PMA Prozeß- und Maschinen-Automation GmbH

Industrial Controller KS 90-1/DP, KS 92-1/DP KS 90-1programmer/DP, KS 92-1programmer/DP

KS 90-1
KS 92-1
PROFIBUS-DP

PROFI PROCESS FIELD BUS BUS

Interface Description PROFIBUS - DP Process Data

9499 040 66611

valid from: 8422

Explanation of symbols


General information
General warning
Attention: ESD sensitive devices

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Contents

1 General

Thank you very much for deciding for the industrial controller KS 90-1/DP / KS 92-1/DP respectivley for the programmer KS 90-1*programmer*/DP / KS 92-1*programmer*/DP. The KS 90-1 format is 48x96 mm, the KS 92-1 format is 96x96 mm. The products are signified as "device"or "instrument" in the following text.

The devices are equipped with a PROFIBUS-DP interface for transmission of process, parameter and configuration data. Connection is on the controller rear. The serial communication interface permits connection to supervisory systems, PC's, visualization tools, etc.

Engineering via Bus

Instruments from DP software version 2.0 are equipped with DPV1 functions which permit direct transmission of an instrument engineering from/to the BlueControl® engineering tool via the bus (→p. 26).

Another interface always provided as standard is the BluePort® -interface on the front panel. It can be used for connecting a BlueControl® tool which runs on a PC.

Communication is according to the master/slave principle. The instrument is always slave.

KS 90-1 / KS 92-1 with PROFIBUS-DP interface offers many advantages referred to handling and integration into a PROFIBUS network.

Advantages

- Configurable process data modules with predefined data contents or free adjustable parameters
- Direct reading and writing of inputs and outputs
- Input forcing
- Back-up controller function
- acyclic services for parameter transmission
- Simple connection even to small PLCs
- Diagnosis and monitoring
- Fast transmission of process values
- Display of bus errors
  - error messages
  - LED
- Bus error signalling via e.g. relay

Interface

Lead and physical and electrical properties of the interface are as follows:
RS485 ; on-site mounting

Network topology

Linear bus with active bus terminating resistor at both ends. Stub lines should be omitted for transmissions rates ≥ 1,5 Mbit/s.

Transmission media

screened, twisted 2-wire cable
The characteristics of the bus wiring are specified in the IEC 61158. With the line type A all data transmission rates to 12 Mbits/s can be used. Beside the standard line also cable for underground, garland cable and trailing cable are available.
The line parameters are as follows:

	Line type A
characteristic impedance in Ω	135 ... 165 at 3 ... 20 MHz
work capacity (pF/m)	<30
loop resistance (Ω/km)	< 110
core diameters (mm)	> 0.64
core cross-sectional area (mm^2)	> 0.34

Cable lengths

The maximum cable length is dependent of the baudrate.
The baudrate is determined by the master configuration and is recognized automatically by the instrument. The cable length can be extended by usage of repeaters.

Baudrates

Automatic baudrate detection

Baudrate		Maximum cable length
9,6 / 19,2 / 45,45 / 93,75	kbit/s	1200 m
187,5	kbit/s	1000 m
500	kbit/s	400 m
1,5	Mbit/s	200 m
3 / 6 / 12	Mbit/s	100m

Number of units

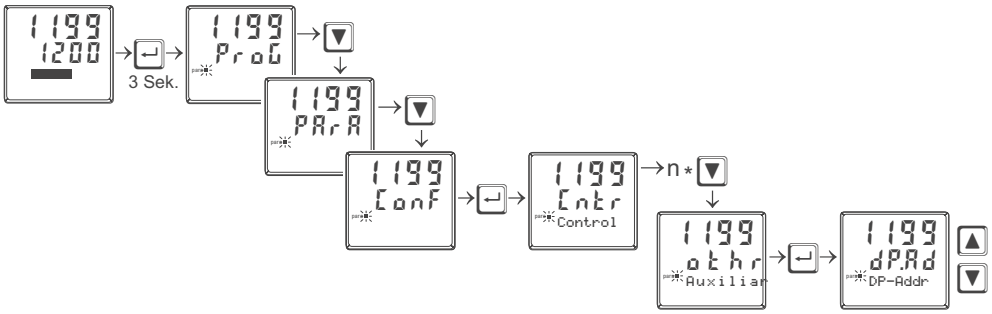
32 units in a segment. Can be extended up to 126 by means of repeater.

Addressing

0 ... 126 and OFF (factory setting: 126)
With setting OFF, the bus function is switched off (operation as if no interface would be provided, incl. bus error message switch-off). When changing from OFF to a valid address, the DP system is reset (DP processor system reset).

- Address setting via front-panel operation:

Fig 1: Address setting (e.g. KS 90-1)



1.1 GSD - File

The actual version of the GSD-file you can find on the homepage www.pma-online.de keyword software.. The GSD-file is valid for both KS 90-1 and KS 92-1 as well as the programmer version of both.

The GSD file is available as a standard file with English texts (PMA29402.gsd) and with German texts (PMA29402.gsg). For working with German texts with your PROFIBUS master configuration, please, install file PMA29402.gsg.

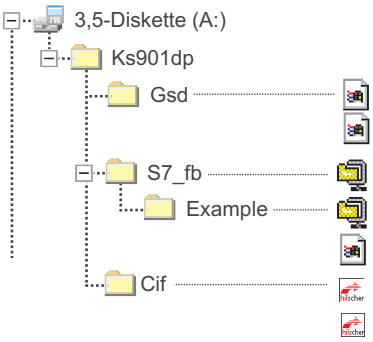
Instruments from series date 8406 require GSD file PMA29402.gs* for using the DPV1 functionality.

1.2 Engineering Set

For easy comissioning there is an engineering set KS 90-1/DP (order-no.. 9407-999-10501). It can be used with KS 90-1 as well as with KS 92-1.

The Engineering set comprises:

- Interface description for PROFIBUS-DP – Process Data
  Document "Interface description PROFIBUS-DP Process Data" (9499-040-66611) provides basic explanations for connection of KS 90-1/DP to PROFIBUS-DP networks. It contains hints for cyclical process data exchange.
- Interface description for PROFIBUS-DP Parameter Data
  Document "Interface description PROFIBUS-DP Parameter Data" (9499-040-65311) describes additional functions for transfer of process values, parameters and configuration data via the parameter channel.
- Floppy
  consisting of GSD file, example projects for SIEMENS STEP7 environments and HILSCHER CIF/SYCON applications, function blocks for parameter transmission with S7.



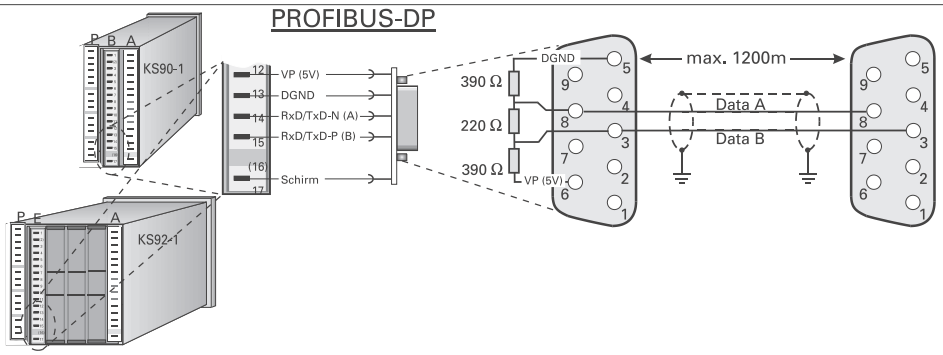
Pma29402.gsd	GSD-file (English texts)
Pma29402.gsg	GSD-file (German texts)
Pma_sup.arj	Function module for STEP® 7 as library
KS90demo.zip	Project example in STEP® 7 for S7-300
DevKS901.bct	Configuration example for BlueControl®
KS90cifV0.pb	Configuration example for CIF®-interface
KS90cifV0.pb	Configuration example for CIF®-interface

2 Hints for operation

2.1 Connecting the interface

The PROFIBUS for KS 90-1 is connected to terminal connector B on the backside of the device, for KS 92-1 to terminal connector E.
The physical signals of the serial interface according to RS485 specification.

Fig.:2 PROFIBUS-DP connection



Cable construction must be done by the user. Thereby, the general cable specifications to IEC 61158 must be followed.

Sub-D bus adaptor

It is recommended to use a standard PROFIBUS connectors (9-pole Sub-D) for an installation. For this purpose, connection to KS 90-1/DP is via a Sub-D bus adaptor which must be fitted. Order no.:

- 9407 998 07001 for flat pin connecting terminals
- 9407 998 07011 for screw terminals.

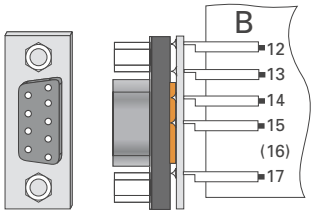
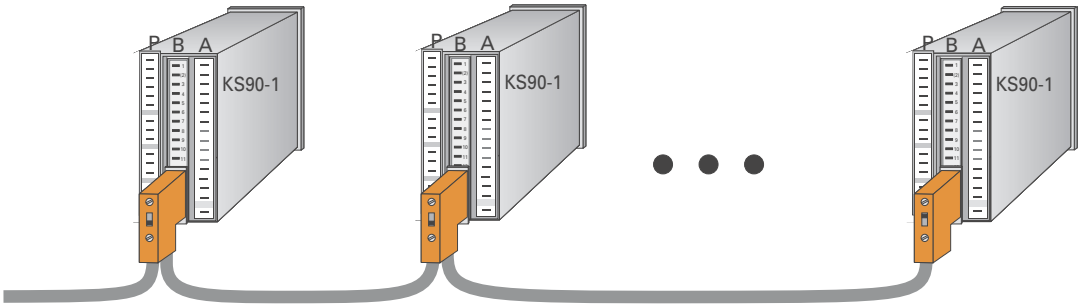


Fig.: 3 Wiring example with sub-D bus adaptor and bus connector



Laying cables

During cable laying, the general hints for cable laying made by the supplier of the master module must be followed:

- Cable run within buildings (inside and outside cabinets)
- Cable run outside buildings
- Potential equalization
- Cable screening
- Measures against interference voltages
- Length of stub line

For special hints for installation of PROFIBUS cables, see PNO Technical guideline "*Installation guidelines for PROFIBUS-DP/FMS*" (Order no. 2.111 [german]; 2.112 [engl.]).

2.2 Hints for installation

- Measurement and data lines should be kept separate from control and power supply cables.
- Sensor measuring cables should be twisted and screened, with the screening connected to earth.
- External contactors, relays, motors, etc. must be fitted with RC snubber circuits to manufacturer specifications.
- The unit must not be installed near strong electric and magnetic fields.

The temperature resistance of connecting cables should be selected appropriately for the local conditions.

The unit is not suitable for installation in explosion-hazarded areas.

Faulty connection can lead to the destruction of the instrument.

The device must be used only in environment with approved protection.

The louvers of the device must not be covered.

In plants where transient voltage peaks are susceptible to occur, the instruments must be equipped with additional protective filters or voltage limiters!

Caution! The instrument contains electrostatically sensitive components.

Please, follow the instructions given in the safety hints.

2.3 Remote/Local

Remote

In status 'REMOTE' , all operations via the serial interface are possible (write and read). The following operations are still possible via the keys of the local operator interface:
Display switch-over (extended operating level, error list), but no value changing.

- Parameter viewing/reading, but no changing.
- Configuration data viewing/reading, but no changing.
- Switch-over via automatic/manual key

Local

In the 'LOCAL' status, complete operation of the instrument via the keyboard is possible.

Switch-over

Remote / local switch-over is possible via digital inputs, function key or all interfaces (BluePort®; PROFIBUS-DP). This switch-over is without effect on the interfaces.
Write / read accesses via the interface (BluePort® or PROFIBUS) are always permitted.

Bus failure

If the configuration data for front blocking is set to Lor = 0 (interface only) then in case of failure of the PROFIBUS, the switch-over from Remote to Local is automatic, i.e. local operation is possible.

2.4 PROFIBUS status display

For PROFIBUS status display, two possibilities are provided:

- Messages in the error list
- Display via LED;
  configuration: LEd = 14 (bus error)

Display signification

Error list	LED[1)]	LED= on / error message active	Cause	Remedial action
dP.1	1	No access by bus master	• Bus error • Connector problem • No bus connection	• Check the cable • Check the connector • Check the connections
dP.2	2	Faulty configuration	• Faulty DP configuration telegram	• Check DP-configuration telegram in the master
dP.3	3	Inadmissible parameter setting telegram was sent	• Faulty DP-parameter setting telegram	• Check DP- parameter setting telegram in the master
dP.4	4	No data communication	• Bus error • Address error • Master in stop	• Check cable connection • Check address • Check master setting
	1...4	Internal error in DP-module (E.5)	• Error during self-test • Internal communication interrupted	• Switch on instrument again • Contact PMA service

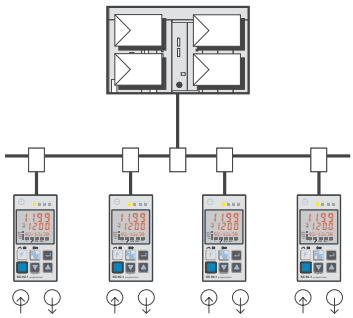
1) If configuration LED is configured to bus error.

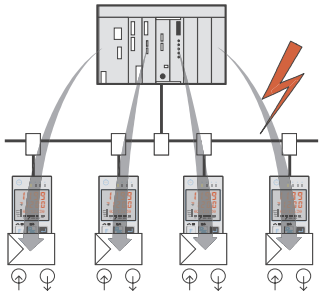
3 Special functions

3.1 *'Back-up'* controller operation

Normal operation

Normally, calculation of the controller outputs is in the PLC. The controllers are used for measuring the





process values and output of the correcting values (incl. duty cycle conversion and display).

Faulty case

In case of trouble, i.e. with failure of PLC or bus communication, control is taken over by the KS 90-1 controllers independently and bumplessly.
By configuration it is determined that the controller switches to automatic mode automatically when recognizing a bus failure . Selection 'back-up operation' is set in configuration `otHr` (`bcuP` = 1).
If the application requires that the controller goes to automatic operation, i.e. that control is taken over by the controller in automatic mode, the following arrangements must be made:

- set 'Back-Up operation' in configuration
- The bus master switches the controller to manual mode using control word 1 (module A.3).
- normal, undisturbed operation: transmission of output value (Yman) and set-point (SP) to controller

Using the back-up operation it is necessary to set the user parametrization value Fail-safe to 'last-value'(→ page - chapter 19 - 4.3).

3.2 Forcing

Via the BlueControl® engineering tool, the physical inputs and outputs can be configured for value input via PROFIBUS-DP (=forcing). In this case, the forced values provided by the bus instead of the physically applied values with the inputs and the data generated by the controller with the outputs are effective. Digital value forcing is possible via module A.3, analog value forcing is possible via freely selectable objects B.6 … B.10 (fixed point) or C.4 … C6 (floating point) and by defining the values accordingly in BlueControl® window "Bus data (write)" (see also page/chapter 18 - 4.2.2.)

Inputs

All physical inputs can be overwritten via the PROFIBUS-DP (configurable). Thus e.g. process value measurement via remote I/O (e.g. RM 200) and forcing via the bus are possible.

Forced analog input values are not changed by any measurement value processing function (linearization, scaling, etc.) which may be adjusted. For compatibility reasons please set the parameter `Corr` to "0: no correction".

The range of forced analog input values for fixpoint format is limited to -3000.0 up to 3200.0

Outputs

With output forcing, note the setting of the fail-safe function. With "zero" fail-safe behaviour adjusted, all outputs are set to zero in case of bus error or master stop, otherwise, the old value remains unchanged. For a detailed description of the behaviour, see the following section 3.3.

The range of forced output value is limited to 0 up 100, this means for Fixpoint format 0 … 1000; for floating point 0.0 … 100.0. The output parameters `Out.0` and `Out.1` do not have influence.

General

The user must ensure that no out-of-range forced measurement values which do not make sense are transmitted to the controller. Where appropriate, monitoring e.g. analog input values using limit values, or providing switch-off and safety functions may be purposeful.

3.3 Fail-safe

User parameter setting 'Fail-safe' (→19) determines the instrument behaviour in case of master bus failure or 'bus stop'.

Bus failure

In case of bus failure, the instrument works acccording to the following rules.

Fail-safe	Reaction in case of bus failure or master stop
last value	Continue working with the values sent last
	Forced analog inputs are set to FAIL [1]
zero	Forced analog inputs are set to FAIL [1]
	Forced digital inputs are set to zero [2]
	Forced outputs are set to zero
	The controller is switched off, when process data module A.3 is used
	The other forced values remain unchanged

A fail-safe condition is also recognized when an incorrect PROFIBUS configuration telegram or a faulty user parameter byte no. 4 was sent.

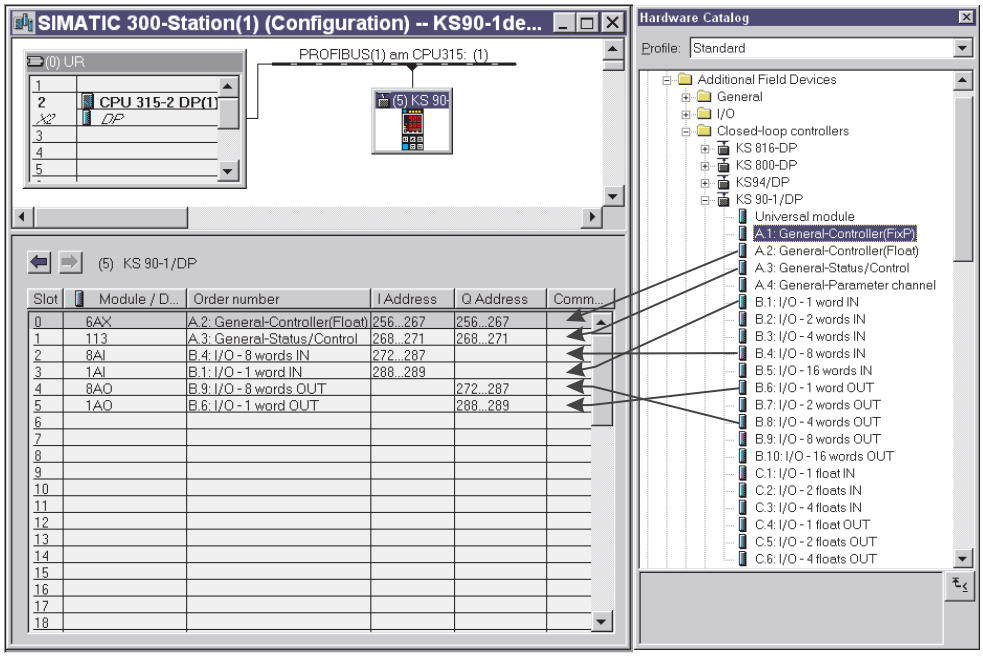
1) In case of a FAIL signal the inputs react as defined in the configuration.
INP1 → (Cntr; FAIL), INP2 → (Inp.2; In.F), INP3 → (Inp.3; In.F)
2) Only with configuration LoG.; d.Fn = 0 or 1

4 Process data

4.1 Introduction

For flexible realization of his requirements on transmitted values, memory space and transmission times, the user can compose the process data to be transmitted from a defined number of modules. The configuration is effected by the particular bus master configuration tool.

Fig.: 4 Example of hardware configuration for SIMATIC® S7



Process data and selected parameter data are written and read cyclically.

Forced values are taken over by the instrument only in case of value change.

Data format

Values as e.g. process values and set-points can be transmitted in floating point format or as 16-bit FixPoint format with one digit behind the decimal point (selectable).

During the FixPoint transmission the following limitations are to be considered:
To data, which are defined as floating-point number in the equipment, applies:

- Values are multiplied by the factor 10.
  Example: 30.0 °C becomes 300.
- The transferable range of values is -3000.0 to 3200.0. Pre-set values outside of the range are not accepted.
- If a range overflow occurs with a read value, then the value -3276.8 (as integer -32768) is transferred.
- As switching off value the value -32000 has to be transferred in the FixPoint - format; during floating decimal point transmission this is the value -32000.0.

For data, which are defined as integer value in the equipment, no transformation takes place.

Parameter channel

Access to all process, parameter and configuration data is possible additionally via the parameter channel. These data are transmitted on request over several cycles. These accesses are described in documentation 9499 040 65311.

The "universal module" offered by Siemens STEP7 in the hardware catalog is program determined and cannot be used.

4.2 Selectable process data modules

The process data that are to be transmitted cyclically are defined by the user during bus configuration. The following options are available:

- pre-defined modules with fixed contents / data signification (module A) and
- freely definable modules as spacekeepers, contents are determined via the instrument engineering.

4.2.1 Objects with pre-defined contents (modules A)

Plug&GO

The modules A "General-Controller", "Status/Control" and "parameter channel" are pre-defined objects and may only be used once respectively. The modules A1 and A2 exclude each other.

Module A.1:

General-Controller: FixPoint data format (FixPoint):

Transfer of typical (predefined) controller data in FixPoint format

Process data	module id: 72_{hex} / 114_{dez}		
Reading	Bytes	Writing	Bytes
Process value (C.Inp); Output value (Ypid); Set-point (SP.ef)	6	Set-point (SP); Output value (Yman)	6

Module A.2:

General-Controller: floating point data format (Float): 1)

Transfer of typical (predefined) controller data in floating point format

Process data	module id: $F5_{hex}$/ 245_{dez}		
Reading	Bytes	Writing	Bytes
Process value (C.Inp); Output value (Ypid); Set-point (SP.ef)	12	Set-point (SP); Output value (Yman)	12

Module A.3:

General- Status / Control:

Transfer of important (predefined) status and control information

Process data	module id: 71_{hex}/ 113_{dez}		
Reading	Bytes	Writing	Bytes
Status word 1 Status word 2	4	Control word 1 Control word 2	4

1) Please note the necessary consistency data transmission!

Status word 1

Data contents of status word 1:

MSB															LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Bit no	Name	Allocation	Status '0'	Status '1'
D0	Auto/Man	control signal manual/automatic	Automatic	Manual[1)]
D1	Coff	control signal Coff	not switched off	Controller switched off
D2	y1	switching signal heating	Off	On
D3	y2	switching signal cooling	Off	On
D4	Lim1	limit 1	Off	On
D5	Lim2	limit 2	Off	On
D6	Lim3	limit 3	Off	On
D7	L_r	local /remote	Local	Remote
D8	di1	digital input 1	Off	On
D9	di2	digital input 2	Off	On
D10	di3	digital input 3	Off	On
D11	SP/SP2	control signal SP.2	SP.2 not active	SP.2 active
D12	SP/SP.E	set-point internal / external	internal	external
D13	Y /Y2	switch-over to second output value	Y	Y2
D14	Y / Y.E	switch-over to external output value	Y	Y.E
D15	Ada	self tuning executed	no	yes

Status word 2

Data contents of status word 2:

MSB															LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Bit no.	Name	Allocation	Status '0'	Status '1'
D0	Fail	sensor error of process value	no	yes
D1	HCA	heating current alarm	no	yes
D2	SSR	SSR alarm	no	yes
D3	Loop	loop alarm	no	yes
D4	Fail 1	sensor error Inp.1	no	yes
D5	Fail 2	sensor error Inp.2	no	yes
D6	Fail 3	sensor error Inp.3	no	yes
D7	Error	device fault	no	yes
D8	NAK	NAK (Error writing process data modules)	no	yes
D9	Conf	configuration mode	no	yes
D10	Para2	parameter set 1 / 2	Set 1	Set 2
D11	Run	programmer run	Stop	Run
D12	Reset	programmer reset	----	Reset
D13	End	program end	----	End
D14	UPD	UPD (changed parameter/configuration data)	no	yes
D15	DEX	DEX (changed bus data assignment)	no	yes

1) If the modules A1/A2 are used, the transferred output value Yman becomes effective with the change-over on hand.

Control word 1

Data contents of control word 1:

MSB															LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Bit no.	Name	Allocation	Status '0'	Status '1'
D0	Auto/Man	automatic/manual	Automatic	Manual[1)]
D1	Coff	controller on / off	on	off
D2 - D6		always '0'		
D7	L_r	local / remote	Local	Remote
D8	di1	forcing di1	0	1
D9	di2	forcing di2	0	1
D10	di3	forcing di3	0	1
D11	SP/SP2	switch-over set-point SP/SP2	SP	SP2
D12	SP/SP.E	switch-over set-point SP/SP.E	SP	SP.E
D13	Y /Y2	switch-over output value Y/Y2	Y	Y2
D14	Y / Y.E	switch-over output value Y/Y.E	Y	Y.E
D15	Ada	start self-tuning	Stop	Start

Control word 2

Data contents of control word 2:

MSB															LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Bit no.	Name	Allocation	Status '0'	Status '1'
D0		forcing Out.1	0	1
D1		forcing Out.2	0	1
D2		forcing Out.3	0	1
D3		forcing Out.4	0	1
D4		forcing Out.5	0	1
D5		forcing Out.6	0	1
D6 - 9		always '0'		
D10		parameter set 1 /2	Set 1	Set 2
D11		programmer run[2)]	Stop	Run
D12		programmer reset	----	Reset
D13		always '0'		
D14		clear UPD	----	Clear
D15		clear DEX	----	Clear

UPD

Parameter or configuration changing via the front panel during operation is signalled by the UPD bit in status word 2.

DEX

Changing the reference to a datum to be transmitted during operation via the engineering interface implies a risk of value misinterpreting both by the bus master and KS90-1/DP. Such a change is signalled via the DEX bit in status word 2. The master can evaluate the DEX bit and react accordingly.

Resetting UPD and DEX is possible via control word 2 or by switching the instrument off and on again.

1) When using the module A.1 ord A.2 the output value set via bus will be effective immediately after a switch-over to manual mode.
2) The programmer state Reset becomes only valid in stop mode. To start the programmer the signal run must changed from 0 to 1.

Module A.4:

General- Parameter channel:[1)]

Acyclical transfer possibilities for the complete device data

Parameter channel		module id: $F3_{hex}$/ 243_{dez}	
Reading	Bytes	Writing	Bytes
Reply data	8	Requested data	8

Detailed description see interface manual 9499 040 65311.

Module A.5:

General- Activate write data:

With this module the validity of write data can be controlled via the bus.

Release of write data in the cyclical process-data transfer

- 0 : Values are not accepted (Default)
- 1 : Changed values are taken over from the bus
- 0→1 : Change from 0 to 1: all write data are taken over from the bus

Process data		module id: 20_{hex} / 32_{dez}	
Reading	Bytes	Writing	Byte
	0	Release	1

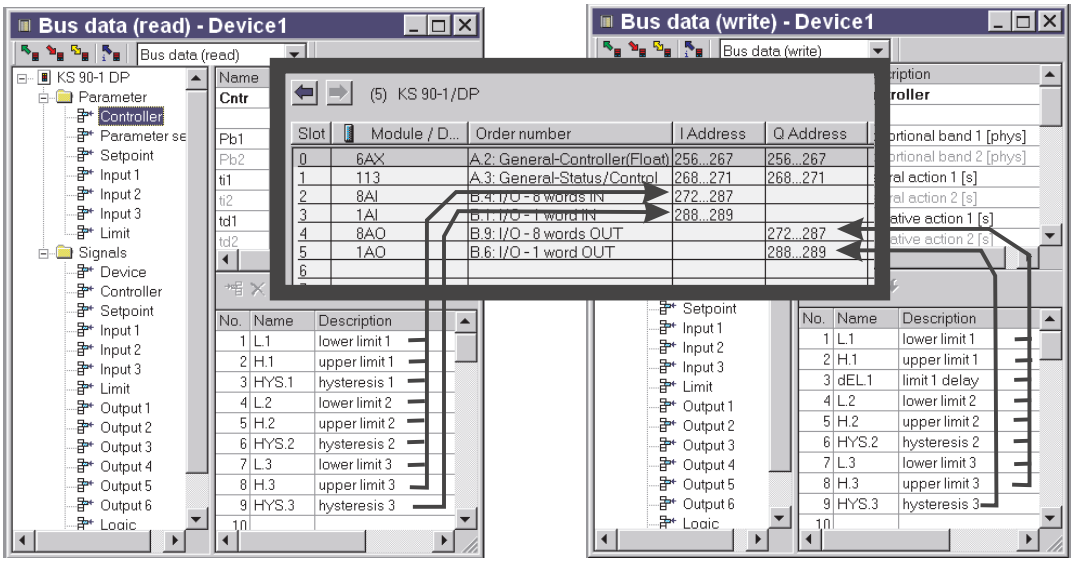
If the module is not configured, all write data are accepted from the bus.

1) Please note the necessary consistency data transmission!

4.2.2 Freely selectable transmission objects (modules B, C)

For modules B and C, the parameters to be transmitted and signals for reading and writing must be selected by means of the 'BlueControl®' engineering tool. The positioning determines the order of transmission (→ Fig.: 5).

Fig.: 5 Assignment of controller data for the fieldbus with 'BlueControl®'



Modules B and C can be selected up to the limit of memory capacity or number of permitted modules.

- max. input length of process data: 115 bytes
- max. output length of process data: 115 bytes
- max. number of modules: 57

Modules B:

Variable input/output data: fixpoint format (FixP):

module	words	variable	type	module id
B.1	1	IN1	FixP	50_{hex} / 80_{dez}
B.2	2	IN1 … IN2	FixP	51_{hex} / 81_{dez}
B.3	4	IN1 … IN4	FixP	53_{hex} / 83_{dez}
B.4	8	IN1 … IN8	FixP	57_{hex} / 87_{dez}
B.5	16	IN1 … IN16	FixP	$5F_{hex}$ / 95_{dez}
B.6	1	OUT1	FixP	60_{hex} / 96_{dez}
B.7	2	OUT1 … OUT2	FixP	61_{hex} / 97_{dez}
B.8	4	OUT1 … OUT4	FixP	63_{hex} / 99_{dez}
B.9	8	OUT1 … OUT8	FixP	67_{hex} / 103_{dez}
B.10	16	OUT1 … OUT16	FixP	$6F_{hex}$ / 111_{dez}

Modules C:

Variable input/output data: floating point format (Float):[1)]

module	words	variable	type	module id
C.1	2	IN1	float	$D1_{hex}$ / 209_{dez}
C.2	4	IN1 … IN2	float	$D3_{hex}$ / 211_{dez}
C.3	8	IN1 … IN4	float	$D7_{hex}$ / 215_{dez}
C.4	2	OUT1	float	$E1_{hex}$ / 225_{dez}
C.5	4	OUT1 … OUT2	float	$E3_{hex}$ / 227_{dez}
C.6	8	OUT1 … OUT4	float	$E7_{hex}$ / 231_{dez}

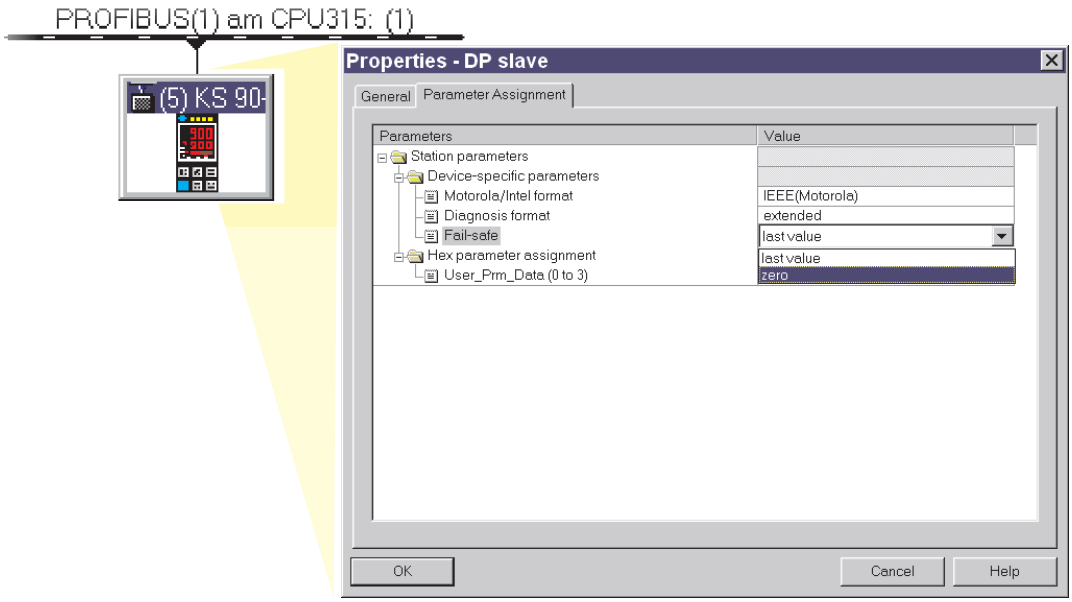
1) Please note the necessary consistency data transmission!

4.3 User parameter setting

4.3.1 *Parameter setting for DPV0 - master*

In addition to the standard parameter data, KS 90-1/DP has also user-specific parameter data. Adjustment is via the relevant bus master bus configuration tool.

Fig.: 6 User parameter setting as example of Step 7®



User parameter setting is valid for the overall instrument. The signification of (4-byte) user parameter data is shown in the following tables. These settings are not stored in the device; after power on the default settings are reactivated.

	Bit	Description.	Signification
1st..3rd byte			Reserved for DP-V1 These bytes are set to zero for DP-V0 operation.

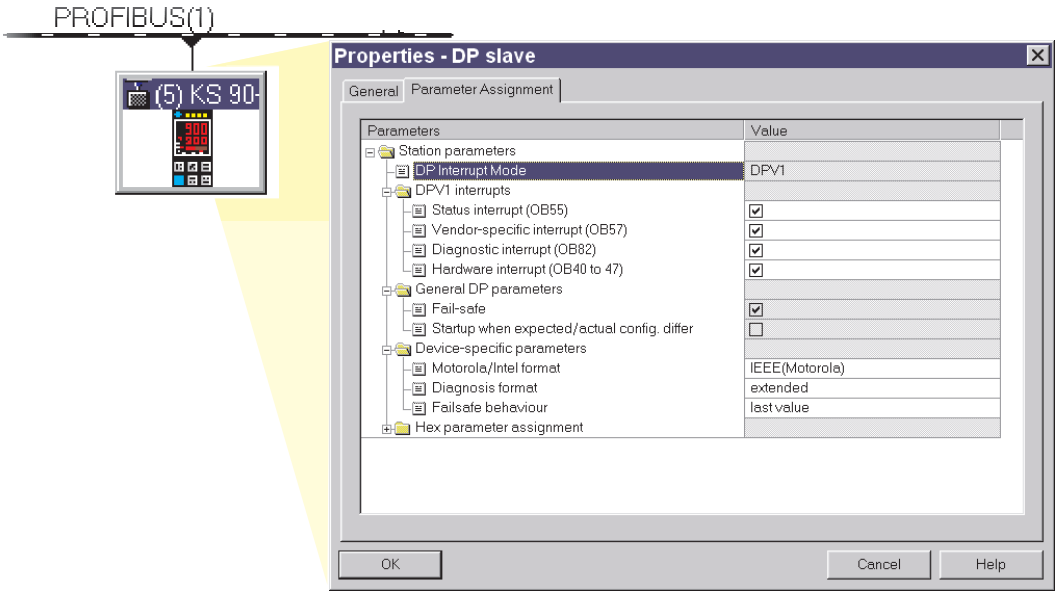
	Bit	Description.	Signification	Default
4th byte	0	Motorola / Intel format	Format for floating point values: Motorola (IEEE 754) / Intel (0 /1) For connection also to non-conforming PLCs or PC cards example: value 123.4 is in Motorola format : 42 F6 CC CD Intel format : CD CC F6 42	0 (Motorola)
	1	Diagnosis format (→pg. 22)	Diagnosis extended / standard (0 / 1) Extended diagnosis: standard diagnosis plus instrument-specific diagnosis. Standard diagnosis: (6 bytes) without instrument-specific infomation	0 (extended)
	2	Fail-safe (→pg. 19)	Last value / zero (0 / 1) Behaviour with bus errors: holding existing values or zero setting, dependent of system concept .	0 (last value)
	3..7	reserved		0

4.3.2 Parameter setting for DPV1 master

In addition to the instrument-specific DPV0 parameter setting data, further settings for DPV1 functions are possible. These adjustments are also made via the relevant bus master bus configuration tool.
With the instrumuent, the following functions can be selected and enabled:

- Operating mode according to DPV0 or DPV1
- Reception of status alarms
- Reception of manufacturer-specific alarms
- Reception of diagnosis alarms
- Reception of process alarms
- Number of simultaneously active alarms (the instrument supports max. 32)

Fig.: 7 User parameter setting at the example of Step® 7



The user parameter setting is applicable throughout the instrument. The following tables explain the signification of DPV1 specific settings (bytes 1 to 3). The instrument-specific parameters (byte 4) are described in chapter 4.3.1, p. 19 . These settings are not stored in the device; after power on the default settings are reactivated.

DPV1 status 1

	Bit	Descr.	Signification	Default
1st byte	0..1	reserved		
	2	WD_Base_1ms	Instrument supports 1ms watchdog time base	1 (fixed)
	3..5	reserved		
	6	Fail safe	Instrument supports fail safe mode. During clear mode, the instrument accepts data telegrams without data.	1 (fixed)
	7	DPV1 enable	The class 1 master determines, if the instrument must work in DPV0 or DPV1 mode. The instrument supports the two versions.	defined by master

DPV1 status 2

	Bit	Descr.	Signification	Default
2nd byte	0	Check_Cfg_Mode	The instrument checks configuration data as defined in IEC 61158	0
	1	reserved		
	2	Enable_Update_Alarm	Not supported	0
	3	Enable_Status_Alarm	Transmission of status alarms is requested optionally	defined by master

	Bit	Descr.	Signification	Default
	4	Enable_Manufacture_Specific_Alarm	Transmission of manufacturer-specific alarms is requested optionally	defined by master
	5	Enable_Diagnostic_Alarm	Transmission of diagnosis alarms is requested optionally	defined by master
	6	Enable_Process_Alarm	Transmission of process alarms is requested optionally	defined by master
	7	Enable_Pull_Plug_Alarm	Not supported	0

DPV1 status 3

	Bit	Descr.	Signification	Default
3rd byte	0..2	Alarm_Mode	Max. number of active alarms on the master The instrument supports 32 alarms.	defined by master
	3..7	reserved		

4.4 PROFIBUS-DP diagnostic information

PROFIBUS-DP offers comfortable and versatile possibilities of processing diagnostic messages due to error states. The diagnostic information of the instrument consists of standard diagnostic information (6 bytes) and additional device specific diagnostic information. The latter can be switched off by user parametrization.

4.4.1 Standard - diagnostic message

A standard-diagnostic message consists of 6 bytes.

Standard diagnosis

	Bit	Name	Meaning
1st byte	0	Diag.station	Station does not exist (set by the master)
	1	Diag.station_not_ready	Slave is not ready for data exchange
	2	Diag.cfg_Fault	Configuration data are not consistent
	3	Diag.ext_diag	Slave has external diagnostic data[1)]
	4	Diag.not_supported	Requested service is not supported by the slave
	5	Diag.invalid_slave_response	Slave sets fixed to 0
	6	Diag.prm_fault	Incorrect parameter setting (ID number etc.)
	7	Diag.master_lock (set by master)	Slave is parameterized by another master

	Bit	Name	Meaning
2nd byte	0	Diag.Prm_req	Slave has to be parameterized again. The application has identified a status, which requires a restart with a new parameter setting and configuring. After the diagnosis the master executes a start-up with given parameter setting and configuring.
	1	Diag.Stat_diag	Static diagnosis The slave is not able to present valid data caused by a condition in the application. The master requires thereupon only diagnostic information, until the slave takes this bit back again. The PROFIBUS-DP status is however DATA Exchange, so that after canceling of the static diagnosis data exchange can be continued immediately again.
	2	fixed on 1	
	3	Diag.WD_on	Watchdog active
	4	Diag.freeze_mode	Freeze command received
	5	Sync_Mode	Sync command received
	6	reserved	
	7	Diag.deactivated	(set by the master)

	Bit	Name	Meaning
3rd byte	0..6	reserved	
	7	Diag.ext_overflow	This bit is set by the slave, if more diagnostic data are available, as fit into the diagnostic data area.

	Bit	Name	Meaning
4th byte	0..7	Diag.master_add	Master address after parameter setting (0xFF without parameter setting)

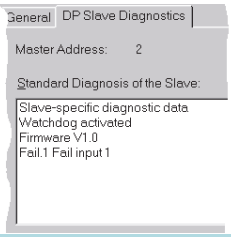
	Bit	Name	Meaning
5th byte	0..7		ID number (high byte); 0x94

	Bit	Name	Meaning
6th byte	0..7		ID number (low-byte); 0x02

1) When adjusting value “Diagnosis format” in user parameter setting byte 4 to “Standard diagnosis” this bit signals that there is instrument-specific diagnosis information.

4.4.2 Device-specific diagnosis

The following device-specific diagnosis (during DPV1 mode: status messages) can be switched off via user parameter setting (→pg.22). Thus switching over to standard diagnosis is possible, e.g. for older DP masters which do not support all functions, or when displayed diagnosis information is not of interest.



	Bit	Name	Meaning
7th byte	0..5	revision number	revision number, e.g. 2
	6, 7		always '1'

	Bit	Name	Meaning
8th byte	0..7	sign length	0x08: block length 8 bytes

	Bit	Name	Meaning
9th byte	0..7	status type	0x81: type Status Message

	Bit	Name	Meaning
10th byte	0..7	Slot number	0x00: slot: device

	Bit	Name	Meaning
11th byte	0..7	specifier	0x00: no status distinction

	Bit	Name	Meaning
12th byte	0..6	firmware version	version of PROFIBUS software

Instrument-specific diagnosis

	Bit	Name	Meaning	caused by
13th byte	0	E.1	Internal error, cannot be removed	e.g. defective EEPROM
	1	E.2	Internal error, can be reset	e.g. EMC problem
	2	E.3	Configuration error, can be reset	e.g. faulty or missing configuration
	3	E.4	Hardware error	Code number and hardware not identical
	4	E.5	Internal error in DP module	
	5	InF.1	Operating hour limit message	Preset number of operating hours reached
	6	InF.2	Switching cycle message (dig. outputs)	Preset number of switching cycles reached
	7		Reserved	

	Bit	Name	Meaning	caused by
14th byte	0	Lim.1	Limit value alarm 1 [1)]	Adjusted limit value 1 exceeded
	1	Lim.2	Limit value alarm 2 [1)]	Adjusted limit value 2 exceeded
	2	Lim.3	Limit value alarm 3 [1)]	Adjusted limit value 3 exceeded
	3	HCA	Heating current alarm	Heating circuit interruption, heater band destroyed
	4	SSR	Heating current short circuit	Current flow in heating circuit with controller off, SSR defective, clotted
	5	Loop	Control loop alarm	Control loop is interrupted (input or output)
	6 /7		Reserved	

	Bit	Name	Meaning	caused by
15th byte	0	Fail.1	Sensor failure INP 1	Sensor defective, wiring fault
	1	Fail.2	Sensor failure INP 2	Sensor defective, wiring fault
	2	Fail.3	Sensor failure INP 3	Sensor defective, wiring fault
	3..7		Reserved	Please, note that earlier Simatic® S7 master versions do not display the diagnosis values correctly.

Please, note that earlier Simatic® S7 master versions do not display the diagnosis values correctly.

1) Only latched alarms are transmitted.
The alarms can only be reset when acknowledging the alarm at the instrument.

4.4.3 Extended diagnosis for DPV1

In the DPV1 mode, the instrument supports an extended diagnosis function for alarm message signalling. The following marginal conditions are applicable:

- The instrument is busy with data exchange.
- The relevant alarm type was enabled in the user parameter setting.
- The instrument supports the following alarm types:
  - Diagnosis alarm
  - Process alarm
  - Status alarm (only for version *programmer*)
  - Manufacturer-specific alarm

	Bit	Descr.	Signification
16th byte	0..5	Header byte	Length always '5_{dec}'
	6, 7		always '0' '0'

	Bit	Descr.	Signification
17th byte	0..6	Alarm type	0x01: diagnosis alarm 0x02: process alarm 0x05: status alarm 0x20: (32_{dec}) manufacturer-specific alarm
	7	Alarm	always '0'

	Bit	Descr.	Signification
18th byte	0..7	Slot number	0x00: Slot: instrument

alternative

Diagnosis alarm

	Bit	Descr.	Signification
19th byte	0..1	Alarm specifier	01: coming error 10: going error, no error pending any more 11: going error, other errors pending
	2	Add Ack	0 : no further acknowledgement
	3..7	Seq no.	Sequence number 0 … 31

	Bit	Descr.	Signification	Cause
20th byte	0	Fail.1	INP1 sensor error	Sensor defective, wiring error
	1	Fail.2	INP2 sensor error	Sensor defective, wiring error
	2	Fail.3	INP3 sensor error	Sensor defective, wiring error
	3..7		Reserved	

alternative

Process alarm

	Bit	Descr.	Signification
19th byte	0..1	Alarm specifier	01: coming error 10: going error, no error pending any more 11: going error, other errors pending
	2	Add Ack	1 : further acknowledgement required
	3..7	Seq no.	Sequence number 0 … 31

	Bit	Descr.	Signification	Cause
20th byte	0	Lim.1	Limit alarm 1	Adjusted limit value 1 exceeded
	1	Lim.2	Limit alarm 2	Adjusted limit value 2 exceeded
	2	Lim.3	Limit alarm 3	Adjusted limit value 3 exceeded
	3	HCA	Heating current alarm	Heating circuit interruption, heater band destroyed
	4	SSR	Heating current short circuit	Current flow in heating circuit with controller off, SSR defective, conglutinated
	5	Loop	Control loop alarm	Control loop is interrupted (input or output)
	6 /7		Reserved	

alternative

Status alarm

(only for KS 90-1programmer)

	Bit	Descr.	Signification
19th byte	0..1	Alarm specifier	01: coming error 10: going error, no error pending any more 11: going error, further errors pending
	2	Add Ack	0 : mo further acknowledgement
	3..7	Seq no.	Sequence number 0 … 31

	Bit	Descr.	Signification
20th byte	0	P.Run	Programmer started
	1	P.Res	Programmer reset
	2	P.End	Program end
	3..7		Reserved

alternative

Manufact.-spec. alarm

	Bit	Descr.	Signification
19th byte	0..1	Alarm specifier	01: coming error 10: going error, no error pending any more 11: error going, further errors pending
	2	Add Ack	0 : no further acknowledgement
	3..7	Seq no.	Sequence number 0 … 31

	Bit	Descr.	Signification	Cause
20th byte	0	E.1	Internal error, cannot be corrected	e.g. EEPROM defective
	1	E.2	Internal error, can be reset	e.g. EMC trouble
	2	E.3	Configuration error, can be reset	e.g. faulty or missing configuration
	3	E.4	Hardware error	Code number and hardware not identical
	4	E.5	Internal error in DP module	
	5	InF.1	Time limit value message	Adjusted number of operating hours reached
	6	InF.2	Switching cycle message (dig. outputs)	Adjusted number of switching cycles reached
	7		Reserved	

4.4.4 Acknowledgement of process alarms

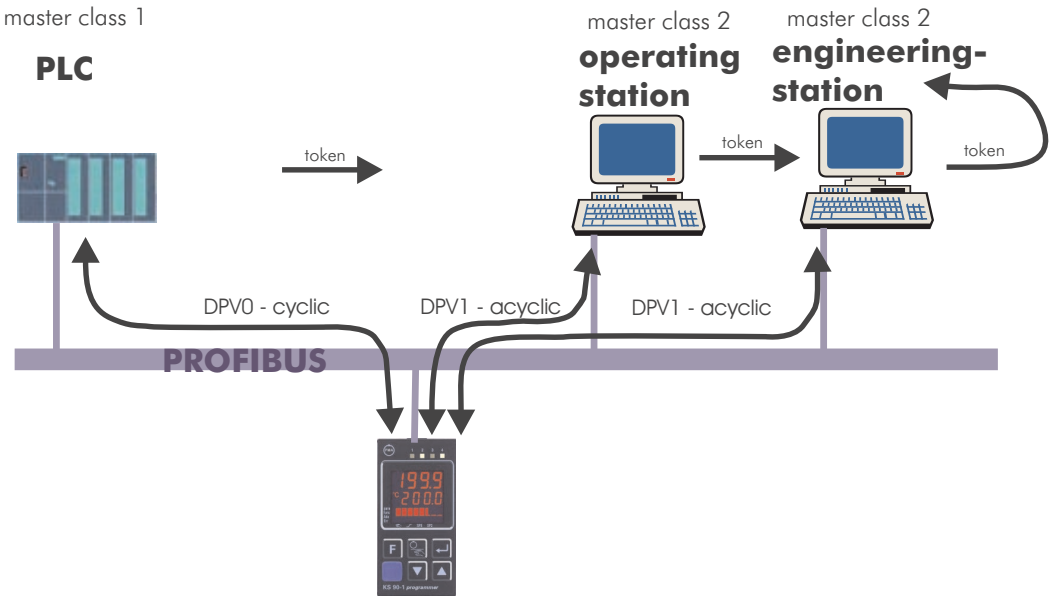
Process alarms which are defined as stored alarms in the instrument must be acknowledged. If an alarm remains pending, because the error cause was not corrected so far (Err LED on the instrument blinks), stored alarms cannot be acknowledged, i.e. reset.
The acknowledgement methods are:

- ❑ Reset via digital inputs
  - Selection of available inputs di1 … di3 via configuration datum Err.r
  - Common message for all pending alarms
  - Note: only with the inputs defined as key functions, other reset commands can be handled
- ❑ Reset via function keys
  - Selection of available keys A/M or F via configuration datum Err.r
  - Common message for all pending alarms
- ❑ Reset via front panel operation in the error list
  - Selection of an individual alarm
- ❑ Reset via interface
  - Selection of an individual alarm via menu “Bus data (write) - Signals- Other”, e.g. Lim.1, Lim.2, Lim.3, HCA, Ssr
  - Selection of an alarm or of all alarms via parameter access

5 Engineering via PROFIBUS

The instrument offers facilities for uploading a complete engineering into the instrument or for reading it into the PC via PROFIBUS by means of BlueControl®. These functions enable central stations to be build up, e.g. without having to transmit the data via a PLC.
The Instrument from DP version 2 supports up to 2 acyclical communications to class 2 masters and one communication to the class 1 master.

Fig.: 8 DPV1 connections



For building up acyclical communication, the following steps are required:

- Determine the Target Rotation Time
- Set up the BlueControl® transmission.

5.1 BlueControl® via PROFIBUS-DPV1

Data transmission between BlueControl® and the instrument is easy via the DPV1 functions. A complete engineering, operating functions and trend recording are possible and can be transmitted.

From version 1.5, the BlueControl® engineering tool presently supports the PROFIBUS PC cards make Hilscher, e.g. CIF50-PB, CIF60-PB, firmware version ≥ 1.0.71.

From version 2.4, the BlueControl® engineering tool additionally supports the PROFIBUS PC cards made by Siemens, e.g. CP5613.

For transmission, settings in the engineering tool and for the PROFIBUS card (Tool SyCon®) are required. Following, the necessary settings in the engineering-tool and for the PROFIBUS-card are shown by example of a PC card by Fa. Hilscher.

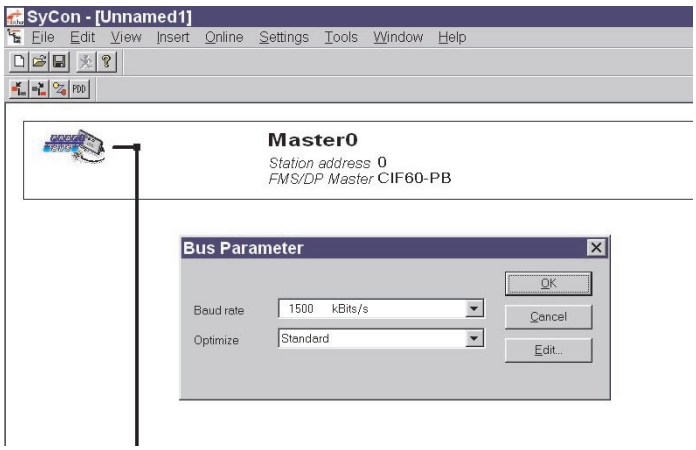
5.1.1 CIF card settings

Case 1:

The Instrument is not integrated into a PROFIBUS network.

The CIF card must be initialized with the master address and the baudrate.(for example, see fig. 9.) .

Fig.: 9 C2 master configuration



Case 2:

The instrument is intgrated into a network with other DP masters, e.g. p.7.

A free master address must be allocated to the CIF card. The Baudrate already used at the bus must be adjusted.

The target rotation time must be adapted and adjusted on all masters connected to the PROFIBUS (s. below).
Only the CIF card needs to be defined as C2 master (no instrument required as slave).

Case 3:

The instrument is integrated into an engineering with the selected CIF card as a slave.
Access to the instrument is in the form of C1 communication. For description, see chapter 6.1, p.31 .
Subsequently, the instrument must be connected with the CIF card.

5.1.2 BlueControl® settings

- Select the transfer channel to BlueControl® by selecting field "Settings" with PROFIBUS 1 to 4 (max. 4 PROFIBUS cards can be fitted in the PC).
- Define the instrument to be selected by specification of the address (PROFIBUS address).

For transmission from BlueControl®, we recommend using the basic settings for the Hilscher interface card:

- KS 90-1/DP user parameters
- Set Motorola/Intel format to "Motorola = 0" .
- Set DP master storage format to "little Endian" (LSB/MSB).

Fig.: 10 Selecting the transfer channel

An engineering download via DPV1 functions is available from DP firmware version 2.0.

If building up of a transmission channel by means of the Hilscher interface cards is not possible, the cause may be e.g.:

- The instrument contains an earlier software version (error message -7).
- The instrument is defined as a DPV0 slave and access to the instrument by the engineering tool is via a class 1 master access (error message 1132).
- The maximum channel data length in the DPV1 settings of the instrument is too low (error message 1132). The instrument is designed for 240 bytes.
- There is no communication with the instrument (error message 1129).
- The target rotation time is too low (error message 1129).

Only one engineering tool per device at a time may be busy exchanging data.

5.2 Hints for setting up the DP master

For smooth operation, we recommend using the following DP master settings:

- Enable the DPV1 functionality at the master and for the selected KS 90-1/DP
- If applicable, specify the max. channel size (240 bytes)
- Check or adjust the Token target rotation time.

The Token target rotation time (Ttr) must not be too low, otherwise, the acyclic message cannot be handled. This time defines the maximum available time for one Token rotation, within which all active DP masters get the permission for bus access once.

When using one or several class 1 masters and one or several class 2 masters in a multi-master system, the token target rotation time must be set to the same value on all masters, e.g. the sum of all individual times.

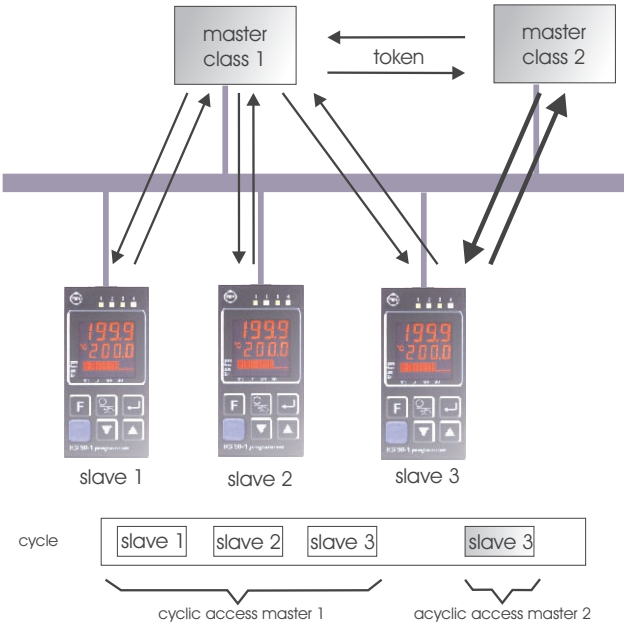
At low PROFIBUS transfer-rates (9.6 bzw. 19.2 kBit/s) the preset target rotation time is to be enlarged at least by factor 5.

An incorrectly adjusted token target rotation time can cause communication troubles.

The DPV1 transmission times are determined from Baudrate, overall number of data to be transmitted and size of data to be transmitted in the addressed instrument. Example: typical values for transmission of a device engineering are within 15 sec. and 3 min.

Further information on acyclic data transmission is given in interface description “SB PROFIBUS-DP parameter data” (9499-040-65311).

Fig.: 11 Token access



6 Getting started with SIMATIC® S7

The disk enclosed in the engineering set contains the GSD file and project examples for a SIMATIC® S7. Communication with a process controller KS 90-1/ KS 92-1 can be built up easily by means of configuration and project.

Test environment
The following components are required for the exemplary test set-up:

- Programming unit (PG) or PC with PC adaptor
- Programming tool STEP®7 ≥ V5.0
- PLC
  - e.g. CPU S7 315-2 DP, latest revision

Components

- e.g. KS 90-1/DP, (e.g. order no. KS90-100-2000D-000)
- Sub-D adaptor (e.g. order no. 9407-998-07001)
- Engineering set (e.g. order no. 9407 999 10511)
- Cable
  - PROFIBUS cable PLC ↔ KS90-1/DP with PROFIBUS connector and integrated termination resistors
  - PG ↔ PLC

Test environment example:

Task

- A KS 90-1/DP with address 5 shall be connected to CPU315-2 DP via PROFIBUS-DP.
- Display or preadjustment of process value, set-point, input 2, deviation xw as well as of the low end high limit of alarm 1 and of several status messages shall be possible.
- A higher accuracy of input 2 and xw is required (float format).
- For this, select process data modules A.1 (General Controller Format FixPoint), A.3 (General-Status / Control), 2 modules C.1 for the float values, one 2-variable module B.2 for reading and one 2-variable module B.7 for writing of limit values.

Before take the test environment into operation, you should ensure that the PLC do not contain any user software ("clear/reset").

Procedure:

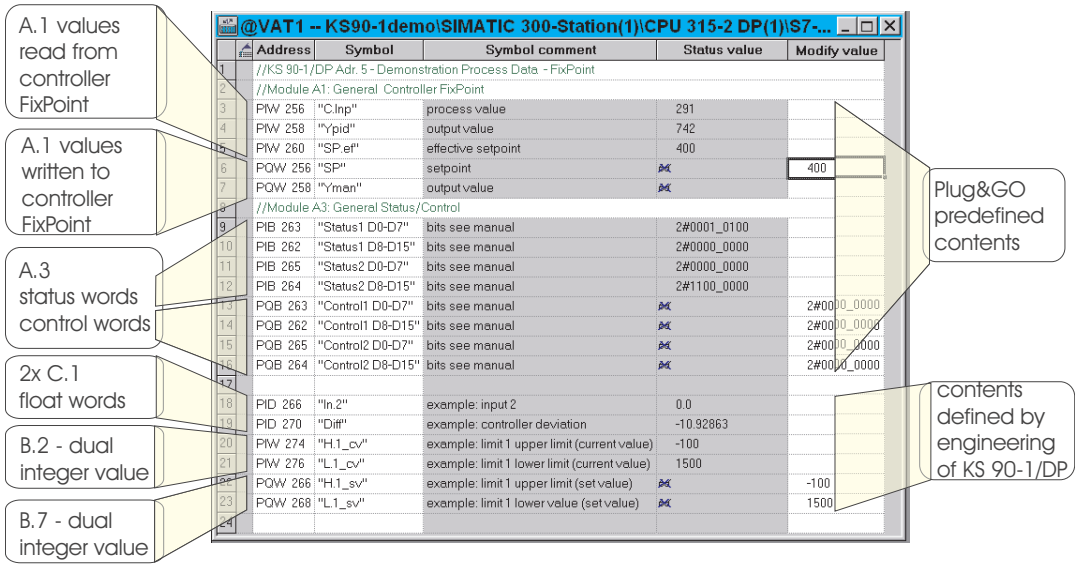
- Make the connections (PROFIBUS)
- Configure the instruments
  - Load the example engineering from the floppy into KS 90-1/DP
  - Adjust address 5 to KS 90-1/DP (via front keys or BlueControl®)
  - connect instruments to PROFIBUS network
  - Activate the bus termination resistors.

Procedure

- PROFIBUS-network configuration
  - Insert disk (Engineering Set) into PG.
  - Retrieve the example project (A:\KS901DP\S7_FB\EXAMPLE\KS90demo.zip)
  - Open project KS90-1demo.
  - if necessary adapt addresses and CPU hardware configuration and download it to the DP master (CPU315-2 DP).
  - Switch PLC to run mode.

After commissioning of the test set-up testing the I/O area can be done by means of the variable tables (VAT 1) enclosed in the project.

Fig.: 13: VAT 1: Presentation of process data



Unless special extensions are required, the typical controller values can be exchanged via prefabricated Plug&GO modules A.1/A.2 and A.3. For this purpose, no further settings on the KS 90-1/DP have to be done except the address.

6.1 Example - Hilscher interface card

6.1.1 *Versions for DPV0*

The floppy packed with the engineering set also contains project examples for a Hilscher interface card. Building up a DPV0 communication with a KS 90-1/DP process controller is easy by means of the system configurator.

Test environment
The following components are required for a test set-up example:

- PC / notebook
- System configurator SyCon®
- a CIF® interface card
  - e.g. CIF50-PB, CIF60-PB

Components

- KS 90-1/DP, (e.g. order no. KS90-100-2000E-000)
- Sub-D adaptor (e.g. order no. 9407-998-07001)
- Engineering set (e.g. order no. 9407 999 10511)
- Cable
  - PROFIBUS cable PC ↔ KS90-1/DP with PROFIBUS connectors and integrated terminating resistors

Test environment example:

Task

- A KS 90-1/DP with address 5 shall be connected to a CIF60-PB via PROFIBUS-DP.
- Process value, set-point and some status messages shall be displayed or defined.
- For this purpose, select process data modules A.1 (general controller format FixPoint), A.3 (general status / control).

Procedure:

- Build up communication (PROFIBUS).
- Configure the instruments.
  - Upload engineering example from floppy into KS 90-1/DP.
  - Adjust address 5 on KS 90-1/DP (via front panel or via BlueControl®) and connect to bus network.
  - Activate bus terminating resistors.

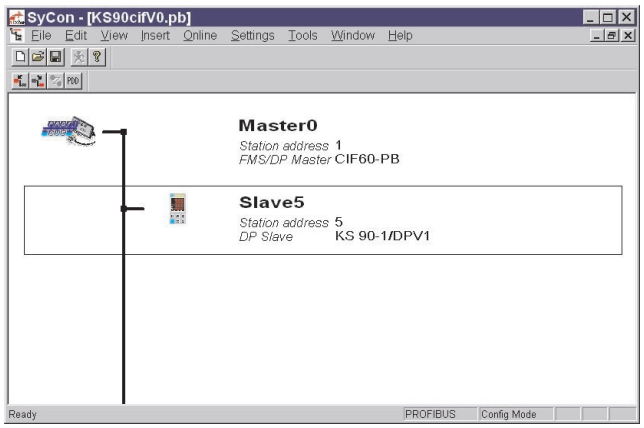
Procedure

- PROFIBUS network configuration
  - Insert floppy (engineering set) into the programming unit.
  - Open project example (e.g. A:\KS901DP\CIF\KS90cifV0.pb)
  - If necessary, adapt addresses and bus master hardware configuration and transmit them to the DP master (menu Online\Download).
  - Start communication.

The following diagrams show the procedures and typical settings for this example:

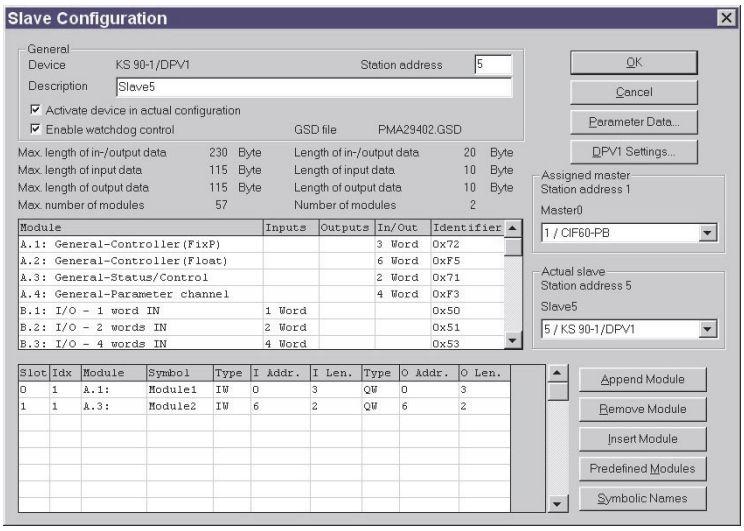
- Network structure

Fig.: 14 Network configuration



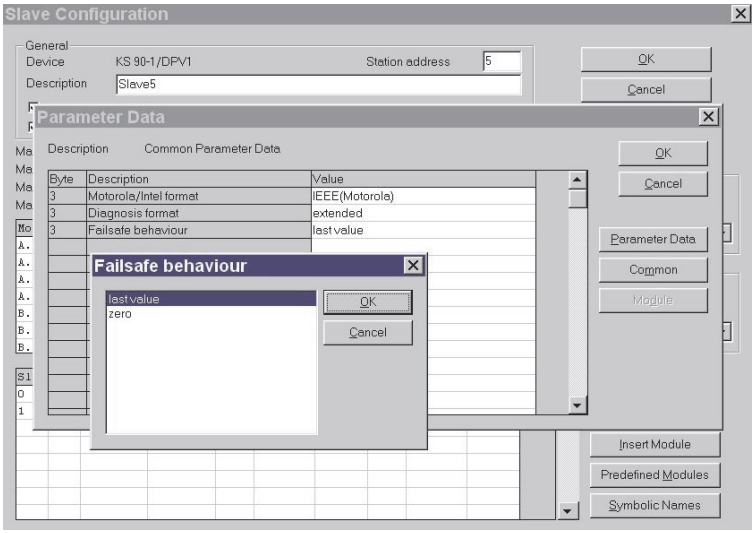
- Selection of KS 90-1/DP process data modules

Fig.: 15 Module selection



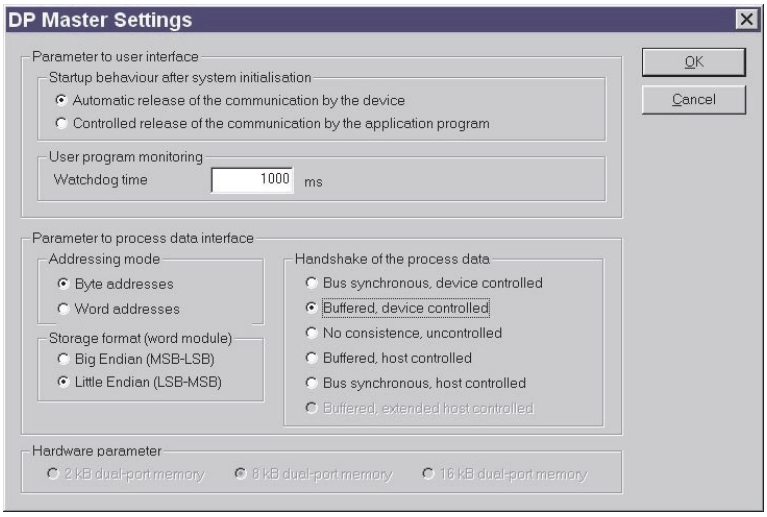
- DPV0 user parameter setting

Fig.: 16 DPV0 user parameter setting



- Master settings

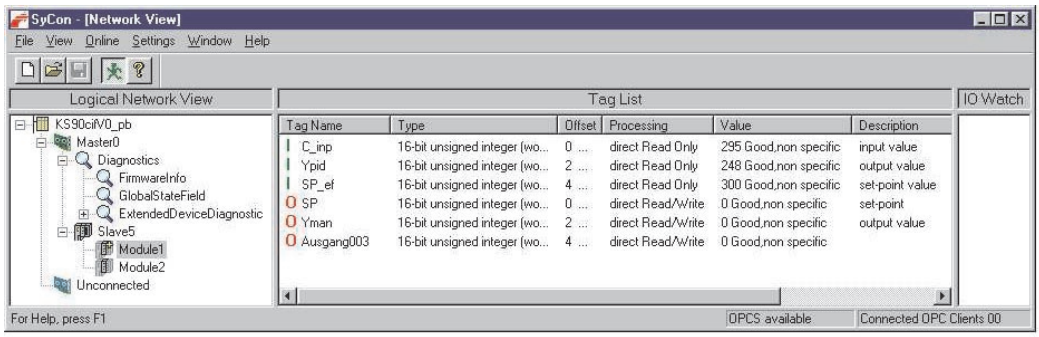
Fig.: 17 Master settings



For consistent data transmission, adjust transmission method ”buffered”. Set storage format "little Endian" (LSB/MSB) for Motorola format.

- The data can be viewed in the network display

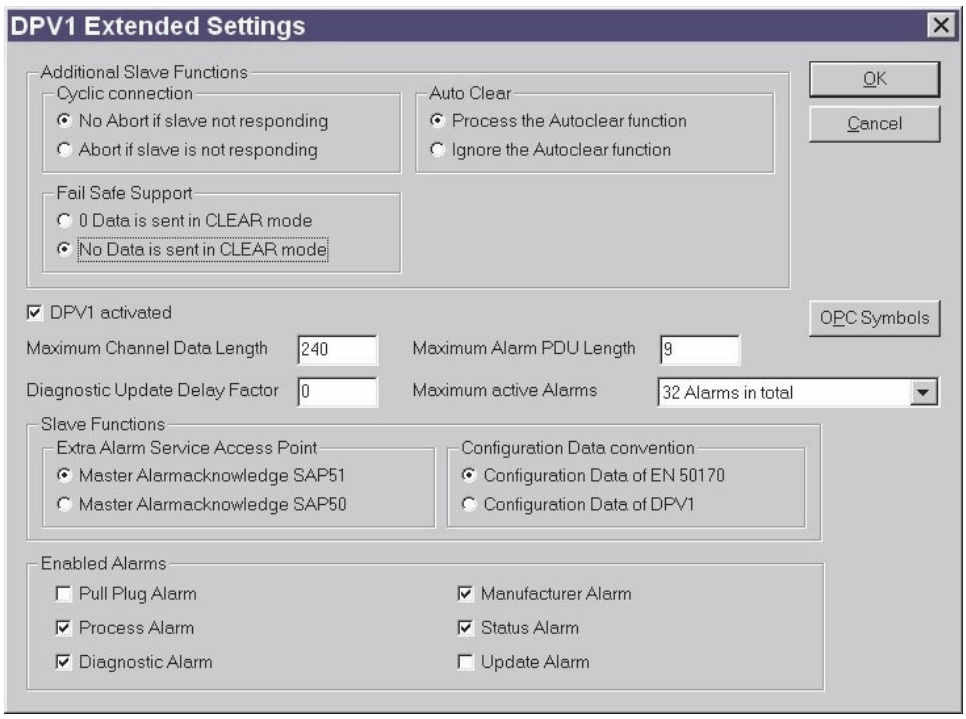
Fig.: 18 Process data display



6.1.2 Versions for DPV1

In project example ..\CIF\KS90cifV1.pb packed with the engineering set, KS 90-1/DP is defined as DPV1 slave. Possible settings are given in the following diagram.

Fig.: 19 DPV1 settings



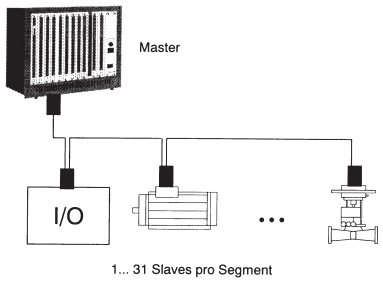
7 Appendix

7.1 Installation hints

7.1.1 Minimum expansion of a PROFIBUS project

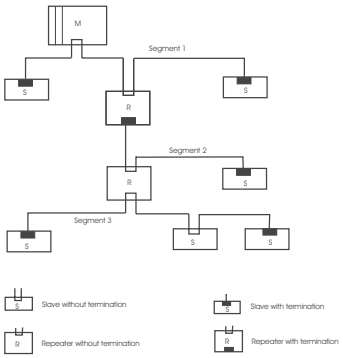
A PROFIBUS system consists at least of the following components:

- a bus master controlling the data exchange,
- a slave as participant or several, which makes data available on request of the master,
- the transmitting medium, consisting of bus cable and bus plug for interconnecting the individual users,
- a bus segment or several, which are connected with repeater.



7.1.2 Maximum extension of a PROFIBUS system

A bus segment consists of max. 32 field devices (active and passive). The maximal quantity of slaves, which can be operated of a PROFIBUS master several segments away, is due to the different internal memory structure of the assigned masters. Therefore you should inform yourself when planning a project about the efficiency of the masters. The bus cable can be opened at each position to take up a new user by adding a bus plug. At the end of a segment the bus can be extended to the given segment lengths and connected to new users. The length of a bus segment depends on the adjusted transmission speed. The data transmission rate essentially becomes by the system constellation (length of a segment, distributed input/outputs) and the required inquiry cycles of individual users determines. All users in the bus communicate with transmission speed given by the master.
At the start and at the end of a segment termination resistors must be connected, in order to guarantee a physically clean signal level. These are already integrated in most available plugs and must be inserted only by switches.



PROFIBUS systems are build as line structure.
A PROFIBUS project can be extended by of connection of repeaters,

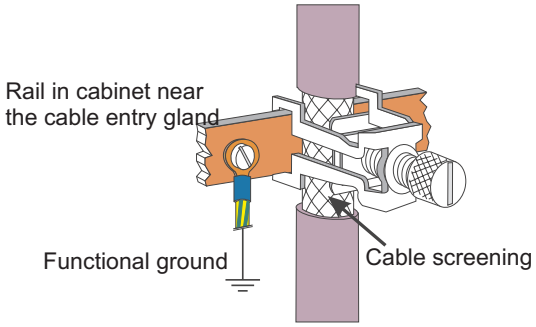
- if more than 32 users have to be attached
- or larger distances have to be reached than are defined in accordance with transmission speed.

In the maximum configuration of a PROFIBUS system max. 126 stations with the addresses 0... 125 can be involved. Each assigned repeater reduces the max. quantity of stations within a segment. It does not have as passive user a PROFIBUS ident number. Its input wiring loads the segment additionally to the current consumption of the bus drivers. A repeater has however no influence on the total number of the attached stations at the bus. The max. connectable quantity of repeaters, which may be switched into series, can differ with the manufacturer. When projecting a project you should inform therefore beforehand with the manufacturer about possible limitations.

7.1.3 Wiring within buildings

The following installation notes apply to a twisted pair wires with screen. The screen serves the improvement of the electromagnetic properties. A PROFIBUS cable according to line type A has a braided screen and a foil screen within the cable. The line screen in the following executions always contains both screen versions (braided screen and foil screen). Always use both screens because the foil screen alone is very thin and can easily be interrupted, which leads to an interruption of the potential leveling system.

The line screen has to be connected at both ends with large surfaces to conducting material to the reference earth. With the installation of a repeaters or a field device in a cubicle the line screen should connected with cable clamps to the ground busbar closely behind the cable entry.



The screen has to be continued up to the field device and be connected there with the conducting case and/or the metallic plug. It is to check that the case of a device and the cubicle, in which the field device is installed have the same earth potential. The assembly of a ground busbar on a painted surface is without effect. If these advises are applied, high frequency interferences are conducted away through the braided screen. If interference voltages from the outside should break through to the data lines, the voltage potential on both data lines is raised in the same way, so that the differential voltage is not destructively influenced under normal conditions. With a shift of the earth potential of a few volts is still a safe data communication possible. If one expects a higher potential shift (potential DGND at the pin 5 against reference earth), then a potential equalization line should be laid parallel to the bus with a minimum cross-sectional area of 10 mm^2, which is to be connected with each field device at the reference earth of the field device. Most of the field devices have a central earth screw. In extreme disturbing environment the bus cable can be laid in a steel tube or a tight tin duct. The pipe or the duct is to be grounded then regularly.

The bus is to be installed always with a minimum distance of 20 cm to other lines, which carry a voltage higher than 60 V. The bus cable is also to lay separated from telephone lines and cables, which lead into explosion protected areas. In such cases it is recommended to use a separate tin duct for the bus cable.

In a tin duct generally only conductive materials should be used, which are connected with the reference earth regularly. The bus cables are not to be exposed to mechanical load or obvious damage. If such impact is expected, special preventive measures have to be taken e.g. installation in pipes etc.

Earth free installation:
If the installation has to be earth-free for certain reasons, then the device mass is to be connected with the reference earth only with a very high impedance (with a RC combination). The system searches itself then its own potential. With of connection of repeaters for interconnecting bus segments the earth-free installation should generally be preferred, to avoid the transfer of potential differences from one bus segment into another.

7.2 Terms

BlueControl®	Engineering tool software for BluePort® controller
BluePort®- interface	interface at the front of the controller to connect an engineering tool
DPV0	Cyclic data exchange, basic functions
DPV1	acyclic services additional to DPV0
ET	Abbreviation of engineering tool
Fail-safe	behaviour of a device in case of PROFIBUS or bus master fault.
FB	Abbreviation of function block
Float	Abbreviation of floating point number
FixPoint	data format with one fixed decimal point
Fkt	Abbreviation for function
Forcing	Presetting of input and output values via bus interface
Function	a partial function of the function block which is self-contained seen from the interface
Function block	closed sequence unit
GSD file	file of instrument data, standardarized description of communication capabilities
HW	Abbreviation of hardware
Class 1 master	Master handling the cyclical data exchange
Class 2 master	Master for commissioning and engineering tasks
MS0	Cyclic communication between class 1 master and slave
MS1	acyclic communication between master class 1 and slave
MS2	acyclic communication between master class 2 and slave
Parameter channel	Possibility to transfer data acyclically and sequentially within the cyclic process data exchange
PG	Abbreviation of programming unit
PNO	PROFIBUS Nutzerorganisation
PROFIBUS-DP	Standard communication protocol to IEC 61158 (DP: decentral peripheral units)
Real	another term for floating point number
RS485	Standard 2-wire connection, half duplex, (EIA RS 485)
S5 / S7	PLC families of the Siemens AG
Serial interface	rear bussable controller interface
SW	Abbreviation of software
TTL	Signal level at chip level
VAT	Variable table: monitoring of values in STEP®7

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