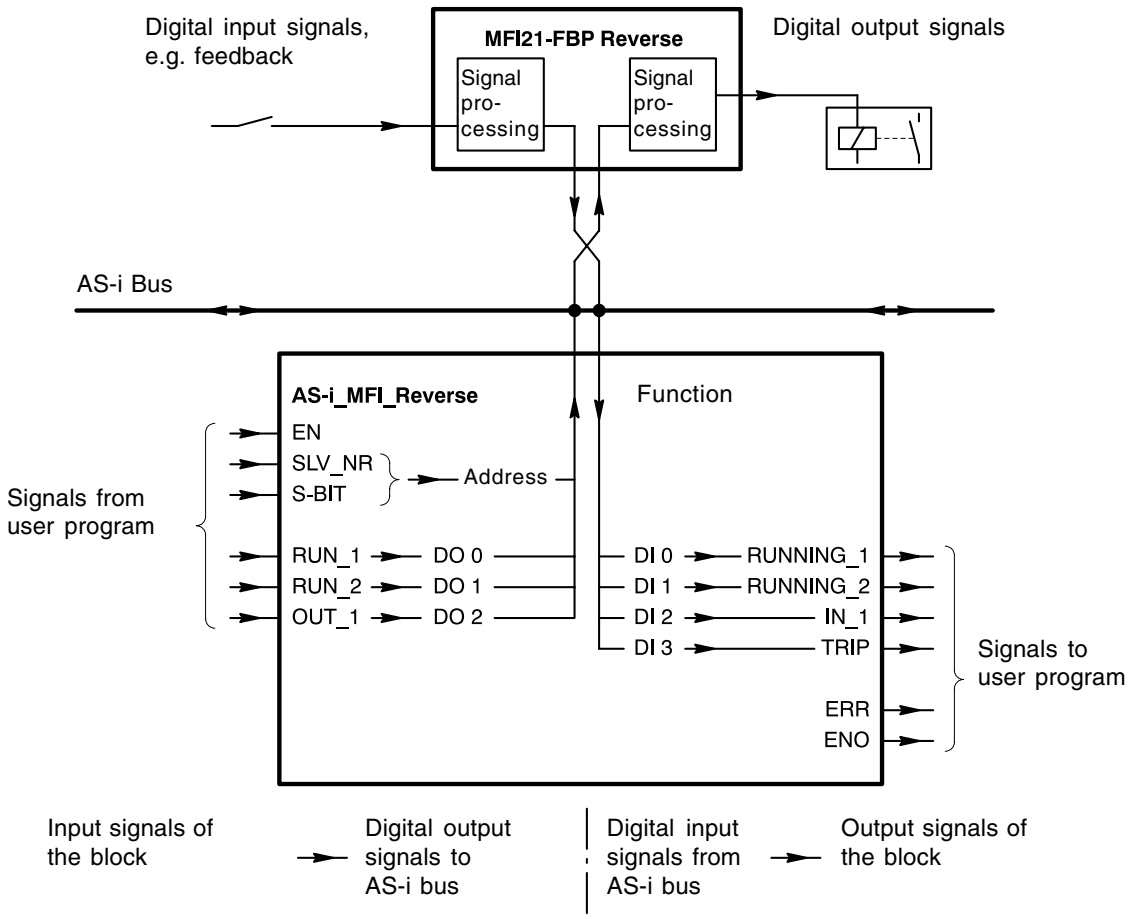
V7

AS-i Bus
Functions for S7-300...



AS-i functions for program creation

with Siemens controller S7-300....

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Purpose

For the comfortable linkage of ABB terminal devices to a field bus, special functions (blocks) were created for programming in an automation system.

Using these functions the user is able to quickly and effectively develop his program. The installation guide provides information to the user on integrating these functions into the library of the manufacturer-specific programming system (refer to the description of the example program).

The functions described here apply to the programming with Siemens STEP 7 software V5.0 in an user program for the Siemens PLC S7-300 on the AS-i bus.

The description contains information on the use of the functions for the different terminal devices and their possible application functions.

The zip file "1SAJ922091R0101.zip" contains the function block library and an example program for an application with the Siemens controller S7-300. This file can be found on the **ABB FBP system CD** under

Software -> Engineering Package-> ASE91-FBP.0101

Master for AS-i standard address range 1..31 or 1A..31A, Siemens device CP 342-2

Only AS-i standard or AS-i-A slaves can be connected to this coupler.
There are a maximum of 4 inputs, 3 outputs and 3 parameters available.

B-Slaves must not be connected to the AS-i standard master CP 342-2.

Master for extended AS-i address range 1..31A and B, Siemens device CP 343-2

Slaves of the type AS-i standard, AS-i-A and AS-i-B can be connected to this coupler.
There are a maximum of 4 inputs, 3 outputs and 3 parameters available.

Signal direction definition

Generally applicable for all functions, the following assignment of the input/output signals in relation to the function (FC in application program/PLC) was defined:

Input signals from terminal device (MSD, MSR, MFI) to PLC	**RUNNING, IN, TRIP**
Output signals from PLC to terminal device	**RUN, OUT**
Parameter value from PLC to terminal device	**P0...P2** [1]**)**

[1]) Parameter value = combination of P0...P2, for the values refer to the table of the corresponding devices

Assignment of the input/output signals and the parameters to the bus telegram bits

Bit	**Input signals**	Bit	**Output signals**	Bit	**Parameter**
DI 0	RUNNING_1	DO 0	RUN_1	P 0	P 0
DI 1	RUNNING_2, IN_1	DO 1	RUN_2, OUT_1	P 1	P 1
DI 2	RUNNING_3, IN_2	DO 2	RUN_3, OUT_2	P 2	P 2
DI 3	Running_4, TRIP				

All other connections of the functions are generated or used in the FC. They are not transmitted via the bus.

For further information to the bus telegrams refer to the Siemens manuals for the AS-Interface Master CP 343-2 and CP 342-2.

General structure of the AS-i address

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		S-Bit	Slave address 1...31				

S(elect)-Bit = 0 Standard AS-i slave in the address range A (1...31 or 1A...31A)
S(elect)-Bit = 1 AS-i slave with extended address mode in the address range B (1...31 A and B)

Conversion table of AS-i addresses from decimal (1A...31B) to hexadecimal (1...3F)

The S-Bit for FC14 is considered for the B addresses.

Decimal address A slave *)	Address FC1...6 hexadecimal S-Bit is entered separately	Entry for FC14 hexadecimal +S-Bit	Decimal address B slave	Address FC1...6 hexadecimal S-Bit is entered separately	Entry for FC14 hexadecimal +S-Bit
1A	1	1	1B	1	21
2A	2	2	2B	2	22
3A	3	3	3B	3	23
4A	4	4	4B	4	24
5A	5	5	5B	5	25
6A	6	6	6B	6	26
7A	7	7	7B	7	27
8A	8	8	8B	8	28
9A	9	9	9B	9	29
10A	A	A	10B	A	2A
11A	B	B	11B	B	2B
12A	C	C	12B	C	2C
13A	D	D	13B	D	2D
14A	E	E	14B	E	2E
15A	F	F	15B	F	2F
16A	10	10	16B	10	30
17A	11	11	17B	11	31
18A	12	12	18B	12	32
19A	13	13	19B	13	33
20A	14	14	20B	14	34
21A	15	15	21B	15	35
22A	16	16	22B	16	36
23A	17	17	23B	17	37
24A	18	18	24B	18	38
25A	19	19	25B	19	39
26A	1A	1A	26B	1A	3A
27A	1B	1B	27B	1B	3B
28A	1C	1C	28B	1C	3C
29A	1D	1D	29B	1D	3D
30A	1E	1E	30B	1E	3E
31A	1F	1F	31B	1F	3F

***)** The slave address **n** (1...31) is identical to the address **nA** (1A...31A).

Extended command functions

For using the extended command functions (e.g. setting the parameter bits), the Siemens function block FC7 "ASI_3422" (in the respectively valid version) has to be integrated into the user program. This function is called in the FC14 (AS-i Management). The function block FC7 "ASI_3422", the corresponding technical data and an example program to the couplers is provided by Siemens on a floppy disk.

Setting the parameter codes in the function block FC14 "AS-i Management"

The parameters of an AS-i slave (e.g. MFI21-FBP) are set using the function block FC14. The FC14 is pre-programmed for 4 slaves in the ABB example program. But it is always possible to adapt the function block to more or less slaves.

Code, slave no. and parameter can be pre-set by using the double word value.
The individual bytes of the double word have the following meaning: [1)]

The following line is important (applies to any parameter record)

// Load parameter record 1

par 1: L DW#16#aabbccdd

aa = Byte 0 = Code number,
here always 00 Hex (SET_PERMANENT_PARAMETER)

bb = Byte 1 = Slave address
1A...31B decimal / 01...3F hexadecimal

cc = Byte 2
Bit 0...3 = Parameter value
1...6 for AS-i master CP 343-2
9...E for AS-i master CP 342-2,

dd = not used, enter always 00

Example:

// Load parameter record 1

par 1: L DW#16#00390100

aa	= Byte 0	= $\mathbf{00}_H$	Code number, (SET_PERMANENT_PARAMETER)
bb	= Byte 1	= $\mathbf{39}_H$	Slave address 25B
cc	= Byte 2 Bit 0...3	= **01**	Parameter value for MFI21 application function Direct without fallback (with Siemens master CP 343-2)
dd	= not used, always **00**		

[1)] refer to the Siemens manuals for the AS-Interface Master CP 343-2 and CP 342-2.

AS-i Functions ...

Description of the AS-i functions for Siemens controller S7-300

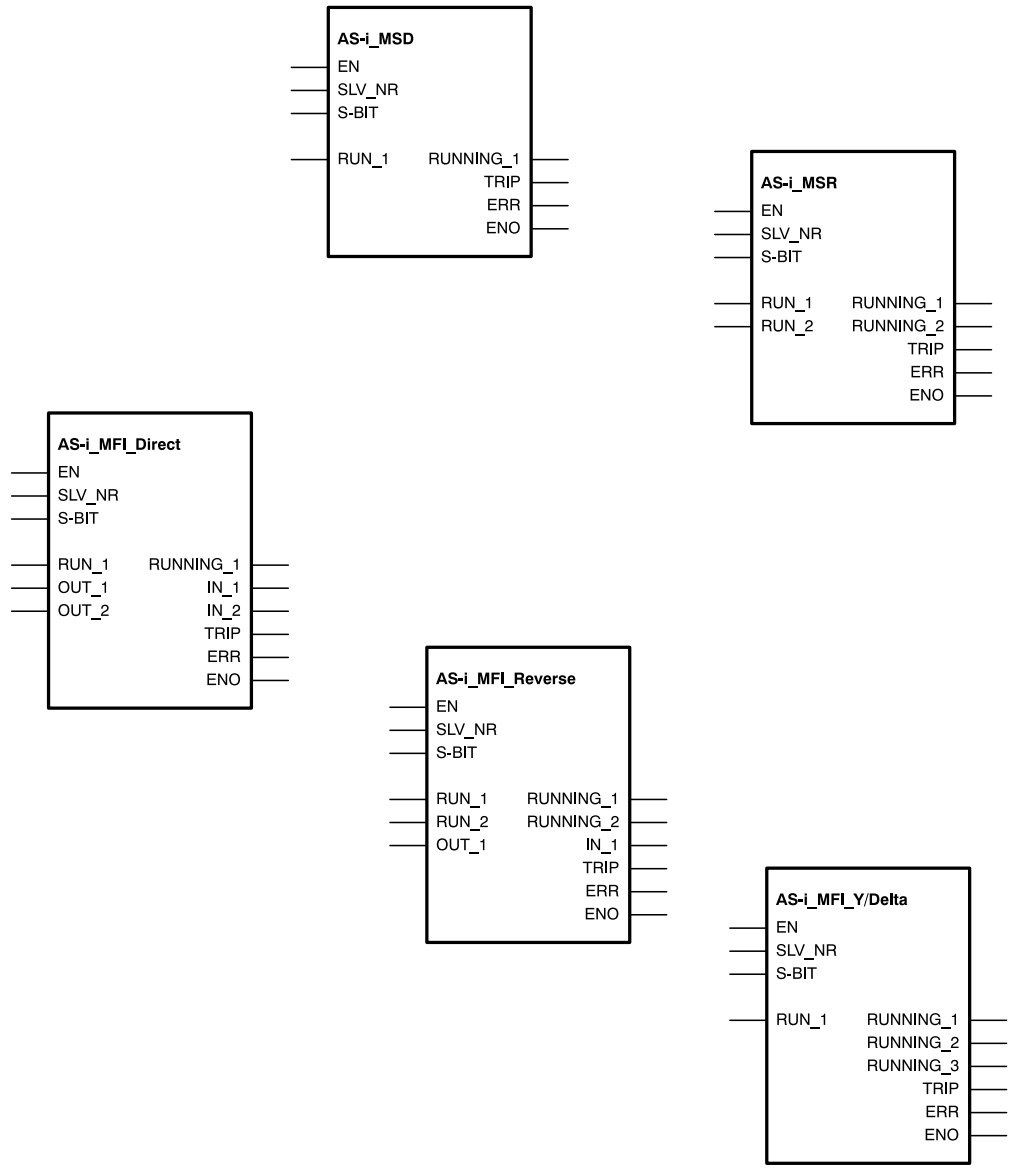

Fig. 1: Examples of functions

FC1 – Function AS-i_4I+3O (4 inputs + 3 outputs)

for Siemens S7-300

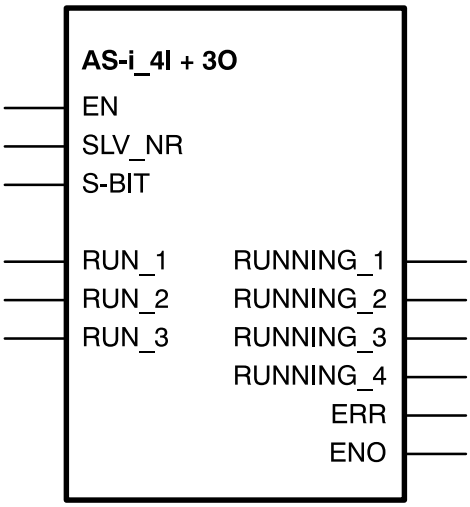

Fig. 2: FC1 - Function AS-i_4I+3O

Meaning of the inputs and outputs of the block:

Name	Type	Data type	Description
EN			General enabling for the block (usage not mandatory)
SLV_NR	E	WORD	Slave number 1...31 (W#16#0...1F$_H$)
S-BIT	E	BOOL	0/FALSE = standard or A slave, 1/TRUE = B slave
RUN_1	A	BOOL	Switching on output RUN_1
RUN_2	A	BOOL	Switching on output RUN_2
RUN_2	A	BOOL	Switching on output RUN_3
RUNNING_1	E	BOOL	Input signal, e.g. feedback from relay (contactor) activated using RUN_1
RUNNING_2	E	BOOL	Input signal, e.g. feedback from relay (contactor) activated using RUN_2
RUNNING_3	E	BOOL	Input signal, e.g. feedback from relay (contactor) activated using RUN_3
RUNNING_4	E	BOOL	Input signal
ERR	A	WORD	Error: Value for SLV_NR is not in the range of 1...31. The signal is generated in the FC, it is not transmitted via the bus.
ENO			Block was processed (usage not mandatory).

FC1 – Function AS-i_4I+3O (4 inputs + 3 outputs)

for Siemens S7-300

Assignment of the input/output signals to the AS-i bus telegram bits (AS-i memory area)

Bit	Input signal	Bit	Output signal
DI 0	RUNNING_1	DO 0	RUN_1
DI 1	RUNNING_2	DO 1	RUN_2
DI 2	RUNNING_3	DO 2	RUN_3
DI 3	RUNNING_4		

Description

This block allows to control 4 inputs and 3 outputs at the AS-i bus. It is not assigned to any ABB terminal device.

For setting the 3 possible AS-i parameters P0...P2, the Step 7 function FC7 "ASI_3422" (in the respectively valid version) for the AS-i couplers CP 342-2 or CP 343-2 has to be integrated into the user program.

Setting the parameters P0...P2 must always be done **before** the initial processing of the used block.

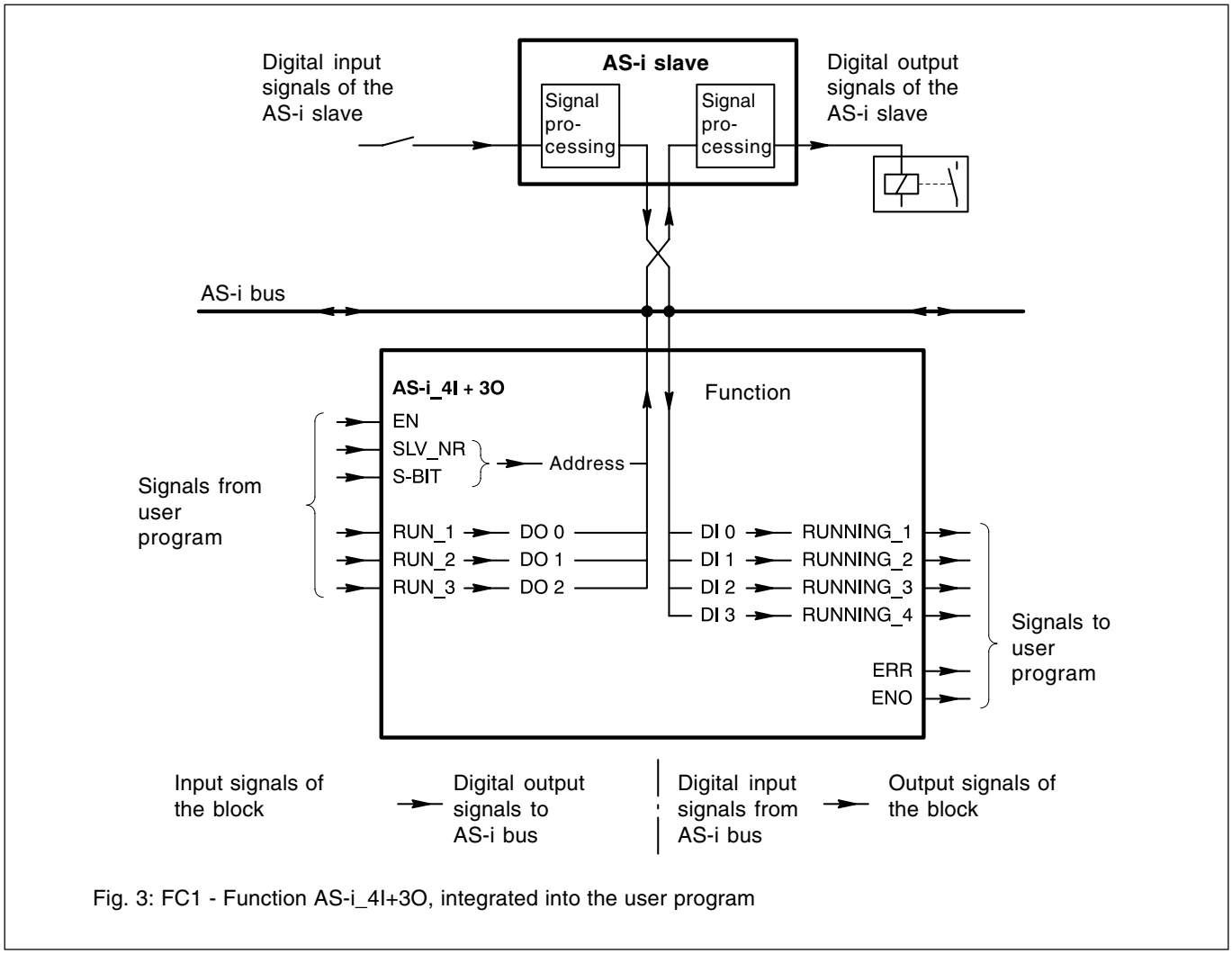

Fig. 3: FC1 - Function AS-i_4I+3O, integrated into the user program

FC2 - Function AS-i_MSD

MSD11-FBP, Motorstarter Direct
for Siemens S7-300

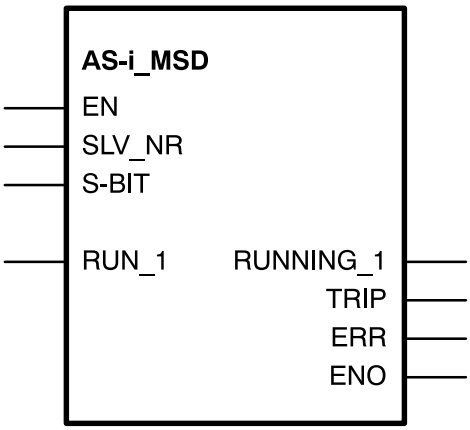

Fig. 4: FC2 - Function AS-i_MSD

Meaning of the inputs and outputs of the block:

Name	Type	Data type	Description
EN			General enabling for the block (usage not mandatory)
SLV_NR	E	WORD	Slave number 1...31 (W#16#0...1F$_H$)
S-BIT	E	BOOL	0/FALSE = standard or A slave, 1/TRUE = B slave
RUN_1	A	BOOL	Switching on output RUN_1 drive
RUNNING_1	E	BOOL	Input signal (feedback) of the relay (contactor) activated using RUN_1
TRIP	E	BOOL	Input signal, motor protecting switch MS 116 has tripped or was manually switched off
ERR	A	WORD	Error: Value for SLV_NR is not in the range of 1...31. The signal is generated in the FC, it is not transmitted via the bus.
ENO			Block was processed (usage not mandatory).

FC2 - Function AS-i_MSD

MSD11-FBP, Motorstarter Direct
for Siemens S7-300

Possible signal status

Command	Status	Status	Comment
RUN_1	TRIP	RUNNING_1	
1	1	1	Ok, contactor ON
1	0	1	Error. Status not possible as locked in the MSD wiring. Welded contactor contacts, the user has to check this in the program.
1	0	0	MS 116 has tripped or was manually switched off
1	1	0	Error. Contactor does not switch.
0	X	1	Error. Possibly welded contactor contacts.
0	X	0	Ok, contactor OFF

X = 0 or 1

The output RUN_1 is switched off, if the motor protecting switch MS 116 has tripped or was manually switched off.

FC2 - Function AS-i_MSD

MSD11-FBP, Motorstarter Direct
for Siemens S7-300

Description

The block controls the terminal device "Motorstarter Direct" MSD11-FBP. Switching on and off an individual drive is possible. There is no additional check between the control signal applied to RUN_1 and the feedback at RUNNING_1. No AS-i parameters have to be set.

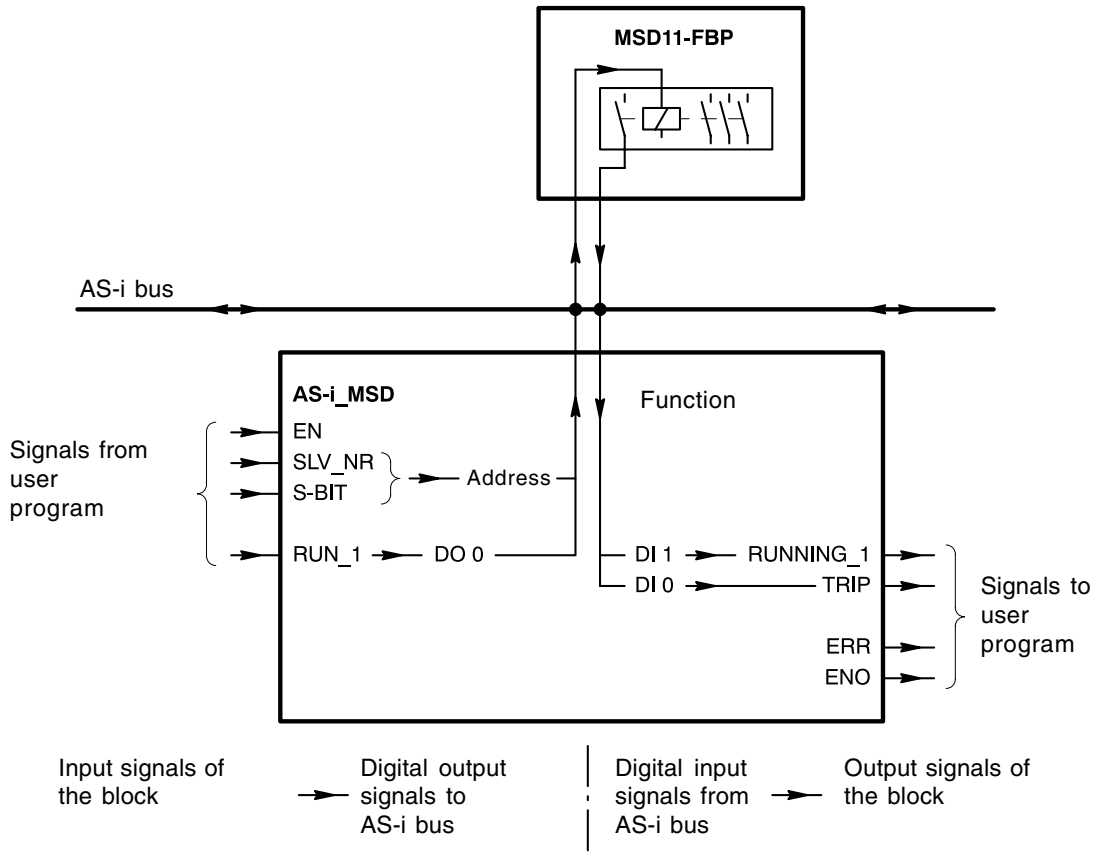

Fig. 5: FC2 - Function AS-i_MSD, integrated into the user program

FC2 - Function AS-i_MSD, error diagnosis MSD11-FBP

MSD11-FBP, Motorstarter Direct for Siemens S7-300

Action / Error	Reaction / Remote situation
MS 116 has tripped or was manually switched off	Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = off FBP plug In action TRIP signal = 0 **After switching on the MS 116:** TRIP signal = 1 **Contactor is switched according to PLC activation.**
Control voltage failure 24...230 V AC/DC (motor contactors)	Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = on, LED SUPPLY = off FBP plug In action TRIP signal = 1 **After voltage recovery:** **Contactor is switched according to PLC activation.**
24 V DC voltage failure, black AS-i flat-ribbon cable	**MSD11: Slide switch for contactor voltage in position "INTERNAL"** Contactor switches off MSD11-FBP all MSD11 LEDs are off (no power supply) FBP plug In action TRIP signal = 0 **MSD11: Slide switch for contactor voltage in position "EXTERNAL"** Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = off, **LED SUPPLY = on** FBP plug In action TRIP signal = 0 **After voltage recovery:** TRIP signal = 1 **Contactor is switched according to PLC activation.**
24 V DC voltage failure, yellow AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = on, LED SUPPLY = on FBP plug Not in action TRIP signal = 0 (no data traffic) **After voltage / data traffic recovery:** **Contactor is switched according to PLC activation.**
Disconnection between FieldBusPlug and MSD11-FBP (plug disconnected)	Contactor switches off MSD11-FBP all MSD11 LEDs are off (no power supply) FBP plug In action TRIP signal = 0 (no data traffic) No "missing slave" message is sent to the AS-i master in case of an error. **After voltage recovery:** **Contactor is switched according to PLC activation.**
AS-i bus master failure	Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = on, LED SUPPLY = on FBP plug Not in action TRIP signal = 0 (no data traffic) **After voltage recovery:** **Contactor is switched according to PLC activation.**

FC3 - Function AS-i_MSR

MSR22-FBP, Motorstarter Reverse
for Siemens S7-300

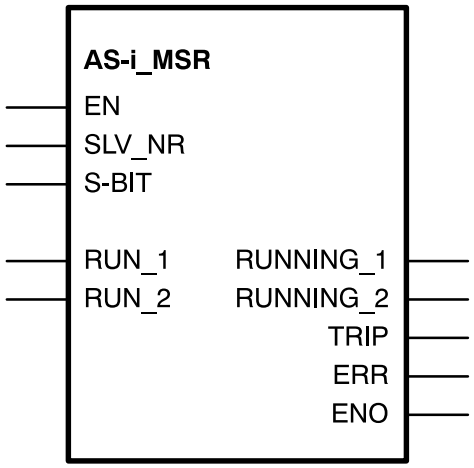

Fig. 6: FC3 - Function AS-i_MSR

Meaning of the inputs and outputs of the block:

Name	Type	Data type	Description
EN			General enabling for the block (usage not mandatory)
SLV_NR	E	WORD	Slave number 1...31 (W#16#0...1F$_H$)
S-BIT	E	BOOL	0/FALSE = standard or A slave, 1/TRUE = B slave
RUN_1	A	BOOL	Switching on drive 1 (e.g. motor right), start = 1 / stop = 0
RUN_2	A	BOOL	Switching on drive 2 (e.g. motor left), start = 1 / stop = 0
RUNNING_1	E	BOOL	Input signal (feedback) of the relay (contactor) activated using RUN_1
RUNNING_2	E	BOOL	Input signal (feedback) of the relay (contactor) activated using RUN_2
TRIP	E	BOOL	Input signal, motor protecting switch MS 116 has tripped or was manually switched off
ERR	A	WORD	Error: Value for SLV_NR is not in the range of 1...31. The signal is generated in the FC, it is not transmitted via the bus.
ENO			Block was processed (usage not mandatory).

FC3 - Function AS-i_MSR

MSR22-FBP, Motorstarter Reverse
for Siemens S7-300

Possible signal status

Cmd. RUN_1	Cmd. RUN_2	Status TRIP	Status RUNNING_1	Status RUNNING_2	Comment
1	0	1	1	0	Ok, drive 1 switched on
0	1	1	0	1	Ok, drive 2 switched on
1	0	X	X	1	Device error
1	0	1	0	X	Device error or external 24 V DC not available
X	X	0	0	0	MS 116 has tripped or was manually switched off
X	X	0	1	0	Error. Status not possible as locked in the MSR22 wiring. Welded contactor contacts, the user has to check this in the program.
X	X	0	0	1	Error. Status not possible as locked in the MSR22 wiring. Welded contactor contacts, the user has to check this in the program.
0	1	X	1	X	Device error
0	1	1	X	0	Device error or external 24 V DC not available

X = 0 or 1

The outputs RUN_1 and RUN_2 are switched off, if the motor protecting switch MS 116 has tripped or was manually switched off.

FC3 - Function AS-i_MSR

MSR22-FBP, Motorstarter Reverse
for Siemens S7-300

Description

The block controls the terminal device "Motorstarter Reverse" MSR22-FBP (e.g. right/left, up/down, back/forward etc). The rotational directions are mutually locked, i.e. if one direction is switched on, the other direction is locked.
When the direction is changed, one direction must be first switched off before the other direction can be switched on. No As-i parameters have to be set.

If both directions are switched on simultaneously, an error message is output.
The contactors are switched off, the red error LED at the MSR22 lights up and the red error LED at the FieldBusPlug flashes.

If an error trip event occurred, both control signals must be first set to zero before a new switching event can be initiated. Only after this the error LED goes off.

Resetting the 1st direction and setting the 2nd direction can be executed within the same PLC cycle. It **must** be guaranteed that the reset command is placed **before** the set command in the PLC program.

The change is executed with a time delay of 50 ms.

This block monitors whether the feedback signal "RUNNING_1/_2" arrives within a checkout time of 50 ms after the control signal "RUN_1/_2" was output.

If the slide switch position for the power supply is changed (INTERNAL / EXTERNAL) while a contactor is switched on, the contactor switches off. Reclosing is only possible after setting the control signals to ZERO.

Both MSR22-FBP address switches are not used for the AS-i bus. Setting the address is done using a separate programming device or via the command interface and the corresponding code (Change_AS-i-Slave_Address). For this the function "ASI_3422" must be used (see Siemens documentation "CP 343-2 AS-Interface Master").

FC3 - Function AS-i_MSR

MSR22-FBP, Motorstarter Reverse
for Siemens S7-300

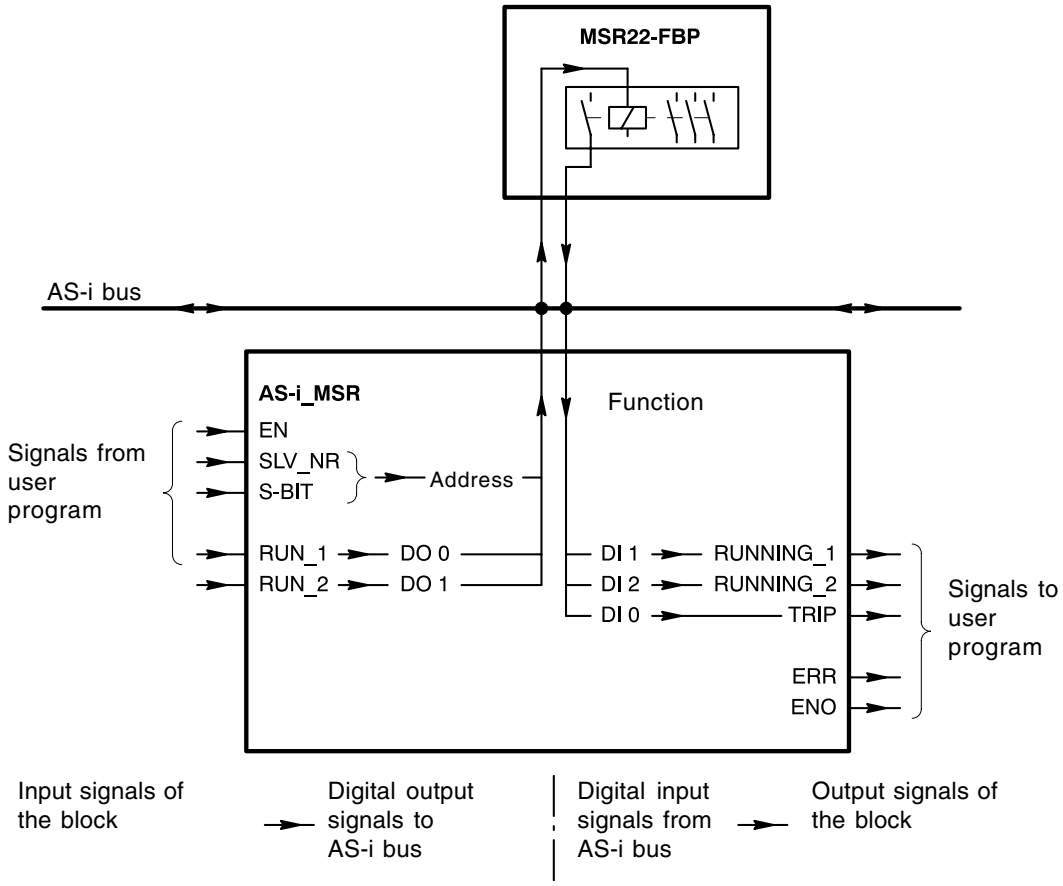

Fig. 7: FC3 - Function AS-i_MSR, integrated into the user program

FC3 - Function AS-i_MSR, error diagnosis MSR22-FBP

MSR22-FBP, Motorstarter Reverse for Siemens S7-300

Action / Error	Reaction / Remote situation
MS 116 has tripped or was manually switched off	Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off FBP plug In action TRIP signal = 0 **After switching on the MS 116:** TRIP signal = 1 **MSR22-FBP start only possible after setting the PLC control to ZERO.**
Control voltage failure 24...230 V AC/DC (motor contactors)	Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off FBP plug In action TRIP signal = 0 **After voltage recovery:** TRIP signal = 1 **MSR22-FBP start only possible after setting the PLC control to ZERO.**
24 V DC voltage failure, black AS-i flat-ribbon cable	Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = off FBP plug In action TRIP signal = 0 **After voltage recovery:** TRIP signal = 1 **Contactor 1/2 is switched according to PLC activation.**
24 V DC voltage failure, yellow AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = on FBP plug Not in action TRIP signal = 0 (no data traffic) **After voltage / data traffic recovery:** **Contactor 1/2 is switched according to PLC activation.**
Disconnection between FieldBusPlug and MSR22-FBP (plug disconnected)	Contactor 1/2 switches off MSR22-FBP all LEDs are off (no power supply) FBP plug In action TRIP signal = 0 A "missing slave" message is sent to the AS-i master in case of an error. **After voltage recovery:** AS-i master detects connection of the missing slave **Contactor 1/2 is switched according to PLC activation.**
AS-i bus master failure	Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = on FBP plug Not in action **After voltage recovery:** **Contactor 1/2 is switched according to PLC activation.**
MSR22-FBP detects RUN/RUNNING error	Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = on FBP plug In action, red error LED flashes TRIP signal = 1 **After error removal:** **MSR22-FBP start only possible after setting the PLC control to ZERO.**

Functions AS-i_MFI_...

MFI21-FBP Motorstarter Fieldbus Interface,
application functions for Siemens S7-300

The MFI21-FBP can only be used together with the ABB motor protection switch MS 325.

Setting the application functions in the MFI21-FBP

Setting the application functions as well as the setting of the behavior of the MFI21 in case of a bus connection failure (fallback behavior) is done by means of the parameter telegram.

The MFI21-FBP cannot be used without valid parameter assignments. No outputs will be switched and no feedback from the MFI21-FBP can be received.

In order to use the application functions of the MFI21-FBP it is required that the parameter values of the corresponding application function have to be transmitted **before** the initial processing of the used function.

To achieve this, the Step 7 function FC7 "ASI_3422" (in the respectively valid version) for the AS-i masters CP 342-2 or CP 343-2 has to be integrated into the user program.

The parameter transmission is done using the function block FC14 and the code ‘Configure parameter value’ (refer to parameter code entry in function block FC14 "AS-i Management").

The parameter value contained in the FC 14 block is transmitted to the Siemens master (CP 342-2 / CP 343-2).

In the AS-i master, the value is stored non-volatile as configured value. The master does **not** immediately send the parameter value to the slave.

The parameter value is first sent when activating the slave after the power supply of the automation system is switched on.

The data are only stored volatile in the MFI21-FBP and will be lost in case of a power supply failure of the MFI21-FBP.

After switching on the MFI21-FBP to the bus once more, the bus master automatically sends the parameter value to the slave.

Functions AS-i_MFI_...

MFI21-FBP Motorstarter Fieldbus Interface,
application functions for Siemens S7-300

Possible application functions for the MFI21-FBP are:

FC4 - Function **AS-i_MFI_Direct**	**Direct starter**	(1 motor for one direction of rotation)
FC5 - Function **AS-i_MFI_Reverse**	**Reversing starter**	(1 motor for left or right rotation)
FC6 - Function **AS-i_MFI_Y/Delta**	**Star-delta starter**	(1 motor with star-delta starting)
	Transparent	(MFI21 only used as I/O device), **not possible for AS-i bus**

Functions AS-i_MFI_...

MFI21-FBP Motorstarter Fieldbus Interface,
application functions for Siemens S7-300

Parameter values of the application functions in the MFI21-FBP

Different values for parameterizing the operating modes for the AS-i masters **CP 342-2** and **CP 342-2** of Siemens must be entered.

The following parameter values apply to the application functions in the MFI21-FBP used on the AS-i bus:

Parameter value		Application function in MFI21-FBP
CP 343-2	CP 342-2	
0	8	No valid operating mode (default setting)
1	9	Direct starter. Fallback behavior: MFI21 outputs switch off
2	A	Direct starter. Fallback behavior: MFI21 outputs remain in previous state
3	B	Reversing starter. Fallback behavior: MFI21 outputs switch off
4	C	Reversing starter. Fallback behavior: MFI21 outputs remain in previous state
5	D	Star-delta starter. Fallback behavior: MFI21 outputs switch off
6	E	Star-delta starter. Fallback behavior: MFI21 outputs remain in previous state
7	F	Transparent mode, **not possible for AS-i bus**

Assigning the application function parameters gives the MFI21-FBP a specific behavior.

This applies to

- the processing of bus commands
- the generation of the relay output signals
- the evaluation of the feedback via the digital inputs
- the generation of signals which are retransmitted to the bus.

FC4 - Function AS-i_MFI_Direct

MFI21-FBP Motorstarter Fieldbus Interface, application function "Direct Starter"
for Siemens S7-300

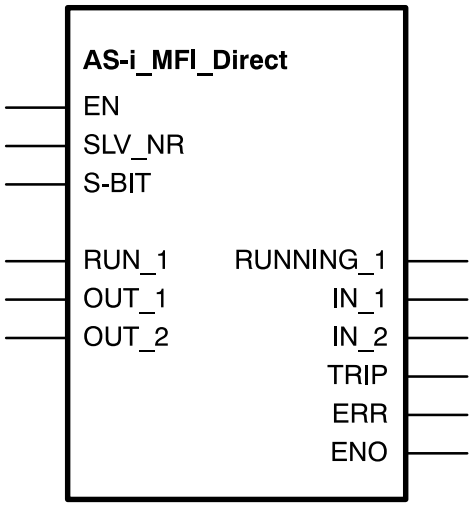

Fig. 8: FC4 - Function AS-i_MFI_Direct

Meaning of the inputs and outputs of the block:

Name	Type	Data type	Description
EN			General enabling for the block (usage not mandatory).
SLV_NR	E	WORD	Slave number 1...31 (W#16#0...1F$_H$)
S-BIT	E	BOOL	0/FALSE = standard or A slave, 1/TRUE = B slave
RUN_1	A	BOOL	Switching on drive (start = 1 / stop = 0)
OUT_1	A	BOOL	Free output, can be used for any output signal.
OUT_2	A	BOOL	Free output, can be used for any output signal.
RUNNING_1	E	BOOL	Input signal (feedback) of the relay (contactor) activated using RUN.
IN_1	E	BOOL	Free input, can be used for any input signal.
IN_2	E	BOOL	Free input, can be used for any input signal.
TRIP	E	BOOL	Input signal, motor protecting switch MS 325 has tripped or was manually switched off.
ERR	A	WORD	Error: Value for SLV_NR is not in the range of 1...31. The signal is generated in the FC, it is not transmitted via the bus.
ENO			Block was processed (usage not mandatory).

FC4 - Function AS-i_MFI_Direct

MFI21-FBP Motorstarter Fieldbus Interface, application function "Direct Starter"
for Siemens S7-300

Possible signal status

Command RUN_1	Status TRIP	Status RUNNING_1	Comment
1	1	1	Ok, drive switched on
1	0	1	Error. Status not possible as locked in the MFI21 wiring. Welded contactor contacts, the user has to check this in the program.
1	0	0	MS 325 has tripped or was manually switched off
1	1	0	Error. Temporarily status or limit switch defective
0	X	1	Error
0	X	0	Ok, drive switched off

X = 0 or 1

The MFI21-FBP can only be used together with the ABB motor protection switch MS 325.

If the motor protection switch MS 325 has tripped or was manually switched off, all three outputs RUN_1, OUT_1 and OUT_2 are switched off simultaneously.

FC4 - Function AS-i_MFI_Direct

MFI21-FBP Motorstarter Fieldbus Interface, application function "Direct Starter"
for Siemens S7-300

Description

The block combines three independently functions.

The output RUN_1 can be used to switch on a drive.

The input signal RUNNING_1 is configured as feedback signal from the contactor or directly from the drive.

The function monitors whether the feedback signal RUNNING_1 arrives within a checkout time of 50 ms after the control signal RUN_1 was output. The MFI21-FBP potentiometer is without any function in this operating mode.

The inputs IN_1/_2 and the outputs OUT_1/_2 are not monitored. They can be used independent from each other.

Both MFI21-FBP address switches are not used for the AS-i bus. Setting the address is done using a separate programming device or via the command interface and the corresponding code (Change_AS-i-Slave_Address). For this the function FC "ASI_3422" must be used (see Siemens documentation "CP 343-2 AS-Interface Master").

For the error case (disturbed communication between MFI21-FBP and FieldBusPlug or between FieldBusPlug and AS-i master) it can be defined, whether the drive is to be switched off or the previous state should be kept (only the connections RUN_1/RUNNING_1).
This characteristic is called "fallback".

MFI21-FBP behavior in case of an error (communication error/data line interrupted)
with "fallback" switched on:
The switched relay outputs remain in their previous state and the MFI21 ERROR LED is on.
After communication recovery **all** relay outputs will be switched off and the MFI21 ERROR LED goes off.
If the control signal RUN_1 from the PLC still applies, a restart of the direct function ‘Switch on drive’ is performed after a short delay time.
The relay outputs, which are not monitored, are switched according to the PLC activation.

If the block "AS-i_MFI_Direct" is used, the parameter value must be set in accordance to the required operating mode. The valid values are listed in the table "Parameter values of the application functions in the MFI21-FBP".

Setting the parameter values must always be done before the initial processing of the used block.

The user can only set the parameters with the help of the Siemens Step 7 function FC7 "ASI_3422" (in the respectively valid version) for the AS-i couplers CP 342-2 or CP 343-2.
The user must integrate this block into the program and apply the required signals (BOOL, True or False) to the corresponding inputs.
The block and a description of the coupler is delivered by Siemens on a floppy disk.

FC4 - Function AS-i_MFI_Direct

MFI21-FBP Motorstarter Fieldbus Interface, application function "Direct Starter" for Siemens S7-300

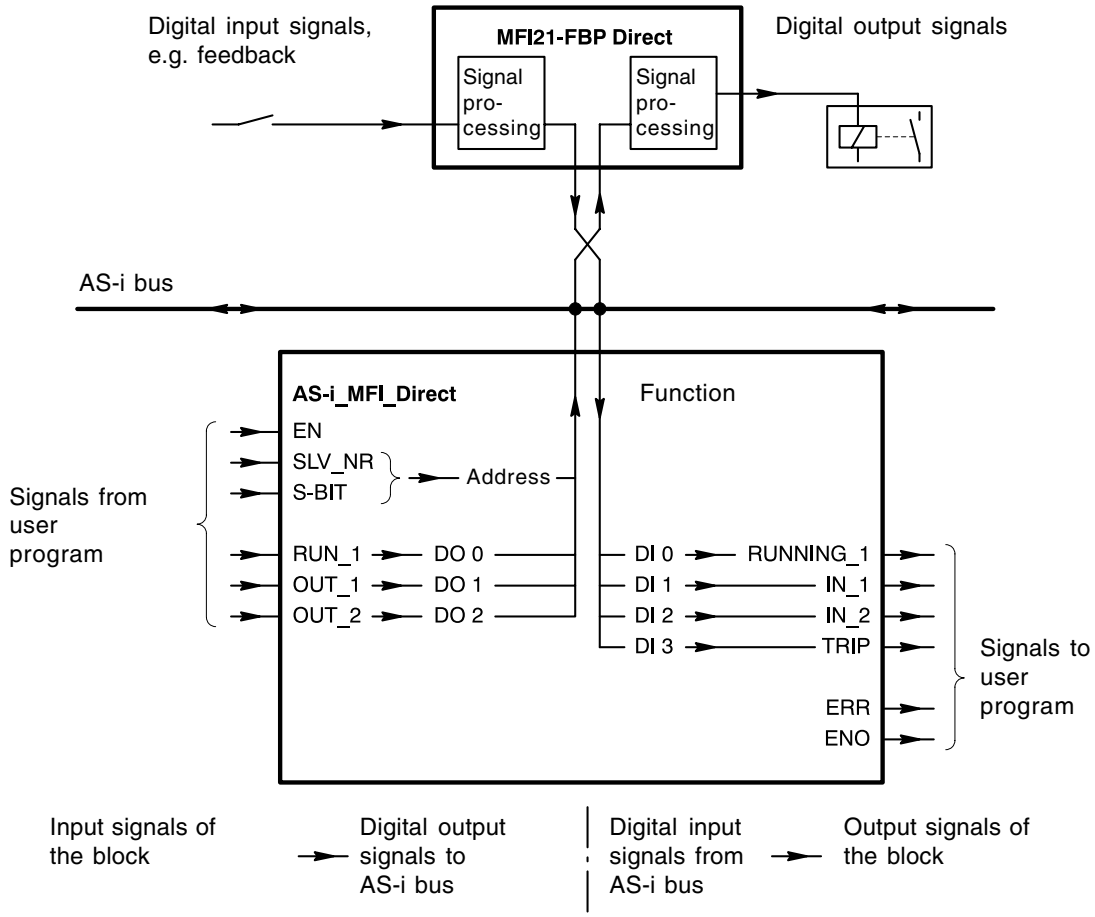

Fig. 9: FC4 - Function AS-i_MFI_Direct, integrated into the user program

FC4 - Function AS-i_MFI_Direct, error diagnosis MFI21-FBP

MFI21-FBP Motorstarter Fieldbus Interface, application function "Direct Starter" for Siemens S7-300

Action / Error	Reaction / Remote situation
MS 325 has tripped or was manually switched off	All relay outputs OUTPUT 0/1/2 (RUN_1, OUT_1, OUT_2) switch off. MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 0 If only the outputs OUTPUT 1/2 are activated and the MS 325 trips, all relay outputs will be switched off. No error messages at the MFI21-FBP or FBP plug are generated as the outputs OUTPUT 1/2 are not monitored by the function. **After switching on the MS 325:** **OUTPUT 1/2 are switched according to PLC activation.** **Starting the function is only possible after setting the PLC control RUN_1 to ZERO.**
Input power supply failure	The monitored relay output OUTPUT 0 (RUN_1) switches off. The inputs INPUT 0/1/2 send no feedback. The outputs OUTPUT 1/2 remain in their switching state (switching possible). MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 1 **After error removal:** **OUTPUT 1/2 are switched according to PLC activation.** **Starting the function is only possible after setting the PLC control RUN_1 to ZERO.**
24 V DC voltage failure, black AS-i flat-ribbon cable	All relay outputs OUTPUT 0/1/2 (RUN_1, OUT_1, OUT_2) switch off. MFI21-FBP all LEDs are off, no power supply FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **OUTPUT 1/2 are switched according to PLC activation.** **OUTPUT 0 (RUN_1) is switched according to PLC activation.**
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	All relay outputs OUTPUT 0/1/2 (RUN_1, OUT_1, OUT_2) switch off. MFI21-FBP all LEDs are off, no power supply FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **OUTPUT 1/2 are switched according to PLC activation.** **OUTPUT 0 (RUN_1) is switched according to PLC activation.**
MFI21-FBP detects an error at RUN_1/RUNNING_1	The monitored relay output OUTPUT 0 (RUN_1) switches off. The outputs OUTPUT 2/3 remain in their switching state (switching possible). MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 1 **After error removal:** **OUTPUT 1/2 are switched according to PLC activation.** **Starting the function is only possible after setting the PLC control RUN_1 to ZERO.**

FC4 - Function AS-i_MFI_Direct, error diagnosis MFI21-FBP

MFI21-FBP Motorstarter Fieldbus Interface, application function "Direct Starter" for Siemens S7-300

Action / Error	Reaction / Remote situation **without FALLBACK** (relays switch off)
Data line disconnection between FieldBusPlug and MFI21-FBP	All relay outputs OUTPUT 0/1/2 (RUN_1, OUT_1, OUT_2) switch off. MFI21-FBP LED: ERR. = on FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After error removal:** **OUTPUT 1/2 are switched according to PLC activation.** **OUTPUT 0 (RUN_1) is switched according to PLC activation.**
24 V DC voltage failure, **yellow** AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	All relay outputs OUTPUT 0/1/2 (RUN_1, OUT_1, OUT_2) switch off. MFI21-FBP LED: ERR. = on FBP plug Not in action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **OUTPUT 1/2 are switched according to PLC activation.** **OUTPUT 0 (RUN_1) is switched according to PLC activation.**

Action / Error	Reaction / Remote situation **with FALLBACK** (relays **do not** switch off)
Data line disconnection between FieldBusPlug and MFI21-FBP	The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After error removal:** After communication recovery **all relay outputs will be switched off** and the MFI21 LED ERROR goes off. If the control signal RUN_1 from the PLC still applies, a **restart of the direct mode** function ‘Switch on drive’ is performed after a short delay time. The relay outputs, which are not monitored, are switched according to the PLC activation.
24 V DC voltage failure, **yellow** AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug Not in action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** After communication recovery **all relay outputs will be switched off** and the MFI21 LED ERROR goes off. If the control signal RUN_1 from the PLC still applies, a **restart of the direct mode** function ‘Switch on drive’ is performed after a short delay time. The relay outputs, which are not monitored, are switched according to the PLC activation.

FC5 - Function AS-i_MFI_Reverse

MFI21-FBP Motorstarter Fieldbus Interface, application function "Reversing Starter"
for Siemens S7-300

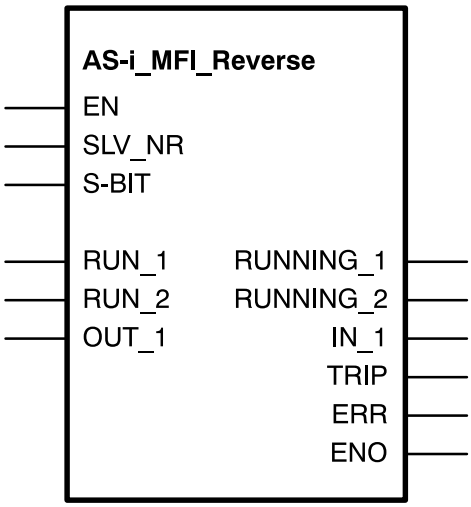

Fig. 10: FC5 - Function AS-i_MFI_Reverse

Meaning of the inputs and outputs of the block:

Name	Type	Data type	Description
EN			General enabling for the block (usage not mandatory)
SLV_NR	E	WORD	Slave number 1...31 (W#16#0...1F$_H$)
S-BIT	E	BOOL	0/FALSE = standard or A slave, 1/TRUE = B slave
RUN_1	A	BOOL	Switching on drive for direction of rotation 1 (start = 1 / stop = 0)
RUN_2	A	BOOL	Switching on drive for direction of rotation 2 (start = 1 / stop = 0)
OUT_1	A	BOOL	Free output, can be used for any output signal
RUNNING_1	E	BOOL	Input signal (feedback), rotational direction 1
RUNNING_2	E	BOOL	Input signal (feedback), rotational direction 2
IN_1	E	BOOL	Free input, can be used for any input signal
TRIP	E	BOOL	Input signal, motor protecting switch MS 325 has tripped or was manually switched off.
ERR	A	WORD	Error: Value for SLV_NR is not in the range of 1...31. The signal is generated in the FC, it is not transmitted via the bus.
ENO			Block was processed (usage not mandatory).

FC5 - Function AS-i_MFI_Reverse

MFI21-FBP Motorstarter Fieldbus Interface, application function "Reversing Starter"
for Siemens S7-300

Possible signal status

Cmd. RUN_1	Cmd. RUN_2	Status TRIP	Status RUNNING_1	Status RUNNING_2	Comment
1	0	1	1	0	Ok, drive 1 switched on
0	1	1	0	1	Ok, drive 2 switched on
1	0	X	X	1	Device error
1	0	1	0	X	Device error or external 24 V DC not available
X	X	0	0	0	MS 325 has tripped or was manually switched off
X	X	0	1	0	Error. Status not possible as locked in the MFI21-FBP wiring. Welded contactor contacts, the user has to check this in the program.
X	X	0	0	1	Error. Status not possible as locked in the MFI21-FBP wiring. Welded contactor contacts, the user has to check this in the program.
0	1	X	1	X	Device error
0	1	1	X	0	Device error or external 24 V DC not available

X = 0 or 1

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

All three outputs RUN_1, RUN_2 and OUT_1 are simultaneously switched off, if the motor protecting switch MS 325 has tripped or was manually switched off.

FC5 - Function AS-i_MFI_Reverse

MFI21-FBP Motorstarter Fieldbus Interface, application function "Reversing Starter"
for Siemens S7-300

Description

This block is designed for reversing drives (right/left, up/down, forwards/backwards, etc.). The rotational directions are mutually locked, i.e. if one direction is switched on, the other direction is locked.

When the direction is changed, one direction must be first switched off before the other direction can be switched on. If both directions are switched on at the same time, an error message appears and the monitored relay outputs OUTPUT 0/1 (RUN_1/_2) will be switched off.

After switching on the supply voltage the initial switch on of the motor's direction of rotation is performed **undelayed**, i.e. the time set with the potentiometer is not yet considered.
The following changes of the rotational direction are executed with a time delay. This delay is at least 50 ms, if the potentiometer is fully turned to the left stop. Otherwise the actual value set with the potentiometer on the MFI21-FBP is valid.

The dependence between the potentiometer setting and the time delay calculates from a square function. The maximum value is 260 seconds.

Resetting the 1st direction and setting the 2nd direction can be executed within the same PLC cycle. It must be guaranteed that the reset command is placed **before** the set command in the PLC program.

This block monitors whether the feedback signal "RUNNING_1/_2" arrives within a checkout time of 50 ms after the control signal "RUN_1/_2" was output.
The checkout time starts after the delay time is expired.

The input INPUT 2 (IN_1) and the output OUTPUT 2 (OUT_1) are not monitored. They can be used independent from each other.

Both MFI21-FBP address switches are not used for the AS-i bus. Setting the address is done using a separate programming device or via the command interface and the corresponding code (Change_AS-i-Slave_Address).
For this the function FC "ASI_3422" must be used (see Siemens documentation for AS-Interface Master CP 343-2 / CP 343-2).

For the error case (disturbed communication between MFI21-FBP and FieldBusPlug or between FieldBusPlug and AS-i master) it can be defined, whether the drive is to be switched off or the previous state should be kept (only the connections RUN_1/_2 and RUNNING_1/_2).
This characteristic is called "fallback".

MFI21-FBP behavior in case of an error (communication error/data line interrupted) with "fallback" switched on:
The switched relay outputs remain in their previous state and the MFI21 ERROR LED is on.
After communication recovery **all** relay outputs will be switched off and the MFI21 ERROR LED goes off.
If the control signal RUN_1/_2 from the PLC still applies, a restart of the reverse function 'Switch on drive for rotational direction x' is performed after a short delay time.
The relay output, which is not monitored, is switched according to the PLC activation.

If the block "AS-i_MFI_Reverse" is used, the parameter value must be set in accordance to the required operating mode. The valid values are listed in the table "Parameter values of the application functions in the MFI21-FBP".

Setting the parameter values must always be done before the initial processing of the used block.

The user can only set the parameters with the help of the Siemens Step 7 function FC7 "ASI_3422" (in the respectively valid version) for the AS-i couplers CP 342-2 or CP 343-2.
The user must integrate this block into the program and apply the required signals (BOOL, True or False) to the corresponding inputs.
The block and a description of the coupler is delivered by Siemens on a floppy disk.

FC5 - Function AS-i_MFI_Reverse

MFI21-FBP Motorstarter Fieldbus Interface, application function "Reversing Starter" for Siemens S7-300

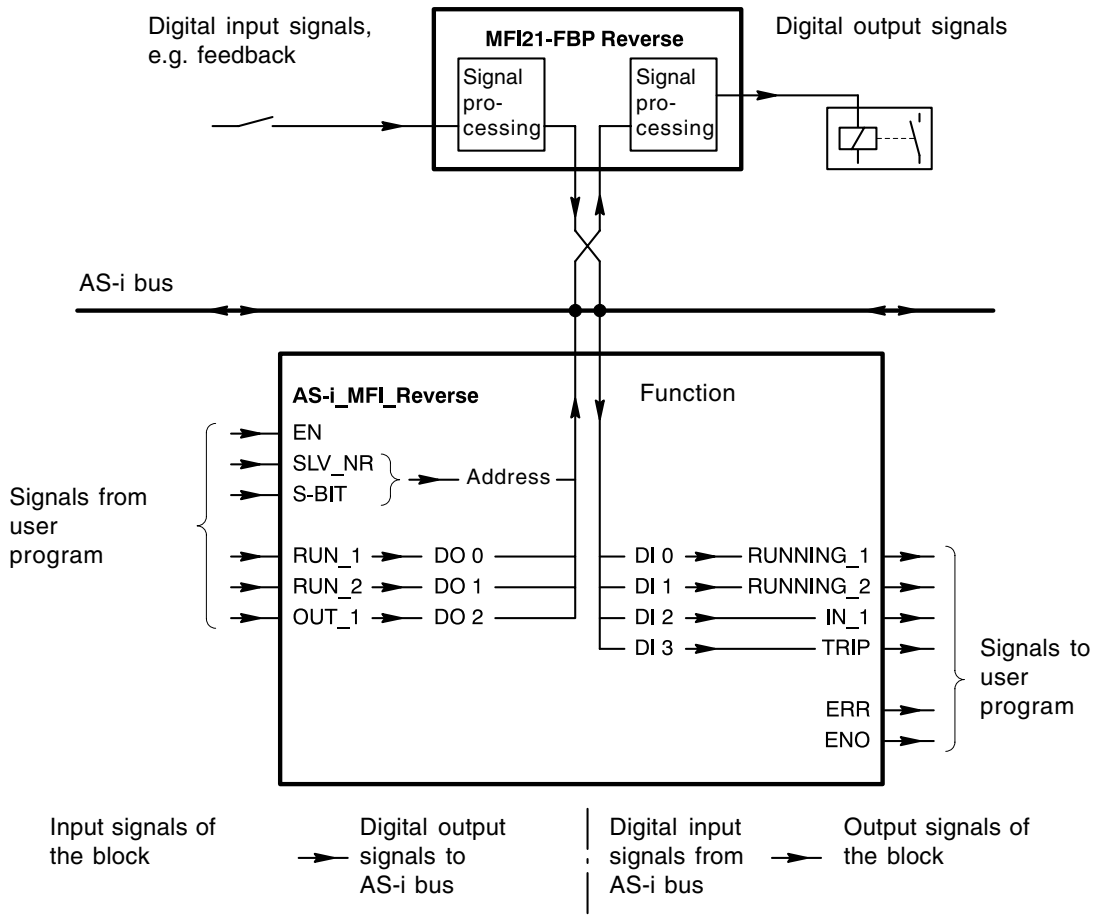

Fig. 11: FC5 - Function AS-i_MFI_Reverse, integrated into the user program

FC5 - Function AS-i_MFI_Reverse, error diagnosis MFI21-FBP

MFI21-FBP Motorstarter Fieldbus Interface, application function "Reversing Starter"
for Siemens S7-300

Action / Error	Reaction / Remote situation
MS 325 has tripped or was manually switched off	All relay outputs OUTPUT 0/1/2 (RUN_1, RUN_2, OUT_1) switch off. MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 0 **After switching on the MS 325:** **OUTPUT 2 is switched according to PLC activation.** **Starting the function is only possible after setting the PLC control RUN_1 or RUN_2 to ZERO.**
Input power supply failure	The monitored relay outputs OUTPUT 0 (RUN_1)/OUTPUT 1 (RUN_2) switch off. The inputs INPUT 0/1/2 send no feedback. The output OUTPUT 2 keeps its switching state (switching is possible). MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 1 **After error removal:** **OUTPUT 2 is switched according to PLC activation.** **Starting the function is only possible after setting the PLC control RUN_1 or RUN_2 to ZERO.**
24 V DC voltage failure, black AS-i flat-ribbon cable	All relay outputs OUTPUT 0/1/2 (RUN_1, RUN_2, OUT_1) switch off. MFI21-FBP all LEDs are off, no power supply FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **OUTPUT 2 is switched according to PLC activation.** **OUTPUT 0 (RUN_1) / OUTPUT 1 (RUN_2) are switched according to PLC activation.**
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	All relay outputs OUTPUT 0/1/2 (RUN_1, RUN_2, OUT_1) switch off. MFI21-FBP all LEDs are off, no power supply FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **OUTPUT 2 is switched according to PLC activation.** **OUTPUT 0 (RUN_1) / OUTPUT 1 (RUN_2) are switched according to PLC activation.**
MFI21-FBP detects an error at RUN_1/RUNNING_1 or RUN_2/RUNNING_2	The monitored relay outputs OUTPUT 0 (RUN_1)/OUTPUT 1 (RUN_2) switch off. The output OUTPUT 2 keeps its switching state (switching is possible). MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 1 **After error removal:** **OUTPUT 2 is switched according to PLC activation.** **Starting the function is only possible after setting the PLC control RUN_1 or RUN_2 to ZERO.**

FC5 - Function AS-i_MFI_Reverse, error diagnosis MFI21-FBP

MFI21-FBP Motorstarter Fieldbus Interface, application function "Reversing Starter" for Siemens S7-300

Action / Error	Reaction / Remote situation **without FALLBACK** (relays switch off)
Data line disconnection between FieldBusPlug and MFI21-FBP	All relay outputs OUTPUT 0/1/2 (RUN_1, RUN_2, OUT_1) switch off. MFI21-FBP LED: ERR. = on FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After error removal:** **OUTPUT 2 is switched according to PLC activation.** **The outputs OUTPUT 0/1 (RUN_1/_2) are switched according to PLC activation.**
24 V DC voltage failure, **yellow** AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	All relay outputs OUTPUT 0/1/2 (RUN_1, RUN_2, OUT_1) switch off. MFI21-FBP LED: ERR. = on FBP plug Not in action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **OUTPUT 2 is switched according to PLC activation.** **OUTPUT 0 (RUN_1) / OUTPUT 1 (RUN_2) are switched according to PLC activation.**

Action / Error	Reaction / Remote situation **with FALLBACK** (relays **do not** switch off)
Data line disconnection between FieldBusPlug and MFI21-FBP	The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After error removal:** After communication recovery **all relay outputs will be switched off** and the MFI21 ERROR LED goes off. If the control signal RUN_1/_2 from the PLC still applies, a **restart of the reverse mode** function 'Switch on drive' is performed after a short delay time. The relay outputs, which are not monitored, are switched according to the PLC activation.
24 V DC voltage failure, **yellow** AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug Not in action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** After communication recovery **all relay outputs will be switched off** and the MFI21 ERROR LED goes off. If the control signal RUN_1/_2 from the PLC still applies, a **restart of the reverse mode** function 'Switch on drive' is performed after a short delay time. The relay outputs, which are not monitored, are switched according to the PLC activation.

FC6 - Function AS-i_MFI_Y/Delta

MFI21-FBP Motorstarter Fieldbus Interface, application function "Star-Delta Starter"
for Siemens S7-300

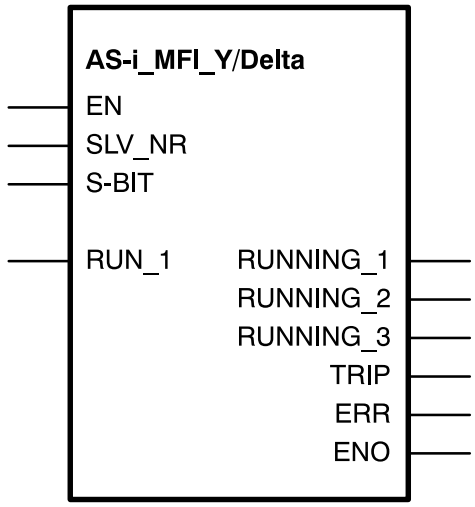

Fig. 12: FC6 - Function AS-i_MFI_Y/Delta

Meaning of the inputs and outputs of the block:

Name	Type	Data type	Description
EN			General enabling for the block (usage not mandatory)
SLV_NR	E	WORD	Slave number 1...31 (W#16#0...1F$_H$)
S-BIT	E	BOOL	0/FALSE = standard or A slave, 1/TRUE = B slave
RUN_1	A	BOOL	Switching on drive (start = 1 / stop = 0)
RUNNING_1	E	BOOL	Input signal (feedback), "mains contactor"
RUNNING_2	E	BOOL	Input signal (feedback), "star contactor"
RUNNING_3	E	BOOL	Input signal (feedback), "delta contactor"
TRIP	E	BOOL	Input signal, motor protecting switch MS 325 has tripped or was manually switched off.
ERR	A	WORD	Error: Value for SLV_NR is not in the range of 1...31. The signal is generated in the FC, it is not transmitted via the bus.
ENO			Block was processed (usage not mandatory).

The MFI21-FBP uses the device outputs OUTPUT 0/1/2 (MFI21-FBP terminals 1, 2 and 3) to activate the contactors "mains", "star" and "delta".

The control signals for the contactors are generated by the MFI21-FBP using the control signal RUN_1 of the PLC function.

FC6 - Function AS-i_MFI_Y/Delta

MFI21-FBP Motorstarter Fieldbus Interface, application function "Star-Delta Starter" for Siemens S7-300

Possible signal status

Cmd. RUN_1 On/Off	**Status** TRIP MS 325	**Status** RUNNING_1 Mains	**Status** RUNNING_2 Star	**Status** RUNNING_3 Delta	**Comment**
1	1	1	1	0	Ok, star operation
1	1	1	0	1	Ok, delta operation
1	0	0	0	0	MS 325 has tripped or was manually switched off
0	1	0	0	0	Ok, stop drive
X	0	1	0	0	Device error, locked by internal connection
X	0	0	1	0	Device error, locked by internal connection
X	0	0	0	1	Device error, locked by internal connection
1	1	0	0	0	Temporary status, possible when switching-over
1	1	0	1	X	Device error
1	1	0	X	1	Device error
0	1	1	X	X	Device error
0	1	X	1	X	Device error
0	1	X	X	1	Device error
0	1	1	X	X	Device error

X = 0 or 1

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

All outputs will be switched off, if the motor protecting switch MS 325 has tripped or was manually switched off.

FC6 - Function AS-i_MFI_Y/Delta

MFI21-FBP Motorstarter Fieldbus Interface, application function "Star-Delta Starter"
for Siemens S7-300

Description

The block is designed for star-delta drives. It is possible to set the time in which the drive is running in the star operation. This time is at least 50 ms (potentiometer is fully turned to the left stop). Otherwise the actual value set with the potentiometer on the MFI21-FBP is valid.

The dependence between the potentiometer setting and the time delay calculates from a square function. The maximum value is 260 seconds.

The change from star to delta operation is executed with a time delay of 50 ms.

The MFI21-FBP monitors whether the feedback signals RUNNING_1/_2_3 arrive within a checkout time of 50 ms after the control signal RUN_1 was output.
The checkout time starts after the delay time is expired.

Both MFI21-FBP address switches are not used for the AS-i bus. Setting the address is done using a separate programming device or via the command interface and the corresponding code (Change_AS-i-Slave_Address). For this the function FC7 "ASI_3422" must be used (see Siemens documentation "CP 343-2 AS-Interface Master").

For the error case (disturbed communication between MFI21-FBP and FieldBusPlug or between FieldBusPlug and AS-i master) it can be defined, whether the drive is to be switched off or the previous state should be kept (only the connections RUN_1 and RUNNING_1/_2_3).

MFI21-FBP behavior in case of an error (communication error/data line interrupted)
with "fallback" switched on:
The switched relay outputs remain in their previous state and the MFI21 ERROR LED is on.
After communication recovery **all** relay outputs will be switched off and the MFI21 ERROR LED goes off.
If the control signal RUN_1 from the PLC still applies, a restart of the star-delta function ‘Switch on drive’ in the **star operation mode** is performed after a short delay time.
In case of an error (missing feedback), the user has to configure the required reaction (e.g. restart) in the PLC program.

If the block "AS-i_MFI_ Y/Delta" is used, the parameter value must be set in accordance to the required operating mode. The valid values are listed in the table "Parameter values of the application functions in the MFI21-FBP".

Setting the parameter values must always be done before the initial processing of the used block.

The user can only set the parameters with the help of the Siemens Step 7 function FC7 "ASI_3422" (in the respectively valid version) for the AS-i couplers CP 342-2 or CP 343-2.
The user must integrate this block into the program and apply the required signals (BOOL, True or False) to the corresponding inputs.
The block and a description of the coupler is delivered by Siemens on a floppy disk.

FC6 - Function AS-i_MFI_Y/Delta

MFI21-FBP Motorstarter Fieldbus Interface, application function "Star-Delta Starter" for Siemens S7-300

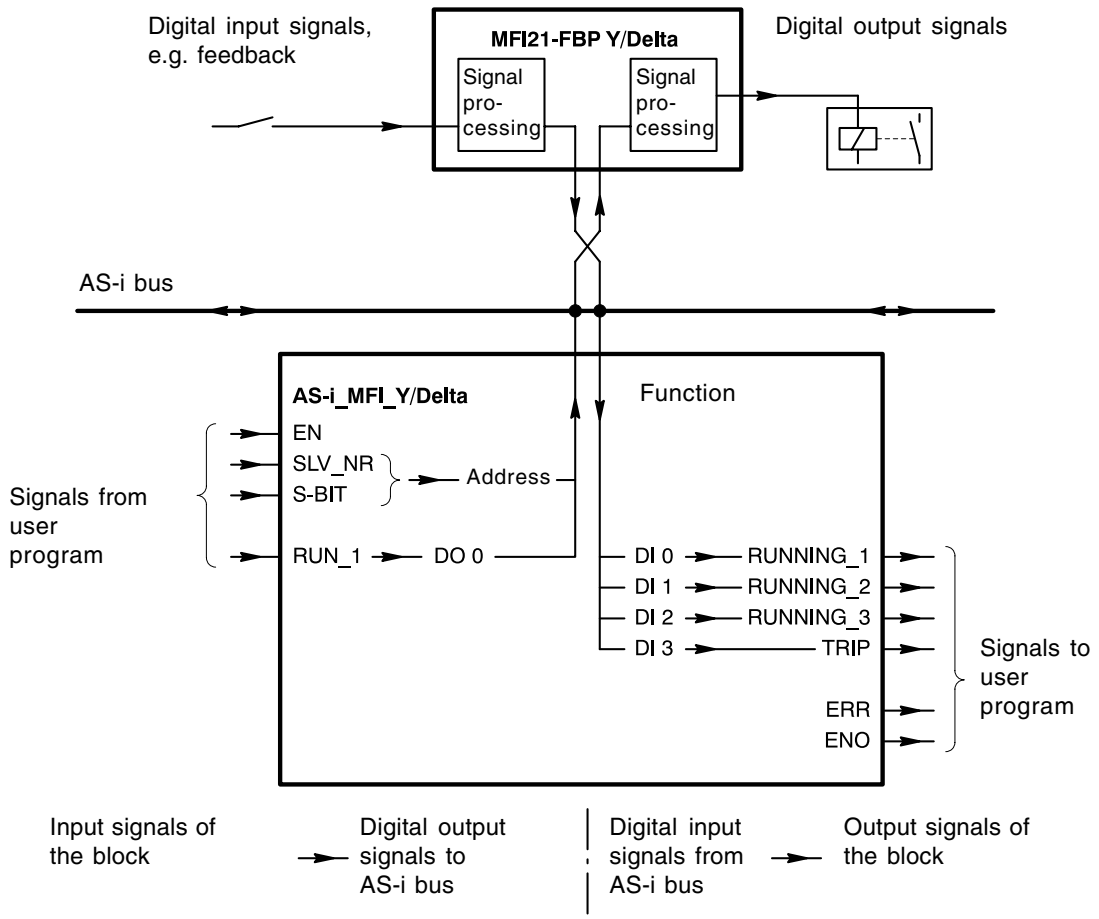

Fig. 13: FC6 - Function AS-i_MFI_Y/Delta, integrated into the user program

FC6 - Function AS-i_MFI_Y/Delta, error diagnosis MFI21-FBP

MFI21-FBP Motorstarter Fieldbus Interface, application function "Star-Delta Starter"
for Siemens S7-300

Action / Error	Reaction / Remote situation
MS 325 has tripped or was manually switched off	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 0 **After switching on the MS 325:** **Starting the function is only possible after setting the PLC control RUN_1 to ZERO.**
Input power supply failure	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 1 **After error removal:** **Starting the function is only possible after setting the PLC control RUN_1 to ZERO.**
24 V DC voltage failure, black AS-i flat-ribbon cable	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP all LEDs are off, no power supply FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **The relay outputs OUTPUT 0/1/2 are switched according to PLC activation (RUN_1).**
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP all LEDs are off, no power supply FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **The relay outputs OUTPUT 0/1/2 are switched according to PLC activation (RUN_1).**
MFI21-FBP detects an error at RUN_1/RUNNING_1	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP LED: ERR. = on FBP plug red LED = flashes (Error) TRIP signal = 1 **After error removal:** **Starting the function is only possible after setting the PLC control RUN_1 to ZERO.**

FC6 - Function AS-i_MFI_Y/Delta, error diagnosis MFI21-FBP

MFI21-FBP Motorstarter Fieldbus Interface, application function "Star-Delta Starter" for Siemens S7-300

Action / Error	Reaction / Remote situation **without FALLBACK** (relays switch off)
Data line disconnection between FieldBusPlug and MFI21-FBP	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP LED: ERR. = on FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After error removal:** **The relay outputs OUTPUT 0/1/2 are switched according to PLC activation (RUN_1).**
24 V DC voltage failure, **yellow** AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	The relay outputs OUTPUT 0/1/2 (controlled by RUN_1) switch off. MFI21-FBP LED: ERR. = on FBP plug Not in action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** **The relay outputs OUTPUT 0/1/2 are switched according to PLC activation (RUN_1).**

Action / Error	Reaction / Remote situation **with FALLBACK** (relays **do not** switch off)
Data line disconnection between FieldBusPlug and MFI21-FBP	The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug In action TRIP signal = 0 / Master detects missing slave #x **After error removal:** After communication recovery **all relay outputs will be switched off** and the MFI21 ERROR LED goes off. If the control signal RUN_1 from the PLC still applies, a **restart of the star-delta function** 'Switch on drive' in the **star operation mode** is performed after a short delay time. In case of an error (missing feedback), the user has to configure the desired reaction (e.g. restart) in the PLC program.
24 V DC voltage failure, **yellow** AS-i flat-ribbon cable (BUS) **=> Data traffic interrupted**	The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug Not in action TRIP signal = 0 / Master detects missing slave #x **After voltage recovery:** After communication recovery **all relay outputs will be switched off** and the MFI21 ERROR LED goes off. If the control signal RUN_1 from the PLC still applies, a **restart of the star-delta function** 'Switch on drive' in the **star operation mode** is performed after a short delay time. In case of an error (missing feedback), the user has to configure the desired reaction (e.g. restart) in the PLC program.

Functions AS-i_MFI_...

MFI21-FBP Motorstarter Fieldbus Interface
Application functions for Siemens S7-300

Replacement of a faulty MFI21-FBP

Replacing a faulty MFI21-FBP can be done without any problems.

To perform this, the field bus plug has to be disconnected from the device and the cable connections to the MFI21-FBP and the motor protection switch have to be loosened. The MFI21-FBP is disassembled by the MS 325 (refer to installation instruction).

A new MFI21-FBP is fixed at the motor protection switch MS 325 according to the installation instruction.
The new combination is inserted and the wiring is done accordingly.

After inserting the field bus plug the bus master detects the device using the plug address and transmits the stored parameter data of this slave.

AS-i functions ...
for Siemens controller S7-300....

Example program

The following functions can be realized with the example program "Bsp_AS-i_d":

1. Setting the parameters P0...P2 for 4 AS-i slaves
   (further slaves can be added).
2. Using the AS-i command interface in "manual planning" mode with the help of the Step 7 standard function "ASI_3422" (in the respectively valid version).
3. Using the functions developed by ABB for the different switching devices (MSD11-FBP, MSR22-FBP, MFI21-FBP).

The library "ABB_AS-i_lib" contains the ABB functions FC1...FC6 for controlling the devices:

MSD11-FBP (Motorstarter Direct),
MSR22-FBP (Motorstarter Reverse)
MFI21-FBP (Motorstarter Fieldbus Interface)

Installation notes

The zip file containing the library and an example program for an application with the Siemens controller S7-300 can be found on the **ABB FBP system CD** under

Software -> Engineering Package-> ASE91-FBP.0101.

Click on **ASE91-FBP.0101** and load the file to a desired folder on your PC.
The zip file "1SAJ922091R0101.zip" is stored on the PC.
Unzip the file.

Two directories with the following files will be generated:

.....\Beispiel-Programm\Bsp_as_i.zip	**(File name: Bsp_AS-i_d)**
.....\Bibliothek\AS_i.zip	**(File name: AS-i)**

Unzip the zip files to your system:.
e.g. the program to the directory: C:\Programs\Siemens\Step7\S7proj\.....
e.g. the library to the directory: C:\Programs\Siemens\Step7\S7libs\.....

The ABB library "AS-i" is now available in the "program elements" under "FC and libraries".

Hardware/Software requirements

PS 300 power supply
CPU 300, a CPU 315-2 DP is used in the example
CP 343-2, slot directly beside the CPU
Front connector for AS_Interfaces connection
AS-Interface, cable with connected slaves
AS-i power supply unit
STEP 7 Software V5.0 or higher

AS-i Functions ... Used resources

for Siemens controller S7-300....

OB1 Cyclic program
Call of FC14 for setting the parameters P0...P2
Open data block, here DB1
Read digital data of standard / A slave and B slaves
Processing the functions FC1...FC6
for the devices MSD11-FBP, MSR22-FBP, MFI 21-FBP
(only one selection, not all functions are used)
Output of digital data of standard or A slave and B slaves
The following variables are used: MW10, MW12, M9.0, M9.1

OB82 Diagnostic alarm processing
Can be adapted according to the customer's requirement.

OB100 Start processing
If FC12 should be processed at the beginning of OB100 (delete BEA in FC12),
the parameterization of P0...P2 (FC14 call with DB12) can only be started after FC12 was completely processed (DONE = 1)
Start FC14 (AS-i Management) for parameterization

FC1...FC6 Functions developed by ABB for controlling the devices
MSD11-FBP, MSR22-FBP, MFI21-FBP
They are contained in the library "ABB_AS-i"
These functions are protected (know how protect).

FC7 AS-Interface Control, Step 7 standard function "ASI_3422",
protected function (know how protect).
This function is called in the FC14 (AS-i Management).
The variables M20.0, M20.1 and MD22 are used.

FC12 Automatic CP configuration, refer to important note under "OB100"

AS-i Functions ... Used resources

for Siemens controller S7-300....

FC14 AS-i Management

The parameters P0...P2 will be set for 4 slaves when starting the PLC program: Code 00 (SET_PERMANENT_PARAMETER).
The value is stored non-volatile in theCP343-2 EEPROM. The value is first sent to the connected slaves after the power supply is switched on at the CP 343-2 (see also "CP 343-2 AS-Interface Master" manual).
The program can be extended by any number of slaves.

It must be guaranteed that the parameters will be sent in the PLC program before accessing the slaves.

It is also possible to send any code via the command interface (value = 6). To perform this, the value 6 must be entered to the variable table VAT1 > DB14.DBB0 and the corresponding code must be entered in DB14.DBD4. In ONLINE mode, the data are transmitted once to the PLC. Beginning at DB14.DBD228 possible response data are entered.
The same variables as in the FC7 are used.

DB1 AS-i data

Here, all input and output data of the standard / A slaves and the B slaves are stored. For a better overview the "data view" must be set in online mode.
The DB1 structure should not be modified.

DB14 DB to FC14

Here, all data used by the FC14 are stored.
The DB14 structure should not be modified.

VAT1 Variable table

Contains the variables which are required to control the AS-i slave via the command interface. Additional variables can be inserted into the table.

SFC51 RDSYSST, system function, write-protected (know how protect)

SFC58 WR_REC, system function "Write", write-protected (know how protect)

SCF59 RD_REC, system function "Read", write-protected (know how protect)

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