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REGARD-1

Single-channel controller

Installation, operation and maintenance

Issue 6 – December 2006

Contents

FOR YOUR SAFETY

Follow the instructions

Follow the instructions for installation, operation and maintenance.

Maintenance

The equipment must be inspected and serviced regularly by trained personnel. Keep a record of inspections and servicing.

Repairs of this apparatus should only be carried out by competent personnel.

We recommend that either a training course or service contract is obtained from Draeger and that all repairs are carried out by them.

Refer to EN 50073 and/or local regulations.

Refer to the operating manual of the transmitter or measuring head information on operation and maintenance of the transmitter or measuring head.

Not for use in areas where explosion hazards are possible

This equipment is not approved or certified for installation in potentially explosive atmospheres.

Liability for proper function or damage

Liability for proper function of the equipment is irrevocably transferred to the owner or operator to the extent that the equipment is serviced or repaired by personnel not employed or authorised by DraegerService, or if the equipment is used in a manner not conforming to its intended use.

Draeger Safety UK Limited can not be held responsible for any damage caused by non-compliance with the above recommendations. The warranty and liability provisions of the terms and conditions of sale and delivery of Draeger Safety UK Limited are likewise not modified by the recommendations given above.

Draeger Safety UK Ltd

INTENDED USE

Regard–1 single-channel controller for 4-20mA transmitters

- For stationary, continuous monitoring of flammable or toxic gases and vapours, oxygen deficiency or enrichment
- Display of measured gas value
- Indication of alarms and control of countermeasures
- Indication of time-weighted average value, time-weighted average alarm output and data logger (requires optional RS-232/TWA alarm board)

Regard–1 single-channel controller for SE Ex measuring heads

- For stationary, continuous monitoring of flammable gases and vapours
- Display of measured gas value
- Indication of alarms and control of countermeasures
- Indication of time-weighted average value, time-weighted average alarm output and data logger (requires optional RS-232/TWA alarm board)

The SE Ex unit will not work with the Dräger SE Ex **LC** measuring head.

Both units are suitable for use in residential, commercial and light industry environments.

The Regard-1 controller is certified according to the directive 94/9/EC (ATEX Directive) to be operated with performance approved 4-20mA transmitters (EC-type examination certificate BVS 03 ATEX G 011X), or with Dräger SE Ex pellistor measuring heads.

CE marking and ATEX approval

Regard-1 is CE marked to indicate conformity to the following directives:

- “ATEX directive” 94/9/EC
- “EMC directive” 89/336/EEC
- “Low-voltage directive” 73/23/EEC

The controller also carries the following ATEX marking:

II (2) G

THIS MARKING DOES NOT MEAN THAT THE UNIT IS “EXPLOSION PROOF”. Regard-1 cannot be used in areas subject to explosion hazards (“hazardous areas”) without suitable protection.

Other tests and approvals

In addition to the measuring function for flammable gases in the range 0 to 100 %LEL and for oxygen (inertisation) in the range 0 to 25 %(V/V), Regard-1 has been tested according to DIN EN 45544-1 combined with DIN EN 45544-2 for toxic gases, and according to DIN EN 50104 for oxygen enrichment and oxygen deficiency, by EXAM BBG Prüf- und Zertifizier GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany.

The "Bericht über die Eignungsuntersuchung" has been issued under PFG-No. 41301303.

In Germany only:
Read and consider chapter 5 of the "Bericht über die Eignungsuntersuchung", which follows. (Text included in German edition manual only.)

Special conditions for safe use according to EC-type examination certificate BVS 03 ATEX G 011 X

Vibration can cause malfunction of alarm and fault contacts. Do not expose to vibrations with frequencies above 55 Hz or amplitudes above 0.15 mm.

For safety relevant decisions only use the status of the relays. Do not use the display reading or LED indications. For calibration and adjustment of alarm set points use a voltmeter between test points TP1 and TP2 to determine the gas reading and the alarm thresholds.

Regard-1 4-20: if used with a transmitter whose output current can be below 20mA for concentrations above full scale, set the alarm relays latching.

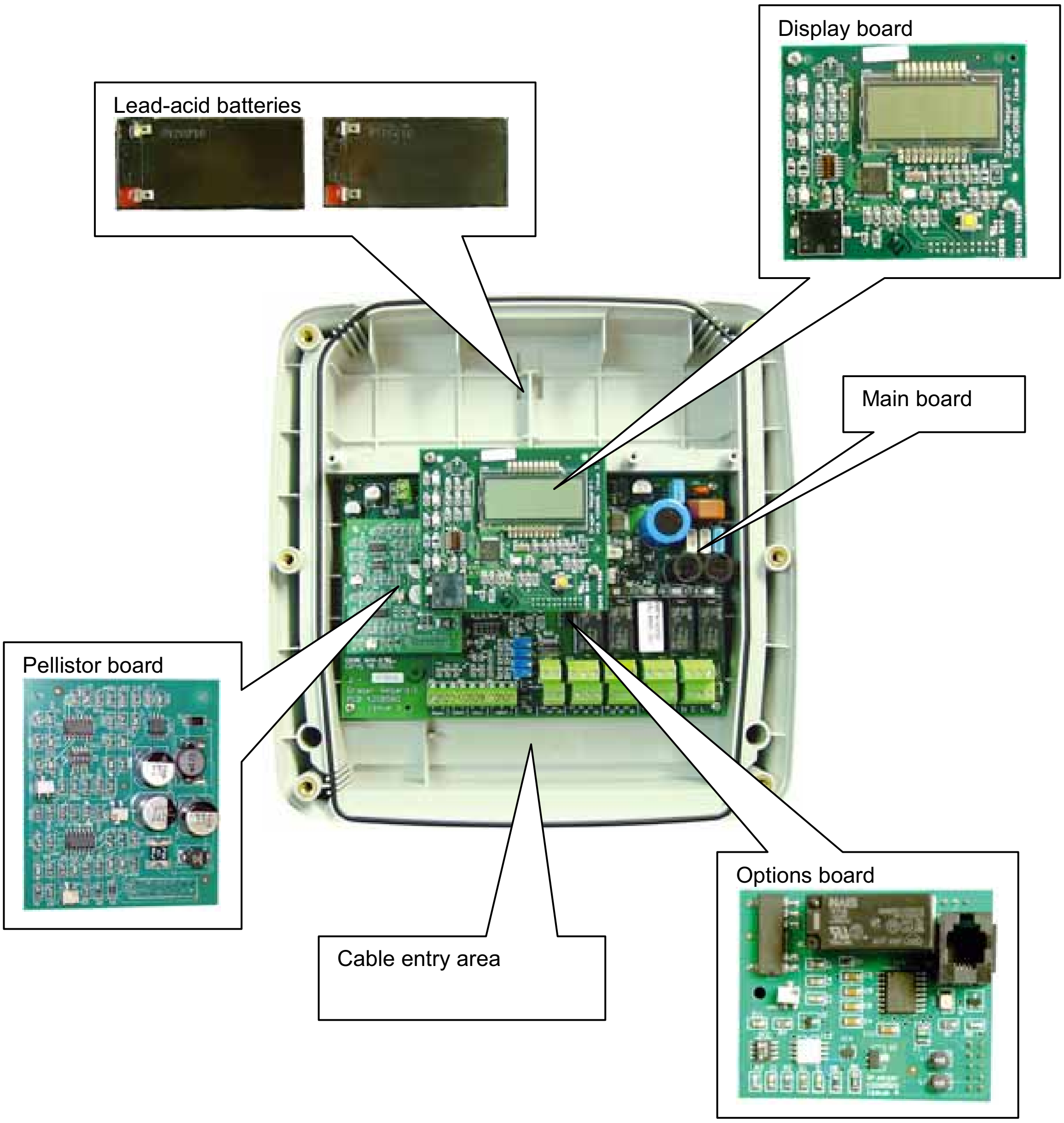
Regard-1 SE Ex: set at least one alarm relay – the one with the highest alarm level – to be latching.

DESCRIPTION

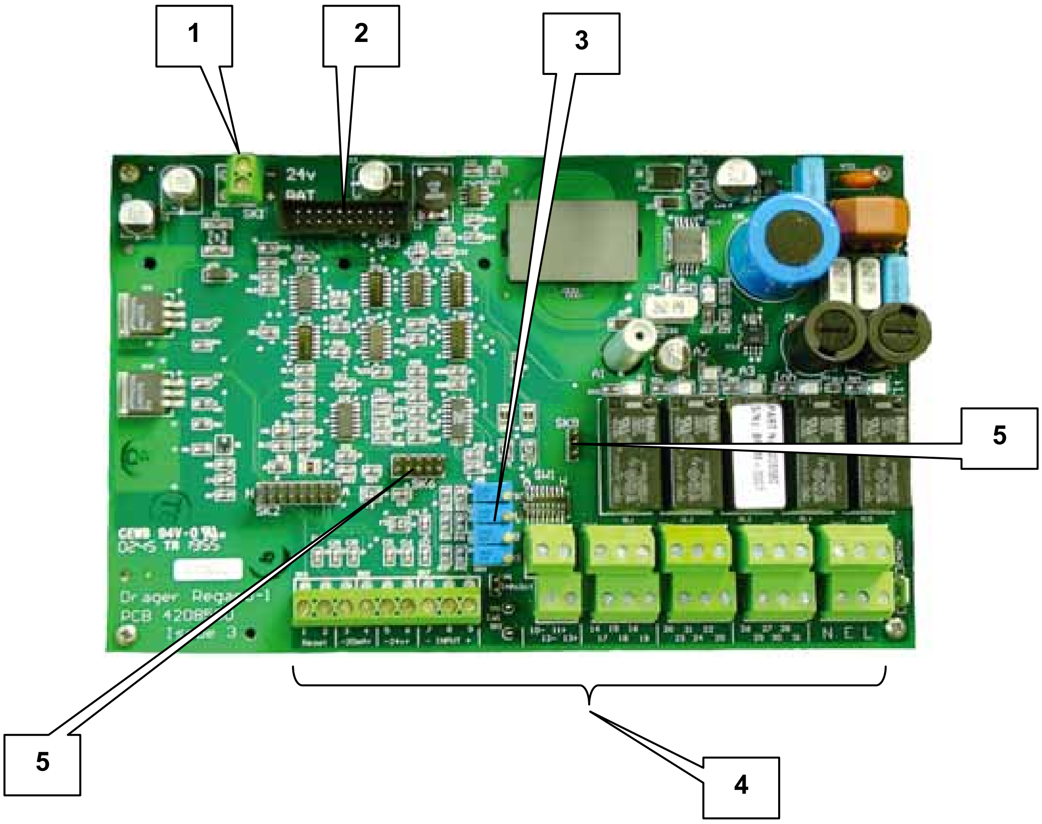
The unit is available in two versions: 4-20mA or SE Ex, with or without gas level display.

An additional “Options board” is available that provides an isolated 4-20mA output, TWA alarm relay and data logger with RS-232.

Two 1.2AH lead-acid batteries can be fitted inside the unit’s enclosure to provide continued operation for several hours if AC power is interrupted.

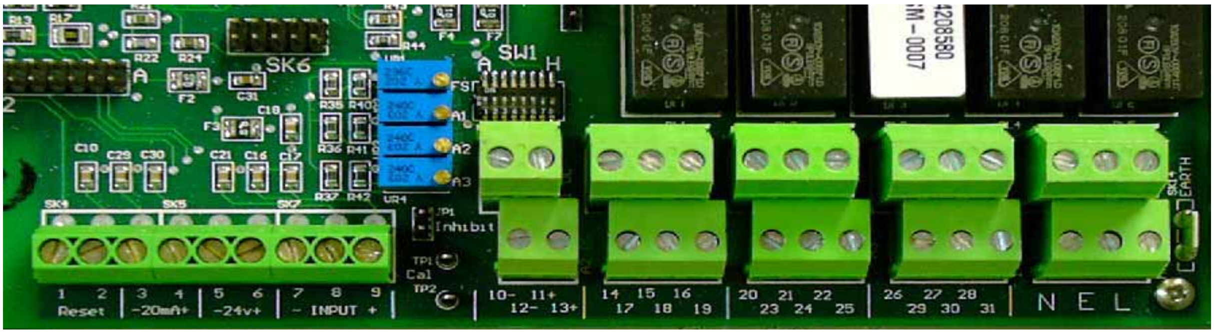


Main board



1. Terminals for batteries or external DC input.
2. Connector for display board.
3. Potentiometers for A1 – A3 alarms and display adjustment.
4. Terminals for field devices.
5. Connector for Options board.

Field devices terminals



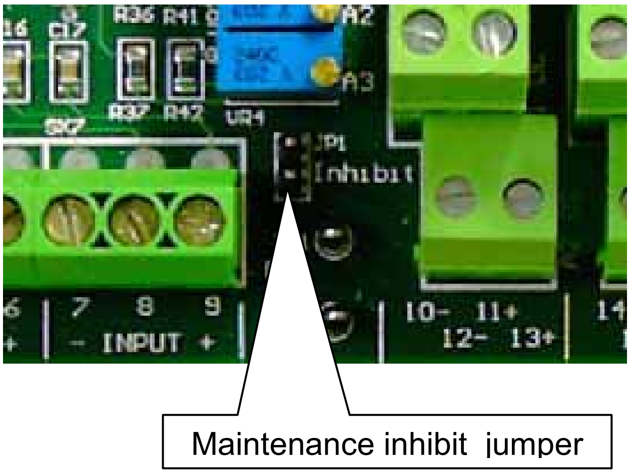
No	Function
1 2 Reset	External reset input
3 4 - 20mA +	4-20mA output **(requires Options board)**
5 6 - 24V +	24 VDC unswitched output (100mA max.)
7 8 9 - Input +	4-20mA transmitter or SE Ex sensor input
10- 11+ 12- 13+	A1 24V switched output (100mA max.) A2 24V switched output (100mA max.)
14 15 16 17 18 19	A1 relay output A2 relay output
20 21 22 23 24 25	TWA relay output **(requires Options board)** A3 relay output
26 27 28 29 30 31	Fault relay output Inhibit relay output
N E L	98 – 253 VAC fused output (500mA max.) (back row terminals) 98 – 253 VAC input (front row terminals)

24 V battery terminals

For continued operation of the controller when the AC supply fails connect two 12V 1.2AH lead-acid batteries in series to the battery terminals. If unsealed batteries are fitted, that could generate hydrogen when charged, drill a vent hole in the top of the enclosure.

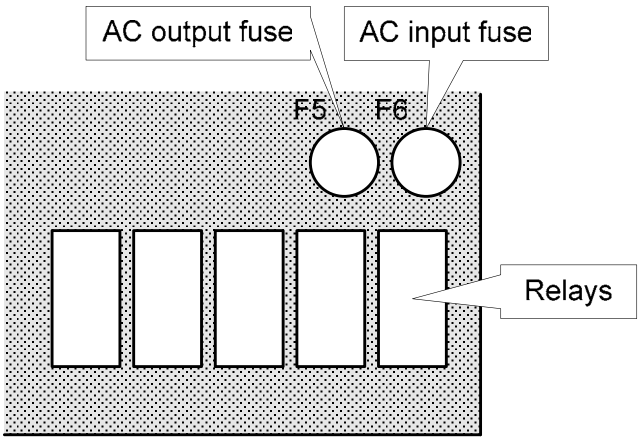
The 24V battery terminals can also be used for an external 24VDC input. **Do not connect AC and external DC supplies at the same time.**

Maintenance inhibit jumper



When the inhibit jumper is fitted all relays will go to their normal, non-alarm, state.

Fuses



Display board

The display shows the gas level, or indicates that the gas level exceeds the measuring range (over-range) or is below the measuring range (under-range).

Examples

0.50	Normal gas level display.
- 0.5	Negative display reading. A negative display reading may be caused by inaccurate calibration or by drift or temperature effect of the sensor.
-Ur-	Under-range: reading below measuring range
-Or-	Over-range: reading above measuring range. The over-range indication is latching and can only be cleared when the reading is again within the measuring range. Press Reset to clear the over-range indication.

There are two versions of the display board:

- V1 displays gas level, under-range and over-range, and calculates a TWA gas level over eight hours; this board contains firmware release 1.00 or 1.01.
- V2 displays gas level, under-range and over-range and calculates the TWA gas level over an user-adjustable period, and logs the gas level to memory; this board contains firmware release 2.00 or 2.01.

The firmware version is shown on the display for a few seconds after the unit is turned on, and is also marked on the display board.

A buzzer on the display board provides a local audible alarm.

Display of measuring range, gas and unit

The front cover of the controller has a window in which to display the measured gas, range and unit. Insert a label showing the required information in the slot inside of the front cover. Pre-printed and blank labels are at the end of this manual.

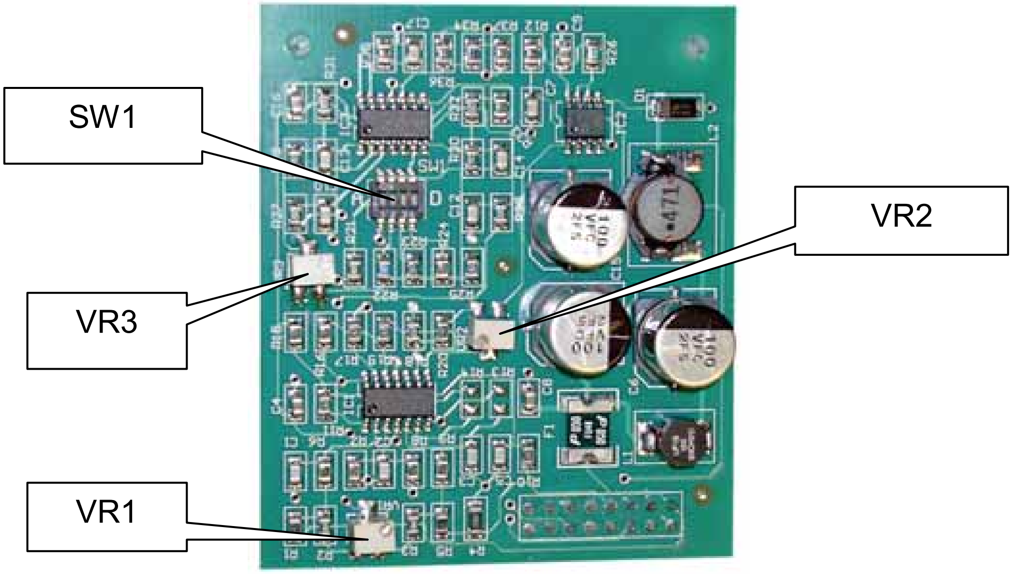
Pellistor board

The pellistor board supplies a constant current to the sensor and amplifies the signal from the sensor.

To fit the pellistor board to a Regard-1 4-20:

- Remove all the links from SK2 on the main board
- Fit the pellistor board onto SK2

The pellistor board has a 4-pole switch and three potentiometers:



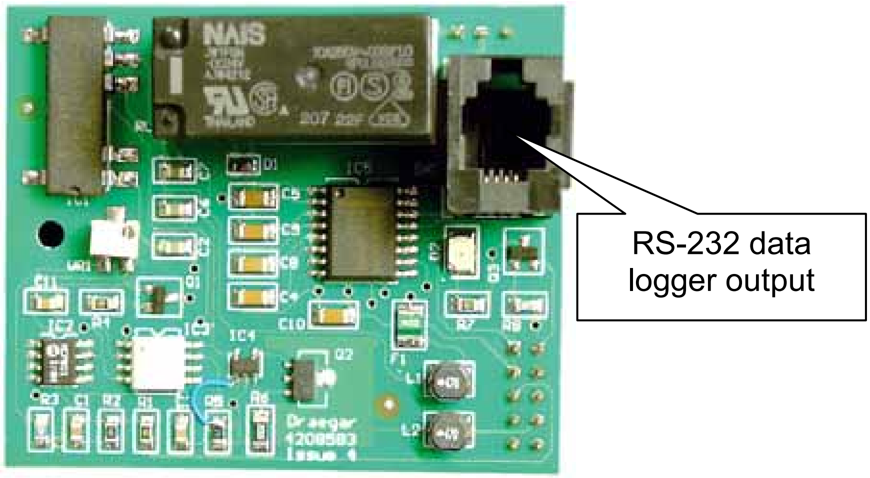
- SW1 Sets sensor current range and amplifier range
- VR1 Sets zero point
- VR2 Sets sensor current
- VR3 Sets gain (span)

Options board

The option board provides

- TWA alarm relay (requires display board V2 to operate)
- 4-20mA output proportional to gas level
- datalogger output

Fit the options board onto SK6 and SK9 on the main board.



When the Options board is fitted, the 4-20mA output is on terminals 3 and 4 of the main board and the TWA relay output is on terminals 20 to 22.

The RS-232 datalogger output is on an RJ11-style 4-position/4-conductor socket.

RJ11 socket		**RS 232 Sub D – 9 Pole**	
Pin	**Function**	**Pins**	**Function**
1	Rx	3	Tx
2	0 V	5	GND
3	Tx	2	Rx
4	0 V	5	GND
		1	nc
		6	nc
		7	RTS
		8	CTS
		9	nc

Data are sent by the controller as ASCII characters

Data rate:	2400 Baud
Data bits:	8
Stop bits:	1
Parity:	none
Protocol:	Xon / Xoff

The gas level is and TWA are printed every 1s. For example:

```
Gas 20.1 TWA 0.1
```

To reset the TWA value to zero, hold the unit’s Reset pushbutton pressed for 10s, or hold the remote reset input closed for 10s, until the display shows **`tA-0`**.

INSTALLATION

Installation environment

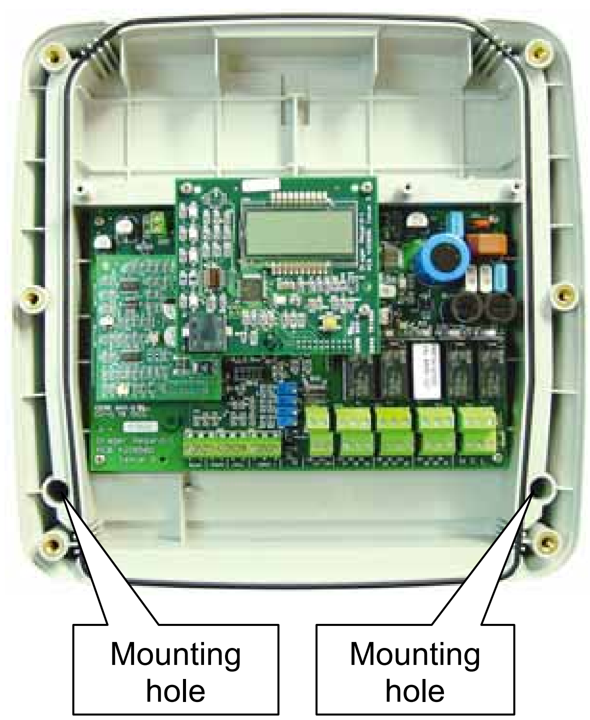
When selecting the installation place, consider the following::

- Locate the unit where the display and indicators are easily seen, and controls are accessible
- The equipment is not “explosion proof” and must not be installed in a hazardous area without additional Ex-protection.
- Avoid locations where excessive vibration is possible
- Avoid locations where aggressive or corrosive gases, contaminants or pollutants harmful to electronic equipment, are present

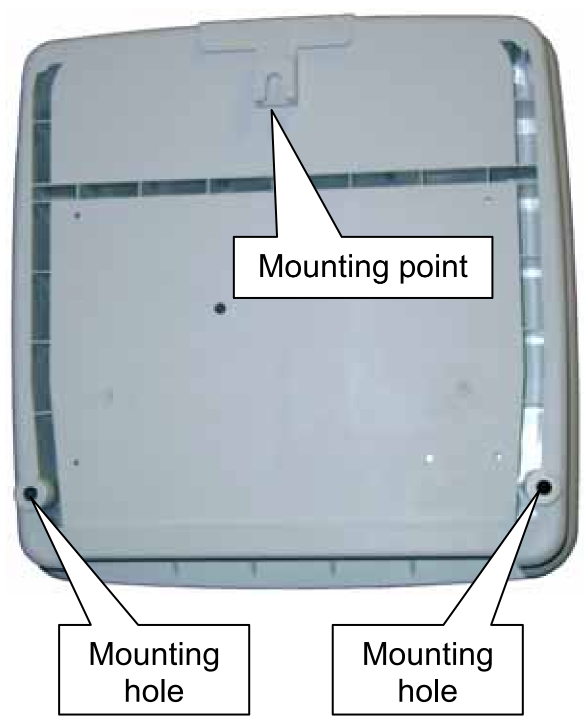
Mounting points

Mounting points of the enclosure base are shown here:

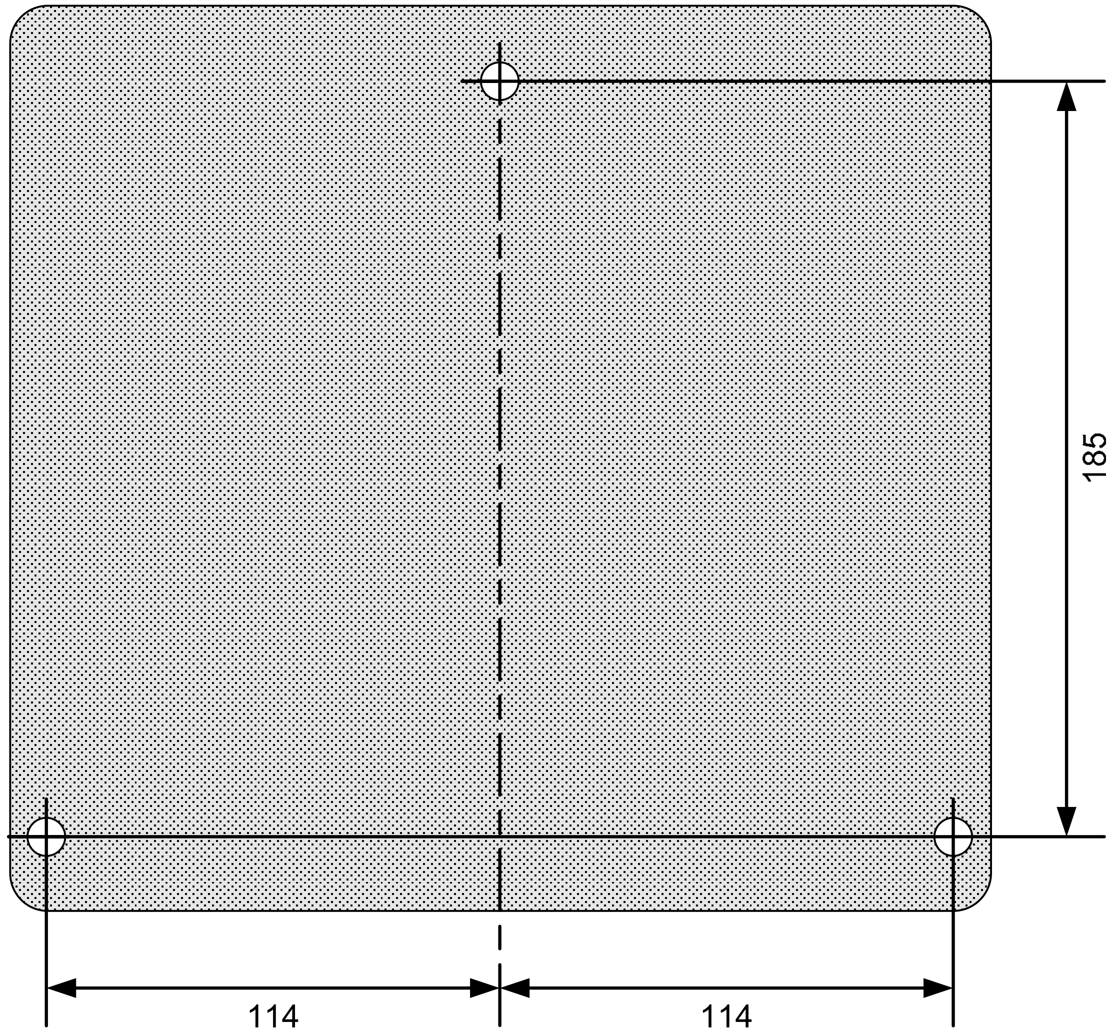
Front view



Back view



Mounting points dimensions (not to scale):



Use a hole cutter to make the cable entries. Do not attempt to “knock out” the cable entries.

AC supply

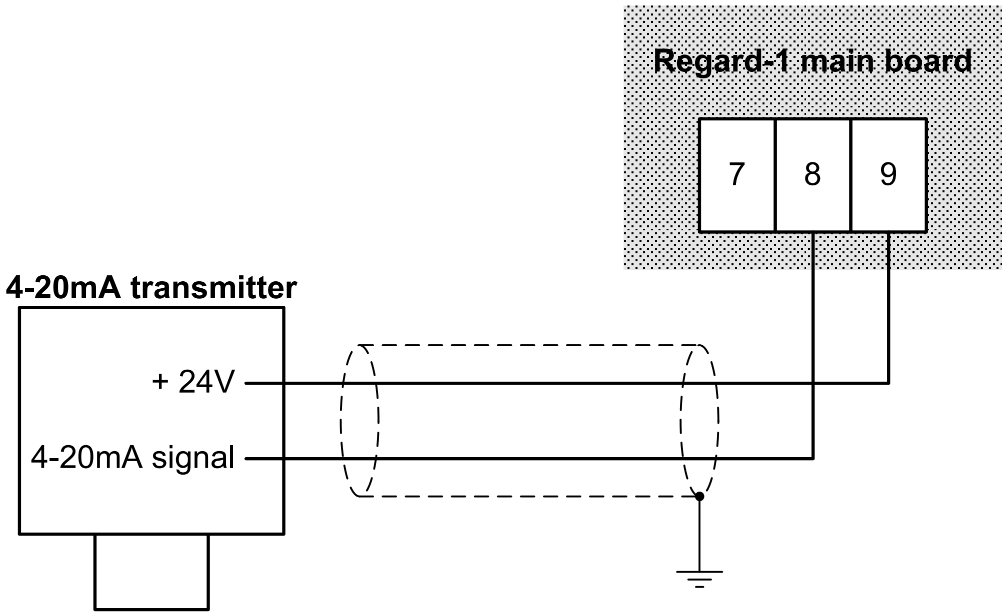
Connect a permanent AC supply to the unit.

If the AC supply to the unit is from an AC socket, the maximum allowed length of cable between the socket and the unit is 3m.

Connecting transmitters and measuring heads

Two-wire 4-20mA transmitter

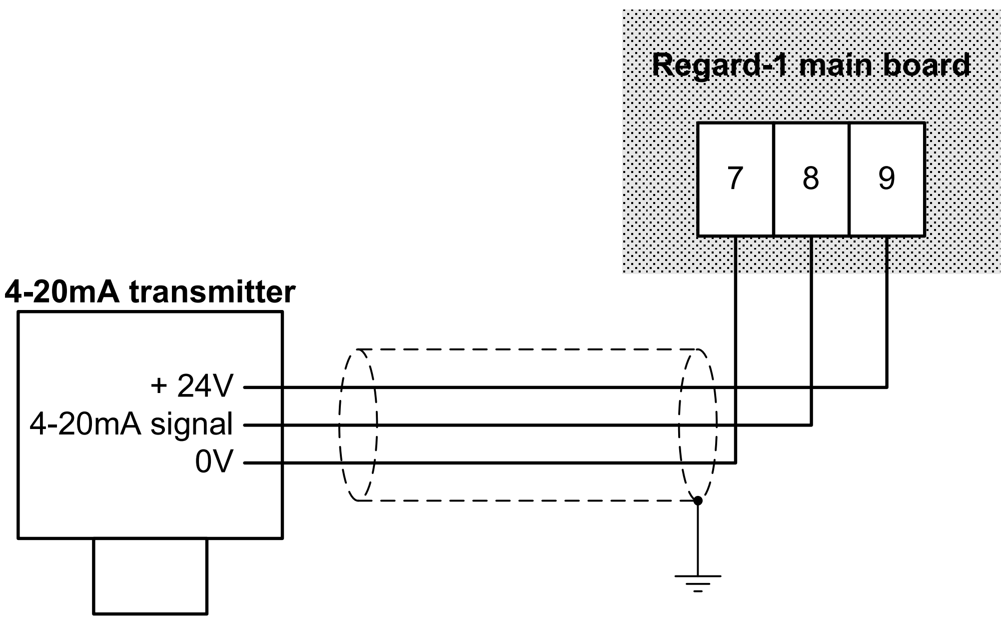
Use cable with braided copper screen.



Three-wire 4-20mA transmitter

Only for a transmitter with 4-20mA source output. Regard-1 will not work with a three-wire transmitter that has a 4-20mA sink output.

Use cable with braided copper screen.



Maximum cable resistance for three-wire transmitters

When using 3-wire transmitters, to ensure that a short circuit between the 4-20mA output and the zero volt wire at the transmitter causes a fault indication at the controller, the cable resistance must not exceed the value given by the following formula:

$$R_{cable} = \frac{800}{I_{txr}}$$

where:

R_{cable} is the resistance per core from Regard-1 to the transmitter,

I_{txr} is the transmitter operating current (in mA)

This formula assumes that the three cores of the connecting cable each have the same resistance.

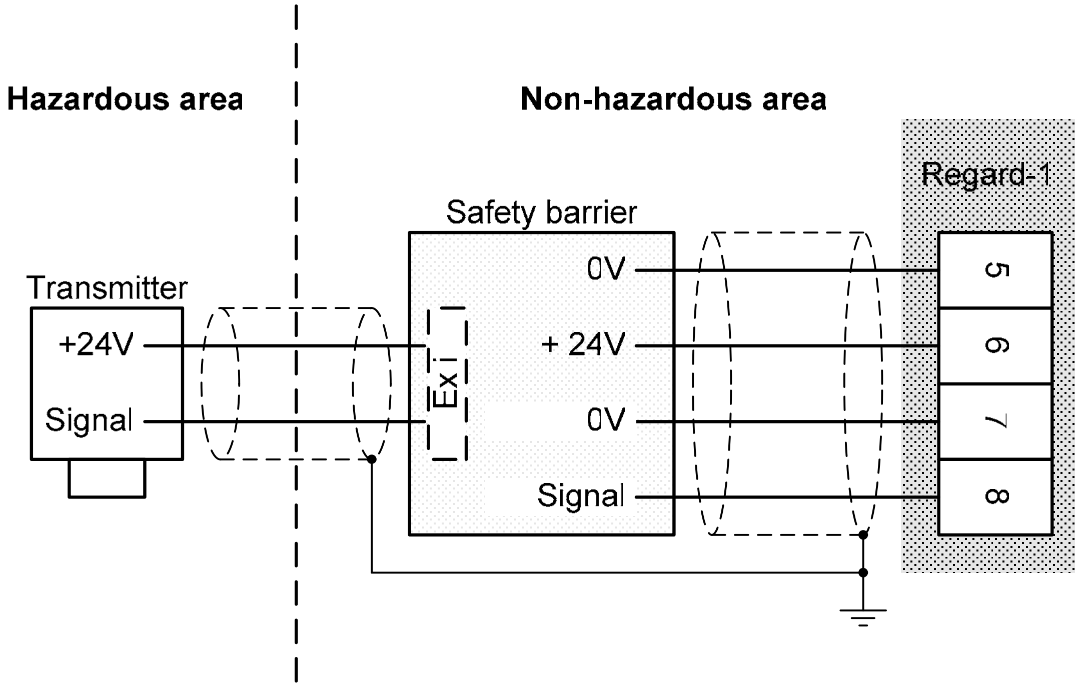
Example Polytron IR operating current at 24V is approx. 200mA. So limit of cable resistance is

$$\frac{800}{200} = 4 \text{ ohms per core}$$

Two-wire 4-20mA transmitter with safety barrier

The following diagram shows the general arrangement. Refer to specific instructions for safety barrier and transmitter for connections between transmitter and barrier, and for instruction for earthing of barrier, where necessary.

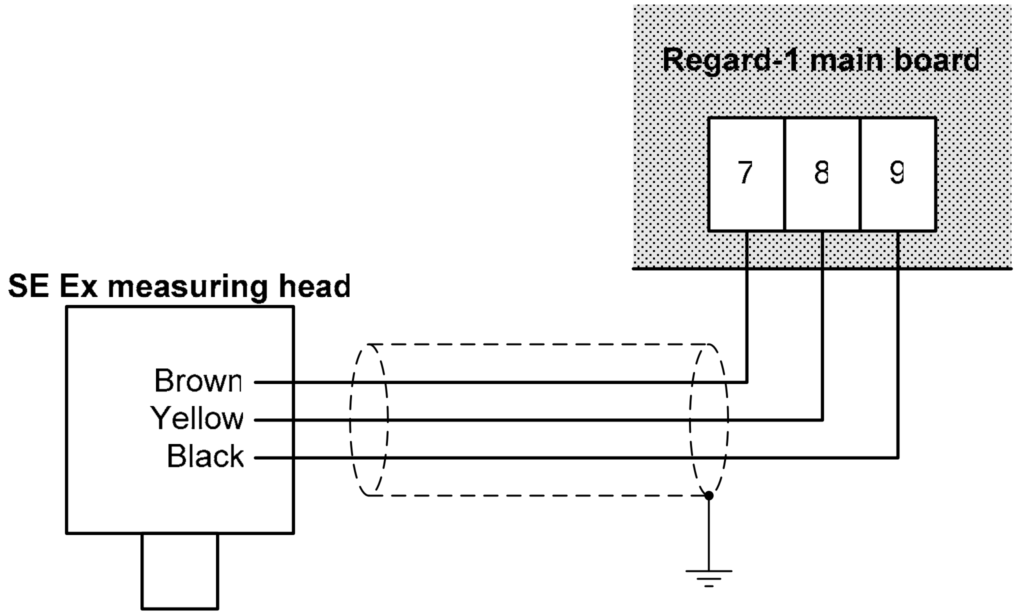
Use cable with braided copper screen.



Polytron SE Ex (Pellistor) measuring head

Use cable with braided copper screen.

Do not connect the sensor/measuring head when the controller is powered: this will damage the sensor.



Maximum cable resistance

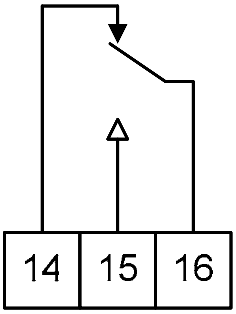
The maximum allowed cable resistance is 6 ohms per core with the Dräger SE Ex sensor. This limits the cable length according to the cross-sectional area of the cable:

Cable x-section	Maximum length
1.0 mm^2	250 m
1.5 mm^2	400 m
2.5 mm^2	700 m
4.0 mm^2	1000 m

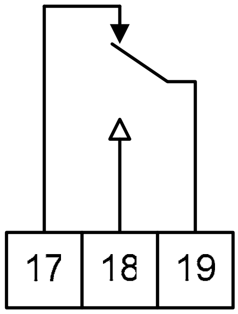
Relay outputs

Relay contacts when relays are in their normal state (ie, no alarm):

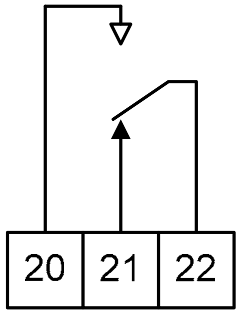
A1 relay



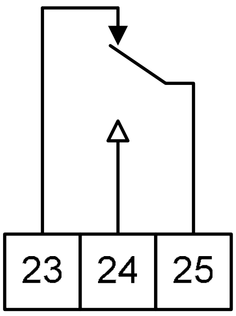
A2 relay



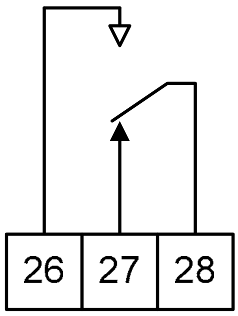
TWA relay



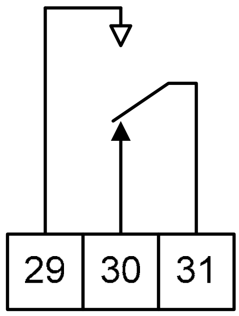
A3 relay



Fault relay



Inhibit relay



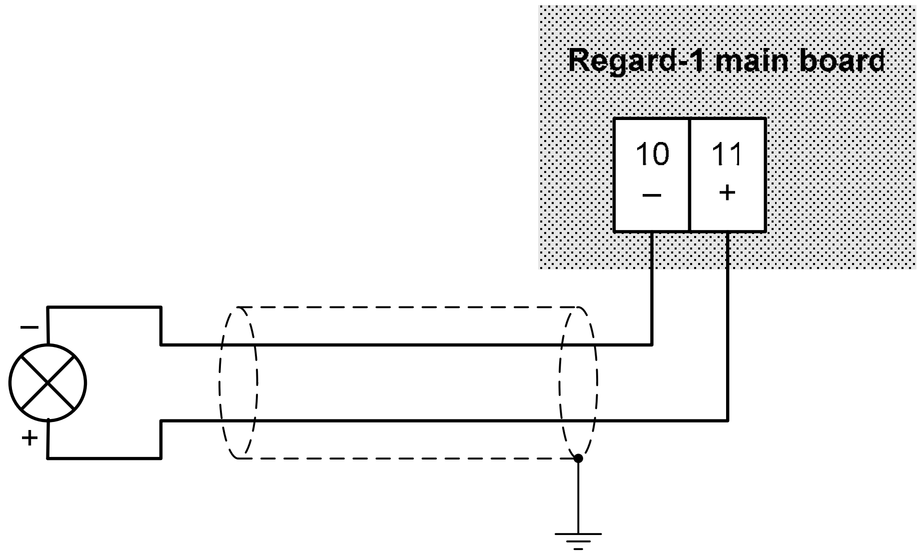
The fault relay is energised in its normal state (ie, when there is no fault)

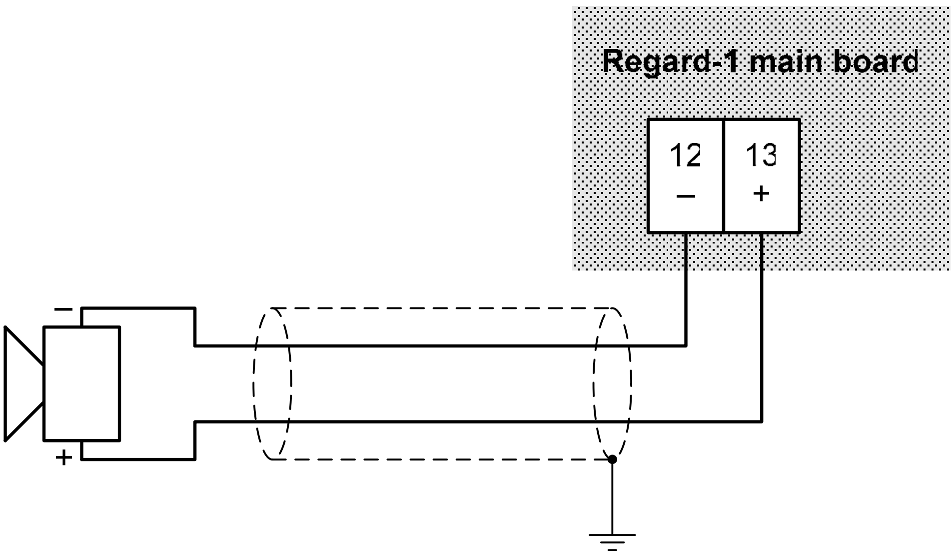
Unscreened cable can be used for relay outputs.

A1 and A2 24V “digital” outputs

The digital outputs can be used to drive alarm devices directly. Use cable with braided copper screen.

Example: flashing beacon activated by A1 alarm and klaxon activated by A2 alarm:





Output voltage and current

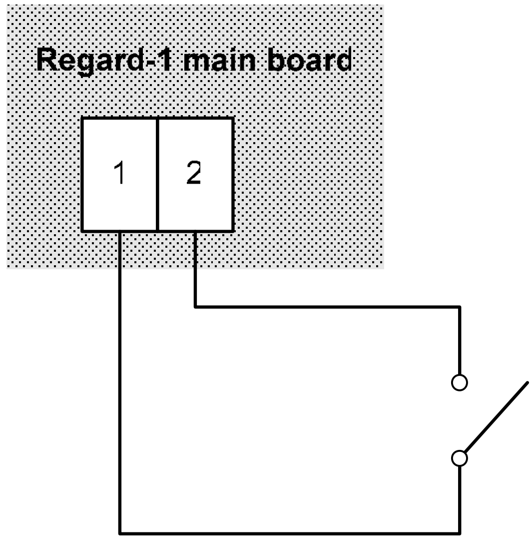
The voltage at each output decreases as the current drawn from the output increases.

Output voltage	Current available
22 V	30 mA
18 V	100 mA

Remote reset input

To acknowledge and reset alarms remotely from the controller, connect a normally-open switch to the remote reset terminals. Close the contacts momentarily to acknowledge / reset alarm(s).

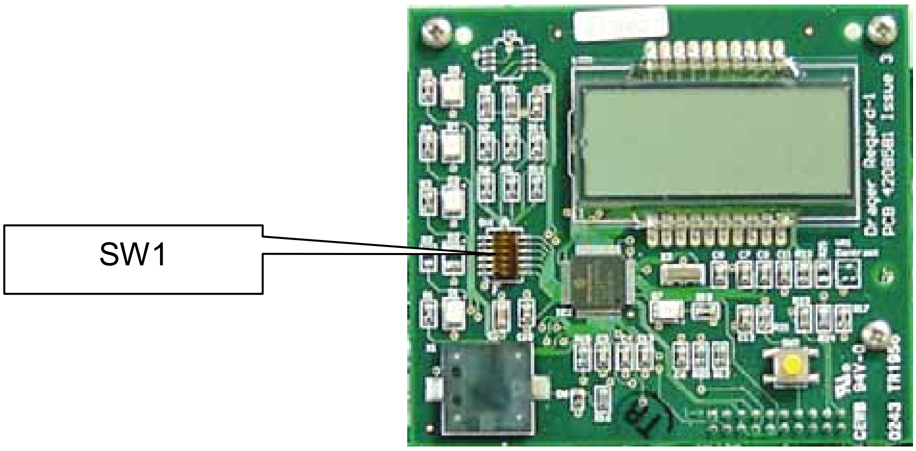
Use cable with braided copper screen.



CONFIGURATION AND CALIBRATION

Set measuring range

Use switch SW1 on the display board to set the display measuring range.



The number of decimal places is fixed according to the measuring range.

For display board with r1.00 or r2.00 firmware*, set the range using this table:

Measuring range	DPs	SW1				
		A	B	C	D	E
0 - 1	2	OFF	OFF	OFF	OFF	OFF
0 - 3	2	ON	OFF	OFF	OFF	OFF
0 - 5	2	OFF	ON	OFF	OFF	OFF
0 - 10	2	ON	ON	OFF	OFF	OFF
0 - 25	1	OFF	OFF	ON	OFF	OFF
0 - 30	1	ON	OFF	ON	OFF	OFF
0 - 50	1	OFF	ON	ON	OFF	OFF
0 - 100	1	ON	ON	ON	OFF	OFF
0 - 200	0	OFF	OFF	OFF	ON	OFF
0 - 250	0	ON	OFF	OFF	ON	OFF
0 - 300	0	OFF	ON	OFF	ON	OFF
0 - 500	0	ON	ON	OFF	ON	OFF
0 - 1000	0	OFF	OFF	ON	ON	OFF
0 - 2000	0	ON	OFF	ON	ON	OFF
0 - 2500	0	OFF	ON	ON	ON	OFF
0 - 3000	0	ON	ON	ON	ON	OFF
0 - 5000	0	OFF	OFF	OFF	OFF	ON
0 - 9999	0	ON	OFF	OFF	OFF	ON

DPs = decimal places

* The firmware version is shown on the display for a few seconds after the unit is turned on.

For display board with r1.0**1** or r2.0**1** firmware, set the range using this table:

Measuring range	DPs	SW1				
		A	B	C	D	E
0 - 1	2	OFF	OFF	OFF	OFF	OFF
0 - 3	2	ON	OFF	OFF	OFF	OFF
0 - 5	2	OFF	ON	OFF	OFF	OFF
0 - 8	2	ON	ON	OFF	OFF	OFF
0 - 10	2	OFF	OFF	ON	OFF	OFF
0 - 20	1	ON	OFF	ON	OFF	OFF
0 - 25	1	OFF	ON	ON	OFF	OFF
0 - 30	1	ON	ON	ON	OFF	OFF
0 - 50	1	OFF	OFF	OFF	ON	OFF
0 - 100	1	ON	OFF	OFF	ON	OFF
0 - 200	0	OFF	ON	OFF	ON	OFF
0 - 250	0	ON	ON	OFF	ON	OFF
0 - 300	0	OFF	OFF	ON	ON	OFF
0 - 500	0	ON	OFF	ON	ON	OFF
0 - 1000	0	OFF	ON	ON	ON	OFF
0 - 2000	0	ON	ON	ON	ON	OFF
0 - 2500	0	OFF	OFF	OFF	OFF	ON
0 - 3000	0	ON	OFF	OFF	OFF	ON
0 - 5000	0	OFF	ON	OFF	OFF	ON
0 - 9999	0	ON	ON	OFF	OFF	ON

DPs = decimal places

For all firmware versions SW1-F sets the TWA function:

SW1-F	TWA
ON	ON
OFF	OFF

Insert a card in the window above the display to show the measured gas and range. Pre-printed and blank labels are at the end of this manual.

Calibrating a 4-20 unit

(Also refer to the transmitter's operating manual for calibration instructions.)

Zero calibration

There is no zero adjustment for the 4-20 unit. The controller will indicate zero for a transmitter signal of 4mA ± 0.3mA. If necessary, calibrate the transmitter to give 4.0mA at zero gas.

Span calibration

Span calibration can be performed either by applying calibration gas to the transmitter/sensor, or by controlling the output of the transmitter directly (eg, by means of the transmitter's front panel controls) to simulate a gas signal.

- Connect a voltmeter across TP1 and TP2 on the main board:

If applying calibration gas to the transmitter:

- Apply calibration gas to the transmitter. Use a gas concentration that is between 40% and 90% of measuring range.
- Adjust potentiometer FS on the main board until the voltage across TP1 and TP2 corresponds to the gas concentration. If the controller has a display, confirm that the reading is correct.

Gas concentration (as % of measuring range)	Voltage across TP1 & TP2 (V)
40	2.08
50	2.40
60	2.72
70	3.04
80	3.36
90	3.68

Location of FS (span adjust) potentiometer:

If controlling the transmitter output:

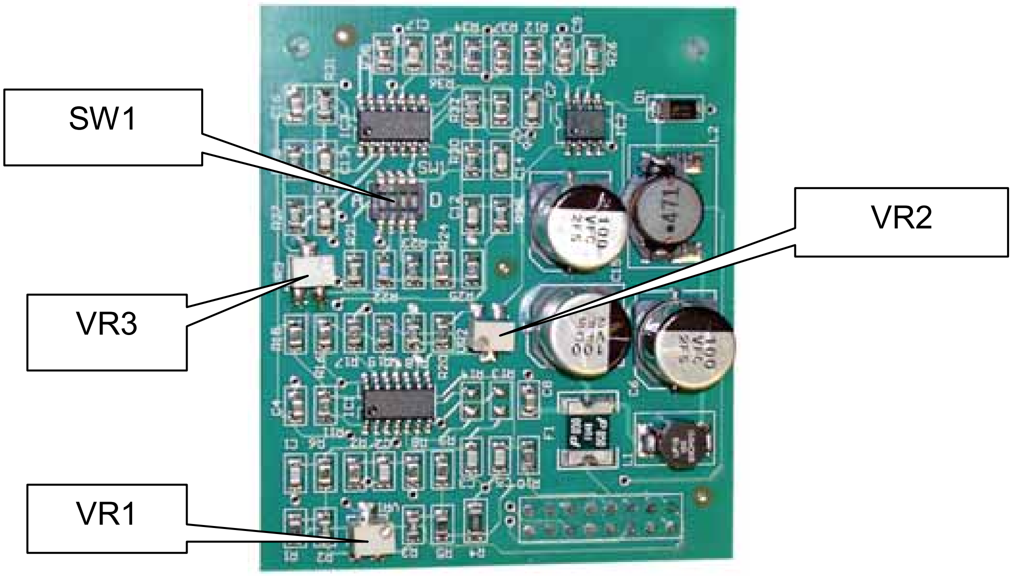
- Adjust the output of the transmitter to 20mA if possible; otherwise to a value between 12mA and 20mA.
- Adjust potentiometer FS on the main board until the voltage across TP1 and TP2 corresponds to the transmitter output. If the controller has a display, confirm that the reading is correct.

Transmitter output (mA)	Voltage across TP1 & TP2 (V)	Display reading (0 – 100 range*)
12	2.4	50
13	2.6	56
14	2.8	63
15	3.0	69
16	3.2	75
17	3.4	81
18	3.6	88
19	3.8	94
20	4.0	100

* Scale for different measuring range

Calibrating an SE Ex unit

Use the controls on the pellistor board to set sensor current, calibrate zero and calibrate span:



(Also refer to the measuring head's operating manual for calibration instructions.)

Set the sensor current

1. Set the sensor drive current range with SW1-A on the pellistor board.

For all Dräger sensors, set SW1-A to **OFF**.

Drive current range	SW1			
	A	B	C	D
95 – 195 mA	ON	–	–	–
190 – 350 mA	**OFF**	–	–	–

The position of switches B, C and D does not matter yet.

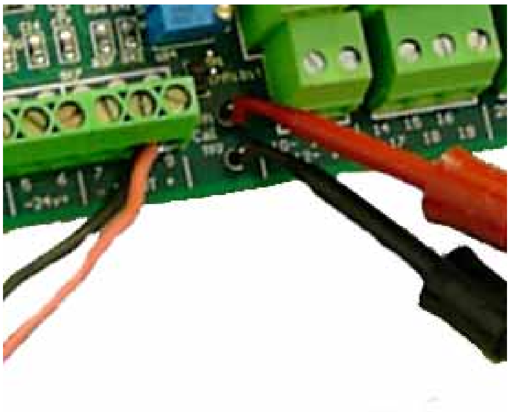
2. Adjust the sensor current to the required value

- Turn off the unit by disconnecting the AC or DC supply and batteries, if fitted
- Connect an ammeter between terminal 9 and the sensor
- Re-connect the AC or DC supply
- Adjust VR2 on the pellistor board to set the current (270.0 mA for Dräger Ex sensors). Allow two minutes for the current to settle after adjusting VR2. Re-adjust VR2 if necessary
- Disconnect power, remove the ammeter and reconnect the sensor
- Turn on power and allow sensor to settle or at least five minutes before continuing with zero and calibration

Do not connect the sensor/measuring head when the controller is powered: this will damage the sensor.

Calibrate zero

- Connect a voltmeter across TP1 and TP2 on the main board:



- Apply known clean air – free of flammable gas – or verify that no flammable gas is present at the sensor.

- Turn VR1 on the pellistor board until the voltage across TP1 and TP2 is 800mV ± 20 mV. To increase the reading, turn VR1 anti-clockwise.

- If the controller has a display, verify that it reads zero.

Calibrate span

1. Set sensitivity range

Set the amplifier gain range using switches SW1-B, -C and -D.

Range		SW1			
No.	**Sensitivity**	**A**	**B**	**C**	**D**
1	10 – 60 mV	•	ON	OFF	OFF
2	60 – 110 mV	•	OFF	ON	OFF
3	110 – 160 mV	•	OFF	OFF	ON
4	160 – 220 mV	•	OFF	OFF	OFF

- **Do not change the position of switch SW1-A.**

For new Dräger Ex sensors, range 3 (110 – 160 mV) should work for most gases. If, during calibration, the gas reading does not reach the required value use a lower-numbered sensitivity range. If the display reading is too high use a higher-numbered sensitivity range.

2. Apply calibration gas

Use a calibration gas with concentration between 40% and 60% of the measuring range.

- Apply gas using calibration adaptor at 0.5 l/min flow rate.
- Allow display reading to settle (about 2 to 3 minutes)
- Adjust VR3 on the pellistor board until the voltage across TP1 and TP2 corresponds to the concentration of the calibration gas.

Gas concentration (as % of measuring range)	Voltage across TP1 & TP2 (V)
40	2.08
45	2.24
50	2.40
55	2.56
60	2.72

- If the unit has a display, verify that the display reading corresponds to the gas concentration.

Configuring alarms

There are three gas alarms. Each alarm can be set to be

- rising or falling
- latching or non-latching

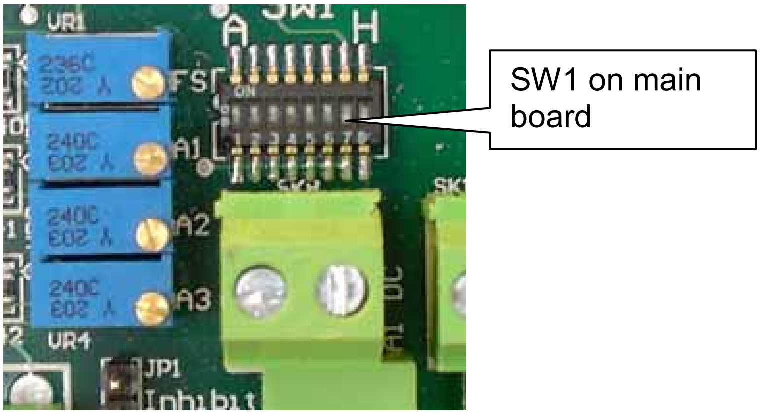
Note

Regard-1 4-20: if used with a transmitter whose output current can be below 20mA for concentrations above full scale, set the alarm relays latching.

Regard-1 SE Ex: set at least one alarm relay – the one with the highest alarm level – to be latching.

The A2 alarm can also be set to be acknowledgeable. You can use the A2 relay to control an audible alarm that you want to be able to silence even when the gas alarm is still tripped.

Use switch SW1 on the main board set the operation of the alarms/relays:



A1 alarm

Mode of operation	SW1	
	A	B
Rising Falling	ON OFF	
Non-latching Latching		ON OFF

A2 alarm

Mode of operation	SW1		
	C	D	H
Rising Falling	ON OFF		
Non-latching Latching		ON OFF	
Not acknowledgeable Acknowledgeable			ON OFF

A3 alarm

Mode of operation	SW1	
	E	F
Rising Falling	ON OFF	
Non-latching Latching		ON OFF

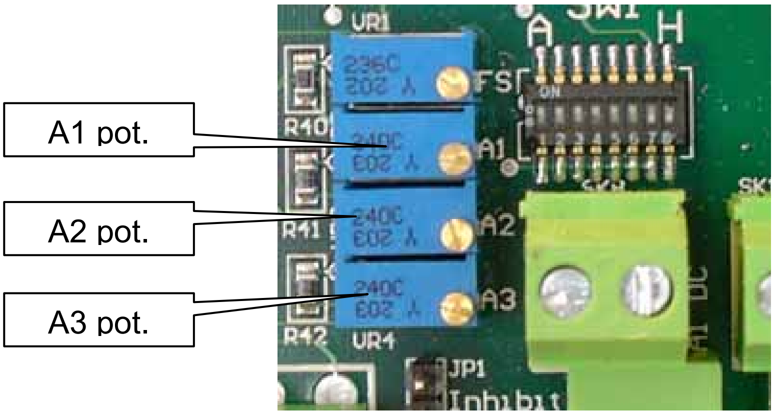
Fault alarm

Mode of operation	SW1
	G
Non-latching Latching	ON OFF

- The A1, A2 and A3 relays energise on alarm.
- The Fault relay de-energises on alarm (ie, is normally energised).

Setting alarm thresholds on 4-20 units

Use the potentiometers marked **A1**, **A2** and **A3** on the main board to set the alarm thresholds:



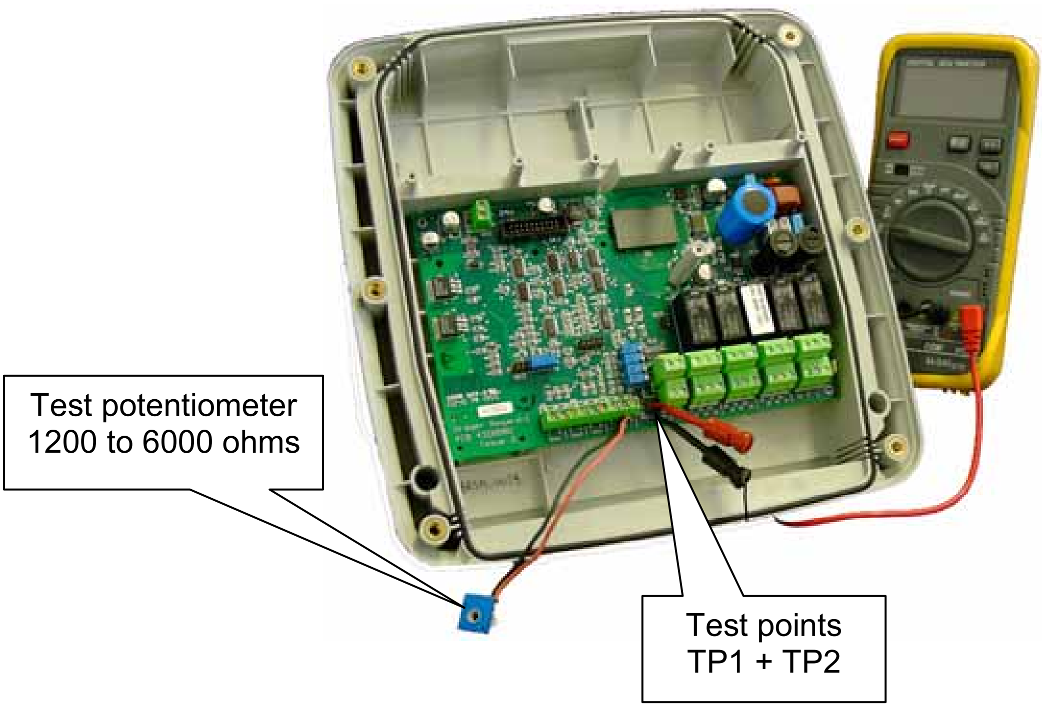
For safety relevant decisions only use status of Alarm/Fault LEDs and relays. Do not use display reading. For calibration and adjustment of alarm set points use DVM between test points TP1 and TP2 only.

To set the alarm levels you must simulate a gas signal. You can do this

- using a potentiometer that can be varied from 1200 to 6000 ohms
- by directly controlling the output of the transmitter
- using a 4-20mA loop calibrator

Using a potentiometer:

- Connect the potentiometer between terminals 8 and 9.



Using a 4-20mA **source** loop calibrator

- Connect the loop calibrator between terminals 7 and 8.

The method to set the alarm thresholds is the same for each.

To set A1 alarm

1. Turn A1 potentiometer fully clockwise
2. Adjust test pot until voltage across TP1 and TP2 is at the required threshold
3. Turn A1 pot anticlockwise until the A1 alarm trips

For the A2 and A3 alarms, repeat the above procedure with the A2 and A3 potentiometers.

- If an alarm is not required, turn its potentiometer fully clockwise.
- The fault alarm threshold is fixed at 3.2mA.

Use this table to determine the alarm threshold. Read off the voltage across TP1 and TP2 corresponding to the required alarm threshold.

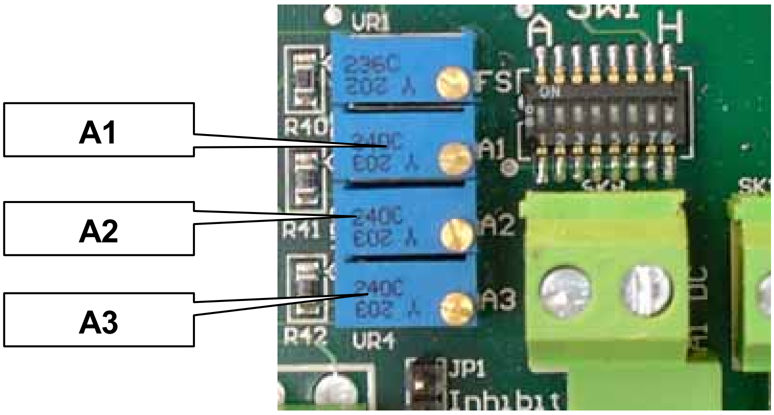
Alarm threshold (% of 0 – 100 range)	Voltage across TP1 & TP2 (V)
5%	0.96
10%	1.12
15%	1.28
20%	1.44
25%	1.60
30%	1.76
35%	1.92
40%	2.08
45%	2.24
50%	2.40
55%	2.56
60%	2.72
65%	2.88
70%	3.04
75%	3.20
80%	3.36
85%	3.52
90%	3.68
95%	3.84

For oxygen deficiency and enrichment alarms, use this table to determine alarm thresholds for a 0 – 25% range:

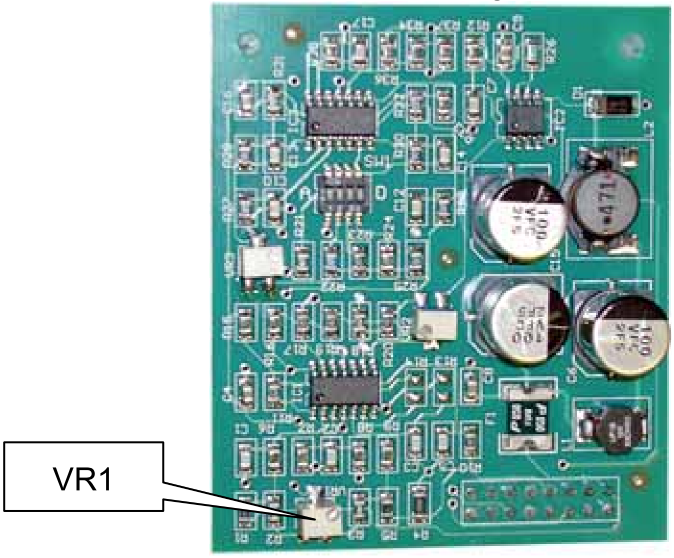
Alarm threshold	Transmitter signal (mA)	Voltage across TP1 & TP2 (V)
17%	14.9	2.98
18%	15.5	3.10
19%	16.2	3.24
20%	16.8	3.36
21%	(Normal reading)	
22%	18.1	3.62
23%	18.7	3.74
24%	19.4	3.88

Setting alarm thresholds on SE Ex units

Use the potentiometers marked **A1**, **A2** and **A3** on the main board to set the alarm thresholds:



Use VR1 <u>on the pellistor board</u> to simulate a sensor signal.



Measure the voltage across test points TP1 and TP2 to determine the alarm threshold. If the unit has a display you can use the display reading to give additional confirmation that the alarm set points are correct.

Alarm threshold (% of 0 – 100 range)	Voltage across TP1 & TP2 (V)
10%	1.12
15%	1.28
20%	1.44
25%	1.60
30%	1.76

35%	1.92
40%	2.08
45%	2.24
50%	2.40
55%	2.56
60%	2.72

Alarms below 10% and above 60% of measuring range are not recommended for flammable gas detection.

To set A1 alarm

1. Turn A1 potentiometer fully clockwise
2. Adjust VR1 until the voltage across TP1 and TP2 is at the required threshold (turn VR1 anticlockwise to increase the voltage across TP1 and TP2)
3. Turn A1 potentiometer anticlockwise until the A1 alarm trips

To set A2 alarm

1. Turn A2 potentiometer fully clockwise
2. Adjust VR1 until voltage across TP1 and TP2 is at the required threshold
3. Turn A2 potentiometer anticlockwise until the A2 alarm trips

To set A3 alarm

1. Turn A3 potentiometer fully clockwise
2. Adjust VR1 until voltage across TP1 and TP2 is at the required threshold
3. Turn A3 potentiometer anticlockwise until the A3 alarm trips

If an alarm is not required turn that alarm’s potentiometer fully clockwise.

After setting the alarm thresholds, adjust VR1 so that the voltage across TP1 and TP2 is 800 mV ± 20 mV.

Regard-1 SE Ex has a fixed fault alarm threshold at about –5% of the measuring range.

MAINTENANCE

Check the unit for operation regularly. Service the controller every 12 months.

The transmitter or measuring head may require periodic recalibration. Refer to the instruction manual for the transmitter or measuring head for guidance.

If batteries are fitted to the control unit then these batteries should be maintained in accordance with the instructions of the battery manufacturer.

Observe EN 50073 and respective national regulations.

Fault finding

	Fault	Remedy
1	Control unit non operational	Check input fuse (F6). Replace if necessary. Check third party electrical supply.
2	Display blank	Check cable connection between main circuit board and display board. Adjust contrast potentiometer on display board.
3	Self test routine fails	Replace display board
4	Under-range displayed	Check transmitter connections. Check and measure loop current. 4-20 units: Ensure links fitted to positions A, B, C, D and E of SK2 on main board
5	24 Vdc output too low	Check loading is < 100mA
6	A1 or A2 24 Vdc output too low	Check loading is < 100mA Reduce load
7	AC output failed	Check loading does not exceed 500mA Replace fuse.
8	Incorrect measuring range	Check setting of SW1 on display board
10	No TWA information	Set SW1-F on the display board to ON
11	Water ingress	Check sealing ring is in place
12	Display repeats power-on test during normal operation(1)	Replace display board

Note 1: Display board program execution is monitored by a watchdog. A watchdog reset during normal operation will cause the display to repeat its power-on self test.

SPECIFICATIONS

	Regard-1 **4-20**	Regard-1 **SE Ex**
Dimensions	270 mm × 270 mm × 90 mm	
Mass (without batteries)	Approx. 2.5 kg	
Housing material	ABS – VO	
Ingress protection	IP 65	
Cable entries	6 No. M20	
AC supply voltage	98 to 253 VAC, 50-60 Hz	
DC supply voltage	18 to 30 VDC	
Power consumption	50 W (without transmitter)	70 W (including sensor)
Mains fuses	500mA (T) HRC.	
Battery charge voltage - maximum current	27.6 ± 0.6 VDC 500 mA	
DC output	24 ± 1 VDC, 100 mA max.	
Battery type (x2)	12 V, 1.2 AH	
A1 and A2 outputs	22 VDC at 30 mA 18 VDC at 100 mA	
Alarm relays (A1, A2, A3)	single-pole changeover max. 250 VAC, 3 A max. 30 VDC, 2 A energise on alarm	
Fault relay	single-pole changeover max. 250 VAC, 3 A max. 30 VDC, 2 A normally energised (de-energise on fault)	
Inhibit relay	single-pole changeover max. 250 VAC, 3 A max. 30 VDC, 2 A energise on alarm	
Visual outputs - with display board fitted	“AC power on” LED “DC power on” LED A1, A2 and A3 alarm LEDs, Fault LED, Inhibit LED LCD gas level indicator	
Transmitter/sensor input	2- or 3-wire 4-20mA, 24 VDC / 400 mA	3-wire Pellistor constant current supply 200…350 mA
Storage conditions	–10°C to 60°C 0 to 100% rH, non-condensing	
Operating conditions	0°C to 55°C 0 to 100% rH, non-condensing	
Warm up time	30 s	
Response time	< 2 s	
Approvals and CE	Electromagnetic Compatibility (EMC) Directive	

marking	Low-voltage directive ATEX directive
Data logger RS-232 output	Format: ASCII Data rate: 2400 Baud Data bits: 8 Stop bits: 1 Parity: none Flow control: Xon / Xoff

Part numbers

Description	Part number
Regard-1 4-20	4208585
Regard-1 SE Ex	4208600
Accessories and spare parts	
Pellistor board	4208582
Options board	4208583
Lead-acid batteries (2 off)	4208586
Display board V1	4208581
Display board V2	4208636
Calibration screwdriver	4208595
PC connection lead	4208596
“Light pipes”	4208589

EC type-examination certificate

EXAM
BBG Prüf- und Zertifizier GmbH

Translation

(1) **EC-Type Examination Certificate**

(2) **- Directive 94/9/EC -**
Equipment and protective systems intended for use in potentially explosive atmospheres

(3) **BVS 03 ATEX G 011 X**

(4) **Equipment:** **Regard-1**

(5) **Manufacturer:** **Draeger Safety UK Limited**

(6) **Address:** **Blyth, Northumberland, United Kingdom**

(7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.

(8) The certification body of EXAM BBG Prüf- und Zertifizier GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The examination and test results are recorded in the test report PFG-no. 41301303P.

(9) The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

EN 61779-1:2000 + A11:2004
EN 61779-4:2000
EN 61779-5:2000
EN 50104:2002 + A1:2004
EN 50271:2001

This EC-type examination certificate covers the measuring function of this control unit, when operated with remote sensors with 4-20 mA interface, for the gases and vapours or for oxygen (measurement of inertisation) which are listed in the EC-type examination certificate of the remote sensor.
This EC-type examination certificate covers control units with software-version 1.00 (display board).

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

page 1 of 3 to BVS 03 ATEX G 011 X

Dinnendahlstrasse 9 44809 Bochum Telefon-Phone 0201/172-3947 Telefax-Fax 0201/172-3948
until 31.05.2003: Deutsche Montan Technologie GmbH, Am Technologiepark 1, 45307 Essen

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(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC.
Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

⟨Ex⟩ **II (2) G**

EXAM BBG Prüf- und Zertifizier GmbH

Bochum, dated 06. August 2004

Signed: Müller	Signed: Kiesewetter
Certification body	Special services unit

page 2 of 3 to BVS 03 ATEX G 011 X

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(13) Appendix to

(14) EC-Type Examination Certificate

BVS 03 ATEX G 011 X

(15) 15.1 Subject and type

Control unit Regard-1 when operated with remote sensors with 4-20 mA interface

15.2 Description

The control unit Regard-1 is, when operated with remote sensors with 4-20 mA interface, a fixed system for the measurement of combustible gases or vapours mixed with air, oxygen or toxic gases and vapours. One remote sensor can be operated with the control unit. The control unit is not suitable for use in potentially explosive atmospheres.

15.3 Parameters

not applicable

(16) Test and assessment report

PFG-no. 41301303P dated 06/08/2004

(17) Special conditions for safe use

see section "Special conditions for safe use according to the EC-type examination certificate BVS 03 ATEX G 011 X" in the instruction manual

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We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

44809 Bochum, 06. August 2004
PFG-Kie

EXAM BBG Prüf- und Zertifizier GmbH

Certification body	Special services unit

page 3 of 3 to BVS 03 ATEX G 011 X
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Translation

1st Supplement

(Supplement in accordance with Directive 94/9/EC Annex III number 6)

to the EC-Type Examination Certificate

BVS 03 ATEX G 011 X

Equipment: **Regard-1**

Manufacturer: **Draeger Safety UK Limited**

Address: **Blyth, Northumberland, United Kingdom**

Description

The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

EN 61779-1:2000 + A11:2004
EN 61779-4:2000
EN 50271:2001

This supplement to the EC-type examination certificate covers control units with software-version 1.01 (display board).
This supplement to the EC-type examination certificate covers the measuring function of this control unit, when operated with remote sensors with 4-20 mA interface, for the gases and vapours or for oxygen (measurement of inertisation) which are listed in the EC-type examination certificate of the remote sensor.
This supplement to the EC-type examination certificate covers the measuring function of this control unit, when operated with remote sensors type SE Ex PR M, for methane, propane, n-butane, hydrogen, ethylene, dimethyl ether, acetone, ammonia, benzene, special boiling point spirit 065/095, 1,3-butadiene, cyclopropane, diethyl ether, n-butyl acetate, ethyl acetate, ethylene oxide, methanol, ethanol, 2-propanol, n-hexane, n-octane, n-nonane, methyl ethyl ketone, propene, toluene, acetylene, n-pentane, and 1,2-propylene oxide with the measuring range 0 - 100 %LEL.

Test report

Test report PFG-no. 41301303P NI dated 07/06/2005
1. supplement to the EC-type examination certificate DMT 97 ATEX E 006 X
2. supplement to the EC-type examination certificate DMT 97 ATEX E 006 X
3. supplement to the EC-type examination certificate DMT 97 ATEX E 006 X

Dinnendahlstrasse 9 44809 Bochum Telefon-Phone 0234/3696-105 Telefax-Fax 0234/3696-110

EXAM

BBG Prüf- und Zertifizier GmbH

Special conditions for safe use

- see section "Special conditions for safe use according to the EC-type examination certificate BVS 03 ATEX G 011 X" in the instruction manual

EXAM BBG Prüf- und Zertifizier GmbH

Bochum, dated 08/06/2005

Signed: Jockers

Certification body

Signed: Kiesewetter

Special services unit

We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

44809 Bochum, 08. June 2005
PFG-Kie

EXAM BBG Prüf- und Zertifizier GmbH

Certification body

Special services unit

Dinnendahlstrasse 9 44809 Bochum Telefon-Phone 0234/3696-105 Telefax-Fax 0234/3696-110

- Display board V2.0 is not included in the scope of this type-examination.
- The options board is not included in the scope of this type-examination.

EC Declaration of Conformity

DECLARATION OF CONFORMITY

We

Draeger Safety UK Ltd
Kitty Brewster Industrial Estate
Blyth, Northumberland
NE24 4RG
England

declare that

REGARD–1

in accordance with Directive 94/9/EC (Equipment and protective systems intended for use in potentially explosive atmospheres), is in conformance with the EC-Type Examination Certificate

BVS 03 ATEX G 011 X

for equipment group and category

II (2) G

issued by

EXAM BBG Prüf- und Zertifizier GmbH
Dinnendahlstrasse 9
44809 Bochum
Germany

Notified body number 0158.

Harmonized standards:

EN 61779-1:2000 + A11:2004
EN 61779-4:2000
EN 61779-5:2000
EN 50104:2002 + A1:2004
EN 50271:2001

(Signed) D Longstaff

Technical Manager
June 2005

Front panel labels

Gas	**Methane (CH$_4$)**	A1:	%LEL
Range	0 – 100	A2:	%LEL
Unit	%LEL	A3:	%LEL

Gas	**Hydrogen sulphide (H$_2$S)**	A1:	ppm
Range	0 – 20 / 50 / 100	A2:	ppm
Unit	ppm	A3:	ppm

Gas	**Carbon monoxide (CO)**	A1:	ppm
Range	0 – 100 / 300 / 1000	A2:	ppm
Unit	ppm	A3:	ppm

Gas	**Ammonia (NH$_3$)**	A1:	ppm
Range	0 – 100 / 300 / 1000	A2:	ppm
Unit	ppm	A3:	ppm

Gas	**Oxygen (O$_2$)**	A1:	%vol rising / falling
Range	0 – 5 / 25 / 100	A2:	%vol rising / falling
Unit	%vol	A3:	%vol rising / falling

Gas		A1:	
Range		A2:	
Unit		A3:	

Gas		A1:	
Range		A2:	
Unit		A3:	

Draeger Safety UK Ltd
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Fax +44 1670 544475

Manual part number 4208591

This manual supersedes and replaces the following manuals:
4208603 issue 1
4208591 issue 5

For use with display board firmware r1.00 and r1.01.