

# 133 and 233

## Light Commercial & Commercial Regulator

### Applications

The 133 and 233 regulators are designed for light commercial and commercial uses such as industries and heating plants, as well as for all installations where accurate pressure control, easy adjustment and fast response times are required, such as for burners, industrial ovens, boilers, etc.

### Description

The 133 and 233 regulators are direct-acting, spring loaded regulators with a built-in safety shut-off device.

A large choice of orifice sizes enables perfect matching of the different flow rates and inlet pressures.

The lever system ensures exact outlet pressure and fast response when the flow rate varies.

The 133 regulator and the flanged versions of the 233 regulators are equipped with a built-in filter (filtration grade 0.5 mm).

### Technical Features

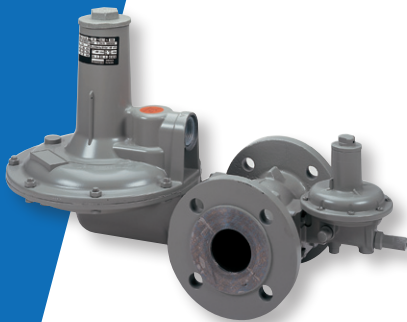
|                             |   |
|-----------------------------|---|
| Maximum inlet pressure      | 8.0 (10) bar  |
| Outlet pressure             | 10 mbar - 0.7 bar   |
| Accuracy & lock-up pressure | Up to AC 5 / up to SG 10  |
| Operating temperature       | Gas: -20°C to +60°C   |
| Ambient temperature         | -30°C to +60°C (body material)  |
| Acceptable gases            | Natural gas, propane, butane, air, nitrogen and all non-corrosive gases.                                      |
| Safety devices              | Optional built-in safety shut-off valve:<br>- OPSO: Over-pressure shut-off<br>- UPSO: Under-pressure shut-off |
| Options                     | Safety diaphragm<br>Safety relief valve   |

### Connections

|            |  |
|------------|--|
| Sizes      | DN 25, DN 40 and DN 50                             |
| Dimensions | See table page 2                                   |
| Flanges    | PN16, ANSI 150                                     |
| Thread     | G 3/4", G 1", G 1 1/2" ISO 228/1, Rp, NPT and BSPT |

### Materials

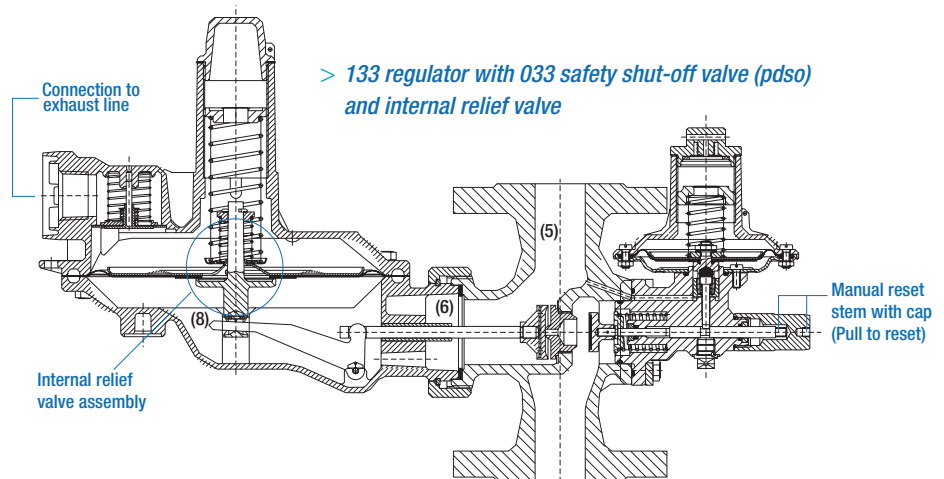
|                |  |
|----------------|--|
| Body           | Spheroidal graphite cast iron GGG 40, DIN 1693 |
| Actuator       | Cast aluminium GD-Al Si 12, DIN 1725           |
| SSV actuator   | Brass  |
| Internal parts | Brass/Steel, zinc protected                    |
| Seals          | NBR rubber/Viton                               |
| Diaphragm      | NBR rubber/NBR rubber, reinforced fabric       |

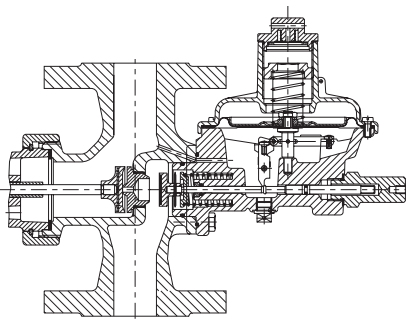


#### > Pressure Regulator 233

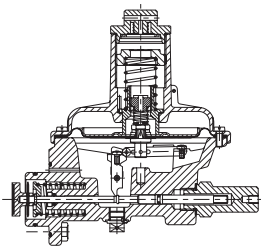
- > Wide range of interchangeable orifices
- > Can be installed in any position
- > Cartridge-type construction allows easy unit withdrawal without removing body from pipeline
- > Complies with high temperature requirements
- > Approved by German DVGW

#### > 133 regulator with 033 safety shut-off valve (pdso) and internal relief valve

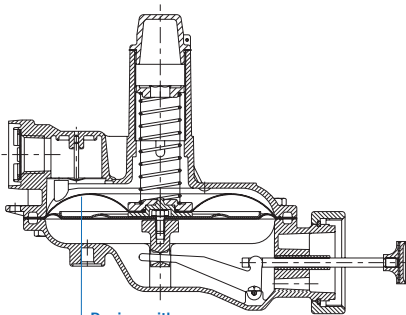




> Safety Shut-off valve type I (psv)  
Details



> Safety Shut-off valve type II (pdsu and pds)  
Details



Design with built-in safety diaphragm

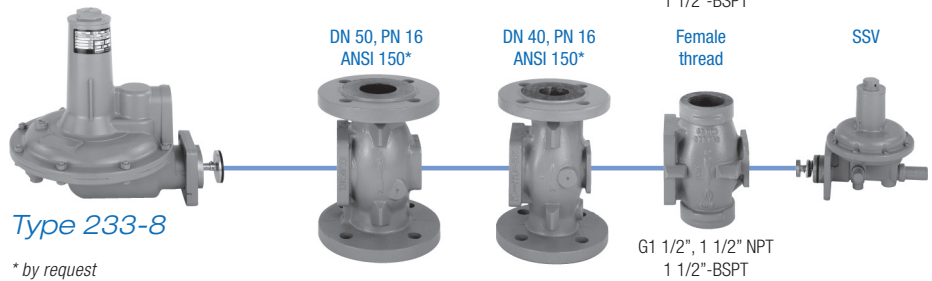
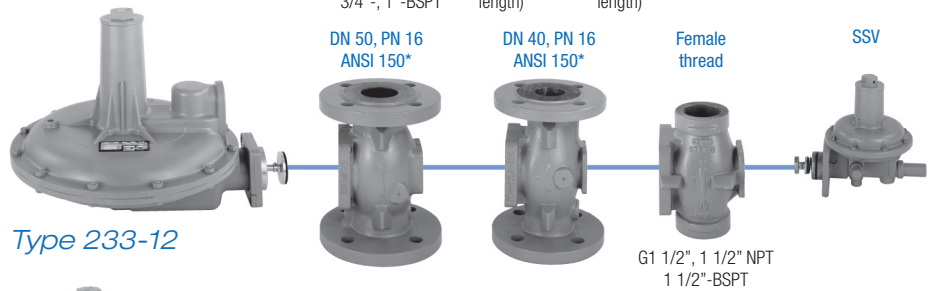
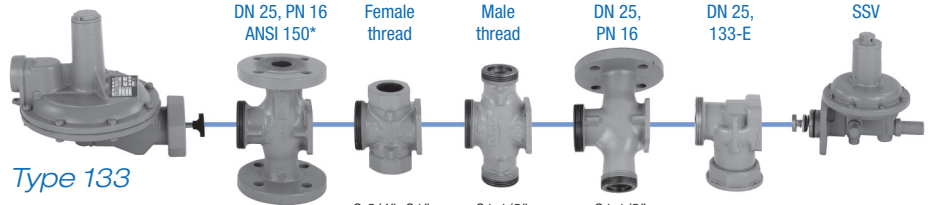
## Body Sizes & Actuator Type

### Selecting the Actuator

| Regulator Type | Actuator Type | Set Range (Wds) |
|----------------|---------------|-----------------|
| 133            |               | 8 - 210 mbar    |
|                | -HP           | 140 - 420 mbar  |
| 233            | -12           | 8 - 210 mbar    |
|                | -8            | 30 - 450 mbar   |
|                | -8HP          | 420 - 700 mbar  |

133 and 233 are differential strength, tightness-tested regulators.

### Body Sizes



\* by request

### Special Features

> **Gas loss protection:** this feature is available on the 133 regulator, where it replaces the UPSO function. In case the outlet pressure drops (to around 50% of the set value), the protection valve closes and interrupts the gas flow. A minimum bleed continues to feed the outlet installation. The protection valve is automatically reset when outlet installations are closed and outlet pressure increases back to the set value.

Outlet pressure might drop accidentally due to inlet pressure dropping below specifications, or gas demand exceeding the regulator capacity.

*Gas loss protection should not be used when inlet pressure exceeds 1 bar.*

> **Safety diaphragm:** this feature offers protection in case of rupture or leak at the main diaphragm. It limits the gas flow rate coming out through the vent connection to around 30 l/h. When the safety diaphragm is pressurized by a large gas leak from the main diaphragm, the outlet pressure increases by around 50%, and thus triggers the safety shut-off valve (OPSO).

*Safety diaphragm should not be used when inlet pressure exceeds 1 bar.*

> **External control line:** 133 and 233 regulators are delivered with an internal control line that optimises the regulator function due to the Venturi effect around the valve disc. However an external control line is recommended in case inlet pressure exceeds 4 bar. In this case, the internal control is removed.

### Relief valve setting:

The standard relief spring setting is 30 mbar above the outlet setting, with an accuracy of 10%.

## Safety Shut-off Valve

### Selecting the SSV

| Type | Max. operating pressure | Function    | Range               |              |
|------|-------------------------|-------------|---------------------|--------------|
|      |                         |             | Wdo                 | Wdu          |
| 033  | Differential strength   | OPSO        | 40 mbar to 0.45 bar | -            |
| I    | Differential strength   | OPSO        | 20 mbar to 1.0 bar  | -            |
| II   | Differential strength   | OPSO & UPSO | 20 mbar to 1.0 bar  | 8 to 50 mbar |

Note that OPSO and UPSO settings are adjustable **separately**.

#### Fire Resistance:

Every shut-off valve is equipped with a temperature fuse that triggers the valve in case of high temperature (around 180 to 200°C).

#### DVGW Safety Recommendations:

133 and 123 regulators are approved by the German DVGW under specific conditions concerning German regulations on safety and gas installations:

- > Inlet pressure below 6 bar
- > OPSO and UPSO safety shut-off valve is activated when inlet pressure exceeds 5 bar.

## Outlet Pressure Range

### Regulator

| Regulator Type                  | Spring Code | Spring Color                      | Spring Range   |
|---------------------------------|-------------|-----------------------------------|----------------|
| 133<br>with gas loss protection | 955-200-08  | red                               | 9 - 15 mbar    |
|                                 | 955-200-09  | blue                              | 14 - 20 mbar   |
|                                 | 955-201-06  | silver                            | 18 - 26 mbar   |
|                                 | 955-202-98  | yellow                            | 24 - 40 mbar   |
|                                 | 955-200-11  | orange                            | 38 - 53 mbar   |
| 133                             | 955-200-08  | red                               | 8 - 16 mbar    |
|                                 | 955-200-09  | blue                              | 12 - 20 mbar   |
|                                 | 955-200-10  | green                             | 15 - 35 mbar   |
|                                 | 955-200-11  | orange                            | 30 - 70 mbar   |
|                                 | 955-200-12  | black-white                       | 50 - 140 mbar  |
|                                 | 955-200-83  | silver                            | 100 - 210 mbar |
|                                 | 955-200-84  | black                             | 140 - 420 mbar |
| 233-12                          | 955-200-13  | red                               | 8 - 16 mbar    |
|                                 | 955-200-14  | blue                              | 12 - 20 mbar   |
|                                 | 955-200-15  | green                             | 15 - 35 mbar   |
|                                 | 955-200-16  | orange                            | 30 - 70 mbar   |
|                                 | 955-200-17  | black                             | 70 - 140 mbar  |
|                                 | 955-200-18  | metal blank                       | 100 - 210 mbar |
|                                 | 955-200-15  | green                             | 30 - 70 mbar   |
|                                 | 955-200-16  | orange                            | 70 - 140 mbar  |
| 233-8                           | 955-200-17  | black                             | 140 - 300 mbar |
|                                 | 955-200-18  | metal blank                       | 210 - 450 mbar |
|                                 | 955-200-69  | silver+metal blank tandem springs | 420 - 700 mbar |
| 233-8 HP                        | 955-200-69  |                                   |                |
|                                 | 955-200-18  |                                   |                |

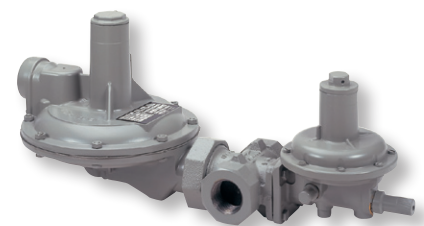
## Safety Shut-off Valves

### SSV 033

| Over-pressure shut-off (OPSO) | Spring Code | Spring Color | Spring Range   |
|-------------------------------|-------------|--------------|----------------|
| SSV 033                       | 955-200-22  | red          | 40 - 70 mbar   |
|                               | 955-200-23  | blue         | 50 - 150 mbar  |
|                               | 955-200-24  | green        | 140 - 450 mbar |

### SSV I - SSV II

| Over-pressure shut-off (OPSO)  | Spring Code | Spring Color | Spring Range    |
|--------------------------------|-------------|--------------|-----------------|
| SSV I and II                   | 955-200-22  | red          | 20 - 60 mbar    |
|                                | 955-200-23  | blue         | 50 - 120 mbar   |
|                                | 955-200-24  | green        | 100 - 400 mbar  |
|                                | 955-200-52  | brown        | 300 - 600 mbar  |
|                                | 955-202-42  | silver       | 400 - 1000 mbar |
| Under-pressure shut-off (UPSO) | Spring Code | Spring Color | Spring Range    |
| SSV II                         | 955-200-32  | red          | 8 - 50 mbar     |



> Pressure Regulator 133

Accuracy class (AC),  
lock-up pressure class (SG)  
and lock-up pressure zone (SZ) :

- > 8 - 20 mbar: AC 20 / SG 30
- > 20 - 50 mbar: AC 10 / SG 20
- > 50 - 700 mbar: AC 5 / SG 10

The typical lock-up pressure zone is SZ 5.

Accuracy class (AG):

- > OPSO: AG 10
- > Minimum difference between regulator and SSV settings ( $\Delta P_w$ ): 20 mbar for OPSO

Accuracy class (AG):

- > OPSO:
  - 20 - 400 mbar: AG 10
  - 0.4 - 1 bar: AG 5
- > UPSO:
  - 8 - 20 mbar: AG 30
  - 20 - 50 mbar: AG 10
- > Minimum difference between regulator and SSV settings ( $\Delta P_w$ ):
  - 14 mbar for UPSO
  - 20 mbar for OPSO

## Flow Capacity

### Regulator Type 133, DN 25

The volumes marked in **bold** are not regulated with the accuracy indicated.

**Do not operate the orifice in the inlet pressure areas marked with ■.**

#### Standard conditions:

- Absolute pressure of 1.013 bar
- Temperature of 15°C

#### Correction factor for non-natural gas applications:

The flow rates are indicated for a 0.6 specific gravity gas.

To determine the volumetric flow rate for gases other than natural gas, multiply or calculate the values in the capacity tables using the sizing equations with a correction factor.

The table below lists correction factors for some common gases:

| Gas type              | Specific gravity | Correction factor |
|-----------------------|------------------|-------------------|
| Air                   | 1.00             | 0.77              |
| Butane                | 2.01             | 0.55              |
| Carbon dioxide (dry)  | 1.52             | 0.63              |
| Carbon monoxide (dry) | 0.97             | 0.79              |
| Natural gas           | 0.60             | 1.00              |
| Nitrogen              | 0.97             | 0.79              |
| Propane               | 1.53             | 0.63              |
| Propane-Air mix       | 1.20             | 0.71              |

*Specific gravity or relative density (air = 1, non-dimensional value)*

Use the following formula to calculate the correction factor for gases not listed above. In the formula, d is the specific gravity of the gas.

$$\text{Correction factor} = \sqrt{\frac{0.6}{d}}$$

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |              |              |               |                |             |
|-------------------------|----------------------|--|--------------|--------------|---------------|----------------|-------------|
|                         |                      | Orifice size                             |              |              |               |                |             |
|                         |                      | 12.5 mm (1/2")                           | 10 mm (3/8") | 8 mm (5/16") | 6.3 mm (1/4") | 4.7 mm (3/16") | 3 mm (1/8") |
| 20 mbar                 | 0.1                  | 24                                       | 17           | 16           | 9             | ■              | ■           |
|                         | 0.3                  | 40                                       | 36           | 29           | 22            | 12             | 6           |
|                         | 0.5                  | 48                                       | 46           | 40           | 30            | 17             | 8           |
|                         | 1.0                  | 61                                       | 56           | 53           | 41            | 25             | 12          |
|                         | 1.5                  | ■  | 63           | 61           | 56            | 33             | 14          |
|                         | 2.0                  | ■  | <b>64</b>    | <b>63</b>    | 57            | 38             | 18          |
|                         | 3.0                  | ■  | ■            | ■            | 59            | 51             | 24          |
|                         | 4.0                  | ■  | ■            | ■            | <b>64</b>     | 52             | 31          |
|                         | 5.0                  | ■  | ■            | ■            | ■             | 53             | 35          |
|                         | 6.0                  | ■  | ■            | ■            | ■             | <b>54</b>      | 40          |
| 50 mbar                 | 0.1                  | 14                                       | 13           | 11           | ■             | ■              | ■           |
|                         | 0.3                  | 31                                       | 29           | 22           | 16            | 12             | 4           |
|                         | 0.5                  | 44                                       | 42           | 37           | 24            | 15             | 8           |
|                         | 1.0                  | 58                                       | 52           | 46           | 40            | 24             | 11          |
|                         | 1.5                  | ■  | 59           | 57           | 54            | 30             | 14          |
|                         | 2.0                  | ■  | <b>61</b>    | <b>60</b>    | 56            | 35             | 16          |
|                         | 3.0                  | ■  | ■            | ■            | 60            | 48             | 22          |
|                         | 4.0                  | ■  | ■            | ■            | <b>65</b>     | 53             | 27          |
|                         | 5.0                  | ■  | ■            | ■            | ■             | 54             | 30          |
|                         | 6.0                  | ■  | ■            | ■            | ■             | <b>56</b>      | 36          |
| 100 mbar                | 0.2                  | 22                                       | 18           | 14           | 12            | 8              | 3           |
|                         | 0.3                  | 33                                       | 28           | 18           | 16            | 11             | 4           |
|                         | 0.5                  | 50                                       | 35           | 28           | 24            | 12             | 8           |
|                         | 1.0                  | 60                                       | 52           | 48           | 39            | 23             | 12          |
|                         | 1.5                  | ■  | 58           | 56           | 52            | 29             | 13          |
|                         | 2.0                  | ■  | <b>60</b>    | <b>59</b>    | 55            | 34             | 16          |
|                         | 3.0                  | ■  | ■            | ■            | 60            | 48             | 21          |
|                         | 4.0                  | ■  | ■            | ■            | <b>63</b>     | 52             | 25          |
|                         | 5.0                  | ■  | ■            | ■            | ■             | 60             | 31          |
|                         | 6.0                  | ■  | ■            | ■            | ■             | 65             | 35          |
| 140 mbar                | 0.1                  | ■  | ■            | ■            | ■             | ■              | ■           |
|                         | 0.3                  | 18                                       | 15           | 12           | 10            | 7              | 3           |
|                         | 0.5                  | 25                                       | 21           | 17           | 14            | 10             | 6           |
|                         | 1.0                  | 44                                       | 36           | 29           | 22            | 17             | 10          |
|                         | 1.5                  | ■  | 46           | 38           | 28            | 24             | 13          |
|                         | 2.0                  | ■  | <b>53</b>    | 43           | 35            | 29             | 16          |
|                         | 3.0                  | ■  | ■            | <b>56</b>    | 47            | 39             | 22          |
|                         | 4.0                  | ■  | ■            | ■            | <b>59</b>     | 49             | 26          |
|                         | 5.0                  | ■  | ■            | ■            | ■             | 55             | 31          |
|                         | 6.0                  | ■  | ■            | ■            | ■             | 65             | 35          |
| 300 mbar                | 0.5                  | 18                                       | 15           | 11           | 8             | 6              | ■           |
|                         | 1.0                  | 35                                       | 29           | 23           | 16            | 13             | 9           |
|                         | 1.5                  | ■  | 38           | 33           | 25            | 18             | 12          |
|                         | 2.0                  | ■  | <b>46</b>    | 40           | 33            | 25             | 15          |
|                         | 3.0                  | ■  | ■            | 53           | 43            | 38             | 21          |
|                         | 4.0                  | ■  | ■            | <b>66</b>    | <b>51</b>     | 46             | 26          |
|                         | 5.0                  | ■  | ■            | ■            | ■             | 55             | 31          |
|                         | 6.0                  | ■  | ■            | ■            | ■             | 65             | 35          |
|                         | 8.0                  | ■  | ■            | ■            | ■             | <b>79</b>      | 42          |
|                         | 400 mbar             | 0.7                                      | 26           | 22           | 17            | 12             | 10          |
| 1.0                     |                      | 33                                       | 28           | 21           | 17            | 12             | 8           |
| 1.5                     |                      | ■  | 37           | 31           | 26            | 16             | 10          |
| 2.0                     |                      | ■  | <b>44</b>    | 38           | 31            | 23             | 12          |
| 3.0                     |                      | ■  | ■            | 50           | 41            | 36             | 18          |
| 4.0                     |                      | ■  | ■            | <b>64</b>    | <b>49</b>     | 44             | 24          |
| 5.0                     |                      | ■  | ■            | ■            | ■             | 53             | 29          |
| 6.0                     |                      | ■  | ■            | ■            | ■             | 63             | 33          |
| 8.0                     |                      | ■  | ■            | ■            | ■             | <b>77</b>      | 40          |

Regulator Type 133-E, DN 25

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |              |              |               |                |             |
|-------------------------|----------------------|--|--------------|--------------|---------------|----------------|-------------|
|                         |                      | Orifice size                             |              |              |               |                |             |
|                         |                      | 12.5 mm (1/2")                           | 10 mm (3/8") | 8 mm (5/16") | 6.3 mm (1/4") | 4.7 mm (3/16") | 3 mm (1/8") |
| 20 mbar                 | 0.1                  | 16                                       | 15           | 12           | 11            | 7              | 3           |
|                         | 0.3                  | 27                                       | 26           | 18           | 14            | 12             | 6           |
|                         | 0.5                  | 32                                       | 28           | 19           | 17            | 15             | 8           |
|                         | 1.0                  | 38                                       | 37           | 20           | 20            | 19             | 11          |
| 50 mbar                 | 0.1                  | ■  | ■            | ■            | ■             | ■              | ■           |
|                         | 0.3                  | 20                                       | 16           | 12           | 10            | 7              | 5           |
|                         | 0.5                  | 24                                       | 20           | 14           | 12            | 10             | 6           |
|                         | 1.0                  | 29                                       | 26           | 17           | 16            | 14             | 10          |
| 100 mbar                | 0.1                  | ■  | ■            | ■            | ■             | ■              | ■           |
|                         | 0.3                  | 21                                       | 18           | 12           | 10            | 9              | 4           |
|                         | 0.5                  | 28                                       | 23           | 16           | 12            | 10             | 6           |
|                         | 1.0                  | 40                                       | 38           | 23           | 19            | 16             | 10          |

Regulator Type 133, DN 25 With Gas Loss Protection

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |
|-------------------------|----------------------|--|
|                         |                      | Orifice size 12.5 mm                     |
| 20 mbar                 | 0.1 bar              | 13                                       |
|                         | 0.3 bar              | 20                                       |
|                         | 0.5 bar              | 25                                       |
|                         | 1.0 bar              | 32                                       |
| 50 mbar                 | 0.15 bar             | 14                                       |
|                         | 0.3 bar              | 22                                       |
|                         | 0.5 bar              | 27                                       |
|                         | 1.0 bar              | 34                                       |

The volumes marked in **bold** are not regulated with the accuracy indicated.

Do not operate the orifice in the inlet pressure areas marked with ■.

Regulator Type 233-12, DN 40

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |                  |                    |                  |                   |
|-------------------------|----------------------|--|------------------|--------------------|------------------|-------------------|
|                         |                      | Orifice size & Valve disk angle          |                  |                    |                  |                   |
|                         |                      | 25 mm (1") 30°                           | 20 mm (3/4") 10° | 12.5 mm (1/2") 10° | 10 mm (3/8") 10° | 6.3 mm (1/4") 10° |
| 20 mbar                 | 0.1                  | 75                                       | 58               | 40                 | 24               | 12                |
|                         | 0.3                  | 142                                      | 114              | 82                 | 48               | 23                |
|                         | 0.5                  | 188                                      | 149              | 110                | 64               | 32                |
|                         | 1.0                  | 250                                      | 208              | 158                | 98               | 47                |
|                         | 1.5                  | <b>280</b>                               | 241              | 195                | 125              | 57                |
|                         | 2.0                  | ■  | 260              | 215                | 147              | 68                |
|                         | 3.0                  | ■  | 300              | 266                | 190              | 92                |
|                         | 4.0                  | ■  | <b>310</b>       | 300                | 210              | 113               |
|                         | 5.0                  | ■  | ■                | 300                | 210              | 113               |
|                         | 6.0                  | ■  | ■                | 300                | 250              | 130               |
| 50 mbar                 | 0.1                  | 51                                       | 43               | 26                 | 20               | ■                 |
|                         | 0.3                  | 125                                      | 95               | 62                 | 43               | 21                |
|                         | 0.5                  | 169                                      | 130              | 88                 | 58               | 29                |
|                         | 1.0                  | 250                                      | 190              | 140                | 95               | 46                |
|                         | 1.5                  | <b>286</b>                               | 228              | 180                | 120              | 57                |
|                         | 2.0                  | ■  | 254              | 210                | 140              | 68                |
|                         | 3.0                  | ■  | 295              | 250                | 190              | 90                |
|                         | 4.0                  | ■  | <b>315</b>       | 280                | 220              | 110               |
|                         | 5.0                  | ■  | ■                | 300                | 230              | 122               |
|                         | 6.0                  | ■  | ■                | 300                | 250              | 130               |
| 100 mbar                | 0.1                  | ■  | ■                | ■                  | <b>250</b>       | 160               |
|                         | 0.2                  | 73                                       | 52               | 38                 | 25               | 15                |
|                         | 0.3                  | 110                                      | 81               | 54                 | 36               | 20                |
|                         | 0.5                  | 160                                      | 119              | 79                 | 53               | 30                |
|                         | 1.0                  | 237                                      | 183              | 136                | 90               | 44                |
|                         | 1.5                  | <b>266</b>                               | 221              | 168                | 119              | 57                |
|                         | 2.0                  | ■  | 258              | 204                | 142              | 65                |
|                         | 3.0                  | ■  | 290              | 248                | 191              | 87                |
|                         | 4.0                  | ■  | <b>319</b>       | 277                | 230              | 109               |
|                         | 5.0                  | ■  | ■                | 300                | 240              | 124               |
| 200 mbar                | 0.1                  | ■  | ■                | ■                  | <b>250</b>       | 160               |
|                         | 0.4                  | 140                                      | 107              | 70                 | 45               | 22                |
|                         | 0.5                  | 175                                      | 134              | 90                 | 56               | 27                |
|                         | 1.0                  | 304                                      | 224              | 156                | 98               | 43                |
|                         | 1.5                  | <b>355</b>                               | 272              | 207                | 127              | 57                |
|                         | 2.0                  | ■  | 291              | 230                | 142              | 64                |
|                         | 3.0                  | ■  | 350              | 287                | 190              | 86                |
|                         | 4.0                  | ■  | <b>376</b>       | 310                | 230              | 110               |
|                         | 5.0                  | ■  | ■                | 320                | 250              | 125               |
|                         | 6.0                  | ■  | ■                | 330                | 260              | 130               |

Regulator Type 233-8, DN 40

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |                  |                    |                  |                   |
|-------------------------|----------------------|--|------------------|--------------------|------------------|-------------------|
|                         |                      | Orifice size & Valve disk angle          |                  |                    |                  |                   |
|                         |                      | 25 mm (1") 30°                           | 20 mm (3/4") 10° | 12.5 mm (1/2") 10° | 10 mm (3/8") 10° | 6.3 mm (1/4") 10° |
| 50 mbar                 | 0.2                  | 75                                       | 56               | 30                 | 19               | 14                |
|                         | 0.3                  | 105                                      | 78               | 47                 | 30               | 18                |
|                         | 0.5                  | 142                                      | 115              | 68                 | 46               | 26                |
|                         | 1.0                  | 235                                      | 189              | 132                | 90               | 46                |
|                         | 1.5                  | <b>262</b>                               | 223              | 166                | 118              | 55                |
|                         | 2.0                  | ■  | 255              | 200                | 147              | 68                |
|                         | 3.0                  | ■  | ■                | 243                | 190              | 90                |
|                         | 4.0                  | ■  | ■                | 278                | 232              | 112               |
|                         | 5.0                  | ■  | ■                | <b>293</b>         | 254              | 126               |
|                         | 6.0                  | ■  | ■                | <b>304</b>         | 270              | 138               |
| 100 mbar                | 0.3                  | 93                                       | 73               | 41                 | 26               | 18                |
|                         | 0.5                  | 136                                      | 106              | 65                 | 42               | 26                |
|                         | 1.0                  | 220                                      | 170              | 114                | 79               | 41                |
|                         | 1.5                  | <b>261</b>                               | 205              | 149                | 102              | 55                |
|                         | 2.0                  | ■  | 236              | 180                | 126              | 66                |
|                         | 3.0                  | ■  | ■                | 231                | 186              | 87                |
|                         | 4.0                  | ■  | ■                | 263                | 225              | 109               |
|                         | 5.0                  | ■  | ■                | <b>285</b>         | 248              | 128               |
|                         | 6.0                  | ■  | ■                | <b>300</b>         | 275              | 146               |
|                         | 8.0                  | ■  | ■                | ■                  | ■                | <b>178</b>        |
| 200 mbar                | 0.4                  | 124                                      | 96               | 63                 | 42               | 23                |
|                         | 0.5                  | 148                                      | 118              | 79                 | 52               | 27                |
|                         | 1.0                  | 260                                      | 198              | 127                | 90               | 46                |
|                         | 1.5                  | <b>298</b>                               | 252              | 152                | 117              | 58                |
|                         | 2.0                  | ■  | 296              | 190                | 143              | 70                |
|                         | 3.0                  | ■  | ■                | 266                | 197              | 89                |
|                         | 4.0                  | ■  | ■                | 300                | 240              | 112               |
|                         | 5.0                  | ■  | ■                | <b>312</b>         | 256              | 131               |
|                         | 6.0                  | ■  | ■                | <b>324</b>         | 279              | 146               |
|                         | 8.0                  | ■  | ■                | ■                  | ■                | <b>178</b>        |
| 400 mbar                | 0.7                  | 152                                      | 126              | 86                 | 61               | 32                |
|                         | 1.0                  | 220                                      | 175              | 118                | 80               | 46                |
|                         | 1.5                  | <b>277</b>                               | 214              | 142                | 107              | 54                |
|                         | 2.0                  | ■  | 256              | 172                | 130              | 66                |
|                         | 3.0                  | ■  | ■                | 223                | 167              | 86                |
|                         | 4.0                  | ■  | ■                | 241                | 176              | 108               |
|                         | 5.0                  | ■  | ■                | <b>266</b>         | 206              | 127               |
|                         | 6.0                  | ■  | ■                | <b>281</b>         | 217              | 142               |

## Flow Capacity (cont'd)

### Regulator Type 233-12, DN 50

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |                  |                  |                    |                  |                   |
|-------------------------|----------------------|--|------------------|------------------|--------------------|------------------|-------------------|
|                         |                      | Orifice size & Valve disk angle          |                  |                  |                    |                  |                   |
|                         |                      | 25 mm (1") 30°                           | 20 mm (3/4") 30° | 20 mm (3/4") 10° | 12.5 mm (1/2") 10° | 10 mm (3/8") 10° | 6.3 mm (1/4") 10° |
| 20 mbar                 | 0.1                  | 97                                       | 74               | 66               | 41                 | 25               | 12                |
|                         | 0.3                  | 214                                      | 180              | 142              | 79                 | 50               | 23                |
|                         | 0.5                  | 288                                      | 250              | 187              | 119                | 69               | 30                |
|                         | 1.0                  | 385                                      | 360              | 267              | 182                | 106              | 46                |
|                         | 1.5                  | <b>425</b>                               | 400              | 292              | 230                | 128              | 57                |
|                         | 2.0                  | ■  | 410              | 317              | 255                | 153              | 68                |
|                         | 3.0                  | ■  | ■                | 362              | 324                | 205              | 86                |
|                         | 4.0                  | ■  | ■                | <b>394</b>       | 340                | 240              | 105               |
|                         | 5.0                  | ■  | ■                | ■                | <b>350</b>         | 264              | 118               |
| 6.0                     | ■                    | ■  | ■                | <b>362</b>       | 288                | 130              |                   |
| 8.0                     | ■                    | ■  | ■                | ■                | <b>305</b>         | 150              |                   |
| 50 mbar                 | 0.1                  | 66                                       | 52               | 45               | 31                 | 20               | ■                 |
|                         | 0.3                  | 165                                      | 130              | 110              | 65                 | 43               | 22                |
|                         | 0.5                  | 245                                      | 200              | 157              | 97                 | 60               | 29                |
|                         | 1.0                  | 387                                      | 320              | 240              | 163                | 98               | 45                |
|                         | 1.5                  | <b>421</b>                               | 390              | 287              | 219                | 127              | 55                |
|                         | 2.0                  | ■  | 410              | 317              | 255                | 152              | 66                |
|                         | 3.0                  | ■  | ■                | 365              | 312                | 205              | 89                |
|                         | 4.0                  | ■  | ■                | <b>394</b>       | 340                | 240              | 110               |
|                         | 5.0                  | ■  | ■                | ■                | <b>350</b>         | 264              | 123               |
| 6.0                     | ■                    | ■  | ■                | <b>362</b>       | 288                | 214              |                   |
| 8.0                     | ■                    | ■  | ■                | ■                | <b>305</b>         | 160              |                   |
| 100 mbar                | 0.2                  | 95                                       | 65               | 60               | 40                 | 30               | 14                |
|                         | 0.3                  | 160                                      | 117              | 105              | 65                 | 44               | 21                |
|                         | 0.5                  | 241                                      | 178              | 155              | 97                 | 62               | 29                |
|                         | 1.0                  | 380                                      | 307              | 260              | 162                | 98               | 45                |
|                         | 1.5                  | <b>446</b>                               | 379              | 326              | 216                | 126              | 57                |
|                         | 2.0                  | ■  | 410              | 376              | 255                | 153              | 69                |
|                         | 3.0                  | ■  | ■                | 420              | 320                | 205              | 91                |
|                         | 4.0                  | ■  | ■                | <b>430</b>       | 375                | 240              | 110               |
|                         | 5.0                  | ■  | ■                | ■                | <b>390</b>         | 270              | 125               |
| 6.0                     | ■                    | ■  | ■                | <b>405</b>       | 300                | 140              |                   |
| 8.0                     | ■                    | ■  | ■                | ■                | <b>310</b>         | 160              |                   |
| 200 mbar                | 0.4                  | 165                                      | 125              | 110              | 70                 | 45               | 25                |
|                         | 0.5                  | 204                                      | 150              | 133              | 83                 | 55               | 30                |
|                         | 1.0                  | 320                                      | 248              | 221              | 149                | 97               | 45                |
|                         | 1.5                  | <b>371</b>                               | 310              | 267              | 198                | 126              | 57                |
|                         | 2.0                  | ■  | 360              | 305              | 230                | 152              | 71                |
|                         | 3.0                  | ■  | ■                | 360              | 200                | 205              | 91                |
|                         | 4.0                  | ■  | ■                | <b>400</b>       | 320                | 240              | 110               |
|                         | 5.0                  | ■  | ■                | ■                | <b>330</b>         | 265              | 125               |
|                         | 6.0                  | ■  | ■                | ■                | <b>350</b>         | 300              | 140               |
| 8.0                     | ■                    | ■  | ■                | ■                | <b>310</b>         | 16               |                   |

### Regulator Type 233-8, DN 50

\*special version

|          |     |            |     |            |            |             |            |
|----------|-----|------------|-----|------------|------------|-------------|------------|
| 50 mbar  | 0.2 | 75         | 60  | 48         | 34         | 22          | 14         |
|          | 0.3 | 122        | 83  | 71         | 52         | 33          | 20         |
|          | 0.5 | 187        | 148 | 117        | 74         | 49          | 28         |
|          | 1.0 | 321        | 266 | 208        | 151        | 104         | 45         |
|          | 1.5 | <b>352</b> | 320 | 240        | 190        | 129         | 55         |
|          | 2.0 | ■          | 370 | 270        | 231        | 155         | 66         |
|          | 3.0 | ■          | ■   | ■          | 300        | 208         | 94         |
|          | 4.0 | ■          | ■   | ■          | 340        | 236         | 117        |
|          | 5.0 | ■          | ■   | ■          | <b>349</b> | 259         | 130        |
| 6.0      | ■   | ■          | ■   | <b>358</b> | 281        | 141         |            |
| 8.0      | ■   | ■          | ■   | ■          | ■          | <b>168</b>  |            |
| 100 mbar | 0.3 | 94         | 78  | 75         | 45         | 28          | 20         |
|          | 0.5 | 137        | 116 | 108        | 70         | 42          | 28         |
|          | 1.0 | <b>293</b> | 241 | 189        | 122        | 83          | 46         |
|          | 2.0 | <b>342</b> | 401 | 270        | 208        | 134         | 66         |
|          | 3.0 | ■          | ■   | ■          | 281        | 189         | 92         |
|          | 4.0 | ■          | ■   | ■          | 317        | 237         | 113        |
|          | 5.0 | ■          | ■   | ■          | <b>340</b> | 251         | 131        |
|          | 6.0 | ■          | ■   | ■          | <b>356</b> | 270         | 146        |
|          | 8.0 | ■          | ■   | ■          | ■          | ■           | <b>172</b> |
| 10.0     | ■   | ■          | ■   | ■          | ■          | <b>198*</b> |            |

The volumes marked in **bold** are not regulated with the accuracy indicated.

**Do not operate the orifice in the inlet pressure areas marked with ■.**

#### Standard conditions:

- Absolute pressure of 1.013 bar
- Temperature of 15°C

#### Correction factor for non-natural gas applications:

The flow rates are indicated for a 0.6 specific gravity gas.

To determine the volumetric flow rate for gases other than natural gas, multiply or calculate the values in the capacity tables using the sizing equations with a correction factor.

The table below lists the correction factors for some common gases:

| Gas type              | Specific gravity | Correction factor |
|-----------------------|------------------|-------------------|
| Air                   | 1.00             | 0.77              |
| Butane                | 2.01             | 0.55              |
| Carbon dioxide (dry)  | 1.52             | 0.63              |
| Carbon monoxide (dry) | 0.97             | 0.79              |
| Natural gas           | 0.60             | 1.00              |
| Nitrogen              | 0.97             | 0.79              |
| Propane               | 1.53             | 0.63              |
| Propane-Air mix       | 1.20             | 0.71              |

*Specific gravity or relative density (air = 1, non-dimensional value)*

Use the following formula to calculate the correction factor for gases not listed above. In the formula, d is the specific gravity of the gas.

$$\text{Correction factor} = \sqrt{\frac{0.6}{d}}$$

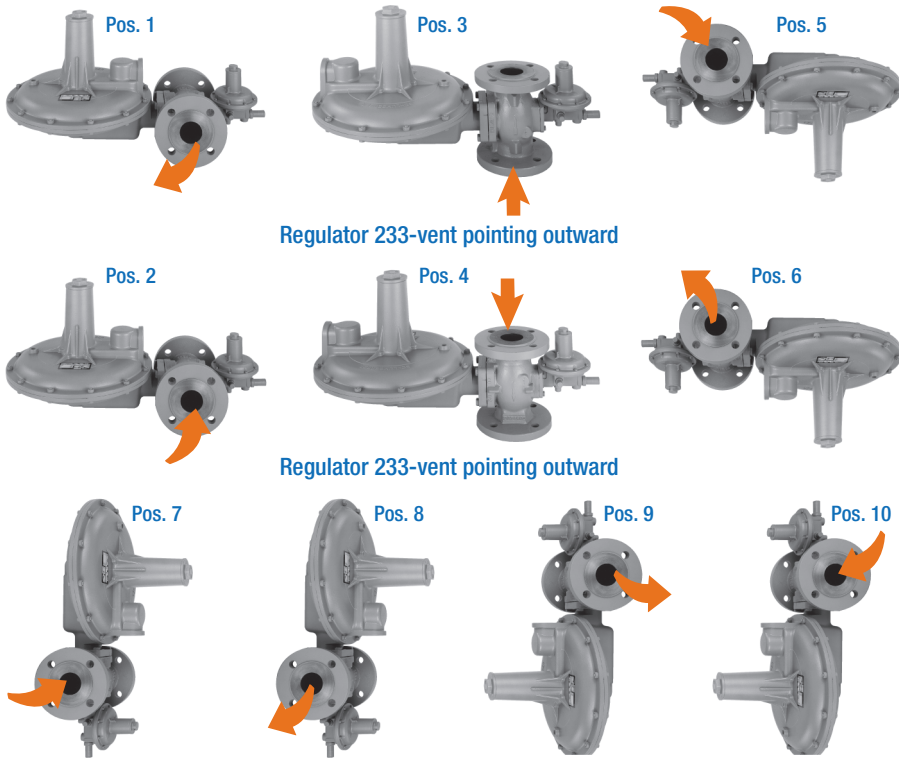
Regulator Type 233-8, DN 50 (cont'd)

\*special version

| Outlet Pressure Setting | Inlet Pressure (bar) | Capacities at Standard Conditions (m³/h) |                  |                  |                    |                  |                   |
|-------------------------|----------------------|--|------------------|------------------|--------------------|------------------|-------------------|
|                         |                      | Orifice size & Valve disk angle          |                  |                  |                    |                  |                   |
|                         |                      | 25 mm (1") 30°                           | 20 mm (3/4") 30° | 20 mm (3/4") 10° | 12.5 mm (1/2") 10° | 10 mm (3/8") 10° | 6.3 mm (1/4") 10° |
| 200 mbar                | 0.4                  | 115                                      | 95               | 88               | 55                 | 38               | 22                |
|                         | 0.5                  | 154                                      | 120              | 116              | 69                 | 48               | 27                |
|                         | 1.0                  | 293                                      | 241              | 198              | 127                | 93               | 45                |
|                         | 1.5                  | <b>363</b>                               | 343              | 252              | 181                | 121              | 57                |
|                         | 2.0                  | ■  | 414              | 296              | 228                | 147              | 69                |
|                         | 3.0                  | ■  | ■                | ■                | 304                | 199              | 95                |
|                         | 4.0                  | ■  | ■                | ■                | 350                | 231              | 117               |
|                         | 5.0                  | ■  | ■                | ■                | <b>378</b>         | 262              | 139               |
|                         | 6.0                  | ■  | ■                | ■                | <b>392</b>         | 284              | 150               |
|                         | 8.0                  | ■  | ■                | ■                | ■                  | ■                | <b>181</b>        |
| 400 mbar                | 0.7                  | 160                                      | 123              | 110              | 81                 | 62               | 29                |
|                         | 1.0                  | 221                                      | 165              | 153              | 113                | 82               | 40                |
|                         | 1.5                  | <b>294</b>                               | 216              | 191              | 142                | 110              | 54                |
|                         | 2.0                  | ■  | 274              | 231              | 170                | 128              | 66                |
|                         | 3.0                  | ■  | ■                | ■                | 226                | 167              | 91                |
|                         | 4.0                  | ■  | ■                | ■                | 252                | 200              | 112               |
|                         | 5.0                  | ■  | ■                | ■                | <b>278</b>         | 232              | 133               |
|                         | 6.0                  | ■  | ■                | ■                | <b>295</b>         | 255              | 150               |
|                         | 8.0                  | ■  | ■                | ■                | ■                  | ■                | <b>183</b>        |
|                         | 10.0                 | ■  | ■                | ■                | ■                  | ■                | <b>208*</b>       |

The volumes marked in **bold** are not regulated with the accuracy indicated.  
**Do not operate the orifice in the inlet pressure areas marked with ■.**

Assembly Position



Regulator 233-vent pointing outward

Regulator 233-vent pointing outward

Please indicate the desired assembly position when you order. If not otherwise stated, the regulators are assembled and adjusted for normal installation (position 2):

- Regulator 133-vent pointing outward
- Regulator 233-vent pointing inward

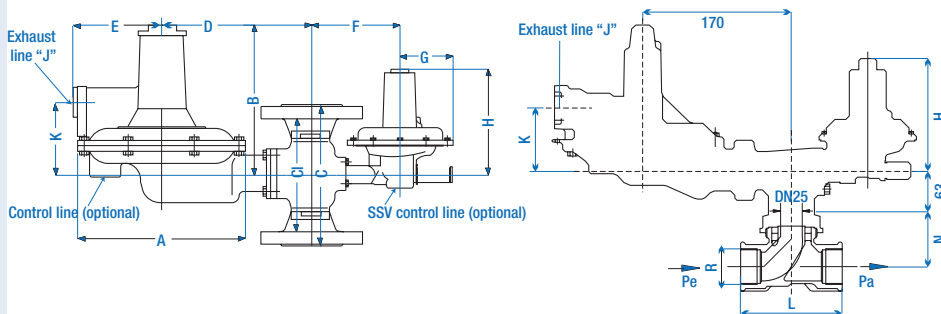
Pos.3 and Pos.4 are not possible for the DN 50 flanged version of regulator 233, when fitted with type 033 SSV.

Installation

- > Diaphragm casing can be mounted in any position relative to the body through a full 360° angle.
- > For OUTDOOR installations, position the vent so that rain, snow, moisture, or foreign particles cannot enter the vent opening. Note: Itron recommends that the vent be positioned to face downward to avoid entry of water or other matter interfering with the proper operation of the regulator. The vent should be located away from building eaves, window openings, building air intakes, and above the expected snow level at the site. The vent opening should be inspected periodically to ensure that it does not become blocked by foreign material.
- > For INDOOR installations, pipe the vent to the outside atmosphere using the shortest length of pipe, the least number of elbows and with a pipe diameter as follows: up to 3 m length: DN 20 - up to 5 m length: DN 25 - above 5 m length: at least DN 40. The outlet end of the pipe must be protected from moisture and the entrance of foreign particles.
- > Under German DVGW rules, it is not necessary to pipe the vent for an indoor installation, when the regulator is fitted with a safety diaphragm and the inlet pressure does not exceed 1 bar.

## Dimensions (mm)

| Model Type | Thread Size (1) | Flange (2) | A   | B   | C'  | C   | D   | E   | F   | G  | H   | J Exhaust Connection | K Weight in kg (approx.) |     |    |
|------------|-----------------|------------|-----|-----|-----|-----|-----|-----|-----|----|-----|----------------------|--------------------------|-----|----|
|            |                 |            |     |     |     |     |     |     |     |    |     |                      | (1)                      | (2) |    |
| 133-       | 3/4"1"          | DN 25      | 190 | 155 | 100 | 160 | 170 | 100 | 100 | 75 | 120 | Rp 3/4               | 74                       | 4   | 6  |
| 233-12     | 1"1/2           | DN 40      | 350 | 250 | 150 | 200 | 265 | 155 | 115 | 75 | 120 | Rp 1                 | 110                      | 11  | 15 |
| 233-12     | •               | DN 50      | 350 | 250 | •   | 200 | 265 | 155 | 115 | 75 | 120 | Rp 1                 | 110                      | •   | 16 |
| 233-8      | 1"1/2           | DN 40      | 260 | 250 | 150 | 200 | 220 | 125 | 115 | 75 | 120 | Rp 1                 | 105                      | 9   | 13 |
| 233-8      | •               | DN 50      | 260 | 250 | •   | 200 | 220 | 125 | 115 | 75 | 120 | Rp 1                 | 105                      | •   | 14 |



## Type Designation

| XX-133<br>233 | XX- | XXX- | XXX- | Variant Type                                    |
|---------------|-----|------|------|---|
|               | E   |      |      | Monopipe (133 only)                             |
|               | HP  |      |      | Actuator size (see page 2)                      |
|               | 8   |      |      |   |
|               | 8HP |      |      |   |
|               | 12  |      |      |   |
|               |     | 4    |      | Max. inlet pressure                             |
|               |     | 5    |      |   |
|               |     | 6    |      |   |
|               |     | 8    |      |   |
|               |     | (10) |      |   |
|               |     |      | 31   | Without safety devices                          |
|               |     |      | 32   | SRV   |
|               |     |      | 34   | Gas loss protection*                            |
|               |     |      | 36   | Gas loss protection* and SRV                    |
|               |     |      |      | <b>With type I or II SSV</b>                    |
|               |     |      | 61   | OPSO  |
|               |     |      | 62   | OPSO and SRV                                    |
|               |     |      | 64   | OPSO and UPSO                                   |
|               |     |      | 66   | OPSO, UPSO and SRV                              |
|               |     |      | 630  | OPSO and safety diaphragm                       |
|               |     |      | 650  | OPSO, UPSO and safety diaphragm                 |
|               |     |      |      | <b>With type 033 SSV</b>                        |
|               |     |      | 71   | OPSO  |
|               |     |      | 72   | OPSO and SRV                                    |
|               |     |      | 77   | OPSO, gas loss protection* and SRV              |
|               |     |      | 730  | OPSO and safety diaphragm                       |
|               |     |      | 770  | OPSO, gas loss protection* and safety diaphragm |

### Device designation examples:

133-4-62, DN 25

or 233-8-4-61, DN 40

\*Available only on 133 regulator

| Dimension (mm), Type 133-E |     |    |
|----------------------------|-----|----|
| R                          | L   | N  |
| Rp 1                       | 110 | 41 |
| Rp 1"1/2                   | 140 | 50 |

In case of external control lines (optional), the regulator is provided with the following fittings:

- Regulator: Ermeto 12,
- SSV: Ermeto 6.

### Information to be specified when ordering:

- Regulator type code
- Body size and connections
- Minimum and maximum inlet pressures
- Outlet pressure range
- Outlet pressure setting
- OPSO setting\*
- UPSO setting\*
- \* (if requested)

## About Itron Inc.

Itron Inc. is a leading technology provider to the global energy and water industries. Our company is the world's leading provider of metering, data collection and utility software solutions, with nearly 8,000 utilities worldwide relying on our technology to optimize the delivery and use of energy and water. Our products include electricity, gas and water meters, data collection and communication systems, including automated meter reading (AMR) and advanced metering infrastructure (AMI); meter data management and related software applications; as well as project management, installation, and consulting services. To know more, start here: [www.itron.com](http://www.itron.com)

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