Pluto Safety PLCs
Product overview
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<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why should I use the Pluto Safety PLC?</td>
<td>2-3</td>
</tr>
<tr>
<td>Pluto Safety PLC facilitates the design of your safety systems</td>
<td>4-5</td>
</tr>
<tr>
<td>Connection examples for Pluto with Safety Bus</td>
<td>6-7</td>
</tr>
<tr>
<td>Pluto D20 and Pluto D45</td>
<td>8-9</td>
</tr>
<tr>
<td>Input connection</td>
<td>10</td>
</tr>
<tr>
<td>I/O Overview</td>
<td>11-13</td>
</tr>
<tr>
<td>Technical data</td>
<td>14-15</td>
</tr>
<tr>
<td>Application example</td>
<td>16-23</td>
</tr>
<tr>
<td>Pluto Gateway GATE-P2</td>
<td>24-25</td>
</tr>
<tr>
<td>Pluto Gateway GATE-D2</td>
<td>26-27</td>
</tr>
<tr>
<td>Pluto Gateway GATE-C2</td>
<td>28-29</td>
</tr>
<tr>
<td>Pluto Gateway GATE-E2</td>
<td>30-31</td>
</tr>
<tr>
<td>Pluto Safety Encoders</td>
<td>32-35</td>
</tr>
<tr>
<td>Pluto identifier IDFIX</td>
<td>36</td>
</tr>
<tr>
<td>Pluto Manager</td>
<td>37-38</td>
</tr>
<tr>
<td>Component list - Pluto Safety PLC</td>
<td>39-40</td>
</tr>
<tr>
<td>Catalog number alphanumeric</td>
<td>Inside back cover</td>
</tr>
</tbody>
</table>
Why should I use the Pluto Safety PLC?

...for simplifying the design!

Pluto is an “All-Supervisor” Safety PLC concept that simplifies design of safety systems and achieves the highest safety (Category 4) according to EN 954-1/EN ISO 13849-1 and SIL 3 according to IEC/EN 61508.

The key difference between Pluto and conventional Safety PLCs is that there is no “supervisor-subordinate” relationship between the control units connected to the Safe Bus. All Plutos are “supervisor” units and can see each others’ inputs and outputs. Using this concept, each Pluto can make decisions about its own immediate safety environment.

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

Pluto offers an economic solution for both a single machine and for large integrated machine systems. Of Pluto B20’s I/O, 8 are dedicated as safety inputs, 8 can be configured as both safety inputs or outputs (sometimes even as inputs and outputs at the same time) and 4 are failsafe outputs independent of each other. 32 Plutos can be connected to a twisted pair safe bus system. This enables the amount of physical I/O connections to be expanded from 20 to 150 for the B20 family and 46 to 390 for the B46 family.

...to supervise safety devices!

Most safety devices on the market can be connected directly to the Pluto unit. When using dynamic sensors from ABB JOKAB SAFETY, the number of I/O points can be significantly reduced. These sensors enable Category 4 in a dynamic pulse system. Up to 10 sensors can be connected in series to one input compared to two inputs for other manufacturers. For example, Eden non-contact sensors, SPOT light beams and Tina adapters (interfacing to emergency stop push buttons, safety switches, etc.) can be connected in series to one input on the Pluto. Up to 150 safety devices can be connected to one Pluto B20 or 390 to one Pluto B46 and maintain Category 4 per EN 954-1 and ISO 13849-1 PLe.
...to save on inputs!

Pluto has inputs for static and/or dynamic sensors. Several sensors can be connected to one dynamic input in accordance with Category 4, PL e, SIL 3.

One input...

Dynamic signals: 1 to 10 sensors while maintaining Category 4, PL e, SIL 3.

Two inputs...

Static inputs: two mechanical switches per door while still maintaining Category 4, PL e, SIL 3.

One input...

Dynamic signals: 1 to 10 doors with one Eden per door while maintaining Category 4, PL e, SIL 3.

One input...

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

Pluto is an All-Supervisor 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-Supervisor system means that each Pluto unit controls their outputs locally, while it is as easy to read other Pluto units’ inputs as it is to read their own.

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. 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.

Regulations and Standards

The Pluto PLC is designed and approved in accordance with appropriate directives and standards. Examples of such are: EN 954-1/EN ISO 13849-1 Category 4, PL e, EN 61496-1 Type 4, EN 61508 SIL 3.
Current monitoring (Pluto A20 only)
Pluto A20 differs from the other models in that it can monitor the current through the IQ16 and IQ17 I/O. 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 D20 and D45 - with analog inputs
Pluto D20 is equipped with 4, and Pluto D45 with 8, safe 4-20mA/0-10V analog inputs. These can be configured as either “ordinary” failsafe inputs, as analog inputs 0-10V or as analog 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 analog 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.

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

A static 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.

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 terminal 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.
Connection examples for Pluto with Safety Bus

1. **Gateway** – For two-way bus communication between Pluto and other control systems.

2. **Absolute Encoder** – 8 single turn or multi turn absolute encoders can be connected directly to the Safety Bus.

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Connection examples for Pluto without a Safety Bus

6. **Stand alone Pluto**
   
   Same functionality as other Plutos, but without Safety Bus connections.

7. **IDFIX** – Identifies Pluto
   
   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.
3. **Pluto bridge** – With a Gateway it is possible to:

- Increase the Safety Bus length
- Use different bus speeds for each section
- Filter information from one section to reduce the load on the Safety Bus.

4. **HMI** – An HMI operator panel can communicate with Pluto in both directions. Connection can be made direct to the front of the Pluto.

5. **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, analog 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.

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### Overview Pluto Safety-PLC

<table>
<thead>
<tr>
<th>Model</th>
<th>S20</th>
<th>S46</th>
<th>A20</th>
<th>B22</th>
<th>D20</th>
<th>D45</th>
<th>B20</th>
<th>B46</th>
<th>AS-i</th>
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<td>Pluto AS-i bus</td>
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<td>Current monitoring</td>
<td>-</td>
<td>-</td>
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<td>90 x 84 x 118</td>
<td>45 x 84 x 118</td>
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<tr>
<td>Supply voltage</td>
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<td>24VDC</td>
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</tbody>
</table>

*4 of the analog inputs can be configured as counter inputs. The total number of analog inputs + counter inputs = 8.
Pluto D20 and Pluto D45
New safety PLC module with Analog Inputs

ABB JOKAB SAFETY has expanded the range of Pluto Safety PLC modules.

The new unit, Pluto D20, is a 45 mm wide module with 4 safe analog inputs. The I/O configuration is the same as for Pluto B20, but with the added feature that 4 of the inputs can be used as either ordinary safe inputs or as safe analog inputs.

Analog inputs Pluto D20 and D45

Pluto D20 is equipped with 4, and Pluto D45 with 8, safe 4-20mA/0-10V analog inputs. These (D20: IA0 – IA3, D45: IA0 – IA7) can be configured as either “ordinary” failsafe inputs, as analog inputs 0-10V or as analog inputs 4-20mA. (For D45 IA0 – IA3 can also be configured as counter inputs, see below.) For an application to reach SIL 3/PL e it is required that two sensors in parallel with one input each must be used. See Pluto Programming Manual.

Counter inputs Pluto D45

For Pluto D45 the inputs IA0 – IA3 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.

### 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 is typically an inductive sensor, photocell or incremental encoder (HTL, 24V). For description of the use of Function blocks see Pluto Programming Manual.

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

Input IA0 and IA2 can be configured as Up/Down counters. When this is done the next input (IA1 or IA3) is automatically reserved for Up/Down counting. This means that for Up/Down counting IA0-IA1 are a pair and IA2-IA3 are another pair.

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. For description of the use of Function blocks see Pluto Programming Manual.

Example of speed monitoring with incremental encoders leaving A and B pulses to two inputs, IA0-1A1 or IA2-1A3. The direction is then possible to measure.

Disabling of test pulses

For Pluto A20 v2, B20 v2, S20 v2 and Pluto D20, the test pulses can be disabled via Pluto Manager. See Pluto Programming Manual.
Pluto D20 and Pluto D45
Function blocks for Analog Inputs

Configuration in Pluto Manager
The inputs can be configured under "I/O Options" in Pluto Manager. If the inputs are configured as Analog inputs, the function blocks "ReadVoltage" or "ReadCurrent" shall be used. If, for a D45, the inputs are configured as Counter inputs, the function blocks "HS_SpeedCount" shall be used. All these function blocks are included in the "Analog01.fps" library.

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

ReadVoltage and ReadCurrent function blocks
For analog input 0-10V the function block "ReadVoltage" is needed, and for analog 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.

ReadVoltage function block. Description of inputs and outputs:
- inp: Input connected to the block.
- Value 0V: Input value for scaling. At 0V the output "Scaled value" will show this value.
- Value 10V: Input value for scaling. At 10V the output "Scaled value" will show this value.
- Q: OK output. Value is within range.
- Voltage: Output with calibrated absolute value in mV.
- Scaled Value: Output with scaled value.

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.

Note: For an application to reach SIL 3/PL e two sensors in parallel, with one analog input and one function block each, must be used.

Example: Both channel 1 and channel 2 need to be at least 5V in order to set "Voltage_OK".

HS_SpeedCount function block
For D45 with inputs configured as "Counter input" the function block "HS_SpeedCount" shall be used.

HS_SpeedCount function block. Description of inputs and outputs:
- inp: Input connected to the block.
- Q: OK output. Value is within range.
- Speed: Output for speed value in pulses/10ms. Shall be connected to a register (R).

Description
The function block reads a high speed counter input configured as "Counter input" (I/O options). When an input is configured to "Counter input" the choice "Up" or "Up/Down" is given.

Up count:
If the input is configured for Up count the output Speed always shows a positive value. The function block simply counts the amount of pulses coming on the input during 10 ms (1 program cycle).

Up/Down count:
A pair of inputs e.g. IA0 and IA1, can be configured for "Up/Down" count. The direction of a motion can then be determined which is shown by a positive or negative value on the output Speed. The requirement for determination of direction is that the sensor connected to the input pair gives pulses that are 90° phase shifted to each other, A/B pulses. This is a common standard for incremental encoders.
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 therefore be able to detect a short-circuit between the channels.

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

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.
I/O Overview

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.

1) Not S-models, S20, ...
2) Current monitored only on A20

Pluto A20, B20, S20

Pluto D20

Fail-safe inputs / Indication outputs (not failsafe) / Dynamic outputs
I/O Overview

Pluto bus

Inputs, individual failsafe

Fail-safe inputs / Outputs (not failsafe) / Dynamic outputs

IQ10  IQ11  IQ12  IQ13  IQ14  IQ15  IQ16  IQ17

Pluto B22

IQ10  IQ11  IQ12  IQ13  IQ14  IQ15  IQ16  IQ17

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

Digital inputs, individual failsafe

Analog inputs 0-10V/4-20mA

Fast counter

Inputs, individual failsafe

Inputs, individual failsafe

Pluto bus

Power supply

ID Identifier IDFIX

CH

CL

CS (Shield)

Pluto D45

IQ10  IQ11  IQ12  IQ13  IQ14  IQ15  IQ16  IQ17  IQ20  IQ21  IQ22  IQ23  IQ24  IQ25  IQ26

Pluto B46, S46

IQ10  IQ11  IQ12  IQ13  IQ14  IQ15  IQ16  IQ17  IQ20  IQ21  IQ22  IQ23  IQ24  IQ25  IQ26  IQ27

Fail-safe inputs / Outputs (not failsafe) / Dynamic outputs

Digital/Analog

Inputs, individual failsafe

Inputs, individual failsafe

Inputs, individual failsafe

+24V 0V 0V

Power supply

ID Identifier IDFIX

CH

CL

CS (Shield)

Pluto bus

1) Not S46

Safety outputs

Q0  Q1  Q2  Q3  Q4  Q5

Q0  Q1  Q2  Q3  Q4  Q5

Q0  Q1  Q2  Q3  Q4  Q5

12 | ABB JOKAB SAFETY - Pluto Safety PLCs
I/O Overview

**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 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 electro-mechanical components such as contactors and valves.

**Q4, Q5:** Failsafe relay outputs with common potential that are individually failsafe and individually programmable.
## Technical data

### Type-specific

<table>
<thead>
<tr>
<th>Pluto A20 v2</th>
<th>Pluto B20 v2</th>
<th>Pluto B22</th>
<th>D20</th>
<th>Pluto S20 v2</th>
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<tbody>
<tr>
<td>20 I/O</td>
<td>20 I/O</td>
<td>22 I/O</td>
<td>20 I/O</td>
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<td>8 (I0..I7)</td>
<td>14 (I0..I7, I20..I25)</td>
<td>8 (I0..I7)</td>
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<td>Failsafe inputs or non-failsafe outputs</td>
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<td>Max total load 2.5 A</td>
<td>Max total load 2.5 A</td>
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</tr>
<tr>
<td>(0-10V/4-20 mA)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Current monitoring</td>
<td>0-1.0 A ±10%</td>
<td>0-1.0 A ±10%</td>
<td>0-1.0 A ±10%</td>
<td>0-1.0 A ±10%</td>
</tr>
<tr>
<td>Counter inputs</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Analog inputs (0-27V)</td>
<td>1 (I5)</td>
<td>1 (I5)</td>
<td>1 (I5)</td>
<td>1 (I5)</td>
</tr>
<tr>
<td>FailSafe relay outputs</td>
<td>2 (Q0..Q1)</td>
<td>2 (Q0..Q1)</td>
<td>–</td>
<td>2 (Q0..Q1)</td>
</tr>
<tr>
<td>FailSafe transistor outputs</td>
<td>2 (Q2..Q3)</td>
<td>2 (Q2..Q3)</td>
<td>–</td>
<td>2 (Q2..Q3)</td>
</tr>
<tr>
<td>Current monitoring</td>
<td>2 (IQ16, IQ17)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Pluto safety bus</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Pluto AS-i bus</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Own current consumption</td>
<td>100...300 mA</td>
<td>100...300 mA</td>
<td>100...300 mA</td>
<td>100...300 mA</td>
</tr>
<tr>
<td>Recommended external fuse</td>
<td>6A</td>
<td>6A</td>
<td>6A</td>
<td>6A</td>
</tr>
<tr>
<td>Dimensions (w x h x d)</td>
<td>45 x 84 x 118 mm</td>
<td>45 x 84 x 118 mm</td>
<td>45 x 84 x 118 mm</td>
<td>45 x 84 x 118 mm</td>
</tr>
</tbody>
</table>

### General

| Color | Grey |
| Operating voltage | 24 VDC ±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 | Cat. 4 |
| EN 61508 | PL e/Cat. 4 |
| EN 62061 | SIL 3 |
| PFH S | SIL 3 |
| Relay output | 2.00×10^9 |
| Transistor output:O | 1.50×10^9 |
| Failsafe inputs I & IQ | +24 V (for PNP sensors) |
| I0..I7 (I30..I47) | +24 V (for PNP sensors) |
| IQ10..17 (IQ20..27) | IQ also configurable as non-failsafe inputs. |
| Current at 24 V | 5.1 mA |
| Max. overvoltage | 27 V continuous |

## Failsafe outputs Q

| Q2, Q3 | Transistor, -24VDC, 800 mA |
| Output voltage tolerance | Supply voltage - 1.5 V at 800 mA |
| Q0, Q1, (Q4, Q5) | Relay outputs |
| VAC-12: 250 V/1.5 A | VAC-15: 250 V/1.5 A |
| VDC-12: 50 V/1.5 A | VDC-13: 24 V/1.5 A |
| VDC-13: 24 V/1.5 A | |

## Non-failsafe outputs Q

| IQ10..17 (IQ20..27) | Transistor +24V, PNP “open collector” also configurable as failsafe inputs. |
| Max. current/output | 800 mA |

## Indicator

| Input/output LED | 1 per I/O (green) |
| Max. current/output | 7-segments, two characters |

## Display

| Pluto safety bus Max number of Pluto units on the databus | 32 |
| Databus type | 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 AS-i bus

<table>
<thead>
<tr>
<th>Master profile</th>
<th>Number of slave units</th>
<th>Bus operation mode</th>
<th>Bus cable length:</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2</td>
<td>31/62*</td>
<td>Master</td>
<td>Up to 500 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safety monitor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safety monitor, slave and safe I/O module.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 500 m between each repeater</td>
<td></td>
</tr>
</tbody>
</table>

#### Additional response times

- **Database between Pluto units**
  - 10 ms
  - 10–40 ms at fault condition

- **Enclosure classification**
  - **Enclosure**
    - IP40, IEC 60 529
  - **Connection terminals**
    - IP20, IEC 60 529

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

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

Electrical connections
Application example
Pluto 0 settings

Robot cabinet

**Pluto 0**

- I0.0=P0_ES1_Ch1: Emergency stop 1 channel 1 - Static
- I0.1=P0_ES1_Ch2: Emergency stop 1 channel 2 - Dynamic A non-inverted
- I0.2=P0_Eden1: Door Eden sensor - Dynamic A
- I0.15=P0_LB1_In: Reset Door - Light button input - Dynamic A
- Q0.2=P0_AS_OK: Robot auto stop - Expansion BT50 relay
- Q0.3=P0_ES: Robot emergency stop - Expansion BT50 relay
- GM0.0=P0_ES_OK: Emergency stop OK in Pluto 0
**Application example**

**Pluto 1 settings**

---

**Machine cabinet**

**Pluto 1**

- I1.1=P2_ES1_Ch1: Emergency stop 1 channel 1 - Dynamic A non-inverted
- I1.2=P2_ES1_Ch2: Emergency stop 1 channel 2 - Static
- I1.3=P2_IS1_Ch1: Interlocking switch channel 1 - Dynamic A non-inverted
- I1.4=P2_IS1_Ch2: Interlocking switch channel 2 - Static
- I1.15=P2_LB1_In: Reset Hatch - Light button input - Dynamic A
- Q1.0=P2_ES: Machine Emergency stop
- Q1.1=P2_PS: Machine protective stop
- GM1.0=P2_ES_OK: Emergency stop OK in Pluto 1
- GM1.1=P2_Hatch_OK: Hatch closed
Robot cabinet

1

2 Two channel monitoring with manual reset of emergency stop at the door.

<table>
<thead>
<tr>
<th>P0_ES1_Ch1</th>
<th>I0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0_ES1_Ch2</td>
<td>I0.1</td>
</tr>
<tr>
<td>P0_LR1_In</td>
<td>I0.15</td>
</tr>
</tbody>
</table>

GM0.0=P0_ES_OK Emergency stop OK in Pluto 0
I0.0=P0_ES1_Ch1 Emergency stop 1 channel 1 - Static
I0.1=P0_ES1_Ch2 Emergency stop 1 channel 2 - Dynamic A non-inverted

3 Emergency stop of robot.

When the emergency stop is actuated 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 machine panel will also emergency stop the robot.

<table>
<thead>
<tr>
<th>P0_ES_OK</th>
<th>P1_ES_OK</th>
<th>P0_ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM0.0</td>
<td>GM1.0</td>
<td>Q0.3</td>
</tr>
</tbody>
</table>

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 door to the robot cell is opened the robot is auto stopped.
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 as a button in and to indicate different reset states.
Constant light means reset is not possible, safety not ok.
Flash 0.4 s high, 0.6 s low means reset is possible but not performed.
No light means reset has been performed and the safety is ok.

<table>
<thead>
<tr>
<th>P0_Eden1</th>
<th>P0_LA1_In</th>
<th>P0_LA1_Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>I0.2</td>
<td>I0.15</td>
<td>Q0.15</td>
</tr>
</tbody>
</table>

I0.15=P0_LA1_In Reset Door - Light button input - Dynamic A
I0.2=P0_Eden1 Door Eden sensor - Dynamic A
Q0.15=P0_LA1_Out Reset Door - Light button output - Static
Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay
Application example
PLC Code Pluto 0 settings

Robot cabinet (continued)

5 Alarm 03 - Machine hatch open.

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

<table>
<thead>
<tr>
<th>P1_Hatch_OK</th>
<th>P0_AS_OK</th>
<th>Q0.2</th>
<th>SR_ErrorCode=0</th>
<th>SR0.11 =0</th>
<th>SR_PlutoDisplay=203</th>
<th>SR0.10=203</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM1.1</td>
<td>Q0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GM1.1=P1_Hatch_OK Hatch closed
Q0.2=P0_AS_OK Robot auto stop - Expansion BT50 relay
SR0.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no
SR0.11=SR_ErrorCode Error code

6 Alarm 02 - Door open.

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

<table>
<thead>
<tr>
<th>P0_Eden1</th>
<th>SR_ErrorCode=0</th>
<th>SR0.11 =0</th>
<th>SR_PlutoDisplay=202</th>
<th>SR0.10=202</th>
</tr>
</thead>
<tbody>
<tr>
<td>I0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I0.2=P0_Eden1 Door Eden sensor - Dynamic A
SR0.10=SR_PlutoDisplay Pluto display figure. For user error: 200+no
SR0.11=SR_ErrorCode Error code

7 Alarm 01 - Emergency stop actuated.

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

<table>
<thead>
<tr>
<th>P0_ES_OK</th>
<th>SR_ErrorCode=0</th>
<th>SR0.11 =0</th>
<th>SR_PlutoDisplay=201</th>
<th>SR0.10=201</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

PLC Code Pluto 1 settings

Machine cabinet

1

Start

2

Two channel monitoring with automatic reset of emergency stop at the machine hatch.

- **P1_ES1_Ch1**
  - I1.1
- **P1_ES1_Ch2**
  - I1.2
- **P0_LR1_In**
  - I0.15

- **GM1.0=P1_ES_OK** Emergency stop OK in Pluto 1
- **I1.1=P1_ES1_Ch1** Emergency stop 1 channel 1 - Dynamic A non-inverted
- **I1.2=P1_ES1_Ch2** Emergency stop 1 channel 2 - Static

3

Two channel monitoring with automatic reset of interlocking switch of the machine hatch.

- **P1_IS1_Ch1**
  - I1.3
- **P1_IS1_Ch2**
  - I1.4

- **GM1.1=P1_Hatch_OK** Hatch closed
- **I1.3=P1_IS1_Ch1** Interlocking switch channel 1 - Dynamic A non-inverted
- **I1.4=P1_IS1_Ch2** Interlocking switch channel 2 - Static

4

Emergency stop of machine.

When the emergency stop is actuated the machine will make an emergency stop. In order to restore safety requires the emergency stop button needs to be reset. An emergency stop from the robot will also emergency stop the machine.

- **P1_ES_OK**
  - GM1.0
- **P0_ES_OK**
  - GM0.0
- **P1_ES**
  - Q1.0

- **GM0.0=P0_ES_OK** Emergency stop OK in Pluto 0
- **GM1.0=P1_ES_OK** Emergency stop OK in Pluto 1
- **Q1.0=P1_ES** Machine Emergency Stop

5

Monitoring of the hatch.

When the hatch is opened the monitoring of the hatch is inactive. To reset the safety the hatch needs to be closed and the reset button pressed and released. Note that Q15 of the Pluto is used both as a button in and to indicate different reset states.

- **P1_Hatch_OK**
  - GM1.1
- **P1_LB1_In**
  - I1.15

- **Reset**

- **HB_Hatch_OK**
  - M1.0
- **HB_Ind_Hatch_OK**
  - M1.1

- **Reset**

Note that Q15 of the Pluto is used both as a button in and to indicate different reset states. Flash 0.4 s high, 0.6 s low means reset is possible but not performed. No light means reset has been performed and the safety is ok.
Machine cabinet (continued)

5 Monitoring of the hatch.
When the hatch is opened the monitoring of the hatch is inactive.
To reset the safety the hatch needs to be closed and the reset button pressed and released.
Note that IQ15 of the Pluto is used both as a button in and to indicate different reset states.
Constant light means reset is not possible, safety not ok.
Flash 0.4 s high, 0.6 s low means reset is possible but not performed.
No light means reset has been performed and the safety is ok.

6 Light button indication of the reset of the hatch.
If the robot cell’s door is closed and reset no light indication is needed inside the cell.

7 Protective stop of the machine.
Either the hatch is closed and reset or the door to the robot cell is closed and reset.
This means the cell can work with the hatch both open or closed as long as the cell’s door is closed and reset.

8 Alarm 03 - Machine hatch open.
To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto.
A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.

9 Alarm 02 - Door open.
To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto.
A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.

10 Alarm 01 - Emergency stop actuated.
To generate User Errors (UE) a value of 200 - 299 can be written to the display of the Pluto.
A check of System Register 11 (SR11) in the Pluto prioritises errors from the Pluto itself over User Errors.
Pluto Gateway
GATE-P2

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 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.

**Use:**
- Bi-directional status information from the Pluto Safety PLC
- For Profinet

**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

**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.

**Profibus DP**
**DeviceNet**
**CANopen**
**Profinet**
**Ethernet/IP**
**Modbus TCP**

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
### Technical data - GATE-P2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article number</td>
<td>2TLA020071R8000</td>
</tr>
<tr>
<td>Databases</td>
<td>- Pluto Safety Bus CAN (isolated)</td>
</tr>
<tr>
<td></td>
<td>- PROFIBUS RS485 (isolated)</td>
</tr>
<tr>
<td>Pluto safety bus speeds</td>
<td>100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)</td>
</tr>
<tr>
<td>PROFIBUS speed</td>
<td>Up to 12 Mbit/s (automatic speed detection)</td>
</tr>
<tr>
<td>PROFIBUS address</td>
<td>Setting via DIP switches (0-99)</td>
</tr>
<tr>
<td>PROFIBUS version</td>
<td>DP slave, DP-V0</td>
</tr>
<tr>
<td>Connections</td>
<td>Top, 3-pole terminal for Pluto Safety Bus (included)</td>
</tr>
<tr>
<td></td>
<td>Front, standard 9-pole PROFIBUS connection.</td>
</tr>
<tr>
<td></td>
<td>Bottom, 2-pole terminal for 24 VDC (included)</td>
</tr>
<tr>
<td>Status indication</td>
<td>Pluto Safety Bus status indication via LED</td>
</tr>
<tr>
<td></td>
<td>PROFIBUS status indication via LED</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>24 VDC, -15% till +20%</td>
</tr>
<tr>
<td>Current at 24 V</td>
<td>&lt; 100 mA (recommended fuse ≤6 A)</td>
</tr>
<tr>
<td>Dimensions (w x h x d)</td>
<td>22.5 x 101 x 119 mm</td>
</tr>
<tr>
<td>Installation</td>
<td>35 mm DIN rail</td>
</tr>
<tr>
<td>Operating temperature (ambient)</td>
<td>-10°C to + 55°C</td>
</tr>
<tr>
<td>Temperature, transport and storage</td>
<td>-25°C to + 55°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>EN 60 204-1 50% at 40°C (ambient 90% at 20°C)</td>
</tr>
<tr>
<td>Enclosure classification</td>
<td>Enclosure IP20 - IEC 60 529</td>
</tr>
<tr>
<td></td>
<td>Terminals IP20 - IEC 60 529</td>
</tr>
</tbody>
</table>

### Gateway block schematic diagram - Pluto Profibus

![Gateway block schematic diagram - Pluto Profibus](image-url)
Pluto Gateway
GATE-D2

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 DIP switches, which means that programming tools are not required to put the Gateway itself into operation.

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

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

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

Pluto bridge
A GATE-D2 can also be used to advantage as a CAN bridge when it is required to divide a Pluto Safety Bus into several sections. This is particularly useful when long databus cables are needed. There is also a built-in filter function which makes it possible to block any data that is not required for use on the other side of the bridge, which reduces the databus loading in the other sections and thereby permits longer databus cables.

ABB Robotics IRC5
PLUTO GATE-D2 has support for integration into an ABB Robotics IRC5-system. The documentation that describes this integration can be obtained via www.abb.com/jokabsafety.
## Technical data - GATE-D2

<table>
<thead>
<tr>
<th>Article number</th>
<th>2TLA020071R8200</th>
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</thead>
<tbody>
<tr>
<td>Databases</td>
<td>Pluto Safety Bus CAN (isolated)</td>
</tr>
<tr>
<td></td>
<td>DeviceNet CAN (isolated)</td>
</tr>
<tr>
<td>Pluto safety bus speeds</td>
<td>100, 200, 250, 400, 500, 800 and 1000 kbit/s</td>
</tr>
<tr>
<td></td>
<td>(automatic speed detection)</td>
</tr>
<tr>
<td>DeviceNet speed</td>
<td>125, 250 and 500 kbit/s (set via DIP switch)</td>
</tr>
<tr>
<td>DeviceNet address</td>
<td>Setting via DIP switches (1-63)</td>
</tr>
<tr>
<td>DeviceNet Version</td>
<td>ODVA version 2.0</td>
</tr>
<tr>
<td>Connections</td>
<td>Top, 3-pole terminal for Pluto Safety Bus (included)</td>
</tr>
<tr>
<td></td>
<td>Front, 5-pole terminal for DeviceNet (included)</td>
</tr>
<tr>
<td></td>
<td>Bottom, 2-pole terminal for 24 VDC (included)</td>
</tr>
<tr>
<td>Status indications</td>
<td>Pluto Safety Bus status indication via LED</td>
</tr>
<tr>
<td></td>
<td>DeviceNet MNS status indication via LED</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>24 VDC, -15% till +20%</td>
</tr>
<tr>
<td>Current at 24 V</td>
<td>&lt; 100 mA (recommended fuse ≤6 A)</td>
</tr>
<tr>
<td>Dimensions (w x h x d)</td>
<td>22.5 x 101 x 119 mm</td>
</tr>
<tr>
<td>Installation</td>
<td>35 mm DIN rail</td>
</tr>
<tr>
<td>Operating temperature (ambient)</td>
<td>-10°C to +55°C</td>
</tr>
<tr>
<td>Temperature, transport and storage</td>
<td>-25°C to +55°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>EN 60 204-1 50% at 40°C (ambient 90% at 20°C)</td>
</tr>
<tr>
<td>Enclosure classification</td>
<td>Enclosure IP20 - IEC 60 529</td>
</tr>
<tr>
<td></td>
<td>Terminals IP20 - IEC 60 529</td>
</tr>
</tbody>
</table>

## Gateway block schematic diagram - Pluto DeviceNet

![Gateway block schematic diagram - Pluto DeviceNet](image)
Pluto Gateway
GATE-C2

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 DIP switches, which means that programming tools are not required to put the Gateway itself into operation.

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

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

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

Pluto bridge
A GATE-C2 can also be used to advantage as a CAN bridge when it is required to divide a Pluto Safety Bus into several sections. This is particularly useful when long databus cables are needed. There is also a built-in filter function which makes it possible to block any data that is not required for use on the other side of the bridge, which reduces the databus loading in the other sections and thereby permits longer databus cables.

Use:
- Bi-directional status information from the Pluto Safety PLC
- For CANopen and Pluto-bridge

Features:
- Two-way communication
- Built-in filter function, shared network
- Only 22.5 mm wide
- Can be located anywhere in the databus
- Common interface with Pluto
- Ready-made function blocks
## Technical data - GATE-C2

<table>
<thead>
<tr>
<th>Article number</th>
<th>2TLA020071R8100</th>
</tr>
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<tbody>
<tr>
<td><strong>Databases</strong></td>
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<tr>
<td>- Pluto Safety Bus CAN</td>
<td>(isolated)</td>
</tr>
<tr>
<td>- CANopen CAN</td>
<td>(isolated)</td>
</tr>
<tr>
<td><strong>Pluto safety bus speeds</strong></td>
<td>100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)</td>
</tr>
<tr>
<td><strong>CANopen speeds</strong></td>
<td>125, 250 and 500 kbit/s (set via DIP switch)</td>
</tr>
<tr>
<td></td>
<td>10, 20, 50, 100, 125, 250, 500, 800 and 1000 kbit/s (via software)</td>
</tr>
<tr>
<td><strong>CANopen address</strong></td>
<td>Setting via DIP switches or software (1-63)</td>
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<tr>
<td><strong>CANopen version</strong></td>
<td>Version 4.02 of the CiA Draft Standard 301</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>Top, 3-pole terminal for Pluto Safety Bus (included)</td>
</tr>
<tr>
<td></td>
<td>Front, 5-pole terminal for CANopen (included)</td>
</tr>
<tr>
<td></td>
<td>Bottom, 2-pole terminal for 24 VDC (included)</td>
</tr>
<tr>
<td><strong>Status indications</strong></td>
<td>Pluto Safety Bus status indication via LED</td>
</tr>
<tr>
<td></td>
<td>CANopen status indication via LED</td>
</tr>
<tr>
<td><strong>Operating voltage</strong></td>
<td>24 VDC, -15% till +20%</td>
</tr>
<tr>
<td><strong>Current at 24 V:</strong></td>
<td>&lt; 100 mA (recommended fuse ≤ 6 A)</td>
</tr>
<tr>
<td><strong>Dimensions (w x h x d)</strong></td>
<td>22.5 x 101 x 119 mm</td>
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<tr>
<td><strong>Installation</strong></td>
<td>35 mm DIN rail</td>
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<tr>
<td><strong>Operating temperature (ambient)</strong></td>
<td>-10°C to + 55°C</td>
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<tr>
<td><strong>Temperature, transport and storage</strong></td>
<td>-25°C to + 55°C</td>
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<tr>
<td><strong>Humidity</strong></td>
<td>EN 60 204-1 50% at 40°C (ambient 90% at 20°C)</td>
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<td><strong>Enclosure classification</strong></td>
<td>Enclosure IP20 - IEC 60 529</td>
</tr>
<tr>
<td></td>
<td>Terminals IP20 - IEC 60 529</td>
</tr>
</tbody>
</table>

### Gateway block schematic diagram - Pluto CANopen

![Gateway block schematic diagram](image)
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 DIP switches, which means that programming tools are not required to put the Gateway itself into operation.

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

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

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

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

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

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
### Technical data - GATE-E2

<table>
<thead>
<tr>
<th>Article number</th>
<th>2TLA020071R8300</th>
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</thead>
<tbody>
<tr>
<td>Buses</td>
<td>Pluto-bus CAN (isolated)</td>
</tr>
<tr>
<td>Pluto safety bus speeds</td>
<td>100, 200, 250, 400, 500, 800 and 1000 kbit/s (automatic speed detection)</td>
</tr>
<tr>
<td>Ethernet</td>
<td>10/100 Mbit/s Half and full duplex</td>
</tr>
<tr>
<td>Ethernet protocol</td>
<td>Status from and to Pluto Safety PLC - EtherNet/IP - PROFINET - Modbus TCP - Binary server (TCP/IP) Note that certain combinations of server protocols cannot be used simultaneously. Gateway status and IP address configuration - Web server - Terminal server (TCP/IP)</td>
</tr>
<tr>
<td>EtherNet/IP</td>
<td>According to ODVA “CIP Edition 3.2” and “EtherNet/IP Adaption of CIP Edition 1.3” Minimum RPI of 50 ms</td>
</tr>
<tr>
<td>PROFINET</td>
<td>According to the Modbus organization, version 1.0b (approx. 20 messages per second). Simple TCP/IP protocol to send status from/to the Pluto system.</td>
</tr>
<tr>
<td>Modbus TCP</td>
<td>PROFINET</td>
</tr>
<tr>
<td>Binary server (TCP/IP)</td>
<td>Simple server with the same commands as via the serial programming port in the unit.</td>
</tr>
<tr>
<td>Web server</td>
<td>For simple sharing of IP addresses.</td>
</tr>
<tr>
<td>Terminal server (TCP/IP)</td>
<td>Simple server with the same commands as via the serial programming port in the unit.</td>
</tr>
<tr>
<td>IP address</td>
<td>Static sharing via web server or via programming port.</td>
</tr>
<tr>
<td>Gateway configuration</td>
<td>Takes place via EtherNet/IP, PROFINET, Modbus TCP or via the binary TCP/IP server.</td>
</tr>
<tr>
<td>Connections</td>
<td>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 VDC (included)</td>
</tr>
<tr>
<td>Status indications</td>
<td>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)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>24 VDC, -15 % till +20 %</td>
</tr>
<tr>
<td>Current at 24 V</td>
<td>&lt; 150 mA (recommended fuse ≤6 A)</td>
</tr>
<tr>
<td>Dimensions (w x h x d)</td>
<td>35 x 101 x 120 mm</td>
</tr>
<tr>
<td>Installation</td>
<td>35 mm DIN rail</td>
</tr>
<tr>
<td>Operating temperature (ambient)</td>
<td>-10°C to + 55°C</td>
</tr>
<tr>
<td>Temperature, transport and storage</td>
<td>-25°C to + 55°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>EN 60 204-1 50 % at 40°C (ambient 90 % at 20°C)</td>
</tr>
<tr>
<td>Enclosure classification</td>
<td>Enclosure IP20 - IEC 60 529 Terminals IP20 - IEC 60 529</td>
</tr>
</tbody>
</table>

### Gateway block schematic diagram - Pluto Ethernet

![Gateway block schematic diagram - Pluto Ethernet](image)

**Dimensions**
- **PLC**: 119 mm x 101 mm x 35 mm
- **PLC (dual)**: 119 mm x 202 mm x 35 mm
- **PLC (quad)**: 119 mm x 404 mm x 35 mm
- **PLC (quad)**: 119 mm x 606 mm x 35 mm

**Enclosure Classification**
- **Enclosure IP20 - IEC 60 529**
Rotational absolute value sensor for safe positioning

This rotational absolute encoder, together with a Pluto Safety PLC, 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 configurable for single and multi-turn applications.

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.

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

Example of an application where 2 sensors provide safe position determination in a gantry robot.
Technical data – Safe Encoder RSA 597/RHA 597

Article number
2TLA020070R3600
2TLA020070R3300
2TLA020070R3400
2TLA020070R5900

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/s² in accordance with IEC 60068-2-6

Shock (6ms)
< 2000 m/s² in accordance with IEC 60068-2-27

Material, enclosure
Aluminium

Surface treatment
Painted and chromed or anodized

Weight
Approx. 300 g

Accuracy and resolution

Resolution
13 bits, 8192 positions per rotation

Accuracy
± ½ LSB (Least Significant Bit)

Operating voltage
9-36 VDC

Polarity-protected
Yes

Short-circuit protected
Yes

Databus speed
5 kbit/s - 1 Mbit/s, preset at 500kbit/s

Address input
Active low

Code type
Binary

Programmable functions
Resolution, 0 position
Direction, Databus speed

Current consumption
50 mA at 24 VDC

Max current consumption
100 mA

Ordering details

<table>
<thead>
<tr>
<th>Shaft</th>
<th>Connection</th>
<th>Type</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø 10 mm with face</td>
<td>12-pole connector</td>
<td>RSA 597</td>
<td>2TLA020070R3600</td>
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<tr>
<td>Ø 6 mm with face</td>
<td>1.5 m cable</td>
<td>RSA 597</td>
<td>2TLA020070R3300*</td>
</tr>
<tr>
<td>Hollow shaft Ø 12 mm</td>
<td>2 m cable</td>
<td>RHA 597</td>
<td>2TLA020070R3400*</td>
</tr>
<tr>
<td>Hollow shaft Ø 12 mm</td>
<td>10 m cable</td>
<td>RHA 597</td>
<td>2TLA020070R5900*</td>
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</tbody>
</table>

*Ordering product
### Technical data – Safe Encoder RSA 698/RHA 698

| Article number         | 2TLA020070R3700  
|------------------------|------------------|
|                        | 2TLA020070R7800  
|                        | 2TLA020070R7900  |

**Ambient temperature**  
-40°C .. +70°C

**Temperature, transport and storage**  
-30°C .. +70°C

Ingress protection class  
IP67 in accordance with IEC 60529

**At shaft inlet**  
IP66 in accordance with IEC 60529

**Vibration (55 to 2000 Hz)**  
< 100 m/s² in accordance with IEC 60068-2-6

**Shock (6ms)**  
< 2000 m/s² in accordance with IEC 60068-2-27

**Material, enclosure**  
Aluminium

**Surface treatment**  
Anodized

**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 VDC

- **Polarity-protected**  
  Yes

- **Short-circuit protected**  
  Yes

- **Databus speed**  
  10 kbit/s - 1 Mbit/s

- **Code type**  
  Binary

- **Programmable functions**  
  Resolution, 0 position

- **Current consumption**  
  50 mA at 24 VDC

- **Max current consumption**  
  100 mA

### Ordering details

<table>
<thead>
<tr>
<th>Shaft</th>
<th>Connection</th>
<th>Type</th>
<th>Order code</th>
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</thead>
<tbody>
<tr>
<td>Ø 10 mm round</td>
<td>M12 5-pole connector</td>
<td>RSA 698</td>
<td>2TLA020070R3700</td>
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<tr>
<td>Ø 6 mm round</td>
<td>M12 5-pole connector</td>
<td>RSA 698</td>
<td>2TLA020071R7800*</td>
</tr>
<tr>
<td>Hollow shaft Ø 12 mm</td>
<td>M12 5-pole connector</td>
<td>RHA 698</td>
<td>2TLA020071R7900*</td>
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</tbody>
</table>

*Ordering product

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![Diagram of Safe Encoder RSA 698/RHA 698](attachment:diagram.png)
Safe Encoder
Function block for two single-turn encoders that generates safe position and speed values.

Function
The block reads and evaluates two 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.

Safe Encoder Multiturn
Function block for two multi-turn encoders that generates safe position and speed values.

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.

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
- AdrEncoderA: Encoder A node address
- AdrEncoderB: Encoder B node address
- MaxDiff: Max allowed deviation between the encoders (max 2% of Range)
- 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.

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.

Descriptions of inputs and outputs
- PosReg: Input for the position value
- MinPos: Minimum limit value
- MaxPos: Maximum limit value

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.
Pluto identifier
IDFIX

IDFIX is an identifier circuit which gives each Pluto an address on the bus. It contains an identification code which can be read by the system. The identification code is declared in the PLC program so that the correct part of the PLC program is executed by each specific Pluto. The use of IDFIX is mandatory in a multi-Pluto project, but voluntary if a unit works alone. If one Pluto in a multi-Pluto project needs to be replaced it is possible to let the new Pluto self load the PLC program from another Pluto on the bus. The IDFIX will ensure that the new Pluto has the correct address on the bus.

Five different versions of IDFIX
R is pre-programmed.
RW is programmable.
DATA is programmable and can also store the AS-i safety codes.
PROG 2k5 is for single-Pluto projects only, and has a 2.3 kbyte memory for storage of the PLC program. It can also store the AS-i safety codes in the same way as IDFIX-DATA.
PROG 10k works in the same way as PROG 2k5, but it has a larger memory (10 kbyte).
IDFIX is connected between the input terminals ID and 0V.

Use:
- Gives each Pluto unit an identity on the bus
- For storage of the PLC program
- For storage of the AS-i safety codes

IDFIX-DATA
IDFIX-DATA is for Pluto AS-i and B42 AS-i, and contains a memory for storage of the AS-i safety codes.

IDFIX-PROG
IDFIX-PROG contains a memory for storage of the PLC program for single-Pluto projects. When a program is downloaded to Pluto the IDFIX-PROG will automatically be updated. If the Pluto unit needs to be replaced, the new Pluto can self load the PLC program from IDFIX-PROG by pressing the K button (in the same way as a Pluto can self load the program over the CAN bus). Only one Pluto is allowed in the project and the IDFIX code is always EEEEEEEEEEE0. IDFIX-PROG can also store the AS-i safety codes in the same way as IDFIX-DATA.

NOTE! “Single-Pluto project” means that the PLC program only contains one Pluto. It is still possible to connect several “Single-Pluto projects”, each with its own program and IDFIX-PROG, together via the Pluto bus.
Pluto Manager

A programming tool for your safety functions

Pluto Manager is a software tailored for the Pluto Safety PLC. Programming is done in ladder, and together with the function block, creates the structure of your safety functions. The software comes with predefined function blocks approved by TÜV to facilitate the work on designing the safety functions. Pluto Manager gives you a structured overview of Plutos, gateways and peripheral components in large and small projects. It gives you an overview and control of the sensors and actuators, and the reactions between them. Pluto Manager also contains manuals for the software and hardware that are connected and need to be handled through the program.

The interface gives the option to get the status directly from Pluto’s two bus options, AS-i and Pluto bus. There are also diagnostic functions and the option to export data.

Systematic working method through project management

Step 1 - Configuration of I/O
In every started project, each Pluto is defined individually. Its inputs and outputs are configured as desired and depending on what they connect to. Pluto’s IQ ports are also configured here as inputs or outputs, dynamic or static signals.

Step 2 - Naming of Variables
After configuration the system’s variables are determined. Inputs (I), outputs (Q), remanent memories (M), global auxiliary memories for bus communication (GM) and registers (R) are given names that can be used in place of the actual variable designation in the PLC program.

Step 3 - Ladder Programming
The program is built using the named variables connected to inputs and outputs. The programming language has a full range of instructions, similar to standard PLCs on the market—with timers, arithmetic, sequence programming etc.

The project is then downloaded to Pluto via a programming cable. This program is distributed simultaneously through bus communication to the other Plutos in the project. In this way, you need only access a single Pluto where each Pluto gets the right information specified in your project.

Pluto Manager is included when purchasing the Pluto Safety PLC. The software is Windows based and can be downloaded free from www.abb.com/lowvoltage.

Applications

- Software for the Pluto Safety PLC
- A tool to structure the safety functions

Features

- Software included with purchase
- Downloaded from www.abb.com/lowvoltage
- Ready to use function blocks for your safety components
- Contains TÜV-approved function blocks
- Provides an overview of the current projects and your Plutos
- Easy programming through ladder language
The safety designer has complete freedom to program the safety functions or to use TÜV-approved pre-defined safety function blocks.

**Blocks in the Standard Library (func05):**
1. Two-channel function with input for start
2. Two-channel function with test input
3. Two-channel function with test and reset inputs, and reset indication. See example.
4. Two-channel function with simultaneous requirement.
5. Single channel function with input for start.
6. Single channel function with start and test inputs.
7. Single channel function with reset and test inputs.
8. Two-channel function with max. time limitation (equivalent to JSHT2). Time begins to count down when both inputs are activated.
9. Two-channel function with max. time limitation (equivalent to JSHT2). Time begins to count down when one of the inputs is activated.
10. Single channel pulse function, e.g. for timed reset.
11. Two-channel pulse function, e.g. for timed reset.
12. Two single channel bypass connection functions with max. time limiting.
13. Single channel bypass connection function with max. time limiting.
14. Two-channel bypass connection function with max. time limiting and simultaneous requirement.
15. Two-channel safety function with max. time limited bypass connection.
16. Two-hand control. See example.
17. Counter which counts up to preset value.
18. Counter which counts down from preset value to 0.
20. Muting lamp Q16.
21. Muting lamp Q17.
22. Muting lamp W Q16. With possibility to set the power level in Watts.
23. Muting lamp W Q17. With possibility to set the power level in Watts.
24. Light curtain with single cycle operation.
25. Light curtain with single cycle operation and reset selection.
26. Multiplication.
27. Division.

**Other function blocks**
1. Safety absolute encoder.
2. Electronic cam.
3. External communication.

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

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**TC1RTI Block 3 Example**

**Two-channel function with test and reset inputs, and reset indication**

- In1 and In2 are safety inputs, to which the safety device outputs are connected.
- Test is a condition that must be true at the moment of switching on, and can be used for monitoring external components. Test must be true before the Reset input closes, i.e. the function block cannot be initiated by Test.
- Reset is a supervised reset input and must be activated (positive flank) after the other inputs have activated for the function output to be activated.
- The IndReset output is activated when the function block is 0 and flashes when the function block is ready for resetting.
- The TCfault output is activated in the case of a two-channel fault, i.e. if the function block is activated and only one of In1 and In2 opens and closes.

**Description**

The function block acts as a conventional two-channel safety relay with dual and supervised inputs (In1, In2).

**Block 16 Example**

**Two-hand control for devices with NO/NC + NO/NC**

- Right_NO is right handed NO contact
- Right_NC is right handed NC contact, etc.
- The test is a condition that must be met before any of the other inputs are activated and can be used for monitoring external components.

**Function**

In stand-by, Right_NO must be 0, Right_NC 1, Left_NO 0 and Left_NC 1. In order to start, these four inputs switch the condition within 0.5 seconds and then retain their conditions. After shut-down, all inputs must return to stand-by before any restart can be made.
## Component list - Pluto Safety PLC

<table>
<thead>
<tr>
<th>Product</th>
<th>Ordering number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUTO A20 v2</td>
<td>2TLA020070R4500</td>
<td>Safety PLC with 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus. Current monitoring on Q16 + Q17.</td>
</tr>
<tr>
<td>PLUTO B20 v2</td>
<td>2TLA020070R4600</td>
<td>Safety PLC with 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus.</td>
</tr>
<tr>
<td>PLUTO B22</td>
<td>2TLA020070R4800</td>
<td>Safety PLC with 14 failsafe inputs + 8 non-failsafe outputs/failsafe inputs. For use with Pluto safe bus and/or a Pluto Safety databus.</td>
</tr>
<tr>
<td>PLUTO D20</td>
<td>2TLA020070R6400</td>
<td>Safety PLC with 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus. 4 0-10V/2-20mA analog inputs.</td>
</tr>
<tr>
<td>PLUTO S20 v2</td>
<td>2TLA020070R4700</td>
<td>Safety PLC with 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus.</td>
</tr>
<tr>
<td>PLUTO AS-i v2</td>
<td>2TLA020070R1100</td>
<td>Safety PLC with 4 failsafe inputs + 4 non-failsafe outputs/failsafe inputs + 2 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus and/or ASi Safe bus.</td>
</tr>
<tr>
<td>PLUTO B46 v2</td>
<td>2TLA020070R1700</td>
<td>Safety PLC with 24 failsafe inputs + 16 non-failsafe outputs/failsafe inputs + 4 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus.</td>
</tr>
<tr>
<td>PLUTO D45</td>
<td>2TLA020070R6600</td>
<td>Safety PLC with 24 failsafe inputs + 15 non-failsafe outputs/failsafe inputs + 4 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus. 8 0-10V/2-20mA analog inputs, 4 high speed counter inputs.</td>
</tr>
<tr>
<td>PLUTO S46 v2</td>
<td>2TLA020070R1800</td>
<td>Safety PLC with 24 failsafe inputs + 16 non-failsafe outputs/failsafe inputs + 4 individual failsafe relay outputs + 2 individually failsafe transistor outputs.</td>
</tr>
<tr>
<td>PLUTO B42 AS-i</td>
<td>2TLA020070R1400</td>
<td>Safety PLC with 20 failsafe inputs + 16 non-failsafe outputs/failsafe inputs + 4 individual failsafe relay outputs + 2 individually failsafe transistor outputs. For use with Pluto safe bus and/or a Pluto Safety databus and/or ASi Safe bus.</td>
</tr>
<tr>
<td>GATE-P2</td>
<td>2TLA020071R8000</td>
<td>Gateway for 2-way communication between the Pluto bus and Profibus.</td>
</tr>
<tr>
<td>GATE-C2</td>
<td>2TLA020071R8100</td>
<td>Gateway for 2-way communication between the Pluto bus and CANopen.</td>
</tr>
<tr>
<td>GATE-D2</td>
<td>2TLA020071R8200</td>
<td>Gateway for 2-way communication between the Pluto bus and DeviceNet.</td>
</tr>
<tr>
<td>GATE-E2</td>
<td>2TLA020071R8300</td>
<td>Gateway for 2-way communication between Pluto databus and Profinet, Gateway Pluto Ethernet/IP, Modbus TCP.</td>
</tr>
<tr>
<td>IDFix-R</td>
<td>2TLA020070R2000</td>
<td>Identifier, read only. For assigning Pluto an address on the Pluto bus. The IDFix number is fixed by delivery.</td>
</tr>
<tr>
<td>IDFix-RW</td>
<td>2TLA020070R2100</td>
<td>Identifier, read/write. For assigning Pluto an address on the Pluto bus. The IDFix number is programmable.</td>
</tr>
<tr>
<td>IDFix DATA</td>
<td>2TLA020070R2300</td>
<td>Identifier, read/write and AS-i safety codes. For assigning Pluto an address on the Pluto bus and storage of AS-i safety codes. The IDFix number is programmable. Intended for Pluto AS-i and B42 AS-i but can be used for all Pluto types.</td>
</tr>
<tr>
<td>IDFix-PROG 2k5</td>
<td>2TLA020070R2400</td>
<td>External program memory, 2.5 kbyte. For projects with only one Pluto the memory can store the PLC program. Can also be used to give Pluto AS-i a specific address.</td>
</tr>
<tr>
<td>IDFix-PROG 10k</td>
<td>2TLA020070R2600</td>
<td>External program memory, 10 kbyte. For projects with only one Pluto the memory can store the PLC program. Can also be used to give Pluto AS-i a specific address.</td>
</tr>
<tr>
<td>R-120</td>
<td>2TLA020070R2200</td>
<td>Terminating resistor for Pluto bus.</td>
</tr>
</tbody>
</table>
## Component list - Pluto Safety PLC

<table>
<thead>
<tr>
<th>Product</th>
<th>Ordering number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROG CABLE</td>
<td>2TLA020070R5600</td>
<td>Cable for connecting PC serial port to Pluto for programming and on-line monitoring. 9-pole D-sub connector to straight modbus contact.</td>
</tr>
<tr>
<td>PROG CABLE</td>
<td>2TLA020070R5700</td>
<td>Cable for connecting HMI-panel to Pluto programming port. Connector at HMI-side: 15-pole D-sub, Pluto side: 90 degrees angled modbus contact.</td>
</tr>
<tr>
<td>PROG CABLE</td>
<td>2TLA020070R5800</td>
<td>For connecting PC, USB port to Pluto for programming and on-line monitoring.</td>
</tr>
<tr>
<td>BUS CABLE</td>
<td>2TLA020070R3000</td>
<td>CAN-Bus cable, yellow, 1 x 2 x 0.50 mm².</td>
</tr>
<tr>
<td>BUS CABLE</td>
<td>2TLA020070R6800</td>
<td>CAN-Bus cable, yellow, 1 x 2 x 0.75 mm². UL &amp; CSA approved.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RSA 597</td>
<td>2TLA020070R3600</td>
<td>Absolute encoder RSA 597, single turn, connector, 10 mm shaft.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RSA 698</td>
<td>2TLA020070R3700</td>
<td>Absolute encoder RSA 698, multi-turn, M12 connector, 10 mm shaft.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RSA 597</td>
<td>2TLA020070R3300</td>
<td>Absolute encoder RSA 597, single turn, 1.5 m cable, 10 mm shaft.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RSA 597</td>
<td>2TLA020070R3400</td>
<td>Absolute encoder RSA 597, single turn, 2 m cable, hollow shaft, 12 mm hole.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RSA 597</td>
<td>2TLA020070R5900</td>
<td>Absolute encoder RSA 597, single turn, 10 m cable, hollow shaft, 12 mm hole.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RSA 698</td>
<td>2TLA020071R7800</td>
<td>Absolute encoder RSA 698, multi-turn, M12 connector, 6 mm shaft.</td>
</tr>
<tr>
<td>ABSOLUTE ENCDR RHA 597</td>
<td>2TLA020071R7900</td>
<td>Absolute encoder RHA 597, multi-turn, M12 connector, hollow shaft, 12 mm hole.</td>
</tr>
<tr>
<td>CONNECTOR ABSOLUTE ENCDR</td>
<td>2TLA020070R3900</td>
<td>Connector for absolute encoder RSA 597 with connector.</td>
</tr>
<tr>
<td>HMI DISPLAY</td>
<td>2TLA850015R1100</td>
<td>3.5&quot; TFT-LCD touch screen display, 320x240 pixels and 64k colors. RS422/RS485, RS232, Ethernet and USB communication.</td>
</tr>
<tr>
<td>HMI DISPLAY</td>
<td>2TLA850015R1300</td>
<td>5.7&quot; TFT-LCD touch screen display, 320x240 pixels and 64k colors. RS422/RS485, RS232, Ethernet and USB communication.</td>
</tr>
<tr>
<td>HMI DISPLAY</td>
<td>2TLA850015R1500</td>
<td>3.5&quot; TFT-LCD touch screen display, 320x240 pixels and 16 grayscales. RS422/RS485, RS232, Ethernet and USB communication.</td>
</tr>
<tr>
<td>HMI DISPLAY</td>
<td>2TLA850015R1600</td>
<td>5.7&quot; TFT-LCD touch screen display, 320x240 pixels and 16 grayscales. RS422/RS485, RS232, Ethernet and USB communication.</td>
</tr>
<tr>
<td>HMI DISPLAY</td>
<td>2TLA850015R1700</td>
<td>6.5&quot; TFT-LCD touch screen display, 640x480 pixels, 64k colors. RS422/RS485, RS232, Ethernet and USB communication, Compact Flash Slot.</td>
</tr>
<tr>
<td>HMI SOFTWARE</td>
<td>2TLA850015R2300</td>
<td>For Exter and Cimrex terminals For use with Windows XP/Vista.</td>
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<td>Catalog number</td>
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<tr>
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<tr>
<td>2TLA020070R1100</td>
<td>15, 39</td>
<td>2TLA020070R3000</td>
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<td>2TLA020070R3300</td>
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