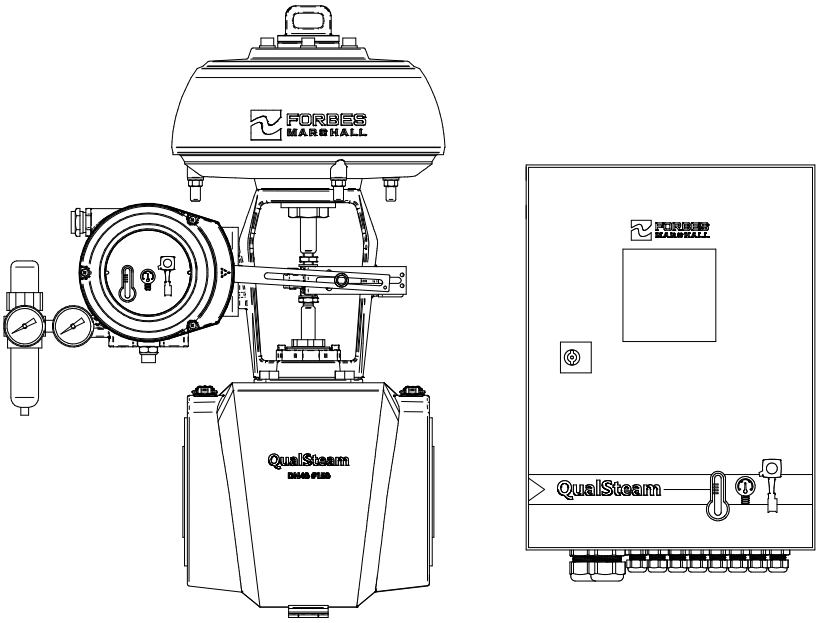
Installation and Maintenance Manual

QualSteam

Temperature Control System at Optimum Steam Pressure with Steam Flow Indication



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PLEASE NOTE - Throughout this manual this cautionary symbol is used to describe a potential damage or injury that might occur if the safety considerations are overlooked. This symbol denotes CAUTION, WARNING or DANGER.

1. Preface:

This manual is intended for anyone using, commissioning, servicing, or disposing the below mentioned products safely and efficiently.

1. **Temperature Control System at Optimum Steam Pressure with Steam Flow Indication (QualSteam)**

PLEASE NOTE

Throughout this manual the following cautionary symbol is used to describe a potential damage or injury that might occur if the safety considerations are overlooked.

2. Important Safety Notes:

Read this section carefully before installing/operating/maintaining the product. The precautions listed in this manual are provided for personnel and equipment safety. Furthermore, Forbes Marshall accepts no responsibility for accidents or damage occurring as a result of failure to observe these precautions. Note that the product is designed to perform for non-contaminated fluids only. A contamination in the form of chemical, foreign particle etc. can lead to problem with product performance and life of the product.

If these products in compliance with the operating instructions are, properly installed, commissioned, maintained and installed by qualified personnel (refer Section 2.7) the safety operations of these products can be guaranteed. General instructions for proper use of tools and safety of equipments, pipeline and plant construction must also be complied with.

2.1 Intended use:

Check if the product is suitable for intended use/ application by referring to the installation and maintenance instructions, name plates and technical information sheets.

i) The product is suitable for use as defined in the technical information sheet. In case the need arises to use the product on any other fluid please contact Forbes Marshall for assistance.

ii) Check for the suitability in conformance to the limiting conditions specified in technical information sheet of the product.

iii) The correct installation and direction of fluid flow has to be determined.

iv) Forbes Marshall products are not intended to resist external stresses, hence necessary precautions to be taken to minimize the same.

2.2 Accessibility and Lighting:

Safe accessibility and working conditions are to be ensured prior to working on the product.

2.3 Hazardous environment and media:

The product has to be protected from hazardous environment and check to ensure that no hazardous liquids or gases pass through the product.

2.4 Depressurizing of systems and normalizing of temperature:

Ensure isolation and safety venting of any pressure to the atmospheric pressure. Even if the pressure gauge indicates zero, do not make an assumption that the system has been depressurized.

To avoid danger of burns allow temperature to normalize after isolation.

2.5 Tools and consumables:

Ensure you have appropriate tools and / or consumables available before starting the work. Use of original Forbes Marshall replacement parts is recommended.

2.6 Protective clothing:

Consider for the requirement of any protective clothing for you/ or others in the vicinity for protection against hazards of temperature (high or low), chemicals, radiation, dangers to eyes and face, noise and falling objects

2.7 Permits to work:

All work to be carried out under supervision of a competent person. Training should be imparted to operating personnel on correct usage of product as per Installation and Maintenance instruction. “Permit to work” to be complied with (wherever applicable), in case of absence of this system a responsible person should have complete information and knowledge on what work is going on and where required, arrange to have an assistant with his primary goal and responsibility being safety. “Warning Notices” should be posted wherever necessary.

2.8 Handling:

There is a risk of injury if heavy products are handled manually. Analyze the risk and use appropriate handling method by taking into consideration the task, individual, the working environment and the load.

2.9 Freezing:

Provision should be made to protect systems which are not self-draining, against frost damage (in environment where they may be exposed to temperatures below freezing point) to be made.

2.10 Returning products:

Customers and Stockist are reminded that, when returning products to Forbes Marshall they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk.This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

2.11 Product Disposal:

It is necessary to dispose this product only in accordance with local regulations at the authorized, qualified collecting point specified for equipment’s and its parts—Please refer the part details mentioned in the material table of this manual. Please follow all waste disposal guidelines (Management & Handling) as published by local governing authorities in India & abroad

3. Brief Product Information:

3.1 Description:

QualSteam is a pre-insulated control valve system for steam pressure and process temperature combo control. The system is developed for process temperature control at optimum steam pressure. In addition, it gives indicative values of instantaneous & totalized steam flow on the display unit.

3.2 Working :

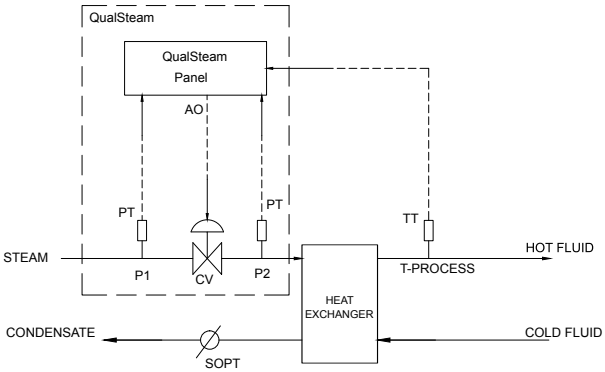


Fig.-1

Measured Parameters:

1) Steam supply pressure (P1)
2) Condensing pressure (P2)
3) Process Temperature (T-Process)

Set Parameters:
Process Temperature Setpoint (T-SP)
Maximum steam pressure setpoint (Max-P2-SP)

The system runs two PID loops simultaneously; one for T-control as primary loop and another for P-Control as secondary loop. The controller analyses the effect of incremental change in opening and closing of control valve on change in measured values of pressure and temperature. In addition, the controller iteratively computes a pressure setpoint equal to or below Max-P2-SP and assigns it as pressure setpoint and changes it dynamically such that process temperature gets achieved at optimum steam pressure

3.3 Steam Flow measurement:

The design Kv of valve is set in the control valve panel. Based on the live values of P1, P2 and % opening, the Kv of the valve is calculated at the actual opening. The steam flow rate is determined from Kv.

4. System Architecture

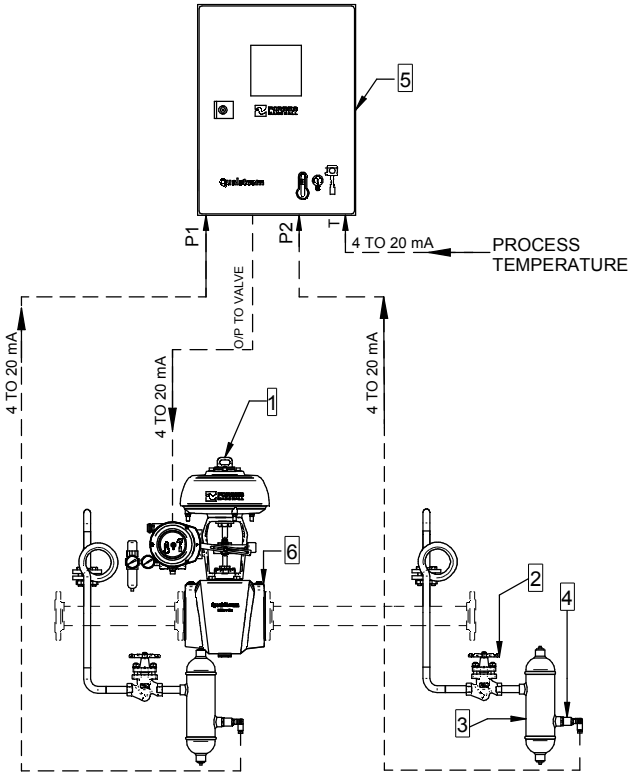


Fig.-2

Standard Bill of Materials

Sr.No.	Item Description	Qty.	Material
1	QualSteam Valve	1	SG IRON ASTM A395
2	Piston Valve	2	ASTM A105N
3	Condensing Pot	2	ASTM A106 Gr. B.
4	Pressure Transmitters	2	ASTM 304/1.4301
5	Control Panel	1	IS 513/CR2
6	Insulation	1	FRP+PU foam

a) Standalone control (P+T Control)

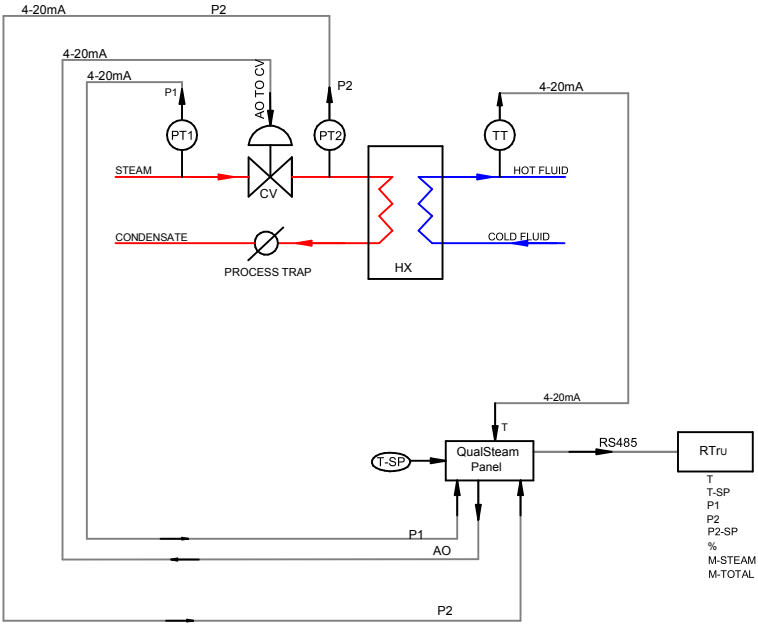


Fig.-3

This is default Configuration .

b) Integration with external PLC (when T-setpoint to be set in external PLC)

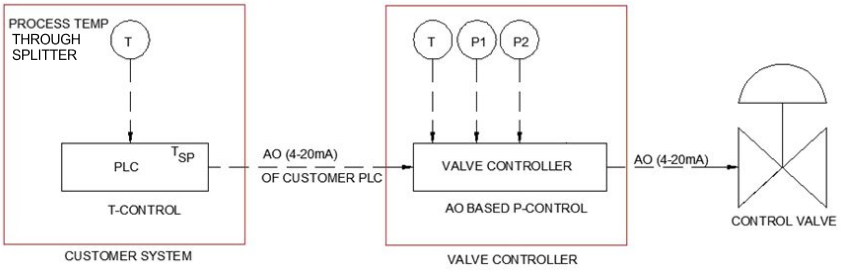


Fig.-4

This configuration is recommended when the process temperature setpoint needs to be set in external PLC.

- No change required on customer PLC side. Process TT will remain connected to customer PLC. Temperature setpoint should be given in customer PLC.
- PLC analog output will be used as input to QualSteam controller.
- QualSteam controller will give optimized P-control output to valve.
- Steam flow rate will be displayed on QualSteam panel.

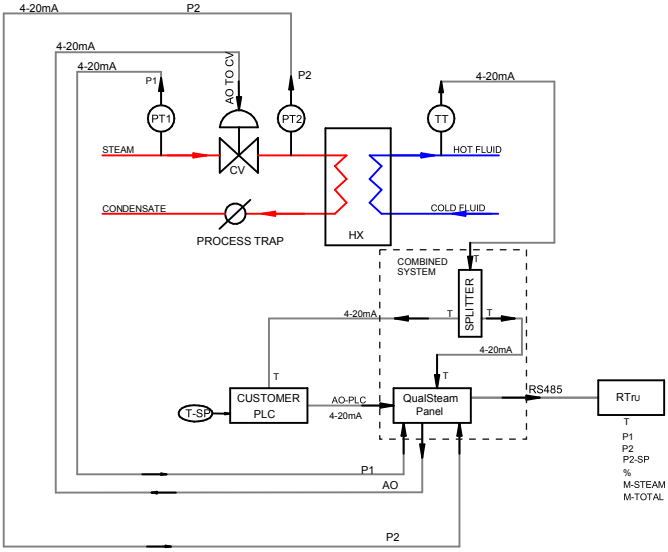


Fig.-5

The process temperature signal is given to external PLC through signal splitter (Isolator). The T-control loop will continue to run by external PLC. The T-control PID output earlier fed to control valve will be fed to control valve panel. P-control loop will run in control valve panel. Based on T-control PID output of external PLC and P-control loop output, the control valve panel drives the control valve and also indicates the steam consumption.

5. Installation Guidelines :

Pre-requisites:

1. Piping material for mounting condensing pots - Size : 15NB (See Fig. 10)
2. M10 Bolts for control panel qty.4.
3. Gasket (qty.-2) as per size of control valve.
4. 2 core, 1.5 sq.mm communication cabels (4-20 mA) as per required length from transmitters & valve to control panel.
5. Process temperature signal from temperature transmitter (4-20mA).
6. 1 KVA . 230V online UPS for control panel

a) Qualsteam Valve Dimensions:

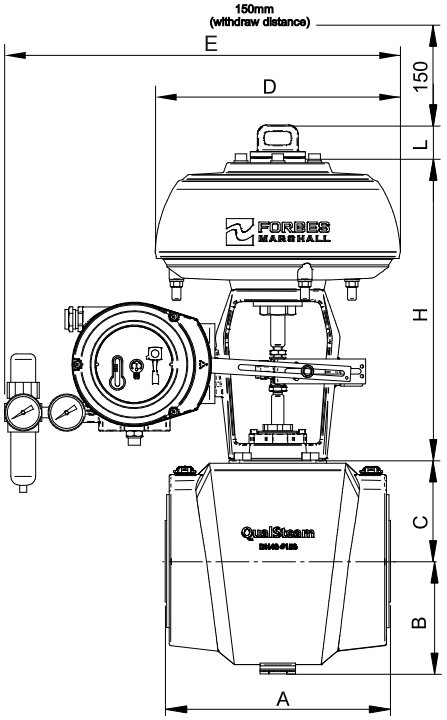


Fig.-6

Dimension details (approx in mm) & weights (approx. in Kg) #150

Valve size	End connection	A	B	C	H	L	D	E	Total Wt.
DN15	Flanged	184	98	103	273	37	201	400	15.2
DN20	Flanged	184	98	103	273	37	201	400	15.4
DN25	Flanged	184	98	103	273	37	201	400	15.6
DN40	Flanged	222	127	114	341	37	272	450	27.2
DN50	Flanged	254	127	114	341	37	272	450	30
DN65	Flanged	276	161	154	434	44	415	550	52.5
DN80	Flanged	298	154	155	434	44	415	550	63.4
DN100	Flanged	352	187	161	434	44	415	550	74.5

b) Lifting Arrangement:

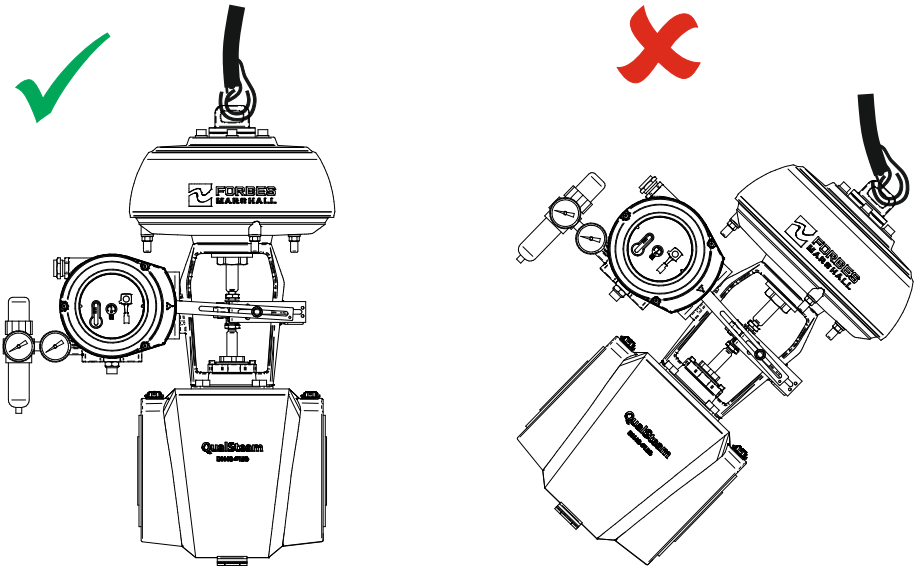


Fig.-7

c) Installation and Commissioning:

1. Check materials, pressure and temperature and their maximum values. Do not exceed the performance rating of the valve. If the maximum operating limit of the product is lower than that of the system in which it is being fitted, ensure that a safety device is included in the system to prevent over-pressurization.

2. Remove protection covers from all connections and protective film from all name-plates, where high temperature applications.

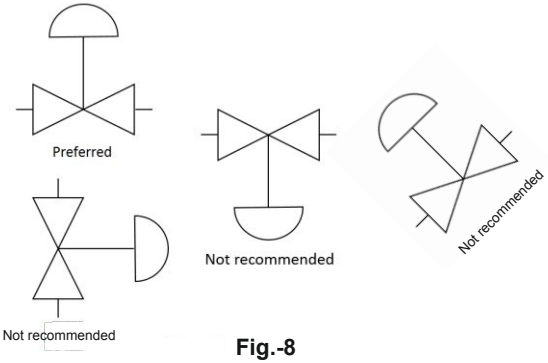


Fig.-8

3. Determine the correct installation situation and the direction of fluid flow. The valve should preferably be installed along a horizontal pipeline with the valve mounted above the pipe (see Fig 8). When mounting an actuator to the valve body, the actuator Installation and Maintenance Instructions must be followed.

4. Bypass arrangements - It is recommended that isolating valves be fitted upstream and downstream of the control valve, together with a manual bypass control valve. This enables the process to be controlled manually using the bypass valve while the pneumatic valve is isolated for maintenance (see Figure 9)

5. Support pipework should be used to prevent stresses being exerted on the valve body.

6. Ensure adequate space is provided for the removal of the actuator from the valve body for maintenance purposes

7. Isolate connecting pipework. Ensure it is clean from dirt, scale etc. Any debris entering the valve may damage the head seal preventing the specified shut off.

8. Open isolation valves slowly, until normal operating conditions are achieved.

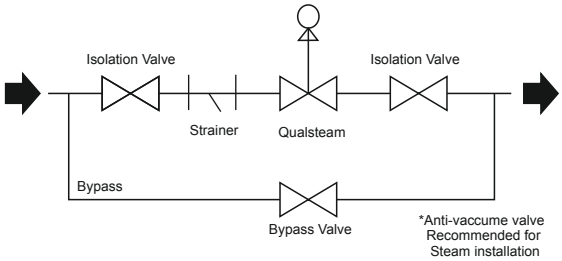


Fig.- 9

d) Installation of valve and pressure transmitter :

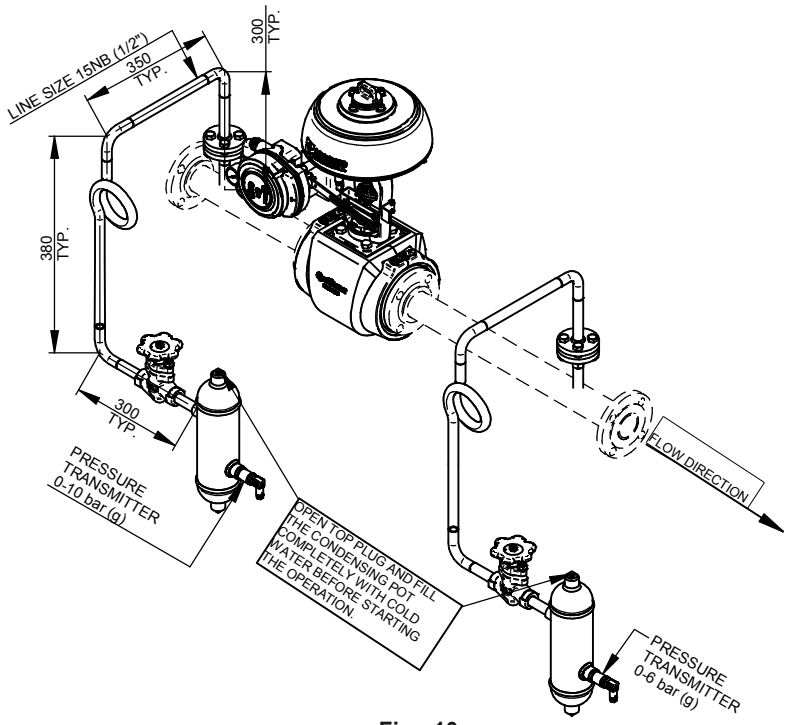


Fig.- 10

1) While installing control valve, make sure that flow arrow direction on valve body matches the flow direction.
2) Refer Fig. 10 for installing pressure transmitters along with condensing pot arrangement.
3) The tapping for 0-10 bar (g) pressure transmitters should be taken at a distance 300 to 500 mm upstream of control valve.
4) The tapping for 0-6 bar (g) pressure transmitters should be taken at a distance 500 to 750 mm downstream of control valve.
5) Both upstream and downstream condensing pots should be filled completely with cold water before starting the operation.

e) Mounting Details of control panel :

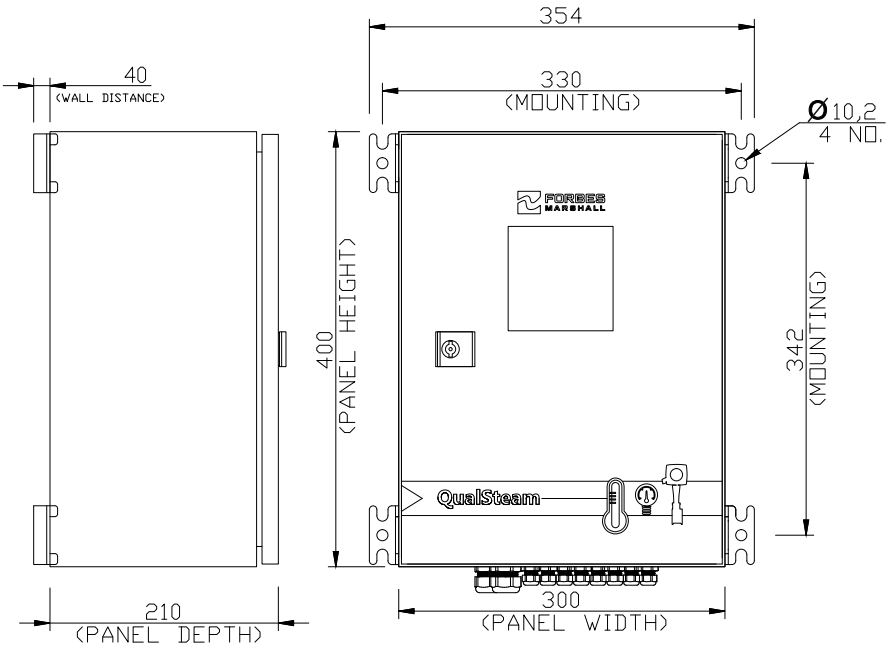


Fig.- 11

Fix control panel to the wall/structure using 4 nos. M10 bolts

6. Startup and Commissioning :

6.1 Connection Terminal Diagram

Note- The control panel power supply should be given through UPS (230V, 1 KVA) only. When operating QualSteam control panel with existing customer temperature controller, standalone mode is used. And when using the QualSteam control panel without any external PID loop, Integrated mode is used

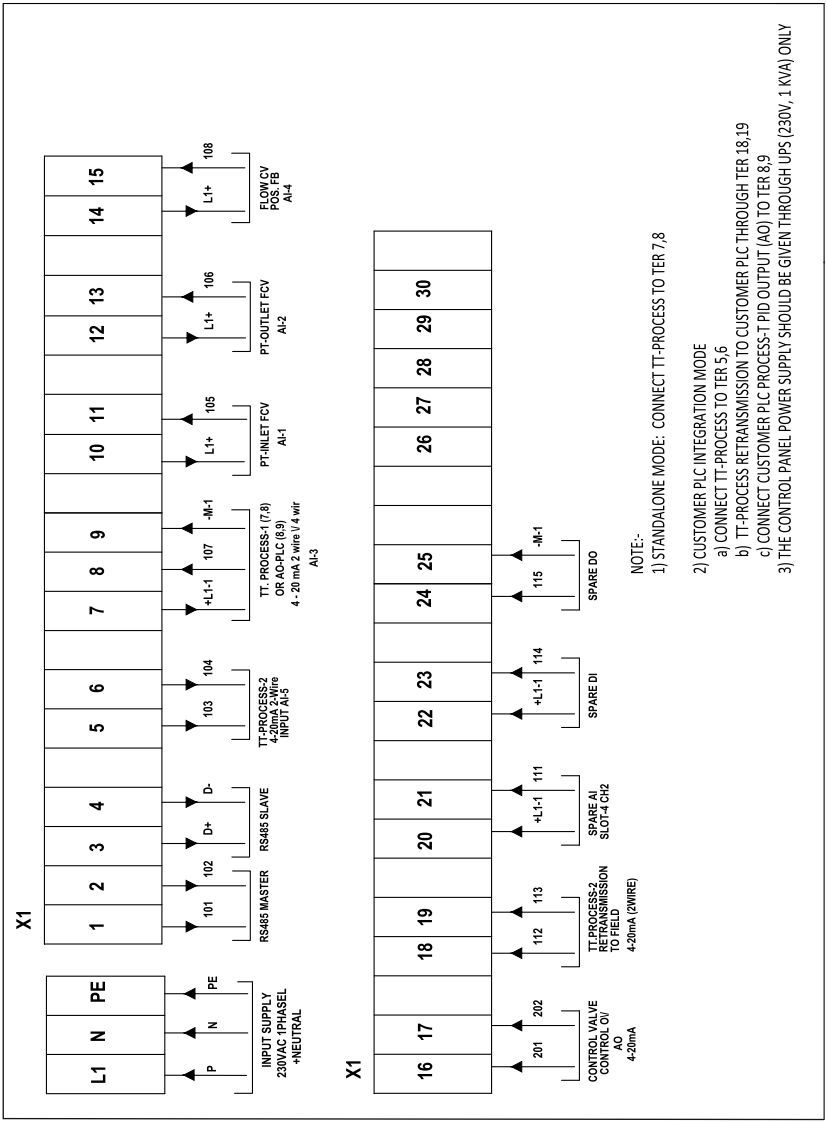


Fig.- 12

6.1.1 The functions of each button are as follows:

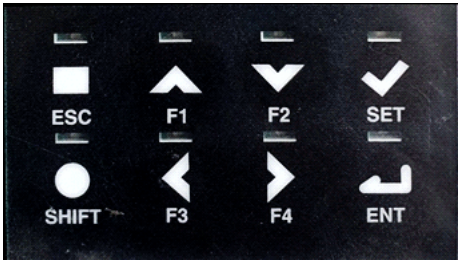


Fig.- 13

1. F1 (Up) – Used to move between values of a window/ change values in SET mode
2. F2 (Down) – Used to move between values of a window/ change values in SET mode
3. F3 (Left) – Used to change between windows/ digits places in SET mode
4. F4 (Right) – Used to change between windows/ digits places in SET mode
5. SET – Used to edit a value
6. ENTER – Used to allocate a value/ move to next value to be edited
7. F1 +F2 simultaneously pressed : Totalizer Reset for screen 2.

SCREEN-1	SCREEN-2	SCREEN-3	SCREEN-4
Temp: 90.5 °C T_SP: 90.0 °C	Pin : 3.5 bar Pout : 1.5 bar Mstm : 200 kg/h Mtot : 1000 kg	Mode: Manual MAN_OP: 90.0 % PID_OP : 90.0 % CV_F/B : 90.0 %	PrL_SP_M: 0.0 bar PrH_SP_M: 2.0 bar PrH_SP_Mode: Auto PrH_SP_A: 1.7 bar
SCREEN-5	SCREEN-6	SCREEN-7	SCREEN-8
PV: 90.5 C P: 500 SP: 90.0 C I : 150 MOP: 0.0% D: 0 OP: 66% M: Auto	PV: 1.5 b P: 150 SP: 1.4 b I : 30 MOP: 0.0% D: 0 OP: 68% M: Auto	V & FF : 100 1.00 PipeID : 25 mm KvMAX: 10.5 T_SPDelta: 40.0	EXT_PLC_MODE: NO CV F/B: NO DYNAMIC SP: YES
SCREEN-9	SCREEN-10		
MIN MAX P1: 0.0 10.0 P2: 0.0 6.0 T1: 0.0 300.0	MIN MAX T2: 0.0 300.0 CV: 0.0 100.0		

Fig.- 14

A) PROCEDURE BEFORE OPENING OF STEAM ISOLATION VALVE UPSTREAM OF CONTROL VALVE

1. Go to screen 8

Ext PLC AO	Select 'No' for standalone mode (TT connected to panel) Select 'Yes' for PLC integration mode (TT connected to customer PLC/controller)
CV F/B	Select 'Yes' for valve opening F/B from smartPoz+ Select 'No' if F/B is not available.
Dynamic SP	Select 'No'

2. Values required for commissioning (to be taken from name plate of transmitters)

Go to screen 9

Enter Minimum and Maximum ranges of PT and TT as mentioned on name plate.

No.	Nomenclature	Remark
1	P1	PT upstream of control valve
2	P2	PT downstream of control valve
3	T1	TT Process
4	T2	TT process (When splitter is used for PLC integration mode)
5	CV	Feedback positioner (0 – 100%)

3. Go to screen 7

V and FF	Keep default values
Pipe ID	Enter pipe dia of upstream pipe / control valve size in mm
Kvmax	Enter control valve Kv
T_SPdelta	Required to set max pressure auto SP Max pressure SP Auto = Temp SP + T_SPdelta. Once Temp SP is changed, max pressure SP will be applied automatically.

4. Go to screen 1: Enter Temperature SP (T_SP)
5. Go to screen 2: Press F1 and F2 keys together to reset totalizer
6. Setting Max limit of pressure: Go to screen 4. In case of fixed Temp SP requirement, enter the required max limit of pressure in PrH_SP_M and select PrH_SP_mode = Manual. In case of batchwise different Temp SP requirement, select PrH_SP_mode = Auto. The PrH_SP_A value will be displayed and assigned. This value is linked to Temp SP. To change the PrH_SP_A value, change T_SPdelta as mentioned in step 3.

B) PROCEDURE FOR PROCESS STARTUP AND PID TUNING

1. Go to screen 3

1) Start the process in manual mode of control valve (screen 3). Increase the valve opening gradually by changing MAN_OP value till the required temperature is achieved (Screen 1).

2) When the live process temperature is very close to T_SP, note down the Pout value on screen 2 & Man_op value of screen 3.

3) Go to screen 4 and set the max pressure limit of pressure atleast 0.5 bar higher t han Pout value obtained in above step.

PrH_SP_M or PrH_SP_A >=(Pout+0.5)

The closer the value of max pressure limit w.r.t actual Pout , the better temperature control will be when the valve is operating in auto mode.

4) Change screen 4 mode to 'Auto'.

5) Go to screen 10. Set Max value of Ymax = (Man_op value of step 2) + 5

6) **PID tuning: PID values of Pressure control (P-loop) need to be tuned first.** Go to screen 6 (where PV value is displayed with suffix 'b' i.e bar (like 0.0 b)). Check the rate of change of PV value w.r.t. change of SP value. The guideline for selecting suitable P, I and D values manually is given section 7.1.

Go to screen 5 (where PV value is displayed with suffix 'C' i.e Celsius (like 0.0 C)). Temp loop P, I, D values can be tuned in same manner as mentioned in section 7.1..

7) Once the process temperature is stable go to screen 8 and set dynamic SP='YES'

Note:- If the control valve start hunting after enabling dynamic SP, then disable dynamic SP by changing its valve to 'No'.

6.1.2 RS 485 address list

Settings: BR – 9600, Data Bits – 8, Parity – None, Stop Bit -1, Device ID – 11

No.	Parameter	Type	Address	(×) Scaling Factor
1	Process Temp (°C) when EXT PLC mode OFF EXT PLC AO (%) when EXT PLC mode ON	Real	31820	0.1
2	Process Temp 2 (when EXT PLC mode ON)	Real	31822	0.1
3	Temperature Setpoint	Real	31824	0.1
4	CV opening F/B	Real	31826	0.1
5	Supply Steam Pressure	Real	31828	0.1
6	Condensing Pressure	Real	31830	0.1
7	Condensing Pressure SP	Real	31832	0.1
8	Steam Flow	Real	31808	1
9	Steam Totalizer	Real	31810	1
10	Max Pressure SP – MAN	Real	31812	1
11	Max Pressure SP – Auto	Real	31814	1
12	Min Pressure SP	Real	31816	1
13	PID output to valve	UInt	30787	0.1
14	MAN Mode output to valve	UInt	30788	0.1
15	PID Mode (Auto / Man)	Bool	556	-
16	Configuration (Standalone / Ext PLC)	Bool	531	-

7. Operation:

7.1 About PID

Proportional band

Proportional band is the area around the set point where the controller is actually controlling the process. If the proportional band is too narrow an oscillation around the setpoint will result. If the proportional band is too wide the control will respond in a sluggish manner, could take a long time to settle at set point and may not respond adequately to upsets.

Integral time

Integral time is defined as the time, in seconds, which corrects for any offset (between setpoint and process variable) automatically over time by shifting the proportioning band. Integral action (also known as "automatic reset") changes the output power to bring the process to setpoint. Integral times that are too fast (small times) do not allow the process to respond to the new output value. This causes over-compensation and leads to an unstable process with excessive overshoot. Integral times that are too slow (large times) cause a slow response to steady state errors.

Derivative time

Derivative action is used to shorten the process response time and helps to stabilize the process by providing an output based on the rate of change of the process. In effect, derivative action anticipates where the process is

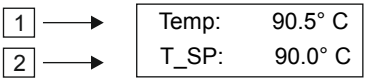
headed and changes the output before it actually "arrives". The derivative time is calculated in seconds. Increasing the derivative time helps to stabilize the response, but too much derivative time coupled with noisy signal processes, may cause the output to fluctuate too greatly, yielding poor control.

ADJUSTMENT SEQUENCE	SYMPTOM	SOLUTION
Proportional band (PB)	Slow Response	Decrease PB
	High overshoot or oscillation	Increase PB
Integral time (IT)	Slow Response	Decrease IT
	Instability or Oscillations	Increase IT
Derivative time (TD)	Slow response or Oscillations	Decrease TD
	High Overshoot	Increase TD

7.2 Screens

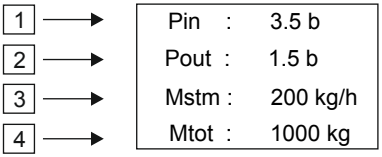
Below mentioned are the set of screens, in sequence, available on the display

7.2.1 Temperature Screen



Number	Parameter	Description
1	Temp	It indicates the current temperature of hot water exiting the heat exchanger.
2	T_SP	It is the setpoint temperature which is expected to be achieved by the hot water exiting the heat exchanger. (Value is user input)

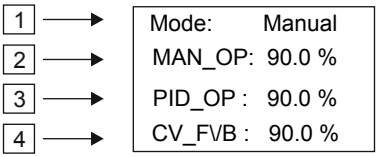
7.2.2 Pressure and Steam Flow Screen



Number	Parameter	Description
1	Pin	Pressure of steam upstream of control valve.
2	Pout	Pressure of steam downstream of control valve.
3	Mstm	Indicates the steam flow rate through the valve.
4	MTot	Steam flow totalizer value

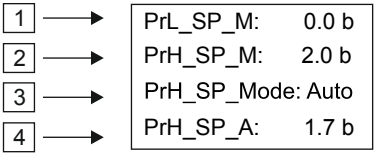
Press and hold the F1 and F2 keys simultaneously to reset the totalizer value

7.2.3 Control Valve Screen



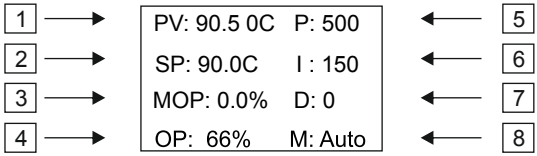
Number	Parameter	Description
1	Mode (Auto/Manual)	Select the operation mode of control valve. (Value is user input)
		Auto- The controller varies the control valve opening depending upon the temperature at set point temperature.
		Manual- Used to set a fixed control valve opening depending upon the user requirement.
2	Man_OP	Represents the value of manually set control valve opening. (Value is user input)
3	PID_OP	It is the calculated opening percentage value of valve depending upon the PID values assigned.
4	CV_F/B	It is the live opening percentage value of valve given as feedback by the positioner.

7.2.4 Pressure Setpoint Screen



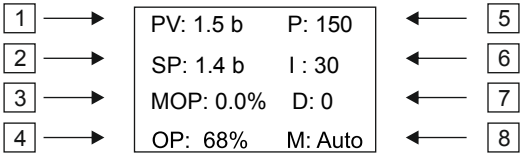
Number	Parameter	Description
1	PrL_SP_M	Lower pressure setpoint value when operated in Manual mode. (Value is user input)
2	PrH_SP_M	Higher pressure setpoint value when operated in Manual mode. (Value is user input)
3	PrH_SP_Mode (Auto/Manual)	Used to select the mode of operation for pressure setpoint.
		Auto- Pressure setpoint is decided automatically based on temperature setpoint.
		Manual- Pressure setpoint is set manually by giving it a range of upper and lower limit. (Value is user input)
4	PrH_SP_A	It is the Pressure setpoint based on temperature setpoint and is obtained by varying T_SPDelta. Refer to section 7.2.7 to know about T_SPDelta. (Value is user input)

7.2.5 Temperature PID Screen



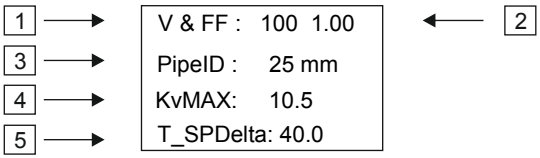
Number	Parameter	Description
1	PV	It represents the indicated value of the parameter at that instant.
2	SP	It is the setpoint for the parameter. (Value is user input)
3	MOP	If the PID is operated in manual mode, it represents the value of control valve opening set. (Value is user input)
4	OP	It represents the actual value of control valve opening.
5	P	Proportional band value. Refer to section 7.1 for information about PID. (Value is user input)
6	I	Integral time value. Refer to section 7.1 for information about PID. (Value is user input)
7	D	Differential time value. Refer to section 7.1 for information about PID. (Value is user input)
8	M	Used to select the mode of operation for PID.
	(Auto/Manual)	Auto- Use the value of PID to control the valve opening while accounting for error.
		Manual- Use the user input value of valve opening without accounting for the PID control values. (Value is user input)

7.2.6 Pressure PID Screen



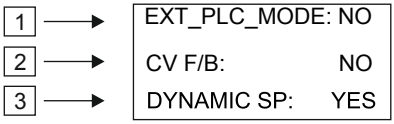
Number	Parameter	Description
	PV	It represents the indicated value of the parameter at that instant.
2	SP	It is the setpoint for the parameter. (Value is user input)
3	MOP	If the PID is operated in manual mode, it represents the value of control valve opening set. (Value is user input)
4	OP	It represents the actual value of control valve opening.
5	P	Proportional band value. Refer to section 2.1 for information about PID. (Value is user input)
6	I	Integral time value. Refer to section 7.1 for information about PID. (Value is user input)
7	D	Differential time value. Refer to section 7.1 for information about PID. (Value is user input)
8	M	Used to select the mode of operation for PID.
	(Auto/Manual)	Auto- Use the value of PID to control the valve opening while accounting for error.
		Manual- Use the user input value of valve opening without accounting for the PID control values. (Value is user input)

7.2.7 Configuration Screen



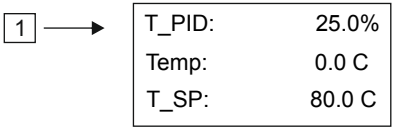
Number	Parameter	Description
1	V	Configurable velocity. (Value is user input)
2	FF	Configurable flow factor. (Value is user input)
3	PipeID	Value of the internal diameter of the pipe near the valve. (Value is user input)
4	KvMax	Flow coefficient of Control Valve. (Value is user input)
5	T_SPDelta	It is the numerical difference between saturation temperature of operation Pressure (Pout) and Temperature setpoint. (Value is user input)

7.2.8 Setting Screen

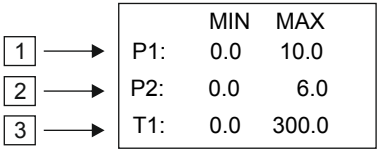


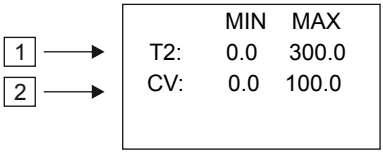
Number	Parameter	Description
1	Ext PLC (No/Yes)	Used to select whether to operate the QualSteam Controller with an external PLC controller or not. Refer to system architecture for connection diagram of an combo valve
		No- Use the to set Temperature setpoint and monitor temperature.
		Yes- Use an external PLC Controller to monitor and set Temperature setpoint. (Value is user input)
2	CV F/B (No/Yes)	Only PID control valve opening value is available when no selected while actual valve opening value is given as feedback when yes selected. (Value is user input)
3	Dynamic P-SP (No/Yes)	Dynamic set of condensing pressure if set to 'Yes' the pressure SP will be varible based on process temperature value if set to 'No' then pressure will be to max pressure setpoint PrH_SP_M or PrH_SP_A as per PrH_SP_Mode selection.

Note: When operating the combo valve with an External PLC Controller, the Temperature Screen on the combo valve shows values in terms of percentage instead of actual temperature in degrees.



7.2.8 Setting Screen





Tag	Parameter	Min Range	Max Range
P1	Steam Pressure upstream of CV	0 bar	10 bar
P2	Steam Pressure downstream of CV	0 bar	6 bar
T1	Process temperature	0 deg C	300 deg C
T2	Process temperature if takenthrough spliterfor PLC integration mode	0 deg C	300 deg C
CV	Control valve feedback	0%	100%

a) Refer to the nameplate of each transmitter for min and max range

8. Troubleshooting:

No.	Problem	Cause	Solution
1	Process Temperature value is displayed in %	External PLC mode is Enabled	For standalone Mode, Go to screen 8 and make Ext_PLC_Mode = No
2	Process Temperature remains less than T–SP	Condensing pressure is already reached to Max pressure setpoint (PrH_SP_M / PrH_SP_A)	If Pout (Screen 2) > PrH_SP_M (Manual mode)/ PrH_SP_A (Auto mode) value on screen-4, then increase PrH_SP_M value for PrH_SP manual mode. For PrH_SP Auto mode, go to screen 7 and increase T_SPDelta value
		Integral gain (I) of T-loop are not set correctly	Go to screen-5 Reduce I value
		Condensate logging	Check trap and trap installation
3	Process Temperature remains more than T–SP	Proportional Band and Integral gain (I) of T-loop are not set correctly	Go to screen-5 Increase I value
4	Process Temperature keeps on changing around setpoint	Proportional Band and Integral gain (I) of T-loop are not set correctly	Go to screen-5 Increase P value Once the fluctuations get reduced, change I value depending on above cases 2 or 3
		Too high limit of PrH_SP	a) If difference betw een Pout and PrH_SP is more than 1.5, then reduce PrH_SP b) Go to Screen-8, Change Dynamic SP to “No” and check the result

8.2 Do`s and Don'ts

1. Do make sure that all the wiring is protected from physical damage.
2. Do read all the manuals before using the PLC and changing its settings.
3. Do make entries of the range and settings in the company logbook.
4. Do clean the computational unit screen with clean and dry cotton cloth only.
5. Don't use sharp pointed needles, pens, etc on the buttons of the computational unit.
6. Don't disconnect wiring without switching OFF the power supply.
7. Don't attempt to repair the PCB assembly.
8. Don't make any transmitter connection without switching OFF the unit
9. Don't change the PID values without consulting the FM engineers

8.3 Technical Specifications

Control Panel

Size	300(W) x 400(H) x 210(D) mm
Display	4-line B&W Display with multiple screens
Power Supply	100-230V, 50/60 Hz
Input - Output	5 AI – 4-20 mA, 1 AO– 4-20 mA
Communication	RS-485 Modbus Output of Display parameters
Digital Connectivity	Through RTru
Environmental Conditions	Temperature: 0 to 55°C Operating, -20 to 70°C Storage, RH: 10 to 95%
Color	RAL 5010
Weight	12 kg.
Protection Category to IEC-60529	IP 65

Size and End Connections

End connections : Flanged (#150)
Size available : DN15, 20, 25, 40, 50, 65, 80 & 100
Available with IBR on request

Limiting Condition

Body Design Condition	#150
Max Allowable Design Pressure	10 bar (g) @ 184°C
Max Allowable Design Temperature	225 °C
Min. Allowable Design Temp	-10 °C
Maximum cold Hydraulic Test Pressure	26 bar (g)

Operating Characteristic - Equal percentage

Technical Data Table:

Compatible Actuators and Positioner

Actuator	Pneumatic, multi-spring diaphragm A series actuator A0, A1 and A2
Positioner	Electro - Pneumatic

Technical Data

Plug design	Parabolic (Equal percent characteristic)
Leakage class	Class IV and VI as per FCI 70.2
Rangeability	50:1
Travel	16 mm-DN15, DN20 and DN25 20 mm-DN40 and DN50 30 mm-DN65, DN80 and DN100
Face to face	ISA 75.08.01 for ANSI #150 Flanged version
Steam Flow	Indicative flow calculated as per Kv, measured up steam & downstream pressure & valve opening.

Kv Details :

Size	Travel	KV Values Parabolic Equal Percent trim		
		Std Kv	Redn 1	Redn 2
DN15	16mm	5	3	1.6
DN20	16mm	6.3	5	3
DN25	16mm	10	6.3	5
DN40	20mm	26	10	6.3
DN50	20mm	36	26	10
DN65	30mm	63	36	26
DN80	30mm	102	63	36
DN100	30mm	160	102	63

9. Maintenance Guidelines:

Note: Before initiating any installation, observe the 'Safety information' in Section 2.

If the application permits, it is recommended that a thin layer of a PTFE based grease is applied to any mating parts before reassembly.

General:

Valve parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance frequency depends on the severity of the service conditions. This section provides instructions on replacement packing, stem, plug and seat. All maintenance operations can be performed with the valve body in the line.

Annually:

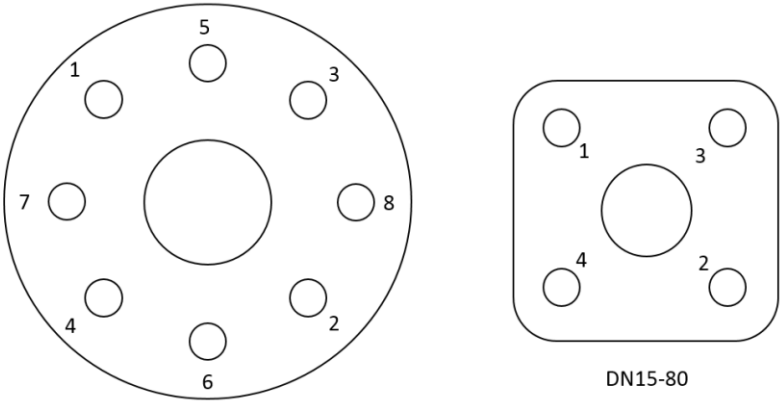
The valve should be inspected for wear and tear replacing any worn or damaged parts such as valve plug and stem, valve seat and gland seals, refer to Section 7 'Spare parts'.

Recommended tightening torques for Body

Bonnet Joint Hex Bolts

Size wise tightening torques

QualSteam Size	Torque (Nm) for #150
DN15 - DN25	70
DN40 - DN50	90
DN65 - DN80	110
DN100	110



DN100 **Note**- Number indicates the sequence of tightening

Fig.- 15

Note- Gland nut tightening torque 20 Nm

9.1 Removal of valve bonnet

(Reference Figure 16 & 17)

Note: This procedure is necessary before carrying out any of the maintenance procedures detailed below:

- Ensure that the valve is depressurized and clear of media and isolate it both upstream and downstream.
- **Caution:** Care should be taken when disassembling the valve in case of residual pressure being trapped between the isolation points.
- First depressurize the actuator, disengage pin at feedback link and c link of positioner then disengage actuator stem from valve stem by removal of Allen bolts of coupling.
- Then apply air pressure to actuator, dismantle coupling halves then remove slotted nut from valve bonnet.
- Undo and remove the bonnet bolts (19).
- Remove the bonnet (2) and plug and stem assembly (5).
- Remove and discard the body gasket (9).

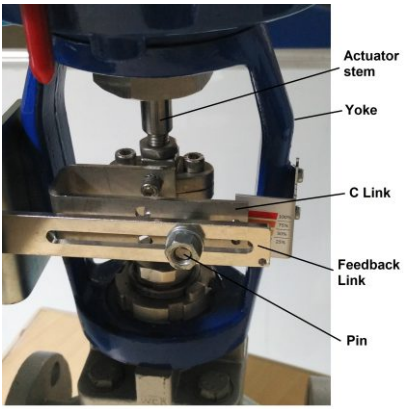


Fig.- 16a

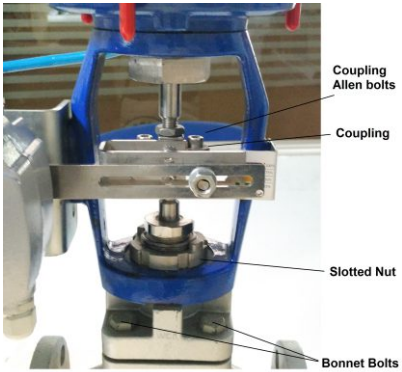


Fig.- 16b

9.2 Removal and replacement of PTFE gland packings

(Reference Figure 17)

- Take plug and stem assembly out from bonnet bore.
- Remove the gland nut (7), take out gland bush (12) from bonnet bore. Remove Scrapper ring (14) and sliding bearing (16) from gland nut. Remove 'O' rings (10 and 11) from the gland bush, ensuring that the grooves are clean and undamaged, and replace with new Items. The use of silicone grease on the 'O' rings is recommended. .
- Withdraw the gland components and discard (10, 11 12, 15 &13).
- Clean the gland cavity bore and fit new gland components in the order as shown. Note that the guide bush must be fitted with the edge having radius downwards. When fitting the chevron seals they should be inserted with downward V orientation as indicated in figure 16, one at a time to ease the assembly process.
- Prior and after insertion of spring (17) in the bore put washers (18)
- Apply a thin layer of anti-seize lubricant to the gland nut threads before screwing it in two or three turns. At this stage the packing must not be significantly compressed.

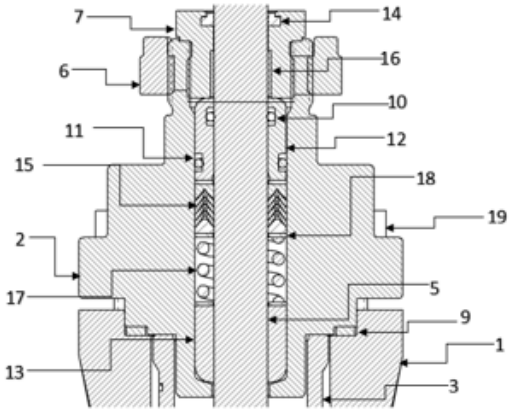


Fig.- 17

9.3 Removal and replacement of Graphite gland packings :

(Reference Figure 18)

- Take plug and stem assembly out from bonnet bore.
- Remove the gland nut (5), take out gland bush (6) from bonnet bore. Remove Scrapper ring (14) from gland nut and discard. Ensure that the gland bush is clean and undamaged otherwise replace with new one. The use of silicone grease on internal surface of gland bush is recommended.
- Withdraw the gland components and discard (7, 8 & 10)

  Use some soft hand tool from lower side of Bonnet to push entire packing set out of the bonnet (as shown)
- Clean the gland cavity bore and fit new gland components in the order as shown. Note that the guide bush must be fitted with the edge having groove downwards. When fitting the Graphite rings they should be inserted with Top & Bottom braided & middle all moulded rings as indicated in figure 18, one at a time to ease the assembly process.
- Apply recommended grease to all spindle OD (4), Gland Bush ID(6), spacer ID (9) before assembly
- Apply a thin layer of anti-seize lubricant to the gland nut threads before screwing it in two or three turns. At this stage the packing must not be fully compressed.

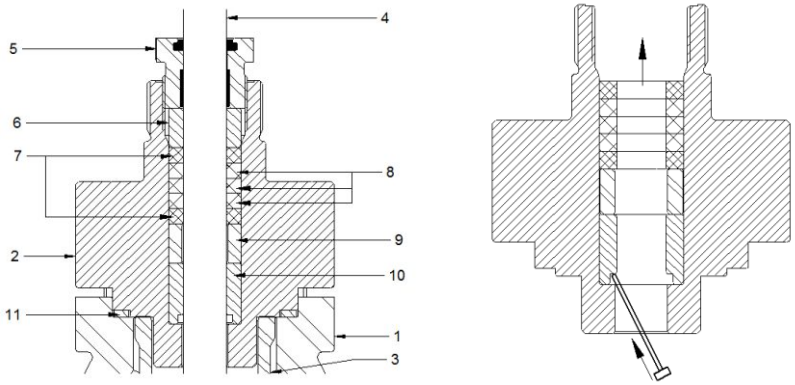


Fig.18

9.4 Removal and refitting of the valve plug /stem assembly and seat :

(Reference Figure 19)

- Take plug and stem assembly out from bonnet bore.
- Remove the gland nut (7), take out gland bush (12) from bonnet bore. Remove Scrapper ring (14) and sliding bearing (16) from gland nut. Remove 'O' rings (10 and 11) from the gland bush, ensuring that the grooves are clean and undamaged, and replace with new items. The use of silicone grease on the 'O' rings is recommended.
- Withdraw the gland components and discard (10, 11 12, 15 &13).
- Clean the gland cavity bore and fit new gland components in the order as shown. Note that the guide bush must be fitted with the edge having radius downwards. When fitting the chevron seals they should be inserted with downward V orientation as indicated in figure 5, one at a time to ease the assembly process.
- Remove the bolts from bonnet by applying specified torque; take out body top gasket from groove and discard
- Lift out the seat retaining cage (3) followed by the seat (4).
- Remove the seat gasket (8) and discard.
- Clean all components, including the seat recess in the valve body.
- Examine the seat and plug / stem assembly for damage or deterioration and renew as necessary.
- While putting seat at the recess ensure that stepped part having serrations should go downward

Note: Score marks or scaly deposits on the valve stem will lead to early failure of the gland seals and damage to seat and plug sealing faces will result in leakage rates higher than those specified for the valve.

- Fit a new seat gasket (8) in the body seat recess followed by the seat (4).
- Ensure that gasket touching surfaces should be serrated.
- Refit the cage (3) ensuring that the low thickness edge is lower most and that it sits squarely on the seat without impinging on the valve body.

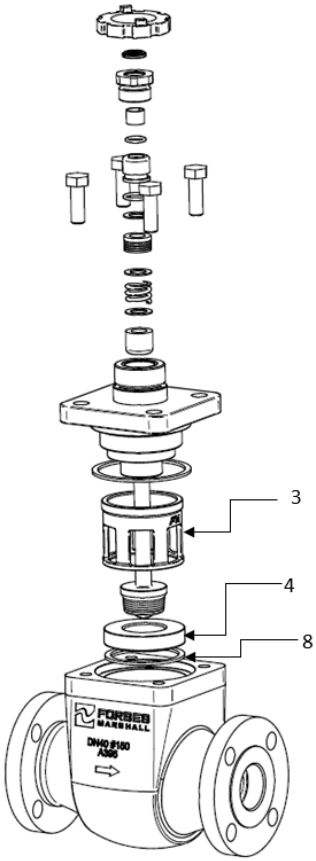


Fig. 19

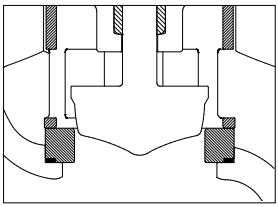
Trim Styles

STD Trim

Hardened Parabolic plug , Cage retained seat.

Metal to metal seated (Leakage class IV), quick rechangable trim.

Available in both Equal Percentage and Linear Characteristics



STD Trim with Soft seating

Parabolic plug , Cage retained seat with Virgin PTFE seat insert

Leakage class VI, quick rechangable trim available in Max Kvs only

On- Off Application.

For applications up to 180 °C Temperature.

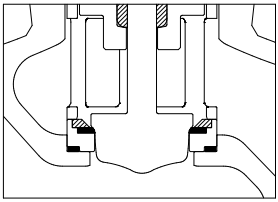


Fig.- 20

The actuators should be installed in such a position as to allow full access to both actuator and valve for maintenance purposes. The preferred mounting position is with the actuator and valve spindle in the vertical position above or below the horizontal pipework. The air supply to the actuator must be 'dry and free from oil'. For high temperature conditions, insulate the control valve and pipework to protect the actuator.

Warning: The actuator housing must only be pressurized on the opposite side of the diaphragm holding the springs. The housing vent cap must be left unrestricted.

Fitting the actuator to a valve (Fig. 21)

- Remove both the Allen screws. Then remove the valve coupling
- Fit the valve coupling onto the valve spindle then manually push the valve plug to its closed position. Caution: Two female threads must be visible inside the coupling when fitted to the valve spindle.
- Apply the control signal pressure required to bring the spindle to mid-travel position (Figure 16). Place the actuator yoke over the valve spindle and locate it onto the bonnet shoulder. Hand tighten the slotted nut.
- Apply the minimum signal pressure + 0.1 bar maximum to the bottom of the actuator, and then adjust actuator coupling so that it touches the valve coupling, then tighten the lock-nut.
- Release the control air signal. Fit the Allen screws as shown in Figure 16.
- Operate the actuator and valve over its full travel four times to ensure alignment.
- Tighten the slotted nut to the recommended torque.

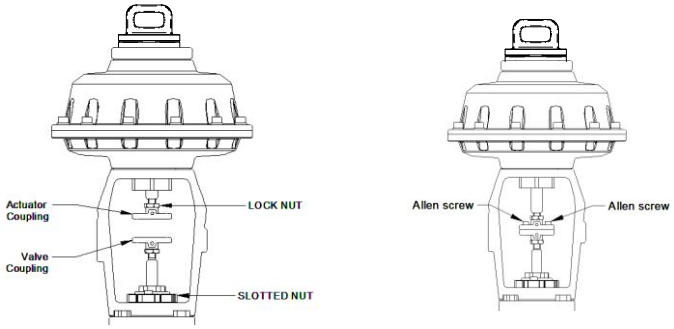


Fig.-21

Warning: To prevent damage to the valve seat, please ensure the plug does not turn while pressing on the seat during assembling or adjustment. To prevent damage to the diaphragm, ensure the actuator spindle is not allowed to rotate when the diaphragm is assembled within its housing.

The FM pneumatic actuators (and variants) are maintenance free. To ensure satisfactory operation it is strongly recommended that the control signal air is filtered and supplied dry and free of oil. Should it be necessary to replace spare parts the following procedure should be used.

CAUTION! The diaphragm housing contains powerful springs under compression. Exercise great care when dismantling. Read this Maintenance section thoroughly prior to commencing any work.

9.1 Removing the actuator from the valve: (Refer Fig. 21)

- Drive the actuator into approximately 25% open travel position with the air supply.
- Loosen and remove the lock nuts and Allen screws and remove the valve coupling
- Loosen and remove the slotted nut (see Figure 10) and lift the actuator off the valve.
- Reduce the air supply pressure until the housing is pressure free. Disconnect the air supply from the actuator.

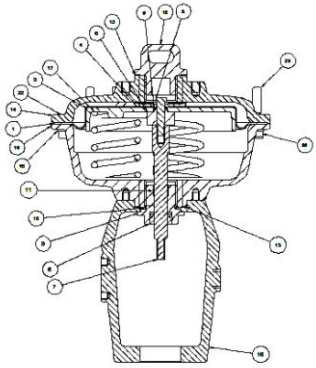


Fig.-22

9.2 Normally Closed Valve:

A) Diaphragm kit - How to fit: (Refer Fig. 22)

- Remove the actuator from the valve as described above section 9.1

  Note 1: There are 3 off longer housing Allen screws with red cap which are fitted to safely allow spring decompression. These should be removed last after all other screws are removed and should be loosened evenly to prevent distortion of the housing.
- Lubricate the threads of the three long Allen screws (20) with a PTFE based grease before releasing the tension in the springs.
- Loosen and remove the short housing Allen screws and nuts (22)

- Holding each nut with a spanner, rotate the three long Allen screws a few turns at a time. Remove the screws and upper housing (18).
- Remove the springs (17). Using a spanner to hold the actuator spindle (4), loosen the upper stem (7). Remove spring washer, Remove bush (6), 'O' ring (5), piston (2) and finally the diaphragm (1)
- Refit the new diaphragm (1) and reassemble all items in reverse order, taking care not to damage the 'O' ring. Using two spanners, while holding the actuator spindle (4) tighten the upper stem (7)
- Refit the upper housing (18) and securing the nuts and Allen screws.

Note: Supporting the actuator spindle (4) ensures that the diaphragm sits evenly in the lower housing. Tighten the housing screws evenly to avoid distortion. 3 off longer housing screws should be positioned 120° apart and tightened evenly prior to fitting the remaining screws To avoid distortion of the diaphragm do not fully tighten housing screws until all screws have been fitted. Final tightening should then be carried out.

Actuator Series	Screw Size	Torque (Nm)
A0	M6	30
A1	M8	40
A2	M10	50

Tightening sequence of Actuator Housing Bolts / Buts

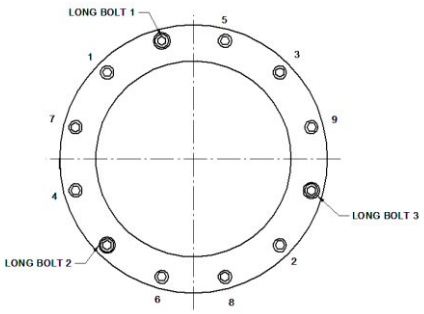


Fig.- 23

B) Spring kit - How to fit (Refer Fig. 22)

- Remove the actuator from the valve as described in Section above 9.1
- Lubricate the threads of the three long Allen screws with a PTFE based grease before releasing the tension in the springs
- Loosen and remove the short housing Allen screws and nuts (23)

- Holding each nut with a spanner, rotate the three long Allen screws a few turns at a time. Remove the screws and upper housing (22).
- Replace with new springs. While supporting the actuator spindle (4) so that the diaphragm sits evenly in the lower housing, refit the upper housing (22) and tighten the screws evenly.

Please observe Note, above section 9.2 (A)

C) WDB Seal holder - How to fit (Refer Fig. 22)

- Remove the actuator from the valve as described in Section above 9.1
- Remove the actuator coupling & lock nut from Actuator spindle (4)
- with the help of spanner remove the WCB seal holder (9) from the lower housing (14)
- Refit the new WDB seal holder (9) dully fitted with new WDB seal (8) , DU bearing (11) & O-ring (10)

Note- To change the WDB seal holder, no need to open Actuator Housing

10. Available Spares :

Control Panel

No.	Description	Code
1	VALVE SPARES, QUALSTEAM CPU KIT, SPARE CONSIST OF CPU(1NO), DISPLAY(1NO) AND SOFTWARE	SPARE-QUALSTEAM-CPUKIT
2	VALVE SPARES, QUALSTEAM AI KIT, SPARE CONSIST OF 2 CH AI CARD(1NO)	SPARE-QUALSTEAM-AICKIT
3	VALVE SPARES, QUALSTEAM AO KIT, SPARE CONSIST OF 1 CH AO CARD(1NO)	SPARE-QUALSTEAM-A0CKIT
4	VALVE SPARES, QUALSTEAM DO KIT, SPARE CONSIST OF 3 CH DO CARD(1NO)	SPARE-QUALSTEAM-D0CKIT
5	VALVE SPARES, QUALSTEAM POWER SUPPLY KIT, SPARE CONSIST OF 24 VDC- 5 AMP DIN RAIL POWER SUPPLY (1NO)	SPARE-QUALSTEAM-PSKIT
6	VALVE SPARES, QUALSTEAM ISOLATOR KIT, SPARE CONSIST OF (24V + 2WIRE I/P & 2WIRE O/P) ISOLATOR (1NO)	SPARE-QUALSTEAM-ISLKIT
7	VALVE SPARES, QUALSTEAM PRESSURE TRANSMITTER KIT, SPARE CONSIST OF 0 TO 6 BARG PRSSURE TRANSMITTER 1/2" NPT(M)(1NO)	SPARE-QUALSTEAM-PT0-6KIT
8	VALVE SPARES, QUALSTEAM PRESSURE TRANSMITTER KIT, SPARE CONSIST OF 0 TO 10 BARG PRSSURE TRANSMITTER 1/2" NPT(M)(1NO)	SPARE-QUALSTEAM-PT0-10KIT

11. Spare parts (Actuator):

	eVALV Spare Codes	
KIT NAME	**DESCRIPTION**	**SPARE CODE**
ACTUATOR CLAMPING NUT	VALVE SPARES,15-25NB EVALV ACTUATOR CLAMP NUT KIT, SPARE CONSISTS OF ACTUATOR CLAMP NUT PACK OF 2 NO'S	SPARE-1525EVALV-ACNKIT
	VALVE SPARES,40-50NB EVALV ACTUATOR CLAMP NUT KIT, SPARE CONSISTS OF ACTUATOR CLAMP NUT PACK OF 2 NO'S	SPARE-4050EVALV-ACNKIT
	VALVE SPARES,80-100NB EVALV ACTUATOR CLAMP NUT KIT, SPARE CONSISTS OF ACTUATOR CLAMP NUT PACK OF 2 NO'S	SPARE-80100EVALV-ACNKIT
STEM STEM SEAL KITS	VALVE SPARES,15-25NB EVALV SEAL KIT,SPARE CONSISTS OF GALND NUT-1NO.,BODY-SEAT GASKETS-1 NO EACH,TOP& BOTTOM O-RING-1NO EACH ,GLAND & GUIDE BUSH -1 NO EACH,SCRAPPER RING-1NO,CHEVRON SET,BEARING-1NO,SPACER-3 NO	SPARE-1525EVALV-SEALKIT
	VALVE SPARES,40-50NB EVALV SEAL KIT,SPARE CONSISTS OF GALND NUT-1NO.,BODY-SEAT GASKETS-1 NO EACH,TOP& BOTTOM O-RING-1NO EACH ,GLAND & GUIDE BUSH -1 NO EACH,SCRAPPER RING-1NO,CHEVRON SET,BEARING-1NO,SPACER-3 NO	SPARE-4050EVALV-SEALKIT
	VALVE SPARES,80-100NB EVALV SEAL KIT,SPARE CONSISTS OF GALND NUT-1NO.,BODY-SEAT GASKETS-1 NO EACH,TOP& BOTTOM O-RING-1NO EACH ,GLAND & GUIDE BUSH -1 NO EACH,SCRAPPER RING-1NO,CHEVRON SET,BEARING-1NO,SPACER-3 NO	SPARE-80100EVALV-SEALKIT

KIT NAME	DESCRIPTION	SPARE CODE
PLUG-STEM AND SEAT KIT	VALVE SPARES,15NB EVALV PLUG SEAT KIT ,SPARE CONSISTS OF PLUG ,SEAT ,SEAT GASKET & BODY GASKET 1 NO EACH	SPARE-15EVALV-PSKIT
	VALVE SPARES,25NB EVALV PLUG SEAT KIT ,SPARE CONSISTS OF PLUG ,SEAT ,SEAT GASKET & BODY GASKET 1 NO EACH	SPARE-25EVALV-PSKIT
	VALVE SPARES,40NB EVALV PLUG SEAT KIT ,SPARE CONSISTS OF PLUG ,SEAT ,SEAT GASKET & BODY GASKET 1 NO EACH	SPARE-40EVALV-PSKIT
	VALVE SPARES,50NB EVALV PLUG SEAT KIT ,SPARE CONSISTS OF PLUG ,SEAT ,SEAT GASKET & BODY GASKET 1 NO EACH	SPARE-50EVALV-PSKIT
	VALVE SPARES,80NB EVALV PLUG SEAT KIT ,SPARE CONSISTS OF PLUG ,SEAT ,SEAT GASKET & BODY GASKET 1 NO EACH	SPARE-80EVALV-PSKIT
	VALVE SPARES,100NB EVALV PLUG SEAT KIT ,SPARE CONSISTS OF PLUG ,SEAT ,SEAT GASKET & BODY GASKET 1 NO EACH	SPARE-100EVALV-PSKIT
GASKET KIT	VALVE SPARES,15-25NB EVALV GASKET KIT ,SPARE CONSISTS OF SEAT GASKET & BODY GASKET 2 NO'S EACH	SPARE-1525EVALV-GKIT
	VALVE SPARES,40-50NB EVALV GASKET KIT ,SPARE CONSISTS OF SEAT GASKET & BODY GASKET 2 NO'S EACH	SPARE-4050EVALV-GKIT
	VALVE SPARES,80NB EVALV GASKET KIT ,SPARE CONSISTS OF SEAT GASKET & BODY GASKET 2 NO'S EACH	SPARE-80EVALV-GKIT
	VALVE SPARES,100NB EVALV GASKET KIT ,SPARE CONSISTS OF SEAT GASKET & BODY GASKET 2 NO'S EACH	SPARE-100EVALV-GKIT

A0 Actuator Spare Codes		
KIT NAME	**DESCRIPTION**	**SPARE CODE**
REPAIR KIT	EVALV A0 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NC WITH & WITHOUT HANDWHEEL, ONE SPRING & WDB SEAL HOLDER ASEMBLY [PACK OF 1	SPARE-EVALV-A0-20NC1-RKIT
	EVALV A0 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NO WITH & WITHOUT HANDWHEEL, ONE SPRING & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A0-20NO1-RKIT
	EVALV A0 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NC WITH & WITHOUT HANDWHEEL, TWO SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A0-20NC2-RKIT
	EVALV A0 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NO WITH & WITHOUT HANDWHEEL, TWO SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A0-20NO2-RKIT
SPRING KIT	EVALV A0 ACTUATOR, SPARE TYPE : SPRING KIT, SPARE CONSIST OF : EXTERNAL SPRING (1 NO) [PACK OF 1]	SPARE-EVALV-A0-20NCNO1-SKIT
	EVALV A0 ACTUATOR, SPARE TYPE : SPRING KIT, SPARE CONSIST OF : EXTERNAL SPRING (1 NO), INTERNAL SPRING (1NO) [PACK OF 1]	SPARE-EVALV-A0-20NCNO2-SKIT
DIAPHRAGM KIT	A0 ACTUATOR, SPARE TYPE : DIAPHRAGM KIT, SPARE CONSIST OF : DIAPHRAGM(NC&NO), STEM O RING (1 NO) [PACK OF 1]	SPARE-EVALV-A0-DKIT
WDB SEAL HOLDER ASSLY KIT	A0 ACTUATOR, SPARE TYPE : WDB SEAL HOLDER ASSLY KIT, SPARE CONSIST OF : WDB SEAL HOLDER(NC&NO), WDB SEAL, DU BEARING & O RING (2 NOS) [PACK OF 1]	SPARE-EVALV-A0-WKIT
COUPLING SUB-ASSEMBLY KIT	EVALV A0-A1 ACTUATOR, SPARE TYPE : COUPLING SUB-ASSEMBLY KIT, SPARE CONSIST OF : UPPER COUPLING, LOWER COUPLING, LOCK NUT M10 (1 NO), ALLEN BOLT M6 (2 NOS), SPRING WASHER (2NOS) [PACK OF 1]	SPARE-EVALV-A0A1-CKIT

KIT NAME	DESCRIPTION	SPARE CODE
POSITIONER MOUNTING KIT	EVALV A0-A1 ACTUATOR, SPARE TYPE:POS. MOUNTING KIT,SPARE CONSIST OF:C-LINK, FEEDBACK LINK,L-BKT,A BOLT M5(2), MOUNTING BKT,PNEUMATIC-MALE CONNECTOR (1/4" X 8), MALE ELBOW (1/4" x 8)(3),TUBEING(0.5M),H BOLT M8(2) [PACK OF 1]	SPARE-EVALV-A0A1-PMKIT
STEM KIT	EVALV A0 ACTUATOR, SPARE TYPE : STEM KIT, SPARE CONSIST OF UPPER STEM NC, WDB SEAL (2 NOS) [PACK OF 1]	SPARE-EVALV-A0-NC-STKIT
	EVALV A0 ACTUATOR, SPARE TYPE : STEM KIT, SPARE CONSIST OFLOWER STEM NO, WDB SEAL (2 NOS) [PACK OF 1]	SPARE-EVALV-A0-NO-STKIT
SEAL KIT	EVALV A0 ACTUATOR, SPARE TYPE : SEAL KIT, SPARE CONSIST OF : STEM O RING (2 NOS), O RING(2 NOS), O RING,ID-29.74MM(2 NOS), WDB SEAL, GASKET(2 NOS) [PACK OF 1]	SPARE-EVALV-A0-SLKIT
HANDWHEEL KIT	EVALV A0 ACTUATOR, SPARE TYPE : HANDWHEEL KIT, SPARE CONSIST OF : GASKET, O-RING HOLDER (NC), SOC.HD.SCREW M5 (4 NOS), O RING, HANDWHEEL WELDING ASSEMBLY(WA), THRUST BEARING, PLAIN WASHER,OD-24MM, HANDWHEEL CAP [PACK OF 1]	SPARE-EVALV-A0-NC-HKIT
	EVALV A0 ACTUATOR, SPARE TYPE:HANDWHEEL KIT,SPARE CONSIST OF: COMPLETE HANDWHEEL ASSLY (NO)	SPARE-EVALV-A0-NO-HKIT
HARDWARE KIT	EVALV A0 ACTUATOR, SPARE TYPE : HARDWARE KIT, SPARE CONSIST OF :A0 ACTUATOR ALL HARDWARE ITEMS [PACK OF 1]	SPARE-EVALV-A0-HAKIT

A1 Actuator Spare Codes		
KIT NAME	**DESCRIPTION**	**SPARE CODE**
REPAIR KIT	EVALV A1 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NC WITH & WITHOUT HANDWHEEL,THREE SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A1-20NC3-RKIT
	EVALV A1 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NO WITH & WITHOUT HANDWHEEL, THREE SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A1-20NO3-RKIT
	EVALV A1 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NC WITH & WITHOUT HANDWHEEL, SIX SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A1-20NC6-RKIT
	EVALV A1 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NO WITH & WITHOUT HANDWHEEL, SIX SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A1-20NO6-RKIT
SPRING KIT	EVALV A1 ACTUATOR, SPARE TYPE : SPRING KIT, SPARE CONSIST OF : EXTERNAL SPRING (3 NO) [PACK OF 1]	SPARE-EVALV-A1-20NCNO3-SKIT
	EVALV A1 ACTUATOR, SPARE TYPE : SPRING KIT, SPARE CONSIST OF : EXTERNAL SPRING (3 NO), INTERNAL SPRING (3 NO) [PACK OF 1]	SPARE-EVALV-A1-20NCNO6-SKIT
DIAPHRAGM KIT	A1 ACTUATOR, SPARE TYPE : DIAPHRAGM KIT, SPARE CONSIST OF : DIAPHRAGM(NC&NO), STEM O RING (1 NO) [PACK OF 1]	SPARE-EVALV-A1-DKIT
WDB SEAL HOLDER ASSLY KIT	A1 ACTUATOR, SPARE TYPE : WDB SEAL HOLDER ASSLY KIT, SPARE CONSIST OF : WDB SEAL HOLDER(NC&NO)(2), WDB SEAL(2), DU BEARING & O RING (2 NOS) [PACK OF 1]	SPARE-EVALV-A1-WKIT
STEM KIT	EVALV A1 ACTUATOR, SPARE TYPE : STEM KIT, SPARE CONSIST OF UPPER STEM NC, STEM SEAL (2 NOS) [PACK OF 1]	SPARE-EVALV-A1-NC-STKIT
	EVALV A1 ACTUATOR, SPARE TYPE : STEM KIT, SPARE CONSIST OFLOWER STEM NO, STEM SEAL (2 NOS) [PACK OF 1]	SPARE-EVALV-A1-NO-STKIT

KIT NAME	DESCRIPTION	SPARE CODE
SEAL KIT	EVALV A0 ACTUATOR, SPARE TYPE : SEAL KIT, SPARE CONSIST OF : STEM O RING (2 NOS), O RING(2 NOS), O RING,ID-29.74MM(2 NOS), STEM SEAL, GASKET(2 NOS), LIP SEAL HOLDER [PACK OF 1]	SPARE-EVALV-A1-SLKIT
HANDWHEEL KIT	EVALV A1 ACTUATOR, SPARE TYPE:HANDWHEEL KIT,SPARE CONSIST OF: COMPLETE HANDWHEEL ASSLY (NC)	SPARE-EVALV-A1-NC-HKIT
	EVALV A1 ACTUATOR, SPARE TYPE:HANDWHEEL KIT,SPARE CONSIST OF: COMPLETE HANDWHEEL ASSLY (NO)	SPARE-EVALV-A1-NO-HKIT
HARDWARE KIT	EVALV A1 ACTUATOR, SPARE TYPE : HARDWARE KIT, SPARE CONSIST OF :A1 ACTUATOR ALL HARDWARE ITEMS [PACK OF 1]	SPARE-EVALV-A1-HAKIT

A2 Actuator Spare Codes		
KIT NAME	**DESCRIPTION**	**SPARE CODE**
REPAIR KIT	EVALV A2 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NC WITH & WITHOUT HANDWHEEL,SIX EXTERNAL SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A2-30NC6-RKIT
	EVALV A2 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NO WITH & WITHOUT HANDWHEEL, SIX EXTERNAL SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A2-30NO6-RKIT
	EVALV A2 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NC WITH & WITHOUT HANDWHEEL, SIX EXTERNAL & SIX INTERNAL SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A2-30NC12-RKIT
	EVALV A2 ACTUATOR, SPARE TYPE : REPAIR KIT, SPARE CONSIST OF : DIAPHRAGM ASSEMBLY NO WITH & WITHOUT HANDWHEEL, SIX EXTERNAL & SIX INTERNAL SPRINGS & WDB SEAL HOLDER ASEMBLY [PACK OF 1]	SPARE-EVALV-A2-30NO12-RKIT

KIT NAME	DESCRIPTION	SPARE CODE
SPRING KIT	EVALV A2 ACTUATOR, SPARE TYPE : SPRING KIT, SPARE CONSIST OF : EXTERNAL SPRING (6 NO) [PACK OF 1]	SPARE-EVALV-A2-30NCNO6-SKIT
	EVALV A2 ACTUATOR, SPARE TYPE : SPRING KIT, SPARE CONSIST OF : EXTERNAL SPRING (6 NO), INTERNAL SPRING (6 NO) [PACK OF 1]	SPARE-EVALV-A2-30NCNO12-SKIT
DIAPHRAGM KIT	EVALV A2 ACTUATOR, SPARE TYPE : DIAPHRAGM KIT, SPARE CONSIST OF : DIAPHRAGM(NC&NO), STEM O RING (1 NO) [PACK OF 1]	SPARE-EVALV-A2-DKIT
WDB SEAL HOLDER ASSLY KIT	EVALV A2 ACTUATOR, SPARE TYPE : WDB SEAL HOLDER ASSLY KIT, SPARE CONSIST OF : WDB SEAL HOLDER-1.5MM PITCH(NC)(2), WDB SEAL(2), DU BEARING & O RING (2 NOS) [PACK OF 1]	SPARE-EVALV-A2NC-WKIT
	EVALV A2 ACTUATOR, SPARE TYPE : WDB SEAL HOLDER ASSLY KIT, SPARE CONSIST OF : WDB SEAL HOLDER-2MM PITCH(NO)(2), WDB SEAL(2), DU BEARING & O RING (2 NOS) [PACK OF 1]	SPARE-EVALV-A2NO-WKIT
COUPLING SUB-ASSEMBLY KIT	EVALV A2 ACTUATOR, SPARE TYPE : COUPLING SUB-ASSEMBLY KIT, SPARE CONSIST OF : UPPER COUPLING, LOWER COUPLING, LOCK NUT M10 (2 NOS), ALLEN BOLT M6 (2 NOS) [PACK OF 1]	SPARE-EVALV-A2-CKIT
POSITIONER MOUNTING KIT	EVALV A2 ACTUATOR, SPARE TYPE:POS. MOUNTING KIT,SPARE CONSIST OF:C-LINK, FEEDBACK LINK,L-BKT,A BOLT M5(2), MOUNTING BKT,PNEUMATIC-MALE CONNECTOR (1/4" X 8), MALE ELBOW (1/4" x 8)(3),TUBEING(0.7M),H BOLT M8(2) [PACK OF 1]	SPARE-EVALV-A2-PMKIT
STEM KIT	EVALV A2 ACTUATOR, SPARE TYPE : STEM KIT, SPARE CONSIST OF UPPER STEM NC, STEM SEAL (2 NOS) [PACK OF 1]	SPARE-EVALV-A2-NC-STKIT
	EVALV A2 ACTUATOR, SPARE TYPE : STEM KIT, SPARE CONSIST OF LOWER STEM NO, STEM SEAL (2 NOS) [PACK OF 1]	SPARE-EVALV-A2-NO-STKIT

KIT NAME	DESCRIPTION	SPARE CODE
SEAL KIT	EVALV A2 ACTUATOR, SPARE TYPE : SEAL KIT, SPARE CONSIST OF : STEM O RING (2 NOS), O RING C/S 5MM(2 NOS), LIP SEAL HOLDER [PACK OF 1]	SPARE-EVALV-A2-SLKIT
HARDWARE KIT	EVALV A2 ACTUATOR, SPARE TYPE : HARDWARE KIT, SPARE CONSIST OF :A2 ACTUATOR ALL HARDWARE ITEMS [PACK OF 1]	SPARE-EVALV-A2-HAKIT

Electrical Connections Diagram :

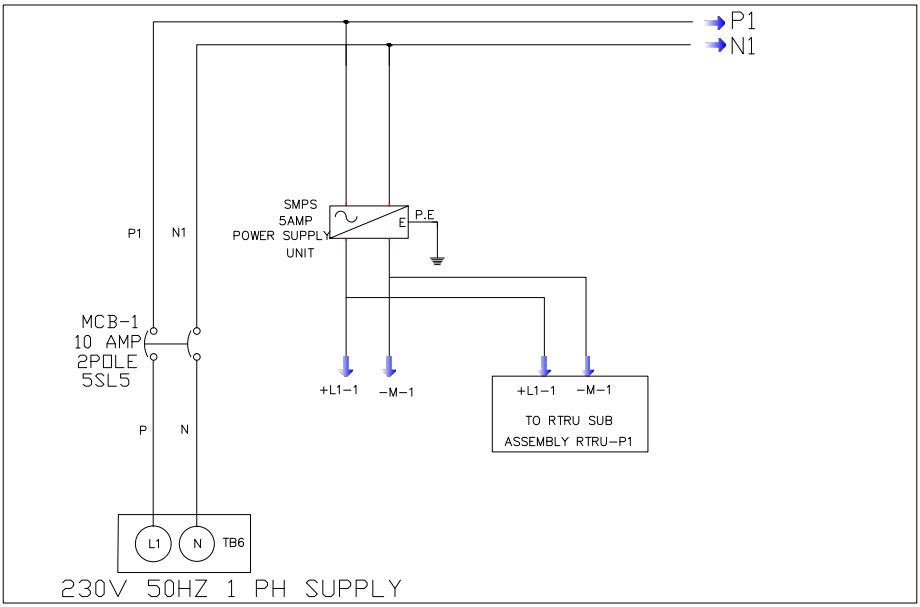


Fig.- a

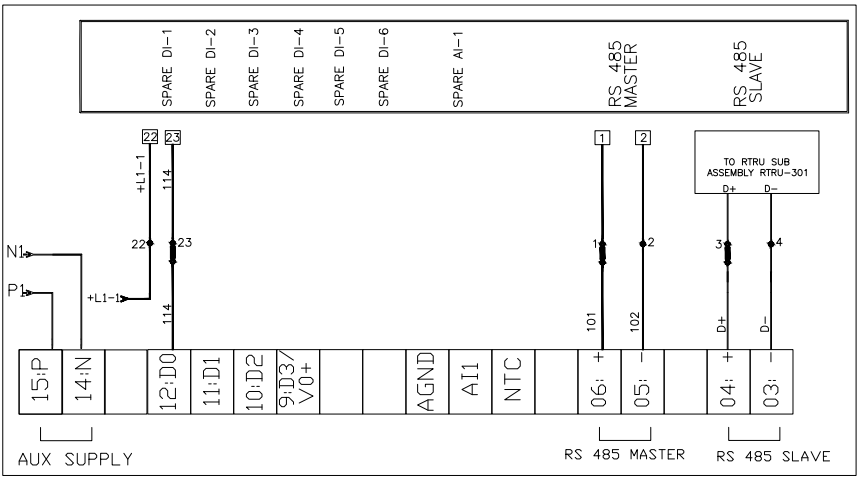

SPARE DI-1
SPARE DI-2
SPARE DI-3
SPARE DI-4
SPARE DI-5
SPARE DI-6
SPARE AI-1
RS 485 MASTER
RS 485 SLAVE
TO RTRU SUB ASSEMBLY RTRU-301
D+
D-
N1
P1
+L1-1
15:P
14:N
12:D0
11:D1
10:D2
9:D3/V0+
AGND
AI1
NTC
06: +
05: -
04: +
03: -
AUX SUPPLY
RS 485 MASTER
RS 485 SLAVE

Fig.- b

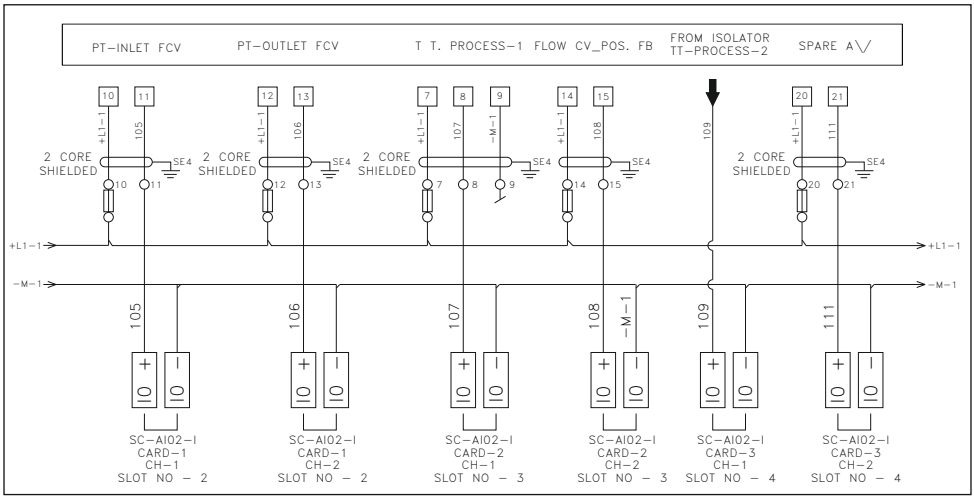

PT-INLET FCV
PT-OUTLET FCV
T T. PROCESS-1
FLOW CV_POS. FB
FROM ISOLATOR TT-PROCESS-2
SPARE A
2 CORE SHIELDED
+L1-1
-M-1
SC-AI02-I CARD-1 CH-1 SLOT NO - 2
SC-AI02-I CARD-1 CH-2 SLOT NO - 2
SC-AI02-I CARD-2 CH-1 SLOT NO - 3
SC-AI02-I CARD-2 CH-2 SLOT NO - 3
SC-AI02-I CARD-3 CH-1 SLOT NO - 4
SC-AI02-I CARD-3 CH-2 SLOT NO - 4

Fig.- c

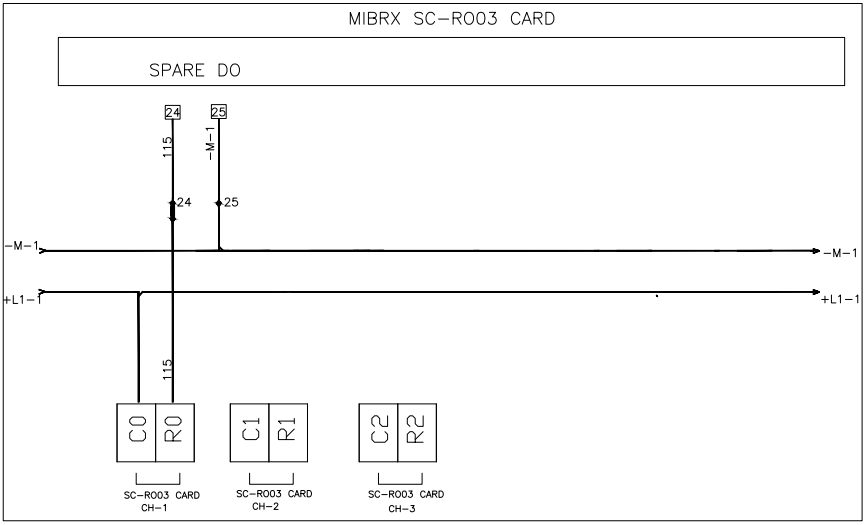

MIBRX SC-RO03 CARD
SPARE DO
24
25
115
-M-1
-M-1
+L1-1
C0
R0
C1
R1
C2
R2
SC-RO03 CARD CH-1
SC-RO03 CARD CH-2
SC-RO03 CARD CH-3

Fig.- d

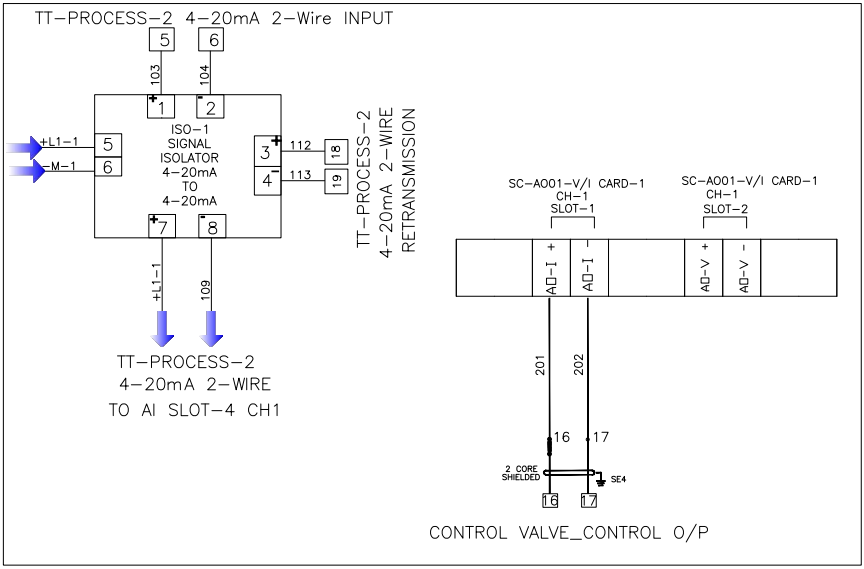

TT-PROCESS-2 4-20mA 2-Wire INPUT
ISO-1 SIGNAL ISOLATOR 4-20mA TO 4-20mA
TT-PROCESS-2 4-20mA 2-WIRE RETRANSMISSION
TT-PROCESS-2 4-20mA 2-WIRE TO AI SLOT-4 CH1
SC-AO01-V/I CARD-1 CH-1 SLOT-1
SC-AO01-V/I CARD-1 CH-1 SLOT-2
AO-I +
AO-I -
AO-V +
AO-V -
2 CORE SHIELDED
SE4
CONTROL VALVE_CONTROL O/P

Fig.- e

Control Panel Components :

SR NO	DESCRIPTION	QTY	MAKE
1	CONTROL PANEL 300 W X 450 H X 260 D WALL MOUNTING RAL 5010 HIGH GLOSS POWDER COATING	1	RITTAL
2	MCB 4 AMP DP	1	SIEMENS
3	**ISOLATER 1 I/P & 2 O/P 4-20 MA 2 WIRE**	**1**	**PRECISION**
4	POWER SUPPLY 24 VDC/ 5 AMP DIN RAIL	1	MEANWELL
5	2 POLE 2 WAY SWITCH WITHOUT OFF	1	SALZER
6	PVC CHANNEL 25 X 60	3	TRINITY/PHONIX
7	DIN RAIL	1	TRINITY
8	TERMINALS KUT 6 RED/ BLACK	2	ELMEX
9	TERMINALS KUT 6 YELLOW/ GREEN	1	ELMEX
10	TERMINALS KUT2.5 YELLOW/BLUE	6	ELMEX
11	SHORT LINKS	1	ELMEX
12	FUSE TERMINALS WITH LED 24 V DC	20	ELMEX
13	TERMINALS 2.5 SQMM	20	ELMEX
14	END CALMP	15	CONNECTWELL
15	MARKER	3	ELMEX
16	GLASS FUSE 100 MA	0	RELIANCE
17	GLASS FUSE 500 MA	20	RELIANCE
18	CABLE 0.5 SQMM GREY YELLOW BLUE GREEN	1	FINOLEX
19	CABLE1.5 SQMM RED/BLAK/YELLOW/BLUE	0.1	FINOLEX
20	PRINTED FERRULES SET	1	LOCAL
21	LUGS REQURIED	1	REPUTED
22	PVC GLAND PG 16	2	JIGO
23	PVC GLAND PG 11	8	JIGO
24	EARTHING BUSBAR	1	CONNECTWELL
25	ENGRAVING LABELS 60 MM 20MM 80 MM 45 MM PLATE ENGRAVING	1	SET
a	PLC (MiBRX-96-1-1-230V)	1	MiBRX
b	Integrated HMI (MiBRX-DSP-96-8-4-16-B	1	MiBRX
c	MIBRX-SC-AIO2-I:	3	MiBRX
d	MIBRX-SC-AO2-V/I :	1	MiBRX
e	MiBRX-SC-RO03	1	MiBRX

Product Codification

Parameter	Code		Example
SIZE (NB)	15NB	015	015
	20NB	020	
	25NB	025	
	40NB	040	
	50NB	050	
	65NB	065	
	80NB	080	
	100NB	100	
MODEL NAME	QualSteam	QSV	QSV
CONNECTION DETAILS	FLANGED #150	Q	Q
TRIM TYPE	NON BALANCED	1	1
VALVE CHARACTERISTICS	EQUAL PERCENT (FTO)	E	E
Kv(SEAT DIA) _STROKE	1.6(9.5)_16	A	C
	3(12)_16	B	
	5 (15.5)_16	C	
	6.3 (18.5)_16	D	
	10.5 (23)_16	E	
	26 (37)_20	F	
	36 (45.5)_20	G	
	26(37)_30	H	
	36(45.5)_30	I	
	63 (52)_30	J	
	102 (76)_30	K	
	160 (96)_30	L	
BONNET DESIGN	STD (A 216 Gr. WCB)	S	S
BODY	A395 SG IRON	4	4
TRIM MOC	SS431 (Nitrided)	1	1

Parameter	Code		Example
SEATING	METAL TO METAL	M	M
	SOFT SEAT (only for 15NB to 100NB)	S	
APPROVAL	IBR	I	I
	NIBR	N	

How to Order:

Example : 015QSV-Q1ECS41MI

015QSV-Q1ECS41MI-S1CE7IP

FM QUALSTEAM, TEMP. CTRL.VLV AT OPTIMUM PR. WITH STEAM FLOW INDICATION, INDICATION,15NB,QSV,FLGD CL150,NON BAL,EQP(FTO),5 (15.5)_16,STD,A395 SG IRON (#150),SS431,MTM,IBR,A0-NC-1 SPRING,WO HW,EPOZ,110-230V AC 50/60HZ,WITH-IJ,WITH (PT+CPT+PSVAL)

How to Order Spares:

Always order spares giving description and P.C. No. given in 'User Manual' under the heading "Available spares".

12. Warranty Period:

As per the ordering information and agreement in the contract

Notes

Notes

Notes

FORBES MARSHALL

Forbes Marshall Pvt Ltd

Manufacturing: B-85, Phase II Chakan Indl Area, Sawardari, Chakan
Tal. Khed, Dist, Pune 410 501. Tel: +91(0)2135 393400

Sales: Opp 106th Milestone, Bombay Pune Road, Kasarwadi,
Pune 411034 Tel.: +91 (0)20 39858555

CIN No: U28996PN1985PTC037806

Email : seg@forbesmarshall.com www.forbesmarshall.com