Light beam PSENop4S operated with PNOZ m0p

pilz

Product
Type: Light beam, AOPD
Name: PNOZmulti, PSENopt
Manufacturer: Pilz GmbH & Co. KG, Safe Automation

Document
Release Number: 01
Release Date: 30 May 2011

Document Revision History

Release	Date	Changes	Chapter
01	2011-05-30	Creation	all

Exclusion of liability

We have taken great care in compiling our application note. It contains information about our company and our products. All statements are made in accordance with the current status of technology and to the best of our know-ledge and belief.
However, we cannot accept liability for the accuracy and entirety of the information provided, except in the case of gross negligence. In particular it should be noted that statements do not have the legal quality of assurances or assured properties.
We are grateful for any feedback on the contents.

May 2011

All rights to this publication are reserved by Pilz GmbH & Co. KG. We reserve the right to amend specifications without prior notice. Copies may be made for the user's internal purposes. The names of products, goods and technologies used in this manual are trademarks of the respective companies.

Support

Technical help round the clock!
Technical support is available from Pilz round the clock.
This service is provided free of charge beyond standard business hours.

Americas
- Brazil
  +55 11 8245-8267
- Mexico
  +52 55 5572 1300
- USA (toll free)
  +1 877-PILZUSA (745-9872)

Asia
- China
  +86 21 62494658-216
- Japan
  +81 45 471-2281
- Korea
  +82 2 2263 9540

Australia
- Australia
  +61 3 95446300

Europe
- Austria
  +43 1 7986263-0
- Belgium, Luxembourg
  +32 9 3217575
- England
  +44 1536 462203
- France
  +33 3 88104000
- Germany
  +49 711 3409-444
- Ireland
  +353 21 4804983
- Italy
  +39 031 789511
- Scandinavia
  +45 74436332
- Spain
  +34 938497433
- Switzerland
  +41 62 88979-30
- The Netherlands
  +31 347 320477
- Turkey
  +90 216 5775552

You can reach our international hotline on:

+49 711 3409-444 or **mailto:support@pilz.com**

Pilz GmbH & Co. KG
Safe Automation
Felix-Wankel-Straße 2
73760 Ostfildern, Germany

Telephone: +49 711 3409-0
Telefax: +49 711 3409-133
E-Mail: pilz.gmbh@pilz.de
Internet: www.pilz.com

Contents

1. Useful documentation 5
1.1. Documentation from Pilz GmbH & Co. KG 5
1.2. Documentation from other sources of information 5

2. Hardware configuration 6
2.1. Pilz products 6
2.2. Hardware configuration 6

3. Application Task 7
3.1. Description 7
3.1.1. Monitoring Light Beam 8
3.1.2. Monitoring Feedback Loop 8
3.1.3. Safety assessment 8
3.2. Functional safety 9
3.2.1. Safety-related characteristics in accordance with EN ISO 13849-1 9
3.2.2. Safety-related characteristics in accordance with EN 62061 10
3.2.3. Classification in accordance with EN 954-1 10
3.3. Program 11
3.4. Circuit diagram of the application 13
3.4.1. Circuit diagram 1/3 13
3.4.2. Circuit diagram 2/3 14
3.4.3. Circuit diagram 3/3 15

4. Table of figures 16

Abbreviations

FBL **F**eed**b**ack **l**oop
AOPD **A**ctive **o**ptoelectronic **p**rotective **d**evice

1. Useful documentation

Reading the documentation listed below is necessary for understanding this application note. The availability of the indicated tools and safe handling are also presupposed with the user.

1.1. Documentation from Pilz GmbH & Co. KG

No.	Description	Item No.
1	Pilz international homepage, download section	www.pilz.com
2	Operating instructions PSEN op4S	1001182-3FR-xx
3	Operating Manual PNOZ m0p	1002053-EN-xx
4		
5		
6		

1.2. Documentation from other sources of information

No.	Description	Item No.
1		
2		

2. Hardware configuration

2.1. Pilz products

No.	Description	Order number	Version	Number
1	PSEN op4S-1-1	630 381	-	1
2	PNOZ m0p	773 110	-	1
3	PNOZmulti Configurator	-	V7.2.0	1

2.2. Hardware configuration

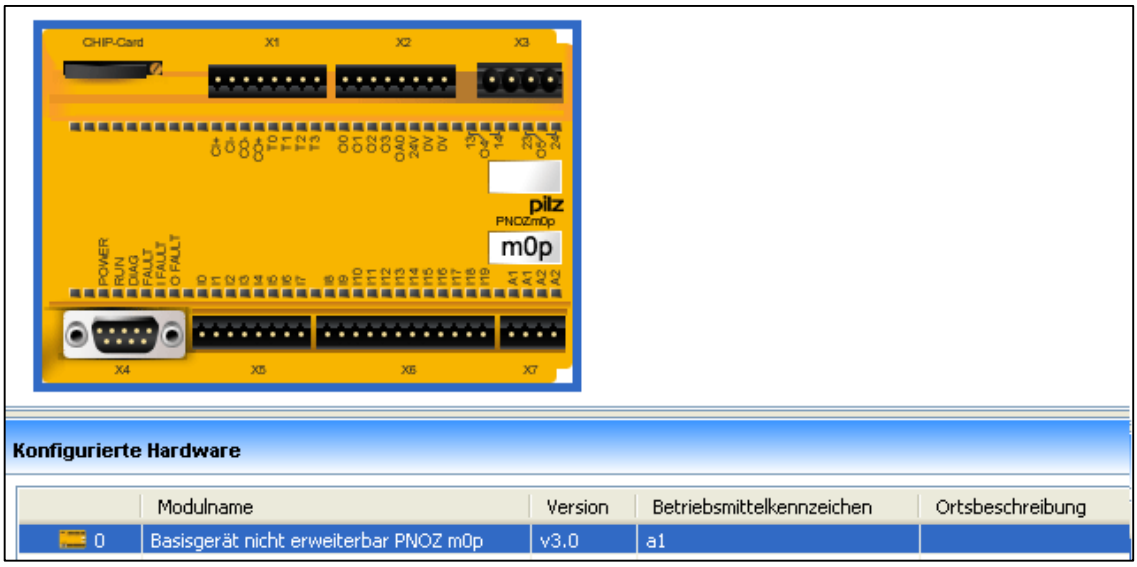


Fig. 1: Hardware configuration

3. Application Task

3.1. Description

The example shows the implementation of a protective device with a PSEN op4S-1-1.
The safe control and evaluation of the signals is taken over by a PNOZ m0p.

Parts are transferred between two machines by passing through a tunnel.
For visual inspection, material testing or operational maintenance and cleaning work the tunnel is open on one side.
To minimize the risk of jamming for the operator, the conveyor belt inside the tunnel does not move when the light beam is interrupted.

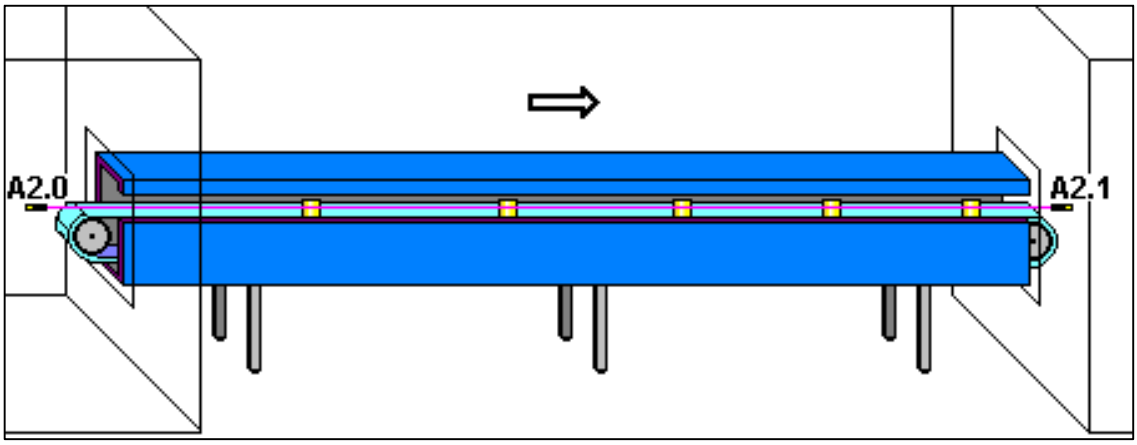


Fig. 2: Application chain-linking

The process is divided into the following main functions:
- Monitoring Light Beam
- Monitoring Feedback Loop

3.1.1. Monitoring Light Beam

The light beam (A2) is turned on safe, by connecting the pulse of the PNOZ m0p (A1) to the input „Test“.
The transmitter (A2.0) sends the pulse to the receiver (A2.1), that sends the signal further to the input of A1

The output in the receiver of the safety light beam (A2.1) is shut off, once the beam of the light beam device is interrupted.
The resulting absence of the light beam signal at the input of the safety system PNOZ m0p (A1) leads to a shut off of the safety outputs. Contactors KM1 and KM2 de-energise and the motor (M1) are cut off.

Caution: If it is not possible to prevent the operator from passing completely beyond the sensitive area, it is necessary that a manual restart procedure is performed on the safety system.

3.1.2. Monitoring Feedback Loop

The positive-guided N/C contacts of contactors KM1 and KM2 are monitored by the feedback loop (I1) of the PNOZ m0p (A1).

3.1.3. Safety assessment

- The circuit of the PNOZ m0p (A1) is redundant with built-in self-monitoring.
- The safety function (A1) remains effective in the case of a component failure.
- The relay contacts from A1 meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- The safety outputs from A1 are tested periodically using a disconnection test.
- The reaction time of light barrier and evaluation device when operated with PNOZmulti amounts to: < 30 ms

- The pulse signal to the transmitter (A2.0) and the output signal from the receiver (A2.1) are to be carried in separate cables over the entire signal route.
- The safety system PNOZ m0p (A1) and contactors KM1 and KM2 must be installed in a single mounting area (control cabinet) in order to exclude a short across the output.
- The PSEN op4S must be installed in a way that it cannot be defeated.

3.2. Functional safety

3.2.1. Safety-related characteristics in accordance with EN ISO 13849-1

No.	Safety function	Achieved Performance Level	Safety-related parts of the control system
1	Machine shut down when the safety light beam is interrupted	PL e	Sensor (PSEN op4S-1-1 A2) Logic (PNOZ m0p A1) Actuator (contactors KM1, KM2)

Prerequisites:

No.	Description		Identification
1	Common cause failure (CCF):		Requirements are considered to be met (must be tested on implementation)
2	Mission time:		20 years
3	Operating interval (electromechanical components):	Actuator	Two operations per hour
4	Characteristic data of contactors KM1/KM2:	B10d	2,000,000

Please note the further requirements of EN ISO 13849-1, e.g. requirements for avoiding systematic faults.

3.2.2. Safety-related characteristics in accordance with EN 62061

No.	Safety-related control function (SRCF):	Achieved Safety Integrity Level	Subsystems
1	Machine shut down when the safety light beam is interrupted	SIL 3	Sensor (PSEN op4S-1-1 A2) Logic (PNOZ m0p A1) Actuator (contactors KM1, KM2)

Prerequisites:

No.	Description		Identification
1	Common cause failure (CCF):		ß = 2 % (must be tested on implementation)
2	Proof test interval:		20 years
3	Operating interval (electromechanical components):	Actuator	Two operations per hour
5	Characteristic data of contactors KM1/KM2:	B10d	2.000.000
		Dangerous failure rate	65 %

Please note the further requirements of EN 62061, e.g. requirements for systematic safety integrity.

3.2.3. Classification in accordance with EN 954-1

Depending on the application area and its respective regulations, this connection example is suitable for applications up to Category 4 of EN 954-1.

3.3. Program

The PNOZmulti function block “Light Curtain” supports only a dual channel contact (Type 3), so it cannot be used for the safety light beam PSEN op4S-1-1.

Therefore a “User-Defined Element” is prepared which has the necessary attributes

- Single channel input
- Manual Reset

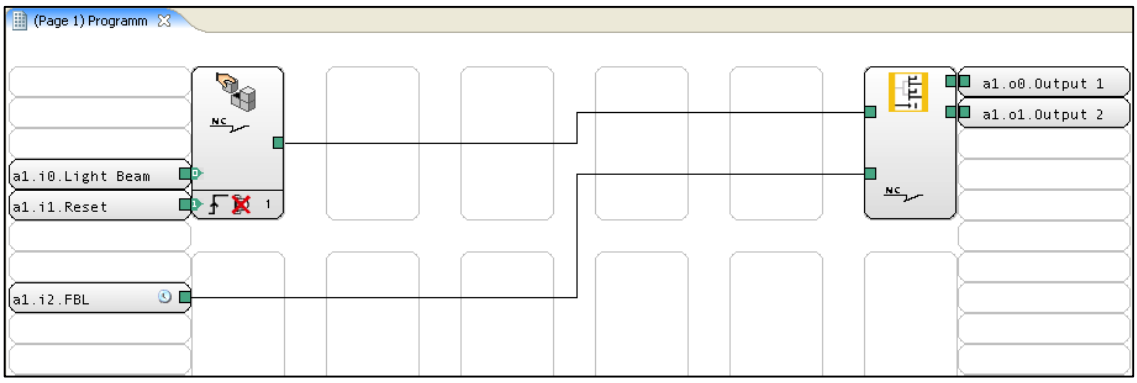


Fig. 3: Multi - Program

The configuration of the function blocks is shown in the following figures:

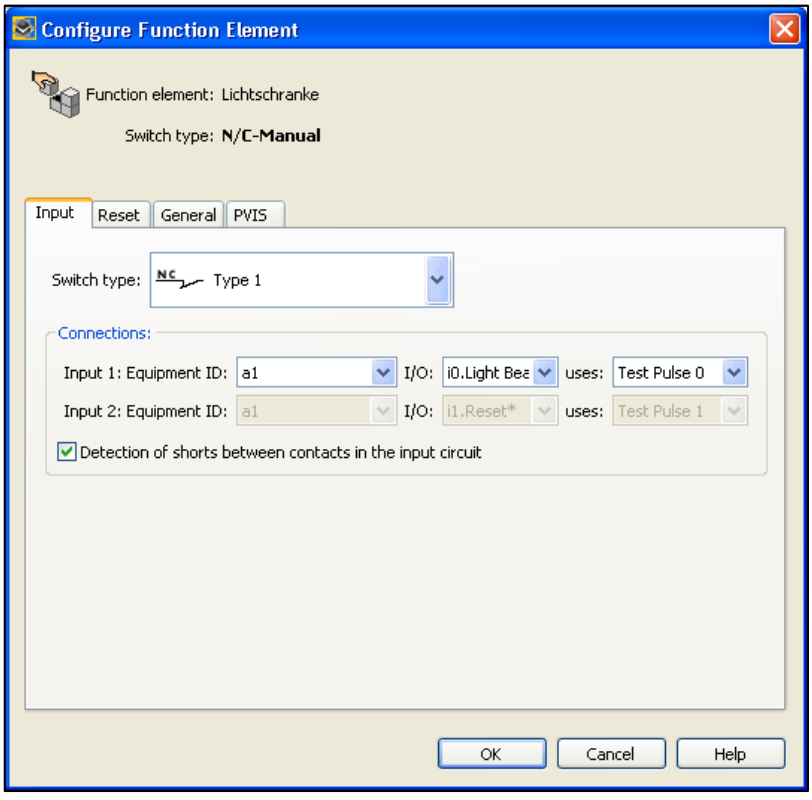


Fig. 4: Function Element Light Beam - Input

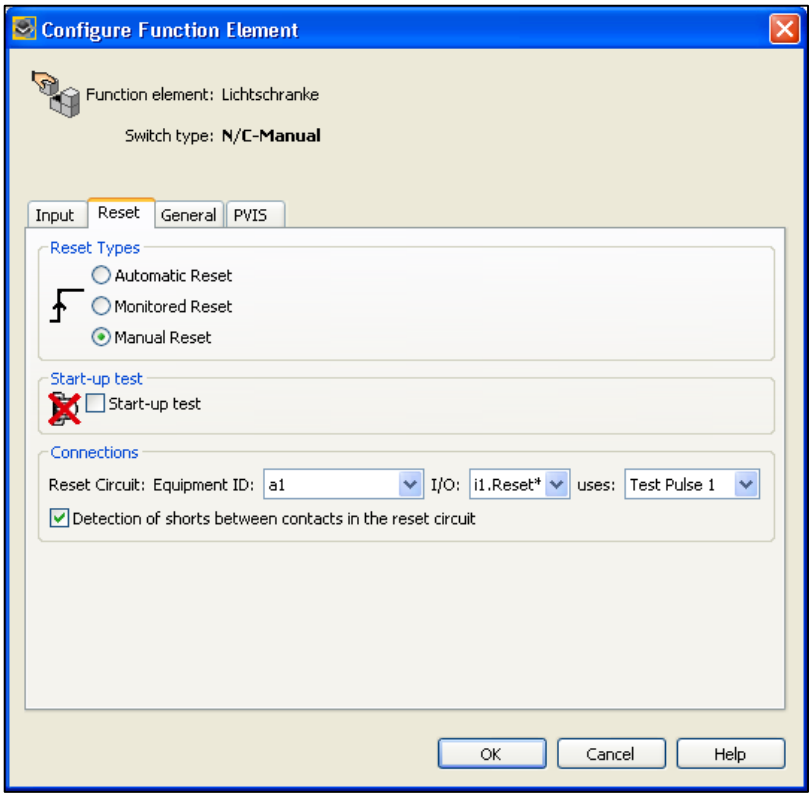


Fig. 5: Function Element Light Beam - Reset

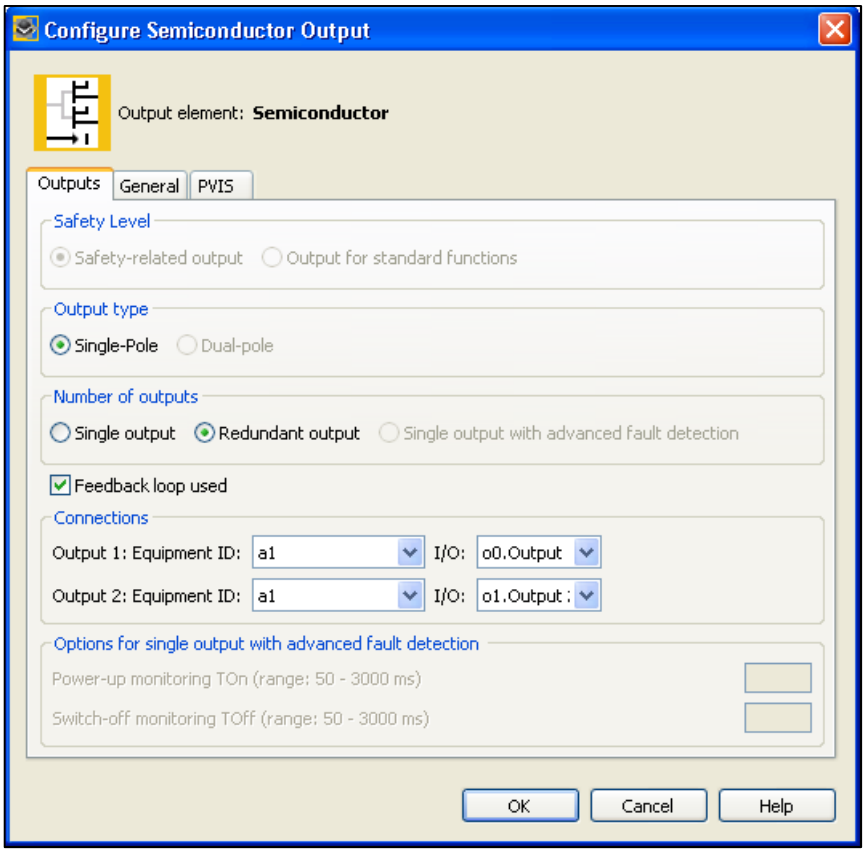
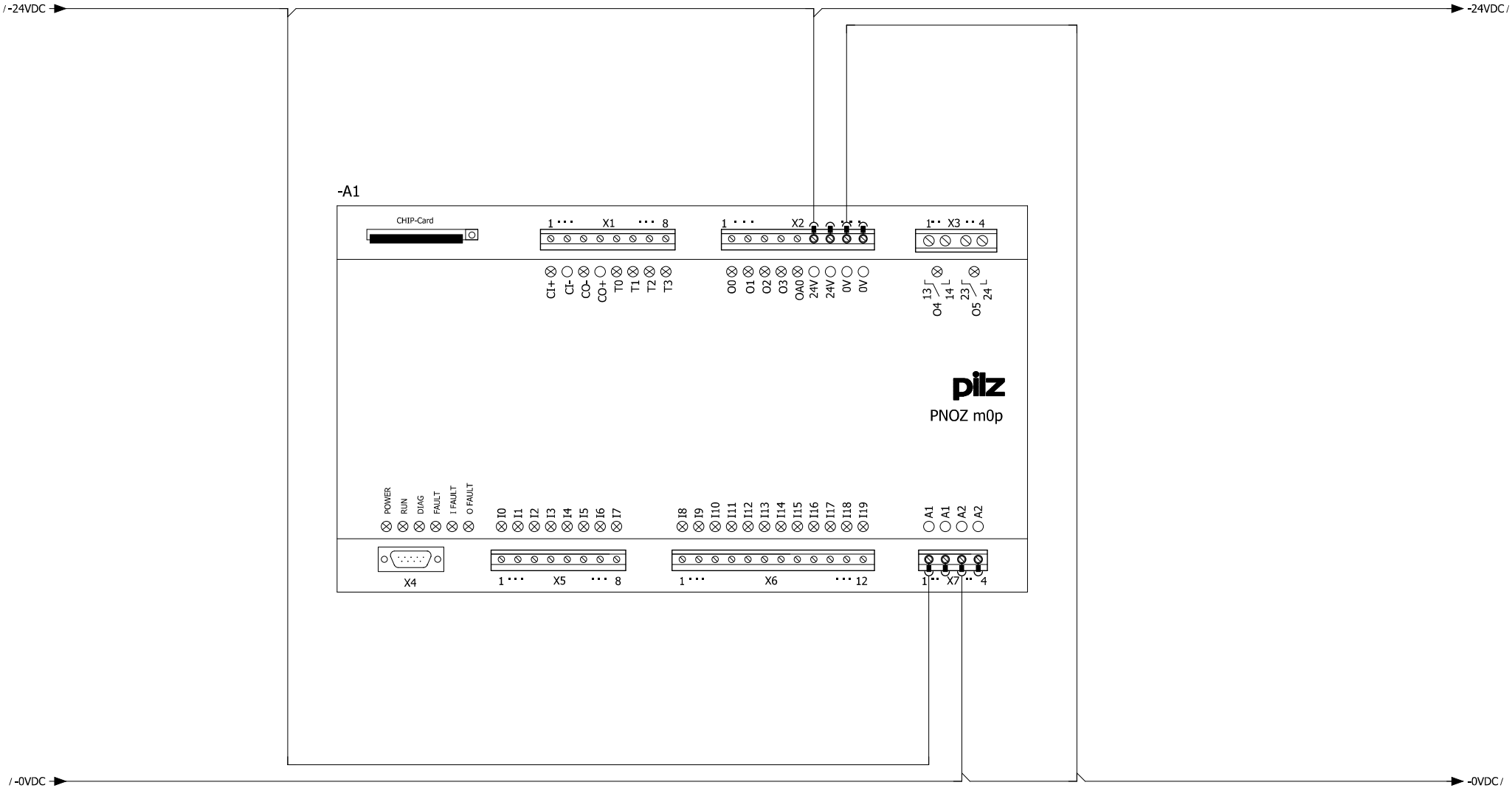
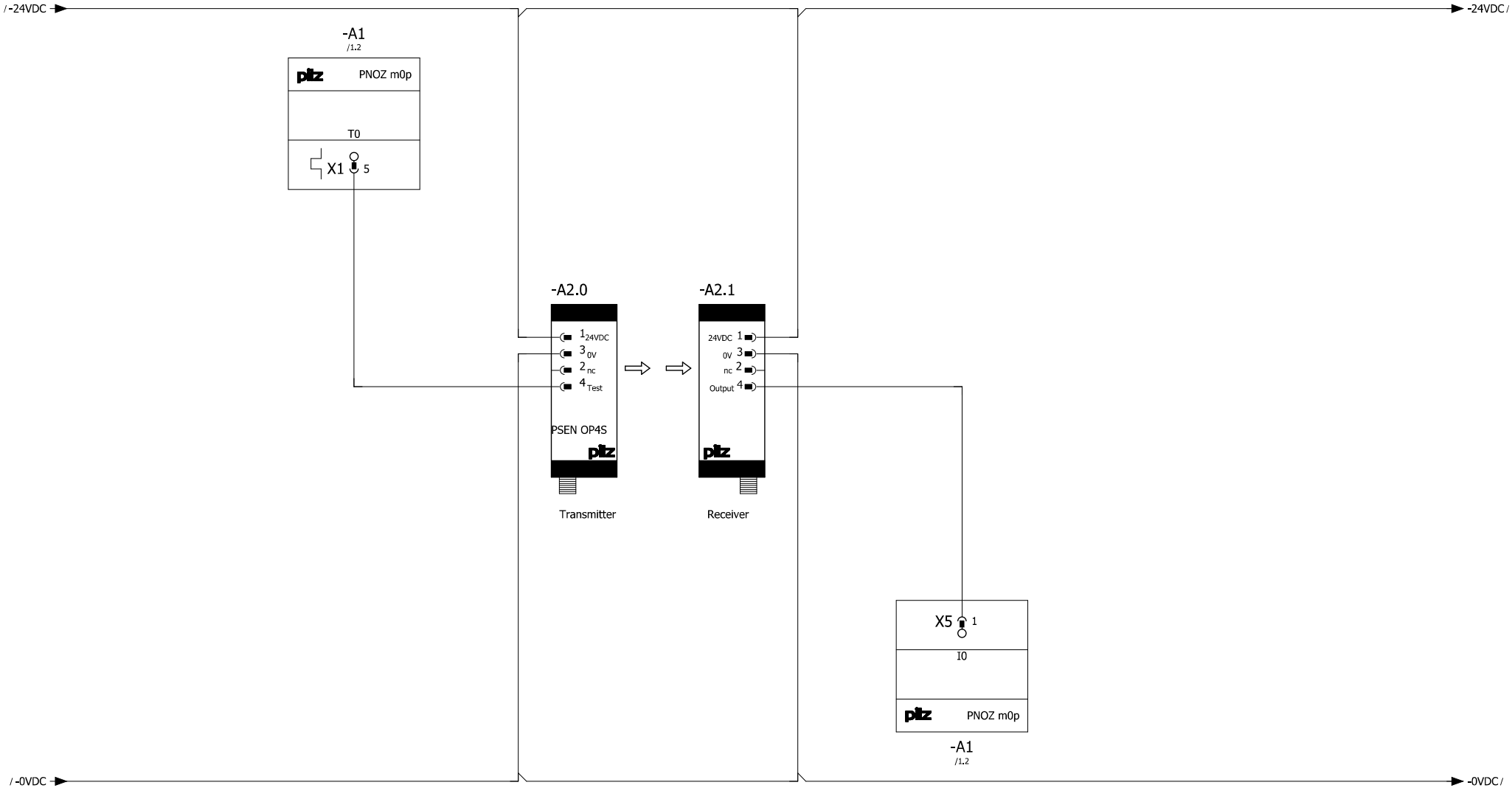


Fig. 6: Output Element Semiconductor

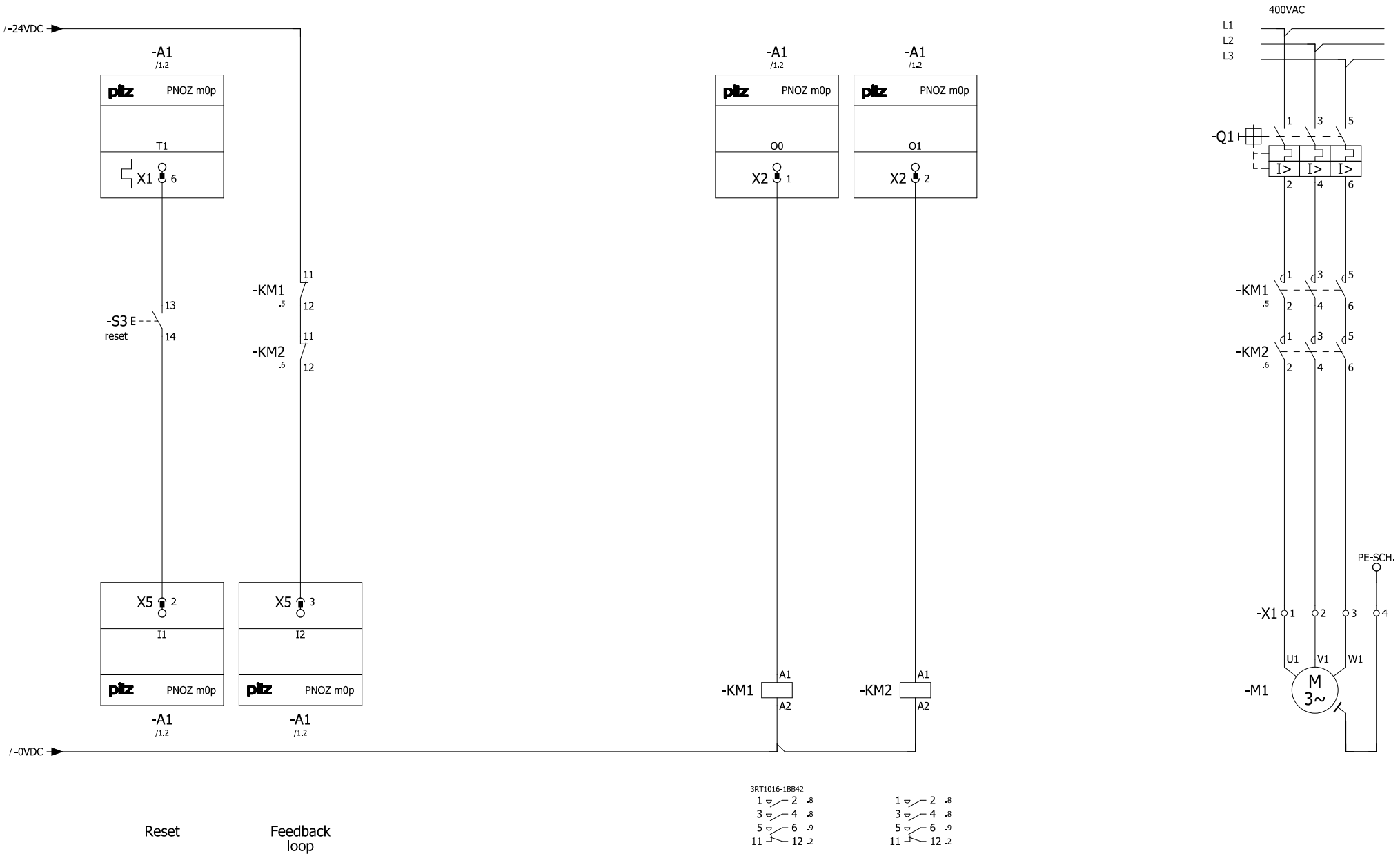


Revision	30.05.2011	Date	24.03.2011	EN ISO 13849-1:2006 PL e	pilz Pilz GmbH & Co.KG Felix-Wankel-Str.2 73760 Ostfildern	Light beam PSEN op4s operated with PNOZ m0p	Mounting place + AN_1002251_01
Name	RDS	Name	RDS				
				EN 62061:2005 SIL 3			Page: 1 / 3
		Dep.	CS				



Light beam
o.k.

Revision	30.05.2011	Date	24.03.2011	EN ISO 13849-1:2006 PL e	Pilz GmbH & Co.KG Felix-Wankel-Str.2 73760 Ostfildern	Light beam PSEN op4s operated with PNOZ m0p	Mounting place + AN_1002251_01
Name	RDS	Name	RDS				
				EN 62061:2005 SIL 3			Page: 2 / 3
		Dep.	CS				



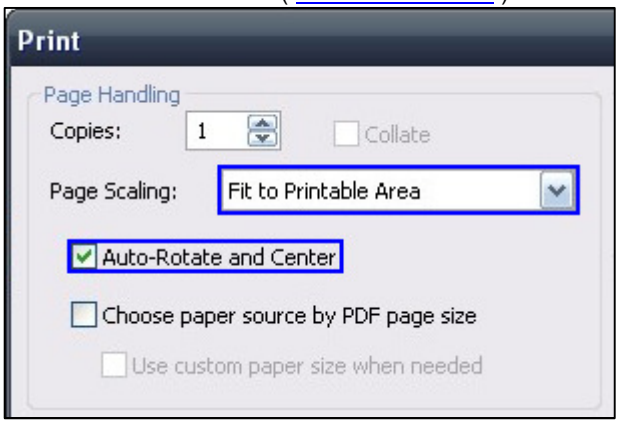
Revision	30.05.2011	Date	24.03.2011	EN ISO 13849-1:2006 PL e	pilz Pilz GmbH & Co.KG Felix-Wankel-Str.2 73760 Ostfildern	Light beam PSEN op4s operated with PNOZ m0p	Mounting place + AN_1002251_01
Name	RDS	Name	RDS				
				EN 62061:2005 SIL 3			Page: 3 / 3
		Dep.	CS				

4. Table of figures

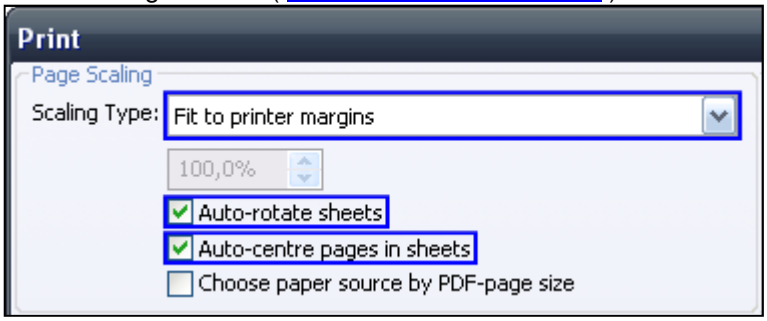
Fig. 1: Hardware configuration 6
Fig. 2: Application chain-linking 7
Fig. 3: Multi - Program 11
Fig. 4: Function Element Light Beam - Input 11
Fig. 5: Function Element Light Beam - Reset 12
Fig. 6: Output Element Semiconductor 12

Recommended printer settings

Adobe Acrobat Reader (www.adobe.com)



PDF-XChange Viewer (www.tracker-software.com)



© Pilz GmbH & Co. KG, 2011

InduraNET p®, Pilz®, PIT®, PMCprotego®, PMI®, PNOZ®, Primo®, PSEN®, PSS®, PVIS®, SafetyBUS p®, SafetyEYE®, SafetyNET p®, the spirit of safety® are registered and protected trademarks of Pilz GmbH & Co. KG in some countries. We would point out that product features may vary from the details stated in this document, depending on the status at the time of publication and the scope of the equipment. We accept no responsibility for the validity, accuracy and entirety of the text and graphics presented in this information. Please contact our Technical Support if you have any questions.

...

In many countries we are represented by our subsidiaries and sales partners.

Please refer to our homepage for further details or contact our headquarters.

Technical support

+49 711 3409-444
support@pilz.com

Pilz GmbH & Co. KG
Felix-Wankel-Straße 2
73760 Ostfildern, Germany
Telephone: +49 711 3409-0
Telefax: +49 711 3409-133
E-Mail: pilz.gmbh@pilz.de
Internet: www.pilz.com