



# VK42.. / VK82.. SERIES

## PX42 GAS CONTROLS FOR PREMIX COMBUSTION SYSTEMS

### PRODUCT HANDBOOK



### APPLICATION

Energy preservation and reduction of CO<sub>2</sub> emissions are the main drivers for appliances with low emission premixed burners. **px42** is the name for the Resideo VK42../VK82 series gas control family. This gas control series has been developed for application in gas fired domestic central heating boilers, combi boilers and warm air furnaces or water heater appliances with automatic ignition and fully premix burners. The VK42../VK82.. series gas controls can be used in direct burner ignition applications.

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# GENERAL

## DESCRIPTION

### **pX42 Gas Valve**

The **pX42** or VK42../VK82 series gas control-family includes a 1:1 gas/air regulator that has been specially developed for fully premixed gas appliances. The gas/air regulator provides the function of regulating/modulating the gas pressure drop equal to the air pressure.

The VK42../VK82.. series gas control comprises a standard body in two versions that differ in gas outlet connection.

Several options can be factory included. These functional options are: throttle valve regulation, line or low voltage coil. The gas control has a first direct on/off operator for opening the class C valve according to EN161 and a second electric on/off servo operator for control of the main valve of class C according to EN161. The regulator is designed for accurate control in gas air ration systems.

The control is in accordance with EN 12067-1: Pneumatic Gas/air ratio controls for gas burners and gas burning appliances.

The gas control can handle the 1<sup>st</sup>, 2<sup>nd</sup> and the 3<sup>rd</sup> family gases.

### **Description of gas/air 1:1 system**

In a boiler with a fully premixed burner, the air flow is controlled by a fan. In an air restriction or across a venturi the air flow generates an air pressure drop. The high air pressure is supplied to the gas control. In the working mode the gas pressure drops across the main burner injector is regulating and/or modulating equal to the air pressure drop across the air restriction. (see principle in fig. 1) The system is electronically controlled to provide programmed safe light up and is in supervision of the main burner.

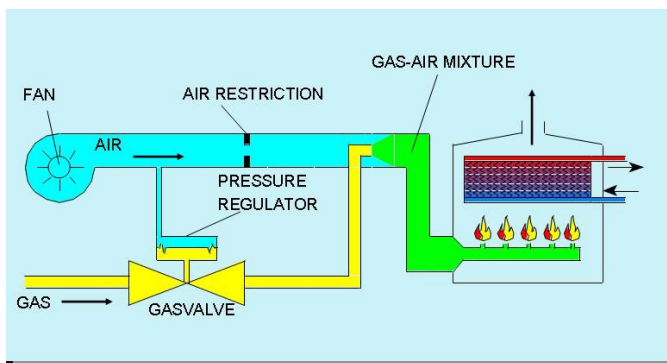


Fig. 1 principle gas air control 1:1

### **Description of 1:1 gas/air regulator**

The 1:1 gas/air regulator is based on the servo regulation principle. The 1:1 gas/air regulator assembly has an air pressure connection and an offset adjustment screw. The 1:1 gas/air regulator equals the gas pressure to the supplied air pressure. With the offset adjustment screw it is possible to adjust the offset. (Offset =  $P_{\text{gas}} - P_{\text{air}}$ )

### **General**

All measurements are carried out under standard conditions, as listed below unless otherwise is indicated.

### **Standard conditions**

- $P_{\text{inlet}}$  20 mbar nominal pressure, dry air of 20°C
- $P_{\text{ambient}}$  1013 mbar
- $T_{\text{ambient}}$  20°C
- Outlet orifice 4.3 mm
- Flow indication in  $\text{m}^3_{\text{st}}/\text{h}$
- Recording of outlet pressure with a transducer connected to a 1/2" pipe with a length of 10 times the diameter of the pipe with a short hose at a length of 5 times the diameter of the pipe.
- Nominal voltage
- Sideward position, i.e. the position when the operators are 90 degrees from straight up in any direction.

### **Quality level of specifications**

Unless otherwise specified the performance values correspond to  $C_{\text{pk}} > 1.17$  (short term) and  $C_{\text{pk}} > 0.7$  (long term) quality levels.

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# FEATURES

## **pX42 Gas Valve**

- Inlet and outlet gas connections are straight through.
- The closing force of the valve is class: C+C.
- Low power and low noise actuators assure quiet operation.
- 24Vdc/rac and 230Vrac powered versions are available.
- Gas air servo pressure regulator provides stable outlet pressure in 1:1 gas air control systems.
- Air pressure connection M5 threaded.
- All adjustments are accessible from the top.
- 9 mm diameter pressure taps on top face for checking pressures.
- Three pressure taps, for inlet pressure, outlet pressure at zero test point and outlet pressure downstream of the optional throttle.
- An internal fine mesh screen is incorporated at the inlet of the gas control.
- Two mounting holes for self tapping screws are at the inlet of the gas control for rigid attachment to the appliance.
- Mounting orientation may be within 90° in any direction from the electric on/off operator upright position.

### **Functional option**

Throttle valve versions are available

### **Gas connection options**

Main gas inlet external thread: 3/4" (ISO-R228)

Main gas outlet external thread: 3/4" (ISO-R228) Alternatively the outlet connection can be quick- connect. For example to connect a Resideo mini venturi or PremiXengine venturi.

Fittings for 4 or 6 mm silicon tube can be mounted in the M5 thread in the regulator to feed the air signal to the gas air regulator.

### **Electrical connection options**

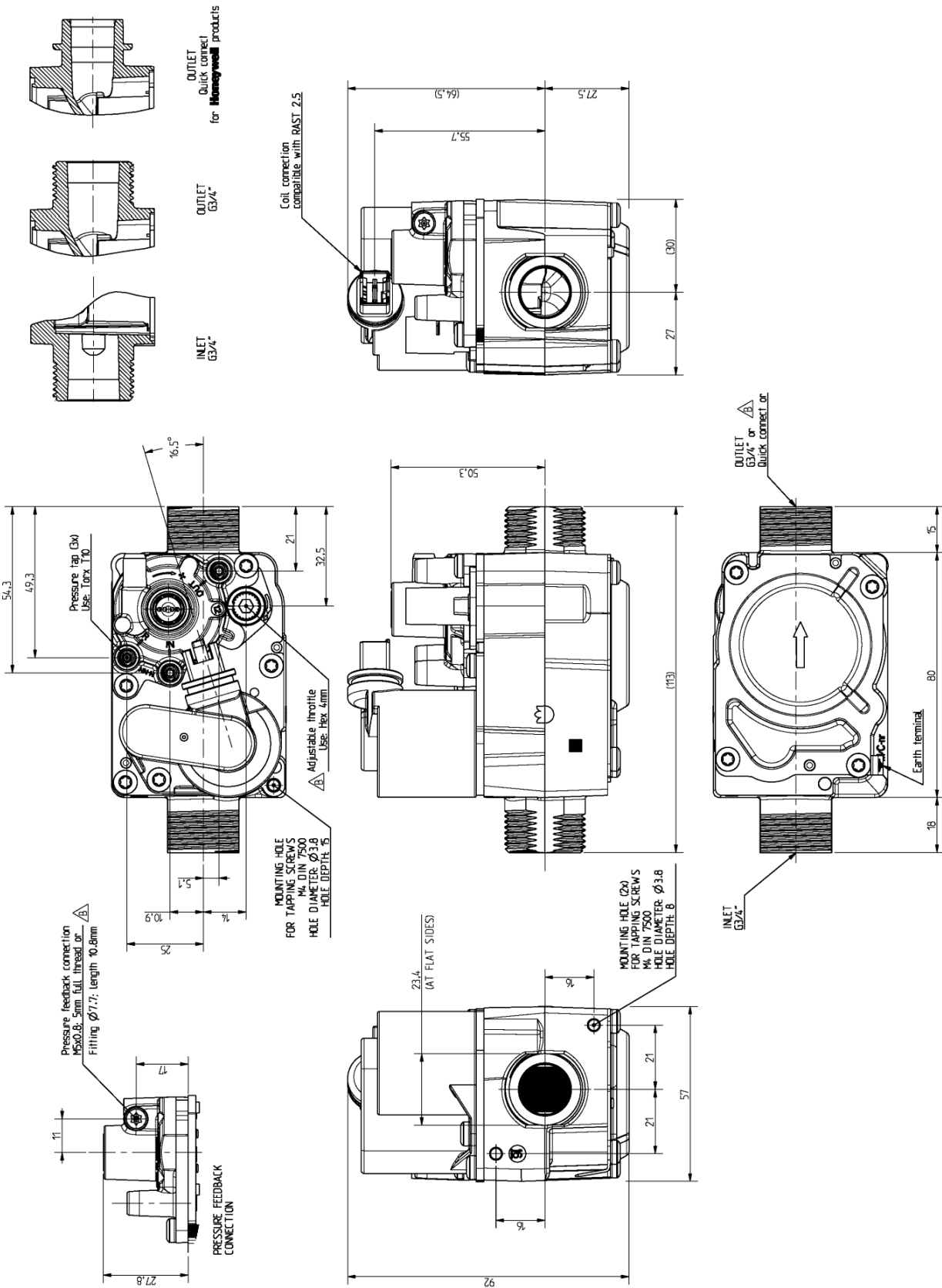
The coil is equipped with a keyed rast 2.5 connector. The rast 2.5 specification can be found at:

<http://www.zvei.org/index.php?id=613>

An optional protective rubber sleeve can be applied on the coil to prevent water and dirt access to the coil terminals.

# DIMENSIONAL DRAWING

Dimensional drawing VK42.5VE/VK82.5VE (Throttle)



Tolerances according to installation drawing 50.050.562

Fig. 2 dimensional drawing

# TECHNICAL

## APPLICATION

The VK42.. / VK82..series gas control have been specially developed for application in domestic appliances.

The VK42.. series gas control can be used in a system in conjunction with any ignition controller according EN298 with a 230 Vrac output.

The VK82.. series gas control can be used in a system in conjunction with any ignition controller according EN298 with a 24 Vdc or Vrac output.

The ignition controller must be of a construction that does not supply any residual voltage to the coil when it is switched off.

## SPECIFICATIONS

### Models

See model number chart figure 10 on page 16.

### Main gas connection

Table 1. Gas connection options.

Inlet	Outlet	Body length
G 3/4"	G 3/4"	113 mm
G 3/4"	Quick Connect	113 mm

Connections with G 3/4" external thread fitted with nuts according to ISO 228-1 in combination with applicable sealing(s) withstand the torsion and bending stress of EN 126 group 1

Connections with Quick connect are suitable for Resideo quick connection with o-ring seal and clip.

### Ambient temperature

-15 ... 70 °C over life of the valve a maximum of 2500 hrs. may be exposed to 70°C max. For the remainder of the life the temperature may be 60°C max.

### Humidity

95% RH max. at 40°C

### Storage

-30 ... 70°C

### Air signal connection

The gas air servo pressure regulator has an M5 thread connection for the air signal feedback.

Feedback fittings for 4 or 6 mm silicon tube can be mounted as an option.

To prevent water entering when the air connection is in upward position a protective cap can be mounted as an option.

### Pressure taps

Three pressure taps are located at the top side of the control:

"IN" test point for inlet pressure

"R" test point for outlet pressure at regulated (zero) pressure

"OUT" test point for outlet pressure downstream of the optional throttle.

### Dimensions

See page 4, fig 2 dimensional drawing and installation drawing 50.050.562

### Offset range for gas air regulator

+30 Pa with coils in sideward position.

46 Pa to -14 Pa with coils on top.

### Minimum regulation capacity

0.2 m<sup>3</sup>/h air

### Minimum differential pressure

4 mbar.

### Maximum operating pressure

60 mbar.

### Maximum air pressure

8 mbar without outlet gas pressure (before ignition);

20 mbar with outlet gas pressure (after ignition)

### Mounting holes

Two mounting holes for thread forming M4 screws are located at on the inlet side of the gas control.

# CAPACITY CURVES

In m<sup>3</sup>/h air at pressure drop as shown in table 2. See also the capacity curves fig 3 and 4.

**Table 2. Capacity**

Model	Extension	Delta P (mbar)	Capacity (st m <sup>3</sup> /h air)	Remark
VK42../VK82..	V	5	2.8	
	VE	5	2.5	
	VE	5	3.3	Delta P until throttle, testpoint "OUT"

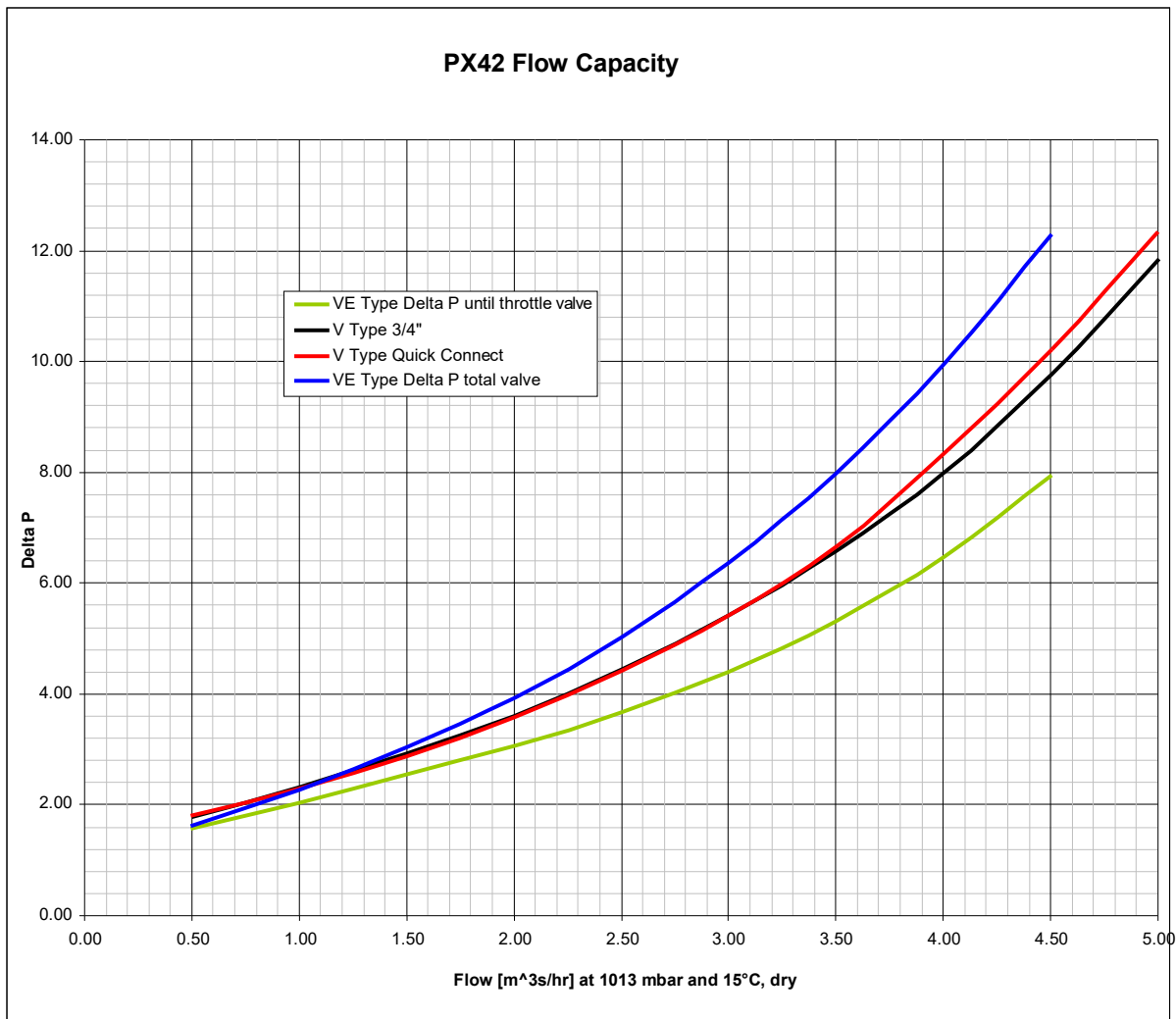


Fig: 3 Capacity curve in air flow

For V types the delta P to be considered is the pressure delta between supply pressure and outlet pressure of the valve (which usually is zero)  
 For VE types the delta P to be considered is the pressure delta between supply pressure and outlet pressure of the valve upstream of the throttle, test point "R" (which usually is zero)

is pressure between test point "R" and test point "OUT". See the capacity curve fig.3.

So for VE application both fig.3 and fig.4 capacity curves should be considered

For VE types the capacity of the throttle is determined by the delta P as generated by the air supply system. Delta P throttle

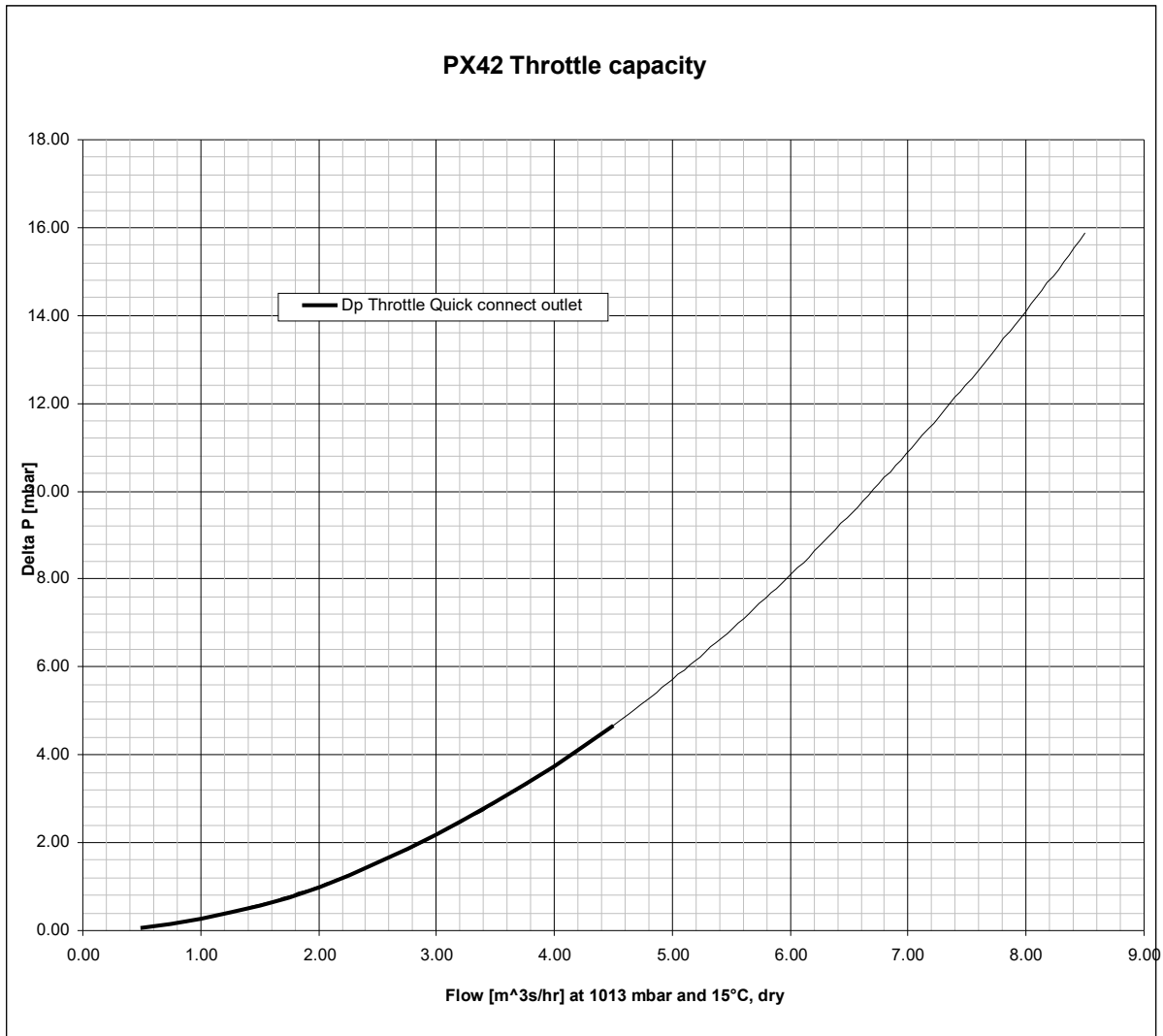


Fig.4 Throttle Capacity curve

**Valve classification**

First valve class C; Second valve class C

**Offset Accuracy**

Conditions for factory setting of offset are:

- Inlet pressure (IN) 2000 Pa.
- Outlet pressure (Po) 100 Pa measured on the “OUT” pressure tap on the gas valve.
- Sideward position, i.e. the position when the operators are 90 degrees from straight up.
- Outlet orifice; Ø4.3 mm.

Setting accuracy of the offset as supplied is +/-3Pa. This includes transportation (acc. ASTM D4169), tap sensitivity and repeatability, but excludes the effect of leak testing of the valve.

**Nominal offset**

The actually measured offset is affected by flow, signal pressure and inlet pressure. The calculated delta is a nominal value that should be used to compensate the offset setting. The deviation can be calculated by using a tool, which is available at Resideo. Examples are in table 3:

**Setting accuracy**

Table 3

Gross Boiler Load @ max rate (kW)	Modulating range	Boiler Load @ min rate (kW)	Gas type	Air Flow @ min rate (m <sup>3</sup> s/h)	Inlet pressure (mbar)	Signal Pressure (Pa)	Total Offset Delta (Pa)
40	1:5	8	G25	0.54	30	100	0.4
40	1:5	8	G20	0.54	30	50	0.6
40	1:5	8	G20	0.54	20	50	0.4
27	1:5	5.4	G25	0.44	20	50	0.6
27	1:5	5.4	G20	0.41	30	50	1.1
25	1:5	5.0	G25	0.41	25	42.9	0,9

### Accuracy over life

Maximum offset shift over life (500k cycles) is +/-2.5 Pa.

### Modulation Speed

Time to modulate from max. to min. flow rate or vice versa must be more than 1 s.

## ELECTRICAL DATA

### Electrical connection

**Table 4.**

Supply Voltage	Coil indication	Coil Connection	Valve indication	Coding of connector
24Vrac or 24Vdc	blue	Rast 2.5	VK8205	R2.5/2-2a
230Vrac	black	Rast 2.5	VK4205	R2.5/2-2d

Electric connector: Rast 2.5, for example: Lumberg duomodul type number: 3523 02 series or alternative.

Protection level with Lumberg duomodul correctly assembled is: IP40

Ground connection: ¼" spade tab located at bottom plate of the control.

### Power consumption

**Table 5**

Supply Voltage	Power Consumption @ nominal voltage	Resistance of coil @20°C
24Vrac or 24Vdc	4.4 VA	114.5 Ω
230Vrac	4.9 VA	9355 Ω



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## PERFORMANCE CHARACTERISTICS

### **Over pressure resistance**

In the "OFF" condition, the gas control will withstand 1 bar (air) inlet pressure without damage. Attempts to operate the gas control, while in this fault condition will not damage it.

### **Operable voltage range**

The gas control will function satisfactory between 85% and 110% of the rated voltage.

### **Main valve opening characteristics (measured with gas)**

#### **Fast opening versions**

Under conditions where the supply pressure is at least 4 mbar above the outlet pressure setting, the dead time is 0.5 s maximum. The outlet pressure will reach 80% of the rated flow within 1 second from start of flow. Full outlet pressure will be reached within 5 seconds.

### **Oscillation**

Maximum oscillation is 20% of pressure delta over injector or throttle.

### **Design life**

500.000 cycles for safety and main valve operator.  
Cycle frequency maximum 100 cycles /hour.

# INSTALLATION

## IMPORTANT

**When installing this product.....**  
 Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.  
 Check the ratings given in the instructions and on the product to ensure the product is suitable for your application.  
 Installer must be a trained, experienced service technician.  
 After installation is complete, use these instructions to check out product operation.

## IMPORTANT

Take care that installer is a trained experienced service person.  
 Turn off gas supply before starting installation.  
 Disconnect power supply to prevent electrical shock and/or equipment damage. Take care that dirt cannot enter the gas control during handling.

### Mounting position

The gas control can be mounted 0 to 90 degrees in any direction from the upright position (from the position when the coil is on top). Keep magnetizable metal at minimal 5mm distance from the sides of the valve.

### Main gas connection

Ensure the gas flows in the same direction as the arrow on the bottom of the gas control.

### External thread connection

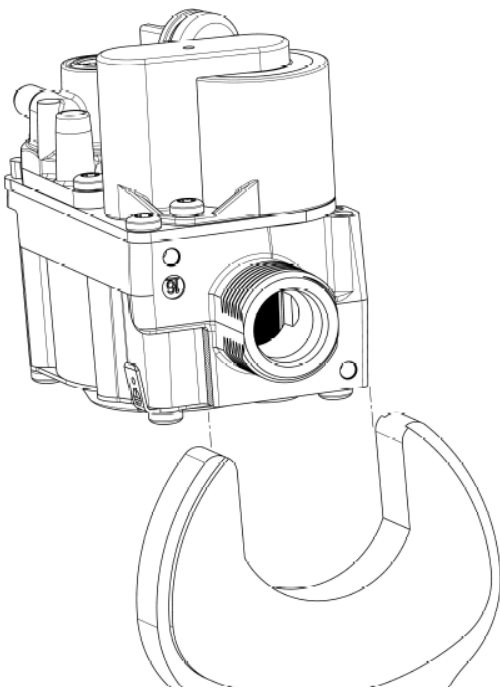


Fig. 5 clamping surfaces on valve body

## WARNING

Never apply any force or torque on the coil before, during or after installation of the valve.

## IMPORTANT

Fastening torque flat sealing ring only applicable for type Klingersil C4324  
 Handle the valve with care, to prevent damage to the sealing surfaces prior to installation.

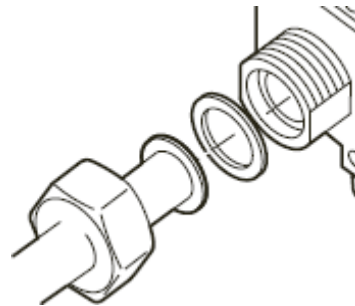


Fig. 6. External thread connection with nut and flat sealing ring

**With 3/4" nut and flat sealing ring for pipe 15 mm (fig. 6)**  
 Nut: drawing:..... 45.006.583-003  
 Flat sealing ring according to DIN 3535-6 with size  $\varnothing 24 \times \varnothing 16 \times 1.5$  mm  
 drawing..... 45.006.582-001  
 Fastening torque: maximum 50 Nm minimum 30 Nm  
 Pipe end construction: fig. 7

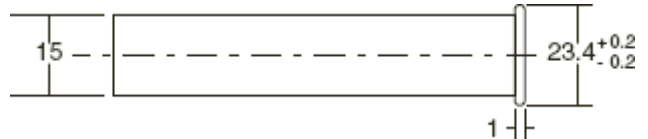


Fig. 7

**With 3/4" nut and flat sealing ring for pipe 18 mm (fig. 6)**  
 Nut: drawing: ..... 45.006.583-002  
 Flat sealing ring according to DIN 3535-6 with size  $\varnothing 24 \times \varnothing 16 \times 1.5$  mm  
 drawing..... 45.006.582-001  
 Fastening torque: maximum 50 Nm minimum 30 Nm  
 Pipe end construction: fig. 8.

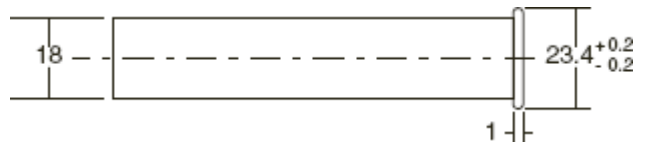


Fig. 8

### Pressure feedback or signal pressure connection

## WARNING

**Make sure that the air signal connection cannot get blocked in any condition. To prevent water entering when the air connection is in upward position a protective cap can be mounted.**

**In applications with a tube connection:**

**To avoid decreasing of performance of pressure regulator by pinching off the pressure feedback tubing, it is recommended to use a tube material which will not kink.**



**Keep water solution away from electrical connections.**

## **ELECTRICAL CONNECTIONS AND WIRING**

### **IMPORTANT**

*Wiring must be in accordance with local regulations. The appliance manufacturer's instructions should always be followed. Before installing or replacing any control check that type number is correct for the application. Ensure combustion chamber is free of gas before start up. Conduct a thorough check out when installation is completed. At the first start the ignition control can be in lock out; depress reset button (when available) to free control.*

*Do not bring extreme magnetic field in valve neighborhood.*



**Take care that installer is a trained experienced service person. Turn off gas supply before starting installation. Disconnect power supply to prevent electrical shock and/or equipment damage.**

### **IMPORTANT**

*Warranty claims are not accepted if the specified circuit is not used.*

#### **Wiring**

Use cable which can withstand 105°C ambient temperature.  
Use cable which is proven against moisture.

#### **Assembling of the cable connector(s)**

Make sure the correct connector is available.  
Follow the instructions of the supplier of the cable connector for assembly of the cables.  
Mount the connector on the coil with the wires on the topline.  
Snap the connector in place on the coil.

### **IMPORTANT**

*Make sure no stress is put on the connecting wires and connection in any way after the installation. Make sure the ground connector is assembled correctly, when applicable.*

*Do not apply excessive force on the ground terminal.*

#### **Choose gas control location**

The gas control is mounted in the appliance vestibule on the gas manifold. If this is a replacement application, mount the gas control in the same location as the old gas control.

Do not locate the gas control where it may be affected by steam cleaning, high humidity, dripping water, corrosive chemicals, dust or grease accumulation, or excessive heat.

To ensure proper operation, follow these guidelines:

- Locate gas control in a well-ventilated area.
- Mount gas control high enough above cabinet bottom to avoid exposure to flooding or splashing water.
- Respect the ambient temperature ratings for each component.
- Cover gas control if the appliance is cleaned with water, steam, or chemicals to avoid dust and grease accumulation.
- Avoid locating gas control where exposures to corrosive chemical fumes or dripping water are likely.

#### **Perform gas leak test**



**FIRE OR EXPLOSION HAZARD CAN CAUSE. PROPERTY DAMAGE, SEVERE INJURY OR DEATH**

**Check gas connections for leaks with a rich soap and water solution any time work is done on a gas control.**

#### **Gas leak test**

- Paint all pipe connections upstream of the gas control with a rich soap and water solution. Bubbles indicate a gas leak.
- If a gas leak is detected, tighten the pipe connection.
- Stand clear while lighting the main burner to prevent injury caused from hidden gas leaks, which could cause flashback in the appliance vestibule. Light the main burner.
- With the main burner in operation, paint all pipe joints (including adapters) and gas control inlet and outlet with an approved leak detection fluid.
- If a gas leak is detected, tighten adapter screws, joints and pipe connections.
- Replace the part if gas leak can not be stopped.

## ADJUSTMENTS AND CHECKOUT

### IMPORTANT

*Adjustments must be made by qualified persons only. If the appliance manufacturer supplies checkout and/or service and maintenance instructions carefully follow them. If these instructions are not provided then use the procedure outlined below.*

#### Pressure tap

The gas control is provided with pressure taps of 9 mm outer diameter at inlet (In) Regulated pressure (Out) and outlet side after throttle (P).

When checking the pressure undo the screw a half turn with a Torx T-10 driver and slip tube over nipple.

Ensure that screw is closed leak tight after making a test. To seal tighten screw with 0.1 - 1 Nm torque.

#### Offset adjustment

- Remove cap screw with a torque bit T40 to expose offset adjustment screw.
- Check gas supply pressure to the appliance using a pressure gauge connected to the inlet pressure tap.
- Start fan and check air flow.
- Energize both electric operators in order to have gas input to burner and ignite boiler.
- Adjust CO<sub>2</sub> % at the desired value at low output with offset adjustment screw using a T40 Torx bit. Turn offset adjustment screw clockwise to increase CO<sub>2</sub> %. Do not apply torque over 1Nm when screw is bottoming out.
- Operate boiler on high output. (Only modulating applications).
- Replace cap screw and tighten pressure taps.

#### Flow adjustment throttle versions VK.2..VE

- Energize electric operators in order to have gas input to burner.
- Check input to the appliance using a clocking gas meter or alternatively a pressure gauge connected to the pressure tap. marked "P".
- Make sure appliance runs at high output
- Turn the flow adjustment screw with a 4mm hex driver **in clockwise direction** to increase and turn counter clockwise to decrease the gas flow.

### IMPORTANT

*When throttle setting screw is fully turned in. Do not apply axial force when rotating the setting anti-clockwise to reduce the flow from maximum setting.*

*Do not apply excessive force to throttle screw or throttle nut.*

*Flow setting may be accompanied with a clicking sound indicating adjustment steps.*

Check safety shutdown performance



## WARNING

**FIRE OR EXPLOSION HAZARD CAN CAUSE. PROPERTY DAMAGE, SEVERE INJURY OR DEATH**

**Perform the safety shutdown test any time work is done on a gas system**

#### Final checkout of the installation

Set appliance in operation after any adjustment and observe several complete cycles to ensure that all burner components function correctly and that cap screw and cover are fitted and secured and all pressure taps are closed and leak tight.

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## MAINTENANCE

### Maintenance and service

Under normal circumstances no maintenance or service is required.

Screws on the gas control must never be removed.

The designed lifetime\* of this product is 10 years, based on date code, according to

a) the standard EN 126

b) the table on designed lifetime as stated on the Afecor website <http://www.afecor.org/>

We cannot assume that the product can be safely used beyond the mentioned designed lifetime.

This lifetime is based on use of the control according manufacturer's instructions.

Regular inspection of the control by authorized personnel in accordance with guidelines of the appliance manufacturer is required.

After reaching the designed lifetime the product has to be replaced by authorized personnel.

**Note: \* Warranty as opposed to designed lifetime is described in the delivery terms.**

## CONSTRUCTION AND WORKING PRINCIPLES

### Servo pressure regulation

The VK4205/VK8205 series gas controls features the positive servo system, i.e. the main gas valve is closed by spring pressure in the normal shut down position and can only be opened when gas pressure is sufficient to overcome the spring force. This valuable built in safety feature ensures the main valve will automatically close in the event of power or gas supply failure.

The heart of the system is the servo pressure regulator which consists of a pressure relief valve integrated in a regulator diaphragm which is fitted above and controls the main valve. When the direct on/off operator and servo on/off operator are energized, inlet gas flows through the servo orifice and through the open operator valve into the servo system and the regulator. This servo gas moves the main valve diaphragm upwards enough to open the main valve. As soon as the main valve has opened, the outlet pressure will be sensed by the regulator diaphragm via the feedback channel. When the force

operated by the pressure is greater than that preset by the adjustment screw and the actual air signal on the diaphragm, the regulator valve opens relieving some of the working pressure. This reduces the force against the main valve spring allowing the main valve to close proportionally. Thus the main valve limits the outlet (or burner) pressure to the preset level. As a result, outlet pressure is continuously maintained by comparing it to the preset pressure and adjusting the position of the main valve accordingly. This means that a constant outlet pressure is maintained regardless of inlet pressure variations. At shut down, the small volume of working gas in the regulator and the diaphragm chamber is dumped into the main outlet chamber.

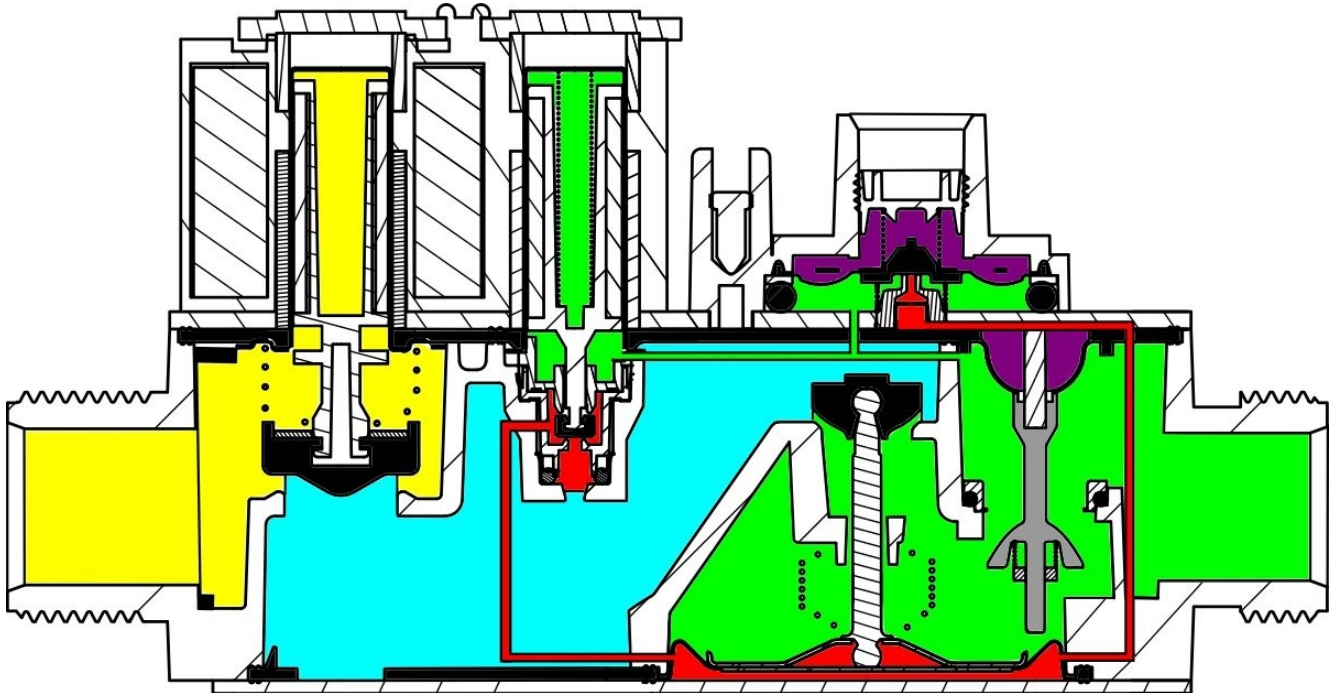


Fig. 9. Servo pressure regulation working

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## VARIOUS

(Immunity, Product Family Standard)

## QUALITY ASSURANCE STATEMENT

for emission based on the standard: EN55014-1  
(Emission , Product Family Standard)

Products are manufactured under an ISO 9001 and ISO 14001 certified Quality System.

The quality system is described in the Resideo ECC Global Management System and its related operational procedures and instructions.

The quality system is approved by QMI.

The product and processes are designed under 6 sigma and lean principles.

The quality organization is responsible for defining, maintaining, improving and verification of the quality systems in the field of design, production process and field quality service.

All processes are guided by work instructions. At the end of the assembly phase, **all** gas controls are leakage and performance tested/adjusted.

All people involved in the production process have received training for their job. New people are trained until they reach the correct level of skill.

The above mentioned product does not contain substances above the limits specified by the RoHS directive 2002/95/EC.

Emmen, March 2011.

On behalf of ResideoTechnologies Sarl,  
B.Veld Manager Standards & Approvals

## APPROVALS

The **pX42** gas valve series **VK4205V(E)** and **VK8205V(E)** have been designed to meet the European standard EN126 for Multifunctional Controls, based on the functionality of:

- EN 161 Automatic shut-off valves
- EN 12067-1 Pneumatic gas/air ratio controls

External parts and connections of the gas valve meet the requirements of EN 60335-2-102 on Heat & Fire resistance for application in gas appliances.

Declaration of Conformity  
ResideoTechnologies Sarl.  
Rolle,  
Switzerland,

declares under it's sole responsibility that the following product family of **multifunctional controls**  
**VK 4205 V(E) VK 8205 V(E)**

to which this statement relates, is:

- in conformity with the essential requirements of the **Gas Appliance Directive 2009/142/EC** based on EN 126 and in conformity with the type as described in the EC type-examination certificate issued by Gastec Certification with PIN 0063CL1247
- in conformity with the essential requirements of the **Low Voltage Directive 2006/95/EC** based on EN 60730-1
- in conformity with the essential requirements of the **EMC Directive 2004/108/EC**

for immunity based on the standard: EN55014-2

## ORDERING INFORMATION

**When ordering specify:**

Model number of **pX42** gas control component required: see model number chart below.

NOTE: Complete gas control, replacement parts and accessories will be available under "TRADELINE" label. Ask your wholesaler for details.

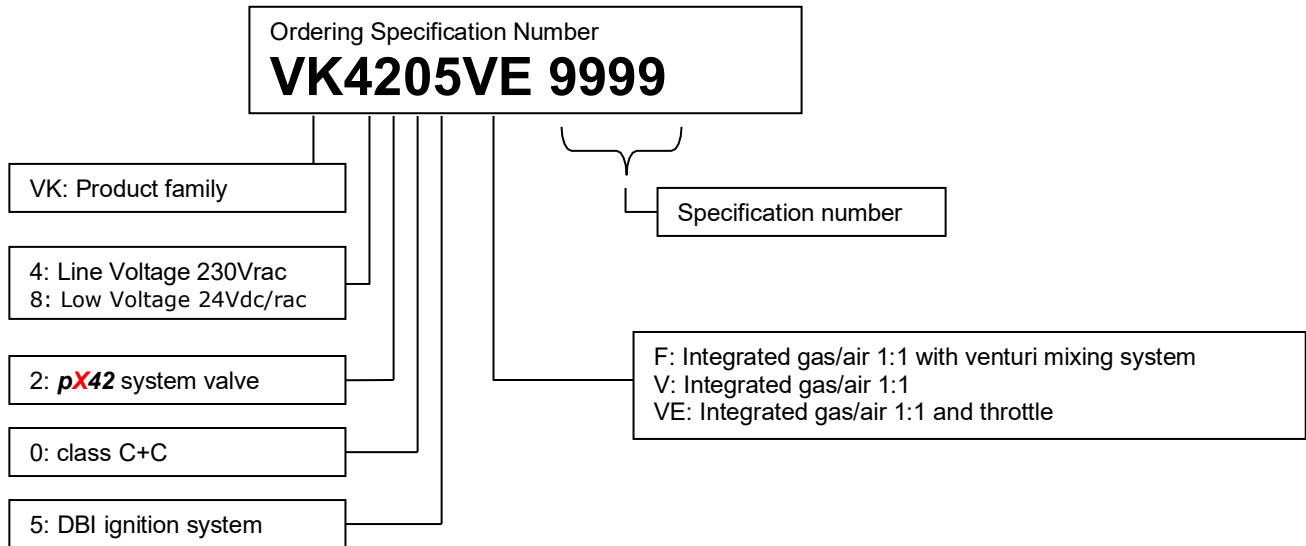


Fig. 10. Model number chart VK series gas controls



# REPLACEMENT PARTS AND ACCESSORIES

## Fitting

Fitting for application on M5 regulator pressure connection. A fitting can be factory installed by O.S. number

Description	Material	Packing quantity	Order number	Color
Pressure feedback fitting for 4 mm tube	Polyamide 6.6	100	45900402-031	Natural
Pressure feedback fitting for 6 mm tube	Polyamide 6.6	100	45900402-034	Blue

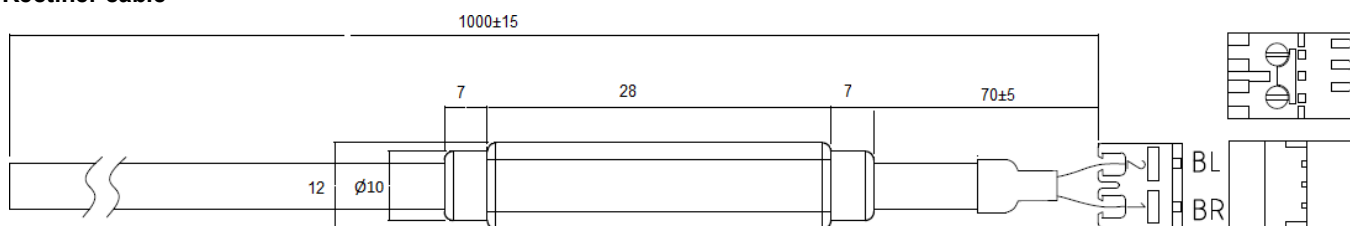
## Protective cap

When outlet is mounted upwards the signal pressure connection should be protected for water entry. A protective cap can be added the part number is 45005041-001

## Seal Plate

To protect the offset setting a seal plated can be added on the cap screw. This will cover the bit hole. It is for one time placement, so tampering will be indicated. The part number is 45006864-001.

## Rectifier cable



Order number 230 V version: 45900458-001 (packing quantity 100 pcs)  
 Order number 24 V version: 45900458-002 (packing quantity 100 pcs)



Ademco 1 GmbH  
 Hardhofweg 40  
 74821 Mosbach  
 Phone: +49 1801 466 388  
 info.de@resideo.com  
 homecomfort.resideo.com

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