ABB solar inverters

Application guide
Adaptive program for PVS800 central inverters

Power and productivity
for a better world™

List of related manuals

Hardware manuals and guides	Code (English)	
PVS800-57 hardware manual	*3AUA0000053689*	1)

Firmware manuals and guides	Code (English)	
PVS800 firmware manual	*3AUA0000058422*	1)
Application guide: Adaptive program for PVS800	*3AUA0000091276*	

Option manuals and guides	
Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.	2)

1) Delivered as a printed copy with the PVS800.

2) Delivered as a printed copy with the option.

Application guide

Adaptive program for
PVS800 central inverters

Table of contents

3AUA0000091276 Rev A
EN
EFFECTIVE: 2010-12-20

Table of contents

Further information

1

Introduction to the guide

What this chapter contains

This chapter gives general information on the guide.

Applicability

The guide is applicable to the master control program of PVS800 central inverters.

Note: All parameter numbers and names refer to the PVS800 master control program (see *PVS800 Firmware manual)* unless otherwise indicated.

Safety instructions

Follow all safety instructions delivered with the PVS800.

- Read the complete safety instructions before you install, commission, or use the PVS800. The complete safety instructions are given at the beginning of the *Hardware Manual.*
- Read the software function specific warnings and notes before changing the default settings of the function. These warnings and notes are presented together with the parameter descriptions wherever appropriate.

WARNING! ABB is not responsible for the operation of a custom-made adaptive program, or for any damage or injury caused by the use of it.

Target audience

This manual is intended for people who adjust the parameters of, or operate, monitor or troubleshoot PVS800 central inverters.

The reader is expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

Contents of the guide

The guide is to be used together with the *PVS800 firmware manual*. The firmware manual contains the basic information on the master control program parameters including the parameters of the adaptive program. This guide gives more detailed information on the adaptive program:

- what the adaptive program is
- how to build an adaptive program
- how the function blocks operate
- how to document the adaptive program.

2

Adaptive program

What this chapter contains

This chapter describes the basics of the adaptive program and instructs in building a program.

What an adaptive program is

Conventionally, the user can control the operation of the PVS800 by parameters. Each parameter has a fixed set of choices or a range of settings. The parameters make programming easy, but the choices are limited: you cannot customize the operation any further. The adaptive program makes freer customization possible without the need of a special programming tool or language.

The adaptive program is built of function blocks (see listing starting on page *13*) by using the DriveAP 2.x PC tool or the CDP 312R control panel. The maximum size of the adaptive program is 10 blocks at 10 ms time level and 20 blocks at 100 ms time level.

The user can document the program by drawing it on block diagram template sheets.

Notes:

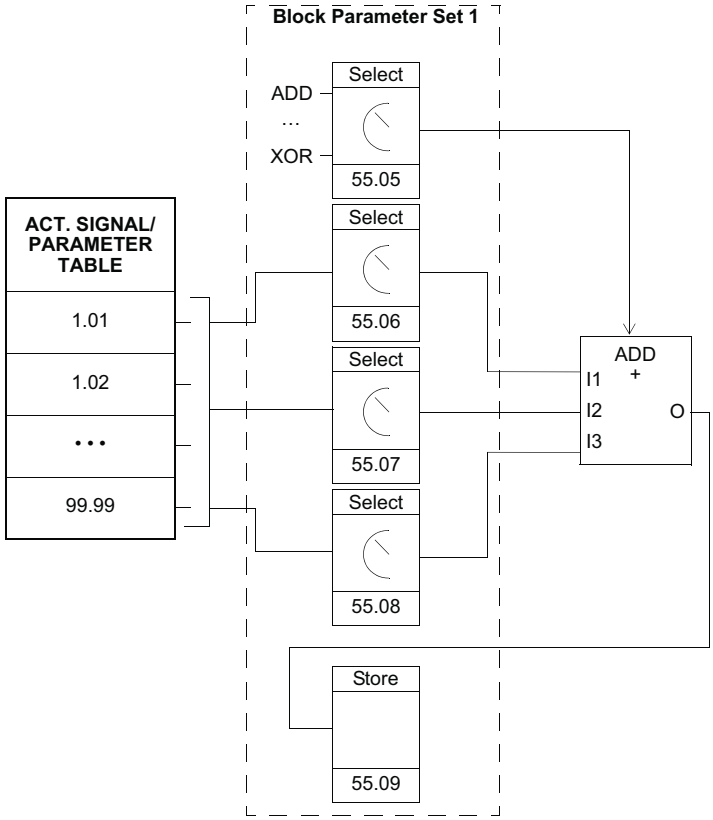
- Only the **master** control program of the PVS800 is intended to be programmed this way.
- If the adaptive program originally created using the DriveAP 2.x tool is modified with the control panel, the function block view in DriveAP 2.x will be different since the location of the function blocks cannot be determined by the control panel.

How to build the program

The programmer connects a function block to other blocks through a block parameter set. The sets are also used for reading values from the master control program, and transfering data to the master control program. Each block parameter set consists of five parameters.

The figure shows the use of block parameter set 1 in the PVS800 master control program (parameters 55.05…55.09).

- Parameter 55.05 selects the function block type
- Parameter 55.06 selects the source that input I1 of the function block is connected to
- Parameter 55.07 selects the source that input I2 of the function block is connected to
- Parameter 55.08 selects the source that input I3 of the function block is connected to
- Parameter 55.09 stores the value of the function block output. The user cannot edit the parameter value.



How to connect the adaptive program to the PVS800 master control program

The output of the adaptive program needs to be connected to the PVS800 master control program. For that purpose, the user needs

- a *WR-I* block for parameters that need a numerical value
- a *WR-PB* block for packed Boolean types of parameters where bits of a word are set.

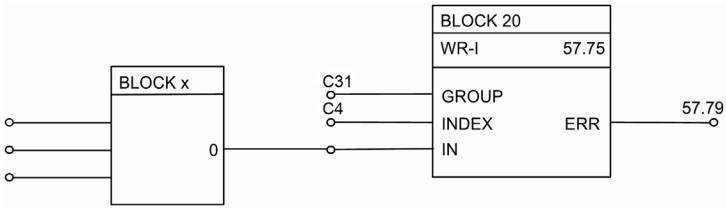
How to control the execution of the program

The adaptive program executes the function blocks in numerical order. The execution order of the blocks can be changed by DriveAP 2.x. The user can

- select the time level, either 10 or 100 ms
- select the operating mode of the program (stop, start, editing)
- delete or add blocks
- add comments (only with DriveAP 2.x)
- add symbolic names for block outputs (only with DriveAP 2.x).

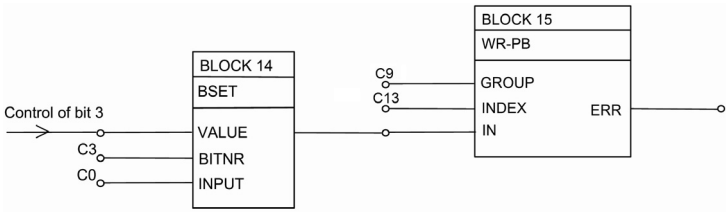
Example:

Controlling parameter *31.04 UDC START LIM* using a *WR-I* block.



Example:

Changing the state of bit 3 in parameter *09.13 AP FW* using a *WR-PB* block.



3

Application blocks

What this chapter contains

The chapter describes the function blocks available in the PVS800 master control program.

General rules

The use of the first input is compulsory (it must not be left unconnected). Use of the second and third input is voluntary for most blocks. As a rule of thumb, an unconnected input does not affect the output of the block.

Block inputs

The blocks use three input formats: integer, boolean and text string. The format to use depends on the block. For example, the ADD block uses integer inputs and the OR block boolean inputs. Text string format is used only by EVENT blocks.

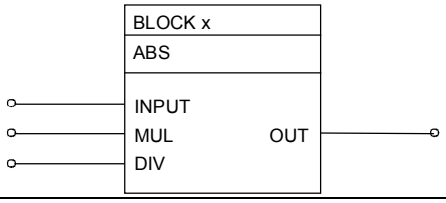
Notes:

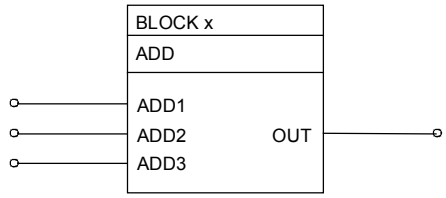
- The inputs of the blocks are read when the execution of the block starts, not simultaneously for all blocks.
- If blocks are programmed with CDP 312R control panel (or DriveWindow PC tool), DriveAP 2.x cannot form a graphic block diagram. Only use DriveAP for adaptive programming if documentation of blocks is needed.

User parameters

There are 10 user parameters available for application purposes. See parameters *53.01 NUMERIC 1* … *53.10 NUMERIC 10*. Group 19 parameters can also be used.

Function blocks

ABS		
	Type **Summary**	Arithmetic function This block is used to obtain the absolute value of an integer number.
	Illustration	
	Operation	The output is the absolute value of INPUT multiplied by input MUL and divided by input DIV. OUT = | INPUT | × MUL / DIV
	Connections	Inputs INPUT, MUL and DIV: 24-bit integer values (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

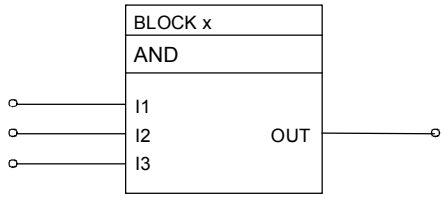
ADD		
	Type **Summary**	Arithmetic function This block is used to calculate the sum of integers.
	Illustration	
	Operation	The output is the sum of the inputs. OUT = ADD1 + ADD2 + ADD3 This block is also used for subtraction. See *SUB* block.
	Connections	Input ADD1, ADD2 and ADD3: 24-bit integer values (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

AND

Type Summary

Logical function
This block is used to form a logical AND function of boolean input variables.

Illustration



Operation

The output is true if all connected inputs are true. Otherwise the output is false. Truth table:

I1	**I2**	**I3**	**OUT** (binary)	**OUT** (value on display)
0	0	0	False (All bits 0)	0
0	0	1	False (All bits 0)	0
0	1	0	False (All bits 0)	0
0	1	1	False (All bits 0)	0
1	0	0	False (All bits 0)	0
1	0	1	False (All bits 0)	0
1	1	0	False (All bits 0)	0
1	1	1	True (All bits 1)	-1

Connections

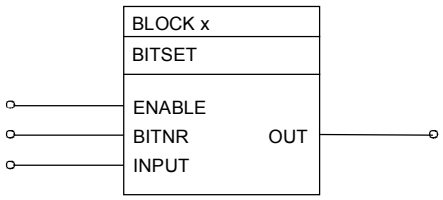
Input I1, I2 and I3:	Boolean values
Output OUT:	24-bit integer value (packed boolean)

BSET

Type Summary

A bit setting of an integer word
This block is used to change the state of one selected bit of an integer value. The integer usually contains packed boolean data.

Illustration



Operation

If ENABLE is active (= 1), the function sets the bit defined by BITNR (0 = bit 0, 1 = bit 1, …), and if not active (= 0), the function resets the bit defined by BITNR.

ENABLE:	Boolean value, set bit = 1, reset bit = 0
BITNR:	Bit number (0 = bit no. 0 … 15 = bit no. 15)
INPUT:	Input word for chaining several blocks or for masking bit pattern

Connections

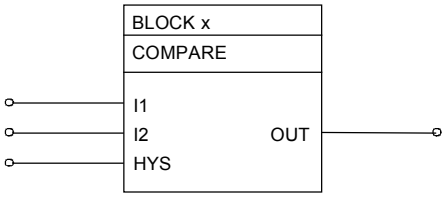
Input ENABLE:	Boolean value
Inputs BITNR and INPUT:	24-bit integer values (23 bits + sign)
Output OUT:	24-bit integer (23 bits + sign)

COMPARE

Type Comparative function

Summary This block is used to compare two integers.

Illustration



Operation

Output bits 0, 1 and 2:

If I1 > I2, OUT = … 001 (output bit 0 is set)
If I1 = I2, OUT = … 010 (output bit 1 is set)
If I1 < I2, OUT = … 100 (output bit 2 is set).

Output bit 3:

If I1 > I2, OUT = … 1xxx (Output bit 3 is set and remains set until I1 < I2 - I3, after which bit 3 is reset.)

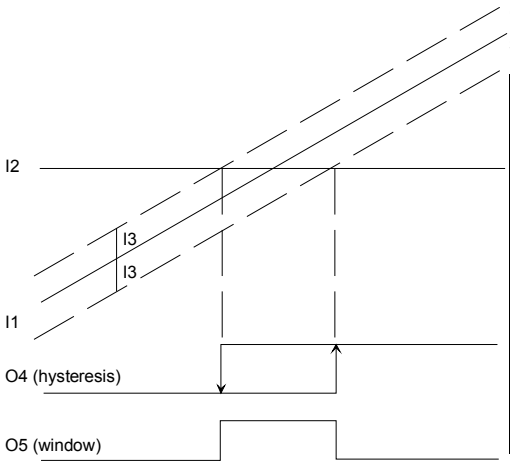
Output bit 4 (O4 in figure):

If I1 - I2 - I3 ≥ 0, output bit 4 = 1
If I1 - I2 + I3 < 0, output bit 4 = 0.

Output bit 5 (O5 in figure):

If I3 ≥ |I1 - I2|, output bit 5 = 1. **Note:** I3 must be ≥ 0.
If I3 < |I1 - I2|, output bit 5 = 0.

When this output is connected to a logical input, it is true if any bit is true.



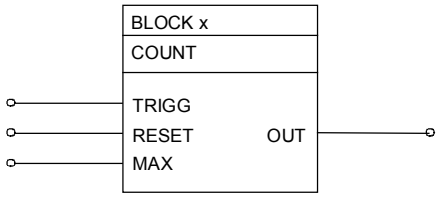
Output bits (if several conditions are true, several bits are set):

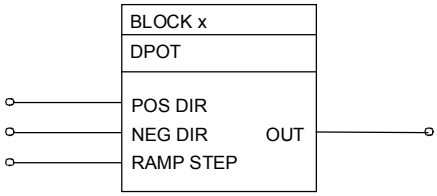
b0	b1	b2	b3	b4	b5	OUT (value on display)
0	0	0	0	0	0	0
1	0	0	0	0	1	1
0	1	0	0	0	0	2
0	0	1	0	0	0	4
0	0	0	0	0	0	8
0	0	0	0	1	0	16
0	0	0	0	0	1	32

Connections

Input I1, I2 and HYS: 24-bit integer values (23 bits + sign)

Output OUT: 24-bit integer (packed boolean)

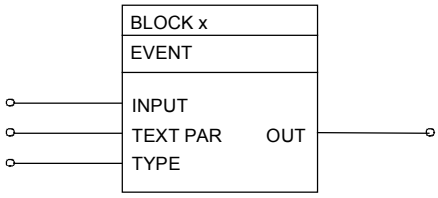
COUNT		
	Type **Summary**	Counter function This block is a reset counter with maximum value limit.
	Illustration	
	Operation	The counter function counts rising edges of input TRIGG. The counter is reset by input RESET and limited to the value set with input MAX. TRIGG: Trigger input RESET: Resets output MAX: Maximum limit of output **Note:** If pin 3 is left unconnected, the maximum count value is zero.
	Connections	Input TRIGG and RESET: Boolean values Input MAX: 24-bit integer value (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

DPOT		
	Type **Summary**	Up/down counter This block is a digitally-controlled potentiometer.
	Illustration	
	Operation	The digitally controlled ramp function increments or decrements the output according to control inputs POS DIR and NEG DIR. Input POS DIR ramps the output to positive direction and NEG DIR to negative direction. If both inputs are active, nothing happens. The step is defined by input RAMP STEP. POS DIR: Control to positive direction NEG DIR: Control to negative direction RAMP STEP: Ramp step on program cycle
	Connections	Input POS DIR and NEG DIR: Boolean values Input RAMP STEP: 24-bit integer value (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

EVENT

Type Summary
Event function
This block is an application-based alarm or fault event.

Illustration



Operation

The block is used to write an event to the alarm or fault logger. A fault event will trigger a fault and trip the PVS800. Alarm events are reflected by the status word alarm bit.

Input INPUT triggers the event. Input TEXT PAR selects the parameter index from which the event message (text string) is read. Use text parameters *53.11 STRING 1* ... *53.24 STRING 14* for user application-specific texts. Type the respective text by clicking the pin with shift pressed. Input TYPE selects the type of the event (warning or fault).

INPUT	TEXT PAR	TYPE	Cause
0 -> 1			Block activates the event.
0			Block deactivates the event.
	Parameter index		Contents of the event message
		0	Type of event: warning
		1	Type of event: fault

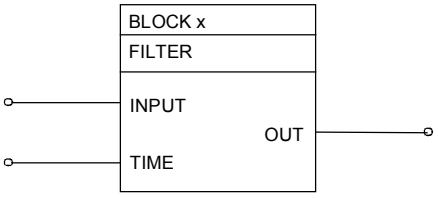
Connections

Inputs INPUT, TEXT PAR:	24-bit integer values (23 bits + sign)
Input TYPE:	String (compulsory)

FILTER

Type Summary
Filtering function
This block is used as a first order low pass filter for integer values.

Illustration



Operation

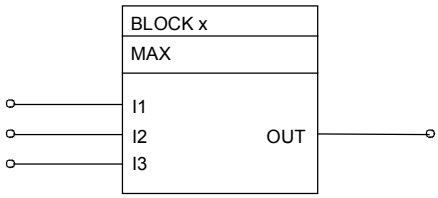
The output is the filtered value of INPUT. Input TIME is the filtering time constant.

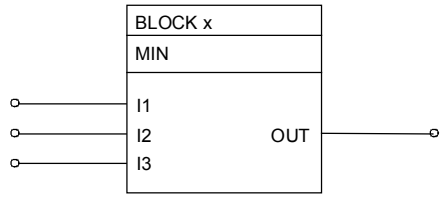
$OUT = INPUT \times (1 - e^{-t/TIME})$

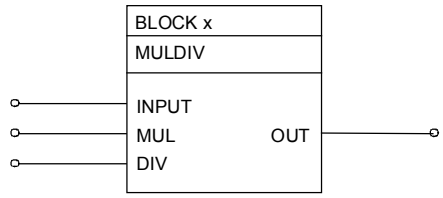
Note: The internal calculation uses 48 bits accuracy to avoid offset errors.

Connections

INPUT:	24-bit integer value (23 bits + sign)
TIME:	24-bit integer value (23 bits + sign). One corresponds to 1 ms.
Output OUT:	24-bit integer (23 bits + sign)

MAX		
	Type Summary	Comparative function: maximum selector This block is used to select the highest value of inputs to the output.
	Illustration	
	Operation	The values at the inputs I1, I2 and I3 are compared and the highest value is written to output OUT. OUT = MAX (I1, I2, I3)
	Connections	Input I1, I2 and I3: 24-bit integer values (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

MIN		
	Type Summary	Comparative function: minimum selector This block is used to select the lowest value of inputs to the output.
	Illustration	
	Operation	The values at the inputs I1, I2 and I3 are compared and the lowest value is written to output OUT. OUT = MIN (I1, I2, I3)
	Connections	Input I1, I2 and I3: 24-bit integer values (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

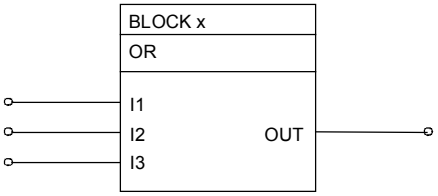
MULDIV		
	Type Summary	Arithmetic function This block is used to scale an integer value by dividing the product of two integers with a third value.
	Illustration	
	Operation	The output is the product of INPUT multiplied by MUL and divided by DIV. OUT = (INPUT × MUL) / DIV
	Connections	Inputs INPUT, MUL and DIV: 24-bit integer values (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

OR

Type Logical function

Summary This block is used to form general combinatory expressions with boolean variables.

Illustration



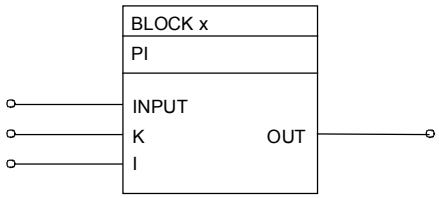
Operation The output is true if any of the inputs is true.

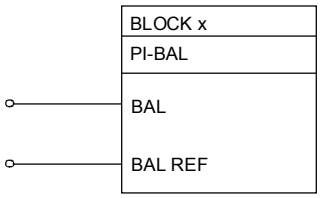
Truth table:

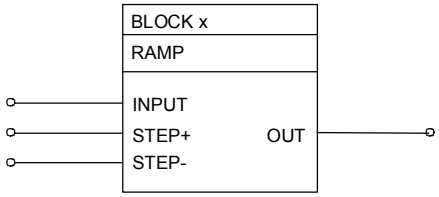
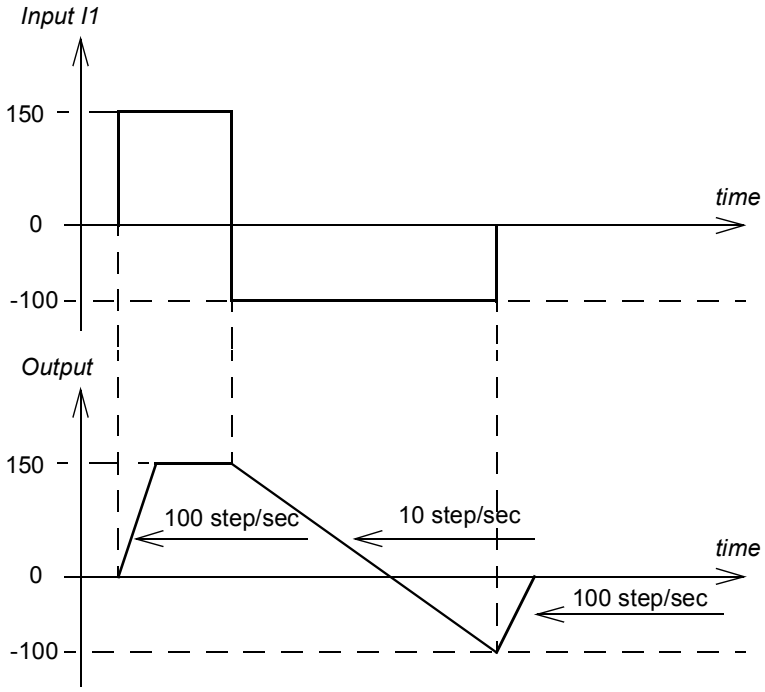
I1	**I2**	**I3**	**OUT**	**OUT** (Value on display)
0	0	0	False (All bits 0)	0
0	0	1	True (All bits 1)	-1
0	1	0	True (All bits 1)	-1
0	1	1	True (All bits 1)	-1
1	0	0	True (All bits 1)	-1
1	1	0	True (All bits 1)	-1
1	1	1	True (All bits 1)	-1

Connections

Input I1, I2 and I3:	Boolean values
Output OUT:	24-bit integer value (packed boolean)

PI	**Type**	PI controller
	Summary	This block is used as a standard PI regulator in closed loop systems.
	Illustration	
	Operation	The output is INPUT multiplied by K/100 plus integrated INPUT multiplied by I/100. $OUT = INPUT \times K / 100 + (I / 100) \cdot \int INPUT$ **Note:** The internal calculation uses 48 bits accuracy to avoid offset errors.
	Connections	Input INPUT: 24-bit integer value (23 bit + sign) Input K: 24-bit integer value (23 bit + sign). Gain factor. 100 corresponds to 1. 10 000 corresponds to 100. Input I: Integrator coefficient. 100 corresponds to 1. 10 000 corresponds to 100. Output OUT: 24-bit integer (23 bits + sign). The range is limited to –10000…10000.

PI-BAL	**Type**	Initialisation block for the PI controller
	Illustration	
	Operation	The block initialises the PI block first. When input BAL is true, the block writes the value of BAL REF to the output of the PI block. When input BAL becomes false, the block releases the output of the PI controller block which continues normal operation from the set output. **Note:** The block may be used only with the PI block. The execution of the block must be after the PI block.
	Connections	Input BAL: Boolean value Input BAL REF: 24-bit integer value (23 bits + sign)

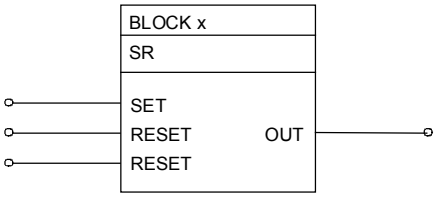
RAMP		
	Type **Summary**	Ramp function This block is used to limit the rate of change of a signal.
	Illustration	
	Operation	The block uses input INPUT as a reference value. The step values (inputs I2 and I3) increase or decrease the output OUT as long as the output differs from limit INPUT. When OUT = INPUT, the output remains steady. Input INPUT: Reference value Input I2: Step to positive direction (step/sec). Increase the output, when OUT < INPUT. Input I3: Step to negative direction (step/sec). Decrease the output, when OUT > INPUT. $OUT_n = OUT_{n-1} + I2$ when INPUT > OUT $OUT_n = OUT_{n-1} - I3$ when INPUT < OUT OUT_n = INPUT when INPUT = OUT Example: Input INPUT: 0 -> 150 -> -100 ->0 Input I2: 100 step/sec Input I3: 10 step/sec Output: Going up: Ramp step from Input I2 Going down: Ramp step from Input I3.
		
	Connections	Inputs INPUT, STEP+ and STEP-: 24-bit integer value (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

SR

Type Logical function

Summary This block is used as a memory for boolean variables.

Illustration



Operation

Input SET sets and RESET inputs reset the output.

If input SET and both RESET inputs are false, the current value remains at the output.

If input SET is true and both RESET inputs are false, the output is true.

If one or both of the RESET inputs is true, the output is false.

SET	**RESET**	**RESET**	**OUT** (Binary)	**OUT** (Value on display)
0	0	0	Output	Output
0	0	1	False (All bits 0)	0
0	1	0	False (All bits 0)	0
0	1	1	False (All bits 0)	0
1	0	0	True (All bits 1)	-1
1	0	1	False (All bits 0)	0
1	1	0	False (All bits 0)	0
1	1	1	False (All bits 0)	0

Connections

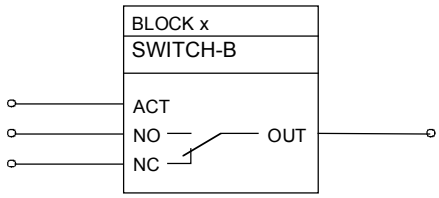
Inputs SET and both RESET: Boolean values

Output OUT: 24-bit integer value (23 bits + sign)

SWITCH-B

Type Summary
Logical function
This block is used as a changeover switch for boolean type of data.

Illustration



Operation

The output is equal to input NO if input ACT is true and equal to input NC if input ACT is false.

ACT	NO	NC	OUT	**OUT** (Value on display)
0	NO	NC	NC	True = -1
1	NO	NC	NO	False = 0

NO = normally open, NC = normally closed

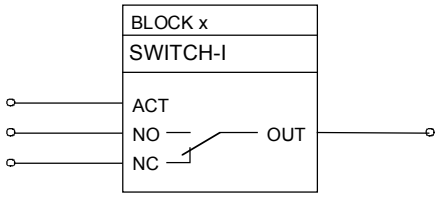
Connections

Input ACT, NO and NC:	Boolean values
Output OUT:	24-bit integer value (packed boolean)

SWITCH-I

Type Summary
Logical function
This block is used as a changeover switch for integer type of data.

Illustration



Operation

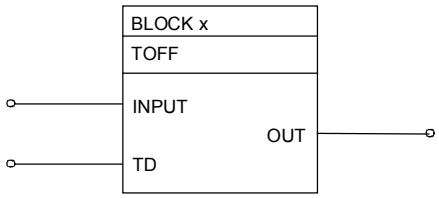
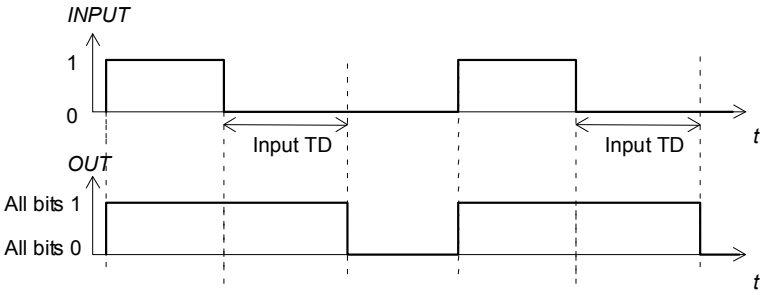
The output is equal to input NO if input ACT is true and equal to input NC if input ACT is false.

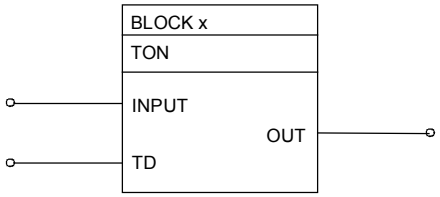
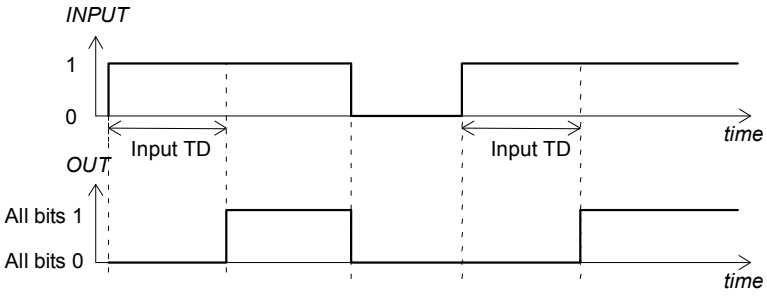
ACT	NO	NC	OUT
0	NO	NC	NC
1	NO	NC	NO

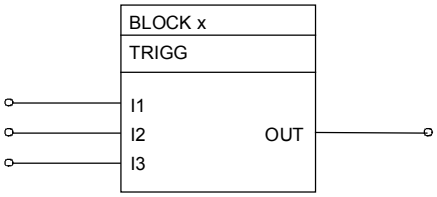
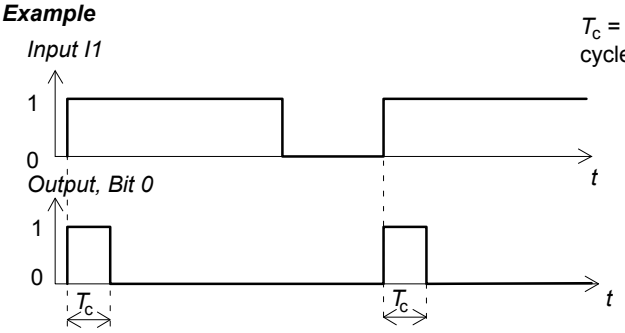
NO = normally open, NC = normally closed

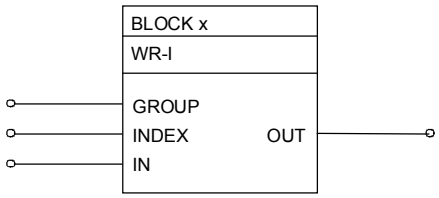
Connections

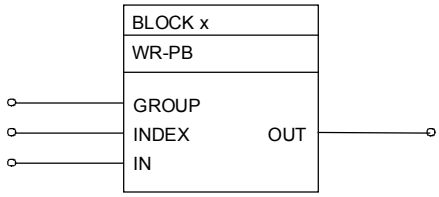
Input ACT:	Boolean value
Input NO and NC:	24-bit integer values (23 bits + sign)
Output OUT:	24-bit integer value (23 bits + sign)

TOFF	**Type**	Timing function
	Summary	This block is used for boolean off state delay.
	Illustration	
	Operation	The output is true when INPUT is true. The output is false when INPUT has been false for a time equal or longer than TD.  Values on display: true = -1, false = 0
	Connections	Input INPUT: Boolean value Input TD: 24-bit integer value (23 bits + sign). One corresponds to 1 ms. Output OUT: 24-bit integer value (packed boolean)

TON		
	Type	Timing function
	Summary	This block is used for boolean on state delay.
	Illustration	
	Operation	The output is true when INPUT has been true for a time equal or longer than TD. The output is false when the INPUT is false.  Values on display: true = -1, false = 0.
	Connections	INPUT: Boolean value Input TD: 24-bit integer value (23 bits + sign). 1 corresponds to 1 ms. Output OUT: 24-bit integer value (packed boolean)

TRIGG		
	Type **Summary**	Timing function This block is used for reducing impulse times at the start of automatic procedures and for calculating functions.
	Illustration	
	Operation	The rising edge of input I1 sets output bit 0 for one program cycle. The rising edge of input I2 sets output bit 1 for one program cycle. The rising edge of input I3 sets output bit 2 for one program cycle. ***Example*** 
	Connections	Input I1, I2 and I3: Boolean values Output OUT: 24-bit integer value (23 bits + sign)

WR-I	**Type**	This block writes an integer value to the parameter in the RAM memory of the control board.
	Illustration	
	Operation	This function writes an integer value to the integer type of AMC table index. **Note:** The function does not consider whether another device e.g. fieldbus is writing into the same location, which would cause oscillation of signal. It is not possible to write into the middle of the reference chain. See the *Firmware manual* for the parameter type (I or PB).
	Connections	Inputs GROUP, INDEX and IN: 24-bit integer value (23 bits + sign) Input GROUP: Parameter group number Input INDEX: Parameter index number Input IN: Data input pin to read a new value for the parameter Output OUT: Error code (24-bit integer value) Error codes: 0 Successful write 131073 Group protected 131074 Index protected 131075 Illegal group 131076 Undefined group 131077 Illegal index 131078 Undefined index 131079 Illegal format 131080 Min max limitation 131088 Illegal selection **Example:** For parameter *24.01 Q POWER REF*, GROUP is 24 and INDEX is 01.

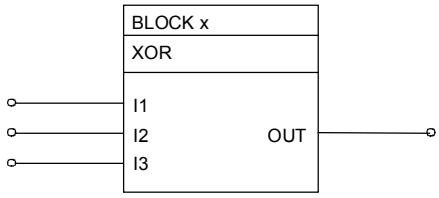
WR-PB	**Type**	This block writes a packed boolean value to the parameter in the RAM memory of the control board.
	Illustration	
	Operation	Writes a packed boolean value to the packed boolean type of AMC table index e.g. command word. **Note:** The function does not consider whether another device e.g. fieldbus is writing into the same location, which would cause oscillation of signal. See the *Firmware manual* for the parameter type (I or PB).
	Connections	Inputs GROUP, INDEX and IN: 24-bit integer value (23 bits + sign) Input GROUP: Parameter group number Input INDEX: Parameter index number Input IN: Data input pin to read A new value for the parameter Output OUT: Error code (24-bit integer value) Error codes: 0 Successful write 131073 Group protected 131074 Index protected 131075 Illegal group 131076 Undefined group 131077 Illegal index 131078 Undefined index 131079 Illegal format 131080 Min max limitation 131088 Illegal selection **Example:** For parameter *07.01 MAIN CTRL WORD*, GROUP is 7 and INDEX is 01.

XOR

Type Summary

Logical function
This block is used to generate combinatory expressions with boolean variables.

Illustration



Operation

The output is true if only one or all connected inputs are true. Otherwise the output is false.The truth table is shown below.

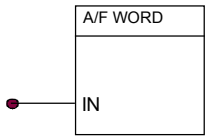
I1	I2	I3	OUT (Binary)	OUT (Value on display)
0	0	0	False (All bits 0)	0
0	0	1	True (All bits 1)	-1
0	1	0	True (All bits 1)	-1
0	1	1	False (All bits 0)	0
1	0	0	True (All bits 1)	-1
1	0	1	False (All bits 0)	0
1	1	0	False (All bits 0)	0
1	1	1	True (All bits 1)	-1

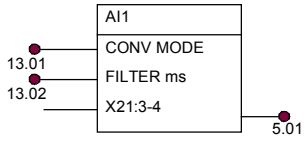
Connections

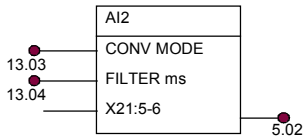
Input I1, I2 and I3: Boolean values
Output OUT: 24-bit integer value (packed boolean)

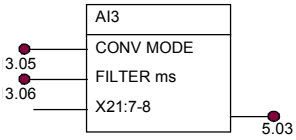
I/O and communication blocks

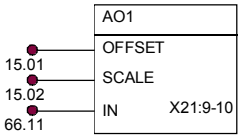
Execution time of these blocks has no relation with execution time of function blocks.

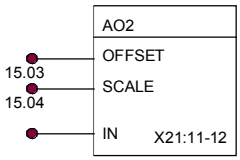
A/F WORD	**Type**	A/F WORD
	Summary	Application-based alarm and fault word. Execution interval is 560 ms.
	Illustration	
	Operation	This block is used to compile application specific alarms and faults into a packed boolean word further to be read e.g. by an overriding system from *09.13 AP FW*. Use e.g. BSET function blocks to set the desired bits of A/F WORD block according to the application needs.
	Connections	IN: 24-bit integer value (23 bits + sign)

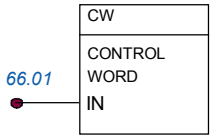
AI1	**Type**	Analog input AI1
	Summary	This block is used to read analog input AI1 of the control unit. The resolution is 10 bits + sign, voltage type of input. The updating interval is 10 ms.
	Illustration	
	Operation	CONV MODE: See parameter *13.01 AI1 CONV MODE*. FILTER ms: See parameter *13.02 AI1 FILTER ms*. A filter time constant for AI1. OUT: See parameter *05.01 BASIC AI1*.
	Connections	Input CONV MODE: Integer value 1…3 Input FILTER ms: Integer value 0…30000 Output: Integer value on range -20000…20000

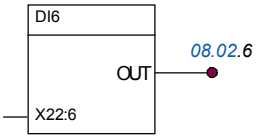
AI2		
	Type **Summary**	Analog input AI2 This block is used to read analog input AI2 of the control unit. Resolution is 10 bits + sign, current type of the input is 0(4)…20 mA.
	Illustration	
	Operation	CONV MODE: See parameter *13.03 AI2 CONV MODE*. FILTER ms: See parameter *13.04 AI2 FILTER ms*. OUT: See signal *05.01 BASIC AI1*.
	Connections	Input CONV MODE: Integer value 1…2 Input FILTER ms: Integer value 0…30000 Output: Integer value on range -20000…20000

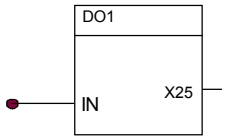
AI3		
	Type **Summary**	Analog input AI3 This block is used to read analog input AI3 of the control unit. Resolution is 10 bits + sign, current type of the input is 0(4)…20 mA.
	Illustration	
	Operation	CONV MODE: See parameter *13.05 AI3 CONV MODE*. FILTER ms: See parameter *13.06 AI3 FILTER ms*. OUT: See signal *05.03 BASIC AI3*.
	Connections	Input CONV MODE: Integer value 1…2 Input FILTER ms: Integer value 0…30000 Output: Integer value on range -20000…20000

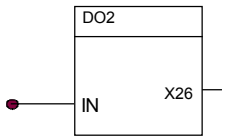
AO1	**Type** **Summary**	Analog output AO1 This block is used to write data to analog output AO1 of the control unit. Execution interval is 10 ms.	
	Illustration		
	Operation	OFFSET:	See parameter *15.01 AO1 OFFSET*.
		SCALE:	See parameter *15.02 AO1 SCALE*.
		IN:	Input pin to control analog output AO1.
	Connections	Input OFFSET:	Integer value 0…20000 = 0…20 mA
		Input SCALE:	Integer value 0…30000
		IN:	24-bit integer value (23 bits + sign)

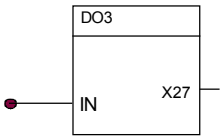
AO2	**Type** **Summary**	Analog output AO2 This block is used to write data to analog output AO2 of the control unit. Execution interval is 10 ms.	
	Illustration		
	Operation	OFFSET:	See parameter *15.03 AO2 OFFSET*.
		SCALE:	See parameter *15.04 AO2 SCALE*.
		IN:	Input pin to control analog output AO2.
	Connections	Input OFFSET:	Integer value 0…20000 = 0…20 mA
		Input SCALE:	Integer value 0…30000
		IN:	24-bit integer value (23 bits + sign)

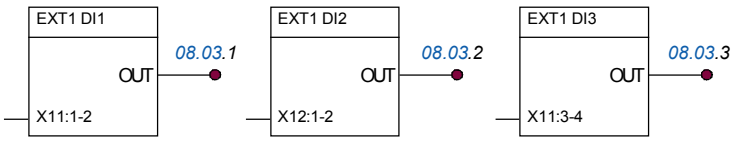
CW	**Type Summary**	Control Word in adaptive program. This block is used to control the PVS800 from the adaptive program. See parameter *07.02 USED MCW* in the *Firmware manual*. Execution interval is 10 ms.
	Illustration	
	Operation	See parameter *66.01 CW* in the *Firmware manual*.
	Connections	IN: 24-bit integer value (23 bits + sign)

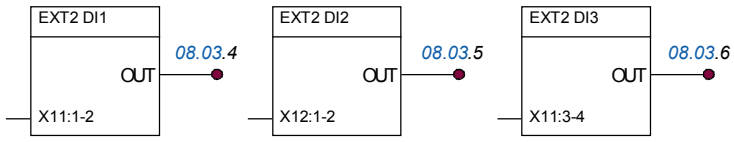
DI1…DI6, DI IL	**Type Summary**	Digital input These blocks are used to read the status of digital inputs DI1…DI6 and DIIL (DI7) of the control unit. Execution interval is 10 ms.
	Illustration	 Example: view of DI6
	Operation	Output of the block corresponds to *08.02 DI STATUS WORD*. bit 0 = not in use bit 1 = status of DI1 bit 2 = status of DI2 bit 3 = status of DI3 bit 4 = status of DI4 bit 5 = status of DI5 bit 6 = status of DI6 bit 7 = status of DIIL
	Connections	OUT: 16-bit packed boolean value.

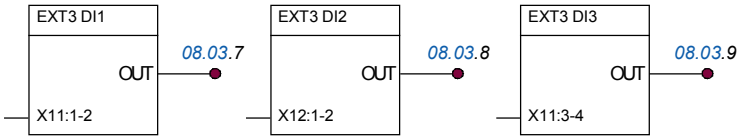
DO1	**Type**	Digital output DO1	
	Summary	This block is used to control relay output RO1 of the control unit. Execution interval is 10 ms.	
	Illustration		
	Operation	IN:	State TRUE energises relay output RO1 and state FALSE de-energises the relay.
	Connections	IN:	24-bit integer value (23 bits + sign).

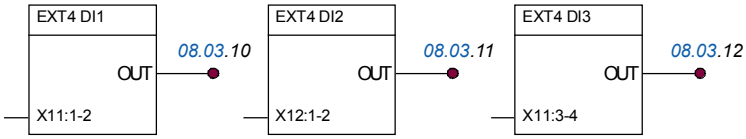
DO2	**Type**	Digital output DO2	
	Summary	This block is used to control relay output RO2 of the control unit. Execution interval is 10 ms.	
	Illustration		
	Operation	IN:	State TRUE energises relay output RO2 and state FALSE de-energises the relay.
	Connections	IN:	24-bit integer value (23 bits + sign).

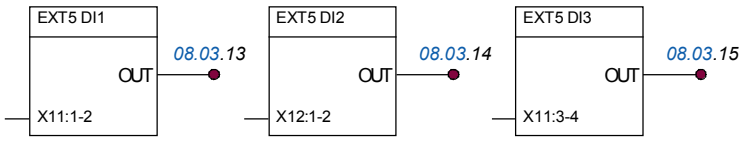
DO3	**Type**	Digital output DO3	
	Summary	This block is used to control relay output RO3 of the control unit. Execution interval is 10 ms.	
	Illustration		
	Operation	IN:	State TRUE energises relay output RO3 and state FALSE de-energises the relay.
	Connections	IN:	24-bit integer value (23 bits + sign).

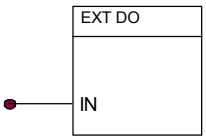
EXT1 DI…DI3	**Type Summary**	Extension module 1 digital inputs This block is used to read the status of digital inputs DI1…DI3 of digital I/O extension module 1. Execution interval is 100 ms.
	Illustration	
	Operation	Output equals *08.03 EXT DI STATUS WOR* bits 1…3.
	Connections	OUT: 16-bit packed boolean value.

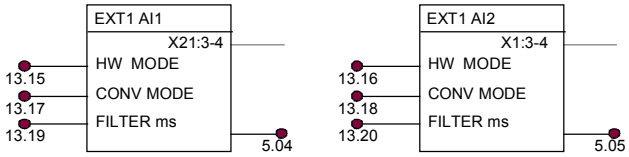
EXT2 DI…DI3	**Type Summary**	Extension module 2 digital inputs This block is used to read the status of digital inputs DI1…DI3 of digital I/O extension module 2. Execution interval is 100 ms.
	Illustration	
	Operation	Output equals *08.03 EXT DI STATUS WOR* bits 4…6.
	Connections	OUT: 16-bit packed boolean value.

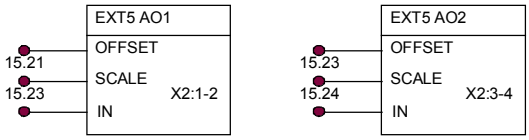
EXT3 DI…DI3	**Type Summary**	Extension module 3 digital inputs This block is used to read the status of digital inputs DI1…DI3 of digital I/O extension module 3. Execution interval is 100 ms.
	Illustration	
	Operation	Output is the same as *08.03 EXT DI STATUS WOR* bits 7…9.
	Connections	OUT: 16-bit packed boolean value.

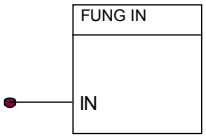
EXT4 DI…DI3	**Type Summary**	Extension module 4 digital inputs This block is used to read the status of digital inputs DI1…DI3 of digital I/O extension module 4. Execution interval is 100 ms.
	Illustration	
	Operation	Output is the same as *08.03 EXT DI STATUS WOR* bits 10…12.
	Connections	OUT: 16-bit packed boolean value.

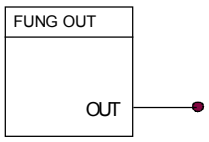
EXT5 DI…DI3	**Type Summary**	Extension module 5 digital inputs This block is used to read the status of digital inputs DI1…DI3 of digital I/O extension module 5. Execution interval is 100 ms.
	Illustration	
	Operation	Output is the same as *08.03 EXT DI STATUS WOR* bits 13…15.
	Connections	OUT: 16-bit packed boolean value.

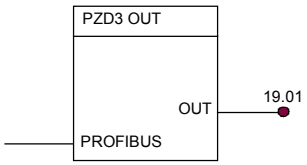
EXT DO	**Type Summary**	Extension module digital output control This block is used to control the relay outputs of digital I/O extension modules 1…5. Execution interval is 100 ms.
	Illustration	
	Operation	This block writes packed boolean value into parameter *66.05 EXT DO*. State TRUE of each bit energises relay output and state FALSE de-energises the relay. Use *BSET* blocks connected in series to set each bit of parameter *66.05 EXT DO*.
	Connections	IN: 16-bit packed boolean value.

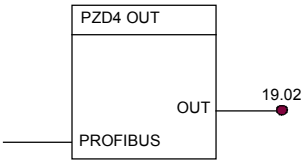
EXT1…5 AI1…AI2	**Type Summary**	Extension module analogue inputs This block is used to read analogue inputs AI1 and AI2 of analogue I/O extension modules 1… 5. Execution interval is 100 ms.	
	Illustration	Example: EXT1 AI1 and EXT1 AI2 	
	Operation	HW MODE:	See parameter *13.15 EXT1 AI1 HW MODE*.
		CONV MODE:	See parameter *13.17 EXT1 AI1 CONV MOD*.
		FILTER ms	See parameter *13.19 EXT1 AI1 FILT ms*.
		OUT:	See signal *05.04 EXT1 AI1*.
	Connections	Input HW MODE:	Integer value 1…2
		Input CONV MODE:	Integer value 1…4
		Input FILTER ms:	Integer value 0…30000
		Output OUT:	Integer value on range –20000…20000
		Hardware settings	See *Analogue I/O Extension User's Manual RAIO-01* (3AFE64484567 English)

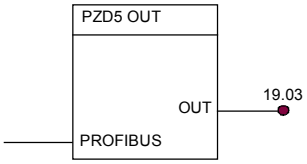
EXT1…5 AO1…AO2	**Type Summary**	Extension module analogue outputs This block is used to write data to analogue output AO1 and AO2 of the analogue I/O extension modules 1…5. Execution interval is 100 ms.	
	Illustration	Example: EXT5 AO1 and EXT5 AO2 	
	Operation	OFFSET:	See parameter *15.05 EXT1 AO1 OFFSET*.
		SCALE:	See parameters *15.06 EXT1 AO1 SCALE*.
		IN:	Input pin to control analogue output
	Connections	Input OFFSET:	integer value 0…20000 = 0…20 mA
		Input SCALE:	integer value 0…30000
		IN:	24-bit integer value (23 bits + sign)
		Hardware settings	See *Analogue I/O Extension User's Manual RAIO-01* (3AFE64484567 English).

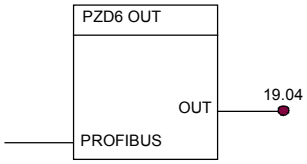
FUNG IN		
	Type Summary	Function generator input This block is a part of an internally built 5-step function generation. It is executed every 100 ms.
	Illustration	
	Operation	Input for function generator. See parameter group *65 FUNCTION GENERATOR*. Function generator is enabled by parameter *65.01 ENABLE* and it includes: IN: Function block *FUNG IN* A function curve is set by parameters: *65.04* X1 *65.05* Y1 *65.06* X2 *65.07* Y2 *65.08* X3 *65.09* Y3 *65.10* X4 *65.11* Y4 *65.12* X5 *65.13* Y5 OUT: Function block *FUNG OUT*
	Connections	IN: 24-bit integer value (23 bits + sign)

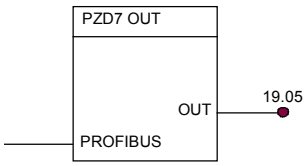
FUNG OUT		
	Type Summary	Function generator output This block is a part of internally built 5 step function generation. It is executed every 100 ms.
	Illustration	
	Operation	Output of the function generator. See parameter group *65 FUNCTION GENERATOR*. Function generator is enabled by parameter *65.01 ENABLE* and it includes: IN: Function block *FUNG IN* A function curve is set by parameters: *65.04* X1 *65.05* Y1 *65.06* X2 *65.07* Y2 *65.08* X3 *65.09* Y3 *65.10* X4 *65.11* Y4 *65.12* X5 *65.13* Y5 OUT: Function block *FUNG OUT*
	Connections	OUT: 24-bit integer value (23 bits + sign)

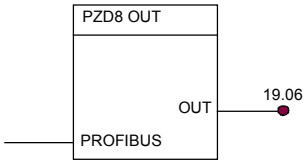
PZD3 OUT	**Type** **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS process data PZD3 OUT for block application program.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.05 PZD3 OUT to 1901. Thereafter, data PZD3 OUT received from the master device is written to parameter *19.01* DATA 1 (output pin of the block). When this block is deleted, it automatically writes zero to parameter *19.01* DATA 1 once. If this block is not activated, parameter *19.01* DATA 1 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	Output OUT: 16-bit integer value (15 bits + sign)

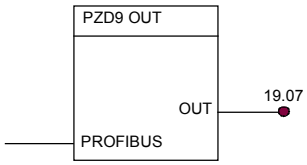
PZD4 OUT		
	Type **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS process data PZD4 OUT for block application program..
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.07 PZD4 OUT to 1902. Thereafter, data PZD4 OUT received from the master device is written to parameter *19.02* DATA 2 (output pin of the block). When this block is deleted, it automatically writes zero to parameter *19.02* DATA 2 once. If this block is not activated, parameter *19.02* DATA 2 can be used for other purposes.. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	OUT: 16-bit integer value (15 bits + sign)

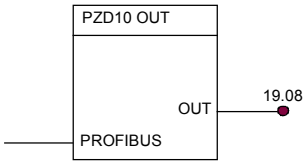
PZD5 OUT		
	Type **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS data PZD5 OUT for block application program.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.09 PZD5 OUT to 1903. Thereafter, data PZD5 OUT received from the master device is written to parameter 19.03 DATA 3 (output pin of the block). When this block is deleted, it automatically writes zero to parameter 19.03 DATA 3 once. If this block is not activated, parameter 19.03 DATA 3 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	Output OUT: 16-bit integer value (15 bits + sign)

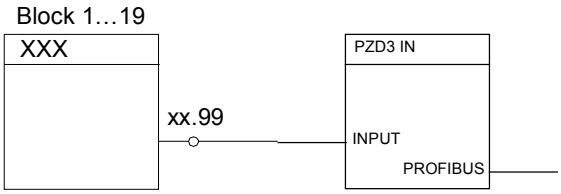
PZD6 OUT	**Type** **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS process data PZD6 OUT for block application program.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.11 PZD6 OUT to 1904. Thereafter, data PZD6 OUT received from the master device is written to parameter 19.04 DATA 4 (output pin of the block). When this block is deleted, it automatically writes zero to parameter 19.04 DATA 4 once. If this block is not activated, parameter 19.04 DATA 4 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	OUT: 16-bit integer value (15 bits + sign)

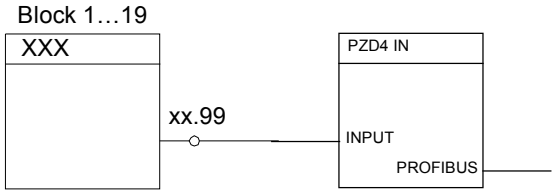
PZD7 OUT	**Type** **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS process data PZD7 OUT for block application program.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.13 PZD7 OUT to 1905. Thereafter, data PZD7 OUT received from the master device is written to parameter 19.05 DATA 5 (output pin of the block). When this block is deleted, it automatically writes zero to parameter 19.05 DATA 5 once. If this block is not activated, parameter 19.05 DATA 5 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	OUT: 16-bit integer value (15 bits + sign)

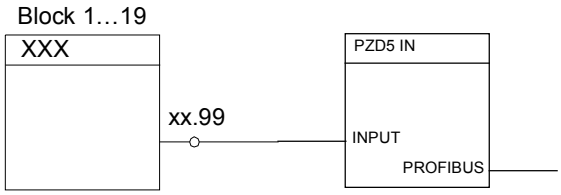
PZD8 OUT		
	Type **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS process data PZD8 OUT for block application program.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.15 PZD8 OUT to 1906. Thereafter, data PZD8 OUT received from the master device is written to parameter 19.06 DATA 6 (output pin of the block). When this block is deleted, it automatically writes zero to parameter 19.06 DATA 6 once. If this block is not activated, parameter 19.06 DATA 6 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	OUT: 16-bit integer value (15 bits + sign)

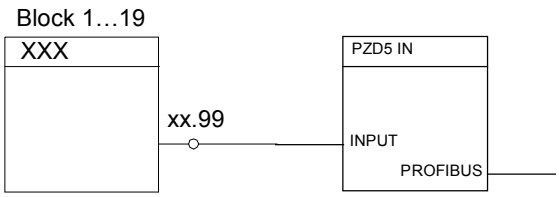
PZD9 OUT		
	Type **Summary**	Communication input block This block is used with RPBA fieldbus module to read PROFIBUS process data PZD9 OUT for block application program. Execution interval is 20 ms.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.17 PZD9 OUT to 1907. Thereafter, data PZD9 OUT received from the master device is written to parameter 19.07 DATA 7 (output pin of the block). When this block is deleted, it automatically writes zero to parameter 19.07 DATA 7 once. If this block is not activated, parameter 19.07 DATA 7 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	OUT: 16-bit integer value (15 bits + sign)

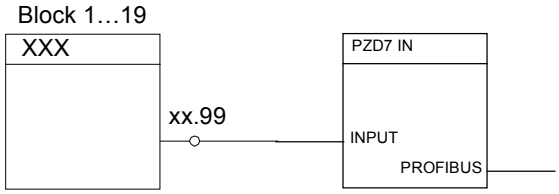
PZD10 OUT		
	Type Summary	Communication input block. This block is used with RPBA fieldbus module to read PROFIBUS process data PZD10 OUT for block application program.
	Illustration	
	Operation	When this block is inserted, it automatically sets parameter 51.19 PZD10 OUT to 1908. Thereafter, data PZD10 OUT received from the master device is written to parameter 19.08 DATA 8 (output pin of the block). When this block is deleted, it automatically writes zero to parameter 19.08 DATA 8 once. If this block is not activated, parameter 19.08 DATA8 can be used for other purposes. In on-line mode PZD3 OUT … PZD10 OUT blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	OUT: 16-bit integer value (15 bits + sign)

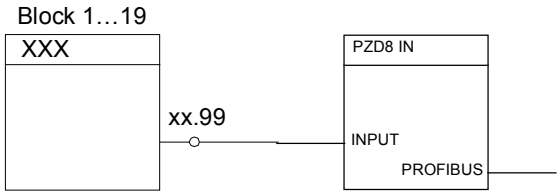
PZD3 IN		
	Type Summary	Communication output block from the PVS800. This block is used with RPBA fieldbus module to write process data value PZD3 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.06 PZD3 IN during the input connection. **Note:** The maximum index number to Profibus is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

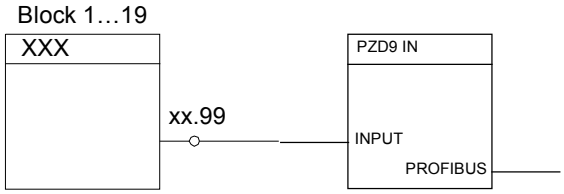
PZD4 IN		
	Type Summary	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD4 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.08 PZD4 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

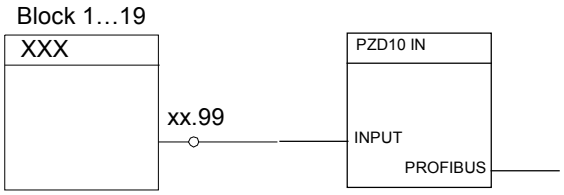
PZD5 IN		
	Type Summary	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD5 IN to the Profibus master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.10 PZD5 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

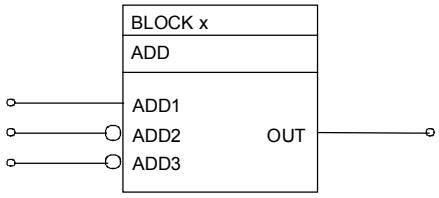
PZD6 IN	**Type Summary**	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD6 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.12 PZD6 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

PZD7 IN	**Type Summary**	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD7 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.14 PZD7 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

PZD8 IN	**Type Summary**	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD8 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.16 PZD8 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

PZD9 IN	**Type Summary**	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD9 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.18 PZD9 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PROFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

PZD10 IN	**Type Summary**	Communication output block from the PVS800. This block is used with RPBA type of fieldbus module to write process data value PZD10 IN to the PROFIBUS master device.
	Illustration	
	Operation	INPUT: Source signal is connected to INPUT and sent to the PROFIBUS master. Assignment of source signal is written automatically to parameter 51.20 PZD10 IN during the input connection. **Note:** The maximum index number to PROFIBUS is 99. Therefore, use only blocks 1…19 as a source from the block application to this block. **Note:** Function block outputs are 24-bit integer values and PEOFIBUS outputs 16-bit integer values. In on-line mode PZD3 IN … PZD10 IN blocks are available only if RPBA module is connected to Slot 1. In off-line mode, use the PROFIBUS template file.
	Connections	INPUT: 16-bit integer value (15 bits + sign)

SUB	**Type Summary**	Arithmetic subtraction function.
	Illustration	
	Operation	Subtraction can be implemented by using ADD block in which the subtracter input is inverted (multiplied by -1). OUT = ADD1 + (-ADD2) + (-ADD3) Example ADD1 = 3000 ADD2 = 1000 (inverted in Connect Pin window of DriveAP) ADD3 = 0 (inverted in Connect Pin window of DriveAP) OUT = ADD1 + (-ADD2) + (-ADD3) 2000 = 3000 + (-1000) + (-0)
	Connections	Inputs ADD1, ADD2 and ADD3: 24-bit integer values (23 bits + sign) Output OUT: 24-bit integer (23 bits + sign)

Further information

More information about ABB products for solar applications on the Internet:
www.abb.com/solar

Contact us

ABB Oy
Drives
P.O. Box 184
FI-00381 HELSINKI
FINLAND
Telephone +358 10 22 11
Fax +358 10 22 22681
www.abb.com/drives

ABB Inc.
Automation Technologies
Drives & Motors
16250 West Glendale Drive
New Berlin, WI 53151
USA
Telephone 262 785-3200
1-800-HELP-365
Fax 262 780-5135
www.abb.com/drives

ABB Beijing Drive Systems Co. Ltd.
No. 1, Block D, A-10 Jiuxianqiao Beilu
Chaoyang District
Beijing, P.R. China, 100015
Telephone +86 10 5821 7788
Fax +86 10 5821 7618
www.abb.com/drives

3AUA0000091276 Rev A (EN) 2010-12-20