PLUTO Safety-PLC

Description of Function Blocks

Libraries: Func05.fps
ASi01.fps
Ext01.fps
Utilities01.fps

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Func05.fps library:

ASi01.fps library:

Ext01.fps library:

Utilities.fps library:

Pluto 0 Plc Code

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Start

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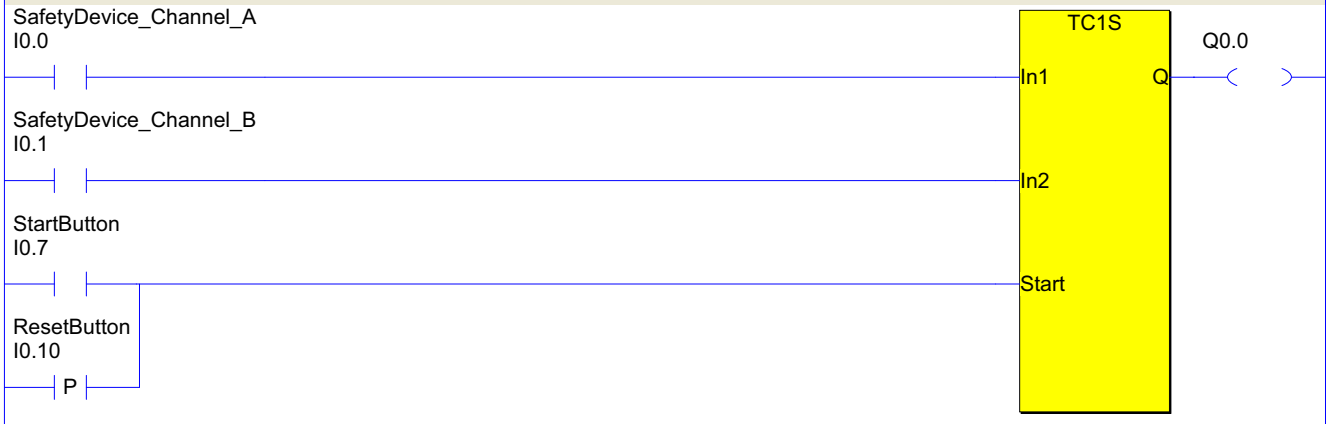
TC1S:
Two-channel function with input for start

- In1 and In2 are primary inputs where safety devices can be connected.
- Start is a start condition which can be used for monitoring or reset.
  In order to get monitored reset the input to Start can be set as pulse/edge.

Description:
The function bock works as a conventional safety relay with redundant and monitored inputs (in1, In2).



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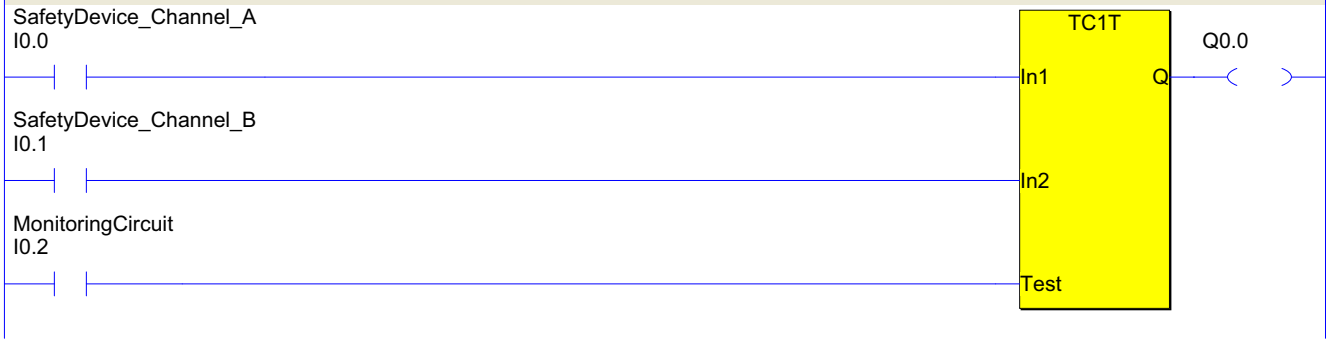
TC1T
Two-channel function with test input

- In1 and In2 are primary inputs where safety devices can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1 and In2, i.e. the function block can not be initiated by Test.

Description:
The function bock works as a conventional safety relay with redundant and monitored inputs (in1, In2).

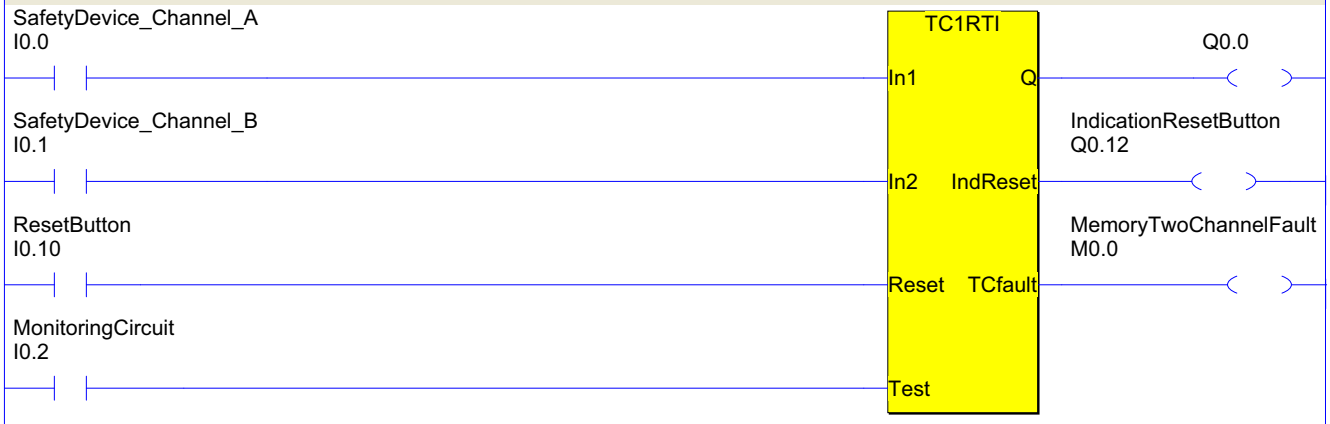


4 TC1RTI
Two-channel function with test and reset inputs.

- In1 and In2 are primary inputs where safety devices can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1 and In2, i.e. the function block can not be initiated by Test.
- Reset is a monitored reset input which must be activated (positive edge) after all other inputs, in order to switch on the output of the function block.

- IndReset is an output for indication which is ON when the function block is switched off and In1, In2 or Test is off, and flashes when the function block is ready for activation with reset.
- TCfault is on by two channel fault, i.e. when the function block is on and just one of In1 and In2 switches off and on again.

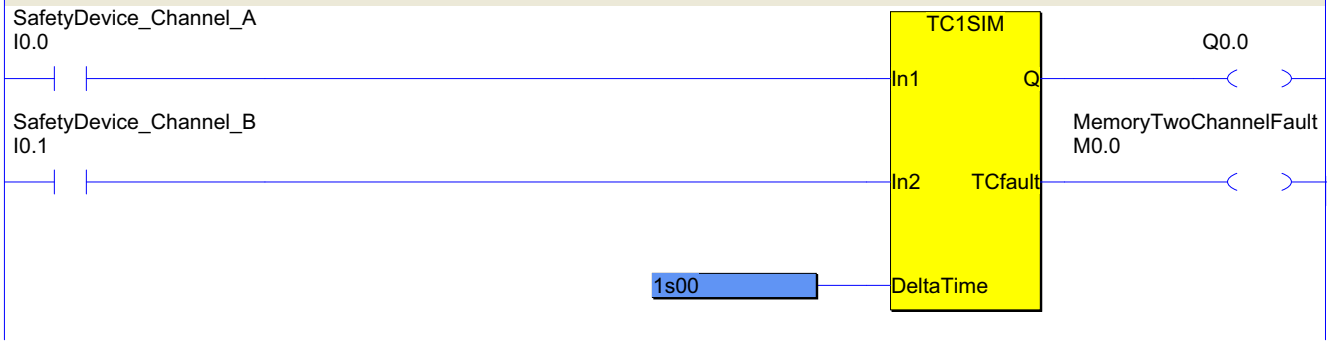
Description:
The function block works as a conventional safety relay with redundant and monitored inputs (in1, In2).



5 TC1SIM - Two-channel function with monitoring of simultaneous operation.

- In1 and In2 are primary inputs where safety devices can be connected.
- DeltaTime is an input for time constant specifying the max time difference between switching on In1 and In2.
- TCfault is on by two channel fault, i.e. when the function block is on and just one of In1 and In2 switches off and on again.

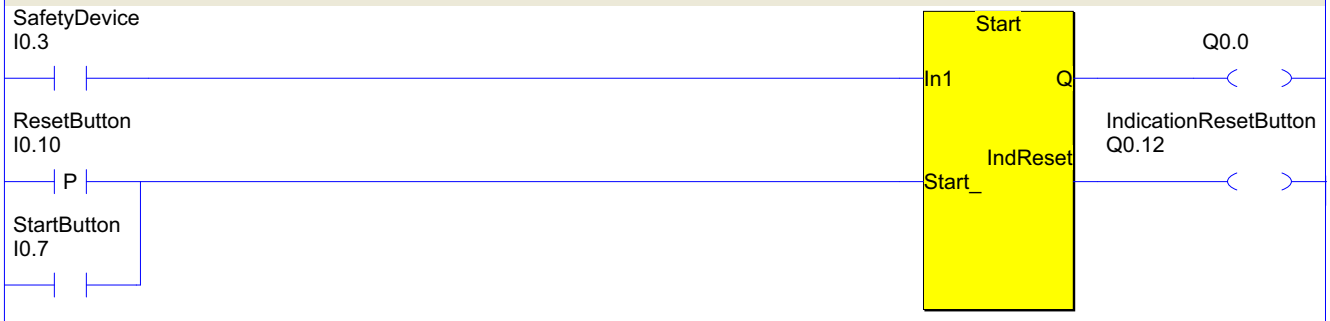
Description:
The function bock works as a conventional safety relay with redundant and monitored inputs (In1, In2) which must switch on simultaneously within the time 'DeltaTime'.



6

Start
Single-channel function with start input

- In1 is primary input to which the output of a safety devices, output of other function blocks or memories can be connected.
- Start is a start condition and can be used as monitor or reset input.
  In order to get monitored reset, the input to Start can be set as pulse/edge.
- IndReset is an output for indication which is on when the function block is switched off and In1 is off,
  and flashes when the function block is ready for activation with Start.



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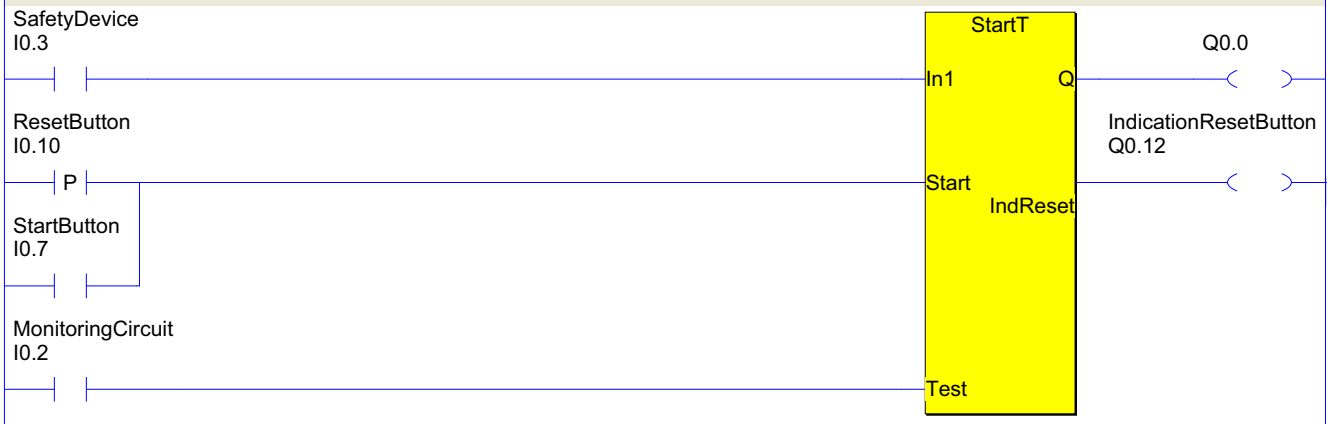
StartT
Single-channel function with start and test input

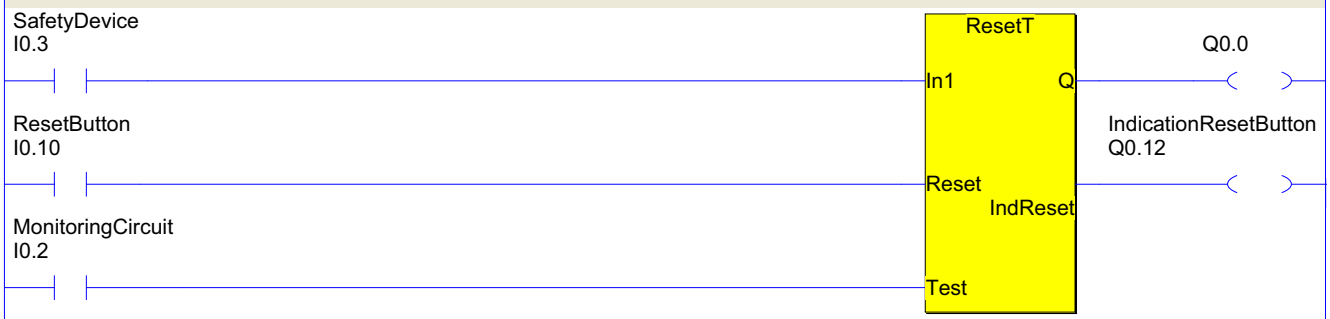
- In1 is primary input to which the output of a safety devices, output of other function blocks or memories can be connected.
- Start is a start condition and can be used as reset input.
  In order to get monitored reset, the input to Start can be set as pulse/edge.
  Start can be bridged in order to get automatic reset by connection of a line directly from "common".
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external
  components. Test must be on before In1 or Start (if Start is bridged to "common", Test must be on before In1),
  i.e. the function block can not be initiated by Test.
  If input Test is not needed it can be bridged by connection of a line direct from the right "common".
- IndReset is an output for indication which is on when the function block is switched off and In1 is off,
  and flashes when the function block is ready for activation with Start.



8

ResetT
Single-channel function with reset and test input

- In1 is primary input to which the output of safety devices, output of other function blocks or memories can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external
  components. Test must switch on before In1 and Reset, i.e. the function block can not be initiated by Test.
- Reset is a monitored reset input which must be activated (positive edge) after all other inputs in order to
  switch on the output of the function block.
- IndReset is an output for indication which is on when the function block is switched off and In1 and Test is off,
  and flashes when the function block is ready for activation with Start.



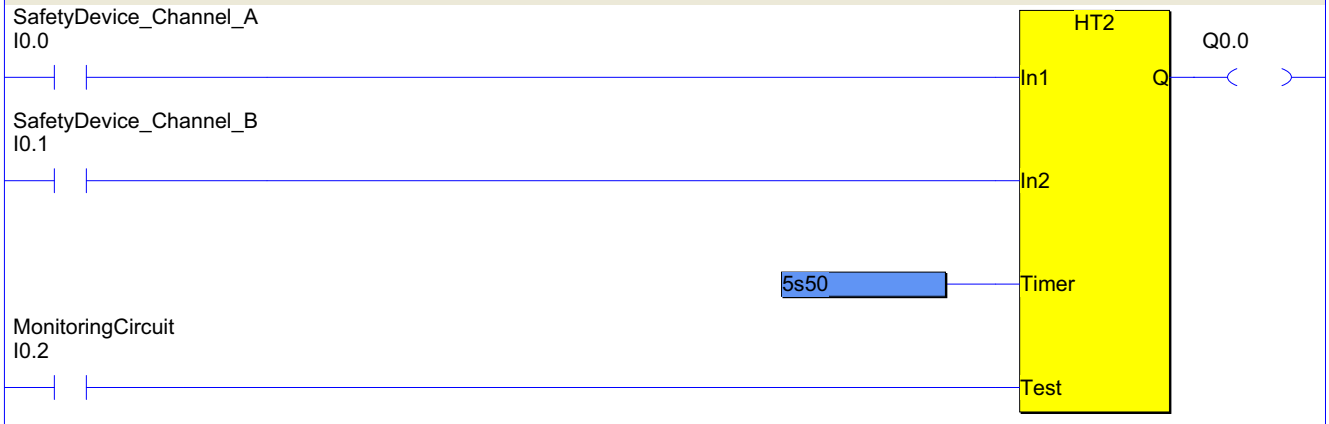
9 HT2

Two-channel function with time limitation.

- In1 and In2 are primary inputs where safety devices can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1 and In2, i.e. the function block can not be initiated by Test.
- Timer is an input for a time constant with the value for the wished time limit.

Description:
When both inputs In1 and In2 switches 0 to1, the function block switches on and remains in that status until the time is elapsed or one of In1 or In2 goes off. The timer starts when both In1 and In2 are on.

The LED indicators in the front panel for In1 and In2 flashes at the input that does not switch on if the other does and also if one of them opens and closes and the other remains on.



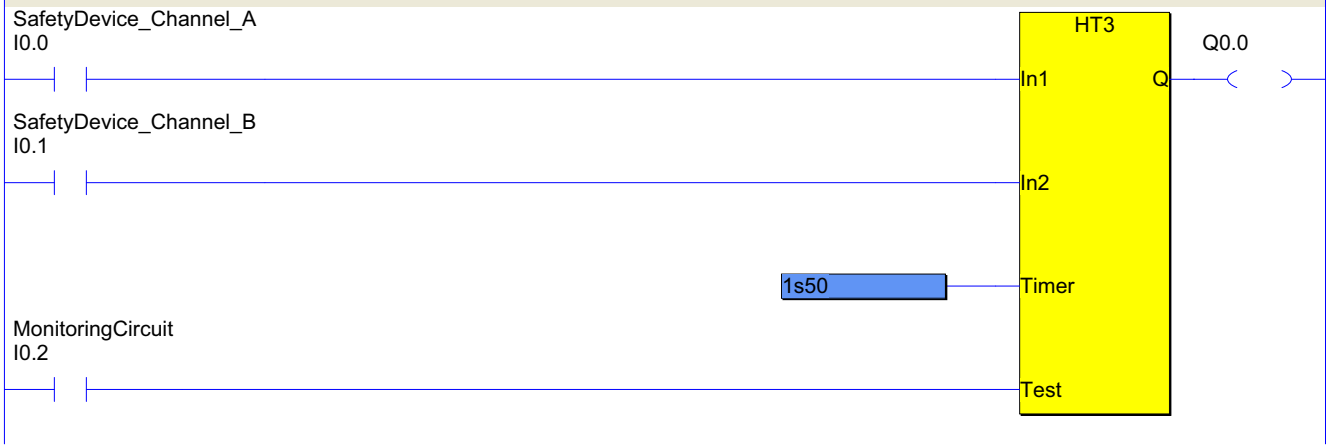
10 HT3

Two-channel function with time limitation.

- In1 and In2 are primary inputs where safety devices can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1 and In2, i.e. the function block can not be initiated by Test.
- Timer is an input for a time constant with the value for the wished time limit.

Description:
When both inputs In1 and In2 switches 0 to1, the function block switches on and remains in that status until the time is elapsed or one of In1 or In2 goes off.
The timer starts when one of In1 and In2 is on. (Different to HT2)

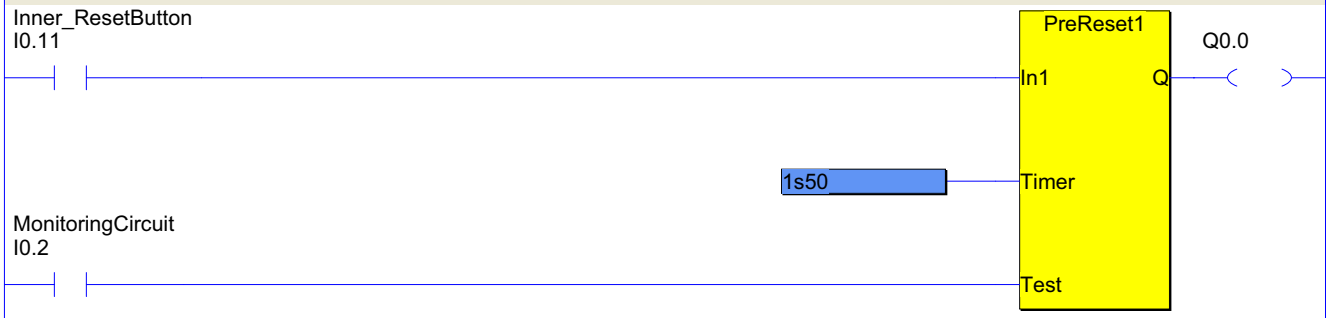
The LED indicators in the front panel for In1 and In2 flashes at the input that does not switch on if the other does and also if one of them opens and closes and the other remains on.



11 PreReset1
Single-channel pulse function (intended for inner reset)

- In1 is an input to which for example a push button for prereset can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1, i.e. the function block can not be initiated by Test.
- Timer is an input for a time constant with the value for the wished pulse time.

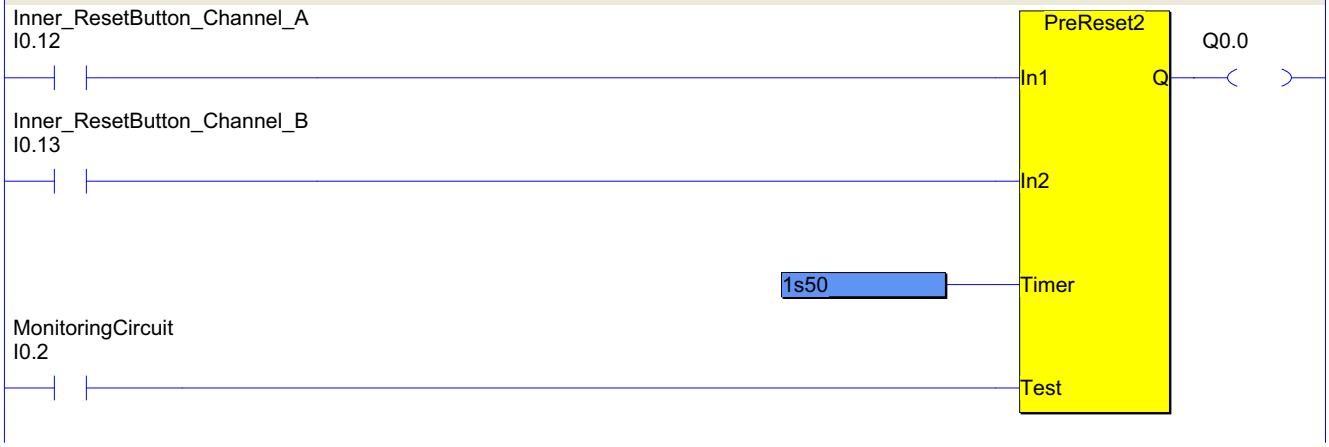
Description:
When In1 switches on, the output of the function block switches on and remains on until the time is elapsed, even if In1 goes low before.



12 PreReset2
Two-channel pulse function (intended for inner reset)

- In1 and In2 are inputs to which for example a two-channel push button for prereset can be connected.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1 and In2, i.e. the function block can not be initiated by Test.
- Timer is an input for a time constant with the value for the wished pulse time.

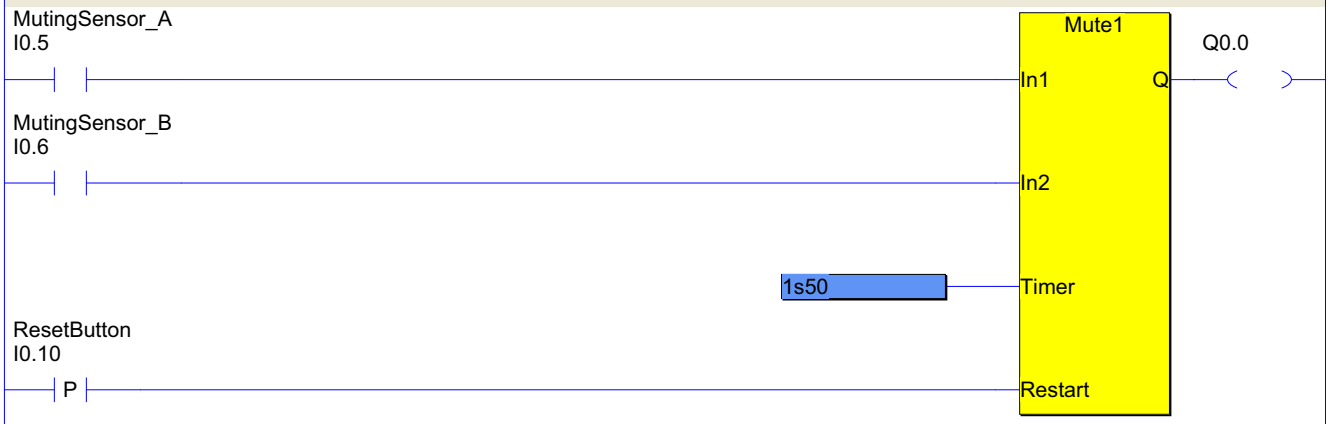
Description:
When In1 and In2 switches on, the output of the function block switches on and remains on until the time is elapsed, even if In1 and In2 goes low before.
The timing starts when both In1 and In2 are switched on.



13 Mute1
Muting function with two-channel input.

- In1 and In2 are inputs for connection of for example two muting sensors.
- Restart is an input which can be used for restart button.
- Timer is an input for a time constant with the value for the maximal muting time.

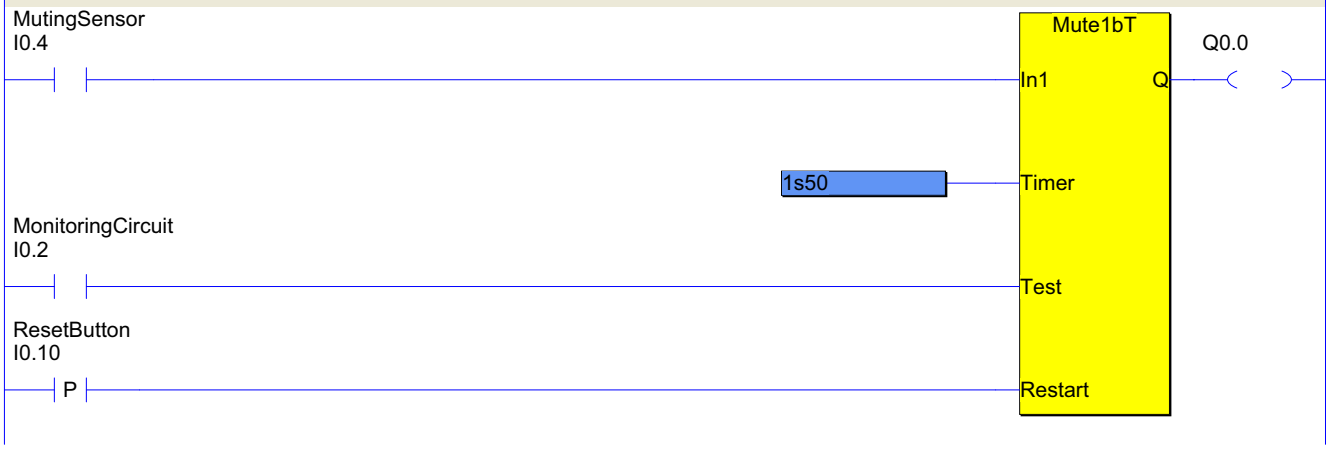
Description:
When both inputs In1 and In2 switches 0 to1, the function block switches on and remains in that status until the time is elapsed or one of In1 or In2 goes off. The timer starts when both In1 and In2 are on.
By activation of the Restart input, the muting can be restarted if it has switched off. The only condition for restart is that In1 and In2 are on. Restart is activated on positive edge of the input signal.



14 Mute1bT
Muting function with single-channel input.

- In1 is inputs for connection of muting sensor, output from other block etc.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1 and Restart, i.e. the function block can not be initiated by Test.
- Restart is an input which can be used for restart button.
- Timer is an input for a time constant with the value for the maximal muting time.

Description:
When input In1 switches 0 to1, the function block switches on and remains in this status until the time is elapsed or In1 goes off.
By activation of the Restart input, the muting can be restarted if the time is elapsed without switching off In1 first.
Restart is activated on positive edge of the input signal.



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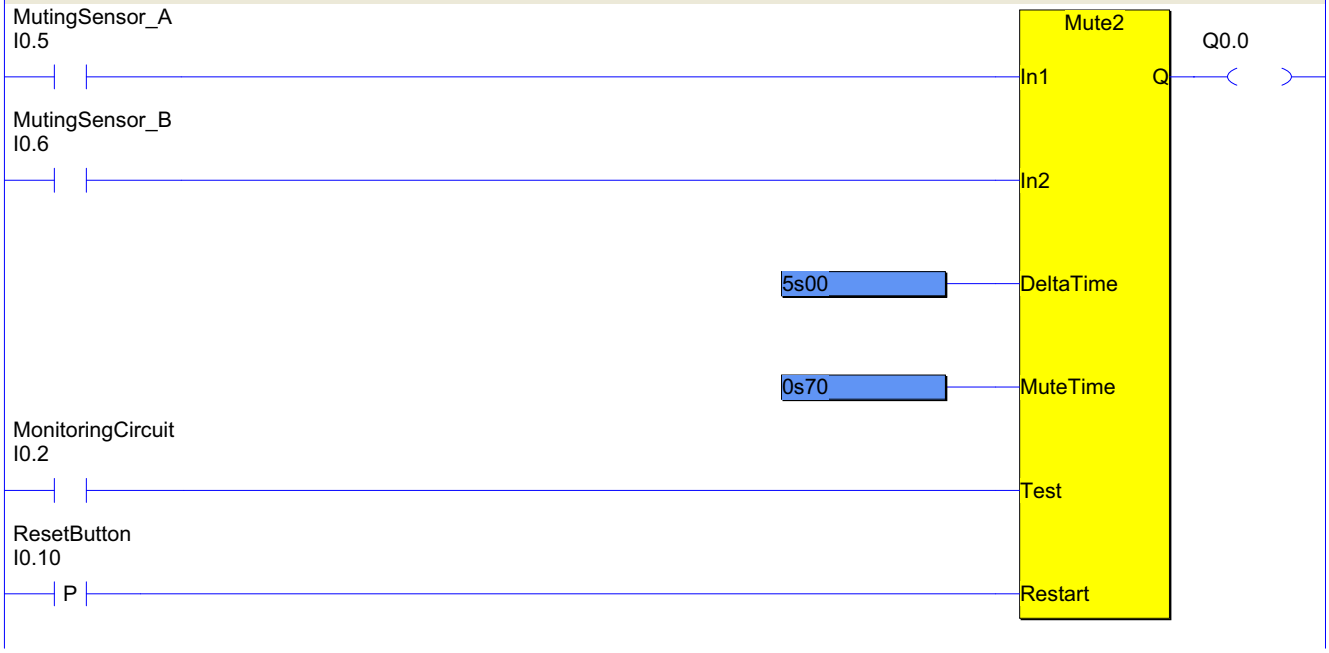
Mute2
Muting function with two-channel input, time limitation and timer for simultaneous activation of inputs.

- In1 and In2 are inputs for connection of for example two muting sensors.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before In1, In2 and Restart, i.e. the function block can not be initiated by Test.
- Restart is an input which can be used for restart button.
- DeltaTime is an input for a time constant with the value for the maximal difference in simultaneity between In1 and In2.
- MuteTime is an input for a time constant with the value for the maximal muting time.

Description:
When both inputs In1 and In2 switches 0 to1, the function block switches on and remains in that status until the time is elapsed or one of In1 or In2 goes off. The timer starts when both In1 and In2 is on.
By activation of the Restart input the muting can be restarted if it has switched off. The only condition for restart is that In1, In2 and Test are on. Restart is activated on positive edge of the input signal.
If the time difference between switching on In1 and In2 exceeds the value of DeltaTime the function block does not switch on.



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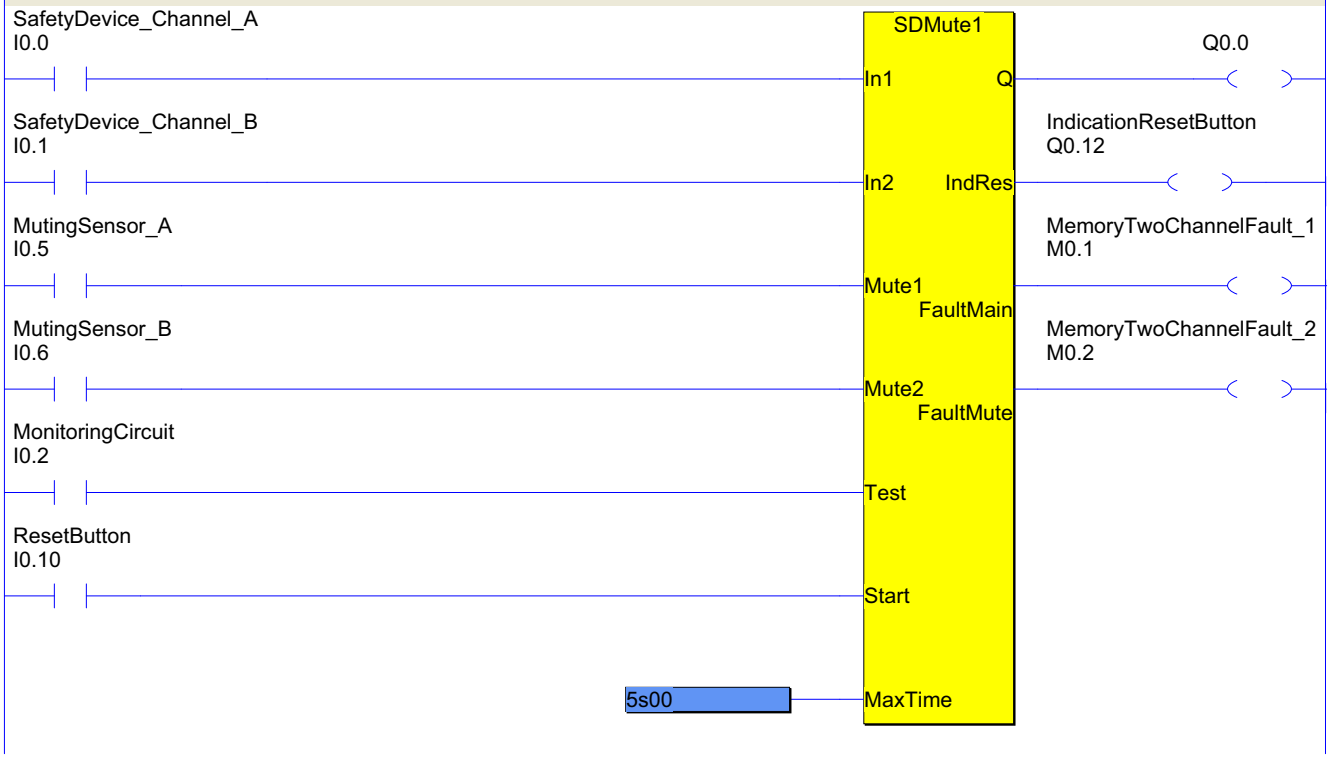
SDMute1
Safety function with two-channel input and integrated two-channel muting function

- In1 and In2 are primary input channels where safety devices can be connected.
- Mute1 and Mute2 are inputs for connection of for example two muting sensors.
- Test is an input condition which must be true at the start up moment and can be used for monitoring of external components. Test must switch on before the start attempt, i.e. the function block can not be initiated by Test.
- Start is a start condition and can be used as reset input.
  In order to get monitored reset, the input to Start can be set as pulse/edge.
- MaxTime is an input for a time constant with the value for the maximal muting time.

- Output IndReset is on when the function block is off and flashes when it is ready for activation with Start.
- Output FaultMain is on at two-channel fault at In1/In2.
- Output FaultMute is on at two-channel fault at Mute1/Mute2

Description:
The main function In1/In2 works as a conventional safety relay with redundant and monitored inputs.
The muting function Mute1/Mute2 works as a time limited muting function. When the muting function is activated the timing starts and the inputs to In1 and In2 are allowed to switch off. Before the time is elapsed In1 and In2 must switch on again, if not the output of the function block switches off.
Start is an input function for start and restart of the function block. Start can be made when the inputs (In1,In2) or (Mute1,Mute2) are active and can be made even after the time has elapsed or a two channel fault exists.
The input to Start can be set as pulse/edge to achieve monitored reset.



17 Twohand1
Two-hand control for actuators with NO/NC + NO/NC contacts.

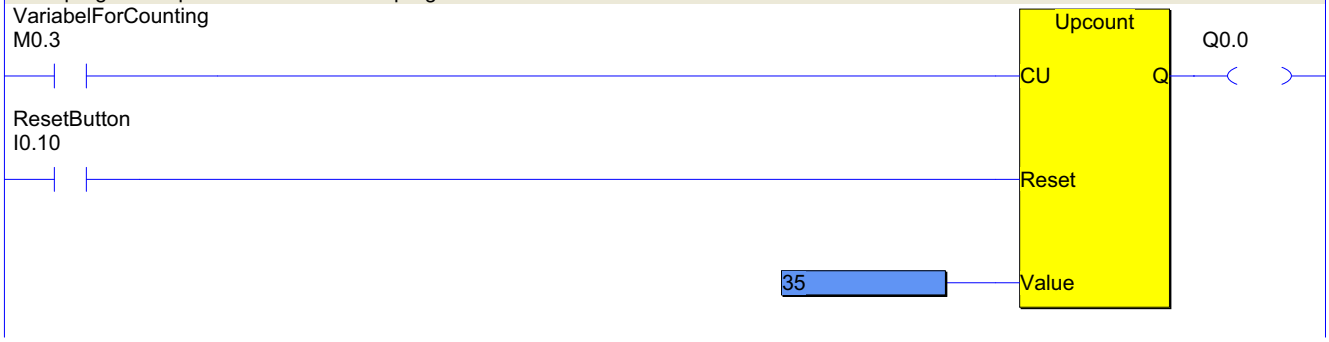
- Right_NO is Right hand NO-contact
- Right_NC is Right hand NC-contact etc.
- Test is an input condition that must be on before any of the other inputs changes from the initial position and can be used for monitoring of external components.

Function:
In initial position shall:
Right_NO be off,
Right_NC be on,
Left_NO be off and
Left_NC be on
To start the output (Q), these four inputs must change state in 0.5 seconds and remain in that position.
After stop, all inputs must come to the initial position to enable restart.

18 Upcount
Counter which counts up to preset value

- CU, counter input
- Reset, resets the counter to 0
- To Value shall a constant 0 - 32767 be connected, representing the preset value.

Function:
The counter is incremented on positive edge at the counter input CU.
When the counter reaches the preset value the output switches on and remains on until it is reseted..
When the Reset input is on the counter is set to 0. A reset of the counter is also done at the first scan of the program step where the counter is programmed

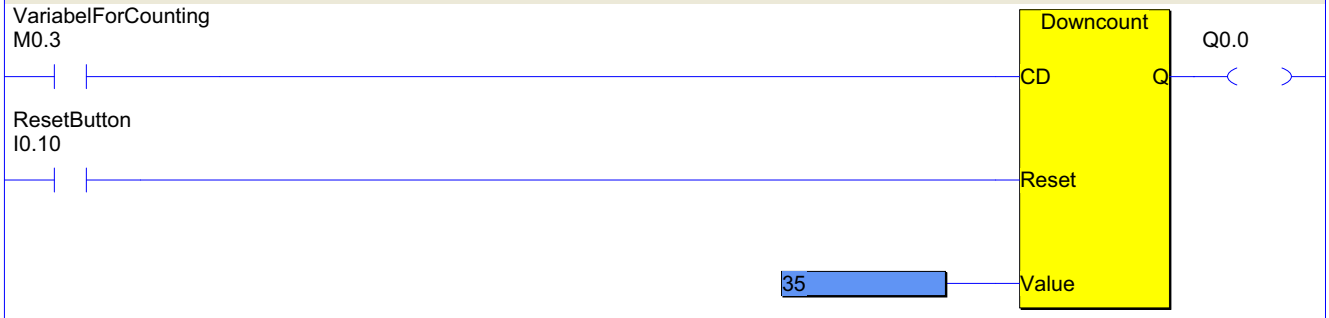


19 Downcount

Counter which counts down from preset value to 0.

- CD, counter input
- Reset sets the counter to preset value.
- To Value shall a constant 0 - 32767 be connected, representing the preset value.

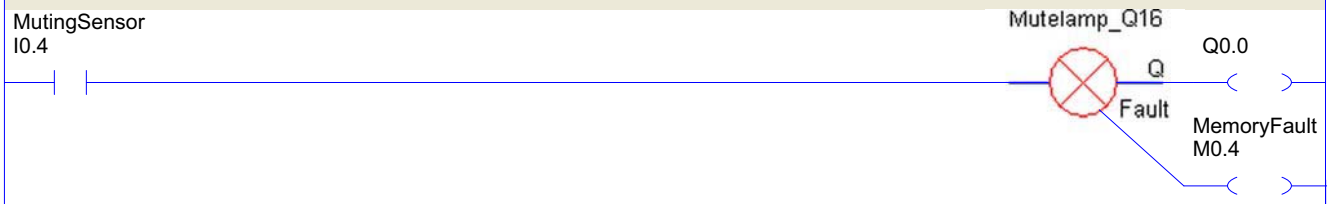
Function:
The counter is decremented on positive edge at the counter input CD.
When the counter reaches 0 the output switches on and remains on until Reset is activated.
When the Reset input is on the counter is set to preset value. A reset of the counter is also done at the first scan of the program step where the counter is programmed.



20 Monitoring of current to muting indicator at output Q16. (Only Pluto A20)

- In1 is primary input to which the output of an muting function can be connected.
- Fault is an output indicating that no current are feeded to Q16.

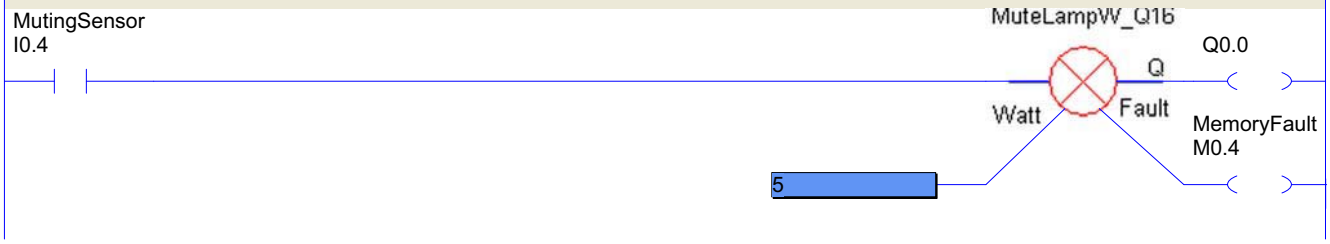
Description:
The block is made for monitoring of the current in a muting indicator connected to Q16.
The current limits min. and max are set to 56 and 800 mA for min 2W bulb.
When In1 is activated the indicators are switched on and when the currents have passed the limit value the output of the block 'Q' is set. The current may not afterwards pass the limits.
If no current is detected or exceeds the upper limit the output switches off and the output 'Fault' is activated.



21 Monitoring of current to muting indicator at Q16. (Only Pluto A20)

- In1 is primary input to which the output of an muting function can be connected.
- Watt_Q16 is a contant with the value in Watt for the bulb connected to Q16.
- IndQ16 is an output from the block which if used must be connected to Q16 where also the muting indicator must connected.
- Fault is an output indicating that no current are feded to one of Q16.

Function:
The block is made for monitoring of current in a muting indicator connected to Q16.
At the input Watt_Q16 the value of the bulb sizes at Q16 can be declared. This value is then translated to a current limit.
1 Watt gives 28 mA, 2 Watt 56 mA etc.
When In1 is activated the indicator is switched on and when the current have passed the min limit value the output of the block is set. The current may not afterwards drop below the min limit or exceed the max limit (800mA).
If no current is detected the output switches off and the output Fault is activated.

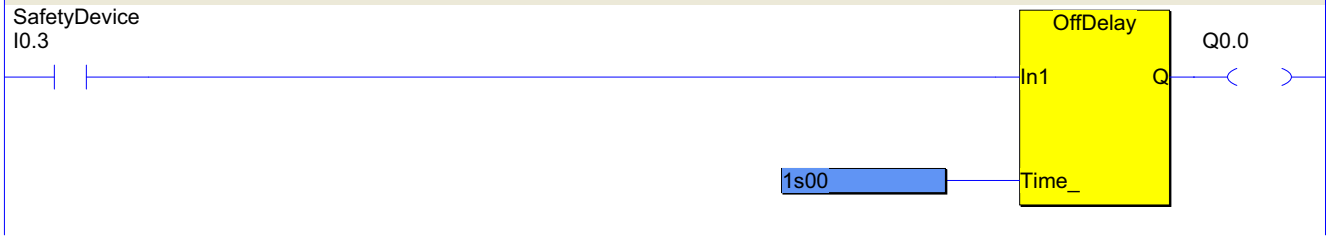


22

Off delay timer function

- In1 is input
- Time_ is input for time constant.

Function:
The output Q switches on imediately when In1 switches on. When In1 switches off Q switches off after the time has elapsed. The time is specified by the time constant commected to the input 'Time_'.



23

Function block for light curtains with three main modes of operation:
Guard only, Single break, Double brake mode.

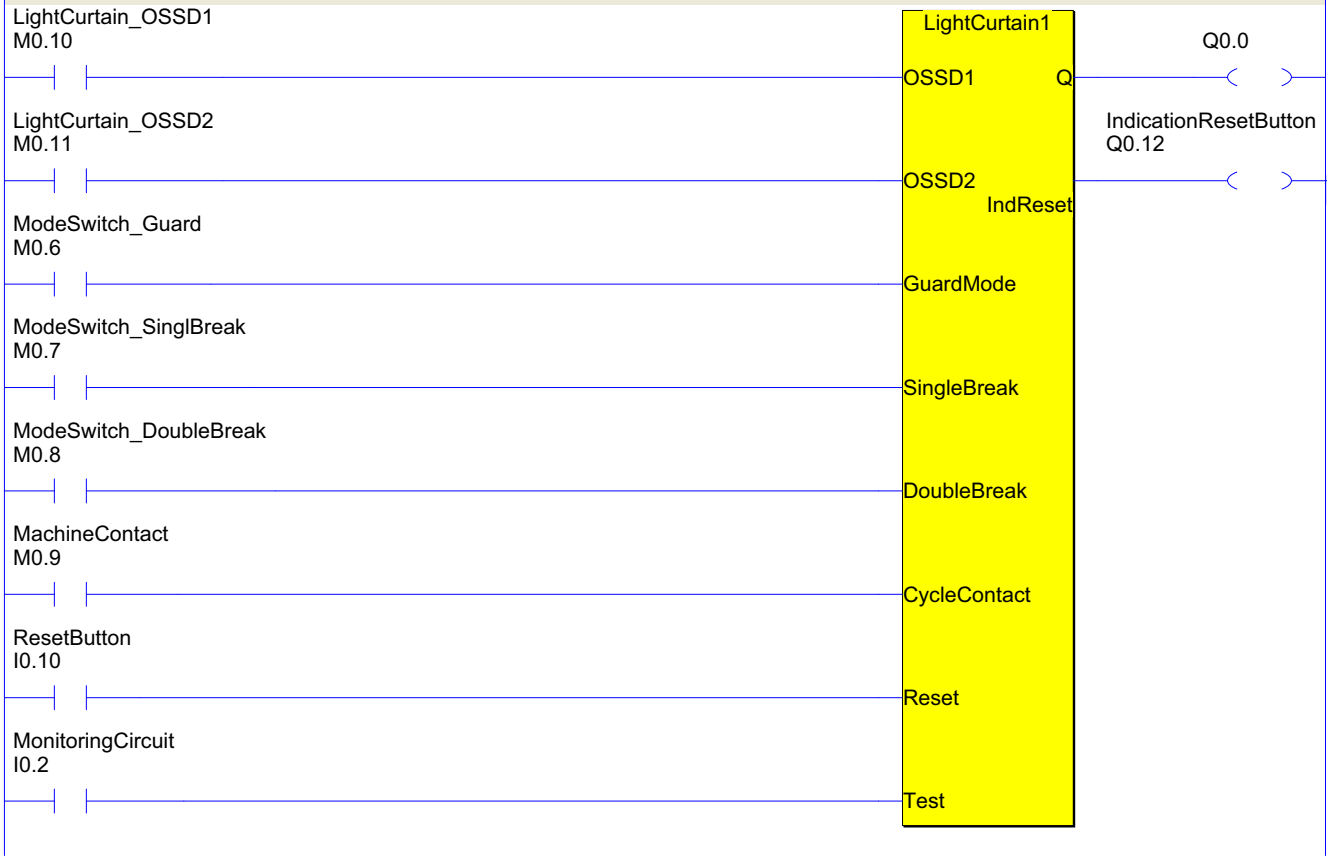
********** Function description **********
In guard only mode the input 'GuardMode' shall be set. The output Q switches on after that input 'Reset' is activated and the light curtain is green (OSSDs on).
The the input 'CycleContact' works as enable function in this mode. Reset is not required after operation of the 'CycleContact'

Single brake and Double brake modes are intended for machines where the light curtain is used for initiation of a new cycle (typically for presses).
When the machine is prepared for a new cycle it shall set the input 'CycleContact'. If 'SingleBreak' is set output Q is not set before the light curtain has been broken/red once and in 'DoubleBreak' mode it must be broken/red two times.
If CycleContact is set in Single and Double breake mode for more than 30 seconds a timeout function will trip out in order to avoid unintended start. Reset is required to restore normal operation.

Reset must be activated after following cases:
- After change of mode, 'GuardMode', 'SingleBreak', 'DoubleBreak'
- If input Test is not activated when output 'Q' shall switch on.
- When the light curtain is not activated within 30 sec. in single and double brake modes.
- After intrusion in the light curtain when the output 'Q' is set.
  (When the machine is stopped by the light curtain.)

When the light curtain is expecting interruption in Single and Double stroke modes Reset is not required.

---------- Description of in- and outputs ----------
- OSSD1: Input connected to light curtain output
- OSSD2: Input connected to light curtain output
- GuardMode: Mode selection, Guard mode
- SingleBreak: Mode selection, Single brake mode
- DoubleBreak: Mode selection, Double brake mode
- CycleContact: Input for initiation of counter for single and double brake.
  After the input is set the counter is decremented at each RED/GREEN transition.
- Reset: Input for reset push button.
- Test: Input which must be set in the moment when the output is switching. When the output has switched on the input can be off.
- IndReset: Output for indicator in reset pushbutton. Flashing when reset is possible, constant on if conditions for reset is not fulfilled.



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Function block for light curtains with three main modes of operation:
Guard only, Single break, Double brake mode and possibility for selection of reset mode.

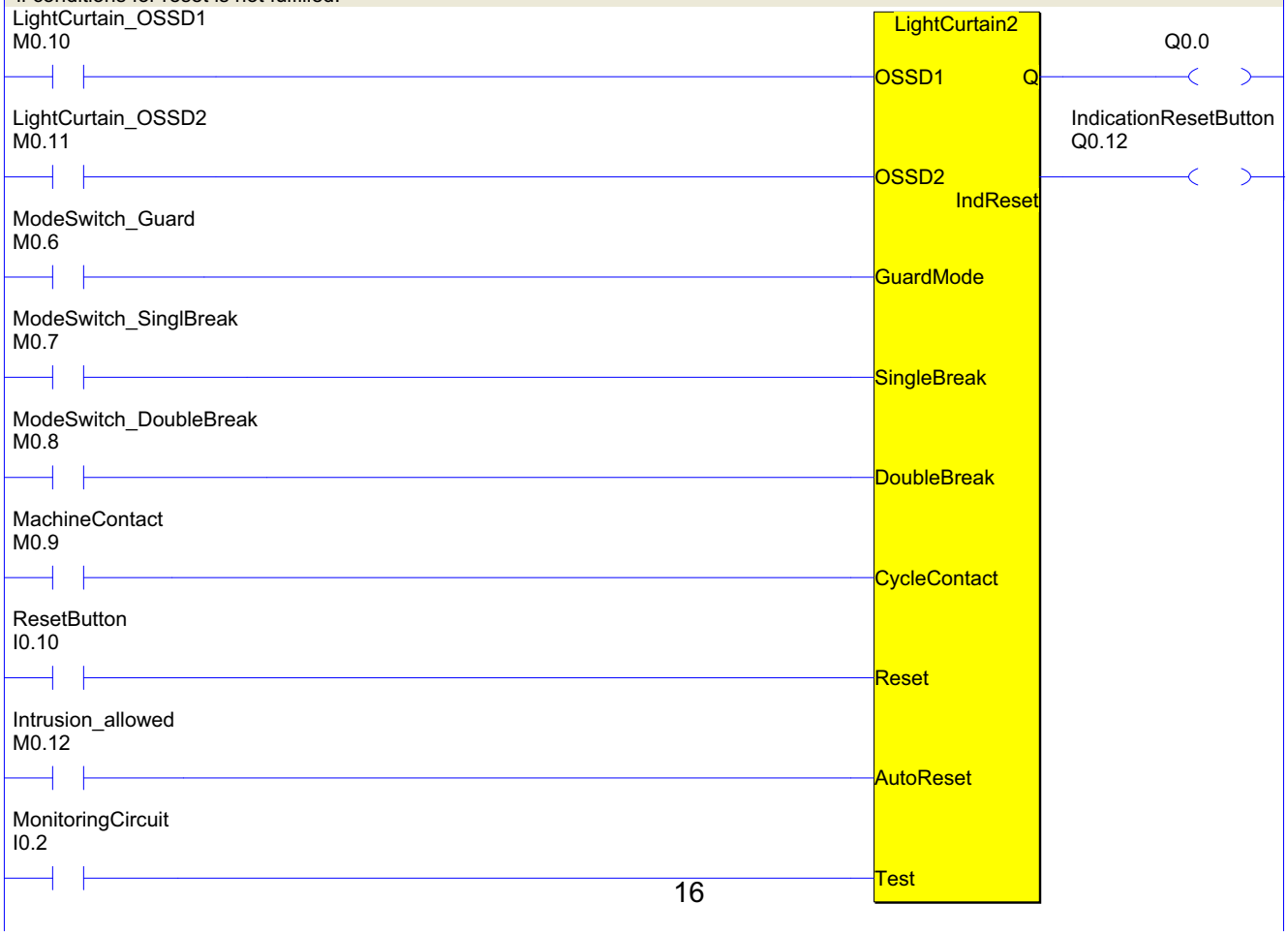
********** Function description **********
In guard only mode the input 'GuardMode' shall be set. The the input 'CycleContact' works as enable function in this mode.
If AutoReset is on, the output Q swtiches on directly when light curtain is green (OSSDs on).
If AutoReset is off, Q switches on after input 'Reset' is activated.

Single brake and Double brake modes are intended for machines where the light curtain is used for initiation of a new cycle (typically for presses).
When the machine is prepared for a new cycle it shall set the input 'CycleContact'. If 'SingleBreak' is set output Q is not set before the light curtain has been broken/red once and in 'DoubleBreak' mode it must be broken/red two times.
If CycleContact is set in Single and Double breake mode for more than 30 seconds a timeout function will trip out in order to avoid unintended start. Reset is required to restore normal operation.

Reset is normally connected to a Reset push button. If the input 'AutoReset' is on, no activation of the input 'Reset' is required after an intrusion in the light curtain (OSSD inputs off / red light curtain).
If 'AutoReset' is off, Reset must be activated after intrusion in the light curtain when the output 'Q' is set. (When the maschine is stopped by the light curtain.) When the light curtain is expecting interruption in Single and Double stroke modes Reset is not required.

Reset must be activated after following cases, even if 'AutoReset' is set:
- After change of mode, 'GuardMode', 'SingleBreak', 'DoubleBreak'
- If input Test is not activated when output 'Q' shall switch on.
- When the light curtain is not activated within 30 sec. in single and double brake modes.

---------- Description of in- and outputs ----------
- OSSD1: Input connected to light curtain output
- OSSD2: Input connected to light curtain output
- GuardMode: Mode selection, Guard mode
- SingleBreak: Mode selection, Single brake mode
- DoubleBreak: Mode selection, Double brake mode
- CycleContact: Input for initiation of counter for single and double brake.
  After the input is set the counter is decremented at each RED/GREEN transition.
- Reset: Input for reset push button.
- AutoReset: When input is set no reset is required after intrusion in the light curtain sensing field
- Test: Input which must be set in the moment when the output is switching. When the output has switched on the input can be off.
- IndReset: Output for indicator in reset pushbutton. Flashing when reset is possible, constant on if conditions for reset is not fulfilled.



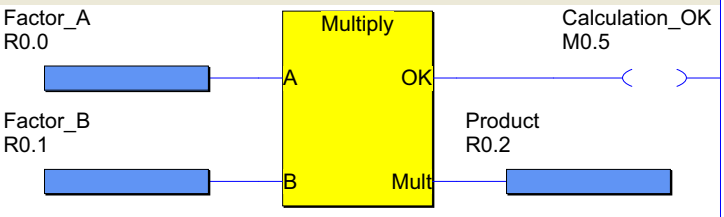
25 Integer multiplication

Mult = A*B

- A and B are inputs for the factors. They can either be registers or constants.
- Mult is the result of the calculation. It can bee assigned to a register.
- OK is an output indicating that the multiplication is successfull.

Overflow:
If the multiplication exceeds the limits -32768 and 32767 (overflow) the OK output switches off and the value of Mult is not relevant. It can be connected to a register (R).
This means that the variable connected to OK shoud be used in combination with the output register later in the PLC code.

NOTE! Pluto system software ver 2.2.3 or higher neeeded.



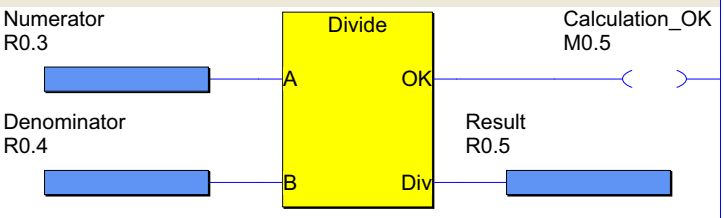
26 Integer division

Div = A/B

- A is inputs for the numerator. It can either be a registers or a constants.
- B is inputs for the denominator. It can either be a registers or a constants.
- Div is the result of the calculation. It can bee assigned to a register..
- OK is an output indicating that the division is successfull. It can be connected to variable types M, GM, Q.

Division with 0:
If B is 0 the calculation can not be performed and is indicated by that the "OK" output is switched off. The output "Div is then 0. This means that the variable connected to OK shoud be used in combination with the output register later in the PLC code.

NOTE! Pluto system software ver 2.2.3 or higher neeeded.



27

ModeSelect8
Monitoring of selector switch with 8 positions

- In1..In8 are inputs from the selector switch.
- Mode1..Mode8 are outputs which are set corresponding to the inputs In1..In8.
  At faulty behaviour in the selector switch none of Mode1..Mode8 is set.
- Fault is set if:
  more than one of In1..In8 are set or
  by overlap in the selector switch, so not all of In1..In8 are off before a new input is set.

Description:
The block is intended to monitor a selector switch. The requirement is that only one position may be activated (ON) and by changing position all inputs must switch off before a new input is set.

Pluto 1 Plc Code

1

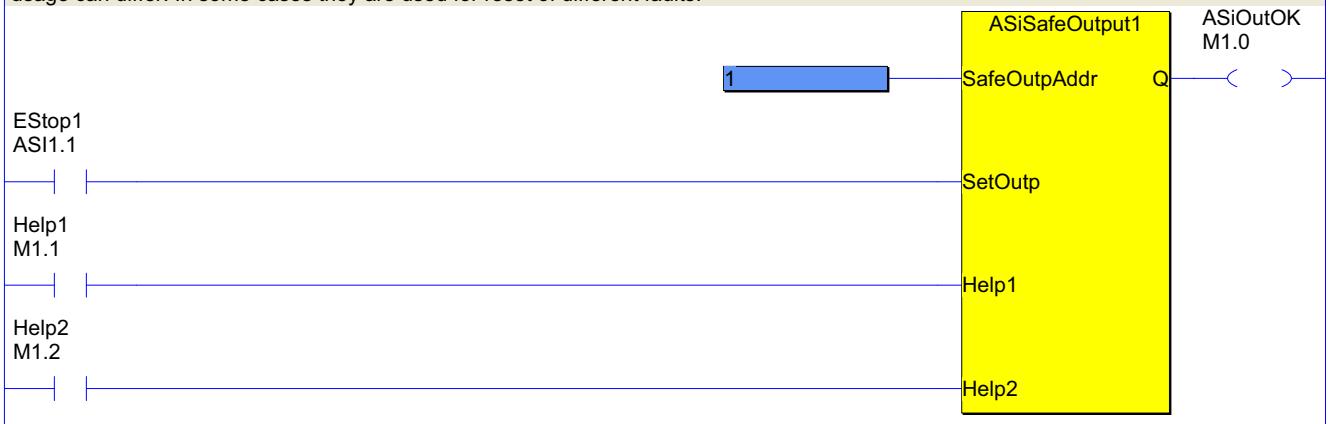
Start

2 ASiSafeOutput1 - Control of AS-i safe output slave (with state ON/OFF)

In- and outputs:
- SafeOutpAddr is an input for a constant setting the address of the output slave (1-31).
- SetOutp is an input for switching the safe output in the slave on and off.
- Help1 and Help2 are two inputs for sending "help"-signals to the slave.
  How and if the help-signals shall be used is individual for different slaves on the market
  For information see user instruction for the actual output slave.
- Q is an output that is set if the slave is demanded to set, but also that it is declared
  on the page "AS-i options" and the block is correct executed.

Description:
The function block controls the safe output in the slave with the block input "SetOutp".
The address of the output slave shall be given to the block by connecting a constant to
the input "SafeOutpAddr".
On the configuration page "AS-i Options" the corresponding address must be configured
as "Safe Output".
The physical output slave unit must also be addressed. This is performed either by an
AS-i addressing tool or by using Pluto and the function "Change AS-i slave address" in Pluto Manager.

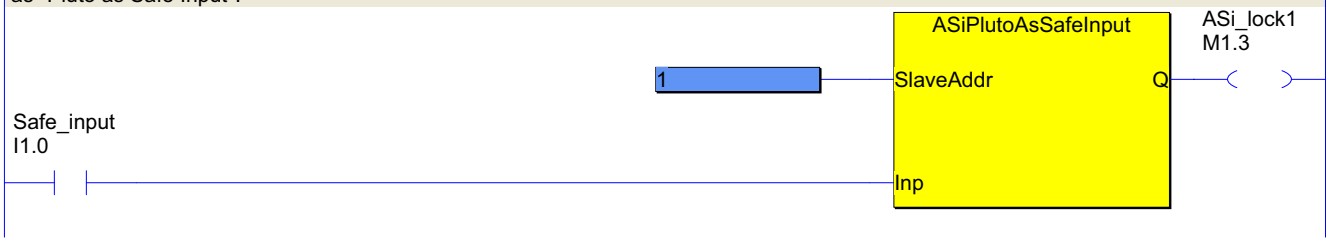
The signals Help1 and Help2 shall be used according to the manufacturers instructions since the
usage can differ. In some cases they are used for reset of different faults.



3 ASiPlutoAsSafeInput - Pluto simulates a safe input slave

In- and outputs:
- SlaveAddr is an input for a constant setting the address of the simulated slave (1-31).
- Inp is an input for switching on and off.
- Q is an output that is set if the simulated slave is on, but also that it is declared
  on the page "AS-i options" and the block is correct executed.

Description:
The function block makes the Pluto simulating a safe input slave which can be read by
another Pluto AS-i connected to the AS-i bus. It is then possible to transfer safe variables
to other Pluto units over the AS-i bus.
The address of the output slave shall be given to the block by connecting a constant to
the input "SlaveAddr".
On the configuration page "AS-i Options" the corresponding address must be configured
as "Pluto as Safe Input".



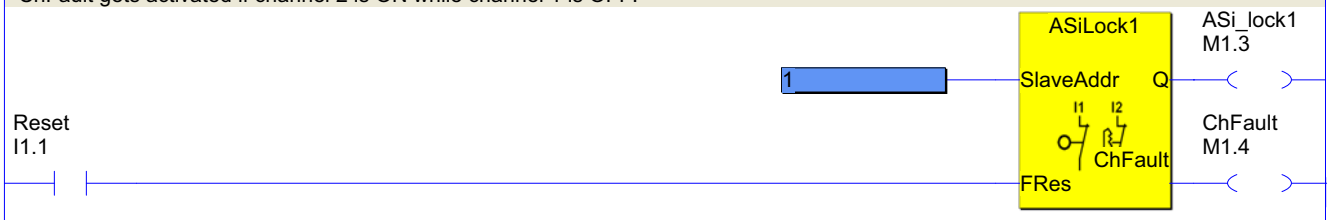
4 ASiLock1:

As-i lock

This block performs channel monitoring on one channel only, typically a door lock:
Channel 1 is used for the guard (protective switch).
Channel 2 is used for the lock monitor.
If the lock is opened, the guard can also be opened. This sequence of events is monitored.
It is an error if the protective switch opens while the lock monitor is active.

The AS-i lock slave shall be configured as Safe input with no channel monitoring on
the AS-i options page. The channel monitoring is done inside the block.

- SlaveAddr is input for a constant specifying the locks AS-i address (1-31).
- FRes is an input that resets error (positive edge)
- Q is an output which is set when the lock is activated, the door is closed
and no error is active. The AS-i input must also be configured correctly.
- ChFault gets activated if channel 2 is ON while channel 1 is OFF.



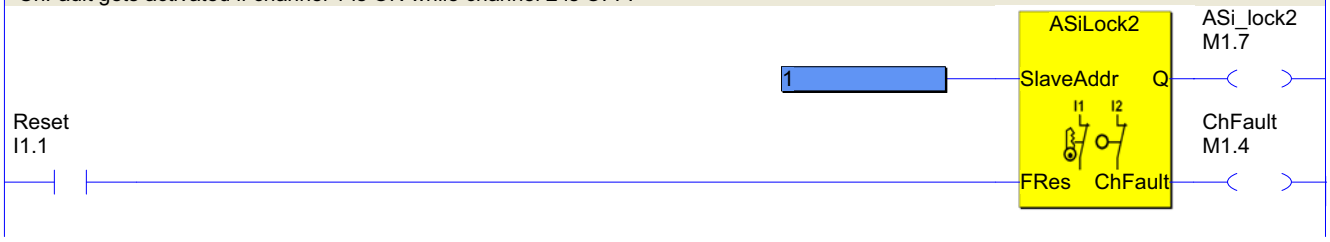
5 ASiLock2:

As-i lock

This block performs channel monitoring on one channel only, typically a door lock:
Channel 2 is used for the guard (protective switch).
Channel 1 is used for the lock monitor.
If the lock is opened, the guard can also be opened. This sequence of events is monitored.
It is an error if the protective switch opens while the lock monitor is active.

The AS-i lock slave shall be configured as Safe input with no channel monitoring on
the AS-i options page. The channel monitoring is done inside the block.

- SlaveAddr is input for a constant specifying the locks AS-i address (1-31).
- FRe is an input that resets error (positive edge)
- Q is an output which is set when the lock is activated, the door is closed
and no error is active. The AS-i input must also be configured correctly.
- ChFault gets activated if channel 1 is ON while channel 2 is OFF.

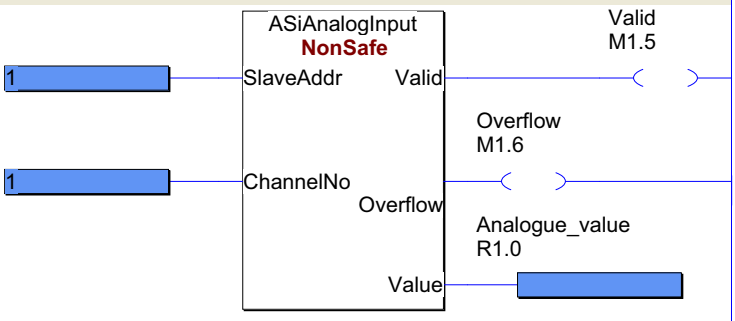


6 ASiAnalogInput - For reading of analogue input slave. (Non-safe)
Profiles: S-7.3.C, S-7.3.D, S-7.3.E och S-7.3.F

In- and outputs:
- SlaveAddr is an input for a constant setting the address of the analogue slave (1-31).
- ChannelNo is an input for a constant setting which channel that shall be read (1-4).
- Valid is an output that is set when the slave is correct declared, Pluto is communicating with it and it has no internal faults.
- Overflow is an output that is set when the analogue value is out of range.
- Value is the output for the analogue value. The output shall be connected to a register.

Description:
The function block reads the analogue value in an AS-i analogue input slave. The value shall be connected to a register. By further evaluation of the register in the PLC program it should be used together with the output Valid which indicates that the value is reliable.

Note: The analogue value is not safety related.



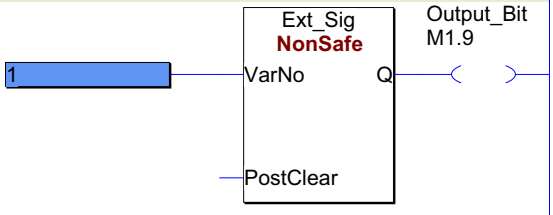
7 Ext_Sig. (Non-safe)

The block reads signals (1 bit) from external devices such as gateway, HMI etc.
The external devices can either be connected to the Pluto CAN-bus or the serial programming port.
By connection to the programming port Modbus ASCII communication protocol is used.

In- and outputs:
- VarNo is an input for a constant which specifies the variable number (0..63).
- Q is output and can control a M, GM or Q according to what the external device transmits.
- PostClear is an input for setting the output "Q" to 0 next cycle.
  If PostClear is not connected Q will keep its value until the external variable is set to 0.
  If time out is selected (under External Communication) Q will be set to 0 when the set time value has expired.

Description:
An external device can transmit up to 64 1-bit variables numbered 0..63. This block can take care of one of these variables and set a memory or output (M, GM or Q) with the output "Q" from the block.
By Modbus devices each "VarNo" corresponds to a Modbus "Output coil":
  VarNo: 0 to Output coil 0,
  VarNo: 1 to Output coil 1,
  ...
  VarNo: 63 to Output coil 63.
So if for example a HMI controls output coil 4 the constant to input "VarNo" shall be set to "4".

PostClear sets the output "Q" to 0 in next PLC cycle, if it is unconditionally set "Q" will be set to "1" during one cycle if the external device writes "1" to the variable (output coil). If time out is selected (under External Communication) Q will be set to 0 when the set time value has expired.



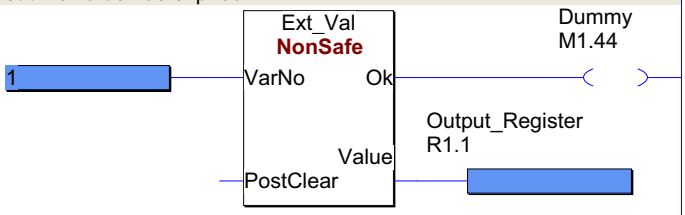
8 Ext_Val. (Non-safe)

The block reads values (16 bit) from external devices such as gateways, HMI etc.
The external devices can either be connected to the Pluto CAN-bus or the serial programming port. By connection to the programming port Modbus ASCII communication protocol is used.

In- and outputs:
- VarNo is an input for a constant which specifies the variable number (0..7).
- Value is the output for the value from the external device and must be connected to a Register (R).
- PostClear is an input for setting the output "Value" to 0 in next PLC cycle. If PostClear is not connected the output "Value" is frozen until it is updated by the external variable. If time out is selected (under External Communication) "Value" will be set to 0 when the set time value has expired.
- Q is mainly a dummy output which is normally 1. However it must be connected to a M, GM or Q.

Description:
An external device can transmit up to 8 16-bit variables numbered 0..7. This block can take care of one of these variables and write it to a register (R) with the output "Value" from the block.
By Modbus devices each "VarNo" corresponds to a Modbus "Holding register":
VarNo: 0 to Holding reg. 400000,
VarNo: 1 to Holding reg. 400001,
...
VarNo: 7 to Holding reg. 400007.
So if for example a HMI controls output coil HREG 400002 the constant to input "VarNo" shall be set to "2".

PostClear sets the output "Value" to 0 in next PLC cycle. If the input is unconditionally set, "Value" will be set to the value written by the external device during one cycle. Then it will be reset to "0" again. If time out is selected (under External Communication) "Value" will be set to 0 when the set time value has expired.



Pluto 1 Plc Code

9

ExtVarBlock. (Non-safe)

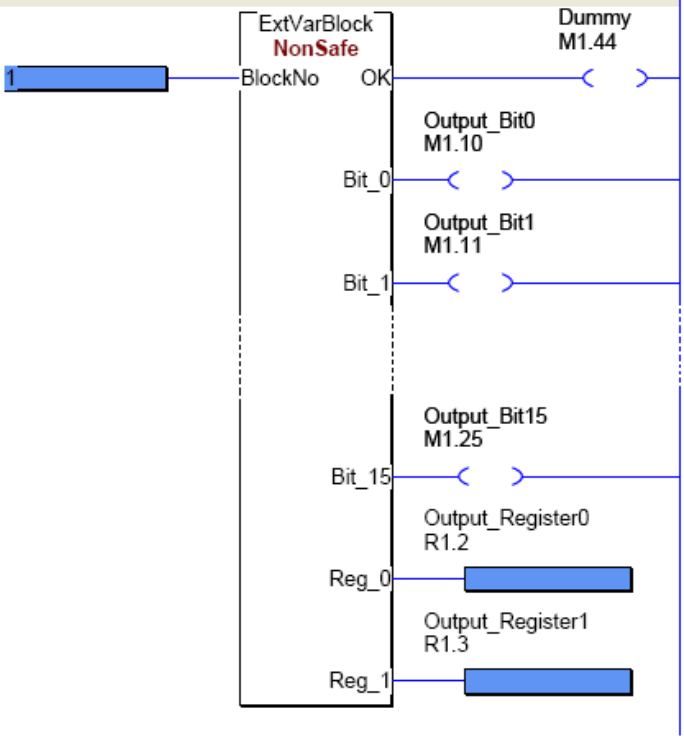
The block reads the variables from external devices such as gateways, HMI etc. and links them to the PLC code.
The external devices can either be connected to the Pluto CAN-bus or the serial programming port. By connection to the programming port Modbus ASCII communication protocol is used.

In- and outputs:
- BlockNo is an input for a constant specifying which "External comm blocks" (0..3) that are used.
- Bit_0...Bit_15 are outputs and can control M, GM or Q according to what the external device transmits.
- Reg_0 and Reg_1 are outputs for the registers from the external device and must be connected to Register (R).
- OK is mainly a dummy output which is normally 1. However it must be connected to a M, GM or Q.

Description:
Pluto can receive up to 64 1-bit variables and 8 registers from external devices.
The data is received into four "External comm blocks". These four blocks can receive data from different sources which means that it is possible for each Pluto to receive data from four different external devices in the same time.
ExtVarBlock reads all the variables in one of the "External comm blocks" which are enabled for each Pluto under the button "External Communication".
Each block has 16 1-bit variables and 2 registers.
Timeout: If the connection with the external device is lost the variables are set to 0 after the timeout time has elapsed. The timeout is set on the page "External Communication"

By Modbus devices:
Bit_0...Bit_15 corresponds to a Modbus "Output coil":
BlockNo: 0, Bit_0 to Output coil 0,
BlockNo: 0, Bit_1 to Output coil 1,
...
BlockNo: 1, Bit_0 to Output coil 16,
...
BlockNo: 3, Bit_15 to Output coil 63,

Reg_0 and Reg_1 corresponds to a Modbus "Holding register":
BlockNo: 0, Reg_0 to Holding reg. 400000,
BlockNo: 0, Reg_1 to Holding reg. 400001,
BlockNo: 1, Reg_0 to Holding reg. 400002,
...
BlockNo: 3, Reg_1 to Holding reg. 400007.



10

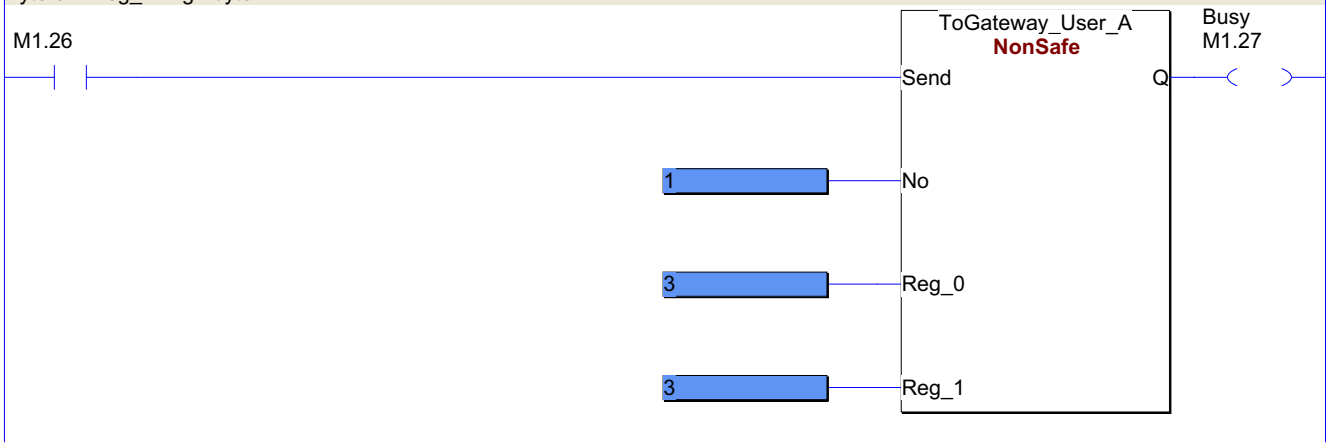
ToGateway_User_A. (Non-safe)

Send to gateway: 2 registers free of chioce.

The block sends the variables which are connected to the block inputs.

- Reg_0 input for a register (R, SR)
- Reg_1 input for a register (R, SR)
- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Reg_0 low byte
Byte 1 = Reg_0 high byte
Byte 2 = Reg_1 low byte
Byte 3 = Reg_1 high byte



11

ToGateway_User_B. (Non-safe)

Send to gateway: 8 bits and 1 register free of chioce and Error code

The block sends the variables which are connected to the block inputs.

- Bit_0...Bit_7 inputs for bit variables (I, Q, M, GM, SM)
- Reg_0 input for a register (R, SR)
- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Reg_0 low byte
Byte 1 = Reg_0 high byte
Byte 2 = Bit_7 Bit_6 Bit_5 Bit_4 Bit_3 Bit_2 Bit_1 Bit_0 (LSB)
Byte 3 = Error code

Pluto 1 Plc Code

12

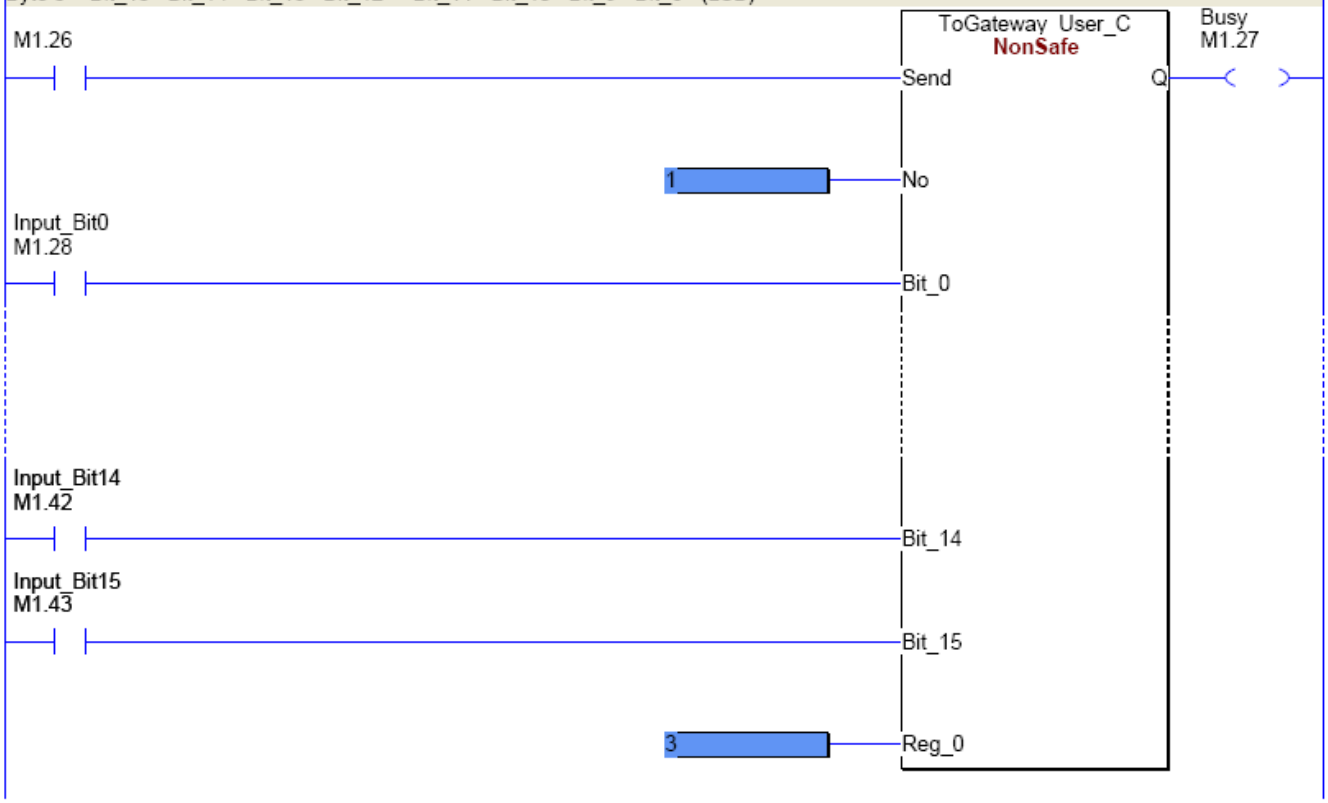
ToGateway_User_C. (Non-safe)

Send to gateway: 16 bits and 1 register

The block sends the variables which are connected to the block.

- Bit 0...Bit 15 inputs for bit variables as inputs, outputs, memories (I, Q, M, GM, SM)
- Reg_0 inputfor a register
- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Reg 0 low byte
Byte 1 = Reg_0 high byte
Byte 2 = Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 Bit 1 Bit 0 (LSB)
Byte 3 = Bit_15 Bit_14 Bit_13 Bit_12 Bit_11 Bit_10 Bit_9 Bit_8 (LSB)

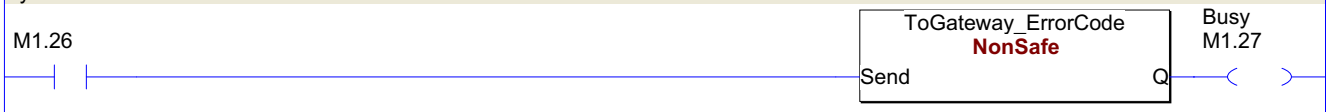


13 ToGateway_ErrorCode. (Non-safe)

Send error code to gateway

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = -
Byte 1 = -
Byte 2 = -
Byte 3 = Error code



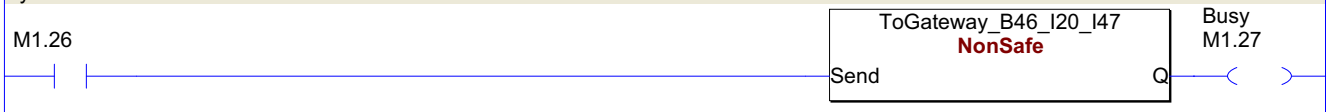
14 ToGateway_B46_I20_I47. (Non-safe)

Send to gateway inputs I20..I27, I30..I37, I40..I47 and Error code.

Only for B46/S46

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = I20..I27: I27 I26 I25 I24 I23 I22 I21 I20 (LSB)
Byte 1 = I30..I37: I37 I36 I35 I34 I33 I33 I31 I30 (LSB)
Byte 2 = I40..I47: I47 I46 I45 I44 I43 I44 I41 I40 (LSB)
Byte 3 = Error code



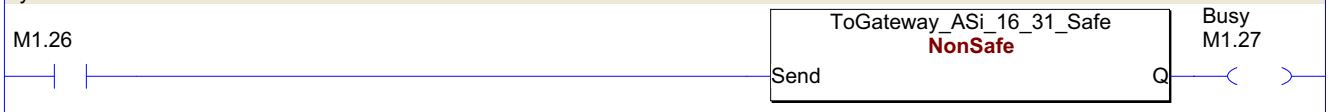
15 ToGateway_ASi_16_31_Safe. (Non-safe)

Send to gateway:
Inputs in Pluto I1...I3, I10...13 and inputs of AS-i safe slaves 16...31.

Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs: I13 I12 I11 I10 I3 I2 I1 -- (LSB)
Byte 1 = ASi16..ASi23: ASi23 ASi22 ASi21 ASi20 ASi19 ASi18 ASi17 ASi16 (LSB)
Byte 2 = ASi24..ASi31: ASi31 ASi30 ASi29 ASi28 ASi27 ASi26 ASi25 ASi24 (LSB)
Byte 3 = Error code



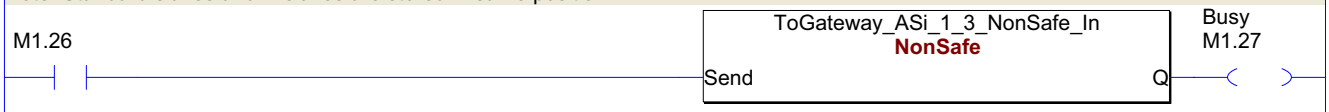
16 ToGateway_ASi_1_3_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 1..3 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Reserved
Byte 1 = Inputs AS-i slave 1 (A/B): 1B4 1B3 1B2 1B1 1A4 1A3 1A2 1A1 (LSB)
Byte 2 = Inputs AS-i slave 2 (A/B): 2B4 2B3 2B2 2B1 2A4 2A3 2A2 2A1 (LSB)
Byte 3 = Inputs AS-i slave 3 (A/B): 3B4 3B3 3B2 3B1 3A4 3A3 3A2 3A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position



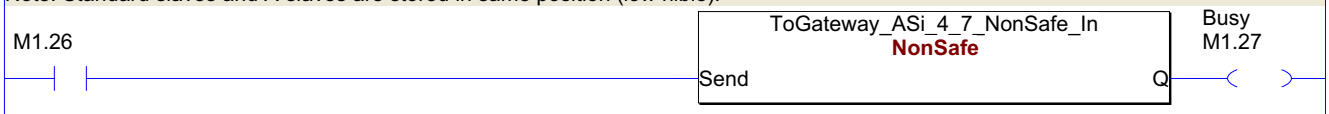
17 ToGateway_ASi_4_7_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 4..7 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 4 (A/B): 4B4 4B3 4B2 4B1 4A4 4A3 4A2 4A1 (LSB)
Byte 1 = Inputs AS-i slave 5 (A/B): 5B4 5B3 5B2 5B1 5A4 5A3 5A2 5A1 (LSB)
Byte 2 = Inputs AS-i slave 6 (A/B): 6B4 6B3 6B2 6B1 6A4 6A3 6A2 6A1 (LSB)
Byte 3 = Inputs AS-i slave 7 (A/B): 7B4 7B3 7B2 7B1 7A4 7A3 7A2 7A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



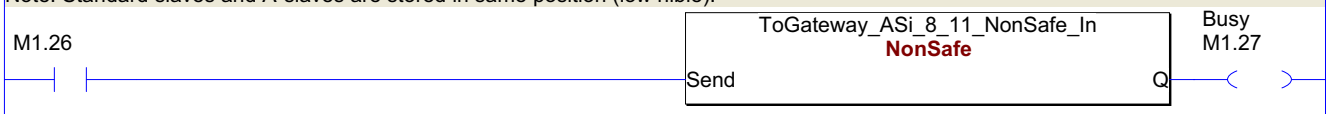
18 ToGateway_ASi_8_11_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 8..11 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 8 (A/B): 8B4 8B3 8B2 8B1 8A4 8A3 8A2 8A1 (LSB)
Byte 1 = Inputs AS-i slave 9 (A/B): 9B4 9B3 9B2 9B1 9A4 9A3 9A2 9A1 (LSB)
Byte 2 = Inputs AS-i slave 10 (A/B): 10B4 10B3 10B2 10B1 10A4 10A3 10A2 10A1 (LSB)
Byte 3 = Inputs AS-i slave 11 (A/B): 11B4 11B3 11B2 11B1 11A4 11A3 11A2 11A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



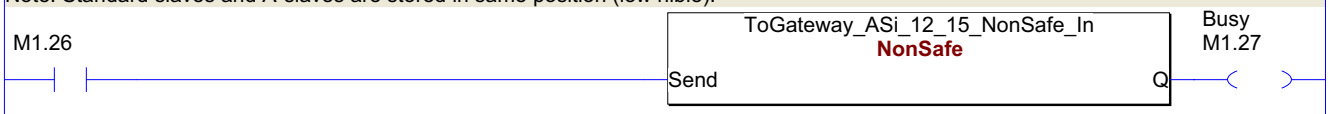
19 ToGateway_ASi_12_15_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 12..15 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 12 (A/B): 12B4 12B3 12B2 12B1 12A4 12A3 12A2 12A1 (LSB)
Byte 1 = Inputs AS-i slave 13 (A/B): 13B4 13B3 13B2 13B1 13A4 13A3 13A2 13A1 (LSB)
Byte 2 = Inputs AS-i slave 14 (A/B): 14B4 14B3 14B2 14B1 14A4 14A3 14A2 14A1 (LSB)
Byte 3 = Inputs AS-i slave 15 (A/B): 15B4 15B3 15B2 15B1 15A4 15A3 15A2 15A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



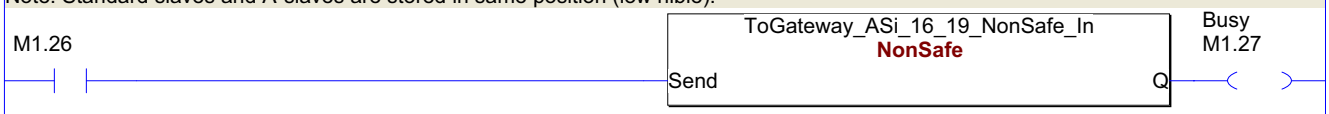
20 ToGateway_ASi_16_19_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 16..19 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 16 (A/B): 16B4 16B3 16B2 16B1 16A4 16A3 16A2 16A1 (LSB)
Byte 1 = Inputs AS-i slave 17 (A/B): 17B4 17B3 17B2 17B1 17A4 17A3 17A2 17A1 (LSB)
Byte 2 = Inputs AS-i slave 18 (A/B): 18B4 18B3 18B2 18B1 18A4 18A3 18A2 18A1 (LSB)
Byte 3 = Inputs AS-i slave 19 (A/B): 19B4 19B3 19B2 19B1 19A4 19A3 19A2 19A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



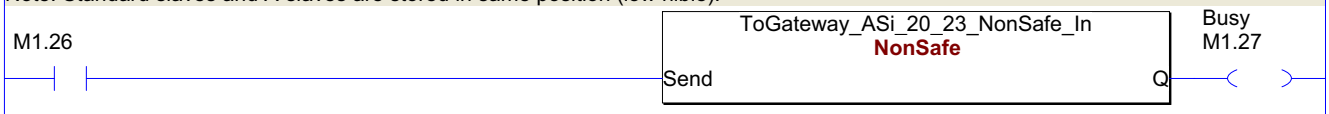
21 ToGateway_ASi_20_23_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 20..23 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 20 (A/B): 20B4 20B3 20B2 20B1 20A4 20A3 20A2 20A1 (LSB)
Byte 1 = Inputs AS-i slave 21 (A/B): 21B4 21B3 21B2 21B1 21A4 21A3 21A2 21A1 (LSB)
Byte 2 = Inputs AS-i slave 22 (A/B): 22B4 22B3 22B2 22B1 22A4 22A3 22A2 22A1 (LSB)
Byte 3 = Inputs AS-i slave 23 (A/B): 23B4 23B3 23B2 23B1 23A4 23A3 23A2 23A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



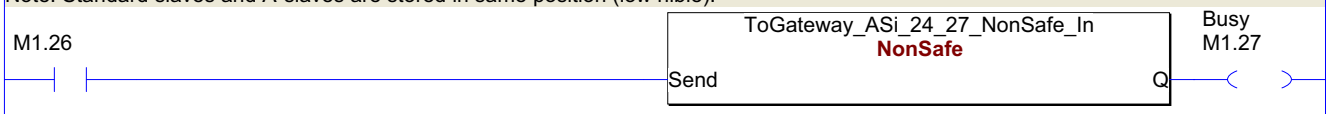
22 ToGateway_ASi_24_27_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 24..27 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 24 (A/B): 24B4 24B3 24B2 24B1 24A4 24A3 24A2 24A1 (LSB)
Byte 1 = Inputs AS-i slave 25 (A/B): 25B4 25B3 25B2 25B5 25A4 25A3 25A2 25A1 (LSB)
Byte 2 = Inputs AS-i slave 26 (A/B): 26B4 26B3 26B2 26B1 26A4 26A3 26A2 26A1 (LSB)
Byte 3 = Inputs AS-i slave 27 (A/B): 27B4 27B3 27B2 27B1 27A4 27A3 27A2 27A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



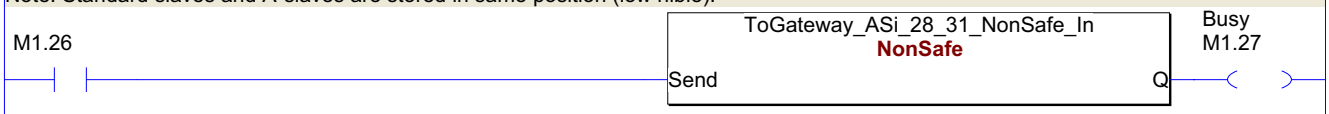
23 ToGateway_ASi_28_31_NonSafe_In. (Non-safe)

Send ASi inputs of nonsafe slaves 28..31 to gateway
Only for Pluto AS-i

- Send: Enable send. Data is transmitted when input is "1"
- Q: Is "1" during transmision.

Byte 0 = Inputs AS-i slave 28 (A/B): 28B4 28B3 28B2 28B1 28A4 28A3 28A2 28A1 (LSB)
Byte 1 = Inputs AS-i slave 29 (A/B): 29B4 29B3 29B2 29B1 29A4 29A3 29A2 29A1 (LSB)
Byte 2 = Inputs AS-i slave 30 (A/B): 30B4 30B3 30B2 30B1 30A4 30A3 30A2 30A1 (LSB)
Byte 3 = Inputs AS-i slave 31 (A/B): 31B4 31B3 31B2 31B1 31A4 31A3 31A2 31A1 (LSB)

Note: Standard slaves and A-slaves are stored in same position (low nible).



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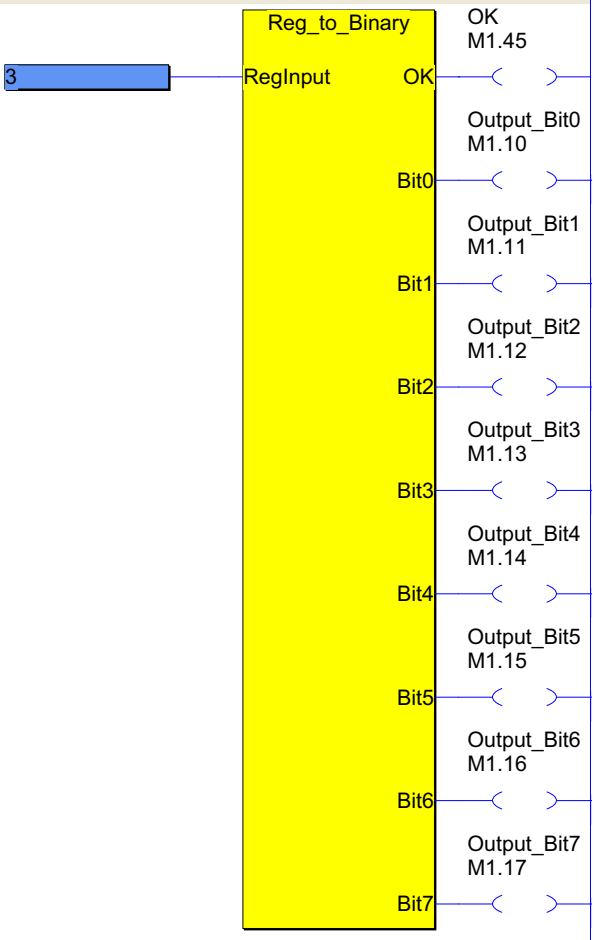
Reg_to_Binary

Conversion of a register to 8 output bits

- RegInput is the input value that shall be converted. It can be connected to a register or a constant.
- Bit0, Bit1, ... Bit7 are output bits for the result of the conversion.
- OK is on as long as the input value is within 0..255

Description:
The function block codes the 8 lowest bits (LSB) in a register to the 8 outputs Bit0..7
Examples:
RegInput = 1 gives Bit0 = 1, Bit1..7 = 0 (00000001)
RegInput = 2 gives Bit1 = 1, Bit0, Bit2..7 = 0 (00000010)
RegInput = 255 gives all of Bit0..7 = 1 (11111111)

Since the registers are 16 bit long the input value is limited to 0..255.
If the value of the input register is outside the limit the output OK
and all of Bit0..7 are set to 0 (off).



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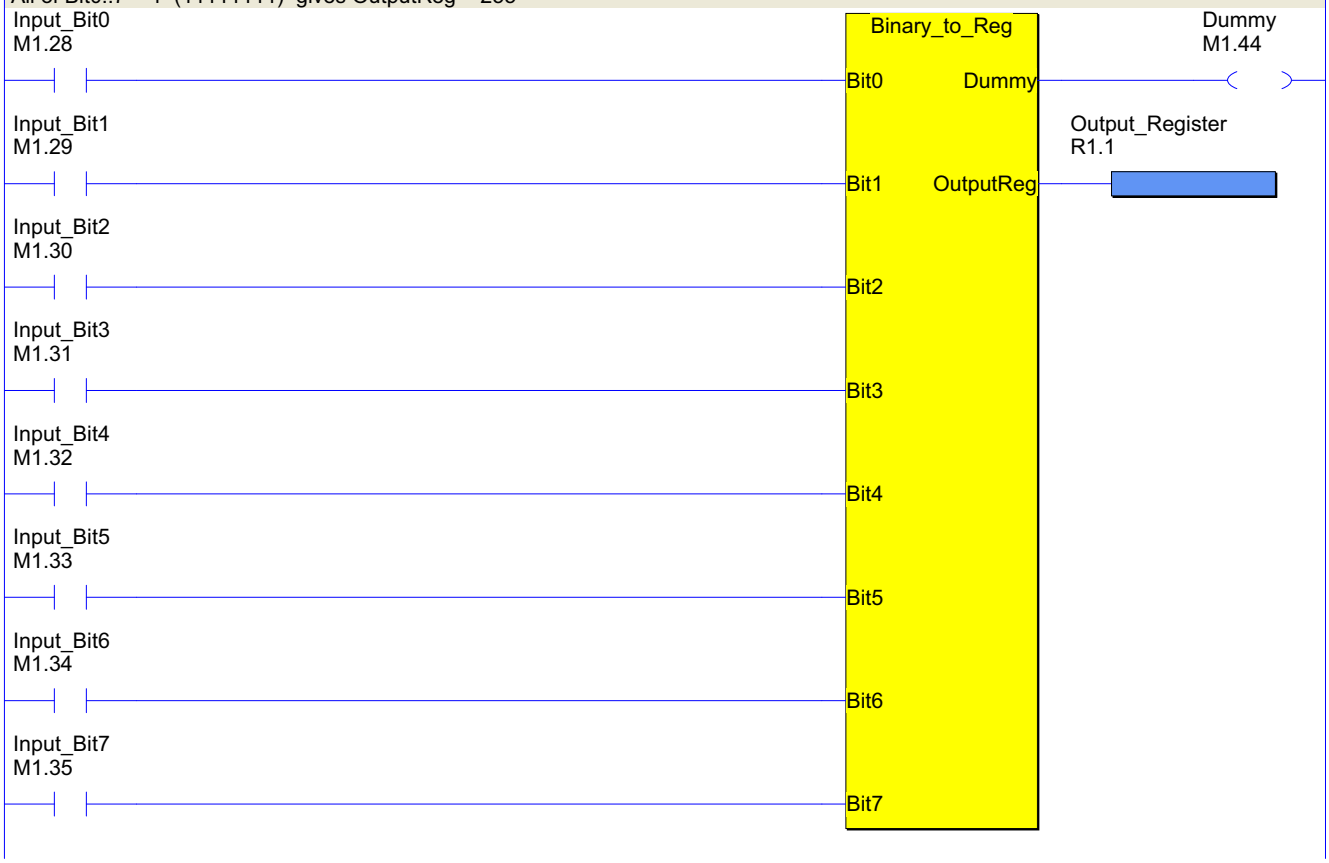
Binary_to_Reg

Conversion of 8 input bits to a decimal register

- Bit0..7 are the input bits which shall be converted to a register value.
- OutputReg is the output for the result of the conversion. It can be connected to a register.
- Q is a dummy output which is always 1 (on)

Description:
The block converts the inputs Bit0..7 from binary to a decimal value. The value
is stored in the register to which the output OutputReg is connected.
Examples:
Bit0 = 1, Bit1..7 = 0 (00000001) gives OutputReg = 1
Bit1..2 = 1, Bit0, Bit3..7 = 0 (00000110) gives OutputReg = 6
All of Bit0..7 = 1 (11111111) gives OutputReg = 255



Pluto 1 Plc Code

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Binary16 to Reg

Conversion of 16 input bits to a decimal register

- Bit0..15 are the input bits which shall be converted to a register value -32768..+32767.
- OutputReg is the output for the result of the conversion. It can be connected to a register.
- Q is a dummy output which is always 1 (on)

Description:
The block converts the inputs Bit0..15 from binary to a decimal value. The value is stored in the register to which the output OutputReg is connected.

Note: The Pluto registers are of type "Signed 16 bit" which means that if bit 15 is set the output register will get a negative value.

Examples:
Bit0 = 1, Bit1..15 = 0 (00000000 00000001) gives OutputReg = 1
Bit1..2 = 1, Bit0, Bit3..15 = 0 (00000000 00000110) gives OutputReg = 6
Bit0..7 = 1, Bit8..15 = 0 (00000000 11111111) gives OutputReg = 255
Bit0..15 = 1, Bit8..15 = 0 (11111111 11111111) gives OutputReg = -1
Bit15 = 1, Bit0..14 = 0 (10000000 00000000) gives OutputReg = -32768