

Isolated and Converter Barriers

Bulletin Numbers 937T, 937C

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Safety Considerations

Prior to mounting, installation, and commissioning of the device, review the appropriate installation instructions to your specific barrier.

- Do not install where corrosive vapors may be present
- IP 20 protection according to IEC/EN 60529
- Designed for use in pollution degree 2 and overvoltage category II as per IEC/EN 60664-1
- If used in areas with higher pollution degree, the devices need to be protected accordingly
- Only use power supplies that provide protection against direct contact (for example, SELV or PELV) for the connection to power feed modules
- Observe the tightening torque of the terminal screws
- The installation instructions in accordance with IEC/EN 60079-14 must be observed
- Intrinsically safe circuits of associated apparatus (installed in safe areas) can be led into hazardous areas, whereby special attention must be paid to maintain separation distances to all non-intrinsically safe circuits according to the requirements in IEC/EN 60079-14.

All separation distances between two adjacent intrinsically safe circuits need to be observed in accordance with IEC/EN 60079-14.

If “Ex i” protected circuits (intrinsically safe) were operated with non-intrinsically safe circuits, they must no longer be used as “Ex i” protected circuits.



The respective peak values of the field device and the associated apparatus with regard to explosion protection should be considered when connecting intrinsically safe field devices with intrinsically safe circuits of associated apparatus (verification of intrinsic safety). Make sure to observe IEC/EN 60079-14 and IEC/EN 60079-25.

If more channels of one device are connected in parallel, make sure the parallel connection is made directly at the terminals of the device. When verifying the intrinsic safety, the maximum values for the parallel connection must be considered.

Product Information and Features

Product Function

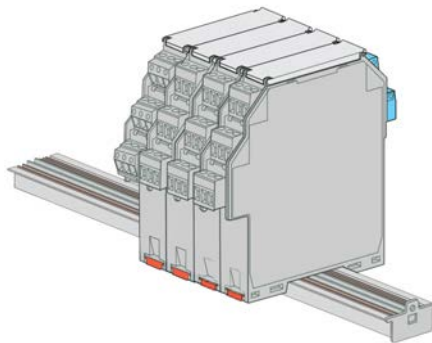
Isolated barriers are used for protection of intrinsically safe circuits in hazardous areas. They have the necessary current and voltage limitation and additionally electrical isolation between field circuit and control.

Figure 1 - Function – Isolating, Amplifying and Transforming Signals



The 937T and 937C consist of wide range of isolated barriers suitable for mounting on 35 mm DIN mounting rail. 937T and 937C are easy to specify, integrate, and expand.

Figure 2 - 937T and 937C on Power Rail



Profile Options

Depending on the functionality and application, 937T and 937C modules have three different housing widths:

- 937TH modules with 12.5 mm width
- 937TS and 937CS modules with 20 mm width
- 937CU modules with 40 mm width

The three profiles have the same system characteristics. All 937T and 937C devices can be combined on the power rail.

Terminals

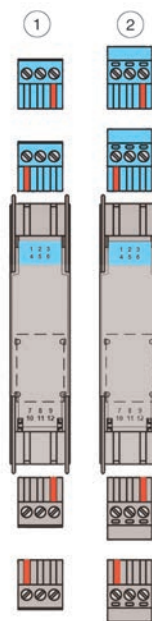
Removable Terminal Blocks

The removable terminal blocks simplify connection and control cabinet construction significantly. These terminal blocks offer adequate space for the connection of leads with core cross-sections of up to 2.5 mm^2 (14 AWG). The terminal blocks are coded with red coding pins preventing wiring errors.

Observe the tightening torque of the terminal screws. The tightening torque is $0.5\text{...}0.6 \text{ N}\cdot\text{m}$.

All modules are equipped with screw terminals.

Figure 3 - 937T and 937C Removable Terminal Blocks



1. Terminal blocks with screw terminals
2. Terminal blocks with screw terminals and test sockets

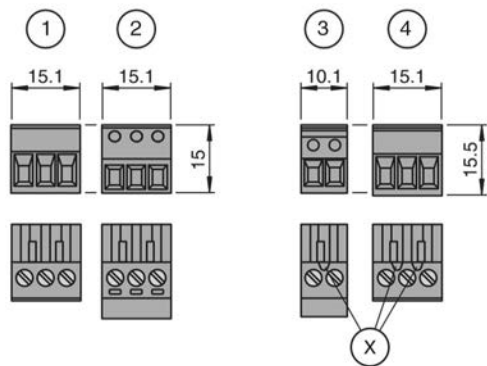
Protection Against Direct Contact

The removable terminal blocks have different heights:

Height 15 mm (1), (2): These terminal blocks are used in applications that have rated voltages lower than 50V AC. The insulation of the removable terminal blocks provides protection against direct contact. The insulation corresponds to a reinforced insulation according to EN 50178 for a rated insulation voltage of 50V AC.

Height 15.5 mm (3), (4): These terminal blocks are used in applications that have rated voltages higher than 50V AC. The insulation of the removable terminal blocks provides protection against direct contact. The insulation corresponds to a basic insulation according to EN 50178 for a rated insulation voltage of 300V AC. The higher terminals are marked (X).

Figure 4 - Removable Terminal Blocks with Different Heights



1. Terminal block with screw terminals, height 15 mm
2. Terminal block with screw terminals and test sockets, height 15 mm
3. Terminal block with screw terminals and test sockets, height 15.5 mm
4. Terminal block with screw terminals, height 15.5 mm

X = Marking

Terminal Designation

Reference appropriate device for precise terminal designation

Figure 5 - 937TH Module (12.5 mm)

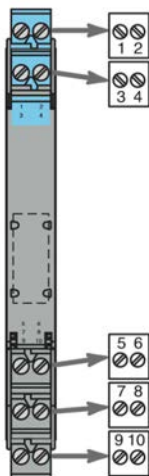


Figure 6 - 937TS Module (20 mm)

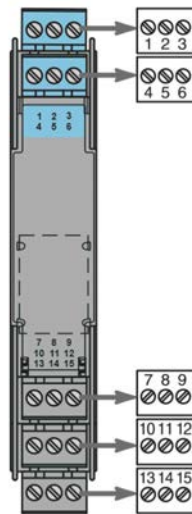
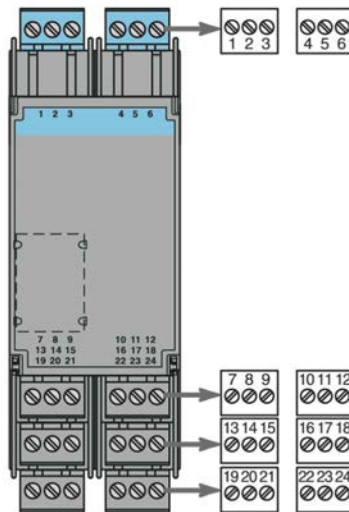
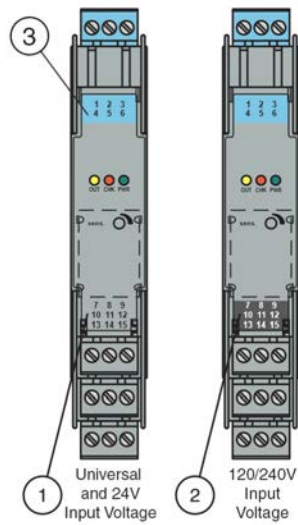


Figure 7 - 937CU Module (40 mm)



Module Input Voltage Color Coding

Figure 8 - 937 Color Coding



The color identification of the devices has the following meaning:

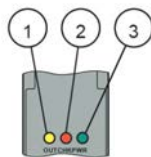
1. Gray—auxiliary power — DC power supply.
2. Black — auxiliary power —AC range power supply.
3. Blue —field hazardous location connections.

Status Indicators

Status indicators are often used on isolators to indicate different states, such as power supply, device failure, status messages, and binary switching states. The colors are assigned to the status display according to NAMUR NE44

Color	Display function	Display	Meaning
Green	Power supply	On	Power supply OK
		Off	Power failure or insufficient power supply – device faulty
Red	Device fault, device failure	On	Internal fault signal, failure signal – fault/failure display of causes detected inside the device, device needs replacing
	Line fault	Flashing	External fault signal, failure signal – fault/failure display of causes detected outside the device, inspection and elimination of fault required
	No fault	Off	No malfunction, device is operating properly
Yellow	Switching states of binary inputs and outputs	On	<p>Possible causes of the output:</p> <ul style="list-style-type: none"> The relay is energized. The NO contact (also a change-over contact) is actively closed. The open collector is switched through. The switching voltage generated inside the device is applied. <p>Possible causes of the input:</p> <ul style="list-style-type: none"> An external contact is closed. A NAMUR sensor is undamped (OK range according to closed-circuit current principle). A switching signal is actively applied.
		Off	<p>Possible causes of the output:</p> <ul style="list-style-type: none"> The relay is de-energized. The NO contact (also a change-over contact) is actively opened. The open collector is not switched through. The switching voltage generated inside the device is not applied. <p>Possible causes of the input:</p> <ul style="list-style-type: none"> An external contact is opened. A NAMUR sensor is damped (fault range according to closed-circuit current principle). A switching signal is not applied.

Figure 9 - Example Status Indicator

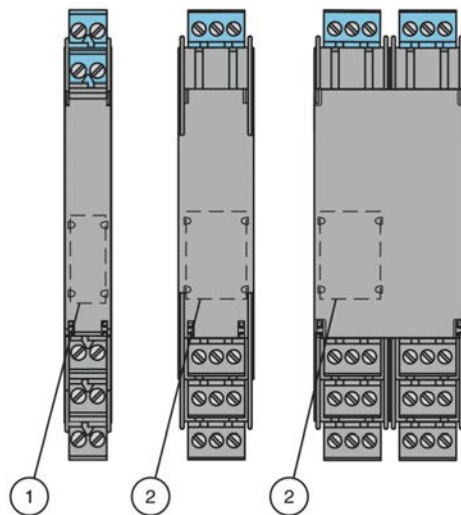


1. Yellow “OUT” — Switching state of the output.
2. Red “CHK” — Lead breakage and short circuit status indicator.
3. Green “PWR” — Power supply status indicator.

Marking Systems

A marker card holder to individually label the device is standard

Figure 10 - 937 Marking System.



1. Marker holder location on 937TH module for 22 mm x 9 mm labels.
2. Marker holder location on 937TS, 937CS, and 937CU modules for 22 mm x 16.5 mm labels.

Installation Types

DIN Mounting Rail

The devices are mounted on a 35 mm DIN mounting rail (Cat. No. 937A-PR_ or 199-DR_) according to EN 60715.

Power Rail

To reduce wiring and installation costs, the power rail is the optimum optional solution. The power rail is a DIN mounting rail with plastic insert, that delivers power to the devices (24V DC) and transfers bus signals and a collective error message.

The power rail is factory-equipped with cover and end caps. These parts cover empty and open segments of the power rail. Thus, the power rail is protected from contamination. Additionally the cover and end caps prevent that electrically conductive parts come in contact with the power rail.

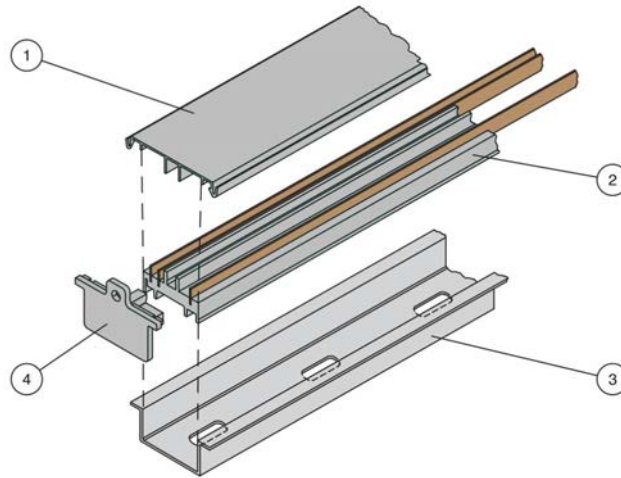
The power rail is available in two versions:

Cat. No. 937A-PR08 (0.8 meters long) and Cat. No. 937A-PR20 (2 meters long)

Contains three conductors:

- two conductors for power
- one conductor for collective error messaging

Figure 11 - Example: Power Rail

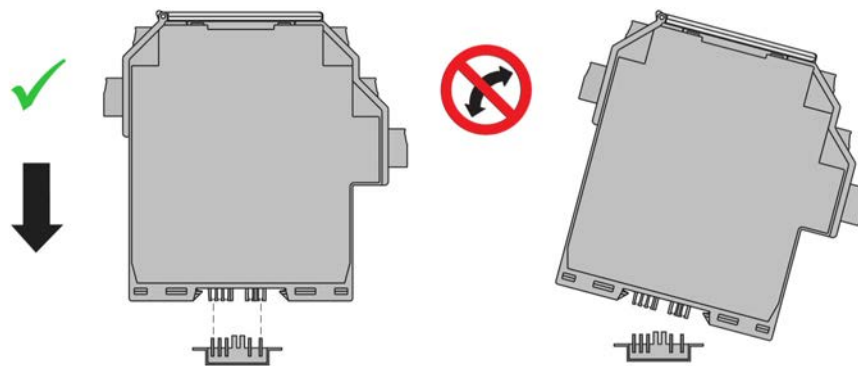


1. Cover
2. Insert
3. DIN mounting
4. End cap (Cat. No. 937A-PREC)

Mounting Configurations

IMPORTANT Snap the device onto the DIN mounting rail in a vertical downward movement.

Figure 12 - Proper Mounting Technique



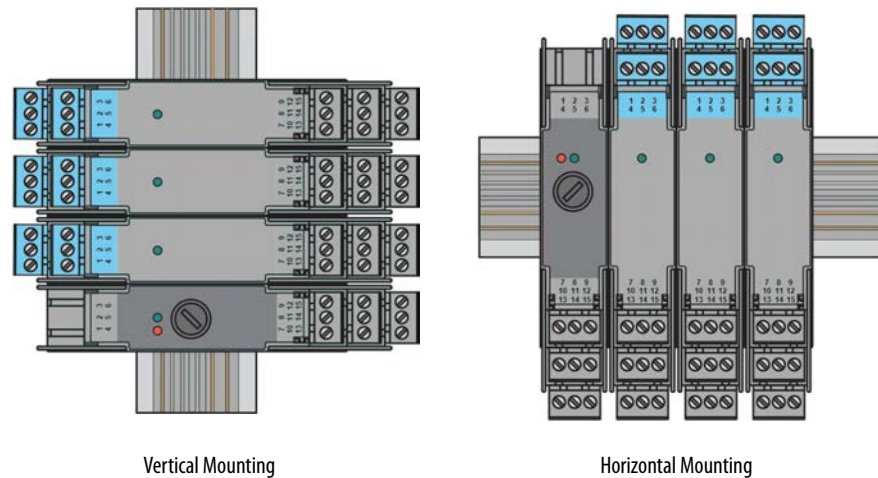
CORRECT: Device snapped on vertically.

INCORRECT: Device snapped on from the side. Can damage the contacts and cause the device to fail.

Vertical and Horizontal Mounting

Low heat dissipation allows vertical or horizontal mounting without spacing. Operation is guaranteed over the full temperature range of the system in any mounting direction and without restriction

Figure 13 - Vertical vs. Horizontal Mounting Configurations



Mounting the Terminal Blocks

The insulation of the removable terminal blocks protect against direct contact. If you replace the terminal blocks, observe the rated insulation voltage. See [Terminals on page 3](#) for more information. If the rated voltage greater than 50V AC, proceed as follows:

1. Switch off the voltage.
2. Connect the terminal blocks or disconnect the terminal blocks.

Connection Options

937T and 937C devices are available with different supply voltages.

- 24V DC power supply
- 115V AC or 230V AC power supply for applications where direct current is not available
- AC/DC wide range supply with 20...90V DC or 48...230V AC

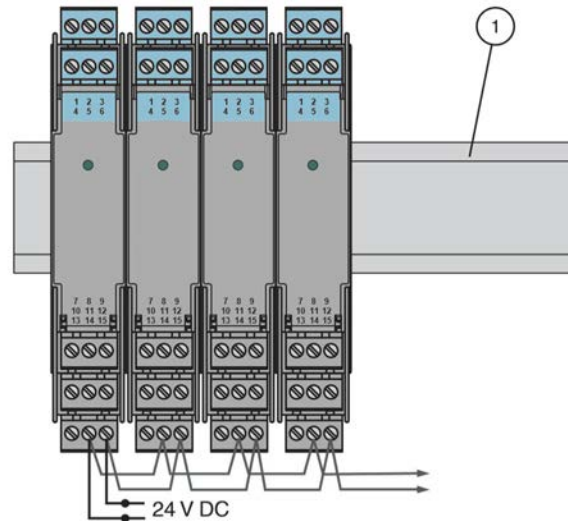
The supported supply voltage for each device is identified on the side plate.

Power Supply without the Power Rail

If devices with AC or universal power supplies are used, the advantages of the power rail are not available.

Conventional power supplies create complicated and expensive wiring systems. After all isolated barriers are connected, there is a significant amount of wiring and more wiring must be added for extra functions such as line fault detection.

Figure 14 - Conventional Installation



1. DIN Mounting Rail

Power Supply with the Power Rail

For devices with a 24V DC supply voltage, use of the power rail reduces wiring and installation costs. The power rail greatly reduces the risk of wiring faults and facilitates expansion.

Power (from Bulletin 1606 Power Supplies) is supplied to the power rail via a power feed module which provides a voltage of 24V DC (max 4 A) to a maximum of 80 devices.

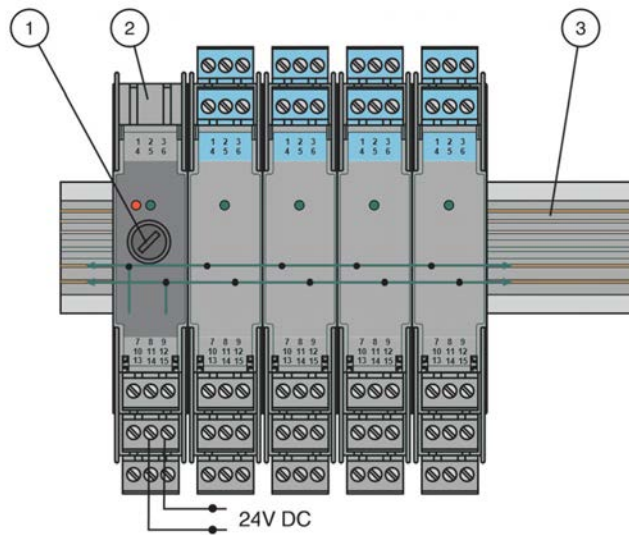
The power feed module features a replaceable 5 A fuse at the front. This fuse helps protect the power rail and connecting contacts. It prevents damage caused by reverse supply voltage or by installing too many isolators. The isolators on the power rail feature integrated device fuses. Any faults in the isolator or in the signal leads do not affect the power rail supply system. The 5 A fuse permits a rated current of up to 4 A across the entire temperature range.

The power feed module also has the task of outputting a collective error message or power failure of the isolators via a separate relay output.

Non-Redundant Supply with Power Feed Modules

The power feed module mounts on the power rail for easy and consistent distribution of power to all connected isolators. This method eliminates the wiring loops (daisy chain) necessary on a conventional installation without the power rail.

Figure 15 - Non-redundant Power Rail Installation

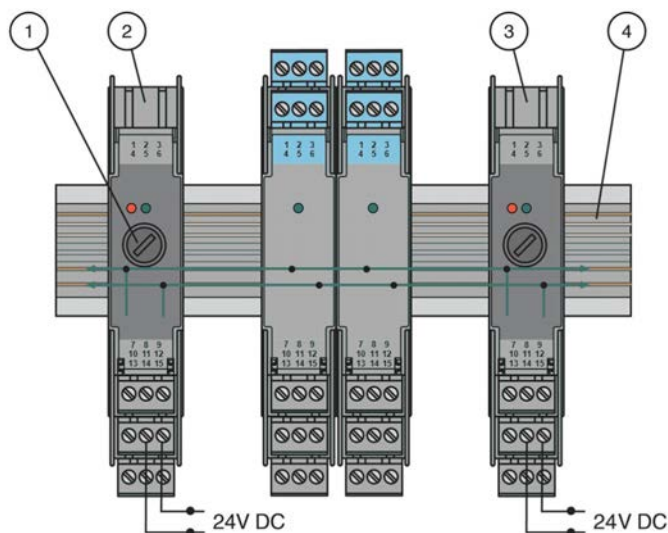


1. Replaceable fuse
2. Power feed module
3. Power rail

Redundant Supply with Power Feed Modules

Two power supplies or a redundant power supply with two power feed modules offer a high degree of availability. If a power supply or the fuse in a power feed module fails, the redundant supply continues to energize the isolators through their power rail connection.

Figure 16 - Redundant Power Rail Installation



1. Replaceable fuse
2. Power feed module 1
3. Power feed module 2
4. Power rail

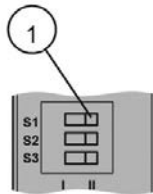
Device Configuration Options

Many 937T and 937C devices can be adapted to different applications. Depending on the device, different controls are available for this configuration. These controls are:

DIP switches

Via DIP switches you can configure the basic functions of the device.

Figure 17 - DIP Switch Controls

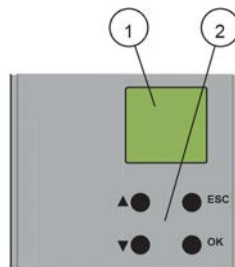


1. DIP Switch

Keypad and LC display

Via keypad you can configure the settings of the device parameters. Measured values, fault signals and configuration settings are displayed on the LC display.

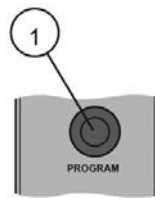
Figure 18 - Keypad and LC Display Location



1. LC display
2. Keypad

Programming sockets for the connection of a Personal Computer with parameterization software PACTware™

Via parameterization software PACTware you can configure the device easily. The configuration data can be edited and saved. The parameterization software helps users for maintenance, diagnostics and troubleshooting

Figure 19 - Programming Socket Location

1. Programming socket

Device configuration

Set the particular controls as described in section 'Configuration' of the data sheet.

Operation Modes and Diagnostics

Fault Monitoring

Numerous faults can occur between measurement of the process variable and evaluation in the control system. This can lead to undesirable process statuses under certain circumstances. These process statuses may result in plant downtime or quality problems or even present a hazard to persons and the environment. Depending on the device version, the isolators enable monitoring of the following faults:

Line faults

Here, the connection cables between the isolator and field device are monitored for lead breakages or short circuits. If a fault is detected, it is output at the fault message output or collective fault message. The relevant switching outputs are then switched to a de-energized state. The red status indicator signal the fault.

Device faults

The isolators are designed so that internal faults are detected and reported. In the case of a power failure, the outputs are switched to a de-energized state.

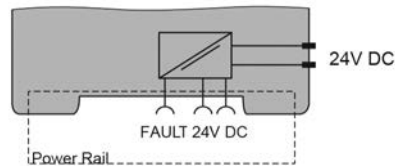
Fault Output

Select 937T and 937C isolators monitor the field cables for lead breakages and short circuits so that faults in the plant can be detected immediately. Line faults are prevented from being interpreted as signals. Depending on the configuration of the devices, these faults are transmitted to the outputs at the control side and in separate fault indication outputs as additional information.

Collective Error Message on Power Rail

In addition to the output of fault message (status indicator) on a particular module, the fault is also outputted at the power rail (FAULT) as a collective error message.

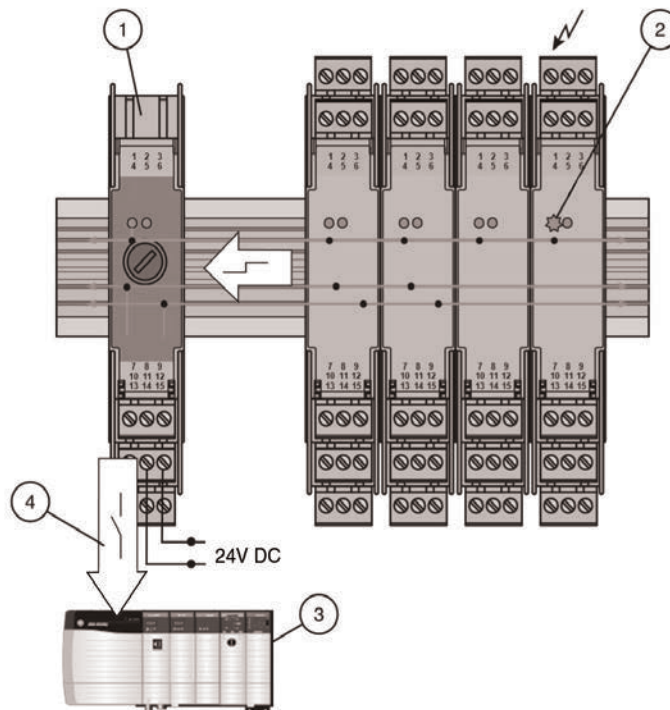
Figure 20 - Collective Error Message



The collective error message enables line fault detection of many isolators without requiring additional wiring. In the event of a fault, a fault message signal is transmitted to the power rail from an isolator. The power feed module evaluates the signal and transmits the fault message signal to the controller by means of a potential-free contact.

The potential-free contact simultaneously reports the device power failure or failure of individual devices.

Figure 21 - Collective Error Message Via Power Feed Module



1. Power feed module
2. Fault indication on one of the devices (red status indicator flashes)
3. Process control system
4. Fault indication output

Current and Voltage Standard Signals

The following signals have established themselves as the standard:

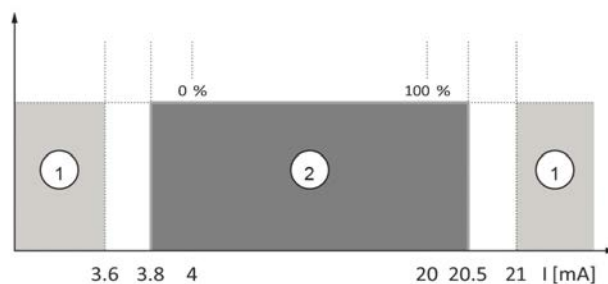
- 0/4...20 mA current signal
- 0/2...10V voltage signal

The 0/1...5V voltage signal is also occasionally encountered in addition to the 0/2...10V voltage signal.

Analog sensor signals and digital frequency signals are converted into one of the two standard signals for processing in a wide variety of measurement, regulatory and control tasks. This offers the measurement and control technician an easy-to-measure standard signal common to all manufacturers. Sensor signals are converted into standard signals via signal converters.

For more diagnostic options, the NAMUR organization published NAMUR recommendation NE43, dividing the value range of the signal (for example: current signal) into several areas. Valid, defined measurement value information is transferred within the range from 3.8...20.5 mA. Failure information is available when the signal current is < 3.6 mA or > 21 mA such as outside of the range for measured value information. The same applies to the voltage signal.

Figure 22 - Signal ranges according to NAMUR NE43



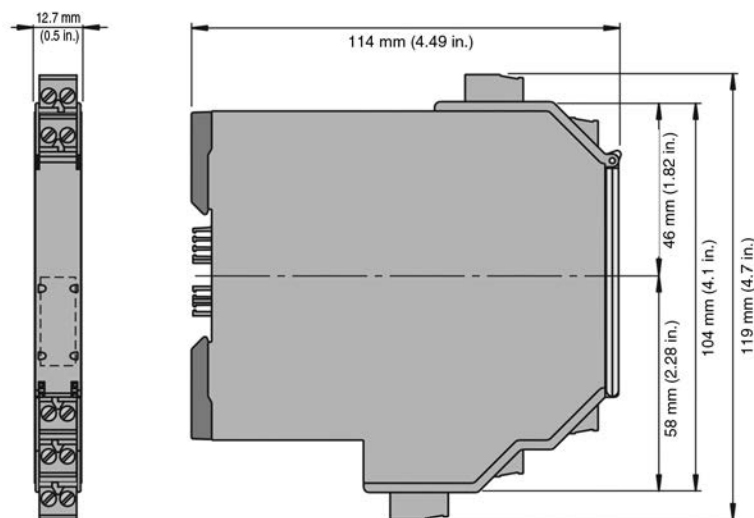
1. Failure information
2. Measuring information

Specifications

Attribute	Value
Environmental Specifications	
Operating Temperature	-20...60 °C (-4...140 °F)
Storage Temperature	-40...90 °C (-40...194 °F)
Reference Conditions for Adjustment	20 °C (68 °F)
Relative Humidity	Max 95 % without moisture condensation
Vibration Resistance	According to EN 60068-2-6, 10...150 Hz, 1 g, high crossover frequency
Shock Resistance	According to EN 60068-2-27, 15 g, 11 ms, half-sine
Marker cards (area located on the front of the product)	937TH modules (12.5 mm width): 22 mm x 9 mm (0.87 x 0.35 in.) 937TS, 937CS, and 937CU modules (20 mm and 40 mm widths): 22 mm x 16.5 mm (0.87 x 0.65 in.)
Mechanical Specifications	
Housing Material	Snap-on 35 mm DIN mounting rail according to EN 60715. Can be mounted horizontally or vertically, side by side.
Dimensions	Polycarbonate (PC)
Protection Degree	Refer to the Intrinsic Safety Modules Selection Guide, publication 937-SG001
Connection	IP20 according to EN 60529/937TH, 937TS, 937CS, and 937CU Modules: removable connector with integrated self-opening terminals for leads of up to a max. of 1 x 2.5 mm ² (14 AWG)
Tightening Torque	0.5...0.6 N·m.
Fire Protection Class	Housing: V2 according to UL 94 standard. Unless stated otherwise all details relate to the reference conditions.

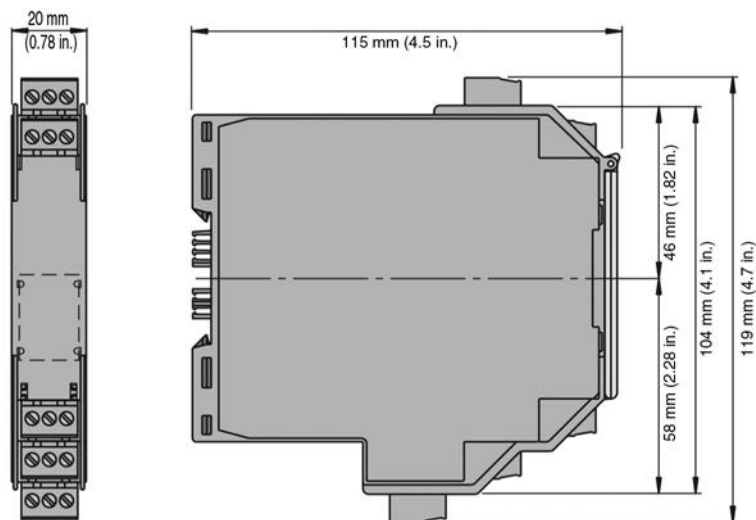
Approximate Dimensions

Figure 23 - 937TH Modules (12.5 mm)



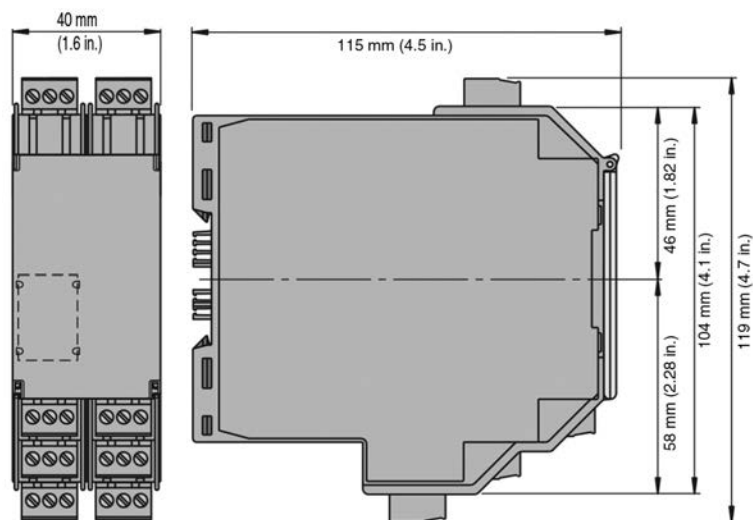
- Number of terminal blocks 5, max
- Dimension drawing with screw terminals
- When using screw terminals with test sockets, the device is 124 mm (4.9 in.) in height

Figure 24 - 937TS Modules (20 mm)



- Number of terminal blocks 5, max
- Dimension drawing with screw terminals
- When using screw terminals with test sockets, the device is 124 mm (4.9 in.) in height

Figure 25 - 937CU Modules (40 mm)



- Number of terminal blocks 10, max
- Dimension drawing with screw terminals
- When using screw terminals with test sockets, the device is 124 mm (4.9 in.) in height

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Intrinsic Safety Modules Selection Guide, publication 937-SG001	Product Selection, Specifications and Dimension information on Intrinsic Safety Modules.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/literature/>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

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