Appendix to the operating manual
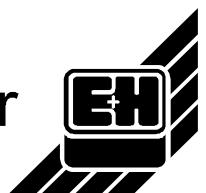
ASP 2000
DP-Slave-Module _is Pro Gate®
("Profibus coupler")

Connecting the ASP 2000 to Profibus DP
using the serial interface and the
_is Pro Gate® from ifak system GmbH

Endress+Hauser

Unser Maßstab ist die Praxis

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1 General

1.1 Transport damage

Please inform both your local sales office as well as the transportation company

1.2 Delivery contents

- These instructions
- The DP-Slave module _is Pro Gate with our manual

- Serial connection cable for the ASP station 2000
- Diskette containing the GSD file and bitmaps

If some components are found to be missing please immediately inform your supplier!

Please take note of the following characters:

Note: ✏️ suggestions for better commissioning

Attention: ⚠️ if this advice is not followed it could lead to malfunction or even damage to the unit!

1.3 Abbreviation index/phraseology explanation

Profibus coupler: The phrase **Profibus coupler** will be used instead of _is Pro Gate.

Profibus master: All units such as PLCs, PC cards that are used in a Profibus-DP master function are called
Profibus master in these instructions.

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2 Installation

2.1 Conditions

This option can only be used when:
- ASP 2000 software version 4.10 /Profibus coupler firmware V1.51 or newer is used
- Together with the 7 programme software

✎ **Note:** The Profibus coupler is connected to the RS232 serial interface of the ASP 2000.
In order that the ASP 2000 recognises the coupler the ASP 2000 Baudrate must be set to 9600.
If the ASP 2000 interface is to be used for set-up or for a software update then the jack plug must be changed at the controller and the Baudrate matched wether in ReadWin 2000 or at the unit. Also the Profibus function must be deactivated at the controller.

2.2 Terminations/connection diagram

✎ **Note:** Always leave non terminated connections free

RS232 interface:

Profibus coupler		Colour Jack plug
GND		Copper
RxD		Red
TxD		White

RS485 interface:

	Profibus coupler	
	3	Data B
RS485	8	Data A
	5	GND

Operation power supply: 24 V DC / 100 mA
The Profibus coupler is connected to the terminal PCB in the ASP 2000.
For a connection diagram of the terminal PCB see the ASP Station 2000 operating manual.
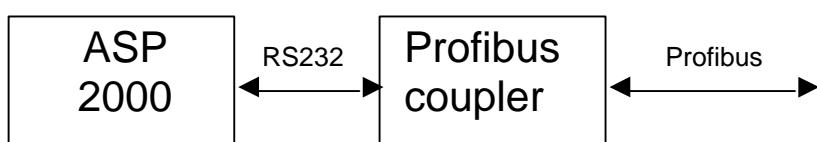
Profibus coupler	ASP 2000 socket X2
GND	Ground (housing)
+-	U+
-+	Gnd

2.3 System description

The Profibus coupler is a connection between the ASP 2000 and Profibus DP, with the functionality of a DP slaves for cyclic data transmission.

Baudrates supported 45.45k, 93.75k, 187.5k, 500k, 1.5M, 3M, 6M and 12MBaud.

2.4 Block diagram

3 Commissioning

3.1 Commissioning

✎ If the functions for a data serial interface are not accessible in the Set-up then a **one time** initialisation phase must be run.

1. Completely switch off the ASP 2000
2. Connect the Profibus coupler to the serial RS232 interface
3. Switch on the ASP 2000

From this time on the ASP 2000 controller releases the Profibus menu in the set-up. This is independent whether the Profibus coupler is connected in the future or not. Only then does this functionality appear in the ReadWin® PC software package. „ASP 0 PB" is then displayed in the second line of the display and the Profibus coupler immediately tries to run cyclic data transfer with the PLC.
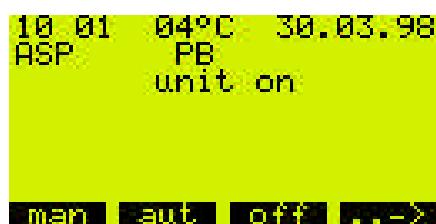
✎ The availability of the Profibus coupler is only recoginsed during the commissioning of the ASP 2000. If the Profibus coupler is not recognised then a programme can be transmitted using the serial interface or the unit can be set up. If the Profibus coupler is recognised and the unit is to be set up then the Profibus function must be deactivated.

3.2 Control of Profibus couplers availability/status information

The Profibus status can be found in the second line of the display.

Status	Meaning
ASP PB	Profibus coupler is recognised
ASP 0 PB	Profibus coupler is released and initialised
ASP <= PB ASP => PB	Der Profibus coupler is operating cyclic data transmission with the PLC (see Fig.)
ASP <|> PB	The ASP 2000 has received faulty data from the Profibus coupler (BCC error). This data was not analysed.

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3.3 Set-up

Once the ASP 2000 is switched on the Profibus coupler is initialised using the RS232 interface (slave address, etc.).

⚠️ If one of the Profibus parameters is changed later using Set/Basic Settings/Profibus/Settings then the coupler is initialised again.

Result: The Profibus coupler removes itself from the DP-Bus, in order to call again a few seconds later. This causes a "Module failure" in the PLC. The PLC, for example the Simatic S7, goes into a STOP mode and must be manually reset into the RUN mode. It is now possible by transmitting the module failure –OBs 86 to the PLC to catch the interruption. The PLC then no longer goes into the STOP mode, all that happens is that the red LED illuminates for a short period of time and the PLC continues in the RUN mode.

The set up settings can only be changed if the initialisation phase has been operated.

Using Set/Basic Settings/Profibus/Settings the Profibus parameters slave address, Profibus baudrate und time-out can be set. The Profibus coupler is initialised new after each change to the set up. Time-out is the maximum time that the ASP 2000 will wait for an answer from the Profibus coupler.

If a Profibus coupler is recognised then the Profibus function is automatically released. With this release further parameters that enable Profibus control of the sampling cycle are also released. **If the serial interface is to be used for other functions such as programme transmission or unit set up then the Profibus function must be "deactivated" with active = "No", the Baudrate must then be changed to suit the selected function and the jack plug changed.** If data is only read out then the Profibus function can be released again with "Yes" after changing the jack plug (if required reset the serial interface Baudrate (not that from Profibus!!) back to 9600). If a programme or programme data have been transmitted to the unit then the jack plug must be changed, the serial interface transmission rate reset to 9600 and the unit must be switched off and then back on in order to complete the initialisation.

3.4 Analogue input

The signal used in the ASP 2000 controller is always transmitted to the PLC and can be monitored there. It is possible to use the controller analogue input for control purposes or to transmit the analogue signal to the ASP 2000 using the Profibus. If the analogue signal is required by Profibus the option "profibus" must be set up in the parameter „analogue" in Set/Basic Settings/Profibus/Functions.

_____

3.5 Sampling using Profibus

In order to release a sampling sequence using Profibus the sampling mode must be set to „profibus" in either the Quick- or Standard set-up.

```
+----------------------------+
|          Sample            |
|                            |
| -mode      :profibus       |
| volume     :      100 ml   |
| shots      :         01    |
|                            |
| Esc     ↓       ↑      ↵    |
+----------------------------+
```

If the ASP 2000 is fitted with the option flow proportional sampling then a flow proportional sampling cycle can be initiated by Profibus using the sampling mode "flow pb".

```
+----------------------------+
|          Sample            |
|                            |
| -mode      :flow pb        |
| volume     :      100 ml   |
| shots      :         01    |
| vol.fact.  :        1,0    |
| Esc     ↓       ↑      ↵    |
+----------------------------+
```

3.6 Bottle position using Profibus

In order to change bottle position using Profibus then the Distribution mode must be set to „profibus" in either the Quick- or Standard set-up.

```
+----------------------------+
|       Distribution         |
|                            |
| -mode      :profibus       |
| bottle     :12             |
| volume     :     01,0 l    |
|                            |
| Esc             ↑      ↵    |
+----------------------------+
```

3.7 Relay output using Profibus

If a relay is to be activated using Profibus the respective output must be set up using the function „profibus".

```
+----------------------------+
|         Output 1           |
|                            |
|                            |
| function :profibus         |
| operation:standard         |
|                            |
| Esc     ↓             ↵     |
+----------------------------+
```

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3.8 Changeover programme using Profibus

The option „profibus" must be selected in the parameter „switch" in the programme selection.

```
 Program Selection

 number   :2
 prog-nr  :1-U1
 switch pr:profibus


 Esc            ↑    ↵
```

3.9 Event programme using Profibus

If an event programme is to be activated using Profibus, The parameter "Event" in Set/Basic Settings/Profibus/Functions must be set to the option „profibus".

```
       Functions


 analogue :input
 event    :profibus


 Esc            ↑    ↵
```

3.10 External Stop using Profibus

There are no changes to the set up of the ASP 2000 required for this function.

3.11 Automatic programme Start/Stop using Profibus

There are no changes required to the set up of the ASP 2000 required for this function.

4 Data transmission

4.1 General

The following can be transmitted or controlled by the Profibus-Master to the ASP 2000:
- Analogue value
- Relay output
- Sample cycle
- Initiation of bottle change and the bottle position
- Changeover programme
- Event programme
- External stop
- Programme start
- Programme stop

The following can be transmitted to the Profibus-Master from the ASP 2000:
- Analogue value
- Analogue value status (ok/cable open circuit)
- Actual bottle position
- Distribution tap (active/inactive)
- Sample cycle status (active/inactive)
- Overflow security (active/inactive)
- Digital input condition
- Relay output condition
- Fault and type
- Programme status (off, active, internal hold, external hold, end, end request, single hold)
- Unit status (off, on, automatic active, fault)
- Name of actual programme
- Actual sample compartment temperature
- Actual electronic compartment temperature

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4.2 Data construction

Input/Output(SPS)	ASP 2000 -> Profibus-Master Input	Profibus-Master -> ASP 2000 Output
60/60 Byte	60 Byte	60 Byte

Data is exchanged from the ASP 2000 and the Profibus coupler in a cycle of 1 second.

Content of the data string is constructed in the following sequence:

From ASP 2000 to Profibus-Master:

Group	Function/value	Address (0-59)	Bytes	Bit
				MSB LSB
Status	**General**			
	- Sampling active	0	1	0000000X
	- Fault occurred (see fault type)	0	1	000000X0
	- Dist. Tap moving	0	1	00000X00
	- Main programme is active	0	1	0000X000
	- Changeover programme is active	0	1	000X0000
	- Event programme is active	0	1	00X00000
	- Overflow security (bottle is full)	0	1	0X000000
	- Fault type [1]	3	4	
	- Actual bottle position	7	1	
	Unit status			
	- Unit is switched off	8	1	0000000X
	- Unit is switched on	8	1	000000X0
	- Unit is in automatic mode	8	1	00000X00
	Programme status			
	- Programme is off	9	1	0000000X
	- Programme is active	9	1	000000X0
	- Stop in Start/Stop mode	9	1	00000X00
	- Prog. stopped due to pause or dig input	9	1	0000X000
	- Programme has been ended	9	1	000X0000
	- Programme end follows	9	1	00X00000
	- Start time has been activated	9	1	0X000000
	- Sample compartment temperature	10	2	
	- Upper compartment temperature	12	2	
In-/outputs	- Digital input 1	16	1	0000000X
	- Digital input 2	16	1	000000X0
	- Digital input 3	16	1	00000X00
	- Relay output 1	18	1	0000000X
	- Relay output 2	18	1	000000X0
	- Relay output 3	18	1	00000X00
	- Analogue input [2] (with 1Byte status see 5.5)	20	3	
Programme name	Name of actual programme	32	10	
BCC (XOR over all Bytes transmitted)[0]		59	1	

_____

From Profibus-Master to ASP 2000:

Group	Function/value	Address (0- 59)	Bytes	Bit
				MSB LSB
Commands	- Start programme (automatic cycle)[4]	0	1	0000000X
	- Stop programme (automatic cycle) [4]	0	1	000000X0
	- Start sampling[4]	0	1	00000X00
	- Start bottle change[4]	0	1	0000X000
	- Start changeover programme[3]	0	1	000X0000
	- Start event programme[3]	0	1	00X00000
	- ext. stop (stops active programme) [3]	0	1	0X000000
	- Bottle position for bottle change	3	1	0-7
In-/outputs	- Relay output 1[3]	16	1	0000000X
	- Relay output 2[3]	16	1	000000X0
	- Relay output 3[3]	16	1	00000X00
	- Analogue input [2] (with 1 Byte status see 5.4)	18	3	
BCC (XOR over all Bytes transmitted)[0]		59	1	

[0] The XOR over all transmitted Bytes (except Byte 59) is neccessary because there is an RS 232 connection between the Profibus coupler and the ASP 2000 and a „tilted" Bit should not lead to a faulty operation of the water sampler. If the BCC received at the ASP 2000 does not correspond to the internally calculated BCC then the command is not initiated and „ASP <|> PB" appears on the display!

[1]

Fault type:
RAM error   *1*
Clock error   *2*
EEPROM error   *4*
FaultConductivity sensor 1   *8*
Fault Conductivity sensor 2   *16*
Fault Air manager   *32*
Fault Distribution tap zero position   *64*
Fault Distribution missing   *128*
Fault Analogue open circuit   *256*
Fault Sample compartment temperature > 60°C   *512*
Fault Electronic compartment temperature > 90°C (Cable O.C. *1024*
Fault Dosing motor zero position   *4096*
Fault Profibus   (see Ifak module operating manual)   *8192*
Fault Distribution must not be installed when using comp. container *16384*
Fault Electronic compartment temperature > 70°C   *32768*
Fault Alternative switch off   *65536*
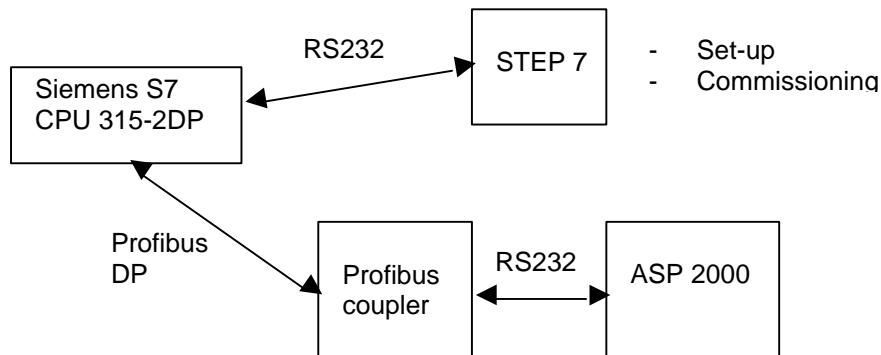
[2]The analogue input is transmitted as a scaled value from 0- 2000. Whereby 0 is the lower value (e.g. 4mA if the unit is set up to 4-20mA, or 0V if 0-1V has been set up).
[3]Control value must be active so long as the function is required to be active.
[4]Control value must only be connected as long as it takes for the status to change. The function is then active and remains so.

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5 Connection to the Simatic S7

5.1 Network overview
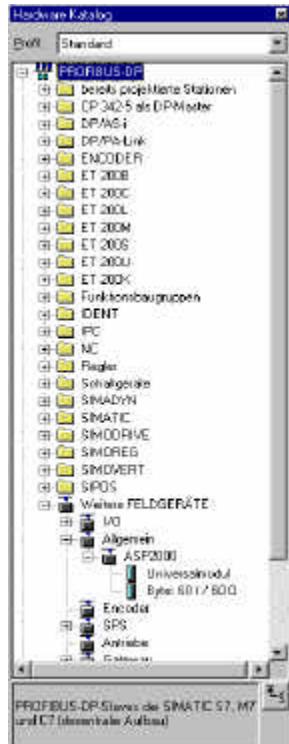
5.2 Hardware projecting

5.2.1 Installation and preparation

5.2.1.1 GSD File

In HW Config:

- Copy the GSD- and BMP- files into the selected directory of the software STEP 7.
  e.g.:   c:\...\Siemens\Step7\S7data\GSD
                     c:\...\Siemens\Step7\S7data\NSBMP

-
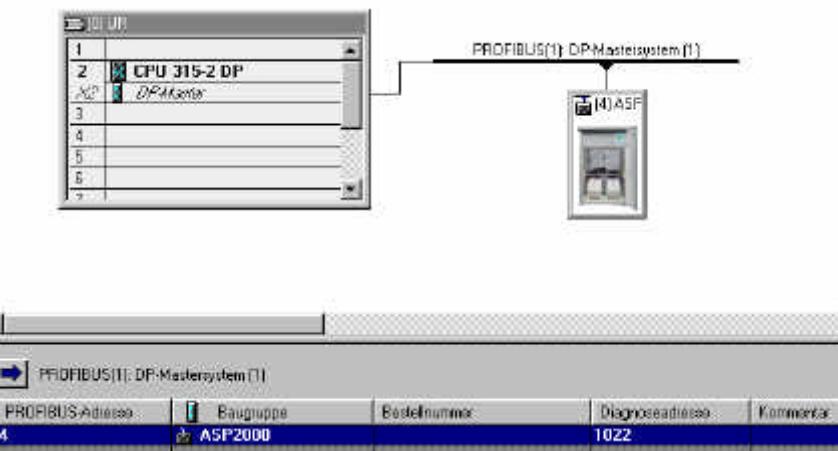
5.2.2 Projecting the ASP 2000 as a slave

In the hardware configuration:
- Extract the unit out of the hardware catalogue
  -> PROFIBUS DP -> Further field units -> General
  in the Profibus DP net work, distribute a user address.
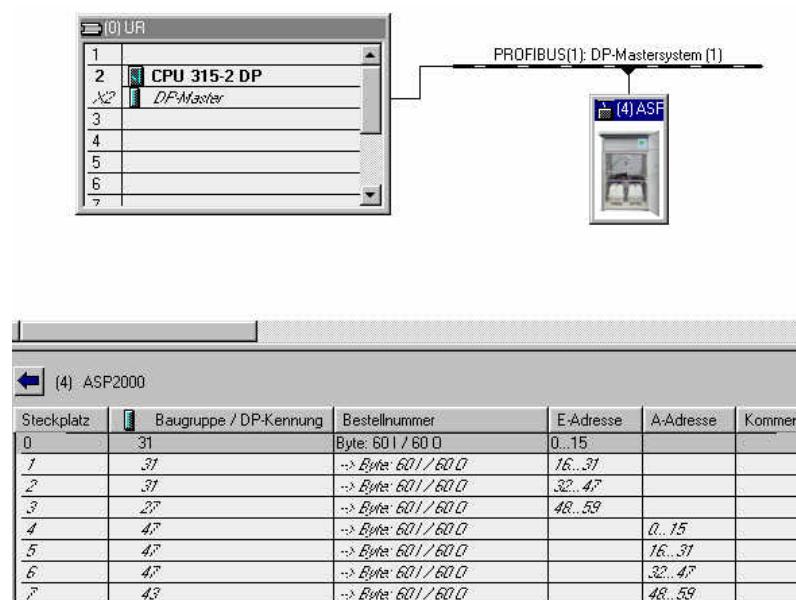
Result:

PROFIBUS-Adresse	Baugruppe	Bestellnummer	Diagnoseadresse	Kommentar
4	ASP2000		1022	

Note: The projected unit address must correspond with the actual preset hardware address.

- Select the data combination (60/60) and place this on socket 0.

Steckplatz	Baugruppe / DP-Kennung	Bestellnummer	E-Adresse	A-Adresse	Kommen
0	31	Byte: 60 I / 60 O	0...15		
1	31	--> Byte: 60 I / 60 O	16...31		
2	31	--> Byte: 60 I / 60 O	32...47		
3	27	--> Byte: 60 I / 60 O	48...59		
4	47	--> Byte: 60 I / 60 O		0...15	
5	47	--> Byte: 60 I / 60 O		16...31	
6	47	--> Byte: 60 I / 60 O		32...47	
7	43	--> Byte: 60 I / 60 O		48...59	

- The input- or output addresses for the data are listed as I-address or O-address, seen here is the hardware address 4 are the I-addresses 0...59 and O-addresses 0...59.

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5.2.3 Configuration transmission

-   Save and translate the configuration.
-   Transmit the configuration to the controller using the menu Target system -> Load.

If the LED "BUSF" lights up after transmission of the configuration then the projected network does not correspond with the one physically available. Check the project and look for differences.

5.3 Programme example

5.3.1 Address connections

Begin the in-/output data address area:

I-address: 0
O-address: 0

ASP 2000 set up: (see section 3)

5.3.2 Programme lines in function block

```
FC1:                                // Read status

        L       EB      0           // 1 Byte collect general status
        T       MB      0           // Transfer to marker 0
        L       EB      9           // 1 Byte collect programme status
        T       MB      1           // Transfer to marker 1
        L       EB      7           // 1 Byte collect bottle position
        T       MB      2           // Transfer to marker 2
        L       EW      20          // 2 Byte collect analogue input
        T       MW      3           // Transfer to marker 3
        L       EB      22          // 1 Byte collect analogue input status
        T       MB      5           // Transfer to marker 5


FC2:                                // Control

        L       MB      6
        T       AB      0           // Command from marker 6 will be transmitted by address 0
                                    // e.g. change bottle Bit 4 = 1
        L       MB      7
        T       AB      3           // Position, to which the distribution tap is to move.

                                    // BCC (XOR over all output Bytes except the last Byte, in
                                    // which the BCC is positioned)
        L       B#16#0
        T       MB      50          // Marker for XOR status
        L       MB      6
        L       MB      50
        XOD                         // XOR
        T       MB      50
        L       MB      7
        L       MB      50
        XOD
        T       AB      59          // Write result in to the last output Byte
                                    // It is taken for granted that the rest of the 60 output Bytes
                                    // are 0!
```
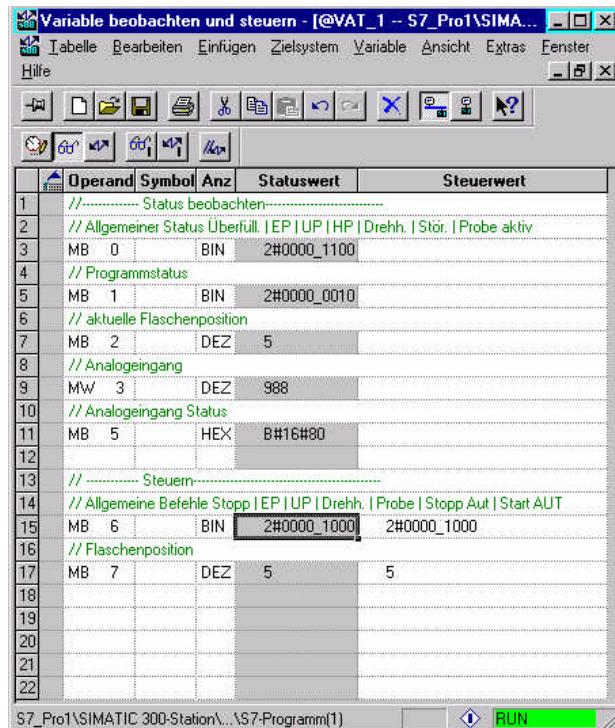
Call functions in OB1:

```
CALL    FC1
CALL    FC2
```

5.4 Monitor measured values/status

The measured values can be read out of the markers and displayed using the variables editor. First create a new variables table and reference the respective marker addresses.
Values can be written into the ASP 2000 data sets.

Example:

In this example the main programme is active and the distribution tap is moved to bottle 5. Analogue value status is OK. Programme status is programme active. The actual control value must be connected of only approx. 1 sec. Until the status changes (address 0: Bit 3 = 1).

5.5 Status codes

Status	Code	Description
Bad, Sensor failure	0x10	Sensor fault, incorrect measured value, cable open circuit
Good, ok	0x80	No sensor fault

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6 Problem solving

Problem	Cause	Cure
Even though connected the Profibus coupler is not recognised when the ASP 2000 is switched on. (Hint "DP ASP" does not appear in the header):	Connection to the Profibus coupler cannot be made.	ASP 2000 serial interface transmission rate must be 9600 Baud.
	Serial connection between ASP 2000 and Profibus coupler incorrectly connected	Please check connections. Take special note of the colour coding (section 2.2).
	No 7 programme software	Upgrade
Profibus menu not available	One off initialisation phase not run.	Run one off initialisation phase.
	No 7 programme software	Upgrade
Profibus available but the Profibus parameters e.g. on sampling mode cannot be set up	Profibus not released	Release Profibus in the Profibus menu
„ASP 0 PB" appears on the display but there is no cycle data transfer („ASP <=> PB" on the display)	PROFIBUS master not active on the DP side.	Activate PROFIBUS master
	Baud rate does not correspond	Make sure Baudrate corresponds
	Incorrect slave address	The ASP 2000 slave address must correspond with the projected DP slave address. (< 126)

✎ Error codes in the acknowledgeable Profibus fault messages in the ASP 2000 display are described in the operating manual of the Profibus couplers.
Additional fault:

0x1   Frame Error
0x2   No signal from the Profibus coupler

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