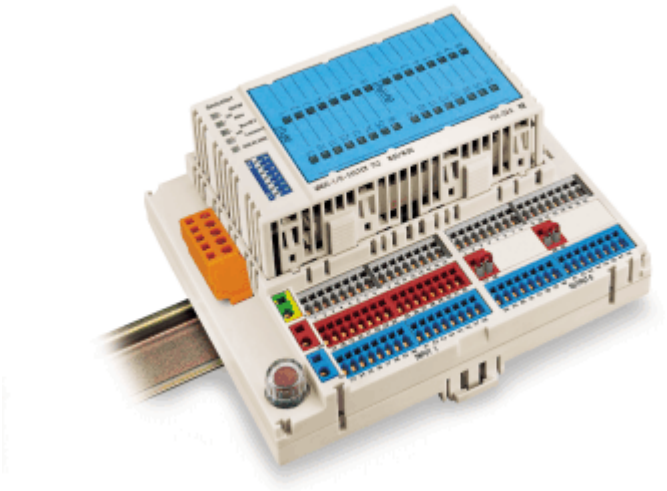
WAGO I/O SYSTEM 752

Fieldbus Dependent I/O Module

DeviceNet



Manual

Technical Description,
Installation and
Configuration

752-125/000-002
Version 1.0.0

WAGO®
INNOVATIVE CONNECTIONS

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Every conceivable measure has been taken to ensure the correctness and completeness of this documentation. However, as errors can never be fully excluded we would appreciate any information or ideas at any time.

We expressively point out that the software and hardware designations and brand names of individual companies used in this manual are subject to general trade name, trademark or patent protection.

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1 Important Explanations

To allow the user fast installation and commissioning of the units described in this manual it is necessary to attentively read and observe the following notes and explanations.

1.1 Legal Basis

1.1.1 Copyright

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1.1.2 Personnel Qualification

The use of the product described in this manual is solely intended for qualified persons trained in PLC programming, qualified electricians or persons instructed by qualified electricians who are also familiar with the applicable standards and directives. WAGO Kontakttechnik declines all liability for faulty operation and damages to WAGO products and products from other suppliers resulting from non-observance of the information contained in this manual.

1.1.3 Intended Use

For the individual application, the components are supplied with a defined hardware and software configuration. Changes are only admitted within the framework of the possibilities documented in the manuals. All other changes to the hardware or software and any use of the components other than that intended entail the exclusion of liability on part of WAGO Kontakttechnik GmbH.

Please contact WAGO Kontakttechnik GmbH for any wishes in terms of a modified or a new hardware or software configuration.

1.2 Scope of Validity

This manual describes the fieldbus dependent I/O module of the WAGO-I/O-SYSTEM 752 for the DeviceNet.

Components	Article No.
Electronic module Base module	752-326 752-826

1.3 Symbols

Warning
Observe this information in all cases to protect the system from damage.

Attention
Marginal conditions to be observed in all cases to ensure a troublefree operation.

ESD (Electrostatic Discharge)
Warning of danger to the components by electrostatic discharge. Precautionary measure when handling components subject to electrostatic discharges.

Note
Routines or advice for an efficient use of the unit and for software optimisation.

Further information
Reference to additional literature, manuals, data sheets and INTERNET pages.

1.4 Abbreviations

CAN	Controller Area Network
DIP	1. Dual In-line Package 2. Discrete Input Point Object
DIx	Digital input „x“ (Discret Input)
DOP	Discrete Output Point Object
DOx	Digital output „x“ (Discret Output)
DSx	Diagnostic status for the output group „x“
EDS	Electronic Data Sheets
I/O	Input / Output
ISO/ OSI	International Organization for Standardization / Open Systems Interconnection (model)
MAC ID	Address
MS	Module Status
NS	Network Status
PCB	Printed Circuit Board
PLC	Programmable Logical Control

2 System Description

The WAGO-I/O-SYSTEM 752 for DeviceNet is part of the compact series of WAGO field bus nodes for distributed automation. It has a fixed number of digital inputs (DI) and digital outputs (DO) and transmits the signals to a higher ranking control system via DeviceNet.

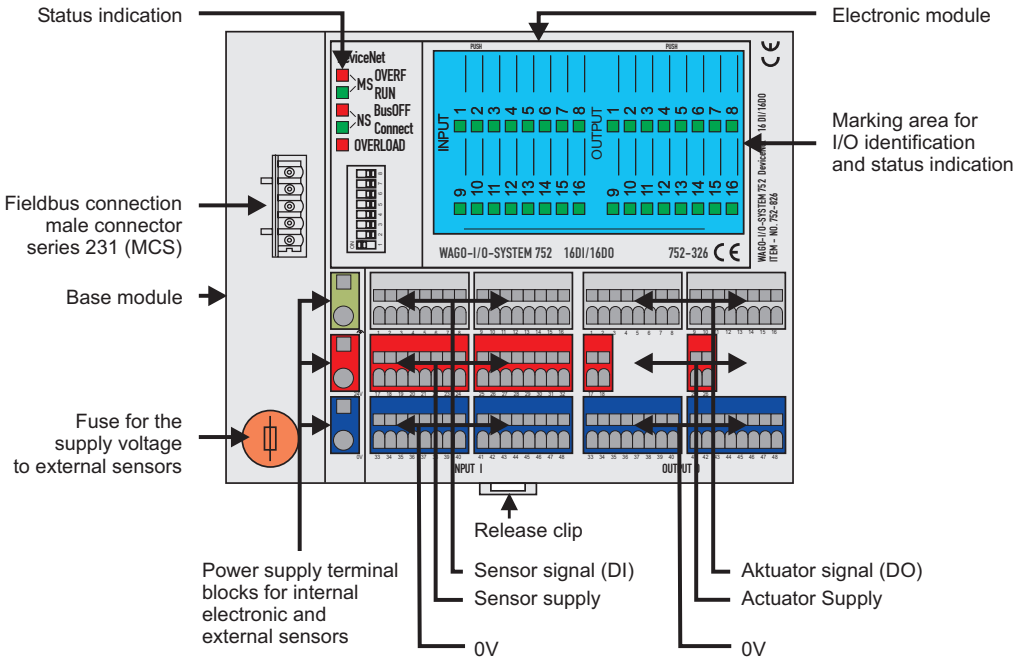

Fig. 2-1: I/O module for DeviceNet g1x2601e

The fieldbus dependent I/O module consists of

- the **base module** allows prewiring of the fieldbus, power supply, and sensor/actuator connections.
- the plug-in **electronic module** contains the processing unit, the fieldbus interface module, and the input and output circuits.

The electronic and base modules are supplied separately packed.

2.1 Base Module

The base module is the interface for all external wiring, including the fieldbus, power supply, and sensor/actuator connections. A multi-conductor connector links the external wiring to the plug-in electronic module.

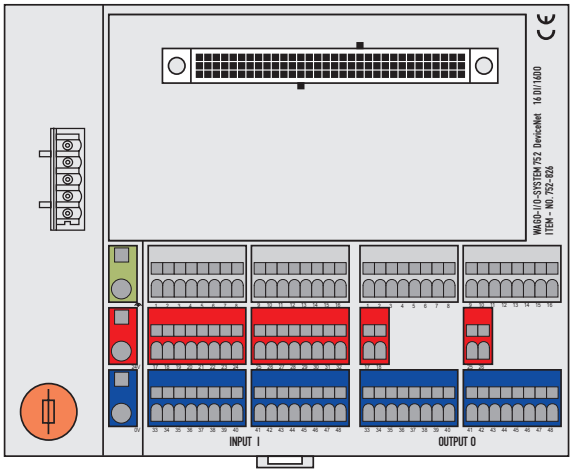

Fig. 2-2: Base Module g1x2606x

- Fieldbus connection, 5 pole Open Style
- Module power supply,
  terminal block with CAGE CLAMP® 2.5 mm² connection
- Sensor connection,
  3 conductors, terminal block with CAGE CLAMP® 1.5 mm² connection
- Actuator connection,
  2 conductors, terminal block with CAGE CLAMP® 1.5 mm² connection
- Separate output supply voltage,
  terminal block with CAGE CLAMP® 1.5 mm² connection
- Fuse holder with protective cap for input supply voltage fuse.
- Clear labeling of the connection group (INPUT or OUTPUT) and each individual terminal block (numbered)
- Wiring can be performed independent of the plug-in electronic module.

2.2 Electronic Module

The plug-in electronic module includes all electronic circuits, i. e. the power pack, the electrically isolated fieldbus interface module, the processing unit, the input and output circuits, and their corresponding status indicators.

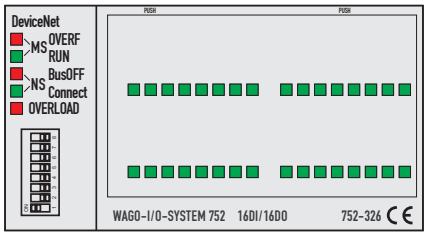

Fig. 2-3: Electronic Module g1x2607x

- Plug-in design provides easily installation into the base module.
- If a replacement of the electronic module is necessary, the wiring remains undisturbed.
- Status indicators for fast diagnostics.

The electronic module includes a marking label for input/output identification.

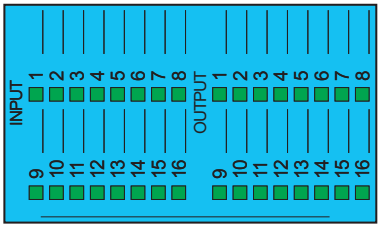

Fig. 2-4: Marking label g1x2608x

Text can be added to the marking label using a permanent felt tip pen (order no. 210-110), or can be labeled by means of a plotter or a laser printer. The WAGO SCRIPT marking system has templates available for easy and professional customization of marking labels.

3 Technical Data

DeviceNet System data	
Number of nodes	64 with scanner
Max. no. I /O points	approx. 6000 (depends on master)
Transmission medium	remote bus: Thick Cable (see appendix) stub cable: Thin Cable (see appendix)
Max. length of fieldbus segment	100 m ... 500 m (depends on baud rate /on the cable)
Baud rate	125 kBaud, 250 kBaud, 500 kBaud
Buscoupler connection	5-pole male connector, series 231 (MCS) connector 231-305/010-000/050-000 is included

Supply	
Supply voltage	DC 24 V (– 15 % / + 20 %)
Current input via – device supply – CAN interface	 < 120 mA at 24 V (no load connected) < 110 mA at 12 V
Total loss of power	< 4,5 W
Fuse F1 for sensor supply	TR5 250 V / 6,3A T **Note:** Use UL-Recognized fuse only

General information	
Dimensions W x H x L	(155 x 129 x 60*) mm
Gehäusewerkstoff	Polycarbonat
Befestigung	Schnappbefestigung auf Tragschiene (TS 35) EN 50022-35
Einbaulage	Senkrecht und waagerecht
Gewicht	ca. 500 g

*) ab Oberkante Tragschiene TS35

Wire connection	
Power supply	CAGE CLAMP® 0.08 mm² ... 2.5 mm², AWG 28-12*
Sensors, actuators	CAGE CLAMP® 0.08 mm² ... 1.5 mm², AWG 28-16
Supply voltage for outputs (8 circuit group)	CAGE CLAMP® 0.08 mm² ... 1.5 mm², AWG 28-16

* AWG12: THHN, TWHN

Inputs	
Number of inputs	16
Input	in accordance with EN 61131-2, type 1
Wire connection	for 3 conductors
Signal voltage (0)	DC –3 V ... +5 V
Signal voltage (1)	DC 15 V ... 30 V
Time constant	5 ms
Insulation electronics/field side	none

Outputs	
Number of outputs	16
Rated voltage	DC 24 V
Rated current – max. per output – max. per group (8 outputs) – max. per module 16 DO	 500 mA 4 A 8 A
Leakage current	< 2 mA
Short circuit protection	electronic, automatic restart
Max. operating frequency (without bus) – resistive load – inductive load	 1 kHz utilization category DC 13, equals 6 Hz
Insulation electronics/field side	none
Diagnosis	Short circuit display by LED (OVERLOAD) for the entire module; signalling via bus for 4 outputs each
Feeding	• all through supply terminal blocks 24 V, 0 V, ⏚ • in groups via supply terminal blocks for 8 outputs each

Degree of Protection	
Degree of protection according to EN 60 529	IP 20 protection against physical contact with standard test probes

Conformity and Certification	
Conformity labelling	CE
UL	E175199, UL 508

Climatic Environmental Conditions	
Operating temperature	0 °C ... 55 °C
Storage temperature	-25 °C ... +70 °C
Relative air humidity	10 ... 45 % , no dew formation
Air pressure in operation	86 ... 106 hPa
Maximum altitude	max. 2000 m above sea level
Strain by harmful substances	Inspection according to IEC 60068-2-42 and IEC 60068-2-43
Special conditions	Exercise caution when subjecting the I/O modules to the following conditions: – dust, corrosive vapors or gasses – ionized radiation.

Mechanical Strength	
Vibration	According to IEC 60068-2-6, inspection Fc 10 ... 57 Hz constant amplitude 0.075 mm 57 ... 150 Hz constant acceleration 1 g
Impact	According to IEC 60068- 2-27; 15 g, 11 ms

Electrical Safety	
Reverse voltage protection	Yes
Air and creepage distances	According to DIN EN 61131-2 and DIN EN 50178 between current circuits and body as well as between electrically isolated, separate current circuits, according to over-voltage category II, degree of pollution 2
Isolation	Yes, between fieldbus and internal electronics
Test voltage	DC 500 V

Electromagnetic Compatibility			
Interference Resistance according to EN50082-2 : 1995			
EN 61000-4-2	4kV/8kV	(2/4)	B
EN 61000-4-3	10V/m 80% AM	(3)	A
EN 61000-4-4	2kV	(3/4)	B
EN 61000-4-6	10V/m 80% AM	(3)	A
Interference emission according to EN50081-2 : 1994			
EN 55011	30 dBµV/m	(30 m)	
	37 dBµV/m		

Dimensions / Distances

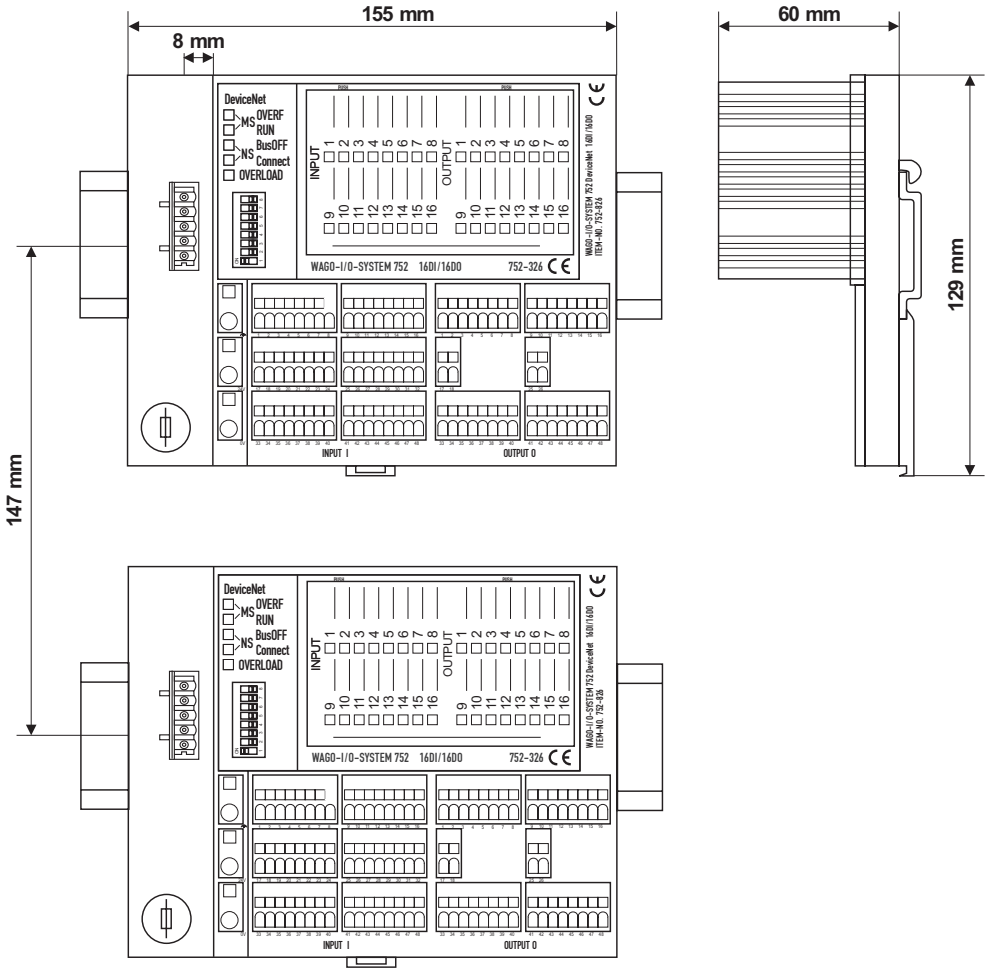

Fig. 3-1: Dimensions g1x2610x

Distances to building walls	
RH / LH:	0 mm
Top:	20 mm
Bottom:	20 mm
Front:	0 mm when fitted 150 mm fitting space

Attention
The distances between I/O module(s) and building walls have to be observed in order to guarantee sufficient ventilation.

4 Installation

4.1 Mechanical Installation

4.1.1 Snapping on / Detaching the Base Module

The WAGO-I/O-SYSTEM 752 is intended for mounting on a TS35 type carrier rail. The base module snaps onto the carrier rail.

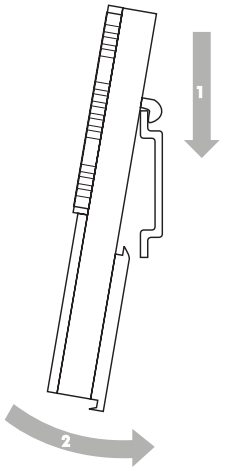

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Fig. 4-1: Snapping the base module onto the carrier rail g1xxx08x

The module can be detached from the carrier rail by releasing the latch using a suitable tool (screw driver).

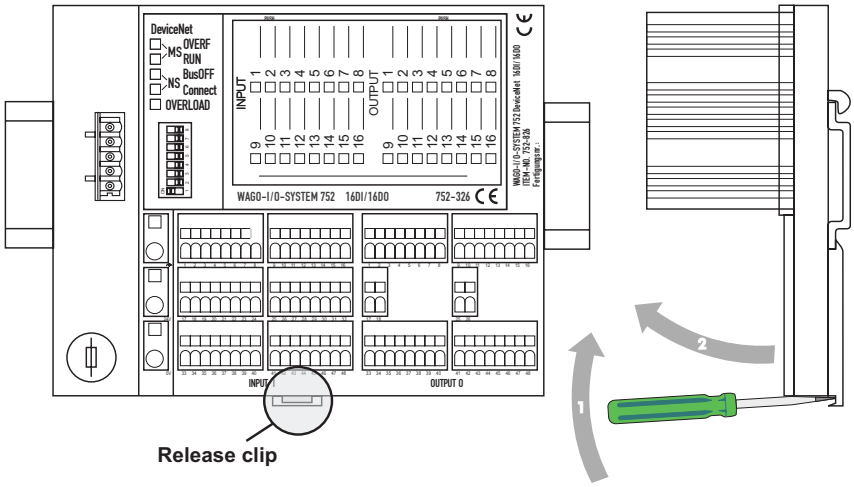


Fig. 4-2: Detachment of the I/O module from the carrier rail g1x2611e

4.1.2 Insertion/Extraction of the Electronic Module

The electronic module is plugged onto the base module.

Attention
Remove power from the base module before installing the electronic module.

Apply force at the positions marked “PUSH” when plugging in the electronic module.

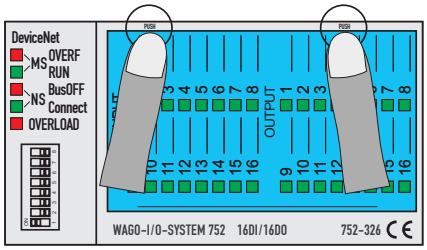


Fig. 4-3: Plugging in the electronic module g1x2602x

The electronic module is correctly inserted when all four latches have engaged.

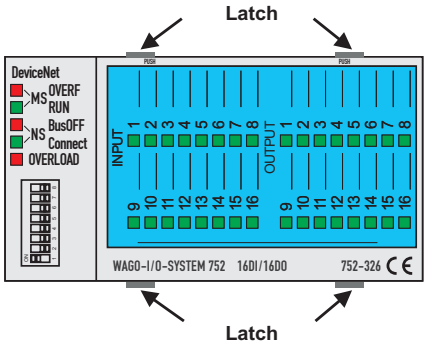


Fig. 4-4: Extracting the electronic module g1x2603e

The electronic module can be extracted by pressing the 4 latches and simultaneously pulling it from the base module.

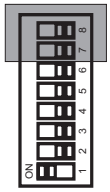
4.1.3 Marking Label

The plastic marking label can be removed from the mounting points by applying slight finger force. To accomplish this, slide the label from one side such that the label bends.

Insert the label by proceeding in the reverse order.

4.1.4 Baud rate

The baud rate can be set with DIP7 and DIP8.



Baud rate	DIP7	DIP8
125 kBaud*)	OFF	OFF
250 kBaud	ON	OFF
500 kBaud	OFF	ON
not allowed	ON	ON

*) Default

Fig. 4-5: DIP switch, Baud rate g1x2812x

4.1.5 MAC ID

The MAC-ID is set with the DIP switches 1 to 6 on the electronic module, switch 1 being the lowest value bit 2^0 and switch 6 the highest value bit 2^5. In switch position ON the bit is set. The MAC ID can be set within the range from 0 to 63.

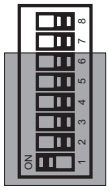


Fig. 4-6: DIP switch, MAC ID g1x2813x

MAC ID	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6
1*)	ON	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF
...						
63	ON	ON	ON	ON	ON	ON

*) Default

The I/O module load the setting of the MAC ID after power-on (initialization). Changing the switches have no effect during operation.

4.2 Electrical Installation

4.2.1 General

ESD (Electrostatic Discharge)
The components are equipped with electronic components susceptible to be destroyed when exposed to electrostatic load. Therefore, when handling these components, ensure proper grounding of the surrounding objects and persons (workplace, packing). Avoid contact with electrically conductive components, e. g. the pins of a plug.

All connecting terminal blocks for the supply voltages and sensor and actuator connections are equipped with CAGE CLAMP® connectors.

These CAGE CLAMP® connectors are suitable for fine-stranded and solid conductors. When using ferrules, select the next smaller nominal cross section for the conductor.

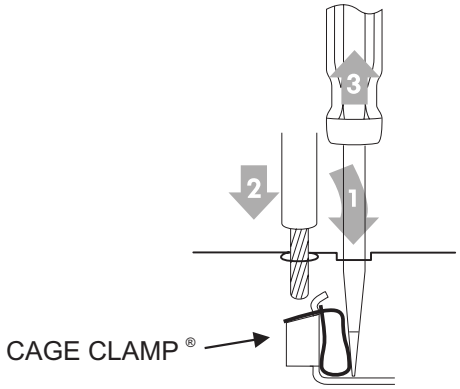


Fig. 4-7: How to operate the CAGE CLAMP®

g1xxx10x

The WAGO-I/O-SYSTEM 752 requires a 24 V DC supply.

The sensors supply voltage is short circuit protected by means of the plug-in fuse F1 (TR 5 / 250 V / 6.3A T).

Note
Use UL-Recognized fuse only

The supply voltage for the outputs can be fed through the module, or sourced separately.

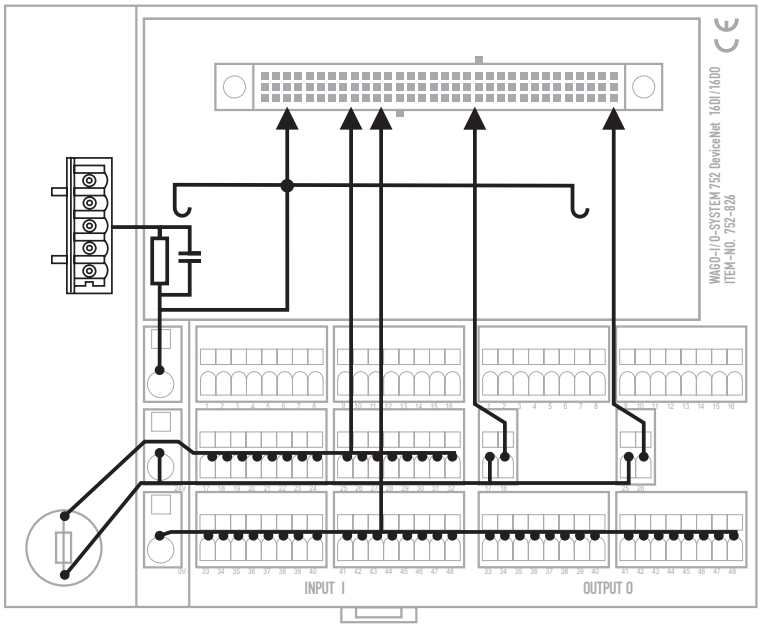


Fig. 4-8: Power supply g1x2600x

Two carrier rail contacts are provided on the underside of the base module to ensure electrical contact between the grounded carrier rail and the I/O module. The contacts are directly connected to the ⏚ terminal block.

Attention
Ensure that solid contact is made between the carrier rail contacts on the underside of the base module and the carrier rail itself.
The carrier rail must be grounded.

4.2.2 Connection of the Module Supply Voltage

The connection of the module supply voltage and earth ground is made on terminal blocks carrying the following labeling:

- 24 V (red terminal block)
- 0 V (blue terminal block)
- ⏚ (green terminal block)

Connection of earth ground to the base module's ground terminal is required for reliable module operation.

4.2.3 Connection of the Input Signals

The input signal connection group is identified by the imprint “INPUT” on the base module. Three terminals are available for each digital input. The terminals for one input are shown superimposed.

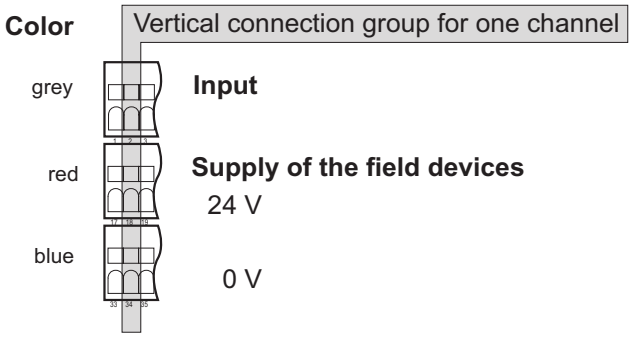


Fig. 4-9: Connection of the Input Signals g1xxx03e

2-conductor sensors, e. g. switches, are connected to the grey and red terminal blocks.

3-conductor sensors receive their 24 VDC supply voltage through the connection to the red and the blue terminal blocks. The output signal of the 3-conductor sensor is connected to the grey terminal block.

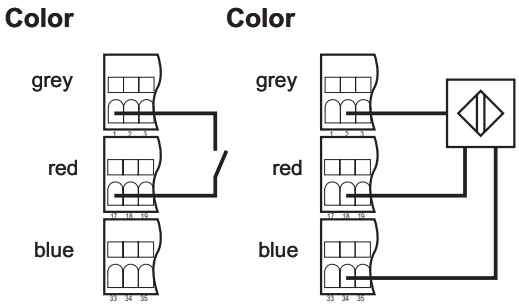


Fig. 4-10: Examples of a sensor connection g1xxx04e

4.2.4 Connection of the Output Supply Voltage

The supply voltage for the two output groups of 8 connections each can be provided either internally using the supply voltage for the module, or externally from a separate power source. The base modules are provided with two sets of terminal blocks in the middle row of the output terminals. The left-hand terminal of each set carries the 24VDC module power, while the right-hand terminal provides a connection point for the output supply voltage.

The base modules are shipped with jumpers installed in each of these terminals, connecting 24VDC module power to connection point for the output supply voltage.

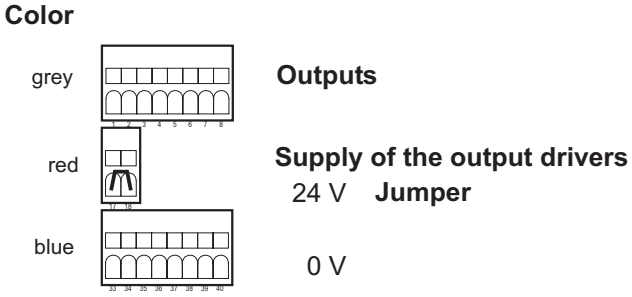


Fig. 4-11: Output supply voltage, internal g1xxx05e

The factory-installed jumper has to be removed when a separate power supply for a group of 8 digital outputs is required. The separately fused or switchable power supply is connected to the right-hand connection point.

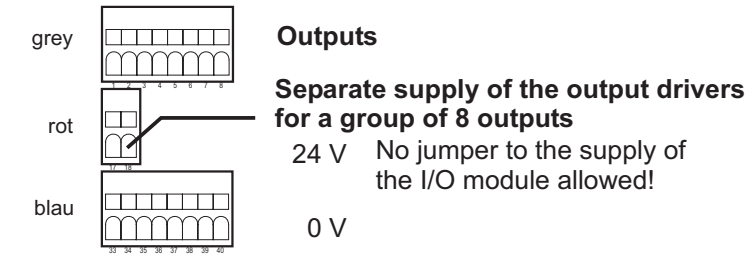


Fig. 4-12: Output supply voltage, separate g1xxx06e

Attention
When providing a separate output supply voltage to a group of 8 outputs, the supply voltage common must be terminated on the base module using the 0 V potential of the WAGO-I/O-SYSTEM 752 (blue terminal block).

The entire current load is applied to the common terminal connection. If more than 6 Amps is applied to the common terminals, separate terminal blocks should be used. Connect all common connections to the terminal blocks, and then connect the 752 common to the terminal blocks. This row of terminal blocks will be wired back to the source common of the supply potential.

4.2.5 Connection of the Output Signals

The output signal terminals are identified by the imprint “OUTPUT” on the base module.

Two terminals are available for each digital output. The terminals for one output are shown superimposed.

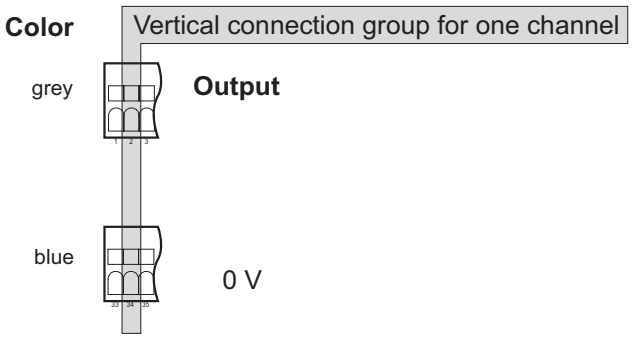


Fig. 4-13: Actuator connection g1xxx07e

The positive connection of an actuator is wired to the grey output terminal block. The negative connection of an actuator is wired to the blue output terminal block.

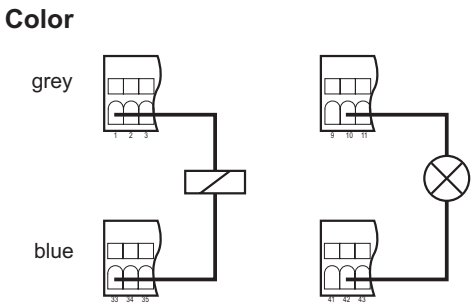


Fig. 4-14: Examples of an actuator connection g1xxx09e

4.2.6 Connection of the Fieldbus Interface

The WAGO-I/O-SYSTEM 752 for DeviceNet is provided with a 5 pole male connector for interfacing to the DeviceNet network. The mating plug is a Open Style Connector.

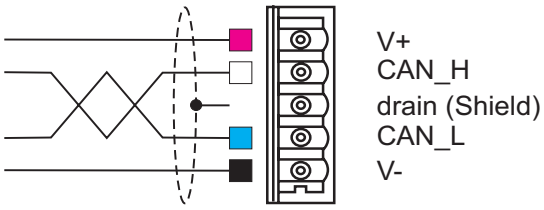


Fig. 4-15: Connection design g1x2614e

The color coding of the wires is defined in the DeviceNet specification.

PIN	Signal	color coding	Signal desciption
1	V+	red P.M.S #207C	11... 25 V
2	CAN_H	white EIA 395A	CAN High
3	drain		Shield
4	CAN_L	blue P.M.S #297C	CAN Low
5	V-	black P.M.S #426C	0 V

The Open-Style Connector 231-305/010-000/050-000 from the WAGO *MULTI CONNECTION SYSTEM* is included. The Connector has gold plated contacts and printed signal marking at the cantact location.

For the connection of smaller cross-sections an insulation stop of series 231-670 (white 0.08 - 0.2mm), 231-671 (light gray 0.25 - 0,5mm) or 231-672 (dark gray 0.75 -1mm) should be used. The marking of the connectors can be made with 210-312. Additionally, housing parts, test plugs with cable and male connectors for cable extensions are available from the MCS series (pin spacing 5.08 mm / 0.200 in). Please contact your local WAGO office or distributor for further information on the MCS series.

Attention
The bus cable must be terminated with a resistor (121 Ω / ±1% / ¼ W). The resistor is contacted with CAN_H and CAN_L.

4.2.7 Cabling of the Fieldbus

4.2.7.1 Topology

DeviceNet build the connection of the node via trunk line and drop lines.

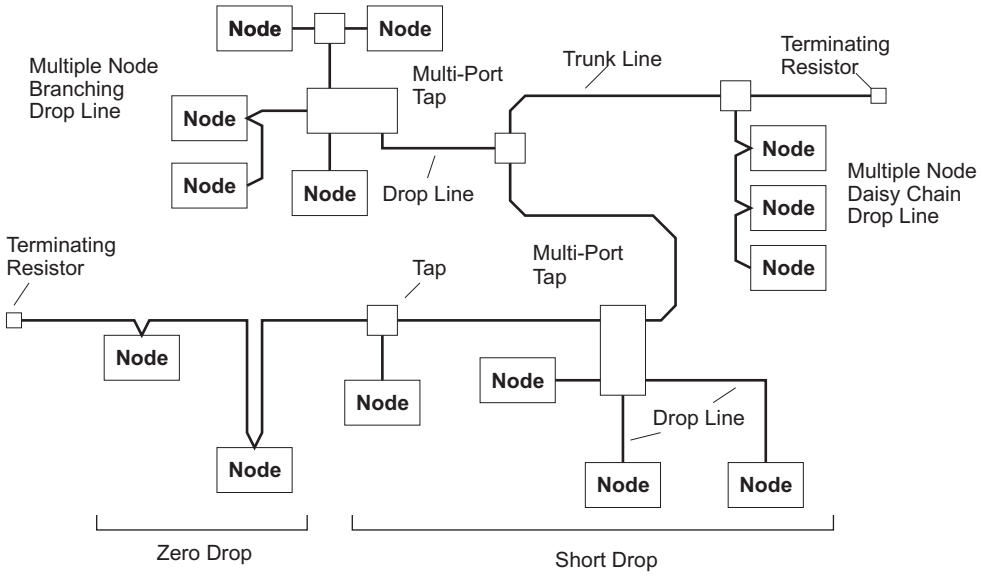


Fig. 4-16: Topology

g1x2615e

4.2.7.2 Trunk Line

The topology has a linear bus topology. Terminating resistors (120 ohm) are required on each end of the trunk line.

4.2.7.3 Drop Line

Drop lines allowing one or more nodes to be attached. DeviceNet allows branching structures only on the drop line. The length of each drop line can be 6 m (20 feet), measured from the branch to the note. The total lenght depends on the baud rate and the type of the cable.

4.2.7.4 Types of cables

The DeviceNet specification distinguish two types of cables:

- Thick Cable
  The Thick Cable is used for long distance remote bus cables or for applications with rigid drop cables. It is made of two screened twisted pair cables with a wire running in the cable center, with an additional external screening.
  The blue and white twisted pair cable will be used for the signal transmission, the black and the red cable for the supply voltage.

- Thin Cable
  The Thin Cable is of a higher flexibility and thereby allows easier routing for drop cables. It can also be used as remote bus cable for shorter distances. The configuration of the individual cables is made analog to the Thick Cable.

Attention
If possible, route the data line separated from all power cables.

Further Information
You will find the detailed specification to the cables in the appendix and in the INTERNET
http://www.odva.org

4.2.7.5 WAGO Multi-Port DeviceNet Tap

WAGO Kontakttechnik GmbH have developed a Multi-Port DeviceNet Tap to connect the nodes permitting the connection of remote bus cables and drop cables by means of the CAGE CLAMP® technique. As a result, a safer, quicker and more vibration and corrosion resistant connection is achieved.

The DeviceNet Taps are available in 2 designs.

Article	Description
810-900/000-001	Closed design allowing the connection of 6 conductors, the housing providing a protection in difficult environmental conditions.
810-901/000-001	Open design permitting the connection of 2 drop cables and 2 remote bus cables.

4.2.8 Network example

The minimum network consists of a scanner, a node, two termination resistors and a power supply.

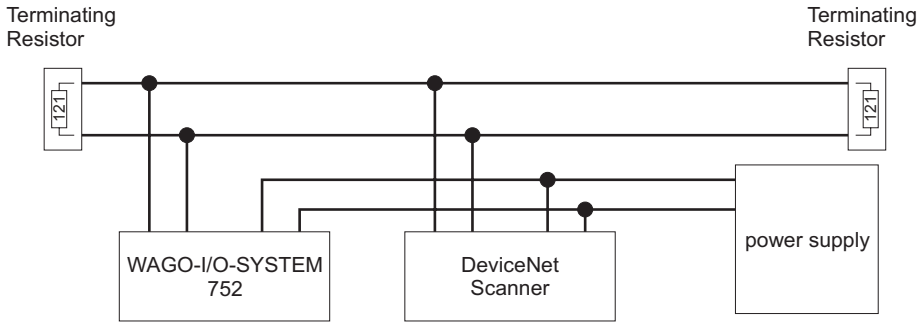


Fig. 4-17: Network example

g1x2616e

5 Schematic Circuit Diagram

A basic representation of the input, output and supply circuitry are shown in the schematic circuit diagram.

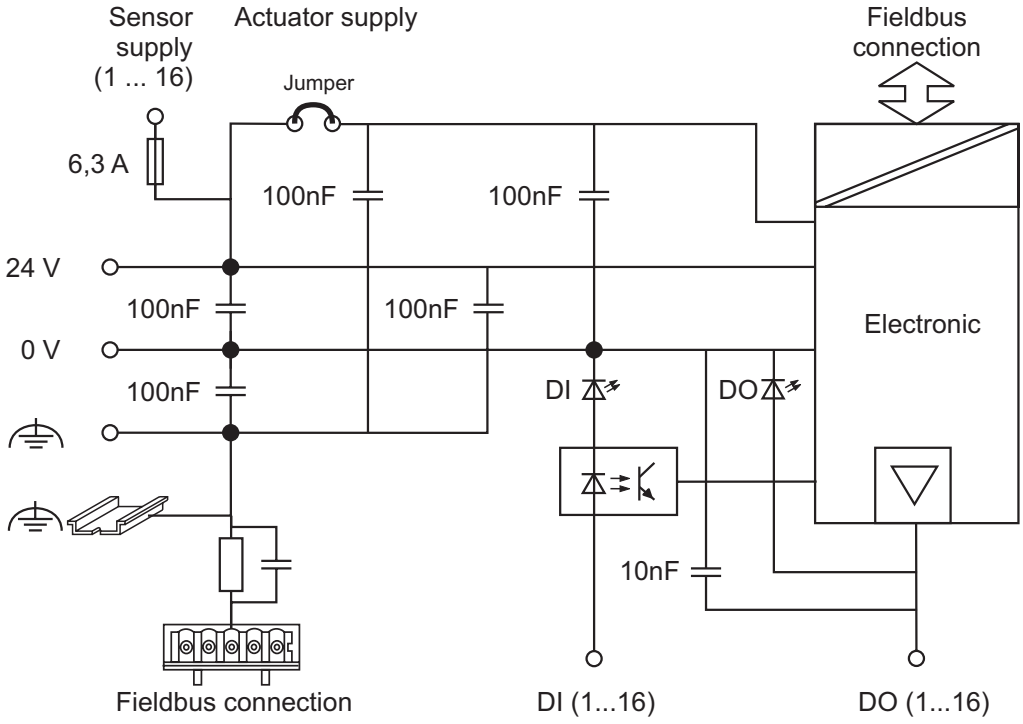


Fig. 5-1: Schematic Circuit Diagram

6 Status Indicators

The electronic module incorporates LED's for displaying the status of the fieldbus connection, the status of the inputs and outputs, and interference in the output circuit.

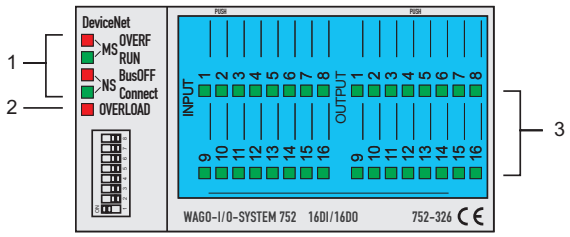


Fig. 6-1: Status Indicators g1x2605x

1 Fieldbus (DeviceNet) specific status indicators.

2 Interference in the output circuit is displayed as a collective fault marked "OVERLOAD".

3 Status LED's for the inputs and outputs are integrated in the area of the marking label.

6.1 Input Status Indicators

The LED's are connected in series with the base module sensor connections, and will illuminate when a threshold input voltage is present.

Input voltage	Input value	LED
-3 V ... +5 V	'0'	OFF
+5 V ... +15 V	Not defined	Not defined
+15 V ... +30 V	'1'	ON

6.2 Output Status Indicators

The output status LED's display the actual state of each output. They will not be illuminated in the event of a short circuit at the output or a missing supply voltage to the output drivers.

Output value of the higher ranking controls	Fault	LED
'1'	None	ON
'0'	None	OFF
'1'	Short circuit	OFF
'0'	Short circuit	OFF
'1'	No supply	OFF
'0'	No supply	OFF

'1' = Output switched on
'0' = Output switched off

6.3 Fieldbus Interface Status Indicators

The module has four DeviceNet specific LEDs. They indicate the Module Status (MS) and the Network Status (NS).

MS-OVERF (Red)	MS-RUN (Green)	Meaning
OFF	OFF	No or to less operating voltage.
FLASHING	FLASHING	Module process the self-test (Initialisation, power-on).
OFF	ON	Module is ready for operating.
ON	OFF	Module alarms fatal error, e. g. ROM Checksum invalid, fault RAM.
NS-BusOFF (Rot)	**NS-Connect (Grün)**	
FLASHING	FLASHING	Module process the self-test (Initialisation, power-on).
OFF	FLASHING	Module is on-line, the Duplicate MAC ID Test is finished. No connection is build up to the master.
OFF	ON	Module is on-line and the connection to a master is build up.
FLASHING	OFF	One or more I/O connections are in the state Timed-Out.
ON	OFF	Module alarms a connection fault, e. g. Duplicate MAC ID or BusOFF.
OFF	OFF	Module is not on-line. Duplicate MAC ID Test not finished or no/ to less operating voltage.

6.4 Overload Status Indicator

The LED designated “OVERLOAD”, when illuminated, indicates the presence of an output fault.

Possible output faults:

- Short circuit of one or more outputs
- Missing supply voltage to the output drivers
- Fault of an output driver
- Feedback

A fault is detected if a transmitted value of “1” by the master controller does not produce a threshold voltage at a corresponding output.

The I/O module switches the LED off again once the fault has been corrected. The I/O module switches the LED off after a 1 second delay and and reset the bit in the Module Status Value (Class 0x65, Instance 1, Attribute 3).

7 DeviceNet

7.1 Review

7.1.1 Description

DeviceNet is an open CAN (Controller Area Network) based system. CAN was developed by R. Bosch for data transmission in vehicles. CAN defines the physical and data link layer in the ISO/OSI reference model.

DeviceNet defines a uniform application layer to make the CAN protocol usable for industrial applications. It is defined by a specification of the ODVA (Open DeviceNet Vendor Association). The ODVA is the user organization for DeviceNet. WAGO Kontakttechnik is a member of the ODVA.

The network in CAN can be designed as a segment (remote bus) with drop cable. The bus interface connections are supplied via the supply lines in the field bus wiring (V+, V-). An inductor voltage drop does not interrupt the communication with other stations.

CAN does not specify the transmission medium. For the DeviceNet, the ODVA has specified different types of plugs and two cable types. Please refer to the appendix for a description of the cable type specification.

Further information
Further details are shown by the DeviceNet user organization ODVA on its INTERNET homepage.
– Technical descriptions
– Regulations/directives

http://www.odva.org

7.1.2 Communication traffic

CAN communication is subdivided into different groups to obtain various priorities.

- Communication group 1 is used for the exchange of I/O data via I/O message
- Communication group 2 is provided for master/slave applications
- Communication group 3 serves the exchange of configuration data via explicit communication connections
- Communication group 4 is reserved for future applications

The so-called CAN identifier is produced by the different communication groups and the MAC ID set on the I/O device.

DeviceNet differentiates between 2 types of communication. I/O messages are transmitted by a node and can be received and processed by one or several nodes. In this manner predominantly I/O data is transmitted. No protocol data is specified in the data field.

Explicit messages are directly transmitted from one node to the other. They consist of a requirement and a reply. As such, services can be directly requested or performed by a different user. The data field contains, amongst others, the transfer address and the service identification. The format of the explicit messages is firmly pre-defined. Explicit message serves to configure equipment or to create a dynamic structure of communication connections.

7.1.3 Data exchange

The transfer or exchange of process data between the scanner and the I/O device is made via a „Polled I/O Connection“, „Change of State/Cyclic“ and „Bit Strobe“.

Polled I/O Connection	Slaves are cyclically polled by the master.
Strobe function	All slaves are polled by the master by means of a command.
Change of State	Messages are transmitted either cyclically by the master or the slave, or in the event of a state change.

7.1.4 Objects, classes, instances and attributes

Protocol processing with DeviceNet is object orientated. Each node in the net is represented as a collection of objects. The following is a definition of several related terms:

- Class:
  A class contains attendant object of a product, organized according to instances, e.g. Identity Class, DeviceNet Class.

- Instance:
  An instance consists of different attributes. Each instance of a class has the same attributes. Different instances in a class can have different attribute values, e.g. different Connection Instances: Explicit Message-, Poll I/O- or Bit-Strobe-Connection Instance.

- Attributes:
  Attributes contain the current values e.g. of a configuration or of an input, e.g. Vendor ID, Device Type or Product Name.

- Object:
  An object is an abstract representation of individual related components within a DeviceNet product. A DeviceNet product is composed of several objects.

- Service:
  Services can be applied to classes or attributes and perform defined actions, e.g. reading attributes or resetting a class.

7.2 Module properties

The I/O device is defined by the Vendor ID and the DeviceType.

Vendor ID	0x28 (40)
DeviceType	0x07 (7), General Purpose Discrete I/O Device

7.3 Process data and diagnosis state

The data is transmitted between master and slave by way of objects, whereby a differentiation is made between input and output objects. The structure of the objects is defined by so-called assembly objects which serve the grouping of attributes of different application objects. For this reason, I/O data of different objects can be grouped to form one data block and be transmitted via a message connection.

7.3.1 Process image

The process image is distinguished between input and output process image. In each instance, the assembly object provides a statically configured process image.

The desired process image can be selected by setting the produced connection path and the consumed connection path of the individual I/O connections (Poll, Bit Strobe, Change of State or Change of Value).

The instances 5, 25, 105, 115 and 125 are available as configurations for the input process image.

Instance 35 is available as configuration for the output process image.

Please refer to the appendix for the structure of the individual instances of the assembly object.

7.3.2 Input process image

Default process data, input image (Assembly Class, Instance 25)

Byte	.7	.6	.5	.4	.3	.2	.1	.0
0	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01
1	DI16	DI15	DI14	DI13	DI12	DI11	DI10	DI09
2	DS08	DS07	DS06	DS05	DS04	DS03	DS02	DS01
3	DS16	DS15	DS14	DS13	DS12	DS11	DS10	DS09

7.3.3 Output process image

Default process data, output image (Assembly Class, Instance 35)

Byte	.7	.6	.5	.4	.3	.2	.1	.0
0	DO08	DO07	DO06	DO05	DO04	DO03	DO02	DO01
1	DO16	DO15	DO14	DO13	DO12	DO11	DO10	DO09

7.4 Status messages

The I/O device signals the module status and the output states.

7.4.1 Module status byte

All internal module status and diagnosis messages are collected in the module status byte.

Module status: Class 0x65, Instance 1, Attribute 3, Module Status Value

Bit	Name	Meaning
1	Overload status	Output error occurred.
2	CAN-Error	CAN controller signals an error.
3	RAM-Error	RAM Test signals an error
4	EPROM-Error	EPROM Test signals an error (check sum)
5	PCB-Error	SW and HW do not agree.
6	SeriesNb.-Error	No access to series number possible.
7	SEERPOM-Error	No access to serial EEPROM possible.
8	DIP-Error	Access to DIP switches not possible.

Note
The module status byte is mapped into the process image when using Assembly Objects, Class 0x04, Instance 105, 115 or 125.

7.4.2 Output status byte

The diagnosis messages of the outputs are collected in the output status byte.

Output Status: Class 0x68, Instance 1, Attribute 3 and
Class 0x09, Discrete Output Point Object.

Note
The output diagnosis messages are mapped into the process image when using Assembly Objects, Class 0x04, Instance 25, 115 or 125.

The diagnosis bit (DSx) is activated (´1´) if the status of an output pre-defined by the higher ranking controls does not agree with the internally read back status.

At the same time, the ”Overload” LED is activated.

Reasons for the activation of a diagnosis message:

- No voltage supply to the output drivers
- Short-circuited output line
- Output overload
- Internal malfunction of an output driver

The internal processing of the output information extends a pending diagnosis message to at least 1s.

Please refer to the appendix for a description of the structure of the individual instances of the assembly objects.

7.5 Configuration / Parameterization

7.5.1 EDS files

Under DeviceNet the performance features of the equipment are documented by the manufacturers by means of an EDS file (Electronic Data Sheet) that is made available to the user.

Structure, contents and coding of the EDS files are standardized so as to allow for projecting with projecting devices from different manufacturers.

EDS file for I/O devices 750-326	**752-326.EDS**

The EDS file is read by the configuration software. Corresponding settings are transmitted. For the necessary inputs and handling steps to this effect, please refer to the software user manuals.

Further information
ODVA provides information on the EDS files of all listed manufacturers.

http://www.odva.org

EDS and symbol files for the configuration of the I/O devices are available under the order number 750-912 on a disc or from the WAGO INTERNET homepage.

http://www.wago.com

7.6 Fieldbus Controller Boards

Master control systems such as PLC's communicate to fieldbus devices on a network via fieldbus controller boards (Scanner). WAGO offers the WAGO-I/O-SYSTEM 758 PC Interface PCB fieldbus controller board.

Fieldbus controller boards for programmable logical controls are available from other manufacturers.

7.7 Configuration Software

Before a PLC can communicate I/O data with a fieldbus device, the fieldbus controller board has to be configured for each field bus device on the network.

To accomplish this, the WAGO-I/O-SYSTEM 758 fieldbus controller board is delivered with WAGO *NETCON* software for configuring and diagnosing fieldbus networks.

Further configuration software, e.g. DeviceNet Manager or RSNetworx, is available from other manufacturers.

7.8 Example of a Configuration with WAGO *NETCON*

The following example shows how to configure an I/O module using WAGO *NETCON*:

1. Update EDS file

Copy the current EDS file and symbol files in the respective directories.

2. Start WAGO NETCON

Fig. 7-1: WAGO *NETCON* Symbol p932x00x

2. Create a new project

Create a new project and select DeviceNet as the fieldbus system.
Menu path: *File - New*

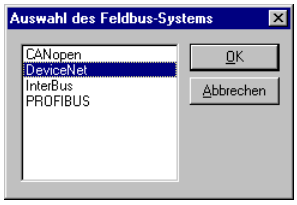


Fig. 7-2: Select fieldbus p112501d

3. Select master

Select a fieldbus master on the surface.
Menu path: *Insert – Master*

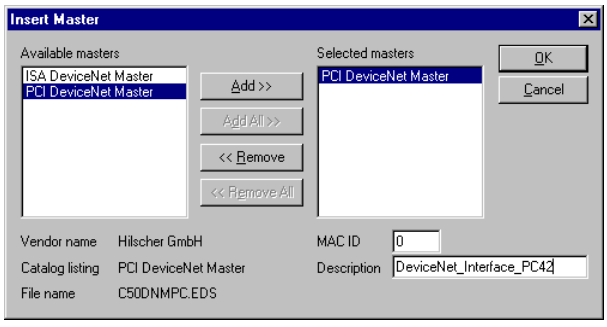


Fig. 7-3: Select controller board p1x2602d

4. Add a slave

Add the I/O module ”752-326 16DI/16DO 24 VDC” as a slave
Menu path: *Insert – Device*

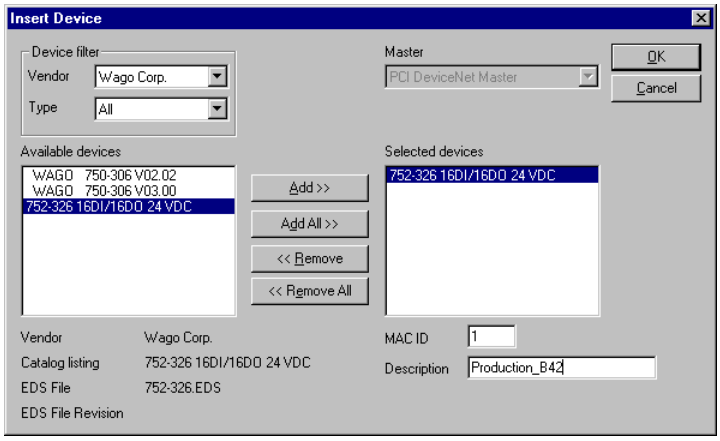


Fig. 7-4: Add a Slave p112503d

The configuration is displayed on a graphic screen.

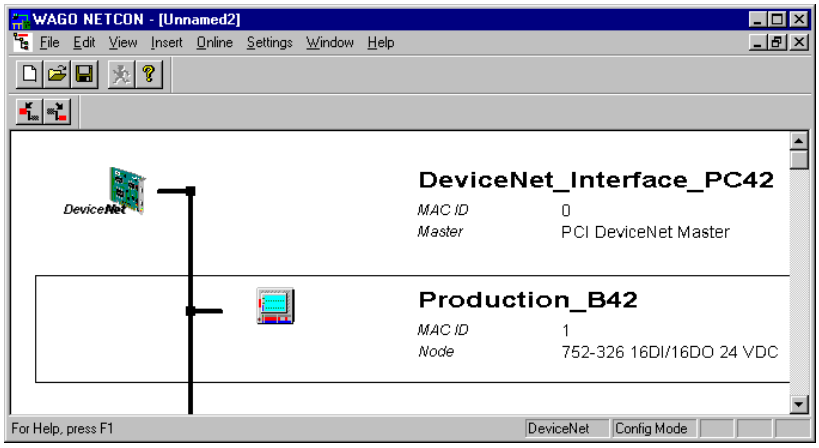


Fig. 7-5: Configuration p112504d

5. Device Configuration

Select a slave and change the settings in the dialog window ”Device Configuration”
Menu path: *Settings – Device Configuration...*,

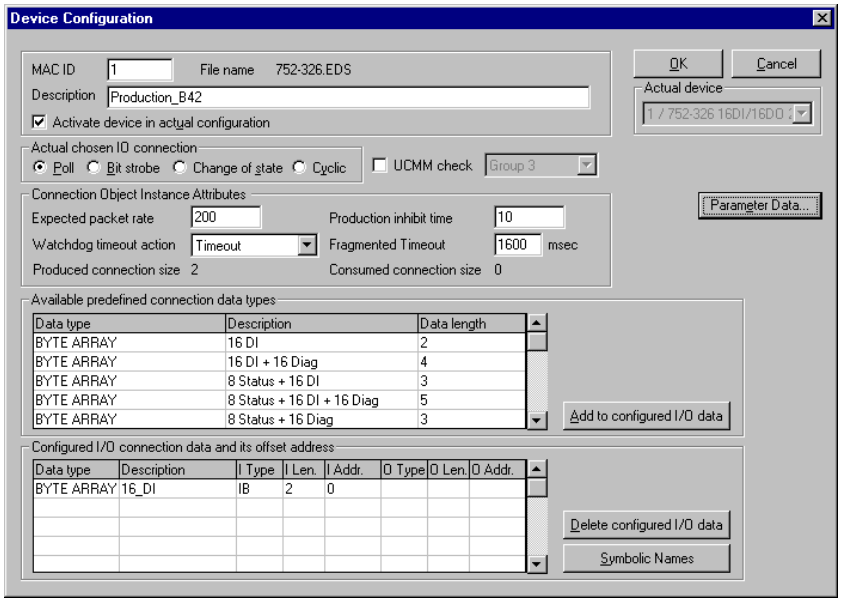


Fig. 7-6: Device Configuration p112505d

6. Parameter Data

Select a slave and in the dialog window ”Device Configuration” open via the button ”Parameter Data...” the dialog

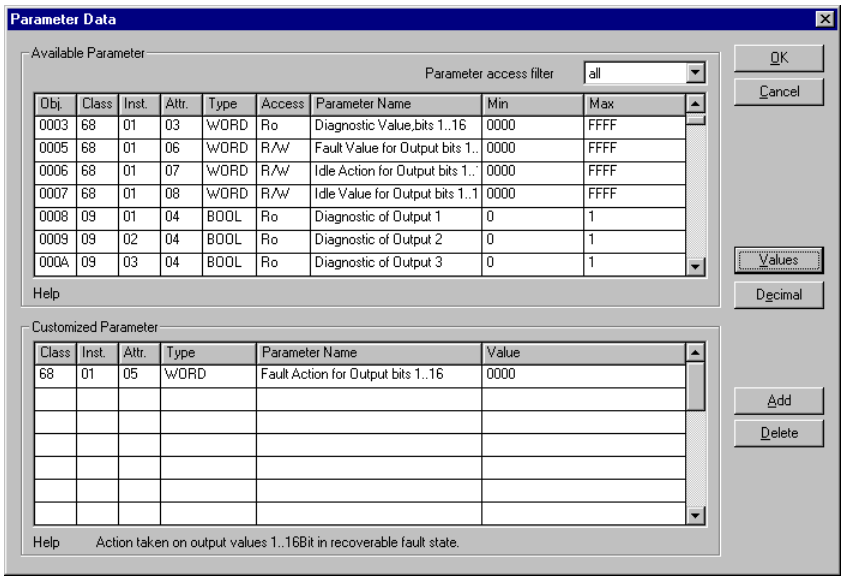


Fig. 7-7: Parameter Data p112506d

7. Load Configuration

Download the project configuration in the interface PCB (Download)
Menu path: *Online – Download*

8 Accessories

Accessories	Article No.	Pcs. per packing unit
EDS files (floppy disk)	750-912	1
Marking label 16 DI/16DO	752-102	1 sheet (9 labels)
Replacement fuse F1 (TR 5 / 250 V / 6.3A T) Micro-fuse according to IEC 127-3 **Note:** Use UL-Recognized fuse only	752-180	5
Felt tipped pen for non-smudge writing	210-110	1
Operating tool (screw driver) - Blade (2.5x0.4) mm - Blade (3.5x0.4) mm - with part. insulated shank, blade (2.5x0.4) mm - with part. insulated shank, blade (3.5x0.4) mm	 210-119 210-120 210-619 210-620	 1 1 1 1

9 Glossar

Actuator Device driven by the I/O module.

Base Module Wiring level to connect the supply, the fieldbus conductors and the sensors and actuators.

Electronic Module Plug-in component from the WAGO-I/O-SYSTEM 752

Fieldbus controller board [Scanner, Master]
Bus master which, as a higher ranking unit, controls the data transmission on the bus. It interrogates the input and status values of the slave devices and transmits output and control data to them.
Processing unit for the interrogation of and access to the decentral fieldbus equipment. It is the fieldbus master which co-ordinates the bus traffic and transfers the data to a control system.

Group [Input / output group, connection group]
General grouping of I/O channels. With their 8 channels, outputs form a sup-ply group.

I/O addresses [I/O register]
Input / output area(s) for the I/O data

I/O data Input / Output data

I/O module Any fieldbus device from the WAGO-I/O-SYSTEM 752 series consisting of a base module and an electronic module for the recording and output of digital signals.

I/O point Input / output point, signal input or output

ISO/OSI reference model Reference model of the ISO/OSI for networks with the objective of creating open communication. It defines the interface standards of the respective software and hardware requirements between computer manufacturers. The model treats communication removed from specific implementations, using seven layers.

Master [->Fieldbus controller board]

Scanner [->Fieldbus controller board]

Sensor [Generator, initiator]
Device interrogated by the I/O module.

Slave	Bus slave addressed by a fieldbus master.
Vendor ID	The Vendor ID identifies a module as a device of a respective Vendor.

10 Appendix

10.1 Cable specification

10.1.1 Thick Cable Profile

10.1.1.1 Thick Cable: Data Pair Specification

Physical Characteristics	Specification
Conductor pair size	#18 Copper (minimum); 19 strands min (individually tinned)
Insulation diameter	0.150 inches (nominal)
Colors	Light blue-Pantone #297C or similar. White
Pair Twist/ft	3 (approx.)
Tape shield over pair	2 mil / 1 mil, Al / Mylar Al side out w/shorting fold (pull-on applied)
Electrical Characteristics	**Specification**
Impedance	120 Ohms +/- 10% (at 1 MHz)
Propagation delay	1.36 nSec/ft (maximum)
Capacitance between conductors	12 pF / ft. at 1 kHz (nominal)
Capacitance between one conductor and other conductor connected to shield.	24 pF / ft. at 1 kHz (nominal)
Capacitive unbalance	1200 pF/1000 ft at 1 kHz (nominal)
DCR - @ 20 deg C	6.9 Ohms/1000 ft (maximum)
Attenuation:	0.13 dB/100 ft at 125 kHz (maximum) 0.25 dB/100 ft at 500 kHz (maximum) 0.40 dB/100 ft at 1.00MHz (maximum)

10.1.1.2 Thick Cable: DC Power Pair Specification

Physical Characteristics	Specification
Conductor pair size	#15 Copper (minimum); 19 strands minimum (individually tinned)
Insulation diameter	0.098 inches (nominal)
Colors	Red Black
Pair Twist/ft	3 approximately
Tape shield over pair	1.0 mil/ 1 mil, Al/Mylar Al side out w/shorting fold (pull-on applied)
Electrical Characteristics	**Specification**
DCR - @ 20 deg C	3.6 Ohms/1000 ft (maximum)

10.1.1.3 Thick Cable: General Specification

Physical Characteristics	Specification
Geometry	Two shielded pairs, Common axis with drain wire in center
Overall braid shield	65% coverage36 AWG or 0.12mm tinned Cu braid minimum (individually tinned)
Drain wire	#18 Copper min.; 19 Strands min. (individually tinned)
Outside diameter	0.410 inches (min) to 0.490 inches (max.)
Roundness	Radius delta to be within 15% of 0.5 O.D .
Jacket marking	Vendor Name & Part #, and additional markings
Electrical Characteristics Specification	
DCR (braid+tape+drain)	1.75 Ohms/1000 ft (nom. at 20 C)
Applicable Environmental Characteristics	**Specification**
Agency Certifications (U.S. and Canada)	NEC (UL) type, CL2/CL3 (min.)
Flexure	2000 cycles at bend radius, 90 degrees, 2 lb. Pull force, 15 cycles per minute, Tic Toc or C track method
Bend Radiusx	20 x diameter (installation) / 7 diameter (fixed)
Operating ambient temperature	-20 to +60 C at 8 amps; de-rate current linearly to zero at 80 C
Storage temperature	-40 to +85 C
Pull tension	190 lbs max.
Connector Compatibility	Mini, Open
Topology Compatibility	Trunk, Drop

10.1.1.4 Thick Cable: Topology

Communications Rate	Trunk Length	Trunk Exchange (Thick Cable)	Cumulative Drop	Maximum Drop
125kBd	500m (1640ft)	1.0	156m (512ft)	6m (20ft)
250kBd	250m (820ft)	1.0	78m (256ft)	6m (20ft)
500kBd	100m (328ft)	1.0	39m (128ft)	6m (20ft)

10.1.1.5 Thick Cable: Max. Current Available (amps) based on Network Length

Network Length in meters (feet)	Maximum Current in amps
0	8.00
25 (82)	8.00
50 (164)	5.42
100 (328)	2.93
150 (492)	2.01
200 (656)	1.53
250 (820)	1.23
300 (984)	1.03
350 (1148)	0.89
400 (1312)	0.78
450 (1476)	0.69
500 (1640)	0.63

10.1.2 Thin Cable Profile

10.1.2.1 Thin Cable: Data Pair Specifications

Physical Characteristics	Specification
Conductor pair size	#24 Copper (minimum); 19 strands minimum (individually tinned)
Insulation diameter	0.077 inches (nominal)
Colors	Light Blue White
Pair Twist/ft	5 (approximately)
Tape shield over pair	1 mil / 1 mil, Al / Mylar Al side out w/shorting fold (pull-on applied)
Electrical Characteristics	**Specification**
Impedance	120 Ohms +/- 10% (at 1 MHz)
Propagation delay	1.36 nSec/ft (maximum)
Capacitance between conductors	12 pF / ft. at 1 kHz (nominal)
Capacitance between one conductor and other conductor connected to shield.	24 pF / ft. at 1 kHz (nominal)
Capacitive unbalance	1,200 pF/1000 ft at 1 kHz (maximum)
DCR - at 20 C	28 Ohms/1000 ft (maximum)
Attenuation:	0.29 db/100 ft at 125 kHz (maximum) 0.50 db/100 ft at 500 kHz (maximum) 0.70 dB/100 ft at1.00 MHz (maximum)

10.1.2.2 Thin Cable: DC Power Pair Specification

Physical Characteristics	Specification
Conductor pair size	#22 Copper (minimum); 19 strands mini-mum(individually tinned)
Insulation diameter	0.055 inches (nominal)
Colors	Red Black
Pair twist/ft	5 approximately
Tape shield over pair	1.0 mil/ 1.0 mil, Al/Mylar Al side out w/shorting fold (pull-on applied)
Electrical Characteristics	Specification
DCR - at 20 C	17.5 Ohms/1000 ft (maximum)

10.1.2.3 Thin Cable: General Specification

Physical Characteristics	Specification
Geometry	Two shielded pairs, Common axis with drain wire in center
Overall braid shield	65% coverage36 AWG or 0.12mm tinned Cu braid minimum (individually tinned)
Drain wire	#22 Copper 19 strands minimum (individually tinned)
Outside diameter	0.240 inches (min.) to 0.280 inches (max.)
Roundness	Radius delta to be within 20% of 0.5 O.D
Jacket marking	Vendor name and part # and additional markings
Electrical Characteristics	**Specification**
DCR (braid+tape+drain)	3.2 Ohms/1000 ft (nom. at 20 C)
Applicable Environmental Characteristics	**Specification**
Agency Certifications (U.S. and Canada)	NEC (UL) type CL2 (min.)
Flexure	2000 cycles at bend radius, 90 degrees,2 lb. Pull force, 15 cycles per minute, Tic Toc or C track method
Bend Radius	20 x diameter (installation) / 7 x diameter (fixed)
Operating ambient temperature	-20 to +70 C at 1.5 amps; de-rate current linearly to zero at 80 C
Storage temperature	-40 to +85 C
Pull tension	65 lbs max.
Connector Compatibility	Mini, Micro, Open
Topology Compatibility	Trunk, Drop

10.1.2.4 Thin Cable: Topology

Communications Rate	Trunk Length	Trunk Exchange (Thick Cable)	Cumulative Drop	Maximum Drop
125kb	100m (328ft)	5.0	156m (512ft)	6m (20ft)
250kb	100m (328ft)	2.5	78m (256ft)	6m (20ft)
500kb	100m (328ft)	1.0	39m (128ft)	6m (20ft)

10.2 Objekt Model 752-326

Data Types	
USINT	Unsigned Short INTeger (8 Bit)
UINT	Unsigned INTeger (16 Bit)
USINT	Unsigned Short INTeger (8 Bit)
UDINT	Unsigned Double INTeger (32 Bit)
BOOL	Boolean, True (1) or False (0)
STRUCT	Structure of ...
ARRAY	Array of ...

10.2.1 Implemented Classes

Object	Class	Instance	Description
Identity	0x01	1	Provides device type, serial number, vendor ID etc.
Message Router	0x02	1	Routes explicit messages to the proper destination.
DeviceNet	0x03	1	Maintains the physical connection to DeviceNet. This object also allocates/de-allocates the master/slave connection set.
Assembly	0x04	9	
Connection class	0x05	3	Allows explicit messaging to be conducted.
Acknowledge Handler	0x2B	1	The Acknowledge Handler Object is used to manage the reception of message acknowledgments. This object communicates with a message producing Application Object within a device. The Acknowledge Handler Object notifies the producing application of acknowledge reception, acknowledge timeouts, and production retry limit.
Discrete Input Point	0x08	0 ... 16	Digital input points
Discrete Output Point	0x09	0 ... 16	Digital output points
Modul configuration Object	0x64 (100)	0, 1	Module configuration
Module Status	0x65 (101)	0, 1	Modul status information
Input Value	0x66 (102)	0 ... 2(4)	Input values
Output Value	0x67 (103)	0 ... 2(4)	Output values
Output Diagnostic	0x68 (104)	0 ... 2(4)	

10.2.2 Class 0x01, Identity Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Values**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
1	Required	Get	Vendor ID	UINT	Identification of the Vendor	0x0028 (40)
2	Required	Get	Device Type	UINT	Indication of general type of product	0x0007 (7)
3	Required	Get	Product Code	UINT	Identification of a particular product of an individual vendor	0x0146 (326)

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
4	Required	Get	Revision: Major Revision; Minor Revision	STRUCT of USINT; USINT	Revision of the item the Identity Object represents	
5	Required	Get	Status	UINT	Summary status of device	-
6	Required	Get	Serial Number	UDINT	Serial number of device	-
7	Required	Get	Product name	SHORT_ STRING; (num, char, char, ...)	Human readable identifi-cation	“WAGO DeviceNet 16DI/16DO“
10	Optional	Get	Heartbeat Interval	USINT	The nominal interval between heartbeat mes-sages in seconds.	0x00

Status (Class 0x01, Instance 1, Attribute 5), Bit Definitions		
Bit (s):	**Called:**	**Definition**
0	Owned	TRUE indicates the device (or an object within the device) has an owner. Within the Master/Slave paradigm the setting of this bit means that the Predefined Master/Slave Connection Set has been allocated to a master. Outside the Master/Slave paradigm the meaning of this bit is tbd (DeviceNet Specification).
1		Reserved, set to 0
2	Configured	TRUE indicates the application of the device has been configured to do something different than the “out–of–box” default. This does not include configuration of the communications.
3		Reserved, set to 0
4,5,6,7		vendor–specific, not used
8	Minor Recoverable Fault	TRUE indicates the device detected a problem with itself, which is thought to be recoverable. Supported minor recoverable faults: - Overload error detected. - CAN-Controller error detected For the detailed reason see Module Status, Class 0x65, Instance 1, Attribute 3, Module Status Value.
9	Minor Unrecoverable Fault	TRUE indicates the device detected a problem with itself, which is thought to be unrecoverable. Supported minor unrecoverable fault: - none
10	Major Recoverable Fault	TRUE indicates the device detected a problem with itself. Supported major recoverable faults: - none
11	Major Unrecoverable Fault	TRUE indicates the device detected a problem with itself. Supported major unrecoverable fault: - RAM error detected - EPROM error detected - PCB error detected - Serial EEPROM error detected - DIP switch error detected For the detailed reason see Module Status, Class 0x65, Instance 1, Attribute 3, Module Status Value. Module Status LED is solid red.
12, 13		Reserved, set to 0
14, 15		Reserved, set to 0

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Returns the contents of the specified attribute.
0x05	Reset	Invokes the Reset service for the device.

10.2.3 Class 0x02, Message Router Object

no attributes

no services

10.2.4 Class 0x03, DeviceNet Object

Instance 0						
Attribute ID	**Implementation**	**Access Rule**	**Name**	**DeviceNet Data Type**	**Description of Attribute**	**Values**
1	Required	Get	revision	UINT	Revision of the DeviceNet Object Range 1–65535 Class Definition upon which the implementation is based.	0x0002

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Semantics of Values**
1	Conditional	Get	MAC ID	USINT	Node Address	Range 0–63
2	Optional	Get	Baud Rate	USINT	Baud Rate	Range 0-2
3	Optional	Get/Set	BOI	BOOL	Bus–Off Interrupt	
4	Optional	Get/Set	Bus–Off Counter	USINT	Number of times CAN went to the bus–off state	Range 0–255
5	Optional	Get	Allocation Info. Alloc. Choice Byte; Master's MAC ID	STRUCT of BYTE; USINT	MAC ID of Master (from Allocate)	Range 0–63, 255 Modified via Allocate only.

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read a DeviceNet Object attribute value
0x10	Set_Attribute_Single	Used to modify a DeviceNet Object attribute value.
0x4B	Allocate_Master/Slave_ Connection	Requests the use of the Predefined Master/Slave Connection
0x4C	Release_Group_2_Identifier_Set	Indicates that the specified Connections within the Predefined Master/Slave Connection Set are no longer desired. These Connections are to be released (Deleted).

10.2.5 Class 0x04, Assembly Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Values**
1	Required	Get	Revision	UINT	Revision of this Object	0x0002

Instance 5: Input Data 16 Bit						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Input Data	UINT	Input Data (Bits 1 ... 16)	0x0000

Instance 25: Input Data 16 Bit + Output Diagnostic 16 Bit						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Input Data + Output Diagnostic	UDINT	Input Data (Bits 1 ... 16) + Output Diagnostic	0x0000 0000

Instance 35: Output Data						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get/Set	Output Data	UINT	Output Data	0x0000

Instance 105: Module Status + Input Data 16 Bit						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Module Status + Input Data	ARRAY of USINT	Module Status + Input Data (Bits 1 ... 16)	0x00 0000

Instance 115: Module Status + Input Data 16 Bit + Output Diagnostic 16 Bit						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Module Status + Input Data + Output Diagnostic 16 Bit	ARRAY of USINT	Module Status + Input Data (Bits 1 ... 16) + Output Diagnostic 16 Bit	0x00 0000 0000

Instance 125: Module Status + Output Diagnostic 16 Bit						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Module Status + Output Diagnostic 16 Bit	ARRAY of USINT	Module Status + Output Diagnostic 16 Bit	0x00 0000

I/O Assembly Data Attribute Format									
Instance	**Byte**	**.7**	**.6**	**.5**	**.4**	**.3**	**.2**	**.1**	**.0**
5	0	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01
	1	DI16	DI15	DI14	DI13	DI12	DI11	DI10	DI09
25	0	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01
	1	DI16	DI15	DI14	DI13	DI12	DI11	DI10	DI09
	2	DS08	DS07	DS06	DS05	DS04	DS03	DS02	DS01
	3	DS16	DS15	DS14	DS13	DS12	DS11	DS10	DS09
35	0	DO 8	DO 7	DO 6	DO 5	DO 4	DO 3	DO 2	DO 1
	1	DO 16	DO 15	DO 14	DO 13	DO 12	DO 11	DO 10	DO 9
105	0	MS 8	MS 7	MS 6	MS 5	MS 4	MS 3	MS 2	MS 1
	1	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01
	2	DI16	DI15	DI14	DI13	DI12	DI11	DI10	DI09
115	0	MS 8	MS 7	MS 6	MS 5	MS 4	MS 3	MS 2	MS 1
	1	DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01
	2	DI16	DI15	DI14	DI13	DI12	DI11	DI10	DI09
		DS08	DS07	DS06	DS05	DS04	DS03	DS02	DS01
	3	DS16	DS15	DS14	DS13	DS12	DS11	DS10	DS09
125	0	MS 8	MS 7	MS 6	MS 5	MS 4	MS 3	MS 2	MS 1
	1	DS08	DS07	DS06	DS05	DS04	DS03	DS02	DS01
	2	DS16	DS15	DS14	DS13	DS12	DS11	DS10	DS09

10.2.6 Class 0x05, Connection Object

Instance 0						
Attribute ID	**Used in Buscoupler**	**Access Rule**	**Name**	**DeviceNet Data Type**	**Description of Attribute**	**Values**
1	Required	Get	revision	UINT	Revision of the Conection Object Range 1–65535 Class Definition upon which the implementation is based.	0x0001

Description for the Connection Object (Class ID 0x05) Instance Ids	
Instance ID	**Description**
1	References the Explicit Messaging Connection into the Server
2	References the Poll I/O Connection
3	References the Bit–Strobe I/O Connection
4	References the Slave's Change of State or Cyclic I/O Connection
5	Reserved for the "Reserved" Identifier, Message ID = 1

Instance 1 (Explicit Messaging)					
Attribute ID	**Need in Implementation**	**Access Rule**	**Attribute Name**	**Data Type**	**Brief Description of Attribute**
1	Available	Get	state	USINT	State of the object
2	Required	Get	instance_type	USINT	Indicates either I/O or Messaging Connection
3	Required	Get	transportClass_trigger	USINT	Defines behavior of the Connection
4	Required	Get	produced_connection_id	UINT	Placed in CAN Identifier Field when the Connection transmits
5	Required	Get	consumed_connection_id	UINT	CAN Identifier Field value that denotes message to be received
6	Required	Get	initial_comm_characteristics	USINT	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur
7	Required	Get	produced_connection_size	UINT	Maximum number of bytes transmitted across this Connection
8	Required	Get	consumed_connection_size	UINT	Maximum number of bytes received across this Connection
9	Required	Get/Set	expected_packet_rate	UINT	Defines timing associated with this Connection
10 - 11	N/A	Get	N/A	N/A	Not used. These attribute IDs have been obsoleted and are no longer defined for a Connection Object
12	Required	Get	watchdog_timeout_action	USINT	Defines how to handle Inactivity/Watchdog timeouts
13	Required	Get	produced_connection_path_len gth	UINT	Number of bytes in the produced_connection_path attribute
14	Required	Get/Set	produced_connection_path	Array of USINT	Specifies the Application Object(s) whose data is to be produced by this Connection Object.
15	Required	Get	consumed_connection_path_le ngth	UINT	Number of bytes in the consumed_connection_path attribute
16	Required	Get	consumed_connection_path	Array of USINT	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object
17	Required	Get	production_inhibit_time	UINT	Defines minimum time between new data production

Instance 2 (Poll I/O Connection)					
Attribute ID	**Need in Implementation**	**Access Rule**	**Attribute Name**	**Data Type**	**Brief Description of Attribute**
1	Available	Get	state	USINT	State of the object
2	Required	Get	instance_type	USINT	Indicates either I/O or Messaging Connection
3	Required	Get	transportClass_trigger	USINT	Defines behavior of the Connection
4	Required	Get	produced_connection_id	UINT	Placed in CAN Identifier Field when the Connection transmits
5	Required	Get	consumed_connection_id	UINT	CAN Identifier Field value that denotes message to be received
6	Required	Get	initial_comm_characteristics	USINT	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur
7	Required	Get	produced_connection_size	UINT	Maximum number of bytes trans-mitted across this Connection
8	Required	Get	consumed_connection_size	UINT	Maximum number of bytes received across this Connection
9	Required	Get/Set	expected_packet_rate	UINT	Defines timing associated with this Connection
10 - 11	N/A	Get	N/A	N/A	Not used. These attribute IDs have been obsoleted and are no longer defined for a Connection Object
12	Required	Get	watchdog_timeout_action	USINT	Defines how to handle Inactiv-ity/Watchdog timeouts
13	Required	Get	produced_connection_path_len gth	UINT	Number of bytes in the pro-duced_connection_path attribute
14	Required	Get/Set	produced_connection_path	Array of USINT	Specifies the Application Object(s) whose data is to be produced by this Connection Object.
15	Required	Get	consumed_connection_path_le ngth	UINT	Number of bytes in the con-sumed_connection_path attribute
16	Required	Get/Set	consumed_connection_path	Array of USINT	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object
17	Required	Get/Set	production_inhibit_time	UINT	Defines minimum time between new data production

Instance 3 (Bit–Strobe I/O Connection)					
Attribute ID	**Need in Implementation**	**Access Rule**	**Attribute Name**	**Data Type**	**Brief Description of Attribute**
1	Available	Get	state	USINT	State of the object
2	Required	Get	instance_type	USINT	Indicates either I/O or Messaging Connection
3	Required	Get	transportClass_trigger	USINT	Defines behavior of the Connection
4	Required	Get	produced_connection_id	UINT	Placed in CAN Identifier Field when the Connection transmits
5	Required	Get	consumed_connection_id	UINT	CAN Identifier Field value that denotes message to be received
6	Required	Get	initial_comm_characteristics	USINT	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur
7	Required	Get	produced_connection_size	UINT	Maximum number of bytes transmitted across this Connection
8	Required	Get	consumed_connection_size	UINT	Maximum number of bytes received across this Connection
9	Required	Get/Set	expected_packet_rate	UINT	Defines timing associated with this Connection
10 - 11	N/A	Get	N/A	N/A	Not used. These attribute IDs have been obsoleted and are no longer defined for a Connection Object
12	Required	Get	watchdog_timeout_action	USINT	Defines how to handle Inactivity/Watchdog timeouts
13	Required	Get	produced_connection_path_len gth	UINT	Number of bytes in the produced_connection_path attribute
14	Required	Get	produced_connection_path	Array of USINT	Specifies the Application Object(s) whose data is to be produced by this Connection Object.
	Required	Get	consumed_connection_path_le ngth	UINT	Number of bytes in the consumed_connection_path attribute
16	Required	Get	consumed_connection_path	Array of USINT	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object
17	Required	Get	production_inhibit_time	UINT	Defines minimum time between new data production

Instance 4 (Change of State and Cyclic I/O Connection)					
Attribute ID	**Need in Implementation**	**Access Rule**	**Attribute Name**	**Data Type**	**Brief Description of Attribute**
1	Available	Get	state	USINT	State of the object
2	Required	Get	instance_type	USINT	Indicates either I/O or Messaging Connection
3	Required	Get	transportClass_trigger	USINT	Defines behavior of the Connection
4	Required	Get	produced_connection_id	UINT	Placed in CAN Identifier Field when the Connection transmits
5	Required	Get	consumed_connection_id	UINT	CAN Identifier Field value that denotes message to be received
6	Required	Get	initial_comm_characteristics	USINT	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur
7	Required	Get	produced_connection_size	UINT	Maximum number of bytes transmitted across this Connection
8	Required	Get	consumed_connection_size	UINT	Maximum number of bytes received across this Connection
9	Required	Get/Set	expected_packet_rate	UINT	Defines timing associated with this Connection
10 - 11	N/A	Get	N/A	N/A	Not used. These attribute IDs have been obsoleted and are no longer defined for a Connection Object

Instance 4 (Change of State and Cyclic I/O Connection)					
Attribute ID	**Need in Implementation**	**Access Rule**	**Attribute Name**	**Data Type**	**Brief Description of Attribute**
12	Required	Get	watchdog_timeout_action	USINT	Defines how to handle Inactiv-ity/Watchdog timeouts
13	Required	Get	produced_connection_path_len gth	UINT	Number of bytes in the pro-duced_connection_path attribute
14	Required	Get/Set	produced_connection_path	Array of USINT	Specifies the Application Object(s) whose data is to be produced by this Connection Object.
15	Required	Get	consumed_connection_path_le ngth	UINT	Number of bytes in the con-sumed_connection_path attribute
16	Required	Get	consumed_connection_path	Array of USINT	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object
17	Required	Get/Set	production_inhibit_time	UINT	Defines minimum time between new data production

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read a Connection Object attribute value
0x10	Set_Attribute_Single	Used to modify a Connection Object attribute value.
0x05	Reset	Restores connection default values.
0x09	Delete	Used to delete a Connection and to release all asso-ciated resources.

The Instances are not available if the connection is in state „Non-Existent“.

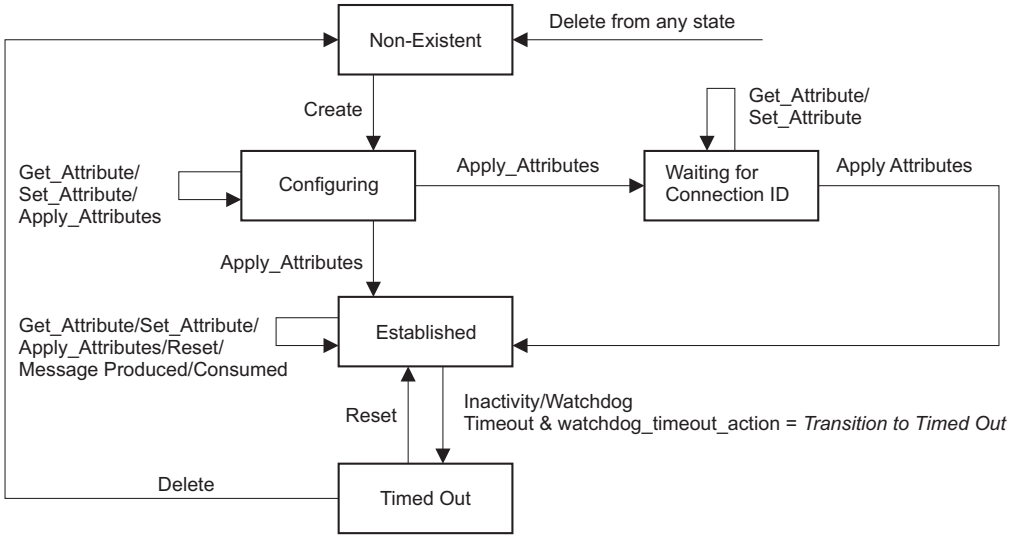


Fig. 10-1: State diagram of Connection Object g1x2617e

10.2.7 Class 0x08, Discrete Input Point Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0002
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0010 (16)

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Value	BOOL	Input Bit 1	0

:

:

Instance 16						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get	Value	BOOL	Input Bit 16	0

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value

10.2.8 Class 0x09, Discrete Output Point Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0010 (16)

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
3	Required	Get/Set	Value	BOOL	Output Bit 1	0
4	Optional	Get	Diagnostic	BOOL	Diagnostic Bit 1 0 : OK 1 : failure	0
5	Optional	Get/Set	Fault Action	BOOL	Action taken on output's value in Recoverable Fault state 0 : Fault Value Attribute 1 : hold last state	0
6	Optional	Get/Set	Fault Value	BOOL	User-defined value for use with Fault State attribute 0 : off 1 : on	0

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description of Attribute**	**Default Value**
7	Optional	Get/Set	Idle Action	BOOL	Action taken on output's value in Idle State 0 : Fault Value Attribute 1 : hold last state	0
8	Optional	Get/Set	Idle Value	BOOL	User-defined value for use with Idle State attribute 0 : off 1 : on	0
9	Optional	Set	Run_Idle_ Command	BOOL	Generates the Receive_Idle or Receive_Ready_to_Run event	0: Receive_Idle 1: Receive_ Ready_to_Run

:

:

Instance 16						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
3	Required	Get/Set	Value	BOOL	Output Bit 16	0
4	Optional	Get	Diagnostic	BOOL	Diagnostic Bit 16 0 : OK 1 : failure	0
5	Optional	Get/Set	Fault Action	BOOL	Action taken on output's value in Recoverable Fault state 0 : Fault Value Attribute 1 : hold last state	0
6	Optional	Get/Set	Fault Value	BOOL	User-defined value for use with Fault State attribute 0 : off 1 : on	0
7	Optional	Get/Set	Idle Action	BOOL	Action taken on output's value in Idle State 0 : Fault Value Attribute 1 : hold last state	0
8	Optional	Get/Set	Idle Value	BOOL	User-defined value for use with Idle State attribute 0 : off 1 : on	0
9	Optional	Set	Run_Idle_ Command	BOOL	Generates the Receive_Idle or Receive_Ready_to_Run event	0: Receive_Idle 1: Receive_ Ready_to_Run

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

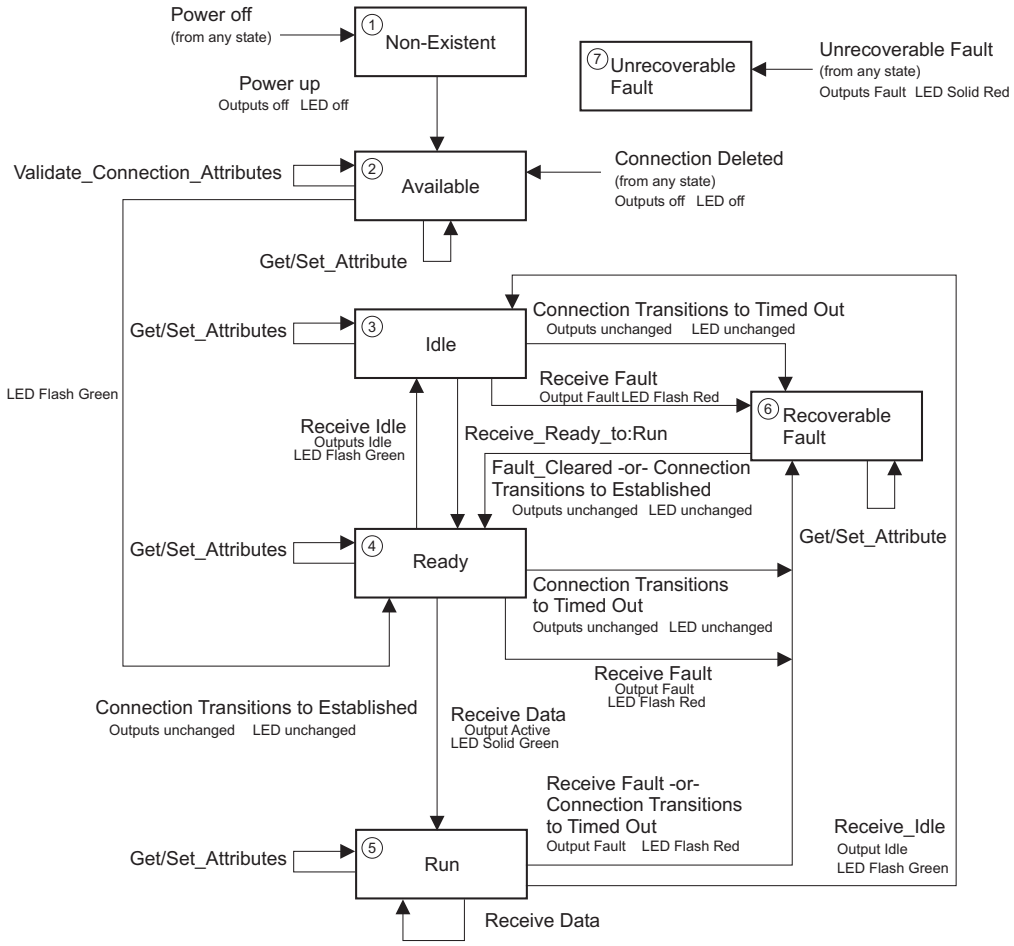


Fig. 10-2: State diagram of Discrete Output Point Object g1x2618e

10.2.8.1 States of the Discrete Output Point Object

- **(1) Non–Existent**: module without power.
- **(2) Available**: DOP defaults configured, waiting for connection.
- (**3)Idle**: DOP in Idle mode and does not apply received data.
- **(4) Ready**: waiting for valid data to apply.
- **(5) Run**: DOP applying received data to its output.
- **(6) Recoverable Fault**: a recoverable fault has occurred.
- **(7) Unrecoverable Fault**: an unrecoverable fault has occurred.

10.2.8.2 Events of the Discrete Output Point Object

This event	Is
Receive_Data	an event that signals the reception of I/O data and causes the object to transition to the Run state.
Receive_Fault	an event that is internally generated and product-specific. The network does not know if a Fault has occurred
Receive_Idle	the setting of the Run_Idle Command attribute to the value 0 -or- the IO connection object receives an I/O message *containing no application data*
Receive _Run	the setting of the Run_Idle Command attribute to the value 1
Apply_Attributes	the Apply service of the I/O connection object the Discrete Output Point object is connected to. Note: the application is responsible for validating the connection object's attributes.
Connection Deleted	I/O connection deleted.
Connection Transitions to Established	I/O connection transitions to Established.
Connection transitions to the Timed Out state	the expiration of the connection timer

10.2.8.2.1 Receive_Fault Event

A Receive_Fault Event is generated internally, if an diagnostic error of the outputs occure. As long as an diagnostic error is present, the LED OVERLOAD is ON. If the Receive_Fault Event happens, the module behaves according to the following table:

	Fault Action = 0	Fault Action = 1
Fault Value = 0	Module uses the value in the Fault Value attribute (0) to update its outputs.	Module leaves Value in last state. Fault Value attribute (0) has no affect.
Fault Value = 1	Module uses the value in the Fault Value attribute (1) to update its value.	Module leaves Value in last state. Fault Value attribute has no affect.

Important

There is one deviation from the behavior specified in the table above. If the DOP enters the Recoverable_Fault state from the Idle state in response to the I/O connection transitioning to Timed Out, the DOP's value should go un-changed. This is shown in the DOP's State Transition Diagram.

10.2.8.2.2 Receive_Idle Event

If an Idle message receives, the module behaves according to the following table:

	Idle Action = 0	Idle Action = 1
Idle Value = 0	Module uses the value in the Idle Value attribute (0) to update its outputs.	Module leaves Value in last state. Idle Value attribute (0) has no affect.
Idle Value = 1	Module uses the value in the Idle Value attribute (1) to update its value.	Module leaves Value in last state. Idle Value attribute has no affect.

Important
There is one deviation from the behavior specified in the table above. If the DOP enters the Recoverable_Fault state from the Idle state in response to the I/O connection transitioning to Timed Out, the DOP's value should go unchanged. This is shown in the DOP's State Transition Diagram.

10.2.9 Class 0x2B, Acknowledge Handler Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get/Set	Acknowledge Timer	UINT	Time to wait for acknowledge before resending.	0x0014
2	Required	Get/Set	Retry Limit	USINT	Number of Ack Timeouts to wait before informing the producing application of a RetryLimit_Reached event.	0x01
3	Required	Get/Set	COS Producing Connection Instance	UINT	Connection Instance which contains the path of the producing I/O application object which will be notified of Ack Handler events.	0x0004
4	Optional	Get	Ack List Size	BYTE	Maximum number of members in Ack List.	0x01
5	Optional	Get	Ack List	BYTE Array of UINT	List of active connection instances which are receiving Acks.	0x00
6	Optional	Get	Data with Ack Path List Size	BYTE	Maximum number of members in Data with Ack Path List.	0x01
7	Optional	Get	Data with Ack Path List	BYTE Array of UINT USINT Array of USINT	List of active connection instance/consuming application object pairs. This attribute is used to forward data received with acknowledgment.	

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

10.2.10 Class 0x64, Configuration Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Optional	Get	Compiler Info	STRING	Firmware compile time and date	
5	Optional	Get	Module Status Value	USINT	Status Value of the Module: Overload Error 0x01 CAN Error 0x02 RAM Error 0x04 Eprom Error 0x08 PCB Error 0x10 SerienNb. Error 0x20 SEEPROM Error 0x40 Shift Register Error 0x80	0x00
9	Optional	Get	Length Digital Out	UINT	Number of Outputs	0x0010
10	Optional	Get	Length Digital In	UINT	Number of Inputs	0x0010
12	Optional	Get/Set	Stored_Poll_ P_C_Path	UINT	Non volatile power up value for the polled I/O produced connection path (Number of Assembly Instance).	25: Input, 16Bit +Output Diagnostic 16Bit valid values: 5: Input, 16Bit 105: Modul Status, 8Bit + Input, 16Bit 115: Modul Status,8Bit + Input, 16Bit + Output Diagnostic 16Bit 125: Modul Status, 8Bit + Output Diagnostic 16Bit
13	Optional	Get/Set	Stored_BitStrobe_ P_C_Path	UINT	Non volatile power up value for the bit strobe I/O produced connection path (Number of Assembly Instance).	25: Input, 16Bit +Output Diagnostic 16Bit valid values: 5: Input, 16Bit 105: Modul Status, 8Bit + Input, 16Bit 115: Modul Status,8Bit + Input, 16Bit + Output Diagnostic 16Bit 125: Modul Status, 8Bit + Output Diagnostic 16Bit

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
14	Optional	Get/Set	Stored_COSCYC_ P_C_Path	UINT	Non volatile power up value for the change of state and cyclic produced connection path (Number of Assembly Instance).	25: Input, 16Bit +Output Diagnostic 16Bit valid values: 5: Input, 16Bit 105: Modul Status, 8Bit + Input, 16Bit 115: Modul Status,8Bit + Input, 16Bit + Output Diagnostic 16Bit 125: Modul Status, 8Bit + Output Diagnostic 16Bit
20	Optional	Get/Set	Load_manufacture_ parameters	USINT	Resets the parameters to manufacture settings after power on. 0 : manufacture settings 1 : user settings	0
30	Optional	Get	Check EPORM	USINT	Calculates the checksum of the EPROM and compares it.	0 : no error 1 : error
31	Optional	Get	Check RAM	USINT	Performs a RAM test	0 : no error 1 : error
32	Optional	Get	Check serial EEPROM	USINT	Checks communication with the serial EPROM	0 : no error 1 : error
33	Optional	Get	Check DIP-Switch	USINT	Reads the current DIP-Switch position.	
34	Optional	Set	Set LEDs	USINT	sets all LEDs to ON for 1s, program stops during this time.	no attribute value

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

10.2.11 Class 0x65, Module Status Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
3	Optional	Get	Module Status Value	USINT	Status Value of the Module: Overload Error 0x01 CAN Error 0x02 RAM Error 0x04 Eprom Error 0x08 PCB Error 0x10 SerienNb. Error 0x20 SEEPROM Error 0x40 DIP-Error 0x80	0x00 1: Access of Serial Number not possible

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

10.2.12 Class 0x66, Input Value Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
3	Optional	Get	Input Value	UINT	Value of the Inputs 1 ... 16	0x0000

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

10.2.13 Class 0x67, Output Value Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
3	Optional	Get/Set	Output Value	UINT	Value of the Outputs 1 ... 16	0x0000

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

10.2.14 Class 0x68, Output Diagnostic Object

Instance 0						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
1	Required	Get	Revision	UINT	Revision of this Object	0x0001
2	Optional	Get	Max Instance	UINT	Maximum instance number	0x0001

Instance 1, Bits 1 ... 16						
Attribute ID	**Need in Implementation**	**Access Rule**	**Name**	**Data Type**	**Description**	**Default Value**
3	Optional	Get	Diagnostic value	UINT	Diagnostic value of the Outputs 1 ... 16 0 : OK 1 : failure	0x0000
5	Optional	Get/Set	Fault Action	UINT	Action taken on output's value in Recoverable Fault state 0 : Fault Value Attribute 1 : hold last state	0x0000
6	Optional	Get/Set	Fault Value	UINT	User-defined value for use with Fault State attribute 0 : off 1 : on	0x0000
7	Optional	Get/Set	Idle Action	UINT	Action taken on output's value in Idle State 0 : Fault Value Attribute 1 : hold last state	0x0000
8	Optional	Get/Set	Idle Value	UINT	User-defined value for use with Idle State attribute 0 : off 1 : on	0x0000

Services		
Service Code	**Service Name**	**Service Description**
0x0E	Get_Attribute_Single	Used to read an Object attribute value
0x10	Set_Attribute_Single	Used to modify an Object attribute value.

10.2.15 Device Shutdown Message

The Device Shutdown message is produced by the device when it transmits to the offline state. Reasons for the change to the offline state:

- Reset command
- Change MAC ID Message received and change to new MAC ID (not supported)
- Internal Rx-Buffer overflow
- Internal Tx-Buffer overflow
- CAN-Controller Overrun bit set

10.2.16 Explicite Message Acknowledge

The Acknowledge Timer is 1.01s

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