PROCENTEC

ProfiHub B4F02+

User Manual

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Safety Guidelines
This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning sign and are marked as follows according to the level of danger:

Draws your attention to important information on handling the product, a particular part of the documentation or the correct functioning of the product.

Warning
This device and its components may only be used for the applications described in this manual and only in connection with devices or components that comply with PROFIBUS and an RS 485 interface. This product can only function correctly and safely if it is transported, stored, set up, installed, operated and maintained as recommended.

Qualified Technicians
Only qualified technicians should be allowed to install and work with this equipment. Qualified technicians are defined as persons who are authorized to commission, to ground, to tag circuits and systems in accordance with established safety practices and standards. It is recommended that the technicians carry a Certified PROFIBUS Installer or Certified PROFIBUS Engineer certificate.

Disclaimer of Liability
We have checked the contents of this manual as much as possible. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the content in this manual is reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Important information

Purpose of the Manual
This manual explains how to put the ProfiHub B4FO2+ into operation.

Recycling and Disposal
The parts of the ProfiHub can be recycled. For further information about environment-friendly recycling and the procedure for disposing of your old equipment, please contact:

PROCENTEC
Klopperman 16
2292 JD WATERINGEN
The Netherlands

Tel.: +31-(0)174-671800
Fax: +31-(0)174-671801
Email: info@procentec.com

Document Updates
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- By phone at +31-(0)174-671800
- By fax at +31-(0)174-671801
- By email at support@procentec.com

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1. Product description

1.1 Introduction

ProfiHub B4FO2+ is an advanced, flexible and robust network component for PROFIBUS DP installations, to create fiber optic backbone structures and long multi-device star/tree segments.

PROFIBUS DP is a high speed communication bus that must comply with strict rules concerning spur lines, because of possible reflections that could lead to communication disturbances. If spur lines or star segments are required, costly investments in repeaters have to be done.

The innovative ProfiHub B4FO2+ is the perfect component for such applications. It is an economic solution to realise reliable spur lines in high speed DP networks. They have the functionality of 4 galvanic isolated transparent repeaters and an Optical Link Module (OLM) in one device. This allows network structures with extended spur lines that individually can handle a maximum of 31 devices and a length equal to the main bus. The ProfiHub B4FO2+ refreshes a received message on one Channel and transfers it to all the other Channels (chicken foot topology).

Because the ProfiHub B4FO2+ creates isolated segments, the devices can now be removed and added during operation. Also most electrical bus problems and EMC disturbances in a spur do not spread to the other segments. The intelligent logic and isolation circuits of the ProfiHubs do not change the bit width. This means the ProfiHubs do not have limitations in serial placement. The logic also detects the transmission speed automatically.

To assist the installation work, termination is integrated and can be switched on/off. The grounding concept is also selectable: direct or capacitive grounding. The ProfiHubs are powered by a 12 to 24 DC Voltage. For troubleshooting, maintenance and commissioning the ProfiHubs are equipped with LEDs on the outside, which indicate the status of each Channel (Data and Error).

Fig. 1 – ProfiHub B4FO2+

1.2 Product features

- 4 Galvanic isolated outgoing channels (repeater segments).
- 2 Fiber Optic channels.
- Transparent for all PROFIBUS DP protocols.
- DP - RS 485 specifications for each channel.
- Cable redundancy for copper channel 3 and 4
- 9.6 Kbps to 12 Mbps.
- 31 devices per channel.
- 3000 m cable length for FO channel 1 and 2
- 1200 m spur line length for copper channel 1 to 4 (depends on transmission speed).
- Redundant power supply
- No limit in serial placement or cascading of ProfiHubs.
- Alarm contact, with manual reset button.
- No address required.
- Integrated termination facilities (switches).
- Configurable grounding system (direct or capacitive).
- IP 20 classification
- Increased temperature range

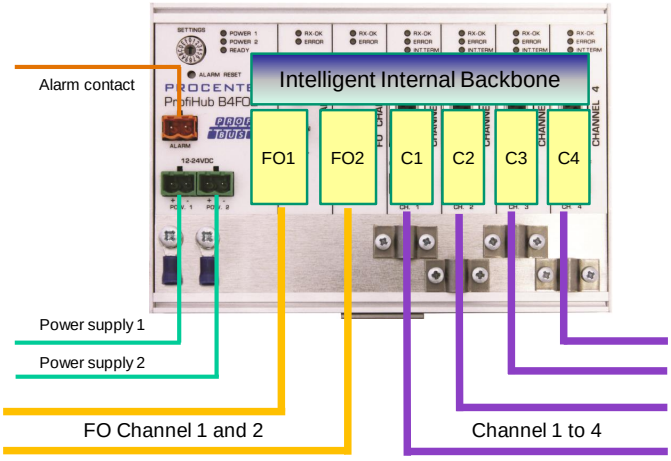

Fig. 2 - ProfiHub connections

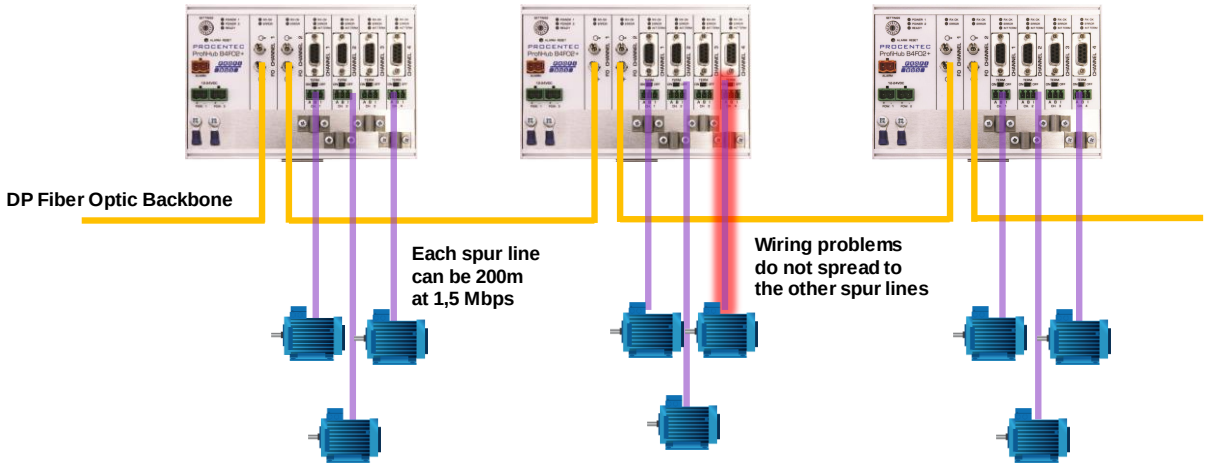

Fig. 3 - Long spur lines to instruments and the possibility to remove/insert them during operation. Short circuit protection on each spur line is automatically provided

1.3 Application areas

- Create Fiber Optic backbones
- Dynamic spur lines to actuators, flow meters and pH analyzers.
- Removable drives and motors.
- Pull/Plug motor control centers (drawers).
- Roof mounted devices in tank farms.
- Barrier for non-galvanic isolated equipment.
- Networks with requirement for High Availability/uptime
- Large star/tree structured networks.

1.4 Additional benefits

- Hot slave insertion and removal during operation.
- Short circuit protection on each Channel.
- Option to create a redundant path to other supporting Hubs or ComBricks
- Compact and robust construction.
- Status and error display (per Channel).
- Suitable for all DP cables.
- Conveniently arranged networks.
- Easy extendable installations.
- On-board DB9 female connector on each channel for maintenance activities.
- Cost Savings

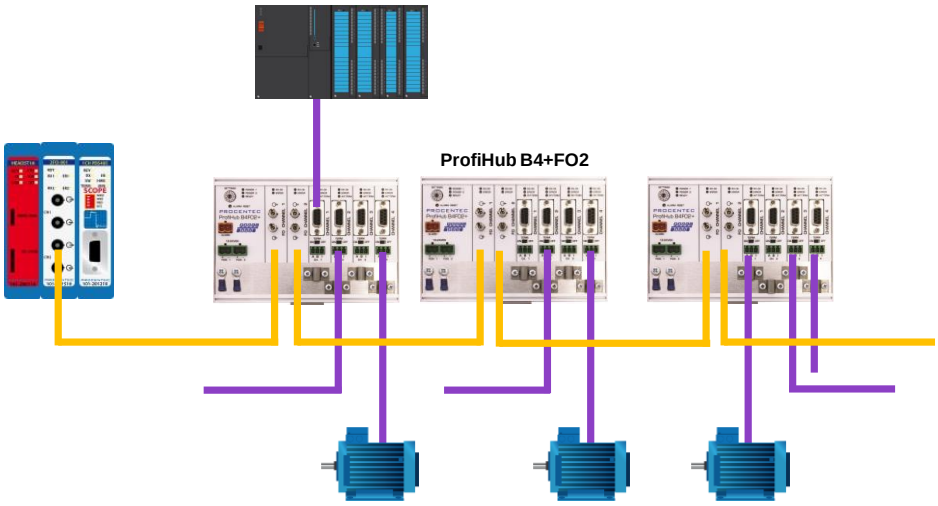

Fig. 4 - Creating a fiber optic backbone increases network reliability and network overview. It is also possible to mix ProfiHubs with ComBricks

1.5 Channel Structure

Each copper channel is electrically isolated and internally connected to the transparent intelligent backbone. The termination is switchable and powered by the ProfiHub. The shielding of the PROFIBUS cable can be directly grounded or indirectly grounded (see the next paragraph).

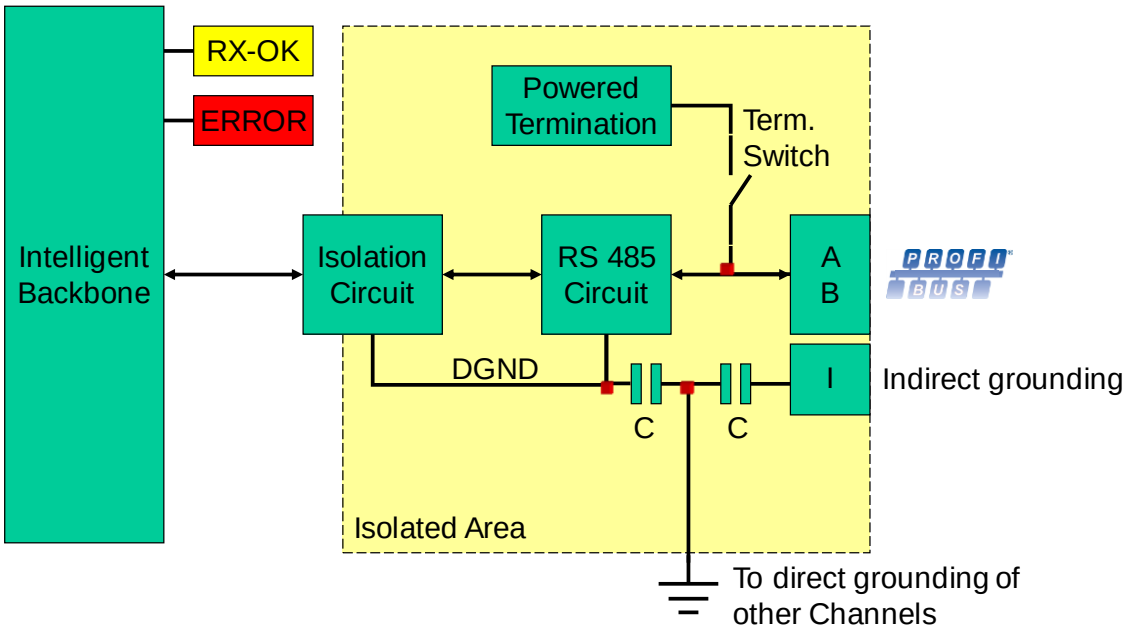

Fig. 5 - Channel structure

1.6 Grounding System

The ProfiHub B4FO2+ can be grounded by 3 methods:
1) Direct grounding on the Ground Rail
2) Indirect grounding (through a capacitor)
3) Combination of direct and indirect.

The power supply must be grounded directly on the Ground Rail. The shielding of the PROFIBUS cables can be directly or indirectly grounded. If you do not want to ground all or some cables to the common ground, i.e. compensating current, the cable shielding must be connected to pin 'I' which stands for Indirect grounding. A capacitor with a parallel high value resistor will separate the 2 potentials (Fig. 5), ensuring protection of the signal against non-DC disturbances.

If by accident on 1 channel the Direct Grounding is connected with the Indirect Grounding, the connection to the Direct Grounding bypasses the capacitor in the Indirect Ground connection. The current on the shield will flow to Direct Ground.

1.7 Cable lengths for PROFIBUS DP

The cables on Channels 1 to 4 must comply with the PROFIBUS DP cable specifications for RS 485 (see Fig. 6).

Baudrate (kbit/s)	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Segment length (m)	1200	1200	1200	1200	1000	400	200	100	100	100
Segment length (feet)	3940	3940	3940	3940	3280	1310	656	328	328	328

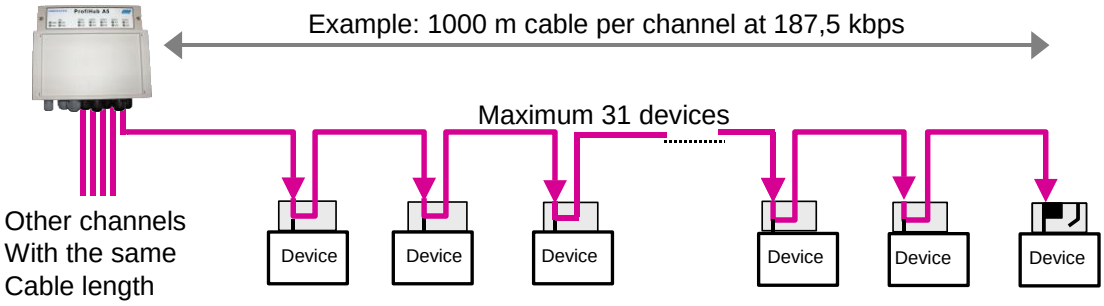

Fig. 6 - Cable lengths for PROFIBUS DP

1.8 Cable types for PROFIBUS DP

The cable type must comply with the PROFIBUS DP cable specifications for RS 485 (Fig. 7).

Parameter	Value
Wires	2 (twisted)
Impedance	135 .. 165 Ohm at 3 to 20 MHz
Capacity	< 30 pF/m
Loop resistance	< 110 Ohm/km
Wire diameter	> 0.64 mm
Wire area	> 0.32 mm^2

Fig. 7 - PROFIBUS DP cable specifications

The ProfiHub B4FO2+ can handle cables based on multiple protection sheaths with an overall cable diameter between 6 to 12 mm (Fig. 8).

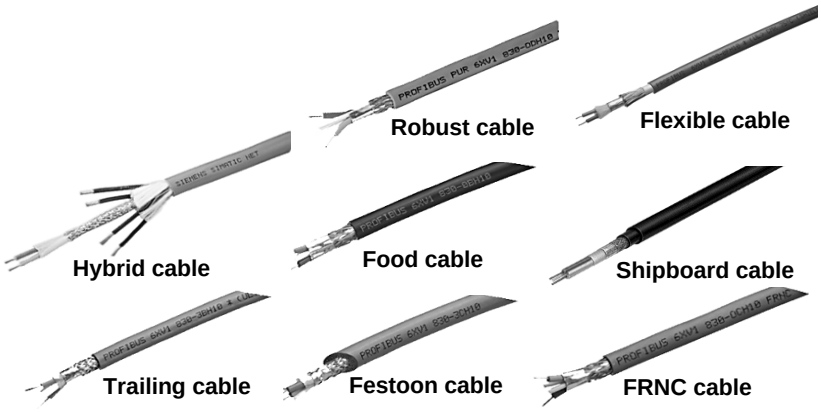

Fig. 8 - Cables with different protection sheaths

1.9 Cable lengths for fiber optic

The maximum cable length for fiber optic cables is 3 kilometers if G62.5 / 125 cable is used.

1.10 Cable types for fiber optic

The following cable types can be used with the ProfiHub B4FO2+:

G62.5/ 125	**G50 / 125**
ISO / IEC 11801 (OM1)	ISO / IEC 11801 (OM2 or better)
IEC 60793-2-10 type A1b	IEC 60793-2-10 type A1a
TIA / EIA 492AAAA	TIA / EIA 492AAAB-A
ITU-651.1	ITU-651.1

1.11 Status LEDs

The Status LEDs on the ProfiHub are very useful for diagnostics.

	OFF	**Blinking**	**ON**
POWER 1 / 2	😐 Power is not switched on or an internal error	☹ Power supply not stable, redundant power supply interrupted or an internal failure	☺ Power supply OK
READY	😐 Power is not switched on or an internal error	☹ Trying to detect the transmission speed, but has not locked it yet	☺ The transmission speed has been detected

FO RX-OK	☹ No communication detected on this channel	☺ 1 or more devices communicating on this channel	☹ Internal error
FO ERROR	☺ No problem has been detected	☹ Problem in the cabling has been detected.	☹ Problem in the cabling has been detected
Channel RX-OK	😐 There is no communication detected on this channel	☺ 1 or more devices communicating on this channel	☹ Internal error
Channel ERROR	☺ No problem has been detected	☹ Problem in the cabling has been detected	☹ Problem in the cabling has been detected
INT. TERM	Termination for this channel is OFF	☹ Internal error	Termination for this channel is ON

1.12 The red Error LED

The red error LEDs will blink shortly if a corrupt message enters the ProfiHub. More specifically, this can be a Parity error (the parity checksum of the byte is incorrect) or a Framing error (the FCS byte is different than the real message). It is necessary to investigate further with an oscilloscope to find out what the problem is. This can easily be done with ProfiTrace.

Another reason for the red error LED is a problem in the redundant cabling (if the ProfiHub is set to redundant). If the redundant line is fixed, press the 'Alarm Reset' button.

It can also be that the baudrate is not locked (no PROFIBUS master on the bus) or the baudrate was set manually and incorrectly with the rotary switch.

1.13 Comparison table

	ProfiHub B5	**ProfiHub B5+R**	**ProfiHub B4FO2+**
Area	IP 20	IP 20	IP 20
Redundant power supply	No	Yes	Yes
Temperature range	-20 to +60˚ Celsius -4 to +140˚ Fahrenheit	-25 to +70˚ Celsius -13 to +158˚ Fahrenheit	-25 to +70˚ Celsius -13 to +158˚ Fahrenheit
Housing	Metal	Metal	Metal
Mounting	DIN-rail	DIN-rail	DIN-rail
Weight	475 g	475 g	475 g
Dimensions	167 x 111 x 38 mm	167 x 111 x 38 mm	167 x 111 x 38 mm
PROFIBUS connectors	Screw terminals and DB9 connectors	Screw terminals and DB9 connectors	ST/BFOC, screw terminals and DB9 connectors
Alternative connectors	No	No	No
Termination LEDs	Yes	Yes	Yes
Ground rail	Yes	Yes	Yes
Redundant channel	No	Yes	Yes
Offshore approvals	None	Yes: DNV	None
UL approvals	None	UL: ITE E365044	None

2. Installation Instructions ProfiHub B4FO2+

2.1 Location

The ProfiHub B4FO2+ can be installed everywhere in a non-hazardous area that complies with IP 20 (DIN 40 050) and the specified temperature range of -25 to +70° Celsius or -13 to +158˚ Fahrenheit.

2.2 Position

The ProfiHub B4FO2+ can be installed in every position, but it is recommended to install it with the cables pointing down. In this position it is also easier to read the status LEDs.

2.3 Mounting

The ProfiHub B4FO2+ can be mounted on 35 mm DIN-rail with a minimum width of 167 mm. Mounting brackets are available for mounting the B4FO2+ directly on a wall.

The supplied rubber studs need to be placed on the back of the housing of the ProfiHub B4FO2+ for extra fixation. This is to prevent the product to potentially slide off the DIN-rail. See Fig. 9 for an example.

Fig. 9 - Rubber studs on backside of housing

2.4 Power Supply

The two 2-pin screw type power connectors are located on the left of the ProfiHub B4FO2+ (Fig. 10).
1 = **+** (left)
2 = **-** (right)

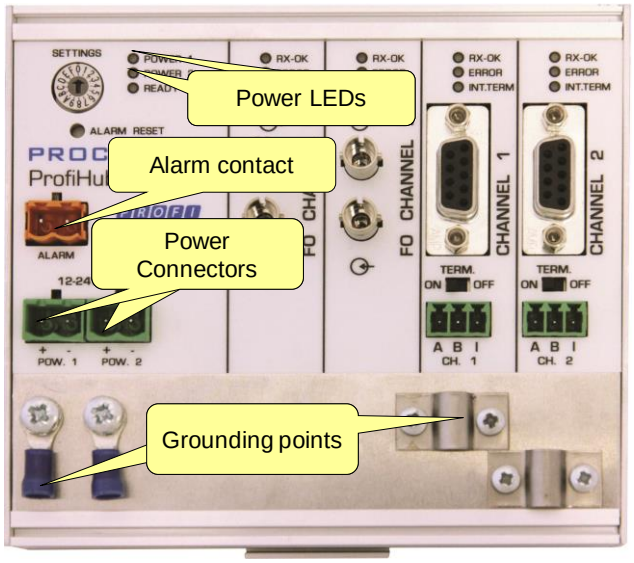

Fig. 10 - Power connectors and LEDs

Both power connectors are linked 1-on-1 to the internal power supply of the B4FO2+. If one power supply fails, the other takes over without delay time. When redundancy is not required, it is sufficient to use one power connector. Please note that when using only one power supply, a voltage of max. 0.25 V will exist on the other unconnected power connector, as shown in Fig. 11.

If only one power supply is used, the alarm contact is closed. If two power sources are connected, the contact is open. As soon as one of the power supplies fails, the contact will close and the Power Indicator LED will blink.

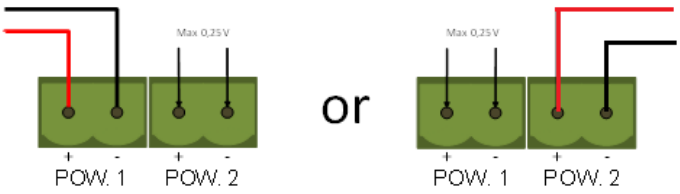

Fig. 11 - Maximum voltage on unconnected Power Connector

The power supply must comply with the following specifications:

- Limited Power Source (LPS) or NEC Class 2 or CEC Class 2
- Voltage: **12 - 24 VDC**
- Current: **min 275 mA**
- Wire diameter: **< 2.5 mm2**

Procedure
To connect the 24V supply to the 2-pin screw-type terminal, proceed as follows:

- Strip the insulation from the cable or the conductors for the 24V power supply.
- Add cable crimp terminals/wire ferrules to the conductors.
- Secure the crimp terminals in the screw-type terminal.

To connect the power supply, you need a 3 mm screwdriver.

Testing:
If the power is switched on it can be diagnosed by the following indicators:

- LEDs should be blinking in a circular animation for a short time.
- The POWER LED of the respective power connector (1, 2 or both) is ON.
- The READY LED is ON or Blinking, depending on baud rate lock.

2.5 Grounding of the power

It is recommended to use a power supply with a ground lead (3-wire). Connect the ground lead of the power lead to the Ground Rail of the ProfiHub B4FO2+. Connect the Ground Rail to the common ground with a separate ground lead. See Fig. 12 for an example.

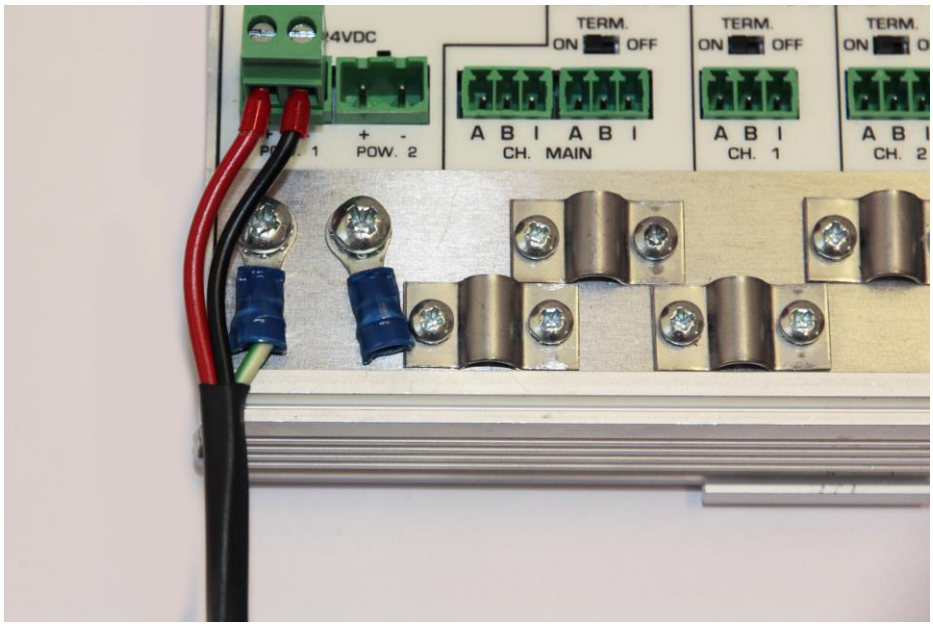

Fig. 12 - Connection to Ground Rail

2.6 Alarm contact

The ProfiHub B4FO2+ features a potential-free relay contact. This alarm contact can be used to monitor the power supplies. Example applications are: Connect a LED tower, alarm buzzer, SMS server or use it as a digital signal for the PLC.

If only one power supply is used, the alarm contact is closed. If two power sources are connected, the contact is open. As soon as one of the power supplies fails, the contact will close and the Power Indicator LED will blink.

In the case of an interrupted power supply you can reset the contact by pressing the 'Reset' button. The contact will open and the LEDs will stop blinking.

The maximum power to be connected to the alarm contact is 24 VDC. The maximum switching current is 500 mA.

2.7 Fiber optic backbone

Use the FO channels to create a fiber optic backbone to other ProfiHubs with FO channels or to ComBricks. Connect the DP copper cable from the master or DCS to one of the two copper channels (Fig. 13).

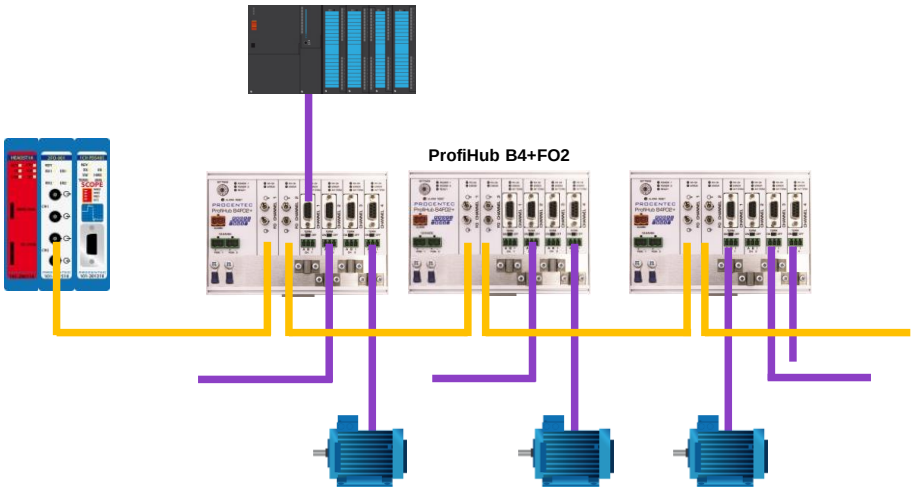

Fig. 13 - Fiber optic backbone

Pin layout of the screw terminals:
Pin "A": Green wire
Pin "B": Red wire
Pin "I": Indirect cable shielding
Note: Connecting the Indirect cable shielding is not required when the ground clips are used.

Testing
If a channel recognizes valid PROFIBUS messages from one or more connected devices, the RXOK LED of the corresponding channel should be blinking.

2.8 Calculating the delay time

Fiber optic applications require a delay time calculation to adjust the MinTSDR and Slottime (Tslot) busparameters in the configuration of the master(s). The B4FO2+ complies with the following formulas:

Example: 1.5 Mbps, 3 km FO cable, 2 FO modules

$$\text{FO cable delay} = (5 * 10^{-6}) \times \text{FO cable length} \times \text{Baudrate}$$
$$\text{FO cable delay} = 0.000005 \times 3 \times 1500000 = 22.5 \text{ TBit}$$

The delay of the module itself is 1.8. This results in the following formula for Tdelay:
$$\text{Tdelay} = (\text{FO cable delay} + (2 \times \text{Module delay time})) \times 2$$
$$\text{Tdelay} = (22.5 + (2 \times 1.8)) \times 2 = \mathbf{52.2\ Tbit}$$

This is the delay between 2 fiber optic interfaces.

Outcome: Make sure the MinTSDR is at least 52.2 bittimes. Change the Max TSDR and Tslot to appropriate numbers accordingly.

2.9 Spur Segments

Connect the spur segments to the connectors of Channel 1 to 5 (Fig. 14). The second method is to place a PROFIBUS standardized plug on the DB9 connector of the specific Channel.

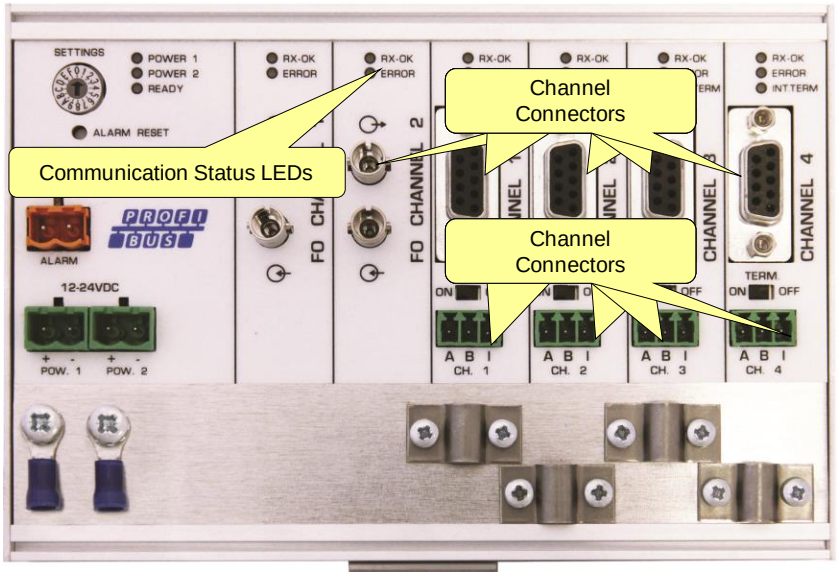

Fig. 14 - PROFIBUS DP spur connectors

Pin layout of the screw terminals:
Pin “A”: Green wire
Pin “B”: Red wire
Pin “I”: Indirect cable shielding, for reducing EMC and noise in demanding areas
Note: Connecting the Indirect cable shielding is not required when the ground clips are used.

Testing
If a Channel recognizes valid PROFIBUS messages from one or more connected devices, the RXOK LED of the Channel should be blinking.

2.10 Termination

The termination of the Channels have been set to ON by default, because it is assumed that the new segment is started at the ProfiHub (Fig. 15).

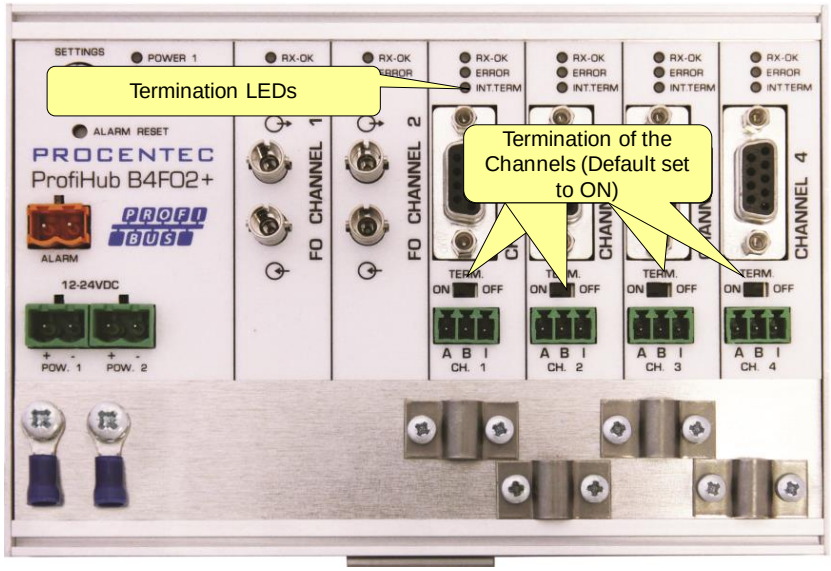

Fig. 15 - Termination switches

The termination LED of the corresponding Channel is activated when the termination switch is set to ON.

When the DB9 connector is used and the cable starts at the ProfiHub, it is recommended to use the termination on the DB9 plug and NOT the ProfiHub. This way, the connector can be removed while maintaining termination on the bus.

2.11 Baudrate switch

The ProfiHub B4FO2+ recognizes the transmission speed by default. If it is required that the ProfiHub B4FO2+ is locked to a certain transmission speed, the baudrate switch should be set to the required value (Fig. 16).

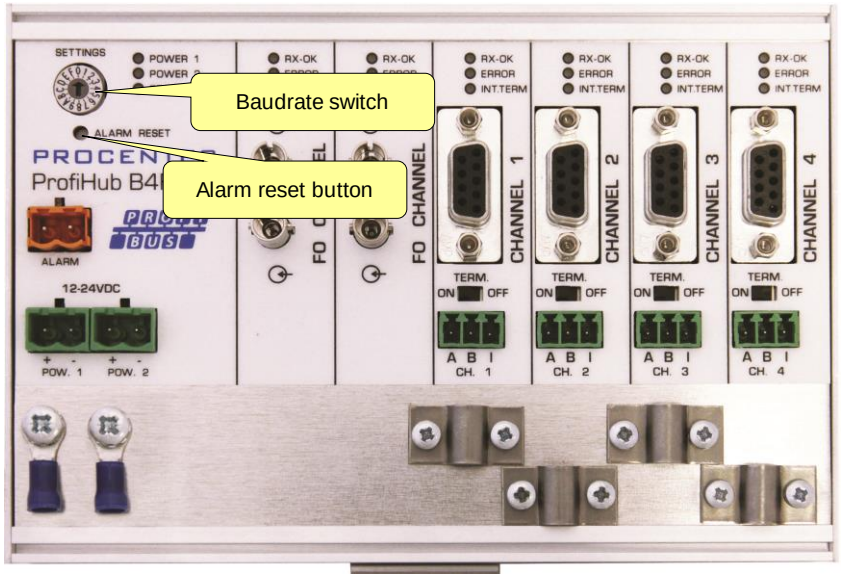

Fig. 16 - Baudrate speed switch

To set the rotary switch, use a 3 mm screwdriver.

Switch values:
0 = Normal repeating, Auto detect (default)
1 = 9.6 kbps
2 = 19.2 kbps
3 = 45.45 kbps
4 = 93.75 kbps
5 = 187.5 kbps
6 = 500 kbps
7 = 1500 kbps
8 = 3000 kbps
9 = 6000 kbps
A = 12000 kbps
B = Robust repeating, Auto detect
C = Robust repeating, redundancy on copper channel 3 and 4
D .. F = Reserved for future use

Please note that the position of the rotary switch is only sampled during start-up. Changing the position of the switch will not have effect during operation.

The auto baudrate detect feature will search for the correct baud rate within 10 seconds of receiving the first telegram. This baud rate lock will be lost after 50 seconds of incorrect or no message reception.

2.12 Robust Repeating mode

The B4FO2+ has two repeating modes: normal (default) and Robust Repeating (rotary switch setting B or C). In normal mode the bits are transferred directly on the other channel with a minimal delay (see Delay Times in the Technical Data chapter). In Robust mode, the first byte is checked to verify if the following bits are a real PROFIBUS message. If the byte is illegal, the message will not be transferred to the other channel. This helps network stability in EMC sensitive environments.

ATTENTION:
Using the ProfiHub B4FO2+ in Robust Repeating mode causes a delay in processing the telegrams. It is required to increase the default MinTSDR in the PLC busparameters slightly. Recommended is to increase the MinTSDR with a value according to the Delay Time table, column ‘Robust Mode’, described in the Technical Data chapter. Generally a MinTSDR of 25 is sufficient. If long fiber optic cables or many optical link modules (OLMs) are used, check paragraph 2.8 for an example of the MinTSDR calculation.

2.13 Channel Redundancy

To use the Redundancy option of the B4FO2+, set the rotary switch to the ‘C’ position. This enables the two copper channels (3 and 4) to be one redundant path to another B4FO2+, a B5+, to a redundant ComBricks, or to any other supporting product. See Fig. 17 for an example.

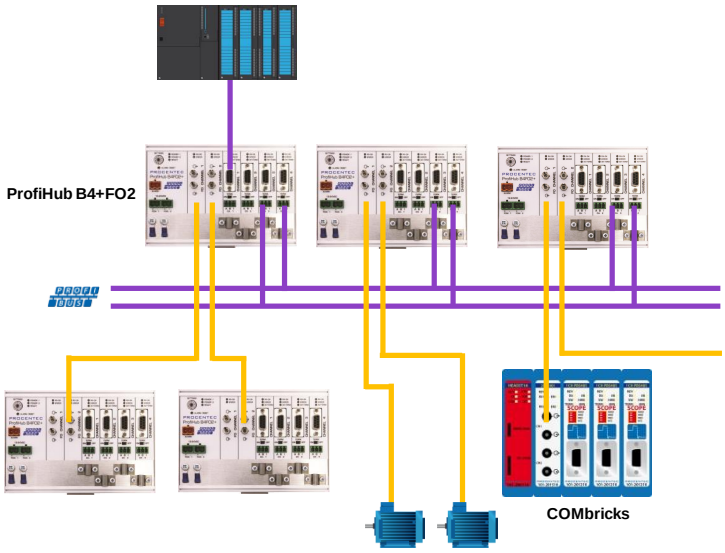

Fig. 17 - Redundant path between multiple ProfiHubs

The telegrams are transferred onto both redundant channels. The logic inside the ProfiHub determines which telegram is used to be transferred onto the other channels. A message received by a redundant channel is repeated on all other channels, except the other redundant channel. A message received by a normal channel is repeated on all other channels.

When one redundant cable breaks, the other cable ensures safe delivery of the telegram. In this event the built-in alarm contact will close. The red 'ERROR' LED will blink with an interval of 100ms. When the redundant path is fixed, press the 'ALARM RESET' pushbutton to reset the alarm.

ATTENTION:
Using the ProfiHub B4FO2+ in Redundancy mode causes a delay in processing the telegrams. It is required to increase the default MinTSDR in the PLC busparameters slightly. Recommended is to increase the MinTSDR with a value according to the Delay Time table, column 'Robust Mode', described in the Technical Data chapter. Generally a MinTSDR of 25 is sufficient. If long fiber optic cables or many optical link modules (OLMs) are used, check paragraph 2.8 for an example of the MinTSDR calculation.

3. Technical Data ProfiHub B4FO2+

Technical Data ProfiHub B4FO2+	
Dimensions and weight	
Dimensions L x W x H (mm) with screws Weight	167 x 111 x 38 mm Approximately 475 g
Ambient conditions	
Operating temperature Isolation class	-25 to +70° Celsius -13 to +158° Fahrenheit IP 20 (DIN 40 050)
Protocol specifications	
Supported Protocols	DP-V0, DP- V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and any other FDL based protocol.
Transmission speed Transmission speed detection Transmission speed switch	9.6 kbps to 12 Mbps (including 45.45 kbps) Auto detect (default) or selectable with rotary switch 0 = Normal repeating (Auto detect) (default) 1 = 9.6 kbps 2 = 19.2 kbps 3 = 45.45 kbps 4 = 93.75 kbps 5 = 187.5 kbps 6 = 500 kbps 7 = 1500 kbps 8 = 3000 kbps 9 = 6000 kbps A = 12000 kbps B = Robust repeating (auto detect) C = Robust repeating, redundancy on channel 4 and 5 D .. F = Same as 0
Transmission speed detection time	< 10 s (if it is set to auto detect)
Data delay time	At baudrate: Normal mode: Robust mode: 9.6 - 93.75 kbps ≤1.7 Tbit ≤13.25 Tbit 187.5 - 500 kbps ≤1.8 Tbit ≤13.30 Tbit 1.5 Mbps ≤1.9 Tbit ≤13.40 Tbit 3 Mbps ≤2.2 Tbit ≤13.60 Tbit 6 Mbps ≤3.0 Tbit ≤14.00 Tbit 12 Mbps ≤4.0 Tbit ≤15.00 Tbit
Delay time jitter	Max. ¼ bit time
Cascading depth	No limits

Technical Data ProfiHub B4FO2+	
PROFIBUS Fiber Optic cable specifications	
Cable types	G62.5 / 125 ISO/IEC 11801 (OM1) IEC 60793-2-10 type A1b TIA/EIA 492AAAA ITU-651.1 G50 / 125 ISO/IEC 11801 (OM2 or better) IEC 60793-2-10 type A1a TIA/EIA 492AAAB-A ITU-651.1
Fiber Optic type	Multimode 850 nm
Cable lengths	G62.5 / 125: 3000 m (baud rate independent) G50 / 125: to be defined
Connectors	4x ST / BFOC
Redundancy	No
PROFIBUS copper cable specifications	
Cable lengths	1200 m at 9.6 kbps to 93.75 kbps 1000 m at 187.5 kbps 400 m at 500 kbps 200 m at 1.5 Mbps 100 m at 3 Mbps to 12 Mbps
Cable thickness Wire diameter Wire type	10 mm (when the ground rail is used) < 2.5 mm^2 Stranded or Solid core
Number of devices	Maximum 31 per Channel (including ProfiHubs, OLMs etc)
Termination	Integrated and switchable. Powered according to IEC 61158 (390/220/390 Ohms) - All Channels (default on)
Redundancy	Yes (channel 3 and 4)

Power supply specifications	
Power source	Limited Power Source (LPS) or NEC Class 2 or CEC Class 2
Nominal supply voltage	12 to 24 VDC
Redundant power supply	Yes
Current consumption	Min 275 mA at 12 V power supply (all Channels fully loaded)
Reverse polarity protection	Yes
Cable thickness	10 mm (when the ground rail is used)
Wire diameter	< 2.5 mm^2
Alarm contact	
Voltage Current	Max. 24 V DC 0.5 A
Others	
MTBF	T.b.d.

4. Sales offices and distributors

HEADQUARTERS

PROCENTEC
Klopperman 16
2292 JD WATERINGEN
Netherlands

T: +31 (0)174 671 800
F: +31 (0)174 671 801
E: info@procentec.com
W: www.procentec.com

ARGENTINA

eFALCOM
Alcorta 2411
B1744 - Moreno
Buenos Aires
Argentina

T: +54 237 46 31 151
F: +54 237 46 31 150
E: santiago.falcomer@efalcom.com
W: www.efalcom.com

AUSTRIA

RELISTE
Enzersdorfer Straße 8-10
A-2345 Brunn am Gebirge
Austria

T: +43 2236 315 25-25
F: +43 2236 315 25-60
E: office@reliste.at
W: www.relise.at

AUSTRALIA

IS Systems Pty Limited
14 Laverick Ave.,
Tomago
NSW, Australia, 2322

T: +61 2 4964 8548
F: +61 2 4964 8877
E: fritz.woller@issystems.com.au
W: www.issystems.com.au

Pentair Flow Control Pacific
1 Percival Road
Smithfield
NSW, Australia, 2164

T: +61 2 4448 0466
F: +61 2 4423 3232
E: sharee.hazell@pentair.com.au
W: www.profibuscentre.com.au

BELGIUM and LUXEMBOURG

Bintz Technics N.V.
Brixtonlaan 23
B-1930 Zaventem
Belgium

T: +32 2 720 49 16
F: +32 2 720 37 50
E: bloemen@bintz.be
W: www.bintz.be

BRAZIL

Westcon Instrument. Indl Ltda
Rual Alvaro Rodrigues, 257
São Paulo – SP
Brazil - CEP 04582-000

T: +55 11 5561-7488
F: +55 11 5093-2592
E: paolo@wii.com.br
W: www.wii.com.br

CANADA

Streamline Process Management Inc.
#3, 4351 – 104 Ave SE
Calgary, Alberta T2C 5C6
Canada

T: +1 403 225 1986
F: +1 587 585 2828
E: admin@streamlinepm.com
W: www.streamlinepm.com

CHILE

RP Ingenieria Limitada
Tucapel 92 oficina 52
Concepción
Chile

T: +56 41 246 93 50
F: +56 41 252 25 92
E: rodrigopinto@rpingenieria.cl
W: www.rpingenieria.cl

CHINA

PROCENTEC Beijing
Room E-1115 WangJingYuan YouLeHui
ChaoYang
Beijing
China

T: +86 (10)847 669 11 / +86 (10) 847 873 11
F: +86 (10)847 667 22
E: info@procentec.net
W: www.procentec.net

CZECH REPUBLIC

FOXON s.r.o.
Polní 367
460 01 Liberec 12
Czech Republic

T: +420 484 845 555
F: +420 484 845 556
E: foxon@foxon.cz
W: www.foxon.cz

DENMARK

ProSaiCon
Jernbanegade 23B
DK 4000 Roskilde
Denmark

T: +45 70 20 52 01
F: +45 70 20 52 02
E: hfj@prosaicon.dk
W: www.prosaicon.dk

EGYPT

Mas Trading
37, 105 Street
Al-Etihad Square
Egypt

T: +2 02 2524 2842
F: +2 02 2524 2843
E: aya.elshafei@masautomation.com
W: www.masautomation.com

ESTONIA

Saksa Automaatika OU
Peterburi Tee 49
Tailinn
EE-11415 Estonia

T: +372 605 2526
F: +372 605 2524
E: info@saksa-automaatika.ee
W: www.saksa-automaatika.ee

FINLAND

Hantekno Oy
Kalliotie 2
04360 Tuusula
Finland

T: +358 40 8222 014
E: info@hantekno.com
W: www.hantekno.fi

FRANCE

AGILiCOM
Bâtiment B
1, rue de la Briaudière
Z.A. La Châtaigneraie
37510 BALLAN-MIRE
France

T: +33 247 76 10 20
F: +33 247 37 95 54
E: jy.bois@agilicom.fr
W: www.agilicom.fr

GERMANY

PROCENTEC GmbH
Benzstrasse 15
D-76185 Karlsruhe
Germany

T: +49 721 831 663-0
F: +49 721 831 663-29
E: info@procentec.de
W: www.procentec.de

INDIA

UL Engineering Services & Software Pvt Ltd
Nirman Classic,
Katraj-Kondhwa Road,
Katraj, Pune-411046
India

T: +91 202 696 0050
F: +91 202 696 2079
E: dileep.miskin@ulepl.com
W: www.ulepl.com

Automation Combine
B.R. House 4th Floor,
Hennur Main Road
Bangalore 560043
India

T: +98 452 84 550 / +98 452 030 47
F: +93 421 375 34 / +93 425 002 90
E: info@automationcombine.com
W: www.automationcombine.in

IRELAND

PROFIBUS Ireland
Automation Research Centre
University of Limerick
National Technology Park, Plassey
Limerick
Ireland

T: +353 61 202 107 or +353 61 240 240
F: +353 61 202 582
E: info@profibus.ie
W: www.profibus.ie

ISRAEL

Instrumetrics Industrial Control
8 Hamlacha St.
New Industrial Zone
Netanya, 42170
Israel

T: +972 9 835 70 90
F: +972 9 835 06 19
E: info@instrumetrics-ic.co.il
W: www.inst-ic.co.il

ITALY

PROCENTEC Italy
Via Branze n. 43/45
25123 Brescia
Italy

T: +39 030 200 8610
F: +39 030 238 0059
E: www.procentec.it
W: www.procentec.it

JAPAN

TJ Group
C/O Japanese PROFIBUS Organisation
West World Building 4F
3-1-6 Higashi-Gotanda,
Shinagawa-ku,
Tokyo, 141-0022
Japan

T: +81 3 6450 3739
F: +81 3 6450 3739
E: info@profibus.jp

KOREA

Hi-PRO Tech. Co., Ltd.
#2802, U-Tower, 1029
Youngduk-dong, Giheung-gu
Yongin-Si, Kyunggi-do,
446-908 Korea

T: +82 82 31 216 2640
F: +82 82 31 216 2644
E: chays@hiprotech.co.kr
W: www.profibus.co.kr

LEBANON

Industrial Technologies S.A.L. (ITEC)
Point Center, Boulevard Fouad Chehab
Sin El Fil
Beirut
Lebanon

T: +961 1 491161
F: +961 1 491162
E: sales@iteclb.com
W: www.iteclb.com

MEXICO

Grid Connect Inc.

T: +1 530 219 2565 (Spanish)
E: tomf@gridconnect.com
W: www.gridconnect.com

NETHERLANDS

PROCENTEC B.V.
Klopperman 16
2292 JD Wateringen
Netherlands

T: +31 (0)174 671 800
F: +31 (0)174 671 801
E: info@procentec.com
W: www.procentec.com

NORWAY

Nortelco Automation AS
Johan Scharffenbergs vei 95
N-0694 Oslo
Norway

T: +47 22 57 61 00
E: post@nortelcoautomation.no
I: www.nortelcoautomation.no

PERU

ControlWare
Jr. Los Silicios 5409
Los Olivos - L39
Peru

T: +51 163 737 35
F: +51 152 804 54
E: info@controlware.com.pe
W: www.controlware.com.pe

POLAND

INTEX Sp. z o.o.
ul. Portowa 4
44-102 Gliwice
Poland

T: +48 32 230 75 16
F: +48 32 230 75 17
E: intex@intex.com.pl
W: www.intex.com.pl

PORTUGAL

IndustrialSys
Rua Alexandre Herculano 25
Mangualde, 3530-144
Portugal

T: +351 96 716 16 05
E: info@industrialsys.pt
W: www.industrialsys.pt

ROMANIA

S.C. SVT Electronics S.R.L.
Brăila 7
540331 Tg-Mure
Romania

T: + 40 744 383 666
F: +40 365 809 305
E: sajgo.tibor@svt.ro
W: www.svt.ro

SAUDI ARABIA

ASM Process Automation
Al-Zahra Dist. – Attas st.
cross section with helmy Kutby St.
Villa no.25
Jeddah-21553
Saudi Arabia

T: +966 2 691 27 41
F: +966 2 682 89 43
E: info@asmestablishment.com
W: www.asmestablishment.com

SINGAPORE / SOUTH EAST ASIA

Allegro Electronics
236 Serangoon Avenue 3 07-98
Singapore 550236

T: +65 628 780 63
E: sales@allegro.com.sg
W: www.allegro.com.sg

SLOVAKIA

ControlSystem s.r.o.
Stúrova 4
977 01 BREZNO
Slovakia

T: +421 486 115 900
F: +421 486 111 891
E: jan.snopko@controlsystem.sk
W: www.controlsystem.sk

SOUTH AFRICA

IDX ONLINE CC
1 Weaver Street
Fourways
Johannesburg
South Africa - 2191

T: +27 (11) 548 9960
F: +27 (11) 465 8890
E: sales@idxonline.com
W: www.idxonline.com

SPAIN

LOGITEK, S.A
Ctra. de Sant Cugat, 63 Esc. B Planta 1ª
Rubí (BARCELONA), 08191
Spain

T: **+34 93 588 67 67**
E: **xavier.cardena@logitek.es**
W: www.logitek.es

SWEDEN

P&L Nordic AB
Box 252
S-281 23 Hässleholm
Sweden

T: +46 451 74 44 00
E: hans.maunsbach@pol.se
W: www.pol.se/profibus

SWITZERLAND

Berner Fachhochschule
PROFIBUS Kompetenzzentrum
Jlcoweg 1
CH-3400 Burgdorf
Switzerland

T: +41 (0) 34 426 68 32
F: +41 (0) 34 426 68 13
E: max.felser@bfh.ch
W: www.profitrace.ch

TAIWAN

Full Data Technology
6F., No.200, Gangqian Rd.
Neihu District, Taipei City
114, Taiwan

T: +886 2 8751 99 41/90 97
F: +886 2 8751 95 33
E: sales@fulldata.com.tw
W: www.fulldata.com.tw

TURKEY

Emikon Otomasyon
DES Sanayi sitesi 103 sokak
B-7 blok No:16 Yukari Dudullu / Umraniye
Istanbul 34776
Turkey

T: +90 216 420 83 47
F: +90 216 420 83 48
E: tolgaturunz@emikonotomasyon.com
W: www.emikonotomasyon.com

UNITED ARAB EMIRATES

Synergy Controls
907, IT Plaza Silicon Oasis :
Dubail
United Arab Emirates

T: +971 4 326 26 92
F: +971 4 326 26 93
E: sales@synergycontrols.ae

UNITED KINGDOM and N. Ireland

Verwer Training & Consultancy
5 Barclay Road
Poynton, Stockport
Cheshire SK12 1YY
United Kingdom

T: +44 (0)1625 871 199
E: andy@verwertraining.com
I: www.verwertraining.com

Hi-Port Controls
The Hub 2 Martin Close
Lee-on-Solent
Hampshire PO13 8LG
United Kingdom

T: +44 (0)8452 902 030
F: +44 (0)2392 552 880
E: sales@hiport.co.uk
W: www.hiport.co.uk

iTech
Unit 1
Dukes Road
Troon
Ayrshire KA10 6QR
United Kingdom

T: +44 (0)1292 311 613
F: +44 (0)1292 311 578
E: sales@itech-troon.co.uk
W: www.itech-troon.co.uk

Parkelect Ltd.
84 Dargan Road
Belfast
BT3 9JU
N. Ireland

T: +44 2890 777 743
F: +44 2890 777 794
E: jgillan@parkelect.co.uk
W: www.parkelect.co.uk

UNITED STATES

Grid Connect Inc.
1630 W. Diehl Road
Naperville, Illinois 60563
USA

T: +1 630 245 14 45
F: +1 630 245 17 17
E: sales@gridconnect.com
W: www.gridconnect.com/procentec.html

VIETNAM

Bavitech Corporation
42 Truong Son Street
Ward 2, Tan Binh District
Ho Chi Minh City
Vietnam

T: +84-8-3547 09 76
F: +84-8-3547 09 77
E: hai.hoang@bavitech.com
W: www.bavitech.com

For the complete list of our Sales Offices and Distributors see www.procentec.com/company/distributors.

- If your country or region is not listed, please contact us. We are still searching for distributors who can cover complete areas or countries.

5. Order codes

Component	Order code	Remarks
ProfiHub B4FO2+	17420	ProfiHub B4FO2+ With Alarm contact With redundant power input

6. Glossary

Address	Unique number of a device connected to the network. With PROFIBUS this can be 0 to 126. 127 is a broadcast address.
Analyzer	Software tool to observe the protocol traffic. Combi-Analyzers can also inspect the signal quality. Other term: Bus Monitor. Example: ProfiTrace.
Backbone	The primary bus cable. Most of the time only the control systems, ProfiHubs and fiber optic couplers are connected to this cable. The field devices are connected behind the ProfiHubs and fiber optic couplers.
Bit Time (Tbit)	The bit time Tbit is the time, which elapses during the transmission of one bit. It depends on the baudrate and is calculated as follows Tbit = 1 (bit) / baudrate (bps). Examples: 12 Mbps --> Tbit = 83 ns 1.5 Mbps --> Tbit = 667 ns
Busparameters	Settings that define the timing behaviour on the bus. They are defined in the master. Examples: Tslot, MaxTSDR.
C	Capacitance.
DGND	Digital Ground.
DIN	German Institute for Standardization (www.din.de).
DP-V0	DP-V0 is the basic stage of the PROFIBUS DP communication protocol. DP-V0 devices (master and slaves) perform the following basic functionalities: - Cyclic exchange of I/O data between controlling and slave devices - Device, Identifier (module) and Channel related Diagnosis - Parameterization of DP-slaves - Configuration of DP-slaves
DP-V1	DP-V1 is the first stage of extension of PROFIBUS DP after DP-V0. DP-V1 devices shall comply with the following features: - Device related diagnosis is replaced by status and alarms. - The first three octets of the user parameterization data are now standardized - Optionally these devices may support: - Acyclic communication (MS1, MS2) - If alarms are used, MS1 shall be supported

DP-V2	DP-V2 is the second stage of extension of PROFIBUS DP after DP-V1. DP-V2 devices shall comply with the following features: - Data Exchange Broadcast (DxB) for slave to slave communication (publisher/subscriber principle). - Isochronous Mode (time tick synchronized operating slaves, e.g. drives) - Up- and/or download of Load Region Data (domains) - Clock Control (synchronization within slaves) and Time Stamping - Redundancy.
Electromagnetic Compatibility	*See EMC.*
EMC	The extent to which an electric or electronic device will tolerate electrical interference from other equipment (immunity), and will interfere with other equipment. Within the European Community as well as in other countries it is regulated by law that electric and electronic components and equipment comply with basic standards such as IEC 61000-6-2 or IEC 61326 or corresponding individual product standards.
Hub	A Hub refreshes a signal and passes the information on to all nodes which are connected to the Hub. Data frames which were received on one port are transferred to all the other ports (chicken foot topology).
MPI	Multiple Protocol Interface. Protocol defined by Siemens which uses the layer 1 and 2 of PROFIBUS (FDL).
PCB	Printed Circuit Board.
PROFIBUS DP	Acronym for "PROFIBUS for Decentralized Peripherals". Specification of an open fieldbus system with the following characteristics: - Polling master-slave-system (cyclic communications, MS0) - Flying masters with robin round token passing coordination (MM) - Connection based (MS1) and connectionless (MS2, MS3) acyclic communication between masters and slaves Options (e.g.): - Data exchange broadcast (DXB), i.e. slave to slaves communication - Isochronous mode of slaves - Clock synchronization - Redundancy PROFIBUS DP is standardized within IEC 61158 and IEC 61784, communication profile families 3/1 and 3/2 The term "PROFIBUS DP" also is a synonym for the RS485 based deployments within factory automation.
Repeater	Active physical layer device that receives and retransmits all signals over a different port to increase the distance and number of devices for which signals can be correctly transferred for a given medium.
Spur line	A cable attached to a bus segment with a T-connection . Spurs are not recommended with PROFIBUS DP. They are prohibited with 12 Mbps and PROFIsafe operations. German term is "Stichleitung".
Stub line	See *Spur line*.

Tbit	See *Bit Time*.
Termination	A (powered) resistor network at both ends of a segment to prevent reflections (with PROFIBUS DP the termination must be powered).
Topology	In a communications network, the pattern of interconnection between network nodes; e.g. bus, ring, star configuration.
PI	PROFIBUS International. The International PROFIBUS Organization based in Karlsruhe.
PNO	PROFIBUS Nutzer Organization. The German PROFIBUS Organization based in Karlsruhe.
Drop cable	See *Spur line*.
Reflection	Part of the original signal that is transmitted back along the cable. It corrupts the original signal.

7. About PROCENTEC

PROCENTEC is a specialist in PROFIBUS and PROFINET technology and develops products to optimize the production processes of end users. Our innovative solutions ensure that our customers successfully operate in the world of industrial automation and enjoy maximum results from their processes.

PROCENTEC globally supplies all the components required to install a measurable and controllable network. Our products measure, signal and connect the various elements of a process installation and ensure it runs optimally. We develop and produce all products in the Netherlands and export them through our worldwide distribution network. PROCENTEC also is the international accredited Competence and Training center for PROFIBUS and PROFINET. We provide training courses that help employees using those techniques optimally for their business objectives. In addition we also provide the necessary support to end users during their implementation procedures, certification processes, audits and malfunctions.

We are of the opinion that the industrial markets need the confidence of believing in the reliable PROFIBUS / PROFINET technology and applications, to ensure their processes are not threatened in any way and the continuity remains guaranteed. In view of the possible negative consequences and impact in that industry, we therefore think that those companies have the right to the best solutions and honest expert advice. Based on that belief, PROCENTEC continues to innovate and develop, which makes us the most reliable service provider and knowledge partner for our customers. We do all of this with total dedication.

We believe that it is important to communicate with our customers, partners, distributors and suppliers in a transparent and decent way. We are empathic, truly interested and passionate in everything we do. Quality, continuity, service and sustainability are essential to us. That enables us to provide our customers with groundbreaking and tailor-made solutions.

Products

- ProfiTrace
- ComBricks
- ProfiHub
- PROFINET tools
- Cables and connectors

Training courses

- PROFIBUS training courses
- PROFINET training courses
- Product training courses

Services

- Competence center
- Support & Consultancy
- Network certification & Audits
- Testlab & Democenter

8. Revision history

Version 1.0

- Initial release

Version 2.0.0

- Updated the manual to the new corporate style

Version 2.1.0

- Added paragraph 1.9, 1.12 and 2.8
- Added text for increasing MinTSDR in paragraph 2.12
- Changed incorrect image Fig. 13
- Removed Certificates, List of Distributors and Next Versions chapter
- Minor textual changes

9. Notes

PROCENTEC BV
Klopperman 16
2292 JD Wateringen
The Netherlands

T: +31 (0)174 671 800
F: +31 (0)174 671 801
E: support@procentec.com
W: www.procentec.com