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MT-CNC
Balluff Processor BIS C - xxx - 007
V16

FUNCTION BLOCK Application Manual

DOK-MT*CNC-FB**BLF*V16-AW01-EN-P

Rexroth
Indramat

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- Drawing no.: 120-1600-B309-01/EN

Purpose of this document This document describes the implementation of the function block for the Balluff Processor.

Revision	Date	Remarks
109-0768-4180-00	05.96	New issue
120-1600-B309-01/EN	07.99	Changeover DOZ ⇒ DOK

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Phone +49 (0)9352/40-0 • Tx 689421 • Fax +49 (0)9352/40-4885

ESM (JA)

Contents

1 General

These function blocks (FBs) are used for communication between the MT-CNC and the Balluff read and write systems BIS C - xxx - 007 (xxx = hardware configuration see Balluff Processor description) via a serial interface with hardware handshake (BTM 03/04 and RECO) using the Balluff protocols.

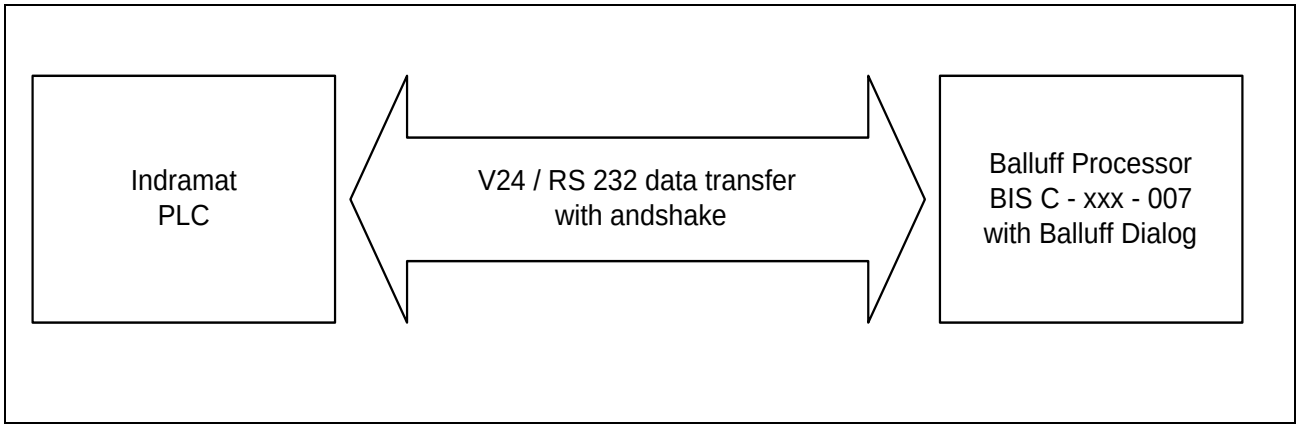
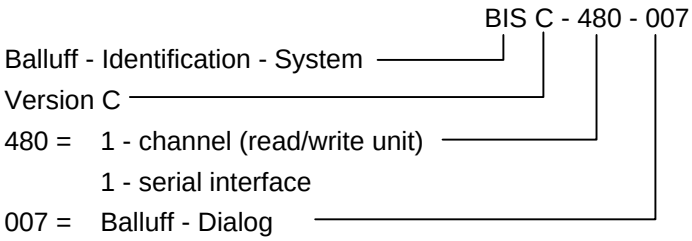


Fig. 1-1: Data transfer with handshake

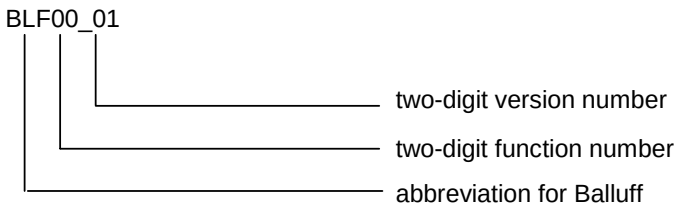
Example: Usable Balluff Processor



The type of data carrier that should be read or written solely depends on the Balluff Processor used. Data carriers for up to 2048 Byte presently exist. A maximum of four (4) read / write units can be controlled per Balluff Processor. The data is transferred to and from the Processor, separated in reading and writing, via a single dimension array of the type BYTE. Within the data field, the start address, the number of bytes to be transferred, as well as the offset address on the data carrier can be defined for each single transfer. The largest data of 2048 bytes can be transferred via a single data block, using function block BLF07_00. Data blocks can be appended, or read and written in smaller junks or steps. This makes the selection of the used data field independent of the Code Tag storage size.

Structure of the Function Block Name

The function block name consists of the three characters BLF, a two-digit function number and a two digit version number.



The function blocks BLF01_01 to BLF07_01 can be used for data transfer and support three telegram types:

- Telegram to read from data carrier with the possibility to select read / write head and block size
- Telegram to write to data carrier with the possibility to select read / write head and carrier block size
- Telegram to reset the Balluff Processor

The function block BLF00_00 supports telegram types to complete the above FBs:

- Telegram to select the read / write head and block size
- Telegram to search for the next data carrier

In addition, the 'Data Carrier Present' message can be evaluated.

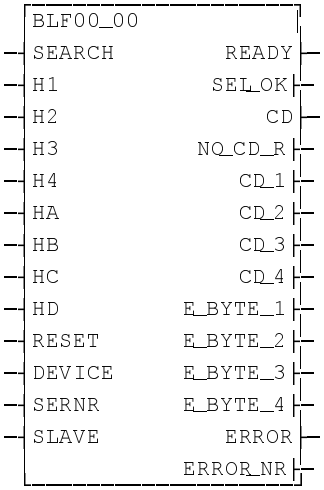
WARNING

⇒ This description does not replace the Balluff hardware and software descriptions. Only required functions are described here. For selection, installation and setup the steps in the Balluff documentation must be conducted and the Balluff units must be configured to accommodate the functions of the described function blocks.

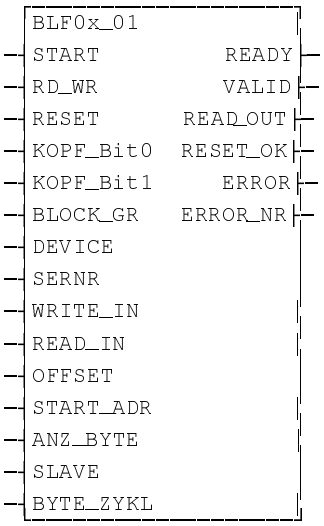
2 Application of Function Blocks for Data Transfer

2.1 Ladder Diagram Function Block Interface

FB for head selection BLF00_00



FB for data transfer BLF01_01 bis BLF07_01



2.2 Interface of FBs BLF01_00 to BLF07_00

FB Inputs

Inputs	TYPE	Function
START	BOOL	Activate read or write with positive edge
RD_WR	BOOL	0=Read; initiate read of data carrier with a positive edge at START 1=Write; a positive edge at the input START initiates writing to the data carrier
RESET	BOOL	Clear error, or if no error present, initiate a reset command (Q) to the Processor
KOPF_Bit0	BOOL	Reader head selection Bit 0
KOPF_Bit1	BOOL	Reader head selection Bit 1
BLOCK_GR	BOOL	Block size Code Tag 0 = 64, 1 = 32 Byte
DEVICE	INT	PLC device address or logical address of the used serial interface (COM)
SERNR	INT	Number of serial interface
WRITE_IN	BYTE512	Data ARRAY depending on used FB, Byte ARRAY BYTE32 .. BYTE2048. Data in the ARRAY can be written to the Code Tag.
READ_IN	BYTE512	Data ARRAY depending on used FB, Byte ARRAY BYTE32 .. BYTE2048. Is copied to the output READ_OUT in every PLC scan and in the case of a read command the ARRAY at the output READ_OUT is being overwritten or completed.
OFFSET	INT	Start address on the Code Tag
START_ADR	INT	Start address in the array
ANZ_BYTE	INT	Number of bytes to be transferred
SLAVE	BOOL	Communication as SLAVE
BYTE_ZYKL	INT	Number of bytes per SPS scan - only for optimization when necessary

FB Outputs

Outputs	Type	Function
READY	BOOL	Read / Write Ready.
VALID	BOOL	Pulse (single PLC scan one shot), read or write is completed.
READ_OUT	BYTE512	Data ARRAY, depending on used FB, Byte ARRAY BYTE32 .. BYTE2048. Is being updated with data ARRAY assigned at READ_IN every PLC scan. The data ARRAY is completed with the read data when reading. Read data is indicated as valid via the VALID signal (ONS).
RESET_OK	BOOL	Pulse (single PLC scan one shot), reset was performed.
ERROR	BOOL	Output when an error is active. Must be cleared using RESET.
ERROR_NR	INT	Active error number *[1])

*[1]) This function must be activated in the Processor.

Sub Function Blocks, Functions and Types

Function Blocks no user or only standard system function blocks

Functions no user or only standard system functions

User Data Types COMMANDS.TY (only internally used)

BYTE 32.TY ... BYTE2048.TY (depending on function block)

Table of Function Blocks and associated Input and Output Arrays

Data Lenght	Function-block	Array 1 (UserData Type)	Array 2 (User Data Type)
Head Switching	BLF00_00	---	COMMANDS
32 Byte	BLF01_01	BYTE32	COMMANDS
64 Byte	BLF02_01	BYTE64	COMMANDS
128 Byte	BLF03_01	BYTE128	COMMANDS
256 Byte	BLF04_01	BYTE256	COMMANDS
512 Byte	BLF05_01	BYTE512	COMMANDS
1024 Byte	BLF06_01	BYTE1024	COMMANDS
2048 Byte	BLF07_01	BYTE2048	COMMANDS

PLC Data Format

The data to be transferred must be available in an ARRAY of BYTE in the PLC program.

Code Tag

The size of the ARRAY in the PLC can deviate from the size of the Code Tag. Fundamentally, the function block works with the largest data length and with the smallest Code Tag, as well as with the smallest data length and with the largest Code Tag, as long as the offset address and number of bytes to be transferred fit on the Code Tag.

2.3 Serial Interface Selection

Basically all available SPS serial interfaces that support handshake can be used.

2.4 General Settings for Data Transfer

Processor Settings

The serial interface settings are programmed in the function block and are oriented on the default settings of the Balluff Processor unit BIS C 480-007.

Baud rate	9600
Stop Bit	1
Data Bit	8
Parity	even
Parity Enable	yes
Code Tag Message	not activated, or activated if the signal should be evaluated by BLF00_00
Block Check	BCC activated
Error Number	activated
Block Size	set by the function block
Wait for Code Tag	off
RTS	activated
Deviated from default setting of BIS C-480-007-P-102-A	error number

Setup or Parameterization at Function Block

Only the I/O device number and serial interface port number must be specified at the function block. The input BYTE_ZYKL is parameterized only in certain situations to optimize the transfer or cycle time.

Required General Settings at the Function Block

DEVICE = Number of PLC fiber optic I/O device (INTeger)	
	RECO = • Selected (switch) device address number (up to Version 16) • Logical device address in I/O-Editor (up to Version 16)
	BTM3 = • Selected (switch) device address number (up to Version 16) • Logical device address in I/O-Editor (up to Version 16)

SERNR = Number of serial interface (INTeger)	
	RECO = 1 (one serial interface available at RECO)
	BTM3 = 1 (one serial interface available at BTM 3)

Special Settings at the Function Block

Input	Description	
SLAVE = False, or logical 0 or not used	MASTER	One FB should always be configured as Master. In case of multiple FB's accessing the interface, the active FB must switch the other FB's into SLAVE mode.
SLAVE = True, or logical 1	SALVE	If another FB actively accesses the serial interface.
BYTE_ZYKL = True, or logical 1	**Only for optimization, if required** Number of data bytes that are transferred in a SPS program scan cycle. This input is internally set to a default value of 50. The larger the number, the more data bytes are transferred per PLC program therefore decreasing the transfer time of large data blocks but also increasing the PLC program scan time during the transfer.	

2.5 Reader Head Selection and Code Tag Setting

Read Head Selection

The inputs KOPF_Bit0 and KOPF_Bit1 are used for Reader Head Selection:

Reader Head	KOPF_Bit0	KOPF_Bit1
1	0	0
2	1	0
3	0	1
4	1	1

Code Tag Setting

The input BLOCK_GR is used to select the block size of the Code Tag.

Block Size	BLOCK_GR
64 Byte	0
32 Byte	1

The block size for the Code Tag must be obtained from the Balluff documentation.

WARNING

⇒ A RESET is accepted but no data transfer is possible if the wrong block size is selected.

2.6 Addressing of Data on the Data ARRAY or Code Tag

This data is addressed with three inputs START_ADR, OFFSET and ANZ_BYTE.

START_ADR Data ARRAY start address

OFFSET Block start address on Code

ANZ_BYTE Number of BYTEs to be transferred

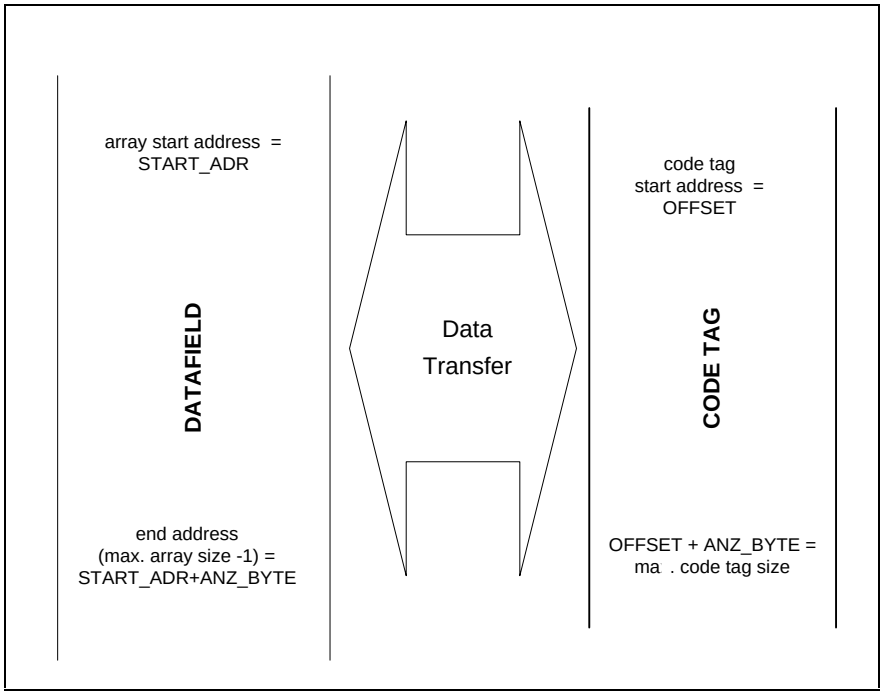


Fig. 2-1: Data Transfer

2.7 Read or Write Selection

The input RD_WR is used to select whether the data of ARRAY WRITE_IN is written to the Code Tag or if the data on the Code Tag is read into the ARRAY READ_OUT. To allow a completion (merge) of read data in the ARRAY, the ARRAY at the output READ_OUT must also be assigned to the input READ_IN.

Input RD_WR	Description
0	read
1	write

2.8 Error Handling

- The output ERROR assumes the status ‘1’ if an error occurs when using the function block and an error number is output at the output ERROR_NR.
- Errors can be cleared with a positive edge at the input RESET. The FUNCTION_BLOCK is also reset to its default settings.
- An active read or write cycle is aborted and the function block’s default settings are set if no error is active and a positive edge is applied to the input RESET.
- A positive edge at the RESET input without an active error and read or write cycle causes a reset request to the Processor (QQ), expecting a response (QQ). Errors that occur during a reset request can be reset only if the response was received without error.

Error Number ERROR_NR	Description
0 bis 19	Error messages from Processor, see Balluff description
20	Time-out when sending ‘QQ’ - Reset to the Processor
21	Time-out when receiving ‘QQ’ - Reset response from Processor
22	Time-out when sending read command
23	Time-out when receiving the response after a read command
24	Time-out when sending STX
25	Time-out when receiving data
26	Time-out when sending the write command
27	Time-out when receiving the response after a write command
28	Time-out when sending data
29	Time-out when receiving the response for write data
30	Received BCC is wrong
31	No ACK / NAK from Processor
32	Start address (OFFSET) is greater than the data ARRAY at the data input or output
33	End address (OFFSET+ANZ_BYTE) is greater than the data ARRAY at data input or output
34	COM-PORT can NOT be opened (eventually incorrect IO device number)
35	There is still data in the receive buffer (after an aborted transfer)

3 Application of Function Block Head Switching

3.1 Function Block BLF00_00 Interface

Function Block Inputs

Inputs	TYPE	Function
SEARCH	BOOL	Activate Code Tag Search *[1])
H1	BOOL	Send H1 to the Processor *[1])
H2	BOOL	Send H2 to the Processor *[1])
H3	BOOL	Send H3 to the Processor *[1])
H4	BOOL	Send H4 to the Processor *[1])
HA	BOOL	Send HA to the Processor *[1])
HB	BOOL	Send HB to the Processor *[1])
HC	BOOL	Send HC to the Processor *[1])
HD	BOOL	Send HD to the Processor *[1])
RESET	BOOL	Reset error, or reset the FUNCTION_BLOCK if ERROR = '0'
DEVICE	INT	Logical device number, or logical address of used serial interface
SERNR	INT	Number of serial interface
SLAVE	BOOL	Communication as SLAVE

Function Block Outputs

Outputs	Type	Function
READY	BOOL	FUNCTION_BLOCK ready
SEL_OK	BOOL	Head selection finished (H1,H2,H3,H4,HA,HB,HC or HD was performed)
CD	BOOL	Code Tag present (Processor sent ' * ' ($2A_H$)) *[2])
NO_CD_R	BOOL	No Code Tag present (a search was started with SEARCH, but no Code Carrier recognized)
CD_1	BOOL	Code Tag was recognized before reader head 1 (initiated by SEARCH)
CD_2	BOOL	Code Tag was recognized before reader head 2 (initiated by SEARCH)
CD_3	BOOL	Code Tag was recognized before reader head 3 (initiated by SEARCH)
CD_4	BOOL	Code Tag was recognized before reader head 4 (initiated by SEARCH)
E_BYTE_1	BYTE	First Byte on the Code Tag (when initiated via SEARCH a Code Tag was recognized)
E_BYTE_2	BYTE	Second Byte on the Code Tag (when initiated via SEARCH a Code Tag was recognized)
E_BYTE_3	BYTE	Third Byte on the Code Tag (when initiated via SEARCH a Code Tag was recognized)
E_BYTE_4	BYTE	Fourth Byte on the Code Tag (when initiated via SEARCH a Code Tag was recognized)
RESET_OK	BOOL	Reset was performed (Pulse, output for one SPS program scan).
ERROR	BOOL	Output when an error occurs and must be reset via RESET
ERROR_NR	INT	Error Number *[2])

*[1]) See Balluff Descriptions for further details

*[2]) This function must be activated in the Processor

Sub Function Blocks, Functions and Types

Function Blocks none

Functions none

User Data Types COMMANDS.TY (only used internally)

Table of Function Blocks and the associated Input and Output Arrays

Data Length	Function Block	Array 1 (User Data Type)	Array 2 (User Data Type)
Head Switching	BLF00_00	---	COMMANDS
32 Byte	BLF01_01	BYTE32	COMMANDS
64 Byte	BLF02_01	BYTE64	COMMANDS
128 Byte	BLF03_01	BYTE128	COMMANDS
256 Byte	BLF04_01	BYTE256	COMMANDS
512 Byte	BLF05_01	BYTE512	COMMANDS
1024 Byte	BLF06_01	BYTE1024	COMMANDS
2048 Byte	BLF07_01	BYTE2048	COMMANDS

Data Format in the PLC

Head Switching No data are transferred to the Code Tag . during head switching

Code Tag Detection The Code Tag detection function reads out the first four byte of the Code Tag, independent of the Code Tag's series, and outputs them to the E_BYTE_1 to E_BYTE_4 outputs.

Code Tag

The Code Tag size is not relevant for head switching.

3.2 Serial Interface Selection

Basically, all serial interfaces available in the PLC that support a transfer protocol with handshake can be used.

3.3 General Settings for Data Transfer

Setup in the Processor

The setup of the serial interface is permanently programmed in the function block and reflects the standard setting of the Balluff Processor BIS C 480-007 :

Baud rate	9600
Stop Bits	1
Data Bits	8
Parity	even
Parity Enable	yes
Code Tag Message	not activated, or activated when this signal should be output by BLF00_00
Block Check	BCC activated
Error Number	activated
Block Size	is given by the FB
Wait for Code Tag	off
RTS	activatediert
Deviation from standard of BIS C-480-007-P-102-A	error number

Required General Setup at the Function Block

DEVICE = Number of device in PLC fiber optic loop (INTEGER)	
RECO =	• Selected device address (up to software version 16) • Logical device address in IO-editor (for software version 16 or later)
BTM3 =	• Selected device address (up to software version 16) • Logical device address in IO-editor (for software version 16 or later)

SERNR = Number of the Serial Interface (INTEGER)	
RECO =	(the RECO provides one serial interface)
BTM3 =	1 (the BTM 03/04 provides one serial interface)

3.4 Read Head Selection and Code Tag Settings

For this function block, the read head selection and Code Tag settings is performed via the inputs H1, H2, H3, H4, HA, HB, HC and HD. A 'H1, H2, H3, H4, HA, HB, HC or HD' is directly commanded to the Processor. Please refer to the Balluff description for a more detailed description about the reaction in the Processor.

3.5 Error Handling

- The output ERROR is set to a '1' and an error number is assigned to the ERROR_NR if errors occur when using the function block.
- Errors are cleared via a positive edge at the input RESET. This also resets the function block to its default state.
- The active action is aborted and the function block is set to its default state if a positive edge is applied to the input RESET when no error is active.

Error Number ERROR_NR	**Meaning**
0 bis 19	Error messages from Processor, see Balluff description
29	Time-out when receiving of acknowledge data write
30	Received BCC is incorrect
31	No ACK / NAK from Processor
34	COM-PORT cannot be opened (eventually incorrect device number)
35	Still data in receive buffer (after an aborted transfer)
40	More than one head selected at the inputs H1 .. HD
41	Error when executing a head selection command H1 .. HD
42	Time-out when executing the head selection command
43	Time-out when executing the Code Tag search command
44	Time-out when receiving the Code Tag search acknowledge
45	Error in response of Processor to Code Tag search

4 Application Example

4.1 Function Block BLF01_01 to BLF07_01

Interfacing the Main Function Block

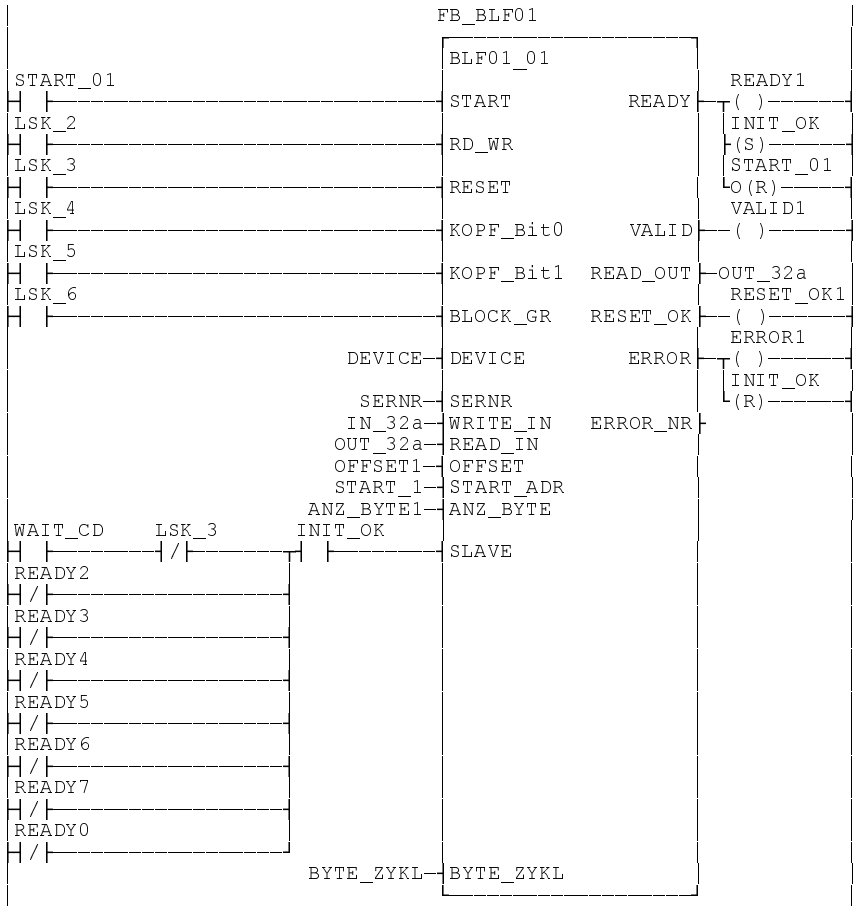
BLF01_01 The function block (FB) BLF01_00 is used as the main FB to initialize the serial interface and to transmit the QQ (reset of Processor). This function can be performed by every FB BLF01_00 .. BLF07_00.

INIT_OK The signal INIT_OK is formed so that the FB opens the serial interface port when switching control power on.

Use of multiple FB's When multiple FB's are used for data transfer, as in this example, the inputs SLAVE is set to '1' when another FB is active, when a reset is requested, or when the FB BLF00_00 is actively waiting for 'Code Tag Present'.

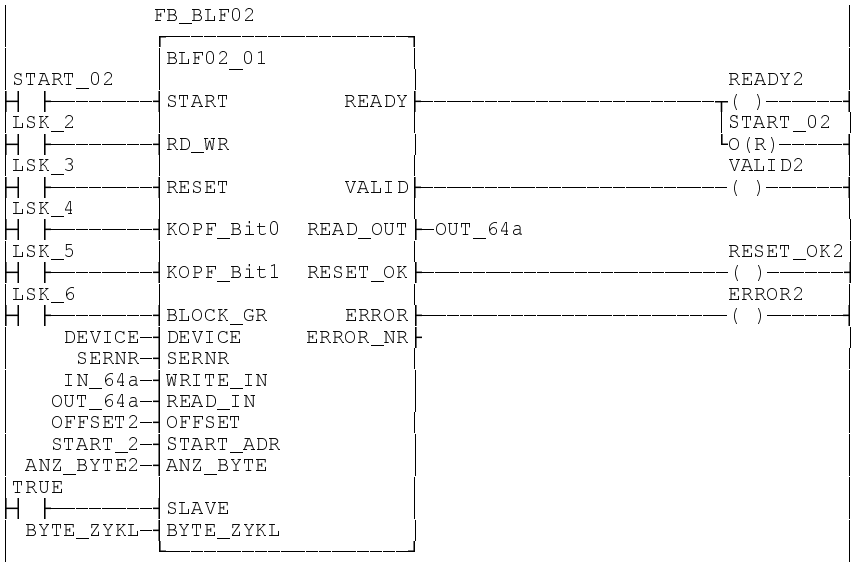
Automatic Code Tag Identification The signals WAIT_CD and LSK_3 at the input SLAVE are required only if the function 'Automatic Code Tag Identification' should be used (this function must be selected in the Processor !).

The following FB's input SLAVE is set to '1' (TRUE). The FB must be started (positive edge at input START) only if no other FB BLFxx_00 is active !



Interfacing the Slave Function Block

The FB'S input SLAVE is set to '1' (TRUE). The FB must be started (positive edge at input START) only if no other FB BLFxx_00 is active !

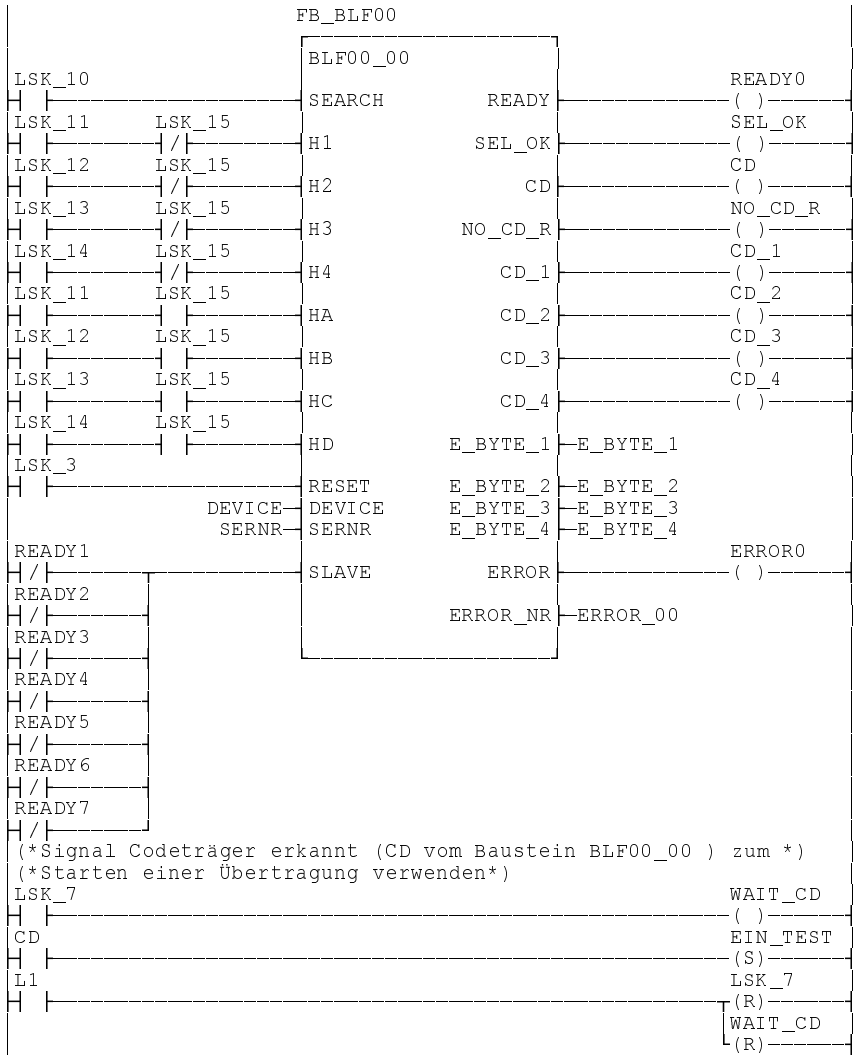


4.2 Function Block for Head Selection and Code Tag Identification

Function Block BLF00_00

Function Block for head selection, Code Tag search, with or without automatic Code Tag Identification when the signal CD should be evaluated.

To use the function 'Automatic Code Tag Identification', the input SLAVE must be set to '1' (TRUE) while another FB communicates actively with the Processor.



4.3 Identifier Description

Identifier	Type	Meaning
ANZ_BYTE1	INT	BLF01 - number of bytes to be transferred
ANZ_BYTE2	INT	BLF02 - number of bytes to be transferred
ANZ_BYTE7	INT	BLF07 - number of bytes to be transferred
BYTE_ZYKL	INT	number of bytes transferred per SPS program scan
CD	BOOL	BLF00 - Code Tag recognized
CD_1	BOOL	BLF00 - Code Tag infront of Head 1
CD_2	BOOL	BLF00 - Code Tag infront of Head 2
CD_3	BOOL	BLF00 - Code Tag infront of Head 3
CD_4	BOOL	BLF00 - Code Tag infront of Head 4
DEVICE	INT	device number
E_BYTE_1	BYTE	BLF00 - first Byte on Code Tag
E_BYTE_2	BYTE	BLF00 - second Byte on Code Tag
E_BYTE_3	BYTE	BLF00 - third Byte on Code Tag
E_BYTE_4	BYTE	BLF00 - fourth Byte on Code Tag
EIN_TEST	BOOL	Identifier Start one cycle
ERROR_00	INT	BLF00 - error message number
ERROR0	BOOL	BLF00 - Error
ERROR1	BOOL	BLF01 - Error
ERROR2	BOOL	BLF02 - Error
ERROR3	BOOL	BLF03 - Error
ERROR4	BOOL	BLF04 - Error
ERROR5	BOOL	BLF05 - Error
ERROR7	BOOL	BLF07 - Error
FB_BLF00	BLF00_00	BLF00 - FUNCTION_BLOCK head selection
FB_BLF01		BLF01 - FB for 32 Byte data
FB_BLF02		BLF02 - FB for 64 Byte data
FB_BLF07		BLF07 - FB for 2048 Byte data
IN_2048a	BYTE2048	BLF07 - 2048 Byte write data
IN_32a	BYTE32	BLF01 - 32 Byte write data
IN_64a	BYTE64	BLF02 - 64 Byte write data
INIT_OK	BOOL	Initialization performed
L1	BOOL	Lamp 1
LSK_10	BOOL	Switch 10 active
LSK_11	BOOL	Switch 11 active
LSK_12	BOOL	Switch 12 active
LSK_13	BOOL	Switch 13 active
LSK_14	BOOL	Switch 14 active
LSK_15	BOOL	Switch 15 active
LSK_2	BOOL	Switch 2 active
LSK_3	BOOL	Switch 3 active
LSK_4	BOOL	Switch 4 active
LSK_5	BOOL	Switch 5 active

Identifier	Type	Meaning
LSK_6	BOOL	Switch 6 active
LSK_7	BOOL	Switch 7 active
NO_CD_R	BOOL	BLF00 - no Code Tag recognized
OFFSET1	INT	BLF01 - Offset address
OFFSET2	INT	BLF02 - Offset address
OFFSET7	INT	BLF07 - Offset address
OUT_2048a	BYTE2048	BLF07 - 2048 Byte read data
OUT_32a	BYTE32	BLF01 - 32 Byte read data
OUT_64a	BYTE64	BLF02 - 64 Byte read data
READY0	BOOL	BLF00 - FB is READY
READY1	BOOL	BLF01 - FB is READY
READY2	BOOL	BLF02 - FB is READY
READY3	BOOL	BLF03 - FB is READY
READY4	BOOL	BLF04 - FB is READY
READY5	BOOL	BLF05 - FB is READY
READY6	BOOL	BLF06 - FB is READY
READY7	BOOL	BLF07 - FB is READY
RESET_OK1	BOOL	BLF01 - FB successfully reset
RESET_OK2	BOOL	BLF02 - FB successfully reset
RESET_OK7	BOOL	BLF07 - FB successfully reset
SEL_OK	BOOL	BLF00 - head selection OK
SERNR	INT	Number of serial interface
START_01	BOOL	BLF01 - Start signal for data transfer
START_02	BOOL	BLF02 - Start signal for data transfer
START_07	BOOL	BLF07 - Start signal for data transfer
START_1	INT	BLF01 - Start address
START_2	INT	BLF02 - Start address
START_7	INT	BLF07 - Start address
TURN_FS	BOOL	Identifier blink fast
VALID1	BOOL	BLF01 - Data transfer successfully finished
VALID2	BOOL	BLF02 - Data transfer successfully finished
VALID7	BOOL	BLF07 - Data transfer successfully finished
WAIT_CD	BOOL	Wait for signal Code Tag present

5 Index

Kundenbetreuungsstellen - Sales & Service Facilities

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