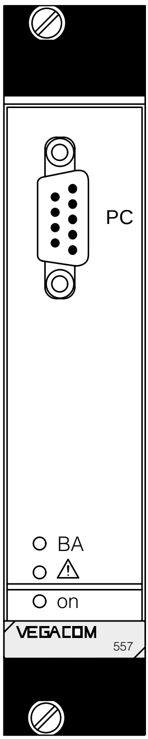
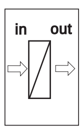
Level and Pressure

Operating Instructions

VEGACOM 557 Profibus FMS





Safety information

Please read this manual carefully, and also take note of country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

For safety and warranty reasons, any internal work on the instruments, apart from that involved in normal installation and electrical connection, must be carried out only by qualified VEGA personnel.

Note Ex area

Please note the approval documents (yellow binder), and especially the included safety data sheet.

Contents

1 Product description

VEGACOM 557 is an interface converter for conversion of VEGA specific protocols of DISBUS and LOGBUS into standard data formats.

The existing version of VEGACOM 557 is used to convert data into the PROFIBUS FMS data format (FMS = Fieldbus Message Specification). As a peripheral device (Slave), the instrument can be connected to a PROFIBUS data line. The bus access is realised according to the Master-Slave procedure, enabling the master (e.g. a Simatic S5 with communication component CP 5431) to collect data from the slave.

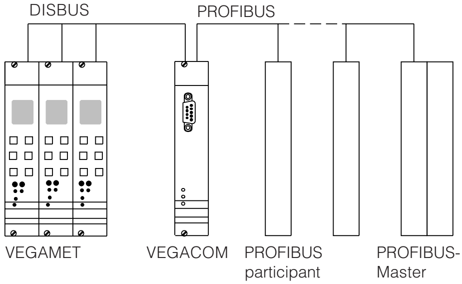
Measurement data and status information from level and pressure measuring systems can be transferred to the primary automation systems, visualised there or further processed for control purposes.

This manual describes the required measures for
- VEGACOM 557 (mounting, connection, settings) as slave
- connection group CP 5431 (parameter settings) as master.

1.1 Function and configuration

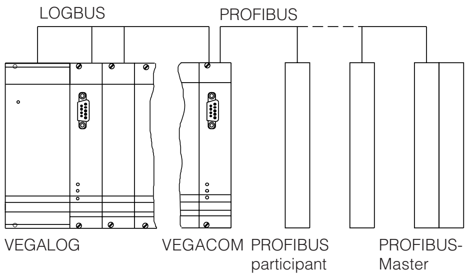
Function

VEGAMET series 500 signal conditioning instruments transmit measurement data and status information via the DISBUS to VEGADIS 174 indicating instruments. VEGACOM 557 receives these data as participant on the DISBUS in a DCS telegram. The telegrams are written in VEGACOM 557 in a buffer memory.



Connection of VEGACOM 557 to the DISBUS and the PROFIBUS

There is a permanent data exchange on the LOGBUS between the individual components of VEGALOG 571. As a participant of LOGBUS, VEGACOM 557 receives that part of the LOGBUS telegram containing the measured values and status information.

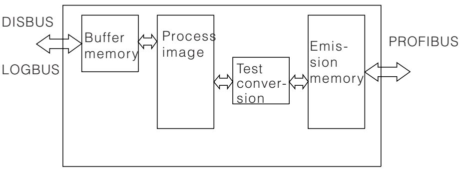


Connection of VEGACOM 557 to the LOGBUS and the PROFIBUS

The data of DISBUS/LOGBUS are first written into a buffer memory of VEGACOM 557.

The data set is transferred from this buffer memory into a process image. The protocol conversion software enquires the stored data cyclically from the individual storage areas. The data sets are checked and converted into the PROFIBUS data format. After the conversion, the data are transferred into emission memory and are sent from there to the PROFIBUS. The PROFIBUS transmits the data to the PROFIBUS master, loading them via a special connection component.

The data communication between VEGACOM 557 and PROFIBUS master must be initiated by the master which can enquire the requested information by special commands.



Function of VEGACOM 557

By means of VEGACOM 557, as well as a PC in conjunction with the adjustment software VEGA Visual Operating (VVO), the connected signal conditioning instruments can be easily set up and configured. Furthermore, measured values and fault signals can be shown graphically with the visualisation software Visual VEGA (VV).

In a planned extension level, the PROFIBUS master can also enquire, in addition to the measurement data and status information, the parameters of VEGAMET/VEGALOG, receive them, and if necessary, modify and return them. This strategy enables the complete control of the behaviour of level and process pressure measuring systems via the PROFIBUS master.

Configuration

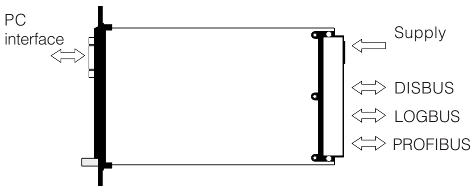
The component is compatible with 19" technology with 5 TE width (1 TE = 5.08 mm) acc. to DIN 41 494. It can be used
- in carrier BGT 596
- in VEGALOG 571 carrier
- in housing type 505

The electrical connection is made via a plug connector acc. to DIN 41 612 on the rear of the component. The connection to LOGBUS is made via an additional 5-pole plug connection mounted to the DIN plug connector.

There is a 9-pole D-SUB plug in the front plate. It is used for connection of a PC via RS 232 C to VEGACOM 557.

The component consists of two boards:
- the basic board
- the additional board

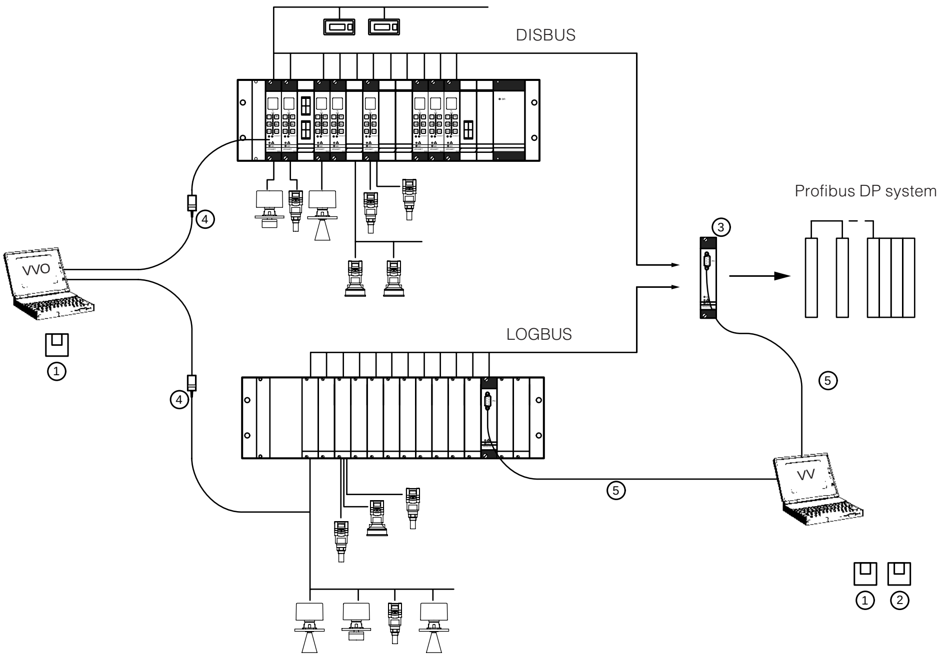
The power supply unit, the PC RS 232C interface as well as the DISBUS/LOGBUS interface are located on the basic board.



Connections of VEGACOM 557

The additional board is screwed to the basic board and contains the microcontroller as well as the PROFIBUS interface.

Complete measuring system with digital communication and networking



Measuring system with digital communication and networking

Explanation:

1 VEGA Visual Operating (VVO)
Adjustment software for the PC for the user-friendly configuration and parameter adjustment of VEGA instruments
- VEGALOG 571 directly via RS 232 connection cable on the CPU card or VEGACOM 557
- several VEGAMET via VEGACOM 557 or individually via VEGACONNECT
- VEGASON, VEGAPULS via VEGACONNECT on the signal cable or on the sensor

2 Visual VEGA (VV)
PC visualisation software for presentation of measurement data from VEGA instruments in graphical or tabular form. Integration of individual measurement loops into groups, saving of fault signals and measured values (recorder function).
Suitable for networks

3 VEGACOM 557
Interface converter for conversion of VEGA specific protocol into standard data formats. Suitable for connection to the DISBUS output of VEGAMET series 500/600 signal conditioning instruments or the LOGBUS of VEGALOG 571 processing center.

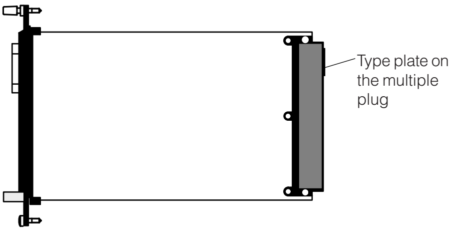
4 VEGACONNECT 2
Connection cable (interface converter) between VEGA instruments (VEGASON, VEGAPULS or VEGAMET) and a PC in conjunction with the adjustment software VEGA Visual Operating.

5 RS 232 connection cable (interlink cable)
Connection cable between PC and VEGALOG 571-CPU or VEGACOM 557

1.2 Type plate

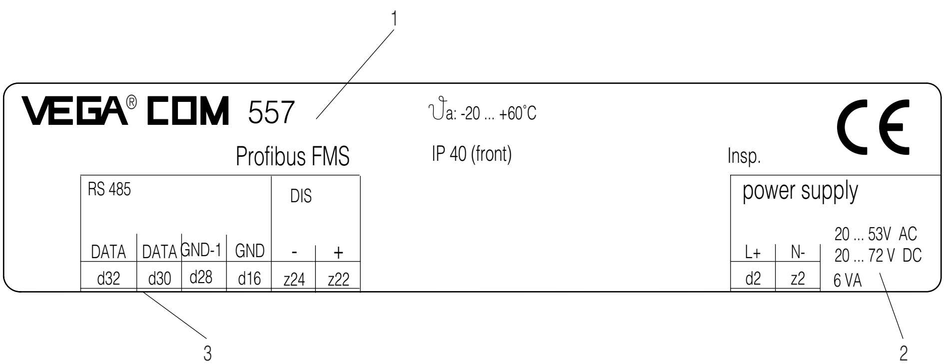
Type plate

Prior to mounting and electrical connection, please check if you are using the correct version of VEGACOM 557. Please note the type plate, located on the multiple plug.



The type plate contains important information required for electrical connection. The layout and data elements of the type plate are explained in the illustration below.

Note:
The serial number of your VEGACOM is on the rear of the plug connector.



1 Version: Profibus FMS
2 Supply voltage
3 Terminal assignment of the RS 485 interface to the Profibus

1.3 Technical data

Technical data

Power supply

Supply voltage	U_{nom} = 24 V AC (20 … 53 V), 50/60 Hz or = 24 V DC (20 … 72 V)
Power consumption	approx. 6 VA
Fuse	1 A, slow-blow

Electrical connection

Component	multiple plug acc. to DIN 41 612, series F 48-pole (d, b, z) with coding holes
Module in carrier BGT 596 or BGT LOG 571	suitable multipoint connector acc. to DIN 41 612 with connection via standard technologies
Housing type 505	via screw terminals max. 1 x 1.5 mm^2

Indicating elements

LED on front panel	green BA: communication signal PROFIBUS red (flashing): DISBUS/LOGBUS failure red (permanent): failure green on: operating voltage on

Measurement data input DISBUS

Data transmission	DISBUS (digital data transmission)
Connection cable	2-wire, unscreened (standard cable)
Cable length	max. 1000 m

Measurement data input LOGBUS

Data transmission	LOGBUS (digital data transmission)
Connection cable	connection via BUS plug

PC interface

Interface standard	RS 232 C
Cable length	max. 15 m
Transmission rate [1)]	300, 600, 1200, 2400, 4800, 9600 and 19200 baud
Transmission format	8 data bits, 1 stop bit, even parity
Plug on the front panel	D-SUB plug connector, 9-pole, pins

[1)] adjustable via DIL switch on the component

PROFIBUS interface

Standards conformity	to DIN 19 245, part 1 and part 2 to pr EN 50 170 acc. to ISO 7498
Interface standard	RS 485
Network topology	linear bus (active bus terminator on both ends), stubs are possible
Number of stations per segment	
- without repeater [1]	32 stations
- with repeater	up to 127 stations
Max. bus length	
- without repeater	100 m with 12 Mbits/s
- cable A	200 m with 1500 Kbits/s up to 1.2 km with 93.75 Kbits/s
- cable B	200 m with 500 Kbits/s up to 1.2 km with 93.75 Kbits/s
- with repeater	up to the 10 km range
Connection cable	2-wire screened [2], twisted
Transmission	half-duplex, serially asynchronous, slip resistant synchronisation
Transmission rate [3]	9.6; 19.2; 93.75 kbits/s up to 1.2 km 187.5 kbits/s up to 600 m 500 kbits/s up to 200 m
Coding system	NRZ code
Number of bits	11 Bits: 1 start bit, 8 data bits, 1 parity bit, 1 stop bit
Parity	EVEN
Data backup	LRC

Electrical protective measures

Protection:	
not mounted	IP 00
in carrier BGT 596 or BGT LOG 571	
- front side completely equipped	IP 40
- upper and lower side	IP 00, BGT LOG 571 IP 20
- wiring side	IP 00
in housing type 505	
- front side	IP 40
- other sides	IP 30
Protection class	II (in housing type 505)
Overvoltage category	II

Electrical protective measures

Reliable separation acc. to VDE 0106, part 1	between power supply, LOGBUS, DISBUS, PC and PROFIBUS connection
- reference voltage	250 V
- test voltage	3 kV

1) Repeater = line amplifier (possibly are at least 3, partly up to 10)
2) Depending on the ambient conditions (EMC), screening can be deleted
3) Adjustable via DIL switch on the component

CE conformity CE

VEGACOM 557 meets the protective regulations of EMC (89/336/EWG) and NSR (73/23/EWG). Conformity has been judged acc. to the following standards:

EMC	Emission	EN 50081-1
	Susceptibility	EN 50082-2
NSR		EN 61010

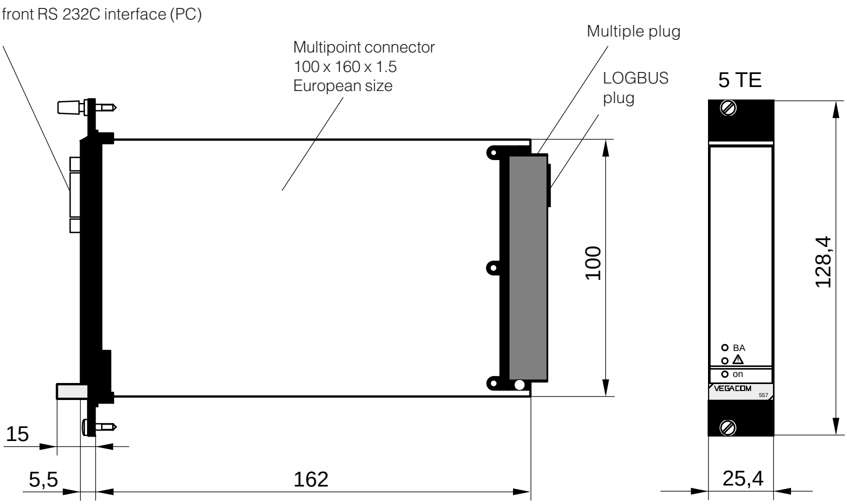
Mechanical data

Series	module unit for - carrier BGT 596 - carrier BGT LOG 571 - housing type 505
Dimensions, not mounted	W = 25.4 mm (5 TE), H = 128.4 mm, D = 166 mm
Weight	approx. 550 g

Ambient conditions

Permissible ambient temperature	-20°C … +60°C
Storage and transport temperature	-20°C … +85°C
Moisture	93 %, T = 40°C acc. to DIN/IEC 68-2-3
Shock load	2 … 100 Hz, 0.7 g

1.4 Dimensions



2 Mounting and electrical connection

2.1 Mounting instructions

The gateway VEGACOM 557 can process measurement data and status information in two different ways:
- via DISBUS (from measuring systems with VEGAMET)
- via LOGBUS (from measuring systems with VEGALOG).

For DISBUS configurations, VEGACOM 557 can be either mounted into carrier BGT 596 or housing type 505.

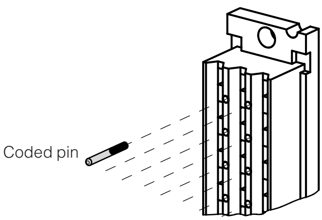
In conjunction with LOGBUS, VEGACOM 557 is mounted into carrier BGT LOG 571. The location is individually selectable, the system adapts automatically when rebooting (autoconfiguration).

Coding

A mechanical coding system prevents mixing up the different module cards in the carrier or in the housing.

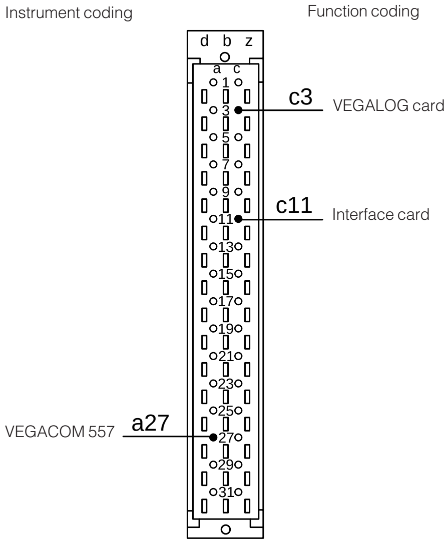
The coding system consists of:
- three coded pins in the multipoint connector
- three holes in the multiple plug of VEGACOM 557.

The coded pins are provided with the module or the housing. The user must fit the plug-in socket with the coded pins according to the following table and diagram.



Plug-in socket of VEGACOM 557

	Instrument coding	Function coding
VEGACOM 557	a27	c3/c11



Positioning of the coded pins

2.2 Mounting into carrier and housing

BGT 596 or BGT LOG 571

For mounting, a slot module must be provided at the requested location. A slot module consists of:
- a multipoint connector acc. to DIN 41 612, series F, 33-pole (d, b, z)
- two screws
- three coded pins
- two guide rails.

The multipoint connector is available in the following versions:
- Wire-Wrap, standard connection 1.0 mm x 1.0 mm
- plug connection 2.8 mm x 0.8 mm
- Termi-Point standard connection 1.6 mm x 0.8 mm
- soldering connection
- screw terminals 0.5 mm^2.

When mounting the module, please note the operating instructions of the carrier.

Housing type 505, type 506

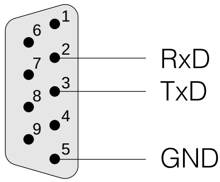
This housing is already equipped with a multipoint connector. Before mounting, please check if the housing is equipped with a power supply unit or not.

The connection is made via screw terminals with max. 1.5 mm^2. Further details are stated in the operating instructions "Housing type 505, type 506".

2.3 Wiring plan VEGACOM 557

PC interface in front panel (SUB-D plug)

The PC interface of VEGACOM 557 is used exclusively for connection of computer systems with VEGA adjustment software via a COM port. The PC interface is based on the RS 232C standard and is assigned as follows.

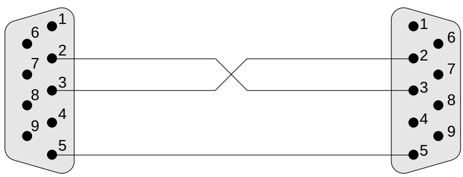


Pin assignment of the PC interface of VEGACOM 557

Pin	Description		I/O
2	RxD	receive data	I
3	TxD	transmit data	O
5	GND	ground	–

Note:
If there is a direct connection to the computer system, VEGACOM 557 works without hardware handshake.

Direct connection
For direct connection of a PC to the PC interface of VEGACOM 557, the interlink (or a standard) cable available from VEGA with 9-pole plugs on both ends should be used. The pin assignments of the interlink cable are shown in the diagram.

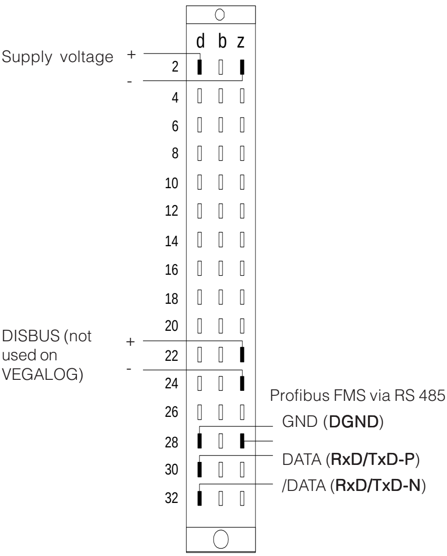


Suggested wiring scheme for interlink cable

Connection via modem
For remote parameter setting, it is possible to connect the PC interface via a modem. In such a case, the modem cable that comes with the respective modem should be used. Modem operation is supported by VEGACOM 557 from software version 2.11. Further information on remote parameter setting is stated in the operating instructions "Remote parameter adjustment".

Connections of the multiple plug (rear)

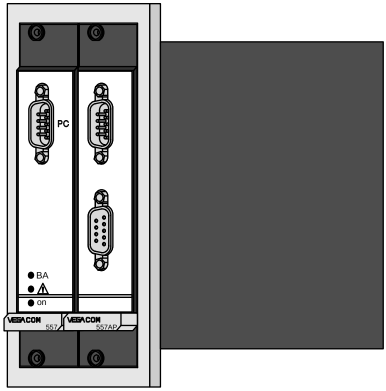
For connection of VEGACOM 557 to the existing Profibus FMS system, a RS 485 interface is available. The following diagrams show the connections of the RS 485 interface, the power supply of the instrument and the connection to the VEGA system.



Multiple plug (rear of VEGACOM 557)

2.4 Mounting and installation instructions with VEGACOM 557AP

As an option, VEGACOM 557 can be extended with the adapter print VEGACOM 557AP. The adapter print VEGACOM 557AP consists of a module with 5 TE width and two modules connected to a back-panel print for carrier BGT 596 or BGT LOG 571.



With the adapter print card, it is possible to put the Profibus FMS interfaces of VEGACOM 557 at the front of the carrier. On the front of the adapter print card, the Profibus FMS interface is available as a 9-pole SUB-D plug and as 9-pole SUB-D socket. The required interface type must be stated when ordering VEGACOM 557AP.

The following interface types are available:
- RS 485 (Profibus FMS)

Keep in mind that for Profibus the interface type RS 485 is necessary!
You can find the pin assignments of the SUB-D plug and the SUB-D socket in the following tables.

Pin assignments VEGACOM 557AP

Pin-no.	RS 485
1	-
2	-
3	DATA (RxD/TxD-P)
4	-
5	GND (DGND)
6	-
7	-
8	/DATA (RxD/TxD-N)
9	-

9-pole SUB-D plug

Pin-no.	RS 485
1	-
2	-
3	DATA (RxD/TxD-P)
4	-
5	GND (DGND)
6	-
7	-
8	/DATA (RxD/TxD-N)
9	-

9-pole SUB-D socket

Mounting instructions for VEGACOM 557AP

The two modules connected to the back-panel print consist of:
- two multipoint connectors acc. to DIN 41 612, series F, 48-pole (d, b, z) connected via the back-panel print
- four screws
- four coded pins
- four guide rails

Coding

The coding should be carried out for both modules as described in chapter "2.1 Mounting in carrier and housing". The coded pin c3 will not be inserted.

Module position

BGT LOG 571

The location of the module can be selected at will, the VEGALOG 571 processing system adapts automatically through autoconfiguration during the first booting.
After autoconfiguration, the slot location of the cards must never be changed.

BGT 596

The location of the module can be selected at will. Please note that the two connected modules cover a width of 10 TE (5 TE for VEGACOM 557 plus 5 TE for the adapter board VEGACOM 557AP).

Connection VEGACOM 557AP

BGT LOG 571

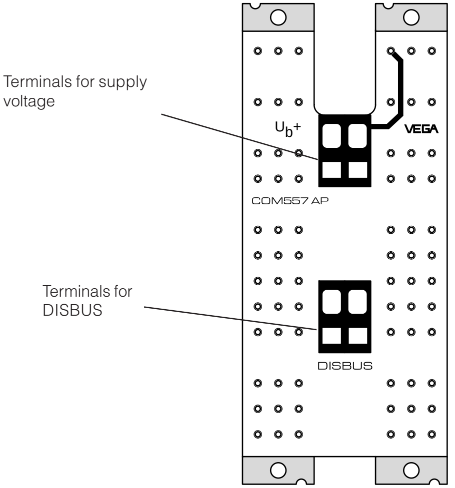
By means of the bus board (part of the carrier BGT LOG 571), connection to LOGBUS is automatically made when inserting VEGACOM 557.

The voltage supply of the card must be provided separately. For this reason, a 2-pole terminal with tension spring connection, called U_b, is available on the back-panel print. The permissible operating voltage of VEGACOM 557 should be observed. In case of DC voltage supply, the correct polarity should be noted!

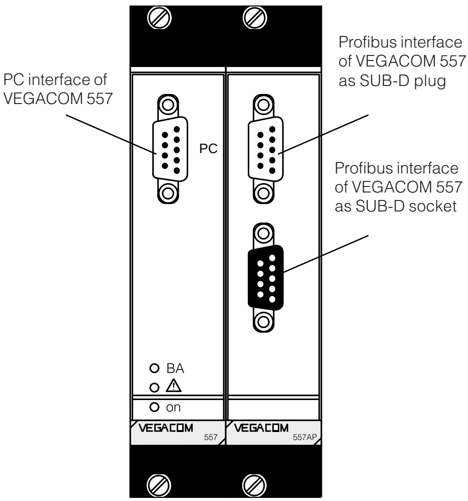
BGT 596

When operating VEGACOM 557 as DISBUS participant, the DISBUS must be wired in addition to the supply voltage.

For the two cables of the DISBUS, a 2-pole terminal with tension spring connection is available. Make sure that the polarity is correct!



View of back-panel board (rear of the carrier)



Front view with SUB-D connections of VEGACOM 557 and VEGACOM 557AP

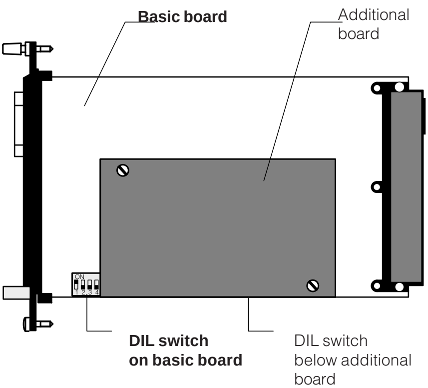
3 Addressing of the process signals

3.1 Switch adjustments on VEGACOM 557

For adjustment of the RS 232 PC interface in the front panel, a 6-pole DIL switch block is located on the basic board. On the additional board there are two 8-pole DIL switch blocks as well as two hook switches for termination of the bus.

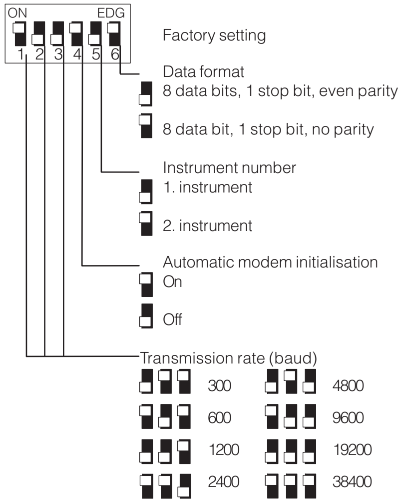
Before inserting VEGACOM 557 into the carrier or the housing, the DIL switches must be set according to the user-specific data. The data of this setting will take effect with the next initialisation (switching on of voltage).

Side view of the component:



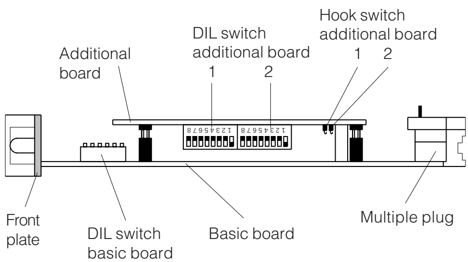
Side view of VEGACOM 557

DIL switch, basic board

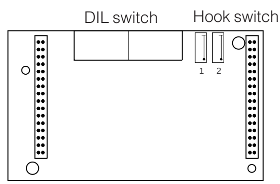


DIL switch, additional board

Bottom view of the component:



Additional board bottom view:



DIL switch 1, additional board

Adjustment of the baud rate

Baud rate (kBit/s)	S8	S7	S6	S5	S4	S3	S2	S1
9.6	off	off	off	off	off	off	off	off
19.2	off	off	off	off	off	off	off	on
93.75	off	off	off	off	off	off	on	off
187.5	off	off	off	off	off	off	on	on
500	off	off	off	off	off	on	off	off
1500	off	off	off	off	off	on	off	on

DIL switch 2, additional board

PROFIBUS address of VEGACOM 557

SW 8	SW 7	SW 6	SW 5	SW 4	SW 3	SW 2	SW 1
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

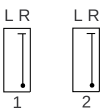
Example: = Address 32

SW 8	SW 7	SW 6	SW 5	SW 4	SW 3	SW 2	SW 1
off	off	on	off	off	off	off	off

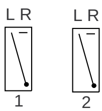
Hook switch, additional board

The hook switches are used to switch on the bus termination resistances.

Switch positions



Bus termination "on"



Bus termination "off"

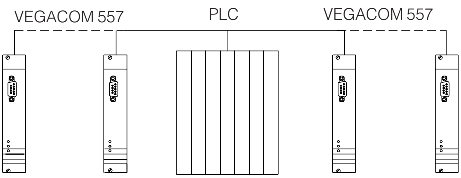
Note:
L = position left,
R = position right

Example 1

Both hook switches "on"

If **one** VEGACOM 557 is connected to **one** PlC, the hook switches must be set to position "on" (bus termination on).

Example 2

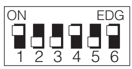


Both hook switches:
on off off on

If **several** VEGACOM 557 are connected to **one** PLC, the hook switches at the beginning and end of the cable have to be in position "on" (VEGACOM), and in position "off" on VEGACOM 557 located in between.

3.2 Factory set switch position

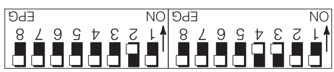
DIL switch, basic board

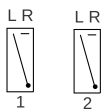


Transmission rate: 9.600 baud

DIL switch and hook switch, additional board

DIL switch 1 DIL switch 2





Bus termination "off"

4 Setup

In this section, all measures you need to take to set up your VEGACOM 557 in conjunction with the Siemens communication processor CP5431 are described. If your PROFIBUS master is an instrument from another manufacturer, please observe the necessary measures found in the respective manufacturer documentation.

In the setup procedure, the parameters of the communication processor must be set first. To do this, the STEP5/ST basic package, as well as the NCM program (Network and Communication Management) from Siemens, is required (note: Siemens is running the Profibus under the name "L2-Bus").

For the reading in of measurement data through VEGACOM 557 PROFIBUS FMS, the three functional components FB 210, FB 211, FB 212 are used, which have to be integrated in your S5 application. The components described in this section are available on the diskette in the file MESSW@ST.S5D.

4.1 Setup check list

1 Check hardware requirements
- PC or S5 programming device
- A connection between PC/programming device and CP5431 and AG through signal converter, e.g. Köster-Box with connection cable to PC and to CP/AG
- Siemens automation device (AG) S5 with power supply component
- Siemens communication processor CP5431 as Profibus master
- VEGACOM 557 version PROFIBUS FMS

2 Check software requirements
- Siemens STEP5/ST basic package
- Siemens additional module NCM (Network and Communication Management)
- VEGACOM 557 Profibus diskette: S5 application "Read in VEGACOM measured values" (file: MESSW@ST.S5D)

3 Carry out adjustments on VEGACOM 557
- Baud rate via DIL switch
- Address via DIL switch
- Connection resistance via hook switches

4 Carry out parameter setting of CP5431
- Basic planning
- Network parameters
- FMS planning (connection planning)

5 Transfer parameter database to CP5431 and activate by switching off/on the voltage supply (power supply component)

6 Integrate S5 program (on diskette), which reads in measured values, into your own application
- Enquire in OB21 and OB22 the functional component FB249 (SYNCHRONOUS)
- Transfer data component DB240 to your own application
- Initialise measured value data components (standard: DB220-235)
- Transfer functional component FB210 or FB211 and/or FB212 into your own application

Note:
The applied functional components must be called up in every program cycle

7 Transfer components to AG

4.2 PROFIBUS characteristics of VEGACOM 557

VEGACOM 557 PROFIBUS supports PROFIBUS-FMS. FMS describes the communication objects, the application services and the resulting models from the user's point of view. The function of VEGACOM 557 is that of the slave. E.g. a communication processor CP5431 can be used as PROFIBUS master.

Object directory (OV)

All communication objects are entered in the local object directory (OV). The OV contains the description of the structure, the data types and the internal address assignment. The master (here CP5431) has access to the entered objects. The static OV is as follows:

Object index (Hex)	Type	Length	Number of elements	Password	Access Group	Access Rights	Symbol
1000	Octett-String	6	16	0	0	READ_ALL	MESSWERT-01
1001	Octett-String	6	16	0	0	READ_ALL	MESSWERT-11
1002	Octett-String	6	16	0	0	READ_ALL	MESSWERT-21
1003	Octett-String	6	16	0	0	READ_ALL	MESSWERT-31
1004	Octett-String	6	16	0	0	READ_ALL	MESSWERT-41
1005	Octett-String	6	16	0	0	READ_ALL	MESSWERT-51
1006	Octett-String	6	16	0	0	READ_ALL	MESSWERT-61
1007	Octett-String	6	16	0	0	READ_ALL	MESSWERT-71
1008	Octett-String	6	16	0	0	READ_ALL	MESSWERT-81
1009	Octett-String	6	16	0	0	READ_ALL	MESSWERT-91
100A	Octett-String	6	16	0	0	READ_ALL	MESSWERT-A1
100B	Octett-String	6	16	0	0	READ_ALL	MESSWERT-B1
100C	Octett-String	6	16	0	0	READ_ALL	MESSWERT-C1
100D	Octett-String	6	16	0	0	READ_ALL	MESSWERT-D1
100E	Octett-String	6	16	0	0	READ_ALL	MESSWERT-E1
100F	Octett-String	6	16	0	0	READ_ALL	MESSWERT-F1

In the OV you can see that 16 groups with 16 elements each are available. They represent the 256 measured values. Each measured value consists of 6 octets (including index and status information). For access to the first 16 measured values, the master has to send a READ service with index = 1000 hex to the slave.

The indices are required in the S5 program for placing the order to the CP.

PROFIBUS FMS services

From the point of view of the application process (S5 program), the communication system represents a group of services, the so-called FMS services. Each slave must provide duty services or can provide additional optional services.

VEGACOM 557 PROFIBUS supports the following services:
- duty services: Initiate, Abort, Reject, Status, Identify, Get OV short form
- optional FMS services: Read, Write, Get OV long form

After switching on the supply voltage, the master sends the initiate service to the slave. Only then can the communication objects can be read out. For reading in measured values, the read service is required. In the S5 program, a reading order is passed to the CP with the functional component FB244, which also uses the read service.

Connection attributes

Defined connection
In planning, the defined connection must be chosen. The communication partners CP5431 (Master) and VEGACOM 557 PROFIBUS (Slave) are permanently defined and must not be modified. They are in a Master/Slave communication relationship. There is no entry necessary for the CP parameter setting.

Acyclical data traffic
The various communication objects (here individual measured values or measured value blocks) are sporadically called by request of the application process via the connection. The Master/Slave connection for acyclical data traffic must be set in the CP parameters (see FMS planning, connection type MSAZ).

Communication relationship list (KBL)

From the user's point of view, the communication with the application processes of the communication partners is done via logical channels. These logical channels are defined in the KBL during the planning phase. The KBL is entered during the FMS planning, in which the connection attribute is permanently set (internally) to defined connection (D).

Example entry of a KBL on the PROFIBUS master with VEGACOM 557 PROFIBUS as communication partner:

KR	SSAP	TYPE	ATTR	RADR	RSAP
2	58	MSAZ	D	12	1
…	…	…	…	…	…

KR: Communication reference
SSAP: own LSAP (of CP5431)
TYPE: Connection type/attribute
RADR: Partner address (Slave), VEGACOM 557 PROFIBUS
RSAP: Partner LSAP (Slave), VEGACOM 557 PROFIBUS

Communication reference KR
A communication relationship is addressed by a local short designation, the communication reference KR. Several communication relationships can be created by the master.

Local and external Service Access Point LSAP
For communication, several service access points are available on both sides. In the KBL, the points where the messages pass must be explicitly stated. VEGACOM 557 PROFIBUS has more than 6 Service Access Points LSAP = 0 … 5.

Master and Slave addresses
To enable the individual Profibus participant to be accessed, each one has its own different address. The address must be entered in the KBL.

4.3 Parameter setting of the S5 communication processor CP5431

The communication processor CP5431 operates as PROFIBUS master. The NCM software (Network and Communication Management) is necessary for configuration of the bus parameters, Slave address, the assignment of the PROFIBUS objects in the PLC data sectors, etc.

The basic information is available in the Siemens manuals: Instrument manual CP5431 FMS with COM5431 FMS volume 1, chapter 6 and volume 2: chapter 4 and 5 as well as the instrument manual for AG.

The NCM software can be selected and started in the menu item "Change / additional…" in the STEP5/ST basic package (NCM is an additional module and must be installed separately from the basic package).

The following main menus are then available:

```
= Init Edit mains Load Test Tools    SINEC CP 5431 FMS
  +————————+
  | Edit           |
  | Path definition |
  | End            |
  +————————+
```

Basic planning

1. Menu: Init –> Edit

Here, the basic initialisation, i.e. the input of the communication processor type (here CP5431) and the name of the planning data base as well as the file names for documentation output, is carried out.

Type of CP:	Type of the communication processor, here CP5431
Database file:	Name of the configuration database
Printer data file:	Name of the printer data file
Footer data file:	Name of footer data file

```
SINEC NCM (ENDE)
 Basic adjustments
______________________________________

KIND OF CP          : CP5431             STATUS : OFFLINE FD

DATABASE FILE       : C : QMESSW


DOCUMENTATION       : FOOTER DATA        OFF
                    PRINTING             OFF

                    PRINTER DATA FILE    : C : MESSW@DR.INI
                    FOOTER DATA FILE     : C : MESSW@F1.INI






F         F         F         F         F         F        F            F HELP
1         2         3         4         5         6        7 TAKE OVER 8 CHOICE
```

2. Menu: Edit –> CP Init

Here, the system parameters are planned. The basic interface number is required later on in the application as parameter for the functional components.

L2 address:
- The address of the CP5431 (Master address)

Active/Passive:
- ACTIVE (the CP5431 runs as master, therefore only active adjustable)

Network data file:
- In the network data file the topology of the network is saved.

Basis-SSNR:
- The basic interface number is required exclusively for SIMATIC components. Sectors of 4 interfaces are always reserved (adjustment range: 0, 4, 8 … 254)

Number of interf.:
- This parameter indicates how many interfaces (tiles) are accessed (adjustment range: 1 … 4)

Module size:
- Information on the storage capacity of the storage module.

In addition, the generation date and the system identification can be saved.

```
SINEC-NCM (ENDE)
Edit - CP Init basic initialisation      Source:  C:QMESSW
_________________________________________

Bootstrap data:                          SIMATIC sepcifi.    :

    L2 - address        : 13             Basis-SSNR          : 0
    Active / Passive    : ACTIVE         Number of interf.   : 1
    Network data file   : MESSWNCM.NET


Informative parameter   :

    Module kind         : EPROM          Module size         : 16 KB
    Comp. identificat.  : CP5431
    Firmware-version    :
    File date           : 15.12.95
    System identific.   : VEGACOM 557 PROFIBUS




F          F          F          F          F          F        F            F HELP
1          2          3          4          5          6        7 TAKE OVER  8 CHOICE
```

3. Menu: Edit –> Network parameter global / local

A difference is made between network parameters local and global. In the global network parameter mask, bus parameters for all participants of a network can be defined. These bus parameters can be entered in all databases belonging to the network with Network –> Network adjustment. The local network parameter mask enables a participant-specific editing of the bus parameters. It must be noted that the baud rates set here are also set on the PROFIBUS-Gateway VEGACOM 557.

Number of external active stations:
- Number of active stations not acquired in the topology file. This adjustment is necessary for the calculation of the bus parameter block.

Max. participant address (HSA):
- This is the highest bus address of an active bus participant.

Baud rate:
- The baud rate of the transmission speed.

Default SAP:
- On receipt of a telegram without Destinations-SAP number, the CP dials the Default SAP.

No. of telegram repeats:
- This value states how often a telegram should be repeated if the acknowledgement is not correct.

Medium redundancy:
- No redundancy

Bus parameters:
- The bus parameters can be reset to default with the F1 key depending on the adjusted baud rate.

```
SINEC-NCM (END)
Edit network parameter - Global            Source:  DEMO1NCM.BPB
________________________________________
     Highest active L2-address within network data file  :  13
additive topology figures :
     No. of external act. stations :   2   max. particip. addess (HSA)  :  31
________________________________________
Busparameter figures :
    Baud rate                                            :     500000    Baud
    Default SAP                                          :         61
    Number of telegram-repeats (Max. Retry Limit)        :          1
    Medium redundancy                                    : no redundancy

Busparameter data:
    Slot-Time (TSL)                   :   1000 Bit times     2.0000 msec
    Setup-Time (TSET)                 :     80 Bit times     .16000 msec
    min. Station-Delay (min TSDR)     :     80 Bit times     .16000 msec
    max. Station-Delay (max TSDR)     :    360 Bit times     .72000 msec
    Target-Rotation-Time (TTR)        :  15000 Bit times     30.000 msec
    GAP-actualisation factor (G)      :     30


F            F         F          F          F          F         F           F HELP
1 CALCULATE  2         3          4          5          6         7 TAKE OVER 8 CHOICE
```

4. Menu: Network –> Network survey

The network survey shows all database files belonging to a network and thus knots, in a list.

```
SINEC-NCM (END)
Network - Network survey                         Source:  C:MESSWNCM.NET
________________________________________

  No. of stations :   1   max. participant address (HSA) :  31

   knot name / Data base file         L2-address      Type

        QMESSW                            13          CP5431











F PAGE +   F PAGE -   F          F          F          F        F           F HELP
1 PAGE +   2 PAGE -   3          4          5 DELETE   6        7 TAKE OVER 8 CHOICE
```

5. Menu: Network –> Network adjustment

In the global network parameter mask, the bus parameters for all participants of a network are defined. These bus parameters are transferred to all databases belonging to the network with the function Network –> Network adjustment. It is therefore useful to first plan all network participants and finally to edit and set the global network parameters.

Network file
- Here, a network file stated in the Edit –> CP Init mask is mentioned, the bus parameters of which were created in Edit –> Network parameters.

The data are actualized with function key F7.

```
SINEC-NCM (END)
Network - Network adjustment
________________________________________


          Network data file        : C : MESSWNCM.NET

          Destination data file    :

          Algorithm                : STANDARD










F          F          F          F          F          F         F            F HELP
1          2          3          4          5          6         7 TAKE OVER 8 CHOICE
```

FMS planning

During FMS planning, the communication relationship list KBL is defined. For control of the selection and the time of the communication services to be furnished from CP5431 through the S5 user program, the acyclical data traffic has to be planned. Only through this will the consistency of the read in measured values be ensured during a program processing cycle.

1. CP connection planning: Edit –> Connections –> FMS connections

Kind of connection:
- MSAZ: acyclical Master-Slave connection.

Monitoring interval:
- Acyclical connections can be monitored by the CP5431. The transmission interval time is calculated from the entered transmission interval multiplied by 10 ms. The value 0 means: no monitoring.

SSNR:
- The interface number SSNR is the tile number of the CP forming the interface between CPU and CP. The interface number must be unique for all orders via one connection and is therefore entered only once, the adjustment range is 0 …3.

ANR:
- Order number. Note: odd order numbers (1 and 3) are client orders. They must be enquired with a SEND handling component (stating the respective ANR/ANZW).

Unconfirmed orders:
- This field remains empty as this is reserved for the service "Indicate variable" and this is no Gateway function.

Local LSAP:
- The Service Access Point (SAP) for the CP5431. With MSAZ (Master-Slave acyclical) connections this value is set automatically to the Poll-SAP 58.

Strange LSAP:
- This is the SAP from VEGACOM 557 Gateway. The values 0 … 5 are permitted.

Strange L2 address:
- The instrument address of VEGACOM 557 Gateway. This address has to correspond with the address setting on the Gateway.

max. PDU length:
- The max. telegram length must be set to 241.

Password:
- No entry or 0, no password

Access to variables:
- No entries. No type test possible, as the read in measured values are structures.

```
CP Connection planning                    Source C:QMESSW
_______________________________________
    Communication referenc:   2        Kind of connection        :  MSAZ

Order planning                         Monitoring intervall      :  0 * 10 ms
    SSNR:   0
    ANR :   1
    ANZW:   MW 100

    unconfirmed  orders:

local connection planning
    local LSAP            :  58            max. PDU-length      : 241

distant connection planning
    Strange LSAP          : 0              strange L2-address   : 12
    Password              :

Access to variables ( GET OV )




F         F         F          F          F            F          F            F HELP
1 +1      2 -1      3 INPUT    4 REP VAR  5 DELREPVAR  6 DELETE   7 TAKE OVER  8 CHOICE
```

Transmission of the data base to CP

Menu: Load –> CP data base transfer –> FD-CP

If the CP parameter setting is finished, the data base must be transferred to the communication processor:
- provide connection PC/programming device with CP5431
- stop CP with "Load –> CP Stop"
- transfer parameter data base to the CP: Load –> CP data base transfer –> FD-CP
- set CP to operating condition with "Load –> CP Start"

Important:
The new data base is only active after switching off the voltage supply of the CP (mains component) and switching it on again.

4.4 S5 functional components for data exchange between AG and CP

To ensure the data exchange between the S5 application (AG) and the communication processor (CP), the AG is equipped with integrated functional components (FB). These are described in detail in the Siemens automation manual and are only explained briefly here. With this FB, orders are transferred to the CP and data received from the CP are collected.

A description of the necessary integrated functional components follows. Each FB requires an interface and an order number as parameter which was determined with the CP parameter setting (see: FMS planning).

Parameters

SSNR	Interface number
A-NR	Order number
ANZW	Indication word
DBNR	Data component number
QANF / ZANF	Relative initial address within the type
QLAE / ZLAE	Number of source/destination data
PAFE	Parameter setting error
BLGR	Block size

Indication word ANZW
The indication word consists of 3 groups

Bit			7	6	5	4	3	2	1	0
Meaning	free	Error message	Data administr.				Status administr.			

Status administration:
Bit 0: Handshake useful
Bit 1: Order running
Bit 2: Order ready without error
Bit 3: Order ready with error, cause of error is stated in the error message

Dat administration:
Bit 4: Data acceptance running
Bit 5: Data transfer being effected
Bit 6: Data acceptance being effected
Bit 7: Disable data block

Failure message:
0: No failure
1: Wrong type information in the functional component
2: Storage area not available
3: Storage area too small
4: Delayed acknowledgement
5: Failure in the indication word
6: Invalid source/destination parameters
A: Connection error
B: Handshake error
C: System error
D: Blocked data block
E: Order cannot be processed
F: Connection or ANR not specified

FB244: SEND component

This functional component gives a transmission command to the CP. The CP initiates the PROFIBUS FMS Read service to read out the measured values

FB244: SEND

Parameter	Format	Description	Example
SSNR	KY	Interface number	KY 0,0
A-NR	KY	Order number	KY 0,1
ANZW	MW	Indication value	MW 2
QTYP	KC	Source type: Data component	KC DB
DBNR	KY	Data component number	KY 0,240
QANF / ZANF	KY	Relative initial address within the type	KY +20
QLAE / ZLAE	KF	Number of source/destination data	KF +15
PAFE	MB	Parameter setting error	MB 255

In the example, an order is given to the CP. The order block describes the CP order and can be found in the data component DB240 from data word DW20 with a length of 15 data words. The parameters ANZW and PAFE deliver status and failure information for processing (here MW2 or MB 255).

FB245: RECEIVE component

The functional component FB245 gives a receive order to the CP. A difference is made between the orders RECEIVE and RECEIVE_ALL. With RECEIVE_ALL (A-NR is 0) receipt data of individual emission orders are received and the order RECEIVE_ALL is recommended here to read in measured values. The information in which data component the received data should be saved, was provided previously with the transmission order. Therefore no further parameters are necessary for RECEIVE_ALL.

Important:
To ensure that the receive data can be always accepted from AG, the FB245 (RECEIVE_ALL) must be called up with each program cycle, even if no transmission order was given immediately before.

FB245: RECEIVE_ALL (A-NR=0)

Parameter	Format	Description	Example
SSNR	KY	Interface number	KY 0,0
A-NR	KY	Order number	KY 0,0
ANZW	MW	Indication value	MW 2
QTYP	KC	Source type : Data component	KC NN
DBNR	KY	Data component number	KY 0,0
QANF / ZANF	KY	Relative initial address within the type	KY +0
QLAE / ZLAE	KF	Number of source/destination data	KF +0
PAFE	MB	Parameter setting error	MB 255

In this example, received data are transferred to AG

4.4.4 FB247: CONTROL component

With the CONTROL component, the indication word ANZW and the failure indication PAFE are updated. Status in failure information can be read in for further processing.

This FB must be applied before calling up a transmission order (FB244). FB244 must be called up only if no transmission order is running. This is done by evaluation of the indicating word. This prevents the transmission order from not being accepted due to an inadmissible CP status.

FB247: CONTROL

Parameter	Format	Description	Example
SSNR	KY	Interface number	KY 0,0
A-NR	KY	Order number	KY 0,1
ANZW	MW	Indication value	MW 2
PAFE	MB	Parameter setting error	MB 255

In this example, the current indication word is saved in marker word 2 and the current failure indication in marker byte 255.

FB249: SYNCHRONOUS component

By calling up this component, the AG-CP interface is initialised. Here the max. block size is stated, which can be exchanged between AG and CP when calling up a functional component. In this case, the block size must be 5 (BLGR=5: 256 Byte block size).

FB249 must be called up in the organisation components OB21 and OB22.

FB249: SYNCHRONOUS

Parameter	Format	Description	Example
SSNR	KY	Interface number	KY 0,0
BLGR	KY	Block size	KY 0,5
PAFE	MB	Parameter setting error	MB 255

4.5 S5 program for reading in measured values

To facilitate reading in of measured values via VEGACOM 557 PROFIBUS FMS, you will find a S5 program (file: MESSW@ST.S5D) on the included diskette. It consists of three functional components (FB210-212) and a data component DB240 which should be taken over in your S5 application.

In this way, it is possible to read in up to 156 measured values via VEGACOM 557 PROFIBUS FMS. Since, depending on the application, it is not necessary to read in all measured values, they are divided into 16 measured value blocks with 16 measured values each. The supplied functional components support reading in of all measured values, individual blocks or individual measured values.

Note:
In these functional components the interface number 0 and order number 1 are used. In your application other values might be necessary. These values relate to adjusted values in the CP connection planning (see FMS planning) and must be adapted, if necessary. In addition, marker byte 0 and 255, as well as marker byte 2, are used by the program.

Functional components:

FB 210:	R-MW-ALL	Read in all 256 measured values (16 measured value blocks)
FB 211:	R-MW-BLK	Read in one measured value block (16 measured values)
FB 212:	R-MW	Read in individual measured value

Data components:

DB240:	Basic settings, order blocks for CP5431
DBxxx-yyy:	Data components for measured values, one DB per measured value block Standard setting: xxx = 220; yyy = xxx + 16 = 235 Setting of xxx in DB240 in DW0

Measured values from DISBUS

On DISBUS up to 15 bus participants can be connected, whereby each DISBUS participant provides less than 16 measured values (between 4 and 7 measured values).

The bus addresses 1 … 15 must be configured on the VEGAMET instruments. Bus address 0 is not permitted, i.e. the measured values are between the second measured value block (for VEGAMET with bus address 1) and measured value block 16 (VEGAMET with bus address 15). No measured values are saved on DISBUS in measured value block 0.

For reading in measured values via the DISBUS, the use of functional component FB211 is recommended, if specific measured values of a DISBUS participant should be read in. With functional component FB210, all 16 measured value blocks are read in. This is a special advantage if many bus participants are connected.

VEGAMET bus address	Measured values in measured value block
0, not permitted	–––
1	2
2	3
…	…
15	16

Saving of DISBUS measured values in measured value blocks.

Measured values from LOGBUS

On LOGBUS, the image of the measured values is read in from the CPU card. The measured values are read in starting from measured value block 1. For reading in the complete image (256 measured values), the use of functional component FB210 is recommended. Individual measured values can be read in with functional component FB212.

Diskette

The diskette contains the CP parameter settings and the components necessary to read in the measured values described in this document. You should therefore read in the functional and data components from the diskette and not enter them line per line in the STEP5 Editor.

The following files are saved on the diskette:

MESSWNCM.NET	Mains file
MESSWNCM.BPB	
MESSW@ST.S5D	Functional and data components (FB210-212 and DB240)
MESSW@XR.INI	Reference list (cross-reference map)
QMESSW	CP parameter setting data base
MESSW_ZF.SEQ	Assignment error list: conversion from *Z0.SEQ to *Z0.INI
MESSW_Z0.SEQ	Sequential assignment list
MESSW_Z0.INI	Symbolic file, converted assignment list
MESSW_Z2.INI	
MESSW_Z1.INI	

DB240: Basic settings

In this DB, the basic settings and order blocks for CP5431 are determined. Here, only the Start-target DB (data word 0) may be modified. All other parameters may not be modified.

Start-target DB:
- By this, when using FB210 (read in all measured values) the first data component for saving the measured values can be stated. Since 16 measured value blocks are read in, 16 data components must be reserved by the Start-target DB.

```
DB240   C:MESSW@ST.S5D                          LAE=40  /64   Blatt 1
                                             —— basic adjustment ——
    0:    KY = 000,220;                 Start-target DB (meas. value: DB 220-235)*
    1:    KY = 000,015;                 Start-target DB (meas. value: DB 220-235)*
    2:    KH = 1000;                    Start Index for 1. meas. value block
    3:    KY = 000,000;                   reserved
    4:    KC ='V-RE';                   — READ-corder, Sub Index—
    6:    KF = +00100;                    Time out
    7:    KH = 0000;                      reserved
    8:    KC ='DB';                     destination, identification
    9:    KY = 000,220;                   destination DB
   10:    KF = +00000;                    Offset
   11:    KC ='AR';                       Data type Array
   12:    KF = +00016;
   13:    KC ='OS';
   14:    KF = +00006;
   15:    KC ='VF';
   16:    KY = 003,004;                 ID=3, Len=4; Index with Subindex
   17:    KF = +04096;                    variable Index
   18:    KY = 000,001;                   Subindex
   19:    KY = 000,000;                 —Read-order without SubIndex—
   20:    KC ='V-RE';                   — Read order without SubIndex —
   22:    KF = +00100;                    Time out
   23:    KH = 0000;                      reserved
   24:    KC ='DB';                     destination, identification
   25:    KY = 000,220;                   destination DB
   26:    KF = +00000;                   destination Offset
   27:    KC ='AR';                       Data type Array
   28:    KF = +00016;
   29:    KC ='OS';                     type of element, Octett-String
   30:    KF = +00006;
   31:    KC ='VF';
   32:    KY = 002,002;                 ID=2, Len=2: Index without SubIndex
   33:    KF = +04096;                    Index
   34:    KY = 000,000;                  ———————————————
   35:
```

* Can be modified.

Saving of measured values blocks in measured value data components

For saving the measured values, the data components DB220 to DB235 are set as a standard feature. The Start data component can be set in DB240 in DW0 (standard: 220). The next 16 data components must be reserved for the measured values.

DB (measured value block) = Start data component + measured value block -1

Start data component = 220 (standard setting); measured value block = 1 … 16

Initialisation of the measured value data components (DB 220-235)

Each measured value block is saved in a data component. For the 16 measured value blocks, 16 data components with 16 measured values each are required. As a standard feature, data components DB220 to DB235 are set. The Start data component can be set in DB240 in DW 0 (standard: 220). The next 16 data components must be reserved for the measured values. The initialisation values must be entered in the data components.

A measured value consists of 4 octetts and one index and status information (6 octetts = 3 data words)

Index Status HI/LO (1 octett)
Measured value (4 octetts)

```
DB220-235   C:MESSW@ST.S5D                          LAE=53  /4

    0:     KH = FFFE; Index=FF Status=FE
    1:     KH = 0000;                                Meas. value 1
    2:     KH = 0000;
    3:     KH = FFFE;
    4:     KH = 0000;                                Meas. value 2
    5:     KH = 0000;
    6:     KH = FFFE;
    7:     KH = 0000;                                Meas. value 3
    8:     KH = 0000;
    9:     KH = FFFE;
   10:     KH = 0000;                                Meas. value 4
   11:     KH = 0000;
   12:     KH = FFFE;
   13:     KH = 0000;                                Meas. value 5
   14:     KH = 0000;
   ...        ...                              ...
   45:     KH = FFFE;
   46:     KH = 0000;                                Meas. value 16
   47:     KH = 0000;
```

Assignment list

Menu: Editor –> Assignment list (F7 key)

The functional components FB210 and FB212 require operating variables (marker words). Symbolic words were assigned to these variables, so that the index word address can be modified easily if the stated index words (MW10 and MW 252) are already used in your application.

```
Seq. Datei: C:MESSW_Z0.SEQ     Zeile:   1       - input mode -   143 kB
    Operand   Symbol   comment
   MW 10     MW_BLKNO meas. value block number
    MW 252    MW      index word

F Text 1  F Text 2  F Text 3  F Text 4  F  Modus  F page >  F page < F Help
1  Note  2 Copy  3 Delete 4  Search 5 Replace 6 Save 7 Take over 8 interrupt
```

FB249: Synchronize communication interface

During a program restart, the synchronous component FB249 must be called up for initialisation of the communication interface in OB21 and OB22:

```
Network 1       0000
0000     :SPA FB 249
0002 Name :SYNCHRON
0004 SSNR :   KY 0,0                  Interface number 0
0006 BLGR :   KY 0,5                  Block sieze 5 = 256 Byte
0008 PAFE :   MB 254
000A      :
000C     :BE
```

FB210: Read in all measured values

With this functional component, all 256 measured values (16 measured value blocks) are read in.

Important information:
The interface number and the order number must be adapted to your application if necessary. These values relate to the values set in the CP connection planning.

Call:
The functional component must be called up in every program cycle.

```
    : SPA FB 210
Name: R-MW-ALL
```

Saving of the measured values in data components:
The 16 measured value blocks are each saved subsequently in one data component. The Start data component is set in the basic adjustment to 220 and can be modified in DB240.

```
DB  = Start-aim-DB  (standard adjustment = 220)
Meas. value-Block = 1
Meas. valueIndex      up from data word (Index, Status, meas. value)
1  DW 0
2  DW 3
3  DW 6
...    ...
15 DW 42
16 DW 45


DB  = Start-aim-DB + 1  (standard adjustment = 221)
Meas. value-Block = 2
Meas. value Index     up from data word (Index, Status, meas. value)
17 DW 0
18 DW 3
19 DW 6
...    ...
31 DW 42
32 DW 45

       etc.

DB  = Start-aim-DB + 15 (standard adjustment = 235)
Meas. value-Block = 16
Meas. value Index     up from data word (Index, Status, meas. value)
240    DW 0
241    DW 3
242    DW 6
...    ...
255    DW 42
256    DW 45
```

Listing

```
FB 210                          C:MESSW@ST.S5D                  LAE=93
                                                                Blatt   1

Network 1       0000
Name :R-MW-ALL

000A      :A   DB 240                     ******************************
000C      :                               * This function component      *
000E      :O   M    0.0                   * enquires all 256 meas. values *
0010      :ON  M    0.0                   * in data components (def. in  *
0012      :SPA FB 247                       * DB 240).                   *
0014 Name :CONTROL
0016 SSNR :    KY 0,0
0018 A-NR :    KY 0,1
001A ANZW :    MW   2
001C PAFE :    MB 255
001E      :
0020      :U   M    3.1
0022      :SPB =REC                        order runs
0024      :
0026      :
0028      :                               —— inkr. MW-block number——
002A      :L   MW  10    -MW_BLKNO
002C      :L   DW   1                      No. of meas. value blocks-1
002E      :>=F
0030      :SPB =M1
0032      :L   MW  10    -MW_BLKNO
0034      :I        1
0036      :T   MW  10    -MW_BLKNO
0038      :SPA =M2
003A M1   :L   KH 0000
003E      :T   MW  10    -MW_BLKNO         MW_BLKNO = 0
0040      :
0042      :                               —— Determine aim-DB ————
0044 M2   :
0046      :L   MW  10    -MW_BLKNO         Aim DB = Start DB + MW_BLKNO
0048      :L   DW   0                      Start aim-DB
004A      :+F
004C      :T   DW  25                      Aim DB in Read-order
004E      :
0050      :
0052      :                               —— Index for order DB ——
0054      :L   DW   2                      Start Index
0056      :L   MW  10    -MW_BLKNO         Index = Start Index + MW_BLKNO
0058      :+F
005A      :T   DW  33                      Write Index
005C      :
005E      :
0060      :
0062 READ :                               —— READ-order to CP ——
0064      :O   M    0.0
0066      :ON  M    0.0
0068      :SPA FB 244
006A Name :SEND
006C SSNR :    KY 0,0                      interface no. = 0
006E A-NR :    KY 0,1                      order number  = 1
0070 ANZW :    MW   2
0072 QTYP :    KC DB                       Order in DB 240 up to DW 20
0074 DBNR :    KY 0,240
```

```
FB 210                          C:MESSW@ST.S5D                LAE=93
                                                              Page 2
0076 QANF :    KF +20
0078 QLAE :    KF +15
007A PAFE :    MB 255
007C      :
007E      :
0080      :
0082      :
0084      :
0086      :
0088      :
008A      :
008C      :
008E      :
0090      :
0092 REC  :O   M    0.0
0094      :ON  M    0.0
0096      :SPA FB 245                 — RECEIVE_ALL order ——
0098 Name :RECEIVE
009A SSNR :    KY 0,0
009C A-NR :    KY 0,0                Order no.=0 -> RECEIVE_ALL
009E ANZW :    MW   2
00A0 ZTYP :    KC NN
00A2 DBNR :    KY 0,0
00A4 ZANF :    KF +0
00A6 ZLAE :    KF +0
00A8 PAFE :    MB 255
00AA      :
00AC      :
00AE      :BE

MW  10   = MW_BLKNO              Meas. value block number
```

FB211: Read in measured value blocks

With this functional component, a measured value block (16 measured values) is read in.

Important information:
The interface number and the order number must be adapted to your application if necessary. These values relate to the values set in the CP connection planning.

Call:
The functional component must be called up in each program cycle.

```
    :SPA FB 211
Name :R-MW-BLK
BLCK :    MW  30                     meas. value block number = 1..16
DB   :    MW  32                     data component for file
STAT :    MW  50                     Status

Status :       0000    =  OK
  0080 =  BLCK Error, unvalid block number
  00FF =  no reading order given to CP
```

Listing

```
FB 211                          C:MESSW@ST.S5D                LAE=114
                                                              Page 1
Network 1       0000
Name :R-MW-BLK                                    input of meas. value block
Bez  :BLCK     E/A/D/B/T/Z: E  BI/BY/W/D: W
Bez  :DB       E/A/D/B/T/Z: E  BI/BY/W/D: W
Bez  :STAT     E/A/D/B/T/Z: A  BI/BY/W/D: W

001C      :                                       ———— Parameter ——————
001E      :                                      BLCK: meas. value block no. = 1..16
0020      :                                       DB  : data component number
0022      :                                       return: STAT 0000 = OK
0024      :                                              00FF = not finished
0026      :                                              0080 = BLCK Error
0028      :A   DB 240                             ————————————————
002A      :O   M    0.0
002C      :ON  M    0.0
002E     :SPA FB 247
0030 Name :CONTROL
0032 SSNR :    KY 0,0                              interface number = 0
0034 A-NR :    KY 0,1                              order number    = 1
0036 ANZW :    MW   2
0038 PAFE :    MB 255
003A      :
003C      :U   M    3.1
003E      :SPB =REC                               Order still running
0040      :
0042      :                                        —— BLCK check ———
0044      :L   KH 0000                            permissible range : 1..16
0048      :L   =BLCK
004A      :!=F
004C     :SPB =BERR
004E      :
0050     :ADD KF -1
0054      :L   DW   1                             No. meas. blocks -1
0056      :>F
0058      :SPB =BERR                               BLCK too big
005A      :
005C      :
005E      :                                       ——— Determine aim-DB ——
0060      :L   =DB                                  Aim DB
0062      :T   DW  25                             Aim DB mention in order
0064      :
0066      :
0068      :
006A      :
006C      :
006E      :                                       ——— Index determine ———
0070      :L   DW   2                              Start Index
0072      :L   =BLCK                              Index = Start Index + BLCK -1
0074      :+F
0076      :D        1
0078      :T   DW  33                             Index mention in order
007A      :
007C      :
007E      :
0080      :                                       ——— Read order to CP ——
```

```
0082       :O   M    0.0
0084       :ON  M    0.0
0086      :SPA FB 244
0088 Name :SEND
008A SSNR :    KY 0,0                       interface number = 0
008C A-NR :    KY 0,1                        order number     = 1
008E ANZW :    MW   2
0090 QTYP :    KC DB                        order DB240 to DW 20
0092 DBNR :    KY 0,240
0094 QANF :    KF +20
0096 QLAE :    KF +15
0098 PAFE :    MB 255
009A       :L   KH 0000
009E       :T   =STAT
00A0      :SPA =REC2
00A2       :
00A4       :
00A6 REC  :L   KH 00FF
00AA       :T   =STAT
00AC       :
00AE REC2 :O   M    0.0
00B0       :ON  M    0.0
00B2       :SPA FB 245                      —— RECEIVE_ALL order ———
00B4 Name :RECEIVE
00B6 SSNR :    KY 0,0
00B8 A-NR :    KY 0,0                       order no.=0 —> RECEIVE_ALL
00BA ANZW :    MW   2
00BC ZTYP :    KC NN
00BE DBNR :    KY 0,0
00C0 ZANF :    KF +0
00C2 ZLAE :    KF +0
00C4 PAFE :    MB 255
00C6       :
00C8       :
00CA      :SPA =END
00CC       :
00CE BERR :L   KH 0080
00D2       :T   =STAT
00D4       :
00D6 END  :
00D8       :BE
```

FB212: Read in individual measured values

With this functional component, an individual measured value is read in. Saving is done in the stated data component beginning from data word offset.

Important information:
The interface number and the order number must be adapted to your application, if necessary. These values relate to the values set in the CP connection planning.

Call:
The functional component must be called up in each program cycle.

```
    :SPA FB 212
Name :R-MW
MWNR :    MW  30                            meas. value no. (Index) = 1...256
DB   :    MW  32                            data component for file
OFFS :    MW  34                            Offset in data component
STAT :    MW  50                            Status, return value

Status :       0000    =  OK
  0080 =  MWNR Error, unvalid meas. value no.
  00FF =  No. reading order passed to CP
```

Listing

```
FB 212                         C:MESSW@ST.S5D               LAE=142
                                                            Blatt   1
Network 1       0000
Name :R-MW
Bez  :MWNR     E/A/D/B/T/Z: E  BI/BY/W/D: W
Bez  :DB       E/A/D/B/T/Z: E  BI/BY/W/D: W
Bez  :OFFS     E/A/D/B/T/Z: E  BI/BY/W/D: W
Bez  :STAT     E/A/D/B/T/Z: A  BI/BY/W/D: W

0022     :                                  ————— Parameter —————
0024     :                                 MWNR: meas. value no. = 1..256
0026     :                                  DB  : Aim data component
0028     :                                  OFFS: Offset in aim DB
002A     :                                  return : STAT : 0000 = OK
002C     :                                       00FF = not processed
002E     :                                       0080 = MWNR Error
0030     :                                  ————————————————
0032     :A   DB 240                        Operating-component
0034     :
0036     :O   M    0.0
0038     :ON  M    0.0
003A    :SPA FB 247
003C Name :CONTROL
003E SSNR :    KY 0,0                        interface number = 0
0040 A-NR :    KY 0,1                        order number = 1
0042 ANZW :    MW   2
0044 PAFE :    MB 255
0046     :
0048     :U   M    3.1
004A     :SPB =M1                            Order run
004C     :
004E     :
```

```
0050      :                                  — check meas. value no. MWNR —
0052      :L   =MWNR                          range: MWNR = 1..256
0054      :L   KH 0000
0058      :!=F
005A      :SPB =ERR
005C      :
005E      :D       1
0060      :L   KF +255
0064      :<=F
0066      :SPB =OK
0068      :SPA =ERR                          Error: meas. value no. too big
006A OK   :
006C      :                                  ==== write order block ===
006E      :L   =DB
0070      :T   DW   9                          Aim DB in order
0072      :L   =OFFS
0074      :T   DW  10                         Offset from aim DB in order
0076      :
0078      :                                  — Index and SubIndex emit.—
007A      :L   =MWNR                         Calculation for MWNR=0...255:
007C      :ADD KF -1                           Index =  MWNR/16
0080      :T   =MWNR                        SubIndex=MWNR-Index*16+1(1..16)
0082      :                                   Index = Start Index + Index
0084      :
0086      :
0088      :SRW     4
008A      :T   MW 254                           Index
008C      :
008E      :SLW     4
0090      :T   MW 252    -MW                  16 * Index
0092      :
0094      :L   =MWNR
0096      :L   MW 252    -MW
0098      :-F
009A      :I       1
009C      :T   DW  18                         SubIndex in order
009E      :                                     ———
00A0      :L   DW   2                          Start Index
00A2      :L   MW 254
00A4      :+F
00A6      :T   DW  17                          Index in order
00A8      :
00AA      :L   =MWNR                           Correct MWNR
00AC      :D       1
00AE      :T   =MWNR
00B0      :                                   ——— Read order to CP ———
00B2      :O   M    0.0
00B4      :ON  M    0.0
00B6      :SPA FB 244
00B8 Name :SEND
00BA SSNR :    KY 0,0                        interface no.= 0
00BC A-NR :    KY 0,1                        order number = 1
00BE ANZW :    MW   2
00C0 QTYP :    KC DB                        order in DB240 up from DW4
00C2 DBNR :    KY 0,240
00C4 QANF :    KF +4
00C6 QLAE :    KF +16
00C8 PAFE :    MB 255
00CA      :
00CC      :L   KH 0000
```

```
00D0      :T   =STAT                       STAT = OK
00D2     :SPA =M2
00D4     :
00D6     :
00D8     :
00DA M1   :L   KH 00FF
00DE      :T   =STAT                       STAT = 00ff
00E0     :
00E2     :
00E4 M2   :O   M    0.0
00E6     :ON  M    0.0
00E8     :SPA FB 245
00EA Name :RECEIVE
00EC SSNR :    KY 0,0
00EE A-NR :    KY 0,0
00F0 ANZW :    MW   2
00F2 ZTYP :    KC NN
00F4 DBNR :    KY 0,0
00F6 ZANF :    KF +0
00F8 ZLAE :    KF +0
00FA PAFE :    MB 255
00FC     :
00FE      :SPA =M3                         End
0100     :
0102     :
0104 ERR  :L   KH 0080
0108     :T   =STAT
010A     :
010C     :
010E     :
0110 M3   :BE

MW 252   = MW2                   index word 2
```

Transfer components to AG

Menu: Object –> Components –> Transfer –> File AG or F5

After the functional components FB210 or FB211 or FB212 and the data component DB240 have been transferred to their own application, the S5 application has to be transferred to the automation device.

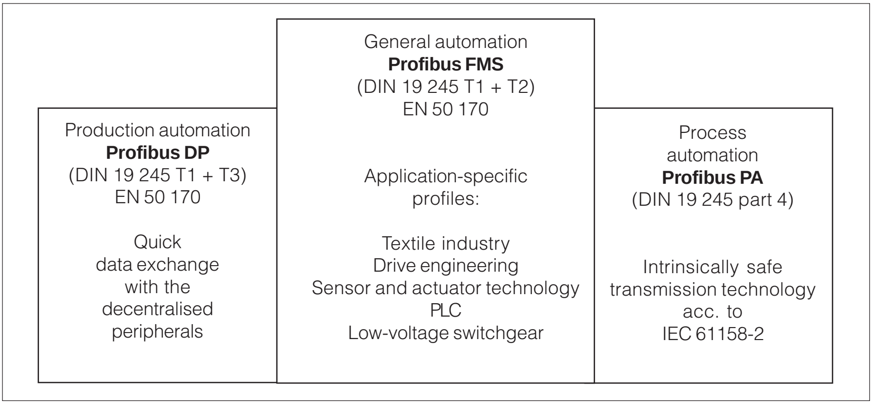
- create connection between PC/programming device and AG
- transfer components to AG: F5 key

To activate a new application: Set AG with switch to STOP and then to RUN.

5 Supplement

5.1 General information on PROFIBUS

Note:
This chapter is an excerpt of the PNO documentation PROFIBUS, and is to be used only as an informational aid.



PROFIBUS consists of three versions for different applications:

Profibus FMS
The FMS services (Fieldbus Message Specification) open a wide application range, offer considerable flexibility, and ensure that comprehensive communication tasks with cyclical or acyclical data traffic can be managed at medium speed.

Since 1990, Profibus FMS is published as standard in DIN 19 245, part 1 and part 2. Along with the European Fieldbus standardisation, Profibus FMS will be integrated in the European Fieldbus standard EN 50 170.

Profibus DP
This speed-optimised Profibus version (DP = decentralised periphery) is especially suitable for communication between automation systems and the decentralised peripherals.

Profibus DP is based on DIN 19 245 part 1 and user-specific extensions determined in the German standardisation draft DIN 19 245 part 3 (published 1993). Along with the European Fieldbus standardisation, Profibus DP is integrated in the European Fieldbus standard EN 50 170.

Profibus PA
Profibus PA (PA = process automation) is the Profibus version for applications in process automation. Profibus PA uses the intrinsically safe transmission technology determined in IEC 61158-2, and enables remote power supply to the participants via the bus on a two-wire cable.

Profibus PA enables the connection of sensors and actuators to a common bus cable (also in hazardous areas).

Instrument profiles determine the instrument-specific functions.

Basic properties of Profibus FMS and Profibus DP

PROFIBUS determines the technical and functional properties of a series field bus system, through which distributed, digital field automation instruments in the lower (sensor/actuator level) up to the medium (cell level) power range can be connected. PROFIBUS distinguishes between Master and Slave instruments.

Master instruments determine the data traffic on the bus. A master can send messages without external request, provided the master is authorised for bus access. In the Profibus protocol, masters are also called active participants.

Slave instruments are low-expenditure peripherals. Typical slave instruments are sensors, actuators, transmitters. They do not receive authorisation for bus access, i.e. they are only allowed to acknowledge received messages or transmit messages to a master on its request. Slaves are also called passive participants. They require only a small portion of the bus protocol, and as a result, a very low-expenditure implementation of the bus protocol is ensured.

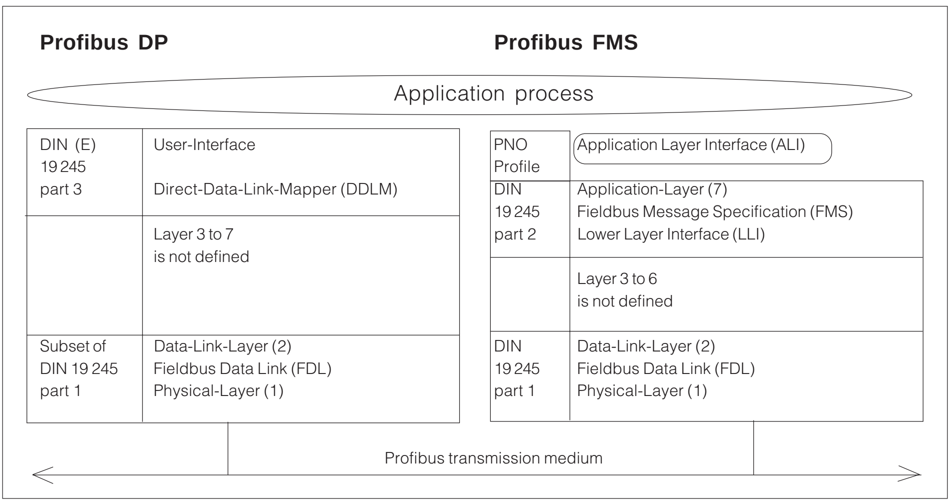
Protocol architecture

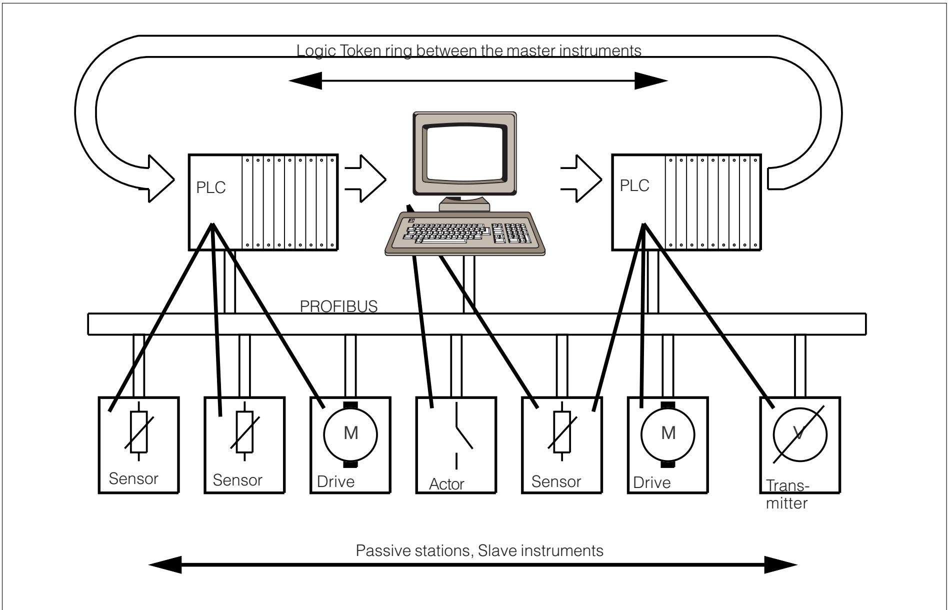
PROFIBUS is based on a number of approved international and national standards. The protocol architecture orients itself on OSI (Open System Interconnection) multilayer system, according to the international standard ISO 7498. The architecture of the Profibus FMS and the Profibus DP protocol is shown in figure 2.

PROFIBUS layer 1 (Physical Layer)
The application range of a field bus system is mainly determined by the selection of the transmission medium and the physical bus interface. Beside the demands on the transmission reliability, the expenditures for procurement and installation of the bus cable are of great consequence. That's why the Profibus standard makes provision for different versions of transmission technology, while keeping to a single, uniform bus protocol.

PROFIBUS layer 2 (Data Link Layer)
The second layer of the OSI multilayer system realises the functions of the bus access control and data backup, as well as the managing of transmission protocols and telegrams. Layer 2 is called Fieldbus Data Link (FDL) with PROFIBUS.

Protocol architecture





Hybrid bus access procedure

Therefore, the Profibus access procedure includes the Token-Passing procedure for communication among complex bus participants (Master), and underlies the Master-Slave procedure for communication of the complex bus participants with low-expenditure peripherals (Slaves). This combined procedure is called hybrid bus access procedure (see figure 3).

The **Token-Passing procedure** empowers the Token to distribute the bus access authorisation within an exactly defined time frame. The Token message, a special telegram for transmission of the dispatch authorisation from one Master to the next Master, must be transferred to each Master in sequence with a (parameter definable) max. Token circulation period. The Token-Passing procedure is used on the PROFIBUS only between the complex participants (Master).

The **Master-Slave procedure** enables the master (active participant), currently in possession of the dispatch authorisation, to contact its allocated Slave instruments (passive participant). The master has here the option of transferring messages to the slaves or collecting messages from the slaves.

Figure 3 shows a Profibus structure with three active participants (masters) and seven passive participants (slaves). The three master instruments form a logic token ring.

The PROFIBUS layer 2 operates without a connection. It enables, beside the logic point-to-point data transmission, also the multiple point transmission with broadcast and multicast communication.

With **broadcast communication,** an active participant emits an unacknowledged message to all other participants (Master and Slaves).

With **multicast communication,** an active participant emits an unacknowledged message to a group of participants (Master and Slaves).

5.2 Special information on PROFIBUS-FMS

PROFIBUS-FMS enables the communication among automation devices as well as the communication of the automation devices with the intelligent field devices. Here the possible functionality is more important than a short system reaction time. In many applications the data exchange is mainly made acyclically on request of the application process.

PROFIBUS layer 7 (Application Layer)

Layer 7 of the ISO/OSI multilayer system provides the communication services which are available to the user. These application services enable efficient, open data traffic between application processes. The PROFIBUS application layer is specified in DIN 19 245 part 2 and consists of:
- Fieldbus Message Specification (FMS) and
- Lower Layer Interface (LLI).

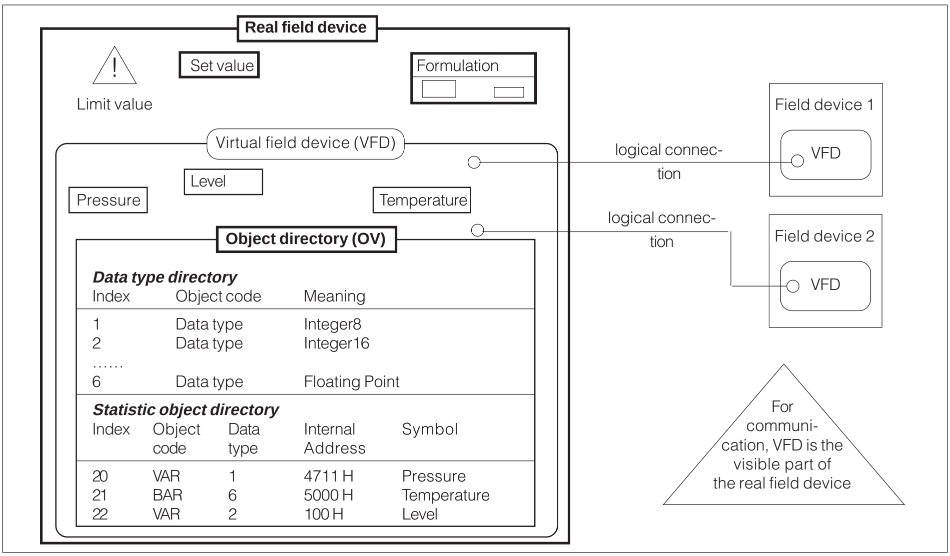
FMS describes the communication objects, the application services and the resulting models from the communication partner's view.

LLI is used for adaption of the application functions to the various characteristics of PROFIBUS layer 2.

PROFIBUS communication model

An application process comprises all programs, resources and tasks not assigned to a communication layer. The PROFIBUS communication model enables the unification of distributed application processes to one complete process through communication relationships.

The part of an application process in a field device which can be reached via the communication is called virtual field device (VFD).



Virtual field device (VFD) with object directory (OV)

The image of the functions of VFD to the real device is provided in the PROFIBUS communication model by the Application Layer Interface (ALI). Image 4 shows the correlation between the real field device and the VFD. In this example, only the variables pressure, level and temperature are part of the VFD and can be read and written via the two communication relationships.

All communication objects of a PROFIBUS participant are entered in its own local object directory. In simple devices, the object directory (OV) can be pre-defined. In complex instruments, the object directory is projected and loaded into the device locally or remotely. The OV contains description, structure and data type as well as the assignment between the instrument-internal address of the communication objects and the name on the bus (Index/Name).

The OV consists of:
- Header (contains information on the structure of the OV)
- List of the statistic data types (list of the supported statistic data types)
- Statistic object directory (contains all statistical communication objects)
- Dynamic list of the variable list (list of the currently known variable lists)
- Dynamic program list (list of the currently known programs)

The individual sections of the OV must be only available if the instrument also supports the respective functions.

In PROFIBUS the logical addressing is determined as preferred method for the addressing of the communication objects. There, the access to the communication objects is done via a short address, the so-called index. The index is a number of the type Unsigned 16. By this, efficient telegrams are enabled and the protocol overhead is reduced. An index is determined in the OV for each communication object. The logical addressing must be supported by all PROFIBUS participants.

In addition, PROFIBUS-FMS enables the following optional addressing procedure for special applications:
- The **addressing with names**: Here, the symbolic name of the communication objects is transferred via the bus.
- The **physical addressing**: Here, an individual physical storage address with the services Physical-Read and Physical-Write can be accessed in the field instruments.

PROFIBUS-FMS services

From the point of view of the application process, the communication system provides a service, the so-called FMS-services. The handling of these services is described by service primitives. They represent an interaction between requester and responder.

Figure 5 gives an overview of the available PROFIBUS services.

The large number of available PROFIBUS application services is used to fulfil the manifold communication requirements of widely differing field instruments. Only a few application services must be implemented. The selection of further services depends on the respective application. This selection is determined in so-called profiles specifically for the respective application.

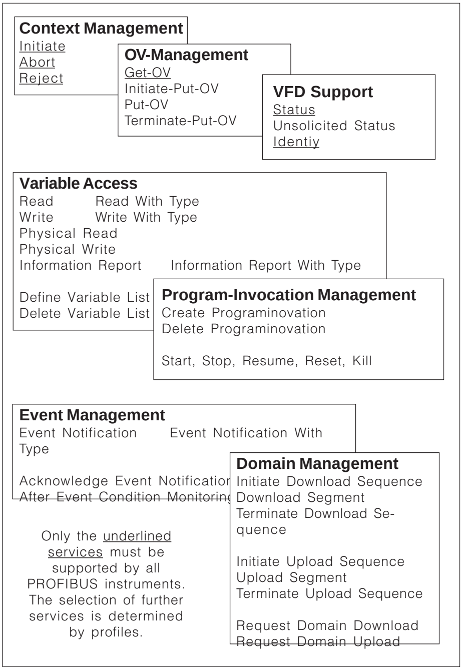


Fig. 5 PROFIBUS-FMS services

Lower Layer Interface (LLI)

The adaption of layer 7 to layer 2 is realised by LLI. LLI takes over the flow control and the connection monitoring as well as the image of the FMS services on layer 2 by considering the different instrument types (Master/Slave).

The user communicates with other application processes via logical channels, the **communication relationships**. For handling of FMS and FMA7 services, LLI provides different types of communication relationships. The communication relationships differ with respect to their connection qualities (monitoring mechanisms, means of transmission and requirements on the communication partners). The selection is made according to the requirements of the application processes. Figure 6 gives a summary of all possible communication relationships.

Communication relationship list

All communication relationships of a PROFIBUS-FMS device must be entered in the communication relationship list (KBL). The KBL contains their description. For simple participants, the list is predefined by the manifacturer. In all other cases, the KBL is projected and loaded locally or remotely by means of the network management services.

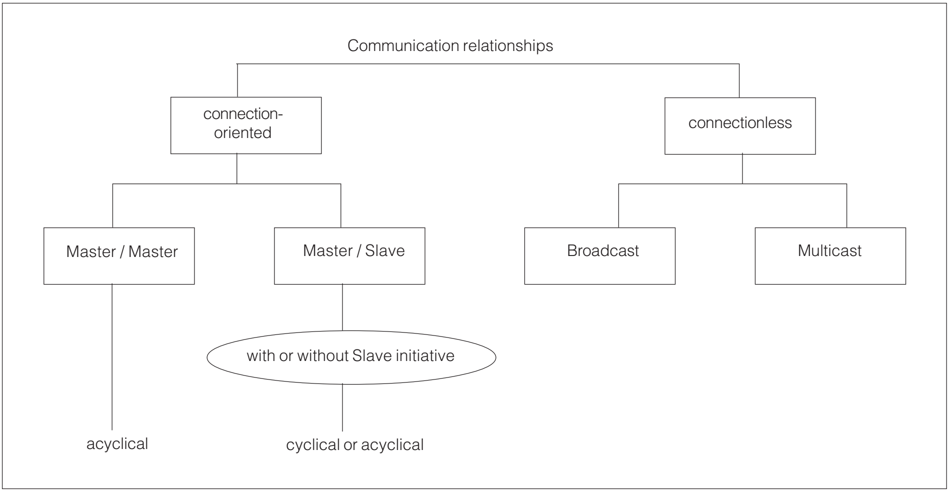
From the application process, a communication relationship is addressed by a local short designation, the **communication reference** (KR).

From the bus layer, a communication relationship is addressed by the participant address, layer 2 service access point and LLI service access point.

The KBL contains the assignment between the local communication references, layer 2 and LLI addressing. In addition the communication context (selection of the services, telegram lengths …) and the applicable monitoring mechanisms are stated specifically for each KR.

Function overview for PROFIBUS-FMS

1 Object oriented Client-Server model
2 Efficient FMS services (field bus specific optimisation of the MMS services)
   - completion and clearing of logical connections (Context Management)
   - reading and writing of variables (Variable Access)
   - loading and reading of storage areas (Domain Management)
   - linking, starting and stopping of programs (Program Invocation Management)
   - transfer of event messages with high or low priority (Event Management)
   - status call and instrument indication (VFD Support)
   - services for administration of the object directory (OV Management)

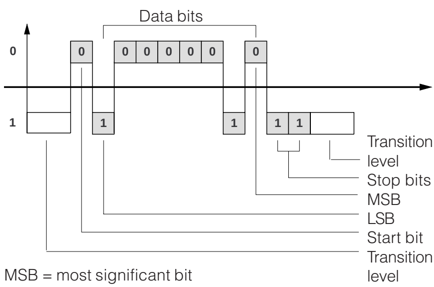


Overview of all possible communication services

3 Field bus relating type of communication relationships
  - Master-Master connections
  - Master-Slave connections for cyclical and acyclical data traffic
  - Master-Slave connections for cyclical or acyclical data traffic with Slave initiative
  - connectionless communication relationships
4 Connection attributes (open, defined, initiator)
  - point-to-point or Multicast/Broadcast communication
  - automatic connection monitoring with adjustable monitoring interval
5 Local and remote network management functions
  - Context Management
  - Fault Management
  - Configuration Management
6 Master and Slave instruments, mono or Multi-Master system configurations
7 Max. 240 bytes of data possible with each service (protocol overhead not included)
8 Bus structure enables non-reactive coupling and decoupling of stations

5.3 Short description of the standard interfaces RS 232, RS 422 and RS 485

The standard interfaces RS 232, RS 422, RS 485 used in VEGACOM 557, depending on the version, transmit the data serially and asynchronously in bit form. Thus, the conditions "0" and "1" are transmitted by defined voltage levels. Usually, the transition level corresponds to a logic "1". The respective levels are specified in the following information according to the individual interfaces.



MSB = most significant bit
LSB = least significant bit
Number of data bits = 8

Standard data transmission

A parity bit can follow the last data bit which is used for detection of transmission errors. The parity bit ensures that with
- EVEN parity always an even number of bits
- ODD parity always an odd number of bits
is transmitted.

A so-called handshake can be used to release or interrupt the data transmission.

Hardware handshake:
The receiver controls via its handshake outputs DTR or DSR the handshake inputs CTS or DSR of the emitter.

Software handshake:
The receiver emits special characters to the transmitter and with this, controls the data transfer.

Although there is no standard for the interfaces **RS 232, RS 422 and RS 485,** they can be considered as a standard because they have gained acceptance as an industrial standard.

The interface **RS 232** transmits the individual bits of a character as a sequence of defined voltage levels via one cable.

Therefore:
- a voltage level of -15 V … -3 V corresponds to a logic "1"
- a voltage level of +3 V … +15 V to a logic "0".

Both levels are related to a common signal ground (GND). The permissible ohmic load must be more than 3 kOhm, the permissible capacitive load can be max. 2500 pF.

The main characteristics of an RS 232 interface are
- reduced cable length (max. 15 m to 9600 baud)
- low data rates (max. 19200 baud)
- only point-to-point connection

For industrial applications, the provided handshake signals are usually not necessary. In such case, the handshake inputs are simply connected to the handshake outputs of the same instrument (release level).

The interface **RS 422** transfers the data as a voltage difference between two corresponding cables. Signal earth as grounding is not required. One pair of wires, consisting of an inverted and a non-inverted signal line, is required for the transmitted, as well as for the received signal. Possible common-mode interferences cause a symmetric shift of the voltage level and cannot deteriorate the useful signal.

Thanks to the higher interference immunity compared to RS 232, distances up to 1200 m and high data rates up to 10 Mbits can be reached. The interference immunity can also be seen on the permissible voltage levels: with an output level of ±2 V from the transmitter under load, the receiver components still accept a level of ±200 mV as a valid signal.

One special feature of the RS 422 is that it allows the unidirectional connection of up to 10 receivers on one transmitter. With higher transmission rates and/or large distances, a termination (adaption of the wave resistance) is necessary and a galvanic separation of the transmitter/receiver components is highly recommended.

The interface **RS 485** represents an extension of the RS 422 concept to a bus-compatible system, whereby the physical differences are negligible.

The bus system can include up to 32 participants, i.e. 1 master and 31 slaves. A protocol ensures that at any time a maximum of one participant is active as a transmitter, while all others are switched to a passive state. For transmission and reception, only one cable pair is required, which is run in an alternating cycle. With 10 Mbits/s as data rate and 1200 m as max. distance, the data correspond to those of the RS 422 interface.

To ensure immunity against (inevitable for large distances) potential shifts, a galvanic isolation of the transmission/reception component is highly recommended. A termination is generally necessary, independent of data rate and distance.

In some cases, the TTY interface (also called 20 mA or Current Loop) is also used. The data are transmitted by switching on and off a current of 20 mA in a cable loop in the cycle of data bits. This interface, however, is not subject to any standardisation and thus must be planned in detail. With galvanic separation, distances up to 1000 m with data rates of 300 … 9600 baud can be transmitted safely.

Conclusion

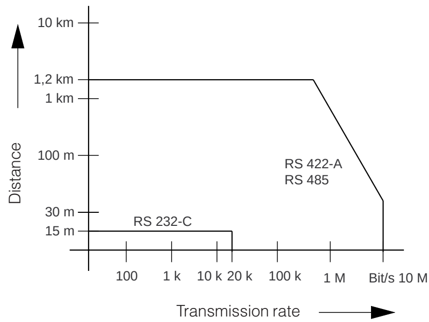
Main charactersitics of interfaces acc. to RS 232 are:
- reduced cable lengths
- low data transmission rates
- only point-to-point connection

Main characteristics of interfaces acc. to RS 422 and RS 485 are:
- greater cable lengths
- high data transmission rates
- basis for bus systems

Table: Comparison of important interface data

Interfaces	**RS 232 C**	**RS 422 A**	**RS 485**
Transmission	asym.	symmetr.	symmetr.
Number of drivers	1	1	32
Number of receivers	1	10	32
Transmission distance	15 m	1200 m	1200 m
max. transmission rate	20 KBit/s	10 MBit/s	10 MBit/s
Emitter			
Permissible driver output voltage	±25 V	-0,25…6 V	-7…12 V
Driver output signal			
- without load	±15 V	±5 V	±5 V
- with load	±5 V	±2 V	±1,5 V
Driver load	3…7 kΩ	100Ω	54Ω
Receiver			
Input voltage	±15 V	±7 V	-7…12 V
Sensitivity	±3 V	±200 mV	±200 mV
Input resistance	3…7 kΩ	4kΩ	12kΩ

Diagram: Distance –– Transmission rate



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