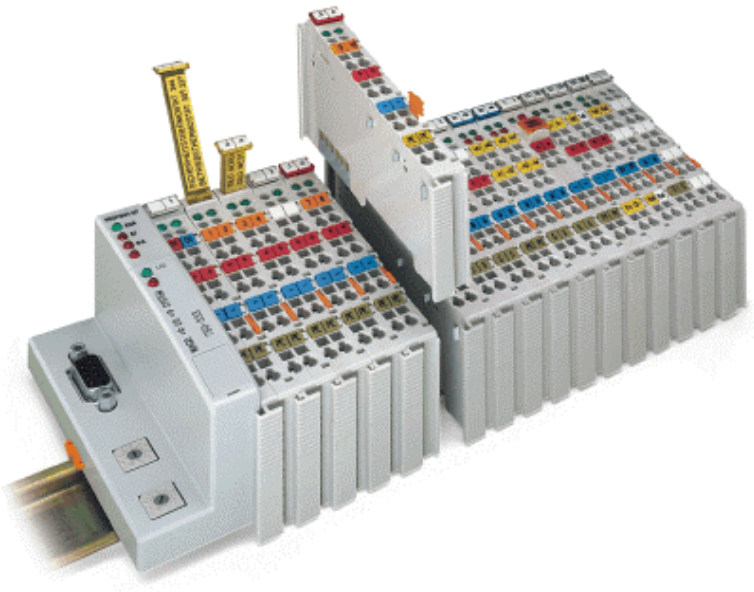
WAGO I/O SYSTEM 750

Modular I/O System

PROFIBUS DPV1

750-333 / 750-833



Manual

Technical description,
installation and
configuration

Supplement for the Manual 750-131
Version 2001-02-27

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 wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally trademark or patent protected.

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1 Important comments

To ensure fast installation and start-up of the units described in this manual, we strongly recommend that the following information and explanation is carefully read and adhered to.

1.1 Legal principles

1.1.1 Copyright

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1.1.2 Personnel qualification

The use of the product detailed in this manual is exclusively geared to specialists having qualifications in PLC programming, electrical specialists or persons instructed by electrical specialists who are also familiar with the valid standards. WAGO Kontakttechnik GmbH declines all liability resulting from improper action and damage to WAGO products and third party products due to non-observance of the information contained in this manual.

1.1.3 Intended use

For each individual application, the components supplied are to work with a dedicated hardware and software configuration. Modifications are only admitted within the framework of the possibilities documented in the manuals. All other changes to the hardware and/or software and the non-conforming use of the components entail the exclusion of liability on part of WAGO Kontakttechnik GmbH.

Please direct any requirements pertaining to a modified and/or new hardware or software configuration directly to WAGO Kontakttechnik GmbH.

1.2 Scope

This manual describes the field bus independent WAGO-I/O-SYSTEM 750 with the fieldbus coupler for PROFIBUS.

Item-No.	Components
750-333	PROFIBUS DP/DPV1 12 MBd
750-833	Contr. PROFIBUS DP/DPV1 12 MBd
750-xxx	I/O Modules

1.3 Symbols

Danger
Always observe this information to protect persons from injury.

Warning
Always observe this information to prevent damage to the device.

Attention
Marginal conditions must always be observed to ensure smooth operation.

ESD (Electrostatic Discharge)
Warning of damage to the components by electrostatic discharge. Observe the precautionary measure for handling components at risk.

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

More information
References to additional literature, manuals, data sheets and INTERNET pages

1.4 Font conventions

Italic	Names of path and files are marked italic e. g.: *C:\programs\WAGO-IO-CHECK*
Italic	Menu items are marked as bold italic e. g.: ***Save***
\	A backslash between two names marks a sequence of menu items z. B.: ***File\New***
END	Press bottons are marked as bold with small capitals e. g.: **ENTER**
< >	Keys are marked bold within angle brackets e. g.: **<F5>**
`Courier`	Program code are printed with the font `Courier`. e. g.: `END_VAR`

1.5 Number notation

Number Code	Example	Note
Decimal	100	normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	Within ', Nibble separated with dots

1.6 Abbreviation

DI	Digital Input
DO	Digital Output
I/O	Input/Output
ID	Identifier
PFC	Programmable Fieldbus Controller
PFC-PI	Programmable Fieldbus Controller - Process Images
PFC-RTS	Programmable Fieldbus Controller - Runtime system
PI	Process Images
PLC	Programmable Logic Control
AO	Analog Output Module
AI	Analog Input Module
SM	Special Module

2 WAGO-I/O-SYSTEM 750

2.1 System Description

2.1.1 General

The WAGO-I/O-SYSTEM 750 consists of various components which are capable of providing modular and application specific fieldbus nodes for various fieldbusses.

A fieldbus node (short: Node) consists in principle of a fieldbus coupler (short: Coupler)) or Programmable Fieldbus Controller (short: Controller)) (1) at the front end, a number of special I/O modules (2) and a End Module (3) which is placed at the other end.

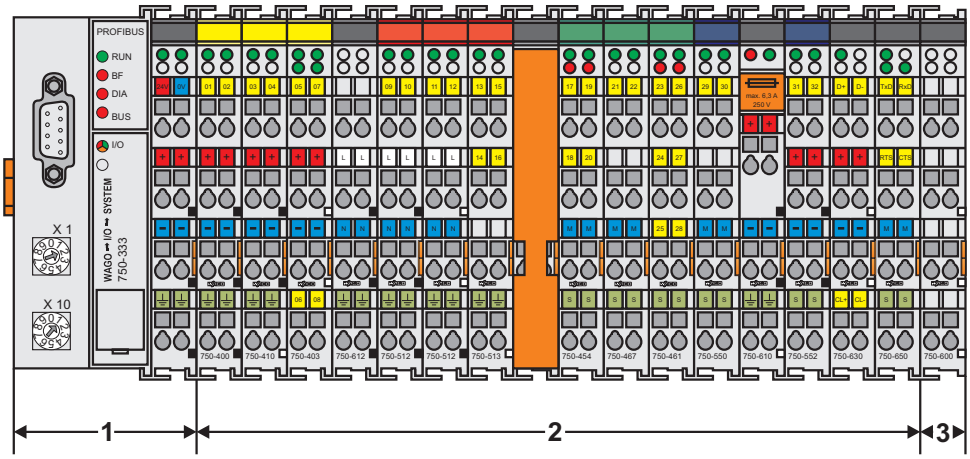

Fig. 2-1: Setting up a fieldbus node for PROFIBUS g01x101x

2.1.2 Coupler/Controller (1)

The Coupler/Controller forms the link between the fieldbus and the field devices with their I/O functions. All control functions required for the faultless operation of the I/O functions are carried out by the Coupler/Controller. The connection to different fieldbus systems is established by each of the corresponding Coupler/Controller, e.g. for PROFIBUS, INTERBUS, CAN, MODBUS etc. In this way a change of the fieldbus system is possible.

The programmable fieldbus controller 750-833 combines the PROFIBUS DP functionality of the fieldbus coupler 750-333 with the functionality of a Programmable Logic Control (PLC). Programming of the application is done with WAGO-I/O-PRO in accordance with IEC 61131-3, covering all 5 programming languages. The programmer can access all fieldbus and I/O data.

Characteristics and use of the Controllers:

- The use of decentralized control can better support a PLC or PC
- Signal pre-processing reduces fieldbus transmissions
- Complex applications can be divided into multiple tasks
- Tasks can be prioritized
- Peripheral equipment can be controlled directly, resulting in faster system response times
- Programmable response in the event of a fieldbus failure
- Simple, self-sufficient control

2.1.3 I/O Modules (2)

In the I/O modules, the incoming process data is converted. Corresponding to the different requirements, special I/O modules are available for a variety of functions. There are digital and analog inputs and outputs and modules for special functions (Counter modules, Terminal blocks for encoder and resolvers and communication modules).

2.1.4 End Module (3)

A End Module is needed for faultless operation of the node. The termination module is always placed as the last module in order to obtain a termination of the fieldbus node. This module has no I/O function.

2.2 Installation

2.2.1 Safty notes

ESD (Electrostatic Discharge)
The modules are equipped with electronic components which may be destroyed by electrostatic discharge.When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. gold contacts**.**

Attention
Switch off the system prior to working on bus modules!

2.2.2 Mechanical Installation

All system components can be snapped directly on a carrier rail in accordance with the European standard EN 50022 (DIN 35).

Attention
Ensure that the carrier rail is fastened with countersunk head screws or blind rivets as the snap-on foot of the I/O components extends onto the carrier rail.

The installation is simple and space saving. All modules have the same shape to minimize the project commitment.

The reliable positioning and connection of the coupler and the individual I/O modules is made using a tongue and groove system. Due to the automatic locking, the individual components are securely seated on the rail after installing.

To secure the coupler/controller against moving sideways, fix it with the orange colored locking disc on the carrier rail. To fix, insert a screwdriver into the top groove of the locking disc and press.

To pull out the fieldbus coupler, release the locking disc by pressing on the bottom groove with a screwdriver and then pulling the orange colored unlocking lug.

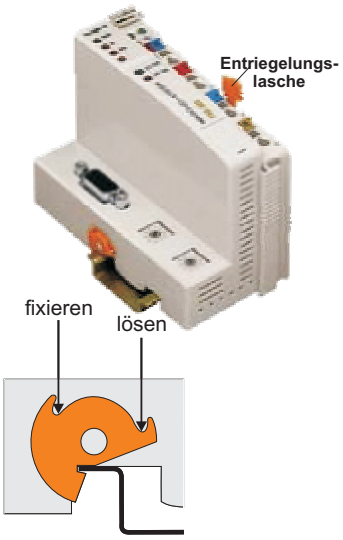

Fig. 2-2: Coupler/Controller and unlocking lug g012201d

It is also possible to release an individual I/O module from the unit by pulling an unlocking lug.

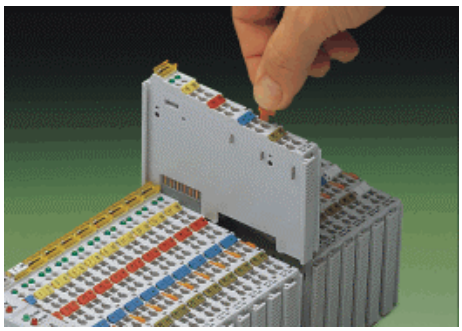

Fig. 2-3: Releasing a I/O Module p0xxx01x

Danger
Ensure that an interruption of the PE will not result in a condition which could endanger a person or equipment!

Self-cleaning power jumper contacts conduct the supply voltage for the field side. They are located on either side of the modules. The female contacts on the right-hand side of the fieldbus coupler and the bus modules are designed as spring contacts to protect against accidental contact. Male contacts are located on the left-hand side of the bus modules.

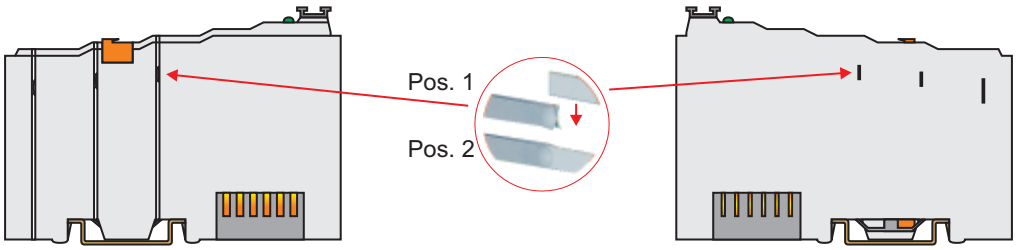

Fig. 2-4: Power Jumper Contacts g01xx00d

Danger
The power contacts are sharp-edged. Handle the module carefully to prevent injury.

Attention
Please take into consideration that some bus modules have no or only some power jumper contacts. The design of some modules does not physically allow assembly them in rows as the grooves for the male contacts are closed at the top.

The data contacts are designed as self-cleaning gold spring contacts which automatically produce a secure connection.

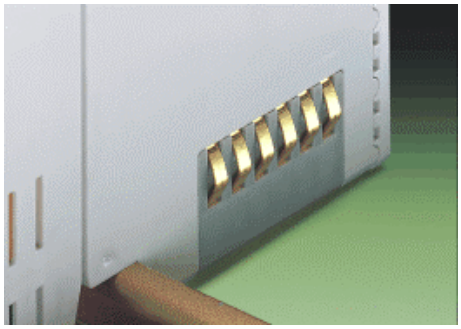

Fig. 2-5: Data contacts p0xxx07x

Warning
Do not connect the I/O module to gold spring contacts in order to avoid soiling or scratches!

2.3 Electrical Installation

2.3.1 Wire Connection

Conductors with a cross section of 0.08 to 2.5 mm² (AWG 28-12) can be connected using a CAGE CLAMP® connection to achieve a vibration resistant, fast and maintenance free connection. To actuate CAGE CLAMP® enter an actuation tool in the opening above the connection. Following this, enter the conductor in the corresponding opening. The conductor is clamped securely with the removal of the actuation tool.

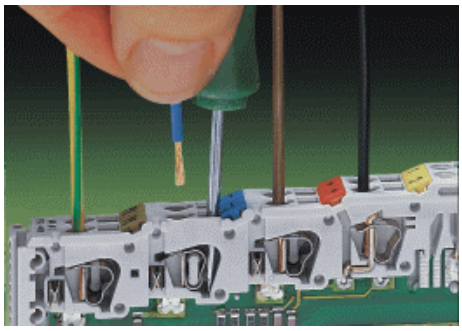

Fig. 2-6: Inserting conductor end p0xxx06x

The clamping force adjusts automatically to the cross section. The full surface of the CAGE CLAMP® pressure is applied against the conductor without damaging it. Conductor deformation is compensated for and self-loosening is avoided. The transition point between the conductor and the CAGE CLAMP® is protected against corrosive influences. The connection can be made quickly and is also maintenance free, saving the costs for a periodic checking of terminal connections.

Two carrier rail contacts responsible for the electrical contact between the grounded carrier rail and the controller, are fitted underneath the coupler/controller.

Attention
Ensure a perfect contact point between carrier rail contacts and carrier rail. The carrier rail must be grounded.

2.3.2 Change fuse

Some Power supply modules of the WAGO-I/O-SYSTEM 750 are equipped with a fuse holder. To isolate the modules to the right of the power supply, the fuse can be removed from the fuse holder. For this insert a srew driver into one of the slits available on each side and lift the holder

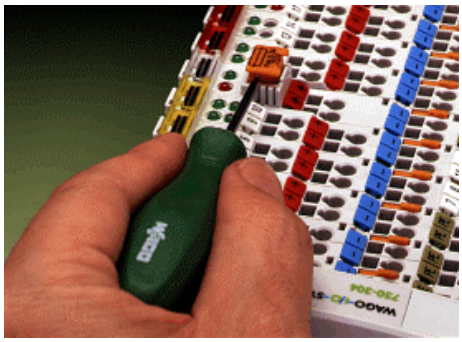

Fig. 2-7: Removing the fuse holder p0xxx05x

The fuses can be removed from or inserted into the holder with the fuse holder cover and push the fuse holder pushed back into the original position.

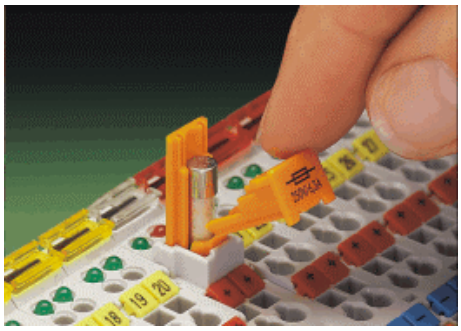

Fig. 2-8: Opening the fuse holder p0xxx03x

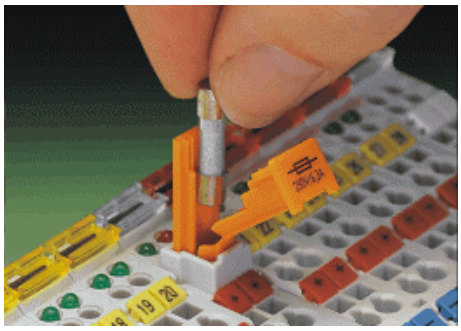

Fig. 2-9: Change fuse p0xxx04x

2.4 Power supply

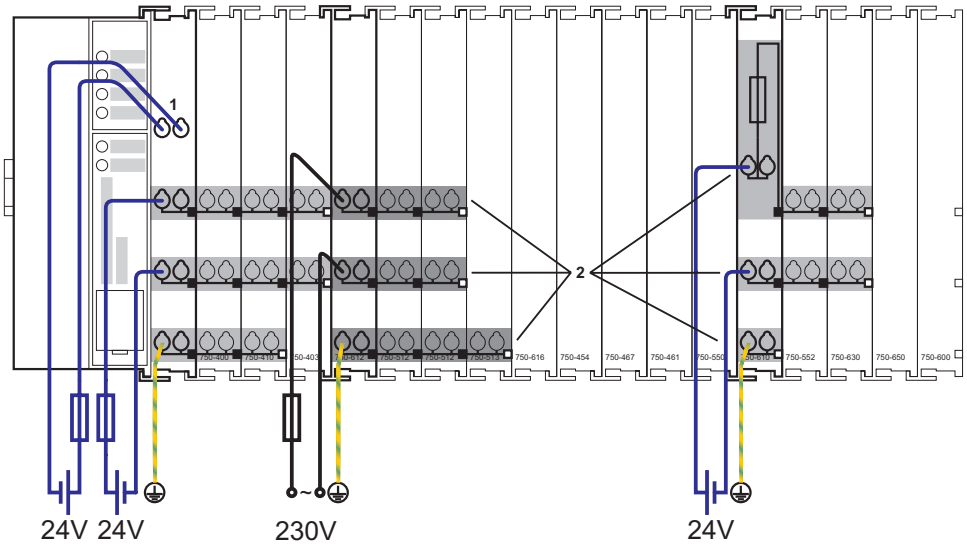

Fig. 2-10: Power supply g01xx02x

1 – Power supply System
2 – Power supply Field-side

The power supply on the field side is electrically isolated from the system supply. In this manner sensors and actuators can be supplied and fused by a separate voltage source.

If a non-regulated power supply is used for the coupler/controller electronics 24 V voltage supply , it must be filtered through a capacitor (200 µF per 1 A load current). To this effect a back-up capacitor module (Order-No. 288-824) was developed for the WAGO-I/O-SYSTEM. This module serves to regulate a noisy 24 V DC voltage supply, to keep the ripple voltage within specified limits. The cause for these fluctuations could be a voltage interruption on the primary side, a secondary side overload or the switching of ”non quenched“ inductance or capacitance.

Warning
The supply modules + and – which are permanently integrated on the buscouplers, can be supplied with 24 V DC only.
120 V AC and 230 V AC can only be supplied via modules 750-609, 750-611 and 750-612!

Warning
The ground (earth) field side contact should be disconnected when testing the isolation. Otherwise the results could be wrong or the module could be destroyed.

2.4.1 System supply voltage

The system supply voltage (24 V DC) is filtered with a voltage regulator before powering the coupler electronics as well as to the internal bus. Electrical isolation from the external fieldbus system depends on the type of Coupler/Controller.

The internal bus includes the internal communication between the coupler/controller and the bus modules as well as the power supply for the bus modules. The power supply is limited to a maximum value. This value depends on the type of Coupler/Controller. If the sum of the internal power consumption of all bus modules exceeds this value, it is necessary to add additional internal system supply modules (Order-No. 750-613).

The control electronics in the bus modules are powered by snap-fit mounting the bus modules using the internal bus contacts. A reliable contact is assured by the gold plated, self cleaning slide contacts. The removal of a bus module will cause an interruption in communication to the following bus modules. The coupler/controller identifies the interruption point and displays a corresponding fault message.

Warning
Removing or inserting the I/O modules with the voltage applied can lead to undefined conditions. For this reason only undertake work on the I/O modules when isolated from the power supply!

2.4.2 Supply Voltage Field Side

The voltage is automatically supplied when the I/O modules are snapped together. Self-cleaning power jumper contacts (P.J.C.s) ensure safe connections. The current capacity of the power contacts is 10 A max.

The PE contact is a preceding ground (earth) contact corresponding to the standards which can be used as a protective earth. The contact has a leakage capacity of 125 A.

Warning
Produce a low impedance connection from the carrier rail to the PE contact point in the switch cabinet.

Attention
Depending on the I/O function, some modules do not have P.J.C.s. It is important to note this when assembling a node. Many modules require field side power, many do not. Please review the circuit diagrams of the individual modules. An additional power supply module may be necessary.
Refer to the individual terminal/module data sheets!

When adding a power supply module, the field supply is always interrupted at the power contacts. From this point a new power supply is made, which can also include a potential change. This feature guarantees a high degree of system flexibility.

2.5 Manufacturing Number

The production number is part of the lateral marking on the component. The number contains the production date, the software version and the hardware of the component.

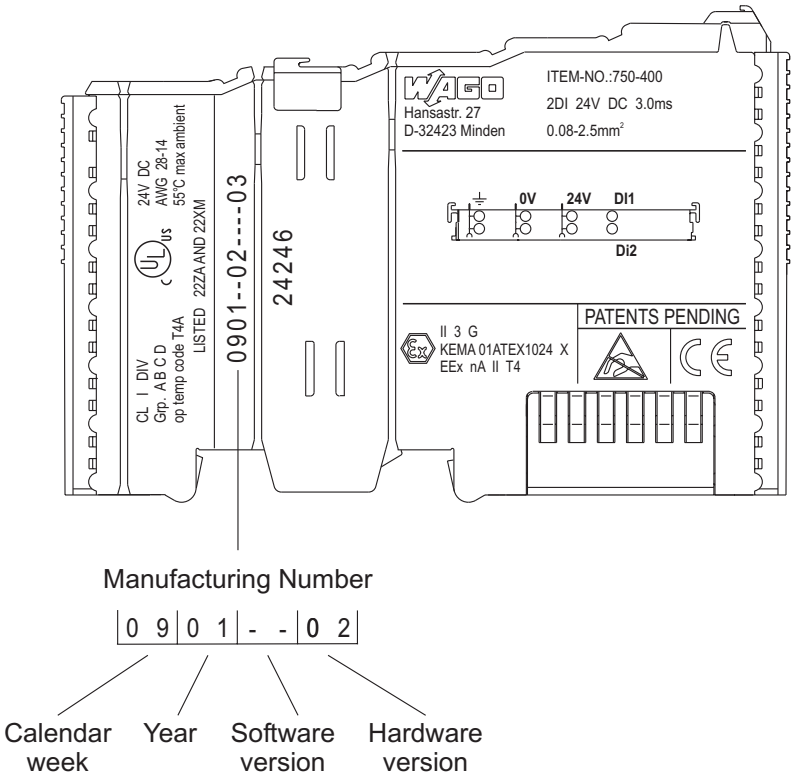

Fig. 2-11: Manufacturing Number g01xx09e

The remaining digits and characters represent internal information by WAGO Kontakttechnik GmbH.

As of calendar week 09/2001, the production number is additionally printed on the cover of the configuration and programming interface of the fieldbus coupler or controller.

2.6 Technical Data

Mechanic	
Material	Polycarbonat, Polyamid 6.6
Installation	on DIN 35 with interlock
modular by	double featherkey-dovetail
Mounting position	any position
Length of entire node	≤ 831 mm
Marking	marking label type 247 and 248 paper marking label 8 x 47 mm
Wire range	
Wire range	CAGE CLAMP® Connection 0,08 mm² ... 2,5 mm² AWG 28-14 8 – 9 mm Stripped lenght
Contacts	
Power jumpers contacts	blade/spring contact self-cleaning
Current via power contacts$_{max}$	10 A
Voltage drop at I_{max}	< 1 V/64 modules
Data contacts	slide contact, hard gold plated 1,5µ, self-cleaning
Climatic environmental conditions	
Operating temperature	0 °C ... 55 °C
Storage temperature	-20 °C ... +85 °C
Relative humidity	95 % without condensation
Resistance to harmful substances	acc. to IEC 60068-2-42 and IEC 60068-2-43
Special conditions	Ensure that additional measures for components are taken, which are used in an environment involving: – dust, caustic vapors or gasses – ionisating radiation.
Mechanical strenght	
Vibration resistance	acc. to IEC 60068-2-6
Shock resistance	acc. to IEC 60068-2-27
Free fall	acc. to IEC 60068-2-32 ≤ 1m (module in original packing)

Safe electrical isolation			
Air and creepage distance	acc. to IEC 60646-1		
Degree of protection			
Degree of protection	IP 20		
Electromagnetic compatibility*			
Derective	**Test values**	**Strenght class**	**Evaluation criteria**
Immunity to interference acc. to EN 50082-2 (95)			
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
Emmission to interference acc. to EN 50081-2 (94)		**Measuring distance**	**Class**
EN 55011	30 dBµV/m	(30m)	A
	37 dBµV/m		

* Exception: 750-630, 750-631

Dimensions

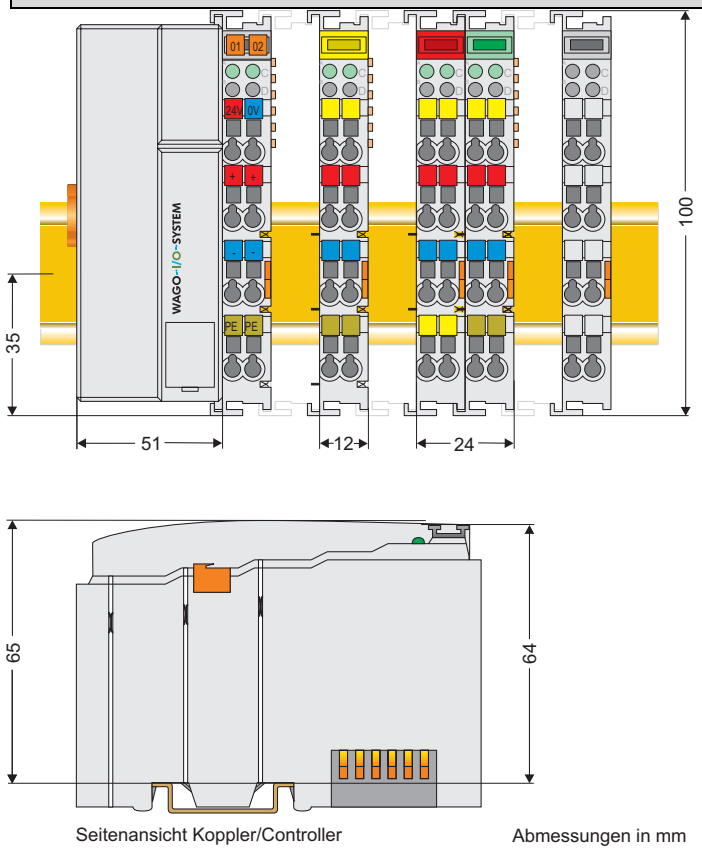

Fig. 2-12: Dimensions

g01xx05d

3 Fieldbus coupler / controller

3.1 Fieldbus coupler 750-333

This chapter includes:

3.1.1 Description

The fieldbus coupler 750-333 displays the peripheral data of all I/O modules in the WAGO-I/O-SYSTEM 750 on PROFIBUS DP.

In the initialisation phase the bus coupler determines the physical structure of the node and creates a process image from this with all inputs and outputs. I/O modules with a bit width smaller than 8 can be combined to form one byte in order to optimise the address space.

In addition the possibility exists to deactivate projected I/O modules. In this manner the physical structure of the node can be individually designed with regard to the peripheral signals, without undertaking any changes to an already existing control application.

The diagnosis concept is based on an identification and channel based diagnosis in accordance with EN 50170. Thus it is not necessary to program modules for the evaluation of manufacturer specific diagnosis information.

- Max. process data length 128 Byte (input and output process image)
- Automatic recognition of transmission speed on the PROFIBUS from 9.6 kBd to 12 MBd
- All I/O modules from the WAGO-I/O-SYSTEM 750 are supported
- Configuration modules can be parameterised as wildcards.
- Parameterable substitute value for each channel
- D-Sub 9 pole bus connection

3.1.2 Hardware

3.1.2.1 View

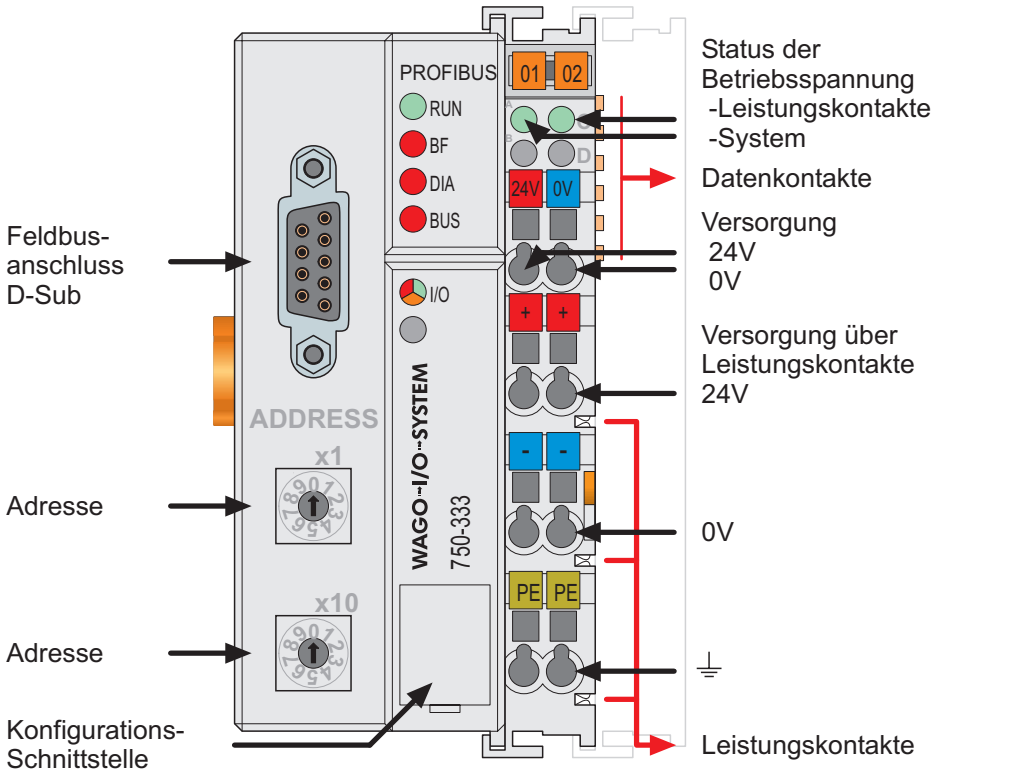

Fig. 3-1: Fieldbus coupler 750-333 PROFIBUS DP/V1

The fieldbus coupler comprises of:

- Supply module with Internal system supply module for the system supply as well as power jumper contacts for the field supply via I/O module assemblies.
- Fieldbus interface with the bus connection
- 2 rotary switches for the station address (decimal)
- Display elements (LED's) for status display of the operation, the bus communication, the operating voltages as well as for fault messages and diagnosis
- Electronics for communication with the I/O modules (internal bus) and the fieldbus interface

3.1.2.2 Device supply

The supply is made via terminal bocks with CAGE CLAMP® connection. The device supply is intended both for the system and the field units.

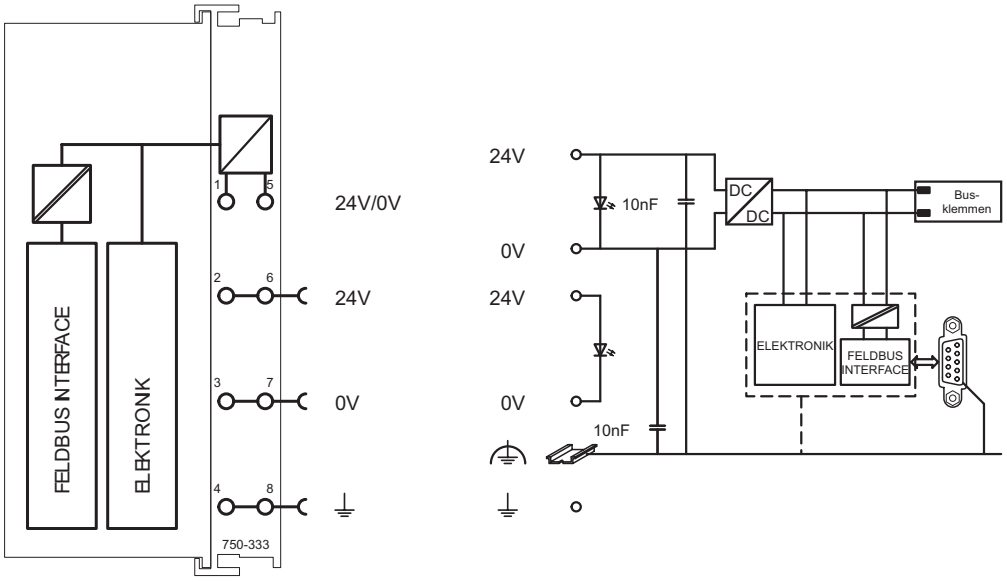

Fig. 3-2: Device supply g012105d

The integrated internal system supply module generates the necessary voltage to supply the electronics and the connected I/O modules.

The fieldbus interface is supplied with electrically isolated voltage from the internal system supply module.

3.1.2.3 Fieldbus connection

The PROFIBUS interface is designed as a Sub-D connection in accordance with the US Standard EIA RS 485 for cable linked data transmission.

9-pol. D-Sub-Buchse

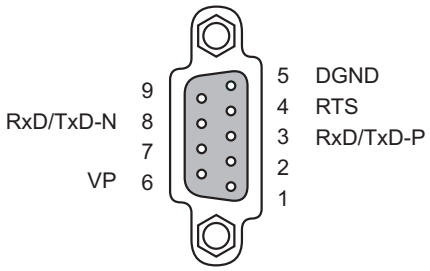

Fig. 3-3: Bus connection, D-SUB g012102d

Pin	Signal	Description
3	RxD(TxD)-P	Transmit (receive) signal
4	RTS	Ready To Send
5	GND	Supply ground (earth)
6	Vcc	Voltage supply
8	RxD(TxD) N	Transmit (receive) signal

The electrical isolation between the fieldbus system and the electronics is achieved by means of DC/DC converters and optocouplers in the fieldbus interface.

The connection point is mechanically lowered permitting fitting in an 80 mm high switch box once connected.

3.1.2.4 Display elements

The operating condition of the fieldbus coupler or node is signalled via light diodes (LED).

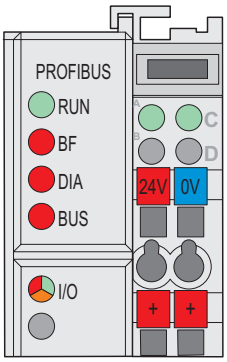

Fig. 3-4: Display elements 750-333 g012106x

LED	Colour	Meaning
RUN	green	The 'RUN' LED indicates to the operator if the fieldbus coupler / controller is correctly initialised.
BF	red	The 'BF'-LED indicates whether the communication functions via the PROFIBUS.
DIA	red	The 'DIA' LED indicates an external diagnosis. The signalling is not supported by all devices.
BUS	red	The 'BUS'-LED signals a projecting fault.
IO	red /green / orange	The 'I/O'-LED indicates the operation of the node and signals faults encountered.
A	green	Status of the operating voltage system
C	green	Status of the operating voltage – power jumper contacts

3.1.2.5 Station address

The station address (decimal) is determined using two rotary switches on the electronic module.

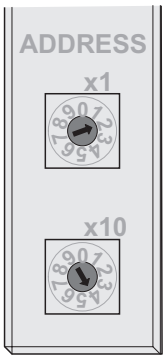

Fig. 3-5: Setting the station address g012102d

The switch „x1“ determines the units position of the address. The switch „x10“ determines the tens positions of the address. Valid station addresses are between 1 and 99. The coupler also permits the station address 0.

The station address is taken over by the fieldbus coupler after switching on the device (initialisation phase). Adjustments of the switch have no effect during operation.

3.1.2.6 Configuration interface

The configuration interface used for the communication with WAGO-I/O-CHECK or for firmware upload is located behind the cover flap.

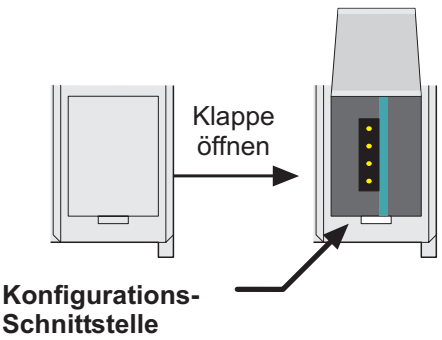

Fig. 3-6: Configuration interface g01xx06d

The communication cable (750-920) is connected to the 4 pole header.

3.1.3 Operating system

Following the configuration of the master activation and the electrical installation if the fieldbus station can start up the system.

After switching on the supply voltage the coupler performs a self test of all functions of its devices, the I/O module and the fieldbus interface. Following this the I/O modules and the present configuration is determined, whereby an external not visible list is generated. This list includes an input and an output area on which is represented the fieldbus RAM of the protocol chip.

In the event of a fault the coupler changes to the "Stop" condition. The "I/O" LED flashes red. After a fault free start up the coupler changes to the "Fieldbus start" status and the "I/O" LED lights up green.

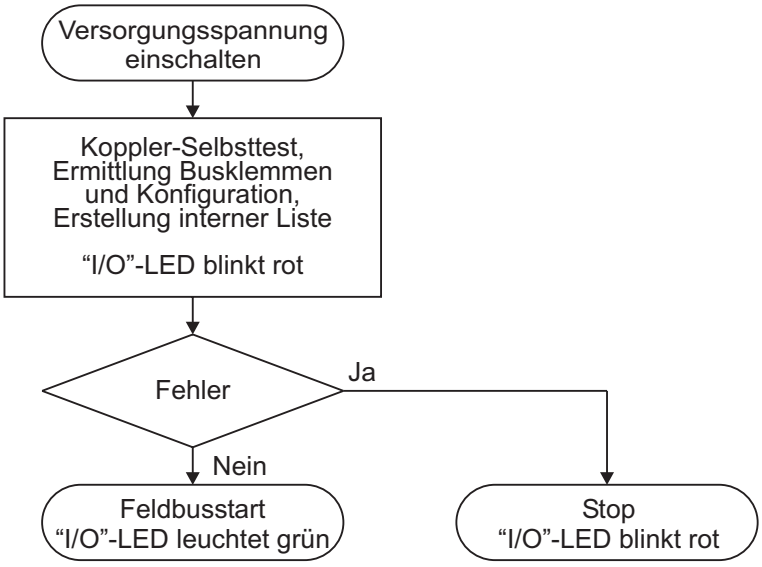

Fig. 3-7: Operating system 750-333 g012113d

3.1.4 Process image

3.1.4.1 Local process image

After switching on, the coupler recognises all I/O modules plugged into the node which supply or wait for data (data width/bit width > 0). In nodes analog and digital I/O modules can be mixed.

Note
For the number of input and output bits or bytes of the individually activated on I/O modules please refer to the corresponding I/O module description.

The coupler produces an internal process image from the data width and the type of type of I/O module as well as the position of the I/O modules in the node. It is divided into an input and an output data area.

The data of the digital I/O modules is bit orientated, i.e. the data exchange is made bit for bit. The analog I/O modules are representative for all byte orientated I/O modules, i.e. those where the data exchange is made byte for byte. These I/O modules include for example the counter modules, I/O modules for angle and path measurement as well as the communication modules.

The data of the I/O modules is separated for the local input and output process image in the sequence of their position after the coupler in the individual process image.

Note
A process image restructuring may result if a node is changed or extended. In this case the process data addresses also change in comparison with earlier ones.

3.1.4.2 Allocation of the input and output data

The process data is exchanged via the PROFIBUS with the higher ranking controls (master). A maximum of 128 bytes of data is transmitted from the master to the coupler or from the node to the output data. The coupler responds by returning a maximum of 128 bytes input data to the master.

Modules are configured when projecting the node which can be taken over from a hardware catalogue of the configuration programs. The information covering the possible modules is contained in the GSD files.

The coupler generates an internal mapping in accordance with the installed and configured settings of the node, in which the allocation of the input and output data is determined in the local process image with the position in the PROFIBUS DP Telegram.

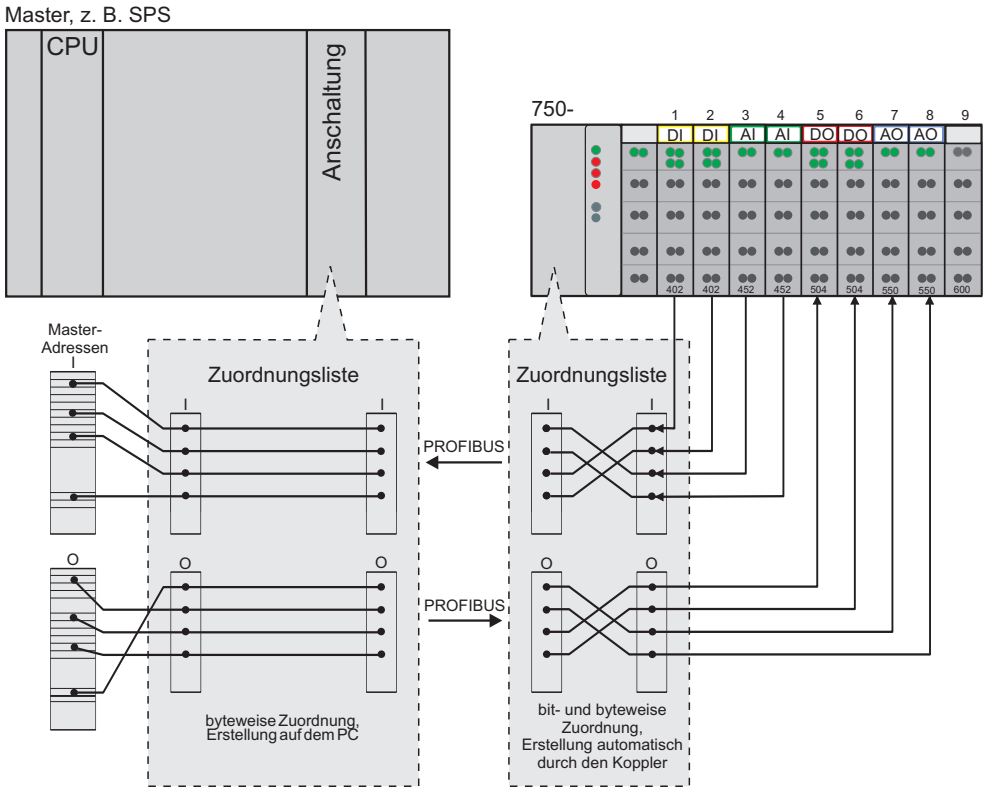

Fig. 3-8: Allocation of the input and output data g012117d

3.1.5 Configuration

The configuration of the node is performed in accordance with the physical requirements of the fieldbus coupler and I/O modules.

The fieldbus coupler or the process data channel is to be configured on the first slot.
The other slots are configured in accordance with the physical requirements of the I/O modules. Here only I/O modules with process data are relevant. The supply modules without diagnosis, bus internal system supply module and the termination module are to be ignored for the configuration because they do not provide any process data.

One or tow modules are entered in the hardware catalogue for each I/O module. The module appear as ***750-xyz ...***, for example ***750-400 2 DI/24 V DC/3.0 ms***.

For all binary modules an addition is made to the entry ****750-xyz ...***. When using these denominations the coupler adds the binary information to the current module in a byte which was previously opened with ***750-xyz ...***. The use of a „*“ module is only permitted when the number of channels is less than or equal to the remaining bits in the previously opened byte. The binary I/O modules combined in a byte can be arranged at separate locations, i.e. binary I/O modules with a different signal type or also byte orientated I/O modules can be connected between.

In order to be able to individually arrange the scope of connected periphery units independent of the control program, it is possible to parameterise I/O modules in the configuration table as „not connected“. In this manner process data still present is filtered for the individual module and not transferred on the PROFIBUS DP to and read by the periphery units.

3.1.5.1 GSD files

Under PROFIBUS DP the features of the modules are defined by the manufacturers in the form of a GSD file (unit basic data).

Structure, content and coding of this unit main data are standardised and made available to the user allowing to project optional DP slaves using the project units of various manufacturers.

Further information
The PNO provides information about the GSD files of all listed manufacturers.

GSD and symbol files for the configuration of the I/O modules are available under the order number 750-910 on disks or from the WAGO INTERNET page.

http://www.wago.com

GSD file for I/O-Module 750-333	**WAGOB754.GSD**

The GSD file is read by the configuration software and the corresponding settings transmitted. For the necessary inputs and handling steps please refer to the software user manuals.

3.1.5.2 Identification bytes

The identification bytes contain information about the design and structure of the unit inputs and outputs. For projecting each I/O module, or each channel is allocated an identification (module).

Bit								Meaning
7	6	5	4	3	2	1	0	
				0 0 0 ... 1	0 0 0 ... 1	0 0 1 ... 1	0 1 0 ... 1	**Data length** 1 byte or word 2 bytes or words 3 bytes or words ... 16 bytes or words
		0 0 1 1	0 1 0 1					**Input and output** spec. identification formats Input Output Input and output
	0 1							**Format** 0 = Byte structure 1 = Word structure
0 1								**Consistence over** Byte or word Total length

This information is saved in the GSD file. During projecting the I/O module is selected in accordance with the article number using the configuration software in the hardware catalogue.

Module	Ident.	Module	Ident
750-333 No process data channel	0x00	750-333 2 Byte process data channel	0xB1
750-400 2 DI/24 V DC/3.0 ms	0x10	*750-400 2 DI/24 V DC/3.0 ms	0x00
750-401 2 DI/24 V DC/0.2 ms	0x10	*750-401 2 DI/24 V DC/0.2 ms	0x00
750-402 4 DI/24 V DC/3.0 ms	0x10	*750-402 4 DI/24 V DC/3.0 ms	0x00
750-403 4 DI/24 V DC/0.2 ms	0x10	*750-403 4 DI/24 V DC/0.2 ms	0x00
750-404 Counter Module	0xF2		
750-405 2 DI/230 V AC/10 ms	0x10	*750-405 2 DI/230 V AC/10 ms	0x00
750-406 2 DI/120 V AC/10 ms	0x10	*750-406 2 DI/120 V AC/10 ms	0x00
750-408 4 DI/24 V DC/3.0 ms	0x10	*750-408 4 DI/24 V DC/3.0 ms	0x00
750-409 4 DI/24 V DC/0.2 ms	0x10	*750-409 4 DI/24 V DC/0.2 ms	0x00
750-410 2 DI/24 V DC/3.0 ms	0x10	*750-410 2 DI/24 V DC/3.0 ms	0x00
750-411 2 DI/24 V DC/0.2 ms	0x10	*750-411 2 DI/24 V DC/0.2 ms	0x00
750-412 2 DI/48 V DC/3.0 ms	0x10	*750-412 2 DI/48 V DC/3.0 ms	0x00
750-413 2 DI/48 V DC/0.2 ms	0x10	*750-413 2 DI/48 V DC/0.2 ms	0x00
750-414 4 DI/5 V DC/0.2 ms	0x10	*750-414 4 DI/5 V DC/0.2 ms	0x00
750-415 4 DI/24 V AC/DC/20 ms	0x10	*750-415 4 DI/24 V AC/DC/20 ms	0x00
750-418 2 DI/24 V DC DIA ACK	0x30	*750-418 2 DI/24 V DC DIA ACK	0x00
750-419 2 DI/24 V DC DIA	0x10	*750-419 2 DI/24 V DC DIA	0x00
750-423 4 DI/24 V AC/DC/50 ms	0x10	*750-423 4 DI/24 V AC/DC/50 ms	0x00
750-424 2 DI/24 V DC DIA	0x10	*750-424 2 DI/24 V DC DIA	0x00
750-452 2 AI/0-20 mA/diff.	0x51		
750-454 2 AI/4-20 mA/diff.	0x51		
750-456 2 AI/±10 V/diff.	0x51		
750-461 2 AI/RTD	0x51		

Module	Ident.	Module	Ident
750-462 2 AI/TC	0x51		
750-465 2 AI/0-20 mA/SE	0x51		
750-466 2 AI/4-20 mA/SE	0x51		
750-467 2 AI/0-10 V/SE	0x51		
750-468 4 AI/0-10 V/SE	0x53		
750-469 2 AI/TC/OCM	0x51		
750-472 2 AI/0-20 mA/OVLP	0x51		
750-474 2 AI/4-20 mA/OVLP	0x51		
750-476 2 AI/±10 V	0x51		
750-478 2 AI/0-10 V	0x51		
750-501 2 DO/24 V DC/0.5 A	0x20	*750-501 2 DO/24 V DC/0.5 A	0x00
750-502 2 DO/24 V DC/2.0 A	0x20	*750-502 2 DO/24 V DC/2.0 A	0x00
750-504 4 DO/24 V DC/0.5 A	0x20	*750-504 4 DO/24 V DC/0.5 A	0x00
750-506 2 DO/24 V DC/0.5 A DIA	0x20	*750-506 2 DO/24 V DC/0.5 A DIA	0x00
750-507 2 DO/24 V DC/2.0 A DIA	0x20	*750-507 2 DO/24 V DC/2.0 A DIA	0x00
750-509 2 DO/230 V AC/0.3 A	0x20	*750-509 2 DO/230 V AC/0.3 A	0x00
750-511 2 DO 24 V DC/PWM	0xF2		
750-512 2 DO Relay/250 V AC	0x20	*750-512 2 DO Relay/250 V AC	0x00
750-513 2 DO Relay/250 V AC	0x20	*750-513 2 DO Relay/250 V AC	0x00
750-514 2 DO Relay/125 V AC	0x20	*750-514 2 DO Relay/125 V AC	0x00
750-516 4 DO/24 V DC/0.5 A	0x20	*750-516 4 DO/24 V DC/0.5 A	0x00
750-517 2 DO Relay/230 V AC	0x20	*750-517 2 DO Relay/230 V AC	0x00
750-519 4 DO/5 V DC/20 mA	0x20	*750-519 4 DO/5 V DC/20 mA	0x00
750-522 2 DO/230V AC/0.5 A DIA	0x20	*750-522 2 DO/230V AC/0.5 A DIA	0x00
750-550 2 AO/0-10 V	0x61		
750-552 2 AO/0-20 mA	0x61		
750-554 2 AO/4-20 mA	0x61		
750-556 2 AO/±10 V	0x61		
750-610 P supply 24 V DC/DIA	0x00		
750-611 P supply 230 V AC/DIA	0x00		
750-630 SSI-Intf. standard	0x95		
750-630 SSI-Intf. alternative	0x93		
750-631 Encoder Intf.	0xB5		
750-650 RS232C Intf. 5 Byte	0xB5		
750-650 RS232C Intf. 3 Byte	0xB3		
750-651 TTY Intf. 5 Byte	0xB5		
750-651 TTY Intf. 3 Byte	0xB3		
750-653 RS485 Intf. 5 Byte	0xB5		
750-653 RS485 Intf. 3 Byte	0xB3		
750-654 Data Exch. Module	0xF1		

3.1.5.3 Example

The allocation should become clear by way of a fieldbus node with a coupler and 17 I/O modules.

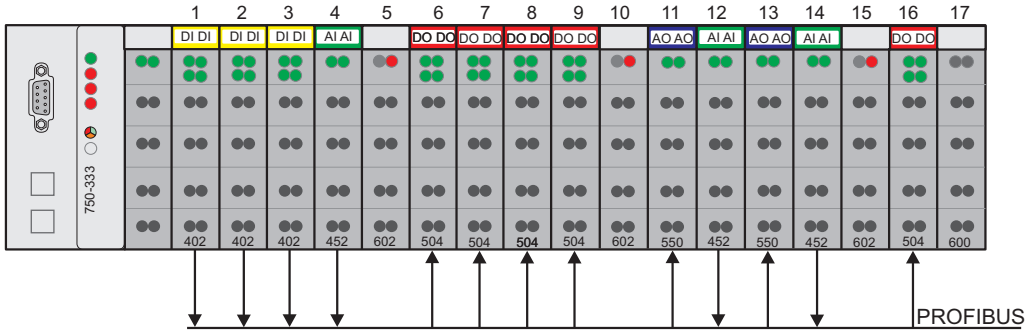

Fig. 3-9: Example application

g012115x

No.	I/O modules	Modul Identification	PI Master *	
			Inputs	Outputs
1	Digital input	750-402 4 DI/24 V DC/3.0 ms	EB12.0	
	Digital input	0x10	EB12.1	
	Digital input		EB12.2	
	Digital input		EB12.3	
2	Digital input	*750-402 4 DI/24 V DC/3.0 ms	EB12.4	
	Digital input	0x00	EB12.5	
	Digital input		EB12.6	
	Digital input		EB12.7	
3	Digital input	750-402 4 DI/24 V DC/3.0 ms	EB13.0	
	Digital input	0x10	EB13.1	
	Digital input		EB13.2	
	Digital input		EB13.3	
4	Analog input	750-452 2 AI/0-20 mA/diff.	EW0	
	Analog input	0x51	EW2	
5	Potential supply	Potential supply	---	---
6	Digital output	750-504 4 DO/24 V DC/0.5 A		AB8.0
	Digital output	0x20		AB8.1
	Digital output			AB8.2
	Digital output			AB8.3
7	Digital output	*750-504 4 DO/24 V DC/0.5 A		AB8.4
	Digital output	0x00		AB8.5
	Digital output			AB8.6
	Digital output			AB8.7

8	Digital output	750-504 4 DO/24 V DC/0.5 A		AB9.0
	Digital output	0x20		AB9.1
	Digital output			AB9.2
	Digital output			AB9.3
9	Digital output	*750-504 4 DO/24 V DC/0.5 A		AB9.4
	Digital output	0x00		AB9.5
	Digital output			AB9.6
	Digital output			AB9.7
10	Potential supply	Potential supply	---	---
11	Analog output	750-550 2 AO/0-10 V		AW0
	Analog output	0x61		AW2
12	Analog input	750-452 2 AI/0-20 mA/diff.	EW4	
	Analog input	0x51	EW6	
13	Analog output	750-550 2 AO/0-10 V		AW4
	Analog output	0x61		AW6
14	Analog input	750-452 2 AI/0-20 mA/diff.	EW8	
	Analog input	0x51	EW10	
15	Potential supply	Potential supply	---	---
16	Digital output	750-504 4 DO/24 V DC/0.5 A		AB10.0
	Digital output	0x20		AB10.1
	Digital output			AB10.2
	Digital output			AB10.3
17	End module	End module	---	---

* The master addresses listed in the table correspond to the allocation of the process data given in the master configuration.

3.1.6 Parameterising the coupler

Before a data exchange is possible between the master and slaves a parameterisation is necessary in addition to the configuration.

The extended parameters (extended User_Prm_Data) is available as a selectable text in the configuration programs using the GSD files.

Description	Value	Meaning
Restart the internal bus after a fault	POWER ON RESET*) AUTORESET	Restart of the internal bus following a fault, such as missing termination module, after interruption of the I/O module supply immediately after overcoming I/O module fault
I/O module diagnosis	released*) lock	The diagnosis information about all diagnosis capable I/O modules, with which the diagnosis is released are transferred to PROFIBUS-DP master not transferred to PROFIBUS-DP master
Process value display	INTEL MOTOROLA*)	Word or double word orientated process data is transferred to the PROFIBUS-DP master in: „Little Endian Format“ „Big Endian Format“
Behaviour in case of a PROFIBUS DP fault	Stop internal bus transmission Set start image to zero Freeze starting image Write substitute values*)	In the case of a fault with the PROFIBUS DP communication the status of the inserted output periphery can be influenced in various manners: the process data exchange of the internal bus is stopped, all outputs drop out after a module specific monitoring time of 100 ms all outputs are reset immediately all outputs contain the last status before the fault all outputs switch a parameter substitute value
Reaction to internal bus faults	Stop PROFIBUS data exchange*) Set start image to zero Freeze starting image	In the case of a fault with the internal communication between the fieldbus coupler and I/O modules, such as, for example: no termination module, the data exchange with the PROFIBUS master is stopped. the input information is set to zero the input information before the fault is maintained

*) Default settings

The complete parameter record encompasses 34 parameterisation bytes. The first 10 bytes are laid down by the DP and DPV1 standard. The others contain manufacturer specific parameters.

Byte No.	Bit No.	Value	Meaning
Standard parameters			
0	0-7		Stations status (see EN 50170)
1	0-7	2-255	Watchdog factor 1
2	0-7	2-255	Watchdog factor 2
			Watchdog: The reaction monitoring is determined in accordance with the Watchdog_Factor_1 x Watchdog_Factor_2 x 10 ms (1 ms)
3	0-7	11-255	Min T_{SDR}, Earliest time in T_{Bit} after which the slave may answer
4	0-7	183, 0xB7	Manufacturer code (high byte)
5	0-7	84, 0x54	Manufacturer code (low byte)
6	0-7		Group allocation, Broad and multicast telegrams (SYNC, FREEZE)
7	0-7		DPV1 status 1 (see EN 50170)
8	0-7		DPV1 status 2 (see EN 50170)
9	0-7		DPV1 status 3 (see EN 50170)
Manufacturer parameters			
10	0-7	0	Table 0, register 0 LB, reserved
11	0-7	0	Table 0, register 0 HB, reserved
12	0-7	0	Table 0, register 1 LB, reserved
13	0-7	0	Table 0, register 1 HB, reserved
14			Table 0, register 2 LB
	0	0	Module diagnosis locked
	0	1 *)	Module diagnosis released
	1	0	Internal bus restart after fault: POWER-ON-RESET
	1	1 *)	Internal bus restart after fault: AUTORESET
	2-7	0	reserved
15	0-7	0	Table 0, register 2 HB, reserved
16			Table 0, register 3 LB
	0-2	'011'	reserved
	3	0	Data format byte orientated I/O modules: INTEL
	3	1 *)	Data format byte orientated I/O modules: MOTOROLA
	4-7	'1100'	reserved
17			Table 0, register 3 HB
	0-2		Reaction to fieldbus fault:
		'000'	- Internal bus transmission stopped
		'001'	- Set output image to zero
		'010'	- Freeze output image
		'011' *)	- Write substitute values
		'100'	- PFC fault strategy
		'101'	- not possible
		'110'	- not possible
		'111'	- not possible
	3-5		Reaction to internal bus fault:
		'000' *)	- Leave data exchange
		'001'	- Set input image to zero
		'010'	- Freeze input image
		'011'	- not possible
		'100'	- not possible
		'101'	- not possible
		'110'	- not possible
		'111'	- not possible
	6-7	'00'	reserved
18	0-7	'1100.0011'	Table 0, register 4 LB, reserved
19	0-7	'0111.1111'	Table 0, register 4 HB, reserved
20	0-7	'0000.0000'	Table 100, register 0 LB, reserved
21	0-7	'0000.0001'	Table 100, register 0 HB, reserved
22	0-7	'0000.0000'	Table 100, register 1 LB, reserved
23	0-7	'0000.0000'	Table 100, register 1 HB, reserved
24	0-7	'0000.0000'	Table 100, register 2 LB, reserved
25	0-7	'0000.0000'	Table 100, register 2 HB, reserved

3.1.7 Configuring the process data channel

The process data channel serves for the communication between the coupler and the higher ranking systems (Master or projecting and diagnosis PC). This channel is allocated to the coupler. The fieldbus coupler 750-333 does not use the process data channel.

Module	Identification hex	Identification dec.
750-333 No process data channel	0x00	0

Note
The module „750-333 no process data channel“ should be configured as the 1st module.

3.1.8 Configuration and parameterisation of I/O modules

3.1.8.1 Digital I/O modules

All binary I/O modules contain parameterisation information extended by 3 bytes, to serve, amongst others, for identification on the internal bus and the structure of the mapping table. With diagnosis capable terminals the diagnosis message can be suppressed or released for a channel or module. Binary outputs offer the alternative to switch to parameterisable substitute values in the case of a master failure.

Note
For simplification the tables only show the article number for the module designation. The module „750-400“ thus corresponds to the module „750-400 2 DI/24 V DC/3.0 ms“

3.1.8.1.1 2 DI I/O modules

Module	Identification hex	Identification dec
750-400, 750-401, 750-405, 750-406, 750-410, 750-411, 750-412	0x10	16
*750-400, *750-401, *750-405, *750-406, *750-410, *750-411, *750-412	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the coupler

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
Italic		Cannot be changed

3.1.8.1.2 4 DI I/O modules

Module	Identification hex	Identification dec
750-402, 750-403, 750-408, 750-409, 750-414, 750-415, 750-423, 750-422, 750-424	0x10	16
*750-402, *750-403, *750-408, *750-409, *750-414, *750-415, *750-423, *750-422, *750-424	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - Set to zero by the coupler

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
Italic		Cannot be changed

3.1.8.1.3 2 DI I/O modules modules with 1 bit diagn. per channel

Module	Identification hex	Identification dec
750-419, 750-425	0x10	16
*750-419, *750-425	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the coupler
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *1*	1 *0*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn1_3$		Diagnosis idle run, short circuit on channel 2
	0	locked
	1	released
$DiagEn0_2$		Diagnosis idle run, short circuit on channel 1
	0	locked
	1	released
Italic		cannot be changed

3.1.8.1.4 2 DO I/O modules

Module	Identification hex	Identification dec
750-501, 750-502, 750-509, 750-512, 750-513, 750-514, 750-517	0x20	32
*750-501, *750-502, *750-509, *750-512, *750-513, *750-514, *750-517	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the coupler
Substitute channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus coupler parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *0*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 SV1	0 SV0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$SV0_0$		Substitute value for channel 1
$SV0_1$		Substitute value for channel 2
Italic		Cannot be changed

3.1.8.1.5 2 DO I/O modules with 1 bit diagn. per channel

Module	Identification hex	Identification dec
750-507, 750-522	0x20	32
*750-507, *750-522	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the coupler
Diagnosis channel x	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master
Substitute channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus coupler parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 SV1	0 SV0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$		Diagnosis idle run, overload, short circuit on channel 1
	0	lock
	1	release
$DiagEn1_3$		Diagnosis idle run, overload, short circuit on channel 2
	0	locked
	1	released
$SV0_0$		Substitute value for channel 1
$SV0_1$		Substitute value for channel 2
Italic		Cannot be changed

3.1.8.1.6 2 DO I/O module with 2 bit diagn. per channel

Module	Information hex	Information dec
750-506	0x20	32
*750-506	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the coupler
Diagnosis channel x	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master
Substitute channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus coupler parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 SV1	0 SV0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$		Diagnosis idle run, short circuit, lower voltage on channel 1
	0	locked
	1	released
$DiagEn1_3$		Diagnosis idle run, short circuit, lower voltage on channel 2
	0	locked
	1	released
$SV0_0$		Substitute value for channel 1
$SV0_1$		Substitute value for channel 2
Italic		cannot be changed

3.1.8.1.7 4 DO I/O modules

Module	Identification hex	Identification dec
750-504, 750-516, 750-519	0x20	32
*750-504, *750-516, *750-519	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - ignored by the coupler
Substitute channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus coupler parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *0*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 SV3	2 SV2	1 SV1	0 SV0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$SV0_0$		Substitute value for channel 1
$SV0_1$		Substitute value for channel 2
$SV0_2$		Substitute value for channel 3
$SV0_3$		Substitute value for channel 4
Italic		Cannot be changed

3.1.8.1.8 2 DI/DO I/O module with 1 bit diagn. per channel

Module	Identification hex	Identification dec
750-418	0x30	48
*750-418	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the coupler
Diagnosis channel x	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *1*	1 *1*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$		Diagnosis idle run, overload, short circuit on channel 1
	0	lock
	1	release
$DiagEn1_3$		Diagnosis idle run, overload, short circuit on channel 2
	0	locked
	1	released
Italic		Cannot be changed

3.1.8.1.9 Internal system supply module with diagnosis

Module	Identification hex	Identification dec
750-610, 750-611	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the coupler
Diagnosis field voltage loss Diagnosis fuse blown	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis field voltage failure info, lock
	1	Diagnosis field voltage failure info., release
$DiagEn1_3$	0	Diagnosis fuse failure info. lock
	1	Diagnosis fuse failure info. release
Italic		Cannot be changed

3.1.8.2 Analog I/O modules

All analog I/O modules have 2 bytes of extendable parameterisation information, which serves for identification on internal bus and the formation of a mapping table.

Analog inputs are followed by 2 bytes reserved for future options. The diagnosis message can be suppressed or released for each individual channel by means of modules capable of diagnostics.

Analog outputs have 4 byte parameterisation data. These are used to save the substitute values for a maximum of 2 channels (2 words).

3.1.8.2.1 2 AI I/O modules

Module	Identification hex	Identification dec
750-461, 750-462, 750-469, 750-465, 750-466, 750-467, 750-472, 750-474, 750-476, 750-478, 750-479, 750-480, 750-491	0x51	81

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the coupler
Diagnosis channel x	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7 reserved	6	5	4	3	2	1	0
2	15 reserved	14	13	12	11	10	9	8
3	7 reserved	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis channel 1 locked
	1	Diagnosis channel 1 released
$DiagEn1_3$	0	Diagnosis channel 2 locked
	1	Diagnosis channel 2 released
Italic		Cannot be changed

3.1.8.2.2 4 AI I/O module

Module	Identification hex	Identification dec
750-468	0x53	83

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the coupler
Diagnosis channel x	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 Diag En3	0 Diag En2
1	7 reserved	6	5	4	3	2	1	0
2	15 reserved	14	13	12	11	10	9	8
3	7 reserved	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn2_0$	0	Diagnosis channel 3 locked
	1	Diagnosis channel 3 released
$DiagEn3_1$	0	Diagnosis channel 4 locked
	1	Diagnosis channel 4 released
$DiagEn0_2$	0	Diagnosis channel 1 locked
	1	Diagnosis channel 1 released
$DiagEn1_3$	0	Diagnosis channel 2 locked
	1	Diagnosis channel 2 released
Italic		Cannot be changed

3.1.8.2.3 2 AO I/O modules

All analog modules have 6 bytes of extended parameterisation information and offer the possibility of switching in parameterisable substitute values in the case of a master failure.

Module	Identification hex	Identification dec
750-550, 750-552, 750-554, 750-556	0x61	97

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - ignored by the coupler
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master
Substitute value channel x	0x0000 or 0x8000 0 or -32767 ... 0x7FFF ... 32767	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus coupler parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 reserved	6	5	4	3	2	1	0
2	15 SubVal_Ch1_HB	14	13	12	11	9	8	7
3	7 SubVal_Ch1_LB	6	5	4	3	2	1	0
4	15 SubVal_Ch2_HB	14	13	12	11	10	9	8
5	7 SubVal_Ch2_LB	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
SubVal_Ch1	0x0000 : 0xFFFF	Substitute value channel 1
SubVal_Ch2	0x0000 : 0xFFFF	Substitute value channel 2
Italic		Cannot be changed

3.1.8.3 Digital special modules

All digital special modules have 2 byte of extended parameterisation information, used for the identification on the internal bus and the creation of a mapping table.

With input modules (counter), 2 bytes follow which are reserved for future options.

For output modules (PWM output) 6 byte parameterisation data follow, used for saving the substitute values for a maximum of 2 channels (2 words).

3.1.8.3.1 Counter modules

Module	Identification hex	Identification dec
750-404, 750-638	0xF2	242

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the coupler

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *reserved*	6	5	4	3	2	1	0
2	15 *reserved*	14	13	12	11	9	8	7
3	7 *reserved*	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
Italic		Cannot be changed

3.1.8.3.2 PWM module

Module	Identification hex	Identification dec
750-511	0xF2	242

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the coupler or ignored by the coupler
Substitute value channel x	0x0000 *) ... 0x7FFF	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus coupler parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *1*	6 *0*	5 *1*	4 *1*	3 *1*	2 *1*	1 *0*	0 *1*
2	15 *reserved*	14	13	12	11	9	8	7
3	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
4	15 SubVal_Ch1_HB	14	13	12	11	9	8	7
5	7 SubVal_Ch1_LB	6	5	4	3	2	1	0
6	15 SubVal_Ch2_HB	14	13	12	11	10	9	8
7	7 SubVal_Ch2_LB	6	5	4	3	2	1	0

$Plug_S$	0	Module is physically not present
	1	Module is physically present (default)
SubVal_Ch1	0x0000 : 0xFFFF	Substitute value channel 1
SubVal_Ch2	0x0000 : 0xFFFF	Substitute value channel 2
Italic		Cannot be changed

3.1.8.4 Distance and Angle Messurment Modules

All interface modules for path and angle measurement have 2 bytes of extended parameterisation information used for the identification on internal bus and the creation of the mapping table. 2 additional bytes follow which are reserved for future options.

3.1.8.4.1 SSI encoder interface

Module	Identification hex	Identification dec
750-630 (Alternative)	0x93	147
750-630 (Standard)	0x95	149

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the coupler or ignored by the coupler
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *1*	6 *1*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
2	15 reserved	14	13	12	11	9	8	7
3	7 reserved	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis released
Italic		Cannot be changed

3.1.8.4.2 Incremental encoder interface

Module	Identification hex	Identification dec
750-631, 750-637	0xB5	181

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the coupler or ignored by the coupler
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *reserved*	6	5	4	3	2	1	0
2	15 *reserved*	14	13	12	11	10	9	8
3	7 *reserved*	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis released
Italic		Cannot be changed

3.1.8.4.3 Digital impulse interface

Module	Identification hex	Identification dec
750-635	0xB3	179

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the coupler or ignored by the coupler
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *1*	6 *1*	5 *0*	4 *0*	3 *0*	2 *1*	1 *0*	0 *1*
2	15 *reserved*	14	13	12	11	10	9	8
3	7 *reserved*	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis released
Italic		Cannot be changed

3.1.8.5 Serial interfaces

All serial interface modules have 2 bytes of extended parameterisation information used for the identification on internal bus and the creation of the mapping table. 2 additional bytes follow which are reserved for future options.

Module	Identification hex	Identification dec
750-650, 750-651, 750-653, 750-654 (3 Byte)	0xB3	179
750-650, 750-651, 750-653, 750-654 (5 Byte)	0xB5	181

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the coupler or ignored by the coupler
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *reserved*	6	5	4	3	2	1	0
2	15 *reserved*	14	13	12	11	10	9	8
3	7 *reserved*	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis released
Italic		Cannot be changed

3.1.9 Diagnosis

The slave diagnosis of the bus coupler now comprises of a 6 byte standard diagnosis, a 9 byte identification diagnosis, a 7 byte device status and an up to 42 byte channel based diagnosis.

In the reply telegram of the diagnosis selection the identification based diagnosis and the device status are transmitted together with the standard diagnosis. This can be followed by up to 14 channel based diagnosis messages (3 byte per message).

Byte		
0		
1		Station status 1 to 3
2		
3		PROFIBUS-DP master address
4		Manufacturer identification
5		
6		
7		Identification based diagnosis
:	:	
14	:	
15		
		Device status
21		
22		
		Channel based diagnosis
		(3 bytes per channel)
63		

3.1.9.1 Station status 1 to 3

see EN 50170

3.1.9.2 PROFIBUS-DP master address

The PROFIBUS-DP master address is located in byte 3 of the slave diagnosis and includes the address of the master which has parameterised the station and which has read and write access.

3.1.9.3 Manufacturer‘s identification

The manufacturer’s identification is located in byte 4 and 5 and includes a 16 bit code, which serves for the identification of the device or the device class.

3.1.9.4 Identification based diagnosis

The identification based diagnosis comprises of a bit field, which contains one bit of information for each connected module. The individual bit provides evidence about the current operating status. A 0 means no fault, a 1 indicates a faulty module condition. The bus coupler can be equipped with up to 63 modules, so that the identification based diagnosis including the header covers 9 bytes from byte 6 to byte 14.

Byte	Information								Meaning
6	0	1	0	0	1	0	0	1	Header byte (9 byte identification based diagnosis incl. header)
7	7	6	5	4	3	2	1	0	
8	15	14	13	12	11	10	9	8	
9	23	22	21	20	19	18	17	16	Diagnosis allocation to
10	31	30	29	28	27	26	25	24	I/O module n (n=1 ... 63)
11	39	38	37	36	35	34	33	32	Coupler (n=0)
12	47	46	45	44	43	42	41	40	
13	55	54	53	52	51	50	49	48	
14	63	62	61	60	59	58	57	56	

3.1.9.5 Device status

The device status encompasses 7 bytes including the required overhead and transmits status information of an internal nature and relating to the I/O module (internal bus), PROFIBUS-DP and the PFC-RTS to the master or the higher ranking controls.

Byte	Information								Meaning
15	0	0	0	0	0	1	1	1	Header byte (7 byte status information incl. header)
16	1	0	1	0	0	0	0	0	Status type (manufacturer specific device status)
17	0	0	0	0	0	0	0	0	Slot number 0
18	0	0	0	0	0	0	0	0	Status differentiation (none)
19	q	q	n	n	n	n	n	n	Status message q – Status source '00' Internal status '01' Internal bus status '10' PROFIBUS DP status n – Status number
20	x	x	x	x	x	x	x	x	Status argument
21	0	0	0	0	0	0	0	0	Reserved

3.1.9.5.1 Internal status messages and arguments

Status message	Status argument	Description
0x00	0x00	No fault
0x01	0x00	EEPROM check sum fault / check sum fault in the parameter area of the flash
0x01	0x01	Overflow inline code buffer
0x01	0x02	Unknown data type
0x01	0x03	Module type of the flash program memory could not be determined / is incorrect
0x01	0x04	Fault when writing in the FLASH memory
0x01	0x05	Fault when deleting the FLASH memory
0x01	0x06	Changed I/O modules configuration determined following AUTORESET
0x01	0x07	Fault when writing in the serial EEPROM
0x01	0x08	Invalid firmware
0x02	0x00	Incorrect table entry
0x07	n	Non-supported modules at position n (n = 1...63)

3.1.9.5.2 Internal bus status messages and arguments

Status message	Status argument	Description
0x63	0xFF	At least one module cannot interpret an internal bus command
0x64	0x00	A data fault or an internal bus interruption exists behind the bus coupler
0x64	n	An internal bus interruption exists behind the module n
0x65	n	Fault in the register communication with module n

3.1.9.5.3 PROFIBUS-DP status messages and arguments

Status message	Status argument	Description
0x81	0x01	Insufficient parameterisation data configuration data
0x81	0x02	Too much parameterisation data
0x82	n	n. parameter byte faulty
0x83	0x01	Insufficient configuration data
0x83	0x02	Too much configuration data
0x84	n	n. configuration byte (module) faulty
0x85	0x01	maximum input data length exceeded
0x85	0x02	maximum output data length exceeded
0x86	0x01	Compilate buffer overflow for DP process image
0x86	0x02	Compilate buffer overflow for PFC process image

3.1.9.6 Channel based diagnosis

The channel based diagnosis is intended for detailing the identification based diagnosis. A structure is appended to each device status per faulty slot which comprises of a header byte, a byte, the channel type supplying the channel number and a third byte, which describes the fault type and the channel organisation.

Byte	Information								Meaning
22	1	0	x	x	x	x	x	x	Header channel based diagnosis (x: 1 to 63, slots of the module)
23	a	a	x	x	x	x	x	x	Channel type (a) and channel number x: 0 to 3
	0	1							Input channel
	1	0							Output channel
	1	1							Input / output channel
24	t	t	t	x	x	x	x	x	Channel type (t) and fault type (x)
	0	0	0						No allocation
	0	0	1						1 Bit
	0	1	0						2 Bit
	0	1	1						4 Bit
	1	0	0						1 Byte
	1	0	1						1 Word
	1	1	0						2 Words
25-27	Next channel based diagnosis message (as byte 22 – 24)								
28-30	Next channel based diagnosis message (as byte 22 – 24)								
...	...								
61-63	Last displayable channel based diagnosis message (such as byte 22 – 24)								

3.1.9.6.1 Fault types of I/O modules with diagnostic capability

The fault types refer to standardised types.

Fault type	Meaning
0	Not specified
1	Short circuit
2	Low voltage
3	High voltage
4	Overload
5	Over temperature
6	Line break
7	Upper limit value exceeded
8	Lower limit value exceeded
9	Fault
10 ... 15	Reserved
16 ... 31	Manufacturer specific
17	Field voltage fault
18	Fuse fault
19	Buffer overflow
20	Check sum fault
21	Parity fault
22	Receive Timeout (partner)
23	Receive Timeout
26	SSI_IN fault
27	SSI FRAME fault
31	I/O module fault

3.1.9.6.2 I/O modules fault cases

Article number	Channel type	Fault type	Meaning
750-418, 750-419, 750-507, 750-522	'001	0.1001'	Fault (line break, overload or short circuit)
750-506	'001	0.0001' 0.0010' 0.0110' 0.1001'	Short circuit Lower voltage Line break Error
750-461, 750-469	'101	0.0110' 0.1000' 1.0000' 1.1111'	Line break Lower limit value gone below Parameterisation fault I/O module fault
750-462, 750-465, 750-466, 750-472, 750-474, 750-479, 750-480	'101	0.0111' 0.1000' 1.0000' 1.1111'	Lower limit value gone below Upper limit value exceeded Parameterisation fault I/O module fault
750-610, 750-611,	'001	1.0001' 1.0010'	Field voltage fault Fuse fault
750-630	'110	1.1010' 1.1011' 1.0000' 1.1111'	SSI_IN fault (external fault) SSI FRAME fault Parameterisation fault I/O module fault
750-635, 750-637	'110	0.1001' 1.0000' 1.1111'	Error Parameterisation fault I/O module fault
750-650, 750-651, 750-653, 750-654	'110 ('000)	0.1001' 1.0000' 1.1111'	Buffer overflow Parameterisation fault I/O module fault

3.1.10 LED signalling

The coupler possesses several LED's for on site signalling of the coupler operating status or the complete node

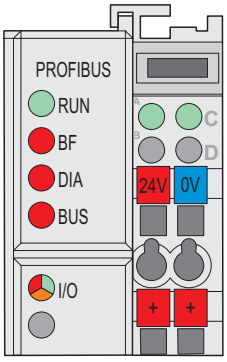

Fig. 3-10: Display elements 750-333 g012106x

3.1.10.1 Blink code

Detailed fault messages are displayed with the aid of a blink code. A fault is cyclically displayed with up to 3 blink sequences.

- The first blink sequence (approx. 10 Hz) starts the fault display.
- The second blink sequence (approx. 1 Hz) following a pause. The number of blink pulses indicates the **fault code**.
- The third blink sequence (approx. 1 Hz) follows after a further pause. The number of blink pulses indicates the **fault argument**.

3.1.10.2 Fieldbus status

The upper four LED´s signal the operating conditions of the PROFIBUS communication.

LED	Colour	Meaning
RUN	green	The 'RUN' LED indicates to the user if the fieldbus coupler is perfectly initialised.
BF	red	The 'BF' LED indicates that the communication functions via the PROFIBUS.
DIA	red	The 'DIA' LED indicates an external diagnosis.
BUS	red	The 'BUS' LED signals a projecting fault.

RUN	BF	DIA	BUS	Meaning
off	off	off	off	No operating voltage to the coupler (status LED of the bus coupler supply does not light up) or a hardware fault is present.
on	on	*	off	PROFIBUS interface started, baud rate was not yet recognised.
on	blinks	*	off	Baud rate recognised, station not yet parameterised and configured.
on	blinks	on	blinks cyclically	Slave was incorrectly projected. Fault message via blink code
on	off	*	off	The coupler is exchanging data.
on	*	on	*	The coupler signals an existing diagnosis.

* Not relevant

3.1.10.3 Fault message via blink code of the BUS-LED

Fault argument	Fault description
Fault code 1: Fault in parameterisation telegram	
1	Insufficient parameterisation data
2	Excessive parameterisation data
Fault code 2: Fault in parameterisation telegram	
n	Faulty parameterised byte n
Fault code 3: Fault in configuration telegram	
1	Insufficient configuration data
2	Excessive configuration data
Fault code 4: Fault in configuration telegram	
n	Configuration byte (module) n is faulty
Fault code 5: Fault in the data length	
1	maximum input data length exceeded
2	maximum output data length exceeded
Fault code 6: Compilate buffer overflow	
1	Compilate buffer overflow for DP process image

3.1.10.4 Node status

The 'I/O' LED indicates the node operation and signals faults occurring.

I/O	Meaning
green	Data cycle on the internal bus
off	No data cycle on the internal bus
red	Coupler hardware defective
red blinks	When starting: internal bus is initialised During operation: general internal bus fault
red blinks cyclically	Fault message during internal bus reset and internal fault:
orange	FLASH access to bus coupler firmware

The coupler starts after switching on the supply voltage. The "I/O" LED flashes red. Following a fault free run up the "I/O" LED changes to green steady light.
In the case of a fault the "I/O" LED continues blinking red. The fault is cyclically displayed with the blink code.

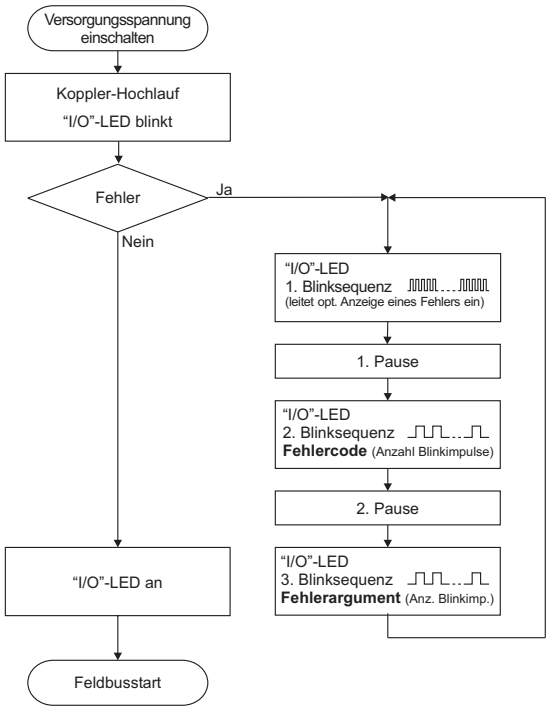

Fig. 3-11: Signalling the LED's node status g012111d

After overcoming a fault restart the coupler by switching off and on the supply voltage.

3.1.10.5 Fault message via the blink code of the I/O LED

Fault argument	Fault description
Fault code 1: Hardware and configuration fault	
0	EEPROM check sum fault / check sum fault in parameter area of the flash memory
1	Overflow of the internal buffer memory for the inline code
2	Unknown data type
3	Module type of the flash program memory could not be determined / is incorrect
4	Fault during writing in the flash memory
5	Fault when deleting the FLASH memory
6	Changed I/O module configuration found after AUTORESET
7	Fault when writing in the serial EEPROM
8	Invalid firmware
Fault code 2: Fault in programmed configuration	
0	Incorrect table entry
Fault code 3: Internal bus command fault	
0	I/O module(s) has (have) identified internal bus command as incorrect
Fault code 4: Internal bus data fault	
0	Data fault on internal bus or Internal bus interruption on coupler
n* (n>0)	Internal bus interrupted after I/O module n
Fault code 5: Register communication fault	
n*	Internal bus fault during register communication with the I/O module n
Fault code 7: I/O module not supported	
n*	I/O module not supported at position n

* The number of blink pulses (n) indicates the position of the I/O module. I/O modules without data are not counted (e.g. supply module without diagnosis)

Example: the 13th I/O module is removed.	
1.	The "I/O" LED generates a fault display with the first blink sequence (approx. 10 Hz).
2.	The first pause is followed by the second blink sequence (approx. 1 Hz). The "I/O" LED blinks four times and thus signals the fault code 4 (internal bus data fault).
3.	The third blink sequence follows the second pause. The "I/O ERR" LED blinks twelve times. The fault argument 12 means that the internal bus is interrupted after the 12th I/O module.

3.1.10.6 Supply voltage status

LED	Colour	Meaning
A	green	Status of the operating voltage – system
C	green	Status of the operating voltage – power jumper contacts

There are two green LED's in the coupler supply section to display the supply voltage. The left LED (A) indicates the 24 V supply for the coupler. The right hand LED (C) signals the supply to the field side, i.e. the power jumper contacts.

3.1.11 Fault behaviour

3.1.11.1 Fieldbus failure

A fieldbus failure has occurred when the master is switched off or the bus cable is interrupted. A fault in the master can also lead to a fieldbus failure.

The red "BF" LED lights up.

The failure of the fieldbus can activate the parameterisable substitute value of the I/O modules. During projecting of the inputs and outputs a substitute value can be laid down for each channel.

Substitute value strategy	Value (bit orientated) Digital output modules	Value (byte orientated) Analog output modules
Minimum value	0	0 or 4 mA, 0 V
Maximum value	1	20 mA, 10 V
Substitute value	0 or 1	0/4 ... 20 mA, -10 ... +10 V
Stop internal bus	Behaviour determined by I/O module	

The value is entered in the output process image by the coupler. With I/O modules with byte orientated data width, e.g. the pulse width module, the substitute value is determined via the value area.

As soon as the fieldbus is active the process data is transmitted and the output correspondingly set in the nodes.

3.1.11.2 Internal bus fault

An internal bus fault is created, for example, if an I/O module is removed. If this fault occurs during operation the output modules behave in the same manner as an I/O module stop. The input process image is set in accordance with the projected strategy.

The "I/O" LED blinks red. The slave generates a detailed fault message.

Once the internal bus fault has been overcome the coupler starts up automatically in accordance with the parameterised restart routine. The process data transfer is then restarted and the outputs reset in the nodes.

3.1.12 Technical data

System data	
Number of I/O modules	96 with repeater
Number of I/O points	approx. 6000 (master dependent)
Transmission medium	Cu cable in accordance with EN 50170
Bus segment length	100 m ... 1200 m (baud rate dependent / cable dependent)
Transmission rate	9.6 kBaud ... 12 MBaud
Transmission time with 10 modules each with 32 DI and 32 DO, 12 MBaud	typically 1 ms max. 3.3 ms
Bus connection	1 x D-SUB 9; socket
Standards and approvals	
UL (UL508)	E175199
Standard	EN 50 170
Conformity marking	CE
Technical data	
Number of I/O modules	63
Protocol	DP / DPV1
Input process image	max. 128 Byte
Output process image	max. 128 Byte
Configuration	via PC or controls
Voltage supply	DC 24 V (-15 % / + 20 %)
Input current$_{max}$	500 mA at 24 V
Internal system supply module efficiency	87 %
Internal power consumption	200 mA at 5 V
Total current for I/O modules	1800 mA at 5 V
Voltage via power jumper contacts	DC 24 V (-15 % / + 20 %)
Current via power jumper contact$_{max}$	DC 10 A
Dimensions (mm) B x H x T	51 x 65* x 100 (*from top edge of mounting rail)
Weight	approx. 195 g
EMC interference resistance	as per EN 50082-2 (95)
EMC interference transmission	as per EN 50081-2 (94)

3.2 Fieldbus Controller 750-833

This chapter includes:

3.2.1 Description

The programmable fieldbus coupler 750-833 combines the PROFIBUS DP-functions of the fieldbus coupler 750-333 with that of a programmable logic control (PLC). The application program is created with WAGO-I/O-PRO in accordance with IEC 61131-3. The programmer has access to all fieldbus and I/O data.

- Load relief for the central controls using decentral processing units
- Dividing complex applications into individual testable units
- Programmable fault reaction in the case of a fieldbus system failure
- Load relief of the communication system PROFIBUS DP by signal processing
- Reduction of reaction times by direct access to the periphery (without having pass through the fieldbus system PROFIBUS DP)
- Autarcic smallest scale controls (station address 0)
- Use for decentral and central control
- Programmable in accordance with IEC 61131-3 in all 5 languages: IL, LD, FBD, ST and SFC

In the initialisation phase the bus coupler determines the physical structure of the node and creates the process image of all inputs and outputs on this basis. I/O modules with a bit width of less than 8 can only be grouped to one byte in each case in order to optimise the address space.

It is also still possible to deactivate projected I/O modules. In this manner the physical structure of the node can be individually structured with reference to its periphery signals, without touching an already existing control application.

The diagnosis concept is based on the identification and channel based diagnosis in accordance with EN 50170. In this manner it is not necessary to program modules for evaluation of the manufacturer specific diagnosis information.

- Max. process data length 128 Byte (input and output process image)
- Automatic recognition of the transmission speed on the PROFIBUS of 9.6 kBd to 12 MBd
- All I/O modules from the WAGO-I/O-SYSTEM 750 are supported
- Configuration modules can be parameterised as wildcards.
- Parameterable substitute value for each channel
- D-Sub 9 pole bus connection

3.2.2 Hardware

3.2.2.1 View

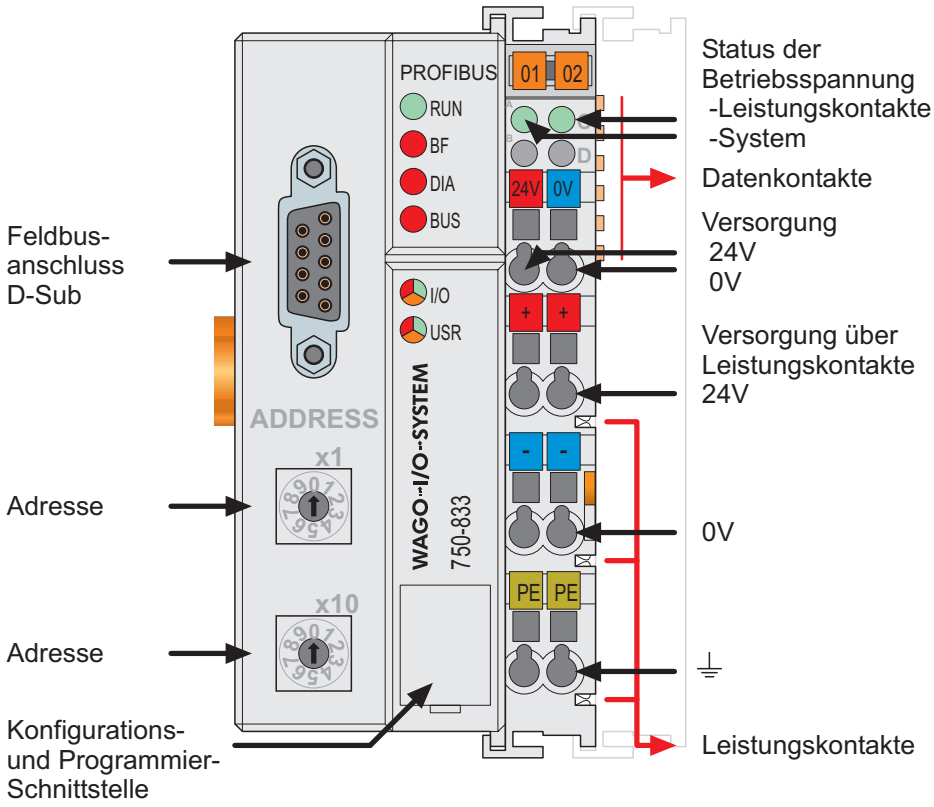

Fig. 3-12: Fieldbus coupler 750-833 PROFIBUS DP/V1 g083300d

The controller comprises of:

- Device supply with internal system supply module for the system supply as well as power jumper contacts for the field supply via assembled I/O modules
- Fieldbus interface with the bus connection
- 2 rotary switches for the station address (decimal)
- Display elements (LED's) for status display of the operation, the bus communication, the operating voltages as well as for fault messages and diagnosis
- Configuration and programming interface
- Operating mode switch
- Electronics for communication with the I/O modules (internal bus) and the fieldbus interface

3.2.2.2 Device supply

The supply is via fed in via terminal blocks with CAGE CLAMP® connection. Device supply is intended for system supply and field side supply.

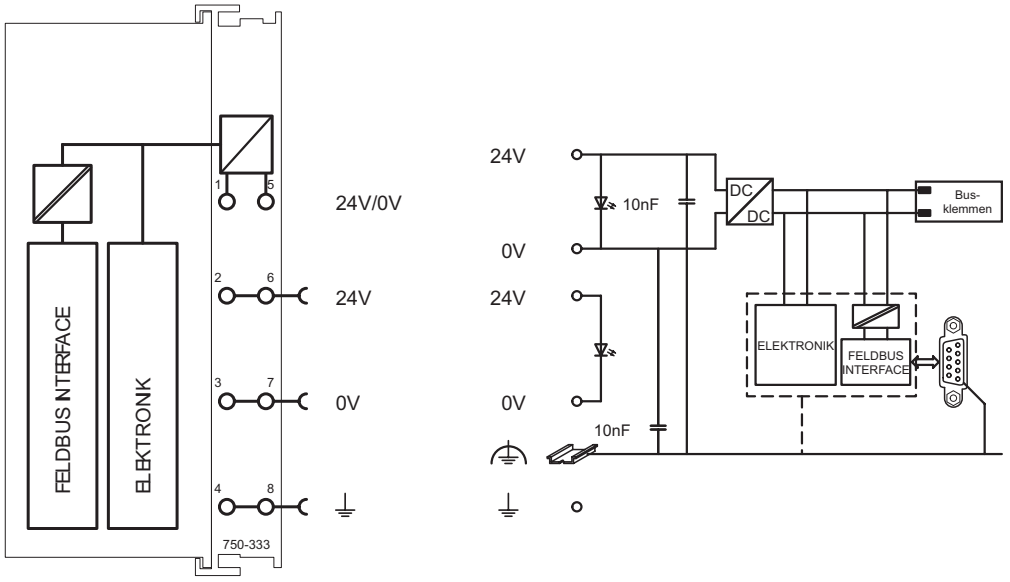

Fig. 3-13: Device supply g012105d

The integrated internal system supply module generates the necessary voltage to supply the electronics and the connected I/O modules.

The fieldbus interface is supplied with electrically isolated voltage from the internal system supply module.

3.2.2.3 Fieldbus connection

The PROFIBUS interface is designed as a Sub-D connection in accordance with the US Standard EIA RS 485 for cable linked data transmission.

9-pol. D-Sub-Buchse

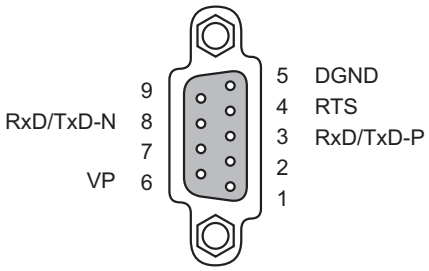

Fig. 3-14: Bus connection, D-SUB g012102d

Pin	Signal	Description
3	RxD(TxD)-P	Transmit (receive) signal
4	RTS	Ready To Send
5	GND	Supply ground
6	Vcc	Supply voltage
8	RxD(TxD) N	Transmit (receive) signal

The connection point is mechanically lowered permitting fitting in an 80 mm high switch box once connected

3.2.2.4 Display elements

The operating status of the fieldbus coupler or of the node is signalled via light diodes (LED).

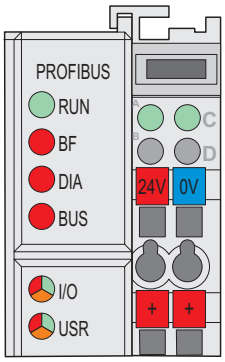

Fig. 3-15: Display elements 750-833 g012107x

LED	Colour	Meaning
RUN	green	The 'RUN' LED indicates to the user whether the fieldbus coupler / controller is correctly initialised.
BF	red	The 'BF' LED indicates whether the communication via the PROFIBUS is functioning.
DIA	red	The 'DIA' LED indicates an external diagnosis. The signalling is not supported by all devices.
BUS	red	The 'BUS' LED signalled a projecting fault.
IO	red /green / orange	The 'I/O' LED indicates the operation of the node an and signals faults occurring.
USR	red /green / orange	The 'USR' LED can be selected by a user program in a programmable fieldbus controller.
A	green	Status of the operating voltage – system
C	green	Status of the operating voltage – power jumper contact

3.2.2.5 Station address

The station address is determined via two decimal rotary switches on the electronic module.

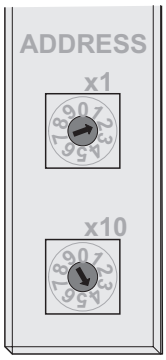

Fig. 3-16: Creating the station address g012102d

The switch „x1“ determines the unit position of the address. The switch „x10“ determines the tens position of the address. Valid station addresses lie between 1 and 99.

The station address is taken over by the fieldbus coupler after switching on the device (initialisation phase). Adjustments to the switch during operation have no effect.

Note
After Power-On the station address 0 causes the run-up of the controller and start of the PLC functions, without the fieldbus being active.
Using this function an autarcic small scale control can be realised using the WAGO-I/O-SYSTEM 750

3.2.2.6 Configuration and programming interface

The configuration and programming interface is located behind the cover flap. This is used to communicate with WAGO-I/O-CHECK and WAGO-I/O-PRO as well as for firmware uploading.

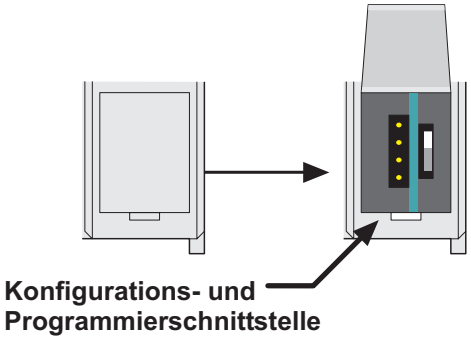

Fig. 3-17: Configuration interface g01xx07d

The communication cable (750-920) is connected to the 4 pole male header.

3.2.2.7 Operating mode switch

The operating mode switch is located behind the cover flap.

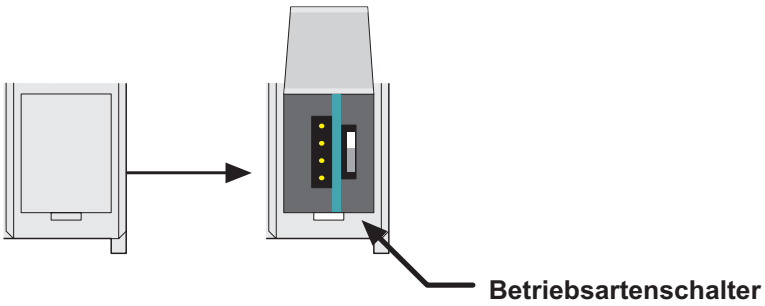

Fig. 3-18: Operating mode switch g01xx10d

The switch is a push/slide switch with 3 settings and a hold-to-run function.

Operating mode switch	Function
From middle to top position	Activate program processing (RUN)
From top to middle position	Stop program processing (STOP)
(Lower position, bootstrap)	(For original loading of firmware, not necessary for user)
Push down (e.g with a screwdriver)	Hardware reset All outputs and flags are reset; variables are set to 0 or to FALSE or to an initial value. The hardware reset can be performed with STOP as well as RUN in any position of the operating mode switch!

Attention
If outputs are set when switching over the operating mode switch from RUN to STOP they remain set! Switching off on the software side e.g. by initiators, are ineffective, because the program is no longer processed.

(An operating mode is internally changed at the end of a PLC cycle.)

Note
With "GET_STOP_VALUE" (library "System.lib") WAGO-I/O-*PRO* 32 provides a function which serves to recognise the last cycle prior to a program stop giving the user the possibility to program the behaviour of the controller in case of a STOP. With the aid of this function the controller outputs can be switched to a safe condition.

3.2.3 Operating system

3.2.3.1 Run-up

The controller runs-up after switching on the supply voltage or after a hardware reset. The PLC program in the flash memory is transferred to the RAM. The "I/O" LED flashes orange.

The controller then checks all functions of its modules in a self test, the internal bus and the fieldbus interface. Following this the I/O modules and the present configuration is determined. At the same time a list is generated which is not visible from outside. This includes an input and an output area, which shows on the fieldbus RAM of the fieldbus RAM. This is followed by the initialisation of the system. The variables are set to 0 or to FALSE or to an initialisation value given by the PLC program. The flags retain their status . The "I/O" LED blinks red during this phase.

Following a fault free run-up the controller changes over to the "Fieldbus start" mode. The "I/O" LED lights up green.

A PLC program does not yet exist in the flash memory when delivered. The controller runs-up as described, without initialising the system. It then behaves as a coupler.

3.2.3.2 PLC cycle

The PLC cycle starts following a fault free run-up when the operating mode switch is in the top position or by a start command from the WAGO-I/O-*PRO* 32. The input and output data of the fieldbus and the I/O modules as well as the times are read. Subsequently the PLC program in the RAM is processed followed by the output data of the fieldbus and the I/O modules in the process image. Operating system functions, amongst others, for diagnosis and communication are performed an the times actualised at the end of the PLC cycle. The cycle starts again with the reading in of the input and output data and the times.

The change of the operating mode (STOP/RUN) is made at the end of a PLC cycle.

The cycle time is the time from the start of the PLC program to the next start. If a loop is programmed within a PLC program the PLC running time and thus the PLC cycle are extended correspondingly.

The inputs, outputs and times are not updated during the processing of the PLC program. This actualisation occurs in a defined manner only at the end of the PLC program. For this reason it is not possible to wait for an event from the process or the elapse of a time within a loop.

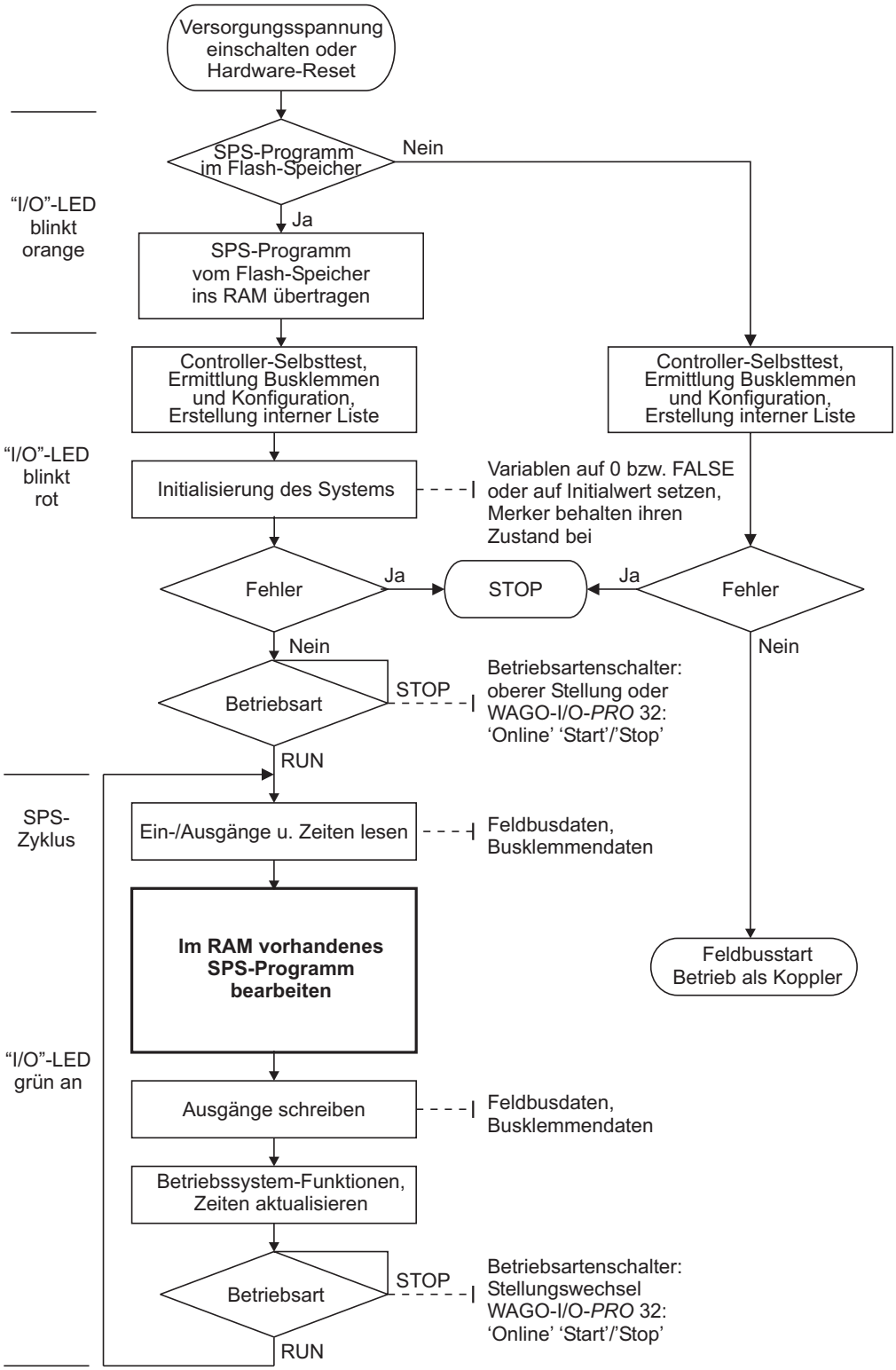

Fig. 3-19: Controller operating system

g012112d

3.2.4 Process image

3.2.4.1 Local process image

After switching on the controller recognises all I/O modules connected in the node, which are waiting for or transmitting data (data width/bit width > 0). In nodes analog and digital I/O modules can be fitted mixed.

Note
For the number of input and output bits or bytes of the individual switched on I/O modules please refer to the corresponding description of the I/O modules.

The controller generates an internal local process image from the data width and the type of I/O module as well as the position of the I/O modules in the node. This is divided into an input and an output area.

The data of the digital I/O modules are bit orientated, i.e. the data exchange is made bit by bit. The analog I/O modules are representative for all I/O modules which are byte orientated, in which the data exchange is also made byte by byte. These I/O modules also include, for example, counter modules, I/O modules for angle and path measurement as well as communication modules.

The data of the I/O modules is separated for the local input and output process image in the sequence of their position after the controller in the individual process image.

Note
If a node is changed or extended this may result in a new process image structure. In this case the process data addresses also change in comparison with earlier versions.

3.2.4.2 Allocation of the input and output data

The process data is exchanged via the PROFIBUS with the higher ranking controls (Master). A maximum of 128 byte of data is transmitted from the master to the controller, or node to the output data. The controller returns a maximum of 128 byte input data as a reply to the master.

The modules are configured when projecting the nodes. These modules can be copied from a hardware catalogue by the configurations programs. The information covering the possible modules is saved in the GSD files.

The controller generates an internal mapping in accordance with the installed and configured settings of the node, in which the allocation of the input and output data is determined in the local process image with the position in the PROFIBUS DP Telegram.

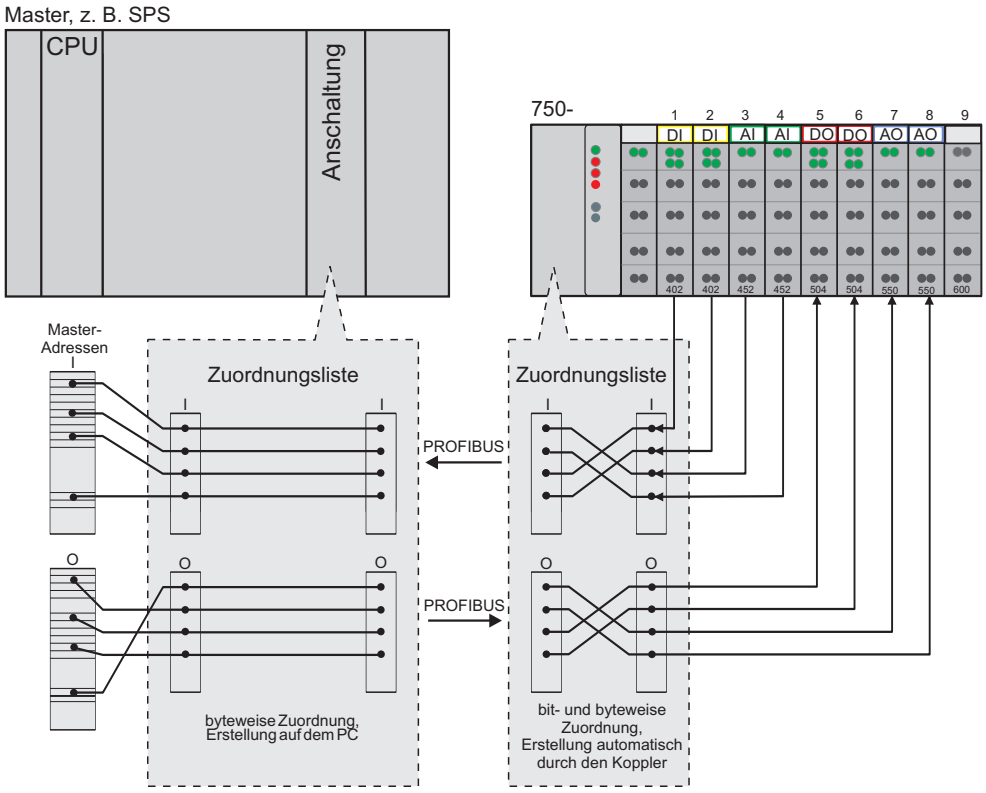

Fig. 3-20: Allocation of the input and output data g012117d

3.2.5 Configuration

The configuration of the node is performed in accordance with the physical requirements of the fieldbus controllers and I/O modules.

The fieldbus controller or the process data channel is to be configured on the first slot.
The other slots are configured in accordance with the physical requirements of the I/O modules, whereby only I/O modules with process data are relevant.
The supply modules without diagnosis, the supply modules without diagnosis, the bus internal system supply module and the termination module are to be ignored during configuration, as they do not provide any process data.

2 or 3 modules per I/O module are entered in the hardware catalogue. The modules appear as
750-xyz ..., e.g. ***750-400 2 DI/24 V DC/3.0 ms***. and
PFC 750-xyz ..., e.g.. ***PFC 750-400 2 DI/24 V DC/3.0 ms***.
The identification ***PFC 750-xyz ...*** states that the module concerned is exclusively processed by the internal control application. Its process data is not transmitted via the PROFIBUS-DP to the master or to the higher ranking controls.

Alos the entry ****750-xyz ...***. is listed for all binary modules. When using this identification the controller adds the binary information of the current module in a byte previously opened with ***750-xyz ...***. The use of a „*“ module is only permitted when the number of channels is less or identical to the remaining bits in the previously opened byte. The binary I/O modules combined in a byte may be at different locations, i.e. binary I/O modules of a different signal type or byte orientated I/O modules can be connected between.

In order to configure the scope of the connected peripheries individually and independent of the control program, it is possible to parameter the I/O modules in the configuration table as „not plug fitted“. In this manner the process data still on the PROFIBUS DP can be filtered for the individual module and not transmitted to the periphery or read by it.

With the 750-833, after configuration of the connected periphery, the memory area is configured due to the variable arrangement of the fieldbus variables.
For this the identification
1 byte PFC outputs, 2 byte PFC outputs to ***64 byte PFC outputs***
is available for the input image as well as
1 byte PFC inputs, 2 byte PFC inputs to ***64 byte PFC inputs***
for the output image.

By optionally combining the existing modules it is possible to project the required length on the fieldbus variables for PROFIBUS-DP.

3.2.5.1 GSD files

Under PROFIBUS DP the power features of the devices are defined by the manufacturer in the form of a GSD file (device master data) and made available to the user.

Structure, content and coding of this device master data are standardised so that projecting with any DP slaves with projecting data from various manufacturers is possible.

Further information
The PNO provides information about the GSD files of all listed manufacturers.

GSD and symbol files for the configuration of the I/O modules are available under the order number 750-910 on disk or from the WAGO INTERNET page.

http://www.wago.com

GSD file for I/O module 750-833	**WAGOB756.GSD**

The GSD file is read by the configuration software and the corresponding settings transferred. For the necessary entries and handling steps please refer to the software user manuals.

3.2.5.2 Identification bytes

The identification bytes contain information about the structure and the scope of the inputs and outputs of the devices. For projecting each I/O module or each channel is allocated an identification (module).

Bit								Meaning
7	6	5	4	3	2	1	0	
				0 0 0 ... 1	0 0 0 ... 1	0 0 1 ... 1	0 1 0 ... 1	**Data length** 1 byte or word 2 bytes or words 3 bytes or words ... 16 bytes or 16 words
		0 0 1 1	0 1 0 1					**Input and output** Spec. identification formats Input Output Input and output
	0 1							**Format** 0 = Byte structure 1 = Word structure
0 1								**Consistency about** Byte or word Total length

For the special identification byte (Bit 4 and 5 = 00) is defined:

Bit								Meaning
7	6	5	4	3	2	1	0	
				0 0 ... 1 1	0 0 ... 1 1	0 0 ... 1 1	0 1 ... 0 1	**Length of the manufacturer specific data** 0 = no manufacturer specific data 1 ... 14 = Length of the manufacturer specific data 15 = no manufacturer specific data follows
		0	0					**Input and output** Spec. identification formats
0 0 1 1	0 1 0 1							**Input and output** unassigned slot a length byte for inputs follows a length byte for outputs follows a length byte for inputs and outputs follows

Structure of the length byte:

Bit								Meaning
7	6	5	4	3	2	1	0	
		0 ... 1	0 ... 1	0 ... 1	0 ... 1	1 ... 1	0 ... 1	**Data length** 1 byte or word ... 63 bytes or 63 words
	0 1							**Format** 0 = Byte structur 1 = Word structur
0 1								**Consistency about** Byte or word Total length

This information is saved in the GSD file. For projecting the I/O module is selected in accordance with the article number using the configuration software contained in the hardware catalogue of the I/O module.

Module	Ident.	Module	Ident.	Module	Ident.
750-833 No process data channel	0x00				
750-833 2 byte process data channel	0xB1				
750-400 2 DI/24 V DC/3.0 ms	0x10	*750-400 2 DI/24 V DC/3.0 ms	0x00	PFC 750-400 2 DI/24 V DC/3.0 ms	0x00
750-401 2 DI/24 V DC/0.2 ms	0x10	*750-401 2 DI/24 V DC/0.2 ms	0x00	PFC 750-401 2 DI/24 V DC/0.2 ms	0x00
750-402 4 DI/24 V DC/3.0 ms	0x10	*750-402 4 DI/24 V DC/3.0 ms	0x00	PFC 750-402 4 DI/24 V DC/3.0 ms	0x00
750-403 4 DI/24 V DC/0.2 ms	0x10	*750-403 4 DI/24 V DC/0.2 ms	0x00	PFC 750-403 4 DI/24 V DC/0.2 ms	0x00
750-404 Counter Module	0xF2	PFC 750-404 Counter Module	0x00		
750-405 2 DI/230 V AC/10 ms	0x10	*750-405 2 DI/230 V AC/10 ms	0x00	PFC 750-405 2 DI/230 V AC/10 ms	0x00
750-406 2 DI/120 V AC/10 ms	0x10	*750-406 2 DI/120 V AC/10 ms	0x00	PFC 750-406 2 DI/120 V AC/10 ms	0x00
750-408 4 DI/24 V DC/3.0 ms	0x10	*750-408 4 DI/24 V DC/3.0 ms	0x00	PFC 750-408 4 DI/24 V DC/3.0 ms	0x00
750-409 4 DI/24 V DC/0.2 ms	0x10	*750-409 4 DI/24 V DC/0.2 ms	0x00	PFC 750-409 4 DI/24 V DC/0.2 ms	0x00
750-410 2 DI/24 V DC/3.0 ms	0x10	*750-410 2 DI/24 V DC/3.0 ms	0x00	PFC 750-410 2 DI/24 V DC/3.0 ms	0x00
750-411 2 DI/24 V DC/0.2 ms	0x10	*750-411 2 DI/24 V DC/0.2 ms	0x00	PFC 750-411 2 DI/24 V DC/0.2 ms	0x00
750-412 2 DI/48 V DC/3.0 ms	0x10	*750-412 2 DI/48 V DC/3.0 ms	0x00	PFC 750-412 2 DI/48 V DC/3.0 ms	0x00
750-413 2 DI/48 V DC/0.2 ms	0x10	*750-413 2 DI/48 V DC/0.2 ms	0x00	PFC 750-413 2 DI/48 V DC/0.2 ms	0x00
750-414 4 DI/5 V DC/0.2 ms	0x10	*750-414 4 DI/5 V DC/0.2 ms	0x00	PFC 750-414 4 DI/5 V DC/0.2 ms	0x00
750-415 4 DI/24 V AC/DC/20 ms	0x10	*750-415 4 DI/24 V AC/DC/20 ms	0x00	PFC 750-415 4 DI/24 V AC/DC/20ms	0x00
750-418 2 DI/24 V DC DIA ACK	0x30	*750-418 2 DI/24 V DC DIA ACK	0x00	PFC 750-418 2 DI/24 V DC DIA ACK	0x00
750-419 2 DI/24 V DC DIA	0x10	*750-419 2 DI/24 V DC DIA	0x00	PFC 750-419 2 DI/24 V DC DIA	0x00
750-423 4 DI/24 V AC/DC/50 ms	0x10	*750-423 4 DI/24 V AC/DC/50 ms	0x00	PFC 750-423 4 DI/24 V AC/DC/50ms	0x00
750-424 2 DI/24 V DC DIA	0x10	*750-424 2 DI/24 V DC DIA	0x00	PFC 750-424 2 DI/24 V DC DIA	0x00
750-452 2 AI/0-20 mA/diff.	0x51			PFC 750-452 2 AI/0-20 mA/diff.	0x00
750-454 2 AI/4-20 mA/diff.	0x51			PFC 750-454 2 AI/4-20 mA/diff.	0x00
750-456 2 AI/±10 V/diff.	0x51			PFC 750-456 2 AI/±10 V/diff.	0x00
750-461 2 AI/RTD	0x51			PFC 750-461 2 AI/RTD	0x00
750-462 2 AI/TC	0x51			PFC 750-462 2 AI/TC	0x00
750-465 2 AI/0-20 mA/SE	0x51			PFC 750-465 2 AI/0-20 mA/SE	0x00
750-466 2 AI/4-20 mA/SE	0x51			PFC 750-466 2 AI/4-20 mA/SE	0x00
750-467 2 AI/0-10 V/SE	0x51			PFC 750-467 2 AI/0-10 V/SE	0x00
750-468 4 AI/0-10 V/SE	0x53			PFC 750-468 4 AI/0-10 V/SE	0x00
750-469 2 AI/TC/OCM	0x51			PFC 750-469 2 AI/TC/OCM	0x00
750-472 2 AI/0-20 mA/OVLP	0x51			PFC 750-472 2 AI/0-20 mA/OVLP	0x00
750-474 2 AI/4-20 mA/OVLP	0x51			PFC 750-474 2 AI/4-20 mA/OVLP	0x00
750-476 2 AI/±10 V	0x51			PFC 750-476 2 AI/±10 V	0x00
750-478 2 AI/0-10 V	0x51			PFC 750-478 2 AI/0-10 V	0x00
750-501 2 DO/24 V DC/0.5 A	0x20	*750-501 2 DO/24 V DC/0.5 A	0x00	PFC 750-501 2 DO/24 V DC/0.5 A	0x00
750-502 2 DO/24 V DC/2.0 A	0x20	*750-502 2 DO/24 V DC/2.0 A	0x00	PFC 750-502 2 DO/24 V DC/2.0 A	0x00
750-504 4 DO/24 V DC/0.5 A	0x20	*750-504 4 DO/24 V DC/0.5 A	0x00	PFC 750-504 4 DO/24 V DC/0.5 A	0x00
750-506 2 DO/24 V DC/0.5 A DIA	0x20	*750-506 2 DO/24 V DC/0.5 A DIA	0x00	PFC 750-506 2 DO/24 V DC/0.5 A	0x00
750-507 2 DO/24 V DC/2.0 A DIA	0x20	*750-507 2 DO/24 V DC/2.0 A DIA	0x00	PFC 750-507 2 DO/24 V DC/2.0 A	0x00
750-509 2 DO/230 V AC/0.3 A	0x20	*750-509 2 DO/230 V AC/0.3 A	0x00	PFC 750-509 2 DO/230 V AC/0.3 A	0x00
750-511 2 DO 24 V DC/PWM	0xF2			PFC 750-511 2 DO 24 V DC/PWM	0x00
750-512 2 DO Relay/250 V AC	0x20	*750-512 2 DO Relay/250 V AC	0x00	PFC 750-512 2 DO Relay/250 V AC	0x00
750-513 2 DO Relay/250 V AC	0x20	*750-513 2 DO Relay/250 V AC	0x00	PFC 750-513 2 DO Relay/250 V AC	0x00
750-514 2 DO Relay/125 V AC	0x20	*750-514 2 DO Relay/125 V AC	0x00	PFC 750-514 2 DO Relay/125 V AC	0x00
750-516 4 DO/24 V DC/0.5 A	0x20	*750-516 4 DO/24 V DC/0.5 A	0x00	PFC 750-516 4 DO/24 V DC/0.5 A	0x00
750-517 2 DO Relay/230 V AC	0x20	*750-517 2 DO Relay/230 V AC	0x00	PFC 750-517 2 DO Relay/230 V AC	0x00
750-519 4 DO/5 V DC/20 mA	0x20	*750-519 4 DO/5 V DC/20 mA	0x00	PFC 750-519 4 DO/5 V DC/20 mA	0x00
750-522 2 DO/230V AC/0.5 A DIA	0x20	*750-522 2 DO/230V AC/0.5 A DIA	0x00	PFC 750-522 2 DO/230V DC/0.5 A	0x00
750-550 2 AO/0-10 V	0x61			PFC 750-550 2 AO/0-10 V	0x00
750-552 2 AO/0-20 mA	0x61			PFC 750-552 2 AO/0-20 mA	0x00
750-554 2 AO/4-20 mA	0x61			PFC 750-554 2 AO/4-20 mA	0x00
750-556 2 AO/±10 V	0x61			PFC 750-556 2 AO/±10 V	0x00
750-610 P supply. 24 V DC/DIA	0x00				
750-611 P supply. 230 V AC/DIA	0x00				
750-630 SSI-Intf. Standard	0x95	750-630 SSI-Intf. alternative	0x93	PFC 750-630 SS intf.	0x00
750-631 Encoder intf.	0xB5	PFC 750-631 Encoder intf.	0x00		
750-650 RS232C-Intf. 5 Byte	0xB5	750-650 RS232C-Intf. 3 Byte	0xB3	PFC 750-650 RS232C intf.	0x00
750-651 TTY-Intf. 5 Byte	0xB5	750-651 TTY-Intf. 3 Byte	0xB3	PFC 750-651 TTY-Intf.	0x00
750-653 RS485-Intf. 5 Byte	0xB5	750-653 RS485 intf. 3 Byte	0xB3	PFC 750-653 RS485- intf.	0x00
750-654 Data exch. module	0xF1			PFC 750-654 Data exch. module	0x00
1 Byte PFC-input	0xA0	2 Byte PFC inputs	0xA1	3 Byte PFC inputs	0xA2
4 Byte PFC inputs	0xA3	5 Byte PFC inputs	0xA4	6 Byte PFC inputs	0xA5
7 Byte PFC inputs	0xA6	8 Byte PFC inputs	0xA7	9 Byte PFC inputs	0xA8

Module	Ident.	Module	Ident.	Module	Ident.
10 Byte PFC inputs	0xA9	11 Byte PFC inputs	0xAA	12 Byte PFC inputs	0xAB
13 Byte PFC inputs	0xAC	14 Byte PFC inputs	0xAD	15 Byte PFC inputs	0xAE
16 Byte PFC inputs	0xAF	17 Byte PFC inputs	0x80 , 0x90	18 Byte PFC inputs	0x80 , 0x91
19 Byte PFC inputs	0x80 , 0x92	20 Byte PFC inputs	0x80 , 0x93	21 Byte PFC inputs	0x80 , 0x94
22 Byte PFC inputs	0x80 , 0x95	23 Byte PFC inputs	0x80 , 0x96	24 Byte PFC inputs	0x80 , 0x97
25 Byte PFC inputs	0x80 , 0x98	26 Byte PFC inputs	0x80 , 0x99	27 Byte PFC inputs	0x80 , 0x9A
28 Byte PFC inputs	0x80 , 0x9B	29 Byte PFC inputs	0x80 , 0x9C	30 Byte PFC inputs	0x80 , 0x9D
31 Byte PFC inputs	0x80 , 0x9E	32 byte PFC inputs	0x80 , 0x9F	33 Byte PFC inputs	0x80 , 0xA0
34 Byte PFC inputs	0x80 , 0xA1	35 Byte PFC inputs	0x80 , 0xA2	36 Byte PFC inputs	0x80 , 0xA3
37 Byte PFC inputs	0x80 , 0xA4	38 Byte PFC inputs	0x80 , 0xA5	39 Byte PFC inputs	0x80 , 0xA6
40 Byte PFC inputs	0x80 , 0xA7	41 Byte PFC inputs	0x80 , 0xA8	42 Byte PFC inputs	0x80 , 0xA9
43 Byte PFC inputs	0x80 , 0xAA	44 Byte PFC inputs	0x80 , 0xAB	45 Byte PFC inputs	0x80 , 0xAC
46 Byte PFC inputs	0x80 , 0xAD	47 Byte PFC inputs	0x80 , 0xAE	48 Byte PFC inputs	0x80 , 0xAF
49 Byte PFC inputs	0x80 , 0xB0	50 Byte PFC inputs	0x80 , 0xB1	51 Byte PFC inputs	0x80 , 0xB2
52 Byte PFC inputs	0x80 , 0xB3	53 Byte PFC inputs	0x80 , 0xB4	54 Byte PFC inputs	0x80 , 0xB5
55 Byte PFC inputs	0x80 , 0xB6	56 Byte PFC inputs	0x80 , 0xB7	57 Byte PFC inputs	0x80 , 0xB8
58 Byte PFC inputs	0x80 , 0xB9	59 Byte PFC inputs	0x80 , 0xBA	60 Byte PFC inputs	0x80 , 0xBB
61 Byte PFC inputs	0x80 , 0xBC	62 Byte PFC inputs	0x80 , 0xBD	63 Byte PFC inputs	0x80 , 0xBE
64 Byte PFC inputs	0x80 , 0xBF				
1 Byte PFC outputs	0x90	2 Byte PFC outputs	0x91	3 Byte PFC outputs	0x92
4 Byte PFC outputs	0x93	5 Byte PFC outputs	0x94	6 Byte PFC outputs	0x95
7 Byte PFC outputs	0x96	8 Byte PFC outputs	0x97	9 Byte PFC outputs	0x98
10 Byte PFC outputs	0x99	11 Byte PFC outputs	0x9A	12 Byte PFC outputs	0x9B
13 Byte PFC outputs	0x9C	14 Byte PFC outputs	0x9D	15 Byte PFC outputs	0x9E
16 Byte PFC outputs	0x9F	17 Byte PFC outputs	0x40 , 0x90	18 Byte PFC outputs	0x40 , 0x91
19 Byte PFC outputs	0x40 , 0x92	20 Byte PFC outputs	0x40 , 0x93	21 Byte PFC outputs	0x40 , 0x94
22 Byte PFC outputs	0x40 , 0x95	23 Byte PFC outputs	0x40 , 0x96	24 Byte PFC outputs	0x40 , 0x97
25 Byte PFC outputs	0x40 , 0x98	26 Byte PFC outputs	0x40 , 0x99	27 Byte PFC outputs	0x40 , 0x9A
28 Byte PFC outputs	0x40 , 0x9B	29 Byte PFC outputs	0x40 , 0x9C	30 Byte PFC outputs	0x40 , 0x9D
31 Byte PFC outputs	0x40 , 0x9E	32 Byte PFC outputs	0x40 , 0x9F	33 Byte PFC outputs	0x40 , 0xA0
34 Byte PFC outputs	0x40 , 0xA1	35 Byte PFC outputs	0x40 , 0xA2	36 Byte PFC outputs	0x40 , 0xA3
37 Byte PFC outputs	0x40 , 0xA4	38 Byte PFC outputs	0x40 , 0xA5	39 Byte PFC outputs	0x40 , 0xA6
40 Byte PFC outputs	0x40 , 0xA7	41 Byte PFC outputs	0x40 , 0xA8	42 Byte PFC outputs	0x40 , 0xA9
43 Byte PFC outputs	0x40 , 0xAA	44 Byte PFC outputs	0x40 , 0xAB	45 Byte PFC outputs	0x40 , 0xAC
46 Byte PFC outputs	0x40 , 0xAD	47 Byte PFC outputs	0x40 , 0xAE	48 Byte PFC outputs	0x40 , 0xAF
49 Byte PFC outputs	0x40 , 0xB0	50 Byte PFC outputs	0x40 , 0xB1	51 Byte PFC outputs	0x40 , 0xB2
52 Byte PFC outputs	0x40 , 0xB3	53 Byte PFC outputs	0x40 , 0xB4	54 Byte PFC outputs	0x40 , 0xB5
55 Byte PFC outputs	0x40 , 0xB6	56 Byte PFC outputs	0x40 , 0xB7	57 Byte PFC outputs	0x40 , 0xB8
58 Byte PFC outputs	0x40 , 0xB9	59 Byte PFC outputs	0x40 , 0xBA	60 Byte PFC outputs	0x40 , 0xBB
61 Byte PFC outputs	0x40 , 0xBC	62 Byte PFC outputs	0x40 , 0xBD	63 Byte PFC outputs	0x40 , 0xBE
64 Byte PFC outputs	0x40 , 0xBF				

3.2.5.3 Example

A fieldbus node with a controller and 17 I/O modules should make the arrangement clear.

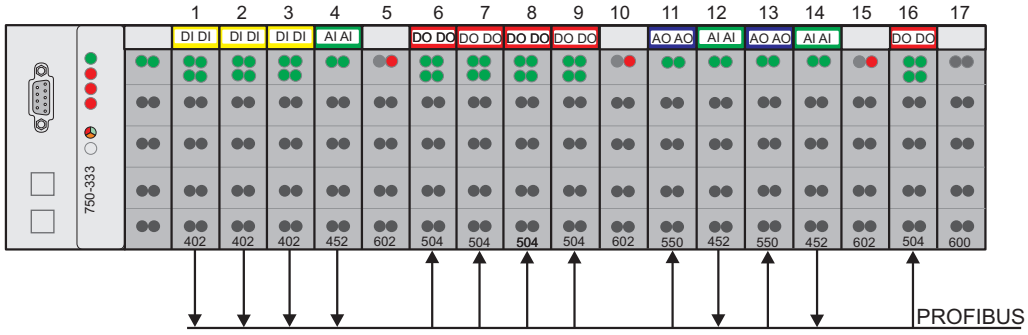

Fig. 3-21: Example application

g012115x

No.	I/O modules	Modul Identification	PI Master *	
			Inputs	Outputs
1	Digital input	750-402 4 DI/24 V DC/3.0 ms	EB12.0	
	Digital input	0x10	EB12.1	
	Digital input		EB12.2	
	Digital input		EB12.3	
2	Digital input	*750-402 4 DI/24 V DC/3.0 ms	EB12.4	
	Digital input	0x00	EB12.5	
	Digital input		EB12.6	
	Digital input		EB12.7	
3	Digital input	750-402 4 DI/24 V DC/3.0 ms	EB13.0	
	Digital input	0x10	EB13.1	
	Digital input		EB13.2	
	Digital input		EB13.3	
4	Analog input	750-452 2 AI/0-20 mA/diff.	EW0	
	Analog input	0x51	EW2	
5	Potential supply	Potential supply	---	---
6	Digital output	750-504 4 DO/24 V DC/0.5 A		AB8.0
	Digital output	0x20		AB8.1
	Digital output			AB8.2
	Digital output			AB8.3
7	Digital output	*750-504 4 DO/24 V DC/0.5 A		AB8.4
	Digital output	0x00		AB8.5
	Digital output			AB8.6
	Digital output			AB8.7

8	Digital output	750-504 4 DO/24 V DC/0.5 A		AB9.0
	Digital output	0x20		AB9.1
	Digital output			AB9.2
	Digital output			AB9.3
9	Digital output	*750-504 4 DO/24 V DC/0.5 A		AB9.4
	Digital output	0x00		AB9.5
	Digital output			AB9.6
	Digital output			AB9.7
10	Potential supply	Potential supply	---	---
11	Analog output	750-550 2 AO/0-10 V		AW0
	Analog output	0x61		AW2
12	Analog input	750-452 2 AI/0-20 mA/diff.	EW4	
	Analog input	0x51	EW6	
13	Analog output	750-550 2 AO/0-10 V		AW4
	Analog output	0x61		AW6
14	Analog input	750-452 2 AI/0-20 mA/diff.	EW8	
	Analog input	0x51	EW10	
15	Potential supply	Potential supply	---	---
16	Digital output	750-504 4 DO/24 V DC/0.5 A		AB10.0
	Digital output	0x20		AB10.1
	Digital output			AB10.2
	Digital output			AB10.3
17	End module	End module	---	---

* The master addresses listed in the table correspond to the allocation of the process data given in the master configuration.

3.2.6 Parameterisation of the controllers

Before a data exchange can be performed between master and slave, a parameterisation is required in addition to configuration.

The extended parameters (Extended User_Prm_Data) are provided via the GSD files as selectable text in the configuration programs.

Description	Value	Meaning
Restart the internal bus after a fault	POWER ON RESET*) AUTORESET	Restart of the terminal bus following a fault, such as, for example, no termination module following an interruption of the supply immediately after overcoming the internal bus fault
I/O module diagnosis	released*) locked	The diagnosis information of all I/O modules with a diagnosis capability, for which the diagnosis is released are transferred to PROFIBUS-DP master, not transferred to PROFIBUS-DP master
Process value display	INTEL MOTOROLA*)	Word or double word oriented process data, is transferred to PROFIBUS-DP master in: „Little Endian Format“ „Big Endian Format“
Behaviour in case of a PROFIBUS DP fault	Stop internal bus transmission Set output image to zero Freeze output image Write substitute value*) PFC fault strategy	In the case of a malfunction of the PROFIBUS DP communication the status of the connected output periphery can be influenced in various ways: The process data exchange on the internal bus is stopped, all outputs drop out after a module specific monitoring time of 100 ms all outputs are immediately reset all outputs maintain the last status before the malfunction all outputs switch a parameterisable substitute value PFC takes over the control via the output image
Reaction to an internal bus fault	Stop PROFIBUS data exchange*) Set input image to zero Freeze input image	In the event of a malfunction of an internal communication between fieldbus controller and I/O modules, such as, for example no termination module, the data exchange with the PROFIBUS master is stopped. the input information is set to zero the input information prevailing before the fault is maintained

*) Default settings

The complete data block encompasses 34 parameterised bytes. The first 10 bytes are laid down via the DP and DPV1 standard. The others receive manufacturer specific parameters.

Byte No.	Bit No.	Value	Meaning
Standard parameters			
0	0-7		Station status (see EN 50170)
1	0-7	2-255	Watchdog factor 1
2	0-7	2-255	Watchdog factor 2
			Watchdog: The response monitoring is the result of Watchdog_Factor_1 x Watchdog_Factor_2 x 10 ms (1 ms)
3	0-7	11-255	Min T_{SDR}, Earliest time in T_{Bit} after which the slave can reply
4	0-7	183, 0xB7	Manufacturer Identification (high byte)
5	0-7	86, 0x56	Manufacturer Identification (low byte)
6	0-7		Group membership, Broad and multicast telegrams (SYNC, FREEZE)
7	0-7		DPV1 status 1 (see EN 50170)
8	0-7		DPV1 status 2 (see EN 50170)
9	0-7		DPV1 status 3 (see EN 50170)
Manufacturer parameters			
10	0-7	0	Table 0, register 0 LB, reserved
11	0-7	0	Table 0, register 0 HB, reserved
12	0-7	0	Table 0, register 1 LB, reserved
13	0-7	0	Table 0, register 1 HB, reserved
14			Table 0, register 2 LB
	0	0	Device diagnosis locked
	0	1 *)	Device diagnosis released
	1	0	Internal bus restart after fault: POWER-ON-RESET
	1	1 *)	Internal bus restart after fault: AUTORESET
	2-7	0	reserved
15	0-7	0	Table 0, register 2 HB, reserved
16			Table 0, register 3 LB
	0-2	'011'	reserved
	3	0	Data format byte orientated I/O modules: INTEL
	3	1 *)	Data format byte orientated I/O modules: MOTOROLA
	4-7	'1100'	reserved
17			Table 0, register 3 HB
	0-2		Reaction to fieldbus fault:
		'000'	- Stop internal bus transmission
		'001'	- Set output image to zero
		'010'	- Freeze output image
		'011' *)	- Write substitute values
		'100'	- PFC fault strategy
		'101'	- Not possible
		'110'	- Not possible
		'111'	- Not possible
	3-5		Reaction to internal bus fault:
		'000' *)	- Exit data exchange
		'001'	- Set input image to zero
		'010'	- Freeze input image
		'011'	- Not possible
		'100'	- Not possible
		'101'	- Not possible
		'110'	- Not possible
		'111'	- Not possible
	6-7	'00'	reserved
18	0-7	'1100.0011'	Table 0, register 4 LB, reserved
19	0-7	'0111.1111'	Table 0, register 4 HB, reserved
20	0-7	'0000.0000'	Table 100, register 0 LB, reserved
21	0-7	'0000.0001'	Table 100, register 0 HB, reserved
22	0-7	'0000.0000'	Table 100, register 1 LB, reserved
23	0-7	'0000.0000'	Table 100, register 1 HB, reserved
24	0-7	'0000.0000'	Table 100, register 2 LB, reserved
25	0-7	'0000.0000'	Table 100, register 2 HB, reserved

3.2.7 Configuration of the process data channels

The process data channels serve the communication between the WAGO-I/O-PRO and the running time system of the fieldbus controller. If this channel is not required it can be projected with a process data length of zero (***750-833 No process data channel***).

Module	Identification hex	Identification dec
750-833 no process data channel 750-833 2 byte process data channel	0x00 0xB1	0 177

Note
Configure the module ***750-833 2 byte process data channel*** or ***750-833 No process data channel*** as 1st module.

3.2.8 Configuration and parameterisation of I/O modules

3.2.8.1 Digital I/O modules

All binary I/O modules contain 3 bytes of extended parameterisation information, which serve, amongst others, for the identification of the internal bus and the structure of the mapping table. For modules capable of diagnosis the diagnosis message can be suppressed or released channel for channel or module for module. Binary outputs offer the possibility to switch parameterisable substitute values in the case of a master failure.

Note
For simplification only the article numbers are shown as module designation in the table. The module „750-400“ thus corresponds to the module „750-400 2 DI/24 V DC/3.0 ms“

3.2.8.1.1 2 DI I/O modules

Module	Identification hex	Identification dec
750-400, 750-401, 750-405, 750-406, 750-410, 750-411, 750-412	0x10	16
*750-400, *750-401, *750-405, *750-406, *750-410, *750-411, *750-412	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
Italic		Cannot be changed

3.2.8.1.2 4 DI I/O modules

Module	Identification hex	Identification dec
750-402, 750-403, 750-408, 750-409, 750-414, 750-415, 750-423, 750-422, 750-424	0x10	16
*750-402, *750-403, *750-408, *750-409, *750-414, *750-415, *750-423, *750-422, *750-424	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
Italic		Cannot be changed

3.2.8.1.3 2 DI I/O modules with 1 bit diagn. per channel

Module	Identification hex	Identification dec
750-419, 750-425	0x10	16
*750-419, *750-425	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *1*	1 *0*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn1_3$		Diagnosis idle run, short circuit on channel 2
	0	Locked
	1	Released
$DiagEn0_2$		Diagnosis idle run, short circuit on channel 1
	0	Locked
	1	Released
Italic		Cannot be changed

3.2.8.1.4 2 DO I/O modules

Module	Identification hex	Identification dec
750-501, 750-502, 750-509, 750-512, 750-513, 750-514, 750-517	0x20	32
*750-501, *750-502, *750-509, *750-512, *750-513, *750-514, *750-517	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - ignored by the controller
Substitute value channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Presetting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *0*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 SV1	0 SV0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$SV0_0$		Substitute value channel 1
$SV0_1$		Substitute channel 2
Italic		Cannot be changed

3.2.8.1.5 2 DO I/O modules with 1 bit diagn. per channel

Module	Identification hex	Identification dec
750-507, 750-522	0x20	32
*750-507, *750-522	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master
Substitute value channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus controller parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 SV1	0 SV0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$		Diagnosis idle run, overload, short circuit on channel 1
	0	Locked
	1	Released
$DiagEn1_3$		Diagnosis idle run, overload, short circuit on channel 2
	0	Locked
	1	Released
$SV0_0$		Substitute value channel 1
$SV0_1$		Substitute value channel 2
Italic		Cannot be changed

3.2.8.1.6 2 DO I/O modules with 2 bit diagn. per channel

Module	Identification hex	Identification dec
750-506	0x20	32
*750-506	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master
Substitute value channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus controller parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 SV1	0 SV0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$		Diagnosis idle run, short circuit, lower voltage on channel 1
	0	locked
	1	released
$DiagEn1_3$		Diagnosis idle run, short circuit, lower voltage on channel 2
	0	locked
	1	released
$SV0_0$		Substitute value channel 1
$SV0_1$		Substitute value channel 2
Italic		Cannot be changed

3.2.8.1.7 4 DO I/O modules

Module	Identification hex	Identification dec
750-504, 750-516, 750-519	0x20	32
*750-504, *750-516, *750-519	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the controller
Substitute value channel x	0*) 1	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus controller parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *1*	0 *0*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 SV3	2 SV2	1 SV1	0 SV0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$SV0_0$		Substitute value channel 1
$SV0_1$		Substitute value channel 2
$SV0_2$		Substitute value channel 3
$SV0_3$		Substitute value channel 4
Italic		Cannot be changed

3.2.8.1.8 2 DI/DO I/O module with 1 bit diagn. per channel

Module	Identification hex	Identification dec
750-418	0x30	48
*750-418	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied to the I/O module - ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *1*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *1*	1 *1*	0 *1*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$		Diagnosis idle run, overload, short circuit on channel 1
	0	lock
	1	release
$DiagEn1_3$		Diagnosis idle run, overload, short circuit on channel 2
	0	locked
	1	released
Italic		Cannot be changed

3.2.8.1.9 Potential supply modules with diagnosis

Module	Identification hex	Identification dec
750-610, 750-611	0x00	0

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller
Diagnosis field voltage failure Diagnosis fuse blown	released locked*)	The diagnosis information for the corresponding case is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 *0*	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
2	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis field voltage failure info, lock
	1	Diagnosis field voltage failure info., release
$DiagEn1_3$	0	Diagnosis fuse failure info. lock
	1	Diagnosis fuse failure info. release
Italic		Cannot be changed

3.2.8.2 Analog I/O modules

All analog I/O modules have 2 byte extendable parameterisation information, which serves for the identification on the internal bus and the structure of the mapping table.

With analog inputs 2 bytes follow which are reserved for future options. Modules with diagnosis capability allow the diagnosis message to be suppressed or released channel for channel.

Analog outputs contain 4 byte parameterisation data. In this case the substitute values are saved for a maximum of 2 channels (2 words).

3.2.8.2.1 2 AI modules

Module	Identification hex	Identification dec
750-461, 750-462, 750-469, 750-465, 750-466, 750-467, 750-472, 750-474, 750-476, 750-478, 750-479, 750-480, 750-491	0x51	81

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Presetting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7	6	5	4	3	2	1	0
	reserved							
2	15	14	13	12	11	10	9	8
	reserved							
3	7	6	5	4	3	2	1	0
	reserved							

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Lock diagnosis channel 1
	1	Diagnosis channel 1 released
$DiagEn1_3$	0	Diagnosis channel 2 locked
	1	Diagnosis channel 2 released
Italic		Cannot be changed

3.2.8.2.2 4 AI module

Module	Identification hex	Identification dec
750-468	0x53	83

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller
Diagnosis channel x	released*) locked	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default settings

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 Diag En1	2 Diag En0	1 *0*	0 *0*
1	7 reserved	6	5	4	3	2	1	0
2	15 reserved	14	13	12	11	10	9	8
3	7 reserved	6	5	4	3	2	1	0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Lock diagnosis channel 1
	1	Diagnosis channel 1 released
$DiagEn1_3$	0	Diagnosis channel 2 locked
	1	Diagnosis channel 2 released
Italic		Cannot be changed

3.2.8.2.3 2 AO modules

All analog output modules have 6 bytes of extended parameterised information and offer the possibility to switch to parameterisable substitute values in case of a master failure.

Module	Identification hex	Identification dec
750-550, 750-552, 750-554, 750-556	0x61	97

Parameter	Value	Meaning
I/O module is physically	Plug fitted*) Not plug fitted	The I/O module process data is: - supplied by the I/O module - ignored by the controller
Diagnosis channel x	Released Locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master
Substitute value channel x	0x0000 or 0x8000 0 or -32767 ... 0x7FFF ... 32767	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus controller parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 reserved	6	5	4	3	2	1	0
2	15 SubVal_Ch1_HB	14	13	12	11	9	8	7
3	7 SubVal_Ch1_LB	6	5	4	3	2	1	0
4	15 SubVal_Ch2_HB	14	13	12	11	10	9	8
5	7 SubVal_Ch2_LB	6	5	4	3	2	1	0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
SubVal_Ch1	0x0000 : 0xFFFF	Substitute value channel 1
SubVal_Ch2	0x0000 : 0xFFFF	Substitute value channel 2
Italic		Cannot be changed

3.2.8.3 Special digital modules

All special digital modules have 2 bytes of extended parameterisation information which serves for the identification on internal bus and the structure of the mapping table.

Input modules (counter) are followed by 2 bytes which are reserved for future options.

For output modules (PWM outputs) are followed by 6 byte of parameterisation data which serve for the saving of substitute values for a maximum of 2 channels (2 words).

3.2.8.3.1 Counter modules

Module	Identification hex	Identification dec
750-404, 750-638	0xF2	242

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module - set to zero by the controller

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *reserved*	6	5	4	3	2	1	0
2	15 *reserved*	14	13	12	11	9	8	7
3	7 *reserved*	6	5	4	3	2	1	0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
Italic		Cannot be changed

3.2.8.3.2 PWM module

Module	Identification hex	Identification dec
750-511	0xF2	242

Parameter	Wert	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the controller or ignored by controller
Substitute value channel x	0x0000 *) ... 0x7FFF	If, in the case of a PROFIBUS-DP fault, the switching of substitute values is enabled by the bus controller parameterisation, this data is transmitted to the periphery in the case of a fault.

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
1	7 *1*	6 *0*	5 *1*	4 *1*	3 *1*	2 *1*	1 *0*	0 *1*
2	15 *reserved*	14	13	12	11	9	8	7
3	7 *0*	6 *0*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
4	15 SubVal_Ch1_HB	14	13	12	11	9	8	7
5	7 SubVal_Ch1_LB	6	5	4	3	2	1	0
6	15 SubVal_Ch2_HB	14	13	12	11	10	9	8
7	7 SubVal_Ch2_LB	6	5	4	3	2	1	0

$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
SubVal_Ch1	0x0000 : 0xFFFF	Substitute value channel 1
SubVal_Ch2	0x0000 : 0xFFFF	Substitute value channel 2
Italic		Cannot be changed

3.2.8.4 Distance and Angle Messurment Modules

All interface modules for path and angle measurement have 2 bytes of extended parameterisation information which serves for the identification on internal bus and the structure of the mapping table. 2 further bytes follow which are reserved for future options.

3.2.8.4.1 SSI generator interface

Module	Identification hex	Identification dec
750-630 (Alternative)	0x93	147
750-630 (Standard)	0x95	149

Parameter	value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the controller or ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *1*	6 *1*	5 *0*	4 *0*	3 *0*	2 *0*	1 *0*	0 *0*
2	15 reserved	14	13	12	11	9	8	7
3	7 reserved	6	5	4	3	2	1	0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis release
Italic		Cannot be changed

3.2.8.4.2 Incremental encoder interface

Module	Identification hex	Identification dec
750-631, 750-637	0xB5	181

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the controller or ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7	6	5	4	3	2	1	0
	reserved							
2	15	14	13	12	11	10	9	8
	reserved							
3	7	6	5	4	3	2	1	0
	reserved							

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis release
Italic		Cannot be changed

3.2.8.4.3 Digital impulse interface

Module	Identification hex	Identification dec
750-635	0xB3	179

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the controller or ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *1*	6 *1*	5 *0*	4 *0*	3 *0*	2 *1*	1 *0*	0 *1*
2	15 *reserved*	14	13	12	11	10	9	8
3	7 *reserved*	6	5	4	3	2	1	0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
$DiagEn0_2$	0	Diagnosis locked (default)
	1	Diagnosis release
Italic		Cannot be changed

3.2.8.5 Serial interfaces

All serial interface modules have 2 bytes of extended parameter information which serves for the identification on the internal bus and the structure of the mapping table. 2 further bytes follow which are reserved for future options.

Module	Identification hex	Identification dec
750-650, 750-651, 750-653, 750-654 (3 Byte)	0xB3	179
750-650, 750-651, 750-653, 750-654 (5 Byte)	0xB5	181

Parameter	Value	Meaning
I/O module is physically	plug fitted*) not plug fitted	The I/O module process data is: - supplied by the I/O module or supplied to the I/O module - set to zero by the controller or ignored by the controller
Diagnosis channel x	released locked*)	The diagnosis information of the corresponding channel is - transmitted to PROFIBUS-DP master - not transmitted to PROFIBUS-DP master

*) Default setting

Parameter								
Offset	Information							
0	7 *0*	6 PFC	5 Plug	4 *0*	3 *0*	2 Diag En0	1 *0*	0 *0*
1	7 *reserved*	6	5	4	3	2	1	0
2	15 *reserved*	14	13	12	11	10	9	8
3	7 *reserved*	6	5	4	3	2	1	0

PFC_6	0	Module is mapped in the fieldbus and PFC-PI
	1	Module is exclusively mapped in the PFC-PI
$Plug_5$	0	Module is physically not present
	1	Module is physically present (default)
DiagEn0	0	Diagnosis locked (default)
	1	Diagnosis release
Italic		Cannot be changed

3.2.9 Diagnosis

The slave diagnosis of the bus controller comprises of a 6 byte standard diagnosis, 9 byte identification based diagnosis, 7 byte device status and up to 42 byte channel based diagnosis.

In the reply telegram of the diagnosis selection, in addition to the standard diagnosis at least the identification based diagnosis and the device status are transmitted. This could be followed by up to 14 channel based diagnosis messages (3 byte per message).

Byte		
0		
1		Station status 1 to 3
2		
3		PROFIBUS-DP master address
4		Manufacturer Identification
5		
6		
7		Identification based diagnosis
:	:	
14	:	
15		
		Device status
21		
22		
		Channel based diagnosis
		(3 bytes per channel)
63		

3.2.9.1 Stations status 1 to 3

see EN 50170

3.2.9.2 PROFIBUS-DP master address

The PROFIBUS-DP master address is located in byte 3 of the slave diagnosis and contains the master address parameterised by the station and to which it has write and read access.

3.2.9.3 Manufacturer identification

The manufacturer identification is located in byte 4 and 5 and contains a 16 bit code, intended for the identification of the device or the device class.

3.2.9.4 Identification based diagnosis

The identification based diagnosis comprises of a bit field containing a bit information for each connected module. The individual bit provides information about the current operating status. A 0 means no fault, a 1 indicates a faulty module status. The bus controller can be fitted with up to 63 modules, so that the identification based diagnosis including header covers 9 bytes from byte 6 to byte 14.

Byte	Information								Meaning
6	0	1	0	0	1	0	0	1	Header byte (9 byte identification based diagnosis incl. header)
7	7	6	5	4	3	2	1	0	
8	15	14	13	12	11	10	9	8	
9	23	22	21	20	19	18	17	16	Diagnosis allocation to
10	31	30	29	28	27	26	25	24	I/O module n (n=1 ... 63)
11	39	38	37	36	35	34	33	32	Controller (n=0)
12	47	46	45	44	43	42	41	40	
13	55	54	53	52	51	50	49	48	
14	63	62	61	60	59	58	57	56	

3.2.9.5 Device status

The device status includes the required overhead 7 Byte and transmits internal status information as well as information relating to the internal bus, PROFIBUS-DP and the PFC running time system to the master or the higher ranking controls.

Byte	Information								Meaning
15	0	0	0	0	0	1	1	1	Header byte (7 Byte status information incl. header)
16	1	0	1	0	0	0	0	0	Status type (manufacturer specific device status)
17	0	0	0	0	0	0	0	0	Slot number 0
18	0	0	0	0	0	0	0	0	Status differentiation (none)
19	q	q	n	n	n	n	n	n	Status message q – Status source '00' Internal status '01' Internal bus status '10' PROFIBUS DP status '11' PFC-RTS status n – Status number
20	x	x	x	x	x	x	x	x	Status argument
21	0	0	0	0	0	0	0	0	Reserved

3.2.9.5.1 Internal status messages and arguments

Status message	Status argument	Description
0x00	0x00	no fault
0x01	0x00	EEPROM check sum fault / check sum fault in the flash parameter area
0x01	0x01	Overflow inline code buffer
0x01	0x02	Unknown data type
0x01	0x03	Module type for flash program memory could not be determined / is incorrect
0x01	0x04	Fault when writing in the FLASH memory
0x01	0x05	Fault when deleting the FLASH memory
0x01	0x06	Changed I/O modules configuration determined after AUTORESET
0x01	0x07	Fault when writing in the serial EEPROM
0x01	0x08	Invalid firmware
0x02	0x00	Incorrect table entry
0x07	n	Module at position n (n = 1...63) is not supported

3.2.9.5.2 Internal bus status messages and arguments

Status message	Status argument	Description
0x63	0xFF	At least one module cannot interpret an internal bus command
0x64	0x00	A data fault or a internal bus interruption exists behind the bus controller
0x64	n	An internal bus interruption exists behind module n
0x65	n	Fault during register communication with module n

3.2.9.5.3 PROFIBUS-DP status messages and arguments

Status message	Status argument	Description
0x81	0x01	Insufficient parameter data configuration data
0x81	0x02	Excessive parameterisation data
0x82	n	Faulty n. parameterisation byte
0x83	0x01	Insufficient configuration data
0x83	0x02	Excessive configuration data
0x84	n	Faulty n. configuration byte (module)
0x85	0x01	Maximum input data length exceeded
0x85	0x02	Maximum output data length exceeded
0x86	0x01	Compilate buffer overflow for DP process image
0x86	0x02	Compilate buffer overflow for PFC process image

3.2.9.5.4 PFC-RTS status messages and arguments

Status message	Status argument	Description
0xC1	0x00	t. b. d.
0xC1	0x01	t. b. d.
0xC2	0x00	t. b. d.

3.2.9.6 Channel based diagnosis

The channel based diagnosis serves for detailing the identification based diagnosis. A structure is added to the device status for each faulty slot. This comprises of a header byte, a byte, the channel type and the channel number and a third which describes the fault type and the channel organisation.

Byte	Information								Meaning
22	1	0	x	x	x	x	x	x	Header channel based diagnosis (x: 1 to 63, slots of the module)
23	a	a	x	x	x	x	x	x	Channel type (a) and channel number x: 0 to 3
	0	1							Input channel
	1	0							Output channel
	1	1							Input / output channel
24	t	t	t	x	x	x	x	x	Channel type (t) and fault type (x)
	0	0	0						No allocation
	0	0	1						1 bit
	0	1	0						2 bit
	0	1	1						4 bit
	1	0	0						1 byte
	1	0	1						1 word
	1	1	0						2 words
25-27	Next channel based diagnosis message (as byte 22 – 24)								
28-30	Next channel based diagnosis message (as byte 22 – 24)								
...	...								
61-63	Last representable channel based diagnosis message (as byte 22 – 24)								

3.2.9.6.1 Fault types of I/O modules with diagnostic capability

The fault types refer to standardised types.

Fault type	Meaning
0	Not specified
1	Short circuit
2	Low voltage
3	High voltage
4	Overload
5	Over temperature
6	Line break
7	Upper limit value exceeded
8	Lower limit value exceeded
9	Fault
10 ... 15	Reserved
16 ... 31	Manufacturer specific
17	Field voltage fault
18	Fuse fault
19	Buffer overflow
20	Check sum fault
21	Parity fault
22	Receive Timeout (partner)
23	Receive Timeout
26	SSI_IN fault
27	SSI FRAME fault
31	I/O module fault

3.2.9.6.2 I/O modules fault cases

Article number	Channel type	Fault type	Meaning
750-418, 750-419, 750-507, 750-522	'001	0.1001'	Fault (line break, overload or short circuit)
750-506	'001	0.0001' 0.0010' 0.0110' 0.1001'	Short circuit Lower voltage Line break Error
750-461, 750-469	'101	0.0110' 0.1000' 1.0000' 1.1111'	Line break Lower limit value gone below Parameterisation fault I/O module fault
750-462, 750-465, 750-466, 750-472, 750-474, 750-479, 750-480	'101	0.0111' 0.1000' 1.0000' 1.1111'	Lower limit value gone below Upper limit value exceeded Parameterisation fault I/O module fault
750-610, 750-611,	'001	1.0001' 1.0010'	Field voltage fault Fuse fault
750-630	'110	1.1010' 1.1011' 1.0000' 1.1111'	SSI_IN fault (external fault) SSI FRAME fault Parameterisation fault I/O module fault
750-635, 750-637	'110	0.1001' 1.0000' 1.1111'	Error Parameterisation fault I/O module fault
750-650, 750-651, 750-653, 750-654	'110 ('000)	0.1001' 1.0000' 1.1111'	Buffer overflow Parameterisation fault I/O module fault

3.2.10 Commissioning (start-up) with WAGO-I/O-*PRO*

in preparation

3.2.11 LED signalling

For the on-site diagnosis the controller has several LED´s, which display the operating status of the controller or the complete node.

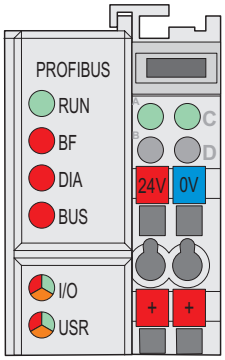

Fig. 3-22: Display element 750-833 g012107x

3.2.11.1 Blink code

A blink code displays detailed fault messages. A fault is cyclically displayed using up to 3 different blink sequences.

- The first blink sequence (approx. 10 Hz) indicates the fault display.
- After a pause a second blink sequence appears (approx. 1 Hz). The number of blink impulses gives the **fault code**.
- The third blink sequence (approx. 1 Hz) appears following a further pause. The number of blink pulses indicates the **fault argument**.

3.2.11.2 Fieldbus status

The upper four LED´s signal the operating status of the PROFIBUS communication.

LED	Colour	Meaning
RUN	green	The 'RUN' LED shows the user whether the fieldbus controller is functioning correctly.
BF	red	The 'BF' LED indicates whether the communication is functioning via the PROFIBUS.
DIA	red	The 'DIA' LED indicates an external diagnosis.
BUS	red	The 'BUS' LED signals a projecting fault.

RUN	BF	DIA	BUS	Meaning
off	off	off	off	The controller is not supplied with operating voltage (Status LED of the bus controller does not light up) or a hardware fault exists.
on	on	*	off	PROFIBUS interface started, baud rate not yet recognised.
on	blinks	*	off	Baud rate recognised, station is not yet parameterised and configured.
on	blinks	on	blinks cyclically	Slave was incorrectly projected. Fault message via a blink code
on	off	*	off	The controller is exchanging data.
on	*	on	*	The controller signals a pending diagnosis.

* Not relevant

3.2.11.3 Fault message by means of blink code of the BUS-LED

Fault argument	Fault description
Fault code 1: Fault in parameterisation telegram	
1	insufficient parameterisation data
2	excessive parameterisation data
Fault code 2: Fault in parameterisation telegram	
n	Parameterisation byte n is faulty
Fault code 3: Fault in configuration telegram	
1	insufficient configuration data
2	excessive configuration data
Fault code 4: Fault in configuration telegram	
n	Configuration byte (module) n is faulty
Fault code 5: Faulty data length	
1	maximum input data length exceeded
2	maximum output data length exceeded
Fault code 6: Compilate buffer overflow	
1	Compilate buffer overflow for DP process image
2	Compilate buffer overflow for PFC process image

3.2.11.4 Node status

The 'I/O' LED indicates the node operation and signals the occurrence of a fault.

I/O	USR	Meaning
green	*	Data cycle on the internal bus
off	*	No data cycle on the internal bus
red	on	Bus controller is in bootstrap mode or hardware defect on the controller systems
red blinks	*	During start up: internal bus being initialised During operation: general internal bus fault
red blinks	*	Fault message during internal bus reset and internal fault
orange	*	FLASH access to bus device firmware

* Not relevant

The controller starts up after switching on the supply voltage. The "I/O" LED blinks. The "I/O" LED has a steady light following a fault free run-up.
In the case of a fault the "I/O" LED continues blinking. The fault is cyclically displayed by the blink code.

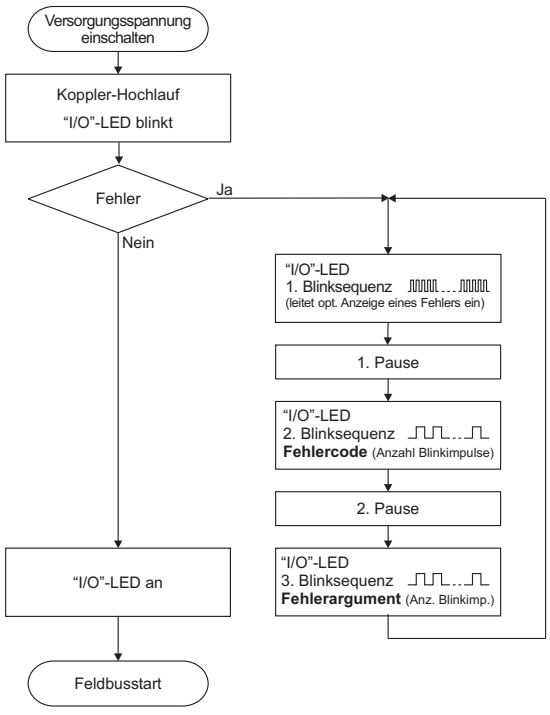

Fig. 3-23: Signalling the LED node status g012111d

After overcoming a fault restart the controller by switching off the supply voltage and then on again.

3.2.11.5 Fault message via blink code from the I/O-LED

Fault argument	Fault description
Fault code 1: Hardware and configuration fault	
0	EEPROM check sum fault / check sum fault in the parameter area of the flash memory
1	Overflow of the internal buffer memory for the inline code
2	Unknown data type
3	Module type of the flash program memory could not be determined / is incorrect
4	Fault when writing in the FLASH memory
5	Fault when deleting the FLASH memory
6	Changed I/O module configuration determined after AUTORESET
7	Fault when writing in the serial EEPROM
8	Invalid firmware
Fault code 2: Fault in programmed configuration	
0	Incorrect table entry
Fault code 3: Internal bus command fault	
0	Internal bus(es) has (have) identified internal bus commands as incorrect
Fault code 4: Internal bus data fault	
0	Data fault on internal bus or Internal bus interruption on controller
n* (n>0)	Internal bus interrupted after I/O module n
Fault code 5: Fault during register communication	
n*	Internal bus fault during register communication with I/O module n
Fault code 7: I/O module is not supported	
n*	I/O module at position n is not supported

* The number of blink pulses (n) indicates the position of the I/O module. I/O modules without data are not counted (e.g. supply modules without diagnosis)

Example: The 13th I/O module has been removed.	
1.	The "I/O" LED starts the fault display with the first blink sequence (approx. 10 Hz).
2.	The second blink phase (approx. 1 Hz) follows the first pause. The "I/O" LED blinks four times and thus signals the fault code 4 (internal bus data fault).
3.	The third blink sequence follows the second pause. The "I/O ERR" LED blinks twelve times. The fault argument 12 means that the internal bus is interrupted after the 12th I/O module.

3.2.11.6 Supply voltage status

LED	Colour	Meaning
A	green	Status of the operating voltage – system
C	green	Status of the operating voltage – power jumper contacts

There are two green LED's in the controller supply section to display the supply voltage. The left LED (A) indicates the 24 V supply for the controller. The right hand LED (C) signals the supply to the field side, i.e. the power jumper contacts.

3.2.12 Fault behaviour

3.2.12.1 Fieldbus failure

A field bus failure is given when the master cuts-out or the bus cable is interrupted. A fault in the master can also lead to a fieldbus failure.

The red "BF" LED lights up.

The failure of the fieldbus can activate the parameterisable substitute value of the I/O modules. During projecting of the inputs and outputs a substitute value can be laid down for each channel.

Substitute value strategy	Value (bit orientated) Digital output modules	Value (byte orientated) Digital input modules
Minimum value	0	0 bzw. 4 mA, 0 V
Maximum value	1	20 mA, 10 V
Substitute value	0 or 1	0/4 ... 20 mA, -10 ... +10 V
PFC takes over	The local PFC application takes over the output data	
Stop internal bus	Behaviour determined by I/O module	

The values are entered in the output process image by the controller. With the I/O modules with byte orientated data width, e.g. with the pulse width module, the substitute value is determined via the value range.

The process data is transmitted as soon as the fieldbus is active again and the outputs in the node are set accordingly.

3.2.12.2 Internal bus fault

An internal bus fault is created, for example, if an I/O module is removed. If this fault occurs during operation the output modules behave in the same manner as an I/O module stop. The input process image is set in accordance with the projected strategy.

The "I/O" LED blinks red. The slave generates a detailed diagnosis message.

Once the internal bus fault has been overcome the controller starts up again automatically in accordance with the parameterised restart behaviour. The transfer of the process data is then resumed and the node outputs are correspondingly set.

3.2.13 Technical data

System data	
Number of I/O modules	96 with repeater
Number of I/O points	approx. 6000 (master dependent)
Transfer medium	Cu cable as per EN 50170
Bus segment length	100 m ... 1200 m (baud rate dependent / cable dependent)
Transmission rate	9.6 kbaud ... 12 Mbaud
Transmission time for 10 modules each with 32 DI and 32 DO	type 1 ms max. 3.3 ms
Bus connection	1 x D-SUB 9; socket
Programming IEC 61131-3	WAGO-I/-PRO IL, LD, FBD, ST, FSC
Standards and approvals	
UL (UL508)	E175199
Standard	EN 50 170
Conformity symbol	CE
Technical data	
Number of I/O modules	63
Protocol	DP / DPV1
Input process image	max. 128 byte
Output process image	max. 128 byte
Configuration	via PC or controls
Voltage supply	DC 24 V (-15 % / + 20 %)
Input current$_{max}$	500 mA at 24 V
Internal system supply module efficiency	87 %
Internal current consumption	200 mA at 5 V
Total current for I/O modules	1800 mA at 5 V
Voltage via power jumper contacts	DC 24 V (-15 % / + 20 %)
Current via power jumper contact$_{max}$	DC 10 A
Dimensions (mm) W x H x D	51 x 65* x 100 (*from mounting rail top edge)
Weight	ca. 195 g
EMC interference resistance	as per EN 50082-2 (95)
EMC interference transmission	as per EN 50081-2 (94)

4 I/O Modules

4.1 Digital Input Modules

4.1.1 List of Digital Input Modules

4.1.2 750-414 [4 DI 5 V 0,2ms]

4.2 Digital Output Modules

4.2.1 List of Digital Output Modules

4.3 Analog Input Modules

4.3.1 List of Analog Input Modules

4.4 Analog Output Modules

4.4.1 List of Analog Output Modules

4.5 ...

5 PROFIBUS

5.1 Description

5.2 Topology

5.3 Wiring

On the PROFIBUS with RS 485 transmission technology all devices are connected in a line structure. The bus line comprises of a twisted and screened pair of wires.

The fieldbus line is specified in EN 50 170 as a line type A and must provide certain line parameters. The line type B also described in the EN 50 170 is an old type and should no longer be used.

Parameter	Value
Wave resistance	135 ... 165 Ω
Operating capacity	< 30 pF/m
Loop resistance	110 Ω/km
Wire diameter*)	> 0.64 mm
Wire cross section*)	> 0.34 mm^2

*) The wire cross sections used must conform with connection possibilities on the bus plug.

Line type A allows maximum line lengths for a bus segment dependent upon the transmission speed.

Transmission speed		Max. bus segment length
9.6 / 19.2 / 45.45 / 93.75	kBaud	1200 m
187.5	kBaud	1000 m
500	kBaud	400 m
1500	kBaud	200 m
3000 / 6000 / 12000	kBaud	100 m

The plugs available on the market offer the possibility that arriving and departing data cables can be directly connected to the plug. In this manner drop cables are avoided and the bus plug can be connected to or disconnected from the bus at any time without interrupting the data traffic. A cut-in type bus connection is integrated in these plugs. Due to the capacitative load of the subscribers and the resulting generated line reflection the connection plugs used should have integrated length inductivity. This is indispensable for transmission rates of > 1.5 MBaud.

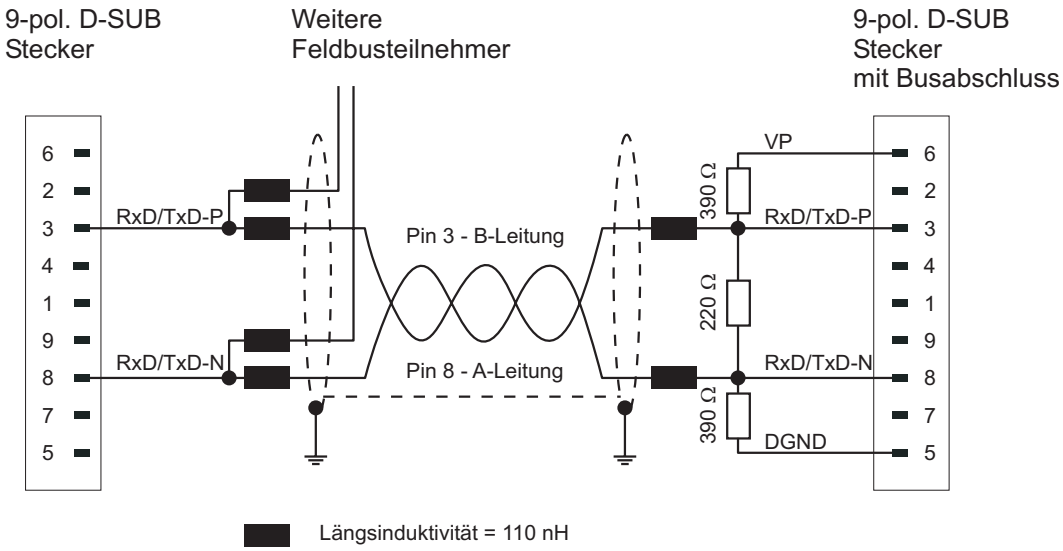

Fig. 5-1: Bus connection

g012102d

Note
When connecting the subscriber ensure that the data lines are not mixed up. The bus termination at the start and end of the bus line must be installed. The bus connection requires the supply voltage VP from the device. For this reason ensure that the slave unit installed on the bus termination, is always supplied with voltage.
Due to the integrated length inductivity in the connection plug ensure that the plug is installed without connected field devices as the missing capacity of the device could cause transmission faults.

In order to achieve a high disturbance resistance of the system against electromagnetic radiated interference ensure that a screened PROFIBUS cable is used. Where possible connect the screen at both ends with good conduction and using large surface area screen clips. In addition ensure that the cables are laid separated from all power line cables if possible. With a data rate of ≥1.5 Mbit/s ensure that spur lines are avoided.

Further information
The PNO provides further documentation for its members in INTERNET. Cable specification information can be obtained from, for example, the „Installation Guideline for PROFIBUS-FMS/DP", 2.112

http://www.profibus.com/

Note
WAGO offers this screen connection system for the optimum connection between fieldbus screening and function earth.

6 Configuration example

6.1 NETCON

in preparation

6.2 Step 7

in preparation

6.3 COM Profibus

in preparation

7 Explosive Environments

7.1 Foreword

Today's development shows that many chemical and petrochemical companies have production plants and process automation machines in operation which use gas-air, vapor-air and dust-air mixtures which can be explosive. For this reason, the electrical components used in such plants and systems must not pose a risk of explosion resulting in injury to persons or damage to property. This is backed by law, directives or regulations, on a national and international scale. WAGO-I/O-SYSTEM 750 is designed for use in zone 2 explosive environments, for which reason the following basic explosion protection related terms have been defined.

7.2 Protective measures

Primarily, explosion protection describes how to prevent the formation of an explosive atmosphere. For instance by avoiding the use of combustible liquids, reducing the concentration levels, ventilation measures, to name but a few. But there are a large number of applications, which do not allow the implementation of primary protection measures. In such cases, the secondary explosion protection comes into play. Following is a detailed description of such secondary measures.

7.3 Classification meeting CENELEC / IEC

The specifications outlined here are valid for use in Europe and are based on the following standards: EN50... of CENELEC (European Committee for Electrotechnical Standardisation) and IEC79-... of IEC (International Electrotechnical Commission):

7.3.1 Division into zones

Explosive environments are areas arein which the atmosphere can potentially become explosive. The term explosive means a special mixture of ignitable substances existing in the form of air-borne gases, fumes, mist or dust under atmospheric conditions which, when heated beyond a tolerable temperature or subjected to an electric arc or sparks, can produce explosions. Explosive zones have been created to describe the concentrations level of an explosive atmosphere. This division is based on the probability of an explosion occurring.

Explosive areas resulting from combustible gases, fumes or mist:

- Zone 0 areas are subject to an explosive atmosphere (> 1000 h /year) continuously or for extended periods.
- Zone 1 areas can expect the occasional occurrence of an explosive atmosphere (> 10 h ≤ 1000 h /year).
- Zone 2 areas can expect the rare or short-term occurrence of an explosive atmosphere (> 0 h ≤ 10 h /year).

Explosive areas subject to air-borne dust:

- Zone 20 areas are subject to an explosive atmosphere (> 1000 h /year) continuously or for extended periods.
- Zone 21 areas can expect the occasional occurrence of an explosive atmosphere (> 10 h ≤ 1000 h /year).
- Zone 22 areas can expect the rare or short-term occurrence of an explosive atmosphere (> 0 h ≤ 10 h /year).

7.3.2 Explosion protection group

In addition, the electrical components for explosive areas are subdivided into two groups:

Group I: Group I includes electrical components for use in fire-damp mine structures.

Group II: Group II includes electrical components for use in all other explosive environments. The group is further subdivided by pertinent combustible gasesin the environment.
Subdivision IIA, IIB and IIC takes into account that different materials/substances/gases have various ignition energy characteristic values. For this reason the three sub-groups are assigned representative types of gases:

- IIA – Propane
- IIB – Ethylene
- IIC – Hydrogen

Minimal ignition energy of representative types of gases				
Explosion group	I	IIA	IIB	IIC
Gases	Methane	Propane	Ethylene	Hydrogen
Ignition energy (mWs)	0,28	0,25	0,082	0,016

7.3.3 Unit categories

Moreover, the areas of use (zones) and the conditions of use (explosion groups) are subdivided into categories for the electrical operating means:

Unit categories	Explosion group	Area of use
M1	I	Fire-damp protection
M2	I	Fire-damp protection
1G	II	Zone 0 Explosivi environment by gas, fumes or mist
2G	II	Zone 1 Explosive environment by gas, fumes or mist
3G	II	Zone 2 Explosive environment by gas, fumes or mist
1D	II	Zone 20 Explosive environment by dust
2D	II	Zone 21 Explosive environment by dust
3D	II	Zone 22 Explosive environment by dust

7.3.4 Temperature classes

The maximum surface temperature for electrical components of explosion protection group I is 150 °C (danger due to coal dust deposits) or 450 °C (if there is no danger of coal dust deposit).

In line with the maximum surface temperature for all ignition protection types, the electrical components are subdivided into temperature classes, as far as electrical components of explosion protection group II are concerned. Here the temperatures refer to a surrounding temperature of 40 °C for operation and testing of the electrical components. The lowest ignition temperature of the existing explosive atmosphere must be higher than the maximum surface temperature.

Temperature classes	Maximum surface temperature	Ignition temperature of the combustible materials
T1	450 °C	> 450 °C
T2	300 °C	> 300 °C ≤ 450 °C
T3	200 °C	> 200 °C ≤ 300 °C
T4	135 °C	> 135 °C ≤ 200 °C
T5	100 °C	>100 °C ≤ 135 °C
T6	85°C	> 85 °C ≤ 100 °C

The following table represents the division and attribution of the materials to the temperature classes and material groups in percent:

Temperature classes						
T1	T2	T3	T4	T5	T6	Total
28 %	37,6 %	30.5 %	3,1 %	0 %	0,3 %	351
	96,5 %					
Explosion group						
IIA	IIB	IIC				Total
80,2 %	18,1 %	0,7 %				436

7.3.5 Types of ignition protection

Ignition protection defines the special measures to be taken for electrical components in order to prevent the ignition of surrounding explosive atmospheres. For this reason a differentiation is made between the following types of ignition protection:

Identification	CENELEC standard	Explanation	Application
EEx o	EN 50 015	Oil encapsulation	Zone 1 + 2
EEx p	EN 50 016	Overpressure encapsulation	Zone 1 + 2
EEx q	EN 50 017	Sand encapsulation	Zone 1 + 2
EEx d	EN 50 018	Pressure resistant encapsulation	Zone 1 + 2
EEx e	EN 50 019	Increased safety	Zone 1 + 2
EEx m	EN 50 028	Cast encapsulation	Zone 1 + 2
EEx i	EN 50 020 (Unit) EN 50 039 (System)	Intrinsic safety	Zone 0 + 1 + 2
EEx n	EN 50 021	Components for zone 2 (see below)	Zone 2

Ignition protection “n“ describes exclusively the use of explosion protected components in zone 2. This zone encompasses three areas where explosive atmospheres can only be expected to occur rarely or short-term. It represents the transition between the area of zone 1, which requires an explosion protection and safe area in which for instance welding is allowed at any time.

Regulations covering these electrical components are being prepared on a world-wide scale. The standard EN 50 021 allows electrical component manufacturers to obtain certificates from the corresponding authorities for instance KEMA in the Netherlands or the PTB in Germany, certifying that the tested components meet the above mentioned standards draft.

Type “n” ignition protection additionally requires electrical components to be marked , with the following extended identification:

- A – non spark generating (function modules without relay /without switches), previously V
- AC – spark generating, contacts protected by seals (function modules with relays / without switches), previously VW
- L – limited energy (function modules with switch)

More information
For more detailed information please refer to the national and/or international standards, directives and regulations!

7.4 Classifications meeting the NEC

The following classifications according to NEC 500 (National Electric Code) are valid for North America, in contrast to the specifications governing use in Europe:

7.4.1 Division into zones

An indication for the probability of a danger – of whatever type it may be – is subdivided into “Divisions“. Here are the following descriptions:

Explosion endangered areas due to combustible gases, fumes, mist and dust:	
Division 1	encompasses areas in which explosive atmospheres are to be expected occasionally (> 10 h ≤ 1000 h /year) as well as continuously and long-term (> 1000 h /year).
Division 2	encompasses areas in which explosive atmospheres can be expected rarely and short-term (>0 h ≤ 10 h /year).

7.4.2 Explosion protection groups

Electrical components for explosion endangered areas are subdivided in three danger categories:

Class I (gases and fumes):	Group A (Acetylene) Group B (Hydrogen) Group C (Ethylene) Group D (Methane)
Class II (dust):	Group E (Metal dust) Group F (Coal dust) Group G (Flour, starch and cereal dust)
Class III (fibers):	No sub-groups

7.4.3 Temperature classes

Electrical components for explosive areas are differentiated by temperature classes:

Temperature classes	Maximum surface temperature	Ignition temperature of the combustible materials
T1	450 °C	> 450 °C
T2	300 °C	> 300 °C ≤ 450 °C
T2A	280 °C	> 280 °C ≤ 300 °C
T2B	260 °C	> 260 °C ≤ 280 °C
T2C	230 °C	>230 °C ≤ 260 °C
T2D	215 °C	>215 °C ≤ 230 °C
T3	200 °C	>200 °C ≤ 215 °C
T3A	180 °C	>180 °C ≤ 200 °C
T3B	165 °C	>165 °C ≤ 180 °C
T3C	160 °C	>160 °C ≤ 165 °C
T4	135 °C	>135 °C ≤ 160 °C
T4A	120 °C	>120 °C ≤ 135 °C
T5	100 °C	>100 °C ≤ 120 °C
T6	85 °C	> 85 °C ≤ 100 °C

7.5 Identification acc. to CENELEC, IEC and ATEX 100a

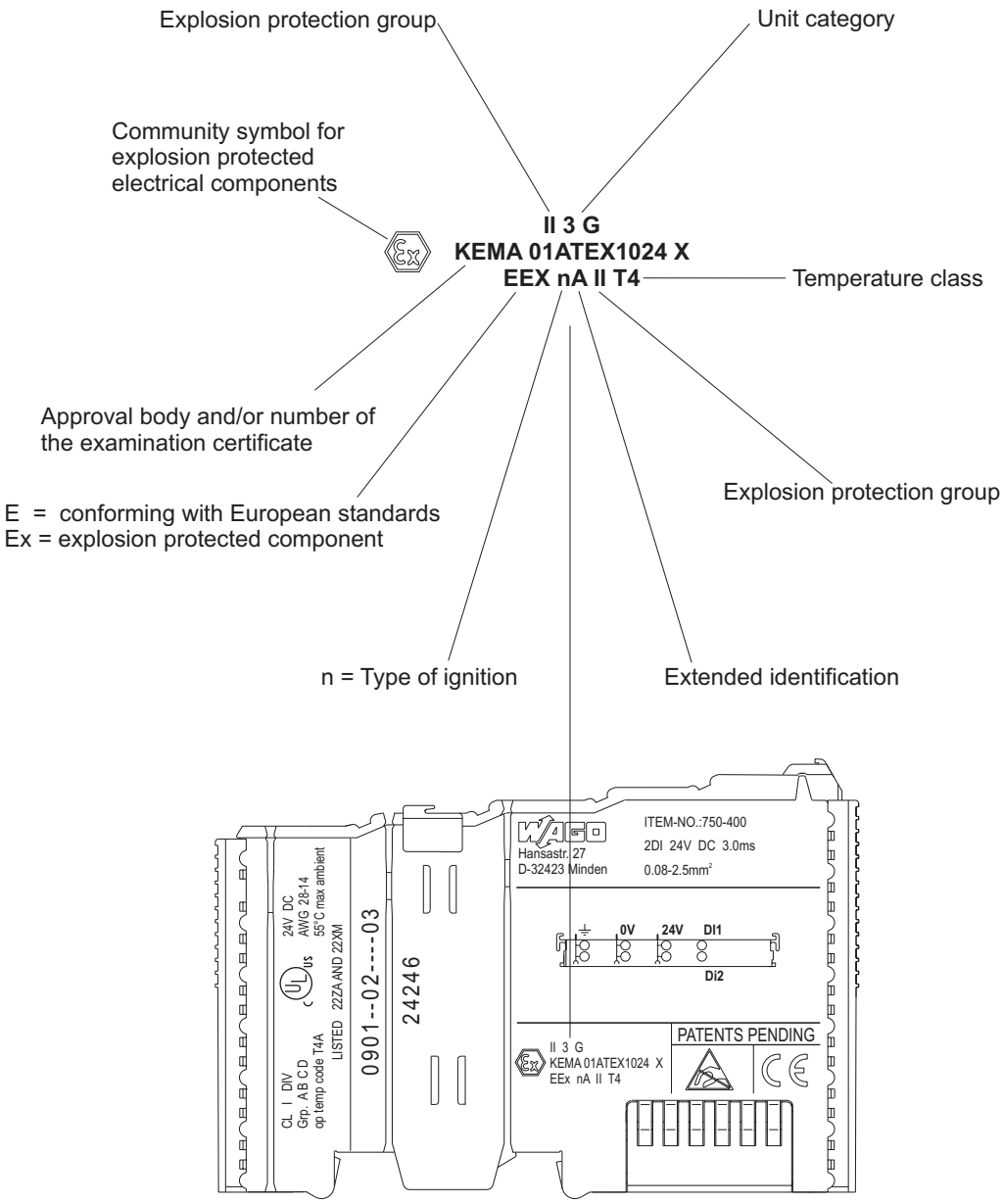

Fig. 7-1: Example for lateral labeling of bus modules
(750-400, 2 channel digital input module 24 V DC)

g01xx03e

7.6 Identification acc. to NEC 500

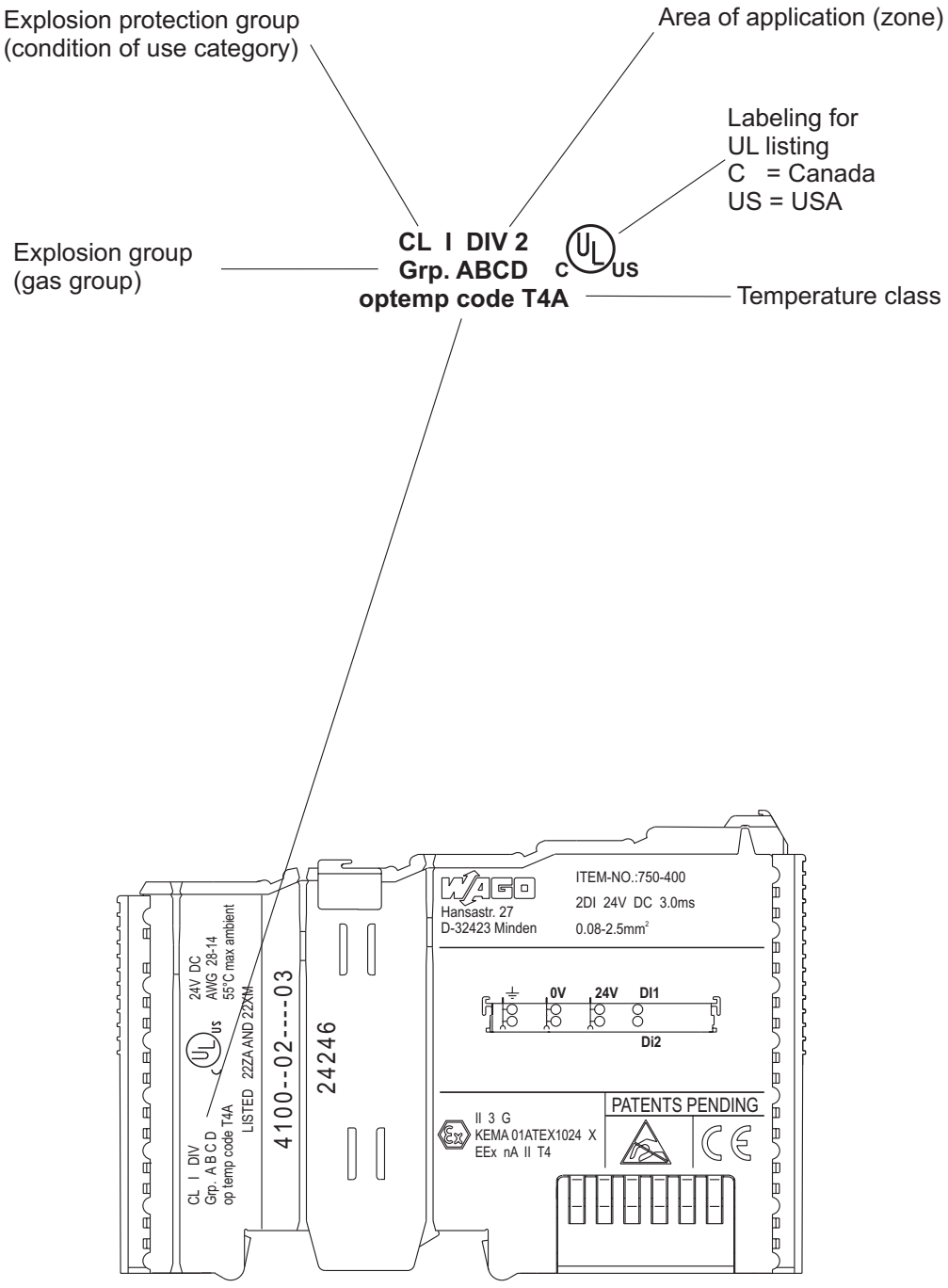

Fig. 7-2: Example for lateral labeling of bus modules
(750-400, 2 channel digital input module 24 V DC)

g01xx04e

7.7 Installation regulations

In contrast to the design regulations for electrical components, a standardization of the design regulations on an international scale is not as advanced.

In the **Federal Republic of Germany,** various national regulations for the installation in explosive areas must be taken into consideration. The basis being the ElexV complemented by the installation regulation DIN VDE 0165/2.91. The following are excerpts from additional VDE regulations:

DIN VDE 0100	installation in power plants with rated voltages up to 1000 V
DIN VDE 0101	installation in power plants with rated voltages above 1 kV
DIN VDE 0800	installation and operation in tele-communication plants including information processing equipment
DIN VDE 0185	lightning protection systems

The **USA** and **Canada** have their own regulations. The following are excerpts from these regulations:

NFPA 70	National Electrical Code Art. 500 Hazordous Locations
ANSI/ISA-RP 12.6-1987	Recommended Practice
C22.1	Canadian Electrical Code

Danger
For components with Ex approval please observe the following information:

A. This equipment is exclusively suitable for applications in Class I, Part 2, Group A, B, C, D or in non-explosive areas.

B. Explosion risk -
The substitution/replacement of components may call the suitability for Class I, Part 2 into question.

C. Only disconnect the equipment when the power supply has been switched off or the area is known to be a non-explosive area.

D. The specifications on fuses, voltage and rated current are printed on the fuse holder of the power supply modules.

Proof of certification is available on request.

8 Glossary

B

Operating system

Software, which links the user programs with the hardware.

Bit

Smallest information unit. Its value can either be 1 or 0.

Bit rate

Number of bits transmitted within a time unit.

Bus

Line for bit serial or bit parallel, clocked data transfer. A bus for the bit parallel data transmission comprises of address, data, control and supply bus. The width of the data bus (8-,16-, 32-, 64 bit) and its clock speed is decisive for the speed at which data can be transferred. The address bus width limits the possible architecture of a network.

Byte

Binary Yoked Transfer Element. A data element greater than one bit and smaller than a word. Generally a byte contains 8 bits. With a 36 bit computer a byte may contain 9 bits.

Bootstrap

Operating mode of the fieldbus coupler /controller (750-333 and 750-833) in in which the device awaits a firmware upload.

D

Data bus

see *Bus*.

F

Fieldbus

System for serial information transmission between devices in automation technology in field areas close to the process.

H

Hardware

Electronic, electric and mechanical components of an assembly group.

S

Segment

A network is generally structured by *Router* or *Repeater* in various physical network segments.

Server

Serving device within a Client Server System. The service to be provided is requested by the *Client*.

Sub-network

Sub-division of a network into logical sub-networks.

9 Literature list

Further information
The PNO provides further documentation for its members in INTERNET. Cable specification information can be obtained from, for example, the „Installation Guideline for PROFIBUS-FMS/DP", 2.112

http://www.profibus.com/

10 Index