Designation: F 2138 – 01

Standard Specification for Excess Flow Valves for Natural Gas Service[1]

This standard is issued under the fixed designation F 2138; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers requirements and test methods for excess flow valves for use in thermoplastic natural gas piping systems. However, it is expected that excess flow valves manufactured to the requirements of this specification may also be used in other natural gas piping systems.

1.2 Excess flow valves covered by this specification are designed for insertion into components for natural gas systems such as pipe, tubing, or fittings in sizes from 1/2 CTS to 2 IPS.

1.3 The tests required by this specification are intended to determine the performance characteristics of an excess flow valve installed in a straight piece of pipe. An excess flow valve could possibly be installed in a straight piece of pipe, in a service tee outlet, as part of a mechanical coupling, or in other configurations. The performance characteristics of the excess flow valve may be significantly different for each installed configuration. Users should conduct their own tests to determine the installed performance characteristics or contact the EFV manufacturer for test data for the installed configuration. Additional guidance on selection and installation of excess flow valves is included in Appendix X1.

1.4 The tests required by this specification are not intended to be routine quality control tests.

1.5 The values given in parentheses are for informational purposes only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 1600 Terminology for Abbreviated Terms Relating to Plastics[2]

F 412 Terminology Relating to Plastic Piping Systems[3]

F 1802 Test Method For Performance Testing of Excess Flow Valves[3]

3. Terminology

3.1 *Definitions of Terms:*

3.1.1 Definitions are in accordance with Terminology F 412, unless otherwise specified. Abbreviations are in accordance with Terminology D 1600.

3.1.2 *bypass flow, n*—an intentional rate of passage of natural gas through an EFVB after trip, which will allow upstream and downstream pressure to equalize across the device to automatically reset to the open position after removal of a fault condition.

3.1.3 *excess flow valve, EFV, n*—a device installed in a natural gas piping system to automatically stop or limit the passage of natural gas when the rate of passage of natural gas through the device exceeds a predetermined level.

3.1.4 *excess flow valve bypass, EFVB, n*—an EFV designed to limit the flow of gas after trip to a small predetermined level and to reset automatically after the pressure is equalized across the valve.

3.1.5 *excess flow valve non-bypass, EFVNB, n*—an EFV designed to stop the flow of gas after trip and to be reset manually.

3.1.6 *leak rate, n*—the flow of natural gas through an EFVNB after trip.

3.1.7 *maximum inlet pressure, n*—the maximum pressure, as stated by the EFV manufacturer, at which an EFV is designed to function.

3.1.8 *minimum inlet pressure, n*—the minimum pressure, as stated by the EFV manufacturer, at which an EFV is designed to function.

3.1.9 *pipe, n*—refers to both pipe and tubing.

3.1.10 *reset, v*—changing an EFV from a closed position to an open position.

3.1.11 *temperature rating, n*—the temperature range, as stated by the EFV manufacturer, within which an EFV is designed to function.

3.1.12 *trip, n*—closure of an EFV.

3.1.13 *trip flow, n*—the rate of passage of natural gas through an EFV that will cause the EFV to stop or limit the passage of natural gas.

4. Ordering Information

4.1 Purchasers should consider specifying the following characteristics when ordering an EFV:

4.1.1 EFVB or EFVNB,

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.60 on Gas.
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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.04.

4.1.2 Trip flow (see 9.1.1),
4.1.3 Maximum inlet pressure (see Section 7),
4.1.4 Temperature rating range (see Section 8),
4.1.5 Minimum inlet pressure, and
4.1.6 Special considerations for insertion of EFV.

5. Materials and Manufacture

5.1 The physical properties of each material used to produce an EFV shall be available from the EFV manufacturer upon request.

NOTE 1—Materials in long-term contact with natural gas of line quality should be demonstrated to not adversely affect the performance of the EFV.

NOTE 2—Materials should have a demonstrated resistance to environmental stress cracking when exposed, under stress, to chemical compounds encountered in natural gas piping systems. Such compounds include, but are not limited to, antifreeze solutions used to thaw frozen lines. The effects of liquid environments such as antifreeze agents, odorants, and hydrocarbons are known to be deleterious to some plastics, particularly when under service conditions.

6. Dimensions

6.1 The EFV shall be of appropriate dimensions for the pipe or fitting in which it is intended to be inserted.

7. Maximum Inlet Pressure

7.1 EFVs manufactured under this specification shall have a maximum inlet pressure of at least 125 psig.

8. Temperature Rating Range

8.1 EFVs manufactured under this specification shall have a temperature rating range of -20 to 140°F (-29 to 60°C).

9. Design Qualification Requirements

9.1 *Performance Requirements*:
9.1.1 *Trip Flow*—The trip flow shall not be less than the minimum trip flow stated by the EFV manufacturer and shall not exceed 1.5 times the minimum trip flow stated by the EFV manufacturer at any given pressure between the minimum and maximum inlet pressures, when tested in accordance with 12.2.
9.1.2 *Leak Rate*—The leak rate of an EFVNB shall not exceed 0.40 standard ft^3/h (0.011 m^3/h) when operating between the minimum and maximum inlet pressures, when tested in accordance with 12.3.
9.1.3 *Bypass Flow*—The bypass flow of an EFVB shall not exceed 20 standard ft^3/h (0.566 m^3/h) at a 10 psig (0.07 MPa) inlet pressure, when tested in accordance with 12.4. At all other pressures between the minimum and maximum inlet pressures, the bypass flow of an EFVB shall not exceed the EFV manufacturer's stated value when tested in accordance with 12.4.
9.1.4 *Pressure Drop*—The pressure drop across the EFV shall not exceed the maximum pressure drop stated by the EFV manufacturer at each flow rate listed in Test Method F 1802, section 4.2.3, Pressure Drop at Flow Rates Less than Closure, and at all inlet pressures between the minimum and maximum inlet pressures, when tested in accordance with 12.5.
9.1.5 *Reset*—The EFV shall reset within the parameters stated by the EFV manufacturer at all inlet pressures between the minimum and maximum inlet pressures, when tested in accordance with 12.6.
9.1.6 *Snap Acting Loads*—The EFV shall not close when tested in accordance with 12.7.
9.1.7 *Cycle Testing*—After the cycle testing described in 12.8, the EFV shall meet the requirements of 9.1.1 and 9.1.2 or 9.1.3.

10. Samples

10.1 The minimum sample size for testing against the performance requirements of 9.1.1-9.1.5 shall be 25. The minimum sample size for testing against the performance requirements of 9.1.6 and 9.1.7 shall be 6.

11. Specimen Preparation

11.1 The tests required by this specification shall be performed on an EFV inserted in a straight section of pipe. The EFV shall be centered between the pipe ends. There shall be at least five diameters of straight pipe on each side of the EFV, but the total length of the straight section of pipe shall not exceed 18 in. (45.7 cm).

12. Test Methods

12.1 *General*:
12.1.1 EFV testing shall be done in accordance with Test Method F 1802, unless otherwise specified.
12.1.2 EFV testing at temperatures other than those listed in Test Method F 1802 may be necessary to establish the EFV temperature rating.
12.2 Trip flow shall be determined as described in Test Method F 1802, section 10.3, on Trip Flow.
12.3 Leak rate for an EFVNB shall be determined as described in Test Method F 1802, section 10.4, Bypass Test or Leak Rate Test.
12.4 Bypass flow for an EFVB shall be determined as described in F 1802, section 10.4, Bypass Test or Leak Rate Test.
12.5 *Pressure Drop*:
12.5.1 The pressure drop testing shall be done as described in Test Method F 1802, section 4.2.3, Pressure Drop at Flow Rates Less than Closure.
12.5.2 The pressure drop shall be calculated based on test results obtained from the tests described in Test Method F 1802. In Test Method F 1802, section 10.6.1, System Pressure Drop, the EFV is replaced by an equivalent length of 1 in. (25.4 mm) IPS pipe. However, when using Test Method F 1802 to determine the pressure drop across an EFV, the EFV shall be replaced with the same size and length of pipe without the EFV. To calculate the pressure drop, subtract the system pressure drop in Test Method F 1802, section 10.6.2, System Pressure Drop, from the total pressure drop in Test Method F 1802, section 10.5.7, Total Pressure Drop.
12.6 Reset of an EFVB shall be tested as described in Test Method F 1802, section 10.7, Reset.
12.7 *Snap Acting Load Test*—A test apparatus shall be assembled consisting of the following components in order: inlet supply pressure connection to EFV, no more than 60 ft (18.3 m) of 1 in. (2.54 cm) NPS pipe, full port ¼ turn ball valve, no more than 2 ft (.61 m) of 1 in. (2.54 cm) NPS pipe,