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 <u>all</u> 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.jokabsafety.com. 2011.

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







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.

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Pluto safety PLC – an overview



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.

to the front of the Pluto. The interface is RS232 and the protocol is Modbus ASCII 8 bit.

- lenath
- 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.



Absolute encoder. 8 single turn or multi turn absolute encoders can be connected directly to the safety bus. **Pluto AS-i** is an AS-i module which can be connected 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.

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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	-	-	•	•	•	•	•	٠
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							

Safety PLC Pluto



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 (Q). 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 (IQ). 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.

 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

Technical info - Pluto



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 Jokab Safety's website.

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. 2

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Single Pluto controls and monitors safety for local systems

- large aswell as small systems



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:	Black and beige			
Operating voltage:	24V DC ±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 _b Relay output Transistor output Type: Current at 24 V Max. overvoltage	2,00×10 ⁻⁹ 1,50×10 ⁻⁹ +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 output:	<20.5 ms + program exec. time <16.5 ms + program exec. time <23 ms + program exec. time <19 ms + program exec. time
Software setting Nor III.	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			9
	Pluto S20 20 I/O <i>Non-Pluto safety bus</i>	Pluto S46 46 I/O Non-Pluto safety bus	10
Article number/ordering data:	2TLJ020070R0500	2TLJ020070R1800	
Failsafe inputs	8 (1017)	24 (1017, 13037, 140147)	11
Failsafe inputs or non-failsafe outputs	8 (IQ10IQ17) Max total load 2.5 A	16 (IQ10IQ17) (IQ20IQ27) Max. total load 2A	11
Analogue inputs	1 (I5) 027V	3 (I5) 027 V	
Failsafe relay outputs	2 (Q0Q1)	4 (Q0Q1 & Q4Q5)	10
Failsafe transistor outputs	2 (Q2Q3)	2 (Q2Q3)	IZ
Current monitoring	-	-	
Pluto safety bus	-	-	
Own current consumption	100300 mA	100500 mA	10
Recommended external fuse:	6 A	10A	19
Dimensions (w x h x d)	45 x 84 x 118 mm	90 x 84 x 118 mm	



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



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



Pluto versions with bus have the same properties as single-Pluto unlike bus communication. With the help of the Plutobus 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:	Black and beige				
Operating voltage:	24V DC ±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_D Relay output Transistor output	2,00×10 ⁻⁹ 1,50×10 ⁻⁹				
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				

Pluto safety bus 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
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 "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
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				TR TATALISTIC CONCERCION CO
	Pluto A20 20 I/O <i>Current monitoring</i>	Pluto B16 16 I/O Non-failsafe outputs	Pluto B20 20 I/O	Pluto B46 46 I/O
Article number/ ordering data:	2TLJ020070R0300	2TLJ020070R0700	2TLJ020070R0600	2TLJ020070R1700
Failsafe inputs	8 (1017)	8 (1017)	8 (1017)	24 (1017, 13037, 140147)
Failsafe inputs or non- failsafe outputs	8 (IQ10IQ17) Max total load 2.5 A	8 (IQ10IQ17) Max total load 2.5 A	8 (IQ10IQ17) Max total load 2.5 A	16 (IQ10IQ17) (IQ20IQ27) Max. total load 2A
Analogue inputs	1 (I5) 027V	1 (I5) 027V	1 (I5) 027V	3 (I5) 027 V
Failsafe relay outputs	2 (Q0Q1)	-	2 (Q0Q1)	4 (Q0Q1 & Q4Q5)
Failsafe transistor outputs	2 (Q2Q3)	_	2 (Q2Q3)	2 (Q2Q3)
Current monitoring	2(IQ16,IQ17)0-1.0A ±10%	-	-	-
Pluto safety bus	•	•	•	•
Own current consumption	100300 mA	100300 mA	100300 mA	100500 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



Failsafe inputs / Outputs (not failsafe) / Dynamic outputs

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.

Certificates

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ZERTIFIK	АТ ЕС Тур	e-Examination Certificate	EG-B	aumusterpr	üfbeschei	nigung
CERTIFIC	ATE	RegNo.: 01/205/5066/10		EC type-examin	ation certificate	
Product tested	Logic unit to ensure safety Certific functions helder	eter ABBAB Jokab Safety Boolinggaten 3		Rogistr Hepster 44 206 11 3	rier-Nr. min Au 190992 000	
	Safety PLC	213 76 Maindi Sweden	Zeichen des Auftraggebers Culturen's reference	Autoregedatum Date of order	Alterostitien File referenze	Problemate I Test report
Type designation	Pluto Manufa For certified Hardware and Software Versions see current "Version Release LAC.	forer see ontificate holder	Name and Anachrith des Auftraggebers	ABB Jokab Varlaberor	AB Safety Wigen 11	Customer's na and ality
Codes and standards forming the basis of testing	EN (50 13946-12008 + AC2006 EN EN (2001-2005 EN EC (5158 Even 1.7 1998 / 2000 EN	50178-1907 61495-12008 + A1.2008 (in extracts) A75-1095 + A1.2008 (in extracts)		434 39 Ku Swe	ngsbacka den	
Intended application	EN 90204-1:2006 + A1 2009 (in extracts) Safety related programmable electronic syst	im for machinery and process industry	Erfullt mit sken The prod	a.g. Produkt die Anhorderungen is als eine Grundlage für die 1 directioni Jector meets the result as a basis für the DC is	es Antiange I der Mascheisere IG-Konformitätserhärung einents sf anses / d' Pe Desch obesten if conformity	whellinia 2008/42/EQ w 2008/42/EC
	The Pluto PLC complies with the requirement in acc. to EN ISO 13849-1, St. CL 3 acc. to S14, Ture 4 of EN 01496-11 and can be used	ts of the selevant standards (Carl. 4 / PL. EN 62081 / IEC 61508, Type IIIC of EN In applications up to Carl. 4 / PL.	Geprüft nach	Maschinenruhl Machinery Dreck	Inia 2006/43/805 Inia 2006/42/805	Topinel in accordance or
Specific requirements	to EN ISO 13849-1 and SL 3 acc. to EN 020 The current "Version Rotizate List" as w Programming Manual, Safety Manual and considered.	H / HC 61508. ell as the conditions defined in the the Operating Instructions must be		EX 619 EX 620 EX 60 13 EX 60 13 Nor URAX EX 50	80.3001 11.3006 645-1.2006 645-2.3008 81 allest 2.2008	
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Internet support - Pluto Our web site has a section dedicated to Pluto customers, offering continuously updated product support. The Pluto customer site offers: E-mail support directly linked to our Pluto specialists • • Hardware manuals The Safety Manual, with the most important safety requirements Programming manual . Gateway manual • Function block descriptions . . Common questions and answers Pluto Manager installation file, programming tools . Pluto OS, files to update system software Confirmation of compliance . =JOKAB SAFETY= **Pluto English** TANKS . local Jonac Safety asks representative in other to the EC Declaration of com Plate FAQ Plate DE ver 2.4.2 fer A28 Security Hectivers 16-18-12 Field OS our 2.4.1.fac B48 Second - Propriet on in pushele Of H-10-12 tool - London figate 1.27 1.1.20 231141.0 100-00 tust Salaty

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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:

the door.

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

Electrical connections





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≡JOKAB SAFETY≡ 2:17

Pluto 0 settings – Robot cabinet



Pluto 0

I0.0=P0_ES1_Ch1
I0.1=P0_ES1_Ch2
I0.2=P0_Eden1
l0.15=P0_LB1_ln
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





I1.1=P1_ES1_Ch1
I1.2=P1_ES1_Ch2
I1.3=P1_IS1_Ch1
I1.4=P1_IS1_Ch2
l1.15=P1_LB1_ln
Q1.0=P1_ES
Q1.1=P1_PS
GM1.0=P1_ES_OK
GM1.1=P1_Hatch_OK

;Emergency stop 1 channel 1 - Dynamic A non-inverted ;Emergency stop 1 channel 2 -Static ;Interlocking switch channel 1 - Dynamic A non-inverted ;Interlocking switch channel 2 - Static ;Reset Hatch - Light button input - Dynamic A ;Machine Emergency stop ;Machine protective stop ;Emergency stop OK in Pluto 1 ;Hatch closed

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PLC code Pluto 0 – Robot cabinet

Start			
Two channel monitoring with auto	matic reset of emergency stop at the door.		
P0_ES1_Ch1		TC1S	P0_ES_OK
		—In1 Q-	
P0_ES1_Ch2			
10.1		In 2	
		1112	
		Start	
GM0.0=P0_ES_OK	Emergency stop OK in Pluto 0		
10.0=P0_ES1_Ch1	Emergency stop 1 channel 1 - Static		
10.1=P0_ES1_Ch2	Emergency stop 1 channel 2 - Dynamic A non-inverted		
Emergency stop of robot.			
When the emergency stop is actu	ated the robot will make an emergency stop		
In order to restore safety requires	the emergency stop button needs to be reset.		
An emergency stop from the mach	nine panel will also emergency stop the robot.		
P0_ES_OK P1_ES_OK			P0_ES
			Q0.0
GM0.0=P0_ES_OK	Emergency stop OK in Pluto 0		
GM1.0=P1_ES_OK	Emergency stop OK in Pluto 1		
Q0.3=P0_ES	Robot emergency stop - Expansion BT50 relay		
Auto stop of robot.			
When the door to the robot cell is	opened the robot is auto stopped.		
To reset the safety the door needs	s to be closed and the reset button pressed and released.		
Constant light means reset is not p	possible, safety not ok.		
Flash 0.4 s high, 0.6 s low means No light means reset has been pe	reset is possible but not performed. rformed and the safety is ok.		
P0 Eden1		PasatT	P0 AS OK
10.2		nesett	Q0.2
		— <mark>In1 Q</mark> —	— ()—
P0_LB1_ln			P0_LB1_Out
10.15			Q0.15
N		-Reset	
		inditiooot	
		Test	
10.15=P0_LB1_In	Reset Door - Light button input - Dynamic A		
10.2=P0_Eden1	Door Eden sensor - Dynamic A		
Q0.15=P0_LB1_Out	Reset Door - Light button output - Static		
QU.2=PU_AS_UK	ουοι αυιο stop - Expansion Β150 relay		

2 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. 3 P1_Hatch_OK P0_AS_OK SR_ErrorCode=0 SR_PlutoDisplay=203 GM1.1 Q0.2 SR0.11=0 SR0.10=203 GM1.1=P1_Hatch_OK Hatch closed 4 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 Alarm 02 - Door open. 5 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. SR_PlutoDisplay=202 SR_ErrorCode=0 P0_Eden1 10.2 SR0.11=0 SR0.10=202 6 10.2=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 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 SR_ErrorCode=0 SR_PlutoDisplay=201 GM0.0 SR0.11=0 SR0.10=201 8 GM0.0=P0_ES_OK Emergency stop OK in Pluto 0 SR0.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no

Error code

5

6

7

SR0.11=SR_ErrorCode

9

10

11

12

13

PLC code Pluto 1 – Machine cabinet

1		Cubility		
	Start			
2	Two channel monitoring with automatic reset	of emergency stop at the machine hatch.		
	P1_ES1_Ch1		TC1S	P1_ES_OK
	11.1		In1	GM1.0
	P1 ES1 Ch2			
	11.2			
			inz	
			Start	
	GM1.0=P1_ES_OK	Emergency stop OK in Pluto 1		
	I1.1=P1_ES1_Ch1 I1 2=P1_ES1_Ch2	Emergency stop 1 channel 1- Dynamic A non-inverted Emergency stop 1 channel 2 - Static		
3	Two channel monitoring with automatic reset	of interlocking switch of the machine hatch.		
	P1_IS1_Ch1 1.3		TC1S	P1_Hatch_OK GM1.1
			— <mark>In1 Q</mark>	()
	P1_IS1_Ch2			
			Start	
			Sidii	
	GM1.1=P1_Hatch_OK	Hatch closed	4	
	11.3=P1_1S1_Cn1 11.4=P1_IS1_Ch2	Interlocking switch channel 2 - Static	1	
4	Emergency stop of machine			
	When the emergency stop is actuated the ma	chine will make an emergency stop.		
	In order to restore safety requires the emerge An emergency stop from the robot will also en	ncy stop button needs to be reset.		
	P1 ES OK P0 ES OK			P1 ES
	GM1.0 GM0.0			Q1.0
				()
	GM0.0=P0_ES_OK	Emergency stop OK in Pluto 0		
	GM1.0=P1_ES_OK	Emergency stop OK in Pluto 1 Machine Emergency Stop		
	Q.0-17_20			
5	Monitoring of the hatch.			
	When the hatch is opened the monitoring of the	ne hatch is inactive.		
	Note that IQ15 of the Pluto is used both as a l	button in and to indicate different reset states.		
	Flash 0.4 s high, 0.6 s low means reset is not possible, sa	sible but not performed.		
	No light means reset has been performed and	the safety is ok.		
	P1_Hatch_OK GM1.1		ResetT	HB_Hatch_OK M1.0
			n1 Q	()
	P1_LB1_ln		H	B_Ind_Hatch_OK
	N	F	Reset	()
			IndReset	
			est	
		• • • • • • • • • • • • • • • • • • •		

11.15-17.LBT, PM Preset Hatch - Light button input - Dynamic A M1-0-18L, Julie, DK Help BT - Hatch closed M1-18L, Julie, Tok, Tok, Tok, Tok, Tok, Tok, Tok, Tok				
MI London, Halen, OK Help Bit - Hatch closed MI London indication of the result of the hatch. Help Bit - Hatch closed in added and reset no light indication is needed inside the cell. Hit rods to closed and arreset no light indication is needed inside the cell. Hit rods to closed and reset no light indication is needed inside the cell. Hit rods. Coll Science 1997 MI LIP I - Match Coll Science 1997 Hit rods. Coll	11.15=P1_LB1_In	Reset Hatch - Light button input - Dynamic A		
Mri 1-Hell, Not, Mr. Help Br Indication Reset Hatch Split Button indication of the reset of the hatch. HB, Indication of the reset on light indication is needed inside the cell. HB, Indication 243, OK PD, 43, OK PD, 44, OK PD, 43, OK PD, 44, OK PD, 4	M1.0=HB_Hatch_OK	Help Bit - Hatch closed		
spit button indication of the resol of the halch. Ithe robust colls door is closed and reset no light indication is needed inside the coll. PT_LB1_Coll Q12=0 PT_LB1_Coll Q12=0 PT_LB1_Coll Q12=0 PT_LB1_Coll Q13=0 PT_LB1_Coll Q1	M1.1=HB_Ind_Hatch_OK	Help Bit - Indication Reset Hatch		
the robust cells do in a closed and reset no light indication is needed inside the cell. Hill Code (1,15) PI LBI Out All (1,16) PI LBI Out All (1,16) PI LBI Out All (1,	ight button indication of the reset of th	ne hatch.		
H2_Ind_Math_OK P0.45.0K P1.15.0d M11 0.02 P1.15 M11-HB_INU_Hatch_OK Holp Bit - Indication Reset Hatch 0.02-P0.45.0K M11-HB_INU_Hatch_OK Holp Bit - Indication Reset Hatch 0.02-P0.45.0K Op-PD, A5.0K Reset Hatch - Light button output - State P1.P5 Trobecive stop of the machine. Ither the tach is closed and reset. Ither the hatch is closed and reset. HB_ Hatch_OK M10 P1.P5 M10 0.15 0.15 M10 0.17 0.11 P1.48.0K M10 P1.P5 M10 0.11 0.11 P1.48.0K M10 P1.P5 M10-HB_Hatch_OK Holp Bit - Hatch closed 0.02-P0.45.0K O2-P0.45.0K Holp Bit - Hatch closed 0.02-P0.45.0K O2-P0.45.0K Holp Bit - Hatch closed 0.02-P0.45.0K O2-P0.45.0K Holp Bit - Hatch closed 0.02-P0.45.0K O2-P1.45.0K Holp Bit - Bit	the robot cell's door is closed and res	set no light indication is needed inside the cell.		
M.1. UL2 UL1 STORE	HB_Ind_Hatch_OK P0_AS_OK		P1_LB1_Out	
M1.1=HB_I.dd_Hatch_OK Help Bit - Indication Reset Hatch QQ=PD_R.26_K K Robot auto stop - Expansion BT50 relay G1.15=PT_LBIT_Out Reset I hatch - Light butten output - Static Trotective stop of the machine. His means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His Hatch_OK OK PI as the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His Hatch_OK OK PI as the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His Hatch_OK OK Reset Can Cell can work with the batch both open or closed as long as the cell's door is closed and reset. His Hatch_OK OK Reset Can Cell can work with the batch stop - Expansion BT50 relay M1.1=P1.P5 Match coded G02=P0 AS (OK Reset Force (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SH11) in the Pluto prioritises errors from the Pluto isself over User Errors. PI Hatch_OK PO AS (OK SR_EtroroCode=0 SR PlutoDisplay=203 SR1.1=SR_EtroroCode SR PlutoDisplay Pluta display figure. For user error: 200+no SR PlutoDisplay=202 SR1.1=SR_EtroroCode SR Pluto Closed Door Eden sensor - Dynamic A SR1.1=SR_EtroroCode SR Pluta display figure. For user error: 200+no SR PlutoDisplay=203 SR1.1=SR_EtroroCode SR PlutoDisplay Pluta display figure. For user error: 200+no SR PlutoDisplay=201 SR1.1=SR_EtroroCode SR Pluta Display figure. SR PlutoDisplay=201 SR1.1=SR_EtroroCode SR Pluta Display figure. SR PlutoDisplay=201 SR1.1=SR_EtroroCode SR Pluta Display	VII.1 QU.2		Q1.15	
MI.1=HB_Ind_Halch_OK Help BH - Indication Reset Halch 02.2=0, AS_OK Rebot auto atop - Expansion BT50 relay Reset Halch - Light button output - State tradective stop of the machine. If the Halch_IOK P1_FPS 10.1	//		()	
00.2-P0_AS_OK Probat auto stop - Expansion BT50 relay 01.15=P1_LBT_OUL Resel Hatch - Lght buttorn output - Static trotactive stop of the machine. Important Static this means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. P1_PS High Hatch_OK Origon of the machine. P1_PS W1.0 Origon of the machine. Origon of the machine. W1.0 Origon of the machine. Origon of the machine. W1.0 Origon of the machine. Origon of the machine. W1.0 Origon of the machine. Origon of the machine. W1.0 Origon of the machine. Origon of the machine. W1.0 Origon of the machine. Origon of the machine. W1.0 Mither the machine. Origon of the machine. Origon of the machine. Machine Protochive Stop Machine Protochive Stop Machine haltch open. Origon of the machine. SR PlusoDisplay=203 SR11-15PL Pluston_OK Machine Protochive Stop SR PlusoDisplay=203 SR1.1-SPL Pluston_OR FrancoCode - SR PlusoDisplay=202 SR1.1-SPL Pluston_Play Pluto display figure. Fore user errors: 200 + no SR PlusoDisplay=2	M1.1=HB_Ind_Hatch_OK	Help Bit - Indication Reset Hatch		
QI. 15=P1_UB1_Out Reset Hatch - Light button output - Static Interceive stop of the machine. Ither the hatch is closed and reset. Ithe mach is closed and reset or the door to the robot cell is closed and reset. PL 18, Hatch_OK QI. 15 19, Hatch_OK No. 10, 20, 20, 20, 20 QI. 15 11, 15 MI. 0-MEL 10, 20, 20, 20, 20, 20 MI. 0-MEL 20, 21, 20, 20, 20, 20 MI. 0-MEL 20, 22, 20, 20, 20, 20 MI. 0-MEL 20, 22, 20, 20, 20, 20 Machine Protective Stop Jarm 03 - Machine hatch open. 0 0 generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. -check of System Register 11 (SRIT) in the Pluto proteines errors from the Pluto listel over User Errors. 20, 11, 15PL Leath_OK Hatch closed 20, 24, 20, X SRI, 10-203 21, 11, 20, 24, 20, X SRI, 10-203 21, 11, 20, 24, 20, X SRI Hatch closed 20, 24, 20, X Rebot auto atop - Expansion BT50 relay 21, 11, 20, 24, 20, X Rebot auto atop - Expansion BT50 relay 21, 11, 20, 24, 20, X Rebot auto atop - Expansion BT50 relay 21, 11, 25PL ErrorCode <t< td=""><td>Q0.2=P0_AS_OK</td><td>Robot auto stop - Expansion BT50 relay</td><td></td><td></td></t<>	Q0.2=P0_AS_OK	Robot auto stop - Expansion BT50 relay		
Rolective stop of the machine. ither the hatch is closed and reset or the door to the robot call is closed and reset. ithe Altaho, OK If A Hatch, OK<	Q1.15=P1_LB1_Out	Reset Hatch - Light button output - Static		
the rub hatch is closed and reset or the choic to the rubot cell is closed and reset. The means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His means the cell can work with the hatch both open or closed as long as the cell's door is closed and reset. His Hatch, OK PILPS OL - OL -	rotective stop of the machine.			
Ha Hatch_OK P1_PS 01.1 02, AS_OK 02.2 01.1 01.1 02, AS_OK Holp Bit - Hatch closed 02.2=0, AS_OK Related and solve - Expansion BTS0 relay 01.1=P1_PS Machine Protective Stop Harm 03 - Machine hatch open. 02.0 eperate User Errors (UE) a value of 200 - 290 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto Itself over User Errors. P1_Hatch_OK P0_AS_OK SR_ErrorCode=0 SR_PlutoDisplay=203 SR1.10=203 SR1.10=203 SR1.10=204 SR1.10=204 SR1.10=205	ither the hatch is closed and reset or his means the cell can work with the	the door to the robot cell is closed and reset. hatch both open or closed as long as the cell's door is closed and re	eset.	
M1.0 OT.1 OT.1 OT.1 OT.1 OT.1 OT.1 OT.1 OT.1	HB_Hatch_OK		P1_PS	
PD. AS. OK Does 2 MI. 0=HB, Hatch, OK Help Bit - Hatch closed C0.2=20, AS, OK Robot auto stop - Expansion BT50 relay C0.1=PT_PS Machine Protective Stop Jarm 03 - Machine hatch open. Machine Protective Stop o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto Itself over User Errors. PL Hatch, OK PA.S. OK SR_ErrorCode=0 GM1.1=PT_Hatch_OK Hatch closed G02=P0_AS_OK SR_ErrorCode=0 GR1.1=PT_Hatch_OK Hatch closed G02=P0_AS_OK SR_ErrorCode=0 GR1.1=PT_Hatch_OK Hatch closed G02=P0_Eden1 SR_ErrorCode D2=P0_Eden1 Door Eden sensor - Dynamic A SR1.11=0 SR_ErrorCode=0 GR1.1=SR_ErrorCode Error code Jam 04 - Emergency stop actuated. ogenerate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. creek of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. SR_PlutoDisplay=202 SR1.10=0 SR1.1=SR_ErrorCode Error code SR Jam 01 - Emergency stop actuated. <	VI1.0		Q1.1	
P0. AS_OK D02 D02_P0_AS_OK Holp Bit - Hatch closed C02_P0_AS_OK Robot auto stop - Expansion BTS0 rolay C1.1=P1_PS Machine Protective Stop Jamm 03 - Machine hatch open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. > otherk of System Register 11 (Sh11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_Hatch_OK_P0_AS_OK_SR_ErrorCode=0 SR_PlutoDisplay=203 SR1.10=203 SR1.11=0 OQ_2=P0_AS_OK Relative closed OQ_2=P0_AS_OK Relative close O_2 <td></td> <td></td> <td></td> <td></td>				
D02 Image: Control of the second	PO AS OK			
M1.0=HB, Hatch, OK Help Bit - Hatch closed (D2.=PO, AS, OK Robot auto stop - Expansion BT50 relay D1.1=P1_PS Machine Protective Stop Nam 03 - Machine hatch open. ogenerate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. -ceteck of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_Hatch_OK P0_AS_OK O2_=P0_AS_OK SR_ErrorCode=0 SR1.11=0 SR_110=203 GM1.1=P1_Hatch_OK Hatch closed O2_=P0_AS_OK SR_EhrorCode=0 SR1.11=0 SR_EhrorCode GM2.=P0_AS_OK Rebot auto stop - Expansion BT50 relay SR1.11=SR_ErrorCode Error code Iarm 02 - Door open. Error code Ogenerate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SN11) in the Pluto prioritises errors from the Pluto itself over User Errors. O2_EC Eden 1 Door Eden sensor - Dynamic A SR1.11=0 SR1.10=202 SR1.11=0 SR1.10=202 SR1.11=0 Error code Iarm 01 - Emergency stop actuated. Error code Iarm 01 - Emergency stop actuated. SR P	Q0.2			
M1.0=HB_Hatch_OK Help Bit - Hatch closed Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay Q1.1=P1_PS Machine Protective Stop Jarm 03 - Machine hatch open. a generate User Errors (UF) a value of 200 - 299 can be written to the display of the Pluto. . check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto liself over User Errors. P1_Hatch_OK P0_AS_OK SR_ErrorCode=0 SR1.10=20 SR1				
MI.0=HB_Hatch_OK Holp Bit - Hatch closed Q0.2=P0_AS_OK Probot auto stop - Expansion BT50 relay Q1.1=P1_PS Machine hatch open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_Hatch_OK P0_AS_OK SR_ErrorCode=0 SR_PlutoDisplay=203 SR1.10=CX Q0.2=P0_AS_OK Return Code=0 Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode=0 Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.11=SR_ErrorCode Error subject for user error: 200+no SR1.11=O Q1_2=P0_Etem1 SR_ErrorCode=0 Q2_2=P0_AS_OK Robot auto stop - Expansion BT50 relay P1_Lot display figure. For user error: 200+no SR1.11=O Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.11=SR_ErrorCode Iarm Q2 - Door open. Q2_2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.11=0 Q2_2=P0_Etem1 SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q2_2=P0_AS_OK SR_ErrorCode=0 Q3_2=P0_AS_OK SR_ErrorCode=0 Q3_2=P0_AS_OK SR_ErrorCode=0 Q3_2=P0_AS_OK SR_ErrorCode=0 Q3_2=P0_AS_OK SR_ErrorCode=0 Q3_2=P0_AS_OK SR_ErrorCode=0 Q4_2=P0_AS_OK SR_ErrorCode=0 Q4_3=P0_AS_OK SR_ErrorCode=0 Q4_3=P0_AS_OK SR_ErrorCode=0 Q4_3=P0_AS_OK SR_Er				
00.2=P0_AS_0K Robot auto stop - Expansion BT50 relay 01.1=P1_PS Machine Protective Stop Iarm 03 - Machine hatch open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_Hatch_OK_KO_AS_OK_SR_ErrorCode=0 SR1.10=CO SR1.11=0 GM1.1=P1_Hatch_OK Hatch closed Q0.2=P0_AS_OK RS1.10=SQ SR1.11=0 SR1.11=0 GM1.1=P1_Hatch_OK Hatch closed Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_ErrorCode Error code Iarm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. Error code Iarm 01 - Emergency stop actuated. Do error the error stor from the Pluto itself over User Errors. P1_ES_OK_SR_ErrorCode=0 SR_	M1.0=HB_Hatch_OK	Help Bit - Hatch closed		
Q1.1=P1_PS Machine Protective Stop Iarm 03 - Machine hatch open. ogenerate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto liself over User Errors. P1_Hatch_OK P0_AS_OK SR_ErrorCode=0 SR1.11=0 SR_PlutoDisplay=203 SR1.10=203 MALI 002 SR1.11=0 SR_PlutoDisplay=203 SR1.10=203 Machine Protective Stop SR_PlutoDisplay=203 SR1.10=204 SR_PlutoDisplay=204 SR1.10=SR_ProrCode Error code Iarm 02 - Door open. ogenerate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto liself over User Errors. P0_Eden1 SR_ErrorCode=0 SR1.11=SR_ErrorCode SR_PlutoDisplay=202 SR1.10=202 SR_PlutoDisplay=202 SR1.10=202 SR_PlutoDisplay=202 SR1.10=SR_PlutoDisplay=202 SR1.10=202 SR_PlutoDisplay=202 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=201 SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay SR1.10=SR_PlutoDisplay=201	Q0.2=P0_AS_OK	Robot auto stop - Expansion BT50 relay		
larm 03 - Machine hatch open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1 Hatch_OK_P0_AS_OK_SR_ErrorCode=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.10=20 SR1.10=20 SR1.10=20 SR1.10=20 SR1.10=20 SR1.10=20 SR1.10=20 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11=0 SR1.10=20 SR1.11=0 SR1.11= SRE.FrorCode=0 SR1.11=0 SR1.11=SRE.FrorCode=0 SR1.11=0 SR1	Q1.1=P1_PS	Machine Protective Stop		
larm 03 - Machine hatch open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto liself over User Errors. P1, Hatch, OK P0, AS_OK SR, ErrorCode=0 SR1.11=0 SR1.10=203 SR1.10=204 SR1.1				
o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_Hatch_OK P0_AS_OK SR_ErrorCode=0 SR1.10=203 SR1.10=203 SR1.10=203 SR1.10=203 SR1.10=204 SR1.10=204 SR1.10=204 SR1.10=204 SR1.10=205 SR1.10=SR_PlutoDisplay=204 SR1.10=SR_PlutoDisplay SR1.10=SR_ErrorCode Error code Iarm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 SR1.11=SR_ErrorCode= Iarm 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay=202 SR1.11=0 SR1.11=SR_ErrorCode= Iarm 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_ES_OK SR_ErrorCode=0 SR1.11=SR_ErrorCode=0 SR1.10=SR_PlutoDisplay=201 SR1.10=SR_PlutoDispla	larm 03 - Machine hatch open.			
o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. SR_PlutoDisplay=203 SR1.11=0 SR1.10=0 SR1		of 000 - 000 one has written to the display of the Dista		
P1. Hatch_OK P0. AS_OK SR. ErrorCode=0 SR. PlutoDisplay=203 SM1.1 Q0.2 SR1.11=0 SR1.10=203 GM1.1=P1_Hatch_OK Hatch closed G02=P0.4S_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR SR1.11=SR_ErrorCode Error code Iarm 02 - Door open. o generate User Errors. P0_Eden1 SR_ErrorCode=0 SR_PlutoDisplay=202 Q2_ SR1.11=0 SR_PlutoDisplay=202 Q3_ SR1.11=0 SR_PlutoDisplay=202 Q3_ SR1.11=0 SR_PlutoDisplay=201 Q2_=PO_Eden1 Door Eden sensor - Dynamic A SR1.11=8_ErrorCode Error code Iarm 01 - Emergency stop actuated. o generate User Errors. Q1_=E_S_OK SR_ErrorCode=0 SR_PlutoDisplay=201 SM1.0 SR1.11=0 SR_PlutoDisplay=201 SM1.0	o generate User Errors (UE) a value (check of System Register 11 (SB11)	of 200 - 299 can be written to the display of the Pluto.		
P1 Hatch_OK_P0_AS_OK_SR_ErrorCode=0 SR_PlutoDisplay=203 SM1.1 Q0_2 SR1.11=0 GM1.1=P1_Hatch_OK Hatch closed Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 02 - Door open. Error code o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. SR_PlutoDisplay=202 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=202 0.2 SR_ErrorCode=0 SR_PlutoDisplay=202 SR1.11=0 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. Door Eden sensor - Dynamic A SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. SR_PlutoDisplay=201 o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto tiself over User Errors. P1_ES_OK_SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.10=SR_PlutoDisplay Pluto display figure. For user				
All 1 00.2 SR1.11=0 SR1.11=0 GM1.1 00.2 SR1.11=0 SR1.11=0 GM1.1=P1_Hatch_0K Hatch closed Barbot auto stop - Expansion BT50 relay SR1.11=0 GM1.1=SR_ErrorCode Error code Error code Error code Iarm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto litself over User Errors. SR_PlutoDisplay=202 SR1.11=0 0.2 SR1.11=0 SR_PlutoDisplay Pluto display figure. For user error: 200+no SR_PlutoDisplay=202 SR1.10=202 0.2 SR1.11=0 SR_PlutoDisplay=202 SR1.11=0 SR_PlutoDisplay=202 SR1.11=0 0.2=P0_Eden1 Door Eden sensor - Dynamic A SR_PlutoDisplay=202 SR1.10=202 0.2=P0_Eden1 Door Eden sensor - Dynamic A SR_PlutoDisplay=201 SR1.11=202 0.2=P0_Eden1 Door Eden sensor - Dynamic A SR_PlutoDisplay=201 SR1.11=0 0.2=P0_Eden1 Door Eden sensor - Dynamic A SR_PlutoDisplay=201 SR1.11=0 SR1.11=SR_ErrorCode Error code Error code SR_PlutoDisplay=201 SR1.10=201 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.10=201 SR1.10=201 SR1.10=201 SR1.11=0 </th <th></th> <th></th> <th></th> <th></th>				
GM1.1=P1 Hatch_OK Hatch closed G02_2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code larm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. ocheck of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 0.2 SR1.11=0 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=202 0.2 SR1.11=0 Door Eden sensor - Dynamic A SR1.11=SR_ErrorCode Error code larm 01 - Emergency stop actuated. Error code o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. SR_PlutoDisplay=201 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.11=0 SR_PlutoDisplay=201 SR1.11=0 SR_PlutoDisplay=201 SR1.1	P1 Hatch OK P0 AS OK SP Err	rorCode=0	SB PlutoDisplay-203	
GM1.1=P1_Hatch_OK Hatch closed Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code larm 02 - Door open. ogenerate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 0.2 SR1.11=0 0.2=P0_Eden1 Door Eden sensor - Dynamic A SR1.11=SR_ErrorCode Error code larm 01 - Emergency stop actuated. error code o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_ES_OK SR_ErrorCode=0 SR1.11=SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.11= SR1.110= P1_ES_OK Emergency stop OK in Pluto 1 SR1.11=0 SR1.110= SR1.11=SR_ErrorCode Error code GM1.0=P1_ES_OK Emergency stop OK in Pluto 1 SR1.11=SR_ErrorCode Error code	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11	rorCode=0 =0	SR_PlutoDisplay=203 SR1.10=203	
GM1.1=P1_Hatch_OK Hatch closed Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 02 - Door open.	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11	rorCode=0 =0	SR_PlutoDisplay=203 SR1.10=203	
Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. coheck of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 0.2 SR1.11=0 SR1.10=202 SR1.11=0 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. coheck of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_ES_OK SR_ErrorCode=0 SR1.11=0 SR_PlutoDisplay=201 SR1.11=0 SR_PlutoDisplay=201 SR1.11=0 SR_PlutoDisplay=201 SR1.11=0 SR_PlutoDisplay=201 SR1.11=0 SR_PlutoDisplay=201 SR1.11=0	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11	rorCode=0 =0	SR_PlutoDisplay=203 SR1.10=203	
SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code larm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. o. check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 SR_1.10=202 0.2 SR1.11=0 SR1.10=202 0.2 SR1.11=0 Image: SR1.10=202 0.2 SR1.11=0 Image: SR1.10=202 0.2 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code larm 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. SR_PlutoDisplay=201 P1_ES_OK SR_ErrorCode=0 SR_PlutoDisplay=201 SM1.0 SR1.11=0 SR1.10=201 GM1.0=P1_ES_OK Errorgency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.10=SR_PlutoDisplay <td< td=""><td>P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11</td><td>rorCode=0 =0 Hatch closed</td><td>SR_PlutoDisplay=203 SR1.10=203</td><td></td></td<>	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11	rorCode=0 =0 Hatch closed	SR_PlutoDisplay=203 SR1.10=203	
SR1.11=SR_ErrorCode Error code Iarm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. SR_PlutoDisplay=202 .02_Eden1 SR_ErrorCode=0 SR_PlutoDisplay=202 .02_SR1.11=0 SR1.10=202 .02_EP0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. o generate User Errors. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. sR_PlutoDisplay=201 .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. sR_PlutoDisplay=201 .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. sR_PlutoDisplay=201 SR1.10=SR_ErrorCode=0 SR_PlutoDisplay=201 GM1.0=P1_ES_OK Error gency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code	P1_Hatch_OK_P0_AS_OK_SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK	rorCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay	SR_PlutoDisplay=203 SR1.10=203	
larm 02 - Door open. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. . check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P0_Eden1 SR_ErrorCode=0 SR_PlutoDisplay=202 SR1.10=202 U0.2 SR1.11=0 SR1.10=202 U0.2=P0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Idam 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. . check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_ES_OK SR_ErrorCode=0 SR_1.11=0 GM1.0=SR_1.11=0 SR_1.11=0 GM1.0=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.10=SR_PlutoDisplay Pluto bisplay =201 SR1.11=SR_ErrorCode=0 SR_1.11=0 GM1.0=SR_1.11=0 SR_1.11=0 GM1.0=SR_1.11=0 SR_1.11=0 GM1.0=SR_1.11=SR_ErrorCode Error code	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay	rorCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no	SR_PlutoDisplay=203 SR1.10=203	
o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. SR_Pluto Bisplay=202 o.2 SR1.11=0 SR_Pluto Bisplay=202 0.2 SR1.11=0 SR_Pluto Bisplay=202 0.2 SR1.11=0 SR_Pluto Bisplay=202 0.2 SR1.11=0 SR_Pluto Bisplay=202 0.2 SR1.10=202 SR1.10=202 0.2 SR1.10 Door Eden sensor - Dynamic A SR1.10=SR_Pluto Display Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. SR_Pluto Display=201 o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. SR_PlutoDisplay=201 SR1.11=SR_ErrorCode=0 SR_Pluto Display=201 SR1.11=0 SR_Pluto Display=201 SR1.11=0 SR_Pluto Display=201 GM1.0=P1_ES_OK Emergency stop OK in Pluto 1 SR1.10=SR_Pluto Display Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Emergency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode	rorCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code	SR_PlutoDisplay=203 SR1.10=203	
P0_Eden1 SR_ErrorCode=0 SR_PlutoDisplay=202 0.2 SR1.11=0 SR_1.10=202 I0.2=P0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. • check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_ES_OK SR_ErrorCode=0 GM1.0=P1_ES_OK Emergency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode larm 02 - Door open.	rorCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code	SR_PlutoDisplay=203 SR1.10=203	
Sh_PlutoDisplay=202 Sh_PlutoDisplay=202 0.2 SR1.11=0 0.2 SR1.11=0 0.2 SR1.10=0 SR1.10=Sh_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. P1_ES_OK SR_PlutoDisplay_201 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no GM1.0=P1_ES_OK Emergency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode larm 02 - Door open. o generate User Errors (UE) a value of . check of System Register 11 (SR11)	orCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto.	SR_PlutoDisplay=203 SR1.10=203	
I0.2=P0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated.	P1_Hatch_OK_P0_AS_OK_SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode larm 02 - Door open. o generate User Errors (UE) a value of . check of System Register 11 (SR11)	orCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto.) in the Pluto prioritises errors from the Pluto itself over User Errors.	SR_PlutoDisplay=203 SR1.10=203	
IO.2=P0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Iarm 01 - Emergency stop actuated. . o generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto. . .check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors. . P1_ES_OK SR_ErrorCode=0 SR_1.10=201 GM1.0=P1_ES_OK Emergency stop OK in Pluto 1 . SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no . SR1.10=SR_ErrorCode Error code . .	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode larm 02 - Door open. o generate User Errors (UE) a value of check of System Register 11 (SR11) P0_Eden1 SR_ErrorCode=0 0.2 SR1.11=0	orCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto.) in the Pluto prioritises errors from the Pluto itself over User Errors.	SR_PlutoDisplay=203 SR1.10=203	
I0.2=P0_Eden1 Door Eden sensor - Dynamic A SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code Idarm 01 - Emergency stop actuated.	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode Jarm 02 - Door open. To generate User Errors (UE) a value of a check of System Register 11 (SR11) P0_Eden1 SR_ErrorCode=0 0.2 SR1.11=0	orCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto.) in the Pluto prioritises errors from the Pluto itself over User Errors.	SR_PlutoDisplay=203 SR1.10=203	
SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code alarm 01 - Emergency stop actuated.	P1_Hatch_OK_P0_AS_OK_SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode Jarm 02 - Door open. To generate User Errors (UE) a value of the check of System Register 11 (SR11) P0_Eden1_SR_ErrorCode=0 0.2 SR1.11=0	orCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto. in the Pluto prioritises errors from the Pluto itself over User Errors.	SR_PlutoDisplay=203 SR1.10=203	
SR1.11=SR_ErrorCode Error code Jarm 01 - Emergency stop actuated.	P1_Hatch_OK_P0_AS_OK_SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode larm 02 - Door open. to generate User Errors (UE) a value of the check of System Register 11 (SR11) P0_Eden1_SR_ErrorCode=0 0.2 SR1.11=0 10.2=P0_Eden1	PorCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto. In the Pluto prioritises errors from the Pluto itself over User Errors.	SR_PlutoDisplay=203 SR1.10=203	
larm 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. P1_ES_OK_SR_ErrorCode=0 GM1.0_SR1.11=0 GM1.0=P1_ES_OK_Emergency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code	P1_Hatch_OK_P0_AS_OK_SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode Jarm 02 - Door open. To generate User Errors (UE) a value of the check of System Register 11 (SR11) P0_Eden1_SR_ErrorCode=0 0.2 SR1.11=0 J I0.2=P0_Eden1 SR1.10=SR_PlutoDisplay	PorCode=0 =0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200+no Error code of 200 - 299 can be written to the display of the Pluto. in the Pluto prioritises errors from the Pluto itself over User Errors.	SR_PlutoDisplay=203 SR1.10=203	
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io 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_ES_OK SR_ErrorCode=0 SR_PlutoDisplay=201 SR1.11=0 SR1.10=201 GM1.0=P1_ES_OK Emergency stop OK in Pluto 1 SR1.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no SR1.11=SR_ErrorCode Error code	P1_Hatch_OK P0_AS_OK SR_Err GM1.1 Q0.2 SR1.11 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode Jarm 02 - Door open. o generate User Errors (UE) a value of check of System Register 11 (SR11) P0_Eden1 SR_ErrorCode=0 0.2 SR1.11=0 I0.2=P0_Eden1 SR1.10=SR_PlutoDisplay SR1.11=SR_ErrorCode Large 04 ErrorCode	Proceed The sensor - Dynamic A Pluto display figure. For user error: 200+no Error code Door Eden sensor - Dynamic A Pluto display figure. For user error: 200+no Error code	SR_PlutoDisplay=203 SR1.10=203	
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JOKAB SAFETY 2:23

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

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 the Jokab Safety web site.



Technical data - GATE-P2		
Manufacturer:	ABB AB/Jokab Safety, Sweden	
Article number/ordering data:	2TLA020071R7800 GATE-P2	
Databuses:	-Pluto safety bus CAN (isolated) -PROFIBUS RS485 (isolated)	
Pluto safety bus 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 slave, DP-V0	
Connections:	Top, 3-pole terminal for Pluto safety bus (included) Front, standard 9-pole PROFIBUS connection. Bottom, 2-pole terminal for 24 V DC (included)	
Status indication:	Pluto safety bus status indication via LED PROFIBUS status indication via LED	
Operating voltage:	24 V DC, -15% till +20%	
Current at 24 V:	< 100 mA (recommended fuse ≤6 A)	
Dimensions (w x h x d):	22.5 x 101 x 119 mm	
Installation:	35 mm DIN rail	
Operating temperature (ambient):	-10°C to + 55°C	
Temperature, transport and storage:	-25°C to + 55°C	
Humidity:	EN 60 204-1 50% at 40°C (ambient 90% at 20°C)	
Enclosure classification:	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529	



Gateway block schematic diagram - Pluto Profibus



www.jokabsafety.com

JOKAB SAFETY 2:25

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

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 nonsafety-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 Jokab Safety web site.



Technical data - GATE-D2			
Manufacturer	ABB AB/Jokab Safety, Sweden		
Article number/ordering data:	2TLA020071R8200 GATE-D2		
Databuses:	-Pluto safety bus CAN (isolated) -DeviceNet CAN (isolated)		
Pluto safety bus 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, 3-pole terminal for Pluto safety bus (included) Front, 5-pole terminal for DeviceNet (included) Bottom, 2-pole terminal for 24 V DC (included)		
Status indications:	Pluto safety bus status indication via LED DeviceNet MNS status indication via LED		
Operating voltage:	24 V DC, -15% till +20%		
Current at 24 V:	< 100 mA (recommended fuse ≤6 A)		
Dimensions (w x h x d):	22.5 x 101 x 119 mm		
Installation:	35 mm DIN rail		
Operating temperature (ambient):	-10°C to + 55°C		
Temperature, transport and storage:	-25°C to + 55°C		
Humidity:	EN 60 204-1 50% at 40°C (ambient 90% at 20°C)		
Enclosure classification:	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 Plutobridge

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

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 nonsafety-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		
Manufacturer	ABB AB/Jokab Safety, Sweden	
Article number/ordering data:	2TLA020071R8100 GATE-C2	
Databuses:	-Pluto safety bus CAN (isolated) -CANopen CAN (isolated)	
Pluto safety bus 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 (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, 3-pole terminal for Pluto safety bus (included) Front, 5-pole terminal for CANopen (included) Bottom, 2-pole terminal for 24 V DC (included)	
Status indications:	Pluto safety bus status indication via LED CANopen status indication via LED	
Operating voltage:	24 V DC, -15% till +20%	
Current at 24 V:	< 100 mA (recommended fuse ≤6 A)	
Dimensions (w x h x d):	22.5 x 101 x 119 mm	



Installation:	35 mm DIN rail
Operating temperature (ambient):	-10°C to + 55°C
Temperature, transport and storage:	-25°C to + 55°C
Humidity:	EN 60 204-1 50% at 40°C (ambient 90% at 20°C)
Enclosure classification:	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529

Gateway block schematic diagram - Pluto CANopen



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Pluto gateway GATE-E2



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. 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

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		
Manufacturer	ABB AB/Jokab Safety, Sweden	
Article number/ ordering data:	2TLA020071R8300 GATE-E2	
Buses:	Pluto-bus CAN (isolated) Profinet (isolated) Ethernet/IP (isolated) Modbus TCP (isolated)	
Pluto safety bus speeds	100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)	
Ethernet	10/100 Mbit/s Half and full duplex	
Ethernet protocol	Status from and to Pluto safety PLC - EtherNet/IP - PROFINET (in development) - 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 Torming Learner (TCD/ID)	
EtherNet/IP	According to ODVA "CIP Edition 3.2" and "EtherNet/IP Adaption of CIP Edition 1.3". Minimum RPI of 50 ms	
PROFINET	PROFINET	
Modbus TCP	According to the Modbus organisation, version 1.0b (approx. 20 messages per second).	
Binary server (TCP/IP)	Simple TCP/IP protocol to send status from/to the Pluto system.	

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.	C
IP address	Static sharing via web server or via programming port.	2
Gateway configuration	Takes place via EtherNet/IP, PROFINET, Modbus TCP or via the binary TCP/IP server.	
Connections	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)	
Status indications	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)	F
Operating voltage	24 V DC, -15 % till +20 %	
Current at 24 V	< 150 mA (recommended fuse ≤6 A)	6
Dimensions (w x h x d):	35 x 101 x 120 mm	
Installation	35 mm DIN rail	
Operating temperature (ambient)	-10°C to + 55°C	-
Temperature, transport and storage	-25°C to + 55°C	
Humidity	EN 60 204-1 50 % at 40°C (ambient 90 % at 20°C)	ſ
Enclosure classification	Enclosure IP 20 - IEC 60 529 Terminals IP 20 - IEC 60 529	(

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Gateway block schematic diagram - Pluto Ethernet





Pluto Safe Encoder



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.

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

Technical data – Safe Encoder RSA 597		
Manufacturer	ABB AB/Jokab Safety, Sweden	
Article number/ordering data:	2TLJ020070R3600 RSA 597	
Ambient temperature	-40°C +70°C	
Temperature, transport and storage	-30°C +70°C	
Ingress protection class	IP-67 in accordance with IEC 60529	
At shaft inlet	IP-66 in accordance with IEC 60529	
Vibration (55 to 2000 Hz)	< 300 m/s ² in accordance with IEC 60068-2-6	
Shock (6ms)	< 2,000 m/s ² in accordance with IEC 60068-2-27	
Material, enclosure	Aluminium	
Surface treatment	Painted and chromed or anodised	
Weight	Approx. 300 g	
Accuracy and resolution		
Resolution	13 bits, 8192 positions per rotation	
Accuracy	± 1/2 LSB (Least Significant Bit)	
Operating voltage	9-36 V dc	
Polarity-protected	Yes	
Short-circuit protected	Yes	
Databus speed	5 kbit/s - 1 Mbit/s, preset at 500kbit/s	
Address input	Active low	
Code type	Binary	
Programmable functions	Resolution, 0 position Direction, Databus speed	
Current consumption	50 mA at 24V dc	
Max current consumption	100 mA	



Safe Encoder RSA 597 – single turn







Technical data – Safe Encoder RSA 698		
Manufacturer	ABB AB/Jokab Safety, Sweden	
Article number/ordering data:	2TLJ020070R3700 RSA 698	
Ambient temperature	-40°C +70°C	
Temperature, transport and storage	-30°C +70°C	
Ingress protection class	IP-67 in accordance with IEC 60529	
At shaft inlet	IP-66 in accordance with IEC 60529	
Vibration (55 to 2000 Hz)	< 100 m/s ² in accordance with IEC 60068-2-6	
Shock (6ms)	< 2,000 m/s ² in accordance with IEC 60068-2-27	
Material, enclosure	Aluminium	
Surface treatment	Anodised	
Weight	Approx. 400g	
Accuracy and resolution		
Resolution, total	25 bit 13 bits, 8192 positions per rotation 12 bits, 4096 rotations	
Accuracy	± 1 LSB (Least Significant Bit)	
Operating voltage	9-36 V dc	
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 24V dc	
Max current consumption	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

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