

CANopen® protocol description POWER IONIZER

Description CANopen® protocol and object directory POWER IONIZER

In this document the CANopen® services as well as the implemented object dictionary supported by the POWER IONIZER are shown and explained.

Supported CANopen® services

The following standard CANopen® services and transfer types are supported:

- NMT services
- Node monitoring
- EMCY service
- LSS services
- SDO transfer
- PDO transfer

NMT services

With the Network Management Services (NMT) the selected power supply POWER IONIZER resp. the entire CANopen® network can be controlled by the master. All NMT commands are always sent from the master to the CANopen® slaves. The protocol for the transmission of NMT commands is shown below:

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x000	NMT Command	Node ID	x	x	x	x	x	x

- NMT Command
Command to control the selected node
 - 0x01: Switch the node to operational state
 - 0x02: Stop the node
 - 0x80: Switch the node to pre-operational state
 - 0x81: Re-start of the node
 - 0x82: Re-start of the CANopen® communication of the node
- Node ID
The address of the selected node
 - 0x00: NMT command is globally executed for all nodes
 - 0x01 – 0x7F: NMT command is executed for the respective node
- X
not used

Node monitoring

With the POWER IONIZER the Heartbeat Protocol can be used to monitor the CANopen® node. The heartbeat is sent cyclically by the power supply in a time that can be set in steps of 100 ms. The structure of the protocol is shown below:

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x700 + Node-ID	Node State	x	x	x	x	x	x	x

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- Node State
 - 0x00: Boot-Up node
 - 0x04: Node in Stopped Mode
 - 0x05: Node in Operational Mode
 - 0x7F: Node in Pre-Operational Mode

EMCY service

With the Emergency Service (EMCY), error and warning messages are transmitted from the power supply to the consumer of the EMCY messages. A confirmation by this service is also transmitted after the successful deletion of an error or a warning. The EMCY protocol is shown graphically below.

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x080 + Node-ID	EMCY Error Code		Error Register	Type	Code	x	x	x

- EMCY Error Code
 - CANopen® specific error code of an error or warning
 - 0x0000: no error / warning occurred
 - 0x1000 – 0xFFFF: CANopen® specific error code; detailed information see CiA301
- Error Register
 - display of the error type
 - 0x00: no error / warning occurred resp. deleted
 - 0x01 – 0xFF: error / warning occurred; detailed information see CiA 301
- Type
 - display of the error type
- 0x01: error
- 0x05: warning
- Code
 - number of the error / warning; detailed information see chapter 6.1 and 6.2 in the Operating Instructions of the POWER IONIZER.
- X
 - not used: always 0x00

LSS Services

The LSS services can be used to set the CANopen® node address and baud rate. The procedure for setting the node address and the baud rate is basically the same. First, the node is started in the LSS Config Status, then the new configuration parameters are transmitted with the Configure Node-ID Service or Configure Bit Timing Parameters Service. The parameters are saved by the Store Configuration Service.

The new parameters are available after restarting the node or communication using the NMT services. The new baud rate can also be activated via the Activate Bit Timing Parameter Service. However, it must be ensured that all devices in the CANopen® network are converted to the new baud rate. Otherwise, communication errors will occur on the individual devices. For further information regarding the LSS services see CiA 305.

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PDO Transfer

The Process Data Object (PDO) transfer represents a direct transfer (without confirmation) by the recipient. The data is transferred without further information - only with the CAN identifier (COB-ID) - for identification. The objects marked in the object directory for PDO mapping are marked in the respective data bytes. The PDO transfer is only available in the operational mode. In the other CANopen® modes, there is no transmission or evaluation of the PDO data.

For detailed information of the PDO transfer and the set parameters, see the POWER IONIZER object directory and the CiA 301 specification.

SDO Transfer

All entries in the object directory can be accessed using Service Data Objects (SDO). This transmission is always confirmed with a response from the selected node. The POWER IONIZER power supply is configured as an SDO server. This means that other devices (SDO clients) within the CANopen® network can access the individual objects by downloading (read access) and uploading (write access). Due to the maximum data length of four bytes, segmented SDO transfer and block transfer are not supported.

The structure of the protocol for the SDO transfer is shown below.

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
COB-ID	Command Byte	Object Index LSB	Object Index MSB	Object Subindex	Data LSB first			

- COB-ID
CAN Identifier of the message
 - 0x580 + Node-ID: Transfer from POWER IONIZER to SDO client
 - 0x600 + Node-ID: Transfer from SDO client to POWER IONIZER
- Command Byte
SDO type of access to the selected object
 - 0x22: write access by SDO client
 - 0x40: read access by SDO client
 - 0x43: confirmation by SDO server reading 4 bytes
 - 0x4B: confirmation by SDO server reading 2 bytes
 - 0x4F: confirmation by SDO server reading 1 byte
 - 0x80: cancellation of the SDO transfer by SDO server
- Object Index LSB
low byte of Object Index
- Object Index MSB
most significant byte of Object Index
- Object Subindex
subindex of the Object

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- **Data (LSB first)**
Data field with the content of the object data. The low byte is the first in the data field. In this area, the new data are transferred in the case of a write access. When reading, the data are contained in the response from the SDO server. Certain CANopen®-specific error codes are also transmitted in the data field in the case of error events. If the entries are not required for the transfer, they must always be filled with 0x00.
For further information see CANopen® specification CiA 301.

Overview POWER IONIZER CANopen® Object directory

All CANopen® objects supported by the POWER IONIZER are listed in the following table.

Object Index	Object name
0x1000	Device type
0x1001	Error register
0x1003	Pre-defined Error Field
0x1008	Manufacturer device name
0x100A	Manufacturer software version
0x1010	Store Parameter Field
0x1011	Restore Parameter Defaults
x01014	COB-ID EMCY message
0x1017	Producer Heartbeat time
0x1018	Identity Object
0x1200	Server SDO parameter
0x1400	1. Receive PDO parameter
0x1600	1. Receive PDO Mapping
0x1800	1. Transmit PDO parameter
0x1801	2. Transmit PDO parameter
0x1A00	1. Transmit PDO Mapping
0x1A01	2. Transmit PDO Mapping
0x2000	Read Operating Hours
0x2001	Read Actual Values
0x2002	Read/Write Parameters
0x2003	Clear Error/Warning
0x6000	Read Input 8 Bit
0x6200	Write Output 8 Bit
0x6401	Read Analog Input 16 Bit

In the further course of the document, the individual objects are explained regarding to the individual parameters for access and the sub-indices contained in an object. All these objects are also summarized in the CANopen® EDS Datei (PI.eds).

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Object 0x1000 Device type

Object for the CANopen[®] device profile

Index	0x1000
Subindex	0x00
Name	Device type
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x000F0191
Low Limit	
High Limit	

Object 0x1001 Error register

Object for the CANopen[®] error register

Index	0x1001
Subindex	0x00
Name	Error register
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

Object 0x1003 Pre-defined Error Field

Object for the CANopen[®] specifically Pre-defined error field

Index	0x1003
Name	Pre-defined Error Field
Object Code	ARRAY

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Index	0x1003
Subindex	0x00
Name	Number of Errors
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	0x00 – 0xFE
Default Value	0
Low Limit	
High Limit	

Index	0x1003
Subindex	0x01
Name	Standard Error Field
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0
Low Limit	
High Limit	

Object 0x1008 Manufacturer device name

Object for the Eltex device name

Index	0x1008
Subindex	0x00
Name	Manufacturer device name
Object Code	VAR
Data Type	VISIBLE STRING
Data Size	3 Byte
Access Type	CONST
PDO Mapping	No
Value Range	
Default Value	PCSC
Low Limit	
High Limit	

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Object 0x100A Manufacturer software version

Object for the software version

Index	0x100A
Subindex	0x00
Name	Manufacturer software version
Object Code	VAR
Data Type	VISIBLE STRING
Data Size	4 Byte
Access Type	CONST
PDO Mapping	No
Value Range	
Default Value	
Low Limit	
High Limit	

Object 0x1010 Store Parameter Field

Object for saving the parameter data. If the object 0x1010 subindex 0x01 is addressed with a write access, all parameter values are stored in an internal memory.

Index	0x1010
Name	Store Parameter Field
Object Code	ARRAY

Index	0x100
Subindex	0x00
Name	Number of entries
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0x01 – 0x7F
Default Value	0x01
Low Limit	
High Limit	

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Index	0x1010
Subindex	0x01
Name	Save all parameters
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	
Low Limit	
High Limit	

Object 0x1011 Restore Default Parameters

Object for loading the factory settings for the parameters. If the object 0x1011 subindex 0x01 is addressed with a write access, all parameter values are reset to the factory settings; except the CANopen® node address and the bit timing; these parameters are not reset.

Index	0x1011
Name	Restore Parameter Defaults
Object Code	ARRAY

Index	0x101
Subindex	0x00
Name	Number of entries
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0x01 – 0x7F
Default Value	0x01
Low Limit	
High Limit	

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Index	0x1011
Subindex	0x01
Name	Restore all Default Parameters
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	
Low Limit	
High Limit	

Object 0x1014 COB-ID EMCY Message

Object for the CAN Identifier of the EMCY message

Index	0x1014
Subindex	0x00
Name	COB-ID EMCY Message
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x80 + Node-ID
Low Limit	
High Limit	

Object 0x1017 Producer Heartbeat Time

The heartbeat time for node monitoring can be set with this object. The time can be set in a range of 100ms - 60000ms (1min) in 100 ms steps. If the value 0 is selected, the heartbeat is deactivated. By default, the heartbeat is sent every second.

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Index	0x1017
Subindex	0x00
Name	Producer heartbeat time
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	0
Low Limit	100
High Limit	60000

Object 0x1018 Identity Object

Object to identify the CANopen® node

Index	0x1011
Name	Identity Object
Object Code	RECORD

Index	0x118
Subindex	0x00
Name	Number of entries
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x04
Low Limit	
High Limit	

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Index	0x1018
Subindex	0x01
Name	Vendor ID
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x0000024E
Low Limit	
High Limit	

Index	0x1018
Subindex	0x02
Name	Product Code
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	
Low Limit	
High Limit	

Index	0x1018
Subindex	0x03
Name	Revision Number
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	
Low Limit	
High Limit	

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Index	0x1018
Subindex	0x04
Name	Serial Number
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	
Low Limit	
High Limit	

Object 0x1200 1. Server SDO parameters

Object with the SDO Server parameters

Index	0x1200
Name	1. Server SDO parameters
Object Code	RECORD

Index	0x1200
Subindex	0x00
Name	Number of entries
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x02
Low Limit	
High Limit	

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Index	0x1200
Subindex	0x01
Name	COB-ID Client -> Server (rx)
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x600 + Node-ID
Low Limit	
High Limit	

Index	0x1200
Subindex	0x02
Name	COB-ID Server -> Client (tx)
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x580 + Node-ID
Low Limit	
High Limit	

Object 0x1400 1st Receive PDO parameters

Object with the communication parameters for the 1st Receive PDO

Index	0x1400
Name	1. Receive PDO Parameter
Object Code	RECORD

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Index	0x1400
Subindex	0x00
Name	Largest Sub-Index supported
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x02
Low Limit	
High Limit	

Index	0x1400
Subindex	0x01
Name	COB-ID used by PDO
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x200 + Node-ID
Low Limit	
High Limit	

Index	0x1400
Subindex	0x02
Name	Transmission Type
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	255
Low Limit	
High Limit	

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Object 0x1600 1st Receive PDO Mapping

Mapping parameter for the 1st Receive PDO

Index	0x1600
Name	1. Receive PDO Mapping
Object Code	RECORD

Index	0x1600
Subindex	0x00
Name	Number of mapped Application Objects supported
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0x01 – 0x40
Default Value	0x01
Low Limit	
High Limit	

Index	0x1600
Subindex	0x01
Name	1. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x62000108
Low Limit	
High Limit	

Object 0x1800 1st Transmit PDO parameter

Object with the communication parameters for the 1st Transmit PDO

Index	0x1800
Name	1. Transmit PDO Parameter
Object Code	RECORD
Data Type	UNSIGNED32

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Index	0x1800
Subindex	0x00
Name	Largest Sub-Index supported
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x02
Low Limit	
High Limit	

Index	0x1800
Subindex	0x01
Name	COB-ID used by PDO
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x180 + Node-ID
Low Limit	
High Limit	

Index	0x1800
Subindex	0x02
Name	Transmission Type
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	255
Low Limit	
High Limit	

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Object 0x1801 2nd Transmit PDO parameter

Object with the communication parameters for the 2nd Transmit PDO

Index	0x1801
Name	2. Transmit PDO Parameter
Object Code	RECORD

Index	0x1801
Subindex	0x00
Name	Largest Sub-Index supported
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x02
Low Limit	
High Limit	

Index	0x1801
Subindex	0x01
Name	COB-ID used by PDO
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x280 + Node-ID
Low Limit	
High Limit	

Index	0x1801
Subindex	0x02
Name	Transmission Type
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	255
Low Limit	
High Limit	

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Object 0x1A00 1st Transmit PDO Mapping

Mapping parameter for the 1st Transmit PDO

Index	0x1A00
Name	1. Transmit PDO Mapping
Object Code	RECORD

Index	0x1A00
Subindex	0x00
Name	Number of mapped Application Objects supported
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0x01 – 0x40
Default Value	0x04
Low Limit	
High Limit	

Index	0x1A00
Subindex	0x01
Name	1. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x60000108
Low Limit	
High Limit	

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Index	0x1A00
Subindex	0x02
Name	2. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x60000208
Low Limit	
High Limit	

Index	0x1A00
Subindex	0x03
Name	3. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x60000308
Low Limit	
High Limit	

Index	0x1A00
Subindex	0x04
Name	4. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x60000408
Low Limit	
High Limit	

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Object 0x1A01 2nd Transmit PDO Mapping

Mapping parameter for the 2nd Transmit PDO

Index	0x1A01
Name	2. Transmit PDO Mapping
Object Code	RECORD

Index	0x1A01
Subindex	0x00
Name	Number of mapped Application Objects supported
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0x01 – 0x40
Default Value	0x04
Low Limit	
High Limit	

Index	0x1A01
Subindex	0x01
Name	1. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x64010110
Low Limit	
High Limit	

Index	0x1A01
Subindex	0x02
Name	2. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x64010210
Low Limit	
High Limit	

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Index	0x1A01
Subindex	0x03
Name	3. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x64010310
Low Limit	
High Limit	

Index	0x1A01
Subindex	0x04
Name	4. mapped Object
Object Code	VAR
Data Type	UNSIGNED32
Data Size	4 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED32
Default Value	0x64010410
Low Limit	
High Limit	

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Object 0x2000 Read Operating Hours

Object contains individual entries for reading out the operating and high voltage hour counter. All entries can be read out by the SDO client. Write access is not supported.

Index	0x2000
Name	Read Operating Hours
Object Code	RECORD

Index	0x2000
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x0C
Low Limit	
High Limit	

- Subindex 0x01: Years of the operating hour counter

Index	0x2000
Subindex	0x01
Name	Read Operating Hours Years
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

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- Subindex 0x02: Days of the operating hour counter

Index	0x2000
Subindex	0x02
Name	Read Operating Hours Days
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0 - 365
Default Value	
Low Limit	
High Limit	

- Subindex 0x03: Hours of the operating hour counter

Index	0x2000
Subindex	0x03
Name	Read Operating Hours Hours
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0 - 60
Default Value	
Low Limit	
High Limit	

- Subindex 0x04: Minutes of the operating hour counter

Index	0x2000
Subindex	0x04
Name	Read Operating Hours Minutes
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0 - 60
Default Value	
Low Limit	
High Limit	

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- Subindex 0x09: Years of the Discharging hour counter

Index	0x2000
Subindex	0x09
Name	Read Discharging Hours Years
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x0A: Days of the Discharging hour counter

Index	0x2000
Subindex	0x0A
Name	Read Discharging Hours Days
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0 - 365
Default Value	
Low Limit	
High Limit	

- Subindex 0x0B: Hours of the Discharging hour counter

Index	0x2000
Subindex	0x0B
Name	Read Discharging Hours Hours
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0 - 60
Default Value	
Low Limit	
High Limit	

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- Subindex 0x0C: Minutes of the Discharging hour counter

Index	0x2000
Subindex	0x0C
Name	Read Discharging Hours Minutes
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	0 - 60
Default Value	
Low Limit	
High Limit	

Object 0x2001 Read Actual Values

The entries for reading out the measured actual values are summarized in this object and assigned to the measured variable.

Index	0x2001
Name	Read Actual Values
Object Code	RECORD

Index	0x2001
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x09
Low Limit	
High Limit	

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- Subindex 0x01: Supply voltage in mV

Index	0x2001
Subindex	0x01
Name	Read Supply Voltage
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

- Subindex 0x02: Supply current in mA

Index	0x2001
Subindex	0x02
Name	Read Supply Current
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

- Subindex 0x03: Supply power in W with one decimal place

Index	0x2001
Subindex	0x03
Name	Read Supply Power
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x04: Percentage capacity of the supply power

Index	0x2001
Subindex	0x04
Name	Read Supply Power Capacity
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x05: Internal temperature in °C

Index	0x2001
Subindex	0x05
Name	Read Temperature Intern
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x06: Temperature of the Discharging in °C

Index	0x2001
Subindex	0x06
Name	Read Temperature Discharging
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x07: Discharging mode

Operating state of the discharging.

The indication of the operating status is divided into two parts. The low-order byte represents the current operating mode. The higher-order byte shows the limiters of the discharge.

- Operating mode Discharging
 - 0 – Passive Discharging
 - 1 – Active Discharging
- Limiter Discharging
 - Bit 8 – Voltage limiter
 - 0 – Voltage limiter not active
 - 1 – Voltage limiter active

Index	0x2001
Subindex	0x07
Name	Read Discharging Mode
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x08: Active power of the discharge connection 1 in mW

Index	0x2001
Subindex	0x08
Name	Read Power Discharge 1
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

Subindex 0x09: Active power of the discharge connection 2 in mW.

Index	0x2001
Subindex	0x09
Name	Read Power Discharge 2
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

Object 0x2002 Read/Write Parameter

With the entries of object 0x2002, all parameters for operating the power supply can be read and written. These entries represent the complete setting options.

Index	0x2002
Name	Read/Write Parameter
Object Code	RECORD

Index	0x2002
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x13
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x01: Read/Write Actual Value Transfer Time

Setting the cycle time for transferring the actual values that are mapped in the two transmit PDOs. Cycle times in the range from 100 ms – 60000 ms (1 min) can be set. A time of 500 ms is set by default. Setting this parameter, the entire bus load must be considered. If a lower time is set, the bus load increases.

Index	0x2002
Subindex	0x01
Name	Read/Write Actual Value Transfer Time
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	500
Low Limit	100
High Limit	60000

- Subindex 0x02: Read/Write HV Release Mode

The software release of the high voltage via the various options can be set with this parameter. The individual release options can be activated separately from one another. The output of the high voltage starts after setting the software and the respective hardware release via the interface.

- Bit 0 – Autostart
 - 0 – Autostart deactivated
 - 1 – Autostart activated (automatic setting of the software release after switching on the supply voltage)
- Bit 1 – HMI
 - 0 – HMI Release deactivated
 - 1 – HMI Release activated (release can be switched on / off via touch screen or keypad)
- Bit 2 – CANopen®
 - 0 – Release via CANopen® deactivated
 - 1 – Release via CANopen® activated (software release can be controlled via fieldbus)
- Bit 3 – Fieldbus Ethernet
 - 0 – Release via Ethernet deactivated
 - 1 – Release via Ethernet activated (software release can be controlled via write access to register 0x1010)

CANopen® protocol description POWER IONIZER

Index	0x2002
Subindex	0x02
Name	Read/Write HV Release Mode
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	2
Low Limit	0
High Limit	15

- Subindex 0x04: Read/Write HV Release Timeout

Timeout for the release of the high voltage. After the timeout has expired, the software approval is automatically deleted. The timer is reset when the release is sent again via the bus. The timeout can be set in a range of 500 ms – 60000 ms. For values less than 500 ms, the value is set to 0. This deactivates the timeout.

Index	0x2002
Subindex	0x04
Name	Read/Write HV Release Timeout
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0
Low Limit	0
High Limit	60000

CANopen[®] protocol description POWER IONIZER

- Subindex 0x05: Read Burn-In Test State

Reading of the burn-in test status

0x00: No burn-in test was carried out.

0x01: Burn-in test was carried out successfully.

Index	0x2002
Subindex	0x05
Name	Read Burn-In Test State
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x06: Read/Write CANopen[®] Node ID

Setting of the CANopen[®] node address

To accept the new node address, it must first be saved using the SDO object 0x1010. The node must then be restarted. This can be done with the NMT command or by switching the supply voltage off and on.

Index	0x2002
Subindex	0x06
Name	Read/Write CANopen [®] Node ID
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	99
Low Limit	1
High Limit	127

CANopen[®] protocol description POWER IONIZER

- Subindex 0x07: Read/Write CANopen[®] Bit Timing

Setting the CANopen[®] baud rate by selecting the corresponding table entry for the bit timing.

To accept the new baud rate, it must first be saved using the SDO object 0x1010. The node must then be restarted. This can be done with the NMT command or by switching the supply voltage off and on.

0x00: 1000 kBit/s, 0x01: 800 kBit/s, 0x02: 500 kBit/s, 0x03: 250 kBit/s
0x04: 125 kBit/s, 0x06: 50 kBit/s, 0x07: 25 kBit/s, 0x08: 10 kBit/s

Index	0x2002
Subindex	0x07
Name	Read/Write CANopen [®] Bit Timing
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	4
Low Limit	0
High Limit	8

CANopen[®] protocol description POWER IONIZER

- Subindex 0x08: Read/Write Pollution Detection Discharging
Parameter for setting the pollution monitoring.
Pollution monitoring is only possible in connection with bars of the R60/R60L series.
If pollution monitoring is activated, the current value of the power for output 1 or 2 (register 0x2001 subindex 0x08 or 0x09) is compared with the determined nominal power for the output (register 0x2002 subindex 0x12 or 0x13). The comparison of the values takes place in a known reference point, which is controlled automatically and independently of the set parameters for the discharge voltage.
The pollution calibration can be used to determine the nominal power. Manual setting of the corresponding parameters for register 0x1A70 und 0x1A80 is also possible.
 - 0 – Pollution monitoring deactivated
 - 1 – Pollution monitoring activated
 - 2 – Calibration of the pollution monitoring

Index	0x2002
Subindex	0x08
Name	Read/Write Pollution Detection Discharging
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0
Low Limit	0
High Limit	2

CANopen® protocol description POWER IONIZER

- Subindex 0x09: Read/Write Keyboard Lock

Activation or deactivation of the keyboard lock of the keypad. When the keyboard lock is activated, an operation via the integrated keypad at the power supply is not possible. Note that this parameter is not saved, and the keyboard lock is always deactivated after the power supply is restarted

The following settings are possible:

- 0 – Keyboard lock not activated
- 1 – Keyboard lock activated

Index	0x2002
Subindex	0x09
Name	Read/Write Keyboard Lock
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	1
Low Limit	0
High Limit	1

- Subindex 0x0A: Read/Write LED Bar Mode

Setting off the mode for displaying the actual values using the integrated LED bar.

The following settings are possible:

- 0 – Display actual value Voltage
- 1 – Display actual value Current

Index	0x2002
Subindex	0x0A
Name	Read/Write LED Bar Mode
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	1
Low Limit	0
High Limit	1

CANopen® protocol description POWER IONIZER

- Subindex 0x0B: Read/Write Voltage Setpoint Discharging

Setting of the voltage setpoint of the discharge in V.

Index	0x2002
Subindex	0x0B
Name	Read/Write Voltage Setpoint Discharging
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	Maximum Voltage Discharging
Low Limit	Minimum Voltage Discharging
High Limit	Maximum Voltage Discharging

- Subindex 0x0C: Read Current Setpoint Discharging

Setting of the current setpoint of the discharge in μ A.

Index	0x2002
Subindex	0x0C
Name	Read Current Setpoint Discharging
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x0D: Read Power Setpoint Discharging

Power setpoint of the discharge. This parameter can only be read. Changes are made exclusively via internal conditions (e.g. temperatures, input power etc.).

Index	0x2002
Subindex	0x0D
Name	Read Power Setpoint Discharging
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x0E: Read/Write Setpoint Percent Discharging

Setting of the voltage setpoint in % for the discharging.

Index	0x2002
Subindex	0x0E
Name	Read/Write Setpoint Percent Discharging
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	100
Low Limit	0
High Limit	100

CANopen® protocol description POWER IONIZER

- Subindex 0x0F: Read/Write Discharging Mode

Setting of the discharging mode. The following settings can be selected:

- 0 – Passive discharging
- 1 – Active discharging

Index	0x2002
Subindex	0x0F
Name	Read/Write Discharging Mode
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	1
Low Limit	0
High Limit	1

- Subindex 0x10: Read/Write Parameter Adjustment Discharging

Setting of the parameter adjustment in % to optimize the discharging result.

Index	0x2002
Subindex	0x10
Name	Read/Write Parameter Adjustment Discharging
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0
Low Limit	0
High Limit	100

CANopen® protocol description POWER IONIZER

- Subindex 0x11: Read/Write Parameter Frequency Discharging

Setting of the discharging voltage frequency.

The setting is made by selecting the respective index for the corresponding frequency. The following frequencies are available:

- 0 – 50Hz
- 1 – 55,7Hz
- 2 – 62,5Hz
- 3 – 71,4Hz
- 4 – 83,3Hz
- 5 – 100Hz
- 6 – 125Hz
- 7 – 166,7Hz
- 8 – 250Hz

Index	0x2002
Subindex	0x11
Name	Read/Write Parameter Frequency Discharging
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0
Low Limit	0
High Limit	8

- Subindex 0x12: Read/Write Nominal Power Discharge 1

Setting of the nominal power for discharging connection 1 in mW.

This parameter is used in conjunction with the pollution monitoring (register 0x2002 Subindex 0x08).

Index	0x2002
Subindex	0x12
Name	Read/Write Nominal Power Discharge 1
Object Code	VAR
Data Type	UNSIGNED8
Data Size	2 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	0
Low Limit	0
High Limit	1000

CANopen® protocol description POWER IONIZER

- Subindex 0x13: Read/Write Nominal Power Discharge 2
Setting of the nominal power for discharging connection 2 in mW.
This parameter is used in conjunction with the pollution monitoring (register 0x2002 Subindex 0x08).

Index	0x2002
Subindex	0x13
Name	Read/Write Nominal Power Discharge 2
Object Code	VAR
Data Type	UNSIGNED8
Data Size	2 Byte
Access Type	Read/Write
PDO Mapping	No
Value Range	UNSIGNED16
Default Value	0
Low Limit	0
High Limit	1000

CANopen® protocol description POWER IONIZER

Object 0x2003 Clear Error/Warning

Object with entries for acknowledging occurred errors and warnings

Index	0x2003
Name	Clear Error/Warning
Object Code	RECORD

Index	0x2003
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x05
Low Limit	
High Limit	

- Subindex 0x01: Clear Error

Entry for acknowledging errors. The transmitted error code is deleted after an internal check.

Index	0x2003
Subindex	0x01
Name	Clear Error
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Write Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	0x01
High Limit	0x50

CANopen® protocol description POWER IONIZER

- Subindex 0x02: Clear Warning

Entry for acknowledging warnings. The transmitted warning code is deleted after an internal check.

Index	0x2003
Subindex	0x02
Name	Clear Warning
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Write Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	
Low Limit	0x01
High Limit	0x60

Object 0x6000 Read Input 8 Bit

Object with 8 bit input data. These entries are mapped to the 1st Transmit PDO. In this way, direct monitoring of the bar can be transferred without any great effort.

Index	0x6000
Name	Read Input 8 Bit
Object Code	ARRAY

Index	0x6000
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x04
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x01: Read System Status

Current system status of the power supply. The status consists of several parts:

- Bit 0: High voltage release
 - 0 – high voltage deactivated
 - 1 – high voltage activated
- Bit 1: Error
 - 0 – no error active
 - 1 – error occurred
- Bit 2: Warning
 - 0 – no warning occurred
 - 1 – warning occurred
- Bit 4: Discharge
 - 0 – discharge deactivated (resp. with existing discharge: passive mode)
 - 1 – discharge active
- Bit 5: Software release
 - 0 – no software release
 - 1 – software release is set

Index	0x6000
Subindex	0x01
Name	Read System Status
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

CANopen[®] protocol description POWER IONIZER

- Subindex 0x02: Read Discharging Capacity

Percentage capacity of the Discharging

Index	0x6000
Subindex	0x02
Name	Read Discharging Capacity
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

- Subindex 0x07: Read Status Discharge 1
Display of the status for the connection Discharge 1.
Determination of pollution is only possible in connection with bars of the R60/R60L series at this connection of the discharge. For the determination of pollution, a corresponding setting of the registers 0x2002 Subindex 0x28 and 0x29 are necessary.
 - 0 – no consumer connected
 - 1 – consumer connected
 - 2 – conductive pollution detected
 - 3 – Insulated pollution detected

Index	0x6000
Subindex	0x07
Name	Read Status Discharge 1
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x08: Read Status Discharge 2
Display of the status for the connection Discharge 2.
Determination of pollution is only possible in connection with bars of the R60/R60L series at this connection of the discharge. For the determination of pollution, a corresponding setting of the registers 0x2002 Subindex 0x28 and 0x2A are necessary.
 - 0 – no consumer connected
 - 1 – consumer connected
 - 2 – conductive pollution detected
 - 3 – insulated pollution detected

Index	0x6000
Subindex	0x08
Name	Read Status Discharge 2
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

Object 0x6200 Write Output 8 Bit

Object with 8 bit output data. These entries are mapped to the 1st Receive PDO. In this way, direct monitoring of the bar can be transferred without any great effort.

Index	0x6200
Name	Write Output 8 Bit
Object Code	ARRAY

Index	0x6200
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x01
Low Limit	
High Limit	

- Subindex 0x01: Write HV Release

The high voltage can be activated or deactivated via a write access. The option for a release via CANopen® must be set in the parameter, so that the controlling can take place via bus.

- Release state
 - 0x00: Release blocked
 - 0x0F: High voltage released

Index	0x6200
Subindex	0x01
Name	Write HV Release
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Write Only
PDO Mapping	Yes
Value Range	UNSIGNED8
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

Object 0x6401 Read Analog Input 16 Bit

Object with 16 bit analog input data. These entries are mapped to the 1st Receive PDO. In this, way, direct monitoring of the bar can be transferred without any great effort.

Index	0x6401
Name	Read Analog Input 16 Bit
Object Code	ARRAY
Index	0x6401
Subindex	0x00
Name	Number of elements
Object Code	VAR
Data Type	UNSIGNED8
Data Size	1 Byte
Access Type	Read Only
PDO Mapping	No
Value Range	UNSIGNED8
Default Value	0x04
Low Limit	
High Limit	

- Subindex 0x01: Read Voltage Discharging

Actual value of the effective discharge voltage in V

Index	0x6401
Subindex	0x01
Name	Voltage Discharging
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x02: Read AC Current Discharging

Actual voltage of the effective discharge current in μA

Index	0x6401
Subindex	0x02
Name	AC Current Discharging
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

- Subindex 0x03: Read DC Current Discharging

Actual voltage of the signed DC discharge current in μA

Index	0x6401
Subindex	0x03
Name	DC Current Discharging
Object Code	VAR
Data Type	INTEGER16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	

CANopen® protocol description POWER IONIZER

- Subindex 0x04: Read Power Discharging

Actual value of the effective discharge power in watts with one decimal place (value 759 corresponds to 75.9 W).

Index	0x6401
Subindex	0x04
Name	Power Discharging
Object Code	VAR
Data Type	UNSIGNED16
Data Size	2 Byte
Access Type	Read Only
PDO Mapping	Yes
Value Range	UNSIGNED16
Default Value	
Low Limit	
High Limit	