



Double gas valves for biogases and recycling gases

VRD4...

- Class A double gas valve for mounting into gas trains
- Safety shutoff valves acc. to EN 161 in connection with actuators
- Suitable for use with slightly aggressive biogases and recycling gases as well as air
- Double gas valves in connection with actuators open slowly and close quickly
- 2-port valves with flange connection, normally closed
- DN40...DN150
- The double gas valve must be equipped with 2 actuators
- For supplementary data sheets for the actuators, see *Mechanical design*

VRD4 and this data sheet are intended for original equipment manufacturers (OEMs) using the VRD4 in or on their products.

Functionally, the VRD4 correspond to Siemens gas valves in accordance with EN 161. They are also designed for use with slightly aggressive and dry gases

- For maximum 60 °C
- Gases according to G262 such as:
Biogases, waste gases, digester gases, other recycling gases, process gases, and air

The VRD4 are designed for special use / procedures in industrial operations

The VRD4 is used as a:

- Shutoff valve (in connection with SKP15)
- Control valve with shutoff function (in connection with SKP25, SKP55, or SKP75). SKPx5 with pressure control function (SKP25, SKP55, and SKP75) must be approved by Siemens with regard to suitability for use with the recycling gases in question.

The chemical composition and aggressiveness of every biogas or recycling gas is different and not constant and depends on several factors.

The aggressiveness increases particularly:

- With increasing hydrogen sulfide H₂S content
- With the humidity content of the gas. Condensation in the VRD4 is not permitted.

In consultation with Siemens, the user must assess the extent to which the materials used for the VRD4 are suitable for the recycling gases in question.

The composition of the gases and the concentration of the components can vary. It is therefore impossible to provide a guarantee or a definitive statement regarding lifetime.

An assessment should be carried out to determine the suitability of the gas used.

For safety reasons, we always recommend the following:

- Installing a valve proving control
- Regular visual inspection of the VRD4 (every 6 to 12 months)
- Using a SKPx5 with valve closure contact

All VRD4 can be combined with the SKPx5 as desired.

Supplementary documentation

| Product type | Product name | Documentation type | Documentation number |
|--------------|----------------------------------|-----------------------|----------------------|
| AGA40.40 | Pilot gas connecting plate | Mounting Instructions | 74 319 0244 0 |
| AGA40.41 | Pressure switch connecting plate | Mounting Instructions | 74 319 0244 0 |
| AGA66 | Gasket kit | Mounting Instructions | 74 319 0421 0 |
| QPLx5 | Pressure switch | Data Sheet | N7221 |
| SKPx5 | Actuator | Data Sheet | N7643 |

Warning notes



To avoid personal injury or damage to property or the environment, the following warning notes must be observed.

Not permitted: Do not open, interfere with, or modify the double gas valves

Any opening, replacement of parts, or modification of the original design is carried out at the user's own risk!

- All activities (mounting, installation, service work etc.) must be performed by qualified staff. Failure to observe this poses a risk of damaging the safety functions
- The VRD4 must **not** be used as a safety equipment in connection with SAX31. The valve will not close according to EN 161
- These double gas valves must not be put into operation after a fall or shock, as this can adversely affect the safety functions even if the gas valves do not exhibit any external signs of damage
- In combination with the valve proving system from other manufacturers, the suitability must be checked individually for the plant
- Unsuitable gases or gas components lead to the loss of the safety shutoff function
- Do not allow any contaminant/particles to enter the VRD4 as this can affect the safety shutoff function
- Gases with H₂S and NH₃ concentrations >1% as well as condensation are not permitted. If this is not observed, the safety functions may be impaired

Mounting notes

- Ensure that the relevant national safety regulations are complied with
- The SKPx5 can be mounted and replaced under gas pressure
- Refer also to the following mounting instructions:

| Product type | Product name | Mounting Instructions | |
|--------------|----------------------------------|-----------------------|---------------|
| AGA40.40 | Pressure switch connecting plate | M7631.2 | 74 319 0244 0 |
| AGA40.41 | Pilot gas connecting plate | M7631.2 | 74 319 0244 0 |
| AGA66 | Gasket kit | M7643.2 | 74 319 0421 0 |
| QPLx5 | Pressure switch | M7221 | 74 319 0551 0 |
| VRD4 | Double gas valve | M7631.2 | 74 319 0244 0 |

- For SKP25: Impulse pipe (pressure return) possible on VRD4
- For SKP75: The impulse pipe (pressure return) must be connected to the gas line after the VRD4 at a distance of 3...5 x the diameter of the supply line

Seal / tightness

- Check the strength of the flange screw connections and that they are sealed tightly with all the connected components
- The O-ring seals or flange gaskets must be mounted between the flanges and the VRD4
- Recommendation if exposed to humidity from the outside: Gasket kit AGA66 (IP65 kit)

Mounting position

The permissible mounting position of the SKPx5 used must be taken into account, see data sheet N7643.

Flow direction

Ensure that the flow of gas is in the same direction as the arrow on the VRD4.

Function

The VRD4 is closed when it is not actuated and opens when the SKPx5 opens. It is recommended to mount a SKPx5.xx1xx to signal the CLOSED position of the VRD4.

Standards and certificates



Note!

Only in connection with the SKPx5, see data sheet N7643.



EAC Conformity (Eurasian Conformity)



ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007



China RoHS

Hazardous substances table:

<http://www.siemens.com/download?A6V10883536>



Lifetime

The combination of the double gas valve and actuator has a designed lifetime* of

| Nominal size | Burner cycles |
|--------------|---------------|
| ≤25 DN | 200,000 |
| 25...80 DN | 100,000 |
| 80...150 DN | 50,000 |

when using gases according to EN 437 (or specification G260).

This is based on the endurance tests specified in the standard EN 161.
A summary of the conditions has been published by the European Control Manufacturers Association (Afecor) (www.afecor.org).

The designed lifetime is based on use of the double gas valve and actuator according to the manufacturer's data sheet.
After reaching the designed lifetime in terms of the number of burner cycles, or after the corresponding usage time, the double gas valve and actuator must be checked and/or replaced by authorized personnel.

* The designed lifetime is not the warranty time specified in the terms of delivery.

Use in gases outside of EN 437 / G260 such as G262 can lead to a limited lifetime.

Service notes

- Check the proper functioning and the internal and external tightness of the VRD4 after every valve replacement
- Siemens double gas valves must **only** be repaired by Siemens repair centers

Disposal notes

Local and currently valid legislation must be complied with.

Mechanical design

VRD4

The VRD4 are normally closed in connection with SKPx5.

Strainer

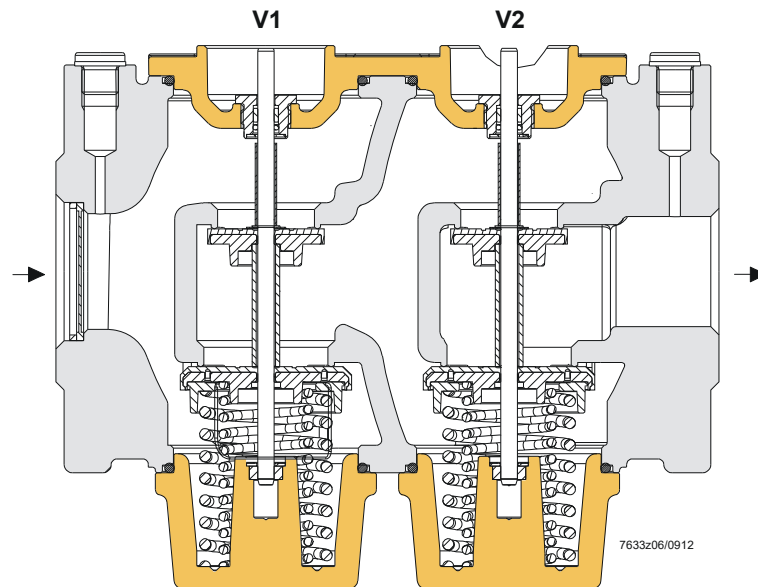
A strainer made of stainless steel in the inlet area protects the VRD4, the seat and disk, as well as downstream units against contamination.

AGA40.41

The AGA40.41 ① enables the installation of a number of commercially available pressure switches or valve proving control. The AGA40.40 ② and the AGA40.41 can be mounted on either side of the valve.

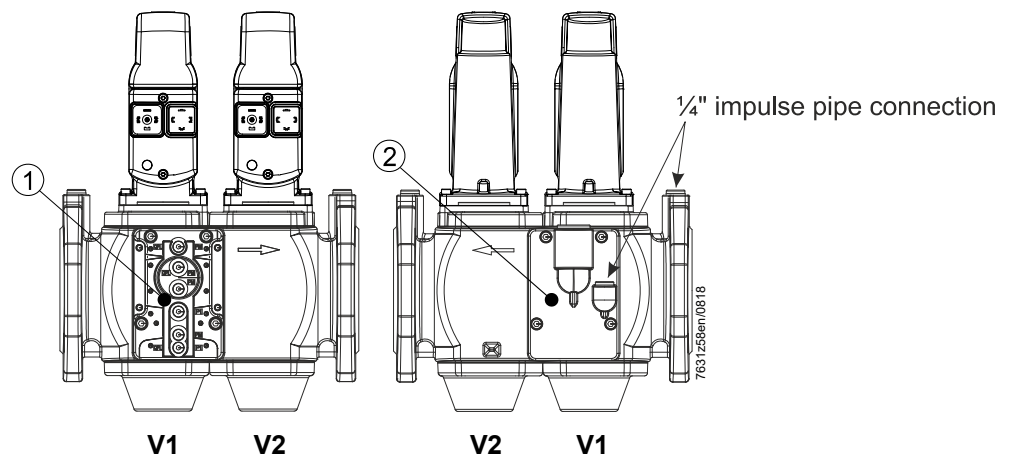
VRD4

Sectional view of VRD4



Application example

VRD40.080 with SKP15 (mounted on valve V1) and SKP15 (mounted on valve V2).



Mechanical design (continued)

SKPx5

The VRD4 can be combined with the following SKPx5:

- SKP15
- Other actuators (SKP25, SKP55, and SKP75) after checking the gas suitability

| Type | Data Sheet number | Function |
|--------------------|-------------------|--|
| SKP15 | N7643 | OPEN/CLOSED |
| SKP25 | N7643 | OPEN/CLOSED with constant pressure control / proportionate governor |
| SKP25.7 with SQS37 | N7643 | OPEN/CLOSED with pressure control and predefined setpoint which can be changed by means of electrical signal |
| SKP55 | N7643 | OPEN/CLOSED with differential pressure control, signal input → differential pressure |
| SKP75 | N7643 | OPEN/CLOSED with ratio control, signal input → static pressure |



Note!

Option for all SKPx5.xx1xx with valve closure contact for signaling the CLOSED position of the VRD4.

Type summary (other types on request)

| DN (mm) | Article no. | Types | Permissible operating pressure kPa | Air flow rate m ³ /h at Δp = 1 kPa | Number of pressure test points Rp ¹ / ₄ ¹⁾ | Number of pilot gas branches G ³ / ₄ ²⁾ |
|---------|----------------------|------------------|------------------------------------|---|---|--|
| 40 | BPZ:VRD40.040 | VRD40.040 | 100 | 85 | 3 | 1 |
| 50 | BPZ:VRD40.050 | VRD40.050 | 100 | 100 | 3 | 1 |
| 65 | BPZ:VRD40.065 | VRD40.065 | 70 | 160 | 3 | 1 |
| 80 | BPZ:VRD40.080 | VRD40.080 | 70 | 250 | 3 | 1 |
| 100 | BPZ:VRD40.100 | VRD40.100 | 70 | 400 | 3 | 1 |
| 125 | BPZ:VRD40.125 | VRD40.125 | 70 | 630 | 3 | 1 |
| 150 | BPZ:VRD40.150 | VRD40.150 | 70 | 800 | 3 | 1 |

¹⁾ On both sides, inlet and outlet side

²⁾ Inlet side

Ordering

When ordering, please specify the double gas valve type reference.

The actuator and double gas valve are delivered in individual packages.

Example:

DN80 double gas valve with 2 actuators

1 VRD40.080 (DN80 double-flange valve for biogas)

2 SKP15.000E2 (OPEN/CLOSED actuator)

The lateral AGA40.4x (pilot gas connection, pressure switch connection) are already included and mounted.

Accessories



Pilot gas connecting plate for VRD4

AGA40.40

Article no.: **BPZ:AGA40.40**

- Spare part, in set with grommet and gaskets
- See mounting instructions M7631.2 (74 319 0244 0)



Pressure switch connecting plate for VRD4

AGA40.41

Article no.: **BPZ:AGA40.41**

- Spare part, in set with gaskets
- See mounting instructions M7631.2 (74 319 0244 0)



Manual adjustment

AGA61

Article no.: **BPZ:AGA61**



Adapter for SAX31 actuators

AGA60

Article no.: **BPZ:AGA60**

Consists of 2 stem parts and a connecting flange.



Gasket kit for SKPx5

AGA66

Article no.: **BPZ:AGA66**

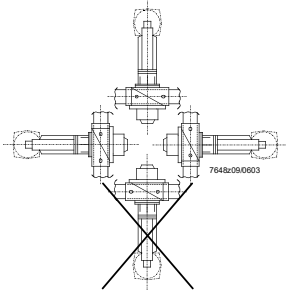
- ... between SKPx5 and VRD4
- ... to increase the degree of protection from IP54 to IP65
- See mounting instructions M7643.2 (74 319 0421 0)
- Recommended for installation in humid environments



QPLx5 pressure switch for VRD4

- For monitoring the gas or air pressure
- See data sheet N7221 and mounting instructions M7221 (74 319 0551 0)

Technical data

| | | |
|--------------------------|---|--|
| General unit data | Valve class in connection with SKPx5 | An according to EN 161 (except with SAX31) |
| | Group | 2 (EN 161) |
| | Permissible media temperature | 0...60 °C |
| | Weight | See <i>Dimensions</i> |
| | Connecting flanges | PN16, according to ISO 7005-2 |
| | Required flow rate | See <i>Flow diagram</i> |
| | Permissible mounting position |  <p>See <i>Mounting notes</i></p> |
| | Permissible gas pressure against flow direction | 30 kPa |
| | Operating pressure | See <i>Type summary</i> |
| | Types of gas | Suitable for biogases and recycling gases - up to maximum 1 vol.% H ₂ S, dry - up to maximum 1 vol.% NH ₃ , dry No non-ferrous metals (except in extremely small quantities bound in plastic components) For further information, see "Use". |
| Strainer | Built-in (mesh width 0.9 mm) | |
| Materials | AISI10Mg to DIN EN 1706 | |
| Environmental conditions | Storage | DIN EN 60721-3-1 |
| | Climatic conditions | Class 1K3 |
| | Mechanical conditions | Class 1M2 |
| | Temperature range | -20...+60 °C |
| | Humidity | <95% r.h. |
| | Transport | DIN EN 60721-3-2 |
| | Climatic conditions | Class 2K2 |
| | Mechanical conditions | Class 2M2 |
| | Temperature range | -15...+60 °C |
| | Humidity | <95% r.h. |
| | Operation | DIN EN 60721-3-3 |
| | Climatic conditions | Class 3K5 |
| | Mechanical conditions | Class 3M2 |
| Temperature range | -10...+60 °C | |
| Humidity | <95% r.h. | |
| Installation altitude | Max. 2,000 m above sea level | |



Warning!
Condensation in the valve is not permitted!
Failure to observe this poses a risk of damaging the safety functions.

Technical data (continued)

| Permissible gas pressures / volumes | Type | Static pressure (permissible inlet pressure with VRD4 closed) kPa | Dynamic pressure (permissible operating pressure) kPa | Volume between V1 / V2 (liters) |
|-------------------------------------|-----------|---|---|---------------------------------|
| | VRD40.040 | 150 | 100 (70)* | 0.8 |
| | VRD40.050 | 150 | 100 (70)* | 0.8 |
| | VRD40.065 | 150 | 70 | 1.3 |
| | VRD40.080 | 150 | 70 | 1.5 |
| | VRD40.100 | 150 | 70 | 3 |
| | VRD40.125 | 150 | 70 | 5.2 |
| | VRD40.150 | 150 | 70 | 8.7 |

* Only Australia

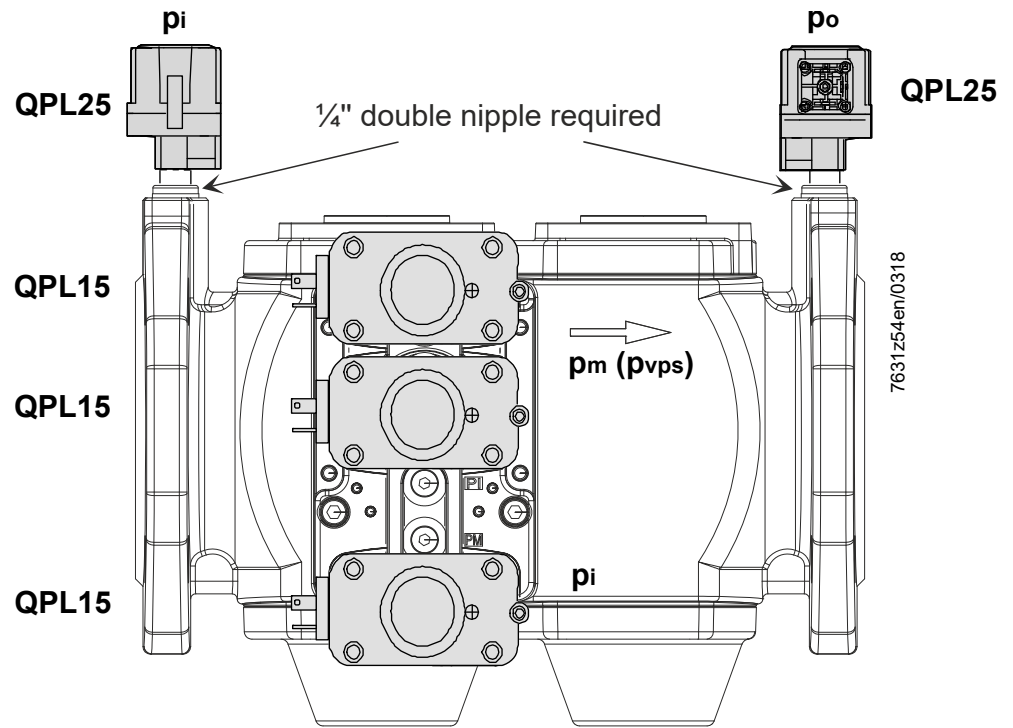
VRD4 The VRD4 are designed to withstand gas pressures up to 150 kPa when the burner is in standby mode.
At a pressure of 150 kPa, the VRD4 remains safely closed or will safely close. A pressure shutdown device must be installed on the inlet side.
The valve's proper functioning and external tightness will not be affected.

Note Due to the internal structure of the VRD4, increasing inlet pressure causes the valve to close (class A according to EN 161).

This means that safety shutoff or venting devices, which are provided in addition to the supply pressure regulator to protect the gas valve on the burner (on the gas appliance), are no longer required if the following conditions are satisfied:

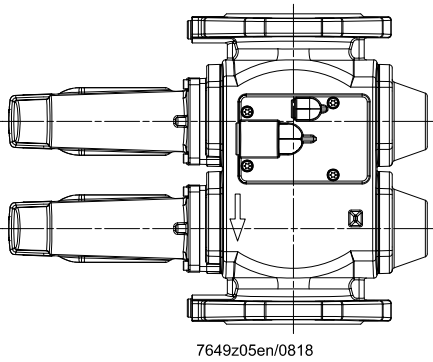
- If the pressure at the VRD4 inlet does not exceed 150 kPa in the event that the upstream supply pressure regulator fails, and
- If a shutoff device (e.g., pressure switch) causes the VRD4 to close in the event that the permissible operating pressure of the VRD4 (DN 65...150: 70 kPa or DN 40...50: 100 kPa) is exceeded.

Example: QPLx5 mounting options on the VRD4

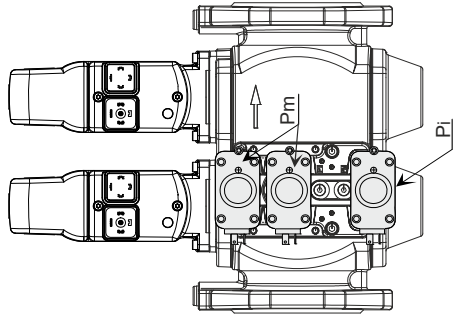
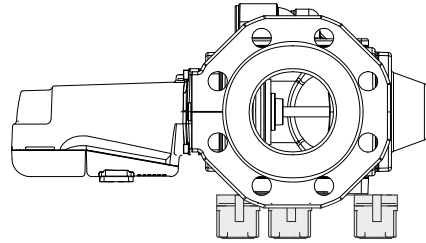


Key

- pi = Inlet pressure
- po = Outlet pressure
- pm = Mid-chamber pressure
- pvps = Valve proving control

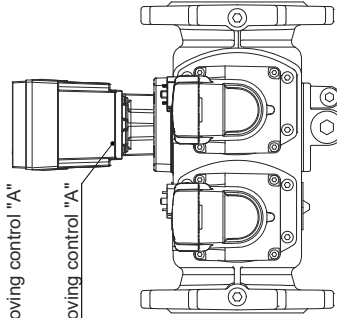


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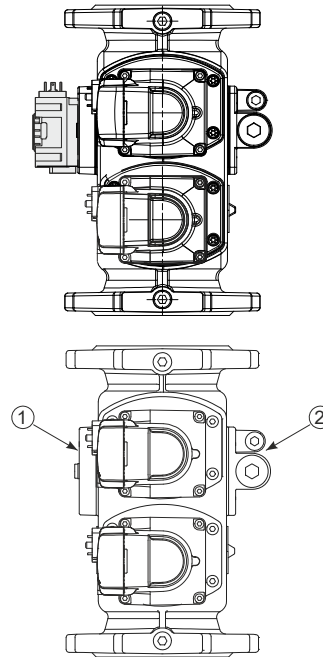


Mounting variants (use of various valve proving systems on request):

Example (not binding):
Valve proving control "A"



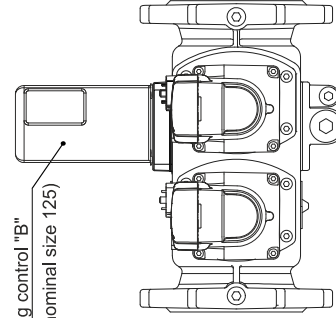
3 x pressure switch (2x PM, Pi)



Example (not binding):

Valve proving control "B" and pressure switch (Pi) mounted below

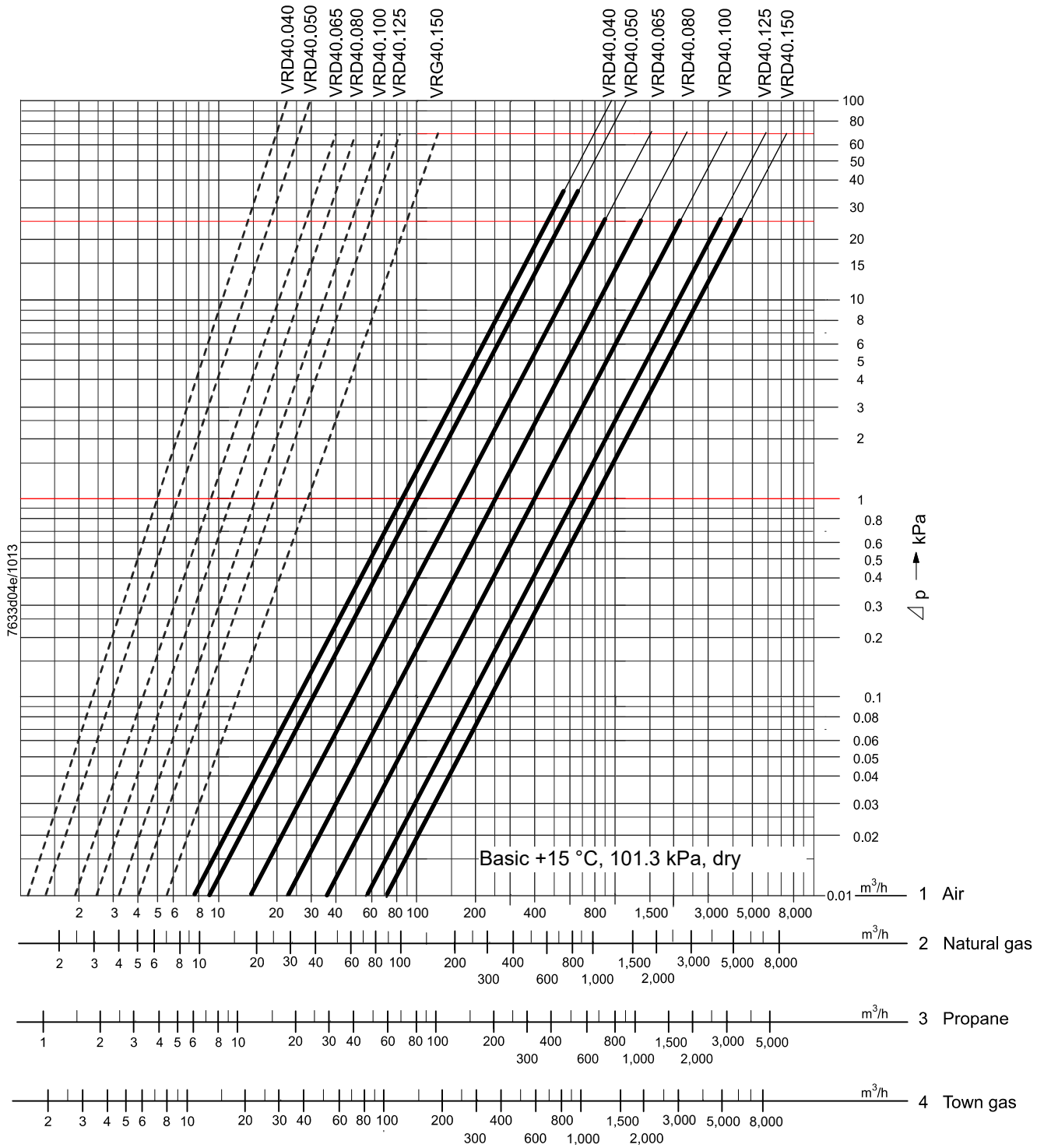
Valve proving control "B"
(only up to nominal size 125)



(Some add-on components are not part of the Siemens range)

The pressure switch plate ① enables the installation of a number of commercially available pressure switches or valve proving control.
The pilot gas flange ② and the pressure switch plate can be fitted on either side of the valve.

Flow diagram for VRD4 (only for fully open VRD4)



Key
 Minimum flow lines
 — Maximum flow lines (with fully open VRD4)

Flow diagram for VRD4 (only for fully open VRD4) (continued)

Determining the pressure drop for gas with a density ratio (dv) other than that of the diagram scales:

Required variables
 p(gas) Gas density in kg/m³
 V(gas) Gas volume in m³/h

Procedure

- Calculate the gas density ratio [dv(gas)]:

$$dv(\text{gas}) = \frac{\text{Density (gas) in kg/m}^3}{1.22 \text{ kg/m}^3 \text{ (= density of air)}}$$

- Determine the air volume [V(air)] that produces the same pressure drop (Δp) as the gas volume [V(gas)]:

$$V(\text{air}) = \frac{V(\text{gas) in m}^3/\text{h}}{\sqrt{dv(\text{gas})}}$$

- Determine the gas pressure drop (Δp) with the help of the flow diagram, based on the calculated volume of air [V(air)] on the diagram scale.

Applications outside of the bold characteristic curve range can lead to flow noises!



Caution!

- For applications with a large modulation range, select the smallest possible nominal valve size, see SKPx5 data sheet N7643.
- If the available gas pressure exceeds the maximum permissible operating pressure, reduce it with an upstream pressure regulator
- The pressure drop (maximum flow lines) is based on a fully open VRD4

Conversion of the air volume into a corresponding gas volume (natural gas)

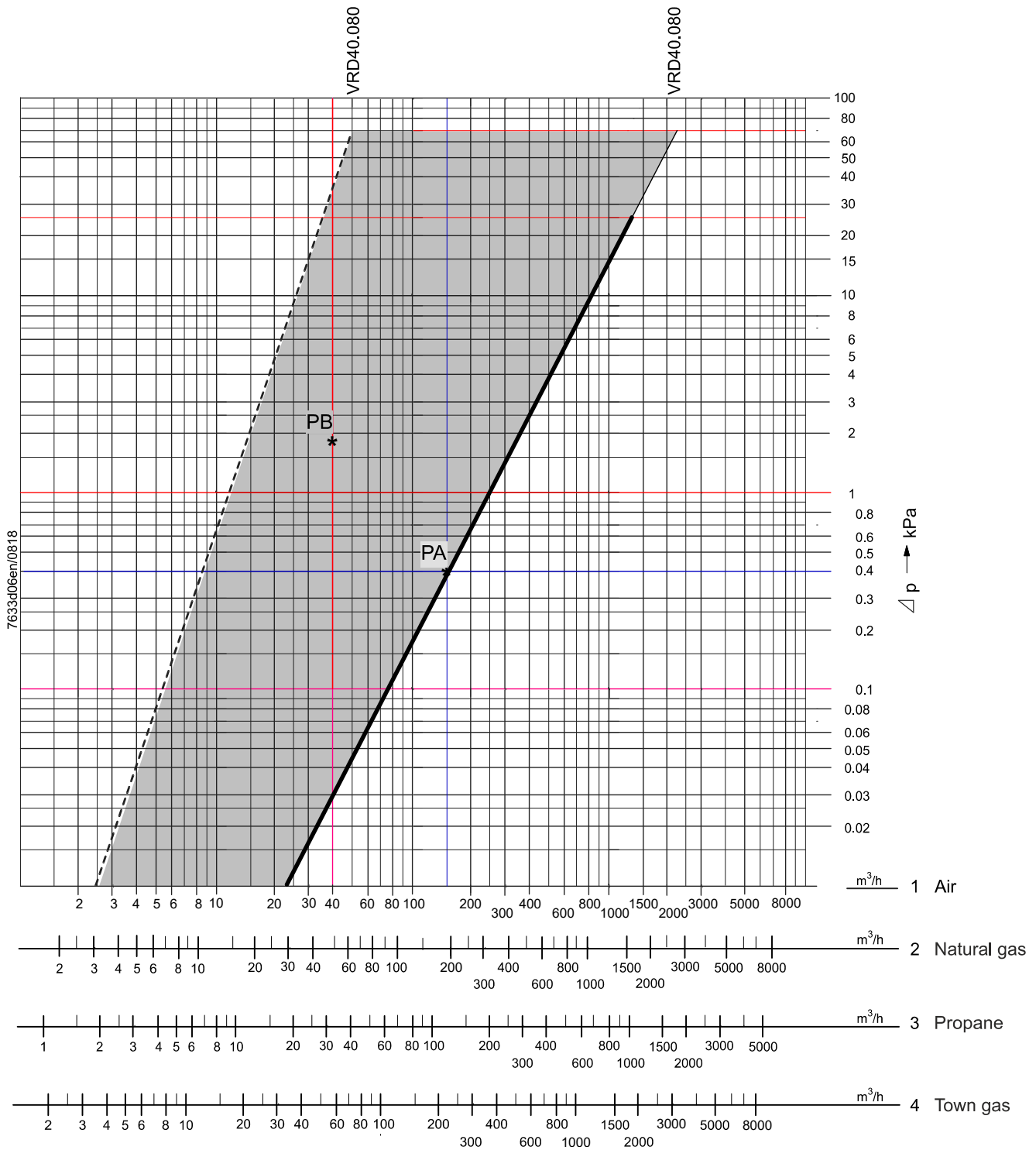
Scale basis

| Abscissa | Medium volumetric flow (QG) in m ³ /h | Density ratio (dv) to air | Conversion factor $f = \sqrt{\frac{1}{dv}}$ |
|----------|--|---------------------------|---|
| 1 | Air | 1 | 1 |
| 2 | Natural gas | 0.61 | 1.28 |
| 3 | Propane | 1.562 | 0.8 |
| 4 | Town gas | 0.46 | 1.47 |

Converting other types of gas to air (m³/h):

$$Q_L = \frac{Q_G}{f} \quad Q_L = \text{air volume in m}^3/\text{h which generates the same pressure drop as } Q_G.$$

Example: Recommended operating range (extract from the VRD4 flow diagram)



- Key**
- Minimum flow lines (can vary depending on the quality of the pressure tapping points)
 - Maximum flow lines (with fully open VRD4)
 - PA Working point
 - PB Working point

Example: Recommended operating range (extract from the VRD4 flow diagram) (continued)

Points **PA** / **PB**, see *Dimensioning example*.

Dimensioning example

Simplified calculation based on the above diagram: VRD4 with SKP15.

| | |
|--|---|
| Prerequisite | Burner gas outlet toward the combustion chamber |
| Simplified example: Constant combustion chamber pressure | = 0 kPa |
| Desired control ratio | RV = 4 : 1 |
| Gas inlet pressure | 2 kPa |

1. **High-fire** → Point **PA** in the characteristic curve area
 Burner pressure at high-fire 1.6 kPa
 Volumetric flow at high-fire 200 m³/h natural gas, corresponds to 156 m³/h air
 - ΔpV... at high-fire 2.0 – 1.6 = 0.4 kPa
 Point **PA** must be situated on or to the left of the maximum flow line.
2. **Low-fire** → Point **PB** in the characteristic curve area

$$PG_{min} = \frac{PG_{max}}{RV^2} = \frac{1.6 \text{ kPa}}{16} = 0.1 \text{ kPa} \quad (\Delta p \text{ diagram} = 2.0 - 0.1 = 1.9 \text{ kPa})$$

$$VG_{min} = \frac{VG_{max}}{RV} = \frac{200 \text{ m}^3/\text{h}}{4} = 50 \text{ m}^3/\text{h} \text{ corresponds to } = 39 \text{ m}^3/\text{h} \text{ air}$$

– Selected valve size VRD40.080

Point **PB** must be situated on or to the right of the minimum flow line.

Dimensions

(not to scale)

VRD4

VRD40

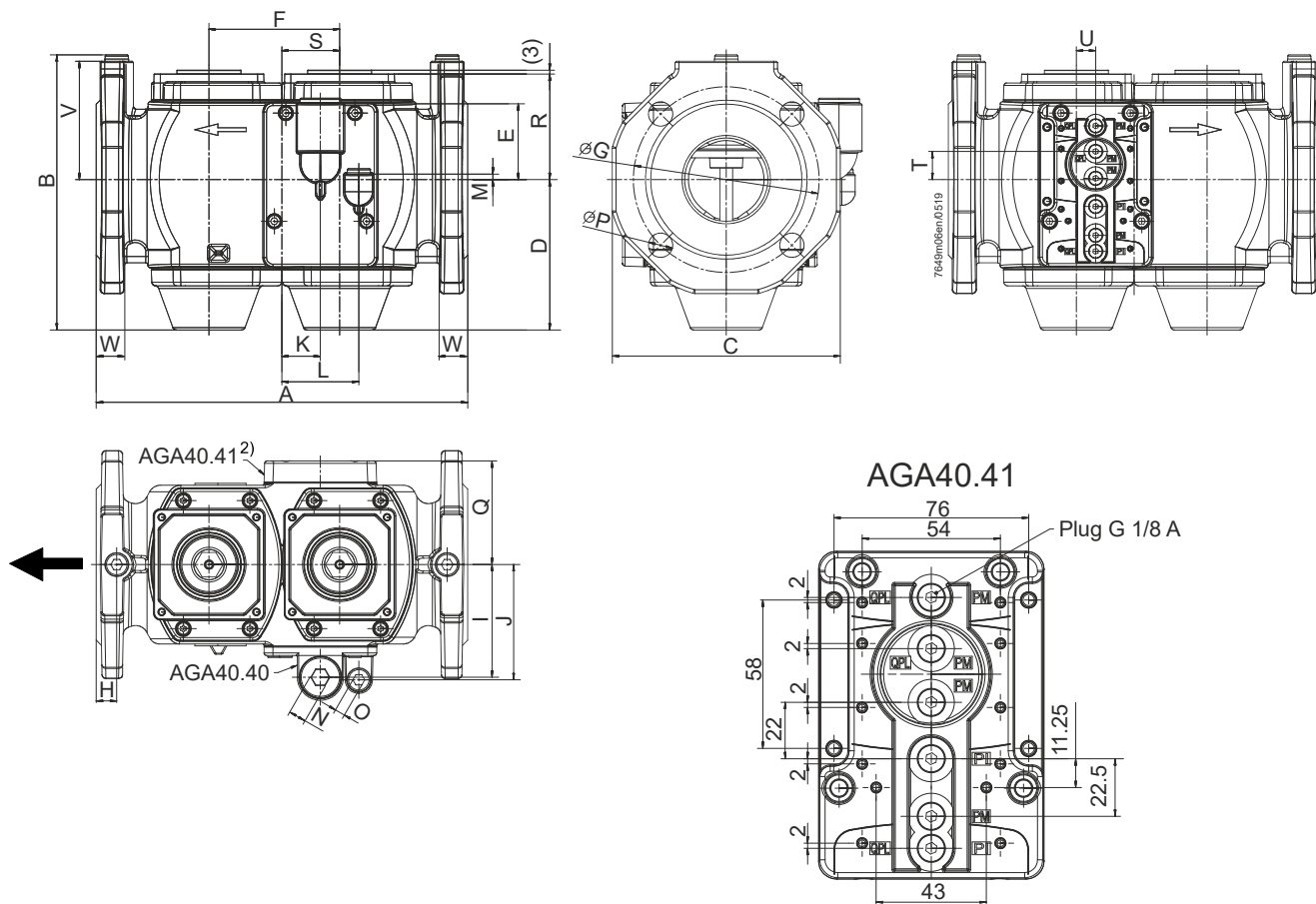


Table of dimensions

| Type | DN ¹⁾ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|-----------|------------------|-----|-----|-----|-----|----|-----|-----|----|-----|-----|----|----|----|----|---|----|-----|
| VRD40.040 | 40 | 240 | 195 | 168 | 115 | 58 | 88 | 110 | 16 | 77 | 79 | 20 | 50 | 2 | 12 | 6 | 19 | 70 |
| VRD40.050 | 50 | 240 | 202 | 175 | 115 | 58 | 88 | 125 | 16 | 77 | 79 | 20 | 50 | 2 | 12 | 6 | 19 | 70 |
| VRD40.065 | 65 | 290 | 214 | 195 | 118 | 60 | 102 | 145 | 16 | 88 | 90 | 30 | 60 | 4 | 12 | 6 | 19 | 81 |
| VRD40.080 | 80 | 310 | 236 | 204 | 132 | 54 | 107 | 160 | 16 | 90 | 92 | 30 | 60 | 3 | 12 | 6 | 19 | 88 |
| VRD40.100 | 100 | 350 | 259 | 228 | 145 | 43 | 131 | 180 | 16 | 106 | 108 | 41 | 71 | 13 | 12 | 6 | 19 | 99 |
| VRD40.125 | 125 | 400 | 305 | 256 | 175 | 31 | 150 | 210 | 16 | 120 | 122 | 41 | 71 | 25 | 12 | 6 | 19 | 113 |
| VRD40.150 | 150 | 480 | 335 | 294 | 188 | 20 | 168 | 240 | 16 | 140 | 143 | 39 | 69 | 36 | 12 | 6 | 23 | 134 |

| Type | R | S | T | U | V | W | Kg |
|-----------|-----|------|----|----|------|----|------|
| VRD40.040 | 79 | 44 | 20 | 20 | 75 | 20 | 6.9 |
| VRD40.050 | 79 | 44 | 20 | 20 | 82,5 | 20 | 7.1 |
| VRD40.065 | 82 | 45 | 22 | 30 | 92 | 22 | 8.1 |
| VRD40.080 | 92 | 48 | 16 | 30 | 100 | 24 | 9.4 |
| VRD40.100 | 110 | 59,5 | 5 | 41 | 110 | 24 | 13.1 |
| VRD40.125 | 128 | 69 | 7 | 41 | 125 | 26 | 18.7 |
| VRD40.150 | 145 | 78 | 18 | 39 | 142 | 26 | 24.4 |

- 1) Flanges according to ISO 7005-2
- DN Nominal size, dimension of the media connection
- R Number of boreholes in flange

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Subject to change!