

## Dräger REGARD-1

### Single-channel controller

en Installation, operation and maintenance guide





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## For your safety

	<p><b>NOTE</b></p> <p><b>Observe the instructions for use</b></p> <p><b>Follow the instructions for installation, operation and maintenance.</b></p>
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### **maintenance**


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

Repairs of this device may only be carried out by competent personnel.

We recommend that either a Dräger Safety training course or a DrägerService service contract be obtained and that all repairs are carried out by DrägerService.

Refer to EN 50073 and/or local regulations.

Concerning transmitter or measuring head operation and maintenance, refer to the transmitter operating manual or to the measuring head information.

	<p><b>WARNING!</b></p> <p><b>Not for use in areas where explosion hazards are possible</b></p> <p><b>This device is not approved or certified for installation in potentially explosive atmospheres.</b></p>
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### **Liability for proper function or damage**

Liability for proper function of the device 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.

*For your safety*

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 4-20 mA 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 initiation of countermeasures.
- Indication of time-weighted average value, time-weighted average alarm output and data logger (requires optional RS-232/TWA alarm circuit 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 initiation of countermeasures.
- Indication of time-weighted average value, time-weighted average alarm output and data logger (requires optional RS-232/TWA alarm circuit board).

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

Both devices are suitable for use in residential, commercial and industrial environments.

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

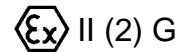
## CE marking and ATEX approval

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 control unit also bears the following ATEX marking:



	<p><b>WARNING!</b></p> <p><b>THIS MARKING DOES NOT MEAN THAT THE UNIT IS “EXPLOSION PROOF”.</b></p> <p><b>Regard-1 cannot be used in areas subject to explosion hazards (“hazardous areas”) without suitable protection.</b></p>
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## 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:

<p><b>NOTE</b></p> <p><b>Read and consider chapter 5 of the "Bericht über die Eignungsuntersuchung".</b></p>
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## **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 check procedures. Do not expose the device 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. Use a voltmeter between test points TP1 and TP2 for calibration and adjustment of alarm set points.

### **Regard-1 4-20:**

The alarm relays must be set latching when using transmitters with an output current which can fall below 20 mA for concentrations above full scale.

### **Regard-1 SE Ex:**

As a minimum, the relay of the main alarm (highest alarm threshold value) must be set latching.

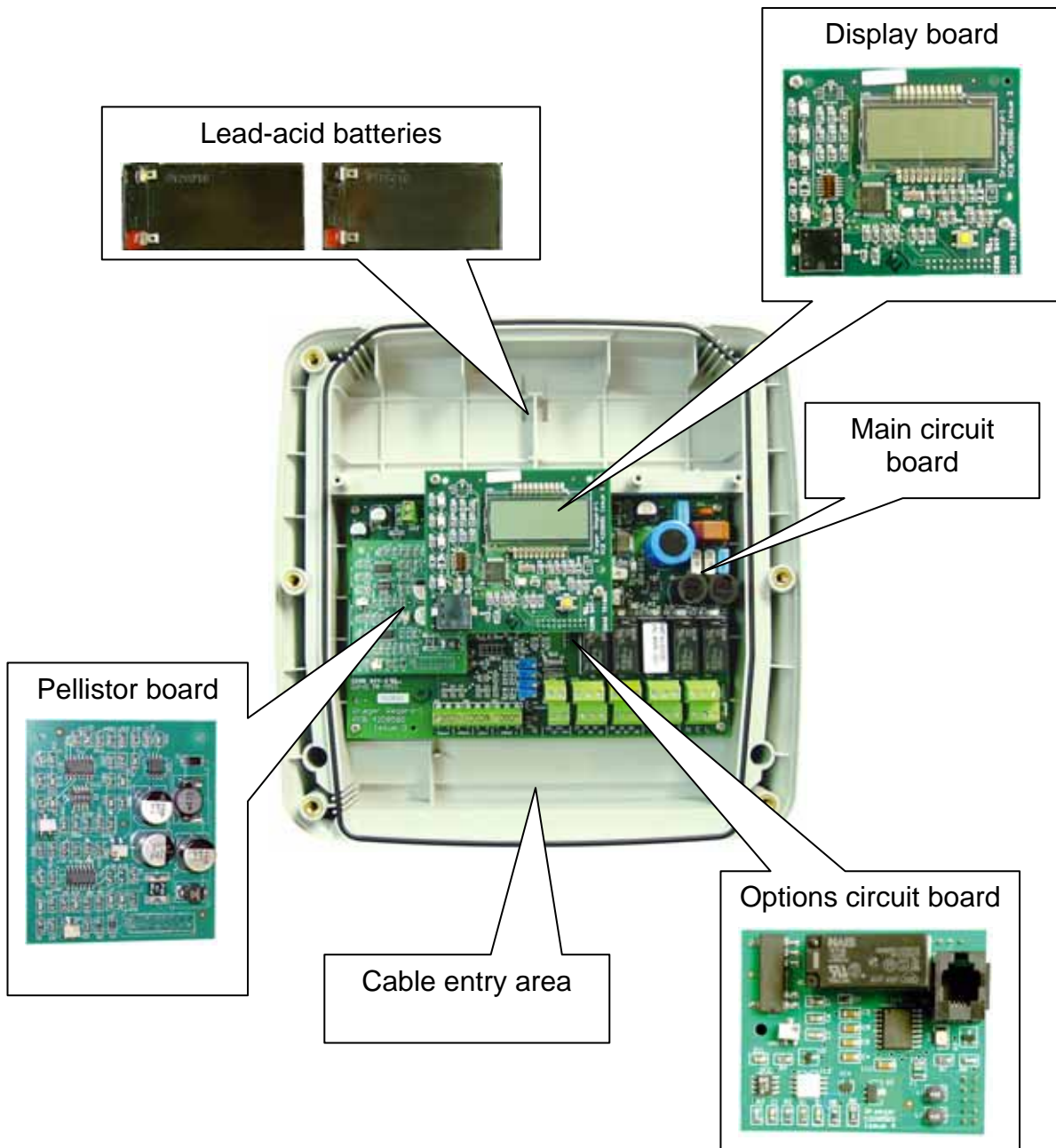
*Description*

## Description

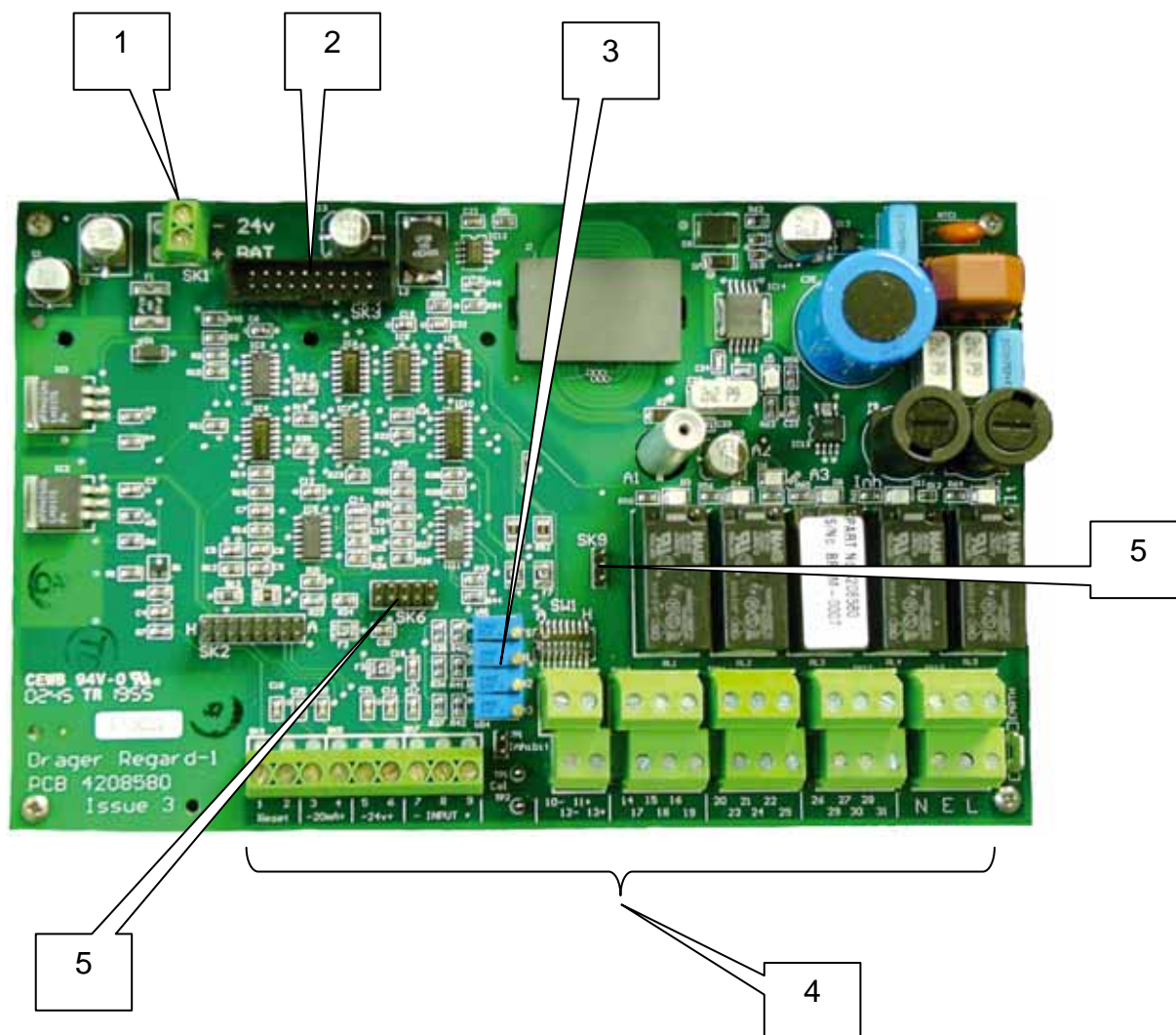
The device is available in two versions: 4-20 mA or SE Ex, with or without gas level display.

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

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



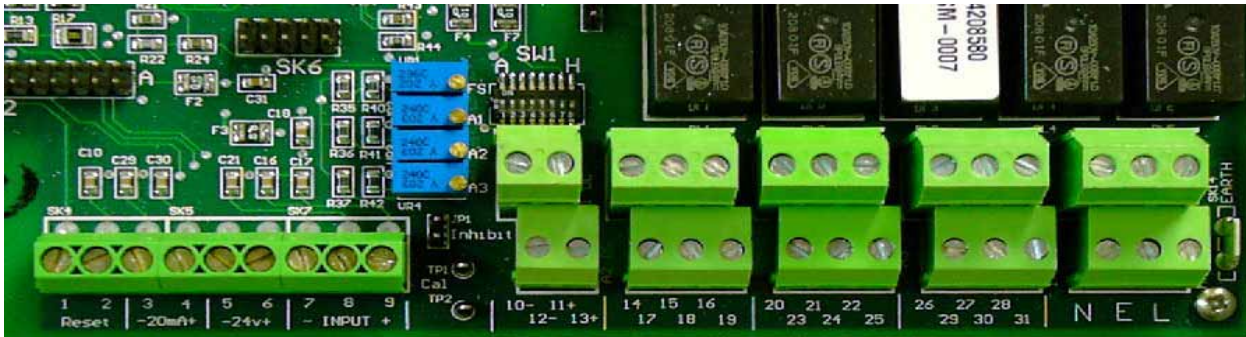
## Main circuit board



1. Terminals for batteries or external DC input.
2. Connector for display board.
3. Potentiometers for A1 – A3 alarms and display adjustment.
4. Field device connecting terminals.
5. Connector for options circuit board.

Description

**Field device connecting terminals**



No.	Function
1      2 Reset	External reset input
3      4 - 20 mA +	4-20 mA output (requires options circuit board)
5      6 - 24 V +	24 VDC output for safety barrier (100 mA max.)
7    8    9 - Input +	4-20 mA transmitter or SE Ex sensor input
10- 11+ 12- 13+	A1 24 V switched output (100 mA max.) A2 24 V switched output (100 mA max.)
14 15 16 17 18 19	Alarm 1 relay output Alarm 2 relay output
20 21 22 23 24 25	TWA relay output (requires options circuit board) A3 relay output
26 27 28 29 30 31	Fault relay output Inhibit relay output
N E L	98 – 253 VAC output (500 mA 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 12 V/1.2 AH 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.

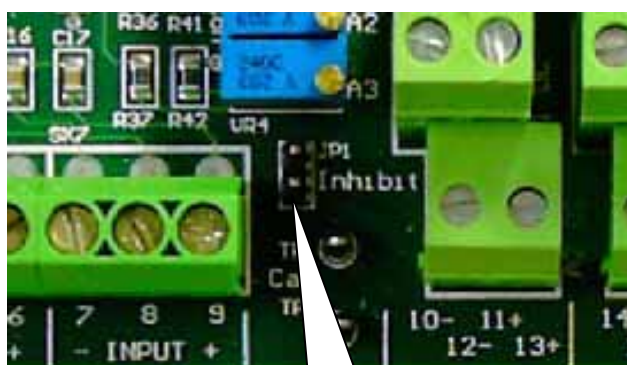
The 24 V battery terminals can also be used for an external 24 VDC input.



### WARNING!

Do not connect AC and DC supplies at the same time.

## Maintenance inhibit jumper

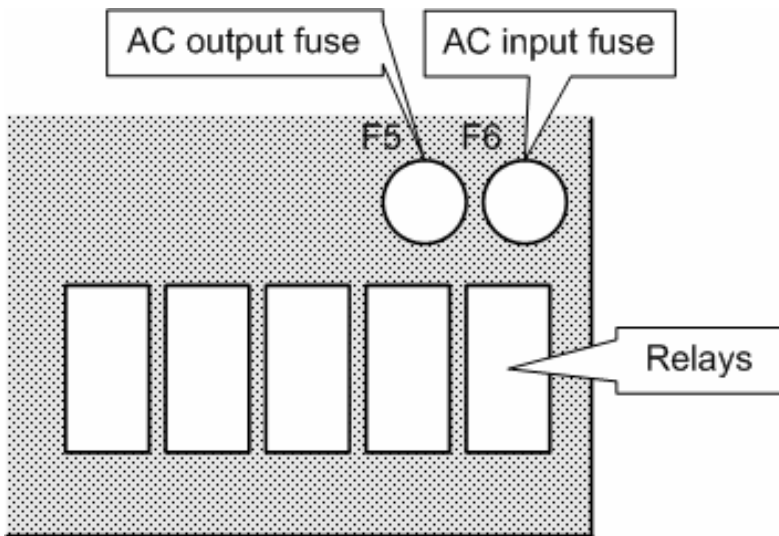


Maintenance

When the maintenance inhibit jumper is fitted, all relays will go to their normal state and all alarms are blocked.

## Description

### 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.

## Description

### 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. A label showing the required information can be inserted in the slot inside of the front cover. Pre-printed and blank labels are at the end of this manual.

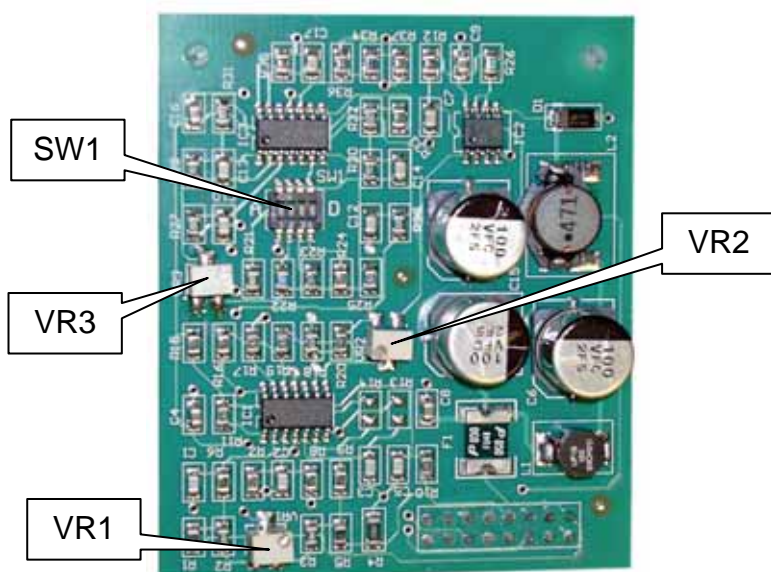
### Pellistor board

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 circuit board
- Fit the pellistor board onto SK2

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



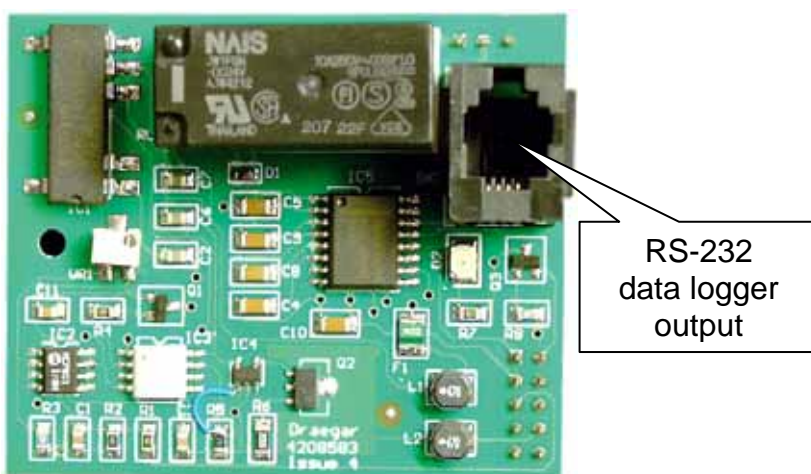
- SW1 Sets sensor current range and amplifier range
- VR1 Sets zero point
- VR2 Sets gain (span)
- VR3 Sets sensor current

## Options circuit board

The options circuit board provides:

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

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



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

The RS-232 datalogger output is on an RJ11 socket with four conductors.

*Description*

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

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 once every second. Example:

**Gas 20.1 TWA 0.1**

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

## Installation

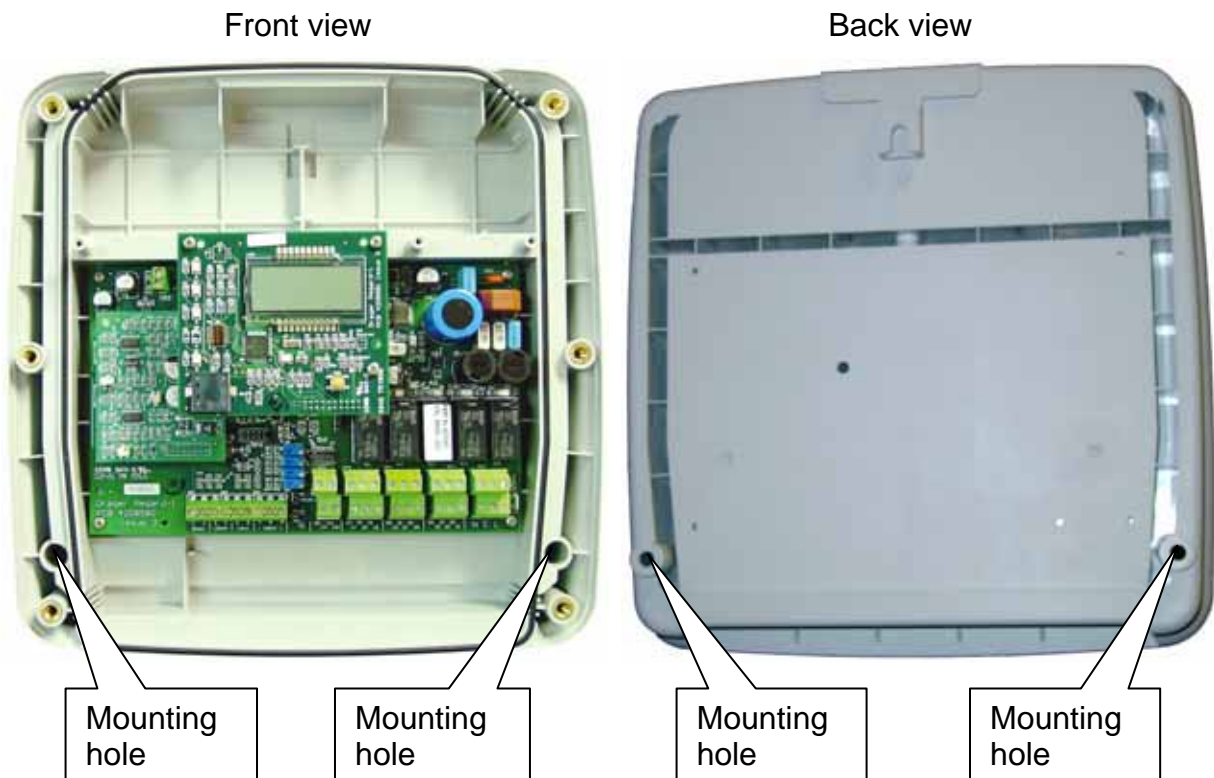
### Installation environment

When selecting the installation place, consider the following:

- Locate the device where the display and indicators are easily seen, and controls are accessible
- The device is not “explosion proof” and may 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.

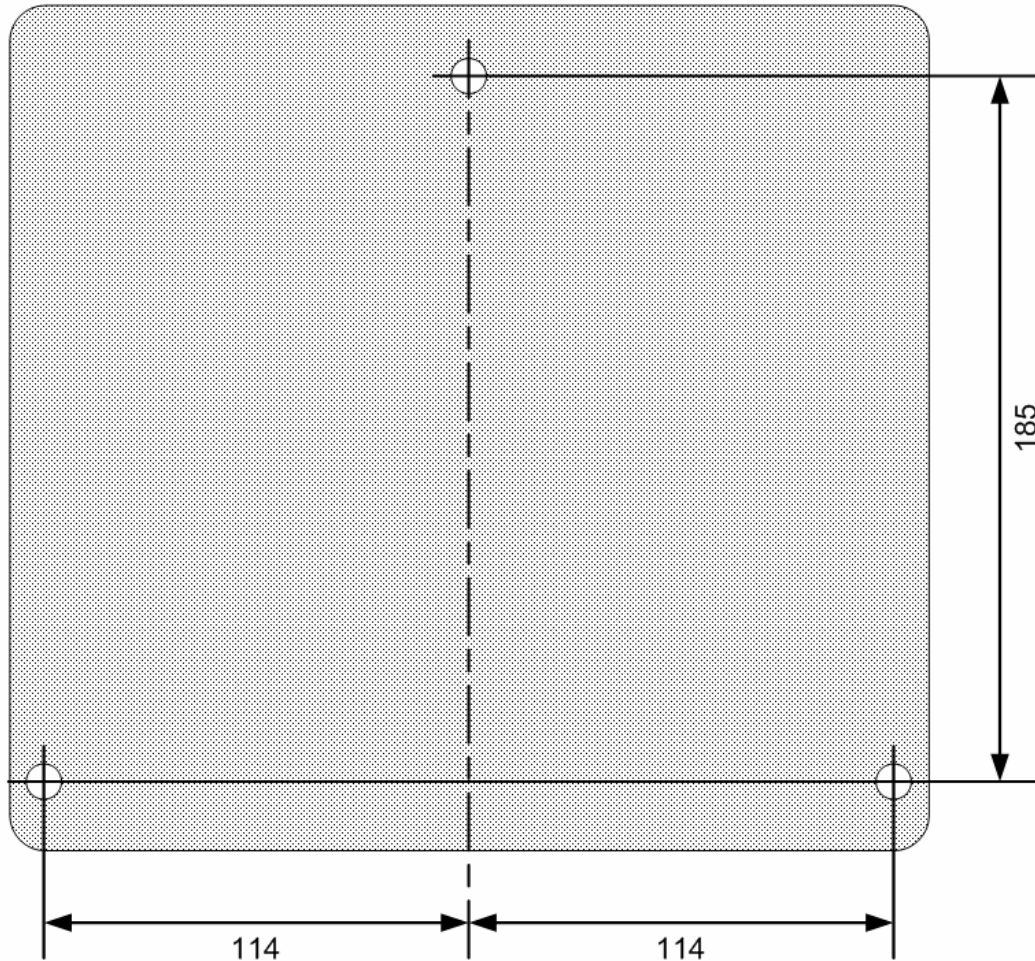
### Mounting points

Mounting points of the enclosure base are shown here:



## Installation

Mounting points dimensions (not to scale):



### NOTE

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

## AC supply

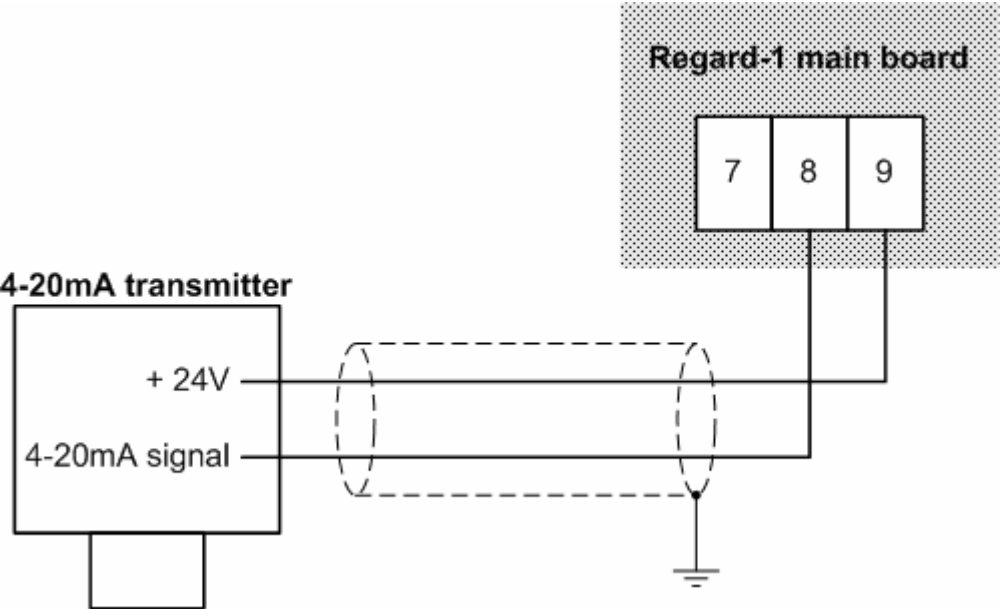
Connect a permanent AC supply to the device.

If the AC supply to the device 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 4-20 mA transmitter

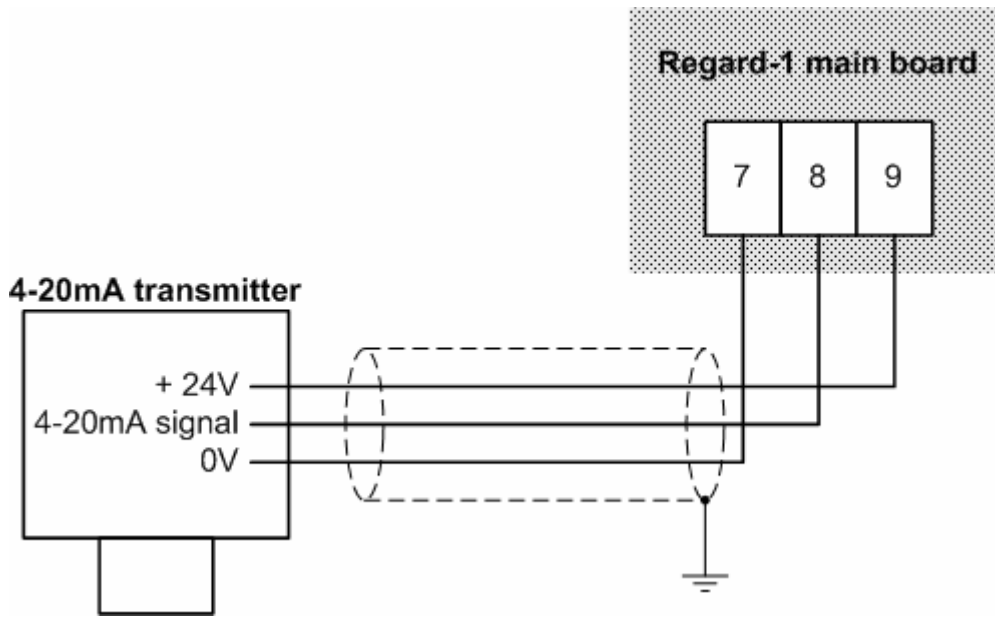
	<b>NOTE</b> Use cable with braided copper screen.
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### Three-wire 4-20 mA transmitter

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

	<b>NOTE</b> Use cable with braided copper screen.
--	--



### Maximum cable resistance for three-wire-transmitters

When using three wire transmitters a short circuit between the 20 mA output and the zero volt wire at the transmitter must cause a fault indication at the controller. The cable resistance may not exceed the value given by the following formula:

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

where:

$R_{\text{cable}}$  is the resistance per core from Regard-1 to the transmitter (in ohms),

$I_{\text{txr}}$  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 24 V is approx. 200 mA. So limit of cable resistance is

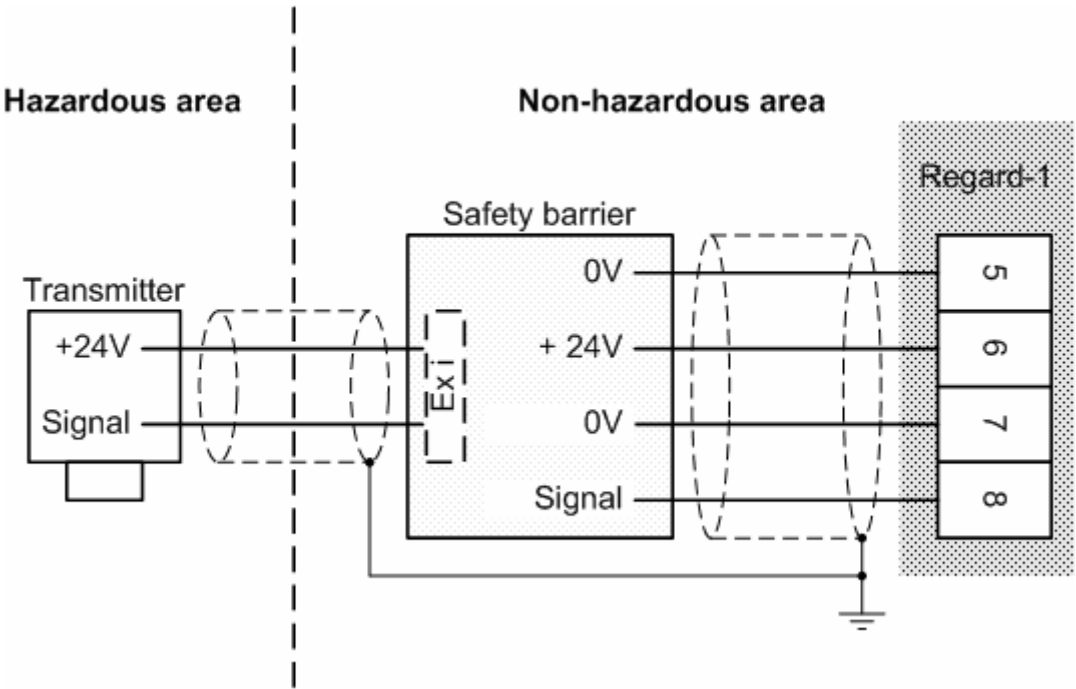
$$\frac{800}{200} = 4 \text{ ohms per core.}$$



### Two-wire 4-20 mA 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.

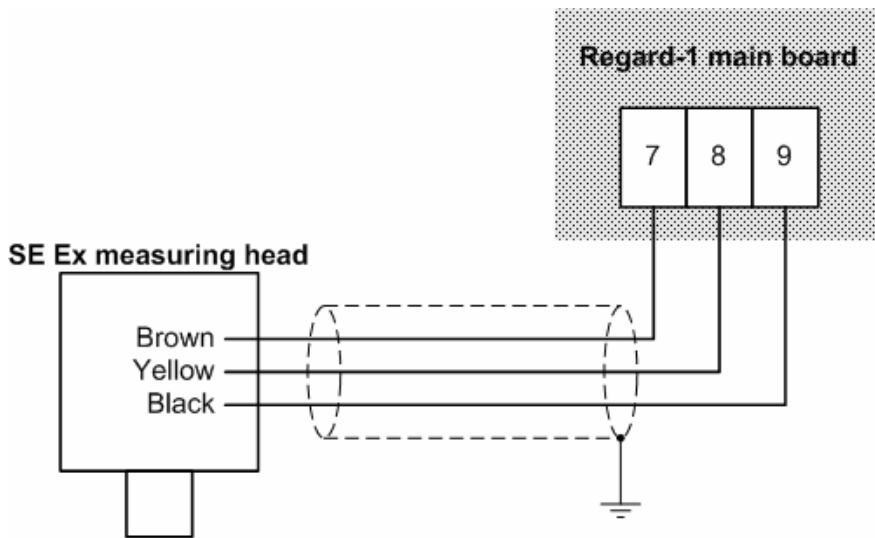
<b>NOTE</b> Use cable with braided copper screen.
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## Polytron SE Ex (Pellistor) measuring head

	<b>NOTE</b> Use cable with braided copper screen.
--	--

	<b>CAUTION!</b> Do not connect the sensor/measuring head when the controller is powered: this will damage the sensor.
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### Maximum cable resistance

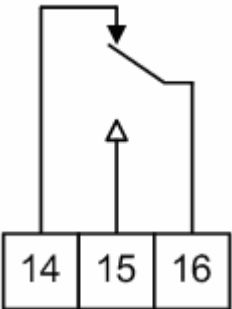
The maximum allowed cable resistance is 7 ohms per core with the Dräger SE Ex sensor. This limits the cable length according to the cross-sectional area of the cable:

Cable x-section	Maximum length
1.0 mm <sup>2</sup>	300 m
1.5 mm <sup>2</sup>	500 m
2.5 mm <sup>2</sup>	850 m
4.0 mm <sup>2</sup>	1200 m

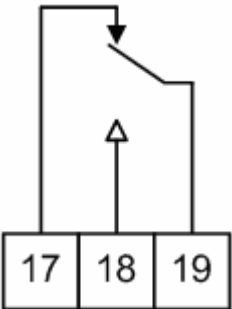
## Relay outputs

Relay contacts when relays are in their normal state (i. e., no alarm):

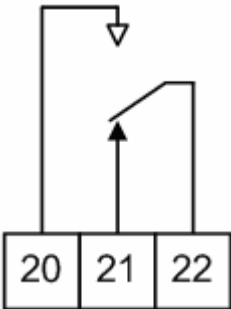
**A1 relay**



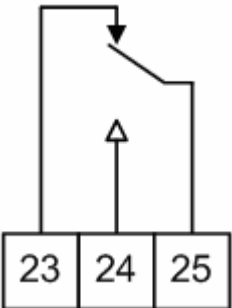
**A2 relay**



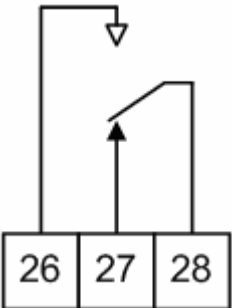
**TWA relay**



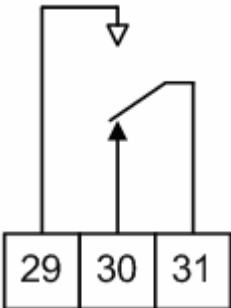
**A3 relay**



**Fault relay**



**Inhibit relay**



The fault relay is energised in its normal state (i. e., when there is no fault).

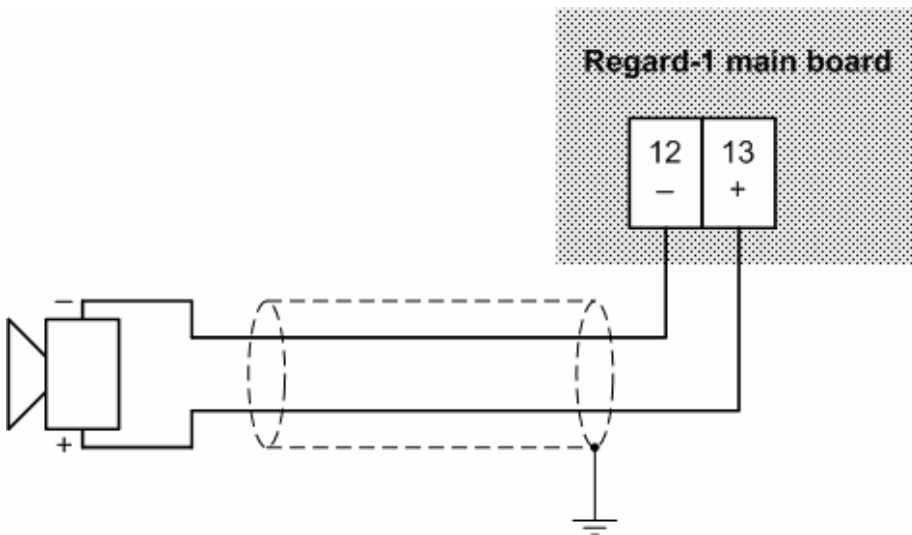
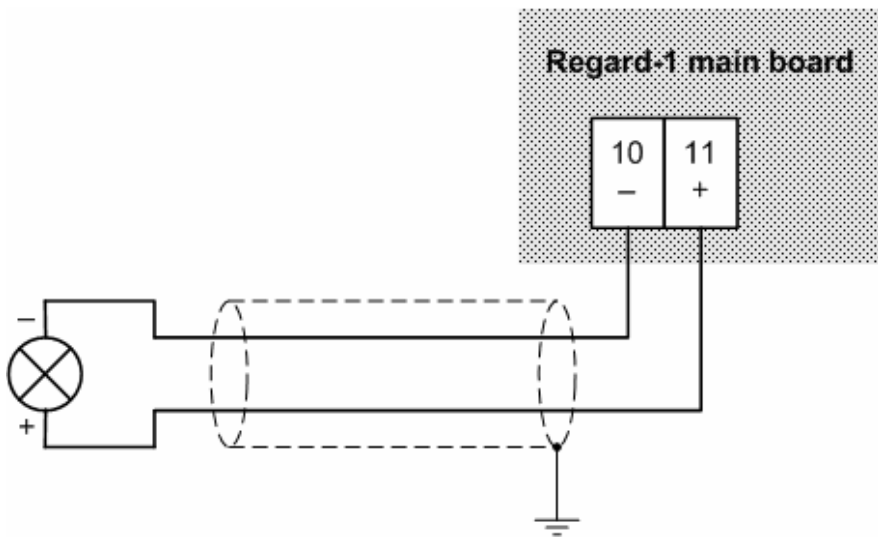
Unscreened cable can be used for relay outputs.

## 24 V digital outputs for A1 and A2

**NOTE**

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**

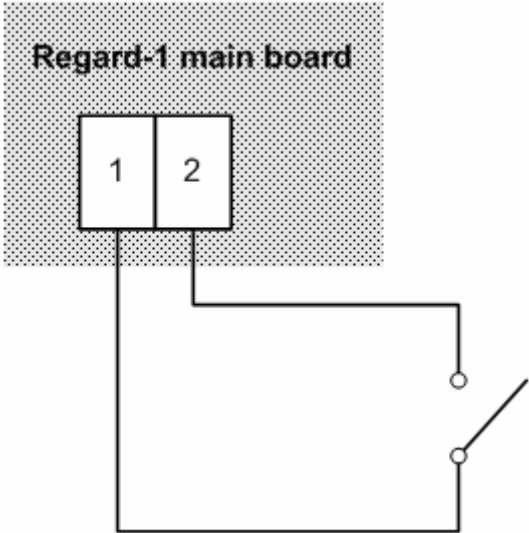
The voltage at the output decreases as the current drawn from the output increases.

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).

**NOTE**  
Use cable with braided copper screen.

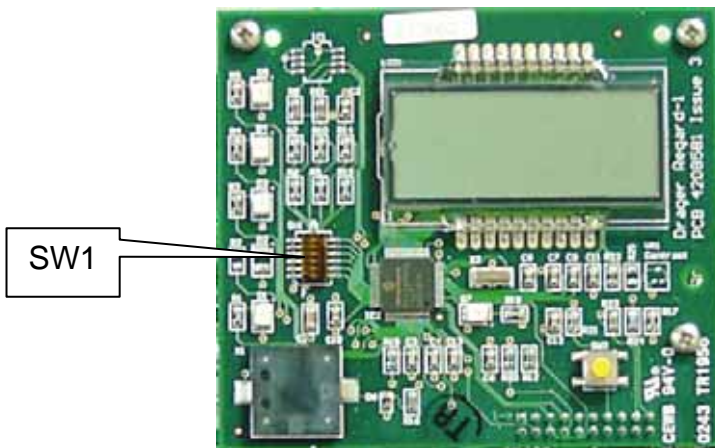


## Configuration and calibration

### Set measuring range

**NOTE**

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 version 1.00 or 2.00 firmware\*, set the measuring 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 device is turned on.

*Configuration and calibration*

For display board with version 1.01 or 2.01 firmware\*, set the measuring 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



The SW1-F switch sets the TWA function for all firmware versions:

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

<b>NOTE</b> For further information, please refer to the calibration instructions in the transmitter's operating manual.
---

### Zero calibration

There is no zero adjustment for the 4-20 unit. The controller indicates zero for a transmitter signal of  $4 \text{ mA} \pm 0.3 \text{ mA}$ . If necessary, calibrate the transmitter to give 4.0 mA at zero gas.

### Span calibration

Span calibration can be performed either by applying calibration gas to the transmitter / sensor or by changing the output signal of the transmitter, to simulate a gas signal. Observe the transmitter manual.

## Configuration and calibration

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

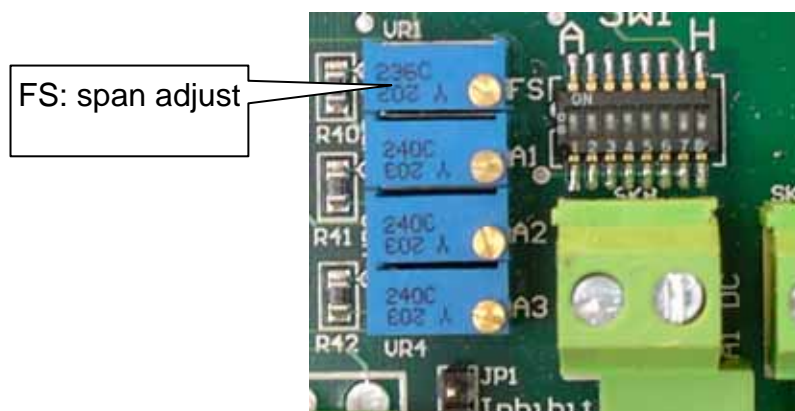


### If applying calibration gas to the transmitter:

- Apply calibration gas to the transmitter. Use a gas concentration that is between 40% and 90% of measuring range. The transmitter must be correctly calibrated.
- Adjust potentiometer FS on the main circuit 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:**



**When simulating a gas level:**

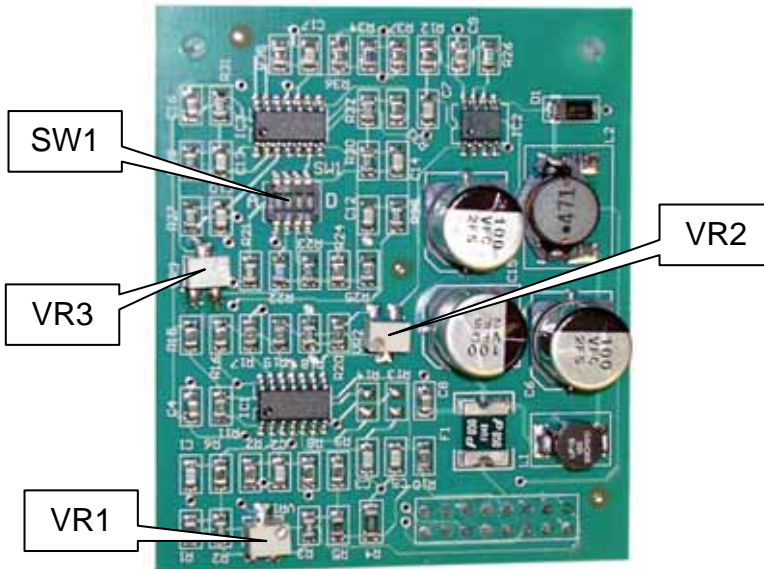
- If possible, adjust the output of the transmitter to 20 mA or to a value between 12 mA and 20 mA.
- Adjust potentiometer FS on the main circuit board until the voltage across TP1 and TP2 corresponds to the transmitter output. If the controller has a display, confirm that the reading is correct.

Transmitter signal (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:



### NOTE

For further information, please refer to the calibration instructions in the measuring head's operating manual.

## Set the sensor current

1. Use the SW1-A switch on the pellistor board to set the sensor current.


### NOTE

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 device by disconnecting the device's AC or DC supply or remove batteries, if fitted.
  - Connect an ammeter between terminal 9 and the sensor
  - Reconnect 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. Readjust 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

	<p><b>CAUTION!</b></p> <p><b>Do not connect the sensor/measuring head when the controller is powered: this will damage the sensor.</b></p>
---	--

## Zero calibration

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



- Make sure that the ambient air is free of measured gas and other interfering gases which could influence the sensor.
- Turn VR1 on the pellistor board until the voltage across TP1 and TP2 is  $800 \text{ mV} \pm 20 \text{ mV}$ . To increase the reading, turn VR1 anti-clockwise.
- If the controller has a display, verify that it reads zero.

## Calibrate span

### 1. Calibrate 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

**WARNING!**

**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 device has a display, verify that the display reading corresponds to the gas concentration.

## Configuring alarms

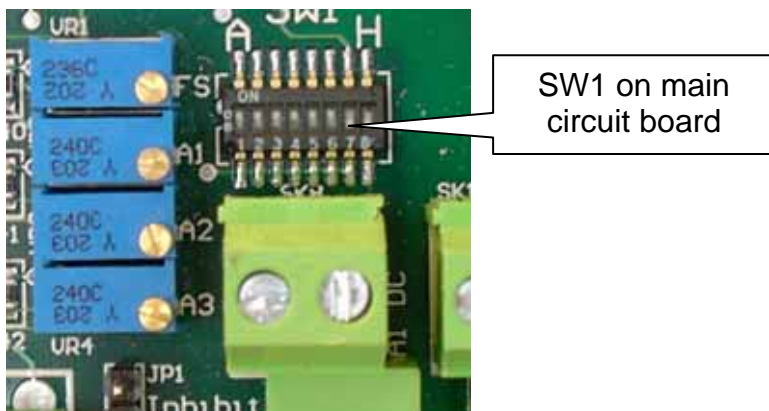
There are three gas alarms. Each alarm can be set to be

- rising or falling
- latching or non-latching

<p><b>NOTE</b></p> <p><b>Regard-1 4-20:</b></p> <p>The alarm relays must be set latching when using transmitters with an output current which can fall below 20 mA for concentrations above full scale.</p> <p><b>Regard-1 SE Ex:</b></p> <p>As a minimum, the relay of the main alarm (highest alarm threshold value) must be set latching.</p>
--

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 circuit board set the operation of the alarms/relays:



### A1 alarm

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

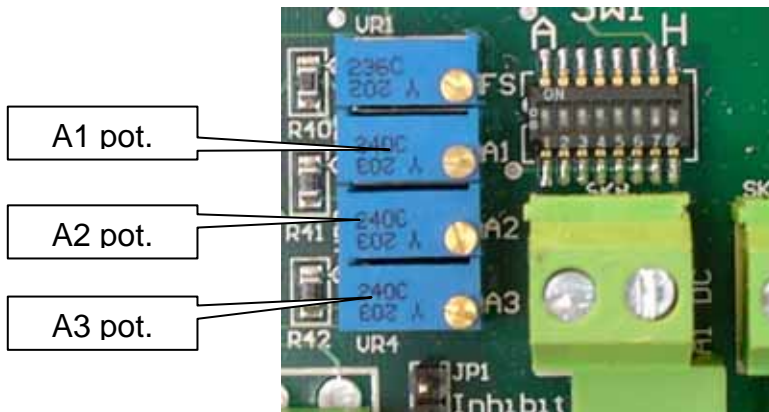
### Fault alarm

Mode of operation	SW1
	G
Non-latching Latching	ON OFF

- The A1, A2 and A3 relays are energised on alarm.
- The fault relay de-energises on alarm.

## Setting alarm thresholds on 4-20 units

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



### **WARNING!**

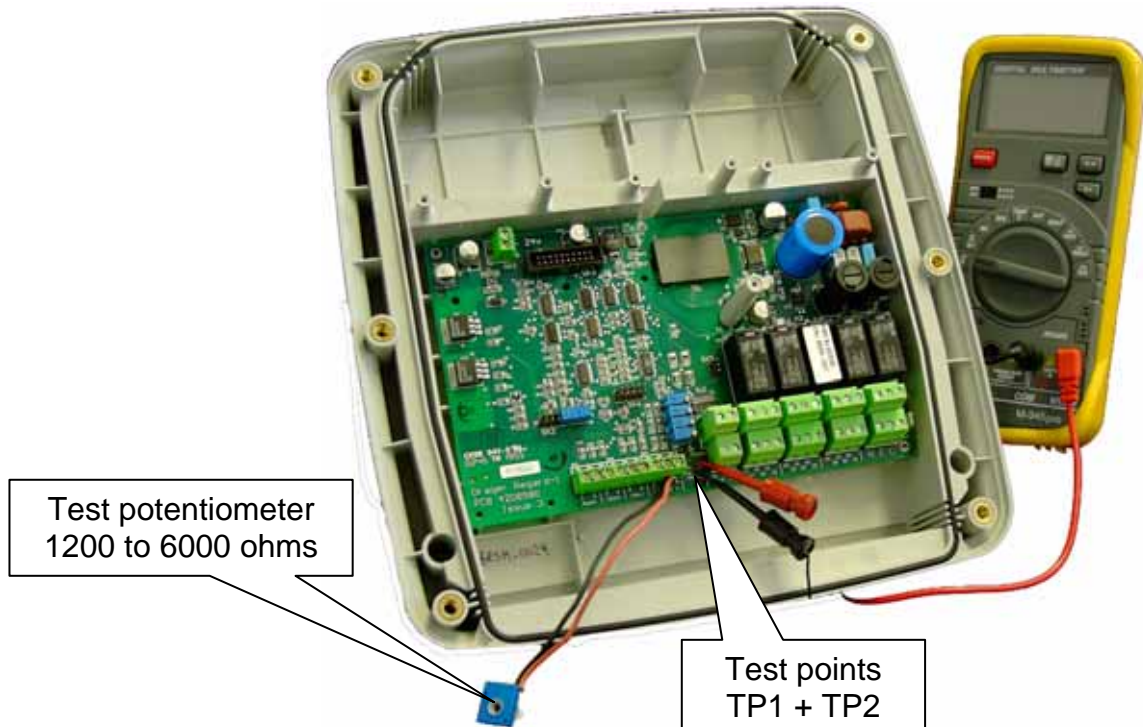
**For safety relevant decisions only use status of Alarm/Fault LEDs and relays. Do not use display reading. For calibration and adjustment of alarm set points use DVM between test points TP1 and TP2 only.**

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 4-20 mA loop calibrator

Using a potentiometer :

- Connect the potentiometer between terminals 8 and 9.



Using a 4-20 mA 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 the corresponding potentiometer fully clockwise.
- The fault alarm threshold is fixed at 3.2 mA.

## Configuration and calibration

Use this table to set the alarm threshold. Measure the voltage across TP1 and TP2 corresponding to the required alarm threshold.

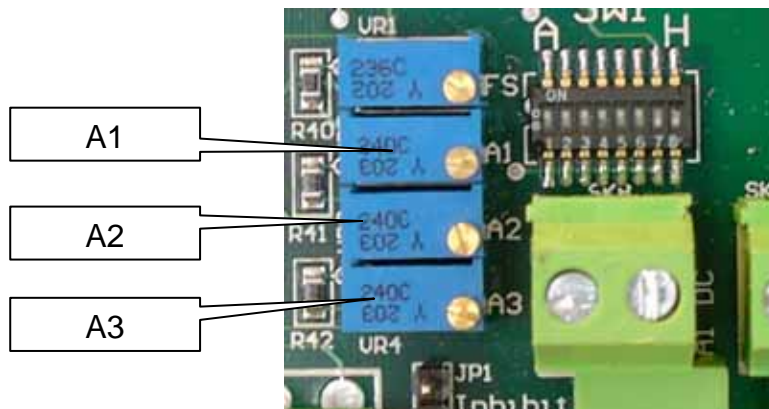
<b>Alarm threshold (% of 0 – 100 range)</b>	<b>Voltage across TP1 &amp; TP2 (V)</b>
5%	0.96
10%	1.12
15%	1.28
20%	1.44
25%	1.60
30%	1.76
35%	1.92
40%	2.08
45%	2.24
50%	2.40
55%	2.56
60%	2.72
65%	2.88
70%	3.04
75%	3.20
80%	3.36
85%	3.52
90%	3.68
95%	3.84

For oxygen deficiency and oxygen 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

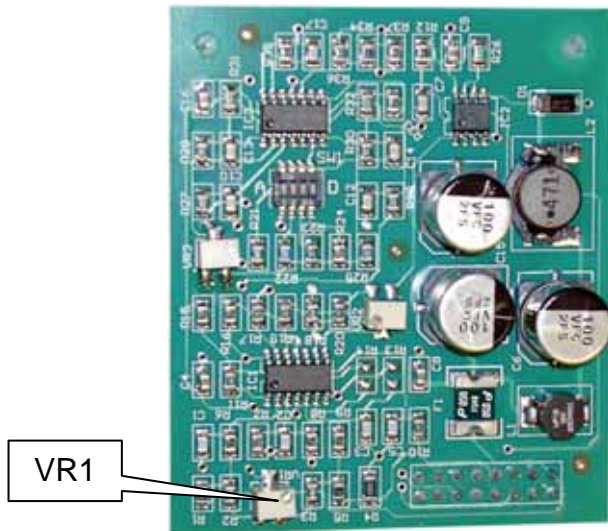
### Setting alarm thresholds on SE Ex units

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



## Configuration and calibration

Use VR1 on the pellistor board to simulate a sensor signal.



Measure the voltage across test points TP1 and TP2 to determine the alarm threshold. If the device 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

### NOTE

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 pot 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 the corresponding potentiometer fully clockwise.

After setting the alarm thresholds, adjust VR1 so that the voltage across TP1 and TP2 is  $800 \text{ mV} \pm 20 \text{ mV}$ .

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. For further information, please refer to the operating manual for the transmitter or measuring head.

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 connections fitted to positions A, B, C, D and E of SK2 on main circuit board.
5	24 VDC voltage output too low	Current must be < 100 mA.



	<b>Fault</b>	<b>Remedy</b>
6	A1 or A2 24 VDC voltage output too low	Current must be < 100 mA. Reduce current.
7	AC output failed	Check loading does not exceed 500 mA 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 <sup>(1)</sup>	Replace display board

	<p><b>NOTE</b></p> <p><b>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.</b></p>
--	--

## 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	6x M20	
AC supply	98 to 253 VAC, 50-60 Hz	
Direct current supply	18 to 30 VDC	
Power consumption	50 W (without transmitter)	70 W (including sensor)
Mains fuses	500 mA (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 VAC, 2 A energised on alarm	
Fault relay	single-pole changeover max. 250 VAC, 3 A max. 30 VAC, 2 A normally energised (de-energised on fault)	
Inhibit relay	single-pole changeover max. 250 VAC, 3 A max. 30 VAC, 2 A energised on alarm	

	Regard-1 4-20	Regard-1 SE Ex
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 4-20 mA, 24 VDC / 400 mA	3-wire Pellistor constant current supply 200...350 mA
Storage conditions	-10°C to 60°C 0 to 100% r. H., non-condensing	
Operating conditions	0°C to 55°C 0 to 100% r. H., non-condensing	
Warm up time	30 s	
Response time	< 2 s	
Approvals and CE marking	Electromagnetic Compatibility (EMC) Directive Low-voltage directive ATEX directive	
RS-232 data logger output	Format: ASCII Data rate: 2400 Baud Data bits: 8 Stop bits: 1 Parity: none Protocol: 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 circuit board	4208583
Lead-acid batteries (2 off)	4208586
Display board V1	4208581
Display board V2	4208636
Calibration screwdriver	4208595
PC connection lead	4208596
Light guide	4208589

## EC type-examination certificate




### Translation

## EC-Type Examination Certificate

- (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.



- (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:

 II (2) G

**EXAM BBG Prüf- und Zertifizier GmbH**

Bochum, dated 06. August 2004

Signed: Müller

\_\_\_\_\_  
Certification body

Signed: Kieseewetter

\_\_\_\_\_  
Special services unit

page 2 of 3 to BVS 05 ATEX G 011 X

This certificate may only be reproduced in its entirety and without change  
Diamendstrasse 9 44809 Bochum Telefon/Fax: 0201/172-3947 Telefax/Fax: 0201/172-3948  
until 31.05.2003: Deutsche Montan Technologie GmbH, Arn Technologiepark 1, 45307 Essen



(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

---

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



**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





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

Signed: Kiesewetter

\_\_\_\_\_  
Certification body

\_\_\_\_\_  
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

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

## Front panel label

Gas	<b>Methane (CH<sub>4</sub>)</b>	A1:	%LEL
Range	0 – 100	A2:	%LEL
Unit	%LEL	A3:	%LEL

Gas	<b>Hydrogen sulphide (H<sub>2</sub>S)</b>	A1:	ppm
Range	0 – 20 / 50 / 100	A2:	ppm
Unit	ppm	A3:	ppm

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

Gas	<b>Ammonia (NH<sub>3</sub>)</b>	A1:	ppm
Range	0 – 100 / 300 / 1000	A2:	ppm
Unit	ppm	A3:	ppm

Gas	<b>Oxygen (O<sub>2</sub>)</b>	A1:	%vol rising / falling
Range	0 – 5 / 25 / 100	A2:	%vol rising / falling
Unit	%vol	A3:	%vol rising / falling

*Front panel label*

Gas	A1:
Range	A2:
Unit	A3:

Gas	A1:
Range	A2:
Unit	A3:

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