



# Installation, Operation and Maintenance Manual

# Connected Roof System

## Gateway & Monitor

### NOTICE

Watts is not responsible for the failure of alerts due to connectivity or power issues.

### WARNING



Read this Manual **BEFORE** using this equipment. Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment. Keep this Manual for future reference.

### WARNING

You are required to consult the local building and plumbing codes prior to installation. If the information in this manual is not consistent with local building or plumbing codes, the local codes should be followed. Inquire with governing authorities for additional local requirements.

### WARNING

**Need for Periodic Inspection and Yearly Maintenance:** Periodic inspection and yearly maintenance by a licensed contractor is required. Corrosive water conditions and/or unauthorized adjustments or repair could render the valve ineffective for service intended. Regular checking and cleaning of the valve's internal components and check stops helps assure maximum life and proper product function. Frequency of cleaning and inspection depends upon local water conditions.



INTELLIGENT  
ROOF



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# 1 Introduction

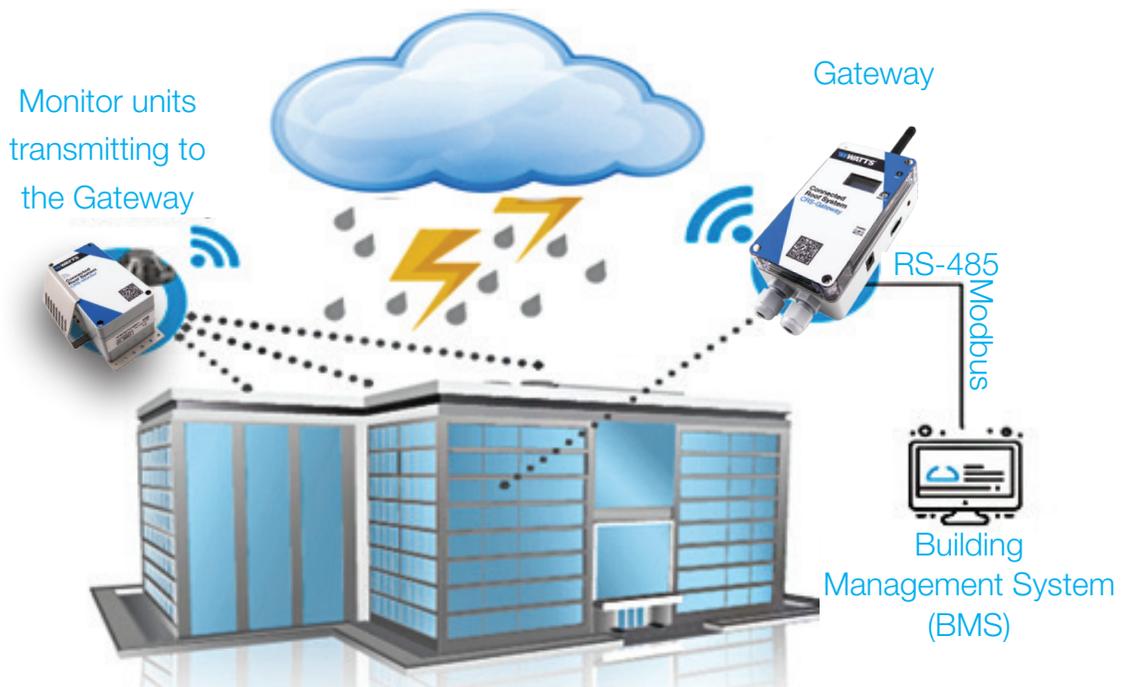
**Watts Connected Roof System** minimizes the risk of damage to construction, production, warehouse, commercial sites or stock facilities, while increasing the lifetime of the roof. The system consists of Gateway(s) and Monitors. The Monitor is mounted next to the roof drain and collects water level and temperature data. The Monitor sends a wireless signal to the Gateway. Easy installation of the wireless Monitor allows **Connected Roof** to detect water levels and temperatures across the rooftop and immediately alert you as soon as drain clogging, or other performance problems occur, allowing for increased safety, more predictable maintenance and reduced maintenance costs.

**Connected Roof** can be installed as a stand-alone system or be integrated with your Building Management Systems (BMS) which allows an easy overview of your facilities

The Gateway functions as a master to the Monitors with one Gateway monitoring up to 16 Monitors. Additional Gateways must be installed if you have more than 16 Monitors in the system.

You can set the system up in different ways to receive the information.

- 1) The information can be read directly on the Gateway display.
- 2) You can use the relay output to trigger a visual or an acoustic alarm.
- 3) You can use the Modbus signal to communicate directly with your Building Management System (BMS) and generate email alerts if supported.



This user manual and installation guide describes the installation and start-up for **Watts Connected Roof Gateway** item number #8200875, and how to connect the Connected Roof Monitor item number #8200874 to the Gateway.

## 2 Delivery Confirmation

Upon delivery, please check that all components of the **Connected Roof System** are included in the box. Should something be missing, contact your dealer at once.

### Gateway:

Item	Description	Quantity
Gateway	Connected Roof Gateway	1
Power supply	5VDC, 1A	1
MicroSD Card	MicroSDHC, Class 4, 4 GB	1
Antenna	915 MHz SMA connection	1
Quick start	Getting started instructions	1

### Monitor:

Item	Description	Quantity
Monitor	Connected Roof Monitor	1
Mounting bracket	Mounting frame for Monitor	1
Quick start	Getting started instructions	1

### Optional accessories:

Item	Description	
External antenna	915 MHz SMA connection w/8' (2.5m) cable	Must to be ordered separately, item number (8200873)

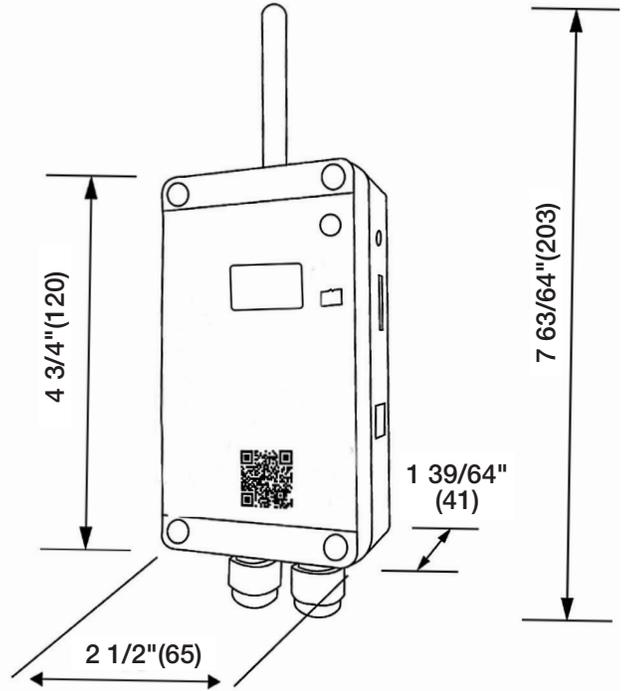
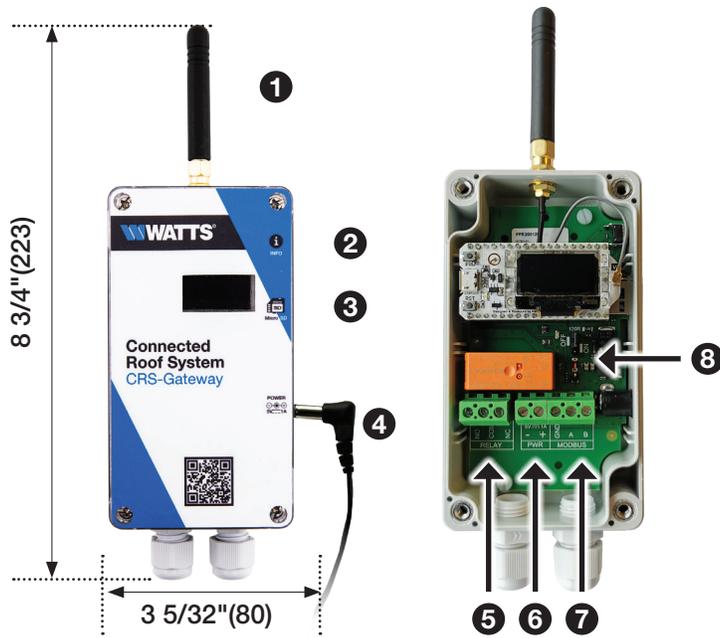
## 3 Safety Instructions and Regulations

Installation must be suitable for the on-site conditions and comply with the local regulations and technical rules.

### **⚠ WARNING**

Please note that alterations, or improper repairs to the product are not permitted. If alterations or improper repairs are carried out, the CE-mark and the manufacturer's warranty will become invalid.

## 4 Technical Specifications



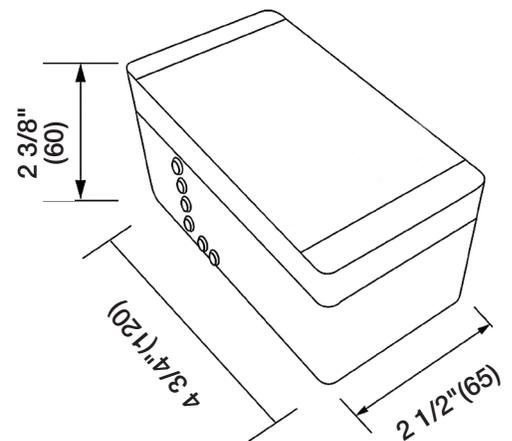
### 4.1 Product overview

#### GATEWAY

1. Antenna
2. Info button
3. MicroSD card
4. Input for power supply
5. Relay output
6. Internal power supply
7. Modbus
8. Jumper switch

#### MONITOR

9. Mounting bracket
10. Level sensor
11. Monitor ID



## 4.2 Gateway Specifications

<b>Power supply</b>	
Voltage	5V DC 1A
Nominal power	0.5W
Electrical protection class	Class 3
<b>Wireless</b>	
Frequency	915 MHz
Antenna connector	SMA
Signal range	Up to 4921'/1500m in free line of sight
<b>User input</b>	
Push button	1
<b>Display</b>	
Type	0.96" OLED
Size	128*64 dot
<b>Micro SD card</b>	
Type	Micro SDHC Class 4 or higher
Size	>4 GB
<b>Relay</b>	
Type	1RT NO/NC
Load limit	230VAC 5A
Connection	3 pin screw terminals (Max 1/16" <sup>2</sup> / 1.5mm <sup>2</sup> )
<b>MODBUS</b>	
Physical Layer	RS485
Baud rate	Up to 115200 Bauds
Connection	3 pin screw terminals (Max 1/16" <sup>2</sup> / 1.5mm <sup>2</sup> )
Termination	Yes, ON/OFF jumper configuration
<b>Cable glands</b>	
Size	PG7 (diameter 3/32"-1/4"/2.5-6.5mm)
<b>Enclosure</b>	
IP protection	IP 30
Material	ABS
Size	4 3/4" x 2 1/2" x 1 39/64" (120 x 65 x 41mm)(without antenna and cable glands)
Mounting hole	5/32"(4mm)
<b>Environmental</b>	
Working temperature	-14°F - 131°F/-10°C - 55°C
Storage temperature	-22°F - 176°F/-30°C - 80°C
Humidity	Below 80% non-condensing

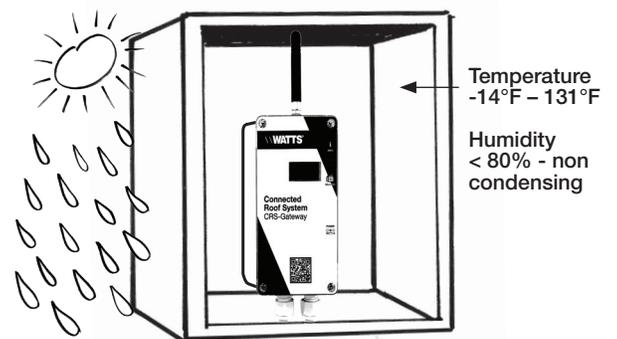
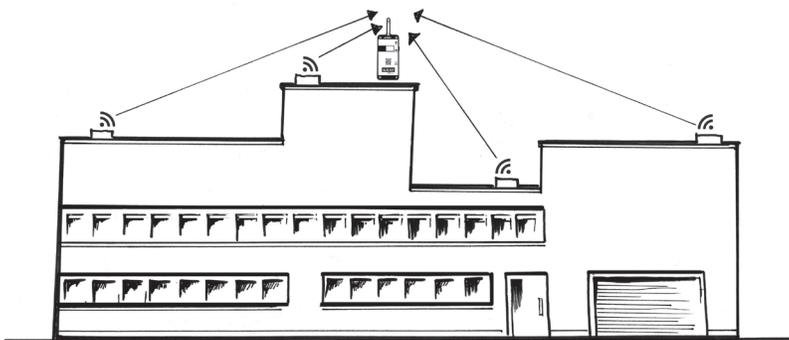
## 4.3 Monitor Specifications

Power supply	
Battery	Lithium battery LS 14500 3.6V (internal) AA
Battery life	Up to 10 years
Level Sensor	
Sensor electrodes	Stainless A2
Enclosure	
IP protection	IP68
Material	Anti-UV PC
Size	4 3/4" x 2 1/2" x 2 3/8" (120 x 65 x 60mm)
Environmental	
Working temperature	-31°F - 185°F/-35°C - 85°C
Storage temperature	-31°F - 185°F/-35°C - 85°C

## 5 Mechanical installation

### 5.1 Gateway

We recommend that the Gateway is placed centrally in relation to the Monitors, and in line of sight to ensure the best possible signal strength. Please note that obstructions such as concrete and metal can reduce the signal range.

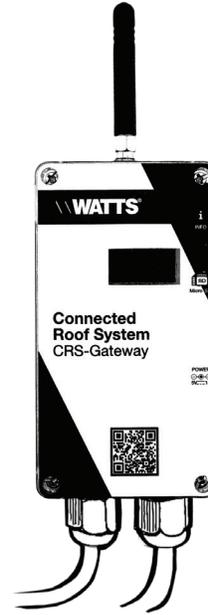
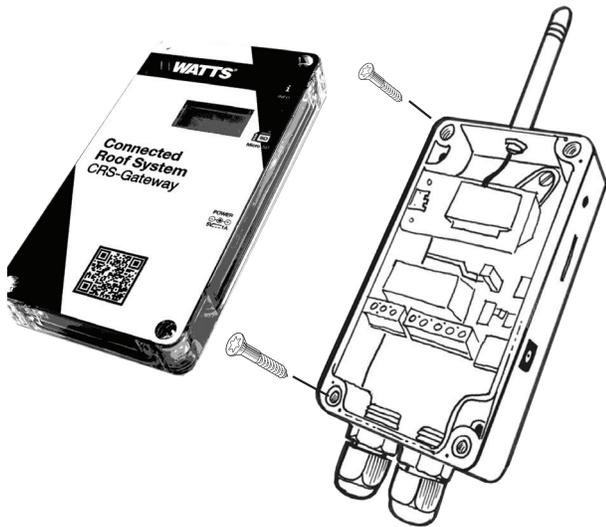


#### **⚠ WARNING**

Do not install the Watts Connected Roof Gateway in areas with a risk of water exposure and high humidity levels. The ambient temperature should be in the range between -14°F and 131°F and the humidity below 80% non-condensing. Please consider the material/thickness of the gateway enclosure for maximized signal strength.

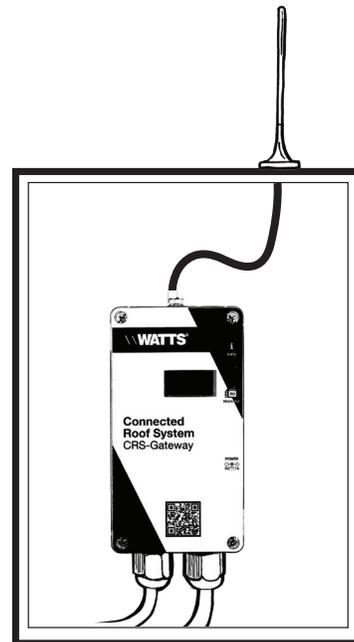
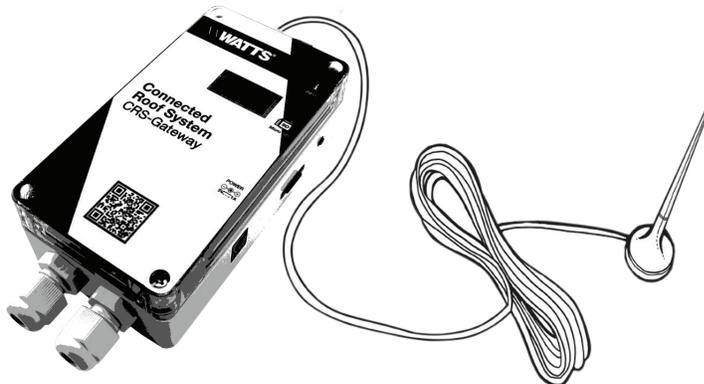
# Mounting Instructions

To mount the enclosure:



Unscrew the 4 no. screws on the front cover, then remove the front cover to access the mounting holes. The mounting holes are 5/32" (4mm), and screws are not included.

Ensure there is enough free space around the unit to enable access to the MicroSD card, and to allow space for the antenna and cable glands.

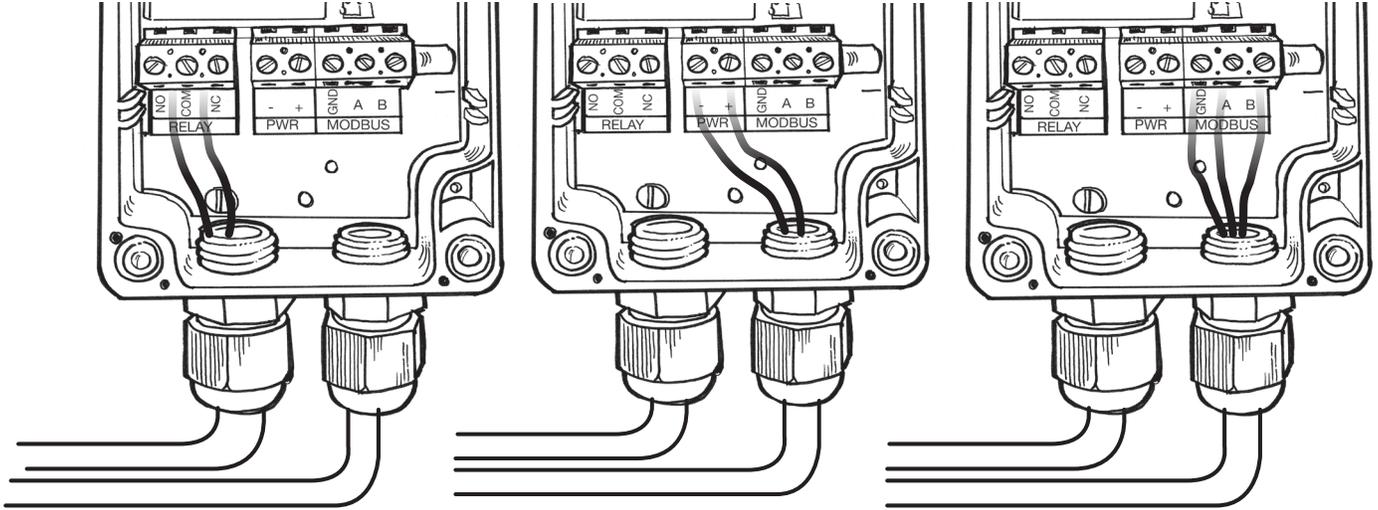


If the gateway will not fit in its intended enclosure because of the attached antenna, or if the placement of the gateway will disturb the signal to the antenna from the monitors, an external antenna is available (Item Number #8200873).

The external antenna has a magnetic socket and can be mounted directly on metal. If preferred it can also be glued to its mounting surface.

# Electrical Wiring

In the bottom of the Gateway you can make three different electric wire connections - Relay, Internal power and Modbus. Below you will find the different ways to set it up.



### Relay

Relay can be wired as NO or NC.

### Internal power

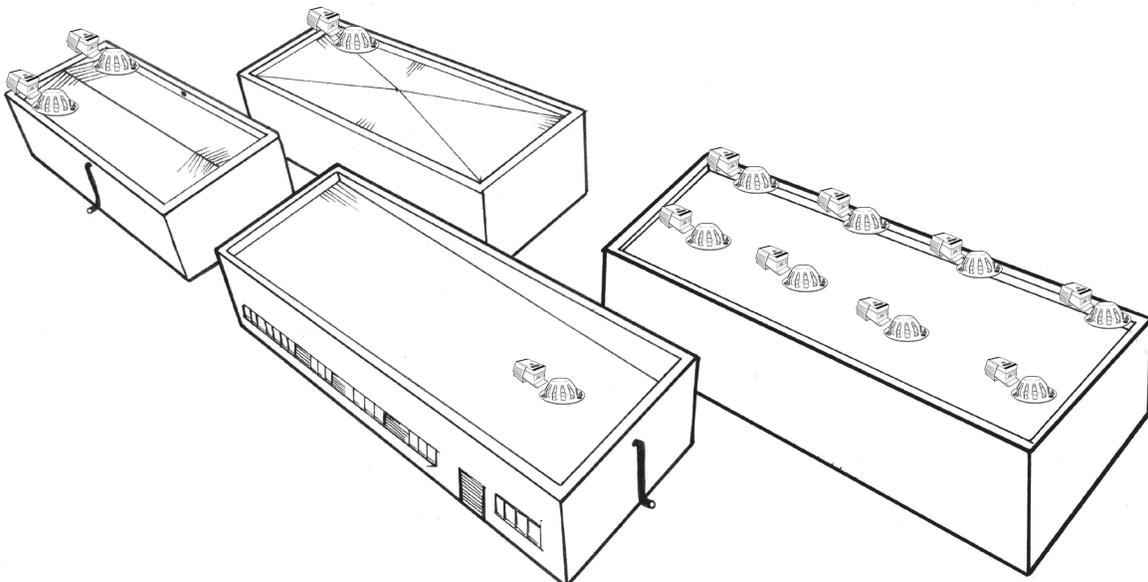
As an alternative to the power connector on the right side of the Gateway, a 5V DC power supply can be wired directly to the power terminals.

### Modbus

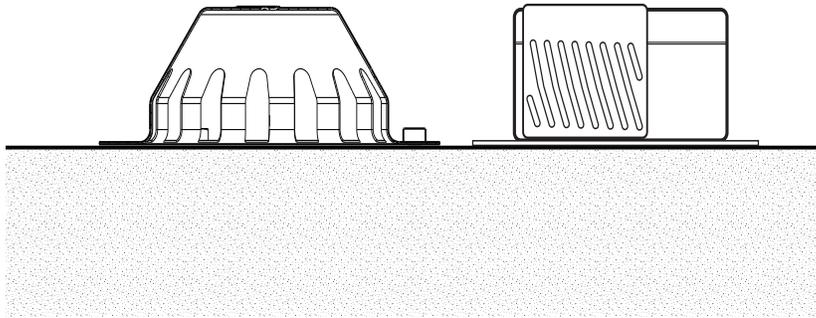
If connection to a Modbus RTU BMS system is required, a suitable RS485, cable must be used and connected to A, B, GND.

## 5.2 Monitor

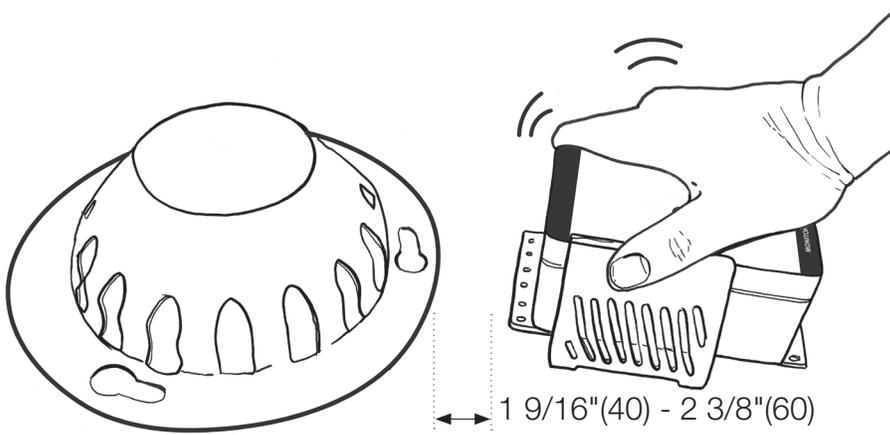
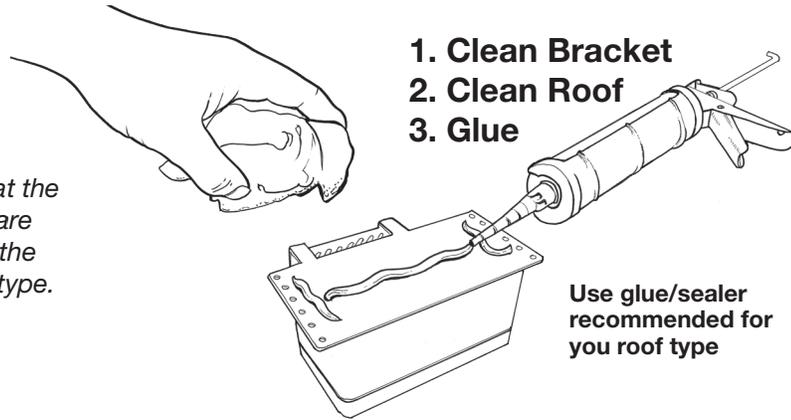
We recommend that one Monitor be installed next to each drain on your roof. Monitors should be installed at the primary drainage system and not at emergency outlets and drains. This gives the system the best conditions to evaluate the performance of the drainage system.



The Monitor should ideally be installed at the same invert level as the roof drain, giving the system the best conditions to measure the right water level. If this is not possible, and the Monitor ends up higher/lower than the roof drain, you will need to offset the water levels on the Monitor in the config file (see section 7.5).



*Before installing the Monitor ensure that the surrounding roof area and the bracket are cleaned carefully before application of the recommended glue/sealer for the roof type.*



*Position the Monitor, including bracket, 1 9/16" - 2 3/8" (40-60mm) from the edge of the drain. If the drain has a leaf guard, the 1 9/16" - 2 3/8" (40-60mm) distance is from the edge of the leaf guard to the bracket.*

## 6 Operation

Prior to operating the system, ensure that all Monitors have been installed and the Gateway is mounted and wired according to the previous chapter.

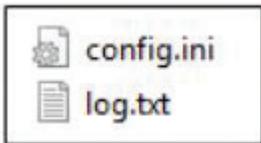
1. Ensure power is OFF\*
2. Remove MicroSD card from the Gateway and open the Config file in an editor
3. Edit the Config file parameters to reflect the application (see section 13)
4. Save the Config file and place the MicroSD card in the Gateway
5. Turn power ON\*
6. Wait for all the Monitors to connect. This process can take up to 30 minutes. Alternatively, enable Monitor Test mode to reduce time (see section 7.6)
7. Verify that there are no errors or warnings in the display
8. Verify Modbus values and functionality\*\*

\* *As an alternative to power OFF/ON the "Remove MicroSD card" mode can be entered by pressing the info button for 5 seconds. When the MicroSD card is mounted again, the Gateway will reboot and read the new configuration.*

\*\* *This step is only for setting up BMS systems.*

### 6.1 MicroSD card

The MicroSD card is used for configuring the Gateway and for storing log data. Out of the box, the MicroSD card will only contain the configuration file. This file is used to setup the system with communication between a Gateway and Monitors.



#### **NOTICE**

Before removing the MicroSD card, either power off or press the info button for 5 seconds to enter "Remove MicroSD card" mode.

## 6.2 Configuration File

The config file has sections that must be parameterized. All parameters are described in detail in section 13.

Description	
Monitor ID's (Mandatory)	Pair all relevant monitor ID's. Monitor ID is unique and found on the Monitor Label. One Gateway supports up to 16 Monitors. Omit all zeros "0" in front of monitor ID. See label and configuration file examples below.
General Settings (Optional)	Gateway system settings. No changes needed.
Relay Settings (Optional)	Only needed if the Relay function is needed.
Roof alarm setting (Optional)	To parameterize the sensitivity of Roof alarms.
BMS Settings (Optional)	If Modbus RTU is used, all connection settings and Monitor TAG's are parametrized here.

### Monitor ID Example



### Configure File Example

```
Filer Rediger Formater Vis Hjælp
[[MONITOR ID]
ID_1=23
ID_2=118
ID_3=
ID_4=
ID_5=
ID_6=
ID_7=
ID_8=
ID_9=
ID_10=
ID_11=
ID_12=
ID_13=
ID_14=
ID_15=
ID_16=
```

# 7 Functions

## 7.1 Display

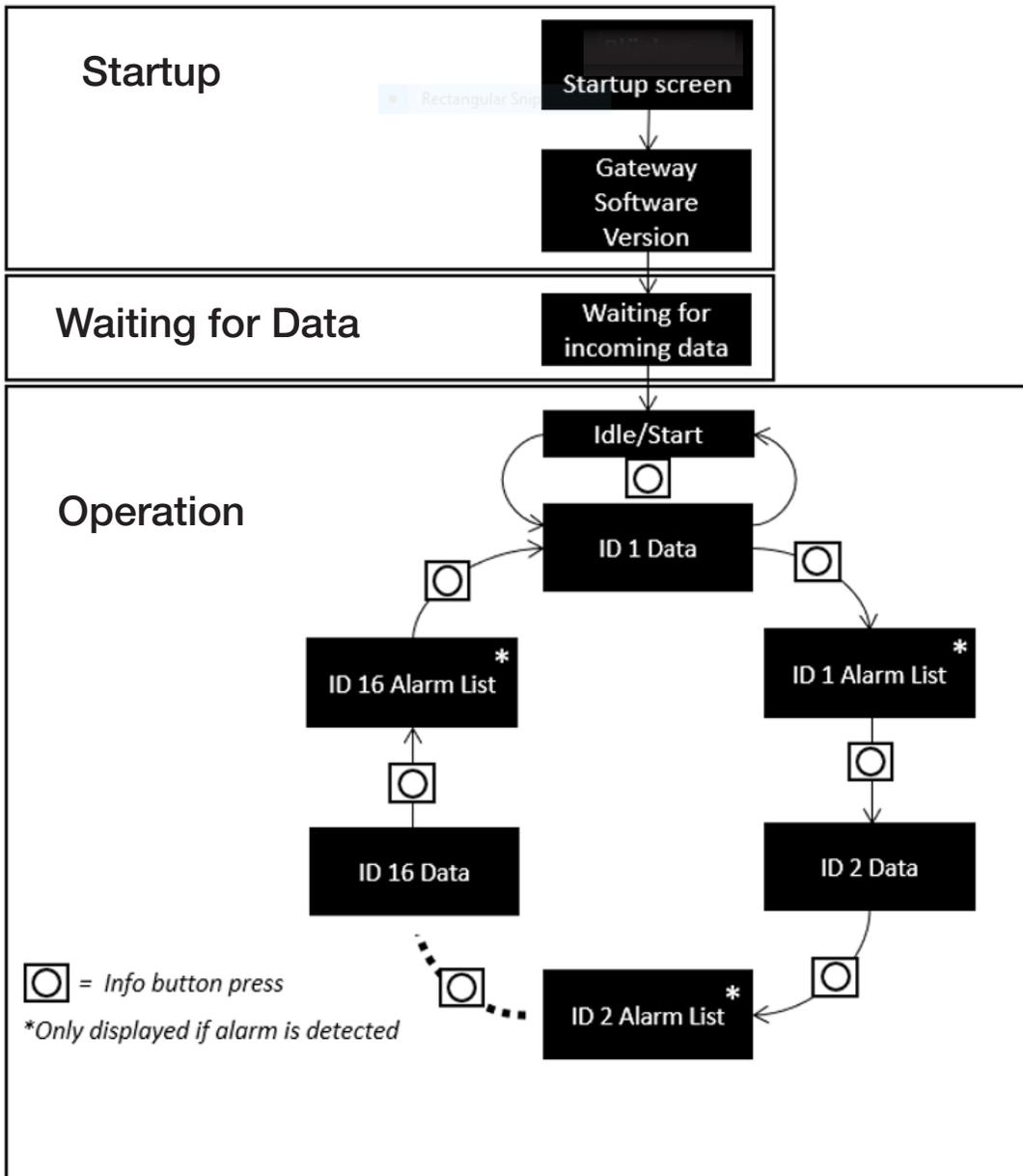
The display provides information on measurement values, diagnostics, and system information.

### 7.1.1 Menu structure

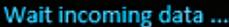
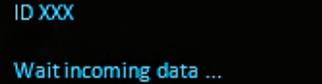
The menu is divided into 3 sections: start-up, waiting for data, and operation.

During start-up, the Gateway software version can be read.

Every time the Gateway has been re-booted it will wait up to 30 minutes until the first Monitor has been detected. When the first Monitor has been detected the display will jump to operation and show the Data view. By pressing the info button, the next Monitor's data will be shown.



## 7.1.2 Menu Content

Phase	Description	Display
Start-up	Start-up protocol will shortly show a company logo following the operating software version	 
Waiting for incoming data	Gateway is waiting for data from Monitor(s)	
Operation	If any Monitor has detected an alarm, the Gateway will show the following information.	 
	During operation, whenever the Gateway receives a frame, it will show the following information.	 
	When several Monitors are linked to a Gateway and connection has been established, <u>Monitors</u> from which the Gateway have received data will be displayed, and the rest will show the following information.	
	If an alarm has been detected, push the info button to reveal the alarm list.	

### 7.1.3 Display Information

Function	Symbol	Description
<b>Monitor ID</b>	XXXXXX	Unique ID on the Monitor, must be set-up in configuration file
<b>Test mode</b>	T	When symbol is visible, Monitor is in Test mode.
<b>Relay status</b>		When lines are unconnected, relay is OFF
		When lines are connected, relay is ON
<b>Monitor battery level</b>		<5% (6 months) - Plan Monitor change for the near future
		<20% (2 years)
		<50% (5 years)
		<100% (10 years)
<b>Signal strength</b>		No messages received from the Monitor for >40 hours
		Signal unstable and can cause intermittent operation
		Low signal - consider distance or any obstructions disturbing the signal
		High signal
<b>Temperature</b>	XX°C	Celsius degrees °C
<b>Water level</b>	X/5	Level 1-5
<b>Alarm</b>	YES/NO	IF YES, alarm will be shown in the alarm list.
<b>Version</b>	X.XX	Monitor software version

### 7.2 Info button

The info button is used for performing several actions. See table below.

<b>Next menu</b>	Short push
<b>Clear alarm</b>	(Alarm list on display) Hold for 2 seconds
<b>Remove MicroSD card</b>	Hold for 5 seconds
<b>Reboot Gateway</b>	Hold for 9 seconds

## 7.3 Relay

The relay functionality is parametrized in the Config file.

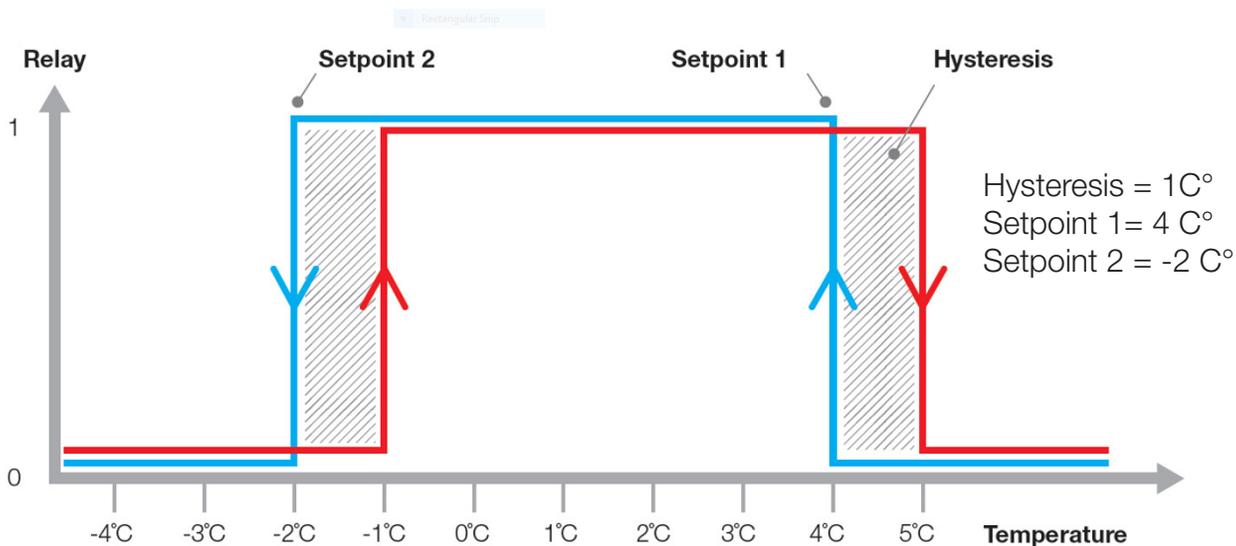
Relay modes	
<b>OFF</b>	Default mode
<b>Alarm roof</b>	Blocked drain, Blocked sensor
<b>Alarm Monitor</b>	Low battery, Lost connection, Internal leak
<b>Alarm Roof and Monitor</b>	Blocked drain, Blocked sensor, Low battery, Lost connection, Internal leak
<b>Temp One setpoint</b>	For application where only one setpoint is needed
<b>Temp Two setpoints</b>	For application where two setpoints are needed

For more info on Alarms, see section 7.5 diagnostics

The parameters for the Temp modes can be parametrized in the config file, see section 13. Depending on the application, 1 or 2 set points can be selected, see below.

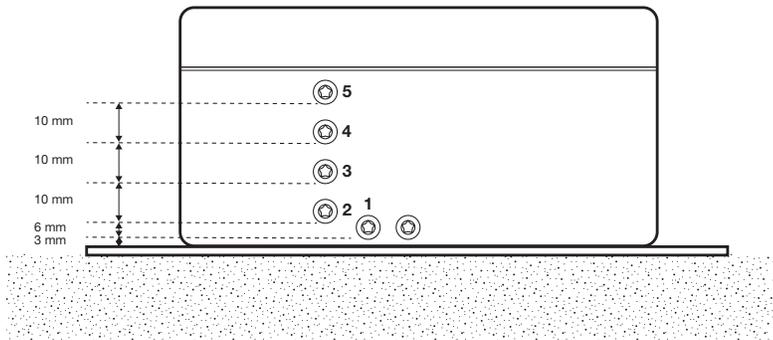
The hysteresis is made so the relay function won't turn on and off if the temperature is hovering near the setpoints. If the temperature drops down to 4°C (setpoint 1), the relay will turn on and it will stay on until -2°C (setpoint 2). If the temperature rises, the relay will first turn on at -1°C (red line), and will stay on until 5°C.

These setpoints can be configured in the config file.



## 7.4 Measurement Values

### 7.4.1 Water Level



Water level is measured in increments from sensor pin 1 to 5, corresponding to 0-42mm water level. Water level information is updated every 30 minutes, or if the water level values change.

### 7.4.2 Temperature

Temperature values are updated every 30 minutes. Should the temperature change more than +/-4 degrees from last update, the temperature will be updated more frequently.

## 7.5 Diagnostics

There are two types of diagnostics, Roof diagnostics and Monitor systems diagnostics:

### 7.5.1 Roof diagnostics

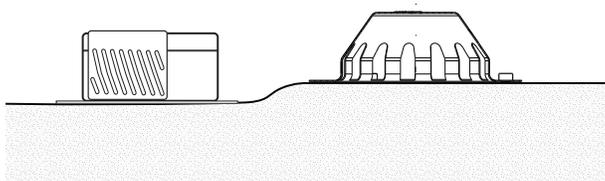
The Gateway incorporates an algorithm that activates an alarm based on water level across all Monitors over time. Two alarm conditions can be detected:

Roof Diagnostics	
<b>Blocked drain</b>	Appears when a Monitor detects higher water level than expected. Remedy: Clean drain inlet from debris or pipe blockage
<b>Blocked sensor</b>	Appears when a Monitor detects lower water level than expected. Remedy: Excessive debris has settled around the sensor preventing it from measuring. Remove debris from sensor area.

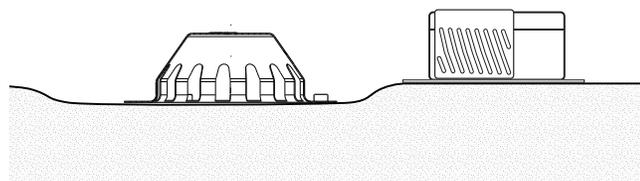
# Roof Alarm Settings

To compensate for different roof designs and conditions the behavior of the default algorithm can be customized. This is to avoid unwanted alarms that relate to e.g. roof design flaws. You can offset the values at each monitor in the configuration file. This is done in "ROOF ALARM SETTINGS". You can offset each monitor +/- 5 levels.

Roof alarms setting	
<b>SAMPLE_NUMBER</b>	Numbers of samples
<b>SAMPLE_PERIOD</b>	Time in minutes between samples
<b>BLOCKED_SENSOR_LIMIT_FACTOR</b> <b>BLOCKED_DRAIN_LIMIT_FACTOR</b>	Sensitivity of the algorithm: Higher value = Lower sensitivity Lower value = Higher sensitivity
<b>BLOCKED_SENSOR_ALARM_SET_COUNTER</b> <b>BLOCKED_DRAIN_ALARM_SET_COUNTER</b>	Counter of incidents that activate an alarm
<b>BLOCKED_SENSOR_NOALARM_RESET_COUNTER</b> <b>BLOCKED_DRAIN_NOALARM_RESET_COUNTER</b>	Number of no incidents to set counter to 0.
<b>AUTOMATIC_ALARM_REMOVING</b>	Alarm removes automatic after time
<b>WATER_LEVEL_OFFSET_ID_1=0</b> <b>WATER_LEVEL_OFFSET_ID_2=0</b> <b>WATER_LEVEL_OFFSET_ID_3=0</b> <b>WATER_LEVEL_OFFSET_ID_4=0</b> <b>WATER_LEVEL_OFFSET_ID_5=0</b> <b>WATER_LEVEL_OFFSET_ID_6=0</b> <b>WATER_LEVEL_OFFSET_ID_7=0</b> <b>WATER_LEVEL_OFFSET_ID_8=0</b> <b>WATER_LEVEL_OFFSET_ID_9=0</b> <b>WATER_LEVEL_OFFSET_ID_10=0</b> <b>WATER_LEVEL_OFFSET_ID_11=0</b> <b>WATER_LEVEL_OFFSET_ID_12=0</b> <b>WATER_LEVEL_OFFSET_ID_13=0</b> <b>WATER_LEVEL_OFFSET_ID_14=0</b> <b>WATER_LEVEL_OFFSET_ID_15=0</b> <b>WATER_LEVEL_OFFSET_ID_16=0</b>	Offset: +/- 5 levels, see figure below.



*If a monitor is installed lower than the drain  
Offset water levels -X levels*



*If a monitor is installed higher than the drain  
Offset water levels +X levels*

## 7.5.2 Monitor Systems Diagnostics

Monitor systems diagnostics	
Lost connection	The RF alarm is set to appear whenever no communication/signal between a Monitor and Gateway hasn't been registered for more than 40 hours.
Battery alarm	Appears if Monitor's battery voltage goes below 2.4V or the battery level is below 20%.
Internal water leak	Appears if water is detected inside the Monitor box.

## 7.6 Monitor modes

### 7.6.1 Operation Mode

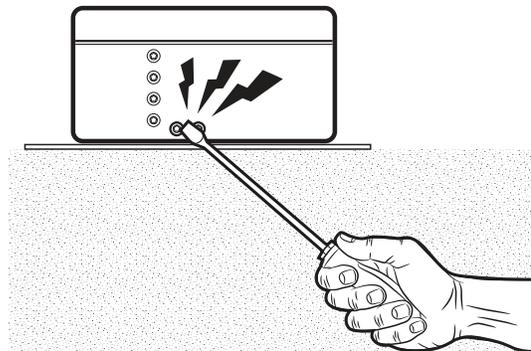
This operating mode is designed to maximize battery lifetime. Measurement values, diagnostics, and system data are transmitted when measurement values change, or at least every 30 minutes.

Out of the box, the Monitor operates in OPERATION MODE, ready to use and connect to a Gateway.

### 7.6.2 Test Mode

In TEST mode, measurement values are sent every 3 minutes. This mode is used to debug or speed up commissioning. To enter TEST mode, short circuit pin 0 and 1 for two seconds. Successful activation will result in a short "beep" sound.

TEST mode will automatically end after 60 minutes.



## 7.7 Power loss / reboot

**Power Loss:** If a gateway loses power (power outlet or product reset), it will lose memory and will await a new frame from a monitor. Furthermore, it will also reset any previous alarms and the algorithm to determine alarms in the system.

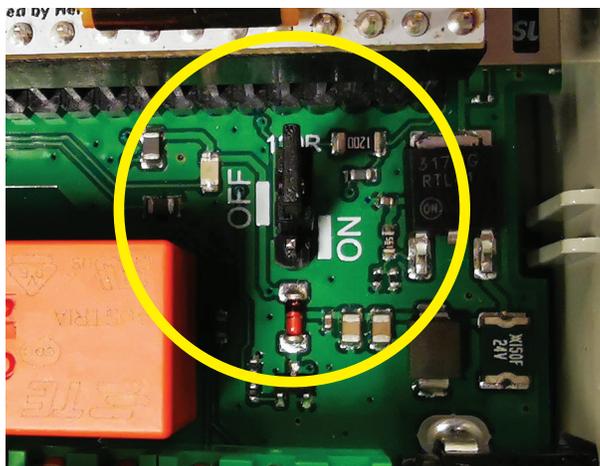
## 8 Modbus Interface

### 8.1 Supported function codes

Function code	Command text
03 (03hex)	Read holding registers
04 (04hex)	Read input registers
06 (06hex)	Write single register
16 (10hex)	Write multiple registers

### 8.2 Modbus Termination

Jumper switch position	Description	
1	ON	Internal termination resistor is connected
	OFF	Internal termination resistor is disconnected



#### **⚠ WARNING**

Power off before changing the jumper switch position.

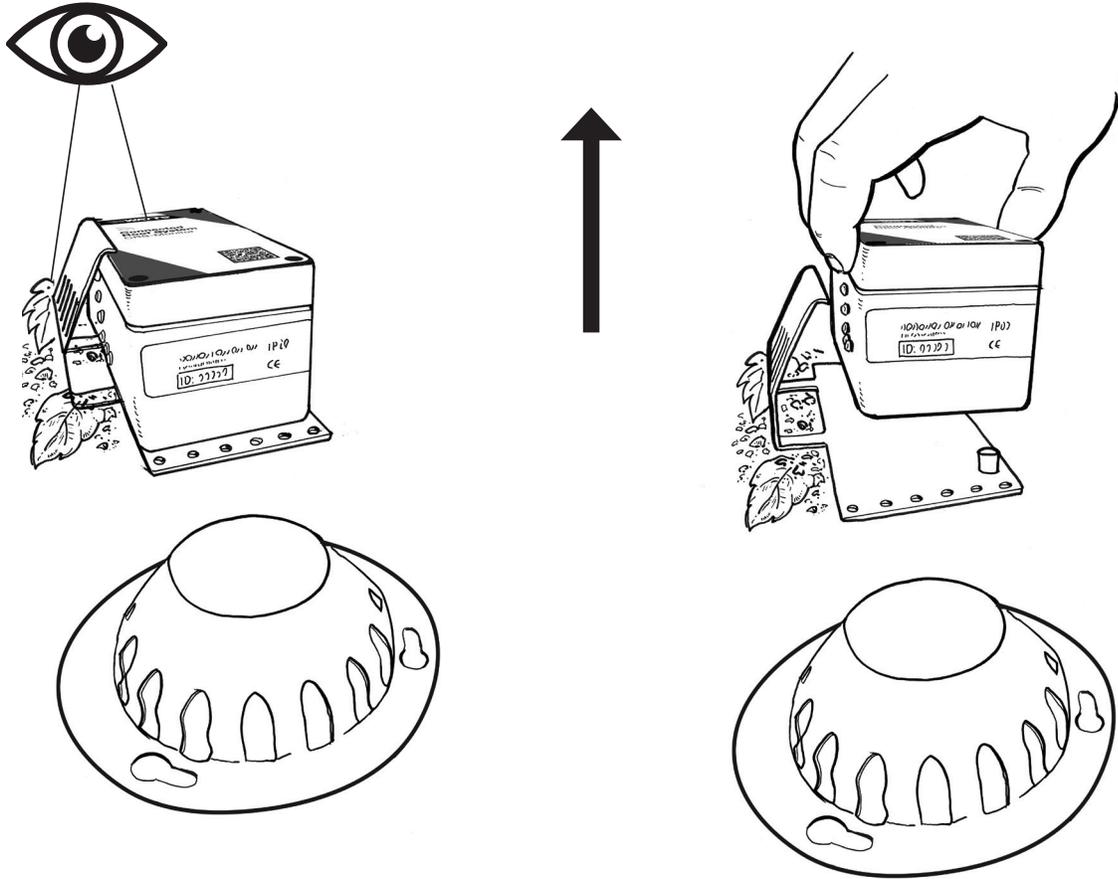
## 9 Gateway Software Update

To install the new software, follow these steps:

1. Press the push button for 5 seconds - this allows the SD card to be ejected.
2. Copy the new firmware file to the MicroSD card.
3. With the MicroSD card reinstalled in the Gateway, the Gateway will reboot, and the new software will automatically be installed - the .bin file will automatically be removed from the MicroSD card after a successful update.

# 10 Service and Maintenance

We recommend periodic service and maintenance around the area of a drain with a Monitor. Dirt and other obstructions can affect the performance of your drainage system and the Watts Connected Roof system.



# 11 Troubleshooting

In this section we have listed possible issues and how to troubleshoot.

Issue - MicroSD card	Cause	Action
<b>Gateway reports: "MicroSD card missing"</b>	Missing MicroSD card	Insert MicroSD card
	File system corrupted	Format MicroSD card
	Defect MicroSD card	Insert new MicroSD card *
	Config file missing	Add config file to MicroSD card or Check the file name: Config.ini
<b>Monitor connection</b>		
<b>Intermittent connection (Just after setup)</b>	Distance too far	Wait up to 4 hours
		Check signal strength
		Move the Gateway closer to the Monitor
		Add external antenna
		Add additional Gateway
<b>Permanent connection loss</b>	Wrong ID in config file Distance too far	Check Config file
		Move the Gateway closer to the Monitor
		Add external antenna
		Add additional Gateway
	Monitor battery issue	Replace Monitor
Defect Monitor	Replace Monitor	
<b>Expected alarm not showing</b>	Incorrect setup of the config file	Check config file: Check if the correct alarm type is chosen.
Check typing errors.		
<b>The relay does not enable/disable as expected.</b>	Incorrect setup of the config file	Check setpoint value in config file

\*MicroSD card is included in the product, but not sold separately by Watts.

## 12 Watts Terms & Conditions

### **FREIGHT TERMS:**

Shipments from the factory of less than \$5,000.00 net are F.O.B. factory. Factory shipments over \$5,000.00 net will be prepaid and allowed within the continental United States when made at the lowest motor carrier transportation rate.

### **TERMS OF SALE:**

All sales are F.O.B. shipping point.

### **PAYMENT TERMS:**

Invoices are due and payable 30 days from the date of invoice.

### **STOCKING WHOLESALE MINIMUM CHARGE:**

A minimum billing charge of \$75.00 applies to shipments F.O.B. factory. Stocking Wholesaler Customers are encouraged to order sufficient material to avoid this charge which is necessitated by increased costs of processing small orders.

### **SPECIAL PRODUCTS:**

Orders for special or modified products are non-cancelable and non-returnable. In the event that the customer cancels an order for such products, Watts shall charge the customer an amount equal to Watts' costs and expenses incurred in performing the purchase order prior to receipt of notice of cancellation.

### **LIMITED WARRANTY:**

**Watts Regulator Co.** (the "Company") warrants each product to be free from defects in material and workmanship under normal usage for a period of one year from the date of original shipment. In the event of such defects within the warranty period, the Company will, at its option, replace or recondition the product without charge.

THE WARRANTY SET FORTH HEREIN IS GIVEN EXPRESSLY AND IS THE ONLY WARRANTY GIVEN BY THE COMPANY WITH RESPECT TO THE PRODUCT. THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED. THE COMPANY HEREBY SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedy described in the first paragraph of this warranty shall constitute the sole and exclusive remedy for breach of warranty, and the Company shall not be responsible for any incidental, special or consequential damages, including without limitation, lost profits or the cost of repairing or replacing other property which is damaged if this product does not work properly, other costs resulting from labor charges, delays, vandalism, negligence, fouling caused by foreign material, damage from adverse water conditions, chemical, or any other circumstances over which the Company has no control. This warranty shall be invalidated by any abuse, misuse, misapplication, improper installation or improper maintenance or alteration of the product.

Some States do not allow limitations on how long an implied warranty lasts, and some States do not allow the exclusion or limitation of incidental or consequential damages. Therefore the above limitations may not apply to you. This Limited Warranty gives you specific legal rights, and you may have other rights that vary from State to State. You should consult applicable state laws to determine your rights. SO FAR AS IS CONSISTENT WITH APPLICABLE STATE LAW, ANY IMPLIED WARRANTIES THAT MAY NOT BE DISCLAIMED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL SHIPMENT.

### **RETURNED GOODS RESTOCKING CHARGE:**

No material shall be returned without authorization. When credit is issued it will be at the price charged, or prevailing price if lower, less handling charges based on costs of reconditioning, boxing, etc. However, a minimum 25% handling charge will apply. A minimum handling charge of \$35.00 is applied whenever the 25% handling deduction does not total \$35.00. Products which are obsolete or made to special order are not returnable.

### **NOTE:**

Prices and terms are subject to change without notice and supersede all previous quotations. The right is reserved to change or modify product design or construction without prior notice and without incurring any obligation to make such changes and modifications on products previously or subsequently sold. All dimensions shown in this catalog are subject to manufacturing tolerances.

**WATTS Drainage** reserves the right to modify or change product design or construction without prior notice and without incurring any obligation to make similar changes and modifications to products previously or subsequently sold.

See your **WATTS Drainage** representative for any clarification.

## 13 Configuration File Parameters

<b>Monitor ID</b>		
ID_1 - ID_16	1-65535	Unique Monitor ID. The ID can be read on the Monitor label.
<b>Relay settings</b>		
RELAY_MODE	OFF, ALARM_ROOF, ALARM_MONITOR, ALARM_ROOF_ MONITOR, TEMP_ONESETPOINT, TEMP_TWOSSETPOINTS	[Factory setting: OFF]
RELAY_TEMP_HYSTERESIS	0 to 5 (°C)	[Factory setting: 1]
RELAY_TEMP_SETPOINT_1	-10 to 15 (°C)	[Factory setting: 8]
RELAY_TEMP_SETPOINT_2	-10 to 15 (°C)	[Factory setting: -2]
<b>General settings</b>		
RF_region	EU	Wireless frequency 868 MHz
<b>Roof Alarm settings</b>		
ID_1 – ID_16 Offset	-5 to 5	[Factory setting: 0]
SAMPLE_NUMBER	1 to 255	[Factory setting: 4]
SAMPLE_PERIOD	1 to 255	[Factory setting: 1]
BLOCKED_SENSOR_LIMIT_FACTOR	1 to 255	[Factory setting: 20]
BLOCKED_SENSOR_ALARM_SET_COUNTER	1 to 255	[Factory setting: 5]
BLOCKED_SENSOR_NOALARM_RESET_COUNTER	1 to 255	[Factory setting: 4]
BLOCKED_DRAIN_LIMIT_FACTOR	1 to 255	[Factory setting: 20]
BLOCKED_DRAIN_ALARM_SET_COUNTER	1 to 255	[Factory setting: 15]
BLOCKED_DRAIN_NOALARM_RESET_COUNTER	1 to 255	[Factory setting: 4]
<b>BMS settings</b>		
BMS_SLAVE_ADDRESS	1 to 247	Modbus slave address of a Gateway [Factory setting: 1]
BMS_BAUDRATE	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200	Communication speed
[Factory setting: 19200]		
BMS_PARITY	EVEN, ODD, NONE	[Factory setting: EVEN]
BMS_FRAMING	1STOPBIT, 2STOPBITS	[Factory setting: 1STOPBIT]
BMS_GATEWAY_TAG	String up to 32 ASCII characters	[Factory setting: WATTSELEC-3 ]
BMS_MONITOR1_TAG - BMS_MONITOR16_TAG	String up to 32 ASCII characters	[Factory setting: Monitor1 - Monitor16]

# 14 Modbus Tables

**Table 1. Modbus registers are grouped by sensor index number**

sensor index					Modbus						
	name	index	value type	range and unit	object type	object access	size, bit	address offset 1	bit offset		
01	device tag	01	string of 32 ASCII characters	1st character	input register	R	16	00101	8-15		
				2nd character			00101	0-7			
				...			...	...			
				31st character			00116	8-15			
	device ID	17	hex	1st octet	input register	R		00116	0-7		
				2nd octet			00117	8-15			
				3rd octet			00117	0-7			
				4th octet			00118	8-15			
	HW version2	19	uint8	A (0 ... 256)	input register	R		00118	0-7		
				B (0 ... 256)			00119	8-15			
	SW version2	20	uint8	A (0 ... 256)	input register	R		00119	0-7		
				B (0 ... 256)			00120	8-15			
	frame counter	21	uint32, big endian byte order		input register	R		00120	0-7		
							00121				
	time counter	23	uint32, big endian byte order	second	input register	R		00122			
	communication lost alarm	25	bool						00123		
	blocked sensor alarm		bool		input register	R		00124			
	blocked drain alarm		bool						00125	0	
	battery low alarm		bool		input register	R		00125	1		
	internal leak alarm		bool						00125	2	
	water level	26	uint8	0 ... 5	input register	R		00125	3		
	temperature	27	int16, decimal place = 2	-35.00 ... 85.00 °C					00125	4	
	temperature min	28	int16, decimal place = 2	-35.00 ... 85.00 °C	input register	R		00126	0-7		
	temperature max	29	int16, decimal place = 2	-35.00 ... 85.00 °C					00127		
	humidity	30	uint16, decimal place = 2	0 ... 100.00 %	input register	R		00128			
	humidity min	31	uint16, decimal place = 2	0 ... 100.00 %					00129		
	humidity max	32	uint16, decimal place = 2	0 ... 100.00 %	input register	R		00130			
	battery level	33	uint16, decimal place = 2	0 ... 100.00 %					00131		
	communication signal level	34	uint16, decimal place = 2	0 ... 100.00 %	input register	R		00132			
	diagnostic sensor signal	35	uint16	0 ... 40					00133		
	diagnostic internal leak	36	uint16	0 ... 255	input register	R		00134			
	diagnostic water level 1	37	uint16	0 ... 255					00135		
	diagnostic water level 2	38	uint16	0 ... 255	input register	R		00136			
	diagnostic water level 3	39	uint16	0 ... 255					00137		
	diagnostic water level 4	40	uint16	0 ... 255	input register	R		00138			
	diagnostic water level 5	41	uint16	0 ... 255					00139		
	diagnostic battery voltage	42	uint8, x20 and decimal place = 3	0 ... 4.000 V	input register	R		00140			
	diagnostic battery voltage min	43	uint8, x20 and decimal place = 3	0 ... 4.000 V					00141		
	diagnostic error counter	44	uint16		input register	R		00142	8-15		
	diagnostic CTN temperature	45	uint16	-35.0 ... 85.0 °C					00143	0-7	
	clear communication lost alarm	51	bool		holding register	R/W	16	00144			
	clear blocked sensor alarm		bool							00151	0
	clear blocked drain alarm		bool							00151	1
	clear battery low alarm		bool							00151	2
	clear internal leak alarm		bool		holding register	R/W	16	00151	3		
									00151	4	
02	tag	01								00201	
	device ID	17								00217	
	...						...				
	...						...				
	...						...				
	clear internal leak alarm	51					00251				
...							...				
16	tag	01					01601				
	device ID	17					01617				
	...						...				
	...						...				
	...						...				
	clear internal leak alarm	51					01651				

1 modbus address structure:  
Xnnnn -> 0 - "parameters combined by monitor index number" group, 1 - "parameters combined by type" group  
nXXnn -> monitor index number  
nnnXX -> parameter index number for a monitor  
2 version numbers are represented by "A,B" format - each letter is a single byte

**Table 2. Modbus registers are grouped by parameter type (the values are mirrored from the corresponding registers in the Table 1)**

sensor index	Modbus								
	name	index	value type	range and unit	object type	object access	size, bit	address offset 1	bit offset
01	device tag	01	string of 32 ASCII characters	1st character	input register	R	16	11901	8-15
				2nd character				11901	0-7
				...				...	...
				31st character				11916	8-15
				32nd character				11916	0-7
...							...		
16	device tag	241	string of 32 ASCII characters	1st character				12141	8-15
				2nd character				12141	0-7
				...				...	...
				31st character				12156	8-15
				32nd character				12156	0-7
...							...		
1	device ID	1	hex	1st octet				12401	8-15
			hex	2nd octet				12401	0-7
			hex	3rd octet				12402	8-15
			hex	4th octet				12402	0-7
...							...		
16	device ID	31	hex	1st octet				12431	8-15
			hex	2nd octet				12431	0-7
			hex	3rd octet				12432	8-15
			hex	4th octet				12432	0-7
...							...		
1	HW version2	1	uint8	A (0 ... 256)				12501	8-15
			uint8	B (0 ... 256)				12501	0-7
...								...	
16	HW version2	16	uint8	A (0 ... 256)				12516	8-15
			uint8	B (0 ... 256)				12516	0-7
...								...	
1	SW version2	1	uint8	A (0 ... 256)				12601	
			uint8	B (0 ... 256)				12601	
...								...	
16	SW version2	16	uint8	A (0 ... 256)				12616	8-15
			uint8	B (0 ... 256)				12616	0-7
...								...	
1	frame counter	1	uint32, big endian byte order					12701	
							12702		
...								...	
16	frame counter	31	uint32, big endian byte order					12731	
							12732		
...								...	
1	time counter	1	uint32, big endian byte order		second			12801	
							12802		
...								...	
16	time counter	31	uint32, big endian byte order		second			12831	
							12832		
...								...	
1	communication lost alarm	1	bool					12901	0
	blocked sensor alarm		bool				12901	1	
	blocked drain alarm		bool				12901	2	
	battery low alarm		bool				12901	3	
	internal leak alarm		bool				12901	4	
...								...	
16	communication lost alarm	16	bool					12916	0
	blocked sensor alarm		bool				12916	1	
	blocked drain alarm		bool				12916	2	
	battery low alarm		bool				12916	3	
	internal leak alarm		bool				12916	4	
...								...	

	Blocked drain alarm - Monitor 1		bool				12951	0
	Blocked drain alarm - Monitor 2		bool				12951	1
	Blocked drain alarm - Monitor 3		bool				12951	2
	Blocked drain alarm - Monitor 4		bool				12951	3
	Blocked drain alarm - Monitor 5		bool				12951	4
	Blocked drain alarm - Monitor 6		bool				12951	5
	Blocked drain alarm - Monitor 7		bool				12951	6
	Blocked drain alarm - Monitor 8		bool				12951	7
	Blocked drain alarm - Monitor 9		bool				12951	8
	Blocked drain alarm - Monitor 10		bool				12951	9
	Blocked drain alarm - Monitor 11		bool				12951	10
	Blocked drain alarm - Monitor 12		bool				12951	11
	Blocked drain alarm - Monitor 13		bool				12951	12
	Blocked drain alarm - Monitor 14		bool				12951	13
	Blocked drain alarm - Monitor 15		bool				12951	14
	Blocked drain alarm - Monitor 16		bool				12951	15
	Blocked sensor alarm - Monitor 1		bool				12952	0
	Blocked sensor alarm - Monitor 2		bool				12952	1
	Blocked sensor alarm - Monitor 3		bool				12952	2
	Blocked sensor alarm - Monitor 4		bool				12952	3
	Blocked sensor alarm - Monitor 5		bool				12952	4
	Blocked sensor alarm - Monitor 6		bool				12952	5
	Blocked sensor alarm - Monitor 7		bool				12952	6
	Blocked sensor alarm - Monitor 8		bool				12952	7
	Blocked sensor alarm - Monitor 9		bool				12952	8
	Blocked sensor alarm - Monitor 10		bool				12952	9
	Blocked sensor alarm - Monitor 11		bool				12952	10
	Blocked sensor alarm - Monitor 12		bool				12952	11
	Blocked sensor alarm - Monitor 13		bool				12952	12
	Blocked sensor alarm - Monitor 14		bool				12952	13
	Blocked sensor alarm - Monitor 15		bool				12952	14
	Blocked sensor alarm - Monitor 16		bool				12952	15
	1'st Blocked drain Alarm Monitor ID		uint16				12953	
	1'st Blocked sensor Alarm Monitor ID		uint16				12954	
...							...	
1	water level	1	uint8	0 ... 5			13001	0-7
...							...	
16	water level	16	uint8	0 ... 5			13016	0-7
...							...	
1	temperature	1	int16, decimal place = 2	-35.00 ... 85.00 °C			13101	
...							...	
16	temperature	16	int16, decimal place = 2	-35.00 ... 85.00 °C			13116	
...							...	
1	temperature min	1	int16, decimal place = 2	-35.00 ... 85.00 °C			13201	
...							...	
16	temperature min	16	int16, decimal place = 2	-35.00 ... 85.00 °C			13216	
...							...	
1	temperature max	1	int16, decimal place = 2	-35.00 ... 85.00 °C			13301	
...							...	
16	temperature max	16	int16, decimal place = 2	-35.00 ... 85.00 °C			13316	
...							...	
1	humidity	1	uint16, decimal place = 2	0 ... 100.00 %			13401	
...							...	
16	humidity	16	uint16, decimal place = 2	0 ... 100.00 %			13416	
...							...	
1	humidity min	1	uint16, decimal place = 2	0 ... 100.00 %			13501	
...							...	
16	humidity min	16	uint16, decimal place = 2	0 ... 100.00 %			13516	
...							...	
1	humidity max	1	uint16, decimal place = 2	0 ... 100.00 %			13601	
...							...	
16	humidity max	16	uint16, decimal place = 2	0 ... 100.00 %			13616	
...							...	
1	battery level	1	uint16, decimal place = 2	0 ... 100.00 %			13701	
...							...	
16	battery level	16	uint16, decimal place = 2	0 ... 100.00 %			13716	
...							...	
1	communication signal level	1	uint16, decimal place = 2	0 ... 100.00 %			13801	
...							...	
16	communication signal level	16	uint16, decimal place = 2	0 ... 100.00 %			13816	

**Table 3. Modbus Registers of the Gateway System**

					Modbus				
	name	index	value type	range and unit	object type	object access	size, bit	address offset1	bit offset
Gateway	SRDP protocol version2	01	uint8	A (0 ... 256)	input register	R	16	00001	8-15
			uint8	B (0 ... 256)				00001	0-7
	HW version2	02	uint8	A (0 ... 256)				00002	8-15
			uint8	B (0 ... 256)				00002	0-7
	SW version2	03	uint8	A (0 ... 256)				00003	8-15
			uint8	B (0 ... 256)				00003	0-7
	region	04	string of 2 ASCII characters	1st character				00004	8-15
				2nd character				00004	0-7
	number of configured sensors	05	uint8	0 ... 99				00005	0-7
	gateway tag	06	string of 32 ASCII characters	1st character				00006	8-15
				2nd character				00006	0-7
				...				...	...
				31st character				00021	8-15
				32nd character				00021	0-7
	relay mode	22	uint4	"0: Temp mode 1: Alarm mode"				00022	0-3
	relay state		bool	"0: Relay is opened 1: Relay is closed"				00022	4
sync time	31	uint32	UNIX Epoch time, seconds, 10-digit	00031					
				00032					
relay derogation mode	51	bool	"0: No derogation 1: Derogation enabled"	00051	0				
relay derogation order	51	bool	"0: Open the relay 1: Close the relay"	00051	1				

1 modbus address structure:

Xnnnn -> 0

nXXnn -> 00

nnnXX -> parameter index number for the gateway

2 version numbers are represented by "A.B" format - each letter is a single byte



# Watts Connected Roof System



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