

OLE T4020/T5020/TCS5020 Tank Level Monitor

MODBUS Technical Documentation

1. Introduction

This document describes the MODBUS registers that are available for use in the T5020 Tank Level Monitor. It details the register number, name and description for each MODBUS register.

Values from certain registers will require scaling in the MODBUS Master device. Where this is necessary, the appropriate scaling factors are detailed in the register description.

When integrating the T5020 device with a MODBUS Master, there are a number of points to be aware of. These are detailed below.

2. Protocol selection

The T5020 device is able to communicate using two distinct serial protocols; "Standard" and "MODBUS". "Standard" protocol should be used to configure the unit in the first instance using the T5020 Configurator PC software. "MODBUS" should be used when integrating with other systems once the device has been set up.

The T5020 has a default protocol setting (see register 00016) that selects which protocol the unit should use on power-up. This is displayed on power-up as "Protocol: Standard" or "Protocol: Modbus".

The default protocol setting can be changed using the T4020 Configurator PC software.

Should the non-default protocol be required, the following procedure should be followed:

- Power down the T5020
- Hold down the middle button
- Power up the T5020
- Keep the button held down until the display comes on

The alternative protocol will then be used until the power is cycled.

3. Long values

Long values are provided in 32-bit unsigned integer format, with the low register storing the low 16 bits and the high register storing the high 16 bits.

4. Analog equivalents

Analog equivalents (holding registers and input registers) of coils and discrete inputs are provided so that the MODBUS Master has the option of using either type of register.

5. Modbus Settings

The driver named "MODBUS" should be used, and the serial port should be set to 9600 baud, 8 data bits, no parity and 1 stop bit. As MODBUS is an RS-485 protocol, an external RS-232 to RS-485 converter is necessary to connect to a PC RS-232 port, or a USB to RS485 adaptor. (Available from OLE T4020-01)

Note: Windows 8 will need the version that is current as old ones are not compatible.

6. MODBUS registers

5.1 Holding registers

Register	Name	Details
40001	Master Alarm Setpoint	Provides the alarm setpoint in % * 100
40002	Master Alarm Direction	Provides the direction of the alarm (0 = none, 1 = rising, 2 = falling)
40003	Master Alarm Hysteresis	Provides the alarm hysteresis in milliseconds
40004	Alarm 1 Setpoint	Provides the alarm setpoint in % * 100
40005	Alarm 1 Direction	Provides the direction of the alarm (0 = none, 1 = rising, 2 = falling)
40006	Alarm 1 Hysteresis	Provides the alarm hysteresis in milliseconds
40007	Alarm 2 Setpoint	Provides the alarm setpoint in % * 100
40008	Alarm 2 Direction	Provides the direction of the alarm (0 = none, 1 = rising, 2 = falling)
40009	Alarm 2 Hysteresis	Provides the alarm hysteresis in milliseconds
40010	Alarm 3 Setpoint	Provides the alarm setpoint in % * 100
40011	Alarm 3 Direction	Provides the direction of the alarm (0 = none, 1 = rising, 2 = falling)
40012	Alarm 3 Hysteresis	Provides the alarm hysteresis in milliseconds
40013 & 40014	Tank Minimum Height	Provides the minimum tank height (* 1000) set point of the tank for the associated ADC value (next register).
40015	Tank Minimum Height ADC Value	Minimum raw tank ADC value.
40016 & 40017	Tank Maximum Height	Provides the Maximum tank height (* 1000) set point of the tank for the associated ADC value (next register).
40018	Tank Maximum Height ADC Value	Maximum raw tank ADC value.
40020	Volume UOM	Provides the unit of measure for the tank volume display (1 = cubic metres, 2 = litres, 3 = gallons, 4 = cubic inches, 5 = cubic feet)
40021	Display Damping	Provides the update rate of the display in milliseconds
40022	Tank Type	Provides the tank type (1 = horizontal cylindrical body with elliptical endcaps, 2 = cuboid, 3 = vertical cylindrical body with elliptical endcaps, 4 = vertical cylinder, 5 = look-up table)
40023	Tank UOM	Provides the unit of measure for the tank dimensions (0 = metres, 1 = inches, 2 = feet)
40024	Specific Gravity	Provides the specific gravity of the tank contents * 1000
40025 & 40026	Tank Length	Provides the tank length * 1000
40027 & 40028	Tank Height	Provides the tank height * 1000
40029 & 40030	Tank Width	Provides the tank width * 1000
40031 & 40032	Tank Radius	Provides the tank radius * 1000
40033 & 40034	Tank Extent	Provides the extent of the endcaps * 1000
40035	Test Mode Delay	Provides the period of time to hold the Alarm Test button down to activate the test.
40036	Reset Tank	Allows the tank calculations to be reset after tank parameters have changed. Reading this register will return 0; writing any value will reinitialise the tank calculations.

40039	(Analog) Master Alarm enabled	Analog equivalent of register 00001
40040	(Analog) Master Alarm manual override enable	Analog equivalent of register 00002
40041	(Analog) Master Alarm override value	Analog equivalent of register 00003
40042	(Analog) Alarm 1 enabled	Analog equivalent of register 00004
40043	(Analog) Alarm 1 override enable	Analog equivalent of register 00005
40044	(Analog) Alarm 1 override value	Analog equivalent of register 00006
40045	(Analog) Alarm 2 enabled	Analog equivalent of register 00007
40046	(Analog) Alarm 2 override enable	Analog equivalent of register 00008
40047	(Analog) Alarm 2 override value	Analog equivalent of register 00009
40048	(Analog) Alarm 3 enabled	Analog equivalent of register 00010
40049	(Analog) Alarm 3 override enable	Analog equivalent of register 00011
40050	(Analog) Alarm 3 override value	Analog equivalent of register 00012
40051	(Analog) 4-20mA output enable	Analog equivalent of register 00013
40052	(Analog) 4-20mA output mirror	Analog equivalent of register 00014
40054	Default Serial Protocol	0 = Standard, 1 = Modbus
40055	(Analog) Totalisation scaling factor	The number of pulses per litre (values 1 – 65000 are valid)
40056	(Analog) Totalisation display timeout	The number of seconds the totalisation display will remain on the screen after flow meter mode has been exited. (values 0 – 60 are valid)
40057	LOW Message Point	Provides the point in uA at which the LOW Message appears on the LCD
40058	HIGH Message Point	Provides the point in uA at which the HIGH Message appears on the LCD
40060	Tank Safe Capacity	Provides the safe capacity of the tank in %
40061 & 40062	Display Resolution	Provides the display resolution * 1000

5.2 Input registers

<i>Register</i>	<i>Name</i>	<i>Details</i>
30001 & 30002	Volume (m ³)	Provides the volume in cubic metres * 1,000,000
30003 & 30004	Volume (litres)	Provides the volume in litres * 10,000
30005 & 30006	Volume (gal)	Provides the volume in gallons * 10,000
30007 & 30008	Volume (in ³)	Provides the volume in cubic inches * 1
30009 & 30010	Volume (ft ³)	Provides the volume in cubic feet * 100,000
30011	Slave ID	Provides the Modbus slave ID

30012	(Analog) Master Alarm status	Analog equivalent of register 10001
30013	(Analog) Alarm 1 status	Analog equivalent of register 10002
30014	(Analog) Alarm 2 status	Analog equivalent of register 10003
30015	(Analog) Alarm 3 status	Analog equivalent of register 10004
30016	Temperature (Unsigned)	Provides the temperature in °C * 10 (temperature range 0 to 70°C) [Value 32767 indicates invalid reading, e.g. sensor disconnected]
30017	Temperature (Signed)	Provides the temperature in °C * 10 (temperature range -10 to 70°C) [Value 65565 indicates invalid reading, e.g. sensor disconnected]
30018 & 30019	Flow Meter Total	The flow meter total in litres. This register is reset to zero every time flow meter mode is entered.
30020 & 30021	Tank Minimum Height	Provides the minimum tank height
30022	Tank Minimum Height ADC Value	Provides the ADC reading at the minimum tank height
30023 & 30024	Tank Maximum Height	Provides the maximum tank height
30025	Tank Maximum Height ADC Value	Provides the ADC reading at the maximum tank height
30026	Application Type	0 = T4020, 1 = T5020, 2 = TCS5020
30027 & 30028	Tank Safe Capacity	Provides the calculated tank safe capacity in litres.

5.3 Discrete Inputs

<i>Register</i>	<i>Name</i>	<i>Details</i>
10001	Master Alarm status	Provides the status of the alarm (0 = not in alarm, 1 = in alarm)
10002	Alarm 1 status	Provides the status of the alarm (0 = not in alarm, 1 = in alarm)
10003	Alarm 2 status	Provides the status of the alarm (0 = not in alarm, 1 = in alarm)
10004	Alarm 3 status	Provides the status of the alarm (0 = not in alarm, 1 = in alarm)
10005	Bund Alarm status	Provides the status of the alarm (0 = not in alarm, 1 = in alarm)
10006	Totalisation Mode status	Provides the status of totalisation mode (0 = not in totalisation mode, 1 = in totalisation mode)
10007	High Level Alarm status	Provides the status of the alarm (0 = not in alarm, 1 = in alarm)
10008	Bund Alarm enabled state	Provides the enabled state of the Bund Alarm (0 = not enabled, 1 = enabled)
10009	High Level Alarm enabled state	Provides the enabled state of the High Level Alarm (0 = not enabled, 1 = enabled)

5.4 Coils

<i>Register</i>	<i>Name</i>	<i>Details</i>
00001	Master Alarm enabled	Enables or disables the alarm
00002	Master Alarm override enable	Allows the 24VDC output to be controlled manually using Modbus commands (0 = output controlled by alarm, 1 = output set by Manual Value)
00003	Master Alarm override value	Sets the output on or off (0 = off, 1 = on). Only used when Manual Override = 1
00004	Alarm 1 enabled	Enables or disables the alarm
00005	Alarm 1 override enable	Allows the 24VDC output to be controlled manually using Modbus commands (0 = output controlled by alarm, 1 = output set by Manual Value)
00006	Alarm 1 override value	Sets the output on or off (0 = off, 1 = on). Only used when Manual Override = 1
00007	Alarm 2 enabled	Enables or disables the alarm
00008	Alarm 2 override enable	Allows the 24VDC output to be controlled manually using Modbus commands (0 = output controlled by alarm, 1 = output set by Manual Value)
00009	Alarm 2 override value	Sets the output on or off (0 = off, 1 = on). Only used when Manual Override = 1
00010	Alarm 3 enabled	Enables or disables the alarm
00011	Alarm 3 override enable	Allows the 24VDC output to be controlled manually using Modbus commands (0 = output controlled by alarm, 1 = output set by Manual Value)
00012	Alarm 3 override value	Sets the output on or off (0 = off, 1 = on). Only used when Manual Override = 1
00013	4-20mA output enable	Enables or disables the 4-20mA output as a percentage of the tank volume
00014	4-20mA output mirror	Enables or disables the 4-20mA output as a mirror of the 4-20mA input signal
00016	Default protocol	Sets the protocol that the T4020 uses by default on power-up (0 = standard, 1 = Modbus)
00017	Master Alarm Mute	Deactivates or activates the alarm mute (0 = deactivate mute, 1 = activate mute)