PUMP CONTROL VALVE

WW-740-03-S – Control Logic

General:
This document describes the operation and control logic of BERMAD WW-740-03-S and provides the parameters (commands, inputs, timers, etc.) required for best integration with the pumping station's control system, allowing extra protection, efficiency, management capabilities and ease of operation.

Attention:
This document and the information enclosed within it contain restricted and/or privileged information that is intended only for usage by the customer's qualified engineers, electricians or programmers and should serve only as guidelines for implementing proper control for the WW-740-03-S Pump Control Valve.
Accordingly, only qualified and trained personnel shall take any action in reliance on this document, including installation, connection, operation and maintenance of WW-740-03-S Pump Control Valve, and must do so in full compliance with all applicable regulations, standards and safety instructions related to this type of work.
The customer bears full responsibility for implementing all necessary safety precautions to protect the pump and its users from any damage, including, but not limited to, overload, low flow, over heating, phase failure and any other protection device required.
The WW-740-03-S Pump Control Valve should be properly sized, selected, installed and operated.

Valve's application:
The WW-740-03-S is a double chambered, diaphragm actuated, hydraulically operated Active Check Pump Control Valve that opens or shuts off in response to electric signals. The valve isolates the system from the pump during pump starting and stopping, there by preventing pipeline surges. In case of power failure, it immediately closes as a spring-loaded non-return valve.
For further understanding of the application and the operation it is recommended to refer to WWW.BERMAD.COM for general information and training on hydraulic control valves, as well as product page, IOM and videos for the specific type and size of the WW-740-03-S.

Main relevant accessories:
- Solenoid valve which in response to an electric command, either directs pressure into the control chamber of the WW-740-03-S to close it, or vents the pressure to open it.
- Limit Switch Assembly which provides VALVE CLOSED feedback when the roller is pressed down by the cam on the indicator rod. The feedback will be disconnected when the cam rises from the roller.

Modes of operation:
- Normally Closed (N.C.): The WW-740-03-S is hydraulically closed when the solenoid is deactivated (not energized).
- Normally Open (N.O.): The WW-740-03-S is hydraulically open when the solenoid is deactivated (not energized).

Notes: - Refer to illustrations at end of this document.
- One WW-740-03-S Pump Control Valve for one pump.

Control Sequence & Logic – Normally Closed (N.C.):

- Prior to Pump Motor Start:
  - The valve is hydraulically closed.
    - VALVE CLOSED input from contacts of the valve's Limit Switch.
  - Some operators may consider an alarm if VALVE CLOSED is not available prior to commencing with START.

- START:
  - START command is issued by one of the following means:
    - An automatic command.
    - A manual command by an approved operator.
  - The START command simultaneously triggers the following actions:
    - Initiation of Pump Motor Start procedure.
    - Activation of solenoid on the valve.
    - Start of Opening Time timer (TO1).
  - The WW-740-03-S opens relative to pressure and demand.
    (Opening speed can be controlled by a needle valve on the control pressure discharge)
  - Opening Time timer (TO1) is stopped when VALVE CLOSED input disconnects as the cam on the indicator rod rises from the Limit Switch's roller.
  - If VALVE CLOSED input does not disconnect within the time set for TO1, then:
    - Trigger VALVE CLOSED Alarm.
    - Initiate Pump Motor Stop procedure.

- RUN:
  - Pump is running as per station plan/control.
  - If the VALVE CLOSED input is triggered for a duration longer than the value set for Delay Time timer (TD1), then:
    - Trigger VALVE CLOSED Alarm.
    - Initiate Pump Motor Stop procedure.
    - Deactivate the solenoid on the valve.
      An override may be considered (see Delay Time (TD1) timer – "Recommended timers" below).

- STOP:
  - STOP command is issued by one of the following means:
    - An automatic command.
    - A manual command by an approved operator
  - The STOP command simultaneously triggers the following actions:
    - Deactivation of solenoid on the valve.
    - Start of Closing Time timer (TC1).
  - The WW-740-03-S closes.
    (Closing speed can be controlled by a needle valve on the control pressure inlet)
  - Delay Time timer (TD1) is started when VALVE CLOSED input is triggered as the cam on the indicator rod pushes down on the Limit Switch's roller.
  - The Pump Motor Stop procedure is initiated when the Delay Time timer (TD1) reaches its set value.
  - Closing Time timer (TC1) reaches its set value.
  - If VALVE CLOSED input is not triggered within the time set for Closing Time timer (TC1), then:
    - Trigger VALVE OPEN Alarm.
    - Initiate Pump Motor Stop procedure.

Control Sequence & Logic – Normally Open (N.O.):

- Prior to Pump Motor Start:
  - The valve is hydraulically closed, but ready to open, as the solenoid valve is connecting the control chamber to the atmosphere.
    - VALVE CLOSED input from contacts of the valve's Limit Switch.
  - Some operators may consider an alarm if VALVE CLOSED is not available prior to commencing with START.

- START:
  - START command is issued by one of the following means:
    - An automatic command.
    - A manual command by an approved operator.
  - The START command simultaneously triggers the following actions:
    - Initiation of Pump Motor Start procedure.
    - Solenoid remains deactivated (no action).
    - Start of Opening Time timer (TO1).
  - The WW-740-03-S opens relative to pressure and demand.
    (Opening speed can be controlled by a needle valve on the control pressure discharge)
  - Opening Time timer (TO1) is stopped when VALVE CLOSED input disconnects as the cam on the indicator rod rises from the Limit Switch's roller.
  - If VALVE CLOSED input does not disconnect within the time set for TO1, then:
    - Trigger VALVE CLOSED Alarm.
    - Initiate Pump Motor Stop procedure.

- RUN:
  - Pump is running as per station plan/control.
  - If the VALVE CLOSED input is triggered for a duration longer than the time set for Delay Time timer (TD1), then:
    - Trigger VALVE CLOSED Alarm.
    - Initiate Pump Motor Stop procedure.
    - Activate the solenoid on the valve.
      An override may be considered (see Delay Time (TD1) timer – "Recommended timers" below).

- STOP:
  - STOP command is issued by one of the following means:
    - An automatic command.
    - A manual command by an approved operator
  - The STOP command simultaneously triggers the following actions:
    - Activation of solenoid on the valve.
    - Start of Closing Time timer (TC1).
  - The WW-740-03-S closes.
    (Closing speed can be controlled by a needle valve on the control pressure inlet)
  - Delay Time timer (TD1) is started when VALVE CLOSED input is triggered when the Limit Switch's contacts change position due to the cam on the valve's Indicator rod is pushing down on the Limit Switch's roller.
  - The Pump Motor Stop procedure is initiated when the Delay Time timer (TD1) reaches its set value.
  - Deactivate solenoid valve when Closing Time timer (TC1) reaches its set value.
  - If VALVE CLOSED input is not triggered within the time set for Closing Time timer (TC1), then:
    - Trigger VALVE OPEN Alarm.
    - Initiate Pump Motor Stop procedure.

Requirements:

- Inputs:
  - VALVE CLOSED position (from Limit Switch).
    - Refer to "Limit Switch Assembly – Main relevant accessories".
    - The valve is considered open when there is no VALVE CLOSED input.
  - START command.
  - STOP command.

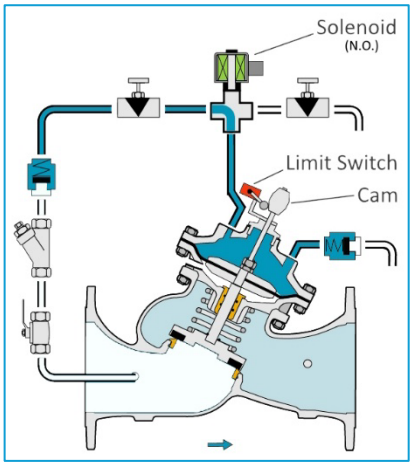
- Outputs:
  - Solenoid activation (recommended voltage – 24VAC).
  - Pump Motor Start procedure.
  - Pump Motor Stop procedure.

- Timers:
  - Opening Time (TO1) – defines the time in which the valve must open after START command.
    - Time from START command until VALVE CLOSED input is disconnected.
    - Protecting the pump from running at zero or too low flow.
    - Normal range is 10-360 seconds, depending on valve size and working conditions.
  - Closing Time (TC1) – defines the time in which the valve must close after STOP command.
    - Ensuring pump shutoff if the synchronized procedure for the pump and valve fails.
    - Setting time should be somewhat longer than normal closing time of the WW-743-03-S.
    - In Normally Open (N.O.) mode it defines the activation time of the solenoid valve.
    - Normal range is 15-300 seconds, depending on valve size and working conditions.
  - Delay Time (TD1) – defines the time from VALVE CLOSED input until initiation of Pump Motor Stop procedure.
    - Protects from pump shutoff caused by an accidental activation of the Limit Switch.
    - Normal range is 1-10 seconds.
    - Can be disabled when low flow conditions are expected, i.e.: when the pump and the valve are sized for future demand (oversized for current demand).

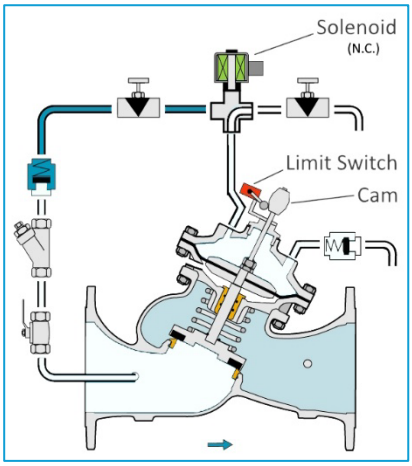
- Recommended additional Inputs, Outputs and Alarms:
  - Power supply is not available.
  - Solenoid coil is disconnected.
  - Solenoid coil is overcurrent (short).
  - VALVE CLOSED Alarm if the valve is closed when it should be open.
  - VALVE OPEN Alarm if the valve is open when it should be closed.
  - Pump On
  - Various alarms from the pump, i.e.: overheat, overload, etc.

Control and Installation illustrations:

Typical control diagram
(700 Sigma series)

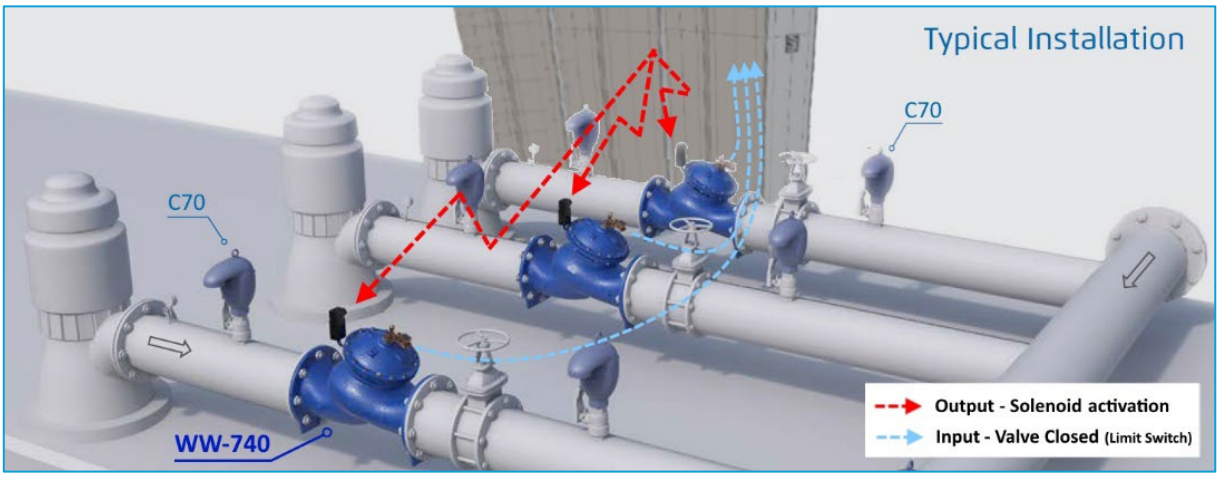


Normally Closed (N.C.)



Normally Open (N.O.)

Typical installation in a pumping station
(example only)



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