



Regard 3900 Series Sixteen Channel Controller

Instructions for Use

WARNING



Strictly follow the Instructions for Use. The user must fully understand and strictly observe the instructions. Use the product only for the purposes specified in the Intended Use section of this document.



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1 For your safety

1.1 General safety statements

- Before using this product, carefully read the Instructions for Use.
- Do not dispose of the Instructions for Use. Ensure that they are retained and appropriately used by the product user.
- Only fully trained and competent users are permitted to use this product.
- Comply with all local and national rules and regulations associated with this product.
- Only trained and competent personnel are permitted to inspect, repair and service the product as detailed in these Instructions for Use (see Section 8 on Page 27). Further maintenance work that is not detailed in these Instructions for Use must only be carried out by Dräger or personnel qualified by Dräger. Dräger recommends a Dräger service contract for all maintenance activities.
- Properly trained service personnel must inspect and service this product as detailed in the maintenance section of this document.
- Use only genuine Dräger spare parts and accessories, or the proper functioning of the product may be impaired.
- Do not use a faulty or incomplete product, and do not modify the product.
- Notify Dräger in the event of any component fault or failure.

1.2 Definitions of alert icons

Alert icons are used in this document to provide and highlight text that requires a greater awareness by the user. A definition of the meaning of each icon is as follows:



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in physical injury or damage to the product or environment. It may also be used to alert against unsafe practices.



NOTICE

Indicates additional information on how to use the product.

2 Description

2.1 Product overview

The Dräger Regard 3900 series is a range of controllers that are used to continuously monitor up to sixteen 4–20 mA remote sensor transmitters in order to warn of potentially dangerous or harmful conditions.

The series includes the Regard 3900, 3910 and 3920. The Regard 3900 and 3920 are sealed control panels, and the Regard 3910 is a modular system intended to be installed in a rack-based system. Other differences are explained in this document where necessary.

The controller monitors the current signals from the remote sensor transmitters on input channels and provides warnings when alarm or fault conditions occur. Each of the input channels can provide alarms for up to three gas levels (A1, A2 and A3) and two fault conditions (F1 and F2). The gas-level alarms are configured to provide an indication of potentially dangerous or harmful gas levels at the transmitter, and can be set to activate as the monitored gas levels are rising or falling. The faults (F1 and F2) operate when the transmitter sends the relevant fault signal (F2 is only used when the transmitter provides a second fault signal).

The combination of internal control modules (input modules, relay modules and output modules) and the controller configuration settings can be altered to meet the gas detection and warning requirements. Additionally the warning devices used with the controller can be selected and configured as required by the user. The Regard 3900 series controllers are configured using a Microsoft Windows® based software program. The Regard 3920 also has a built-in configuration system.

2.2 Intended use

Regard 3900 series controllers are used with 4–20 mA transmitters to provide stationary, continuous monitoring of flammable or toxic gases and vapours, and oxygen deficiency or enrichment. The controller is primarily intended for use as a part of a gas detection system, but can be used with any remote sensor transmitter which uses a 4–20 mA source output (transmitters that use a 4–20 mA sink output cannot be used). This document describes the Regard 3900 series used as a controller for a gas detection system.

The controller is intended for use in residential, commercial and industrial environments to provide:

- Display of measured gas level.
- Visual and audible alarms at the controller and external warning devices.

2.3 Limitations on use



WARNING

The controller is not designed or approved for use in areas where combustible or explosive gases, vapours or dust mixtures are likely to occur. Do not use the Regard 3900 series controller in areas subject to explosion hazards ("hazardous areas") without suitable protection. Contact Dräger for further information.

The controller cannot be used with three-wire transmitters that have a 4–20 mA sink output.

2.4 Approvals

The Regard 3900 series 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 TRL 06 ATEX 21099X).

Output modules are not included in the scope of the Regard 3900 ATEX EC-type examination. Output modules shall not be used for countermeasures against risk of explosion.

Special conditions for safe use according to EC-type examination certificate TRL 06 ATEX 21099 X

1. Only remote sensor transmitters with valid and appropriate ATEX certification for safety and measurement performance shall be connected to this control equipment. These connections may be via ATEX certified safety interface barriers.
2. Any cable used for interconnection of remote sensor transmitters should be selected to ensure that its resistance does not have any adverse effects on the operation of the control unit.

Requirements of EN 60079-29-1

If a Regard 3900 series controller is used for flammable gas detection to protect against risk of explosion, at least one gas alarm relay should be set latching. (See EN 60079-29-1:2007 Explosive atmospheres – Gas detectors – Performance requirements of detectors for flammable gases.)

CE Marking and ATEX approval

The Regard 3900 is CE marked to indicate conformity to the following directives:

- ATEX directive 94/9/EC
- EMC directive 2004/108/EC
- Low-voltage directive 2006/95/EC





NOTICE

Using a power supply unit (PSU) not supplied or installed by Dräger may require reassessment of the compliance of the controller with the EMC directive and/or the low-voltage directive.

ATEX Marking

The controller also has the following ATEX marking:

Ⓔ II (2) G



WARNING

This marking does not mean that the unit is “explosion proof”. The Regard 3900 series cannot be used in areas subject to explosion hazards (“hazardous areas”) without suitable protection.

3 User information



3.1 Display screen

The display screen is a multi-line, 20-character, backlit, LCD screen that provides information about the gases that the controller is monitoring. During the normal gas-level display, the screen shows four lines of text.

Channel identity	Gas level	Measurement units	Gas name or measuring range
0 1 :	0	% L E L	M e t h a n
0 2 :	0 . 0 1	p p m	C h l o r i
0 3 :	0 . 1	p p m	H 2 S
0 4 :	1 2 3 4	p p b	G a s n a m

- Very low gas levels of ± 2% of the measuring range are displayed as zero (this is referred to as the zero clamp).
- The display screen contrast is adjustable. Contact a trained maintenance technician or Dräger if adjustment is required.

3.1.1 Display screen scrolling

The display screen shows the information from up to four channels at a time, and if there are more than four channels installed, the display screen scrolls to show all channels sequentially.

- Press **Hold / II / ▲** for <1 second to freeze the display screen (stop scrolling).
- Press **Hold / II / ▲** again for <1 second to unfreeze the display screen (restart scrolling).

3.1.2 Gas name or measuring range

The display screen can toggle between the gas name and the measuring range. The default is the gas name.

- Press **Hold / II / ▲** for >1 second to show the full-scale deflection (FSD) (the example below shows measuring range of 0–2000).

0 2 :	1 2 3 5	p p m	(2 0 0 0)
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3.1.3 Over-range

Over-range is displayed if the gas level increases above the measuring range (the transmitter signal is above 20 mA). The over-range indication is latching (i.e. it remains on-screen even if the gas level returns into the measuring range).

- Press **Acknowledge / OK** (or operate the remote reset if available) to clear an over-range indication. If it is pressed when the gas level is above the measuring range, the indication clears when gas level falls into the measuring range.

0 2 :	O v e r - r a n g e
-------	---------------------

3.1.4 Under-range

Under-range is displayed when the gas level is below the measuring range (the transmitter signal is below 3.8 mA – but not a recognized maintenance or fault signal).

0 2 : U n d e r - r a n g e

3.1.5 Maintenance

Maintenance is displayed when transmitter maintenance is due (the transmitter signal is a recognized maintenance signal).

0 2 : M a i n t e n a n c e

3.2 Alarm, fault and active LEDs



WARNING

The alarm levels and the activation modes are configured to meet the requirements of the user. The actions and countermeasures to be taken when any alarm or fault LED activates must be defined by the person responsible for the gas detection system.

Although there are up to three gas-level alarms (A1 to A3) and two fault alarms (F1 and F2), there are no LEDs on the controller for alarm A3 or fault F2. Remote warning devices can be configured to provide indications for alarm A3 and fault F2 when required.

LED		Condition
Alarm A1	Flashing Steady Off	A1 alarm tripped A1 alarm acknowledged but alarm condition present No alarm condition
Alarm A2	Flashing Steady Off	A2 alarm tripped A2 alarm acknowledged but alarm condition present No alarm condition
Fault F1	Flashing Steady Off	F1 alarm tripped F1 alarm acknowledged but fault present Channel healthy
Active / ✓	Steady Blinking (off every 30 sec) Off	Channel active Alarms inhibited (see also Inhibit / ! LED in Section 3.3) Channel inactive

3.3 Power and inhibit LEDs

The power supply to the controller can be from an AC or DC power source or both. When both are used, the DC power source (usually a battery system) is used as a backup supply in case of AC power supply failure.

Power AC / ~ LED

It is optional to connect this LED when the controller uses both AC and DC power sources. When the LED is connected, it is illuminated when the controller is supplied from the (primary) AC supply, and is off when the controller is supplied from the (backup) DC supply.

Power DC / = LED

Illuminates when there is a 24 Vdc supply to the internal control modules. (Irrespective of the power supply to the controller, the internal control modules require a 24 Vdc supply.)

Inhibit / ! LED

Illuminates to indicate that the alarms are inhibited, and therefore the normal gas-level monitoring and warning functions of the controller are inactive. When the LED is illuminated, the Active / ✓ LEDs blink off and the internal sounder beeps every 30 seconds. Any remote warning device configured to activate when the alarms are inhibited would also activate.

The alarms are inhibited when an internal inhibit switch is set to the maintenance position: usually for maintenance or repair of the controller.

3.4 Internal sounder

The internal sounder emits an audible warning tone when A1, A2, A3, or F1 activates (not when F2 activates). The sounder also beeps every 30 seconds when alarms are inhibited.

- Press **Acknowledge / OK** (or operate the remote reset if available) to silence the sounder.

3.5 External warning devices

External warning devices used with the Regard 3900 series controllers are activated by relays inside the controller, and are configured to meet the user's gas detection requirements. The relays can be configured to operate in a number of ways:

- Latching relays remain activated (in the alarm state) when an alarm condition has occurred but is no longer present.
- Non-latching relays deactivate (return to the non-alarm state) when an alarm condition is no longer present.
- Acknowledgeable relays can be manually deactivated (returned to the non-alarm state) when the alarm condition is still present. This is used to switch off or silence external warning devices when the alarm condition is still present.
- Non-acknowledgeable cannot be deactivated when the alarm condition is present.
- Alarms inhibited relays activate when an internal inhibit switch is set to the maintenance position (see Inhibit / ! LED in Section 3.3 on Page 4).

Latching or non-latching

Setting	Meaning
Latching	The relay requires manual action to reset after alarm activation. Press Acknowledge / OK or operate the remote reset: <ul style="list-style-type: none"> • If the alarm condition is clear or if the relay is acknowledgeable, the relay returns to the non-alarm state immediately. • If the alarm condition is present, the relay returns to the non-alarm state when the alarm condition clears.
Non-latching	The relay automatically returns to the non-alarm state when the alarm condition clears.

Acknowledgeable or non-acknowledgeable

Setting	Meaning
Acknowledgeable	The relay can be reset manually when the alarm condition is present. Press Acknowledge / OK or operate the remote reset – the relay returns to the non-alarm state.
Non-acknowledgeable	Relay cannot be reset manually. The relay automatically returns to the non-alarm state when the alarm condition clears.

3.6 Control buttons (and remote reset)

Acknowledge / OK

Acknowledges activated alarms, faults and display screen messages. When pressed, depending on the associated transmitter signal and the controller settings:

- Alarm and fault LEDs on the controller extinguish or change to steady.
- The internal sounder is silenced.
- Display screen messages clear (for example: over-range).
- External warning devices remain activated or deactivate depending on the configuration.

Remote reset

A remote reset is a switch that performs the same functions as the **Acknowledge / OK** button, remotely from the controller.

Hold / II / ▲

Controls the scrolling function and toggles between the gas name and the measuring range on the display screen.

- Press **Hold / II / ▲** for <1 second to freeze and unfreeze scrolling (when more than four channels are used).
- Press **Hold / II / ▲** for >1 second to toggle between the gas name and the measuring range.

Regard 3920 only

The ▲ / ▼ / **OK** buttons on Regard 3920 are also used to navigate and select settings within the built-in configuration menus (see Annexe A on Page 30).

3.7 LED and display screen test

Pressing and holding two control buttons simultaneously tests the LEDs, display screen and internal sounder of the controller. While the buttons are held, all LEDs illuminate (the Power AC / ~ LED only illuminates if connected), all display screen segments fill and the sounder emits the alarm tone.

- Regard 3900: press **Acknowledge** and **Hold**
- Regard 3910: press **OK** and **II**
- Regard 3920: press **OK** and **▲**

Use this function as a confidence check of controller visual and audible outputs when required.

4 Technical information

WARNING
 This section and all subsequent sections contain technical and set-up information for trained maintenance technicians. The procedures should not be attempted by untrained personnel as it could make the controller or gas detection system unsafe for use.

4.1 General

The controller has a display board and up to six control modules. The control modules are a combination of input modules, relay modules and output modules, which is flexible within the limitations of the controller. Internally, all control modules and the display board are connected together using a ribbon cable.

The controller can be supplied from an AC or DC source or both, and irrespective of the power supply to the controller the internal control modules receive a 24 Vdc supply. The following internal LEDs operate during use:

- A green LED on each of the control modules illuminates to indicate that the internal DC voltage is supplied.
- Two red LEDs on the right-hand side of the display board and each of the control modules flicker during normal operation.
- A red LED next to each relay on an input module or relay module illuminates when the relay is energized.

4.2 Display board

The display board is fitted inside the controller, and houses the display screen and the LEDs that are visible on the front panel. The display screen and LEDs provide information and warnings in response to the conditions measured at the remote sensor transmitters. Also on the display board are the inhibit switch and the contrast control.

4.2.1 Inhibit switch

The inhibit switch is used during maintenance or repair of the controller to hold the controller relays in their current state, and thereby prevent activation of the gas-level warnings. The inhibit switch operates as follows:

Position	Effect
0	All relays operate normally
1	Relays configured as “alarms inhibited” energize (associated remote warning devices activate). All other relays are held in their current state. The Inhibit / ! LED illuminates. The Active / ✓ LEDs blink off and the internal sounder beeps every 30 seconds. Output module signals freeze at their current level.

WARNING
 Setting the inhibit switch to position 1 holds the controller relays in their current state and prevents activation of gas-level warnings. Always return the switch to position 0 after the maintenance or repair task.

4.2.2 Contrast control

The display screen contrast can be adjusted using the contrast control. When required, use a suitable screwdriver to turn the control to adjust the contrast. Note that LCD screens are affected by temperature and adjustment may be required to suit very cold or very hot environments.

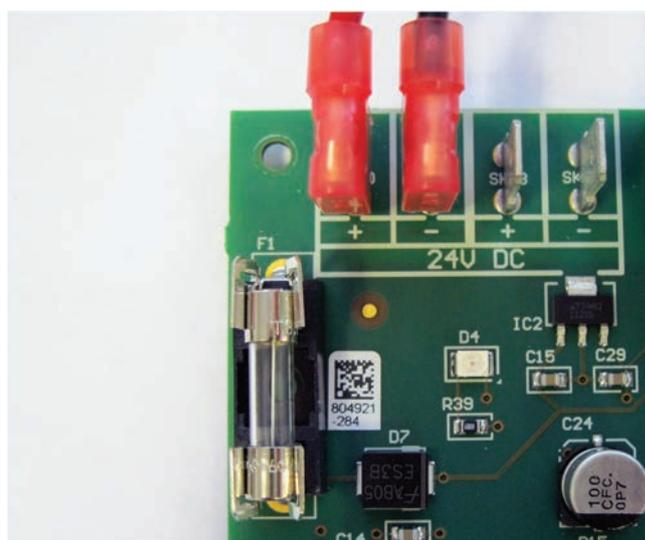
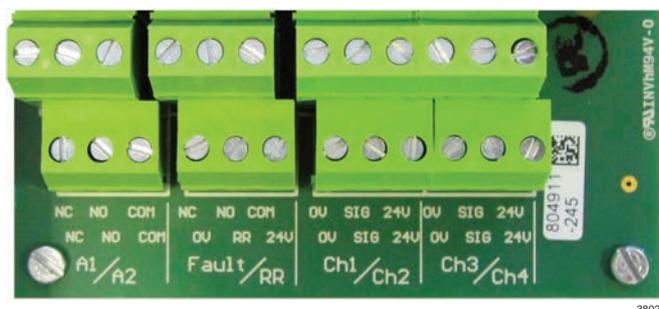


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4.3 Input module

An input module has four channels that can each monitor the current signal from a remote sensor transmitter. Each of the channels can provide alarms for up to three gas levels (A1, A2 and A3) and two fault conditions (F1 and F2). The gas-level alarms are configured to provide an indication of potentially dangerous or harmful gas levels at the transmitter, and can be set to activate as the monitored gas levels are rising or falling. The faults (F1 and F2) operate when the transmitter sends the relevant fault signal (F2 is only used when the transmitter provides a second fault signal).

Each input module has three relays that operate when an F1 (fault 1), A1 (alarm 1) and A2 (alarm 2) signal is received from any of the channels monitored by the board. The relays are volt-free single-pole changeover type that can be used to activate external warning devices. The fuse on the input module protects the module against a short circuit on the input channels (Ch1 to Ch4).



The input module terminals are:

- Ch1 to Ch4 are channels for two-wire or three-wire 4–20 mA remote sensor transmitters.
- A1, A2 and Fault (F1) are terminals for the input module relays.
- RR are the remote reset terminals that are used to connect a normally-open switch, remote from the controller, to perform the same function as the **Acknowledge / OK** button.

During installation, each input module is configured with a different module number (1–4) in order to set the channel numbers (1–16) within the controller system (see Section 5.6.2 on Page 17).

Each input module requires a 24 Vdc supply using cables that are supplied with the module (see Section 5.6.3 on Page 18).

4.3.1 Input module relay settings

Input module relays settings are preset or can be set during configuration as follows:

- All input module relays are non-acknowledgeable.
- A1 and A2 relays energize on alarm.
- F1 relay is always (preset) normally energized.
- Each relay can be set latching or non-latching during configuration.

4.4 Relay module

A relay module is used to activate external warning devices (alarms, ventilators or other safety equipment) when alarm or fault conditions are sensed at the Regard 3900 series controller. The module has eight volt-free single-pole changeover relays of which one is a non-configurable system-fault relay (RL1) and seven are configurable relays (RL2 to RL8).

RL1 to RL8 are the terminals for the relay module relays.

During installation, each relay module is configured with a different module number (1 or 2) in order to set the relay numbers (1–16) within the controller system (see Section 5.6.2 on Page 17).



4.4.1 Relay module relay settings

RL1 is used to indicate that a system-fault has occurred. For example: RL1 will de-energize if the ribbon cable is disconnected from the relay module, or if an F1 fault signal is received from any remote sensor transmitter in the system. RL1 is preset to:

- Function: common F1
- Normally energized
- Latching
- Non-acknowledgeable

The other seven relays can be set during configuration to:

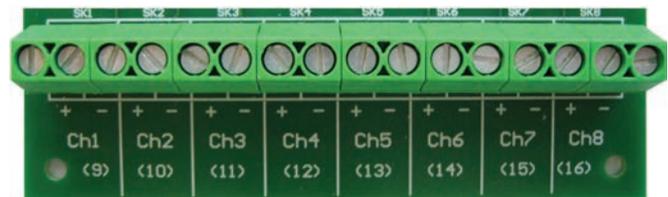
- Function: see table below
- Normally energized or energize on alarm
- Latching or non-latching
- Acknowledgeable or non-acknowledgeable

Function	Relay changes state when
Common A1	A1 trips on any channel
Common A2	A2 trips on any channel
Common A3	A3 trips on any channel
Common F1	F1 trips on any channel
Common F2	F2 trips on any channel
Common A1, A2 or A3	A1 or A2 or A3 trips on any channel
Single A1	A1 trips on one specified channel
Single A2	A2 trips on one specified channel
Single A3	A3 trips on one specified channel
Single F1	F1 trips on one specified channel
Single F2	F2 trips on one specified channel
Voting A1	A1 trips on a specified number of channels in a group
Voting A2	A2 trips on a specified number of channels in a group
Voting A3	A3 trips on a specified number of channels in a group
Voting F1	F1 trips on a specified number of channels in a group
Voting F2	F2 trips on a specified number of channels in a group
Alarms inhibited	The inhibit switch on the display board is moved to position 1
No function	Relay does not change state

4.5 Output module

An output module is used to send the current signals that are received from the remote sensor transmitters to an external monitoring device or system. The module has eight output channels (Ch 1–8) that match the signals from the controller input channels (either Ch 1–8 or Ch 9–16) (see Section 5.6.2 on Page 17).

- + Signal
- 0 V



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The signal outputs and 0 V duplicate the input channel signals but are electrically isolated from the input channels. The signal outputs are current source that will only work when connected to a passive load.

Input channel signal (mA)	Display screen reading (0–100 range)	Output channel signal (mA)
Below 3.8	Under-range or maintenance	Matches input signal
3.8 to 4.2	0	4.0 (zero clamp ¹)
4.3	2	4.3
12	50	12
20	100	20
Above 20	Over-range	Matches input signal
Input channel inactive	Not applicable	0

Note 1: The zero clamp provides a 4 mA output signal for very low gas levels of $\pm 2\%$ of the measuring range.

Alarms inhibit

If the inhibit switch is set to position 1 the output signals freeze at their current level. When the inhibit switch is returned position 0 the output signals return to the normal level.

Output module fault

If the output module has a fault, the output signal on all channels is 1 mA (± 0.3 mA).

5 Installation and set up

5.1 General instructions

The following general instructions should be observed for all installation, repair or maintenance tasks on the controller. Refer also to the remote sensor transmitter operating manual for information about the transmitters and sensors.



WARNING

Disconnect or switch off all AC and DC supplies to the controller before attempting installation, repair or maintenance tasks on the controller. Failure to disconnect the power supply may result in personal injury and/or may damage the controller, remote sensor transmitter, or wiring.

1. Disconnect or switch off all AC and DC supplies to the controller.
2. Remove the two cover screws (5 mm hexagonal key) and open the front cover.
3. Carry out the necessary installation, repair or maintenance task.
4. Check the sealing ring and close the front cover.
5. Refit and secure the two cover screws.

5.2 Positioning and mounting the controller



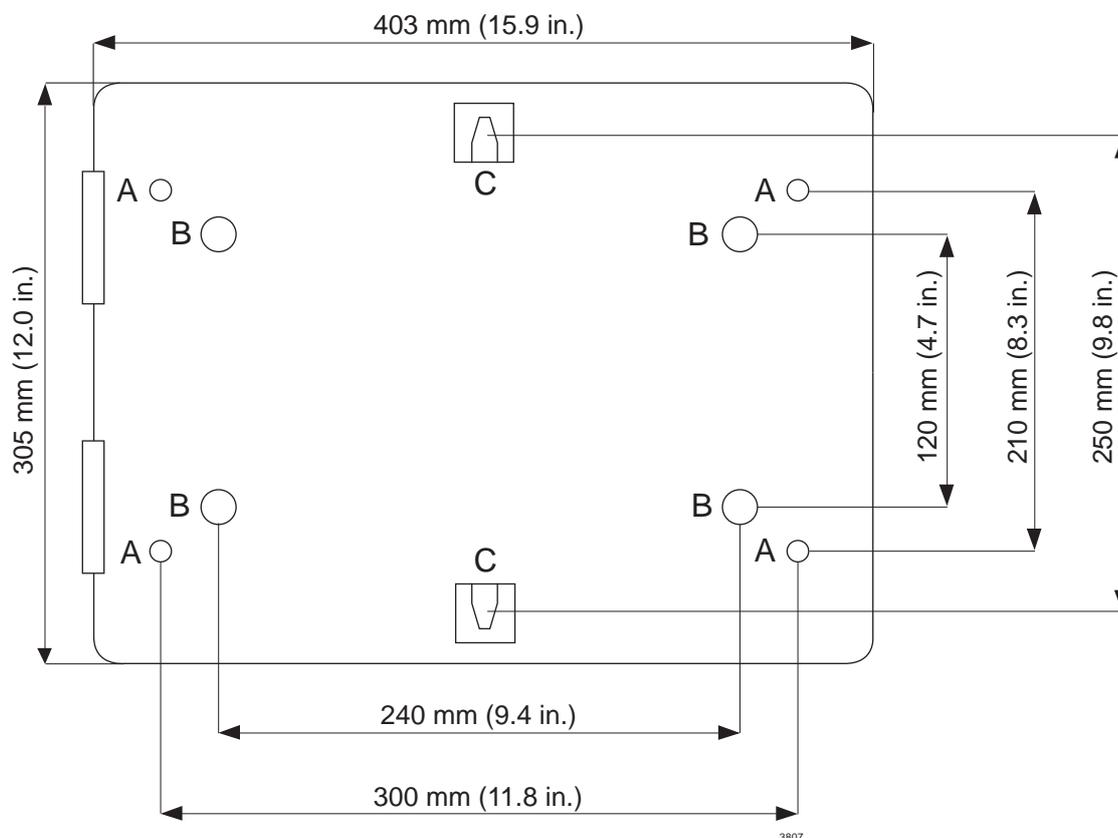
WARNING

The Regard 3900 series controllers are not “explosion proof” and must not be installed in a hazardous area without additional Ex-protection.

Observe the following instructions regarding the installation environment:

- Locate the controller where it is accessible, and the display screen and indicators are easily seen.
- Avoid locations where excessive vibration (frequency above 55 Hz or amplitude above 0.15 mm (0.006 in.)) is possible.
- Avoid locations where aggressive or corrosive gases, contaminants or pollutants harmful to electronic equipment are present.
- Temperature conditions: 0 to 55 °C (32 to 131 °F).
- Relative humidity: Regard 3900/3920 – 0 to 100%, non-condensing; Regard 3910 – 0 to 95%, non-condensing.

5.2.1 Regard 3900 and 3920



Mounting template – Dimensions not to scale

- A M6 x 10 mm (0.4 in.) threaded hole
- B Mounting hole
- C Hanger



CAUTION

If the controller is mounted using the mounting holes (B), remove all control modules to prevent damage when drilling the holes in the panel.

Observe normal precautions if drilling into walls or other structures to avoid damage to existing wiring, gas pipes, water pipes, etc.

The panel requires a space of at least 50 mm (2 in.) on the left-hand side to allow the front cover to open. Dräger recommend a space of at least 50 mm (2 in.) around the entire panel.

Mount the panel using the following as required:

- Use the M6 threaded holes (A) or the hangers (C) to maintain the ingress protection rating (IP 65) of the panel.
- Drill through the mounting holes (B) using a 5 mm (3/16 in.) drill bit. Drilling the mounting holes reduces the ingress protection.
- A mounting bracket that maintains the ingress protection rating of the panel is available from Dräger. The bracket is supplied with the screws and washers required to fit the bracket to the threaded holes (A) on the rear of the panel (see Section 11 on Page 29 for the part number).

5.2.2 Regard 3910

Separate Assembly Instructions are supplied with the Regard 3910 controller.

5.3 Cable entries



CAUTION

Do not attempt to knock out cable entries as it may crack the control panel casing. Take care when cutting the cable entries to avoid damaging internal components and wiring, and remove control modules to prevent damage when drilling if necessary.

1. Select the cable hole on the top or bottom of the panel casing which is adjacent to the cable termination inside the panel.
2. Use an M20 hole cutter to cut out the pre-marked cable hole.
3. Insert the cable and fit an M20 cable gland to seal the cable hole and prevent moisture ingress.

5.4 Cable screen earthing plate

An earthing plate is available from Dräger to earth cable screen inside the panel of the Regard 3900 and 3920. When used, connect the plate to an external low-impedance earth using braided cable with a large cross-section. Note that the earthing plate is not required for the controller to meet the EMC directive.

5.5 Power supplies

The external power supply to the controller can be from an AC or DC power source or both. When both are used the DC power source is used as a backup supply and can be a 24 Vdc supply or a 24 V battery. The specification and tolerances for AC and DC power sources is shown in the technical data (Section 10 on Page 28).

5.5.1 AC Supply



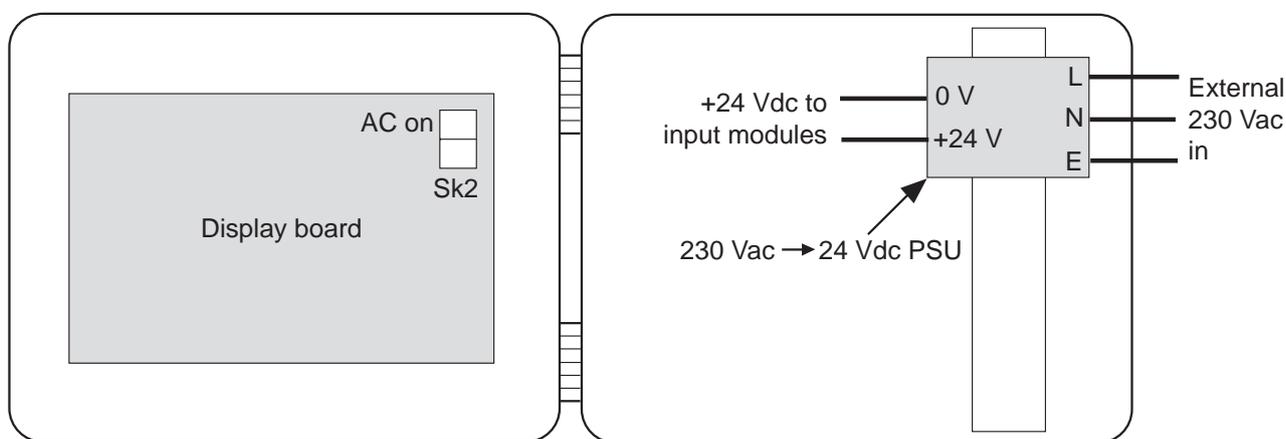
NOTICE

If the internal 24 Vdc power supply unit (PSU) is not provided by Dräger, ensure that it meets the EMC (electromagnetic compatibility) directive and the LVD (low-voltage directive) requirements. The PSU must also meet the following EMC standards – immunity: EN 61000-6-2; emissions: EN 61000-6-3 or EN 61000-6-4.

If the AC supply to the controller is from an AC socket, the maximum length of cable between the socket and the controller is three metres (9.8 feet).

For an AC power supply, use a 24 Vdc PSU connected as shown below. The PSU should be selected depending on the number of input channels used. Dräger recommend the following:

- 4 channels – 2 A PSU.
- 8 channels – 5 A PSU.
- 12 or 16 channels – 10 A PSU.

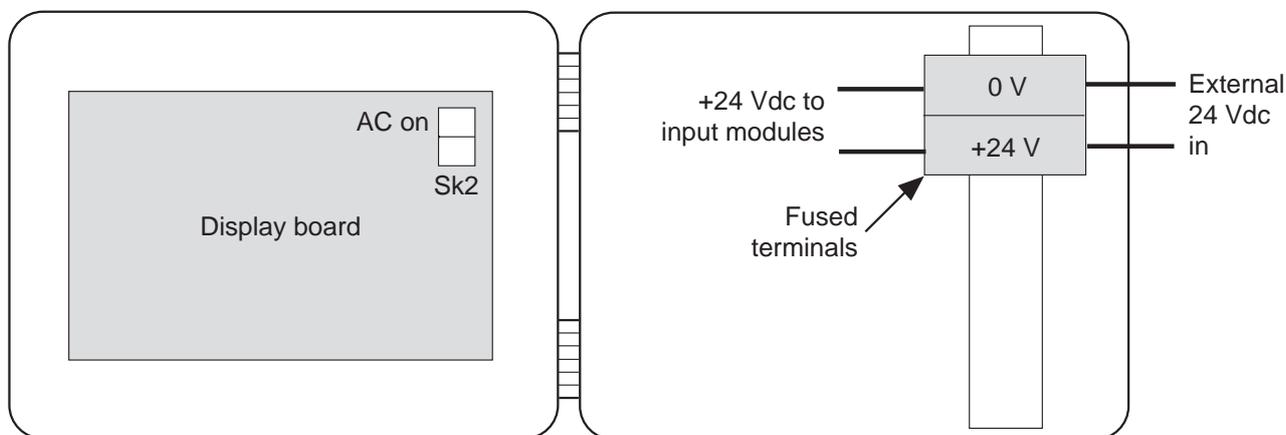


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5.5.2 DC Supply

To supply the controller from an external DC supply:

- Use a regulated interference-free 24 Vdc supply.
- If the supply could be subject to high levels of conducted RF interference, use a filter to remove the interference.
- If HART (highway addressable remote transducer) diagnostics can be used for the remote sensor transmitters, the supply must conform to the HART requirements (refer to the remote sensor transmitter operating manual).



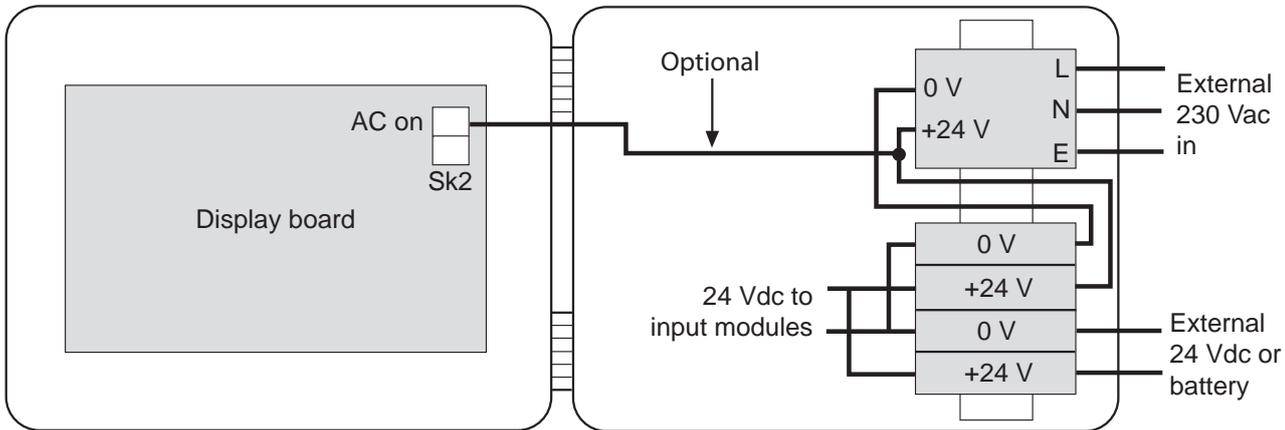
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5.5.3 AC and DC Supplies

When used together, AC is the primary supply and DC is the backup supply. Diodes and/or relays may be required to switch between the primary and the backup supplies.

Power AC / ~ LED

When the controller is supplied with both AC and DC, it is optional to connect the 24 Vdc output from the PSU to the AC on terminal on Sk2 on the display board. When connected, the Power AC / ~ LED is illuminated when controller is supplied from the (primary) AC supply, and is off when the controller is supplied from the (backup) DC supply. Note that a diode is required to prevent current flow from the backup supply falsely indicating a functioning AC supply.



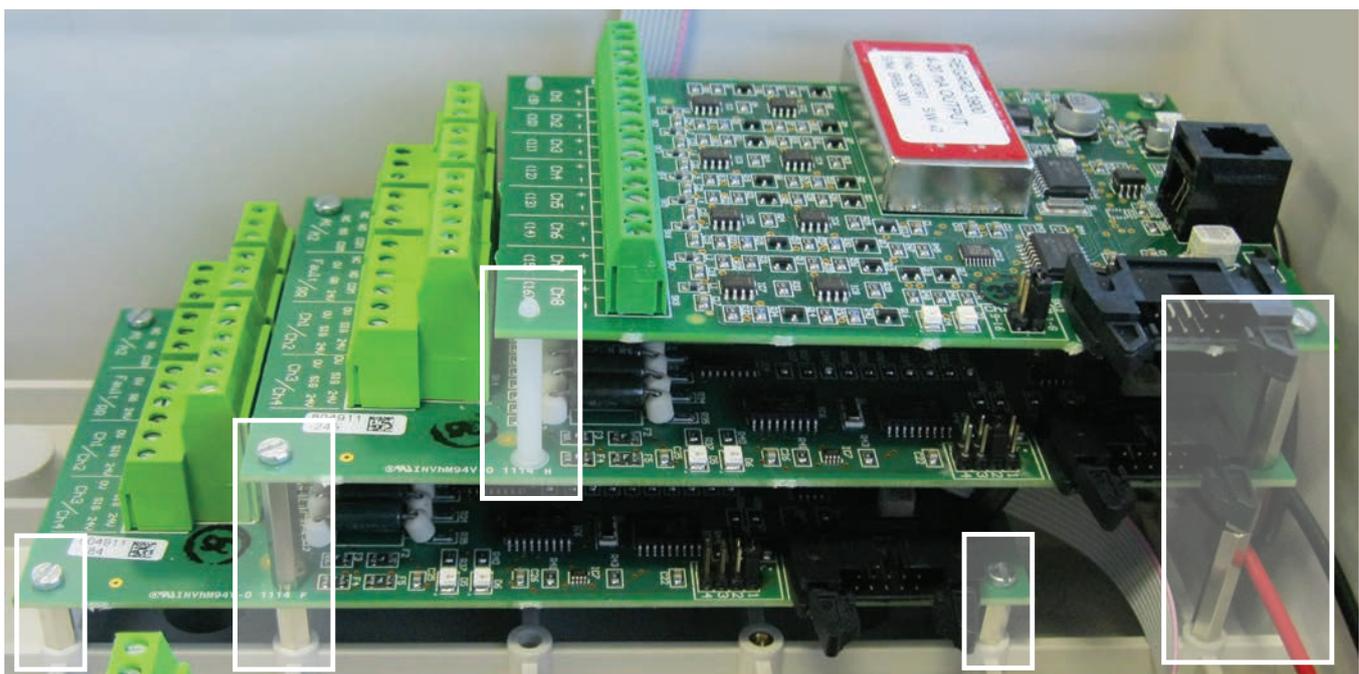
3811

5.6 Installing control modules

WARNING Output modules are not included in the scope of the Regard 3900 ATEX EC-type examination. When an output module is fitted, the controller cannot be used for control of countermeasures against risk of explosion.

The controller can have up to six control modules using the combinations detailed in Section 5.6.1. When fitting control modules observe the following:

- Use the short pedestal screws for the lower level; use the long pedestal screws for the middle level; and use the long pedestal screws and the plastic spacers for the upper level. (All of the screws have M3 threads.)
- Do not connect control modules outside the control panel of Regard 3900 and 3920 controllers.
- Refer also to the separate Assembly Instructions supplied for fitting control modules to a Regard 3910 controller.



5.6.1 Control module combinations

The combination of control modules must meet the following conditions:

- A maximum of six control modules (input, relay and output modules combined)
- A maximum of four input modules.
- A maximum of two relay modules.
- A maximum of four input modules and relay modules combined.
- A maximum of four output modules.

The table below shows the combinations. Using the highlighted row in the table as an example, the controller could have: three input modules (up to 12 input channels); a single relay module (up to 8 relays); two, one or no output modules (16, 8 or 0 output channels).

Input module	Relay module	Maximum number of output modules
4	0	2
3	1	2
3	0	3
2	2	2
2	1	3
2	0	4
1	2	3
1	1	4
1	0	4

5.6.2 Numbering control modules



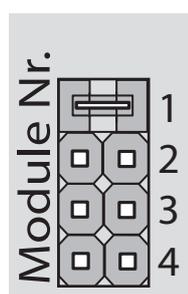
WARNING

Renumbering an input or relay module (by moving the link on the module) after configuring the controller could prevent alarms from activating as required. If an input or relay module is renumbered, reconfigure the controller to ensure that alarms activate as required.

Input modules

Place a link on the relevant "Module Nr" terminals on the input module to determine the channel numbers in the Regard 3900 system. When numbering the input module observe the following:

- Each input module within the controller must have a different module number (1 to 4).
- If there is only one module fitted, set it as number 1.
- Number modules in sequence or difficulty will occur when trying to configure the system.



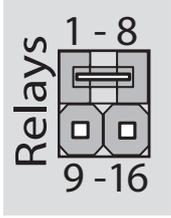
3813

Link position	Channels
1	1 – 4
2	5 – 8
3	9 – 12
4	13 – 16

Relay modules

Place a link on the relevant “Relays” terminals on the relay module to determine the relay numbers in the Regard 3900 system. When numbering the relay module observe the following:

- If there is only one relay module fitted, place the link on position 1–8.
- If a second relay module is fitted, place the link on position 9–16.



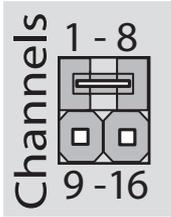
3814

Link position	Relay on module	Number in system
1-8	RL1	1
	RL2	2
	RL3	3
	RL4	4
	RL5	5
	RL6	6
	RL7	7
	RL8	8

Link position	Relay on module	Number in system
9-16	RL1	9
	RL2	10
	RL3	11
	RL4	12
	RL5	13
	RL6	14
	RL7	15
	RL8	16

Output modules

Place a link on the relevant “Channels” terminals on the output module to determine the channel outputs: 1–8 or 9–16. Two or more output modules can be set to the same channels if required.

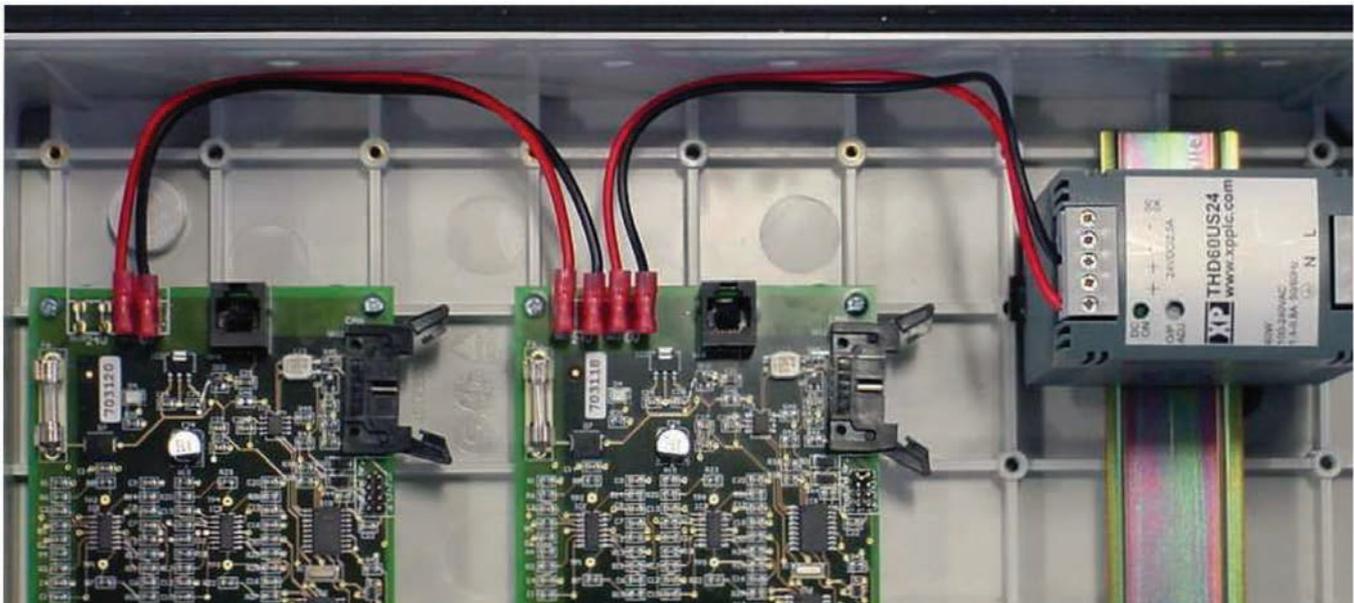


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5.6.3 Control module and display board wiring

Input module 24 Vdc supply

Connect all input modules to the internal DC supply using the cables supplied with the module. Connect the first input module using the long (PSU to module) cables, and connect subsequent input modules in parallel using the short (module to module) cables as shown.

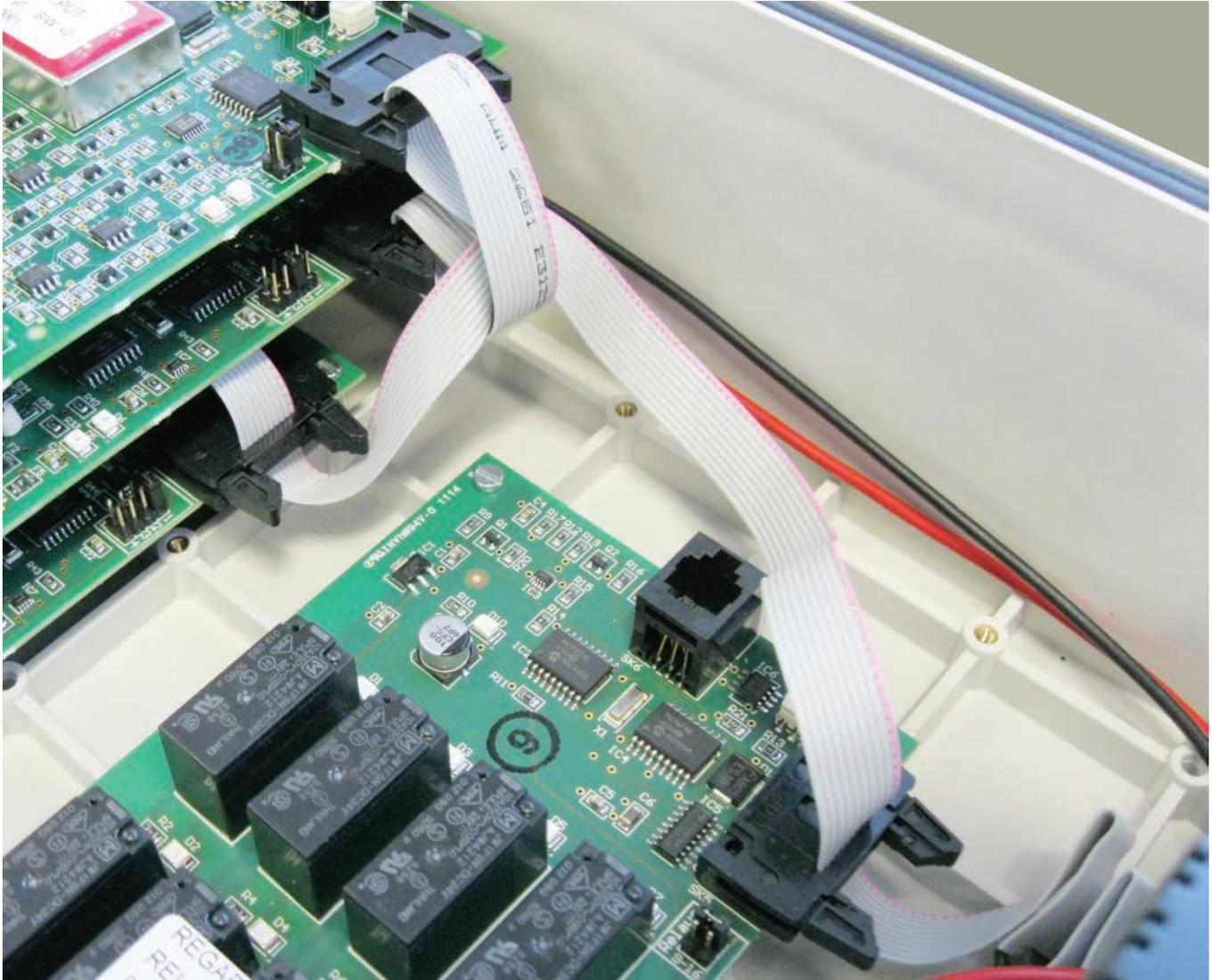


3809

Ribbon cable

Connect the ribbon cable to the display board and to all control modules, using the standard ribbon cable supplied by Dräger. The display board, relay modules and output modules do not require a separate DC supply.

Note: For Regard 3910 non-standard cable lengths can be supplied by Dräger. The maximum permitted length of the ribbon cable is 2 metres (6.6 feet).



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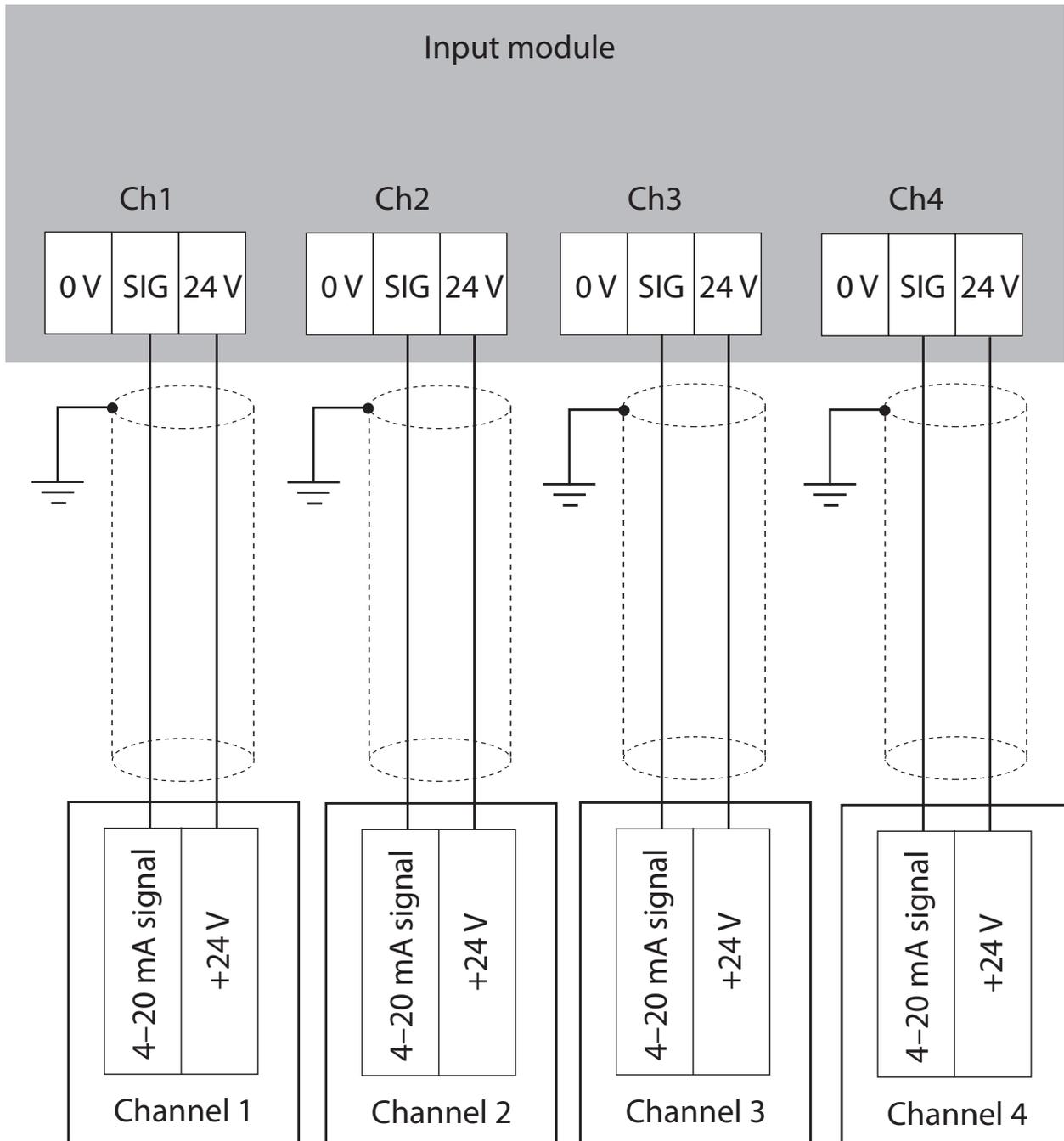
5.7 Connecting remote sensor transmitters

The wiring diagrams in this section show the general wiring layout for remote sensor transmitters. Refer to the remote sensor transmitter operating manual for the specific details about the remote connections, including terminal marking, colour coding, lettering, etc.

Observe the following for all transmitter types:

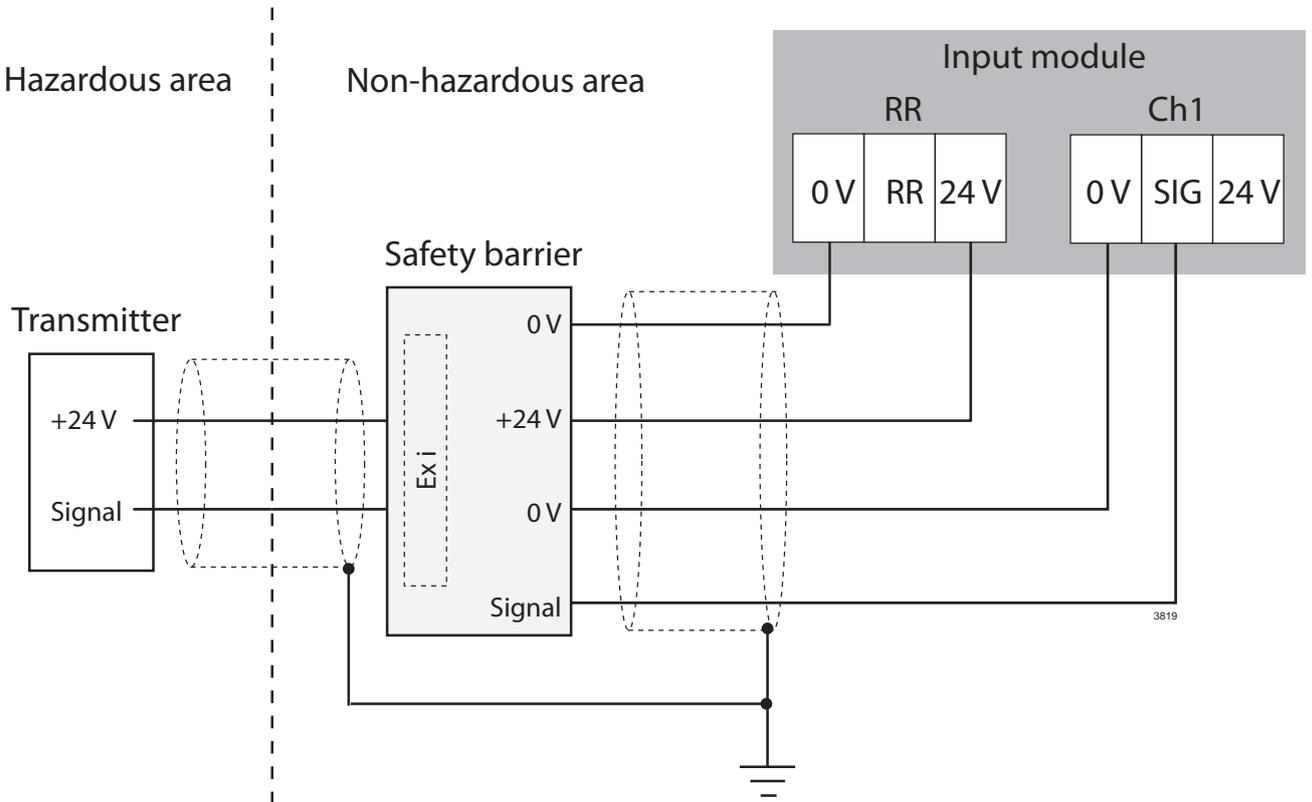
- The cable cross-section for transmitter wiring is a maximum 2.5 mm² (0.004 in.²) and a minimum 0.5 mm² (0.0008 in.²).
- Use screened cable if required by the transmitter.

5.7.1 Two-wire 4–20 mA transmitters



5.7.2 Two-wire 4–20 mA transmitters with safety barrier

- Refer also to the instructions for the safety barrier and transmitter for connections between transmitter and barrier, and for the barrier earth connection.



5.7.3 Three-wire 4–20 mA transmitters

- Only connect transmitters that have a 4–20 mA source output. Regard 3900 cannot be used with a three-wire transmitter that has a 4–20 mA sink output (if necessary use a sink-to-source converter).
- The module can supply up to 400 mA to a three-wire transmitter.
- Use a cable where the three cores each have the same resistance.
- To ensure that a short circuit between the 4–20 mA signal output and the 0 V wire at the transmitter causes a fault indication at the controller, each cable core must not exceed the resistance given by the formula:

$$R_{\text{cable}} = \frac{250 \times I_{\text{fault}}}{I_{\text{tr}}}$$

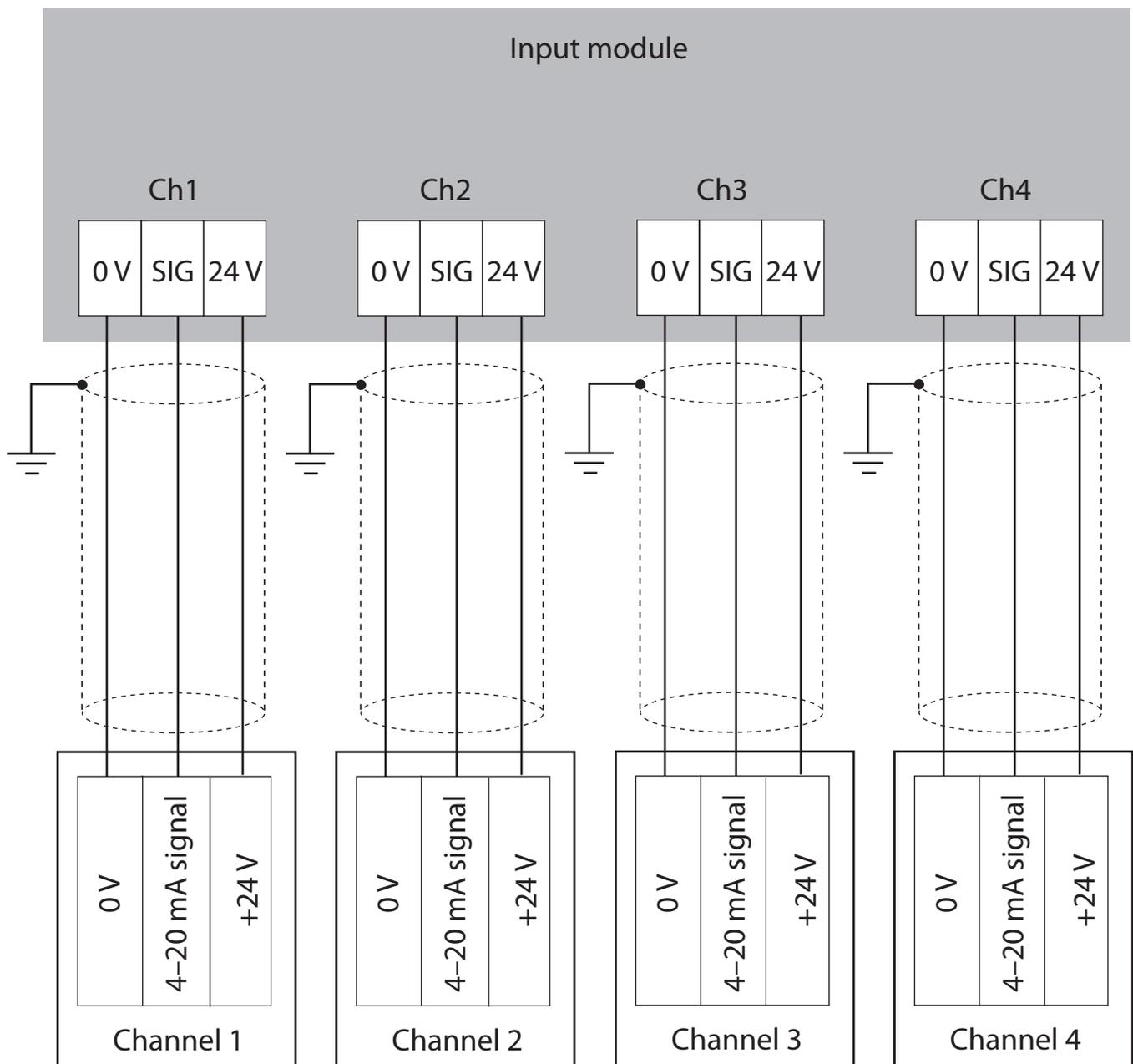
R_{cable} is the maximum resistance per core from the controller to the transmitter (in Ω).

I_{fault} is the fault trip level (in mA).

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

Example using a transmitter with an operating current of 100 mA and a fault trip level of 3.2 mA.

$$R_{\text{cable}} = \frac{250 \times 3.2}{100} = 8 \Omega \text{ per core}$$



3820

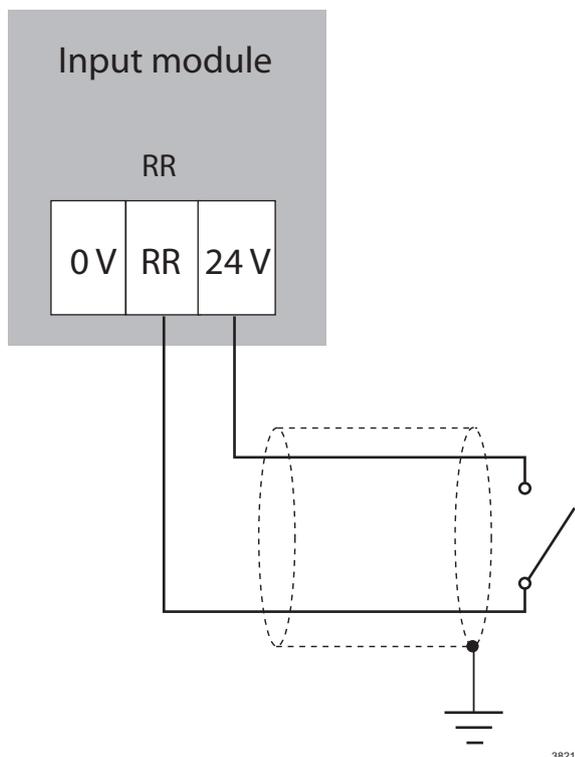
5.8 Connecting other remote devices

- The cable cross-section for remote devices is a maximum 2.5 mm² (0.004 in.²) and a minimum 0.5 mm² (0.0008 in.²).

5.8.1 Remote reset

A remote reset is a switch that performs the same functions as the **Acknowledge / OK** button remotely from the controller (see Section 3.6 on Page 9). When a remote reset is required:

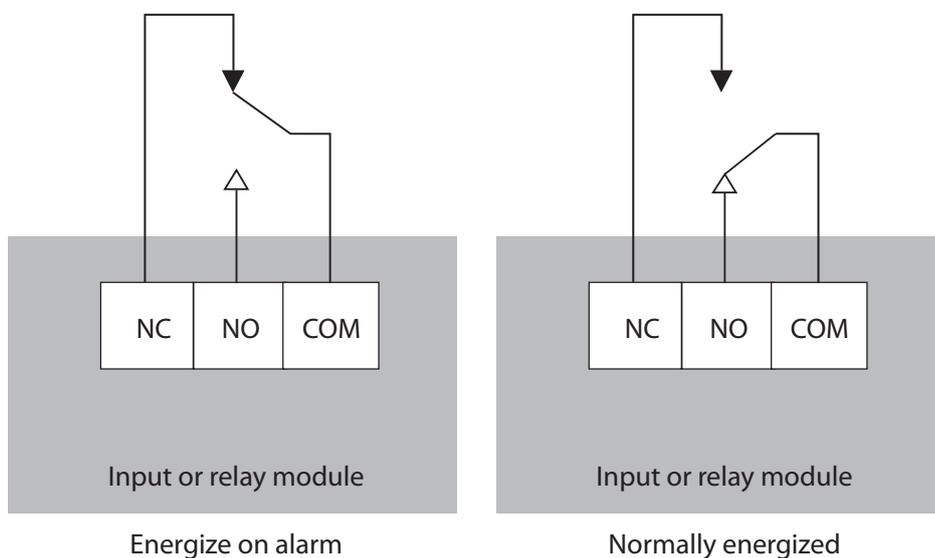
- Connect a normally-open switch to the remote reset (RR) terminals of an input module.
- If more than one input module is installed, it is sufficient to connect the remote reset switch to only one input module.



5.8.2 Relay terminals (input and relay modules)

The relay terminals on input modules (A1, A2 and Fault (F1)) and relay modules (RL1 to RL8) can be used to provide a switching function for remote warning devices such as alarms, ventilators or other safety equipment. When connecting remote devices observe the following:

- The voltage and current ratings of the relay contacts are shown in the technical data (see Section 10 on Page 28).
- Use screened or unscreened cable for relay outputs.
- When an internal supply is required to drive the external device, use an output from the power supply unit (PSU).
- The figures below show the relay contacts when relays are in the non-alarm or non-fault state.

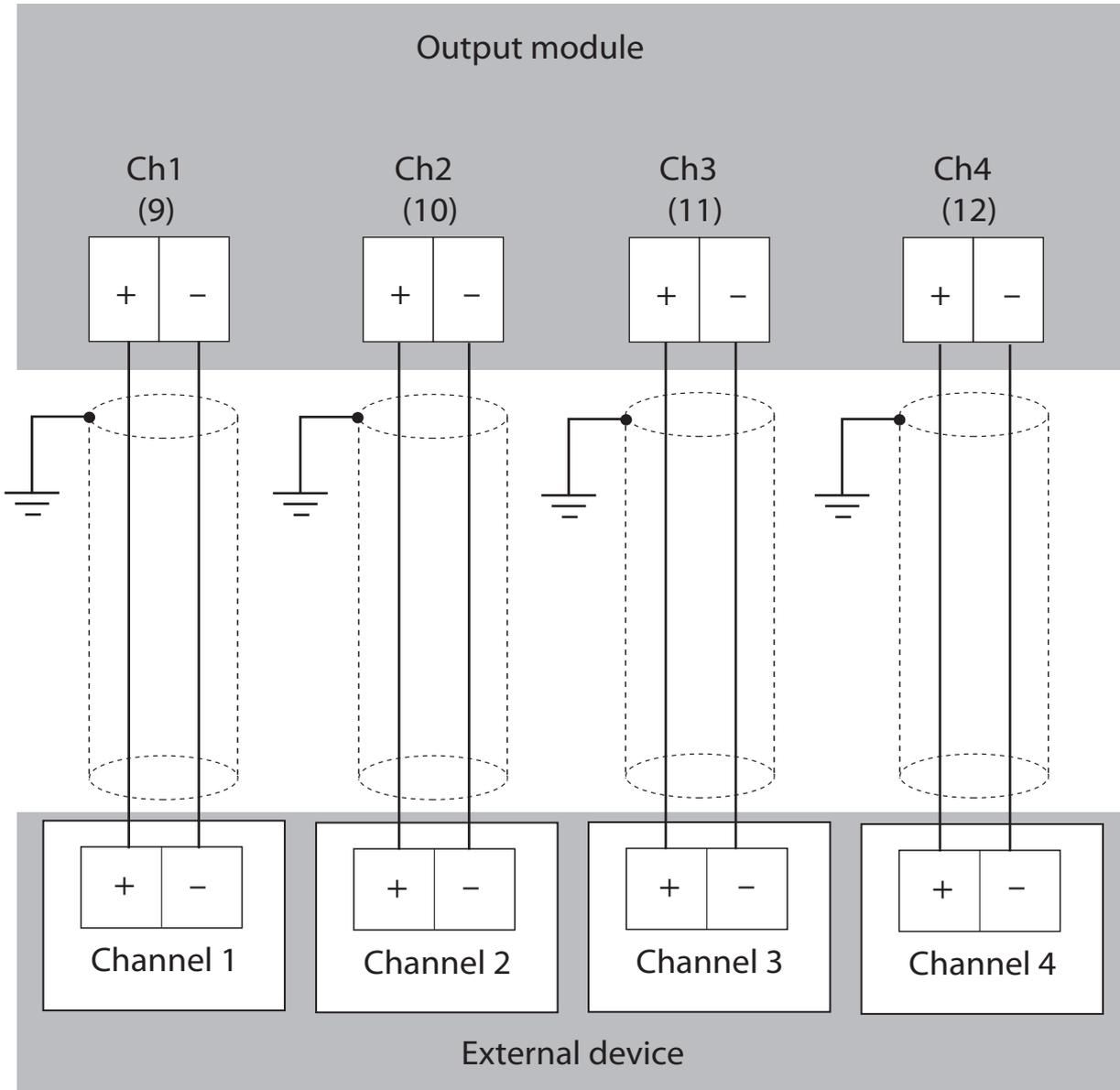


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5.8.3 Output module terminals

The output module terminals (Ch1 to Ch8) are used to output the corresponding remote sensor transmitter signal to an external monitoring device or system.

- Each channel output is a current source that will only work when connected to a passive load.



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6 Configuring and calibrating the controller

The configuration and calibration tools for Regard 3900 series controllers are used to view and change the configuration of the controller, including the combination of internal control modules and the settings for the gas detection and warning devices. The tools also allow zero point and span calibration.

Configure and calibrate the controller for all channels during initial installation and then when required during maintenance or repair of the controller or gas detection system.

After completing any configuration or calibration, ensure that all alarms and warning devices operate as intended.

Configuration and calibration tools

For Regard 3900 and 3910, use the Dräger Regard 3900 Configuration Software. The software is a Microsoft Windows based program that requires an interface unit (RS-232) and a compatible PC. The software and interface unit are available from Dräger. See the Instructions for Use supplied with the software for full instructions.

For Regard 3920, use the built-in configuration system (see Annexe A on Page 30). Regard 3920 can also be configured using the Dräger Regard 3900 Configuration Software if required.

7 Troubleshooting

Symptom	Fault	Remedy
Display screen blank and all LEDs off	No supply to controller	Check and repair the external supply and wiring
	Faulty power supply unit	Replace power supply unit
	Internal wiring fault	Check and repair internal power distribution wiring
Display screen blank	No supply to display board	Check and reconnect ribbon cable to display board and all modules Replace display board
Display screen shows: NO INPUTS	Ribbon cable fault	Repair or replace ribbon cable
Display screen shows: 4–20 BOARD ERROR or RELAY BOARD ERROR or OUTPUT BOARD ERROR	Faulty input, relay or output module	Replace the faulty module
LED and display screen test fails	Faulty display board	Replace display board
Power DC / --- LED not illuminated, but display screen on	Controller supply fault	Check and repair the external or internal 24 Vdc supply
	Faulty display board	Replace display board
Display screen shows: Under-range	Faulty transmitter connection	Check and repair the transmitter wiring
	Incorrect loop current	Recalibrate
	Faulty transmitter	Replace the transmitter
Display screen shows: Over-range	Short-circuit remote sensor transmitter wiring	Check and repair the transmitter wiring
	Remote sensor transmitter fault	Check and repair the transmitter
Fault (F) LED illuminated for a single channel	Transmitter wiring fault	Check and repair the transmitter wiring
	Incorrect loop current	Recalibrate
	Faulty transmitter	Replace the transmitter
	Faulty input module	Replace input module
Fault (F) LED illuminated for a group of four channels.	Transmitter wiring fault	Check and repair the transmitter wiring
	Ribbon cable fault	Check and repair/replace ribbon cable
	Faulty input module	Replace input module
Input module fitted, but no LEDs illuminated or data on the display screen for the module	Ribbon cable fault	Check and repair/replace ribbon cable
	Internal wiring fault	Check and repair internal power distribution wiring
	Faulty input module	Replace input module
	Faulty display board	Replace display board
Controller gas level different to the level displayed at the remote sensor transmitter	Transmitter calibration fault	Recalibrate
	Input channel calibration fault	Recalibrate
	Input channel range incorrectly set	Set the input channel range the same as the transmitter range
Fault (F) LED illuminated (steady) or flashing when channel inactive	Configuration error	Set the inhibit switch to position 1, then return it to position 0
Water ingress	Faulty seal	Check and repair the cover sealing ring, cable entries and the front cover information label
Output module faults		
No signal from all outputs; green LED not illuminated	No supply to module	Check and connect/repair ribbon cable to module
	Faulty output module	Replace output module
No signal from all or some outputs; green LED illuminated	Incorrect channels selected on output module	Move link to the correct terminals on the output module
Output is constant at 1 ± 0.3 mA.	No signal from input modules	Check and connect/repair the ribbon cable
	Faulty output module	Replace output module
Output constant but gas-level on display screen changing	Alarms inhibited	Return inhibit switch to position 0
Output signal too low or will not reach 20 mA	Load resistance too high	Reduce load resistance

Symptom	Fault	Remedy
Dräger Regard 3900 Configuration Software faults		
Unable to transfer configuration to or from the controller	No supply to controller	Check and repair the external supply and wiring
	Interface unit (RS-232) fault	Check and repair/replace the interface unit
Calibration failure message on screen	Remote sensor transmitter fault	Check and repair the transmitter wiring and recalibrate

7.1 Polytron remote sensor transmitter faults

Polytron warning signal

The Polytron transmitter warning signal (3 mA for 1s every 10s) will trip the Fault (F1) relay on the input module if the trip level is set above 2.9 mA. If the fault relay is non-latching, the relay will change state momentarily every 10s in time with warning signal. Because the duration of the 3 mA signal is short, it may not trip the relay every time. If this occurs, refer to the remote sensor transmitter operating manual.

Polytron maintenance signal

The maintenance signal on older Polytron transmitters (3~5 mA at 1 Hz) will trip the Fault (F1) relay on the input module if the trip level is set above 2.9 mA. If the fault relay is non-latching, the fault relay will toggle. If this occurs, refer to the remote sensor transmitter operating manual.

8 Maintenance

Observe EN 60079-29-2 and any relevant national regulations in the country of use.

There are no specific maintenance tasks for the Regard 3900 controller. Carry out any maintenance or calibration tasks in line with the instructions and frequency described in the remote sensor transmitter operating manual.



NOTICE

During maintenance the inhibit switch on the display board can be used to hold the controller relays in their current state, and thereby prevent activation of the gas-level warnings. See Section 4.2.1 on Page 10 for the inhibit switch operating instructions.

9 Disposal of electrical and electronic equipment

EU-wide regulations for the disposal of electrical and electronic equipment, which have been defined in the EU Directive 2002/96/EC and in national laws, are effective from August 2005 and apply to this device. Common household appliances can be disposed of using special collecting and recycling facilities. However, as this device has not been registered for household usage it must not be disposed of through these means. The device can be returned to your national Dräger Safety Sales Organization for disposal. Please do not hesitate to contact Dräger if you have any further questions about this issue.



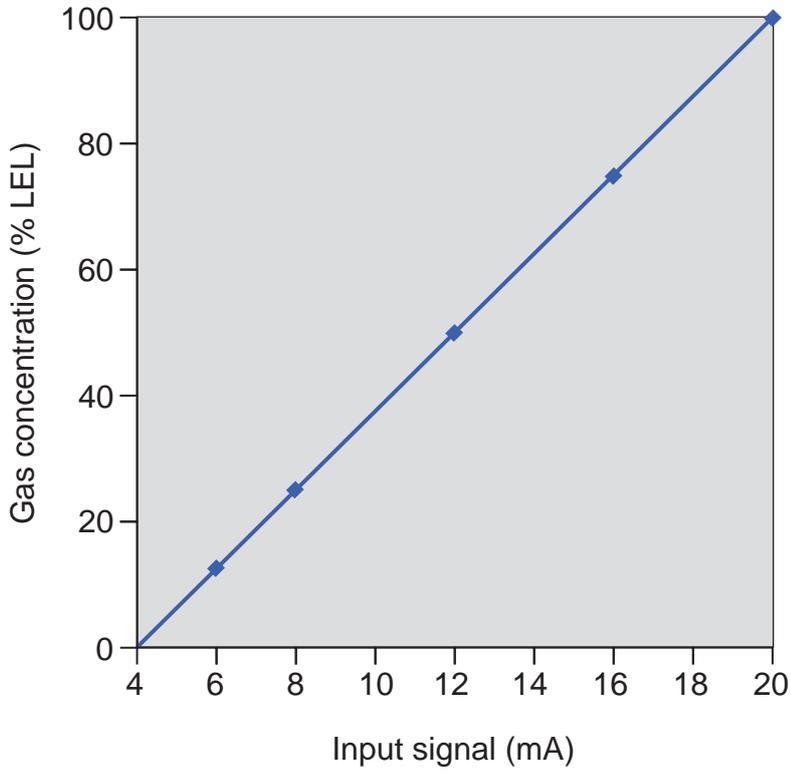
10 Technical data

Control panel versions (Regard 3900 and 3920)			
Dimensions	415 × 305 × 175 mm (16.3 x 12 x 6.9 in.)		
Weight	Approximately 5 kg (11 lb)		
Material	ABS – VO		
Ingress protection	IP65		
Cable entries	M20 (qty 30)		
All versions			
Cable cross-section	Maximum 2.5 mm ² (0.004 in. ²) Minimum 0.5 mm ² (0.0008 in. ²)		
AC input voltage (to PSU)	Typical: 98 to 253 Vac, 50 to 60 Hz		
AC current consumption		Typical	Maximum
	2 A PSU	< 0.5 A	0.5 A
	5 A PSU	0.5 A	1 A
	10 A PSU	1 A	2 A
DC input voltage	18 to 30 Vdc		
DC current consumption @ 24 V	Input module:	60 mA excluding transmitters	
	Relay module:	200 mA	
	Output module:	300 mA	
	Display screen:	170 mA	
	Interface unit (RS-232):	50 mA	
Visual and audible outputs	Visible: LEDs and display screen Audible: Sounder		
Storage temperature	-25 to 70 °C (-13 to 158 °F)		
Operating temperature	0 to 55 °C (32 to 131 °F)		
Relative humidity (RH) – operating and storage	Regard 3900/3920: 0 to 100%, non-condensing Regard 3910: 0 to 95%, non-condensing		
Start-up time	< 40 seconds		
Response time	< 2 seconds		
Accuracy	Within 1% of measured value		
Module fixings	M3		
Relays (all modules)			
Type	Volt-free single-pole changeover		
Contact material	Silver alloy		
Nominal switching capacity	5 A 250 Vac; 5 A 30 Vdc		
Maximum switching power	1250 VA; 150 W		
Switching voltage	Maximum: 250 Vac; 100 Vdc Minimum: 10 V		
Switching current	Maximum: 5 A Minimum: 100 mA		
Output module			
Output range	0.1 to 21.7 mA		
Isolation	50 V		
Resolution	0.1 mA		
Accuracy	Within 1% of input signal (less zero clamp)		
Maximum load	500 Ω		
Storage temperature	-25 to 70 °C (-13 to 158 °F)		

10.1 Transfer function

Input signal	Display reading
> 20.0 mA	Over-range
4.3 to 20 mA	Linear gas reading according to selected range
3.7 to 4.3 mA	0
< 3.7 mA	Under-range or maintenance, depending on fault trip level

Gas concentration reading for 0–100 % LEL



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11 Order list


NOTICE

Regard 3800 series components are not compatible with the Regard 3900 series. Always refer to the relevant Regard series order list when ordering parts and accessories.

Description	Quantity	Order code
Regard 3900 (control panel with display board)	1	4208780
Regard 3910 (bezel assembly with display board)	1	4208830
Regard 3920 (control panel with display board)	1	4208850
Display board (Regard 3900 and 3910)	1	4208781
Display board (Regard 3920)	1	4208856
Input module	1	4208782
Relay module	1	4208784
Output module	1	4208797
Dräger Regard 3900 Configuration Software	1	4208804
Interface unit (RS-232)	1	4208785
Ribbon cable	1	4208750
Power cable long (PSU to module)	1 (pair)	4208792
Power cable short (module to module)	1 (pair)	4208791
Earthing plate	1	4208777
Mounting bracket	1	4208796
Instructions for Use (English)	1	4208800
Instructions for Use (German)	1	4208801
Instructions for Use (French)	1	4208802
Instructions for Use (Spanish)	1	4208803

A Configuring and calibrating a Regard 3920 controller

A.1 General

The built-in configuration system in the Regard 3920 allows the user to view and change the controller configuration, including the combination of internal control modules and the settings for the gas detection and warning devices. The system also allows zero point and span calibration.

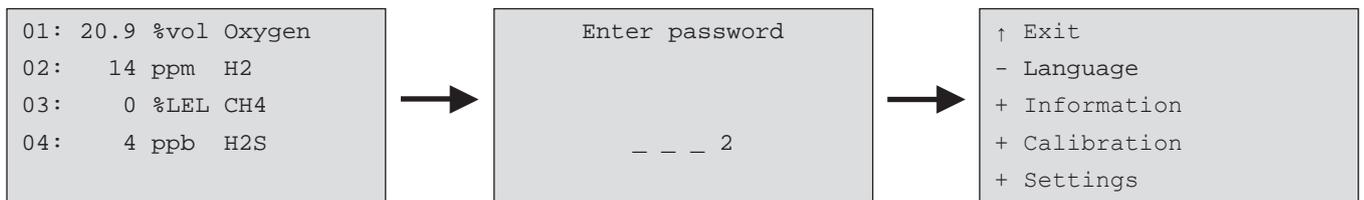
Entry into the configuration system is password protected and there are two entry levels. The calibration level is used when only calibration is required, and the settings level is used when altering controller settings and calibration are required. The initial entry passwords are shown below, and changing passwords is described in the settings menu (see Section A.5 on Page 19).

Calibration: _ _ _ 1

Settings: _ _ _ 2

To enter and use the configuration system:

1. Press **▼** for >1 second and then press **OK** to open the **Enter password** screen.
2. Enter the password and then press **OK** to open the main menu.



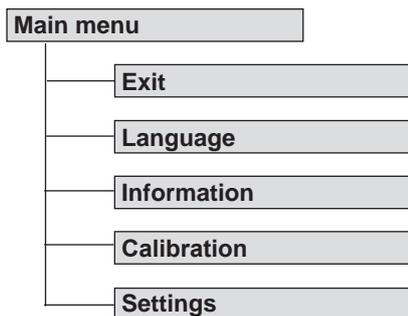
3. Use the **▲** / **▼** / **OK** buttons to navigate and select settings as shown in table below.

Key	Function
OK	Accept menu items and characters
▲	Navigate up/back in the menus and character lists
▼	Navigate down/ forward in the menus and character lists

When using the configuration system, note the following:

- Before configuring the controller, ensure that all input, relay and output modules are correctly numbered (see Section 5.6.2 on Page 11).
- Alarms are automatically inhibited when a configuration menu is open.
- Changes made during configuration are saved automatically.
- The display screen automatically returns to the gas-level display if a key is not pressed for 10 minutes.

A.2 Main menu



Exit – Returns to the normal gas-level display.

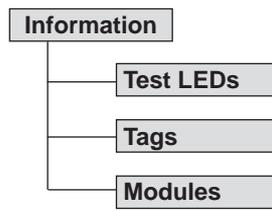
Language – Selects the on-screen language (the settings menu is always in English).

Information – Enters the information menu (see Section A.3 on Page 31).

Calibration – Enters the calibration menu (see Section A.4 on Page 32).

Settings – Enters the settings menu (see Section A.5 on Page 33).

A.3 Information menu

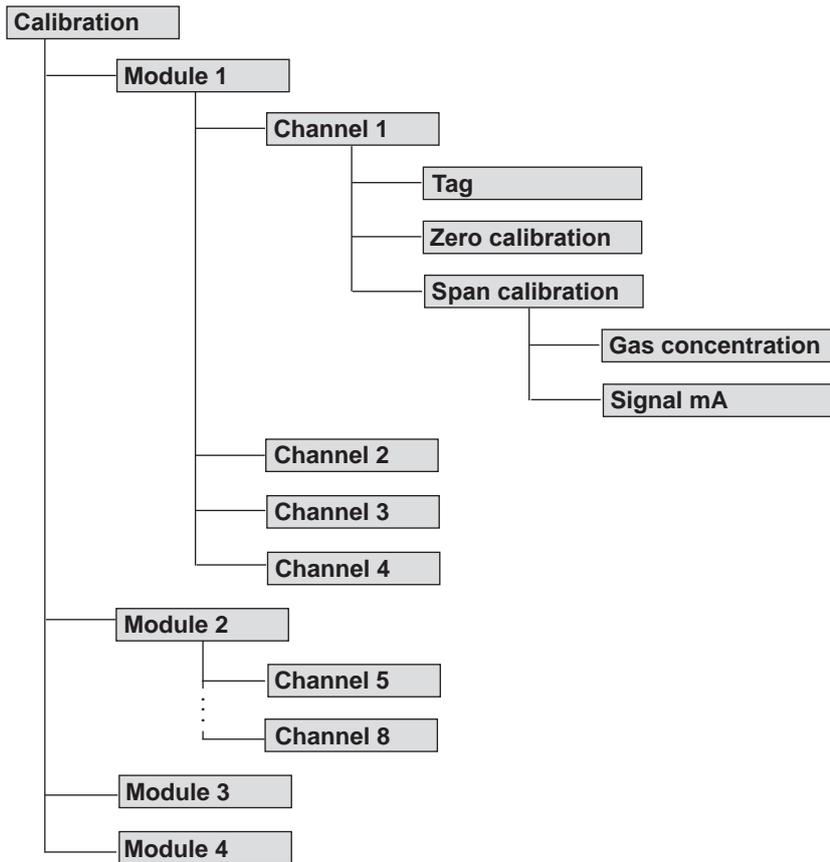


Test LEDs – Activates the LED and display screen test (see Section 3.7 on Page 9). Press **OK** to start and stop the test.

Tags – Displays all channel tags (read only).

Modules – Displays all module types and versions (read only).

A.4 Calibration menu



Use the calibration menu to calibrate the controller for all channels during initial installation and then when required during maintenance or repair of the controller or gas detection system. Refer also to the remote sensor transmitter operating manual for transmitter calibration instructions.

In the chart above, the **Module 1** menu is expanded to show the zero and span calibration menus for **Channel 1**. Depending on the number of modules configured as input modules, Channels 5 to 16 would be available on Modules 2, 3 and 4. The chart shows **Module 2** configured as an input module.

Tag – Displays the channel tag (read only).

Zero calibration – Before calibrating the channel, it is mandatory to calibrate the transmitter to ensure that the transmitter output signal is 4 mA for a zero gas reading.

1. Select **Zero calibration** for the relevant channel.
2. Select **Calibrate channel**.
 - When the success message appears, exit the menu to save the calibration.
 - If a failure message appears, refer to the troubleshooting information (see Section 7 on Page 26).

Span calibration – Calibrate the span by either applying calibration gas to the remote sensor transmitter, or by controlling the transmitter output using the transmitter controls to simulate a gas signal.

Applying a calibration gas

1. Use a calibration adaptor to apply calibration gas to the transmitter. Use a concentration between 40% and 90% of the measuring range, at the flow rate in the transmitter operating manual.
2. Allow the controller display screen reading to settle for 2 to 3 minutes.
3. Navigate to the relevant channel calibration menu.
4. Select **Span calibration** and then **Gas concentration**.
5. Enter the concentration of the calibration gas, and then select **Calibrate channel**.
 - When the success message appears, exit the menu to save the calibration.
 - If a failure message appears, refer to the troubleshooting information (see Section 7 on Page 26).

Controlling the transmitter output

1. Set the signal output of the transmitter between 10 mA and 20 mA.
2. Navigate to the relevant channel calibration menu.
3. Select **Span calibration** and then **Signal mA**.
4. Enter the transmitter signal, and then select **Calibrate channel**.
 - When the success message appears, exit the menu to save the calibration.
 - If a failure message appears, refer to the troubleshooting information (see Section 7 on Page 26).

A.5 Settings menu



NOTICE

The settings menu and the channel and relay sub-menus always use English language text.

Use the settings menu and the channel and relay sub-menus to configure the combination of internal control modules and the settings for the gas detection and warning devices.

Module – Shows the module type (**mA** = input module **Rly** = relay module **-** = none). Module 1 and 2 can be an input module or none. Module 3 and 4 can be an input module, relay module or none.

A1 relay – Sets the A1 (alarm 1) relay latching or non-latching.

A2 relay – Sets the A2 (alarm 2) relay latching or non-latching.

If a Regard 3900 series controller is used for flammable gas detection to protect against risk of explosion, at least one gas alarm relay should be set latching. (See EN 60079-29-1:2007 Explosive atmospheres – Gas detectors – Performance requirements of detectors for flammable gases.)

Fault relay – Sets the F1 (fault 1) relay latching or non-latching.

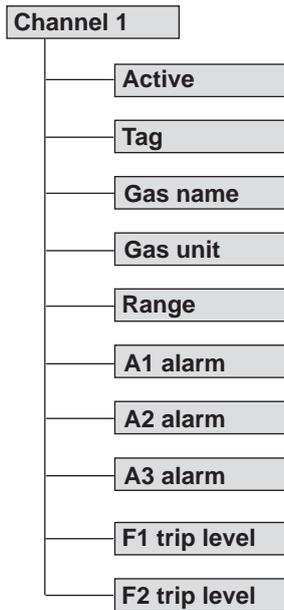
Channel – Selects the input (4–20) channel settings (see Section A.5.1 on Page 34).

Relay – Selects the relay settings (see Section A.5.2 on Page 35).

Passwords – Resets the entry passwords.

Date & time – Sets the controller date and time. The date format is YYYY/MM/DD. The time format is HH:MM:SS (setting the time resets seconds to zero).

A.5.1 Channel menu



Use the channels menu to view or configure the input (4–20) module channels.

The input channels present depend on the combination of internal control modules. For a controller using four input modules (sixteen input channels), the channel layout would be:

Module 1 – Channels 1–4 Module 3 – Channels 9–12
 Module 2 – Channels 5–8 Module 4 – Channels 13–16

Active – Activates (**Yes**) or deactivates (**No**) the channel.



WARNING

Deactivating an input module channel after it has been allocated to an alarm could prevent the alarm from activating as required. Do not deactivate an input module channel after it has been allocated to a single or voting alarm.

Tag – Enter a unique channel identification name/number if required (maximum of sixteen characters).

Gas name – Enter the gas name (maximum of six characters).

Gas Unit – Enter the gas units (maximum of four characters).

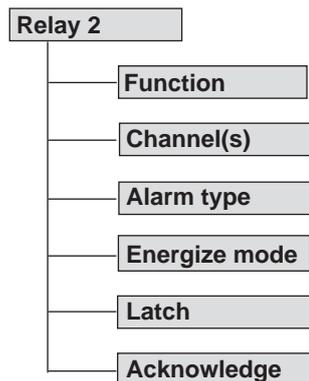
Range – Choose from the list to select the measuring range (no custom ranges are allowed). When a measuring range is selected, the A1 and A2 trip levels are automatically set to 20 % and 40 % of the range. The table below shows the measuring range, resolution (step increment) and decimal places for the A1, A2 and A3 alarm trip levels.

Range	Resolution	Decimal places	Range	Resolution	Decimal places
0 – 1	0.01	2	0 – 25	0.1	1
0 – 2	0.01	2	0 – 30	0.1	1
0 – 3	0.01	2	0 – 50	0.1	1
0 – 4	0.01	2	0 – 75	0.1	1
0 – 5	0.01	2	0 – 100	1	0
0 – 6	0.01	2	0 – 200	1	0
0 – 7	0.01	2	0 – 250	1	0
0 – 8	0.01	2	0 – 300	1	0
0 – 9	0.01	2	0 – 500	1	0
0 – 10	0.1	1	0 – 1000	5	0
0 – 11	0.1	1	0 – 2000	5	0
0 – 12	0.1	1	0 – 3000	10	0
0 – 15	0.1	1	0 – 5000	10	0
0 – 20	0.1	1	0 – 9999	25	0

A1 / A2 / A3 alarm – Enter an alarm **Trip level** between 4 % and 100 % of the measuring range (setting A3 to zero switches off the A3 alarm). Also select **Rising** or **Falling** to set the alarm to activate for rising or falling gas levels.

F1 / F2 trip level – Enter a fault alarm trip level between 1 mA and 3.8 mA (setting F2 to zero switches off the F2 alarm).

A.5.2 Relay menu



Use the relay menu to view or configure the relay module relays.

Relays 1 and Relay 9 are preset, non-configurable, system-fault relays, which cannot be configured. Relays 2–8 and 10–16 are configurable. The relays present depend on the combination of internal control modules. For a controller using two relay modules (sixteen relays), the relay layout would be:

Module 3 – Relay 1–8

Module 4 – Relay 9–16

Function – Set the relay as: **Common, Single, Voting, Alarms inhibited** or **No function**.

Channel(s) – Only required for single or voting alarms.

Single – Select the channel from the channel list.

Voting – Enter [number of channels required to satisfy vote] **out of** [number of channels in voting group]. Then select the channels from the channel list.

 **NOTICE**
Inactive channels are shown with a dotted tick box.

If the selected channels do not match the number of channels required or the voting group, an on-screen message informs the user.

Create a common alarm for a group of N channels by configuring the relay as voting 1 out of N, and specifying the relevant channels in the voting group.

The following settings are only required for common, single and voting alarms.

Alarm type – Select the alarm or fault required (A1, A2, A3, F1 or F2).

Energize mode – Select energize on alarm or normally energized.

Latch – Select latching or non-latching.

Acknowledge – Select acknowledgeable or non-acknowledgeable.

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