ProBeck-CANopen

User Manual

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1 Abstract

PB-CANopen module allow direct communication between a CANopen network and the ProBeck-IPS relay.

Quick set of features supported by the PB-CANopen module is:

- 1 x PDO Rx channel,
- 4 x PDO Tx channels,
- 1 x SDO Rx and Tx support,
- Time stamp protocol,
- SYNC protocol,
- Emergency protocol and
- Error protocol.

This gives the ProBeck-IPS the ability to work on higher-level of automation system with aid off a CAN bus physical network.

Advantages of a CAN bus system is comprised of:

- Multi-master capability,
  - Each unit can Tx and Rx to another unit,
  - Without the aid of a master.
- Message-oriented communication,
  - Unit can get onto the bus without being configured by a master PLC.
- Prioritization of messages and
  - Lower address (COB-ID) has priority of sending data.
- Residual error probability.
  - Various security features are added to the bus.

2 Definitions

Name	Symbol	Description
Consumer	Consumer	Takes a publish message from the producer on the CANopen network and uses the message.
ProBeck-IPS	ProBeck-IPS / PB-IPS	Is a 3-phase motor protection relay.
Hexadecimal	$_h$	Subscript "$_h$" means that the value in front is shown as a hexadecimal value. 10_h will be 16 decimals.
Heartbeat	Heartbeat	Signal that gets published to let other devices know that the unit is still on the bus and active.
Network management	NMT	Describes the status of the CANopen module on the bus.
Node address	NodeID	Unique identification number that identifies the module on the CANopen bus.
Object dictionary	OD	Overview of describing the CANopen device.
Process data object	PDO	Message that gets published at a regular interval containing process messages and control messages at a regular interval.
ProBeck-IPS	ProBeck-IPS / PB-IPS	Is a 3-phase motor protection relay.
Producer	Producer	Message that is published on the CANopen bus to be used by the relevant consumer.
Service data object	SDO	Message used to retrieve and send data on the CANbus.

3 Specifications

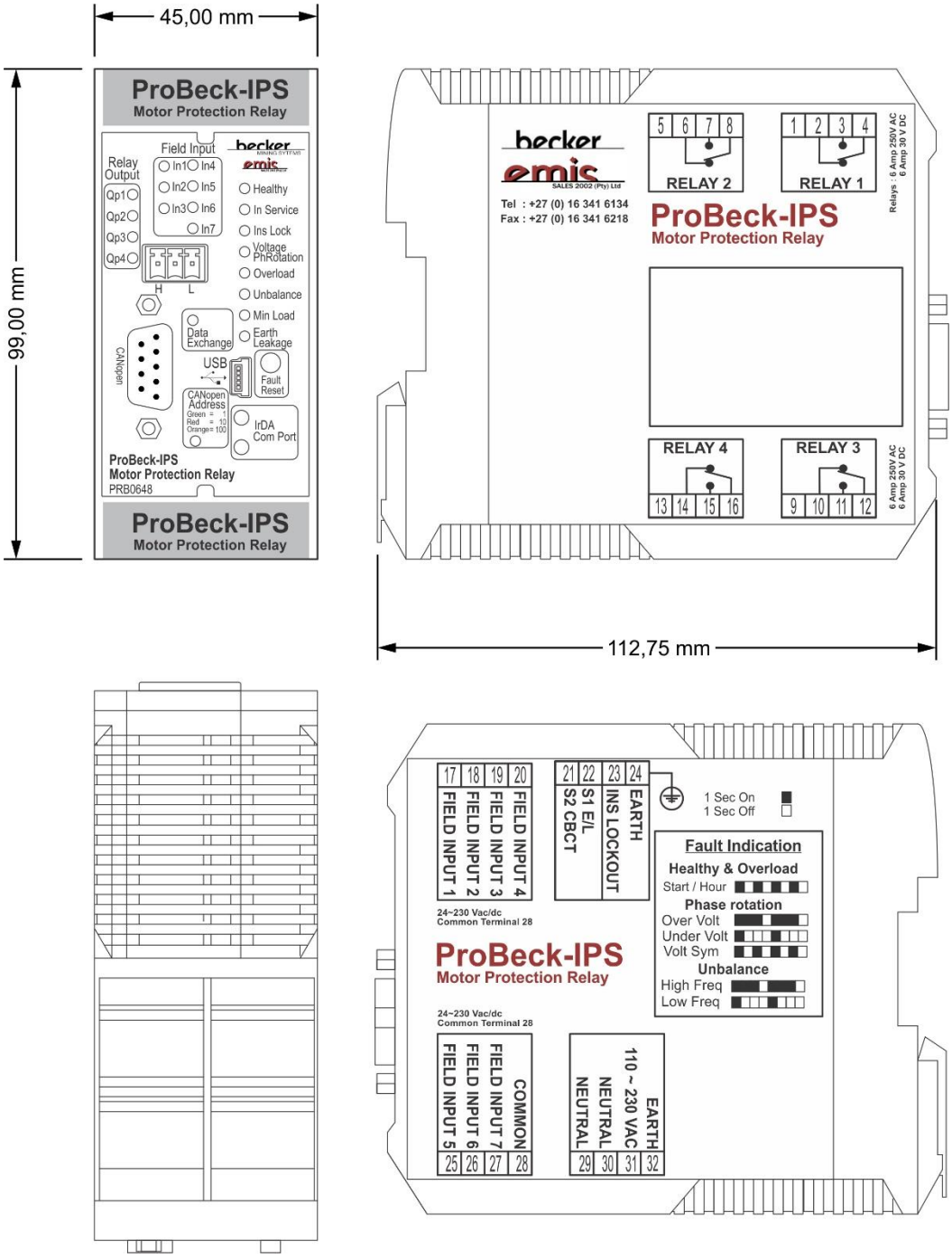
General Data	Dimensions	• 45 (W) mm x 99 mm (H) x 112.75 mm (D)
	Auxiliary supply	• 85 Vac/dc ~ 264 Vac/dc 50Hz / 60Hz
	Mounting	• Din rail clip
Field Inputs	Amount	• 7 common field inputs.
	Input Voltage Range	• 24Vac/dc to 220Vac/dc
Outputs	Amount	• 4 x normally open and close relays
	Rating	• 6 Amps at 250Vac • 6 Amps at 30 Vdc
CT modal range	PB 001 (PRB0104)	• 0.01 Amp to 10 Amp • MLC 10%, 100% load 0.1 Amp • MLC 100%, 100% load 1 Amp
	PB 005 (PRB0105)	• 0.05 Amp to 50 Amp • MLC 10%, 100% load 0.5 Amp • MLC 100%, 100% load 5 Amp
	PB 025 (PRB0106)	• 0.25 Amp to 250 Amp • MLC 10%, 100% load 2.5 Amp • MLC 100%, 100% load 25 Amp
	PB 050 (PRB0107)	• 0.50 Amp to 500 Amp • MLC 10%, 100% load 5 Amp • MLC 100%, 100% load 50 Amp
	PB 100 (PRB0108)	• 1.00 Amp to 1000 Amp • MLC 10%, 100% load 10 Amp • MLC 100%, 100% load 100 Amp
	PB 300 (PRB0109)	• 3.00 Amp to 3000 Amp • MLC 10%, 100% load 30 Amp • MLC 100%, 100% load 300 Amp
	External CT	• External current transformer can be added. • XXX:5 or XXX:1 or existing CT's can be used.
	Current range	• 0% to 1000% In
	Resolution	• 2%
Line Voltage on CT's	Direct Measurement	• 110Vac to 550Vac Line
	Converter (FPR0208) Plugged Into CT Block.	• 680 Vac to 1100Vac Line
	Voltage Transformer	• 3K3Vac to 110Vac Line • 6K6Vac to 110Vac Line • 11K0Vac to 110Vac Line
Earth leakage	CBCT in NC100 and 300 Fault Level	• 0.03 Amps to 3 Amps
	External core that can be used	• 57mm ID core. • 63mm ID core. • 104mm ID core. • 150mm ID core.
Insulation lockout	Ohm reading	• 1 to 10 MOhm.

	Incremental	• 1 MOhm.
Communication interfaces	USB	• Interface to PC.
	IrDA	• IrDA cable needed to communicate. • Baud rate 19200 kbs. • Distance 0.5 meter.
	SCADA	• Modbus-RTU. • CANopen

4 Parts and Dimensions

4.1 ProBeck-IPS with CANopen

- PRB0648



5 PB-CANopen Communication Network

CANopen is a network system based on the serial bus Controller Area Network (CAN). The CANopen communication profile used by the PB-CANopen is CiA DS-301 which supports both direct access to device parameters and time critical process data communication.

CANopen takes advantage of CAN by allowing direct peer-to-peer communication between nodes.

CANopen is based on the CAN2.B passive specification (11 bit Identifier code).

For more information about CANopen, visit CAN in Automation (CiA) website www.can-cia.org

5.1 Configuring the PB-CANopen via ProBeck-IPS frontend

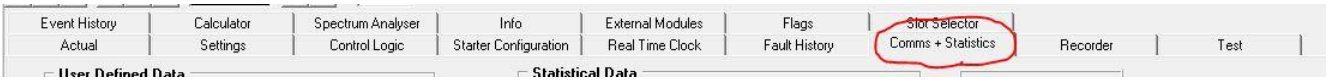
By using the ProBeck-IPS frontend the following can be configured:

- Node address.
  - NodeID on the CANopen network.
  - Range 1 to 127. (0 Factory setup).
- Node baud rate.
  - Bit rate that the CAN network is operating on.
  - 20 kbits/s
  - 50 kbits/s
  - 125 kbits/s
  - 500 kbits/s
  - 800 kbits/s
  - 1000 kbits/s
  - (500 kbits/s is the factory default)
- Producer heartbeat time
  - Produces a heartbeat signal at a set interval.
  - 0 – 39321 mSec.
  - 0 will disable the heartbeat.
- Endian selection.
  - Word least significant or most significant byte first
  - LSB (Byte 0, Byte 1)
  - MSB (Byte 1, Byte 0).
- Consumer heartbeat time
  - Consumer heartbeat rate that the PB-CANopen will receive a heartbeat from the producer.
  - 0 – 39321 mSec.
  - 0 will disable the heartbeat.
- Consumer heartbeat Node-ID
  - Consumer heartbeat Node-ID to identify the producer of the heartbeat.

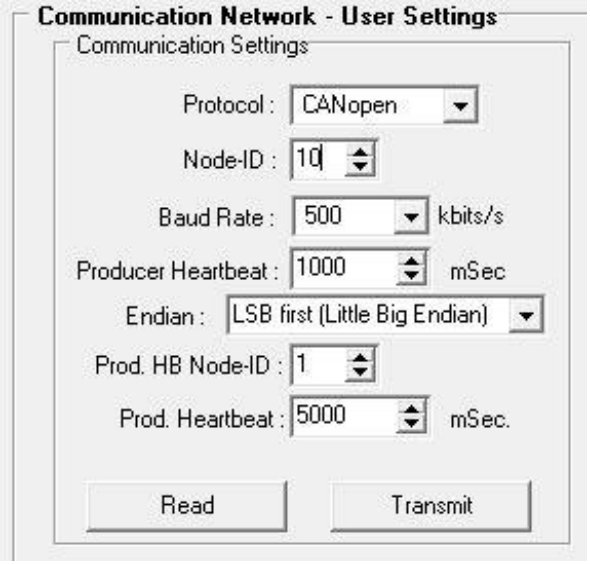
- 0 – 127.
- 0 will let any node that controls the control word reset the heartbeat timer.

Be advise that knowledge of operating the ProBeck-IPS frontend and relay is necessary to understand the section below.

Left click on the ProBeck-IPS frontend ***"Comms+Statistic"*** tab.



The bottom left side will show the configuration for the communication network.



Select ***"CANopen"*** in the ***"Protocol"*** drop down box.

After setting the correct configuration press the ***"Transmit"*** button to transmit the settings to the ProBeck-IPS relay.

5.2 Using PDO

PDO mapping is configured via the CANopen (Master) via the aid of the SDO protocol.

PDO data is used to send data at an interval between the PLC and the PB-CANopen module.

PB-CANopen has 1 set of receive (PLC to PB-CANopen) PDO

- RxPDO1 set is predefined for control purpose and is activated by default.

The receive PDO looks as follow:

COB-ID		**Word 0**	**Word 1**	**Word 2**	**Word 3**
200_h + NodeID	CANopen Index	2002_h:01_h	2002_h:02_h	2002_h:03_h	Not used
	Description	Slot selection	PLC control bits	4 – 20mA control	00_h

and 4 sets of transmit (PB-CANopen to PLC).

- TxPDO1 set is predefined for monitor purpose and can be altered. Is activated by default.
- TxPDO2 set is predefined for monitor purpose and can be altered. Is not activated by default.
- TxPDO3 set is predefined for monitor purpose and can be altered. Is not activated by default.
- TxPDO4 set is predefined for monitor purpose and can be altered. Is not activated by default.

Transmit PDO will look as follow:

COB-ID		**Word 0**	**Word 1**	**Word 2**	**Word 3**
TPDO1 = 180_h + NodeID	CANopen Index	2001_h:02_h	2001_h:03_h	2001_h:04_h	2001_h:09_h
	Description	Status bit	ILevel (x 0.1A)	VLine (VAC)	RC remain (%)
TPDO2 = 280_h + NodeID	CANopen Index	2001_h:05_h	2001_h:06_h	2001_h:07_h	2001_h:08_h
	Description	EL level (mA)	Pow Fact (x 0.01 CosØ)	Freq level (Hz)	Ins. Level (kΩ)
TPDO3 = 380_h + NodeID	CANopen Index	2001_h:$0A_h$	2001_h:$0B_h$	2001_h:$0C_h$	2001_h:31_h
	Description	Field inputs	Relay outputs	PLC inputs	Pilot Level (Ohm)

TPDO4 = 480_h + NodeID	CANopen Index	2001_h:30_h	2001_h:11_h	2001_h:12_h	2001_h:01_h
	Description	Slot sel	Unbalance (%)	Volt. Sym. (%)	Status word

The transmit PDO communication mode can be configured to asynchronous, cyclic or acyclic synchronize. The SYNC command is defaulted on 80_h.

Transmission type (OD $180X_h$:02_h X = PDO channel -1)	**PDO transmission**			
	Cyclic	**Acyclic**	**Synchronous**	**Asynchronous**
0 = PDO sent synchronously with SYNC object triggered by change of value		X	X	
1 - 240 = PDO sent once every 1 to 240 receptions of the SYNC command.	X		X	
255 = PDO sent at a set interval.		X		X

5.3 Using SDO

SDO telegram is used to access a CANopen object in the object dictionary of the slave device. SDO consist of a request message and response message.

Request SDO message

Request SDO message from the PLC to the PB-Open:

COB-ID	**Byte 0**	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**
600_h + Node-ID	Request code	Object index		Object sub index	Request data			
		LSB	MSB		Bits 0-7	Bits 8–15	Bits 16–23	Bits 31 - 24

Response SDO message

Response SDO message from the PB-CANopen to the PLC after a request SDO is received:

COB-ID	**Byte 0**	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**
580_h + Node-ID	Response code	Object index		Object sub index	Request data			
		LSB	MSB		Bits 0-7	Bits 8–15	Bits 16–23	Bits 31 - 24

Request and respond SDO codes

Depending on the requested SDO message the following response codes can be expected from the PB-CANopen device:

Request code	Command	Byte 4	Byte 5	Byte 6	Byte 7
23_h	Write 4 byte data	Bits 0–7	Bits 8-15	Bits 16-23	Bits 24-31
$2B_h$	Write 2 byte data	Bits 0–7	Bits 8-15	00_h	00_h
$2F_h$	Write 1 byte data	Bits 0–7	00_h	00_h	00_h
40_h	Read data	00_h	00_h	00_h	00_h
80_h	Abort SDO command (See note 1)	Bits 0–7	Bits 8-15	Bits 16-23	Bits 24-31
Notes: (1) In the event that multilabel data is read a command 80_h is used to abort the transaction.					

Respond code	Command	Byte 4	Byte 5	Byte 6	Byte 7
23_h	Read 4 byte data	Bits 0–7	Bits 8-15	Bits 16-23	Bits 24-31
$2B_h$	Read 2 byte data	Bits 0–7	Bits 8-15	00_h	00_h
$2F_h$	Read 1 byte data	Bits 0–7	00_h	00_h	00_h
40_h	Write a 1/2/4 byte data response	00_h	00_h	00_h	00_h
80_h	Error response: Abort code (See note 1)	Bits 0–7	Bits 8-15	Bits 16-23	Bits 24-31
Notes: (1) The response data (bytes 4 to 7) corresponds to a 32-bit abort code. A list of all supported abort codes are given in the following table.					

Abort codes

Following abort codes are supported:

Abort code	Description
$0503\ 0000_h$	Segment transfer: The toggle bit did not alternate.
$0504\ 0000_h$	SDO protocol timed out.
$0504\ 0001_h$	Request code not valid or unknown.
$0601\ 0000_h$	Access fault. (Trying to write to a read only register.)
$0601\ 0001_h$	Read request on a write only register. (Register is marked WO)
$0601\ 0002_h$	Write request on a read only register. (Register is marked RO)
$0602\ 0000_h$	Index does not exist in the object dictionary.
$0604\ 0041_h$	Parameter cannot be mapped to the PDO.
$0604\ 0042_h$	Value or length of the parameter exceeds the maximum length of the PDO length.
$0609\ 0011_h$	Sub-index does not exist.
$0609\ 0030_h$	Value range of the parameter exceeded. (Write only)
$0609\ 0031_h$	Parameter written to high.
$0609\ 0032_h$	Parameter written to low.
$0609\ 0036_h$	The parameter maximum value is less than the minimum value.
$0800\ 0000_h$	General error.

5.4 Communication Profile Parameter

The communication profile contains the following parameters in the object identification for the CANopen network:

- Device type
- Diagnostic
- CANopen communication object description
- SDO specification
- Receive PDO specification
- Transmit PDO specification

Device type

Following table gives the device type parameters:

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1000_h	00_h	RO	VAR	Unsigned 32	4	$0000\ 0000_h$	Bits 16-23 = Device type mode Bits 00-15 = Device profile number

Diagnostic

Following table gives the diagnostic parameters:

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1001_h	00_h	RO	VAR	Unsigned 8	1	00_h	Error register. 0 = No error. 1 = Error.
1002_h	00_h	RO	VAR	Unsigned 32	4	$0000\ 0000_h$	Device manufacturer status register

CANopen communication object description

Following table gives the CANopen communication object parameters:

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1004_h	00_h	RO	ARRAY	Unsigned 32	4	$0001\ 0004_h$	Number of PDO supported.
1004_h	01_h	RO	VAR	Unsigned 32	4	$0001\ 0004_h$	Number of synchronous PDOs. Bits 16-31 = Number of receive PDOs supported. Bit 00-15 = Number of transmit PDOs supported.
1004_h	02_h	RO	VAR	Unsigned 32	4	$0001\ 0004_h$	Number of asynchronous PDOs. Bits 16-31 = Number of receive PDOs supported. Bit 00-15 = Number of transmit PDOs supported.
1005_h	00_h	RW	VAR	Unsigned 32	4	80_h	COB-ID SYNC message.
1006_h	00_h	RW	VAR	Unsigned 32	4	00_h	Communication cycle period in microseconds.
1007_h	00_h	RW	VAR	Unsigned 32	4	80_h	Synchronous window length in microseconds.
1008_h	00_h	RO	VAR	Visible string	10	PB-CANopen	Manufacturer device name.
1009_h	00_h	RO	VAR	Visible string	3	V01	Manufacturer hardware revision.
$100A_h$	00_h	RO	VAR	Visible string	4	V01A	Manufacturer software revision.
$100C_h$	00_h	RW	VAR	Unsigned 16	2	0000_h	Guard time: By default, the Node Guarding Protocol is inhibited; the unit for this object is 1 ms.
$100D_h$	00_h	RW	VAR	Unsigned 8	1	00_h	Life time factor: Multiplier applied to the "Guard Time" to obtain a "Life Time"
1014_h	00_h	RW	VAR	Unsigned 32	4	Node ID + 80_h	COB-ID emergency message: COB-ID used for the EMCY service
1016_h	00_h	RO	ARRAY	Unsigned 8	1	01_h	Consumer Heartbeat Time - Number of Entries
1016_h	01_h	RW	VAR	Unsigned 32	8	$0000\ 0000_h$	Consumer Heartbeat Time: Bits 16-23 = Node-ID of the producer Bits 00-15 = Heartbeat time (unit = 1 ms) Note: Only one heartbeat producer can be configured here. By default, no producer is watched. If Node-ID = 0 then the program will use any publisher sending data to the control commands to reset the Heartbeat time.
1017_h	00_h	RW	VAR	Unsigned 16	2	0000_h	Producer Heartbeat Time: The unit of this object is 1 ms. By default, the controller sends no Heartbeat messages.
1018_h	00_h	RO	VAR	Unsigned 8	1	04_h	Identity object - Number of entries
1018_h	01_h	RO	VAR	Unsigned 32	4	$0000\ 04A7_h$	Identity object - Vendor ID: This value is unique for each manufacturer. ("Power Control and Protection Activity")
1018_h	02_h	RO	VAR	Unsigned 32	4	$0000\ 0028_h$	Product code -To determine the product family and product number
1018_h	03_h	RO	VAR	Unsigned 32	4	$0000\ 0000_h$	Major and minor Product revision number
1018_h	04_h	RO	VAR	Unsigned 32	4	$0000\ 0000_h$	Serial number.
1020_h	00_h	RO	ARRAY	Unsigned 8	1	02_h	Verify configuration.
1020_h	01_h	RW	VAR	Unsigned 32	4	$0000\ 0000_h$	Configuration date.

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1020_h	02_h	RW	VAR	Unsigned 32	4	$0000\ 0000_h$	Configuration time.
1029_h	00_h	RO	ARRAY	Unsigned 8	1	01_h	Error Behaviour - No. of Error Classes
1029_h	01_h	RO	VAR	Unsigned 8	1	00_h	Communication error 0:pre-operational / 1:no state change / 2:stopped

SDO specification

Following table gives the SDO specification parameters:

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1200_h	00_h	RO	RECORD	Unsigned 8	1	02_h	Server SDO - Number of entries
1200_h	01_h	RO	VAR	Unsigned 32	4	Node ID + 0600_h	Server SDO - COB-ID: FBC -> K7 (receive)
1200_h	02_h	RO	VAR	Unsigned 32	4	Node ID + 0580_h	Server SDO - COB-ID: FBC <- K7 (transmit)

Receive PDO specification

Following table gives the receive PDO specification (Slave to master / Client to Server) parameters:

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1400_h	00_h	RO	RECORD	Unsigned 8	1	02_h	Receive PDO1 - Number of entries
1400_h	01_h	RW	VAR	Unsigned 32	4	Node ID + $0000\ 0200_h$	Receive PDO1 - COB-ID Write (0x4000 + COBID) to enable RPDO Write (0xC000 + COBID) to disable RPDO
1400_h	02_h	RW	VAR	Unsigned 8	1	FF_h	Receive PDO1 - Transmission type: three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1600_h	00_h	RW	ARRAY	Unsigned 8	1	02_h	Receive PDO1 mapping - Number of mapped objects
1600_h	01_h	RO	VAR	Unsigned 32	4	$2002\ 0110_h$	Receive PDO1 Word 0 mapped to register (See manufacturer specific profile) (Slot select)
1600_h	02_h	RO	VAR	Unsigned 32	4	$2002\ 0210_h$	Receive PDO1 Word 1 mapped to register (See manufacturer specific profile)(Map to control word)
1600_h	03_h	RO	VAR	Unsigned 32	4	$2002\ 0310_h$	Receive PDO1 word 2 mapped to register (See manufacturer specific profile) (Map to 4 to 20 Control)

Transmit PDO specification

Following table gives the transmit PDO specification (Master to slave / Server to Client) parameters:

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
1800_h	00_h	RO	RECORD	Unsigned 8	1	04_h	Transmit PDO1 - Number of entries
1800_h	01_h	RW	VAR	Unsigned 32	4	Node ID + 000 00180_h	Transmit PDO1 - COB-ID Write (0x4000 + COBID) to unlock Write (0xC000 + COBID) to unlock
1800_h	02_h	RW	VAR	Unsigned 8	1	FF_h	Transmit PDO1 - Transmission type: three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)
1800_h	03_h	RW	VAR	Unsigned 16	2	0064_h	Transmit PDO1 - Inhibit time: Minimum time between two transmissions; unit = 1 ms
1800_h	04_h	RW	VAR	Unsigned 8	1	00_h	Transmit PDO1 – Reserved
1801_h	00_h	RO	RECORD	Unsigned 8	1	04_h	Transmit PDO1 - Number of entries
1801_h	01_h	RW	VAR	Unsigned 32	4	Node ID + 0000 0280_h	Transmit PDO2 - COB-ID
1801_h	02_h	RW	VAR	Unsigned 8	1	FF_h	Transmit PDO2 - Transmission type: three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)
1801_h	03_h	RW	VAR	Unsigned 16	2	0064_h	Transmit PDO2 - Inhibit time: Minimum time between two transmissions; unit = 1 ms
1801_h	04_h	RW	VAR	Unsigned 8	1	00_h	Transmit PDO2 – Reserved
1802_h	00_h	RO	RECORD	Unsigned 8	1	04_h	Transmit PDO3 - Number of entries
1802_h	01_h	RW	VAR	Unsigned 32	4	Node ID + 0000 0380_h	Transmit PDO3 - COB-ID
1802_h	02_h	RW	VAR	Unsigned 8	1	FF_h	Transmit PDO3 - Transmission type: three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously acyclic (0)
1802_h	03_h	RW	VAR	Unsigned 16	2	0064_h	Transmit PDO3 - Inhibit time: Minimum time between two transmissions; unit = 1 ms
1802_h	04_h	RW	VAR	Unsigned 8	1	00_h	Transmit PDO3 – Reserved
1803_h	00_h	RO	RECORD	Unsigned 8	1	04_h	Transmit PDO4 - Number of entries
1803_h	01_h	RW	VAR	Unsigned 32	4	Node ID + 0000 0480_h	Transmit PDO4 - COB-ID
1803_h	02_h	RW	VAR	Unsigned 8	1	FF_h	Transmit PDO4 - Transmission type: three modes are available for this PDO: asynchronous (255), synchronously cyclic (1-240), and synchronously

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
							acyclic (0)
1803_h	03_h	RW	VAR	Unsigned 16	2	0064_h	Transmit PDO4 - Inhibit time: Minimum time between two transmissions; unit = 1 ms
1803_h	04_h	RW	VAR	Unsigned 8	1	00_h	Transmit PDO4 – Reserved

Index	Sub index	Access	Object type	Data type	Length Bytes	Factory setting	Description
$1A00_h$	00_h	RW	ARRAY	Unsigned 8	1	03_h	Transmit PDO1 mapping - Number of mapped objects
$1A00_h$	01_h	RW	VAR	Unsigned 32	4	2001 0210_h	Transmit PDO1 word 0 mapped to register (See manufacturer specific profile)
$1A00_h$	02_h	RW	VAR	Unsigned 32	4	2001 0310_h	Transmit PDO1 word 1 mapped to register (See manufacturer specific profile)
$1A00_h$	03_h	RW	VAR	Unsigned 32	4	2001 0410_h	Transmit PDO1 word 2 mapped to register (See manufacturer specific profile)
$1A00_h$	04_h	RW	VAR	Unsigned 32	4	2001 0910_h	Transmit PDO1 word 3 mapped to register (See manufacturer specific profile)
$1A01_h$	00_h	RW	ARRAY	Unsigned 8	1	03_h	Transmit PDO2 mapping - Number of mapped objects
$1A01_h$	01_h	RW	VAR	Unsigned 32	4	2001 0510_h	Transmit PDO1 word 0 mapped to register (See manufacturer specific profile)
$1A01_h$	02_h	RW	VAR	Unsigned 32	4	2001 0610_h	Transmit PDO1 word 1 mapped to register (See manufacturer specific profile)
$1A01_h$	03_h	RW	VAR	Unsigned 32	4	2001 0710_h	Transmit PDO1 word 2 mapped to register (See manufacturer specific profile)
$1A01_h$	04_h	RW	VAR	Unsigned 32	4	2001 0810_h	Transmit PDO1 word 3 mapped to register (See manufacturer specific profile)
$1A02_h$	00_h	RW	ARRAY	Unsigned 8	1	03_h	Transmit PDO3 mapping - Number of mapped objects
$1A02_h$	01_h	RW	VAR	Unsigned 32	4	2001 $0A10_h$	Transmit PDO1 word 0 mapped to register (See manufacturer specific profile)
$1A02_h$	02_h	RW	VAR	Unsigned 32	4	2001 $0B10_h$	Transmit PDO1 word 1 mapped to register (See manufacturer specific profile)
$1A02_h$	03_h	RW	VAR	Unsigned 32	4	2001 $0C10_h$	Transmit PDO1 word 2 mapped to register (See manufacturer specific profile)
$1A02_h$	04_h	RW	VAR	Unsigned 32	4	2001 3110_h	Transmit PDO1 word 3 mapped to register (See manufacturer specific profile)
$1A03_h$	00_h	RW	ARRAY	Unsigned 8	1	03_h	Transmit PDO4 mapping - Number of mapped objects
$1A03_h$	01_h	RW	VAR	Unsigned 32	4	2001 3010_h	Transmit PDO1 word 0 mapped to register (See manufacturer specific profile)
$1A03_h$	02_h	RW	VAR	Unsigned 32	4	2001 1110_h	Transmit PDO1 word 1 mapped to register (See manufacturer specific profile)
$1A03_h$	03_h	RW	VAR	Unsigned 32	4	2001 1210_h	Transmit PDO1 word 2 mapped to register (See manufacturer specific profile)
$1A03_h$	04_h	RW	VAR	Unsigned 32	4	2001 0110_h	Transmit PDO1 word 3 mapped to register (See manufacturer specific profile)

5.5 Manufacturer Specific Profile

Area used for the PB-CANopen specific profile that can be accessed via the SDO or mapped to the PDO. With aid of the EDS file the CANopen master PLC will be able to label variables.

PB-CANopen specific profile can be grouped according to the following criteria:

Variable group	CANopen address
Identification variables	$2000_h:00_h$ to $2000_h:18_h$
Monitor variables	$2001_h:00_h$ to $2001_h:2C_h$
Control variables	$2002_h:00_h$ to $2002_h:03_h$
Protection configuration variables	$2003_h:00_h$ to $2003_h:57_h$
Statistic variables	$2004_h:00_h$ to $2004_h:0A_h$
Fault record variables	$2005_h:00_h$ to $2005_h:41_h$
Description longer variables	$2006_h:00_h$ to $2006_h:03_h$

Identification variables

Helps describe and identify the PB-CANopen module and ProBeck-IPS relay:

CANOpen address	Access	Data type	Format	Length Words	Description
$2000_h:00_h$	CONST	Unsigned 8		0.5	Largest sub index supported = 18_h
$2000_h:01_h$ - $2000_h:04_h$	RW	Unsigned 16 [4]		4	Unit unique ID.
$2000_h:05_h$ - $2000_h:0E_h$	RW	Unsigned 16 [10]		10	Unit description.
$2000_h:0F_h$ - $2000_h:12_h$	RO	Unsigned 16 [4]		4	Serial number.
$2000_h:13_h$	RO	Unsigned 16		1	Reserved.
$2000_h:14_h$	RO	Unsigned 16		1	PB-CANopen revision number.
$2000_h:15_h$	RO	Unsigned 16		1	Maximum amps selected (x0.1A).
$2000_h:16_h$	RO	Unsigned 16		1	Line voltage selected (VAC).
$2000_h:17_h$	RO	Unsigned 16		1	Maximum load current selected (MLC).
$2000_h:18_h$	RO	Unsigned 16		1	Thermal class curve selected (Sec).

Monitor variables

Actual reading values that is read from the ProBeck-IPS relay:

CANOpen address	Access	Data type	Format	Length Words	Description
2001_h:00_h	CONST	Unsigned 8		0.5	Largest sub index supported = 31_h
2001_h:01_h	RO	Unsigned 16	F1	1	Relay Status word
2001_h:02_h	RO	Unsigned 16	F2	1	Relay Status bit
2001_h:03_h	RO	Unsigned 16	F3	1	I level (x0.1A)
2001_h:04_h	RO	Unsigned 16		1	Line voltage level (VAC)
2001_h:05_h	RO	Unsigned 16		1	Earth leakage level (mA)
2001_h:06_h	RO	Unsigned 16	F4	1	Power factor level (x0.01 CosØ)
2001_h:07_h	RO	Unsigned 16		1	Frequency level (Hz)
2001_h:08_h	RO	Unsigned 16		1	Insulation measured (kΩ)
2001_h:09_h	RO	Unsigned 16		1	Thermal capacity remaining (%)
2001_h:$0A_h$	RO	Unsigned 16	F5	1	Field inputs
2001_h:$0B_h$	RO	Unsigned 16	F6	1	Relay outputs
2001_h:$0C_h$	RO	Unsigned 16	F7	1	PLC input control
2001_h:$0D_h$	RO	Unsigned 16	F8	1	Temperature reading RTD 1 (-30DegC/*10Ohm)
2001_h:$0E_h$	RO	Unsigned 16	F8	1	Temperature reading RTD 2 (-30DegC/*10Ohm)
2001_h:$0F_h$	RO	Unsigned 16	F8	1	Temperature reading RTD 3 (-30DegC/*10Ohm)
2001_h:10_h	RO	Unsigned 16	F8	1	Temperature reading RTD 4 (-30DegC/*10Ohm)
2001_h:11_h	RO	Unsigned 16		1	IL unbalance level (%)
2001_h:12_h	RO	Unsigned 16		1	Voltage symmetry level (%)
2001_h:13_h - 2001_h:17_h	RO	Unsigned 16 [5]	F9 – F13	2	Alarm flags
2001_h:18_h - 2001_h:$1C_h$	RO	Unsigned 16 [5]	F14 – F18	2	Trip flags
2001_h:$1D_h$ - 2001_h:22_h	RO	Unsigned 16 [6]	F19 – F24	6	Logic flags
2001_h:23_h	RO	Unsigned 16	F25	1	Warning flag
2001_h:24_h	RO	Unsigned 16		1	Counter A counts
2001_h:25_h	RO	Unsigned 16		1	Counter B counts
2001_h:26_h	RO	Unsigned 16		1	IL1 percentage level of MLC (%)
2001_h:27_h	RO	Unsigned 16		1	IL2 percentage level of MLC (%)
2001_h:28_h	RO	Unsigned 16		1	IL3 percentage level of MLC (%)
2001_h:29_h	RO	Unsigned 16		1	VL1 phase level (VAC)
2001_h:$2A_h$	RO	Unsigned 16		1	VL2 phase level (VAC)
2001_h:$2B_h$	RO	Unsigned 16		1	VL3 phase level (VAC)
2001_h:$2C_h$	RO	Unsigned 16	F3	1	4 – 20 mA In 1 level (x0.1mA)
2001_h:$2D_h$	RO	Unsigned 16	F3	1	4 – 20 mA In 2 level (x0.1mA)
2001_h:$2E_h$	RO	Unsigned 16	F3	1	4 – 20 mA Out 1 level (x0.1mA)
2001_h:$2F_h$	RO	Unsigned 16	F3	1	4 – 20 mA Out 2 level (x0.1mA)
2001_h:30_h	RO	Unsigned 16		1	Slot selected
2001_h:31_h	RO	Unsigned 16		1	Pilot Level (Ohm)

Control variables

Variables used to control the ProBeck-IPS from the CANopen producer (master) message:

CANOpen address	Access	Data type	Format	Length Word	Description
2002_h:00_h	CONST	Unsigned 8		0.5	Largest sub index supported = 03_h
2002_h:01_h	RW	Unsigned 16	F26	1	Slot selection word from CANopen to relay Bit 7 - 4 = Takes over slot selection. Set all bits. Bit 3 = Reserved Bit 0 – 2 = Select protection slot 0 – 7 on PB-Relay
2002_h:02_h	RW	Unsigned 16	F7	1	Control word from CANopen to relay
2002_h:03_h	RW	Unsigned 16	F27	1	4 to 20 mA word from CANopen to relay Byte 0 = 4 to 20 mA Channel 1 out. Byte 1 = 4 to 20 mA Channel 2 out.

Protection configuration variables

Variables configures the ProBeck-IPS protection settings from the CANopen producer (master) message:

CANOpen address	Access	Data type	Format	Length Words	Description
2003_h:00_h	CONST	Unsigned 8		0.5	Largest sub index supported = $2C_h$
2003_h:01_h	RW*	Unsigned 16		1	Maximum load current 0 selected (%) (Range: 10 – 100)
2003_h:02_h	RW*	Unsigned 16		1	Thermal curve 0 selection (Sec) (Range: 3 – 40)
2003_h:03_h	RW*	Unsigned 16		1	Maximum load current 1 selected (%) (Range: 10 – 100)
2003_h:04_h	RW*	Unsigned 16		1	Thermal curve 1 selection (Sec) (Range: 3 – 40)
2003_h:05_h	RW*	Unsigned 16		1	Line voltage selection (VAC) (Range: 110, 380, 400, 525, 550, 680, 950, 1100, 3300, 6600, 11000)
2003_h:06_h	RW*	Unsigned 16		1	Voltage symmetry trip level (%) (Range: 60 – 100)
2003_h:07_h	RW*	Unsigned 16		1	Voltage high limit (% of line voltage selected) (Range: 0 – 25)
2003_h:08_h	RW*	Unsigned 16		1	Voltage low limit (% of line voltage selected) (Range: 0 – 30)
2003_h:09_h	RW*	Unsigned 16		1	IL Unbalance trip level (%) (Range: 0 – 50)
2003_h:$0A_h$	RW*	Unsigned 16		1	IL Unbalance trip delay (Sec) (Range: 1 – 10)
2003_h:$0B_h$	RW*	Unsigned 16		1	Minimum load current trip level (%) (Range: 10 – 100)
2003_h:$0C_h$	RW*	Unsigned 16		1	Minimum load power trip level (x0.1 CosØ) (Range: 10 – 100)
2003_h:$0D_h$	RW*	Unsigned 16		1	Minimum load trip delay (Sec) (Range: 1 – 10)
2003_h:$0E_h$	RW*	Unsigned 16		1	Minimum load startup hold delay (Sec) (Range: 0 – 200)
2003_h:$0F_h$	RW*	Unsigned 16		1	Minimum load reset selection.

CANOpen address	Access	Data type	Format	Length Words	Description
					(Range: 0 – 9)
2003_h:10_h	RW*	Unsigned 16		1	Earth leakage trip level (mA) (Range: 30 – 999)
2003_h:11_h	RW*	Unsigned 16		1	Earth leakage trip delay (mSec) (Range: 50 – 1000 @ 50 interval)
2003_h:12_h	RW*	Unsigned 16		1	Earth leakage trip type selection (Range: 0 – 1)
2003_h:13_h	RW*	Unsigned 16		1	Thermal capacity remaining reset threshold (%) (Range: 0 – 100)
2003_h:14_h	RW*	Unsigned 16		1	Running stall trip level (%) (Range: 110 – 300)
2003_h:15_h	RW*	Unsigned 16		1	Running stall trip delay (mSec) (Range: 100 – 2000 @ 50 interval)
2003_h:16_h	RW*	Unsigned 16		1	Running stall hold off time (Sec) (Range: 0 – 200)
2003_h:17_h	RO	Unsigned 16		1	Not used
2003_h:18_h	RW*	Unsigned 16		1	Starts per hour limit (Range: 1 – 60)
2003_h:19_h	RW*	Unsigned 16		1	Consecutive starts (Range: 1 – 3)
2003_h:$1A_h$ - 2003_h:$1D_h$	RW*	Unsigned 16 [4]	F28 - F31	4	Feature enable bits (Range: 0 – 65535)
2003_h:$1E_h$	RW*	Unsigned 16		1	Digital field input 1 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:$1F_h$	RW*	Unsigned 16		1	Digital field input 2 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:20_h	RW*	Unsigned 16		1	Digital field input 3 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:21_h	RW*	Unsigned 16		1	Digital field input 4 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:22_h	RW*	Unsigned 16		1	Digital field input 5 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:23_h	RW*	Unsigned 16		1	Digital field input 6 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:24_h	RW*	Unsigned 16		1	Digital field input 7 delay (mSec) (Range: 0 – 2000 @ 50 interval)
2003_h:25_h	RW*	Unsigned 16		1	CT primary ratio (Range: 1 – 1000)
2003_h:26_h	RW*	Unsigned 16		1	CT secondary ratio (Range: 1 – 9)
2003_h:27_h	RW*	Unsigned 16		1	Modal number (Range: 1, 5, 25, 50, 100, 300)
2003_h:28_h	RO	Unsigned 16		1	Unused
2003_h:29_h - 2003_h:$2B_h$	RW*	Unsigned 16 [3]	F32 – F34	3	RTC (yy/mm/dd – hh:mm)
2003_h:$2C_h$	RW	Unsigned 16		1	Password register. • Unlock = $A55A_h$. • Change setting value. • Write 0 to send settings to ProBeck-IPS.

	Note
	* = Setting needs to be unlocked in order to change value.

Statistic variables

ProBeck-IPS behaviour over a period of time:

CANOpen address	Access	Data type	Format	Length Words	Description
$2004_h:00_h$	CONST	Unsigned 8		0.5	Largest sub index supported = $0A_h$
$2004_h:01_h$	RW	Unsigned 16		1	Startup counter
$2004_h:02_h$	RW	Unsigned 16		1	Trip counter
$2004_h:03_h$	RW	Unsigned 16		1	Total motor running hours (Hrs)
$2004_h:04_h$	RW	Unsigned 16		1	Motor full load running hours (Hrs)
$2004_h:05_h$	RW	Unsigned 16		1	Drive available hours (Hrs)
$2004_h:06_h$	RW	Unsigned 16	F4	1	Apparent power consumption (x0.01 kVAh)
$2004_h:07_h$	RW	Unsigned 16	F4	1	Real power consumption (x0.01 kWh)
$2004_h:08_h$ - $2004_h:0A_h$	RO	Unsigned 16 [3]	F32 – F34	3	Power up time (yy/mm/dd – hh:mm)

Fault record variables

ProBeck-IPS behaviour over a period of time:

CANOpen address	Access	Data type	Format	Length Words	Description
2005_h:00_h	CONST	Unsigned 8		0.5	Largest sub index supported = 41_h
2005_h:01_h	R	Unsigned 16	F35	1	Fault 1 status
2005_h:02_h - 2005_h:04_h	R	Unsigned 16 [3]	F32 – F34	3	Fault 1 Fault time (yy/mm/dd – hh:mm)
2005_h:05_h - 2005_h:09_h	R	Unsigned 16 [5]	F14 – F18	5	Fault 1 Trip flags
2005_h:$0A_h$	R	Unsigned 16		1	Fault 1 Running hours (Hrs)
2005_h:$0B_h$	R	Unsigned 16		1	Fault 1 IL maximum level (%)
2005_h:$0C_h$	R	Unsigned 16		1	Fault 1 VL minimum level (VAC)
2005_h:$0D_h$	R	Unsigned 16		1	Fault 1 Breaker clear timer (mSec)
2005_h:$0E_h$	R	Unsigned 16	F35	1	Fault 2 status
2005_h:$0F_h$ - 2005_h:11_h	R	Unsigned 16 [3]	F32 – F34	3	Fault 2 Fault time (yy/mm/dd – hh:mm)
2005_h:12_h - 2005_h:16_h	R	Unsigned 16 [5]	F14 – F18	5	Fault 2 Trip flags
2005_h:17_h	R	Unsigned 16		1	Fault 2 Running hours (Hrs)
2005_h:18_h	R	Unsigned 16		1	Fault 2 IL maximum level (%)
2005_h:19_h	R	Unsigned 16		1	Fault 2 VL minimum level (VAC)
2005_h:$1A_h$	R	Unsigned 16		1	Fault 2 Breaker clear timer (mSec)
2005_h:$1B_h$	R	Unsigned 16	F35	1	Fault 3 status
2005_h:$1C_h$ - 2005_h:$1E_h$	R	Unsigned 16 [3]	F32 – F34	3	Fault 3 Fault time (yy/mm/dd – hh:mm)
2005_h:$1F_h$ - 2005_h:23_h	R	Unsigned 16 [5]	F14 – F18	5	Fault 3 Trip flags
2005_h:24_h	R	Unsigned 16		1	Fault 3 Running hours (Hrs)
2005_h:25_h	R	Unsigned 16		1	Fault 3 IL maximum level (%)
2005_h:26_h	R	Unsigned 16		1	Fault 3 VL minimum level (VAC)
2005_h:27_h	R	Unsigned 16		1	Fault 3 Breaker clear timer (mSec)
2005_h:28_h	R	Unsigned 16	F35	1	Fault 4 status
2005_h:29_h - 2005_h:$2B_h$	R	Unsigned 16 [3]	F32 – F34	3	Fault 4 Fault time (yy/mm/dd – hh:mm)
2005_h:$2C_h$ - 2005_h:30_h	R	Unsigned 16 [5]	F14 – F18	5	Fault 4 Trip flags
2005_h:31_h	R	Unsigned 16		1	Fault 4 Running hours (Hrs)
2005_h:32_h	R	Unsigned 16		1	Fault 4 IL maximum level (%)
2005_h:33_h	R	Unsigned 16		1	Fault 4 VL minimum level (VAC)
2005_h:34_h	R	Unsigned 16		1	Fault 4 Breaker clear timer (mSec)
2005_h:35_h	R	Unsigned 16	F35	1	Fault 5 status
2005_h:36_h - 2005_h:38_h	R	Unsigned 16 [3]	F32 – F34	3	Fault 5 Fault time (yy/mm/dd – hh:mm)
2005_h:39_h - 2005_h:$3D_h$	R	Unsigned 16 [5]	F14 – F18	5	Fault 5 Trip flags
2005_h:$3E_h$	R	Unsigned 16		1	Fault 5 Running hours (Hrs)
2005_h:$3F_h$	R	Unsigned 16		1	Fault 5 IL maximum level (%)
2005_h:40_h	R	Unsigned 16		1	Fault 5 VL minimum level (VAC)
2005_h:41_h	R	Unsigned 16		1	Fault 5 Breaker clear timer (mSec)

Description longer variables

Repeat of information but to be give only once with the aid of the SDO protocol:

CANOpen address	Access	Data type	Length Words	Description
2006_h:00_h	CONST	Unsigned 8	0.5	Largest sub index supported = 03_h
2006_h:01_h	RO	Unsigned 16 [4]	4	Unit unique ID.
2006_h:02_h	RO	Unsigned 16 [10]	10	Unit description.
2006_h:03_h	RO	Unsigned 16 [4]	4	Serial number.

6 PB-CANopen Data Format

Table below contains the format type of special data structures:

Format Code	Name	Description
F1	Relay Status word	Describes the ProBeck-IPS status in a word. 00000 = Healthy. 00001 = Alarm frozen contact active. 00002 = Alarm short circuit active. 00003 = Alarm earth fault active. 00004 = Alarm earth leakage active. 00005 = Alarm running stall active. 00006 = Alarm vectorial stall active. 00007 = Alarm single phase active. 00008 = Alarm unbalance active. 00009 = Alarm over current active. 00010 = Alarm minimum load active. 00011 = Alarm insulation lockout active. 00012 = Alarm vacuum active. 00013 = Alarm over frequency active. 00014 = Alarm under frequency active. 00015 = Alarm over voltage active. 00016 = Alarm under voltage active. 00017 = Alarm voltage symmetry active. 00018 = Alarm user 1 active. 00019 = Alarm user 2 active. 00020 = Alarm user 3 active. 01000 = Load active. 02000 = Trip unauthorized load. 02001 = Trip short circuit. 02002 = Trip earth fault. 02003 = Trip earth leakage. 02004 = Trip running stall. 02005 = Trip vectorial stall. 02006 = Trip single phase. 02007 = Trip unbalance. 02008 = Trip over current. 02009 = Trip minimum load. 02010 = Trip vacuum fail. 02011 = Trip insulation fail. 02012 = Trip over frequency. 02013 = Trip under frequency. 02014 = Trip over voltage. 02015 = Trip under voltage. 02016 = Trip voltage symmetry. 02017 = Trip voltage phase rotation. 02018 = Trip analog input 1 level high. 02019 = Trip analog input 1 level low. 02020 = Trip analog input 2 level high. 02021 = Trip analog input 2 level low. 02022 = Trip analog output 1 level high. 02023 = Trip analog output 1 level low. 02024 = Trip analog output 2 level high. 02025 = Trip analog output 2 level low. 02026 = RTD 1 level high. 02027 = RTD 1 level low. 02028 = RTD 2 level high. 02029 = RTD 2 level low. 02030 = RTD 3 level high. 02031 = RTD 3 level low. 02032 = RTD 4 level high.

Format Code	Name	Description
		02033 = RTD 4 level low. 02034 = Trip user 1. 02035 = Trip user 2. 02036 = Trip user 3. 02037 = Trip execution fault. 02038 = Trip feedback fault. 02039 = Trip frozen contact. 02040 = Trip CTMB disconnected. 02041 = Trip CBCT disconnected. 02042 = IO expander disconnected. 02043 = Pilot wire disconnected. 02044 = Pilot wire open circuit. 02045 = Pilot wire short circuit. 02046 = Trip MMI disconnected. 02047 = Trip RTD disconnected. 02048 = Trip analog disconnected. 02049 = Lockout starts per hour. 02099 = Trip system fault.
F2	Relay Status bit	Describes the ProBeck-IPS status in bit format. Bit 00 = Current present. Bit 01 = Voltage present. Bit 02 = Any alarm active. Bit 03 = Any trip active. Bit 04 - 06 = Reserved. Bit 07 = Settings unlocked. Bit 08 = Field input 1. Bit 09 = Field input 2. Bit 10 = Field input 3. Bit 11 = Field input 4. Bit 12 = Field input 5. Bit 13 = Field input 6. Bit 14 = Field input 7. Bit 15 = Simulator active.
F3	Word x 0.1	Word value that needs to be divided by 10 to give a 0.1 resolution.
F4	Word x 0.01	Word value that needs to be divided by 100 to give a 0.01 resolution.
F5	Field inputs	Status of the field inputs. Bit 00 = Field input 1. Bit 01 = Field input 2. Bit 02 = Field input 3. Bit 03 = Field input 4. Bit 04 = Field input 5. Bit 05 = Field input 6. Bit 06 = Field input 7. Bit 07 = Field input 8. Bit 08 = Field input 9. Bit 09 = Field input 10. Bit 10 = Field input 11. Bit 11 = Field input 12. Bit 12 = Field input 13. Bit 13 = Field input 14. Bit 14 = Field input 15. Bit 15 = Reserved.
F6	Relay outputs	Status of the relay outputs. Bit 00 = Relay output 1. Bit 01 = Relay output 2. Bit 02 = Relay output 3. Bit 03 = Relay output 4. Bit 04 = Relay output 5. Bit 05 = Relay output 6. Bit 06 = Relay output 7. Bit 07 = Relay output 8.

Format Code	Name	Description
		Bit 08 – 15 = Reserved.
F7	PLC input control	Bit status or used to control the PLC bits of the ProBeck-IPS. Bit 00 = PLC input bit 1. Bit 01 = PLC input bit 2. Bit 02 = PLC input bit 3. Bit 03 = PLC input bit 4. Bit 04 = PLC input bit 5. Bit 05 = PLC input bit 6. Bit 06 = PLC input bit 7. Bit 07 = PLC input bit 8. Bit 08 = PLC input bit 9. Bit 09 = PLC input bit 10. Bit 10 = PLC input bit 11. Bit 11 = PLC input bit 12. Bit 12 = PLC input bit 13. Bit 13 = PLC input bit 14. Bit 14 = PLC input bit 15. Bit 15 = PLC input bit 16.
F8	Temperature levels	When RTD channel is configured as PT100 or PT1000 then the following formula applies: Temp DegreeC = Value – 30 DegreeC. When RTD channel is configured as PTC or NTC then the following formula applies: Ohms = Value * 10Ohms.
F9	Alarm flag 0	Containing detail information on the alarm flags: Bit 00 = IL present > 20%. Bit 01 = Earth leakage. Bit 02 = Overcurrent. Bit 03 = Running stall. Bit 04 = IL Unbalance. Bit 05 = IL Single phase. Bit 06 = Minimum load. Bit 07 = Short circuit. Bit 08 = VL present > 20VAC. Bit 09 = Over voltage. Bit 10 = Under voltage. Bit 11 = Voltage symmetry. Bit 12 = Insulation lockout. Bit 13 = Under frequency. Bit 14 = Over frequency. Bit 15 = Earth fault.
F10	Alarm flags 1	Containing detail information on the alarm flags: Bit 00 = Vectorial stall Bit 01 = Frozen contact. Bit 02 = Vacuum fail. Bit 03 = Pilot transmit a start command. Bit 04 – 07 = Reserved. Bit 08 = RTD 1 level high. Bit 09 = RTD 1 level low. Bit 10 = RTD 2 level high. Bit 11 = RTD 2 level low. Bit 12 = RTD 3 level high. Bit 13 = RTD 3 level low. Bit 14 = RTD 4 level high. Bit 15 = RTD 4 level low.
F11	Alarm flags 2	Containing detail information on the alarm flags: Bit 00 = Analog input 1 level high. Bit 01 = Analog input 1 level low. Bit 02 = Analog input 2 level high. Bit 03 = Analog input 2 level low. Bit 04 = Analog output 1 level high.

Format Code	Name	Description
		Bit 05 = Analog output 1 level low. Bit 06 = Analog output 2 level high. Bit 07 = Analog output 2 level low. Bit 08 = Custom trip 1. Bit 09 = Custom trip 2. Bit 10 = Custom trip 3. Bit 11 – 15 = Reserved.
F12	Alarm flags 3	Reserved
F13	Alarm flags 4	Reserved
F14	Trip flags 0	Containing detail information on trip flags: Bit 00 = Overcurrent. Bit 01 = Running stall. Bit 02 = IL Unbalance. Bit 03 = IL single phase. Bit 04 = Minimum load. Bit 05 = Short circuit. Bit 06 = Voltage phase rotation. Bit 07 = Earth leakage. Bit 08 = Over voltage. Bit 09 = Under voltage. Bit 10 = Voltage symmetry. Bit 11 = Insulation fail. Bit 12 = Under frequency. Bit 13 = Over frequency. Bit 14 = Earth fault. Bit 15 = Starts per hour.
F15	Trip flags 1	Containing detail information on trip flags: Bit 00 = System failure. Bit 01 = Vectorial stall. Bit 02 = Frozen contact. Bit 03 = Execution fault. Bit 04 = Feedback fault. Bit 05 = Unauthorized load. Bit 06 = Vacuum fail. Bit 07 = CTMB disconnected. Bit 08 = RTD 1 level high. Bit 09 = RTD 1 level low. Bit 10 = RTD 2 level high. Bit 11 = RTD 2 level low. Bit 12 = RTD 3 level high. Bit 13 = RTD 3 level low. Bit 14 = RTD 4 level high. Bit 15 = RTD 4 level low.
F16	Trip flags 2	Containing detail information on trip flags: Bit 00 = Analog input 1 level high. Bit 01 = Analog input 1 level low. Bit 02 = Analog input 2 level high. Bit 03 = Analog input 2 level low. Bit 04 = Analog output 1 level high. Bit 05 = Analog output 1 level low. Bit 06 = Analog output 2 level high. Bit 07 = Analog output 2 level low. Bit 08 = CBCT disconnected. Bit 09 = Pilot open. Bit 10 = Pilot short. Bit 11 = Pilot communication lost. Bit 12 = MMI communication lost. Bit 13 = RTD communication lost. Bit 14 = Analog module communication lost. Bit 15 = IO expander module communication lost.
F17	Trip flags 3	Containing detail information on trip flags:

Format Code	Name	Description
		Bit 00 = Communication module communication lost. Bit 01 = Custom trip 1. Bit 02 = Custom trip 2. Bit 03 = Custom trip 3. Bit 04 = System earth test fail. Bit 05 = System earth loop test fail. Bit 06 = System CBCT test fail. Bit 07 = System pilot test fail. Bit 08 – Bit 15 = Reserved.
F18	Trip flags 4	Reserved.
F19	Logic flags 0	Containing detail information on logic flags: Bit 00 = Logic table 1 status. Bit 01 = Logic table 2 status. Bit 02 = Logic table 3 status. Bit 03 = Logic table 4 status. Bit 04 = Logic table 5 status. Bit 05 = Logic table 6 status. Bit 06 = Simulation active. Bit 07 = Counter B status. Bit 08 = Timer A status. Bit 09 = Timer B status. Bit 10 = RTC start stop status. Bit 11 = Relay 1 status. Bit 12 = Relay 2 status. Bit 13 = Relay 3 status. Bit 14 = Relay 4 status. Bit 15 = Counter A status.
F20	Logic flags 1	Containing detail information on logic flags: Bit 00 = Field input 1 status. Bit 01 = Field input 2 status. Bit 02 = Field input 3 status. Bit 03 = Field input 4 status. Bit 04 = Field input 5 status. Bit 05 = Field input 6 status. Bit 06 = Field input 7 status. Bit 07 = Reserved. Bit 08 = Starter output 1 status. Bit 09 = Starter output 2 status. Bit 10 = Starter output 3 status. Bit 11 = Starter output 4 status. Bit 12 = Starter output 5 status. Bit 13 = LSB selection status. Bit 14 = MSB selection status. Bit 15 = Reserved.
F21	Logic flags 2	Containing detail information on logic flags: Bit 00 = PLC input 1 status. Bit 01 = PLC input 2 status. Bit 02 = PLC input 3 status. Bit 03 = PLC input 4 status. Bit 04 = PLC input 5 status. Bit 05 = PLC input 6 status. Bit 06 = PLC input 7 status. Bit 07 = PLC input 8 status. Bit 08 = PLC input 9 status. Bit 09 = PLC input 10 status. Bit 10 = PLC input 11 status. Bit 11 = PLC input 12 status. Bit 12 = PLC input 13 status. Bit 13 = PLC input 14 status. Bit 14 = PLC input 15 status. Bit 15 = PLC input 16 status.

Format Code	Name	Description
F22	Logic flags 3	Containing detail information on logic flags: Bit 00 = Timer A status. Bit 01 = Timer B status. Bit 02 = Emergency stop status. Bit 03 = Latch A status. Bit 04 = Relay 5 status. Bit 05 = Relay 6 status. Bit 06 = Relay 7 status. Bit 07 = Relay 8 status. Bit 08 = Pre start warning active. Bit 09 = DC break active. Bit 10 = Transition active. Bit 11 = Backspin active. Bit 12 = Pulse generator status. Bit 13 = Latch B status. Bit 14 = Pilot local selected. Bit 15 = TC warning level status.
F23	Logic flags 4	Containing detail information on logic flags: Bit 00 = Field input 8 status. Bit 01 = Field input 9 status. Bit 02 = Field input 10 status. Bit 03 = Field input 11 status. Bit 04 = Field input 12 status. Bit 05 = Field input 13 status. Bit 06 = Field input 14 status. Bit 07 = Field input 15 status. Bit 08 = Pilot test active. Bit 09 = Pilot run active. Bit 10 = Earth leakage test active. Bit 11 = Insulation test active. Bit 12 = Comparator A level high high status. Bit 13 = Comparator A level high low status. Bit 14 = Comparator A level low high status. Bit 15 = Comparator A level low low status.
F24	Logic flags 5	Containing detail information on logic flags: Bit 00 = Pilot healthy status. Bit 01 = Comparator A level high status. Bit 02 = Comparator A level low status. Bit 03 = Comparator A level between status. Bit 04 = Comparator B level high high status. Bit 05 = Comparator B level high low status. Bit 06 = Comparator B level low high status. Bit 07 = Comparator B level low low status. Bit 08 = Comparator B level high status. Bit 09 = Comparator B level low status. Bit 10 = Comparator B level between status. Bit 11 = Earth loop test active. Bit 12 – 15 = Reserved.
F25	Warning flags	Contains warning flags. Bit 00 = RTD 1 level high. Bit 01 = RTD 1 level low. Bit 02 = RTD 2 level high. Bit 03 = RTD 2 level low. Bit 04 = RTD 3 level high. Bit 05 = RTD 3 level low. Bit 06 = RTD 4 level high. Bit 07 = RTD 4 level low. Bit 08 = Analog input 1 level high. Bit 09 = Analog input 1 level low. Bit 10 = Analog input 2 level high. Bit 11 = Analog input 2 level low. Bit 12 = Analog output 1 level high.

Format Code	Name	Description
		Bit 13 = Analog output 1 level low. Bit 14 = Analog output 2 level high. Bit 15 = Analog output 2 level low.
F26	Slot selection	Bit 05 – 07 must be set to '111' in order to take control of the ProBeck-IPS slot selection. If any other combination then the ProBeck-IPS will use internal configuration to select the slot. Bit 00 – 02 selects a range from slot 0 to 7 to use as configuration. These configurations are stored in the ProBeck-IPS memory. Bit 03, 08 – 15 = Reserved.
F27	Analog output control	Bit 00 – 03 = Controls analog output 1 level. Bit 04 – 07 = Controls analog output 2 level. Bit 08 – 15 = Reserved.
F28	Feature enable bits 0	Enabled protection features: Bit 00 = Minimum load. Bit 01 = Under voltage. Bit 02 = Over voltage. Bit 03 = Voltage symmetry. Bit 04 = Relay 1 configured fail safe.(Only if starter type=protection) Bit 05 = Unbalance. Bit 06 = Phase rotation. Bit 07 = Short circuit. Bit 08 = Single phase. Bit 09 = Running stall. Bit 10 = Minimum load type selection (0 = Load, 1 = Power). Bit 11 = Earth leakage. Bit 12 = Vacuum fail. Bit 13 = Insulation fail. Bit 14 = Frequency monitor. Bit 15 = Auto calculate TC reset threshold.
F29	Feature enable bits 1	Enabled protection features: Bit 00 = Starts per hour. Bit 01 = Voltage phase rotation connected in reverse. Bit 02 = Vectorial stall. Bit 03 = TC auto reset. Bit 04 = Relay 1 configuration. (0 = Protection, 1 = Logic control). Bit 05 = IO expander module selected. Bit 06 = MMI module selected. Bit 07 = Analog module selected. Bit 08 = RTD 1 trip enabled. Bit 09 = RTD 2 trip enabled. Bit 10 = RTD 3 trip enabled. Bit 11 = RTD 4 trip enabled. Bit 12 = Analog input 1 trip enabled. Bit 13 = Analog input 2 trip enabled. Bit 14 = Analog output 1 trip enabled. Bit 15 = Analog output 2 trip enabled.
F30	Feature enable bits 2	Enabled protection features: Bit 00 = RTD module selected. Bit 01 = Pilot module selected. Bit 02 = Pilot trip on communication loss. Bit 03 = Pilot must auto reset when fault is clear. Bit 04 = Short circuit trip on power factor. Bit 05 = Short circuit high high trip. Bit 06 – 15 = Reserved.
F31	Feature enable bits 3	Reserved.
F32	Date time 0	Bit 00 – 07 = Year. Bit 08 – 15 = Month.
F33	Date time 1	Bit 00 – 07 = Day. Bit 08 – 15 = Hour.
F34	Date time 2	Bit 00 – 07 = Minutes.

Format Code	Name	Description
		Bit 08 – 15 = Reserved.
F35	Fault type	0 = Actual, 1 = Simulated.

7 Operations

A couple of operational controls to take note of.

7.1 Slot selection

The following must be written to OD 2002_h:01_h:

Bit 05 – 07 must be set to '111' in order to take control of the ProBeck-IPS slot selection.

If any other combination then the ProBeck-IPS will use internal configuration to select the slot.

Bit 00 – 02 selects a range from slot 0 to 7 to use as configuration. These configurations are stored in the ProBeck-IPS memory.

7.2 Writing protection setting

Following steps must be followed:

1. Select the correct slot to overwrite.
2. Write the hexadecimal value $A55A_h$ to OD 2003_h:$2C_h$.
3. Change the desired setting.
4. Write 0 to OD 2003_h:$2C_h$.
5. The setting will been overwritten.

8 Part Numbers

Description.	**Part No**	**Bin No.**
ProBeck-IPS with CANopen 110VAC ~ 220VAC auxiliary supply	PRB0648	
ProBeck-IPS with CANopen 24VDC auxiliary supply	PRB0656	

9 Revision History

Revision History		
Date	**Revision**	**Description**

Approvals			
Read and Approved by	**Position**	**Signature**	**Date**