

Connectivity Function Block to SIMATIC PLC

TERMS OF USE OF BLOCK SOFTWARE SOURCE CODE

Documentation of Connectivity Function Block to Simatic PLC for eBreakers

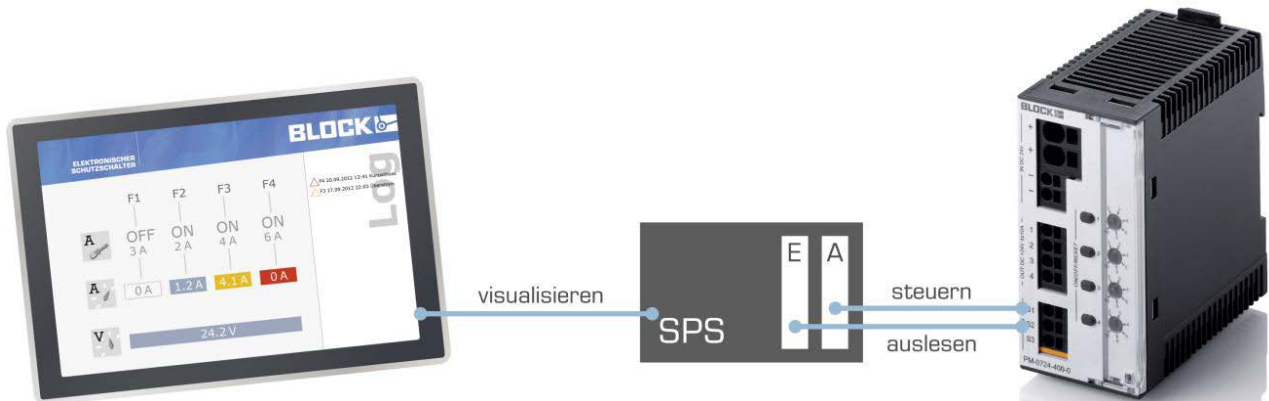
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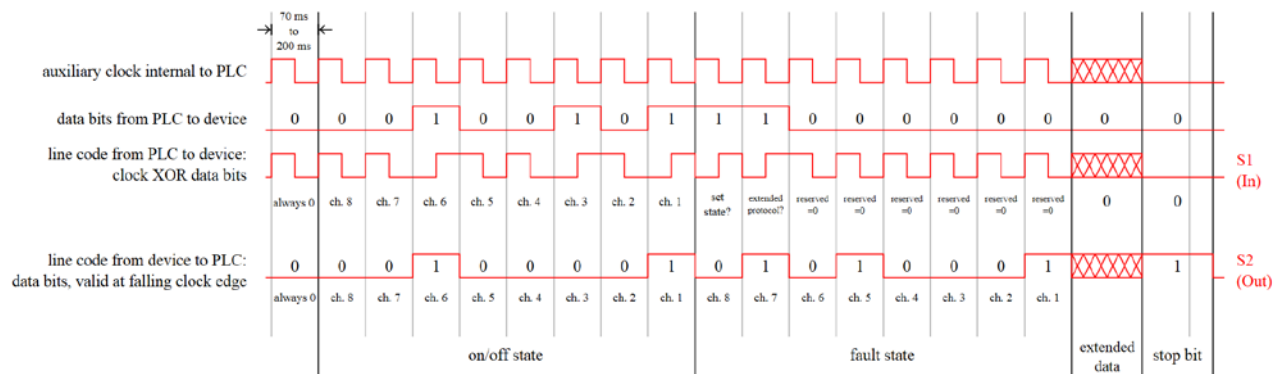
Supported Devices

This functional block is to generate a communication telegram which operates with all solid-state overcurrent protectors (eBreakers) of BLOCK's PM and PC families.



Implementation of FB28 in a TIA-Portal Program

This block needs to be called by a cyclic interrupt (e.g. OB35 or equivalent). Clock-time for one bit within Manchester Code can be 35 to 100ms and cycle time / jitter needs to be adjusted based on the application used.



Short Description of Pulse Pattern

The pulse pattern consists of 17 or optionally 89 bits, which needs to be sent as Manchester-Code (per IEEE 802.3). First bit sent needs to be false and is used as start-bit followed by 16 or optionally 88 more data bits.

Data-Bit

First 8 bits contain ON / OFF status of channels in descending row. If the one bit is true, the related channel will be switched on. If it is false, the related channel will be shut down. The following 8 bits, the 3 most significant, need to be taken into account:

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- Bit 7 = True ON/OFF states, sent by first 8 bits, will be set
- Bit 7 = False ON/OFF states, sent by first 8 bits, will be ignored
- Bit 6 = True the optional 89 bit protocol will be used to submit additional data
- Bit 6 = False the short 17 bit long protocol will be used
- Bit 5 = True adjusted channel FLA and input voltage will be send
- Bit 5 = False actual input voltage and, for eBreakers of Basic Series ("PM/PC-08xx") the output currents will be transmitted.

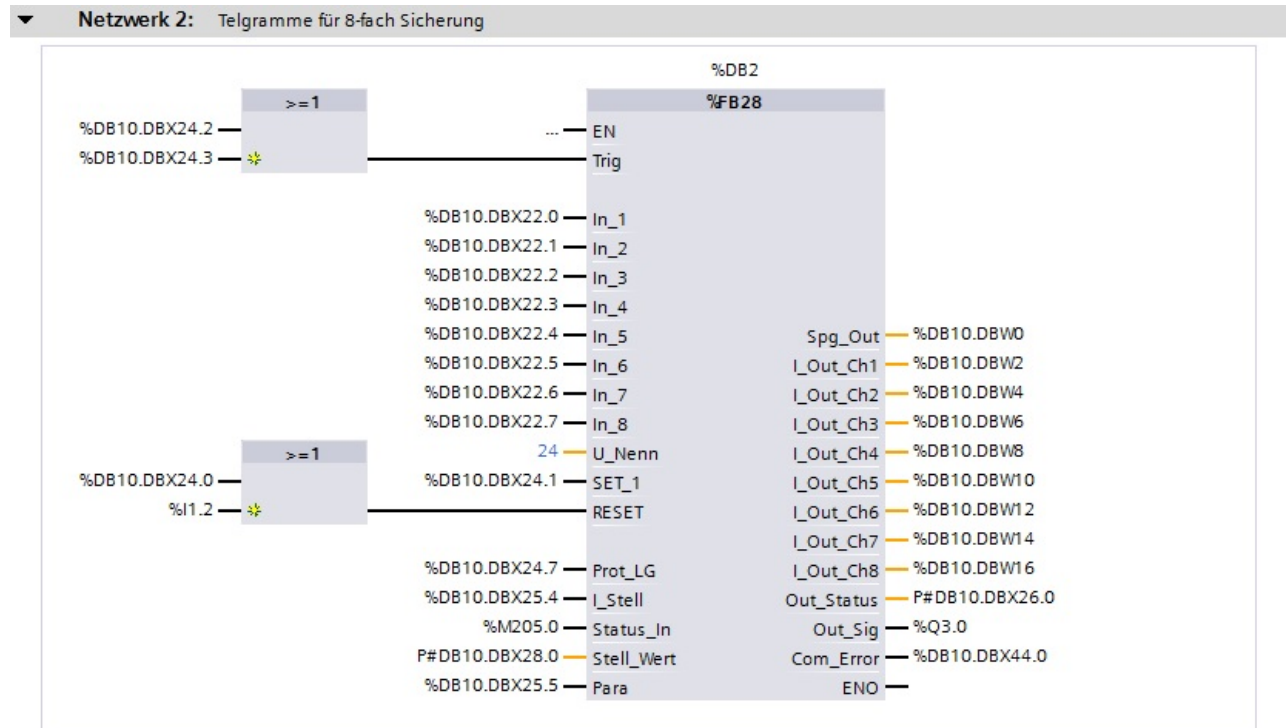
Note: to use bit 5 functionality firmware 2.1 or higher is required.

The following 6 or optional 78 Bits are to be as false and are used to clock signal output "S2". If all data Bits are successfully received the eBreaker will send one additional as Stop-Bit to acknowledge for 1.5 cycles. During this acknowledgement the PLC is allowed to send any other bit. After sending the complete pulse pattern, S1 and S2 have to be set on false state.

For the next pulse pattern on S1, a waiting-time of minimum 200ms is required.

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Description of Functional Block FB28



Connection	Type	Input	Output	Description
EN	BOOL	x		Enable, Enabeling that FB
Trig	BOOL	x		To be set as permanent True to enable an cycling operation.
In_1 bis In_8	BOOL	x		On / Off – State of Channels 1 - 8 In_1 = True → Channel 1 will be switched on In_1 = False → Channel 1 will be switched off For 2 or 4 Channel units, only Bit 1 & 2, respectively Bit 1 to 4 are used
U_Nenn	INT	x		Rated Voltage of eBreaker 12V(Value = 12), 24V(Value = 24) or 48V(Value = 48). Bei fehlender oder falscher Eingabe wird 24V angenommen.
Set	BOOL	x		On / Off States of Channels to be acknowledged or Protocol is used for Read-Only (Bit 10) Set = True → In_1 to In_8 to be set (read/write) Set = False → In_1 to In_8 to be ignored. (read only)
Reset	BOOL	x		Reset of tripped channels (switch on) Reset = True for >0,5 sec reactivates all tripped channels
Prot_LG	BOOL	x		Input voltage, adjusted or actual current per channel can be read out (for PM/PC-08xx only). Extended protocol of 89 Bit to be used. Prot_LG = False → 17 Bit protocol (short) Prot_LG = True → Extended 89 Bit protocol (long)
I_Stell	BOOL	x		I_Stell = False → actual current will be send (for PM/PC-08xx only) I_Stell = True → adjusted rated current will be send (Firmware 2.1 or later for all eBreakers)
Status_In	BOOL	x		Signaling Output „S2“ of eBreaker
Stell_Wert	Struct (8xInt)	x		Some eBreakers can be set through PLC (e.g. PM-0724-400-4). Use Input “Stell_Wert” to submit adjustments (0-5) as a struct containing 8 integer variables.
Para	BOOL	x	x	Set Input “Para” as True to initiate transfer of adjusted currents submitted with “Stell_Wert”. “Para” will be reset to false after all data was transferred. The following protocol, the set status will be send.

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Spg_Out	INT		x	When extended protocol is used ("Prot_LG" = true), the input voltage of the eBreaker will be send.
I_Out_Ch1 bis I_Out_Ch8	INT		x	Depending on the protocol used (long or short), the adjusted currents will be transferred in relation to "I_Stell" or the actual currents will be transferred (e.g. 14 = 1.4A)
Out_Status	Struct (16xBOOL)		x	Output of operation or error states. First 8 bits contain the channel status information, Bit 9 – 16 contain the actual operation states (tripped or overcurrent) for each channel. If Bit 1 and Bit 9 are set, Channel 1 is running overcurrent.
Out_Sig	BOOL		x	Output of Signalport "S1" of eBreaker
Com_Error	BOOL		x	Communication Error. It will be set, if PLC didn't get any Stop-Bit within 3 protocol cycles. All data received from eBreaker into FB28 are updated after a stop-bit is received. If "Com_Error" is true, all output data of FB28 are not valid.

Force-Table

All relevant variables used within program are listed in that Force-Table below.

Name	Adresse	Anzeigeformat
// Set bit true for cycle operation		
Daten_SPS_Visu.Funktionen.Zyklisch	%DB10.DBX24.2	BOOL
// Desired condition of outputs		
Daten_SPS_Visu.Ausgaenge.Kanal_1	%DB10.DBX22.0	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_2	%DB10.DBX22.1	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_3	%DB10.DBX22.2	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_4	%DB10.DBX22.3	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_5	%DB10.DBX22.4	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_6	%DB10.DBX22.5	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_7	%DB10.DBX22.6	BOOL
Daten_SPS_Visu.Ausgaenge.Kanal_8	%DB10.DBX22.7	BOOL
// Actual condition of outputs		
Daten_SPS_Visu.Status.Stat_Kanal_1	%DB10.DBX26.0	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_2	%DB10.DBX26.1	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_3	%DB10.DBX26.2	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_4	%DB10.DBX26.3	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_5	%DB10.DBX26.4	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_6	%DB10.DBX26.5	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_7	%DB10.DBX26.6	BOOL
Daten_SPS_Visu.Status.Stat_Kanal_8	%DB10.DBX26.7	BOOL
// Alarm outputs		
Daten_SPS_Visu.Status.Alarm_Kanal_1	%DB10.DBX27.0	BOOL
Daten_SPS_Visu.Status.Alarm_Kanal_2	%DB10.DBX27.1	BOOL
Daten_SPS_Visu.Status.Alarm_Kanal_3	%DB10.DBX27.2	BOOL
Daten_SPS_Visu.Status.Alarm_Kanal_4	%DB10.DBX27.3	BOOL
Daten_SPS_Visu.Status.Alarm_Kanal_5	%DB10.DBX27.4	BOOL
Daten_SPS_Visu.Status.Alarm_Kanal_6	%DB10.DBX27.5	BOOL
Daten_SPS_Visu.Status.Alarm_Kanal_7	%DB10.DBX27.6	BOOL

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Daten_SPS_Visu.Status.Alarm_Kanal_8	%DB10.DBX27.7	BOOL
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// Set remote if eBreaker shall be controlled via PLC		
Daten_SPS_Visu.Funktionen.Remote	%DB10.DBX24.1	BOOL
// Extended protocol (89Bit)		
Daten_SPS_Visu.Funktionen.M_Tele_Lang	%DB10.DBX24.7	BOOL
// To be set as true to setup rated currents (remote versions only)		
Daten_SPS_Visu.Funktionen.Para_I	%DB10.DBX25.5	BOOL
// Rated currents (Step 0-5, remote versions only)		
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_1	%DB10.DBW28	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_2	%DB10.DBW30	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_3	%DB10.DBW32	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_4	%DB10.DBW34	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_5	%DB10.DBW36	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_6	%DB10.DBW38	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_7	%DB10.DBW40	DEZ +/-
Daten_SPS_Visu.Ausloesewerte.Wert_Ch_8	%DB10.DBW42	DEZ +/-
// Output of set voltage and currents (0.0A)		
Daten_SPS_Visu.Messwerte.Spannung	%DB10.DBW0	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_1	%DB10.DBW2	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_2	%DB10.DBW4	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_3	%DB10.DBW6	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_4	%DB10.DBW8	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_5	%DB10.DBW10	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_6	%DB10.DBW12	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_7	%DB10.DBW14	DEZ +/-
Daten_SPS_Visu.Messwerte.Strom_Ch_8	%DB10.DBW16	DEZ +/-

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Examples

Turn on Channel 2:

BIT	Comment
„Trig“ = true	Cycling operation (permanently true)
„Set“ = true	States „In_1“ till „In_8“ are taken over into eBreaker (write access)
„In_2“ = true	Channel 2 will be switched on.

Read out adjusted channel current:

BIT	Comment
„Trig“ = true	Cycling operation (permanently true)
„Prot_LG“ = true	Extended Protocol to be activated
„I_Stell“ = true	Read out adjusted channel currents.

Set rated current per channel (for REMOTE Versions only):

BIT	Comment
„Trig“ = true	Cycling operation (permanently true)
„Prot_LG“ = true	Extended Protocol to be activated
„Stell_Wert“ = true	Adjust rated current within STRUCT Variable per channel. For PM-3824-400-0 steps 2/3/4/6/8/10 A (step 0 = 2A ... step 5 = 10A) are selectable.
„Para“ = true	Transfer of rated currents will start.
„Para“ = false	FB28 will set „Para“ to false after current steps are successfully set.