The Modbus RTU to Profibus gateways, the T511 and T510

Reference Manual

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About this document

The Reference Manual gives an overview of the capabilities and the use of the T510 and the T511 DIN rail mounted generic Profibus gateways. Furthermore, it explains how to configure the device.

The following abbreviations are used in this document:

DPV1	Extended functions in Profibus DP that allow acyclic communication for parameter configuration. DP is traditionally only suited for transfer of measured variables.
MSAC1	Acyclic communication services from a Master Class 1 (PLC).
MSAC2	Acyclic communication services from a Master Class 2 (configurations station)
PV	Primary dynamic variable in the transmitter
SV	Secondary dynamic variable in the transmitter
GSD file	Data sheet that describes the behavior of the device on Profibus, like data-rates, dynamic variables etc. A Master Class 1 uses the GSD file to start cyclic communication with the instrument.
IDENT_NO	A type number for a Profibus device. The GSD file describes the communication capabilities of a device type and is the description of the capabilities that are related to a particular IDENT_NO. The allocation of IDENT_NO is administered by PI.
PI	Profibus International
DD	Device description
TB	Transducer Block
PB	Physical Block
FB	Function Block
RB	Resource Block
PA	Profibus PA
DP	Profibus DP
PDM	Simatic Configuration tool
CRC	Cyclic redundancy check. Check bits that ensures that bit errors are detected.
NAMUR NE107	Standard for Field Diagnostics
PLC	Control or monitoring system

Summary

The T510, handling Profibus PA, and the T511, handling DP, have many common properties and therefore it is convenient to cover the two devices, named T51x, with only one, single Reference manual.

The common capabilities of T51x can be summarized as follows:

- Interfaces up to four Modbus RTU devices to Profibus
- Standard Profibus PA 3.02 profile
- Supports cyclic input and output block transfer
- Supports reading of a status register in each Modbus instrument
- Supports transparent Read/Write services for configuration of Modbus devices
- Two connections are supported for acyclic configuration traffic
- Powered from 18V – 30 V instrument power
- The maximum supply current is 58 mA
- -40°C to 85°C operation range
- Slide/DIP switches for bus terminations and address setting
- Profibus DP-V0 and DP-V1 configuration services supported
- NAMUR NE 107 diagnostic supported
- Connects up to 4 Modbus RTU Slave instruments (RS-485)
- Change address function is supported

The specific properties of T511

- Interfaces up to four Modbus RTU devices to Profibus DP (DP)
- Automatic Profibus baud rate detection
- All Profibus data rates supported

The specific properties of T510

- Interfaces up to four Modbus RTU devices to Profibus PA (PA)

The instrument interface:

Protocol:

- Modbus RTU

Physical interfaces:

- RS 485

1. T511

1.1. Functional Description

The T511 is a Profibus DP compliant DIN rail mountable gateway for connecting Modbus RTU instruments (Modbus slaves) to DP. See Figure 1. Applying the T511 enables legacy instruments with a Modbus RTU interface to connect to a Profibus DP network.

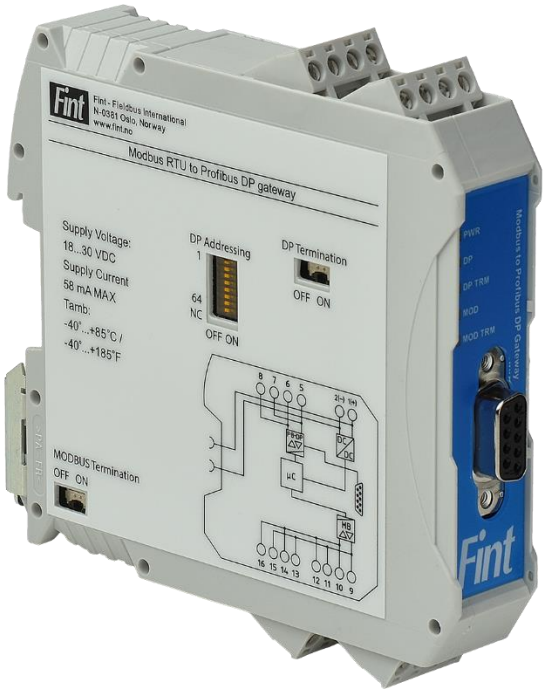

Figure 1. The T511

Up to four Modbus instruments can be connected through one T511 module. This is illustrated in **Figure *2***

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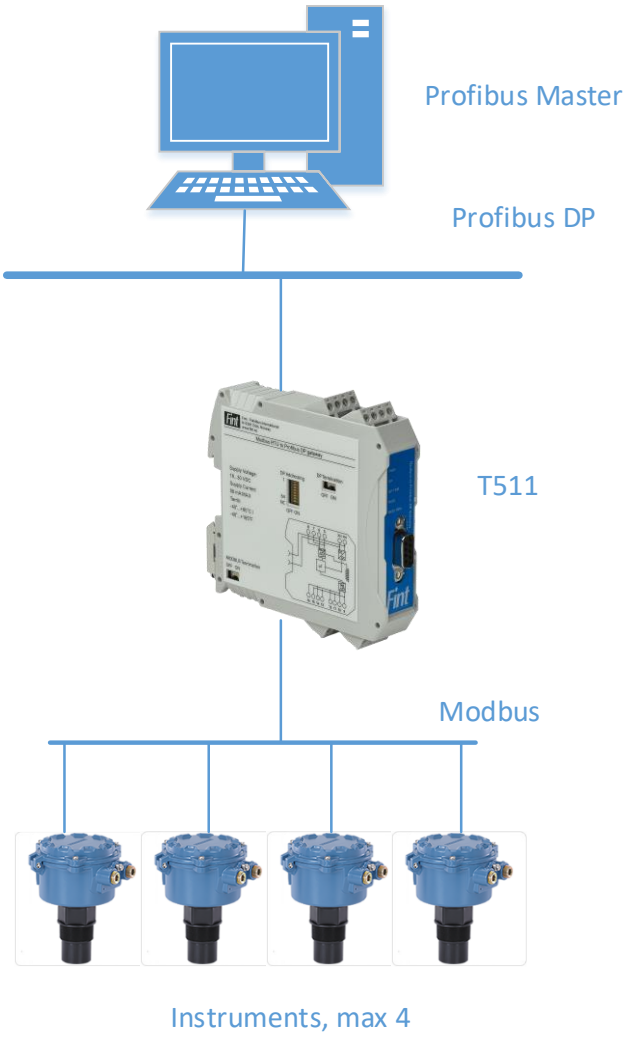

Figure 2 The T511 device in a typical application

The T511 is intended for installation on a DIN rail and within a cabinet. It is powered from an 18 – 30 VDC supply. A functional diagram is shown in Figure 3.
Figure 3

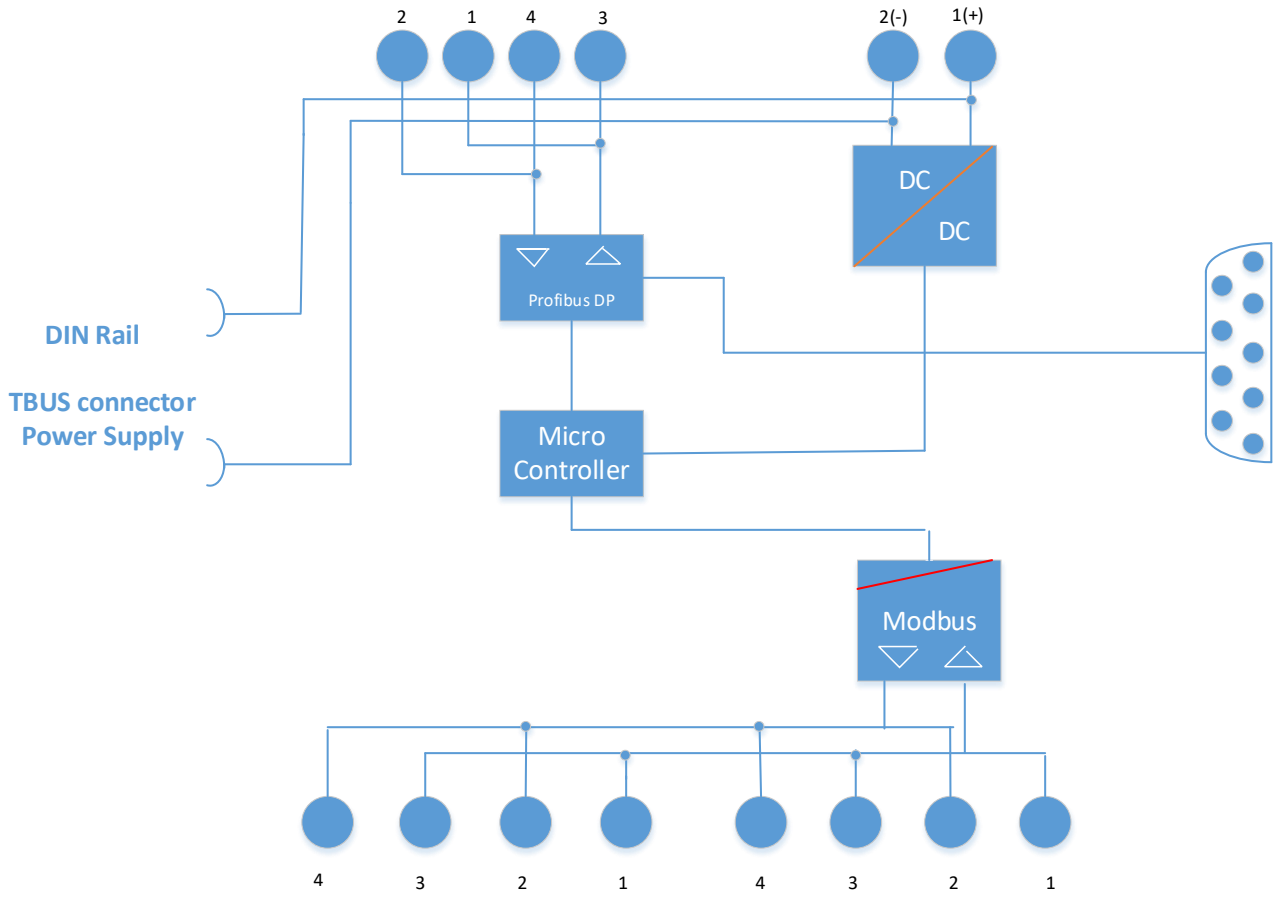

Figure 3. Functional Diagram

1.2. Installation

The T511 is designed for being mounted in a cabinet on a DIN rail.

1.3. Electrical Connections

The T511 contains 4 pluggable screw terminals.

The T511 shall use the connector pinout as shown in Table 1

Connector		Pin	Comment
PWR	Upper Front	1	Positive supply to T511
		2	Negative supply to T511
		3	No Connection
		4	No Connection
DP	Upper	1	DP + B
		2	DP - A
		3	DP + B
		4	DP - A
Modbus Con1	Lower Front	1	MODBUS Device 1 – Signal A
		2	MODBUS Device 1 – Signal B
		3	MODBUS Device 2 – Signal A
		4	MODBUS Device 2 – Signal B
Modbus Con2	Lower	1	MODBUS Device 3 – Signal A
		2	MODBUS Device 3 – Signal B
		3	MODBUS Device 4 – Signal A
		4	MODBUS Device 4 – Signal B
DIN clip		-	PE connection for EMC (see Figure 5)
TBUS		1	Positive supply to T511 (pin 1 is at top of the TBUS connector
		2	Negative supply to T511

Table 1. Connector Arrangement Table

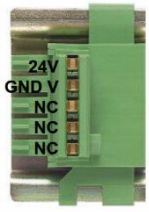

Figure 4 The TBUS connector

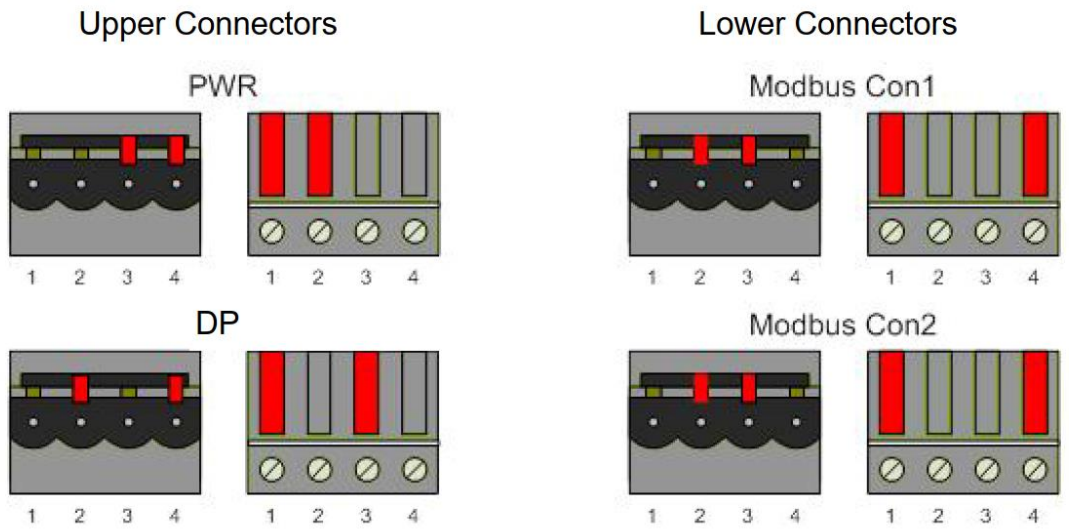

Figure 5 Connect

or Keying

T511 supports a Profibus DSUB connector with the pin-out shown in Table 2.

Connection	Pin No	Signal Type	Description
	1	NC	
	2	NC	
Profibus B	3	RS485	Signal connection - DP+
	4	NC	
	5	GND	Profibus Termination GND
	6	VCC	
	7	NC	
Profibus A	8	RS485	Signal Connection – DP-
	9	NC	

Table 2 Profibus DSUB Connector Arrangement Table

1.4. Slide switches and DIP switches

1.4.1. Modbus termination

The RS485 Modbus line may be terminated in the T511. Whether to terminate is selected by a slide switch as indicated in Figure 6. There is one terminator serving all the four Modbus instruments. Internally they are connected together. The terminator terminates all four instruments.

1.4.2. DP termination

The Profibus lines may be terminated in the T511. Whether to terminate is selected by a slide switch as indicated in Figure 6.

1.4.3. DIP switches

The Profibus address can be set using DIP switches as indicated in Figure 6.

1.4.4. Programming utility

Behind the panel on the top of the device there is a USB Connector for configuration of the T511 from a PC using the utility T51x Configurator, provided by Fint. T511 firmware upgrade is also possible through this connector. See Figure 6.

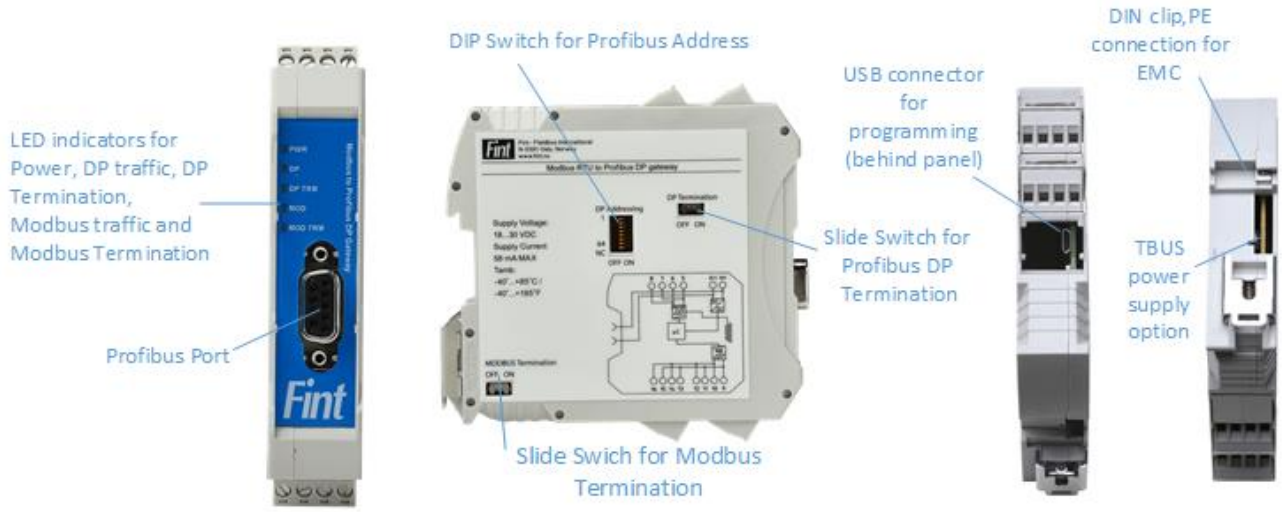

Figure 6 Front and Side Label mounted on T511, showing the functions

1.5. Power, Termination and Diagnostic LEDs

There are five double LEDs on the front. One for Power ON, One for Modbus Termination ON/OFF, one for DP Termination ON/OFF, one for the Modbus communication and one for the DP communication. The communication LEDs are bicolor. One color is blinking on request telegrams and the other on responding telegrams. A slow blink in one of the Modbus LED indicates that there is no Modbus communication. The blinking frequency is determined by the configured time-out time on Modbus.

1.6. Setting Profibus address

The T511 is delivered from factory with address 126. To set the device in operation, the address has to be moved to the operational range 1-125.

The address can be set using the DIP switches or through Profibus using the Set Address command.

If a legal address is set on the DIP switches, the DIP switches determine the address. The coding on the switches is binary.

If the address switches are set to address 126 (or higher), address setting can be performed using the Profibus command, (Set Address).

2. T510

2.1. Functional Description

The T510 is a Profibus PA compliant DIN rail mountable gateway for connecting Modbus RTU instruments (Modbus slaves) to PA. Applying the T510 enables legacy instruments with a Modbus RTU interface to connect to a Profibus PA network.

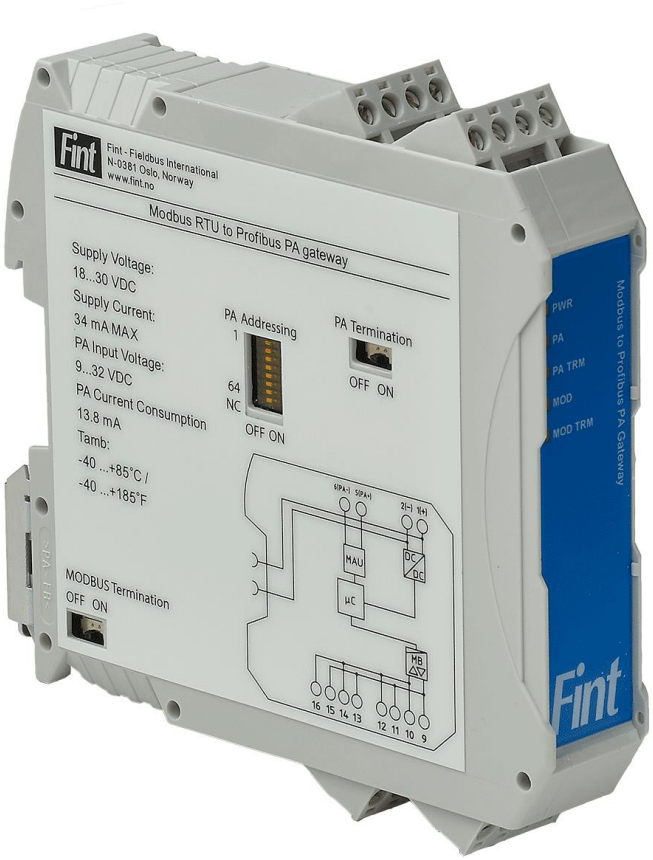

Figure 7 *The T510*

Up to four Modbus instruments can be connected through one T510 module.

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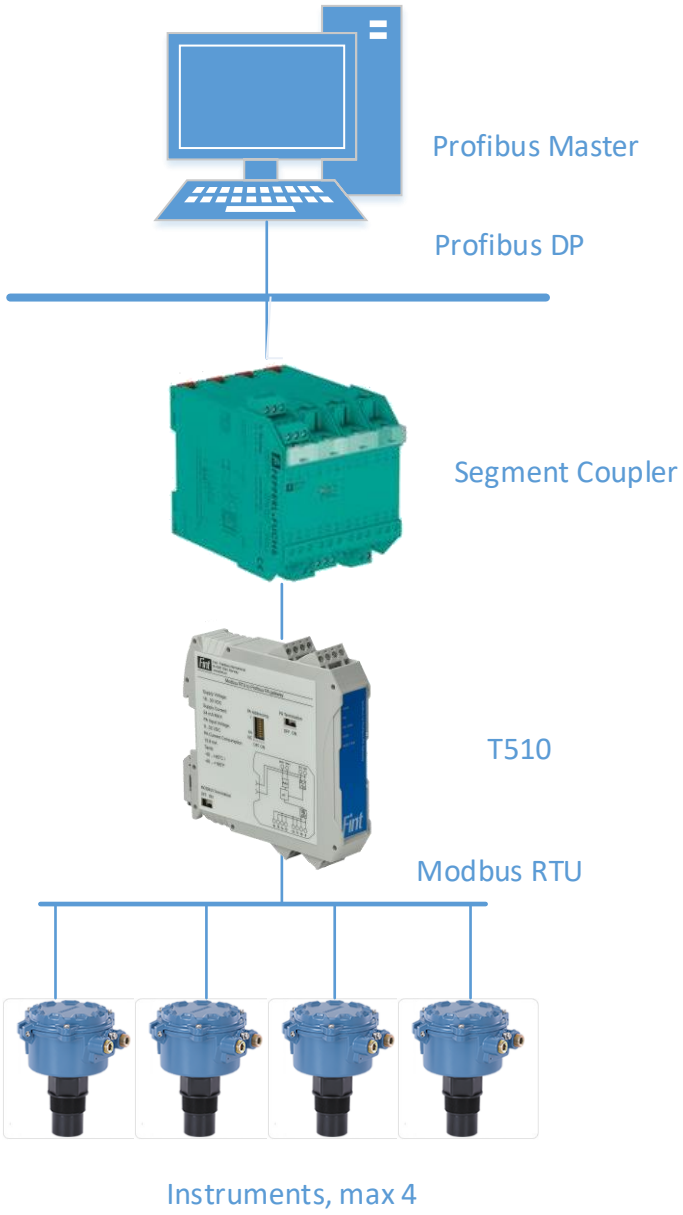

Figure 8 The T510 device in a typical application

The T510 is intended for installation on a DIN rail and within a cabinet. It is powered from an 18 – 30 VDC supply.

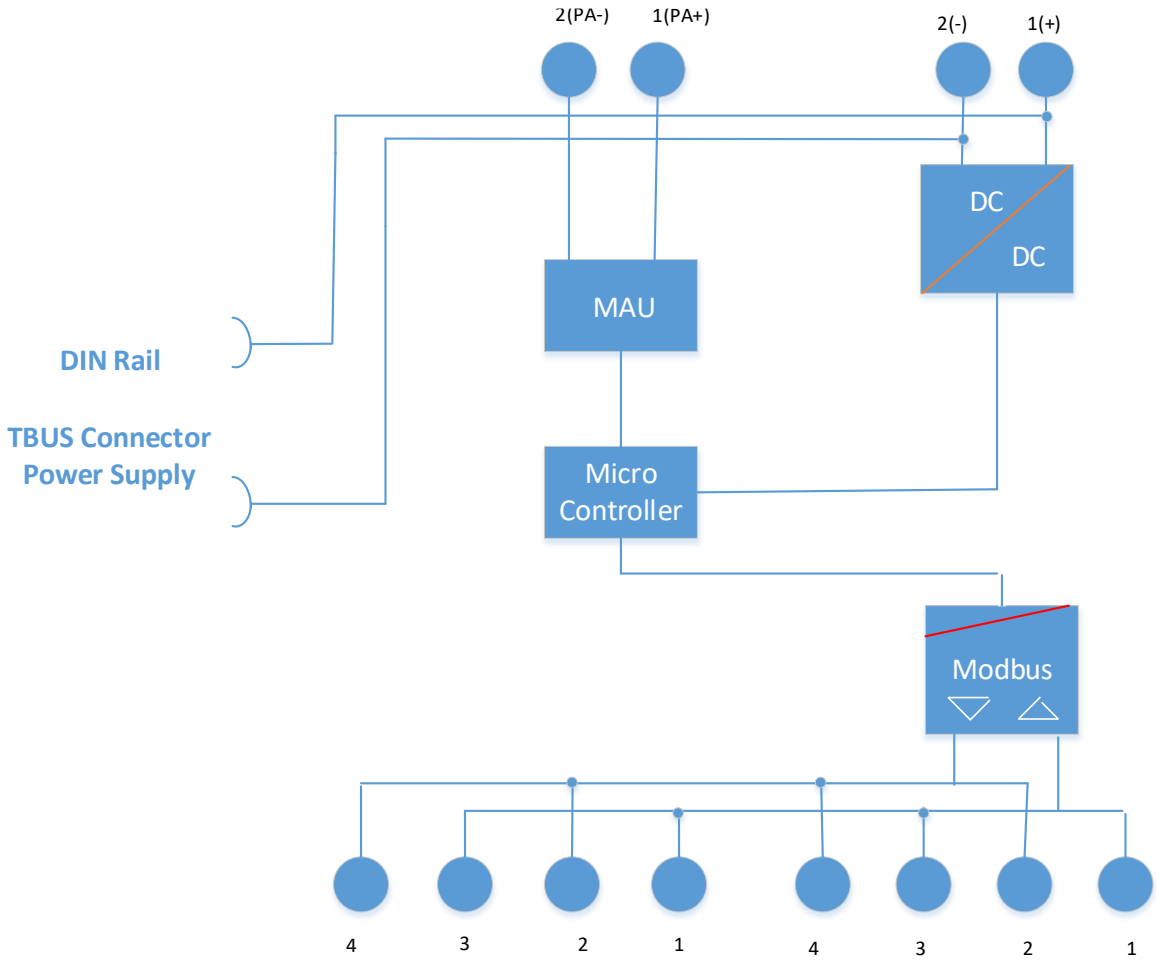

Figure 9 - Functional Diagram

2.2. Installation

The T510 is designed for being mounted in a cabinet on a DIN rail.

2.3. Electrical Connections

The T510 contains 4 pluggable screw terminals.

The T510 shall use the connector pinout as shown in Table 3:

Connector		Pin	Comment
PWR	Upper Front	1	Positive supply to T510
		2	Negative supply to T510
		3	No Connection
		4	No Connection
PA	Upper	1	PA +
		2	PA -
		3	No Connection
		4	No Connection
Modbus Con1	Lower Front	1	MODBUS Device 1 – Signal A
		2	MODBUS Device 1 – Signal B
		3	MODBUS Device 2 – Signal A
		4	MODBUS Device 2 – Signal B
Modbus Con2	Lower	1	MODBUS Device 3 – Signal A
		2	MODBUS Device 3 – Signal B
		3	MODBUS Device 4 – Signal A
		4	MODBUS Device 4 – Signal B
DIN clip		-	PE connection for EMC (see Figure 12)
TBUS		1	Positive supply to T510 (pin 1 is at top of the TBUS connector
		2	Negative supply to T510

Table 3 Connector Arrangement Table

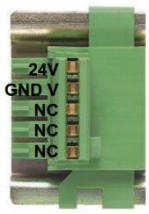

Figure 10 The TBUS connector

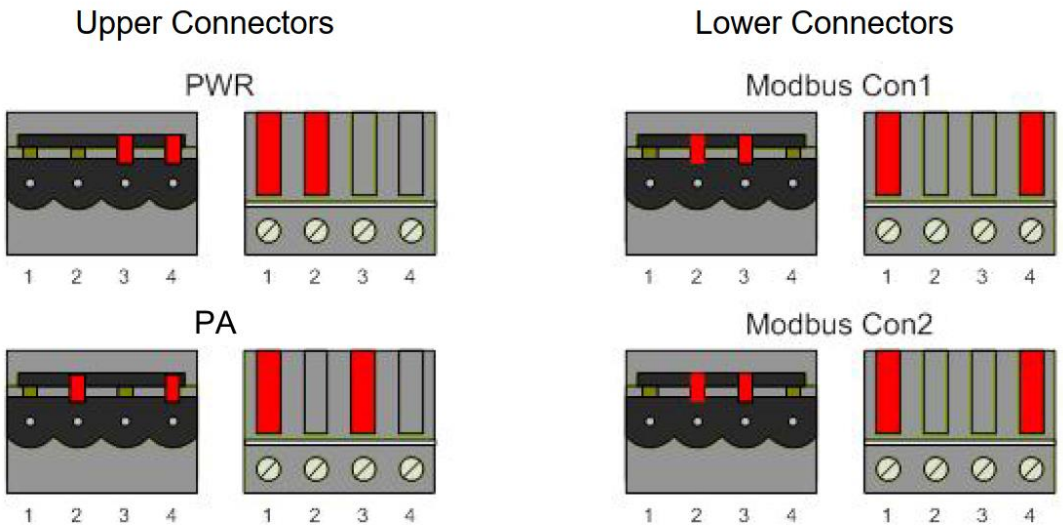

Figure 11 Connector Keying

2.4. Slide switches and DIP switches

2.4.1. Modbus termination

The RS485 Modbus line may be terminated in the T510. Whether to terminate is selected by a slide switch as indicated in Figure 12. There is one terminator serving all the four Modbus instruments. Internally they are connected together. The terminator terminates all four instruments.

2.4.2. PA termination

The Profibus lines may be terminated in the T510. Whether to terminate is selected by a slide switch as indicated in Figure 12.

2.4.3. DIP switches

The Profibus address can be set using DIP switches as indicated in Figure 12.

2.4.4. Programming utility

Behind the panel on the top of the device there is a USB Connector for configuration of the T510 from a PC using the utility T51x Configurator. T510 firmware upgrade is also possible through this connector. See Figure 12.

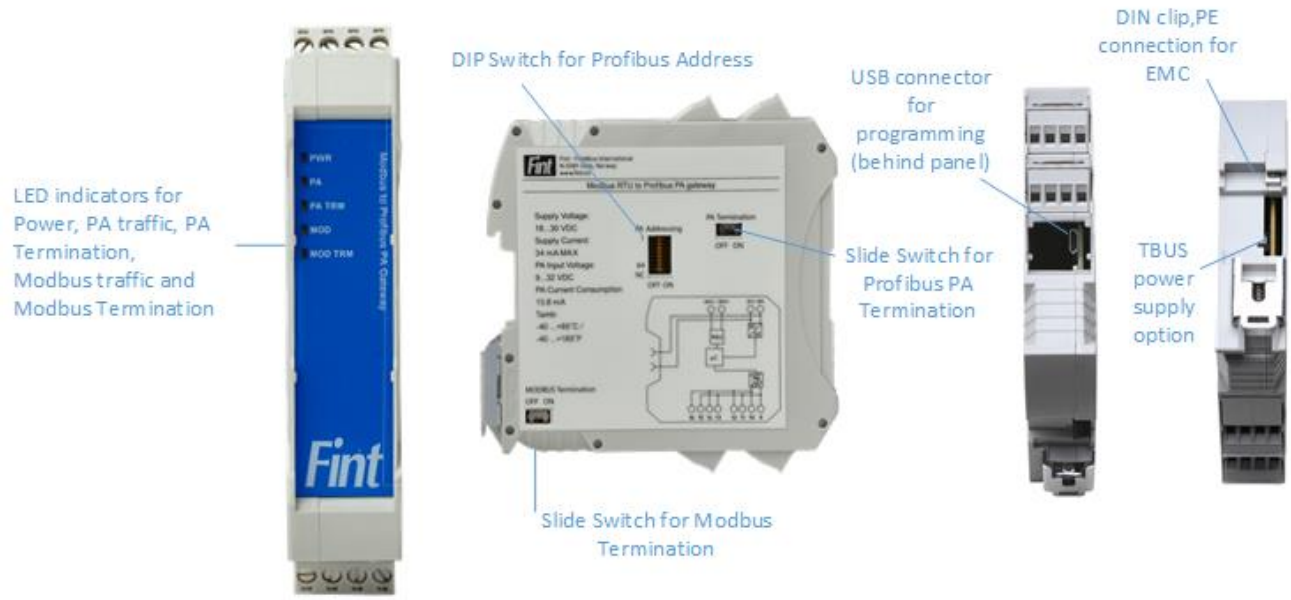

Figure 12. Front and Side Label mounted on T510, showing the functions

2.5. Power, Termination and Diagnostic LEDs

There are five double LEDs on the front. One for Power ON, One for Modbus Termination ON/OFF, one for PA Termination ON/OFF, one for the Modbus communication and one for the PA communication. The communication LEDs are bicolor. One color is blinking on request telegrams and the other on responding telegrams. A slow blink in one of the Modbus LED indicates that there is no Modbus communication. The blinking frequency is determined by the configured time-out time on Modbus.

2.6. Setting Profibus address

The T510 is delivered from factory with address 126. To set the device in operation, the address has to be moved to the operational range 1-125.

The address can be set using the DIP switches or through Profibus using the Set Address command.

If a legal address is set on the DIP switches, the DIP switches determine the address. The coding on the switches is binary.

If the address switches are set to address 126 (or higher), address setting can be performed using the Profibus command, (Set_Address).

3. GSD FILES

3.1. GSD file, T51x

The T511 supports a manufacturer and a profile Ident No:

	Ident No	GSD file
Profile	9703	pa139703.gsd
Manufacturer	A004	T511a004.gsd

The T510 supports a manufacturer and a profile Ident No:

	Ident No	GSD file
Profile	9703	pa139703.gsd
Manufacturer	A002	T510a002.gsd

Both manufacturer GSD files support the following configurations:

Configurations	Format	No of bytes	Comment
PV channel 1	Float + status	Five bytes	
PV channel 2	Float + status	Five bytes	
PV channel 3	Float + status	Five bytes	
PV channel 4	Float + status	Five bytes	
Data block Input Ch1	1, 2, 4, 8 or 16 registers	2 – 32 bytes	=< than configuration in the TB
Data block Input Ch2	1, 2, 4, 8 or 16 registers	2 – 32 bytes	=< than configuration in the TB
Data block Input Ch3	1, 2, 4, 8 or 16 registers	2 – 32 bytes	=< than configuration in the TB
Data block Input Ch4	1, 2, 4, 8 or 16 registers	2 – 32 bytes	=< than configuration in the TB
Data block Output Ch1	1, 2, or 4 registers	2 – 8 bytes	=< than configuration in the TB
Data block Output Ch2	1, 2, or 4 registers	2 – 8 bytes	=< than configuration in the TB
Data block Output Ch3	1, 2, or 4 registers	2 – 8 bytes	=< than configuration in the TB
Data block Output Ch4	1, 2, or 4 registers	2 – 8 bytes	=< than configuration in the TB

4. MECHANICAL DIMENSIONS OF T51X

The mechanical dimensions of the T51x are presented in Figure 13.

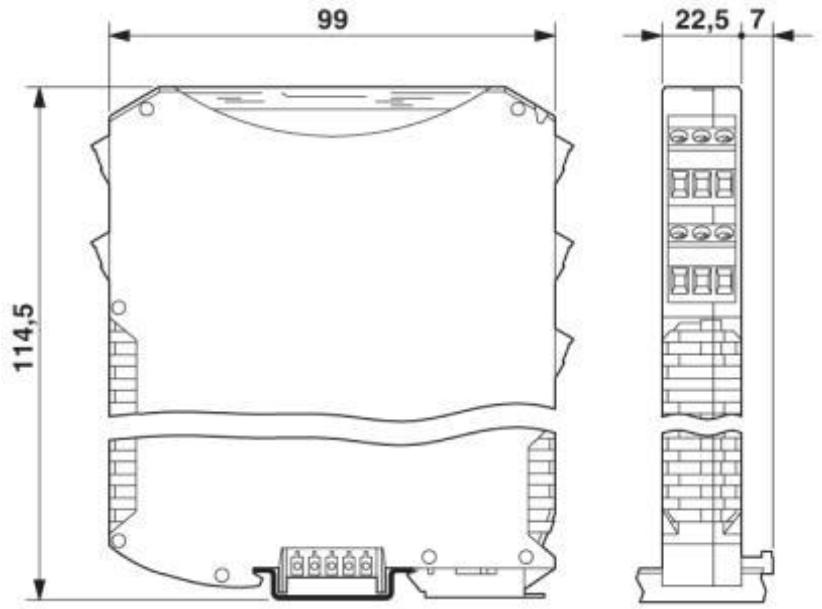

Figure 13 – ME MAX Dimensions

5. OPERATION PRINCIPLE OF T51X

5.1. Connecting Modbus devices

The T51x is a protocol converter, to allow legacy Modbus RTU devices to communicate on a Profibus network (PA or DP).

Four channels are supported. The source of each channel is defined by a Modbus Device Address. Up to four Modbus devices may be connected. This implies four different Modbus addresses. The instruments are electrically interconnected.

The channels may be assigned to the same Modbus address. This will allow more information to be interchanged with one Modbus instrument.

NOTE: *Set-up can only be performed when the Channels are in Out of Service mode*.

Each Channel supports five types of traffic, transfer of measurement(s) (PV), transfer of status/diagnostic information, transferring a block of input Modbus registers to the cyclic data exchange, transferring output data to a block of Modbus registers and Modbus instrument read/write services. The principle diagram for the communication is shown in Figure 16.

The PV, the registers blocks, the status information and the configuration data can be located anywhere within the Modbus Register map. In order for the T51x to find the data, it must be configured. The configuration is done through the Profibus DP interface. The Profibus DP read and write services are used to configure the Modbus channels.

The device parameters are organized in a Block structure consisting of a Physical Block (PB), Function Blocks (FBs) and a Transducer Block (TB). There are standard parameters defined for all these three Block categories.

The PB is used to describe the device's identity in the field, such as name, manufacturer and serial number. The common Modbus parameters like baud rate, parity and number of stop bits are also located in the PB (see Chapter 5.2). There are no input or output parameters in the PB. There is one PB for each device.

The TB contains the setup parameters required to establish the Modbus communication for each channel.

The Modbus communication is configured independently for each channel. The setup is performed using read and write services, by reading and writing to indexes in the TBs. Fint provides a DD

package that allows the configuration to be done from a DD based Host, like Simatic PDM from Siemens.

The configurator, T51x Configurator, provided by Fint can also be used. This is a PC program that can connect via USB directly to the device through the microUSB connector beneath the blind plug on the T51x. See Figure 6 and Figure 12.

5.2. Setting up the Modbus

The Modbus setup is generic for the four channels. It is set-up in the Physical Block, PB.

Parameter	Value	Comment
Modbus baud rate	9 600, 19 200, 38 400, 57 600, 115 200 Kbits/s	
# stop bits	1 or 2 (1 is default)	
Modbus Parity	0 = Odd parity 1= Even parity 2= No parity	
CRC byte order	0 = Normal byte order 1 = Reverse byte order	
Timeout for Read	0 - x ms	Time-out on reading dynamic variables
Timeout for Write	0 - x ms	Time-out on writing dynamic variables
Target Poll Cycle Time	In ms	Preferred update rate of reading Dynamic variables.
Real Poll Cycle Time	In ms	The measured update rate
Output Update Period Time	2000 - ms	The highest possible output update rate, limited upwards to 5 Hz
Delay Between Polls	In ms	A configurable delay to allow a Modbus slave to prepare itself to receive the next request

Table 4 The Modbus set-up parameters

Note! *If Delay Between Polls is set short or 0 ms, please verify that the slave device has deactivated its RTS signal before next request. If the request comes before RTS is turned off, the T51x will not detect the response.*

Figure 14 shows how the set-up Window appears applying the PDM.

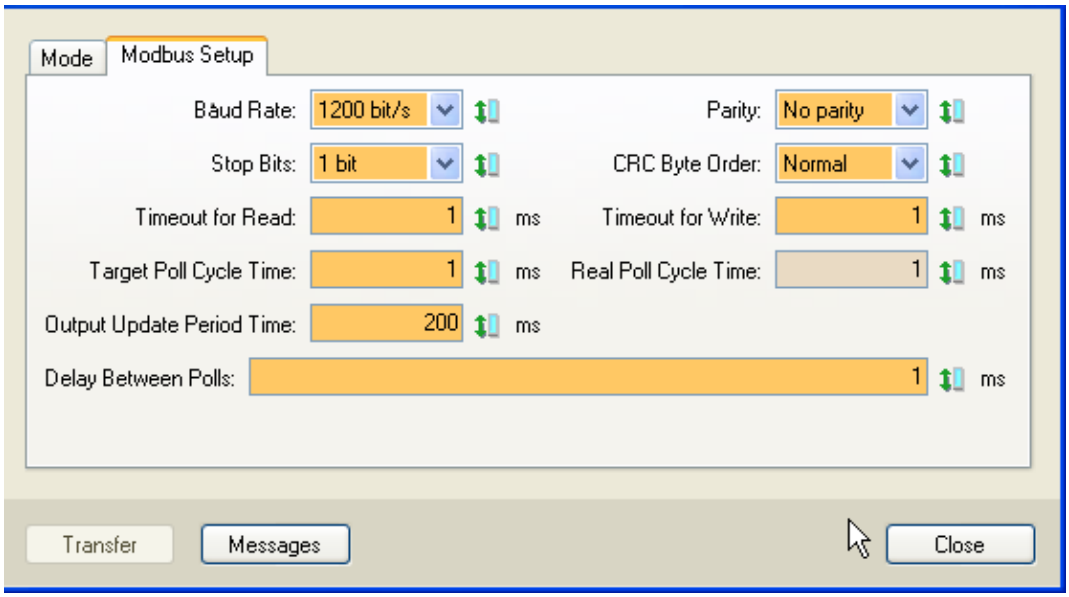

Figure 14 Set-up window for Modbus

5.3. Channel communication services

For each of the four channels there is a set-up record.

The Modbus address is configured per channel. This implies that the PVs may reside in four different instruments (four different Modbus addresses). They may also be located in the same instrument. The menu shown in Figure 15, allows the user to configure Modbus address and TAG name for the connected instrument. The mode handling is used to control the configuration of the Channel. The channel needs to be in Out of Service mode in order to allow the channel parameterization.

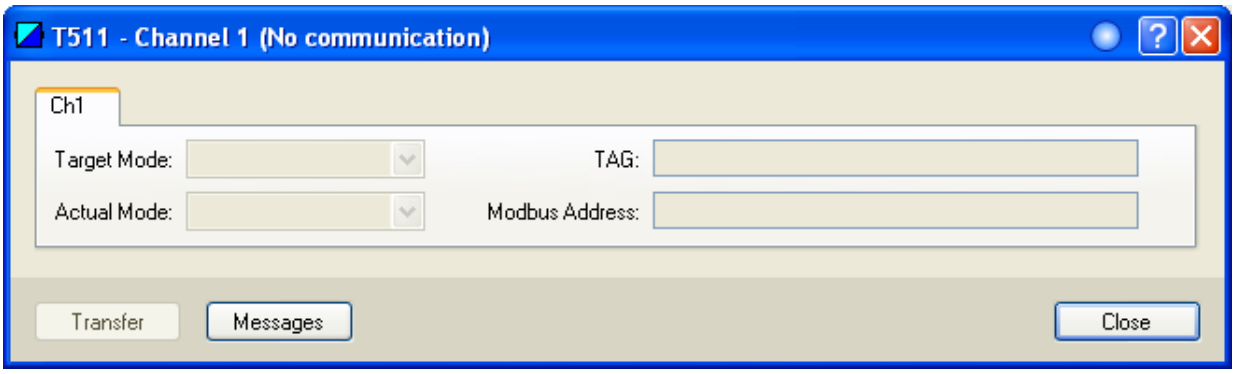

Figure 15 Channel control menu for the T51x

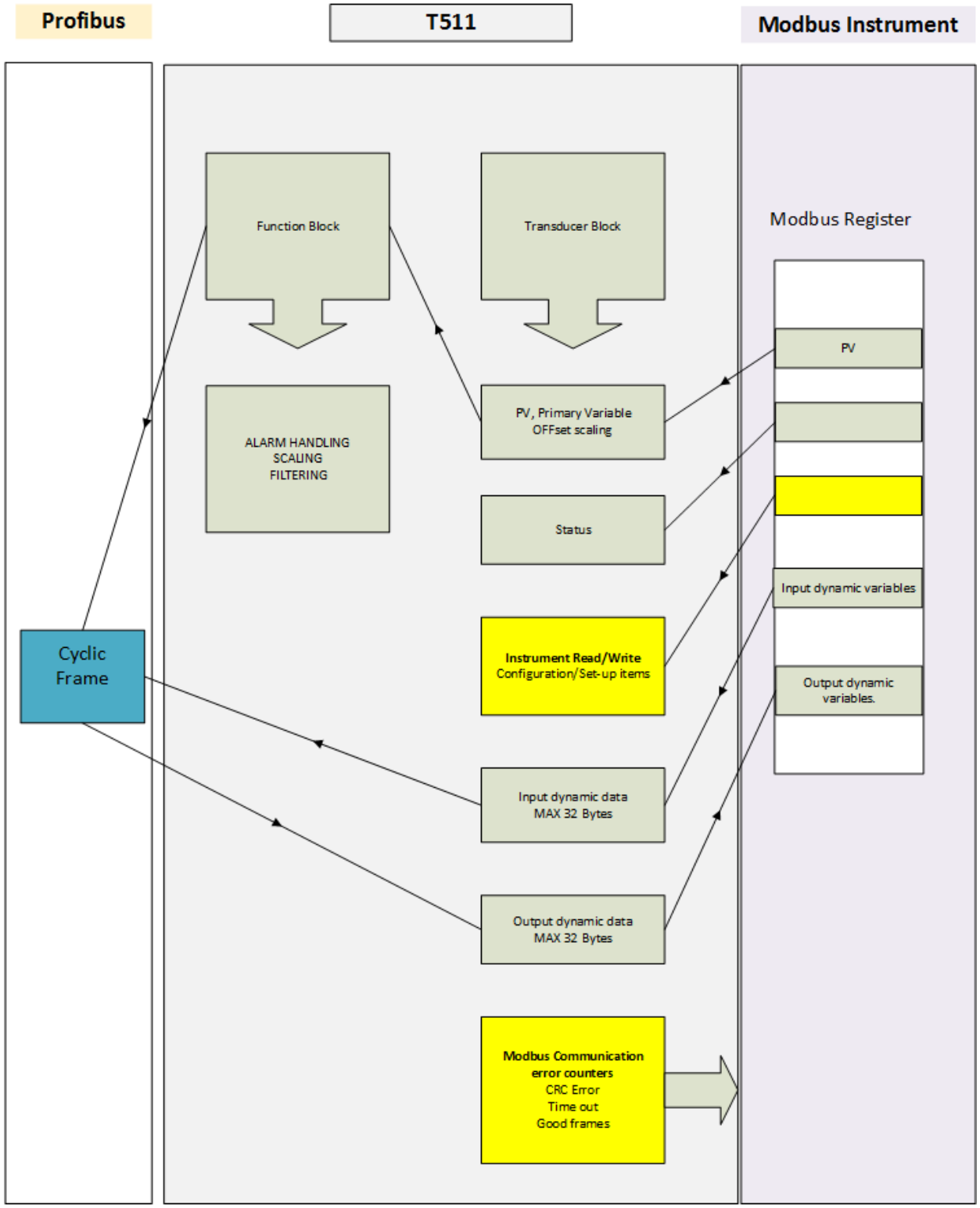

Figure 16 Channel communication services

5.3.1. Set-up of PV

The T51x can support up to 4 channels. Figure 17 shows the connection between the PV in the Modbus instrument and the T51x.

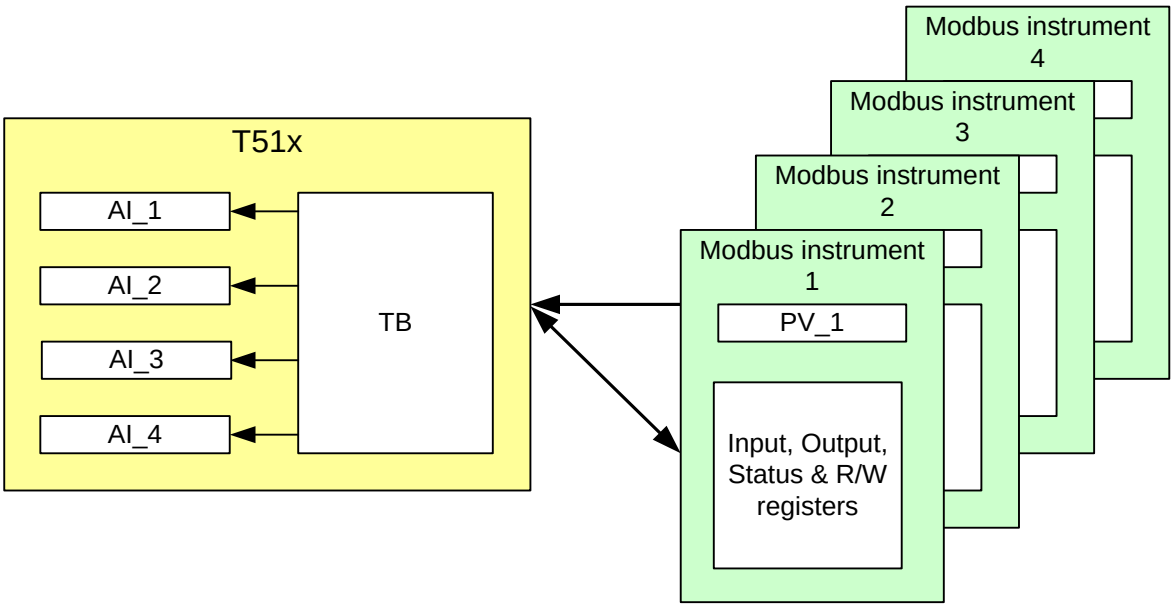

Figure 17 PV, from Modbus to T51x

Each channel supports one PV (Primary Variable). The PV is processed through an Analog Input Function Block (AI FB).

The PV is read from a Holding or Input register in the Modbus instrument. The register address and the Function Code to be used shall be set-up by the user.

The T511 supports a variety of data types and related byte ordering. The variable needs to be converted into the IEEE 754 float format in order to be processed through an AI FB. The data type parameter allows the user to select the right data type and byte ordering.

The PV type defines the data type and the byte ordering of the dynamic variable stored in the Modbus device. T511 needs this information in order to convert the variable to an IEEE format float used by PI. The PV may be defined as float, integer or unsigned integer in the Modus instrument. T511 assumes that there are two bytes per register, so a float will be located in two adjacent registers. An integer will be located in one register.

The byte ordering is defined in the type. The byte is numbered so the Most Significant byte has the higher number. This is illustrated in Table 5.

Data Type Modbus	Byte and nibble order	PV Type Code
Float	4 3 2 1	0
Float	2 1 4 3	1
Float	3 4 1 2	2
Float	1 2 3 4	3
Short Integer	2 1	4
Short Integer	1 2	5
Unsigned short	2 1	6
Unsigned short	1 2	7
Long Integer	4 3 2 1	8
Long Integer	2 1 4 3	9
Long Integer	3 4 1 2	10
Long Integer	1 2 3 4	11
Long unsigned	4 3 2 1	12
Long unsigned	2 1 4 3	13
Long unsigned	3 4 1 2	14
Long unsigned	1 2 3 4	15

Table 5 Byte order for PV

If the PV is stored as a float or long in the Modbus device, T51x assumes that two consecutive registers are used, as illustrated in Figure 18. The Register address pointer in T51x will point to the lower address.

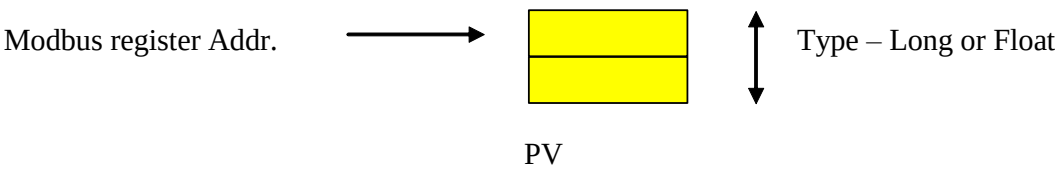

Figure 18 Storage when the PV is a float or Long

The scaling factors allow offset and gain to be adjusted before the variables are processed further. If an Integer value is stored in a fixed format with one decimal, the scaling factor (gain) must be specified to “0,1” to allow T51x to interpret the value correctly.

The PV unit may be specified by the user. There is no unit conversion in the T51x module. The PV unit is just for information purposes.

T51x adds a status byte to the PV. The status provides quality information about the measurement.

The configuration widow for PV as it appears in the PDM tool, is shown in Figure 19

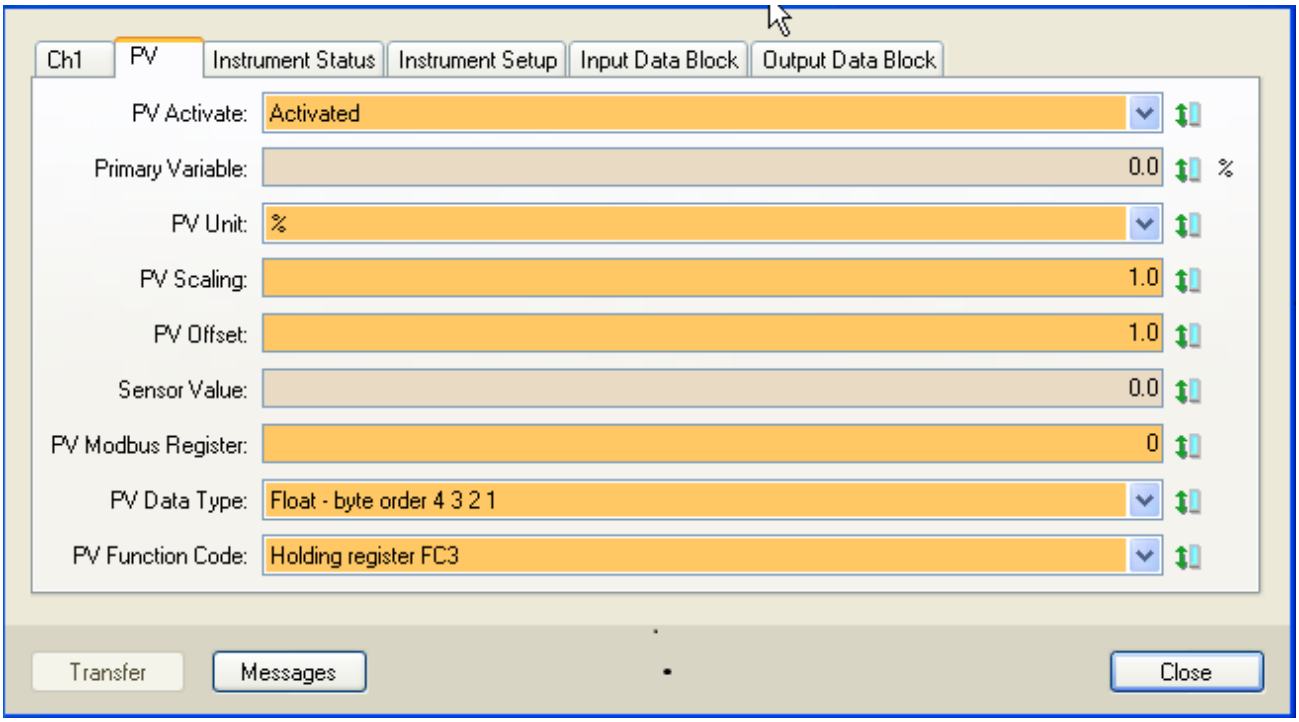

Figure 19 Configuration window in PDM

5.3.2. Diagnosis

5.3.2.1. Diagnosis information from the Modbus Instrument

For each channel the user can fetch four flags from the Modbus device. The flag must be located in one Modbus register which is denoted the Status register.

The operation on the Status register is defined by its Modbus register address and Function Code. A Status register can either be an Input or a Holding register. The four flags to be used in the register are selected using a Status Mask. The Status Mask is configured by the user. This is illustrated in Figure 20.

Set-up is only allowed when the channel is in Out of Service mode.

The four selected flags are transferred to the NAMUR NE107 structure in the same order as stored in the status register.

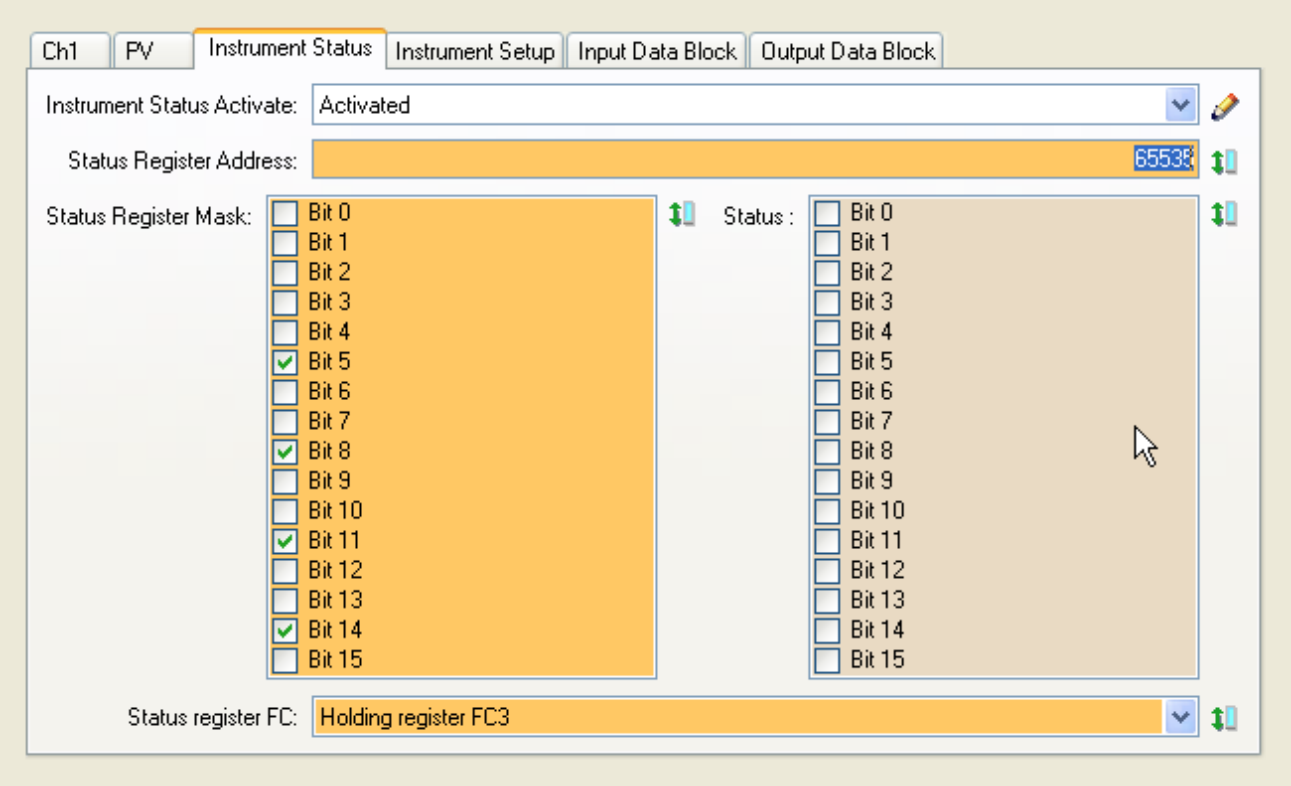

Figure 20 Set-up of Status Flag reading from Modbus Instruments

5.3.2.2. Modbus communication diagnostics

The Modbus communication is supervised. If the communication on one channel is unstable, a warning flag is set, if it stops working, an error flag is set.

If the Modbus registers are erroneously set, the Modbus device is returning Error Codes and the Configuration Error Flag is set.

Output traffic has its separate diagnosis flags, one per channel. If the device is not responding, the corresponding flag is set.

The output messages are sent to the device at the frequency sent by the PLC. The update frequency is, however, upwards limited to 5 Hz. If the Modbus devices are not responding and the time-out time is configured to be too long, the output is saturated, and the Configuration Error flag is set.

5.3.2.3. Diagnosis flags

The NAMUR NE107 Diagnosis structure contains:

- Modbus Device Status Flags
- Modbus Device Communication Errors
- Modbus Device Communication Warning
- Modbus Device Configuration Error.
- Modbus Output Errors

An overview of the Error Diagnosis is presented in Table 6.

Error flags		Comments
Channel flags	4 flags per channels	Configurable in the Channel
Modbus Input Com	1 Error-bit per channel	Communication lost
	1 Warning bit per channel	Communication comes and goes
Config error	The set-up of T51x is not correct	The instrument is present but returns error code on one or more requests
Schedule saturated	The set-up of outputs from T51x is not correct	Long time-out times prohibit the schedule to be met. Inputs may not have been read.
Modbus Output Com	1 Error bit per channel. Set if Modbus slave does not respond on a write	

Table 6 Diagnosis flags

Map and mask parameters determine how these flags shall be NAMUR flags, Fault, Function Check Maintenance required and Out of spec. This is described in Figure 21.

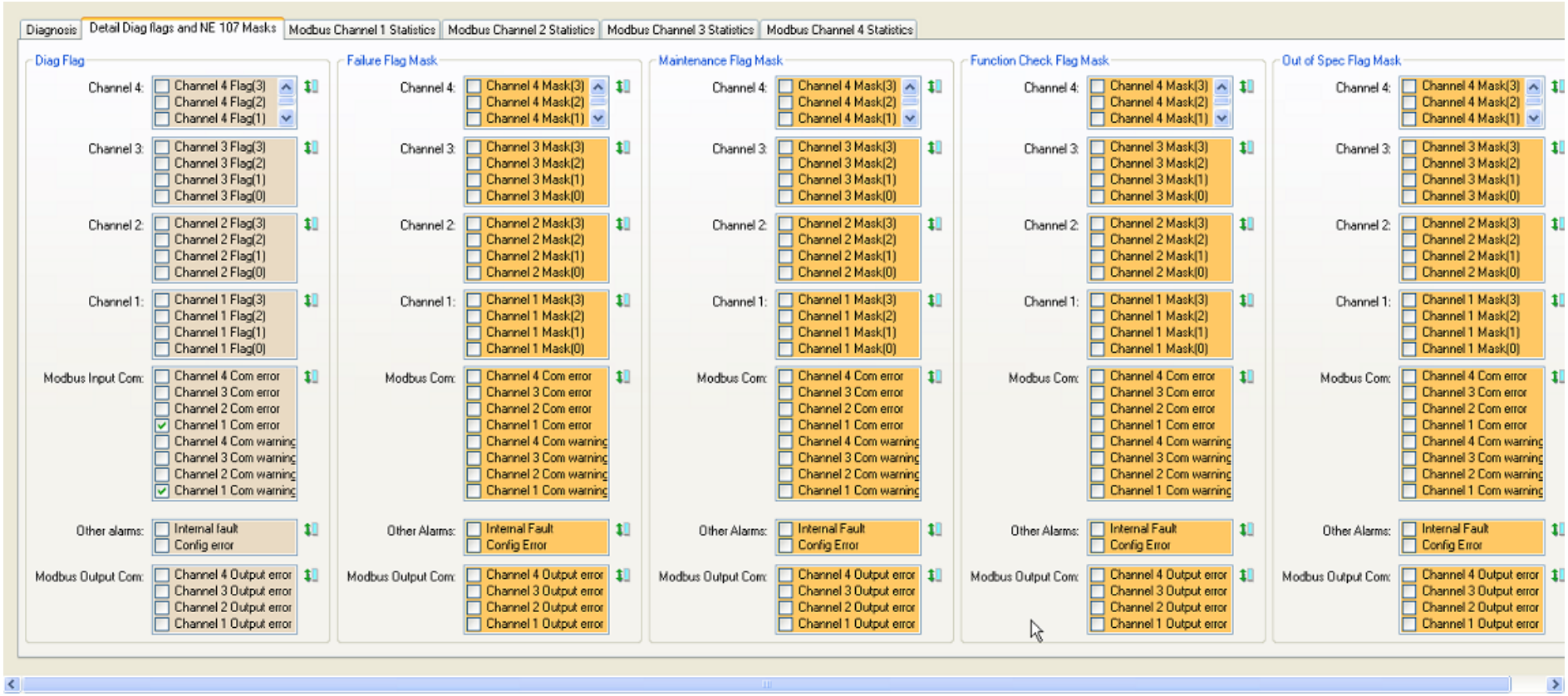

Figure 21 Diagnosis flags and NAMUR masks

5.3.3. Transparent Read/Write services.

For each channel there is a block of up to ten consecutive Modbus Read/Write Holding registers. They can be reached from the Profibus control system. This block of up to ten registers is characterized with a start address (The lower address of the block) and number of registers. They start at a configured Modbus register. The number of registers defines how many of the ten registers that is used. Figure 22 illustrates the behavior, and Figure 23 shows the set-up Window using the PDM tool.

The content of these registers will be written to the Modbus device when the user is writing to the corresponding indexes of the T51x. This service is only supported when the block is in Out of Service mode.

Read-back of the parameters takes place when the user is requesting an Update.

Table 7 shows which Function Codes that is used for the transparent Read/Write services.

Modbus Operation	**Function Code**
Read single and multiple registers	3
Write single register	6
Write multiple registers	16

Table 7 Function code usage

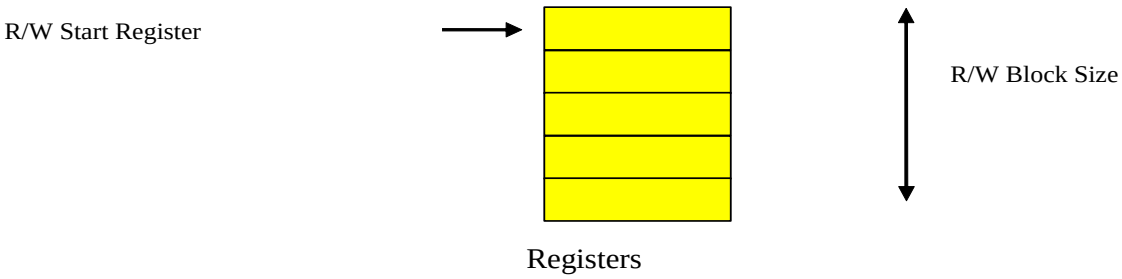

Figure 22 Read/Write registers

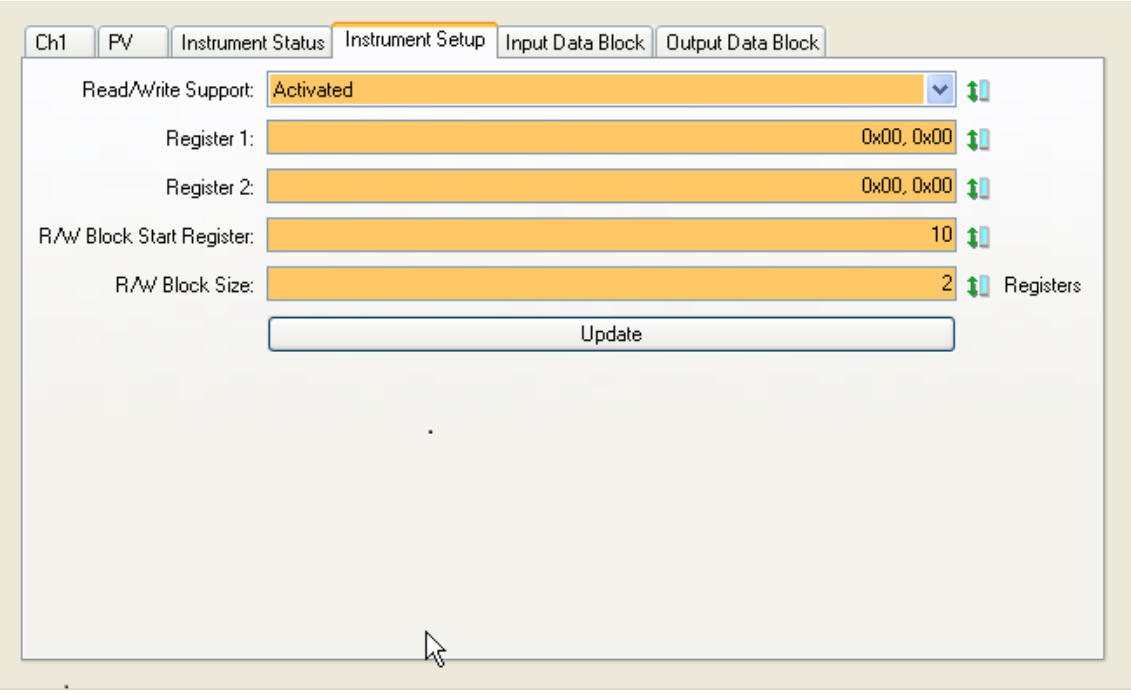

Figure 23 Read/write configuration

5.3.4. Input data block

Each channel support transparent transfer of a block of registers on the Cyclic data exchange frame.

The function needs to be activated to be used. The start address of the block, how many registers and whether Function Code 3 or 4 shall be used, can be configured. The Input register parameters are presented in Table 8.

Figure 24 illustrates the data block, and Figure 25 shows the set-up Window using the PDM tool.

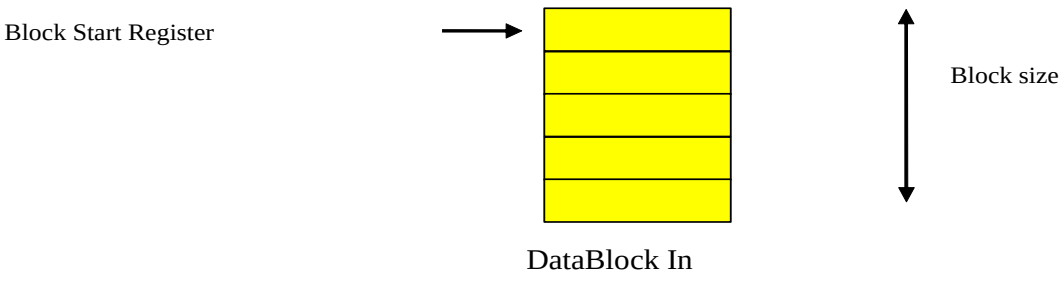

Figure 24 Data input register block

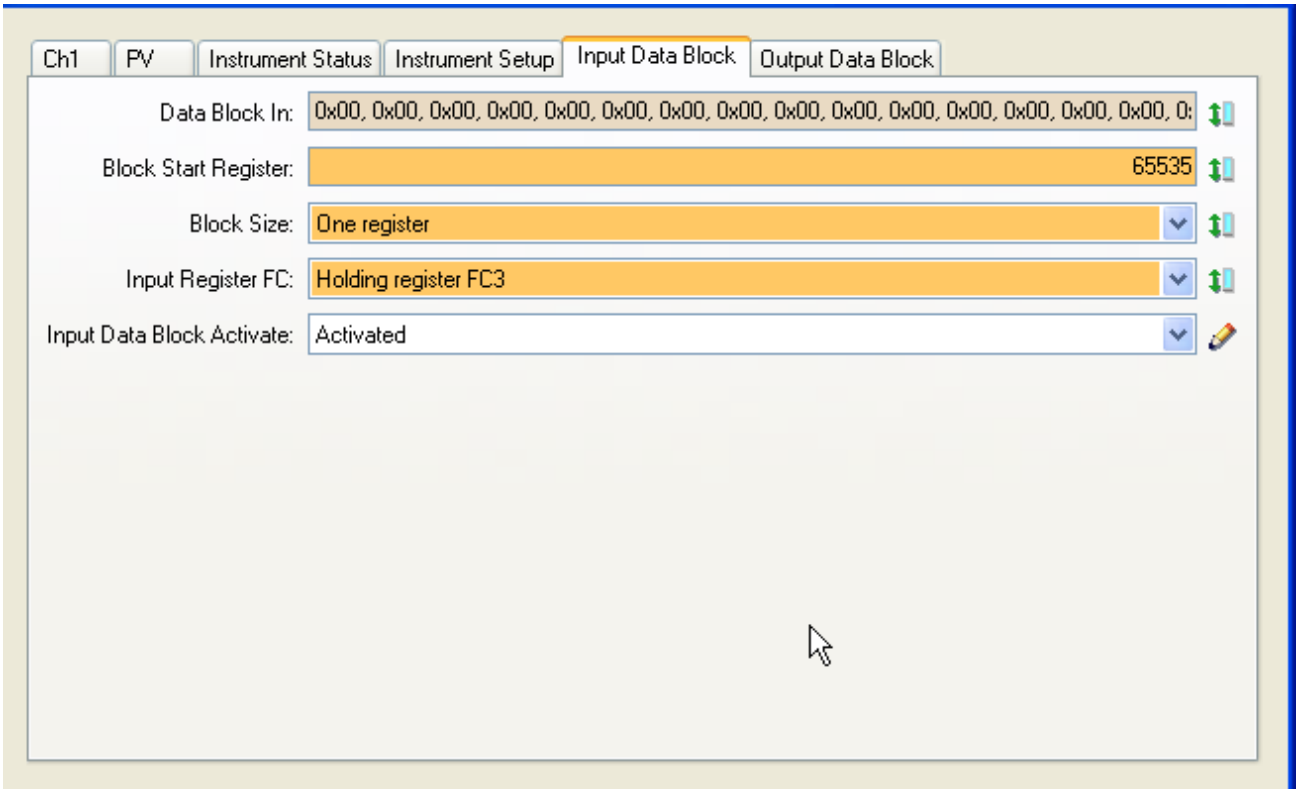

Figure 25 Configuration of the Input register block

Parameters	Value
Function code	3 or 4 (Read Holding or Input register)
Number of registers	1,2, 4, 8 or 16
Start address	0 - 65534

Table 8 Input register

5.3.5. Output registers

Each channel supports transparent transfer of a data block to the Modbus device from the PLC.

The Function Code used is 6 for single register and 16 for multi registers. The Output register parameters are presented in Table 9.

NB! *Only data sent in the cyclic data exchange frame is sent on Modbus. The data sent to the Modbus device is always the data sent from the PLC.*

Figure 26 illustrates the data block, and Figure 27 shows the set-up Window using the PDM tool

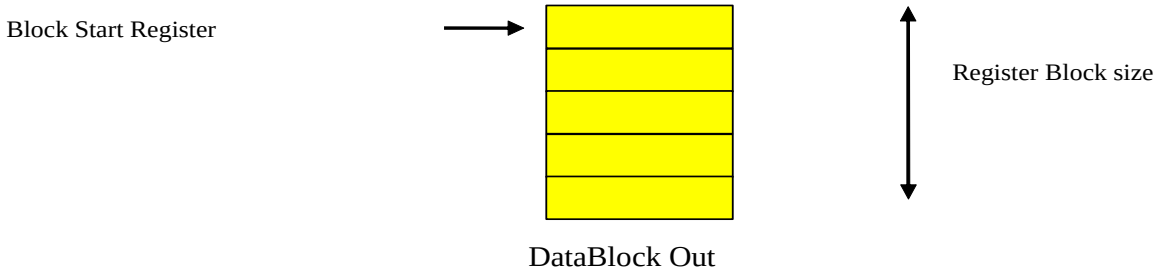

Figure 26 Data output register block

The data block is updated in the same frequency as the output on Profibus, but the maximum update rate is 5 Hz.

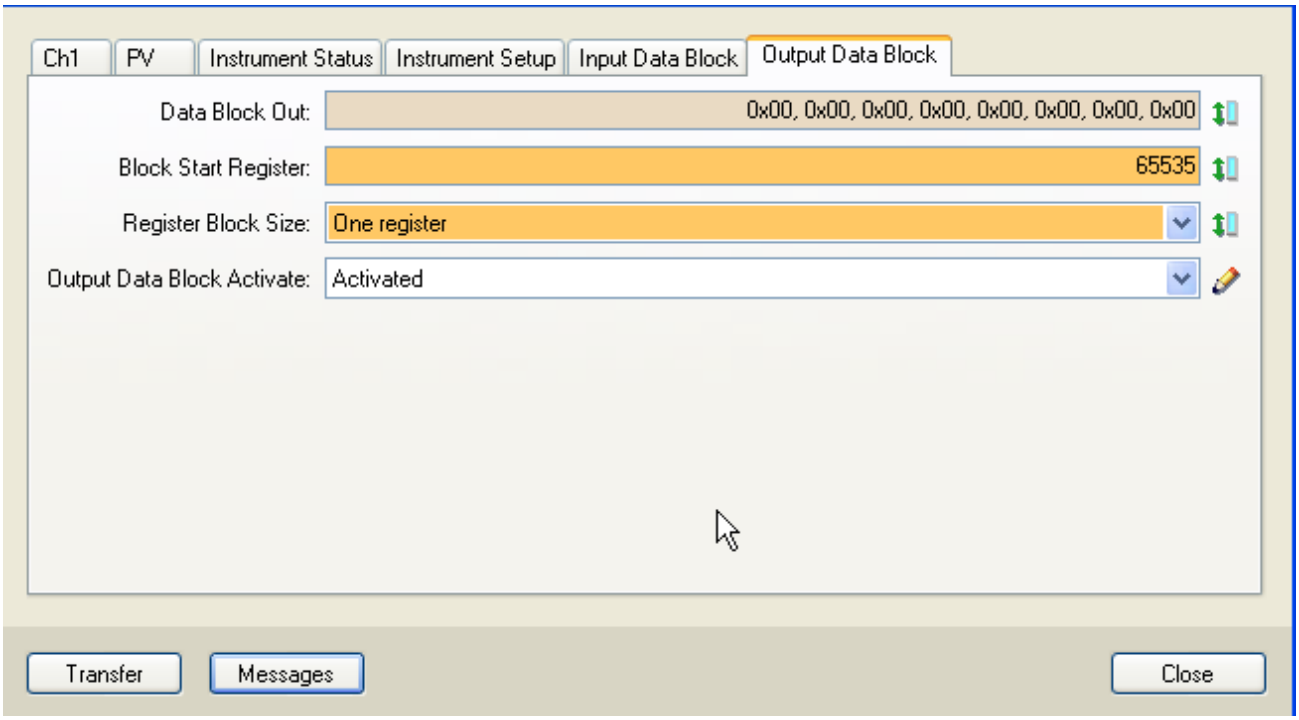

Figure 27 Configuration of Output register block

Parameters	Value
Function code	6 or 0x10 (Write Holding register)
Number of registers	1,2 or 4
Start address	0 - 65534
Maximum update rate	5 Hz

Table 9 Output register block

6. APPENDIX A: TECHNICAL SPECIFICATIONS

Mechanical:

Size	114,5 * 99 mm
Mounting	DIN rail
Module width	23,2 mm
Weight	126 gram
Housing	Plastic Polyamid, IP-20 protection
DIP Switch	Profibus address (1-125)
Slide Switch	DP Terminator
Slide Switch	Modbus Terminator

Electrical:

Supply voltage	18....30 VDC
Supply current	58 mA MAX

Environmental:

Operating temperature range	-40 °C to + 85 °C
Shock	IEC 600068-2-27
Vibration resistance	IEC 600068-2-6

Protocols and Ports:

Number of DP ports	1
Number of Modbus ports	4
PA protocol profile	PA, 3.02
Modbus protocol	Modbus RTU, Master
Modbus serial standard	RS-485

T511 specific:

Profibus Baud rates	9.6 kb/s
	19,2 kb/s
	45,45 kb/s
	93,75 kb/s
	187,5 kb/s
	500 kb/s
	1,5 Mb/s
	3 Mb/s
	6 Mb/s
	12 Mb/s

7. APPENDIX B: SCHEDULE

A Modbus frame will be defined as complete when there has been silence for 3.5 characters. If an instrument does not respond within the configured parameter, time-out will occur and the T511 will proceed with the next request.

The T51x shall support Free Running and Fixed Schedule modes.

1) Free running

When the response is received from one instrument, the next request is sent.
When all different messages are read, one poll cycle is finished and the next one begins.

2) Fixed schedule

Only the start of a poll cycle is scheduled. The different frames in one cycle are still executed at "best effort". A default value will be provided.
If the configured schedule is too short, it will degrade to the fastest poll cycle possible.

The "Free schedule" mode with 1 second update rate will be default.

Figure 28 illustrates the behavior.

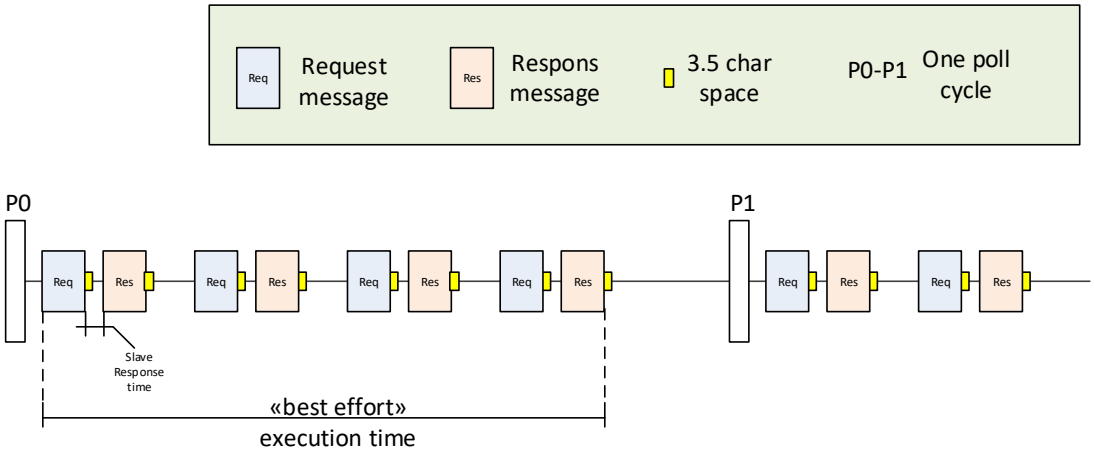

Figure 28 Modbus Poll Cycle, Fixed Schedule Mode

The 3.5-character silence after each message will be used for baud rates up to 19200 bits/s. For higher baud rates a fixed time of 1.75 ms will be used (as recommended in the Modbus specification).

8. APPENDIX C: CONFIGURATION CODES

Configurations	Configuration Code	No of Modbus registers	No of bytes
Data block Input	D0	1	2
Data block Input	D1	2	4
Data block Input	D3	4	8
Data block Input	D7	8	16
Data block Input	DF	16	32
Data block Output	E0	1	2
Data block Output	E1	2	4
Data block Output	E3	4	8

Table 10 Configuration cyclic data exchange

Table 10 shows an overview of which configurations that are supported for cyclic data-exchange for transferring blocks of dynamic data. These configurations will be found in the gsd file.