SIEMENS

PROFIBUS DP/P-bus link

User's guide

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1 General

1.1 Overview

The DP/P-bus link connects the DESIGO P-bus to the Profibus DP (“Distributed Peripherals”).This allows the direct exchange of data between DESIGO I/O modules and the SIMATIC S7 via Profibus DP.

1.2 Application

The purpose of the DP/P-bus link is to connect two communications media, the P-bus and the Profibus DP, allowing access to the DESIGO I/O modules from a SIMATIC S7.

Within the SIMATIC, the DESIGO I/O modules are treated as standard Profibus DP data points.

On the Profibus, the link operates as a Profibus DP slave, supporting datagram traffic in the direction of the Profibus DP master (SIMATIC S7). On the P-bus, the link operates as the P-bus master, and is responsible for the flow of data to and from the DESIGO I/O modules. All data transferred via the DP/P-bus link is converted into the datagram format used by the communications partner.

Engineering is carried out using standard Profibus DP engineering methods. The properties of the DESIGO I/O modules are saved in the product-specific Profibus master device file (the .GSD file of the Profibus DP/P-bus link). The .GSD file provides the basis for engineering with the Profibus project engineering tool (e.g. SIMATIC Manager).

The DP/P-bus link itself does not require engineering. It receives its parameters from the Profibus DP master assigned to it (e.g. the SIMATIC S7).

1.3 Configuration

The following shows how the I/O modules are connected to SIMATIC S7 and to the higher-level management PC, SICLIMAT X-OS.

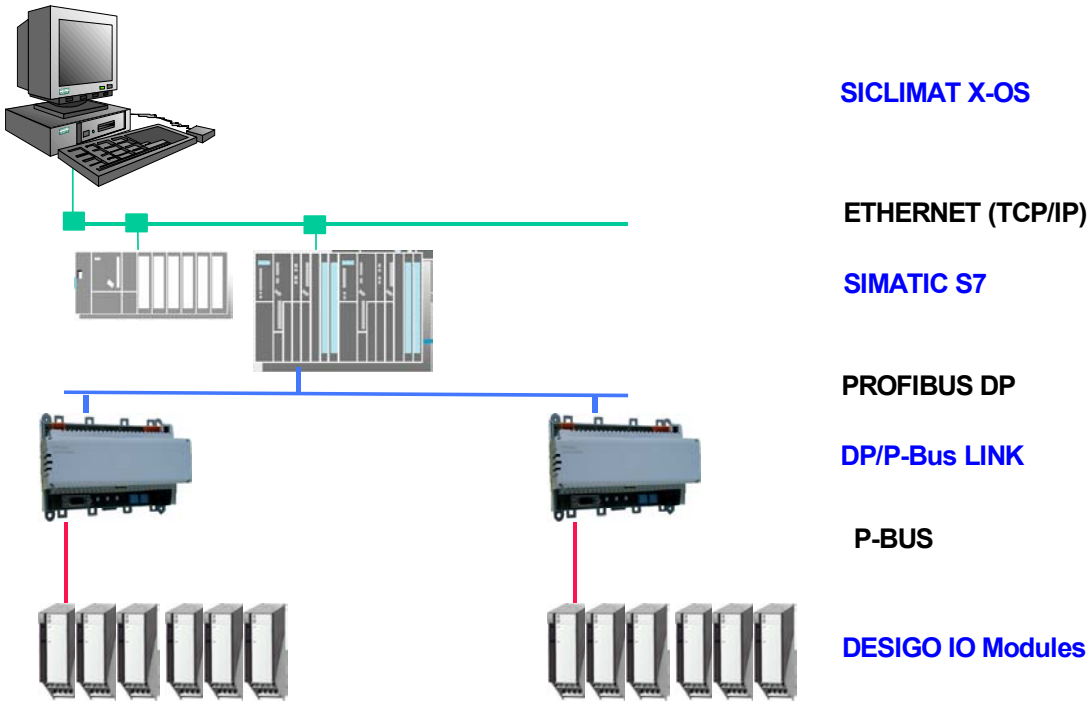


Fig. 1-1: Configuration

1.4 Features

On the P-bus side, the DP/P-bus link is enabled for the local bus (a P-bus cable up to 50m in length). On the Profibus side, distances of up to 1000m can be covered.

The number of DESIGO I/O modules per DP/P-bus link depends on the following conditions:

Maximum 50 DESIGO I/O modules are supported

- Up to 128 load units
- Max. 216 input bytes
- Max. 216 output bytes
- The maximum total must not exceed 216 bytes
- Programmable Profibus DP address spaces 1…99

The following example shows how to determine the number of load units and address space:

With the module mix shown in the table below, the totals are 9 load units and an address space of 6 input bytes and 9 output bytes. For the maximum configuration, a further 119 load units and an additional 201 input/output bytes are available for the I/O modules.

DESIGO I/O modules		Load units	Input bytes	Output bytes
PTM1.2D20	DIGITAL INPUT 2 x DI potential-free contacts DC 22 V	2	1	0
PTM1.4QD	DIGITAL OUTPUT 2 x DO; with feedback	4	1	1
PTM1.2P100	ANALOG INPUT 2 x AI; 0…250 ohms Pt100/Ni100 (4-wire)	2	4	0
PTM1.4Y10S	ANALOG OUTPUT 4 x AO 0…10V	1	0	8
	Total	**9**	**6**	**9**

1.5 Cycle times of the DP/P-bus link

The cycle times depend on the number and type of DESIGO I/O modules connected.

The DP/P-bus link takes less time to process digital modules than it does to process analog modules. With the latter, more time is required to convert the values into the format of the receiving device.

The cycle time also depends on the number of channels of a module. Here too, more time is required for analog modules, as most of them have two or four channels.

For an average module mix, comprising 30 digital and 20 analog modules, the duration of one cycle is approximately 350ms.

When calculating cycle times for the DP/P-bus link, remember to include the processing time of the DP master CPU and the transfer time for the Profibus connection.

1.6 Range overview

The DP/P-bus link can be combined with the following DESIGO I/O modules:

Digital In		Load units	Input bytes	Output bytes	Remarks
PTM1.2D20	Digital input 2 x DI; potential-free contacts DC 22 V	2	1	0	
PTM1.4D20	Digital input 4 x DI; potential-free contacts DC 22 V	1	1	0	
PTM1.4D20R	Digital input 4 x DI; open contact	1	1	0	
PTM1.8D20E	Digital input 8 x DI; potential-free contacts	1	1	0	
PTM1.2D42	Digital input 2 x DI not electrically isolated; voltage signaling	2	1	0	
PTM1.2D250	Digital input 2 x DI electrically isolated; voltage signaling	2	1	0	

Digital Out		Load units	Input bytes	Output bytes	Remarks
PTM1.2Q250	Digital output 2 x DO; AC 24..250V, 3A inductive	2	0	1	
PTM1.2Q250B	Digital output 2 x DO; single-stage, bistable	2	0	1	
PTM1.2QD	Digital output 1 x DO; with feedback	2	1	1	
PTM1.4QD	Digital output 2 x DO; with feedback	4	1	1	
PTM1.2Q250-M	Digital output 2 x DO; with manual operation; AC 24..250V, 3A inductive	2	1	1	
PTM1.2QD-M	Digital output 1 x DO; with feedback and manual operation	2	1	1	
PTM1.4QD-M2	Digital output 2 x DO; with feedback and manual operation	2	1	1	
PTM1.3Q-M3	Digital output 3-stage; with manual operation	2	1	1	

Digital Out		Load units	Input bytes	Output bytes	Remarks
PTM1.4Q250-P	Pulse switching command; 2 single-stage consumers	2	1	1	Pulse modules must be operated by pulse switching commands from the SIMATIC. However, in order for the module to recognize the pulsed signal, it must be present for longer than one SICLIMAT cycle.
PTM1.4Q250-P3	Pulse switching command; one 2-stage or 3-stage consumer	1	1	1	See PTM1.4Q250-P
PTM1.4Q250AP	Pulsed switching command 4 normally-open contacts	2	1	1	See PTM1.4Q250-P

Counters		Load units	Input bytes	Output bytes	Remarks
PTM1.2C	Digital input 2 x pulse inputs max. 25 Hz (7-bit counter)	2	2	0	7-bit counter, modulo 0…127, non-resettable

Analog In		Load units	Input bytes	Output bytes	Remarks
PTM1.2R1K	Analog input 2 x AI; Ni1000 -50..+150°C (2-wire)	1	4	0	
PTM1.4R1K	Analog input 4 x AI; Ni1000 -50..+150°C (2-wire)	1	8	0	
PTM1.2P100	Analog input 2 x AI; 0…250 ohm Pt100/Ni100 (4-wire)	2	4	0	
PTM1.2P1K	Resistance, passive Pt1000, Ni1000	2	4	0	Only for use with Pt1000
PTM1.2U10	Analog input 2 x AI; 0…10 V	1	4	0	
PTM1.2I420	Analog input 2 x AI; 4…20 mA	1	4	0	
PTM1.2I25/020	Analog input 2 x AI; 0(4)…20 mA	1	4	0	

Analog Out		Load units	Input bytes	Output bytes	Remarks
PTM1.2Y10S	Analog output 2 x AO 0…10V	1	0	4	
PTM1.4Y10S	Analog output 4 x AO 0…10V	1	0	8	
PTM1.2Y10S-M	Analog output 2 x AO with manual operation; 0…10V	1	1	4	
PTM1.2Y420	Analog output 2 x AO 4…20mA	1	0	4	
PTM1.2Y250T	Digital output 1 x DO; positioning modules, 3-position output	2	1	3	
PTM1.2Y250T-M	Digital output 1 x DO; with manual operation positioning modules with 3-position output	2	1	3	
PTM6.1PSI20-M	Pneumatic	2	1	2	

Compact		Load units	Input bytes	Output bytes	Remarks
PTK1.30V01	P-bus compact module, 30 I/O points	13	14	10	
PTK1.23V02	P-bus compact module, 23 I/O points	17	24	2	

Special modules		Load units	Input bytes	Output bytes	Remarks
PHM1.36TL	Status display unit, 24 messages / 12 operating points	4	2	4	
PTM50.16V01	WILO pumps 2 single/1 double pump	8	24	8	
PTM52.16V01	GRUNDFOS pumps 2 pumps	8	24	8	

2 Engineering

The engineering is based on the master device file (.GSD) which is standardized in accordance with the Profibus DP and which describes the module response of every Profibus DP slave.

2.1 Importing the GSD file into the engineering tool

As part of the engineering process, the engineering tool needs to be informed about which GSD file to use for the DP/P-bus link. This is normally done by importing the GSD file. (For the exact path details refer to the description of the engineering tool.)

As a result of the import, the DP/P-bus link will appear as a field device in the program's hardware list, and the possible I/O module types will be selected automatically.

Procedure:

- Engineer the S7-CPU 3xx/4xx-2DP under **HW-Config** on the programming device.
- Import the GSD file from the DP/P-bus link

  Current GSD file: SIEM80F6.GSD
  ID number: 0x80F6

2.2 Engineering the DP/P-bus link with the SIMATIC Manager

When engineering a plant, the project engineering tool interprets the data in the GSD file for the DP/P-bus link. It also runs plausibility checks to ensure that the engineering data is correctly structured in terms of logic. When the engineering process is complete, the user can transfer the combined engineering data from the DP/P-bus link and CPU 3xx/4xx-2DP to the CPU via the SIMATIC S7 programming device.

Procedure:

- Add DP/P-bus link as a DP slave.
- Select the DESIGO I/O modules
- Set the DP slave address on the associated DP/P-bus link module.
- Modify the address on the link itself, using the address switch.
- Load the hardware settings into the S7-CPU.

The following describes the engineering of a DP/P-bus link in a SIMATIC S7 system:

The example shows an existing project with a CPU 315-2 DP.

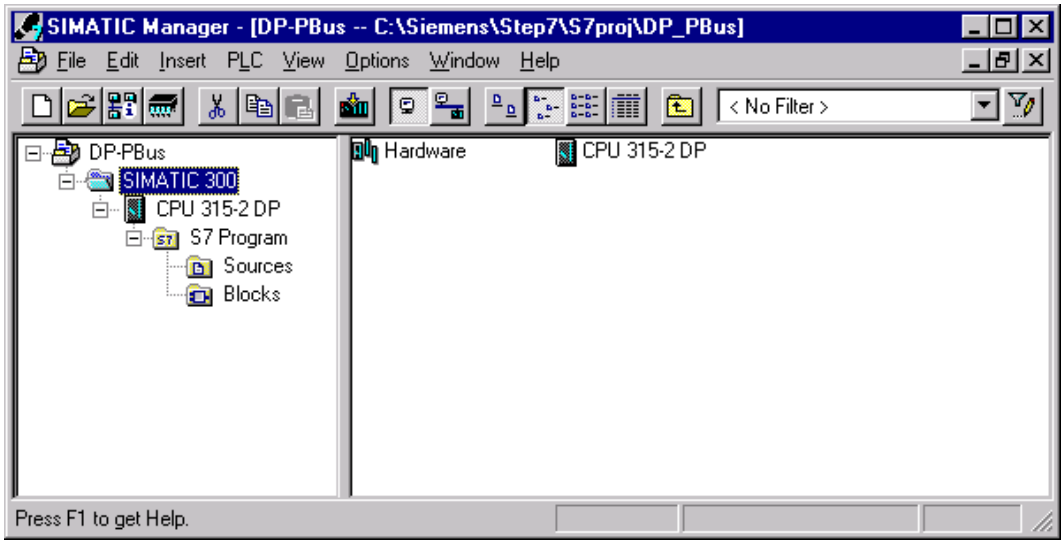


Fig. 2-1: SIMATIC S7-CPU hardware plan

The “Hardware” object is then opened and the hardware plan for the station is displayed.

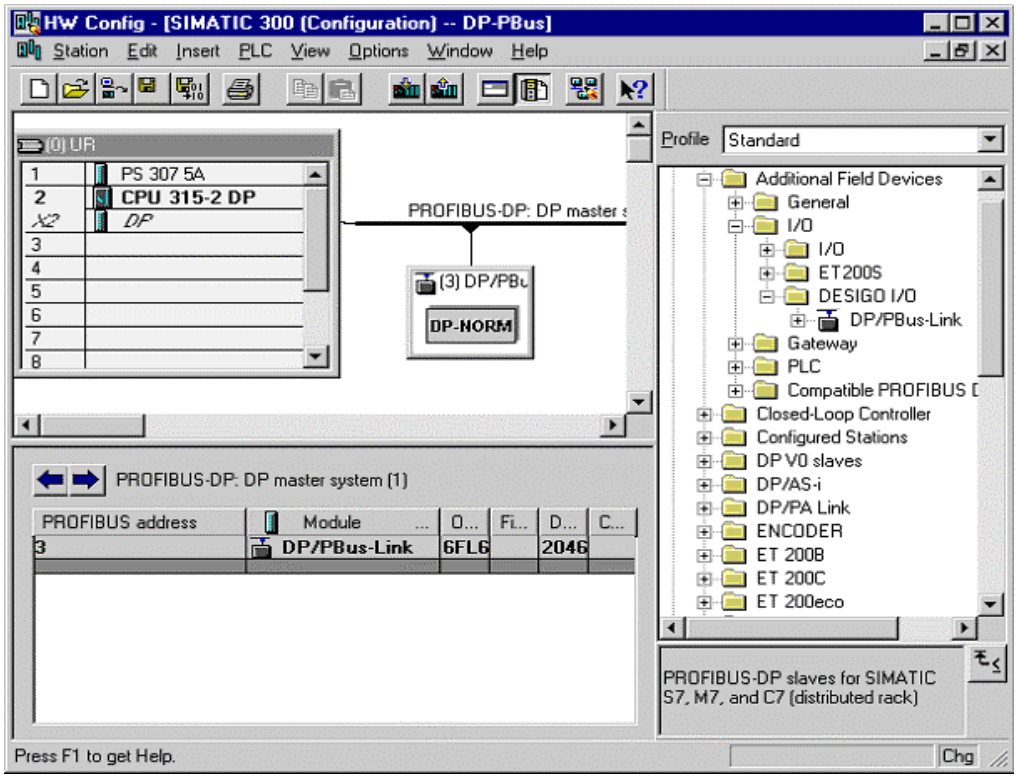


Fig. 2-2: DP/P-bus link hardware plan

The power supply, CPU and DP/P-bus link are displayed in the form of a master/slave system. The hardware list appears to the right of the hardware plan.
This list contains the DP/P-bus link under the following path:

```
( \ PROFIBUS-DP \Additional FIELD DEVICES\ I/O \ DESIGO I/O \ DP/P-bus-Link)
```

- The device can be connected to the DP master by highlighting the DP/P-bus link in the hardware list and dragging the bus connection indicated in the upper pane of the dialog box.
- Now click the DP/P-bus link to show which modules are assigned to which slots, and the I/O addresses for that station.

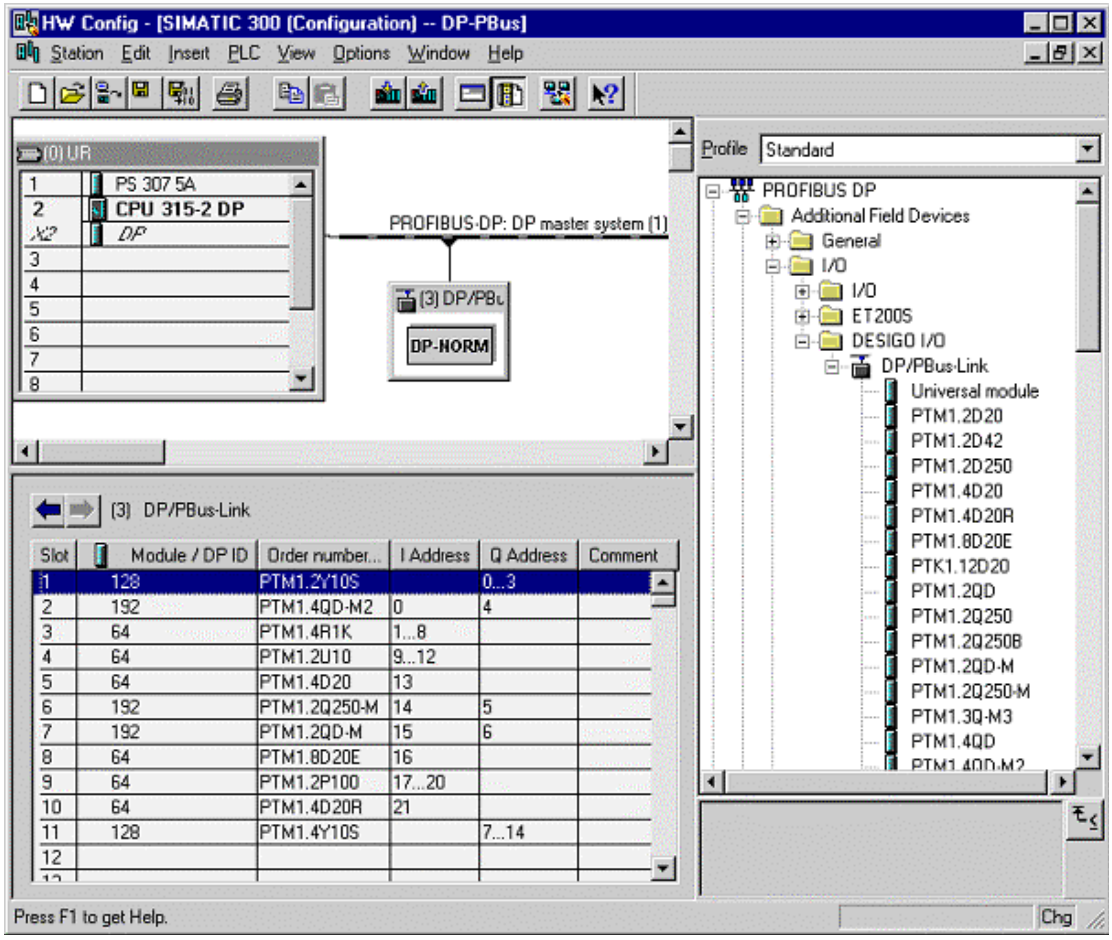


Fig. 2-3: DP/P-bus link module configuration

The modules are inserted into the appropriate slots in ascending P-bus address order, i.e. in the order in which they were addressed on the P-bus side.

The input and output addresses for the automation station are allocated automatically in this process. The address range of the DP/P-bus link must **not** overlap with the address range of other bus subscribers.

The DESIGO I/O modules already in position are listed, starting with Slot 1. The engineering tool assigns the associated input and output addresses in accordance with the information in the GSD file.

- Other modules can then be dragged from the list and dropped into the required slot. In this process, it is important to ensure that the slots are filled without any gaps.

A maximum of 50 modules can be positioned in this way. Above this number, the engineering tool rejects any further inputs. In the example shown, there are no other S7 modules, and there is only one DP slave, giving a continuous sequence of input and output addresses.

However, if the overall system includes several DP slaves and additional S7 modules, the positioning of the modules can result in gaps in the address space of a given DP/P-bus link. This depends on the order in which, for example, the individual DP slaves are configured with modules. In such cases, the engineering tool ensures that consistent data structures are transmitted when data is exchanged.

On the P-bus side, there are no specific rules related to the positioning of the DESIGO I/O modules or their P-bus addresses. However, when using the SIMATIC Manager for engineering, it is important to ensure that the I/O modules are engineered in ascending order of their P-bus addresses.

2.3 Modifying the DESIGO I/O configuration

Note the following when modifying the hardware configuration:

- The addresses allocated in the engineering process must not be modified manually. This makes the data structures inconsistent at transmission time, which can lead to unpredictable signal states at the outputs. It can also mean that the input signals are wrongly assigned.
- Similarly, modules must not be **moved** after they have been positioned in the list of module slots, as the engineering tool does not automatically re-sort the address sequence.
- When modules are **inserted** later, the address range is not automatically adjusted to accommodate them. This means that all the subsequent addresses have to be modified.
- If several links and additional modules are engineered, and the engineer wants to **add** an additional module to one of the intervening links, the next unused address will be assigned to this module. However, the engineering tool will ensure that the data is transmitted consistently.

3 Diagnostics

Code-based diagnostics are used for the DP/P-bus link. The LED display on the DP/P-bus link also indicates the overall operational status.

Diagnostic data can be evaluated in the SICLIMAT X environment with the function module "`DIAGNOSTIC I/Os`" in the Emx.

3.1 Structure of slave diagnostics

Profibus DP includes the option of processing diagnostic requirements based on error states. If diagnostics are required, the DP/P-bus link transmits a diagnostic datagram to the Profibus master (SIMATIC S7). The next section describes the structure for evaluating the datagram in SIMATIC.

Byte 0	Station status 1 to 3
Byte 1	
Byte 2	
Byte 3	Master Profibus address
Byte 4	High byte ID number
Byte 5	Low byte
Byte 6	**CODE-BASED DIAGNOSTICS**
: : Byte 14	

3.1.1 Station status 1

Bit	Description	Cause / Remedy
0	**1: No access to the DP/P-bus link from the master**	**Is the Profibus address set correctly?** Is the bus plug connected? Voltage to the DP/P-bus link ok? DP/P-bus link reset carried out?
1	**1: The DP/P-bus link is not ready to exchange data**	Wait until start-up procedure is complete
2	1: The engineering data transmitted by the master to the DP/P-bus link does not correspond to the actual structure	Correct station type or correct DP/P-bus link structure entered in the engineering software?
3	1: External diagnosis available (common diagnostic display)	Evaluate diagnosis. The bit will be reset as soon as all errors have been cleared.
4	1: The DP/P-bus link does not support the required function (e.g. modification of Profibus address via the software)	**Check engineering procedure.**
5	1: The master cannot interpret the response from the DP/P-bus link.	Check the bus structure.
6	1: The DP slave type does not match the software engineering	Enter the correct station type in the engineering software.
7	1: The DP/P-bus link parameters were set by another DP master.	The bit is always set to 1 whenever a programming device, for example, or another DP master accesses the DP/P-bus link. The Profibus address of the DP master which set the DP/P-bus link parameters, in the “Master Profibus address” diagnostic byte.

3.1.2 Station status 2

Bit	Description
0	**1: The DP/P-bus link parameters must be reset.**
1	**1: Diagnostic message received. The DP/P-bus link will not work until the fault has been cleared (static diagnostic message).**
2	1: This bit is always set to "1".in the DP/P-bus link.
3	1: Response monitoring is enabled in this DP slave.
4	1: The DP/P-bus link has received the control command "FREEZE". This bit is only updated if another diagnostic message also changes.
5	1: The DP/P-bus link has received the control command "SYNC". This bit is only updated if another diagnostic message also changes.
6	0: This but is always set to "0".
7	1: The DP/P-bus link is disabled, i.e. removed from the current processing routine.

3.1.3 Station status 3

Bit	Description
0 to 6	**0: These bits are always set to "0".**
7	1: There are more diagnostic messages present than can be accommodated by the DP/P-bus link.

3.1.4 Master Profibus address

The “Master Profibus Address” diagnostic byte stores the Profibus address of the DP master, which

- sets the DP/P-bus link parameters, and
- has “read” and “write” access to the DP slave.

The Master Profibus address is in byte 3 of the slave diagnostics.

3.1.5 Manufacturer identification

The manufacturer’s identification includes a code which defines the type of DP slave.
The code for the DP/P-bus link is $80F6_H$

3.1.6 Code-based diagnostics

Code-based diagnostics provide the master with an overall view of which modules in a slave assembly are currently in diagnostic mode. One bit is assigned to each module for this purpose. The length of the diagnostic message is rounded up to byte limits, with any unconfigured bits being filled with zeros. When a bit is set, this indicates that there is a diagnostic message in this input/output range. The code-based diagnostics start at byte 6 and comprise 9 bytes.

Byte	**7**			**Bit**				**0**	**Description**
6	0	1	0	0	1	0	0	1	Bits 7 and 6: Code-based diagnostics Bits 5…0: Length = 9 (including byte 6)

Byte	**7**			**Bit**				**0**	**Description**
7	*8*	*7*	***6***	*5*	*4*	*3*	*2*	*1*	Module 1 to 8
8	*16*	*15*	*14*	*13*	*12*	*11*	*10*	*9*	Module 9 to 16
9	*24*	*23*	*22*	*21*	*20*	*19*	*18*	*17*	Module 17 to 24
10	*32*	*31*	*30*	*29*	*28*	*27*	*26*	*25*	Module 25 to 32
11	*40*	*39*	*38*	*37*	*36*	*35*	*34*	*33*	Module 33 to 40
12	*48*	*47*	*46*	*45*	*44*	*43*	*42*	*42*	Module 41 to 48
13	*56*	*55*	*54*	*53*	*52*	*51*	*50*	*49*	Module 49 to 56
14	***S***	*63*	*62*	*61*	*60*	*59*	*58*	*57*	Module 57 to 63

Each number in the relevant bit field represents a module. A module which has caused a diagnostic message is identified by a “1” set in the bit field.

Example:

Byte 7, bit 5 set: The DESIGO module with the sixth-highest address has caused a diagnostic message.

- There is no Module No. 64. This is where the common alarm bit is located.
- A new diagnostic message with the bit set is stored in the diagnostics buffer of the SIMATIC S7 as an “`incoming fault`”. The system fault LED of the S7 CPU lights up. Similarly, an “`outgoing fault`” is stored in the diagnostics buffer.
- If the same DESIGO module address was allocated more than once when setting up the system, all bits in the bit field are set to “`1`”.

3.2 Diagnostics with LED indicators

The DP/P-bus link has three LEDs to indicate the status of the module.

- The DP LED lights up to indicate DP communications.
- The PU LED lights up during normal operation, provided that the internal power supply for the DP/P-bus link is not overloaded.
- The IM LED uses various flashing sequences to indicate different types of fault. Each IM module fault has a separate priority, so that if several IM faults occur, only the one with the highest priority is indicated.

Error type	**DP LED**	**PU LED**	**IM LED flashing**	**Priority**
RAM test failed	x	x	Frequency 0.5 Hz	1 (highest)
SPC3-RAM test failed	x	x		2
Internal power supply overload	x	Off	x	
DP communications errors			Every 10 s for 3 s (module scan: i.e. the DP/P-bus link tries to establish a connection with the P-bus and/or Profibus every 10 seconds).	
Connection dropped	Off	x		3
No exchange of process images (mapping)	Off	x		
Configuration error	Off	x		
P-bus communications errors:				
Connection dropped	x	x		

x : Not relevant

During normal operation of the DP/P-bus link, the DP LED and PU LED remain on continuously. The IM LED flashes rapidly. The flashing sequence slows down as the number of connected DESIGO modules increases.

3.3 Diagnostics using the EMX block

Field of application

This module can be used to check module-specific faults in a DP/P-bus link.

Description of functions

- When a fault in the P-bus I/O modules occurs or is cleared, the DP/P-bus link triggers diagnostics function OB 82. OB 82 then calls system function SFC 13 to call up the diagnostics for the DP subscriber whose basic module address is "B-ADR".

- When the CPU starts up, it also calls system function SFC 13 for a diagnosis of the DP/P-bus link.

- The data received from the diagnostic SFC also includes the appended common faults of the individual I/O modules; these are stored in a specific data area.

- The module faults are read one byte at a time from this data area in the cyclical part of the program, and transmitted to outputs S 1-8. A common fault message for all the I/O modules engineered in the DP/P-bus link is transmitted to output ST-SAM.

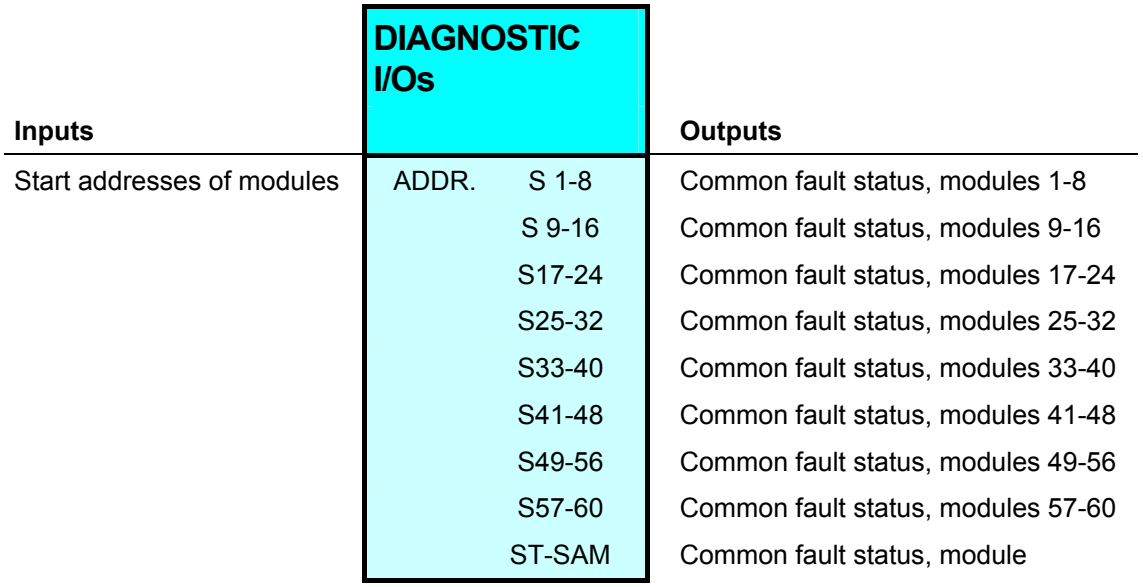
- It is advisable to connect an integer resolution block for access to the faults from individual channels.
  Bit "0" of the outputs contains the fault from the module with the lowest number.
  Bit "7" contains the fault from the module with the highest number
  (e.g. for output S 1-8, Bit 0 = Module 1 and Bit 7 = Module 8).

Important **The block may be called once only for each DP/P-bus link.**

Mounting location:

Anywhere below the CPU "Typical" block structure.

Diagram for graphics-based engineering



List of input and output parameters

Name	I/O	Can be linked to	Assignment	Value range		Prior use	Related parameter	Test mode 1 By selection 2 By parameter setting		
				Min	Max			1	2	
B-ADR	I	-		0	32767	0	-	No	No	
B-ADR	I	-		0	32767	0	-	No	No	
S 1-8	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S 9-16	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S17-24	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S25-32	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S33-40	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S41-48	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S49-56	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
S57-60	O	Byte	Byte connection M-A-P	-	-	Byte connection M-A-P	-	Yes	No	
ST-SAM	O	Bit	Bit connection M-A	-	-	Bit connection M-A-P	-	Yes	No	

4 Module data

4.1 Digital modules

This section shows how the digital signals/channels of the DESIGO I/O modules are displayed in the SIMATIC S7.

4.1.1 Digital input modules

The digital channels are displayed right-justified and in ascending order, so that the first channel is mapped to Bit 0.

Type	MSB				**Input byte**			LSB
PTM1.2D20	0	0	0	0	0	0	i2	i1
PTM1.4D20	0	0	0	0	i4	i3	i2	i1
PTM1.4D20R	0	0	0	0	i4	i3	i2	i1
PTM1.8D20E	i8	i7	i6	i5	i4	i3	i2	i1
PTM1.2D42	0	0	0	0	0	0	i2	i1
PTM1.2D250	0	0	0	0	0	0	i2	i1

ix i = Input bit information, x = Channel No.

4.1.2 Digital output modules

Type	MSB			**Input byte**				LSB	MSB				**Output byte**			LSB
PTM1.2Q250	None								x	x	x	x	x	x	o2	o1
PTM1.2Q250B	None								x	x	x	x	a2	e2	a1	e1
PTM1.2QD	0	0	0	0	0	0	0	c1	x	x	x	x	x	x	x	o1
PTM1.4QD	0	0	0	0	0	0	c2	c1	x	x	x	x	x	x	o2	o1
PTM1.2Q250-M	0	0	h2	h1	k2	k1	0	0	x	x	x	x	x	x	o2	o1
PTM1.2QD-M	0	0	0	h1	0	k1	0	c1	x	x	x	x	x	x	x	o1
PTM1.4QD-M2	0	0	h2	h1	0	k1	c2	c1	x	x	x	x	x	x	o2	o1
PTM1.3Q-M3	0	h3	h2	h1	0	k1	0	0	x	x	x	x	x	o3	o2	o1
PTM1.4Q250-P	0	0	0	0	k2	k1	0	0	0	0	0	0	a2	e2	a1	e1
PTM1.4Q250-P3	0	0	0	0	0	k1	0	0	x	x	x	x	a	s3	s2	s1
PTM1.4Q250A-P	0	0	0	0	k2	k1	0	0	x	x	x	x	o4	o3	o2	o1

ox o = Output bit information, x = Channel No.

ax Pulse relay, channel x : 0 = On 1 = Off

ex Pulse relay, channel x : 1 = On 0 = Off

hx Setpoint in HND mode for channel/stage no. x; 0 = FALSE, 1 = TRUE

kx Feedback AUT/HND mode for channel/stage no. x; 0 = HND, 1 = AUT

cx Feedback signal for channel/stage no. x
(for code D modules, this is an actual input)

a Pulse relay off for channel 1, 1 = Off 0 = ON

sx Pulse relay, channel/stage x.

4.2 Analog modules

The DESIGO I/O range incorporates various analog modules for the connection of sensors and/or loads/actuators. The following describes the principles of the SIMATIC S7 analog value display and the display of DESIGO analog values in the format required by SIMATIC S7.

4.2.1 Analog value display

The digitized analog value is the same for input and output values in the same nominal range. The analog values are displayed in two's complement format. The analog value sign (+/–) is always located at bit number 15.

- A value of 0 represents the plus sign (+)
- A value of 1 represents the minus sign (–)

If the resolution of an analog value is less than 15 bits, the analog value is displayed left-justified. The bits marked "x" are set to "0".

Note This resolution does not apply to temperature values. The converted temperature values are the result of conversion in the analog module or the DP/P-bus link. (See Tab. 4-3 to Tab. 4-5)

The table below shows how analog values are displayed by the analog modules:

Resolution	**Analog value**															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit value	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
8-bit resolution	VZ	0	0	0	0	0	0	0	1	x	x	x	x	x	x	x
9-bit resolution	VZ	0	0	0	0	0	0	0	0	1	x	x	x	x	x	x
10-bit resolution	VZ	0	0	0	0	0	0	0	0	0	1	x	x	x	x	x
11-bit resolution	VZ	0	0	0	0	0	0	0	0	0	0	1	x	x	x	x
12-bit resolution	VZ	0	0	0	0	0	0	0	0	0	0	0	1	x	x	x
13-bit resolution	VZ	0	0	0	0	0	0	0	0	0	0	0	0	1	x	x
14-bit resolution	VZ	0	0	0	0	0	0	0	0	0	0	0	0	0	1	x
15-bit resolution	VZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Tab. 4-1: Analog value display

4.2.2 Analog measuring ranges

SIMATIC S7			Voltage/current measuring range			Range
			PTM1.2U10	PTM1.2I25	PTM1.2I420	
Measured value in %	Decimal	Hex.	0 to 10V	0 to 1 V/20mA (with shunt)	4 to 20 mA	
118,515	32767	7FFF				Overflow, error
113,972	31511	7B17	>11,397	>1,1397V >22,24mA	>22,24mA	
113,968	31510	7B16	11,397	1,1397V 22,24mA	22,24mA	Overshoot range
100,004	27649	6C01	>10	>1V >20mA	>20mA	
100	27648	6C00	10	1V 20mA	20mA	Nominal range
0	0	0	0	0V 0mA	4mA	
-0,004	-1	FFFF	<0	<0V <0mA	<4mA	Undershoot range
-14,001	-3871	F0E1	-1,4	-0,14V	1,76mA	
-14,005	-3872	F0E0	<-1,4	<-0,14V		Overflow, error
-118,519	-32768	8000				

Tab. 4-2: Voltage/current measuring ranges

SIMATIC S7		PTM1.2R1K/4R1K		Range
Decimal	Hex.	Ohms	L&S Ni1000 air conditioning range in °C (1 digit = 0.01 K)	
32767	7FFF		>150.01	Overflow, error
15001	3A99		150.01	
15000	3A98	1987	150	Nominal range
-5000	EC78	743	-50	
-5001	EC77		-49.99	Overflow, error
-32768	8000		<-49.99	

Tab. 4-3: L&S Ni1000 measuring ranges

SIMATIC S7		PTM1.2P100		Range
Decimal	**Hex.**	**Ohms**	**L&S Ni1000 standard range in °C (1 digit = 0.1 K)**	
32767	7FFF		>408.1	Overflow, error
3874	F22		408.1	
3873	F21	250	408	Nominal range
600	258	123.24	60	
0	0	100	0	
-2582	F5EA	0	-234	
-2581	F5EB		-233.9	Overflow, error
-32768	8000		<-233.9	

Tab. 4-4: Pt100 measuring ranges

SIMATIC S7		PTM1.2P1K		Range
Decimal	**Hex.**	**Ohms**	**L&S Pt1000 standard range in °C (1 digit = 0.1 K)**	
32767	7FFF		>408.1	Overflow, error
3874	F22		408.1	
3873	F21	2500	408	Nominal range
600	258	1232.4	60	
0	0	1000	0	
-2582	F5EA	0	-234	
-2581	F5EB		-233.9	Overflow, error
-32768	8000		<-233.9	

Tab. 4-5: Pt1000 measuring ranges

4.2.3 Analog input modules

Type	Input word															
PTM1.2R1K PTM1.4R1K PTM1.2P100 PTM1.2P1K PTM1.2U10 PTM1.2I25 PTM1.2I420	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0

4.2.4 Analog output modules

Analog output values are displayed in the form of a word value to a resolution of 11 bits. In the case of modules with manual operation, the output word is preceded by an input byte in which the feedback signals are mapped.

Input byte comparison:

Type	Input byte							
PTM1.2Y10(S)	None							
PTM1.4Y10S	None							
PTM1.2Y10(S)-M	0	0	0	0	k2	k1	0	0
PTM1.2Y420	None							
PTM1.1PSI20-M	0	0	0	0	0	k1	0	0

Output word comparison:

Type	Output word															
PTM1.2Y10(S)	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	0	0	0	0	0
PTM1.4Y10S	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	0	0	0	0	0
PTM1.2Y10(S)-M	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	0	0	0	0	0
PTM1.2Y420	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	0	0	0	0	0
PTM1.1PSI20-M	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	0	0	0	0	0

A5...A15 Analog output value

kx Feedback AUT/HND mode for Channel/Stage No. x; 0=HND, 1=AUT

For PTM1.2Y250T(-M), manual operation is mapped in an input byte. The output value consists of 3 bytes, where the first two bytes display the output value as “word” and the runtime as a “Byte” data type.

Type PTM1.2Y250T(-M)

Input Byte

0	0	0	0	0	k1	0	0

Output Word

0	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0

Output Byte

0	0	0	0	L3	L2	L1	L0

A0 ... A14 Analog output value

kx Feedback AUT/HND mode for Channel/Stage No. x; 0=HND, 1=AUT

L0 ... L3 Runtime:

L3	L2	L1	L0	Value	Runtime
0	0	0	0	**0**	Timeout
0	0	0	1	**1**	8.5 ... 13 s
0	0	1	0	**2**	13 ... 18 s
0	0	1	1	**3**	18 ... 25 s
0	1	0	0	**4**	25 ... 35 s
0	1	0	1	**5**	35 ... 48 s
0	1	1	0	**6**	48 ... 66 s
0	1	1	1	**7**	1.1 ... 1.6 min
1	0	0	0	**8**	1.6 ... 2.3 min
1	0	0	1	**9**	2.3 ... 3.2 min
1	0	1	0	**10**	3.2 ... 4.5 min
1	0	1	1	**11**	4.5 ... 6.3 min
1	1	0	0	**12**	6.3 ... 9 min
1	1	0	1	**13**	9 ... 11 min
1	1	1	0	**14**	Stop*
1	1	1	1	**15**	Stop

* Blank. Set to “Stop” for safety reasons

4.2.5 I/O compact modules

A compact module consists of a selection of individual modules accommodated together in a single housing. From the software viewpoint, a compact module is handled in the same way as the equivalent individual module structure, and is displayed in the same way in the SIMATIC Manager engineering tool.

A distinction is made between “real” module types (also available as single modules) and “virtual” module types (implemented only in the software).

The basic P-bus address is set on the compact module by means of an address coding plug. The address offsets for the individual modules are accounted for automatically (see the table below). The user simply has to ensure that the offset address range is not used by other modules. The address coding on the other modules must be lower than the basic address and higher than the basic address +5 (or +7).

Compact modules are mapped to the SIMATIC memory in the order of their individual modules.

The PTK1.23V02 compact module comprises the following individual modules:

PTK1.23V02		
Basic P-bus address + offset	**Individual module**	**Module type**
+ 1	PTM1.2R1K	Real module
+ 2	PTM1.2R1K	Real module
+ 3	PTM1.2R1K	Real module
+ 4	PTM1.2R1K	Real module
+ 5	PTM1.2U10	Real module
+ 6	PTM1.2U10	Real module
+ 7	PTK1.11Q250	Virtual module

The PTK1.30V01 compact module comprises the following individual modules:

PTK1.30V01		
Basic P-bus address + offset	**Individual module**	**Module type**
+ 0	PTM1.4Y10S	Real module
+ 1	PTM1.2R1K	Real module
+ 2	PTM1.2R1K	Real module
+ 3	PTM1.2U10	Real module
+ 4	PTK1.12D20	Virtual module
+ 5	PTK1.8Q250	Virtual module

Virtual modules:

Input word comparison:

Type	Input word															
PTK1.12D20	0	0	0	0	i12	i11	i10	i9	i8	i7	i6	i5	i4	i3	i2	i1
PTK1.8Q250	None								None							
PTK1.11Q250	None								None							

Output word comparison:

Type	Output word															
PTK1.12D20	None								None							
PTK1.8Q250	o8	o7	o6	o5	o4	o3	o2	o1								
PTK1.11Q250	x	x	x	x	x	o11	o10	o9	o8	o7	o6	o5	o4	o3	o2	o1

ox write: Bit information to be written

ix Input but information

4.2.6 Status display unit PHM1.36TL

Up to 24 LEDs and 12 buttons on thePHM1.36T can be made to respond via the P-bus. A single key press provides a process signal to the SIMATIC for approximately 4 seconds, after which the signal is reset (behaves like an “acknowledge” key).

Type PHM1.36TL

Input Word

0	0	0	0	i12	i11	i10	i9	i8	i7	i6	i5	i4	i3	i2	i1

Output Word 1

0	0	0	0	g12	g11	g10	g9	g8	g7	g6	g5	g4	g3	g2	g1

Output Word 2

0	0	0	0	r12	r11	r10	r9	r8	r7	r6	r5	r4	r3	r2	r1

ix	Input bit information for buttons,	where x = Button	No. 1…12
gx	Bit information to be written for green LEDs,	where x = LED	No. 1…12
rx	Bit information to be written for red LEDs,	where x = LED	No. 1…12

4.2.7 Interface modules WILO PTM50.16V01 / GRUNDFOS PTM52.16V01

As with the compact modules, these interface modules consist of a selection of individual modules accommodated together in a single housing. From the software viewpoint, a pump module is handled in the same way as the equivalent individual module structure, and is displayed in the same way in the SIMATIC Manager engineering tool.

The basic P-bus address is set on the interface module by means of an address coding plug. The address offsets for the individual modules are accounted for automatically (see the table below). The user simply has to ensure that the offset address range is not used by other modules. The address coding on the other modules must be lower than the basic address and higher than the basic address +13.

Compact modules are mapped to the SIMATIC memory in the order of their individual modules.

The WILO PTM50.16V01 and GRUNDFOS PTM52.16V01 interface modules comprise the following individual modules:

PTM50.16V01 and PTM52.16V01		
Basic P-bus address + offset	**Individual module**	**Remarks**
+ 0	PTM1.2Y10	Channel 1: Switching command P1 Channel 2: Switching command P2
+ 1	PTM1.2Y10	Pump head setpoint P1 Pump head setpoint P2
+ 4	PTM1.2R1K	Normal operation code P1 Normal operation code P2
+ 5	PTM1.2R1K	Fault status code P1 Fault status code P2
+ 8	PTM1.2R1K	Pump head P1 Pump head P2
+ 9	PTM1.2R1K	Pump volume P1 Pump volume P2
+ 12	PTM1.2R1K	Pump capacity P1 Pump capacity P2
+ 13	PTM1.2R1K	

For more details, please refer to the data sheets for the pump modules (8663 and 8665).

4.2.8 Counter modules

The PTM1.2C module has two independent counters each with a 7-bit value combined to a word. When using this module, note that the counter is a cyclical counter and that it cannot be reset.

Type	Input word															
PTM1.2C	0	1C6	1C5	1C4	1C3	1C2	1C1	1C0	0	2C6	2C5	2C4	2C3	2C2	2C1	2C0

1Cx Input bit information for Counter 1

2Cx Input bit information for Counter 2

5 Hardware

The DP/P-bus link consists of a housing base, a housing cover and the printed circuit board with connection terminals. The unit also has a service socket and service LEDs.

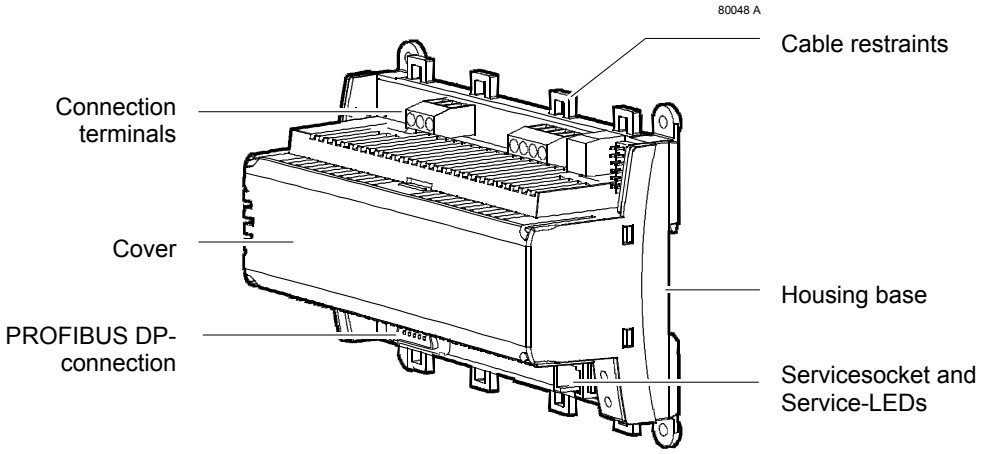


Fig. 5-1: Hardware design

5.1 Mounting instructions

- Cable restraints are essential for the wires to the AC 24 V terminals.
  The conductors must be secured with cable ties (see diagram) to the lugs provided for this purpose on the base unit.

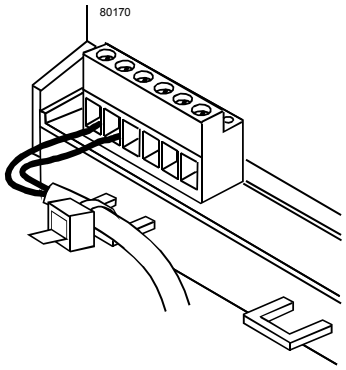


Fig. 5-2: Cable strain relief

- To ensure that heat is dissipated, the DP/P-bus link must be installed horizontally as shown in the diagrams below.

  There are two options for installing the link:

  Rail mounting

  The housing base is designed for snap-mounting on a DIN rail, type EN50022-35x7.5 (access with a screwdriver)

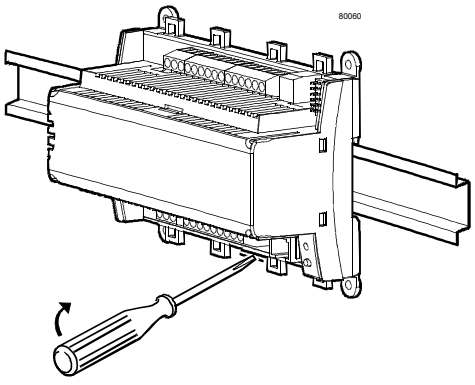


Fig. 5-3: Rail mounting

Surface mounting

There are four drill holes for screw mounting (see “Dimensions” for drilling diagram). The housing base is fitted with raised supports.

Screws: Max. diameter 3.5 mm

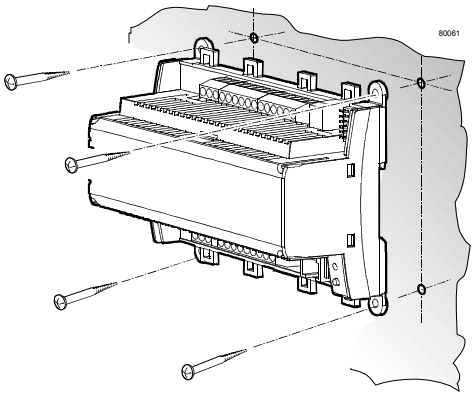


Fig. 5-4: Surface mounting

When mounting note the following:

- There must be a means of dissipating the heat generated during operation.
- Ensure easy access for service purposes.
- Local installation regulations must be observed.

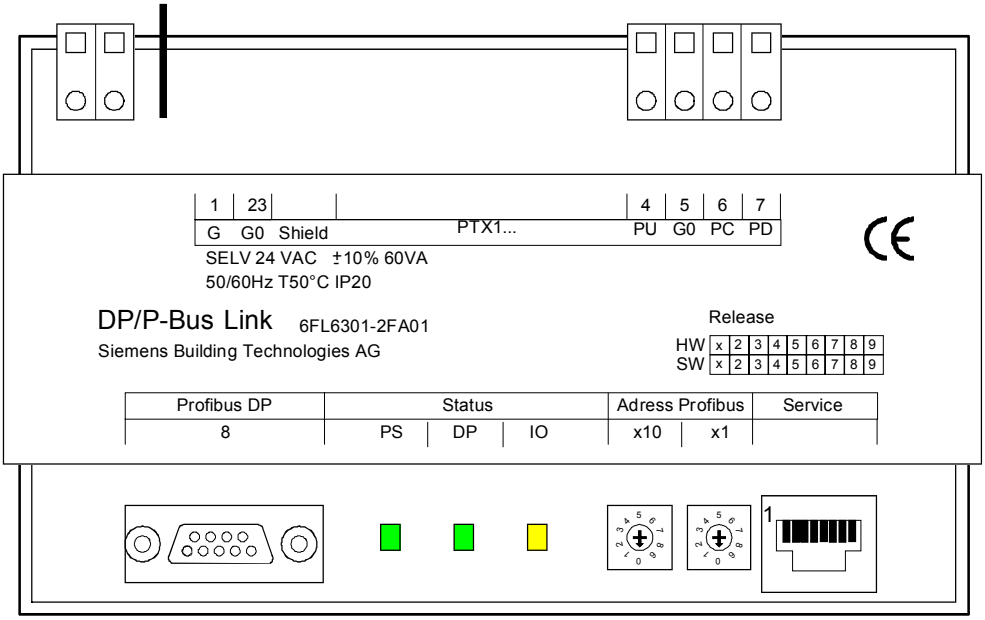
Note Mounting instructions are printed on the packaging.

5.2 Technical data

	Type	
Power supply	Operating voltage	AC 24 V ± 10%
	Frequency	50/60 Hz
	Power consumption of DP/P-bus link including DESIGO I/O modules (128 load units)	60 VA
	Internal fuse protection	None
Interfaces	Protection standard to EN 60529	IP20
P bus	See data sheets for the process bus (CM2N8022E) and the I/O modules and P-bus (CM2M8102D)	Max. 128 load units
	Permissible cable length subject to info in above data sheets	Local bus 50 m; Remote bus not yet released
PROFIBUS DP	9-pin female sub-D connector	RS 485
	Baud rate	2.4 kbps 12 Mbps
Service (Not used at present)	RJ45	RS 232 version
Accessories	Connector	For connection of supply voltage and P-bus
Ambient conditions	Operation: Temperature	0 ... 50 °C
	Operation: Humidity	< 85 % rh
	Transport: Temperature	-25 ... 65 °C
	Transport: Humidity	< 95 % rh
Standards and regulations	Automatic electronic controls for household and similar use	IEC / EN 60 730-1
	Electromagnetic compatibility	
	Interference immunity	IEC / EN 61 000-6-2
	Interference emission	IEC / EN 61 000-6-3

Product safety	CE conformity	As per EMC directive 89/336/EEC, and low-voltage directive 73/23/EEC
Dimensions	See dimension diagrams	
	Width in DIN modular spacing units	8.5
Weight	Including packaging	0.25 kg

5.3 Connections



Power supply

G	1	AC 24 V
G0	2	Ground
Shield	3	The earthing connection for the Profibus cable shield is not physically connected to ground (G0).

P bus connections

PU	4	P-bus signal PU
G0	5	P-bus ground in preparation for remote bus
PC	6	P-bus signal PC
PD	7	P-bus signal PD

Profibus DP connection

PROFIBUS DP	9	9-pin sub-D, RS485

Status LEDs

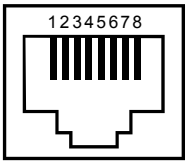
PS	Power supply status LED
DP	DP status LED
IO	I/O module status LED

Address settings

Address	x10	“Tens” position of the Profibus DP address
Address	x1	“Units” position of the Profibus DP address

Service interface

Service	RJ45 for firmware update if required



1	GND	**5**	VPP
2	RxD	**6**	CHM
3	Not used	**7**	BTL
4	TxD	**8**	GND

5.4 Interconnection

The P-bus connection of the link incorporates an internal DC power supply for 128 load units, to supply the power for the DESIGO I/O modules. The DESIGO I/O modules are connected via the P-bus connection using the P-bus coupling module (I/O bar type PTX 1.01). The main supply voltage is derived from a separate AC 24 V transformer.

As described in data sheets CM2M8102 and CM2N8022. a double-insulated safety transformer to EN 61 558, designed for continuous operation, must be used. At least conductor G must be fused. The transformer must be sized for the effective load of the equipment in the control panel including the connected field devices.

For separate control panel construction, please observe grounding precautions (as described in CM2M8102).

To avoid earth loops, only G0 must be earthed to a central point. The earthing precautions for the P-bus must be observed
(see data sheets CM2M8102 and CM2N8022).

For load distribution purposes, the G0 connection of the P-bus coupling module (I/O bar, type PTX1.01) **must** be connected to G0 of the transformer. The G0 connection (between PU and PC) of the DP/P-bus link is designed for connection of the P-bus/remote bus. The remote bus has not yet been released.

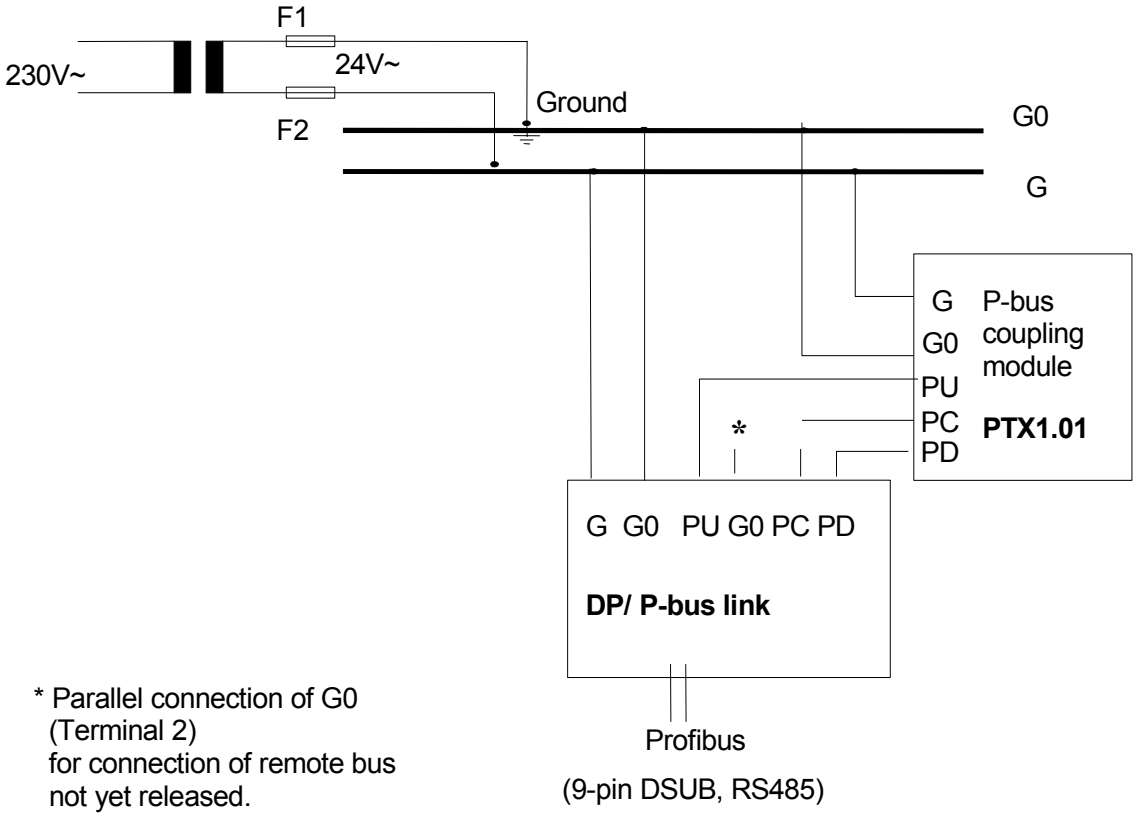


Fig. 5-5: Overview of connections

5.5 Dimension diagrams

(All dimensions in mm)

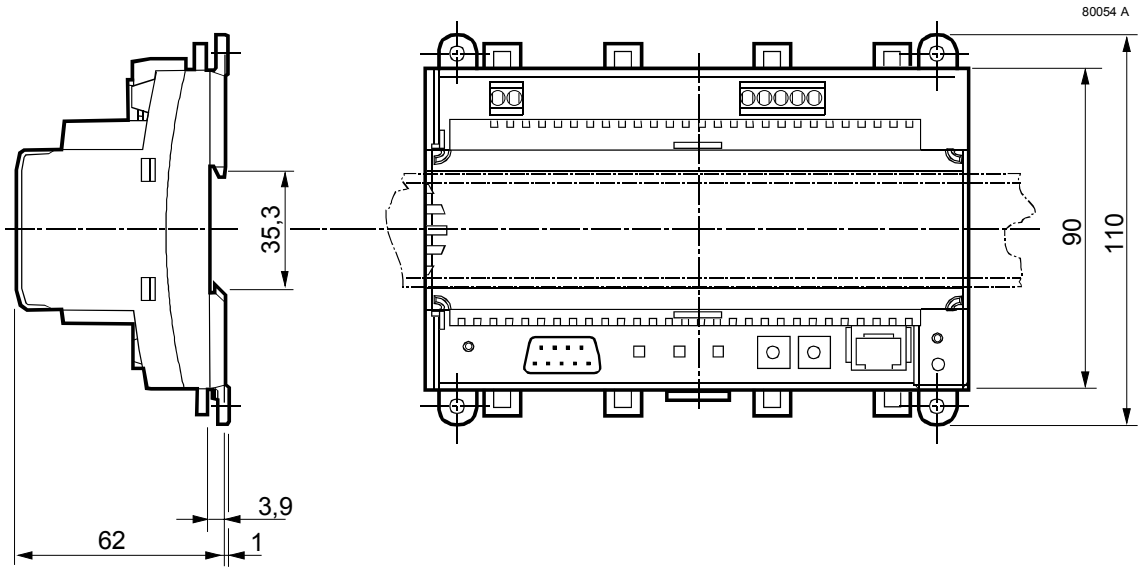


Fig. 5-6: Dimensions

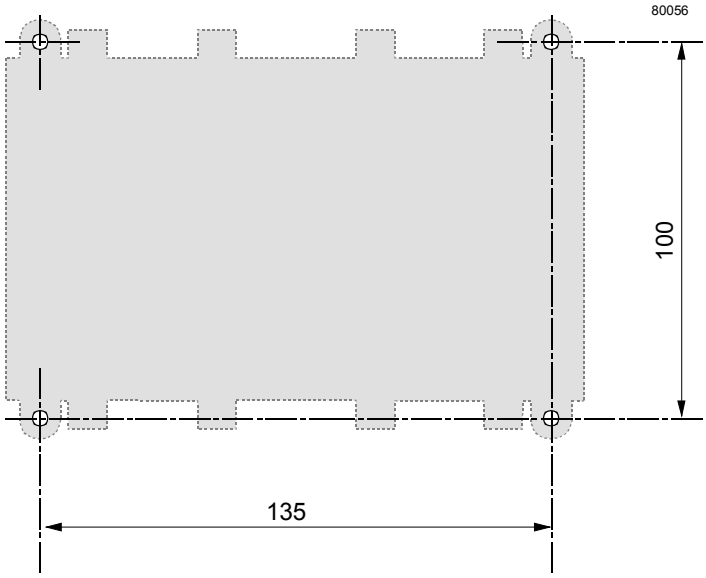


Fig. 5-7: Drilling diagram

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