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# LXS\_BYPASS V1.0

(Bypassing of sensors or actuators)

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## General

This module maintains the requesting and activation of bridging a sensor or an actuator. The module is triggered by the process control system.

A bridging only can be requested if TRUE is entered at the inputs RESET and KEY and FALSE at the inputs PCTLOCK1 and PCTLOCK2 or PROLOCK. A positive pulse at the input PCT\_FIX or PRO\_FIX sets an internal flip-flop and confirms the request of a PCT or process bridge to the process control system by setting the output QPR\_PCT or QPR\_PRO to TRUE.

Finally, a positive pulse at the input ACKN activates the bridging. The output QPCT\_ON or QPRO\_ON changes from FALSE to TRUE and remains at TRUE until a reset event occurs in case of reset mode, or until the signal at the input KEY becomes FALSE.

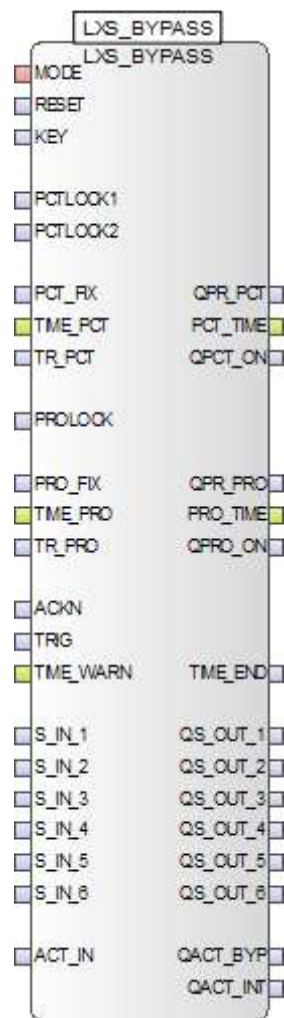
The inputs PCTLOCK1, PCTLOCK2, and PROLOCK have to be used for mutual interlocking of redundant sensors or actuators. The outputs QPR\_PCT or QPR\_PRO of the first module are connected to the inputs PCTLOCK1, PCTLOCK2 or PROLOCK of the redundant sensor or actuator, as required - and vice versa.

The bridging is terminated by FALSE at the input RESET or expiration of the time set at the input TIME\_PCT or TIME\_PRO, depending on the reset mode set at the input MODE. In addition, the bridging can always be reset by FALSE at the input KEY. The timers are started by the positive pulse at the input ACKN, and are re-triggered by a positive pulse at the input TRIG, depending on the masking of the inputs TR\_PCT and TR\_PRO. A warning is issued as TRUE at the output TIME\_END if the time to automatic reset falls below the time set at the input TIME\_WARN.

If bridging is active, the outputs QS\_OUT\_1 to QS\_OUT\_6 are set to TRUE and the input ACT\_IN is connected to QACT\_BYP. If bridging is not active, the inputs S\_IN\_x are connected to the corresponding outputs QS\_OUT\_x and ACT\_IN to QACT\_INT.

The building block is intended to be used in HIMax or HIMatrix systems, programmed with the Engineering Tool SILworX.

## Function block layout



Name	Data type	Description
<b>Inputs</b>		
MODE	INT	Reset mode (Range 1-4)
RESET	BOOL	Reset bridging abort = FALSE, release = TRUE
KEY	BOOL	Key-operated switch on = TRUE, off = FALSE
		( <b>P</b> rocess <b>C</b> ontrol <b>T</b> echnology)

PCTLOCK1, PCTLOCK2	BOOL	Lock PCT bridge by redundancy
PCT_FIX	BOOL	Select PCT bridge
TIME_PCT	TIME	PCT bridging time
TR_PCT	BOOL	Re-triggering of PCT bridge is allowed
		<b>(PRO</b> cess)
PROLOCK	BOOL	Lock process bridge by redundancy
PRO_FIX	BOOL	Select process bridge
TIME_PRO	TIME	Process bridging time
TR_PRO	BOOL	Re-triggering of process bridge allowed
ACKN	BOOL	Activation of selected bridge
TRIG	BOOL	Re-trigger bridging time
TIME_WARN	TIME	Warning time before bridging expires
S_IN_1 ... S_IN_6	BOOL	Sensor limit value 1 ... Sensor limit value 6
ACT_IN	BOOL	Control signal
<b>Outputs</b>		
		<b>(P</b> rocess <b>C</b> ontrol <b>T</b> echnology)
QPR_PCT	BOOL	PCT bridge is selected
PCT_TIME	TIME	Remaining PCT bridging time
QPCT_ON	BOOL	State of the PCT bridge on = TRUE, off = FALSE
		<b>(PRO</b> cess)
QPR_PRO	BOOL	Process bridge is selected
PRO_TIME	TIME	Remaining bridging time
QPRO_ON	BOOL	State of the process bridge on = TRUE, off = FALSE
TIME_END	BOOL	Warning: Operating time expires
QS_OUT_1 ... QS_OUT_6	BOOL	Sensor limit 1 ... Sensor limit 6
QACT_BYP	BOOL	Control signal actuator bridge

QACT_INT	BOOL	Control signal for interlocking logics
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# Inputs

## MODE

Data type: INT  
 Range: see table  
 Initial value: 0

Resetting of a bridge is dependent on the parameter MODE. The outputs QPR\_PCT, QPCT\_ON, QPR\_PRO and QPRO\_ON are reset by FALSE at the input RESET or after expiration of the time.

Value	Description
1	<p>Reset of the PCT and process bridge after the time set at the input TIME_PCT or TIME_PRO, or by setting the input RESET to FALSE.</p> <p>An activated bridge can be re-triggered by a positive pulse at the input TRIG during the runtime. The output TIME_END is set to TRUE as a warning of time expiration. The advance warning time is entered at the input TIME_WARN.</p> <p>TRUE at the input TR_PCT allows re-triggering a PCT bridge, while FALSE locks re-triggering. TRUE at the input TR_PRO allows re-triggering a process bridge, while FALSE locks re-triggering.</p>
2	<p>Reset of the PCT bridge after the time set at the input TIME_PCT, or if the input RESET is set to FALSE.</p> <p>Reset of the process bridge setting the input RESET to FALSE</p> <p>An activated bridge can be re-triggered by a positive pulse at the input TRIG during the runtime. The output TIME_END is set to TRUE as a warning of time expiration. The advance warning time is entered at the input TIME_WARN.</p> <p>The input TR_PCT set to TRUE allows re-triggering a PCT bridge, while FALSE locks re-triggering.</p>
3	<p>Reset of the PCT bridge after the time set at the input TIME_PCT, or setting the input RESET to FALSE.</p> <p>Reset of the PCT bridge by setting the input RESET to FALSE.</p> <p>An activated bridge can be re-triggered by a positive pulse at the input TRIG during the runtime. The output TIME_END is set to TRUE as a warning of time expiration. The advance warning time is entered at the input TIME_WARN.</p> <p>The input TR_PRO set to TRUE allows re-triggering a process bridge, while FALSE locks re-triggering.</p>
4	<p>Reset of the PCT and process bridge by setting the input RESET to FALSE.</p>

## RESET

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

Using this input the bridging is aborted. Setting the input RESET to FALSE resets the outputs QPR\_PCT, QPCT\_ON, QPR\_PRO and QPRO\_ON. By setting this input permanently to FALSE the bridging function is locked.

The internal changeover switches connect the input ACT\_IN to the output QACT\_INT, and the inputs S\_IN\_x to the outputs QS\_OUT\_x.

## KEY

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

This input is connected to the output QKEY of a LXS\_KEY module. TRUE must be attached to this input in order that bridging can be activated. FALSE at this input switches the outputs QPR\_PCT, QPCT\_ON, QPR\_PRO and QPRO\_ON from TRUE to FALSE. By setting this input permanently to FALSE the bridging function is locked.

The internal changeover switches connect the input ACT\_IN to the output QACT\_INT, and the inputs S\_IN\_x to the outputs QS\_OUT\_x.

## PCTLOCK1, PCTLOCK2

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

The inputs PCTLOCK1 and PCTLOCK2 are used to prevent the request of a PCT bridge. TRUE at one of this inputs locks the input PCT\_FIX.

## PCT\_FIX

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

If all release conditions are fulfilled and neither PCTLOCK1 nor PCTLOCK2 have the value TRUE, a PCT bridge is requested by a positive pulse at this input. The request is indicated by a signal change from FALSE to TRUE at the output QPR\_PC.

## **TIME\_PCT**

Data type: TIME  
Range: T#0ms ... T#106751991167d  
Initial value: T#0ms

This input is the maximum time the PCT bridge is active.  
If the internal timer has expired, then the outputs QPR\_PCT and QPCT\_ON change from TRUE to FALSE.  
The internal changeover switches connect the input ACT\_IN to the output QACT\_INT, and the inputs S\_IN\_x to the outputs QS\_OUT\_x, and the bridging is cancelled.

## **TR\_PCT**

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

TRUE at the input TR\_PCT allows re-triggering an active PCT bridge, whereas FALSE locks re-triggering.

## **PROLOCK**

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

This input is used to prevent the request of a PCT bridge. TRUE at this input locks the input PRO\_FIX.

## **PRO\_FIX**

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

If all release conditions are fulfilled and neither PCTLOCK1 nor PCTLOCK2 have the value TRUE, a PCT bridge is requested by a positive pulse at this input. The request is indicated by a signal change from FALSE to TRUE at the output QPR\_PRO.  
If the PCT bridge is active, then it is possible to switch the module to a process bridge by a positive pulse at this input.

## **TIME\_PRO**

Data type: TIME

Range: T#0ms ... T#106751991167d

Initial value: T#0ms

This input is the maximum time the PCT bridge can be active.

If the internal timer has expired, then the outputs QPR\_PCT and QPCT\_ON change from TRUE to FALSE.

The internal changeover switches connect the input ACT\_IN to the output QACT\_INT, and the inputs S\_IN\_x to the outputs QS\_OUT\_x.

## TR\_PRO

Data type: BOOL

Range: FALSE, TRUE

Initial value: FALSE

TRUE at the input TR\_PRO allows re-triggering a process bridge, while FALSE locks re-triggering.

## ACKN

Data type: BOOL

Range: FALSE, TRUE

Initial value: FALSE

After one of the outputs QPR\_PCT or QPR\_PRO shows a bridging request by TRUE, the bridging has to be confirmed by a positive pulse at this input. One of the outputs QPCT\_ON or QPRO\_ON changes depending on request from FALSE to TRUE and the bridge is thus active. Depending on the value at the input MODE the time until the automatic deactivation of the bridge starts to expire.

The internal changeover switches switch the input ACT\_IN to the output QACT\_BYP and TRUE to the outputs QS\_OUT\_1 till QS\_OUT\_6 and the bridging is active.

## TRIG

Data type: BOOL

Range: FALSE, TRUE

Initial value: FALSE

A positive pulse at this input resets the running timer, if this is released by TRUE at the inputs TR\_PCT or/and TR\_PRO.

## TIME\_WARN

Data type: TIME

Range: T#0ms ... TIME\_PRO or TIME\_PCT



Initial value: T#0ms

The warning time is entered at this input. If the current time value of the running timer is less than or equal to TIME\_WARN, then TRUE is issued at the output TIME\_END.

## **S\_IN\_1 ... S\_IN\_6**

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

If this module is used for bridging a sensor, then these inputs are connected to the limit signals to be bridged. If the bridge is not activated, the signals at these inputs are switched to the corresponding outputs QS\_OUT\_1 till QS\_OUT\_6.

## **ACT\_IN**

Data type: BOOL  
Range: FALSE, TRUE  
Initial value: FALSE

If this module is used for bridging an actuator, then the control signal of the actuator control block of the process control system is connected to this input. ACT\_IN is connected to the root of the internal changeover switch. If bridging is active, then ACT\_IN is connected to the output QACT\_BYP. If the bridging is not active, ACT\_IN is switched to the output QACT\_INT.

# **Outputs**

## **QPR\_PCT**

Data type: BOOL  
Range: FALSE, TRUE

By issuing TRUE, this output indicates that all release conditions were fulfilled and a bridging request was sent to the input PCT\_FIX. If the function isn't activated, QPR\_PCT issues FALSE.

## **PCT\_TIME**

Data type: TIME  
Range: T#0ms ... TIME\_PCT

This output displays the remaining time until the automatic disconnection of the PCT bridge. If the value of the input PCT\_TIME becomes zero, the internal changeover switches connect the input ACT\_IN to the output QACT\_INT, and the inputs S\_IN\_x to the outputs QS\_OUT\_x.

## QPCT\_ON

Data type: BOOL  
Range: FALSE, TRUE

QPCT\_ON indicates by TRUE that the output QPR\_PCT was set to TRUE, and a bridging confirmation was sent to the input ACKN. The internal changeover switch switches the input ACT\_IN to the output QACT\_BYP and the outputs QS\_OUT\_1 till QS\_OUT\_6 are set constantly to TRUE. If the function is not activated, QPCT\_ON issues FALSE, and the internal changeover switch connects ACT\_IN to QACT\_INT and S\_IN\_x to QS\_OUT\_x.

## QPR\_PRO

Data type: BOOL  
Range: FALSE, TRUE

By issuing TRUE, this output indicates that all release conditions were fulfilled and a bridging request was sent to the input PCT\_FIX. If the function isn't activated, QPR\_PCT issues FALSE.

## PRO\_TIME

Data type: TIME  
Range: T#0ms ... TIME\_PRO

This output displays the remaining time until the automatic disconnection of the PCT bridge. If the value of the input PCT\_TIME becomes zero, the internal changeover switches connect the input ACT\_IN to the output QACT\_INT, and the inputs S\_IN\_x to the outputs QS\_OUT\_x.

## QPRO\_ON

Data type: BOOL  
Range: FALSE, TRUE

QPCT\_ON indicates by TRUE that the output QPR\_PCT was set to TRUE, and a bridging confirmation was sent to the input ACKN. The internal changeover switch switches the input ACT\_IN to the output QACT\_BYP and the outputs QS\_OUT\_1 till QS\_OUT\_6 are set constantly to TRUE. If the function is not activated, QPRO\_ON issues FALSE, and the internal changeover switch connects ACT\_IN to QACT\_INT and S\_IN\_x to QS\_OUT\_x.

**TIME\_END**

Data type: BOOL

Range: FALSE, TRUE

Shows by TRUE that the remaining time until the automatic canceling is smaller than or equal to TIME\_WARN.

**QS\_OUT\_1 ... QS\_OUT\_6**

Data type: BOOL

Range: FALSE, TRUE

If this module is used for bridging a sensor, these outputs are connected to the inputs S1 till S12 of a module LXS\_INTERLOCK. The outputs are set to TRUE if a bridge is activated. If no bridging is active, then the respective input S\_IN\_x is connected to QS\_OUT\_x.

**QACT\_BY\_P**

Data type: BOOL

Range: FALSE, TRUE

If this module is used for bridging an actuator, this output is connected to the input QACT\_BYP of the module LXS\_INTERLOCK. QACT\_BYP is internally connected to the normally closed contact of the integrated changeover switch. If bridging is active, then ACT\_IN is connected to the output QACT\_BYP.

## QACT\_INT

Data type: BOOL

Range: FALSE, TRUE

If this module is used for bridging an actuator, the output QACT\_INT is connected to the input QACT\_INT of the LXS\_INTERLOCK. QACT\_INT is internally connected to the normally closed contact of the integrated changeover switch. If no bridging is active, then ACT\_IN is connected to the output QACT\_INT.

## Function table, Application, Characteristics

### PCT bypass:

Comment	In- valid mode	Bypass reset	Bypass reset	No key switch	Bypass locked	Bypass locked	Bypass re- quested	Bypass con- firmed	No key switch
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Inputs									
MODE	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
RESET	(3)	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
KEY	(3)	(3)	(3)	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE
PCT_LOCK1	(3)	(3)	(3)	(3)	TRUE	(3)	FALSE	(3)	(3)
PCT_LOCK2	(3)	(3)	(3)	(3)	(3)	TRUE	FALSE	(3)	(3)
PCT_FIX	(3)	(3)	(3)	(3)	(4)	(4)	(4)	(3)	(3)
ACKN	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(3)

Outputs									
QPR_PCT	FALSE	FALSE	FALSE	FALSE	(5)	(5)	TRUE (6)	TRUE (6)	FALSE
QPCT_ON	FALSE	FALSE	FALSE	FALSE	(5)	(5)	FALSE	TRUE (6)	FALSE

(1) MODE is less than 1 or greater than 4

(2) MODE is greater than 0 and less than 5

(3) The input is not relevant for this function

(4) Transition on this input from FALSE to TRUE

(5) The output value is not changed by this function

(6) If MODE = 1 or MODE = 2 the output is reset after the time TIME\_PCT

#### Process bypass:

Comment	In- valid mode	Bypass reset	Bypass reset	No key switch	Bypass locked	Bypass re- quested	Bypass con- firmed	No key switch
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Inputs								
MODE	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
RESET	(3)	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
KEY	(3)	(3)	(3)	FALSE	TRUE	TRUE	TRUE	FALSE
PROLOCK	(3)	(3)	(3)	(3)	TRUE	FALSE	(3)	(3)
PRO_FIX	(3)	(3)	(3)	(3)	(4)	(4)	(3)	(3)
ACKN	(3)	(3)	(3)	(3)	(3)	(3)	(4)	(3)

Outputs								
QPR_PRO	FALSE	FALSE	FALSE	FALSE	(5)	TRUE (6)	TRUE (6)	FALSE
QPRO_ON	FALSE	FALSE	FALSE	FALSE	(5)	FALSE	TRUE	FALSE

						(6)	
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- (1) MODE is less than 1 or greater than 4
- (2) MODE is greater than 0 and less than 5
- (3) The input is not relevant for this function
- (4) Transition on this input from FALSE to TRUE
- (5) The output value is not changed by this function
- (6) If MODE = 1 or MODE = 2 the output is reset after the time TIME\_PRO

**Sensor trip signals:**

Comment	No active bypass (QPCT_ON and QPRO_ON = FALSE)	No active bypass (QPCT_ON and QPRO_ON = FALSE)	Active bypass (QPCT_ON or QPRO_ON = TRUE)	Active bypass (QPCT_ON or QPRO_ON = TRUE)
<b>Inputs</b>				
S_IN_x	FALSE	TRUE	FALSE	TRUE
<b>Outputs</b>				
QS_OUT_x	FALSE	TRUE	TRUE	TRUE

**Actuator control signals:**

Comment	No active bypass (QPCT_ON and QPRO_ON = FALSE)	No active bypass (QPCT_ON and QPRO_ON = FALSE)	Active bypass (QPCT_ON or QPRO_ON = TRUE)	Active bypass (QPCT_ON or QPRO_ON = TRUE)
<b>Inputs</b>				
ACT_IN	FALSE	TRUE	FALSE	TRUE
<b>Outputs</b>				
QACT_BYP	FALSE	FALSE	FALSE	TRUE
QACT_INT	FALSE	TRUE	FALSE	FALSE

The signal inputs and signal outputs are to be connected as described below.

Input	Connection
RESET	Signal output QRESET of building block LXS_KEY
KEY	Signal output QKEY of building block LXS_KEY

Output	Connection
QS_OUT_x	If this block is used to bypass a sensor, the outputs QS_OUT_1 ... QS_OUT_6 have to be connected to the inputs S1 ... S12 of block LXS_INTERLOCK

QACT_BYP	If this block is used to bypass an actuator, the output QACT_BYP has to be connected to the input QACT_BYP of block LXS_INTERLOCK
QACT_INT	If this block is used to bypass an actuator, the output QACT_INT has to be connected to the input QACT_INT of block LXS_INTERLOCK

The inputs PCTLOCK1, PCTLOCK2 and PROLOCK are to be use for mutual locking of redundant sensors or actuators. In accordance with requirement the outputs QPR\_PCT or QPR\_PRO of the first module are to be connected to the inputs PCTLOCK1, PCTLOCK2 or PROLOCK of the redundant sensor or actuator and vice versa.

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