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 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. It is also easy to both read and write to global memory locations available across the Pluto bus.

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

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

extend the Pluto network. You can also connect speed and position sensors via the Pluto bus.

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.

Single Pluto - Pluto without safety bus

The Pluto models S20 and S46 without bus communication are stand alone units which are perfectly suited for smaller systems that do not require communication with other Pluto units or gateways. In all other ways the S20 has the same functionality as the B20 model, and the S46 as the B46 model – but without a safety bus connection.

Current monitoring (Pluto A20 only)

Pluto A20 differs from the other models in that it 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.

Pluto for the AS-i system

Pluto AS-i can either be AS-i master on the AS-i bus or work together with an AS-i master as a monitor. It includes AS-i nodes, analogue and digital outputs, as well as safety outputs. Also available as Pluto B42 AS-i for more I/O. For more information see the AS-i safety chapter.

Pluto D20 and D45 - with analogue inputs

Pluto D20 is equipped with 4, and Pluto D45 with 8, safe 4-20mA/0-10V analogue inputs. These can be configured as either "ordinary" failsafe inputs, as analogue inputs 0-10V or as analogue inputs 4-20mA. For an application to reach SIL 3/PL e it is required that two sensors in parallel with one input each are being used.

Counter inputs Pluto D45

For Pluto D45 four of the analogue inputs can be configured as counter inputs (pulse counting) which work for frequencies up to 14000 Hz. As counter inputs IA0 – IA3 can be used in two ways, Up counting or Up/Down counting.

Pluto B22 - expansion module with increased number of inputs

Pluto B22 is an expansion module without safety outputs. It is equipped with 14 safe inputs and 8 safe inputs or non-safe outputs.

Technical info - Dynamic signal



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

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

Technical info - 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.

Technical info - 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.

Technical info - 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).

Technical info - Q - individual failsafe outputs

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

Technical info - 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.

Technical info - 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.

Function Blocks for Analogue inputs Pluto D20 and D45

Configuration in Pluto Manager

The inputs can be configured under "I/O Options" in Pluto Manager. As analogue inputs they can be configured either as 0-10V inputs, or as 4-20mA inputs. For Pluto D45 they can also be configured as Counter inputs.

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	1A0.3	Analog input 👻	4-20nA +	Thought Thought

IA0.0 and IA0.1 are configured as Analogue input 0-10V, and IA0.2 and IA0.3 are configured as Analogue input 4-20mA.

ReadVoltage and ReadCurrent function blocks

For analogue input 0-10V the function block "ReadVoltage" is needed, and for analogue input 4-20mA the function block "ReadCurrent" is needed. There are also 32-bit versions of these function blocks ("ReadVoltage_32" and "ReadCurrent_32") for use with Double Registers. As output from the blocks there is one output with the absolute value in V or mA, and one output which can be scaled as desired. The picture and table below shows the "ReadCurrent" function block only, but "ReadVoltage" works in the same way.



ReadCurrent function block. Description of inputs and outputs:

inp	Input connected to the block.
Value 4mA	Input value for scaling. At 4mA the output "Scaled value" will
	show this value.
Value 20mA	Input value for scaling. At 20mA the output "Scaled value" will
	show this value.
Q	OK output. Value is within range.
Current	Output with calibrated absolute value in µA.
Scaled Value	Output with scaled value.

Counter inputs Pluto D45

For Pluto D45 the inputs IA0 – IA3 can be configured as counter inputs (pulse counting). As counter inputs IA0 – IA3 can be used in two ways, Up counting or Up/Down counting.

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Configuration of counter input

Up count

When the input is configured for Up count Pluto counts the pulses on the input. Via a function block the user gets the pulse rate which for example can represent a speed. The sensor can be anything, like an inductive sensor, photocell or incremental encoder (HTL, 24V).



Example of speed monitoring. The sensors can for example be proximity switches or photocells. Any of the inputs IA0..IA3 can be used.

Up/Down count

With the function Up/Down count it is possible to detect the direction of the movement. A pair of inputs, IA0/IA1 and/or IA2/IA3 can be configured as Up/Down counters. In order to make up/down counting it requires that the sensors can produce A/B-pulses. A/B-pulses are two square wave signals that are 90° phase shifted to each other. The sensor is typically an incremental encoder with HTL (24V) interface.



Example of speed monitoring with incremental encoders leaving A and B pulses to two inputs, IA0-IA1 or IA2-IA3. The direction is then possible to measure.

Sensor types

The upper frequency limit is dependent on the type of senor. For incremental encoders with HTL output ("push – pull") the counter inputs work for frequencies up to 14 kHz.

For photocells, proximity switches, inductive sensors etc. which normally do not have a "push – pull" output the maximum frequency might typically be 1 - 4 kHz, but the limit is also dependent on the output resistance, the cable length etc.

Function blocks for speed monitoring

For inputs configured as Up count the function block "HS_ SpeedCount_Up" shall be used.



For inputs configured as Up/Down count the function block "HS_SpeedCount_Dir" shall be used.



The function block "SpeedMon1" is intended to be used for redundant speed monitoring, but has also functions for stand still monitoring and safe low speed. It has two inputs for speed values. These input registers can take their values from different sources such as the function blocks for incremental encoders, absolute encoders, analogue inputs etc. The input "Speed" is a primary input for a speed value and "Comp-Speed" is a secondary channel for monitoring the correctness of the primary speed value.



Input connection

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

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

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



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

Reset button that uses the combined input and output facility



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

Output connector expansion



Using an expansion relay, such as BT50, the number of safe outputs in Pluto can be expanded. The connection shall be made as shown in the figure. Several expansion relays can be connected to a single Pluto safety output while retaining the safety level.

I/O Overview



Failsafe inputs / Indication outputs (not failsafe) / Dynamic outputs

1) Not S-models, S20,...

2) Current monitored only on A20



Failsafe inputs / Indication outputs (not failsafe) / Dynamic outputs

individual failsafe



Failsafe inputs / Outputs (not failsafe) / Dynamic outputs





Failsafe inputs / Outputs (not failsafe) / Dynamic outputs

- ID: Connection for identifier, which has a unique ID number that can be read by the system.
- Safety inputs (24 VDC) that are individually failsafe. 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 electromechanical components such as contactors and valves.
- Q4, Q5 Failsafe relay outputs with common potential that are individually failsafe and individually programmable.

Technical data -	120	129	· · · · ·	120	
type-specific	2000 2000 2000 2000 2000 2000 2000 2000			10000 10000 10000 10000 10000 10000 10000 10000	1 2000 20
	Pluto A20	Pluto B20	Pluto B22	D20	S20
	20 I/O	20 I/O	22 I/O	20 I/O	20 I/O
	Current monitoring			Analogue inputs	Without safety bus
Article number	2TLA020070R4500	2TLA020070R4600	2TLA020070R4800	2TLA020070R6400	2TLA020070R4700
Failsafe inputs	8 (1017)	8 (1017)	14 (1017, 120125)	8 (1017)	8 (1017)
Failsafe inputs or	8 (IQ10IQ17)	8 (IQ10IQ17)	8 (IQ10IQ17)	8 (IQ10IQ17)	8 (IQ10IQ17)
non-failsafe outputs	Max total load 2.5 A	Max total load 2.5 A	Max total load 2.5 A	Max total load 2.5 A	Max total load 2.5 A
Analogue inputs (0-10V/4-20 mA)	-	-	-	4	-
Counter inputs	-	-	-	-	-
Analogue inputs (0-27V)	1 (I5)	1 (I5)	1 (I5)	1 (I5)	1 (I5)
Failsafe relay outputs	2 (Q0Q1)	2 (Q0Q1)	-	2 (Q0Q1)	2 (Q0Q1)
Failsafe transistor outputs	2 (Q2Q3)	2 (Q2Q3)	-	2 (Q2Q3)	2 (Q2Q3)
Current monitoring	2 (IQ16, IQ17)	-	-	-	-
	0-1.0 A ±10%				
Pluto safety bus	•	•	•	•	-
Pluto AS-i bus	-	-	-	-	-
Own current consumption	100300 mA	100300 mA	100300 mA	100300 mA	100300 mA
Recommended external fuse	6A	6A	6A	6A	6A
Dimensions (w x h x d)	45 x 84 x 118 mm	45 x 84 x 118 mm	45 x 84 x 118 mm	45 x 84 x 118 mm	45 x 84 x 118 mm

Technical data - general

Colour	Grey	Failsafe outputs Q	
Operating voltage	24 VDC ±15%	Q2, Q3	Transistor, –24VDC, 800 mA
Installation	35 mm DIN rail	Output voltage tolerance	Supply voltage - 1.5 V at 800 mA
Electrical insulation	Category II in accordance with IEC 61010-1	Q0, Q1, (Q4, Q5)	Relay outputs VAC-12: 250 V/1.5 A
Safety level EN 954-1 EN ISO 13849-1	Cat. 4 Pl. e/Cat. 4		VAC-15: 250 V/1.5 A VDC-12: 50 V/1.5 A VDC-13: 24 V/1.5 A
EN 61508 EN 62061	SIL 3 SIL 3	Non-failsafe outputs Q IQ1017 (IQ2027)	Transistor +24V, PNP "open coll-
PFH _D Relay output Transistor output:0	2.00×10 ⁻⁹ 1.50×10 ⁻⁹	Max. current/output	ector" also configurable as failsafe inputs. 800 mA
Failsafe inputs I & IQ I07 (I3037, I4047) IQ1017 (IQ2027)	+24 V (for PNP sensors) +24 V (for PNP sensors)	Indicator Input/output LED Display	1 per I/O (green) 7-segments, two characters
Current at 24 V Max. overvoltage	IQ also configurable as non-failsafe outputs. 5.1 mA 27 V continuous	Pluto safety bus Max number of Pluto units on the databus Databus type	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

•			•	
Pluto B46	Pluto D45	Pluto S46	Pluto AS-i	Pluto B42 AS-i
46 I/O	45 I/O Analogue/counter inputs	46 I/O Without safety bus	AS-i bus	AS-i bus
2TLA020070R1700	2TLA020070R6600	2TLA020070R1800	2TLA020070R1100	2TLA020070R1400
24 (1017, 130137, 140147)	24 (1017, 130137, 140147)	24 (1017, 130137, 140147)	4 (1013)	20 (1013, 130147)
16 (IQ10IQ17, IQ20IQ27)	15 (IQ10IQ17, IQ20IQ26)	16 (IQ10IQ17, IQ20IQ27)	4 (IQ10IQ13)	16 (IQ10IQ27)
Max total load 2A	Max total load 2A	Max total load 2A	Max total load 2A	Max total load 2A
-	4*	-	_	-
-	8*	-	-	-
3 (l5l7)	3 (IQ10IQ12)	3 (I5I7)	4 (IQ10IQ13)	3 (l1l3)
4 (Q0Q1 & Q4Q5)	4 (Q0Q1 & Q4Q5)	4 (Q0Q1 & Q4Q5)	2 (Q0Q1)	4 (Q0Q1 & Q4Q5)
2 (Q2Q3)	2 (Q2Q3)	2 (Q2Q3)	2 (Q2Q3)	2 (Q2Q3)
-	-	-	-	-
•	•	-	•	•
-	-	-	•	•
100500 mA	100500 mA	100500 mA	100 mA	150 mA
10A	10A	10A	6A	10A
90 x 84 x 118 mm	90 x 84 x 118 mm	90 x 84 x 118 mm	45 x 84 x 118 mm	90 x 84 x 118 mm

*4 of the analogue inputs can be configured as counter inputs. The total number of analogue inputs + counter inputs = 8.

Pluto AS-i bus		Additional Response times	
Master profile	M2	Databus between Pluto units	10 ms
Number of slave units	31/62*	Databus between Pluto units	10–40 ms
Bus operation mode	Master	at fault condition	
	Safety monitor	Enclosure classification	
	Safety monitor, slave and safe I/O	Enclosure	IP40, IEC 60 529
	module.	Connection terminals	IP20, IEC 60 529
Bus cable length:	Up to 500 m	The terminal blocks are detachable	without needing to disconnect the
	100 m between each repeater	wiring. The units shall be assemble	ed with a gap of at least 5 mm.
Iemperature			
Ambient temperature	–10°C to +50°C		
Storage and transport	–25°C to +55°C		
Response times			
Dyn. A or static input to relay	<20.5 ms + program exec. time		
output			
Dyn. A or static input to	<16.5 ms + program exec. time		
transistor output			
Dyn. B or Dyn. C input to	<23 ms + program exec. time		
relay output			
Dyn. B or Dyn. C input to	<19 ms + program exec. time		
transistor output			
Software setting "NoFilt"	5 ms shorter response time on		
	I & IQ inputs		
AS-i bus to relay output	<33 ms + prog. execution time		
AS-i bus to transistor output	<29 ms + prog. execution time		

APPLICATION EXAMPLE - Pluto

Robot cell with Pluto



Description

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

Function

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

After the door has been opened, the system must be reset by means of the reset button on the outside of the door. Emergency stop is reset when the pressed-in button is pulled out. NOTE. The cell operating cycle must not however start immediately on resetting the emergency stop or the door.

Electrical connections



APPLICATION EXAMPLE - Pluto

PLC code Pluto 0 – Robot cabinet

4				
	Start			
2	Two channel monitoring with automatic re	eset of emergency stop at the door		
2			_	
	PU_ES1_Ch1 10.0		TC1S P G	WOLDS_OK
			In1 Q	-< >
	P0 ES1 Ch2			
	10.1			
			In2	
			Start	
			Jan	
	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		
3	Emergency stop of robot.			
	When the emergency stop is actuated th	e robot will make an emergency stop		
	In order to restore safety requires the em	hergency stop button needs to be reset.		
	An emergency stop from the machine pa	inel will also emergency stop the robot.		
	P0_ES_OK P1_ES_OK		P	0_ES
			Q	-< ->
	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		
4	Auto stop of robot.			
	When the deer to the rebet cell is append	d the relation oute standard		
	To reset the safety the door needs to be	closed and the reset button pressed and released.		
	Note that IQ15 of the Pluto is used both a Constant light means reset is not possible	as a button in and to indicate diffirent reset states.		
	Flash 0.4 s high, 0.6 s low means reset is	s possible but not performed.		
	No light means reset has been performed	d and the safety is ok.		
	P0_Eden1		ResetT P	0_AS_OK
	10.15		Q	0_LB1_Out
	N		Reset	-< >
			IndReset	
			Test	
		Depart Depart Light butter insult. Dimensio 4		
	10.15=PU_LB1_IN 10.2=P0_Eden1	Heset Door - Light button input - Dynamic A Door Eden sensor - Dynamic A		
	Q0.15=P0_LB1_Out	Reset Door - Light button output - Static		
	Q0.2=P0_AS_OK	Robot auto stop - Expansion BT50 relay		

5 Alarm 03 - Machine hatch open.

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

P1_Hatch_OK P0_AS_OK SR_ErrorCode GM1.1 Q0.2 SR0.11=0	=0	SR_PlutoDisplay=203 SR0.10=203
GM1.1=P1 Hatch OK	Hatch closed	
Q0.2=P0 AS OK	Robot auto stop - Expansion BT50 relav	
SR0.10=SR_PlutoDisplay	Pluto display figure. For user error: 200+no	
SR0.11=SR_ErrorCode	Error code	
Alarm 02 - Door open		
To generate User Errors (UE) a value of 200 -	299 can be written to the display of the Pluto.	
A check of System Register 11 (SR11) in the F	Pluto prioritises errors from the Pluto itself over User Errors.	
P0 Eden1 SR ErrorCode=0		SR PlutoDisplay=202
I0.2 SR0.11=0		SR0.10=202
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 -	200 can be written to the display of the Pluto	
A check of System Register 11 (SR11) in the F	Pluto prioritises errors from the Pluto itself over User Errors.	
P0_ES_OK SR_ErrorCode=0		SR_PlutoDisplay=201
GIVIO.0 SR0.11=0		3R0.10=201
GM0.0=P0_ES_OK	Emergency stop OK in Pluto 0	
SR0.10=SR_PlutoDisplay	Pluto display figure. For user error: 200+no	
SR0.11=SR_ErrorCode	Error code	

APPLICATION EXAMPLE - Pluto

PLC code Pluto 1 – Machine cabinet

Start				
Two channels				
i wo channel r	nonitoring with automatic rese	et of emergency stop at the machine natch.		
P1_ES1_Ch1 11.1			TC1S	P1_ES_0 GM1.0
			<mark>In1</mark>	<mark>a</mark> < >
P1_ES1_Ch2	1			
11.2				
			In2	
			<mark>Start</mark>	
				-
GM1.0=P1_E	:S_OK I_Ch1	Emergency stop OK in Pluto 1 Emergency stop 1 channel 1- Dynamic A non-inverter	d	
11.2=P1_ES1	_Ch2	Emergency stop 1 channel 2 - Static	-	
.	1. 1. 1			
I wo channel r	nonitoring with automatic rese	et of interlocking switch of the machine hatch.		
P1_IS1_Ch1 I1.3			TC1S	P1_Hatch_ GM1.1
			In1 Q	
P1 IS1 Ch2				
11.4				
			Start	
GM1.1=P1_H	latch_OK	Hatch closed		
I1.3=P1_IS1_	_Ch1 Ch2	Interlocking switch channel 1 - Dynamic A non-inverte	ed	
11.1=1 1_101_	_0/12	monooning owner on annor 2 Claud		
Emergency sto	op of machine.			
When the eme	rgency stop is actuated the n	nachine will make an emergency stop.		
An emergency	stop from the robot will also	emergency stop the machine.		
P1 ES OK	P0 ES OK			P1 ES
GM1.0	GM0.0			Q1.0
GMO 0-PO F	IS OK	Emergency stop OK in Pluto 0		
GM1.0=P1_E	ES_OK	Emergency stop OK in Pluto 1		
Q1.0=P1_ES		Machine Emergency Stop		
Monitoring of t	he hatch.			
	h is opened the monitoring of	f the hatch is inactive.		
When the hatc	allety the natch needs to be ci	a button in and to indicate different reset states.		
When the hato To reset the sa Note that IQ15	of the Pluto is used both as			
When the hate To reset the sa Note that IQ15 Constant light Flash 0.4 s hic	5 of the Pluto is used both as means reset is not possible, s (h, 0.6 s low means reset is p	safety not ok. ossible but not performed.		
When the hatc To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means	5 of the Pluto is used both as means reset is not possible, s ph, 0.6 s low means reset is p s reset has been performed a	safety not ok. ossible but not performed. Ind the safety is ok.		
When the hatc To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means	5 of the Pluto is used both as means reset is not possible, : Jh, 0.6 s low means reset is p s reset has been performed a	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT	HB_Hatch_
When the hatc To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means P1_Hatch_Ol GM1.1	5 of the Pluto is used both as means reset is not possible, : h, 0.6 s low means reset is p s reset has been performed a <	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT	HB_Hatch_ M1.0
When the hatk To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means P1_Hatch_OH GM1.1	5 of the Pluto is used both as means reset is not possible, : h, 0.6 s low means reset is p s reset has been performed a	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT	HB_Hatch_ M1.0
When the hatk To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light mean: P1_Hatch_OI GM1.1 P1_LB1_In P1_LB1_In 11.15	5 of the Pluto is used both as means reset is not possible, : h, 0.6 s low means reset is p s reset has been performed a	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT In1 Q HI M	HB_Hatch_ M1.0
When the hatk To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means P1_Hatch_OI GM1.1 P1_LB1_In P1_LB1_In I1.15	5 of the Pluto is used both as means reset is not possible, : jh, 0.6 s low means reset is p s reset has been performed a <	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT In1 Q HI M Reset	HB_Hatch_ M1.0 3_Ind_Hatch_ 1.1
When the hatk To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means P1_Hatch_Of GM1.1 P1_LB1_In I1.15 N	5 of the Pluto is used both as means reset is not possible, : h, 0.6 s low means reset is p s reset has been performed a	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT In1 Q HI M Reset IndReset	HB_Hatch_ M1.0 3_Ind_Hatch_ 1.1
When the hatt To reset the si Note that IQ15 Constant light Flash 0.4 s hig No light means P1_Hatch_OF GM1.1 P1_LB1_In I1.15 N	5 of the Pluto is used both as means reset is not possible, : h, 0.6 s low means reset is p s reset has been performed a	safety not ok. ossible but not performed. Ind the safety is ok.	ResetT In1 Q HI M Reset IndReset	HB_Hatch_ M1.0 3_Ind_Hatch_ 1.1

GM1.1=P1_Hatch_OK		
	Hatch closed	
I1.15=P1_LB1_In	Reset Hatch - Light button input - Dynamic A	
M1.0=HB_Hatch_OK	Help Bit - Hatch closed	
M1.1=HB_Ind_Hatch_OK	Help Bit - Indication Reset Hatch	
Light button indication of the reset of the h	hatch.	
If the robot cell's door is closed and reset	no light indication is needed inside the cell.	
HP Ind Hotob OK DO AS OK	5 • • • • • • • • • • • • • • • • • • •	D1 LD1
M1.1 Q0.2		Q1.15
		(
M1.1=HB_INd_Hatch_OK	Help Bit - Indication Reset Hatch	
QU.2=PU_AS_OK	Robot auto stop - Expansion B i 50 relay	
Q1.15=P1_LB1_Out	Resel Halch - Light button output - Static	
Protective stop of the machine.		
Either the hatch is closed and reset or the This means the cell can work with the hat	e door to the robot cell is closed and reset. ich both open or closed as long as the cell's door is closed and	d reset.
HB_Hatch_OK		P1_PS
M1.0		Q1.1
		(
P0_AS_OK		
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	
Alarm 03 - Machine hatch open. To generate User Errors (UE) a value of 2 A check of System Register 11 (SR11) in	200 - 299 can be written to the display of the Pluto. the Pluto prioritises errors from the Pluto itself over User Erro	ors.
Alarm 03 - Machine hatch open. To generate User Errors (UE) a value of 2 A check of System Register 11 (SR11) in P1_Hatch_OK P0_AS_OK SR_ErrorO	200 - 299 can be written to the display of the Pluto. the Pluto prioritises errors from the Pluto itself over User Errc Code=0	SR_PlutoDisplay=203
Alarm 03 - Machine hatch open. To generate User Errors (UE) a value of 2 A check of System Register 11 (SR11) in P1_Hatch_OK P0_AS_OK SR_ErrorC GM1.1 Q0.2 SR1.11=0	200 - 299 can be written to the display of the Pluto. the Pluto prioritises errors from the Pluto itself over User Erro Code=0	ors. SR_PlutoDisplay=203 SR1.10=203
Alarm 03 - Machine hatch open. To generate User Errors (UE) a value of 2 A check of System Register 11 (SR11) in P1_Hatch_OK P0_AS_OK SR_ErrorC GM1.1 Q0.2 SR1.11=0	200 - 299 can be written to the display of the Pluto. the Pluto prioritises errors from the Pluto itself over User Erro Code=0	ors. SR_PlutoDisplay=203 SR1.10=203
Alarm 03 - Machine hatch open. To generate User Errors (UE) a value of 2 A check of System Register 11 (SR11) in P1_Hatch_OK P0_AS_OK SR_ErrorC GM1.1 Q0.2 SR1.11=0 GM1.1-P1 Hatch OK	200 - 299 can be written to the display of the Pluto. the Pluto prioritises errors from the Pluto itself over User Erro Code=0	ors. SR_PlutoDisplay=203 SR1.10=203
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Alarm 03 - Machine hatch open. To generate User Errors (UE) a value of 2 A check of System Register 11 (SR11) in P1_Hatch_OK P0_AS_OK SR_ErrorC GM1.1 Q0.2 SR1.11=0 GM1.1=P1_Hatch_OK Q0.2=P0_AS_OK SR1 10_SR_PlutoDisplay	200 - 299 can be written to the display of the Pluto. the Pluto prioritises errors from the Pluto itself over User Erro Code=0 Hatch closed Robot auto stop - Expansion BT50 relay Pluto display figure. For user error: 200400	ors. SR_PlutoDisplay=203 SR1.10=203
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