

# SDIL-1608

## Safe loop-monitored digital input module with earth fault monitor (16 channels)

### Description

The SDIL-1608 digital input module has sixteen channels for either loop-monitored loops or status signals derived from proximity switches, as set in DIN 19234 (NAMUR). The module also supports monitoring of earth faults that occur within these sixteen loops.

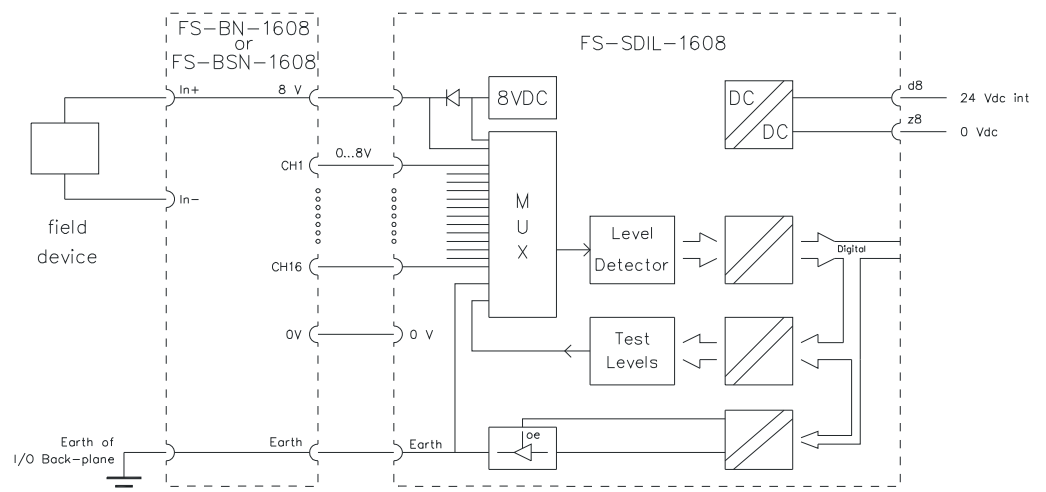
The SDIL-1608 module can be used in applications up to SIL 3, in compliance with IEC 61508.

The power for the connected field devices is supplied by an on-board DC/DC converter common to all sixteen channels.

LEDs on the front of the module indicate the status of the channel, loop and module diagnostics.

The input of proximity switch signals to the SDIL-1608 module needs to be converted to a level that is suitable for the SDIL-1608 module. To enable this conversion, you need to place the signal converter module BN-1608 or BSN-1608 on programming connector P<sub>x</sub> on the back of the IO backplane in the IO chassis.

**Figure 186** Schematic diagram for connection of inputs to SDIL-1608 module



## Self-test

The self-test of the module, which is controlled by the SM Controller, includes:

- Functional tests of the various trip levels applied
- Channel independence
- Monitoring of supply voltage to input devices
- Earth connection
- Used supply voltages

## Field devices

Different types of field devices can be connected to the SDIL-1608 channels, depending on the signal converter that is used, as shown in Table 50 on page 314.

**Table 50** Connection of field devices

Type of field signal	Used converter type	
	BN-1608	BSN-1608
Dry contacts with line monitoring function <sup>1</sup>	Yes	Yes
Dry contacts without line monitoring function	Yes	Yes <sup>2</sup>
Proximity switches according to DIN 19234 (NAMUR), for example Pepperl+Fuchs (P+F) N-series	Yes	No
Pepperl+Fuchs (P+F) SN-series safe proximity switches (ferrometal sensing) <sup>3</sup>	No	Yes
Pepperl+Fuchs (P+F) SIN-series safe proximity switches (non-ferrometal sensing) <sup>***</sup>	No	Yes

1 This requires a line terminator with a 10 kΩ resistor and a 1 kΩ resistor ±10%, 0.25 W (see electronic diagrams in the first column of Table 52 on page 317).

2 Max. 8 channels per BSN-1608 converter may be used for dry contacts without line-monitoring function.

3 The combination of safe sensors with the safe input module SDIL-1608 meets the safety integrity requirements in IEC 61508.

## Earth fault monitor

For proper operation of the earth fault monitor, you need to ensure there is an earth connection for pin z28 of the SDIL-1608 module and the monitor software has been activated.

The earth fault monitor uses floating field sensors to check for and indicate a connection between any of the 2x16 input wires and earth. In zener-barrier

applications, the earth fault monitor checks for and indicates a loss of connection between the '8 Vdc' of the SDIL-1608 module and earth.

## LED indicators

The module front has a number of LED indicators that indicate the status of the channel, loop and module.

Each channel has two LEDs to indicate its status.

- The green channel LED shows the channel status is high (**ON**) or low (**OFF**).
- The **red** channel LED shows a fault occurred in the channel, or if a lead breakage or short circuit was found (**ON**).

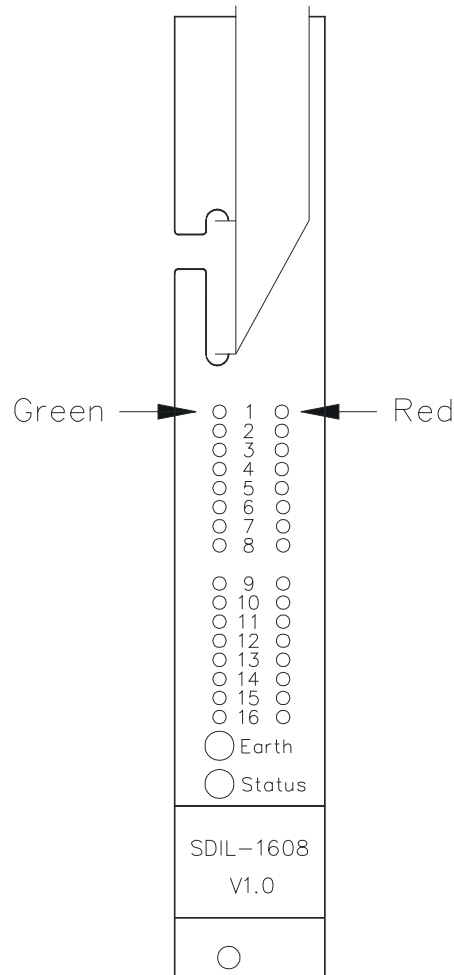
For inputs without active line monitors, these two LEDs are always off.

Table 51 on page 316 and Table 52 on page 317 shows the status indications of the green and red channel LEDs for different field situations.

The bi-colored earth LED indicates whether the earth connection test is OK (**green**), false (**red**) or disabled (**OFF**).

The bi-colored status LED indicates whether the module is OK (**green**) or faulty/not running (**red**).

**Figure 187** Module front



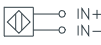


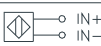
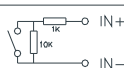
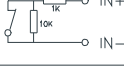
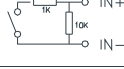
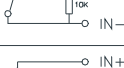





**Table 51** Status LED behavior for line-monitored inputs

Field status	Green channel LED	Red channel LED
Normal	See Table 52 on page 317	ON/OFF <sup>1</sup>
Lead breakage	OFF	ON
Short circuit	ON	ON

<sup>1</sup> OFF if no channel fault has been detected since the last fault reset.  
ON if a channel fault has been detected since the last fault reset.

**Table 52** Green channel LED behavior

	field situation	green channel LED	loop monitored
 DIN 19234 NAMUR	sensor $I < 1.2\text{mA}$	OFF	YES
 DIN 19234 NAMUR	sensor $I > 2.1\text{mA}$	ON	
 P+F SN sensor	sensor covered (safe state)	OFF	YES
 P+F SN sensor	sensor uncovered (active state)	ON	
 P+F S1N sensor	sensor uncovered (safe state)	OFF	YES
 P+F S1N sensor	sensor covered (active state)	ON	
 IN+ IN-	switch open	OFF	YES
 IN+ IN-	switch closed	ON	
 IN+ IN-	switch open	OFF	YES
 IN+ IN-	switch closed	ON	
 IN+ IN-	switch open	OFF	NO
 IN+ IN-	switch closed	ON	
 IN+ IN- Spore	any	OFF	NO

## Hazardous locations (FM 3611)

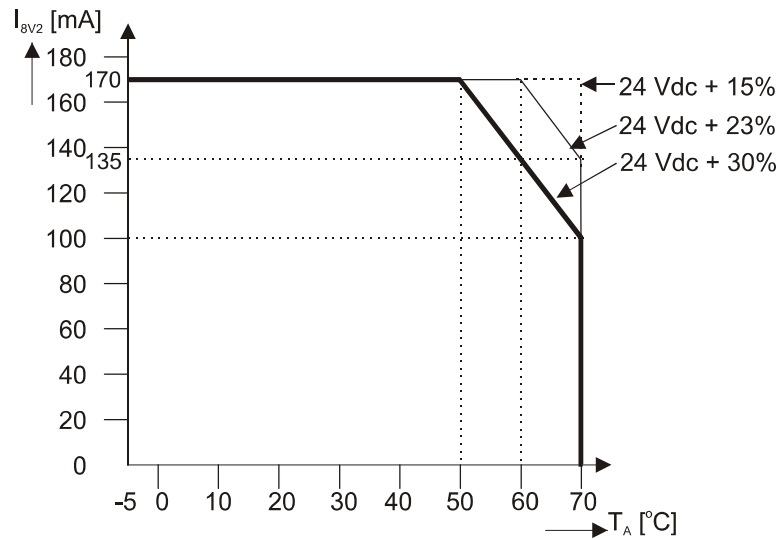
The SDIL-1608 module can be used for hazardous zones in compliance with FM 3611 (Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG). Its non-incentive field device may reside in Division 2 area but module, FTA and converter must reside in a non-hazardous area. For more details, see the FM Approval Guide EP-SM.6287.

## Maximum output load

The power for the connected field devices is supplied by an on-board DC/DC converter, common to all sixteen channels.

Figure 188 on page 318 shows the derating curve of the total 8V output load versus the ambient temperature and (24 Vdc) supply voltage level.

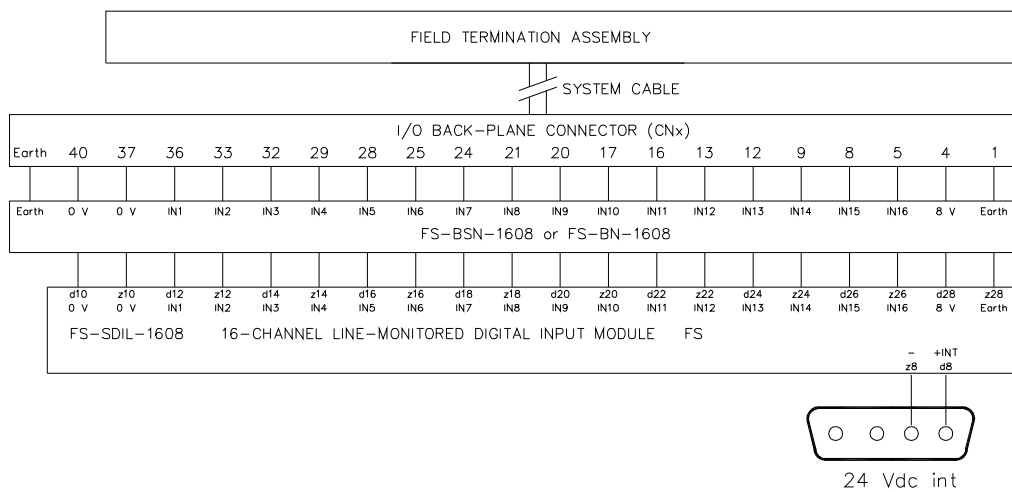
**Figure 188** Derating curve (8V output load current vs. ambient temperature) for the SDIL-1608



## Connection example

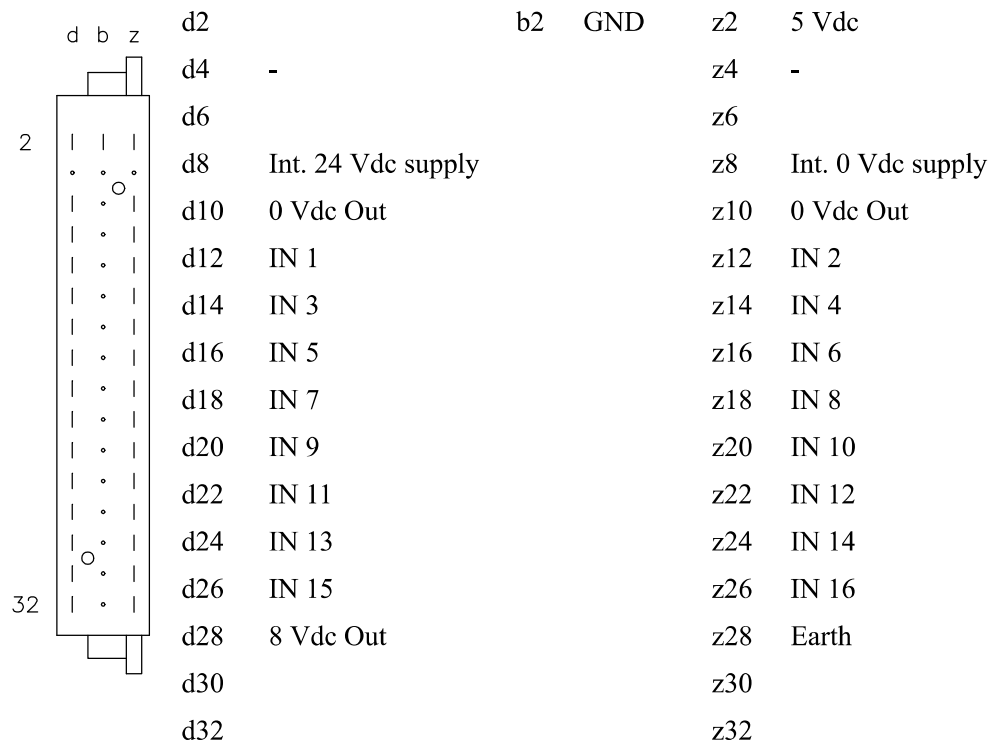
Figure 189 on page 318 shows a typical connection example for SDIL-1608.

**Figure 189** Connection example of SDIL-1608 module with signal converter BN-1608



## Pin allocation

The following overview contains the back view and pin allocation of the SDIL-1608 module connector:



## Technical data

The SDIL-1608 module has the following specifications:

<b>General</b>	Type numbers <sup>1 2</sup> :	FS-SDIL-1608 V1.1
		FC-SDIL-1608 CC V1.1
		FA-SDIL-1608 CA V1.1
	Approvals:	CE, TUV, UL, CSA, FM
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
<b>Power</b>	Power requirements:	5 Vdc, 160 mA 24 Vdc, 110 mA
<b>Input</b>	The following specifications are all in combination with BN-1608.	
	Number of input channels:	16
	Input type:	according to DIN 19234 (= NAMUR)
	Switch level:	1.4—1.9 mA
	Hysteresis:	0.2 mA ± 0.05 mA
	Input filter:	first order, low pass 100 Hz
	Field wire resistance:	max. 50 Ω
	8 V loop supply:	
	• output voltage	7.9—8.7 V
	• output current	170 mA (short-circuit proof) <sup>3</sup>
<b>Earth</b>	Connection monitor:	1
	Input resistance:	typically 0.5 MΩ (–40V < U < 40V)
	Test current:	typically 0.5 mA
	Output voltage:	typically 0.5 Vdc
	Field fault voltage:	max. 250 Vac
<b>Key coding</b>	(See section “Key coding” on page 17)	
	Module connector code:	
	• holes	A5, C29
	Chassis connector code:	
	• large pins	A5, C29

- 1 FS-type modules are non conformal coated modules.  
FC-type modules are conformal coated modules. Conformal coated modules have the letters “CC” preceding the version number.  
FA-type modules can be used to connect to devices in explosive atmospheres, conform to the ATEX guidelines in the *Safety Manager TUV EExn Approval Manual (PM.MAN.8183)*. ATEX approved modules have the letters “CA” preceding the version number.
- 2 Modules with suffix code V1.1 or CCV1.1 have an improved designed. There are no functional changes.
- 3 This current is the maximum output current. To determine the actual output current limitation see “Maximum output load” on page 318.



# Input converter modules

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This chapter describes the input converter modules that are available for Safety Manager.

The following input converter modules are described:

Input converter module		See
BSAI-04x + BSDIL-0426	Analog input converter modules for use with SAI-0410	page 324
BSAI-1620mE	Analog input converter module, 0—25 mA to 0—4.1 V (16 channels)	page 335
BSDI-16UNI	Converter module for normally open digital inputs with ELD function (16 channels)	page 337
BN-1608	Digital converter module for NAMUR Signals (16 channels)	page 339
BSN-1608	Digital converter module for Safety sensor signals (16 channels)	page 341

For related input modules, see “Input modules” on page 289.

## General info about input converter modules

An input converter module converts input field signals to values appropriate for the Safety Manager input module being used. Converting input field signals can also be done on the FTA (see “General info about Termination Assembly modules” on page 501).

The converter modules described here are “B” type converters, meaning they are placed on an IO programming connector on the IO backplane in the IO chassis.

Table 53 on page 322 shows all available input converter modules and the input modules for which they are used.

**Table 53** input converter modules and their corresponding input modules

Input converter module	Input module
BSAI-0420mI	SAI-0410
BSAI-0420mE	
BSAI-0405E	
BSAI-0410E	
BSDIL-0426	
BSAI-1620mE	SAI-1620m
BSDI-16UNI	SDI-1624
	SDI-1648
BN-1608	SDIL-1608
BSN-1608	SDIL-1608

Figure 190 on page 323 shows a part of the back of a non-redundant IO chassis with input converters in slots P1, P4, P6 and P7.

**Figure 190** Detail of the back of a non-redundant IO chassis

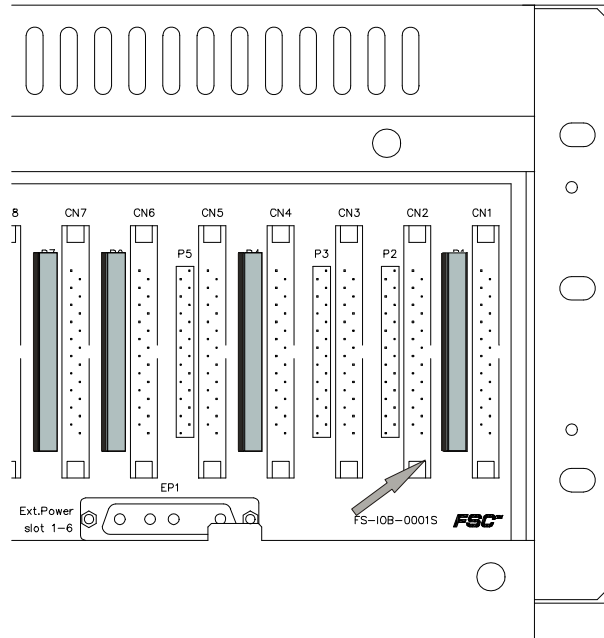
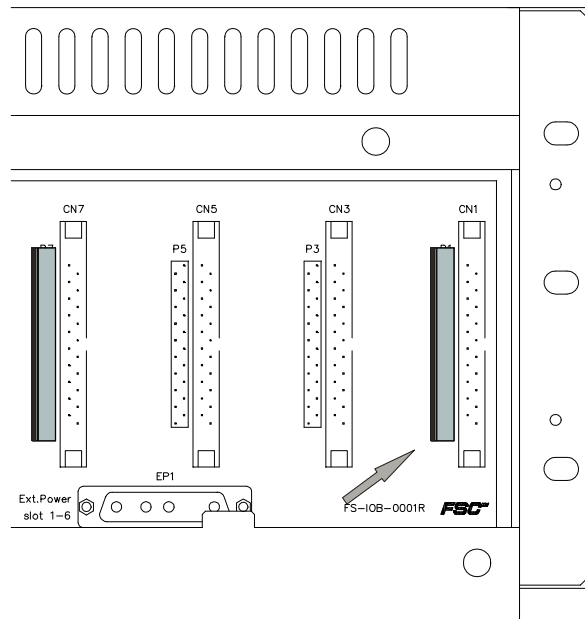


Figure 191 on page 323 shows a part of the back of a redundant IO chassis with input converters in slots P1 and P7.

**Figure 191** Detail of the back of a redundant IO chassis



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## BSAI-04x + BSDIL-0426

Analog input converter modules for use with SAI-0410

### Description

The analog inputs of an SAI-0410 module require an BSAI-04x or BSDIL-0426 analog input converter module to convert field signals into 0—2 V signals for the SAI-0410 module.

The following analog input converters are available for the SAI-0410:

- “BSAI-0420mI” on page 325
- “BSAI-0420mE” on page 327
- “BSAI-0405E” on page 329
- “BSAI-0410E” on page 331
- “BSDIL-0426” on page 333

The BSAI-04x or BSDIL-0426 module is placed on a programming connector (Px) on the back of the IO backplane in the 19-inch chassis.

Redundant modules require only one BSAI-04x or BSDIL-0426 module.