Compact Saia[®]PCD3.M2x30V6 User's Guide

Introduction

These CPUs are similar as PCD3.M3230 /.M3330 CPUs except that there is no I/O slots (replaced with a compact I/O Board) and no I/O extension connector.

This User's Guide only specifies differences. Please refer to existing PCD3 Hardware Manual (P+P26/789) for the whole feature set.



Content

1	CPU	CHARACTERISTICS	2
2	COM	IPACT I/O BOARD V6: I/O LAYOUT & CONNECTION	3
	2.1	I/O LAYOUT	3
	2.2	PIN ASSIGNMENT OVERVIEW	
	2.3	DIGITAL INPUTS CONNECTION (TERMINAL BLOCK X1, X2 & PART OF X4)	4
	2.4	DIGITAL OUTPUTS CONNECTION (TERMINAL BLOCK X3 & PART OF X4)	
	2.5	ANALOGUE INPUTS CONNECTION (PART OF TERMINAL BLOCK X0 – BLACK)	5
	2.6	ANALOGUE OUTPUTS CONNECTION (PART OF TERMINAL BLOCK X0 - BLACK)	6
	2.7	COMMUNICATIONS INTERFACES CONNECTION (BOTTOM MIDDLE TERMINAL BLOCK XF - ORANGE)	7
	2.8	CHANGING THE BATTERY	7
3	PG5	CONFIGURATION & I/O ACCESS	8
	3.1	HARDWARE CONFIGURATION – DEVICE CONFIGURATOR	8
	3.1.1	Digital inputs properties	9
	3.1	1.1.1 General	9
		1.1.2 Standard inputs	
		1.1.3 Counters with enable input	
		1.1.4 Encoders with A, B and index signal 1.1.5 Interrupts	
	3.1.2		
	3.1.2		
	3.1.3		
	3.1.4		
	3.2	PROGRAMMING	
4	DIM	ENSION DRAWING	22

NOTE: THIS PROJECT IS STILL IN DEVELOPMENT; THEREFORE THE FINAL PRODUCT CAN BE SLIGTHLY DIFFER FROM PICTURES AND MENTIONNED SPECIFICATIONS. THANKS FOR YOUR COMPREHENSION

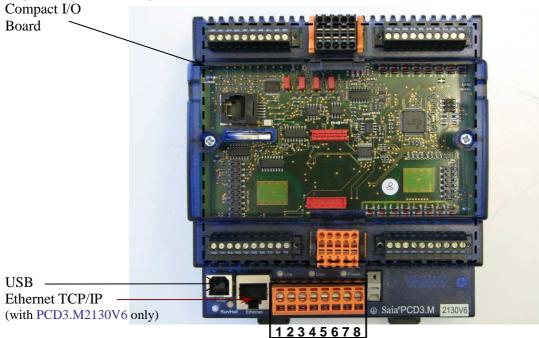
1 CPU characteristics

- Compact size*: $130 \times 140 \times 75 \text{ mm} (W \times H \times D)$
- User program memory : 512 KByte RAM
- Flash onboard for user program backup : 512 KByte
- Flash onboard for file system* : 1024 KByte
- USB, RS485, 2 interrupts onboard and integrated Web server
- Ethernet TCP/IP (with PCD3.M2130V6 only)
- Data protection with removable lithium battery* : 1-3 years
- 38 Data points* with compact I/O Board V6:
 - 20 Digital Inputs (DI): 15..30 VDC, 0.3 ms "ON"-Delay. The first 6 of them are configurable either as
 6 standard inputs or
 - 2 counters with enable input and 2 standard inputs or
 - 2 encoders A, B and index signal or
 - 4 interrupts and 2 standard inputs
 - 12 Digital Outputs (DO): 24 VDC, 0.5A, transistors
 - o 4 Analogue Inputs (AI): 13 Bit +/- 10 V; 12 Bit 0..10 V, 0..20 mA
 - o 2 Analogue Outputs (AO): 12 Bit 0..10 V
- 1 port* (socket A) for PCD7.F1xx (with restriction see chap. 2.7)
- Adequate pluggable screw terminal blocks included*
- Options: Terminal block with LED (10 poles 1x plus, 1x ground, 8x I/O signals)
- * Differences with PCD3.M3x30

0

0

Top view of the compact controller without cover

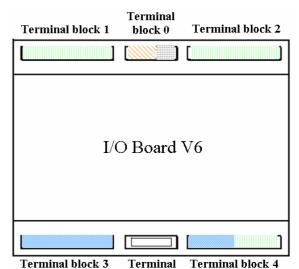


Connection of the CPU (Reminder, like other PCD3 CPUs)

3	Ferminal bl	Profibus signal	Profibus wiring			
		Pin	Signal	Explanation		
D	-	1	D	Port 2; RS485 up to 115 kbps usable as free user interface	RxD/TxD-N	A green
10 10	10	2	/D	or Profi-S-Bus up to 187.5 kbps (PCD3.M3xxx only)	RxD/TxD-P	B red
Ξ	101	3	IntO	2 interrupt inputs or	a 1	8
8	H dib i	4	Int1	1 fast counter	8	
8	II Chi	5	WD	Weekshidowa		
	11 (1)	6	WD	Watchdog		
THE AFT	1.00	7	+24V	5 mm mm h		
5		8	GND	Power supply		
RS4	85 termina	ator sv	vitch	9	8	
Switch position				Explanation		
- 65	left	-	0	without termination resistors	8	
()	right	-	С	with termination resistors		

2 Compact I/O Board V6: I/O layout & connection

2.1 I/O Layout 20 digitals inputs 15..30 VDC Typical delay 0.3 ms 12 digitals outputs 24 VDC 0,5A Transistors 4 analogue inputs Configuration via jumpers 12 Bit, 0..20 mA, 0..10 VDC 13 Bit, ± 10 VDC 2 analogue outputs 12 Bit, 0..10 VDC



Block F

2.2 Pin assignment overview

Pluggable terminal block X0						
AI0	Analogue input 0					
Al1	Analogue input 1					
Al2	Analogue input 2					
AI3	Analogue input 3					
AGND	Analogue GND					
AGND	Analogue GND					
AO0	Analogue output 0					
AO1	Analogue output 1					
AGND	Analogue GND					
AGND	Analogue GND					
	AI0 AI1 AI2 AI3 AGND AGND AO0 AO1 AGND					

AGND is internal connected to GND and PGND

Plug	Pluggable terminal block X2							
20	24V	Supply voltage 24V						
21	DI8	Digital input 8						
22	DI9	Digital input 9						
23	DI10	Digital input 10						
24	DI11	Digital input 11						
25	DI12	Digital input 12						
26	DI13	Digital input 13						
27	DI14	Digital input 14						
28	DI15	Digital input 15						
29	GND	Supply GND						

Plug	Pluggable terminal block X4							
40	GND	Supply GND						
41	DO8	Digital output 8						
42	DO9	Digital output 9						
43	DO10	Digital output 10						
44	DO11	Digital output 11						
45	DI19	Digital input 19						
46	DI18	Digital input 18						
47	DI17	Digital input 17						
48	DI16	Digital input 16						
49	24V	Supply voltage 24V						

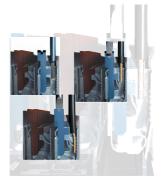
Plug	Pluggable terminal block X1							
10	24V	Supply voltage 24V						
11	DI0	Digital input 0						
12	DI1	Digital input 1						
13	DI2	Digital input 2						
14	DI3	Digital input 3						
15	DI4	Digital input 4						
16	DI5	Digital input 5						
17	DI6	Digital input 6						
18	DI7	Digital input 7						
19	GND	supply GND						

Plug	Pluggable terminal block X3							
30	GND	Supply GND						
31	DO0	Digital output 0						
32	DO1	Digital output 1						
33	DO2	Digital output 2						
34	DO3	Digital output 3						
35	DO4	Digital output 4						
36	DO5	Digital output 5						
37	DO6	Digital output 6						
38	DO7	Digital output 7						
39	24V	Supply voltage 24V						

Pluggable	PCD7.F121	PCD7	'.F110	PCD7.F180
Terminal	RS232	RS485	RS422	Belimo
block XF *				
0	PGND	PGND	PGND	PGND
1	TxD	Rx-Tx	Tx	ACom
2	RxD	/Rx-/Tx	/Tx	MST
3	RTS		Rx	IN
4	CTS		/Rx	GND
5	PGND	PGND	PGND	PGND
6	DTR		RTS	
7	DSR		/RTS	
8	COM		CTS	
9	DCD		/CTS	

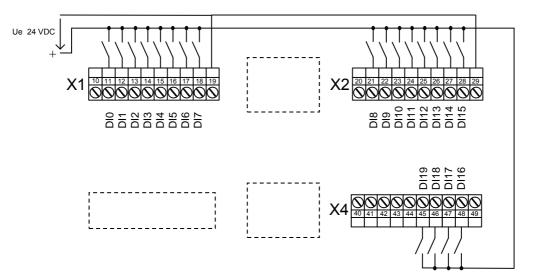
*Same terminal block as delivered with PCD3.F2xx

Terminal block with "Push In" system and LED (optional)

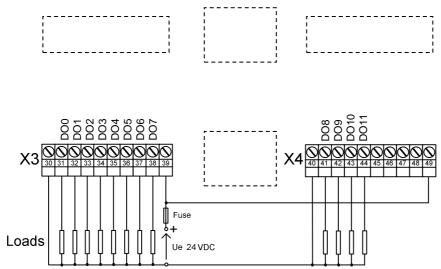


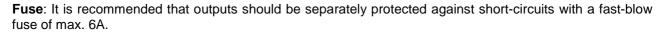
- Push In
 - o for solid wires (max. 1.5mm²)
 - o for flexible wires
 - o with or without ferrules
 - 1.5mm² wire size with or without ferrules
- Easy handling
 - Simply insert the wire to connect it
 - Push the button to remove the wire
 - LED
 - Clear and save monitoring of the signals

2.3 Digital inputs connection (Terminal block X1, X2 & part of X4)



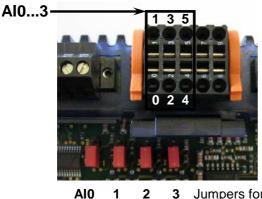
2.4 Digital outputs connection (Terminal block X3 & part of X4)





Sala-DUrgess

2.5 Analogue inputs connection (Part of terminal block X0 – black)



2 3 Jumpers for Inputs voltage/current range

- Position "± 10 V" : Voltage output (lower position Default) .
- Position "± 20 mA": Current output (higher position)

Remark: The jumper's order on first HW version is 1 0 3 2 (from the right to the left).



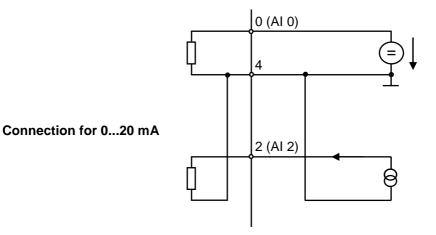
Changing the jumpers

Throughout the circuit board there are components which are sensitive to electrostatic discharges.

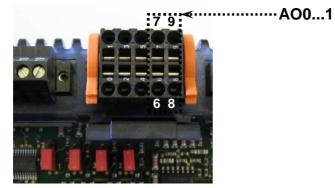
Change jumpers without power supply only.

Connection concept

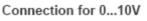
Connection for 0...10V

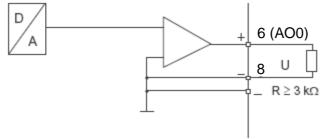


2.6 Analogue outputs connection (Part of terminal block X0 - black)

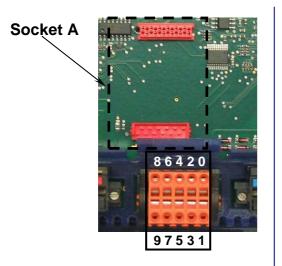


Connection concept



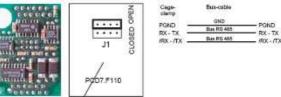


2.7 Communications interfaces connection (Bottom middle terminal block XF - orange)



Possible PCD7.F1xx module overview: (Optional & pluggable on socket A)

PCD7.F110 Serial interface module RS 422 / RS 485



PCD7.F121 Serial interface module RS 232, suitable for modem connection



PCD7.F180 Serial interface module for Belimo MP-BUS, max. 8 actuators and sensors connectable



Restriction: The not mentioned PCD7 modules are not allowed on the compact CPU due the limited power consumption (power dissipation at the limit).

Pin connection table:

	RS232				RS422					RS485				Belimo	MP-Bus	;
0	PGND	TxD	1	0	PGND	Tx	1	C)	PGND	Rx-Tx	1	0	PGND	Acom	1
2	RxD	RTS	3	2	/Tx	Rx	3	2	2	/Rx-/Tx		3	2	MST	IN	3
4	CTS	PGND	5	4	/Rx	PGND	5	4	1		PGND	5	4	GND	PGND	5
6	DTR	DSR	7	6	RTS	/RTS	7	e	5			7	6			7
8	COM	DCD	9	8	CTS	/CTS	9	8	3			9	8			9

2.8 Changing the battery

- Remove the Controller cover
- Push slightly toward the front the locking clip (See arrow on the picture)
- Remove Battery
- Insert CR 2032 coin cell in such a way that the positive pole is in contact with the locking clip, the light must switch off.

CPU type	Buffer	Buffer time
PCD3.M2x30V6	CR 2032 lithium battery	1-3 years ¹⁾

Light Battery Fail



1) Depending on the ambient temperature; the higher the temperature, the shorter the buffer time

3 PG5 & I/O configuration

Software requirements: PG5 1.4.300 or higher

The IO handling functionalities defines:

- A cyclically media mapping to enables a link between peripheral I/O modules values and the device resources (PCD Media).
- Direct access programming instructions to read value from the peripheral input module and write value to the peripheral output module.

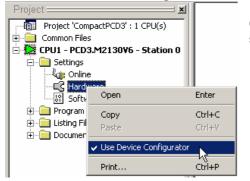
Notes:

- Input/Output handling is always enabled for the PCD3.M2x30V6.
- Via direct access there is no bit access command. The minimal access range is "byte", therefore we recommended to use the media mapping to read/write all I/O channels.

For more details refer to Preliminary I/O Handling manual.

3.1 Hardware configuration – Device Configurator

Choose the Device Configurator instead of the normal Hardware Settings window



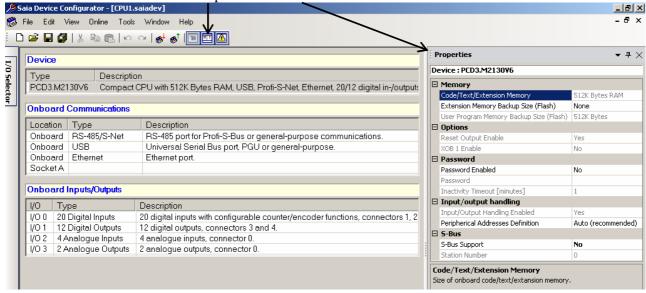
Click right mouse button on "Hardware" and select "Use Device Configurator"

- Project Project 'CompactPCD3' : 1 CPU(s) Common Files CPU1 - PCD3.M2130V6 - Station 0 Settings CONIne Conine Soft Conine Project 'CompactPCD3' : 1 CPU(s) Common Files
- Starting the Device Configurator

Double click on "Hardware" The Device Configurator takes longer to be open/start at the first time (.Net loading)

Device Configurator overview

Properties window



3.1.1 Digital inputs properties

3.1.1.1 General

All first 6 inputs (0 to 5) can be used either as:

- standard inputs or
- up to 2 counters with enable input and 2 standard inputs or
- up to 2 encoders A, B, and index signal or
- up to 4 interrupts and 2 standard inputs.

Those multiple modes must be selected under "Input Mode" property.

All digital inputs of the PCD3 Compact PC module can be mapped in flags or registers. Select under "Onboard Inputs/Outputs" the line I/O 0, all corresponding properties appears on the right side.

a) Accessing over flags mapping

- 1) Enabled Media mapping
- 2) Select "Media" Type as "Flag"

3) Give first "Media Address" x

The "inputs" flags are updated before COB 0's start with the current input's state: Example: x=0

- F0 = DI0
- F1 = DI1
- ...
- F19 = DI19

Remark: F20 to F23 will be put to '0' value

- b) Accessing over registers mapping
 - 1) Enabled Media mapping
 - 2) Select "Media Type" as "Register"
 - 3) Give first "Media Address" x

The "input" registers are updated before first COB's start, with the current input's state:

- Bit0 of Rx = DI0
- Bit1 of Rx = DI1
- ...
- Bit19 of Rx = DI19

Remark: Bit20 to Bit31 of Rx will be put to '0' value

3.1.1.2 Standard inputs

a) Input Mode

Select "Mode for Inputs 0 to 2" and "Mode for Inputs 3 to 5" as "Standard Inputs" (defined as default Input mode)

🗆 Media mapping digital inputs					
Enabled Media Mapping Digital Inputs	Yes				
Media Type Digital Inputs	Flag				
Number of Media for Digital Inputs	24				
Media Address for Digital Inputs	0				
🗄 Input Mode					
🗄 Encoder/Counter 0					
🗄 Encoder/Counter 1					
Media mapping counter/encoder	0 and 1				
🗄 Interrupts					

Properties 🔹 🕈 🗙					
I/O 0 : 20 Digital Inputs					
🗆 Media mapping digital inputs					
Enabled Media Mapping Digital Inputs	Yes				
Media Type Digital Inputs	Register 🔹				
Number of Media for Digital Inputs	1				
Media Address for Digital Inputs	0				
🗄 Input Mode					
🗄 Encoder/Counter 0					
Encoder/Counter 1					
🗄 Media mapping counter/encoder 0	and 1				
⊞ Interrupts					
Media Type Digital Inputs					
Type of media used to map the 20 digital va	alues.				

Properties 🔹 🕈 🗸		
I/O 0 : 20 Digital Inputs		
 Media mapping digital input Input Mode 	5	
Mode for Inputs 0 to 2	Standard Inputs	
Mode for Inputs 3 to 5	Standard Inputs	
🗉 Encoder/Counter 0		
🗄 Encoder/Counter 1		
🗄 Media mapping counter/end	oder 0 and 1	
🗄 Interrupts		
Mode for Inputs 0 to 2 Inputs 0 to 2 may be configured as	standard inputs, as encoder with A, B and index	

Inputs 0 to 2 may be configured as standard inputs, as encoder with A, B and index signal, as counter with enable, as configurable interrupts.

(chap. 3.1.1.2)

(chap. 3.1.1.3)

(chap. 3.1.1.4)

(chap. 3.1.1.5)

3.1.1.3 Counters with enable input

a) Input Mode Select "Mode for Inputs 0 to 2" as "Counter 0 (0,1)..." and/or "Mode for Inputs 3 to 5" as "Counter 1 (3,4) ..." Input 1 and input 4 are to enable respectively counter's 0 and 1 count up.

b) Accessing over register mapping

1) Enabled Media mapping

2) Give first "Media Address" y

- The "counter" registers are updated before COB 0's start with counter's value:
 - Ry = Counter 0
 - Ry+1= Counter 1

Properties	▼ ₽
I/O 0 : 20 Digital Inputs	
🗆 Input Mode	
Mode for Inputs 0 to 2	Counter 0 (0,1) Standard Input (2)
Mode for Inputs 3 to 5	Counter 1 (3,4) Standard Input (5)
🗄 Encoder/Counter 0	
🗄 Encoder/Counter 1	
🗆 Media mapping counter/encoder 0 a	ind 1
Enabled Media Mapping Counter/Encoder	Yes 🔹
	Register
Media Type Counter/Encoder	
Media Type Counter/Encoder Number of Media Counter/Encoder	2

saia-burgess

Control Systems and Components

Remarks:

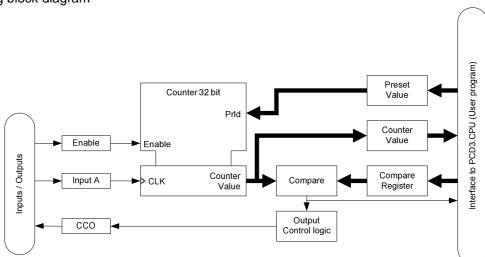
If digital inputs are mapped to flags (see (a) of chap. 3.1.1.1) then example F0, F1 & F3, F4 will show the state of the counter as standard inputs.

Or if digital inputs are mapped to register (see (b) of chap. 3.1.1.1) then Bit0, 1 & Bit3, 4 of Rx will show the state of the counter as standard inputs.

c) <u>Counter's properties (for Counter 0, same for Counter 1)</u>

I/O 0 : 20 Digital Insut-		• # ×			
I/O 0 : 20 Digital Inputs					
 ⊞ Media mapping digital in ⊞ Input Mode 	puts	_			
Encoder/Counter 0					
Mode of Digital Output 0	Standard Out	put			
Digital Output 0 Polarity	Active Low				
Interrupt 0	On Compare	a Value 🔹			
Index Polarity 0	Active Low				
Pulse Duration 0	1				
Encoder/Counter 1					
🖽 Media mapping counter/	encoder 0 and 1				
Interrupts					
Interrupt XOB Number	35				
Interrupt XOB Start Info	0	-			
Interrupt 0					
roperties	lue" can activa	is equal to the No") Properties		perties	→ ₽)
0 0 : 20 Digital Inputs		I/O 0 : 20 Digital Inputs		0 : 20 Digital Inputs	
· ·				ledia mapping digital inputs	
Media mapping digital inputs Input Mode Encoder/Counter 0 Mode of Digital Output 0 Counter Contro Digital Output 0 No Interrupt 0 No Index Polarity 0 Active Low Pulse Duration 0 1 Encoder/Counter 1	olled Output (CCO) 🔽	Image: Second Secon	tput (CCO) tput (hter Mode hter Counter 0 Gode of Digital Output 0 Gala Output 0 Polarity Active High Active High Active Low Jacobarity 0 Active Low Jacobarity 0 Active Low Jacobarity 0 Active Low Jacobarity 0 Active Low Active Low Jacobarity 0 Active Low Active	tput (CCO)
Media mapping digital inputs Input Mode Encoder/Counter 0 Mode of Digital Output 0 Counter Control Digital Output 0 Polarity Active Low Interrupt 0 No Index Polarity 0 Active Low Pulse Duration 0 1		Encoder/Counter 0 Mode of Digital Output 0 Output 0 Polarity Interrupt 0 No Index Polarity 0 Active Low Pulse Duration 0 1	tput (CCO)	Active Low ode of Digital Output 0 Counter Controlled Outgital Output 0 Gala Output 0 Active High terrupt 0 No idex Polarity 0 Active Low Jse Duration 0 10 incoder/Counter 1 Iedia mapping counter/encoder 0 and 1 terrupts Interrupts	tput (CCO)
Media mapping digital inputs Input Mode Encoder/Counter 0 Mode of Digital Output 0 Counter Control Digital Output 0 Counter Control Digital Output 0 No Interrupt 0 No Index Polarity 0 Active Low Pulse Duration 0 1 Encoder/Counter 1 Media mapping counter/encoder 0 and	11	Input Mode Incoder/Counter 0 Mode of Digital Output 0 Counter Controlled Out Digital Output 0 Polarity 0 Index Polarity 0 Active Low Pulse Duration 0 I Encoder/Counter 1 Media mapping counter/encoder 0 and 1	tput (CCO) tput (Active High ode of Digital Output 0 Counter Controlled Outgital Output 0 Active High kerrupt 0 No dex Polarity 0 Active Low Jse Duration 0 10 ncoder/Counter 1 ledia mapping counter/encoder 0 and 1	

d) Counting block diagram



e) Counting description:

The counter has following inputs, outputs and configuration possibilities at his disposal:

Counting input (input A): Enable input:	Falling edge causes a counting impulse The Enable input must be statically high so that the counter counts impulses. (And - connected with software Enable of the PCD)			
CCO (output):	Counter Controlled output, configurable as comparison value indicator (dynamic). The CCO remains active during a configurable number of counting steps.			
Preset Value: Counter Value: Compare register:	With the writing of the Preset-Value overwrite the current counter value Return reading value of the current counter value The counter value is compared with the Compare Value. As soon as the counter value reached the comparison value, the CCO is switched active or/and a XOB is executed on the PCD. The logic comparison is always sharp-switched with the written of a Compare Values for a comparison. In order to cause a renewed comparison, the Compare register must be rewrite again. With the writing of the Compare Value, the CCO is returns to the initial place; if it is still be active.			
f) Counting functions	The counter works as 32 bits of counter . If the counting value is considered			

-1 0 1 up -2'147'483'647 -2'147'483'648 The counter works as **32 bits of counter**. If the counting value is considered, so the counter works like the opposite represented principle.

Counting area: -2'147'483'648 ...0...+2'147'483'647

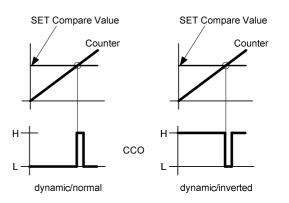
It is counted by achievement of the maximum counter value further upward, so the value jumps to the lowest negative value and counts upward further. **There is not any Overflow-Indication**.

When switching on, the counter is initialized on zero (0).

g) Compare – function and **CCO** (Counter Controlled Output) The Compare - function compares the counters value with the Compare-register. As soon as the counter value is equal to the compared value, CCO is activated alternatively or respectively a XOB is executed.

With the writing of a new Compare Values, the CCO state returns to the initial state, if the comparison was true.

Possibilities in the PCD user program: At the event 'reading = Compare Value ' can be caused a XOB.



h) Program instructions:

System symbol names:

Counter x (x= 0 or 1):

Preset value => S.IO.PRESET_VALUE_ENCODER_COUNTER_x Compare value => S.IO.COMPARE_VALUE_ENCODER_COUNTER_x Counter value => S.IO.COUNTER_ENCODER_x

Counter's initialization (for counter 0, same for counter 1 using corresponding system symbol name):

1) Loading of the Preset value with following list instruct	ction
WRP S.IO.PRESET_VALUE_ENCODER_COUNTER_0	; ex. value from R100 is written
R 100	; into system preset_value_counter
2) Loading of the Compare value with following list inst WRP S.IO.COMPARE_VALUE_ENCODER_COUNTER_0	

R 101 ; into system compare_value_counter

Counter value:

Reading of this last value through one destination register with following instruction RDP S.IO.COUNTER_ENCODER_0 R 102

This value can also be cyclically mapped into one register (see (b)).

Interrupts Status:

"On compare value" must be configured for the Interrupt 0

RDP	S.IO.INTERRUPT_STATUS	; Interrupts Status is copied
	R 106	; from system Interrupt status into R 106

			Interrupt	Status Byte			
Ir	nt D	Int C/	Int C/ Enc 1		B	Int A /Enc 0	
ILost	Int	ILost	Int	ILost	Int	ILost	Int
Int	,1'	Interrupt due edge at the input. In case of a configured interrupt with "Rising and falling edge", it is possible, trough the reading on the corresp. Input, to define the edge. Is the corresp. Input $0: \rightarrow$ falling edge. Is the corresp. Input $1: \rightarrow$ rising edge					
ILOST	,1'	Interrupt appea acknowledged	Interrupt appears, before one already present interrupt was				

By reading the interrupt's status Byte, interrupt will be acknowledged!

3.1.1.4 Encoders with A, B and index signal a) Input Mode Properties • **7** > Select "Mode for Inputs 0 to 2" as I/O 0 : 20 Digital Inputs "Encoder 0 (0,1,2)" and/or 🗆 Input Mode "Mode for Inputs 3 to 5" as Mode for Inputs 0 to 2 Encoder 0 (0,1,2) Mode for Inputs 3 to 5 "Encoder 1 (3,4,5)". Encoder 1 (3,4,5) Encoder/Counter 0 Encoder/Counter 1 b) Accessing over register mapping Media mapping counter/encoder 0 and 1 Enabled Media Mapping Counter/Encoder -Yes 1) Enabled Media mapping /ledia Type Counter/Encoder Register 2) Give first "Media Address" y Number of Media Counter/Encoder The "encoder" registers are updated before COB Media Address for Counter/Encoder 1 0's start with encoder's value: Enabled Media Mapping Counter/Encoder Select 'Yes' to enable the media mapping for the counter/encoder 0 and 1; a cyclic actualization of the media specified with the inputs values present in the memory in Ry = Encoder 0 Ry+1= Encoder 1

Remarks:

If digital inputs are mapped to flags (see (a) of chap. 3.1.1.1) then F0 to F5 will show the state of the encoders as standard inputs.

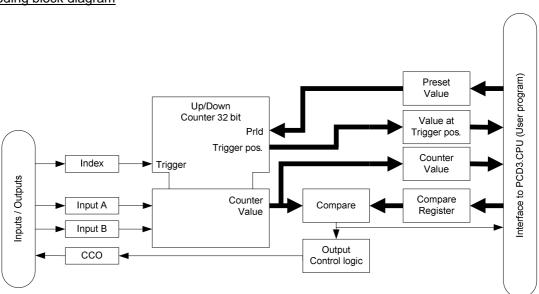
Or if digital inputs are mapped to register (see (b) of chap. 3.1.1.1) then Bit0 to Bit5 of Rx will show the state of the encoders as standard inputs.

c) Encoder's properties (for Encoder 0, same for Encoder 1)

Properties		- म ×		Properties			• • ×
I/O 0 : 20 Digital Inputs				I/O 0 : 20 Digital Inpu	ıts		
 	ts	-		 ■ Media mapping dig ■ Input Mode 	jital inputs	5	
Mode of Digital Output 0	Standard Out	out		🗆 Encoder/Counter ()		
Digital Output 0 Polarity	Active Low			Mode of Digital Outpu	it O	Standard Output	
Interrupt 0	On Compare	Yalue		Digital Output 0 Polari	ity	Active Low	
Index Polarity 0	Active Low			Interrupt 0		No	
Pulse Duration 0	1			Index Polarity 0		Active High	-
🗄 Encoder/Counter 1				Pulse Duration 0		1	
🗄 Media mapping counter/en	coder 0 and 1	<u> -</u>		Encoder/Counter 1	1		
🗆 Interrupts				Media mapping co		oder () and 1	
Interrupt XOB Number	35			⊞ Interrupts ■ ■ ■	uncerrene		
Interrupt XOB Start Info	0	-		to incerrupts			
Interrupt 0 Set 'On Compare Value' to enable to counter/encoder 0 reach the comp		when the		Index Polarity 0 Select the index polarity mode).	of the enco	oder 0 (no meaning in co	ounter
is equal to the	XOB 35 (selectable) when the counting value is equal to the compare value. (Default "No") the input 2 is recognized on the rising edge ("Active High") or falling edge ("Active Low") (Default "Active Low")						
roperties	- ₽ ×	Properties		- म ×	Properties		• ‡ ×
0 : 20 Digital Inputs		I/O 0 : 20 Digital Inputs			I/O 0 : 20 Digi	tal Inputs	
Media mapping digital inputs Input Mode Encoder/Counter 0 Mode of Digital Output 0 Digital Output 0 Polarity Interrupt 0 Index Polarity 0 Pulse Duration 0 Encoder/Counter 1 Media mapping counter/encoder 0 and 1 Interrupts	Output (CCO) 💌	Media mapping digital i Input Mode Encoder/Counter 0 Mode of Digital Output 0 Digital Output 0 Polarity 0 Index Polarity 0 Pulse Duration 0 Encoder/Counter 1 Media mapping counter Interrupts	Cou Acti No Activ 1	nter Controlled Output (CCO) ve High · ve Low	Input Mode Content of the second sec	al Output 0 Counter Controlle t 0 Polarity Active Low y 0 Active Low n 0 10	ed Output (CCO)
ode of Digital Output 0 t the digital output 0 as standard output or as cou tput (CCO) for counter/encoder 0.	inter controlled	Digital Output 0 Polarity Polarity of the output 0 when counter/encoder 0 reaches th				n 0 er of steps) of the digital output ac er 0 reaches the compare value.	tivation after the
Digital output 0 can be use hen the compare value of t 0 is reached. (Default "Standard out	he counter			ore to			

 С С С С

d) Encoding block diagram

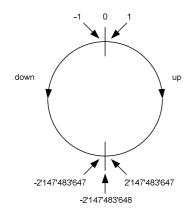


e) Encoding description:

The encoder has following inputs, outputs and configuration possibilities at his disposal:

Counting inputs: (Input A and B) Trigger (index):	Counting inputs A and B are designed for the connection of Encoder's signals The counting act for rising and falling edge of both signals, the counting direction result in the phase position of both Signal A and B. With the Trigger – Input (Index) the counter is reset to 0 by an external event. The 'old' counting state will additionally memorise and can be read back after. The Trigger's control is by user program enabled and is active until that the
	event comes. Afterwards the counter runs as usual.
CCO (output):	Counter Controlled output , configurable as comparison value indicator (dynamic). The CCO remains active during a configurable number of counting steps.
Preset Value: Counter Value: Compare register:	With the writing of the Preset-Value overwrite the current counter value Return reading value of the current counter value The counter value is compared with the Compare Value. As soon as the counter value reached the comparison value, the CCO is switched active or/and a XOB is executed on the PCD. The logic comparison is always sharp-switched with the written of a Compare Values for a comparison. In order to cause a renewed comparison, the Compare register must be rewrite again. With the writing of the Compare Value, the CCO is returns to the initial place; if it is still be active.

f) Counting description:



The counter works as **32 bits of counter**. If the counting value is considered, so the counter works like the opposite represented principle.

Counting area: -2'147'483'648 ...0...+2'147'483'647

It is counted by achievement of the maximum counter value farther upward, so the value jumps to the lowest negative value and counts upward further.

There is not any Overflow-Indication.

When switching on, the counter is initialized on zero (0).

WRP	S.IO.PRESET_VALUE_ENCODER_COUNTER_0 R 100	; ex. value from R100 is written ; into system preset_value_counter
2) Load WRP	ing of the Compare value with following list inst S.IO.COMPARE_VALUE_ENCODER_COUNTER_0 R 101	ruction ; ex. value from R101 is written ; into system compare_value_counter

Encoder's initialization (for encoder 0, same for encoder 1 using corresponding system symbol name):

Encoder value:

Reading of this last value through one destination register with following instruction RDP S.IO.COUNTER ENCODER 0 ; in DWord R 102

This value can also be cyclically mapped into one register (see (b)).

Reference mode:

RDPB

1) Start the reference mode of encoder with following instruction (valid for both encoders) **WRPB** S.IO.REF_MODE_ENCODER_0_AND_1 ; in Byte

R 103	
-------	--

	0	No Influence for both encoder
R value	1	The encoder 0 will be switch in Reference mode & no influence on encoder 1
	16	The encoder 1 will be switch in Reference mode & no influence on encoder 0

2) Read the mode of the encoder with following instruction S.IO.ENCODER_0_STATUS_REF_MODE

ŀ	R 104	
MODE	,0'	The encoder is not in the Reference mode
MODE	,1'	The encoder is in Reference mode

3) Reading of counter value since the Set Reference mode to index signal through one destination register with following instruction

; in Byte

RDPW	S.IO.ENCODER_0_REF_COUNTER	; in Word
	R 105	

Output)

The Compare - function compares the counters value with the Compare-register. As soon as the counter value is equal to the compared value, CCO is activated alternatively or respectively a XOB is executed.

With the writing of a new Compare Values, the CCO state is reset, if the comparison was true.

Possibilities in the PCD user program:

Encoder x (x=0 or 1):

Preset value

Compare value

Counter value

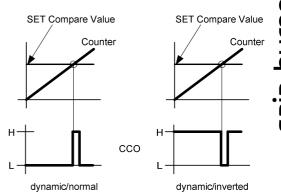
RefMode Status **RefCounter Value**

Set encoder RefMode

h) Program instructions: System symbol names:

User's Guide PCD3.M2x30V6

At the event 'reading = Compare Value ' can be caused a XOB.



=> S.IO.PRESET_VALUE_ENCODER_COUNTER_X

=> S.IO.COUNTER ENCODER x

=> S.IO.REF_MODE_ENCODER_0_AND_1 => S.IO.ENCODER x STATUS REF MODE

=> S.IO.ENCODER_X_REF_COUNTER

=> S.IO.COMPARE VALUE ENCODER COUNTER x

Interrupts Status:

	S.IO.INTERF R 106	RUPT_STATUS		errupts Statu om system Int		ıs into R 106	
			Interrupt S	Status Byte			
	nt D	Int C/	Enc 1	Int	В	Int A /	Enc O
ILost	Int	ILost	Int	lLost	Int	ILost	Int
Int	,1' I	nterrupt due e ising and fallin nput, to define s the corresp. s the corresp.	ig edge", it is the edge. Input 0: \rightarrow f	s possible, tr alling edge.			
ILOST		nterrupt appea acknowledged	•	one already p	resent inter	rupt was	

By reading the interrupt's status Byte, interrupt will be acknowledged!

3.1.1.5 Interrupts

a) Input Mode Select "Mode for Inputs 0 to 2" as "Interrupts A and B (0,1)..." and "Mode for Inputs 3 to 5" as "Interrupts C and D (3,4)..."

Properties	▼ ₽ >
I/O 0 : 20 Digital Inputs	
🗉 Media mapping digital i	inputs
🗆 Input Mode	
Mode for Inputs 0 to 2	Interrupts A and B (0,1) Standard Input (2)
Mode for Inputs 3 to 5	Interrupts C and D (3,4) Standard Input (5)
🗄 Encoder/Counter 0 👘	
🗄 Encoder/Counter 1	
🗄 Media mapping counte	r/encoder 0 and 1
🗄 Interrupts	
Mode for Inputs 0 to 2	
Inputs 0 to 2 may be configu	red as standard inputs, as encoder with A, B and enable, as configurable interrupts.

Remarks:

If digital inputs are mapped to flags (see (a) of chap. 3.1.1.1) then example F0 to F5 will show the state of the interrupts as standard inputs.

Or if digital inputs are mapped to register (see (b) of chap. 3.1.1.1) then Bit0 to Bit5 of Rx will show the state of the interrupts as standard inputs.

		- + ×	Properties	▼ #)
I/O 0 : 20 Digital Inputs			I/O 0 : 20 Digital Inputs	
🗆 Interrupts			🗆 Interrupts	
Interrupt XOB Number	35		Interrupt XOB Number	35
Interrupt XOB Start Info	0		Interrupt XOB Start Info	0
Interrupt A	Disabled	-	Interrupt A	On rising edge 🗾 💽
Interrupt B	Disabled		Interrupt B	Disabled
Interrupt C	Disabled		Interrupt C	Disabled
Interrupt D	Disabled	•	Interrupt D	Disabled
set to 'Interrupts A and B' and B the interrupt can be activated b Interrupt A is disabled, i	by user program command.		the interrupt can be activated	d the 'Interrupt A' is set to 'Disabled', I by user program command. KOB 35 if the input 0 goes from
	the XOB 35 (selectal		low to high	("On rising edge").
	r (Default "Disabled	· · · · · · · · · · · · · · · · · · ·	Properties	▼ ₽ \
Properties	r (Default "Disabled	d") ▼ ╄ ×	Properties	• # >
Properties I/O 0 : 20 Digital Inputs	r (Default "Disabled	· · · · · · · · · · · · · · · · · · ·	-	↓ ↓ >
Properties I/O 0 : 20 Digital Inputs	r (Default "Disabled	· · · · · · · · · · · · · · · · · · ·	I/O 0 : 20 Digital Inputs	▼
Properties I/O 0 : 20 Digital Inputs		· · · · · · · · · · · · · · · · · · ·	I/O 0 : 20 Digital Inputs	
Properties I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number	35	· · · · · · · · · · · · · · · · · · ·	I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number	35
Properties I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number Interrupt XOB Start Info	35 0	· · · · · · · · · · · · · · · · · · ·	I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number Interrupt XOB Start Info	35 0
Properties I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number Interrupt XOB Start Info Interrupt A	35 0 On falling edge	· · · · · · · · · · · · · · · · · · ·	I/O 0 : 20 Digital Inputs Interrupt XOB Number Interrupt XOB Start Info Interrupt A	35 0 On rising and falling edge
Properties I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number Interrupt XOB Start Info Interrupt A Interrupt B	35 0 On falling edge Disabled	· · · · · · · · · · · · · · · · · · ·	I/O 0 : 20 Digital Inputs Interrupt XOB Number Interrupt XOB Start Info Interrupt A Interrupt B	35 0 On rising and falling edge v Disabled
Properties I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number Interrupt XOB Start Info Interrupt A Interrupt B Interrupt C	35 0 On falling edge Disabled Disabled Disabled A. If the 'Mode for Inputs (the 'Interrupt A' is set to 'Di	• # ×	I/O 0 : 20 Digital Inputs Interrupts Interrupt XOB Number Interrupt XOB Start Info Interrupt A Interrupt B Interrupt C Interrupt D Interrupt A Select the type of the interrup	0 On rising and falling edge Disabled Disabled Disabled Disabled Ot A. If the 'Mode for Inputs 0 to 2' is d the 'Interrupt A' is set to 'Disabled',

b) Interrupt's properties (for Interrupt A, same for Interrupts B, C & D)

All other interrupts have the same properties and are freely configurable. All interrupts are calling the same XOB. Read the status of all enabled Interrupts into this XOB to run the corresponding program part.

c) Program instructions <u>System symbol names:</u>

Interrupt's configuration Interrupt's status => S.IO.INTERRUPT_CONFIG => S.IO.INTERRUPT_STATUS

Interrupts configuration:

The configuration can be done by user program if interrupt's configuration is "Disabled" with following instruction

WRP S.IO.INTERRUPT_CONFIG

R 99

Byt	e 1	Byte	e 0
INTD	INTC	INTB	INTA

INTn (n = A, B, C, D)				
3	2	1	0	
'0'	'0'	ENEG	EPOS	

EPOS ,0' No Interrupt with the rising edge on		No Interrupt with the rising edge on the input
LI 03	,1'	Interrupt with the rising edge on the input
ENEG	,0'	No Interrupt with the falling edge on the input
LINEG	,1'	Interrupt with the falling edge on the input

;

Interrupts Status:

RDPS.IO.INTERRUPT_STATUS
R 106; Interrupts Status is copied
; from system Interrupt status into R 106

			Interrupt S	Status Byte			
Int D		Int C/ Enc 1		Int B		Int A /Enc 0	
ILost	Int	ILost	Int	ILost	Int	ILost	Int
Int	61	nterrupt due e Rising and fal nput, to define	ling edge", it				

int	, '	Is the corresp. Input 0: \rightarrow falling edge. Is the corresp. Input 1: \rightarrow rising edge
ILOST	,1'	Interrupt appears, before one already present interrupt was acknowledged.

By reading the interrupt's status Byte, interrupt will be acknowledged!

3.1.2 Digital outputs properties

All the digital outputs of the PCD3 Compact PC module can be mapped in flags or registers. Select under "Onboard Inputs/Outputs" the line I/O 1, all corresponding properties appears on the right side.

a) Accessing over flags mapping

- 1) Enabled Media mapping
- 2) Select "Media Type" as "Flag"
- 3) Give first "Media Address" y

The Flag's states are transferred to outputs DO0 until DO11 at COB's end.

Example: y=24

- DO0 = F24
- DO1 = F25
 - ...

DO11 = F35

F36 to F39 have always '0' bit

b) Accessing over registers mapping

- 1) Enable Media mapping
- 2) Select "Media Type" as "Register"
- 3) Give first "Media Address" y

The register's value ('Low'-Bits) is transferred to outputs DO0 until DO11 at COB's end:

- DO0 = Bit0 of Ry
- DO1 = Bit1 of Ry
- ..
- DO11 = Bit11 of Ry
- Bit12 to Bit31 of Ry have always '0' value

3.1.3 Analogue inputs properties

Properties	→ ₽ >
🗆 Media mapping	
Enabled Media Mapping	Yes 🔹
Media Type	Flag
Number of Media	16
Media Address	24
Enabled Media Mapping Select 'Yes' to enable the medi	a mapping for the digital

outputs; a cyclic actualization of the output values present in the memory image with the specified media contents.

(/0	1 : 12 Digital Outputs		
٦N	1edia mapping		
E	nabled Media Mapping	Yes	
M	1edia Type	Register	
N	lumber of Media	1	
M	1edia Address	24	

On the analogue inputs of the PCD3 Compact PC module can be mapped in registers. Select under "Onboard Inputs/Outputs" the line I/O 2, all corresponding properties appears on the right side.

- a) Accessing over registers mapping
 - 1) Enable Media Mapping
 - 2) Give first "Media Address" a

The 4° "inputs" registers are updated at the COB 0's start with the current values of analogue inputs: Example: a=3

- a=3
 - R3 = AI0
 R4 = AI1
 - R4 = AI1
 R5 = AI2
 - R6 = Al3

b) Filter activation and Range mode

Filtering: The analogue inputs can be read directly (unfiltered) or a 16 tap floating average filter can be switch "on" to reduce noise

Possible Range mode:

- 12 Bit Resolution (default)
 - → -4096..4095
- -20..+20mA in uA resolution
 → -20'000..20'000
- -10..+10V in mV or % resolution
 → -10'000..10'000
- User defined range

(Value between -32'768 and 32'767)

Remark: Don't forget to place corresponding jumpers for Inputs voltage/current range

Properties	Properties 🔹 🕈 🗙				
I/O 2 : 4 Analogue Inpu	ts				
🗆 Media mapping					
Enabled Media Mapping	Yes 🔹				
Media Type	Register				
Number of Media	4				
Media Address	3				
🗆 Analogue Input 0					
Filter Analogue Input 0	Off				
Input 0 Range	12 Bit resolution				
Minimal Value Input 0	-4096				
Maximal Value Input 0	4095				
🗆 Analogue Input 1					
Filter Analogue Input 1	Off				
Input 1 Range	-20+20mA in uA resolution				
Minimal Value Input 1	-20000				
Maximal Value Input 1	20000				
🗆 Analogue Input 2	Analogue Input 2				
Filter Analogue Input 2	Off				
Input 2 Range	-10+10V in mV or % resolution				
Minimal Value Input 2	-10000				
Maximal Value Input 2	10000				
🗆 Analogue Input 3					
Filter Analogue Input 3	Off				
Input 3 Range	User defined range				
Minimal Value Input 3	-10000				
Minimal value Input 3					

inputs values present in the memory image.

• • ×

•

3.1.4 Analogue outputs properties

On the analogue outputs of the PCD3 Compact PC module can be mapped in registers. Select under "Onboard Inputs/Outputs" the line I/O 3, all corresponding properties appears on the right side.

Properties

🗆 Media mapping

Media Type

Number of Media

Analogue Output 0
 Output 0 Range

🗆 Analogue Output 1

Output 1 Range

Minimal Value Output 0

Maximal Value Output 0 Reset Value Output 0

Minimal Value Output 1

Maximal Value Output 1

Reset Value Output 1

Enabled Media Mapping

Media Address

I/O 3 : 2 Analogue Outputs

Enabled Media Mapping

Yes

2

7

Register

10000

12 Bit resolution

0

0

0

Select 'Yes' to enable the media mapping for the analogue

outputs; a cyclic actualization of the output values present in the memory image with the specified media content.

4095

0..10V in mV or % resolution

- a) Accessing over registers mapping
 - 1) Enable Media Mapping
 - 2) Give first "Media Address" b
- The 2 "output" registers value are transferred to analogue outputs at COB's end:

Example: b=7

- AO0 = R7
- AO1 = R8
- b) Possible Range mode:
 - 12 Bit Resolution (default)
 - → 0...4095
 - 0..10V in mV or % resolution → 0...10'000
 - User defined range (Value between -32'768 and 32'767)

c) Reset Value Output:

Defines the reset value of the output (Power -up initialization)

3.1.5 General remarks:

Overlapping are warn in the Messages window

	Maccaaac
1.00	Messages

1 C C	·					
1	Code	Item	Message			
×	ER_1204	1/0 0 : 20 Digital Inputs	Register address range of this slot overlap with other register address range.			
×	ER_1205	I/O 1 : 12 Digital Outputs	Flag address range of this slot overlap with other flag address range.			

Version E2.5 – February 08 - Subject to change without notice

3.2 Programming

Symbol management

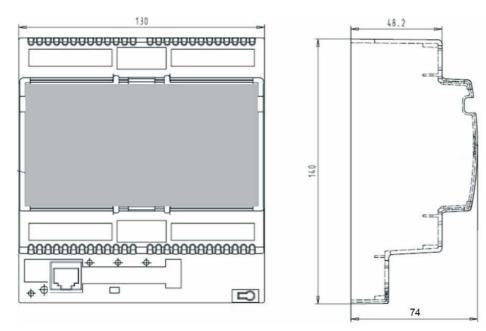
up/Symbol		Туре	Address/	Comment
3				
🗃 🚍 S 👘		GROUP		
- 🕂 💼 CF		GROUP		
- 🖨 🔁 IC)	GROUP		
	ANALOGUE_INPUT_0		4	Address of analogue input 0 in memory input range - used for direct access
	ANALOGUE_INPUT_1		6	Address of analogue input 1 in memory input range - used for direct access
	ANALOGUE_INPUT_2		8	Address of analogue input 2 in memory input range - used for direct access
	ANALOGUE_INPUT_3		10	Address of analogue input 3 in memory input range - used for direct access
	ANALOGUE_OUTPUT_0		2	Address of analogue output 0 in memory output range - used for direct acc
	ANALOGUE_OUTPUT_1		6	Address of analogue output 1 in memory output range - used for direct acc
	AnalogueInput0	R	3	Analogue inputs 0
	AnalogueInput1	R	4	Analogue inputs 1
	AnalogueInput2	R	5	Analogue inputs 2
	AnalogueInput3	R	6	Analogue inputs 3
	AnalogueOuput0	R	7	Analogue outputs 0
	AnalogueOuput1	R	8	Analogue outputs 1
	COUNTER_ENCODER_0		1044	Address of counter/encoder 0 in memory input range - used for direct access
	COUNTER_ENCODER_1		1048	Address of counter/encoder 0 in memory input range - used for direct access
	DIGITAL_INPUT_0T07		0	Address of digital 0 to 7 inputs in memory input range - used for direct acces
	DIGITAL_INPUT_8TO15		1	Address of digital inputs 8 to 15 in memory input range - used for direct acc
	DIGITAL_INPUT_16TO19		2	Address of digital inputs 16 to 20 in memory input range - used for direct ac
	DIGITAL_OUTPUT_0T07		0	Address of digital outputs 0 to 7 in memory output range - used for direct
	DIGITAL_OUTPUT_8TO11		1	Address of digital outputs 8 to 12 in memory output range - used for direct.
	DigitalInput0	F	0	Digital input 0
	DigitalInput1	F	1	Digital input 1
	DigitalInput2	F	2	Digital input 2
	DigitalInput3	F	3	Digital input 3
	DigitalInput4	F	4	Digital input 4
	DigitalInput5	F	5	Digital input 5
	DigitalInput6	F	6	Digital input 6
	DigitalInput7	F	7	Digital input 7
	DigitalInput8	F	8	Digital input 8
	DigitalInput9	F	9	Digital input 9
	DigitalInput10	F	10	Digital input 10
	DigitalInput11	F	11	Digital input 11
	DigitalInput12	F	12	Digital input 12
	DigitalInput13	F	13	Digital input 13
	DigitalInput14	F	14	Digital input 14

During programming, you can always drag & drop Symbols from "IO Group" under "System Symbol" of the Symbol Editor.

Remark: HMI Editor need "Global Symbol" in this case copy & paste Symbols from "System Symbol".

4 Dimension drawing

Valid for both controllers PCD3.M2130V6 and PCD3.M2030V6 without Ethernet connection



Ordering information

Туре	Description	Weight
PCD3.M2130V6	Base units with 38 data points CPU with 512 Kbytes user program, backup with onboard Flash memory, USB port for PG5, 2 Interrupts, Web-Server, RS 485, 32 digital I/O and 6 analogues I/O, 1 port (socket A) for PCD7.F1xx, Ethernet TCP/IP data protection 1-3 years, terminal blocks delivered	750g
PCD3.M2030V6 (In preparation)	Same as PCD3.M2130V6 without Ethernet TCP/IP	750g
4 405 5066 0	Optional Pluggable "Push-in" terminal block with LED, 10-pole, as connector for X1, X2, X3 & X4	12g

Addresses

Switzerland and international Saia-Burgess Controls Ltd. Bahnhofstrasse 18 CH-3280 Murten/Switzerland T +41 26/672 71 11 F +41 26/672 74 99 pcd@saia-burgess.com www.saia-burgess.com

Product support, Technical reference website: www.sbc-support.ch Other addresses: www.saia-burgess.com - Contact This brochure was received from: