• 15Q0059B00 •

DCREG

DCREG interface via CANopen

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SW Version D4.02 or higher

English

Enertronica Santerno S.p.A.
Via della Concia, 7 - 40023 Castel Guelfo (BO) Italia
Tel. +39 0542 489711 - Fax +39 0542 489722
santerno.com info@santerno.com

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FIGURES

1 COMMUNICATION FEATURES

This manual describes how to interface a DCREG (slave) converter with an intelligent outside control unit (master) via CANopen.

In order to create this interface, an optional module must be installed on the DCREG (see Module description).

The converter thus becomes a slave node from which a CANopen master can read and on which it can write. The DCREG will never start a communication towards other nodes, but will only answer incoming commands.

Via CANopen you can:

- read the parameters mentioned in the following From Master to DCREG
- write the parameters mentioned in the following From DCREG to Master

1.1 EDS File

Each device in a CANopen network is associated with an Electronic Data Sheet (EDS), containing all the information needed about the device. This file is used by the network configuration program during configuration of the network.

Contact Enertronica Santerno S.p.A. directly to get the most recent version of the EDS file.

2 CANOPEN FIELDBUS COMMUNICATIONS BOARD

The CANopen communications board allows to interface a DCREG with an external control unit using communications interface operating with a CAN protocol of the CANopen type complying with the CIA DS-301 V3.0 specifications.

The baud rate and the Device Address can be set through the on-board rotary switches.

Eight baud rate levels can be set, up to 1Mbit/s.

2.1 Main Features

- Unscheduled data exchange support
- Synch & Freeze operating mode
- Possibility of setting Salve Watch-dog timer
- Eight baud rate levels, from 10kbits/s to 1Mbit/s
- Possibility of setting different Device Addresses up to max. 99 nodes
- Optically isolated CAN interface
- CANopen conformity: CIA DS-301 V3.0

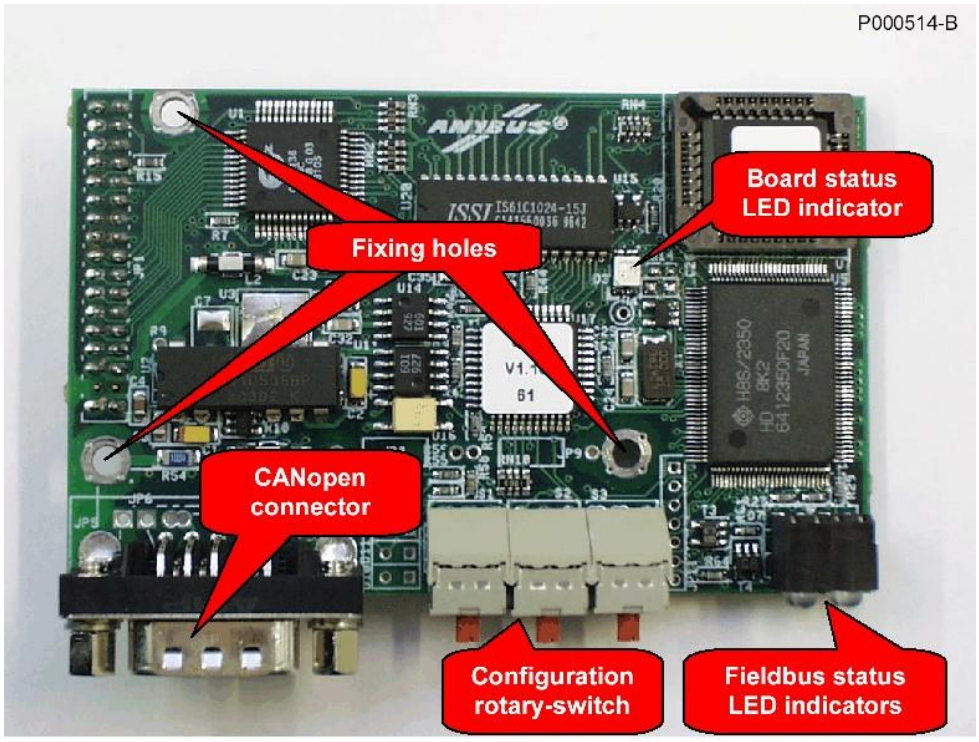

Figure 1: CANopen Fieldbus communication board

2.2 CANopen Fieldbus Terminals

The CANopen communications board is provided with a 9-pin male "D" connector. The bus interface circuitry is internally supplied, as prescribed by the CANopen specifications.

Pins are arranged as follows:

N.	Name	Description
Shell	CAN_SHLD	Cable shielding
1	-	
2	CAN_L	CAN_L line
3	CAN_GND	Common terminal of the CAN driver circuit
4	-	
5	CAN_SHLD	Cable shielding
6	GND	Option common terminal internally connected to pin 3
7	CAN_H	CAN_H line
8	-	
9	(reserved)	do not use

2.3 Board Configuration

The CANopen communications board shall be used with three rotary-switches for configuration, which are required to set up the inverter operating mode. The rotary-switches also allow to set the baud rate and the Device Address. The figure below shows the position of the rotary-switches and a setting example with a baud rate of 125kbits/s and a Device Address equal to 29.

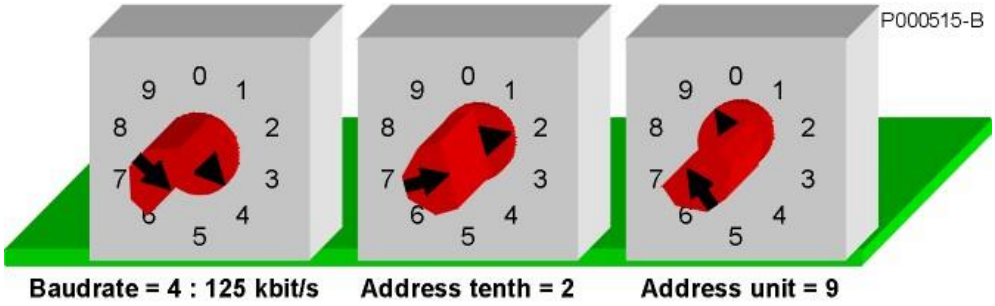

Figure 2: Example of the position of the rotary-switches for 125kbits/s and Device Address 29.

NOTE Device Address = 0 is not allowed by the CANopen specifications. Values ranging from 1 to 99 can be selected.

The table below shows the possible settings of the rotary-switches for the baud rate selection.

Rotary-switch setting	Baudrate
0	setting not allowed
1	10 kbit/s
2	20 kbit/s
3	50 kbit/s
4	125 kbit/s
5	250 kbit/s
6	500 kbit/s
7	800 kbit/s
8	1000 kbit/s
9	setting not allowed

2.4 Connection to the Fieldbus

High quality wiring is fundamental for the correct operation of the bus. For CANopen wiring, a shielded twisted pair with known resistance and impedance is recommended. The conductor unit is also fundamental for the quality of the signal. The higher the baud rates, the shortest the bus lengths allowed. The maximum length of the bus is also affected by the number of nodes.

The tables below indicate the cable specifications based on the cable length and the variation features of the max. length based on the number of nodes and the cross-section of the conductors.

Tables refer to copper wires with a characteristic impedance of 120Ω and a typical propagation delay of 5ns/m.

Bus length [m]	Max. specific resistance of the cable [mΩ/m]	Recommended cross-section for conductors [mm²]	Recommended terminator resistance [Ω]	Max. baud rate [Kbit/s]
0÷40	70	0.25÷0.34	124	1000 kbit/s
40÷300	60	0.34÷0.6	150÷300	500 kbit/s (max 100m)
300÷600	40	0.5÷0.75	150÷300	100 kbit/s (max 500m)
600÷1000	26	0.75÷0.8	150÷300	50 kbit/s

The total resistance of the cable and number of nodes determine the max. allowable length for the cable as per static features, not for dynamic features. Indeed, the max. voltage delivered by a node with a dominant bus is reduced by the resistive divider consisting of the cable resistor and the terminator resistors. The residual voltage must exceed the dominant voltage of the receiving node.

The table below indicates the max. length values based on the cable cross-section, i.e. the cable resistance, and the number of nodes.

Cross-section of the conductors [mm²]	Max. wiring length [m] based on the number of nodes		
	node n. < 32	node n. < 64	node n. < 100
0.25	200	170	150
0.5	360	310	270
0.75	550	470	410

NOTE

Each CANopen trunk line shall meet particular geometric requirements and shall be equipped with two terminator nodes provided with adequate resistors. Refer to the document CiA DR303-1 "CANopen Cabling and Connector Pin Assignment" and to all the application notes available at www.can-cia.org.

2.5 Indications

The module is provided with four LEDs installed on its front part and with one LED assembled on the control board which is used for debugging operations.

2.5.1 Front LEDs

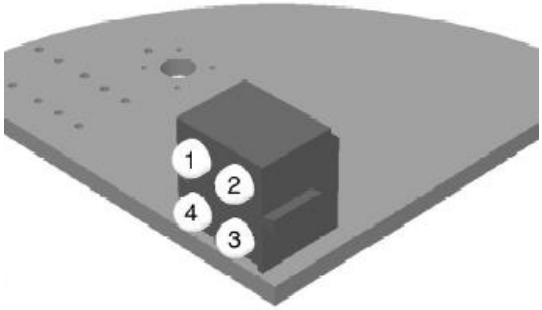

Figure 3: Indications LEDs

The LED functions are described in the table below:

Name	State	Description
1. not used		
2. State	Green 1 Hz Green 2 Hz Green steady on Red 1 Hz	Module in 'Pre-Operational' state Module in 'Prepared' state Module in 'Operational' state Bus initialisation failed
3. Bus	Green 1 Hz Green steady on Red 1 Hz Off	Bus off / error passive Bus running Other error Power off or module not initialised
4. Power	Green steady on	Module has power

2.5.2 LED on the Control Board

The LED located on the control board is a Watchdog LED indicating the state of the module according to the table below:

Colour	Frequency	Description
Red	– 1 Hz 2 Hz 4 Hz	Unspecified internal error, or module operating in bootloader mode. RAM fault ASIC or FLASH fault DPRAM fault
Green	2 Hz 1 Hz	Module not initialized Module initialized and operating

3 PARAMETER EXCHANGE

The following table shows the parameters of the DCREG exchanged via CANopen.
In each of the following are listed:

1) the number and the name of the parameter,
2) its meaning,
3) its range,
4) its unit of measure (shown on the display),
5) the ratio between the value inside the DCREG (exchanged via CANopen) and the physical value represented (as shown on the display).

NOTE: unless otherwise specified, each parameter is exchanged as integer with sign at 16 bit (between –32768 and +32767).

For further information on parameter configuration, refer to the "**OPERATION MANUAL 15P0059B3 DCREG2 DCREG4" R.05 Software Vers. D4.01...**

3.1 From Master to DCREG

1) Name	2) Meaning	3) Range	4) Unit of measure	5) Ratio
M016 FBRref	Speed / voltage reference from CANopen	-100 ÷ +100	%	100 / 3FFFh
M019 AnOut1	Analog output 1 on terminal 8	-10 ÷ +10	V	10 / FFFh
M020 AnOut2	Analog output 2 on terminal 10	-10 ÷ +10	V	10 / FFFh
M022 MDO	Digital output state	00000xxxb ÷ 11111xxxb	Note A)	–
P050 Ilim1A	First current limit bridge A	0 ÷ 300	%	1
P051 Ilim1B	First current limit bridge B	0 ÷ 300	%	1
not used	–	–	–	–
M031 FBDigIn	Digital input state from CANopen	00000000b ÷ 11111111b	Note B)	–

3.2 From DCREG to Master

1) Name	2) Meaning	3) Range	4) Unit of measure	5) Ratio
temp	–	–	Note C)	
M001 nFdbk	Speed / voltage feedback	–100 ÷ +100	%	–100 / 3FFFh
M004 Iarm	Armature current	–1.5DriveSize ÷ +1.5DriveSize	A Note D)	DriveSize / 2400
M006 Varm	Armature voltage	–1000 ÷ +1000	V	1
M010 AnIn1	Auxiliary analog input 1 at terminals 11 and 13	–100 ÷ +100	%	100 / 3FFFh
M011 AnIn2	Auxiliary analog input 2 at terminal 17	–100 ÷ +100	%	100 / 3FFFh
M012 AnIn3	Auxiliary analog input 3 at terminal 19	–100 ÷ +100	%	100 / 3FFFh
M026 EFreq	Encoder frequency	–102.4 ÷ +102.4	kHz	10 / 3FFFh

Note A)

Bit 3 → MDO5
Bit 4 → MDO1
Bit 5 → MDO2
Bit 6 → MDO3
Bit 7 → MDO4

Note B)

Bit 0 → ENABLE
Bit 1 → START
Bit 2 → MDI1
Bit 3 → MDI2
Bit 4 → MDI3
Bit 5 → MDI4
Bit 6 → MDI5
Bit 7 → MDI6

Note C)

The two 8-bit variables **AlarmNumber** and **Led** are mapped inside the variable **temp.** Its meaning is the following:

high part	low part
Led	**AlarmNumber**

AlarmNumber has the following meaning:
Drive OK if **AlarmNumber** = 0;
Alarm = **AlarmNumber** if **AlarmNumber** ≤ 33;
Warning = **AlarmNumber**-33 if **AlarmNumber** > 33.

Led indicates the state of the LEDs on the remotable keyboard with the following map:
Bit 0 → RUN
Bit 1 → FORWARD
Bit 2 → LOC SEQ
Bit 3 → BRAKE
Bit 4 → REF
Bit 5 → REVERSE
Bit 6 → LOC REM
Bit 7 → LIMIT

Note D)

DriveSize identifies the size of the armature circuit of DCREG within the range 10 ÷ 3500 A, as can be seen on the starting page of the remotable keyboard.

3.3 Alarm A028 Communication Interrupted

This alarm will trip if the DCREG does not receive any valid message via CANopen within the timeout which can be set using parameter **C143 A028Delay.** This alarm can be inhibited using parameter **C159 A028Inhibit.**