Operating Manual

Inferface
CANopen

English

Disclaimer
The information in this brochure corresponds to our current state of knowledge. However, it is not to be understood as a warranty for certain characteristics or for suitability of the products for certain applications.
Our general contractual terms apply in this regard, and reference should also be made to these terms with regard to liability. No industrial property rights of any kind are granted to the user along with this brochure, nor are any assurances made with regard to a licence. Corresponding separate agreements would be necessary for this purpose. The suitability of the products for particular applications may only be checked with our own specialists. The German version of the brochure is binding with regard to accuracy of the information given.

Version 1.1, gb, Art.-No. 35754

Table of contents

1 Introduction to CANopen

CANopen is a communication protocol for the usage in industrial control environments and in mobile applications. The lower-layer implementation is based on the Controller Area Network (CAN).

CAN is a two-wire-bus system that was originally developed for passenger cars. In the past CAN has also become popular in all mobile systems such as ships, trains, and airplanes. As today practically all manufactures of microcontroller offer integrated CAN interfaces it has become widespread in industrial application as well. The advantages of CAN are high reliability, cost-efficiency and simplicity.

CANopen complements CAN with a network management. Each node of the network can be controlled and monitored. The organization of the network management is done by a master-slave relationship.

Common device types such as digital and analog I/O modules, drives, sensors are described in “Device Profiles”. They specify the functionality and the parameters of a device.

The main element of CANopen is the description of the device functionality by the “Object Dictionary”. It contains general information about the device and the manufacturer as well as specific device functionality. The entries in the Object Dictionary provide access to objects such as inputs, outputs, parameters, functions and network variables.

Besides the commands for the network management, synchronization and emergency messages CANopen provides to basic communication methods: for the transmission of real-time data the “Process Data Objects” (PDO) and for the access to the Object Dictionary the “Service Data Objects” (SDO).

The characteristics and functionality of a CANopen device can be described in a file called “Electronic Data Sheet” (EDS). This file uses the ASCII-Format. If one wants to use a CANopen device the EDS contains all relevant data for inserting the device into a network and to operate the device correctly.

CANopen is described shortly in the following chapters. For further information about CAN and CANopen please refer to:

- Etschberger, Konrad:
  CAN–Basics, Protocols, Chips and Applications
  IXXAT Press, ISBN: 3-00-007376-0
- Zeltwanger, Holger:
  CANopen
  VDE Verlag, ISBN: 3-8007-2448-0
- CAN Specification Version 2.0
  Robert Bosch GmbH; Sept 1991
- www.can-cia.de

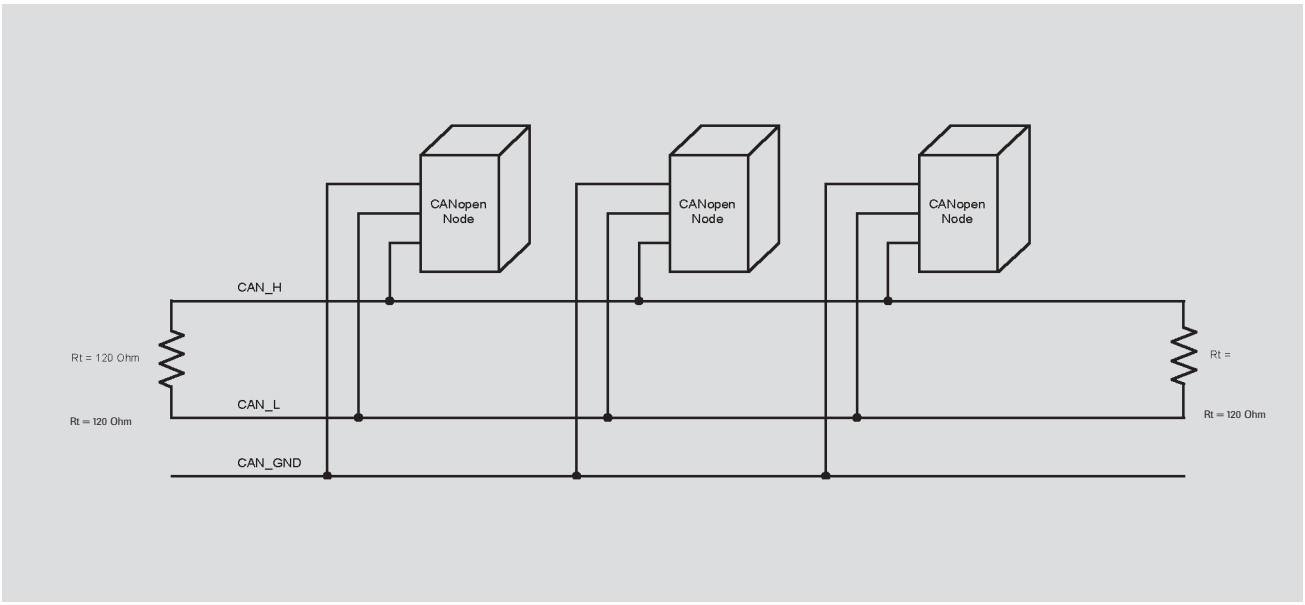
2 Bus structure

2.1 Maximum bus length

CANopen allows different baud rates up to 1 Mbit/s. The ultrasonic generators from RINCO ULTRASONICS however run with a fixed baud rate of 1Mbit/s. Therefore the maximum bus length is 25 m.

2.2 Bus topology

In order to implement a CANopen network a two-wire bus with common return (Ground) is used. The bus lines must be terminated at each end by a resistor of 120 Ohm to avoid signal reflection.

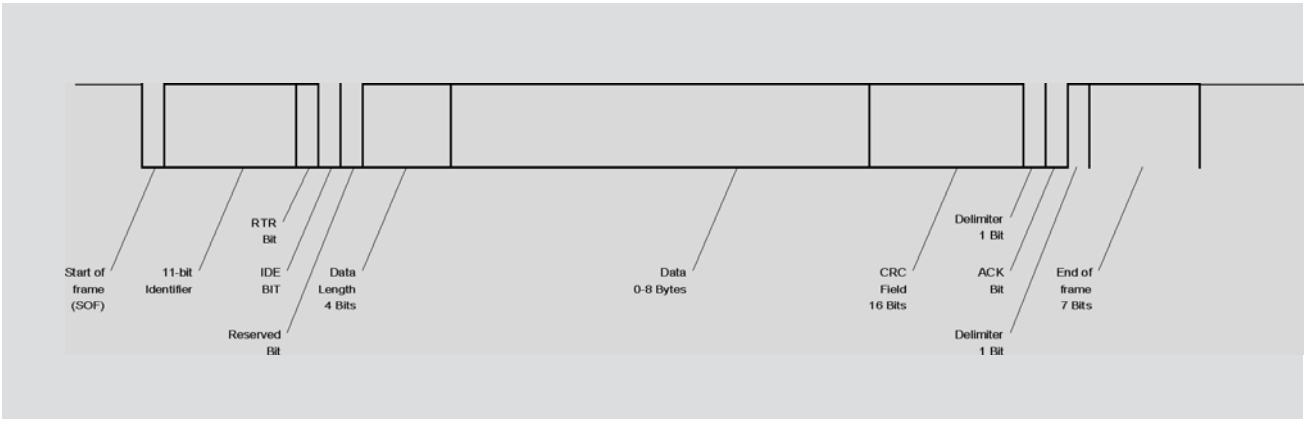


3 CANopen Communication

3.1 Physical Layer

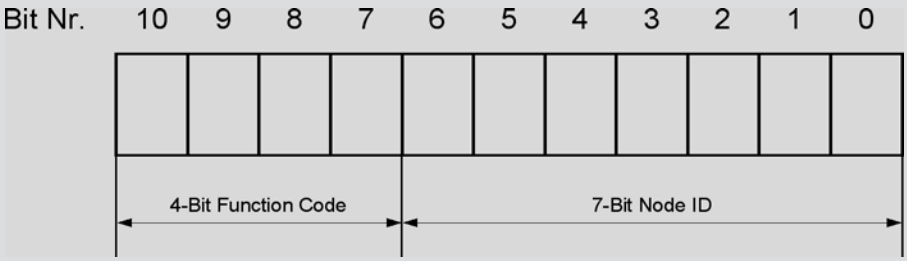
CANopen is based on CAN. Therefore the data and the remote frames are the same as with CAN. A date frame carries data from a transmitter to one or more receivers. A remote frame is used to request a data frame from a CANopen device.
The only difference between a data frame and a remote frame is the RTR bit. In case of a data frame it is set to 0 and in case of a remote frame it is set to 1.

CAN distinguishes between standard frames (with 11-bit identifier) and extended frames (with 29-bit identifier). As CANopen only uses standard frames it is only described here. The physical bit stream of a standard frame shows following figure.



3.2 Message Identifier (COB-ID)

The COB-ID is divided into two sections:



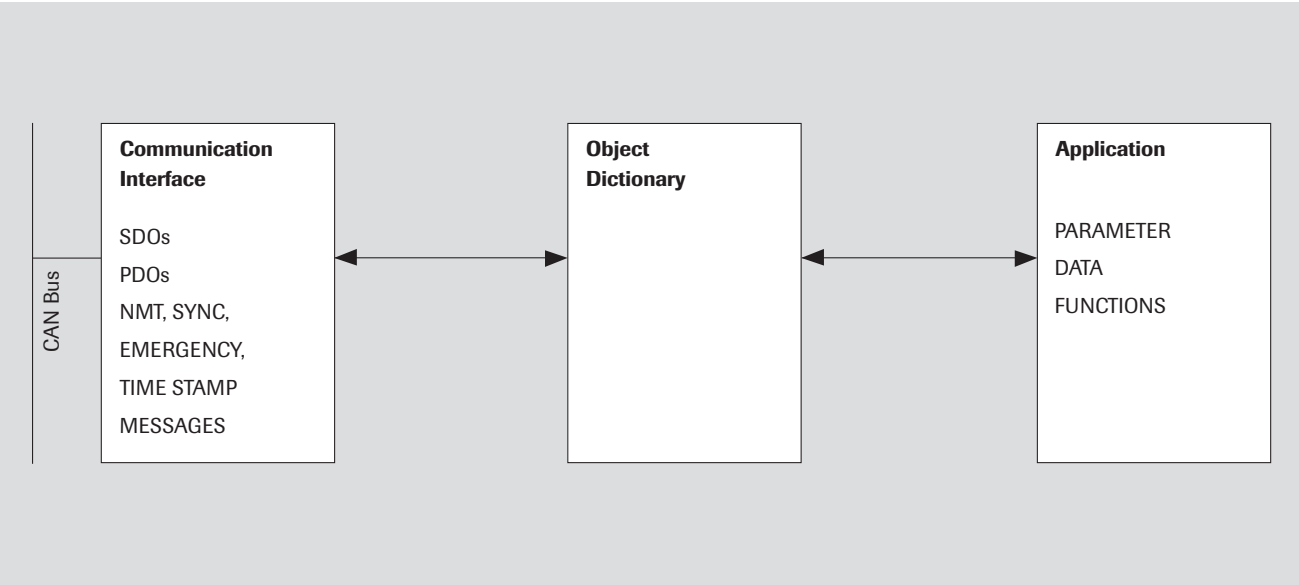
With the 7-Bit Node ID a maximum of 127 nodes are allowed in a CANopen network. It is not possible to use NODE ID 0. It is reserved for network management messages.

With the 4-Bit function code following message identifiers are possible:

Object	Function Code	Resulting COB ID
NMT	0000	0x000
SYNC	0001	0x080
TIME STAMP	0010	0x100
EMERGENCY	0001	0x080 + NODE ID
TX-PDO1	0011	0x180 + NODE ID
RX-PDO1	0100	0x200 + NODE ID
TX-PDO2	0101	0x280 + NODE ID
RX-PDO2	0110	0x300 + NODE ID
TX-PDO3	0111	0x380 + NODE ID
RX-PDO3	1000	0x400 + NODE ID
TX-PDO4	1001	0x480 + NODE ID
RX-PDO4	1010	0x500 + NODE ID
TX-SDO	1011	0x580 + NODE ID
RX-SDO	1100	0x600 + NODE ID
NMT Error Control	1110	0x700 + NODE ID

3.3 Object Dictionary

Each CANopen device has an object dictionary. It is the connecting link between the application and the CANopen communication interface.



The object dictionary consists of different objects or entries. An entry is defined by a 16-Bit address. Additionally each object can be divided into up to 256 components. These can be distinguished by an 8-Bit sub-index.

The structure of the CANopen object dictionary is shown in the following table.

Index	Object
0x0000	Not used
0x0001 – 0x025F	Data types
0x0260 – 0xFFFF	Reserved
0x1000 – 0x1FFF	Communication Profile Area
0x2000 – 0x5FFF	Manufacturer Specific Area
0x6000 – 0x9FFF	Standardized Device Profile Area
0xA000 – 0xBFFF	Standardized Interface Profile Area
0xC000 – 0xFFFF	Reserved

The data types contain type definitions like Boolean, Integer, String etc. They cannot be accessed.

The communication profile area contains all relevant parameter for the CANopen communication. The structure of this area is standardized. For a detailed description of the communication profile area of the ultrasonic generators by RINCO ULTRASONICS see chapter 7.1.

In the manufacturer specific profile area the manufacturer can create its own entries. The structure of this area is not standardized. For a detailed description of the communication profile area of the ultrasonic generators by RINCO ULTRASONICS see chapter 7.2.

The other areas are only for standardized devices such a drives or I/O modules. They do not apply for ultrasonic generators by RINCO ULTRASONICS and are here not described.

4 Service Data Object (SDO)

SDOs are used for accessing entries in the object dictionary and are confirmed messages between two nodes. A “SDO client” initiates a SDO for uploading or downloading data of the object dictionary of the “SDO server”.

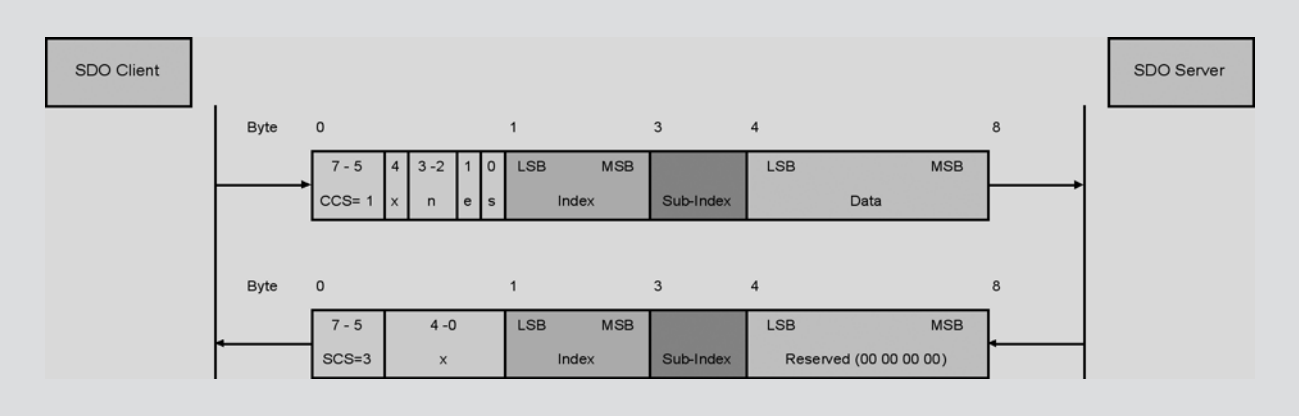
There are two transfer types:
- Expedited: For transmission of up to 4 Bytes
- Segmented: For transmission of more than 4 Bytes

4.1 Expedited SDO

Most entries in the object dictionary are less or equal 4 Bytes. The non-segmented expedited SDO allows the access to such entries. For this only two CANopen messages are necessary: a request and a confirmation.

4.1.1 SDO Download Protocol

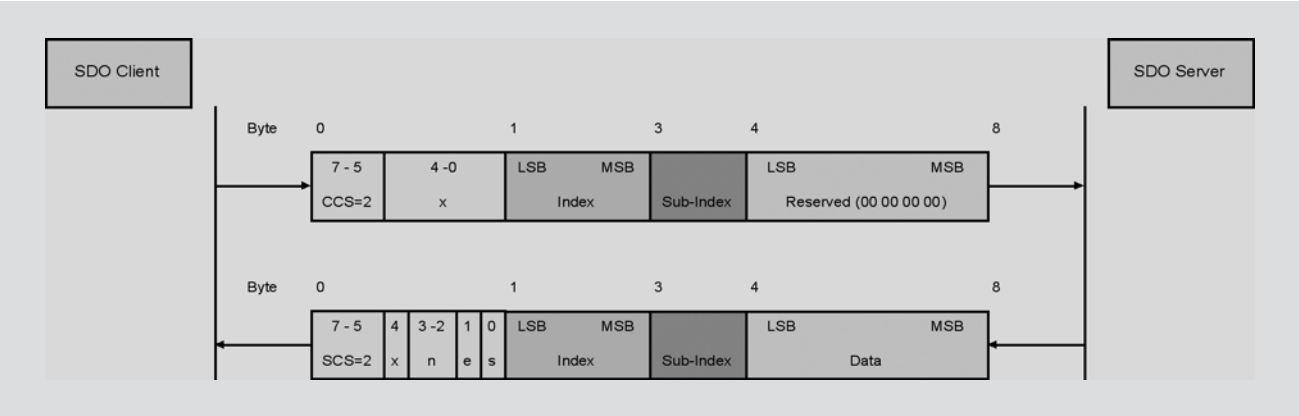
Following figure shows the data of an expedited SDO download (or a write access) to an entry in the object dictionary.



CCS = 1: SDO Download Request
SCS = 3: SDO Download Response
x : Don’t care
n: Number of data bytes that **do not** contain data
e: 1 = expedited
s: 1 = size in n is valid

4.1.2 SDO Upload Protocol

Following figure shows the data of an expedited SDO upload (or a read access) to an entry in the object dictionary.



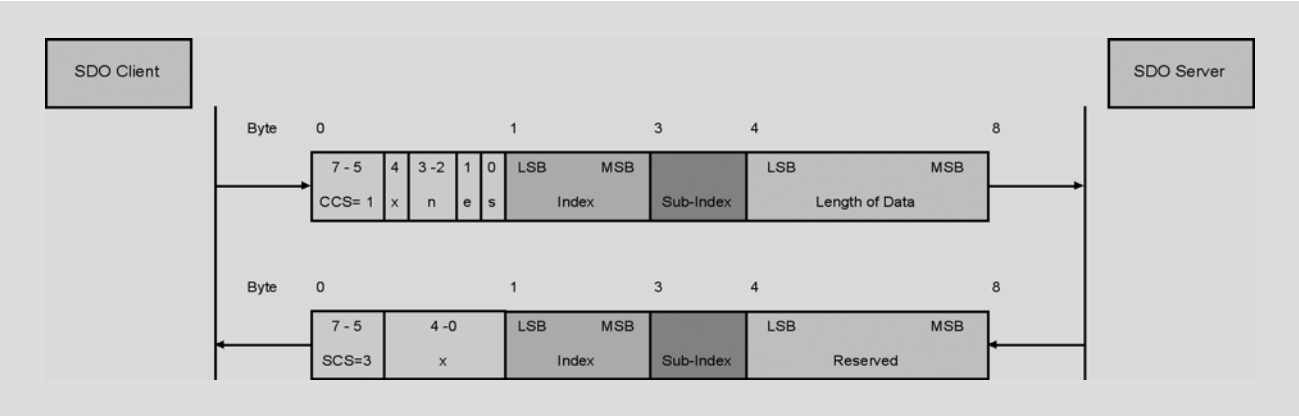
CCS = 2: SDO Download Request
SCS = 2: SDO Download Response
x : Don't care
n: Number of data bytes that **do not** contain data
e: 1 = expedited
s: 1 = size in n is valid

4.2 Segmented SDO

The segmented transfer delivers data with more than 4 Bytes. Up to 7 Bytes of data are transferred per transfer sequence. Two Bits in the SDO, the toggle Bit (t) and the end Bit (c) guarantee the correct flow transfer.

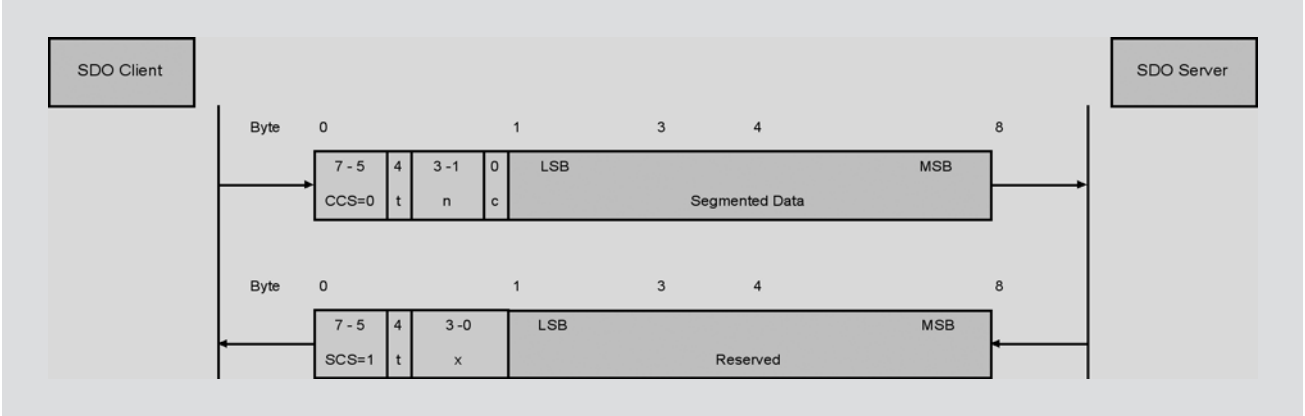
4.2.1 SDO Download Protocol

The segmented download starts with an “Initiate SDO Download”.



CCS = 1: Initiate SDO Download Request
SCS = 3: Initiate SDO Download Response
x : Don’t care
n: Number of data bytes that **do not** contain data
e: 0 = non-expedited (segmented)
s: 1 = size in n is valid

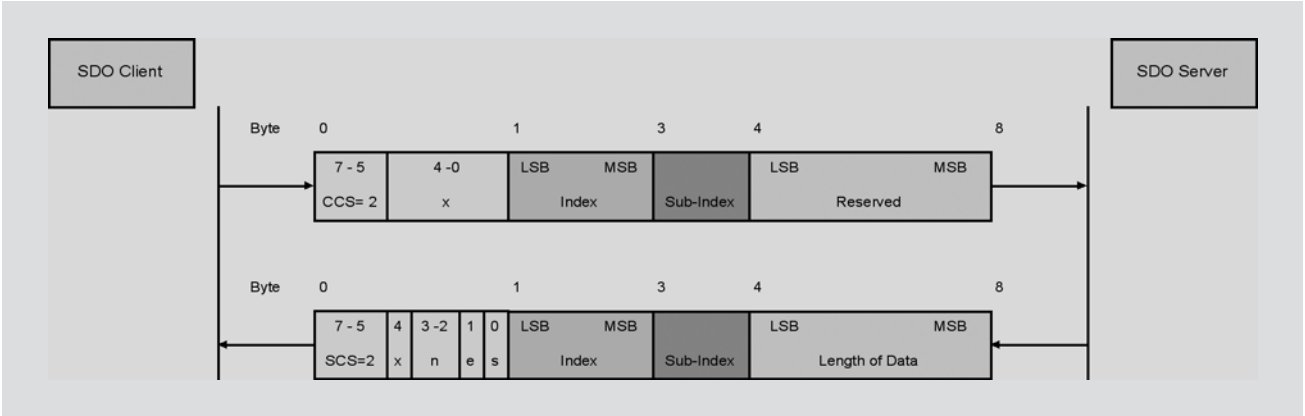
After the initiation the segmented transfer (see following figure) can start. Segmented transfer messages are continuously transmitted until all data is transferred.



CCS = 0: Segmented SDO Download Request
SCS = 1: Segmented SDO Download Response
x : Don't care
n: Number of data bytes that **do not** contain data
t: Toggle Bit
c: 0 = more segments will follow;
1 = this was the last segment

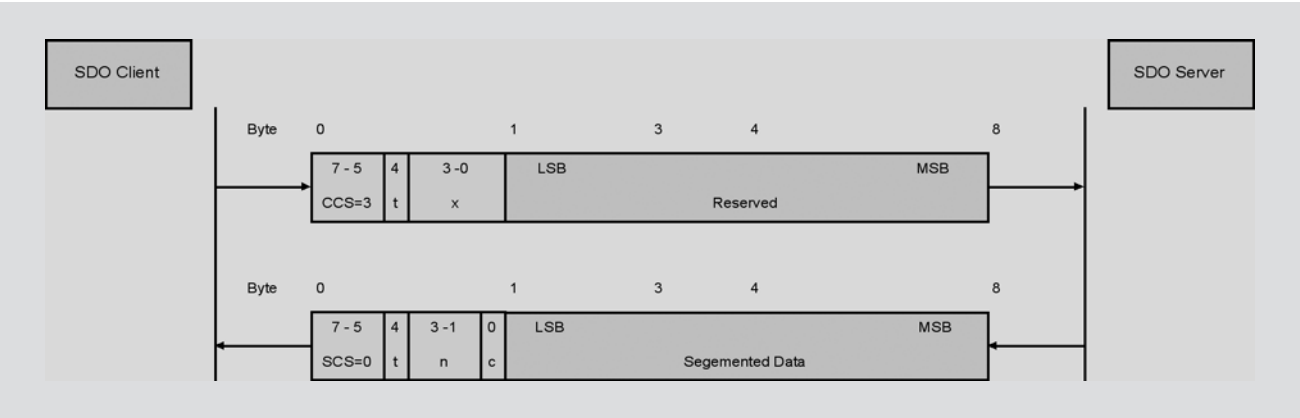
4.2.2 SDO Upload Protocol

The segmented upload starts with an "Initiate SDO Upload".



CCS = 2: Initiate SDO Upload Request
SCS = 2: Initiate SDO Upload Response
x : Don't care
n: Number of data bytes that **do not** contain data
e: 0 = non-expedited (segmented)
s: 1 = size in n is valid

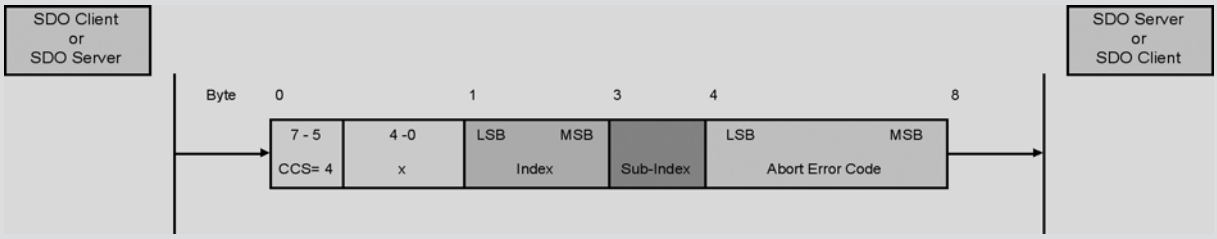
After the initiation the segmented transfer (see figure below) can start. Segmented transfer messages are continuously transmitted until all data is transferred.



CCS = 3: Segmented SDO Upload Request
SCS = 0: Segmented SDO Upload Response
x : Don't care
n: Number of data bytes that **do not** contain data
t: Toggle Bit
c: 0 = more segments will follow;
1 = this was the last segment

4.3 Abort SDO Transfer

The abort transfer is used to request an abort of a running SDO transfer. The client or the server can request the abort transfer. The data of the abort transfer contains an error code.



CCS = 4: Abort SDO Request
x : Don't care

The abort error codes are displayed in the following table:

Abort Error Code	Description
0503 0000h	Toggle bit not alternated.
0504 0000h	SDO protocol timed out.
0504 0001h	Client/server command specifier not valid or unknown.
0504 0002h	Invalid block size (block mode only).
0504 0003h	Invalid sequence number (block mode only).
0504 0004h	CRC error (block mode only).
0504 0005h	Out of memory.
0601 0000h	Unsupported access to an object.
0601 0001h	Attempt to read a write only object.
0601 0002h	Attempt to write a read only object.
0602 0000h	Object does not exist in the object dictionary.
0604 0041h	Object cannot be mapped to the PDO.
0604 0042h	The number and length of the objects to be mapped would exceed PDO length.
0604 0043h	General parameter incompatibility reason.
0604 0047h	General internal incompatibility in the device.
0606 0000h	Access failed due to an hardware error.
0607 0010h	Data type does not match, length of service parameter does not match
0607 0012h	Data type does not match, length of service parameter too high
0607 0013h	Data type does not match, length of service parameter too low
0609 0011h	Sub-index does not exist.
0609 0030h	Value range of parameter exceeded (only for write access).
0609 0031h	Value of parameter written too high.
0609 0032h	Value of parameter written too low.
0609 0036h	Maximum value is less than minimum value
0800 0000h	General error
0800 0020h	Data cannot be transferred or stored to the application.
0800 0021h	Data cannot be transferred or stored to the application because of local control.
0800 0022h	Data cannot be transferred or stored to the application because of the present device state.
0800 0023h	Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of an file error).

5 Process Data Object (PDO)

PDOs are unconfirmed data frames of maximum 8 Bytes. A PDO is transmitted by a “PDO producer” and can be received by one or more “PDO consumers”.

There are two transmission modes:

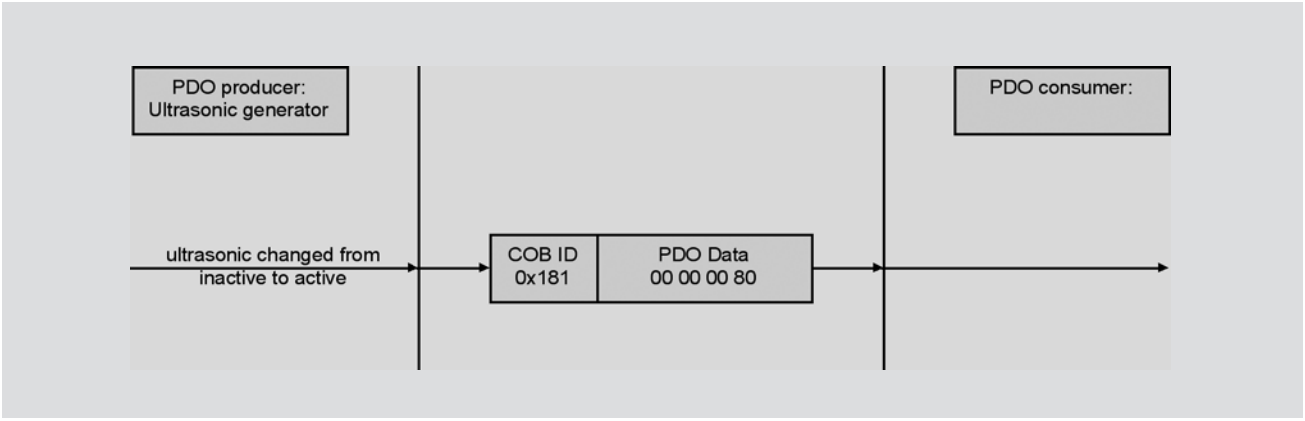
- Asynchronous: A PDO is initiated by an event, this can be a state transition or after expiration of a timer.
- Synchronous: A PDO is transmitted after reception of a SYNC object.

The ultrasonic generators by RINCO ULTRASONICS contain two asynchronous PDOs. TX-PDO1 is triggered by a transition of the generator status. An internal timer triggers TX-PDO2 if the ultrasonic is active.

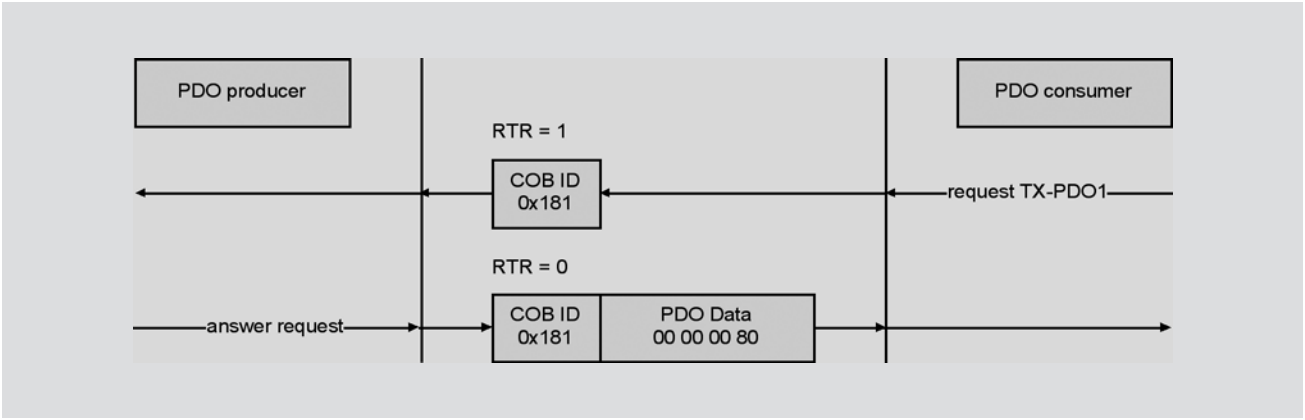
A PDO can be distinguished between a Transmit PDO (TX-PDO) and a Receive PDO (RX-PDO). This is always from the view of the device itself. For example, the ultrasonic generators by RINCO ULTRASONICS AG send TX-PDO1 and this is received by a RX-PDO of the PDO consumer.

The Transmit PDO mapping parameters in the object dictionary (0x1A00, 0x1A01 etc.) indicate which entries are mapped to the TX-PDOs. The Receive PDO mapping parameters in the object dictionary (0x1600, 0x1601 etc.) indicate which entries are mapped to the RX-PDOs.

The following figure shows an example of TX-PDO1.



A PDO consumer can also request a PDO by a remote transmission request. The remote frame must have the same message identifier as the requested PDO. The following figure shows a requested PDO transmission.

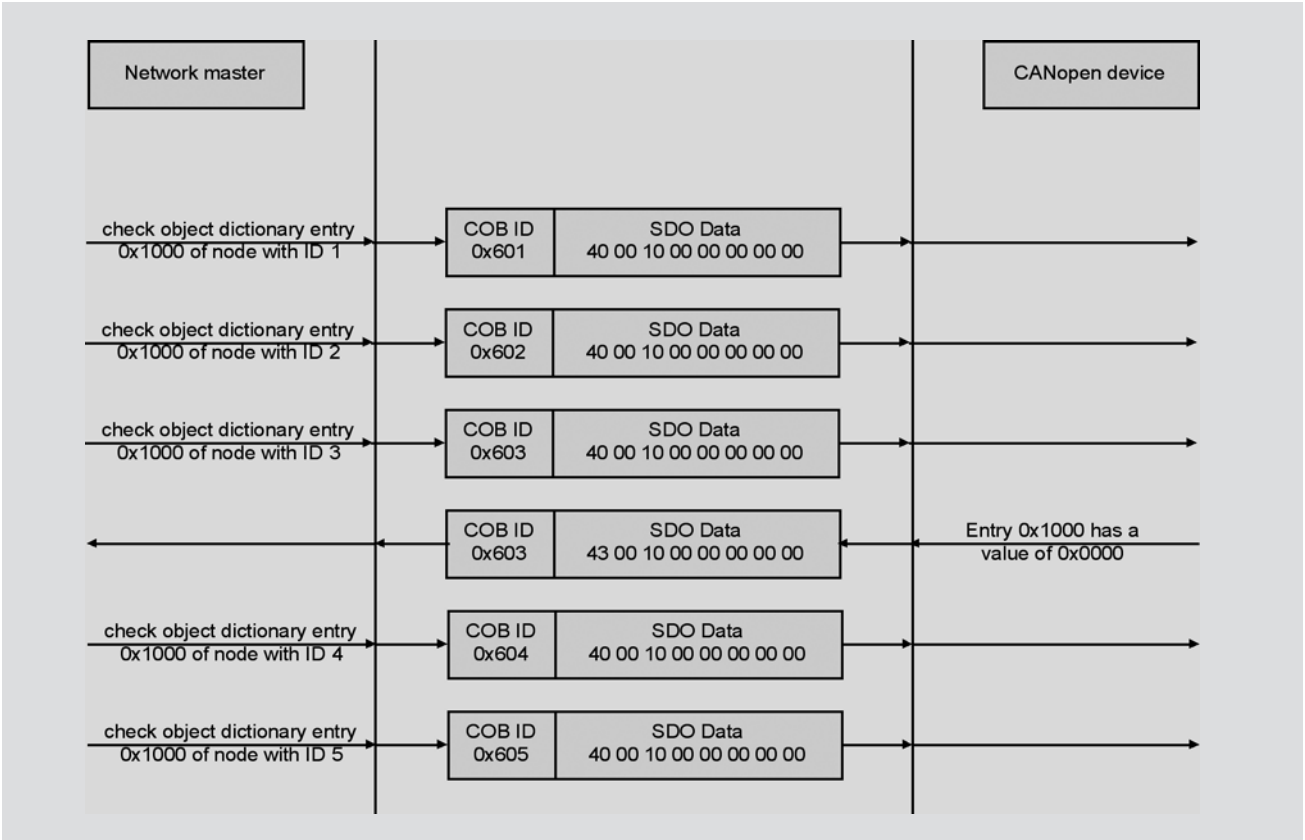


6 Network management

In this chapter only the minimum network function is described. For further information refer to the literature given in Chapter 1.

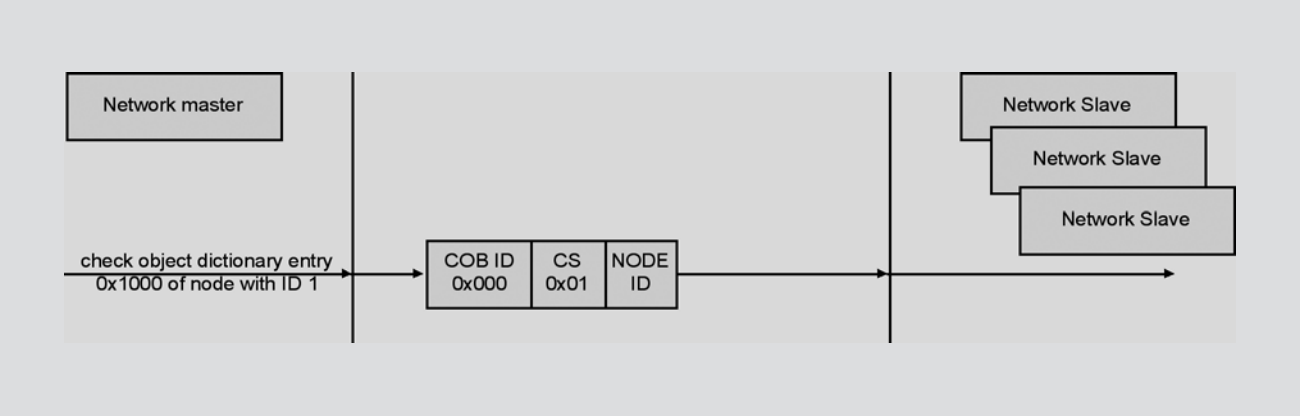
6.1 Scanning the CANopen bus

First a CANopen network master can scan the CANopen bus in order to see what devices are connected. For this the mandatory object dictionary entry 0x1000 can be accessed. For example if the master scan node IDs from 1 to 5 and there is only one CANopen device in the network (with node ID 3) the communication looks like this:



6.2 Starting the network

After power-on a CANopen device is in a PRE-OPERATIONAL state. For proper operation the device has to be set into the operational state by a network master.



CS: 0x01 = start remote note;
0x02 = stop remote node;
0x80 = Enter PRE-OPERATIONAL State;
0x81 = Reset Node;
0x82 = Reset Communication

Node ID: 0 = address all Nodes;
other = only the node with the matching Node ID is addressed

7 Object dictionary of the ultrasonic generators

7.1 Communication Profile Area

Index	Name	Type	see page
0x1000	Device Type	Unsigned32	17
0x1001	Error Register	Unsigned8	17
0x1008	Manufacturer Device Name	Visible String	17
0x1009	Manufacturer Hardware Version	Visible String	17
0x100A	Manufacturer Software Version	Visible String	18
0x1010	Store Parameter	Array Unsigned32	18
0x1011	Restore Default Parameter	Array Unsigned32	18
0x1017	Producer Heartbeat Time	Unsigned16	18
0x1018	Identity Object	Identity	19
0x1800	1st Transmit PDO Parameter	PDO Communication Parameter	19
0x1801	2nd Transmit PDO Parameter	PDO Communication Parameter	19
0x1A00	1st Transmit PDO Mapping	PDO Mapping	19
0x1A01	2nd Transmit PDO Mapping	PDO Mapping	19

7.1.1 Object 0x1000 Device Type

This object indicates the device type. As there is no device profile for ultrasonic generators, this object is set to 0 (no standard device).

Index	Subindex	Name	Type	Attribute	Default Value
0x1000	0	DeviceType	Unsigned32	RO	0

7.1.2 Object 0x1001 Error Register

This object indicates internal errors.
Furthermore this object is part of the emergency message.

Index	Subindex	Name	Type	Attribute	Default Value
0x1001	0	Error Register	Unsigned8	RO	–

The ultrasonic generators from RINCO ULTRASONICS do not use the error register. Instead of the error register the generator status can be read for a detailed error analysis (see 7.2.4).

7.1.3 Object 0x1008 Manufacturer Device Name

This object indicates the device name of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x1008	0	Error Register	Visible String	RO	Device Name

7.1.4 Object 0x1009 Manufacturer Hardware Version

Indicates the hardware version of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x1009	0	Manufacturer Hardware Version	Visible String	RO	/0

7.1.5 Object 0x100A Manufacturer Software Name

This object indicates the name of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x100A	0	Manufacturer Software Version	Visible String	RO	Software Version

7.1.6 Object 0x1010 Store Parameter

With this object it is possible to save the current settings of the object dictionary into a non-volatile memory.

Index	Subindex	Name	Type	Attribute	Default Value
0x1010	0	Number of Subindex	Unsigned8	RO	1
	1	Save all parameters	Unsigned32	RW	0

The store mechanism is triggered by a write access to subindex 1 with the code “save”.

3 (MSB)	2	1	0 (LSB)
e (0x65)	v (0x76)	a (0x61)	s (0x73)

The execution of the store service needs about 1 second. During this time no new CANopen communication is possible.

7.1.7 Object 0x1011 Restore Parameter

With this object it is possible to load the default settings of the object dictionary into a non-volatile memory.

Index	Subindex	Name	Type	Attribute	Default Value
0x1011	0	Number of Subindex	Unsigned8	RO	1
	1	Restore all parameters	Unsigned32	RW	0

The restore mechanism is triggered by a write access with the code “load”.

3 (MSB)	2	1	0 (LSB)
d (0x64)	a (0x61)	o (0x6F)	l (0x6C)

The execution of the restore service needs about 1 second. During this time now new CANopen communication is possible.

7.1.8 Object 0x1017 Heartbeat time

This object defines the time between two heartbeat messages (in milliseconds). If a time of 0 is set no heartbeat messages are sent.

Index	Subindex	Name	Type	Attribute	Default Value
0x1017	0	Heartbeat time	Unsigned16	RW	0

7.1.9 Object 0x1018 Identity Object

The identity object contains the manufacturer ID that is unique for every manufacturer. The ID is assigned by CAN in Automation (CiA).

Index	Subindex	Name	Type	Attribute	Default Value
0x1018	0	Number of Subindex	Unsigned8	RO	1
	1	Manufacturer ID	Unsigned32	RO	0x169
	2	Product Code	Unsigned32	RO	0
	3	Revision Number	Unsigned32	RO	0
	4	Serial Number	Unsigned32	RO	Serial Number

Sub-index 4 gives the serial number of the control unit inside the ultrasonic generator by RINCO ULTRASONICS and not of the ultrasonic generator itself!

7.1.10 Object 0x1800-0x1801

Transmit PDO Communication Parameter

These objects are used to set the communication parameters of the TX-PDOs. The default COB IDs of the two TX-PDOs are preassigned according to the DS301 standard.

Index	Subindex	Name	Type	Attribute	Default Value
0x1800,	0	Number of Subindex	Unsigned8	RO	5
0x1801					
	1	COB-ID	Unsigned32	RW	Idx 0x1800: 0x180+Modul ID Idx 0x1801: 0x280+Modul ID
	2	Transmission Type	Unsigned8	RW	254
	3	Inhibit Time	Unsigned16	RW	0

Inhibit Time shows the min. time between two consecutive PDOs having the same COB ID.
One time unit is 100us.
Example: Min. time interval between two PDOs having the same COB ID: 10 ms.
Sub-index 3 = 100 = 0x64

7.1.11 Object 0x1A00-0x1A01

Transmit PDO Mapping Parameter

This object defines which object entries are transmitted by the two transmit PDOs.

Index	Subindex	Name	Type	Attribute	Default Value
0x1A00,	0	Number of Subindex	Unsigned8	RO	1
0x1A01	1	COB-ID	Unsigned32	RO	Idx 0x1A00: 0x20030020 Idx 0x1A01: 0x20040020

Subindex 1 contains the mapping information:

3 (MSB)	2	1	0 (LSB)
Index of mapped object entry		Subindex of mapped object entry	Object length in Bits

7.2 Manufacturer Specific Profile Area

Index	Name	Type	see page
0x2000	Command Register	Unsigned8	20
0x2001	Nominal Frequency	Unsigned32	21
0x2002	Nominal Power	Unsigned16	21
0x2003	Generator Status	Unsigned32	21
0x2004	Current Weld Power	Real32	22
0x2005	Current Weld Energy	Real32	22
0x2006	Current Weld Time	Unsigned32	22
0x2007	Current Peak Power	Unsigned16	22
0x2008	Current Power Loss	Unsigned16	22
0x2009	Current Weld Frequency	Real32	22
0x2010	Weld Amplitude	Unsigned8	22
0x2011	Weld Mode	Unsigned8	22
0x2012	Weld Time	Unsigned16	23
0x2013	Lower Energy Limit	Real32	23
0x2014	Upper Energy Limit	Real32	23
0x2015	Weld Energy	Real32	23
0x2016	Lower Time Limit	Unsigned16	23
0x2017	Upper Time Limit	Unsigned16	24
0x2018	Lower Power Limit	Unsigned16	24
0x2019	Upper Power Limit	Unsigned16	24
0x201A	Switch Off Delay Time	Unsigned16	24
0x2020	Softstart Time	Unsigned16	25
0x2021	Softstop Time	Unsigned16	25
0x2022	Start Amplitude	Unsigned8	25
0x2023	Frequency Reset	Unsigned8	25
0x2024	Lower Frequency Limit	Unsigned16	25
0x2025	Upper Frequency Limit	Unsigned16	25
0x2026	Power Overload	Unsigned16	26
0x2027	Amplitude Source	Unsigned8	26
0x2028	External Analog Amplitude	Unsigned8	26
0x2029	After Pulse Time	Unsigned16	26
0x202A	Power Interval	Unsigned8	26
0x2040	Node ID	Unsigned8	27
0x5680	Service Mode	Unsigned32	27

7.2.1 Object 0x2000 Command Register

This object is used to write commands to the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2000	0	Command Register	Unsigned8	WO	–

The command register has following bit structure:

0	Start ultrasonic
1	Stop ultrasonic
2	Ultrasonic test
3	Start after pulse

Any write access must have only one bit set to 1

7.2.2 Object 0x2001 Nominal Frequency

This object indicates the nominal frequency (in Hz) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2001	0	Nominal Frequency	Unsigned32	RO	Nominal Frequency

7.2.3 Object 0x2002 Nominal Power

This object indicates the nominal power (in W) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2002	0	Nominal Power	Unsigned16	RO	Nominal Power

7.2.4 Object 0x2003 Generator Status

This object indicates the status of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2003	0	Generator status	Unsigned32	RO	Generator status

The command register has following bit structure:

0	Main supply voltage too low
1	Internal 12V supply error
2	Minimal PWM level reached
3	Temperature too high
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Frequency too low
9	Frequency too high
10	Maximum converter voltage reached
11	Power Overload
12	Maximum PWM level reached
13	No converter connected
14	Reserved
15	Reserved
16	Minimum energy limit error
17	Maximum energy limit error
18	Minimum time limit error
19	Maximum time limit error
20	Minimum power limit error
21	Maximum power limit error
22	External analog amplitude too low
23	Reserved
24	Reserved
25	Reserved
26	Reserved
27	Reserved
28	Reserved
29	Reserved
30	Ultrasonic was stopped irregularly
31	Ultrasonic active

7.2.5 Object 0x2004 Current Weld Power

This object indicates the current weld power (in Watt) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2004	0	Current Weld Power	Real32	RO	Current Weld Power

7.2.6 Object 0x2005 Current Weld Energy

This object indicates the current weld energy (in Ws) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2005	0	Current Weld Energy	Real32	RO	Current Weld Energy

7.2.7 Object 0x2006 Current Weld Time

This object indicates the current weld time of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2006	0	Current Weld Time	Unsigned32	RO	Current Weld Time

7.2.8 Object 0x2007 Current Peak Power

This object indicates the current peak power (in W) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2007	0	Current Peak Power	Unsigned16	RO	Current Peak Power

7.2.9 Object 0x2008 Current Power Loss

This object indicates the current power loss (in Watt) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2008	0	Current Power Loss	Unsigned16	RO	Current Power Loss

7.2.10 Object 0x2009 Current Weld Frequency

This object indicates the current weld frequency (in Hz) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2009	0	Current Weld Frequency	Real32	RO	Current Weld Frequency

7.2.11 Object 0x2010 Weld amplitude

This object indicates the weld amplitude of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2010	0	Weld amplitude	Unsigned8	RW	60d

This is the desired weld amplitude (in %).

7.2.12 Object 0x2011 Weld mode

This object indicates the weld mode of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2011	0	Weld mode	Unsigned8	RW	2

The weld mode can be:

0	Time mode
1	Energy mode
2	Continuous mode

7.2.13 Object 0x2012 Weld time

This object indicates the weld time (for the time mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2012	0	Weld time	Unsigned16	RW	1000d

This is the desired weld time value (in Milliseconds) in the time mode.

7.2.14 Object 0x2013 Lower energy limit

This object indicates the lower energy limit (for the time mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2013	0	Lower energy limit	Real32	RW	0.0

If the ultrasonic is stopped and the lower energy limit (in Ws) has not been reached an error bit is set in the generator status (see 7.2.4)

7.2.15 Object 0x2014 Upper energy limit

This object indicates the upper energy limit (for the time mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2014	0	Upper energy limit	Real32	RW	Nominal Power * 10.0

After exceeding the upper energy limit (in Ws) the ultrasonic will be switched off immediately. An error bit is set in the generator status (see 7.2.4).

7.2.16 Object 0x2015 Weld energy

This object indicates the weld energy (for the energy mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2015	0	Weld energy	Real32	RW	Nominal Power * 1.0

This is the desired weld energy value (in Ws) in the energy mode.

7.2.17 Object 0x2016 Lower time limit

This object indicates the lower time limit (for the energy mode) of the ultrasonic generator.

IIndex	Subindex	Name	Type	Attribute	Default Value
0x2016	0	Lower time limit	Unsigned16	RW	100d

If the ultrasonic is stopped and the lower time limit (in Milliseconds) has not been reached an error bit is set in the generator status (see 7.2.4)

7.2.18 Object 0x2017 Upper time limit

This object indicates the upper time limit (for the energy mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2017	0	Upper time limit	Unsigned16	RW	1000d

After exceeding the upper time limit (in Milliseconds) the ultrasonic will be switched off immediately. An error bit is set in the generator status (see 7.2.4)

7.2.19 Object 0x2018 Lower power limit

This object indicates the lower power limit (for the continuous mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2018	0	Lower power limit	Unsigned16	RW	0

After leaving the upper or lower power limit (in Watt) the ultrasonic will be switched off if the switch off delay time (in Milliseconds) is exceeded. An error bit is set in the generator status (see 7.2.4).

7.2.20 Object 0x2019 Upper power limit

This object indicates the upper power limit (for the continuous mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2019	0	Upper power limit	Unsigned16	RW	Nominal Power * 1.1

After leaving the upper or lower power limit (in Watt) the ultrasonic will be switched off if the switch off delay time (in Milliseconds) is exceeded. An error bit is set in the generator status (see 7.2.4).

7.2.21 Object 0x201A Switch off delay time

This object indicates the switch off delay time (for the continuous mode) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x201A	0	Switch off delay time	Unsigned16	RW	100d

After leaving the upper or lower power limit the ultrasonic will be switched off if the switch off delay time (in Milliseconds) is exceeded.

7.2.22 Object 0x2020 Softstart time

This object indicates the softstart time of the ultrasonic generator.

IIndex	Subindex	Name	Type	Attribute	Default Value
0x2020	0	Softstart time	Unsigned16	RW	20d

The softstart time (in Milliseconds) is the time for changing the amplitude from the start amplitude to the weld amplitude..

7.2.23 Object 0x2021 Softstop time

This object indicates the softstop time of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2021	0	Softstop time	Unsigned16	RW	0

The softstop time (in Milliseconds) is the time for changing the amplitude from the weld amplitude to 0.

7.2.24 Object 0x2022 Start amplitude

This object indicates the start amplitude of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2022	0	Start amplitude	Unsigned8	RW	30d

This start amplitude (in %) is the value at which a new ultrasonic is started.

7.2.25 Object 0x2023 Frequency reset

This object indicates the frequency reset of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2023	0	Frequency reset	Unsigned8	RW	0

If the frequency is set to 1 a new ultrasonic will be started always at the nominal frequency. If it is set to 0 a new ultrasonic will be started with the last frequency.

7.2.26 Object 0x2024 Lower frequency limit

This object indicates the lower frequency limit of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2024	0	Lower frequency limit	Unsigned16	RW	500d

After exceeding the lower frequency limit the ultrasonic is switched off immediately and an error bit is set in the generator status (see 7.2.4).

7.2.27 Object 0x2025 Upper frequency limit

This object indicates the upper frequency limit of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2025	0	Upper frequency limit	Unsigned16	RW	500d

After exceeding the upper frequency limit the ultrasonic is switched off immediately and an error bit is set in the generator status (see 7.2.4).

7.2.28 Object 0x2026 Power Overload

This object indicates the power overload limit of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2026	0	Power Overload	Unsigned16	RW	Nominal power * 1.1

After exceeding the power overload limit for more than 50 Milliseconds the ultrasonic is switched off and an error bit is set in the generator status (see 7.2.4).

7.2.29 Object 0x2027 Amplitude source

This object indicates the amplitude source of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2027	0	Amplitude source	Unsigned8	RW	0

If the amplitude source is set to 0 the internal weld amplitude (see 7.2.11) is taken. If it is set to 1 the external analog amplitude will be used.

7.2.30 Object 0x2028 External analog amplitude

This object indicates the external analog amplitude of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2028	0	External analog amplitude	Unsigned8	RO	-

The external analog amplitude depends on the analog input. It is given in %.

7.2.31 Object 0x2029 After pulse time

This object indicates the after pulse time of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2029	0	After pulse time	Unsigned16	RW	100d

The after pulse can be started with the command register (see 7.2.1). The after pulse time is in milliseconds.

7.2.32 Object 0x202A Power interval

This object indicates the power interval (transmit interval of TX-PDO2) of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x202A	0	Power interval	Unsigned8	RW	0

The ultrasonic generator transmits the TX-PDO2 periodically. The period is given by power interval (in milliseconds). A power interval of 0 means that TX-PDO2 is disabled.

7.2.33 Object 0x2040 Node ID

This object indicates the node ID of the ultrasonic generator.

Index	Subindex	Name	Type	Attribute	Default Value
0x2040	0	Node ID	Unsigned8	RW	1d

In order to change the node ID following procedure has to be done:

- Change the Node ID (Object 0x2040)
- Store Parameter (Object 0x1010)
- Switch off the power supply of the ultrasonic generator

After switching on the power supply the ultrasonic generator has the new node ID.

7.2.34 Object 0x5680 Service mode

This object indicates the service mode of the ultrasonic generator (only for RINCO ULTRASONICS)

Index	Subindex	Name	Type	Attribute	Default Value
0x5680	0	Service mode	Unsigned32	RW	-

8 Examples

In the following chapters are examples how to access the object dictionary with SDOs. The used abbreviations are:

M Master
G Ultrasonic Generator

8.1 Configure time mode and start ultrasonic

- Set time mode
- Set weld time of 500 Milliseconds
- Set weld amplitude to 100%
- Set power interval to 100 Milliseconds
- Start ultrasonic

Direction	COB ID	Data bytes 0-7	Description
M -> G	0x601	2F 11 20 00 00 00 00 00	Write 0x0 (time mode) into object 0x2011 (weld mode)
G -> M	0x581	60 11 20 00 00 00 00 00	Confirmation by the ultrasonic generator
M -> G	0x601	2B 12 20 00 F4 01 00 00	Write 0x01F4 (500ms) into object 0x2012 (weld time)
G -> M	0x581	60 12 20 00 00 00 00 00	Confirmation by the ultrasonic generator
M -> G	0x601	2F 10 20 00 64 00 00 00	Write 0x64 (100%) into object 0x2010 (weld amplitude)
G -> M	0x581	60 12 20 00 00 00 00 00	Confirmation by the ultrasonic generator
M -> G	0x601	2F 2A 20 00 64 00 00 00	Write 0x64 (100ms) into object 0x202A (power interval)
G -> M	0x581	60 2A 20 00 00 00 00 00	Confirmation by the ultrasonic generator
M -> G	0x601	2F 00 20 00 01 00 00 00	Write 0x01 (Start ultrasonic) into object 0x2000 (command register)
G -> M	0x581	60 00 20 00 00 00 00 00	Confirmation by the ultrasonic generator
G -> M	0x181	00 00 00 80	TX-PDO1: generator status -> ultrasonic active
G -> M	0x281	11 27 8E 3F	TX-PDO2: current weld power
G -> M	0x281	3B D1 35 41	TX-PDO2: current weld power (after 100ms)
G -> M	0x281	45 42 32 41	TX-PDO2: current weld power (again after 100ms)
G -> M	0x281	AF BF 32 41	TX-PDO2: current weld power (again after 100ms)
G -> M	0x281	CE 66 36 41	TX-PDO2: current weld power (again after 100ms)
G -> M	0x181	00 00 00 00	TX-PDO1: generator status -> ultrasonic inactive, no error

9 Service Addresses

If you experience problems with welding or technical faults with the equipment, please contact the Technical Customer Service of RINCO ULTRASONICS AG, who will be pleased to help you.
For an efficient response our Customer Service requires the following information:

– A precise description of the technical fault or welding problem.

Our address:
RINCO ULTRASONICS AG
Industriestrasse 4
CH-8590 Romanshorn
Switzerland

National calls
Tel. 071 466 41 00
Fax 071 466 41 01

International calls
Tel. ++41 71 466 41 00
Fax ++41 71 466 41 01
www.rincoultrasonics.com
info@rincoultrasonics.com

rinco® ultrasonics

TECHSPANGROUP
P O Box 1012, Mascot, NSW 1460
P O Box 15262, New Lynn, Auckland

Ph: AA: 1800 148791
Ph: NZ: +64 9 827 6567

sales@techspanonline.com
www.techspanonline.com

RINCO ULTRASONICS IS A CREST GROUP COMPANY