

5.3 TYPE TESTS—DYNAMIC TESTS

5.3.1 General

Dynamic tests shall be carried out in accordance with Clause 5.3.2 to 5.3.9 using a DN 100 PN 16 valve. Separate dynamic tests shall be carried out for each type of valve (e.g., full port valve, reduced port valve, valve with flat disc, valve with V-port throttling plug, or valve with anti-cavitation trim).

The test valve shall be configured to operate as a fixed-outlet pressure reducing valve with a hydraulic pilot. The valve shall be fitted with a position transmitter to indicate valve position.

The closed-loop test rig shall comprise a storage tank, centrifugal pump, upstream isolating valve IV1, inlet pressure gauge, test valve (control valve), outlet pressure gauge, downstream isolating valve IV2, and electromagnetic flowmeter. The upstream and downstream isolating valves shall be located at a minimum distance of 1 m from the test valve. The inlet and outlet pressure gauges shall be located at a minimum distance of 0.5 m from the test valve. The electromagnetic flowmeter shall be located at a minimum distance of 1 m from the downstream isolating valve and a minimum distance of 0.5 m from the storage tank.

The pressure gauges (or pressure transmitters) and flowmeter shall have current calibration certificates to ensure accuracy of measurements.

5.3.2 Test 6: Control precision

Throttle the upstream and downstream isolating valves and adjust the pilot valve to provide inlet and outlet pressures according to Table 5.1, with a flow of 55 m³/h. Record IV1 and IV2 openings, number of turns of the pilot valve adjustment screw from its fully closed position, test valve opening, inlet and outlet pressures, flow through the valve, and maximum deviation from the set-point. The valve shall maintain the outlet pressure within ± 15 kPa of its set-point for a minimum duration of 5 min.

TABLE 5.1
PRESSURE SET-POINTS

Pressure class PN	Pressure set-point kPa	
	Inlet	Outlet
16	900	300

NOTES:

- 1 Tolerance on flow rate is ± 2 m³/h.
- 2 Tolerance on pressure set-points in dynamic tests is ± 10 kPa.

5.3.3 Test 7: Pilot valve adjustment for increasing pressure set-point

Adjust the pilot valve to increase the outlet pressure set-point to 400 kPa while closing IV2 to maintain the flow of 55 m³/h. Record IV1 and IV2 openings, number of turns of the pilot valve adjustment screw from its original position in Test 6, test valve opening, inlet and outlet pressures, and flow through the valve. The valve shall maintain the outlet pressure within ± 15 kPa of its set-point for a minimum period of 5 min.

5.3.4 Test 8: Pilot valve adjustment for decreasing pressure set-point

Adjust the pilot valve to decrease the outlet pressure set-point to 200 kPa while opening IV2 to maintain the flow of 55 m³/h. Record IV1 and IV2 openings, number of turns of the pilot valve adjustment screw from its original position in Test 6, test valve opening, inlet and outlet pressures, and flow through the valve. The valve shall maintain the outlet pressure within ± 15 kPa of its set-point for a minimum period of 5 min.

5.3.5 Test 9: Response to gradual flow increase

Readjust IV2 and the pilot valve to their original positions in Test 6. Gradually increase the flow by opening IV2 sufficiently to achieve a flow of 80 m³/h while opening IV1 to maintain the inlet pressure of 900 kPa. Record IV1 and IV2 openings, test valve opening, inlet and outlet pressures, and flow through the valve. The valve shall maintain the outlet pressure within ± 15 kPa of its set-point for a minimum period of 5 min.

5.3.6 Test 10: Response to gradual flow reduction

Gradually reduce the flow by further throttling of IV2 until a flow of 30 m³/h is achieved while closing IV1 to maintain the inlet pressure of 900 kPa. Record IV1 and IV2 openings, test valve opening, inlet and outlet pressures, and flow through the valve. The valve shall maintain the outlet pressure within ± 15 kPa of its set-point for a minimum period of 5 min.

5.3.7 Test 11: Minimum controllable flow

Gradually reduce the flow by further throttling of IV2 while closing IV1 to maintain the inlet pressure of 900 kPa until the test valve fails to maintain the outlet pressure set-point within ± 20 kPa. Record IV1 and IV2 openings, test valve opening, inlet and outlet pressures, and flow through the valve. The minimum controllable flow and the corresponding valve opening shall be within $\pm 10\%$ of the values stated in the manufacturer's published data.

5.3.8 Test 12: Response to rapid flow increase

Adjust IV1 and IV2 to their original positions in Test 6. Open IV2 in less than 5 s to increase the flow to approximately 80 m³/h. Record the maximum deviation from the set-point during the transient period, and the time for the test valve to increase the outlet pressure to its set-point. At final steady-state, record IV1 and IV2 openings, test valve opening, inlet and outlet pressures, and flow through the valve. The maximum deviation from the set-point during the transient period shall be within ± 15 kPa of the value stated in the manufacturer's published data.

5.3.9 Test 13: Response to rapid flow decrease

Adjust IV2 to its original position in Test 6. Close IV2 in less than 5 s to decrease the flow to approximately 30 m³/h. Record the maximum deviation from the set-point during the transient period, and the time for the test valve to reduce the outlet pressure to its set-point. At final steady-state, record IV1 and IV2 openings, test valve opening, inlet and outlet pressures, and flow through the valve. The maximum deviation from the set-point during the transient period shall be within ± 15 kPa of the value stated in the manufacturer's published data.

5.4 BATCH RELEASE TESTS

5.4.1 General

Production tests shall be carried out sequentially in accordance with Clauses 5.4.2 to 5.4.6. Valves of nominal sizes up to and including DN 300 may use a 'bulkhead' test. Valves of nominal sizes larger than DN 300 shall be subject to a 'free end' test.