- Compact
- Powerful
- Flexible
- Expandable
- Modular

Pluto Safety PLC

Simplify safety system design!
Supervise all types of safety devices!
Inputs for static/dynamic sensors!

Pluto Safety PLC Programmable Controller

Networked Pluto

Pluto is an all-supervisor system in which the inputs and other information are shared via the databus. Several safety sensors can be connected to one input while still achieving the highest level of safety. There are also combined inputs and outputs that can be used, for example, for lamp push buttons where the input and output functions are used simultaneously. Pluto has inputs for all safety devices on the market, and the Pluto Manager software selects how each input shall respond. Pluto with a bus connection is available in two sizes:

Pluto A20/B20

Up to 4,800 Dynamic Input Devices on Bus with 128 Individual Safe Outputs

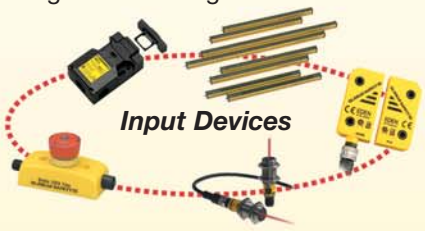
Pluto B46

Up to 12,480 Dynamic Input Devices on Bus with 192 Individual Safe Outputs

safebus

Pluto B20 Machine #1

- Sealing
- Stamping
- Cutting
- Pressing



- **Modular Design**
- **32 Plutos on Safe Bus**
- **Maximum 55ms Overall Response Time**
- **Hot Swap (All Supervisor) No PC Required**

Gateway Pluto Bridge

makes it possible to increase the databus length, use different databus speeds for each page and filter information from one page to reduce the databus loading on other pages.

HMI Operator

communicates with Pluto in both directions. Connection can be made via the bus or direct to the front of the Pluto. The interface is RS232 using ASCII commands.

Pluto Manager

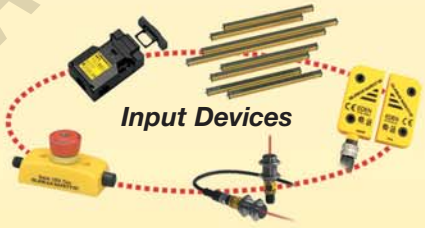
Programming is performed using ladder or Boolean algebra with timers, auxiliary memory, registers, sequential programming and TUV-approved function blocks.

SOFTWARE & SUPPORT INCLUDED

- Profibus DP
- DeviceNet
- CANopen
- Ethernet

Gateway

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



Pluto AS-i

+31 AS-I Nodes

- Safety Monitor or AS-i Safety Master
- Up to 70 Input Devices
- 4 Independent Category 4 Safety Outputs
- Up to 4 Analog Inputs or 4 Digital Outputs

C US TESTED TO UL 508

TÜV Rheinland FS

EN 954, Category 4
EN 61496-1, Type 4
EN 61508, SIL 3

Stand-Alone Pluto

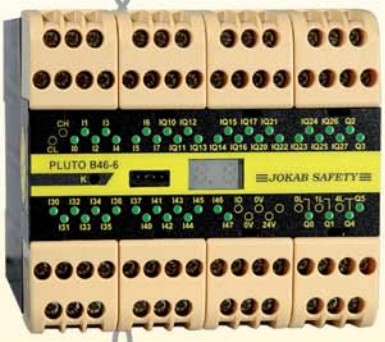
A single Pluto can be used as a fully programmable safety logic controller. Pluto without a bus connection is also available in two sizes:

Pluto S20

Up to 20 Standard I/Os or 150 Dynamic Devices

Pluto S46

Up to 46 Standard I/Os or 390 Dynamic Devices

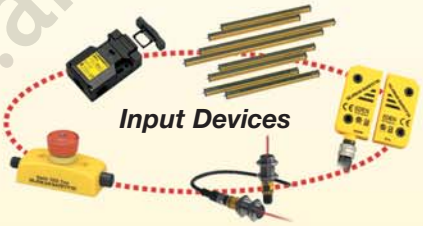


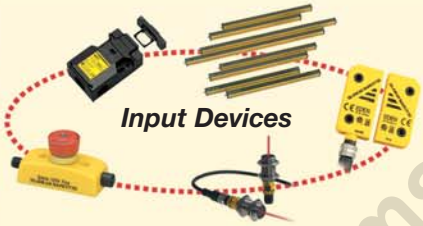
Pluto B46
Machine #2

- Bottling
- Packaging
- Welding
- Feeding

Pluto S20

- Up to 150 Input Devices
- 4 Independent Category 4 Safety Outputs





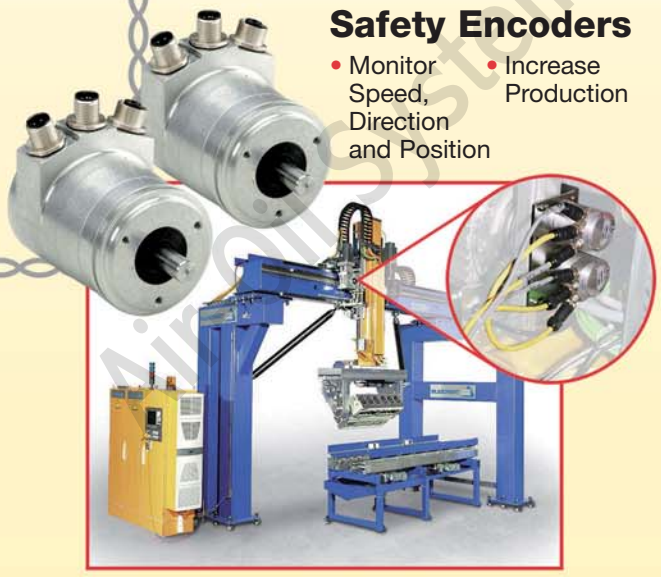
HMI Operator

Pluto S46

- Up to 390 Input Devices
- 6 Independent Category 4 Safety Outputs

Safety Encoders

- Monitor Speed, Direction and Position
- Increase Production



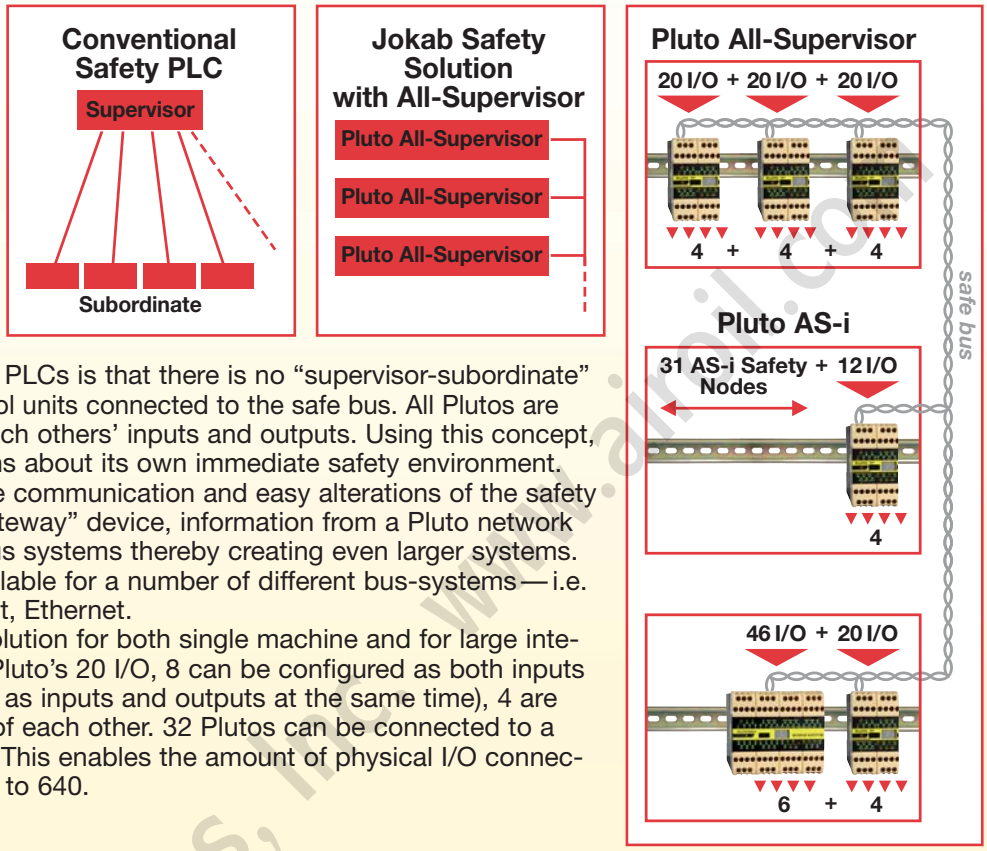
Robot Machine #3

BT51
Expansion Relay

Several expansion relays can be connected to a single Pluto safety output while retaining the safety level.

Why should I use the Pluto Safety PLC?

...for simplifying the design!



Pluto is a new "All-Supervisor" Safety PLC concept that simplifies the design of safety systems and achieves the highest safety (category 4) according to EN 954-1/EN ISO 13849-1 and SIL 3 according to IEC/EN 61508. The key difference between Pluto and conventional safety PLCs is that there is no "supervisor-subordinate" relationship between the control units connected to the safe bus. All Plutos are "master" units and can see each others' inputs and outputs. Using this concept, each Pluto can make decisions about its own immediate safety environment.

This concept enables simple communication and easy alterations of the safety system. With the use of a "gateway" device, information from a Pluto network can be transferred to other bus systems thereby creating even larger systems. Gateway units are readily available for a number of different bus-systems — i.e. Profibus, CanOpen, DeviceNet, Ethernet.

Pluto offers an economic solution for both single machine and for large integrated machine systems. Of Pluto's 20 I/O, 8 can be configured as both inputs and outputs (sometimes even as inputs and outputs at the same time), 4 are failsafe outputs independent of each other. 32 Plutos can be connected to a twisted pair safe bus system. This enables the amount of physical I/O connections to be expanded from 20 to 640.

...to supervise safety devices!

Most safety devices on the market can be connected directly to the Pluto unit. Only half the number of I/O are required when using dynamic sensors from Jokab Safety. These sensors enable category 4 in a dynamic pulse system. Up to 10 sensors can be connected in series to one input. For example, Eden non-contact sensors, SPOT light beams and Tina adapters (interfacing to emergency stop push buttons, safety switches, etc.) can be connected in series to one input on the Pluto. Even mechanical switches can be connected to the "dynamic safety circuit using Jokab Safety's Tina adapters. Up to 150 safety devices can be connected to one Pluto and maintain category 4 per EN 954-1.

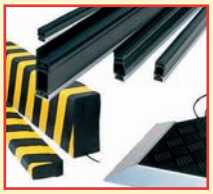

Light Beams


Light Curtains and Grids


3-Position Devices


Gate Switches and Sensors


Two-Hand Controls


Strips, Mats and Bumpers

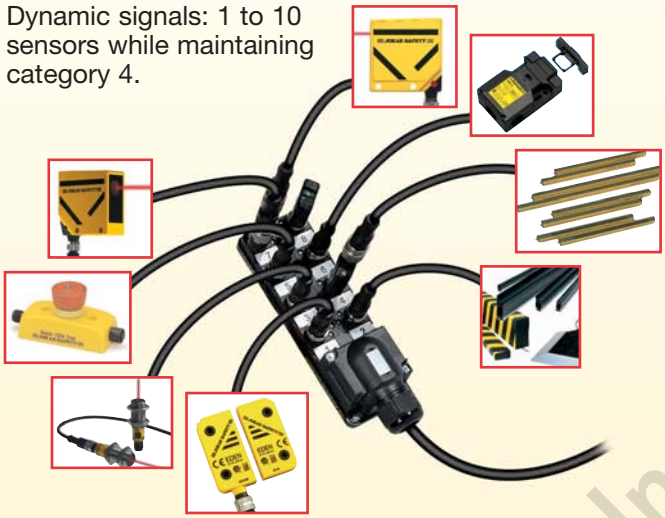

Emergency Stop Buttons

...to save on inputs!

Pluto has inputs for static and dynamic sensors. Several sensors can be connected to one dynamic input in accordance with category 4.

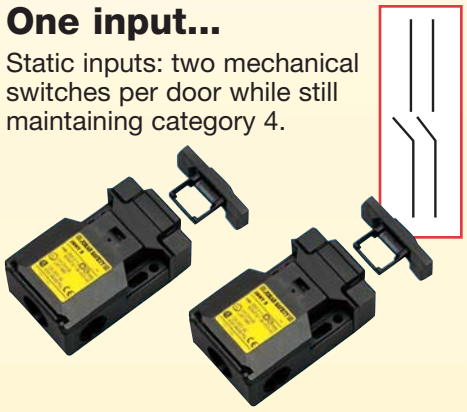
One input...

Dynamic signals: 1 to 10 sensors while maintaining category 4.



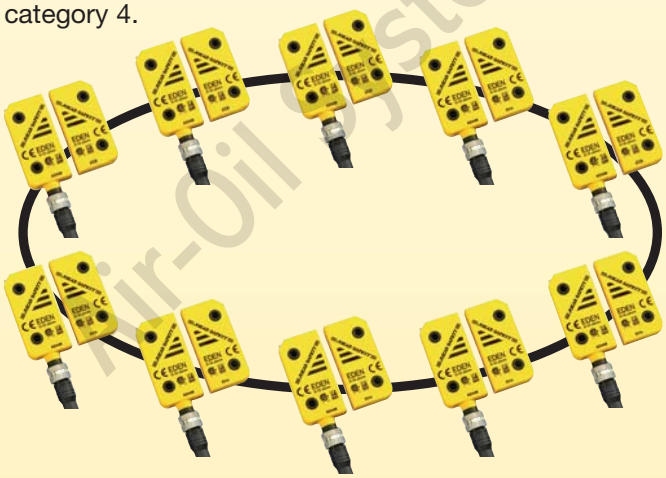
One input...

Static inputs: two mechanical switches per door while still maintaining category 4.



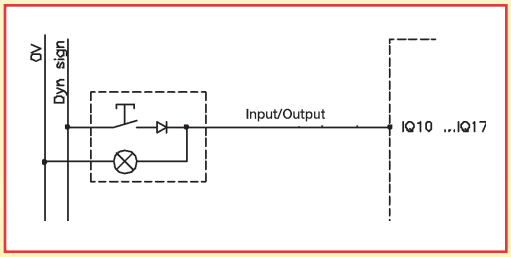
One input...

Dynamic signals: 1 to 10 doors with one Eden per door while maintaining category 4.



One input...

I/O connections: can be used in three ways — inputs, outputs or both input and output at the same time (e.g. for a reset button with lamp indication).



Pluto Safety PLC: The New Concept that simplifies the Design of Safety Systems

Pluto is a programmable safety system intended for safety applications where it is not accepted that faults in the control system lead to loss of a safety function. To achieve this requirement the system is designed with integral redundancy and monitoring. Unlike ordinary PLC systems, Pluto utilizes two micro-processors, which both control and monitor each safety function for correct operation. Each input to the system is separately connected to each processor, each having their own memory and executing their own program. The processors continuously compare the results with each other to ensure integrity of data.

Every safety output is connected to both processors and cannot be set without the two processors both checking that the logic conditions in the application program are fulfilled. Most Pluto units have connections for CANbus and can be interconnected with other Pluto units via Category 4 Safety Bus. The degree of safety is the same over the bus as it is within each unit.

Pluto is designed to fulfill the demands of numerous standards regarding the safety of control systems, including the EU Machinery Directive 98/37/EG, ANSI B11, CSA, RIA 15.06, ANSI/PMMI 155.1, and Category 4 according to the harmonized standard EN 954-1/EN ISO 13849-1 and SIL 3 according to IEC/EN 61508. The system can be used in other applications — e.g. processing industry, furnaces, etc. — which have similar requirements.

Enclosure

Pluto is constructed in a 45mm wide box for snap mounting on a DIN-rail in control cabinets or other suitable enclosures.

External wiring is connected via screw terminals. To make it easy and to avoid incorrect connection when a unit is exchanged, the connector blocks are detachable so that individual wires do not have to be disconnected.

Applications

- Emergency Stops
- 3-Position Devices
- Interlocked Gates/Hatches
- Safety Mats
- Light Curtains
- Light Beams
- Two-Hand Devices
- Contact Strips
- Foot-Operated Switches
- Timing Functions
- Logic Functions
- Muting (bypassing)

Regulations and Standards

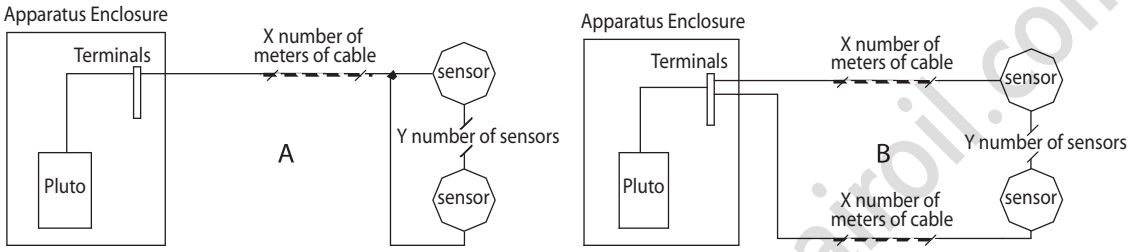
The Pluto PLC is designed and approved in accordance with appropriate directives and standards. Examples of such are: EN 954-1/EN ISO 13849-1 Category 4, EN 61496-1 Type 4, EN 61508 SIL 3

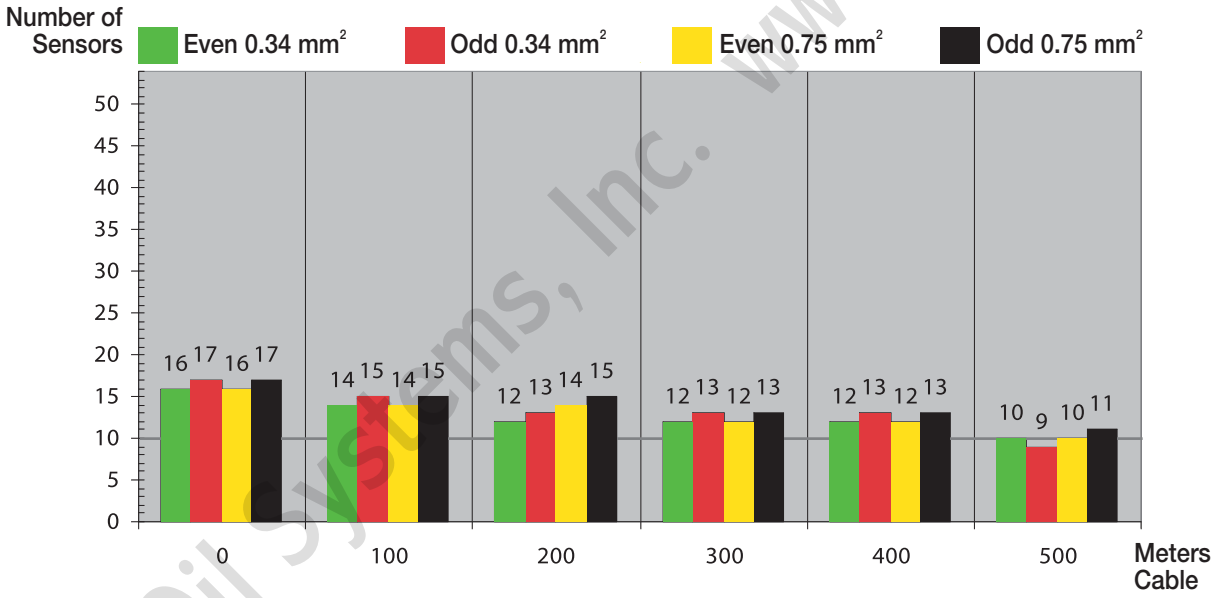
Approvals

Number of Edens that can be used with Pluto

The table below shows the number of Edens that can be connected to Pluto with the maximum voltage variation. The values have been established in a laboratory environment. The actual possible number of connected Edens may therefore differ from those given in the table. The values should be regarded as guidelines;

Jokab Safety recommends a maximum of 30 Edens per Vital. the table was prepared according to measurements with connection example A. If connection example B and 0.34 mm² cable is used (with feed voltage from two directions), the values for 0.75 mm² in the tables are used.

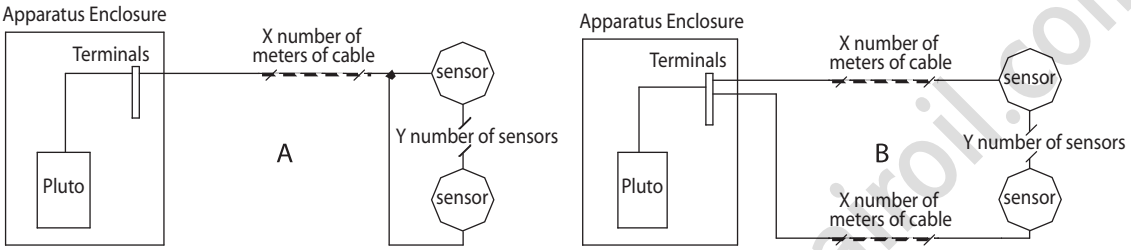


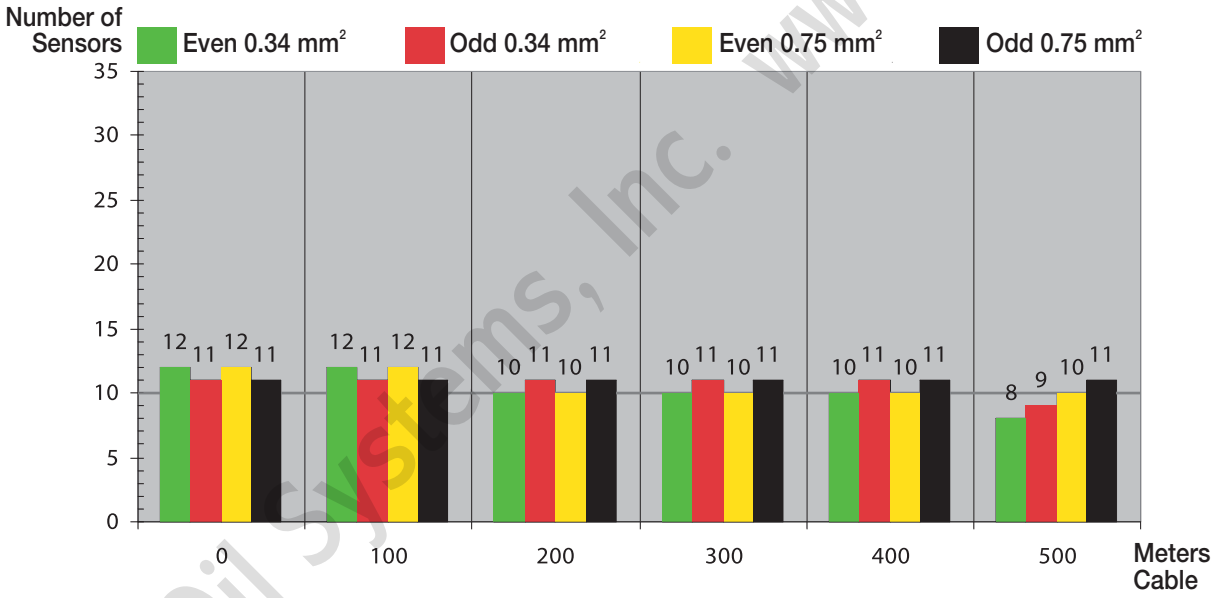


Number of Tinas that can be used with Pluto

The following table shows the numbers of Tina-3A, Tina-6A, Tina-7A and SmileTina that can be connected to Pluto with the maximum voltage variation. The values have been established in a laboratory environment. The actual possible number of connected Tinas may therefore differ from those given in the table.

The values should be regarded as guidelines; Jokab Safety recommends a maximum of 30 Tinas per Pluto. The table was prepared according to measurements with connection example A. If connection example B and 0.34 mm² is used, the values for 0.75 mm² in the tables are used.





Pluto Connection of Input Devices

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

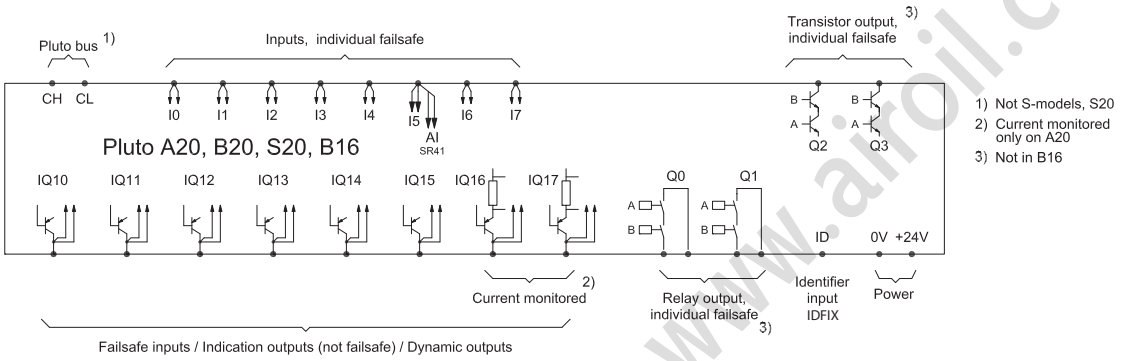
I..: Safety inputs (24VDC) that are individually secure. This means that complete safety can be achieved with only one input if Jokab Safety dynamic safety components are used.

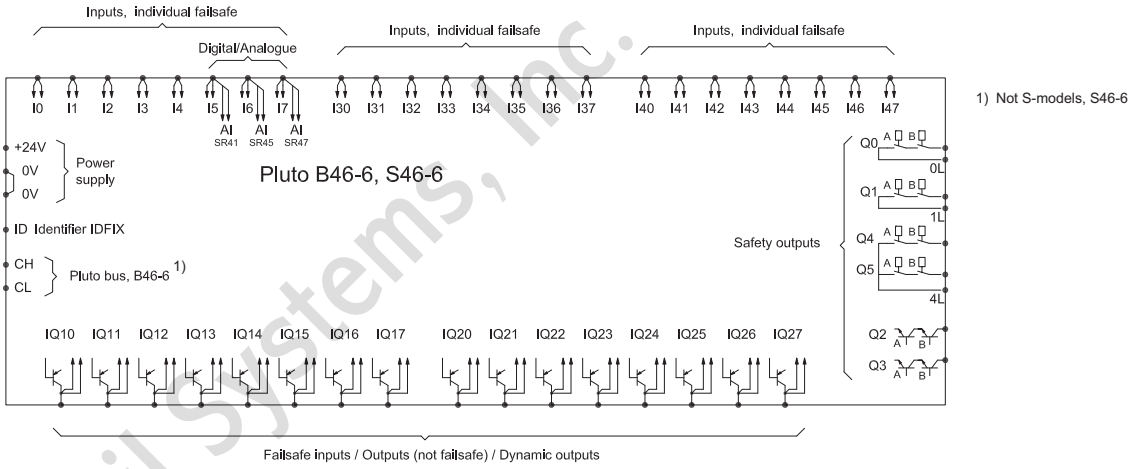
IQ..: I/O that can be used for safety inputs or signal outputs, e.g. to indicate or control functions that are not safety-related. For IQ.. as safety inputs, refer to I..

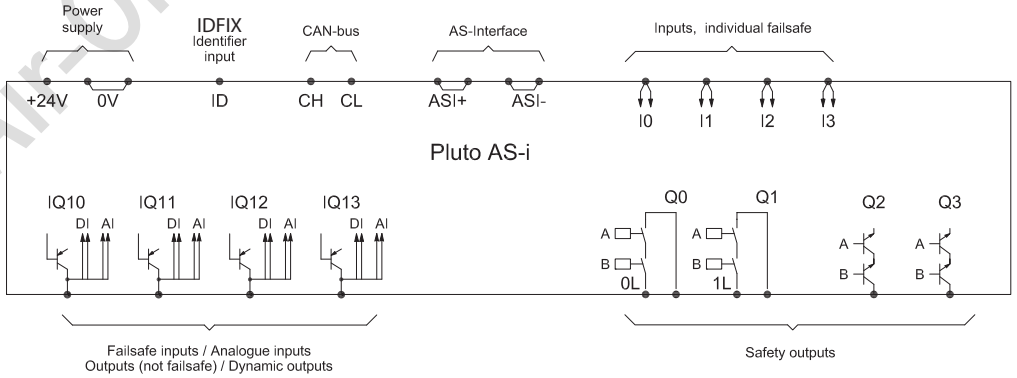
Q0, Q1: Failsafe relay outputs that are individually failsafe and individually programmable.

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

Q4, Q5: Failsafe relay outputs that are individually failsafe and individually programmable.







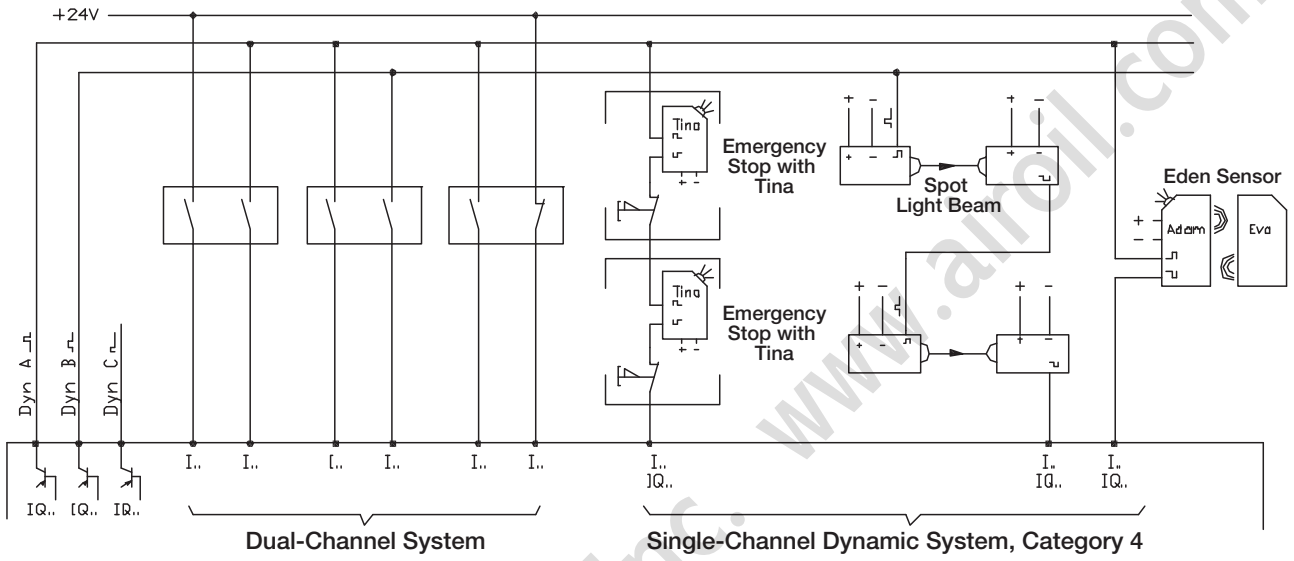
SEE DISCLAIMER ON PAGE 42

Input Connection

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

In a dual channel system, both channels will be measured using two different signals. The system will therefore 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. Category 4 can thus be achieved by using only one channel and one input.

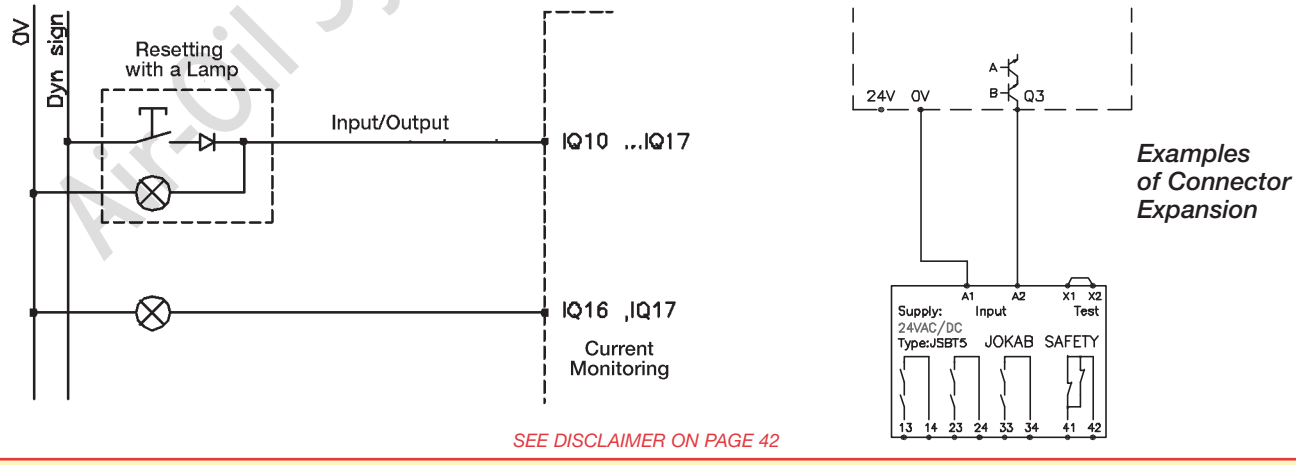


Input connection alternative in accordance with category 4 EN 954-1/EN ISO 13849-1.

Reset Button that uses the combined Input and Output Facility

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

The Pluto A20 has a current monitoring function. IQ16 and 17 can monitor that a lamp is intact. The lamp is only considered to be intact if sufficient current is being drawn from the output. One application is muting lamps (safety device bypass). However, according to EN 61496-1:2004, there is no longer a requirement to monitor muting lamps.



SEE DISCLAIMER ON PAGE 42

Pluto General Technical Data

Manufacturer.....JOKAB SAFETY

Ordering Data/Article Numbers..... see page 40

Safety Category
(according to EN 954-1/EN ISO 13849-1 and
SIL 3 in accordance with EN 61508/EN 62061)..... 4

Color..... black and beige

Operating Voltage..... 24 VDC +/-15%

Installation..... 35mm DIN rail

Electrical Insulation
(according to IEC 61010-1.....category II

Failsafe Inputs I and IQ
Type..... +24V (for PNP sensors)
(IQ also configurable as non-failsafe outputs)
Current at 24V.....5.1 mA
Max. overvoltage.....27V continuous

Failsafe Transistor Outputs Q
Output voltage.....-24 VDC
Output voltage tolerance.....supply voltage 1.5V at 800 mA
Max. current.....800 mA

Failsafe Relay Outputs Q
Max. voltage.....250 VAC
Max. current.....1.5 A

Non-Failsafe Outputs Q
Type.....transistor +24V
(PNP "open collector" also configurable as failsafe outputs)
Max. current/output..... 800 mA

Indication
Input/output LED display.....1 per I/O (green)
(7-segments, 2 characters)

Temperature
Ambient temperature..... -10° C to + 50° C
Storage and transport..... -25° C to + 55° C

Pluto Databus
Maximum number of Pluto units on databus.....32 CAN
Databus speeds.....100, 125, 200, 250, 400, 500, 800, 1000 kb/s
Databus cable length..... up to 600 m
(150 m at 400 kb/s)

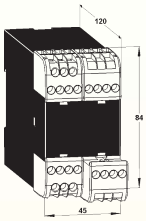
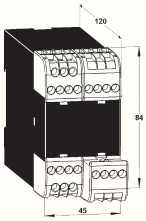
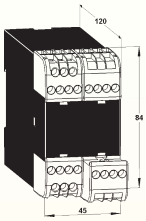
AS-i Databus
Master profile..... M2
Number of subordinate units.....31/62
Databus operation.....master, safety monitor, safety monitor and slave

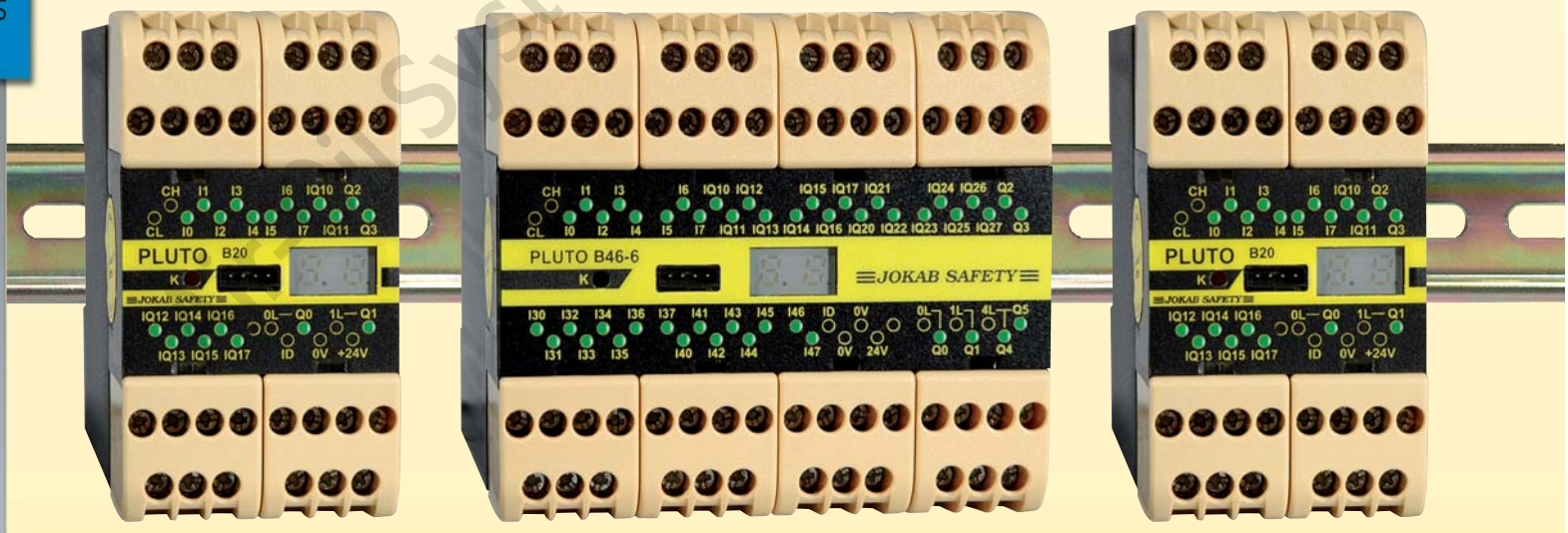
Response Times
Dyn. A or static input to relay output.....< 20.5 ms + program exec. time
Dyn. A or static input to transistor output.....< 16.5 ms + program exec. time
Dyn. B or Dyn C input to relay output.....< 23 ms + program exec. time
Dyn. B or Dyn C input to transistor output.....< 19 ms + program exec. time
Software setting "NoFilt".....5 ms shorter response time on I and IQ inputs
AS-i databus to relay output..... < 33 ms + program exec. time
AS-i databus to transistor output.....< 29 ms + program exec. time

Additional Response Times
Databus between Pluto units.....10 ms
Databus between Pluto units on error.....10-40 ms

Protection Class
Enclosure..... IP 40 IEC 60529
Connection terminals.....IP 20 IEC 60529

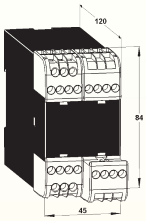
Pluto Type-Specific Technical Data

			
Ordering Data/Article Numbers ..... see page 40	**Pluto A20** *20 I/O* *Current Monitoring*	**Pluto B16** *16 I/O* *Non-Failsafe Outputs*	**Pluto B20** *20 I/O*
Failsafe Inputs	8 (I0..I7)	8 (I0..I7)	8 (I0..I7)
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
Analog Inputs	1 (I5) 0..27V	1 (I5) 0..27V	1 (I5) 0..27V
Failsafe Relay Outputs	2 (Q0..Q1)	no	2 (Q0..Q1)
Failsafe Transistor Output ...	2 (Q2..Q3)	no	2 (Q2..Q3)
Current Monitoring	..2 (IQ16, IQ17) 0-1.0A ±10%	no	no
Pluto Databus	yes	yes	yes
AS-i Databus	no	no	no
Own Current Consumption	100 mA	100 mA	100 mA
Recommended External Fuse	6 A	6 A	6 A
Dimensions (w x h x d)	45 x 84 x 118 mm	45 x 84 x 118 mm	45 x 84 x 118 mm



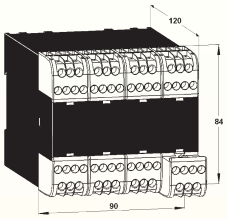
Note: Units should be installed with a minimum spacing of 5mm.

Pluto Type-Specific Technical Data



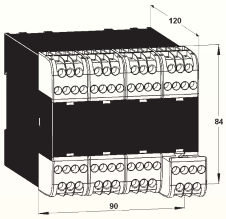
Pluto S20
20 I/O
Non-Pluto Databus

	8 (I0..I7)
	8 (IQ10..IQ17) max. total load 2.5 A
	1 (I5) 0..27V
	2 (Q0..Q1)
	2 (Q2..Q3)
	no
	no
	no
	100 mA
	6 A
	45 x 84 x 118 mm



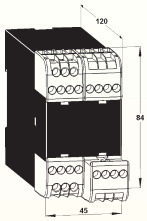
Pluto B46-6
46 I/O

	24 (I0..I7, I30..I37, I40..I47)
	8 (IQ10..IQ17) max. total load 2 A 8 (IQ20..IQ27) max. total load 2 A
	3 (I5) 0..27V
	4 (Q0..Q1 and Q4..Q5)
	2 (Q2..Q3)
	no
	yes
	no
	150 mA
	10 A
	90 x 84 x 118 mm



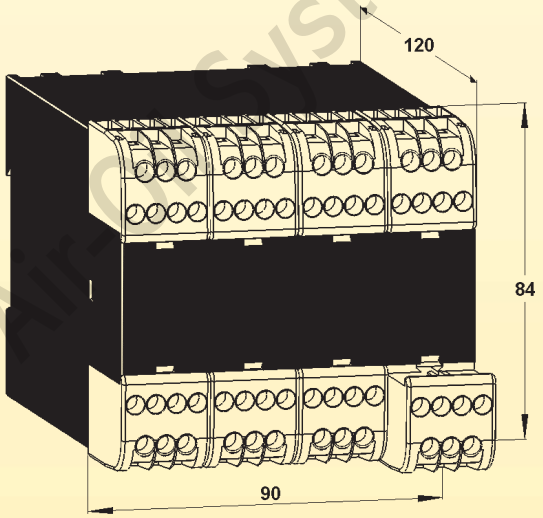
Pluto S46-6
46 I/O
Non-Pluto Databus

	24 (I0..I7, I30..I37, I40..I47)
	8 (IQ10..IQ17) max. total load 2 A 8 (IQ20..IQ27) max. total load 2 A
	3 (I5) 0..27V
	4 (Q0..Q1 and Q4..Q5)
	2 (Q2..Q3)
	no
	no
	no
	150 mA
	10 A
	90 x 84 x 118 mm

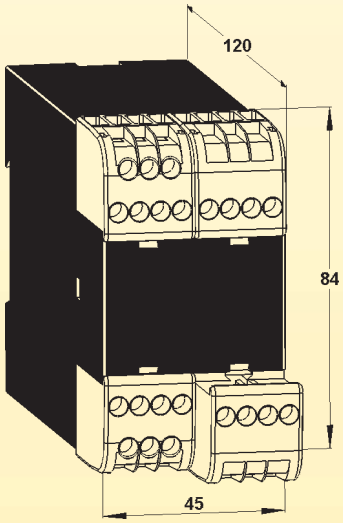


Pluto AS-i
AS-i Databus

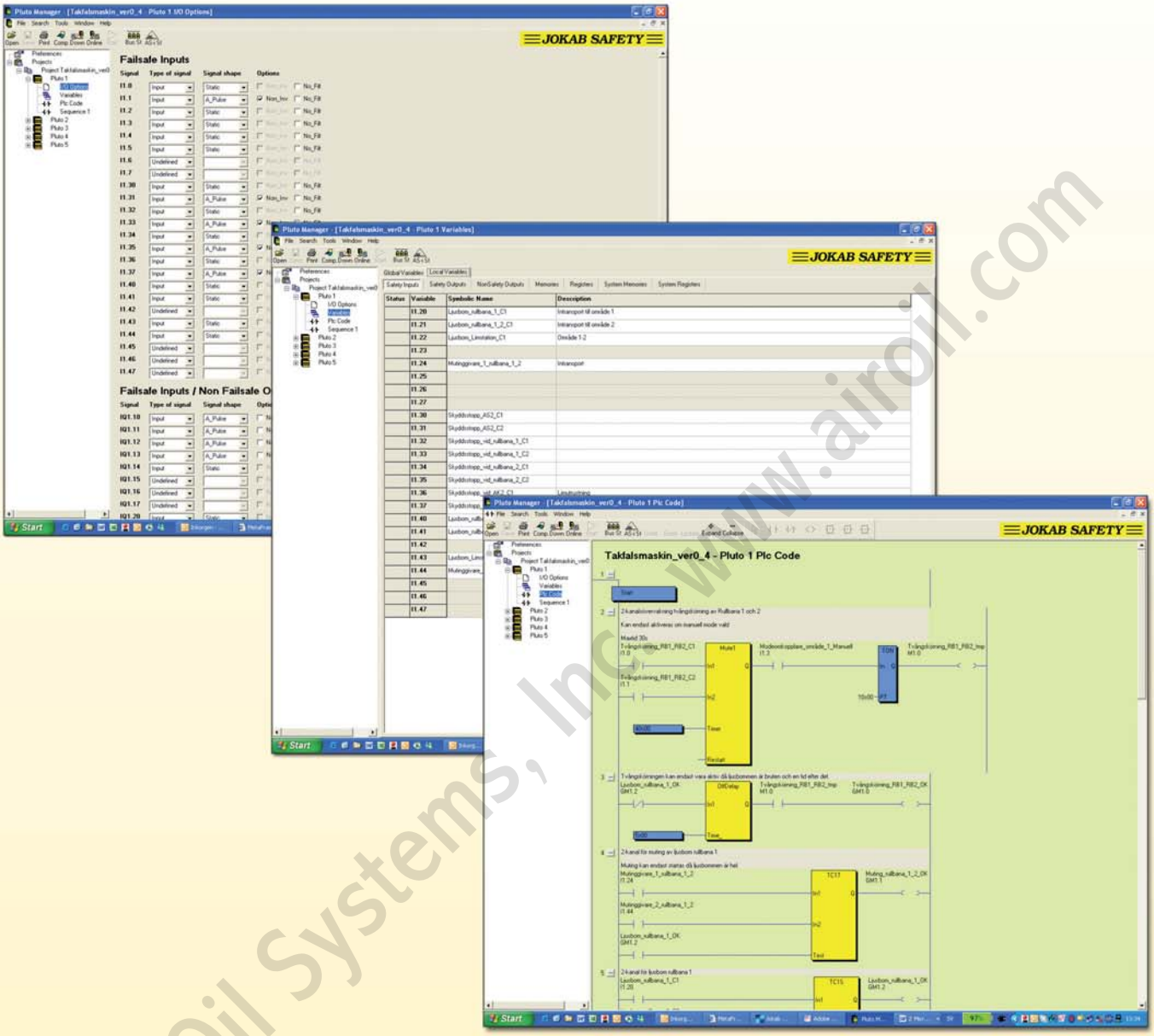
	4 (I0..I3)
	4 (IQ10..IQ13) max. total load 2 A
	4 (IQ10..IQ13) 0..27V
	2 (Q0..Q1)
	2 (Q2..Q3)
	no
	yes
	yes
	100 mA
	6 A
	45 x 84 x 118 mm



Note:
Connector blocks are detachable without cables having to be disconnected.



Pluto Manager



Step 1: I/O Configuration

The inputs and outputs are configured depending on what they are connected to: static or dynamic signals, inputs and/or outputs, etc.

Step 2: Defining Variables

The variables in the system are: inputs (I), outputs (Q), auxiliary memories (M), global auxiliary memories for databus communication (GM) and registers (R).

The names of the variables can be changed as required instead of the default variable names used in the PLC program.

Step 3: Ladder Programming

The programming language used in Pluto contains function blocks, certified by TÜV Rheinland, with solutions for the most common safety functions.

The function blocks can be used in conjunction with standard ladder instructions. The programming language has a full instruction repertoire, similar to standard PLCs on the market, including timers, arithmetic functions, sequential programming set, etc.

Standards and Special Function Blocks for Pluto Manager

Blocks in the Standard Library (func05)

1. Dual channel function with input for start.
2. Dual channel function with test input.
3. Dual channel function with test and reset inputs, as well as reset indication.
4. Dual channel function with simultaneous requirement.
5. Single channel function with input for start.
6. Single channel function with start and test inputs.
7. Single channel function with reset and test inputs
8. Dual channel function with maximum time limitation (equivalent to JSHT2). Time begins to count down when both inputs are activated.
9. Dual channel function with maximum time limitation (equivalent to JSHT2). Time begins to count down when one of the inputs is activated.
10. Single channel pulse function, e.g. for timed reset.
11. Dual channel pulse function, e.g. for timed reset.
12. Two single channel bypass connection functions with maximum time limiting.
13. Single channel bypass connection function with maximum time limiting.
14. Dual channel bypass connection function with maximum time limiting and simultaneous requirement.
15. Dual channel safety function with maximum time limited bypass connection.
16. Two-hand control.
17. Counter which counts up to preset value.
18. Counter which counts down from preset value to 0.
19. Off delay.
20. Muting lamp_Q16.
21. Muting lamp_Q17.
22. Muting lamp W_Q16 with possibility to set the power level in watts.
23. Muting lamp W_Q17 with possibility to set the power level in watts.
24. Light curtain with single cycle operation.
25. Light curtain with single cycle operation and reset selection.
26. Multiplication.
27. Division.

Other Function Blocks

1. Safety absolute encoder.
2. Electronic cam.
3. External communication.

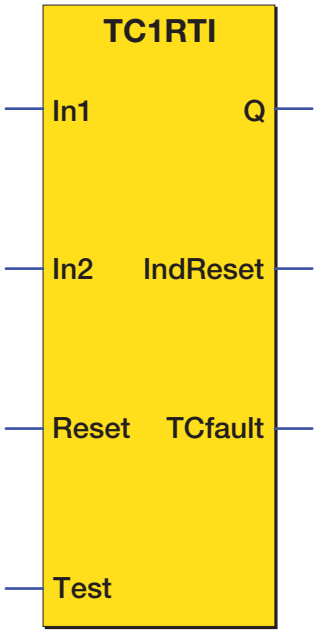
Special Function Blocks

1. Program library with program block for eccentric shaft presses.
2. Custom special blocks can be made available.

TC1RTI Function Block Example

Dual channel function with test and reset inputs, as well as reset indication: The function block acts as a conventional dual channel safety relay with dual and supervised inputs (In1, In2).

- In1 and In2 are safety inputs to which the safety device outputs are connected.
- Test is a condition that must be true at the moment of switching on and can be used for monitoring external components. Test must be true before the Reset input closes—i.e. the function block cannot be initiated by Test.
- Reset is a supervised reset input and must be activated (positive flank) after the other inputs have activated for the function output to be activated.



- The IndReset output is activated when the function block is 0 and flashes when the function block is ready for resetting.
- The TCfault output is activated in the case of a dual channel fault—i.e. if the function block is activated and only one of In1 and In2 opens and closes.

Pluto Gateway

Pluto Gateway is a unit providing two-way communication between a Pluto Safety PLC and other field buses. There are four different types available:

- GATE-P1 - Profibus DP
- GATE-D1 - DeviceNet
- GATE-C1 - CANopen
- GATE-E1 - EtherNet/IP, PROFINET and Modbus TCP

The Pluto Gateway is a compact unit, mounted on a DIN rail, and can be connected anywhere in a Pluto databus. 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 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.

The GATE-D1 and GATE-C1 types, which use a CAN databus on both sides, can also be used as CAN bridges where it is required to split a Pluto databus 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 data that is not required for use on the other side of the bridge. This reduces the databus loading in the other sections and thereby permits longer databus cables.

Profibus DP

DeviceNet

CANopen

Ethernet

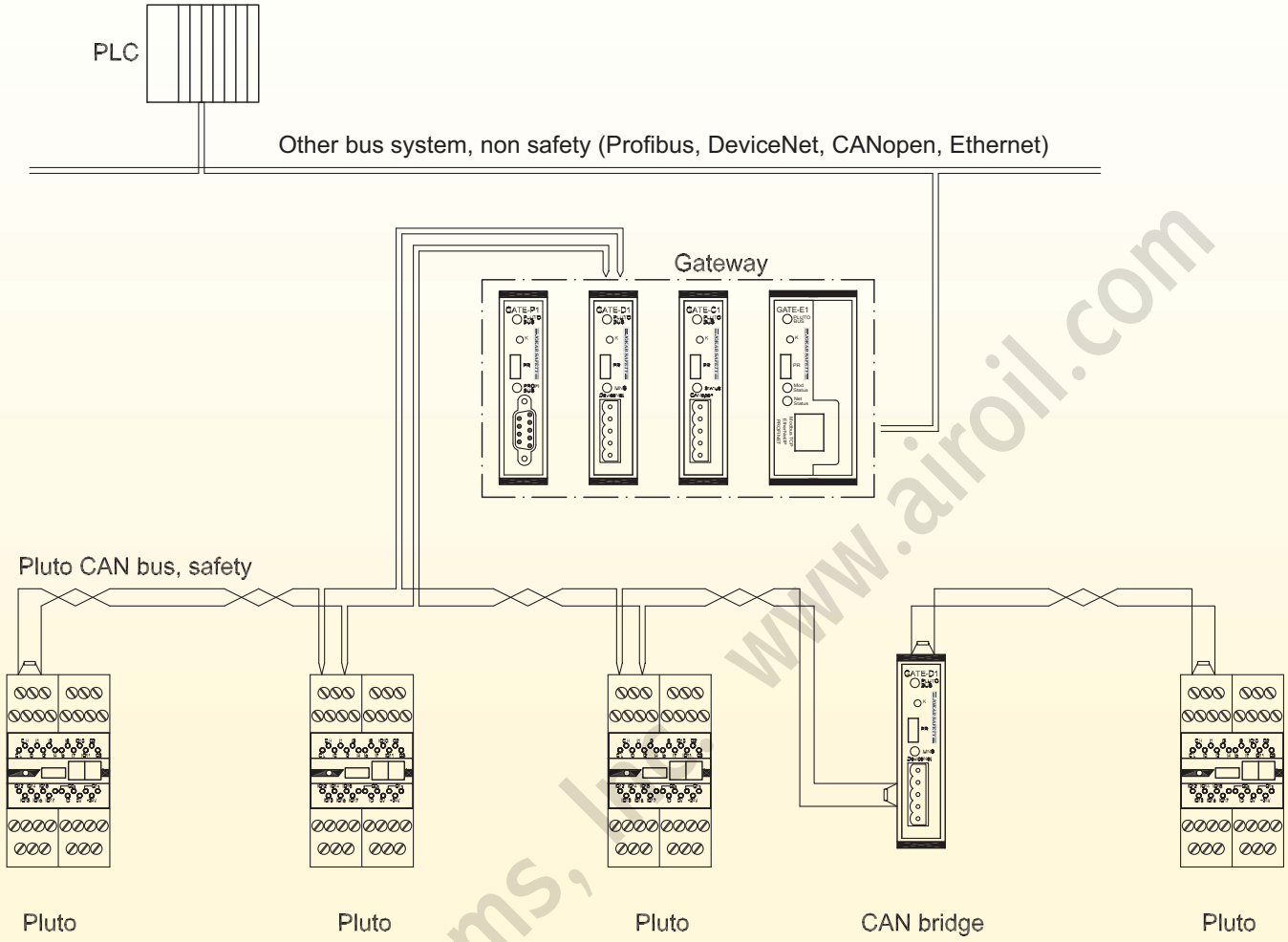
Applications

- Bi-directional status information from the Pluto Safety PLC

Features

- Two-way communication
- Build-in filter function, shared network
- Profibus DP, DeviceNet and CANopen 22.5mm wide/Ethernet 35mm wide
- Can be located anywhere in the databus
- Common interface with Pluto
- Ready-made function blocks

Pluto Gateway Block Schematic Diagram



Pluto Gateway Profibus DP

Pluto Gateway Profibus is a unit providing two-way communication with a Pluto Safety PLC.

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/Os 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, 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.

Gateway Profibus Technical Data

Manufacturer.....JOKAB SAFETY

Ordering Data/Article Numbers.....see page 40

Databuses.....Pluto databus CAN
Profibus RS485
(both isolated)

Pluto Databus Speeds.....100, 200, 250, 400, 500, 800 and 1000 kbit/s
(automatic speed detection)

Profibus Speed..... up to 12 Mbit/s
(automatic speed detection)

Profibus Address..... setting via DIP switches
(0-99)

Profibus Version.....DP subordinate, DP-V0

Connections

Top *(included)*.....3-pole terminal for Pluto databus
Front.....standard 9-pole Profibus connection
Bottom *(included)*.....2-pole terminal for 24VDC

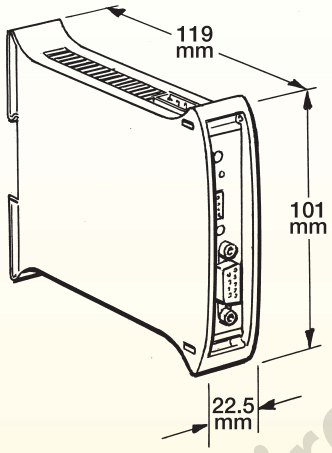
Status Indication

Pluto databus.....via LED
Profibus.....via LED

Operating Voltage..... 24VDC -15% till +20%

Current at 24V.....<100mA
(recommended fuse ≤ 6A)

Installation..... 35mm DIN rail



Temperature Range

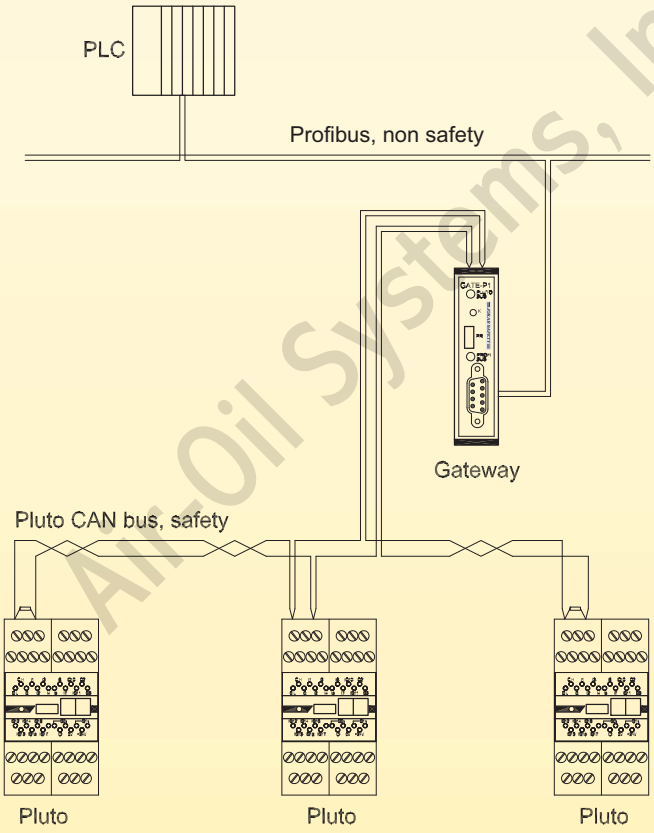
Operating (ambient)..... -10°C to +55°C
Transport and storage..... -25°C to +55°C

Humidity.....EN 60 204-1 50% at 40°C
(ambient 90% at 20°C)

Protection Class

Enclosure.....IP 20 IEC 60529
Terminals.....IP 20 IEC 60529

Pluto Gateway Profibus Block Schematic Diagram



Pluto Gateway DeviceNet

Pluto Gateway DeviceNet is a unit providing two-way communication with a Pluto Safety PLC.

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.

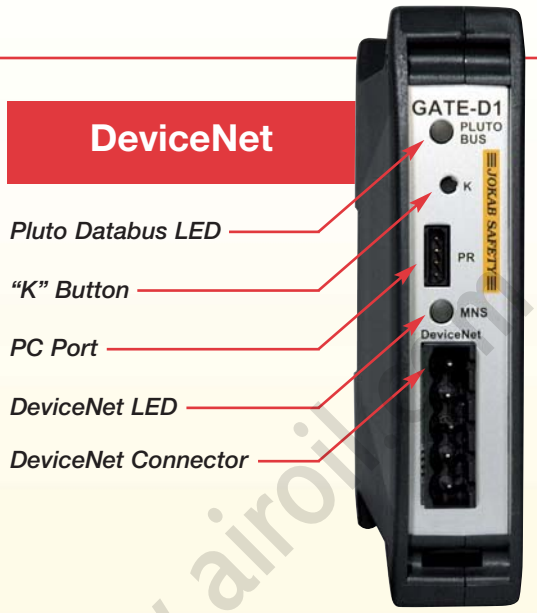
Pluto Bridge

A GATE-D1 can also be used to advantage as a CAN bridge when it is required to divide a Pluto databus 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 data that is not required for use on the other side of the bridge. This reduces the databus loading in the other sections and thereby permits longer databus cables.

ABB Robotics IRC5

Pluto Gateway DeviceNet has support for integration into an ABB Robotics IRC5-system.



Gateway DeviceNet Technical Data

Manufacturer.....JOKAB SAFETY

Ordering Data/Article Numbers.....see page 40

Databuses.....Pluto databus CAN
DeviceNet CAN RS485
(both isolated)

Pluto Databus Speeds.....100, 200, 250, 400, 500, 800 and 1000 kbit/s
(automatic speed detection)

DeviceNet Speeds.....125, 250 and 500 Kbit/s
(set via DIP switch)

DeviceNet Address.....setting via DIP switches
(1-63)

DeviceNet Version..... ODVA version 2.0

Connections

Top *(included)*.....3-pole terminal for Pluto databus
Front *(included)*.....5-pole terminal for DeviceNet
Bottom *(included)*.....2-pole terminal for 24VDC

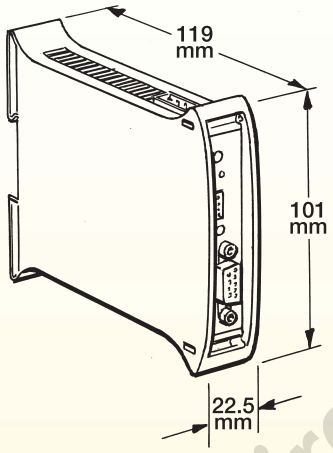
Status Indication

Pluto databus.....via LED
DeviceNet MNS..... via LED

Operating Voltage..... 24VDC -15% till +20%

Current at 24V.....<100mA
(recommended fuse ≤ 6A)

Installation..... 35mm DIN rail



Temperature Range

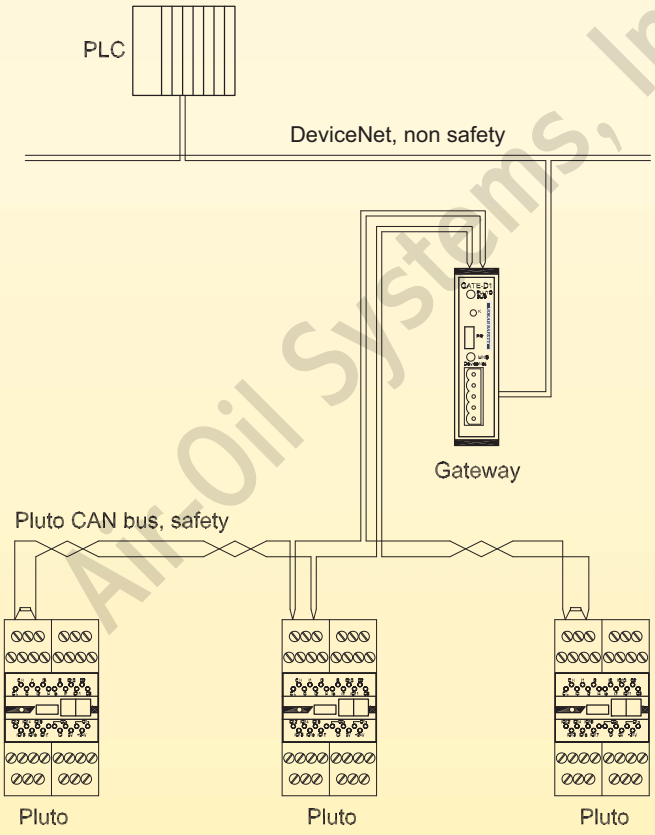
Operating (ambient)..... -10°C to +55°C
Transport and storage..... -25°C to +55°C

Humidity.....EN 60 204-1 50% at 40°C
(ambient 90% at 20°C)

Protection Class

Enclosure.....IP 20 IEC 60529
Terminals.....IP 20 IEC 60529

Pluto Gateway DeviceNet Block Schematic Diagram



Pluto Gateway CANopen

Pluto Gateway CANopen is a unit providing two-way communication with a Pluto Safety PLC.

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.

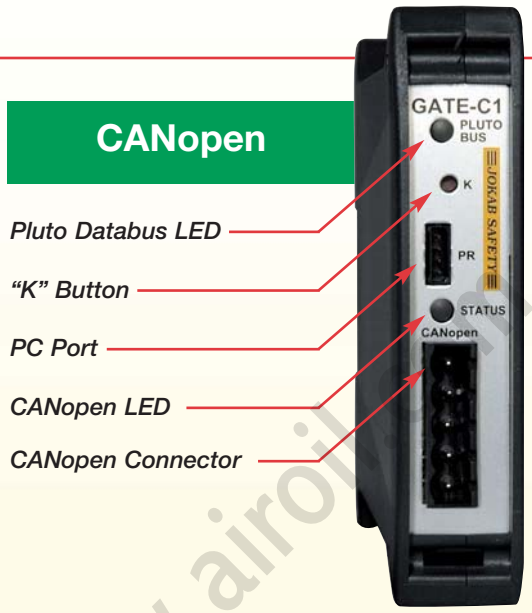
Data to Pluto

Via CANopen, a supervisory PLC system can 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 CANopen PDO or SDO messages). Function blocks for these commands are available in Pluto Manager.

Pluto Bridge

A GATE-C1 can also be used to advantage as a CAN bridge when it is required to divide a Pluto databus 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 data that is not required for use on the other side of the bridge. This reduces the databus loading in the other sections and thereby permits longer databus cables.



Gateway CANopen Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 40
Databuses.....Pluto databus CAN
CANopen CAN RS485
(both isolated)

Pluto Databus
Speeds.....100, 200, 250, 400, 500, 800 and 1000 kbit/s
(automatic speed detection)

CANopen Speeds..... 125, 250 and 500 Kbit/s
(set via DIP switch)
10, 20, 50, 100, 125, 250, 500, 800 and 1000 Kbit/s
(set via software)

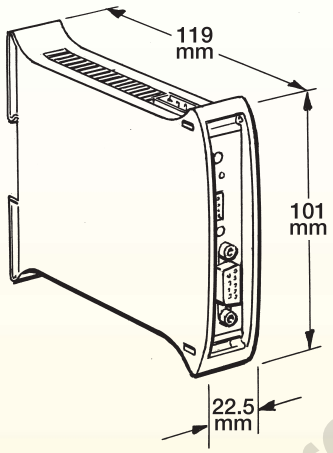
CANopen Address.....setting via DIP switches or software
(1-63)

CANopen Version.....Version 4.02 of the
CiA Draft Standard 301

Connections
Top *(included)*.....3-pole terminal for Pluto databus
Front *(included)*..... 5-pole terminal for CANopen
Bottom *(included)*.....2-pole terminal for 24VDC

Status Indication
Pluto databus.....via LED
CANopen MNS..... via LED

Operating Voltage..... 24VDC -15% till +20%
Current at 24V.....<100mA
(recommended fuse ≤ 6A)



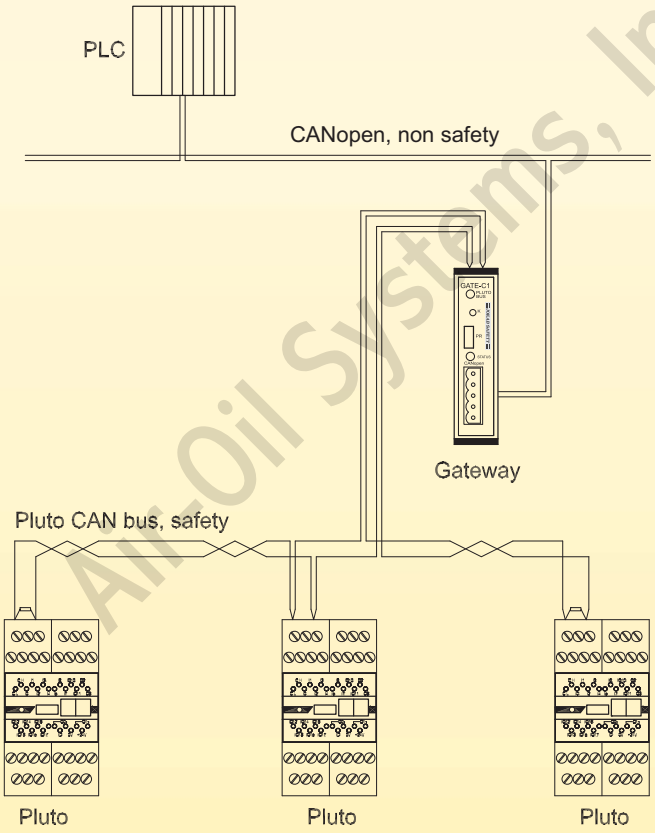
Installation..... 35mm DIN rail

Temperature Range
Operating (ambient)..... -10ºC to +55ºC
Transport and storage..... -25ºC to +55ºC

Humidity.....EN 60 204-1 50% at 40ºC
(ambient 90% at 20ºC)

Protection Class
Enclosure.....IP 20 IEC 60529
Terminals.....IP 20 IEC 60529

Pluto Gateway CANopen Block Schematic Diagram



Pluto Gateway Ethernet

Pluto Gateway Ethernet is a unit providing two-way communication with a Pluto Safety PLC.

Protocol

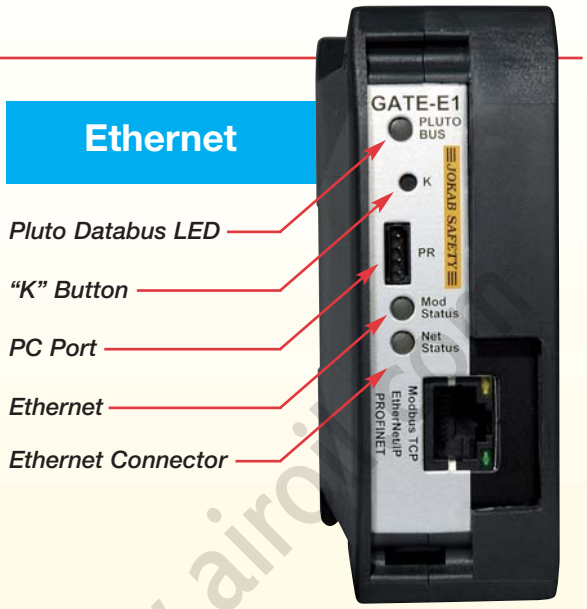
Pluto Gateway Ethernet GATE-E1 handles the status from and to Pluto Safety PLCs via Ethernet protocols — Ethernet/IP, PROFINET (in development), Modbus TCP and a simple binary protocol that uses TCP/IP. For IP-address configuration, etc. there is a simple web server and a terminal server.

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 commands are available in Pluto Manager.



Gateway Ethernet Technical Data

Manufacturer.....JOKAB SAFETY

Ordering Data/Article Numbers.....see page 40

Pluto Databus.....CAN *(isolated)*

Pluto Databus Speeds.....100, 200, 250, 400, 500, 800 and 1000 kbit/s *(automatic speed detection)*

Ethernet Speeds.....10 and 100 Mbit/s *(half and full duplex)*

Ethernet Protocol
Status from and to Pluto Safety PLC

Ethernet/IP.....according to ODVA "CIP Edition 3.2" and "Ethernet/IP Adaption of CIP Edition 1.2" *(minimum RPI of 50 ms)*

PROFINET..... *(in development)*

Modbus TCP.....according to the Modbus organization, version 1.0b *(approx 20 messages per second)*

Binary Server (TCP/IP).....simple TCP/IP protocol to send status to and from the Pluto Safety PLC

(note that certain combinations of server protocols cannot be used simultaneously)

Ethernet Protocol
Gateway status and IP address configuration

Web Server.....for simple sharing of IP addresses

Terminal Server (TCP/IP).....simple server with the same commands as via the serial programming port in the unit

IP Address..... static sharing via web server or via programming port

Gateway Configuration..... takes place via Ethernet/IP, PROFINET, Modbus TCP or via the binary TCP/IP server

Connections

Top *(included)*.....3-pole terminal for Pluto databus

Front *(screened cable cat. 5e FTP)*.....Ethernet connection via RJ-45

Bottom *(included)*.....2-pole terminal for 24VDC

Status Indication

Pluto databus.....via LED *(Pluto databus)*

Ethernet module.....via LED *(Mod status)*

Ethernet network.....via LED *(Net status)*

Operating Voltage..... 24VDC -15% till +20%

Current at 24V.....<150mA *(recommended fuse ≤ 6A)*

Installation..... 35mm DIN rail

Temperature Range

Operating (ambient)..... -10°C to +55°C

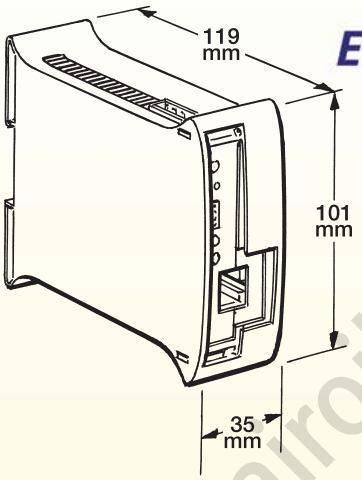
Transport and storage..... -25°C to +55°C

Humidity.....EN 60 204-1 50% at 40°C *(ambient 90% at 20°C)*

Protection Class

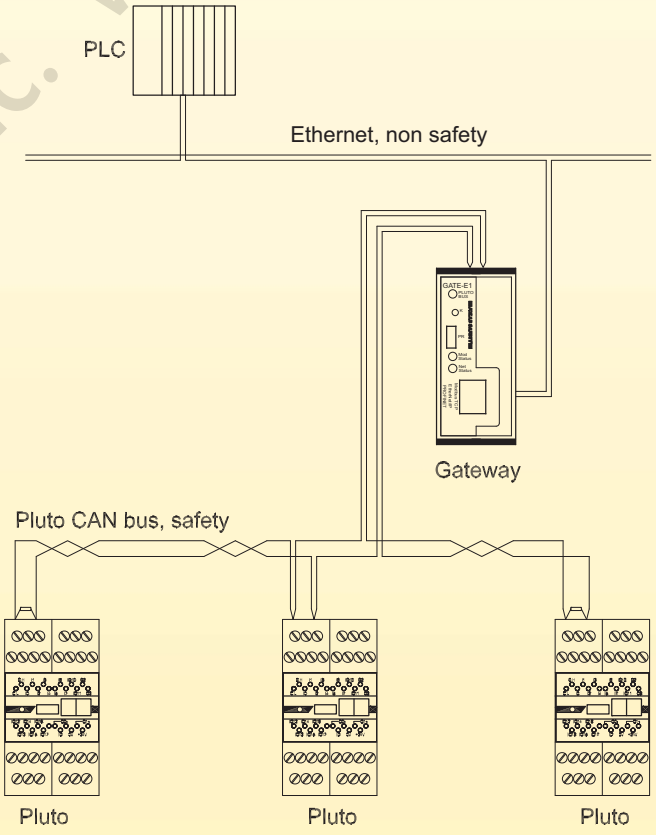
Enclosure.....IP 20 IEC 60529

Terminals.....IP 20 IEC 60529



EtherNet/IP™

Pluto Gateway Ethernet Block Schematic Diagram



Pluto Safety Encoders

Pluto Safety Encoders are units with rotational absolute value sensors. Together with a Pluto Safety PLC, they 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 safety 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 then evaluated. With a special function block in the PLC code, it is possible to design dual-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.

Applications

- Safe Position and Speed Determination of Machine Movements

Features

- High resolution
- Selectable resolution
- Connected directly to the Pluto databus
- Standard function blocks

Example of an application where two Pluto Safety Encoders provide safe position determination in a gantry robot.

Safety Encoder RSA 597 Technical Data

Manufacturer.....JOKAB SAFETY

Ordering Data/Article Numbers.....see page 42

Temperature Range

Operating (ambient)..... -40ºC to +70ºC

Transport and storage..... -30ºC to +70ºC

Protection Class

Ingress.....IP 67 IEC 60529

At shaft inlet.....IP 66 IEC 60529

Vibration (55 to 2000 Hz).....< 300 m/s² in accordance with IEC 60068-2-6

Shock (6ms).....< 2000 m/s in accordance with IEC 60068-2-27

Enclosure Material..... aluminum

Surface Treatment.....painted and chromed or anodized

Weight.....approx. 300 g

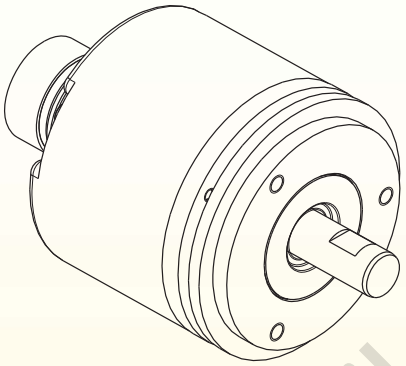
Resolution.....13 bits, 8192 positions per rotation

Accuracy.....+/- 1/2 LSB *(Least Significant Bit)*

Operating Voltage..... 9 - 36 VDC

Polarity protected.....Yes

Short-Circuit protected.....Yes



Databus Speed.....5 kbit/s - 1 mbit/s *(preset at 500 kbit/s)*

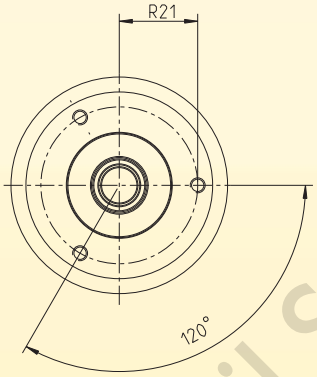
Address Input..... active low

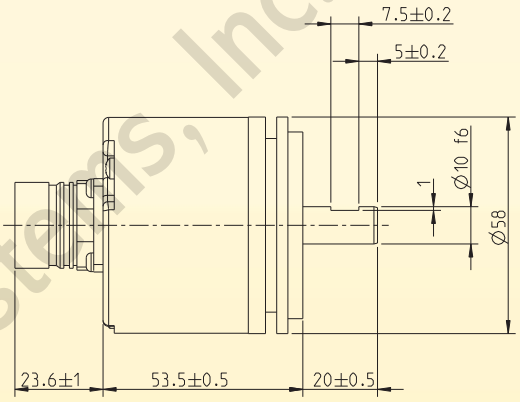
Code Type..... binary

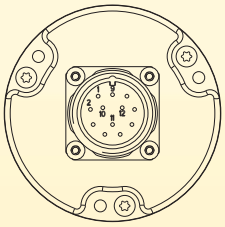
Programmable Functions..... resolution, 0 position direction, databus speed

Current Consumption.....50 mA at 24 VDC

Max Current Consumption..... 100 mA

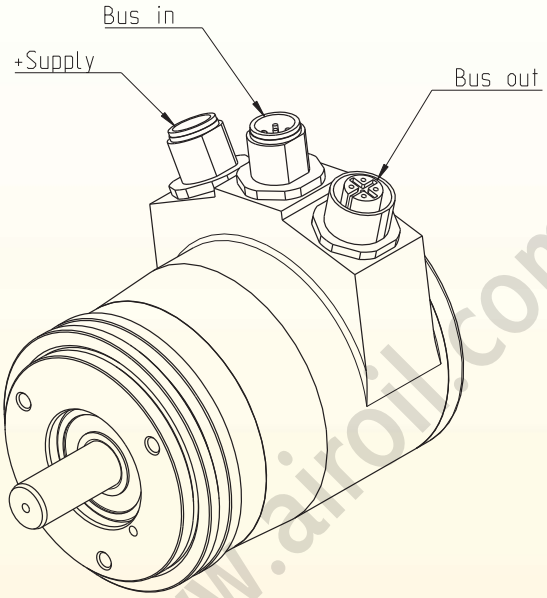




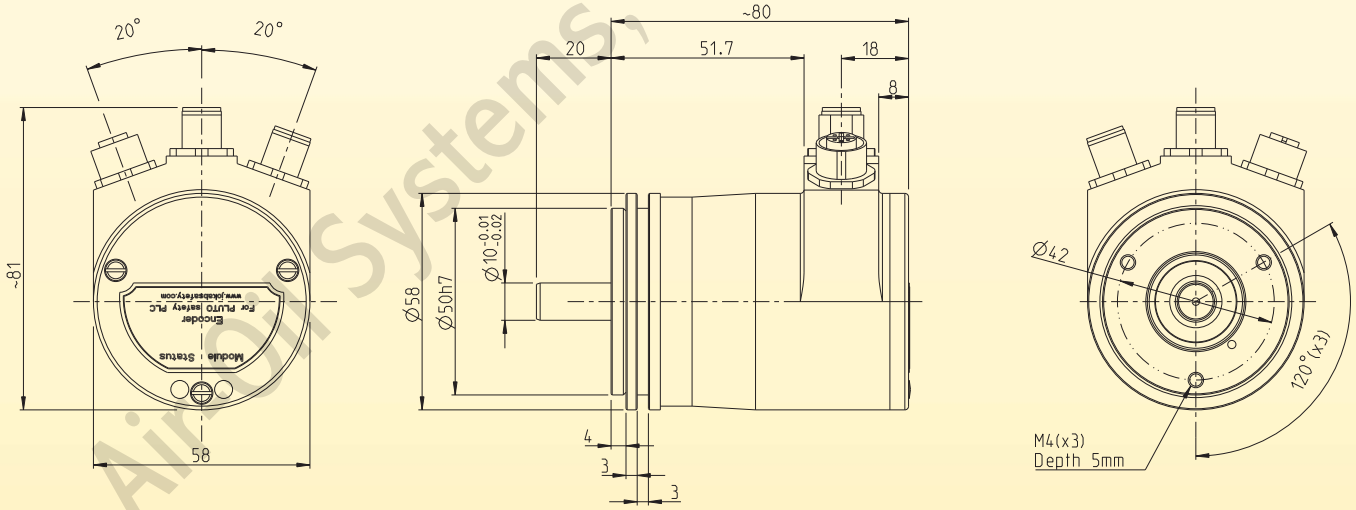


Safety Encoder RSA 698 Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 42
Temperature Range
Operating (ambient)..... -40ºC to +70ºC
Transport and storage..... -30ºC to +70ºC
Protection Class
Ingress.....IP 67 IEC 60529
At shaft inlet.....IP 66 IEC 60529
Vibration (55 to 2000 Hz).....< 100 m/s² in accordance with IEC 60068-2-6
Shock (6ms)..... < 2000 m/s om accordance with IEC 60068-2-27
Enclosure Material..... aluminum
Surface Treatment..... anodized
Weight.....approx. 400 g
Resolution
Total.....25 bits
8192 positions per rotation.....13 bits
4096 rotations.....12 bits
Accuracy..... +/- 1 LSB
(Least Significant Bit)
Operating Voltage..... 9 - 36 VDC
Polarity protected.....Yes
Short-Circuit protected.....Yes
Databus Speed..... 10 kbit/s - 1 mbit/s



Code Type..... binary
Programmable Functions..... resolution, 0 position
Current Consumption.....50 mA at 24 VDC
Max Current Consumption..... 100 mA



Safety Encoder Descriptions of Inputs and Outputs

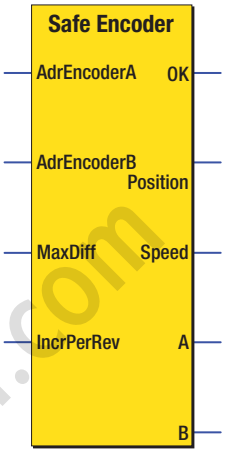
Safe Encoder (Single-turn)

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 encoder. 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.

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

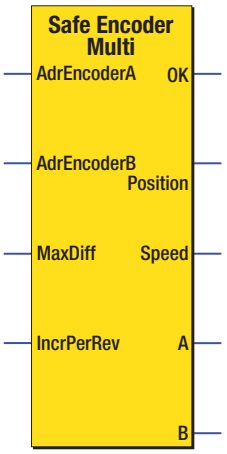
Safe Encoder (Multi-turn)

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.

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

Encoder Cam

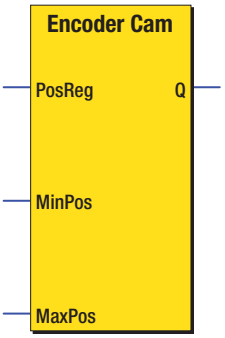
Function block for electronic cam gear.

Function

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

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

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.



Example of Robot Cell with Pluto

Description

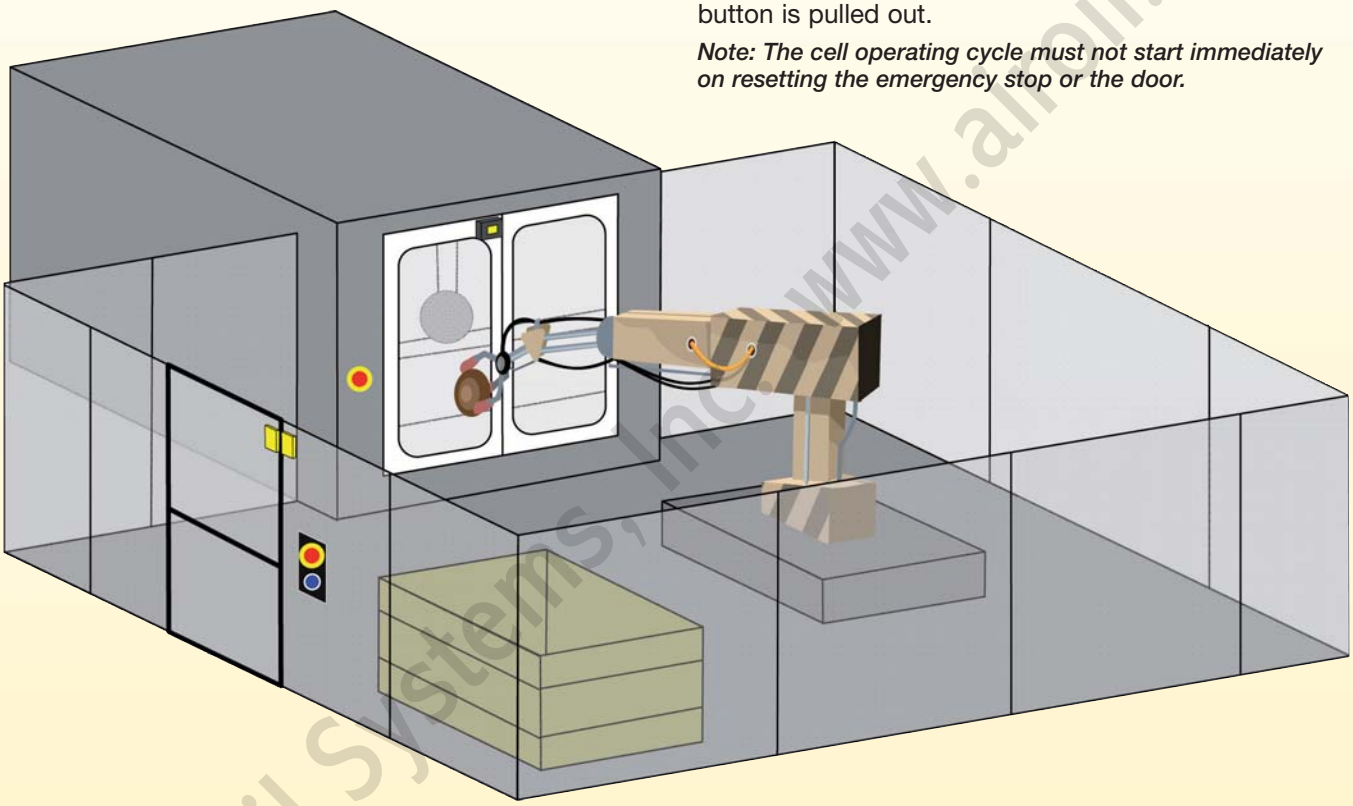
The example describes a processing machine served by a robot. The machine safety system consists of one Pluto to which all protection has been connected. The robot has been equipped with a Pluto to which the cell protection has been connected. The Pluto for the machine has been connected via a databus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

Function

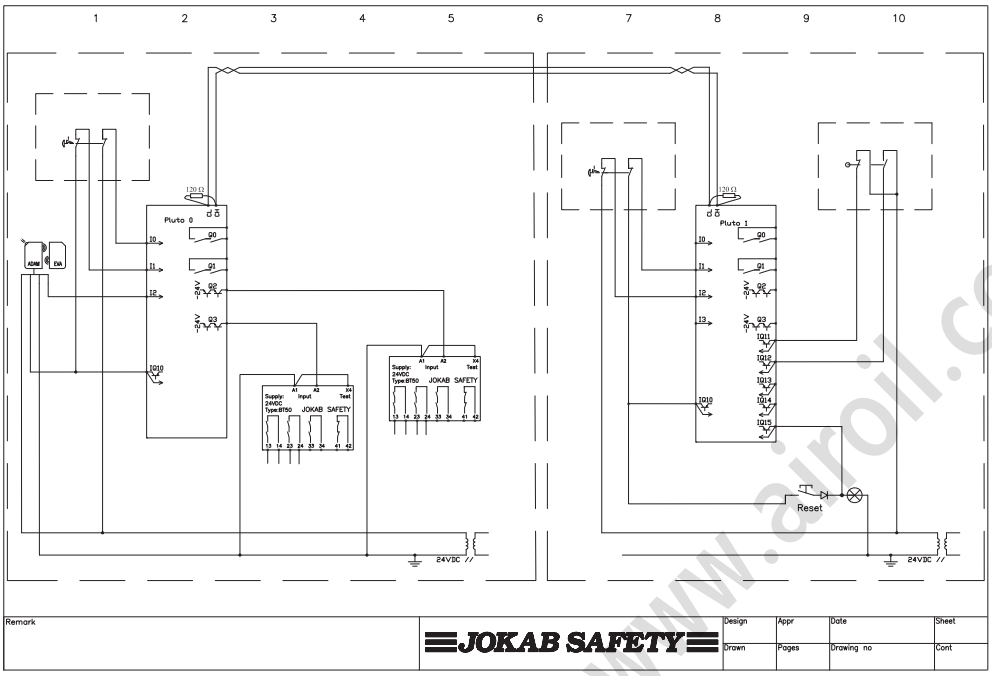
Emergency stop takes priority and will stop both the machine and the robot. The machine hatch acts as the zone divider. When the hatch is closed the machine forms one zone and the robot another zone. When the machine hatch is open, both the machine and the robot belong to the same zone. If the door is 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.

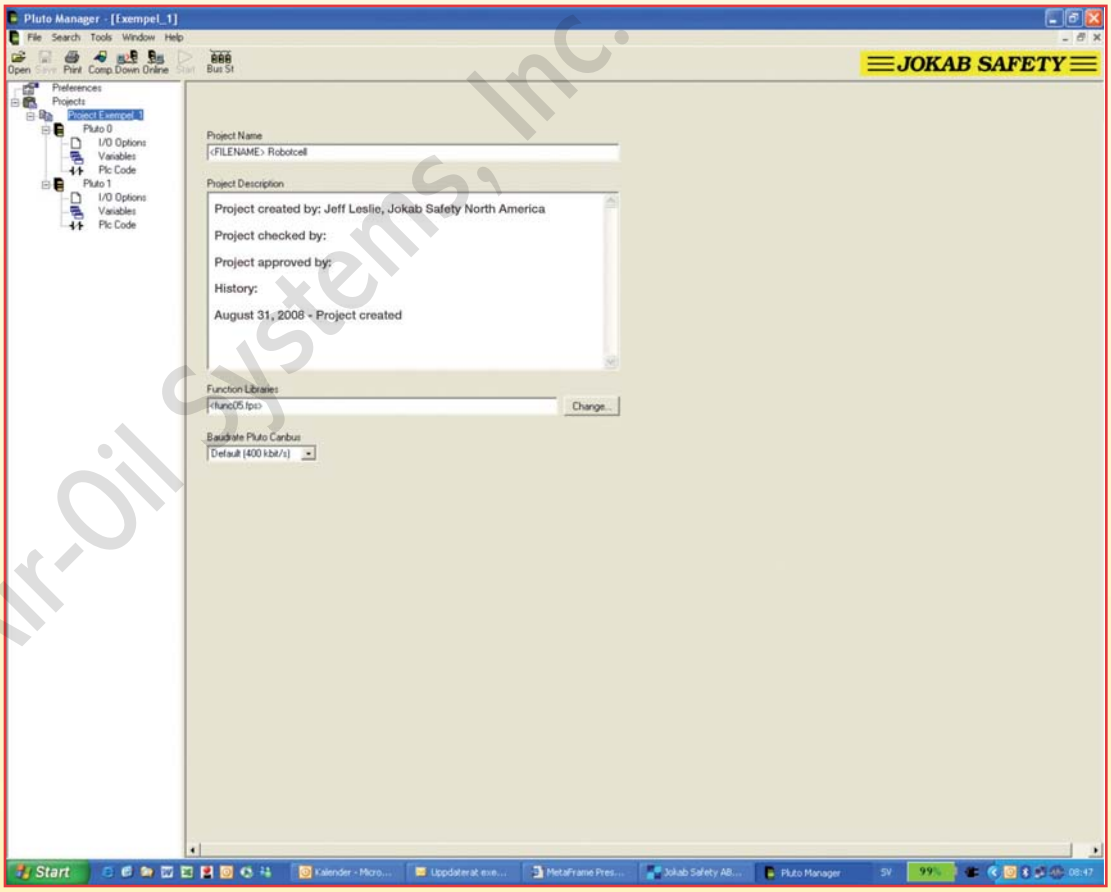
Note: The cell operating cycle must not start immediately on resetting the emergency stop or the door.



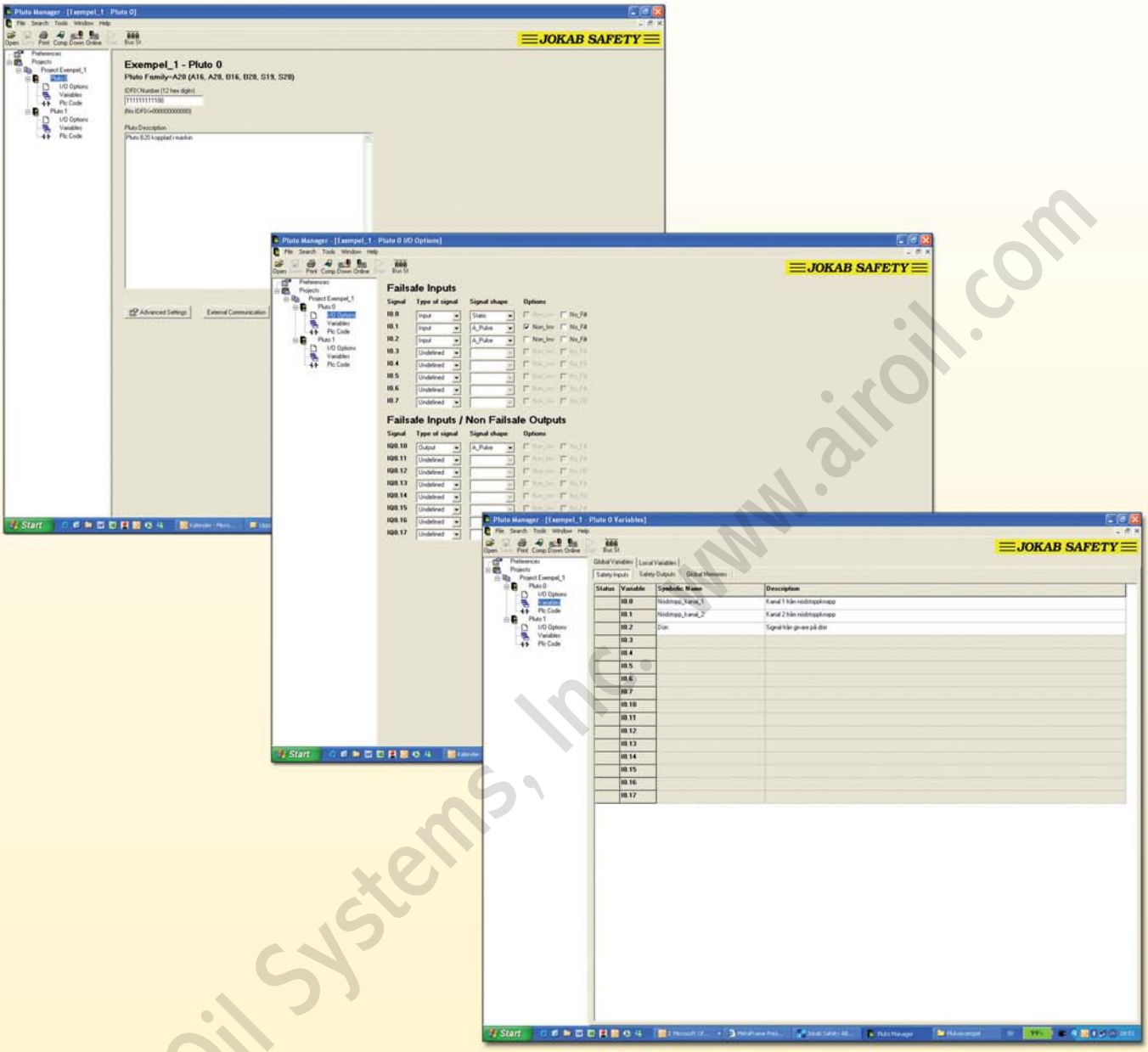
Connection Example - Robot Cell with Pluto



SEE DISCLAIMER ON PAGE 42



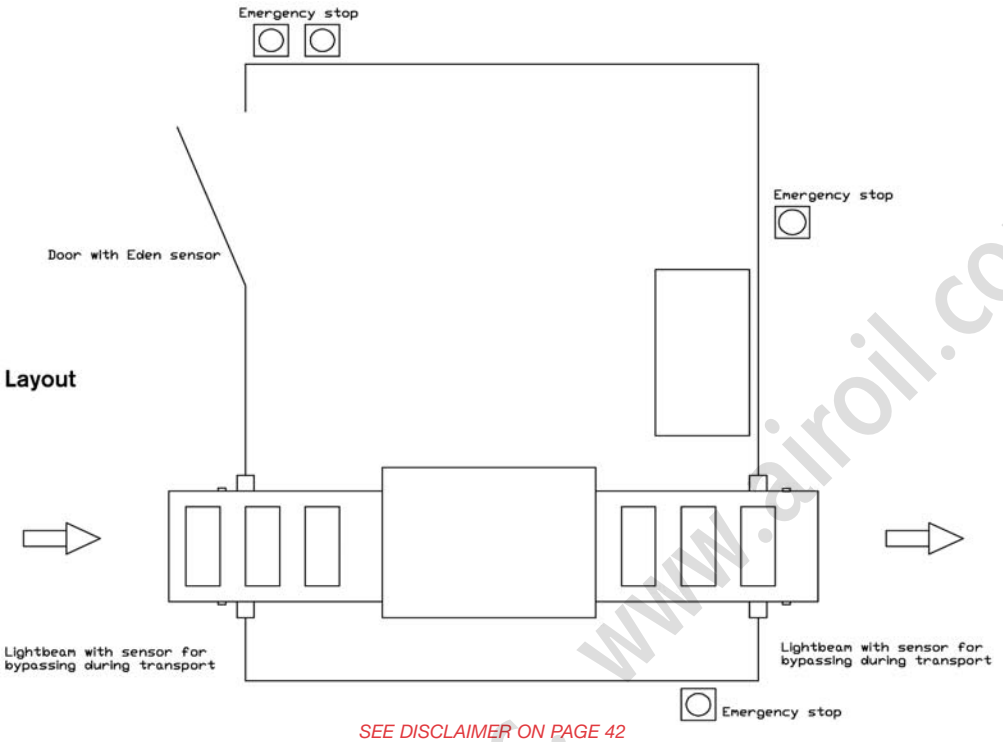
Pluto 0 Settings



I0.0 = Emergency stop_channel_1..... Channel 1 from the emergency stop button
I0.0 = Emergency stop_channel_2..... Channel 2 from the emergency stop button
I0.2 = Door..... Signal from the door sensor
Q0.2 = Robot_Auto stop_OK..... Automatic stop for the robot
Q0.3 = Robot_Emergency stop_OK ..... Emergency stop for the robot
Q0.10 = ... Output that generates a dynamic signal
GM0.0 = Reset_ind_mem ..... Collective memory for indication in the reset button
GM0.1 = Emergency stop_OK_mem..... Auxiliary memory for emergency stop OK
M0.0 = Reset_Ind_1_mem ..... Auxiliary memory 1 for indication in the reset button

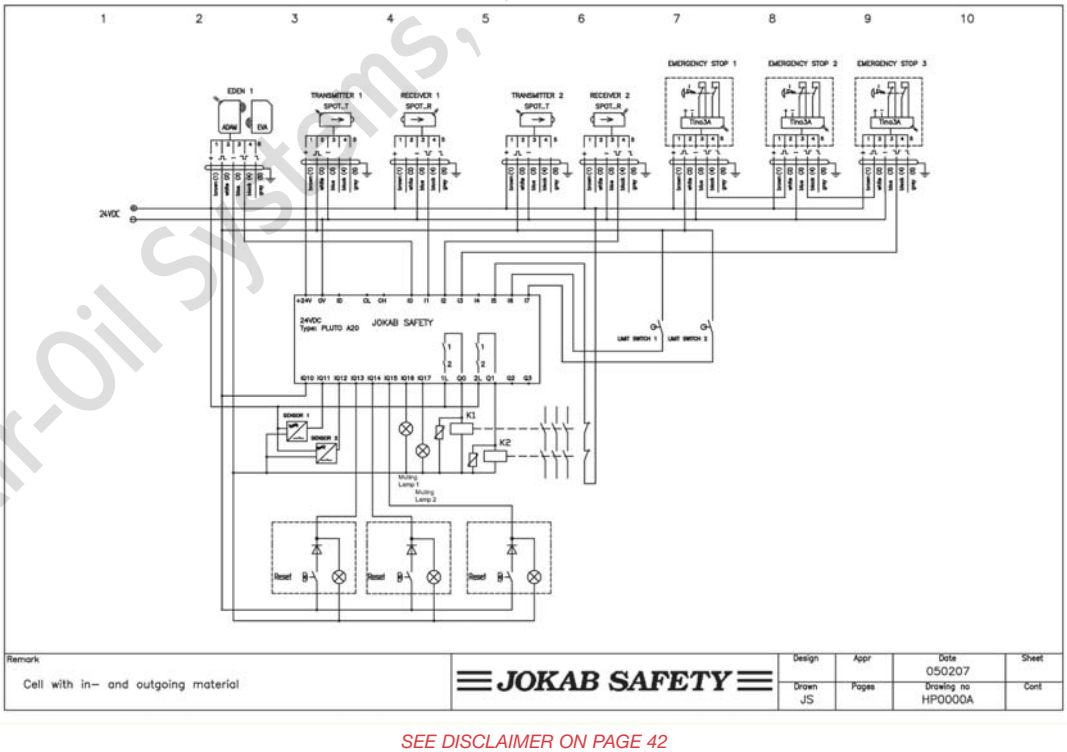
Application Example

Pluto Cell with Incoming and Outgoing Material



SEE DISCLAIMER ON PAGE 42

Electrical Connection



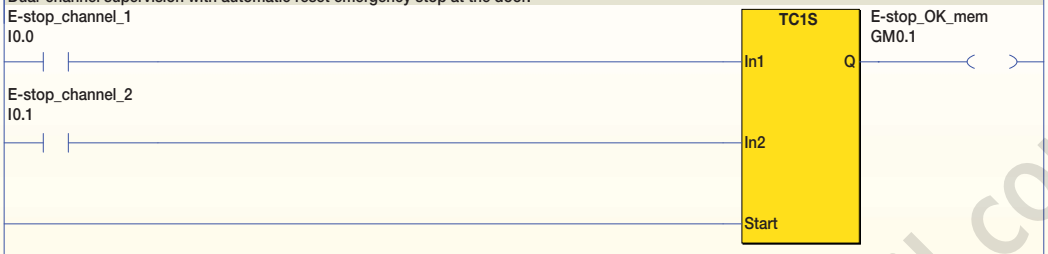
SEE DISCLAIMER ON PAGE 42

PLC Code Pluto 0

1

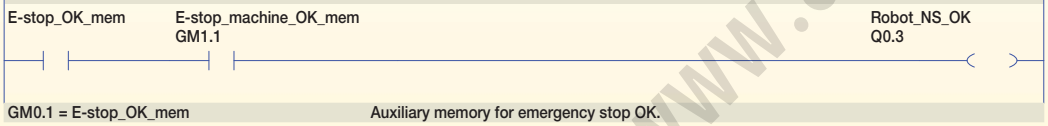
START

2 Dual-channel supervision with automatic reset emergency stop at the door.



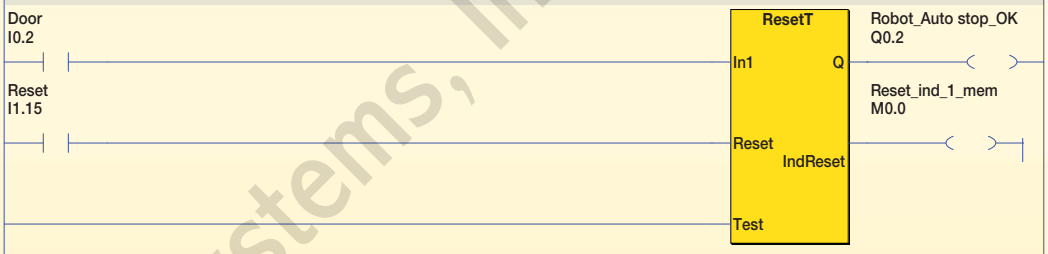
GM0.1 = E-stop_OK_mem	Auxiliary memory for emergency stop OK.
I0.0 = E-stop_channel_1	Channel 1 from the emergency stop button.
I0.1 = E-stop_channel_2	Channel 2 from the emergency stop button.

3 Emergency stop for the robot.
When the emergency stop is activated, the robot will perform an emergency stop.
To reset the safety features, the emergency stop button must be reset.



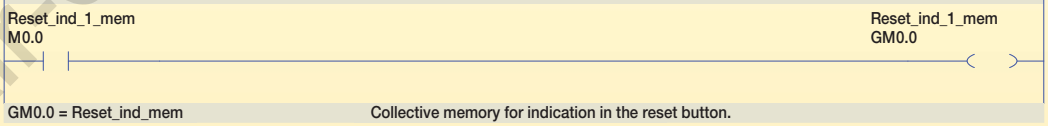
GM0.1 = E-stop_OK_mem	Auxiliary memory for emergency stop OK.
GM1.1 = E-stop_machine_OK_mem	Global auxiliary memory from dual-channel supervision of the emergency stop on the machine.
Q0.3 = Robot_NS_OK	Emergency stop for the robot.

4 Automatic stop for the robot.
When the door of the cell opens the robot is set to automatically stop.
To reset the safety features, the door must be closed and then the reset signal given.



I0.2 = Door	Signal from the door sensor.
I1.15 = Reset	Reset button reset.
M0.0 = Reset_ind_1_mem	Auxiliary memory for indication in the reset button.
Q0.2 = Robot_Auto stop_OK	Automatic stop for the robot.

5 Indication lamp in the reset button.
Summary of local memories that shall generate the signal in the reset lamp.
The global memory is then used in the Pluto where the output is.

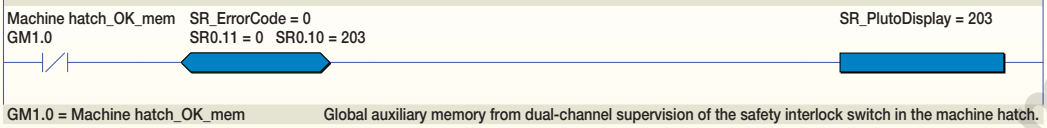


GM0.0 = Reset_ind_mem	Collective memory for indication in the reset button.
M0.0 = Reset_ind_1_mem	Auxiliary memory 1 for indication in the reset button.

6

Indication on the display.

Alarm 03 - Machine hatch open.
To generate an alarm, a UE code (UE = User Error) can be shown on the Pluto's display.
This alarm code is selected by a value of between 200 and 299 being written into the Pluto's display register.
SR_ErrorCode = 0 is used as a condition to prioritize an internal alarm from the unit.

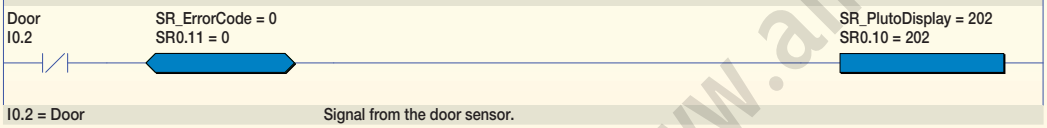


GM1.0 = Machine hatch_OK_mem	Global auxiliary memory from dual-channel supervision of the safety interlock switch in the machine hatch.
SR0.10 = SR_PlutoDisplay	Pluto display figure.
SR0.11 = SR_ErrorCode	Error code for user error 200 + no.

7

Indication on the display.

Alarm 02 - Door open.
To generate an alarm, a UE code (UE = User Error) can be shown on the Pluto's display.
This alarm code is selected by a value of between 200 and 299 being written into the Pluto's display register.
SR_ErrorCode = 0 is used as a condition to prioritize an internal alarm from the unit.

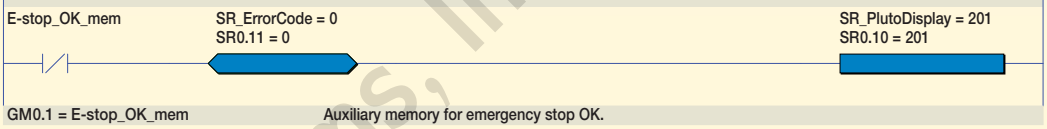


I0.2 = Door	Signal from the door sensor.
SR0.10 = SR_PlutoDisplay	Pluto display figure.
SR0.11 = SR_ErrorCode	Error code for user error 200 + no.

8

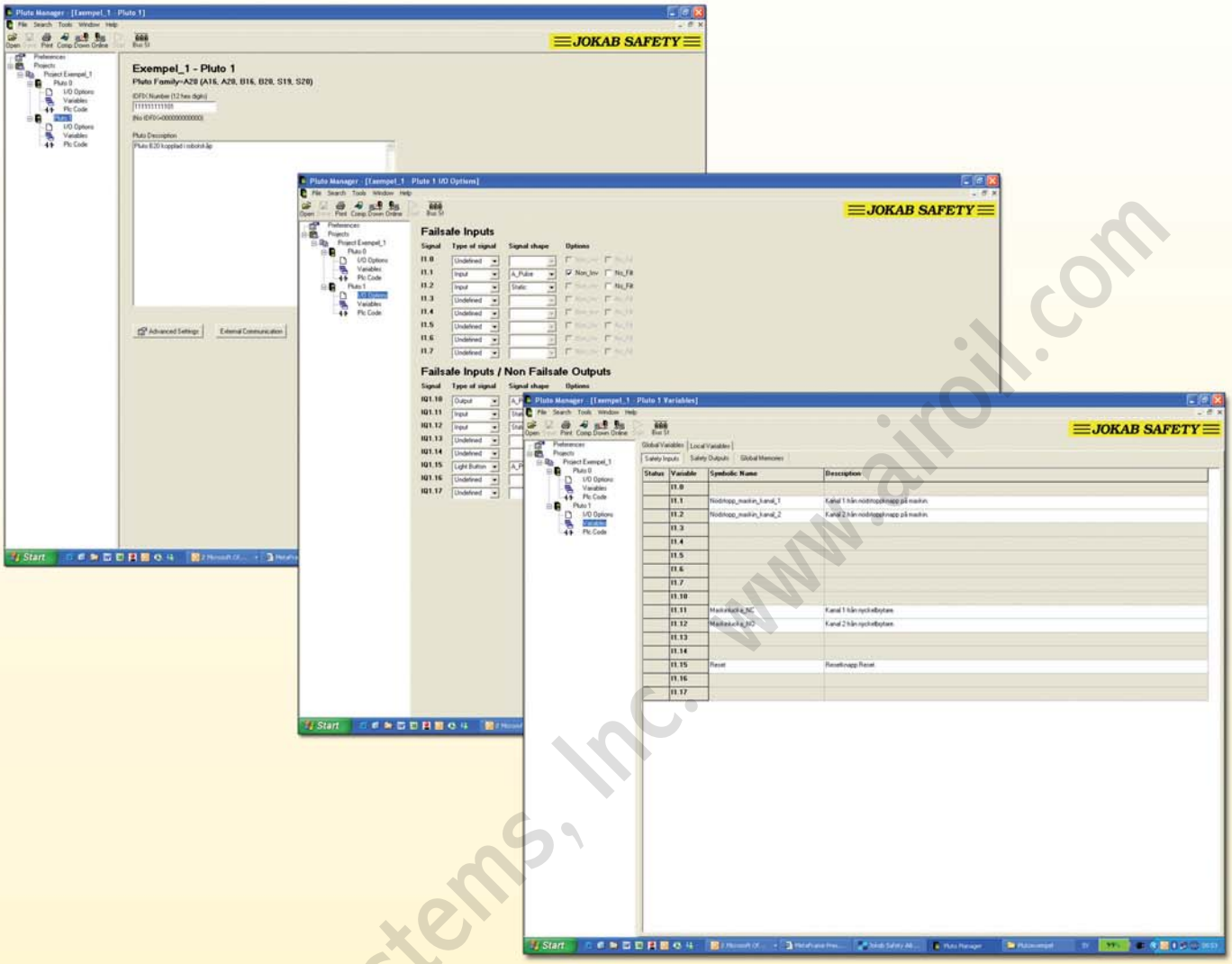
Indication on the display.

Alarm 01 - Emergency stop activated.
To generate an alarm, a UE code (UE = User Error) can be shown on the Pluto's display.
This alarm code is selected by a value of between 200 and 299 being written into the Pluto's display register.
SR_ErrorCode = 0 is used as a condition to prioritize an internal alarm from the unit.



GM0.1 = E-stop_OK_mem	Auxiliary memory for emergency stop OK.
SR0.10 = SR_PlutoDisplay	Pluto display figure.
SR0.11 = SR_ErrorCode	Error code for user error 200 + no.

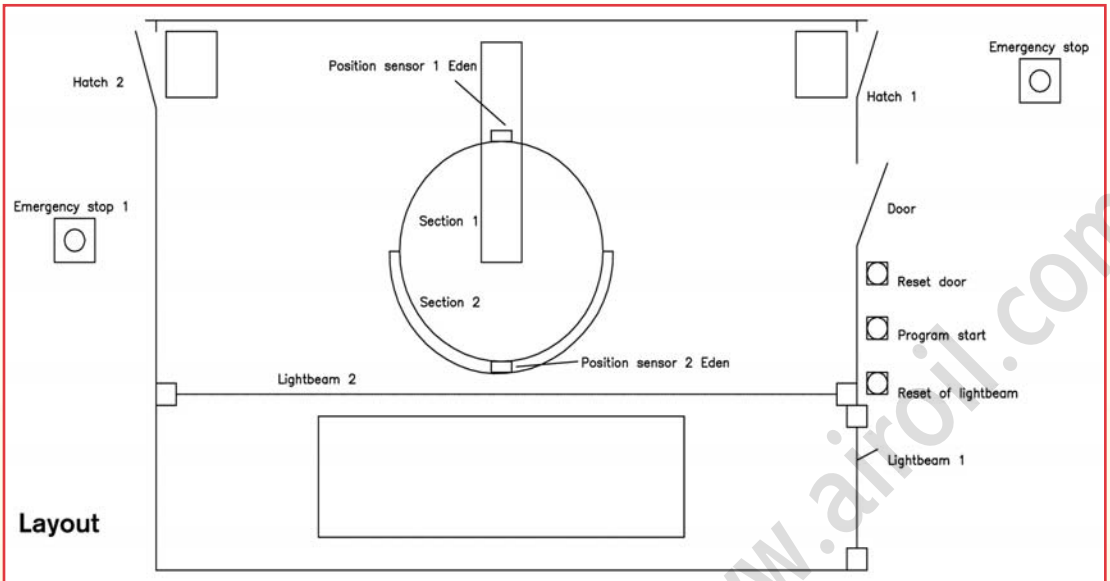
Pluto 1 Settings



I1.1 = Emergency stop_machine_channel_1..... Channel 1 from the emergency stop button on the machine
I1.2 = Emergency stop_machine_channel_2..... Channel 2 from the emergency stop button on the machine
I1.11 = Machine hatch_NC..... Channel 1 from the safety interlock switch
I1.12 = Machine hatch_NO..... Channel 2 from the safety interlock switch
I1.15 = Reset..... Reset button reset
Q1.0 = E-stop_machine_OK..... Emergency machine stop
Q1.1 = Machine_prot.stop_OK ..... Protective machine stop
Q1.10 = ... Output that generates a dynamic signal
Q1.15 = Reset_Ind ..... Indication lamp in the reset button
GM1.0 = Machine hatch_OK_mem..... Global auxiliary memory from dual-channel supervision of the safety interlock switch in the machine hatch
GM1.1 = E-stop_machine_OK_mem ..... Global auxiliary memory from dual-channel supervision of the emergency stop on the machine
M1.0 = Reset_Ind_2_mem..... Auxiliary memory 2 for indication in the reset button

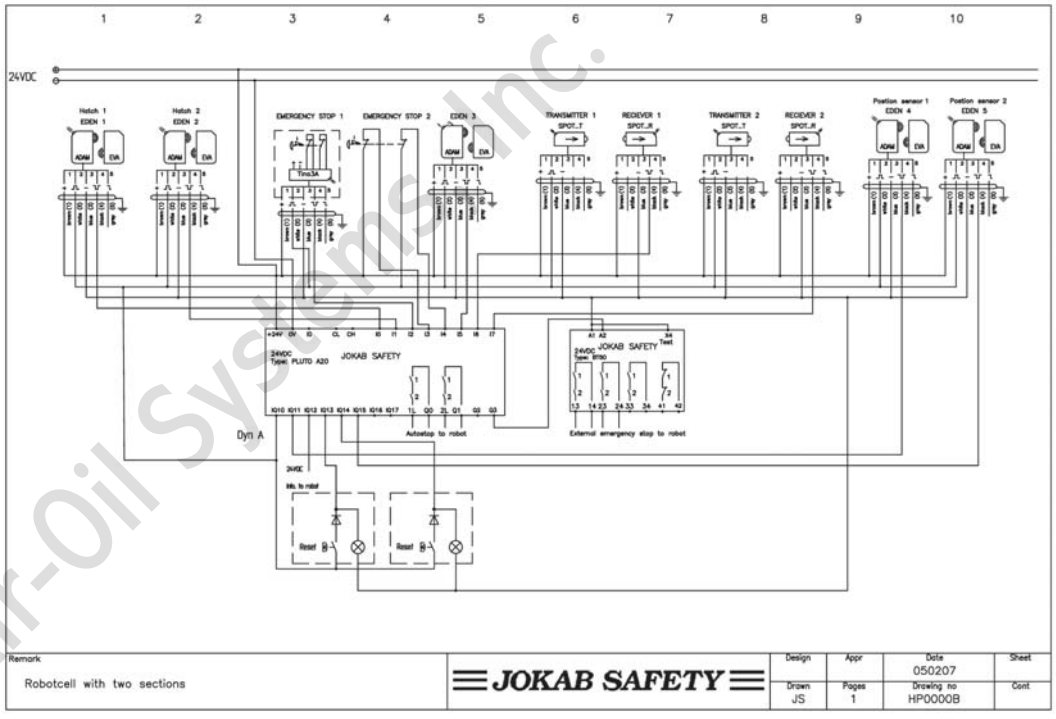
Application Example

Pluto Robot Cell



SEE DISCLAIMER ON PAGE 42

Electrical Connection

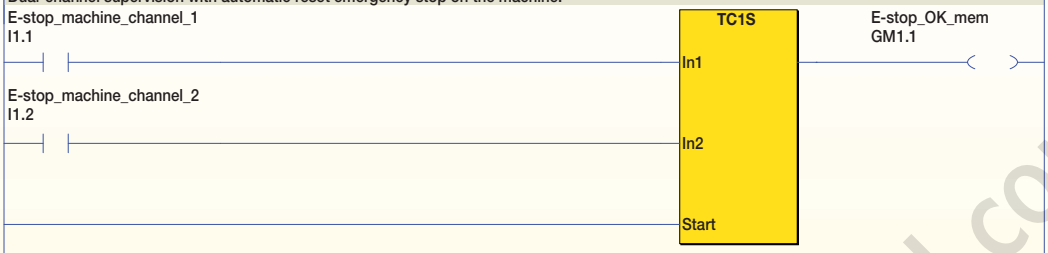


SEE DISCLAIMER ON PAGE 42

PLC Code Pluto 1

1

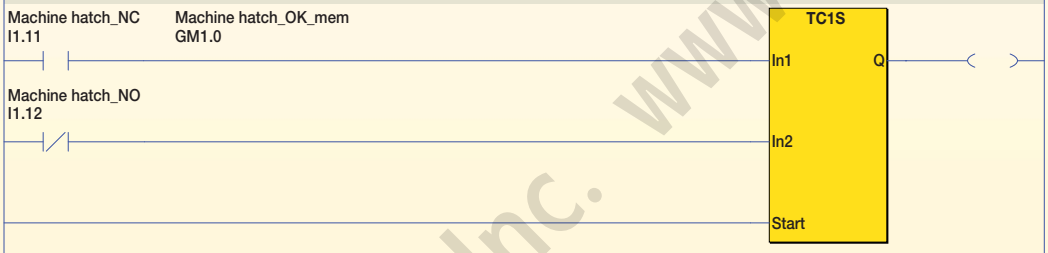
2 Dual-channel supervision with automatic reset emergency stop on the machine.



GM1.1 = E-stop_machine_OK_mem	Global auxiliary memory from dual-channel supervision of the emergency stop on the machine.
I0.0 = E-stop_machine_channel_1	Channel 1 from the emergency stop button on the machine.
I0.1 = E-stop_machine_channel_2	Channel 2 from the emergency stop button on the machine.

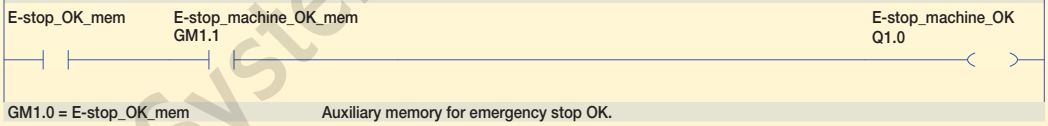
3 Dual-channel supervision of the machine hatch switch.
The switch has alternating contacts and the variable name shows the contact arrangement for the respect signals when the key is in the sensor.

Machine hatch_NC gives a signal.
Machine hatch_NO gives a signal.



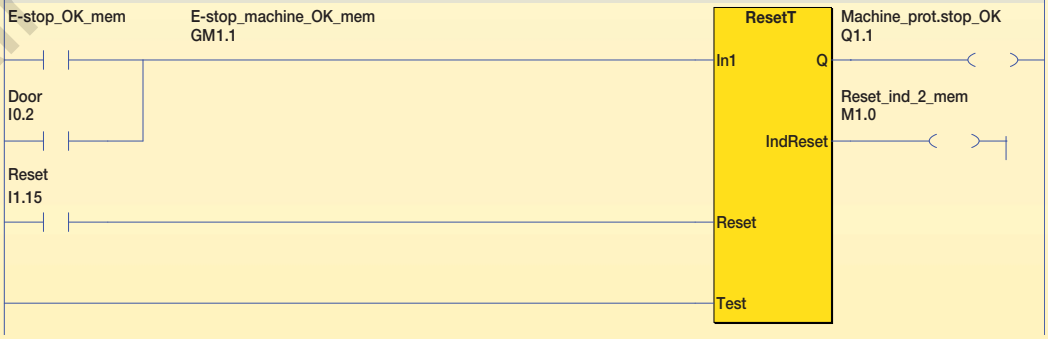
GM1.0 = Machine hatch_OK_mem	Global auxiliary memory from dual-channel supervision of the safety interlock switch in the machine hatch.
I1.11 = Machine hatch_NC	Channel 1 from the safety interlock switch.
I1.12 = Machine hatch_NO	Channel 2 from the safety interlock switch.

4 Emergency machine stop.
When the emergency stop is activated, the machine will perform an emergency stop.
To reset the safety features, the emergency stop button must be rest.



GM1.0 = E-stop_OK_mem	Auxiliary memory for emergency stop OK.
GM1.1 = E-stop_machine_OK_mem	Global auxiliary memory from dual-channel supervision of the emergency stop on the machine.
Q1.0 = E-stop_machine_OK	Emergency machine stop.

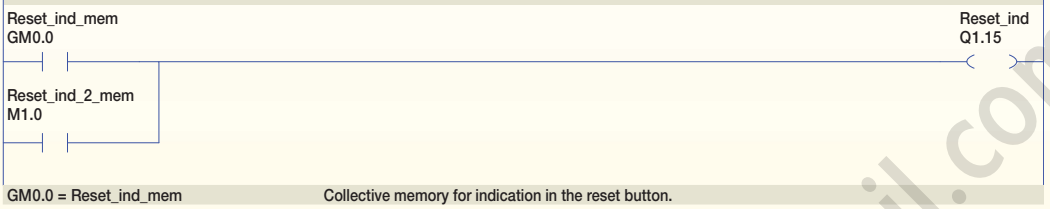
5 Protective machine stop.
When the protective stop is activated, the machine will stop.
If the door in to the robot area is opened at the same time as the machine hatch is closed, the machine will continue with its work cycle.
To reset the safety fetures, the door or the machine hatch must be closed and then the reset signal given.



GM1.0 = Machine hatch_OK_mem	Global auxiliary memory from dual-channel supervision of the safety interlock switch in the machine hatch.
I0.2 = Door	Signal from the door sensor.
I1.15 = Reset	Reset button reset.
M1.0 = Reset_ind_2_mem	Auxiliary memory 2 for indication in the reset button.
Q1.1 = Machine_prot.stop_OK	Protective machine stop.

6

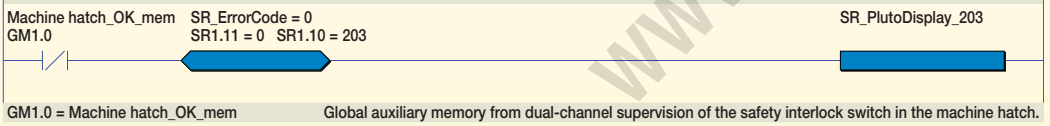
Indication lamp in the reset button.
Summary of memories that shall generate the signal in the reset lamp.



GM0.0 = Reset_ind_mem	Collective memory for indication in the reset button.
M1.0 = Reset_ind_2_mem	Auxiliary memory 2 for indication in the reset button.
Q1.15 = Reset_ind	Indication lamp in the reset button.

7

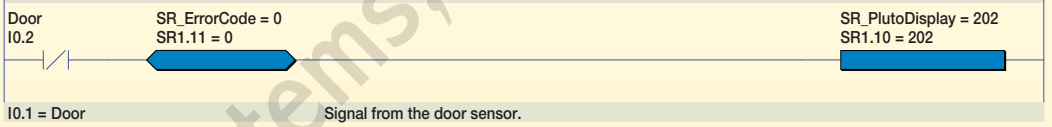
Indication on the display.
Alarm 03 - Machine hatch open.
To generate an alarm, a UE code (UE = User Error) can be shown on the Pluto's display.
This alarm code is selected by a value of between 200 and 299 being written into the Pluto's display register.
SR_ErrorCode = 0 is used as a condition to prioritize an internal alarm from the unit.



GM1.0 = Machine hatch_OK_mem	Global auxiliary memory from dual-channel supervision of the safety interlock switch in the machine hatch.

8

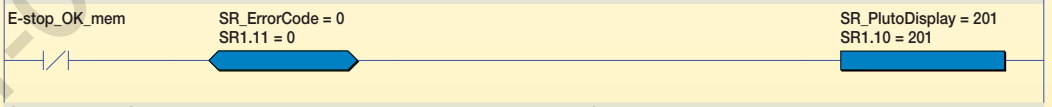
Indication on the display.
Alarm 02 - Door open.
To generate an alarm, a UE code (UE = User Error) can be shown on the Pluto's display.
This alarm code is selected by a value of between 200 and 299 being written into the Pluto's display register.
SR_ErrorCode = 0 is used as a condition to prioritize an internal alarm from the unit.



I0.1 = Door	Signal from the door sensor.
SR1.10 = SR_PlutoDisplay	Pluto display figure.
SR1.11 = SR_ErrorCode	Error code for user error 200 + no.

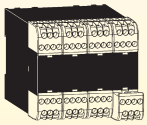
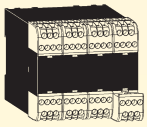
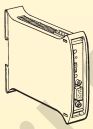
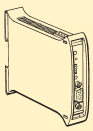
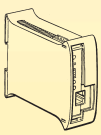
9

Indication on the display.
Alarm 01 - Emergency stop activated.
To generate an alarm, a UE code (UE = User Error) can be shown on the Pluto's display.
This alarm code is selected by a value of between 200 and 299 being written into the Pluto's display register.
SR_ErrorCode = 0 is used as a condition to prioritize an internal alarm from the unit.

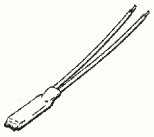
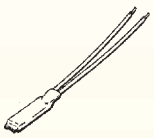


GM0.1 = E-stop_OK_mem	Auxiliary memory for emergency stop OK.
SR1.10 = SR_PlutoDisplay	Pluto display figure.
SR1.11 = SR_ErrorCode	Error code for user error 200 + no.

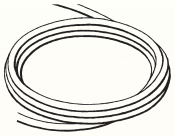
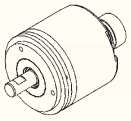
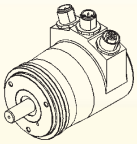
Component List - Pluto Safety PLC

Designation		Article Number	Description
Pluto A20		20-070-03	Safety PLC with 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus.
Pluto S20		20-070-05	Same as A20 except without Pluto safe bus and without current monitoring on Q16 + Q17.
Pluto B20		20-070-06	Same as A20 except without current monitoring on Q16 + Q17.
Pluto B16		20-070-07	Same as B20 except without safety outputs Q0 - Q3.
Pluto B46-6		20-070-15	Safety PLC with 24 failsafe inputs + 16 non-failsafe outputs/failsafe inputs + 4 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto safety databus.
Pluto S46-6		20-070-16	Same as B46-6 except without a databus.
Pluto AS-i		20-070-10	Safety PLC with AS-i databus and 4 failsafe inputs + 4 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individual failsafe transistor outputs. With connection for Pluto safety databus.
Gate-P1 Gateway Pluto Profibus DP		20-070-70	Gateway for 2-way communication between the Pluto bus and Profibus.
Gate-C1 Gateway Pluto CANopen		20-070-71	Gateway for 2-way communication between the Pluto bus and CANopen.
Gate-D1 Gateway Pluto DeviceNet		20-070-72	Gateway for 2-way communication between the Pluto bus and DeviceNet.
Gate-E1 Gateway Pluto Ethernet		20-070-73	Gateway for 2-way communication between Pluto databus and Ethernet.

Component List - Pluto Safety PLC

Designation		Article Number	Description
IDFIX-R		20-070-20	Identifier - assigns Pluto a specific address.
IDFIX-RW		20-070-21	Identifier - assigns Pluto an address. This version is programmable.
IDFIX DATA		20-070-23	Identifier - to give Pluto AS-i a specific address.
R-120		20-070-22	Terminating resistance for Pluto databus.
HMI Display		20-070-25	HMI display 4 x 20 LCD Graphic. UNIOP (Exor)
		20-070-28	HMI software Designer 6.
		20-070-29	HMI programming cable.
HMI Display		50-015-11	3.5" TFT-LCD touch screen display, 320x240pixels and 64k colors. RS422/RS485, RS232, Ethernet and USB communication.
HMI Display		50-015-13	5.7" TFT-LCD touch screen display, 320x240pixels and 64k colors. RS422/RS485, RS232, Ethernet and USB communication.
HMI Display		50-015-15	3.5" TFT-LCD touch screen display, 320x240pixels and 16 grayscales. RS422/RS485, RS232, Ethernet and USB communication.
HMI Display		50-015-16	5.7" TFT-LCD touch screen display, 320x240pixels and 16 grayscales. RS422/RS485, RS232, Ethernet and USB communication.
HMI Display		50-015-17	6.5" TFT-LCD touch screen display, 640x480 pixels. 64k colors. RS422/RS485, RS232, Ethernet and USB communication. Compact Flash Slot.
HMI Software Information Designer		50-015-23	For Exter and Cimrex terminals For use with Windows XP/Vista.
HMI Programming Cable		50-015-22	3m PCRS232 to exter terminal RS232, 9-pin D sub female to 9-pin D sub female.
Pluto Manager		20-070-40	Programming tool for Pluto equipped with safety function blocks.

Component List - Pluto Safety PLC

Designation	Article Number	Description
Bus Cable 	20-070-30	CAN-Bus cable - yellow 2 x 0.50 mm^2.
	20-070-31	CAN-Bus halogen-free cable - purple 2 x 0.50 mm^2.
Safety Encoder Model RSA 597 	20-070-36	Absolute value single-turn encoder.
Safety Encoder Model RSA 698 	20-070-37	Absolute value multi-turn encoder.
Cable	20-070-38	Cable for absolute value sensor Unitronic LiYCY 12 x 0.25.
Connector	20-070-39	Connector for absolute encoder RSA 597.
Communication Cable	20-070-57	Pluto communication cable for HMI display.
Terminal Block with 12nf Capacitor 	20-070-32	Modular terminal block with a 12nF radio interference suppression capacitor between clamping connector and DIN rail, separate ground connection, for mounting on Din Rail, terminal width: 6.2 mm, terminal height: 69 mm, Includes pre installed end barrier.
Ceramic Capacitor 	50-015-21	12nf, X1 440VAC, Y2 250VAC, 20 percent tolerance.