EUROPROT +

Circuit breaker control function block

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Circuit breaker control function block

The Circuit breaker control function block can be used to integrate the circuit breaker control of the EuroProt+ device into the station control system and to apply active scheme screens of the local LCD of the device.

The Circuit breaker control function block receives remote commands from the SCADA system and local commands from the local LCD of the device, performs the prescribed checking and transmits the commands to the circuit breaker. It processes the status signals received from the circuit breaker and offers them to the status display of the local LCD and to the SCADA system.

Main features:

- Local (LCD of the device) and Remote (SCADA) operation modes can be enabled or disabled individually.
- The signals and commands of the synchro check / synchro switch function block can be integrated into the operation of the function block.
- Interlocking functions can be programmed by the user applying the inputs “EnaOff” (enabled trip command) and “EnaOn” (enabled close command), using the graphic equation editor.
- Programmed conditions can be used to temporarily disable the operation of the function block using the graphic equation editor.
- The function block supports the control models prescribed by the IEC 61850 standard.
- All necessary timing tasks are performed within the function block:
    - Time limitation to execute a command
    - Command pulse duration
    - Filtering the intermediate state of the circuit breaker
    - Checking the synchro check and synchro switch times
    - Controlling the individual steps of the manual commands
- Sending trip and close commands to the circuit breaker (to be combined with the trip commands of the protection functions and with the close command of the automatic reclosing function; the protection functions and the automatic reclosing function directly gives commands to the CB). The combination is made graphically using the graphic equation editor
- Operation counter
- Event reporting

The Circuit breaker control function block has binary input signals. The conditions are defined by the user applying the graphic equation editor. The signals of the circuit breaker control are seen in the binary input status list.

Technical data

Function	Accuracy
Operate time accuracy	±5% or ±15 ms, whichever is greater

Parameters

Enumerated parameter

Parameter name	Title	Selection range	Default
The control model of the circuit breaker node according to the IEC 61850 standard			
CB1Pol_ctlMod_EPar_	ControlModel*	Direct normal, Direct enhanced, SBO enhanced	Direct normal

**ControlModel*

- Direct normal: only command transmission
- Direct enhanced: command transmission with status check and command supervision
- SBO enhanced: Select Before Operate mode with status check and command supervision

Boolean parameter

Boolean parameter	Title	Explanation
CB1Pol_DisOverR_BPar_	Forced check	If true, then the check function cannot be neglected by the check attribute defined by the IEC 61850 standard

Timer parameters

Parameter name	Title	Unit	Min	Max	Step	Default
Timeout for signaling failed operation						
CB1Pol_TimOut_TPar_	Max.Operating time	msec	10	1000	1	200
Duration of the generated On and Off impulse						
CB1Pol_Pulse_TPar_,	Pulse length	msec	50	500	1	100
Waiting time, at expiry intermediate state of the CB is reported						
CB1Pol_MidPos_TPar_	Max.Intermediate time	msec	20	30000	1	100
Length of the time period to wait for the conditions of the synchron state. After expiry of this time, the synchro switch procedure is initiated (see synchro check/ synchro switch function block description)						
CB1Pol_SynTimOut_TPar_	Max.SynChk time	msec	10	5000	1	1000
Length of the time period to wait for the synchro switch impulse (see synchro check/ synchro switch function block description). After this time the function resets, no switching is performed						
CB1Pol_SynSWTimOut_ TPar_	Max.SynSW time*	msec	0	60000	1	0
Duration of the waiting time between object selection and command selection. At timeout no command is performed						
CB1Pol_SBOTimeout_ TPar_	SBO Timeout	msec	1000	20000	1	5000

* If this parameter is set to 0, then the "StartSW" output is not activated

Binary input status signals

Binary input status signal	Title	Explanation
CB1Pol_Local_GrO_	Local	If this input is active, the circuit breaker can be controlled using the local LCD of the device.
CB1Pol_Remote_GrO_	Remote	If this input is active, the circuit breaker can be remote-controlled via communication channels of the SCADA system.
CB1Pol_SynOK_GrO_	SynOK	This input indicates if the synchron state of the voltage vectors at both sides of the circuit breaker enables the closing command. This signal is usually generated by the synchro check/ synchro switch function. If this function is not available, set the input to logic true.
CB1Pol_EnaOff_GrO_	EnaOff	The active state of this input enables the opening of the circuit breaker. The state is usually generated by the interlocking conditions defined graphically by the user.
CB1Pol_EnaOn_GrO_	EnaOn	The active state of this input enables the closing of the circuit breaker. The state is usually generated by the interlocking conditions defined graphically by the user.
CB1Pol_BlkProc_GrO_	BlkProc	The active state of this input blocks the operation of the circuit breaker. The conditions are defined graphically by the user.
CB1Pol_stValOff_GrO_	stValOff	Off state of the circuit breaker.
CB1Pol_stValOn_GrO_	stValOn	On state of the circuit breaker.
CB1Pol_ExtTrip_GrO_	ExtTrip	External trip command for the circuit breaker (e.g. from protection). This signal is considered when evaluating unintended operation.

Binary output status signals

Binary output status signal	Title	Explanation
CB1Pol_CmdOff_GrI_	Off Command	Off command impulse, the duration of which is defined by the parameter “Pulse length”
CB1Pol_CmdOn_GrI_	On Command	On command impulse, the duration of which is defined by the parameter “Pulse length”
CB1Pol_StartSW_GrI_	Start Synchro-switch	If the synchro check/synchro switch function is applied and the synchron state conditions are not valid for the time defined by the parameter “Max.SynChk time”, then this output triggers the synchro switch function (see synchro check/ synchro switch function block description).
CB1Pol_Oper_GrI_	CB Operated	An impulse with a duration of 150 ms at any operation of the circuit breaker
CB1Pol_SelfOper_GrI_	Unintended Oper	This output is logic true if the status of the circuit breaker has changed without detected command from the SCADA system or on the input “Ext trip”
CB1Pol_Opened_GrI_	Opened	The filtered status signal for opened state of the circuit breaker
CB1Pol_Closed_GrI_	Closed	The filtered status signal for closed state of the circuit breaker

Available internal status variable and command channel

To generate an active scheme on the local LCD, there is an internal status variable indicating the state of the circuit breaker. Different graphic symbols can be assigned to the values. (See Chapter 3.2 of the document “EuroCAP configuration tool for EuroProt+ devices”).

Status variable	Title	Explanation
CB1Pol_stVal_Ist_	Status	Can be: 0: Intermediate 1: Off 2: On 3: Bad

The available control channel to be selected is:

Command channel	Title	Explanation
CB1Pol_Oper_Con_	Operation	Can be: On Off

Using this channel, the pushbuttons on the front panel of the device can be assigned to close or open the circuit breaker. These are the “Local commands”.