RHP303 - smar

USER´S MANUAL

PROFIBUS HUB REPEATER

JAN / 14

RHP303

RHP303ME

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AVOIDING ELECTROSTATIC DISCHARGES

ATTENTION

Electrostatic discharges may damage semiconductor electronic components in printed circuit boards. They usually occur when touching components or connector pins from modules and racks, without wearing the appropriate equipment to prevent discharges. It is recommended to take the following precautions:

- ✓ Before handling modules and racks, remove the electrostatic charge from your body by wearing a proper wristband or touching grounded devices;
- ✓ Avoid touching electronic components or connector pins from racks and modules.

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RHP303 – PROFIBUS HUB REPEATER

Description

RHP303 is an active element serving as interface between segments on Profibus network and ensures adequate signal levels, while guarantees the communication signal integrity. The repeater prevents signal deterioration in long distances. Essentially it receives the signal from a network segment, cleans, amplifies and transmits it to other segments. This way, the original message is preserved for all network segments. The RHP303 executes this function bidirectionally. In addition, serves to galvanically isolate the segments.

The PROFIBUS DP is a high speed communication bus that follows strict spur lines rules due to possible reflections that disturb communications.

The RHP303 is the innovative solution for applications that need spur lines or star segments. It is the most economical solution to install reliable spur lines on high speed DP networks. It has 5 insulated galvanic transparent repeaters, allowing network structures with extended spur lines, which, individually, may include up to 31 devices and a length equal to the main bus. The RHP303 regenerates the electric signal in one channel and transfers it to all the others (chicken foot topology).

As RHP303 creates insulated segments, the devices can be removed and inserted during the operation. Likewise, electric bus problems and EMC disturbances on a spur do not spread to other segments. The RHP303 smart circuits and its insulation do not electrically modify the communication signal. These circuits also identify automatically the transmission speed.

The RHP303 has a differential feature that is to work in Modbus for two communication rates in manual mode: 9.6 Kbps and 19.2 Kbps.

To help installation, a terminator is integrated and can be turned on or off. The RHP303 is powered by 12 to 30Vdc voltage. For faults identification, maintenance and commission, it has LEDs that indicate each channel status.

Main features

- IP 20 classification;
- 5 insulated channels;
- Transparent for all PROFIBUS DP protocol versions;
- RS-485 specifications for each channel;
- Maximum 12 Mbps communication rate;
- Supports up to 31 devices per channel;
- Supports up to 1200 m length of spur line;
- No address required;
- Integrated terminator;
- Supports Modbus protocol in manual mode on 9.6 Kbps and 19.2 Kbps;
- Ideal for applications in areas susceptible to EMI;
- Allows expansion of the Profibus DP/Modbus RTU network with reliability;
- Regenerates Profibus DP/Modbus RTU signals that were affected by capacitive effects;
- Insertion and removal of slave equipment during the operation;
- Protection against short circuit and indication on each channel;
- Compact and robust construction;
- Status and error display per channel;
- Compatible with all DP cables;
- Provides more convenient arrangement for the network cables;
- Easily extensible installations;
- DB9 connector available for diagnostics;
- Cost savings with cabling and repeaters.

IMPORTANT
This equipment must only be used with devices or components complying with PROFIBUS and RS-485 standards. This product can only work correctly and safely if installed, configured and operated according to recommendations.

Figure 1 – RHP303

Areas of Application

- Dynamic spur lines for actuators, flow meters and pH analyzers;
- Inverters and motors;
- Motor control centers;
- Barrier for galvanic and non-insulated equipment;
- Large star/tree structured networks.

Examples of Application

The figure below shows a general RHP303 application. Each insulated channel prevents short circuit propagation from one channel to another and allows expansion of up to 1200m per segment.

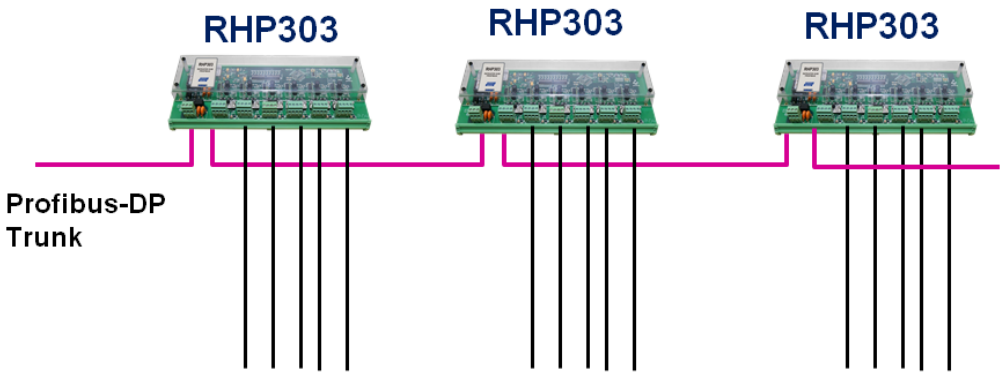


Figure 2 – General application

Furthermore, the RHP303 amplifies and corrects communication signals that are affected by capacitive effects in the segments. See example in the following figure of a network affected by capacitive effect:

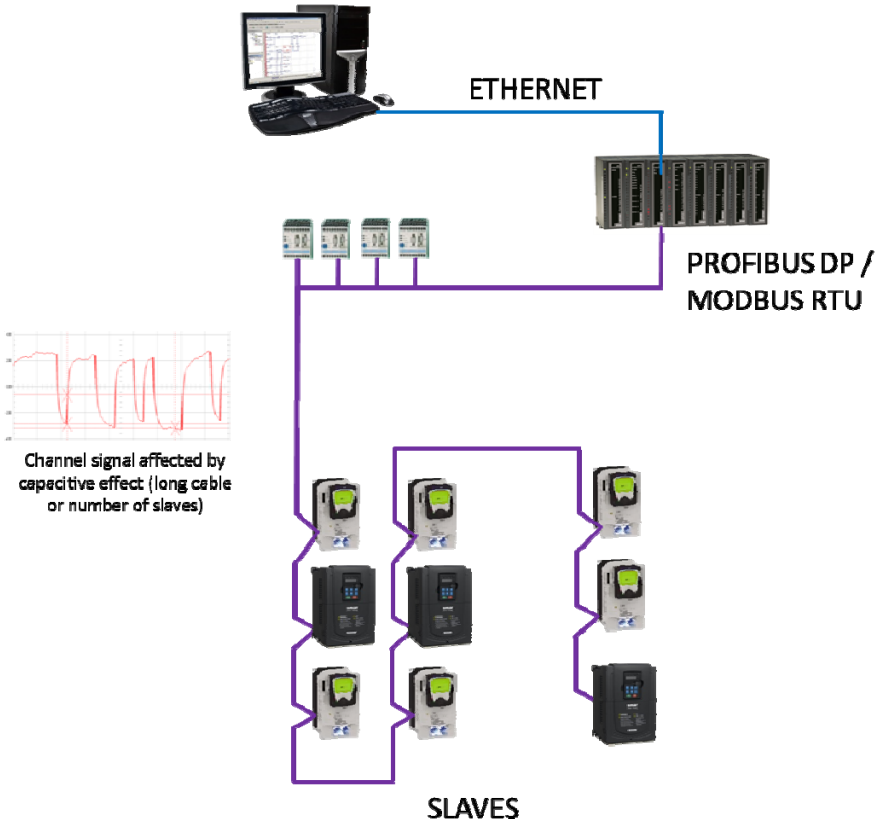


Figure 3 – Communication signals affected by capacitive effect

The following figure shows the communication signals recovered by RHP303.

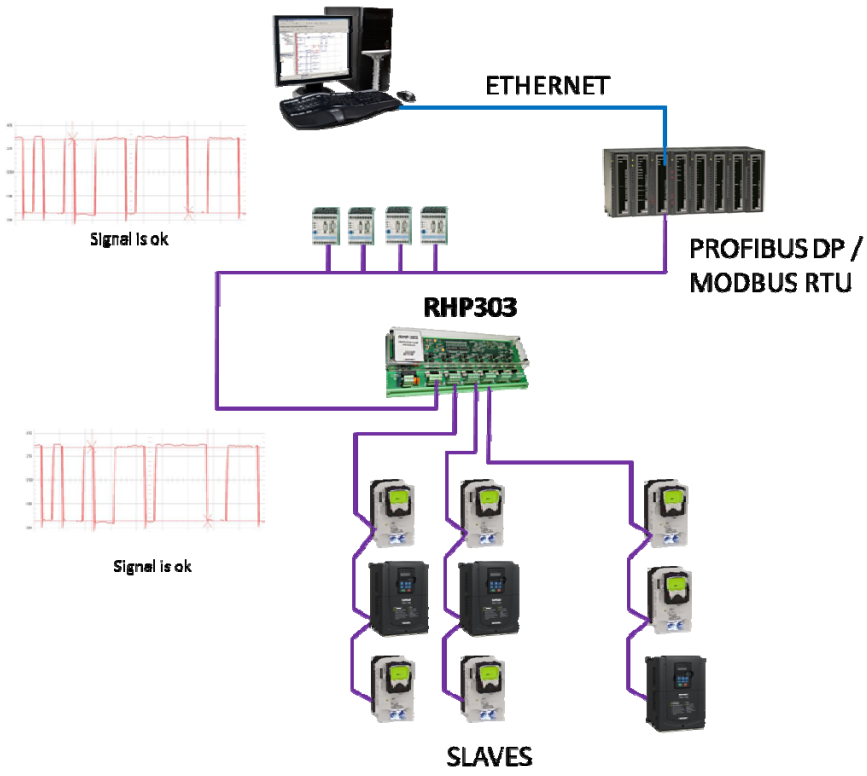


Figure 4 – Communication signals recovered by RHP303

The RHP303 increases the network availability by filtering EMI noises so that one channel does not interfere with the other or with the main trunk. The isolated RHP303 spurs ensure that common noise in critical areas, such as MCCs, does not interfere in the remaining areas.

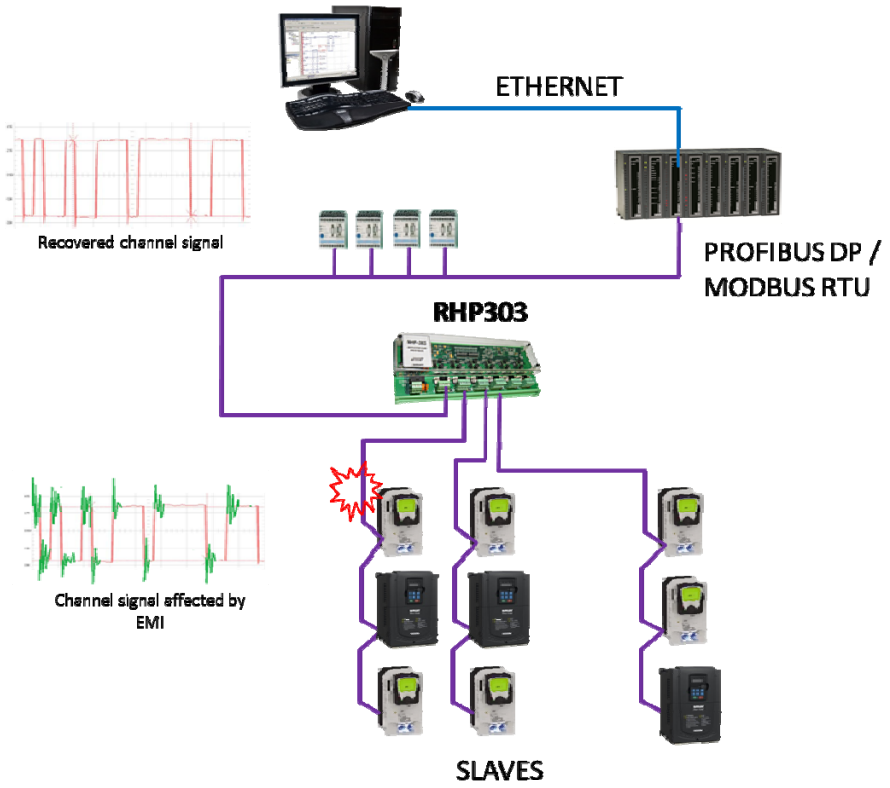


Figure 5 – Application in areas susceptible to Electromagnetic Interference

Profibus DP/Modbus RTU networks can be expanded in tree or star topology, without limits for RHP303 in cascade. Thus it is possible to increase channel length and its number of devices with communication signal integrity. See the next figure.

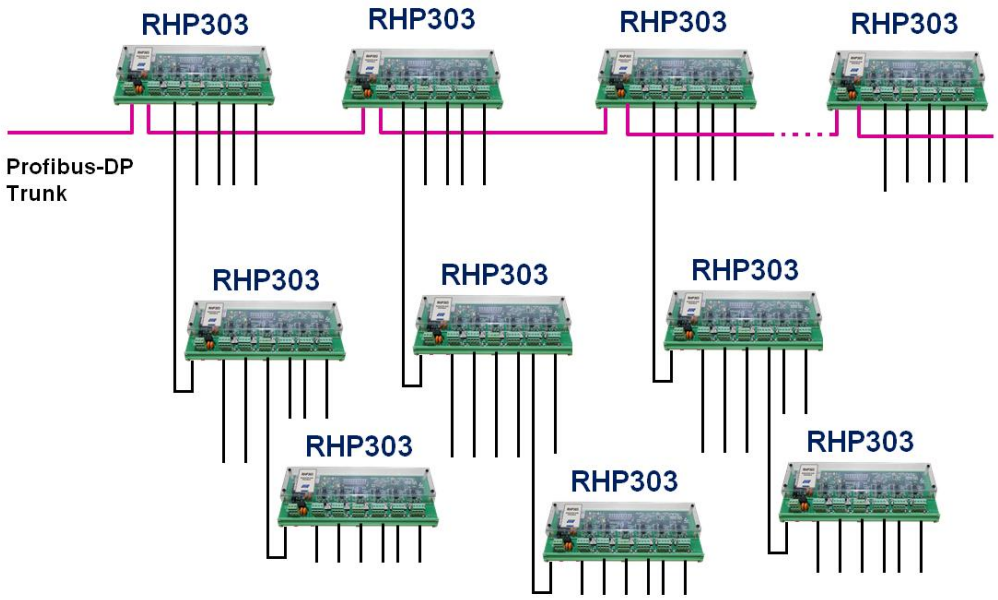


Figure 6 – Expansion of Profibus DP networks

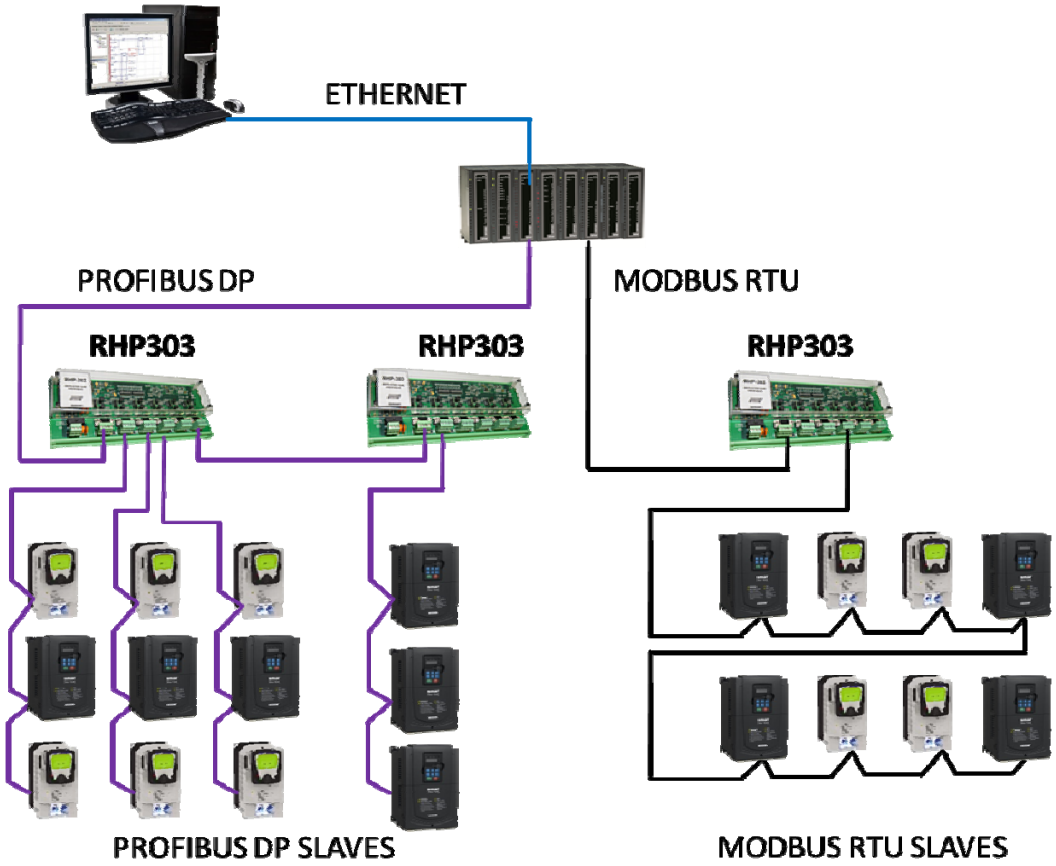


Figure 7 – Application example of Profibus- DP and Modbus RTU

PROFIBUS DP cable lengths

See on the table below the relation between the several communication rates and the allowed lengths. Make sure the cables on the main channel (A) and the derived channels (B to F) comply with the PROFIBUS DP cable specifications for the RS-485.

Baud rate (kbps)	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

Baud Rate LEDs

The BD0 to BD9 LEDs blink in yellow to indicate the baud rate used by the Profibus DP Repeater according to the next figure. The baud rate will be the same for every channel.

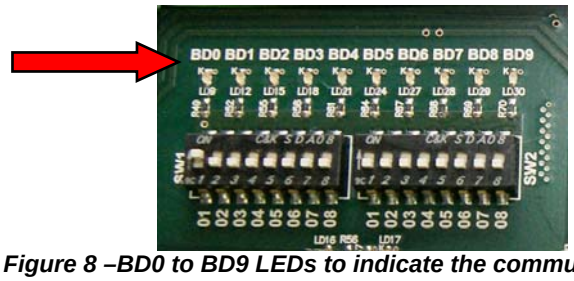


Figure 8 –BD0 to BD9 LEDs to indicate the communication rate

Baudrate	LEDS									
	BDO	BD1	BD2	BD3	BD4	BD5	BD6	BD7	BD8	BD9
9,6 Kbps	ON	off	off	off	off	off	off	off	off	off
19,2 Kbps	off	ON	off	off	off	off	off	off	off	off
45,45 Kbps	off	off	ON	off	off	off	off	off	off	off
93,75 Kbps	off	off	off	ON	off	off	off	off	off	off
187,5 Kbps	off	off	off	off	ON	off	off	off	off	off
500 Kbps	off	off	off	off	off	ON	off	off	off	off
1,5 Mbps	off	off	off	off	off	off	ON	off	off	off
3,0 Mbps	off	off	off	off	off	off	off	ON	off	off
6,0 Mbps	off	off	off	off	off	off	off	off	ON	off
12 Mbps	off	off	off	off	off	off	off	off	off	ON

Status LEDs (ST)

Each Profibus DP Repeater channel has a ST LED. The red ST LED indicates the channel status.

If the LED is off, the channel is good. If it is on, the channel has some fault. It can be caused by a cable short circuit or any other problem that may degrade the signal until it is no longer recognized by the RHP303.

Channel Status	ST LED
Good	Off
Faulty	On

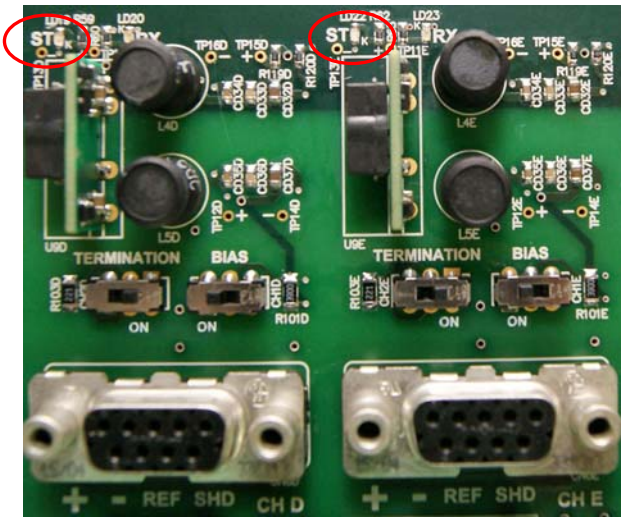


Figure 9 – ST LEDs to indicate the channel status

RX LEDs

Each Profibus DP Repeater channel has a RX LED. The yellow RX LED indicates the reception by the channel.

When turned off, the channel is not receiving a valid signal. When turned on, the channel is receiving a valid signal.

Reception	RX LED
Invalid or non-existing signal	Off
Receiving a valid signal	On

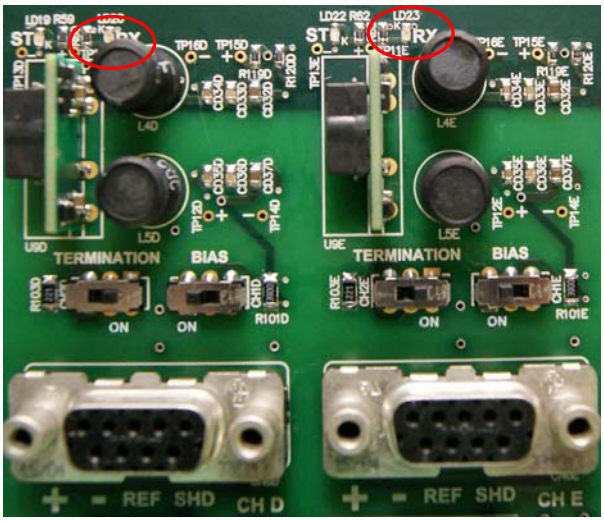


Figure 10 – RX LEDs to indicate signal reception

Installation

The RHP303 can be installed anywhere in a non-hazardous area and on the specified temperature range of 0 to 60ºC.

The RHP303 must be installed on DIN rail, with the connector cable on the bottom part. In this position the cables go down and it is also easier to read the status LEDs.

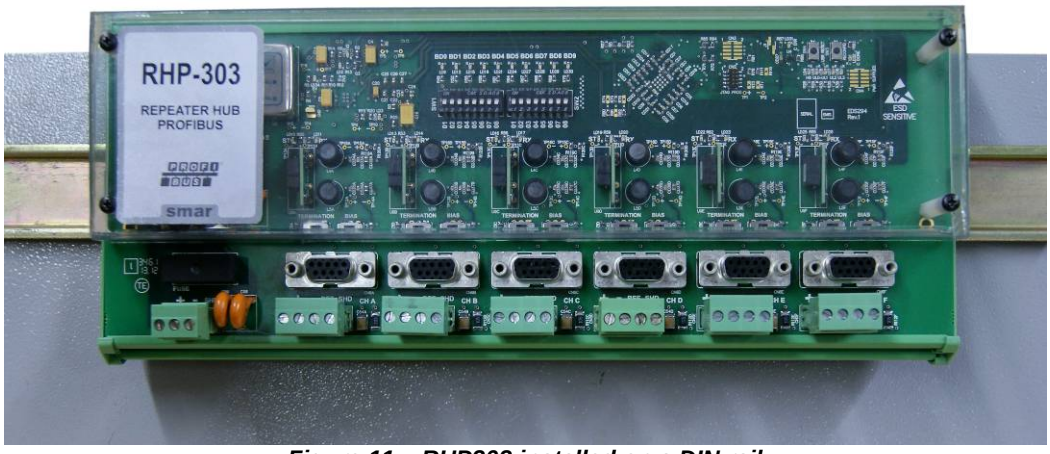


Figure 11 – RHP303 installed on a DIN rail

NOTE
The installation must be executed by qualified technicians with a PROFIBUS Installer or a PROFIBUS Engineer certificate.

Power supply

The power supply connector, a 3-pin terminal block, is located on the RHP303 lower left corner. The power supply must comply with the Technical Specifications topic.

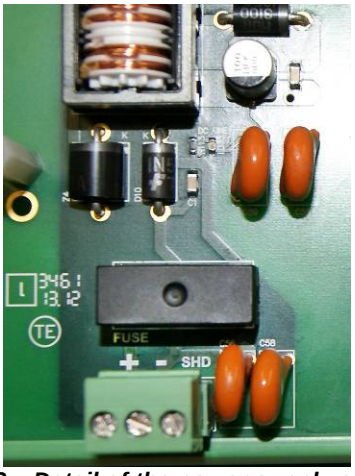


Figure 12 – Detail of the power supply connector

Spur segments

Connect the spur segments on the channel B, C, D, E and F connectors, according to the table below.

Pin	Signal
B (+)	Positive
A (-)	Negative
REF	GND
SHD	Shield

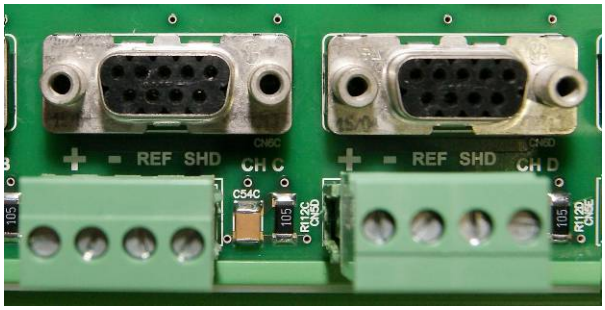


Figure 13 – Detail of spur segment connectors

IMPORTANT
The SHD connector is available for connecting the cable shield. Make sure that the shield is connected only at this point.

Terminators

All RHP303 channels have configurable terminators. The main channel termination is adjusted in OFF by default. If the RHP303 is the last or the first segment device, the termination must be adjusted in ON.

The termination of the other channels is adjusted in ON by default because the new segment is expected to be initiated on the RHP303.

Do not forget to turn on the switch at the other segment end.

NOTE
Non-used channels must have their terminators activated.

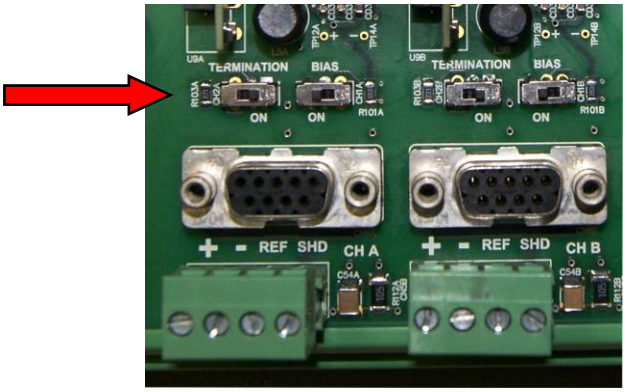


Figure 14 – Detail of channel terminators position

Baud Rate Configuration

The RHP303 recognizes the transmission speed by default. If necessary lock the RHP303 on given transmission speeds, the SW1.1 to SW1.5 must be adjusted on the required value. To execute the adjustment remove the top cover.

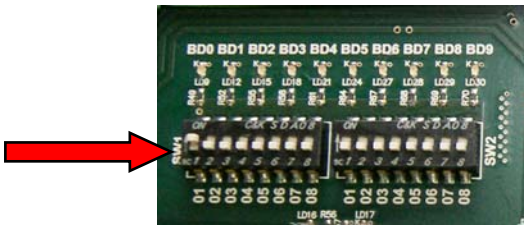


Figure 15 – Switches SW1.1 to SW1.5 for communication rate adjustment

The switches SW1.1 to SW1.5 are used to select the baud rate used by the Profibus DP Repeater according to the next table. The baud rate selected will be the same for all channels. These baud rates are standardized by the Profibus DP protocol.

	BAUD RATE	SW1.1	SW1.2	SW1.3	SW1.4	SW1.5	SW1.6	SW1.7	SW1.8
	AUTO	OFF	X	X	X	X	X	X	X
MANUAL	9.6 Kbps	**ON**	**ON**	OFF	OFF	OFF	X	X	X
	19.2 Kbps	**ON**	OFF	**ON**	OFF	OFF	X	X	X
	45.45 Kbps	**ON**	**ON**	**ON**	OFF	OFF	X	X	X
	93.75 Kbps	**ON**	OFF	OFF	**ON**	OFF	X	X	X
	187.5 Kbps	**ON**	**ON**	OFF	**ON**	OFF	X	X	X
	500 Kbps	**ON**	OFF	**ON**	**ON**	OFF	X	X	X
	1.5 Mbps	**ON**	**ON**	**ON**	**ON**	OFF	X	X	X
	3.0 Mbps	**ON**	OFF	OFF	OFF	**ON**	X	X	X
	6.0 Mbps	**ON**	**ON**	OFF	OFF	**ON**	X	X	X
	12 Mbps	**ON**	OFF	**ON**	OFF	**ON**	X	X	X

Note: The “X” on the table means “The switch position is irrelevant”.

To adjust the transmission speed, use a screwdriver.

NOTE
For the Modbus protocol, the available rates must be adjusted in “Manual”: 9.6 Kbps and 19.2 Kbps.

Technical Specifications

POWER SUPPLY	
Power connector	3-pin terminal block
Voltage	12 to 30 Vdc (24 Vdc nominal)
Maximum current	270 mA @ 24 Vdc
Protection against reverse polarity	Yes
Cabling	< 2.5 mm^2

FUNCTION SPECIFICATIONS	
Supported Protocols	Modbus, DP-V0, DP- V1, DP-V2, FDL, MPI, FMS, PROFIsafe, PROFIdrive and any other FDL-based protocol
Communication Rates (kbps)	9.6; 19.2; 45.45; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000
Communication Rate detection	Self-detectable by default or switch configurable
Communication rate selection switch	0 = Self-detectable by default
Communication rate detection time	< 5 s (if self-detection selected)
Data delay time	1 Tbit for all rates
Jitter delay time	±0.1 Tbit for all rates
Terminators	One on each spur

ENVIRONMENT CONDITIONS	
Operation temperature	0 to 60 ºC
Protection degree	IP 20

DIMENSIONS AND WEIGHT	
Dimensions (LxWxH)	296 x 125.4 x 65 mm
Weight	612 g

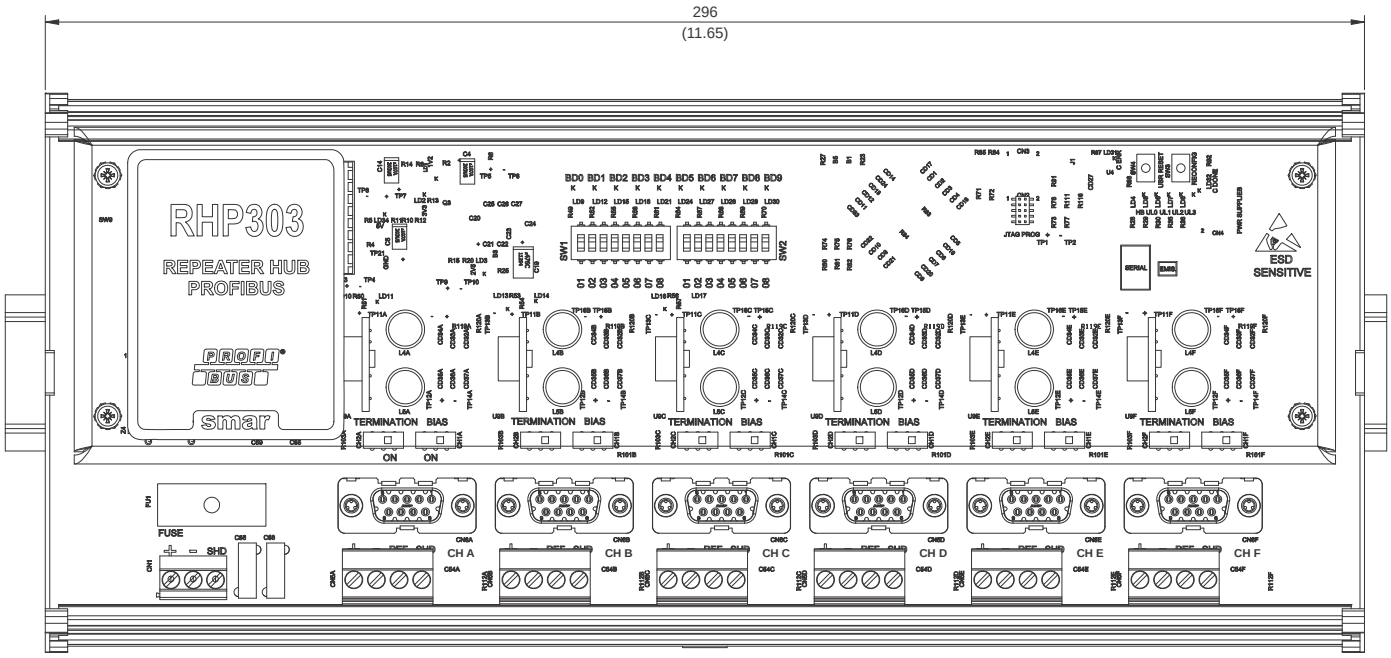
MOUNTING	
Support	DIN rail

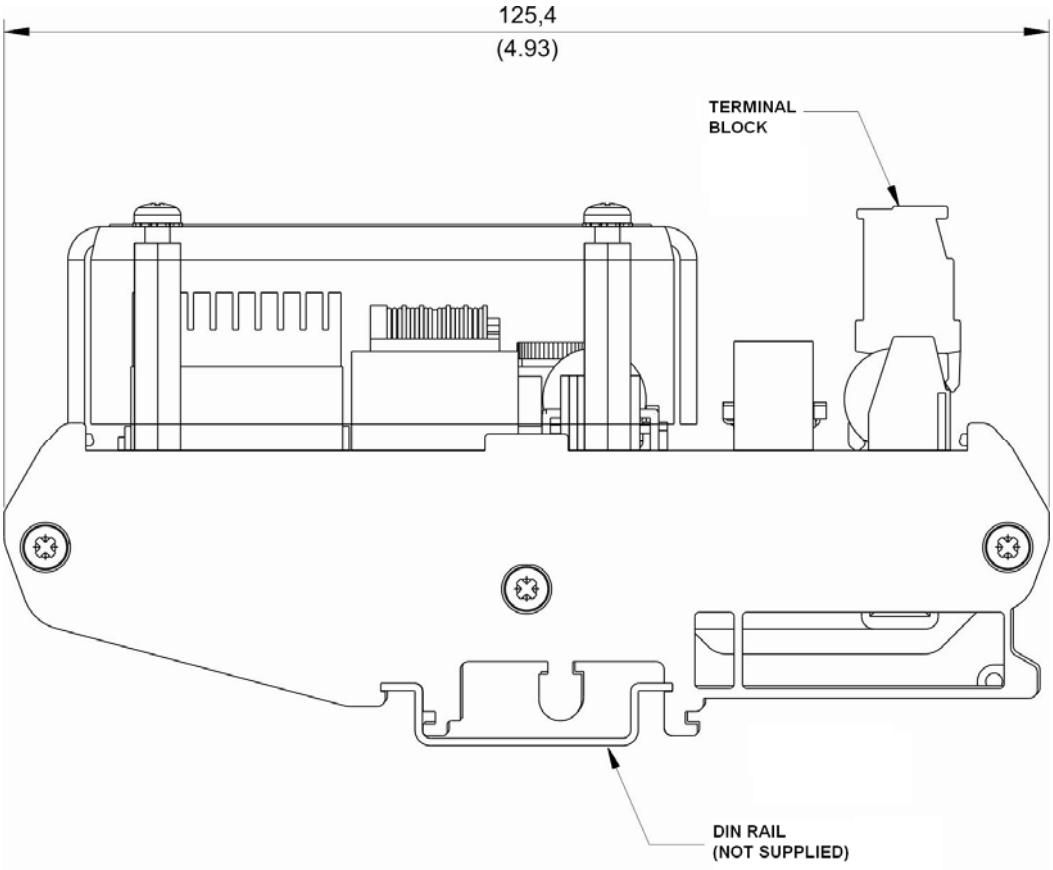
Spare part components

SPARE COMPONENTS LIST	
COMPONENTS DESCRIPTION	**CÓDE**
5 x 20 mm Fuse – 500 mA (package with 10 pieces)	400-1241

Dimensional Drawings

The sizes are in millimeters and in brackets for inches.


296
(11.65)
RHP303
REPEATER HUB
PROFIBUS
PROFI
BUS
smar
ESD
SENSITIVE
TERMINATION BIAS
ON
FUSE
SHD
CH A
CH B
CH C
CH D
CH E
CH F


125,4
(4.93)
TERMINAL
BLOCK
DIN RAIL
(NOT SUPPLIED)

Appendix

smar	SRF – SERVICE REQUEST FORM	
	RHP303 – Profibus Hub Repeater	**Proposal Nº:**

COMPANY INFORMATION

Company: _____
Unit: _____
Invoice: _____

COMMERCIAL CONTACT

Full Name: _____
Phone: _____ _____ _____ _____ **Fax:** _____
E-mail: _____

TECHNICAL CONTACT

Full Name: _____
Phone: _____ _____ _____ _____ **Extension:** _____
E-mail: _____

EQUIPMENT DATA

Model: _____
Serial Number: _____

PROCESS DATA

Process Type (Ex. boiler control)**:** _____
Operation Time: _____
Failure Date: _____

FAILURE DESCRIPTON

(Please, describe the failure. Can the error be reproduced? Is it repetitive?)

_____

_____

_____

_____

OBSERVATIONS

_____

_____

_____

_____

USER INFORMATION

Company: _____
Contact: _____
Section: _____
Title: _____ **Signature:** _____
Phone: _____ _____ _____ _____ **Extension:** _____
E-mail: _____ **Date:** _____/ _____/ _____

For warranty or non-warranty repair, please contact your representative.
Further information about address and contacts can be found on **www.smar.com/contactus.asp**