



# User manual

Smart\_DP for Radio Data Technology RDT  
RM 9600 Modem Series

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Rev. rel. 13.1.03



## Versions

Documentation:	V1.10
Configuration tool, RS-232:	V1.00
Firmware version:	V1.10
Hardware version:	V1.20

This product has been developed in cooperation RDT/SUA Telenet



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## A - Notes

**The usage of hardware and software should only take place after reading the manual.**

Generally:

1. Connect the hardware correctly to the power supply (polarity).
2. Use the right voltage (+18...36V DC) - voltage out of the defined range can lead to the destruction of the device.

### **SELV Compliance**

**The safety status of any connections to the Smart\_DP module must comply to the SELV requirements.**

## B - Delivery content

The Smart\_DP Box consists of the following parts:

### **Smart\_DP Box for Radio Modem Series**

Smart\_DP electronic with additional integrated 18-36V power supply in a robust aluminium housing, including a power supply connector.



Accessories (optional):

Software

- **Smart\_DP CD for Radio Modem Series**

CD with configuration tool for the serial interface, GSD file to include the device in the project of a standard DP-Master configuration tool (e.g. Step7, COM-Profinet, projecting tools from Softing, Hilscher, etc.), user manual as \*.pdf file.

Hardware

- **Smart\_DP Railmount**

Fixing hanger to mount the box on a standard rail.



## **C - Introduction**

The Smart\_DP Box for Radio Data Technology Series RM 96xx is used for a simple coupling of one Central Station (Radio Master) to other Stations (max. 8 Radio Slaves)

In principle, the system acts as a DP/DP-coupler polling system making use of a unique control mode in the RM 9600.

This standard package includes the hardware within a rugged aluminium housing, configuration software for the settings via the serial interface and a GSD file to include the system in a project of a Profibus-DP master.

## **D - Hardware specification**

### ***D.1 Dimensions***

- 46 x 73 x 93 mm

### ***D.2 Connectors, State display***

#### Side A

- Profibus Interface
- Bus state LED
- Operating LED
- Profibus Address Highnibble
- Profibus Address Lownibble

#### Side B

- Interface to RM 96xx
- VCC +18 V – 36 V DC (2 Watts)
- GND
- PE

### D.3 Technical data

<b>Power supply (Smart_DP Box)</b>	
Operating voltage	+18-36V DC
Power consumption (RS-232 and Profibus in operating state)	approximately 2 Watt
<b>Profibus-DP interface</b>	
Interface	9-SUBD female connector
Baudrate	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000 kBit/s
<b>RS-232 interface</b>	
Standard PC/RS-232 interface	9-SUBD male connector
Baudrate	19.2 kBit/s adapted to the radio modem rm96xx from RDT

### D.4 Interface signals

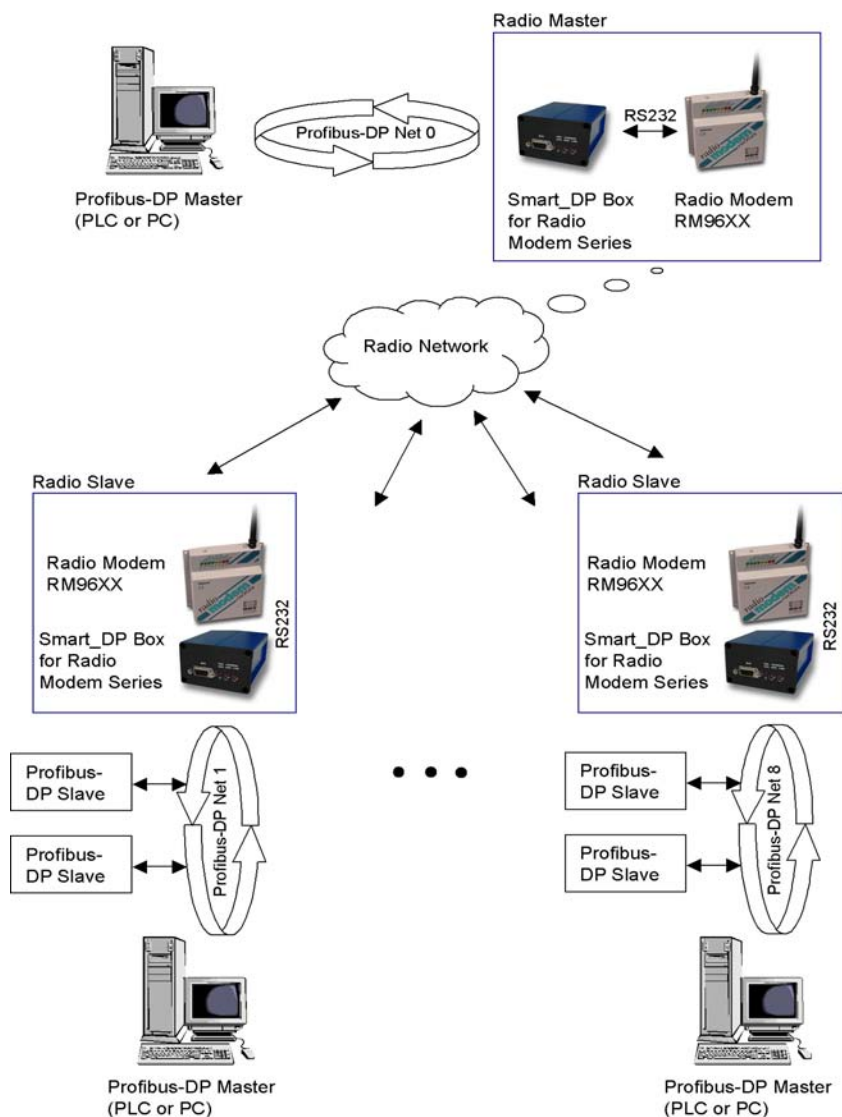
<b>Power supply (PIN)</b>	
+	+18-36V DC
GND	GND
PE	PE
<b>RS-232 (PIN)</b>	
<b>9-SUBD male connector</b>	
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI
<b>Profibus-DP Interface (PIN)</b>	
<b>9-SUBD female connector</b>	
1	n.c.
2	n.c.
3	B+
4	n.c.
5	DGND
6	VP (+5V)
7	n.c.
8	A-
9	n.c.
<b>LED-Signals (Profibus-DP)</b>	
LED red	Profibus state
LED green	Operational state

## E - Usage of the hardware

### E.1 Working scenario

The picture below shows a possible scenario for the b-plus Smart\_DP for Radio Modem Series device. The power supply for the Profibus-DP/RS-232 interface must provide an operating voltage between +18-36V DC, whereby the power consumption of the Smart\_DP module is about 2 W.

The Profibus-DP interface is equipped with a SUBD female connector. Via this connector the Smart\_DP can be connected with a standard Profibus cable to the master system (e.g. a PLC or a PC).





The RS232 interfaces of the Smart\_DP modules must be connected to the RS232 interfaces of the radio modems. Please refer to point E.2 - „Connection of the hardware“. Data will be exchanged as fast as possible between the Radio Master (Profibus network) and the individual Radio Slaves (Profibus networks) over radio in a polling mode.

The Radio Master changes the address of the controller from 1 to the defined number of configured Radio Slave addresses (1 to max 8) beginning with 1, 2, and so on. After changing the address the Radio Master tries to send the configured data bytes (the number was requested from Radio Slave after changing address) to the specific Radio Slave. After the Radio Slave receives the data bytes it sends its own configured data bytes to the Radio Master. If a Radio Slave doesn't answer within a predefined time, the Radio Master is changing to the next address automatically, according to the defined timeout parameters (see section F3.1 and F3.4 for details)

**Exception:**

If only one Radio Slave is configured the address change by the Radio Master is made only one time. So there is a time saving factor improving the data throughput.

**Attention:**

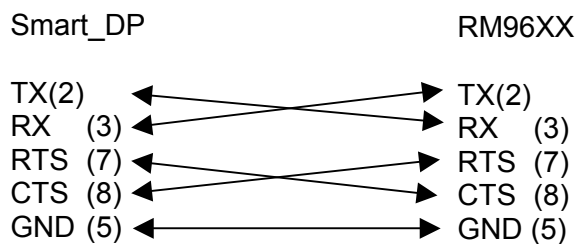
Radio Master and Slaves need to be configured with a Guard Time of 200 ms to avoid a mix of 'Set Address'-command format with real data being transmitted.



## E.2 Connection of the hardware

The following points have to be considered when connecting the Smart\_DP module:

1. Take care about connecting lines to the power connector in the right way (polarity).
2. Connect PE to safety ground.
3. Pay attention to the right operating voltage. The Smart\_DP module allows an operating voltage range between +18-36V DC.
4. Connect the Smart\_DP module via a norm Profibus cable to the Profibus network.
5. Connect the Smart\_DP for Radio Modem Series via the RS232-interface with the radio modem RM96XX as follows:



**All other connectors must be left open!**

6. Switching on the operating voltage to the module:
  - The green LED is permanently on and signals "ready for operation".
  - The red LED is on if the connected Profibus (master system) is in state „off“ or if no bus system is connected
  - The red LED is blinking if the connected Profibus (master system) is in state „stop“ or „clear“.
  - The red LED is permanently off if the Profibus system is in „operation (cyclic data exchange) and the module is included to the project of the master via the GSD file in the right way (only blinking in case of an error).

## F - Configuration

In order to use the whole function of the Smart\_DP device, some parameters must be set according to the respective working scenario. The user has three possibilities to configure the Profibus-DP/RS-232 interface:

- **Set the bus address via the code switches**
- **RS-232 configuration software for setting the bus address parameter**
- **Configuration via the project tool of the respective master system through the GSD file, and the 'SetSlaveAddress-telegram'**

Profibus parameter	RS-232	Profibus-DP / GSD	Code switches	Description
DP-address	r/w	r/w	w	Hardware address of Smart_DP
<b>Serial Interface</b>				
Speed	r/w	r/w	n.a.	Baudrate
Bits	r/w	r/w	n.a.	Length of data word
Stop bits	r/w	r/w	n.a.	Stop bits
Handshake	n.a.	n.a.	n.a.	Handshake mode, not implemented
Parity	r/w	r/w	n.a.	Parity
<b>Additional parameter</b>				
Serial number	r	n.a.	n.a.	Serial number
Firmware version number	r	n.a.	n.a.	Firmware version

(Legend: **r** read, **w** write, **n.a.** not available)

The table above shows, which parameters can be read or set by which tool.

### **Important note:**

***If the Smart\_DP cannot be found in the Profibus network, the setting of the bus address should in any case first be done by means of the code switches!***



## ***F.1 Configuration via code switches***

The Profibus-DP address of Smart\_DP can be configured via the code switches. This method of setting the address has a higher priority than the configuration by software. By software the address can be set through the 'SetSlaveAddress-telegram' of the master or by the serial configuration tool described in the following sentences. The settings done by software are only active if the code switches are switched to a value above 126. Otherwise, the hardware settings have priority.

### ***Important note:***

***A changing of the value of the code switches will only be active if the Profibus-DP/RS-232 interface is booted again (that means the power supply is separated and then connected again).***

### ***In any case:***

***If you are not sure what address should be used for connecting Smart\_DP to your special Profibus-DP network, please ask the engineer who is responsible for your bus system.***



## ***F.2 Configuration via the RS-232 interface***

The Profibus-DP/RS-232 module can be configured through a tool via the RS-232 interface. **However, the settings given by the GSD file, (they are especially adapted to the radio modem) should be used. That ensures the right functionality.**

### **F.2.1 Installation of the tool**

Start the program 'setup.exe' from the corresponding directory of the delivered CD ('...\ConfigSer') for the software 'Smart\_DP Serial Configuration-Tool' and follow the instructions on the monitor.

After successful installation the program 'Smart\_DP Serial Configuration' can be started from the task ledge under the program group 'b-plus'.

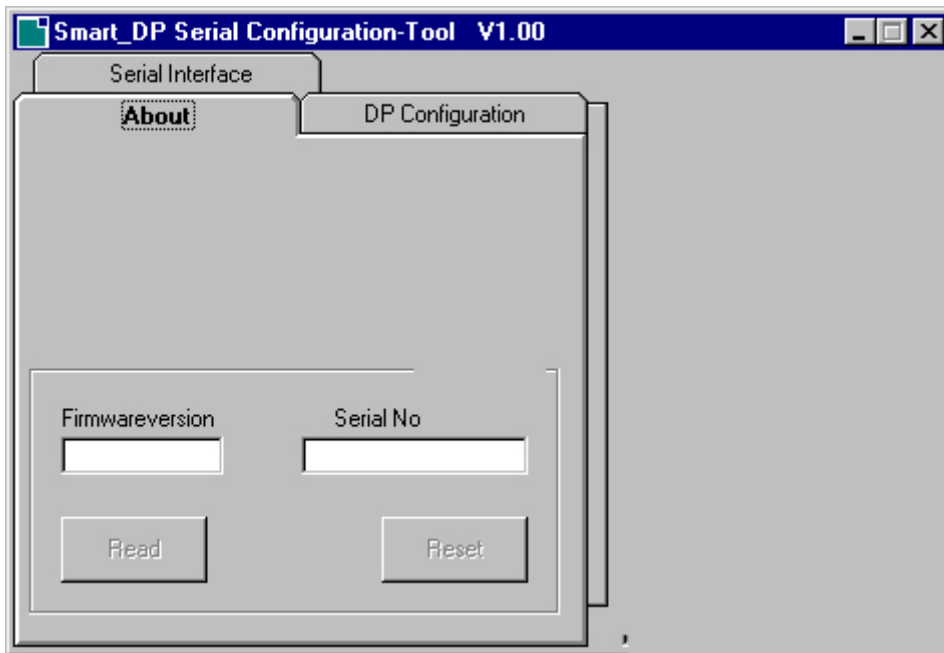
### **F.2.2 Usage of the 'Smart\_DP Serial Configuration-Tool'**

In order to get a connection via the 'Smart\_DP Serial Configuration-Tool' to the Profibus-DP/RS-232 interface **the following steps have to be carried out:**

1. Connect the Smart\_DP module through a zero modem cable (crossed data lines) to a free serial port of the PC.
2. Start the application 'Smart\_DP Serial Configuration' from the task ledge under the program group 'b-plus'.
3. Choose the COM port of the connected Smart\_DP module.
4. Power up the Smart\_DP module when the starting window of the application is shown on the screen.
5. After a short moment the buttons ('Read', 'Write', 'Reset') aren't shadowed any more (they are active now). Further on, the fields 'Firmware version' and 'Serial No' now contain the corresponding entries. The connection to the Smart\_DP is now established.

If setting up a connection to the module is not possible, the program will finish automatically after 10 seconds.

If there is no active connection to the Profibus-DP/RS-232 interface or if the search of the module by 'Smart\_DP Serial Configuration-Tool' is in process, the application window looks like the picture below:



**Picture 1 – Configuration tool (no connection)**

**Important note:**

***If a connection to Smart\_DP is not possible please check the following points:***

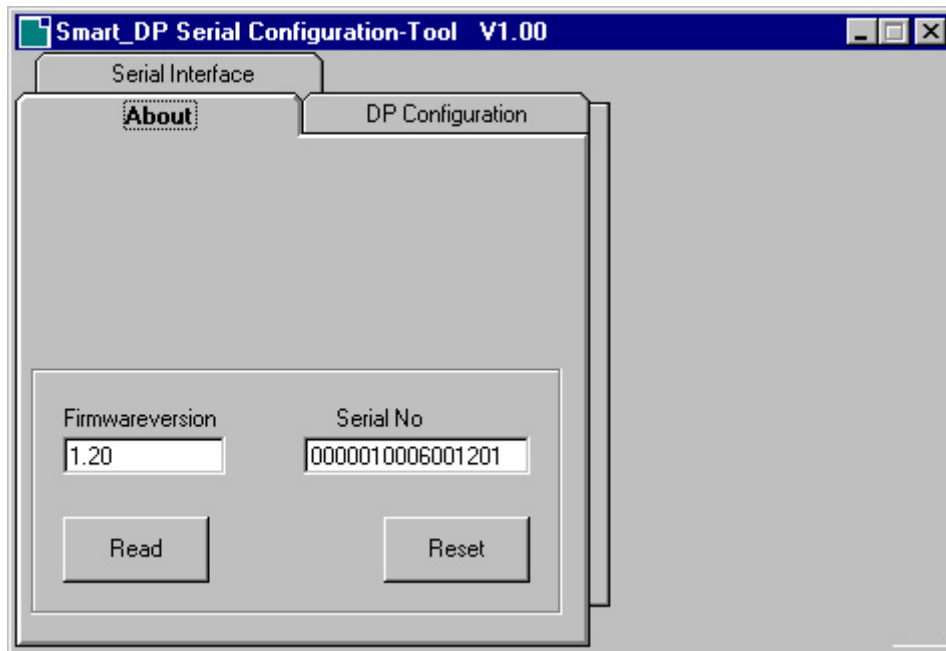
***Are all cables (lines, RS-232 and power) connected correctly?***

***Is the selected COM-port the right one?***

***Was the sequence kept in this way: starting the PC tool and then connecting the Smart\_DP to power?***

***Remark: the Smart\_DP module checks during startup if there is a PC connected to an active 'Smart\_DP Serial Configuration-Tool'.***

With a successful connection to the Profibus-DP/RS-232 interface the buttons are activated and the fields 'Firmware version' and 'Serial No' are filled with the corresponding contents as shown in the picture below:



**Picture 2 – Configuration tool (connection established)**

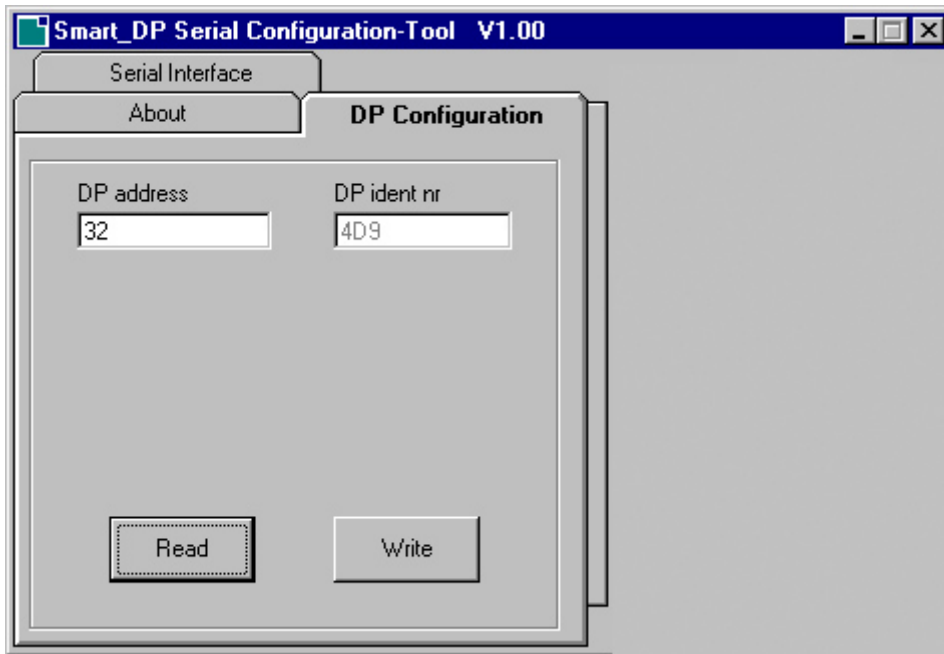
In the main window the following buttons can be shown:

**'Read':** Reads the actual firmware version and the serial number from the module.

**'Reset':** Resets the module (a contact with the configuration tool is not possible before the first reboot of the module).

By choosing a tab from the tabbed dialog in the above shown window the individual configuration masks can be selected.

Configuration of the Profibus-DP parameters:



**Picture 3 – Configuration tool (DP configuration)**

**DP address:** Shows the Profibus address stored in the EEPROM of the Smart\_DP module. This address is active, if the code switches are switched to a value above 126. In this case the address can be changed during active bus operation mode by the master via a 'SetSlaveAddress-Telegram'. The changed address will then be stored in the EEPROM.

**DP ident nr:** Shows the used PNO-Ident number of the module.

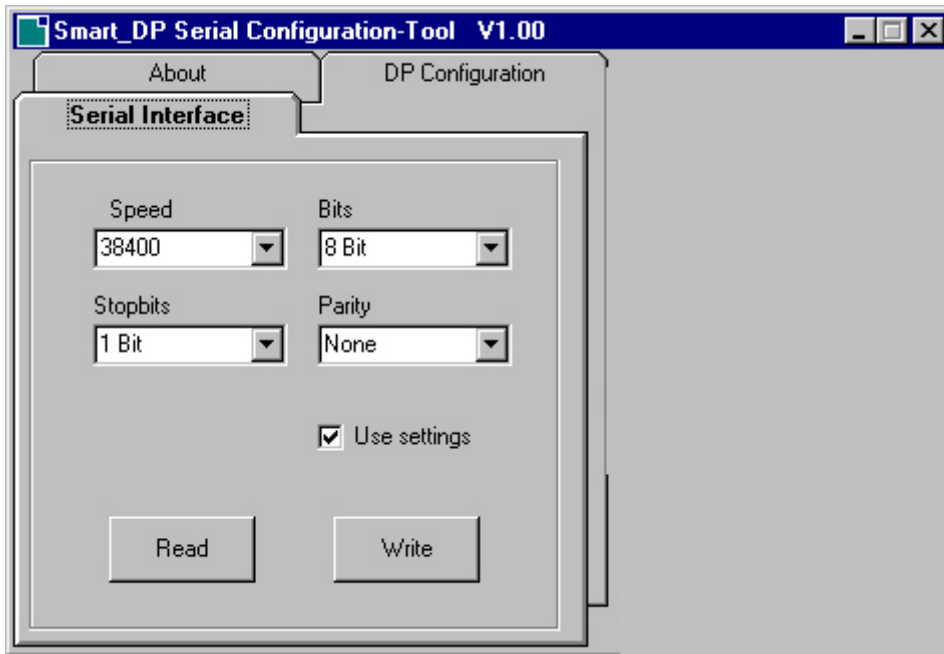
**Read:** Reading of the parameters stored in the EEPROM.

**Write:** Writes the actual values to the EEPROM of the Smart\_DP module – the settings are not active before the next reboot of the Smart\_DP module.

***Important note:***

***If you are not sure what address should be used for connecting Smart\_DP to your special Profibus-DP network, please ask the engineer who is responsible for your bus system.***

Configuration of the serial interface parameters of the Smart\_DP:



**Picture 4 – Configuration tool (configuration of the serial interface)**

**Speed:** Baudrate of the RS-232 interface.

**Bits:** Defines the length of a data word.

**Stop bits:** Number of stop bits.

**Parity:** Parity of the serial interface.  
**Use settings:** When this option is activated these settings are used for the configuration of the serial interface (when Smart\_DP is started). Otherwise, the settings sent by the Profibus master during network startup (project data) are used.

**Read:** Reading the EEPROM stored values.

**Write:** Writes the actual values to the EEPROM of the Smart\_DP module – the settings are not active before the next reboot of the Smart\_DP module.

Note: If the 'Use settings' flag is not activated, the defined values are written to the EEPROM too, but they are not used after the next reboot. The settings sent by the Profibus master during network startup (project data) are used.

**Important note:**

**The RS232 interface should always be set to the following parameter settings for Smart\_DP for Radio Modem Series: 19200 baud, 8 data bits, no parity and 1 stop bit. Only these parameters guarantee a correct functionality with the radio modem.**



## F.3 Configuration via the Profibus-DP master systems project

A GSD-File is part of the delivery. This file is used by the respective Profibus master system to define the application's specific parameter data set and the configuration data set for each Profibus slave which work together with the RM 96xx.

These data sets are produced via a master-specific project tool. The Profibus master uses these data sets when starting the bus system to set e.g. the characteristics of the Smart\_DP module.

The Smart\_DP module could be configured as a 'Radio Master'-module or as a Radio Slave'-module which are described in the following sections.

### F.3.1 Definition of the parameter data set for a 'Radio Master'

The GSD file contains the following parameters (projecting via a master specific software):

Parameters (Display projecting tool)	Configurable parameters	Description
Timeout_Mode	All inputs 0	Defines how input data of the slave should behave, if a NO_LINK-Timeout occurs.
	Hold old values	
Timeout NO_LINK-Diag	Unsigned Integer: Value in ms. Values between 1000 ms and 65536 ms are allowed.	Defines the timeout time to the polled radio slave until diagnose information is set on Profibus.
Modem Guard Time Recommended: 200ms	Unsigned Integer: Value in ms. Values between 0 ms and 65500 ms are allowed.	Defines the time which must keep before a new radio slave could be selected.

**Timeout\_Mode (Bool):** This parameter defines, how the profibus input data of the profibus slave should behave, if a NO\_LINK-Timeout is detected. The selection „All inputs 0“ sets all input data to zero, whereas the selection „Hold old values“ saves the last values in the register area.

**Timeout NO\_LINK-Diag (Integer value in ms):** Defines how long no data from the radio slave station can be received until a diagnose information (NO\_LINK-Diag) is set onto the profibus.

**Modem Guard Time (Integer value in ms):** Defines how long the radio master module must wait until it try to connect the next radio slave module.

Please refer to point G - „Configuration of the RDT RM96XX-modem“.

**Important note:**

**These defined settings (project data) are sent through the profibus master during network startup.**

### F.3.2 Definition of the configuration data set for a 'Radio Master'

The configuration data set defines the number of data bytes, which are cyclically transmitted via the Profibus.

This number of bytes is fixed for the respective used 'Radio Master'-module. It is possible to select one of max. eight different available 'Radio Master' modules. All modules have the same parameter data set, but different amount of input/output data.

For each 'Radio Slave' there were 30 data bytes needed.

List for several Radio Master:

Radio Master (1 Radio Slave):	maximum of data input:	30 bytes
Radio Master (2 Radio Slave):	maximum of data input:	60 bytes
Radio Master (3 Radio Slave):	maximum of data input:	90 bytes
Radio Master (4 Radio Slave):	maximum of data input:	120 bytes
...		
Radio Master (8 Radio Slave):	maximum of data input:	240 bytes

The 'Radio Master'-module must selected for the respective scenario the Smart\_DP for Radio Modem Series – module is used for.

***Important note:***

***These defined settings (configuration data set) are sent by the Profibus master during network startup.***

### F.3.3 Diagnose data for a 'Radio Master'

The Smart\_DP module provides the Profibus master the possibility to obtain diagnose information about errors from the Profibus slave device (Radio Master). Because of that, the Smart\_DP module is coding the diagnose information in 7 Profibus user-specific diagnose bytes.

Byte (user specific)	Bit	Description
1 to 4		Internally (DPV1) used
5	0	RS-232 TX-Buffer Overflow
	1	RS-232 RX-Buffer Overflow
	2	Inputlength-Error
	3	Outputlength-Error
	4	Baudrate-Error
	5	Parity-Error
	6	Stopbit-Error
	7	Bytesize-Error
6	0	LRC Error
	1-6	Not used
	7	RADIO_TX_FULL
7	0	NO_LINK_1
	1	NO_LINK_2
	2	NO_LINK_3
	3	NO_LINK_4
	4	NO_LINK_5
	5	NO_LINK_6
	6	NO_LINK_7
	7	NO_LINK_8

The first 4 bytes of the user-specific diagnose data and the bit 1 to 6 in the 6<sup>th</sup> byte respectively are not relevant for information.

For radio modem operation, the following diagnose information is important:

**LRC Error:** This error bit signals to the profibus master, that the actual checked LRC Byte from the corresponding partner was wrong.

**RADIO\_TX\_FULL:** This parameter informs the profibus master that the radio modems TX buffer is full.

**NO\_LINK\_X:** This error bits signals to the profibus master, that no actual data is transmitted from the corresponding partner which is selected since a configured time.

The remaining diagnose bits mentioned above are not relevant in that case.

### F.3.4 Definition of the parameter data set for a 'Radio Slave'

The GSD file contains the following parameters (projecting via a master specific software):

Parameters (Display projecting tool)	Configurable parameters	Description
Timeout_Mode	All inputs 0	Defines how input data of the slave should behave, if a NO_LINK-Timeout occurs.
	Hold old values	
Timeout NO_LINK-Diag	Unsigned Integer: Value in ms. Values between 1000 ms and 65536 ms are allowed.	Defines the timeout time to the polling radio master until diagnose information is set on profibus.
Modem Guard Time Recommended: 200ms	Unsigned Integer: Value in ms. Values between 0 ms and 65500 ms are allowed.	Defines the time which must keep before a new radio slave could be selected.
Radio Slave Address	Byte: Values between 1 and 8 are allowed.	Defines the address of the Radio Slave module.

**Timeout\_Mode (Bool):** This parameter defines, how the profibus input data of the profibus slave should behave, if a NO\_LINK-Timeout is detected. The selection „All inputs 0“ sets all input data to zero, whereas the selection „Hold old values“ saves the last values in the register area.

**Timeout NO\_LINK-Diag (Integer value in ms):** Defines how long no data from the radio master station can be received until a diagnose information (NO\_LINK-Diag) is set onto the profibus.

**Modem Guard Time (Integer value in ms):** Defines how long the radio slave module must wait until it configures the address of the radio modem.

**Radio Slave Address (Byte):** Defines the own address of the Radio Slave which is set on startup of Profibus communication via serial to the radio modem.

**Important note:**

***These defined settings (project data) are sent through the profibus master during network startup.***



### **F.3.5 Definition of the configuration data set for a 'Radio Slave'**

The configuration data set defines the number of data bytes, which are cyclically transmitted via the Profibus. This number of bytes can be variable adjusted to the scenario the Smart\_DP for Radio Modem Series – module is used for.

On the whole, the Smart\_DP module allows a maximum data input of 30 bytes and a maximum data output of 30 bytes. According to the max. 'Radio Slave' stations which the 'Radio Master' system could be handled. (Actually a maximum of 8 units, other options on request)

Thus, the configuration of the number of bytes is integrated as a modular concept. By using different radio slave modules (each one corresponds to a special number of DI/DO mark) – the maximum is 30 bytes – the necessary length of input and output data can be defined.

***Important note:***

***These defined settings (configuration data set) are sent by the Profibus master during network startup.***

### F.3.6 Diagnose data for a 'Radio Slave'

The Smart\_DP module provides the Profibus master the possibility to obtain diagnose information about errors from the Profibus slave device (Radio Slave). Because of that, the Smart\_DP module is coding the diagnose information in 7 Profibus user-specific diagnose bytes.

Byte (user specific)	Bit	Description
1 to 4		Internally (DPV1) used
5	0	RS-232 TX-Buffer Overflow
	1	RS-232 RX-Buffer Overflow
	2	Inputlength-Error
	3	Outputlength-Error
	4	Baudrate-Error
	5	Parity-Error
	6	Stopbit-Error
	7	Bytesize-Error
6	0	LRC Error
	1-6	Not used
	7	RADIO_TX_FULL
7	0	NO_LINK
	1-7	Not used

The first 4 bytes of the user-specific diagnose data, the bit 1 to 6 in the 6<sup>th</sup> byte and the bit 1 to 7 in the 7<sup>th</sup> byte respectively are not relevant for information.

For radio modem operation, the following diagnose information is important:

**LRC Error:** This error bit signals to the profibus master, that the actual checked LRC Byte from the corresponding partner was wrong.

**RADIO\_TX\_FULL:** This parameter informs the profibus master that the radio modems TX buffer is full.

**NO\_LINK:** This error bit signals to the profibus master, that no actual data is transmitted from the polling Radio Master system since a configured time.

The remaining diagnose bits mentioned above are not relevant in that case.



## G - Configuration of the RDT RM96XX-modem

In order to have the Smart\_DP for Radio Modem Series module working together optimally with the RDT RM96XX radio modem, some configuration must be done to the radio modem. These settings are absolutely necessary to guarantee the right functionality!

Only the tables of the user configurable settings of the radio modem are fixed below, which are necessary for the right operation of the coupling module with the modem.

### ROTARY SWITCH = 0 / RUN MODE

Irrelevant for modem/Smart\_DP coupling, only important for the general configuration of the RF communication.

### ROTARY SWITCH = 1 / TEST

Irrelevant for modem/Smart\_DP coupling, only important for the general configuration of the RF communication.

### ROTARY SWITCH = 2 / ADDRESS

Will be changed automatically via serial communication with Smart\_DP module. (no manual configuration needed)

### ROTARY SWITCH = 3 / MODE

1	2		3	4	5	6	7	8
PRIMARY MODE		OF OPEARTION	SERIAL CON- TROL	REPEATER ON/OFF	REPET ALL ON/OFF	AUTO REPEAT ON/OFF	REPEATER REMOTE	RS232/ RS485
OFF	OFF	ASYNC	OFF	OFF-X-X = REPEATER OFF		OFF	OFF	OFF
OFF	ON	SYNC	ON	ON-OFF-OFF = STANDARD REPEATER		ON	ON	ON
ON	OFF	MODEM		ON-OFF-ON = AUTOMATIC REPEATER				
ON	ON	N/U		ON-ON-OFF = REPEAT ALL				

### ROTARY SWITCH = 4 / RF PARAMETERS

1	2		3	4	5	6	7	8
RF BAUD RATE			LISTEN BE- FORE Tx	FEC ON/OFF	ARQ ON/OFF	RTS/CTS HANDSHAKE	DSR/DTR HANDSHAKE	ARQ TIMEOUT
OFF	OFF	4K	OFF	OFF	OFF	OFF	OFF	OFF
OFF	ON	8K	ON	ON	ON	ON	ON	ON
ON	OFF	16K						
ON	ON	N/U						

### ROTARY SWITCH = 5 / SERIAL INTERFACE CONFIGURATION

1	2	3	
SERIAL PORT BAUD RATE			
OFF	OFF	OFF	150
OFF	OFF	ON	300
OFF	ON	OFF	600
OFF	ON	ON	1200
ON	OFF	OFF	2400
ON	OFF	ON	4800
ON	ON	OFF	9600
ON	ON	ON	19200

4	5		6	7		8	
PARITY			CHARACTER LENGTH			STOP BITS	
OFF	OFF	NONE	OFF	OFF	7 BITS	OFF	1
ON	OFF	EVEN	OFF	ON	8 BITS	ON	2
ON	ON	ODD	ON	ON	9 BITS		



## ROTARY SWITCH = 7 / SERIAL CONTROL

Serial Control Guard Time should be the same value as configured in the project engineering via a master specific software. (Recommended are 200ms)

An exception is declared in E.1. For a point to point link 1: Radio Master / 1 Radio Slave (Recommended are 0ms = equal to factory presetting)

ROTARY SWITCH =7 Serial Control		1	2	3	4	5	6	7	8
		Spare	Spare	Serial Control	Guard Time	ARQ Retries	Global Address	Sensitivity	Spare
				<b>OFF</b>	<b>OFF=none</b>	ON=20	ON	ON=LOW	OFF=LED ALL
				<b>OFF</b>	<b>ON=200ms</b>	<b>OFF=Inf.</b>	<b>OFF</b>	<b>OFF=Normal</b>	ON=Only D17 ON
				ON	OFF=500ms				
				ON	ON=1sec				

Factory presetting in bolt letters

## H - Support

Technical support is available from

SUA Telenet GmbH  
 Gründenstrasse 82  
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