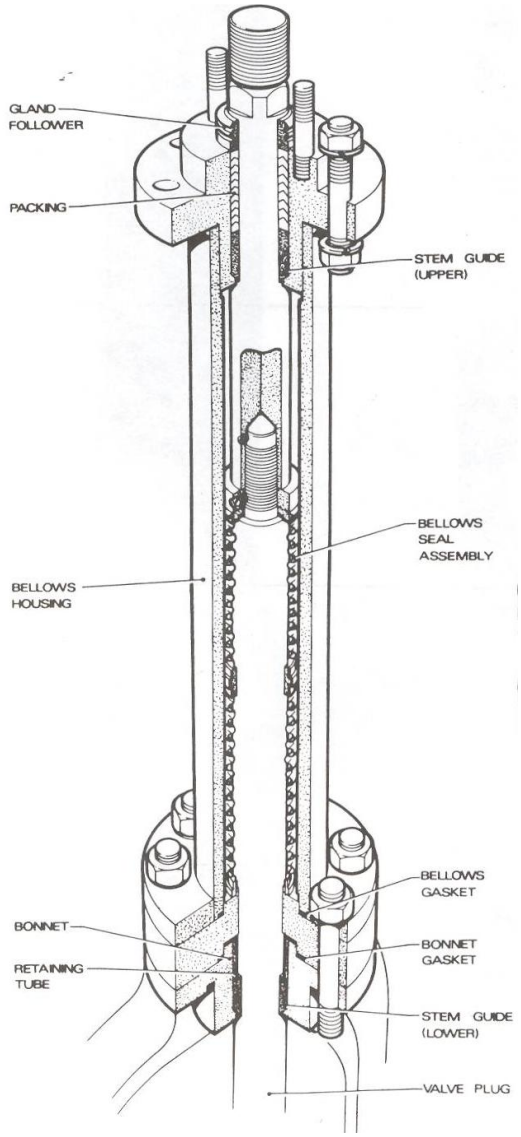
PHASE 1 INSTRUMENTS

Project Write-up

Name:……Group……

Module Title: Final Control Devices Module No: I-9

Project Description: Bellows Seal Control Valves Project No: V1
Objective Nos: 1, 2d, 3, 4, 5, 7, 8, 9,11



PROJECT WRITE UP SHEET

Principle/Theory of Operation

What do the bellows act like?

What is the only method of process to escape from the bellows seal?

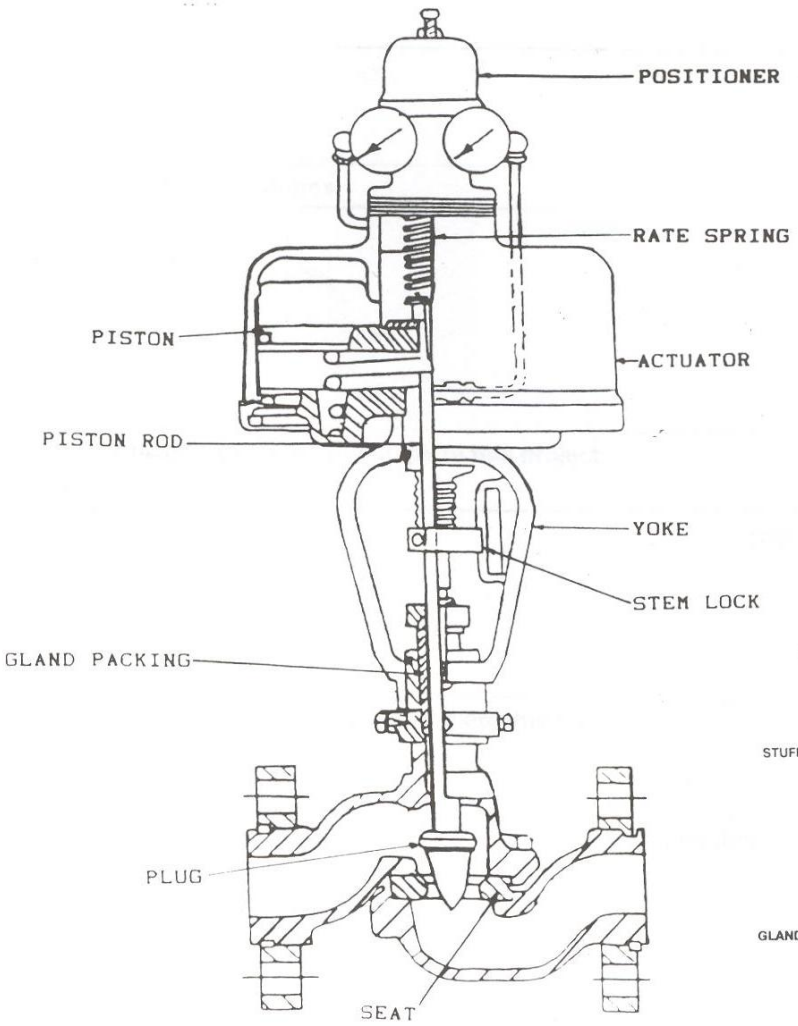
How may a secondary seal to the bellows seal be created?

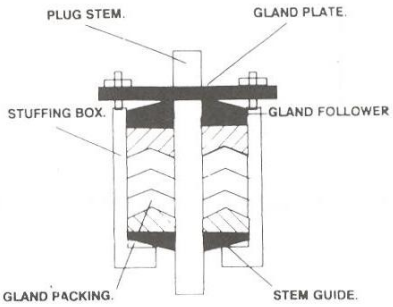
PROJECT WRITE UP

Module I-9 Control Valves

Name:……..

Module Title: Final Control Devices
Project Description: Gland Seal Control Valves
Objective Nos: 1, 2d, 3, 4, 5, 6, 7, 8, 9, 11
Project No: V2





PROJECT WRITE UP SHEET

Principle/Theory of Operation

What is the most commonly used sealing medium on a gland seal?

What is the deep recess around the inside of the top of the valve body called that holds the packing?

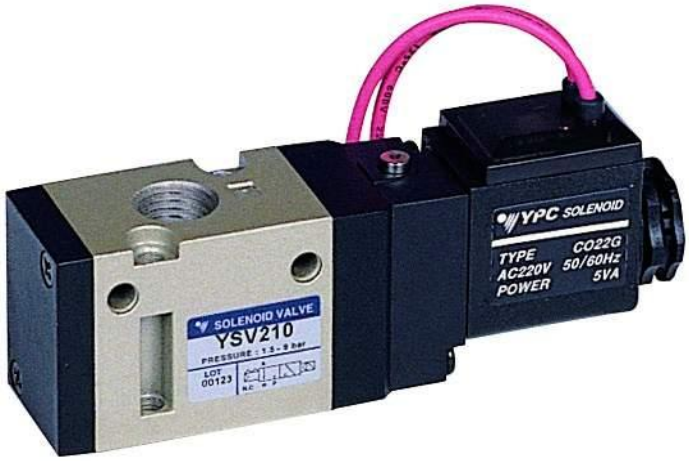
How much pressure can the force of the compression seal be up to?

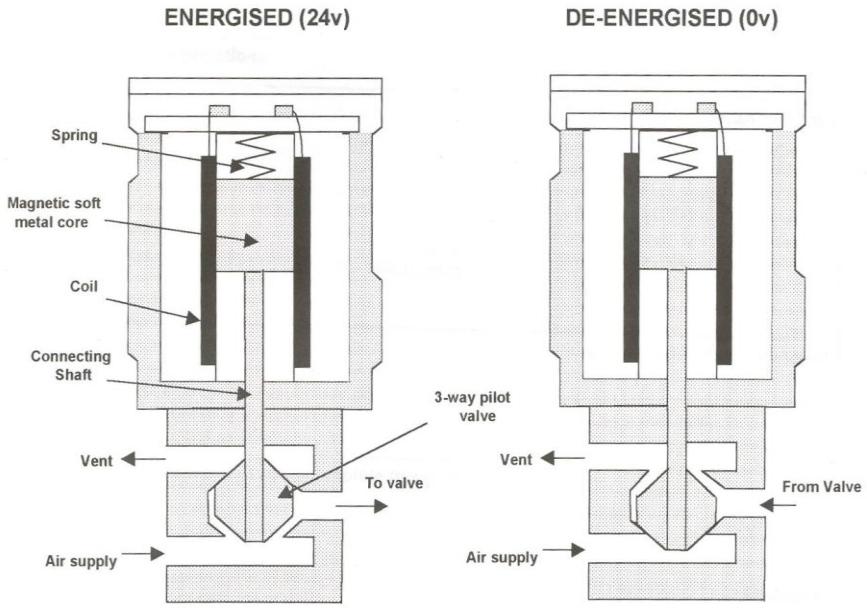
PROJECT WRITE UP

Module I-9 Control Valves

Name:……..

Module Title: Final Control Devices
Project Description: Solenoid Valves
Objective Nos: 8, 12, 13
Project No: V3





PROJECT WRITE UP SHEET

Principle/Theory of Operation

How many ports could a solenoid valve have?

What does the term port mean?

How can the operation of a solenoid valve be detected?

What can solenoid valves exhibit?

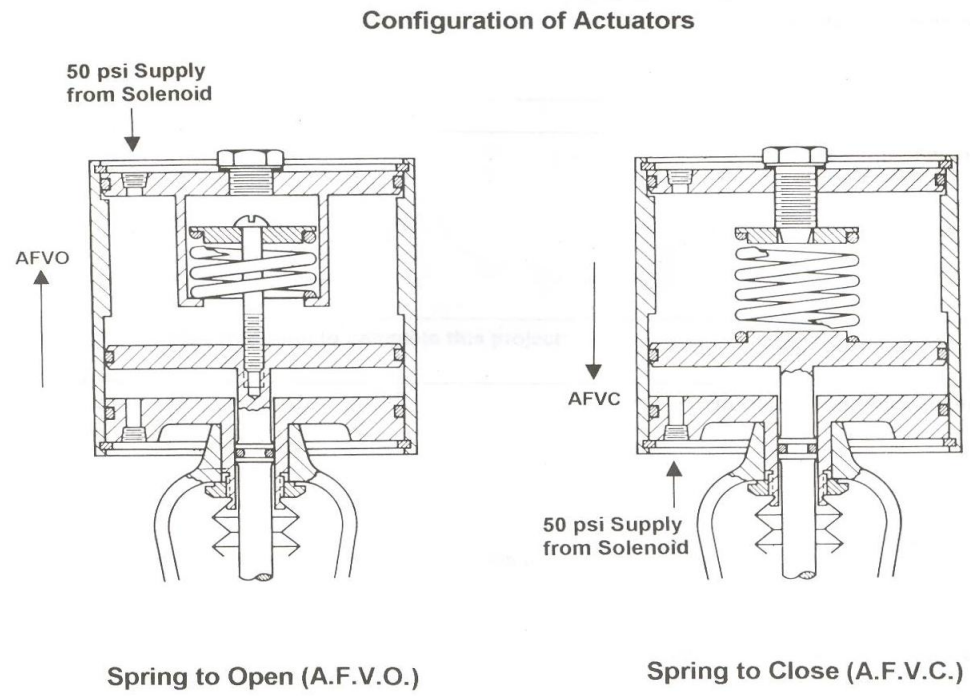
What is the most common fault?

PROJECT WRITE UP

Module I-9 Control Valves

Name:……..

Module Title: Final Control Devices
Project Description: ShutdownValves
Objective Nos: 14
Project No: V4



PROJECT WRITE UP SHEET

Principle/Theory of Operation

What does the term split range mean?

Where could this type of techniques be useful and why?

SUPPLEMENTARY QUESTIONS

Module I-9 Control Valves

The successful completion of these questions provides the additional competencies required for Module I-9

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1. Draw a simple block diagram which shows how a control valve fits into a control loop.

2. What is the purpose of a control valve?

3. Draw and label a simple diagram which shows the four main parts of a control valve Supplement your drawing by briefly explaining the operation/function of each of the four component parts.

4. Name the two standard air connections to a control valve and state what pressure is applied to each.

5. What do the terms ‘Direct’ and ‘Reverse’ acting mean?

6. What is the purpose of air fail action?

7. Name two common modes of air fail action and show, with the aid of simple diagrams, a practical example of each using the correct engineering symbols.

8. Name four types of valve and, in each case, give an example of where these may be typically used.

   a) Ball Valve

   b) Butterfly

   c) Globe

   d) Needle

9. The TRIM SET is another name for the …….. and ……..in a valve

10. Name 3 types of plug profiles and draw and label a graph which shows the flow characteristics of each.

11. The size of a control valve is not only denoted by its ……size but also by what is known as the ……or ……..

    The ……..of the valve is denoted as:

    The number of ……..…….per minute of water, that the valve will allow through with a pressure drop of ……across it.

12. Valves can be either…… or ……..sealed.

    …… ….seals provide complete containment of the process and, for safety purposes, are best suited for extremely ……..substances, including pure oxygen, and for high ……..or high ……applications.

13. The method of checking the operation of a valve is known as……..
    .
    This involves applying a ……input and checking the …….. of the valve from fully ……..to ……..
    With the valve in its ……..position, the air supply is now removed and the valve either fully ……..or …… depending upon its air fail action.

14. Describe briefly how the air fail action may be changed in:

    a) the positioner……

    b) The actuator…….

15. A solenoid valve is an ……..activated ……..switch which is commonly used to operate ……valves on emergency trip systems.

    As the coil in the solenoid ……supply air is removed from the trip valve, which then trips either fully ……or……, depending upon its ……action.

16. In terms of operation, what is the fundamental difference between a control valve and a shutdown valve?

17. The type of valve best suited for shutdown duty would be a……

18. Other than obtaining a Permit to Work and ensuring that the process line has been drained and isolated, what other steps would you take prior to removing a control valve?

19. Draw a simple line diagram showing a system which would enable you to maintain/remove a control valve without having to shut down the process:

What is the main safety consideration when stripping down a shutdown valve for overhaul?

CONTROL VALVE/PROCESS CONTROL PROJECT
Module I-9 Control Valves
Project No: 5

Carefully read all instructions before commencing project

All equipment should be checked and calibrated before installation.

Your working design/drawing should be clearly labeled and show all pneumatic and electrical connections/including polarities).

Aim

To re-enforce areas already covered during Phase 1 Instruments, you are now required to design and build a simulated flow/indicator alarm loop (FIA) and at ½ max flow the system must be shutdown on a low flow (control valve to close on air failure).
Your loop must incorporate the following equipment:

a. Foxboro 13A Pneumatic Transmitter (Input Range See T.O. Output 0.2 – 1.0 bar). The pressure input will simulate the pressure drop produced by the flow across the venture/orifice plate.

b. Pressure Switch connected to the output of the D/P cell (to be set at half maximum flow rate to isolate a 24volt supply to the solenoid valve).

c. A solenoid valve to switch the 50 psi supply to the control valve.

d. A control valve whose signal is supplied from the I/P convertor

e. Pressure to Current Transducer (P/I)

f. A mA indicator showing the output of the P/I

g. Current to Pressure Transducer (I/P)

The system should be arranged so that the O/P of the Tx feeds the P/I, the mA meter and then the I/P.

The signal from the transmitter is used to switch the pressure switch which in turn switches the supply to the solenoid valve.

Note – The solenoid valve is not connected into the mA signal loop.

WORKING IN TEAMS

Produce a line/wiring diagram including all interconnections
Calibrate all instrumentation and build the loop

EQUIPMENT

Foxboro13A transmitter
3 port solenoid valve
1” Glocon control valve
I/P transducer
P/I transducer
Multimeter
Pressure switch
Solenoid Valve
Glocon control valve

Reference to the flow carousel might be helpful in this exercise.