Control System Type ABS PCxp

Installation Manual

81300042G

Contents

1   General information

The PCx series is a Control system from Sulzer. It includes a control unit, PCx, expansion unit, PCxp and operator panel PCxop. The communication between the units is through a CAN-network.

PCx is a control unit that can measure and log data, receive and transmit alarms, control of water and sewage pump works, pumping pits and booster stations. The PCx has many built in functions for controller of pumps, measurements of flows, etc. PCx communicates with other units through two interfaces, RS232 and RS485. The PCx software is supporting the protocols COMLI and Modbus. Examples of units that can be connected to the RS232/485 port are telephone modem, GSM-modem and radio.

PCx can have up to seven expansion units, PCxp, attached. The amount of in- and outputs for the PCx, the PCxp and a full system is shown in the table below:

	PCx	**PCxp**	PCx and 7 PCxp
Digital inputs	16	16	**128**
Digital outputs	8	8	**64**
Analogue inputs	4	4	**32**
Analogue outputs	**2**	**2**	**16**

The PCxop is a permanent mounted operator panel. The communication and power supply to the units are through the CAN-bus.

The PCx can be configured by two different ways,
> From the operator panels, PCxop
> From a PC with the software AQUA PROG from Sulzer. The PC can be connected directly to the PCx or via GSM-/telephone modems.

2   Nomenclature

AI	Analogue input.
AO	Analogue output.
CAN	Control Area Network, an interface for communication.
PCx	The PCx series electrical control processor unit.
DI	Digital input.
DO	Digital output.
I/O	In- and outputs, can be either analogue or digital.
PCxop	permanent mounted operator panel.
RS232/485	communication interfaces
PCxp	PCx series expansion unit for more I/O.

3   Mechanical installation of PCxp

The PCxp fits on a standard 35 mm DIN-rail. Mounted on a DIN-rail, the PCxp has a length of 143 mm and width of 74 mm and the depth of 53 mm, see figure 3.1.
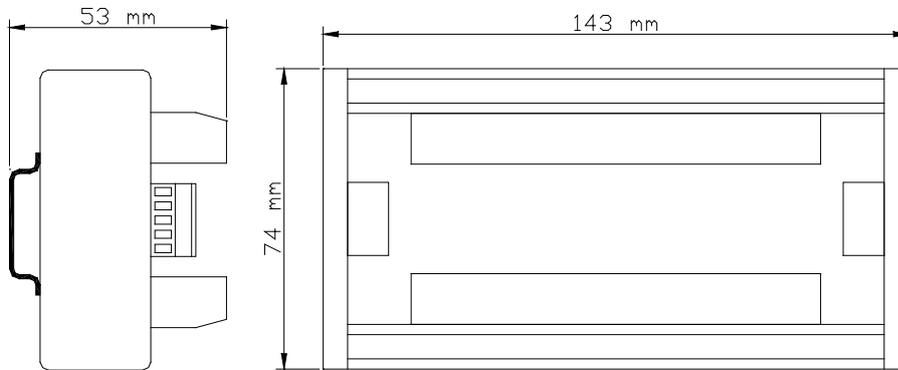
Figure 3.1: The dimensions of the PCxp when mounted on a 35 mm DIN-rail

To avoid interference, it is recommended to have the PCx and the PCxp-units in a separate section when putting together a cabinet alternative in a separate metallic enclosure. If contactors and relays are put in the same cabinet as the PCx and PCxp, those should be put as far away as possible from the PCx, PCxp units and their signal cables.

Power cables to or from electrical motors or similar shall not be put in the same duct as the signal cables from PCx or PCxp.

4   Electric installation of PCxp
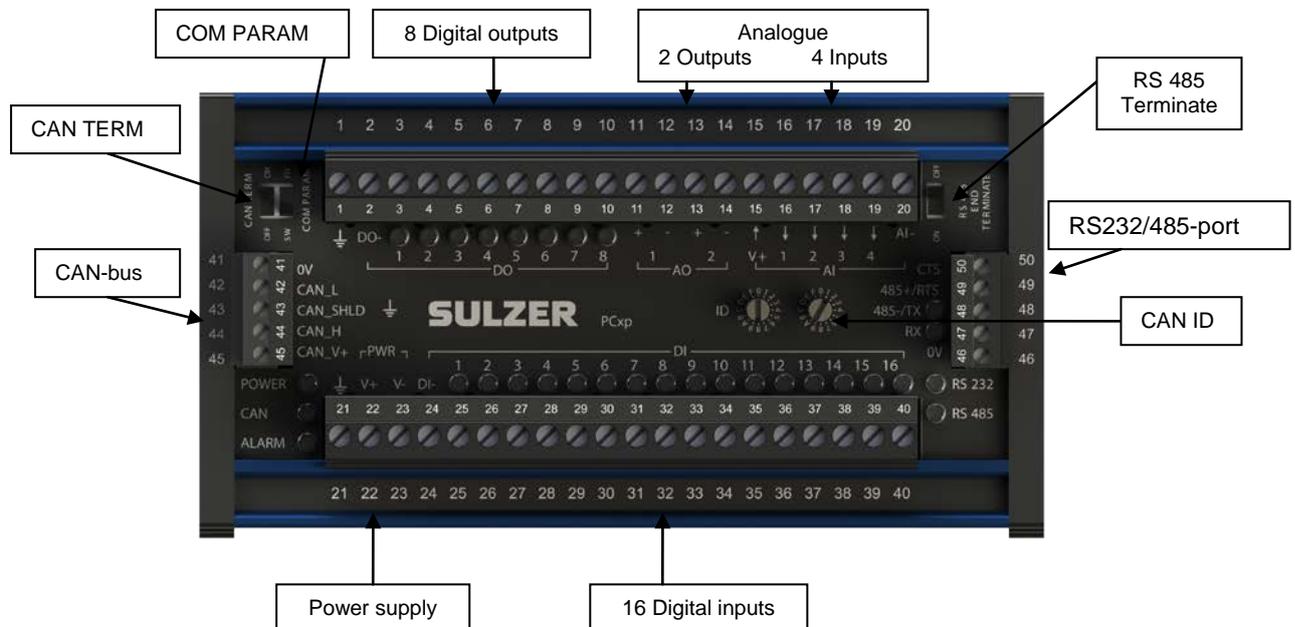
PCxp can be used in many applications. This chapter describes the most common cable wiring for the PCxp. The unit is equipped with transient and interference suppression components. When the unit is put in hazardous areas, external transient and lightning protection is recommended especially on the RS232/485-port.

4.1   Power supply
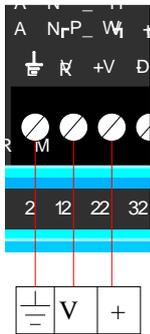
The plus pole from the power supply connects to terminal number 22 and the negative to terminal number 23.

The connection between the chassie of the PCxp and the chassie (ground) of the cabinet is from either terminal number 1 or 21 to the. Internally in the PCxp, the power supply is galvanic separated from ground.

4.1.1   Power supply and battery backup
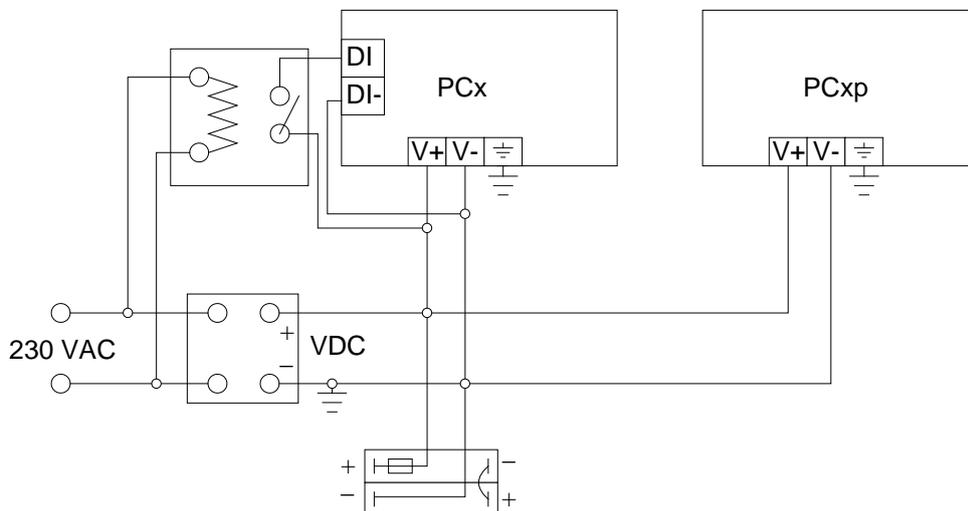
The power supply and the backup battery should be connected as the figure above. To monitor the net power, a relay can be connected to a digital input on the PCxp to receive alarm about it.

To prevent ground currents is the system built on a single point ground. Therefore a connection should be made between the negative power from the power supply and ground for the whole system only on a single point, the best solution is near the power supply unit. The figure above is illustrating that. The use of external transient protection is important when the unit is installed in exposed stations and in environments with high transient levels should also a magnetic stabiliser be used for the power supply to computers and signal sensors.

4.2   Digital outputs

The PCxp has 8 digital voltage outputs. They are numbered with terminal number 3 to 10. The digital outputs have a common minus output, DO-, with the terminal number 2. The voltage output is equal as the power supply voltage to the PCx. Every digital output has one LED indicator, which is lit when the output is high. The LED indicators are numbered 1-8.
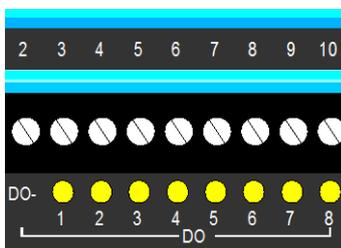
One single digital output can have a maximum current of 1 A.
The total current for the 8 outputs may not be more then 4 A.

When backup power is installed, it is recommended to have a separate power supply for operations to lengthen the time for the backup functions, see figure on the next page.
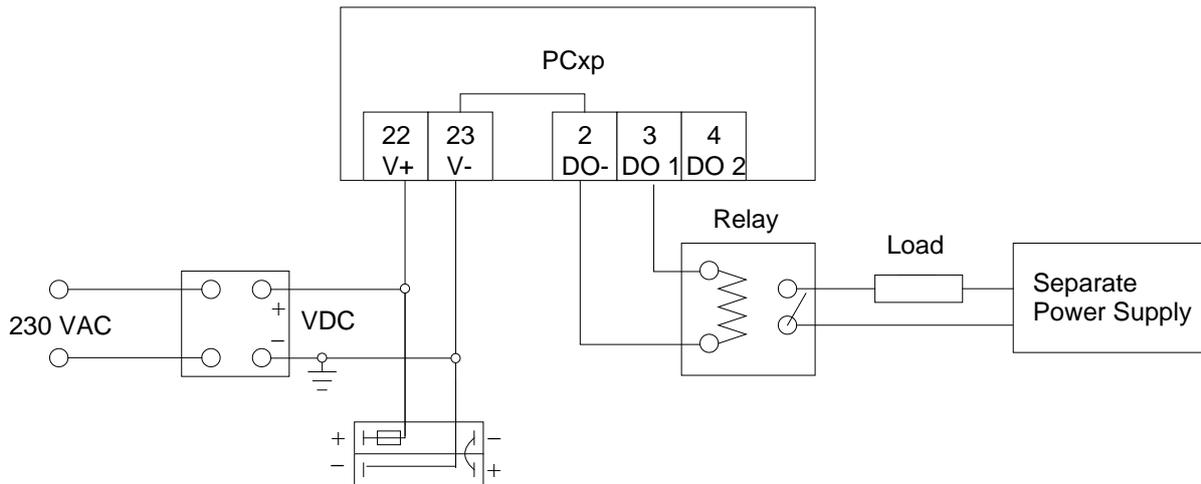
When installing a relay, The terminal number 3-10, depending on which output is used, is connected to the relay and the terminal number 2, DO-. The DO- is internally connected to V-.

When PCxp shall send digital signals to a PLC, it is DO 1-8 that should be connected. If both units do not have the same potential shall DO- be connected to the PLC V-.

A digital output can be configured as a power supply for a modem, see chapter 4.7.2

All loads that can induce currents, in example contactors, shall be connected trough a RC-filter. Also all big power consumers shall be connected through relays as close to them as possible. Signal cables and power cables should be in separate cable channels to suppress interference.

4.3   Analogue Outputs

The PCxp has two analogue outputs with the precision of 14 bits (1 μA). The maximum load is 500 ohm at 12 V and 1100 ohm at 24V. An example on installation is in the figure below.
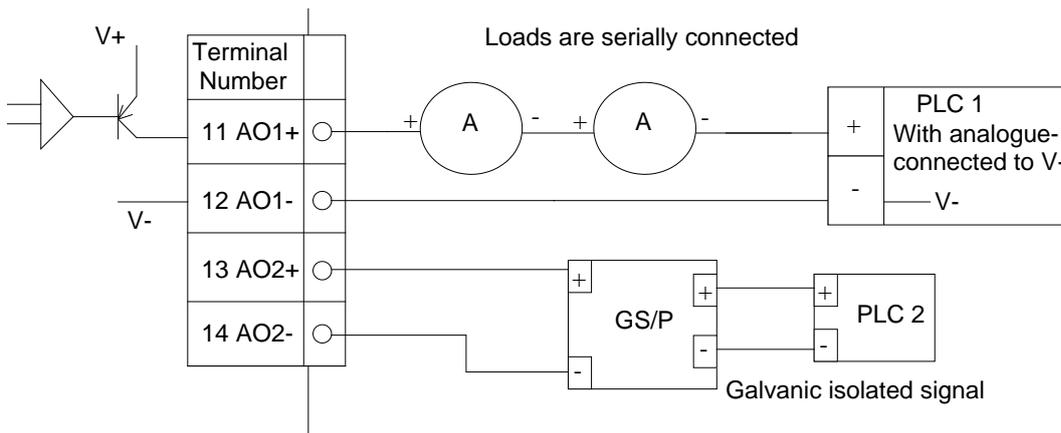
Units with a minus output connected to ground, PLC1, can be connected directly to the output. When more units are used to the same output shall these be connected serially.
In the figure above is the PLC 2 not connected to the same ground as that the PCxp uses. To solve this problem, a passive galvanic isolator, GS/P, is connected between the PLC and PCxp.

4.4   Analogue inputs

The PCxp has 4 analogue inputs with a precision of 20 bits (0,025 μA)
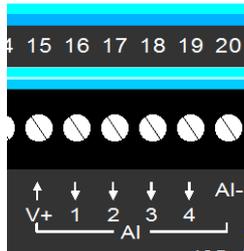
The inputs have the terminal numbers 16-19. See figure below for examples on installations. The inputs may need a galvanic isolator when connecting units to it.

The PCxp can provide external sensors with power through terminal numbers 15 and 20.

Figure below is showing installations of sensors.
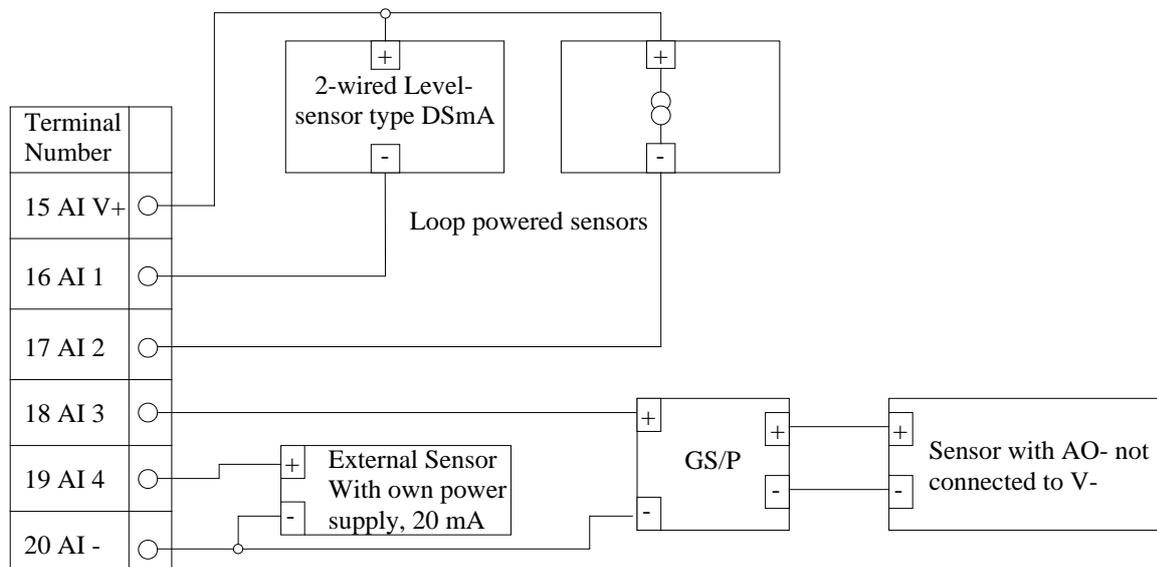
4.4.1   Installation of a 4-20 mA loop powered 2-wire sensor

To install a loop powered sensor, connect the positive power cable to the terminal number 15 and connect the signal cable to terminal number 16-19, depending on which input that shall be used.

4.4.2   Installation of a self powered sensor with a 0/4-20 mA signal

To install a sensor that have an external power supply, connect the signal cable to the terminal number 16-19, depending on which input that shall be used. Also connect a cable between the negative power supply cable and terminal number 20 to get the same ground potential for both the sensor and PCxp.
Observe that this is only for sensors that do not need to be galvanic isolated.

4.4.3   Installation of a galvanic isolator

When units are used together with the PCxp, there are sometimes needs for galvanic isolation between the units. To solve this problem, a galvanic isolator can be installed, an example is Sulzer's passive galvanic isolator GS/P. listed below are the most common cases where it is needed.

External Sensors that not have the same ground potential as the PCxp.

Units that do not have its negative output connected to ground

Long distances between sensor and PCx.

4.4.4   Installation of a sensor (not loop powered)

When a sensor needs to be power supplied from the PCxp, connect the positive power cable from the sensor to the terminal number 15 and the negative cable to the terminal number 20. Connect the signal cable to the terminal number 16-19, depending on which input that shall be used

4.5   Digital inputs

The PCxp has 16 digital voltage inputs with the terminal numbers 25-40. Each input has a LED indicator. The maximum signal level on the inputs is 34 V. The inputs are galvanic isolated from the rest of the PCxp, in other words the DI- is not internally connected to V-.

Signal cables that come from far situated sensors with long wirings should have a surge and transient protection.

The figure below shows how the digital inputs should be connected if galvanic isolation is required.
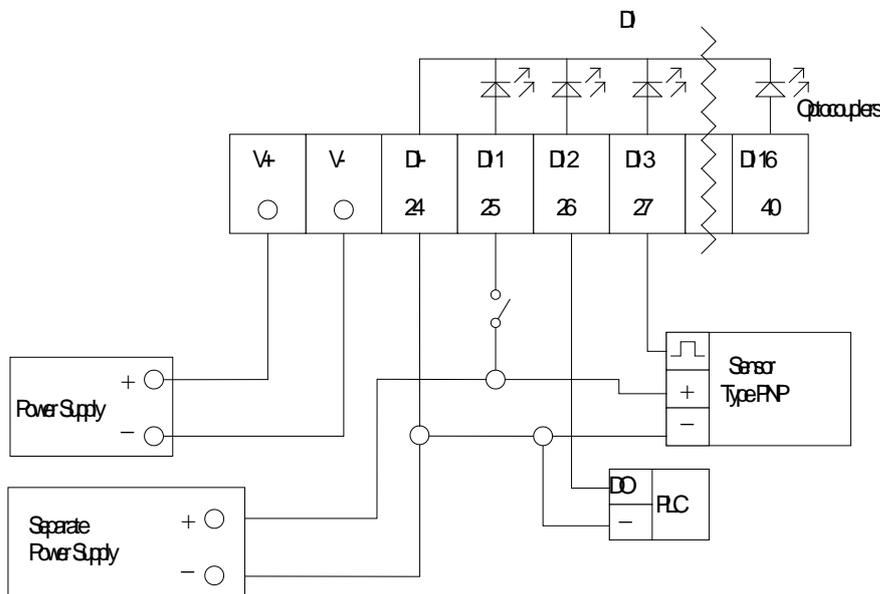
NOTE: DI- must be connected to the negative cable.

When galvanic isolation is not required should the units be connected as figure below.
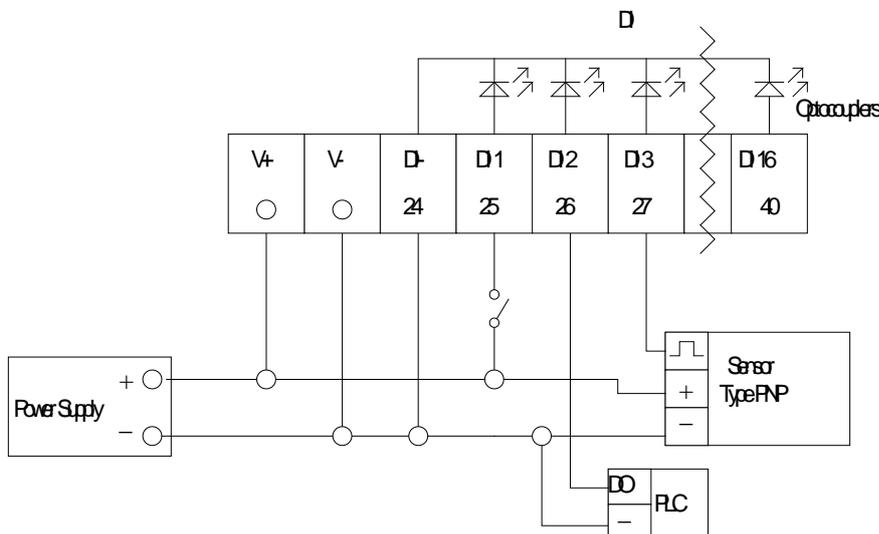
NOTE:

24, DI- must be connected to V- for the PCxp and the units that are connected to DI.

4.5.1   Installation of a relay switch

When a relay switch is used, connect it to V+ and terminal number 25-40, depending on which input shall be used.

4.5.2   Installation of a digital signal from a PLC.

When a PLC shall send digital signals to the PCxp, connect the signal cable to the input that shall be used. See note in the figures above about the DI-.

4.5.3   Installation of a sensor with an open collector output type PNP

When a sensor with an open collector output type PNP is used, shall the signal cable be connected to the terminal number 25-40, depending on which input shall be used. The positive power cable to V+ and the negative to terminal number 24, DI-.

Note: A sensor with an output type NPN cannot be connected directly to the PCxp, but can be connected to a relay switch which then can be used for the signal.

4.6   Installation of the CAN bus

The terminals for the CAN-bus are located to the left on the PCxp. The cable for the CAN-bus depends on application but the colour standard is the same as the table below.

Terminal number	Cable Colour	Description
41, 0V	Green	**Common**
42, CAN_L	White	**CAN low**
43, CAN_SHLD	Shield	**Cable shield**
44, CAN_H	Braun	**CAN High**
45, CAN_V+	**Yellow**	**Positive Power supply, (PCxop)**

All units with CAN interface shall be connected in parallel. The maximum length of the CAN network is 250 meters. To the PCxop all Cables are connected. In the connection between PCxp units and the PCx unit are only CAN_L, CAN_H and the cable shield used. Shielded cable is always recommended. For more information about the CAN-switches see chapter 5.2.

4.7   RS232/RS485 port

PCxp can communicate with the protocols COMLI and Modbus via the interfaces RS232 and RS485. The PCxp has one port for either RS232 or RS485 the configuration is made in software.

4.7.1   RS485

When the PCxp is installed in a RS485 network is these rules applied:

- Positive RS485 cable is connected to terminal number 49 with description RS 485 +/RTS
- Negative RS485 cable is connected to terminal number 50 with description RS 485-/TX
- All connected units on the network shall be connected in parallel, in other words cable + to + and – to -.

The maximum length on the RS485 network depends on the Baud rate for the network. The table below is showing this

Baud rate	Maximal length
115 200 bit/s	600 meters
57 600 bit/s	1200 meters

The network shall have termination in both ends. In other words resistors for termination shall be put on the units that are placed at the end of the network, The PCxp has a switch for that see chapter RS 485 END TERMINATE.

The RS485 port is connected to earth potential and is intended to be used for connection between units in the same building. When there is a long distance between the units where the potential may differ, a galvanic isolated multi drop modem is recommended, for example Westermo TD48.

4.7.2   RS232

There are many devices and accessories that can be connected to the RS232 port.

Direct connection to a personal computer can be made with a cable, part no.43360094.

The contact on modems from different manufactures is not always the same, to solve this is there adapters and cables available. To install and to know which adapter to use see next page.

The software in the PCx has a built in function that can restart a modem that has been jammed. A digital output, DO 1-8 is used to control this. The function controls the power supply to the modem. Positive power cable from the modem is connected to the DO 1-8, and the negative power cable from the modem to the DO-.

NOTE: The voltage level to the modem is equal as the power supply voltage level to the PCxp.

PCx/PCxp TO PC SERIAL PORT

PCx/PCxp
RS232/485

46 47 48 49 50

PC

RS 232/485 Terminal		PCx/PCxp		PC		RS 232 9-pole D-sub
	CTS	50		7	RTS	
	485+/RTS	49		8	CTS	
	485-/TX	48		2	RXD	
	RX	47		3	TXD	
	0V	46		5	GND	
				6	DSR	
				1	CD	

Cable Shield

PCx/PCxp CONNECTED TO A MODEM CABLE WITH 25-POLE D-SUB

PCx/PCxp
RS232/485

46 47 48 49 50

Modem cable
43320573

Modem Westermo
TD22/32 12-24VDC

Modem Control
Digital output

2 3-10

RS 232/485 Terminal		PCx/PCxp		Modem Cable	Pins
	CTS	50		Yellow	5
	485+/RTS	49		Green	4
	485-/TX	48		White	2
	RX	47		Braun	3
	0V	46		Grey	7
				Blue	20

Cable Shield

Modem Control
Digital output

DO 1-8	3-10	RED	+
DO -	2	BLACK	- 12-24 V

Power Cable

PCx/PCxp CONNECTED TO MODEM TERMINAL

PCx/PCxp
RS232/485

46 47 48 49 50

DO
2 3-8

Modem Westermo
TD22/32 12-24VDC

RS 232/485 Terminal		PCx/PCxp		Modem Pin	
	CTS	50		5	CTS
	485+/RTS	49		6	RTS
	485-/TX	48		8	TD
	RX	47		7	RD
	0V	46		1	SG
				3	DTR

Modem Control
Digital output

DO1-8	3-8		+	12-24 V
DO -	2		-	

Cable Shield

PCx/PCxp CONNECTED TO A GSM-MODEM WITH 9-POLE D-SUB

PCx/PCxp
RS232/485

46 47 48 49 50

Modem cable
43320573

Adapter
43800174

GSM Modem
V.Dot RS232

Modem Control
Digital output

2 3-10

RS232/485 Terminal		PCx/PCxp		Modem Cable	Pin
	CTS	50		Yellow	5
	485+/RTS	49		Green	4
	485-/TX	48		White	2
	RX	47		Braun	3
	0V	46		Grey	7
				Blue	20

Kabelskärm

Modem Control
Digital output

DO 1-8	3-10	RED	+
DO -	2	BLACK	- 12-24 V

Power Cable

PCx/PCxp CONNECTED TO A GSM-MODEM WITH 15-POLE D-SUB

PCx/PCxp
RS232/485

46 47 48 49 50

Modem Cable
43320573

Adapter
43800174

Com-Cable
43800176

GSM Modem
Wavecom

Modem Control
Digital output

2 3-10

RS232/485 Terminal		PCx/PCxp		Modem Cable	Pins
	CTS	50		Yellow	5
	485+/RTS	49		Green	4
	485-/TX	48		White	2
	RX	47		Braun	3
	0V	46		Grey	7
				Blue	20

Kabelskärm

Modem Control
Digital output

DO 1-8	3-10	RED	+
DO -	2	BLACK	- 12-24 V

Power Cable

5   Indicators and settings on PCxp

The PCxp has 5 different switches and 9 different LED indicators. These are described in detail in this chapter

5.1   LED indicators
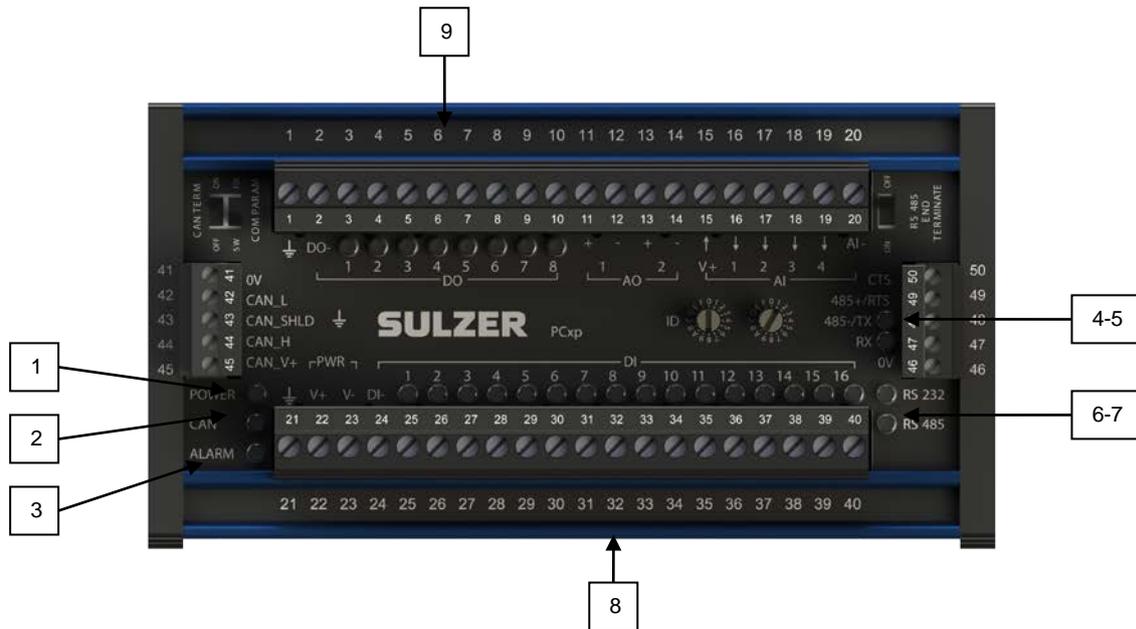
1.   Power,   Green light, the PCxp is in normal mode.

2.   CAN,   Green light, the PCxp has found one or more units to communicate with on the CAN
                   bus
                   Flashing green light, the unit has not found other units on the CAN bus
                   Flashing red light, the CAN ID is set wrong

3.   ALARM,   Red light if it is low power supply voltage level. 1, 2, 6 and 7 is also lit in that case.

4.   485-/TX,   Red light, when data is transmitted to the RS485/232 port.

5.   RX,   Red light, when data is received from the RS485/232 port

6.   RS232,   Green light, if the interface RS232 is set.

7.   RS485,   Green light, if the interface RS485 is set.

8.   DI 1-16,   Yellow light, if the input is set, otherwise it is off

9.   DO 1-8,   Yellow light, if the output is set, otherwise it is off

5.2   Switches

5.2.1   CAN ID

In a CAN network must every unit have a unique address or ID-Number. On the PCx this is set by two switches. It is a hexadecimal number, when wrong ID is set the CAN LED is flashing red.
The table is showing the ID-numbers that every unit should have.
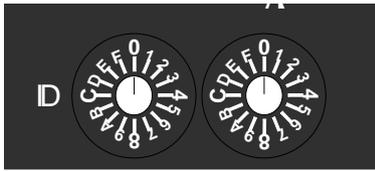
Unit	CAN ID
PCx	**01**
PCxp	**02 – 08**
PCxop	**16**

5.2.2   CAN TERM

A CAN network is of the type multi drop, more units can be connected parallel to each other on the same cable. The units that are at the ends of the network must have a termination. To do this with the PCx the switch CAN TERM is set ON.

One example on a CAN network is shown I the figure below, in this case the CAN TERM is set ON on the PCx and the last PCxp unit. On the PCxp units between those two is the CAN term set OFF.
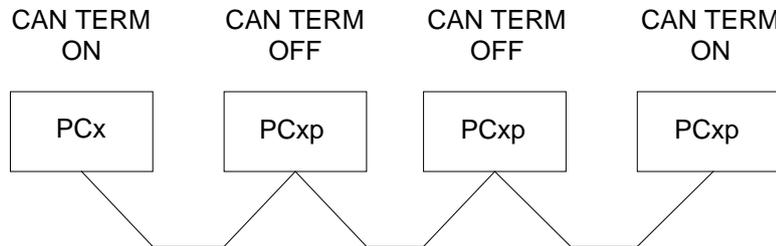
A CAN network with one PCx and 3 PCxp units

5.2.3   COM PARAM

This switch has the function to set fix values to the parameters for the communications ports, CAN and RS232/485. This can be used when the unit is not responding correctly and shall only be used in that purpose to change the software parameters to correct values. When the COM PARAM switch is set to SW, the parameters that are in the software are used for the communications ports. When the COM PARAM switch is set to FIX, are the parameters fix and are these: CAN 250 Kbit/s, The RS232/485 port is set on RS232, 9600 bit/s, no parity.

5.2.4   RS 485 END TERMINATE

RS485-network is of same type as CAN, multi drop. This means also that resistors for termination must be at both ends. This switch is used for that purpose. If the switch is set ON is there a termination at the unit and if set OFF it is not.

An example on the placement of the termination is shown in the figure below.

RS485 TERM ON	RS485 TERM OFF	RS485 TERM OFF	RS485 TERM ON
PCx	PCx	PCx	PCx
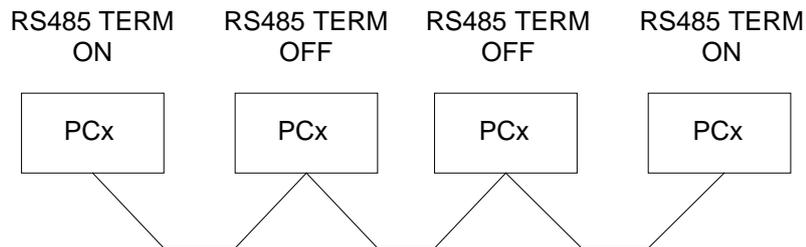
NOTE: This switch shall be set **OFF** if RS232 is used

6   Technical data for thePCxp

The PCxp has the following data:

CPU type:	Philips XA-C3
Clock frequency:	32 MHz
Power supply:	9-34 VDC
Max currents:	< 210 mA at 24 VDC (Every in and output are active and without any external loads on outputs and inputs)
	< 270 mA at 12 VDC ((Every in and output are active and without any external loads on outputs and inputs)
Min currents:	< 60 mA at 24 VDC
	< 100 mA at 12 VDC
Installation:	35 mm DIN-rail
Dimensions:	143 x 74 x 53 mm (W x H x D)
Digital outputs:	8
Maximum load	1 A/output and the total current for all 8 outputs is maximum 4 A
Digital inputs:	16
Input resistance:	10 kohm
Trig level:	4.2 V
Analogue outputs:	2
Maximum load:	500 ohm at 12V, 1100 ohm at 24V
Resolution:	14 bits 1 μA
Current limit:	22 mA
Analogue inputs:	4
Resolution:	20 bits 0,025 μA
Inaccuracy:	less than 0.1% of FS
Temperature deviation:	less than 0.2% of FS in the temp. range -20 to 70 °C
CAN ports:	1
Max baud rate:	512 kBaud
RS232/485 port:	1
Max baud rate:	115200 baud
Ambient temperature:	-20 – 70 °C

7   Accessories and part numbers.

Description	Part no.	Note.
PCx GB	15100015	
Installation manual PCx GB	81300040	
PCxp	15000002	Expansion module
Installation manual PCxp GB	81300042	
PCxop Panel GB	15000006	
Installation manual PCxop GB	81300044	
CAN-cable per meter	43320586	
CAN-cable 3 m	43360096	
PC-cable	43360094	9-pole D-contact – 5-pole Phoenix contact, Length 2 m.
System manual for PCx GB	81300046	
COMLI/Modbus-Manual GB	81300048	
Power supply 27,2 V/1,2 A dc	28000000	Without socket
11-pole socket	43190000	For power supply
Battery 12 V/4 Ah	47000000	2 are needed
Battery case	39000041	
AQUA PROG	71400006	PC-configuring program for PCx

Declaration of Conformity

As defined by:
EMC Directive 2014/30/EU, RoHS II Directive 2011/65/EU

(EN)	EC Declaration of Conformity	(SV)	EG-försäkran om överensstämmelse
(DE)	EG-Konformitätserklärung	(NO)	EUs Samsvarserklæring
(FR)	Déclaration de Conformité CE	(DA)	EC-Overensstemmelseserklæring
(NL)	EC-Overeenkomstigheidsverklaring	(FI)	EU-Vaatimustenmukaisuusvakuutus
(ES)	Declaración de confirmidad CE	(ET)	EÜ Vastavuse deklaratsioon
(PT)	Declaracão de conformidade CE	(PL)	Deklaracja zgodnosci WE
(IT)	Dichiarazione di conformità CE	(CS)	Prohlášení o shodšě ES
(EL)	Δήλωση εναρμόνισης ΕΚ	(SK)	EC Vyhlásenie o zhode
(TR)	AT Uygunluk Beyanı	(HU)	EK Megfelelőségi nyilatkozat

Sulzer Pump Solutions Ireland Ltd., Clonard Road, Wexford, Ireland

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DE: Name und Adresse der Person, die berechtigt ist, das technische Datenblatt den Behörden auf Anfrage zusammenzustellen:
FR: Nom et adresse de la personne autorisée pour générer le fichier technique auprès des autorités sur demande :
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Frank Ennenbach, Director Product Safety and Regulations, Sulzer Management AG , Neuwiesenstrasse 15, 8401 Winterthur, Switzerland

EN: Declare under our sole responsibility that the products:
DE: Erklärt eigenverantwortlich dass die Produkte:
FR: Déclarons sous notre seule responsabilité que les produits:
NL: Verklaren geheel onder eigen verantwoordelijkheid dat de produkten:
ES: Declaramos bajo nuestra exclusiva responsabilidad que los productos:
PT: Declaramos sob nossa unica responsabilidade que los produtos:
IT: Dichiariamo sotto la nostra esclusiva responsabilità che i prodotti:
EL: Δηλώνουμε με αποκλειστική μας ευθύνη ότι τα προϊόντα:
TR: Sorumluluk tamamen bize ait olarak beyan ederiz ki aşağıdaki ürünler:

SV: Försäkrar under eget ansvar att produkterna:
NO: Erklærer på eget ansvar, at følgende produkter
DA: Erklærer på eget ansvar, at følgende produkter:
FI: Vakuutamme yksinomaan omalla vastuullamme, että seuraavat tuotteet
ET: Deklareerime ainuvastutajana, et tooted:
PL: Deklaruje z pelna odpowiedzialnoscia, ze urzadzenia typu:
CS: Prohlašuje na vlastní odpovědnost, že výrobky:
SK: Vyhlasujeme na našu zodpovednosť, že výrobky:
HU: Felelősségünk teljes tudatában kijelentjük, hogy a termékek:

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EN: to which this declaration relates are in conformity with the following standards or other normative documents:
DE: auf die sich diese Erklärung bezieht, den folgenden und/oder anderen normativen Dokumenten entsprechen:
FR: auxquels se réfère cette déclaration sont conformes aux normes ou à d'autres documents normatifs:
NL: waarop deze verklaring betrekking heeft, in overeenstemming zijn met de volgende normen of andere normatieve documenten:
ES: objeto de esta declaración, están conformes con las siguientes normas u otros documentos normativos:
PT: aque se refere esta declaracão está em conformidade com as Normas our outros documentos normativos:
IT: ai quali questa dichiarazione si riferisce sono conformi alla seguente norma o ad altri documenti normativi:
EL: τα οποία αφορά η παρούσα δήλωση είναι σύμφωνα με τα ακόλουθα πρότυπα ή άλλα κανονιστικά έγγραφα:
TR: bu beyanın konusunu oluşturmakta olup aşağıdaki standart ve diğer norm belgelerine uygundur:
SV: som omfattas av denna försäkran är i överensstämmelse med följande standarder eller andra regelgivande dokument:
NO: som dekkes av denne erklæringen, er i samsvar med følgende standarder eller andre normative dokumenter:
DA: som er omfattet af denne erklæring, er i overensstemmelse med følgende standarder eller andre normative dokumenter:
FI: joihin tämä vakuutus liittyy, ovat seuraavien standardien sekä muiden sääntöämääräävien asiakirjojen mukaisia:
ET: mida käespöev deklaratsioon puudutab, on vastavuses järgmiste standardite ja muude normatiivdokumentidega:
PL: do których odnosi sie niniejsza deklaracja sa zgodne z nastepujacymi normami lub innymi dokumentami normatywnymi:
CS: na které se toto prohlášeni vztahuje, jsou v souladu s následujícími normami nebo jinými normativními dokumenty:
SK: na ktoré sa vz ahuje toto vyhlásenie, zodpovedajú nasledujúcim štandardom a iným záväzným dokumentom:
HU: amelyekre ez a nyilatkozat vonatkozik, megfelelnek a következőszabványokban és egyéb szabályozó dokumentumokban leírtaknak:

EMC: **EN 61326-1:2013**

Wexford 08-04-2022
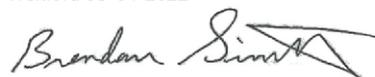
Brendan Sinnott, General Manager,
Sulzer Pump Solutions Ireland Ltd.

SULZER

UKCA Declaration of Conformity

Manufacturer: Sulzer Pump Solutions Ireland Ltd.
Address: Clonard Road, Wexford, Ireland

Declare under our sole responsibility that the product:
Control system type ABS PCxp

To which this declaration relates is in conformity with the following standards or other normative documents as defined by:
Electromagnetic Compatibility Regulations 2016, S.I. 2016 No 1091
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, S.I. 2012 No 3133

BS EN 61326-1:2013

Brendan Sinnott

Brendan Sinnott
General Manager,
Sulzer Pump Solutions Ireland Ltd.
Wexford
08-04-2022

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