Guide to Installation and Operation

Multi Gas Detector
SH-2001-WAD
SH-2002-WAD

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CONTENTS

1 Introduction

1.1 The multi gas detection unit

The series SH-200x-WAD multi gas detection units (also referred to in this document as “SH-WAD” unit), are systems capable of monitoring a wide variety of toxic, corrosive and flammable gases both in low parts per billion/million (ppb/ppm) concentrations as well as in the higher concentrations (vol. %).

The SH-WAD unit is a wall mount model, suction type, multi gas detection unit equipped with integrated membrane pump(s) to draw in the air/gas mixture(s) and designed for the continuous monitoring of these mixtures.

The key elements of the unit are electrochemical gas sensors, which are designed for a selective response to a specific gas or group of gases. Nearly all types of gas sensors operate according to the principle of membrane electrolysis[1].

The ability to trace events and changes has been an important aspect in the design and programming of the SH-WAD. Nearly all SH-WAD units are equipped with a smart sensor and all units contain a trend/history recording function and have self-diagnostics.

The SH-2001-WAD is almost similar to the SH-2002-WAD unit. The main differences are presented in the following table.

	SH-2001-WAD	SH-2002-WAD
		
Target	Detector for maximum 2 individual gasses from 1 source	Detector for maximum 2 individual gasses from 2 sources
Typical application	Tool and environmental detection	Gas cabinet and VMB[2] detection
Number of gas sensors (max.)	2	2
Number of gas inlets	1	2
Number of gas outlets	1	2
Number of flow indicators / control	1	2

1 See appendix 1 for an explanation.

2 Valve Manifold Box(es) (tool in the fluid/gas processing industry)

The SH-WAD operates on external 24 VDC power. The unit is equipped with gas inlet/outlet ports, an internal interface connector for power connections / additional features (such as 4…20 mA output(s), external buzzer and relay functions) and an external interface connector for serial communications (Modbus / SIMS, Profibus DP).

Features overview:

- A large variety of gas sensors.
- Integrated membrane pump(s).
- 24 VDC operations.
- Wide-angle VF display, displaying the gas concentration, gas type, full scale range, alarm and error messages as well as diagnostic data.
- LED indicators, quick visual indication of channel state.
- Optional plug-in modules for relay functions and support for Profibus-DP, Modbus and SIMS protocols (by means of RS-485).
- Internal electrical connection for input power, 4…20 mA output(s), relays, external buzzer.
- External electrical connection for serial communication.
- Smart sensor provided with EEPROM memory.
- Sensor calibration both on- and off-site.
- Test and calibration with “live gas”, using safe and non-destructive concentrations.
- Complete system self-diagnostics.
- Extensive “Trend/History” data recording.
- RS-232 interface for local programming, operation and troubleshooting.

1.2 Safety

The multi gas detection system has been designed to provide long-term reliable performance. Nevertheless, we recommend you to take the following basic precautions whilst installing operating and maintaining this device.

- Read this “Guide to Installation and Operation” carefully.
- Be sure to file this guide for future reference.
- Installation, maintenance, calibration and testing should be carried out by qualified personnel only.
- Check if the power supply matches the specifications given in this guide and ensure that the system has been connected properly.

If you have any doubt with regard to the power supply, please contact your local sales office.

If there are any signs of system damage or malfunctioning, please do the following:

- If the unit is connected to an external alarm/control unit put this unit into ‘Stand-by’ or inhibit the channel.
- Put the SH-WAD in standby and activate the relay inhibit mode (see section 2.5).
- Contact your local sales office.

1.3 Overview of configurations

With the following optional modules the SH-WAD can interact with a variety of external systems.

- ProGas-RC card. Potential-free relay (4x) plug-in card.
- ProGas-DP card. Profibus-DP communication plug-in card (RS-485).
- ProGas-RX card. Modbus / SIMS communication plug-in card (RS-485).
  Note: this optional hardware part is not required for later product generations as it has become a standard integrated feature (available as software option).

1.4 The components of the SH-WAD and related systems

1.4.1 Codes and letters identifying parts and components

A Toxic Gas (TG) number is used to identify a gas or group of gases.
This Toxic Gas number is a '100' number, e.g.; Ammonia is TG-2400.
For a full list of the TG codes please refer to our commercial documentation.

The Gas Sensor (GS) number has been derived from the TG number. This means the GS number for a specific gas or group of gases will start with the same '100' number. For example; the GS-2460HS is a sensor for the detection of ammonia. The two letters at the end identify the specific model of the sensor.

Other identification codes frequently used for components and parts:

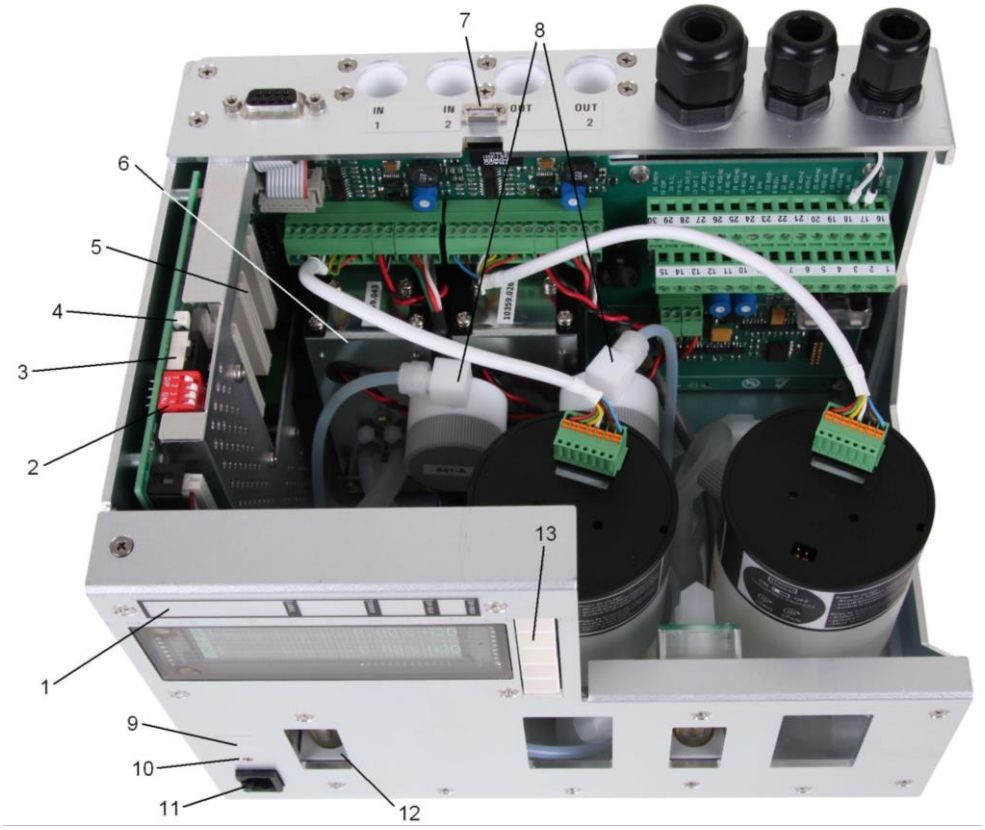
Abbreviation	Component / part
GS-	Sensor
EL-	Electrolyte
M-	Membrane
PC-	Printed Circuit board
RX-	Alarm/Control unit
SH-	Sampler housing

1.4.2 Components of the SH-200x-WAD detection unit – front part

		Description
1	-	Mounting bracket.
2	-	Interface connector for serial communication (Profibus-DP, Modbus & SIMS).
3	-	Air/gas inlet port(s) of the unit; ¼“ BSPT / R TAPERED / ISO 7/1, female connector(s).
4	-	Cover fastening latch. To remove the cover: Unlock latch and slide the cover towards horizontally until it comes free. At first some force is required to unlock the cover from the front-bracket. To close the cover: Slide the cover backwards horizontally, until it locks into the front-bracket. Finally lock latch to fix the cover in place.
5	-	Air/gas outlet port(s) of the unit; ¼“ BSPT / R TAPERED / ISO 7/1, female connector(s).
6	-	Cable glands (1 x M20) for optional connection with external systems. Cable diameter specification: 8...13 mm.
7	-	Cable gland (2 x M16) for power connection. Cable diameter specification: 6...10 mm.
8	-	LED indicators, quick visual indicating of channel state.
9	-	Slide-in label with optional channel information.
10	-	Wide angle VF display (incl. cover plate): Displays operational data such as: gas type, gas concentration (either in ppm, ppb or volume %), full scale reading, possible error messages and diagnostic data. The gas concentration is shown both in numerical format as well as in a bar graph presentation.
11	-	Flow indicator with integrated flow sensor: Indicates the flow rate in liters/min. It will detect a low flow situation with its integrated optical flow sensor.
12	-	Function selector: Used for performing/activating various functions. Function of the button depends on the operation mode of the unit (standby, alarm etc.).
13	-	RS-232 programming port: Used to program/configure the unit by means of the InControl software package.

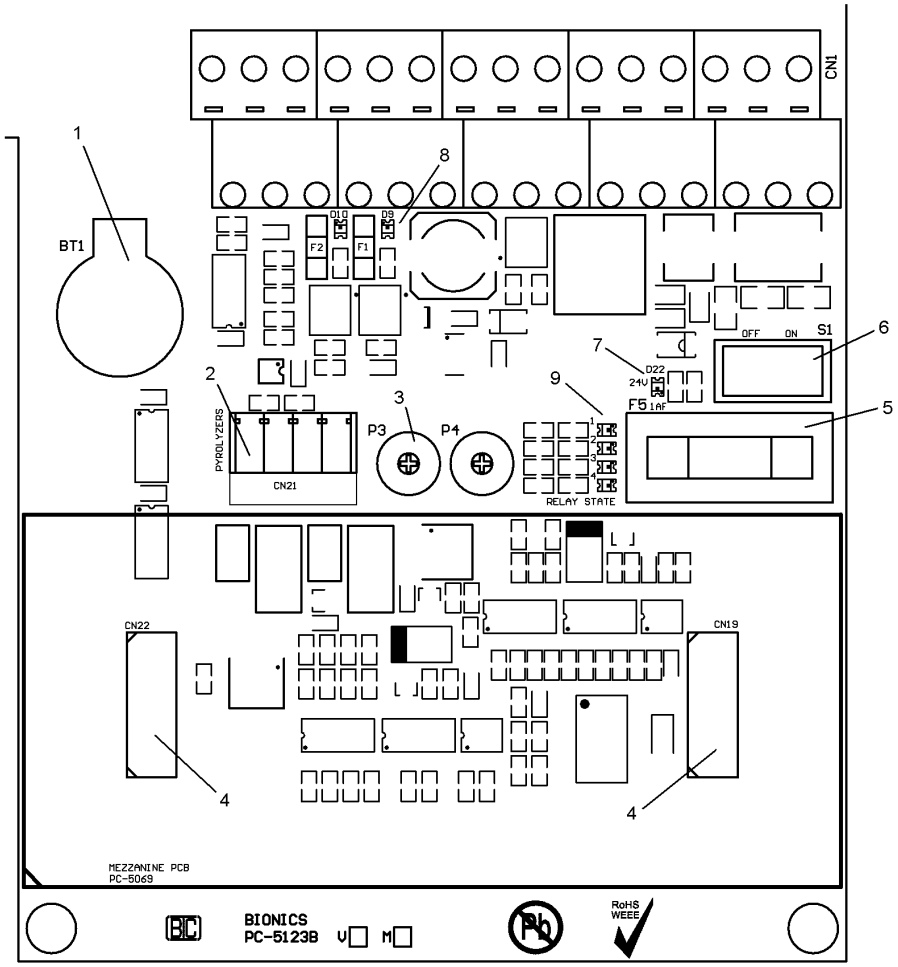
1.4.3 Components of the SH-200x-WAD detection unit – inside part I

		Description	
1	-	Identification label.	
2	-	Configuration dip switches (see also 2.5.1).	
		SW1-1	When 'On' it will prevent users to change the programming/configuration (with In-Control).
		SW1-2	When 'On' it will prevent the gas-concentration to appear as "–.– –" in case of error.
		SW1-3	When 'On' it will prevent the sensor type accessed as a "smart" type.
		SW1-4	Reserved for future usage
3	-	Relay inhibit switch (see 2.5.1) When put in the position 'ON' it will lock the relays in their present condition.	
4	-	Relay inhibit LED (see 2.5.1)	
5	-	Connector CN1~CN3: Mounting connectors for the optional ProGas-DP and ProGas-RX plug-in cards.	
6	-	Sampling pump: DC operated membrane pump used to draw in the air/gas mixture to be monitored.	
7	-	Fastening latch; secures the cover of the unit.	
8	-	Pyrolyzer housings; accommodates the decomposer element (option).	
9	-	Flow adjustment potentiometer; used to adjust the flow rate of the pump (SH-2001-WAD only, for SH-2002-WAD see 1.4.5)	
10	-	Function selector; used for performing/activating various functions. Functions of the button depend on the operation mode of the unit (standby, alarm, etc.).	
11	-	RS-232 Programming port; type RJ-45.	
12	-	Flow indicator with integrated flow sensor; indicates the flow rate in liters/min. It will detect a low flow situation with its integrated optical flow sensor.	
13	-	LED indicators; for quick channel status indication.	



1.4.4 Components of the SH-200x-WAD detection unit – inside part II

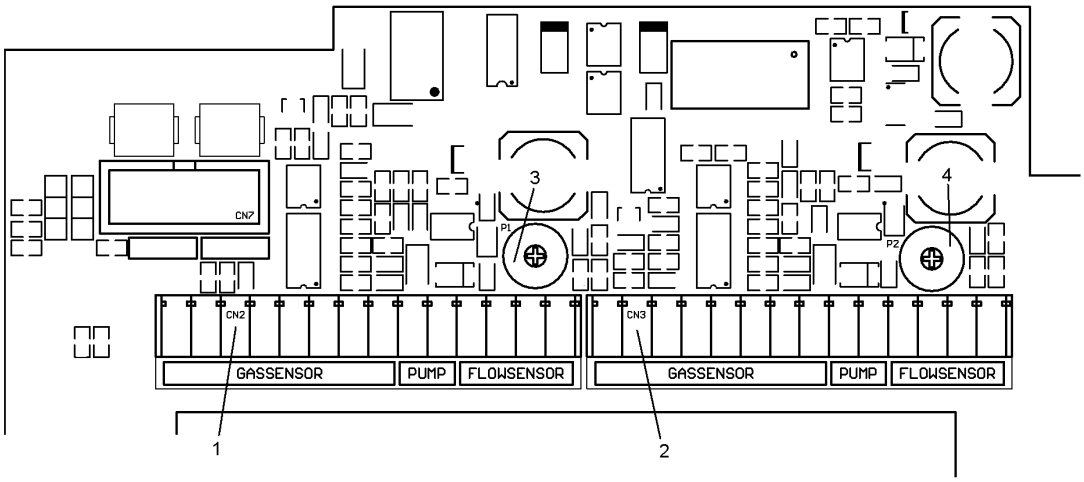
Item		Description
1	-	Clock back-up battery (3V, type CR1216).
2	-	Connector CN22: Mounting connector for the optional pyrolyzers.
3	-	Trimming pot meters for adjusting pyrolyzer voltages. Clockwise = increasing the voltage.
4	-	Connector CN19/CN22: Mounting connector for the optional ProGas-RC plug-in card.
5	-	Fuse F5 – External power supply output signal protection (1A fast, type 5 x 20 mm).
6	-	Fuse F1…F2 – 4~20 mA output signal protection (50mA fast, type TRE).
7	-	LED D22: Lights up when the detector has 24 VDC power.
8	-	LED D9…D10: Lights up in relation to the 4~20 mA output signal. Full brightness at 20 mA.
9	-	LED 1: Indicates the energized state for the K01 relay. LED 2: Indicates the energized state for the K02 relay. LED 3: Indicates the energized state for the K03 relay. LED 4: Indicates the energized state for the K04 relay.



Internal view.

1.4.5 Components of the SH-2002-WAD detection unit – inside part

Item		Description
1	-	CN2: Mounting connector for gas sensor I, pump I & flow sensor I.
2	-	CN3: Mounting connector for gas sensor II, pump II & flow sensor II.
3	-	P1: Trimming potmeter for adjusting flow I. Clockwise = increasing the flow.
4	-	P2: Trimming potmeter for adjusting flow II. Clockwise = increasing the flow.

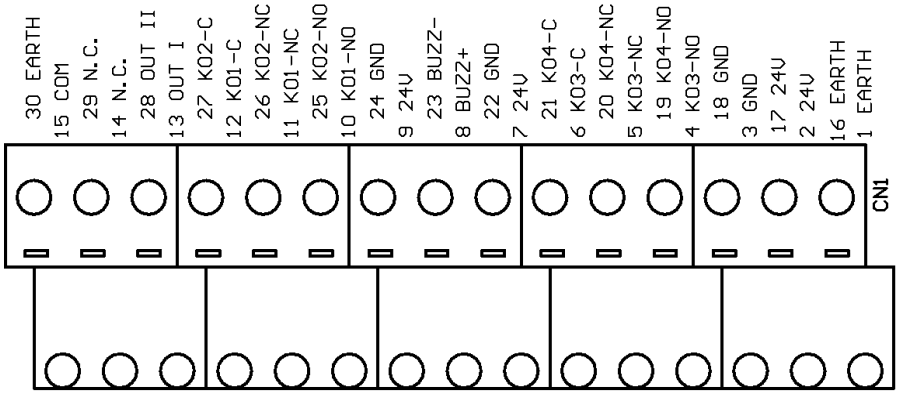


Internal view.

1.5 Description of the optional components and modules

1.5.1 Internal interface connector

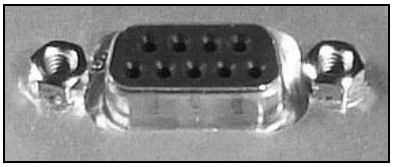
Pin	Signal	Remark
1	EARTH	Earth connection, use the grounding terminal to connect the detector to your grounding circuit.
2	24V	Input power
3	GND	Input power
4	K03-NO	K03 contacts; normally open.
5	K03-NC	K03 relay contacts; normally closed.
6	K03-C	K03 relay contact; common for no // nc.
7	24V	Connection for optional use.
8	BUZZ+	Connection for external buzzer, plus side.
9	24V	Connection for optional use.
10	K01-NO	K01 relay contact; normally open.
11	K01-NC	K01 relay contact; normally closed.
12	K01-C	K01 relay contact; common for no // nc.
13	OUT I	Recorder current channel I; 4...20 mA.
14	N.C.	Not connected.
15	COM	Common connection for recorder currents (out I...out II).
16	EARTH	Earth connection, use the grounding terminal to connect the detector to your grounding circuit.
17	24V	Connection for optional use.
18	GND	Connection for optional use.
19	K04-NO	K04 relay contact; normally open.
20	K04-NC	K04 relay contact; normally closed.
21	K04-C	K04 relay contact; common for no // nc.
22	GND	Connection for optional use.
23	BUZZ-	Connection for external buzzer, minus side.
24	GND	Connection for optional use.
25	K02-NO	K02 relay contact; normally open.
26	K02-NC	K02 relay contact; normally closed.
27	K02-C	K02 relay contact; common for no // nc.
28	OUT II	Recorder current channel II; 4...20 mA.
29	N.C.	Not connected.
30	EARTH	Earth connection, use the grounding terminal to connect the detector to your grounding circuit.



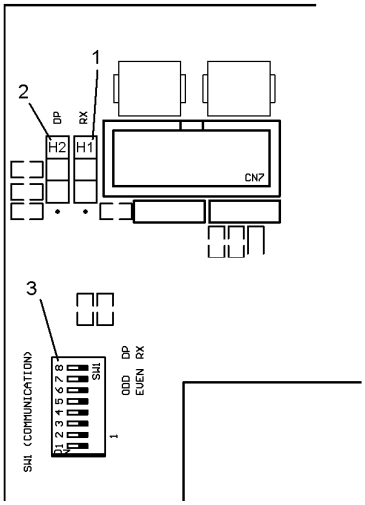
Internal terminal block.

External interface connector

Pin	Signal SW1 = ODD Profibus DP	Signal SW1 = EVEN RS-485	Remark
1		A-in	
2		B-in	
3	B	E-in	DP: use always the red wire for signal B (pin3 - TXD/RXD-positive).
4			
5	GND	A-out	
6	+5V	B-out	
7			
8	A	E-out	DP: use always the green wire for signal A (pin8 - TXD/RXD-negative).
9			



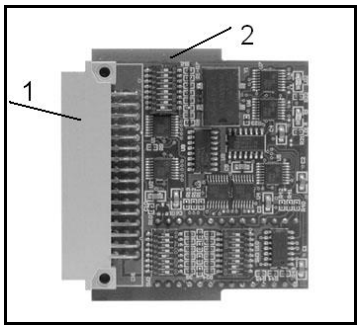
External connector.



Communication protocol
Selector and terminator jumpers.

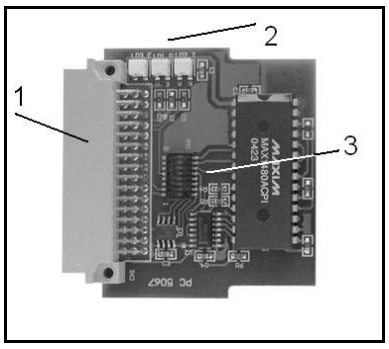
Item		Description
1	-	Jumper H1 – RS-485 (Modbus // SIMS) end-of-line termination: 1-2: Termination off (upper position). 2-3: Termination on (lower position).
2	-	Jumper H2 – RS-485 (Profibus-DP) end-of-line termination: 1-2: Termination off (upper position). 2-3: Termination on (lower position).
3	-	Switch SW1 – RS-485 mode select: ODD: Profibus-DP compatible mode (select this when using the ProGas-DP plug-in card). SW1 ODD setting: 10101010 [SW1-1...SW1-8]. 1 = ON position; 0 = OFF position. EVEN: SIMS/Modbus compatible mode (select this when using the ProGas-RX plug-in card). SW1 EVEN setting: 01010101 [SW1-1...SW1-8]. 1 = ON position; 0 = OFF position.

1.5.2 ProGas-DP plug-in Profibus-DP communication module



Item		Description
1	-	Connector to mount plug-in module on connector sockets CN1~3 of SH-WAD unit.
2	-	Dipswitch to select the communication slave address. For slave address settings see appendix (section 5.8.6).

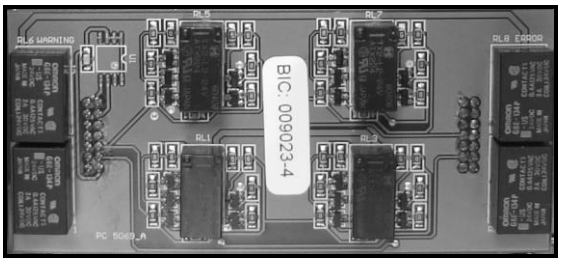
1.5.3 ProGas-RX plug-in Modbus/SIMS communication module



Item		Description
1	-	Connector to mount plug-in module on connector sockets CN1~3 of SH-WAD unit.
2	-	Status leds: LD1: Receiving data LD2: Transmitting data LD3: Error during communication.
3	-	Dipswitch SW1 for selecting isolated / non-isolated communication. None isolated: SW1-1...SW1-4 = ON; SW1-5...SW1-8 = OFF. Isolated: SW1-1...SW1-4 = OFF; SW1-5...SW1-8 = ON.

Note: this optional hardware part is not required for later product generations as it has become a standard integrated feature (available as software option).

1.5.4 ProGas-RC plug-in Relay module



2 Installation

2.1 Mounting the detector and its plug-in modules

2.1.1. General mounting procedures

The SH-WAD unit is a multi gas detector, intended for indoor wall mount use and should be mounted against a dry, clean, vibration-free and potential-free surface. Do not place the gas monitoring system in the neighbourhood off equipment that emit large levels of electro-magnetic radiation (if in doubt, please contact your local sales office for additional advice).

Place the unit at a location, which is easily accessible for wiring, tubing and maintenance activities. Allow sufficient free space above the unit to install cables and sample tubing. The built-in diaphragm pump(s) is/are capable of extracting samples from a maximum distance of 10 meters and more. For distances over 10 meters please contact your local sales office for advice.

To open the cover:
Unlock the latch on the topside of the detector and slide the cover backwards horizontally until it comes free. At first some force is required to unlock the cover from the front-bracket.

To close the cover:
Slide the cover forwards horizontally, until it locks into the front-bracket. Finally lock the latch to fix the cover in place.

2.1.1 Mounting the ProGas-DP plug-in Profibus-DP communication module

Procedure:

- Open the cover, as described previously.
- Switch the power off by means of the detector on/off switch (S1).
- Set the address dip-switch on the ProGas-DP card to its correct slave address (see section 5.8.6).
- Mount the card inside the detector on connector socket CN1~3.
- Set switch SW1 (RS-485 mode select) into position ODD (Profibus-DP).
- Switch the detector on.
- Close the cover, as described previously.
- Use InControl software to enable the “ProGas-DP” hardware option.

Note.
If the optional protective cover for plug-in cards is supplied, first mount the card as described above, then position the protective cover over the card and finally slide the spring-clamp into place that can be locked with two screws.

2.1.2 Mounting the ProGas-RX plug-in Modbus/SIMS communication module

Procedure:

- Open the cover, as described previously.
- Switch the power off by means of the detector on/off switch (S1).
- Mount the card inside the detector on connector socket CN1~3.
- Set switch SW1 (RS-485 mode select) into position EVEN (SIMS RS-485).
- Switch the detector on.
- Close the cover, as described previously.
- Use InControl software to enable the “ProGas-RX” hardware option.
- Use InControl software to set the RX address field to its correct slave address.

Note.
If the optional protective cover for plug-in cards is supplied, first mount the card as described above, then position the protective cover over the card and finally slide the spring-clamp into place that can be locked with two screws.

2.1.3 Mounting the ProGas-RC plug-in Relay module

Procedure:

- Open the cover, as described previously.
- Switch the power off by means of the detector on/off switch (S1).
- Mount the card inside the detector on connector socket CN19/CN22.
- Switch the detector on.
- Close the cover, as described previously.
- Use InControl software to enable the “ProGas-RC” relay card hardware option.

Note: After you’ve installed the relay card, it is advised to check or re-program the “energized” state of the K01, K02, K03 and K04 relays with InControl. Also make sure that the relay inhibit switch is not ‘On’ when the unit is finally commissioned as this will prevent the relays from changing state.

2.2 Connecting the sample tubing

Latest product generation:
The inlet and outlet sample lines are connected to the integrated Quick-Connect tube-connectors, located on the top of the SH-WAD.

Former product generations:
The inlet and outlet sample lines are connected to the R¼" BSPT female inlet/outlet ports, located on the top of the SH-WAD by using R¼" BSPT male tube-connectors.
Tube-connectors are optionally available on request.

Tubing:
The length of the inlet sample line should preferably not exceed 10 meters. It is recommended to keep the length of the inlet sample line to a minimum to positively influence the system response time. The type of gas monitored determines the type of sample tubing to be used. Using PTFE tubing with an inner diameter of 4 mm and an outer diameter of 6 mm ensures, with almost all types of gases, a proper transport of the air/gas mixture. For specific questions on the use of other tube materials, please contact your local sales office.

When running the sample line, please ensure that obstacles will not cause any obstructions to the air/gas flow within the sample tube. Likewise, it should not run between any equipment or objects that may move, squeeze or wear out the tubing.

The inlet sample line should not be exposed to under-pressure. Under-pressure will affect the flow rate and possibly prevent the target gas from reaching the detector.
For the same reason, the end of the outlet sample line should not be exposed to over-pressure.
The integrated flow sensor will detect a low flow situation.

2.3 Mounting the gas sensor

The SH-WAD currently supports the following gas sensor types:

Smart sensor GS-[…]# (where #)	Sensor principle:
HA/HS	Refillable Electrochemical sensor
EA/ES	Exchangeable Electrochemical sensor
KTSA/KTSS	Exchangeable Electrochemical sensor
HSZ	Exchangeable Zirconium Oxide sensor
HSR	Exchangeable Infrared sensor
HSC	Exchangeable Catalytic Bead sensor
OP-S	Exchangeable Photo-Ionization sensor

To install a gas sensor proceed as follows.

2.3.1 HA type sensors

- Unscrew the blind-plug from the side of the sensor and replace it with the vent-plug supplied with the sensor.

fig. 2.3.1.a
Blind plug

fig. 2.3.1.b
Vent plug

- Store the blind-plug at a dry and clean location as it may be required at a later stage when the sensor is removed from the detector.
- Remove an optional battery from the top of the sensor. Store the battery at a dry and clean location as it may be required at a later stage when the sensor is removed from the detector.
- Place the transport protection ON/OFF switch in the OFF position.

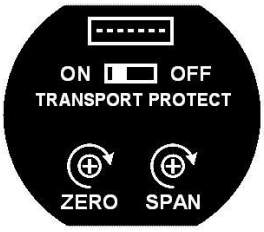


fig. 2.3.1.c
Info label on side of sensor.

fig. 2.3.1.d
Top view picture of HA type sensor.

- Gently push the sensor, straight down, into the flow cap of the detector. Make sure not to twist or turn it, as this may loosen the membrane holder cap. This might accidentally disrupt the calibration and could also cause a leakage of electrolyte.
- Connect the sensor signal cable with the green 7-pin female connector, coming from the detector, to the green on the sensor.

2.3.2 HS type sensors

- Unscrew the blind plug (fig. 2.3.1.a) from the side of the sensor and replace it with the vent-plug (fig. 2.3.1.b) supplied with the sensor. Store the blind-plug at a dry and clean location as it may be required at a later stage when the sensor is removed from the detector.
- Remove the jumper or battery from header JP1A on the sensor pcb PC-1407.

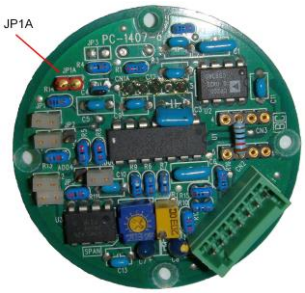


fig. 2.3.2.a
PC-1407 with header JP1A.

- Store the jumper or battery at a dry and clean location as it may be required at a later stage when the sensor is removed from the detector.
- Gently push the sensor, straight down, into the flow cap of the detector. Make sure not to twist or turn it, as this may loosen the membrane holder cap. This might accidentally disrupt the calibration and could also cause a leakage of electrolyte.
- Connect the sensor signal cable with the green 7-pin female connector, coming from the detector, to the green on the sensor.

2.3.3 EA/ES type sensors

- Gently push the sensor, straight down, into the flow cap.
- Connect the sensor signal cable with the green 7-pin female connector, coming from the detector, to the green on the sensor.

2.3.4 HSZ/ HSR/ HSC/ OP-S type sensors

- Gently push the sensor, straight down, into the flow cap.
- Connect the sensor signal cable with the green 7-pin female connector, coming from the detector, to the green on the sensor.

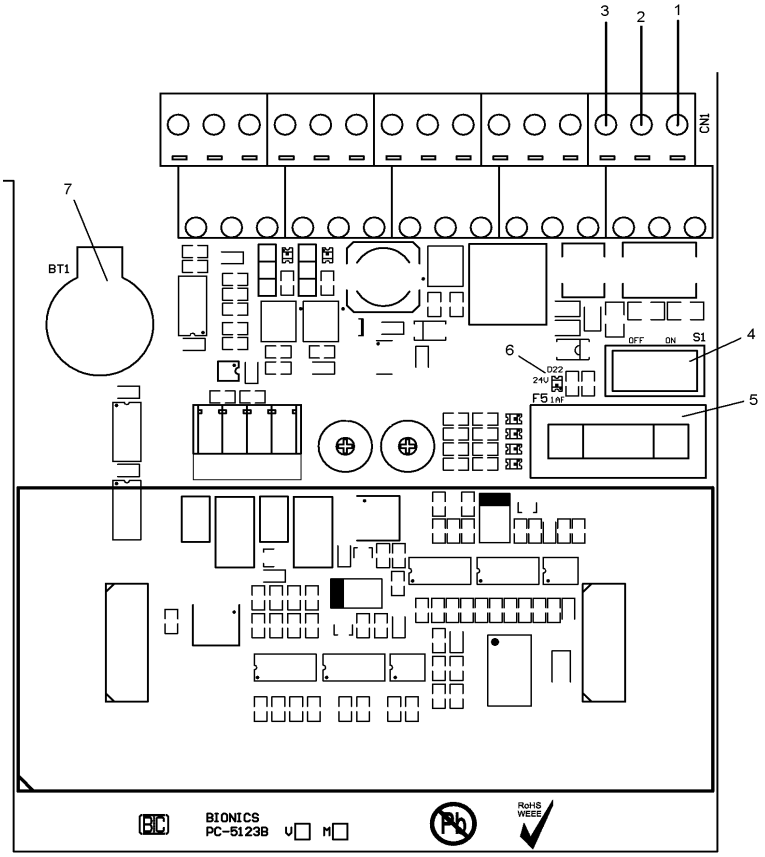
2.3.5 KTSA/KTSS sensors

- These sensors are shipped pre-installed in combination with the SH-WAD and can only be re-installed by qualified personnel.
  KTSA: Place the transport protection ON/OFF switch in the OFF position.

2.4 Electrical connections

Connect the 24V DC power cable to the internal terminal (see 1.5.1) on the back plane PC-5123 board. Use a two-wire cable with a braided shield, preferably 2 x 1,5 mm^2 to make the connection to the power supply / alarm- control unit. The cable should be connected as indicated below:

Item		Description
1	-	Earth connection, use the grounding terminal to connect the detector to your grounding circuit.
2	-	+24V DC
3	-	0 VDC (system GND)
4	-	S1: Unit ON/OFF switch.
5	-	F5: External power supply output signal protection (1A fast, type 5 x 20 mm).
6	-	LED D22: Lights up when the detector has 24 VDC power.
7	-	BT1: Clock back-up battery (3V, type CR1216).



The SH-200x-WAD detector requires a DC supply in the range 18-30 volts. Care should be taken to ensure the minimum DC supply of 18 volts is observed at the detector taking into account the voltage drop due to cable resistance.
For example, a nominal DC supply at the power supply side of 24 volts has a guaranteed minimum supply of 18 volts at the detector side. The maximum voltage drop allowed is therefore 6 volts. The SH-200x-WAD can demand up to 600 mA and so the maximum loop resistance allowed is 10 ohms. A 1.5 mm^2 cable will typically allow cable runs up to 400m. The following table below shows maximum cable distances given typical cable parameters.

Cable (mm^2)	Resistance (Ohms per km)	Maximum distance (m)
1.0	18.1	275
1.5	12.1	400
2.5	7.4	675

Above table is provided for guidance only, actual cable parameters for each application should be used to calculate maximum cable distances.

To supply power from one 24 Volt supply to several units (daisy chaining) there are extra terminals available at the internal terminal (see 1.5.1).

The SH-WAD features a power led D22 (red) that indicates when power is supplied to the detector. This is controlled by on/off switch S1 and fused by F5.

2.5 Start-up of the unit

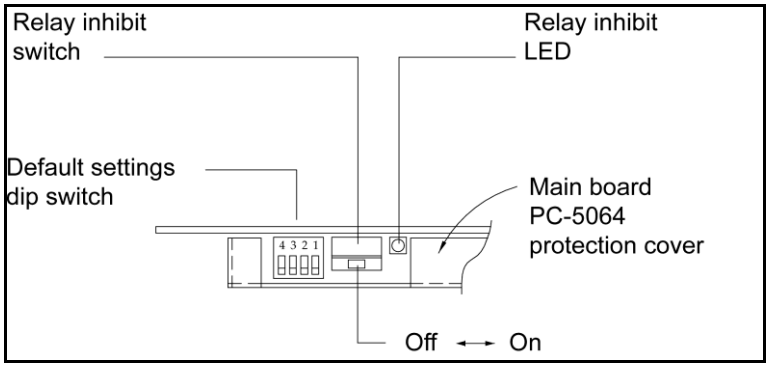
Sensors are pre-tested prior to shipment. However, it is mandatory that a complete calibration test and subsequent adjustment is made during initial commissioning by skilled / qualified personnel.

Be aware that, unless the so-called power protection mode (power-up standby) is activated, there may be an increase in the sensor output signal directly after applying power to the system.

2.5.1 Before powering up the SH-WAD

Perform the following actions:

- If the unit is connected to external alarm unit/ system by a 4-20 mA connection please make sure that the alarm unit or channel is set to standby (inhibited).
- If the unit has a ProGas-RC relay card installed make sure the relay inhibit switch in the SH-WAD is set to the position 'On'.



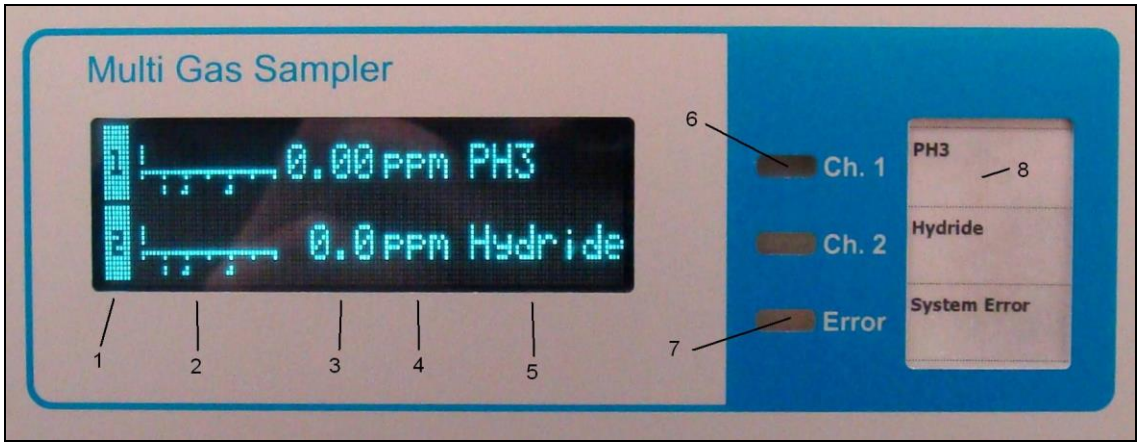
With the inhibition activated the inhibit red LED will be lit. Activation means that all the relays will be locked at their present condition. Under normal circumstances the display of the SH-WAD will show the report 'relays locked'.

When the display shows the report 'relays locked (inh. sw unsafe)' it means that the current state of the relay card (energized/non-energized) differs from the programmed settings in the SH-WAD. This condition can arise if the relay card has been replaced. To resolve this diagnostic report, re-program the relay settings in the SH-WAD with InControl software or put the relay inhibit switch to the position 'Off'. Be aware that the relays will switch instantly to the settings programmed in the SH-WAD.

When the relays are wired to external devices this action may cause an external alarm or shutdown!

2.5.2 Putting power on the system

When the power is put on the unit, the screen of the SH-WAD will display the text ‘system initialising ...’ followed by the following screen:



Item		Description			
1	-	Channel number.			
2	-	Bargraph with real time indication of gas detection level. Warning, Alarm 1 & Alarm 2 levels are visualized by means of vertical lines.			
3	-	Numerical indication of actual detection level.			
4	-	Units for numerical indication.			
5	-	Gas name.			
6	-	Channel state LED indicators.			
		Color	Led state	Frequency (Hz)	Channel state
		Green	Blinking	1.25	Standby/Power-up.
		Green	Continuous	-	Measuring
		Orange	Blinking	1.25	Warning
		Orange	Continuous	-	Warning; acknowledged by user.
		Red	Blinking	1.25	Alarm 1
		Red	Continuous	-	Alarm 1; acknowledged by user.
		Red	Blinking	5.0	Alarm 2
		Red	Continuous	-	Alarm 2; acknowledged by user.
		Green (3 pulses) / red (1 puls)	Blinking	1.25	Channel with actual error.
7	-	Error LED indicator			
		Color	Led state	Frequency (Hz)	Channel state
		Red	Blinking	1.25	Error
		Red	Continuous	-	Error; acknowledged by user.
8	-	Slide-in label for additional channel info (e.g. gas name and location)			

Power-up is a status in which the alarms are inhibited. If the gas concentration rises it will be shown on the display, but no alarms will be activated. The default time (factory setting) for which the Power-up mode is turned on after start-up is 180 seconds. After this time the unit will automatically switch to normal measuring mode (default factory setting) in which alarms can be activated. However there is one exception. If the gas concentration is still in the alarm zone after the Power-up 'delay period' has elapsed the unit will automatically switch to standby mode. In standby mode the alarms remain inhibited. A manual action is required to change to normal measuring mode.

Don't forget to put the relay inhibit switch back to its normal 'OFF' position after powering up the system.

2.5.3 Verification of the electrical connections

When power is properly connected to the SH-200x-WAD unit the red LED (D22) on PCB PC-5023 should be on. This LED indicates the presence of 24 Volt. If the unit is used as a stand-alone unit (4-20mA output signal(s)) the green LED's (D9...D10) will also be lit. These LED's indicates the output signals are present in a closed 4 and 20 mA loop.

2.6 Adjusting the flow rate

2.6.1 SH-2001-WAD

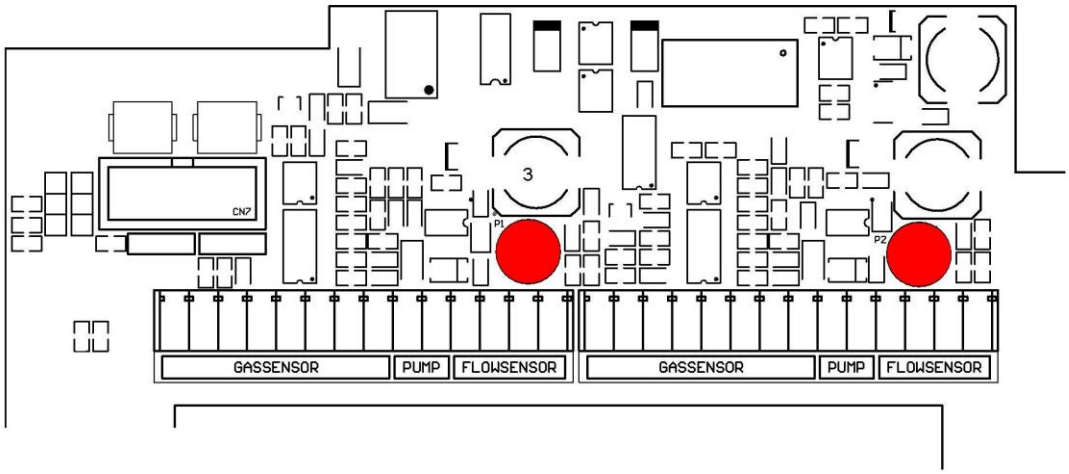
The flow rate of the SH-2001-WAD can be adjusted to its correct value from the front (cover removed). Turn the flow adjust potentiometer to set the appropriate flow.

System type	Advised flow rate
SH-2001-WAD	0.5 l/min
SH-2001-WAD equipped with a GS-4060HS/HA gas sensor	0.15 l/min
SH-2001-WAD equipped with pyrolyzer	0.15 l/min

2.6.2 SH-2002-WAD

The flow rate of the SH-2002-WAD can be adjusted inside the detector. Turn the flow adjust potentiometers to set the appropriate flow for each channel.

System type	Advised flow rate
SH-2002-WAD	0.5 l/min
SH-2002-WAD equipped with a GS-4060HS/HA gas sensor	0.15 l/min
SH-2002-WAD equipped with pyrolyzer	0.15 l/min

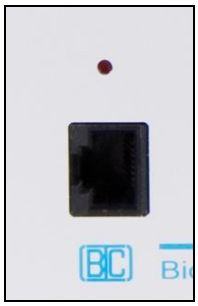


Back plane PCB PC-5123.

3 Configuration

3.1 Introduction

Configuration of the SH-WAD is performed by using the optional InControl software package. To configure units at different locations it is recommended to install the software on a laptop computer. By means of a RS-232 configuration cable (optional accessory) a computer can be connected to the RJ-45 port on the front of the detector.



When connected to the unit, the software is used to view or set the following data:

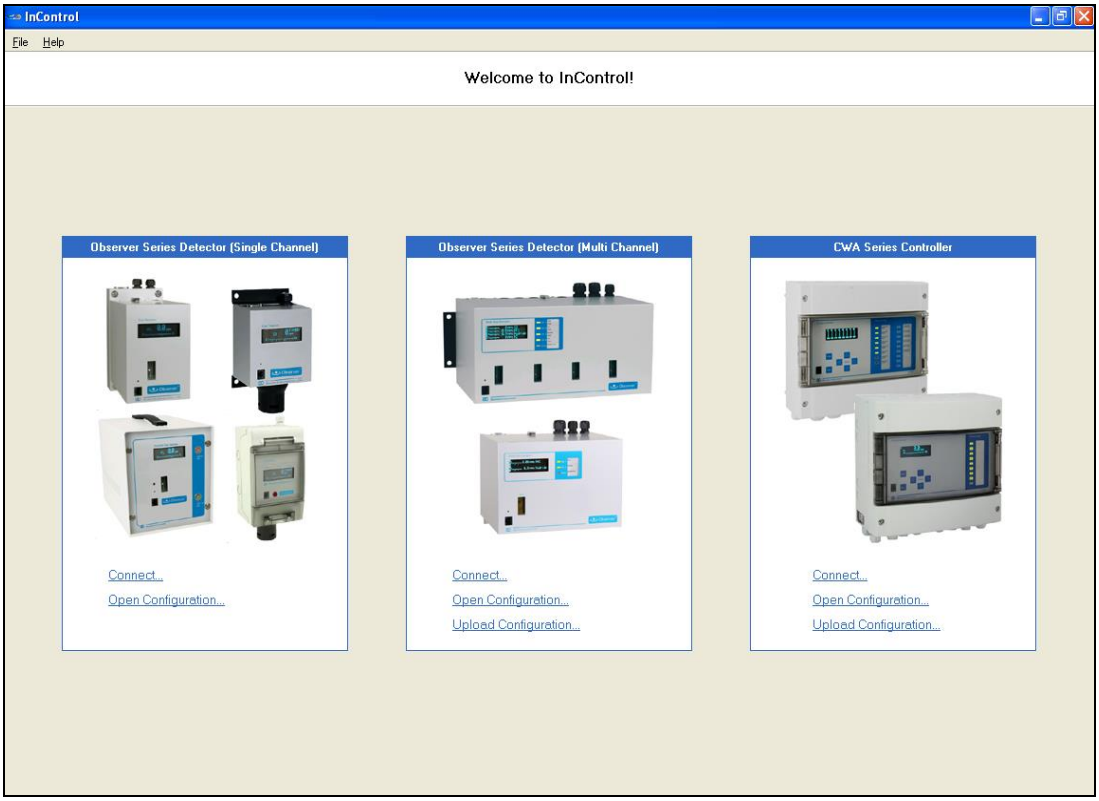
- Sensor parameters and identification
- Detector hardware configuration and options
- Display information
- Power-up information
- Alarm and error settings
- Visualization information of the optional SIMS monitoring software
- Communication settings.

The InControl software can also be used to view trend and history information stored in the internal memory of the unit.

3.2 InControl software and connecting to the SH-WAD

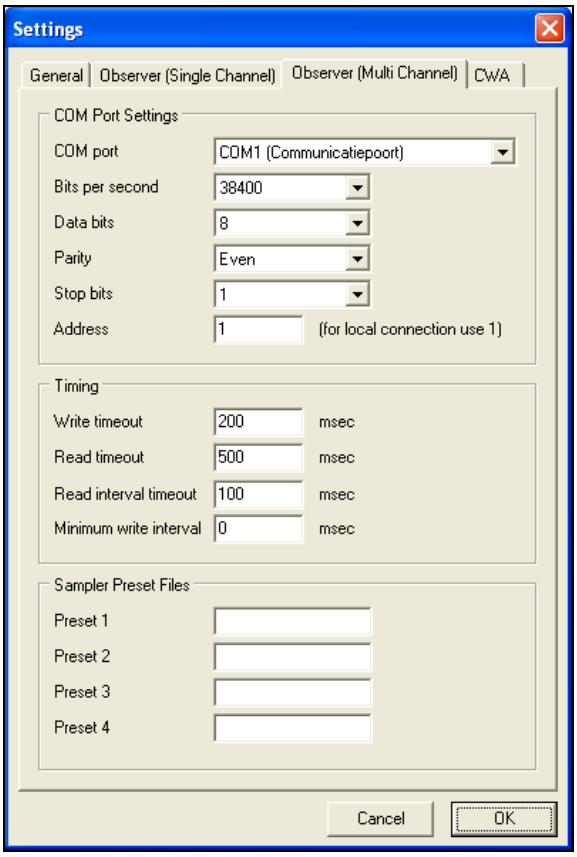
The following procedure should be performed to start the software and connect to the SH-WAD:

- Plug the PC-45 cable into the front of the SH-WAD unit. Connect the other end of the cable to a COM port of the computer.
- Start the InControl software. Windows > Start > Programs > InControl > InControl



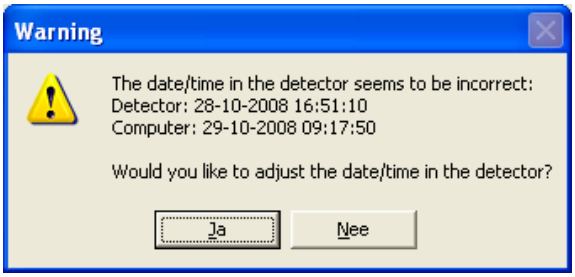
- Go to the Observer Series Detector (Multi Channel) section > select Connect.
- On connection one of the following messages may appear:

- **COM port error**
  If the software is set to operate on a different COM port than the cable is connected to, an error message will appear. Press OK to accept the message.
  Go to the File menu > settings … > in the 'Settings Window' change the COM port number to the appropriate port.

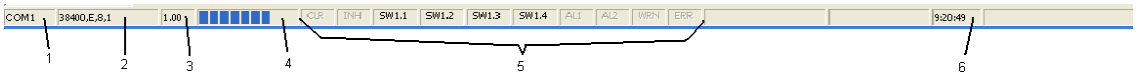


Do not change any of the other settings in this Window.

- **Date and time incorrect**
  If the date/time settings of the computer deviate from the settings in the SH-WAD a warning report will appear. Before pressing 'yes' and updating the settings in the SH-WAD ensure your computer has been set to the correct date and time (if not please correct the settings of your computer before continuing).



The bottom of the screen shows a status bar, which provides information about the connection and the communication. When properly connected the communication activity indicator should be running.



Item		Description
1	-	COM port activated in the software.
2	-	COM port settings (communication speed etc.).
3	-	Firmware of SH-200x-WAD unit.
4	-	Communication activity.
5	-	Operating status of SH-200x-WAD.
6	-	Actual time

3.3 Read and Write data

At the bottom of controller, sensor, channel, relay matrix and sensor matrix page there is a ‘Read ' and ‘Write' button. When settings on a certain page have been modified press the ‘Write’ button to store the new data in the SH-WAD unit.

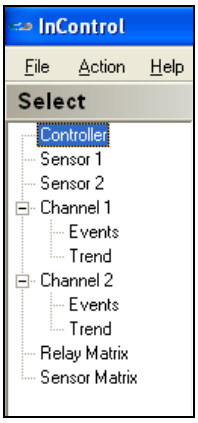
If you change any of the components in the SH-WAD while the unit is connected to the InControl software press the ‘Read’ button to load new data into the software. This operation could for example be performed when a gas sensor is replaced.

It is important to know that the ‘Read ' and ‘Write ' buttons only apply to the page which is shown at that moment. If data is changed both on the sensor and detector page the ‘Write’ button should be pressed on each individual page.

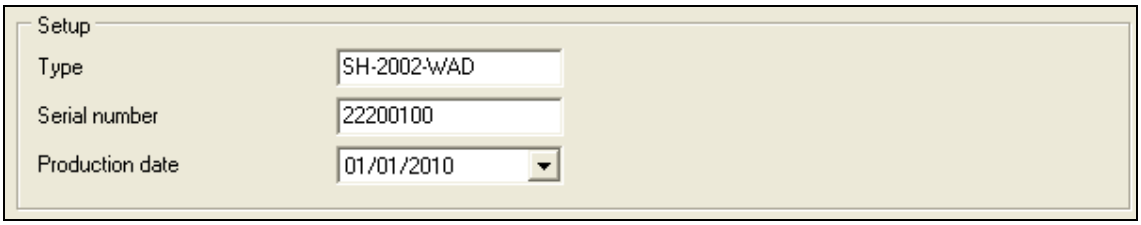
Please note that a ‘Connect to WAD’ action will automatically perform a ‘Read’ operation for both sensor and detector data. It is not necessary to press the ‘Read’ button following a software connection to the SH-WAD.

3.4 Adjusting and checking settings on the ‘Controller’ information page

All information shown of a controller page is stored in the memory of the SH-WAD detector.

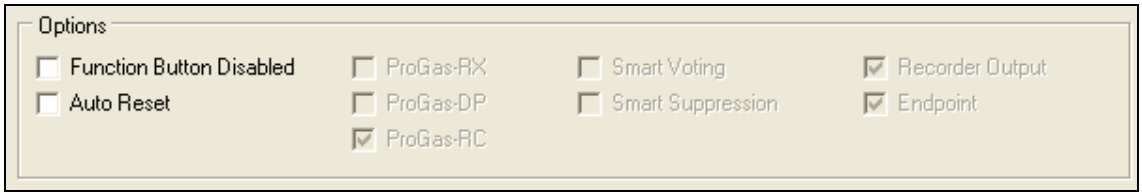


The first field of the controller page is the ‘Set-up’ section.



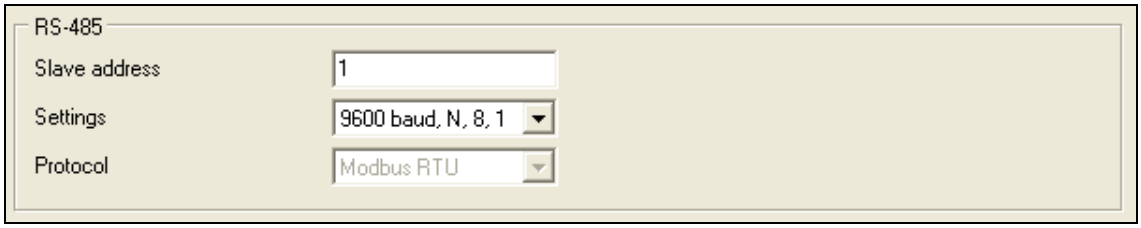
Item		Description
Type	-	Controller type.
Serial number	-	Controller serial number.
Production date	-	Controller production date.

The second field of the controller page is the ‘Options’ section.



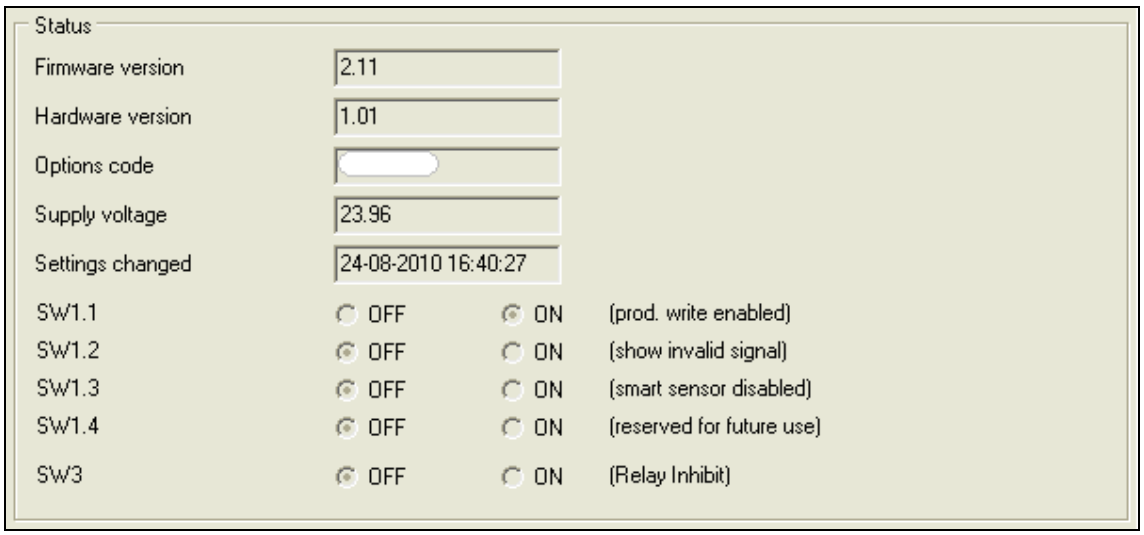
Item		Description
Function Button Disabled	-	Enabling/disabling the function button on the front of the detector.
Auto Reset	-	Enabling/disabling automatic reset of warning, alarms and error.
ProGas-RX	-	Progas-RX card communication option state (enabled/disabled).
ProGas-DP	-	Progas-DP card communication option state (enabled/disabled).
ProGas-RC	-	Progas-RC card relay option state (enabled/disabled).
Smart Voting	-	Smart Voting option state (enabled/disabled).
Smart Suppression	-	Smart Suppression state (enabled/disabled).
Recorder Output	-	Recorder output current state (enabled/disabled).
Endpoint	-	Endpoint options (enabled/disabled).

The third field of the controller page is the ‘RS-485’ section.



Item		Description
Slave address	-	RS-485 slave address of the first channel.
Baudrate	-	Baudrate of the RS-485 bus.
Protocol	-	Pick list for selection of protocol.

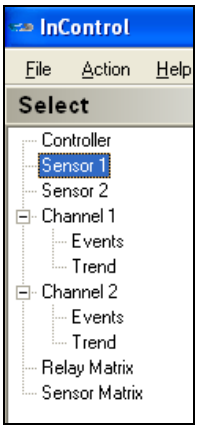
The fourth field of the controller page is the ‘Information’ section.



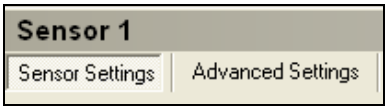
Item		Description
Firmware version	-	Software version in the controller.
Hardware version	-	Hardware version in the controller.
Options code	-	Code which determines the valid detector options.
Supply voltage	-	Incoming power supply voltage (real time measurement)
Settings changed	-	Time stamp last time settings changed.
SW1.1 (prod. write enabled)	-	Real time indication of detector dipswitch setting. See 1.4.3 for additional information.
SW1.2 (show invalid signal)	-	Real time indication of detector dipswitch setting. See 1.4.3 for additional information.
SW1.3 (smart sensor disabled)	-	Real time indication of detector dipswitch setting. See 1.4.3 for additional information.
SW1.4 (reserved for future use)	-	Real time indication of detector dipswitch setting. See 1.4.3 for additional information.
SW3 (Relay Inhibit)	-	Real time indication of detector relay inhibit switch setting. See 1.4.3 for additional information.

3.5 Adjusting and checking settings on the ‘Sensor’ information page

All information shown of a sensor page is stored in the memory of the SH-WAD detector and in the *smart* sensor (if present) as well. If a *smart* sensor is transferred to another SH-WAD this unit will read its data and if necessary warn the user for a sensor incompatibility.

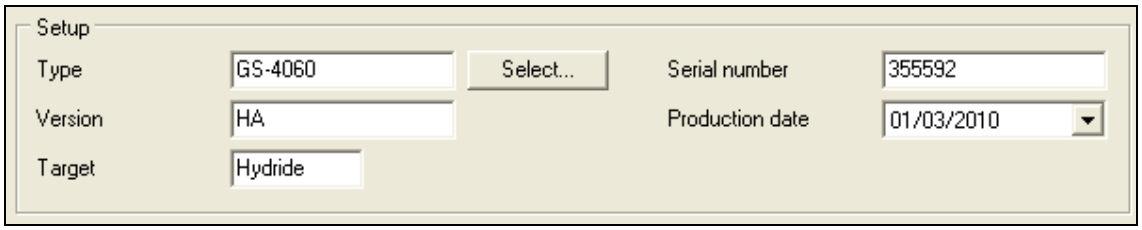


At the top of sensor pages there is a ‘Sensor Settings ' and ‘Advanced Settings' page selector.



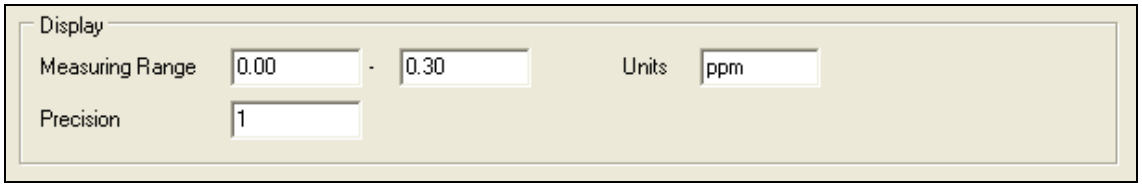
Item		Description
Sensor Settings	-	Basic configurable settings options related to the sensor
Advanced Settings	-	Advanced configurable settings options related to the sensor

The first field of a ‘Sensor > Sensor Settings’ page is the ‘Setup’ section. The information in these fields is predefined and cannot be changed by the user.



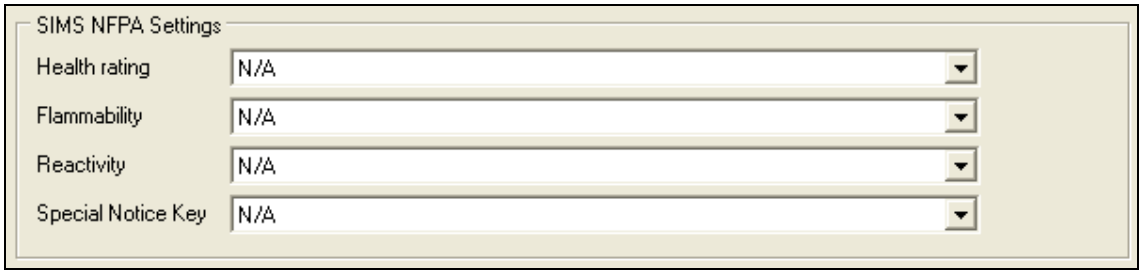
Item		Description
Type		Type of sensor used.
Version		Version of sensor used.
Target		Target gas name to detect.
Serial number		Serial number of sensor.
Production date		Production date of sensor.

The second field of a ‘Sensor > Sensor Settings’ page is the ‘Display’ section. It is possible to adjust the range and the number of digits shown after the decimal.



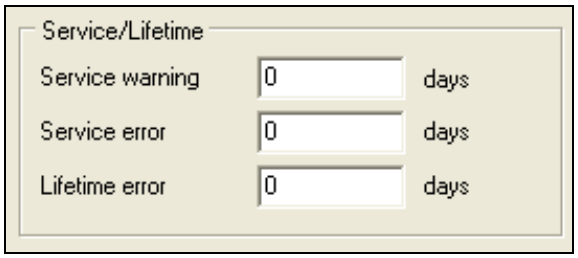
Item		Description
Measuring Range	-	The measuring rage is the range, which is displayed on the screen of the SH-WAD. The sensor defines this range!
Precision	-	Number of digits shown after the decimal.
Units	-	Units of measuring range.

The third field of a ‘Sensor > Sensor Settings’ page is the ‘SIMS NFPA’ section. This field gives NFPA[1] information about the detected gas or vapour. This information is also predefined and cannot be changed by the user.



Item		Description
Health rating	-	Pick list.
Flammability	-	Pick list.
Reactivity	-	Pick list.
Special notice Key	-	Pick list.

The fourth field of a ‘Sensor > Sensor Settings’ page is the ‘Service/Lifetime’ section.



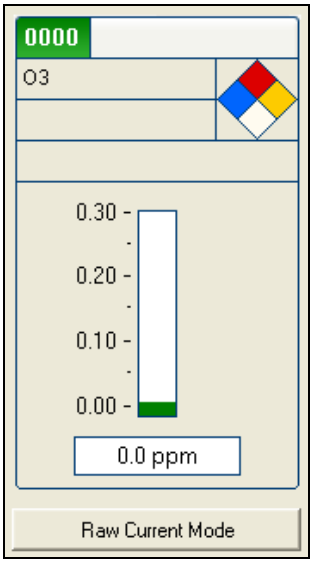
Item		Description
Service warning	-	Service warning interval. Function under development.
Service error	-	Service error interval. Function under development.
Lifetime error	-	Lifetime error interval. Function under development.

The fifth field of a ‘Sensor > Sensor Settings’ page is the ‘Status’ section.

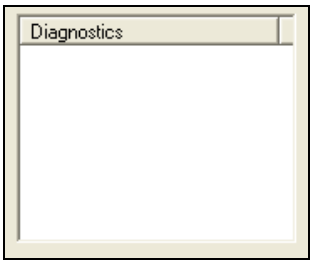
1) NFPA 704 Hazard Identification system. The system indicates the hazard of a substance in the NFPA ‘hazard diamond’. The diamond indicates the health, flammability and reactivity properties.

Item		Description
Commission date	-	Commission date. Function under development.
Last service date	-	Last service date. Function under development.

The sixth field of a ‘Sensor > Sensor Settings’ page provides a preview of the specific sensor as shown in SIMS. Changes in the sensor and detector page will be shown in this preview.
With the Raw Current Mode button the actual measured gas concentration indication can be switched between the configured ‘Units’ and the default ‘Units’ in the range 4000...20000 µA [equal to 4...20 mA] .

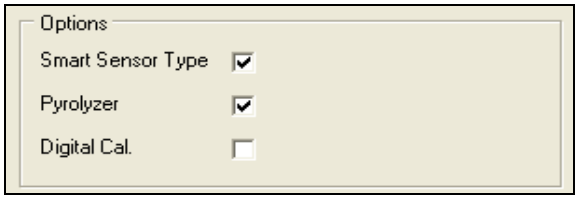


The seventh field provides direct diagnostic information of the sensor.



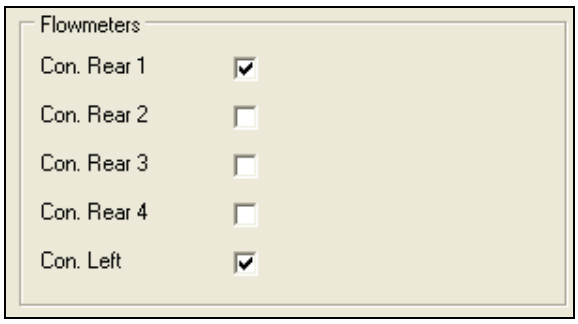
Possible diagnostic messages are ‘Low electrolyte’, ‘Sensor missing’, ‘Sensor incompatible’, and ‘Sensor data failure’. Please refer to the troubleshooting section in the appendix (5.8.13) for more detailed information about the diagnostic messages.

The first field of a ‘Sensor > Advanced Settings’ page is the ‘options’ section.



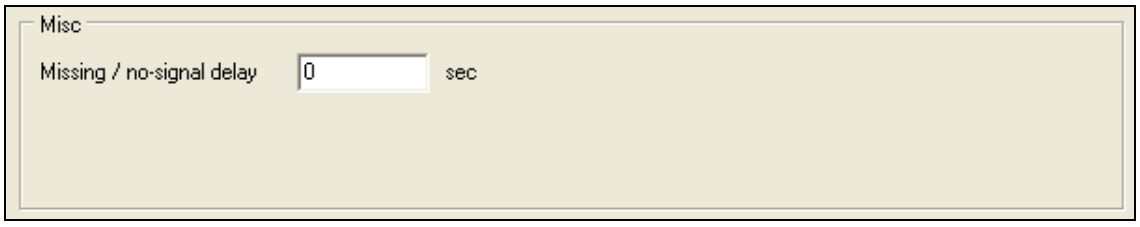
Item		Description
Smart Sensor Type	-	Enabled when a sensor with integrated EEPROM is used.
Pyrolyzer	-	Enabled when a pyrolyzer is used.
Digitally Cal.	-	Enabled when a sensor with digitally calibration function is used.

The second field of a ‘Sensor > Advanced Settings’ page is the ‘Flowmeters’ section.



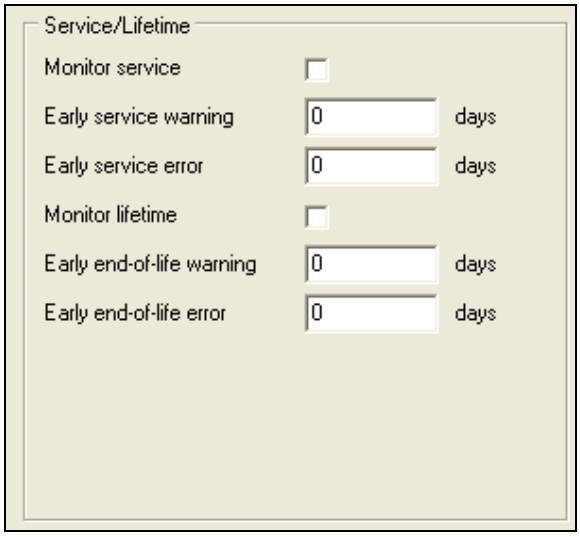
Item		Description
Con. Rear 1	-	Enabled when flow meter is connected to connector at the rear pcb (connector CN2; see section 1.4.5)
Con. Rear 2	-	Enabled when flow meter is connected to connector at the rear pcb (connector CN3; see section 1.4.5)
Con. Rear 3 / 4	-	Not available for SH-200x-WAD series.
Con. Left	-	Enabled when flow meter is connected to connector at the left pcb (main board; PC-5064)

The third field of a ‘Sensor > Advanced Settings’ page is the ‘Misc.’ section.



Item		Description
Missing / no-signal delay	-	The delay interval which is used to generate an error when the sensor signal is very low.

The fourth field of a ‘Sensor > Advanced Settings’ page is the ‘Service/Lifetime’ section.

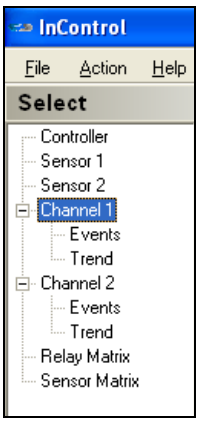


Item		Description
Monitor service	-	A warning/error is generated when the sensor requires maintenance. Function under development.
Early service warning	-	Maintenance warning interval. Function under development.
Early service error	-	Maintenance error interval. Function under development.
Monitor lifetime	-	A warning/error is generated when the sensor requires replacement. Function under development.
Early end-of-life warning	-	Replacement warning interval. Function under development.
Early end-of-life error	-	Replacement error interval. Function under development.

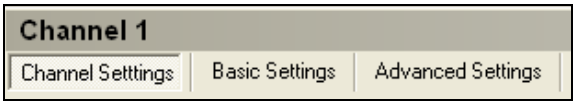
3.6 Adjusting and checking settings on the ‘Channel’ information page

3.6.1 General

All information shown of a ‘Channel’ page is stored in the memory of the SH-WAD detector.



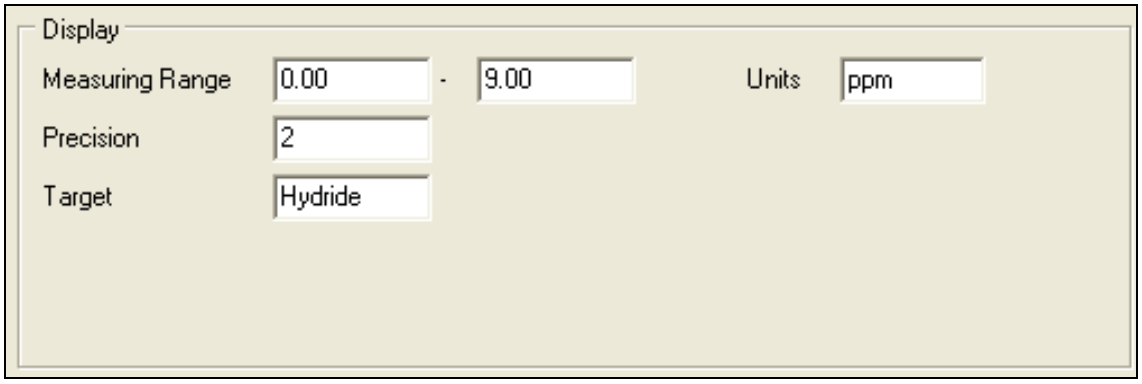
At the top of channel pages there is a ‘Channel Settings', ‘Basic Settings' and ‘Sensor > Advanced Settings’ page selector.



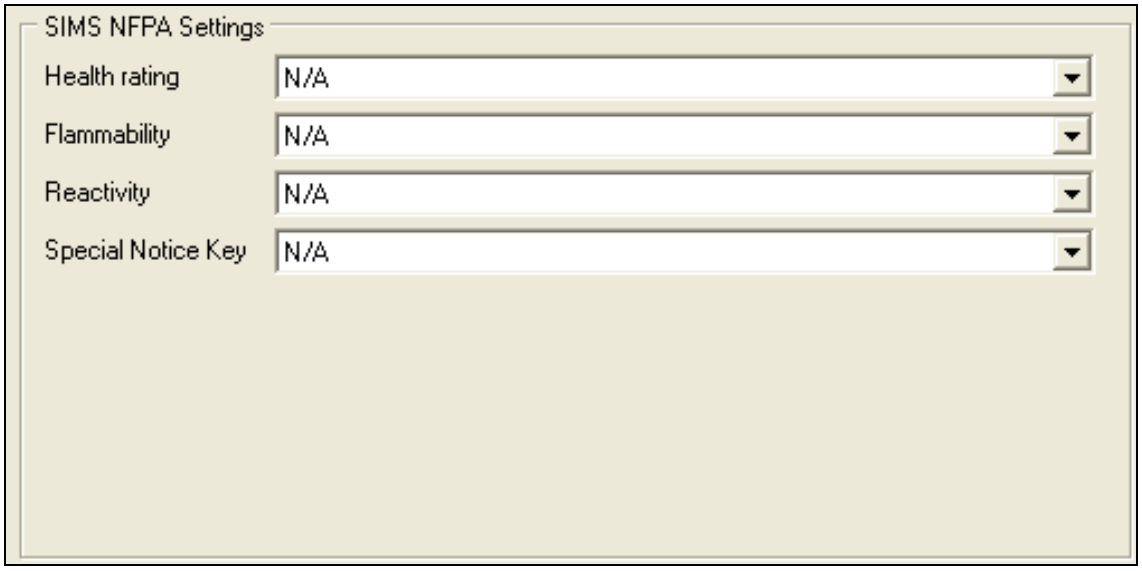
Item		Description
Channel Settings	-	Configurable channel options related to the sensor
Basic Settings	-	Basic configurable channel options related to the detector
Advanced Settings	-	Advanced configurable channel options related to the detector

3.6.2 Adjusting and checking settings on the ‘Channel > Sensor Settings’ information page

The first field of a ‘Channel > Channel Settings’ page is the ‘Display’ field.
This information is in most cases equal to the sensor setup. In case the channel output is based one 2 sensors the different fields can be configured to customer requirements.

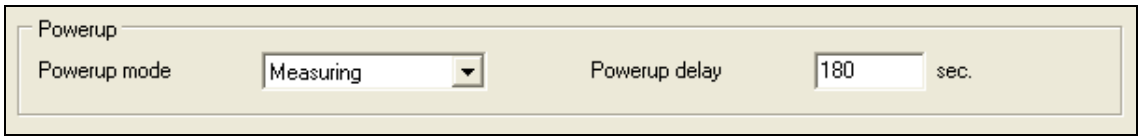


The second field of a ‘Channel > Sensor Settings’ page is the ‘SIMS NFPA Settings’ field.
This information is in most cases equal to the sensor setup. In case the channel output is based one 2 sensors the different fields can be configured to requested requirements.



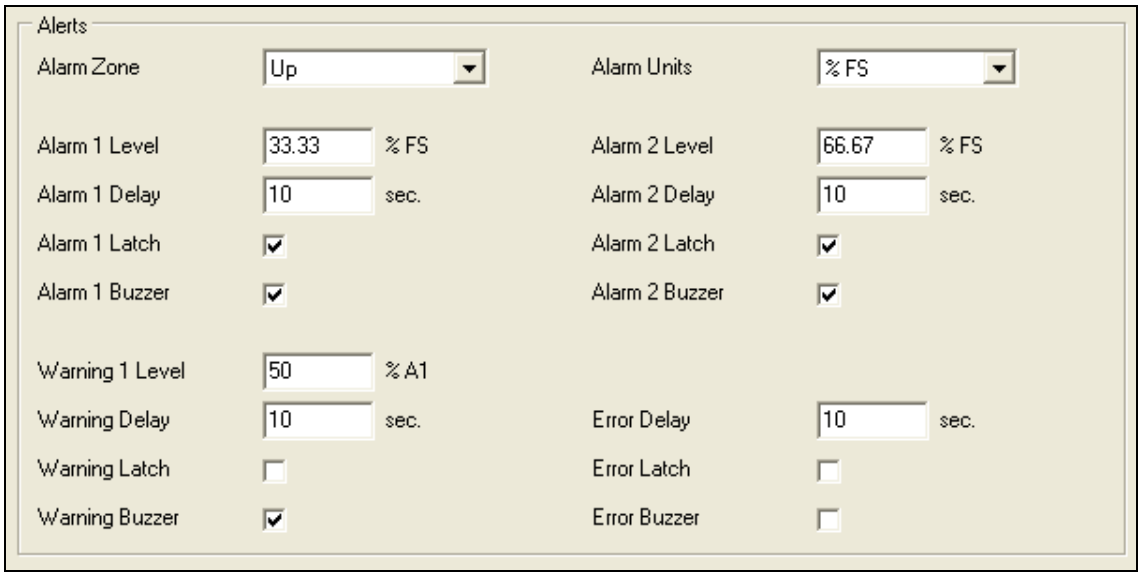
3.6.3 Adjusting and checking settings on the ‘Channel > Basic Settings’ information page

The first field of a ‘Channel – Basic Settings’ page is the ‘Power-Up’ field.
Power-Up is an automatic inhibition of the alarms when the SH-WAD is powered up. The field ‘Power-Up mode’ defines the operation mode to which the unit will switch after the ‘Power-Up delay’ period has elapsed. Factory default for the ‘Power-Up delay’ is 180 seconds (= 3 minutes).
During the Power-Up delay period, the detector is in the so-called Power-Up standby mode. The analog recorder output signal can be fixed at any level during the Power-Up standby mode period.



Item		Description
Power-Up mode	-	Pick list.
Power-Up delay	-	Delay time value in seconds.

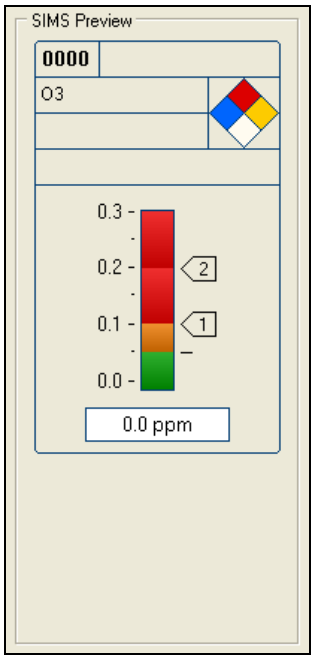
The second field of a 'Channel > Basic Settings' page is the 'Alerts' field. This field defines all the alarm, warning and error settings of the SH-WAD.



These settings are only relevant when the detector is used in Controller Mode ('Controller Mode' is checked in the 'Options' field). To remove any alarm markers from the screen of the SH-WAD all alarm levels should be set to a value zero. In all other situations the Alarm settings should be defined. The programmed values are used to generate both internal and external alarm/error reports and actions.

Item		Description
Up	-	When the gas concentration rises above a limit (Alarm1, Alarm2 or Warning level) it will trigger that specific alarm. This is the standard setting for toxic gas detectors.
Down	-	When the gas concentration drops below one of the limits (Alarm1, Alarm2 or Warning level) it will trigger the alarm. (e.g. Oxygen deficiency detection)
Region	-	A region is defined, which is called the safe region (no alarms). Alarm1 and Alarm2 are the boundaries of this region. In this situation there are two warning zones. Please note that the size of the warning zone is always defined in proportion to Alarm1. This alarm zone setting can for example be used when detecting oxygen concentrations.
Alarm Units	-	By choosing a setting in the field 'Alerts' the levels can be defined as a concentration reading (ppm, ppb or vol %) or as a percentage of Full Scale (%FS).
Alarm\Warning x Level	-	Alert sensor signal threshold(s). Specified in measuring units or % of Alarm 1.
Alarm\Warning x Delay	-	The time between reaching an alarm concentration and actual activation of alarm status.
Alarm\Warning x Latch	-	When latching is 'on' it means that the alarm status is maintained until acknowledgment, even if the gas concentration returns to a normal (no alarm) concentration.
Alarm\Warning x Buzzer	-	Controls if the corresponding events will activate the buzzer. Manual acknowledgement of the event will silence the buzzer.
Error Delay	-	The time between reaching an error and actual activation of error status.
Error Latch	-	When latching is 'on' it means that the error status is maintained until acknowledgment, even if the error is solved.
Error Buzzer	-	Controls if an error will activate the buzzer. Manual acknowledgement of the event will silence the buzzer.

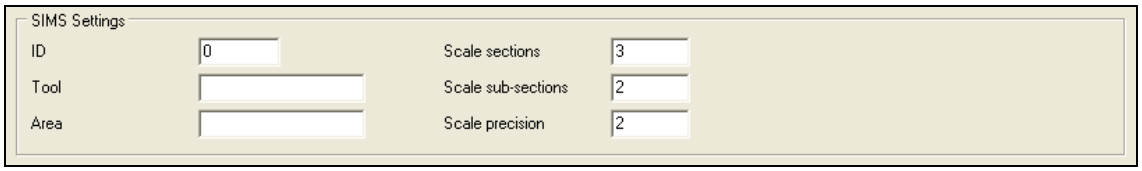
After adjusting the settings of the 'Alarm Zone' look at the SIMS Preview to observe the impact of the changes.



Function of the colours in the SIMS Preview:

- Green = Zone with no alarms (safe region)
- Orange = Zone in which warning is activated
- Red = Zone in which Alarm1 and/or Alarm2 are activated

The third field of a ‘Channel \ Basic Settings’ page is the ‘SIMS Settings’ field.



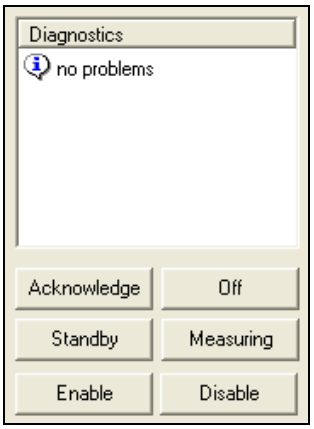
This field only has to be completed when using SIMS (Sensor Information Management System) in combination with the SH-WAD.

Item		Description
ID	-	The detector identification number. This number also defines the detectors position on the SIMS screen (bargraph and table view). Make sure not to use the same number twice.
Tool	-	The name of the tool or device on which the detector is installed.
Area	-	The name of the area in which the detector is installed.
Scale sections	-	Defines the number of sections (values) in which the scale is divided.
Scale sub-sections	-	Defines the number of markers between the scale sections.
Scale precision	-	Defines the number of digits after the decimal for the values on the scale.

At the bottom of ‘Channel > Basic Settings’ page there are ‘Load ' and ‘Save ' buttons.

Item		Description
Load	-	Load option predefined detector settings file.
Save	-	Save option actual detector settings file.

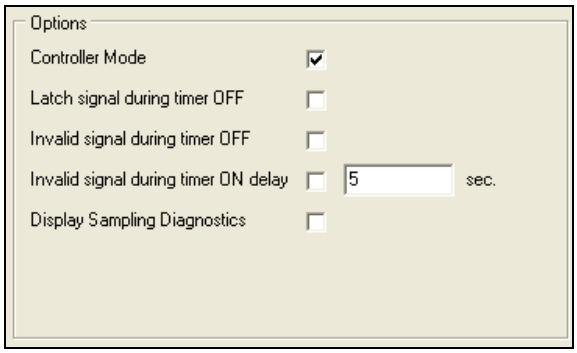
The fourth field of a ‘Channel > Basic Settings’ page is the ‘Diagnostics’ field.



Item		Description
Acknowledge	-	Acknowledge of state.
Off	-	Switches the detector channel into ‘off’ mode. Channel remains in serial communication data.
Standby	-	Switches the detector channel into ‘standby’ mode.
Measuring	-	Switches the detector channel into ‘measuring’ mode.
Enable	-	Switches the detector channel into ‘standby’ mode. Channel data added to serial communication data.
Disable	-	Switches the detector channel into ‘off’ mode. Channel removed from serial communication data.

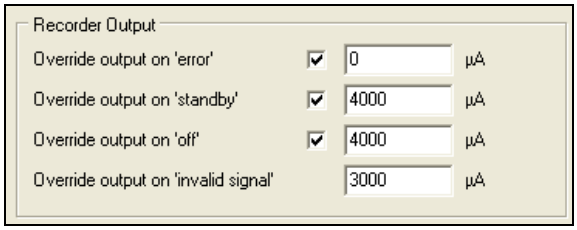
3.6.4 Adjusting and checking settings on the ‘Channel > Advanced Settings’ information page

The first field of a ‘Channel > Advanced Settings’ page is the ‘Options’ field.



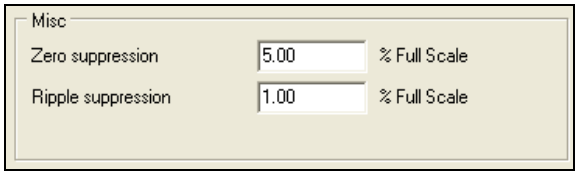
Item		Description
Controller mode	-	When omitted, the unit behaves as a basic ‘4...20mA output’ detector and will not generate local alarms
Latch signal during timer OFF	-	When the timer is in OFF state, the signal level will not change.
Invalid signal during timer OFF	-	When the timer is in OFF state, the signal level will be set ‘invalid’.
Invalid signal during timer ON delay	-	When the timer changes from OFF to ON state, signal level will be set ‘invalid’ for the specified delay.
Display Sampling Diagnostics	-	The detector displays the sampling state; purging/pre-sampling/sampling.

The second field of a ‘Channel > Advanced Settings’ page is the ‘Recorder Output’ field.



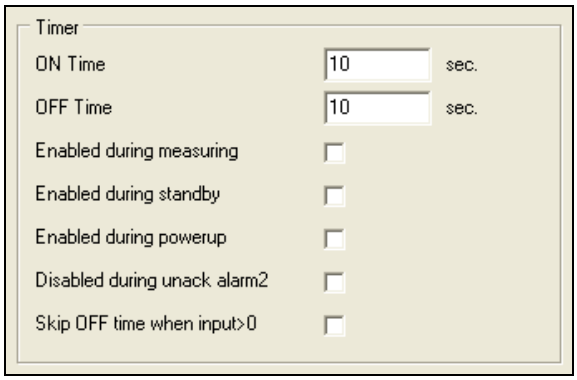
Item		Description
Override output on ‘error’	-	Recorder output in ‘error’ state.
Override output on ‘standby’	-	Recorder output in ‘standby’ state.
Override output on ‘off’	-	Recorder output in ‘off’ state.
Override output on ‘invalid signal’	-	Recorder output in ‘invalid signal’ state.

The third field of a ‘Channel – Advanced Settings’ page is the ‘Misc’ field.



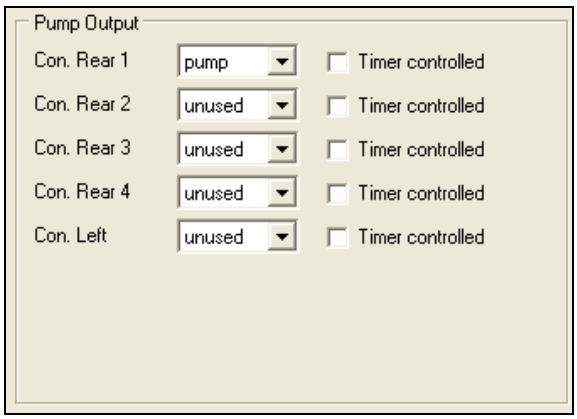
Item		Description
Zero suppression	-	Zero-base suppression used on the concentration, prior to it’s indication on the display. It does not affect the values of the out going signals.
Ripple suppression	-	Defines the maximum value of change as a percentage of full scale.

The fourth field of a ‘Channel > Advanced Settings’ page is the ‘Timer’ field.



Item		Description
ON Time	-	Timer ON period.
OFF Time	-	Timer OFF period.
Enabled during measuring	-	Timer active in ‘measuring’ mode.
Enabled during standby	-	Timer active in ‘standby’ mode.
Enabled during powerup	-	Timer active in ‘powerup’ mode.
Disabled during unack alarm2	-	Timer inactive when an unacknowledged alarm2 is active.
Skip OFF time when input > 0	-	Timer will change to ON state when the signal rises above zero suppression level.

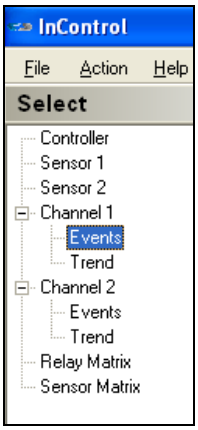
The fifth field of a ‘Channel > Advanced Settings’ page is the ‘Pump Output’ field.



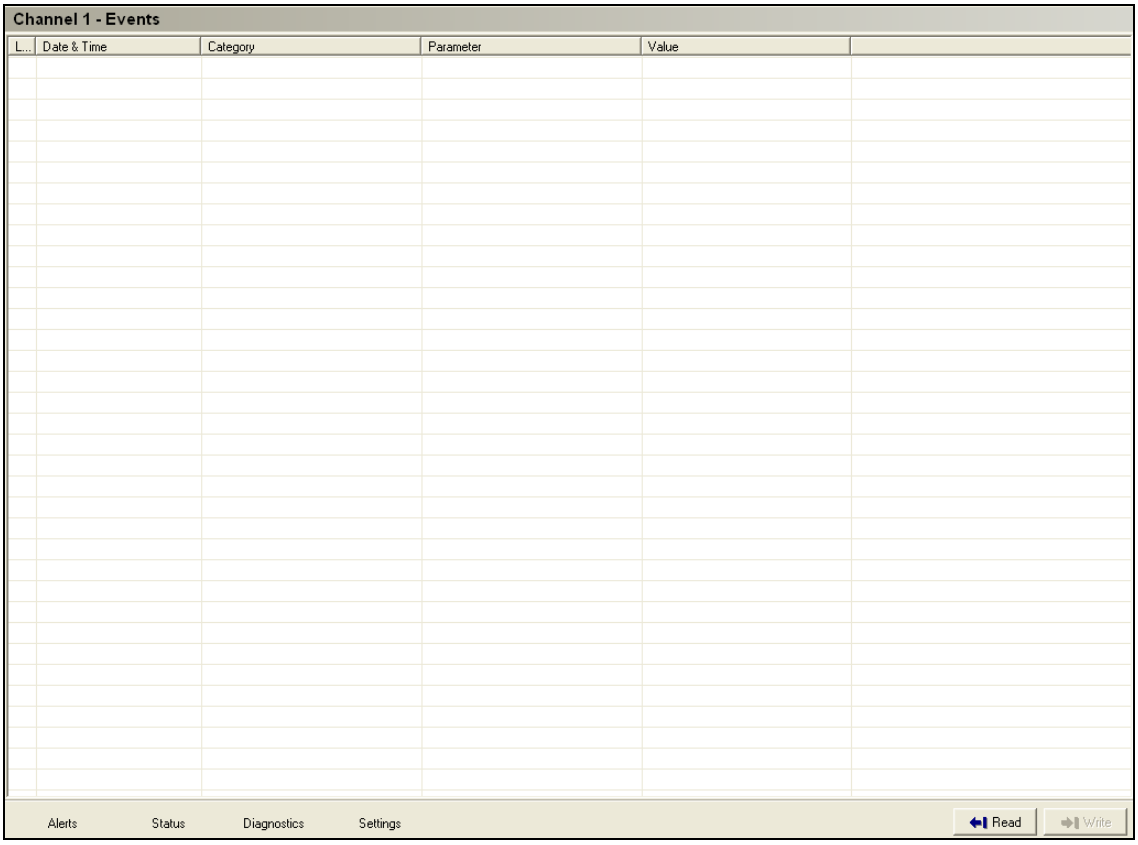
Item		Description
Con. Rear 1	-	Pick list [unused, pump, pyrolyzer & valve] Output connected at connecter rear 1 is controlled by timer.
Con. Rear 2	-	Pick list [unused, pump, pyrolyzer & valve] Output connected at connecter rear 2 is controlled by timer.
Con. Rear 3 (not available on SH-200x-WAD)	-	Pick list [unused, pump, pyrolyzer & valve] Output connected at connecter rear 3 is controlled by timer.
Con. Rear 4 (not available on SH-200x-WAD)	-	Pick list [unused, pump, pyrolyzer & valve] Output connected at connecter rear 4 is controlled by timer.
Con. Left	-	Pick list [unused, pump, pyrolyzer & valve] Output connected at connecter at the left main board PCB is controlled by timer.

3.6.5 Adjusting and checking settings on the ‘Channel > Events’ information page

All information shown of a ‘Channel > Events’ page is stored in the memory of the SH-WAD detector.

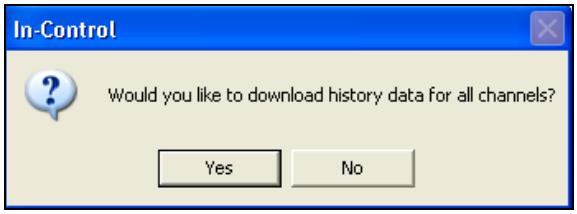


The following page layout will be shown when selecting the “Channel > Events’ option.



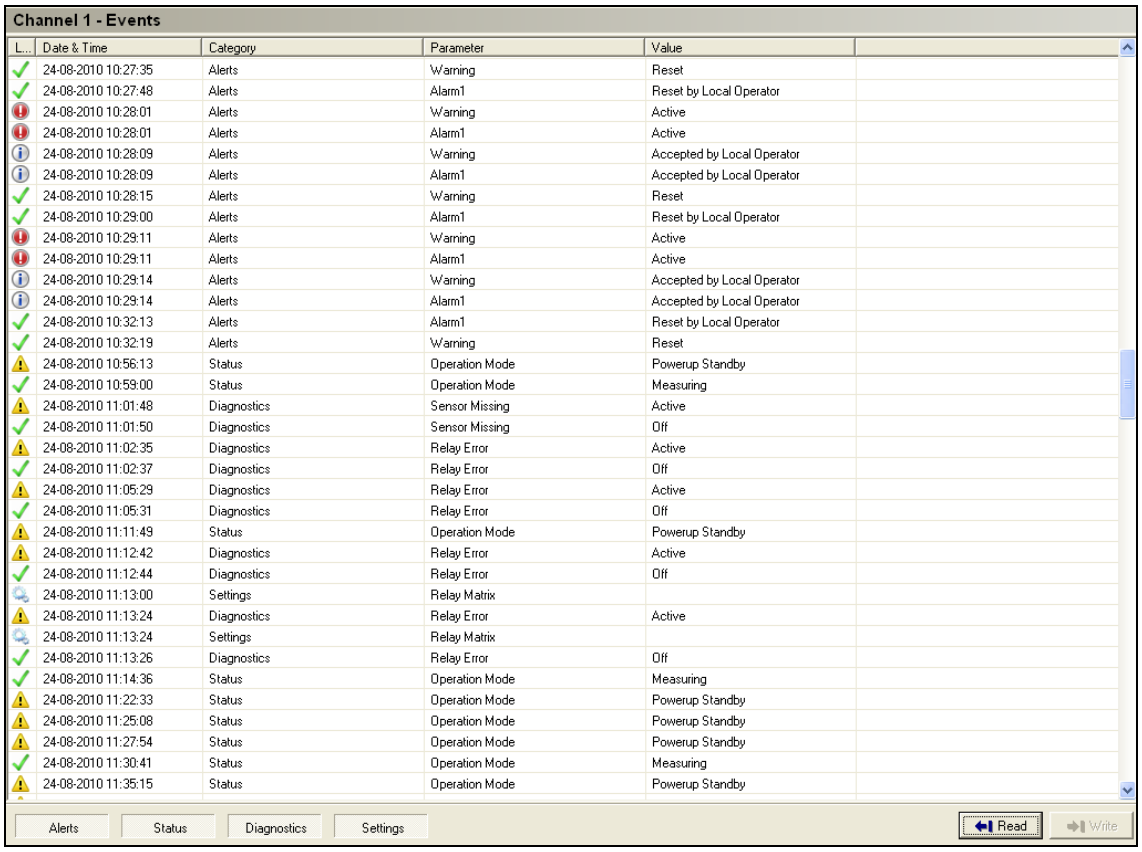
Press the ‘READ’ button on the bottom of the page to transfer the ‘Events’ data from detector to computer.

The following pop-up window will appear:



Item		Description
Yes	-	History data from all channels will be downloaded.
No	-	History data from only the selected channel will be downloaded.

Example of a 'Events' table:



Column explanation ‘event’ table:

Column: level.

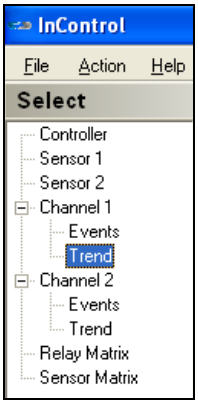
Item		Description
	-	Status changes & active diagnostics.
	-	Warnings, alarms & errors changes to inactive.
	-	Warnings, alarms & errors changes to active.
	-	Extra information & acknowledge of alerts.
	-	Configuration changes.

At the bottom of the ‘Channel > Events’ page there is the option to enable / disable different groups of events.

Item		Description
Alerts	-	Enable \ disable the appearance of ‘alerts’ records in the events table.
Status	-	Enable \ disable the appearance of ‘status’ records in the events table.
Diagnostics	-	Enable \ disable the appearance of ‘diagnostics’ records in the events table.
Settings	-	Enable \ disable the appearance of ‘settings’ records in the events table.

3.6.6 Adjusting and checking settings on the ‘Channel > Trend’ information page

All information shown of a ‘Channel > Trend’ page is stored in the memory of the SH-WAD detector.



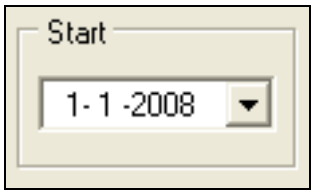
The first field of a ‘Channel > Trend’ page is the ‘Tools’ field.

Item		Description
	-	Zoom in/out mode selected.
	-	Scroll mode selected.
	-	Measure mode selected.

The second field of a ‘Channel > Trend’ page is the ‘Period’ field.

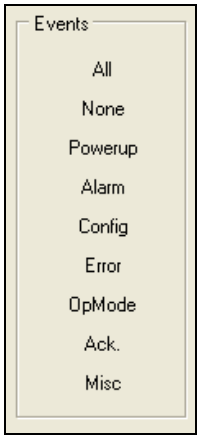
Item		Description
Year	-	Trend range select for viewing 1 year.
Month	-	Trend range select for viewing 1 month.
Week	-	Trend range select for viewing 1 week.
Day	-	Trend range select for viewing 1 day.
2 Hour	-	Trend range select for viewing 2 hours.

The third field of a ‘Channel > Trend’ page is the ‘Start’ field.



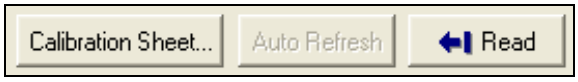
Item		Description
Start	-	Opens window for selection of trend start date.

The fourth field of a ‘Channel > Trend’ page is the ‘Events’ field.



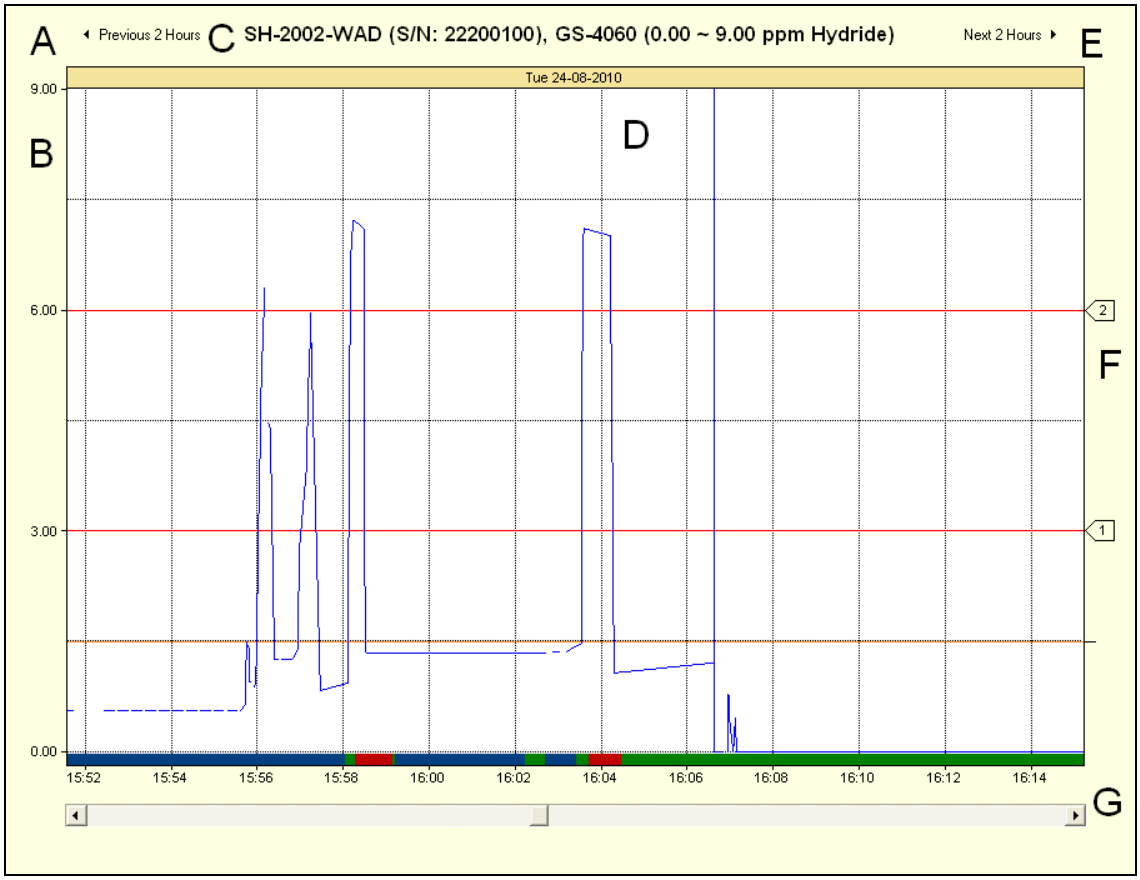
Item		Description
Events	-	Setting the viewing state of different events.

At the bottom of ‘Channel > Trend’ pages there are the following buttons.



Item		Description
Calibration Sheet	-	Starts the ‘export calibration sheet’ option. Please refer to the appendix for more detailed information about this option.
Auto Refresh	-	Enable the option for automatic refreshment of trend view.
Read	-	Read the trend data from detector.

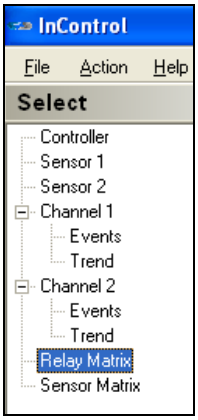
Main ‘Channel > Trend’ pages explanation.



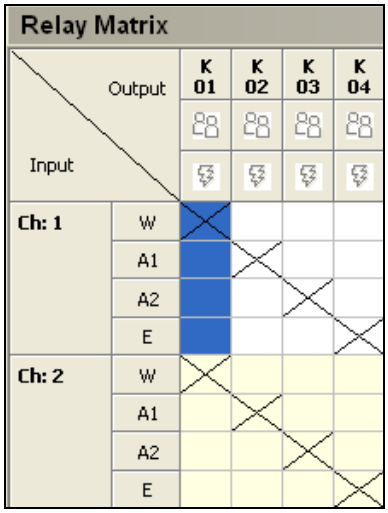
Item		Description
A	-	Button for selection of previous trend period.
B	-	Gas detection range of sensor.
C	-	Selected detector and sensor data.
D	-	Selected trend period
E	-	Button for selection of next trend period.
F	-	Warning, Alarm 1 and Alarm 2 channel levels.
G	-	Period time indicator.

3.7 Adjusting and checking settings on the ‘Relay Matrix’ information page

All information shown of a ‘Relay Matrix’ page is stored in the memory of the SH-WAD detector.



Main ‘Relay Martix’ page view.



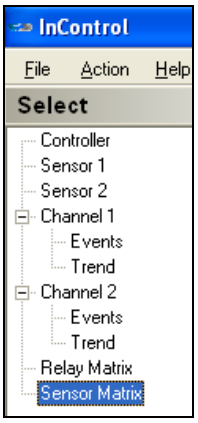
Item		Description
W	-	Warning alert rule. Horizontal crosses will activate the corresponding (vertical) relays.
A1	-	Alarm 1 alert rule. Horizontal crosses will activate the corresponding (vertical) relays.
A2	-	Alarm 2 alert rule. Horizontal crosses will activate the corresponding (vertical) relays.
E	-	Error alert rule. Horizontal crosses will activate the corresponding (vertical) relays.
	-	Defines if the corresponding relays are energized during normal operation. These settings are only relevant if the optional ProGas-RC card is installed.
	-	When enabled, and the user accepts the alert that triggered the specific relay, the relay will return to its default state. Typically used when sounding devices are connected to the relay.
	-	Alert Action (dbl. click)

Where applicable the term ***Alert*** corresponds to Warning, Alarm 1, Alarm 2 and/or Error.

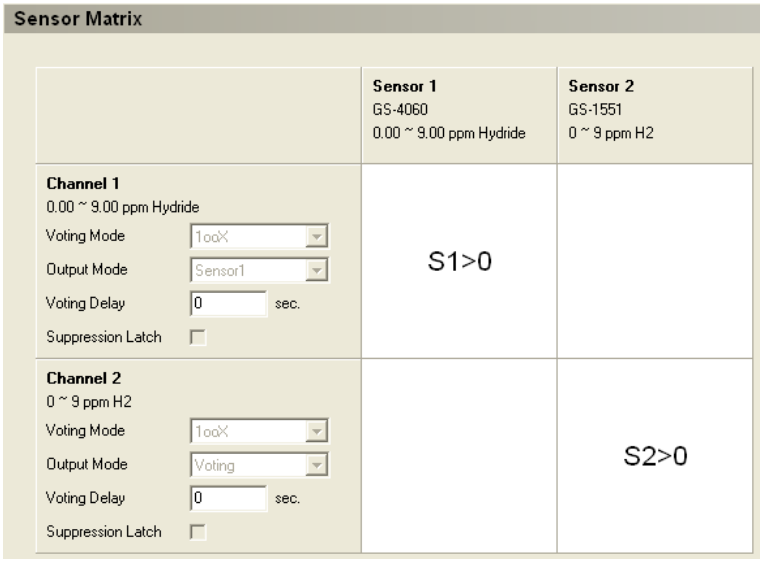
- Each channel has four alert conditions (Warning, Alarm 1, Alarm 2 and Error) that could be triggered simultaneously. All corresponding rules will be executed at all times, also during simultaneous alerts.
- Use the “write” button to apply changes.

3.8 Adjusting and checking settings on the ‘Sensor Matrix’ information page

All information shown of a ‘Sensor Matrix’ page is stored in the memory of the SH-WAD detector.



Main ‘Sensor Martix’ page view.



Voting architecture explanation

Probably one of the most important design parameters to realize a highly reliable gas detection system is the concept of fault tolerance. Systems become fault-tolerant if multiple sensors are used and not all of them are needed to full fill the safety function. Fault tolerance is normally expressed as a specific voting scheme.
For example, 1oo2 voting (one-out-of-two) implies that only one sensor of a two sensor systems is required to full fill the intended detection function.

The following table describes the available options possible with the SH-WAD detector.

Voting architecture	Number of sensors selected (required)	Channel recorder output current / channel state.
1oo1	1	Directly related to the selected sensor.
1oo2	2	Analogical to the highest value of the 2 selected sensors.
2oo2	2	Analogical to the lowest value of the 2 selected sensors.

4 Operation

4.1 Manual operation of the SH-WAD

Important functions and actions can be activated manually using the small red button (function selector) at the front of the SH-WAD unit.

With this button common tasks can be initiated without using the InControl or SIMS software. It is not necessary to remove the cover of the unit to operate the button. Simply insert a small pin into the hole just above the RJ-45 connector and press gently. Hold the button and the available functions will appear in the lower left corner, one after each other. Releasing the button will activate the indicated function.

The tables below provide an overview of the different functions. The functions are always dependent on the operation status of the unit at the particular moment.

Status of the unit		**Functions of the button (short activation of button)**
Normal measuring mode and no alarm	1/3	Status screen with main overview all channels.
	2/3	Status screen channel 1.
	3/3	Status screen channel 2

Status of the unit		**Functions of the button (long activation of the button)**
Normal measuring mode and no alarm	1/2	SET STANDBY
	2/2	CANCEL
Standby	1/4	SET MEASURING
	2/4	ZERO ADJUST: Use the zero potentiometer on the gas sensor to adjust the output signal for a zero gas concentration. Set it to 3.9 mA. To return to normal standby mode after adjusting the zero setting press the small button (select EXIT ZERO ADJUST)
	3/4	VIEW DEVICE PROPERTIES: Information about the units hardware and software
	4/4	CANCEL
Alarm	1/2	ACKNOWLEGDE: Acknowledge alarms – when acknowledged the alarm indication in the upper right corner will stop flashing or the alarm will disappear if the concentration is in the ‘safe region’.
	2/2	CANCEL
Error	1/2	ACKNOWLEGDE: Acknowledge errors - in case the errors have been resolved the error reports will disappear.
	2/2	CANCEL
Power-Up mode	1/2	SET STANDBY
	2/2	CANCEL It is not possible to switch directly to measuring mode when the unit is in Power-Up mode
Off mode (can only be initiated from SIMS or InControl software)	1/2	SET STANDBY
	2/2	CANCEL

*Please note the listed functions may differ depending on the firmware version.

4.2 Maintenance

Regular preventive maintenance of the detection equipment ensures optimum safety.
All maintenance, calibration and testing should be carried out by qualified personnel.
Training courses for your maintenance staff are available upon request.
We recommend carrying out maintenance/calibration at least every six months (unless particular circumstances request for a shorter interval, please contact your local sales office to advise).

When an external alarm/control unit is attached to the SH-WAD unit, please ensure that the alarm/control unit is set to “stand-by” mode before performing any maintenance or calibration.

4.2.1 Maintenance procedure for the GS-[…]HA/HS type sensor

The following steps describe the replacement of electrolyte, membrane and “O” ring.

The type of electrolyte and membrane to be used is indicated on the label of the gas sensor. The code EL-[….] indicates the electrolyte type and the code M-[….] indicates the membrane type. Depending on the type of sensor the O-ring’s will either be white or black. When replacing the O-ring’s please make sure to replace it with an O-ring of the same colour.

The electrolyte is a non-toxic chemical substance. However, avoid contact with your eyes, skin or clothing. If such contact should occur, flush the affected area with water immediately. New Cosmos – BIE BV cannot be held responsible for accidents or injuries resulting from careless handling of the electrolyte.

1. Put the SH-WAD in standby.

   To put the unit in standby please use one of the following procedures:

   a) Hold the small red button (function selector) on the front of the SH-WAD unit. Release it when the message SET STANDBY appears in the lower left corner of the display.
   b) Connect a computer running the In-control software. File menu > Connect to the WAD. On the right side of the screen there is a grey coloured button, which will put the unit in standby when clicked.
   c) Use SIMS. Go to the specific channel in the Bargraph or Table mode. Right click the channel. Select put to standby. Type in your username and password.

2. Remove the cover box of the SH-WAD unit (when running the In-control software please note that the PC-45 cable has to be disconnected before removing the cover box).

3. Disconnect the sensor cable from the green connector on top of the sensor.

4. Remove the gas sensor from the flow chamber (Fig. 4.2.2) by pulling it straight upwards. Do not twist the gas sensor while removing it, as this may cause the retaining ring to loosen.

   If correct the screen of the SH-WAD will now display two error messages.
   [1/2] sensor missing
   [2/2] low flow
   No actions have to be taken on these error reports.

5. Turn the gas sensor upside down; unscrew the membrane holder cap (fig.4.2.3). Remove and dispose the O-ring and membrane. Allow the electrolyte to drain out. Unscrew the vent plug (fig. 4.2.4a & 4b) if the electrolyte does not drain readily.

In addition to the normal O-ring, some types of gas sensors carry thin silicon mini seal. This silicon seal should remain with the gas sensor and should under normal circumstances not be replaced.

6. After the electrolyte has been drained out, hold the sensor with the measuring electrode pointing upwards and inspect the electrode. If necessary, clean the electrode with a clean soft tissue (fig. 4.2.5). Make sure the tissue is not impregnated with any kind of chemical.

7. To prevent contamination from the old electrolyte, rinse out the gas sensor interior twice with a small amount of fresh electrolyte (fig. 4.2.6)

8. Hold the gas sensor with the electrode pointing upwards. Ensure that the new O-ring has the appropriate colour and that, if applicable, the silicon seal is in place. (fig. 4.2.7)

9. Place a drop of fresh electrolyte carefully on the measuring electrode (fig. 4.2.8).

10. Place a new membrane onto the measuring electrode. Due to the hygroscopic behaviour of the electrolyte, the membrane will easily stay in place (fig. 4.2.9). Position the membrane holder and screw on the membrane holder cap, which should be firmly tightened (fig. 4.2.10).

11. Holding the sensor with the membrane pointing downwards, pour fresh electrolyte from the dispenser bottle into the electrolyte supply opening until the electrolyte in the sensor reaches the ‘MAX’ level (fig. 4.2.11). If necessary, wipe clean the electrolyte supply opening with dry paper tissue (fig. 4.2.12).

12. Remount the vent plug (fig. 4.2.13) and gently shake the sensor to dislodge any air bubbles, which may have formed around the electrode.

13. Place the sensor back in the flow chamber.

14. Connect the sensor cable to green connector. When the sensor is connected the signal of the detector may increase. Leave the sensor to stabilize.

    The two error reports mentioned under step 4 should be cleared by now.

Electrolyte is subject to evaporation. The degree of evaporation depends on the initial evaporation factor of the electrolyte and the circumstantial conditions, such as humidity and environmental temperature. The level of the electrolyte in the gas sensor can be read from the scale on the gas sensor body.

Check this level at regular time intervals and top-up to max. in case the electrolyte level has dropped below one quarter of the scale. Topping up must be followed by a “zero” and “span” calibration (see section 4.5).

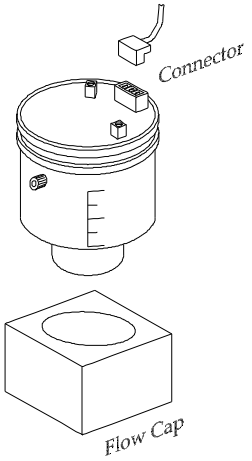


Fig. 4.2.2

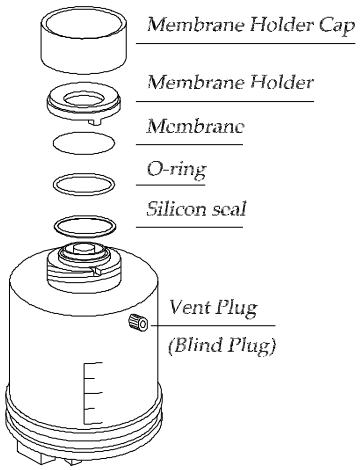


Fig. 4.2.3

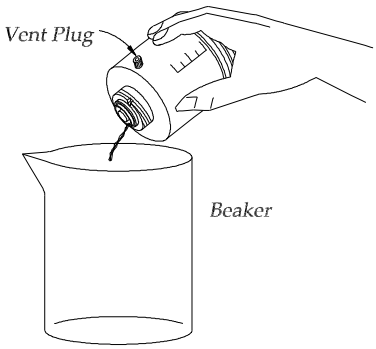


Fig. 4.2.4a

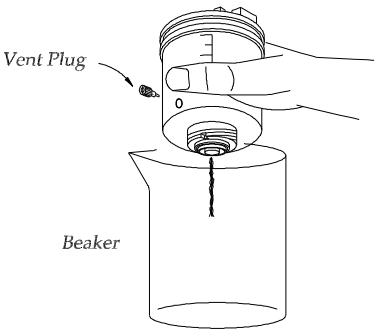


Fig. 4.2.4b

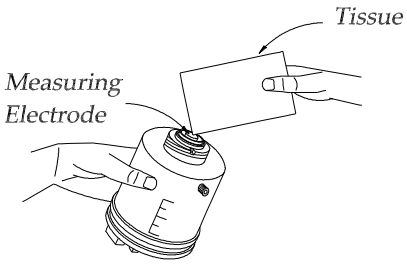


Fig. 4.2.5

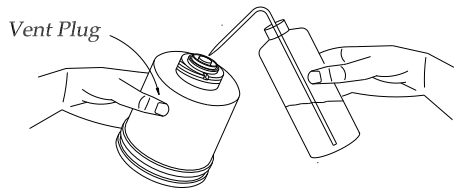


Fig. 4.2.6

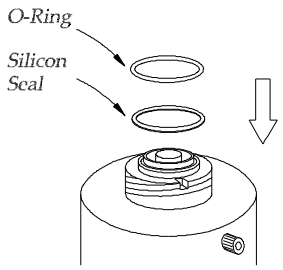


Fig. 4.2.7

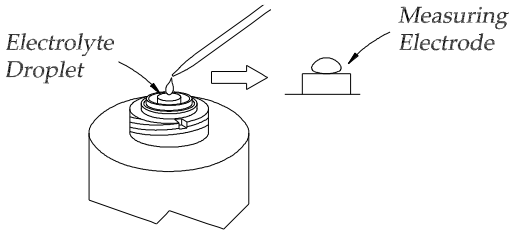


Fig. 4.2.8

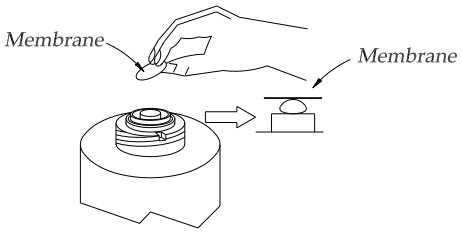


Fig. 4.2.9

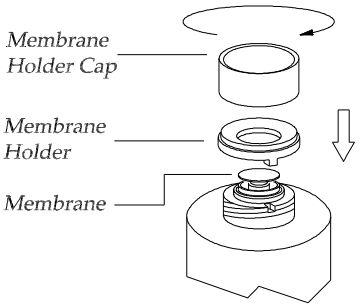


Fig. 4.2.10

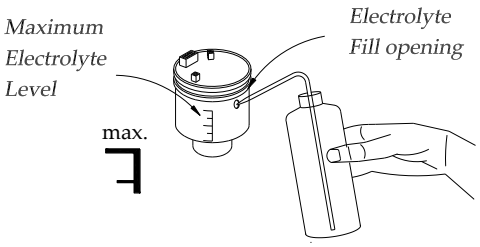


Fig. 4.2.11

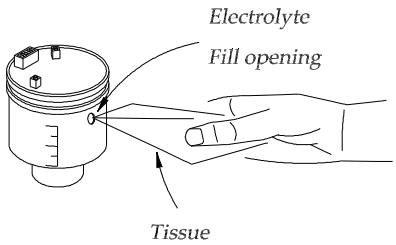


Fig. 4.2.12

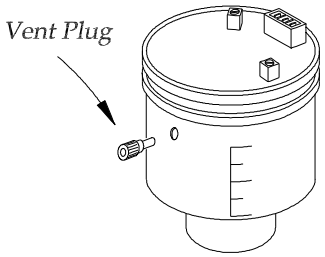


Fig. 4.2.13

4.2.2 Replacement of the GS-[….]EA/ES type gas sensor

The gas sensor performance can be tested by means of a gas sensor response test (see section 4.6). If the test reading is not equal to the gas concentration of the test gas, the reading can be corrected by adjusting the span potentiometer (see section 4.5).
If the adjustment exceeds the advised maximum span, the element in the GS-[….]EA/ES gas sensor needs to be replaced.

Type of sensor element:

Gas sensor	Internal sensor element (fig 4.2.14 item 3)
GS-EA/ES	GS-EP

Please follow the sequential steps below to replace the gas sensor
(See fig. 4.2.14).

1. Put the SH-WAD is in standby.

   To put the unit in standby do one of the following:

   a) Hold the small red button (function selector) on the front of the SH-WAD unit. Release it when the message SET STANDBY appears in the lower left corner of the display.
   b) Connect a computer running the In-control software. File menu > Connect to the WAD. On the right side of the screen there is a grey coloured button, which will put the unit in standby when clicked.
   c) Use SIMS. Go to the specific channel in the Bargraph or Table mode. Right click the channel. Select put to standby. Type in your username and password.

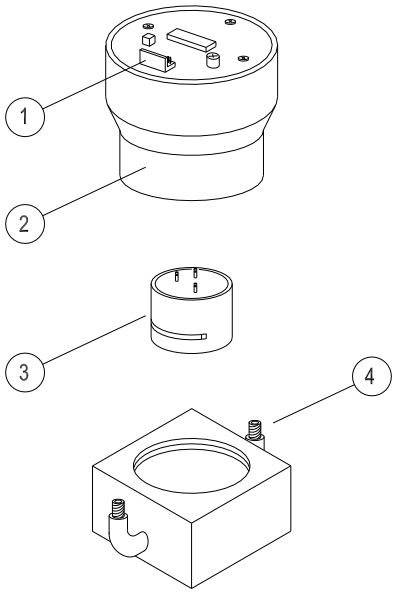


Fig. 4.2.14

2. Remove the cover of the SH-WAD unit.

3. Disconnect the sensor cable from the green connector on top of the sensor.

4. Pull out the body (2) incl. the sensor element (3) from the flow cap (4).

   If correct the screen of the SH-WAD will now display two error messages.
   [1/2] sensor missing
   [2/2] low flow
   No actions have to be taken on these error reports.

5. Place new sensor element (3) and re-assemble in reverse order. The error reports as mentioned above should disappear.

4.2.3 Replacement of the GS-[….]KTSA/KTSS type gas sensor

The gas sensor performance can be tested by means of a gas sensor response test (see section 4.6). If the test reading is not equal to the gas concentration of the test gas, the reading can be corrected by adjusting the span potentiometer (see section 4.5).
If the adjustment exceeds the advised maximum span, the GS-[….]KTSA/KTSS gas sensor requires a replacement.
To replace the gas sensor, follow the sequential steps below (see fig. 4.2.15).

1. Put the SH-WAD is in standby.
   To put the unit in standby do one of the following:

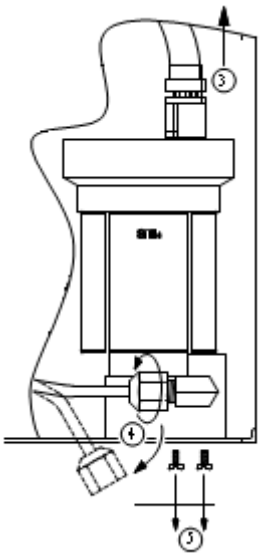
   a) Hold the small red button (function selector) on the front of the SH-WAD unit. Release it when the message SET STANDBY appears in the lower left corner of the display.
   b) Connect a computer running the In-control software. File menu > Connect to the WAD. On the right side of the screen there is a grey coloured button, which will put the unit in standby when clicked.
   c) Use SIMS. Go to the specific channel in the Bargraph or Table mode. Right click the channel. Select put to standby. Type in your username and password.

2. Remove the cover of the SH-WAD unit.

3. Disconnect the sensor cable from the green connector on top of the sensor.

4. Unscrew the tube connector.

   If correct the screen of the SH-WAD will now display two error messages.
   [1/2] SENSOR MISSING
   [2/2] LOW FLOW
   No actions have to be taken on these error reports.



5. Unscrew the fixing screws in the bottom plate.

6. Place new gas sensor assembly and re-assemble in reverse order. The error reports mentioned under step 4 should now disappear.

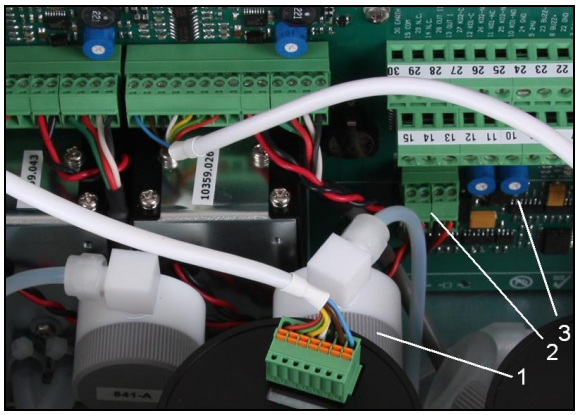
The KTSA and KTSS gas sensor contains a chemical substance. Therefore, the sensor should never be dismantled, neither during its lifetime nor after exceeding its lifetime. Please return the gas sensor to your local sales office once the gas sensor has become obsolete.

4.2.4 Pyrolyzer (decomposer) replacement

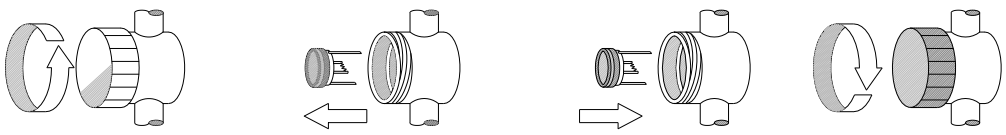
In case of a defective decomposer element the following message will appear on the display of the SH-WAD: [1/1] Pyrolyzer failure. Also the 'ERROR' LED indicator will be on. As a result the analog output signal of the SH-WAD will drop to zero mA and all other signals will be set to an error state. In this situation the decomposer element needs to be replaced immediately.

To replace the decomposer element, proceed as follows:

- Acknowledge the error either by pressing the small button on the front of the unit or by using the InControl or SIMS software.
- Put the unit is standby either by operating the function button on the front of the unit or by using the InControl or SIMS software.
- Remove the cover of the SH-WAD.
- Remove the cover (1) of the decomposer element housing by turning it counter clockwise.



- Take the decomposer element from the assembly (Make sure to pull out straight).
- Insert a new decomposer element of the correct type. Apply a voltmeter between the two outer contacts marked "2" and set the voltage to ±1.55 V by adjusting the potentiometer (3).
- Note: the voltage increases by turning clockwise.
- Remount the cover on the enclosure.



4.2.5 Different types of decomposer elements

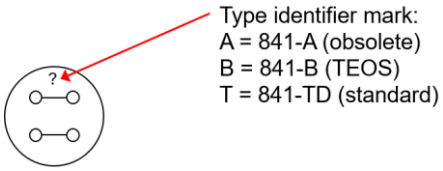
There are various types of decomposer elements (e.g. 841-A, 841-B, 841-TD).
A miniature single character “A”, “B” or “T” on the back of the element identifies the type.

The pyrolizer housing also contains a label to identify the pyrolizer element that is installed.
The pyrolizer element type is used in combination with a specific sensor type.

Always replace the pyrolizer element and sensor for an identical type as this combination forms a working set.

Caution:
Always follow the service and replacement recommendations of your supplier.

Note: the pyrolizer elements are small and very delicate, please handle with case.



4.3 Calibration

Following the maintenance or replacement of the electrochemical gas sensor, a full calibration of the system is required. Usually calibration is done “on-site”, however “off-site” calibration is also possible. For additional information regarding “off-site” calibration, please contact your local sales offices. To ensure an accurate calibration, each sensor needs stabilizing for a certain period of time. Ideally calibration should be carried out with a standard gas or with one of the gases, which can be generated by using an optional instrument calibration kit (see appendix). It is recommended to use a gas concentration, which is equal or nearly equal to the full range of the gas sensor.

4.3.1 Calibration procedure

The following procedure should be performed for a full calibration:

Check if the SH-WAD and/or alarm/controller are in ‘stand-by’ mode!

- Fill the “Tedlar” bag with calibration gas of the required concentration level
- (Please refer to the instructions with the calibration kit for preparation of calibration gas).
- The calibration gas can be applied to the inlet on the top-side of the SH-WAD.
- Whilst having the system exposed to normal clean air the zero point should be adjusted by using the Zero potentiometer on top of the gas sensor.
- Apply calibration gas to the sensor.

Although nearly all gas concentrations used for the calibration are safe inhalation of these mixtures should be avoided. Ensure that during calibration the gases are always vented to a safe location!

- Adjust the Span potentiometer (see fig. 4.5.3).
- Check if the indicator on the front of the SH-WAD returns to zero after removing the calibration gas.
- If zero re-adjustment is required, please repeat steps.
- After calibration please make sure that all tubes are re-connected properly!
- Set dipswitch 2 on the detector back to its normal ‘Off’ position if necessary.

When calibration is not possible for the GS-[…]ES/MS/KTSA/KTSS/HSZ/HSR/HSC/OP-S type sensor, because the ‘Span’ setting has reached its maximum value, the sensor should be replaced (see section 4.2.2 or 4.2.3 for the replacement procedure).

fig. 4.5.3.: Span adjust for different type of transmitter board.

4.3.2 Span response test

If desired, a response test may be carried out in between the normal maintenance intervals. The test can be performed with a standard gas or with one of the gases, which can be generated by using an optional instrument calibration kit (for information see: appendix).

Steps to follow:

Check if the SH-WAD and/or alarm/controller are in ‘stand-by’

- The test gas can be applied to the inlet on the top-side of the SH-WAD. Apply calibration gas to the sensor.

Although nearly all gas concentrations used for the calibration are safe inhalation of these mixtures should be avoided. Ensure that during calibration the gases are always vented to a safe location!

- Check the reading.
- Check if the indicator on the front of the SH-WAD returns to zero after removing the calibration gas.
- If the application requires an adjustment of the signal, please perform a full calibration as described.
- After the test please make sure that all tubes are connected properly!
- Set dipswitch 2 on the detector back to its normal ‘Off’ position if necessary.

5 Appendices

5.1 Principle of membrane electrolysis

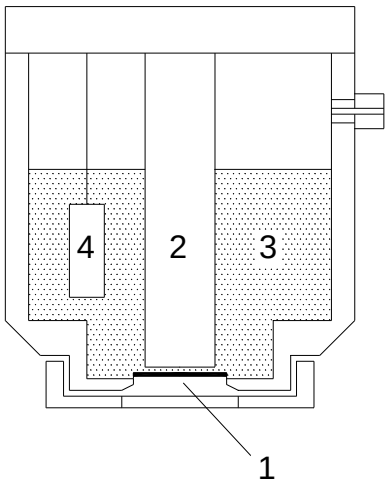
Explanation of the principle of membrane electrolysis:

When the gas being monitored passes through the membrane (1), an electrochemical reaction arises at the working electrode (2), which is in contact with the electrolyte (3). An equivalent “redox” reaction then occurs at the counter electrode (4) producing a current ‘I’ that is in linear proportion to the partial pressure of the detected gas.
‘I’ is calculated according to the following formula:

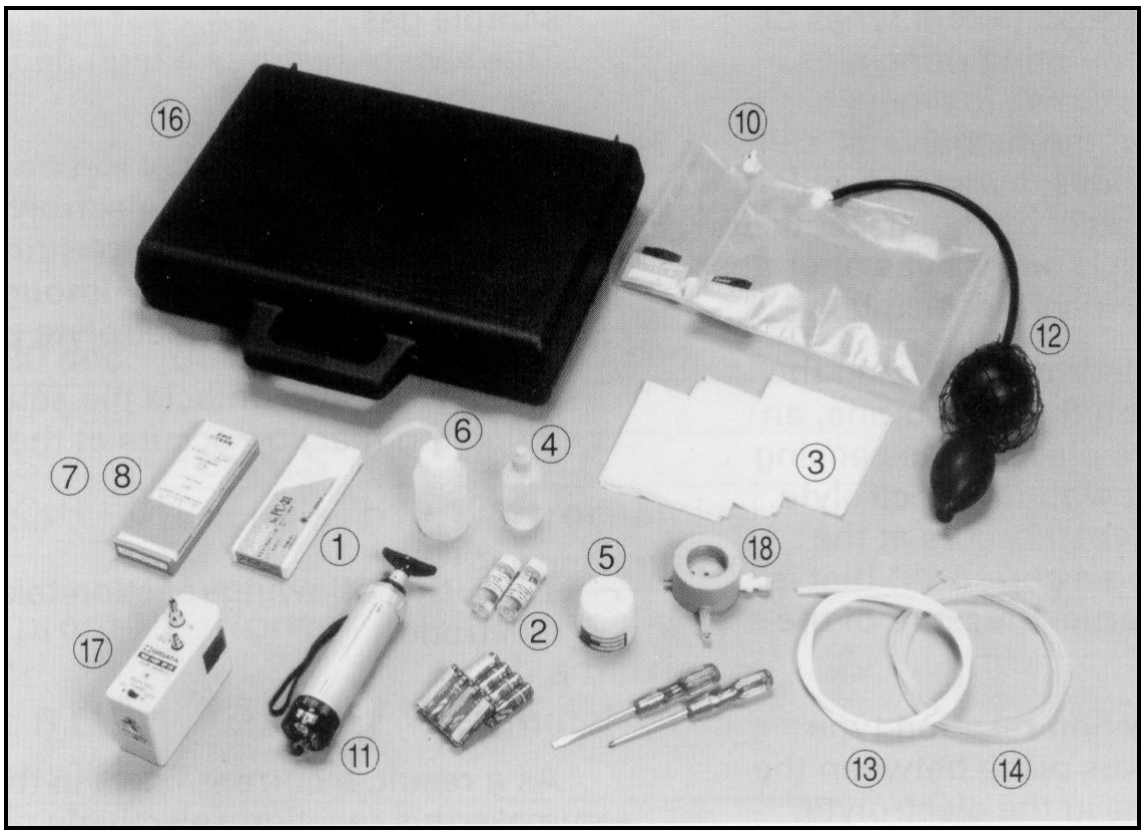
$$I = \frac{nFaDC}{d}$$

Where:

n = number of electrons per mole of gas
F = Faraday’s constant (approx. 96,500 coulombs)
a = area of working electrode
D = diffusion coefficient of the gas in cm/sec.
C = gas concentration in mol/liter.
d = thickness of the diffusion layer in cm



5.2 Calibration kits and accessories



1	Gas generation tubes
2	Gas generation liquid
3	Soft paper towels
4	Reagent I, 1 bottle
5	Reagent II, 1 bottle
6	Plastic bottle (100 ml)
7	Gas detection tubes
8	Gas detection tube
10	Tedlar bag 10 liters
11	Gas sampling pump
12	Double bellows
13	Teflon tube (6 Ø x 4 Ø)
14	Silicone tube (8 Ø x 4 Ø)
16	Carrying case
17	Mini pump
18	Sensor adapter/ flow cap

Note: example image only, actual product and contents may vary.

Model	**K-I**	**K-II**	**K-III**	**K-IV**	**K-V**	**K-VI**	**K-VII**	**K-VIII**	**K-XI**
Gas to Generate	**PH_3**	**Cl_2**	**HCN**	**SO_2**	**H_2S**	**NH_3**	**HCl**	**HF**	**NO_2**
Gas generation tube 10 pcs.	1 box	-	1 box	1 box	1 box	1 box	-	-	1 box
Gas generation liquid 10 ml	1 btl.	-	1 btl.	1 btl.	1 btl.	1 btl.	-	-	1 btl.
Soft paper towel 10 sheets	1 pack	-	1 pack	1 pack	1 pack	1 pack	-	-	1 pack
Reagent I, 1 bottle		(25ml)					(25ml)	(25ml)	
Reagent II, 1 bottle		(25ml)					(30 g)	(30 g)	
Plastic bottle (100 ml)		1 btl.					1 btl.	1 btl.	
Gas detection tube 20 pcs.	1 box								
Gas detection tube 10 or 5 pcs.		1 box (10)	1 box (10)	1 box (10)	1 box (10)	1 box (10)	1 box (5)	1 box (10)	1 box (10)
Tedlar bag 10 liters.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.
TG-code of system to be calibrated	2800 4000 4900	100 800 900 1400 3100 4400 [1)]4500	300	500[2)] 4500	200 600 1200 2100 2900 3000 3200 4200	2400	400 2200 3400 4300	700 3700 4700	1700 4100 4600

1) Low range SF6 detection
2) High range SF6 detection

The procedure to generate a certain calibration gas is described in the manual ‘Guide to Generating Calibration’ which is supplied with the calibration kits and calibration materials.

5.3 Sales office and technical support

For questions of any kind please contact us.

New Cosmos – BIE B.V.
Maxwellstraat 7
NL-1704 SG Heerhugowaard
The Netherlands
Tel. : +31 72 576 5630
Fax : +31 72 572 1818
E-mail : info@newcosmos-europe.com

For general information
info@newcosmos-europe.com

For sales enquiries
sales@newcosmos-europe.com

For technical questions
techcenter@newcosmos-europe.com

For more information, visit the New Cosmos - BIE on the World Wide Web:
www.newcosmos-europe.com

5.4 Specifications and dimensions

Model	SH-2001-WAD	SH-2002-WAD
Product code	See ordering information	See ordering information
Sensor model	GS-[…]HA/HS/ES/KTSA/KTSS/HSZ/HSR/HSC/OP-S	
Detectable gases	See ordering information	
Detection principle	Electrochemical/ IR/ Catalytic Bead/ Zirconium Oxide/Photo-Ionization	
Pyrolyzer	Optional (depends on gas to be detected)	
Monitoring configuration	Continuous, multi-gasses, sensors in serial configuration.	Continuous, multi-gasses, sensors in parallel configuration.
Sampling Pump	1 x long life diaphragm pump	2 x long life diaphragm pump
Flow meter	1 x optical (with low-flow error function)	2 x optical (with low-flow error function)
Indicator	140x32 dot matrix ”Vacuum Fluorescent” technology	
Installation method	Indoor, wallmount.	
Tube connectors	Latest product generation: In (1x) & out (1x): Quick-Connect fittings (integrated) 6/4mm OD/ID. Former product generations: In (1x) & out (1x): R¼” BSPT female.	Latest product generation: In (2x) & out (2x): Quick-Connect fittings (integrated) 6/4mm OD/ID. Former product generations: In (2x) & out (2x): R¼” BSPT female.
Operating temperature	0-40 ^{O}C; 32-104 ^{O}F	
Operating humidity	5% - 95% (non condensing)	
Buzzer	External (optional).	
Analogue output signal	Optional; 4-20 mA (typ.) / 0-25 mA (max.)	
Analogue output load capacity	0 – 600 Ω @ 24V DC.	
Accuracy	+/- 5% (depending on calibration gas and ambient conditions)	
Alarm handling & relays	Programmable (on/ off/ level/ %FS). Optional 4 Potential-free relays (C, N/O, N/C; energized yes/no).	
Communication protocols	Profibus-DP (optional hardware feature) SIMS/Modbus-RTU protocol (optional software feature)	
Programming interface	RS-232: InControl (front RJ-45 connector)	
Date/Time back-up capacity	Min. 2 years.	
Analogue output protection fuse	50 mA fast, TRE (TE5 WICKMANN)	
Power supply protection fuse	20x5 mm glass tube, 1A fast.	
Power requirements	24V DC typical (18...30 VDC).	
Power consumption	14.4 Watt (max.)	20.0 Watt (max.)
Dimensions	Approx. 236x187x194 mm (see 5.6).	
Weight	< 5.0 kg	

Specifications ProGas-DP plug-in module

Model	ProGas-DP
Product code	11692
Protocol	Profibus-DP acc. to DIN 19245 Part 1
Baud rate	9.6 kBaud to 1.5 Mbaud
Recommended baud rate	1.5 Mbaud
Output signals	Isolated RS-485
Unit load Isolated output	1 or 32 devices max per bus
PNO number	0x083F
RS-485 isolation barrier	1600Vrms (for 1 minute)

Specifications ProGas-RX plug-in module

Model	ProGas-RX
Product code	11693
Protocol	SIMS (Bionics-RX protocol)
Baud rate	9.6 to 76.8 kBaud
Default baud rate	9.6 kBaud
Output signals	Selectable Non-isolated / isolated RS-485 protocol
Unit load Non-Isolated output	¼ (max. 128 devices per bus)
Unit load Isolated output	1 (max. 32 devices per bus)
RS-485 isolation barrier	1600Vrms (for 1 minute)

Note: this optional hardware part is not required for later product generations as it has become a standard integrated feature (available as software option).

Specifications ProGas-RC plug-in module

Model	ProGas-RC
Product code	11691
Number opt. relays	4
Contact arrangement per relay	SPCO
Available contacts per relay	Normally open / Common / Normally Closed
Contact rating per relay	24V DC @ 2A max.

5.5 Serial bus recommendations

5.5.1 RS-485-Modbus / RS-485-RX (SIMS)

Cable:

Manufacturer	Type	Picture	Remarks
Belden	3106A		1.5 twisted-pair (3-wire). Braided shield with drain wire.
Alpha Wire	6454 BK005		

Connector:

Use a 9-pins sub-D connector on top of the SH-200x-WAD unit.

Manufacturer	Type	Picture	Remarks
Phoenix Contact	Subcon-Plus M1 Ordercode: 2761826.		Plug connection: 9-pos. D-SUB pin strip.

Interface:

Pin on D9-Shell	Modbus name	RX (SIMS) Name	EIA/TIA-485 name
1	D0	A	A/A´
2	D1	B	B/B´
3	Common	E	C/C´
5	D0	A	A/A´
6	D1	B	B/B´
8	Common	E	C/C´

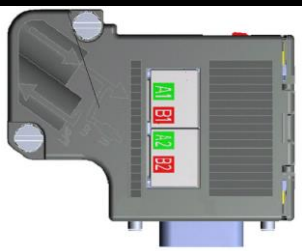
5.5.2 Profibus-DP

Cable:

Manufacturer	Type	Picture	Manufacturer
Siemens	6XV1830-0EH10		PROFIBUS FC Standard Cable

Connector:

Use a 9-pins sub-D connector on top of the SH-200x-WAD unit.

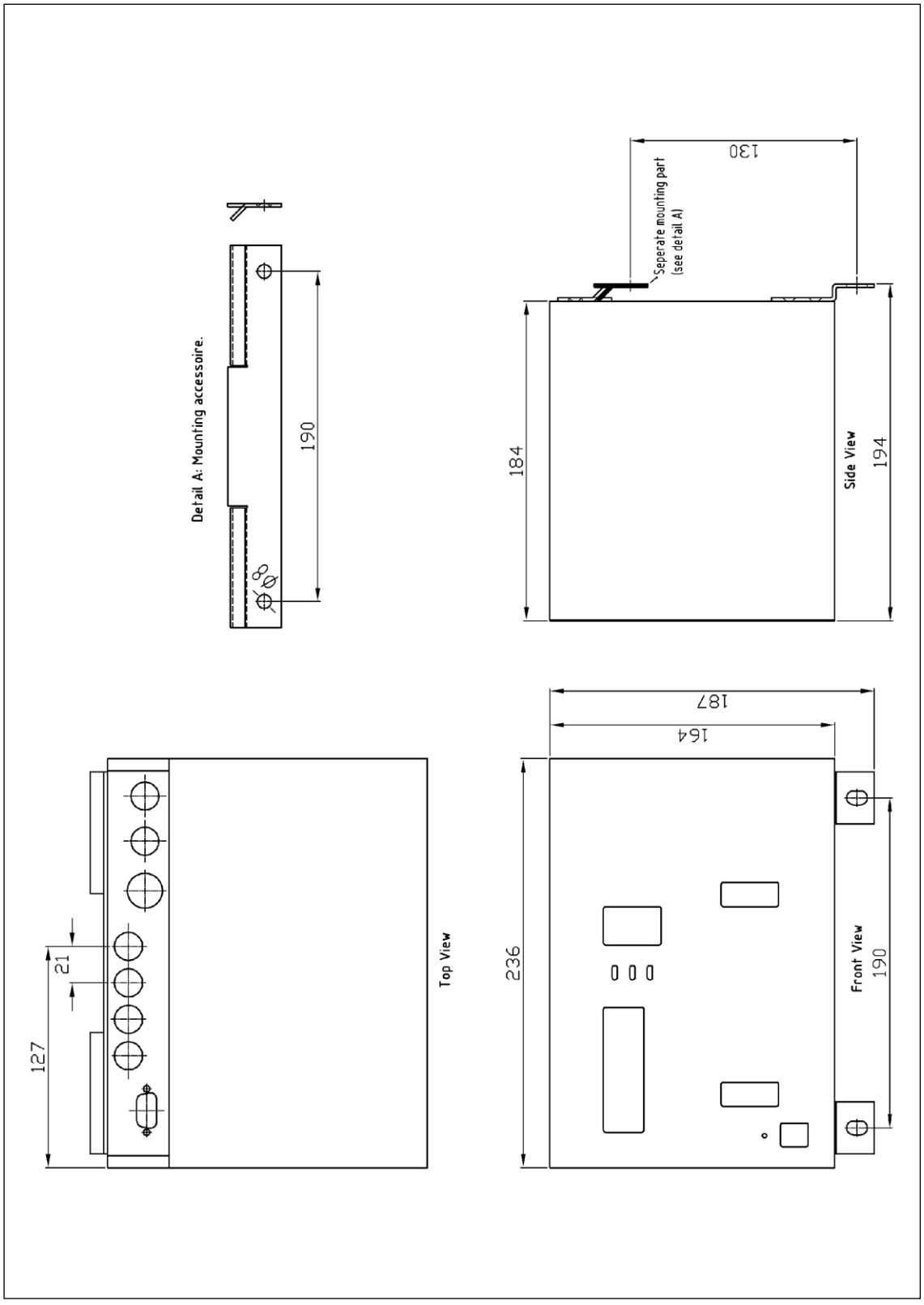
Manufacturer	Type	Picture	Remarks
Siemens	6ES7972-0BA60-0XA0		Plug connection: 9-pos. D-SUB pin

Interface:

Pin on D9-Shell	Name	Remark
3	B	DP: use always the red wire for signal B (pin3 - TXD/RXD-positive).
5	GND	
6	+5V	
8	A	DP: use always the green wire for signal A (pin8 - TXD/RXD-negative).

5.6 Dimensional drawings

SH-2001-WAD / SH-2002-WAD (Wall mount).



5.7 CE Declaration

NEW COSMOS - BIE

COSMOS

EU Declaration of Conformity

EU18002-1

In accordance with EN ISO/IEC 17050-1:2010

We,

Bionics Instrument Europe B.V. t/a New Cosmos - BIE
Maxwellstraat 7
1704 SG Heerhugowaard
The Netherlands

declare under our sole responsibility that the following products:

Product: Gas Detector
Series: SH-[xxxx]WAD

are in accordance with the following directive(s):

Electromagnetic Compatibility Directive (EMC) 2014/30/EU

Restriction of Hazardous Substances (RoHS) 2011/65/EU

The following harmonized standard(s) or other normative documents have been applied:

EMC: EN 50270:2015\C1:2016. Type 2.

RoHS: EN 50581:2012

Date of issue: 30-06-2018

Place of issue: Heerhugowaard, The Netherlands

Signature:

Mrs. M. Zegers

Position: General Manager

5.8 Trouble shooting guide

5.8.1 Contents

The issues discussed in this guide are divided into the following topics:

- Start-up
- Operation
- Operation mode
- Sensor
- Profibus-DP
- SIMS communication
- Relay-card
- InControl software
- Calibration
- Flow
- Pyrolyzer (decomposer element)
- Overview of all possible error reports (SH-WAD)

5.8.2 Start-up related issues

Situation	Description
If 'system initialising ...' is completed the following report is shown: **'Please restart with inhibit switch enabled'**.	Put the relay inhibit switch to the position 'On' and restart the unit (by disconnecting and reconnecting the power). It is possible that this report is generated because a relay card or JC-box has been exchanged. This procedure avoids any risk on unexpected switching of the relays.

5.8.3 Operation

Situation	Description
The **Function selector button** does not work (little red button on the front panel of the unit)	Possible cause: In the Setup of the unit the option "Function Button Disabled" is active. Use InControl software to verify the detector Set-up.

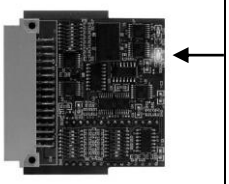
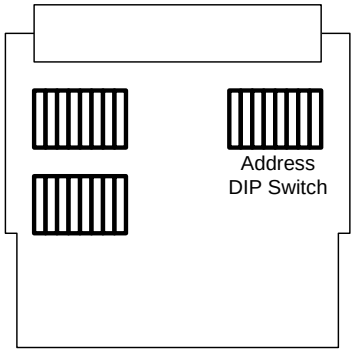
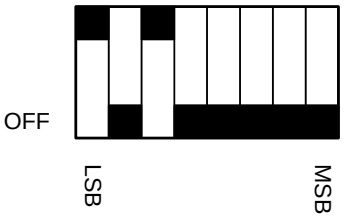
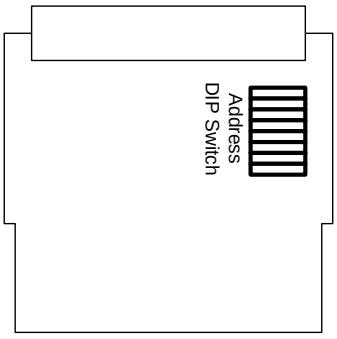
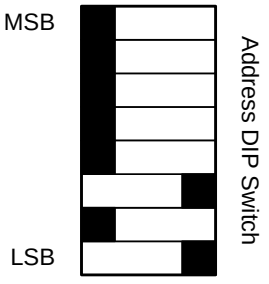
5.8.4 Operation mode related issues

Situation	Description
The unit reports **'measuring mode not available'** when trying to put the unit in measuring mode using the function button.	In the following situations it is not possible to switch to measuring mode: There is an error. The unit is in standby mode and the gas concentration is at a level where either a warning or an alarm status is activated when switching to measuring mode. Please resolve the error or make sure that the indication of the gas concentration is in the 'safe region'.
The analog output signal is fixed at 4mA and does not rise with an increasing gas concentration.	This situation can arise when the unit is in standby and the option "4mA in Standby" is active. Use InControl software to verify the detector Set-up functions.

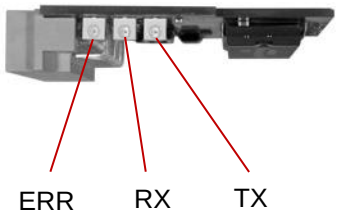
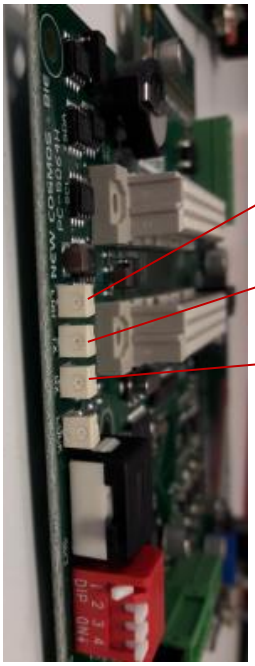
5.8.5 Sensor related issues

Situation	Description
No response when applying calibration gas.	Possible causes: The jumper on TP1A or JP1A has not been removed or the transport protect switch is on the ON position. When performing maintenance the drop of electrolyte on the measuring electrode has not been placed properly. Open the sensor and place a new drop in accordance with the maintenance procedure.
A full scale reading.	Possible causes: The jumper on TP1A or JP1A has not been removed or the transport protect switch is on the ON position. After sensor maintenance it might be that the sensor is still stabilizing. If there is any doubt about the stabilization time please contact your local sales office. The unit has not been properly calibrated or the zero potentiometer has been set to full scale.
Report: sensor incompatibility.	When exchanging sensors in the SH-WAD the unit checks if the new sensor is compatible with the detection unit in ways of: sensor type (GS- number) target gas measuring range and units. If a mismatch is found the error report will show. If a change over in sensor type, target gas or measuring range is required please contact your local sales office for instructions.
Report: **Low Electrolyte** report.	Possible cause: The electrolyte level in the refillable electrochemical sensor GS-[…]HA/HS is too low. To refill the sensor perform a full maintenance procedure. The sensor/detector has been placed under an angle greater as specified.

5.8.6 Profibus-DP related issues

Situation	Description
No communication with the SH-WAD	Check if the red 'communication error' LED on the ProGas-DP card (PC-5063B) is lit or it is blinking. This indicates a network related problem. Possible causes: The ProGas-DP card is set to the wrong address or the address is already in use. The Profibus-DP line is not connected or terminated correctly. Please refer to the manual, which comes with the cable or connector. The communication error can also be caused by a wrong connection/configuration at the PLC side. Please refer to the instructions/manual of this device. If the LED is off and there is no communication it might be that The ProGas-DP module has not been activated. 
ProGas-DP Type 1 	 Example: address 5
ProGas-DP Type 2 	 Example: address 5

5.8.7 SIMS communication related issues

Situation	Description
No or bad communication with the SH-WAD   Mainboard (PC-5064)	On the topside of the ProGas-RX card **or on the topside of the mainboard (PC-5064)** there are three LED's with the following functions: LED 1 (when lit) indicates framing errors (ERR) LED 2 (when lit) indicates incoming data (RX) LED 3 (when lit) indicates outgoing data (TX) Error situations and possible causes: - No LED's are lit: The RS-232 cable is connected to the wrong COM port of the PC. In this situation all SH-WAD units connected to the same bus line will show the same status on the ProGas-RX card. There might be a cross-link or switching of the A, B and E line. Check all cable connections. - LED 2 blinks and all other LED's are off: The wrong communication address is set from InControl. The ProGas-RX card has not been activated. The end of the RS-485 cable has not been terminated properly or there is an interruption somewhere down the line. For the correct termination, please refer to the instructions, which come with the connector or contact your local sales office. A and B lines are reversed in the connector. In this situation all other SH-WAD units can still be communicating properly. - LED 1 + 2 are blinking (framing errors) Communication rate might be incorrect. The default setting is 9600 baud.

5.8.8 Relay card related issues

Situation	Description
Relays on the RC-card are not switching although there is an warning, alarm or error	Possible causes: The relay inhibit switch is activated. Verify the position of the switch, which is located inside the SH-WAD unit. It should be in the position 'off'. Also the inhibit LED should be off. The RC-card has not been activated.

5.8.9 InControl software related issues

Situation	Description
A **COM port error** report appears in InControl when connecting	An error message will appear if the software is set to operate on a different COM port than the cable is connected to. Press OK to accept the message. Go to the File menu > settings … > in the 'Settings Window'. Change the COM port number to the appropriate port. Do not change any of the other settings in this Window. Restart the application.
A **COM port error** appears in InControl when using a **USB** COM port adapter	Open the MS-Windows device manager to determine the COM port, which has been assigned to the USB device. To change the COM port settings please refer to the instructions mentioned above. 
No reply report **in InControl**	Make sure to use the correct cable and that the cable is properly connected. **!! Do not use an Ethernet cable for the connection.** The cable should be a special cable supplied with the product (optional part).
A warning report appears when connecting InControl. Report: **Date and time are incorrect**.	The date/time settings of the computer deviate from the settings in the SH-WAD. Before pressing 'yes' and updating the settings in the SH-WAD make sure your computer has been set to the correct date and time.
InControl reports: the **configuration** in the controller **has changed** since the last save-file was created	Every time a SH-WAD is connected to a PC a copy of all settings is made on the hard disk of the PC (laptop). This report is shown when a mismatch is found with earlier saved settings. Possible cause of this report: Another PC has been connected to the SH-WAD. The settings in the SH-WAD have been adjusted from this PC. Before overwriting the settings in a SH-WAD investigate the cause of the changes. Choose the 'No' option to leave the settings in the SH-WAD unchanged.

5.8.10 Calibration related issues

Situation	Description
There is a low flow report (ERROR) when preparing to calibrate. There is **no indication of the gas concentration**.	Possible cause: When disconnecting the inlet tubing at the flow cap the airflow through the flow meter is interrupted. To be able to view the gas concentration when calibrating put dip switch pin number 2 in the position 'On'. Please note that the ERROR report will remain displayed until the tubing has been reconnected.

5.8.11 Flow related issues

Situation	Description
Flow error when **calibrating**.	See 'calibration related issues'.
The flow meter indicates a **highly fluctuating flow** or the **flow will drop or rise** at certain moments.	Make sure that both the inlet and outlet tubing are connected to the same environment. It is important to have the same pressure conditions on both the in and outlet sample lines.
Low flow report	To resolve the issue perform the following checks/actions: Acknowledge the error. Put the SH-WAD in standby (see section 4.1). The sample tubing outside the SH-WAD might be bent or blocked. To find out first disconnect the inlet tubing on top of the SH-WAD then disconnect the outlet tubing. Open the cover. Check all internal tube connections. Turn the flow adjust potentiometer (see section 2.6).

5.8.12 Pyrolyzer related issues

Situation	Description
Pyrolyzer error report	The decomposer element is not performing according to the specifications or it is broken. Required action: Replace the decomposer element immediately.

5.8.13 Overview of all possible error reports (SH-WAD)

Message	Description
Low flow	No airflow through the flow meter. See item 'flow related issues' for a possible solution.
Low electrolyte	The electrolyte level in the refillable electrochemical sensor HS is too low. See item 'sensor related issues' for a solution.
Pyrolyzer error	The decomposer element is not performing according to the specifications or it has been broken. See item 'pyrolyzer related issues' for a solution.
Sensor missing	There is no sensor present or it has not been connected properly. Mount and connect the gas sensor to resolve this report.
Sensor incompatible	The type of the sensor does not match with the configuration of the system. See item 'sensor related issues' for an explanation.
ProGas-RX card missing	The card function has been activated but there is no ProGas-RX card present. It can also indicate a possible defect in the ProGas-RX card.
ProGas-DP card missing	The card function has been activated but there is no ProGas-DP card present. It can also indicate a possible defect in the ProGas-DP card.
Sampler data failure	The settings/data in the SH-WAD are lost or damaged. In this case the unit should be reprogrammed using InControl. If the failure persists, please contact your local sales office.
Sensor data failure	Possible causes: The jumper JP5 on top of the HS, ES or KTSS sensor is set to the position AD04. It should be at the position AD00. Settings/data in the sensor are lost or damaged. In this case the unit should be reprogrammed using InControl. If the failure persists, please contact your local sales office.
Relays locked (Relays frozen)	Appears when a relay card is present and the relay inhibit switch is in the position 'On'. Put the switch back to the position 'Off' to resolve the report.
Relays locked (inh. sw. unsafe)	The programming of the relay card (energized/non-energized) differs from the programmed settings in the SH-WAD. To resolve this report put the relay inhibit switch to the position 'Off'. However, be aware that the relays will switch instantly to the settings programmed in the SH-WAD!

5.9 Revision history

Document ID	Release date	Change notice
v0.0.1	September 2010	First release.
v0.0.2	February 2011	- Start-up recommendation (2.5) added. - Earth connection text changed (1.5.1).
v0.0.3	April 2011	Update CE declaration.
v1.0.0	March 2021	Various updates.