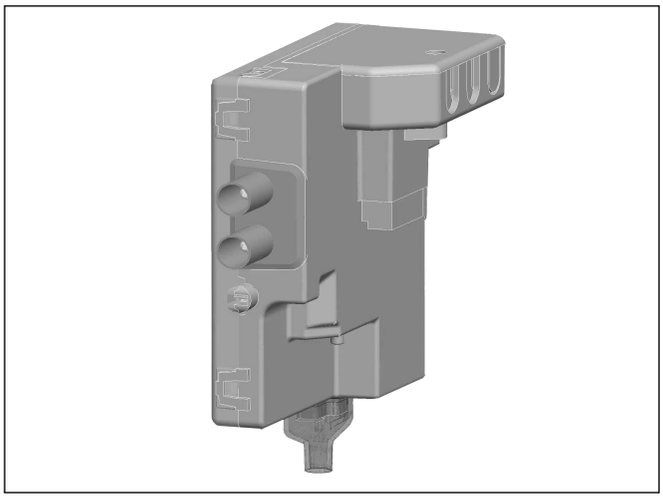
Honeywell

S4965-2000 SERIES

ESYS - COMBINED VALVE AND BOILER CONTROL SYSTEMS

PRODUCT HANDBOOK



APPLICATION

The S4965-2000 boiler controls have been developed for application in gas fired domestic appliances.

The S4965-2000 boiler controls are used in conjuction with the VK41.. series modulating or non modulating gas controls. (see Product Handbook EN2R-9025 and EN2R-9004) They provide both an optimised safety sub-system for programmed safe light-up and flame supervision of the main burner of the appliance and a boiler comfort control sub system for temperature, pump, and 3-way valve control

Bi-directional communication with a MMI enables comprehensive diagnostics and operation.

For glossary of terms, abbrevations and symbols see document EN2R-9039

Contents

General

Description 2
Features 3
Dimensional drawing S4965-2000 boiler control 4

Technical

Specifications 5
Connection diagram 7
Timing diagram 8
Description of MINCON 9
Description of SQUARE 10
General considerations 11
Electrical connections and wiring 12
Adjustments and final checkout 13

Various

EMC guidelines 14
Spark application note 14
Quality assurance statement 15
Standards and approvals 15
Ordering information 16

Subject to change without notice. All rights reserved.

АНКАС

ПРОМЭЛЕКТРОНИКА / sales@prom-elec.com

DESCRIPTION

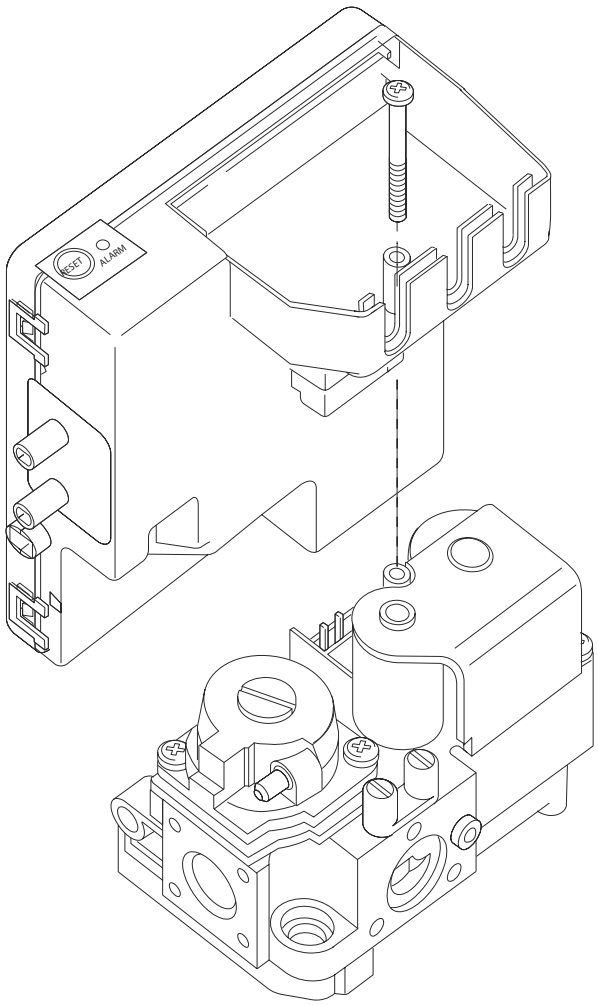
ESYS is the combination of a VK41.. modulating or non-modulating gas control with an electronic boiler control.

The boiler control consists of an automatic ignition control and a comfort boiler control.

Most of the standard control functions of a gas fired boiler can be performed within one single control box which can easily be clicked on the gas control.

Possible applications are:

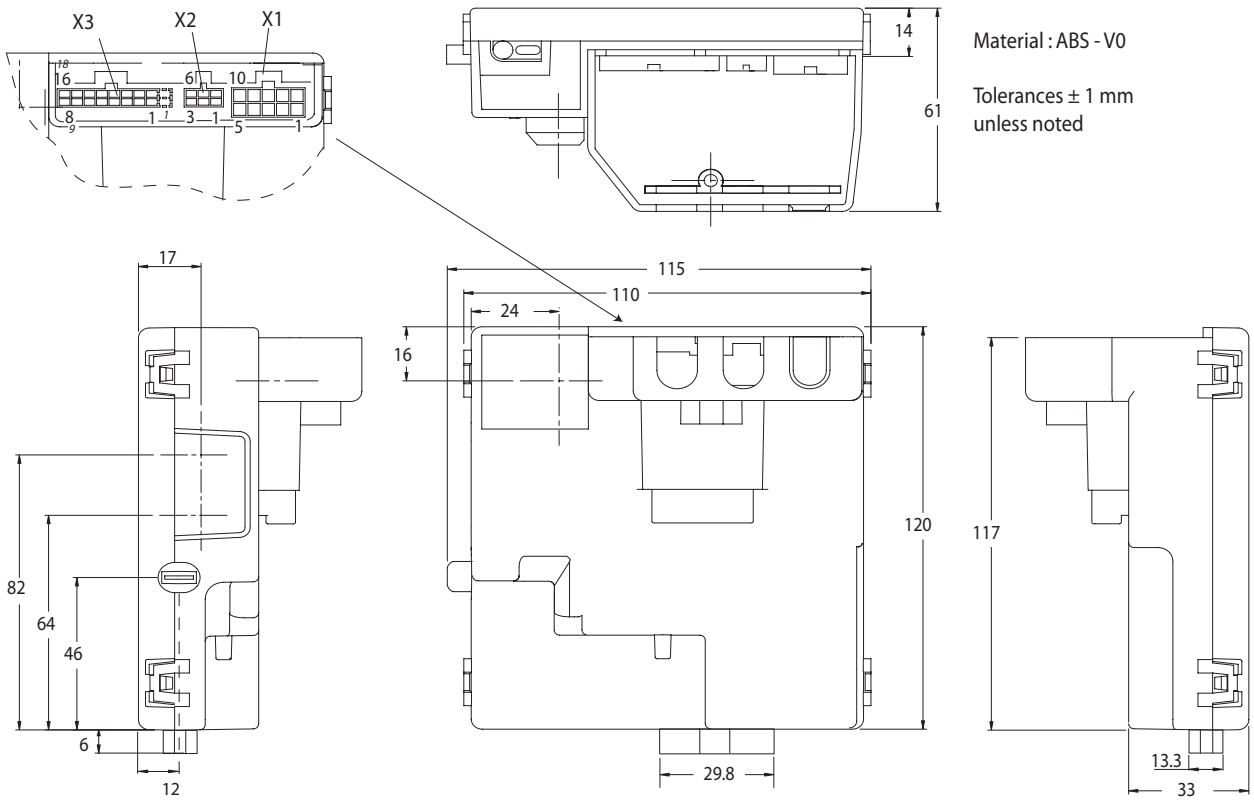
- Instantaneous water heaters.
- Floor standing boilers.
- Combi boilers.
- Low Nox boilers.
- Condensing boilers.
- See chapter Features for the standard features which can be implemented in this control box.



FEATURES

- Multi trial full sequence ignition control. • Non volatile lock-out.
- Self learning ignition sequence; no minimum adjustment, using MINCON.
- Direct Burner- or Intermittent Pilot operation.
- Integral ignition including emission filter.
- Combined ignition and flame sensing option.
- Phase insensitive flame detection.
- Lock-out at flame simulation.
- Restart or reignition after flame loss.
- AC or DC fan control (24 VDC fan needs external trafo).
- Dynamic airflow check.
- Lock-out on no air.
- Automatic fan assisted/atmospheric recognition.
- Integral gas pressure modulation circuitry.
- Pump control.
- 3-way valve control.
- Multi temperature CH and DHW control with DHW priority setting.
- Δ T control in CH mode
- Flow sensor input for DHW detection and control
- Sensor- or contact switch high limit at control.
- Communication to MMI enabling comprehensive diagnostics and operation.
- Factory safety parameter settings.
- Installer and OEM comfort boiler control parameter settings.
- On board SMPS for MMI and wiring center.
- Integral and/or remote reset and alarm indicator.
- Electrical safety in accordance with EN 60730-1 (2003) + EN 60730-2-5.
- OpenTherm communication
- 230V dc fan commutation electronics
- 50-60Hz mains frequency
- 115V mains voltage option

DIMENSIONAL DRAWING S4965-2000 BOILER CONTROL

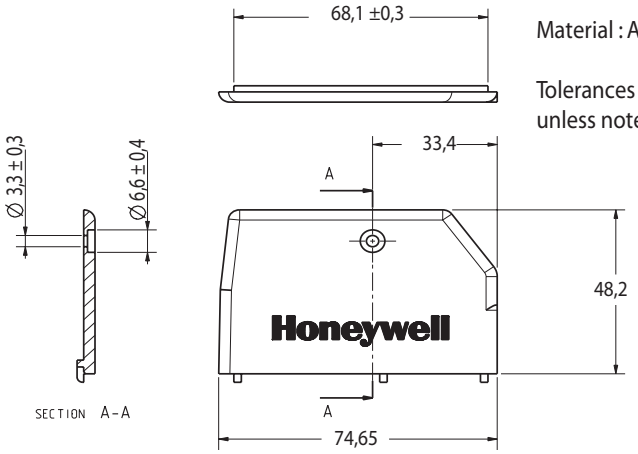


Material : ABS - V0

Tolerances ± 1 mm
unless noted

FOR CONNECTORS, USE FEMALE PARTS			
	Plastic part	Pins	Terminal
X1	TYCO 1-106527-0	10	TYCO 106528-2 (reel) (for AWG 22-26, insulation diameter 1,20 - 1,75 mm)
X2	TYCO 794617-6	6	TYCO 794607 (reel) TYCO 794611 (for AWG 26-30)
X3	TYCO 1-794617-6	16	
X3	TYCO 1-794617-8	18	

Molex Minifit (for X1) and Microfit (for X2 and X3) can be used as alternatives



Material : ABS - V0

Tolerances ± 1 mm
unless noted

Dimension cover

PLASTIC PART PINS TERMINALS		
X201	MOLEX 5557 5	44476
X201	RUBBER SEAL	45007691-001

SPECIFICATIONS

Models
Basically there is one PCB for a number of applications.
Depending on which components are mounted different applications can be covered.

Application		Atmospheric combustion				Premix combustion	
		Normal		Combustion feedback (MinCon)		Normal (Pneumatic gas/air)	SQUARE (Electronic gas/air or Gas addaptive)
		Open flue	Fan assisted	Open flue	Fan assisted		
On /Off	Electronics	S4965A	S4965C	----------	----------	S4965V	----------
	Gasvalve	VK4105A2/C2	VK4105A2/C2	----------	----------	VK4115V2	----------
Modulation	Electronics	S4965AM	S4965CM	S4965AL	S4965CL	S4965V	S4965S
	Gasvalve	VK4105G1	VK4105G1	VK4105G2	VK4105G2	VK4115V2	VK4105G3

Supply voltage
230 Vac -15% +10%
115 Vac ± 15% optional
47-65 Hz

Power consumption
2.5 VA

Humidity
90% RH max. at 40°C (non condensing)

Ambient temperature
-20 ... 60°C

Electrical rating
fusing: external: 2 A slow, sand filled
mains output 1 (ac fan or lpg valve):
115 or 230 Vac, 0.8 A max, cos ? ≥ 0.6

mains output 2 (pump or aux):
115 or 230 Vac, 0.8 A max, cos ? ≥ 0.6

mains output 3 (3 way or aux):
115 or 230 Vac, 0.8 A max for max 1 minute, cos ? ≥ 0.6, 0.4A continuous

mains output 4 (3 way or aux):
115 or 230 Vac, 0.8 A max for max 1 minute, cos ? ≥ 0.6, 0.4A continuous

mains output 5 (3 way or aux):
115 or 230 Vac, 0.8 A max for max 1 minute, cos ? ≥ 0.6, 0.4A continuous

Total output (1..5) : 2A

Room thermostat input:
115 or 230 Vac, 1 mA, Y-plan compatible or by communication

Gas valve output: :
230Vrac, 50mA

Auxilary input:
24 Vdc, 22 kOhm

Air pressure switch input:
24 Vdc, 22 kOhm

DC fan control output:
7 V 10 mA or 24 V 5mA

High limit switch input:
24 Vdc, 22 kOhm

Water pressure switch input:
24 Vdc, 22 kOhm

Flow sensor input and output:
7 Vdc, 10 mA max supply open collector input

Alarm output:
24 Vdc, 5 mA or by communication

OpenTherm output and communication:
In accordance with OpenTherm standard

Sensors inputs (total maximum 6):
Standard NTC T7335 10k-A material (see survey S-T7335)

10 V input optional

High limit dual sensor 10 kOhm NTC *
(Sensor type : T7336B 1001)

* this sensor needs special input

MicroCom Communication input and output:
input: logic "0" < 0.8 Vdc
logic "1" > 2 , < 24 Vdc (10 kOhm)
output: open collector 24 V dc and 10 mA max
MM I DC output: 24Vdc and 7V dc, total 1 W

Electrical PCB connectors
High voltage spark: 2.8 x 0.5 mm faston or 4 mm round.
Flame sensing: 4.8 x 0.8 mm faston
Mains connector: 10 pole TYCO, AMP-duac
Low voltage connectors: 16 or 18 and 6 pole TYCO, MATE-N-LOCK

Flame sensing
Factory parameter setting:
minimum flame current 0.4 µA other values on request
Response time ON: < 0.4 s
Response time OFF: < 1 s

Ignition
Spark voltage: 15 or 20 kV @ 30pF
Spark frequency: 5.5, 7.3, 11 or 22 Hz
Spark pulse energy: 4 or 12 µAs

Timing
Pre purge time: 0 ... 51 s
Waiting time (T_w): 0 ... 51 s
Pre ignition time: 0 ... 51 s
Safety time (T_s): 0 ... 51 s
Number of retrials: 0 ... 255
Flame failure response time: < 1 s
Stabilisation time: 0 ... 51 s
Post ignition/stabilisation time: 0 ... 51 s
Post purge time: 0 ... 51 s
Pump over run time: 0 ... 600 s
Anti cycling time: 0 ... 255 s
Timing tolerance ± 5%

Communication

Bit rate:	2400 or 19200 baud
Byte format:	1 start, 8 data, 1 stop, no parity
Bit value “1“:	low line level at connector
Bit value “0“:	high line level at connector

RS232 with additional PC cable (nr. 45.900.419-038).
(see document EN2R-9066)

Cable and wiring length

flame sensing cable and spark cable 0.5 m max.

for external components 1 m max., except heat demand, which is > 1 m and OTC sensor which is 10 m max

Remote reset

Maximum of 5 resets in 15 minutes

Tolerances and product life

Nominal ± 5 %

Spark energy

>0.6 * specified spark energy

Product life

500.000 cycles for safety and main valve operator of gas valve
250.000 cycles at rated loads
6.000 lock out operations with rated loads

ПРОМЭЛЕКТРОНИКА / sales@prom-elec.com

CONNECTION DIAGRAM

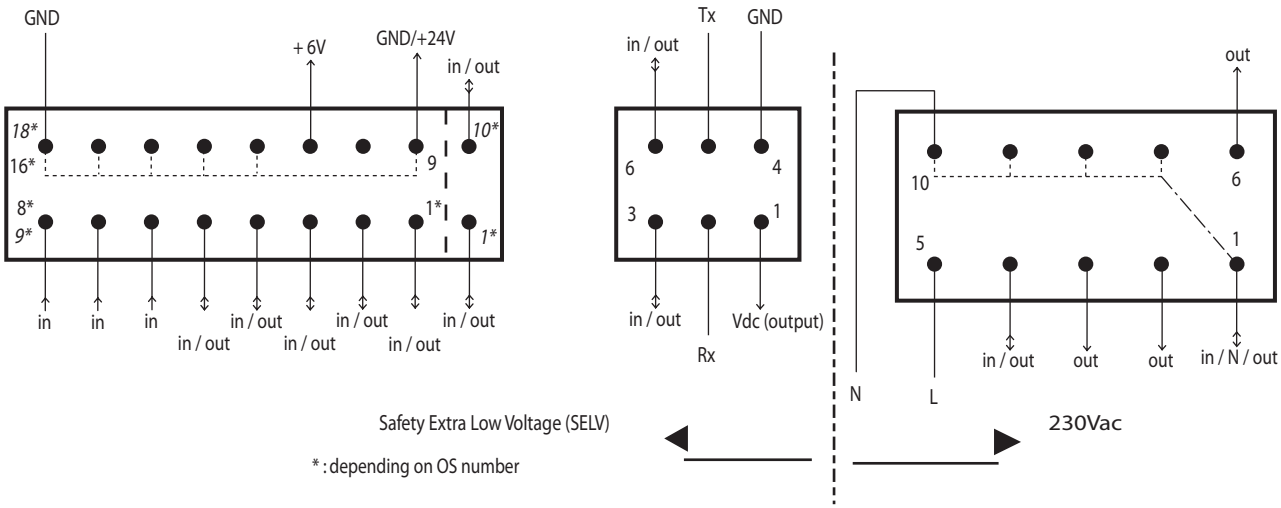


Fig. 1. General connection diagram ESYS

Due to software parameters and hardware jumpers, specific configurations can be made.
See OS# specific connection diagram !
Connection diagram is mounted on the back of the housing

IN/OUT can only be configured as input or output.

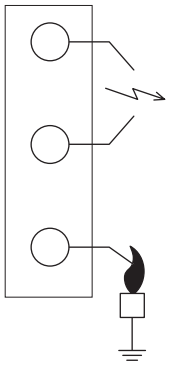


Fig. 2. Side connection ESYS for closed loop sparking

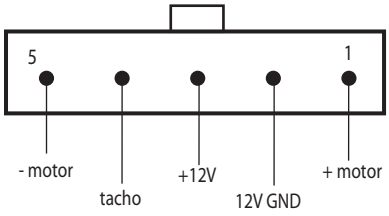


Fig. 3. 300V DC fan

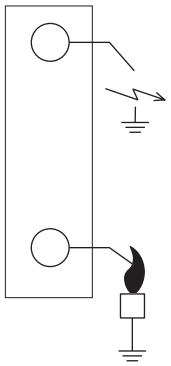


Fig. 4. Side connection ESYS for sparking to ground

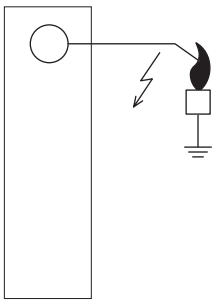


Fig. 5. Side connection ESYS for combined ignition and flame sensing

TIMING DIAGRAM

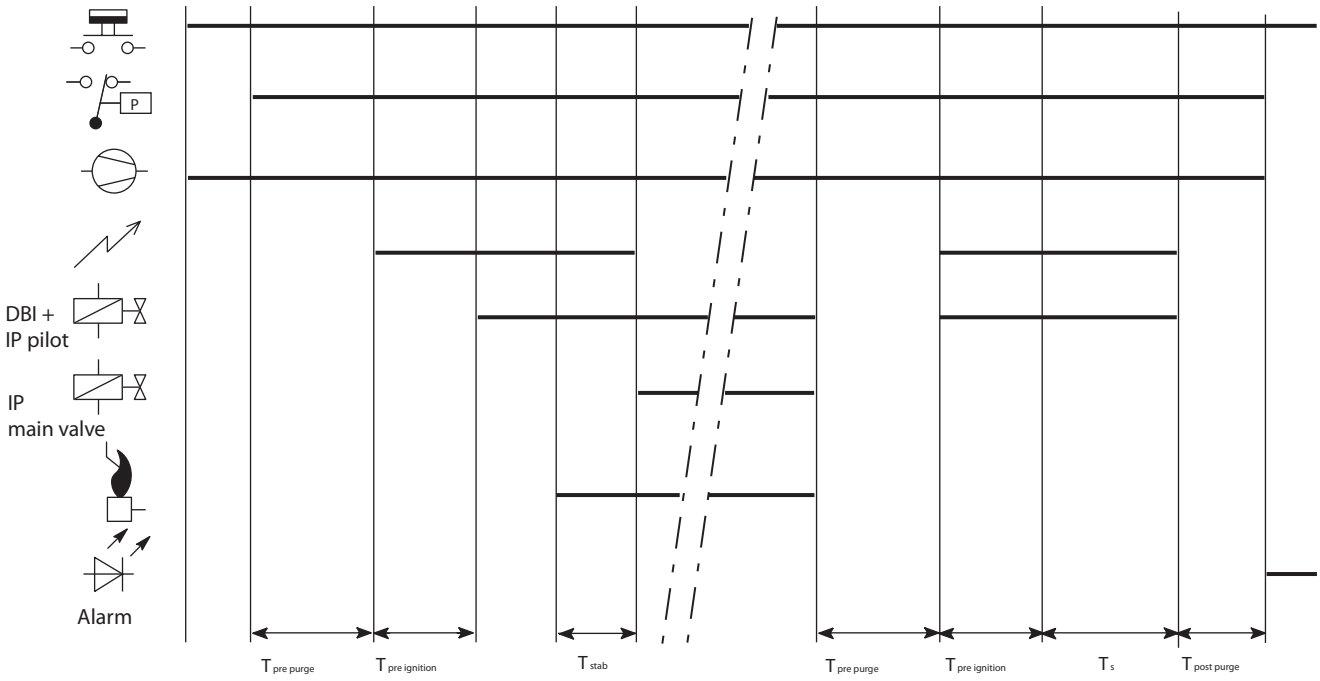


Fig. 6. General timing diagram ESYS

DESCRIPTION OF MINCON

MINCON means Minimum Load Control.
MINCON is able to measure and control the load of a gas fired heating appliance.
MINCON is suitable for atmospheric (with or without fan) modulating boilers.
Features are:
No or minimum adjustments of VK4105G2000 valve at the production of the combiboiler.
Improvement of the DHW temperature control performance.
Easy swap from LPG to natural gas

MINCON is based on the phenomena that the ionisation flame current in an atmospheric boiler is almost linear with burner load. (see fig. 8)
Using this property the critical minimum pressure and ignition pressure adjustment can be avoided.

(see fig. 7.for the control flow diagram)

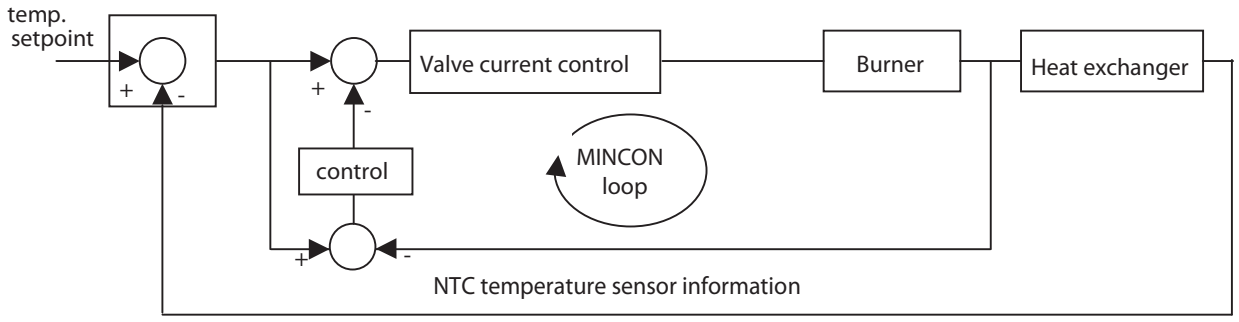


Fig. 7. MINCON control flow diagram

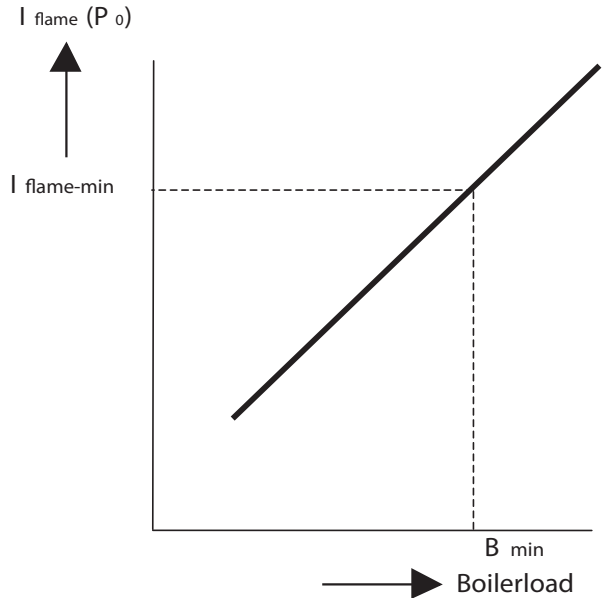


Fig. 8. Ionisation flame current versus the boiler load

REMARK: Electrode postition and choice is important.

In cooperation with Polidoro, Honeywell has made a standard solution.
New applications require Honeywell approval.

DESCRIPTION OF SQUARE TECHNOLOGY

SQUARE is the abbreviation of Self adaptive, Quality, User friendly, Adjustment free, Reliable, Environmental friendly.

SQUARE is able to control the load and burning process of a fully premix heating appliance under varying gas quality conditions. See fig. 8.

Features are :
- Gas adaptive control over the full natural gas band, with a modulation range of 1:5
- Electronic gas-air at a constant gas quality with a modulation range of 1:10
- Automatic chimney length compensation

SQUARE is based on the phenomena that the ionisation current is a measure of the gas quality at a specific range of the burner load in a fully premix burner.

After calibration based on this phenomena, the burner can be influenced by means of a micro bridge flow sensor. see fig. 8.

If the gasvalve is closed, the micro bridge acts as an airflow meter in order to measure the chimney resistance.

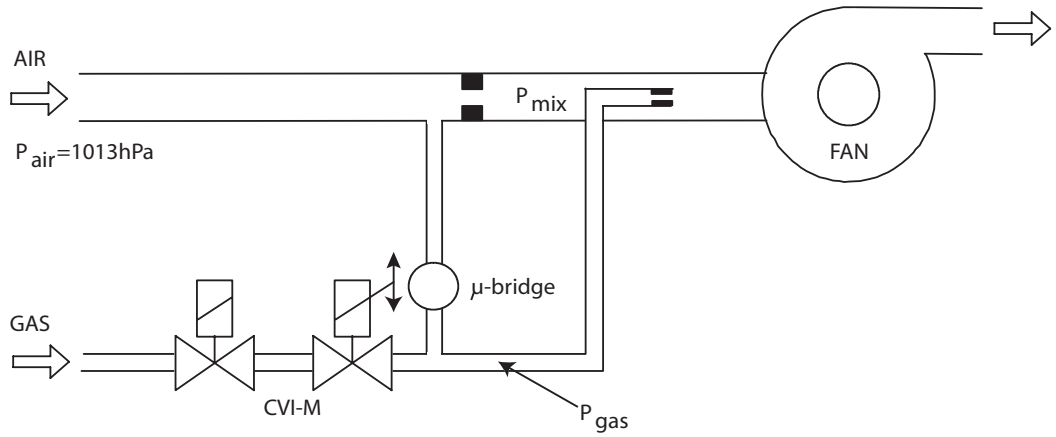


Fig. 9. schematic SQUARE system

GENERAL CONSIDERATIONS

To ensure reliable long term operation, mount the boiler control at a position in the appliance with a low ambient temperature and a low radiation.
The boiler control should be externally fused.
High temperatures will affect product life.

NOTE 1.: When first starting the boiler control has a self check time of about 10 seconds.

NOTE 2.: Electrical rating of connected controls should be appropriate for the load that is switched by the boiler control.

NOTE 3.: Disconnect the boiler control from mains before performing a dielectric strength test.

NOTE 4.: When first starting, the control can be in the lock-out condition; reset the boiler control.

NOTE 5.: The flame connection pin of all types is not protected against electrical shock.

NOTE 6.: An automatic return high limit thermostat can be used.
Gold contacts for high limit thermostat are required.

NOTE 7.: The modulation function of the S4965-2000 boiler control units is checked during the start up safety check. As a result the gas technical safety of the appliance provided with a S4965-2000 boiler control unit can rely on the proper functioning of the adjustable gas outlet pressure during ignition of this boiler control unit.
This means that due to a safe ignition pressure level, the safety time of the boiler can be extended.

NOTE 8.: Exhaust temperature protection may only be used in non safety critical applications.

NOTE 9.: Remote reset function may only be used in applications where a maximum of five resets per 15 minutes is allowed.

NOTE 10.: The controller can only be used in IP application where the pilot output is less than 250 W.

⚠ WARNING

Honeywell is not responsible for damage and/or injury due to mis wiring.
After installation boiler control can become wet due to condensation. Do not connect wet device to mains.

ELECTRICAL CONNECTIONS AND WIRING

⚠ WARNING

Take care that installer is a trained experienced service person.
Disconnect power supply to prevent electrical shock and/or equipment damage.

IMPORTANT

Wiring must be in accordance with local regulations.

The appliance manufacturer's instructions should always be followed when provided. If such instructions are not provided see the connection diagrams for typical systems.

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 boiler control can be in lock-out; depress reset button to free control.

⚠ CAUTION

Do not connect the boiler control to power supply when it is not connected to the gas control.

Wiring

- Use leadwire which can withstand at least 105 °C ambient.
- Use leadwire which is proven against moisture.
- Wiring between boiler control and spark sensing probe should have good quality insulation, suitable for the temperatures encountered.
- Gas valve should be connected to protective earth.

Fusing
The boiler control has to be externally fused at maximum 2A slow sand filled.
This can be done externally or optional integrated.

Spark gap
Max. allowable spark gap 3.5 mm (recommended 3 mm.)

ADJUSTMENTS AND FINAL CHECKOUT

⚠ WARNING

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.

Checking flame current

- The minimum value should be in accordance with specified value.
- To check flame current connect a DC micro-Amp èremeter between flame sensing wire and flame sensing rod. Short micro-Amp èremeter during ignition to prevent damage of the micro-Amp èremeter in single rod applications.
- Meter connections polluted with e.g. alkaline substances lying close to earth can cause flame current simulation. Make sure no false flame current can flow from meter connections to earth.
- As in normal operation the flame current is measured during 50% of the time, the read out value is half of the real value. The read out value has to be multiplied by 2 to get the real value.
- If flame current is insufficient check that the flame sensing rod is fully enveloped by the flame and that the burner and the boiler control are reliable grounded.

Final checkout

After installation and any adjustment start the appliance and observe a complete cycle to ensure that all burner components function correctly.

Maintenance and service

Under normal circumstances no maintenance or service is required.

Adjustment of gas pressure.

- The gas pressure can be adjusted after the S4965-2000 automatic ignition control has been mounted on the VK4100/VK4105 gas valve.
- Depending on the O.S. number the different values of the gas pressure must be adjusted.
- Adjustments can be executed with the help of a PC tool and a communication link between the S4965-2000 and the PC tool.
- Adjustment is described in an O.S. number specific instruction sheet.

With parameter "High limit active during running operation" it is possible to disable the overheat detection in stand-by (so only detection in running mode). If such setting for this parameter is applied, an analysis on the appliance shalll be made to determine that no hazardous situation can occur due to possible exceeding of the parameter defined maximum allowed temperature.

EMC GUIDELINES

- The position of the ignition cable has to be determined for lowest emission. In general conduct ignition cable along metal pipes or shield metal for lowest loop area
- Do not lead ignition cable close to other cabling.
- To suppress Radio Frequency Interference (RFI) the boiler control including spark ignition cable should be mounted in sufficient shielded environment.
- High frequency radiated emission can be reduced by a 1K spark ignition plug.
- Do not lead flame cable close to other cabling.
- Do not lead DC fan commutation cable close to other cabling.
- Keep high voltage spark wire at least 10 cm. away from other wires.

SPARK APPLICATION NOTE

The breakdown voltage of a spark electrode is depending on the electrode shape.
In general an electrode with a sharp shape has a significantly lower breakdown voltage than a ball shape electrode.
Therefore it is important to make use of a sharp electrode.
But also the polarity of the voltage is an important parameter in the breakdown of a spark plug.
Figure below shows an investigation (Uhlmann ,1930) of the relation between shape and breakdown voltage.
This is a theoretical environment.
In practice shapes are different, but what can be learned is that polarity is an important factor of ignition reliability.
The Honeywell high energy spark transformer (with one integral leg to earth) generates a positive high voltage.
The Honeywell high energy closed loop spark transformer can be connected in the most favorite way by the customer. One of the legs may be connected to earth.

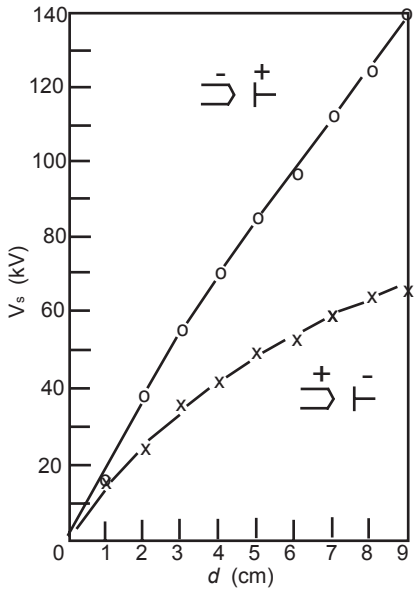


Fig. 10. Breakdown voltage vs. electrode distance

QUALITY ASSURANCE STATEMENT

Products are manufactured under an ISO 9001 (1994) based and certified Quality System.

The quality system is described in the Honeywell Combustion Controls Center Quality Assurance Programme and its related operational procedures and instructions.

The quality system is approved by Gastec against certificate number 9.302/2.

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

Assembly processes are guided by work instructions. Patrol inspections form part of the assembly processes.

Assembly inspection is performed by employees of the quality control department, using their own authorised equipment.

All inspections (incoming and assembly) are performed by trained personel and according inspection procedures.

STANDARDS AND APPROVALS

Standards

The S4965-2000 has been designed to meet the European Standards:

- EN 298 (2003): Automatic gas burner control systems.
- EN 60730-1 and EN 60730-2-5: Automatic electric controls for household and simular use.

Regarding electric safety, the S4965-2000 can be used in appliances according to European Standard for household electrical requirements EN 60335 series

S4965-2000 systems function in accordance with EN 298.

S4965A, AM, AL ..... code A/M/C/L/X/K

S4965C, CM, CL, V ..... code F/M/C/L/X/K

Approvals

The boiler control conforms with the following EC - Directives:

- Gas Appliance Directive (90/396/EEC)
- Low Voltage Directive (73/23/EEC)
- Electro Magnetic Compatibility Directive (89/336/EEC) *

* Conformity with Electro Magnetic Compatibility Directive regarding emission for non industrial appliances can be assumed for all selected Ordering .Specification (O.S.). numbers. However conformity can only be declared as part of the appliance.

Regarding immunity, all controls comply with the levels for non industrial appliances.

ORDERING INFORMATION

When ordering specify:

- Model number of CVI ignition components required: see model number chart below.
- Order numbers of replacement parts and accessories required.

- Cover should be ordered seperately :
  order nr: 45.900.431-014 (the same screw can be used)

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

NOTE: An up-to-date product survey, with details of all new and existing products in these series, is available. Contact your local Honeywell sales representative for more information.

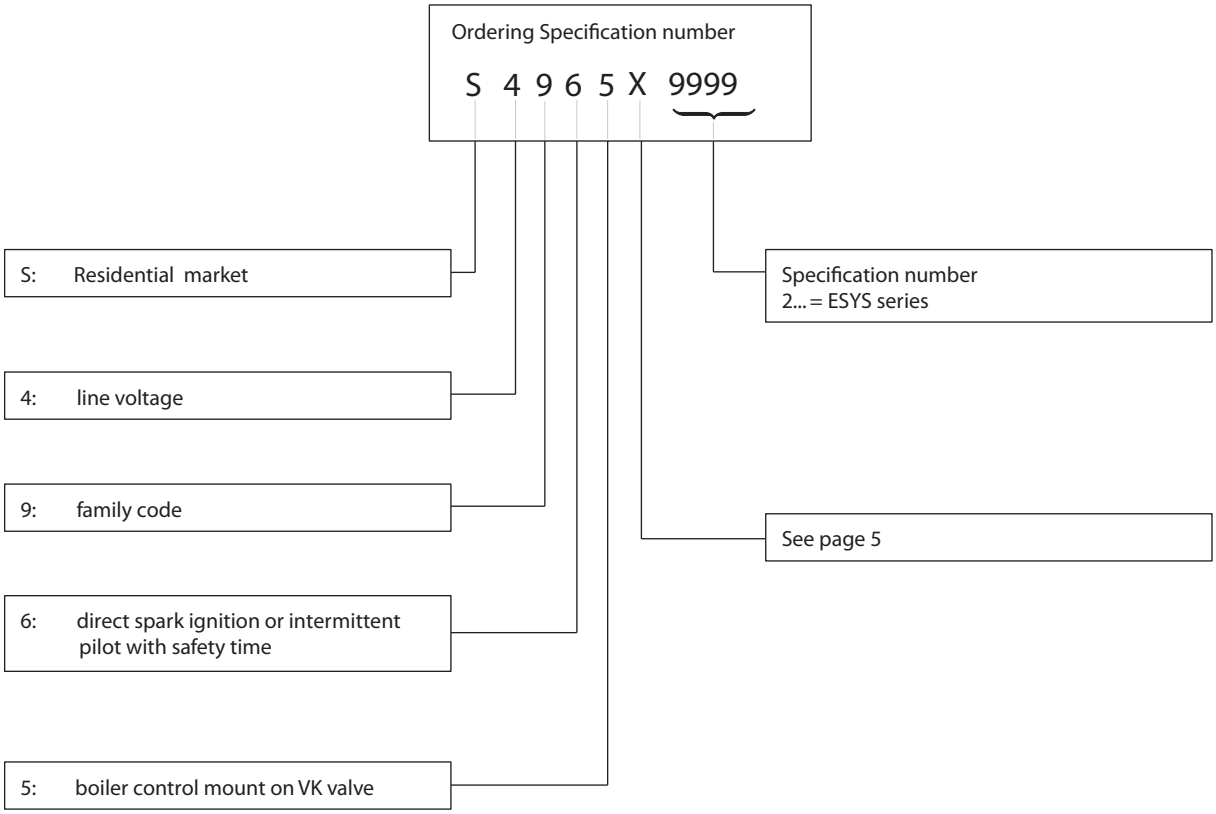


Fig. 11. Model number chart S4965

Honeywell

AHKAC