

IKD Series

Technical Manual | Relay Output Expansion Board



IKD-OUT-16

Release 1.0

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Manual (original)

This is no translation but the original Technical Manual in English.

Designed in PRC and Germany; manufactured in PRC.

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Brief Overview

The IKD-OUT-16 is an expansion module which has 16 digital output channels. The output port status of the IKD-OUT-16 are controlled by an upper level controller e.g. the easYgen-3000XT controller via CAN bus port.

Scope of delivery

The following parts are included in the scope of delivery. Please check prior to the installation that all parts are present.

- Device IKD-OUT-16 module. All screwable terminal connectors are delivered with plug and jack.
- IPS (Installation Procedure Supplement) that contains a QR code and URL like below to access product literature.



The latest versions of the Technical Manual are available at the Woodward web site.

QR Code



To get access to the complete product documentation, scan this QR code or use the following link: \Rightarrow <http://wwdmanuals.com/ikd-out-16>.

Sample application setup

A typical application for the module is to extend the digital outputs of an easYgen-3000XT.

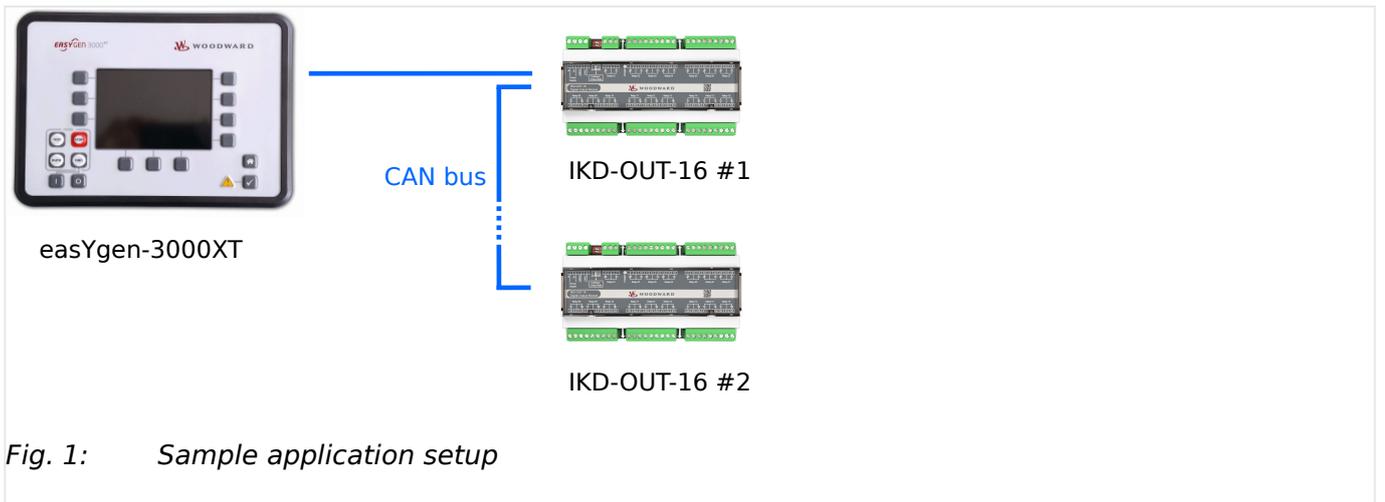


Fig. 1: Sample application setup

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1 General Information

1.1 Revision History

Rev.	Date	Editor	Changes
A	2022-10	MK	Technical Manual - 1st release <ul style="list-style-type: none">• Describing device software release 1.0
B	2022-11	BL	Corrections/Repairs Technical Manual <ul style="list-style-type: none">• Corrected picture "CAN bus - termination"



Up to date documentation?

Please check Woodward web site for latest revision of this Technical Manual (search for: "37952") and if there is an Errata Sheet with latest information.

1.2 Depiction Of Notes And Instructions

Safety instructions

Safety instructions are marked with symbols in these instructions. The safety instructions are always introduced by signal words that express the extent of the danger.

DANGER!



This combination of symbol and signal word indicates an immediately-dangerous situation that could cause death or severe injuries if not avoided.

WARNING!



This combination of symbol and signal word indicates a possibly-dangerous situation that could cause death or severe injuries if it is not avoided.

CAUTION!



This combination of symbol and signal word indicates a possibly-dangerous situation that could cause slight injuries if it is not avoided.

NOTICE!



This combination of symbol and signal word indicates a possibly-dangerous situation that could cause property and environmental damage if it is not avoided.

Tips and recommendations



This symbol indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

Dimensions



Dimensions in Figures

All dimensions shown are in **mm**, unless specified otherwise.

1.2.1 Copyright And Disclaimer

Disclaimer

All information and instructions in this manual have been provided under due consideration of applicable guidelines and regulations, the current and known state of the art, as well as our many years of in-house experience. Woodward assumes no liability for any damages due to:

- Failure to comply with the instructions in this manual
- Improper use / misuse
- Willful operation by non-authorized persons
- Unauthorized conversions or non-approved technical modifications
- Use of non-approved spare parts

The originator is solely liable for the full extent for damages caused by such conduct. The obligations agreed-upon in the delivery contract, the general terms and conditions, the manufacturer's delivery conditions, and the statutory regulations valid at the time the contract was concluded, apply.

Copyright

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Actions to the contrary will entitle us to claim compensation for damages. We expressly reserve the right to raise any further accessory claims.

1.2.2 Service And Warranty

Our Customer Service is available for technical information.

For regional support, please refer to: ⇒ http://www.woodward.com/Support_pgd.aspx.

In addition, our employees are constantly interested in new information and experiences that arise from usage and could be valuable for the improvement of our products.

Warranty terms



Please enquire about the terms of warranty from your nearest Woodward representative.

For our contact search webpage please go to: ⇒ <http://www.woodward.com/Directory.aspx>

1.3 Safety

NOTICE!



Damage due to improper use!

Improper use of the device may cause damage to the device as well as connected components.

Improper use includes, but is not limited to:

- Storage, transport, and operation outside the specified conditions.

1.3.1 Personnel

WARNING!



Hazards due to insufficiently qualified personnel!

If unqualified personnel perform work on or with the control unit hazards may arise which can cause serious injury and substantial damage to property.

- Therefore, all work must only be carried out by appropriately qualified personnel.

This manual specifies the personnel qualifications required for the different areas of work, listed below:

Personnel:

- **Qualified electrician**

The qualified electrician is able to execute tasks on electrical equipment and independently detect and avoid any possible dangers due to his training, expertise and experience, as well as knowledge of all applicable regulations.

The qualified electrician has been specially trained for the work environment in which he is active and is familiar with all relevant standards and regulations.

- **User**

The user operates the device within the limits of its intended use, without additional previous knowledge but according to the instructions and safety notes in this manual.

The workforce must only consist of persons who can be expected to carry out their work reliably. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are prohibited.

When selecting personnel, the age-related and occupation-related regulations governing the usage location must be observed.

1.3.2 General Safety Notes

Electrical hazards

DANGER!



Life-threatening hazard from electric shock!

There is an imminent life-threatening hazard from electric shocks from live parts. Damage to insulation or to specific components can pose a life-threatening hazard.

- Only a qualified electrician should perform work on the electrical equipment.
- Immediately switch off the power supply and have it repaired if there is damage to the insulation.
- Before beginning work at live parts of electrical systems and resources, cut the electricity and ensure it remains off for the duration of the work. Comply with the five safety rules in the process:
 - cut electricity;
 - safeguard against restart;
 - ensure electricity is not flowing;
 - earth and short-circuit; and
 - cover or shield neighboring live parts.
- Never bypass a fuse or render it inoperable. Always use the correct amperage when changing a fuse.
- For critical functions we recommend the usage of the on board relays (e.g. of the easYgen-3000XT).
- Keep moisture away from live parts. Moisture can cause short circuits.

Prime mover safety

WARNING!



Hazards due to insufficient prime mover protection

The engine, turbine, or other type of prime mover should be equipped with an overspeed (over-temperature, or over-pressure, where applicable) shutdown device(s), that operates totally independently of the prime mover control device(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

Modifications

WARNING!



Hazards due to unauthorized modifications

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment.

Any unauthorized modifications:

- constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage
- invalidate product certifications or listings.

Use of batteries/alternators

NOTICE!



Damage to the control system due to improper handling

Disconnecting a battery from a control system that uses an alternator or battery-charging device whilst the charging device is still connected causes damage to the control system.

- Make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic discharge



- Protective equipment: ESD wrist band

NOTICE!

 **Damage from electrostatic discharge**

All electronic equipment sensitive to damage from electrostatic discharge, which can cause the control unit to malfunction or fail.

- To protect electronic components from static damage, take the precautions listed below.

1. ▷ Avoid build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as easily as synthetics.
2. ▷  Before working on terminals on the control unit, ground yourself by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.) to discharge any static electricity.
Alternatively wear an ESD wrist band connected to ground.
3. ▷  Before any maintenance work on the control unit, ground yourself by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.) to discharge any static electricity.
Alternatively wear an ESD wrist band connected to ground.
4. ▷ Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, etc.) away from the control unit, modules and work area.
5. ▷ Opening the control cover may void the unit warranty. Do not remove the printed circuit board (PCB) from the control cabinet unless instructed by this manual.

 If instructed by this manual to remove the PCB from the control cabinet, follow these precautions:

- Ensure that the device is completely voltage-free (all connectors have to be disconnected).
- Do not touch any part of the PCB except the edges.
- Do not touch the electrical conductors, connectors, or components with conductive devices or with bare hands.
- When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

 For additional information on how to prevent damage to electronic components caused by improper handling, read and observe the precautions in:

- "Woodward manual 82715, Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules".

1.3.3 Protective Equipment And Tools

Protective gear

Personal protective equipment serves to protect risks to the safety and health of persons as well as to protect delicate components during work.

Certain tasks presented in this manual require the personnel to wear protective equipment. Specific required equipment is listed in each individual set of instructions.

The cumulative required personal protective equipment is detailed below:

Protective equipment: ESD wrist band

The ESD (**e**lectro**s**tatic **d**ischarge) wrist band keeps the user's body set to ground potential. This measure protects sensitive electronic components from damage due to electrostatic discharge.

Tools

Use of the proper tools ensures successful and safe execution of tasks presented in this manual.

Specific required tools are listed in each individual set of instructions.

The cumulative required tools are detailed below:

1.3.4 Intended Use

This control unit has been designed and constructed solely for the intended use described in this manual.

The IKD-OUT-16 devices are designed to be installed on the back panel of a switch gear cabinet. The terminals are always located on the inner side of the housing.

This control unit must be used exclusively as extension of upper level control units.

- Intended use requires operation of the control unit within the specifications listed in [↳ “7.1 Technical Data”](#).
- Intended use also includes compliance with all instructions and safety notes presented in this manual.
- Any use which exceeds or differs from the intended use shall be considered improper use!
- No claims of any kind for damage will be entertained if such claims result from improper use.

2 System Overview

2.1 LEDs Indicate State

The IKD-OUT-16 indicates the state of the device via LEDs.

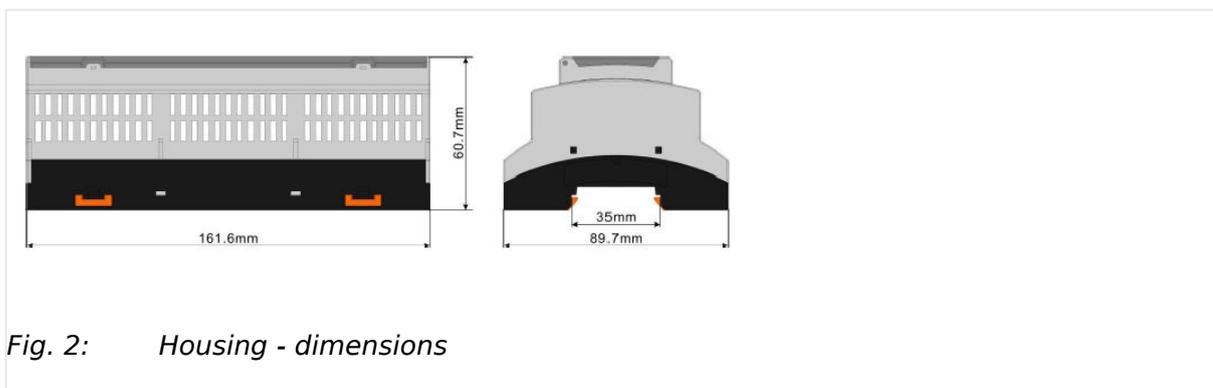
LED	Function
POWER	Device operation (CPU ok)

3 Installation

3.1 Mount Unit

The IKD-OUT-16 is a unit for DIN-rail/rear panel mounting.

Dimensions



3.2 Setup Connections

NOTICE!



Avoid electrostatic discharge!

Before working with terminals please read and follow the instructions of chapter [↗](#) “Electrostatic discharge”.

For CAN shielded cabling, no more than 25 mm wiring exposed without shield coverage are allowed at terminal plug side.

General notes

NOTICE!



Malfunctions due to literal use of example values

All technical data and ratings indicated in this chapter are merely listed as examples. Literal use of these values does not take into account all actual specifications of the control unit as delivered.

- For definite values please refer to chapter [↗](#) “7.1 Technical Data”.

Wire sizes



Field wiring shall be made with use of cables which have temperature rating not less than 90 °C.

3 Installation

3.2.1 Wiring Diagram

AWG	mm ²	AWG	mm ²	AWG	mm ²	AWG	mm ²	AWG	mm ²	AWG	mm ²
30	0.05	21	0.38	14	2.5	4	25	3/0	95	600MCM	300
28	0.08	20	0.5	12	4	2	35	4/0	120	750MCM	400
26	0.14	18	0.75	10	6	1	50	300MCM	150	1000MCM	500
24	0.25	17	1.0	8	10	1/0	55	350MCM	185		
22	0.34	16	1.5	6	16	2/0	70	500MCM	240		

Table 1: Conversion chart - wire sizes

3.2.1 Wiring Diagram



General recommendations

Ensure appropriate cable cross sections following the local standards and restrictions.

The maximum cable cross section of the terminal blocks is 2.5 mm².

For every type of signal lines like power supply, DO:

- Return line has to be close to forward signal line.
- Use cables instead of single wires.
 - In case of using single wires please do at least one twist per meter to keep wires together closely.

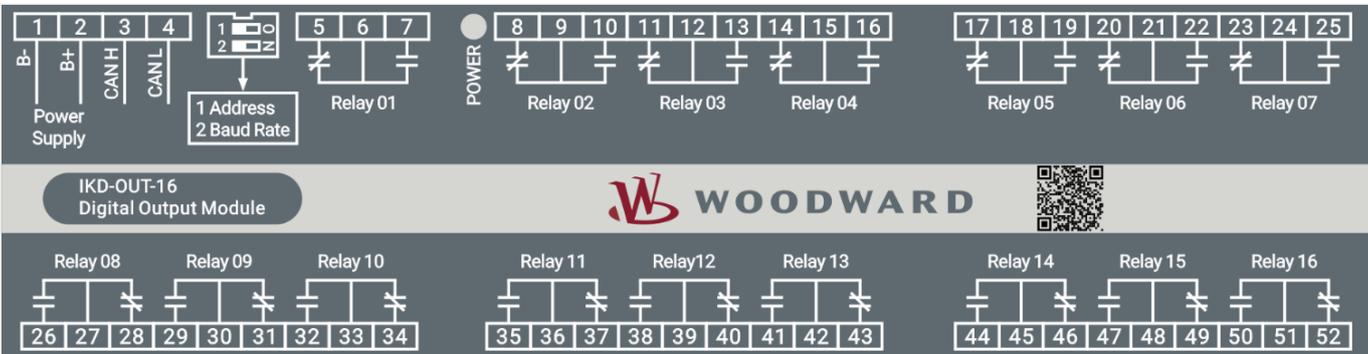


Fig. 3: Label/print IKD-OUT-16 wiring

3.2.2 CAN Bus Interfaces

NOTICE!



Avoid electrostatic discharge!

Before working with terminals please read and follow the instructions of chapter [“Electrostatic discharge”](#).

For CAN shielded cabling, no more than 25 mm wiring exposed without shield coverage are allowed at terminal plug side.



Avoid electrostatic discharge!

Avoid electrostatic discharge during cable connection to the unit.

Pin assignment

Terminal	Description	A _{max}
3	CAN-H	1.5 mm ²
4	CAN-L	1.5 mm ²

Topology



To terminate install a 120Ω terminal resistor between terminal CAN-H and CAN-L.

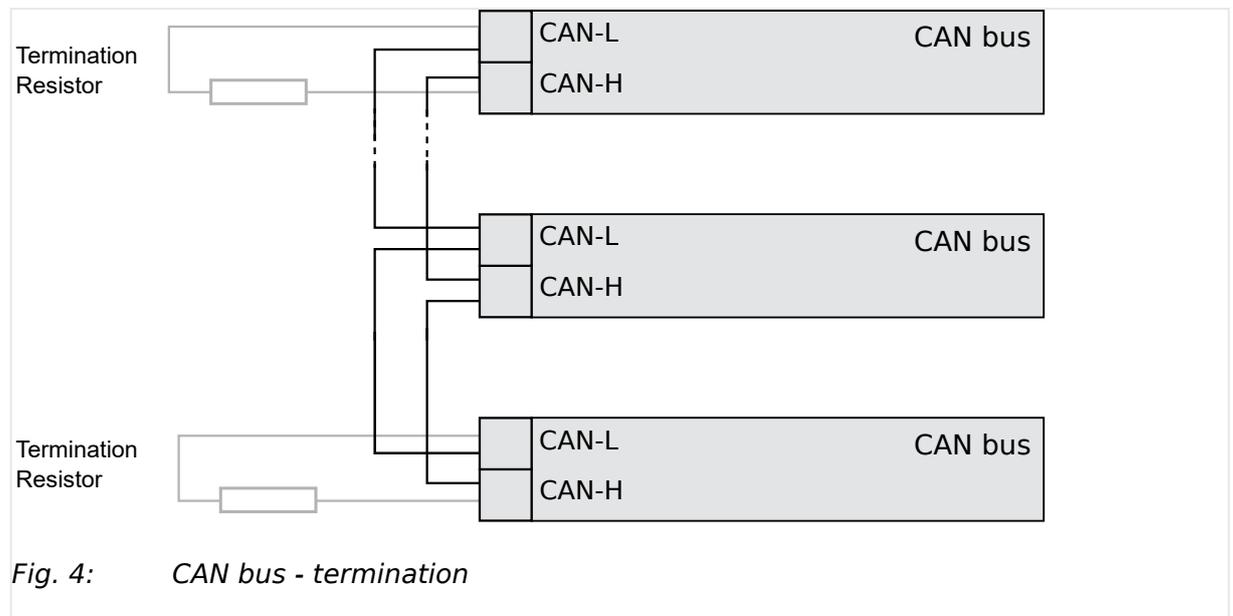


Fig. 4: CAN bus - termination

Maximum CAN bus length

The maximum length of the communication bus wiring is dependent on the configured baud rate. Observe the maximum bus length.

We recommend to use shielded cables.

(Source: CANopen; Holger Zeltwanger (Hrsg.); 2001 VDE VERLAG GMBH, Berlin und Offenbach; ISBN 3-8007-2448-0).

Baud rate	Max. length
250 kB	250 m
125 kB	500 m

i When the cable is too long, impedance 120 Ohm matching is required at the CAN transceiver to meet the communication quality, and the shielding layer of the shielded wire needs to be grounded.

Troubleshooting

i If there is no data transmission on the CAN bus, check for the following common CAN bus communication problems:

- A T-structure bus is utilized
- CAN-L and CAN-H are switched
- Not all devices on the bus are using identical baud rates
- Termination resistor(s) are not activated
- The configured baud rate is too high for wiring length
- The CAN bus cable is routed in close proximity with power cables

i Woodward recommends the use of shielded, twisted-pair cables for the CAN bus (see examples).

- Lappkabel Unitronic Bus CAN UL/CSA
- UNITRONIC-Bus LD 2×2×0.22

3.2.3 Digital Outputs

Schematic and terminals

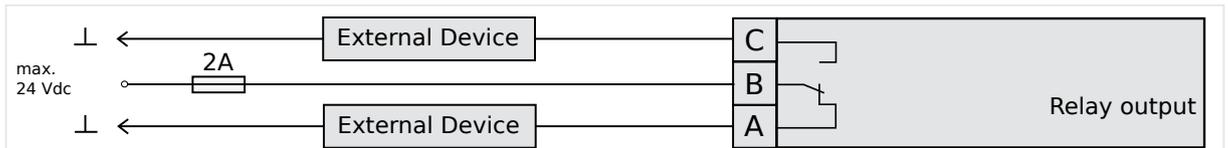


Fig. 5: Relay outputs - example

Terminal			Description
A	B	C	
N.C.	Root	N.O.	
5	6	7	Relay 01
8	9	10	Relay 02
11	12	13	Relay 03
14	15	16	Relay 04
17	18	19	Relay 05
20	21	22	Relay 06
23	24	25	Relay 07

Terminal			Description
A	B	C	
N.C.	Root	N.O.	
28	27	26	Relay 08
31	30	29	Relay 09
34	33	32	Relay 10
37	36	35	Relay 11
40	39	38	Relay 12
43	42	41	Relay 13
46	45	44	Relay 14
49	48	47	Relay 15
52	51	50	Relay 16

Avoid electrostatic discharge during cable connection to the unit.

3.2.4 Terminal Allocation

NOTICE!



Avoid electrostatic discharge!

Before working with terminals please read and follow the instructions of chapter [↪](#) "Electrostatic discharge".

For CAN shielded cabling, no more than 25 mm wiring exposed without shield coverage are allowed at terminal plug side.

The device terminals are allocated as follows:

The max. possible conductor cross-section of the terminals used is $A_{\max} = 2.5 \text{ mm}^2$!

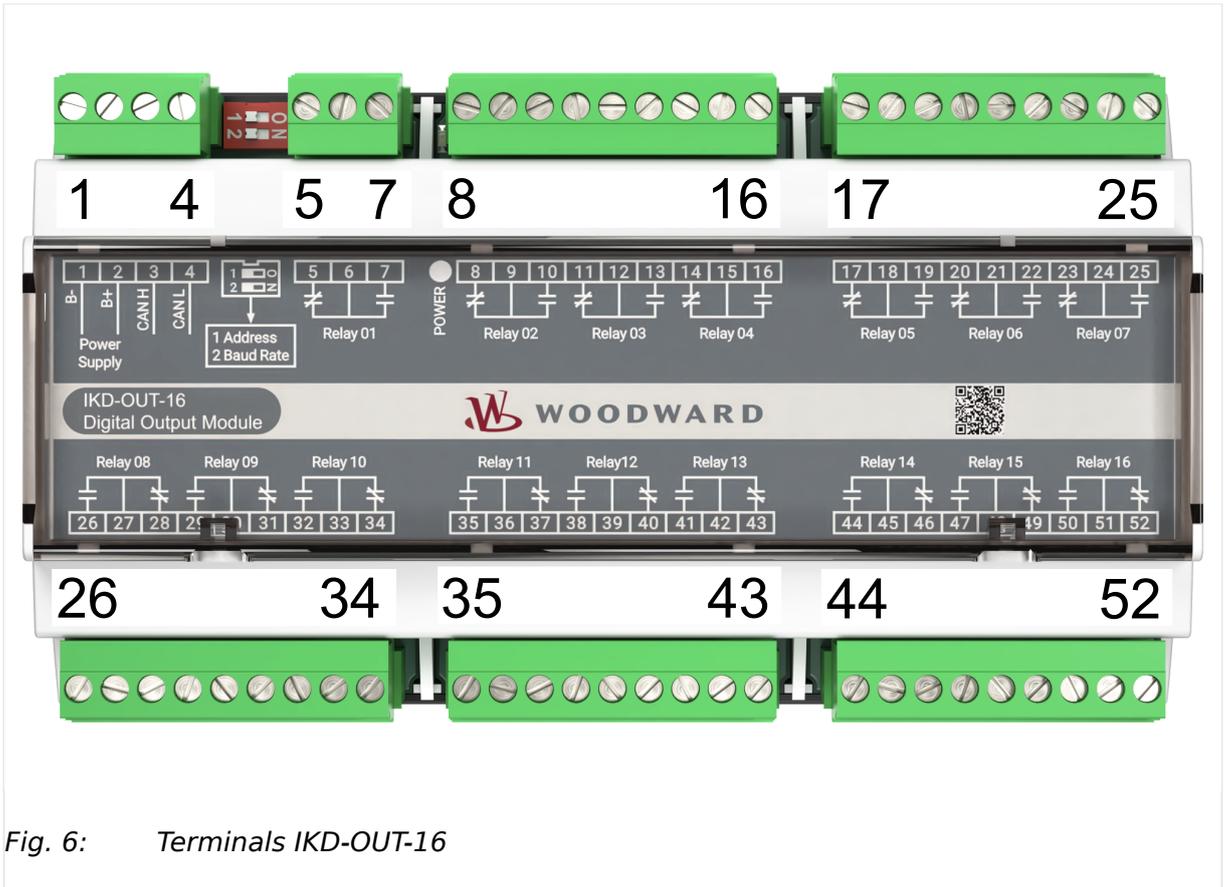


Fig. 6: Terminals IKD-OUT-16

3.2.5 Power Supply

General notes

WARNING!



Risk of electric shock - plastic housing

- The conductor providing the connection must have a wire larger than or equal to 2.5 mm² (14 AWG). The connection must be performed properly.

WARNING!



Risk of electric shock - sheet metal housing

- The conductor providing the connection must have a wire larger than or equal to 2.5 mm² (14 AWG). The cable length should be as short as possible.
- The connection must be performed properly.



Woodward strictly recommends to use a power supply that is fulfilling the SELV restrictions (SELV = separated or safety extra-low voltage, see IEC)



Woodward recommends to use one of the following slow-acting protective devices in the supply line to terminal 1:

- Fuse NEOZED D01 6A or equivalent **or**
 - Miniature Circuit Breaker 6A / Type C
- (for example: ABB type: S271C6 or equivalent)



Power ON

With power ON the IKD-OUT-16 device LED 'POWER' shows the device is working.

Schematic and terminals

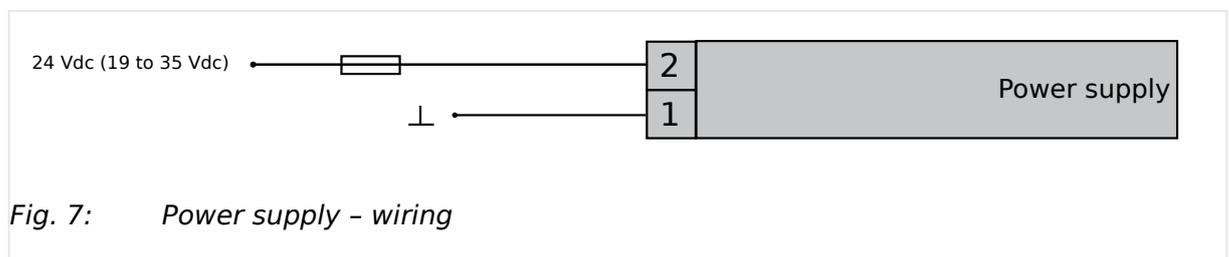


Fig. 7: Power supply - wiring

Terminal	Description
1	B- / 0 Vdc
2	B+ / 24Vdc (19 to 35.0 Vdc)

Table 2: Power supply - terminal assignment

Characteristics

Cranking (supply voltage drops):

The IKD-OUT-16 operates correctly only in the specified supply voltage range (19-35 Vdc).

In order to ensure correct function in the event of a supply voltage drop, e.g. during **cranking**, we recommend the use of an appropriate DC-DC converter. This must be selected in such a way that it keeps the supply voltage within the range during the expected voltage drops.

For voltage drops up to 12 V (9 V), the following DC-DC converters can be used for example:

- PHOENIX: QUINT4-PS/12-24DC/24DC/2.5/PT - 1066714 **or**
- PHOENIX: QUINT4-PS/12-24DC/24DC/1.3/PT - 1066716 **or**
- PHOENIX: QUINT4-PS/12-24DC/24DC/1.3/SC - 1066703 **or**
- PHOENIX: QUINT4-PS/12-24DC/24DC/2.5/SC - 1066718 **or**
- MEAN WELL: DDR - 15 G - 24



Refer to the corresponding data sheets.

4 Configuration

Module address

The module address is configured via DIP switch 1.

DIP Switch 1 position	Module number
OFF	1 (easYgen-3000XT channel 1-16)
ON	2 (easYgen-3000XT channel 17-32)

Baudrate

The CAN bus baudrate of the IKD-OUT-16 is configured via DIP switch 2.

DIP Switch 2 position	Baudrate
OFF	250 kB
ON	125 kB

5 Operation

5.1 Function of LEDs

The LEDs indicate the internal status of the module.

LED POWER

The LED is activated if the device is in operation (the CPU is ok).

5.2 Function of Relays

The Relays are controlled by the superior device.

Relay 01 to 16

A distinction between different control principles is made with the selection between operating (NO) and closed circuit current (NC) contact. An NO output can be used if a wire break can lead to no great alarm; the NC output performs advanced tasks e. g. for safety-relevant lines.



Refer to upper level controller manual eg. easYgen-3200XT (#37574) for configuration related to each DO.

6 Application Field

The IKD-OUT-16 is an expansion module that provides 16 digital / relay outputs that can be controlled by

- a higher level control unit (eg. easYgen-3000XT) **or**
- a PLC

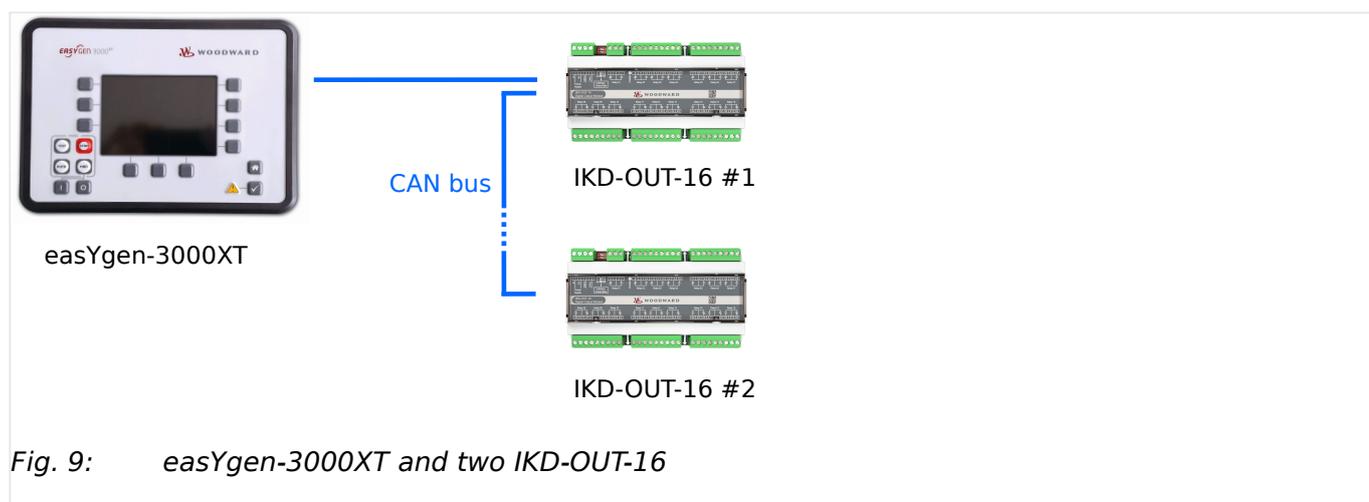
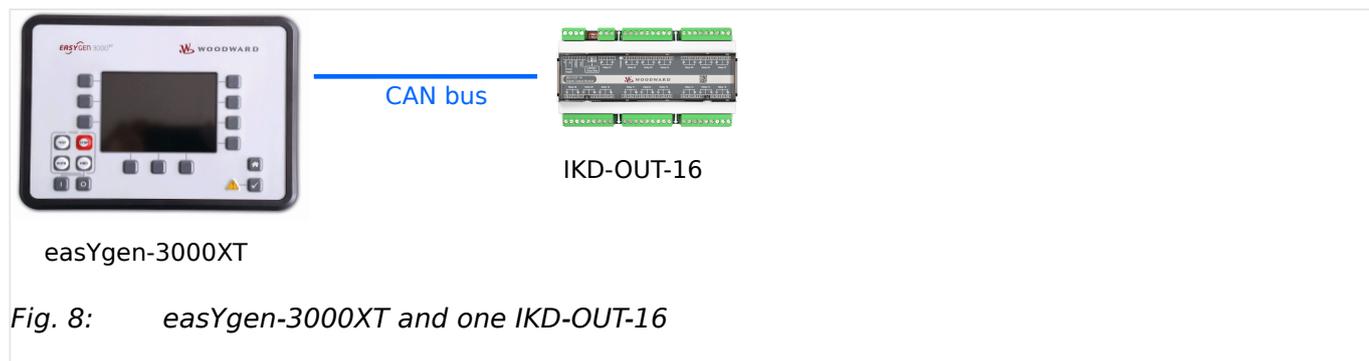
Coupling to a Higher Level Control Unit (e.g. easYgen-3000XT)

Output of signals to the relays that are received from the higher level control unit. For this feature it is possible to configure the relays of the IKD-OUT-16 using the LogicsManager of the higher level control unit.

Coupling to a PLC

Output of signals to the relays that are received from the PLC. For this feature the relays have to be controlled by the PLC. See Appendix (↳ [“8.1 CAN Messages”](#)) for according CAN Telegrams.

6.1 Overview of applications with easYgen-3000XT



6 Application Field

6.1 Overview of applications with easYgen-3000XT

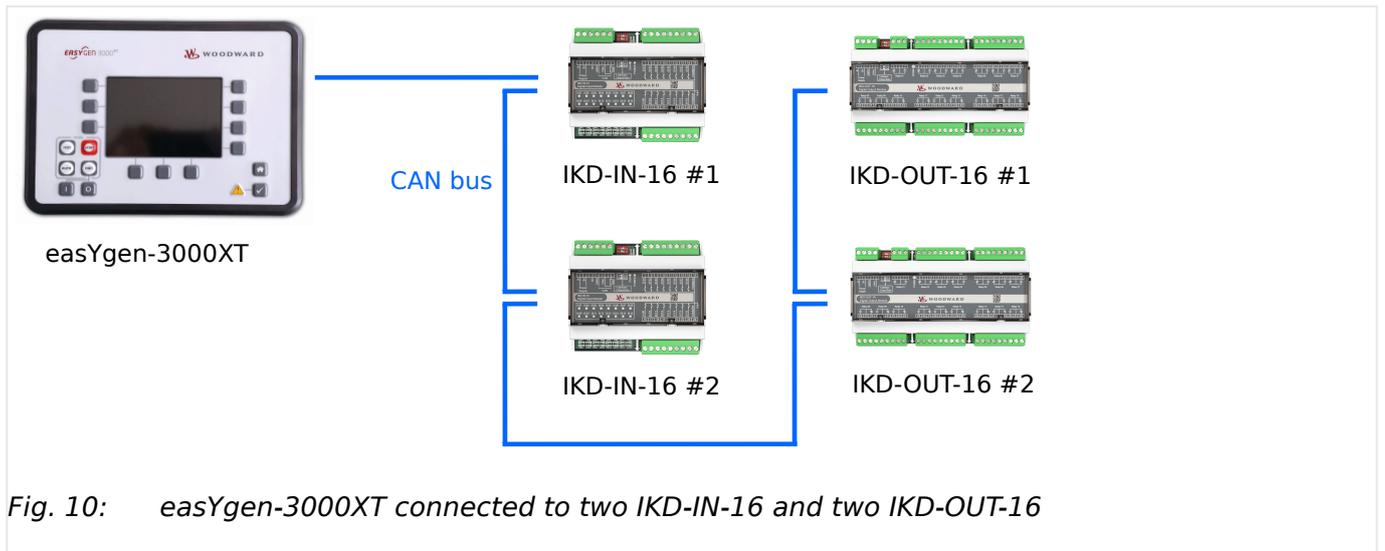


Fig. 10: easYgen-3000XT connected to two IKD-IN-16 and two IKD-OUT-16

7 Technical Specifications

7.1 Technical Data

Product label

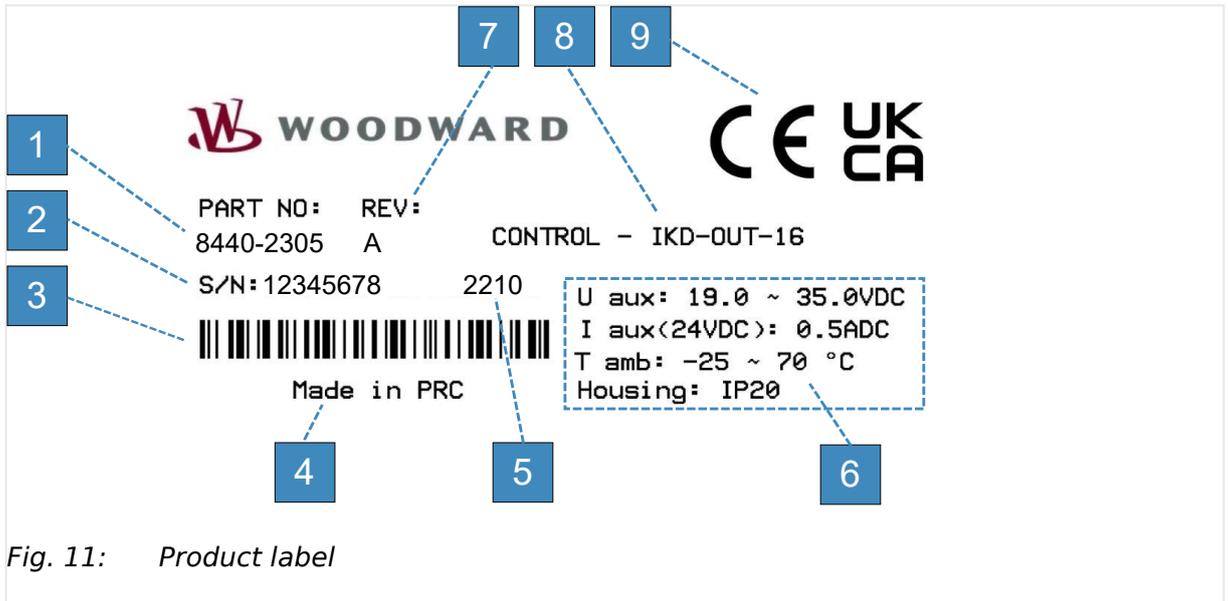


Fig. 11: Product label

Number	Name	Description
1	P/N	Item number
2	S/N	Serial number (numerical)
3	S/N	Serial number (barcode)
4	Address	Manufacturer
5	S/N	Date of production (year-month)
6	Details	Technical data
7	REV	Item revision number
8	Type Description	Description (product name)
9	Approval	Approvals

7.1.1 Ambient Variables

CAUTION!



Device Operating Voltage

Connect the unit only to a DC power source that complies with the safety extra-low voltage (SELV) requirements.

Power supply	24 V _{DC} (19 to 35.0 V _{DC}), SELV
Current consumption	I min : 22 mA (24V)

	I max : 460.8 mA (24V)
Intrinsic consumption	max. 5 W
Degree of pollution	2
Maximum elevation	3000 m
Reverse voltage protection (of power supply)	Yes

7.1.2 Outputs

Discrete outputs 'R xx' (relay outputs)

Discrete/relay outputs	Galvanically isolated
Contact material	AgSnO ₂
General purpose (GP) (V_{cont} , relays)	7A@28V _{DC}

7.1.3 Interfaces

CAN bus interface

CAN bus interface	Galvanically isolated 3.048 mm
Insulation voltage (continuously)	2500 V _{DC}
Version	CAN bus
Internal line termination	No (120 Ohm to be wired externally)

7.1.4 Housing

Housing type

Type	Plastic
Dimensions (W × H × D)	161.6 × 89.7 × 60.7 mm
Weight	approx. 600 g
Wiring	Screw-plug-terminals 2.5 mm ²
Recommended locked torque	4 inch pounds / 0.5 Nm. Use 90 °C copper wire or better. Use class 1 wire only or equivalent.

Protection

Protection system	IP20
-------------------	------

7.1.5 Approvals

Listings	CE UKCA UL/cUL pending
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7.2 Environmental Data

Vibration

Vibration test	5 Hz~8 Hz, amplitude ± 7.5 mm, fixed displacement, 3 cycles of vibration respectively for 14 min. 8 Hz~500 Hz, 2g fixed acceleration, three axial vibration respectively for 120 min. Number of sweep cycles: 10
Standards	GB/T2423.10

Shock

Shock	Half sine pulse, peak acceleration 20 g _n , pulse duration 16 ms, Number of impacts in three directions: 1000 \pm 10
Standards	GB/T2423.5

Temperature

Cold, Dry Heat (storage)	-30 °C (-22 °F) to 80 °C (176 °F)
Cold, Dry Heat (operating)	-25 °C (-13 °F) to 70 °C (158 °F)
Standards	GB/T 2423.1
	GB/T 2423.2

Humidity

Humidity	40 °C, 93% RH, 4 days
----------	-----------------------

8 Appendix

8.1 CAN Messages

8.1.1 DO module 1 (Dip switch 1 off)

DO 1-8 Receive message

ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
181h	MUX	Desired relay state						
	1	see details	0	0	0	0	0	0

Details to Byte 1:

	meaning
Bit 0 = 1	set relay 1
Bit 1 = 1	set relay 2
Bit 2 = 1	set relay 3
Bit 3 = 1	set relay 4
Bit 4 = 1	set relay 5
Bit 5 = 1	set relay 6
Bit 6 = 1	set relay 7
Bit 7 = 1	set relay 8

DO 9-16 Receive message

ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
182h	MUX	Desired relay state						
	1	see details	0	0	0	0	0	0

Details to Byte 1:

	meaning
Bit 0 = 1	set relay 9
Bit 1 = 1	set relay 10
Bit 2 = 1	set relay 11
Bit 3 = 1	set relay 12
Bit 4 = 1	set relay 13
Bit 5 = 1	set relay 14
Bit 6 = 1	set relay 15

	meaning
Bit 7 = 1	set relay 16

DO Send / Alive message

ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
209h	MUX	relay state 1	relay state 2					
	1	see details	see details	0	0	0	0	0

Details to Byte 1:

	meaning
Bit 0 = 1	state relay 1
Bit 1 = 1	state relay 2
Bit 2 = 1	state relay 3
Bit 3 = 1	state relay 4
Bit 4 = 1	state relay 5
Bit 5 = 1	state relay 6
Bit 6 = 1	state relay 7
Bit 7 = 1	state relay 8

Details to Byte 2:

	meaning
Bit 0 = 1	state relay 9
Bit 1 = 1	state relay 10
Bit 2 = 1	state relay 11
Bit 3 = 1	state relay 12
Bit 4 = 1	state relay 13
Bit 5 = 1	state relay 14
Bit 6 = 1	state relay 15
Bit 7 = 1	state relay 16

8.1.2 DO module 2 (Dip switch 1 on)**DO 1-8 Receive message (easYgen-3000XT channel 17-24)**

ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
183h	MUX	Desired relay state						
	1	see details	0	0	0	0	0	0

Details to Byte 1:

	meaning
Bit 0 = 1	set relay 1
Bit 1 = 1	set relay 2
Bit 2 = 1	set relay 3
Bit 3 = 1	set relay 4
Bit 4 = 1	set relay 5
Bit 5 = 1	set relay 6
Bit 6 = 1	set relay 7
Bit 7 = 1	set relay 8

DO 9-16 Receive message (easYgen-3000XT channel 25-32)

ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
184h	MUX	Desired relay state						
	1	see details	0	0	0	0	0	0

Details to Byte 1:

	meaning
Bit 0 = 1	set relay 9
Bit 1 = 1	set relay 10
Bit 2 = 1	set relay 11
Bit 3 = 1	set relay 12
Bit 4 = 1	set relay 13
Bit 5 = 1	set relay 14
Bit 6 = 1	set relay 15
Bit 7 = 1	set relay 16

DO Send / Alive message

ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
20Ah	MUX	relay state 1	relay state 2					
	1	see details	see details	0	0	0	0	0

Details to Byte 1:

	meaning
Bit 0 = 1	state relay 1
Bit 1 = 1	state relay 2
Bit 2 = 1	state relay 3

	meaning
Bit 3 = 1	state relay 4
Bit 4 = 1	state relay 5
Bit 5 = 1	state relay 6
Bit 6 = 1	state relay 7
Bit 7 = 1	state relay 8

Details to Byte 2:

	meaning
Bit 0 = 1	state relay 9
Bit 1 = 1	state relay 10
Bit 2 = 1	state relay 11
Bit 3 = 1	state relay 12
Bit 4 = 1	state relay 13
Bit 5 = 1	state relay 14
Bit 6 = 1	state relay 15
Bit 7 = 1	state relay 16

9 List Of Abbreviations

AC	Alternating current
AI	Analog input
AM	AnalogManager
AO	Analog output
BDEW	German community of 1,800 companies represented by the German Association of Energy and Water Industries (Bundesverband der Energie- und Wasserwirtschaft)
BMS	Battery management system
CL	Code Level
COB-ID	Communication Object Identifier (CAN)
CT	Current Transformer
DI	Discrete Input
DO	Discrete (Relay) Output
EG	Name of device 'easYgen'
HMI	Human Machine Interface e.g., a front panel with display and buttons for interaction
I	Current
LM	LogicsManager©
LSx	Name of a device LS-5 or LS-6XT
NW	Network
P	Active power
P/N	Part Number
PDO	Process Data Object (CAN)
PLC	Programmable Logic Control
PT	Potential (Voltage) Transformer
PV	Photovoltaic
SAE	Society of Automotive Engineers (defines J1939 CAN protocol standard)
SDO	Service Data Object (CAN)
S/N	Serial Number
SNTP	Simple Network Time Protocol
V	Voltage
W	Unit of active power (P). Often also as kW
Wb	Wire break

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