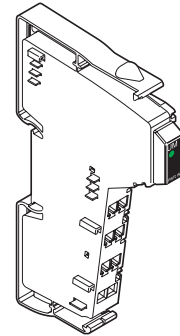


IB IL 24 PWR IN APPL

Creating a safe segment circuit with the IB IL 24 PWR IN (-PAC) power terminal



5567A001

Application note
6756_en_02

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1 Introduction

Phoenix Contact recommends using a safety terminal to create a safe segment circuit (see the AH EN IL SAFE application note).

If you want to create a safe segment circuit without using a safety terminal, you can proceed as described in this document.

The IB IL 24 PWR IN (-PAC) power terminal is suitable for creating a safety-related segment circuit in conjunction with an external safety device as described in this document.

The principle of the safety circuit is that when the supply voltage for the IB IL 24 PWR IN (-PAC) power terminal is disconnected by the external safety device, the I/O of the subsequent segment circuit of the Inline system is shut down safely.



This data sheet is only valid in association with the IL SYS INST UM E user manual.



When using the terminal also refer to the IB IL 24 PWR IN (-PAC) power terminal data sheet.



Make sure you always use the latest documentation.
It can be downloaded at www.phoenixcontact.net/catalog.

2 Ordering data

Products

Description	Type	Order No.	Pcs. / Pkt.
Power terminal without fuse; including connector and labeling field	IB IL 24 PWR IN-PAC	2861331	1
Power terminal without fuse	IB IL 24 PWR IN	2726311	1



You need one of the listed connectors for the power supply of the IB IL 24 PWR IN terminal.

Accessories

Description	Type	Order No.	Pcs. / Pkt.
Connector for voltage supply (black, w/o color print)	IB IL SCN-PWR IN	2727462	10
Connector for voltage supply (black, with color print)	IB IL SCN-PWR IN-CP	2727637	10

Documentation

Description	Type	Order No.	Pcs. / Pkt.
"Automation terminals of the Inline product range" user manual	IL SYS INST UM E	-	-
"Safety-related segment circuit" application note	AH EN IL SAFE	-	-
"Power terminal without fuse" data sheet	DB EN IB IL 24 PWR IN (-PAC)	-	-

3 Technical data

For the technical data, please refer to the IB IL 24 PWR IN (-PAC) terminal data sheet.

4 Explanation of symbols used



DANGER:

This indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING:

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



CAUTION:

This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTE:

This symbol and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware or software, or surrounding property.



This symbol and the accompanying text provide the reader with additional information, such as tips and advice on the efficient use of hardware and on software optimization. It is also used as a reference to other sources of information (user manuals, data sheets).

5 Safety notes

The machine/system manufacturer and the operator are solely responsible for validating the safety of the machine or system and the implemented application, in which the machine or system is used. The Machinery Directive must be observed.



WARNING: Loss of safety function

Use the safety terminal or the terminals in the safety-related segment circuit correctly.

Damage and personal injury will occur when these regulations are not observed.

The following points must be observed:

- When working on safety terminals, on terminals in safety-related segment circuits, and/or on the system, the latest version of the data sheets for the terminals and other product documentation must always be at hand and referred to.
 - It is prohibited for unqualified personnel to work on terminals in safety-related segment circuits, on the system, or in their vicinity.
 - Only qualified personnel who are familiar with applicable safety regulations in the workplace and accident prevention measures should install and operate the safe segment circuit while observing the information given in this document. Electrical work is only to be carried out by qualified electricians.
 - Observe all applicable regulations, especially those regarding safety equipment.
 - Repairs to Inline terminals, especially if the housing must be opened, should only be carried out by the manufacturer or authorized personnel.
 - Manufacturers and users of the machine, in which the IB IL 24 PWR IN (-PAC) terminal is used as described in these application notes, must ensure that all applicable safety instructions, safety regulations, and standards are agreed with the relevant authorities and observed at all times.
- **Check the shutdown process regularly**
At regular intervals, check the shutdown process for the external safety device and therefore the shutdown process for the segment voltage and the outputs.
The interval at which testing is to take place depends on the applicable standard and the application.

Observe the following points during installation:

- Observe the safety instructions given in the “Automation terminals of the Inline product range” user manual.
- Mount the Inline terminal in housing protected from dust and humidity (IP 54 or higher); dust and humidity can lead to malfunctions.
- Take measures to prevent the incorrect connection, polarity reversal, and manipulation of connections.
- Disconnecting an output via the bus system does not guarantee the safety-related function of the system (e.g., emergency stop, safety door). The safety-related function is only obtained if the supply voltage of the output groups is disconnected via the safety device.
- Establish a conductive connection between the ground contact (GND) of the power supply unit and the protective conductor/grounding terminal directly on the power supplies that supply the Inline station to ensure reliable functional earth grounding.
- Connect the power terminal for the safe segment circuit with PE using a grounding terminal (see Figure 4 on page 8).
- Provide the supply voltage, which can be safely disconnected by the upstream safety device, to the power terminal at a supply point for the segment circuit. Supply points for the main circuit must not be wired (see “Terminal point assignment” on page 6).

6 Requirements of terminal wiring in the safety-related segment circuit



WARNING: Loss of safety function in case of power feedback

When wiring Inline terminals in the safety applications, ensure that errors are prevented in terms of feedback for:

- All connected cables supplying the device with actuator voltage, and
- The connecting cables of the actuators.

Please also take all connected loads into consideration. This means, for example, that the cables must be wired using separate cable sheaths.

Observe the relevant DIN and VDE regulations, which must be met to prevent errors.

Feedback is the voltage supply into an outgoing cable (caused, for example, by generator effects of the connected load, by an insulation fault or by supply from a connected load due to an internal insulation fault).

6.1 Voltage supply requirements



WARNING: Loss of the safety function when using unsuitable power supplies.

Inline terminals are designed exclusively for protective extra-low voltage (PELV) operation according to EN 60204-1. Only PELV according to the defined standard may be used for supply purposes.

The following applies to the network (INTERBUS, PROFIBUS...) and the I/O devices used in it: Only use power supply units that meet EN 61204-1 with safe isolation and PELV according to EN 50178/VDE 0160 (PELV). This prevents short circuits between primary and secondary sides.

Also make sure that the output voltage of the voltage supply does not exceed 32 V even in the event of error.

6.2 Requirements for connecting the DIN rail to PE



WARNING: Loss of safety function when the connection of the DIN rail to PE is interrupted.

When you connect the DIN rail to PE make sure that errors are prevented when the connection is lost (interrupted).

If you cannot ensure that errors are prevented, establish an additional, discrete connection from the DIN rail to PE first.



Loss of safety function when the connection of GND to PE is interrupted.

When you connect GND of the power supply unit to PE make sure that errors are prevented when the connection is lost (interrupted).

If you cannot ensure that errors are prevented, the application can be used up to a maximum of performance level C/Cat. 2 - depending on the upstream safety device.

Observe the relevant DIN and VDE regulations, which must be met to prevent errors.

6.3 Requirements for DO terminals

Only use the terminals in the safety-related segment circuit that are listed in the AH EN IL SAFE application note.



WARNING: Loss of the safety function due to parasitic voltages

The ground contact of the connected load is only to be connected to the ground contact of the Inline terminal. This means, for example, that 1-wire terminations are not permitted.

6.4 Requirements for controlled devices/actuators

Dimension the controlled device used such that a leakage current of 2 mA does not cause a hazardous system condition. This requirement is met if the connected loads are adapted to the outputs since the outputs of the Inline terminals meet the requirements of EN 61131-2.

Use only loads that have an insulated structure, therefore:

- Make sure there is no electrically conductive connection between GND and PE/FE at the load.
- Make sure that - even in the event of an error - no external voltage is conducted via the load onto the device outputs (no feedback).

Only use appropriately qualified actuators.

Use reliable components. These include, for example:

- Control contactors according to EN 60947-4-1
- Power contactors
- Relays with forcibly guided contacts according to DIN EN 50205

Use relays or contactors with forcibly guided N/C contacts to safely monitor the state (pick-up, drop-out).

7 Application description

The IB IL 24 PWR IN (-PAC) power terminal is designed for use within a 24 V area of an Inline station. A safe segment circuit is created by supplying a 24 V voltage from an external safety device to the power terminal.

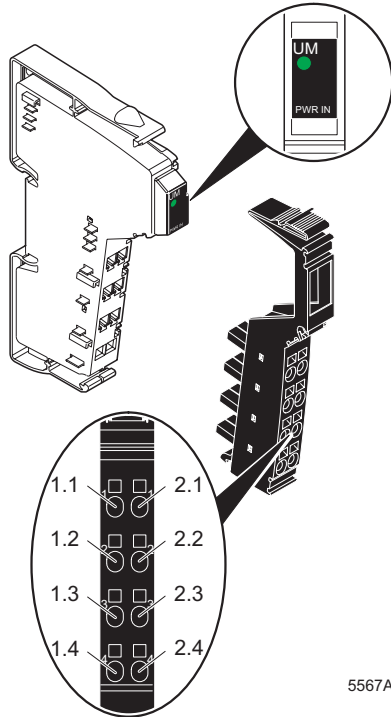
The safe segment circuit starts at the IB IL 24 PWR IN (-PAC) terminal in conjunction with the external safety device and finishes at the last terminal before another power supply unit or at the end of a station.

Various safety categories can be achieved depending on the safety device and the wiring (see safety device documentation).

Only Inline terminals that are specifically designed for the safety-related segment circuit may be used. They are listed under AH EN IL SAFE.

By using these terminals within the safe segment circuit, the category (Cat.) or the performance level (PL) according to EN ISO 13849-1 achieved by the supply is not restricted. This means that when you provide the supply voltage via an external safety device, which corresponds to Cat. 4/PL e according to EN ISO 13849-1, to the terminal, the segment voltage is disconnected according to Cat. 4/PL e in conformity with EN ISO 13849-1

8 Diagnostic/status indicators and terminal point assignment



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Figure 1 IB IL 24 PWR IN (-PAC) with appropriate connector

8.1 Function identification

Black

8.2 Local diagnostic indicator

Des.	Color	Meaning
UM	Green	24 V voltage (in the main circuit UM)



The supply voltage, which can be safely disconnected by the upstream safety device, should only be provided in the segment circuit, therefore, the LED has no significance in this application and should **not** light up.

8.3 Terminal point assignment

This section describes the assignment of the terminal points for a specific application. It differs from the representation given in the IB IL 24 PWR IN (-PAC) terminal data sheet.

Terminal point	Assignment
1.1, 2.1	Supply point for the segment circuit US (+24 V)
1.2, 2.2	These terminal points must not be used. (Supply point for the main circuit)
1.3, 2.3	Ground contact (GND) The reference potential is directly led to the potential jumper GND and is, simultaneously, ground reference for the segment voltage.
1.4, 2.4	FE connection The contacts are directly connected with the potential jumper FE and the FE spring on the bottom of the housing. The terminal is grounded when it is snapped onto a grounded DIN rail.
	Terminal points 1.1, 1.2, and 1.3 are connected with a capacitor to FE.



NOTE: Electronics is damaged when overloaded

Make sure that the maximum permissible current of 8 A flowing through potential jumper US is not exceeded.



In this application the power terminal must be supplied via the supply points for the segment circuit.

The terminal supplies the segment circuit US on the output side. The main circuit UM is not available after the power terminal.

9 Connection note



The supply to the segment terminal used to create a **safety-related** segment circuit (**Figure 2**) differs from the supply to the segment terminal used to create a **non-safe** segment circuit (**Figure 3**).

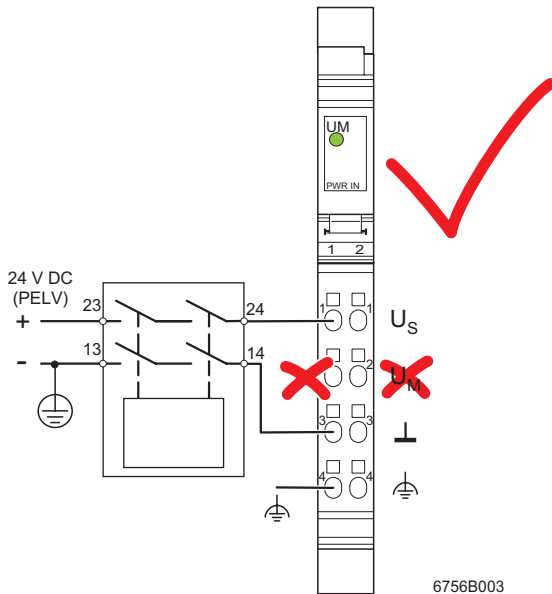


Figure 2 Supply to the segment terminal used to create a **safety-related** segment circuit

The supply voltage, which is supplied to the power terminal, can be safely disconnected by the upstream safety device.



WARNING: Loss of safety function by means of cross circuits

Lay the cables between the safety device and the Inline terminal in a protected environment. Make sure that the type of cable installation prevents errors in cross circuits with external signals.

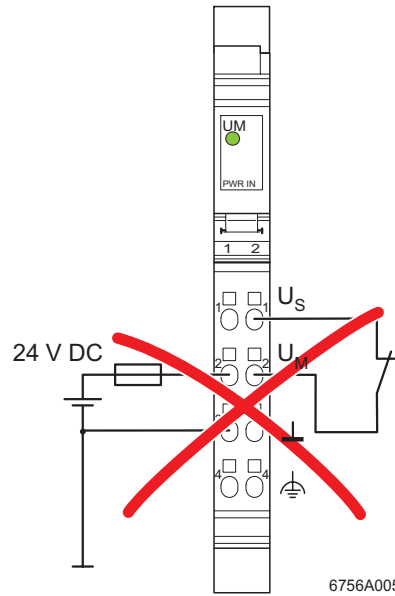


Figure 3 Supply to the segment terminal used to create a **non-safe** segment circuit



See also the IB IL 24 PWR IN (-PAC) terminal data sheet.

Key to Figure 4:

A	Power supply unit
B	Safety device (e.g., PSR-SCP-24UC/ES...4/2X1/1X2 from Phoenix Contact, see INTERFACE catalog)
C	Inline station with one safe and several non-safe segment circuits
D	Safety-related segment circuit

No.	Function	Example
1	Bus coupler	IBS IL 24 BK-T/U (-PAC)
2	Terminals corresponding to the application in the non-safety-related segment circuit	IB IL 24 DO 8 ...
3	Power terminal as the start of a safe segment circuit	IB IL 24 PWR IN (-PAC)
4	Approved terminals for the safety-related segment circuit according to the application	For approved terminals, see the AH EN IL SAFE application note
5		
6	Power terminal as termination of the safety-related segment circuit and start of a non-safety-related segment circuit	IB IL 24 PWR IN (-PAC)
7	Terminals corresponding to the application in the non-safety-related segment circuit	IB IL 24 DI 8 ...
8		IB IL 24 DI 2 ...
9	End plate as termination of the Inline station	Supplied with the bus coupler
10	Grounding terminal (universal ground terminal block)	USLKG... according to the configuration (see CLIPLINE catalog from Phoenix Contact)
11	End clamps	CLIPFIX 35



If the Inline station is not to be continued after the safety-related segment circuit, the end plate (9) must be installed instead of the power terminal (6).