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شرکت ملی گاز ایران

مدیریت پژوهش و فنآوری

امورتدوین استانداردها

# IGS

## مشخصات فنی خرید

# شیرایمنی قطع کننده ضربه ای

# Safety Slam Shut off  Valve

برای استفاده از مقررات فنی  فقط به آخرین نسخه منتشرشده در سایت امور تدوین استانداردها مراجعه گردد

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# ابلاغ مصوبه هیأت مدیره

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باسلام،

به استحضار می‌رساند در جلسه ۱۹۷۴ مورخ ۱۴۰۱/۰۵/۰۲ هیات مدیره، نامه شماره گ۹/۰۰۰/۵۲۱۶۳ مورخ ۱۴۰۱/۰۴/۱۲ آن مدیریت درمورد تصویب نهایی مقررات فنی شرکت ملی گاز ایران به شرح زیر مطرح و مورد تصویب قرار گرفت.

۱-مشخصات فنی خرید شیرایمنی قطع کننده ضربه ای

IGS-M-IN-303(0)

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## Foreword

This standard specification is intended to be mainly used by N.I.G.C. and contractors, and has been prepared base on interpretation of recognized standards and technical documents, as well as knowledge, backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Specification (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research and technology management and submitted to "the standards council of NIGC" for approval.

IGSs are subjected to revision, amendment or withdrawal, if required, and thus the latest edition of IGS shall be checked / inquired by NIGC'S users.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation or conflicts between this specification and other applicable standards, codes, procedure or well-known manufacturer's specifications must be resolved in writing by the user or its representative through Manager, Engineering Department or standardization division of NIGC.

The technical standard committee welcomes comments and feedbacks from concerned or interested corporate and individuals about this standard, and may revise this document accordingly based on the received feedbacks.

## General Definitions

Throughout this standard the following definitions, where applicable, should be followed:

1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.

2- "COMPANY": refers to National Iranian Gas Company (NIGC).

3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.

4- "SHALL ": is used where a provision is mandatory.

5- "SHOULD": is used where a provision is advised only.

6- "MAY": is used where a provision is completely discretionary.

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## 1. SCOPE

This specification covers the minimum design, material, fabrication, testing, marking and packing requirements for safety slam shut off valve of both stand-alone and integral types for gas supply installations operating at working pressure up to and including 100 bar and nominal diameters up to DN 400.

This document does not apply to:

safety slam shut off valve upstream from /on/in domestic gas consuming appliances which are installed downstream of domestic gas meter.

safety slam shut off valve incorporated into pressure regulating devices used in service lines with volumetric flow rate≤ 200 m^ 3/h at normal conditions and inlet pressure ≤ 5 bar.

## 2. REFERENCE

2.1 EN14382 (2019) -safety devices for gas pressure regulating station and installations-cos safety shut off devices for inlet pressure up to 100 bar

2.2 EN334 (2019)-Gas pressure regulators for inlet pressures up to 100 bar

2.3 IGS-CH-033(1)-Quality specification for pipe line natural gas

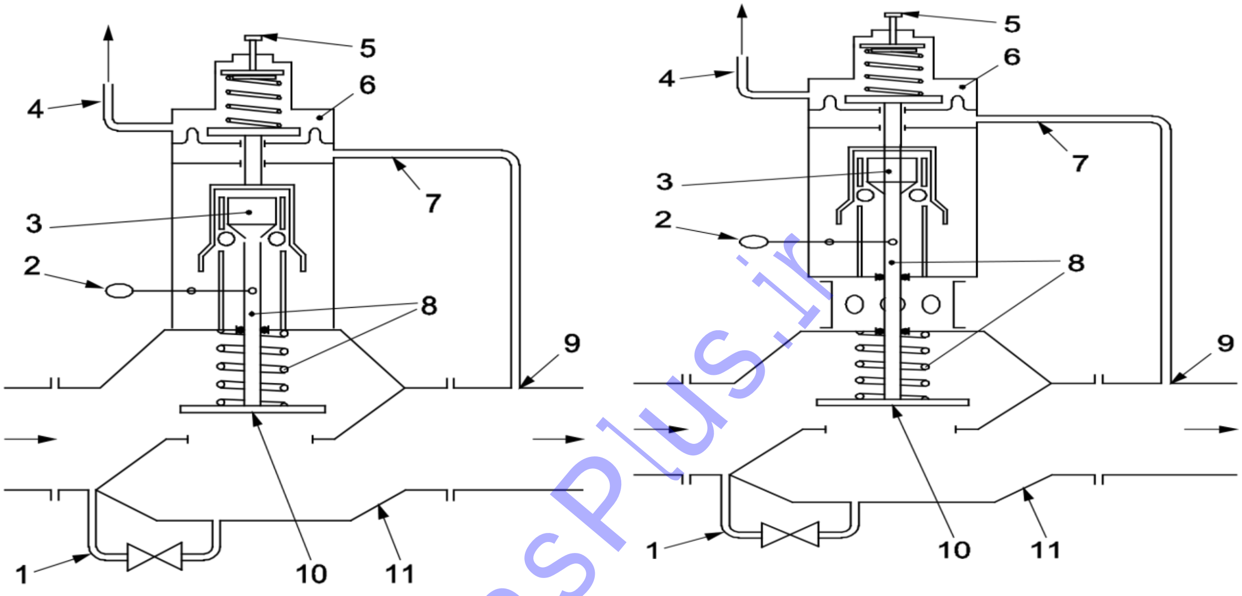
## 3. DEFINITIONS

### 3.1 Safety shut-off device

Device whose function is to stay in the open position under normal operating conditions and to shut-off the gas flow automatically and completely when the monitored pressure exceeds the pre-set values (over-pressure monitoring and under-pressure monitoring)

### 3.2 Direct acting shut-off device

SSD in which the pressure detector element is directly connected to the trip mechanism (see Figure 1)"



a)

**Key**

Figure: 1

| | | | |
|---|---|---|---|
| 1 | bypass (Equalizing valve) | 6 | controller |
| 2 | re latching device | 7 | sensing line |
| 3 | trip mechanism | 8 | actuator |
| 4 | breather line | 9 | sensing point |
| 5 | setting element | 10 | closing member |
| 11 | SSD Body | | |

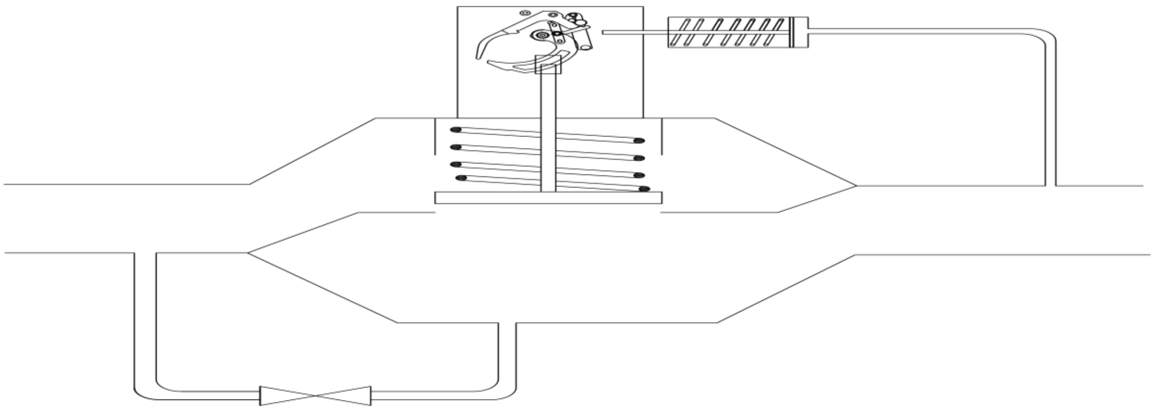


Figure: 2

### 3. 3 Indirect acting shut-off device

SSD without mechanical connection between the pressure detector element and the trip mechanism and where (pressure) energy from an internal or external source is used for activating the trip mechanism and moving the closing element (See Figure 3)

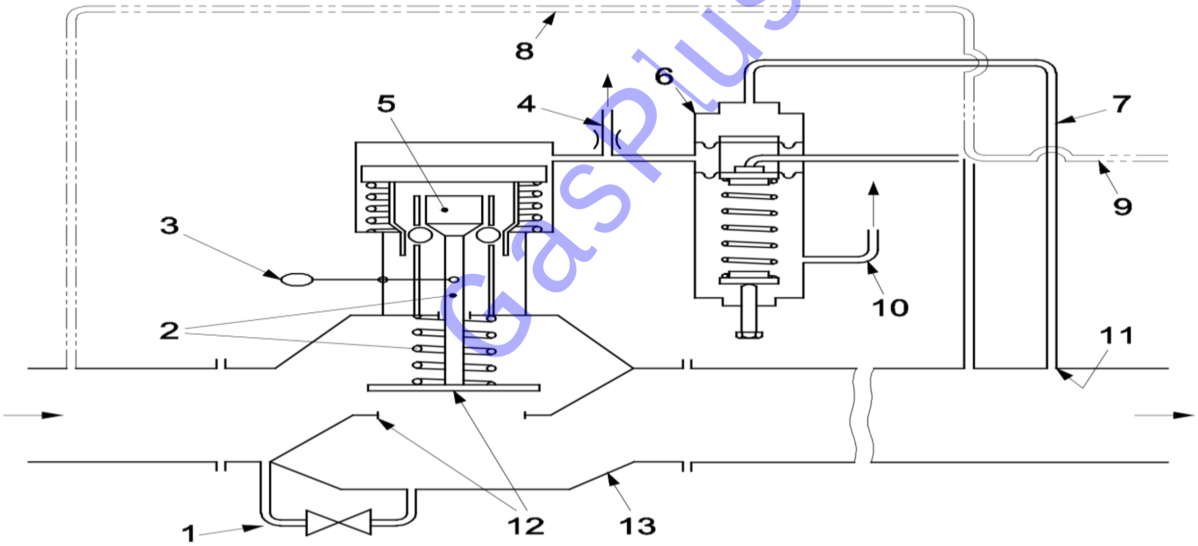


Figure: 3

**Key**

| | |
|---|---|
| 1 | bypass (Equalizing valve) |
| 2 | actuator |
| 3 | re latching device |
| 4 | exhaust line |
| 5 | trip mechanism |
| 6 | controller |
| 7 | sensing line |
| 8 | loading pressure line (from internal power source) |
| 9 | loading pressure line (from power external source) |
| 10 | breather/exhaust line |
| 11 | sensing point |
| 12 | closing member |
| 13 | SSD Body |

### 3.4 Gas slam shut device

Gas slam shut device SSD designed to quickly shut-off the gas flow when the monitored pressure exceeds the pre-set values

### 3.5. SSD size nominal

Size DN of the inlet connection in accordance with EN ISO 6708 (5)

### 3.6 Trip pressure

**$p_{do}$ (for over-pressure monitoring) $p_{du}$ (for under-pressure monitoring)**

Pressure value at which the closing member moves to closed position

### 3.7 Accuracy group

AG maximum permissible absolute value of trip pressure deviation

### 3.8 Maximum component operating pressure $p_{max}$

Highest operating pressure at which a component of an SSD will continuously operate within specified conditions

### 3.9 Maximum inlet pressure pumax

Highest inlet pressure at which the SSD can continuously operate within specified conditions

### 3.10 Maximum allowable pressure PS

Maximum pressure for which the body, its inner metallic partition walls and some other pressure bearing parts are designed in accordance with the strength requirements in this document

### 3.11 Main components

Parts including normally: a controller, a trip mechanism, an actuator, a closing member and re latching device permitting the manual opening of the SSD. All these parts are functionally connected

(See Figures 1 to 2, 3).

### 3.12 Gas inlet temperature

Min.: -10 Max.: +45 (Otherwise please specify)

### 3.13 Gas cut-off device

SSD designed to shut-off the gas flow, which responds slower dynamically than a slam shut device when the monitored pressure exceeds the pre-set values

EXAMPLE SSD using actuator driven by pipeline gas or external power.

### 3.14 Sensing point

Point from which the monitored variable is fed to the SSD

### 3.15 Closing member

Part which shuts off the gas flow completely

### 3.16 Trip mechanism

Mechanism which releases the closing member when activated by the controller

### 3.17 Re latching device

Device which enables the complete opening of the SSD

### 3.18 Bypass

Device permitting manual equalization of pressure across a closed SSD

### 3.19 Auxiliary device

Any device functionally connected to the main components of the SSD

### 3.20 Pressure bearing parts

Parts whose failure to function would result in a release of the retained fuel gas to the atmosphere

### 3.21 Inner metallic partition walls

Metallic wall that separates a chamber into two individual pressure-containing chambers at different pressures under normal operating conditions

### 3.22 Sensing line

Line connecting the sensing point and the controller

### 3.23 Exhaust line

Line connecting the controller and/or actuator of the SSD to atmosphere for the safe exhausting of fuel gas in the event of closing and/or failure of any part

### 3.24 Monitored pressure

Pressure monitored and safeguarded by the SSD, normally the outlet pressure of the pressure regulating station/installation

### 3.25 Response Time(ta)

Time interval between attaining the permissible limit value of the trip pressure at the sensing point and complete closure of the closing member

## 4. REQUIREMENTS

SSDs shall not have any continuous discharge of gas into the atmosphere, however, temporary discharges from auxiliary devices may occur.

SSDs shall be so designed that external tightness and internal sealing meet the requirements of 5.1.8 and 5.1.9.

If in the event of failure (e.g. of a diaphragm) leakage to atmosphere is possible, the breather shall be provided with, a threaded connection of at least DN 10 to enable an exhaust line to be connected.

For SHUT-off devices the operating and maintenance manual shall specify whether a by-pass shall be provided and how this will be accomplished.

After re leaching, all functional units shall have returned to their starting position without impeding the closing function and the SSD shall be ready for operation. The handle of

The re leaching device may be detachable. Any device to lock the SSD in the open position is not permitted.

Where pipeline gas is utilized as a source of energy for indirect acting SSDs, the location on the pipeline of the loading pressure connection shall not affect the safety performance of the SSD. If applicable, this information shall be given in the operating manual.

Pressure bearing parts not intended to be dismantled during servicing, adjustment or conversion shall be sealed by means which will show evidence of interference (e.g. lacquer).

Pressure bearing parts, including measuring and test points, which may be dismantled for servicing, adjustment or conversion, shall be made pressure tight by mechanical means (e.g. metal to metal joints, O-rings, gaskets). Jointing compounds, such as liquids and pastes, shall not be used.

Jointing compounds, however, may be used for permanent assemblies and shall remain effective under normal operating conditions.

### 4.1 Types of use gas shut-off devices

### 4.1.1 Stand-alone gas shut-off devices

SSDs may be designed as independent units for separate installation. A stand-alone SSD comprises all the main components (see 3.11).

### 4.1.2 Gas shut-off devices integrated into a gas pressure regulator

SSDs shall be functionally independent from the components of the regulator and from other safety devices.

This requirement is met if the function of the SSD is not affected in the event of the failure and/or loss of functionality of one or more of the following components of the regulator or other safety devices:

- Control/closing/relieving member;
- Seat ring;
- Actuator;
- Actuator casing;
- Controller;
- Sensing and process lines.

### 4.1.3 Gas safety shut-off device with in-line gas pressure regulator

The system includes a regulator with the function of active regulator and an in-line SSD (in series).

The SSD shall be installed directly upstream of the regulator and both devices shall control the pressure at the same location.

The associated in-line regulator shall be functionally independent from the SSD.

This requirement is met if:

a) the function of the regulator is not affected in the event of the failure and/or loss of functionality of one or more of the following SSD components:

- Controller;
- sensing and process lines;

And if:

b) the function of the SSD is not affected in the event of the failure and/or loss of functionality and/or functionality of one or more of the following regulator components:

- pilot (in case of pilot-controlled regulator);
- sensing and process lines.

The motorization energy for regulator in case of pilot-controlled type, shall be taken downstream from the SSD.

### 4.2 Strength of housings and other parts

### 4.2.1 Body and its inner metallic partition walls

The limit pressure $p_l$ (determined or calculated in accordance with 7.3), maximum allowable pressure PS and maximum inlet pressure $p_{umax}$ shall be as follows:

$p_l \geq Sb \times PS \geq Sb \times p_{umax}$

### 4.2.2 Flanges

The ratings of flanges in accordance with ANSI B 16.5.

### 4.2.3 Other pressure bearing parts

The other pressure bearing parts are classified in the following three groups:

I) parts that are subjected to inlet pressure under normal operating conditions and that are designed to withstand a maximum allowable pressure equal to PS, e.g. specific pressure bearing parts as body, controller as per Figure 2 and 3;

II) parts that are subjected to inlet pressure as a result of failure conditions

a) are designed to withstand a maximum allowable pressure equal to PS; or

b) are designed to withstand a specific maximum allowable pressure of PSD which is lower than PS and have additional protective measures;

III)parts of all types of SSD (IS or DS) that can never be subjected to inlet pressure even in the case of failure conditions and that are designed to withstand a maximum allowable pressure PS or a specific maximum allowable pressure PSD which is lower than PS, (e.g. controller as per scheme of Figure 1b).

Pressure bearing parts group I)

For this group the limit pressure $p_l$, the maximum allowable pressure PS and the maximum inlet pressure $pu_{max}$ shall comply with the following requirements:

$p_l \geq S \times PS \geq S \times pu_{max}$

Pressure bearing parts group II)

a) For this sub-group the limit pressure pl, the maximum allowable pressure PS and the maximum inlet pressure pumax, shall comply with the following requirements:

$pl \geq S \times PS \geq S \times pumax$

b) For this sub-group pressure bearing parts may be protected against exceeding their allowable limits of pressure by an appropriate design (specific safety accessory e.g. a relief valve, vent tapping, bleeding through sensing / process lines and/or limiting of the flowing gas by appropriate clearances between movable and fixed parts). In this case, it

is necessary to consider also the working conditions with the downstream isolation valve of the installation in the closed position.

In this case, the limit pressure pl of the concerned pressure bearing parts, the specific maximum allowable pressure PSD and the maximum pressure $p_{max}$ reached in the event of a failure, shall comply with the following requirements:

$p_l \geq S \times PSD \geq S \times p_{max}$

The set point of the specific safety accessory shall be adjusted in such a way to limit the pressure to the relevant specific maximum allowable pressure PSD. Appropriate instructions on this subject shall be included in the operating and maintenance manual.

Pressure bearing parts group III)

Where the parts are designed to withstand PS, the limit pressure $p_l$, the maximum allowable pressure PS and the maximum inlet pressure $p_{umax}$, shall comply with the following requirements:

$Pl \geq S \times PS \geq S \times p_{umax}$

Where the parts are designed to withstand PSD, the limit pressure $p_l$, the specific maximum allowable pressure PSD and the maximum pressure $p_{max}$ reached in the event of a failure, shall comply with the following requirements:

$p_l \geq S \times PSD \geq S \times p_{max}$

In above last case with specific maximum allowable pressure PSD, the markings shall include also the maximum component operating pressure $p_{max}$ and the specific maximum allowable pressure PSD as detailed in Clause 9.

### 4.2.4 Integral strength gas safety shut-off devices

SSDs classified as integral strength SSDs shall include only pressure bearing parts designed to withstand the maximum allowable pressure PS.

For these types of SSDs the marking shall include the symbol “IS “.

### 4.2.5 Differential strength gas safety shut-off devices

SSDs classified as differential strength SSDs include some pressure bearing parts designed to withstand the specific maximum allowable pressure PSD where PSD< PS.

For these type of SSDs the marking shall include the symbol “DS “.

### 4.2.6 Inner metallic partition walls

Where a chamber in the SSD is separated into individual pressure bearing chambers by a metallic partition wall, the partition wall shall be designed taking into account the maximum differential pressure. The following requirement shall be complied with:

$p_l \geq S \times \Delta p_{max}$

### 4.2.7 Minimum values of safety factor for pressure bearing parts

The values listed in Table 1 shall be used to limit the stress in the walls of pressure bearing parts and inner metallic partition walls at the maximum allowable pressure.

The values of the safety factors applicable to diaphragms when they have both the function of pressure bearing parts and inner metallic partition wall are those detailed in 7.3.2.2.

Table 1 — Minimum values of safety factor

| Group of materials | Minimum value of safety factor | |
|---|---|---|
| | S | For parts of the body stressed by forces from pipelines only Sb |
| Rolled and forged steel | 1,7 | 2,13 |
| Cast steel | 2,0 | 2,5 |
| Spheroidal graphite cast iron and malleable cast iron | 2,5 | 3,13 |
| Copper-zinc wrought alloys and aluminum wrought alloys | 2,0 | 2,5 |
| Copper-tin cast alloys and copper-zinc cast alloys | 2,5 | 3,13 |
| Aluminum cast alloys Amin 4 % | 2,5 | 3,13 |
| Aluminum cast alloys Amin 1,5 % | 3,2 | 4,0 |

### 4.3 Materials

**4.3.1** Internal metallic parts shall be durably constructed of a corrosion resistant material such as stainless or corrosion resistant plated steel. Valve mechanism (such as orifice, valve stem, valve seat, closure,) shall be at least stainless steel type 316. All metallic parts shall meet the requirement of salt spray test (section 5.2.10).

**4.3.2** Material of SLAM SHUT OFF body shall be at least cast carbon steel according to ASTM A 216 grade WCB or forged carbon steel according to ASTM A 105 or seamless pipe according to API 5L suitable for -25°C to +55°C ambient temperature.

**4.3.3** Nuts, bolts and screws shall be steel according to ASTM A194 grade 2H, ASTM A193 grade B7 and ANSI B1.1 respectively.

**4.3.4** All tubes and sensing lines shall be stainless steel type 316.

**4.3.5** Pilot body material shall be at least cast carbon steel, according to ASTM A216 grade WCB or forged carbon steel according to ASTM A105 or die cast aluminum according to ASTM B85 or forged brass according to ASTM B283 grade C 37700

**4.3.6** Diaphragm shall be made of synthetic reinforced rubber material.

**4.3.7** Diaphragms of gas safety shut off devices

The diaphragms to be used in SSD's shall comply with EN 334:2019, 4.3.9.

**4.3.8** Non – metallic parts material of regulator such as diaphragm, sleeve, "0" rings, etc. shall be resistant to odorized natural gas and not to reduce its service life or result in sluggish operation of unit at maximum and minimum temperature specified.

Test requirements for these materials shall be according to test item 5.2.11 of inspection, test and certification section.

### 4.4 The maximum volumetric flow rate

**4.4.1** At inlet flange should be Calculated Acc.to ANNEX E EN14382-2019 the maximum pressure drop shall be calculated Acc.to ANNEX C EN14382-2019 the requirements of this specification over ally are in according to EN14382 but furthermore the following requirement shall specially be considered

**4.4.2** ambient temperature rang is from-25ºc to +55ºc.

**4.4.3** Safety slam shut off valve shall be closed when damage to the pressure detecting element occurs or when external power fails and who's re-opening, is possible only manually

**4.4.4** Safety slam shut off valve connections shall be flanged end, raised face, serrated finished, pressure rating class 300,600 According to ANSI B16.5

**4.4.5** For welded joints both in pressure bearing parts and into inner metallic part ion walls, all Welded joints (100%) shall be subjected to NDT

**4.4.6**The safety slam shut off valve shall be type tested in accordance with these specification requirements.

**4.4.7** The trip pressure deviation for a "SSDs" shall conform to an accuracy group of following table.

Shut off set point repeatability test: when the shut off valve set randomly at different points by varying the sensing pressure for at least 10 times, the shut off points shall be read. The difference between minimum and maximum deviations to readings shall not be greater than 2% of set pressure.

**4.4.8** Accuracy group determined at 7.9.

Table 2 — Specified accuracy groups

| Accuracy group | Permissible deviation |
|---|---|
| AG 1 | ± 1 % a |
| AG 2,5 | ± 2,5 % a |
| AG 5 | ± 5 % a |

a Or 1 mbar, whichever is greater.
b Accuracy group will be determined by the manufacturer

An SSD type can conform to different accuracy groups as a function of the set range $W_{do}$ and $W_{du}$ or of the inlet operating pressure range bpu.

At the lower limit temperature, the permissible deviation for the declared accuracy group may move to a less stringent group as detailed in 7.10.3.

### 4.4.9 Sealing of the adjusting device

A means for sealing the adjusting device shall be available ACC.TO IGS-M-IN-308. If requested in the order specification the adjusting device shall be sealed.

### 4.4.10 External visual Indication of the position of the closing member

For SSDs it shall be possible to check whether the closing member is in fully open position by visual inspection.

### 4.4.11 Springs

Springs shall not be overstressed under any operating conditions and there shall be sufficient free movement of the spring to allow satisfactory operation.

The spring shall be designed such that buckling does not occur, confirmation shall be obtained from reputable centers.

### 4.4.12 Parts transmitting actuating forces

Parts transmitting actuating forces shall be made of metallic material and shall be designed with a safety factor of ≥ 3 against permanent deformation. Verification is made by proving the compliance of the actual safety factors specified above and the compliance of dimensions shown on drawings with values specified in the strength calculations. Alternatively, verification shall be made by an actual test.

## 5. Functional and characteristic requirements

The response time shall be for slam shut devices ≤ 2 s.

### 5.1 General

### 5.1.1 Shutting-off and opening

The shutting-off of the gas flow shall be automatic and shall not be interruptible until the closed position of the closing member has been reached.

The opening of SSDs shall only be possible by manual operation.

### 5.1.2 Mounting position

SSDs within the scope of this document shall function in any mounting position specified by the installation, operation and maintenance manual, ± 5°.

### 5.1.3 Equalizing valve

If an internal bypass is fitted for the purpose of pressure equalization, it shall close safely and automatically after closing of the SSD.

### 5.1.4 Ice formation

If requested in the order specification, the SSD shall be type-tested in accordance with the customer requirements, for example in accordance with Annex A.

### 5.1.5 Failure modes

### 5.1.5.1General

A failure of a bellows or piston-type pressure detecting element need not to be considered.

### 5.1.5.2 Slam shut off of functional

Slam shut off of functional shall fail closed in the following cases:

- damage to the diaphragm of the pressure detecting element;
- Reduction of auxiliary energy to less than 1, 5 times of the minimum required for moving the closing element to its closed position, unless:

1) a backup system is used;
2) Pressurized gas from the system itself is used as auxiliary energy and this pressure has dropped.

### 5.1.6 Pressure drop

The pressure drop across the SSD body in relation to the operating conditions shall be specified by the manufacturer.

For SSDs incorporated in a regulator the calculation of pressure drop may be carried out by the reciprocal of the in EN 334:2019, Formulae (3) or (4) or (5) or (6).

For stand-alone SSDs the manufacturer shall declare the pressure drop in terms of diagrams or applicable equations e.g. as those detailed in Annex C.

### 5.1.7 Body strength

Pressure bearing parts subjected to the test described in according to EN 14382(2019) clouse7.5 shall show no visible leakage.

### 5.1.8 External tightness

The pressure bearing parts and all connecting joints shall be leak-proof when tested in accordance with according to EN 14382(2019) clause 7.7.

### 5.1.9 Internal sealing

For gas slam shut device, the requirements of internal sealing are met when:

- bubble tight for a time of 5 s;
- Leakage is no higher than the value given in Table 3. These values are to be used both in the test at ambient temperature and the tests at limit temperatures.

Recognized alternative detection methods may be used for checking the internal leakage (e.g. electronic device).

For such methods the equivalence of the above requirements shall be demonstrated.

The accumulated internal leakage from internal walls, the closing member in its closed position, any bypass and connecting joints shall not exceed the values shown in Table 3 when tested in accordance with according to EN 14382(2019) clause 7.8.

If specified in the order specification, the leakage class of SSD in accordance with EN 1349 shall be declared.

Table 3 — Maximum external and internal leakage rates

| Nominal size DN | Air leakage rate in cm3/h a | |
|---|---|---|
| | external | internal b |
| 25 | 40 | 15 |
| 40 to 80 | 60 | 25 |
| 100 to 150 | 100 | 40 |
| 200 to 250 | 150 | 60 |
| 300 to 350 | 200 | 100 |
| 400 | 400 | 300 |

a At normal conditions.

b Leakage class in accordance with EN 1349, if specified in the order specification, may be accepted for gas cut-off devices only.

**5.1.10** Endurance and accelerated ageing when tested in accordance with 7.14 the SSD shall meet the tightness requirements in accordance with 5.1.8 and 5.1.9 and the set pressure deviations shall remain within its AG.

**5.1.11** Strength of the trip mechanism, valve seat and closing member against the dynamic Impact of flowing gas.

This requirement shall be applied to SSDs where there is a dynamic impact on the closing member in its fully open position.

After testing in accordance with 7.16 the SSD shall meet the internal sealing requirements.

### 5.1.12 Antistatic characteristics

Any external actuated part shall be electrically connected/bonded to the body in such way to meet the requirements detailed in 7.9.

### 5.1.13 Flow coefficient

When the SSD is incorporated in a regulator the flow coefficients in accordance EN 334:2019 are used.

For stand-alone SSDs, a flow coefficient in accordance with 7.10.5 may be used.

Verification is carried out in accordance with the requirement in 4.2.

**5.1.14** Verification of the strength of the trip mechanism, valve seat and closing member against dynamic impact of flowing gas

This test shall only be carried out on SSDs where there is a dynamic impact on the closing member in its fully open position.

The test shall be carried out with the closing member in its fully open position, on a test rig in accordance with EN 334:2019, 7.7.9.4.7. Flow conditions shall be such that the product calculated below is a maximum:

$$\left(Q_{ul2} \times \rho_{ul}\right)_{max}$$

Where

Qul is the volumetric flow rate at the inlet flange at operating conditions (not at normal conditions), in m3/h;

ρul is the density of the fluid with Qul at inlet flange in kg/m3.

Both the values of Qul and that of ρul shall be chosen from those declared by the manufacturer.

The test operating conditions shall be such that:

$$\left(Q_{ut2} \times \rho_{ut}\right) = 1,5 \times \left(Q_{ul2} \times \rho_{ul}\right)_{max}$$

Where

Qut is the volumetric flow rate at the inlet flange at test conditions (not at normal conditions), in m3/h;

ρut is the density of the test fluid with Qut at the inlet flange in kg/m3.

Test method:

These tests shall be carried out where technically possible and economically justified. Where this is not the case, alternative test methods may be used, e.g. those detailed in Annex D.

## 6. INSPECTION AND TESTING

### 6.1 General

Clause 6 provides guidance on the procedure that may be used when a certification of compliance with the requirements of this document is required.

The sub clauses in Clause 6 may be applied also to the conformity assessment to the PED.

### 6.2 Tests

Table 4 gives an overview of the different types of tests and correlates them to the requirements and test methods detailed in Clauses 4, 5 and 7.

The requirements in this chapter shall be followed when compliance evaluation with this document is requested.

Where compliance evaluation to this document is finalized with positive result, the SSD can bear as marking the number of this document.

Table 4 — Summary of tests and requirements

| Test schedule | | | Requirements | Test method | |
|---|---|---|---|---|---|
| T | M | S | Clause (According to EN14382) | Title | Clause (According to EN14382) |
| Constructional tests | | | | | |
| A | A | A | 4.1 | Dimensional check and visual inspection | 7.1 |
| A | A | A | 4.2 | Materials check | 7.2 |
| A | | | 4.4.1 | Verification of strength of elastomeric pressure containing parts | 7.3.2 |
| Functional tests | | | | | |
| A | A | A | 5.1.7 | Body and inner metallic partition walls strength test | 7.5 |
| A | A | A | 5.1.8 | External tightness test | 7.7 |
| A | A | A | 5.1.9 | Internal sealing test | 7.8 |
| A | A<br>a | A<br>a | 5.2 | Test at ambient temperature | 7.10.2 |

| | | | | | |
|---|---|---|---|---|---|
| A | | | 5.2 | Test at the limit temperatures −20 °C or −10 °C and 60 °C | 7.10.3 |
| A | | | 5.2 | Verification of the upper limit of highest set range for overpressure monitoring | 7.10.4 |
| A | | A | 5.3 | Response time | 7.11 |
| A | | | 5.4 | Re latching difference and unlatching(Trip pressure for over-pressure monitoring & lower trip pressure) | 7.12 |
| A | | | 5.5 | Closing force | 7.13 |
| A | | | 5.6 | Endurance and accelerated ageing | 7.14 |
| A | | | 5.7 | Verification of the strength of the trip mechanism, valve seat and closing member against dynamic impact b | 7.16 |
| A | | | 5.9 | Determination of the flow coefficient | 7.10.5 |
| A | | | 5.10.1 | Final visual inspection after type test | 7.17.1 |
| | A | A | 5.10.2 | Final visual inspection after routine tests and production surveillance | 7.17.2 |

A = Applicable
S = Production surveillance
M = Routine tests T = Type test

[a] Test: generally, as 7.10.2, but only at ambient temperature. N. 6 consecutive operations for test “S” and N. 2 consecutive operations for test “M”. The set range or the specific set range or the trip pressure in accordance to order specifications or at the manufacturer’s discretion when not otherwise specified.

[b] This test shall be carried out on SSDs only if there is a dynamic impact on the closure member in its fully open position.

### 6.3 Type test

Those tests (see Table 4) carried out to establish the performance classification of the SSD or the series of SSDs. These include verification of the documentation listed in 9.1.1.

NOTE This type test covers also the provisions of EC type-examination of Annex III of Directive 2014/68/EU.

When changes are made to the design of an SSD or a series of SSDs in such a manner as to affect the above tests, the manufacturer shall inform the parties involved, if any, in the compliance evaluation to this document.

### 6.4 Selection of test samples

The number and types of SSD to be subjected to type test shall be selected according to the following requirements:

- One SSD for each type of fixture and controller;
- two sizes from a series of up to six sizes and three sizes from series greater than six in number;
- One SSD for each accuracy group (AG).

If the same SSD can be used as a stand-alone or combined device, it will be tested only once.

### 6.5 Routine tests

Those tests (see Table 4) carried out on each SSDi by the manufacturer during the production process. The tests verify that materials, dimensions, external conditions and accuracy groups remain in compliance with the results of the type test.

Routine tests for integrated pressure regulators, if any, are detailed in EN 334:2019.

### 6.6 Production surveillance

Those tests and verifications (see Table 4) carried out in order to confirm continuing compliance with this document.

The tests and verifications include additionally:

- Verification of routine tests records;
- Verification of drawings and material certificates.

## 7 .Test and verification methods

### 7.1 Dimensional check and visual inspection

The actions to assess:

- The dimensional compliance of pressure bearing parts with the applicable drawings;
- The compliance of the SSD construction with the relevant assembly drawing and the construction requirements of this document.

### 7.2 Materials check

The actions to assess the compliance of the materials used or prescribed with the requirements in 4.2.

The verification of the materials used shall be carried out by the review of the material certificates.

The verification of the materials prescribed shall be carried out by the review of the list of parts.

### 7.3 Verification of the strength of parts under pressure

**7.3.1** Elastomeric pressure containing parts

Diaphragms used as pressure containing parts in chambers subjected to a maximum differential pressure Δpmax shall withstand a test pressure of 4.4.

**7.4** Shell and inner metallic partition walls strength test

For this subject the provisions EN 334:2019, 7.7.4 shall be applied.

**7.5** Alternative shell and inner metallic partition walls strength test

For this subject the provisions EN 334:2019, 7.7.5 shall be applied.

### 7.6 External tightness test

**7.6.1** External tightness test of metallic housing

The assembled SSD and its auxiliary devices are pneumatically tested to assess compliance with the requirements detailed below. The test is carried out at ambient temperature with air or gas at the test pressure specified in Table 4. This test shall be carried out for at least:

- 15 min in the type test;
- 1 min in the routine tests and in the production surveillance.

The result of test is satisfactory if one of the following conditions is met:

- bubble tight for a time of 5 s. This test may be carried out by covering the SSD with a foaming liquid, by immersing the SSD into a tank of water or by other equivalent methods;
- External leakage not higher than the values listed in Table 5.

The test pressures in Table 5 do not apply to any chambers bounded on at least one side by a diaphragm even if they are subjected to gas pressure under normal operating conditions.

The test is carried out in such a manner that deformations of the SSD in all directions are possible. There shall be no additional stresses due to bending, torque or tension. Forces from fastening systems shall be similar to those experienced under normal installation conditions at least during the type test.

Recognized alternative detection methods may be used for checking leakage (e.g. electronic device). For such methods the equivalence to the above requirements shall be demonstrated.

Table 5 — Pressure values in the external tightness test

| Chambers with the maximum allowable pressure PS | | Chambers with specific maximum allowable pressure PSD |
|---|---|---|
| Chamber of controller | Other chambers | |
| Test pressures | | |
| 1,2 $p_{d\,so,max}$, but at least 0,5 PS whichever is the greater | 1,1 PS | 1,1 PSD |

Table 6 — Maximum external and internal leakage rates

| Nominal size DN | Air leakage rate in cm3/h [a] | |
|---|---|---|
| | external | internal [b] |
| 25 | 40 | 15 |
| 40 to 80 | 60 | 25 |
| 100 to 150 | 100 | 40 |
| 200 to 250 | 150 | 60 |
| 300 to 350 | 200 | 100 |
| 400 | 400 | 300 |

A At normal conditions.

B Leakage class in accordance with EN 1349, if specified in the order specification, may be accepted for gas cut-off devices only.

**7.6.2** External tightness test of chambers bounded on at least one side by a diaphragm such chambers shall be pneumatically tested at a test pressure equal to at least:

| | |
|---|---|
| 0,2 bar | if $\Delta p_{max} < 0,15$ bar; |
| 1,33 $\Delta p_{max}$ | if 0,15 bar $\leq \Delta p_{max} < 5$ bar; |
| 1,1 $\Delta p_{max}$ but at least 6,6bar | if $\Delta p_{max} \geq 5$ bar. |

Test method and acceptance criteria shall be in accordance with 7.7.1.

## 7.7 Internal sealing test

The internal sealing test is carried out at ambient temperature with two different test pressures of 0, 1 bar and 1, 1 x PS upstream of the closing member and atmospheric pressure downstream of the assembled SSD and its auxiliary devices to assess compliance with the requirements of 5.1.9. This test may be carried out before or after the functional tests specified in 7.10.2.

SSDs built into regulators are tested with the regulator in the open position.

When leakage class in accordance with EN 1349 is requested in the order specification, the test method to measure the leakage class shall be in accordance with EN 1349.

## 7.8 Accuracy group

### 7.8.1 General conditions

The tests may be carried out with either air or gas. Wherever necessary measured flow rates are converted into values that are related to air at normal conditions. Pressure measurement devices shall have an accuracy of at least 0, 25 AG. Tests shall be carried out at ambient temperature. SSDs shall be tested in the mounting position specified by the manufacturer.

The external sensing and loading pressure lines shall be located on the pipeline according to the prescription of the manufacturer.

The test is carried out in a test rig (equivalent to Figure 6) under the following operating conditions:

- The body of the SSD is pressurized from both ends;
- The controller of the SSD is pressurized with a variable pressure representing the monitored pressure. The rate of the pressure change is kept constant;
- The whole unit is installed in a chamber with a controlled temperature between –10 °C (or –20 °C) and +60 °C for tests at limit temperatures.

The accuracy groups for overpressure protection and under-pressure protection, if applicable, are determined separately.

### 7.8.2 Accuracy Group test at ambient temperature

Test method:

For each specified accuracy group (AG) and relevant:

- Maximum inlet pressure pumax,
- set range;

a) ensure that the body is at atmospheric pressure;

b) adjust the trip pressure to the lower limit of the set range;

c) with the SSD in the open position, starting from approximately 80 % of the selected trip pressure, increase the monitored pressure with a pressure change rate not greater than 1,5 % of the selected trip pressure per second until closure of the SSD occurs;

d) repeat test c) five times; the set value is the arithmetic mean of the six actual values; the routine tests are repeated once only and the set value is the arithmetic mean of the two actual values;

e) without further adjustment repeat the tests c) to d) with the body pressurized to the maximum inlet pressure ($pu_{max}$);

f) The set point is the arithmetic mean of the two set values calculated in d) and e).

The test method for under pressure protection is similar to that specified above; the starting pressure for operation c) shall be 120 % of the selected trip pressure.

The test requirements are met if all the values of the trip pressure in c), d) and e) are within:

$$p_{ds} \times (1 \pm \frac{AG}{100})$$

### 7.8.3 Accuracy Group test at the limit temperatures –20 °C or –10 °C and 60 °C

The tests are carried out in a temperature controlled chamber, at the lowest limits of (−20 ± 2) °C or (−10 ± 2) °C with a dry test medium (dew point ≤ −25 °C) and at (60 ± 2) °C.

There shall be no adjustment of the trip pressure between the test at ambient temperature (7.10.2) and this test.

Test method:

a) pressurize the body of SSD in the open position and maintain the inlet pressure at 0,1 bar;

b) adjust the temperature of the test chamber to the limit value; the test may commence when the temperature becomes uniform in all parts of the SSD with a tolerance of ± 2 °C;

c) starting from approximately 80 % of the selected trip pressure, increase the monitored pressure at a rate of change not greater than 1,5 % of the selected trip pressure per second until closure of the SSD occurs;

d) verify the internal sealing;

e) The test method for under-pressure protection is similar to that specified above; the starting pressure for operations c) shall be 120 % of the selected trip pressure.

The test requirements are met if the internal sealing complies with the requirement in 5.2 and the value of the trip pressure in c) corresponds to the specified accuracy group.

For the tests at –20 °C and at –10 °C only, the results may correspond to accuracy groups at ambient temperature multiplied by 2 except when, at ambient temperature, AG = 30. In this case the AG = 30 may be multiplied by 1, 5.

EXAMPLE At ambient temperature AG 5 may change to AG 10 both at –20 °C and at –10 °C.

At ambient temperature AG 30 may change to AG 45 both at –20 °C and at –10 °C.

### 7.8.4 Verification of the upper limit of the highest set range for overpressure monitoring

Test method:

Ensure that the body is at atmospheric pressure;

Adjust the trip pressure to the upper limit of the highest set range;

Starting from approximately 80 % of the selected trip pressure increase the monitored pressure at a rate of change not greater than 1, 5 % of the selected trip pressure per second until closure of the SSD occurs;

Repeat the test c) five times;

Calculate the arithmetic mean of the six actual values.

The test requirements are met if the set value calculated in e) corresponds to the specified accuracy group.

### 7.8.5 Determination of flow coefficient

For a stand-alone SSD, a specific determination shall be carried out by testing the SSD with its closing member in fully open position, in a test rig in accordance with EN 334:2019, 7.7.9.4.7 Cg or KG according to EN 334:2019, 7.7.9.2 The following flow coefficient equations may be used:

- Those appropriate in EN 334:2019, 7.7.9.2 referred to sub-critical conditions i.e. Formulae (7), (8) and (12); or

-Cv flow coefficient in accordance with EN 60534-1 as detailed below.

The Cv coefficient shall be determined for at least three different operating conditions with:

$$C_{vi} = 404,83 \times \frac{Q_n}{\sqrt{\Delta p \times \frac{p_u + p_b}{d \times (t_u + 273,15)}}}$$

where

| | |
|---|---|
| Cvi | is the flow coefficient for a test; |
| Qn | is the flow rate in m3/h at normal conditions with fluid with the relative density d and inlet temperature tu; |
| Δp | is the pressure drop across the SSD in bar; |
| pu | is the inlet pressure in bar; |
| tu | is the inlet temperature in °C; |
| pb | is the absolute ambient atmospheric pressure in bar; |
| d | is the relative density (air = 1, not dimensional value). |

The Cv flow coefficient shall be assumed to be equal to the arithmetic mean of the three values. For Cv values a tolerance of ± 10 % against the declared value is permitted.

### 7.9 Closing force

When tested in accordance with 7.13, the closing force shall ensure closing of the closing member by a sufficient safety factor under all operating conditions. In the case of closing springs, appropriate measures against breakage shall be considered as those detailed in 4.1.9.

The closing forces shall correspond to the following:

Open position:

Fs ≥ × ± × ± × + ×5 R f S f W f D

Closed position:

Fs ≥ × ± × ± ×2, 5 R f S f W

Where

*R* is the friction force in N, (non-static friction);

*S* is the unbalanced load in N from static pressure;

W is the weight in N of the moving parts;

D is the dynamic force in N on the closing member from the mass flowing through the SSD; f = 1, 1 where the force (S, W, D) opposes the closing of the closing member; f = 0, 9 where the force (S, W) assists the closing of the closing member.
The addition (+) is applied when the force opposes the closing of the closing member and the subtraction (-) when the force assists the closing of the closing member.

The dynamic force (D) is considered zero if it assists the closing of the closing member.
When there is any torque developed in moving parts by the flowing mass it shall be considered when calculating FS.
Both equations shall be verified at the most critical operating conditions in the most critical mounting position.

### 7.10 Final visual inspection

### 7.10.1 Final visual inspection after type test

Upon completion of the tests in 7.5 up to and including 7.16 and the tests in 7.4 and in Annex A when applicable, the test samples shall be dismantled and inspected to verify the compliance with the requirements detailed in 5.10.1.

### 7.10.2 Final visual inspection after routine tests and production surveillance

Upon completion of the routine tests the SSD shall be externally inspected.

## 8. Marking

Each safety slam shut off valve shall carry markings containing at least the following data :
-Manufacturer’s name and/or logo and/or registered trade-mark
-EN 14382 /IGS-M-IN-303(0)
-Ambient temperature range
-Serial number
-Year of manufacture
- Nominal size DN
-Flange ratings
- Maximum allowable pressure
-Specific set range;
-maximum component operating pressure pmax
- Additional marking in accordance with order specification

## 9. PACKING AND PACKAGING

Packing and Packaging is primarily based on IPS-G-GN-210 recommendations and additional requirements are specified here in.

**9.1** The supplier of the equipment under this specification is the sole responsible for packing and preparation for shipment.

**9.2** The packaging and preparation for shipment shall be adequate to avoid mechanical damage during transport and handling.

**9.3** The connections shall be fitted with suitable plastic covers to prevent the entry of foreign mater during transportation and storage.

**9.4** Depending on size and weight, meters with DN 100 connections and above shall be securely fastened to a hard wood skid of pallet suitable for fork truck handling and shall be covered for protection against dirt and moisture during transport and outdoor storage.

**9.5** Each meter package container shall be provided with permanently attached identification tag containing necessary information.

**9.6** Silica-gel of similar dehydrating compounds shall be enclosed in each meter package container.

**9.7** The transportation and storage should be according to EN 12261, clause 6.2.6.

## 10. Documentation

**10.1** A description of the Slam Shut-off Valve, giving the technical characteristics and the principles of its operation.

**10.2** A perspective drawing or photograph of the Slam Shut-off Valve.

**10.3** A dimensional drawing.

**10.4** A drawing showing the location of verification marks and seals

**10.5** Instructions for installation, operation, periodic maintenance and trouble – shooting

**10.6** Maintenance documentation including third–party drawings for any filed repairable components.

**10.7** Documentations about that the designs and constructions comply with applicable safety codes and regulations

**10.8** a list of the documents submitted

**10.9** Manufacturer standard (informative)

**10.10** Completed, signed and submitted attached data sheet

Note: All the documents should be dated.

## 11. DATA SHEET

| **To be filled by Purchaser** | **To be Filled by Manufacturer /Supplier** |
|---|---|
| Inquiry No: | Quotation No. : |
| Inquiry Date : | Quotation Date : |
| NIGC Standard : IGS-M-IN-303(0) | Catalogue No. : |
| | Standard: |
| The Data Sheet is Provided by : | Manufacturer ☐ Supplier ☐ |

| **Item** | **Inquiring** | | | | **Offer Data** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Indent Item No.** | **Size/ Class** | **Required Flow Rate** | **Required Quantity** | **Offer Item No.** | **Size/ Class** | **Offered Flow Rate** | **Offered Quantity** |
| | | | | | | | | |

Note 1: This data sheet is an integrated part IGS-M-IN-303(0) and should not be used separately.

Manufacture/ Supplier Signature and Stamp:

| Item | Subject | To be filled by Purchaser | To be filled by Manufacture/supplier |
|---|---|---|---|
| **General** | Tag No.: | …………… | …………… |
| | Application: | …………… | …………… |
| | Types: | Stand-alone ☐ | Yes ☐ No ☐ |
| | | integrated into a Gas Pressure Regulator ☐ | Yes ☐ No ☐ |
| | Acting Types: | Direct Acting ☐ | Yes ☐ No ☐ |
| | | Indirect Acting ☐ | Yes ☐ No ☐ |
| | Model No.: | _____ | ………….. |
| | P&ID (Attached ): | To be Provided by Purchaser | Yes ☐ No ☐ |
| **Performance Data** | Fluid: | Natural Gas | _______ |
| | Allowable Pressure (Ps): | _____ bar/psi | …. bar/psi |
| | Maximum Operating Pressure (Pumax): | ____ bar/psi | ..… bar/psi |
| | Specific Set Range for Overpressure ($W_{dso}$): | ___ to ___ bar/psi | …... To….. bar/psi |
| | Specific Set Range for Under pressure ($W_{dsu}$): | | …... To….. bar/psi |
| | Trip Pressure for Overpressure ($P_{do}$): | ___ bar/psi | ….. bar/psi |
| | Trip Pressure for Under pressure: | ___ bar/psi | ….. bar/psi |
| | Response Time (ta): | ____ | …. |
| | Accuracy Group (AG) (Note 2): | ____ | …. |
| | Valve Seat Diameter (mm): | ____ | …. |
| | Maximum Pressure drop: | to be calculated by Manufacturer | …. |
| | Max Flow Rate ($S_{cmh}$): | to be calculated by Manufacturer | …. |
| | Gas inlet temperature (ºC): | Min.: -10 Max.: +45 (Otherwise please specify) | Min.: ….. Max.: ….. |
| | Design temperature (ºC): | _______ | ………… |
| | Ambient temperature (ºC): | Min.: -25 Max.: +55 | Min.: ….. Max.: ….. |
| | Specific gravity: | ……….. | _______ |
| | Standard Condition: | 1.01325 bara & 15.56 ºC (14.696 PSIA & 60 ºF) | Yes ☐ No ☐ |

Note 2: Accuracy group will be determined by the manufacturer.

Manufacture/ Supplier Signature and Stamp:

| Item | Subject | To be filled by Purchaser | To be filled by Manufacture/supplier |
|---|---|---|---|
| Slam shut off device data | Size (IN): | ……… | ……… |
| | Type of end Connections : | Flanged Ends (RF)<br>ACC. to ANSI B16.5 | Yes ☐ No ☐ |
| | Class Rating : | ANSI Class ……… | ANSI Class ……… |
| | Valve Body Material: | Carbon Steel According to ASTM A216 grade WCB ☐ or…. | Yes ☐ No ☐ |
| | Internal Metallic Parts Material: | Corrosion Resistant Material such as Stainless Steel/Aluminum Alloy / Brass or… | Yes ☐ No ☐ |
| | Bolt & Nut: | According to ASTM A 194 and ASTM A 193 | Yes ☐ No ☐ |
| | Controller Body Material : | Carbon steel according to ASTM A216 grade WCB | Yes ☐ No ☐ |
| | | Forged carbon steel according to ASTM A 105 | Yes ☐ No ☐ |
| | | Brass according to ASTM B 283 grade C 37700 or…. | Yes ☐ No ☐ |
| | | Aluminum Alloy according to ASTM B85 / AA6082 or…. | Yes ☐ No ☐ |
| | Sensing line Material: | S.S Type 316 | Yes ☐ No ☐ |
| | Internal Non - Metallic Parts: | Rubber or Plastic Material Resistant to Odorized Natural Gas | Yes ☐ No ☐ |
| | Minimum required safety factors: | As per clause 4.2.7 | Yes☐ No☐ |
| | Other Devices: | Internal By-Pass with Pressure Equalization Valve (Note 3) | Yes ☐ No ☐ |
| | | Lifting facilities (Note 3) | Yes ☐ No ☐ |
| | | External Visual Indicator(Note 3) | Yes☐ No ☐ |
| | | Manual Closing Device | Yes ☐ No ☐ |

Note 3: Applicable for stand-alone Types.

Manufacture/ Supplier Signature and Stamp:

| Item | Subject | To be filled by Purchaser | To be filled by Manufacture/supplier | |
|---|---|---|---|---|
| **Tests, Certificates, Guarantee** | Visual inspection: | For the Samples Selected by inspector | Yes ☐ | No ☐ |
| | Dimensional check: | For the Samples Selected by inspector | Yes ☐ | No ☐ |
| | Material check:<br>• Valve Body<br>• Pilot Body<br>• Internal Metallic Parts<br>• Non-metallic Parts<br>• Springs | Test Certificates | Yes ☐ | No ☐ |
| | Hydrostatic test: | Required for each SSD | Yes ☐ | No ☐ |
| | External leak test: | Required for each SSD | Yes ☐ | No ☐ |
| | Set pressure test: | Required for each SSD | Yes ☐ | No ☐ |
| | Accuracy class test: | Type Test | Yes ☐ | No ☐ |
| | Ambient Temperature Test: | Type Test | Yes ☐ | No ☐ |
| | Ice Formation: | Type Test | Yes ☐ | No ☐ |
| | Paint adhesion & Thickness test: | For the Samples Selected by inspector | Yes ☐ | No ☐ |
| | Guarantee: | 24 months after shipment or one year after putting in service whichever occurs first | Yes ☐ | No ☐ |

Manufacture/ Supplier Signature and Stamp