I/O expansions for pCO

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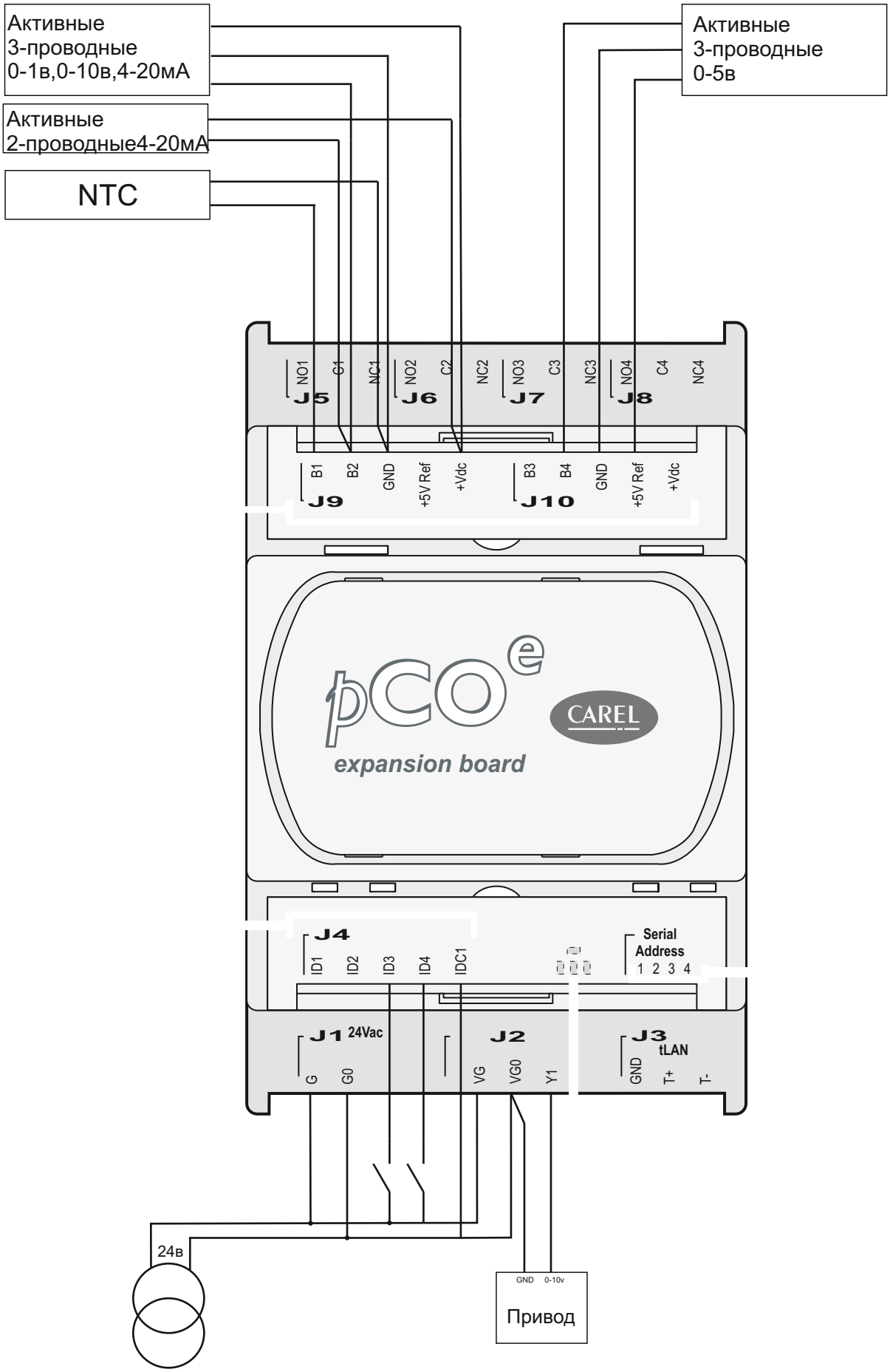


pCOE RS485 and tLAN I/O expansions

Introduction

The pCOE expansions do not require software onboard, as they communicate according to a predefined table.

tLAN expansions

The tLAN expansions can be connected directly to a pCOxs or pCO1 tLAN using the serial connection card (code PCO100TLN0).
A maximum of 5 expansions can be connected.

The tLAN must be configured with the following system variables:

- COM_PROTOCOL_FIELDBUS set to 20
- COM_BAUDRATE_FIELDBUS (0-4) set to 4 (19200).

In addition, the system variable SLAVE_CFG must be used to define which expansions should be queried. Not setting this variable is the same as checking all 5 addresses available for the expansions. It is in any case recommended to configure the exact number of expansions connected, so as to significantly reduce the response times.
In this variable, the bits from 1 to 5 indicate the respective expansions to be queried.
For example, setting bit 1 of this variable and leaving the others at 0 means only the expansion address 1 will be queried.

RS485 expansions

The RS485 expansions must be connected to terminal J23 on a pCO2 large with production date after December 2001.
They can also be connected to the serial port reserved for the pLAN or the shared terminal, by setting the system variable COM_PROTOCOL_PLAN to 7.
These decisions are mutually exclusive (only one of the two is possible).
In the first case, no variable needs to be set.
A maximum of 5 expansions can be connected, however, unlike the tLAN, there is no variable that indicates which ones to query. The pCO2 will always query all 5 addresses.

General information

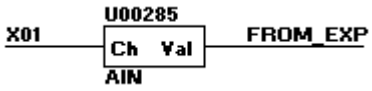
(See the configuration on page 3)
To check if an expansion is online, simply check the corresponding read-only system variable EXP_BOARD_TYPE1..2..3..4..5 (where 1, 2, 3, 4, 5 identify the addresses of the expansions).
If one of these variables is 0, the corresponding expansion is off-line.

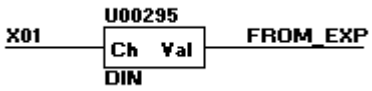
Both the expansions have the following I/O available:

- 4 digital inputs
- 4 digital outputs
- 4 analogue inputs
- 1 analogue output

How to read a variable from the expansion

The digital/analogue variables are read in the same way from a RS485 and tLAN expansion.
To read a variable, simply use the AIN (! not AIN_CFG !) atom (in the case of analogue or integer variables) DIN atom (in the case of digital variables), as for the expansions using pCOX controllers.



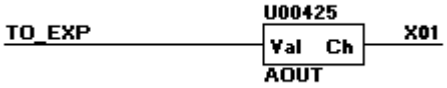


The output value Val will be the variable read from the expansion.
The number set for Ch will be set in a similar way as described for expansions with pCOX boards.

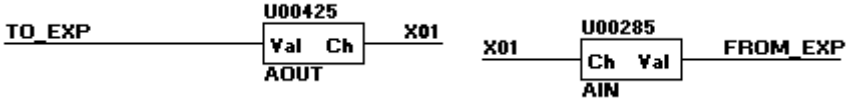
How to send a variable to the expansion

The variables are sent to the expansion in a different way for the RS485 and tLAN.
The addresses of the variables (obviously only with write access) are also different. In addition, the configuration of a variable on an RS485 expansion will only involve them being sent using the DOUT or AOUT atoms, while on a tLAN expansion they are sent with DOUT or AOUT and received as confirmation with DIN or AIN at the same address.

In the example below, an analogue variable is sent to a RS485 and tLAN expansion respectively.



In this case, the operation is similar to that with pCOX expansions.



In this case, however, a check is performed that the data written to the expansion was successfully received.
Both the write/read atoms with the same address need to be used for correct communication.

Integer configuration variables

The configuration variables allow the expansion parameters to be set, such as the type of analogue probe used (NTC, 0 to 5 V, 4 to 20 mA).
In certain cases, the configuration variables may not be used by the application; in these cases, the pCOe expansion uses the default values.
If the application uses the configuration variables, check that these fall within the range of allowable values.

Description	R/W	RS485 address	tLAN address	Range	Default
Time constant for filtering probe 1	R/W	AOUT x11	AOUT x50 / AIN x50	0 to 15	8
Time constant for filtering probe 2	R/W	AOUT x12	AOUT x51 / AIN x51	0 to 15	8
Time constant for filtering probe 3	R/W	AOUT x13	AOUT x52 / AIN x52	0 to 15	8
Time constant for filtering probe 4	R/W	AOUT x14	AOUT x53 / AIN x53	0 to 15	8
Type of analogue inputs 1 and 2	R/W	AOUT x15	AOUT x54 / AIN x54	0/2/4/6 see table	0
Type of analogue inputs 3 and 4	R/W	AOUT x16	AOUT x55 / AIN x55	0/2/4/6 see table	0
Pattern for disabling the digital outputs according to the digital inputs	R/W	AOUT x17	AOUT x56 / AIN x56	-32767 to 32767	0
Pattern for disabling the digital outputs according to the selected analogue input	R/W	AOUT x18	AOUT x57 / AIN x57	0 to 15	0
Activation delay for the disabling pattern from digital inputs (s)	R/W	AOUT x19	AOUT x58 / AIN x58	0 to 65535	0
Activation delay for the disabling pattern from analogue input (s)	R/W	AOUT x20	AOUT x59 / AIN x59	0 to 65535	0
Select analogue input for the activation of the pattern	R/W	AOUT x21	AOUT x60 / AIN x60	1/2/3/4	1
Pattern of the analogue output and the four digital outputs in the event of no communication for over 30 seconds	R/W	AOUT x22	AOUT x61 / AIN x61	0 to 255 see table	144

Where x represents the number of the expansion to be communicated with, from 1 to 5.

Type of analogue inputs
This selection is similar to the "Ain_pco2" atom when configuring an analogue probe for a pCO.

The possible values are:

0 or 7	NTC or NTC HT
2	0-1V probe
4	0-20mA probe
6	0-5V probe

Pattern of the analogue output and the four digital outputs
This is used to establish the status of the outputs when there is no communication for over 30 seconds.

Bit	7	6	5	4	3	2	1	0
Meaning	*Enable AOUT*	AOUT Bit 1	AOUT Bit 0	*Enable Relay*	Relay 4	Relay 3	Relay 2	Relay 1

The pattern for the digital outputs is enabled by bit "4":

0 = pattern not enabled

1 = pattern enabled

The pattern for the digital outputs envisages the configuration of bits from "0" to "3" with the following meanings:

0 = relay off

1 = relay on

The pattern for the analogue output is enabled by bit "7":

0 = pattern not enabled

1 = pattern enabled

The pattern for the analogue output envisages the configuration of bits "5" and "6" as per the following table:

Bit 6	**Bit 5**	**Analogue output value**
0	0	**0 V**
1	1	
0	1	**5 V**
1	0	**10 V**

Digital variables

Description	R/W	RS485 address	TLAN address
Status of input 1	R	DIN x01	DIN x01
Status of input 2	R	DIN x02	DIN x02
Status of input 3	R	DIN x03	DIN x03
Status of input 4	R	DIN x04	DIN x04
Status of output (relay) 1	R	DIN x05	DIN x05
Status of output (relay) 2	R	DIN x06	DIN x06
Status of output (relay) 3	R	DIN x07	DIN x07
Status of output (relay) 4	R	DIN x08	DIN x08
I/O mismatch alarm (no confirmation of output pattern for 10 s)	R	DIN x09	DIN x09
Control output (relay) 1	R/W	DOUT x01	DOUT x10 / DIN x10
Control output (relay) 2	R/W	DOUT x02	DOUT x11 / DIN x11
Control output (relay) 3	R/W	DOUT x03	DOUT x12 / DIN x12
Control output (relay) 4	R/W	DOUT x04	DOUT x13 / DIN x13
Enable the pattern on opening (“0”) or closing (“1”) the digital inputs	R/W	DOUT x05	DOUT x14 / DIN x14
Enable the analogue pattern above (“0”) or below (“1”) the set threshold	R/W	DOUT x06	DOUT x15 / DIN x15

Where x represents the number of the expansion to be communicated with, from 1 to 5.

Analogue variables

Description	R/W	RS485 address	TLAN address
Value of analogue probe 1	R	AIN x01	AIN x01
Value of analogue probe 2	R	AIN x02	AIN x02
Value of analogue probe 3	R	AIN x03	AIN x03
Value of analogue probe 4	R	AIN x04	AIN x04
Set analogue output value	R/W	AOUT x01	AOUT x05 / AIN x05
Pattern activation threshold	R/W	AOUT x01	AOUT x06 / AIN x06

Where x represents the number of the expansion to be communicated with, from 1 to 5.

Using the disabling patterns

The disabling patterns allow the value of one or more digital outputs to be set to "0". The effects of the two disabling patterns overlap.
If, with the patterns active, the OFF-LINE alarm occurs, any alarm pattern for the digital outputs has priority over the disabling patterns.

Pattern according to the digital inputs.

This function is used to set one or more digital outputs to "0" according to the status of the predefined digital inputs on the expansion.

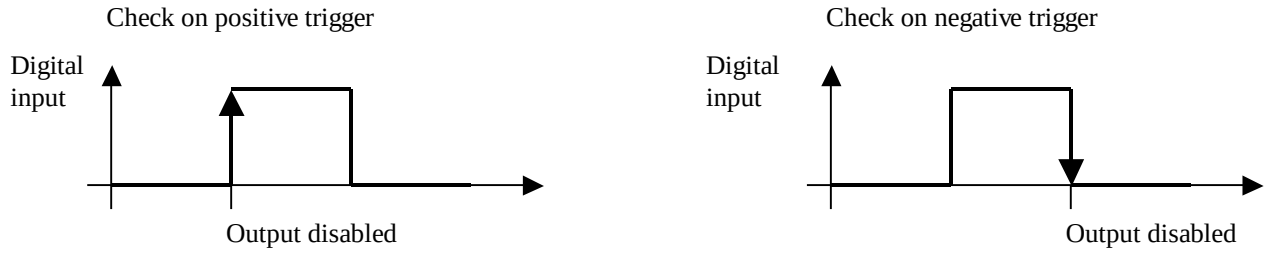
1) First of all, the inputs to be checked for each output need to be set, configuring the variable "Pattern for disabling the digital outputs according to the digital inputs" (integer).
This is a 16-bit variable in which each bit is used to check the status of a digital input so as to disable a determined output.
Bit "0" to bit "3" are used to control input 4, bit "4" to bit "7" input 3, and so on.

The table shows the digital inputs/outputs for each bit (from "0" to "15"):

Bit	*15*	*14*	*13*	*12*	*11*	*10*	*9*	*8*	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*
Dig. In.	**1**				**2**				**3**				**4**			
Relay	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

The variable is made up as follows:
0 = relay ignored
1 = relay off

2) Then configure the variable "Enable the pattern on opening ("0") or closing ("1") the digital inputs" (digital).
The value "0" means the check is performed on a positive trigger (that is, when the selected inputs switch from logical status "0" to "1"), while the value "1" means the check is performed on a negative trigger (that is, when the selected inputs switch from logical status "1" to "0").



3) Finally, the time must be set for the "Delay in the activation of the disabling pattern from digital inputs (s)" (integer).

Pattern according to the analogue inputs.

This function is used to set one or more digital outputs to "0" according to the status of the predefined analogue input on the expansion.

1) First of all "Select the analogue input for the activation of the pattern" (integer).

The table below shows the possible values for this variable:

1	Set probe 1
2	Set probe 2
3	Set probe 3
4	Set probe 4

2) Then select the digital outputs to be affected by the pattern, setting the bits (from "0" to "3") of the variable "Pattern for disabling the digital outputs according to the analogue input selected" (integer).

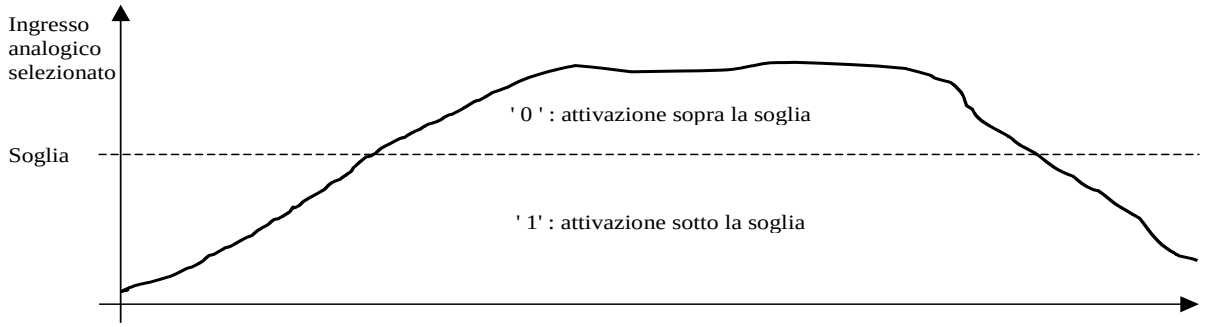
The table shows the digital inputs/outputs for each bit (from "0" to "3"):

Bit	**3**	**2**	**1**	**0**
Relay off	**Relay 4**	**Relay 3**	**Relay 2**	**Relay 1**

The variable is made up as follows:
0 = relay ignored
1 = relay off

3) Once having selected the probe to be checked and the outputs that the pattern will act on, set the "Pattern activation threshold" (analogue).

4) The variable "Enable the pattern when crossing the threshold from low to high (0) or vice-versa (1)" (digital) defines whether the pattern is activated when the value of analogue input selected exceeds ("0") or falls below the threshold ("1").



5) Finally, set the time for the "Delay in the activation of the disabling pattern from analogue input (s)" (integer).

Meaning of the signal LEDs

The meanings of the LEDs shown in the table below are

Red LED	Yellow LED	Green LED	meaning
-	-	on	communication active.
-	on	-	probe error.
on	-	-	"I/O mismatch" error for more than 10 sec., caused by the disabling patterns.
flashing	-	-	no communication for more than 30 seconds (priority over "I/O mismatch" error)
-	-	-	wait for initialisation from the master.