STG Series WMBus (Wireless MBus) – Modbus TCP/RTU Gateway with 2 x 10/100Base-T(x) Ports, 1 x RS232 and 1 x RS485 Serial Ports and/or BPL (Broadband Power Line Link) User Manual

1. About STG Series Wireless Mbus Gateways



STG Series Wireless MBus (WMBus) Gateways are designed for industrial-grade Radio Frequency (RF) communication. STG Series WMBus Gateways are tailored to perform various features such as wide temperature range, wide power input range and several connectivity ports. Thus, STG Series WMBus Gateways are the best choice for smart metering, power utility, telecommunication and all other applications that require industrial Wireless MBus Radio Frequency connectivity.

STG Series which have REDZ Broadband Power Line (BPL) link allows devices to communicate with full transparent TCP/IP standard over Low Voltage power lines and allows easy connection between TCP/IP based terminals without use of extra cables.

STG Series WMBus Gateways can listen WMBus RF network and connect Serial and/or ETH based devices with Wireless MBus devices. All communication can be done over Radio Frequency network based on WMBus standard. STG Series WMBus Gateways are all in one devices and can operate in 3 main modes: Transparent Mode, WMBus OMS Converter to Modbus RTU packages (in this mode meter data can also be sent to MQTT Server in several formats), WMBus OMS Converter to Modbus TCP packages. Typical applications: Automated Meter reading, Home – Building – Industrial Automation, Wireless Sensors, Telemetry...

## 2. Hardware Features

STG Series WMBus Gateways have the versions with and without BPL (Broadband Power Line) Link.

## 2.1 Features

- Supports 2 x 10/100Base-T(X) ports
- Supports Full/Half-Duplex, auto MDI/MDI-X on each port
- DHCP Server Capability
- Supports 1 x RS232 and 1 x RS485 Serial Connection up to 460800 Baud
- Embedded web interface for ease of use
- 868MHz Wireless MBus (WMBus) Radio Frequency (RF) Communication
- 3 Main Device Functions:

WMBus OMS to Modbus TCP Converter (and/or send Meter Data to MQTT Server)

WMBus OMS to Modbus RTU Converter

Transparent Mode (Sends/Receive WMBus Packages to/from TCP/IP or Serial Side)

- Up to 20 Modbus device connection in Modbus TCP or RTU Conversion Modes
- MQTT Publisher with different data transfer options

Raw WMBus Decrypted Frame

Parsed WMBus Frame As Objects

Parsed WMBus Frame As Modbus Frame

- WMBus link mode Configurable (S Mode, T Mode, C Mode, C/T Mode together)
- AES Decryption of Received Frames for up to 40 WMBus Devices (Mode 5, Mode 7, Mode 128 and custom modes)
- Supported CI Values: 53h, 5Bh, 60h, 6Ch, 6Dh, 6Eh, 6Fh, 72h, 74h, 75h, 78h, 7Ah, 7Ch, 7Dh, 80h, 8Ah, 8Bh, 8Ch, 8Dh, 8Eh, 8Fh, C3h, C4h, C5h
- Unlimited Numbers of WMbus device data can be listened over air and WMBus frames can be sent to remote server in Transparent Mode
- WMBus Radio Power Level Configurable (-1 dBm to 13 dBm) when sending WMBus frames in Transparent Mode
- AES Encryption of Transmitted frames is available in Transparent Mode
- WMBus device mode Configurable (Meter send frames or Other Device listen frames)
- Easy to follow WMBus data packages on web interface
- Easy monitor of parsed WMbus OMS Parsed data on web interface
- Easy to follow Device Status on web interface
- Black List and White List based WMBus package filter
- Firmware Upgrade over Web
- 2 firmware storage capability on same device (1 active only)
- AC or DC wide range power options
- Wide operating temperature range from -25 to 70 °C AC and -40 to 85 °C DC power input versions
- Rugged Metal IP-40 housing design
- DIN-Rail mounting

## 2.2 Extra Features for Models with BPL

- Supports 2 x 10/100Base-T(X) ports + 1 x BPL link
- Wide range 3 phase AC input
- Supports up to 30Mbps PHY rate on BPL with Up to 10 hops and 1000 nodes
- Up to 432 sub-carriers from 2 to 28MHz analog bandwidth
- Support LDPC-C FEC with 128-bit AES core
- Plug and play with Master/Slave selection via web interface

## 3. Installation

Each device has a Din-Rail kit on rear panel. The Din-Rail kit helps device to fix on the Din-Rail. Slant the switch and mount the metal spring to Din-Rail.



Then Push the switch toward the Din-Rail until you heard a "click" sound.



## 4. Front Panel Description

## 4.1 STG154 & STG254



- 1. Standard SMA female Antenna interface, 50 ohm.
- Micro USB or USB Type-C Console port for LOG in 115200 baud. Console Tx and Rx Blinks when data transmission occurs.
- 3. WMBus Activity LEDs

ALIVE: Blinks during normal operation.

WMBus Tx and Rx Blinks when data transmission occurs.

4. Device Status LEDs

STATUS: Blinks based on device operation.

- When TCP line used blinks during no connection and keeps ON after TCP connection.
- When Serial line used keeps ON.

Device Tx and Rx Blinks when data transmission occurs.

SERVER: Keeps ON after selecting Server from Server-Client Operating Modes. Keeps OFF if Client operating Mode selected.

- 5. ETHERNET Activity LEDs for port 1, 2 and STG device itself. Blinks during ethernet activity.
- 6. 5 pin Terminal Block

RS232: Tx, Rx and GND pins

RS485: A, B and GND pins

Can be activated over web interface and baud rate/data type configurable.

## 7. 10/100Base-T(X) Ethernet ports

## 4.2 STG655



- 1. Standard SMA female Antenna interface, 50 ohm.
- Micro USB or USB Type-C Console port for LOG in 115200 baud. Console Tx and Rx Blinks when data transmission occurs.
- 3. WMBus Activity LEDs

ALIVE: Blinks during normal operation.

WMBus Tx and Rx Blinks when data transmission occurs.

4. Device Status LEDs

STATUS: Blinks based on device operation.

- When TCP line used blinks during no connection and keeps ON after TCP connection.
- When Serial line used keeps ON.

Device Tx and Rx Blinks when data transmission occurs.

SERVER: Keeps ON after selecting Server from Server-Client Operating Modes. Keeps OFF if Client operating Mode selected.

5. ETHERNET Activity LEDs for port 1, 2 and STG device itself. Blinks during ethernet activity.

- 6. 5 pin Terminal Block for Serial Line
  RS232: Tx, Rx and GND pins
  RS485: A, B and GND pins
  Can be activated over web interface and baud rate/data type configurable
- 7. BPL Status LEDs

ACTIVITY: Blinks during BPL Ethernet activity LINK: LED Turns ON if the link can be established over BPL MASTER INDICATION: LED Turns ON if the device is configured and powered as "BPL Master" device

8. 10/100Base-T(X) Ethernet ports

## 5. Top Panel Description

5.1 STG154



- 1. Power Input DC: 5-48V DC (max. 60V). Polarity protected so that the power input can be connected in any direction
- 2. Power LED: Turns ON when there is power in device
- 3. Reset Buttons

RESET TO SERVER: Resets the device to factory setting as Server from Server-Client Operating Modes RESET TO CLIENT: Resets the device to factory setting as Client from Server-Client Operating Modes Reset can be done at any time by pushing any of the button for 5 seconds.

## 5.2 STG254



- 1. Power Input AC: 100 240V AC (120 370V DC), 50Hz to 60Hz AC Input
- 2. Power LED: Turns ON when there is power in device
- 3. Reset Buttons

RESET TO SERVER: Resets the device to factory setting as Server from Server-Client Operating Modes RESET TO CLIENT: Resets the device to factory setting as Client from Server-Client Operating Modes Reset can be done at any time by pushing any of the buttons for more than 5 seconds.

5.3 STG655



1. Power Input AC: 3 phase input, 110V–240V/50–60Hz. It is also ok to connect only single phase to the device such as L1–N connection only.

AC Power supply use L1-N only. Phase 2-3 connections are used to BPL signal transmission.

- 2. Power LED: Turns ON when there is power in device
- 3. Reset Buttons

RESET TO SERVER: Resets the device to factory setting as Server from Server-Client Operating Modes RESET TO CLIENT: Resets the device to factory setting as Client from Server-Client Operating Modes Reset can be done at any time by pushing any of the buttons for more than 5 seconds.

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NOTE1: BPL Model can be purchased in 2 versions:

1. P-N Model: Phase to neutral model (Standart Model). That version gets power from terminal pins 1 and 2 from phase and neutral. It can also transmit data from that pins and other pins usage is optionAl (Ex: Master can be connected to all phases and slaves can be connected to relevant phases)

2. P-P Model: Phase to phase model. That version also gets power from terminal pins 1 and 2 from phase and neutral. Data transmission only done through terminal pins 3 and 4. Phase to phase connection can be done to data transmission pins for better performance.

If not used then phase and neutral can still be connected for data transmission for terminal pins 3 and 4.

NOTE2: BPL Model can be purchased in DC model as well:

This model will be same as "P-P Model"(Phase to phase model) on data connection and gets **12V DC power** from terminal pins 1 and 2. Data transmission only done through terminal pins 3 and 4.

## 6. Ethernet Cables

STG Series WMBus Gateways have standard Ethernet ports. According to the link type, the switches use CAT 3, 4, 5, 5e UTP cables to connect to any other network device (PCs, servers, switches, routers, or hubs).

### 6.1 Cable Type and Specifications

Cable	Туре	Max. Length	Connector
10BASE-T	Cat. 3, 4, 5 100-ohm	UTP 100 m (328 ft)	RJ-45
100BASE-TX	Cat. 5 100-ohm UTP	UTP 100 m (328 ft)	RJ-45

## 6.2 ETH Cable Pin Assignments

With 100BASE-TX/10BASE-T cable, pins 1 - 2 are used for transmitting data and pins 3 - 6 are used for receiving data.

Pin Number	Description
1	TD+
2	TD-
3	RD+
4	Not Used
5	Not Used
6	RD-
7	Not Used
8	Not Used

## 7. System Comparison Between CAT5 and BPL Links

	CAT5 Based System	BPL Link Based System
Media	CAT5	Power Line
Bandwidth	100Mbps	Up to 30Mbps
Re-Wire	Yes	No, Using existing Power Line
Span	<100m	<600m
Multiple Nodes	N/A	Up to 10 hops/1000 nodes
Encryption	Yes, but difficult to configure	Yes, Plug & Play
Installment	Difficult	Easy, simply user power line
Installment Cost	High	Low
Total Cost	High	Low

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NOTE1: BPL Model can be purchased in 2 versions:

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data from that pins and other pins usage is optionAl (Ex: Master can be connected to all phases and slaves can be connected to relevant phases)

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transmission for terminal pins 3 and 4.

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NOTE2: BPL Model can be purchased in DC model as well:

This model will be same as "P-P Model"(Phase to phase model) on data connection and gets 12V DC power from terminal pins 1 and 2. Data transmission only done through terminal pins 3 and 4.

## 8. Serial Cables

STG Series WMBus Gateways have 1 x RS232 and 1 xRS485 port. Serial line can be connected other serial devices such as RTUs, PLCs, energy meters or any other field device.

## 8.1 RS232 Cable Pin Assignments



1. Terminal connector for 3 wire Tx-Rx-GND RS232 data transmission

Pin Number	Description
1	GND
2	Rx
3	Тх

## 8.2 RS485 Cable Pin Assignments



1. Terminal Connector for 2 wire RS485 connection and GND ( if needed)

Pin Number	Description
1	А
2	В
3	GND (Suggested to use)

## 9. Usage Scenarios and Connection Diagrams

Some of the usage scenarios of STG Series WMBus Gateways are described below. Usages are not limited to that examples and user may create their own usage scenario.

### 9.1 Convert WMBus OMS Packages to Modbus TCP

STG Series WMBus Gateways can receive WMBus OMS packages and convert them to Modbus TCP packages. This way WMBus packages of many meters can directly be collected on a remote or local Data Server or RTU device as Modbus registers and can be used for other applications.

#### **STG Configuration**

- Server Mode
- Device Function: WMBus Modbus TCP Gateway
- Wmbus Device Mode Other



STG set in Server mode and Device function set as WMBus – Modbus TCP Gateway. Manufacturing IDs of field devices can be listed with related Modbus addresses. If needed decryption list can be set and White list can be enabled. Received WMBus OMS messages will be converted to Modbus Registers and field or remote Modbus RTU devices can query that data from related Modbus addresses.

## 9.2 Convert WMBus OMS Packages to Modbus RTU

STG Series WMBus Gateways can receive WMBus OMS packages and convert them to Modbus RTU packages. This way WMBus packages of many meters can directly be collected on a remote or local Data Server or RTU device as Modbus registers and can be used for other applications.

#### **STG Configuration**

- Client Mode
- Device Function: WMBus Modbus RTU Gateway
- Wmbus Device Mode Other



STG set in Client mode and Device function set as WMBus – Modbus RTU Gateway. Manufacturing IDs of field devices can be listed with related Modbus addresses. If needed decryption list can be set and White list can be enabled. Received WMBus OMS messages will be converted to Modbus Registers and field or remote Modbus RTU devices can query that data from related Modbus addresses.

## 9.3 Transmit Received and Parsed WMBus Packages to MQTT Server

STG Series WMBus Gateways can receive WMBUS packages, decrypt and parse. All parsed data can be sent to MQTT server for web based applications in several different formats.

#### STG Configuration

- Server Mode
- Device Function: WMBus Modbus TCP Gateway and MQTT Publisher
- Wmbus Device Mode Other



STG act as TCP Server to WMBus Gateway configured in Server Mode. Field devices still can connect to STG device and read WMBus packages in Modbus TCP protocol. STG will get WMBus frames, decrypt them, parse them serve as Modbus TCP packages if needed and send WMBus data to MQTT Server simultaneoulsy.

## 9.4 Transmit Received WMBus Packages to Remote or Local Server over TCP/IP

STG Series WMBus Gateways can receive WMBus packages and send them to remote or local server over TCP/IP link. This way WMBus packages of many meters can directly be collected on a remote or local Data Server and that data can be used for other applications.



- Connect to NON STG Server IP and port
- Wmbus Device Mode Other

STG act as TCP Client to WMBus Gateway configured in Client Mode, Server device listening the connections and its IP and port must be configured in STG. WMBus configured to operate in Other Mode to listen WMBus packages and all received WMBus packages from the field devices will be transferred to remote server.

# 9.5 Transmit Received WMBus Packages to Local or Remote STG Clients over TCP/IP to Regenerate WMBus packages (Extend WMBus range)

STG Series WMBus Gateways can receive WMBUS packages and send them to remote or local clients over TCP/IP link. STG can act as server and up to 20 clients can connect. This way WMBus packages of meters can directly be shared with local or remote devices such as in-home displays.

STG can act as client and can regenerate the WMBus received over TCP/IP line. STG server can receive WMBus packages and send to STG client over TCP/IP network and WMBus packages can be regenerated on STG client side. This way WMBus range can be extended over TCP/IP network.



## 9.6 Transmit Received WMBus Packages to Local Serial Devices over RS232 or RS485

STG Series WMBus Gateways can receive WMBUS packages and send them to local serial devices over RS232 or RS485 serial connection. This way WMBus packages of many meters can directly be shared with local serial devices and that data can be used for other applications.



STG act as Serial to WMBus Gateway configured in Server Mode and listens WMBus packages. WMBus configured to operate in Other Mode to listen WMBus packages and all received WMBus packages from the field WMBus devices will be transferred to field serial devices.

## 9.7 Generate WMBus Packages for WMBus Devices over RS232 or RS485

STG Series WMBus Gateways can receive WMBUS messages from local serial devices over RS232 or RS485 serial connection and generate WMBus package based on those messages. This way WMBus packages for WMBus devices can directly be generated by local serial devices over RS232 or RS485.



STG act as Serial to WMBus Gateway configured in Client Mode and listens serial packages. WMBus configured to operate in Meter Mode to be able to send WMBus packages and all received WMBus packages from the field serial devices will be transferred to field WMBus devices.



## 10. Configuration via WEB Interface

STG Series WMBus Gateways can be configured over web interface. Device will get IP from DHCP client when connected to a network. User can use discovery tool to see IP of the device.



Once the IP of the device is set, user may login the device by simply typing the Ip address of device.



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NOTE 1: STG default firmware runs with DHCP off and expects an IP lease. If user need static IP or prefers DHCP on during start up, additional firmware is available.

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NOTE 2: If there is no DHCP server in LAN, REDZ device will get default 192.168.1.1 IP if it is set as Server Mode. It will get default 192.168.1.100 IP if it is set as Client mode.

## 10.1 Connecting Web Interface

Simply write IP of the device to the http client. Google Chrome is suggested to use. Login screen will pop up. Default user name: **admin** Default password: **admin** 

Oturum açın				
http://192.168.0.155 Bu siteye bağlantınız gizli değil				
Kullanıcı adı	admin			
Şifre				
	Oturum açın İptal			

Main screen of device will appear with following information:

		REDZ STG Series Wireless MBus Gateway Version: 2.01.01, -built Feb 14 2024 10:10:31 MAC: 60.9a:10.a3:4e:5c
×	Operating Mode	Operating Mode
۲		O Server Configuration
ئى		Client Configuration
••• <b>•</b> ••		Device ID
<u></u> జి		0x5B02
૾ઌૢ૾		Device Name
$\bigcirc$		STGSLAB
£.		Device Functionality Settings
		Device Function
		WMBus Transparent Gateway 🗸 🗸 🗸

Firmware Info, MAC details and Device Name on top

Menu Items on left

Menu Item details in center

### 10.2 MENU: Operating Mode

From this menu user may select the operating mode and device function of the device.

STG has 3 Main Device Function:

#### 1. WMBus OMS to Modbus TCP Converter (and/or send Meter Data to MQTT Server):

Set "<u>Server Configuration</u>" and select Device Function "<u>WMBus – Modbus TCP Gateway (and MQTT Publisher</u>)" to get Wireless MBus frames, decrypt and parse them and read data as Modbus TCP frames and/or send data to MQTT Server.

2. WMBus OMS to Modbus RTU Converter:

Set "<u>Client Configuration</u>" and select Device Function "<u>WMBus - Modbus RTU Gateway</u>" to get Wireless MBus frames, decrypt and parse them and read data as Modbus RTU frames.

3. Transparent Mode (Sends/Receive WMBus Packages to/from TCP/IP or Serial Side): Set "Server Configuration" and select Device Function "WMBus Transparent Gateway" to get Wireless MBus frames and send data to TCP/IP client or serial device (RS232 or RS485). Set "Client Configuration" and select Device Function "WMBus Transparent Gateway" to get Wireless MBus frames and send data to TCP/IP server. In this mode STG can send frame as it is or still can decrypt if device is listed on "AES Decryption List" defined under "WMBus Settings" menu.

Also in Device Function "<u>WMBus Transparent Gateway</u>" user can change "WMBus reception Mode" under "WMBus Settings" menu and if receiver is closed, STG will send frames to WMBus RF network, thus STG can be used to create or recreate WMBus frames.

×	Operating Mode	
		Client Configuration
		Device ID
		0x5B02
		Device Name
$\bigcirc$		WMBUS_SERVER
£.		Device Functionality Settings
		Device Function
		WMBus Transparent Gateway 🗸 🗸 🗸 🗸 🗸
		Save Configuration

"Device ID" field is the unique Device ID of STG device itself, based on WMBus Module serial number.

"Device Name" field is used to identify device.

"Device Function" field is used to select device behaviour.

STG can act as WMBus to Modbus TCP Gateway and make conversion between WMBus and Modbus TCP protocols and if enabled can also send WMBus data to MQTT Server. STG is set to Server Mode and "<u>Device Function</u>" is "WMBus - Modbus TCP Gateway (and MQTT Publisher)".

STG can act as WMBus to Modbus RTU Gateway and make conversion between WMBus and Modbus RTU protocols. STG is set to Client Mode and "<u>Device Function</u>" is "WMBus - Modbus RTU Gateway".

STG can act as WMBus Transparent Gateway and transfer data between WMBus RF Network and field TCP/IP or Serial (RS232 or RS485) devices. STG is set to Server Mode or client Mode based on TCP/IP connectivity need (do not matter for serial connection, Server Mode can be used) and "<u>Device Function</u>" is "WMBus Transparent Gateway". User can change "WMBus reception Mode" under "WMBus Settings" menu and if receiver is closed, STG will send frames to WMBus RF network, if opened then STG will receive frames from WMBus RF Network..

If Device Function is set as "WMBus - Modbus TCP Gateway (and MQTT Publisher)" or "WMBus - Modbus RTU Gateway", following settings will be shown.

Users may enter Modbus Address that they want to use with field device in this List. They can match the Modbus Address with field WMBus device Manufacturing ID and they can enable the entry they use.

Device	e Functiona	lity Settings					
Device	Function						
	WMBus -	Modbus TCP Gateway (and MQT	T Publisher)				
Modbu	s Scheduler S	Settings					
	Modbus Address	WMBus Device Address	Enable		Modbus Address	WMBus Device Address	Enable
	1	0x00144739	<ul> <li>Image: A second s</li></ul>		2	0x19142190	<ul> <li>Image: A start of the start of</li></ul>
		0x00003874	Image: A start of the start	04.		0x000DCBFB	<ul> <li>Image: A start of the start of</li></ul>
		0x00024095	<ul> <li>Image: A set of the /li></ul>	06.		0x0000000	
		0x0000000		08.		0x0000000	
		0x0000000				0x0000000	
		0x0000000				0x0000000	
	13	0x00000000				0x0000000	
	15	0x0000000			16	0x0000000	
	17	0x0000000			18	0x0000000	
	19	0x0000000			20	0x0000000	
	21	0~000000			22	0~0000000	

"Modbus Address" Modbus Address to be used to Access Modbus registers for field WMBus Device

"<u>WMBus Device Address</u>" Manufacturing ID of field WMBus Device that matched with Modbus Address

"Enable" Option to enable or disable the entry

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**NOTE:** STG Series WMBus Gateways have built in mechanism to get WMBus frames and Auto Configure which is described in "WMBus Settings" menu. This list can be auto filled by Auto Configuration mechanism, thus user do not have to enter manually.

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption.

Once the setting has been changed, "Save Configuration" button will be enabled.

#### Save Configuration

After clicking button system will tell if the settings applied successfully or not.

Oper	ating Mode	Changed	
Oper	ating mode	changed.	
	ОК		

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NOTE 1: STG Series WMBus Gateways can keep configuration of 2 different modes in its memory and once the configuration enabled, its already saved settings will be applied. Device can act as Server or Client at a time.

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NOTE 2: Settings will be applied once the device is rebooted from web interface or repowered manually.

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**NOTE 3:** If STG will be used to generate WMBus packages and TCP/IP connection will be used for that, there are 2 options:

1. "Device Function" is set to "WMBus Transparent Gateway" in "Server configuration" and serial line is not enabled.

2. "Device Function" is set to "WMBus Transparent Gateway" in "Client configuration" and serial line is not enabled.

STG will act as WMBus to TCP/IP Transparent Gateway and can send data from WMBus to TCP/IP or send TCP/IP data to WMBus RF Network (generate WMBus frames)

STG has 2 versions as hardware as well:

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list. This version can receive WMBus frame from TCP/IP as it is and send to WMBus RF Network.

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption. If that version is used, HCI protocol must be used to generate WMBus frames.

SOF	Msg	g Header Field	Payload Field		FCS (optional)
8 Bit		24 Bit	n*8Bit 16Bit		
OF (S	tart of l	-rame): (	)xA5		
1essa	ge Hea	der Fielc	1:		
Control Field	Endpoint ID	Msg ID Field	Length Field		

end Endpoint ID: It is 0x2 Message ID Field: It is 0x01 for sending data Length Field: It is the payload length which means data size of framed WMBus package

Example WMBus Message:

 Frame in Hex

 0E 06 23 12 67 45 23 01 01 01 80 54 65

 73 74

Example encapsulated WMBus Message with HCI protocol:

Frame in Hex A5 02 01 0E 06 23 12 67 45 23 01 01 01 80 54 65 73 74

Please contact our company if you need full implementation of protocol including CRC16 calculation.

## 10.3 MENU: Network Settings - Server

From this menu user may change the network settings of the device.

- User can change NTP Server address that used in MQTT data transmission.
- User can activate MQTT Publisher mode and change settings for MQTT data tranmission.
- User can change TCP Listening port for field devices.
- User can select maximum number of clients allowed to connect device.
- User can activate DHCP server.
- User can force device to a static IP.

۲	Network Settings	NTP Settings	
		NTP Server	
		MQTT Settings	
		Enable MQTT Publisher for Parsed WMBus Packages	
		Server Network Settings	
		Server Listening Port	Maximum Number of Clients
		502	
		DHCP Server Enabled	Use Static Address for Device

"NTP Server": NTP Server address that used in MQTT data transmission.

<u>"Enable MQTT Publisher for Parsed WMBus Packages"</u>: Click to enable MQTT Publisher. STG will send data read from WMBus meters for enabled devices ( there are up to 40 available) to MQTT Server. Data can aonly be sent if the WMBus frame can be (decrypted and) parsed. This Option is not available if "Device Function" is set to "WMBus Transparent Gateway".

If "Enable MQTT Publisher for Parsed WMBus Packages" is checked, following settings will be shown.

MQTT Settings	
Enable MQTT Publisher for Parsed WMBus Packages	
MQTT Broker IP	MQTT Broker Port
75.2.83.130	
Client ID	
MQTT_STG_Client	
User Name	Password
MQTT_STG_User	b2835bfa-458c-4e0c-87f8-f17fd4458674
Publish Topic	Subscribe Topic
MQTT_STG_Publish_topic	MQTT_STG_Conf_topic
Minimum Send Interval for a Parsed Data (in seconds)	Data Format
	PARSED DATA AS MODBUS FRAME 🗸

<u>"MQTT Broker IP"</u>: TCP IP of the MQTT Server. User must enter IP value Ex: 75.2.83.130 is for "https://tago.io/" web address

<u>"MQTT Broker Port"</u>: TCP Port of the MQTT Server. Ex: 1883 is for "https://tago.io/" web address

<u>"Client ID</u>": MQTT Publisher client ID. Default is MQTT\_STG\_Client. Maximum length for this field is 32.

<u>"User Name"</u>: MQTT Publisher user name. This must be entered based on MQTT server settings. Maximum length for this field is 64.

"Password": MQTT Publisher password. This must be entered based on MQTT server settings. Maximum length for this field is 48.

<u>"Publish Topic"</u>: MQTT Publisher topic value. Default is MQTT\_STG\_Publish\_topic. Maximum length for this field is 32.

<u>"Subscribe Topic"</u>: MQTT Publisher subscribe topic value. Default is MQTT\_STG\_Subscribe\_topic. Maximum length for this field is 32.

<u>"Minimum Send Interval for a Parsed Data (in seconds)</u>": Minimum value to send meter data to MQTT Server. This time is the minimum time to send data to server, if WMBus meter sends frames in longer periods then it will be basis of the sending interval.

"Data Format": Options for how data is shared by STG with MQTT server. There are 2 options:

#### RAW WMBUS DECRYPTED DATA

#### PARSED DATA AS OBJECTS

PARSED DATA AS MODBUS FRAME

When selected as "Raw WMBus Decrypted Data", STG will share WMBus frame as it is but decrypted as follows as an example:

#### 13:58:03: [MQTT] Device publish

{ "topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710413878\",\"Data\": {\"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-

51\",\"AcNu\":\"45\",\"RawDt\":\"202D900F002C2540430000CF464FAE2BBFB78B7239471400952642032D181007102F2F04953A6F4400002F2F2F2F2... "qos": 0, "device": "65e076784d9b150010876950", "messageld": null, "isHex": false }

{ "topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710413878\",\"Data\": {\"DevId\":\"144739\",\"Manld\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"RawDt\":\"202D900F002C2540430000CF464FAE2BBF78B7239471400952642032D181007102F2F04953A6F4400002F2F2F2F2F2F2F2F2F1}}, "qos": 0, "device": "65e076784d9b150010876950", "messageId": null, "isHex": false }

MQTT message shows STG device name, device id, NTP time and data itself

Data has values of WMBus Device Id, Manufacturer Id, Device Version, Device Type, RSSI Value of received signal, Access Number value and Decrypted frame Data Block.

When selected as "Parsed Data As Objects", STG will share WMBus data as parsed objects as follows as an example:

#### 14:04:57:

[MQTT] Device publish

"topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710414288\",\"Data\": {\"DevId\".\"144739\",\"ManId\".\"2695\",\"Ver\".\"42\",\"Typ\".\"37\",\"RSSI\".\"-51\",\"AcNu\".\"45\",\"DtCnt\".\"1\",\"Blcks\":

[{'"S\":\"0\",\"F\":\"1\",\"T\":\"3\",\"V\":\"1751900.0\"}]}}", "gos": 0, "device": "65e076784d9b150010876950", "messageld": null, "isHex": false }
{"topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710414288\",\"Data\":
{\"Devid\":\"144739\",\"Manld\":"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"DtCnt\":\"1\",\"Blcks\":[{\"S\":\"0\\",\"F\:\"1\",\"T\\",\"T\\",\"T\\",\"T\\",\"T\\",\"T\\",\"1751900.0\"]}]}", "gos": 0,

"device": "65e076784d9b150010876950", "messageId": null, "isHex": false }

MQTT message shows STG device name, device id, NTP time and data itself

Data has values of WMBus Device Id, Manufacturer Id, Device Version, Device Type, RSSI Value of received signal, Access Number value.

Parsed Data is shared in blocks and Data Count value shows how many blocks are there.

In this example there is 1 block

{\"\$\":\"0\",\"F\":\"1\",\"T\":\"3\",\"V\":\"1751900.0\"}

Here are explanations:

- S: Storage Number (of data from meter)
- F: Function Field (of data from meter)
- T: Data Type (STG uses this value to identify type of Data)
- V: Data Value (can be float or UINT 4 byte data, matched with Data Type)

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NOTE: Parsed data shared as data blocks. This is valid for both Modbus Frames and web page visualization. Each data block has following values:

- Data Type specified by STG
- Data Value (can be a float or long value)
- Function, available values are:

INSTANTANEOUS, MAXIMUM, MINIMUM or ERROR STATE

- Data Storage Number as an integer

details are explained in "Chapter 11: WMBus Data Parsing Format".

#### example:

#### 14:22:03:

[MQTT] Device publish { "topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710415316\",\"Data\": {\"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-

- 51\",\"AcNu\":\"45\",\"ModFr\":\"1A0014473926950042003700010000001000349D5DAE0002DFFCD\"}}", "qos": 0, "device":
- "65e076784d9b150010876950", "messageld": null, "isHex": false }

{"topic": "MQTT\_STG\_Publish\_topic", "payload": "{"STGi(d":"45FA!",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710415316\",\"Data\": {\"Devld\":\"144739\",\"Manld\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"ModFr\":\"1A0014473926950042003700010000001000349D5DAE0002DFFCD\"}]", "qos": 0, "device": "65e076784d9b150010876950", "messageld": null, "isHex": false }

MQTT message shows STG device name, device id, NTP time and data itself

Data has values of WMBus Device Id, Manufacturer Id, Device Version, Device Type, RSSI Value of received signal, Access Number value.

Parsed Data is shared in Modbus like frame, in this example as follows.

1A0014473926950042003700010000001000349D5DAE0002DFFCD

1A: 1 byte frame length, which is 1Ah and which is 26 in decimal and WMBus data shared as blocks

00144739: 4 bytes of WMBus device id

2695: 2 bytes of WMBus device manufacturer id

0042: 2 bytes of WMBus device version

0037: 2 bytes of WMBus device type

0001: 1 byte of Data count value. Data shared in blocks and this value shows how many blocks are there

0000001000349D5DAE0: Each data blocks has following values in 6 registers and 12 bytes

Storage Number (of data from meter) - 2 bytes

Function Field (of data from meter) - 2 bytes

Data Type (STG uses this value to identify type of Data that is shown in previous example) - 2 bytes, Data Type is Volume in this example

Data Value (float data based on Data Type in this example) - 4 bytes, 1751900.0 in this example

002D: 1 byte of Access Number value as unsigned integer. 45 in this example.

FFCD: 1 byte of RSSI value as signed integer. -51 in this example.

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NOTE: Parsed data shared as data blocks. This is valid for both Modbus Frames and web page visualization. Each data block has following values:

- Data Type specified by STG
- Data Value (can be a float or long value)
- Function, available values are:

INSTANTANEOUS, MAXIMUM, MINIMUM or ERROR STATE

- Data Storage Number as an integer

details are explained in "Chapter 11: WMBus Data Parsing Format".

There is also 2 registers at the end of each frame (service registers) to show Access Number and RSSI values of frame.

Following parameters and static IP settings available for "Server Network Settings" part.

Server Network Settings	
Server Listening Port	Maximum Number of Clients
DHCP Server Enabled	Use Static Address for Device
Server IP Address	Server Net Mask
192 168 0 143	
Server Gateway Address	
192 168 0 1	

"Listening Port": TCP Port that STG uses for incoming connections. Remote devices can use STG IP and this port to connect to STG for Modbus TCP query. This Option is not available if "Device Function" is set to "WMBus Transparent Gateway" and one of the serial line (RS232 or RS485) is activated.

<u>"Maximum Number of Clients"</u>: Maximum numbers of incoming connections accepted. STG can accept up to 10 simultaneous connection and all devices can query Modbus TCP. This Option is not available if "Device Function" is set to "WMBus Transparent Gateway" and one of the serial line (RS232 or RS485) is activated.

<u>"Use Static Address for Device"</u>: Set a static TCP IP for STG from this part. Enable and enter network settings and STGwill be available to connect from this static IP locally or remotely (gateway must be set properly for remote WAN connection).

Following parameters available if "DHCP Server" setting is enabled. This is used if DHCP server is needed in network. STGcan distribute IP to field devices connected to it in this way.

DHCP Server Enabled	Use Static Address for Device
Server IP Address	Server Net Mask
192 168 1 1	255 255 255 0
Server Gateway Address	
192 168 1 1	
DHCP Server Primary DNS Address	DHCP Server Range Start Address
192 168 1 1	192 168 1 100
DHCP Server Secondary DNS Address	
192 168 1 1	

Also if the device has Broadband Power Line (BPL) option:

User can select operating mode of BPL either MASTER or NODE.





Once the setting has been changed, "Save Configuration" button will be enabled.



After clicking button system will tell if the settings applied successfully or not.

Network Settings Changed.		
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NOTE 1: STG Series WMBus Gateways can keep configuration of 2 different modes in its memory and once the configuration enabled, its already saved settings will be applied. Device can act as Server or Client at a time.

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NOTE 2: Settings will be applied once the device is rebooted from web interface or repowered manually.

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**NOTE 3:** If "Device Function" is set to "WMBus Transparent Gateway" and one of the serial line (RS232 or RS485) is activated the device will act as Serial to WMBus Gateway and only following menu items will be available.

NTP Settings	
NTP Server	
Server Network Settings	
DHCP Server Enabled	Use Static Address for Device
Save Configuration	

## 10.4 MENU: Network Settings - Client

From this menu user may change the network settings of the device.

- User can change NTP Server address.
- User can force device to a static IP.

×	Operating Mode	
۲	Network Settings	NTP Settings
ئى	Serial Settings	NTP Server
••• <u></u> •••	Device Status	
رم م	WMBus Settings	Client Network Settings
Å	WMBus Status	Use Static Address
$\bigcirc$		
÷.		Save Configuration

<u>"Use Static Address"</u>: Set a static TCP IP for TLM from this part. Enable and enter network settings and TLM will be available to connect from this static IP locally or remotely (gateway must be set properly for remote WAN connection).

Following parameters and static IP settings available for "Use Static IP Address" setting.

Use Static Address	
Client IP Address	Client Net Mask
192 168 1 100	255 255 255 0
Client Gateway Address	
192 168 1 1	

Also if the device has Broadband Power Line (BPL) option,

User can select operating mode of BPL either MASTER or NODE.

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NOTE: Standard firmware of REDZ BPL supports up to 10 hops and 1000 nodes. Only 1 device can be MASTER in same network. If the device is in client mode, it is suggested to use "NODE" as setting.



Once the setting has been changed, "Save Configuration" button will be enabled.



After clicking button system will tell if the settings applied successfully or not.

Network Settings Changed.	
OK	

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NOTE 1: STG Series WMBus Gateways can keep configuration of 2 different modes in its memory and once the configuration enabled, its already saved settings will be applied. Device can act as Server or Client at a time.

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NOTE 3: If "Device Function" is set to "WMBus Transparent Gateway" and serial line is disabled, the device will act as WMBus to TCP/IP client device Gateway and following menu items will be available.

34		
۲	Network Settings	NTP Settings
ئى		NTP Server pool ntp org
••• <u>•</u> •••		
<del>ద</del> ి		Client Network Settings
~\$		Server Static IP Address Server Listening Port
Ø		192 168 0 201 502
÷.		Use Static Address
		Save Configuration

<u>"Server Static Ip Address"</u>: Remote TCP IP adress that STG will try to connect automatically.

"Listening Port": Remote TCP Port that STG will try to connect automatically.

## 10.5 MENU: Serial Settings

This menu is available only when

- "Device Function" is set to "WMBus Transparent Gateway" in "Server configuration" and one of the serial line is enabled (RS232 or RS485)
   STG can will as WMBus to Serial Gateway and can send data from WMBus to serial (RS232 or RS485) line or send serial data to WMBus RF Network (generate WMBus frames)
- "Device Function" is set to "WMBus Transparent Gateway" in "Client configuration" and one of the serial line is enabled (RS232 or RS485)
   Again STG will act as WMBus to Serial Gateway and can send data from WMBus to serial (RS232 or RS485) line or send serial data to WMBus RF Network (generate WMBus frames)
- "Device Function" is set to "WMBus -Modbus RTU Gateway" in "Client configuration". STG will act as WMBus to Modbus RTU Gateway and receive, decrypt WMBus frames and convert to Modbus RTU frames.

From this menu user may activate RS232 or RS485 connection.

- User can select RS232 line and can set baud rate and data type for serial line.
- User can select RS485 line and can set baud rate and data type for serial line.

Here are menu options:



"Enable RS232 for Modbus RTU" Enable and set the baud rate and data type of RS232 serial line for Modbus RTU communication.

If "Device Function" is set to "WMBus Transparent Gateway" and "Rx Package Reception Mode" is set to any of listening modes (S, T, C/T Modes) under "WMBus Settings", the text will be "Send WMBus Messages to RS232"
If "Device Function" is set to "WMBus Transparent Gateway" and "Rx Package Reception Mode" is set to "OFF" under "WMBus Settings", text will be "Receive WMBus Messages from RS232"

"Enable RS485 for Modbus RTU" Enable and set the baud rate and data type of RS485 serial line for Modbus RTU communication.

If "Device Function" is set to "WMBus Transparent Gateway" and "Rx Package Reception Mode" is set to any of listening modes (S, T, C/T Modes) under "WMBus Settings", the text will be "Send WMBus Messages to RS485"
If "Device Function" is set to "WMBus Transparent Gateway" and "Rx Package Reception Mode" is set to "OFF" under "WMBus Settings", text will be "Receive WMBus Messages from RS485"

"Baud rate": Serial communication baud rate selection.

"Line Control": Serial communication data type selection in form of Data bits-Parity-Stop bits. Available options are: 8 NONE 1

9\_NONE\_1 8\_EVEN\_1 8\_EVEN\_2 8\_ODD\_1 8\_ODD\_2 8\_NONE\_2 9\_NONE\_2

Once the setting has been changed, "Save Configuration" button will be enabled.



After clicking button system will tell if the settings applied successfully or not.

Serial Settings Changed.	
ОК	

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NOTE 1: STG Series WMBus Gateways can keep configuration of 2 different modes in its memory and once the configuration enabled, its already saved

settings will be applied. Device can act as Server or Client at a time. Lets say TCP Server enabled in Server operating mode and RS232 serial line enabled in Client operating mode on same device, the device can switch between to settings simply by changing the mode.

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NOTE 2: Settings will be applied once the device is rebooted from web interface or repowered manually.

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NOTE 3: If STG will be used to generate WMBus packages and one of serial line (RS232 or RS485) will be used for that, there are 2 options:

1. "Device Function" is set to "WMBus Transparent Gateway" in "Server configuration" and one of the serial line is enabled (RS232 or RS485)

2. "Device Function" is set to "WMBus Transparent Gateway" in "Client configuration" and one of the serial line is enabled (RS232 or RS485)

STG will act as WMBus to Serial Transparent Gateway and can send data from WMBus to serial (RS232 or RS485) line or send serial data to WMBus RF Network (generate WMBus frames)

STG has 2 versions as hardware as well:

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list. This version can receive WMBus frame from one of serial line (RS232 or RS485) as it is and send to WMBus RF Network.

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption. If that version is used, HCI protocol must be used to generate WMBus frames.

#### Msg Header Field Payload Field FCS (optional SOF 8 Bit 24 Bit 16 Bit n\*8 Bit SOF (Start of Frame): 0xA5 Message Header Field: Endpoint Control Field Msg ID Field Length 4 Bit 4 Bit 8 Bit 8 Bit Control Field: User may use 0x0 for this part to ignore CRC16 attachment at end Endpoint ID: It is 0x2 Message ID Field: It is 0x01 for sending data Length Field: It is the payload length which means data size of framed WMBus package

Example WMBus Message:

 Frame in Hex

 0E 06 23 12 67 45 23 01 01 01 80 54 65

 73 74

Example encapsulated WMBus Message with HCI protocol:

Frame in Hex

HCI protocol:

A5 02 01 0E 06 23 12 67 45 23 01 01 01 80 54 65 73 74

Please contact our company if you need full implementation of protocol including CRC16 calculation.

## 10.6 MENU: Device Status - Server

From this menu user may monitor device status and statistics based on operating mode of device. The page also helps users to check device health.



"IP Address": TCP/IP address of STG itself.

<u>"App Status"</u>: It shows current status of STG application. "SERVING CONNECTIONS" means device is ready for normal operation.

"Log Status": It is only available when "Log" is enabled from "Management" menu and shows current status of STG

logging. "LOG\_STATE\_TRYWRITELOG" means normal operation.

"Log Counter": It is only available when "Log" is enabled from "Management" menu and shows how many log lines has been transfered till now.

<u>"MQTT Sent Messages"</u>: It is only available when "MQTT" is enabled from "Network Settings" menu and shows how many MQTT messages has been transfered till now.

<u>"MQTT Status"</u>: It is only available when "MQTT" is enabled from "Network Settings" menu and shows current status of LKM MQTT Publisher. "APP\_MQTT\_STATE\_SUBSCRIBED" means MQTT publisher is ready for normal operation.

"N. of Module UART Errors": Number of module uart errors. Device will enter "Reboot State" if this number is above 20.

"<u>N. of Module Incorrect Chars Received</u>" Number of incorrect packages length that does not fit Protocol Data Unit that device uses.

"N. of Module UART Input Overflow Errors": Number of module input overflow errors.

"<u>N. of Module UART CRC Errors</u>" Number of CRC errors based on Protocol Data Unit that device uses.

"N. of Module Message Retries" Number of WMBUS packages tried to send again due to a previous failure.

"N. of TCP Disconnections": Number of TCP disconnections from STG. Not available if one of serial line is enabled.

<u>"N. of TCP Output Full Errors"</u>: Number of TCP output full errors during trying to send data to TCP side. Device will enter "Reboot State" if this number is above 5. Not available if one of serial line is enabled.

"N. of Gateway Side Message Retries" Number of tries to send data to TCP/IP.

<u>"N. of Gateway Side Input Overflow Errors</u>": Number of input overflow errors on TCP/IP. Not available for transparent gateway mode.

"<u>N. of Module Incorrect Chars Received</u>" Number of incorrect packages length that does not fit Modbus Protocol Data Unit on TCP/IP side. Not available for transparent gateway mode.

<u>"N. of WMBus Messages Received Correctly</u>": Number of WMBus packages received successfully over the WMBus Network.

"N. of WMBus Messages Sent Correctly": Number of WMBus packages sent to WMBus Network successfully.

<u>"N. of Modbus Messages Received Correctly"</u>: Number of Modbus data packages received from TCP side. Not available for transparent gateway mode.

<u>"N. of Modbus Messages Sent Correctly"</u>: Number of Modbus data packages sent to TCP side based. Not available for transparent gateway mode.

# In "Modbus TCP Status" part (Available when "Device Function" is Set to "WMBus - Modbus TCP Gateway (and MQTT Publisher)":

Device will show 40 lines in this part to show modbus communciation status of each WMBus device available for decryption and parsing.

Mod	bus TC	P Status			
	Modbus Slave Address	WMBus Device ID	Last Query Time	Last Modbus Package	Status
		0x144739	27-09-2023 06:28:47	7 00 47 00 00 00 1D 01 03 1A 00 14 47 39 26 95 00 42 00 37 00 01 00 00 00 01 00 03 49 D5 DA E0 00 2D FF CD	READY
		0x19142190	N.A.	N.A.	READY
		0x3874	N.A.	N.A.	READY
04.		0xDCBFB	N.A.	N.A.	READY
		0x24095	N.A.	NA.	READY
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA	DISABLED
		0x0	NA.	N.A.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA	DISABLED
		0x0	N.A.	N.A.	DISABLED
		0x0	N.A.	NA.	DISABLED
		0x0	N.A.	NA	DISABLED
		0x0	NA	NA	DISABLED
		0x0	NA	NA	DISABLED
		0x0	NA.	NA	DISABLED
		0x0	NA.	NA	DISABLED

"Modbus Slave Address": Is the Modbus Slave address for the device in entry.

"WMBus Device ID": Is the device id of WMBus meter that is queried.

"Last Query Date": Is the last time the modbus query is executed.

"Last Modbus Package": Is the last modbus frame sent for the WMBus meter in entry.

<u>"Status"</u>: Is the status for communication.

After clicking "Refresh Status" button, system will reload data only and will not reload page. Button will be disabled during reload for an instance. If timeout occurs during the reload, the button will be enabled again with warning of timeout. In normal operation reload of status data will be done immediately.

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NOTE 1: Following screen will show up if "WMBus Transparent Gateway" is selected as "Device Function"

26	Operating Mode	Server Status	
۲			
్లి		IP Address 192 168 0 121	App Status SERVING_CONNECTIONS
••• <u></u> •••	Device Status	Log Status	Log Counter
e,		LOG_STATE_TRYWRITELOG	1587
ъ¢		N. of Module UART Errors	N. of Module Incorrect Chars Received
Ø			•
÷÷•		N. of Module UART Input Overflow Errors	N. of Module UART CRC Errors
		N of Module Message Retries	N of TCP Disconnectors
		N. of TCP Output Full Errors	N. of Catlowey Side Mescage Rohites
		N. of WMBlus Messages Received Correctly 83	N. of WMBus Messages Sent Corracity
		Connections	
		Ip Address Device Name 01. 192.168.0.120 61168 02.	
		Roset Logs Rotresh Status	

#### In "Connections" part :

Device can show up to 10 lines in this part based on <u>"Maximum Number of</u> <u>Clients</u>" setting under "<u>Network Settings</u>" Menu.

"Ip Address": Is the TCP IP address of client connected to STG.

"Incoming Port": Is the TCP Port of socket used by client connected to STG.

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NOTE 2: Following screen will show up if "WMBus Transparent Gateway" is selected as "Device Function" and if one of serial (RS232 or RS485) line is activated.

×	Operating Mode	Server Status	
۲			
تى		IP Address 192 168 0.121	App Status SERVING_CONNECTIONS
••• <u></u> •••	Device Status	Log Status	Log Counter
e,		LOG_STATE_TRYMFUTELOG	1587
×		N. of Module UART Errors	N. of Module Incorrect Chars Received
0			
<u>.</u>		N of Module UMRT Input Overflow Errors	N of Module UART CRC Errors
		N of Module Mossage Retries	N. of Senal UART Errors
		N. of Galeway Side Message Retries	
		N of WMBus Messages Received Correctly	N. of WMBus Messages Sent Correctly
		Reset Logs Refresh Shiha	
## 10.7 MENU: Device Status - Client

From this menu user may monitor device status and statistics based on operating mode of device. The page also helps users to check device health.

		Client Statu	5				
		IP Address	100 100 0 00				App Status
Device	Sinto						
		Log States	TRANSITE OG				Log Counter
		N. of Module LU	AT Eron				N. of Module Incorrect Chara Received
		N. of Module U	UIT input Overflow (				N. of Module UART CRC Errors
		N. of Module Mi	rssage Rebies				N. of Serial WATT Errors
		N. of Galeway 5	ide incorrect Chars	Received			N. of Gateway Side Input Overflow Errors
		N. of Galeway 5	Side CRC Errom				
		N. of WMBus M	essages Received (	Correctly			N. of WMExe Messages Sent Carredly
		N. of Modbus M	kanagen Racelved (	Correctly			N. of Modeus Meanages Sent Connectly
		Marthur D	Til Status				
		MODULS IN					
		Slave	William Device I	D Lost Geery Tie	e Last Modbus Packag	r Status	
		01. 1	0x1044739 0x10142190	NA. NA.	NA. NA	READY READY	
		05. 3	0x3874 0xDC8F8	NA. NA	NA. NA	READY	
		05. 5	0.24095	NA.	NA.	READY	
		07. 7	0.0	NA.	NA.	DISABLED	
		06. 8	0.0	NA.	NA.	DISARLED DISARLED	
		10. 10	0:0	NA.	NA.	DISABLED	
			0.0	NA.	NA.	DISABLED DISABLED	
			000			DISABLED	
		14. 14 15. 15	0.0	NA. NA.	NA.	DISABLED	
			0x0	NA.	NA.	DISABLED	
			0-0	NA.	NA.	DISABLED	
		19. 19	0.0	NA.	NA.	OFSARLED OFSARLED	
		21. 21	0x0	NA.	NA.	DEARLED	
		22. 22 23. 23	0.0	NA.	NA.	DISARLED DISARLED	
		24. 24	0x0	NA.	NA.	OSALID	
		25 25 25	0.0	NA.	NA.	DEABLED ORABLED	
			0.0			DISABLED	
		26. 25 29. 29	0x0	NA. NA	NA.	DEABLED	
		30. 30	0.0	NA.	NA.	ORSABLED	
		31, 31 32, 32	0.0	NA.	NA.	DISABLED	
		33. 33	0x0	NA.	NA.	DISABLED	
		35 35	0.0	NA	NA.	ORSARLED	
		36. 36	0.0	NA.	NA.	DISABLED	
			000	inge.	n.a.	Disal D	
						Custure	
		36 36 39 39 40 40	0x9 0x9 0x9	NA NA	RA. RA.	DISARLED DISARLED	
		36 38 39 39 40 49	0x0 0x0 0x0	NA NA NA	NA NA NA	DEARLED	
		36. 38 39. 39 40. 40	0x0 0x0 0x0	NA NA NA	NA NA NA	CISALED DISALED	
		36 38 39 39 40 40 ResetLogs	0x0 0x0 Refeath Statur	NA NA NA	RA RA RA	GEARID DEARID	

"IP Address": TCP/IP address of STG itself.

<u>"App Status"</u>: It shows current status of STG application. "SERVING CONNECTIONS" means device is ready for normal operation.

"Log Status": It is only available when "Log" is enabled from "Management" menu and shows current status of STG logging. "LOG\_STATE\_TRYWRITELOG" means normal operation.

"Log Counter": It is only available when "Log" is enabled from "Management" menu and shows how many log lines has been transfered till now.

"N. of Module UART Errors": Number of module uart errors. Device will enter "Reboot State" if this number is above 20.

"<u>N. of Module Incorrect Chars Received</u>" Number of incorrect packages length that does not fit Protocol Data Unit that device uses.

"N. of Module UART Input Overflow Errors": Number of module input overflow errors.

"<u>N. of Module UART CRC Errors</u>" Number of CRC errors based on Protocol Data Unit that device uses.

"N. of Module Message Retries" Number of WMBUS packages tried to send again due to a previous failure.

"N. of Serial UART Errors": Number of serial uart errors. Device will enter "Reboot State" if this number is above 20. Not available for transparent gateway mode when serial line (RS232 or RS485) is not activated.

"<u>N. of Gateway Side Incorrect Chars Received</u>": Number of incorrect bytes recived on Serial line (RS232 or RS485) that does not fit Modbus protocol. Not available for transparent gateway mode.

<u>"N. of Gateway Side Input Overflow Errors"</u>: Number of input overflow errors on Serial line (RS232 or RS485). Not available for transparent gateway mode.

"<u>N. of Gateway Side CRC Errors</u>": Number of CRC errors on Serial line (RS232 or RS485) that does not fit Modbus protocol. Not available for transparent gateway mode.

<u>"N. of WMBus Messages Received Correctly</u>": Number of WMBus packages received successfully over the WMBus Network.

<u>"N. of WMBus Messages Sent Correctly"</u>: Number of WMBus packages sent to WMBus Network successfully.

<u>"N. of Modbus Messages Received Correctly"</u>: Number of Modbus data packages received from Serial RS232 or RS485 line. Not available for transparent gateway mode.

<u>"N. of Modbus Messages Sent Correctly"</u>: Number of Modbus data packages sent to Serial RS232 or RS485 line. Not available for transparent gateway mode.

#### In "Modbus RTU Status" part (Available when "Device Function" is Set to "WMBus - Modbus RTU Gateway":

Device will show 40 lines in this part to show modbus communciation status of each WMBus device available for decryption and parsing.

#### **Modbus RTU Status**

	Modbus Slave	: WMBus Device ID	) Last Query Time	e Last Modbus Package	Status
	Address	5			
01.		0x144739	N.A.	N.A.	READY
02.	2	0x19142190	N.A.	N.A.	READY
03.	3	0x3874	N.A.	N.A.	READY
04.	4	0xDCBFB	N.A.	N.A.	READY
05.		0x24095	N.A.	N.A.	READY
06.		0x0	N.A.	N.A.	DISABLED
07.	7	0x0	N.A.	N.A.	DISABLED
08.	8	0x0	N.A.	N.A.	DISABLED
09.		0x0	N.A.	N.A.	DISABLED
10.	10	0x0	N.A.	N.A.	DISABLED
11.	11	0x0	N.A.	N.A.	DISABLED
12.	12	0x0	N.A.	N.A.	DISABLED
13.	13	0x0	N.A.	N.A.	DISABLED
14.	14	0x0	N.A.	N.A.	DISABLED
15.	15	0x0	N.A.	N.A.	DISABLED
16.	16	0x0	N.A.	N.A.	DISABLED
17.	17	0x0	N.A.	N.A.	DISABLED
18.	18	0x0	N.A.	N.A.	DISABLED
19.	19	0x0	N.A.	N.A.	DISABLED
20.	20	0x0	N.A.	N.A.	DISABLED
21.	21	0x0	N.A.	N.A.	DISABLED
22.	22	0x0	N.A.	N.A.	DISABLED
23.	23	0x0	N.A.	N.A.	DISABLED
24.	24	0x0	N.A.	N.A.	DISABLED
25.	25	0x0	N.A.	N.A.	DISABLED
26.	26	0x0	N.A.	N.A.	DISABLED
27.	27	0x0	N.A.	N.A.	DISABLED
28.	28	0x0	N.A.	N.A.	DISABLED
29.	29	0x0	N.A.	N.A.	DISABLED
30.	30	0x0	N.A.	N.A.	DISABLED
31.	31	0x0	N.A.	N.A.	DISABLED
32.	32	0x0	N.A.	N.A.	DISABLED
33.	33	0x0	N.A.	N.A.	DISABLED
34.	34	0x0	N.A.	N.A.	DISABLED
35.	35	0x0	N.A.	N.A.	DISABLED
36.	36	0x0	N.A.	N.A.	DISABLED
37.	37	0x0	N.A.	N.A.	DISABLED
38.	38	0x0	N.A.	N.A.	DISABLED
39.	39	0x0	N.A.	N.A.	DISABLED
40.	40	0x0	N.A.	N.A.	DISABLED

"Modbus Slave Address": Is the Modbus Slave address for the device in entry.

"WMBus Device ID": Is the device id of WMBus meter that is queried.

"Last Query Date": Is the last time the modbus query is executed.

"Last Modbus Package": Is the last modbus frame sent for the WMBus meter in entry.

<u>"Status"</u>: Is the status for communication.

After clicking "Refresh Status" button, system will reload data only and will not reload page. Button will be disabled during reload for an instance. If timeout occurs during the reload, the button will be enabled again with warning of timeout. In normal operation reload of status data will be done immediately.

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NOTE 1: Following screen will show up if "WMBus Transparent Gateway" is selected as "Device Function"

×		Client Status	
۲			
ئى		IP Address 192 168 0 121	App Status WAIT_FOR_CONNECTION
<u>ộ</u>	Device Status	Loo Status	Loo Counter
⊜-²		LOG_STATE_TRYWRITELOG	22
×		Server IP Address	
Ø			
÷.		N of Module UART Enors	N of Module Incomed Chars Received
		N of Module UART Input Overflow Errors	N. of Modulo UNRT CRC Errors
		N of Module Message Retries	N. of TCP Disconnections
		N of TCP Output Full Errors	N. of Galenwy Side Message Retries
		N of VMBus Mussages Received Correctly	N. of WMBus Messages Sent Connectly 0
		Reset Logs Refresh Status	

<u>"N. of TCP Disconnections</u>": Number of TCP disconnections from STG.

<u>"N. of TCP Output Full Errors"</u>: Number of TCP output full errors during trying to send data to TCP side. Device will enter "Reboot State" if this number is above 5.

"<u>N. of Gateway Side Message Retries</u>" Number of tries to send data to TCP/IP.

Also an extra item will appear to show remote IP of the target TCP device.

Server IP Address 192.168.0.120

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NOTE 2: Following screen will show up if "WMBus Transparent Gateway" is selected as "Device Function" and if one of serial (RS232 or RS485) line is activated.

∞	Operating Mode	Client Status	
۲			
لاست		IP Address 192.168.0.121	App Status SERVING_CONNECTIONS
<u></u>	Device Status	Los Steter	Los Pounter
e-1		LOG_STATE_TRYWRITELOG	675
~¢¢		N. of Module UART Errors	N. of Medule Incorrect Chars Received
0			•
<i>.</i> #•		N. of Module LMRT input Overflow Errors	N of Module LWRIT CRC Errors
		N: of Module Mossage Retries	N of Senal UART Enrors
		N: of Calenary Side Message Rufries	
		N of WARBus Messages Received Correctly	N et WMBus Mensages Sent Correctly 0
		Reset Logs Refresh Status	

"<u>N. of Gateway Side Message Retries</u>" Number of tries to send data to Serial line (RS232 or RS485).

## 10.8 MENU: WMBus Settings

The Wireless MBus protocol stack implemented on STG is compliant the European standard 13757 part 4: "Communication systems for meters and remote reading of meters". It describes the wireless communication of water, heat, electricity and gas meters with data concentrators. For sake of convenience in this manual such meter devices are called "Meter", the communications partner devices like concentrators are called "Other". From this menu user may change following WMBus RF parameters:

• "Rx Package Reception Mode": Determines if the module operates in Meter (only sends WMBus packages) or

Other Mode (receives and sends WMBus packages).

Device Mode is always Other Mode when device Function is set to Wmbus – Modbus Gateway.

Available options are: S - Mode, T - Mode, C/T - Mode (combined receiption of T and C Mode messages) and OFF

OFF is used to turn of reception and set the device to Meter mode.

• "<u>Tx Package Transmission Mode</u>": Determines the message sending format of STG while sending WMBus messages, used only if reception mode is "OFF"

Available options are: S - Mode Packet Format A, T - Mode, Packet Format A, C - Mode 50 000 bps Packet

Format A, C - Mode 100 000 bps Packet Format A, C - Mode 50 000 bps Packet Format B, C - Mode 100 000 bps Packet Format B

• "<u>Tx Power Level</u>": Determines the power level of STG while sending WMBus messages, used only if reception mode is "OFF"

Available options are from -1dBm to 13dBm

- "<u>AES Decryption</u>": The list of devcies for AES decryption. STG can decrypt up to 40 WMBus devices messages and in this list Manufacturer Id, Device Id, Device Version, Device Type and Decryption Key must be entered for each WMBus device that is needed to be read, decrypted, parsed and data converted to Modbus and/or sent to MQTT Server.
- <u>"Auto Configure</u>" option can be used to fill this list (besides the key) and other parts of device settings

automatically. When this button clicked, STG will show received frames with latest RSSI values for all WMBus devices since the device powered up. If there is no RSSI value, that means STG did not receive any frame for that entry yet, user may wait and click button again. If a line has notation "Recently Dedected" on the right side of entyr and framed with green line, that means this WMBus frame received and this device is not in configuration (or not in Black List), user may select it to "Add to Config" or "Add to Black List" based on needs ( and click "Save Configuration" button). That process will also put the device id to Modbus list automatically thus ease up configuration process dramatically.

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**NOTE:** STG Series WMBus Gateways have built in mechanism to get WMBus frames and Auto Configure. AES Decryption, Modbus Adress mapping and Black list items can be auto filled by Auto Configuration mechanism, thus user do not have to enter manually each item besides AES Key.

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption.

		Serve	r WMBus S	ettings						
۲										
		Rx Pace	age Receptor T-N	Node Rede	-					t and a set of the
ىي	WMBus Settings									
~		TX Pace	age Transmiss	ian Mode						
			T - Made, Pa							
Ø		Ta Powe	er Level							
st.			8m 🛩							
		AES De	cryption							
		Reb	mh Auto Config							
						Recently Ded				
										a di panta di
		AE5-12	0 Decryption L							
			Manufacturer	Device ID	Version	Device	AES-125 bit Decryption Key	Latest RSSI Value	Add to Config Add to Bi	ecR.
ЪĘ.			042695			0403				
			0x0984	Dx19142190	Dx13	8407	00-00-00-00 00-00-00-00-00-00-00-00-00-0	-76		
						8603	as a	-82		
			0x05856 0x8654	DH000005874 DH000005874	Cw01 Dw03	9673 6673	00 (00 \$4 00 (00 \$4 00 (00 \$4 00 (00 \$4 00 \$10 \$4 00 \$10 \$10 \$10 \$10 \$10 \$10 \$10 \$10 \$10	-10 -17		
			0x0985 0x8654 0x662C	0x00003874 0x000024056	0x01 0x03 0x12	8603 8603 8604	00 (Co-95 00 (Co-95 00 (Co-95 00 (Co-95 00 (Co-95 00 00 (Co-95 00 (Co-95 00 (Co-95 00 (Co-95 00 (Co-95 00 00 (Co-95 00 (Co-95 00 (Co-95 00 (Co-95 00 (Co-95 00	-17		
			0x0205 0x5514 0x5620C 0x09021	DH30003874 DH5000CBFB DH30024096 DH34686475	0x01 0x03 0x12 0x14	0603 0603 0604 0607	00 (0000) (000 00 (000 00 (000 00 (000 00 (000 00	-81 -77 -73		Receivity Deviced
			0x0255 0x6920 0x6920 0x9901 0x9901	840000874 04600003978 0400004656 0404656473 0404485627	0x01 0x03 0x42 0x14	0x03 0x03 0x04 0x07	93 (0-35 -03 (0-35 (	-83 -77 -73 -79		Recently Dedected Recently Dedected
			SH2988 CH8514 CH8514 CH9901 CH9901 DH9501 DH95042	6x00000574 0x000000179 0x000024046 0x04466473 0x04466473 0x0446552 0x12545675	0x01 0x03 0x12 0x14 0x14 0x14	8403 8403 8404 8407 8407 8400		40 .77 .73 .73		Recently Dedected
			9x288 0x8514 0x682C 0x9901 0x9901 0x9001 0x9001 0x9004	0x00000074 0x00000079 0x00004056 0x04405677 0x12545675 0x12545675	85 83 82 84 85 85 85 85	8000 6000 6007 6007 6000 6000		49 -77 -79 -79		Recently Destected Recently Destected
			9x2288 0x8554 0x9901 0x9901 0x9901 0x9901 0x9004 0x9004 0x9004 0x9004	940000874 040000406 940408405 9404686473 9404686473 9412545478 9412545478	835 843 842 845 845 845	8000 8400 8400 8400 8400 8400 8400		<b>9</b> л .Э		Recently Desected Recently Dedected
			942285 046020 046020 046000 046001 046001 046001 046004 046004 046004	excounces/vi     customers/	83 83 83 83 83 83 85 85 85	883 863 861 867 867 860 860		4) -7 -7 -7		Recently Detected
			Bac285 Da551 Da562C Da5921 Da5921 Da5921 Da5921 Da5921 Da5921 Da5921 Da5921 Da5921 Da5921 Da5921	Extractions Descentific Extractions Descentific Descentific Extractions Descentific Descentific Descentific Descentific Descentific Descentific	83 83 83 83 85 85 85 85 85 85	885 845 845 847 847 847 848 848 848 848 848		4) -11 -73 -73		Recently Desected
			90285 9460C 94901 94901 94924 94924 94924 94924 94924 94924 94924	EM0000074 De0002077 EM0002066 De0002066 De0002066 De100607 De1007 DE1007 DE				4) -71 -73 -73		Recently Desected Recently Dedected

Supported Link modes are:

Frequency	Coding	Chiprate	Bitrate	Frame Format

S - Mode	868.30 MHz	Manchester	32786 cps	16384 bps	А
T - Mode (Rx) (Meter to Other)	868.95 MHz	3-Out-Of-6	10000 cps	66666 bps	A
T - Mode (Tx) ( Other to Meter)	868.30 MHz	Manchester	32768 cps	16394 bps	A
C - Mode (Rx) (Meter to Other)	868.95 MHz	NRZ	100000 cps	100000 bps	А, В
C - Mode (Tx) ( Other to Meter)	869.525 MHz	NRZ	50000 cps	50000 bps	А, В
C/T - Mode (Rx) (Meter to Other)	868.95 MHz	NRZ 3-Out-Of-6	10000 cps 10000 cps	10000 bps 66666 bps	А, В А

Supported CI Values are:

CI-Field	Function / Layer	Up- or Down-link	TPL header - Type	Protocol / Service
53h	Application Reset or Select	Down	Long	Application Reset or Select
5Bh	Command	Down	Long	M-Bus
60h	Command	Down	Long	DLMS
6Ch	Time Sync	Down	Long	Generic
6Dh	Time Sync	Down	Long	Generic
6Eh	Application Error	Up	Short	Generic
6Fh	Application Error	Up	Long	Generic
72h	Response	Up	Long	M-Bus
74h	Alarm	Up	Short	Generic
75h	Alarm	Up	Long	Generic
78h	Response	Up	None	M-Bus
7Ah	Response	Up	Short	M-Bus
7Ch	Response	Up	Long	DLMS
7Dh	Response	Up	Short	DLMS
80h	Pure Transport Layer	Down	Long	None
8Ah	Pure Transport Layer	Up	Short	None
8Bh	Pure Transport Layer	Up	Long	None
8Ch	Extended Link Layer	Up / Down	Short	Lower Layer Service ( 2 Byte )
8Dh	Extended Link Layer	Up / Down	Long	Lower Layer Service ( 8 Byte )
8Eh	Extended Link Layer	Up / Down	Long	Lower Layer Service ( 10 Byte )
8Fh	Extended Link Layer	Up / Down	Long	Lower Layer Service ( 16 Byte )
C3h	Command	Down	Long	Security Information Transport
C4h	Response	Up	Short	Security Information Transport
C5h	Response	Up	Long	Security Information Transport

Packet Decryption and Encryption Support List is:

Mode	Encryption Type	Authentication	Supported
0	None	None	YES
2	DES CBC	None	NO
3	DES CBC	None	NO
5	AES-128 CBC	None, MIC	YES
7	AES-128 CBC, dynamic key	CMAC	YES
8	AES-128 CTR	CMAC	NO
9	AES-128 GCM	GCM/GMAC	NO
10	AES-128 CCM	CCM	NO
128	ELL AES-128 CTR	None, CRC	YES
129	Custom Modes	None	e.g. AT-WMBUS-NA-1

Here is an example for "<u>AES Decryption</u>" part: After clicking of "Refrefsh Auto Config List", STG will fill WMBus device address, Manufacturer ID, Device version and Device Type based on received frames.

In this example entries 1 to 5 are from previous configuration (already saved in configuration) and entries 6 & 7 are new frames and marked with "Recently Dedected" sign. User can mark those devices as "Add to Config" ( and enter AES Key) or "Add to Black List".

If "Add to Config" checked, user must enter AES Key (if Key is used). After clicking "Save Configuration", STG will save this entry and add that device to "Modbus Scheduler Settings" under "Operating Mode" menu.

If "Add to Black List" checked, after clicking "Save Configuration", STG will save this device id under "Black List Table" (and enables list by checking "Black List Enabled" checkbox, if not enabled already) under "Security Settings" menu. This entry also will be freed up from decryption list to be used for new coming frames.

AESD	ecryption						
Ref	resh Auto Config						
	edected Size			Recently Ded			
AES-1	28 Decryption L	ist					
	Manufacturer ID	Device ID	Version	Device Type	AES-128 bit Decryption Key	Latest RSSI Value Add to Confi	Add to Black
	0x2695		0x42				
			0x13			-76 🗸	
	0x0688		0x01			-89 🗹	
			OxeOS			-11 🗹	
	0x0B2C		0x42			- <u>-</u>	
	0x0601		Ox14			er.	Recently Dedected
			0x14			-r» 🗸	Recently Dedected
	OVDCAE		0x01				
			0.00				

Once the setting has been changed, "Save Configuration" button will be enabled.



After clicking button system will tell if the settings applied successfully or not.

WMBus Settings Changed.
ок
0x00 00-00-00-00-00-00-00-00-00-00-00-00-0

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NOTE 1: STG Series WMBus Gateways can keep configuration of 2 different modes in its memory and once the configuration enabled, its already saved settings will be applied. Device can act as Server or Client at a time. This way different WMBus settings can be stored in 2 different operating modes.

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NOTE 2: Settings will be applied once the device is rebooted from web interface or repowered manually.

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#### NOTE 3:

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption. In that version, menu items are different:



- "<u>Device Mode</u>": Determines if the module operates in Meter (only sends WMBus packages) or Other Mode (receives and sends WMBus packages). Device Mode is always Other Mode when device Function is set to Wmbus – Modbus Gateway
- "<u>Link Mode</u>": Determines one of the following radio link modes: S1, S1-m,
   S2, T1, T2, R2, C1, C2.
- "<u>Radio Channel</u>": Selectable Radio Channel only for R2 Mode.
- "<u>AES Encryption</u>": User can Enable or Disable Encryption and determine its key
- "<u>AES Decryption</u>": User can Enable or Disable Decryption and determine its details

If Enabled STG supports automatic AES-128 encryption and decryption of radio link messages.

There is the chance to configure up to 16 decryption keys for 16 different devices. The keys can be stored in a RAM table together with the complete WM-Bus device address, Manufacturer ID, Device version and Device Type.

Following table shows the RF channel setup. These channels are available in R-Mode for transmissions from Meter to Other devices. The opposite direction is always done in 868.33 MHz (channel 5).

Channel	Frequency (MHz)
1	868,09 MHz
2	868,15 MHz
3	868,21 MHz
4	868,27 MHz
5	868,33 MHz
6	868,39 MHz
7	868,45 MHz
8	868,51MHz

- "Radio Power Level": Radio Output Power from -8dBm to +13dBm
- "<u>Power Saving Mode</u>": Enables the module to enter the low power mode

as soon as possible without data interaction.

This version of STG is a bidirectional radio device for the 868 MHz frequency band. STG is optimal suited for use in Smart Metering Applications, which are compliant to EN 13757 part 4.

This version of STG supports all link modes according to EN 13757-4: S (stationary), T (frequent transmit), R (frequent receive), C (compact operation). These four main modes are divided into further sub-modes for dedicated applications. All modes are available in web interface. Following table gives an overview over all WM-Bus modes and their physical parameters.

Mode	Direction	Data Rate	Coding	Frequency	Preamble + Synchronization
S1	Meter => Other	32,768 kcps	Manchester	868,3 MHz	582 chips
S1-m	Meter => Other	32,768 kcps	Manchester	868,3 MHz	56 chips
S2	Meter => Other	32,768 kcps	Manchester	868,3 MHz	56 chips
	Other => Meter	32,768 kcps	Manchester	868,3 MHz	56 chips
T1	Meter => Other	100 kcps	3 out of 6	868,95 MHz	56 chips
T2	Meter => Other	100 kcps	3 out of 6	868,95 MHz	56 chips
	Other => Meter	32,768 kcps	Manchester	868,3 MHz	56 chips
R2	Meter => Other	4,8 kcps	Manchester	868,03 MHz + n*60 kHz	104 chips
	Other => Meter	4,8 kcps	Manchester	868,33 MHz	104 chips
C1	Meter => Other	100 kcps	NRZ	868,95 MHz	64 chips
C2	Meter => Other	100 kcps	NRZ	868,95 MHz	64 chips
	Other => Meter	50 kcps	NRZ	868,525 MHz	64 chips

#### 10.9 MENU: WMBus Status

From this menu user may monitor WMBus status and package details as well as WMBus OMS parsed data if available.

The page also helps users to see decryption status of received frames and check STG protocol specific and WMBus protocol specific parameters.

		WMBue Statue	
		TIMUUS Julius	
		Sysiem Time	
		27-09-2023 11-44-37	
		Latest Message Received - Module protocol fields	
×	WMBus Status	Harrans Data Terra	Darket DPPI in 4Bre
	Security Settings	Message Uale - Hine 27-09-2023 11:44:36	-52
		Decryption Status	
		Encryption Mode	
		Packet Info	
		Application ID	Message ID
		0x9	0x20
		Latest Message Received - WMBUS Link Layer fields	
		C-Field	Manufacturer ID
		Device ID	Version ID
		Туре	CI-Field
		Latest Message Received - Payload	
		Message Revealed Time	
		27-09-2023 11:44 36	
		Davload	
		CMAS Parsing	
		Refresh WMBus Status	

"<u>System Time</u>": Shows the system of STG.

The page has several parts.

"Latest Message Received - Module protocol fields":

Latest Message Received - Module protocol fields	
Message Date-Time	Packet RSSI in dBm
27-09-2023 11:44:36	
Decryption Status	
Decyryption Successfull	
Encryption Mode	
Mode 7: AES-128 CBC, Dyn. Key	
Packet Info	
T-Mode	
Application ID	Message ID
0x9	

"<u>Message Date-Time</u>": Shows the system time when latest WMBus frame received.

"Packet RSSI in dBm": Received Signal Strenght Indicator (dBm) of last package received from WMBus side.

"Decryption Status": Decryption status of received WMBus frame. Available values are:

- "Not Encrypted"
- "Decyryption Successfull"
- "No Key Found for WM-Bus Address"
- "Decryption Mode Not Supported"
- "Decryption Error, Key Might Be Wrong"
- "UNKNOWN"

"Encryption Mode": Dedected encryption mode of received WMBus frame. Available values are:

- "None"
- "Mode 5: AES-128 CBC"
- "Mode 7: AES-128 CBC, Dyn. Key"
- "Mode 128: ELL AES-128 Counter Mode"
- "Mode 129: Custom Encryption Mode"
- "UNKNOWN: " (gives also number of encryption mode)

"Packet Info": Dedected packet type for received WMBus frame. Available values are:

- "S-Mode"
- "T-Mode"
- "C-Mode, 50.000 bps, Format A"
- "C-Mode, 100.000 bps, Format A"
- "C-Mode, 50.000 bps, Format B"
- "C-Mode, 100.000 bps, Format B"
- "UNKNOWN"

"<u>Application ID</u>": STG built in protocol specific parameter.

"<u>Message ID</u>": STG built in protocol specific parameter.

"Latest Message Received - WMBUS Link Layer fields":

Latest Message Received - WMBUS Link Layer fields	
C-Field	Manufacturer ID
U.444	0.2055
Device ID	Version ID
0x00144739	66
Туре	CI-Field
	0x8C

"<u>C-Field</u>": Control Field of WMBus Frame.

"Manufacturer ID": Manufacturer ID which is parsed from received WMBus Frame.

"Device ID": Device ID which is parsed from received WMBus Frame.

"Version ID": Device version which is parsed from received WMBus Frame.

"<u>CI-Field</u>": CI-Field of received WMBus Frame.

#### "Latest Message Received - Payload":



"Message Received Time": Shows the system time when this specific WMBus frame received.

"Payload" WMBus frame (if decryption is successfull it is also decrypted) after CI-Field part.

"Message Sent Time" Latestw WMBus package received time (based on STG system time)

"Poyload" Latest WMBus package payload in HEX format

"OMS Parsing" OMS parsed data (if available)

Parsed data shared as data blocks. This is valid for both Modbus Frames and web page visualization. Each data block has following values.

- Data Type specified by STG
- Data Value (can be a float or long value)
- Function, available values are:
- INSTANTANEOUS, MAXIMUM, MINIMUM or ERROR STATE
- Data Storage Number as an integer

details are explained in "Chapter 11: WMBus Data Parsing Format".

After clicking "Refresh WMBus Status" button, system will reload data only and will not reload page. Button will be disabled during reload for an instance. If timeout occurs during the reload, the button will be enabled again with warning of timeout. In normal operation reload of status data will be done immediately.

NOTE: This page has same options both for Server and Client operating modes.

#### 10.10 MENU: Security Settings

From this menu user may activate WMBUs RF communication package filter based on White list (accepted packages from Device ID field of WMBus packages) or Black list (rejected packages from Device ID field of WMBus packages).

Up to 40 entry can be defined for each filter list.

User can get ID of device from "Device Status" menu page.

• User can select to activate White List and STG device will accept WMBus packages only from the devices with

Device ID stated in the list.

• User can select to activate Black List and STG device will accept all WMBus packages except from the devices

with Device ID stated in the list.

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**NOTE:** STG Series WMBus Gateways have built in mechanism to get WMBus frames and Auto Configure which is described in "WMBus Settings" menu. Black List can be auto filled by Auto Configuration mechanism, thus user do not have to enter manually.

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption.

×	Operating Mode		
-		Security Settings	
	Network Settings		
్లి		White List Enabled	Black List Enabled
··•ô··•			
(er	WMBus Settings	Save Security Settings	
~¢°			
Ô	Security Settings		
· ·			
÷.			

"<u>While List Enabled</u>" Enable to set the White List "<u>Black List Enabled</u>" Enable to set the Black List Following settings are available for any of the list:

#### ۲

	Filter Device ID		Filter Device ID
	0x0000000	02.	0×0000000
	0x0000000	04.	0x0000000
	0x0000000	06.	0×0000000
	0×0000000	08.	0×0000000
	0×0000000	10.	0x0000000
	0x0000000	12.	0×0000000
13.	0x0000000	14.	0×0000000
	0x0000000	16.	0×0000000
	0x0000000	18.	0×00000000
	0x0000000	20.	0×00000000
n this	s page user can	enter	decimal values an

In this page user can enter decimal values and page will format it to hexadecimal automatically after cursor is moved out of scope.



Once the setting has been changed, "Save Configuration" button will be enabled.



After clicking button system will tell if the settings applied successfully or not.

Ox00	
0x00	Security Settings Changed.
Ox00	
0x00	ОК
0x00	

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**NOTE 1:** STG Series WMBus Gateways can keep configuration of 2 different modes in its memory and once the configuration enabled, its already saved settings will be applied. Device can act as Server or Client at a time. That means users can configure different configuration settings for different operating modes and switch between each other in an instant.

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NOTE 2: Settings will be applied once the device is rebooted from web interface or repowered manually.

## 10.11 MENU: Management

From this menu user may change parameters or send command to device.

• User can change system time. There is no battery inside the device so clock will be lost after a power down and will set to default.

The device restarts itself every 86400 seconds. (Which means every 24 hours.) There are also timeout restart routines in Server mode during listening clients and in Client Mode trying to connect to the server. (Both preset to 10 minutes which means device will restart system if fails to connect a server in Client mode or a client do not connect in preset time in Server mode.)

• User can change firmware of device. REDZ STG WMbus Gateways has easy to use firmware capability and system can store 2 firmware at memory. After a firmware change, user can restore back old firmware anytime needed.

After a firmware change old configuration will be used for minor changes. If a major change occurs system will restore to factory default configuration.

- User can change the login information.
- User can change the log level of the device. REDZ STG Series WMBus Gateways series has micro USB or USB Type-C and gives log in 115200 – 8N1 format.

Any terminal program can be used to listen the LOG over USB type-C or micro USB port of the device which is recognized as Virtual COM port in PC.

LOG to remote UDP server is also available. If set to UDP server, then TLM will send LOG data to remote UDP server device.

• User can restore to factory settings and force device to reboot. Factory settings restored for Client if the device in Client mode and factory settings are restored for Server if the device in Server mode.

	والمتعالية المتعالية المتعالية	Management	والمتحدث والمتحدث والمحاج والمتحدث والمحاج و
۲			
en?		Let Device Time	
***			
e-1			
¥		Set Device Time and Reboot	
Ø		Live Firmware Updale	
ዱ	Nanagement	Select Firmware File	Firmware file to upload
		Alternative Firmware Date	Alternative Firmware Version
		Peo 14 2024 10:10:31	
		Reboot Alternative Firmware	
		Download / Upload Configuration	
		Download Current Configuration	Upload Configuration File
		Change Password	
		Current Password	
		New Password	
		Confirm New Password	
		Change Pessword	
		Log Level	
		NONE V	
		Restore / Reboot	
		Restore Factory Configuration Reboot Device	

"<u>Set Device Time</u>" This part shows time at page load. Reload page to see updated time. Current local time shows the PC time. User can set the STG time based on shown PC time. The device sets the date and time and reboots.

#### In "Live Firmware Update" part:

Firmware upgrade is possible only with files that REDZ supplied. Once the file selected, TLM shows selected file:



Then "Upload Firmware" button must be clicked. STG will start to upload file and show status on pop up screen.

Upload	firmware file	
Uţ	oloading	
%45		

Click "Close" when finished. If somehow LKM fails to upload, refresh webpage and try again please.

After successful upload, TLM will show "Alternative Firmware Date" and "Alternative Firmware Version" data.

Alternative Firmware Date	Alternative Firmware Version
Mar 4 2024 14:32:44	
Reboot Alternative Firmware	

Click "Reboot Alternative Firmware" and STG will reboot with new firmware and show status on screen.

Dehaot Alternative Firmware Command has been
sent.
Rebooting
%100

This will take 5 seconds only. Please wait .

Check firmware details from upper part of main screen please if the update firmware procedure finalized properly



#### In "Download / Upload Configuration" part:

User download current configuration of the device to a file or restore a previously defined configuration to device from file.

<u>"Download Current Configuration"</u>: Downloads the configuration to a file. It uses "Device Name" for file name and the extensions will be "\*.zcfg". <u>"Download Configuration File"</u>: Uploads the configuration from "\*.zcfg" file.

#### In "Log" part:

User may activate Logging and see details of operation. There are different levels of Log with different amount of data.

<u>"None"</u>: Logging is closed <u>"Error"</u>: Only errors in systems will be logged <u>"Info"</u>: General info and errors will be logged <u>"Debug"</u>: All details regarding device operation will be logged If "Console" is selected as output of Log, then micro USB or USB Type-C port of device will be used for logging. Proper cable must be connected and a teminal should be used to receive Log data. As an example "RealTerm" tool can be used.

Simply select COM port and set baud rate 115200 and data type 8N1 and then click open. Device will send log data.

$\begin{array}{c} 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 1 - 01 - 197\\ 4 - 12 - 202\\ 4 - 12 - $	9 90:00: 9 00:00: 9 00:0	0011NF1WHBus 1M883 0011NF1Product ID: 0011NF1Product ID: 0011NF1Product ID: 0011NF1Module Type 0011NF1MHBus Modul 0011NF1MHBus Modul 0011NF1Prnw. Build 0011NF1Prnw. Build 0011NF1Prnw. Build 0011NF1Prnw. Build 0011NF1Prnw. Build 0011NF1Prnw. Build 0011NF1Prnw. Build 0011DBG1Module:Get 0411NF1Go to SERV1 2411DBG1White List	A: Get device info( A: Get device info( A: S5B82(A) 23298 - 0x55B82(A) 23298 - 0x5	OK (RF		
aud 115200 Parity Parity None C Odd C Even C Mark C Space		Pins Send Echo Port C Stop Bits C 1 bit C 2 bits Hardware Flow Control C DTR/DSR C RS485-0	C 2C-2 12CMisc Misc Open Spy Chai Software Flow Control Receive Xon Char: Transmit Xoff Char: S Winsoc C Ray (* Tel	\n	<u>Clear</u>	Freeze         ?           Status         Disconnec           RXD (2)         TXD (3)           TXD (3)         CTS (8)           DCD (1)         DSR (6)           Ring (9)         BREAK           Error         Error
			Char Court 2140	CDC-0	Dart 161	115200 ONI1 N

If "UDP Server" is selected as output of Log, then proper tool must be used to get log data. User must set "UDP Server IP" and "UDP Server Port". Device will send Log to that address. As an example "Package Sender" tool can be used.

Click "File" and then "Settings". Enable "UDP Server" and set the port. Device will send Log data to UDP server.

Tools Mu Name I ASCII A HEX HE Address	ulticast Panels Packet Name ASCII represent EX representat IPv4, IPv6, D	tation ion NS Look							Load File
Name ASCII A HEX HE Address		tation ion NS Look) <b>Port</b> (1 to 65							Load File
Name ASCII A HEX HE Address		tation ion NS Look <b>Port</b> 1 to 65							Load File
ASCII A HEX HE Address		tation ion NS Look <b>Port</b> 1 to 65							Load File
HEX HE Address		ion NS Look <b>Port</b> 1 to 65							
Address earch Saved		NS Look Port 1 to 65							
				Resend Delay 0.0/b		🖨 TCP		Send	Save
							Delete	Saved Packet	Persistent TC
Sen	nd	Name	lesent	To Address	lo Por	Method			
	Send DNS	dannagle.com				UDP	\f7\e3\01\00\00\0	01\00\00\00\00\00	\00\08danna
	Send DNS	example.com		8.8.8.8		UDP	\91\8b\01\00\00\	01\00\00\00\00\0	0\00\07exam
	Send FTP	debian.org		cdimage.debian.org		TCP	\r\nUSER anonym	ious\r\nPASS anor	ymous\/\/nqu
	Send Goo	gle DNS over HTTPS / DoH		dns.google	443	HTTPS Get	/resolve?name=p	acketsender.com	
	Send HTT	P GET		neverssl.com	80	HTTP Get			
-	Send HTT	P POST Params		httphin.org		HTTP Post			
Clear Log (0	0)				🔳 Log	Traffic Sa	we Log Save	Traffic Packet Co	py to Clipboar
		n IP From Port	To Add	fress To Port	м	ethod			

Here is a video example to enable UDP log and receive data via UDP Server software. Video is created with CKL series but applies to all series.

NOTE: This page has same settings both for Server and Client operating modes.

# 11. WMBus Data Parsing Format

STG decrypts WMBus frames and convert data to Modbus registers Modbus is stored in three parts: Status Block, several Data Blocks depends on number measurements stored in WMBus device and finally the Service Block.

#### Status Block, 6 Registers:

- WMbus Device ID: 2 Registers
- WMbus Man ID: 1 Register
- WMbus Version: 1 Register
- WMbus Type: 1 Register
- Total Data Count: 1 Register (Represents how many data blocks exists)

#### Data Block, each 5 Bytes total n bytes:

- Storage Number: 1 Register
- Function Field: 1 Register
- Data Type: 1 Register
- Data Value: 2 Registers

#### Service Block, 2 Registers:

- Access Number: 1 Register
- RSSI Value: 1 Register

## 11.1 Parsed Data Details

Parsed data is shared by STG as data blocks. This is valid for both Modbus Frames and web page visualization. Each data block has following values:

- Data Type specified by STG
- Data Value itself (can be a float or long value)
- Function Field, available values are:
- INSTANTANEOUS, MAXIMUM, MINIMUM or ERROR STATE
- Data Storage Number as an integer

Here is complete list for Data types available in STG

Item	Data Type Name	Data Type Value	Data Lenght in bytes stored in MODBUS register	Data Type Format	Data Type description	Range
0	SPECIAL_FUNC	0	4			
1	ENERGY_WH	1	4	FLOAT32	Energy	0.001Wh to 10000Wh
2	ENERGY_J	2	4	FLOAT32	Energy	0.001kJ to 10000kJ
3	VOLUME_M3	3	4	FLOAT32	Volume	0.0011 to 100001
4	MASS_KG	4	4	FLOAT32	Mass	0.001kg to 10000kg
5	POWER_W	5	4	FLOAT32	Power	0.001W to 10000W
6	POWER_J_H	6	4	FLOAT32	Power	0.001kJ/h to 10000kJ/h
7	VOLUMEFLOW_M3_H	7	4	FLOAT32	Volume Flow	0.001l/h to 10000l/h

9         VOLUMEFLOW_M3_S         9         4         FLOATS2         Volume Flow ext.         DOCUM/s DOCOM/s           10         MASSFLOW_KG, H         10         4         FLOATS2         Mass flow         0.000kg/h           11         FLOWTEMPERATURE_C         11         4         FLOATS2         Mass flow         0.000kg/h           12         RFURMEMERATURE_C         12         4         FLOATS2         Temperature Difference         1000000000           13         TEMPERATUREDHT_K         13         4         FLOATS2         Temperature Difference         100000000           14         FLOATS2         FLOATS2         Chitme         600000000         0.00000000000000000000000000000000000	8	VOLUMEFLOW_M3_M	8	4	FLOAT32	Volume Flow ext.	0.0001l/min to 1000l/min
10         MASSELOW, KG, H         10         4         FLOAT32         Moss flow         O.000kg/h to 0000kg/h to 000kg/h to 0000kg/h to 000kg/h to 000kg/h to 000kg/h to 000kg/h to 000kg/h to	9	VOLUMEFLOW_M3_S	9	4	FLOAT32	Volume Flow ext.	0.001ml/s to 10000ml/s
II         II         III         4         FLOATS         Float Temperature         0.007° to 1°C           12         RETURNETMERTATURE_C         12         4         FLOATS2         Temperature Difference         0.007° to 1°C           13         TEMPERATURE_DIFF         13         4         FLOATS2         Temperature Difference         0.007° to 1°C           14         ENTERNATURE_C         14         4         FLOATS2         Temperature Difference         0.007° to 1°C           15         PRESSURE_Bar         15         4         FLOATS2         Pressure         0.007° to 1°C           16         ON TIME_M         17         4         LONAS2         ON time         ace           16         ON TIME_M         18         4         LONAS2         ON time         hour           16         ON TIME_M         18         4         LONAS2         ON time         hour           17         ONE,TIME_M         21         4         LONAS2         Operating time         inm           10         OPER_TIME_M         22         4         LONAS2         Average duration time         icos           20         OPER_TIME_M         22         4         LONAS2         Averag	10	MASSFLOW_KG_H	10	4	FLOAT32	Mass flow	0.001kg/h to 10000kg/h
12         RETURNTEMPERATURE.C         12         4         FLOAT32         Return Temperature         DoOTC to PC           14         EXTERNALTEMP.C         14         4         FLOAT32         External Temperature         Imbar to DOORC to PC           15         PRESSURE_Bar         15         4         FLOAT32         Pressure         Imbar to DOORC to PC           16         ON_TIME_M         17         4         FLOAT32         Pressure         Imbar to DOORC to PC           16         ON_TIME_M         17         4         FLOAT32         Pressure         Imbar to DOORC to PC           17         ON_TIME_M         17         4         FLOAT32         OR         Imbar to DOORC to PC           18         ON_TIME_D         17         4         FLOAT32         ORE time         hour         Imbar to DOORC to PC           19         ON_TIME_M         17         4         FLOAT32         ORE time         hour         Imbar to DOORC to PC           19         ON_TIME_M         21         4         FLOAT32         ORE time         hour         Imbar to DOORC to PC           20         OPER_TIME H         22         4         FLOAT32         Average ducation time         hour         hour	11	FLOWTEMPERATURE_C	11	4	FLOAT32	Flow Temperature	0.001°C to 1°C
13         TEMPERATURED/FF.K         13         4         FLOAT32         Temperature Difference         Intik to 1000mk           14         EXTERNALTEMP C         14         FLOAT32         Pressure         0007to 10           15         PRESSURE_Bar         15         4         FLOAT32         Pressure         1000mbar           16         ON_TIME_S         16         4         FLOAT32         Pressure         1000mbar           16         ON_TIME_S         16         4         FLOAT32         Pressure         1000mbar           16         ON_TIME_B         17         4         10N032         ON time         sec         1000           17         OPER_TIME_M         19         4         10N032         Operating time         min         doys           10         OPER_TIME_M         22         4         10N032         Operating time         mour         doys           12         OPER_TIME_M         22         4         10N032         Operating time         min         min         doys           12         OPER_TIME_S         28         4         10N032         Average duration time         hour           13         ACT_DUR_M         29 <t< td=""><td>12</td><td>RETURNTEMPERATURE_C</td><td>12</td><td>4</td><td>FLOAT32</td><td>Return Temperature</td><td>0.001°C to 1°C</td></t<>	12	RETURNTEMPERATURE_C	12	4	FLOAT32	Return Temperature	0.001°C to 1°C
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15         PRESSURE_Bar         15         4         FLOAT32         Pressure         Imbor to Imbor           16         ON_TIME_S         16         4         LONG32         ON time         sec.           17         ON_TIME_M         17         4         LONG32         ON time         hour           18         ON_TIME_D         19         4         LONG32         ON time         hour           19         ON_TIME_D         19         4         LONG32         ON time         hour           20         OPER_TIME_H         22         4         LONG32         Operating time         hour           23         OPER_TIME_H         22         4         LON32         Operating time         hour           24         AVR_DUR_N         25         4         LON32         Average duration time         hour           25         AVR_DUR_D         27         4         LON32         Average duration time         hour           26         AVR_DUR_D         27         4         LON32         Average duration time         hour           27         AVR_DUR_H         26         4         LON32         Average duration time         hour           33<	14	EXTERNALTEMP C	14	4	FLOAT32	External Temperature	0.001°C to 1°C
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18         ON, TIME_D         18         4         LONG32         ON time         Hour           19         ON, TIME_D         19         4         LONG32         ON time         Hour           20         OPER, TIME_S         20         4         LONG32         Operating time         min           21         OPER, TIME_H         21         4         LONG32         Operating time         hour           23         OPER, TIME_D         23         4         LONG32         Operating time         hour           23         OPER, TIME_D         23         4         LONG32         Average duration time         days           24         AVR_DUR_S         24         LONG32         Average duration time         days           25         AVR_DUR_D         27         4         LONG32         Average duration time         days           26         AVR_DUR_D         27         4         LONG32         Average duration time         mout           30         ACT_DUR_H         30         4         LONG32         Actuality Duration time         days           31         ACT_DUR_D         31         4         LONG32         Actuality Duration time         day <t< td=""><td>17</td><td></td><td>17</td><td>4</td><td></td><td></td><td>min</td></t<>	17		17	4			min
B         ON, TIME, D         ID         ID <thid< th=""> <thid< th="">         ID         &lt;</thid<></thid<>	10		10				bour
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20         OPER_TIME_M         21         4         LON322         Operating time         ssc           21         OPER_TIME_H         22         4         LON322         Operating time         hour           22         OPER_TIME_D         23         4         LON322         Operating time         days           24         AVR_DUR_S         24         4         LON322         Average duration time         sec           25         AVR_DUR_H         26         4         LON322         Average duration time         four           26         AVR_DUR_H         26         4         LON322         Average duration time         four           27         AVR_DUR_H         26         4         LON322         Actailty Duration time         four           28         ACT_DUR_M         29         4         LON322         Actailty Duration time         four           31         ACT_DUR_H         30         4         LON322         Actailty Duration time         four           32         DURATION_LAST_CUMULATION_H         32         4         LON322         Duration since last cumulation         four           33         DURATION_LAST_CUMULATION_H         34         LON322         But	19		19	4	LONG32		days
21         OPER_TIME_M         21         4         LONG32         Operating time         min           23         OPER_TIME_D         23         4         LONG32         Operating time         doys           24         AVR_DUR_S         24         4         LONG32         Operating time         doys           25         AVR_DUR_M         25         4         LONG32         Average duration time         min           26         AVR_DUR_H         26         4         LONG32         Average duration time         min           27         AVR_DUR_D         27         4         LONG32         Average duration time         doys           28         ACT_DUR_S         28         4         LONG32         Actualty Duration time         hour           30         ACT_DUR_H         30         4         LONG32         Actualty Duration time         hour           31         ACT_DUR_LAST_CUMULATION_H         32         4         LONG32         Actualty Duration time         hour           33         DURATION_LAST_CUMULATION_H         34         4         LONG32         Buttery operation time         hour           34         DURATION_LAST_CUMULATION_H         35         4         LON	20	OPER_TIME_S	20	4	LONG32	Operating time	sec
22         OPER_TIME_D         23         4         LONG32         Operating time         hour           24         AVR_DUR_S         24         4         LONG32         Operating time         days           24         AVR_DUR_S         24         4         LONG32         Average duration time         sec           25         AVR_DUR_H         25         4         LONG32         Average duration time         hour           26         AVR_DUR_D         27         4         LONG32         Average duration time         days           27         AVR_DUR_S         28         4         LONG32         Average duration time         days           28         ACT_DUR_H         29         4         LONG32         Actuality Duration time         hour           30         ACT_DUR_D         31         4         LONG32         Actuality Duration time         days           31         ACT_DUR_LAST_CUMULATION_H         32         4         LONG32         Duration since last cumulation         month           33         DURATION_LAST_CUMULATION_M         34         4         LONG32         Battery operation time         hour           34         DURATION_LAST_CUMULATION_M         35         4 <td>21</td> <td>OPER_TIME_M</td> <td>21</td> <td>4</td> <td>LONG32</td> <td>Operating time</td> <td>min</td>	21	OPER_TIME_M	21	4	LONG32	Operating time	min
23         OPER_TIME_D         23         4         LDNG32         Operating time         days           24         AVR_DUR_S         24         4         LONG32         Average duration time         ssc           25         AVR_DUR_M         25         4         LONG32         Average duration time         min           26         AVR_DUR_H         26         4         LONG32         Average duration time         days           27         AVR_DUR_N         29         4         LONG32         Actuality Duration time         days           28         ACT_DUR_M         29         4         LONG32         Actuality Duration time         bour           30         ACT_DUR_H         30         4         LONG32         Actuality Duration time         hour           31         ACT_DUR_LAST_CUMULATION_H         32         4         LONG32         Duration since last cumulation         month           33         DURATION_LAST_CUMULATION_Y         35         4         LONG32         Battery operation time         hour           34         DURATION_LAST_CUMULATION_Y         35         4         LONG32         Battery operation time         hour           35         DURATION_LAST_CUMULATION_Y <t< td=""><td>22</td><td>OPER_TIME_H</td><td>22</td><td>4</td><td>LONG32</td><td>Operating time</td><td>hour</td></t<>	22	OPER_TIME_H	22	4	LONG32	Operating time	hour
24         AVR_DUR_S         24         4         LONG32         Average duration time min         sec           25         AVR_DUR_M         25         4         LONG32         Average duration time hour         hour           26         AVR_DUR_D         27         4         LONG32         Average duration time doys           27         AVR_DUR_D         27         4         LONG32         Average duration time doys           28         ACT_DUR_S         28         4         LONG32         Actuality Duration time hour         doys           30         ACT_DUR_H         30         4         LONG32         Actuality Duration time hour         hour           31         ACT_DUR_D         31         4         LONG32         Actuality Duration time hour         hour           32         DURATION_LAST_CUMULATION_M         32         4         LONG32         Duration since last cumulation         month           33         DURATION_LAST_CUMULATION_M         34         4         LONG32         Battery operation time doy         year           34         BATTERY_OP_TIME_H         36         4         LONG32         Battery operation time doy         doy           35         DURATION_LAST_CUMULATION_Y         37<	23	OPER_TIME_D	23	4	LONG32	Operating time	days
25         AVR_DUR_M         25         4         LDNG32         Average duration time in hour         min           26         AVR_DUR_D         26         4         LONG32         Average duration time is constraints         hour           27         AVR_DUR_D         27         4         LONG32         Average duration time is constraints         hour           28         ACT_DUR_S         28         4         LONG32         Actuality Duration time is constraints         hour           30         ACT_DUR_H         30         4         LONG32         Actuality Duration time is constraints         hour           31         ACT_DUR_LAST_CUMULATION_H         32         4         LONG32         Duration since lost comulation         month           33         DURATION_LAST_CUMULATION_D         33         4         LONG32         Duration since lost comulation         Wear           34         DURATION_LAST_CUMULATION_D         35         4         LONG32         Battery operation time is hour         hour           35         DURATION_LAST_CUMULATION_D         35         4         LONG32         Battery operation time is hour         hour           36         BATTERY_OP_TIME_H         36         4         LONG32         Battery operation ti	24	AVR_DUR_S	24	4	LONG32	Average duration time	sec
26     AVR_DUR_H     26     4     LONG32     Average duration time     hour       27     AVR_DUR_D     27     4     LONG32     Average duration time     doys       28     ACT_DUR_S     28     4     LONG32     Actuality Duration time     min       29     ACT_DUR_H     29     4     LONG32     Actuality Duration time     hour       31     ACT_DUR_H     30     4     LONG32     Actuality Duration time     hour       31     ACT_DUR_H     30     4     LONG32     Actuality Duration time     hour       32     DURATION_LAST_CUMULATION_H     32     4     LONG32     Duration since last cumulation     hour       33     DURATION_LAST_CUMULATION_D     33     4     LONG32     Duration since last cumulation     month       34     DURATION_LAST_CUMULATION_Y     35     4     LONG32     Battery operation time     hour       36     BATTERY_OP_TIME_H     36     4     LONG32     Battery operation time     hour       37     BATTERY_OP_TIME_H     36     4     LONG32     Battery operation time     hour       38     BATTERY_OP_TIME_H     36     4     LONG32     Battery operation time     hour       39     BATTERY_OP_T	25	AVR_DUR_M	25	4	LONG32	Average duration time	min
27       AVR_DUR_D       27       4       LONG32       Average duration time       days         28       ACT_DUR_S       28       4       LONG32       Actuality Duration time       sec         30       ACT_DUR_H       30       4       LONG32       Actuality Duration time       hour         31       ACT_DUR_H       30       4       LONG32       Actuality Duration time       days         32       DURATION_LAST_CUMULATION_H       32       4       LONG32       Duration since last cumulation       hour         33       DURATION_LAST_CUMULATION_H       32       4       LONG32       Duration since last cumulation       month         34       DURATION_LAST_CUMULATION_H       34       4       LONG32       Duration since last cumulation       month         35       DURATION_LAST_CUMULATION_Y       35       4       LONG32       Battery operation time       hour         36       BATTERY_OP_TIME_H       36       4       LONG32       Battery operation time       hour         38       BATTERY_OP_TIME_M       38       4       LONG32       Battery operation time       hour         40       REMAINING BATTERY_H       40       4       LONG32       Remaining battery time </td <td>26</td> <td>AVR DUR H</td> <td>26</td> <td>4</td> <td>LONG32</td> <td>Average duration time</td> <td>hour</td>	26	AVR DUR H	26	4	LONG32	Average duration time	hour
28     ACT_DUR_S     28     4     LONG32     Actuality Duration time     sec       29     ACT_DUR_M     29     4     LONG32     Actuality Duration time     hour       31     ACT_DUR_H     30     4     LONG32     Actuality Duration time     hour       31     ACT_DUR_D     31     4     LONG32     Actuality Duration time     hour       32     DURATION_LAST_CUMULATION_H     32     4     LONG32     Duration since last cumulation     hour       33     DURATION_LAST_CUMULATION_D     33     4     LONG32     Duration since last cumulation     month       34     DURATION_LAST_CUMULATION_N     34     4     LONG32     Duration since last cumulation     month       35     DURATION_LAST_CUMULATION_Y     35     4     LONG32     Battery operation time     hour       36     BATTERY_OP_TIME_H     36     4     LONG32     Battery operation time     month       38     BATTERY_OP_TIME_M     38     4     LONG32     Battery operation time     hour       41     REMAINING BATTERY_H     40     4     LONG32     Retrey operation time     hour       42     REMAINING BATTERY_H     40     4     LONG32     Retrey operation time     hour <t< td=""><td>27</td><td>AVR DUR D</td><td>27</td><td>4</td><td>LONG32</td><td>Average duration time</td><td>davs</td></t<>	27	AVR DUR D	27	4	LONG32	Average duration time	davs
20       ACT_DUR_M       29       4       LONG32       Actuality Duration time       min         30       ACT_DUR_H       30       4       LONG32       Actuality Duration time       min         31       ACT_DUR_D       31       4       LONG32       Actuality Duration time       days         32       DURATION_LAST_CUMULATION_H       32       4       LONG32       Actuality Duration time       days         33       DURATION_LAST_CUMULATION_H       32       4       LONG32       Duration since last cumulation       doy         34       DURATION_LAST_CUMULATION_M       34       4       LONG32       Duration since last cumulation       month         35       DURATION_LAST_CUMULATION_Y       35       4       LONG32       Battery operation time       hour         36       BATTERY_OP_TIME_H       36       4       LONG32       Battery operation time       hour         38       BATTERY_OP_TIME_Y       39       4       LONG32       Battery operation time       hour         40       REMAINING_BATTERY_D       41       4       LONG32       Remaining battery time       month         43       REMAINING_BATTERY_D       41       4       LONG32       Remaining battery time	28		28	4			500
29       ACL_DUR_H       29       4       LONG32       Actuality Duration time       hour         31       ACT_DUR_H       30       4       LONG32       Actuality Duration time       hour         32       DURATION_LAST_CUMULATION_H       32       4       LONG32       Actuality Duration since last cumulation       hour         33       DURATION_LAST_CUMULATION_D       33       4       LONG32       Duration since last cumulation       hour         34       DURATION_LAST_CUMULATION_M       34       4       LONG32       Duration since last cumulation       month         35       DURATION_LAST_CUMULATION_Y       35       4       LONG32       Battery operation time       hour         36       BATTERY_OP_TIME_H       36       4       LONG32       Battery operation time       hour         37       BATTERY_OP_TIME_H       36       4       LONG32       Battery operation time       hour         38       BATTERY_OP_TIME_H       36       4       LONG32       Battery operation time       hour         39       BATTERY_OP_TIME_Y       39       4       LONG32       Battery operation time       hour         40       REMAINING_BATTERY_H       40       LONG32       Remaining batte	20		20	4		Actuality Duration time	min
30       ACL DUR, H       30       4       LONG32       Actuality Duration time       hour         31       ACT_DUR_D       31       4       LONG32       Actuality Duration time       hour         32       DURATION_LAST_CUMULATION_H       32       4       LONG32       Duration since last cumulation       hour         33       DURATION_LAST_CUMULATION_D       33       4       LONG32       Duration since last cumulation       day         34       DURATION_LAST_CUMULATION_M       34       4       LONG32       Duration since last cumulation       month         35       DURATION_LAST_CUMULATION_Y       35       4       LONG32       Battery operation time       hour         36       BATTERY_OP_TIME_D       37       4       LONG32       Battery operation time       hour         38       BATTERY_OP_TIME_M       38       4       LONG32       Battery operation time       day         40       REMAINING_BATTERY_H       40       4       LONG32       Remaining battery time       hour         43       REMAINING_BATTERY_D       41       4       LONG32       Remaining battery time       day         44       REMAINING_BATTERY_H       40       4       LONG32       Remain	29		29	4	LONG32	Actuality Duration time	
31       ACLUDICAL       31       4       LORS2       Actuality Duration time       days         32       DURATION_LAST_CUMULATION_H       32       4       LONG32       Duration since last cumulation       hour         33       DURATION_LAST_CUMULATION_D       33       4       LONG32       Duration since last cumulation       day         34       DURATION_LAST_CUMULATION_M       34       4       LONG32       Duration since last cumulation       month         35       DURATION_LAST_CUMULATION_Y       35       4       LONG32       Battery operation time       hour         36       BATTERY_OP_TIME_H       36       4       LONG32       Battery operation time       hour         38       BATTERY_OP_TIME_M       38       4       LONG32       Battery operation time       hour         39       BATTERY_OP_TIME_M       38       4       LONG32       Battery operation time       hour         39       BATTERY_OP_TIME_Y       39       4       LONG32       Battery operation time       hour         41       REMAINING_BATTERY_H       40       LONG32       Remaining battery time       day         42       REMAINING_BATTERY_H       42       LONG32       Remaining battery time <t< td=""><td>30</td><td>ACT_DUR_H</td><td>30</td><td>4</td><td>LONG32</td><td>Actuality Duration time</td><td>nour</td></t<>	30	ACT_DUR_H	30	4	LONG32	Actuality Duration time	nour
32     DURATION_LAST_CUMULATION_H     32     4     LONG32     Duration since last cumulation     hour       33     DURATION_LAST_CUMULATION_D     33     4     LONG32     Duration since last cumulation     day       34     DURATION_LAST_CUMULATION_M     34     4     LONG32     Duration since last cumulation     month       35     DURATION_LAST_CUMULATION_Y     35     4     LONG32     Duration since last cumulation     year       36     BATTERY_OP_TIME_H     36     4     LONG32     Battery operation time     hour       37     BATTERY_OP_TIME_H     36     4     LONG32     Battery operation time     hour       38     BATTERY_OP_TIME_Y     39     4     LONG32     Battery operation time     hour       40     REMAINING_BATTERY_H     40     4     LONG32     Remaining battery time     hour       41     REMAINING_BATTERY_H     40     4     LONG32     Remaining battery time     hour       43     REMAINING_BATTERY_H     40     4     LONG32     Remaining battery time     hour       43     REMAINING_BATTERY_H     40     4     LONG32     Remaining battery time     hour       44     MODEL_VERSION     44     LONG32     Remaining battery time     h	51	ACI_DUR_D	31	4	LONG32	Actuality Duration time	days
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34DURATION_LAST_CUMULATION_M344LONG32Duration since last cumulationmonth35DURATION_LAST_CUMULATION_Y354LONG32Duration since last cumulationyear36BATTERY_OP_TIME_H364LONG32Battery operation timehour37BATTERY_OP_TIME_H384LONG32Battery operation timehour38BATTERY_OP_TIME_M384LONG32Battery operation timemonth39BATTERY_OP_TIME_Y394LONG32Battery operation timeyear40REMAINING_BATTERY_H404LONG32Remaining battery timehour41REMAINING_BATTERY_M424LONG32Remaining battery timedoy42REMAINING_BATTERY_Y434LONG32Remaining battery timeyear44MODEL_VERSION444LONG322bytes date (in 4 bytes register), Data Type GYY:MM:DD45HUMIDITY_Percent454LONG322bytes time and date, Data Type FYY:MM:DD48BATTERY_CHANGE_DATE_TIME484LONG32LoNG321Hytestime49FABRICATION_NO494LONG32LONG32LoNG32LoNG32150SPECIAL_SUPPLIER_INFO504LONG32LONG32LoNG32LoNG32151REVERSELOW_VOLUME514FLOAT32LoNG32LoNG32LoNG32LoNG3	33	DURATION_LAST_CUMULATION_D	33	4	LONG32	Duration since last cumulation	day
35DURATION_LAST_CUMULATION_Y354LONG32Duration since last cumulationyear36BATTERY_OP_TIME_H364LONG32Battery operation timehour37BATTERY_OP_TIME_D374LONG32Battery operation timehour38BATTERY_OP_TIME_M384LONG32Battery operation timemonth39BATTERY_OP_TIME_Y394LONG32Battery operation timeyear40REMAINING_BATTERY_H404LONG32Remaining battery timehour41REMAINING_BATTERY_D414LONG32Remaining battery timehour42REMAINING_BATTERY_M424LONG32Remaining battery timeyear44MODEL_VERSION444LONG32Remaining battery timeyear45HUMIDITY_Percent454LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD47TIME_POINT_DATE_TIME474LONG322 bytes time and date, Data Type FYY:MM:DD48BATTERY_CHANGE_DATE_TIME484LONG3250SPECIAL_SUPPLIER_INFO504LONG3251REVERSEFLOW_VOLUME514FLOAT3252ERROR_FLAGS524LONG3253HUMIDITY_Relative534FLOAT3254VOLUME_UNCORRECTED56 <t< td=""><td>34</td><td>DURATION_LAST_CUMULATION_M</td><td>34</td><td>4</td><td>LONG32</td><td>Duration since last cumulation</td><td>month</td></t<>	34	DURATION_LAST_CUMULATION_M	34	4	LONG32	Duration since last cumulation	month
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42ALPHAINING_DATTERT_Y4244LONG32Remaining bottery timeInditi43REMAINING_BATTERY_Y434LONG32Remaining bottery timeyear44MODEL_VERSION444LONG32Remaining bottery timeyear45HUMIDITY_Percent454LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD46TIME_POINT_DATE464LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD47TIME_POINT_DATE_TIME474LONG324 bytes time and date, Data Type FYY:MM:DD48BATTERY_CHANGE_DATE_TIME484LONG324 bytes time and date, 	/.2	DEMAINING BATTERY M	42				month
44MODEL_VERSION4444LONG32Reindning bottery timeyear44MODEL_VERSION444LONG32	42	DEMAINING BATTERY V	42	4		Remaining battery time	Noar
44MODEL_VERSION444LONG32Addition45HUMIDITY_Percent454LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD46TIME_POINT_DATE464LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD47TIME_POINT_DATE_TIME474LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS48BATTERY_CHANGE_DATE_TIME484LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS49FABRICATION_NO494LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS50SPECIAL_SUPPLIER_INFO504LONG3251REVERSEFLOW_VOLUME514FLOAT3252ERROR_FLAGS524LONG3253HUMIDITY_Relative534FLOAT3254DIMENSIONLESS544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564LONG3258NOT_IMPLEMENTED564LONG3259UNIT_FOR_HCA574LONG3260RESERVED584LONG32	43		43	4	LONGJZ	Remaining buttery time	yeui
45HOMIDITY_Percent454LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD46TIME_POINT_DATE464LONG322 bytes time and date, Data Type GYY:MM:DD47TIME_POINT_DATE_TIME474LONG324 bytes time and date, Data Type FYY:MM:DD48BATTERY_CHANGE_DATE_TIME484LONG324 bytes time and date, Data Type FYY:MM:DD49FABRICATION_NO494LONG324 bytes time and date, Data Type FYY:MM:DD50SPECIAL_SUPPLIER_INFO504LONG3251REVERSEFLOW_VOLUME514FLOAT3252ERROR_FLAGS524LONG3253HUMIDITY_Relative534FLOAT3254DIMENSIONLESS544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564LONG32Energy-57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG3259UNIT_FOR_HCA574LONG3260RESERVED584LONG32	44		44	4	LONG32		
46TIME_POINT_DATE464LONG322 bytes date (in 4 bytes register), Data Type GYY:MM:DD47TIME_POINT_DATE_TIME474LONG324 bytes time and date, Date Type FYY:MM:DD48BATTERY_CHANGE_DATE_TIME484LONG324 bytes time and date, Date Type FYY:MM:DD49FABRICATION_NO494LONG324 bytes time and date, Date Type FYY:MM:DD50SPECIAL_SUPPLIER_INFO504LONG3251REVERSEFLOW_VOLUME514FLOAT3252ERROR_FLAGS524LONG3253HUMIDITY_Relative534FLOAT3254DIMENSIONLESS544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564LONG3257ENERGY_RESRVD_GJ514FLOAT32Energy-58NOT_IMPLEMENTED564LONG3259UNIT_FOR_HCA574LONG3260RESERVED584LONG32	45	HUMIDH Y_Percent	45	4	LONG32		
47TIME_POINT_DATE_TIME474LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS48BATTERY_CHANGE_DATE_TIME484LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS49FABRICATION_NO494LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS50SPECIAL_SUPPLIER_INFO504LONG3251REVERSEFLOW_VOLUME514FLOAT3252ERROR_FLAGS524LONG3253HUMIDITY_Relative534FLOAT3254DIMENSIONLESS544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564FLOAT32Kolume0.0011/h to 100001/h57ENERGY_RESRVD_GJ514FLOAT32Energy-58NOT_IMPLEMENTED564LONG3259UNIT_FOR_HCA574LONG3260RESERVED584LONG32	46	TIME_POINT_DATE	46	4	LONG32	2 bytes date (in 4 bytes register), Data Type G	YY:MM:DD
48BATTERY_CHANGE_DATE_TIME484LONG324 bytes time and date, Data Type FYY:MM:DD HH:MM:SS49FABRICATION_NO494LONG32	47	TIME_POINT_DATE_TIME	47	4	LONG32	4 bytes time and date, Data Type F	YY:MM:DD HH:MM:SS
49       FABRICATION_NO       49       4       LONG32         50       SPECIAL_SUPPLIER_INFO       50       4       LONG32         51       REVERSEFLOW_VOLUME       51       4       FLOAT32         52       ERROR_FLAGS       52       4       LONG32         53       HUMIDITY_Relative       53       4       FLOAT32         54       DIMENSIONLESS       54       4       LONG32         55       VERSION       55       4       LONG32         56       VOLUME_UNCORRECTED       56       4       FLOAT32       Volume         57       ENERGY_RESRVD_GJ       51       4       FLOAT32       Energy         58       NOT_IMPLEMENTED       56       4       LONG32       Intervention         59       UNIT_FOR_HCA       57       4       LONG32       Intervention         60       RESERVED       58       4       LONG32       Intervention	48	BATTERY_CHANGE_DATE_TIME	48	4	LONG32	4 bytes time and date, Data Type F	YY:MM:DD HH:MM:SS
50SPECIAL_SUPPLIER_INFO504LONG32Image: constraint of the system51REVERSEFLOW_VOLUME514FLOAT32Image: constraint of the systemImage: constraint of the system52ERROR_FLAGS524LONG32Image: constraint of the systemImage: constraint of the systemImage: constraint of the system53HUMIDITY_Relative534FLOAT32Image: constraint of the systemImage: constraint of the system54DIMENSIONLESS544LONG32Image: constraint of the systemImage: constraint of the system54VOLUME_UNCORRECTED564FLOAT32VolumeImage: constraint of the system57ENERGY_RESRVD_GJ514FLOAT32EnergyImage: constraint of the system58NOT_IMPLEMENTED564LONG32Image: constraint of the systemImage: constraint of the system59UNIT_FOR_HCA574LONG32Image: constraint of the systemImage: constraint of the system60RESERVED584LONG32Image: constraint of the systemImage: constraint of the system	49	FABRICATION_NO	49	4	LONG32		
51REVERSEFLOW_VOLUME514FLOAT3252ERROR_FLAGS524LONG32-53HUMIDITY_Relative534FLOAT32-54DIMENSIONLESS544LONG32-55VERSION554LONG32-56VOLUME_UNCORRECTED564FLOAT32Volume57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG32-59UNIT_FOR_HCA574LONG32-60RESERVED584LONG32-	50	SPECIAL SUPPLIER INFO	50	4	LONG32		
52ERROR_FLAGS524LONG3253HUMIDITY_Relative534FLOAT3254DIMENSIONLESS544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564FLOAT32Volume57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG3259UNIT_FOR_HCA574LONG3260RESERVED584LONG32	51	REVERSEFLOW VOLUME	51	4	FLOAT32		
52FICHOS52FICHOS53FICHOS53HUMIDITY_Relative534FLOAT32Image: State of the sta	52	FRROR FLAGS	52	4	LONG32		
53110111011101101005341100110254DIMENSIONLESS544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564FLOAT32Volume0.0011/h to 100001/h57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG3259UNIT_FOR_HCA574LONG3260RESERVED584LONG32	57	HUMIDITY Relative	53	4			
544LONG3255VERSION554LONG3256VOLUME_UNCORRECTED564FLOAT32Volume57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG32-59UNIT_FOR_HCA574LONG32-60RESERVED584LONG32-	5/		5/	-			
55VERSION554LONG5256VOLUME_UNCORRECTED564FLOAT32Volume0.001l/h to 10000l/h57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG32-59UNIT_FOR_HCA574LONG32-60RESERVED584LONG32-	54		54	4			
56VOLUME_UNCORRECTED564FLOAT32Volume0.001l/h to 10000l/h57ENERGY_RESRVD_GJ514FLOAT32Energy58NOT_IMPLEMENTED564LONG32-59UNIT_FOR_HCA574LONG32-60RESERVED584LONG32-	55	VERSION	55	4	LUNG32		0.0011/1
57         ENERGY_RESRVD_GJ         51         4         FLOAT32         Energy           58         NOT_IMPLEMENTED         56         4         LONG32	56	VOLUME_UNCORRECTED	56	4	FLOAT32	Volume	0.0011/h to 100001/h
58         NOT_IMPLEMENTED         56         4         LONG32           59         UNIT_FOR_HCA         57         4         LONG32           60         RESERVED         58         4         LONG32	57	ENERGY_RESRVD_GJ	51	4	FLOAT32	Energy	
59         UNIT_FOR_HCA         57         4         LONG32           60         RESERVED         58         4         LONG32	58	NOT_IMPLEMENTED	56	4	LONG32		
60 RESERVED 58 4 LONG32	59	UNIT_FOR_HCA	57	4	LONG32		
	60	RESERVED	58	4	LONG32		

61	ENHANCED_ID	59	4	LONG32	
62	BUS_ADDRESS	60	4	LONG32	

## 11.1 Modbus Frame Details

Parsed data is shared by STG as data blocks as the details are given above. There is also 2 registers at the end of each frame (service registers) to show Access Number and RSSI values of frame.

Here is an example Modbus data frame (without Modbus frame header part and CRC part for Modbus RTU)

1A0014473926950042003700010000001000349D5DAE0002DFFCD

1A: 1 byte frame length, which is 1Ah and which is 26 in decimal and WMBus data shared as blocks

00144739: 4 bytes of WMBus device id

2695: 2 bytes of WMBus device manufacturer id

0042: 2 bytes of WMBus device version

0037: 2 bytes of WMBus device type

0001: 1 byte of Data count value. Data shared in blocks and this value shows how many blocks are there

0000001000349D5DAE0: Each data blocks has following values in 6 registers and 12 bytes

Storage Number (of data from meter) - 2 bytes

Function Field (of data from meter) - 2 bytes

Data Type (STG uses this value to identify type of Data that is shown above) - 2 bytes, Data Type is Volume in this example

Data Value (float data based on Data Type in this example) - 4 bytes, 1751900.0 in this example

002D: 1 byte of Access Number value as unsigned integer. 45 in this example.

FFCD: 1 byte of RSSI value as signed integer. -51 in this example.

## 12. WMBus OMS – Modbus Conversion Example

STG series WMBus Gateways can get WMBus frames, decrypt the data and share data as Modbus values.

## 11.1 Selecting Modbus TCP or Modbus RTU

As a first step user should select "Device Function" under Operating Mode page:

"<u>WMBus - Modbus TCP Gateway (and MQTT Publisher)</u>" (available when device operation mode is server)

Or

"<u>WMBus - Modbus RTU Gateway</u>" (available when device operation mode is client)



In this example we have selected "<u>WMBus - Modbus TCP Gateway (and MQTT Publisher</u>)" and saved configuration reboot device under "Management" menu.

"Modbus Scheduler Settings" is still empty in this stage.

## 11.2 Entering Field Device Details with Auto Configuration

STG will listen WMBus frames.

Click "Refresh Auto Config List" button under "WMBus Settings" menu. When this button clicked, STG will show received frames with latest RSSI values for all WMBus devices since the device powered up. If there is no RSSI value, that means STG did not receive any WMBus frame yet, user may wait and click button again.

AES D	ecryption							
Ret	tesh Auto Config							
	edected Size			Recently Ded				
AES-1	28 Decryption Li	st						
	Manufacturer ID	Device ID	Version	Device Type	AES-128 bit Decryption Key	Latest RSSI Value Add to Config	Add to Black List	
	0x0601		0x14			-78 🗹		Recently Dedected
	0x0501		0x14			-78 💙		Recently Dedected
	0x0588		Qx01			-90	<ul> <li>Image: A second s</li></ul>	Recently Dedected
	0x0984		0x13			-78 🗹		Recently Dedected
	Dx8514					-76 🗹		Recently Dedected
	0x2695		0x42			-51 🗹		Recently Dedected
	0x0CAE		Gx01					
	ONDCAE							
	OVICAL		0.01					

If a line has notation "Recently Dedected" on the right side of entyr and framed with green line, that means this WMBus frame received and this device is not in configuration (or not in Black List), user may select it to "Add to Config" or "Add to Black List" based on needs.

If "Add to Black List" checked, after clicking "Save Configuration", STG will save this device id under "Black List Table" (and enables list by checking "Black List Enabled" checkbox, if not enabled already) under "Security Settings" menu. This entry also will be freed up from decryption list to be used for new coming frames.

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NOTE: User must enter AES keys manually.

After all settings are done, click "Save Configuration" button. That process will save configuration and also put the device id to Modbus list ( and black List if it is used) automatically thus ease up configuration process dramatically.

Here is "Modbus Scheduler Settings" view under "Operating Mode" menu after saving settings.

Devic	e Functiona	lity Settings					
Device	Function						
	WMBus - I	Modbus TCP Gateway (and MQTT	Publisher)				
Modbu	s Scheduler S	ettings					
uu	Modbus	WMBus Device Address	Enable		Modbus Address	WMBus Device Address	Enable
01.		0x04485522		02.	2	0x04688473	<
03.	3	0x19142190		04.	4	0x000DCBFB	<ul> <li>Image: A start of the start of</li></ul>
05.		0x00144739		06.		0x0000000	
07.		0x0000000		08.		0x0000000	
09.		0x0000000		10.	10	0x0000000	

Each WMBus device is separate MODBUS device so user should matched Manufacturing IDs of field devices with selected Modbus Device Addresses. Then user should enable the entry that STG will expect the WMBus data and share info as Modbus register.

Here is "Black List Address Table" view under "Security Settings" menu after saving settings.

Secu	rity Settings						
White L	ist Enabled						
Black L	Black List Address Table						
	Filter Device ID						
			Filter Device ID				
01.	0x00003874	02.	Filter Device ID				
01. 03.	0x000003874 0x00000000	02. 04.	Filter Device ID           0x00000000           0x00000000				
01. 03. 05.	0x000003874 0x00000000 0x00000000	02. 04. 06.	Filter Device ID           0x00000000           0x00000000           0x00000000           0x00000000				
01. 03. 05. 07.	0x00003874 0x00000000 0x00000000 0x00000000	02. 04. 06.	Filter Device ID           0x00000000           0x00000000           0x00000000           0x00000000           0x00000000				

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**NOTE:** All values in "AES-128 Decryption List", "Modbus Scheduler Settings" and "Black List Address Table" can also be entered/changed mnaually. In that case user may get help from "WMBus Status" menu to get WMBus frame details as follows:

Latest Message Received - WMBUS Link Layer fields	
C-Field	Manufacturer ID
	0x0601
Device ID	Version ID
	20
Туре	CI-Field
	OxAO

## 11.3 Setting Modbus Communication Parameters

If WMbus – Modbus RTU Gateway is set, user can make serial interface settings under menu Serial Settings.

≫		Modbus Serial Settings	
۲			
<b>ئ</b> م	Serial Settings	Enable R5232 for Modbus RTU	Enable RS485 for Modbus RTU
<u></u>			
\$J		Baud rate 115200 V	Line Cantrol 8_NONE_1 V
×			
Ø			
÷.	Management		

If WMbus – Modbus TCP Gateway is set, user can change Modbus TCP Port under menu Network Settings.

≫		Server Network Settings
۲	Network Settings	
ộ		EPL Operating Mode
<sup>ي</sup>		WMDus Server Listening Part
Å		
Ø		DHCP Server Enabled Use Static Address for Device
÷.		

## 11.4 Reading Modbus Register - Rules

STG series WMbus – Modbus TCP/RTU Gateway devices can get WMBus OMS data and convert those to Modbus registers. Users or field devices can read WMBus data over Modbus registers. Here are basic rules:

- Each wMBUS device is separate MODBUS slave

Slave ID is possible to configure in STG web page "Operating Mode" in table "Modbus Scheduler Settings" column "Modbus address"

- MODBUS data is stored in three parts: Status Block, several Data Blocks depends of number measurements stored in WMBus device and finally the Service Block

Number of words needed to read all register is possible after counting length of data blocks. For example, if in status block "data count" value is equal to 2 you have to read 6+(2\*5 (16))+2 words from address 0

- To restrict number of WMBUS devices it is possible use "White" or "Black" list of WMBus devices

See "Security Settings" in STG web configuration page

- To Decrypt WMBus devices you have to fill "AES-128 Decryption List"
- See "WMBus Settings" in STG web configuration page
- Current WMBus frame details is possible to find in "WMBus Status" page
- See "WMBus Status" in STG web configuration page
- Current Modbus frame details is possible to find in "Device Status" page

See "Device Status" in STG web configuration page

#### 11.5 Reading Modbus Register – Modbus Register Structure

MODBUS data is stored in three parts: Status Block, several Data Blocks depends on number measurements stored in WMBus device and finally the Service Block.

#### Status Block, 6 Registers:

- WMbus Device ID: 2 Registers
- WMbus Man ID: 1 Register
- WMbus Version: 1 Register
- WMbus Type: 1 Register
- Total Data Count: 1 Register (Represents how many data blocks exists)

#### Data Block, each 5 Bytes total n bytes:

- Storage Number: 1 Register
- Function Field: 1 Register
- Data Type: 1 Register
- Data Value: 2 Registers

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NOTE: Please check "Chapter 11: WMBus Data Parsing Format" to see details of Data Types used by STG

#### Service Block, 2 Registers:

- Access Number: 1 Register
- RSSI Value: 1 Register

#### 11.6 Reading Modbus Register – Modbus Function

In this example "Marcom OPC Server Modnet" software is used to read Modbus values and Modbus TCP protocol is used.

Any Modbus software can read following values with similar settings.

Enter TCP IP and TCP Port of STG for connection. In our example TCP IP is "192.168.0.121" and port is "502".

15 0 2 2 2	× • · · ×	r 190 10 10 10							
STG_ModbusTCP	2 Connections	Devices	🥔 Varia	bles 🕅 (	ommands	🕕 Log			
-	Status STG_	Name Conne ModbusTCP Ethernet	tion type TCP/IP	Remote host 192.158.0.121	Remote port 502	COM port	Active	Description	
	l l	Connection Prope	rties			×			
		Name	STG_Modb	ISTOP		Active 🛃			
		Connection Type	Ethernet T	CP/IP ~					
		Remote Hos	192.168.0	121					
		Remote Port	502	•					
		Watch Time	30	ŧ	Delay	0 🜩			
		Description							
					Read/Write File !	Modbus 🗌			
		Help		Cancel	Apply	ОК			
		N 4		1 of 1		F H			
Connected Client 0									
License Points 0 Used Points 11									
							0	3/15/2024	17:02:44 .::

Then enter device Modbus ID.

Modbus	Scheduler S						
	Modbus Address	WMBus Device Address	Enable		Modbus Address	WMBus Device Address	Enable
		0x04485522	<ul> <li>Image: A set of the /li></ul>			0x04688473	<ul> <li>Image: A set of the /li></ul>
			<ul> <li>Image: A second s</li></ul>	04.		0x000DCBFB	<ul> <li>Image: A start of the start of</li></ul>
		0x00144739	<ul> <li>Image: A set of the /li></ul>	06.		0x0000000	
		0x0000000		08.		0x0000000	
		0x0000000				0x0000000	
11.	11	0x0000000		12.	12	0x00000000	

In this example we want to read device id "0x00144739" and this is mapped with modbus address "5".

STG_ModbusTCP	Connecti	ons 😡	Devices	av	viables	P) Commands	0	Lon			
Add14_0x00144739	Status	Name	Active	Address	Retries	Timeout Watch Tir	ne R	tefresh Time	Enable Refresh Time	Max Byte Data	De
	Add	Device Pro	perties					×		32	
			Name	adds o	00144739		Acti	-			
			Address	Rouse of		Datrias	-				
			Timeout	2000	•	Watch Time	30				
		Common Re	fresh Time	2000		Max Data Byte	32				
			escription				-	-			
								- 88			
				Swap							
				Ву	te	word D	word (				
				1	Write Singl	e Coil: use the function	code	05 🗌			
				Write	: Single Re	gister: use the function	code	06			
		Help			Cancel	Apply	01				
		н 4			1 of 1		Þ.	н			
								-			
onnected Client 0											
Used Points 0											
									03/15/2024	17.05.59	

Then checked parsed data from "WMBus Status" page to see the parsed data. We will read 1 data blook in this example.

OMS Parsing Data Type - Data Value - Function - Storage No VOLUME I1751900.0INSTANTANEOUS0
<ul> <li>NOTE: If data type part show "NOT IMPLEMENTED", data is not implemented as a valid type in STG and cannot be read via Modbus and that is not count in data blocks.</li> <li>User may contact our company if that data is needed to be implemented and read via Modbus.</li> </ul>

Enter register details and data types baesd on read data, in this example we will read Status Block, Data Block and Service Block (all blocks)

	Connections	Devices	Ø Variables	P Comm	ands	O Log			
Add5_0x00144739	Status evi	Name	Value	Refresh Time	st Read Ti	Type	Address	Data Type	в
	A Device	Id	0	1000	17:77:77.77	4x - Output Register	1	Unsigned Long	
	Ar ManId		0	1000	17:77:77.77	4x - Output Register	3	Unsigned Integer	
	At Veriso	n	0	1000	17:77:77.77	4x - Output Register	4	Unsigned Integer	
	Ar Type		0	1000	17:77:77.77	4x - Output Register	5	Unsigned Integer	
	A: DataCo	unt	0	1000	17:77:77.77	4x - Output Register	6	Unsigned Integer	
	Ar Data1	StorageNumber	0	1000	17:77:77.77	4x - Output Register	7	Unsigned Integer	
	Ar Data1	FunctionField	0	1000	17:77:77.77	4x - Output Register	8	Unsigned Integer	
	Ar Data1.	DataType	0	1000	17:77:77.77	4x - Output Register	9	Unsigned Integer	
	Ar Data1	DataFloat	0	1000	17:77:77.77	4x - Output Register	10	Float	
	At Access	Number	0	1000	17:77:77.77	4x - Output Register	12	Unsigned Integer	
	At RSSI		0	1000	17:77:77.77	4x - Output Register	13	Signed Integer	
nnected Client 0 License Points 0	-								

#### Status Block, 6 Registers:

- WMbus Device ID: 2 Registers, unsigned long
- WMbus Man ID: 1 Register, unsigned integer
- WMbus Version: 1 Register, unsigned integer
- WMbus Type: 1 Register, unsigned integer
- Total Data Count: 1 Register, unsigned integer

#### <u>1 Data Block:</u>

- Storage Number: 1 Register, unsigned integer
- Function Field: 1 Register, unsigned integer
- Data Type: 1 Register, unsigned integer
- Data Value: 2 Registers, Float 32 bytes

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NOTE: Please check "Chapter 11: WMBus Data Parsing Format" to see details of Data Types used by STG.

In this example, "Data Type" is "VOLUME I".

#### Service Block, 2 Registers:

- Access Number: 1 Register, unsigned integer
- RSSI Value: 1 Register, signed integer

Save settings and click "Start OPC Server" (or F9) button to read values.

STG_ModbusTCP	Connections	Devices	Ø Variables	(*) Comma	nds 🕕	Log			
Add5_0x00144739	Status evi	Name	Value	New value	Refresh Time	st Read Ti	Туре	Address	Data Type
	At Device	rād	1328953		1000	7:16:03.42	4x - Output Register	1	Unsigned Long
	Ar Manid		9877		1000	7:16:03.42	4x - Output Register	3	Unsigned Integer
	Ar Veriso	in	66		1000	7:16:03.42	4x - Output Register	4	Unsigned Integer
	A: Type		55		1000	7:16:03.42	4x - Output Register	5	Unsigned Integer
	Ar DataC	ount	1		1000	7:16:03.42	4x - Output Register	6	Unsigned Integer
	Ar Data1	StorageNumber	0		1000	7:16:03.42	4x - Output Register	7	Unsigned Integer
	Ar Data1	FunctionField	1		1000	7:16:03.42	4x - Output Register	8	Unsigned Integer
	Ar Data1	DataType	3		1000	7:16:03.42	4x - Output Register	9	Unsigned Integer
	Ar Data1	Datafloat	1751900		1000	7:16:03.42	4x - Output Register	10	Float
	Ar Acces	sNumber	45		1000	7:16:03.42	4x - Output Register	12	Unsigned Integer
	Ar RSSI		-52		1000	7:16:03.42	4x - Output Register	13	Signed Integer
nnected Client 0 License Points 0 Used Points 11									

Here is log for sent and received frames

Connections	Devices	🧼 Va	ariables	(*) Commands	🕕 log
Туре	Date	1	Description		
Data	03/15/2024 17:17:27	1:154	Connection	STG_ModbusTCP: <	<= 00-54-00-00-00-1D-05-03-1A-00-14-47-39-26-95-00-42-00-37-00-01-00-00-00-01-00-03-49-D5-DA-E0-00-2D-FF-CC
Data	03/15/2024 17:17:27	7:133	Connection	STG_ModbusTCP: =	=> 00-54-00-00-06-05-03-00-00-00-0D

Received frame details are as follows:

0054000001D: 6 bytes of Modbus TCP protocol header

- 05:1 byte of Modbus adress
- 03: 1 byte fo Modbus Function Code

1A: 1 byte data length, which is 1Ah and which is 26 in decimal and WMBus data shared as blocks

00144739: 4 bytes of WMBus device id

2695: 2 bytes of WMBus device manufacturer id

0042: 2 bytes of WMBus device version

0037: 2 bytes of WMBus device type

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0001: 1 byte of Data count value. Data shared in blocks and this value shows how many blocks are there

0000001000349D5DAE0: Each data blocks has following values in 6 registers and 12 bytes

Storage Number (of data from meter) - 2 bytes

Function Field (of data from meter) - 2 bytes

Data Type (STG uses this value to identify type of Data that is shown in previous example) - 2 bytes, Data Type is Volume in this example

Data Value (float data based on Data Type in this example) - 4 bytes, 1751900.0 in this example

002D: 1 byte of Access Number value as unsigned integer. 45 in this example.

FFCD: 1 byte of RSSI value as signed integer. -51 in this example.

be similar in following manne	r:		
	← Modbus	RTU Message —	<b>&gt;</b>
	SlavID FCode	Data	CRC
		4	
← MBAP Header	───→ ←─ Modbu	s TCP/IP PDU $\longrightarrow$	
Transaction ID Protocol ID Len	gth UnitID FCode	Data	
← Modbus	TCP/IP ADU		

# 13. MQTT Communication Example

STG Series WMBus Gateways can get Wireless MBus (WMBus) frames, decrypt them and parse them. Field devices or applications can get meter WMBus data mapped to Modbus registers via Modbus TCP (or Modbsu RTU). Simultaneously all meter data can be sent to MQTT Server.

## 13.1 MQTT Data Transmission: Example

Enter meter reading details to STG and make sure all readings are ok.

Please follow details regarding settings and put into operation of STG based on explanations in "Chapter 12: WMBus OMS – Modbus Conversion Example" for adding WMBus meter details and parsing WMBus meter data.

Then go to "Network Settings" menu and "Enable MQTT Publisher for Parsed WMBus Packages" part.

			REDZ STG Series Wireless MBus Gateway Versien: 2.02.02, - dvait: Mar 8.2024 14.4330 - MAC: e8 eb 11:53.ab.14
×			그는 거도를 들어야 한 것 이 것 같아.
۲	Network Settings	NTP Settings	
ộ		NTP Server	
ئي		pool.ntp.org	
*		MQTT Settings	
0 .f.		Enable MQTT Publisher for Parsed WMBus Packages	
		MQTT Broker IP	MQTT Broker Port
			1883
		Cilent ID	
숺봂			
		User Name	Password
		MQTT_STG_User	
		Publish Topic	Subscribe Topic
		MQTT_STG_Publish_topic	MQTT_STG_Conf_topic
		Minimum Send Interval for a Parsed Data (in seconds)	Data Format
			RAW WMBUS DECRYPTED DATA 🗸
		Server Network Settings	
		Server Listening Port	Maximum Number of Clients
			2 ~
		DHCP Server Enabled	Use Static Address for Device
		Save Configuration	

In our example we will use "https://tago.io/" as MQTT Server.

Go to MQTT server panel and click "Add Device" to add STG to MQTT Server. We will also get password after adding device.



Select "Custom MQTT".

	MQTT: The Standard for IoT	<sup>r</sup> Messaging
Details	Device name	Data storage type
Give a name for this device and learn about this network here.	LISM	A Device Data Optimized (Immutable)
Define the type of bucket to be used to store data for this device.		
Data Retention	O Period	O Retention
removes old data from the bucket after the period you define here. Learn more.	Monthly	~ 1
	O This selection limits the storage for this d to change the Period and Retention.	levice to 1 Million data registers per month. Upgrade your plan
Main information	Payload Type	
Set the initial configurations for this device.	Auto Parser (JSON or TEXT)	~
Description Learn how this device works, and what its capabilities are.	This is quick setup to create new devices that ca MQIT broker. Wore device will only need to use the device-tok when working directly our broker. More information can be found in the document interview.	en be used for any applications and functions to access the TagolO en to send data to your account. Don't use the Authorization feature tation link shown above.
Cancel		Create my Device

Then enter "Device name" in pop up screen and click "Create My Device".

MQTT: The Standard for IoT Messaging
6
All done! Creating device Creating and linking a bucket
Create another device Finish

Click "Finish" when all done.

go IO	Z Telemetri Ltd									
A Home		STG Last Input bir saat önce   Type Device Data Optimized (Immutable)								
Home	_	General Information	Emulator	Payload Parser	Live Inspecto	or				
Buckets	Files	a Name				Statist				
5	Ø	STG				View th				
Actions	Cores	Network		(1) Connector		Dat				
Users	Run	MQTT		Custom MQTT						
DS	Q. 12 III +	📰 Token & Serial Numb	er							
te	NEW	Token Name								
		Token #2		Ge	Copy token					
		Default		- @	ළු					
	go lo   Home Buckets Actions Users	Cores       Actions       Image: Series       Image: Series	Image: Stripping of Constraints       Image: Stripping of Constraints         Image: Stripping of Constraints       Image: Stripping of Constraints	STG   Home   Buckets   Files   Actions   Cores   Mathematical Strice   Math   Math <td>STG   Home   Buckets   Files   Y   Actions   Cores   W   Buckets   Files   Y   Cores   W   Petwork   Or Lation   Token &amp; Serial Number   Token #2   Default</td> <td>STG   Buckets   Files   Y   Cores   Y   Users   Run   Ds   Q. 12 == +   NEW     New     Cores   Image: Cores   Imag</td>	STG   Home   Buckets   Files   Y   Actions   Cores   W   Buckets   Files   Y   Cores   W   Petwork   Or Lation   Token & Serial Number   Token #2   Default	STG   Buckets   Files   Y   Cores   Y   Users   Run   Ds   Q. 12 == +   NEW     New     Cores   Image: Cores   Imag				

Once the device is created, click "Copy Token" button. This will copy password value.

Then go back to STG and enter that value as password and click "Save Configuration" button.
			REDZ \$TG Service Wireless MBus Gateway Vension 2 102.82, -4-wit: Mar 8 2024 14 43:30, MAC, et set 19 73-30, 1d				
×							
۲	Network Settings	NTP Settings					
÷÷ộ++		NTP Server					
**							
¥		MQTT Settings					
Ø		Enable MQTT Publisher for Parsed WMBus Packages					
Å							
		MQTT Bloker IP	MQTT Broker Port				
		Client ID					
		User Name					
		Publish Topic	Subscribe Topic				
		MQTT_STG_Publish_topic	MQTT_STG_Cont_topic				
		Minimum Send Interval for a Parsed Data (in seconds)	Data Format				
		Server Network Settings					
		Server Listening Port	Maximum Number of Clients				
		DHCP Server Enabled	Use Static Address for Device				
		Save Configuration					

<u>"MQTT Broker IP"</u>: TCP IP of the MQTT Server. User must enter IP value 75.2.83.130 is IP of "https://tago.io/" web address.

<u>"MQTT Broker Port"</u>: TCP Port of the MQTT Server. 1883 is TCP Port of "https://tago.io/" web address.

<u>"Client ID</u>": MQTT Publisher client id. Default is MQTT\_STG\_Client. Maximum length for this field is 32.

<u>"User Name"</u>: MQTT Publisher user name. This must be entered based on MQTT server settings. Maximum length for this field is 64.

"Password": MQTT Publisher password. This must be entered based on MQTT server settings. Maximum length for this field is 48.

<u>"Publish Topic"</u>: MQTT Publisher topic value. Default is MQTT\_STG\_Publish\_topic. Maximum length for this field is 32.

<u>"Subscribe Topic"</u>: MQTT Publisher subscribe topic value. Default is MQTT\_STG\_Subscribe\_topic. Maximum length for this field is 32.

"<u>Minimum Send Interval for a Parsed Data (in seconds)</u>": Minimum value to send meter data to MQTT Server. This time is the minimum time to send data to server, if WMBus meter sends frames in longer periods then it will be basis of the sending interval.

"Data Format": Options for how data is shared by STG with MQTT server. There are 2 options:

RAW WMBUS DECRYPTED DATA

PARSED DATA AS OBJECTS

#### When selected as "Raw WMBus Decrypted Data", STG will share WMBus frame as it is but decrypted as follows as an example:

13:58:03:

#### [MQTT] Device publish

- { "topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710413878\",\"Data\": {\"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\'
- 51\",\"AcNu\".\"45\",\"RawDt\".\"202D900F002C2540430000CF464FAE2BBFB78B7239471400952642032D181007102F2F04953A6F4400002F2F2F2... "qos": 0, "device": "65e076784d9b150010876950", "messageId": null, "isHex": false }
- { "topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710413878\",\"Data\": {\"DevId\":\"144739\",\"Manld\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"RawDt\":\"202D900F002C2540430000CF464FAE2BBF78B7239471400952642032D181007102F2F04953A6F4400002F2F2F2F2F2F2F2F2F1}}, "qos": 0, "device": "65e076784d9b150010876950", "messageld": null, "isHex": false }

MQTT message shows STG device name, device id, NTP time and data itself

Data has values of WMBus Device Id, Manufacturer Id, Device Version, Device Type, RSSI Value of received signal, Access Number value and Decrypted frame Data Block.

When selected as "Parsed Data As Objects", STG will share WMBus data as parsed objects as follows as an example:

#### 14:04:57:

[MQTT] Device publish { "topio": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710414288\",\"Data\": {"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"DtCnt\":\"1\",\"Blcks\": [{\"S\":\"0\\",\"F\\":\"1\\",\"T\\":\"3\",\"V\":\"1751900.0\"]}]}", "qos": 0, "device": "65e076784d9b150010876950", "messageld": null, "isHex": false } {"topic": "MQTT\_STG\_Publish\_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS\_SERVER\",\"Time\":\"1710414288\",\"Data\": {\"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"DtCnt\":\"1\",\"Rot\"."[\"\","I'\" "device": "65e076784d9b150010876950", "messageld": null, "isHex": false }

MQTT message shows STG device name, device id, NTP time and data itself

Data has values of WMBus Device Id, Manufacturer Id, Device Version, Device Type, RSSI Value of received signal, Access Number value.

Parsed Data is shared in blocks and Data Count value shows how many blocks are there.

In this example there is 1 block

{\"\$\":\"0\",\"F\":\"1\",\"T\":\"3\",\"V\":\"1751900.0\"}

Here are explanations:

S: Storage Number (of data from meter)

F: Function Field (of data from meter)

T: Data Type (STG uses this value to identify type of Data)

V: Data Value (can be float or UINT - 4 byte data, matched with Data Type)

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NOTE: Parsed data shared as data blocks. This is valid for both Modbus Frames and web page visualization. Each data block has following values:

- Data Type specified by STG
- Data Value (can be a float or long value)
- Function, available values are:

INSTANTANEOUS, MAXIMUM, MINIMUM or ERROR STATE

- Data Storage Number as an integer

details are explained in "Chapter 11: WMBus Data Parsing Format".

When selected as "Parsed Data As Modbus Frame", STG will share WMBus data as Modbus like frame as follows as an example:

14:22:03:

[MQTT] Device publish
{ "topic": "MQTT_STG_Publish_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS_SERVER\",\"Time\":\"1710415316\",\"Data\":
{\"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-
51\",\"ACNu\":\"45\",\"ModFr\":\"1A0014473926950042003700010000001000349D5DAE0002DFFCD\"}}", "qos": 0, "device":
"65e076784d9b150010876950", "messageld": null, "isHex": false }
{ "topic": "MQTT_STG_Publish_topic", "payload": "{\"STGid\":\"45FA\",\"STGNme\":\"WMBUS_SERVER\",\"Time\":\"1710415316\",\"Data\":
{\"DevId\":\"144739\",\"ManId\":\"2695\",\"Ver\":\"42\",\"Typ\":\"37\",\"RSSI\":\"-51\",\"AcNu\":\"45\",\"ModFr\":\"1A0014473926950042003700010000001000349D5DAE0002DFFCD\"}}",
"aos": 0, "device": "65e076784d9b150010876950", "messageld": null, "isHex": false }

MQTT message shows STG device name, device id, NTP time and data itself

Data has values of WMBus Device Id, Manufacturer Id, Device Version, Device Type, RSSI Value of recevied signal, Access Number value.

Parsed Data is shared in Modbus like frame, in this example as follows.

1A0014473926950042003700010000001000349D5DAE0002DFFCD

1A: 1 byte frame length, which is 1Ah and which is 26 in decimal and WMBus data shared as blocks

00144739: 4 bytes of WMBus device id

2695: 2 bytes of WMBus device manufacturer id

0042: 2 bytes of WMBus device version

0037: 2 bytes of WMBus device type

0001: 1 byte of Data count value. Data shared in blocks and this value shows how many blocks are there

0000001000349D5DAE0: Each data blocks has following values in 6 registers and 12 bytes

Storage Number (of data from meter) - 2 bytes

Function Field (of data from meter) - 2 bytes

Data Type (STG uses this value to identify type of Data that is shown in previous example) - 2 bytes, Data Type is Volume in this example

Data Value (float data based on Data Type in this example) - 4 bytes, 1751900.0 in this example

002D: 1 byte of Access Number value as unsigned integer. 45 in this example.

FFCD: 1 byte of RSSI value as signed integer. -51 in this example.

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**NOTE:** Parsed data shared as data blocks. This is valid for both Modbus Frames and web page visualization. Each data block has following values:

- Data Type specified by STG
- Data Value (can be a float or long value)
- Function, available values are:

INSTANTANEOUS, MAXIMUM, MINIMUM or ERROR STATE

- Data Storage Number as an integer

details are explained in "Chapter 11: WMBus Data Parsing Format".

When all settings are done click "Save Configuration".

Go back to "https://tago.io/" panel and click "Live Inspector" for the STG and click "Play button".

Data will be shown in real time.



User has to parse and use that parsed data for visualization (for graphs for example) for their application. That is beyond scope of STG usage.

# 14. WMBus OMS – Modbus Conversion and Send Data to MQTT Server - Video Examples

STG Series WMBus Gateways have built in mechanism to get WMBus frames and Auto Configure. AES Decryption, Modbus Adress mapping and Black list items can be auto filled by Auto Configuration mechanism, thus user do not have to enter manually each item besides AES Key. STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list.

## 14.1 Convert WMBus OMS Packages to Modbus TCP - Video Example

STG Series WMBus Gateways can receive WMBus OMS packages and convert them to Modbus TCP packages. This way WMBus packages of many meters can directly be collected on a remote or local Data Server or RTU device as Modbus registers and can be used for other applications.

#### **STG Configuration**

- Server Mode
- · Device Function: WMBus Modbus TCP Gateway
- Wmbus Device Mode Other



STG set in Server mode and Device function set as WMBus – Modbus TCP Gateway. Manufacturing IDs of field devices can be listed with related Modbus addresses. If needed decryption list can be set and White list can be enabled. Received WMBus OMS messages will be converted to Modbus Registers and field or remote Modbus RTU devices can query that data from related Modbus addresses.

Here is an example video for this application (this video follows steps described in Chapter 12. WMBus OMS – Modbus Conversion Example) :

## 14.2 Transmit Received and Parsed WMBus Packages to MQTT Server - Video Example

STG Series WMBus Gateways can receive WMBUS packages, decrypt and parse. All parsed data can be sent to MQTT server for web based applications in several different formats.

#### STG Configuration

- Server Mode
- Device Function: WMBus Modbus TCP Gateway and MQTT Publisher
- Wmbus Device Mode Other



STG act as TCP Server to WMBus Gateway configured in Server Mode. Field devices still can connect to STG device and read WMBus packages in Modbus TCP protocol. STG will get WMBus frames, decrypt them, parse them serve as Modbus TCP packages if needed and send WMBus data to MQTT Server simultaneoulsy.

Here is an example video for this application (this video follows steps described in Chapter 13. MQTT Communication Example) :

# 15. Ordering Information

<u>STG154:</u> 868MHz WMBus – Modbus TCP/RTU Gateway with MQTT Publisher, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-48V (max. 60V) DC Power Input

<u>STG254:</u> 868MHz WMBus – Modbus TCP/RTU Gateway with MQTT Publisher, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

<u>STG655:</u> 868MHz WMBus – Modbus TCP/RTU Gateway with MQTT Publisher, 2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

<u>STG154 - D16:</u> 868MHz WMBus - Modbus TCP/RTU Gateway with MQTT Publisher, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-48V (max. 60V) DC Power Input

<u>STG254 - D16:</u> 868MHz WMBus - Modbus TCP/RTU Gateway with MQTT Publisher, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 100 - 240V AC (120 - 370V DC), 50Hz to 60Hz AC Power Input

<u>STG655 - D16:</u> 868MHz WMBus – Modbus TCP/RTU Gateway with MQTT Publisher, 2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

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NOTE:

STG has capability to decrypt and convert WMBus data to Modbus protocol for up to 40 devices in list

There is also a version with up to 20 devices for Modbus conversion and up to 16 devices for decryption. Those version model names differantiated with - D16 extension.

Model	5-48V (max. 60V) DC Power Input	100 - 240V AC (120 - 370V DC), 50Hz to 60Hz AC Power Input	3 Phase AC Power input, 110V–240V/50– 60Hz AC Power Input	2 x 10/100 T(x) ETH Ports	1 x RS232 and 1 x RS485 Serial Ports	BPL (Broadband Power Line) Link	Up to 40 WMBus device data decryption and parse	Up to 16 WMBus device data decryption and up to 20 WMBus device data parse
<u>STG154</u>	Х			Х	Х		Х	
<u>STG254</u>		Х		Х	Х		Х	
<u>STG655</u>			Х	Х	Х	Х	Х	
<u>STG154 - D16</u>	Х			Х	Х			Х
<u>STG254 - D16</u>		Х		Х	Х			Х
<u>STG655 - D16</u>			Х	Х	Х	Х		Х

## 16. Product Selection