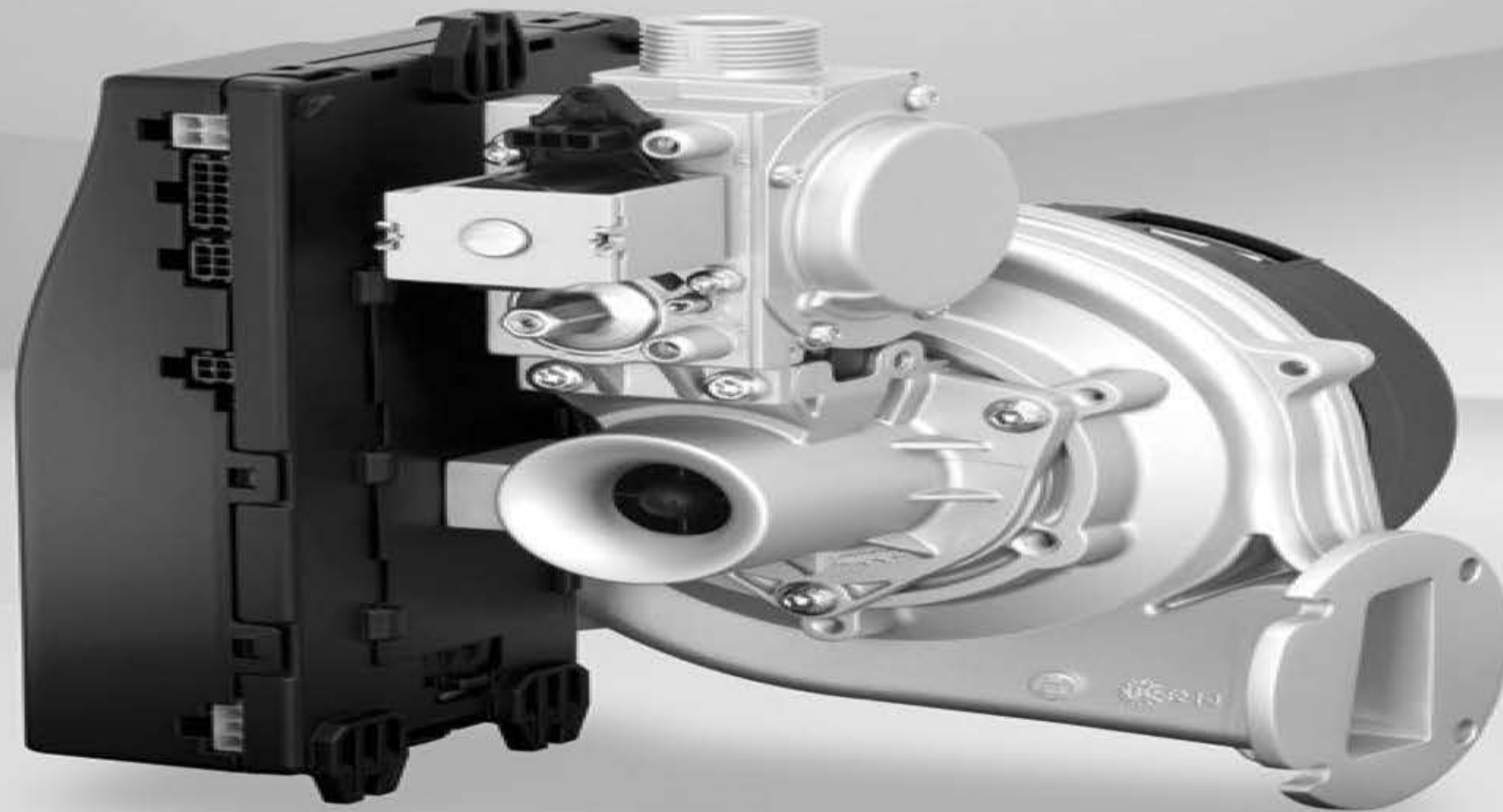


Condensing boiler technology

Issue 2017-03

ebmpapst

The engineer's choice



Ideally suited for all applications

Residential technology



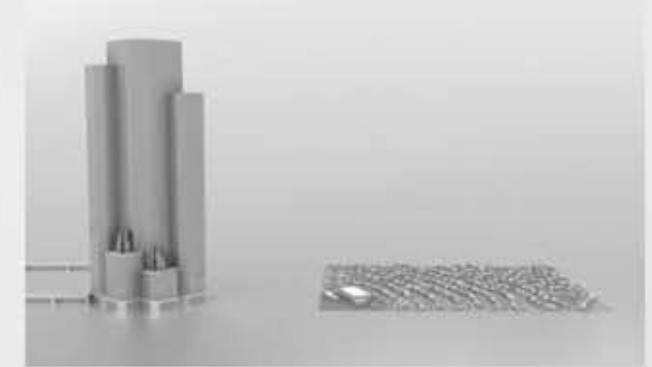
- + Gas condensing heating systems for private households
- + Use as heating unit only, as combi boiler or in conjunction with regenerative energies

Commercial technology



- + Gas condensing heating systems for applications ranging from small trade businesses to heating installations in large industrial plants
- + From single boiler to cascade system installations

Apartment blocks / residential areas



- + The first condensing blower for heat outputs of up to 2MW rounds off our extensive product portfolio
- + For decentralized heating solutions keeping construction work and heat loss from long pipes to a minimum compared to large Combined Heat and Power stations

2 kW



2 MW

Laboratory equipment

As market and technology leaders, we are constantly endeavoring to improve our performance and provide our customers with the best possible complete solution. Our engineers and technicians assist our customers with the development of their applications right from the start and help with the further process of improvement. Before series launch we conduct extensive tests to ensure compliance with legal requirements and customer specifications. We have a wide range of measuring equipment at our disposal for this purpose.

For example our checks include examining design influences such as modifications to the gas-air mixing device, the backflow flaps or the venturi. All these factors can affect the efficiency, noise level and functionality of a condensing heating system. We take measurements on gas-air composite systems directly in the heating unit and ensure ideal matching of the individual components and motor performances. This is accompanied by numerical flow simulation with direct incorporation of the results obtained.

+ Endurance test rooms:

- About 150 different endurance tests with over 700 specimens in progress

+ Sound measurement laboratory:

- Precise sound power and gas measurement technology with incorporation of real conditions

+ Vibration test:

- For simulation of transportation and operation with different vibration profiles



+ Gas laboratory:

- Highly advanced measuring equipment with all the standard test and limit gases used in Europe, America and Asia
- Exhaust gas measurements (CO₂, CO, air ratio), measurements with variable aerodynamic parameters (venturi pressure, mass flow, exhaust gas back pressure) to increase and optimize the modulation range
- Measurement of thermal and electrical performance data
- Simulation of wind and turbulence in the exhaust gas area, e. g. for electronic gas-air composite systems
- Communication with all standard bus systems, e. g. CANbus, Modbus, ebus, OpenTherm

+ Climate chambers:

- Environmental simulation and service life tests with more than 30 climatic, cold and warm chambers
- Simulation of temperature range from 70°C to 300°C possible

+ Air performance test stands:

- Checking of the operating characteristics of blowers and systems with recording of the air performance curves

+ EMC measurement room:

- Emission and immission measurements

+ Approvals:

- AGA, CCC, CSA, DVGW, EAC, KIWA, TÜV, VDE

+ Gas valve test stands:

- For gas valves with pneumatic and electronic modulation

+ Standards and Directives:

- Low-Voltage Directive
- Machinery Directive
- Gas Appliance Directive
- EMC Directive

+ Additional equipment:

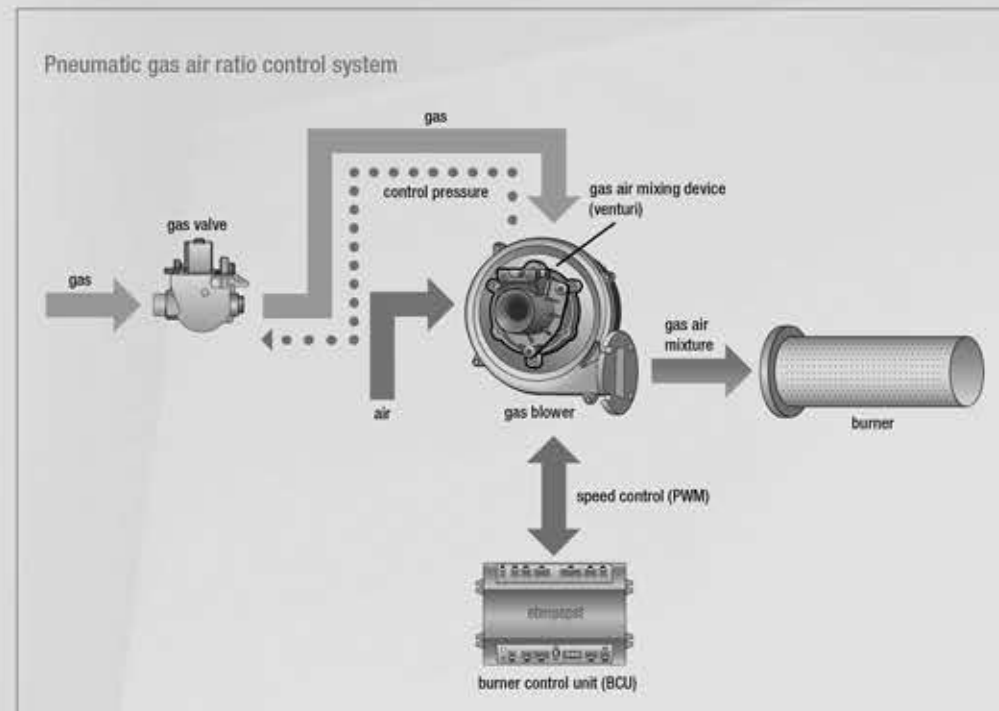
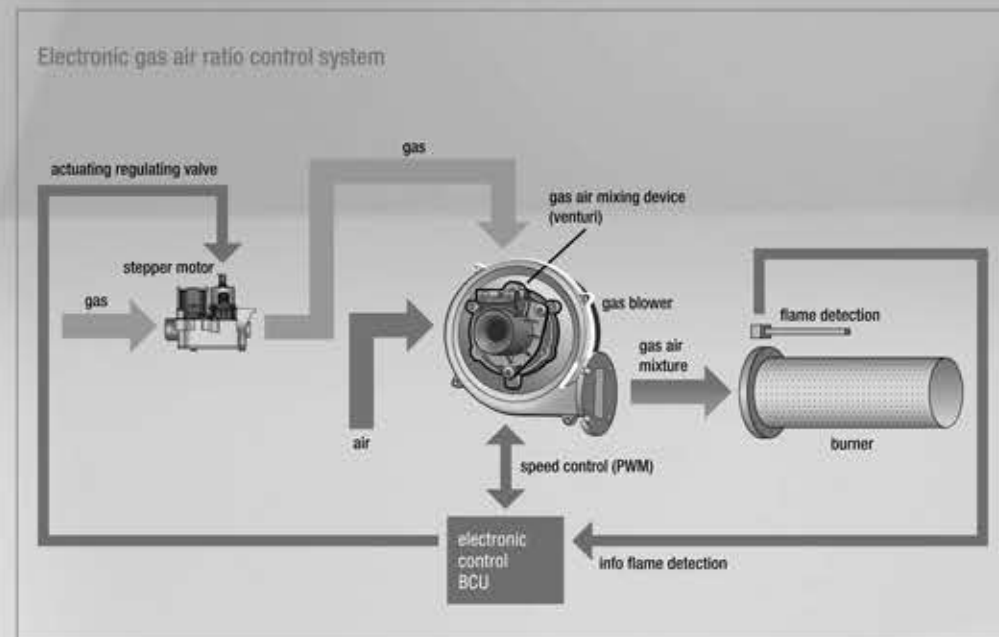
- 3D microscope
- 3D plotter

Systems for condensing boiler technology

An optimum gas-air mixing ratio is crucial to the energy yield realized during combustion. The mixing ratio needs to be exactly adjusted to the heating value of the gases being used (e.g. natural gas, LPG or biogas). An additional challenge is the flexibility of heat output. The greater the modulation range of a heating system, the better its heating output can be adjusted to actual needs. The limits of the

modulation level are determined among others by the minimum and maximum output of the premixing blower. This means its components need to be perfectly matched. That's why we offer complete heating systems including gas blowers, venturis, gas valves and burner control units from a single source.

Ideally suited for pneumatic and electronic gas air ratio control systems



+ Gas blower
State-of-the-art blower technology for modulating operation with low noise and a long service life.

+ Venturi
The pressure generated by the venturi effect provides an optimum mixture of gas and air in the pneumatic gas-air ratio control.

+ Gas valve
The device required for the secure supply and the correct quantity of gas has a particularly compact design.

+ Burner control with display
The electronic control is matched precisely to the system. Signals from the burner controls can be read out and evaluated in the lab using LabVision software.

Our system solutions at a glance.

All heating technology components must be perfectly harmonized in order to achieve optimum performance and efficiency. This is why we offer complete heating systems, including gas blower, venturi and gas valve, from a single source.

A key benefit of our gas-air composite systems is their optimal mixing ratio with simultaneously high modulation ranges. To achieve this high level of efficiency, we provide different venturi elements for

multi-venturis, depending on the heat output range. Our multi-venturi solutions provide you with a wide variety of motor performances and options for assigning our systems to your devices. This gives you the benefit of flexible integration into compact spaces.

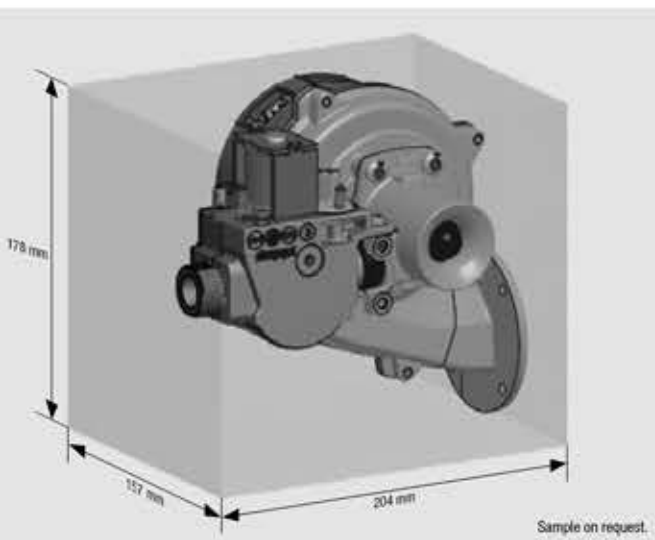
We supply our systems as completely tested, harmonized units with optimized interfaces to minimize your effort.

Mounting positions:

– With horizontal shaft or vertical shaft with motor positioned at top



Illustration examples



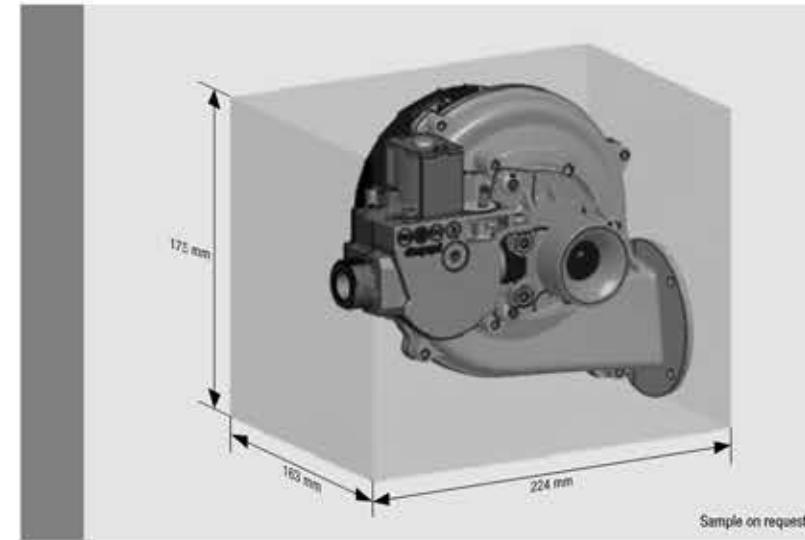
NRV 77 The system for heat outputs from 2 to 35 kW

- Gas blower NRG 77 with multi-venturi
- Gas valve GB-ND 055 E01
- Operating voltage 230 V, option of 120 V
- 24 V gas valve on request

Nominal data

Type	Heating range [kW]*	Part number
Venturi 1	2 – 15	55734.33000
Venturi 2	5 – 28	55734.33010
Venturi 3	7 – 35	55734.33020

* Approximate figures. Heat output range depending on type of gas concerned and system conditions.

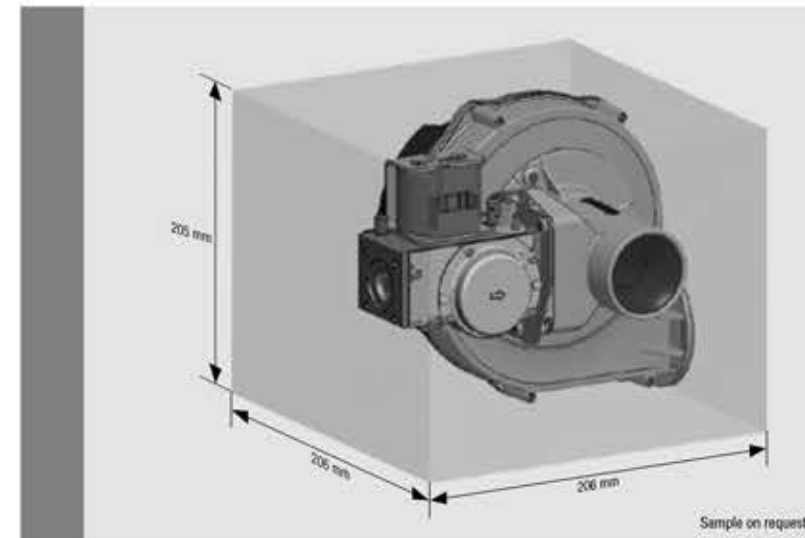


NRV 118 The system for heat outputs from 3 to 42 kW

- Gas blower NRG 118 with multi-venturi
- Gas valve GB-ND 055 E01
- Operating voltage 230 V, option of 120 V
- 24 V gas valve on request

Nominal data

Type	Heating range [kW]*	Part number
Venturi 1	3 – 23	55734.32010
Venturi 2	5 – 28	55734.32020
Venturi 3	7 – 42	55734.32030

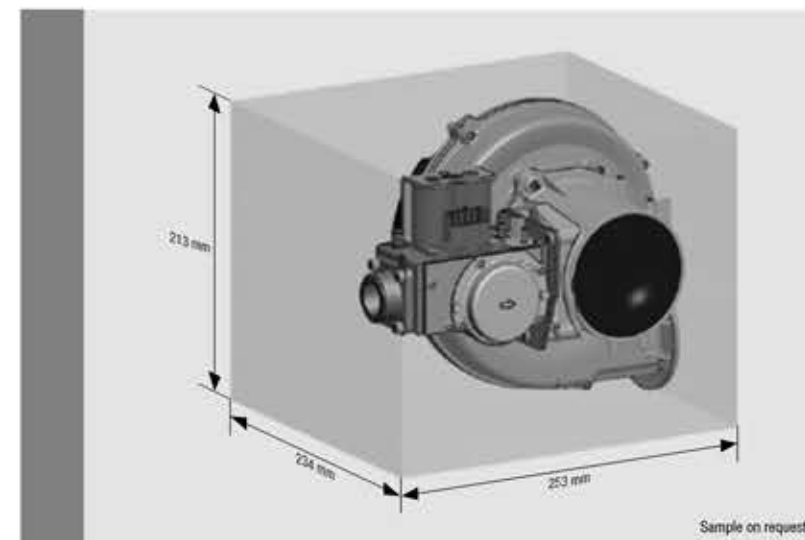


NRV 148 Das System für Heizleistungen von 13 bis 115 kW

- Gas blower RG 148 with multi-venturi
- Gas valve GB-ND 055 D01 (Venturi 1); GB-ND 057 D01 (Venturi 2)
- Operating voltage 230 V, option of 120 V
- 24 V gas valve on request

Nominal data

Type	Heating range [kW]*	Part number
Venturi 1	13 – 80	55714.50000
Venturi 2	20 – 115	55724.50000



NRV 137 The system for heat outputs from 15 to 145 kW

- Gas blower NRG 137 with multi-venturi
- Gas valve GB-ND 057 D01
- Operating voltage 230 V, option of 120 V
- 24 V gas valve on request

Nominal data

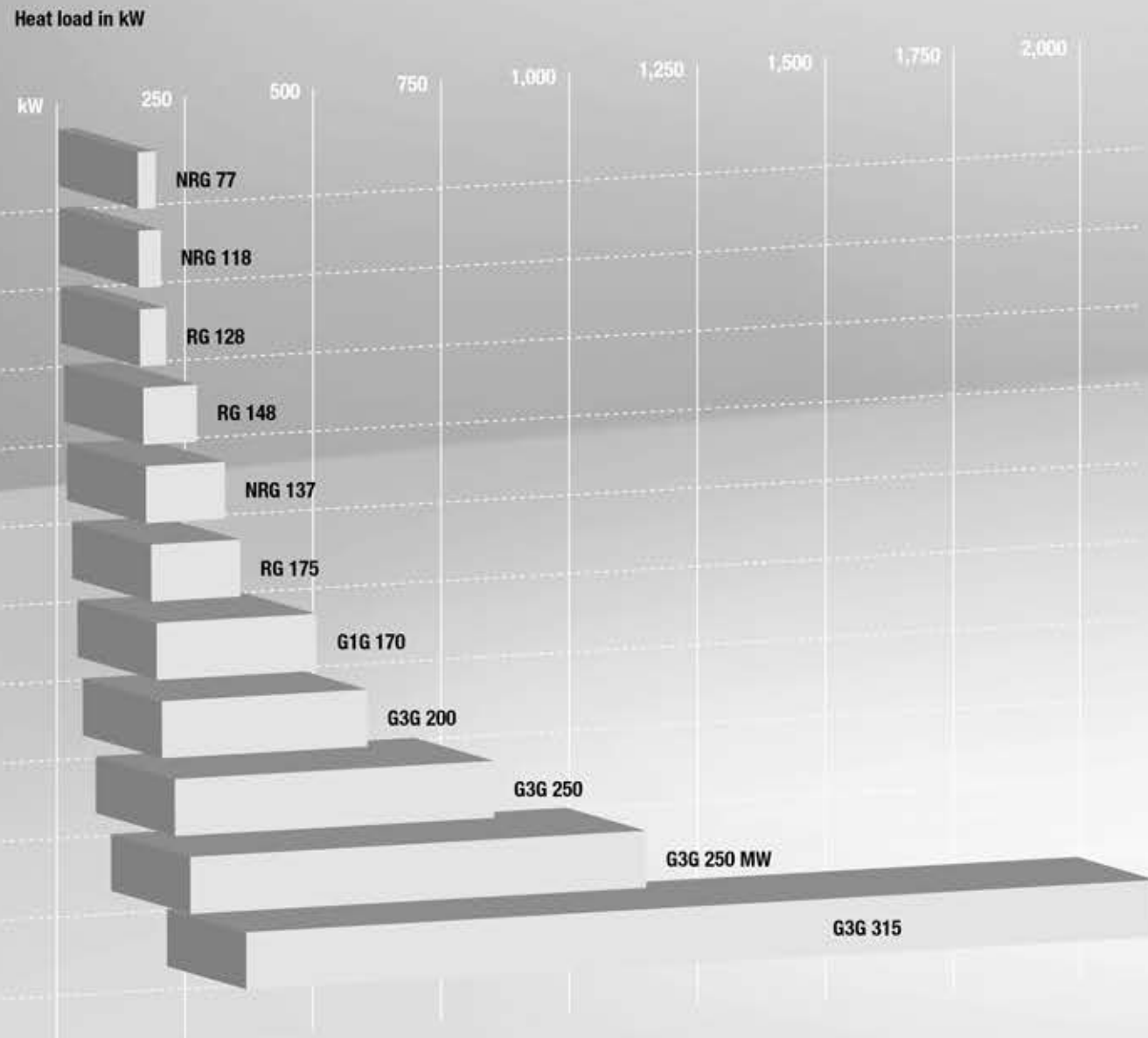
Type	Heating range [kW]*	Part number
Venturi 1	15 – 90	55724.10000
Venturi 2	24 – 145	55724.10020

* Approximate figures. Heat output range depending on type of gas concerned and system conditions.

Radial blowers

Modern gas-fired modulated condensing units have to be supplied with the optimum volume and mixture of air and fuel in all operating modes and ambient conditions. They require adjustable blowers with steep pressure/air flow characteristic curves and high maximum pressures. ebm-papst played a significant role in developing EC

blowers for this purpose and now offers the widest range of solutions for this application area. However, the special properties of these blowers make them suitable for many other applications as well. Examples include gas-powered cooking appliances for the food service industry or gas-powered deep fryers for commercial use.



Heat output range depending on type of gas concerned and system conditions.

+ Commutation electronics

- Integrated into the blower unit and perfectly harmonized with the motor
- Integrated blockage switch-off and overheating protection as per EN 60335
- Various standard interfaces available for the respective burner control
- Optimized in accordance with EMC emissions and pollution

+ Speed controls

- Adjustment required in individual cases
- Controlled via PWM signal
- 0-10 V input optional
- CANbus communication optional

+ Bearings

- Maintenance-free ball bearings covered on both sides for long service life and smooth operation
- Use of lubricants suited for the particular application

+ Mounting positions

- With horizontal shaft or vertical shaft with motor positioned at top
- For vibration-cushioned motor installation, the motor's weight is additionally supported by a flexible element.



+ Drive

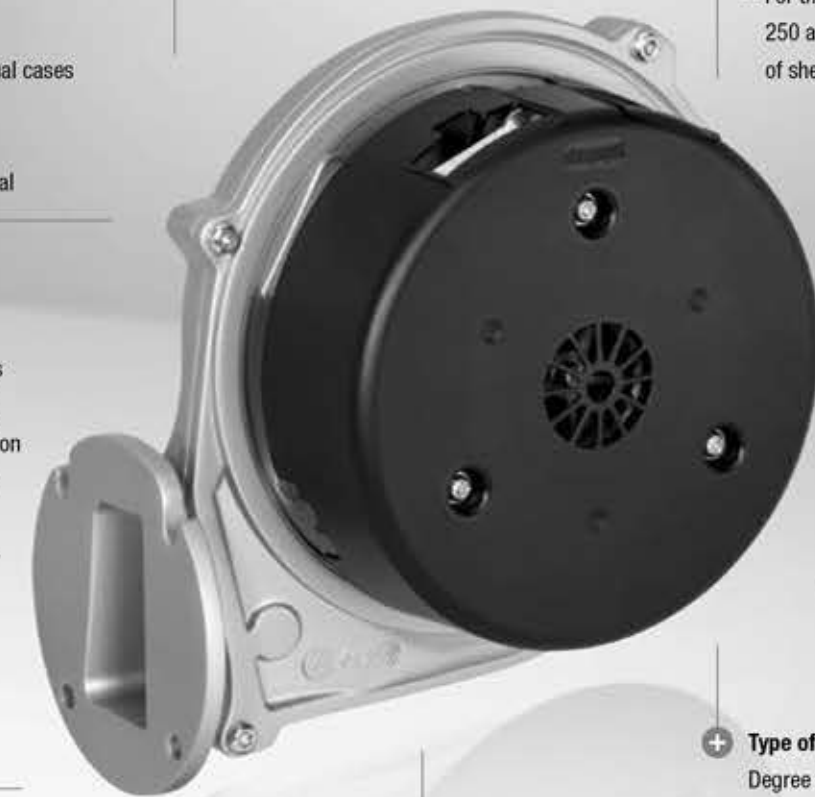
- Brushless DC (EC) motors with integrated electronics
- Vibration-free mounting to minimize structure-borne sound
- Adjustment of motor power on an individual basis

+ Housing

- Made of die-cast aluminum
- Required density thanks to special seal for housing halves and drive shaft conduit
- Outlet flange adjustable to many designs

+ Impellers

- For type NRG and RG blowers made of pentane-resistant plastic; dynamically fine balanced
- For the G1G 170, G3G 200, G3G 250 and G3G 315 models made of sheet aluminum



+ Protection class

Protection class I

+ Type of protection

Degree of protection IP20 with cover, depending on the mounting position

+ Speed output

- With Hall IC signal output; in case of motors for line voltage operation, speed signal output is galvanically isolated
- NRG and RG blowers, each with two pulses per revolution
- G1G and G3G blowers, each with three pulses per revolution
- G3G 250 MW blower with four pulses per revolution
- G3G 315 blower with five pulses per revolution

- **Material:** Housing: Aluminum
Impeller: Plastic
Motor protection cap: Plastic
- **For potential mounting positions, page 15**
- **Multi-venturi available**
- **Mains connector X, interface connector W and interface see page 27 ff.**



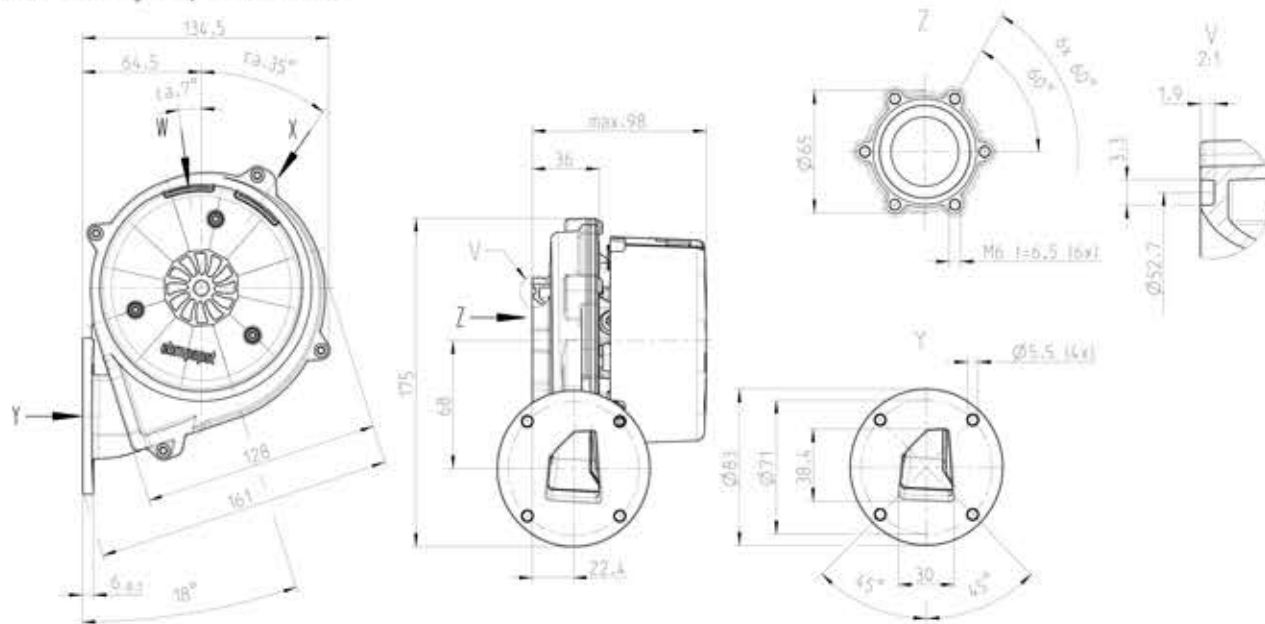
- **Material:** Housing: Aluminum
Impeller: Plastic
Motor protection cap: Plastic
- **For potential mounting positions, page 15**
- **Multi-venturi available**
- **Mains connector X, interface connector W and interface see page 27 ff.**



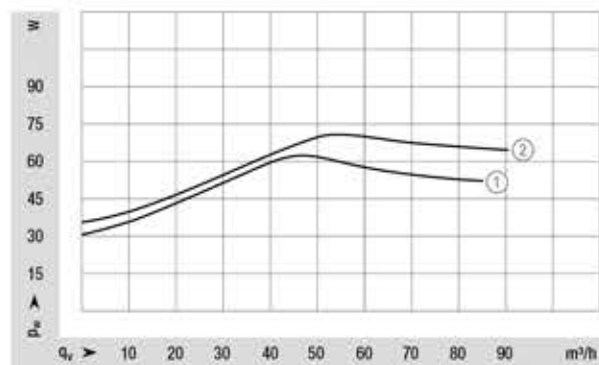
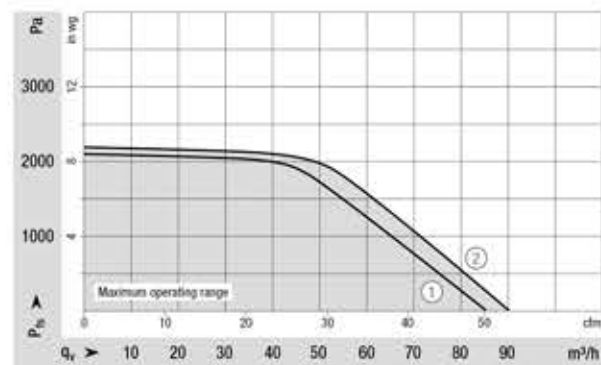
Nominal data	Curve	Rated voltage	Frequency	Max. air flow	Max. air flow	Max. pressure increase	Max. pressure increase	Max. input power	Max. speed	Perm. amb. motor temp.	Perm. temp. of medium	Part number
Type	V	Hz	m³/h	cfm	Pa	wg	W	min⁻¹	°C	°C		
NRG 77	①	230	50/60	87	51	2,100	8.4	62	14,000	60	80	55667.70030
	②	120	60	90	53	2,200	8.8	72	14,000	60	80	on request

Subject to change.

Dimensions in mm. Drawing valid for part number 55667.70030.



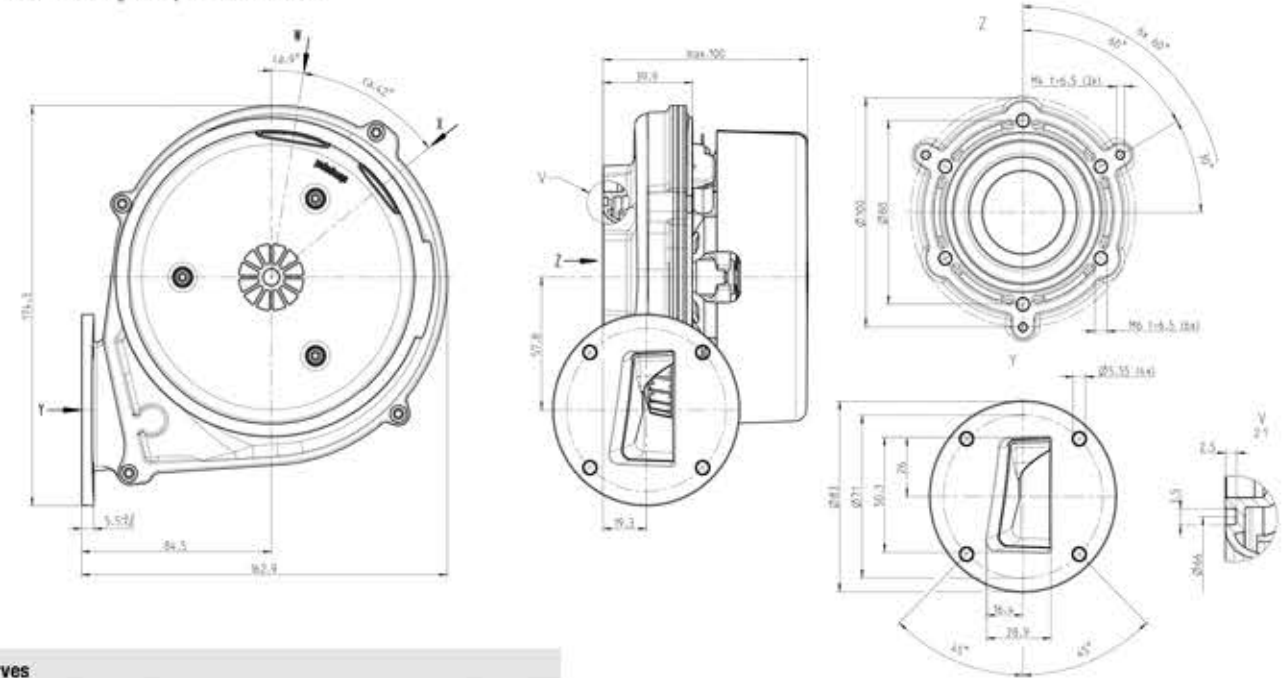
Curves



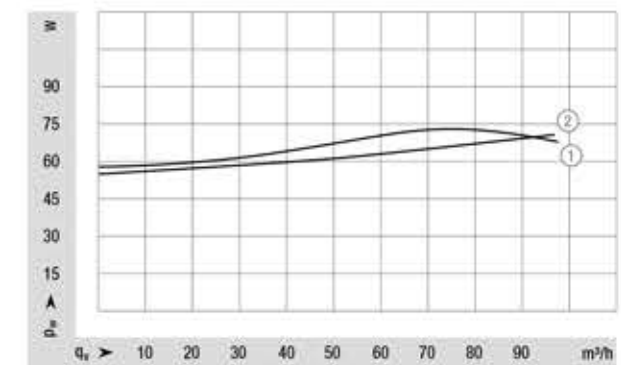
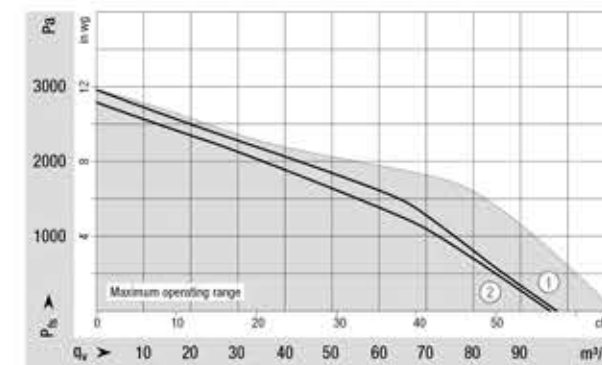
Nominal data	Curve	Rated voltage	Frequency	Max. air flow	Max. air flow	Max. pressure increase	Max. pressure increase	Max. input power	Max. speed	Perm. amb. motor temp.	Perm. temp. of medium	Part number
Type	V	Hz	m³/h	cfm	Pa	wg	W	min⁻¹	°C	°C		
NRG 118	①	230	50/60	98	58	3,000	12	72	9,000	60	80	55667.31160
	②	120	60	97	57	2,800	11.2	70	9,000	60	80	55667.30030

Subject to change. More powerful motor optional.

Dimensions in mm. Drawing valid for part number 55667.31160.



Curves



Gas valves

Our gas valves are mainly used in condensing unit applications for domestic heating technology in the low-to-medium output range. They ensure precise air-gas ratio adjustment.

The D01 and E01 gas valves are suitable for condensing units with pneumatic composite controls. Regardless of the suction pressure generated by the premix blower, these gas valves always keep the offset pressure at zero and compensate for pressure fluctuations in the supply network as well.

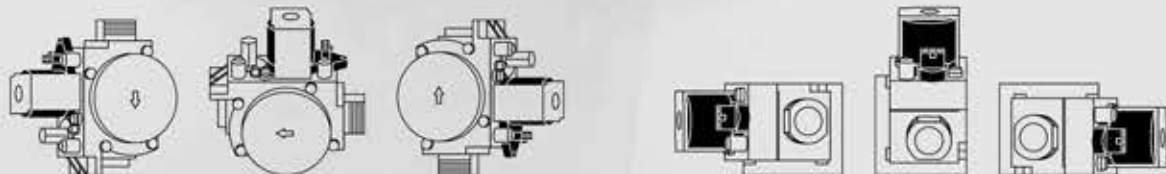
The offset (zero point shift) can be configured at the servo controller. At the same time, the desired gas quantity is adjusted using an integrated flow control element. Depending on the design, reference pressure can be connected to the servo controller if required.

The F01 gas valve is suitable for condensing units with electronic composite controls. Regardless of gas quality and any pressure fluctuations in the supply network, this gas valve automatically regulates the constant air-gas ratio without relying on mechanical gas valve settings.



+ Mounting position

Solenoid at any position between vertical and horizontal – but not upside down



+ Type examination certificate for North America (USA and Canada): Master Contract No. 172723

Applicable standards

- ANSI Z21.78 2010 / CSA 6.20 2010: Combination Gas Controls for gas appliances

Approvals exist for the chief gas consuming countries.

Type examination certificate in accordance with EC Gas Appliances Directive: CE 0085CM0036 (product ID number)

Applicable standards

- EN126:2012 06: Multifunctional controls for gas burning appliances
- EN13611:2007 + A2:2011: Safety and control devices for gas burners and gas burning appliances – General requirements
- EN161:2012 08: Automatic shut-off valves for gas burners and gas appliances
- EN88-1:2011: Pressure regulators and associated safety devices for gas appliances – Part 1: Pressure regulators for inlet pressures up to and including 50 kPa

+ Additional notes

- Work on the gas valve may be performed by authorised specialists only.
- Please be sure to observe the corresponding installation instructions.
- Corresponding documents with safety instructions are available upon request or on the Internet.

Burner control units

We supply the right electronics for controlling ignition, performance regulation and monitoring the function of the condensing boiler as well as user interfaces needed for conveniently controlling central heating and DHW. The burner control can also be combined with other modules and provide control for system regulation, for example cascade operation.

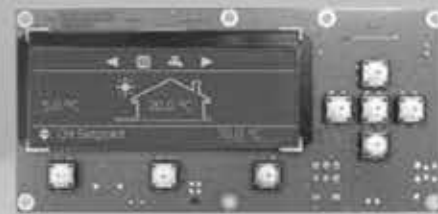
Our product range, consisting of tried-and-tested hardware and software, enables reliable operating performance and short development cycles. The versatile software architecture enables easy interface integration. In addition, as with our blowers, we value having the lowest possible energy consumption.

+ For Commercial Applications

- For commercial boilers up to 2MW
- Integrated cascade control
- Flexibility to configure many systems: preset appliance types
- Configurable inputs and outputs
- Integrated low water cutoff
- Many modes for CH and DHW

+ For Residential Applications

- Smart control for various appliances up to 50kW: water heaters (with/without tank) and residential combi boilers
- Also applicable as general burner control
- Optional Modbus communication
- Available as all-in-one kit



+ User Interface

- Touch screen: communication with boiler control via Modbus
- Ethernet connection to web server
- Graphical LCD interface for boiler status, operation and configuration
- Password-protected user levels
- Includes diagnostics software and a smart app



+ User Interface

- On-board HMI: Reset button and status LED
- Advanced external display options