DIESEL MECHANIC

MINING QUALIFICATIONS AUTHORITY

CODE: PN - 9

CONSTRUCT AND SET A CIRCUIT WITH A TIME DELAY VALVE

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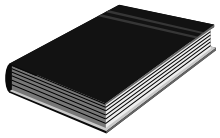
TRG 9

INDEX

The following elements are contained in this learning guide:

SOURCE REFERENCES



Demonstration by a competent person, e.g. a Training Officer.

FESTO – Pneumatics Basic Level Textbook

OBJECTIVE

You will be learning towards the outcome “Construct and set a circuit with a time delay valve”. Whilst learning towards the outcome you will be required to achieve the following:

- Know the components which make up a time delay valve.
- Know what causes the time delay switching inside the time delay valve.
- Construct a circuit and set the time delay valve to hold the piston in the extended position for 5 seconds before it starts to retract.

On completion of this module, the learner must be able to:

- State the components which make up a time delay valve.
- State what causes the time delay switching inside the time delay valve.
- Construct a circuit and set the time delay valve to hold the piston in the extended position for 5 seconds ±1 second before it starts to retract.

During this process you must adhere to certain specified requirements as listed in the Module.

ASSESSMENT AND EVALUATION CRITERIA

You will be assessed, when you are confident that you may achieve the outcomes as listed, to determine your competence as measured against the required criteria. This assessment will be in line with accepted best practices regarding assessment.

- Theoretical and practical assessments will be set during the module and must be completed without using reference.
- The learner will be required to answer all the questions without any reference.

HAZARD IDENTIFICATION AND CONTROL (HIAC) FORM

PN - 9

CONSTRUCT AND SET A CIRCUIT WITH A TIME DELAY VALVE

STEPS IN OPERATION / PROCESS	POTENTIAL ACCIDENT / INCIDENT	CONTROLS (BY RESPONSIBLE PERSON)
1. Construct a pneumatic circuit.	• Improper or careless handling of pneumatic components and pipes can lead to damage of equipment.	• Always handle components and pipes correctly, and with great care. • Wipe components and panel clean after use and store components.
2. Use of compressed air in a pressurised circuit.	• Circuit under pressure.	• Ensure circuit is depressurised before removing components or pipes
3. Insure work area is safe.	• Dirt particles in eyes and laceration of skin.	• Wear correct PPE.

NOTE: Before doing the practical work contained in this module, the learner must study the content of the above HIAC form again and then sign the statement below.

The above risks, which will be encountered in this module, are fully understood and will be controlled during the practical work.

Signature of learner: _____

Signature of Training Officer: _____

Date: _____

1. TIME DELAY VALVE

ITEM / TASK: Introduction.

DESCRIPTION:

A. In certain circuits a timer is required to delay the return action of the cylinder for a certain time or to delay the transmission of a signal to an impulse valve.
B. Components of different control groups can be combined into the body of one unit with the features, characteristics and construction of a combination of valves. These are referred to as combinational valves and their symbols represent the various components that make up the combined unit.
C. An example is the time delay valve which is the combination of a one-way flow control valve, a reservoir and a 3/2-way directional control valve.
D. Depending on the setting of the throttling screw, a greater or lesser amount of air flows per unit of time into the air reservoir. When the necessary control pressure has built up, the valve switches to through flow. This switching position is maintained for as long as the control signal is applied.

ITEM / TASK: Components of a time delay valve.

DESCRIPTION:

A. The time delay valve is a combined 3/2-way valve, one way flow control valve and air reservoir. The 3/2-way valve can be a valve with either ***normal open position or normally closed*** position. The delay time is generally 0-30 seconds for both types of valves.
B. Although the time delay valve is a unit indicated by the dot - dash line, it consists of three different units namely:
    - a flow control valve
    - a 3/2-way valve
    - a capacitor (vessel in which compressed air can be accumulated and stored)
C. By using additional reservoirs, the time can be extended. An accurate switch-over time is assured, if the air is clean and the pressure relatively constant.

D. The time delay valve consist of the following components: (Fig 1)

a. Housing with capacitor chamber
b. Flow control valve with a throttling screw
c. Control spool
d. Valve disc
e. Spring
f. Capacitor chamber (accumulator)

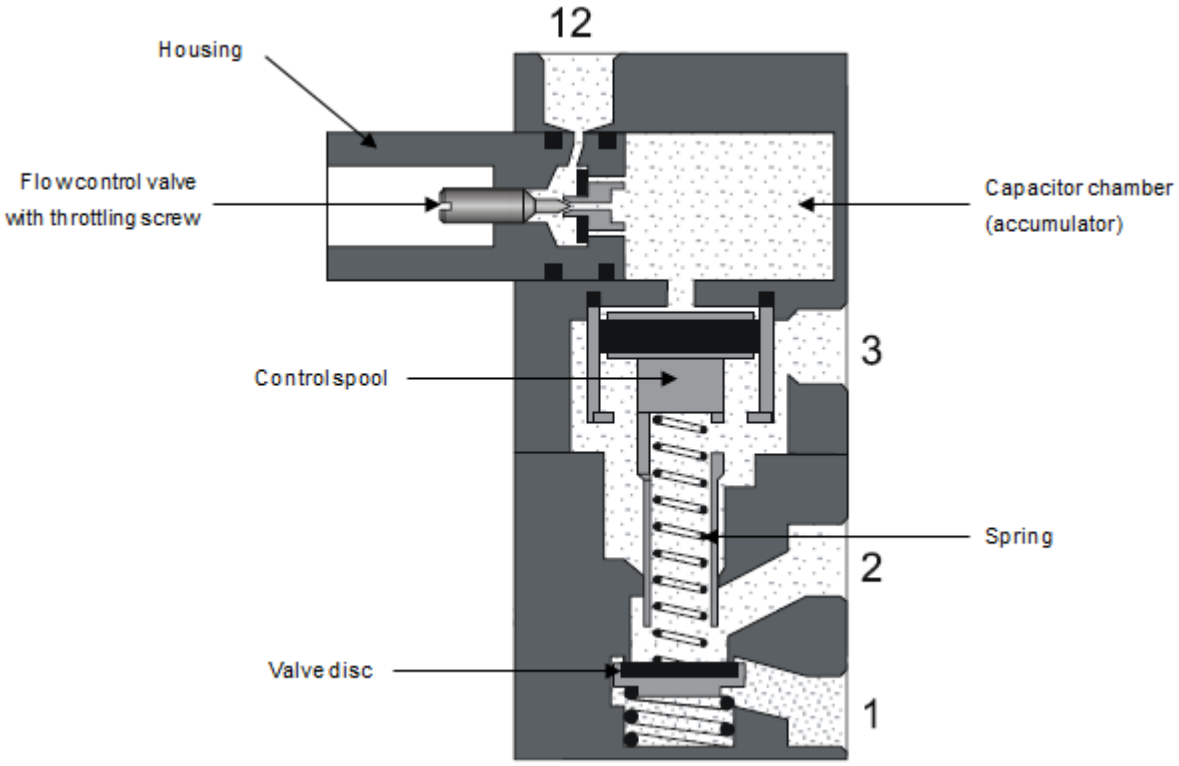


FIG 1.

E. The symbol for a time delay valve (normally closed) is shown in Fig 2.

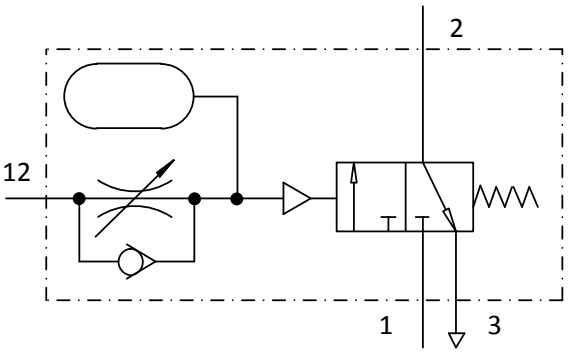


FIG 2.

F. The symbol for a time delay valve (normally open) is shown in Fig 3.

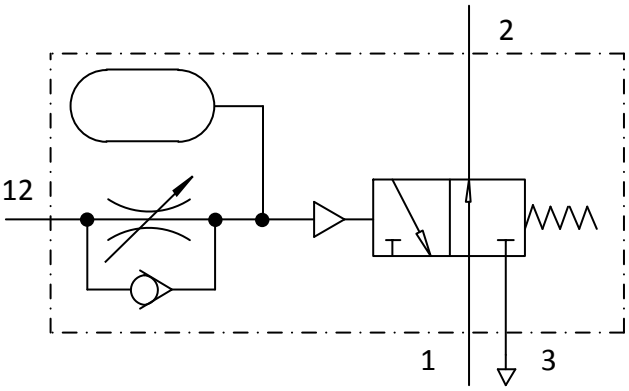


FIG 3.

ITEM / TASK: Function of a time delay valve.

DESCRIPTION:

A. The time delay valve is actuated by a pneumatic signal after a preset time delay has elapsed. It is returned to the normal position via return spring when the signal is terminated. The time delay is infinitely adjustable by means of a regulating screw.
B. Time delay valve is used to delay the output signal.

ITEM / TASK: Operation of a time delay valve.

DESCRIPTION:

A. The following operational principle applies for a time delay valve with a 3/2-way valve in normally closed position: (Fig 4)
    - The compressed air is supplied to the valve at connection port 1 (P). The control air flows into the valve at port 10 (Z) through a one-way flow control valve and depending on the setting of the throttling screw, a greater or lesser amount of air flows per unit of time into the air reservoir. When the necessary control pressure has built up in the air reservoir, the pilot spool of the 3/2-way valve is moved downwards. This blocks the passage from port 2 (A) to port 3 (R). The valve disc is lifted from its seat and thus air can flow from port 1 (P) to port 2 (A). The time required for pressure to build up in the air reservoir is equal to the control time delay of the valve.

- If the time delay valve is to switch to its initial position, the pilot line (port 10 / Z) must be exhausted. The air flows from the air reservoir to atmosphere through the bypass of the one-way flow control valve and then to the exhaust line. The valve spring returns the pilot spool and the valve disc seat to their initial positions. Working line (port 2 / A) exhausts to port 3 (R) and port 1 (A) is blocked.

B. The normally open time delay valve includes a 3/2-way valve which is open. Initially the output port 2 (A) is active. When the valve is switched by a signal at port 10 (Z), the output port 2 (A) is exhausted to port 3 (R) and port 1 (P) is closed. The result is that the output signal is turned off after a set time delay. The time delay corresponds to the pressure build up in the reservoir again. If the air at port 10 (Z) is removed, then the 3/2-way valve assumes the normal position. (Fig 5)

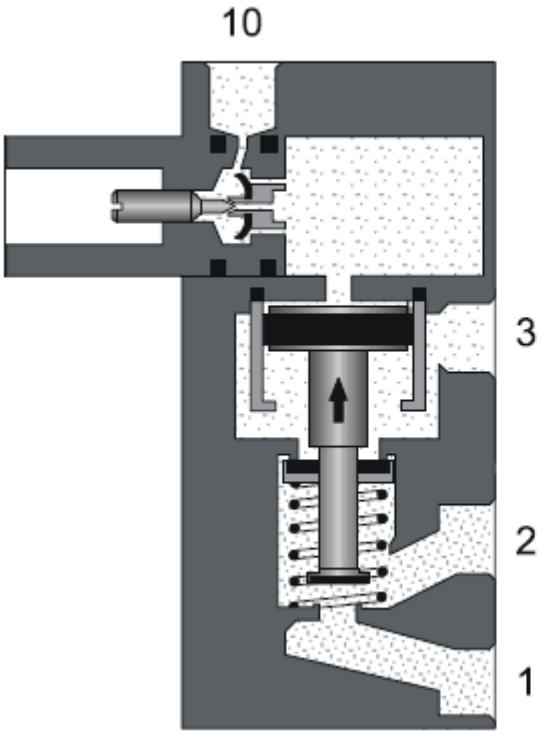


FIG 4.

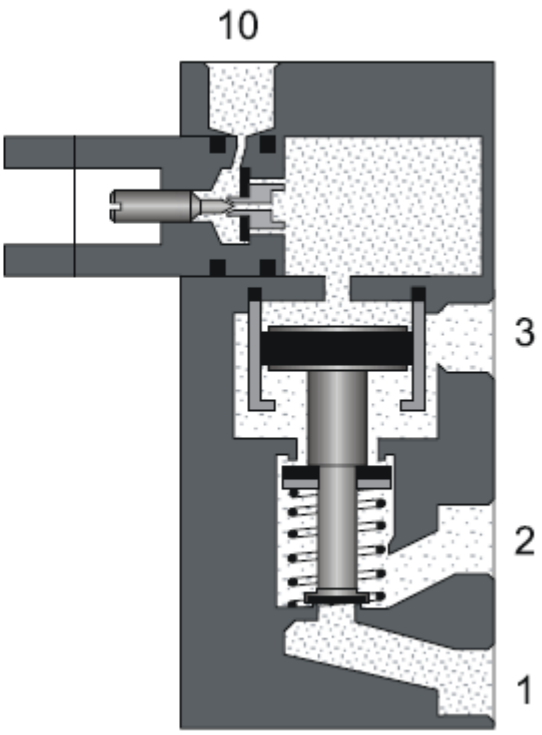


FIG 5.

DO THE SELF TEST AND PRACTICE ON THE NEXT PAGES BEFORE ATTEMPTING THE ASSESSMENT.

SELF TEST 1

1. What causes the time delay switching inside the time delay valve?

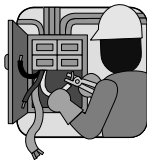
2. What devices make up a time delay valve?

3. What is the function of a time delay valve?

Refer to your notes to check your answers.

Ask your Training Officer to check your work and if it is correct, to sign below.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

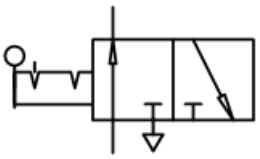


PRACTICE

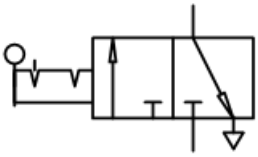
1. Practice drawing the symbol for a time delay valve.

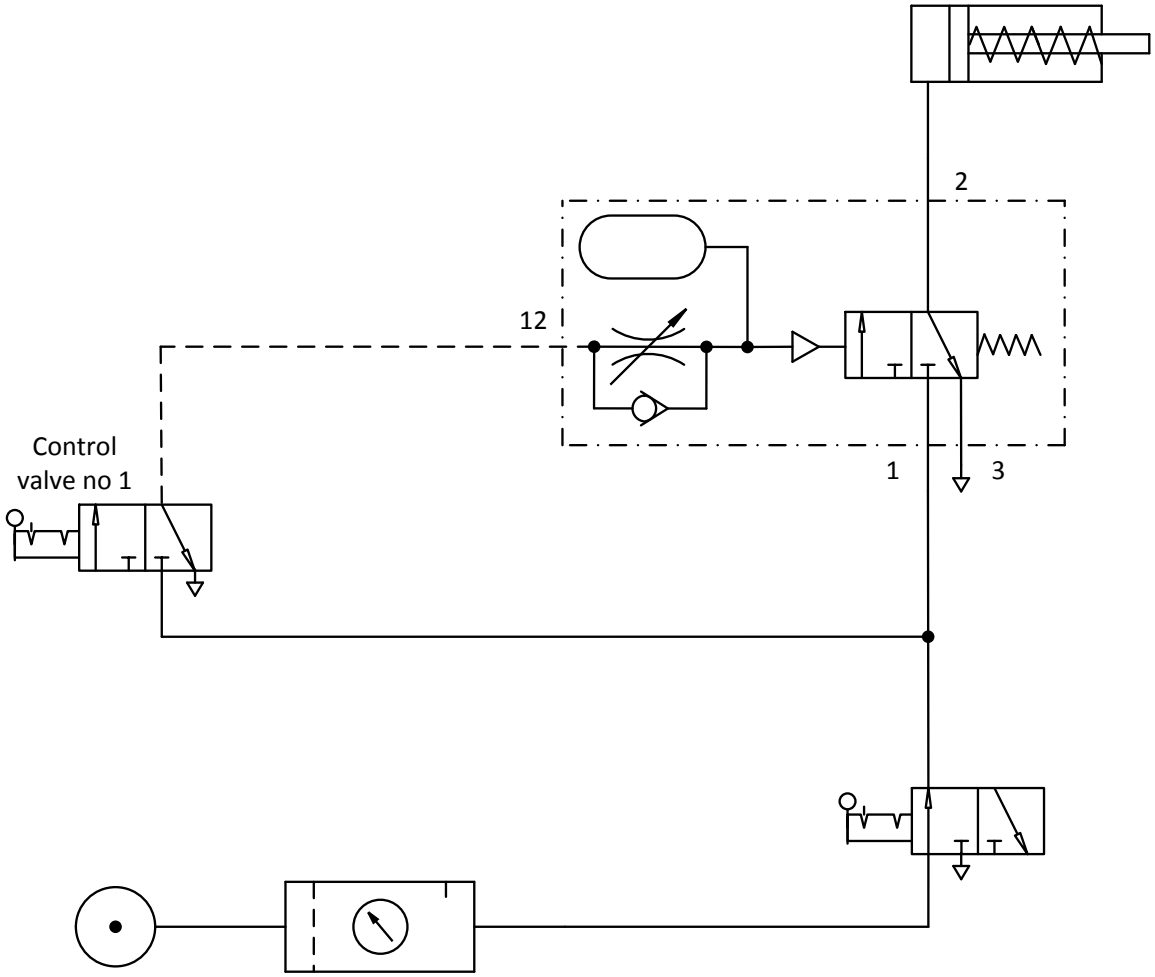
2. Identify the time delay valve from the training panel / equipment.
3. Construct the circuit on the training panel.
   - Adjust the time delay valve for various time delays before the piston of the single acting cylinder starts to move.
4. Indicate the flow of air when :
   - The control valve no 1 is in the operated position and the 3/2 way valve in the time delay valve is in the stationary position.
   - The control valve no 1 is in the operated position and the 3/2 way valve in the time delay valve is in the operated position.
   - The control valve no 1 is in the stationary position and the 3/2 way valve in the time delay valve is in the stationary position.

Operated position – "a"



Stationary position – "b"





Ask your Training Officer to check your work and if it is correct, to sign below.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

REMEMBER ALWAYS WORK SAFE

Once you have passed the entire practices, you are now at liberty to request a Formative Assessment from your Assessor.