ENGLISH

1. INTRODUCTION

The FC400CH carbon monoxide plus heat detector forms part of the 400 Series Addressable Fire detectors.
The detector is intended to plug into the following:

- 5B 5” Universal Base.
- FC450IB 5” Isolator Base.
- FC430SB Low Power Sounder Base.

The detector is designed to transmit, to a remote FireClass fire controller, digital signals which represent status of the carbon monoxide and heat elements of the detector.
Software within the controller is used to interpret the returned carbon monoxide and heat values to raise alarm or other appropriate response according to the type of detector configured in FireClass Console.
The mode of the detector may be:

- Heat only detector (A1R or A2S).
- Carbon monoxide only detector (sensitivity: High, Normal or Low).
- Compensated carbon monoxide detector (sensitivity: High, Normal or Low).
- Compensated carbon monoxide (sensitivity: High or Normal) combined with heat (A1R).

☞ *Note:*

- *The heat detection grades are to EN54-5.*
- *Normal and High sensitivity settings have been approved by the Loss Prevention Council Board.*

1.1 DAY/NIGHT SWITCHING

Two modes of detector operation are selectable from the list of possible modes as follows:

- ‘Normal’ mode, ie night time operation in which the detector will be evaluated most of the time.
- ‘Day’ mode in which the detector can be switched under certain circumstances, eg during daytime when the building is occupied with people being able to detect a fire manually. Switching to the ‘daytime’ mode can be done either by or time driven.

1.3 SENSITIVITY SWITCHING

In addition to mode switching, the sensitivity can be changed within the actual mode.This can be done either by PC programming or be time driven (eg, day/night switching). Changing the sensitivity is done by shifting the sensitivity up or down.

2. OPERATING PRINCIPLE

2.1 CARBON MONOXIDE

2.1.1 SENSING CELL

The CO element of the detector uses an electrochemical cell to detect the build up of carbon monoxide generated by fires. The cell operates by oxidising carbon monoxide on a platinum sensing electrode. Whilst on a corresponding counter electrode the reduction half of the reaction takes place. The Sensing Cell is represented diagrammatically in Fig. 2.
When this reaction takes place the potential across the cell tries to change and this causes a current to flow within the circuit around the cell. The current is mirrored into a current to voltage conversion circuit with the resulting output directly proportional to the carbon monoxide concentration.
The cell itself has a diffusion limiting component to ensure that all carbon monoxide in the area proximate to the sensing electrode is continuously oxidised. This means that the rate of transport of carbon monoxide to the cell is directly proportional to the external concentration and independent of air-speed.

2.2 HEAT DETECTOR

The heat element of the detector uses a single thermistor to produce an output proportional to temperature. Rate of change of temperature is determined by the controller by using differences between consecutive temperature values returned to the controller.

2.3 CIRCUIT DESCRIPTIONS

2.3.1 CARBON MONOXIDE

Refer to Fig.3.
The current through the cell circuit is added to a fixed baseline voltage and mirrored by the current mirror. This is fed to a current to voltage converter amplifier which buffers and scales the signal. The resultant voltage is fed to an analogue input on the common circuit.

2.3.2 HEAT

Refer to Fig. 3.
The negative temperature coefficient thermistor produces an analogue output which is fed to an analogue input on the communications interface.

2.4 COMMON CIRCUIT

Refer to Fig. 3.
Communications between the controller and detector uses the Frequency Shift Keying (FSK) method. The ‘Discrimination Circuit’ filters the FSK signal from the +ve line voltage and converts it to a digital square wave input for the ‘Communications ASIC’.The ‘Communications ASIC’ decodes the signal and when its own address is decoded, the analogue inputs received from the carbon monoxide and heat sensing elements are converted to corresponding digital values. These digital values are then passed to the ‘Tx Driver Circuit/Current Sink’ which converts them to FSK signals and applies them to the +ve line for transmission to the controller.
The Common Circuit is also used to:

- Control Sounder and Relay bases via the ‘Functional Base Interface Circuit’ from controller commands.
- Control the operation of the Remote LED via the ‘Remote LED Circuit’ from controller commands.

2.5 WIRING

Loop cabling is connected to base terminals L (-ve) and L1 (+ve). A drive is provided for a remote indicator connected between loop positive and terminal R. Terminal L2 (FUNCTIONAL BASE output) is for use with functional sounder base.

3. MECHANICAL CONSTRUCTION

The major components of the detector are:

- Body Assembly
- Printed Circuit
- CO Cell
- Screening Can
- CO Closure
- Thermistor
- Light Pipe
- Outer Cover

3.1 BODY ASSEMBLY

The body assembly consists of a plastic moulding which has four embedded detector contacts which align with contacts in the base.The moulding incorporates securing features to retain the detector in the base.
The CO cell is inserted onto the PCB followed by the screening can.
Four PCB mounted spring contacts provide electrical connection between the detector contacts and the PCB.
The light pipe is slotted into the CO closure which is then clipped to the body. Finally, the outer cover is clipped to the body.

FIG.1 *FC400CH Addressable Carbon Monoxide + Heat Detector*

4. TECHNICAL SPECIFICATION

4.1 MECHANICAL

Dimensions: The overall dimensions are shown in Fig.5 (less base).

Materials
Body,cover, and closure: FR110 'BAYBLEND' flame retardant.
Weight
Detector: 0.088kg
Detector + Base: 0.152kg

4.2 ENVIRONMENTAL

Temperature
Operating: -0°C to +55°C
Storage: -20°C to +55°C

☞ *The detector may be operated for short periods between the limits of 0° C to -20°C but with reduced performance.*

☞ *The detector may be operated for short periods between the limits +55°C to +70°C, prolonged use between these limits will degrade the performance and shorten the life of the detector.*

Relative Humidity: 95% (non-condensing)
Shock:
Vibration: prEN54 Pts. 5 and 7
Impact:
Corrosion: prEN54 Pts.5 and 7

The detectors comply with Lloyd's Register Test Specification Number 1 (1996). Environmental Category ENV2 plus Salt Mist test.

4.3 ELECTROMAGNETIC COMPATIBILITY

The detector complies with the following:
- product family standard EN50130-4 in respect of Conducted Disturbances, Radiated Immunity, Electrostatic Discharge, Fast Transients and Slow High Energy;
- EN50081-1 for Emissions.

4.4 ELECTRICAL CHARACTERISTICS

The following characteristics (Table 1) apply at 25°C and nominal supply voltage of **37.5V** unless otherwise specified.

Table 1: Electrical Characteristics

Characteristic	Min.	Typ.	Max.	Unit
Loop Voltage	20.0	-	40	V
Quiescent Current	-	275	305	μA
Alarm Current*		3	3.3	mA

* No remote indicator fitted

Addressable circuit voltage:
40V dc max. with addressable waveform (polarity conscious).

4.5 PERFORMANCE CHARACTERISTICS

4.5.1 CARBON MONOXIDE

The FC400CH carbon monoxide sensing element with base, forms an addressable detector which transmits, to remote equipment, signals representing the state of the sensing cell. The control equipment evaluates these signals against predetermined criteria and decides when an alarm condition should be signalled.The information given below therefore relates to the performance of the carbon monoxide element of the detector simply as a transducer, since the system alarm response is determined by the control unit.

4.5.1.1 RESPONSE TO CARBON MONOXIDE

The response to carbon monoxide will vary from detector to detector. For this reason each detector is characterised on manufacture and calibration values are stored in the internal detector memory. The controller will then normalise the output signal from the detector such that the output is equivalent to 2.5 bits/ppm carbon monoxide above a threshold of 20 bits. Carbon monoxide may be present in some environments under certain circumstances (high values of pollution or extreme environmental conditions). However, the deviation is unlikely to be significant compared with the alarm threshold level.

4.5.1.2 EFFECT OF AIRFLOW ON SENSITIVITY

The signal status of the FC400CH detector has been specifically designed to be insensitive to abnormal air velocities. The effect of normal air velocities upon sensitivity is negligible.

4.5.1.3 EFFECT OF TEMPERATURE ON SENSITIVITY

The carbon monoxide detector incorporates temperature compensation and its condition current will be substantially constant over its specified operating range.

4.5.1.4 EFFECT OF ATMOSPHERIC PRESSURE ON SENSITIVITY

The sensitivity of the detector is not effected by changes in atmospheric pressure unless they happen very quickly ie explosions.

4.5.2 RESPONSE TO FIRE TESTS

The response of the FC400CH carbon monoxide detection element of the detector to real or large-scale test fires will be dependent on the detection mode chosen and the sensitivity set in the control unit.
Other factors however, such as the rate of development of the fire, and relative oxygen supply are also important. The fire tests defined in prEN54 pt. 7 which are intended for ionisation and optical detectors are less appropriate for carbon monoxide fire detectors as their design means that they produce significant levels of carbon monoxide only in their later stages.
However, the FC400CH using compensated carbon monoxide combined with A1R heat (sensitivity High and Normal) mode, pass all tests laid down in prEN54 pt 7 including the fire tests.

4.5.3 HEAT DETECTOR

4.5.3.1 GENERAL

The performance of heat detectors is defined in European Standard prEN54-5.

5. DETECTOR ADDRESS

The loop address of the detector is held in internal E^2PROM which is programmed from the FC490ST Address Programmer.

☞ *Note: this device use one address only on the loop.*

6. ADDRESS FLAG

Refer to Fig.6. The address flag is used to identify the address and zone of the detector.The address flags are supplied in one of two packs (address 1 - 127 or 128-255 , with a different colour for each loop) and are ordered separately from the detector.The address flag is fitted to the bottom of the detector. When the detector is fitted to the base and turned until fully located the address flag is then transferred to the base. If the detector is removed from the base, the address flag remains with the base.

7. ORDERING INFORMATION

FC400CH Carbon Monoxide + Heat detector.
Address Flag Labels - Loop A (White).
Address Flag Labels - Loop B (Yellow).

8. RECYCLING INFORMATION

Customers are recommended to dispose of their used equipments (panels, detectors, sirens, and other devices) in an environmentally sound manner. Potential methods include reuse of parts or whole products and recycling of products, components, and/or materials.

9. WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE

In the European Union, this label indicates that this product should NOT be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling.

The manufacturer reserves the right to change the technical specifications of this product without prior notice.

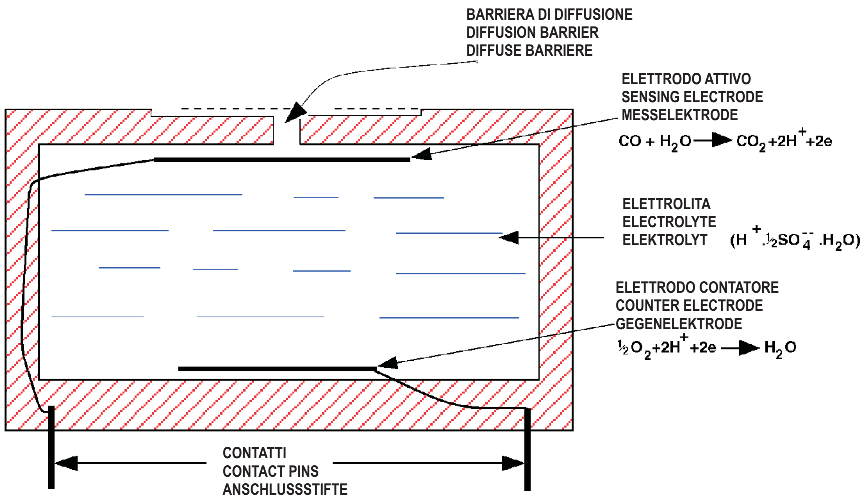

FIG.2 *Schema del sensore*

Representational Diagram of CO Sensing Cell

Diagramm der CO-Messzelle

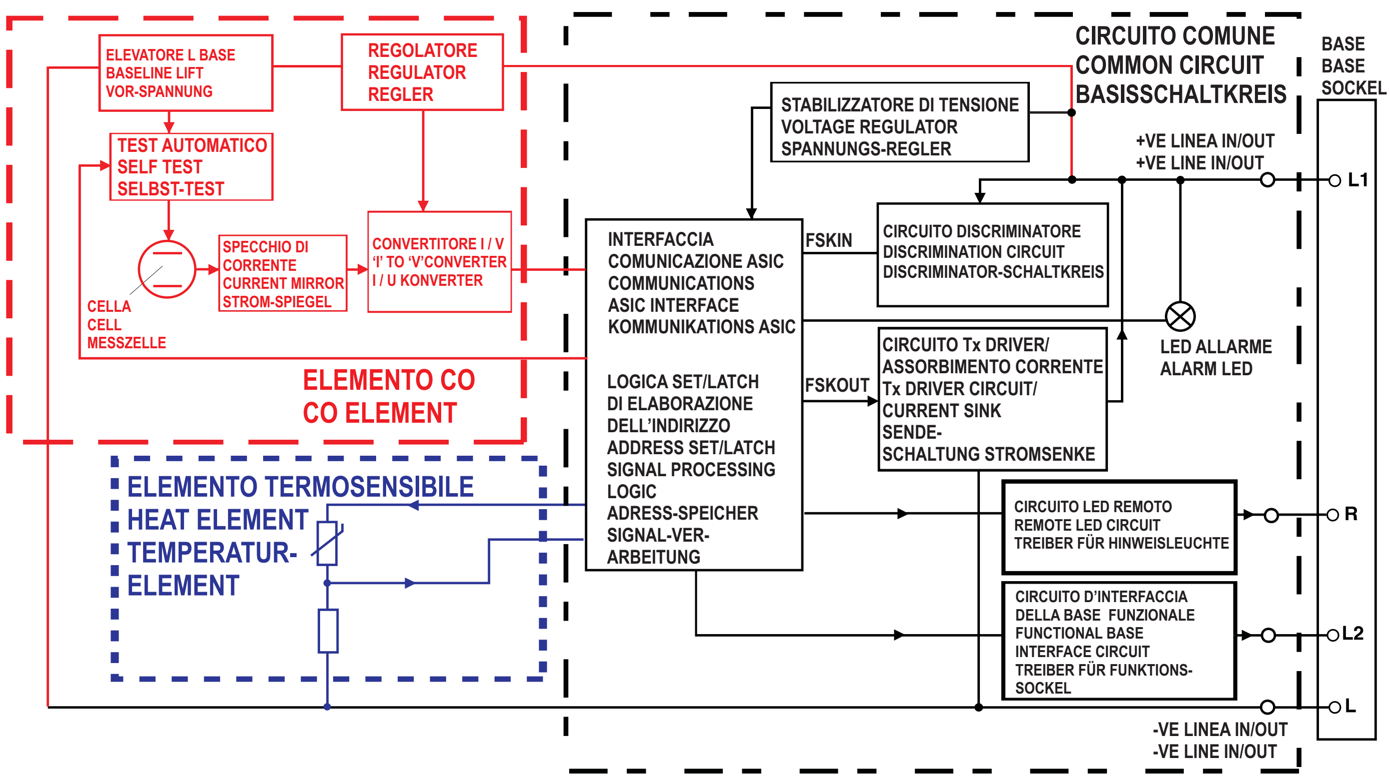

FIG.3 *Schema a blocchi semplificato del rilevatore*

Simplified Block Schematic Diagram of detector

Vereinfachte Block-Schemadarstellung des Melders FC400CH

ISTSUBL3FC400CH 1.0 140212 V10

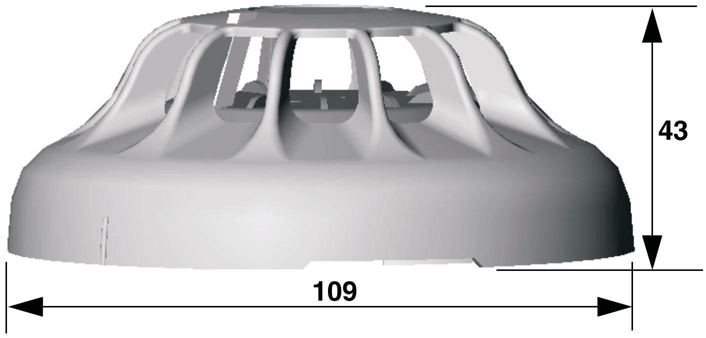

FIG.4 *Sezione e vista superiore del rilevatore*
Sectioned and Top View of the detector
Schnittdarstellung und Ansicht von oben

FIG.5 *Dimensioni generali del rilevatore FC400CH*
Overall Dimensions of FC400CH detector
Abmessungen des Melders FC400CH

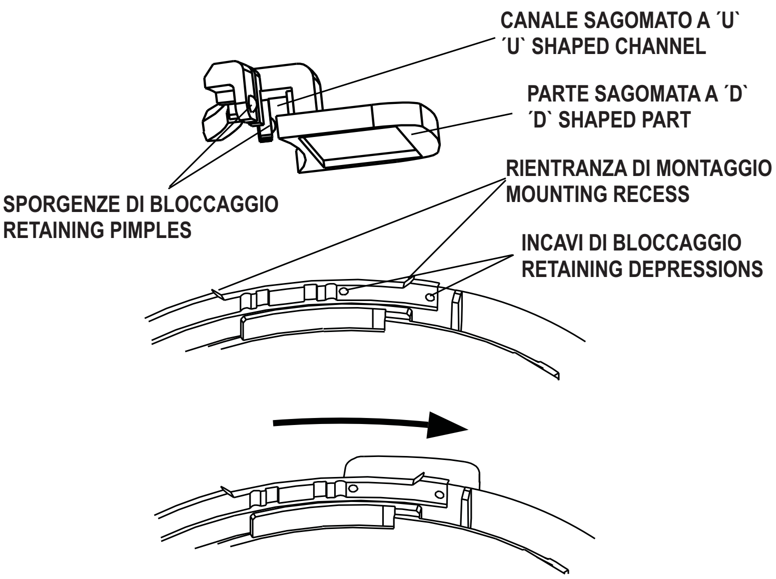

FIG.6 *Inserimento della linguetta indirizzo*
Fitting Address Label Carrier

Via Gabbiano 22, Z. Ind. S. Scolastica
64013 Corropoli (TE), Italy

Hillcrest Business Park Cinderbank Dudley West Midlands
DY2 9AP United Kingdom

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