



# nVent RAYCHEM Elexant 650c-Modbus Protocol Interface Mapping Unit User Manual

[Home](#) » [nVent RAYCHEM](#) » nVent RAYCHEM Elexant 650c-Modbus Protocol Interface Mapping Unit User Manual



## Contents

- [1 nVent RAYCHEM Elexant 650c-Modbus Protocol Interface Mapping](#)
- [2 Product Usage Instructions](#)
- [3 INTRODUCTION](#)
- [4 MODBUS REGISTER MAP](#)
- [5 Documents / Resources](#)
  - [5.1 References](#)
- [6 Related Posts](#)



**nVent RAYCHEM Elexant 650c-Modbus Protocol Interface Mapping**



## Product Specifications

- Modbus Protocol Interface
- Modbus RTU via RS485
- Variable Address Range: 1 to 247
- Baud Rate Options: 2400, 4800, 9600, 19200
- Parity Options: None, Odd, Even
- Stop Bits Options: 1, 2

## Product Usage Instructions

### Introduction

The product uses the Modbus protocol for communication. The manual provides details about the system's configuration, resources, setup parameters, current conditions, alarms, and other data points.

### How to Use This Manual

The manual includes the complete Modbus register map. It is recommended that system integrators thoroughly test their system after writing to the database to ensure proper functionality.

### Frequently Asked Questions (FAQ)

#### **Q: What is the default Modbus Station Address?**

A: The default Modbus Station Address used to identify the controller is 1.

## INTRODUCTION

This manual details the Modbus registers of the nVent RAYCHEM Elexant 650c – Modbus. It is intended to be used by the users' system integrators who wish to interface with their external device (i.e. DCS or Building management system – BMS – system) to the using the Modbus protocol. The manual includes details of the system's current configuration, availability resources, set-up parameters, current conditions, alarm status, log info and numerous other fixed and variable data points.

## How to Use This Manual

The Elexant 650c – Modbus register can be accessed by DCS or BMS systems. However, this should only be done by expert users who understand that the system makes use of extensive semaphore fields to assure synchronization between the possibility of multiple users and conflicting instructions. These portions of the Modbus register map provide access to the current set – up and real time values being measured by the system. A snap shot of the current conditions, data for trending, alarm status, the current setting for the alarm thresholds and setpoints can be easily read without any risk to the system performance.

The entire Modbus register map is included in this document for completeness. Writing to the database is within the capability of most Modbus host devices. However, we strongly recommend that system integrators who write to the database must thoroughly test their system to ensure it is working properly and that there are no unintended consequences.

## Modbus Communications

The controller acts as Modbus slave device. A modbus master device can read and write to the controller. This enables the possibility to monitor, configure and view the alarms remotely. The protocol used is Modbus RTU via RS485.

Variable	Description	Default	Range/options
Address	Modbus Station Address used to identify the controller.	1	1 to 247
Baud	The data rate at which communications occur on the serial network.	9600	2400, 4800, 9600, 19200
Parity	Parity Defines the type of parity bit to be used with any of the three serial communications ports.	None	None, Odd, Even
Stop Bits	Defines the number of stop bits used with any of the three serial communications ports.	1	1,2

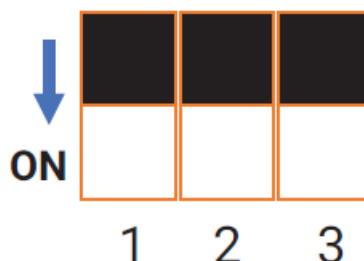
### The host defaults are:

- Modbus Address: 1
- Baud Rate: 9600

The standard configuration is: 8 data bits, no parity and one stop bit.

The dip switches (below terminal 26 and 27):

Button	Resistor
1	Pull down resistor
2	Pull up resistor
3	Termination resistor



Push the button to ON (as the arrow indicates) side will connect the corresponding resistor in.

## MODBUS REGISTER MAP

### Alarm Status Coils

- Modbus Function Code: 1
- Modbus Start Address: 4
- Modbus Block Size: 13
- Number of Blocks: 1

Description	Modbus Address	Function	Comments
TS 1 Failure	4	1	0 = no alarm, 1 = alarm
TS 2 Failure	5	1	0 = no alarm, 1 = alarm
Internal Error	15	1	0 = no internal error, 1 = internal error
Panel Alarm status	16	1	0 = no alarm, 1 = alarm

### Controller Setup Parameters

- Modbus Function Code: 1, 5, 15
- Modbus Start Address: 145
- Modbus Block Size: 5
- Number of Blocks: 1

Description	Modbus Address	Function	Comments
TS1 Fail Mode	145	1, 5, 15	0 = Fail off, 1 = Fail on
TS2 Fail Mode	146	1, 5, 15	0 = Fail off, 1 = Fail on
Test Program	147	1, 5, 15	0 = no, 1 = yes, test program is running
Alarm Buzzer	148	1, 5, 15	0 = no, buzzer off 1 = yes, buzzer on
Panel Alarm Control	149	1, 5, 15	0 = alarm deactive, 1 = alarm active

### Controller Status

- Modbus Function Code: 2
- Modbus Start Address: 3
- Modbus Block Size: 3
- Number of Blocks: 1

Description	Modbus Address	Function	Comments
Raw Switch Output1	3	2	0 = HC1 relay off, 1 = HC1 relay on
Keylock Status	4	2	0 = no, 1 = yes, locked
Raw Switch Output2	5	2	0 = HC2 relay off, 1 = HC2 relay on

## INPUT Parameters

- Modbus Function Code: 3, 6, 16
- Modbus Start Address: 0
- Modbus Block Size: 19
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Control Moisture Setpoint 1	0	3, 6, 16	1–10	–	1
Switch Control Mode	2	3, 6, 16	4 = Line/Line, 5 = ECO1/ECO1, 6 = Line/ECO1, 7 = ECO1/Line, 8 = Line/OFF, 9 = ECO1/OFF, 10 = OFF/Line, 11 = OFF/ECO1, 12 = OFF/OFF, 13 = Line/ECO2, 14 = ECO1/ECO2, 15 = ECO2/ECO2, 16 = OFF/ECO2, 17 = ECO2/OFF, 18 = ECO2/Line, 19 = ECO2/ECO1	–	1
Sensor Setup	7	3, 6, 16	bit 1 = TS 1 assign for Circuit 1 bit 2 = TS 2 assign for Circuit 1 bit 5 = TS 1 assign for Circuit 2 bit 6 = TS 2 assign for Circuit 2 bit 0,3,4,7 = NA 0 = No (No select) 1 = Yes (Select)	–	1

Language	8	3, 6, 16	0 = DANISH, 1 = GERMAN, 2 = DUTCH, 3 = ENGLISH, 4 = FRENCH, 5 = ITALIAN, 6 = SWEDISH, 7 = NORWEGIAN, 8 = FINNISH, 9 = RUSSIAN, 10 = CZECH, 11 = POLISH, 12 = JAPANESE, 13 = MANDARIN, 14 = LITHUANIAN	–	1
Country	9	3, 6, 16	0 = GERMANY, 1 = AUSTRIA, 2 = SWITZERLAND, 3 = UK, 4 = FRANCE, 5 = ITALY, 6 = POLAND, 7 = CZECH REPUBLIC, 8 = DENMARK, 9 = BELGIUM, 10 = RUSSIA, 11 = CHINA, 12 = JAPAN, 13 = SWEDEN, 14 = NORWAY, 15 = LITHUANIA, 16 = SLOVAKIA, 17 = NETHERLANDS, 18 = FINLAND, 19 = IRELAND	–	1
Cable type 1	10	3, 6, 16	0 = CABLE_GM2CW, 1 = CABLE_EMMI, 2 = CABLE_ICESTOPGM2X, 3 = CABLE_EMEM2XR, 4 = CABLE_FROSTSTOP_BLACK, 5 = CABLE_WINTER_GARD, 6 = CABLE_WINTERGARD_MAT	–	1

Cable type 2	11	3, 6, 16	0 = CABLE_GM2CW, 1 = CABLE_EMMI, 2 = CABLE_ICESTOPGM2X, 3 = CABLE_EMEM2XR, 4 = CABLE_FROSTSTOP_BLACK, 5 = CABLE_WINTER_GARD, 6 = CABLE_WINTERGARD_MAT	–	1
Date – Year	13	3, 6, 16	18 – 99	year	1
Date – Month	14	3, 6, 16	1 – 12	month	1
Date – Day	15	3, 6, 16	1 – 31	day	1
Time – Hour	16	3, 6, 16	0 – 23	hour	1
Time – Minute	17	3, 6, 16	0 – 59	minute	1
Control Moisture Setpoint 2	18	3, 6, 16	1 – 10	–	1

### Temperature Sensor Parameters

- Modbus Function Code: 3, 6, 16
- Modbus Start Address: 20
- Modbus Block Size: 4
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
TS 1 Upper Limit	20	3, 6, 16	0°C – 5°C	°C	10ths*
TS1 Lower Limit	21	3, 6, 16	–31°C – 5°C –31°C = Off	°C	10ths*
TS 2 Upper Limit	22	3, 6, 16	0°C – 5°C	°C	10ths*
TS 2 Lower Limit	23	3, 6, 16	–31°C – 5°C –31°C = Off	°C	10ths*

\* Temperature displayed in 1/10th of °C (example: 10°C = 100)

### Override

- Modbus Function Code: 3, 6, 16
- Modbus Start Address: 34
- Modbus Block Size: 2
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Remote Override Status 1	4	6, 16	0 = Override not active 1 = Force on Override active 2 = Force off Override active	–	–
Remote Override Status 2	35	3, 6, 16	0 = Override not active 1 = Force on Override active 2 = Force off Override active	–	–

### Output Delay

- Description: Output Delay
- Modbus Address: 40
- Function: 3, 6, 16
- Comments: 0 to 60
- Units: sec
- Scaling: 1

### Ice Rain Feature & Sensor Types

Description	Modbus Address	Function	Comments	Units	Scaling
Global Ice Rain Enable	60	3, 6, 16	0 = disabled, 1 = enabled	–	–
Fallback Setpoint	61	3, 6, 16	–5°C to 5°C	°C	10ths
Gradient Setpoint	62	3, 6, 16	0.5 K to 4 K	K	10ths
18h Ground Setpoint	63	3, 6, 16	–15°C to –1°C	°C	10ths
Sensor Typ 1	64	3, 6, 16	0 = UNKNOWN, 1 = ROOF, 2 = RAMP	–	1
Sensor Typ 2	65	3, 6, 16	0 = UNKNOWN, 1 = ROOF, 2 = RAMP	–	1

### Controller's Identification Tag

- Modbus Function Code: 3, 6, 16
- Modbus Start Address: 90
- Modbus Block Size: 10
- Number of Blocks: 1



Description	Modbus Address	Function	Comments	Units	Scaling
Controller's Identification Tag	90 to 99	, 6, 16	<p>Letters (A – Z) numbers (0–9), /.( ) _ – # Two characters per address.</p> <p>String terminators = Null or space Note: LSByte of 99 is always Null.</p> <p>Input the ascii code for the characters above, for example, input 0 x 4142 (Hex or 16706 in Dec) for register 90,</p> <p>and 0x3031 (in Hex or 12337 in Dec) for register 91, then the controller ID will be AB01.</p>	–	–

### Console Parameters

- Modbus Function Code: 3, 6, 16
- Modbus Start Address: 120
- Modbus Block Size: 2
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Keylock Passcode	120	3, 6, 16	<p>1 to 9999:</p> <p>Incorrect passcode input will be ignored, and correct input will be valid for</p> <p>2 minutes. (used to enter the code to</p> <p>unlock access to register 121)</p>	–	–
Lock Enable/Disable	121	3, 6, 16	<p>0 = Keylock inactive,</p> <p>1 = Keylock active</p>	–	–

### Communication Parameters

- Modbus Function Code: 3, 6, 16
- Modbus Start Address: 147
- Modbus Block Size: 1
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Communications Activity Time – out	147	3, 6, 16	Used for load shedding and remote override 0–255	sec	1

### General Controller Information

- Modbus Function Code: 4
- Modbus Start Address: 0
- Modbus Block Size: 4
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Device Type	0	4	Fixed value = 650	–	1
Firmware Version	1	4	Firmware Version – Major 0–255	–	1
Firmware Version	2	4	Firmware Version – Minor 0–255	–	1
Firmware Version	3	4	Firmware Version – Build 0–255	–	1

### Dynamic Output Status

- Modbus Function Code: 4
- Modbus Start Address: 50
- Modbus Block Size: 9
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Control Output Duty Cycle 1	50	4	For Line, ECO1 and ECO2 mode. 100 = full on, 70 = ECO2 mode or ECO1 mode and matching temp.	%	1
Tracing Control Status	51	4	2 digits, the first for circuit 1 and the second for circuit 2 (for example 0 means both are normal, 12 means circuit 1 = force off, circuit 2 = test program)  0 = normal temperature control 1 = output override force off 2 = Test program in progress 5 = output override force on	–	1
Control Output Duty Cycle 2	8	4	For Line, ECO1 and ECO2 mode. 100 = full on, 70 = ECO2 mode or ECO1 mode and matching temp.	%	1

## Analog Readings

- Modbus Function Code: 4
- Modbus Start Address: 81
- Modbus Block Size: 4
- Number of Blocks: 1

Description	Modbus Address	Function	Comments	Units	Scaling
Current TS 1 Temperature	81	4	TS 1 failure = +3000.0°C TS 1 not used = +3200.0°C	°C	10ths*
Current TS 2 Temperature	82	4	TS 2 failure = +3000.0°C TS 2 not used = +3200.0°C	°C	10ths*
Last TS1 Moisture Value	83	4	3001 = Invalid/Off, Valid Range 0 ...10	–	1
Last TS2 Moisture Value	84	4	3001 = Invalid/Off, Valid Range 0 ...10	–	1

\* Temperature displayed in 1/10th of °C (example: 10°C = 100)


## Disclaimer

MODBUS map information is proprietary and confidential. Use of this information is permitted solely in order to implement a communications link between customer equipment and nVent RAYCHEM controllers. It may not be used for any other purpose, and it is not to be disclosed to 3rd parties without the written consent of nVent Thermal LLC.

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## Documents / Resources

	<p><a href="#">nVent RAYCHEM Elexant 650c-Modbus Protocol Interface Mapping Unit</a> [pdf] User Manual E650C-G, Elexant 650c-Modbus Protocol Interface Mapping Unit, Elexant 650c-Modbus, Protocol Interface Mapping Unit, Interface Mapping Unit, Mapping Unit, Unit</p>
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## References

- [🔥 Electrical Heat Tracing | Heat Tracing | nVent RAYCHEM](#)
- [User Manual](#)

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