SIEMENS

Add 7
AddFEM PCS7 Driver Blocks

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Add 7

AddFEM
PCS7 Driverblocks

Manual

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Preface

Use of the driver libraries included on the CD
The “PCS 7\Driver disks” directory contains the following four installation packages

Driver disk	Applicable AddFEM types	Applicable PCS 7 versions	HMI
“PCS 7 V6 and V7 with WinCC”	6DL3100-8AC 6DL3100-8AC02 6DL3100-8AC03 6DL3200-8AA	PCS 7 V6 PCS 7 V7 [1)] PCS 7 V8 [2)]	WinCC
“PCS 7 V6 and V7 without WinCC”	6DL3100-8AC 6DL3100-8AC02 6DL3100-8AC03 6DL3200-8AA	PCS 7 V6 PCS 7 V7 [1)] PCS 7 V8 [2)]	Customer's HMI [3)]
“PCS 7 V8 with WinCC”	6DL3100-8AC 6DL3100-8AC02 6DL3100-8AC03	PCS 7 V8	WinCC
“PCS 7 V8 without WinCC”	6DL3100-8AC 6DL3100-8AC02 6DL3100-8AC03	PCS 7 V8	Customer's HMI[3)]

[1)] In the case of installation with PCS 7 V7.0 SP1 - SP3 only: please note the Product Information: “Error message 'False object id' in PCS 7 V7.0 SP1-SP3” in Appendix

[2)] The use of drivers for PCS 7 V6/V7 is also possible with PCS 7 V8, if the following libraries available in the PCS 7 V8 installation package are also installed. For new installations, however, we recommend using only the driver disk for PCS 7 V8.
- PCS 7 Library V6.1 + SP1 + UPD17
- PCS 7 Library V7.1 + SP3
- PCS 7 Basic Library V7.1 + SP5 + UPD6
- PCS 7 Advanced Library V7.1 + SP5 + UPD3

[3)] In the case of the driver disks for use of a customer's HMI system, the driver wizard does not make any interconnection to WinCC, so that the customer can set up the connection to an HMI other than WinCC.

General installation procedure
The manual “Getting started” (please check directory 6DL3100-8AC\Getting Started\english\ A5E00075541AC-02.pdf on the CD) describes the installation procedure.
The AddFEM hardware module contains different types of inputs and outputs. Therefore for communication within PCS 7 one AddFEM module within HW-Config is split up into 7-8 single logical software modules. Please see chapter A.2 “Device model – module allocation (when using PCS 7)”

The driver library on CD contains the blocks for processing these 8 logical modules.
When starting a new project the basic addressing and basic connections for some of these driver blocks have to be done by customer. As soon as the necessary information is available, the module drivers will be installed by the driver wizard.

The necessary steps to prepare the configuration for the start of the driver wizard are described in “Getting started”.
It is recommended to read these explanations and use them additionally during installation of the AddFEM drivers.

In this document the further details of the driver blocks to process the 8 logical AddFEM modules and additionally the redundancy blocks are listed.

Changes/additions for the driver disks for PCS 7 V8

In the blocks of the PCS 7 V8 library, the option exists when forwarding analog and digital signals to also supply additional diagnostic information, e.g., OosAct signal (field device out of service). Units (mA or V) can also be included in the supplied information.

As a result of these additions/changes, the previously used input/output blocks in PCS 7 V6 and V7 are being replaced by new variants that provide this additional information, as shown in the table below.

Block in PCS 7 V6 and V7	**Expanded blocks in PCS 7 V8**
CH_AI	Pcs7AnIn
CH_AO	Pcs7AnOu
CH_DI	Pcs7DiIn
CH_DO	Pcs7DiOu

In the case of installation with the driver disk for PCS 7 V8, only the new input/output blocks can be used.
The driver wizard and the AddFEM driver blocks have been adapted to the new blocks and signals.

Note: these standard signal types additionally available as of PCS 7 V8 are not listed in the descriptions of drivers for PCS 7 V6, V7, and V8 in the remainder of this manual.

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1 Common blocks

1.1 RED_AFIN : Copies the process image of inputs

1.1.1 Description of RED_AFIN

Object name (type + number)
FB602

RED_AFIN : I/Os

Area of application
In redundant configuration both AddFEM modules always gather the information from their own hardware inputs and use it for further operation.
But only the active module, which has taken mastership, activates its outputs and forwards the hardware-signals to the process.
(Exception: AddFEM PoCo with parallel current output for the manipulated value)

In contrast to the hardware output the communication with S7-CPU via profibus always is performed for both AddFEMs in both directions.

This guarantees that profibus communication is possible for both modules completely and at any time.

Therefore the selection of the signals for further processing e.g like indicating the valve position in the faceplate has to be done within the CPU
The signals for further processing are provided by RED_AFIN by copying the values of the active module to the PAE of both modules.

Note:
With this measure the values for further processing can be fetched from the PAE of both modules. But via driver wizard further blocks always get connected to the PAE of the primary AddFEM (with address LADDR1)

Note concerning naming:
“Primary AddFEM” always indicates the AddFEM with lower profibus address.
“Redundant AddFEM” always indicates the AddFEM with higher profibus address
“Active AddFEM” indicates the AddFEM, which has taken mastership and outputs the hardware signals to the process

Calling OBs
The block must be installed in the run seqence of following OBs:
(done automatically in the CFC):

- OB3x Cyclic interrupt

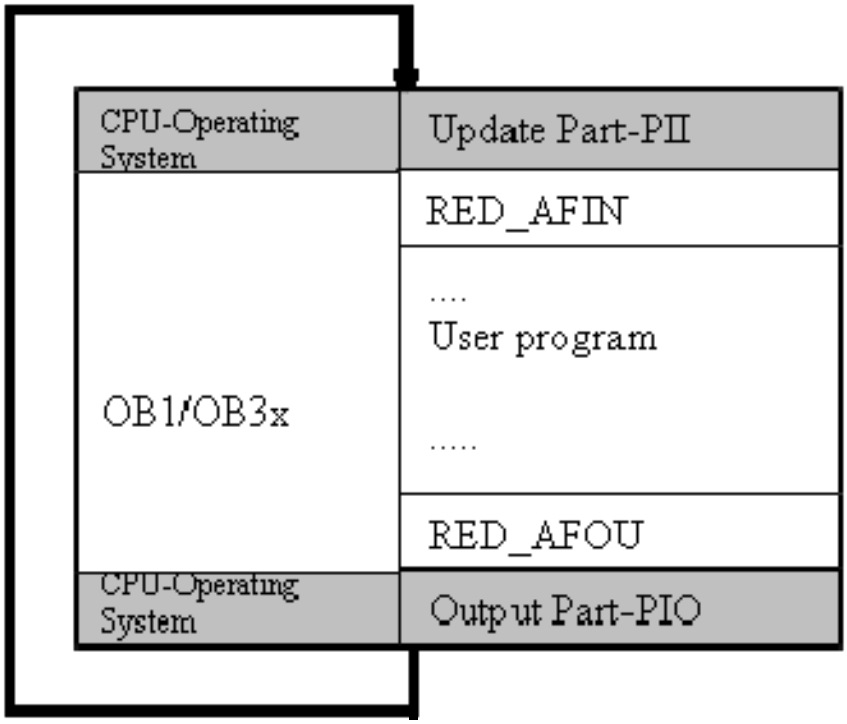


Fig. 1-1 Implementation of the redundancy image of update blocks

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Installs the RED_AFIN block in its runtime group upstream from the runtime group of the channel-blocks in the same OB
- Interconnects
  - the ACTIV_P input to the ACTIV_P output of the RED_AFST block
  - the ACTIV_R input to the ACTIV_R output of the RED_AFST block
  - the LADDR1 input to the OLADDR1 output of the AFN_ADDR/AF_ADDR block of the primary AddFEM
  - the LADDR2 input to the OLADDR2 output of the AFN_ADDR/AF_ADDR block of the redundant AddFEM
  - the LENG input to the LENG output of the AFN_ADDR/AF_ADDR block

Function and operating principle
The block identifies the active and passive AddFEM by scanning the value at input parameter ACTIV_P and ACTIV_R. The start addresses of both modules are defined at the LADDR1 and LADDR2 parameters. The address at parameter LADDR1 represents the start address of the process image area used to configure the channel block parameters.
When ACTIV_P = 1, the number of words defined in LENG are copied from the process image of the “primary AddFEM”, starting at address LADDR1, to the process image of the “redundant AddFEM” starting at address LADDR2.
When ACTIV_R = 1, the source and destination will be swapped to ensure operation of the channel blocks with valid values (values of the active master AddFEM.)
The block does not process any data when ACTIV_P = 0 and ACTIV_R = 0.

Redundancy
The block is used for redundant operation of the AddFEM.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
Not applicable.

Time response
Not applicable..

Message response
Not applicable..

Operator control and monitoring
The block does not contain a faceplate.

Note: "I/Os ..." (O&M column) identifies the tags which will be transferred to the OS, if the "Operating and Monitoring" option is set in the object properties of the block in CFC. Default: option is not set.

1.1.2 RED_AFIN : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name **bold** = connection visible, standard = invisible.

Connection (parameter)	Meaning	Data type	Default	Type O&M
ACTIV_P	1 = primary AddFEM is active [1)]	BOOL	0	I
ACTIV_R	1 = redundant AddFEM is active [2)]	BOOL	0	I
LADDR1	Logic address of the primary AddFEM	INT	0	I
LADDR2	Logic address of the redundant AddFEM	INT	0	I
LENG	Number of words to copy	INT	0	I

1) “Primary AddFEM” always indicates the AddFEM module with the lower Profibus address
2) **“**Redundant AddFEM” always indicates the AddFEM module with the higher Profibus address

1.2 RED_AFOU : Copies the process image of outputs

1.2.1 Description of RED_AFOU

Object name (type + number)
FB603

RED_AFOU : I/Os

Area of application
Update of the process image of the redundant AddFEM .

Calling OBs
The block must be installed in the run seqence of following OBs:
(done automatically in the CFC):

- OB3x Cyclic interrupt

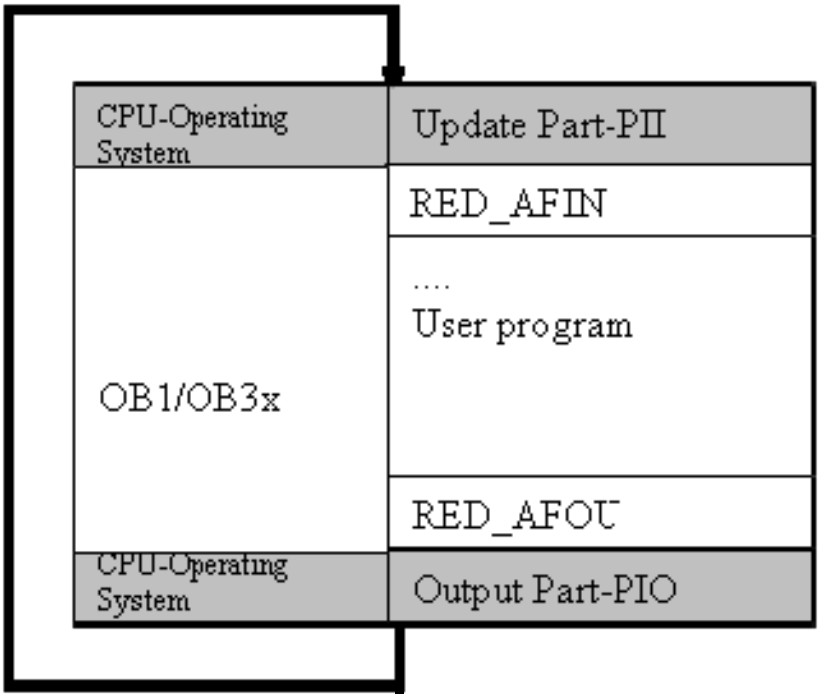


Fig. 1-2 Implementation of the redundancy image of update blocks

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Installs the RED_AFOU block in its runtime group downstream from the runtime group of the channel-blocks in the same OB
- Interconnects
  - the ACTIV_P input to the ACTIV_P output of the RED_AFST block
  - the ACTIV_R input to the ACTIV_R output of the RED_AFST block
  - the LADDR1 input to the OLADDR1 output of the AFN_ADDR/AF_ADDR block
  - the LADDR2 input to the OLADDR2 output of the AFN_ADDR/AF_ADDR block
  - the LENG input to the LENG output of the AFN_ADDR/AF_ADDR block

Function and operating principle
When ACTIV_P = 1, the block copies the values from the PIO of which the start addresses are defined at parameter LADDR1 to the process image of which the address is defined at parameter LADDR2. The number of words to copy is defined at the LENG parameter. This ensures consistency of the output values at both redundant AddFEMs.
The block does not process any data when ACTIV_P = 0 AND ACTIV_R = 0.

Redundancy
The block is used for redundant operation of the AddFEM.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
Not applicable.

Time response
Not applicable.

Message response
Not applicable.

Operator control and monitoring
The block does not contain a faceplate.

Note: "I/Os ..." (O&M column) identifies the tags which will be transferred to the OS, if when the "Operating and Monitoring" option is set at the object properties of the block in CFC. Default: option is not set.

1.2.2 RED_AFOU : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection visible, standard = invisible.

Connection (parameter)	Meaning	Data type	Default	Type O&M
ACTIV_P	1 = primary AddFEM is active [1)]	BOOL	0	I
ACTIV_R	1 = redundant AddFEM is active [2)]	BOOL	0	I
LADDR1	Logic address of the primary AddFEM	INT	0	I
LADDR2	Logic address of the redundant AddFEM	INT	0	I
LENG	Number of words to copy	INT	0	I

[1)] "Primary AddFEM" always indicates the AddFEM module with the lower Profibus address
[2)] "Redundant AddFEM" always indicates the AddFEM module with the higher Profibus address

1.3 RED_AFST : Identifies the redundancy – state

1.3.1 Description of RED_AFST

Object name (type + number)
FB600

RED_AFST : I/Os

Area of application
The block checks the redundancy state of two redundant AddFEM, and processes the default master setting of the host.

Calling OBs
The block must be installed in the run seqence of following OBs:
(done automatically in the CFC):
OB3x Cyclic interrupt

The CFC function "**Generate module driver**" automatically:

- Installs the RED_AFST block in its runtime group upstream from the runtime group of the RED_AFIN - blocks in the same OB
- Interconnects
  - the LADDRI1 input to the OLADDR1 output of the AFN_ADDR/AF_ADDR block of the primary AddFEM
  - the LADDRO1 input to the OLADDR2 output of the AFN_ADDR/AF_ADDR block of the primary AddFEM
  - the LADDRI2 input to the OLADDR1 output of the AFN_ADDR/AF_ADDR block of the redundant AddFEM
  - the LADDRO2 input to the OLADDR2 output of the AFN_ADDR/AF_ADDR block of the redundant AddFEM
  - the RAC_DIAG1 structur to the RAC_DIAGO output of the AFN_ADDR/ AF_ADDR block of the primary AddFEM
  - the RAC_DIAG2 structur to the RAC_DIAGO output of the AFN_ADDR/ AF_ADDR block of the redundant AddFEM

Function and operating principle
The block accepts the default master setting at input parameter MAST, and writes the corresponding identifier to the PIO of the primary AddFEM. The default master setting only applies if the redundant AddFEMs are free of error. The AddFEMs otherwise negotiate master mode directly.
The block evaluates the status data of the AddFEMs, and then sets logic 1 at the relevant ACTIV_P or ACTIV_R output parameter.
If this status information is not available (failure of both AddFEMs), the block sets the output parameters ACTIV_P = 0, or ACTIV_R = 0.
The block assigns the master mode to one of the two AddFEMs if the fiber optic connection between those partners is interrupted. This selection is based on the evaluation of the error weighting of both AddFEMs.
Control input ADDF_SIN must be equal to 1 if the AddFEM is not operated in redundant mode. ADDF_NAT must be 1 if a native AddFEM (not an AddFEM-HART) is installed. ADDF_RED must be 1 if the AddFEM is redundancy partner. The control input parameters are automatically configured by the driver wizard.

Redundancy
The operating system evaluates bus redundancy of the redundant DP master systems.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
Not applicable.

Message response
The block reports any failure of the fiber optic connection at SFB ALARM_8P. The block generates also a message, if one redundancy - partner drops out. EN_MSG = FALSE can be used to disable the message function (please see 1.3.3 Message texts and associated values of RED_AFST).

Operator control and monitoring
The block does not contain a faceplate.

Note: The "Operating and Monitoring" option is set at MAST connection.

1.3.2 RED_AFST : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection visible, standard = invisible.

Connection (parameter)	Meaning	Data type	Default	Type	O&M
ACTIV_P	1= primary AddFEM active	BOOL	0	O	
ACTIV_R	1= redundant AddFEM active	BOOL	0	O	
ADDF_SIN	AddFEM is used in single mode	BOOL	0	I	
ADDF_NAT	Block operates with native AddFEM	BOOL	0	I	
ADDF_RED	AddFEM is redundancy partner	BOOL	0	I	
EN_MSG	1 = enable messages	BOOL	1	I	
EV_ID1	Message number	DWORD	0	I	
LADDRI1	Logic address (inputs) of the primary AddFEM	INT	0	I	
LADDRI2	Logic address (inputs) of the redundant AddFEM	INT	0	I	
LADDRO1	Logic address (outputs) of the primary AddFEM	INT	0	I	
LADDRO1	Logic address (outputs) of the primary AddFEM	INT	0	I	
MAST	Default master setting by the host 0=primary AddFEM is master 0=redundant AddFEM is master	BOOL	0	I/O	+
MS	Maintenance status	DWORD	0	I	+
MSG_ACK1	Message acknowledgement	WORD	0	O	
MSGSTAT1	Message error information	WORD	0	O	
O_MS	Maintenance status of output	DWORD	0	O	

Connection (parameter)	Meaning	Data type	Default	Type	O&M
RAC_DIAG1	Rack diagnostics data of the primary AddFEM	STRUCT		I	
RAC_DIAG2	Rack diagnostics data of the redundant AddFEM	STRUCT		I	

See also:

Message texts and associated values of RED_AFST

1.3.3 Message texts and associated values of RED_AFST

Assignment of message texts / classes to the block parameters of RED_AFST

Message block ALARM_8P	Message number	Block parameter	Default message text	Message class
EV_ID1	1	-	AddFEM @1%d@/@2%d@/: redundancy error in fiber optic connection	S
	2	-	AddFEM @1%d@/@2%d@/: redundancy error	S

Assignment of associated values to the block parameters of RED_AFST

Message block ALARM_8P	Associated value	Block parameter	Meaning
EV_ID1	1	SUBN_ID	DP master system number (byte)
	2	RACK_NO	Rack/station number (byte)

See also:

RED_AFST : I/Os

1.4 RED_AFOR : OR - gate for the OMODE_x – outputs of two redundant MOD_x – blocks

1.4.1 Description of RED_AFOR

Object name (type + number)
FB601

RED_AFOR : I/Os

Area of application
The block forms the value status of two redundant AddFEMs.

Calling OBs
The block must be installed in the run seqence of following OBs:
(done automatically in the CFC):

- OB1 Cyclic program
- OB3x Cyclic interrupt

Usage in CFC

The CFC function "**Generate module driver**" automatically:

- Installs the RED_AFOR block in its runtime group upstream from the runtime group of the channel-blocks in the same OB
- Interconnects
  - the MODE1_x input to the corresponding OMODE_xx output of the MOD_D1 block of the primary AddFEM.
  - the MODE2_x input to the corresponding OMODE_xx output of the MOD_D1 block of the redundant AddFEM.
  - the ACTIV_P input to the ACTIV_P output of the RED_AFST block
  - the ACTIV_R input to the ACTIV_R output of the RED_AFST block

Function and operating principle
The block writes the value status (MOD_xx) of the active AddFEM to the output parameter (OMOD_xx). The active AddFEM is selected based on the input parameters ACTIV_P and ACTIV_R.

Redundancy
The operating system evaluates bus redundancy of the redundant DP master systems

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
Not applicable.

Message response
Not applicable.

Operator control and monitoring
The block does not contain a faceplate.

Note: "I/Os ..." (O&M column) identifies the tags which will be transferred to the OS if the "Operating and Monitoring" option is set at the object properties of the block in CFC. Default: option is not set.

1.4.2 RED_AFOR : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection visible, standard = invisible.

Connection (parameter)	Meaning	Data type	Default	Type	O&M
ACTIV_P	1= primary AddFEM active	BOOL	0	O	
ACTIV_R	1= redundant AddFEM active	BOOL	0	I	
MODE1_xx	Channel operating mode (xx = 00 - 31)at the primary module	DWORD	0	I	
MODE2_xx	Channel operating mode (xx = 00 - 31)at the redundant module	DWORD	0	I	
OMODE_xx	Channel operating mode (xx = 00 - 31)	DWORD	0	O	+

1.5 CH_ADDFEM :Input Basic Module AddFEM

1.5.1 Description of CH_ADDFEM

Object name (type + number)
FC602

CH_ADDFEM : I/Os IDH_CHA_ADDFEM_PARAM

Area of application
Input parameter VALUE must be interconnected with the first input word of the process image of the AddFEM. At redundant AddFEMs, VALUE is interconnected with the first input word in the process image of the primary AddFEM (AddFEM with the **lower** PROFIBUS address

Calling OBs
It is **mandatory** to install the block at the same run level as the channel blocks (CH_AI, CH_AO or CH_DO) of the AddFEM (for example, OB 35). The block must be installed once per AddFEM operating in single mode, and once per redundancy pair.

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Interconnects
  - the MODE input to the corresponding OMODE_xx output of the MOD_1 block.

Function and operating principle
The installation of this block for a redundant pair of AddFEMs ensures the correct run sequences in the redundancy blocks installed for the AddFEM by the driver wizard.

Addressing
The symbol (symbol table) generated by HW-Config for the input address of the base module must be interconnected with the VALUE input parameter (interconnection to address...).

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
Not applicable.

Time response
Not applicable.

Message response
The block does not support message function.

Operator control and monitoring
The block does not contain a faceplate.

1.5.2 CH_ADDFEM : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Type
MODE	Value state and operating mode	DWORD	0	I/O
VALUE	Input value	WORD	0	I/O

2 AddFEM - blocks

2.1 CH_AFCO : Counter Inputs AddFEM

2.1.1 Description of CH_AFCO

Object name (type + number)
FB614

CH_AFCO : I/Os

Area of application
Signal processing of a counter tag of the AddFEM.

Calling OBs
The block is called by the cyclic interrupt OB 3x in which it has to be installed (e.g. OB32). Additionally it has to be installed in restart OB 100. When using CFC the block is installed automatically in OB100.

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Configures
  - the LADDR input with the logical address of the slot
  - the Z_NR input with the counter-number
- Interconnects
  - the MODE input to the corresponding OMODE_xx output of the MOD_1 block.
  - the RACF_P input to the QRACKF output of block MOD_D1 (in singular configuration) or to the RACF_P output of block RED_AZIN block (in redundant configuration)

    Additionally only in redundant configuration
  - the RACF_R input to the RACF_R output of the RED_AZIN block
  - the RED_WR input to the RED_WR[Z_NR] output of the RED_AZIN block

Function and operating principle
The block cyclically processes the information of logical AddFEM module no. 6 “Counter inputs”, which is visible in HW-Config.
Note: Concerning allocation of the different hardware in- and outputs of a single AddFEM module to different logical PCS 7 modules please see A.2 “Device model – module allocation (when using PCS 7)”
.
The block reads the physical real value from the process image (or partition of it) and then returns the value at output parameter V as a frequency with dimension unit Hz (Hertz) or as number of revolutions with dimension unit RPM .
If the upper or lower limit (as defined by V_HL and V_LL) is violated, the function block sets the corresponding output bit (QCHF_HL or QCHF_LL).

If parameter NUM_TEETH is set to 0 output V indicates the frequency, which is measured at the AddFEM hardware input.
With parameter NUM_TEETH ≥ 0 output V indicates the revolution speed, which is already calculated by the AddFEM module according to the following formula:

V = Measured frequency at the hardware input * 60 / NUM_TEETH

NUM_TEETH (Number of teeth) means e.g. the number of teeth of a gear-wheel that rotates in a light barrier.

Parameter BW_TIME is used to define the time of the Butterworth filter. With BW_TIME=0 the filter is disabled (please see manual 6DL3100-8AC)

Note:
The parameters NUM_TEETH and BW_TIM are transferred via acyclic Profibus Communication.
Therefore they only get initialized or refreshed after the following events:
CPU-Startup, Clearance of Profibus fault, AddFEM Startup or by setting the Input WR_PARA=1

The value is considered invalid if the high byte at input parameter MODE = 16#40 (value status = error of higher-priority error).
In addition to the result value, the function block generates a Quality Code (QC) (QUALITY) which may take the following states:

State	QC
Valid value	16#80
Simulation	16#60
Last valid value	16#44
Substitution value	16#48
Invalid value	16#00

Addressing
The symbol (symbol table) generated for the counter tag channel by HW-Config will be interconnected with input parameter VALUE (interconnection to address...).

Simulation
When input parameter SIM_ON = TRUE then the value of input parameter SIM_V is indicated with QC QUALITY = 16#60.
QBAD (invalid process value because a high-priority error has occurred) is reset to FALSE.
In simulation mode a valid operating mode in the low word of the MODE input has to be set additionally. Otherwise. QBAD is set 1.
Simulation has highest priority. If the block is in simulation state, then QSIM = TRUE

Substitution value
When input parameter SUBS_ON = TRUE, the block returns the value of input parameter SUBS_V, provided the raw value is invalid. The QC will be set to QUALITY = 16#48 and QBAD = 1.

Hold last value
When input parameter SUBS_ON = FALSE, and the value is invalid, the block returns the last valid output value (V_LAST).

Error handling
The plausibility of input parameters is not checked.

If an invalid operating mode is set in the low word of input parameter MODE, the function block considers the value being invalid.

Startup characteristics
Not applicable.

Time response
Not applicable.

Message response
The block does not support message function.

Operator control and monitoring
The block does not contain a faceplate.

2.1.2 CH_AFCO : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Type
BW_TIME	butterworth-filter-time	INT	0	I/O
LADDR	Logical startaddresse of the counters	INT	0	I/O
MODE	Value state and operating mode	DWORD	0	I/O
NUM_TEETH	Number of teeth	INT	60	I/O
QBAD	1 = invalid process value	BOOL	0	O
QCHF_HL	1 = process value overshoot	BOOL	0	O
QCHF_LL	1 = process value undershoot	BOOL	0	O
QSIM	1 = simulation active	BOOL	0	O
QSUBS	1 = value substitution active	BOOL	0	O
QERR_WRP	1 = write-error primary AddFEM	BOOL	0	O
QERR_WRR	1 = write-error redundant AddFEM	BOOL	0	O
QUALITY	Value status of the process value	BYTE	0	O
RACF_P	1 = rack-failure primary AddFEM	BOOL	0	I/O
RACF_R	1 = rack-failure redundant AddFEM	BOOL	0	I/O
RED_WR	Feetback from the redundant AddFEM	BYTE	0	I/O
R_PAR	parameter for the redundant AddFEM	STRUCT	-	O
SIM_ON	1 = enable simulation	BOOL	0	I/O
SIM_V	Simulation value	REAL	0	I/O
SUBS_ON	1 = enable value substitution	BOOL	0	I/O
SUBS_V	Substitution value	REAL	0	I/O
V	Process value	REAL	0	O
V_HL	Overshoot limit of the input value	REAL	10000	I/O
V_LL	Undershoot limit of the input value	REAL	0	I/O
WR_PAR	1 = parameter (BW_TIME und NUM_TEETH) to AddFEM transmit	BOOL	0	I/O
Z_NR	Counter-number (0..2)	INT	0	I/O

2.2 RED_AZIN : Copies process image for Counter Inputs and writes data to the redundant AddFEM

2.2.1 Discription of RED_AZIN

Objektname (Art + Nummer**)**
FB615

RED_AZIN : I/Os

Area of application
The block updates the process image of the redundant AddFEM concerning data of logical module 5 “Counter Inputs” as visible in HW-Config (please also see A.2 “Device model – module allocation (when using PCS 7)”)

Calling OBs
The block must be installed in the run sequence of the following OBs (automatically in CFC):

- OB 3x Cyclic interrupt

Usage in CFC
When the CFC function "**Generate module driver**" is used, the system automatically

- Installs
  the RED_AZIN block in the OB of the CH_AFCO count channel blocks to which it is interconnected
  The runtime group of the RED_AZIN block in this OB then is located before the runtime group of the CH_AFCO count blocks
- interconnects:
  - inputs R_PARx with the R_PAR outputs of the corresponding CH_AFCO count value channel blocks
  - output RED_WRx with the RED_WR inputs of the corresponding CH_AFCO count value channel blocks
  - input ACTIV_P with the relevant ACTIC_P output of RED_AFST
  - input ACTIV_R with the relevant ACTIC_R output of RED_AFST
  - input LADDR1 with output OLADDR1 at AFN_ADDR/AF_ADDR of the primary AddFEM
  - input LADDR2 with output OLADDR1 at AFN_ADDR/AF_ADDR of the redundant AddFEM
  - input LENG with output LENG at AFN_ADDR/AF_ADDR of the primary AddFEM

Function and operating principle
When ACTIV_P = 1, the block copies the values from the process image of outputs at the start addresses defined at parameter LADDR1 to the process image area at the start addresses defined at parameter LADDR2. The number of copied words is defined at parameter LENG. It is thus ensured that both redundant AddFEMs are supplied with identical output values. The block does not process the data when both input parameters are ACTIV_P = 0 and ACTIV_R = 0.
The block writes the acyclic counter parameters to the redundant AddFEM. The parameters are transferred at the R_PARx structure. This structure contains the control word used to output the read request from the CH_AFCO count channel blocks. The information indicating

successful completion or cancellation of the write request is written to output RED_WRx. Output QERR_WR = TRUE if an error is detected.

Redundancy
The block is used for redundant operation of AddFEM.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
n.a

Time characteristics
n.a.

Message characteristics
n.a.

Operating and monitoring
The block does not contain a faceplate.
Note: "Connections of ..." identifies the tags transferred to the OS (at column O&M "+") if "enable operating and monitoring" is set at the block properties in the CFC.
Default:
Option not set.

2.2.2 RED_AZIN : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (Parameter)	Meaning	Data type	Default	Type O&M
ACTIV_P	1 = primary AddFEM its active	BOOL	0	I
ACTIV_R	1 = redundant AddFEM is active	BOOL	0	I
LADDR1	Logic address of the primary AddFEM	INT	0	I
LADDR2	Logic address of the redundant AddFEM	INT	0	I
LENG	Length of words to copy	INT	0	I
QERR_WR	1= write error	BOOL	0	0
R_PARx	Acyclic parameter of count value channel x (x = 0 ...2)	ISTUCT	0	I
RED_WRx	Return value of the read job	BYTE	0	0

2.3 AFN_ADR : Allocates the logic AddFEM – addresses

2.3.1 Description of AFN_ADR

Object name (type + number)
FB607

AFN_ADR : I/Os

Area of application
Redundant operation of AddFEM.

Calling OBs
The block must be installed in the run seqence of following OBs:
(done automatically in the CFC):

- OB1 Cyclic program
- OB100 Startup

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Installs the AFN_ADDR block in its runtime group in the OB mentioned above
- Configures
  - the LADDR1 input with the logical address of the input slot
  - the LADDR2 input with the logical address of the output slot (if existing)
- Interconnects
  - the structure RAC_DIAG of block OBDIAG1 with RAC_DIAGI.

Function and operating principle
The block returns the addresses and lengths of the modules of two redundant AddFEM to the processing blocks, such as the redundancy status block and process image update blocks.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
As in cyclic operation.

Time response
Not applicable.

Message response
Not applicable.

2.3.2 AFN_ADR : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name **bold** = connection visible, standard = invisible.

Connection (parameter)	Meaning	Data type	Default	Type O&M
DADDR	Diagnostics address of the module	INT	0	I
LADDR1	Logic address of the input	INT	0	I
LADDR2	Logic address of the output	INT	0	I
LENG	Number of words of the module	BYTE	0	I
OLADDR1	Logic address of the input	INT	0	O
OLADDR2	Logic address of the output	INT	0	O
RAC_DIAGI	Structure of the OB_DIAG1 block	STRUCT	0	I
RAC_DIAGO	Copy of the OB_DIAG1 structure	STRUCT	0	O
SLOT_NO	Slot number	BYTE	0	I

2.4 AF_DIAG : AddFEM Diagnostics

2.4.1 Description of AF_DIAG

Objektname (Art + Nummer**)**
FC600

AF_DIAG : I/Os

Area of application
The function shows the channel faults of analog inputs, analog outputs and digital outputs of one AddFEM module (only for hardware 6DL3100-8AC including FEF variants, not for AddFEM-HART).
In redundant configuration an individual instance can be installed for each AddFEM.

Calling OBs
The block should be placed in OB1.

Note
The AF_DIAG accesses the process periphery of the AddFEM directly; therefore it needs additional runtime. **The runtime for one instance is 600µsec**.

Usage in CFC
In CFC the block has to be parameterized with the logical input address of the basic module (slot 1 in HW-Config) and the logical start address of analog inputs (slot 2)

Function and operating principle
The block reads the qualifier of the analog input, analog outputs and digital outputs and displays shows them on the output parameters BAD_AIxx, BAD_AOx and BAD_DOxx. Zero means the value is ok, one means the value is bad.

Addressing
The block has to be parameterized with the logical start adresses for inputs and outputs of the basic module (logical AddFEM module in slot 1 in HW-Config) and the logical start address of the analog inputs (slot 2 in HW-Config)

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
Not applicable.

Time response
Not applicable.

Message response
The block does not support message function.

Operator control and monitoring
The block does not contain a faceplate.

2.4.2 AF_DIAG : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Art	O&M
BAD_ANY	At least one output BAD_xx is set	BOOL	0	O	
BAD_AI1	Qualifier of Analog input 1	BOOL	0	O	
...					
BAD_AI12	Qualifier of Analog input 12	BOOL	0	O	
BAD_AO1	Qualifier of Analog output 1	BOOL	0	O	
...					
BAD_AO8	Qualifier of Analog output 8	BOOL	0	O	
BAD_DO1	Qualifier of Digital output 1	BOOL	0	O	
...					
BAD_DO16	Qualifier of Digitaloutput 16	BOOL	0	O	
LADIN_BA	Logical start address of inputs from basic module (Slot 1)	INT	0	I	
LADOU_BA	Logical start address of outputs from basic module (Slot 1)	INT	0	I	
LADDR_AI	Logical start address of analog inputs (Slot 2)	INT	0	I	
RACKF	Device failure AddFEM	BOOL	0	O	
STOP	Operating status STOP (key switch on AddFEM in position STOP)	BOOL	0	O	

3 AddFEM HART - blocks

3.1 CH_AFHV : Input for HART-Variable

3.1.1 Description of CH_AFHV

Object name (type + number)
FC601

CH_AFHV : I/Os

Area of application
Signal processing of a HART tag of the AddFEM HART.

Calling OBs
The calling OB is the cyclic interrupt OB3x, in which you install the block (for example OB 32) and the restart OB100. Using CFC the block is installed automatically in OB100.

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Interconnects
  - the MODE input to the corresponding OMODE_xx output of the MOD_2 block.

Function and operating principle
The block cyclically processes a HART tag of the HART IEEE tags in the AddFEM module. It reads the physical real value from the process image (partition), checks the configured limits and then returns the value at output parameter V. If limits are violated, the function block sets the corresponding output bit (QCHF_HL or QCHF_LL.)
The value is considered invalid if the high byte at input parameter MODE = 16#40 (value status = error of higher-priority error.) In addition to the result value, the function block generates a Quality Code (QC) (QUALITY) which may take the following states:

State	QC
Valid value	16#80
Simulation	16#60
Last valid value	16#44
Substitution value	16#48
Invalid value	16#00

Addressing
The symbol (symbol table) generated for the HART tag channel by HW-Config will be interconnected with input parameter VALUE (interconnection to address...). Always interconnect the symbol for the HART quality byte with the QC input parameter. QC will be copied to output QUALITY_PA without changes.

Simulation
When input parameter SIM_ON = TRUE then the value of input parameter SIM_V is indicated with QC QUALITY = 16#60.
QBAD (invalid process value because a high-priority error has occurred) is reset to FALSE.
In simulation mode a valid operating mode in the low word of the MODE input has to be set additionally. Otherwise. QBAD is set 1.
Simulation has highest priority. If the block is in simulation state, then QSIM = TRUE

Substitution value
When input parameter SUBS_ON = TRUE, the block returns the value of input parameter SUBS_V, provided the raw value is invalid. The QC will be set to QUALITY = 16#48 and QBAD = 1.

Hold last value
When input parameter SUBS_ON = FALSE, and the value is invalid, the block returns the last valid output value (V_LAST).

Error handling
The plausibility of input parameters is not checked.
If an invalid operating mode is set in the low word of input parameter MODE, the function block considers the value being invalid.

Startup characteristics
Not applicable.

Time response
Not applicable.

Message response
The block does not support message function.

Operator control and monitoring
The block does not contain a faceplate.

3.1.2 CH_AFHV : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Art
MODE	Value state and operating mode	DWORD	0	I/O
QBAD	1 = invalid process value	BOOL	0	O
QCHF_HL	1 = process value overshoot	BOOL	0	O
QCHF_LL	1 = process value undershoot	BOOL	0	O
QSIM	1 = simulation active	BOOL	0	O
QSUBS	1 = value substitution active	BOOL	0	O
QUALITY	Value status of the process value	BYTE	0	O
QUALITY_PA	Value status from the HART device	BYTE	0	O

Connection (parameter)	Meaning	Data type	Default	Art
SIM_ON	1 = enable simulation	BOOL	0	I/O
SIM_V	Simulation value	REAL	0	I/O
SUBS_ON	1 = enable value substitution	BOOL	0	I/O
SUBS_V	Substitution value	REAL	0	I/O
V	Process value frequency	REAL	0	O
VALUE	Input value	REAL	0	I/O
V_HL	Overshoot limit of the input value	REAL	10000	I/O
V_LL	Undershoot limit of the input value	REAL	0	I/O

3.2 AF_ADDR: Allocates the logic AddFEM HART - addresses

3.2.1 Description of AF_ADDR

Object name (type + number)
FB606

AF_ADDR : I/Os

Area of application
Redundant operation of AddFEM.

Calling OBs
Install the block in the following OBs
(done automatically in the CFC):

- OB1 Cyclic program
- OB100 Startup

Usage in CFC
The CFC function "**Generate module driver**" automatically:

- Installs the AFN_ADDR block in its runtime group in the OB mentioned above
- Configures
  - the LADDR1 input with the logical address of the input slot
  - the LADDR2 input with the logical address of the output slot (if existing)
- Interconnects
  - the structure RAC_DIAG of block OBDIAG1 with RAC_DIAGI.

Function and operating principle
The block returns the addresses and lengths of the modules of two redundant AddFEM to the processing blocks, such as the redundancy status block and process image update blocks.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
As in cyclic operation.

Time response
Not applicable.

Message response
Not applicable.

3.2.2 AF_ADDR : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name **bold** = connection visible, standard = invisible.

Connection (parameter)	Meaning	Data type	Default	Type	O&M
DADDR	Diagnostics address of the module	INT	0	I	
LADDR1	Logic address of the input	INT	0	I	
LADDR2	Logic address of the output	INT	0	I	
LENG	Number of words of the module	BYTE	0	I	
OLADDR1	Logic address of the input	INT	0	O	
OLADDR2	Logic address of the output	INT	0	O	
RAC_DIAGI	Structure of the OB_DIAG1 block	STRUCT	0	I	
RAC_DIAGO	Copy of the OB_DIAG1 structure	STRUCT	0	O	
SLOT_NO	Slot number	BYTE	0	I	

4 FEF-PoCo - blocks

4.1 CH_APOCO : Position Controller

4.1.1 Description of CH_APOCO

Objektname (Art + Nummer)
FB 608

CH_AFPOCO : I/Os

Area of application
The block is used to operate and display position controller parameters of the S7 CPU.

Calling OBs
The block must be installed in a Cyclic interrupt OB (OB 32, for example), and in startup OB100. Using CFC, it is installed automatically in OB100.
.
Usage in the CFC
When the CFC function "**Generate module drivers**" is used, the system automatically:

- Configures
  - input LADDR_I with the logical address of the slots of inputs
  - input LADDR_O with the logical address of the slots of outputs
  - input POCO_NR with the PoCo channel number
- Interconnects
  - input MODE with the relevant output OMODE_xx of the MOD_1 block
  - input RED_WR in redundant mode with output RED_WR[POCO_NR] of RED_APOU
  - input RB_PARA in redundant mode with output RB_PARA[POCO_NR] of RED_APIN
  - input RACF_P with output QRACKF of MOD_D1, or in redundant mode with output RACF_P of RED_APIN
  - input RACF_R in redundant mode with output RACF_R of RED_APIN
  - input ACTIV_P in redundant mode with output OACTIV_P of RED_APOO
  - input ACTIV_R in redundant mode with output OACTIV_R of RED_APOO

Function
The block is divided into several function units:

- Setpoint processing in manual, auto and follow-up mode
- Transfer of PoCo parameters
- Processing of manipulated variable
- Limit monitoring of the controlled process variable, and generation of messages using the ALARM8_P block

Set point processing

Set point SP can be obtained from three different sources which are selected by setting SP_TRK_ON and SPEXTSEL_OP according to the table below

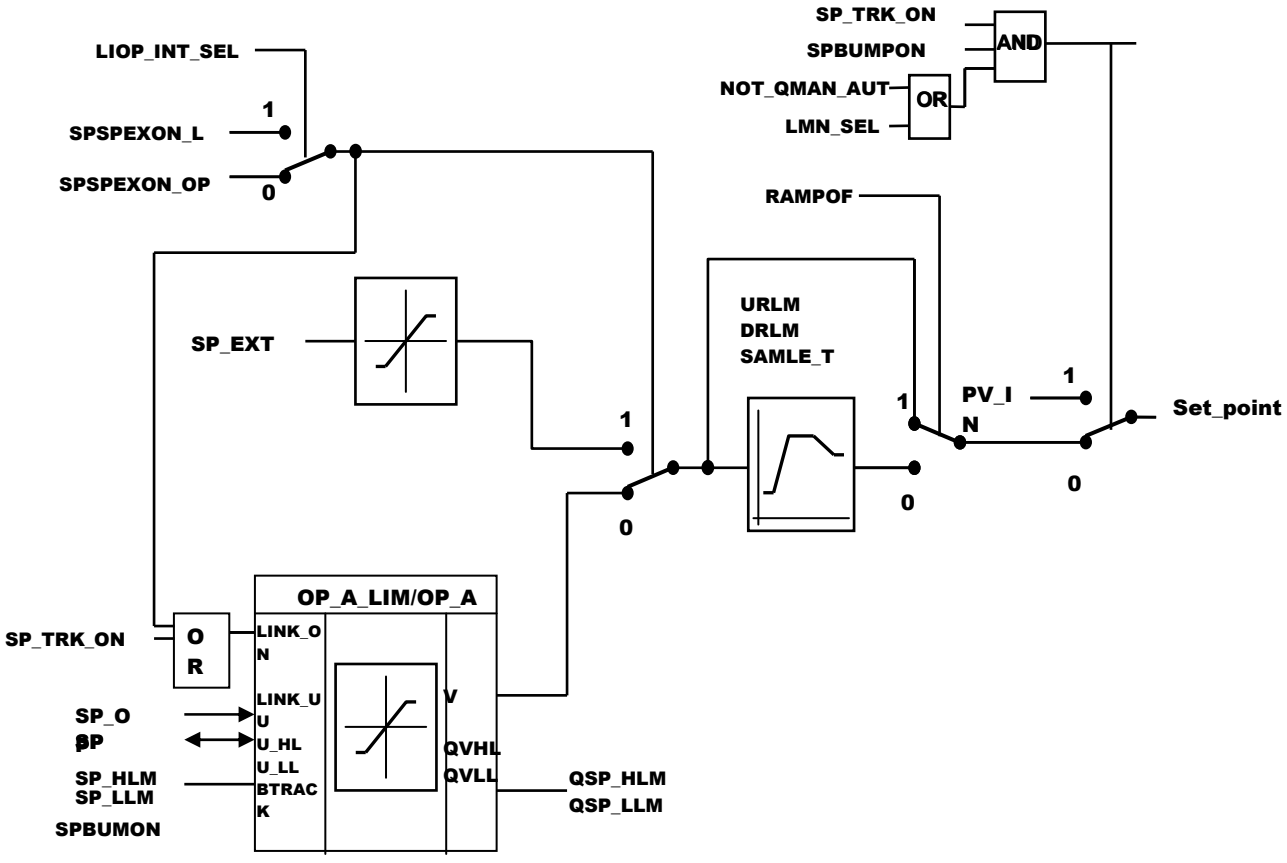
SP_TRK_ON	SPEXTSEL_OP	SP =	State
0	0	SP_OP	Internal sepoint
Irrelevant	1	SP_EXT	External setpoint
1	0	PV_IN**	Tracked setpoint
		** in manual mode only when SPBUMPON=1	

Internal set point
The internal set point SP_OP is operated and limited using OP_A_LIM or OP_A_RJC (range SP_LLM - SP_HLM).

External set point
The external set point SP_EXT can be interconnected, and is limited to the range (SPEXTLLM, SPEXTHLM).
Changes at the internal or external set point are limited to a maximum gradient (DRLM, URLM), provided the set point ramp is set (SPRAMPOF = 0).

Tracked set point
Process variable PV_IN is used as set point when SP_TRK_ON = 1.
Set point tracking of the actual value is only active in manual mode (with internal set point and SPBUMPON = 1), and is only used to provide a suitable set point for the changeover from manual mode to auto mode.

The generated set point is transferred as PoCo set point to the AddFEM.



Transfer of PoCo parameters
The block transfers the input parameters to a PoCo channel in AddFEM and reads the values transferred from the PoCo channel. The parameters which are read are indicated at the output parameters. Parameters and set points transferred in cyclic mode are refreshed dynamically (within the OB cycle) in AddFEM. Acyclic parameters are only transferred on request.
The setting of parameter WR_PARA = 1 initiates an acyclic transfer of parameters from S7-CPU to AddFEM. The setting of parameter UPD_PARA = 1 initiates an acyclic transfer from AddFEM to the S7-CPU (in order to read the current value of the parameters in the AddFEM module). WR_PARA and UPD_PARA are set back to 0 automatically after the initiated acyclic transfer is finished.

An instance of the block must be installed in the CFC chart for each one of the eight PoCo channels.
PoCo_Channel 1 operates with analog input 1and analog output 1.
PoCo_Channel 2 operates with analog input 2 and analog output 2, and so on.
The analog input is fetched by a CH_AI block and must be interconnected with input FP_POSTION_I. The CH_AO can be discarded as the PoCo transfers the output values directly to the AddFEM.
For the first PoCo channel, interconnect input parameter VALUE with the first symbolic address of the inputs.
Each PoCo channel has a length of five words. The second PoCo channel is thus interconnected with the sixth address.
Example: The PoCo inputs start at address 560 (first address). The address of the second PoCo channel has an offset of 5 words and therefore starts with 570 (second address).
Parameter WR_SZEIT can be used for the acyclic transfer of measured closing times via digital inputs OMAX_CLOS_T_B, OBE_POS_AT_OPN_L and OBE_POS_AT_CLS_L.

Note
The control loop parameters / closing times transferred in acyclic DPV1 communication are only updated after a CPU startup, when WR_PARA = 1/ WR_SZEIT = 1, after the elimination of a bus error or after a device failure of the AddFEM PoCo.

With a rising edge 0-1 at the input LI_WR_PA the user can write the controller parameter to the AddFEM. The user is responsibly for the function which generates this rising edge.
The input LI_WR_PA is only active if the input SEL_WRITE = false. In this case the operation of the parameters is only possible in the CFC chart. The operation at the OS faceplate is locked; the background of the display is gray.

Manipulated variable processing

Manual mode

The manipulated variable is determined by manipulating input MAN_OP on the OS. Operation and limitation is determined at OP_A_LIM or OP_A_RJC (range MAN_HLM - MAN_LLM). The output values of QVHL and QVLL of OP_A_LIM or OP_A_RJC are passed to the outputs QLMN_HLM und QLMN_LLM.
Manual changes of the manipulated variable are limited to a maximum gradient (DRLM, URLM), provided the set point ramp is enabled (SPRAMPOF = 0).
The internal parameter OPEN_LOOP_Y is used to pass the manipulated variable to AddFEM.

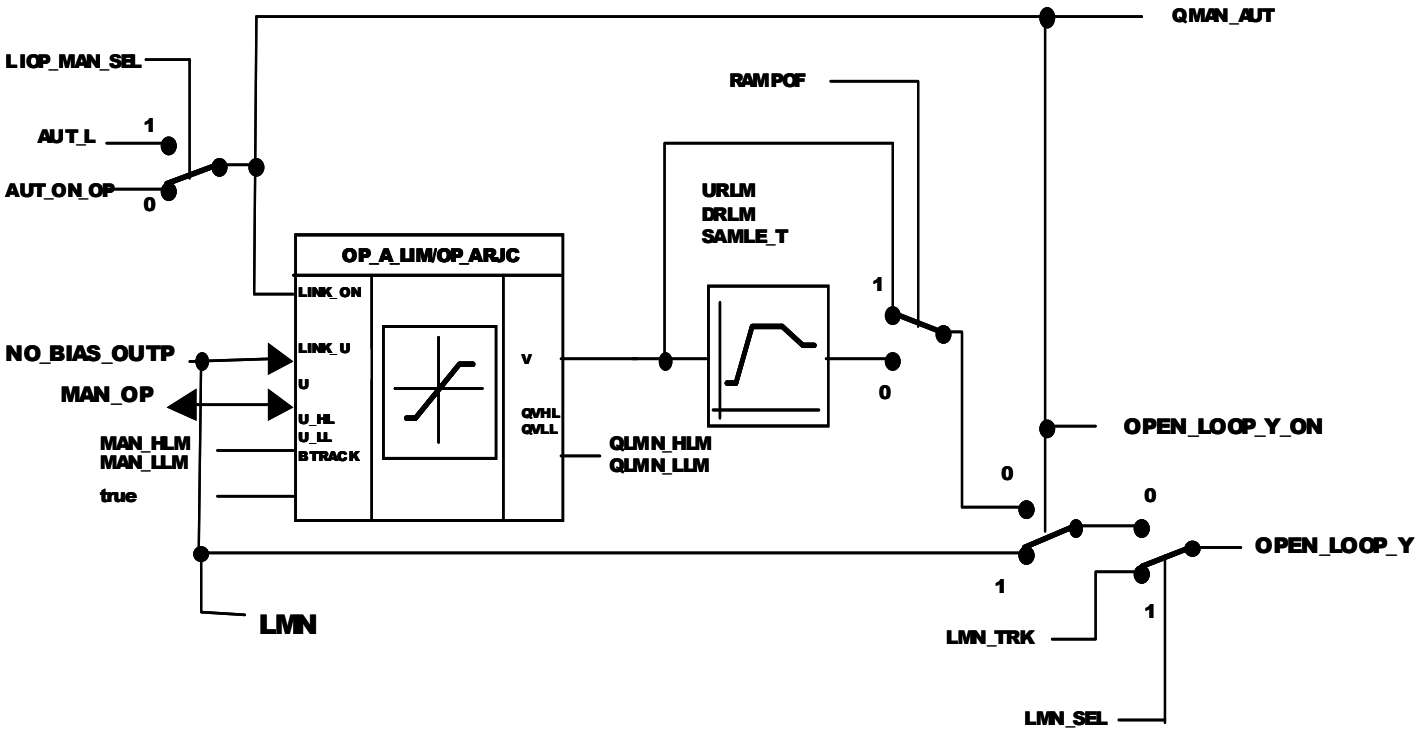
The switchover from automatic mode to hand mode is initiated by the AddFEM internal parameter OPEN_LOOP_Y_ON = 1 (for details please see manual 6DL3100-8AC02).

Auto mode

The manipulated variable is calculated in the AddFEM and leads to a respective current or voltage output at the analogue hardware outputs of the module.
The manipulated variable itself cannot be reported as the value cannot be read back by the S7 CPU. The value of the manipulated variable without bias is reported at the output parameter NO_BAIS_OUTP. The value is copied internally to the parameter LMN. For displaying the manipulated variable at the faceplate the output parameter LMN must be connected with the input parameter LMNR_IN

Tracking mode

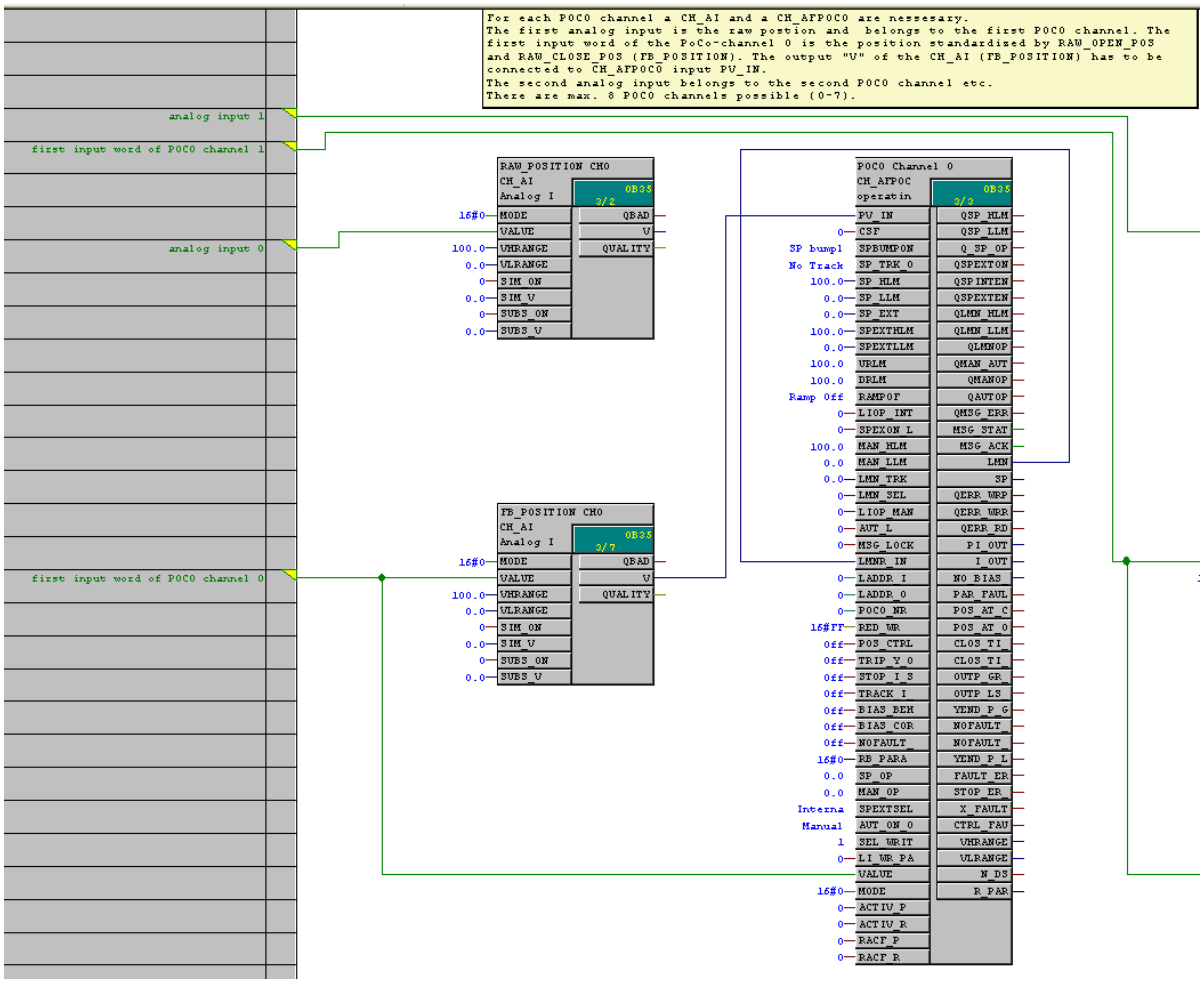
In this state (LMN_SEL = 1), the manipulated variable is fetched from the interconnected tracking value LMN_TRK and set at the output. The outputs QLMN_HLM and QLMN_LLM are set to FALSE.
"Tracking" mode takes priority over all other modes of operation, and thus allows the configuration of a safety shutdown of the plant function using this input, if applicable. Another safety shutdown can be carried out using the parameter TRIP_Y_ON = 1. PoCo conducts the trip directly using the value TRIP_Y for the manipulated variable. OPEN_LOOP_Y remains unaffected.



Scaling of the controlled value from the process image

The controlled value (position), which is read by the analogue input of the AddFEM is normalized (e.g. from 0% to 100%) via the setting of the parameters RAW_OPEN_POS and RAW_CLSD_POS.
In redundant configuration the signal range for the controlled value at the AddFEM inputs may differ slightly between both AddFEM depending on the hardware installation.

Therefore, these parameters can be set individually for each AddFEM and are available for both modules in the parameter list.
P_RAW_OPEN_POS and P_RAW_CLSD_POS are used for the primary AddFEM (the AddFEM with the lower PROFIBUS DP - address).
R_RAW_OPEN_POS and R_RAW_CLSD_POS are used for the redundant AddFEM (the AddFEM with the higher PROFIBUS DP - address).
The un-normalized actual value will be collected from the process image as raw value (WORD format) and transformed into a REAL value by the function block CH_AI (RAW_POSITION CHx). The output value V can be used for the determination of the final positions RAW_POS_OPEN and RAW_CLOSE_POS. The normalized position (FB_POSITION) is stored in the first word of the current PoCo channel (Word format). The function block CH_AI (FB_POSITION CHx) transforms the value into REAL format. The output V of the function block must be connected to the input PV_IN of the function block CH_AFPOCO.



Error handling

The block has no error handling routine.

Startup characteristics
The acyclic parameters are transferred to the AddFEM PoCo during initial startup / restart..

Time characteristics
n.a.

Message characteristics
The block reports an external error based on the status at input CSF and PoCo failure, and if output CTRL_FAULT = 1.

Operating and monitoring
The block alo generates special signals to control the symbol screen and faceplates.

VSTATUS of CH_AFPOCO
The 32-bit status word is used for advanced status indication at the block symbols and faceplates. The block uses the 16 least significant bits (bits 0 to 15) as follows:

Bit Nr.:	7	6	5	4	3	2	1	0
Parameter	-	-	-	QSPEXTON	QMAN_AUT	MSG_LOCK	BA_EN	OCCUPIED

Bit Nr.:	15	14	13	12	11	10	9	8
Parameter	OOS	QMSG_SUP	LMN_SEL	-	-	-	-	-

4.1.2 CH_AFPOCO : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Type	O&M
ACTIV_P	1 = primäres AddFEM ist aktiv	BOOL	0	I/O	
ACTIV_R	1 = redundantes AddFEM ist aktiv	BOOL	0	I/O	
AUT_L	Interconnectable input for MAN/AUTO;1:AUTO;0=MANUAL	BOOL	0	I	
AUT_ON_OP	Operator input for MAN/AUTO;1=AUTO;0=MANUAL	BOOL	0	I	+
BA_NA	Batch logging enable (significant only to faceplate)	BOOL	0	I	+
BA_ID	Batch ID (significant only to faceplate)	BOOL	0	I	+
BE_POS_AT_CLS_L	Enable binary input for closing time measurement (close)	BOOL	1	I/O	+, acy
BE_POS_AT_OPN_L	Enable binary input for closing time measurement (open)	BOOL	1	I/O	+, acy
BIAS_BEHIND_LIM_ON	Bias low limit	BOOL		I	+
BIAS_CONST	Constant bias	REAL	0.0	I/O	+, acy
BIAS_CORR_SEL	Bias correction parameter	BOOL		I	+
CASCADE_ON	Enable cascaded controller mode Applies only to PO01 - PO04	BOOL	0	I/O	+, acy
CFS	control system fault	BOOL	0	I	
CLOSING_TIME_A_OK	Closing time A ok! Actuation time monitoring analog	BOOL	0	O	+
CLOSING_TIME_B_OK	Closing time B ok! Actuation time monitoring binary, depends on DI0x and DI0x state.	BOOL	0	O	+

Connection (parameter)	Meaning	Data type	Default	Type	O&M
CTRL_FAULT	Controller fault	BOOL	0	O	+
DITHER_AMPLITUDE	Amplitude of dither frequency	REAL	0.0	I/O	+, acy
DITHER_PERIOD	Dither frequency (period) in ms	REAL	4.0	I/O	+, acy
DRLM	Max. negative gradients of setpoint / manipulated value	REAL	0	I	+
FAULT_ER_GR_UL	ER control error > FAULT_ER_UL	BOOL	0	O	+
FAULT_ER_UL	Limit value 5	REAL	120.0	I/O	+, acy
FAULT_ON_DELAY	Trigger delay default: in seconds	REAL	10.0	I/O	+, acy
FAULT_Y	Setpoint controller error	REAL	-5.0	I/O	+, acy
GAIN	GAIN	REAL	1.0	I/O	+, acy
GAIN_AUX_CH	Factor auxiliary channel in parallel mode	REAL	0.0	I/O	+, acy
GAIN_LEAD_CH	Factor leading channel in parallel mode	REAL	100.0	I/O	+, acy
GAIN_SINGLE	Factor single mode	REAL	100.0	I/O	+, acy
I_OUT	Only I output of the controller	REAL	0.0	O	+
I_STOP_ER_GR_UL	ER control error > I_STOP_ER_UL	BOOL	0	O	+
I_STOP_ER_UL	ER-limit for I-stop	REAL	15.0	I/O	+, acy
I_STOP_POS_LL	Upper limit Y for I-stop	REAL	-5.0	I/O	+, acy
I_STOP_POS_UL	Lower limit Y for I-stop	REAL	100.0	I/O	+, acy
LADDR_I	Start address PoCo inputs	INT	0	I	
LADDR_O	Start address PoCo outputs	INT	0	I	
LI_WR_PA	0->1 rising edge writes the parameter by interconnetion	BOOL	0	I/O	
LIOP_INT_SEL	1=interconnection enable 0=operator control enable	BOOL	0	I	+
LIOP_MAN_SEL	1=interconnection active 0=operator input enable	BOOL	0	I	+
LMN	Manipulated variable output	REAL	0	O	
LMN_SEL	External manipulated variable 1= active	BOOL	0	I	
LMN_TRK	External manipulated variable	REAL	0	I	
LMNR_IN	manipulated variable return signal for display in OS **(must be interconnected with LMN)**	REAL	0	I	+
MAN_HLM	High limit of manual manipulated variable	REAL	100	I	+
MAN_LLM	Low limit of manual manipulated variable	REAL	0	I	+
MAN_OP	Operator input: Manipulated variable	REAL	0	I	+
MAX_CLOS_T_B	Maximum closing time in s (binary measurement)	REAL	3.0	I/O	+, acy
MAX_CLS_TI_AI	Maximum closing time in s	REAL	40.0	I/O	+, acy
MAX_I_PART	High limit of integrator	REAL	80.0	I/O	+, acy
MAX_LIMIT_POS	Max. position reached (for closing time measurement)	REAL	100.0	I/O	+, acy
MIN_I_PART	Low limit of integrator	REAL	-80.0	I/O	+, acy
MIN_LIMI_POS	Min. position reached (for closing time measurement)	REAL	0.0	I/O	+, acy
MO_PVHR	High limit display (measuring range)	REAL	110	I	+
MO_PVLR	Low limit display (measuring range)	REAL	-10	I	+
MODE	Value status and operating mode	DWORD	0	I/O	
MSG_ACK	Acknowledge messages	WORD	0	O	
MSG_EVID	Message ID	DWORD	0	I	+
MSG_LOCK	1=message suppressed	BOOL	0	I	
MSG_STAT	Message error information	WORD	0	O	

Connection (parameter)	Meaning	Data type	Default	Type	O&M
N_DS	Request : read parameter from redundant AddFEM	BOOL	0	O	
NO_BIAS_OUTP	Controller output signal No bias , but with effective output variable limiting for display.	REAL	0.0	O	+
NO_FAULT_ENDP_SEL	Enable limits I_STP_POS_UL/LL	BOOL		I	+
NO_FAULT_P_GR_UL	Process value > I_STOP_POS_UL	BOOL	0	O	+
NO_FAULT_P_LS_LL	Process value < I_STOP_POS_LL	BOOL	0	O	+
OBE_POS_AT_CLS_L	Enable binary input for closing time measurement (close)	BOOL	0	O	+, acy
OBE_POS_AT_OPN_L	Enable binary input for closing time measurement (open)	BOOL	0	O	+, acy
OBIAS_CONST	Constant bias	REAL	0.0	O	+, acy
OCASCADE_ON	Enable cascaded control mode Applies only to PO01 to PO04	BOOL	0	O	+, acy
ODITHER_AMPLITUDE	Amplitude dither frequency	REAL	0.0	O	+, acy
ODITHER_PERIOD	Dither frequency (period) in ms	REAL	0.0	O	+, acy
OFAULT_ER_UL	Limit value 5	REAL	0.0	O	+, acy
OFAULT_ON_DELAY	Trigger delay default: in seconds	REAL	0.0	O	+, acy
OFAULT_Y	Setpoint controller error	REAL	0.0	O	+, acy
OGAIN	GAIN	REAL	0.0	O	+,+, acy
OGAIN_AUX_CH	Factor auxiliary channel in parallel mode	REAL	0.0	O	+, acy
OGAIN_LEAD_CH	Factor leading channel in parallel mode	REAL	0.0	O	+, acy
OGAIN_SINGLE	Factor single mode	REAL	0.0	O	+, acy
OI_STOP_ER_UL	ER-limit for I-stop	REAL	0.0	O	+, acy
OI_STOP_POS_LL	Upper limit Y for I-stop	REAL	0.0	O	+, acy
OI_STOP_POS_UL	Lower limit Y for I-stop	REAL	0.0	O	+, acy
OMAX_CLOS_T_B	Maximum closing time in s (binary measurement)	REAL	0.0	O	+, acy
OMAX_CLOSE_TIME_AI	Maximum closing time in s	REAL	0.0	O	+, acy
OMAX_I_PART	High limit of integrator	REAL	0.0	O	+, acy
OMAX_LIMIT_POS	Max. position reached (for closing time measurement)	REAL	0.0	O	+, acy
OMIN_I_PART	Low limit of integrator	REAL	0.0	O	+, acy
OMIN_LIMI_POS	Min. position reached (for closing time measurement)	REAL	0.0	O	+, acy
OOS	Reserve	BOOL	0	i	+
OP_RAW_CLSD_POS	Configuration of 0% position = set measuring range low limit (primary AddFEM)	REAL	0.0	O	+, acy
OP_RAW_OPEN_POS	Configuration of 100% position = set measuring range high limit (primary AddFEM)	REAL	0.0	O	+, acy
OR_RAW_CLSD_POS	Configuration of 0% position = set measuring range low limit (redundant AddFEM)	REAL	0.0	O	+, acy
OR_RAW_OPEN_POS	Configuration of 100% position = set measuring range high limit (redundant AddFEM)	REAL	0.0	O	+, acy

Connection (parameter)	Meaning	Data type	Default	Type	O&M
OSCALING_FACTOR	Factor auxiliary channel in parallel mode	REAL	0.0	O	+, acy
OSETP_GAIN	Gain DT1	REAL	0.0	O	+, acy
OSETP_TIME1	Time constant DT element for SETPOINT in s	REAL	0.0	O	+, acy
OTN	Correction time TN in s	REAL	0.0	O	+, acy
OTRIP_Y	Setpoint safety	REAL	0.0	O	+, acy
OUTP_GR_MAX	Limit max. 1 > 2	BOOL	0	O	+
OUTP_LS_MIN	Limit min. 1 < 2	BOOL	0	O	+
OY_MAX	Output MAX	REAL	0.0	O	+, acy
OY_MAX_END_POS	MAX end position	REAL	0.0	O	+, acy
OY_MIN	Output MIN	REAL	0.0	O	+, acy
OY_MIN_END_POS	MIN end position	REAL	0.0	O	+, acy
OYEND_POS_LL	(min_end)	REAL	0.0	O	+, acy
OYEND_POS_UL	(max_end)	REAL	0.0	O	+, acy
OYPI_TIME2	Time constant PT1 elements PI_OUTP in s	REAL	0.0	O	+, acy
P_RAW_CLSD_POS	Configuration of 0% position = set measuring range low limit (primary AddFEM)	REAL	0.0	I/O	+, acy
P_RAW_OPEN_POS	Configuration of 100% position = set measuring range high limit (primary AddFEM)	REAL	100.0	I/O	+, acy
PAR_FAULT	Parameter error	BOOL	0	O	+
PI_OUT	P-action and I-action output of the controller	REAL	0.0	O	+
POCO_NR	PoCo channel number (0 to 7)	IN	0	I	
POS_AT_CLS_LIM	Min. position reached Actuation time monitoring analog	BOOL	0	O	+
POS_AT_OPN_LIM	Home position reached Actuation time monitoring analog	BOOL	0	O	+
POS_CTRL_ON	Toggle between normal and loop control function	BOOL		I	+
PV_IN	Process value	REAL	0	I	+
QC_LMN	Quality Code for output LMN	BYTE	16#80	O	
QAUTOP	Control enable for auto mode	BOOL	0	O	
QC_LMN_I	Quality Code for LMN	BYTE	16#80	I	
QC_LMNR_IN	Quality Code for LMNR_IN	BYTE	16#80	I	
QDNRLM	Negative limit of ramp reached	BOOL	0	O	
QMANOP	Control enable for manual mode	BOOL	0	O	+
QC_PV_IN	Quality Code for input LMN	BYTE	16#80	I	
QCAS_CUT	1 = cascade is cut	BOOL	1	I	
QERR_RD	Error when reading parameters	BOOL	0	O	
QERR_WRP	Error when writing parameters to primary AddFEM	BOOL	0	O	
QERR_WRR	Error when writing parameters to redundant AddFEM	BOOL	0	O	
QLMN_HLM	1 = high limit set at manipulated variable output	BOOL	0	O	
QLMN_LLM	1 = low limit set at manipulated variable output	BOOL	0	O	
QMAN_AUT	1 = Auto, 0= Manual	BOOL	0	O	
QMSG_ERR	1= Message error	BOOL	0	O	
QMSG_SUB	1= Message suppressed	BOOL	0	O	
QSP_HLM	1 = setpoint high limit active	BOOL	0	O	
QSP_LLM	1 = setpoint low limit active	BOOL	0	O	

Connection (parameter)	Meaning	Data type	Default	Type	O&M
QSPEXTEN	1 = operate enable for external	BOOL	0	O	
QSPEXTON	1 = external, 0 = internal	BOOL	0	O	+
QSPINTEN	1 = external, 0 = internal	BOOL	0	O	+
QUNRLM	Positive limit of ramp reached	BOOL	0	O	
R_RAW_CLSD_POS	Configuration of 0% position = set measuring range low limit (redundant AddFEM)	REAL	0.0	I/O	+, acy
R_RAW_OPEN_POS	Configuration of 100% position = set measuring range high limit (redundant AddFEM)	REAL	100.0	I/O	+, acy
RACF_P	Rack error, primary AddFEM	BOOL	0	I/O	
RACF_R	Rack error, redundant AddFEM	BOOL	0	I/O	
RAMPON	1 = setpoint / manipulated variable ramp is ON	BOOL	0	I	+
R_PARA	Controller-specific parameter output for redundant AddFEMs	STRUCT	0	O	+
RB_PARA	Controller-specific parameters read from redundant AddFEMs	STRUCT	0	I	
RED_WR	Return signal : parameter written to redundant AddFEMs	BYTE	0	I	
RUNUPCYC	Number of run-up cycles	INT	3	I	
SAMPLE_T	Scan time in s	REAL	0	I	
SCALING_FACTOR	Factor auxiliary channel in parallel mode	REAL	100.0	I/O	+, acy
SEL_WRITE	1=Write parameter by Faceplate 0= Write parameter by interconnection	BOOL	0	I	
SETP_GAIN	Gain DT1	REAL	0.0	I/O	+, acy
SETP_TIME1	Time constant DT element for SETPOINT in s	REAL	2.0	I/O	+, acy
SP	Active setpoint	REAL	0	O	+
SP_BUMPON	1 = bumpless setpoint	BOOL	1	I	+
SP_EXON_L	1 = interconnectable input for Internal/External 0=Internal ; 1= External	BOOL	1	I	+
SP_EXT	External setpoint	REAL	0	I	
SP_HLM	Setpoint high limit	REAL	100	I	
SP_LLM	Setpoint high limit	REAL	0	I	
SP_OP	Setpoint operating input	REAL	0	I	
SP_TRK_ON	1 = track SP_OP setpoint	BOOL	0	I	+
SPEXTHLM	High limit of external setpoint	REAL	100	I	
SPEXTLLM	Low limit of external setpoint	REAL	0	I	
SPEXTSEL	Operating input 0=Internal;1=external	BOOL	0	I/O	+
STEP_NO	Batch step number (significant only to faceplate)	DWORD	0	I	
STOP_I_SEL	Stop I selected	BOOL		I	+
TN	Correction time TN in s	REAL	5.0	I/O	+, acy
TRACK_I_SEL	Tracking selected	BOOL		I	+
TRIP_Y	Tripping setpoint	REAL	-0.7	I/O	+, acy
TRIP_Y_ON	Tripping trigger	BOOL		I	+
URLM	Max. positive gradient of limit of setpoint / manipulated variable	REAL	0	I	+
UPD_PARA	1 = read settings of acyclic controller parameters from AddFEM	BOOL	0	I/O	
UPD_SZEI	1 = read settings of acyclic closing time parameters from AddFEM	BOOL	0	I/O	
USTATUS	Status word in VSTATUS, for user-specific definition	WORD	0	I	
VALUE	Input value	WORD	0	I/O	
VHRANGE	High limit for process value for block CH_AI	REAL	0	O	
VLRANGE	Low limit for process value for block CH_AI	REAL	0	O	

Connection (parameter)	Meaning	Data type	Default	Type	O&M
VSTATUS	Advanced status indication in block symbols	DWORD	0	O	+
WR_PARA	1 = write settings of acyclic controller parameters to AddFEM	BOOL	0	I/O	
WR_SZEI	1 = write settings of acyclic closing time parameters to AddFEM	BOOL	0	I/O	
X_FAULT	Actual value error	BOOL	0	O	+
Y_MAX	Output MAX	REAL	100.0	I/O	+, acy
Y_MAX_END_POS	MAX end position reached	REAL	100.0	I/O	+, acy
Y_MIN	Output MIN	REAL	-100.0	I/O	+, acy
Y_MIN_END_POS	MIN end position reached	REAL	-50.0	I/O	+, acy
YEND_P_GR_UL	X > YEND_POS_UL	BOOL	0	O	+
YEND_P_LS_LL	X < YEND_POS_LL	BOOL	0	O	+
YEND_POS_UL	(max_end)	REAL	100.0	v	+, acy
YPI_TIME2	Time constant PT1 elements PI_OUTP in s	REAL	2.0	I/O	+, acy
YEND_POS_LL	(min_end)	REAL	-90.0	I/O	+, acy

acy = acyclic transfer (DPV1)

4.1.3 Message texts and associated values of CH_AFPOCO

Assignment of message texts / classes to the block parameters of CH_AFPOCO

Message block ALARM_8P	Message number	Block parameter	Default message text	Message class
EV_ID1	1	-	AddFEM @1%d@/: Controller fault	S
	2	-	AddFEM @1%d@/: External fault	S

Assignment of associated values to the block parameters of RED_AFST

Message block ALARM_8P	Associated value	Block parameter	Meaning
EV_ID1	1	POCO_NR	PoCo channel number

See also:

CH_AFPOCO : I/Os

4.1.4 Views of CH_AFPOCO in WinCC

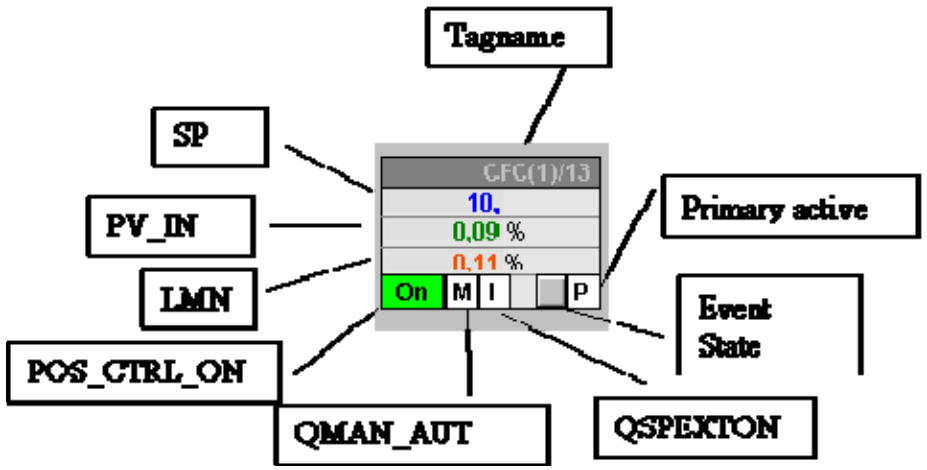


Fig. 4-1 CH_AFPOCO Symbol in WinCC

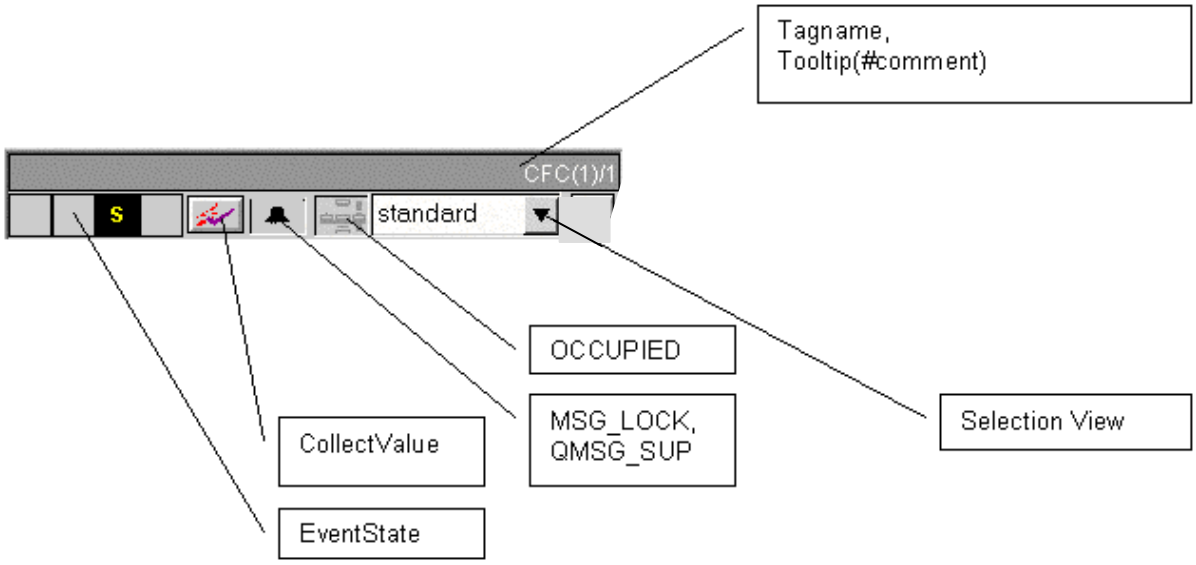


Fig. 4-2 CH_AFPOCO headline in WinCC

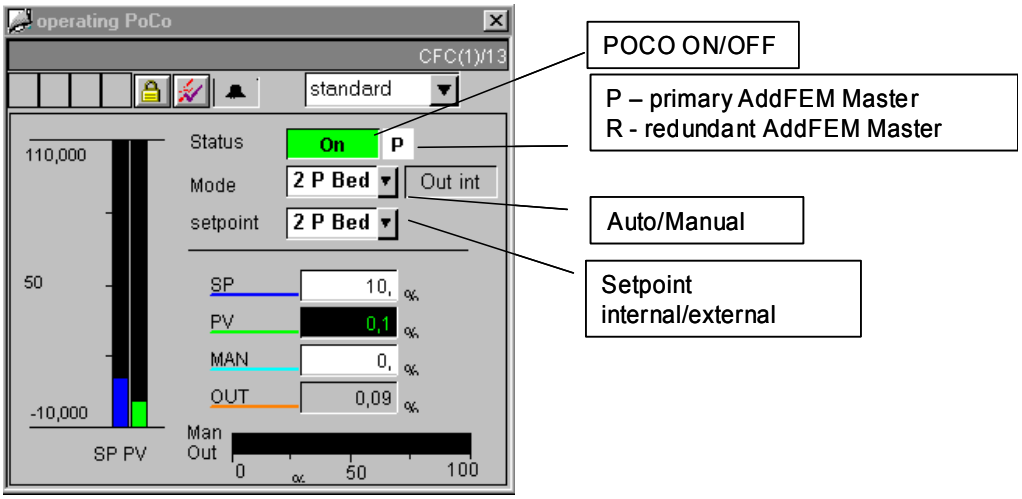


Fig. 4-3 CH_AFPOCO standard view in WinCC

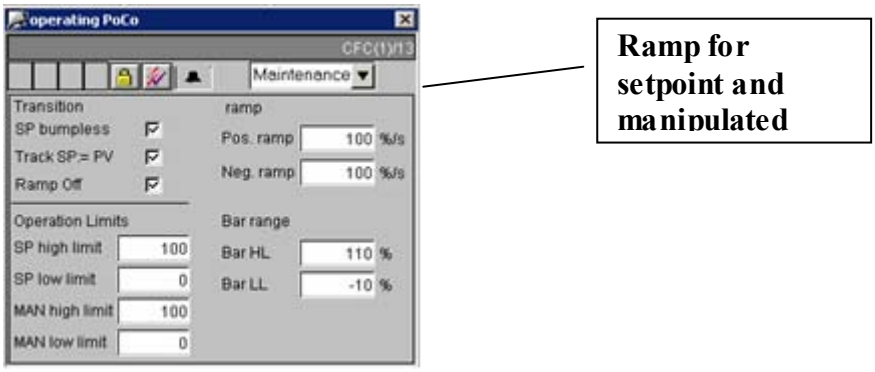


Fig. 4-4 CH_AFPOCO Maintenance WinCC

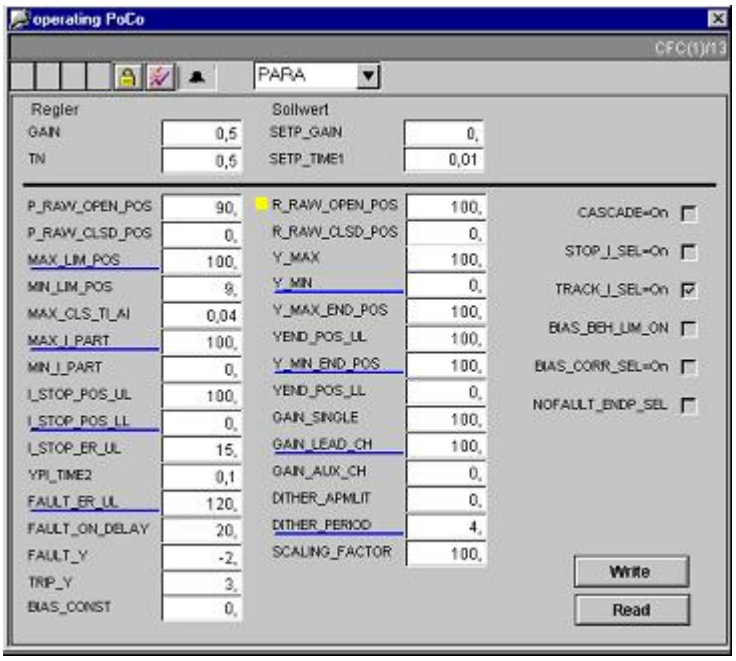


Fig. 4-5 CH_AFPOCO Parameter View WinCC

By using the buttons “Write” and “Read” the parameters are written or read on the AddFEM. Changed parameters are marked with a yellow square. The marking disappears only if the changed parameter was written and read again on the AddFEM.

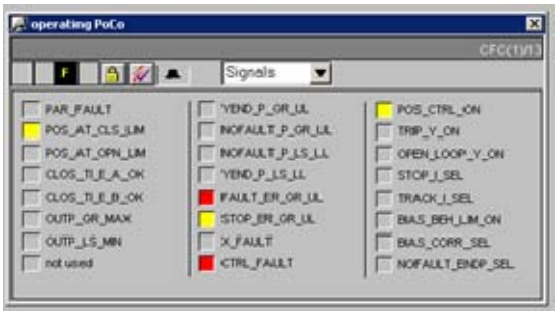


Fig. 4-6 CH_AFPOCO Signal View WinCC

The state “true” of the binary signals is color-coded; yellow for normal operating status, red for failrure.

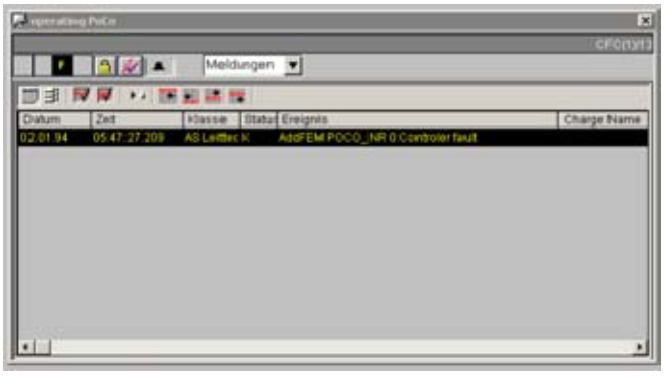


Fig. 4-7 CH_AFPOCO Messagel View WinCC

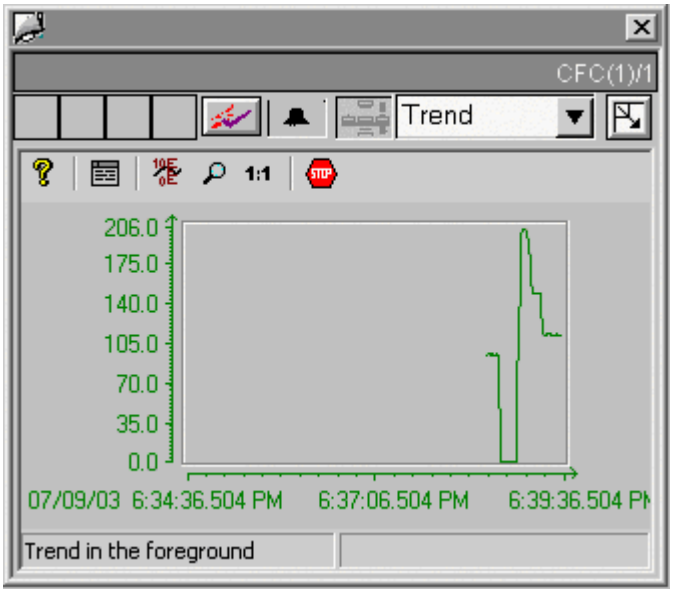


Fig. 4-8 CH_AFPOCO Trend View WinCC

4.2 RED_APOO : : OR - gate for the OMODE_x – outputs of two redundant MOD_x – blocks for PoCo

4.2.1 Description of RED_APOO

Objektname (Art + Nummer)
FB 610

RED_APOO : I/Os

Area of application
The block generates the value status of two redundant AddFEMs.

Calling OBs
The block must be installed in the run sequence of the following OBs
(takes place automatically in CFC):

- OB1 cyclic program
- OB 3x Cyclic interrupt

Usage in CFC
When the CFC function "**Generate module driver**" is used, the system automatically:

- Installs the RED_AFOR block in its runtime group upstream of the runtime group of the channel blocks CH_x to which it is interconnected
- Interconnects:
  - inputs MODE1_x with outputs OMODE_xx of the MOD_1 block in the primary AddFEM
  - inputs MODE2_x with outputs OMODE_xx of the MOD_1 block in the redundant AddFEMs
  - input ACTIV_P with output ACTIV_P of the RED_AFST block
  - input ACTIV_R with output ACTIV_R of the RED_AFST block
  - input RACKF_P with output QRACKF of the MOD_1 block in the primary AddFEM
  - input RACKF_R with output QRACKF of the MOD_1 block in the redundant AddFEMs
  - output OACTIV_P with input ACTIV_P of CH_AFPCOC block
  - output OACTIV_R with input ACTIV_R of CH_AFPCOC block
  -

Function and function principle
The block sets the value status MOD_xx of the active AddFEM at output parameter OMOD_xx. The active AddFEM is selected by input parameter ACTIV_P and AKTIV_R.
If a AddFEM device failure or bus error is detected, the block sets the outputs RACF_P = TRUE or RACF_R = TRUE.

Redundancy
The operating system evaluates bus redundancy at the DP master systems of an H system.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
n.a.

Message characteristics
n.a.

Operating and monitoring
The block does not contain a faceplate.

Note: "Connections of ..." (column O&M "+") identifies the tags transferred to the OS, if the "enable operation and monitoring" option is set in the object properties of the block in the CFC. Default:
Option not set.

4.2.2 RED_APOO : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Type	O&M
ACTIV_P	1= primary AddFEM active	BOOL	0	I	
ACTIV_R	1= redundant AddFEM active	BOOL	0	I	
MODE1_xx	Channel mode (xx = 00 to 7) of the primary module	DWORD	0	I	
MODE2_xx	Channel mode (xx = 00 to 7) of the redundant modules	DWORD	0	I	
OACTIV_P	1= primary AddFEM active	BOOL	0	O	
OACTIV_R	1= redundant AddFEM active	BOOL	0	O	
OMODE_xx	Channel mode (xx = 00 to 7)	DWORD	0	O	+
RACKF_P	1= Device failure at primary AddFEM	BOOL	0	I	
RACkF_R	1= Device failure at redundant AddFEM	BOOL	0	I	
RACF_P	1= Device failure at primary AddFEM	BOOL	0	O	
RACF_R	1= Device failure at redundant AddFEM	BOOL	0	O	

4.3 RED_APOU : Copies process image of outputs for PoCo and writes data to the redundant AddFEM

4.3.1 Description of RED_APOU

Objektname (Art + Nummer)
FB 609

RED_APOU : I/Os

Area of application
Update of the process image of the redundant AddFEM.

Calling OBs
The block must be installed in the run sequence of the following OBs
(takes place automatically in CFC):

- OB 3x Cyclic interrupt

Usage in CFC
When the CFC function "**Generate module driver**" is used, the system automatically:

- Installs the RED_APOU block in the OB of the CH_AFPOCO PoCo channel blocks to which it is interconnected, in its runtime group following this channel block runtime group
- Interconnects:
  - inputs R_PARx with the outputs R_PAR of the relevant CH_AFPOCO PoCo channel blocks
  - outputs RED_WRx with the RED_WR inputs of the relevant CH_AFPOCO PoCo channel block
  - outputs RED_WRx with the RED_WR inputs of the relevant CH_AFPOCO PoCo channel blocks
  - input ACTIV_P with output ACTIC_P of RED_AFST
  - input ACTIV_R with output ACTIC_R of RED_AFST
  - input LADDR1 with output OLADDR1 at AFN_ADDR/AF_ADDR of the primary AddFEM
  - input LADDR2 with output OLADDR1 at AFN_ADDR/AF_ADDR of the redundant AddFEM
  - input LENG with output LENG at AFN_ADDR/AF_ADDR of the primary AddFEM

Function and operating principle
When ACTIV_P = 1, the block copies the values from the process image of outputs at the start addresses defined at parameter LADDR1 to the process image area at the start addresses defined at parameter LADDR2. The number of copied words is defined at parameter LENG. It is thus ensured that both redundant AddFEMs are supplied with identical output values. The block does not process the data when both input parameters are ACTIV_P = 0 and ACTIV_R = 0.
The block writes the acyclic PoCo parameters to the redundant AddFEM. The parameters are transferred at the R_PARx structure. This structure contains the control word used to output the read request from the CH_AFPOCO PoCo channel blocks. The information indicating successful completion or cancellation of the write request is written to output RED_WRx. Output QERR_WR = TRUE if an error is detected.

Redundancy
The block is used for redundant operation of AddFEM.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
n.a.

Time characteristics
n.a.

Message characteristics
n.a.

Operating and monitoring
The block does not contain a faceplate.
Note: "Connections of ..." identifies the tags transferred to the OS (at column O&M "+") if "enable operating and monitoring" is set at the block properties in the CFC. Default: Option not set.

4.3.2 RED_APOU : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (Parameter)	Meaning	Data type	Default	Type	O&M
ACTIV_P	1 = primary AddFEM its active	BOOL	0	I	
ACTIV_R	1 = redundant AddFEM is active	BOOL	0	I	
LADDR1	Logic address of the primary AddFEM	INT	0	I	
LADDR2	Logic address of the redundant AddFEM	INT	0	I	
LENG	Number of words to copy	INT	0	I	
QERR_WR	1= write error	BOOL	0	0	
R_PARx	Acyclic parameters of PoCo channel x (x = 0 ...7)	ISTUCT	0	I	
RED_WRx	Return value of the write job	BYTE	0	0	

4.4 RED_APIN : Copies process of image inputs for PoCo and reads data from the redundant AddFEM

4.4.1 Description of RED_APIN

Objektname (Art + Nummer**)**
FB611

RED_APIN : I/Os

Area of application
The block updates the process image of the redundant AddFEM.

Calling OBs
The block must be installed in the run sequence of the following OBs
(takes place automatically in CFC):

- OB 3x Cyclic interrupt

Usage in CFC
When the CFC function "**Generate module driver**" is used, the system automatically:

- Installs the RED_APIN block in the OB of the CH_AFPOCO PoCo channel blocks to which it is interconnected, in its runtime group following this channel block runtime group
- Interconnects:
  - outputs RB_PARAx with the RB_PARA inputs of the relevant CH_AFPOCO PoCo channel blocks
  - inputs N_DSx with the N_DS outputs of the relevant CH_AFPOCO PoCo channel blocks
  - outputs RED_WRx with the RED_WR inputs of the relevant CH_AFPOCO PoCo channel blocks
  - input ACTIV_P with output ACTIC_P of RED_AFST
  - input ACTIV_R with output ACTIC_R of RED_AFST
  - input LADDR1 with output OLADDR1 at AFN_ADDR/AF_ADDR of the primary AddFEM
  - input LADDR2 with output OLADDR1 at AFN_ADDR/AF_ADDR of the redundant AddFEM
  - input LENG with output LENG at AFN_ADDR/AF_ADDR of the primary AddFEM

Function and operating principle

The block reads the input parameters ACTIV_P and ACTIV_R to determine the active and passive state of the redundant AddFEMs. The LADDR1 and LADDR2 parameters return the start addresses of the redundant modules. The address at parameter LADDR1 forms the start address of the process image area assigned to the parameters of the channel blocks. When ACTIV_P = 1, the block copies the number of words defined at LENG from the process image starting at address LADDR1 to the process image starting at address LADDR2. When ACTIV_P = 1, source and destination data are interchanged. This ensures block operation with valid values (values from the active AddFEM.)
The block does not process any data when the status at both input parameters ACTIV_P = 0 and ACTIV_R = 0.
The block reads the acyclic PoCo parameters from the redundant AddFEM. Those parameters are saved to the R_PARx structure which contains the control word for positive or negative read job acknowledgment at the CH_AFPOCO PoCo channel blocks. The

CH_AFPOCO PoCo channel blocks request the read job when parameter N_DS = true.
Output QERR_RD = TRUE when an error is detected.

Redundancy
The block is used for redundant operation of AddFEM.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
n.a

Time characteristics
n.a.

Message characteristics
n.a.

Operating and monitoring
The block does not contain a faceplate.
Note: "Connections of ..." identifies the tags transferred to the OS (at column O&M "+") if "enable operating and monitoring" is set at the block properties in the CFC.
Default:
Option not set.

4.4.2 RED_APIN : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Type O&M
ACTIV_P	1 = primary AddFEM its active	BOOL	0	I
ACTIV_R	1 = redundant AddFEM is active	BOOL	0	I
LADDR1	Logic address of the primary AddFEM	INT	0	I
LADDR2	Logic address of the redundant AddFEM	INT	0	I
LENG	Number of words to copy	INT	0	I
N_DSx	Read job request	BYTE	0	0
QERR_RD	1= read error	BOOL	0	0
RB_PARAx	Read back acyclic parameters of PoCo channel x (x = 0 to 7)	STUCT	0	O

5 FEF-SoE - blocks

5.1 SOE_PARA : Sequence of Event – parameterize function in AddFEM

5.1.1 Description of SOE_PARA

Objektname (Art + Nummer)
FB612

SOE_PARA : I/Os

Area of application
The block updates the SoE (Sequence of Event) parameters of an AddFEM with SoE functionality.

Calling OBs
Install the block in the run sequence of a Cyclic interrupt OB (OB 32, for example), in the cyclic program, and in startup OB100. In the CFC, it is automatically installed in OB 1and OB100.
.

Usage in CFC
When the CFC function "**Generate module driver**" is used, the system automatically:

- Configures
  - input RACF to output QRACKF des MOD_D1
  - input LADDR_I to the logic slot address of the inputs
  - input LADDR_O the logic slot address of the outputs
- Interconnects
  - input MODE with the relevant OMODE_xx output at the MOD_1 block

Function and operating principle
The block transfers the SoE parameters to the AddFEM using acyclic PROFIBUS DP services. On request, it successively transfers all 32 data records. This data record transfer to the AddFEM is initiated by a CPU restart, power on, after a bus error at the AddFEM, and by setting parameter WR_PARA. The first data record contains the global parameters: sign-of-life interval, number of events to go until a buffer overflow occurs, and a transfer interval for the message buffer. The remaining 31 data records contain signal-specific parameters: enable SoE, enable flutter suppression, positive/negative signal edge, and flutter suppression parameters. Output QERR_WR = FALSE when an error is detected.
Input parameter VALUE must be interconnected with the first input bit of the SoE module (slot).

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
n.a.

Time characteristics
n.a.

Message characteristics
n.a.

Operating and monitoring
The block does not contain a faceplate.
Note: "Connections of ..." identifies the tags transferred to the OS (at column O&M "+") if "enable operating and monitoring" is set at the block properties in the CFC.
Default:
Option not set.

5.1.2 SOE_PARA : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (parameter)	Meaning	Data type	Default	Type O&M
EV_BUF_TR_I	Event buffer transfer interval in s	REAL	0	I
EVENT_NR	Number of events before buffer overflow	INT	1000	I
FL_MON_ON1	1= Flutter suppression enabled	BOOL	0	I
FL_MON_ON2	1= Flutter suppression enabled	BOOL	0	I
FL_MON_ON3	1= Flutter suppression enabled	BOOL	0	I
FL_MON_ON5	1= Flutter suppression enabled	BOOL	0	I
	.			
	.			
	.			
FL_MON_ON32	1= Flutter suppression enabled	BOOL	0	I
FL_MON_WIN1	Flutter suppression monitoring window in s	REAL	10.0	I
FL_MON_WIN2	Flutter suppression monitoring window in s	REAL	10.0	I
FL_MON_WIN3	Flutter suppression monitoring window in s	REAL	10.0	I
FL_MON_WIN5	Flutter suppression monitoring window in s	REAL	10.0	I
	.			
	.			
	.			
FL_MON_WIN32	Flutter suppression monitoring window in s	REAL	10.0	I
FL_NUM_OF_SIG1	Number of edge transitions for flutter suppression	BYTE	5	I
FL_NUM_OF_SIG2	Number of edge transitions for flutter suppression	BYTE	5	I
FL_NUM_OF_SIG3	Number of edge transitions for flutter suppression	BYTE	5	I
FL_NUM_OF_SIG5	Number of edge transitions for flutter suppression	BYTE	5	I

Connection (parameter)	Meaning	Data type	Default	Type O&M
	.			
	.			
	.			
FL_NUM_OF_SIG32	Number of edge transitions for flutter suppression	BYTE	5	I
LADDR_I	Address process image of inputs of SoE	INT	0	I
LADDR_O	Address process image of outputs of SoE	INT	0	I
MODE	Value status and mode of operation	DWORD	0	I/O
SOE_CTRL_ON1	1 = SoE **Signal 1** is set	BOOL	0	I
SOE_CTRL_ON2	1 = SoE **Signal 2** is set	BOOL	0	I
SOE_CTRL_ON3	1 = SoE **Signal 3** is set	BOOL	0	I
SOE_CTRL_ON5	1 = SoE **Signal 5** is set	BOOL	0	I
	.			
	.			
	.			
SOE_CTRL_ON32	1 = SoE **Signal 32** is set	BOOL	0	I
SOE_FLANK	Pos./neg. edge detection for the SOE_DRV block	STUCT	0	O
SOE_LIVE_I	Sign-of-life interval in s	REAL	0	I
SOE_SIGFLANK1	0 = Incoming event at positive edge 1 = Incoming event at negative edge	BOOL	0	I
SOE_SIGFLANK2	0 = Incoming event at positive edge 1 = Incoming event at negative edge	BOOL	0	I
SOE_SIGFLANK3	0 = Incoming event at positive edge 1 = Incoming event at negative edge	BOOL	0	I
SOE_SIGFLANK5	0 = Incoming event at positive edge 1 = Incoming event at negative edge	BOOL	0	I
	.			
	.			
	.			
SOE_SIGFLANK32	0 = Incoming event at positive edge 1 = Incoming event at negative edge	BOOL	0	I
RACF	Rack error AddFEM	BOOL	0	I/O
QERR_WR	1 = write data record error	BOOL	0	O
VALUE	Input value process image of inputs	BOOL	0	I/O
WRD_PARA	1 = write data records	BOOL	0	1
VALUE	Input value process image of inputs	BOOL	0	I/O

5.2 SOE_DRV : Sequence of Event – Driver

5.2.1 Description of SOE_DRV

Objektname (Art + Nummer)
FB613

SOE_DRV : I/Os

Area of application
The block transfers process signal changes with time stamp, and events which are not signal-specific (special messages) from an AddFEM with SoE functionality to the OS.

Calling OBs
The block must be installed in the run sequence of the following OBs
(takes place automatically in CFC):

- OB 1 cyclic program
- OB 57 user-specific interrupt
- OB 100 restart (warm restart)

Usage in CFC
When the CFC function "**Generate module driver**" is used, the system automatically:

- Installs the SOE_DRV block in the OBs (see above) of its runtime group
- Interconnects:
  - input RAC_DIAG with output RAC_DIAG at the OBDIAG1 block
  - structure SOE_FLANK with structure SOE_FLANK at the SOE_PARA block

Function and operating principle
In an AS, the block forms the interface between an AddFEM and the OS (WinCC.) It reads the AddFEM message buffer, and then transfers those messages to the OS using the ALARM_T message function. The ALARM_T message function represents an ALARM_8P block whose time stamp values for its eight messages are written to the first associated value in a byte array.

- User-specific interrupt: The AddFEM generates a user-specific interrupt when new messages were received (see manual 6DL3100-8AC03). Based on the start information at the user-specific interrupt OB, the block calls SFB 54 (RALARM) to save the data record number and the number of messages in the data record for cyclic processing. A data record may contain up to 14 events. New data will be lost if the maximum (1500 events) is exceeded.
- Cyclic processing: SFC 59 (RD_REC, read data record) reads the relevant data record (message buffer) if any messages are queued for reading. It searches for the data record based on exception events, and on the events 1 to 3 and 5 to 32. If a match is found, the message is assigned the corresponding event ID (EV_ID_xxx) and signal number (1 to 8) of the ALARM_T block. The message time stamp (8 bytes) is written to the ARRAY of bytes (index according to the signal number at ALARM_T).

  When all messages are assigned, the block calls the ALARM_T block to transfer the messages to the OS. The return messages of the ALARM_T blocks and of ALARM_8P (M_STAT_x, M_ACK_x) are available at the block output. When M_STAT_x= 11 (previous job not yet done), it once again calls ALARM_T in the next cycle. In any other situations, messages may be lost.
  Specific ALARM_T blocks can be disabled by setting the parameters M_LOCK_x = 1.

Redundancy
The block can be implemented in H system. It does not support device redundancy of the AddFEM.

Error handling
The plausibility of input parameters is not checked.

Startup characteristics
n.a

Time characteristics
n.a

Message characteristics
The block uses five ALARM_T blocks which are implemented as multiple instances. The eight time stamp values are transferred at each call of ALARM_T in an ARRAY [0...65] of BYTE. Structure of this ARRAY:
BYTES 0 to 1: recognition of the format of the next data/time stamps
BYTES 2 to 9: date/time stamps for signal_1
BYTES 10 to 17: date/time stamps for signal_2
.
.
.
.
BYTE 58 - 65: date/time stamps for signal_8
The format ID at bytes 0 to 1 defines the bit coding of the time stamp structure (8 bytes per time stamp value):

Format ID	Byte 0 = 0, Byte 1 = 0	Date / time in SIMATIC S7 BCD format (DATE_AND_TIME)
	Byte 0 = 0, Byte 1 = 1	Date / time in ISP format

Time stamp in ISP format
Complete time according to ISP specification (time since 1.1.1900; 0:00 h). The first four bytes are used for seconds (units) and express the time expired since 1.1.1900; 0:00 h in seconds.
BYTE 0 to 3 : seconds (4 BYTE)
BYTE 4 to 7 : 4-seconds fractions (4 BYTE)
The driver passes the time stamp returned by the IM without changes in ISP format.
When the driver is operating in cyclic mode, the ALARM_T blocks will only be called if the signal states have changed. This avoids unnecessary load in runtime.

Operating and monitoring
The block does not contain a faceplate.
Note: "Connections of ..." identifies the tags transferred to the OS (at column O&M "+") if "enable operating and monitoring" is set at the block properties in the CFC. Default: Option not set.

5.2.2 SOE_DRV : I/Os

The default state of the block representation in CFC is indicated in the connection column: connection name in **bold** = connection is visible, standard = invisible

Connection (Parameter)	Meaning	Data type	Default	Type O&M
LADDR_I	Address process image of inputs of SoE	INT	0	I
LADDR_O	Address process image of outputs of SoE	INT	0	I
M_ACK_x	Message acknowledgment ALARM_T_x (x = 1 to 5)	WORD	0	O
M_EVID_x	Message number for ALARM_T_x (x = 1 to 5)	DWORD	0	I
M_LOCK_x	Disable ALARM_T_x (x = 1 - 5) messages	BOOL	0	I
M_STAT_x	Message status ALARM_T_x (x = 1 to 5)	WORD	0	O
QERR_RD	1 = data record read error	INT	0	O
QM_ERR_x	Error in message block execution ALARM_T_x (x = 1 to 5)	BOOL	0	O
RAC_DIAG	Rack diagnostics of the OBDIAG1 block	STUCT	0	I
RUNUPCYC	Disable messages at startup for n number of cycles (n=3)	INT	3	I
SOE_FLANK	Pos./neg. edge detection for the SOE_DRV block	BOOL	0	O

See also:

Message texts and associated values of SOE_DRV

5.2.3 Message texts and associated values of SOE_DRV

Assignment of the message text and class of ALARM_T1

Message block ALARM_8P	Message number	Signal assignment	Default message text	Message class
M_EVID_1	1	Exception event	Start the process	S
	2	Exception event	Clock difference	S
	3	Exception event	Buffer_overflow	S
	4	Exception event	SoE sign of live	S
	5	Exception event	Synchronization failure	S
	6	Exception event	Flutter suppression	S

Assignment of associated values at ALARM_T1

Message block ALARM_8P	Associated value	Block parameter	Meaning
EV_ID1	1	Timestamp[0]	Array of BYTE for time stamping

Assignment of the message text and class of ALARM_T2

Message block ALARM_8P	Message number	Signal assignment	Default message text	Message class
M_EVID_2	1	Sig_1 (DI_1)	SIG_TEXT_1	S
	2	Sig_2 (DI_2)	SIG_TEXT_2	S
	3	Sig_3 (DI_3)	SIG_TEXT_3	S
	5	Sig_5 (DI_5)	SIG_TEXT_5	S
	6	Sig_6 (DI_6)	SIG_TEXT_6	S
	7	Sig_7 (DI_7)	SIG_TEXT_7	S
	8	Sig_8 (DI_8)	SIG_TEXT_8	S

Assignment of associated values at ALARM_T2

Message block ALARM_8P	Associated value	Block parameter	Meaning
EV_ID1	1	Timestamp[1]	Array of BYTE for time stamping

Assignment of the message text and class of ALARM_T3

Message block ALARM_8P	Message number	Signal assignment	Default message text	Message class
M_EVID_3	1	Sig_9 (DI_9)	SIG_TEXT_9	S
	2	Sig_10 (DI_10)	SIG_TEXT_10	S
	3	Sig_11 (DI_11)	SIG_TEXT_11	S
	4	Sig_12 (DI_12)	SIG_TEXT_12	S
	5	Sig_13 (DI_13)	SIG_TEXT_13	S
	6	Sig_14 (DI_14)	SIG_TEXT_14	S
	7	Sig_15 (DI_15)	SIG_TEXT_15	S
	8	Sig_16 (DI_16)	SIG_TEXT_16	S

Assignment of associated values at ALARM_T3

Message block ALARM_8P	Associated Wert	Block parameter	Meaning
EV_ID1	1	Timestamp[2]	Array of BYTE for time stamping

Assignment of the message text and class of ALARM_T4

Message block ALARM_8P	Message number	Signal assignment	Default message text	Message class
M_EVID_4	1	Sig_1 (DIO_1)	SIG_TEXT_17	S
	2	Sig_2 (DIO_2)	SIG_TEXT_18	S
	3	Sig_3 (DIO_3)	SIG_TEXT_19	S
	4	Sig_4 (DIO_4)	SIG_TEXT_20	S
	5	Sig_5 (DIO_5)	SIG_TEXT_21	S
	6	Sig_6 (DIO_6)	SIG_TEXT_22	S
	7	Sig_7 (DIO_7)	SIG_TEXT_23	S
	8	Sig_8 (DIO_8)	SIG_TEXT_24	S

Assignment of associated values at ALARM_T4

Message block ALARM_8P	Associated value	Block parameter	Meaning
EV_ID1	1	Timestamp[3]	Array of BYTE for time stamping

Assignment of the message text and class of ALARM_T5

Message block ALARM_8P	Message number	Signal assignment	Default message text	Message class
M_EVID_5	1	Sig_9 (DIO_9)	SIG_TEXT_25	S
	2	Sig_10 (DIO_10)	SIG_TEXT_26	S
	3	Sig_11 (DIO_11)	SIG_TEXT_27	S
	4	Sig_12 (DIO_12)	SIG_TEXT_28	S
	5	Sig_13 (DIO_13)	SIG_TEXT_29	S
	6	Sig_14 (DIO_14)	SIG_TEXT_30	S
	7	Sig_15 (DIO_15)	SIG_TEXT_31	S
	8	Sig_16 (DIO_16)	SIG_TEXT_32	S

Assignment of associated values at ALARM_T5

Message block ALARM_8P	Associated value	Block parameter	Meaning
EV_ID1	1	Timestamp[4]	Array of BYTE for time stamping

See also:
SOE_DRV : I/Os

Appendix

A.1 Technical data

Meaning:

Block type name

Symbolic name in the symbol table of the library for the corresponding FB or FC.
These names must be unique in the project.

FB/FC no.

Block number.

Typical runtime

Time normally required by the CPU for processing the corresponding block program (for example, for a driver this represents the execution time in the cyclic interrupt OB (OB3x) without generation of a channel error message). The table below shows the runtime of blocks in a CPU S7 414-4. The block runtime on other CPUs depends on the CPU performance

Block length

Memory requirements of the program code, once for each block type.

Length of instance data

Memory requirement of an instance DB

Temporary memory

Local data requirements for one block execution cycle. This limit is CPU-specific; a CPU STOP will be triggered if it is exceeded. You must verify this in your CPU configuration and redistribute memory to the blocks if necessary.

Multiple instance blocks

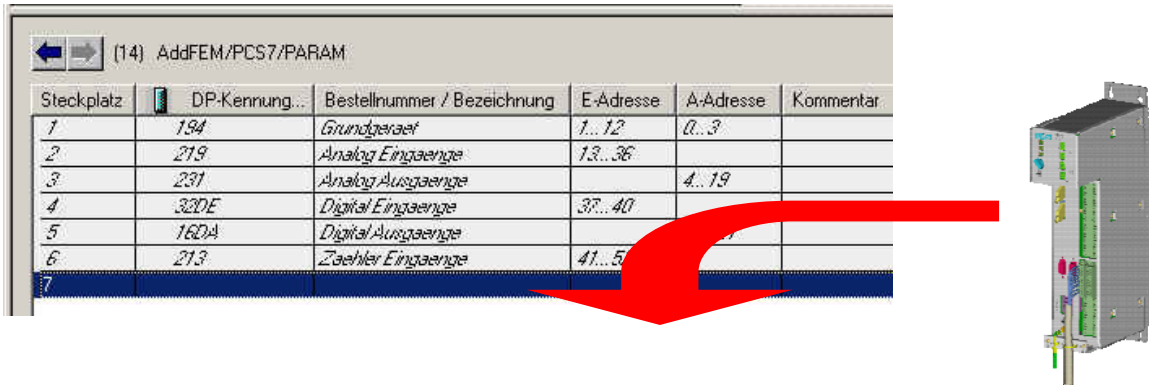
The blocks specified are used by the block, must be implemented in the user program and are stored in the same library.

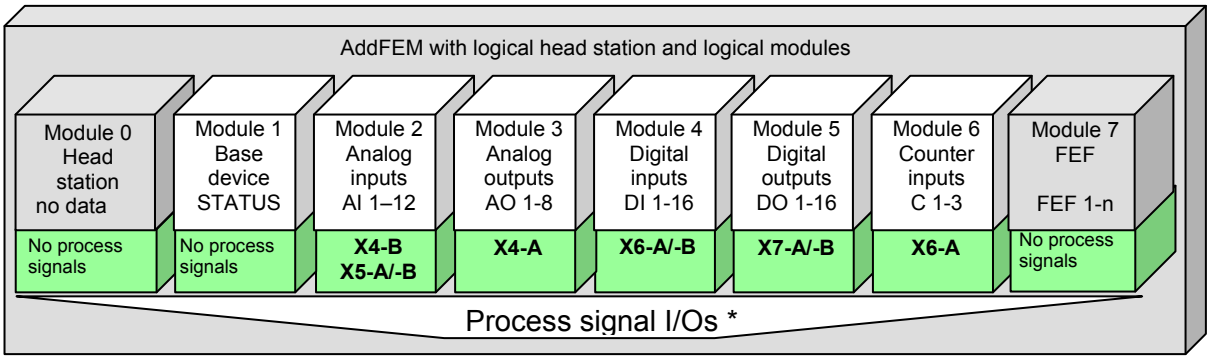
AddFEM Driver blocks A5E00075541AE-02 57 - 58 Edition 01/2006 AddFEM Driver blocks

Block (Type name)	FB/FC no.	Typical runtime CPU 414-4 (µs)	Block length in load/user memory (bytes)	Instance data length in load/user memory (bytes)	Temporary memory (bytes)	Multiple instance
AF_ADDR	**FB606**	**10**	**482 / 338**	**162 / 58**	**4**	
AFN_ADDR	**FB607**	**10**	**482 / 338**	**162 / 58**	**4**	
CH_ADDFEM	**FC602**	**8**	**102 / 48**	**- / -**	**2**	
CH_AFCO	**FB614**	**32**	**1426 / 1152**	**302 / 98**	**84**	
CH_AFHV	**FC601**	**28**	**422 / 308**	**- / -**	**6**	
CH_AFPOCO	**FB608**	**350**	**9908 / 8716**	**1906 / 940**	**120**	**SFB35**
RED_AFIN	**FB602**	**20**	**272 / 192**	**108 / 44**	**16**	
RED_AFOR	**FB616**	**40**	**2010 /1624**	**1054 / 680**	**6**	
RED_AFOU	**FB603**	**20**	**250 / 176**	**108 / 44**	**16**	
RED_AFST	**FB600**	**38**	**2466 / 2092**	**450 / 202**	**20**	**SFB35**
RED_APIN	**FB611**	**25**	**2658 / 1834**	**1400 / 644**	**76**	
RED_APOO	**FB610**	**42**	**590 / 344**	**628 /392**	**6**	
RED_APOU	**FB609**	**25**	**2618 / 1798**	**1406 / 650**	**76**	
RED_AZIN	**FB615**	**25**	**1152 / 940**	**256 / 84**	**76**	
SOE_DRV	**FB613**	**40**	**8490 / 7358**	**2262 / 1400**	**104**	**SFB34, SFB35**
SOE_PARA	**FB612**	**65**	**6348 / 5192**	**1014 / 286**	**98**	

A.2 Device model – module allocation (when using PCS 7)

The AddFEM features analog and digital inputs and outputs as well as count pulse inputs for speed detection. The AddFEM can be optionally equipped with a pre-processing function (FEF) (software function).
Signal types are allocated in logical modules (similar to a modular DP device with pluggable I/O modules) for the display and processing of the various AddFEM signal types in the higher-level PCS 7 host system. The allocation to logical modules corresponds to the numbering below the heading Slot for the hardware configuration, for example in HW-Config.

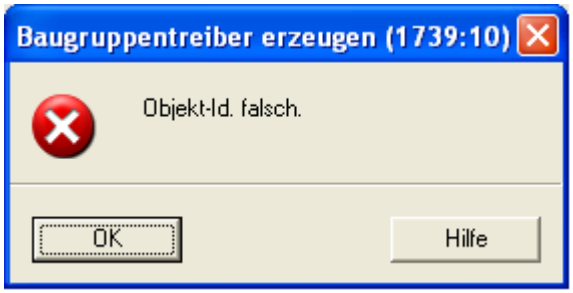


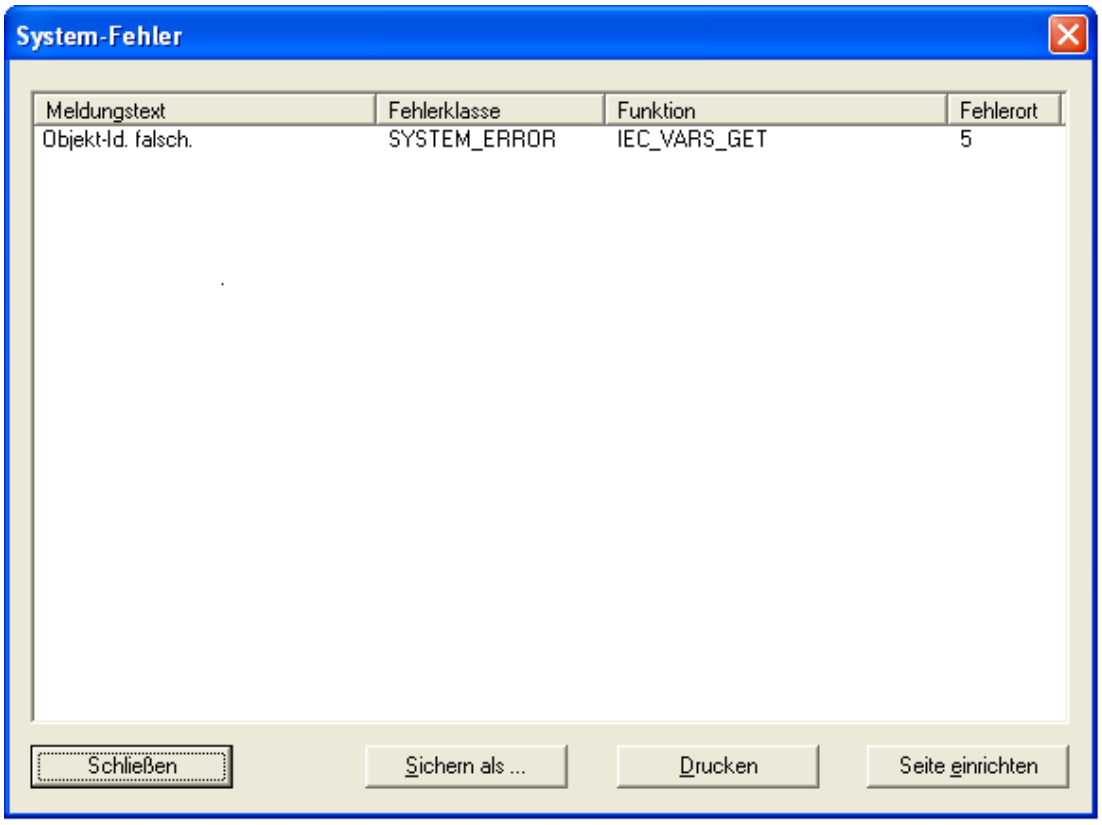


* You can find the I/O assignments in manual 6DL3100-8AC appendix A.1 “Front connector pin assignment”

A.3 Product Information: “Error message 'False object id' in PCS 7 V7.0 SP1-SP3”

The "Generate block drivers" function aborts and the following error message appears:





This error message and abort can be avoided, if at least one channel block is installed for each slot of the AddFEM (analog inputs, analog outputs, digital inputs and digital outputs) and connected to the symbolic name of the logical address, even if the value is not actually necessary for the remaining functions.