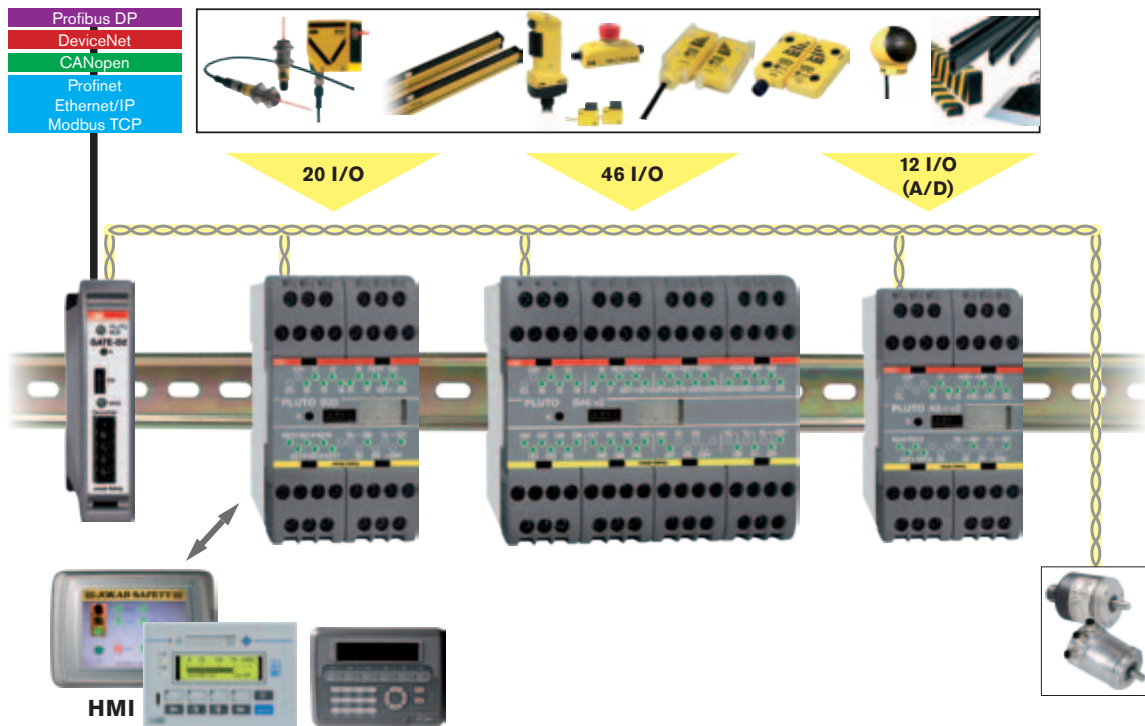


# Pluto Safety PLC

With dynamic safety concept.

## Pluto/Gateway/Encoder



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Descriptions and examples in this book show how the products work and can be used. This does not mean that they can meet the requirements for all types of machines and processes. The purchaser/user is responsible for ensuring that the product is installed and used in accordance with the applicable regulations and standards. We reserve the right to make changes in products and product sheets without previous notice. For the latest updates, refer to [www.abb.com/lowvoltage](http://www.abb.com/lowvoltage). 2012.

# Why you should have Pluto safety PLC's.

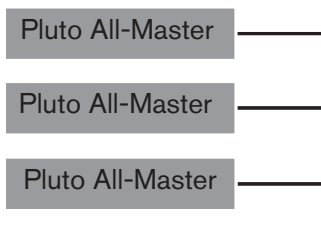
– for simplifying the design of and changes to safety systems!

Pluto is an "All-Master" safety PLC concept, that simplifies the design of safety systems and achieves the highest safety level PL e according to EN ISO 13849-1 and SIL 3 according to EN 62061 and EN 61508. The key difference between Pluto and conventional safety PLC's is that there is no "Master-Slave" relationship between the control units connected to the safety bus. Each Pluto is a 'Master' unit and can see the other Plutos' inputs and outputs, and can thereby make decisions about its own safety environment.

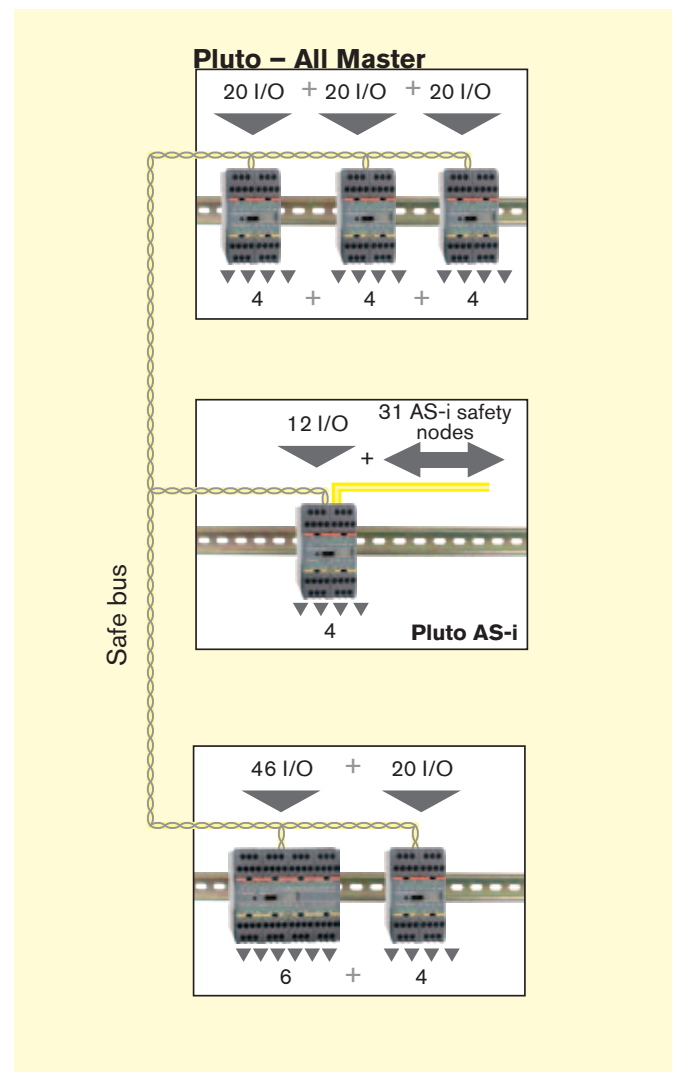
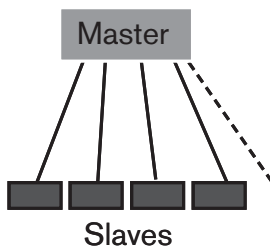
This concept enables simple communication, programming and changes to the safety system. With the use of a 'Gateway' device, a Pluto can communicate with other bus systems and thereby form part of a larger network. Gateway units are available for several different bus systems, such as Profibus, CanOpen, DeviceNet, Profinet, Ethernet/IP and Modbus TCP. With a Pluto AS-i, both safety slaves and standard slaves can be handled.

Pluto offers an economic solution for both single machines and for major machine systems.

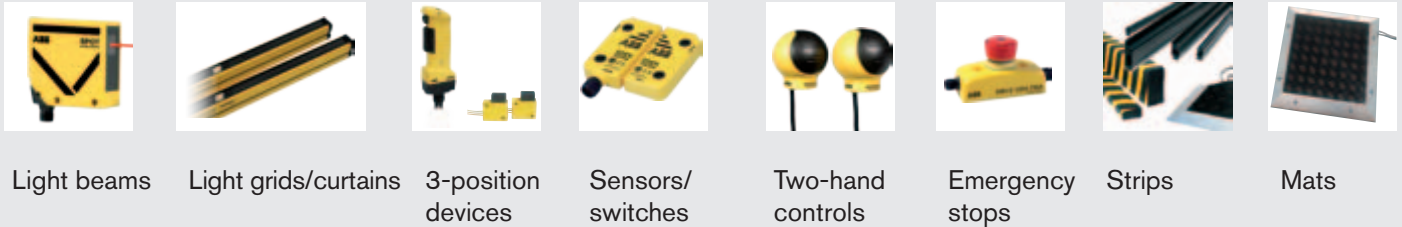
## Our solution with All-Master



## Traditional safety PLC



**- to supervise safety devices!**



Light beams

Light grids/curtains

3-position devices

Sensors/switches

Two-hand controls

Emergency stops

Strips

Mats

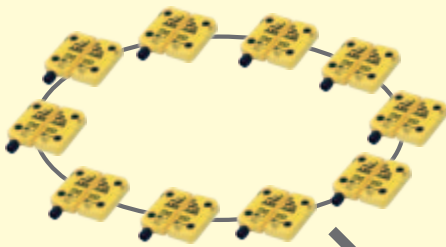
Most safety devices on the market can be connected directly to Pluto units. By using dynamic signals with sensors from ABB Jokab Safety only one input is needed to achieve the highest level of safety, compared to two inputs for other manufacturers' PLCs. It is also possible to connect up to 10 sensors in series to a single input on Pluto and still achieve the highest level of safety. For example non-contact Eden

sensors, Spot light beams and Tina emergency stop buttons can all be connected in series to a single Pluto input. Even mechanical switches can be connected to the 'dynamic' safety circuit using ABB Jokab Safety's various Tina adapters. Pluto also has IO connections that can be used as both inputs and outputs.

**- to save on inputs!**

**Dynamic signals**

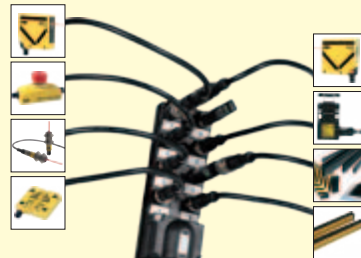
1-10 doors with one Eden per door  
PL e



One input

**Dynamic signals**

1-10 sensors  
PL e



One input

**Pluto**

has inputs for static and dynamic sensors. Several sensors can be connected to one dynamic input in accordance with PL e.



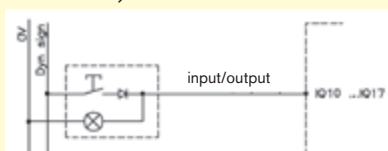
One connection

Two inputs

**IO connections**

Pluto has IO connections that can be used in three ways:

- input
- output
- both input and output at the same time (e.g. for a reset button with lamp indication)



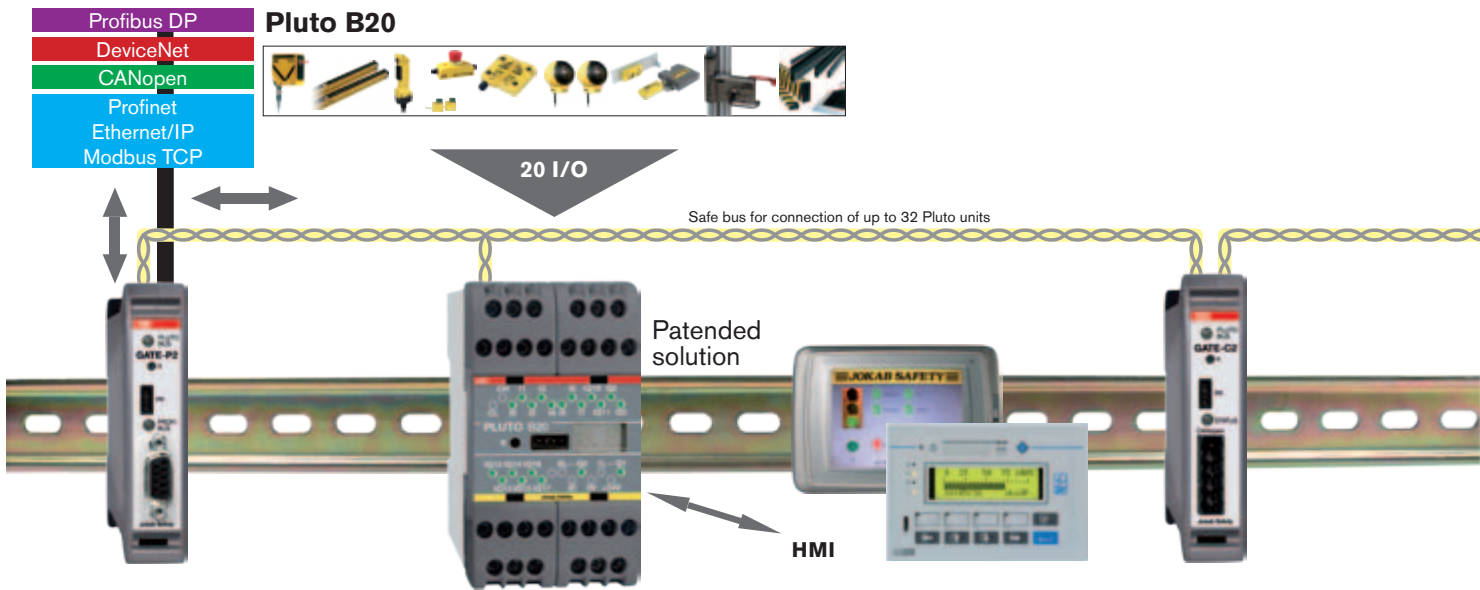
**Static inputs (mechanical switches)**

2 for each door = PL e



## Pluto safety PLC – an overview

### Pluto with a safety bus



**Gateway** for two-way databus communication between Pluto and other control systems.

**Pluto** is an All-Master-System for dynamic and static safety circuits where the inputs and other information are shared on a databus. Several safety sensors can be connected to one input while still achieving the highest level of safety. Pluto has inputs for all safety devices on the market, and the Pluto Manager software selects how each input shall respond.

4 independent failsafe safety outputs

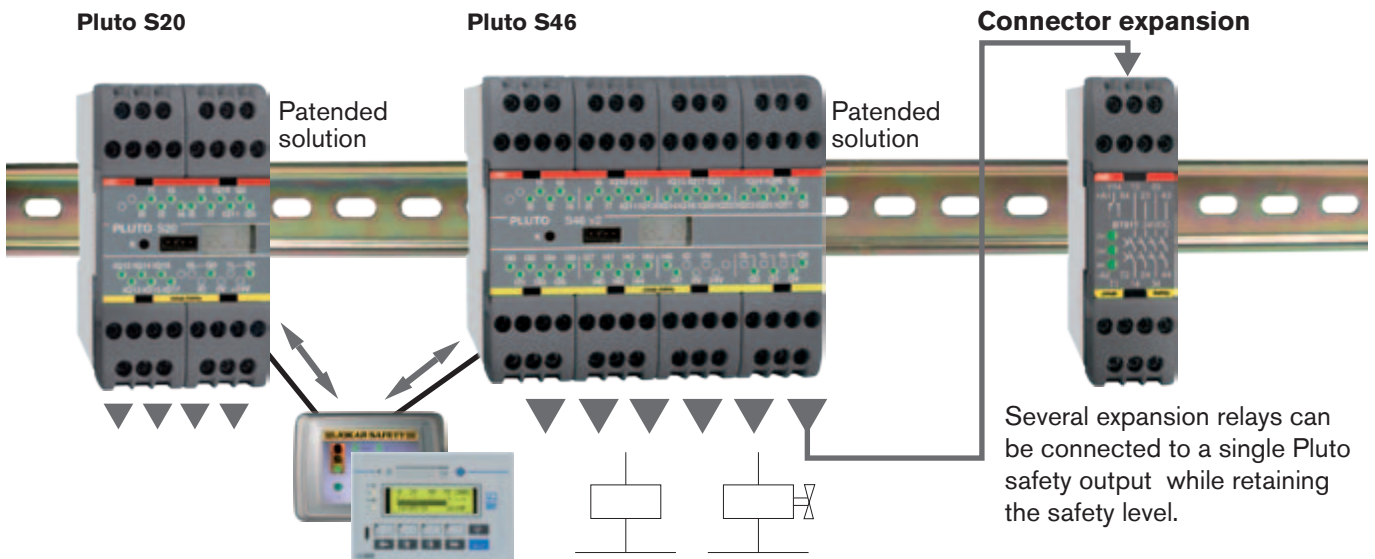
**HMI**, An HMI operator panel can communicate with Pluto in both directions. Connection can be made via the bus or direct to the front of the Pluto. The interface is RS232 and the protocol is Modbus ASCII 8 bit.

**Pluto bridge**  
With a Gateway set up as a Pluto bridge, it is possible to:

- increase the databus length
- use different databus speeds for each section
- filter information from one section to reduce the databus loading on other sections.

### Pluto without a safety bus – Singel-Pluto

A single Pluto can be used as a fully programmable safety logic controller.



Pluto without a bus connection is available in two sizes, with 20 and 46 I/O , the S20 and S46 respectively. In other words, they are similar to the equivalent versions with bus connections, the B20 and B46.

## Pluto B46



46 I/O



6 independent  
failsafe safety outputs

Patented  
solution

Patented  
solution



**Absolute encoder.**  
8 single turn or multi  
turn absolute encoders  
can be connected di-  
rectly to the safety bus.

## Pluto AS-i



Safety Monitor/Master

12 I/O  
(A/D)

31 AS-i safety slaves



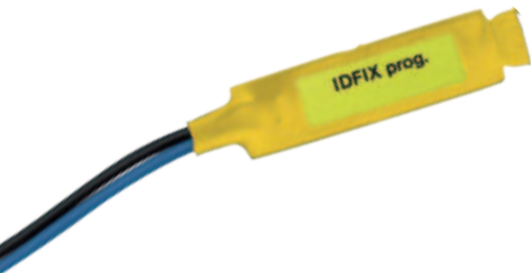
4 independent  
failsafe safety outputs

**Approvals**  
EN 954-1, Category 4  
EN ISO 13849-1, PL e  
EN 61496-1, Type 4  
EN 61508, SIL 3  
EN ISO 62061, SIL 3  
EN ISO 60204-1  
EN 50178  
EN ISO 574, Type IIIc



**Pluto AS-i** is an AS-i module which can be con-  
nected to a AS-i bus. It can either be AS-i master  
on the bus or work together with an AS-i master  
as monitor. It includes AS-i nodes, analogue and  
digital outputs, as well as safety outputs.

## IDFIX - identifies Pluto



IDFIX is a identification circuit that is unique to each device on the Pluto bus. It includes an identification code and makes it possible to distribute a PLC program in the network. There are four different versions: R, RW, DATA and PROG. IDFIX PROG also has the current PLC program. If the Pluto PLC module needs to be replaced, all the information on this is held in memory at IDFIX.

## Overview Pluto Safety-PLC

Model	S20	S46	A20	B16	B20	B46	AS-i	B42 AS-i
Number of I/O	20	46	20	16	20	46	12	42
Failsafe inputs	8	24	8	8	8	24	4	20
Failsafe inputs or non-failsafe outputs	8	8	8	8	8	8	4	16
Analog inputs	1	3	1	1	1	3	4	3
Failsafe relay outputs	2	4	2	-	2	4	2	4
Failsafe transistor outputs	2	2	2	-	2	2	2	2
Pluto bus	-	-	●	●	●	●	●	●
Current monitoring	-	-	2	-	-	-	-	-
Dimensions (b x h x d) mm	45 x 84 x 118	90 x 84 x 118	45 x 84 x 118	45 x 84 x 118	45 x 84 x 118	90 x 84 x 118	45 x 84 x 118	90 x 84 x 118
Supply voltage	24VDC	24VDC	24VDC	24VDC	24VDC	24VDC	24VDC	24VDC

# Safety PLC

# Pluto

## Approvals:

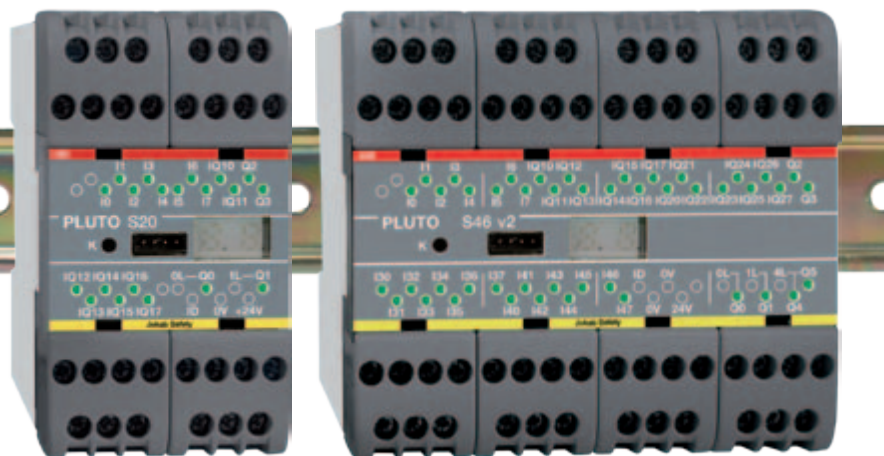
TÜV Rheinland  

## Control of:

Safety products in dynamic and static circuits  
Electrically controlled actuators such as contactors, valves, motors  
Indicators and buttons

## Features:

A Safety-PLC for each system part  
Dispersed constructions of machines  
Great flexibility  
Up to 10 sensors in series connected to one input  
Software Pluto Manager free of charge  
Handles conventional circuit breakers as well as dynamical sensors  
Custom made safety bus



### Pluto Safety PLC facilitates the design of your safety systems

Pluto is an All-Master system for dynamic and static safety circuits where inputs and other information are shared over the bus. Multiple safety sensors can be connected to a single input and still achieve the highest level of safety. Pluto has inputs suited for every safety product on the market, and each input function is configured in the accompanying software Pluto Manager.

Besides failsafe inputs (I) Pluto has a number of failsafe relay and transistor outputs (O). On every Pluto unit there is also a possibility of using a number of terminals as failsafe inputs, non-failsafe outputs or both in and output simultaneously (IO). The characteristics of the terminals are easily configured in Pluto Manager.

### Safety in large and small systems

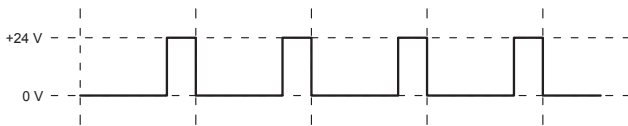
Pluto models without bus communication are stand alone units and are therefore perfectly suited for smaller systems that do not require communication with other Pluto units or gateways. Pluto models with bus communication can be connected to the Pluto bus where up to 32 Pluto units can interact and control large as well as small safety systems. The fact that Pluto is an All-Master system means that each Pluto unit controls their outputs locally, while it is as easy to read other Pluto units' inputs as their own.

Specifically for Pluto A20 is that it is equipped with an analogue input for current measurement, which can be used for e.g. monitoring of muting lamps.

Pluto is primarily designed to satisfy the requirements of EU Machinery Directive (2006/42/EG) regarding safety in control systems, but the system can also be used in other areas as in the process industry, boiler plants etc which have similar requirements.

## Technical info - Pluto

### Dynamic signal



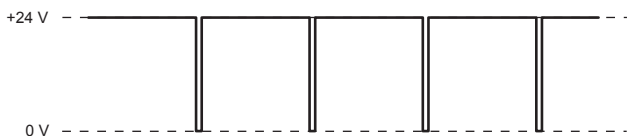
A dynamic signal makes it possible to achieve the highest level of safety with only one conductor. By transmitting a square wave and then evaluating the signal when it comes back to the controller you achieve the redundancy required. The signal is inverted once at each safety sensor (if the protection is OK) which makes it possible to detect short circuits across a sensor. When the signal switches between high (+24 V) and low (0V) it can be evaluated and tested about 200 times per second.

Pluto can generate three unique dynamic signals; A pulse, B pulse or C pulse. Short circuits between two different dynamic signals are detected whenever the signal that is created is different from the expected signal in Pluto. The kind of signal Pluto expects at the input terminal is determined in Pluto Manager (A, B or C pulse and if the signal should be inverted or not).

### Static signal

Static signals (+24 V or 0 V) can be connected to all inputs on Pluto. The kind of signal Pluto expects at the input terminal is determined in Pluto Manager. To achieve a two-channel structure according to EN ISO 13849-1 you need two inputs.

### OSSD-signal



There are safety products with internal monitoring of dual OSSD signals (the device detects its own faults rather than Pluto doing this). From these devices, at least one of the two signals is connected to an I-input in Pluto, i.e. both signals must not be connected to the IQ-terminals. The terminal blocks are then configured in Pluto Manager to expect static inputs (OSSD signals are filtered internally in Pluto).

### IQ – individual failsafe inputs and non-failsafe outputs

The IQ terminals can be used either as individual failsafe input or non-failsafe output (e.g. for indicator light or status signal). The terminal blocks can also be used as both input and output simultaneously, which is useful for example for push buttons (input) with indicator light (output). This function is designed primarily for reset buttons to reduce the number of used terminal blocks on the controller.

### I - individual failsafe inputs

All inputs are individually failsafe as each input is connected separately to both processors in Pluto. In order to maintain the redundancy required for two-channel structure and the highest level of safety, the dynamic signal must be used. When using static signals, two inputs must be used to achieve two-channel structure. The expected signal to the terminals blocks is determined in Pluto Manager (static or dynamic signal).

### Q - individual failsafe outputs

All Q outputs are individually safe and are independently programmable. There are both relay outputs and transistor outputs.

### Transistor outputs (-24 VDC)

The transistor outputs are just like the relay outputs, that is individually safe and independently programmable. However, the transistor outputs are different from the relay outputs as the internal connection provides the nominal input voltage -24 VDC, which is primarily intended for controlling electromechanical components such as contactors and valves. As -24 VDC is a unique signal in the majority of electrical cabinets and the fact that the output is monitored by Pluto, short circuits with other potentials can be detected right away.

### Pluto-bus

The Pluto-bus is a CAN-bus with its own safety protocol. The bus cable can be up to 600 m long at the minimum bus speed, and up to 150 m at 400 kb/s. The bus can be both extended and connected to other types of buses through gateways.

## Pluto Manager and IDFIX

### Pluto manager

The Pluto Manager is a freeware for fast, easy and safe programming of the PLC program for Pluto. The programming language used is ladder, which is supplemented with TÜV-approved function blocks for many common features. The software can also be used to configure Pluto's terminal blocks, e.g. to specify the IQ terminals that serve as inputs or outputs, and if the controller should expect a static or dynamic signal. Pluto Manager can be downloaded from [www.abb.com/lowvoltage](http://www.abb.com/lowvoltage).

### IDFIX

IDFIX is a identification circuit that is unique to each device on the Pluto bus. It includes an identification code and makes it possible to distribute a PLC program in the network. There are four different versions: R, RW, DATA and PROG. In addition to the identification code, DATA may also include safety codes from the AS-i nodes in an AS-i system. PROG includes the current PLC program and is used with single-Pluto for program distribution. IDFIX is connected between the input terminals ID and 0V.

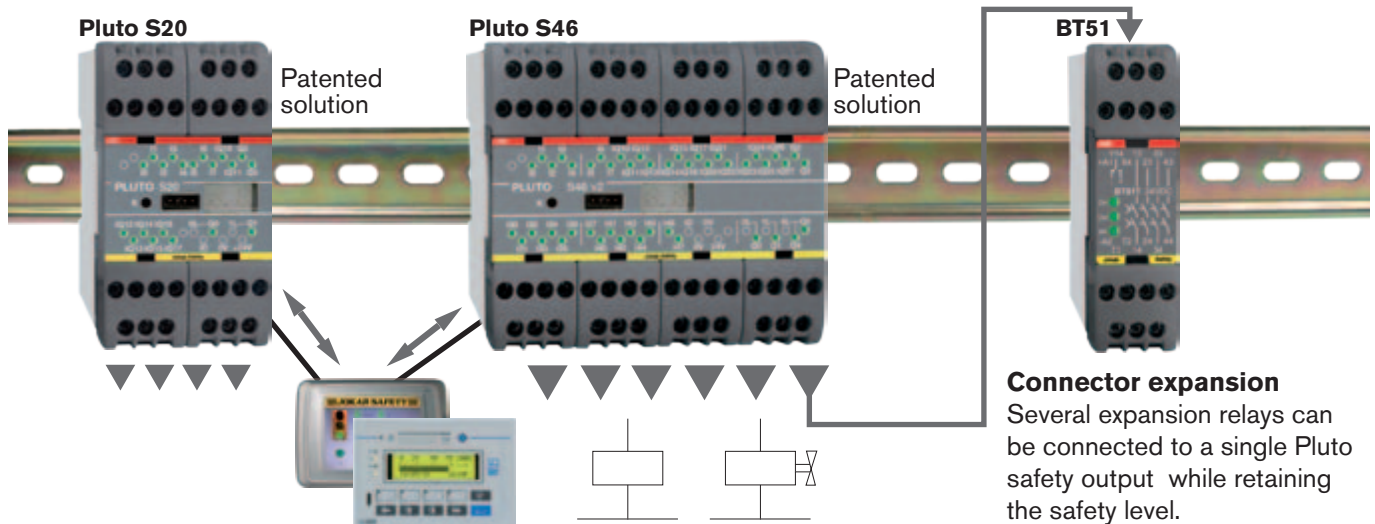


## Pluto without a safety bus

**Single Pluto controls and monitors safety for local systems**  
**- large as well as small systems**

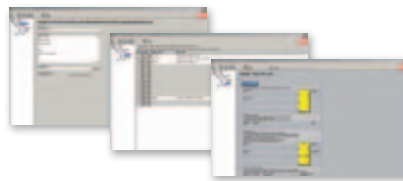


20/46 I/O



### HMI

A HMI-terminal is easy to connect to one or more Plutos through the Modbus contact.

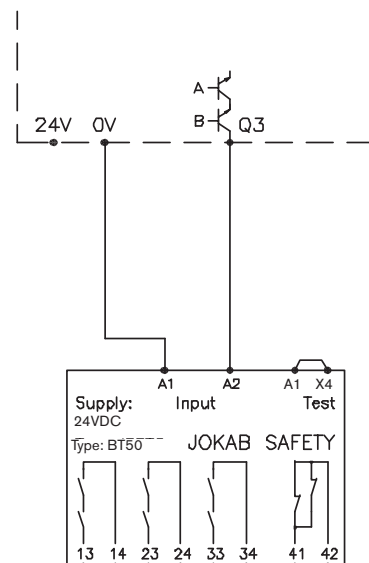


### Pluto Manager

A free of charge software is available on our website.

The Pluto S20 and Pluto S46 versions are safety PLC's that are designed for safety and protection products installed locally on a machine. With a wide range of connectivity options, a lot of protection is integrated into a PLC which in turn controls, for example, one or more safe outputs in a qualified manner without risking a dangerous situation.

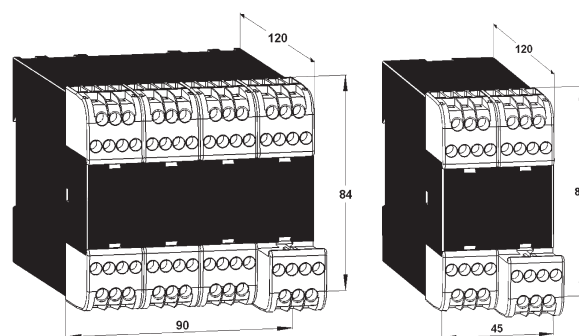
Using an expansion relay, such as BT50, the number of safe outputs in Pluto can be expanded. The connection will then be made as shown in the figure. If IDFIX PROG is used for single-Pluto, there is the option of copying a PLC program via the identification circuit over to Pluto without having to connect a computer.



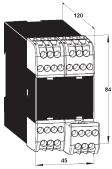
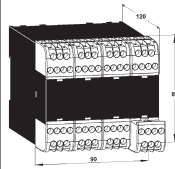
Connection example of a contact expansion with Pluto

Technical data - general	
Manufacturer:	ABB AB/Jokab Safety, Sweden
Colour:	Grey
Operating voltage:	24V DC $\pm$ 15%
Installation:	35 mm DIN rail
Electrical insulation:	Category II in accordance with IEC 61010-1
Level of safety: EN 954-1 EN ISO 13849-1 EN 61508 EN 62061	Kat. 4 PL e/kat. 4 SIL 3 SIL 3
PFH <sub>p</sub> Relay output Transistor output	2,00×10 <sup>-9</sup> 1,50×10 <sup>-9</sup>
Failsafe inputs I & IQ Type:  Current at 24 V Max. overvoltage	+24 V (for PNP sensors), IQ also configurable as non-failsafe outputs 5.1 mA 27 V continuous
Safe outputs Q Q2-Q3: Output voltage tolerance  Q0, Q1, (Q4, 5):	Transistor, -24VDC, 800 mA Supply voltage - 1,5 V at 800 mA Relay outputs AC-1: 250 V/1,5 A AC-15: 250 V/1,5 A DC-1: 50 V/1,5 A DC-13: 24 V/1,5 A
Non-failsafe outputs Q Type:  Max. current/output:	Transistor +24V, PNP "open collector" also configurable as failsafe inputs 800 mA

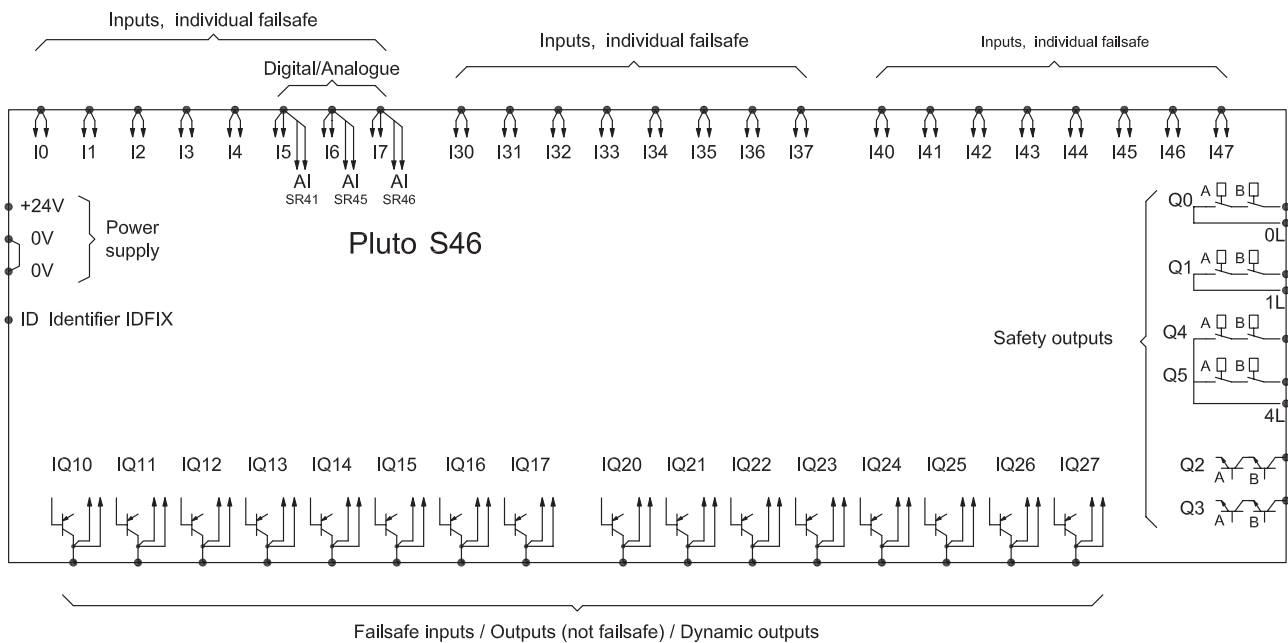
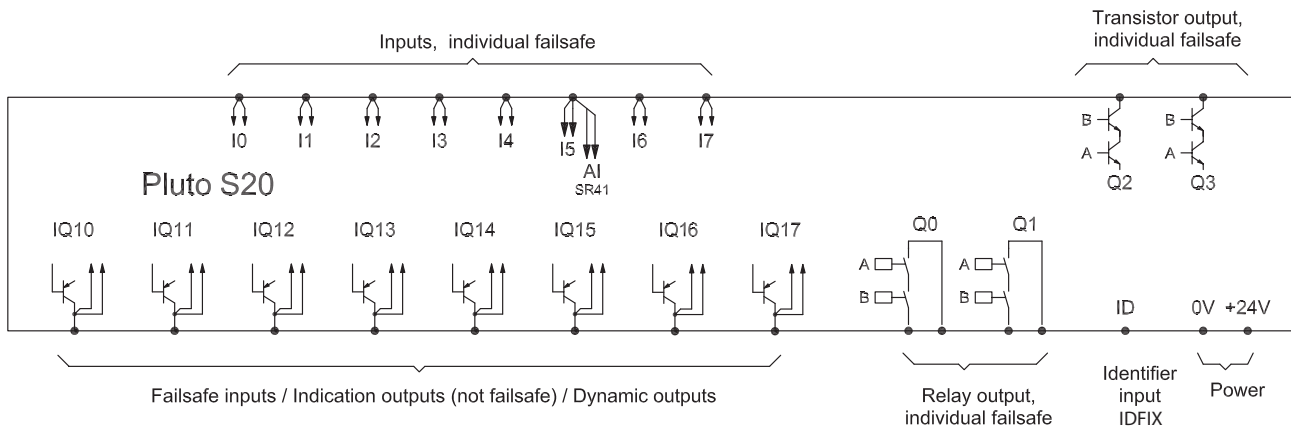
Temperature Ambient temperature: Storage and transport:	-10°C to +50°C -25°C to +55°C
Response times Dyn. A or static input to relay output: Dyn. A or static input to transistor output: Dyn. B or Dyn. C input to relay output: Dyn. B or Dyn. C input to transistor output: Software setting "NoFit".	<20.5 ms + program exec. time <16.5 ms + program exec. time <23 ms + program exec. time <19 ms + program exec. time 5 ms shorter response time on I & IQ inputs
Additional Response times Databus between Pluto units Databus between Pluto units on error	10 ms 10-40 ms
Enclosure classification Enclosure: Connection terminals:	IP 40, IEC 60 529 IP 20, IEC 60 529



The terminal blocks are detachable without needing to disconnect the wiring. The units are assembled with a gap of at least 5 mm.

Technical data - type-specific		
	<b>Pluto S20</b> 20 I/O Non-Pluto safety bus	<b>Pluto S46</b> 46 I/O Non-Pluto safety bus
Article number/ordering data:	2TLA020070R0500	2TLA020070R1800
Failsafe inputs	8 (I0..I7)	24 (I0..I7, I30..37, I40..I47)
Failsafe inputs or non-failsafe outputs	8 (IQ10..IQ17) Max total load 2.5 A	16 (IQ10..IQ17) (IQ20..IQ27) Max. total load 2A
Analogue inputs	1 (I5) 0..27V	3 (I5) 0..27 V
Failsafe relay outputs	2 (Q0..Q1)	4 (Q0..Q1 & Q4..Q5)
Failsafe transistor outputs	2 (Q2..Q3)	2 (Q2..Q3)
Current monitoring	-	-
Pluto safety bus	-	-
Own current consumption	100...300 mA	100...500 mA
Recommended external fuse:	6 A	10A
Dimensions (w x h x d)	45 x 84 x 118 mm	90 x 84 x 118 mm

## I/O Overview - Pluto without a safety bus



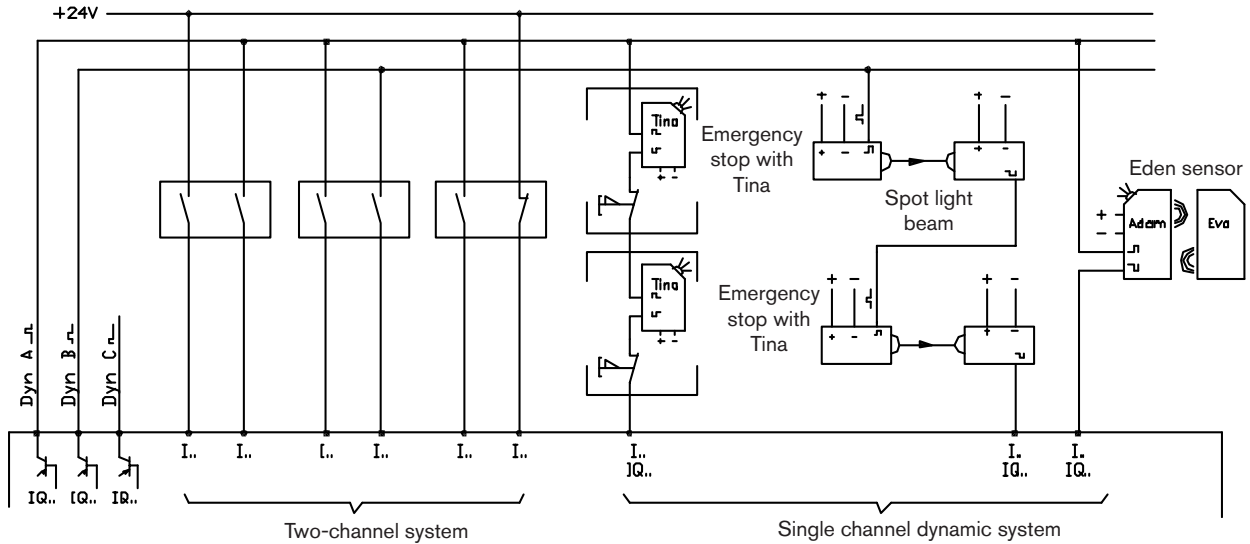
- ID: Connection for identifier, which has a unique ID number that can be read by the system.
- I.. Safety inputs (24 VDC) that are individually secure. This means that the highest level of safety can be achieved with only one input if ABB Jokab Safety dynamic safety components are used. Otherwise two inputs are required for each safety function.
- IQ.. I/O that can be used for safety inputs or signal outputs, e.g. to indicate or control functions that are not safety-related. For IQ.. as safety inputs, refer to I..
- Q0, Q1: Failsafe relay outputs that are individually failsafe and individually programmable.
- Q2, Q3: Failsafe transistor outputs (-24 VDC) that are individually failsafe and individually programmable. Intended for electro-mechanical components such as contactors and valves.
- Q4, Q5: Failsafe relay outputs with common potential that are individually failsafe and individually programmable.

## Input connection

The system offers solutions for both single and two-channel safety devices. In order to monitor wiring short-circuits it is possible to use up to three different dynamic signals and static voltage (+24 V) to supply the inputs. The inputs are then programmed to only accept one of the signal types.

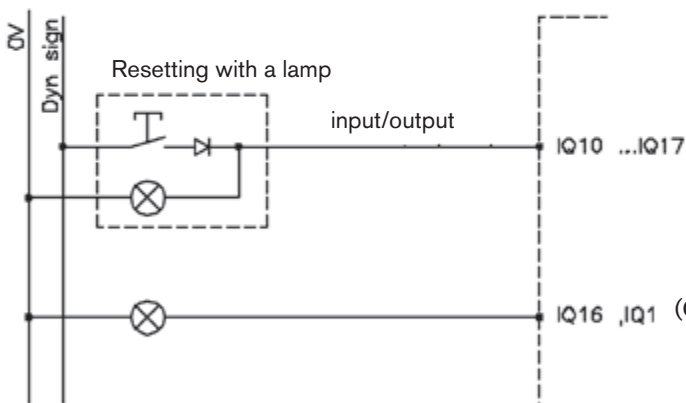
In a two-channel system both channels will be measured, using two different signals. The system will thereby be able to detect a short-circuit between the channels.

In a single channel system the dynamic signal is modified at each sensor. A short-circuit between the input and the output of the sensor will be detected at the Pluto input. PL e according to EN ISO 13849-1 can thus be achieved by using only one channel and one input.



Input connection alternative in accordance with PL e EN ISO 13849-1.

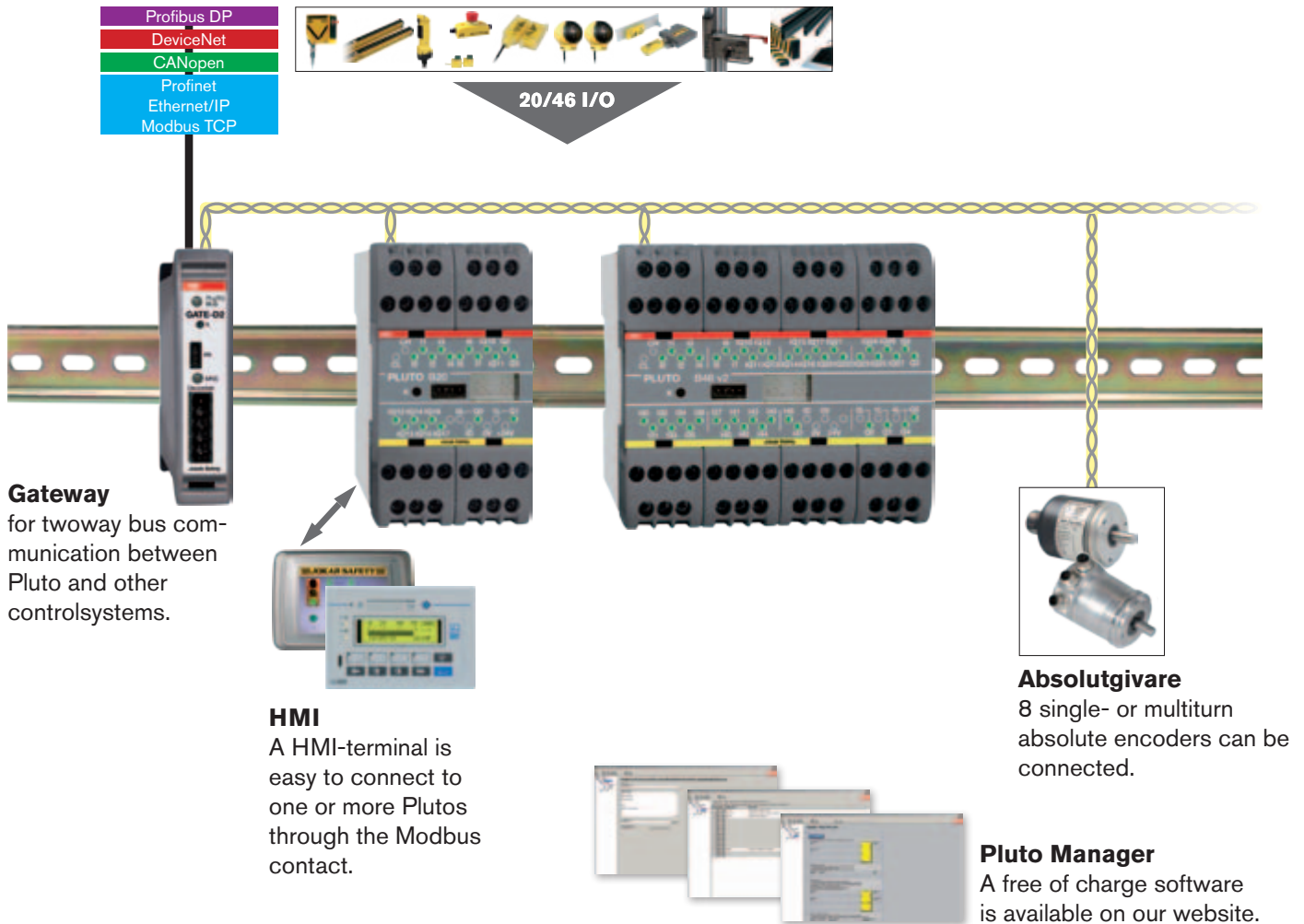
## Reset button that uses the combined input and output facility



Both a lamp and a pushbutton can be connected to the same terminal. This function is for resetting safety devices and to reduce the number of I/Os used.

## Pluto with a safety bus

**Pluto models with a safety bus controls and monitors safety for dispersed systems – large as well as small systems.**



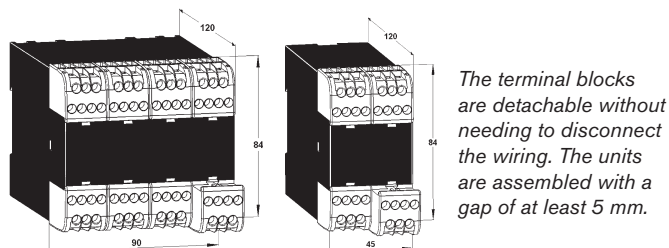
Pluto versions with bus have the same properties as single-Pluto unlike bus communication. With the help of the Pluto-bus networks can be created with multiple Plutos in interaction. Gateways can be connected to the Pluto bus for communication with other systems. The gateway models GATE D2 and C2 can also be used as an extension of the bus cable to extend the Pluto network. The fact that Pluto is an All-master system means that each Pluto device controls its outputs locally, while it is just as easy to read the inputs of other Pluto-units as it is to read its own. It is also easy to both read and write to global memory locations available across the Pluto bus. The PLC program is created using the Pluto Manager freeware and is distributed to all Pluto units. You can also connect speed and position sensors via the Pluto bus.

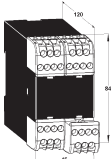
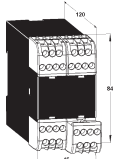
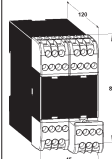

### Current monitoring (Pluto A20 only)

Pluto A20 can monitor the current through the IQ16 and IQ17 outputs. The function is designed for, but not limited to, ensuring that the muting lamps are working. The hardware for current monitoring is not designed with individual redundancy, which means that the function must be used dynamically if it is to be used in a safety function. This means that the current must be read and evaluated both when the output is enabled and disabled.

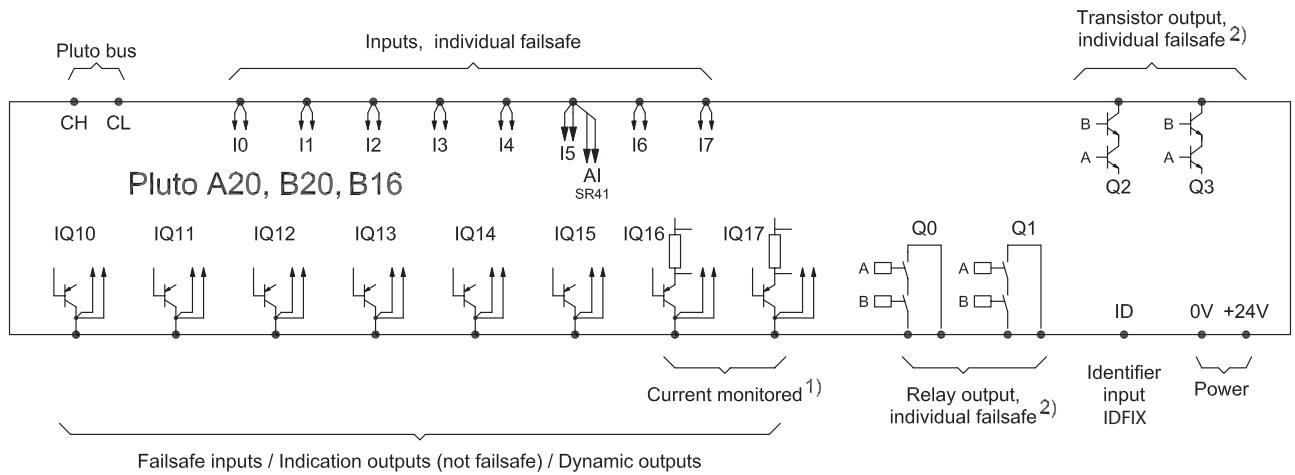
Technical data - general	
Manufacturer:	ABB AB/Jokab Safety, Sweden
Colour:	Grey
Operating voltage:	24V DC $\pm 15\%$
Installation:	35 mm DIN rail
Electrical insulation:	Category II in accordance with IEC 61010-1
Safety level EN 954-1 EN ISO 13849-1 EN 61508 EN 62061	Kat. 4 PL e/kat. 4 SIL 3 SIL 3
PFH <sub>D</sub> Relay output Transistor output	2,00×10 <sup>-9</sup> 1,50×10 <sup>-9</sup>
Failsafe inputs I & IQ Type:	+24 V (for PNP sensors), IQ also configurable as non-failsafe outputs
Current at 24 V Max. overvoltage	5.1 mA 27 V continuous
Safe outputs Q Q2–Q3: Output voltage tolerance	Transistor, –24VDC, 800 mA Supply voltage - 1,5 V at 800 mA
Q0, Q1, (Q4, 5):	Relay outputs AC-1: 250 V/1,5 A AC-15: 250 V/1,5 A DC-1: 50 V/1,5 A DC-13: 24 V/1,5 A
Non-failsafe outputs Q Type:	Transistor +24V, PNP "open collector" also configurable as failsafe inputs
Max. current/output:	800 mA

<b>Pluto safety bus</b> Max number of Pluto units on the databus: Databus type: Databus speeds:  Databus cable length:	32 CAN 100, 125, 200, 250, 400, 500, 800, 1000 kb/s Up to 600 m, 150 m at 400 kb/s
<b>Temperature</b> Ambient temperature: Storage and transport:	–10°C to +50°C –25°C to +55°C
<b>Response times</b> Dyn. A or static input to relay output: Dyn. A or static input to transistor output: Dyn. B or Dyn. C input to relay output: Dyn. B or Dyn. C input to transistor output: Software setting "NoFilt".	<20.5 ms + program exec. time <16.5 ms + program exec. time <23 ms + program exec. time <19 ms + program exec. time 5 ms shorter response time on I & IQ inputs
<b>Additional Response times</b> Databus between Pluto units Databus between Pluto units on error	10 ms 10–40 ms
<b>Enclosure classification</b> Enclosure: Connection terminals:	IP 40, IEC 60 529 IP 20, IEC 60 529



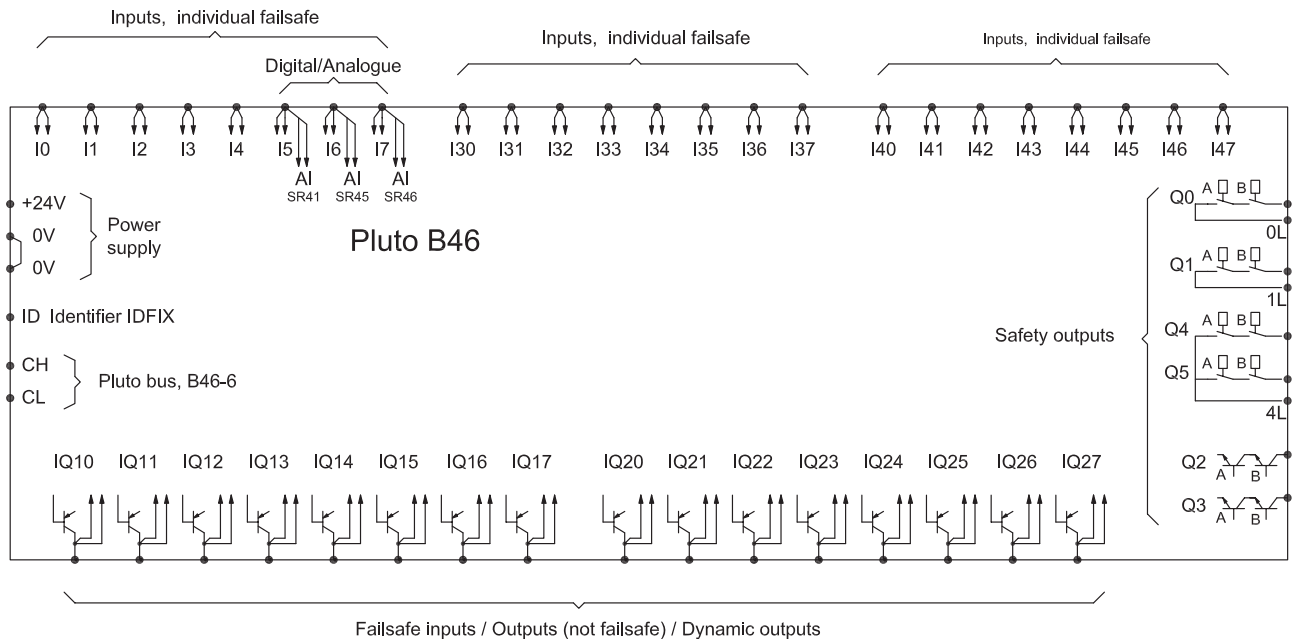
Technical data - type-specific				
		<b>Pluto A20</b> 20 I/O <i>Current monitoring</i>	<b>Pluto B16</b> 16 I/O <i>Non-failsafe outputs</i>	<b>Pluto B20</b> 20 I/O
Article number/ ordering data:	2TLA020070R0300	2TLA020070R0700	2TLA020070R0600	2TLA020070R1700
Failsafe inputs	8 (I0..I7)	8 (I0..I7)	8 (I0..I7)	24 (I0..I7, I30..37, I40..I47)
Failsafe inputs or non-failsafe outputs	8 (IQ10..IQ17) Max total load 2.5 A	8 (IQ10..IQ17) Max total load 2.5 A	8 (IQ10..IQ17) Max total load 2.5 A	16 (IQ10..IQ17) (IQ20..IQ27) Max. total load 2A
Analogue inputs	1 (I5) 0..27V	1 (I5) 0..27V	1 (I5) 0..27V	3 (I5) 0..27 V
Failsafe relay outputs	2 (Q0..Q1)	–	2 (Q0..Q1)	4 (Q0..Q1 & Q4..Q5)
Failsafe transistor outputs	2 (Q2..Q3)	–	2 (Q2..Q3)	2 (Q2..Q3)
Current monitoring	2(IQ16,IQ17)0-1.0A $\pm 10\%$	–	–	–
Pluto safety bus	▪	▪	▪	▪
Own current consumption	100...300 mA	100...300 mA	100...300 mA	100...500 mA
Recommended external fuse:	6 A	6 A	6 A	10A
Dimensions (w x h x d)	45 x 84 x 118 mm	45 x 84 x 118 mm	45 x 84 x 118 mm	90 x 84 x 118 mm

## I/O Overview - Pluto with a safety bus



1) Current monitored only on A20

2) Not in B16



ID: Connection for identifier, which has a unique ID number that can be read by the system.

I.. Safety inputs (24 VDC) that are individually secure. This means that the highest level of safety can be achieved with only one input if ABB Jokab Safety dynamic safety components are used. Otherwise two inputs are required for each safety function.

IQ.. I/O that can be used for safety inputs or signal outputs, e.g. to indicate or control functions that are not safety-related. For IQ.. as safety inputs, refer to I..

Q0, Q1: Failsafe relay outputs that are individually failsafe and individually programmable.

Q2, Q3: Failsafe transistor outputs (-24 VDC) that are individually failsafe and individually programmable. Intended for electro-mechanical components such as contactors and valves.

Q4, Q5 Failsafe relay outputs with common potential that are individually failsafe and individually programmable.

**TÜVRheinland®**

**ZERTIFIKAT EC Type-Examination Certificate**  
**CERTIFICATE Reg.-No.: 01/205/5066/10**

<b>Product tested</b>	Logic unit to ensure safety functions Safety PLC	<b>Certificate holder</b>	ABB AB Jakob Safety Regelgatan 3 213 76 Malmö Sweden
<b>Type designation</b>	Pluto	<b>Manufacturer</b>	see certificate holder
<b>Causes and standards forming the basis of testing</b>	EN ISO 13049-1:2008 + AC:2009 EN 62061:2005 IEC 61508 Parts 1-7:1998 / 2000 EN 62004-1:2006 + A1:2009 (in extracts)	EN 6178:1997 EN 61496-1:2005 + A1:2006 (in extracts) EN 574:1996 + A1:2006 (in extracts)	
<b>Intended application</b>	Safety related programmable electronic systems for machinery and process industry applications  The Pluto PLC complies with the requirements of the relevant standards (Cat. 4 / PL, e acc. to EN ISO 13049-1, Sil, Cl. 3 acc. to EN 62061 / IEC 61508, Type IIC of EN 574, Type 4 of EN 61496-1) and can be used in applications up to Cat. 4 / PL, e acc. to EN ISO 13049-1 and Sil, 3 acc. to EN 62061 / IEC 61508.		
<b>Specific requirements</b>	The current "Version Release List" as well as the conditions defined in the Programming Manual, Safety Manual and the Operating Instructions must be considered.		
It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.			
This certificate is valid until 2015-11-18.			



Functional Safety Type Approved  
**FS**



The test report no. 5066/10 dated 2010-11-18 is an integral part of this certificate.  
The holder of a valid license certificate for the product tested is authorized to affix the FS mark shown opposite to products, which are identical with the product tested.



*E. J.*

Berlin, 2010-11-19  
Certification (PLC) for Machinery, NR 0035  
Prof.-Ing. Eckhard Fiebig

**TUV NORD**

**EG-Baumusterprüfbescheinigung**  
EC type-examination certificate

**Registrier-Nr.**  
Registrierung Nr:  
**44 205 11 300992 000**

<b>Zustellen des Auftragsgebers</b> Customer's reference	<b>Auftragdatum</b> Date of order	<b>Akzeptanzform</b> File reference	<b>Prüfbericht Nr.</b> Test report no.
	15.12.2010	000210002	11 205 20092 000
<b>Name und Anschrift des Auftragsgebers</b>	<b>ABB AB</b> Jakob Safety Varblomgsvägen 11 434 39 Kungälv Sweden		<b>Kundenref. name and address</b>

Erhält mit dem u. g. Produkt die Anforderungen des Anhangs I der Maschinenrichtlinie 2006/42/EG als neue Baubestimmung für die EG-Konformitätsbewertung.  
The product described below meets the requirements of Annex I of the Directive 2006/42/EC as a basis for the CE-Declaration of conformity.

<b>Geprüft nach</b>	<b>Maschinenrichtlinie 2006/42/EG</b> Machinery Directive 2006/42/EC	<b>Träger der Bescheinigung</b>
	EN 61508:2001 EN 62061:2005 EN ISO 13049-1:2008 EN ISO 13049-2:2008 für URAX, 01 über EN 574:1996	
<b>Beschreibung des Produktes</b> (Details siehe Anlage 1)	Safe input drive for bus system "ASi Safety at Work"	<b>Beschreibung des Produktes</b> (Details see annex 1)
<b>Typenbezeichnung</b>	<b>URAX ...</b>	<b>Type Description</b>
<b>Serial-Nr.</b>	siehe Anlage 1 see annex 1	<b>Serial no.</b>
<b>Normung</b>	EN 61508 / EN 62061, Sil, 3, PL, e + 1719 <sup>4</sup> EN ISO 13049-1, pl "1"	<b>Marking</b>

Bitte beachten Sie auch die untenstehenden Hinweise.  
Please also pay attention to the information stated overleaf.

TÜV NORD CERT GmbH  
Zertifizierungsstelle / Certification Body  
Machinery / Machinery  
Bismarckstraße 29A / Bismarck Street, 33699  
Bielefeld



Gültig bis / Valid to: 02.02.2016  
Hannover, 02.02.2011

Telefonnummer: 051 4141 2000 • Fax: +49 (0)51 41 41 20 20 • Fax: +49 (0)51 41 41 20 20 • E-Mail: machinen@tuv-nord.de

**CSA INTERNATIONAL**

**Certificate of Compliance**

<b>Certificate:</b> 1700374	<b>Master Contract:</b> 155430
<b>Project:</b> 1933410	<b>Date Issued:</b> 2008/01/25
<b>Issued to:</b> Jakob Safety AB Regelgatan 3 Malmö, 213 76 Sweden	

*The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US'*



**Issued by:** David Dupuy, T.P.

**Authorized by:** Helene Vallée-Desrosiers  
Operations Manager

*Helene Vallée-Desrosiers*

**PRODUCTS**

- CLASS 1252 B1 - PROCESS CONTROL EQUIPMENT - Certified to US Standards
- CLASS 1252 B3 - PROCESS CONTROL EQUIPMENT - Components
- CLASS 1252 B3 - PROCESS CONTROL EQUIPMENT - Certified to US Standards
- CLASS 1211 B7 - INDUSTRIAL CONTROL EQUIPMENT - Miscellaneous Apparatus

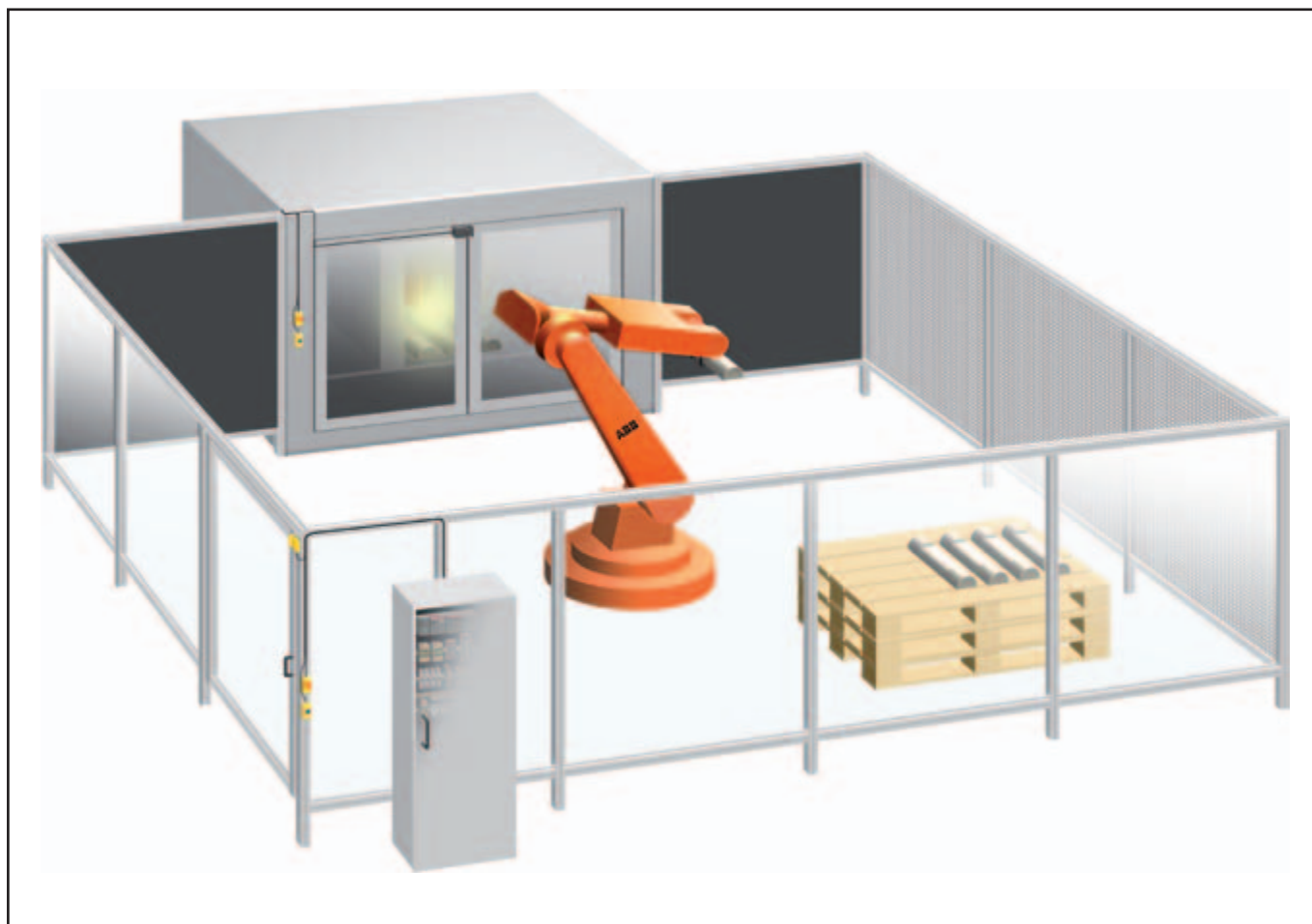
Component type<sup>1</sup> Programmable Logic Controller, permanently installed rail mounted, Models: PLUTO A/0, PLUTO I/0, PLUTO S/0, PLUTO A/16, PLUTO B/16, PLUTO B/16-6, PLUTO S/16-6 and PLUTO AS-4, rated output: 24Vdc, 5A (max), rated output: 24Vdc, 800mA / 2-3A max total load all outputs (R310-R317) (RQ30-77) and 250Vvac, 1.5A (R04-Q104-Q5), -24Vdc, 300mA (QE-Q3), IP40, IP70 terminals.

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and UL/ETL Standards for use in Canada and the U.S., respectively. The 'C' indicator includes products eligible to bear the 500V, 1000V, 1500V, and 2500V National Recognition Testing Laboratory, as a designation granted by the U.S. Department of Safety and Health Administration (DHS) to laboratories which have been accepted to perform evaluations on U.S. Standards.

Issued for file: 1700374



## Robot cell with Pluto



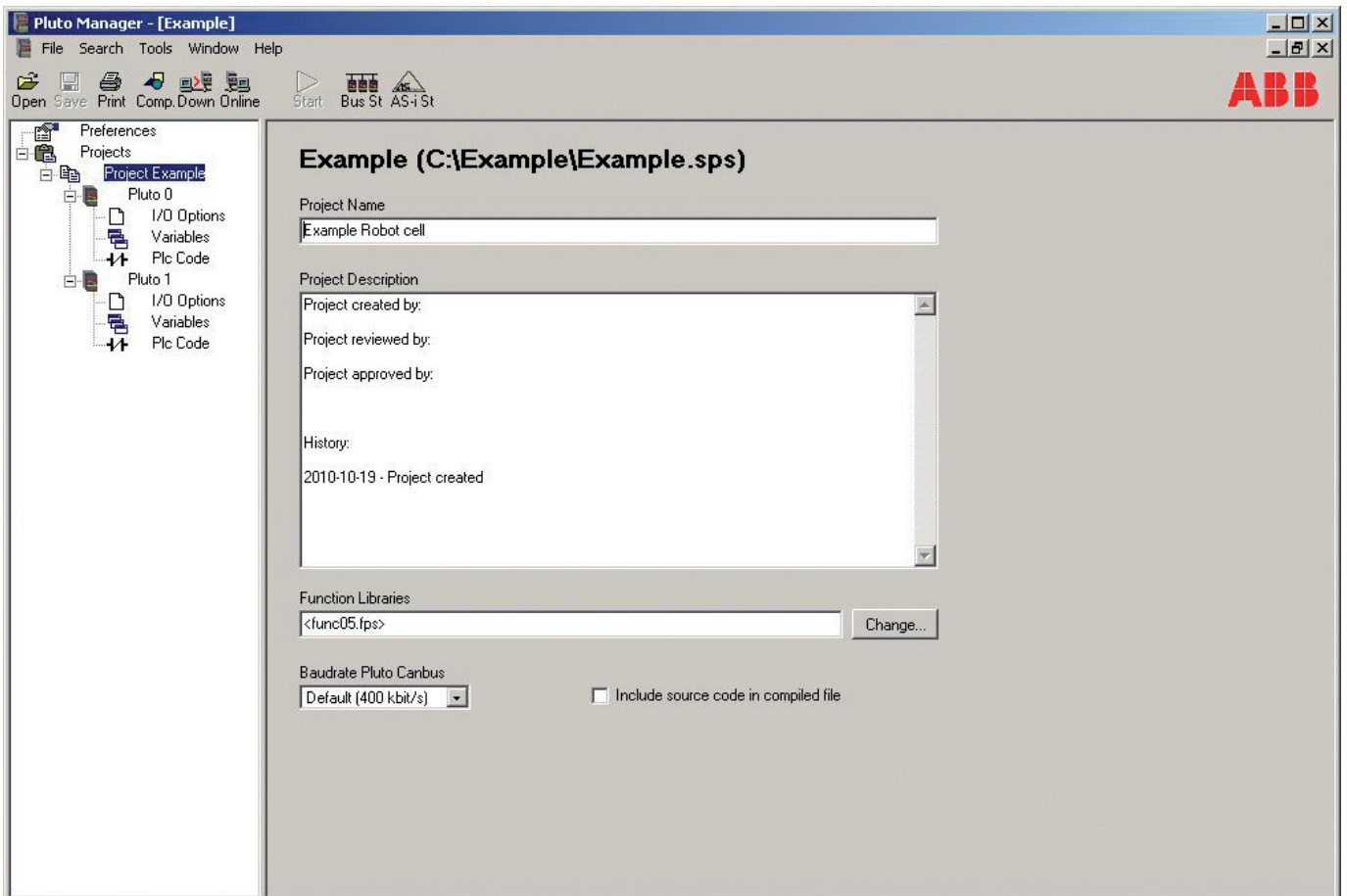
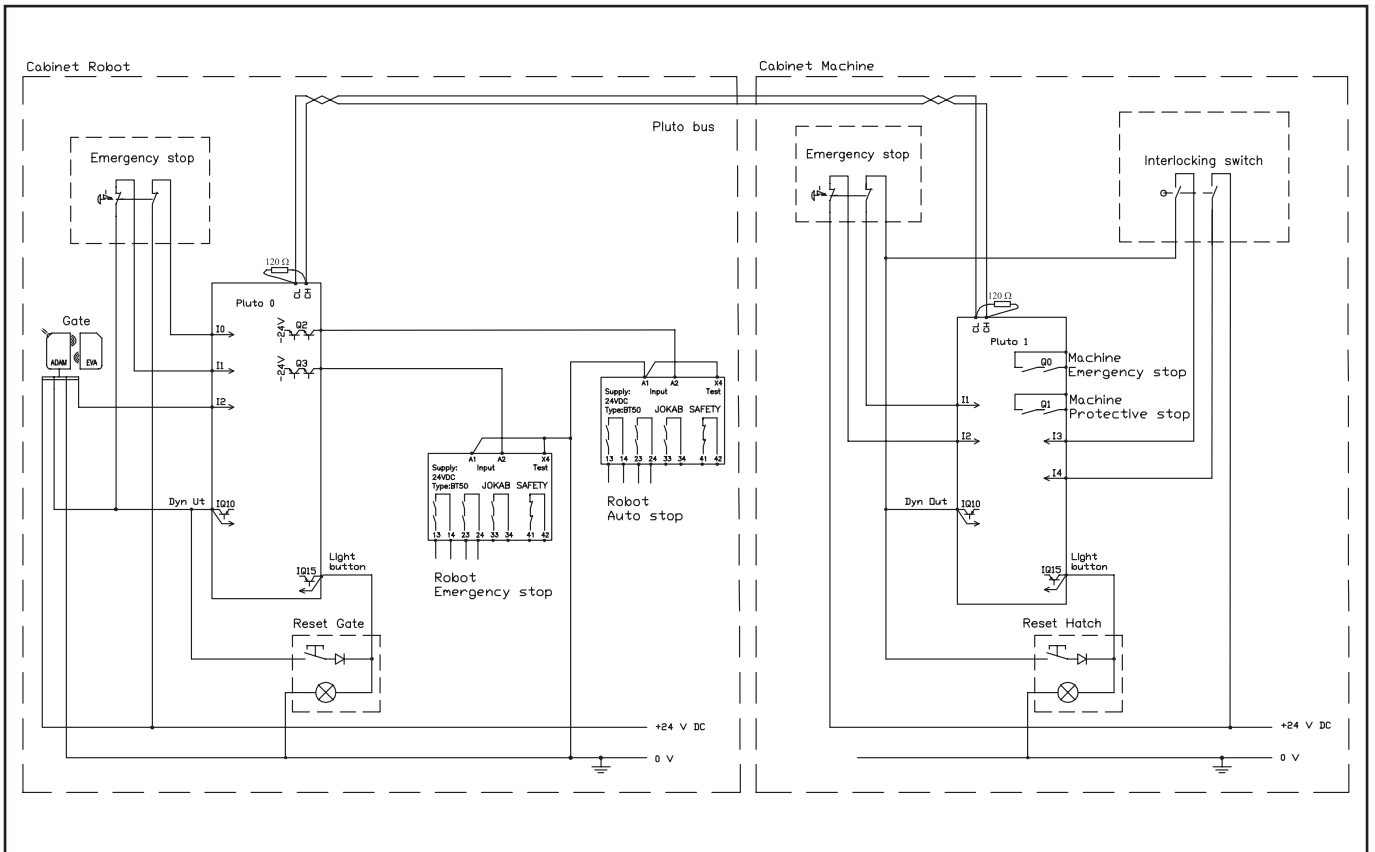
### Description:

The example describes a processing machine served by a robot. The machine safety system consists of one (Pluto 1) to which all protection has been connected. The robot has been equipped with a (Pluto 0) to which the cell protection has been connected. The Pluto for the machine has been connected via a databus cable to the robot's Pluto so that common functions, such as emergency stop, can be used by the whole cell.

### Function:

Emergency stop takes priority and will stop both the machine and the robot. The machine hatch acts as the zone divider, when the hatch is closed the machine forms one zone and the robot another zone. When the machine hatch is open, both the machine and the robot belong to the same zone. If the door is opened when the machine hatch is open, the machine and the robot will both stop, but if the machine hatch is closed, only the robot will be stopped. After the door has been opened, the system must be reset by means of the reset button on the outside of the door. Emergency stop is reset when the pressed-in button is pulled out. NOTE. The cell operating cycle must not however start immediately on resetting the emergency stop or the door.

# Electrical connections



## Pluto 0 settings – Robot cabinet



### Pluto 0

IO.0=P0\_ES1\_Ch1  
 IO.1=P0\_ES1\_Ch2  
 IO.2=P0\_Eden1  
 IO.15=P0\_LB1\_In  
 Q0.2=P0\_AS\_OK  
 Q0.3=P0\_ES  
 GM0.0=P0\_ES\_OK

;Emergency stop 1 channel 1 - Static  
 ;Emergency stop 1 channel 2 - Dynamic A non-inverted  
 ;Door Eden sensor - Dynamic A  
 ;Reset Door - Light button input - Dynamic A  
 ;Robot auto stop - Expansion BT50 relay  
 ;Robot emergency stop - Expansion BT50 relay  
 ;Emergency stop OK in Pluto 0

## Pluto 1 settings – Machine cabinet



### Pluto 1

I1.1=P2\_ES1\_Ch1

;Emergency stop 1 channel 1 - Dynamic A non-inverted

I1.2=P2\_ES1\_Ch2

;Emergency stop 1 channel 2 -Static

I1.3=P2\_IS1\_Ch1

;Interlocking switch channel 1 - Dynamic A non-inverted

I1.4=P2\_IS1\_Ch2

;Interlocking switch channel 2 - Static

I1.15=P2\_LB1\_In

;Reset Hatch - Light button input - Dynamic A

Q1.0=P2\_ES

;Machine Emergency stop

Q1.1=P2\_PS

;Machine protective stop

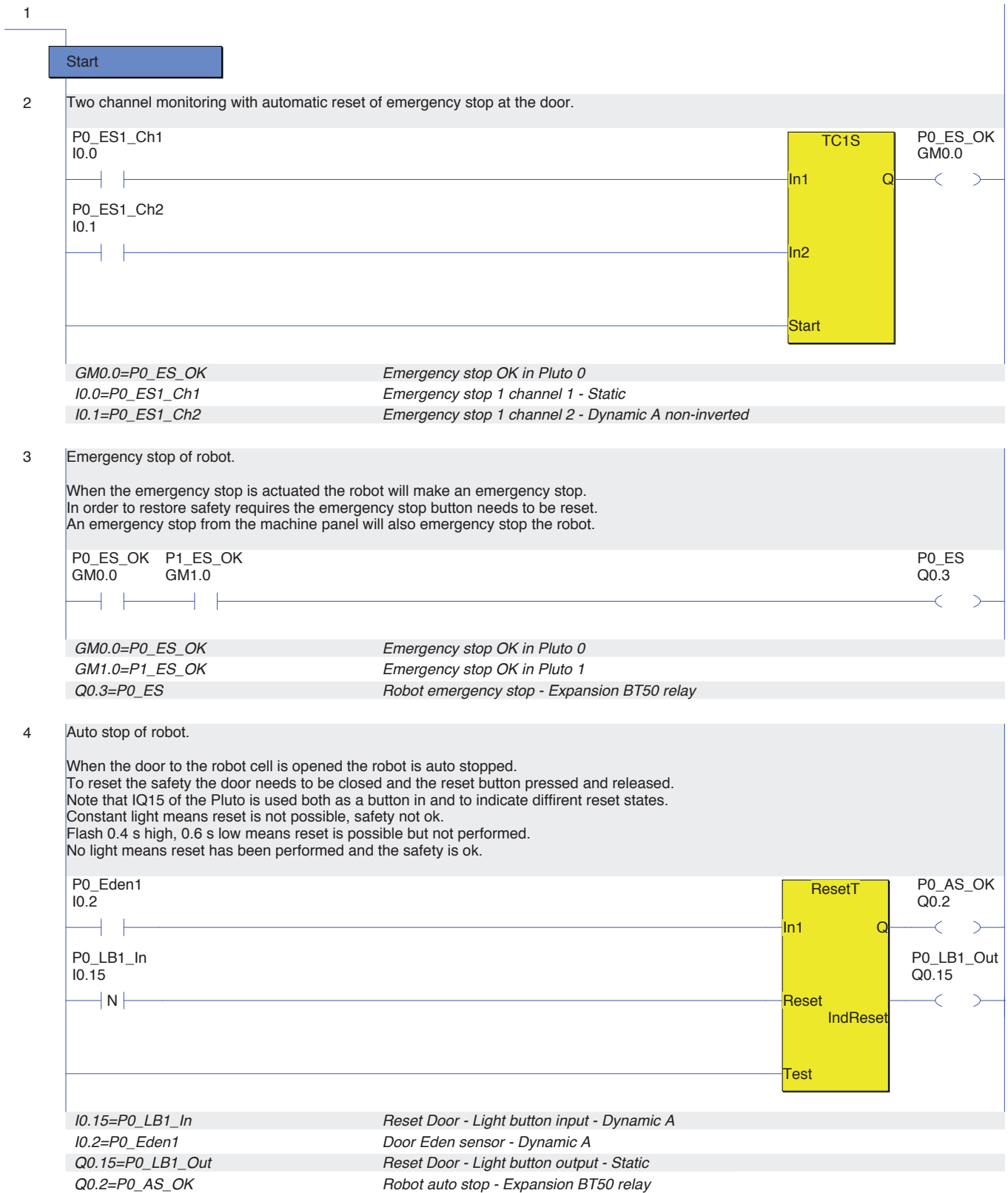
GM1.0=P2\_ES\_OK

;Emergency stop OK in Pluto 1

GM1.1=P2\_Hatch\_OK

;Hatch closed

## PLC code Pluto 0 – Robot cabinet



5 Alarm 03 - Machine hatch open.

To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto.  
A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.

P1\_Hatch\_OK GM1.1    P0\_AS\_OK Q0.2    SR\_ErrorCode=0 SR0.11=0    SR\_PlutoDisplay=203 SR0.10=203



GM1.1=P1\_Hatch\_OK                      Hatch closed  
Q0.2=P0\_AS\_OK                              Robot auto stop - Expansion BT50 relay  
SR0.10=SR\_PlutoDisplay                  Pluto display figure. For user error: 200+no  
SR0.11=SR\_ErrorCode                      Error code

6 Alarm 02 - Door open.

To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto.  
A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.

P0\_Eden1 I0.2    SR\_ErrorCode=0 SR0.11=0    SR\_PlutoDisplay=202 SR0.10=202



I0.2=P0\_Eden1                              Door Eden sensor - Dynamic A  
SR0.10=SR\_PlutoDisplay                  Pluto display figure. For user error: 200+no  
SR0.11=SR\_ErrorCode                      Error code

7 Alarm 01 - Emergency stop actuated.

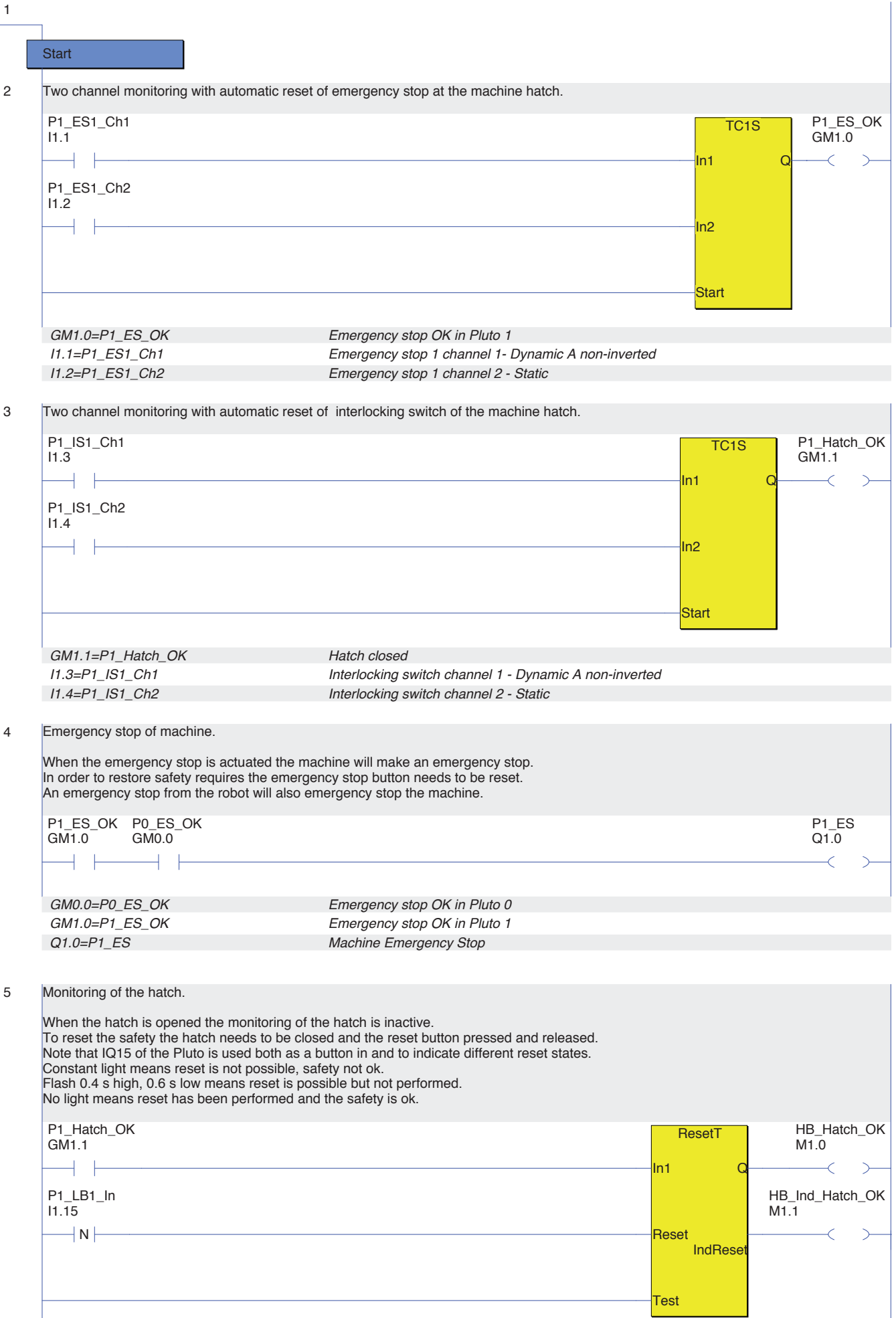
To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto.  
A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.

P0\_ES\_OK GM0.0    SR\_ErrorCode=0 SR0.11=0    SR\_PlutoDisplay=201 SR0.10=201



GM0.0=P0\_ES\_OK                              Emergency stop OK in Pluto 0  
SR0.10=SR\_PlutoDisplay                  Pluto display figure. For user error: 200+no  
SR0.11=SR\_ErrorCode                      Error code

## PLC code Pluto 1 – Machine cabinet



GM1.1=P1_Hatch_OK	Hatch closed
I1.15=P1_LB1_In	Reset Hatch - Light button input - Dynamic A
M1.0=HB_Hatch_OK	Help Bit - Hatch closed
M1.1=HB_Ind_Hatch_OK	Help Bit - Indication Reset Hatch

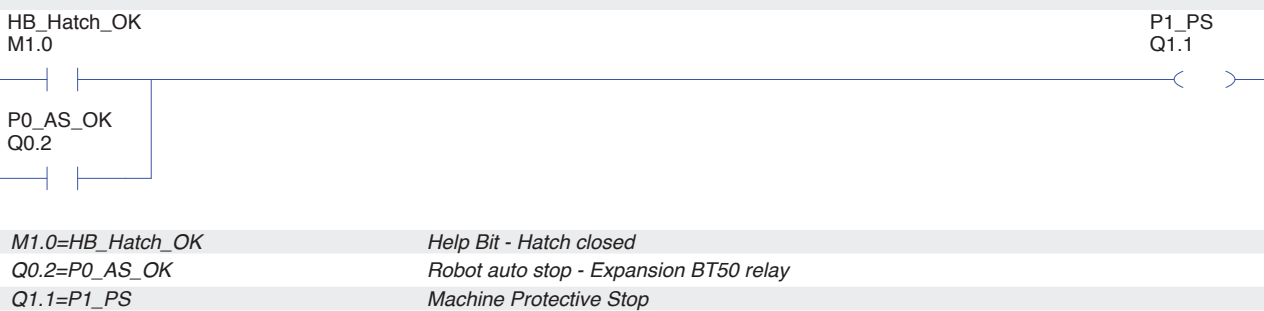
6 Light button indication of the reset of the hatch.

If the robot cell's door is closed and reset no light indication is needed inside the cell.



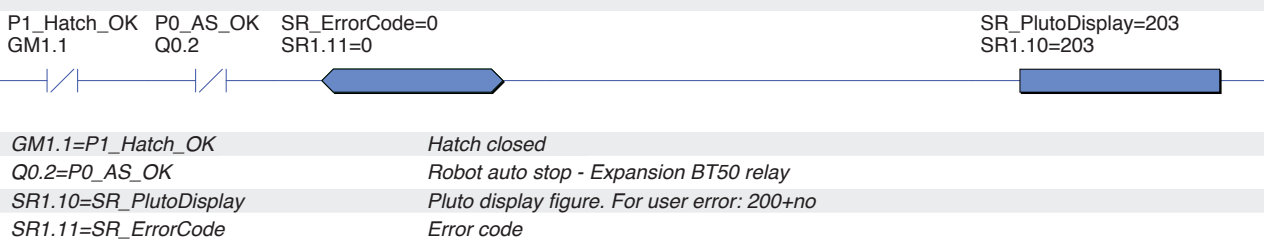
7 Protective stop of the machine.

Either the hatch is closed and reset or the door to the robot cell is closed and reset. This means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset.



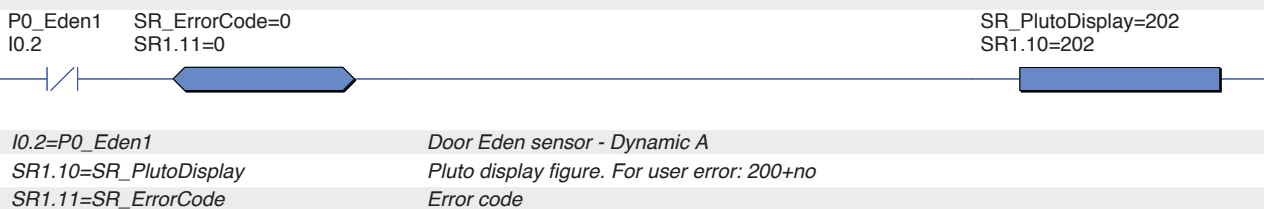
8 Alarm 03 - Machine hatch open.

To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.



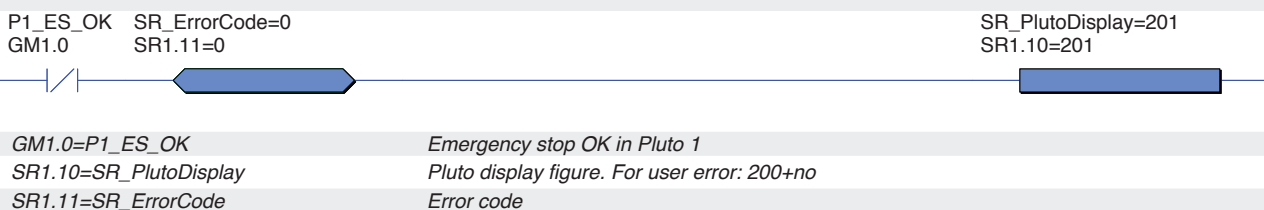
9 Alarm 02 - Door open.

To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.



10 Alarm 01 - Emergency stop actuated.

To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.





## Pluto gateway

# GATE-P2

### Use:

Bi-directional status information from the Pluto safety PLC

For Profibus

### Features:

Two-way communication

Built-in filter function, shared network

Only 22.5 mm wide

Can be located anywhere in the databus

Common interface with Pluto

Ready-made function blocks

Profibus DP

DeviceNet

CANopen

Profinet

Ethernet/IP

Modbus TCP



Pluto gateway is a unit providing two-way communication between a Pluto safety PLC and other field buses.

The Pluto gateway is a compact unit mounted on a DIN rail, and can be connected anywhere in a Pluto safety bus. The unit has a common interface with Pluto, i.e. the same cabling, and the Pluto Manager PC program can be used for servicing and where necessary programming. Normally, however, all the settings are made via a DIP switches, which means that programming tools are not required to put the gateway itself into operation.

For programming Pluto there are ready-made function blocks which, via a Pluto gateway, send and receive data from the supervisory system.

### Data from Pluto

Via PROFIBUS a supervisory PLC system can have access to the I/O and other variables in a Pluto safety PLC. Global I/O in a Pluto safety PLC are accessible via PROFIBUS modules in the gateway, one module for each Pluto unit. Local data in Pluto units can be read by a "local data" module together with the PLC codes in the supervisory system.

### Data to Pluto

Via PROFIBUS a supervisory PLC system can transmit non-safety-related information to a Pluto safety PLC. A total of 64 Boolean values and 8 different 16-bit registers can be transmitted. Function blocks for these functions are available in Pluto Manager.

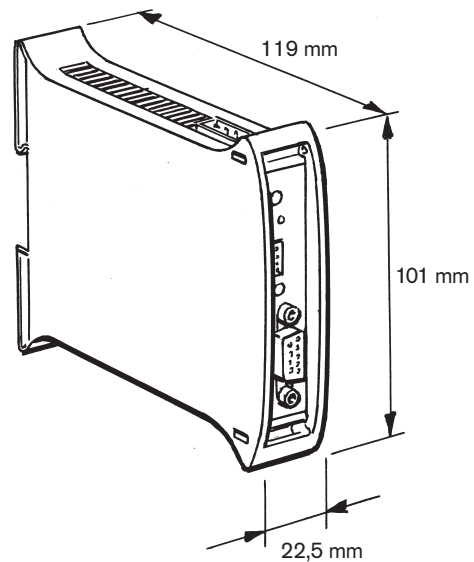
### PLC function blocks

To simplify the integration of a Pluto gateway PROFIBUS into the supervisory PLC system, ABB Jokab Safety provides ready-made function blocks for several popular brands of PLC. The function blocks make it easier to receive and send information to the Pluto system. The function blocks are supplied as open units with full access for the customer to change and add functions. These function blocks can be obtained via [www.abb.com/lowvoltage](http://www.abb.com/lowvoltage).

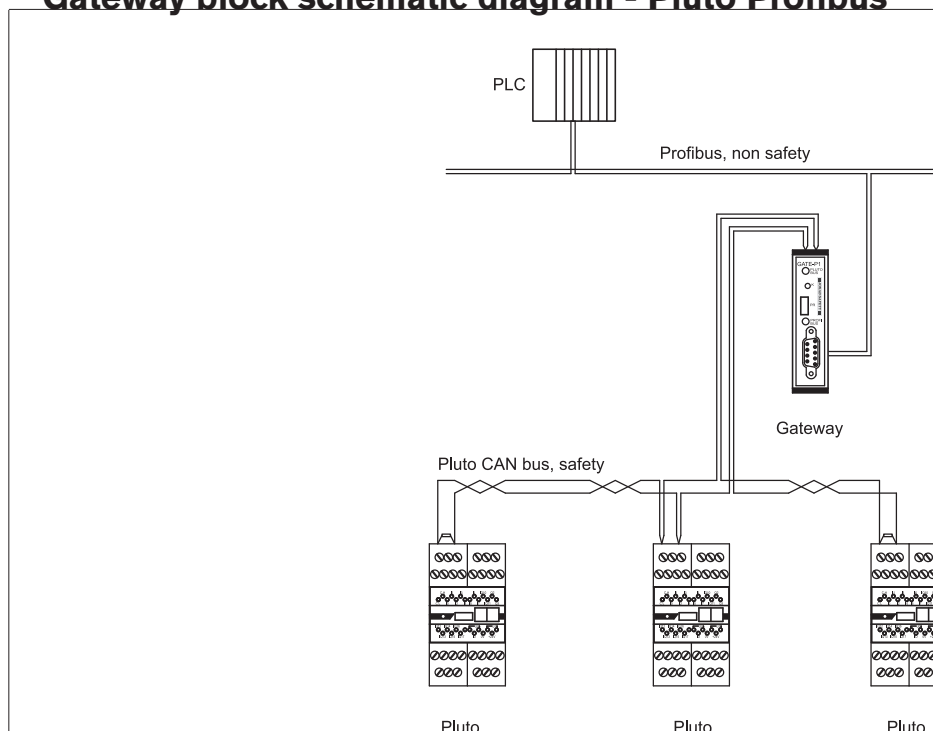


## Technical data - GATE-P2

<b>Manufacturer:</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ordering data:</b>	2TLA020071R8000 GATE-P2
<b>Databases:</b>	-Pluto safety bus CAN (isolated) -PROFIBUS RS485 (isolated)
<b>Pluto safety bus speeds:</b>	100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)
<b>PROFIBUS speed:</b>	Up to 12 Mbit/s (automatic speed detection)
<b>PROFIBUS address:</b>	Setting via DIP switches (0-99)
<b>PROFIBUS version:</b>	DP slave, DP-V0
<b>Connections:</b>	Top, 3-pole terminal for Pluto safety bus (included) Front, standard 9-pole PROFIBUS connection. Bottom, 2-pole terminal for 24 V DC (included)
<b>Status indication:</b>	Pluto safety bus status indication via LED PROFIBUS status indication via LED
<b>Operating voltage:</b>	24 V DC, -15% till +20%
<b>Current at 24 V:</b>	< 100 mA (recommended fuse ≤ 6 A)
<b>Dimensions (w x h x d):</b>	22.5 x 101 x 119 mm
<b>Installation:</b>	35 mm DIN rail
<b>Operating temperature (ambient):</b>	-10°C to + 55°C
<b>Temperature, transport and storage:</b>	-25°C to + 55°C
<b>Humidity:</b>	EN 60 204-1 50% at 40°C (ambient 90% at 20°C)
<b>Enclosure classification:</b>	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529



## Gateway block schematic diagram - Pluto Profibus



## Pluto gateway

# GATE-D2

### Use:

Bi-directional status information from the Pluto safety PLC

For DeviceNet and Pluto bridge

### Features:

Two-way communication

Built-in filter function, shared network

Only 22.5 mm wide

Can be located anywhere in the databus

Common interface with Pluto

Ready-made function blocks

Profibus DP

DeviceNet

CANopen

Profinet

Ethernet/IP

Modbus TCP



Pluto gateway is a unit providing two-way communication between a Pluto safety PLC and other field buses.

The Pluto gateway is a compact unit mounted on a DIN rail, and can be connected anywhere in a Pluto safety bus. The unit has a common interface with Pluto, i.e. the same cabling, and the Pluto Manager PC program can be used for servicing and where necessary programming. Normally, however, all the settings are made via a DIP switches, which means that programming tools are not required to put the gateway itself into operation.

For programming Pluto there are ready-made function blocks which, via a Pluto gateway, send and receive data from the supervisory system.

### Data from Pluto

Via DeviceNet a supervisory PLC system can have access to the I/O and other variables in a Pluto safety PLC. Global I/Os in a Pluto safety PLC are accessible via DeviceNet "implicit" messages. Local data in Pluto units can be read via DeviceNet "explicit" messages.

### Data to Pluto

Via DeviceNet a supervisory PLC system can transmit non-safety-related information to a Pluto safety PLC. A total of 64 Boolean values and 8 different 16-bit registers can be transmitted (via DeviceNet "implicit" or "explicit" messages). Function blocks for these commands are available in Pluto Manager.

### Pluto bridge

A GATE-D2 can also be used to advantage as a CAN bridge when it is required to divide a Pluto safety bus into

several sections. This is particularly useful when long databus cables are needed.

There is also a built-in filter function which makes it possible to block any data that is not required for use on the other side of the bridge, which reduces the databus loading in the other sections and thereby permits longer databus cables.

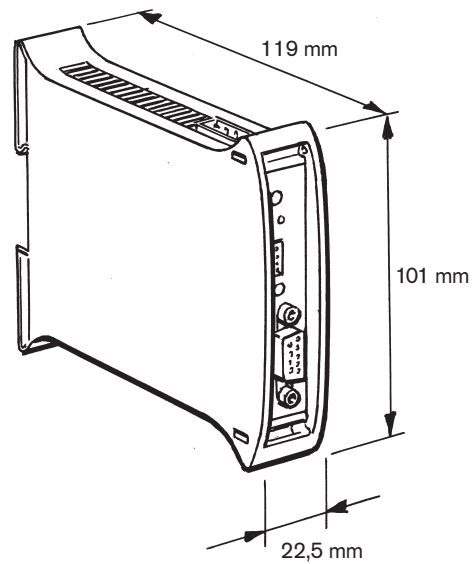
### ABB Robotics IRC5

PLUTO GATE-D2 has support for integration into an ABB Robotics IRC5-system. The documentation that describes this integration can be obtained via the [www.abb.com/low-voltage](http://www.abb.com/low-voltage).

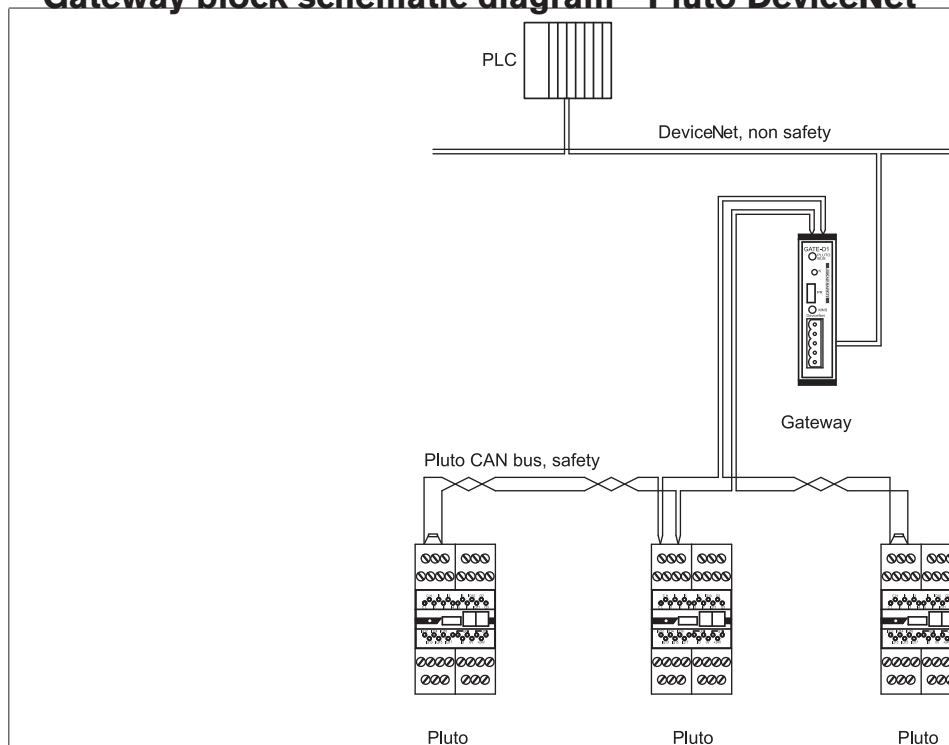


## Technical data - GATE-D2

<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ordering data:</b>	2TLA020071R8200 GATE-D2
<b>Databuses:</b>	-Pluto safety bus CAN (isolated) -DeviceNet CAN (isolated)
<b>Pluto safety bus speeds:</b>	100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)
<b>DeviceNet speeds:</b>	125, 250 and 500 kbit/s (set via DIP switch)
<b>DeviceNet address:</b>	Setting via DIP switches (1-63)
<b>DeviceNet Version:</b>	ODVA version 2.0
<b>Connections:</b>	Top, 3-pole terminal for Pluto safety bus (included) Front, 5-pole terminal for DeviceNet (included) Bottom, 2-pole terminal for 24 V DC (included)
<b>Status indications:</b>	Pluto safety bus status indication via LED DeviceNet MNS status indication via LED
<b>Operating voltage:</b>	24 V DC, -15% till +20%
<b>Current at 24 V:</b>	< 100 mA (recommended fuse ≤ 6 A)
<b>Dimensions (w x h x d):</b>	22.5 x 101 x 119 mm
<b>Installation:</b>	35 mm DIN rail
<b>Operating temperature (ambient):</b>	-10°C to + 55°C
<b>Temperature, transport and storage:</b>	-25°C to + 55°C
<b>Humidity:</b>	EN 60 204-1 50% at 40°C (ambient 90% at 20°C)
<b>Enclosure classification:</b>	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529



## Gateway block schematic diagram - Pluto DeviceNet



## Pluto gateway

# GATE-C2

### Use:

Bi-directional status information from the Pluto safety PLC

For CANopen and Pluto-bridge

### Features:

Two-way communication

Built-in filter function, shared network

Only 22.5 mm wide

Can be located anywhere in the databus

Common interface with Pluto

Ready-made function blocks

Profibus DP

DeviceNet

CANopen

Profinet

Ethernet/IP

Modbus TCP



Pluto gateway is a unit providing two-way communication between a Pluto safety PLC and other field buses.

The Pluto gateway is a compact unit mounted on a DIN rail, and can be connected anywhere in a Pluto safety bus. The unit has a common interface with Pluto, i.e. the same cabling, and the Pluto Manager PC program can be used for servicing and where necessary programming. Normally, however, all the settings are made via a DIP switches, which means that programming tools are not required to put the gateway itself into operation.

For programming Pluto there are ready-made function blocks which, via a Pluto gateway, send and receive data from the supervisory system.

### Data from Pluto

Via CANopen a supervisory PLC system can have access to the I/O and other variables in a Pluto safety PLC. Global I/Os in a Pluto safety PLC are accessible via CANopen PDO messages. Local data in Pluto units can be read via CANopen SDO messages together with the PLC codes in the supervisory system.

### Data to Pluto

Via CANopen a supervisory PLC system can send non-safety-related information to a Pluto safety PLC. A total of 64 Boolean values and 8 different 16-bit registers can be transmitted (CANopen PDO or SDO messages). Function blocks for these commands are available in Pluto Manager.

### Pluto bridge

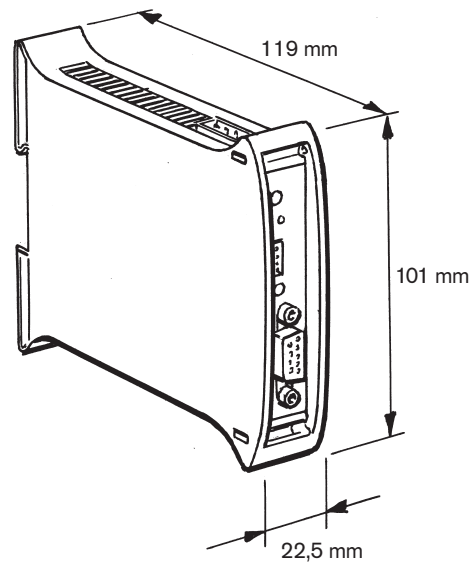
A GATE-C2 can also be used to advantage as a CAN bridge when it is required to divide a Pluto safety bus into several sections. This is particularly useful when long databus cables are needed.

There is also a built-in filter function which makes it possible to block any data that is not required for use on the other side of the bridge, which reduces the databus loading in the other sections and thereby permits longer databus cables.



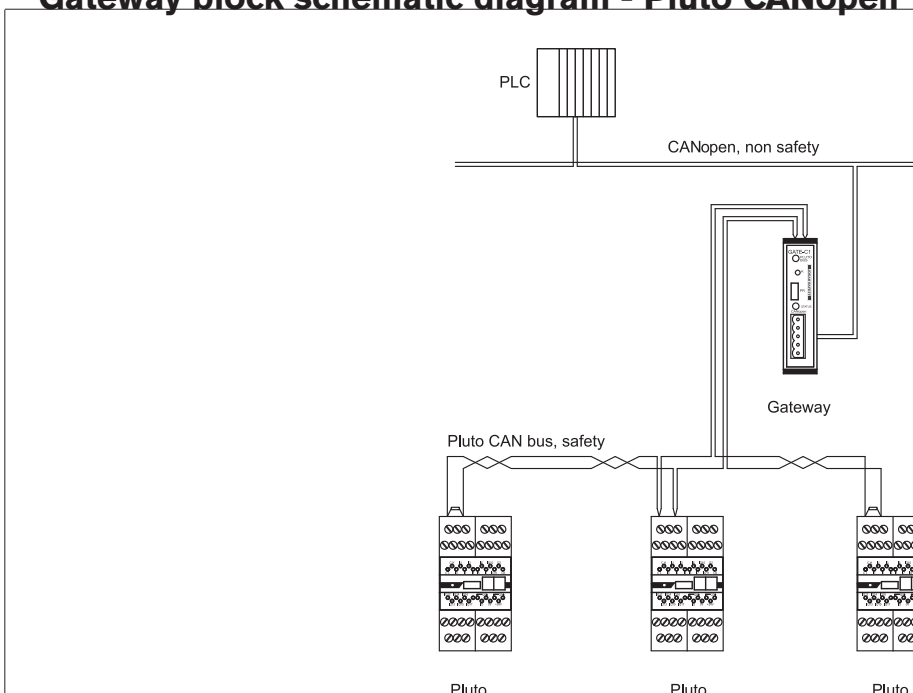
## Technical data - GATE-C2

<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ordering data:</b>	2TLA020071R8100 GATE-C2
<b>Databuses:</b>	-Pluto safety bus CAN (isolated) -CANopen CAN (isolated)
<b>Pluto safety bus speeds:</b>	100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)
<b>CANopen speeds:</b>	125, 250 and 500 kbit/s (set via DIP switch) 10, 20, 50, 100, 125, 250, 500, 800 and 1000 kbit/s (via software)
<b>CANopen address:</b>	Setting via DIP switches or software (1-63)
<b>CANopen version:</b>	"Version 4.02 of the CiA Draft Standard 301"
<b>Connections:</b>	Top, 3-pole terminal for Pluto safety bus (included) Front, 5-pole terminal for CANopen (included) Bottom, 2-pole terminal for 24 V DC (included)
<b>Status indications:</b>	Pluto safety bus status indication via LED CANopen status indication via LED
<b>Operating voltage:</b>	24 V DC, -15% till +20%
<b>Current at 24 V:</b>	< 100 mA (recommended fuse ≤6 A)



<b>Dimensions (w x h x d):</b>	22.5 x 101 x 119 mm
<b>Installation:</b>	35 mm DIN rail
<b>Operating temperature (ambient):</b>	-10°C to + 55°C
<b>Temperature, transport and storage:</b>	-25°C to + 55°C
<b>Humidity:</b>	EN 60 204-1 50% at 40°C (ambient 90% at 20°C)
<b>Enclosure classification:</b>	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529

## Gateway block schematic diagram - Pluto CANopen



## Pluto gateway

# GATE-E2

### Use:

Bi-directional status information from the Pluto safety PLC

Profinet, Ethernet/IP, Modbus TCP

### Features:

Two-way communication

Built-in filter function, shared network

Can be located anywhere in the databus

Common interface with Pluto

Ready-made function blocks

Profibus DP

DeviceNet

CANopen

Profinet  
Ethernet/IP  
Modbus TCP



Pluto gateway is a unit providing two-way communication between a Pluto safety PLC and other field buses.

The Pluto gateway is a compact unit mounted on a DIN rail, and can be connected anywhere in a Pluto safety bus. The unit has a common interface with Pluto, i.e. the same cabling, and the Pluto Manager PC program can be used for servicing and where necessary programming. Normally, however, all the settings are made via a DIP switches, which means that programming tools are not required to put the gateway itself into operation.

For programming Pluto there are ready-made function blocks which, via a Pluto gateway, send and receive data from the supervisory system.

### Protocol

PLUTO Gateway GATE-E2 handles the status from and to Pluto safety PLCs via Ethernet protocols EtherNet/IP, PROFINET, Modbus TCP and a simple binary protocol that uses TCP/IP.

For IP-address configuration, etc. there is a simple web server and a terminal server.

### Data from Pluto

Via one of the Ethernet protocols a supervisory PLC system can have access to the I/O and other variables in a Pluto safety PLC. Global I/Os in a Pluto safety PLC are accessible via the usual I/O transfer in the respective protocol. Local data in Pluto units can be read by special commands together with the PLC codes in the supervisory system.

### Data to Pluto

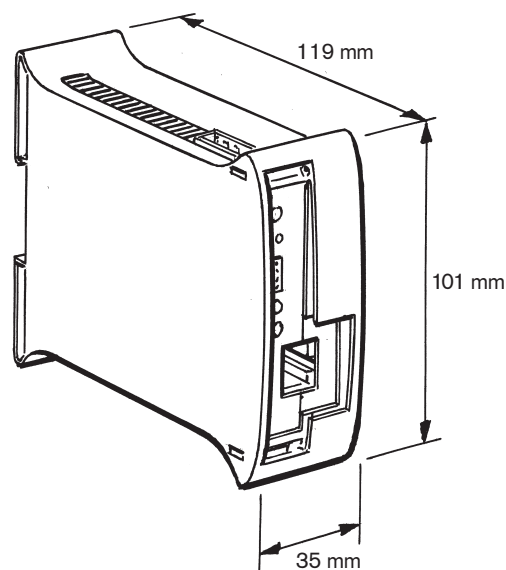
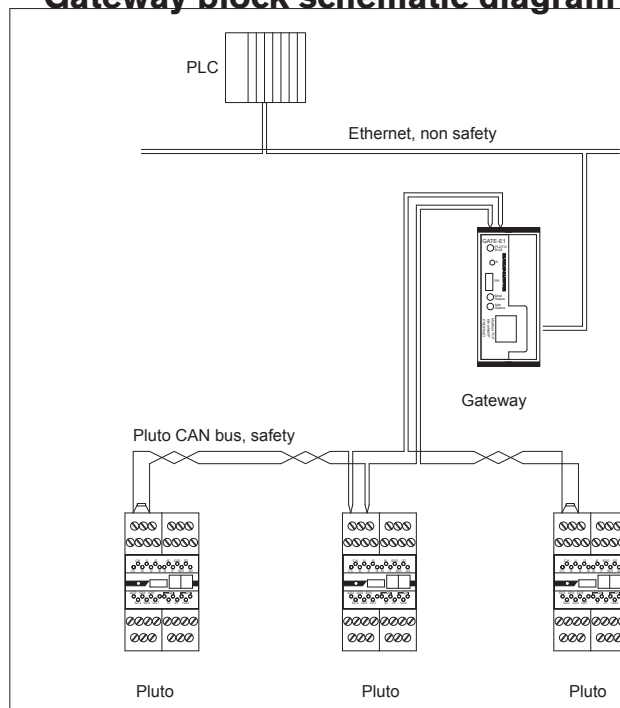
Via the Ethernet protocol a supervisory PLC system can transmit non-safety-related information to a Pluto safety PLC. A total of 64 Boolean values and 8 different 16-bit registers can be transmitted. Function blocks for these functions are available in Pluto Manager.



Technical data - GATE-E2	
<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ ordering data:</b>	2TLA020071R8300 GATE-E2
<b>Buses:</b>	Pluto-bus CAN (isolated) Profinet (isolated) Ethernet/IP (isolated) Modbus TCP (isolated)
<b>Pluto safety bus speeds</b>	100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)
<b>Ethernet</b>	10/100 Mbit/s Half and full duplex
<b>Ethernet protocol</b>	Status from and to Pluto safety PLC - EtherNet/IP - PROFINET - Modbus TCP - Binary server (TCP/IP)  Note that certain combinations of server protocols cannot be used simultaneously.  Gateway status and IP address configuration - Web server - Terminal server (TCP/IP)
<b>EtherNet/IP</b>	According to ODVA "CIP Edition 3.2" and "EtherNet/IP Adaption of CIP Edition 1.3". Minimum RPI of 50 ms
<b>PROFINET</b>	PROFINET
<b>Modbus TCP</b>	According to the Modbus organisation, version 1.0b (approx. 20 messages per second).
<b>Binary server (TCP/IP)</b>	Simple TCP/IP protocol to send status from/to the Pluto system.

<b>Web server</b>	For simple sharing of IP addresses.
<b>Terminal server (TCP/IP)</b>	Simple server with the same commands as via the serial programming port in the unit.
<b>IP address</b>	Static sharing via web server or via programming port.
<b>Gateway configuration</b>	Takes place via EtherNet/IP, PROFINET, Modbus TCP or via the binary TCP/IP server.
<b>Connections</b>	Top, 3-pole terminal for Pluto safety bus (included) Front, Ethernet connection via RJ-45 (screened cable cat. 5e FTP) Bottom, 2-pole terminal for 24 V DC (included)
<b>Status indications</b>	Pluto safety bus status indication via LED (Pluto safety bus) Ethernet module status indication via LED (Mod Status) Ethernet network status indication via LED (Net Status)
<b>Operating voltage</b>	24 V DC, -15 % till +20 %
<b>Current at 24 V</b>	< 150 mA (recommended fuse ≤6 A)
<b>Dimensions (w x h x d):</b>	35 x 101 x 120 mm
<b>Installation</b>	35 mm DIN rail
<b>Operating temperature (ambient)</b>	-10°C to + 55°C
<b>Temperature, transport and storage</b>	-25°C to + 55°C
<b>Humidity</b>	EN 60 204-1 50 % at 40°C (ambient 90 % at 20°C)
<b>Enclosure classification</b>	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529

## Gateway block schematic diagram - Pluto Ethernet





# Pluto Safe Encoder

## Use:

Safe position and speed determination of machine movements.

## Features:

- High resolution
- Selectable resolution
- Connected directly to the Pluto safety bus
- Ready-made function blocks

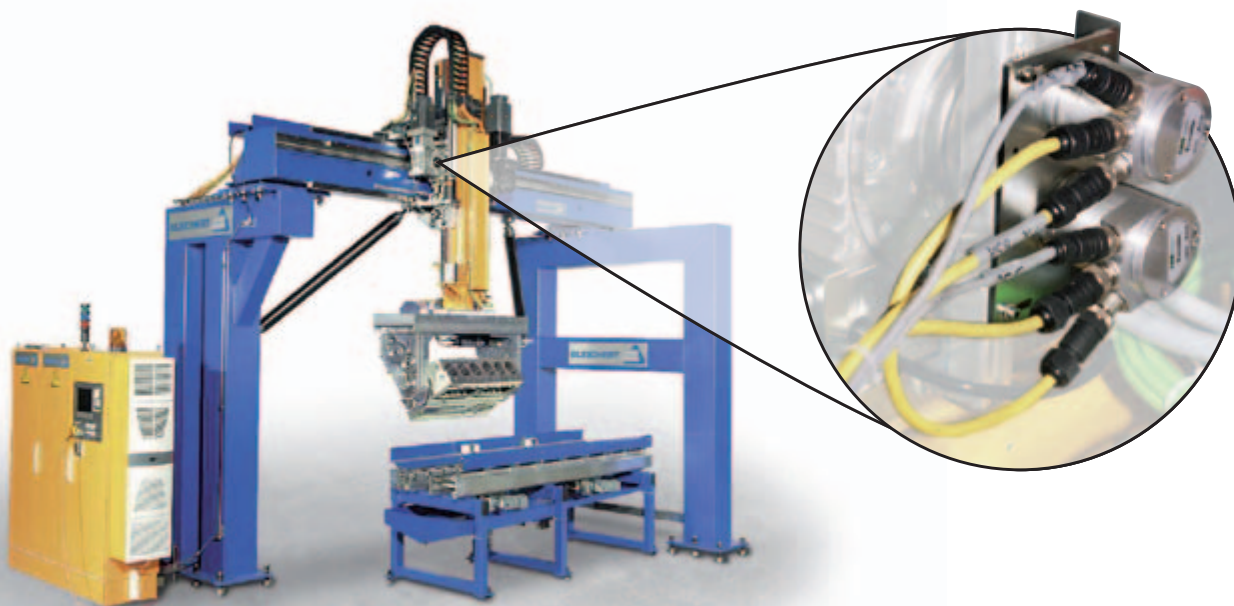


### Rotational absolute value sensor for safe positioning

Together with a Pluto safety PLC, this rotational absolute encoder can be used for safe position determination. This is particularly useful in the case of such equipment as gantry robots, industrial robots, etc. Also in eccentric shaft presses, existing cam mechanisms can be replaced by absolute value position sensors for safe positioning. The sensors are available in single and multi-turn versions.

Up to 16 absolute encoders can be connected to a Pluto CAN databus. A Pluto on the databus reads the sensor values, which are evaluated. With a special function block in the PLC code, it is possible to design two-channel solutions with the sensors. The user can obtain safe values for position and speed from these values. This enables supervision of stationary and overspeed conditions.

The absolute value sensors are standard sensors with modified software to meet the safety requirements.



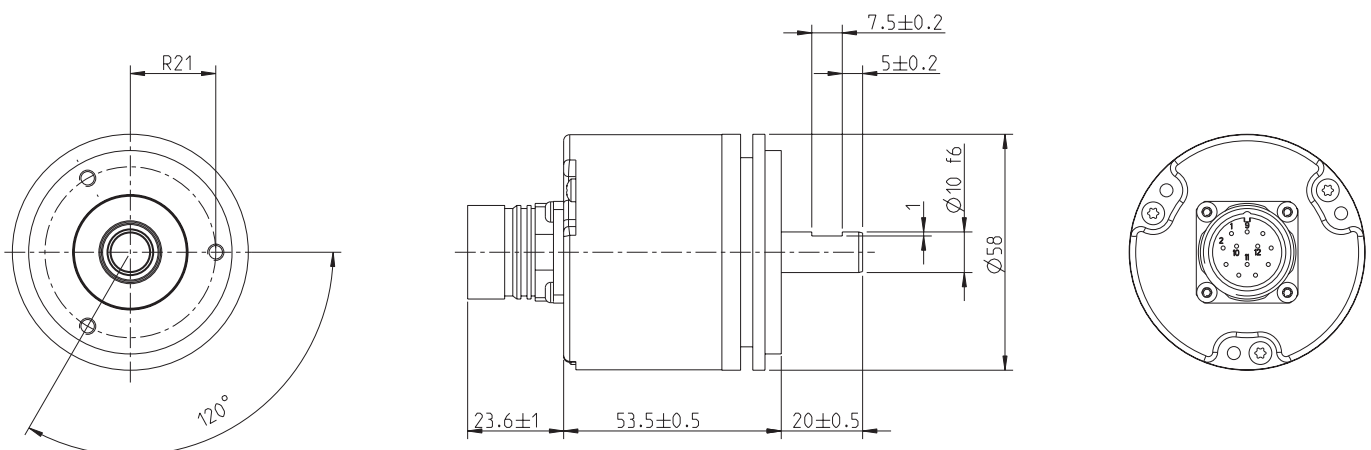
*Example of an application where 2 sensors provide safe position determination in a gantry robot.*

## Technical data – Safe Encoder RSA 597

<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ordering data:</b>	2TLA020070R3600 RSA 597
<b>Ambient temperature</b>	-40°C .. +70°C
<b>Temperature, transport and storage</b>	-30°C .. +70°C
<b>Ingress protection class</b>	IP-67 in accordance with IEC 60529
<b>At shaft inlet</b>	IP-66 in accordance with IEC 60529
<b>Vibration (55 to 2000 Hz)</b>	< 300 m/s <sup>2</sup> in accordance with IEC 60068-2-6
<b>Shock (6ms)</b>	< 2,000 m/s <sup>2</sup> in accordance with IEC 60068-2-27
<b>Material, enclosure</b>	Aluminium
<b>Surface treatment</b>	Painted and chromed or anodised
<b>Weight</b>	Approx. 300 g
<b>Accuracy and resolution</b>	
<b>Resolution</b>	13 bits, 8192 positions per rotation
<b>Accuracy</b>	± ½ LSB (Least Significant Bit)
<b>Operating voltage</b>	9-36 V dc
<b>Polarity-protected</b>	Yes
<b>Short-circuit protected</b>	Yes
<b>Databus speed</b>	5 kbit/s - 1 Mbit/s, preset at 500kbit/s
<b>Address input</b>	Active low
<b>Code type</b>	Binary
<b>Programmable functions</b>	Resolution, 0 position Direction, Databus speed
<b>Current consumption</b>	50 mA at 24V dc
<b>Max current consumption</b>	100 mA



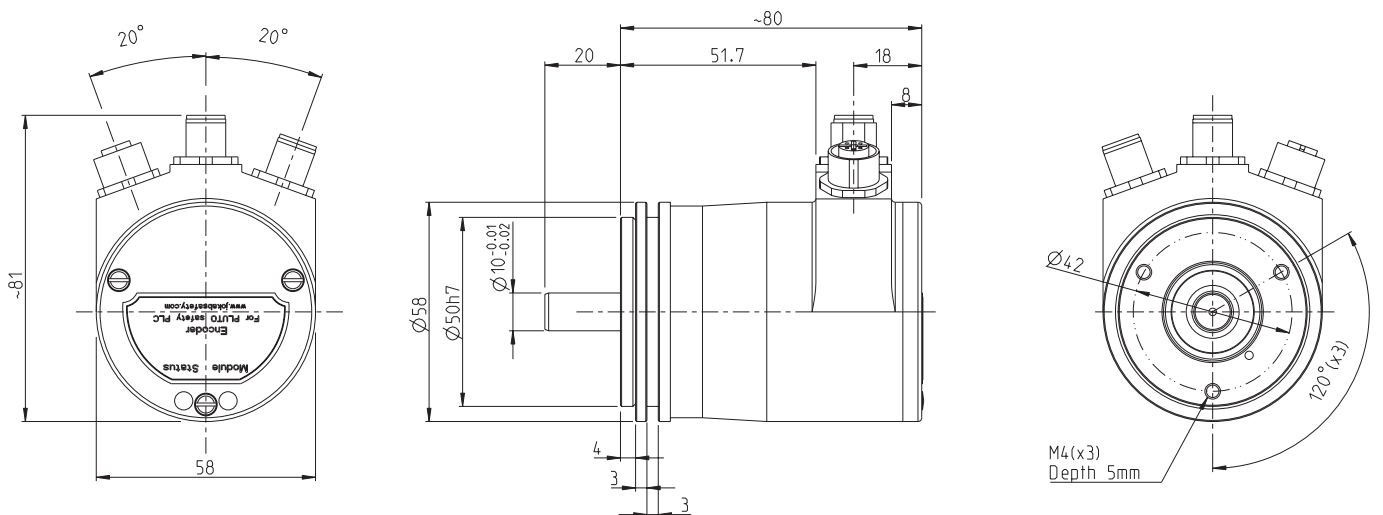
Safe Encoder RSA 597 – single turn



Technical data – Safe Encoder RSA 698	
<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ordering data:</b>	2TLA020070R3700 RSA 698
<b>Ambient temperature</b>	-40°C .. +70°C
<b>Temperature, transport and storage</b>	-30°C .. +70°C
<b>Ingress protection class</b>	IP-67 in accordance with IEC 60529
<b>At shaft inlet</b>	IP-66 in accordance with IEC 60529
<b>Vibration (55 to 2000 Hz)</b>	< 100 m/s <sup>2</sup> in accordance with IEC 60068-2-6
<b>Shock (6ms)</b>	< 2,000 m/s <sup>2</sup> in accordance with IEC 60068-2-27
<b>Material, enclosure</b>	Aluminium
<b>Surface treatment</b>	Anodised
<b>Weight</b>	Approx. 400g
<b>Accuracy and resolution</b>	
<b>Resolution, total</b>	25 bit 13 bits, 8192 positions per rotation 12 bits, 4096 rotations
<b>Accuracy</b>	± 1 LSB (Least Significant Bit)
<b>Operating voltage</b>	9-36 V dc
<b>Polarity-protected</b>	Yes
<b>Short-circuit protected</b>	Yes
<b>Databus speed</b>	10 kbit/s - 1 Mbit/s
<b>Code type</b>	Binary
<b>Programmable functions</b>	Resolution, 0 position
<b>Current consumption</b>	50 mA at 24V dc
<b>Max current consumption</b>	100 mA



Safe Encoder RSA 698 – multi turn

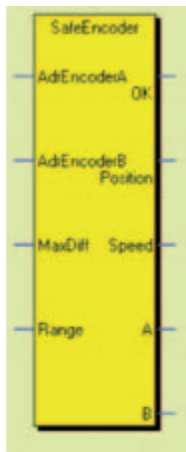


## Safe Encoder

Function block for a single-turn encoder that generates safe position and speed values from two absolute encoders.

### Function

The block reads and evaluates one absolute encoders. The position value is sent to the 'Position' output. The 'Speed' output is the average value for the speed, at the rate of pulses/10 ms. If an error occurs, the 'OK' output is set to zero. In certain applications the values of 'Position' and 'Speed' are used in conjunction with the 'OK' output.



### Descriptions of inputs and outputs

- AdrEncoderA: Encoder A node address
- AdrEncoderB: Encoder B node address
- MaxDiff: Max allowed deviation between the encoders (max 2% of Range)
- Range: Number of increments per revolution
- OK: Set when encoders are working OK and the position values are within the margin set by 'MaxDiff'
- Position: Position value
- Speed: Speed value as increments/10ms
- A: Encoder A position. Must not be used in PLC program!
- B: Encoder B position. Must not be used in PLC program!

**NOTE!** Position values from single encoders are only available for adjustment purposes and must NOT be used for safety.

**NOTE!** When error occurs 'Position' = -1, 'Speed' = -32768 and the OK output will be reset.

## Safe Encoder Multiturn

Function block for a multi-turn encoder that generates safe position and speed values from two absolute encoders. Operative system 2.4.4 or higher is required.

### Function

The block reads and evaluates two absolute encoders. The average value for the two sensors is calculated and sent to the 'Position' output. The 'Speed' output is the average value for the speed, at the rate of pulses/10 ms. The block monitors that the encoder position values do not differ by more than the input value set by 'MaxDiff'. If an error occurs, the 'OK' output is set to zero. In certain applications the values of 'Position' and 'Speed' are used in conjunction with the 'OK' output.



### Descriptions of inputs and outputs

- AdrEncoderA: Encoder A node address
- AdrEncoderB: Encoder B node address
- MaxDiff: Max allowed deviation between the encoders (max 2% of IncrPerRev)
- IncrPerRev: Number of increments per revolution
- OK: Set when encoders are working OK and the position values are within the margin set by 'MaxDiff'
- Position: Position value
- Speed: Speed value as increments/10ms
- A: Encoder A position. Must not be used in PLC program!
- B: Encoder B position. Must not be used in PLC program!

**NOTE!** Position values from single encoders are only available for adjustment purposes and must NOT be used for safety.

**NOTE!** When error occurs 'Position' = -1, 'Speed' = -32768 and the OK output will be reset.

## Encoder Cam

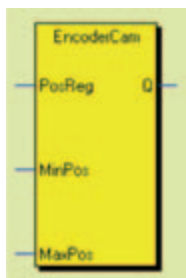
Function block for electronic cam gear.

### Function

Output Q is activated if the value of the input register 'PosReg' is within the limits for 'MinPos' and 'MaxPos'.

**NOTE!** It is possible to specify a value that defines the sensor's zero position. Position < 0 is not permitted.

Example: If MinPos = 3000 and MaxPos = 200, Q is activated when the position is greater than 2999 or less than 201.



### Descriptions of inputs and outputs

- PosReg: Input for the position value
- MinPos: Minimum limit value
- MaxPos: Maximum limit value