TRV

Advanced Information Product Manual

Engineering Specification

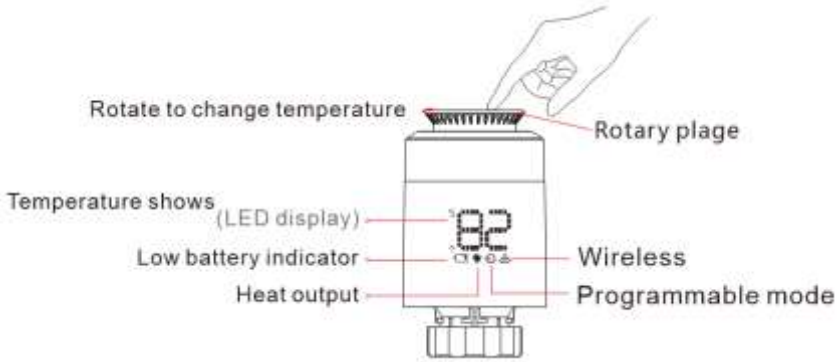
TRV Advanced Information Product Manual

Document No.	Engineering Specification – Z-Wave™ Product Line (Z-TRV-V01)
Version	2.1
Description	This document mainly introduces the new generation TRV. The content mainly includes its interfaces, accessories, features, specifications, quick start, and software function definition. This device is a security enabled Z-Wave Plus™ v2 product that is able to use encrypted Z-Wave Plus v2 messages to communicate to other security S2 enabled Z-Wave Plus v2 products. This device must be used in conjunction with a security enabled Z-Wave controller in order to fully utilize all implemented functions. This product can be operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers. All non-battery operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.
Written By	
Date	
Reviewed By	
Date	
Approved By	
Date	

Version	Date	Brief description of changes
2.0	2023.06.26	First revision.
2.1	2023.07.29	Add Thermostat Mode 0x1F.

Table of Content

1 INTERFACES & INSTALLATION



Terminology	Description
LED	Indicates Temperature or low battery or Z-Wave network status
Rotary plage	Rotate to change room set temperature
QR Code	2D barcode format that can contain large amounts of information in a small square of encoded blocks resembling a random checkerboard pattern. In Z-Wave, it is used to represent the S2 public part of the DSK on a device, as well as additional information needed for the inclusion process

2 FEATURES & SPECIFICATIONS

2.1 Structural Characteristics

Parameter	Value
Product Identifier	Z-TRV-V01
Dimensions	⌀55mm * 94.3mm
Weight	
Color	White
Shell Material	
Usage	For indoor use.
Relative Humidity	Up to 85% non-condensing

2.2 Hardware Characteristics

Parameter	Value
Z-Wave Module	ZGM130S037HGN2R
Z-Wave TX Power	Max: 13dBm
Z-Wave Antenna Distance	40m (Indoor) /100m (Outdoor)
Display	LED screen
Power	2A battery
Operating Temperature	5° C -30° C
Temperature setting accuracy	0.5° C
Room temperature display range	0° C -50° C

2.3 Software Characteristics

Parameter	Value
Wireless Technology	Z-Wave
Certification Type	Z-Wave Plus v2
Z-Wave SDK Version	7.16.03

Z-Wave Library Type	Enhanced 232 Slave
Z-Wave Role Type	ZWAVEPLUS_INFO_REPORT_ROLE_TYPE_SLAVE_SLEEPING_LISTENING(0x07)
Generic Device Type	GENERIC_TYPE_THERMOSTAT (0x08)
Specific Device Type	SPECIFIC_TYPE_THERMOSTAT_GENERAL_V2 (0x00)
Security Class	Non-Security, S2-UNAUTHENTICATED, S2-AUTHENTICATED
SmartStart	Support. After powering on, SmartStart is auto active if it' s out of the Z-Wave network.
Over The Air （OTA）	Support. Firmware can be updated via RF.
Multichannel Device	No
Association	Support. Refer to Section 4.7 Association Group Info.
Factory Reset	Support. Refer to Section 3.6 How to factory reset.
Power-down Memory	Support. All command settings will stay unchanged even power down.
Room Temperature Report	Support. When room temperature change is greater than 0.5℃(Configurable by param 8)or the report interval is reached(Configurable by param 7).
Thermostat Mode Report	Support. When the TRV mode changed.
Thermostat Setpoint Report	Support. When setting temperature changed.
Low battery warning	Support.
Timed battery report	Support.
External Temperature	Support. Refer to Section 3.10 How to Use External Temperature.
Direct valve control	Support. Refer to Section 4.9 Switch Multilevel.

3 PRODUCT QUICK START

3.1 Important safety information

Please read this Engineering Specification carefully for correct and effective use.

Failure to follow the recommendations set forth by ZVIDAR Limited may be dangerous or cause a violation of the law. The manufacturer, importer, distributor, and/or reseller will not be held responsible for any loss or damage resulting from not following any instruction in this guide or in other materials.

The product is intended for indoor use in dry locations only. Do not use in damp, moist, and /or wet locations.

3.2 About Z-Wave

Z-Wave is the international wireless protocol for communication in the Smart Home.

Z-Wave ensures a reliable communication by reconfirming every message (two-way communication) and every mains powered node can act as a repeater for other nodes (meshed network) in case the receiver is not in direct wireless range of the transmitter.

This device and every other certified Z-Wave device can be used together with any other certified Z-Wave device regardless of brand and origin as long as both are suited for the same frequency range.

If a device supports secure communication it will communicate with other devices secure as long as this device provides the same or a higher level of security. Otherwise it will automatically turn into a lower level of security to maintain backward compatibility.

3.3 About SmartStart

SmartStart enabled products can be added into a Z-Wave network by scanning the Z-Wave QR Code present on the product with a controller providing SmartStart inclusion. No further action is required and the SmartStart product will be added automatically within 10 minutes of being switched on in the network vicinity.

3.4 How to add the product into Z-Wave network

1. Follow the user guide of hub to enter inclusion mode.

2. In "OF" state, short press rotary plate three times until the screen shows "--", enter "Include mode"

3. The screen will show "PA" after few seconds, which meant the inclusion is successful. And the "((•))" will light on. Otherwise, the inclusion is failed, which you will need to repeat the process form step 1

3.5 How to remove the product from Z-Wave network

1. Follow the user guide of hub to enter exclusion mode.

2. In "OF" state, short press rotary plate three times until the screen shows "--", enter " Exclusion mode "

3. The screen will turn back to "OF" after few seconds, which meant the exclusion is successful. The "" light will be off. Otherwise, the exclusion is failed which you will need to repeat the process form step 1

3.6 How to factory reset

1. Please use this procedure only when the network primary controller is missing or otherwise inoperable.

2. In "OF" state, press and hold rotary plate for at least 5 seconds and release when the screen will blink "OF". When the reset is successful, the screen will show "OF" in solid for 2 seconds then turn off. And TRV will reset itself to factory default by sending a "Device Reset Locally Notification" to gateway.

3.7 Z-Wave DSK Location

You can find the QR code when press buckle to take off cover.

You may also find the QR Code and DSK card in the individual package of each product.

Please do not remove or damage them.

3.8 About Product

This product can be operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers. All mains operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

3.9 About Security

This device is a security enabled Z-Wave Plus product that is able to use encrypted Z-Wave Plus messages to communicate to other security enabled Z-Wave Plus products. S2 Security Enabled Controller is required to operate the device.

4 SOFTWARE FUNCTION DEFINITION

4.1 User Behavior Interaction

User behavior	Out of the Z-Wave network	In the Z-Wave network
Power on	Send Inclusion Requests for SmartStart	TRV will match valve stroke
Inclusion network	In "OF" state, short press rotary plate three times until the screen shows "--", enter "Include mode"	NA
Exclusion network	NA	In "OF" state, short press rotary plate three times until the screen shows "--", enter "Exclusion mode"
Factory reset	NA	In "OF" state, press and hold rotary plate for at least 5 seconds and release
Set Temperature	The display temperature will be changed when rotary the rotary plage	The display temperature will be changed when rotary the rotary plage or receive a Thermostat Setpoint Set. Send Thermostat Setpoint Report to association group
Set Mode	The mode will be changed when rotary the rotary plage	The mode will be changed when rotary the rotary plage or receive a Thermostat Mode Set. Send Thermostat Mode Report to association group

4.2 Supported Command Classes

Command		Mapped
COMMAND_CLASS_ZWAVEPLUS_INFO_V2	2	None
COMMAND_CLASS_TRANSPORT_SERVICE_V2	2	None
COMMAND_CLASS_SECURITY_2_V1	1	None
COMMAND_CLASS_SUPERVISION_V1	1	None
COMMAND_CLASS_APPLICATION_STATUS	1	None
COMMAND_CLASS_VERSION_V2	3	Highest granted Security Class
COMMAND_CLASS_ASSOCIATION_V2	2	Highest granted Security Class

COMMAND_CLASS_ASSOCIATION_GRP_INFO_V3	3	Highest granted Security Class
COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION_V3	3	Highest granted Security Class
COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2	2	Highest granted Security Class
COMMAND_CLASS_DEVICE_RESET_LOCALLY_V1	1	Highest granted Security Class
COMMAND_CLASS_BATTERY_V1	1	Highest granted Security Class
COMMAND_CLASS_CONFIGURATION_V4	4	Highest granted Security Class
COMMAND_CLASS_SWITCH_MULTILEVEL_V4	4	Highest granted Security Class
COMMAND_CLASS_SENSOR_MULTILEVEL_V11	11	Highest granted Security Class
COMMAND_CLASS_THERMOSTAT_MODE	3	Highest granted Security Class
COMMAND_CLASS_THERMOSTAT_SETPOINT	3	Highest granted Security Class
COMMAND_CLASS_FIRMWARE_UPDATE_MD_V5	5	Highest granted Security Class
COMMAND_CLASS_POWERLEVEL_V1	1	Highest granted Security Class
COMMAND_CLASS_INDICATOR_V3	3	Highest granted Security Class

4.3 Basic Command Class mapping

Basic Command maps to Thermostat Mode Command Class, as shown below.

Command	Value	Mapped	Value	Function
Basic Set	0x00	Thermostat Mode Set	0x00	No Heating, Only Frost-protection
	0xFF		0x01	TRV into comfort heating mode
	0x1F		0x1F	TRV into direct Valve control mode
Basic Report	0x00	Thermostat Mode Report	0x00	off
	0xFF		0x01	Heat Mode
	0x1F		0x1F	Manufacturer Specific
Basic Get		Thermostat Mode Get		

4.4 ZWAVEPLUS_INFO

The Command is used to differentiate between Z-Wave Plus v2, Z-Wave for IP and Z-Wave devices. This command provides additional information about the Z-Wave Plus v2 device in question.

Parameter	Value
Z-Wave Plus Version	0x02
Role Type	0x07 (ZWAVEPLUS_INFO_REPORT_ROLE_TYPE_SLAVE_SLEEPING_LISTENING)
Node Type	0x00 (ZWAVEPLUS_INFO_REPORT_NODE_TYPE_ZWAVEPLUS_NODE)
Installer Icon Type	0x1200 (ICON_TYPE_GENERIC_THERMOSTAT)
User Icon Type	0x1200 (ICON_TYPE_GENERIC_THERMOSTAT)

4.5 Manufacturer Specific

The Command is used to advertise manufacturer specific information.

Parameter	Value
Manufacturer ID 1	0x04
Manufacturer ID 2	0x5A
Product Type ID 1	0x04
Product Type ID 2	0x00
Product ID 1	0x05
Product ID 2	0x01

4.6 Version

The Command may be used to obtain the Z-Wave library type, the Z-Wave protocol version used by the application, the individual command class versions used by the application.

Parameter	Value
Z-Wave Protocol Library Type	0x03
Z-Wave Protocol Version	0x07
Z-Wave Protocol Sub Version	0x10
Firmware 0 Version	Z-Wave Chip Firmware Version Major
Firmware 0 Sub Version	Z-Wave Chip Firmware Version Minor

Hardware Version	0x01
Number of firmware targets	0x00

4.7 Association Group Info

The Command is used to manage associations to Node ID destinations.

ID	Name	Count	Profile	Function
1	Lifeline	5	General: Lifeline (0x0001)	**Battery Report(0x8003):** Battery level change is greater than 5%(configurable) or the report interval is reached (Configurable by param 8). **Switch Multilevel Report(0x2603):** Issued when valve opening level changes. **Sensor Multilevel Report(0x3103):** Issued when Room temperature change is greater than 0.5℃ (configurable) or the report interval is reached. **Thermostat Mode Report (0x4003):** Issued when the TRV mode changed. **Thermostat Setpoint Report(0x4303):** Issued when setting temperature changed. **Device Reset Locally Notification (0x5A01):** Issued when Factory Reset is performed. **Indicator Report(0x8703):** Issued when indicator set received

4.8 Sensor Multilevel

The Command is used to advertise room temperature.

1. Support Sensor Type: Air Temperature(0x01)
2. Support Temperature scale: 0x03(Celcius & Fahrenheit)

The TRV support receive a Sensor Multilevel Report temperature used to instead of its temperature sensor.

4.9 Switch Multilevel

Allows to request the valve opening in percent. 0% represents a fully shut valve. 100 % a fully open valve. The valve opening can be reported on change. If the configuration parameter is set.

Controlling the valve directly via multilevel switch command class is only possible if the TRV is in manufacturer specific mode.

4.10 Thermostat Mode

The Command is used to advertise Thermostat Mode.

Mode	Name	Description
0x00	Off	No heating
0x01	Heat	TRV into comfort heating mode. The room temperature will be kept at the configured comfortable level.
0x1F	Manufacturer Specific	TRV into direct valve control mode. The valve opening percentage can be controlled using the Switch multilevel command class.

4.11 Thermostat Setpoint

The Command is used to advertise thermostat Setpoint.

1. Support Thermostat Setpoint: 0x02(Heating)
2. Thermostat Setpoint Capabilities:

   Setpoint Type = 0x01(Heating)

   Min Value Precision = 0x01

   Min Value Scale = 0x00(Celcius)

   Min Value Size = 0x02

   Min Value = 0x0032

   Max Value Precision = 0x01

   Max Value Scale = 0x00(Celcius)

   Max Value Size = 0x02

   Max Value = 0x012C

4.12 Indicator

The Command is used to help end users to monitor the operation or condition of the application provided by a supporting node.

Indicator ID		Property ID	
Node Identify	0x50	On Off Period	0x03
		On Off Cycles	0x04
		On time within an On/Off period	0x05

4.13 Configuration

The Command allows product specific configuration parameters to be changed.

Note: No Bulk Support equals to True. ***It will return an Application Rejected Request Command when receiving Configuration Bulk Set or Get (if received without Supervision encapsulation).*** It will reset all its configuration parameters if either manually reset to factory default or receives a Configuration Default Reset Command. It will NOT modify or reset any configuration parameter when being included or excluded of a Z-Wave network.

Parameter 1:

Parameter	**0x01 (1)**			
Name	Open window detect function			
Info	Open window detect function			
Properties	Size	1	Min Value	0
	Format	Enumerated	Max Value	1
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False
Description	When use radiator to heating, the window is opened, when room temperature drop 6℃ in 4 minutes, TRV will close valve automatic, display will show "OP" ,When window is closed, meanwhile room temperature increase 2℃,TRV will open valve automatic, back to operation mode.			
	Value	Function		
	0	Disable.		
	1	Enable.		

Parameter 2:

Parameter	**0x02 (2)**			
Name	Anti-freezing function			
Info	Anti-freezing function			
Properties	Size	2	Min Value	0
	Format	Enumerated	Max Value	1
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False

Description	The TRV is at "☞" state, the screen show 🔥. Anti-freezing function: the valve will be opened when the temperature is below 5℃,when the temperature rises to 8℃,the valve will be closed.	
	Value	Function
	0	Disabled.
	1	Enabled.

Parameter 3:

Parameter	**0x03 (3)**			
Name	Measured temperature offset			
Info	Measured temperature offset			
Properties	Size	1	Min Value	-6
	Format	Signed Integer	Max Value	6
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False
Description	Offsets the measured temperature by-6.0℃ – (+)6.0℃.			
	Value	Function		
	0	0℃ Offset.		
	0xFA-0x06	-6~(+)6℃ Offset		

Parameter 4:

Parameter	**0x04 (4)**			
Name	Set away home mode			
Info	Set away home mode			
Properties	Size	1	Min Value	0
	Format	Enumerated	Max Value	1
	Read-only	False	Default Value	0

	Altering capabilities	False	Advanced	False
Description	Set away home.			
	Value	Function		
	0	No.		
	1	Yes.		

Parameter 5:

Parameter	**0x05 (5)**			
Name	Anti-scale function			
Info	Anti-scale function			
Properties	Size	1	Min Value	0
	Format	Enumerated	Max Value	1
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False
Description	If radiator not open within two weeks or long time not open will let valve clogged as scale, radiator will be damaged. In order to let radiator to use normally, TRV will open valave running 30 seconds every two weeks, display will show "AS", when run finished will recovery running condition.			
	Value	Function		
	0	Disabled.		
	1	Enabled.		

Parameter 6:

Parameter	**0x06 (6)**			
Name	Valve opening level report threshold			
Info	Valve opening level report threshold			
Properties	Size	1	Min Value	0

	Format	Unsigned Integer	Max Value	99
	Read-only	False	Default Value	1
	Altering capabilities	False	Advanced	False
Description	Valve opening level change threshold. The unit = %.			
	Value	Function		
	0	Disabled.		
	1-99	1%-99%.		

Parameter 7:

Parameter	**0x07 (7)**			
Name	Temperature auto report interval time			
Info	Temperature auto report interval time			
Properties	Size	4	Min Value	0
	Format	Unsigned Integer	Max Value	2678400
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False
Description	The time interval when to send the temperature report. The unit= second.			
	Value	Function		
	0	Disable.		
	1-2678400	1-2678400s.		

Parameter 8:

Parameter	**0x08 (8)**			
Name	Temperature change report threshold			
Info	Temperature change report threshold			
Properties	Size	1	Min Value	0
	Format	Unsigned Integer	Max Value	100

	Read-only	False	Default Value	5
	Altering capabilities	False	Advanced	False

Description	Temperature change threshold, unit 0.1℃.	
	Value	Function
	0	Disable.
	1-100	0.1-10.0℃.

Parameter 9:

Parameter	**0x09 (9)**			
Name	Battery auto report interval time			
Info	Battery auto report interval time			
Properties	Size	4	Min Value	0
	Format	Unsigned Integer	Max Value	2678400
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False

Description	The time interval when to send the battery report. The unit= second.	
	Value	Function
	0	Disable.
	1-2678400	1-2678400s.

Parameter 10:

Parameter	**0x0A (10)**			
Name	Battery change report threshold			
Info	Battery change report threshold			
Properties	Size	1	Min Value	1
	Format	Unsigned Integer	Max Value	50
	Read-only	False	Default Value	5

	Altering capabilities	False	Advanced	False
Description	Battery power change threshold. The unit = %			

Value	Function
0	Disable.
1-50	1-50%.

Parameter 11:

Parameter	0x0B (11)			
Name	Enable child lock			
Info	Enable child lock			
Properties	Size	1	Min Value	0
	Format	Enumerated	Max Value	1
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False
Description	Enable child lock.			

Value	Function
0	Disabled.
1	Enabled.

Parameter 12:

Parameter	0x0C (12)			
Name	Enable external temperature sensor			
Info	Enable external temperature sensor			
Properties	Size	1	Min Value	0
	Format	Enumerated	Max Value	1
	Read-only	False	Default Value	0
	Altering	False	Advanced	False

	capabilities			
Description	Enable or Disable External temperature sensor.			

Value	Function
0	Disable external temperature sensor. The para 13 and para 14 is invalid.
1	Enable external temperature sensor. The value set by para 13 and para 14 will be used by TRV.

Parameter 13:

Parameter	**0x0D (13)**			
Name	External temperature			
Info	External temperature			
Properties	Size	2	Min Value	-500
	Format	Signed Integer	Max Value	500
	Read-only	False	Default Value	0
	Altering capabilities	False	Advanced	False
Description	Set external temperature. The unit = 0.1℃			

Value	Function
0xFE0C-0x01F4	-500~500 is -50.0℃ ~ 50.0℃

Parameter 14:

Parameter	**0x0E (14)**			
Name	External temperature timeout			
Info	External temperature timeout			
Properties	Size	2	Min Value	0
	Format	Unsigned Integer	Max Value	300
	Read-only	False	Default Value	30
	Altering capabilities	False	Advanced	False

Description	External temperature timeout. The unit= Minute.	
	Value	Function
	0	The external temperature does not timeout,
	1-300	1-300 Minute.