

plasma brush[®]

Operating instructions

Communication package ProfiNet



BA-KommPN_EN / F0354700

Thank you for buying a high-quality **relyon plasma** GmbH product. To get the best from your product, please read these instructions carefully.

Important! Read these instructions carefully before assembling, installing and starting up the machine!

Always follow the safety instructions! Failure to follow the safety instructions may result in accidents, serious injury and serious damage to the machine.

The product may only be started up and operated by trained and qualified persons!

Train your staff! The operator / user is responsible for ensuring that personnel have fully understood the operation of the machine and the safety requirements.

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Original Operating Instructions



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1 Safety

The system was designed in accordance with the relevant international standards. However, as with any technical product, hazards may arise if the system is not used properly or is used for purposes other than its intended use.

Working with the system can be dangerous and may result in serious or fatal injury. It is therefore essential to protect yourself and others.

In addition to the safety instructions in this document, you must also comply with general safety standards.



Caution - Danger!

When working with the system, please note and observe the safety instructions and requirements in these operating instructions because non-compliance may result in serious or fatal injury.

1.1 Residual risks

This system has been manufactured in accordance with the current state of the art. However, it is impossible to eliminate residual risks.

Always adhere to the following safety instructions:



Caution – Electrical voltage!

- Danger: 230 V. If damage is visible on the electrical connection, mains cable or system:
 - Do not start up the system.
 - Have the damaged parts repaired by a qualified person or replace them.



Trip hazard!

Lay the connection cables in suitable cable trays. Lay cables such that they do not present a trip hazard.

1.2 Information and obligations for the operator

- The system may emit interference.
 - The system has been tested in accordance with EMC legislation.
 - The operator must verify and assure electromagnetic compatibility with other electrical and electronic equipment in the immediate vicinity of the system.
- Ensure that
 - operating personnel have read and understood these operating instructions.
 - anyone working near the machine is made aware of the dangers and is provided with the necessary protective equipment.
 - Repairs are only carried out by qualified persons.
- In particular, make operating personnel aware of the safety instructions in this document.
- Always keep the system in fully functional condition.
- Any modifications made to the machine will invalidate the operating licence and the warranty unless such modifications are expressly authorised by the manufacturer.

1.3 Intended use

The system is intended solely for operation with the PS2000 high-voltage source and a plasma generator from **relyon plasma** GmbH.

Coupled with a suitable plasma generator, the machine is intended solely for the plasma treatment of surfaces (metals, textiles, glass, plastics) to activate, clean, coat or remove residue at atmospheric pressure.

Under no circumstances may the system be used by non-trained persons.

1.4 Impermissible operating conditions

The system must not be operated under the following conditions:

- In explosive (ex) zones
- In areas with severe build-up of dust
- Where there is excessive air humidity (see Technical data, chapter 3)
- Installation heights above 2,000m above Sea Level
- Where there are strong vibrations

Note!

Please also observe the information in the operating instructions of all additional components connected to the system.

2 System description

2.1 Function

The components of this system are the basic elements for communicating with a PS2000 current source via Profinet.

2.2 System overview

2.2.1 Description of the components



Figure 1: Scope of delivery

No.	Component
1	Anybus X-gateway (CANopen Master – PROFINET-IO AB7307-B)
2	CAN cable (length 2m)
3	CAN terminal resistor (sub-D)
4	CAN terminal resistor (RJ45)
5	USB stick with software and documentation

2.2.2 Scope of delivery

The scope of delivery includes the following components:

- Anybus X-gateway with specific Software by relyon plasma
- CAN cable (length 2m)
- CAN terminal resistor (sub-D)
- CAN terminal resistor (RJ45)
- Manual
- USB stick with software

2.2.3 Other hardware components needed

Depending on the stage of expansion, several additional hardware components are needed for a functioning overall system. Either recommendations for these or the characteristics needed are listed below.

Component	Description
Voltage supply	U = 24 V DC; I \ge 1 A; to supply the Anybus X-gateway
Wiring material	Various cables, top hat rail terminals and bridges depending on stage of expansion

2.3 Connection assignments

2.3.1 Anybus X-gateway control connection assignments

The following figures show the connection assignment of the converter. On the front of the Anybus X-gateway (Figure 2) is the network connector for the Profinet. On the lower side (Figure 4) there are the connections for the supply voltage (+24V DC), the CANopen bus and a USB interface for programming. On the side of the module (Figure 5) are various parameters for setting the CANopen network. The allowed node address range is 1 - 127, the baud rate is pre-set to 500kbit/s and the address (Node-ID) of the module is 1.





	3	1	TX+
		2	TX-
		3	RX+
		6	RX-
1	8	4, 5, 7, 8	Termination

Figure 3: Profinet port



Figure 4: Lower side of the Anybus X-gateway

Setting	Baud Rate (kbit/s)	
0	20	@ @ @
1	50	
2	125	\square
3	250	Baud rate
4	500	Address v10
5	800	
6	1000	Address X1
7	Auto	
8,9	Not available	2

Figure 5: Side of the Anybus X-gateway

Technical data

3

X-gateway CANopen						
Maximum number of Slaves	126					
CANopen Connector	DSUB9M					
Baud rate	Up to 1 Mbit/s	Up to 1 Mbit/s				
I/O data	128 PDOs received/128 PDOs transmitted, 5	128 PDOs received/128 PDOs transmitted, 510 bytes IN/OUT				
Extras	CANopen specifications DS301 v4.0.2	•				
Technical details		Standard				
Weight	150 g, 0,33 lb					
Dimensions (L•W•H)	120 x 75 x 27 mm, 4,72" x 2,95" x 1,06"					
Protection class	IP20, NEMA 1					
Housing material	PC-ABS, UL 94					
Position for installation	any					
Mounting	DIN rail (35 x 7, 5/15)	EN 50022				
Electrical properties	· · · · · ·					
Eelectrical connection	24 VDC +/- 10 %					
Eelectrical consumption	250 mA					
Hardware properties						
Voltage protection	Yes					
Short-circuit protection	Yes					
Galvanic isolation in the subnet	Yes					
Operating conditions	·					
Temperature	-25 - 55 °C, -13 - 131 °F	IEC 60068-2-1 IEC 60068-2-2				
Humidity	< 90 % rel. (non-condensing)	IEC 60068-2-30				
Installation height	< 2000 m					
Storage conditions						
Temperature	-40 - 85 °C, -40 - 185 °F	IEC 60068-2-1 IEC 60068-2-2				
Humidity	< 80 % rel. (non-condensing)	IEC 60068-2-30				
Electromagnetic emissions						
Elektrostatic discharge	+/- 4 kV	EN 61000-4-2				
Electromagnetic HF-fields	10 V/m 80 MHz - 1 GHz 3 V/m 1,4 GHz - 2,0 GHz 1 V/m 2,0 GHz - 2,7 GHz	EN 61000-4-3				
Fast transients	+/- 1 kV	EN 61000-4-4				
Overvoltage protection	+/- 1 kV	EN 61000-4-5				
HF-guided interference	10 V/rms	EN 61000-4-6				
Emissions (at 10 m)	40 dB 30 MHz - 230 MHz 47 dB 30 MHz - 1 GHz	EN 55016-2-3				

4 Transport/Storage

- Store the device in a dry place. This protects the device from corrosion of the electrical contacts.
- Protect the device from dirt and foreign bodies.

5 Unpacking and Installation

5.1 Unpacking

- Open the packaging carefully. Observe the directional instructions on the packaging.
- Take the components out of the packaging.

5.2 Installation requirements

Before installing the machine, the following must be true:

- The components must be undamaged.
- If installing as a permanent installation or in a building, a suitable switch or circuit breaker that satisfies national safety requirements (in Germany: VDE 0100) must be fitted as an upstream all-pole cut-off device that will disconnect the system from the power supply. This cut-off device should be fitted near the machine and must be easily accessible to the user. The switch must also be labelled as the cut-off device for the machine.
- Only a trained electrician may wire the system.
- Observe all installation requirements and safety notices of the additional machines connected.

5.3 Installation

To install the system, perform the following steps in the order given:

- 1. Mount the components provided for this purpose on a DIN rail (35 x 7, 5/15) to ensure stable mounting.
- 2. Ensure that the Anybus X-gateway and the power source P2000 are without power.
- Connect the CAN terminating resistor bushing (Sub-D) (#4) to the CAN cable (length 2m) (#2) and all this to the Anybus X-gateway



Figure 6: Wiring to X-gateway

- 4. Connect the CAN cable (length 2m) (#2) to the rear connector of the power source PS2000 and terminate the CAN bus with the terminating resistor provided for this purpose, see also the operating manual of the power source PS2000 if applicable. If two power sources are used, they are connected to each other with another CAN cable. (Figure 7)
- 5. Set the node number of the PS2000 to "10" (or "11" for a possible second power source) (#7).



Figure 7: Wiring to PS2000

- 6. Establish the emergency stop circuit of the PS2000 as well as all other connections of the additional devices as described in the corresponding operating manuals.
 - \checkmark The system is installed.

6 Operation and configurations

6.1 Taking into operation

To operate the system the following requirements must be met:

- The main switches of the connected power sources PS2000 must be switched on.
- The emergency stop circuit must be connected correctly.
- There must be no error on the PS2000.
- The CAN bus line must be connected, both ends terminated with terminating resistors and the correct CAN bus address must be set on the power sources.
- The Profinet cable must be connected.
- The power supply oft he Anybus X-gateway must be provided.
- The status LEDs of the Anybus X-gateway must be green.
- The gas supply of the plasma generator must be given.
- All additionally connected devices/components must be connected correctly.

6.2 Anybus X-gateway CANopen Master Configuration

Anybus X-gateway is set as manager in the CANopen network with the following parameters:

,	Manager Settings			
	Download NMT Startup Config	\checkmark		
	Device is NMT master			
	Start all remote nodes			
	Application will decide when to switch to ope			
	Master shall not start the slaves			
	Reset all remote nodes			
	Node is flying master			
	Stop all remote nodes			
	Download Concise DCF to the manager	\checkmark		

Figure 8: CANopen master configuration

The control of the manager and all nodes is monitored with a hearbeat of:

- Producer Interval (ms): 1000ms
- Consuming Node ID/Time Out (ms): 1500ms

6.3 PS2000 CANopen Slave Konfiguration

PS2000 is set as slave in the CANopen network with the following parameters:

 Slave S 	ettings in Manager 1 - Anybus X-gateway C/	ANopen ma	ster			
Downlo	oad Slave Assignment					
Node is	s NMT slave and available					
Slave s	hall be booted by the NMT master					
Slave is	mandatory on the network					
Slave s	hall not be reset in operational					
Check	software version of slave					
Restore	e slave to factory default					
Downlo	oad Concise DCF to the manager					
Check	device type identification		0x0			
Check	vendor identification		0x0			
Check	product code		0x0			
Check	revision number		0.00			
Check	serial number		0x0			

Figure 9: CANopen slave configuration

6.4 PDO mapping

Translation of the signals from CANopen to PROFINET is realized with the following PDO mappings:

Network PDO Mapping Object Dictionary	1			
Node	Transmit Object	Node	Receive Object	
1 - Anybus X-gateway CANopen master	> Transmit Byte 1 [2000,01]	✓ 10 - PS2000EM	 Error Status [2000,00] 	×
1 - Anybus X-gateway CANopen master	 Transmit Byte 2 (2000,62) 	✓ 10 - Р52000ЕМ	→ High Voltage (2030,00)	Y
1 - Anybus X-galaway CANopen master	 Transmit Byte 3 (2000,03) 	 и развородни на праводни на Праводни на праводни на праводни На праводни на праводни Праводни на праводни на праводни Праводни на праводни на Праводни на праводни на праводни Праводни на праводни на прав Праводни на праводни на пр Праводни на праводни на п	 Power Set [2040,00] 	v
1 - Anybus X-gateway CANopen master	 Transmit Word 3 [2010,03] 	10 - PS2000EM	 Frequency Set [2041,00] 	
1 - Anybus X-gateway CANopen master	Transmit Word 4 [2010,04]	4 4 10 - PS2000EM	 Voltage Threshold [2042,00] 	v
1 - Anybus X-gateway CANopen master	Transmit Word 5 (2010,05)	V 🤣 10 - PS2000EM	 Current Threshold (2043,00) 	*
10 - P\$20000EM	V Status Code [2010,00]	🗸 🍁 1 - Anybus X-gateway CANopen matter	 Receive Byte 1 [2100;01] 	~
10 - PS20000EM	 Power Actual [2020.00] 	🗸 🤟 1 - Anybus X-geleway CANopen master	 Receive Word 2 [2110,02] 	
10 - PS20000EM	 Frequency Actual [2021,00] 	V 🍁 1 - Anybus X-geteway CANopen master	 Receive Byte 2 [2100,02] 	v
10 - PS2000GEM	Voltage RMS Actual [2022,00]	V 🤑 1 - Anybus X-gateway CANopen master	 Receive Word 3 [2110,03] 	×
10 · PS20000EM	 Current RMS Actual [2022;00] 	🗸 🤟 1 - Anybus X-gateway CANopen master	 Receive Word 4 [2110;04] 	v
10 - PS20000EM	 Temperature 1 (2050,01) 	🗸 🤌 🛛 - Anybus X-gateway CANopen master	 Receive Byte 11 [2100,08] 	~
10 - PS2000DEM	 Temperature 2 (2050,02) 	 V 😝 I - Anybus X-gateway CANopen master 	 Receive Byte 12 [2100,0C] 	4
10 - PS20000EM	Y Temperature 3 (2050,03)	\vee 🍁 1 - Anybus X-gateway CANopen master	 Receive Byte 13 [2100,0D] 	×
10 - P\$2000.0EM	× Temperature 4 (2050,04)	V 🥠 1 - Anybus X-gateway CANopen master	 Receive Byte 14 [2100;0E] 	v
10 - PS2000DEM	✓ Power-On time [2000,00]	🤟 🌼 1 - Anybus X-gateway CANopen matter	 Receive Word 5 [2110,05] 	~
	4			

Figure 10: PDO mapping

In the Master/Slave configuration the first 6 objects of the PDO mapping are to be considered as outputs and the remaining 10 objects as inputs. These are the data sets:

Output Data	Output Data Size	Details
Error Status [2000,00]	1 Byte	Reset PS2000 [0 / 1]
High Voltage [2030,00]	1 Byte	Switch on plasma [0 / 1]
Power Set [2040,00]	1 Byte	Setting power level [70 - 100%] (Default: 100 %)
Frequency Set [2041,00]	1 Word = 2 Byte	Setting frequency [40000Hz - 65000Hz] (Default: 54000Hz)
Voltage Threshold [2042,00]	1 Word = 2 Byte	Internal error threshold -Do not change! (Default: 500 V)
Current Threshold [2043,00]	1 Word = 2 Byte	Internal error threshold -Do not change! (Default: 100 mA)
Total Output Data Size:	9 Byte	

Input Data	Input Data Size	Details
Status Code [2010,00]	1 Byte	Status code of PS2000 (4: Plasma off, 7: Plasma on, 8: Error)
Power Actual [2020,00]	1 Word = 2 Byte	Power of PS2000 [0 - 3200W]
Frequency Actual [2021,00]	1 Byte	Frequency of PS2000 [40000Hz - 65000Hz]
Voltage RMS Actual [2022,00]	1 Word = 2 Byte	Voltage RMS of PS2000 [0 - 1500V]
Current RMS Actual [2023,00]	1 Word = 2 Byte	Current RMS of PS2000 [0 - 1000mA]
Temperature 1 [2050,01]	1 Byte	Temperature#1
Temperature 2 [2050,02]	1 Byte	Temperature#2
Temperature 3 [2050,03]	1 Byte	Temperature#3
Temperature 4 [2050,04]	1 Byte	Temperature#4
Power-On time [2060,00]	1 Word = 2 Byte	Power-On time
Total Input Data Size:	14 Byte	

İ Important!

In a slave/slave configuration, the first 6 objects of the PDO mapping are to be considered as inputs and the remaining 10 as outputs.

6.5 Siemens configuration

The Input Data Size and Output Data Size are required in the Siemens configuration to map the data networks. A correct Siemens configuration looks like this:

CANOpen to Profinet2 + Ungrouped devices + X-gateway-COPM [RT Standard]							-	. 🖬 🖬 🗙
			🚽 Торо	ology vie	ew 💾 I	Vetwork vi	ew 🛛 🕅 Device	view
🛃 🔀 🕂 X-gateway-COPM [RT Standard 🕶 🔛 🔛 🎼 🚮 🖽 🛄 🔍 ±		evice overview					<u>.</u>	
4	^	🕐 Module	Rack	Slot	I address	Q address	Туре	Art
CORT		 X-gateway-COPM 	0	0			RTStandard	AB 🔨
- and		PROFINET interface_1	0	0 X1			X-gateway-COPM	
. spe	=	Status word	0	1	6869		Input 002 bytes	
<i>4</i> ,		Input 008 bytes_1	0	2	7077		Input 008 bytes	
		Input 004 bytes_1	0	3	7881		Input 004 bytes	
		Input 002 bytes_1	0	4	8283		Input 002 bytes	
		Control word	0	5		6465	Output 002 bytes	=
		Output 008 bytes_1	0	6		6673	Output 008 bytes	
		Output 001 byte_1	0	7		74	Output 001 byte	
			0	8				
			0	9				
			0	10				
			0	11				-
			0	12				
			0	13				
	-		0	14				
	-		0	15				
	•		0	16				
			0	17				
			0	18				

Figure 11: Siemens configuration

Devices											🖉 Topology view 🔛 Network view 📑 Device view Options
19	11 2	58	Networ	Connections Hill con		· 2 31		Q ±			Network overview
											A unit - V Catalon
CANOpen to Profinet(v1.0)	20	CAI	NOper	to Profinet(v1.0) > PLC	1 [CPU 1212C	ACIDCIRiy] +	PLC tags	Input a	and Outp	ut [19]	
💣 Add new device			1999					-		-	
📥 Devices & networks				MANY MARKET MARK							a rags. La oser constante
* G PLC_1 [CPU 1212C ADDORN]	20	1	2	3 UF 😤 👔							
Y Device configuration			Input a	and Output							
🐰 Online & diagnostics			1.5	iame .	Data type	Address	Rétai	n Acce	s Write.	sites.	Comment
Frogram blocks			-63	01 StatusWord(Euffer)	Word	94/1968		P			Andus Buffer(not used)
Technology objects		2	-61	02 StatusCode	Bute	%/B70					4 Masma off, 7 Masmaon, 8 Error
• 🙀 External source files		3	-0	03 FregActual	Bute	SIB71		(40-650Hzl, Default:54Hz
• 🙀 PLC tags		4	-01	04 PowerActual	Word	36072		i i			0.3200W0 (Value in Little Endian format)
Show all tags		5	-0	05.VoltageR\/GActual	Word	%////74					0.1500(V) (value in Little Endian format)
💣 Add new tag table		6	-01	06.CurrentRVSActual	Vibrd	%1076		P			0_1000(m4) (Value in Little Endian format)
🏹 Default tag table (42)		2	-61	07.FoxerCr-lime	Word	%///78		R			0.65000 (firs meschine was switched on) (Value in Little Endian format)
a Input and Output [19]			-01	08.lemp1	5/ce	54880			1 2	2	Temperaute¥1
 PLC date types 		9	-	09 lemp2	89.04	54551					Temperautet 2
 Wetch and force tables 		10;	-23	10 Temp3	Byte	54882		R		9	Temperaute#3
💕 Add new watch table		tt.	-43	11.Temp4	Byle	54883		1	1 2	2	Tempolaute #4
Es force table		12	-	12 Control Mand(Buller)	Wand	%.QW64		R		9	Anglasi Buller(nut used)
🕨 🙀 Unline backups		13:	-	13.EmorStatus(Resot)	Byte	%Q866		V		9	Reset with falling Rig (1-x0)
• 🔛 Instes		14	-	14 HighVoltage	Byte	%Q867		V		9	Plasma on (0~51), Plasma off (1~50)
🕨 🖉 Devite proxydata		15	-61	15.PowerSet	Byte	%Q868		V		2	70 100(%) (Plasma Power)
2 Program info		15	-63	16.BullerByte	8/00	%Q869					1 Byte asButterByte
PLC alarm test lists		17	-	17.FreqSet	Word	%QW70					(Default:S4000Hz) Input Value in Littel Endian format (40000 65000) (eg. 45000Hz-v/FC8(Hex)-vC8/F(Hex Little Endian))
) 👔 Local modules	1	18:	-63	18.VoltageThreshold	Word	%QW72					Do not change (input Value in non Little Endian format if needed)
Distributed BO		19	-61	19.CurrentThreshold	Byte	160874		Ø		2	Do not change (input Value in non Little Endian format if needed)
+ 🔚 Ungrouped devices		20		ordd news-				V	1 1	1	
Security settings											
• 😹 Cross-device functions											

Figure 12: Variable configuration

More information about a Siemens integration and configuration can be found in the supplied documentation "User Manual: Anybus X-gateway CANopen PROFINET".

6.6 Error messages on the Anybus X-gateway

The following table shows the possible status of the LEDs on the converter and serves as a possible assistance. In the figure on the right, the six LEDs are marked with a respective allocation number.

LED no	Indication	Meaning					
1 (Communication Status)	Off Green Flashing green	Not online Online, connection with IO established, IO control- ler in run state Online, connection with IO established, IO control- ler in stop state	0				
2 (Module status)	Off Green Single flash, green Double flash, green Single flash, red Triple flash, red Quadruple flash, red	Module initialized Module initialized, no errors Diagnostics available Used by engineering tool to identify the module Configuration error No station name or no IP address assigned Failed to initialize PROFINET IO object or no MAC address	ĺ				
3 (Link/Activitiy)	Off Green Flashing green	No link Link established Packet is recieved or transmitted	C				
4 (not used)	а С	1.1 1					
5 (CANopen Subnet Status) ¹	Off Flickering green/red Blinking green Single flash, green Green Blinking red Single flash, red Double flash, red Triple flash, red Quadruple flash, red Red	Power off The LSS services are in progress Pre-operational state Stopped state Operational state Configuration error Warning limit reached Error control event Sync error Data communication timeout Bus off					
6 (Device Status)	Off Single flash, green Green Single flash, red Double flash, red Triple flash, red Quadruple flash, red Red	Power off Bootup Running Initialization error Timeout Hardware failure General error Fatal error					

1. This LED shows the status of the CANopen subnet that is controlled by the X-Gateway CANopen.

Figure 12: Error messages on the Anybus X-gateway

a

7 Environment

7.1 Disposal



Consider the environment.

Used electrical and electronic equipment must not be disposed of along with normal waste.

- The devices contain valuable materials that can be recycled. Take the device to a suitable collection point.
- 8 Conformity / Standards
- 8.1 CE

CE We declare CE-conformity. The marking can be found on the

The marking can be found on the type plate on the back of the device housing.

8.2 Product standards

The device complies with the following regulations and standards:

2014/30/EU
EMC Directive (Electromagnetic Compatibility)
2011/65/EU
RoHS Directive with amendment 2015/863
EN 61000-6-4 (2007) + AI (2011)
Emission standard for industrial environment
EN 61000-6-2 (2005)
Immunity for industrial environment
EN 55016-2-3, Class A (2017)
EN 55032, Class A (2012)
EN 61000-4-2 (2009)
EN 61000-4-3 (2006) + AI (2008) + A2 (2010)
EN 61000-4-4 (2012)
EN 61000-4-5 (2014) + AI (2018)
EN 61000-4-6 (2014)

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