USER MANUAL & INSTALLATION GUIDE

BLÜCHER® Connected Roof

INTELLIGENT ROOF

BLÜCHER®

A WATTS Brand

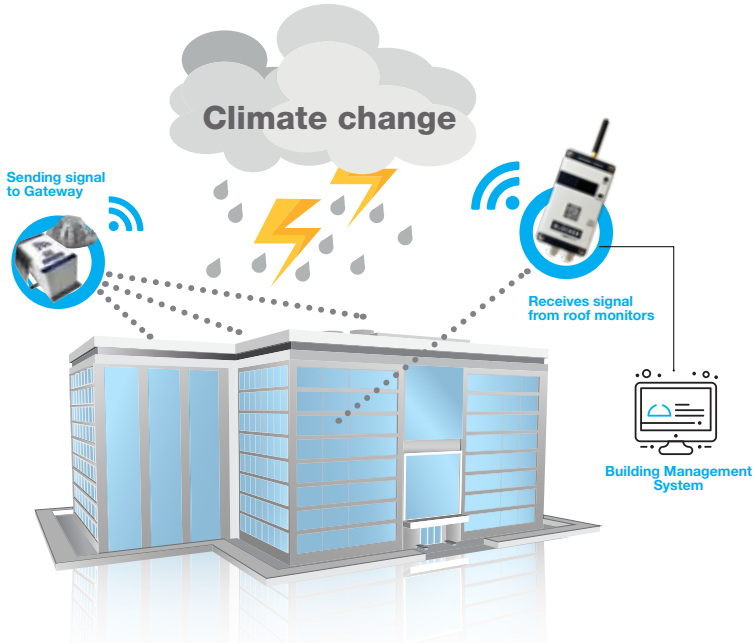
Content

1 Introduction

Thank you for buying this BLÜCHER® Connected Roof product. We hope that it will live up to your expectations and make monitoring your roof performance easier.
All documents related to this product can be found at **www.blucher.com**.

BLÜCHER® Connected Roof allows you to easily supervise the performance of your roof. The system is designed to detect a possible blocked drainage system before any major issues occur.
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.
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 the Building Management System (BMS).
4) You can apply a GSM-gateway to receive the information on your mobile phone or via email.



This user manual and installation guide describes the installation and start-up for BLÜCHER® Connected Roof Gateway item number #900.000.400, and how to connect the Connected Roof Monitor item number #900.100.400 to the Gateway.

Prior to installation, please read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

2 Scope of delivery

Please carefully check all components 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
SD Card	Micro SDHC, Class 4, 4 GB	1
Antenna	868 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	868 MHz SMA connection w/ 3 m cable	Must to be ordered separately, item number (900.900.000)

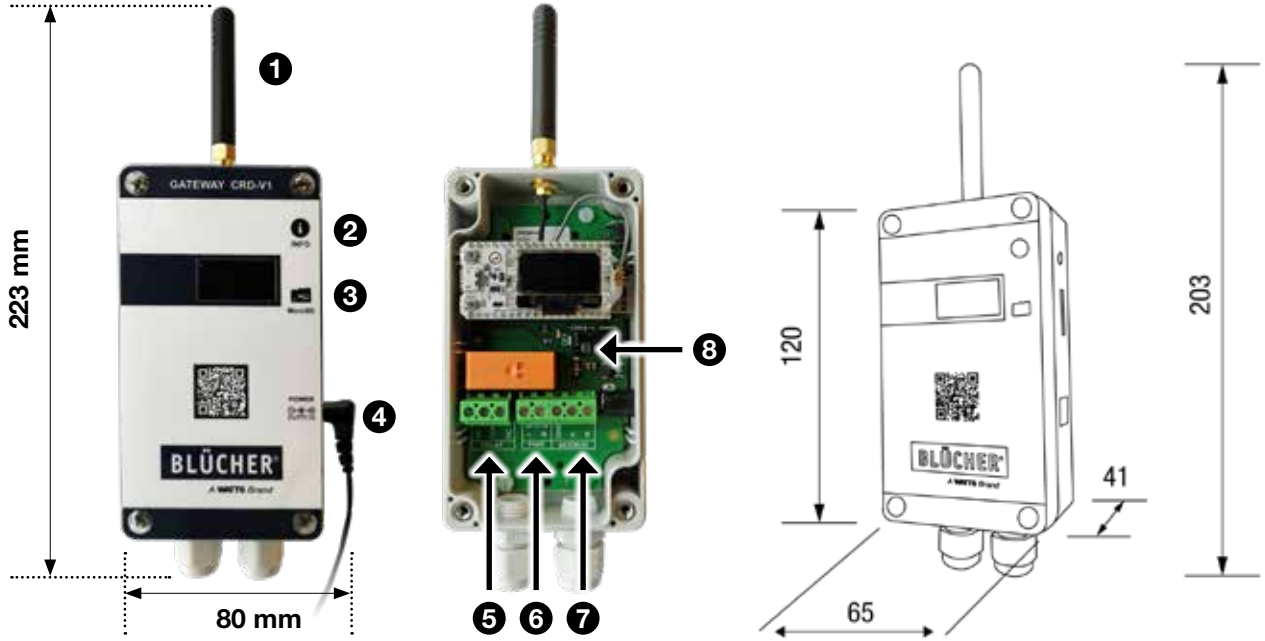
3 Safety instructions and regulations

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

CAUTION
Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation. Only qualified personal should install or operate the device.

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 specification



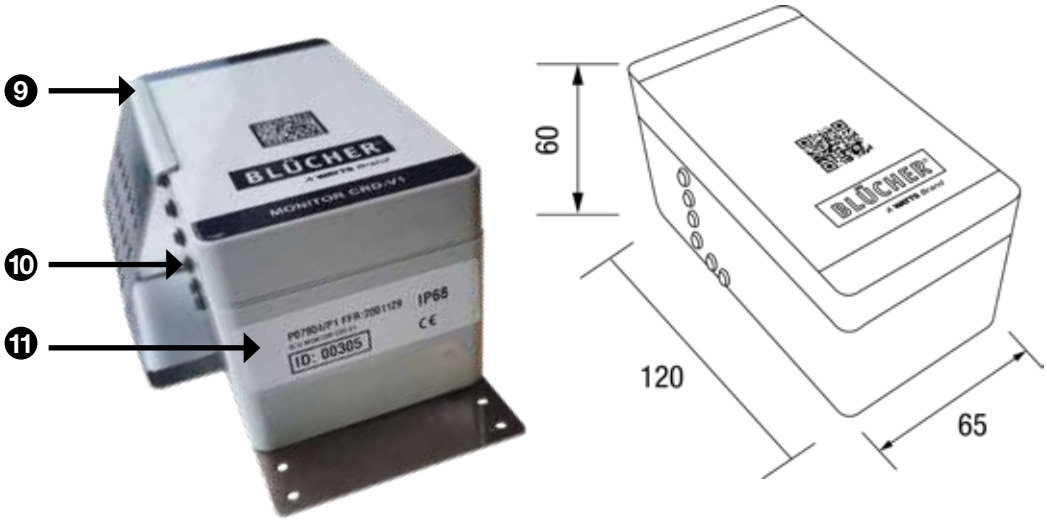
4.1 Product overview

GATEWAY

1. Antenna
2. Info button
3. SD 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

Power supply	
Voltage	5V DC 1A
Nominal power	0,5 W
Electrical protection class	Class 3
Wireless	
Frequency	868 MHz
Antenna connector	SMA
Signal range	Up to 1500m in free line of sight
User input	
Push button	1
Display	
Type	0.96” OLED
Size	128*64 dot
SD card	
Type	MicroSDHC Class 4 or higher
Size	>4 GB
Relay	
Type	1RT NO/NC
Load limit	230VAC 5A
Connection	3 pin screw terminals (Max 1.5mm^2)
MODBUS	
Physical Layer	RS485
Baud rate	Up to 115200 Bauds
Connection	3 pin screw terminals (Max 1.5mm^2)
Termination	Yes, ON/OFF jumper configuration
Cable glands	
Size	PG7 (diameter 2.5-6.5mm)
Enclosure	
IP protection	IP 30
Material	ABS
Size	120 x 65 x 40mm (without antenna and cable glands)
Mounting hole	Ø4 mm
Environmental	
Working temperature	-10°C - 55°C
Storage temperature	-30°C - 80°C
Humidity	Below 80% non-condensing

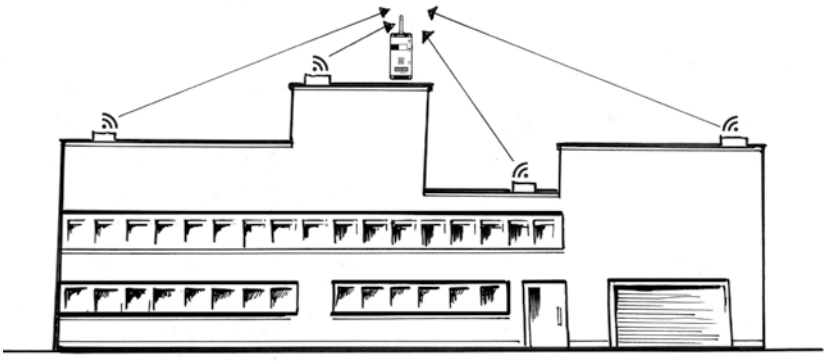
4.3 Monitor specifications

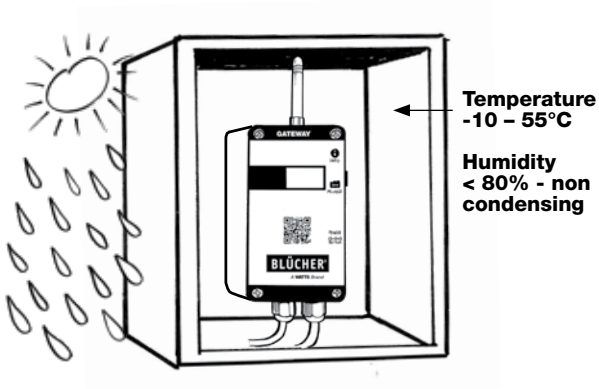
Power supply	
Battery	Lithium battery LS 14500 3.6V (internal) AA
Battery life	Up to 10 years
Level Sensor	
Sensor electrodes	Stainless A2
Enclosure	
IP protection	IP68
Material	Anti-UV PC
Size	120 x 65 x 60mm
Environmental	
Working temperature	-35°C - 85°C
Storage temperature	-35°C - 85°C

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.

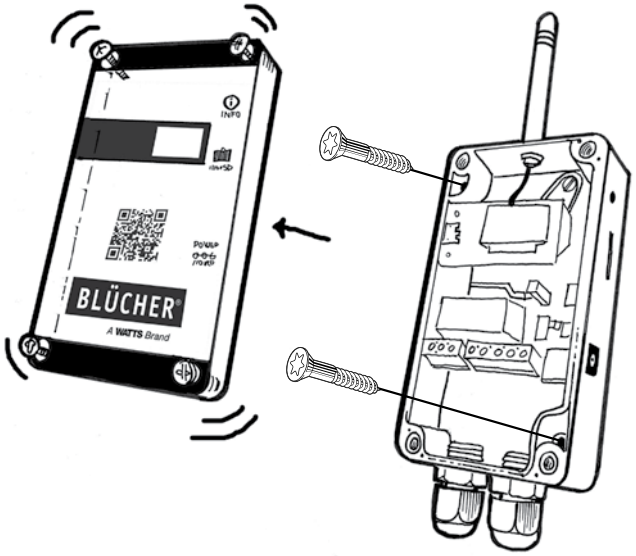




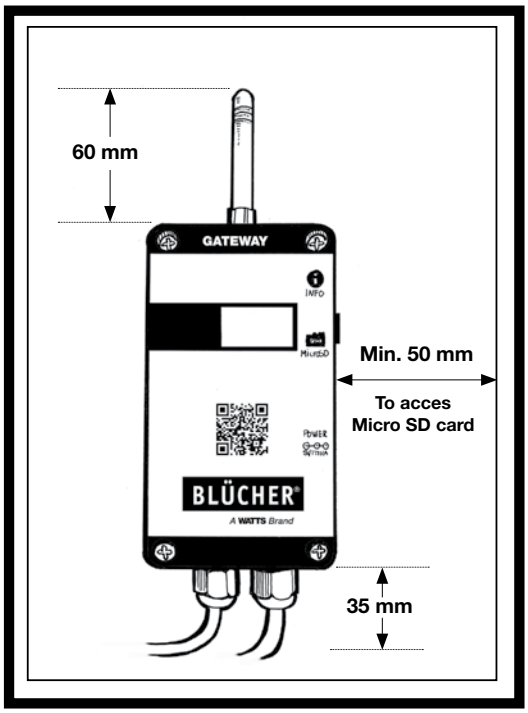
Do not install the BLÜCHER® Connected Roof Gateway in areas with a risk of water exposure and high humidity levels. The ambient temperature should be in the range between -10 °C and 55 °C and the humidity below 80% non-condensing. Please consider the material/thickness of the gateway enclosure for maximized signal strength.

Mounting instructions

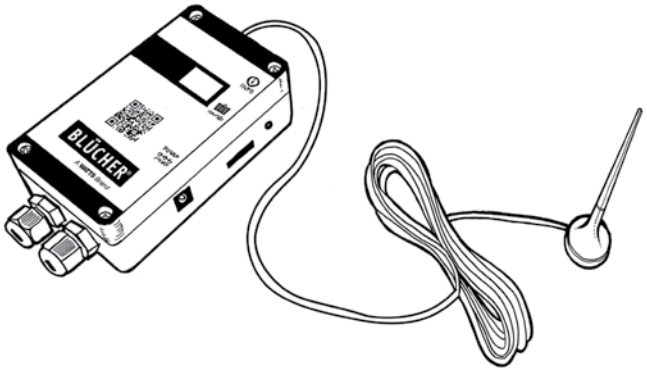
To mount the enclosure:

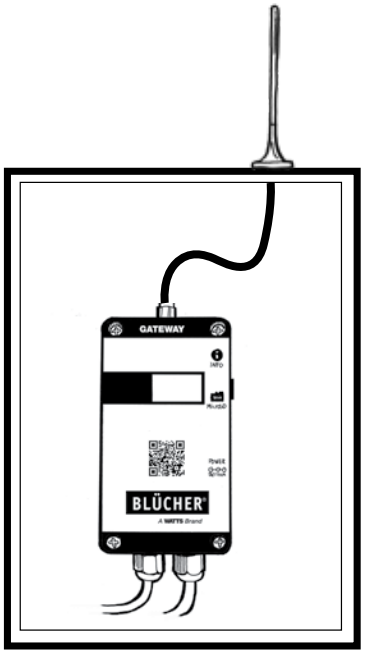


Unscrew the 4 no. screws on the front cover, then remove the front cover to access the mounting holes. The mounting holes are Ø4 mm, and screws are not included.



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

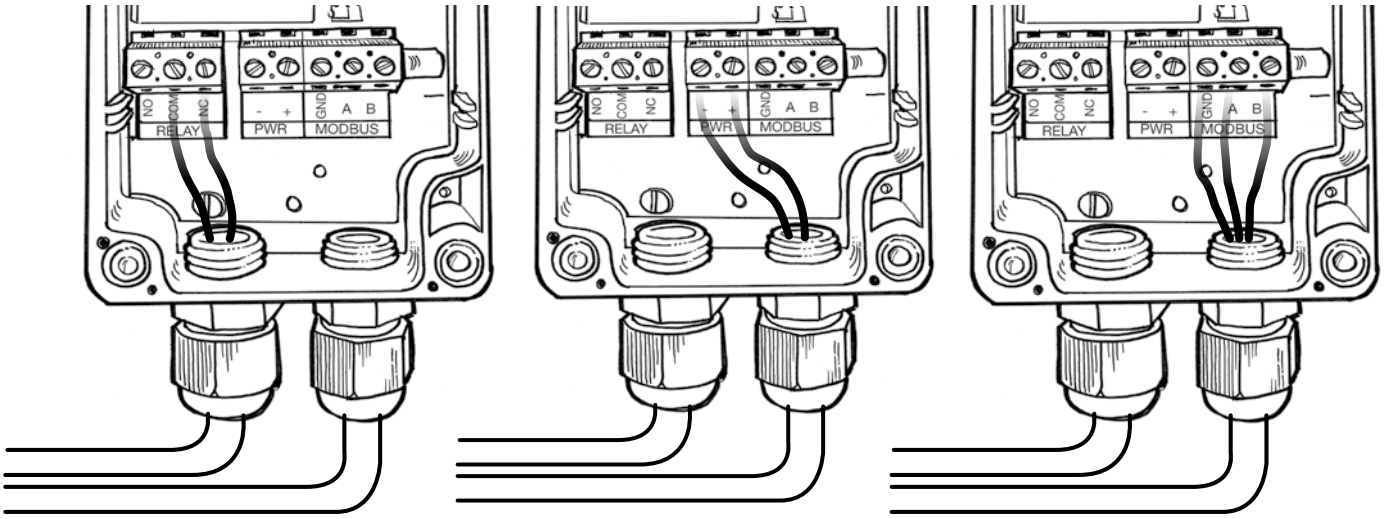




If there is no room for the gateway, because of the antenna, or if the placement of the gateway will disturb the signal to the antenna, an external can be an option. Item number #900.900.000
The external has a magnetic socket and can be mounted directly on metal. If preferred it can also be glued.

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.



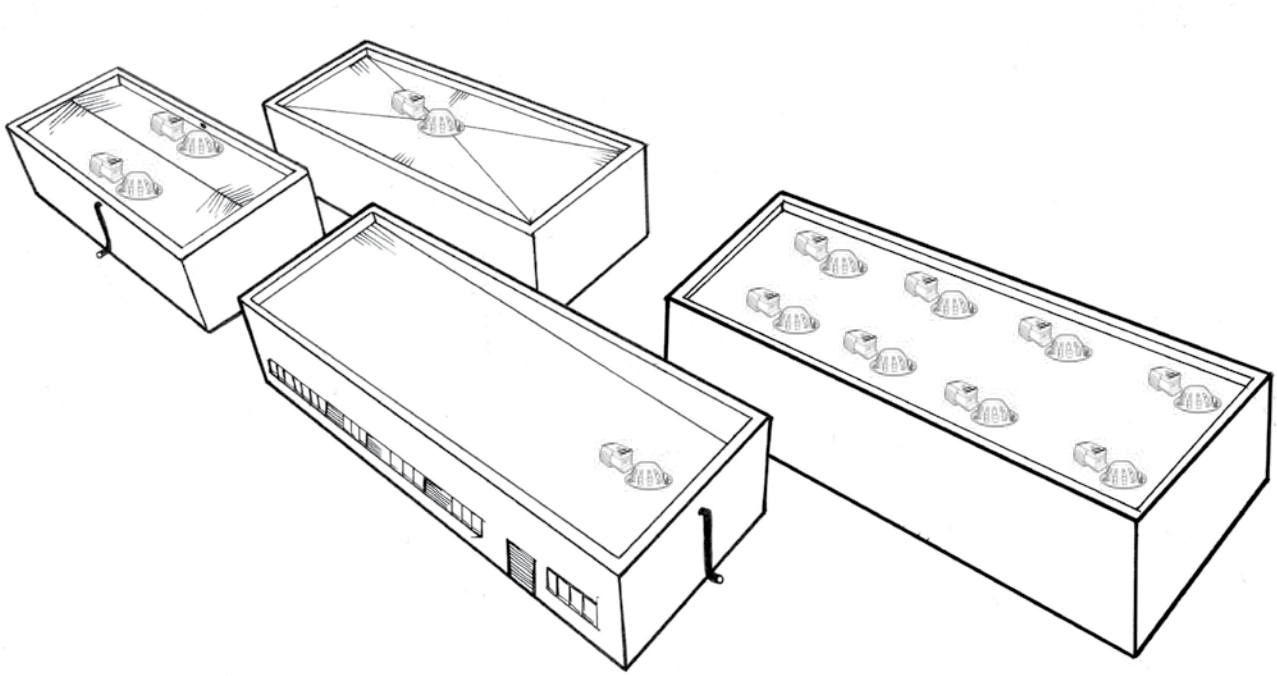
Relay
Relay can be wired as NO or NC.

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.

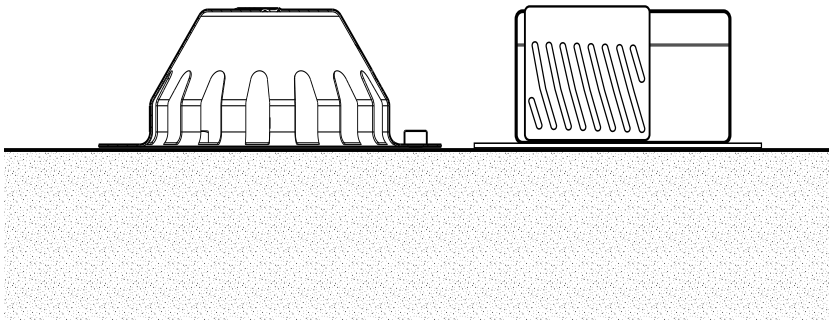
Modbus
If connection to a Modbus RTU BMS system is required, a suitable RS485, cable must be used and connected to A, B, GND. If connection to a Modbus RTU BMS system is required, a suitable RS485 cable must be used and connected to A, B, GND.

5.2 Monitor

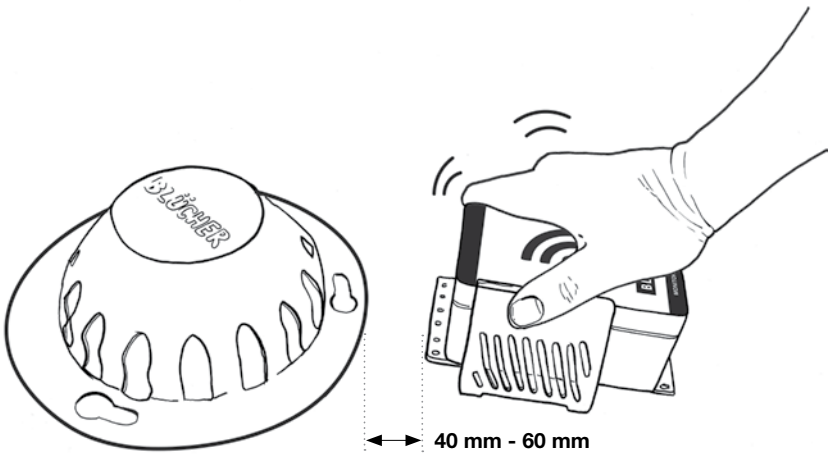
We recommend that one Monitor is installed next to each drain on your roof. Monitors should be installed at the primary drainage system and not at emergency outlets and drains. This gives the system the best conditions to evaluate the performance of the drainage system.



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 chapter 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, 40-60 mm from the edge of the drain. If the drain has a leaf guard, the 40-60 mm distance is from the edge of the leaf guard to the bracket.

6 Commissioning

Prior to commissioning, 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 SD card from the Gateway and open the Config file in an editor
3. Edit the Config file parameters to reflect the application (see appendix 13)
4. Save the Config file and place the SD 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 capture 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 SD card" mode can be entered by pressing the Info button for 5 seconds. When the SD card is mounted again, the Gateway will reboot and read the new configuration.*

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

6.1 SD card

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

NB: Before removing the SD card, either power off or press the Info button for 5 seconds to enter "Remove SD card" mode.

6.2 Configuration file

The config file has sections that must be parameterized. All parameters are described in detail in appendix 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 (Optinal)	To parameterized 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


```
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=
```

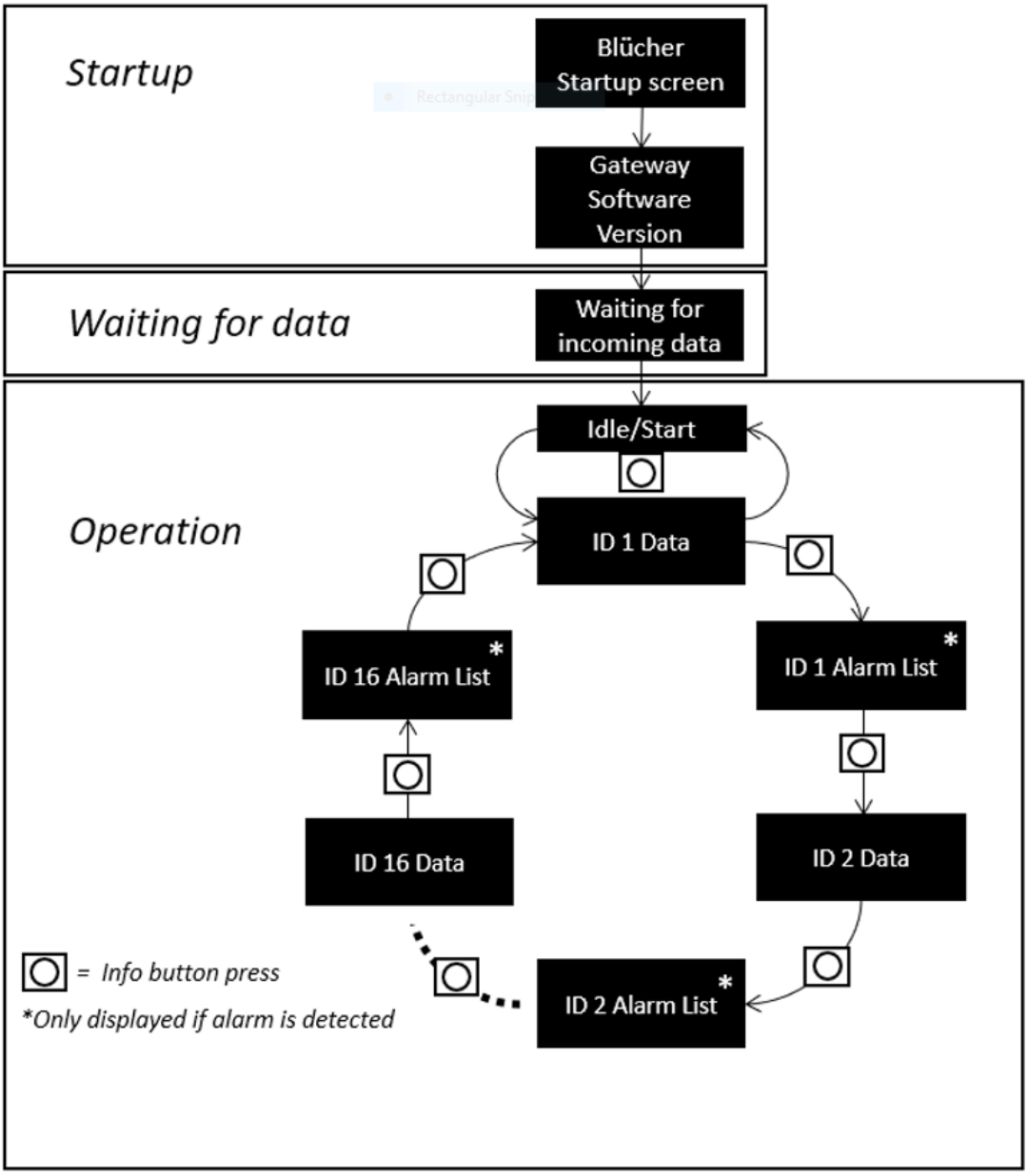
7 Functions

7.1 Display

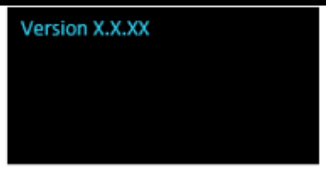
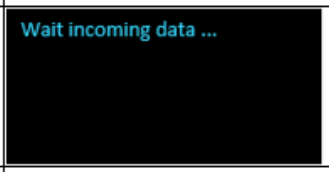
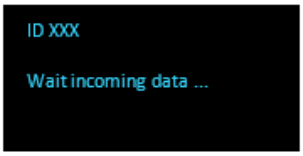
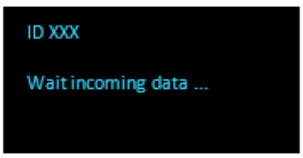
The display provides information on measurement values, diagnostics, and system information.

7.1.1 Menu structure

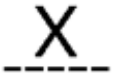
The menu is divided into 3 sections: start-up, waiting for data, and operation.
During start-up, the Gateway software version can be read.
Every time the Gateway has been re-booted it will wait up to 30 minutes until the first Monitor has been detected. When the first Monitor has been detected the display 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, Monitors 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

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

7.2 Info button

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

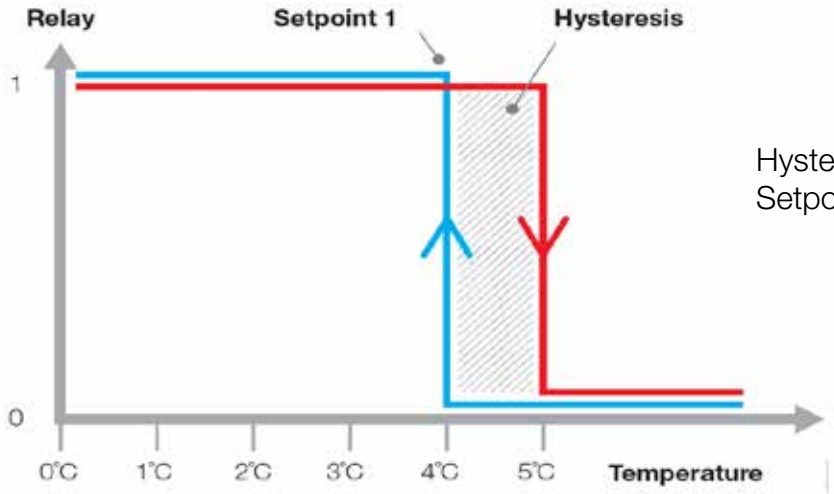
Next menu	Short push
Clear alarm	(Alarm list on display) Hold for 2 seconds
Remove SD card	Hold for 5 seconds
Reboot Gateway	Hold for 9 seconds

7.3 Relay

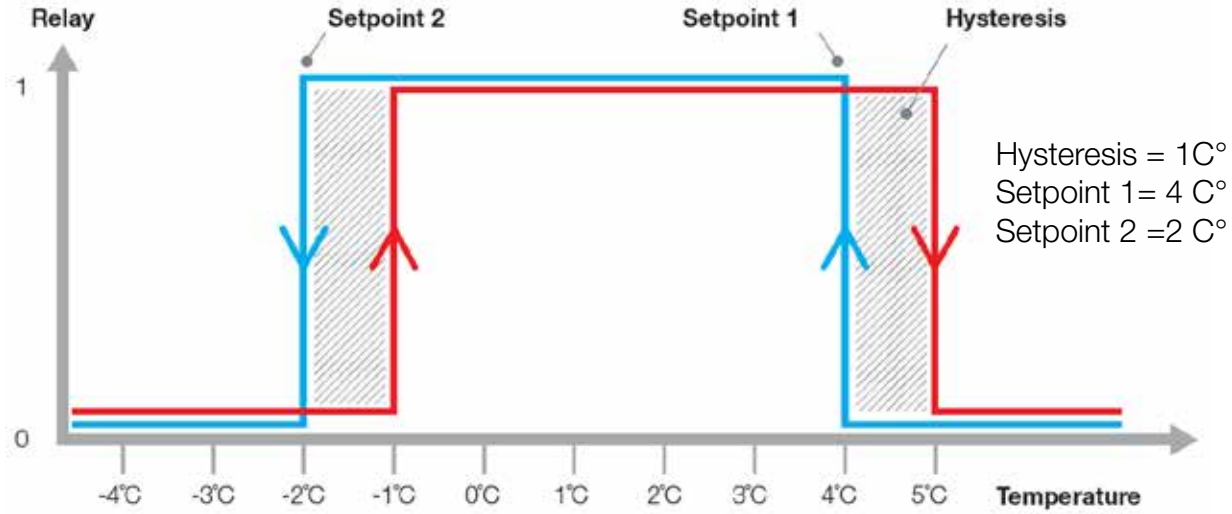
The relay functionality is parametrized in the Config file.

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

For more info on Alarm's, see chapter 7.5 diagnostics
The parameters for the Temp modes, can be parametrized in the config file, see Appendix 13.
Appending on the application, 1 or 2 set points can be selected, see below.



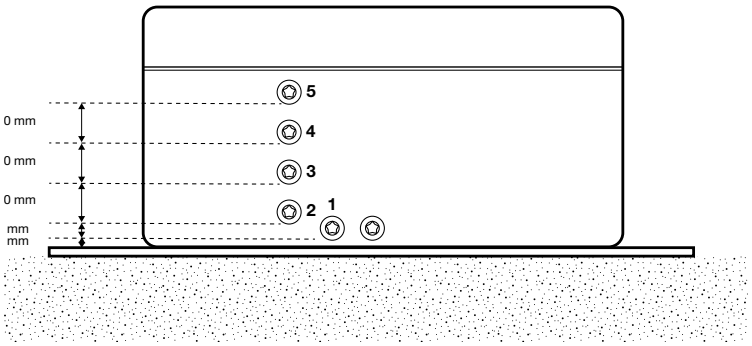
Hysteresis = 1C°
Setpoint 1= 4 C°



Hysteresis = 1C°
Setpoint 1= 4 C°
Setpoint 2 =2 C°

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:
See detail in chapter 7.5.1 and 7.5.2

7.5.1 Roof diagnostics

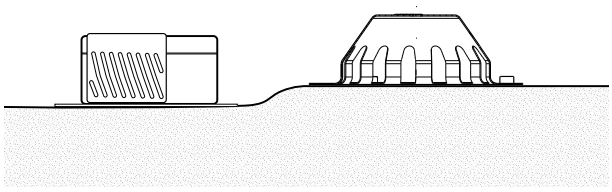
The Gateway incorporates an algorithm that activates an alarm based on water level across all Monitors over time. Two alarm conditions can be detected:

Roof Diagnostics	
Blocked drain	Appears when a Monitor detects higher water level than expected. Remedy: Clean drain inlet from debris or pipe blockage
Blocked sensor	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.

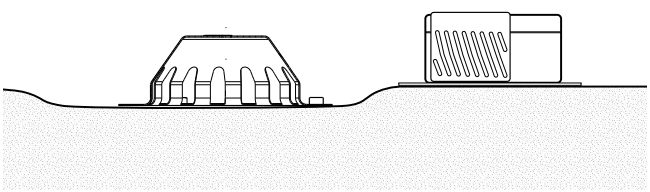
Roof alarm settings

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	
SAMPLE_NUMBER	Numbers of samples
SAMPLE_PERIOD	Time in minutes between samples
BLOCKED_SENSOR_LIMIT_FACTOR **BLOCKED_DRAIN_LIMIT_FACTOR**	Sensitivity of the algorithm: Higher value = Lower sensitivity Lower value = Higher sensitivity
BLOCKED_SENSOR_ALARM_SET_COUNTER **BLOCKED_DRAIN_ALARM_SET_COUNTER**	Counter of incidents that activate an alarm
BLOCKED_SENSOR_NOALARM_RESET_COUNTER **BLOCKED_DRAIN_NOALARM_RESET_COUNTER**	Number of no incidents to set counter to 0.
ALARM_TEMPERATURE_LIMIT:	Roof alarms deactivated when temperature is < 5°C on any Monitor. This is to avoid false alarms due to ice and snow. The roof alarms will reactivate when the temperature is >5°C on all Monitors. The temperature limit can be configured in the config file.
AUTOMATIC_ALARM_REMOVING	If set to YES, alarms will automatically clear when alarm conditions are no longer present. If set to NO, alarms will remain active until manually cleared via INFO button or via Modbus.
WATER_LEVEL_OFFSET_ID_1=0 **WATER_LEVEL_OFFSET_ID_2=0** **WATER_LEVEL_OFFSET_ID_3=0** **WATER_LEVEL_OFFSET_ID_4=0** **WATER_LEVEL_OFFSET_ID_5=0** **WATER_LEVEL_OFFSET_ID_6=0** **WATER_LEVEL_OFFSET_ID_7=0** **WATER_LEVEL_OFFSET_ID_8=0** **WATER_LEVEL_OFFSET_ID_9=0** **WATER_LEVEL_OFFSET_ID_10=0** **WATER_LEVEL_OFFSET_ID_11=0** **WATER_LEVEL_OFFSET_ID_12=0** **WATER_LEVEL_OFFSET_ID_13=0** **WATER_LEVEL_OFFSET_ID_14=0** **WATER_LEVEL_OFFSET_ID_15=0** **WATER_LEVEL_OFFSET_ID_16=0**	



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 lost communication alarm appears when there has been no communication between Monitor and Gateway 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

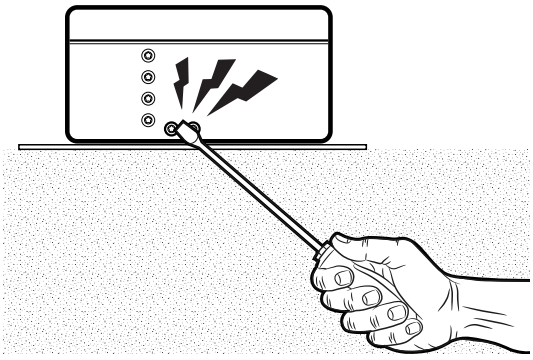
7.6.1 Operation Mode

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.

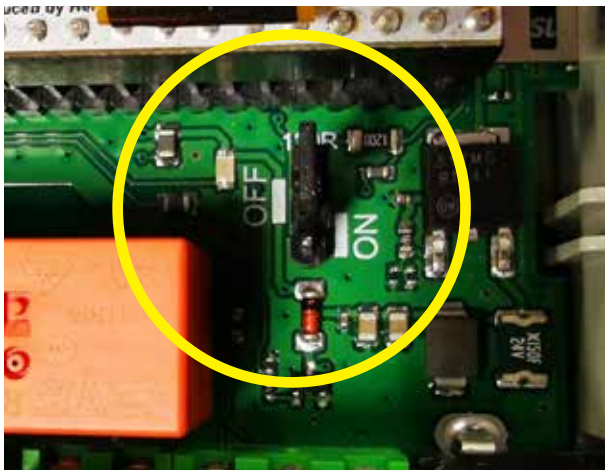
8 Modbus interface

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



NB. Power off before changing the jumper switch position.

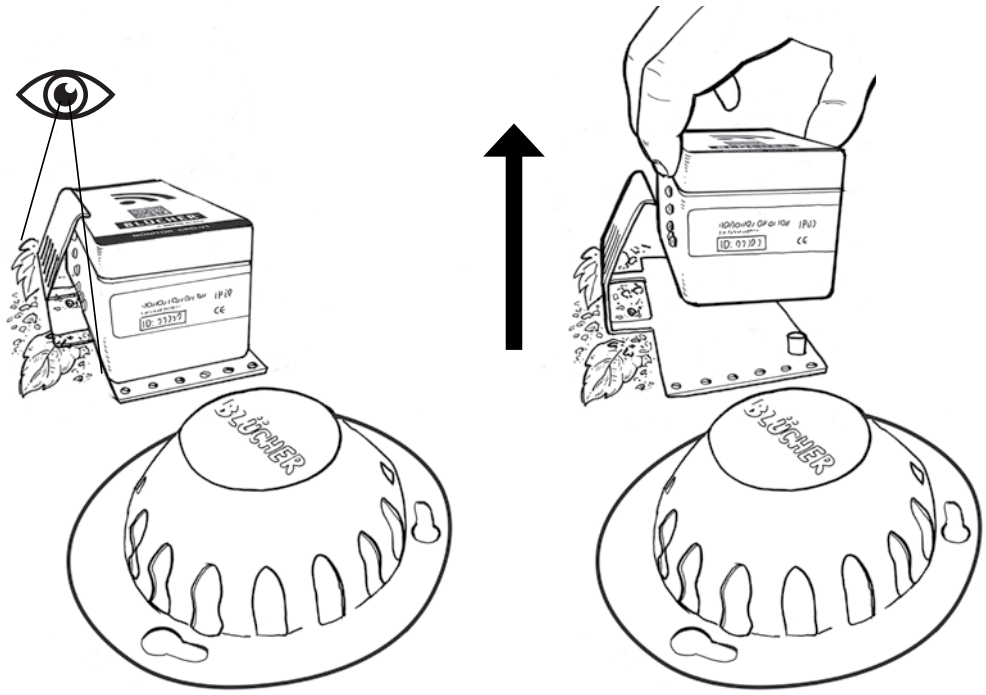
9 Gateway software update

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 update file to the SD card.
3. With the SD 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 SD card after a successful update.

10 Service and maintenance

We recommend regular 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 BLÜCHER Connected Roof system.



11 Troubleshooting

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

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

12 Disclaimer

BLÜCHER offers its Connected Roof Product for enhancing the daily supervision of your roof performance. However, the BLÜCHER's liability must be understood as limited by decreasing prevalence order as follow:
- The present DISCLAIMER statements
- The BLÜCHER's General Terms and Conditions of Sale

1- Limited Warranty Product Disclaimer

* BLÜCHER's Connected Roof Product is under a limited warranty intended to cover the material defects of the product device only, for a period in accordance with our General Terms and Conditions of Sale. During the warranty period, BLÜCHER will repair, recondition, or replace any defective Connected Roof Product (in whole or in part) according to BLÜCHER's General Terms and Conditions of Sale.

* However, the warranty does not cover device defects that result from abuse, accident, or misuse. Also, it does not cover uses that are not in accordance with the present "User manual Installation Guide".

2- Limit of Liability Product Disclaimer

* BLÜCHER's Connected Rooftop Product does not excuse you from regular inspection and reasonable care of your roof area.

* Unless there are mandatory legal provisions, BLÜCHER accepts no liability whatsoever for the safety, reliability, durability and performance of our Connected Roof Product.

Therefore, BLÜCHER shall not be held in justice for any indirect property damage (included but not limited to roof or building that the BLÜCHER's Connected Roof Product monitors) or any indirect personal injury.

13 Appendix – Configuration file parameters

Monitor ID		
ID_1 - ID_16	1-65535	Unique Monitor ID. The ID can be read on the Monitor label.
Relay settings		
RELAY_MODE	OFF, ALARM_ROOF, ALARM_MONITOR, ALARM_ROOF_ MONITOR, TEMP_ONESETPOINT, TEMP_TWOSETPOINTS	[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]
General settings		
RF_ region	EU	Wireless frequency 868 MHz
Roof Alarm settings		
ID_1 – ID_16 Offset	-5 to 5	[Factory setting: 0]
ALARM_TEMPERATURE_LIMIT	-10 to 10 (°C)	[Factory setting: 5(°C)]
AUTOMATIC_ALARM_REMOVING	YES, NO	[Factory setting: YES]
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]
BMS settings		
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 Appendix – 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
				32nd character				00116	0-7
	device ID	17	hex	1st octet				00117	8-15
			hex	2nd octet				00117	0-7
			hex	3rd octet				00118	8-15
			hex	4th octet				00118	0-7
	HW version2	19	uint8	A (0 … 256)				00119	8-15
			uint8	B (0 … 256)				00119	0-7
	SW version2	20	uint8	A (0 … 256)				00120	8-15
			uint8	B (0 … 256)				00120	0-7
	frame counter	21	uint32, big endian byte order					00121	
								00122	
	time counter	23	uint32, big endian byte order	second				00123	
								00124	
	communication lost alarm	25	bool					00125	0
	blocked sensor alarm		bool					00125	1
	blocked drain alarm		bool					00125	2
	battery low alarm		bool					00125	3
	internal leak alarm		bool					00125	4
	water level	26	uint8	0 ... 5				00126	0-7
	temperature	27	int16, decimal place = 2	-35.00 ... 85.00 °C				00127	
	temperature min	28	int16, decimal place = 2	-35.00 ... 85.00 °C				00128	
	temperature max	29	int16, decimal place = 2	-35.00 ... 85.00 °C				00129	
	humidity	30	uint16, decimal place = 2	0 ... 100.00 %				00130	
	humidity min	31	uint16, decimal place = 2	0 ... 100.00 %				00131	
	humidity max	32	uint16, decimal place = 2	0 ... 100.00 %				00132	
	battery level	33	uint16, decimal place = 2	0 ... 100.00 %				00133	
	communication signal level	34	uint16, decimal place = 2	0 ... 100.00 %				00134	
	diagnostic sensor signal	35	uint16	0 ... 40				00135	
	diagnostic internal leak	36	uint16	0 ... 255				00136	
	diagnostic water level 1	37	uint16	0 ... 255				00137	
	diagnostic water level 2	38	uint16	0 ... 255				00138	
	diagnostic water level 3	39	uint16	0 ... 255				00139	
	diagnostic water level 4	40	uint16	0 ... 255				00140	
	diagnostic water level 5	41	uint16	0 ... 255				00141	
	diagnostic battery voltage	42	uint8, x20 and decimal place = 3	0 ... 4.000 V				00142	8-15
	diagnostic battery voltage min	43	uint8, x20 and decimal place = 3	0 ... 4.000 V				00143	0-7
	diagnostic error counter	44	uint16					00144	
	diagnostic CTN temperature	45	uint16	-35.0 ... 85.0 °C				00145	
	clear communication lost alarm	51	bool		holding register	R/W	16	00151	0
	clear blocked sensor alarm		bool					00151	1
	clear blocked drain alarm		bool					00151	2
	clear battery low alarm		bool					00151	3
	clear internal leak alarm		bool					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	

…								…	
1	diagnostic sensor signal	1	uint16	0 ... 40				13901	
…								…	
16	diagnostic sensor signal	16	uint16	0 ... 40				13916	
…								…	
1	diagnostic internal leak	1	uint16	0 ... 255				14001	
…								…	
16	diagnostic internal leak	16	uint16	0 ... 255				14016	
…								…	
1	diagnostic water level 1	1	uint16	0 ... 255				14101	
…								…	
16	diagnostic water level 1	16	uint16	0 ... 255				14116	
…								…	
1	diagnostic water level 2	1	uint16	0 ... 255				14201	
…								…	
16	diagnostic water level 2	16	uint16	0 ... 255				14216	
…								…	
1	diagnostic water level 3	1	uint16	0 ... 255				14301	
…								…	
16	diagnostic water level 3	16	uint16	0 ... 255				14316	
…								…	
1	diagnostic water level 4	1	uint16	0 ... 255				14401	
…								…	
16	diagnostic water level 4	16	uint16	0 ... 255				14416	
…								…	
1	diagnostic water level 5	1	uint16	0 ... 255				14501	
…								…	
16	diagnostic water level 5	16	uint16	0 ... 255				14516	
…								…	
1	diagnostic battery voltage	1	uint8, x20 and decimal place = 3	0 ... 4.000 V				14601	0-7
…								…	
16	diagnostic battery voltage	16	uint8, x20 and decimal place = 3	0 ... 4.000 V				14616	0-7
…								…	
1	diagnostic battery voltage min	1	uint8, x20 and decimal place = 3	0 ... 4.000 V				14701	0-7
…								…	
16	diagnostic battery voltage min	16	uint8, x20 and decimal place = 3	0 ... 4.000 V				14716	0-7
…								…	
1	diagnostic error counter	1	uint16					14801	
…								…	
16	diagnostic error counter	16	uint16					14816	
…								…	
1	diagnostic CTN temperature	1	uint16	-35.0 ... 85.0 °C				14901	
…								…	
16	diagnostic CTN temperature	16	uint16	-35.0 ... 85.0 °C				14916	
…								…	
1	clear communication lost alarm	1	bool		holding register	R/W	16	15001	0
	clear blocked sensor alarm		bool					15001	1
	clear blocked drain alarm		bool					15001	2
	clear battery low alarm		bool					15001	3
	clear internal leak alarm		bool					15001	4
…								…	
16	clear communication lost alarm	16	bool					15016	0
	clear blocked sensor alarm		bool					15016	1
	clear blocked drain alarm		bool					15016	2
	clear battery low alarm		bool					15016	3
	clear internal leak alarm		bool					15016	4

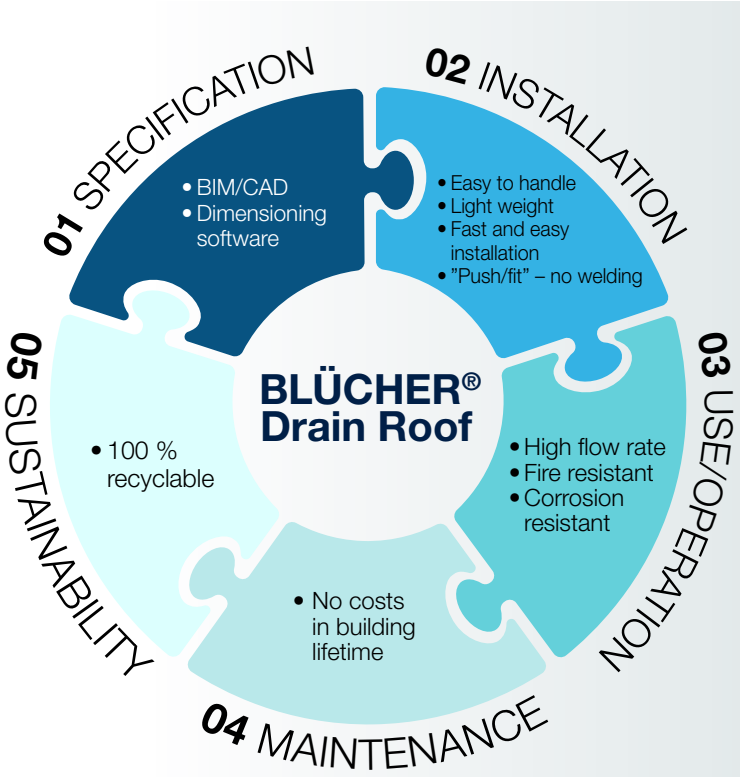
1 modbus address structure:
Xnnnn -> 0 - “parameters combined by monitor index number” group, 1 - “parameters combined by type” group
nXXnn -> monitor index number
nnnXX -> parameter index number for a monitor
2 version numbers are represented by “A.B” format - each letter is a single byte

Table 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	holding register	R/W	16	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

“The **BLÜCHER® Drain Roof** range is easily connected to the BLÜCHER® EuroPipe pipework system - offering you a safe and complete roof drainage system“.



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