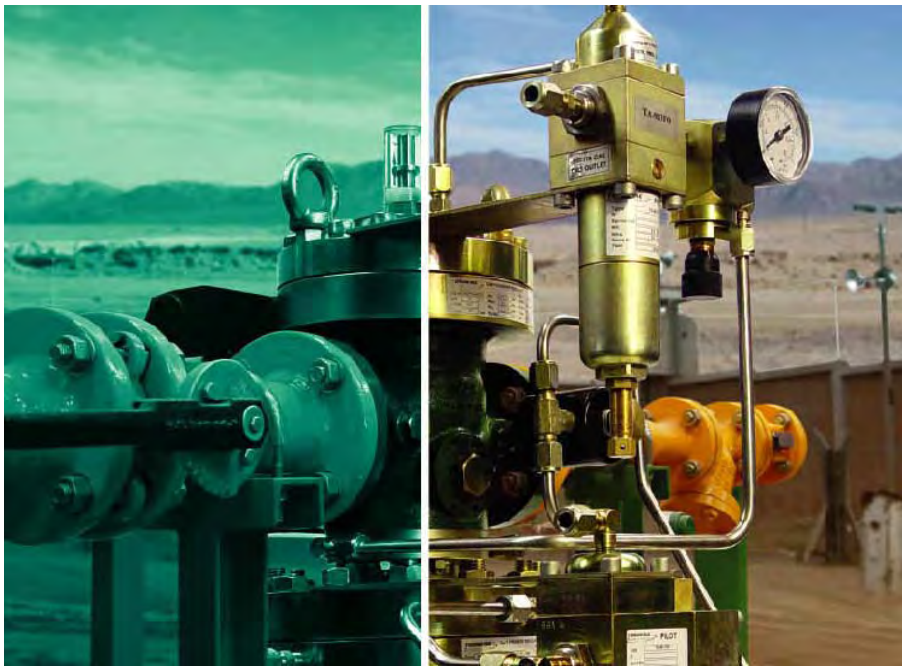
SERIES 956
GAS PRESSURE REGULATORS
AND SSV
INSTALLATION, OPERATING AND MAINTENANCE MANUAL



CONTENTS

IMPORTANT NOTICE

BEFORE INSTALLATION OR ANY MAINTENANCE ON THE EQUIPMENT, READ CAREFULLY THIS MANUAL AND STRICTLY FOLLOW INSTRUCTIONS GIVEN. MANUFACTURER IS NOT RESPONSIBLE FOR DAMAGES DUE TO MISUSE OR WRONG OPERATIN PROCEDURES DUE GENERATED BY A LACK OF KNOWLEDGE OF THIS MANUIAL CONTENT.

This equipment has been manufactured to operate safely and without risks within the design conditions and only if the following points are observed:

1. Installation, operation and maintenance are performed by skilled personnel fully experienced with this type of equipment and familiar with the contents of this manual, all activity are carried out in strict adherence with instructions given in this manual;
2. Operating conditions and, in particular, pressure and temperature, are within the design value of the equipment.

Different use or modifications carried out not in accordance with manufacturer written instructions are not allowed.

The user will be responsible for damages or injuries due to improper use, guarantee will be immediately terminated in case of improper use.

This equipment contains pressure containing parts, therefore any operating or maintenance activity shall be performed only by skilled and qualified personnel aware of the precautions to be taken. Before opening any part of the equipment make sure that pressure has been completely relieved.

Equipment covered by this manual are in accordance with PED 97/23/EC, EN 334 and EN 14382.

The equipment are made of metal and plastic parts that shall be disposed with in accordance with local regulations.

Gas pressure regulators do not need protection against exceeding their allowable limit of pressure if the maximum downstream incidental pressure (MIPd) of the upstream gas pressure regulating station is less than or equal to 1,1 times the maximum allowable pressure (PS) of the regulator itself.

Explosion Risk.

WARNING! Activities marked by this symbol shall only performed by skilled personnel trained on the use and maintenance of this equipment and familiar with the contents of this manual

CAUTION! Information marked are mandatory.

NOTE Important information

PRECAUTION IN THE USE OF THE EQUIPMENT IN POTENTIALLY EXPLOSIVE ATMOSPHERE CE DIRECTIVE 94/9/CE

- Following instructions integrate the content of this manual in accordance with Directive 97/23/CE.
- Equipments described in this manual are in accordance with requisites of Group II category 2 G for non electric equipment to be used in Zone 1.
- All equipments are provided with screwed connection to be connected to the ground system in accordance with local regulations.
- It is furthermore necessary that all other equipment installed in the piping system as well as the piping system itself are correctly grounded in accordance with local regulations.
- Grounding of equipment and their adjoining piping elements shall be performed by the user employing trained personnel following local regulations.
- It is not allowed to disconnect, even temporarily, the equipment from the ground lines.
- It is mandatory that under maintenance activities the equipment end their joined components be continuously connected to the grounding system and that suitable tools are used in order to prevent any type of sparks including electrostatic ones.
- Electrical continuity between bolted parts shall be guaranteed also after maintenance activities by properly cleaning the same from paint or rust or scale.
- It is forbidden to use free flames or electrical systems that are not in accordance with the classified area.
- Maintenance personnel shall be adequately trained with regards to the risks involved in operating in a classified area Zone 1 and Zone 2. Personnel shall carry out its job in accordance with local regulations in operating in a classified area.
- All prescriptions container in Directive 94/9/CE as well as those related to local regulations shall be adequately implemented.
- The equipment shall be suitably protected against rust for the parts that are not made in stainless steel. Care shall be taken not to damage the protective paint.
- Equipment are provided with vent connections in order to collect possible leakage from diaphragms in a safe area.
- All checks prescribed by local regulations shall be carried out and documented.
- Minimum time interval for periodic maintenance as detailed in Par. 10 shall be adhered to. Local regulations shall be applied as well, but time limits in the use of soft components, and in particular diaphragms, shall not be exceeded.
- Do not tamper the supplied equipment.
- TORMENE AMERICANA SA shall not be responsible of any damage or loss of properties or personal injuries derived from an improper application of the equipment or improper application of the instructions given in this manual.

1 INTRODUCTION

This manual provides installation, operating and maintenance instructions for the high and medium pressure family of SERIES 956 gas pressure regulators and Safety Shutoff Valves.
It also provides information on spare parts ordering.
Ancillary equipment are also presented in this manual as far as they are involved with the start up and operation of the main unit. Specific instructions for maintenance shall anyway be found in their manuals.

2 DESCRIPTIONS

2.1 TA-956 SERIES

956 Series of gas pressure regulators for high and medium pressure is a fully modular range of gas pressure regulators and SSV.
The system is made around a top entry body that is capable of housing up to three different functions each equipped with its own pilots, seats and shutter.
This integrated family is the most compact high integrity solution that may be found in the market.
Many years of experience in designing and installing gas pressure regulators and SSV have been condensed in each single part of this family of valves.
There are several basic configurations that may be easily composed into single body integrated units or conventional multi body units.
Gas pressure regulators are highly accurate piloted units capable of delivering high rangeabilty as well as outstanding accuracy. They are all pressure balanced units, soft seated suitable for dry, clean gas applications. They are designed to be used in high, medium and low pressure gas stations in gas transmission, city gates, large capacity distribution systems and power plants.
The SERIES 956 gas pressure regulators provide smooth operation, tight shut off, low noise and long operating life with ease of maintenance.
The family is composed by the following types.

ACRONYM	DESCRIPTION
TA 956 FC	Fail Close Sleeve Type Pressure Regulator
TA 956 DFO	Fail Open Diaphragm Type Pressure Regulators
TA 956 MFO	Fail Open Sleeve Type Pressure Regulator
TA 956 SSV	Fail Close Safety Shutoff Valve

The modular design allows for a very wide combinations of functions housed in the same body, but with completely independent pilots and seats.
Double function units.

ACRONYM	DESCRIPTION
TA 956 FC+SSV	Fail Close Sleeve Type Pressure Regulator With Built in Safety Shutoff Valve
TA 956 DFO+SSV	Fail Open Diaphragm Type Pressure Regulators With Built in Safety Shutoff Valve
TA 956 MFO+SSV	Fail Open Sleeve Type Pressure Regulator With Built in Safety Shutoff Valve
TA 956 SSV	Fail Close Safety Shutoff Valve
TA 956 FC+FC	Fail Close Sleeve Type Pressure Regulator With Built Fail Close Sleeve Type Monitor
TA 956 DFO+FC	Fail Open Diaphragm Type Pressure Regulators With Built in Fail Close Sleeve Type Monitor

ACRONYM	DESCRIPTION
TA 956 MFO+FC	Fail Open Sleeve Type Pressure Regulator With Built Fail Close Sleeve Type Monitor

Triple function units.

ACRONYM	DESCRIPTION
TA 956DFO+FC+SSV	Fail Open Diaphragm Type Pressure Regulator with Built in Fail Close Sleeve Type Monitor With Built in Safety Shutoff Valve
TA 956FC+FC+SSV	Fail Close Sleeve Type Pressure Regulator With Built in Fail Close Monitor With Built in Safety Shutoff Valve
TA 956MFO+FC+SSV	Fail Open Sleeve Type Pressure Regulator with Built in Fail Close Sleeve Type Monitor With Built in Safety Shutoff Valve

TA956 FAMILY

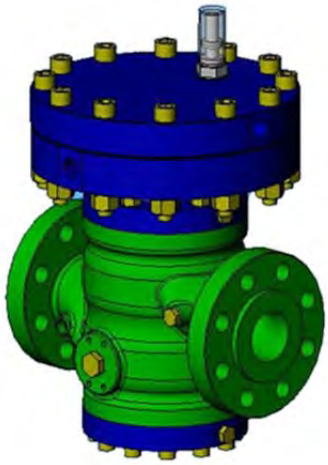
FC+SSV

DFO+SSV

MFO+SSV

DFO+FC

DFO



FC

SSV

MFO

MFO+FC

DFO+FC+SSV

MFO+FC+SSV

FC+FC

FC+FC+SSV

2.2 TA-980 PILOTS

956 SERIES pressure regulators are operated through the 980 FAMILY pilots.
This family of pilots is state of the art equipment suitable for every operating configuration including remote set point modifications.
Series 980 family of pilots comprises the following models.

MODEL	FUNCTION	PRESSURE RANGE (barg)/[psig]
TA-981FC	Fail Close Sleeve Type Pressure Regulators TA-956FC	(0.8 to 43.0) [11 to 624]
TA-981FCR	Fail Close Sleeve Type Pressure Regulators TA-956FC	(0.3 to 0.8) [4 to 11]
TA-982FC	Fail Close Sleeve Type Pressure Regulators TA-956FC	(0.05 to 0.58) [0.73 to 8.4]
TA-983FO	Fail Open Diaphragm Type Pressure Regulators TA-956DFO	(7.0 to 60.0) [101 to 870]
TA-984FO	Fail Open Diaphragm Type Pressure Regulators TA-956DFO	(0.8 to 9.5) [11 to 138]
TA-985FO	Fail Open Diaphragm Type Pressure Regulators TA-956DFO	(0.1 to 2.0) [1.4 to 29]
TA-986FO	Fail Open Diaphragm Type Pressure Regulators TA-956DFO	(0.05 to 0.1) [0.73 to 1.40]
TA-987FO	Fail Open Sleeve Type Pressure Regulators TA-956MFO	(0.8 to 43.0) [11 to 624]

2.3 TA-958 SSV PRESSURE SWITCH

Series 956 SSV are equipped with Series 958 Pressure Switch.
This pressure switch is a dedicated unit that by sensing line pressure is capable of tripping the main valve to the fully closed position in case line pressure is above MAX set point or below MIN set point.
This unit has independent set point springs for Maximum and Minimum pressure.
A local mechanical push button is provided to operate manually the SSV to the closed position.
Series 958 pressure switch can not be re-latched remotely. After the valve has been tripped to the closed position only local manual re-latch is possible using a special wrench provided with the valve.

The following configurations are available

MODEL	FUNCTION	PRESSURE RANGE MIN (barg)/[psig]	PRESSURE RANGE MAX (barg) / [psig]
TA-958CX615	Trip for MAX and MIN pressure	(2.0 to 29.0) [29 to 420]	(3.0 to 76.0) [43 to 1102]
TA-958CX630	Trip for MAX and MIN pressure	(0.8 to 7.0) [11 to 101]	(1.0 to 18.0) [14 to 261]
TA-958CX640	Trip for MAX and MIN pressure	(0.15 to 4.0) [2 to 58]	(0.2 to 10.0) [2.9 to 145]
TA-958CX677	Trip for MAX and MIN pressure	(0.01 to 0.65) [0.14 to 9.5]	(0.015 to 1.2) [0.2 to 17]

3 SPECIFICATIONS

Body sizes:
1” (DN 25), 2” (DN 50), 3” (DN 80), 4” (DN 100), 6” (DN 150), 8” (DN 200), 10” (DN 250)

End Connections and Pressure Ratings
ANSI 600 RF 100.0 barg (1450 psig)
ANSI 300 RF 51.0 barg (740 psig)
ANSI 150 RF 20.3 barg (294 psig)

Temperature range.
-20°C to +60°C (-4 F to 140 F)
Material of construction.
Body: ASTM A216 WCB, Class 150 Nodular Cas Iron ASTM A A 536 GR. 65-45-12
Diaphragm housing: ASTM A105, SAE 1020, ASTM A216 WCB, Class 150 Nodular Cas Iron ASTM A A 536 GR. 65-45-12
Diaphragm: Nitrile rubber with nylon fabric
Seals: Nitrile (NBR) or flouroelastomer (FKM)

Reference Standards:
EN 334
EN 14382 (SSV)
DIRECTIVE 97/23/EC(PED)
ANSI B16.5
ANSI B16.34

FEATURE	DESCRIPTION	TA-956FC	TA-956DFO	TA-956MFO
ΔP_{MIN}	Minimum operating differential pressure	0.5 bar 7.25 psi	0.85 bar 12 psi	1.85 bar 27 psig
bpe	Range of inlet pressure	0.5–100 barg 7.25-1450 psig	1–100 barg 14-1450 psig	2.5–100 barg 36-1450 psig
Wh	Range of regulated pressure	0.3-75.0 barg 4-1087 psig	0.8-60.0 barg 11-870 psig	0.8-75.0 barg 11-1087 psig
AC	Accuracy Class	Up to 1.0	Up to 1.5	Up to 1.0
SG	Lock up pressure class	Up to 2.5	Up to 2.5	Up to 2.5

TA-956SSV have the following characteristics
Range of operating pressure: 0.01 to 100 barg (0.14 to 1450 psig)
Maximum Allowable Pressure (PS)

- #600 102 barg (1480 psig)
- #300 51 barg (740 psig)
- #150 21 barg (305 psig)

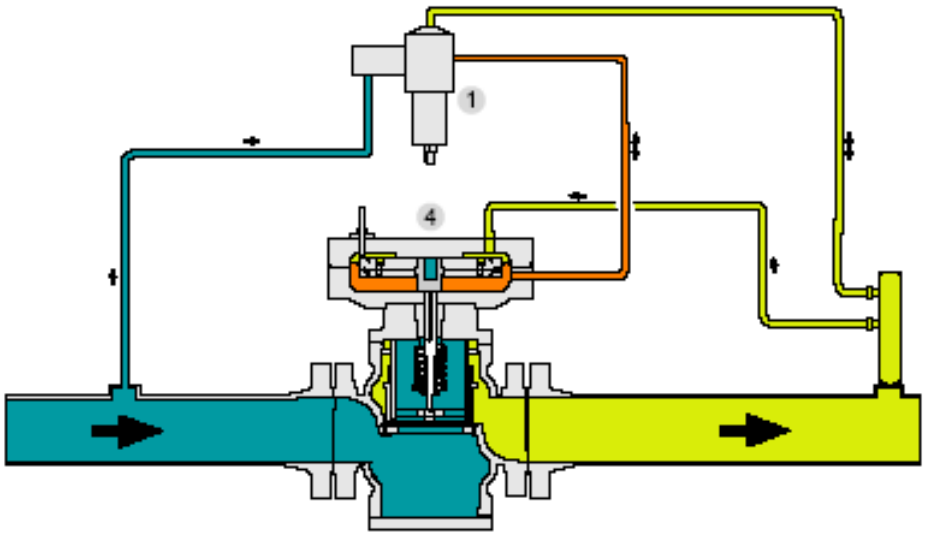
Range of Maximum pressure set point: 0.015 to 76 barg (0.2 to 1102 psig)
Range of Minimum pressure set point: 0.01 to 29.0 barg (0.14 to 420 psig)
Accuracy: up to 0.5%
Re-latch pressure: 15%

4 OPERATING PRINCIPLE

As the 956 Series is modular and several combinations of functions may be accommodated in the same valve body, the operating principle of each function will be analyzed separately for clarity. Combined units do not differ in their operating principle from stand alone units.
After examining the operating principle of each type the available configurations will be presented in the compact multi function feature as well as in the stand alone design.
All 956 Series gas pressure regulators and SSV pressure containing parts are designed to withstand the maximum allowable pressure PS, they are therefore of the Integral Strength type (IS).

4.1 TA-956FC

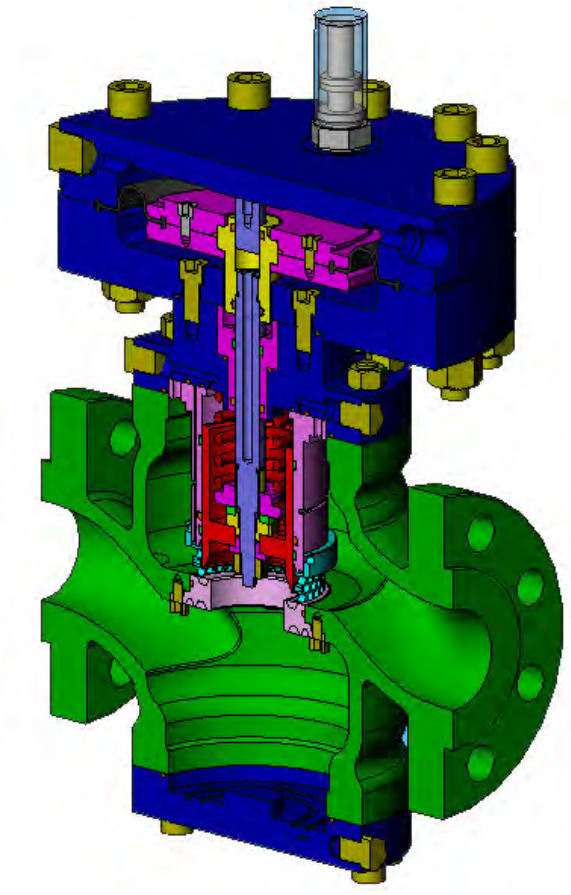
This is a Fail Close reaction pressure regulator, this means that the main valve will move to the fully closed position in case of diaphragm rupture of main valve, diaphragm rupture of pilot, supply pressure to pilot not available.
This Pressure regulator uses a steel sleeve as the shutter, the sleeve is connected to the valve diaphragm by a stem and is therefore rigidly coupled to it. A spring is forcing the shutter to the fully closed position.



The shutter and the stem are fully balanced to the inlet pressure, therefore control accuracy is independent of inlet pressure variations.

The pilot takes high pressure upstream and delivers a motorisation pressure to the lower portion of the control valve diaphragm housing. The other side

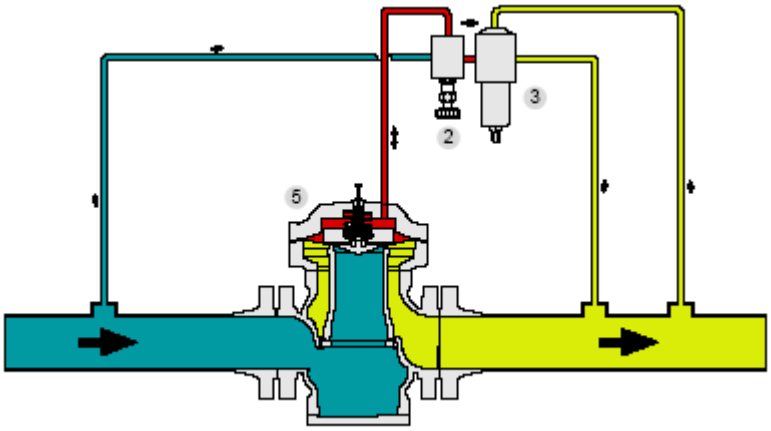
of the control valve diaphragm housing is filled by downstream controlled pressure.
The joint action of control valve spring, downstream pressure and motorising pressure are placed in equilibrium by the selected pilot spring load.
Acting on the pilot spring set screw will increase set point, by increasing compression on the spring, or reduce set point by decreasing compression on the spring.
When the pressure downstream tends to increase due to a reduction of flow rate demand the pilot reacts by closing slightly therefore the motorisation pressure is decreased, excess pressure is released through a calibrated orifice placed across the main valve diaphragm.
With a decrease of motorisation pressure the main valve shutter will be forced by its spring to get to a less open position therefore reducing the flow rate through the valve and re-establishing the controlled pressure at its set point.
If an increased flow rate tends to reduce the downstream pressure the pilot will be forced to a higher degree of opening therefore increasing the



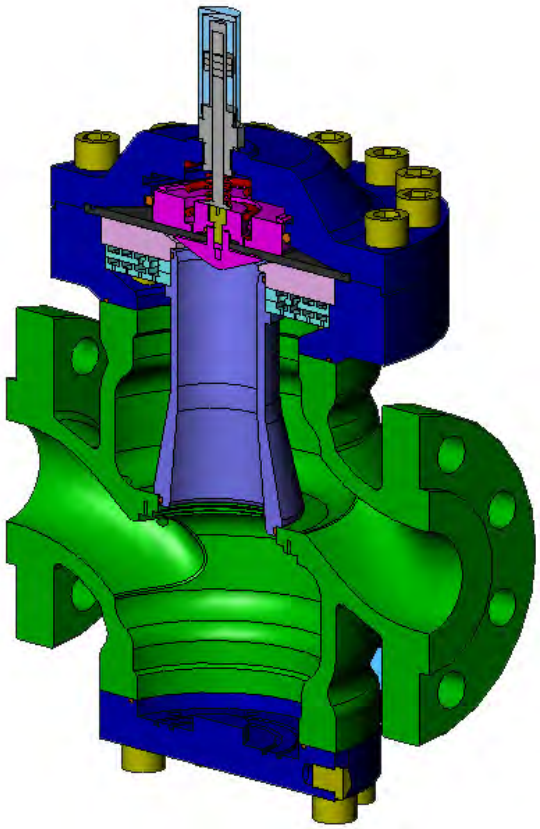
motorising pressure, this, in turn will drive the main valve to a larger opening re-establishing the required set point at the downstream side.

4.2 TA-956DFO

This is a Fail Open reaction pressure regulator, this means that the main valve will move to the fully open position in case of diaphragm rupture of main valve, diaphragm rupture of pilot, supply pressure to pilot not available.



This pressure regulator is based on a special diaphragm that is acting as the shutter itself.
Inlet pressure is taken to the diaphragm – grid area and the position of the diaphragm is controlled by the pressure on its top side. The diaphragm is also forced by a spring against the grid for increased tightness.
This solution allows to reduce drastically the number of parts in the valve and makes maintenance activity less time consuming.

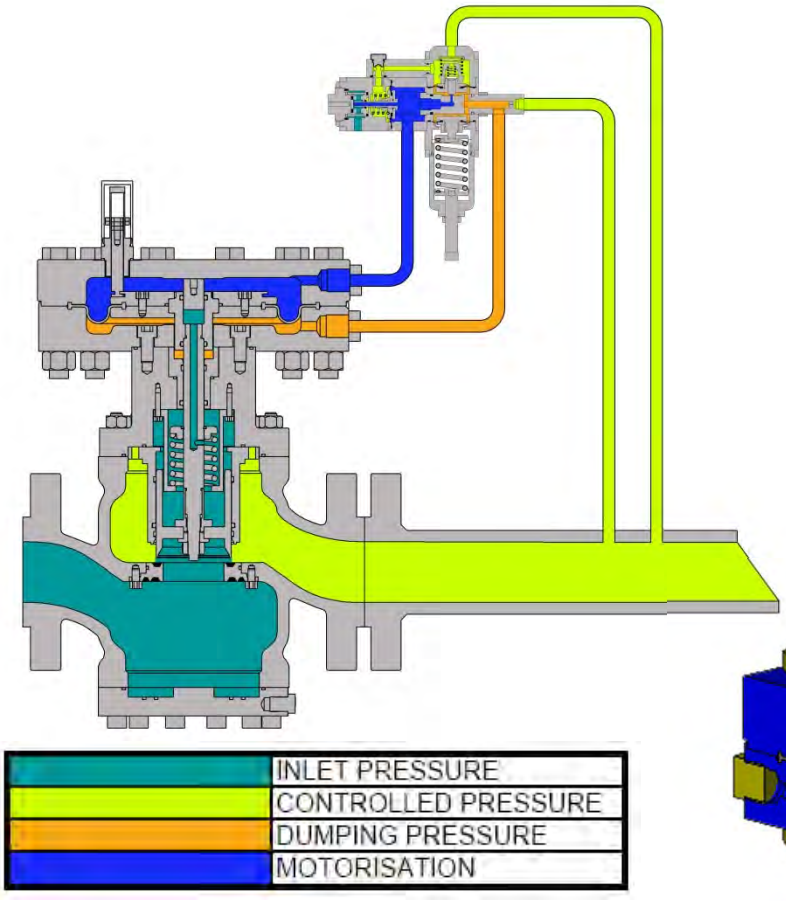


This, of course, comes to a price; use of this type of configuration is not recommended where even fine dust of submicron size is expected in the gas stream.
The piloting system for this valve is made of a combination of flow restrictor TA-VRC05_A and a FO pilot.
The laminating valve is supplying pressure to the pilot and to the upper chamber of the main valve diaphragm housing. The fixed position of the restrictor, adjustable, is providing to the upper chamber of the main valve diaphragm a pressure that may reach the upstream value, in the fully closed position, or a intermediate value when the pilot is maintaining the required downstream pressure. The pilot takes its gas supply from the upper diaphragm chamber itself. When pressure is increasing downstream by effect of a reduction in flow rate, the pilot moves slightly to the closed position, therefore reducing the flow through it seat and, at the same time, increasing the pressure in the main valve upper diaphragm chamber. This increased pressure forces the main valve diaphragm to a closer position therefore reducing the flow passed and re-establishing the controlled pressure to the set value.
When downstream pressure decreases by effect of a reduced demand of flow, the pilot tends to open and at the same time reduces the pressure on the upper chamber of the main valve diaphragm. This

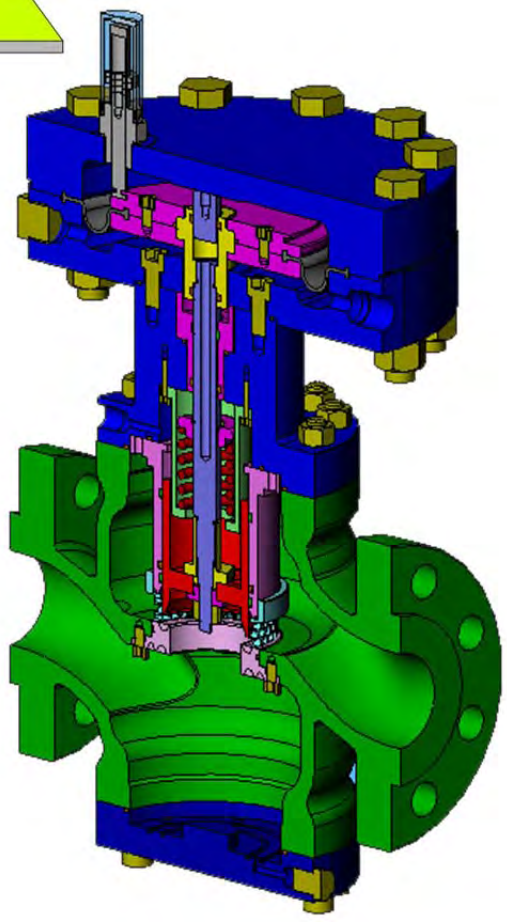
allows the diaphragm to take a less closed position allowing a higher flow to pass through and re-establishing the controlled pressure to the set value.

4.3 TA-956MFO

This is a Fail Open reaction pressure regulator, this means that the main valve will move to the fully open position in case of diaphragm rupture of main valve, diaphragm rupture of pilot, supply pressure to pilot not available.

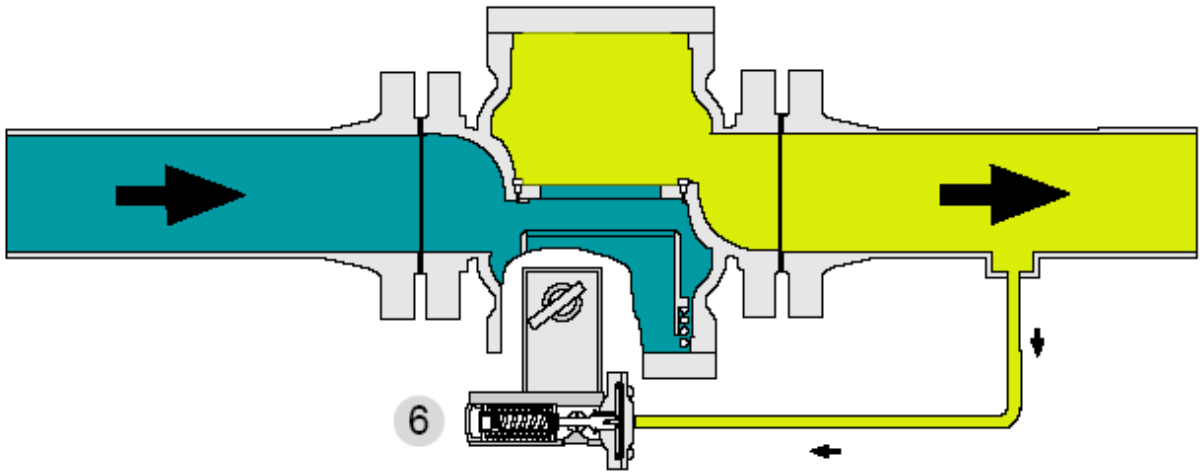


This Pressure regulator uses a steel sleeve as the shutter, the sleeve is connected to the valve diaphragm by a stem and is therefore rigidly coupled to it. A spring is forcing the shutter to the fully open position.
The shutter and the stem are fully balanced to the inlet pressure, therefore control accuracy is independent of inlet pressure variations
The pilot takes gas supply form the high pressure side. It generates an intermediate pressure called motorisation which is sent to the upper chamber of the main valve diaphragm, the same pressure is than used to generate a dumping pressure .
When the downstream pressure increases by effect of a reduction in flow rate the pilot close slightly and the dumping pressure is reduced so the motorisation pressure prevails and brings the main valve to a less open position therefore re-establishing the controlled pressure value.
When an increase of flow rate generates a reduction in the downstream pressure the pilot opens a little and the dumping pressure increases, forcing the main valve shutter to open a little therefore re- establishing the controlled pressure level.

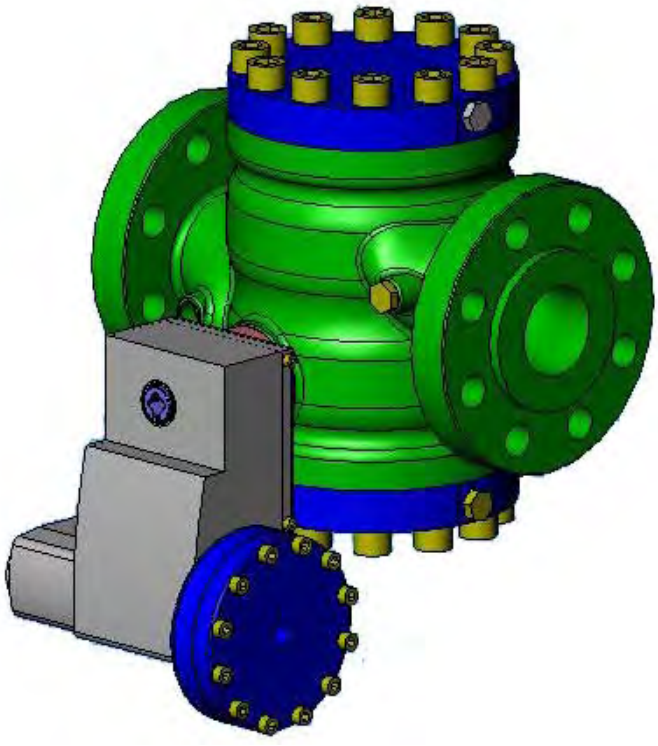


4.4 TA-956SSV

This type of valve is used as a safety measure to cut the gas flow in case of downstream pressure higher than the MAX set point or lower than the MIN set point.



This valve is equipped with a spring loaded shutter that is maintained in the open position by a mechanism that is controlled by a pressure switch.



The pressure switch may be equipped with one ore more of the following control modes:

- minimum pressure control;
- maximum pressure control;
- minimum and maximum pressure control;
- manual control (local button);
- remote control with 3-way solenoid valve(optional).

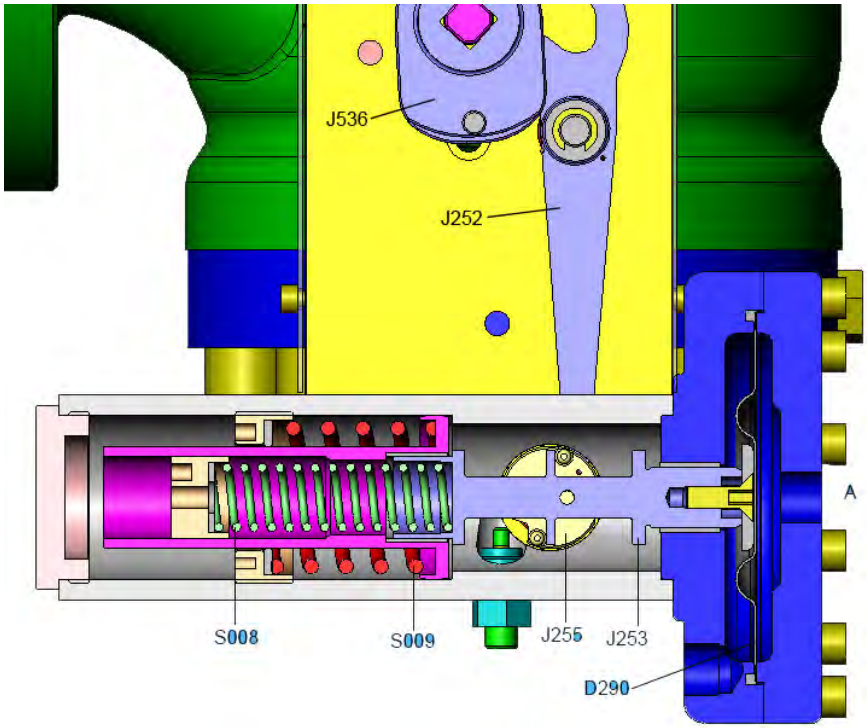
Once the set point according to the installed spring is reached the pressure switch releases the latching mechanism that in turn let the shutter close. The shutter is fully balanced therefore its operation is not affected by pressure. In the fully closed position the shutter sealing is also supported by differential pressure.

Pressure to be monitored is sent to port A were it acts on the diaphragm D290, the force generated by pressure is balanced by the set point springs S009 for MAX set point and S008 for MIN set point.

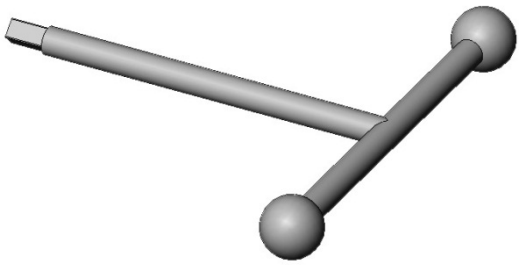
The stem J253 connects the springs to the diaphragm. The position of the stem J253 determines the rotation of balance J255. Part J255 retains release lever J252, which, in turn, retains the latching lever J536.

When the pressure increases the stem J255 is forced to move against spring S009 therefore imposes a rotation to the balance J255 that releases the “release lever” J252 and finally the latching lever J536.

This allow the cam that retains the SSV shutter in fully open position to rotate and let the shutter close.
The system may be re-latched to the open position only when the pressure conditions allow for that and only by operating the latching lever J536 to the open position using the suitable wrench.



Remote operation is possible by installing an optional solenoid valve mono stable that in normal conditions would maintain the connection of the pressure switch head to the monitored line. When the valve is remotely tripped it will connect the pressure switch head to atmosphere therefore venting the pressure entrained and generating a minimum pressure trip
The SSV can be always closed with the manual button J258. This button **MUST BE** used only by qualified personnel during normal maintenance operations or during emergencies.

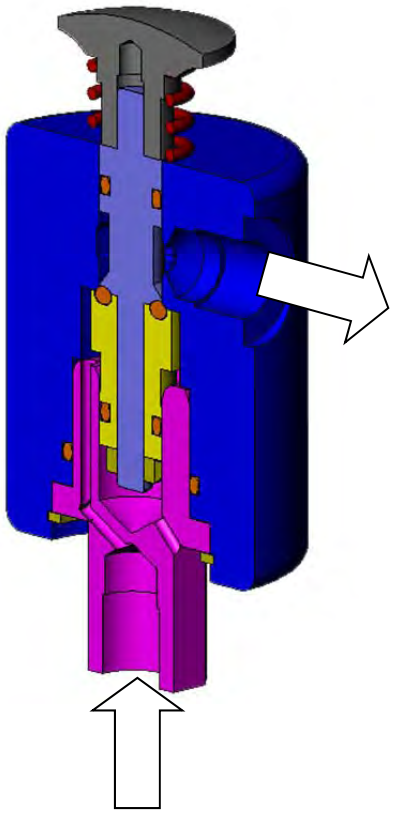


4.5 ACCESSORIES

Several accessories are available for the SERIES 956 integrated gas pressure regulators. Some of them are of standard supply in specific applications others are required by some gas plant configurations.

4.5.1 PUSH BUTTON

This accessory is normally used in conjunction with TA-956SSV either built in or as separate unit when line pressure is above 20 barg (290 psig).
This equipment allows the equalization of pressure across the SSV shutter.
It is a fully balanced 2 way valves equipped with a fail close string.
In applications with pressure in excess of 20 barg (290 psig) the force required to re-latch the SSV shutter may be excessive due to the positive pressure action in the closed position. Operating the push button will equalize de pressure across the shutter leaving only the load generated by the closure spring to be dealt with by means of the wrench.
Push button is a fully balanced fail close pop valve, therefore force required to operate it is independent of the line pressure.
Push button is designed to operate up to 100 barg (1450 psig).



5 CONFIGURATIONS

The following configurations will be presented, other configurations are available on request in order to fulfil specific process needs, their description will be included in specific addendum of this manual related to the project they are used in.

- TA-956FC+SSV
- TA-956FC+FC
- TA-956FC+FC+SSV
- TA-956FC+FC+QEV
- TA-956FC+FC+SSV+QEV
- TA-956DFO+SSV
- TA-956DFO+FC
- TA-956DFO+FC+QEV
- TA-956DFO+FC+SSV
- TA-956DFO+FC+SSV+QEV
- TA-956MFO+SSV
- TA-956MFO+FC
- TA-956MFO+FC+QEV
- TA-956MFO+FC+SSV
- TA-956MFO+FC+SSV+QEV

Some of the most used configurations include a monitor valve; this valve, normally installed upstream of the active regulator, may operate in two different ways, fully open monitor or working monitor.

Fully open monitor is a valve that is set to a pressure slightly higher than the active regulator set and therefore is always open while the entire pressure drop is achieved in the active regulator.

This is the most common configuration that in some instances may be equipped with a Quick Exhaust Valve in the monitor piloting system in order to make the take over of the monitor faster. The QEV acts as a relief system in the motorising chamber of the monitor, so upon an increase of downstream pressure, due to failure of active, it vents the motorising chamber of the monitor to atmosphere taking very fast the valve to the correct opening required by the flow rate.

The other monitor arrangement, called working monitor, uses the monitor as a first step pressure reducing valve followed by a second stem made by the active regulator. In this type of installation an intermediate pressure between upstream and downstream values is selected and the working monitor is set to control this pressure before the active valve. This is achieved by adding a second pilot to the monitor with a sensing point located in the pipe between monitor end active. In normal operation is this second pilot that drives the monitor to control the intermediate pressure; if active valve fails the first pilot of the monitor comes into operation and make possible that all required pressure drop is taken by the monitor itself. This configuration has the advantage of splitting the pressure drop in two valves, with the relevant noise abatement, and, also, of keeping the monitor operating at the same time as the active. The latter means that the monitor is always in the condition of taking over full pressure differential and is not required to be checked for correct operation after long time standing in fully open position.

It shall be noted that in the multi function units of TA-956 family only fully open monitor may be installed.

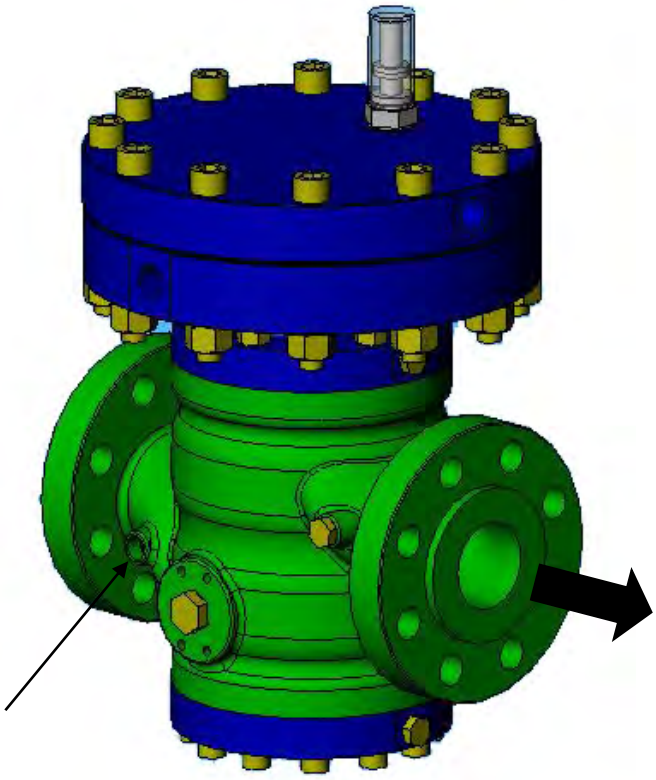
In case of working monitor configuration two different valve bodies are required in order to have the necessary expansion volume between working monitor and active.

High pressure connection is shown from the inlet piping in the following diagrams for better understanding.

NOTE

Although this is a correct installation, equipment are supplied with a connection to the upstream side of the body for ease of installation.

See picture below.



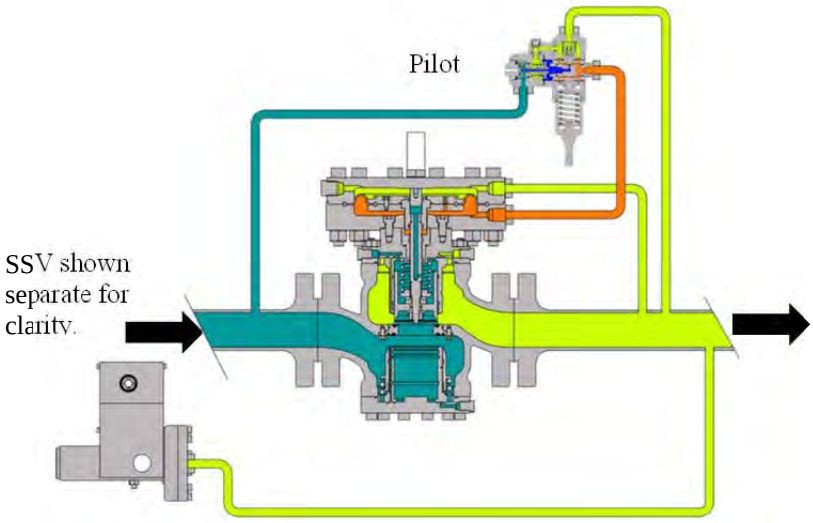
Tapping points are all shown WITHOUT isolating valves.

WARNING!

This configuration is the safest in order to avoid wrong pressurization of the system.

Some installation may require that every pressure tapping on the line be equipped with isolation valves. In this case care shall be taken to remove wrenches from the isolation valves in order to prevent accidental closure of the tapping points.

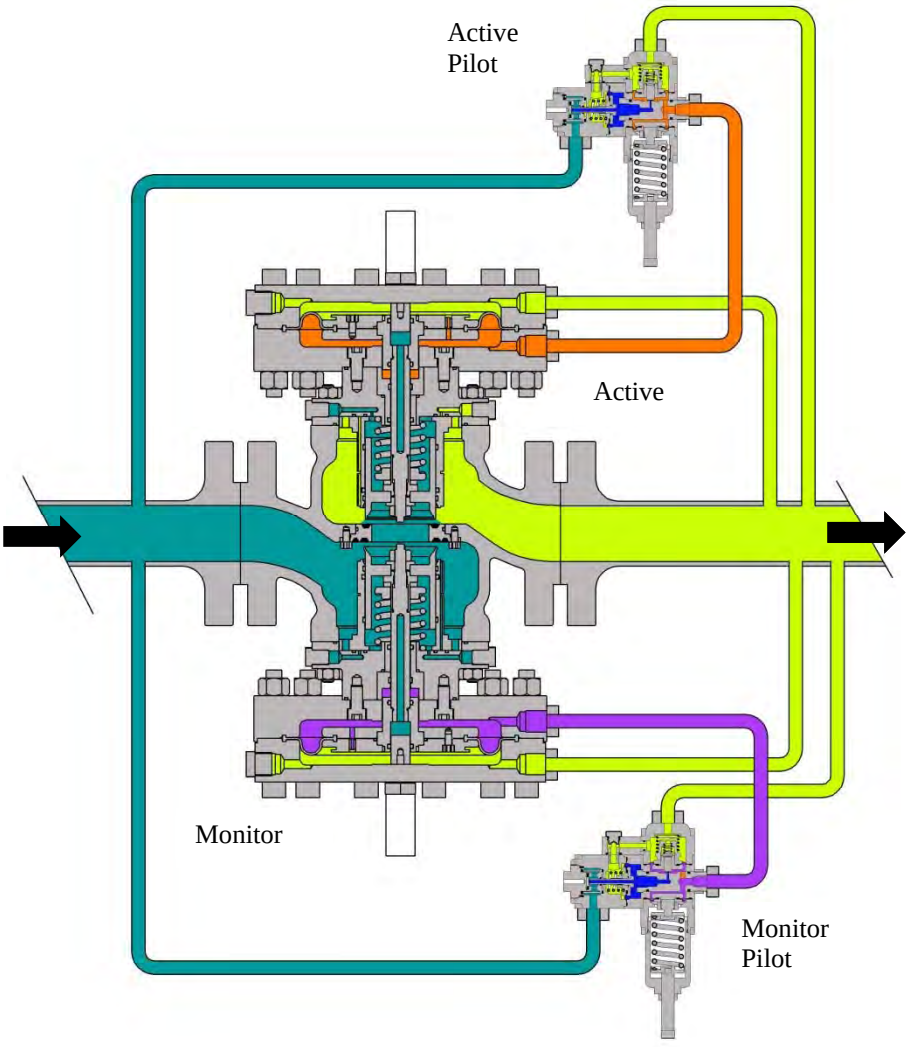
5.1 TA-956FC+SSV



This is a typical configuration for a stand alone unit equipped with a SSV suitable for High and Low pressure protection of the system
Pilots may be: TA-981FC, TA-981FCR, TA-982FC according to the controlled pressure range required.
SSV pressure switch may be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.

PRESSURE LEGEND	
	INLET
	CONTROLLED
	FIRST STAGE PILOT
	MOTORISATION

5.2 TA-956FC+FC



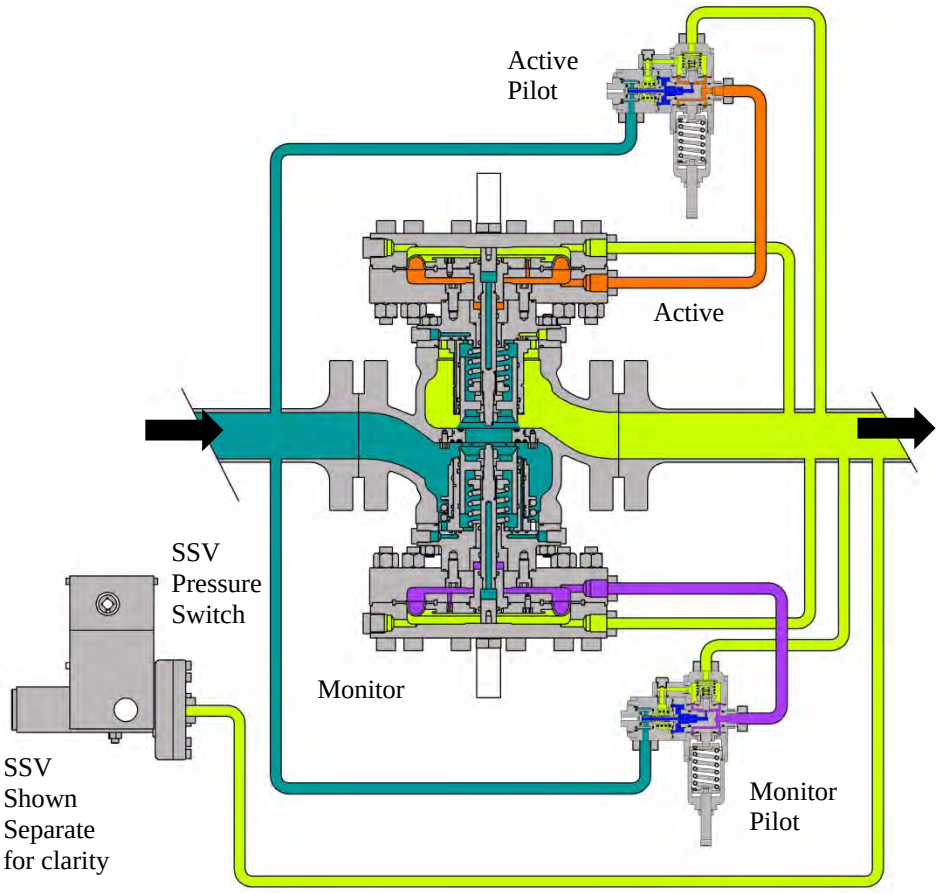
This is a typical configuration for a fully open monitor installation. The downstream valve, called active, operates as a full drop pressure regulator, meanwhile the upstream valve, called monitor, is standing in the fully open position. This is obtained by setting the monitor controlled pressure to a slightly higher value than the active set point. In this way the monitor, trying to bring the downstream pressure to its set point, will keep in the open position while the pressure drop is managed by the active. If for some reasons the active is no longer capable of controlling downstream pressure the monitor will start to take the pressure control action as soon as the downstream pressure will reach its set point.

Pilots may be for both monitor and active: TA-981FC, TA-981FCR, TA-982FC according to the controlled pressure range required.

PRESSURE LEGEND
INLET
CONTROLLED
FIRST STAGE PILOT
MOTORISATION ACTIVE
MOTORISATION MONITOR

5.3 TA-956FC+FC+SSV

This is a configuration that adds to the previous another safety level by having a Safety Shutoff Valve built in the same body.

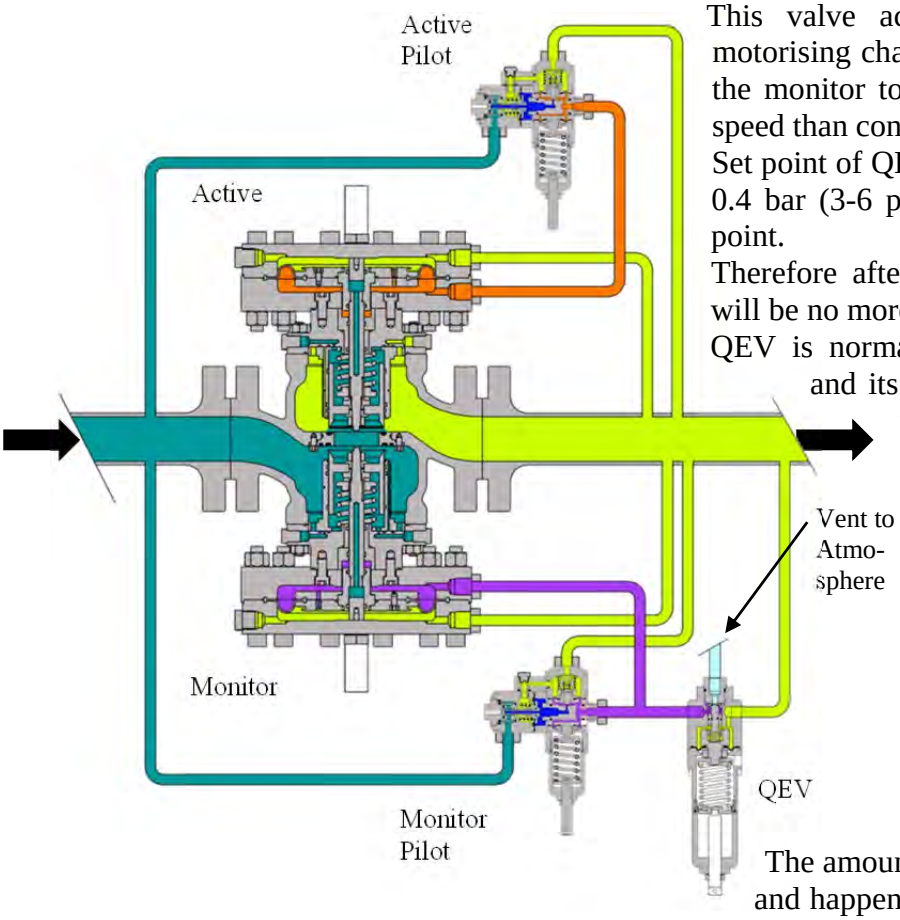


The SSV may be equipped with MAX, MIN, or both protection modes.
Pilots may be for both monitor and active: TA-981FC, TA-981FCR, TA-982FC according to the controlled pressure range required.
SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.

PRESSURE LEGEND
INLET
CONTROLLED
FIRST STAGE PILOT
MOTORISATION ACTIVE
MOTORISATION MONITOR

5.4 TA-956FC+FC+QEV

This configuration has the same performance of the FC+FC of Point 5.2, but it has an additional Quick Exhaust Valve installed on the monitor.
This QEV is used in order to guarantee a quick exchange from active to monitor in case of active failure.



This valve acts as a relief valve of the motorising chamber of the monitor and brings the monitor to the closed position at a faster speed than conventional setup.
Set point of QEV shall always be selected 0.2-0.4 bar (3-6 psi) higher than the monitor set point.
Therefore after the monitor takes over there will be no more discharge from the QEV.
QEV is normally discharging to atmosphere and its vent shall be adequately piped to a suitable position.

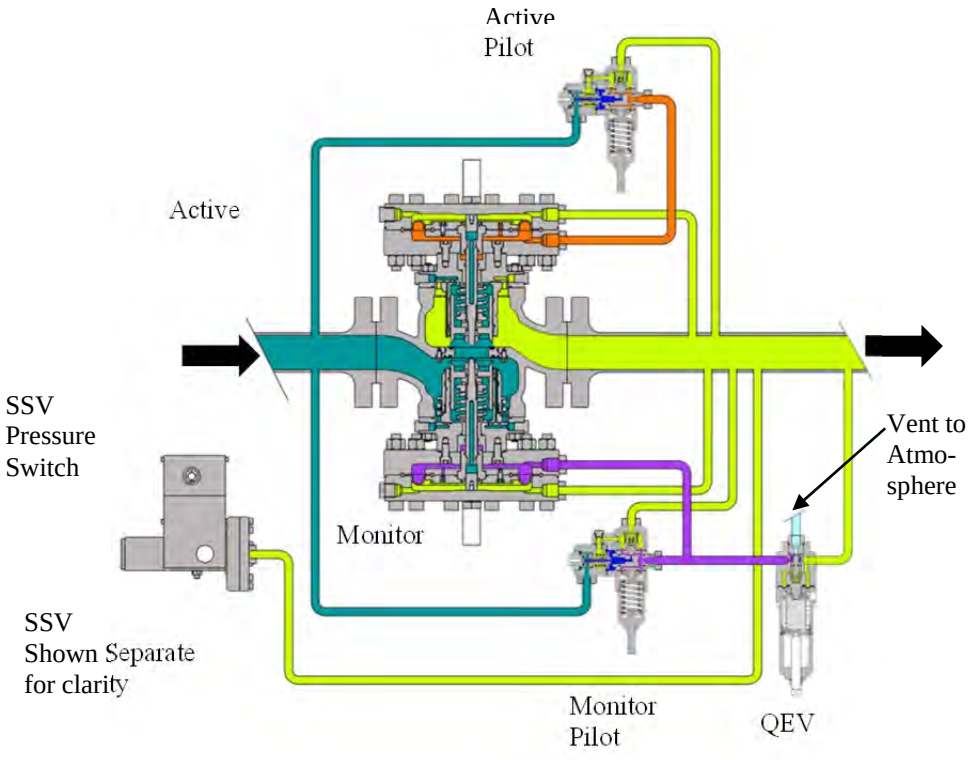
The amount of gas discharged is minimum and happens only in the transition from the active operation to the monitor operation.

PRESSURE LEGEND	
	INLET
	CONTROLLED
	FIRST STAGE PILOT
	ATMOSPHERIC
	MOTORISATION ACTIVE
	MOTORISATION MONITOR

Pilots may be for both monitor and active: TA-981FC, TA-981FCR, TA-982FC according to the controlled pressure range required. QEV may be one of the following: TA-981QEV, TA-982QEV according to the controlled pressure range required.

5.5 TA-956FC+FC+SSV+QEV

This configuration adds to the previous a Safety Shutoff Valve for extra protection of downstream piping under minimum and maximum pressure.



PRESSURE LEGEND	
	INLET
	CONTROLLED
	FIRST STAGE PILOT
	ATMOSPHERIC
	MOTORISATION ACTIVE
	MOTORISATION MONITOR

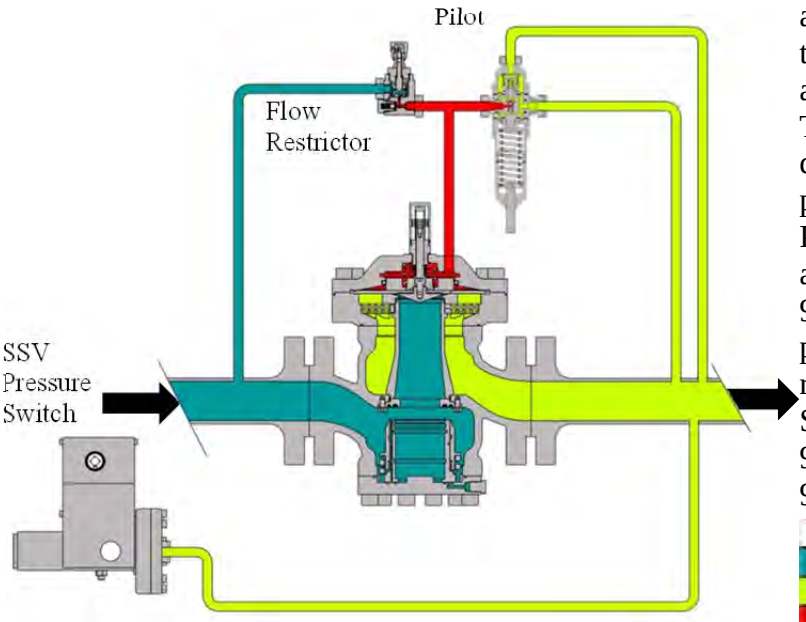
Pilots may be for both monitor and active: TA-981FC, TA-981FCR, TA-982FC according to the controlled pressure range required.

SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.

QEV may be one of the following: TA-981QEV, TA-982QEV according to the controlled pressure range.

5.6 TA-956DFO+SSV

This configuration is used in many applications where the accuracy of the controlled pressure is not a critical factor and the advantage in the maintenance downtime is appreciated.



The built in SSV may be set to protect downstream piping from Low or High pressure or both.

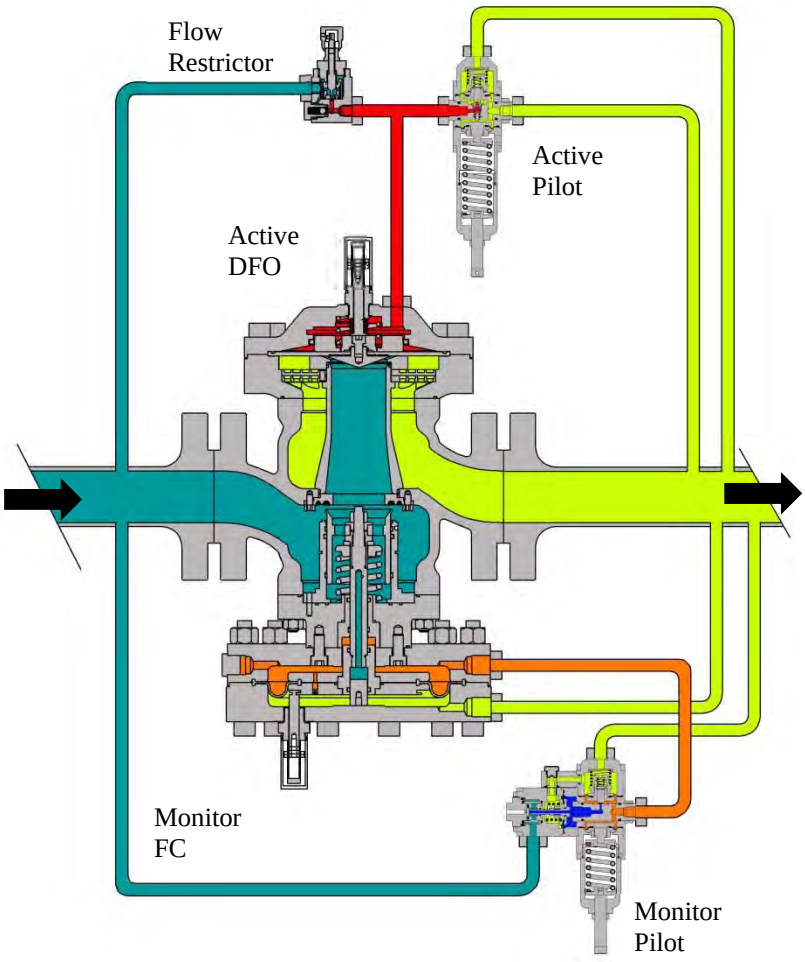
Pilots may be for both monitor and active: TA-981FC, TA-981FCR, TA-982FC according to the controlled pressure range required. Flow restrictor is TA-VRC05_A.

SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.

PRESSURE LEGEND
INLET
CONTROLLED
MOTORISATION

5.7 TA-956DFO+FC

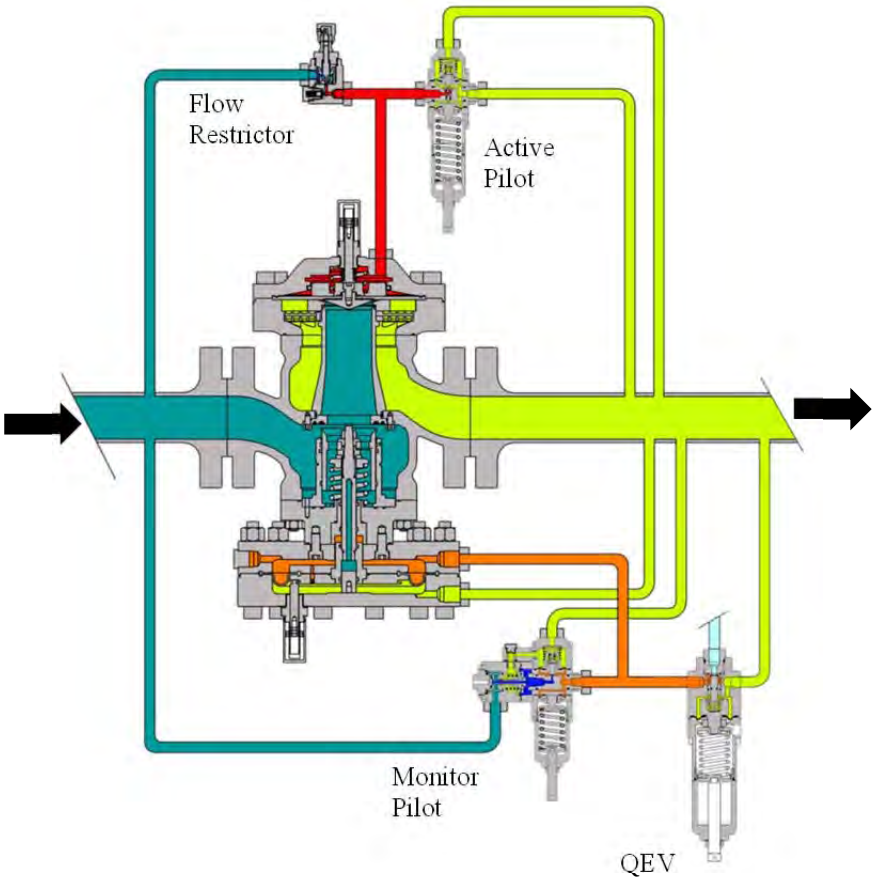
This a typical configuration with fail open active and fail close monitor. The fail open diaphragm type guarantees smooth operation and ease of maintenance with very limited number of moving parts. Fail close monitor is set to a somehow higher controlled pressure and takes over pressure control in case of failure of the active. Active may equipped with the following pilots according to range of controlled pressure: TA-983FO, TA-984FO, TA-985FO, TA-986FO. Flow restrictor is TA-VRC05_A. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC.



PRESSURE LEGEND
INLET
CONTROLLED
MOTORISATION ACTIVE DFO
FIRST STAGE PILOT MONITOR
MOTORISATION MONITOR

5.8 TA-956DFO+FC+QEV

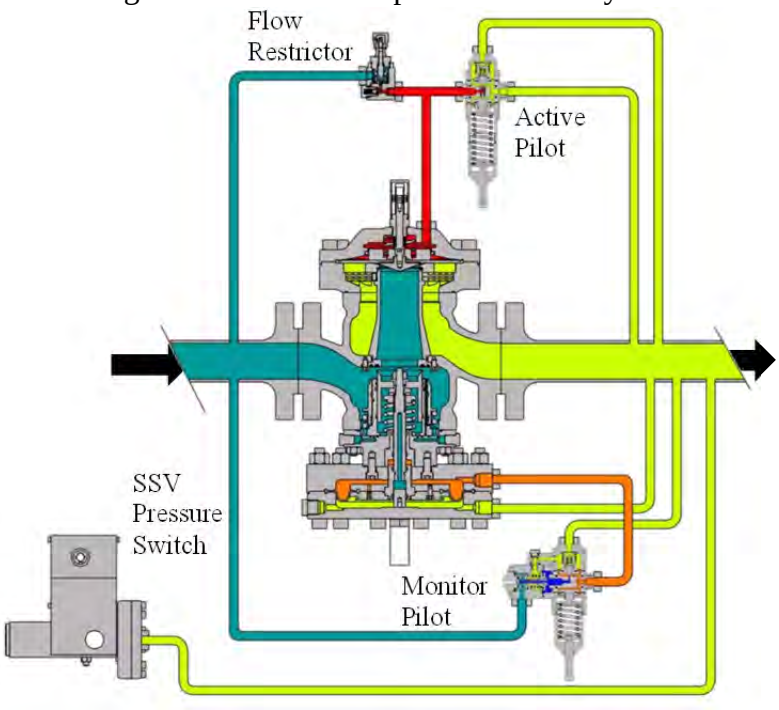
This a typical configuration with fail open active and fail close monitor. The fail open diaphragm type guarantees smooth operation and ease of maintenance with very limited number of moving parts. Fail close monitor is set to a somehow higher controlled pressure and takes over pressure control in case of failure of the active. Active may equipped with the following pilots according to range of controlled pressure: TA-983FO, TA-984FO, TA-985FO, TA-986FO. Flow restrictor is TA-VRC05_A. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC. QEV may be one of the following: TA-981QEV, TA-982QEV according to the controlled pressure range.



PRESSURE LEGEND
INLET
CONTROLLED
FIRST STAGE PILOT
ATMOSPHERIC
MOTORISATION ACTIVE
MOTORISATION MONITOR

5.9 TA-956DFO+FC+SSV

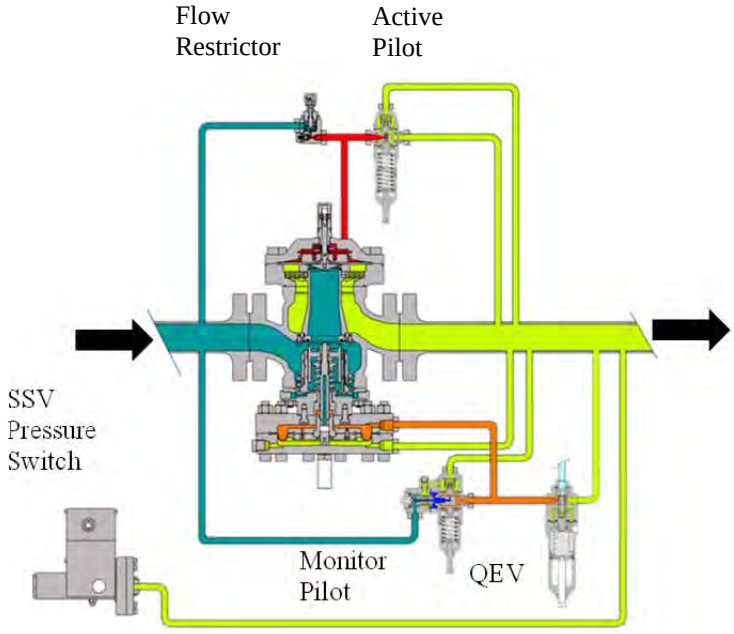
This configuration adds to the previous a Safety Shutoff Valve for extra protection of downstream piping under minimum and maximum pressure. Active may equipped with the following pilots according to range of controlled pressure: TA-983FO, TA-984FO, TA-985FO, TA-986FO. Flow restrictor is TA-VRC05_A. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC. SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.



PRESSURE LEGEND
INLET
CONTROLLED
MOTORISATION ACTIVE DFO
FIRST STAGE PILOT MONITOR
MOTORISATION MONITOR

5.10 TA-956DFO+FC+SSV+QEV

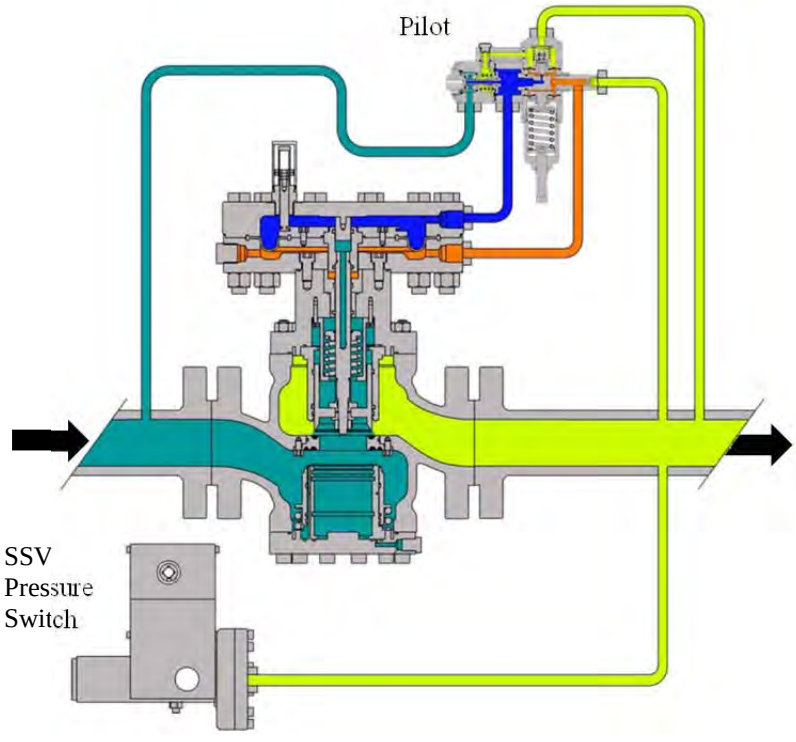
This configuration adds to the previous a Safety Shutoff Valve for extra protection of downstream piping under minimum and maximum pressure.



Active may equipped with the following pilots according to range of controlled pressure: TA-983FO, TA-984FO, TA-985FO, TA-986FO. Flow restrictor is TA-VRC05_A. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC. SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected. QEV may be one of the following: TA-981QEV, TA-982QEV according to the controlled pressure range.

PRESSURE LEGEND
INLET
CONTROLLED
FIRST STAGE PILOT
ATMOSPHERIC
MOTORISATION ACTIVE
MOTORISATION MONITOR

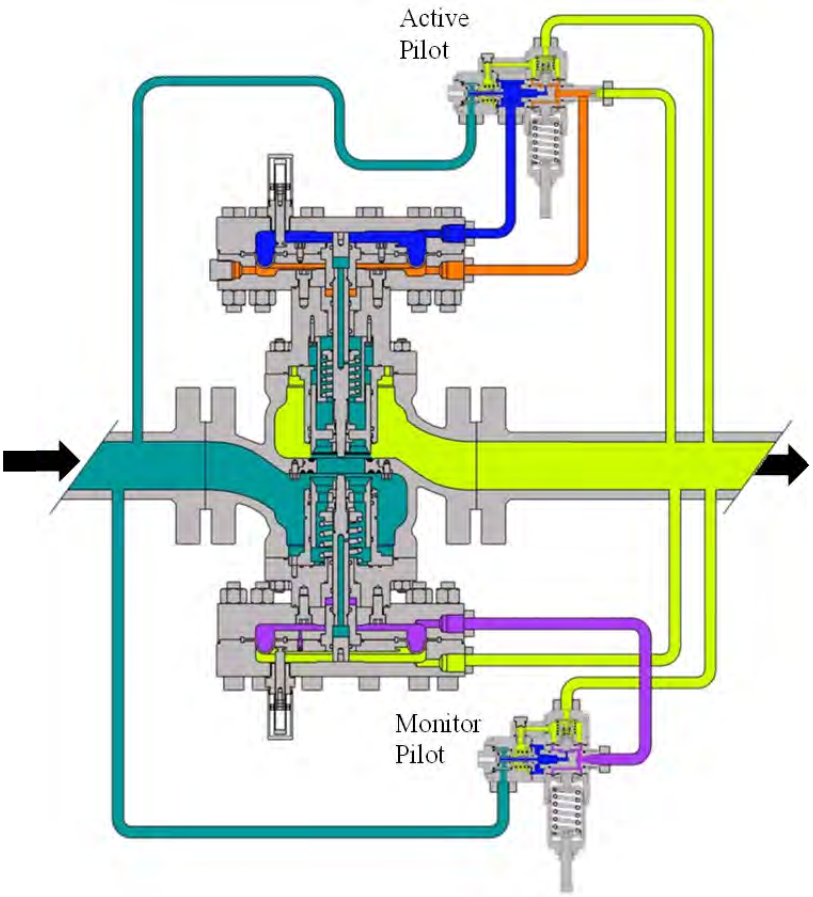
5.11 TA-956MFO+SSV



This configuration is based on a fail open sleeve type pressure regulator and a SSV in the same body. Regulator may be equipped with pilot TA-987FO. SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.

PRESSURE LEGEND
INLET
CONTROLLED
MOTORISATION
DUMPING

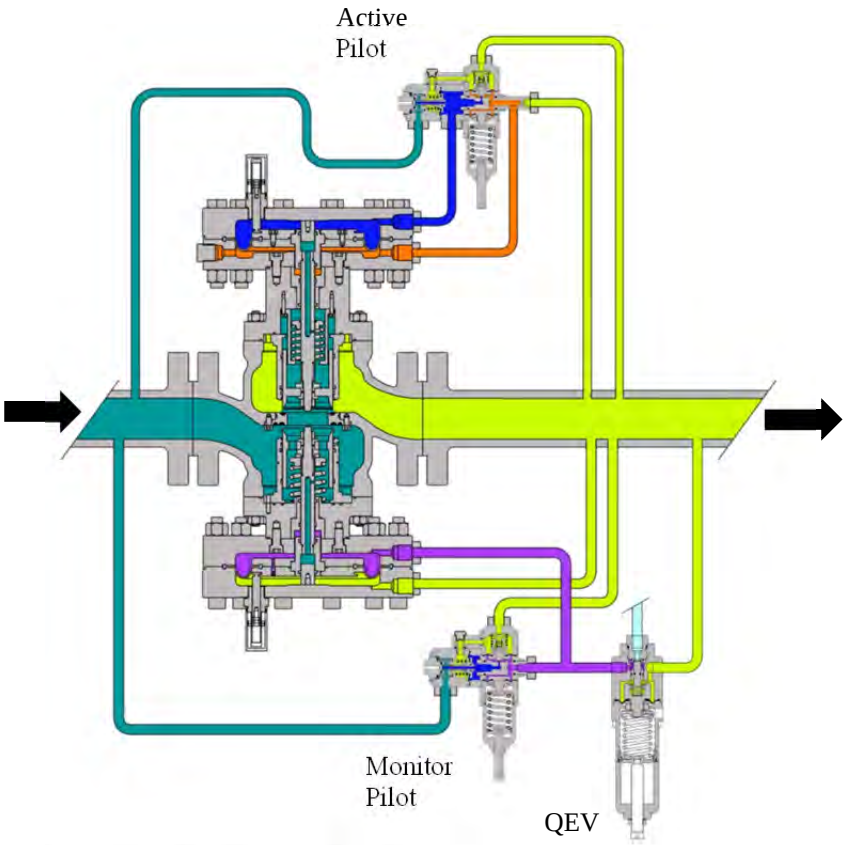
5.12 TA-956MFO+FC



This a typical configuration with fail open active and fail close monitor. The fail open sleeve type guarantees excellent performance and rangeability even under the most demanding process conditions. Fail close monitor is set to a somehow higher controlled pressure and takes over pressure control in case of failure of the active. Active may equipped with the pilot TA-987FO. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC.

PRESSURE LEGEND
INLET
CONTROLLED
FIRST STAGE PILOT
DUMPING
MOTORISATION MONITOR

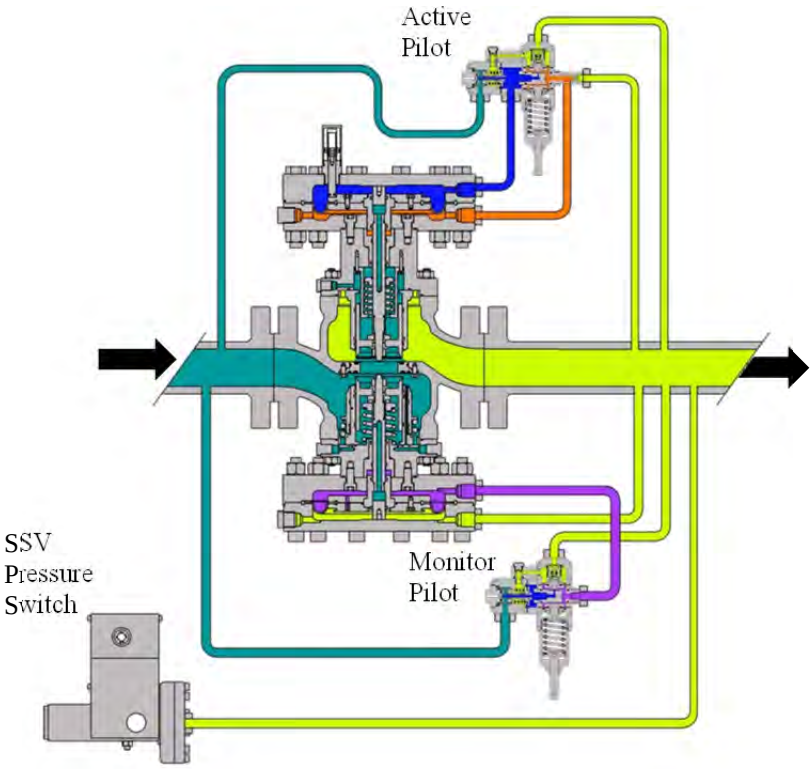
5.13 TA-956MFO+FC+QEV



This configuration adds to the previous one a QEV to allow a faster take over of the monitor. Active may equipped with the pilot TA-987FO. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC. QEV may be one of the following: TA-981QEV, TA-982QEV according to the controlled pressure range.

PRESSURE LEGEND
INLET
CONTROLLED
ATMOSPHERIC
F. ST. PILOT & MOTORISATION
DUMPING
MOTORISATION MONITOR

5.14 TA-956MFO+FC+SSV

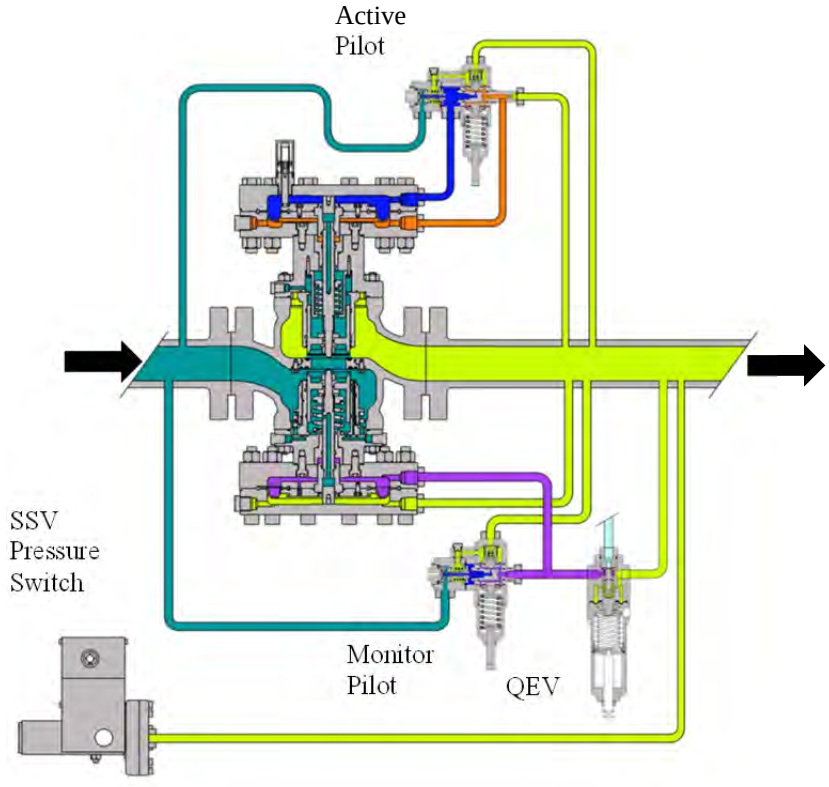


This configuration adds to the previous a Safety Shutoff Valve for extra protection of downstream piping under minimum and maximum pressure. Active may equipped with the pilot TA-987FO. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC. SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.

PRESSURE LEGEND
INLET
CONTROLLED
FIRST STAGE PILOT
DUMPING
MOTORISATION MONITOR

5.15 TA-956MFO+FC+SSV+QEV

This configuration adds to the previous one a QEV to allow a faster take over of the monitor. Active may equipped with the pilot TA-987FO. Monitor may be equipped with the following pilots according to range of controlled pressure: TA-981FC, TA-981FCR, TA-982FC. QEV may be one of the following: TA-981QEV, TA-982QEV according to the controlled pressure range. SSV pressure switch will be: TA-958CX615, TA-958CX630, TA-958CX640, TA-958CX677 according to the range of pressure to be protected.



PRESSURE LEGEND
INLET
CONTROLLED
ATMOSPHERIC
F. ST. PILOT & MOTORISATION
DUMPING
MOTORISATION MONITOR

6 PREVENTION

Before starting installation and maintenance operations carry out the following check list.

1 Personnel in charge of the activity is skilled, trained to this type of equipment and fully aware of the content of this manual
2 Al necessary prevention measures have been taken before commencing the job in accordance with this manual and local regulations.
3 Operator is equipped with necessary tools and consumables required to safely and correctly apply the procedures described.
4 All special tools and proper lifting equipment in accordance with local regulation are available
5 All necessary spare parts are available and they are Original Spare Parts of Tormene Americana SA

7 INSTALLATION

WARNING!

Explosion Risk.

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gas may accumulate, causing personal injury, death, or property damage due to bursting of pressure-retaining parts. Vent a regulator in hazardous gas service to a remote, safe location away from air intakes or any hazardous location. The vent line or stack opening must be protected against condensation or clogging.

7.1-BEFORE INSTALLATION, check that:

- the regulator and its accessories have not been damaged during transport;
- the inlet and outlet flanges are free from dirt and any other foreign material;
- the face-to-face dimension of the regulator is equal to the face-to-face dimension available in the piping;
- the upstream and downstream pipes are at the same level;
- the pipe flanges are parallel to each other and perpendicular to the piping axis;
- all dirt has been cleaned from the upstream piping.

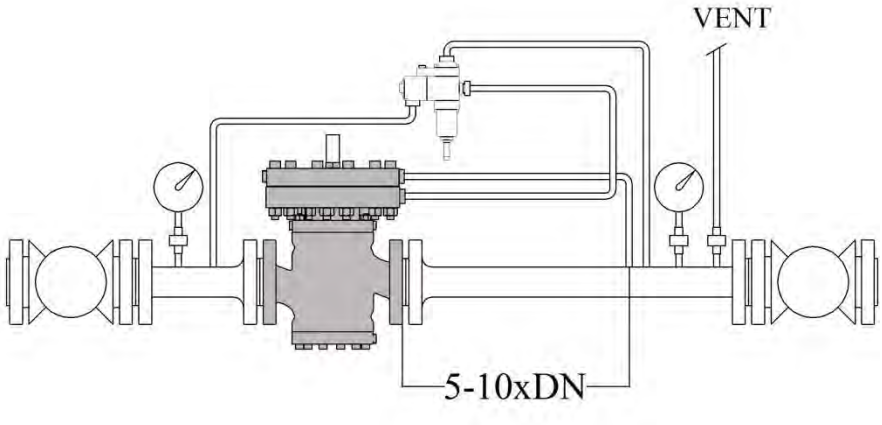
7.2-DURING IN-LINE INSTALLATION, follow the instructions below:

CAUTION!

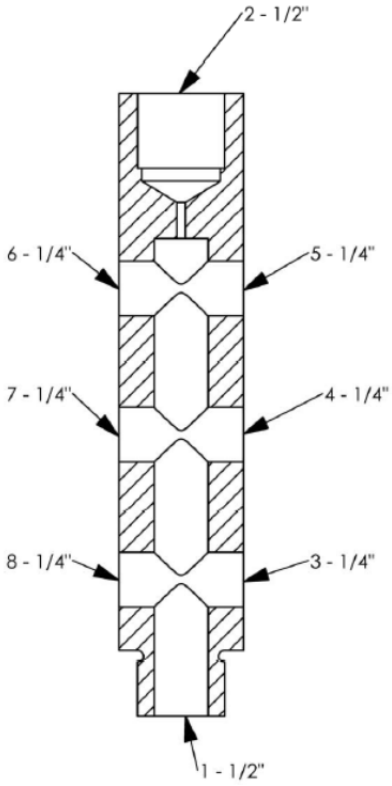
Use the eyebolts provided or suitable stripes correctly placed for handling the equipment, avoiding damaging the external parts (control panels and/or trip devices).

- The regulator must be positioned so that the gas direction corresponds to the direction indicated by the arrow on the body.
- The sensing points for the pilots, and regulators must be positioned as shown in next figure. In particular, the downstream sensing points must be at a straight-line distance from the regulator of 5 to 10 times the diameter of the downstream piping.

- It is advisable to install two pressure gauges, one upstream and one downstream of the regulator near the sensing points.
- It is advisable to install downstream of the regulator, before the outlet valve, a vent valve for discharge to the atmosphere.



Connections of sensing point tubing may be performed individually with one pressure take off for each tubing or using a manifold as detailed in the side picture.
Using the manifold allows for a much compact installation.
Connecting ports in the manifold shall be assigned according to the following table.



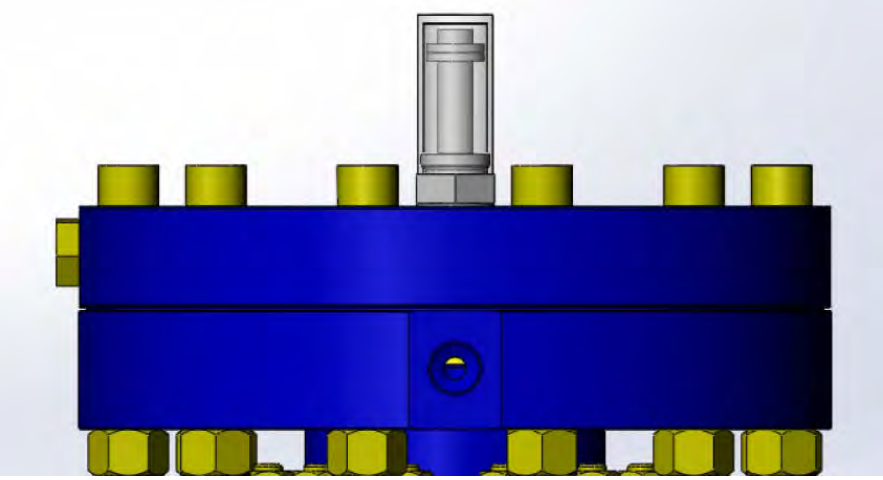
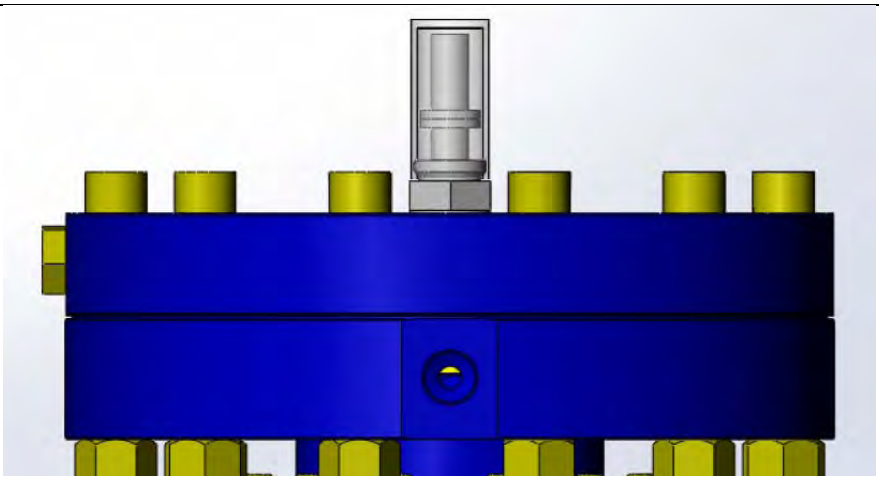
PORT No.	FUNCTION
1	½”M to downstream piping (NO VALVE INTERPOSED)
2	½”F to pressure gauge (OPTIONAL, VALVE MAY BE INTERPOSED)
3, 8	¼”F to regulator diaphragm housing
4, 7	¼”F to pilots
5, 6	¼”F to SSV, QEV, pilots

Connecting lines shall be at least made in stainless steel tubing OD10x1.
Venting lines shall be taken to safe area according to the relevant applicable standard.
Connecting lines shall be orderly laid out in view of maintenance activities.
Tubing slope shall be 5-10% towards the sensing point downstream.
Pressure take offs shall be always taken from top of piping in horizontal lines.

Appropriate downstream pipe sizing shall be provided in order to allow the following speed limitations.

- Pa>5 bar Vmax=30 m/s
- 0.5<Pa<5 bar Vmax=25 m/s

Series 956FC regulators are shipped in the fully closed position.
This applies also to built in FC monitors.
This position may easily be detected by checking the travel indicator provided.
See following table.

REGULATOR / MONITOR IN OPEN POSITION	
REGULATOR / MONITOR IN CLOSED POSITION	

WARNING!

The equipment is designed for dry, clean natural gas: do not use liquid or corrosive substances or gas with solid particles.

All installation and operating procedures must be performed slowly.

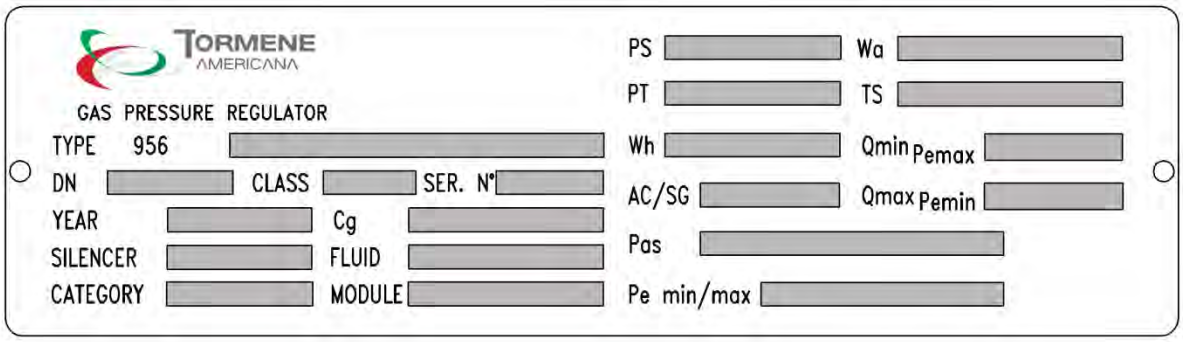
Avoid fast actions during opening and closing of the upstream and downstream valves.

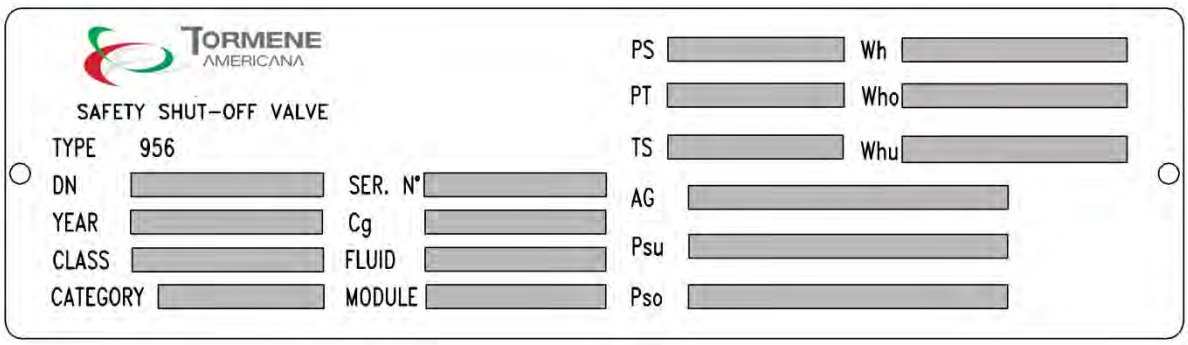
Do not exceed temperature range, pressure range, etc., as specified on the equipment nameplate

Installation of TA956 piloted gas pressure regulators in natural gas pressure reducing stations shall be performed in accordance with EN 12186 & EN 12279 provisions.

8 NAMEPLATES

Nameplates for pressure regulator and SSV are shown below.
The following table gives also explanation on the symbols used.





Common terms			
TYPE	**regulator type**	**DN**	**nominal diameter**
CLASS/ANSI	**pressure class**	**SER.N°**	**serial number**
YEAR	**year of manufacture**	**Ps/Pzul**	**design pressure**
Wh	**pilot set range**	**AC-RG/SG**	**precision class**
Pas	**set point**	**Pe min/max**	**minimum and maximum inlet pressure**
Qpe min	**flow rate at minimum pressure**	**Qpe max**	**flow rate at maximum pressure**
SILENCER	**with or without silencer and its rate (100,70,50,30)**	**Cg**	**flow coefficient**
FLUID	**fluid type (natural gas)**	**CATEGORY**	**category according to Ped directive (97/23/EC)**
MODULE	**type of conformity assessment adopted**	**Wa/Whs**	**spring range**
P.TEST	**hydraulic test pressure**	**Ts**	**design temperature**

9 START-UP

After completing installation, check that the upstream and downstream isolation valves, the downstream vent valve and any by-pass lines are closed. Check that the regulator is closed watching the travel indicator.

CAUTION! **In order to adjust the regulator, use the pilot screw; turn clockwise to increase the pressure and counter-clockwise to reduce it.**

WARNING! **The adjustment order is:**

- **SSV shut-off valve;**
- **Monitor;**
- **Regulator.**

CAUTION! **Be sure to slowly introduce pressure into the system to prevent downstream overpressure due to potential rapid pressure increase. Pressure gauges should always be used to monitor downstream pressure during start up. Procedures used in putting this regulator into operation must be planned accordingly if the downstream system is pressurized by another regulator or by a manual bypass.**

CAUTION! **To prevent damage to the pilot during start up, the sense and bleed lines of pilots and regulator should be located on the same side of the downstream isolation valve.**

9.1-SINGLE REGULATOR OR FULLY OPEN MONITOR & ACTIVE

If the fully open monitor is installed, it will be fully open while the outlet pressure is controlled by the regulator . When the outlet pressure exceeds the monitor set point, it will take over the pressure control .

CAUTION! **Regulator and monitor set points are printed on the nameplates**

CAUTION! **Special instructions are given for MFO active regulators see end of this chapter**

a) Open SLOWLY downstream vent valve.
b) Open VERY SLOWLY upstream isolation valve, avoiding sudden actions.
c) Check that the monitor, if installed, opens completely, while the outlet pressure is within the range printed on the nameplates.
d) Close SLOWLY the downstream vent valve and check that regulator and/or monitor close.
e) Check the outer seal of the regulator and/or monitor, pilots, feeder and connections using a foaming agent.

CAUTION! **Check carefully all tubing connections for possible leakage. Remember that vibrations and shocks during transport may loosen compression fittings.**

CAUTION! **If monitor is installed, the outlet pressure will reach the monitor set point, as its pilot will remain open until this value has been reached.**

f) Check the regulator sleeve seal, ensuring that the outlet pressure does not increase beyond its set point and/or the monitor set point.

NOTE

Following instructions are to be used ONLY if monitor is installed.

g) Open VERY SLOWLY the downstream vent valve.
j) Increase VERY SLOWLY the regulator set point via the pilot screw (clockwise rotation). Continue increasing until you exceed the set point of the monitor.
i) Check take over of the monitor according to the operations described in par.10.5 and its set point (See table in Appendix 1); if necessary, turn the monitor pilot screw until reaching the required pressure (rotate clockwise to increase the pressure).
j) Reduce SLOWLY the regulator set point _via the pilot screw (anti-clockwise rotation).

k) Close SLOWLY the downstream vent valve.
l) Check that after the downstream isolation valve the pressure is not above the regulator set point.
m) Open VERY SLOWLY the downstream isolation valve until the downstream pipe is completely filled (if the downstream pipe is very large, the valve must be operated very carefully in order not to exceed the maximum line flow rate, thus damaging volumetric meters that may be installed).
n) When the downstream pipe pressure is equalized, fully open the valve and check the regulator calibration; modify as required.
o) Close the pilot screw lock nut.

9.1.1 MFO SINGLE REGULATOR OR FULLY OPEN MONITOR & MFO ACTIVE

MFO regulators are designed to provide a positive opening of the valve in case of failure of regulator diaphragm, pilot diaphragm or signal piping. Suitable means of protection of downstream piping shall be provided in order to avoid over pressure in the same.

CAUTION! **The following configurations are recommended**

MFO+SSV

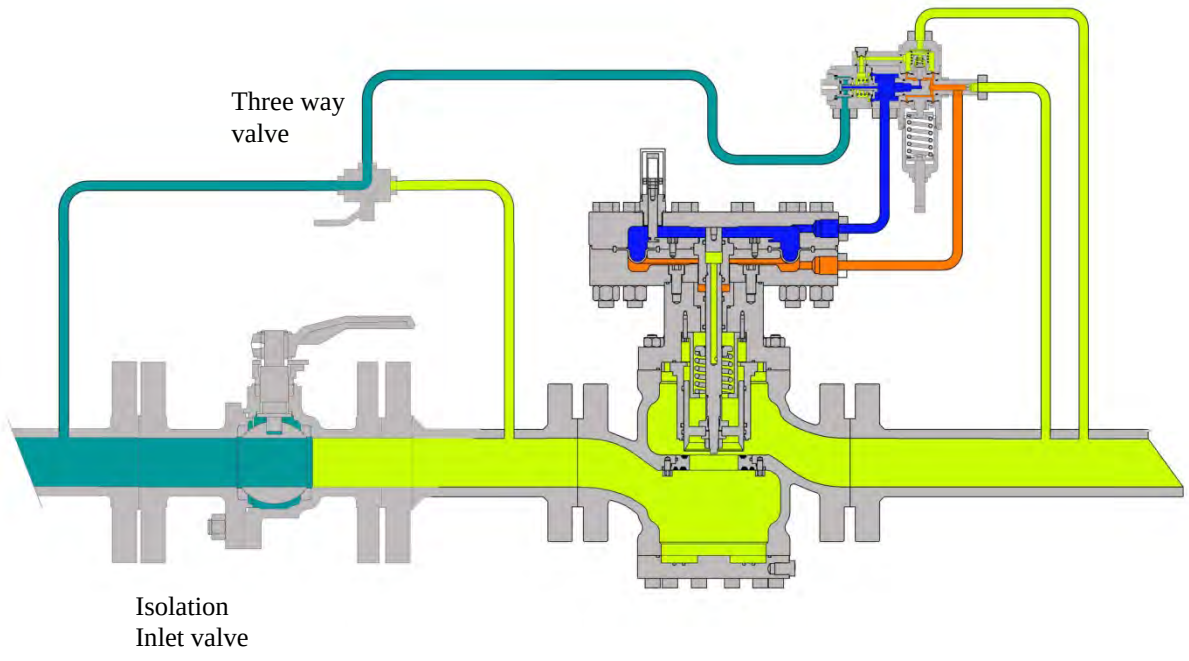
MFO+FC (+QEV)

MFO+FC+SSV (+QEV)

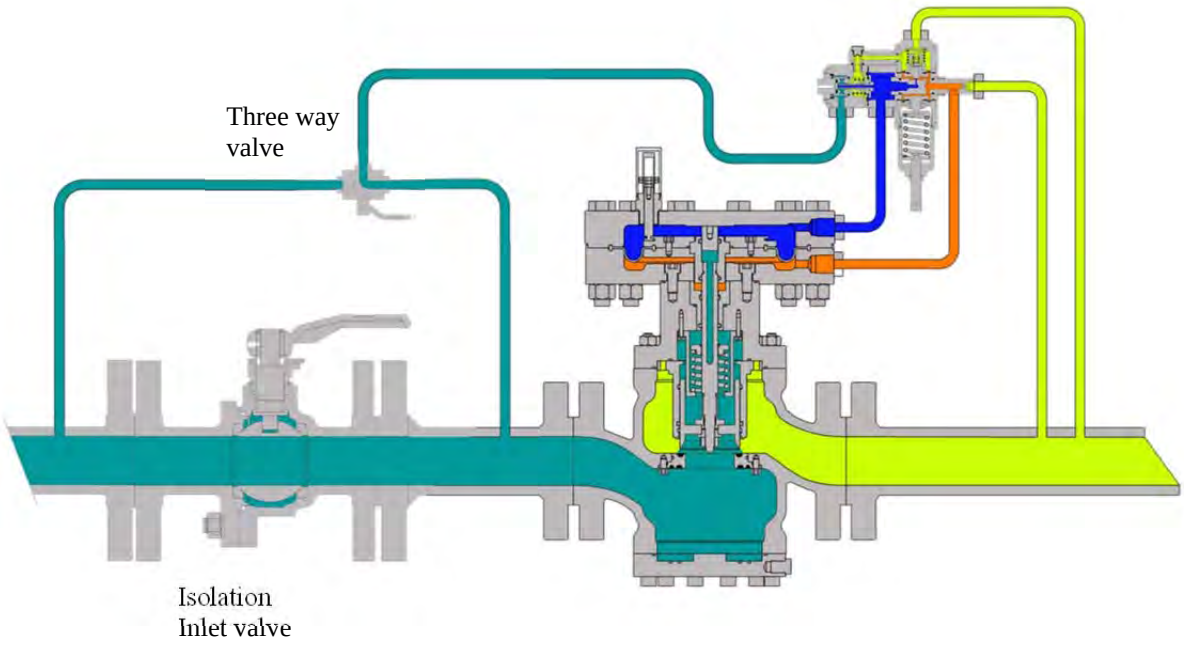
MFO pressure regulators are Fail Open regulators, that is a failure in either, regulator diaphragm, pilot diaphragm or impulse piping will cause the regulator to fully open.
Since the regulator is piloted, therefore the pilot is capable of operating the regulator only when a pressure differential across the regulator not les then 2.5 bar is available.
Under certain circumstances the differential pressure across the regulator may fall below that value and the MFO pilot will take the regulator to the fully open position.
Return to operating conditions when upstream pressure increases above 2.5 bar over the set pressure depends on the configuration of the regulating line according to the following table.

CONFIGURATION	RETURN TO NORMAL OPERATION	NOTES
MFO	MANUAL RESET	**WARNING!** DOWNSTREAM PIPING IS NOT PROTECTED
MFO+FC	AUTOMATIC	
MFO+FC+QEV	AUTOMATIC	
MFO+FC+SSV	AUTOMATIC, IF SSV TRIPPED AUTOMATIC AFTER SSV RESET	
MFO+FC+SSV+QUEV	AUTOMATIC, IF SSV TRIPPED AUTOMATIC AFTER SSV RESET	
MFO+SSV	AUTOMATIC AFTER SSV RESET	

MFO single regulator need a special set up for the high pressure connection of the pilot.
As the MFO regulator may be operate only with a differential of 2.5 bar between upstream pressure and controlled pressure, during start up of the unit we need to generate this differential pressure while the regulator is still fully open.
To do so it is necessary to install a three way valve on the high pressure supply of the pilot as per the following figure.



During start up the isolation ball valve is closed, the three way valve is turned in a way that connect the high pressure side of the isolation valve to the inlet of the pilot.
The isolation valve is then opened slowly in order to bring downstream piping to the set point pressure. As the set point pressure is reached the pilot will close the regulator.
When the regulator set point has been adjusted the three way valve may be turned to connect the pressure intake downstream of the isolation valve to the pilot inlet.
In this way when the valve will be closed there will be no possible leakage downstream.
See following figure.



When the MFO active regulator is used in conjunction with a FC monitor there is no need of a three way valve to be installed.
The start up procedure is the following.

a) Open SLOWLY downstream vent valve.
b) Open VERY SLOWLY upstream isolation valve, avoiding sudden actions.
c) Check that the monitor, if installed, opens completely, while the outlet pressure is within the range printed on the nameplates.
d) Close SLOWLY the downstream vent valve and check that regulator and/or monitor close.
e) Check the outer seal of the regulator and/or monitor, pilots, feeder and connections using a foaming agent.

CAUTION! **Check carefully all tubing connections for possible leakage. Remember that vibrations and shocks during transport may loosen compression fittings.**

CAUTION! **If monitor is installed, the outlet pressure will reach the monitor set point, as its pilot will remain open until this value has been reached.**

f) Check the regulator sleeve seal, ensuring that the outlet pressure does not increase beyond its set point and/or the monitor set point.

g) Open VERY SLOWLY the downstream vent valve.
h) Increase VERY SLOWLY the regulator set point via the pilot screw (clockwise rotation). Continue increasing until you exceed the set point of the monitor.
i) Check take over of the monitor according to the operations described in par.10.5 and its set point (See table in Appendix 1); if necessary, turn the monitor pilot screw until reaching the required pressure (rotate clockwise to increase the pressure).
j) Reduce SLOWLY the regulator set point via the pilot screw (anti-clockwise rotation).
k)
l) Close SLOWLY the downstream vent valve.
m) Check that after the downstream isolation valve the pressure is not above the regulator set point.
n) Open VERY SLOWLY the downstream isolation valve until the downstream pipe is completely filled (if the downstream pipe is very large, the valve must be operated very carefully in order not to exceed the maximum line flow rate, thus damaging volumetric meters that may be installed).
o) When the downstream pipe pressure is equalized, fully open the valve and check the regulator calibration; modify as required.
p) Close the pilot screw lock nut.

When the MFO regulator is used in conjunction with a SSV there is no need of a three way valve to be installed.
The start up procedure is the following.

a) Open VERY SLOWLY upstream isolation valve, avoiding sudden actions.
b) Operate the push button to increase downstream pressure up to a value close to the regulator set point.
c) Verify that the regulator closes.
d) Operate the SSV wrench to fully open the SSV shutter.

CAUTION! **Check carefully all tubing connections for possible leakage. Remember that vibrations and shocks during transport may loosen compression fittings.**

e) Open SLOWLY downstream vent valve.
f) Verify that the set point of the regulator is correct; if necessary, turn the regulator pilot screw until reaching the required pressure (rotate clockwise to increase the pressure).
g) Close slowly the downstream vent valve.

Check set point and operation of SSV according to the following procedure.
a) Open the downstream vent valve.
b) Increase the outlet pressure of the regulator until reaching the maximum set point of SSV.
c) Check that the SSV has closed and that there are no leaks from the downstream vent valve.
d) Close the downstream vent valve.
e) Reset the regulator to its original set point following the same procedure described above.
f) If the SSV has a MIN set spring proceed as above only reducing regulator set point.

9.2-WORKING MONITOR & ACTIVE

In this configuration the monitor is controlling an intermediate pressure in normal operation and the total pressure drop is divided between regulator and monitor (working monitor): complete description is available in par.5.0.

NOTE **It is advisable to install a pressure gauge in the pipe between working monitor and active**.

CAUTION! **Regulator and monitor set points are printed on the nameplates**

a) Open SLOWLY the downstream vent valve.
b) Open VERY SLOWLY the upstream isolation valve, avoiding sudden actions.
c) Check that monitor and regulator begin to open and that the intermediate and outlet pressures are within the ranges printed on the nameplates. If the monitor calibration is not correct, adjust the pilot screw to re-set it to the established value (turn clockwise to increase the pressure).
d) Close SLOWLY the downstream vent valve and check that the regulator and monitor close.
e) Check the outer seal of the regulator, monitor, pilots, feeder and connections by means of a foaming agent.

CAUTION! **Check carefully all tubing connections for possible leakage. Remember that vibrations and shocks during transport may loosen compression fittings.**

f) Check the regulator and monitor seal, ensuring that the outlet and intermediate pressure do not increase.
g) Open slowly the downstream vent valve.
h) Increase VERY SLOWLY the regulator set point via the pilot screw (clockwise rotation) until exceeding the monitor set point.
i) Check take over of the monitor according to the operations described in par.10.5 and its set point (See table in Appendix 1); if necessary, adjust the monitor pilot screw until the required pressure is reached (rotate clockwise to increase the pressure).
j) Check that the intermediate pressure is equal to the outlet pressure.
k) Reduce VERY SLOWLY the regulator calibration via the pilot screw (rotate anti-clockwise) until reaching its set point.
l) Close SLOWLY the downstream vent valve.
m) Check that after the downstream isolation valve, the pressure is not above the regulator set point.
n) Open VERY SLOWLY the downstream isolation valve until completely filling the downstream piping (if it is very large, the valve must be operated very carefully in order not to exceed the maximum line flow rate, thus damaging volumetric meters that may be installed).
o) When the downstream pipe pressure is equalized, fully open the valve and check the regulator calibration; modify as required.
p) Close the pilot screw lock nut.

9.3-SSV WITH MAX PRESSURE CONTROL ONLY

We assume that the SSV is installed in a system that has a pressure regulator controlling the pressure in the line that has to be protected by the SSV.

In cases where this is not verified all the actions described shall be performed with an auxiliary pressure source equipped with a pressure regulator and pressure gauges suitable for the range of pressure necessary to properly check SSV operation.
In the latter case the pressure switch head shall be disconnected from the main line and, instead, connected to the auxiliary pressure source. After completing the verifications, the pressure switch head shall be connected to the main line again.

CAUTION! **SSV set points are printed on the nameplates**

g) Open the SSV by means of the re-latch wrench.
h) Open VERY SLOWLY the upstream isolation valve.
i) Check that the controlled pressure is in the desired range.
j) Open the downstream vent valve.
k) Increase the outlet pressure of the regulator until reaching the maximum set point.
l) Check that the SSV has closed and that there are no leaks from the downstream vent valve.
m) Close the downstream vent valve.
n) Reset the regulator to its original set point.
o) Pressurise the downstream piping via the push-button, when provided, or crack opening the SSV shutter by using the re-latching wrench.

WARNING!

If a PUSH BUTTON is provided it SHALL be always used to equalize the pressure across the SSV.

Using the re-latch wrench to perform equalization of pressure across the SSV is possible ONLY with differential pressure < 20 bar (< 290 psi)

p) Open VERY SLOWLY the SSV with the re-latch wrench.
q) Open VERY SLOWLY the downstream isolation valve.

9.4-SSV WITH MAX & MIN PRESSURE CONTROL

We assume that the SSV is installed in a system that has a pressure regulator controlling the pressure in the line that has to be protected by the SSV.
In cases where this is not verified all the actions described shall be performed with an auxiliary pressure source equipped with a pressure regulator and pressure gauges suitable for the range of pressure necessary to properly check SSV operation.
In the latter case the pressure switch head shall be disconnected from the main line and, instead, connected to the auxiliary pressure source. After completing the verifications, the pressure switch head shall be connected to the main line again.

CAUTION! **SSV set points are printed on the nameplates**

a) The SSV is closed when the controlled pressure is below the Min set point.
b) With the push-button, if provided, or by lifting the SSV shutter with the re-latch wrench when there is no push button, fill the downstream section until the Min set point is exceeded.

WARNING!

If a PUSH BUTTON is provided it SHALL be always used to equalize the pressure across the SSV.

Using the re-latch wrench to perform equalization of pressure across the SSV is possible ONLY with differential pressure < 20 bar (< 290 psi)

c) Open VERY SLOWLY the SSV, to prevent overpressure.
d) Open the downstream vent valve.
e) Check that the SSV closes, when downstream pressure drops below the Min set point value.

f) Check that there are no leaks from the SSV through the downstream vent valve.
g) Close the downstream vent valve.
h) Set the pressure regulator to its original set point.
i) Pressurise the downstream piping with the push-button, or by lifting the SSV shutter with the re-latch wrench when there is no push button.
j) Using the re-latch wrench, open the VERY SLOWLY SSV to prevent overpressure.
k) Increase downstream pressure until Max set point is reached.
l) Check that the SSV has closed.
m) Check for any leaks from the downstream vent valve.
n) Close the downstream vent valve.
o) Set the pressure regulator to its original set point.
p) Using the re-latch wrench, open VERY SLOWLY the SSV to prevent overpressure.
q) Open VERY SLOWLY the downstream isolation valve.

9.5- REGULATOR WITH BUILT IN SSV

The SSV is normally supplied calibrated to the required pressure set (minimum, maximum or both). You are nevertheless recommended to perform field verification.

CAUTION! **Regulator & SSV set points are printed on the nameplates**

a) If the SSV is provided with MAX set point only, open the SSV and go on to point p).
b) Open VERY SLOWLY the upstream isolation valve.
c) Keep the push button on the SSV pressed to equalize the pressure across the SSV. Use re-latch wrench to lift the SSV shutter when there is no push button.

WARNING!

If a PUSH BUTTON is provided it SHALL be always used to equalize the pressure across the SSV.

Using the re-latch wrench to perform equalization of pressure across the SSV is possible ONLY with differential pressure < 20 bar (< 290 psi)

d) The pressure regulator start to close when pressure approaches its set point.
e) Keep the push button pressed a little longer after downstream pressure has reached the regulator set point.
f) Open the SSV by means of the re-latch wrench.
g) Open SLOWLY the downstream vent valve.
h) Check calibration of the regulator (and monitor, if present) as illustrated in paragraphs 9.1 and 9.2.
i) Reduce the outlet pressure by adjusting the regulator pilot until it drops below the Min set pressure of the SSV.
j) Check closure of the SSV.
k) If the SSV Min pressure set point is not correct, adjust it following the instructions of paragraph 9.4.
l) Slightly increase the pressure via the pilot screw (clockwise rotation).
m) Close SLOWLY the downstream vent valve.
n) Press the push button on the SSV to equalize pressure across the SSV. Verify that the pressure regulator has gone to the fully closed position upon reaching its set point. Keep the push button pressed a little longer after downstream pressure has reached the regulator set point. Use re-latch wrench to lift the SSV shutter when there is no push button.

WARNING!

If a PUSH BUTTON is provided it SHALL be always used to equalize the pressure across the SSV.

Using the re-latch wrench to perform equalization of pressure across the

SSV is possible ONLY with differential pressure < 20 bar (< 290 psi)

o) Open VERY SLOWLY the SSV using the re-latch wrench.
p) It is now possible to check Max set point of SSV.
q) Increase the outlet pressure via the pilot screw (clockwise rotation). When the SSV Max set point value is reached, the SSV closes.
r) If the SSV Max pressure set point is not correct, adjust it following the instructions of paragraph 9.4.
s) Reduce the outlet pressure via the pilot screw (anti-clockwise rotation).
t) Close SLOWLY the downstream vent valve.
u) Press the push button on the SSV to equalize pressure across the SSV. Verify that the pressure regulator has gone to the fully closed position upon reaching its set point. Keep the push button pressed a little longer after downstream pressure has reached the regulator set point. Use re-latch wrench to lift the SSV shutter when there is no push button.

WARNING!

If a PUSH BUTTON is provided it SHALL be always used to equalize the pressure across the SSV.

Using the re-latch wrench to perform equalization of pressure across the SSV is possible ONLY with differential pressure < 20 bar (< 290 psi)

v) Open SLOWLY the SSV using the re-latch wrench.
w) Check that downstream piping pressure does not exceed the regulator set point.
x) Open VERY SLOWLY the downstream valve until the piping is completely filled (if it is very large, the valve must be operated very carefully in order not to exceed the maximum line flow rate, thus damaging volumetric meters that may be installed).
y) When the downstream piping pressure is equalized, fully open the valve and check the regulator calibration; make the necessary adjustment, if required.
z) Close the pilot screw lock nut.

10 PERIODIC FUNCTIONAL CHECKS

WARNING! **The continuing integrity of gas pressure regulators and SSV is assured by periodic functional checks. For periodic functional checks it is common to refer to national regulations/standards where existing or users/manufacturers practices.**

What is presented here is Manufacturer recommendation for a minimum level of check required to maintain continuity of integrity of gas pressure regulators and SSV.
The following checks and preventative maintenance activities shall be performed and recorded according to user quality system.
Time intervals given are intended to support user in the management of preventative maintenance. Very aggressive or demanding services may require a reduction of the time intervals proposed as well as critical services with high availability index.

CAUTION! **It is user responsibility to establish a suitable interval of time to perform the periodic functional checks required by the type of service conditions, criticality of service and local regulations.**

PERIOD OF TIME	ACTIVITY
6 Months	Performa a complete series of functional checks.
1 Year	Change dynamic seals and check diaphragms.
3 Years	Change all seals and diaphragms.

The following functional checks are described.

- Regulator and/or monitor operation
- Regulator and/or monitor tightness
- SSV operation
- Monitor take over time

WARNING! **Periodic functional checks described herein require that the pressure reducing line in which the equipment to be checked are installed be taken out of service and available for performing the periodical checks only.**

10.1-FUNCTIONAL CHECK FC & MFO REGULATOR AND/OR MONITOR

Downstream vent valve must be kept open.
Close the downstream isolation valve VERY SLOWLY so that the regulator and monitor, if present, close and there is no overpressure in the downstream piping.
Watch the travel indicator.
In order to verify if the movement of the indicator, and therefore of the regulator shutter, is smooth modify regulator shutter position by modifying the opening degree of the vent valve. Alternatively the regulator set point may be modified acting on pilot screw.

CAUTION! **These operations must be performed SLOWLY, without sudden actions, to prevent hunting.**

If the movement of travel indicator is not smooth, but rough and bumping, it means that friction in the moving parts is too high and the regulator requires maintenance.

Monitor & regulator: the two equipment must be checked by decommissioning one of the two. With the monitor not working (the monitor set point is increased via the pilot adjustment screw: clockwise rotation), the regulator is checked and vice versa.

CAUTION! **Original set point shall be re-adjusted on both monitor and regulator after performing functional checks.**

10.2-FUNCTIONAL CHECK DFO REGULATOR

DFO regulators have a coupling of the travel indicator that is not suitable for performing checks according to point 10.1. Therefore this type of check are meaningless.

10.3-FUNCTIONAL CHECK FULLY OPEN MONITOR & REGULATOR TIGHTNESS

a) The downstream vent valve must be kept open.
b) Close VERY SLOWLY the downstream isolation valve.
c) Close SLOWLY the downstream vent valve.
d) Check that the outlet pressure is stable and equal to the monitor calibration value.
e) If the pressure increases, it means that the regulator does not close perfectly.
f) Open SLOWLY the downstream vent valve.
g) Increase the regulator calibration value above that of the monitor.
h) Close SLOWLY the downstream vent valve.
i) The outlet pressure will be equal to the new regulator set point.
j) If the pressure increases, it means that the monitor does not close perfectly.
k) Re-adjust set points to the original values.

CAUTION! **During this test, an increase in the outlet pressure, as described, may be due not only to the regulator (or monitor) but also to the pilots not closing perfectly. In this case, however, the pressure increase stops at a certain value whereas in the case of the regulators, the pressure keeps on increasing until it reach the value of the inlet pressure..**

10.4-FUNCTIONAL CHECK WORKING MONITOR & REGULATOR TIGHTNESS

a) The downstream vent valve must be kept open.
b) Close VERY SLOWLY the downstream isolation valve.
c) Close SLOWLY the downstream vent valve.
d) Outlet pressure must be equal to the monitor pilot set point whereas the intermediate pressure must be equal to the monitor working pilot set point.
e) If the outlet pressure increases, it means that the regulator does not close perfectly.
f) If the intermediate pressure increases, it means that the monitor does not close perfectly.

CAUTION! **During this test, an increase in the outlet pressure, as described, may be due not only to the regulator (or monitor) but also to the pilots not closing perfectly. In this case, however, the pressure increase stops at a certain value whereas in the case of the regulators, the pressure keeps on increasing until it reach the value of the inlet pressure..**

10.5-FUNCTIONAL CHECK MONITOR TAKE OVER TIME

a) Downstream vent valve must be kept open.
b) Close VERY SLOWLY downstream isolation valve.
c) Increase regulator set point beyond the monitor calibration value (if there is a working monitor, the increased pressure must exceed the monitor working pilot calibration value, if there is a QEV installed the increased pressure shall exceed the QEV set point).
d) Record take over time.

e) Re-set the regulator to its original set point.

10.6-FUNCTIONAL CHECK SSV OPERATION

The following checks may be performed either on a SSV installed in a line where pressure is controlled by a pressure regulator that may be used to modify pressure at SSV sensing point or on a SSV installed without a pressure regulator in line. In the latter case it is necessary to remove SSV sensing point from the line and connect it to an auxiliary pressure source equipped with a pressure regulator suitable for the range of pressure to be checked.
Downstream vent valve must be kept open.
Close VERY SLOWLY downstream isolation valve.
Open downstream vent valve.

The following actions shall be made according to the functions installed in the SSV.

MIN SET POINT
Reduce regulator set point until the valve trips.
Check closing pressure and compare it to the required value stamped on the nameplate.
Check SSV tightness.
Increase regulator set point.
Pressurise downstream piping using the push button.
Using the re-latch wrench, open VERY SLOWLY the SSV to prevent overpressures.
Re-calibrate the regulator.

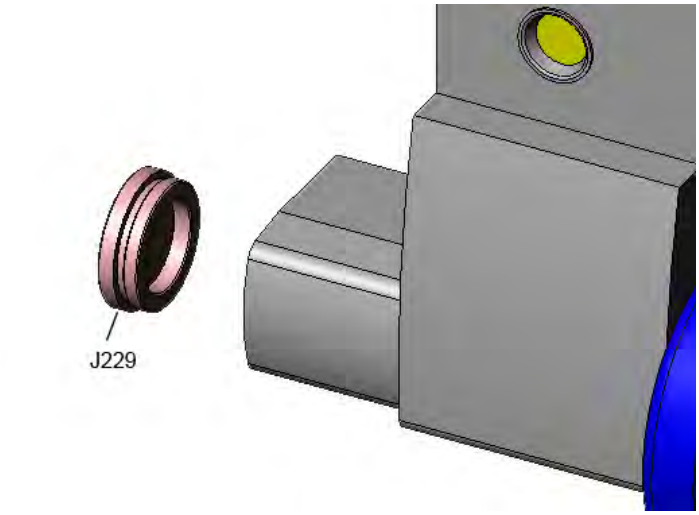
MAX SET POINT
Increase regulator set point until the valve trips.
Check closing pressure and compare it to the required value stamped on the nameplate.
Check SSV tightness.
Reduce the regulator set point.
Pressurise downstream piping using the push button.
Using the re-latch wrench, open VERY SLOWLY the SSV to prevent overpressures.
Re-calibrate the regulator.

10.7-FUNCTIONAL CHECK SSV CALIBRATION

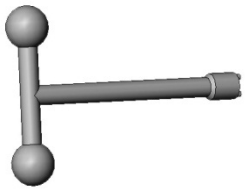
Should a re-calibration of the SSV be required proceed following the instructions below.

Close VERY SLOWLY downstream isolation valve.
Open the downstream vent valve.
Remove the plug J229.

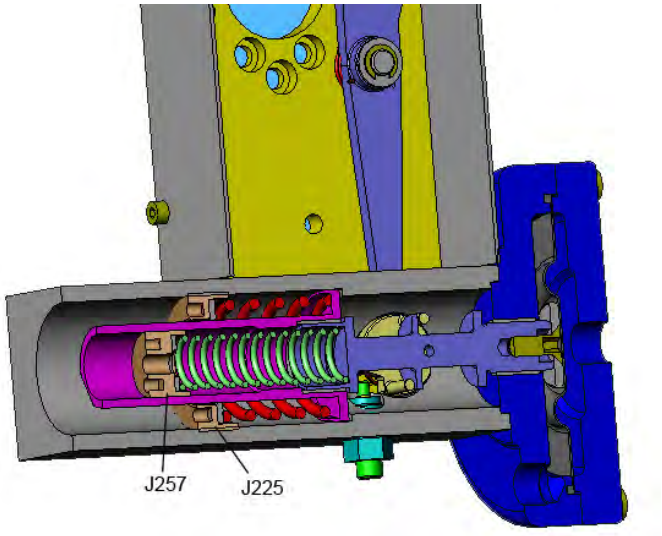
CAUTION! **Re-calibrating SSV equipped with both MAX and MIN springs require the MAX set point be calibrated first.**



MIN SET POINT CALIBRATION



a) Load (or release) the spring of the MIN pressure operating on the ring J257, using the MIN Set Wrench.
b) Increase the set point (or reduce if the spring is released).
c) Reduce the regulator outlet pressure until the SSV closes.
d) Reset the regulator to its original set point.



e) Equalize downstream pressure using the push button until the MIN pressure is exceeded.
f) Open the SSV slowly to prevent overpressures.
g) Repeat instructions c)-d)-e)-f) until obtaining the required pressure.
h) Close the downstream vent valve.
i) Open VERY SLOWLY the downstream isolation valve.

MAX SET POINT CALIBRATION

a) Load (or release) the spring of MAX pressure via the ring J225, using the MAX Set Wrench.
b) Increase (or reduce) the set point.
c) Increase the regulator outlet pressure until the SSV closes.
d) Reset the regulator to its original set point.
e) Equalize downstream pressure using the push button until the MAX pressure is exceeded.
f) Fully open the SSV.
g) Repeat instructions c)-d)-e)-f) until obtaining the required pressure.
h) Close the downstream vent valve.
i) Open VERY SLOWLY the downstream isolation valve.

11 MAINTENANCE

Normal maintenance operations can be performed on the Series 956 equipment without need to disassemble the body from the line.

Before beginning any maintenance operation, follow the instructions below:

- **Check that there are no parts under pressure between the two isolation valves.**
- **ENSURE THAT THE SYSTEM IS COMPLETELY DE-PRESSURISED.**
- **Close VERY SLOWLY downstream isolation valve to close the regulator (and monitor, if present).**
- **Close VERY SLOWLY upstream isolation valve .**
- **Completely vent the upstream and downstream pipes, with the downstream vent valve. If the SSV is provided with minimum pressure spring, the valve closes when the set point is reached and the remaining pressure is trapped. To discharge this pressure, by-pass the SSV with the push button.**
- **DE-PRESSURIZE the parts between monitor sleeve and SSV, if both are built in the same body, via the upstream vent valve.**

The following instructions will be divided, for clarity, for each type of single function configuration. Multi function equipment may be treated as single function units housed in the same body; there is no difference in the sequence of operations to perform maintenance.

Exploded views of multi function units are given for reference as well. The description on how to perform maintenance shall therefore be found in the relevant single function unit.

The following single function units will be reviewed:

- TA-956FC
- TA-956DFO
- TA-956MFO
- TA-956SSV

WARNING! **Suitable lifting equipment shall always be used during maintenance activity. Equipment shall be adequately sized for the parts to be lifted and shall be under verification program in accordance with local regulations.**

WARNING! **To avoid personal injury or property damage from sudden release of pressure, isolate the regulator from the pressure system, and release all pressure from the pilot and main valve before performing maintenance operations.**

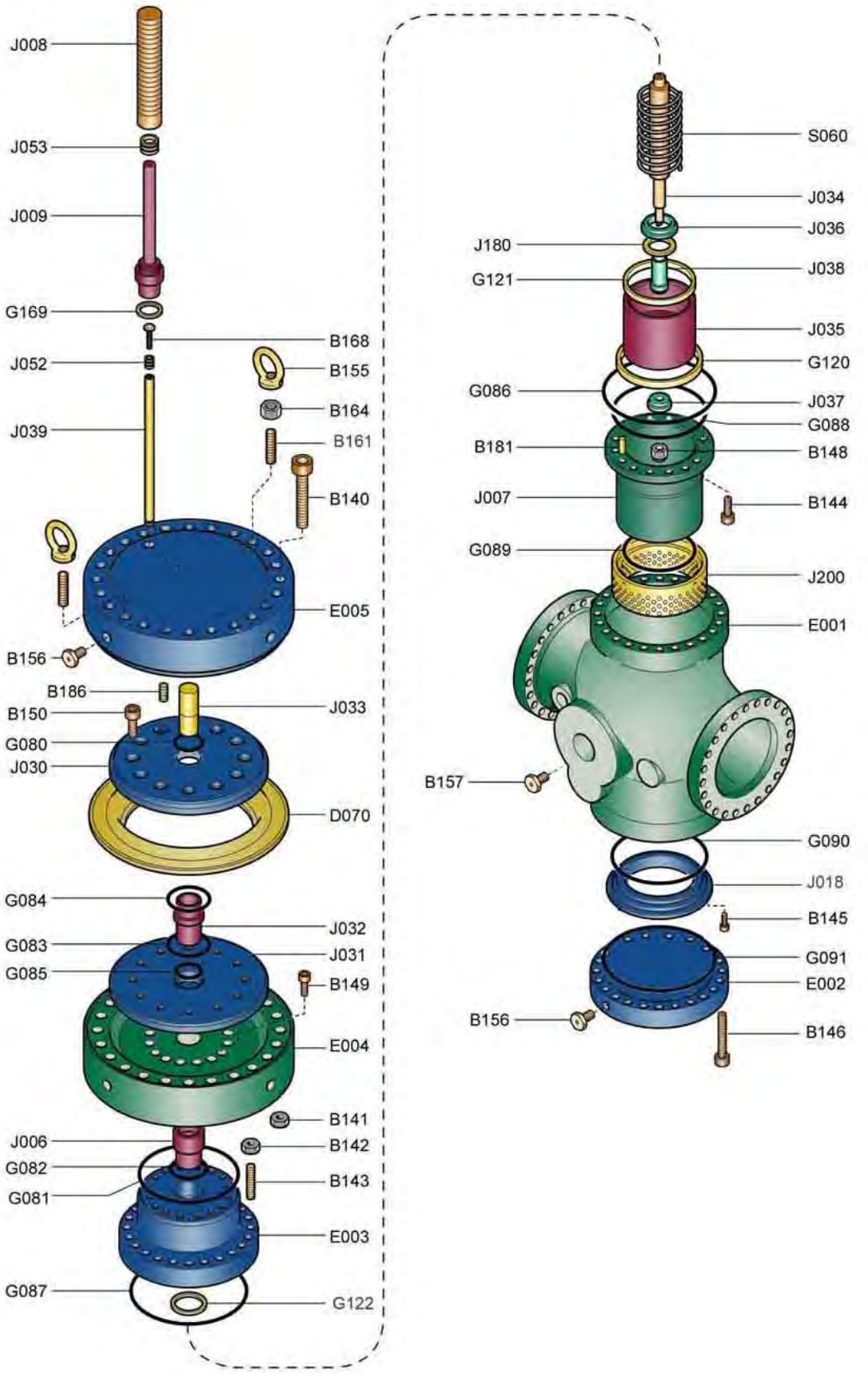
CAUTION! **Use the eyebolts provided or suitable stripes correctly placed for handling the equipment, avoiding damaging the external parts (control panels and/or trip devices).**

CAUTION!

Before beginning any maintenance operation, follow the instructions below:

- **REMOVE ALL THE SENSING POINT CONNECTIONS;**
- **REMOVE THE PILOTS, if necessary;**
- **REMOVE THE POSITION TRANSDUCERS OR PROXIMITY SENSORS, if present.**

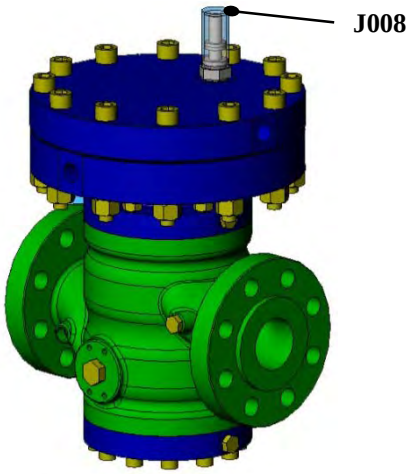
11.1-TA-956FC ACTIVE OR MONITOR



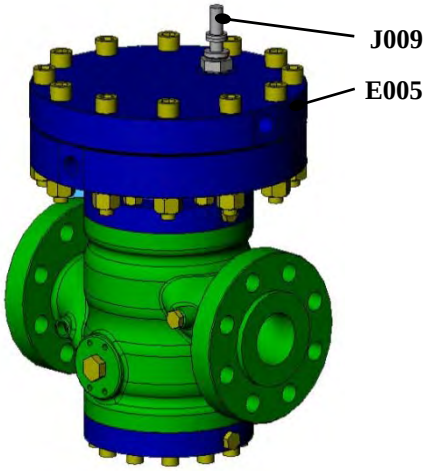
DESCRIPTION	POS.	DESCRIPTION	POS.
HEX HEAD SCREW	B140	O RING	G087
NUT	B141	O RING	G088
NUT	B142	O RING	G089
STUD	B143	O RING	G090
CAP SCREW	B144	O RING	G091
CAP SCREW	B145	SLIDING RING	G120
CAP SCREW	B146	SLIDING RING	G121
NUT SELF LOCKING	B148	SLIDING RING	G122
CAP SCREW	B149	STEM GUIDE	J006
CAP SCREW	B150	BALANCING SLEEVE	J007
LIFTING LUG	B155	SEAT	J018
HEX PLUG	B156	UPPER DIAPHRAGM RETAINER	J030
HEX PLUG	B157	LOWER DIAPHRAGM RETAINER	J031
STUD	B161	EQUALIZING STEM GUIDE	J032
NUT	B164	EQUALIZING CYLINDER	J033
CYLINDRICAL PIN	B181	STEM	J034
CALIBRATED ORIFICE	B186	SHUTTER REGULATOR	J035
DIAPHRAGM	D070	SPRING HOLDING PLATE	J036
REGULATOR BODY	E001	STEM BUSHING RING	J037
FLAT COVER	E002	SPRING BUSHING	J038
SPACING COVER	E003	AXIAL BEARING	J180
LOWER COVER	E004	SILENCER	J200
UPPER COVER	E005	SPRING	S060
O RING	G080	TRAVEL INDEX COVER	J008
O RING	G081	TRAVEL INDEX BUSHING	J009
O RING	G082	TRAVEL INDEX	J039
O RING	G083	INTERNAL MAGNETIC RING	J052
O RING	G084	EXTERNAL MAGNETIC RING	J053
O RING	G085	CAP SCREW	B168
O RING	G086	GASKET	G169

11.1.1 DIAPHRAGM MAINTENANCE

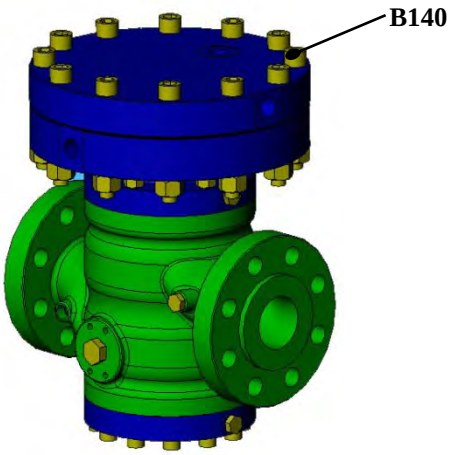
1. Remove the travel index transparent cover J008.



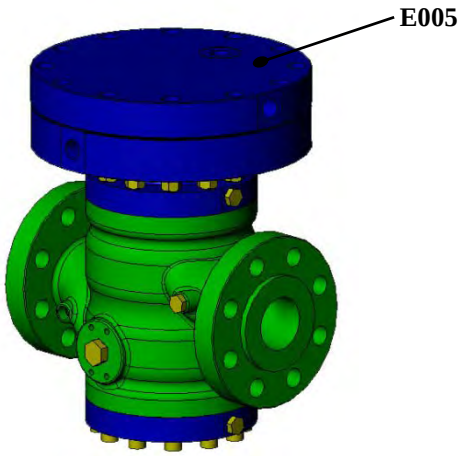
2. Unscrew the travel index bushing J009 from the upper diaphragm cover E005.



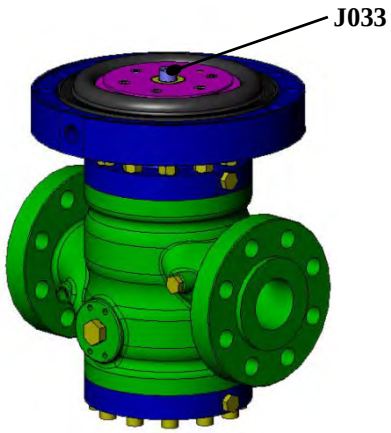
3. Remove the screws B140.



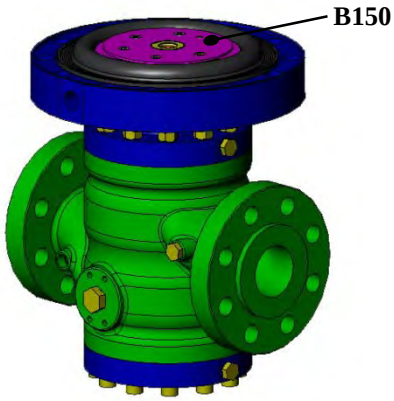
4. Remove the upper diaphragm cover E005.



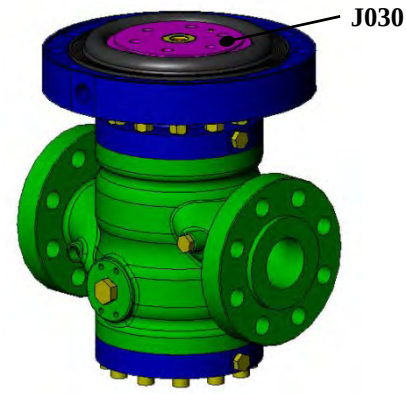
5. Remove the equalizing cylinder J033.



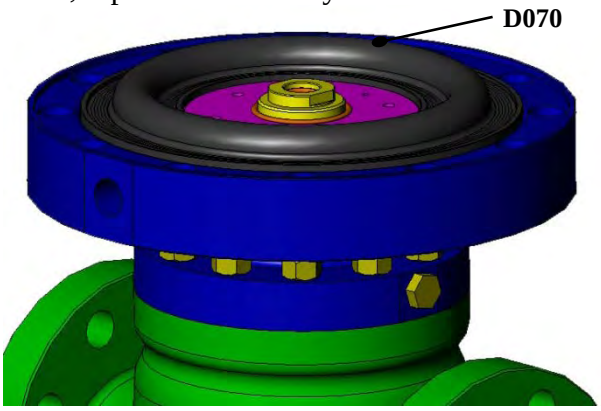
6. Remove the screws B150.



Remove the top diaphragm retainer J030.



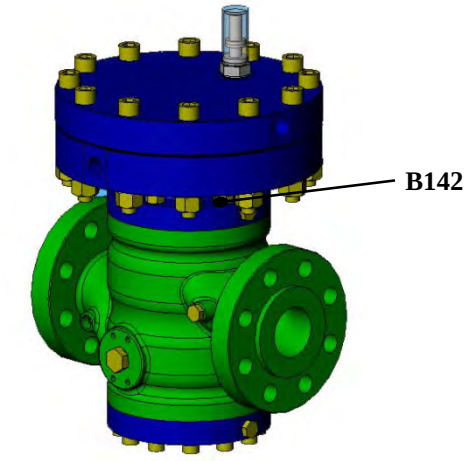
7. Remove the diaphragm D070 and inspect it; replace if necessary.



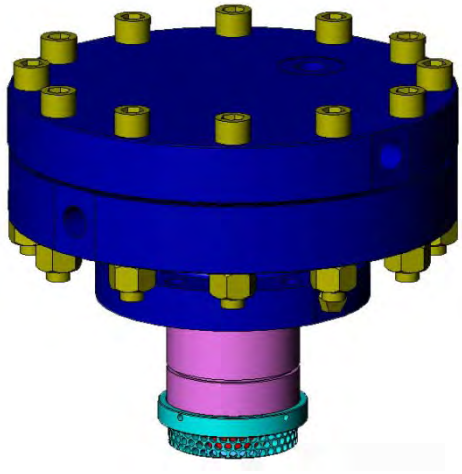
8. Assemble the unit following the instructions in reverse order.

11.1.2 CLEANING THE SILENCER (IF INSTALLED)

1. Remove the nuts B142.

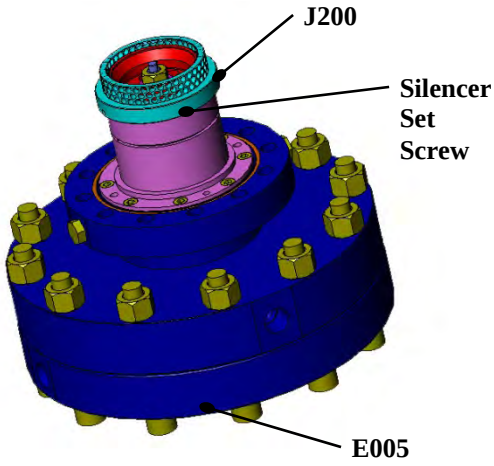


2. Raise the regulator motor head.



CAUTION! **The lifting of the regulator motor head shall be done with great care to avoid damaging the edge of the shutter.**

3. Turn the head 180° and rest it with the upper diaphragm cover E005 on a suitable base.

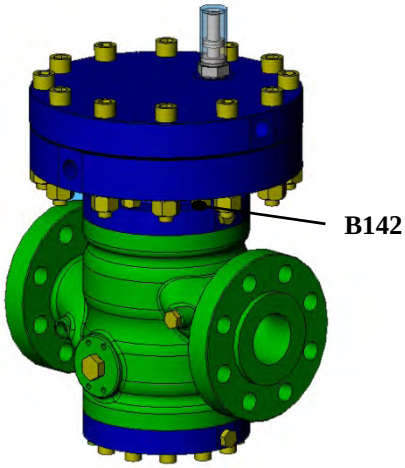


4. Remove the set screws that hold silencer in place.
5. Remove and inspect the silencer J200.

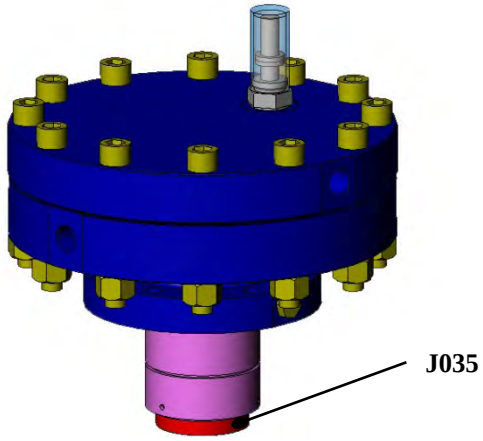
6. If necessary clean it with compressed air or liquid solvents.
7. Assemble the unit following the instructions in reverse order.

11.1.3 SHUTTER O-RING AND SLIDING RING MAINTENANCE

1. Install suitable lifting equipment on the upper cover E005.
2. Remove the nuts B142.

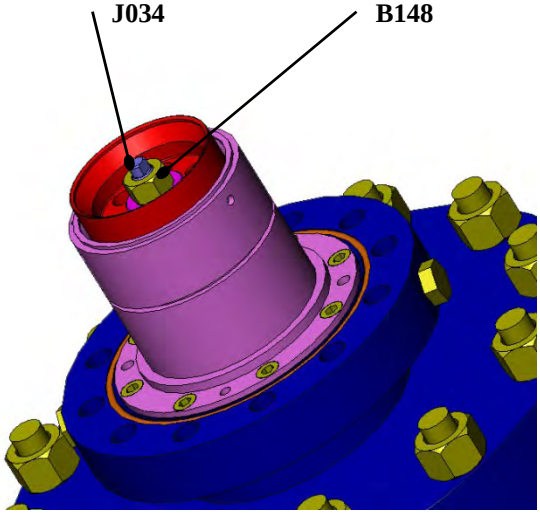


3. Raise the complete motor head.

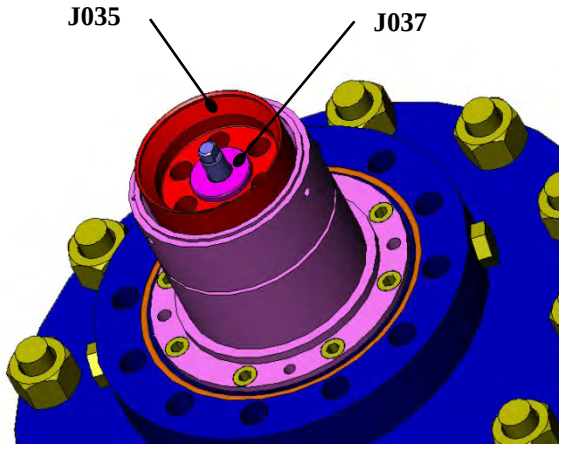


4. lifting shall be done with great care to avoid damaging the edge of the shutter J035 (Monitor J049).
5. Remove the nut B148; use a spanner to hold stem J034 in position by means of the flat surfaces provided; care shall be taken to avoid damages to the shutter rim.

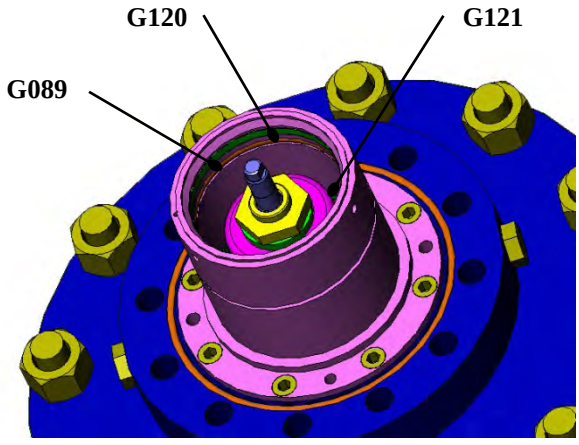
CAUTION! **The lifting of the regulator motor head shall be done with great care to avoid damaging the edge of the shutter.**



6. Remove the stem bushing J037.



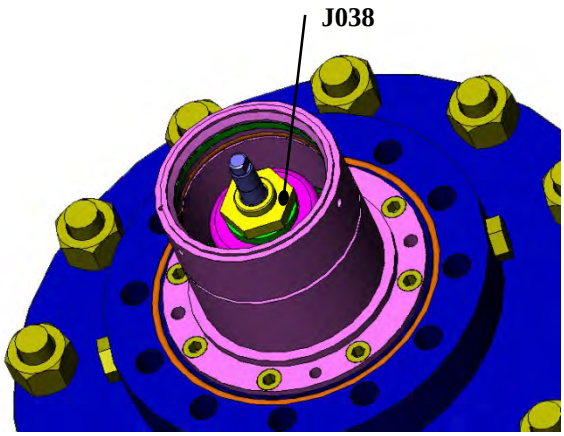
7. Remove the shutter J035 (Monitor J049), care shall be taken to avoid damages to the shutter rim.
8. Inspect the O-ring G089 and the sliding rings G120 and G121; replace if necessary.



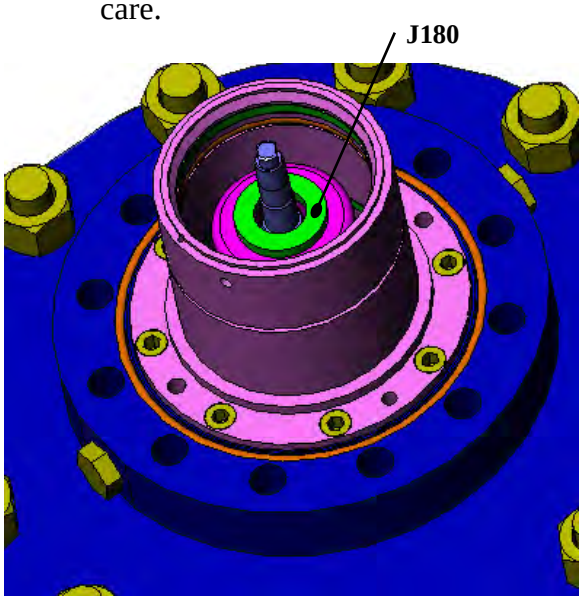
9. Assemble the unit following the instructions in reverse order.

11.1.4 STEM O-RING MAINTENANCE

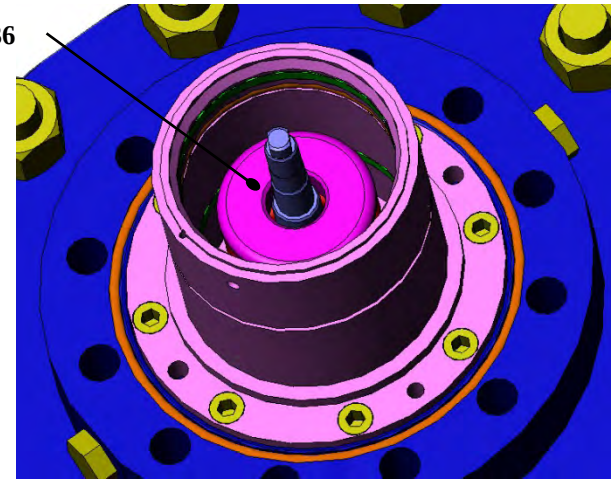
1. Follow the same instructions given in 11.1.2 up to point 9.



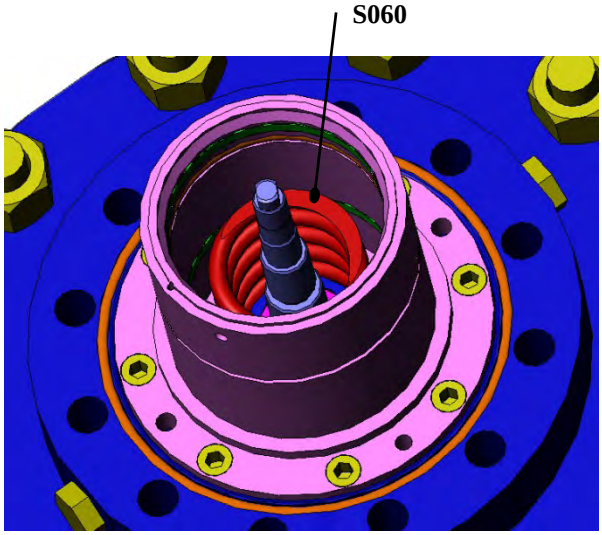
2. Remove the spring bushing J038, this part is subject to the spring pre-load and shall be disassembled with great care.



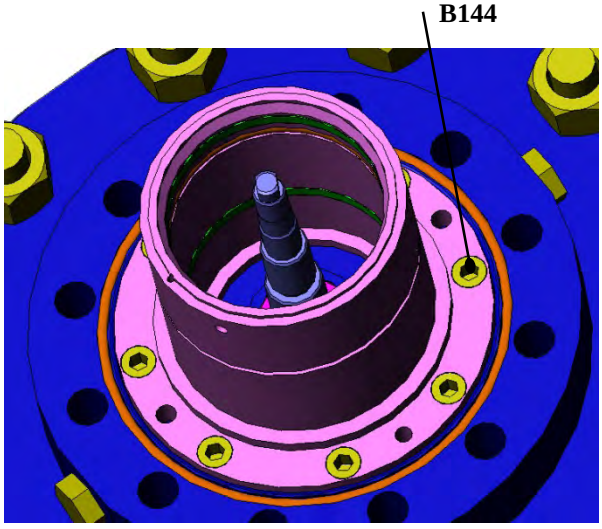
3. Remove the axial bearing J180.



4. Remove the spring retainer J036.

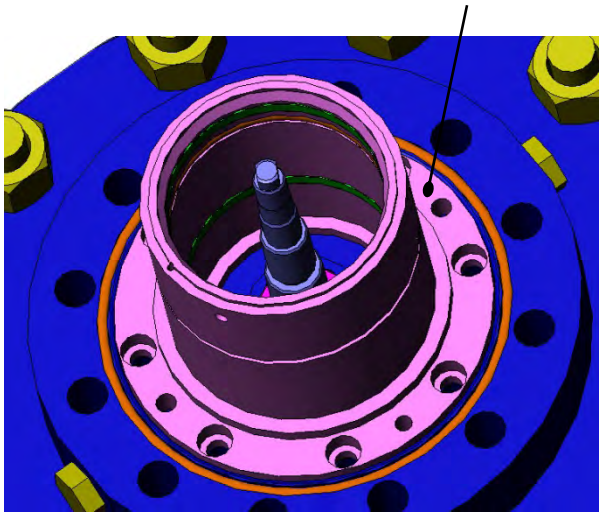


5. Remove the spring S060.

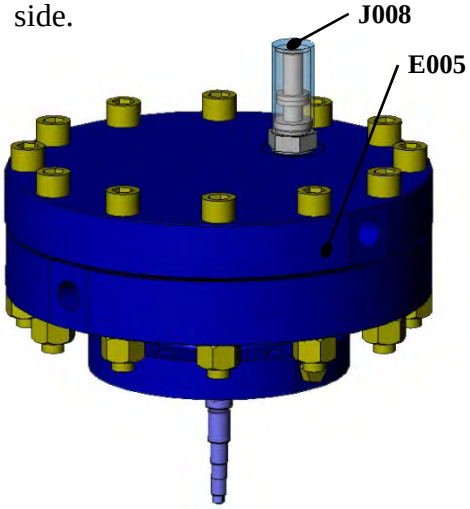


6. Remove the screws B144.

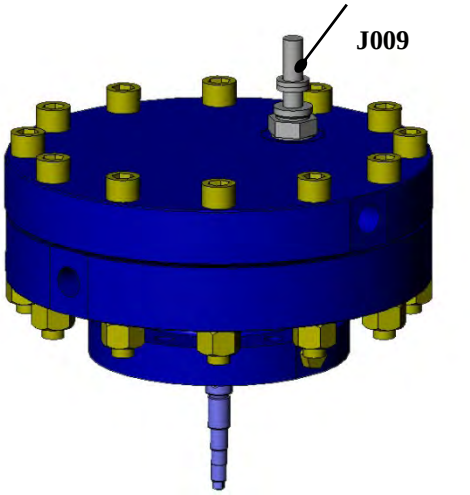
J007



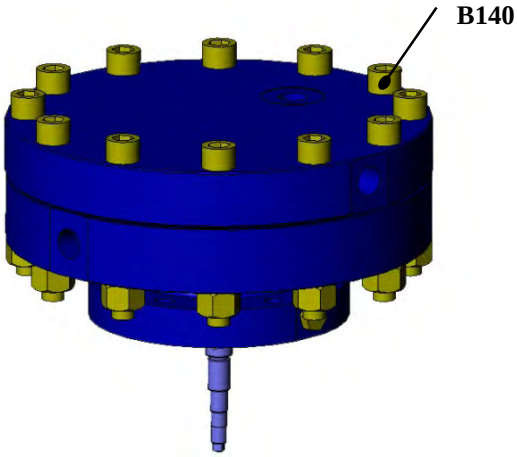
7. Remove the balancing sleeve J007.
8. Position the motor head in a way that the stem is not damaged and the upper diaphragm housing E005 is on the top side.



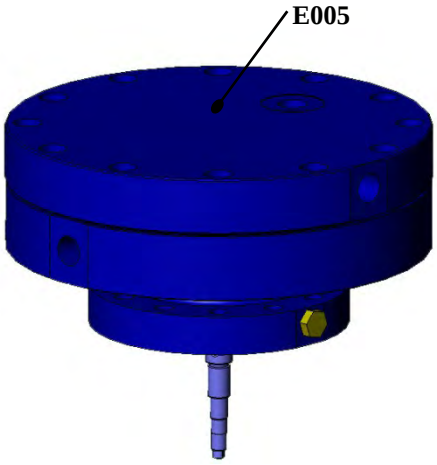
9. Remove the travel index cover J008.



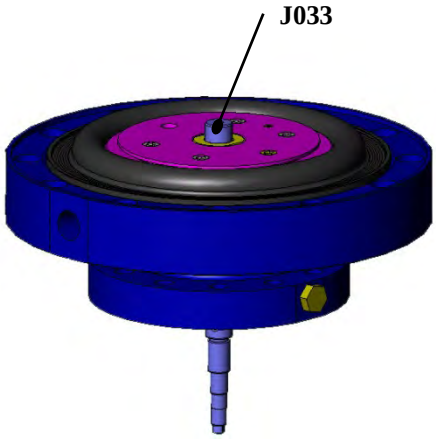
10. Remove the travel index bushing J009 from the upper diaphragm cover E005.



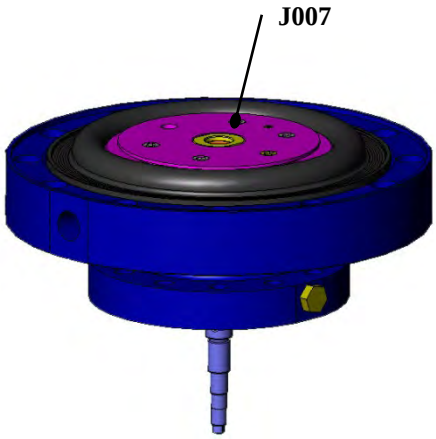
11. Remove the screws B140.



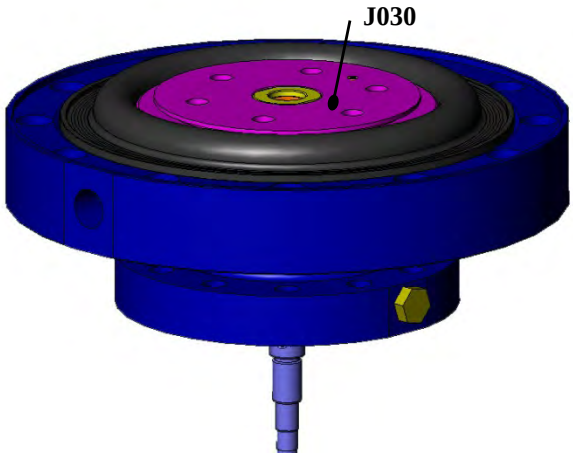
12. Remove the upper diaphragm cover E005.



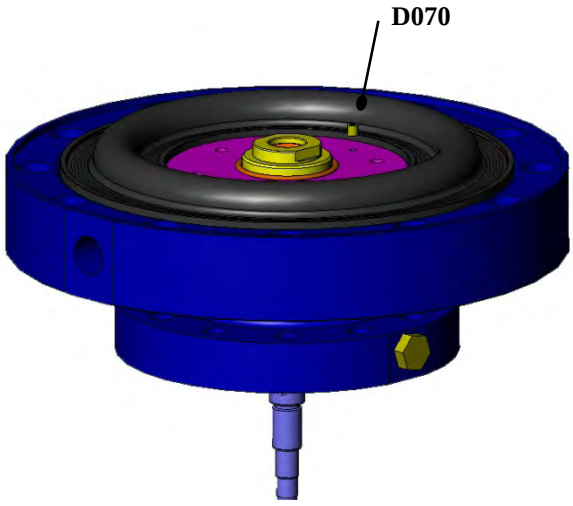
13. Remove the equalizing cylinder J033.



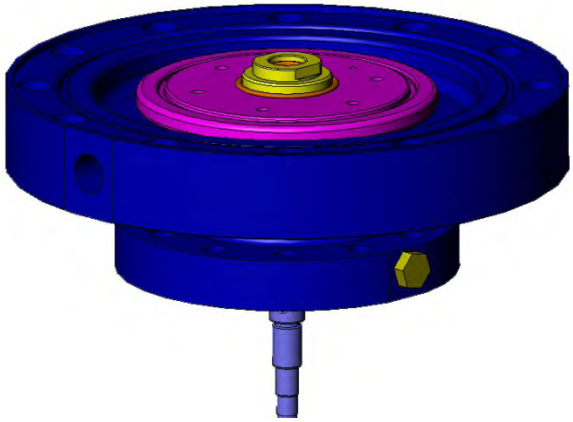
14. Remove the screws B150.



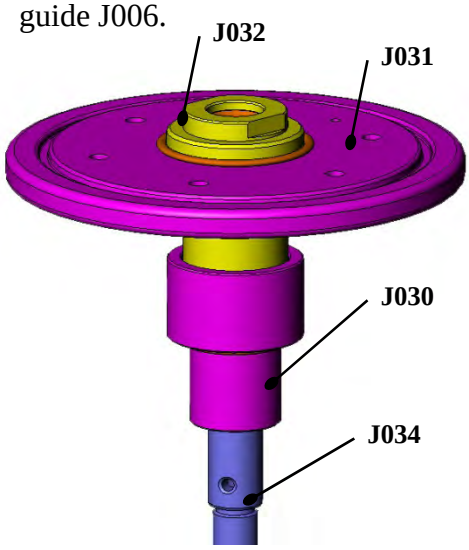
15. Remove the upper diaphragm holder J030.



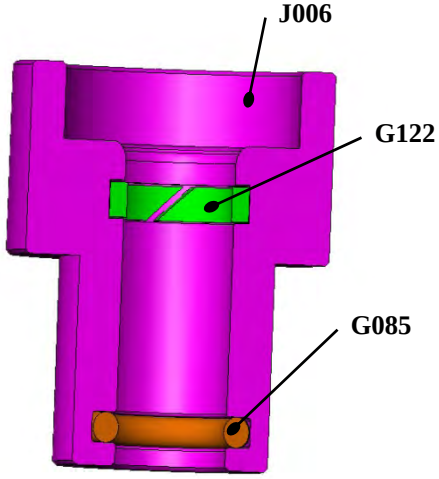
16. Remove the diaphragm D070.



17. Remove together the lower diaphragm holder J031, the stem J034 and the equalizing stem guide J032 and stem guide J006.



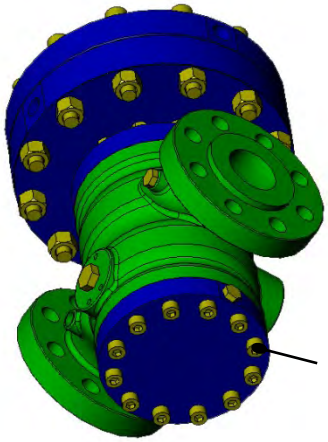
18. Remove and inspect the O-ring G085 and sliding ring G122; replace if necessary.

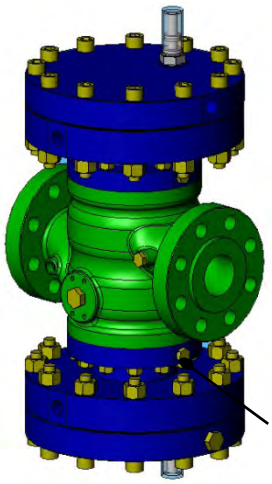


19. Assemble the unit following the instructions in reverse order.

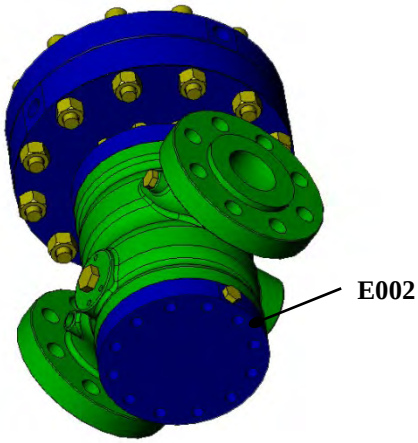
11.1.5 SEAT MAINTENANCE

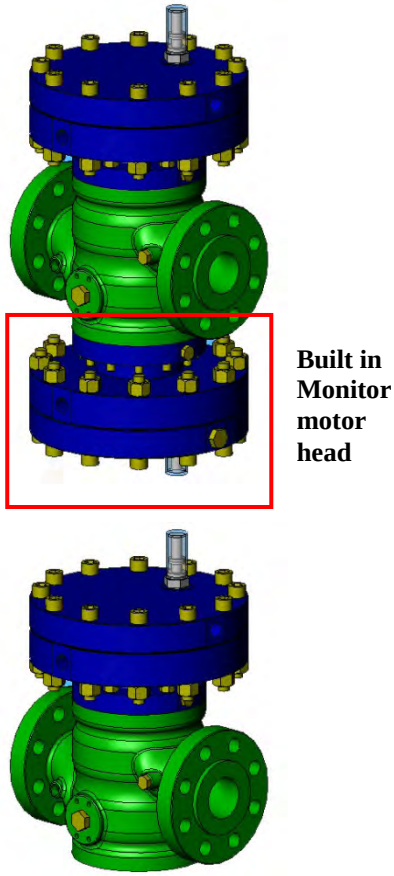
1. Remove the screws B146 (built in monitor: remove nuts B142).



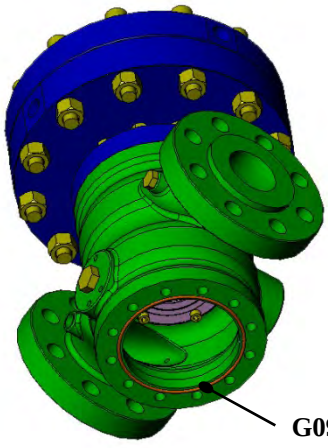


2. Remove the flat cover E002 (built in monitor: remove the entire monitor motor head).

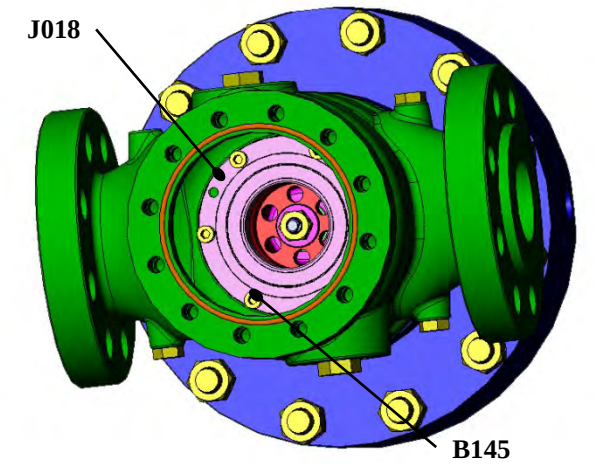




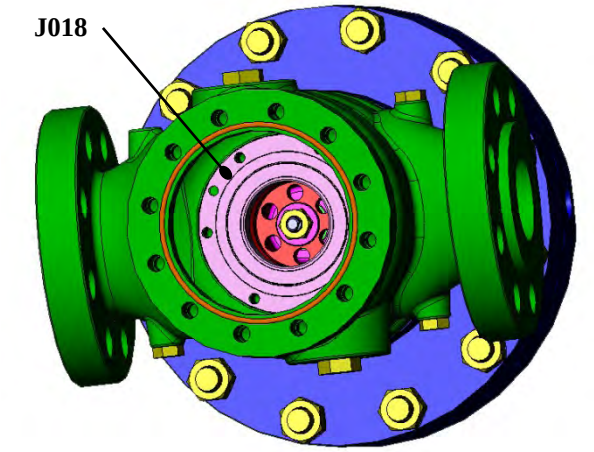
3. Remove and inspect the O-ring G091; replace it if necessary.



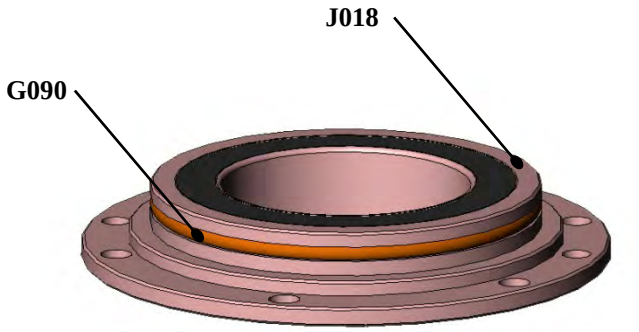
4. Remove the screws B145, holding the seat J018 to prevent it from falling.



5. Remove and inspect the seat J018; replace it if necessary.

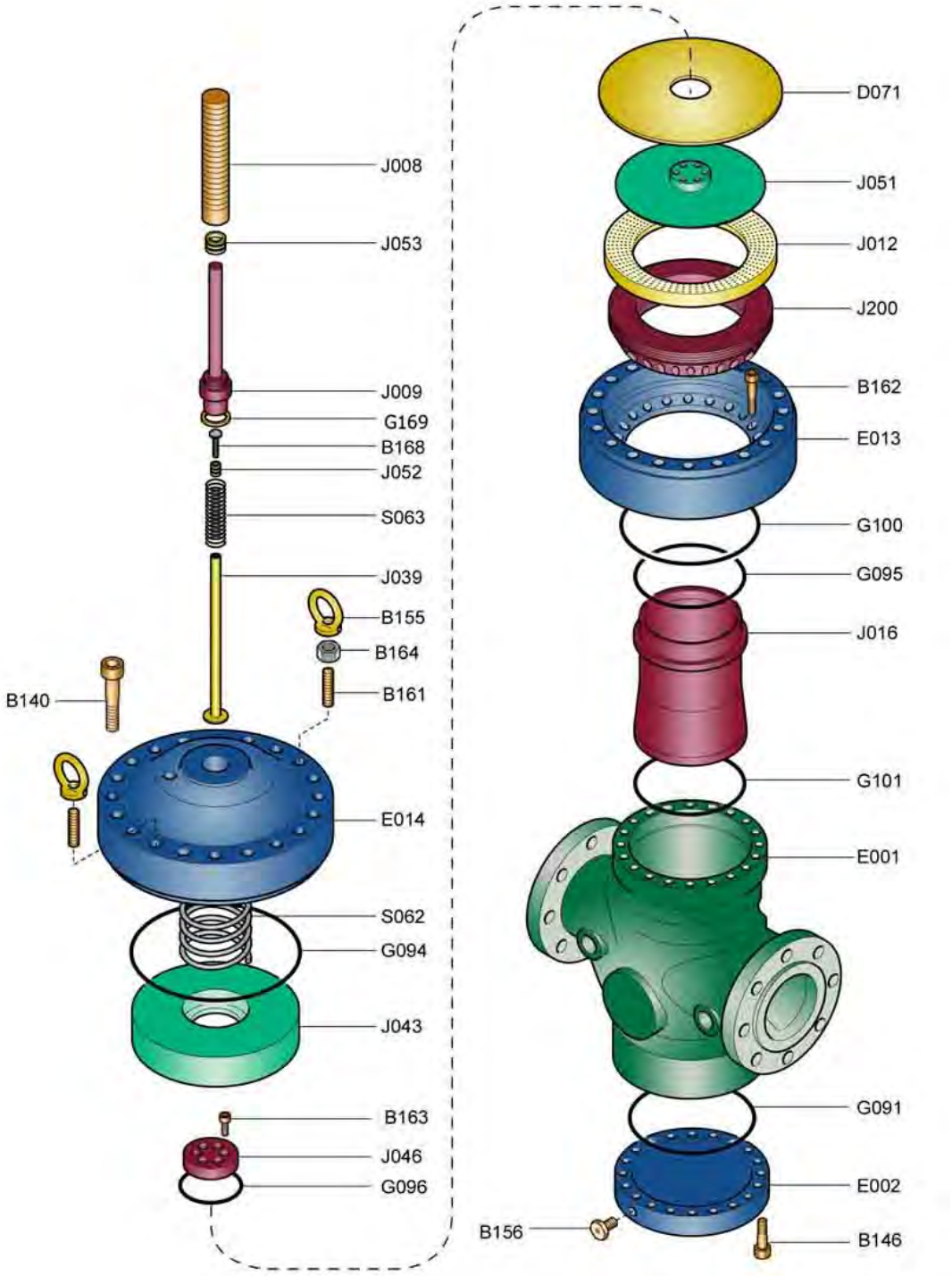


6. Remove and inspect the O-ring G090; replace it if necessary.



7. Assemble the unit following the instructions in reverse order.

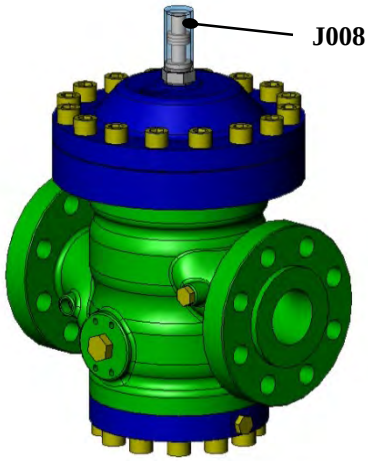
11.2-TA-956DFO ACTIVE OR MONITOR



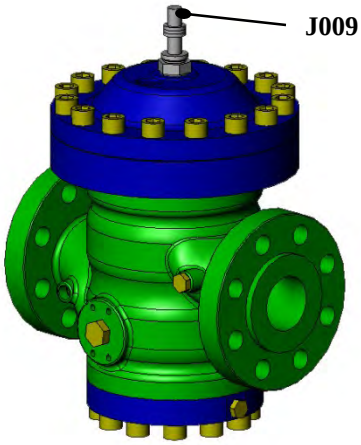
DESCRIPTION	ITEM	DESCRIPTION	ITEM
CAP SCREW	B140	O RING	G100
CAP SCREW	B146	O RING	G101
LIFTING LUG	B155	RADIAL SLOT GRID	J012
HEX PLUG	B156	NOZZLE	J016
HEX PLUG	B157	UPPER DIAPHRAGM RETAINER	J043
STUD	B161	DIAPHRAGM RETAINING RING	J046
CAP SCREW	B162	LOWER DIAPHRAGM RETAINER	J051
CAP SCREW	B163	SILENCER	J200
NUT	B164	SPRING	S062
DIAPHRAGM	D071	TRAVEL INDEX COVER	J008
REGULATOR BODY	E001	TRAVEL INDEX BUSHING	J009
FLAT COVER	E002	INTERNAL MAGNETIC RING	J052
SPACING COVER	E013	EXTERNAL MAGNETIC RING	J053
UPPER COVER	E014	CAP SCREW	B168
O RING	G091	GASKET	G169
O RING	G094	TRAVEL INDEX STEM	J039
O RING	G095	SPRING	S063
O RING	G096		

11.2.1 DIAPHRAGM MAINTENANCE

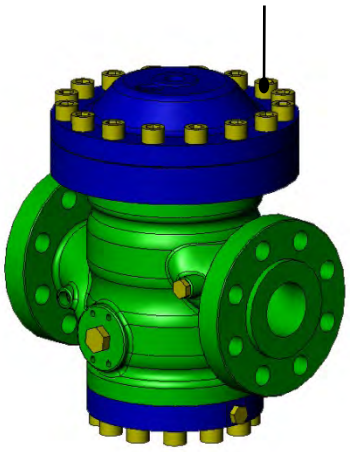
1. Remove the travel index cover J008.



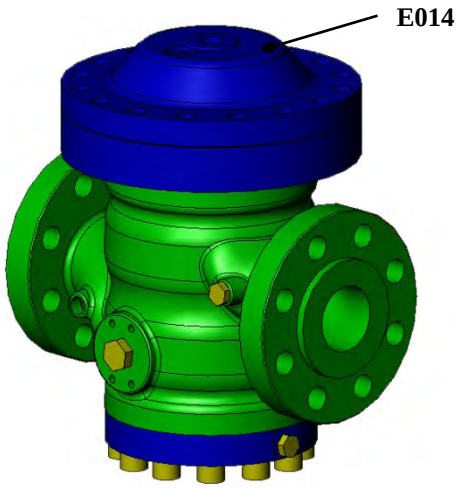
2. Remove the travel index bushing J009, including travel index stem J039 and spring S063.



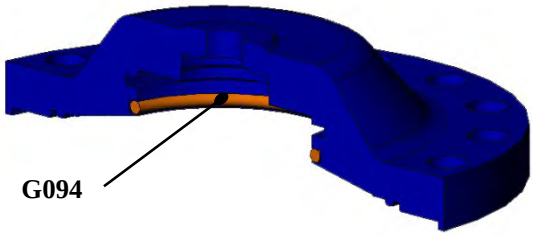
3. Remove the screws B140.



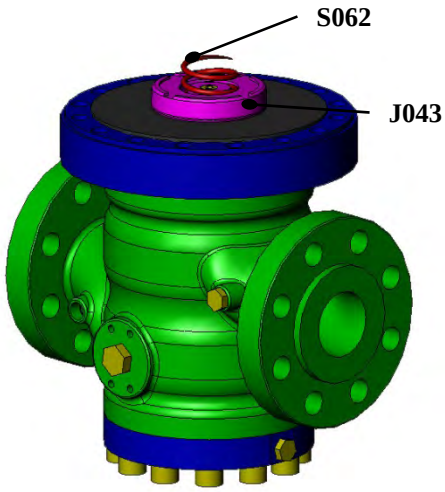
4. Remove the upper diaphragm cover E014 using suitable lifting equipment.



5. Remove the o-ring G094 and inspect it, replace it if necessary.

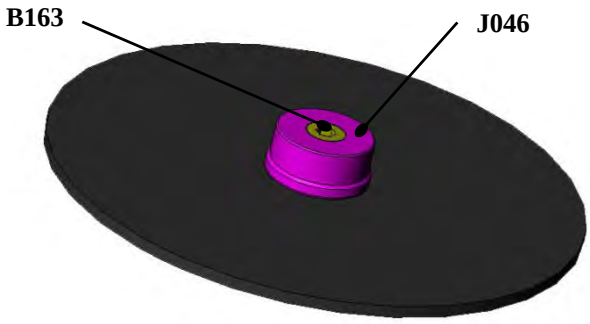


6. Remove spring S062.

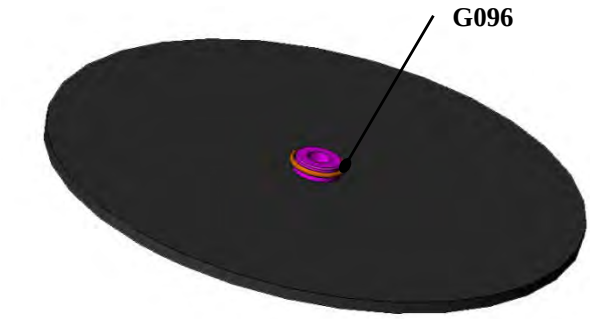


7. Remove the upper diaphragm retainer J043.

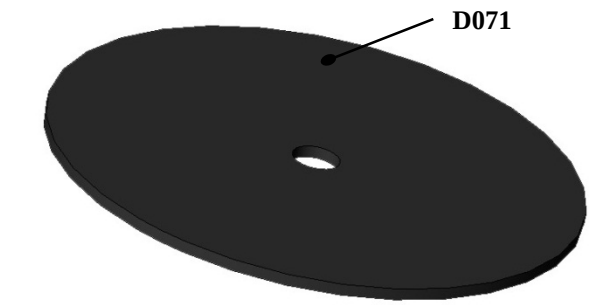
8. Remove the assembly of the diaphragm retaining ring J046, the diaphragm D071 and lower diaphragm retainer J051.



9. Remove the screws B163 and remove the diaphragm retaining ring J046; check O ring G096 and replace it if necessary.



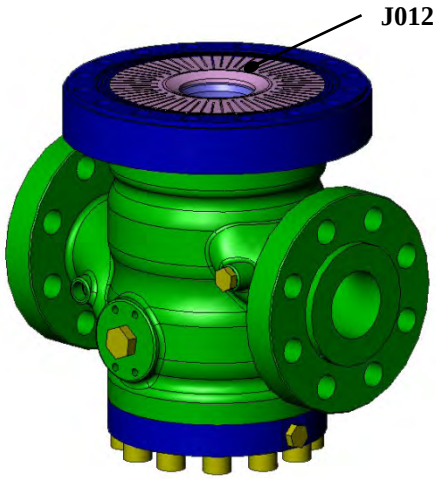
10. Remove the diaphragm 71 and inspect it; diaphragm D071 may be supplied in a two pieces and single piece versions which are fully interchangeable.



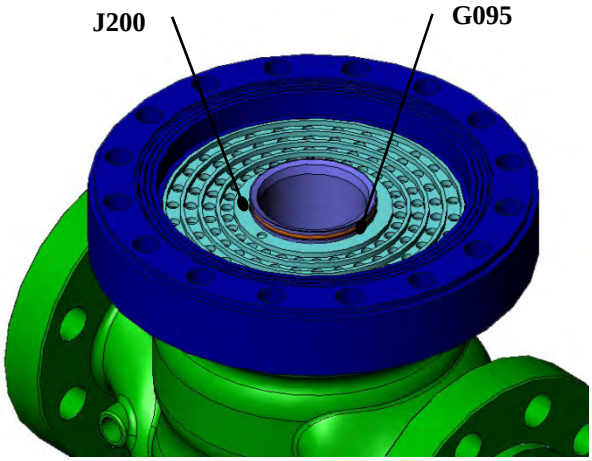
11. If necessary replace the diaphragm.
12. Assemble the unit following the instructions in reverse order.

11.2.2 GRID AND SILENCER (IF INSTALLED) MAINTENANCE

1. Follow the instructions given in 11.2.1 up to point 11.

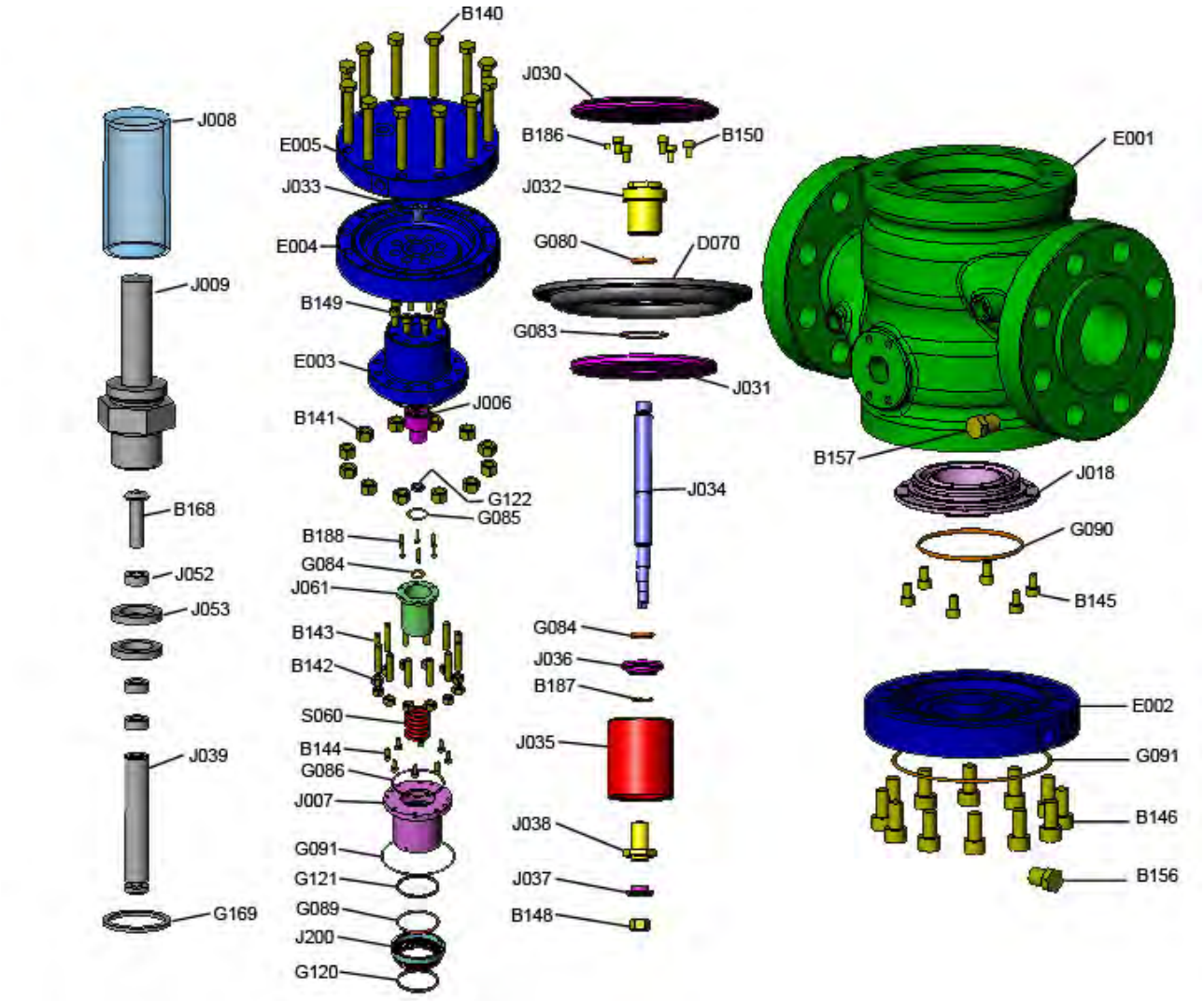


2. Remove the grid J012 using threaded holes provided.
3. Check it, looking carefully at the small sealing rim that must not bear scratches or damages; clean as necessary.



4. Check O ring G095 and replace it if necessary.
5. Remove the silencer assembly J200 using threaded holes provided.
6. Check it and, if necessary, clean it.
7. Assembly the unit following the instructions in reverse order.

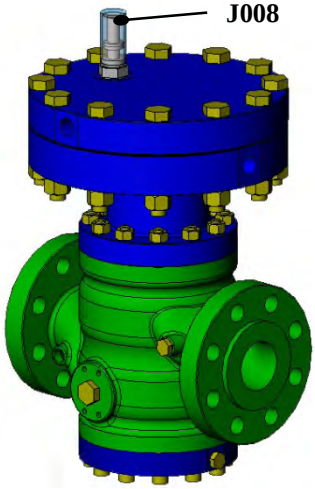
11.3-TA-956MFO ACTIVE OR MONITOR



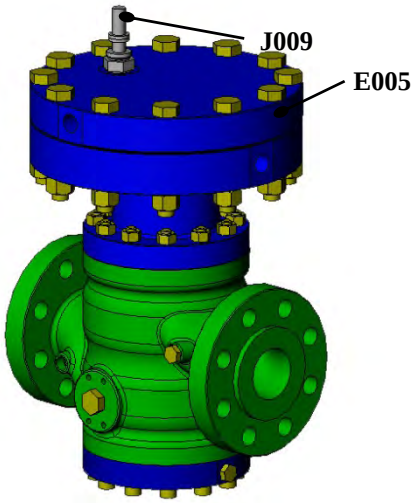
DESCRIPTION	ITEM	DESCRIPTION	ITEM
HEX HEAD SCREW	B140	O RING	G086
NUT	B141	O RING	G087
NUT	B142	O RING	G089
STUD	B143	O RING	G090
CAP SCREW	B144	O RING	G091
CAP SCREW	B145	SLIDING RING	G120
CAP SCREW	B146	SLIDING RING	G121
NUT SELF LOCKING	B148	SLIDING RING	G122
CAP SCREW	B149	STEM GUIDE	J006
CAP SCREW	B150	BALANCING SLEEVE	J007
LIFTING LUG	B155	SEAT	J018
HEX PLUG	B156	UPPER DIAPHRAGM RETAINER	J030
HEX PLUG	B157	LOWER DIAPHRAGM RETAINER	J031
STUD	B161	EQUALIZING STEM GUIDE	J032
NUT	B164	EQUALIZING CYLINDER	J033
SET SCREW	B186	STEM	J034
RETAINING RING	B187	SHUTTER REGULATOR	J035
CAP SCREW	B188	SPRING HOLDING PLATE	J036
DIAPHRAGM	D070	STEM BUSHING RING	J037
REGULATOR BODY	E001	SPRING BUSHING	J038
FLAT COVER	E002	SPRING HOUSING	J061
SPACING COVER	E003	SILENCER	J200
LOWER COVER	E004	SPRING	S060
UPPER COVER	E005	TRAVEL INDEX COVER	J008
O RING	G080	TRAVEL INDEX BUSHING	J009
O RING	G081	TRAVEL INDEX	J039
O RING	G082	INTERNAL MAGNETIC RING	J052
O RING	G083	EXTERNAL MAGNETIC RING	J053
O RING	G084	CAP SCREW	B168
O RING	G085	GASKET	G169

11.3.1 DIAPHRAGM MAINTENANCE

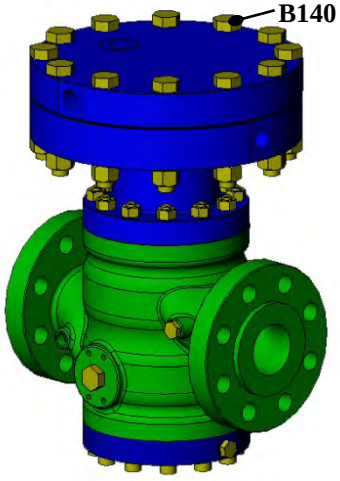
1. Remove the travel index transparent cover J008.



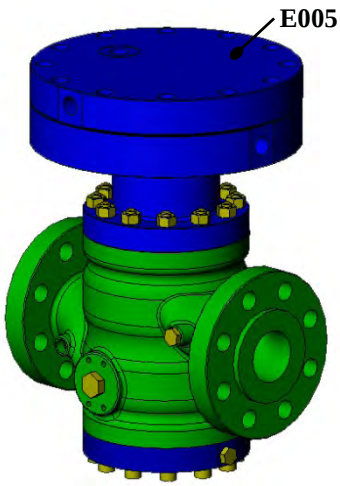
2. Unscrew the travel index bushing J009 from the upper diaphragm cover E005.



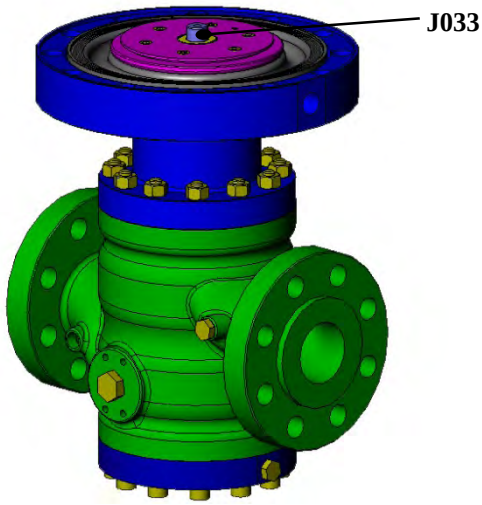
3. Remove the screws B140.



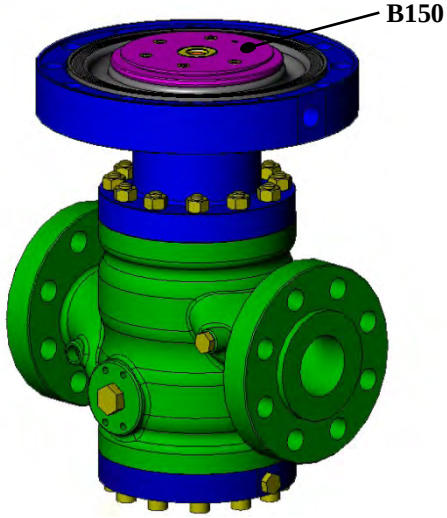
4. Remove the upper diaphragm cover E005.



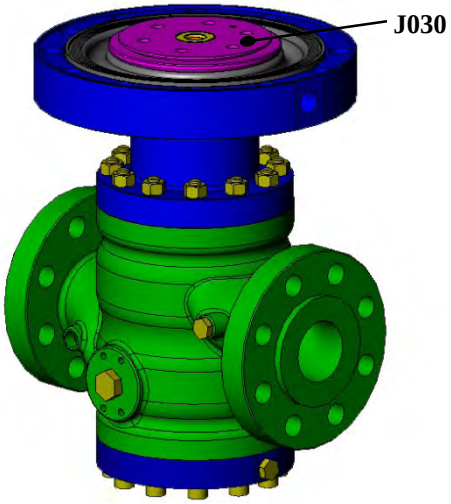
5. Remove the equalizing cylinder J033.



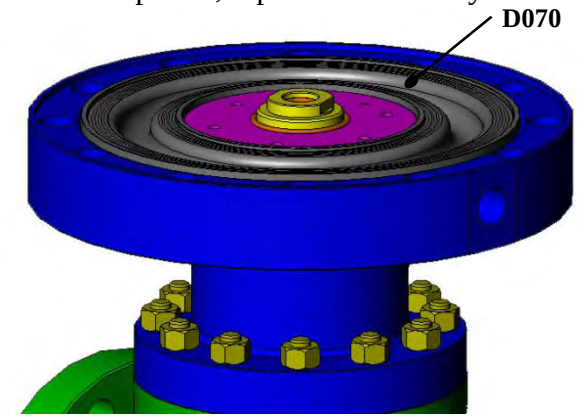
6. Remove the screws B150.



7. Remove the top diaphragm retainer J030.



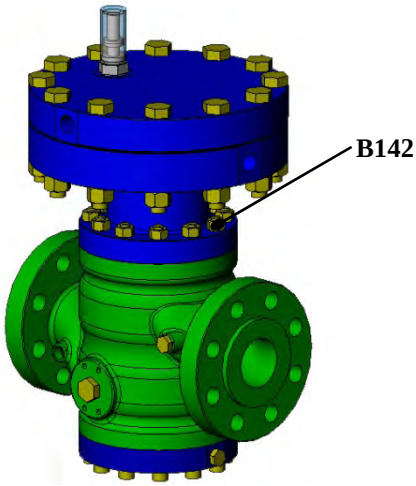
8. Remove the diaphragm D070 and inspect it; replace if necessary.



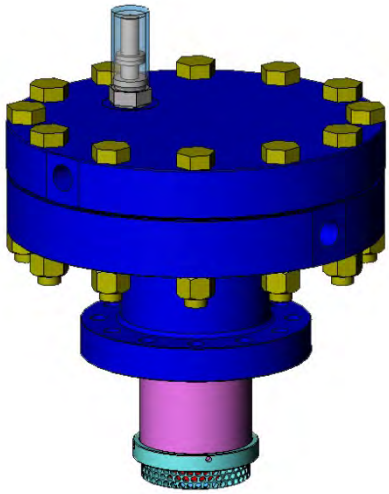
9. Assemble the unit following the instructions in reverse order.

11.3.2 CLEANING THE SILENCER (IF INSTALLED)

1. Remove the nuts B142.

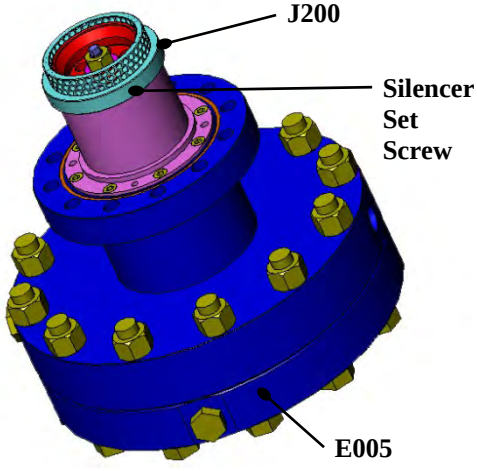


2. Raise the regulator motor head.



CAUTION! **The lifting of the regulator motor head shall be done with great care to avoid damaging the edge of the shutter.**

3. Turn the head 180° and rest it with the upper diaphragm cover E005 on a suitable base.

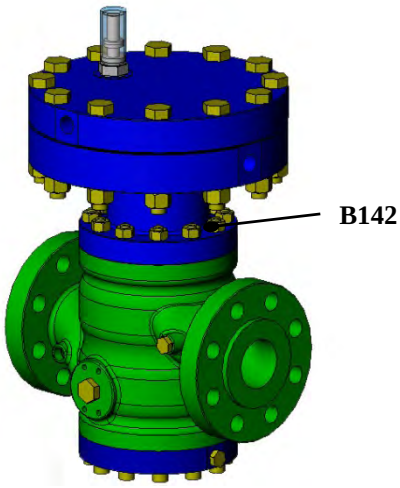


4. Remove the set screws that hold silencer in place.
5. Remove and inspect the silencer J200.

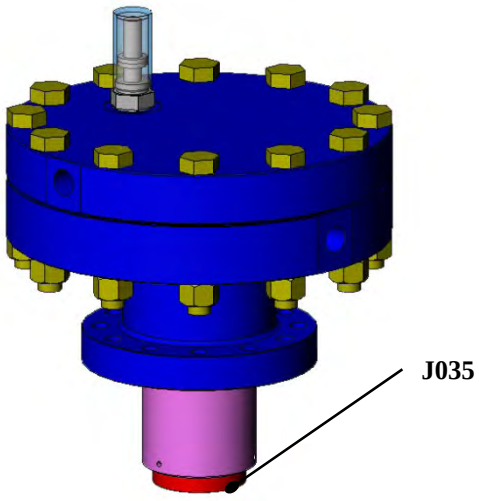
6. If necessary clean it with compressed air or liquid solvents.
7. Assemble the unit following the instructions in reverse order.

11.3.3 SHUTTER O-RING AND SLIDING RING MAINTENANCE

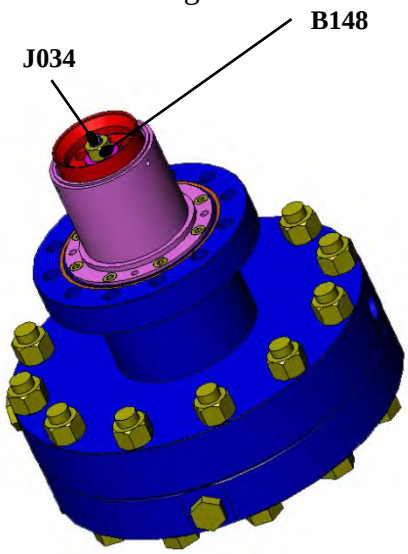
1. Install suitable lifting equipment on the upper cover E005.
2. Remove the nuts B142.



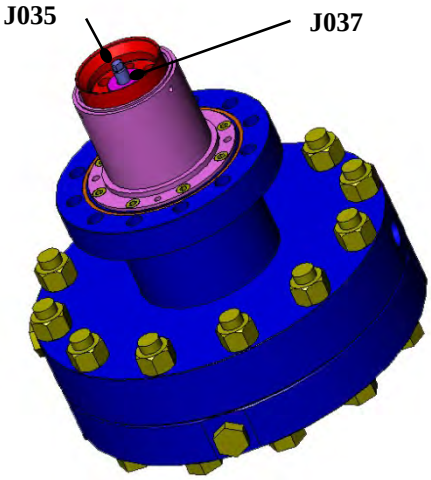
3. Raise the complete motor head.



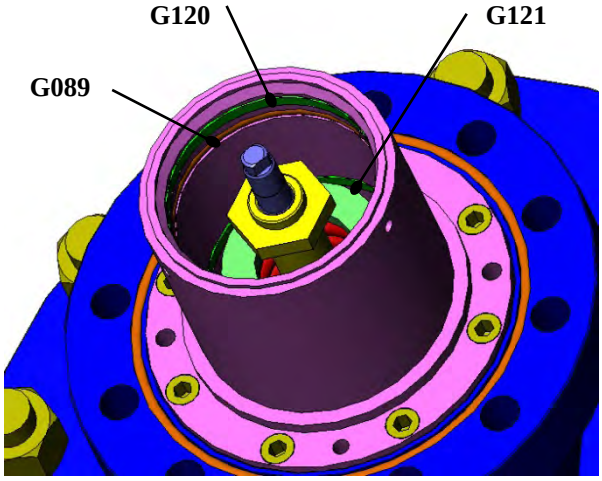
4. lifting shall be done with great care to avoid damaging the edge of the shutter J035 (Monitor J049).
5. Remove the nut B148; use a spanner to hold stem J034 in position by means of the flat surfaces provided; care shall be taken to avoid damages to the shutter rim.



6. Remove the stem bushing J037.



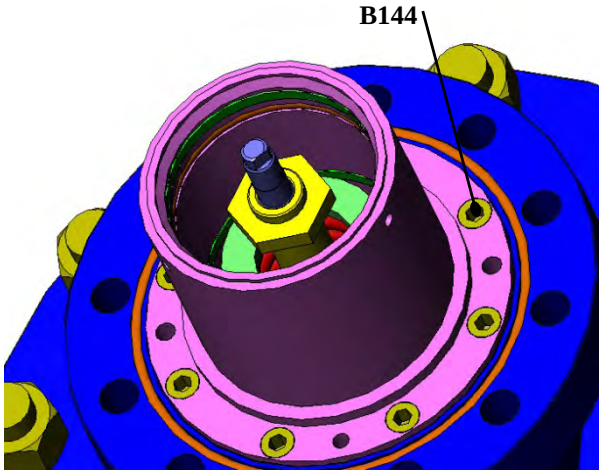
7. Remove the shutter J035 (Monitor J049), care shall be taken to avoid damages to the shutter rim.
8. Inspect the O-ring G089 and the sliding rings G120 and G121; replace if necessary.



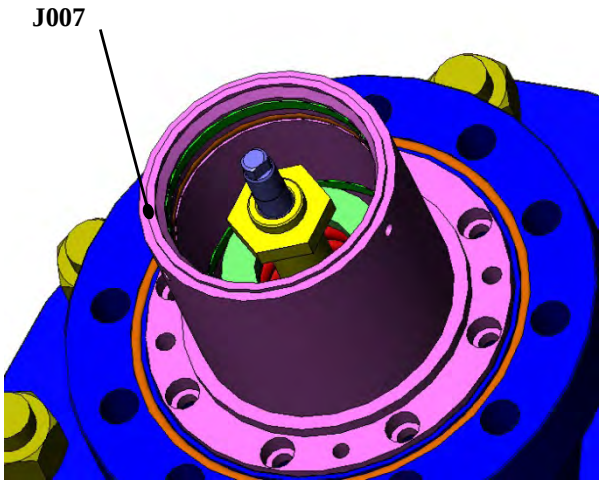
9. Assemble the unit following the instructions in reverse order.

11.3.4 STEM O-RING MAINTENANCE

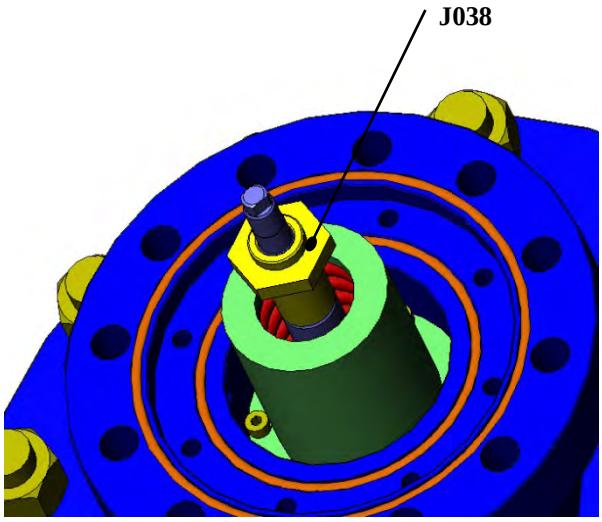
1. Follow the same instructions given in 11.3.2 up to point 9.



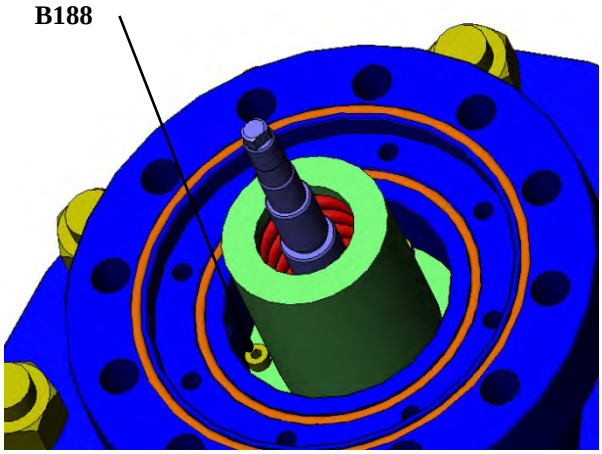
2. Remove screws B144



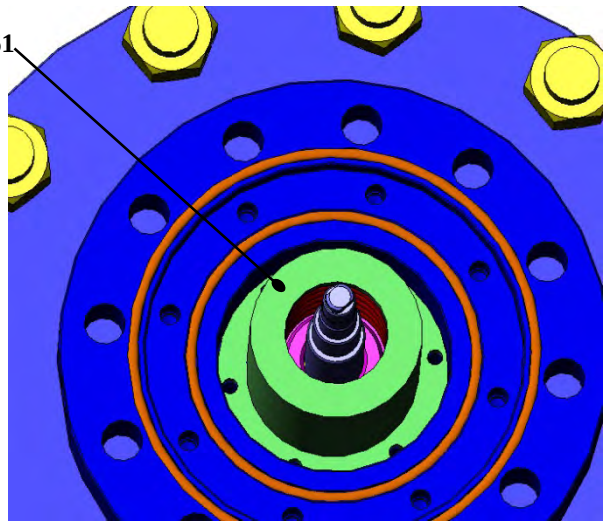
3. Remove the balancing sleeve J007.



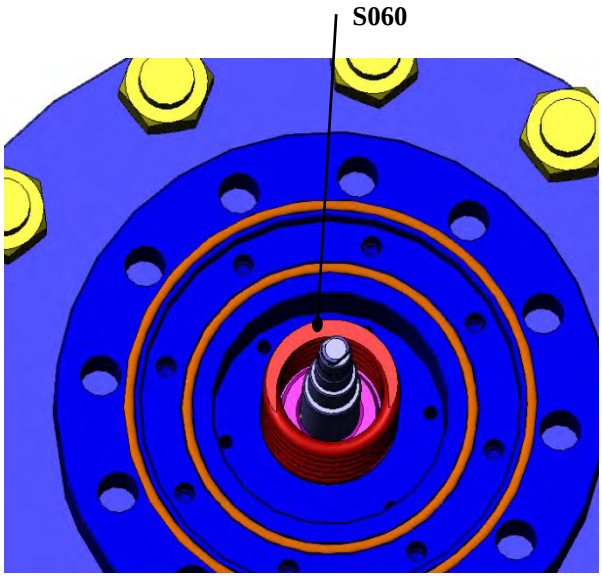
4. Remove the spring bushing J038.



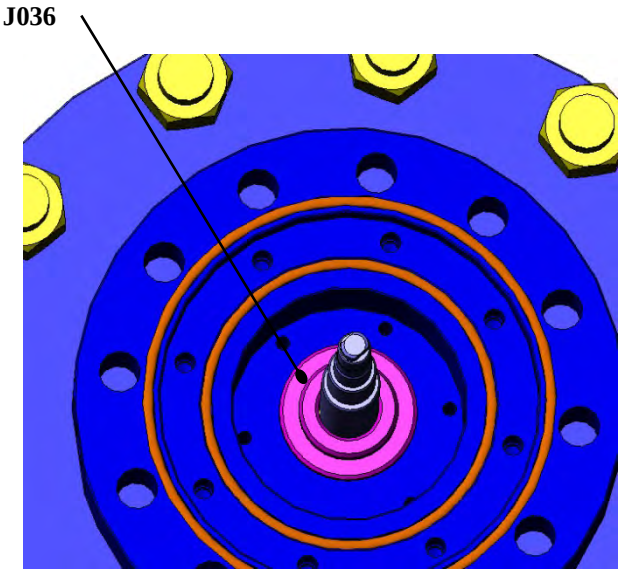
5. Remove the screws B188



6. .Remove the spring housing J061

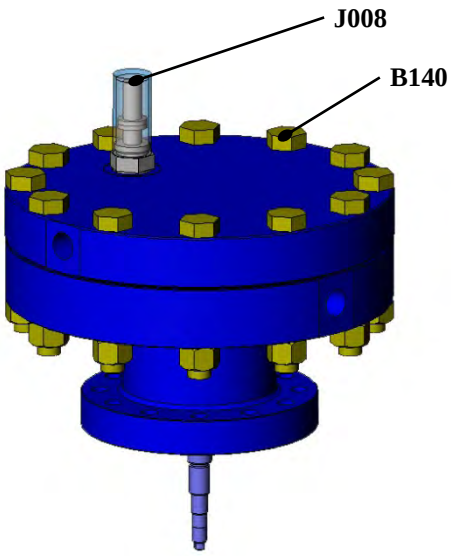


7. Remove the spring S060.

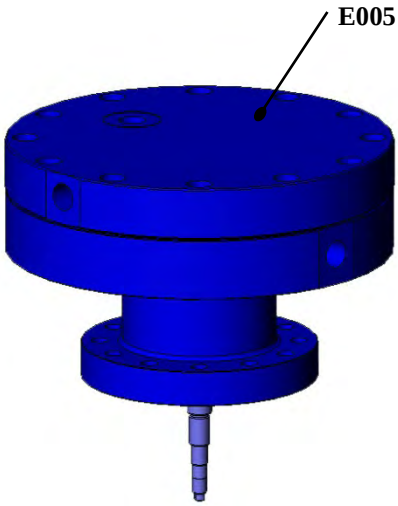


8. Remove the spring holding plate J036.

9. Position the motor head in a way that the stem is not damaged and the upper diaphragm housing E005 is on the top side.

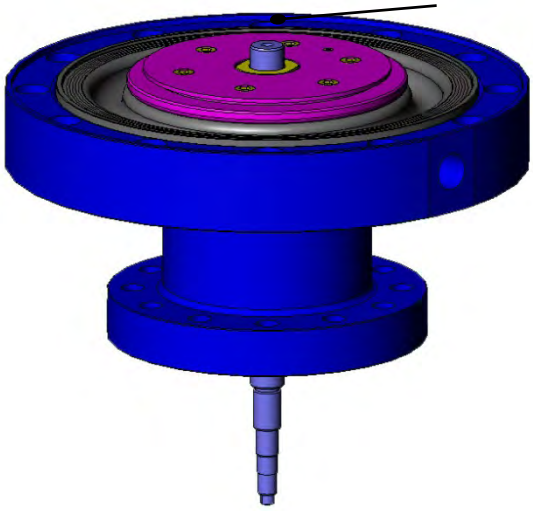


10. Remove the travel index assembly and the screws B140.

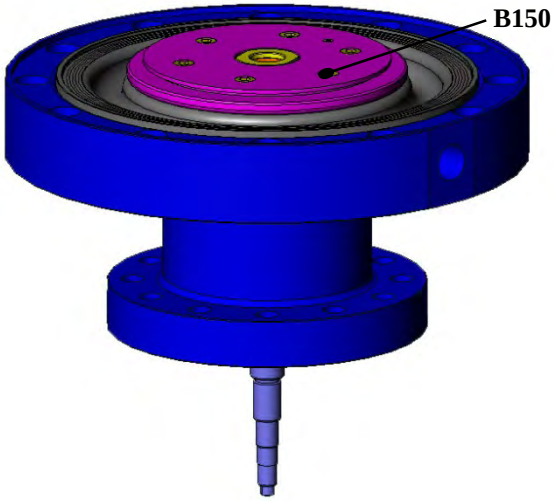


11. Remove the upper diaphragm cover E005.

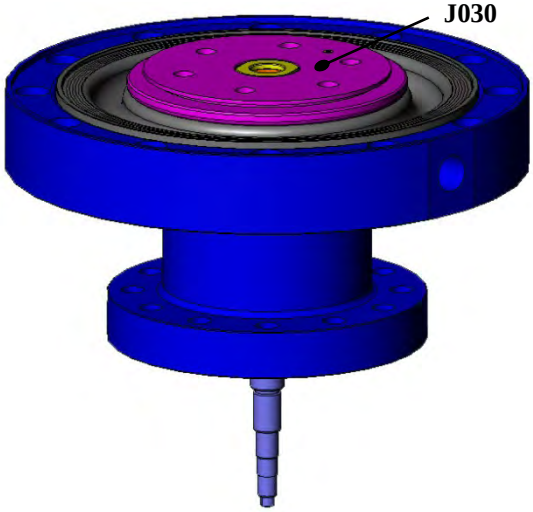
J033



12. Remove the equalizing cylinder J033.

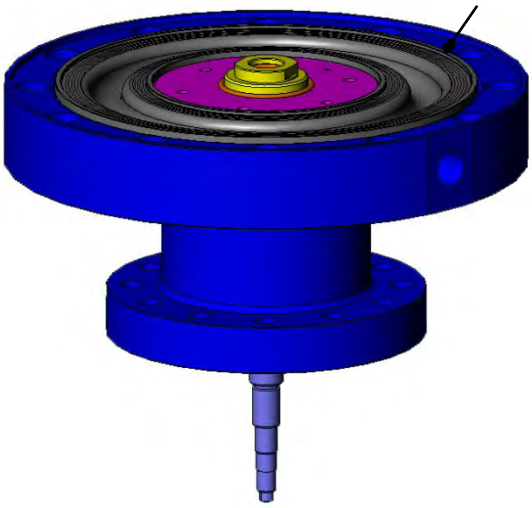


13. Remove the screws B150.

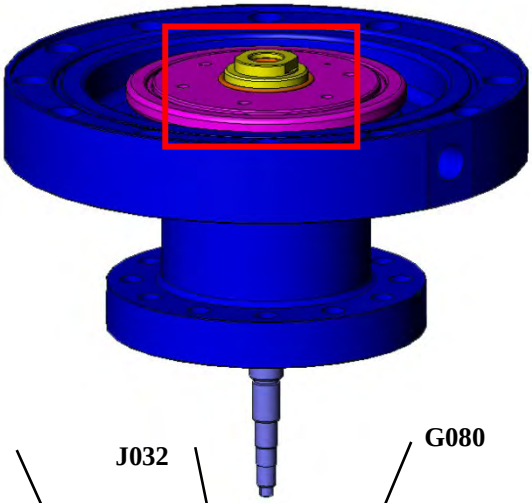


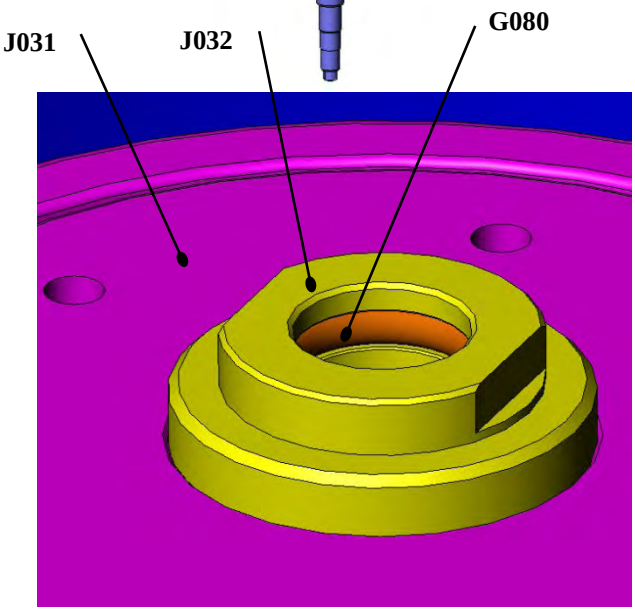
14. Remove the upper diaphragm holder J030.

D070



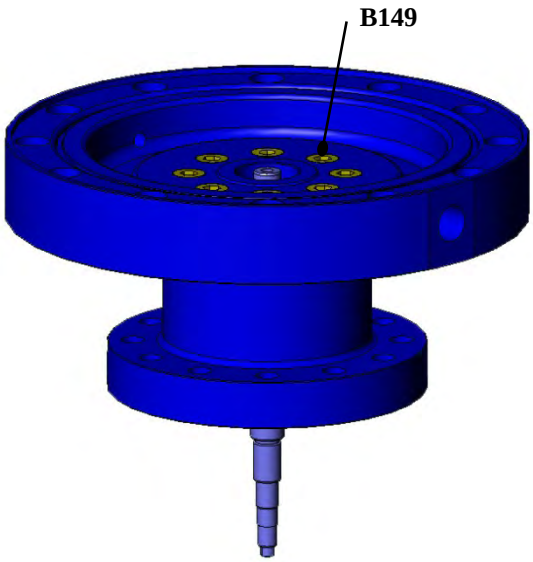
15. Remove the diaphragm D070.



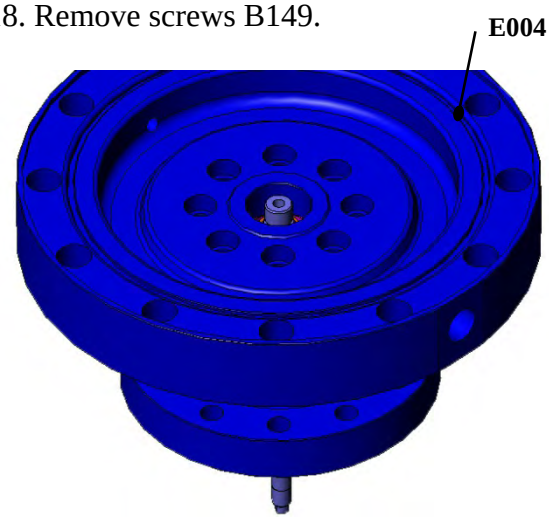


16. Check O ring G080 and change it if necessary.
17. Remove lower diaphragm retainer J031 and the equalizing stem guide J032

holding the stem from the flat surfaces provided (see 11.3.2 point 5).

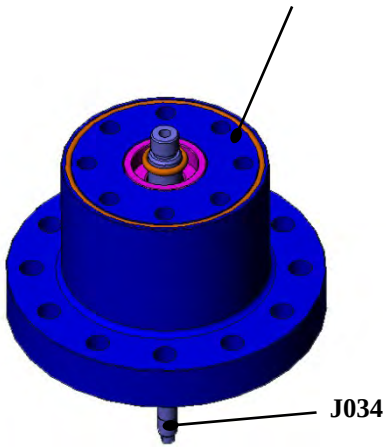


18. Remove screws B149.

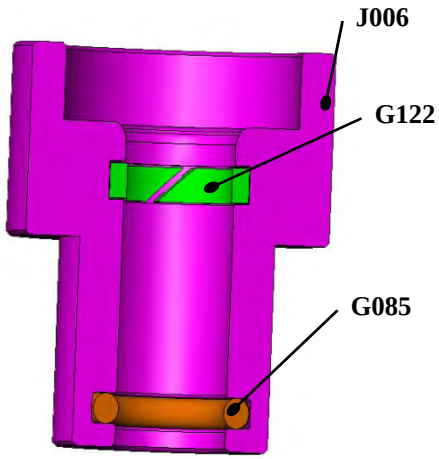


19. Remove lower diaphragm cover E004.

E003



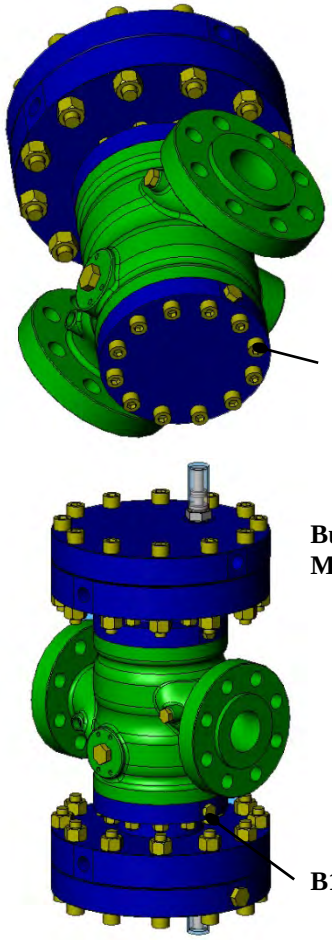
20. Remove spacing cover E003 and stem J034.
21. Remove and inspect the O-ring G085 and sliding ring G122; replace if necessary.



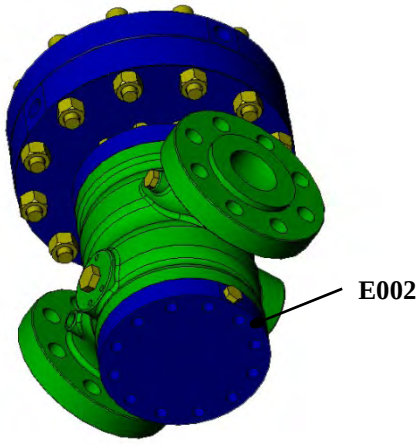
22. Assemble the unit following the instructions in reverse order.

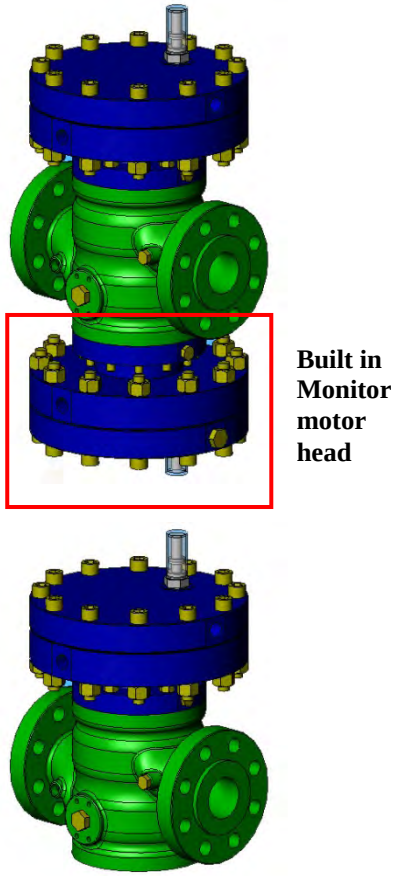
11.3.5 SEAT MAINTENANCE

1. Remove the screws B146 (built in monitor: remove nuts B142).

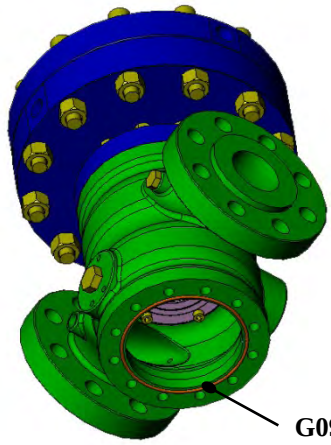


2. Remove the flat cover E002 (built in monitor: remove the entire monitor motor head).

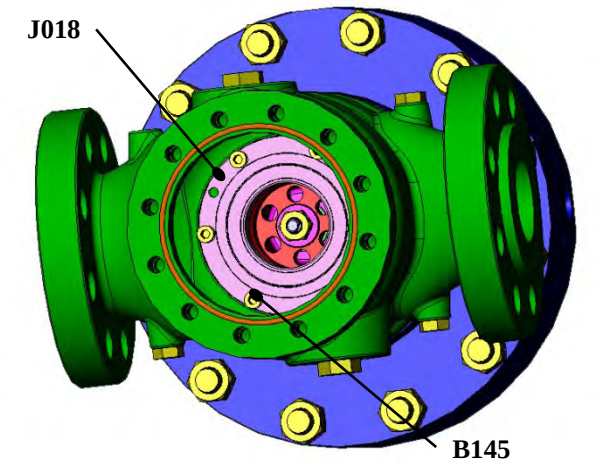




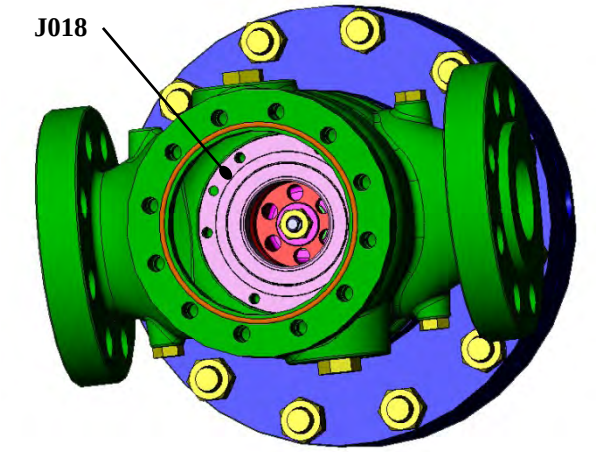
3. Remove and inspect the O-ring G091; replace it if necessary.



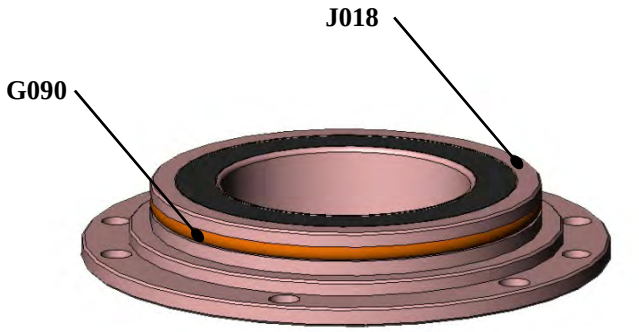
4. Remove the screws B145, holding the seat J018 to prevent it from falling.



5. Remove and inspect the seat J018; replace it if necessary.

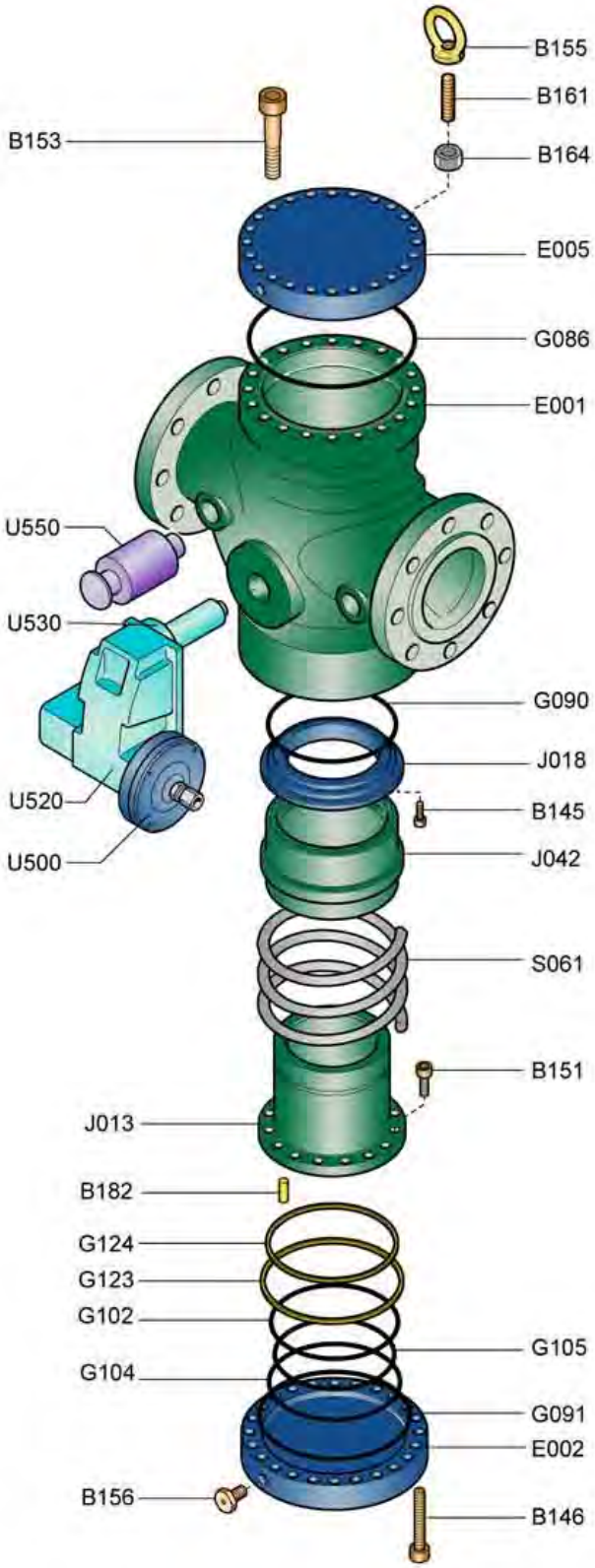


6. Remove and inspect the O-ring G090; replace it if necessary.



7. Assemble the unit following the instructions in reverse order.

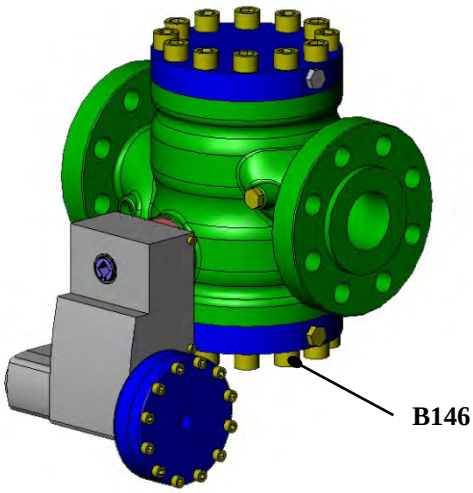
11.4-TA-956SSV



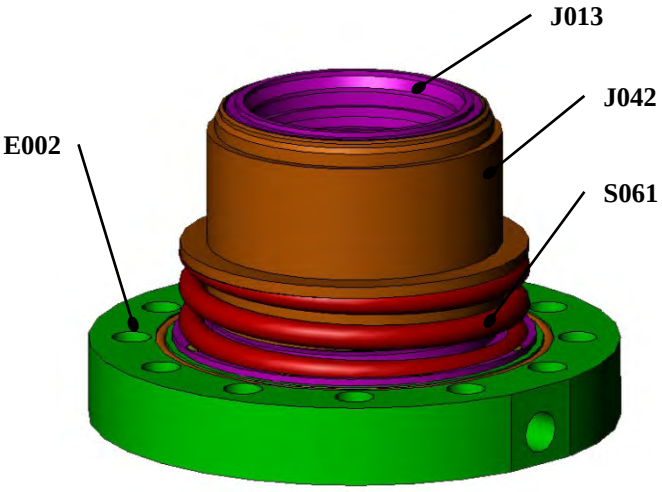
DESCRIPTION	ITEM	DESCRIPTION	ITEM
Cap Screw	B145	O Ring	G091
Cap Screw	B146	O Ring	G102
Cap Screw	B151	O Ring	G104
Cap Screw	B153	O Ring	G105
Lifting Lug	B155	Sliding ring	G123
Hex Plug	B156	Sliding ring	G124
Hex Plug	B157	BALANCING SLEEVE	J013
Stud	B161	SEAT	J018
Nut	B164	SHUTTER SSV	J042
Cylindrical Pin	B182	SPRING	S061
REGULATOR BODY	E001	PRESSURE SWITCH HEAD	U500
FLAT COVER	E002	PRESSURE SWITCH MECHANISM	U520
FLAT COVER	E005	LEVER ASSEMBLY SS DEVICE	U530
O Ring	G086	PUSH BUTTON	U550
O Ring	G090		

11.4.1 SHUTTER O-RING, SLIDING RINGS AND SEAT MAINTENANCE

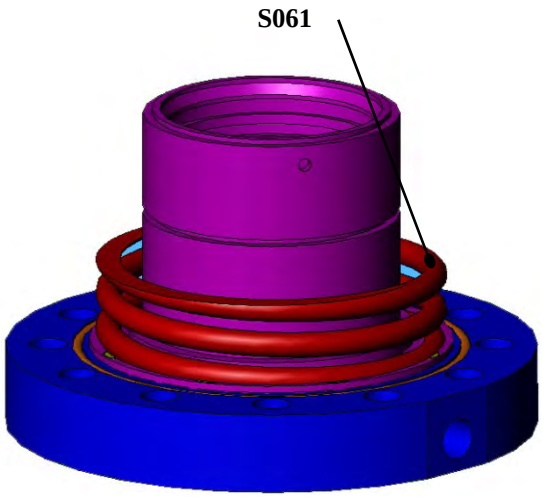
1. Remove screw B146, so that the flat cover E002 together with the shutter guide J013 and shutter J042 can be taken out.



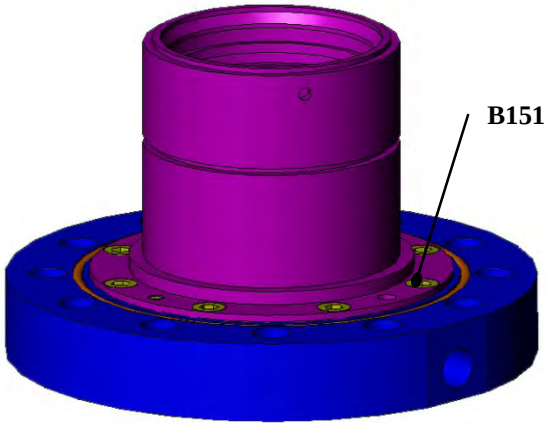
CAUTION! **Handle parts with great care to avoid damaging the edge of the shutter.**



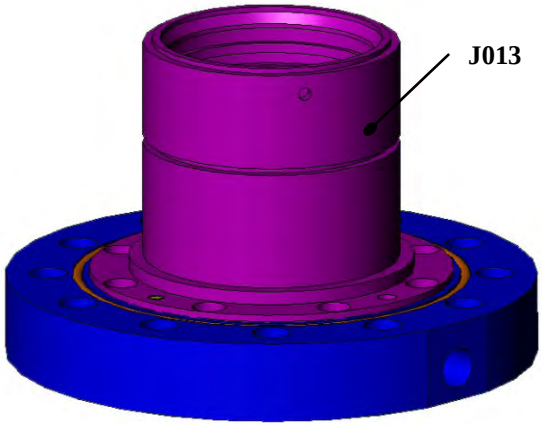
2. Remove shutter J042.



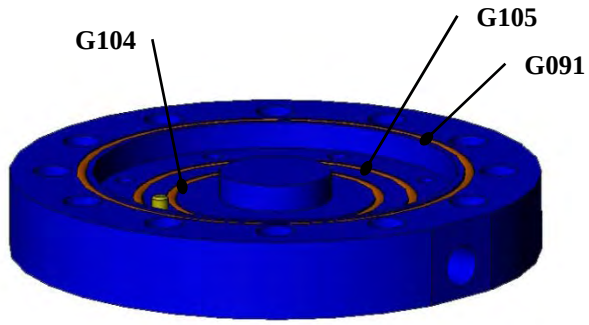
3. Remove spring S061.



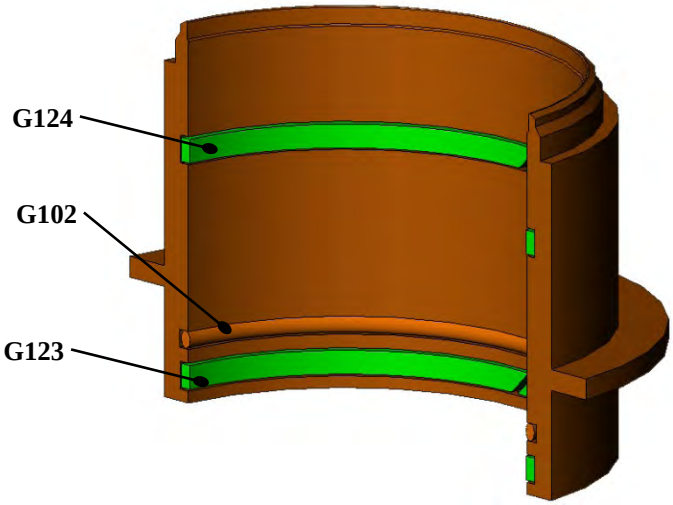
4. Remove screws B151



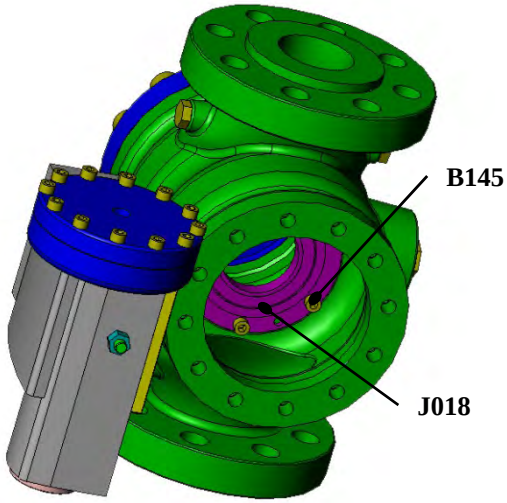
5. Remove the balancing sleeve J013.



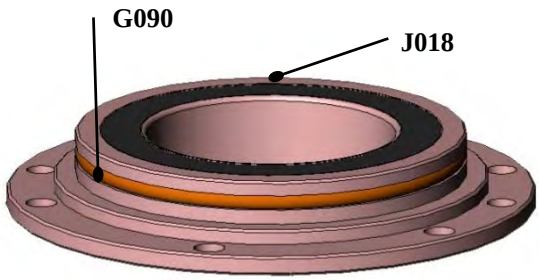
6. Inspect the O-rings G091, G104, G105 and replace them if necessary.



7. Inspect the O-ring G102 and replace it if necessary.
8. Inspect the sliding ring G123 and G124 and replace them if necessary.

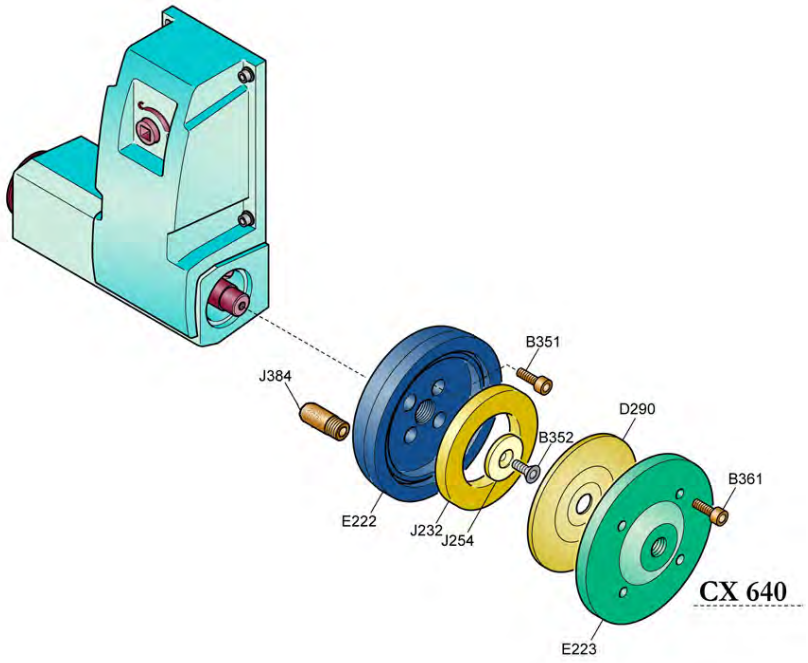


9. Remove screws B145 holding the seat J018 to prevent it from falling.



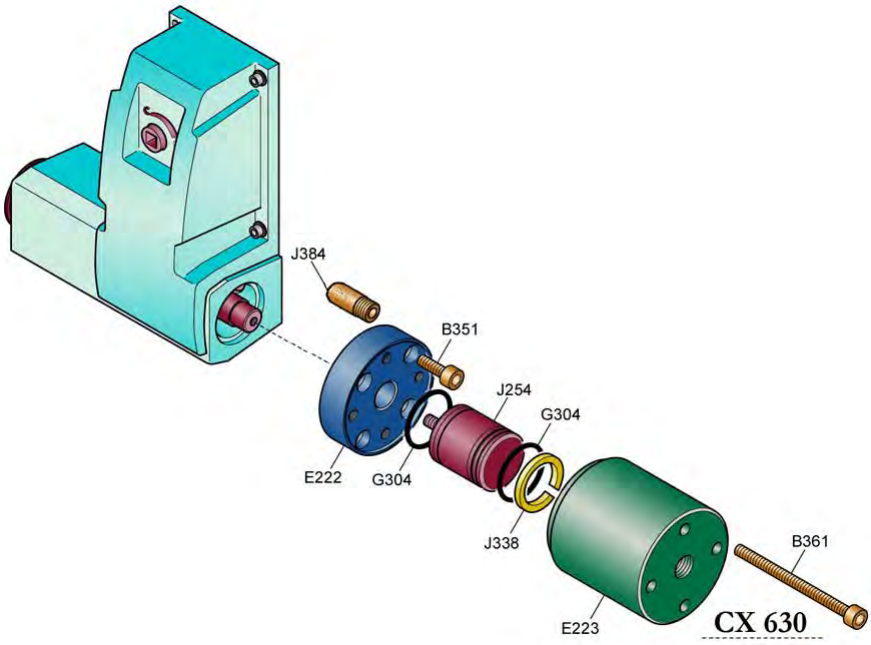
10. Remove the seat J018, inspect and replace it if necessary.
11. Inspect the O-ring G090 and replace it if necessary.
12. Assemble the unit following the instructions in reverse order.

11.4.2 MAINTENANCE OF PRESSURE SWITCH HEAD TA-958CX 640 AND TA-958CX677



1. Remove the screws B361.
2. Remove the upper diaphragm cover E223.
3. Remove and check the diaphragm D290 and replace if necessary.
4. Assemble the unit following the instructions in reverse order.

11.4.3 MAINTENANCE OF PRESSURE SWITCH HEAD TA-958CX 615 AND TA-958CX630



5. Remove the screws B361.
6. Remove the head E223.
7. Remove, check and, if necessary, replace the O-ring G304.
8. Remove, check and, if necessary, replace the sliding ring J338.
9. Assemble the unit following the instructions in reverse order.

12 TROUBLESHOOTING

In the following tables are recorded the most common malfunctions that may be found in operating TA-956 pressure regulators and SSV.
They are divided by function so that they may be applied to multi function valves as well.
Other malfunctions are possible and care shall be taken in evaluating the part responsible or the process conditions in which they appear.
Consult always with factory in case of doubt.

12.1 TA-956FC

PROBLEM	PART	CAUSE	SOLUTION
Leakage at Q=0	Pilot	O-rings damaged	Replace the damaged part
		Diaphragm broken	Replace
		Rubber pad damaged	Replace
	Regulator	O-rings G089, G090 damaged	Replace
		Seat J018 damaged	Replace
		Shutter damaged	Replace
Hunting	Pilot	Unstable signal from sensing point	Tighten the needle valve on the sensing point until the problem disappears
	Regulator	High friction	Remove and lubricate the shutter O-rings and sliding rings
		Calibrated orifice B186 not correct.	Install a smaller or larger orifice. Smaller orifice increases opening speed; larger orifice increases closing speed
	Regulator with fully open monitor	Interference between the calibration of the two pilots	Space the calibrations
Decreasing of regulated pressure when flow rate increases	Cartridge filter	Cartridge dirty	Replace cartridge
	Pilot	Diaphragm damaged	Replace
	Regulator	Diaphragm D070 damaged	Replace
		Shutter J035 blocked	Identify and solve the problem
Increase in outlet pressure	Pilot	O-rings, diaphragm and seat damaged	Replace the parts
		Rubber pad damaged	Replace
	Regulator	Shutter J035 blocked	Remove and replace the damaged parts
		Ice on sleeve and seat	Check the gas inlet temperature, install a pre heating system for gas.

12.2 **TA-956DFO**

PROBLEM	PART	CAUSE	SOLUTION
Leakage at Q=0	Pilot	O-rings damaged	Replace the damaged part
		Diaphragm broken	Replace
	Regulator	O-rings G095, G096, G101 damaged	Replace
		Diaphragm D071 damaged	Replace
		Radial slot grid J012 damaged	Replace
Hunting	Pilot	Unstable signal from sensing point	Tighten the needle valve on the sensing point until the problem disappears. Modify position of flow restrictor TA-VRC05_A.
	Regulator		A dumping valve may be installed in critical application on the motorizing line to regulator motor head.
	Regulator with fully open monitor	Interference between the calibration of the two pilots	Space the calibrations
Decreasing of regulated pressure when flow rate increases	Cartridge filter	Cartridge dirty	Replace cartridge
	Pilot	Diaphragm damaged	Replace
	Regulator	Diaphragm D071 damaged	Replace
Increase in outlet pressure	Pilot	O-rings, diaphragm and seat damaged	Replace the parts
	Regulator	Diaphragm D071 damaged	Replace
		Ice on diaphragm and radial slot grid	Check the gas inlet temperature, install a pre heating system for gas .

12.3 TA-956MFO

PROBLEM	PART	CAUSE	SOLUTION
Leakage at Q=0	Pilot	O-rings damaged	Replace the damaged part
		Diaphragm broken	Replace
		Rubber pad damaged	Replace
	Regulator	O-rings G089, G090 damaged	Replace
		Seat J018 damaged	Replace
		Shutter J035 damaged	Replace
Hunting	Pilot	Unstable signal from sensing point	Tighten the needle valve on the sensing point until the problem disappears
	Regulator	High friction	Remove and lubricate the shutter O-rings and sliding rings
	Regulator with fully open monitor	Interference between the calibration of the two pilots	Space the calibrations
Decreasing of regulated pressure when flow rate increases	Cartridge filter	Cartridge dirty	Replace cartridge
	Pilot	Diaphragm damaged	Replace
	Regulator	Diaphragm D070 damaged	Replace
		Shutter J035 blocked	Identify and solve the problem
Increase in outlet pressure	Pilot	O-rings, diaphragm and seat damaged	Replace the parts
		Rubber pad damaged	Replace
	Regulator	Shutter J035 blocked	Remove and replace the damaged parts
		Ice on sleeve and seat	Check the gas inlet temperature, install a pre heating system for gas.

12.4 TA-956SSV

PROBLEM	PART	CAUSE	SOLUTION
Leakage with closed SSV	Valve	O-ring, G090 damaged	Replace
		Seat J018 damaged	Replace
		Shutter J042 damaged	Replace
SSV does not close	Valve	Shutter J042 blocked	Remove and lubricate the shutter O-rings and sliding rings
	Pressure switch TA-958CX640/677	Diaphragm D290 damaged	Replace
	Pressure switch TA-958CX615/630	O-ring, G304 damaged	Replace
Set pressure required are not achieved		Calibration not correct	Perform a new calibration sequence
	Pressure switch TA-958CX640/677	Diaphragm D290 damaged	Replace
	Pressure switch TA-958CX615/630	O-ring, G304 or sliding ring J338damaged	Replace
	Pressure switch TA-958CX___	MAX / MIN spring fully compressed or too extended	Chose a correct spring for the required calibration range

13 SPARE PARTS

Spare parts for Series 956 gas pressure regulators and SSV are normally supplied in kits.
There are two types of kits available.
Full spare parts kit and soft parts kit.
Full spare parts kit includes all soft parts as well as seat.
Soft parts kit includes only soft components but not seat.
Every configuration, size and pressure class of the 956 family equipment has it own specific kit.
Spare parts kits data sheet may be obtained from factory at any time by specifying the PO or the serial number of the equipment.
Spare parts shall be stored appropriately.
In particular parts that are subject to damage if exposed to direct light, like rubber parts and rubber bonded parts, shall be stored in closed cubicles repaired from direct exposure to light.
Storage shelf time shall be limited to rubber parts to a maximum of two years from purchase.
Further limitations may apply in case of specific climatic conditions as may be envisaged by local regulations.

APPENDIX 1

SET POINT TABLES

The following tables are intended to support user in the planning of the set point values for the equipment involved in a pressure regulating system.
Pressure regulating system are normally made of one or more lines each equipped with various equipment active pressure regulator, monitor regulator, Safety Shutoff Valve, Relief Valve, Quick Exhaust Valve.
The relevant set points are critical to the satisfactory operation of the pressure regulating system as well as to the proper sequence of the safety systems.

FC+SSV+Relief Valve DFO+SSV+Relief Valve MFO+SSV+Relief Valve			
CLASS 600 & 300			
Regulator Set Point SP_R	Relief Valve Set Point	SSV MAX Set Point	SSV MIN Set Point
0.3<SP_R<=2.0 barg 4.5<SP_R<=30 psig	SP_R*1.1	SP_R*1.2	SP_R-0.3 barg SP_R-4.5 psig
2.0<SP_R<=5.0 barg 30<SP_R<=72 psig	SP_R*1.1	SP_R*1.2	SP_R-0.5 barg SP_R-7.0 psig
5.0<SP_R<=25.0 barg 72<SP_R<=363 psig	SP_R*1.05	SP_R*1.1	SP_R-3.0 barg SP_R-44.0 psig
25.0<SP_R<=75.0 barg 363<SP_R<=1088 psig	SP_R*1.02	SP_R*1.05	SP_R-5.0 barg SP_R-72.0 psig

Table: Ap1-01

FC+FC+SSV+QEV+Relief Valve DFO+FC+SSV+QEV+Relief Valve MFO+FC+SSV+QEV+Relief Valve					
CLASS 600 & 300					
Regulator Set Point SP_R	Monitor Set Point	QEV Set Point	Relief Valve Set Point	SSV MAX Set Point	SSV MIN Set Point
0.3<SP_R<=2.0 barg 4.5<SP_R<=30 psig	SP_R*1.1	SP_R*1.2	SP_R*1.3	SP_R*1.5	SP_R-0.3 barg SP_R-4.5 psig
2.0<SP_R<=5.0 barg 30<SP_R<=72 psig	SP_R*1.1	SP_R*1.2	SP_R*1.3	SP_R*1.4	SP_R-0.5 barg SP_R-7.0 psig
5.0<SP_R<=25.0 barg 72<SP_R<=363 psig	SP_R*1.05	SP_R*1.1	SP_R*1.15	SP_R*1.3	SP_R-3.0 barg SP_R-44.0 psig
25.0<SP_R<=75.0 barg 363<SP_R<=1088 psig	SP_R*1.03	SP_R*1.06	SP_R*1.15	SP_R*1.3	SP_R-5.0 barg SP_R-72.0 psig

Table: Ap1-02

FC+SSV+Relief Valve DFO+SSV+Relief Valve MFO+SSV+Relief Valve			
CLASS 150			
Regulator Set Point SP_R	Relief Valve Set Point	SSV MAX Set Point	SSV MIN Set Point
0.005<SP_R<=0.010 barg 0.073<SP_R<=0.145 psig	0.020 barg 0.290 psig	0.025 barg 0.366 psig	N/A
0.010<SP_R<=0.015 barg 0.145<SP_R<=0.218 psig	SP_R*1.5	0.025 barg 0.366 psig	N/A
0.015<SP_R<=0.020 barg 0.218<SP_R<=0.290 psig	SP_R*1.5	SP_R+0.020 barg SP_R+0.290 psig	0.010 barg 0.145 psig
0.020<SP_R<=0.025 barg 0.290<SP_R<=0.363 psig	SP_R*1.5	SP_R+0.020 barg SP_R+0.290 psig	SP_R-0.010 barg SP_R-0.145 psig
0.025<SP_R<=0.030 barg 0.363<SP_R<=0.435 psig	SP_R*1.4	SP_R+0.020 barg SP_R+0.290 psig	SP_R-0.010 barg SP_R-0.145 psig
0.030<SP_R<=0.060 barg 0.435<SP_R<=0.870 psig	SP_R*1.25	SP_R+0.030 barg SP_R+0.435 psig	SP_R-0.010 barg SP_R-0.145 psig
0.060<SP_R<=0.080 barg 0.870<SP_R<=1.160 psig	SP_R*1.25	SP_R+0.030 barg SP_R+0.435 psig	SP_R-0.010 barg SP_R-0.145 psig
0.080<SP_R<=0.120 barg 1.160<SP_R<=1.740 psig	SP_R*1.25	SP_R+0.040 barg SP_R+0.580 psig	SP_R-0.020 barg SP_R-0.290 psig
0.120<SP_R<=0.200 barg 1.740<SP_R<=2.900 psig	SP_R*1.15	SP_R+0.040 barg SP_R+0.580 psig	SP_R-0.040 barg SP_R-0.580 psig
0.200<SP_R<=0.500 barg 2.900<SP_R<=7.252 psig	SP_R*1.15	SP_R+0.100 barg SP_R+1.450 psig	SP_R-0.060 barg SP_R-0.870 psig
0.500<SP_R<=1.000 barg 7.252<SP_R<=14.5 psig	SP_R*1.15	SP_R+0.200 barg SP_R+2.900 psig	SP_R-0.100 barg SP_R-1.450 psig
1.0<SP_R<=2.5 barg 14.5<SP_R<=36.3 psig	SP_R*1.15	SP_R+0.500 barg SP_R+7.251 psig	SP_R-0.300 barg SP_R-4.351 psig
2.5<SP_R<=5.0 barg 36.3<SP_R<=72.5 psig	SP_R*1.15	SP_R+1.0 barg SP_R+14.5 psig	SP_R-0.300 barg SP_R-4.351 psig
5.0<SP_R<=7.5 barg 72.5<SP_R<=108.8 psig	SP_R*1.1	SP_R+1.0 barg SP_R+14.5 psig	SP_R-0.700 barg SP_R-10.2 psig
7.5<SP_R<=10.0 barg 108.8<SP_R<=145.0 psig	SP_R*1.1	SP_R+1.5 barg SP_R+21.8 psig	SP_R-1.0 barg SP_R-14.5 psig

Table: Ap1-03

FC+FC+SSV+QEV+Relief Valve DFO+FC+SSV+QEV+Relief Valve MFO+FC+SSV+QEV+Relief Valve					
CLASS 150					
Regulator Set Point SP_R	Monitor Set Point	QEV Set Point	Relief Valve Set Point	SSV MAX Set Point	SSV MIN Set Point
0.005<SP_R<=0.010 barg 0.073<SP_R<=0.145 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	0.025 barg 0.366 psig	0.030 barg 0.435 psig	N/A
0.010<SP_R<=0.015 barg 0.145<SP_R<=0.218 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	0.025 barg 0.366 psig	0.030 barg 0.435 psig	N/A
0.015<SP_R<=0.020 barg 0.218<SP_R<=0.290 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	0.025 barg 0.366 psig	0.030 barg 0.435 psig	N/A
0.020<SP_R<=0.025 barg 0.290<SP_R<=0.363 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	SP_R*1.8	SP_R+0.020 barg SP_R+0.290 psig	0.010 barg 0.145 psig
0.025<SP_R<=0.030 barg 0.363<SP_R<=0.435 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	SP_R*1.55	SP_R+0.020 barg SP_R+0.290 psig	SP_R-0.010 barg SP_R-0.145 psig
0.030<SP_R<=0.060 barg 0.435<SP_R<=0.870 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	SP_R*1.4	SP_R+0.030 barg SP_R+0.435 psig	SP_R-0.010 barg SP_R-0.145 psig
0.060<SP_R<=0.080 barg 0.870<SP_R<=1.160 psig	SP_R+0.005 barg SP_R+0.073 psig	SP_R+0.011 barg SP_R+0.160 psig	SP_R*1.3	SP_R+0.030 barg SP_R+0.435 psig	SP_R-0.010 barg SP_R-0.145 psig
0.080<SP_R<=0.120 barg 1.160<SP_R<=1.740 psig	SP_R*1.15	SP_R*1.25	SP_R*1.3	SP_R+0.040 barg SP_R+0.580 psig	SP_R-0.020 barg SP_R-0.290 psig
0.120<SP_R<=0.200 barg 1.740<SP_R<=2.900 psig	SP_R*1.15	SP_R*1.25	SP_R*1.3	SP_R*1.41	SP_R-0.040 barg SP_R-0.580 psig
0.200<SP_R<=0.500 barg 2.900<SP_R<=7.252 psig	SP_R*1.15	SP_R*1.25	SP_R*1.3	SP_R*1.41	SP_R-0.060 barg SP_R-0.870 psig
0.500<SP_R<=1.000 barg 7.252<SP_R<=14.5 psig	SP_R*1.12	SP_R*1.25	SP_R*1.3	SP_R*1.45	SP_R-0.150 barg SP_R-2.176 psig
1.0<SP_R<=2.5 barg 14.5<SP_R<=36.3 psig	SP_R*1.05	SP_R*1.12	SP_R*1.18	SP_R*1.4	SP_R-0.3 barg SP_R-4.351 psig
2.5<SP_R<=5.0 barg 36.3<SP_R<=72.5 psig	SP_R*1.05	SP_R*1.1	SP_R*1.18	SP_R*1.3	SP_R-0.3 barg SP_R-4.351 psig
5.0<SP_R<=7.5 barg 72.5<SP_R<=108.8 psig	SP_R*1.05	SP_R*1.1	SP_R*1.15	SP_R*1.23	SP_R-0.5 barg SP_R-7.252 psig
7.5<SP_R<=10.0 barg 108.8<SP_R<=145.0 psig	SP_R*1.05	SP_R*1.1	SP_R*1.15	SP_R*1.23	SP_R-0.6 barg SP_R-8.702 psig

Table: Ap1-04

APPENDIX 2

PILOT SPRING TABLE

PILOTS 980 GROUPS PLAN

PILOT	PILOT SPRING					FIRST STAGE PILOT SPRING					PRESSURE	
	Nr	CODE	Color	RAL		Nr	CODE	Color	RAL		MIN. [bar]	MAX. [bar]
TA-982FC	1521	0000000000431	Pink	3015		1520	0000000000430	Yellow	1023		0.005	0.013
TA-982FC	1522	0000000000432	Brown	8003		1520	0000000000430	Yellow	1023		0.012	0.030
TA-982FC	1523	0000000000433	Aluminium	9006		1520	0000000000430	Yellow	1023		0.028	0.055
TA-982FC	1524	0000000000434	Orange	2613		1520	0000000000430	Yellow	1023		0.040	0.085
TA-982FC	1501	0000000000403	White	9010		1520	0000000000430	Yellow	1023		0.069	0.180
TA-982FC	1502	0000000000404	Green	6029		1520	0000000000430	Yellow	1023		0.150	0.358
TA-982FC	1525	0000000000435	Lylium	4005		1520	0000000000430	Yellow	1023		0.350	0.580
TA-981FC-R	1501	0000000000403	White	9010		1517	0000000000427	Green	6029		0.3	1.2
TA-981FC	1502	0000000000404	Green	6029		1517	0000000000427	Green	6029		0.8	2.8
TA-981FC	1503	0000000000405	Yellow	1023		1517	0000000000427	Green	6029		1.5	7.0
TA-981FC	1504	0000000000406	L.Blue	5012		1517	0000000000427	Green	6029		4.0	14.0
TA-981FC	1505	0000000000406	Blue	5017		1517	0000000000427	Green	6029		8.0	20.0
TA-981FC	1506	0000000000416	Red	3001		1517	0000000000427	Green	6029		15.0	33.0
TA-981FC	1507	0000000000417	Black	9005		1517	0000000000427	Green	6029		22.0	43.0
TA-986FO	1521	0000000000431	Pink	3015							0.005	0.013
TA-986FO	1522	0000000000432	Brown	8003							0.012	0.030
TA-986FO	1523	0000000000433	Aluminium	9006							0.028	0.055
TA-986FO	1524	0000000000434	Orange	2613							0.040	0.085
TA-986FO	1501	0000000000403	White	9010							0.069	0.100
TA-985FO	1501	0000000000403	White	9010							0.10	0.31
TA-985FO	1502	0000000000404	Green	6029							0.28	0.65
TA-985FO	1525	0000000000435	Lylium	4005							0.64	1.04
TA-985FO	1504	0000000000406	L.Blue	5012							0.8	1.2
TA-984FO	1508	0000000000418	White	9010							0.8	1.3
TA-984FO	1509	0000000000419	Green	6029							1.2	2.1
TA-984FO	1568	0000000000605	Aluminium	9006							1.5	2.9
TA-984FO	1510	0000000000420	Yellow	1023							2.0	3.3
TA-984FO	1511	0000000000421	L.Blue	5012							3.0	4.8
TA-984FO	1512	0000000000422	Blue	5017							4.5	7.0
TA-984FO	1513	0000000000423	Red	3001							6.0	9.5
TA-983FO	1511	0000000000421	L.Blue	5012							7.0	12.0
TA-983FO	1512	0000000000422	Blue	5017							10.0	17.0
TA-983FO	1513	0000000000423	Red	3001							15.0	25.0
TA-983FO	1514	0000000000424	Black	9005							20.0	35.0
TA-983FO	1515	0000000000425	Pink	3015							30.0	45.0
TA-983FO	1516	0000000000426	Brown	8003							40.0	60.0
TA-987FO	1510	0000000000420	Yellow	1023		1534	0000000000444	Black	9005		1.0	3.2
TA-987FO	1511	0000000000421	L.Blue	5012		1534	0000000000444	Black	9005		3.2	5.2
TA-987FO	1512	0000000000422	Blue	5017		1534	0000000000444	Black	9005		5.2	8.2
TA-987FO	1513	0000000000423	Red	3001		1534	0000000000444	Black	9005		8.2	17.0
TA-987FO	1514	0000000000424	Black	9005		1534	0000000000444	Black	9005		12.0	25.0
TA-987FO	1515	0000000000425	Pink	3015		1534	0000000000444	Black	9005		17.0	26.0
TA-987FO	1516	0000000000426	Brown	8003		1534	0000000000444	Black	9005		25.0	33.0
TA-987FO-H	1514	0000000000424	Black	9005		1534	0000000000444	Black	9005		20.0	30.0
TA-987FO-H	1515	0000000000425	Pink	3015		1534	0000000000444	Black	9005		30.0	44.0
TA-987FO-H	1516	0000000000426	Brown	8003		1534	0000000000444	Black	9005		44.0	60.0
TA-987FO-HH	1516	0000000000426	Brown	8003		1534	0000000000444	Black	9005		41.0	75.0

TA-981QEV	1510	0000000000420	Yellow	1023							3.5	8.5
TA-981QEV	1511	0000000000421	L.Blue	5012							6.5	12.5
TA-981QEV	1512	0000000000422	Blue	5017							9.0	18.0
TA-981QEV	1513	0000000000423	Red	3001							12.0	26.0
TA-981QEV	1514	0000000000424	Black	9005							18.0	36.0
TA-981QEV	1515	0000000000425	Pink	3015							26.0	46.5

Table: Ap2-01

Pilot Spring Dimensions								
n°	**Code**	**DE [mm]**	**d [mm]**	**p [mm]**	**L [mm]**	**Color**	**RAL** *RAL*	
1521	0000000000431	35.00	2.30	8.70	60.00	Pink	3015	
1522	0000000000432	35.00	2.50	11.00	60.00	Brown	8003	
1523	0000000000433	35.00	2.80	10.00	60.00	Aluminium	9006	
1524	0000000000434	35.00	3.00	10.00	60.00	Orange	2613	
1525	0000000000435	35.00	4.50	12.00	60.00	Lylium	4005	
1501	0000000000403	35.00	3.50	10.00	60.00	White	9010	
1502	0000000000404	35.00	4.00	11.00	60.00	Green	6029	
1503	0000000000405	35.00	5.00	10.50	60.00	Yellow	1023	
1504	0000000000406	35.00	6.00	10.50	60.00	L.Blue	5012	
1505	0000000000406	35.00	7.00	10.50	60.00	Blue	5017	
1506	0000000000416	35.00	8.00	12.00	60.00	Red	3001	
1507	0000000000417	35.00	8.50	11.50	60.00	Black	9005	
1508	0000000000418	35.00	4.00	12.50	100.00	White	9010	
1509	0000000000419	35.00	4.50	11.50	100.00	Green	6029	
1510	0000000000420	35.00	5.00	11.00	100.00	Yellow	1023	
1511	0000000000421	35.00	5.50	11.00	100.00	L.Blue	5012	
1512	0000000000422	35.00	6.00	11.00	100.00	Blue	5017	
1513	0000000000423	35.00	6.50	10.50	100.00	Red	3001	
1514	0000000000424	35.00	7.00	12.50	100.00	Black	9005	
1515	0000000000425	35.00	7.50	12.00	100.00	Pink	3015	
1516	0000000000426	35.00	8.00	11.00	100.00	Brown	8003	

Table: Ap2-02

First Stage Pilot Spring Dimension								
n°	**Code**	**DE [mm]**	**d [mm]**	**p [mm]**	**L [mm]**	**Color**	**RAL** *RAL*	
1517	0000000000427	22.00	2.00	4.50	40.00	Green	6029	
1520	0000000000427	22.00	1.80	4.50	40.00	Yellow	1023	
1534	0000000000444	22.00	2.50	4.50	40.00	Black	9005	

Table: Ap2-03

APPENDIX 3

SSV SPRING TABLE

SSV DEVICE 958 GROUPS PLAN

MODEL	Minimum Pressure Range							Maximum Pressure Range						
	Spring				Min	Max	Dpw	Spring				Min	Max	Dpw
	n°	Color	RAL		[bar]	[bar]	[bar]	n°	Color	RAL		[bar]	[bar]	[bar]
CX 615	1261	Blue	5017		2.00	6.50	1.50							
CX 615	1262	Red	3001		4.00	12.50	2.00							
CX 615	1263	Brown	8003		6.00	19.00	2.50							
CX 615	1264	Black	9005		12.00	29.00	3.50							
CX 615								1267	Light Blue	5012		3.00	10.00	1.50
CX 615								1268	Blue	5017		6.00	22.00	2.00
CX 615								1269	Red	3001		13.00	40.00	3.50
CX 615								1270	Brown	8003		28.00	76.00	4.00
CX 615	1261	Blue	5017		2.00	6.50	1.50	1267	Light Blue	5012		3.00	10.00	1.50
CX 615	1261	Blue	5017		2.00	6.50	1.50	1268	Blue	5017		6.00	22.00	2.00
CX 615	1262	Red	3001		4.00	12.50	2.00	1268	Blue	5017		6.00	22.00	2.00
CX 615	1261	Blue	5017		2.00	6.50	1.50	1269	Red	3001		13.00	40.00	3.50
CX 615	1262	Red	3001		4.00	12.50	2.00	1269	Red	3001		13.00	40.00	3.50
CX 615	1263	Brown	8003		6.00	19.00	2.50	1269	Red	3001		13.00	40.00	3.50
CX 615	1261	Blue	5017		2.00	6.50	1.50	1270	Brown	8003		28.00	76.00	4.00
CX 615	1262	Red	3001		4.00	12.50	2.00	1270	Brown	8003		28.00	76.00	4.00
CX 615	1263	Brown	8003		6.00	19.00	2.50	1270	Brown	8003		28.00	76.00	4.00
CX 615	1264	Black	9005		12.00	29.00	3.50	1270	Brown	8003		28.00	76.00	4.00
CX 630	1261	Blue	5017		0.80	1.70	0.40							
CX 630	1262	Red	3001		1.40	3.00	0.60							
CX 630	1263	Brown	8003		2.50	4.50	0.70							
CX 630	1264	Black	9005		3.80	7.00	1.00							
CX 630								1267	Light Blue	5012		1.00	2.50	0.40
CX 630								1268	Blue	5017		1.80	4.70	0.60
CX 630								1269	Red	3001		3.90	10.00	0.80
CX 630								1270	Brown	8003		8.00	18.00	1.30
CX 630	1261	Blue	5017		0.80	1.70	0.40	1267	Light Blue	5012		1.00	2.50	0.40
CX 630	1261	Blue	5017		0.80	1.70	0.40	1268	Blue	5017		1.80	4.70	0.60
CX 630	1262	Red	3001		1.40	3.00	0.60	1268	Blue	5017		1.80	4.70	0.60
CX 630	1261	Blue	5017		0.80	1.70	0.40	1269	Red	3001		3.90	10.00	0.80
CX 630	1262	Red	3001		1.40	3.00	0.60	1269	Red	3001		3.90	10.00	0.80
CX 630	1263	Brown	8003		2.50	4.50	0.70	1269	Red	3001		3.90	10.00	0.80
CX 630	1261	Blue	5017		0.80	1.70	0.40	1270	Brown	8003		8.00	18.00	1.30
CX 630	1262	Red	3001		1.40	3.00	0.60	1270	Brown	8003		8.00	18.00	1.30
CX 630	1263	Brown	8003		2.50	4.50	0.70	1270	Brown	8003		8.00	18.00	1.30
CX 630	1264	Black	9005		3.80	7.00	1.00	1270	Brown	8003		8.00	18.00	1.30
CX 640	1260	Light Blue	5012		0.15	0.32	0.08							
CX 640	1261	Blue	5017		0.25	0.90	0.12							
CX 640	1262	Red	3001		0.50	1.80	0.20							

SSV DEVICE 958 GROUPS PLAN

MODEL	Minimum Pressure Range							Maximum Pressure Range						
	Spring				Min	Max	Dpw	Spring				Min	Max	Dpw
	n°	Color	RAL		[bar]	[bar]	[bar]	n°	Color	RAL		[bar]	[bar]	[bar]
CX 640	1263	Brown	8003		0.80	2.50	0.30							
CX 640	1264	Black	9005		2.00	4.00	0.50							
CX 640								1266	Green	6029		0.20	0.60	0.10
CX 640								1267	Light Blue	5012		0.50	1.70	0.20
CX 640								1268	Blue	5017		1.00	3.50	0.30
CX 640								1269	Red	3001		2.00	6.00	0.50
CX 640								1270	Brown	8003		4.50	10.00	1.00
CX 640	1260	Light Blue	5012		0.15	0.32	0.08	1266	Green	6029		0.20	0.60	0.10
CX 640	1260	Light Blue	5012		0.15	0.32	0.08	1267	Light Blue	5012		0.50	1.70	0.20
CX 640	1261	Blue	5017		0.25	0.90	0.12	1267	Light Blue	5012		0.50	1.70	0.20
CX 640	1260	Light Blue	5012		0.15	0.32	0.08	1268	Blue	5017		1.00	3.50	0.30
CX 640	1261	Blue	5017		0.25	0.90	0.12	1268	Blue	5017		1.00	3.50	0.30
CX 640	1262	Red	3001		0.50	1.80	0.20	1268	Blue	5017		1.00	3.50	0.30
CX 640	1260	Light Blue	5012		0.15	0.32	0.08	1269	Red	3001		2.00	6.00	0.50
CX 640	1261	Blue	5017		0.25	0.90	0.12	1269	Red	3001		2.00	6.00	0.50
CX 640	1262	Red	3001		0.50	1.80	0.20	1269	Red	3001		2.00	6.00	0.50
CX 640	1263	Brown	8003		0.80	2.50	0.30	1269	Red	3001		2.00	6.00	0.50
CX 640	1260	Light Blue	5012		0.15	0.32	0.08	1270	Brown	8003		4.50	10.00	1.00
CX 640	1261	Blue	5017		0.25	0.90	0.12	1270	Brown	8003		4.50	10.00	1.00
CX 640	1262	Red	3001		0.50	1.80	0.20	1270	Brown	8003		4.50	10.00	1.00
CX 640	1263	Brown	8003		0.80	2.50	0.30	1270	Brown	8003		4.50	10.00	1.00
CX 640	1264	Black	9005		2.00	4.00	0.50	1270	Brown	8003		4.50	10.00	1.00
CX 677	1259	Green	6029		0.010	0.040	0.012							
CX 677	1260	Light Blue	5012		0.035	0.120	0.015							
CX 677	1261	Blue	5017		0.085	0.250	0.020							
CX 677	1262	Red	3001		0.220	0.450	0.050							
CX 677	1263	Brown	8003		0.400	0.650	0.060							
CX 677	1264	Black	9005		0.600	1.000	0.090							
CX 677								1265	Yellow	1023		0.015	0.050	0.008
CX 677								1266	Green	6029		0.040	0.130	0.020
CX 677								1267	Light Blue	5012		0.100	0.350	0.024
CX 677								1268	Blue	5017		0.270	0.700	0.040
CX 677								1269	Red	3001		0.600	1.200	0.090
CX 677	1259	Green	6029		0.010	0.040	0.012	1265	Yellow	1023		0.015	0.050	0.008
CX 677	1259	Green	6029		0.010	0.040	0.012	1266	Green	6029		0.040	0.130	0.020
CX 677	1259	Green	6029		0.010	0.040	0.012	1267	Light Blue	5012		0.100	0.350	0.024
CX 677	1260	Light Blue	5012		0.035	0.120	0.015	1267	Light Blue	5012		0.100	0.350	0.024
CX 677	1259	Green	6029		0.010	0.040	0.012	1268	Blue	5017		0.270	0.700	0.040
CX 677	1260	Light Blue	5012		0.035	0.120	0.015	1268	Blue	5017		0.270	0.700	0.040
CX 677	1261	Blue	5017		0.085	0.250	0.020	1268	Blue	5017		0.270	0.700	0.040

SSV DEVICE 958 GROUPS PLAN

MODEL	Minimum Pressure Range							Maximum Pressure Range						
	Spring				Min	Max	Dpw	Spring				Min	Max	Dpw
	n°	Color	RAL		[bar]	[bar]	[bar]	n°	Color	RAL		[bar]	[bar]	[bar]
CX 677	1259	Green	6029		0.010	0.040	0.012	1269	Red	3001		0.600	1.200	0.090
CX 677	1260	Light Blue	5012		0.035	0.120	0.015	1269	Red	3001		0.600	1.200	0.090
CX 677	1261	Blue	5017		0.085	0.250	0.020	1269	Red	3001		0.600	1.200	0.090
CX 677	1262	Red	3001		0.220	0.450	0.050	1269	Red	3001		0.600	1.200	0.090
CX 677	1263	Brown	8003		0.400	0.650	0.060	1269	Red	3001		0.600	1.200	0.090

Table: Ap3-01

SSV Minimum Pressure Range Spring Dimension							
n°	DE [mm]	d [mm]	p [mm]	L [mm]	Color	RAL	
1259	17.00	1.20	7.80	70.00	Green	6029	
1260	17.00	1.60	6.10	70.00	Light Blue	5012	
1261	17.00	2.00	5.30	70.00	Blue	5017	
1262	17.00	2.40	5.00	70.00	Red	3001	
1263	17.00	2.80	4.80	70.00	Brown	8003	
1264	17.00	3.20	5.00	70.00	Black	9005	

Table: Ap3-02

SSV Maximum Pressure Range Spring Dimension							
n°	DE [mm]	d [mm]	p [mm]	L [mm]	Color	RAL	
1565	37.00	6.00	11.00	70.00	Green	6029	
1266	37.00	2.20	15.00	70.00	Green	6029	
1267	37.00	2.80	15.00	70.00	Light Blue	5012	
1268	37.00	3.50	13.50	70.00	Blue	5017	
1269	37.00	4.50	11.50	70.00	Red	3001	
1270	37.00	5.50	11.00	70.00	Brown	8003	

Table: Ap3-03

APPENDIX 4

FLOW COEFFICIENT TABLE

FLOW COEFFICIENT TABLE Cg						
SIZE	**TA-956FC**	**TA-956FC SIL 100**	**TA-956DFO**	**TA-956DFO SIL**	**TA-956MFO**	**TA-956MFO SIL 100**
1”	580	440	550	400	580	440
2”	2300	1800	1912	1250	2300	1800
3”	4700	3600	3825	2700	4700	3600
4”	8400	6800	6375	5800	8400	6800
6”	16600	13520	12675	11500	16600	13520
8”	28500	23200	20300	18700	28500	23200
10”	46000	37600	32900	26400	46000	37600

Table: Ap4-01

APPENDIX 5

SERIES 956 PRESSURE REGULATORS AND SSV WEIGHT AND DIMENSIONS TABLES

CAUTION! **The weights and dimensions values detailed in next tables, are approximated, and can be modified without any previous advice.**

DIMENSIONS: GENERAL REFERENCES

"F" and "G" dimensions: minimum distances recommended for maintenance.
"E" dimensions: face to face dimension.
Push button and travel indicator/s not considered in class 150.

CAUTION! **The pilot/s and SSV position indicated in next drawings are only illustrative. It can be modified according size or valve type.**

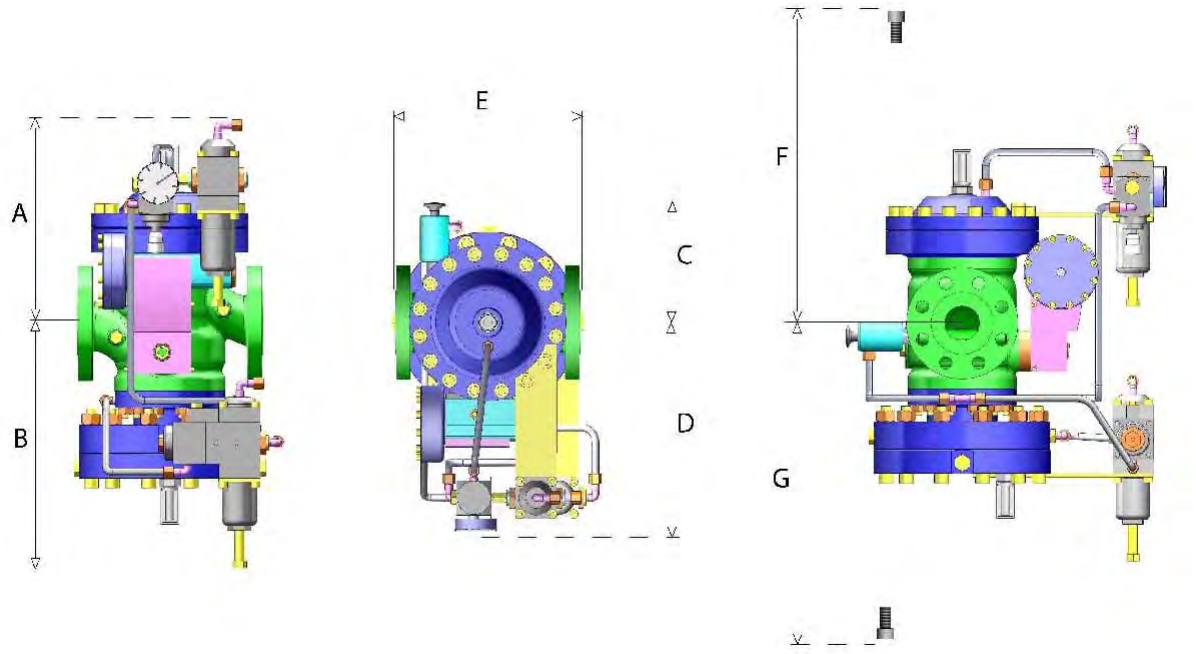
APP5.1 WEIGHTS TABLE

MODEL	CLASS	WEIGHT [kg]						
		DN25	DN50	DN80	DN100	DN150	DN200	DN250
TA-956 DFO+FC+SSV	#150	67	98	180	206	391	846	2015
	#300	71	100	162	229	489	1058	2315
	#600	72	102	163	235	504	1095	2344
TA-956 DFO+FC	#150	62	91	171	197	380	829	1865
	#300	66	93	151	220	475	1037	2165
	#600	67	96	152	226	491	1074	2194
TA-956 DFO+SSV	#150	29	50	73	100	244	469	1015
	#300	41	63	100	122	305	587	1065
	#600	42	64	101	127	320	625	1094
TA-956 DFO	#150	25	43	64	90	233	453	865
	#300	36	56	89	112	291	566	915
	#600	37	58	90	117	307	604	944
TA-956 MFO+FC+SSV	#150	75	115	254	287	508	1157	2937
	#300	77	119	194	307	596	1371	3232
	#600	79	122	195	314	612	1409	3291
TA-956 MFO+FC	#150	70	108	212	277	466	1081	2787
	#300	72	112	182	297	581	1349	3082
	#600	73	115	183	304	597	1387	3141
TA-956 MFO+SSV	#150	37	69	112	177	361	781	1917
	#300	47	82	132	200	449	973	1962
	#600	49	84	133	206	465	1011	2031
TA-956 MFO	#150	32	62	100	167	319	705	1787
	#300	42	75	120	190	397	878	1832
	#600	43	77	121	196	413	916	1891
TA-956 FC+FC+SSV	#150	74	113	251	282	500	1147	2925
	#300	76	117	191	302	588	1361	3220
	#600	78	120	192	309	604	1399	3275
TA-956 FC+FC	#150	69	106	209	272	458	1071	2775
	#300	71	110	179	292	573	1339	3070
	#600	72	113	180	299	589	1377	3125
TA-956 FC+SSV	#150	39	71	144	175	353	771	1570
	#300	46	80	129	195	441	963	1970
	#600	48	82	130	201	457	1000	2025
TA-956 FC	#150	33	64	122	165	311	695	1775
	#300	41	73	117	185	389	868	1820
	#600	42	75	118	191	405	906	1875
TA-956 SSV	#150	14	25	49	70	170	292	570
	#300	21	47	74	87	213	365	712
	#600	22	48	76	92	227	403	787

NOTES: table values are subject to modifications without notice.

APP5.2 DIMENSIONS TABLES

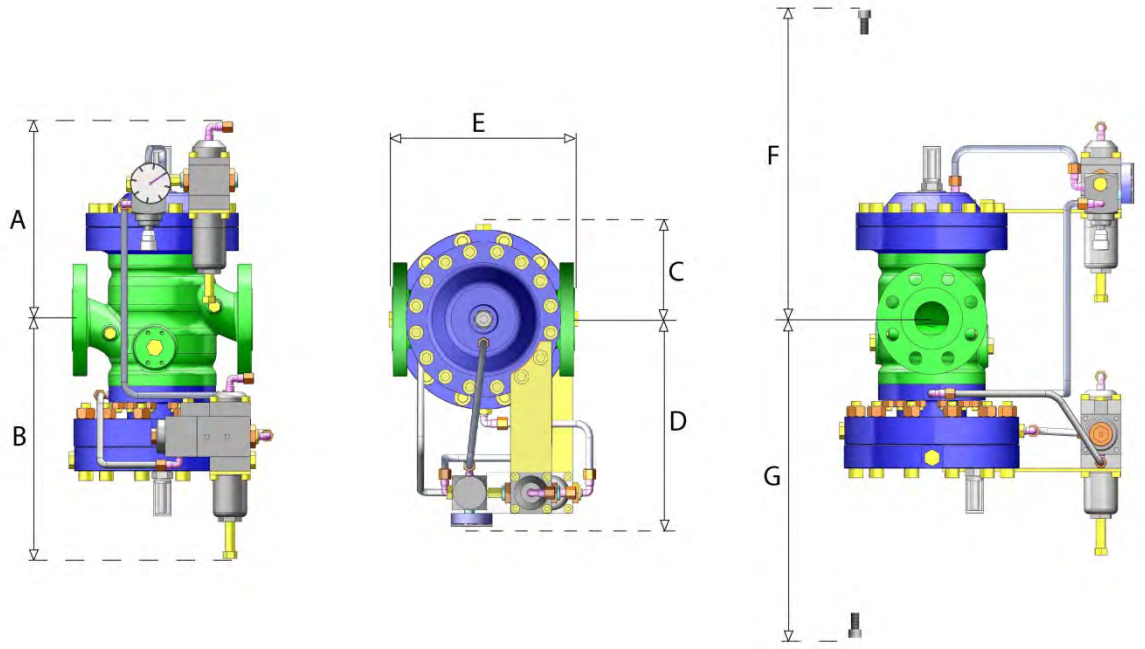
APP5.2.1 TA-956 DFO+FC+SSV REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 DFO+FC+SSV	25 1”	#150	265	340	180	350	184	310	380
		#300			170	310	197		
		#600					210		
	50 2”	#150	295	355	195	345	254	350	440
		#300				310	267		
		#600					286		
	80 3”	#150	330	320	280	450	298	400	520
		#300		370	230	350	318		
		#600					337		
	100 4”	#150	370	355	280	340	352	480	590
		#300		420	250	360	368		
		#600					394		
	150 6”	#150	480	460	280	450	451	650	800
		#300	530	570	300		473		
		#600					508		
	200 8”	#150	590	630	350	490	543	900	1100
		#300	650	740			568		
		#600					610		
	250 10”	#150	700	750	400	550	673	980	1200
		#300	760	860			708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

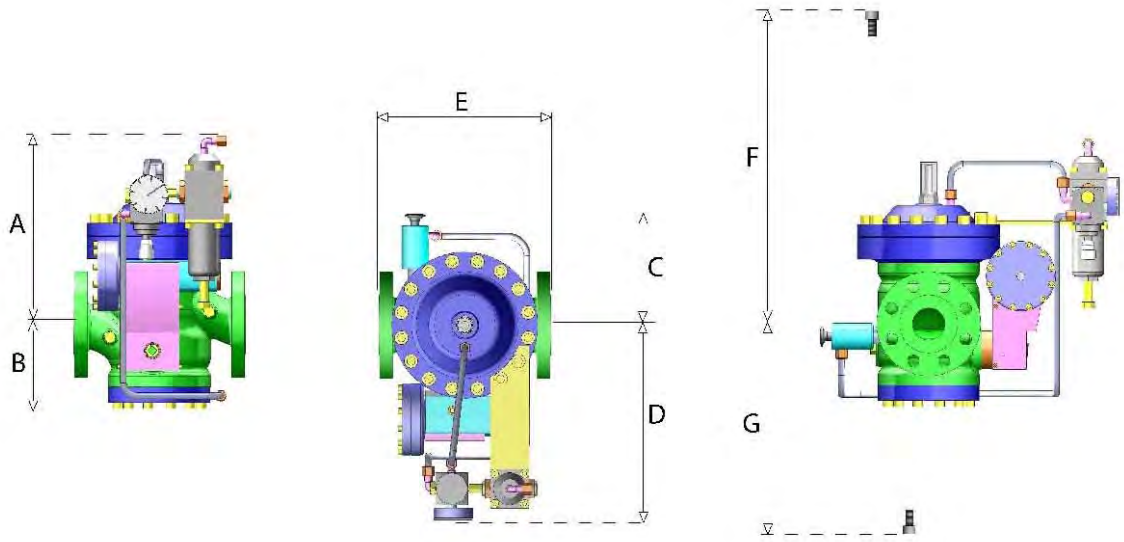
APP5.2.2 TA-956 DFO+FC REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 DFO+FC	25 1”	#150	265	340	180	350	184	310	380
		#300			120	310	197		
		#600					210		
	50 2”	#150	295	355	195	345	254	350	440
		#300			150	310	267		
		#600					286		
	80 3”	#150	330	320	280	450	298	400	520
		#300		370	180	350	318		
		#600					337		
	100 4”	#150	370	355	280	340	352	480	590
		#300		420	230	360	368		
		#600					394		
	150 6”	#150	480	460	280	450	451	650	800
		#300	530	570			473		
		#600					508		
	200 8”	#150	590	630	350	490	543	900	1100
		#300	650	740			568		
		#600					610		
	250 10”	#150	700	750	400	550	673	980	1200
		#300	760	860			708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance

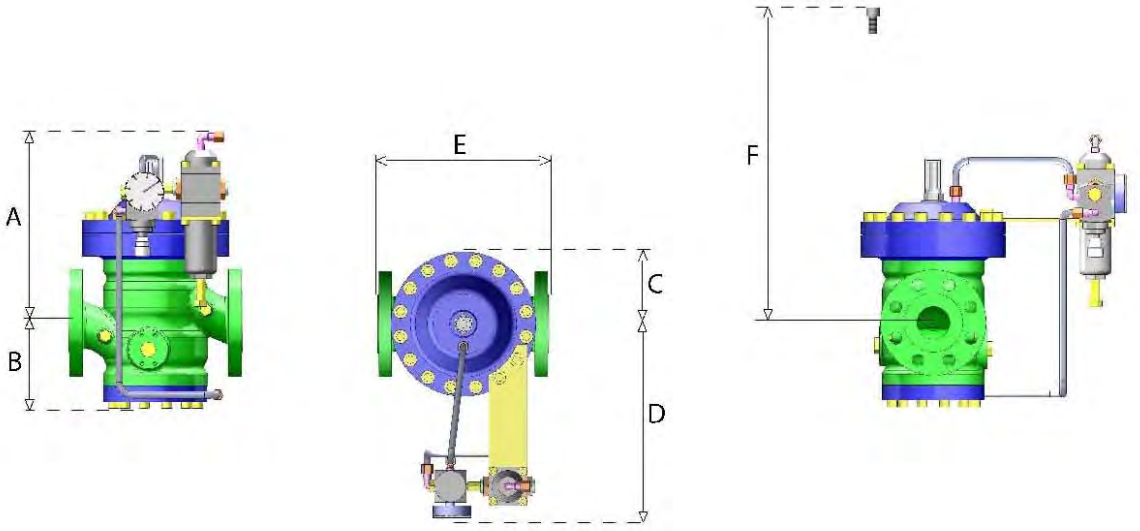
APP5.2.3 TA-956 DFO+SSV REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 DFO+SSV	25 1”	#150	265	150	110	310	184	310	220
		#300			170		197		
		#600					210		
	50 2”	#150	295	140	130	310	254	350	290
		#300			195		267		
		#600					286		
	80 3”	#150	330	170	150	350	298	400	370
		#300			230		318		
		#600					337		
	100 4”	#150	370	200	170	350	352	480	450
		#300			250		368		
		#600					394		
	150 6”	#150	480	290	220	400	451	650	650
		#300	530		300		473		
		#600					508		
	200 8”	#150	590	360	280	450	543	900	820
		#300	650		350		568		
		#600					610		
	250 10”	#150	700	450	330	510	673	980	920
		#300	760		400		708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

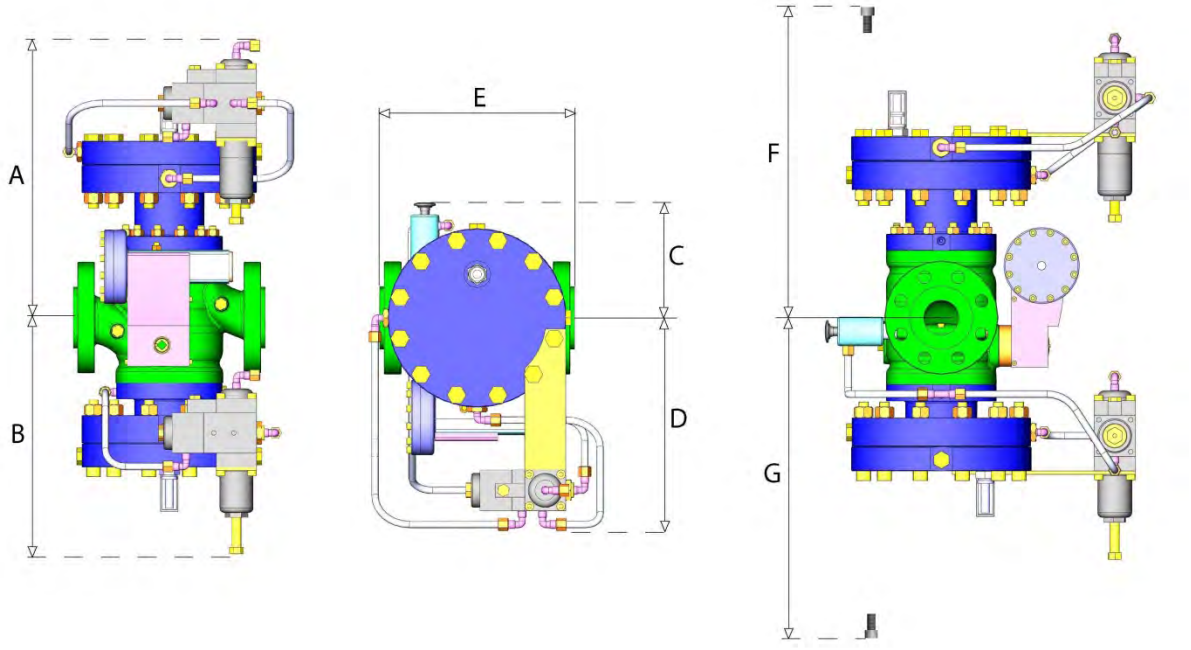
APP5.2.4 TA-956 DFO REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 DFO	25 1”	#150	265	110	110	310	184	310	
		#300					197		
		#600					210		
	50 2”	#150	295	140	130	310	254	350	
		#300					267		
		#600					286		
	80 3”	#150	330	170	150	350	298	400	
		#300					318		
		#600					337		
	100 4”	#150	370	200	170	350	352	480	
		#300					368		
		#600					394		
	150 6”	#150	480	290	220	400	451	650	
		#300	530				473		
		#600					508		
	200 8”	#150	590	360	280	450	543	900	
		#300	650				568		
		#600					610		
	250 10”	#150	700	450	330	510	673	980	
		#300	760				708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance

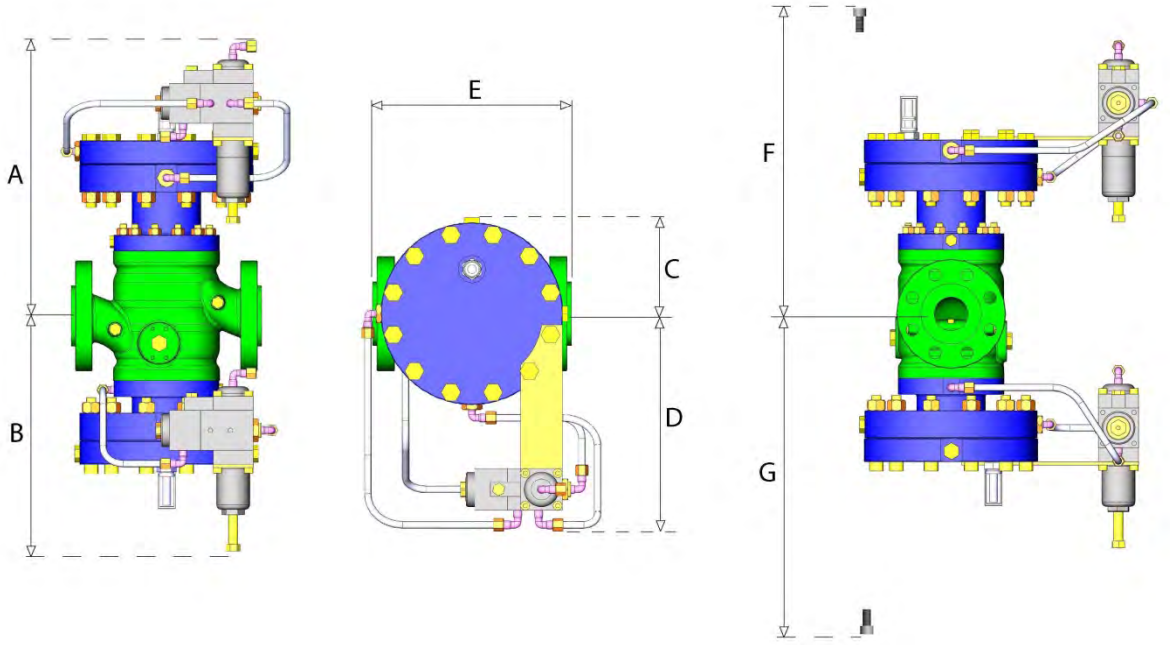
APP5.2.5 TA-956 MFO+FC+SSV REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 MFO+FC+SSV	25 1”	#150	365	340	180	350	184	410	380
		#300			170	310	197		
		#600					210		
	50 2”	#150	330	355	195	345	254	480	440
		#300				310	267		
		#600					286		
	80 3”	#150	375	320	280	450	298	550	520
		#300	410	370	230	350	318		
		#600					337		
	100 4”	#150	411	355	280	340	352	620	590
		#300	450	420	250	360	368		
		#600					394		
	150 6”	#150	580	460	280	450	451	850	800
		#300	630	570	300		473		
		#600					508		
	200 8”	#150	760	630	350	490	543	1200	1100
		#300	810	740			568		
		#600					610		
	250 10”	#150	800	750	400	550	673	1280	1200
		#300	860	860			708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

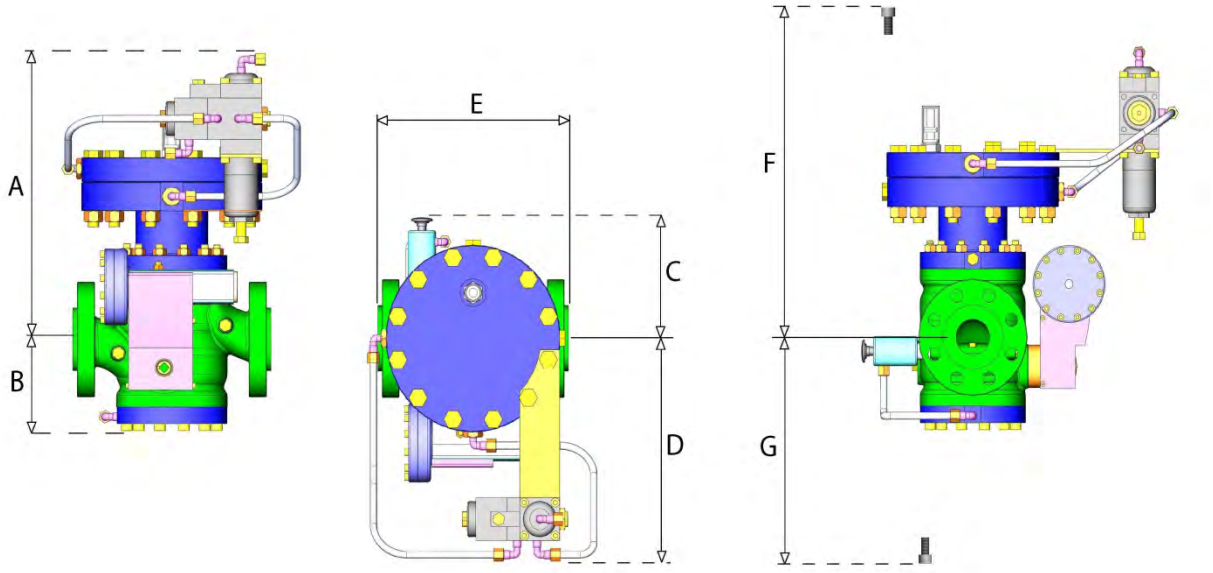
APP5.2.6 TA-956 MFO+FC REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 MFO+FC	25 1”	#150	365	340	180	350	184	410	380
		#300			120	310	197		
		#600					210		
	50 2”	#150	330	355	195	345	254	480	440
		#300			150	310	267		
		#600					286		
	80 3”	#150	375	320	280	450	298	550	520
		#300	410	370	180	350	318		
		#600					337		
	100 4”	#150	410	355	280	340	352	620	590
		#300	450	420	230	360	368		
		#600					394		
	150 6”	#150	580	460	280	450	451	850	800
		#300	630	570			473		
		#600					508		
	200 8”	#150	760	630	350	490	543	1200	1100
		#300	810	740			568		
		#600					610		
	250 10”	#150	800	750	400	550	673	1280	1200
		#300	860	860			708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance

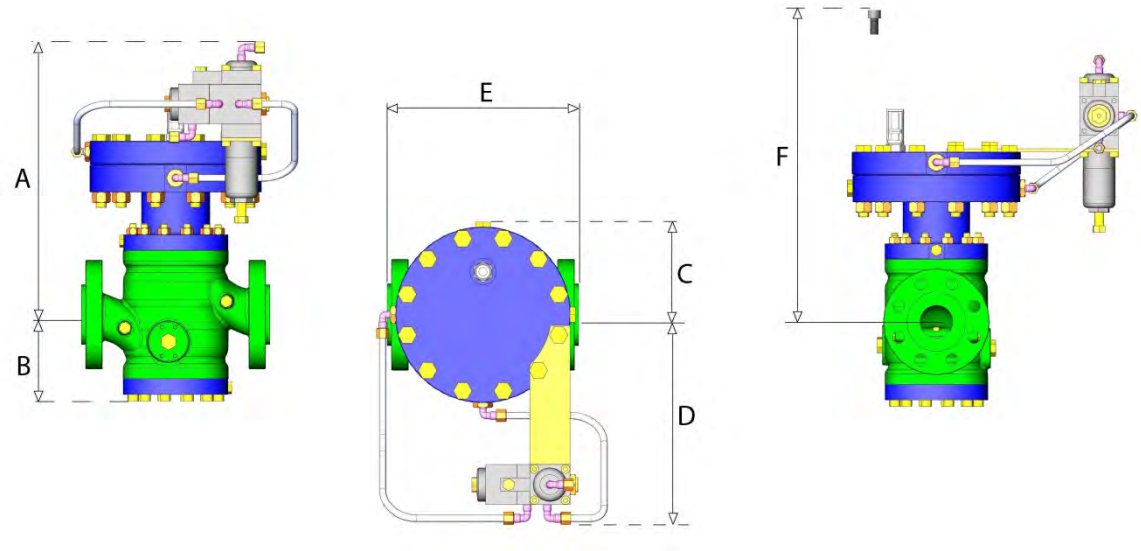
APP5.2.7 TA-956 MFO+SSV REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 MFO+SSV	25 1”	#150	365	150	180	310	184	410	220
		#300					197		
		#600					210		
	50 2”	#150	330	140	150	310	254	480	290
		#300			200		267		
		#600					286		
	80 3”	#150	375	170	150	350	298	550	370
		#300	410		230		318		
		#600					337		
	100 4”	#150	411	200	230	380	352	620	450
		#300	450		250		368		
		#600					394		
	150 6”	#150	580	290	280	470	451	850	650
		#300	630		300		473		
		#600					508		
	200 8”	#150	760	360	350	510	543	1200	820
		#300	810				568		
		#600					610		
	250 10”	#150	800	450	400	570	673	1280	920
		#300	860				708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

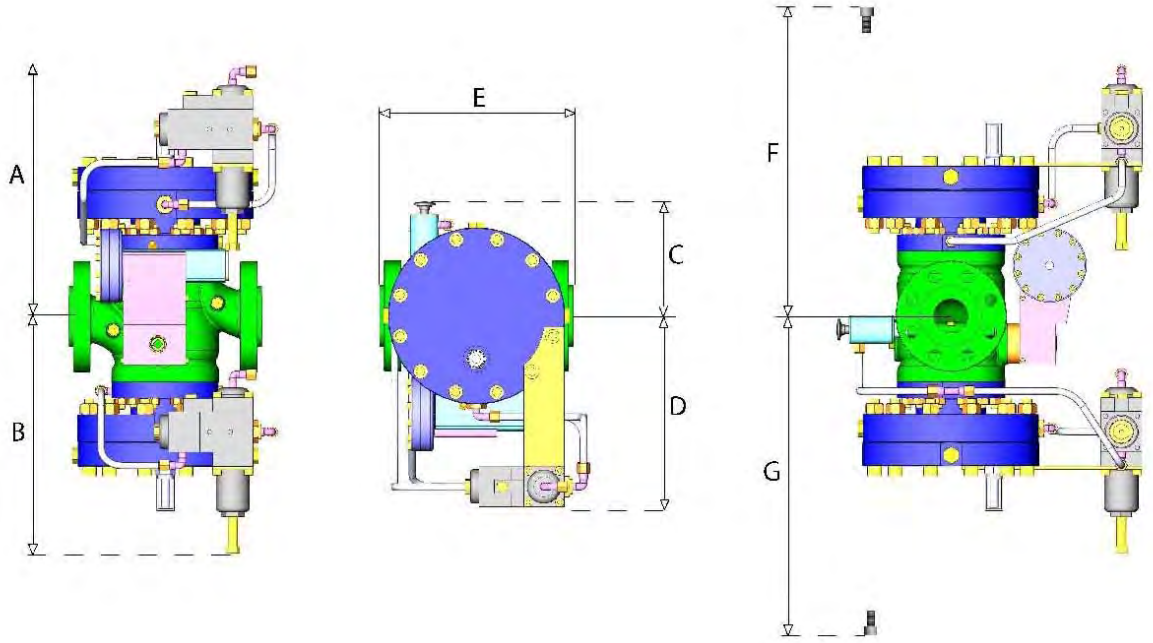
APP5.2.8 TA-956 MFO REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 MFO	25 1”	#150	365	110	120	310	184	410	
		#300					197		
		#600					210		
	50 2”	#150	330	140	150	310	254	480	
		#300					267		
		#600					286		
	80 3”	#150	375	170	180	350	298	550	
		#300	410				318		
		#600					337		
	100 4”	#150	411	200	230	380	352	620	
		#300	450				368		
		#600					394		
	150 6”	#150	580	290	280	470	451	850	
		#300	630				473		
		#600					508		
	200 8”	#150	760	360	350	510	543	1200	
		#300	810				568		
		#600					610		
	250 10”	#150	800	450	400	570	673	1280	
		#300	860				708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance

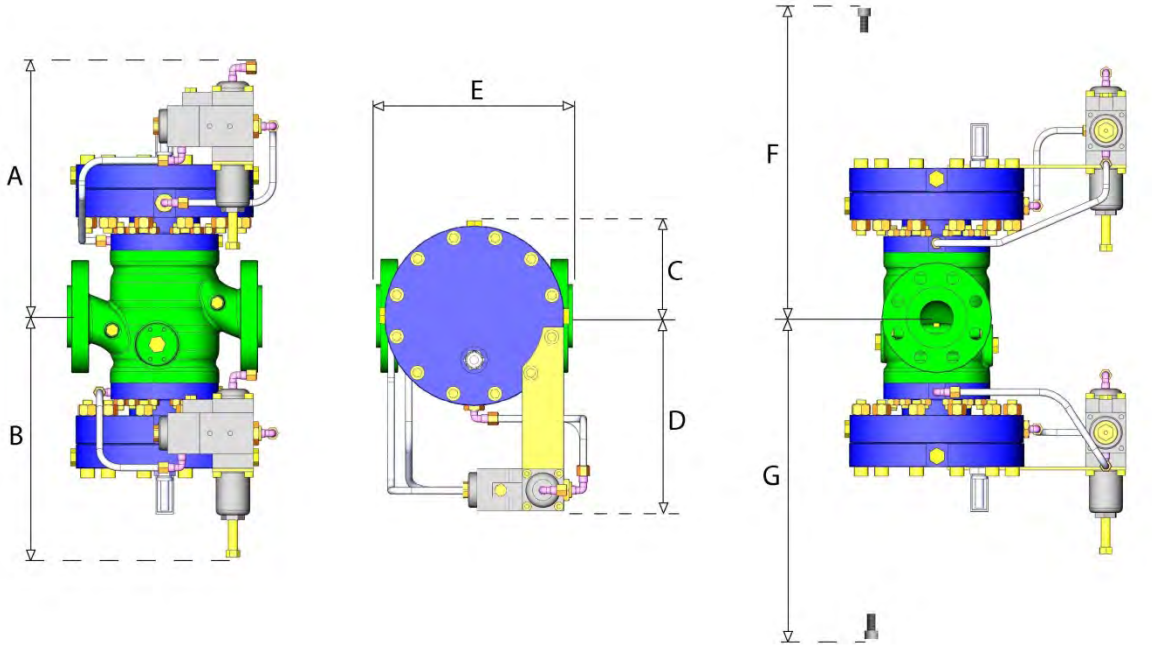
APP5.2.9 TA-956 FC+FC+SSV REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 FC+FC+SSV	25 1”	#150	325	340	180	350	184	380	380
		#300			170	310	197		
		#600					210		
	50 2”	#150	290	355	195	345	254	440	440
		#300				310	267		
		#600					286		
	80 3”	#150	330	320	280	450	298	520	520
		#300	370	370	230	350	318		
		#600					337		
	100 4”	#150	370	355	280	340	352	590	590
		#300	410	420	250	360	368		
		#600					394		
	150 6”	#150	510	460	280	450	451	800	800
		#300	570	570	300		473		
		#600					508		
	200 8”	#150	700	630	350	490	543	1100	1100
		#300	750	740			568		
		#600					610		
	250 10”	#150	810	750	400	550	673	1200	1200
		#300	870	860			708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

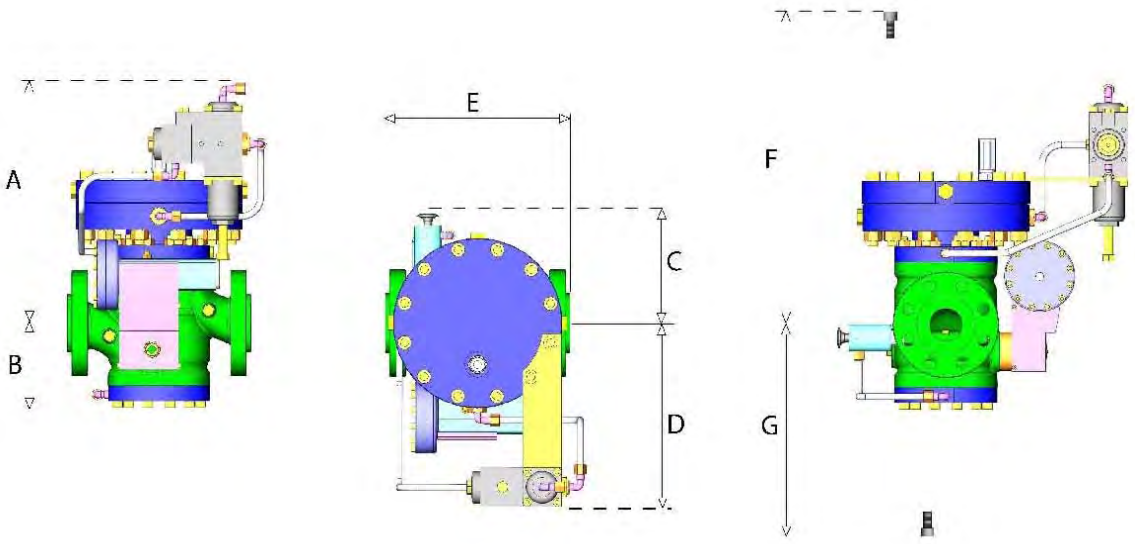
APP5.2.10 TA-956 FC+FC REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 FC+FC	25 1”	#150	325	340	180	350	184	380	380
		#300			120	310	197		
		#600					210		
	50 2”	#150	290	355	195	345	254	440	440
		#300			150	310	267		
		#600					286		
	80 3”	#150	330	320	280	450	298	520	520
		#300	370	370	180	350	318		
		#600					337		
	100 4”	#150	370	355	280	340	352	590	590
		#300	410	420	230	360	368		
		#600					394		
	150 6”	#150	510	460	280	450	451	800	800
		#300	570	570			473		
		#600					508		
	200 8”	#150	700	630	350	490	543	1100	1100
		#300	750	740			568		
		#600					610		
	250 10”	#150	810	750	400	550	673	1200	1200
		#300	870	860			708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance

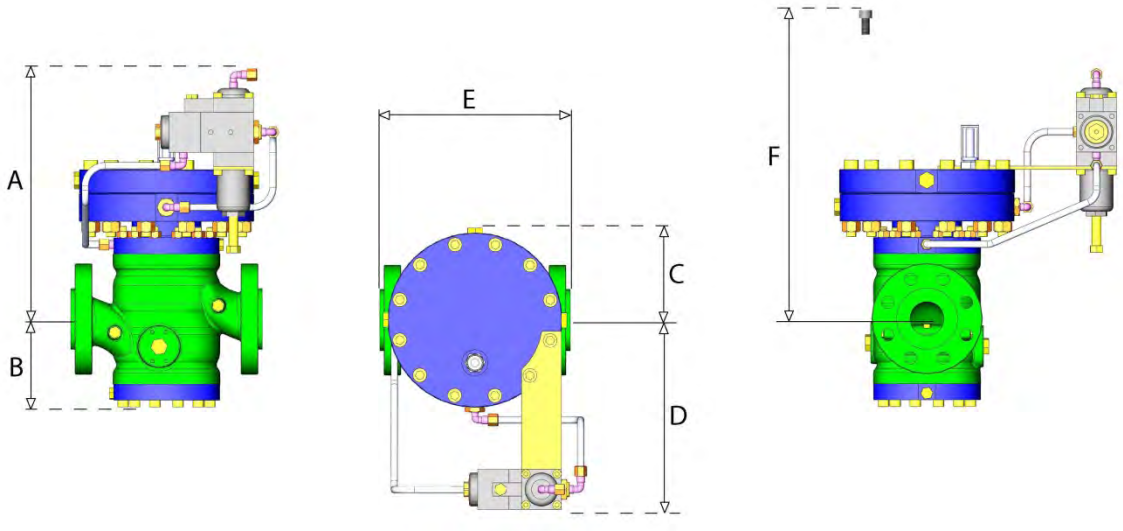
APP5.2.11 TA-956 FC+SSV REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 FC+SSV	25 1”	#150	325	150	180	350	184	380	220
		#300				310	197		
		#600					210		
	50 2”	#150	290	140	150	345	254	440	290
		#300			200	310	267		
		#600					286		
	80 3”	#150	330	170	150	450	298	520	370
		#300	370		230	350	318		
		#600					337		
	100 4”	#150	370	200	230	340	352	590	450
		#300	410		250	360	368		
		#600					394		
	150 6”	#150	510	290	280	450	451	800	650
		#300	570		300		473		
		#600					508		
	200 8”	#150	700	360	350	490	543	1100	820
		#300	750				568		
		#600					610		
	250 10”	#150	810	450	400	550	673	1200	920
		#300	870				708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

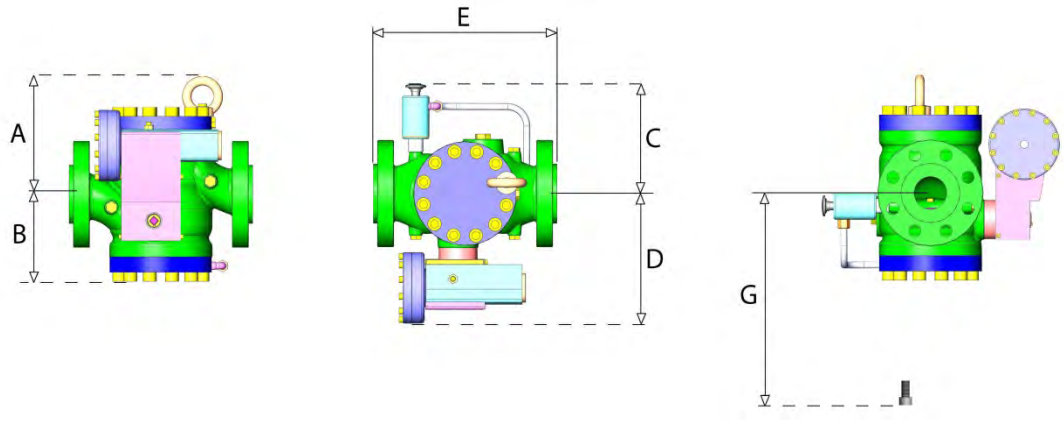
APP5.2.12 TA-956 FC REGULATOR



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 FC	25 1”	#150	325	110	120	310	184	380	
		#300					197		
		#600					210		
	50 2”	#150	290	140	150	310	254	440	
		#300					267		
		#600					286		
	80 3”	#150	330	170	180	350	298	520	
		#300	370				318		
		#600					337		
	100 4”	#150	370	200	230	380	352	590	
		#300	410				368		
		#600					394		
	150 6”	#150	510	290	280	450	451	800	
		#300	570				473		
		#600					508		
	200 8”	#150	700	360	350	490	543	1100	
		#300	750				568		
		#600					610		
	250 10”	#150	810	450	400	550	673	1200	
		#300	870				708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance

APP5.2.13 TA-956 SSV - SAFETY SHUT-OFF VALVE



MODEL	DN	CLASS	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
TA-956 SSV	25 1”	#150	170	120	80	170	184		220
		#300			180		197		
		#600					210		
	50 2”	#150	170	140	100	200	254		290
		#300			200		267		
		#600					286		
	80 3”	#150	200	170	150	230	298		370
		#300			230		318		
		#600					337		
	100 4”	#150	250	200	150	250	352		450
		#300			250		368		
		#600					394		
	150 6”	#150	350	290	200	300	451		650
		#300			300		473		
		#600					508		
	200 8”	#150	430	360	270	360	543		820
		#300			350		568		
		#600					610		
	250 10”	#150	500	430	350	420	673		920
		#300			420		708		
		#600					752		

NOTES: E = Face to Face Dimension
F/G Minimum recommended clearance for maintenance
Push Button is not installed in #150 equipment

REVISION HISTORY

REVISION	DATE	DESCRIPTION
1	08/04/08	Table Ap2-01 updated to reflect Rev. 3 of 980-Pilots_groups. Picture of QEV revised on par. 5.4, 5.5, 5.8, 5.10, 5.13, 5.15. Par. 9.1.1 added.
2	16/09/10	Table Ap2-01 updated to reflect Rev. 4 of 980-Pilots_groups.
3	11/04/11	Appendix 5 added: Weights and dimensions tables
4	24/05/12	Modifications on Pgg. 3, 29, 30, 79, 85, 88, 89,91 to 104
5		
6		
7		
8		
9		
10		