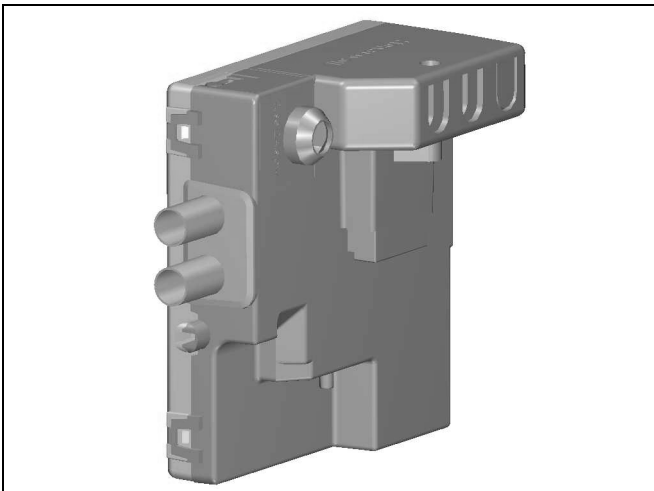


## S4965 SERIES

### COMBINED VALVE AND BOILER CONTROL SYSTEMS

#### PRODUCT HANDBOOK



#### APPLICATION

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

The S4965 boiler controls are used in conjunction 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, abbreviations and symbols see document EN2R-9039

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## DESCRIPTION

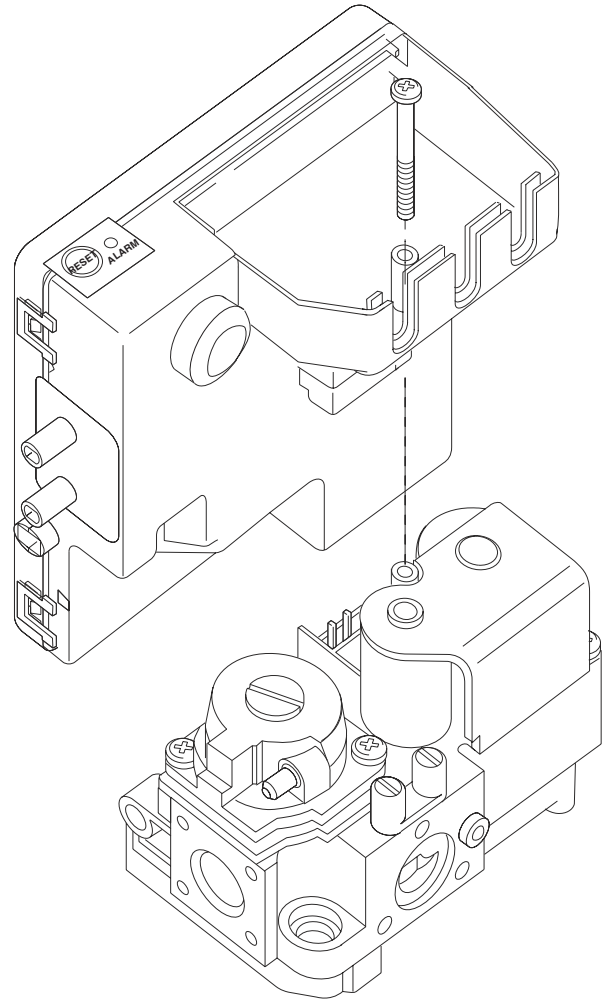
The **Combined Valve Boiler Control (CVBC)** is the combination of a VK41.. modulating or non-modulating gas control with an electronic boiler control.

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.

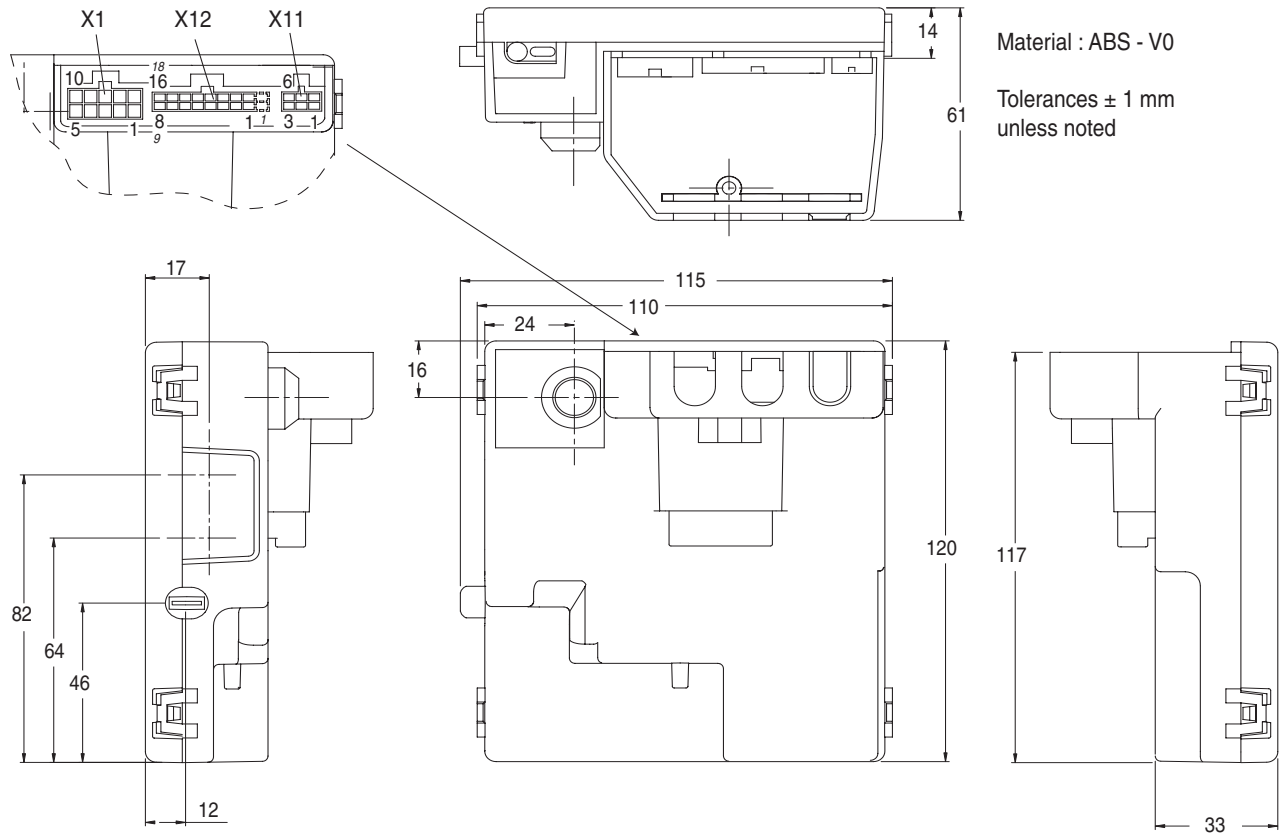


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## FEATURES

- Multi trial full sequence ignition control.
- Permanent operation in accordance with EN 298 (2003).
- Non volatile lock-out.
- Self learning ignition sequence; no minimum adjustment, using LOCON.
- 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 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.
- $\Delta T$  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 transformer and wiring center.
- Integral and/or remote reset and alarm indicator.
- Electrical safety in accordance with EN 60730-1 (2000).
- Replacable fuse
- OpenTherm communication

# DIMENSIONAL DRAWING S4965 BOILER CONTROL

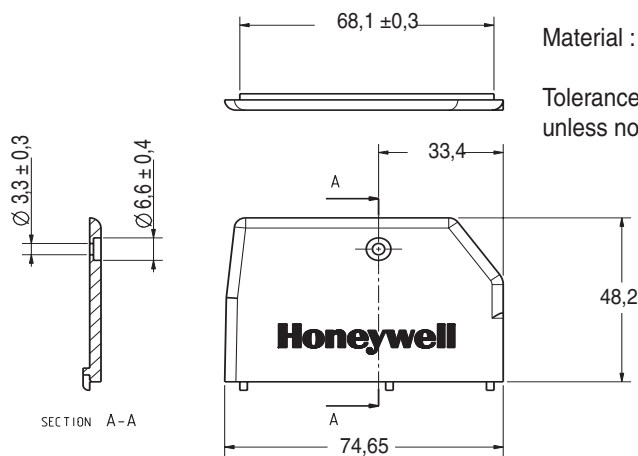


Material : ABS - V0

Tolerances  $\pm 1$  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)
X11	TYCO 794617-6	6	TYCO 794607 (reel) TYCO 794611 (for AWG 26-30)
X12	TYCO 1-794617-6	16	
X12	TYCO 1-794617-8	18	

Molex Minifit (for X1) and Microfit (for X11 and X12) can be used as alternatives



Material : ABS - V0

Tolerances  $\pm 1$  mm unless noted

Dimension cover

# 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 (LoCon)		Normal (Pneumatic gas/air)	SQUARE (Electronic gas/air or Gas adaptive)
		Open flue	Fan assistant	Open flue	Fan assistant		
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%  
50Hz ± 2%

## Power consumption

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  
optional integral: 2A slow, sand filled

230V output 1 (ac fan or lpg valve):  
230 Vac, 0.8 A max,  $\cos \varphi \leq 0.6$

230V output 2 (pump or aux):  
230 Vac, 0.8 A max,  $\cos \varphi \leq 0.6$

230V output 3 (3 way or aux):  
230 Vac, 0.8 A max,  $\cos \varphi \leq 0.6$

230V output 4 (3 way or aux):  
230 Vac, 0.8 A max,  $\cos \varphi \leq 0.6$

Total output (1..4) : 2A

Room thermostat input:  
230 Vac, 1 mA or by communication

Gas valve output :  
230V<sub>rac</sub>, 50mA

Auxiliary input:  
12 Vdc, 100 kOhm

Air pressure switch input:  
12 Vdc, 100 kOhm

DC fan control output:  
5 V 10 mA

High limit switch input:  
5 Vdc, 100 kOhm

Water pressure switch input:  
12 Vdc, 100 kOhm

Flow sensor input and output:  
12 ± 4Vdc, 10 mA max supply open collector input

Alarm output:  
12 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)

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 and 10 mA max  
depending on OS number:  
DC output: 9V<sub>rac</sub>, 5mA max  
or 24Vdc, 50mA and 7V, 250mA

## 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 settable between 0.5 and 5 µA  
Response time ON: < 0.2 s  
Response time OFF: < 1 s

## Ignition

Spark voltage: 15 or 20 kV @ 30pF

Spark frequency: 15 Hz

Spark pulse energy: 4 or 15 µAs

## Timing

Pre purge time: 0 ... 51 s

Waiting time (T<sub>w</sub>): 0 ... 51 s

Pre ignition time: 0 ... 51 s

Safety time (T<sub>s</sub>): 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%

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**Communication**

Bit rate: 2400 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 0.5 m max., except heat demand

**Remote reset**

Maximum of 5 resets in 15 minutes

**Tolerances and product life**

Spark frequency at 230 V line voltage

$0.7 f_{\text{spark}} \leq f_{\text{spark}} \leq 1.4 f_{\text{spark}}$

**Spark energy**

>0.6 \* specified spark energy

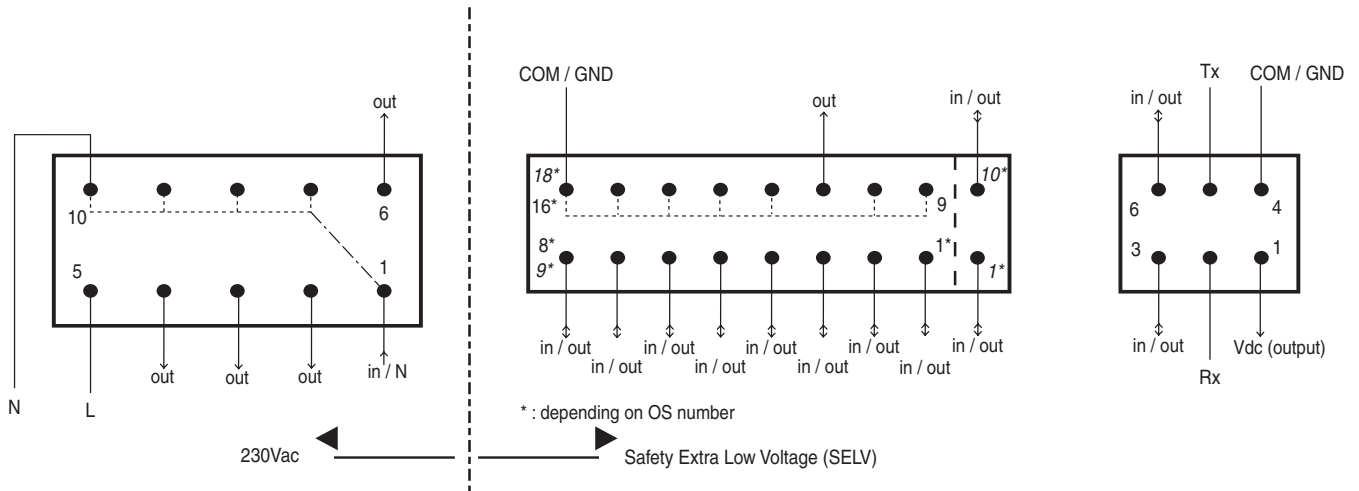
**Product life**

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

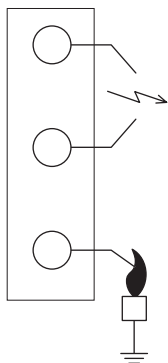
# CONNECTION DIAGRAM



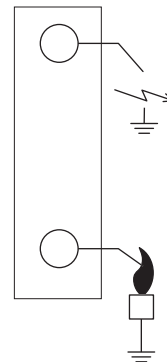
**Fig. 1. General connection diagram CVBC**

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

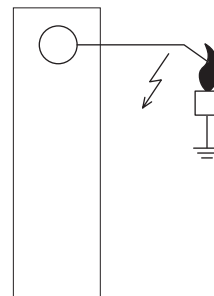
IN/OUT can only be configured as input or output.



**Fig. 2. Side connection CVBC for closed loop sparking**



**Fig. 3. Side connection CVBC for sparking to ground**



**Fig. 4. Side connection CVBC for combined ignition and flame sensing**

# TIMING DIAGRAM

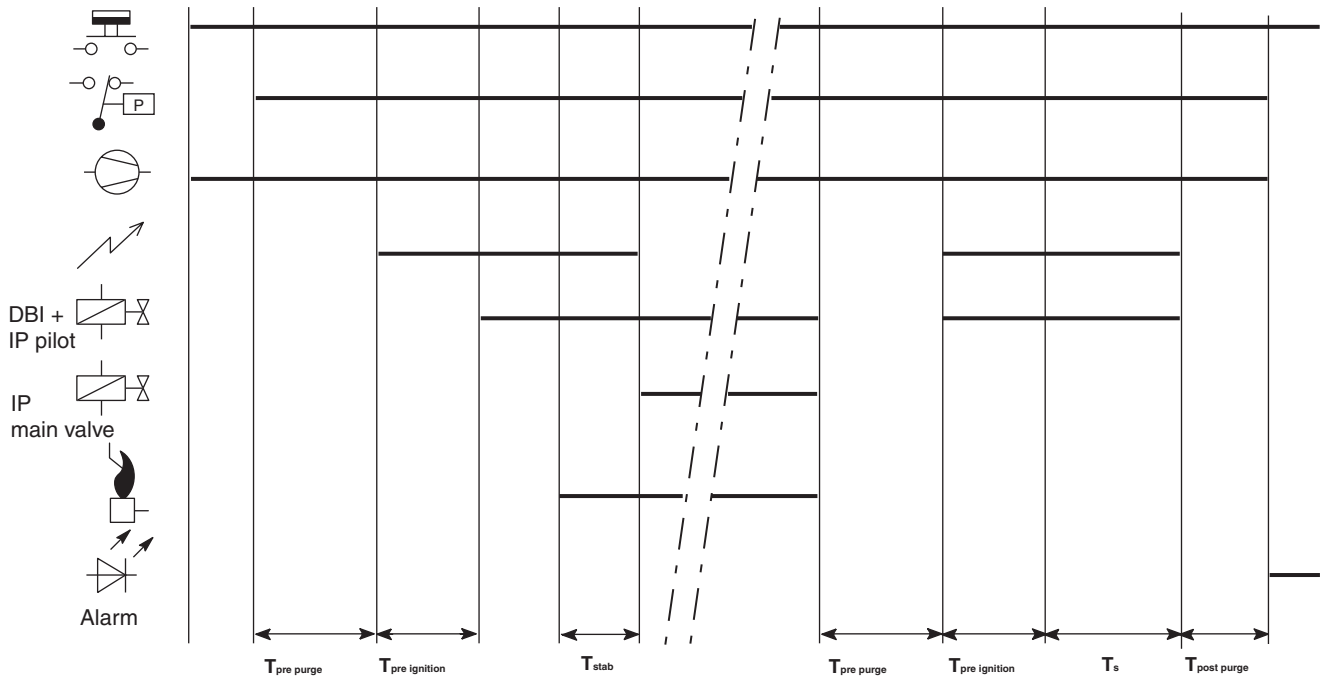


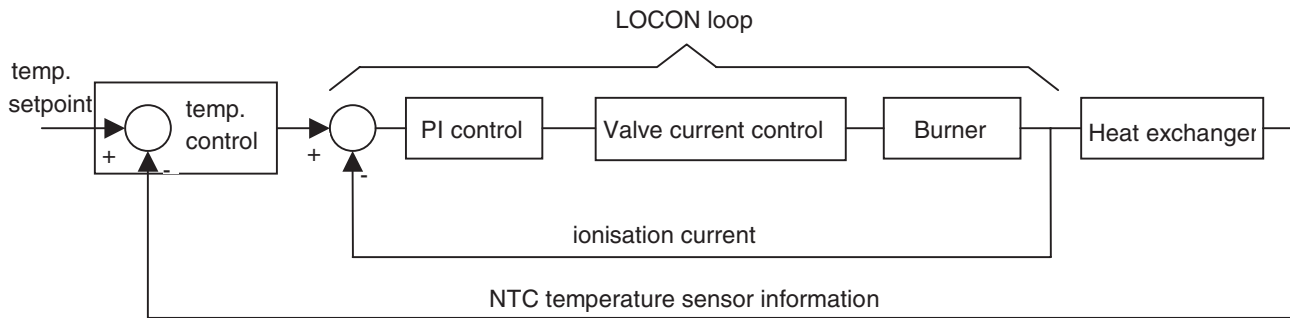
Fig. 5. General timing diagram CVBC



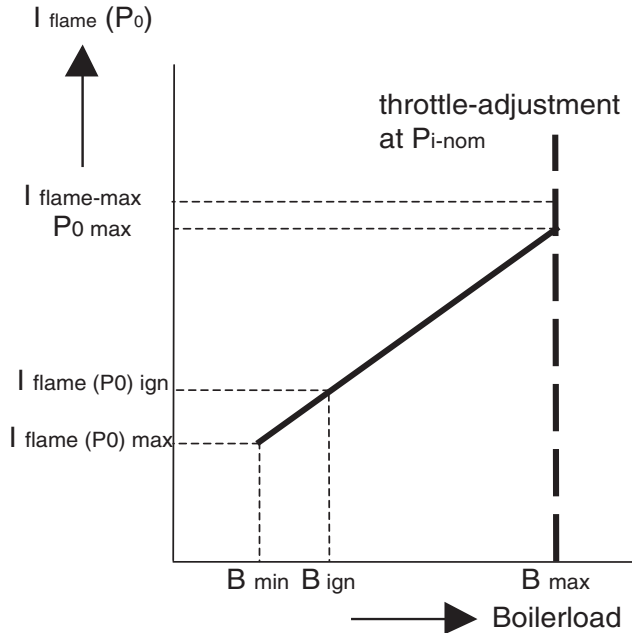
# DESCRIPTION OF LOCON

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

LOCON is based on the phenomena that the ionisation flame current in an atmospheric boiler is almost linear with burner load. (see fig. 7)  
 Using this property the critical minimum pressure and ignition pressure adjustment can be avoided.  
 If a throttle is used for maximum pressure regulation no adjustment is needed.  
 Only injectors have to be changed if LPG is needed.  
 ( see fig. 6. for the control flow diagram )



**Fig. 6. LOCON control flow diagram**



**Fig. 7. Ionisation flame current versus the boiler load**

REMARK: Electrode position 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.

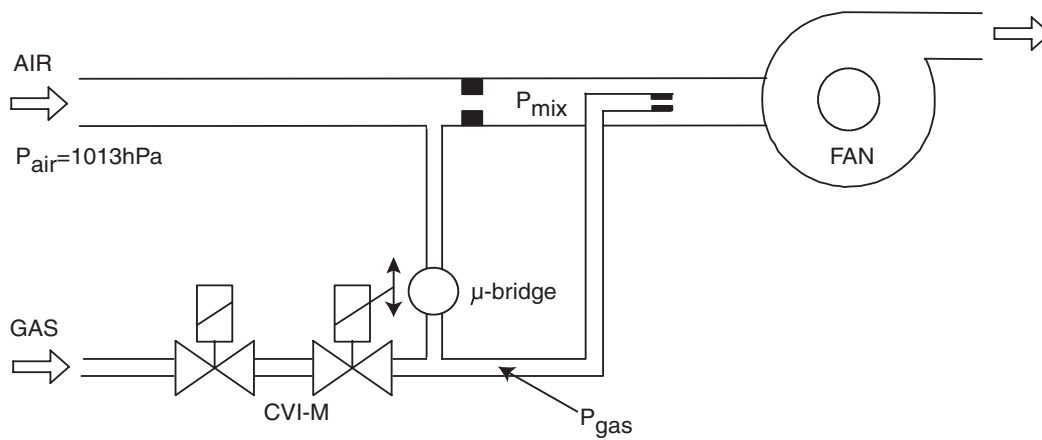


Fig. 8. schematic SQUARE system

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## 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 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 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.



### 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.
- Keep high voltage spark wire at least 10 cm. away from other wires.
- Conduct spark wire as close as possible along shield metal or metal pipes.

#### Fusing

The boiler control has to be externally fused at maximum 2A slow sand filled.

This can be done externally or optional integrated.

The integrated fuse has to be mounted and demounted as follows:

**Demount:** Press with screw driver the fuse cover against spring inside fuse holder and turn 90° to left. Release screw driver. Fuse holder including fuse can be taken out.

**Mount:** Mount new fuse in fuse cover and place total in fuse holder. Press cover carefully against spring in fuse holder, and turn 90° to right.

#### 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-Ampèremeter between flame sensing wire and flame sensing rod. Short micro-Ampèremeter during ignition to prevent damage of the micro-Ampèremeter 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.
- 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 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 and the PC tool.
- Adjustment is described in an O.S. number specific instruction sheet.

---

## **EMC GUIDELINES**

The position of the ignition cable has to be determined for lowest emission.

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.

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## 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 personnel and according inspection procedures.

## STANDARDS AND APPROVALS

### Standards

The S4965 has been designed to meet the European Standards:

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

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

S4965 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 Compatability 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.

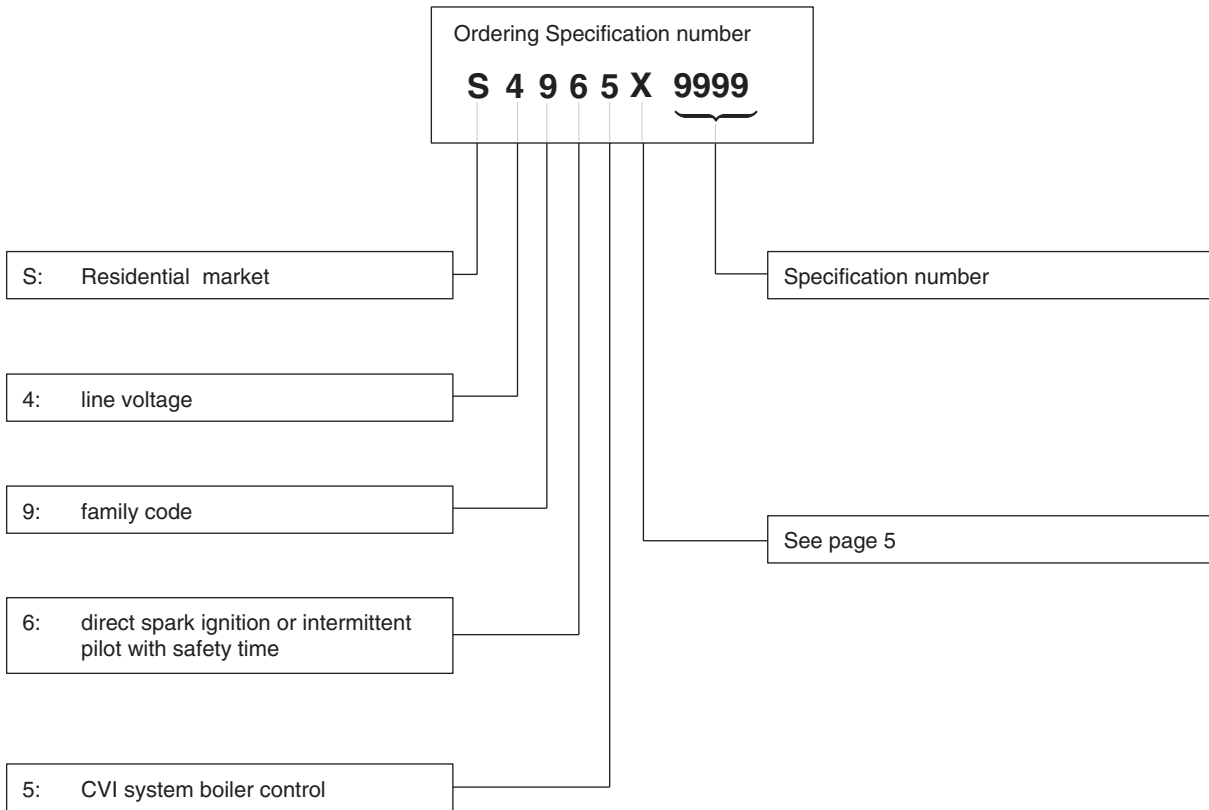
# ORDERING INFORMATION

**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. 9. Model number chart S4965**

**Honeywell**

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