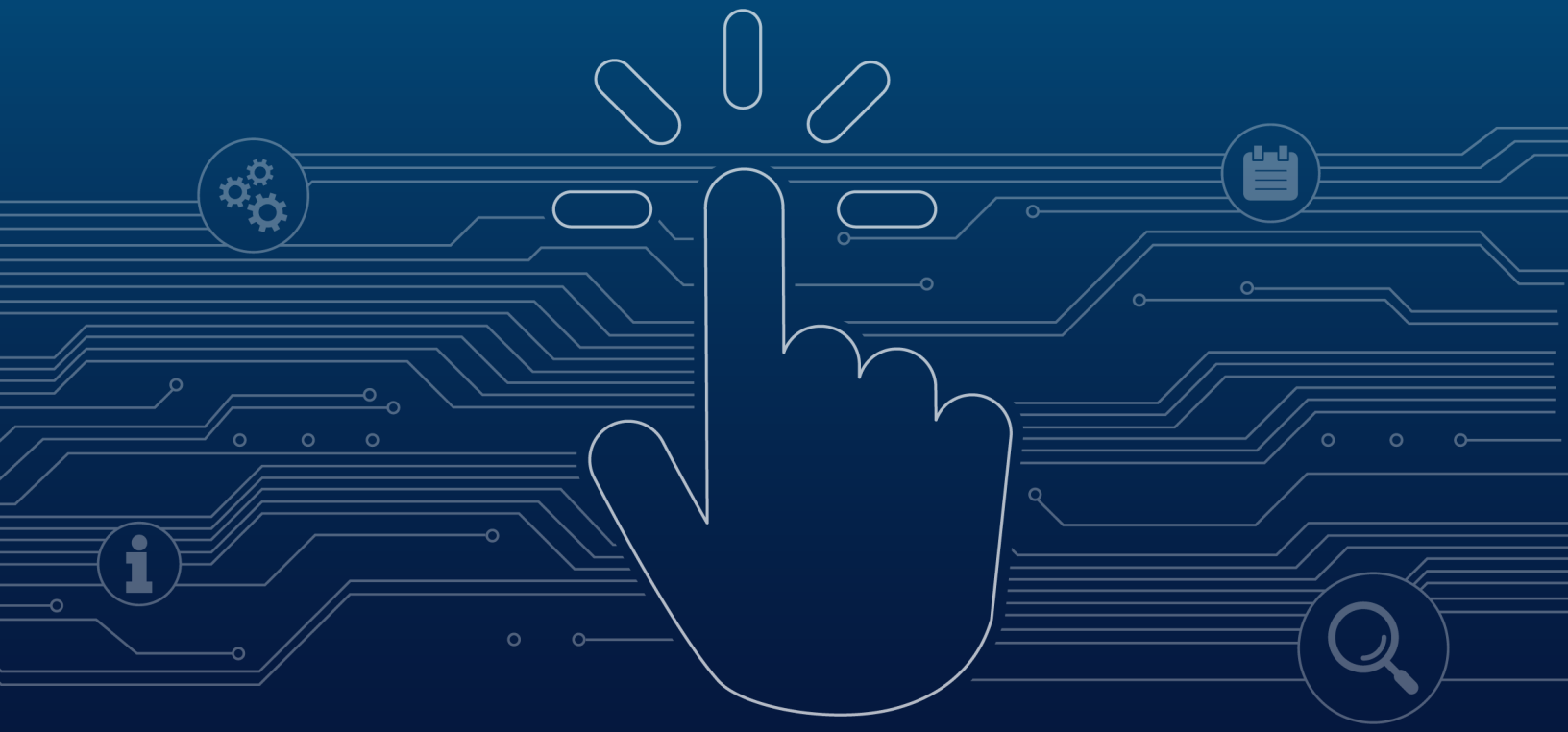
PAESSLER
THE MONITORING EXPERTS

USER MANUAL

Paessler BitDecoder

Payload Decoding of LPWAN Data Sent by IoT Devices



PAESSLER BITDECODER BETA

Paessler BitDecoder Manual

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Part 1

Welcome to Paessler BitDecoder

1 Welcome to Paessler BitDecoder

Welcome to Paessler BitDecoder, a tool for decoding encoded low-power wide-area network data delivered by IoT devices. This document describes the underlying concepts and applications of Paessler BitDecoder. It also explains how to use Paessler BitDecoder in detail.

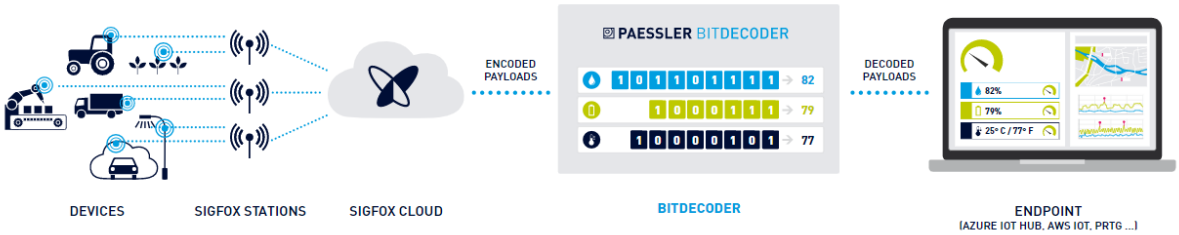
How Paessler BitDecoder works

IoT devices deliver LPWAN metering data and information in payloads that are usually encoded in binary format. Post-processing IoT platforms need these payloads in decoded form to be able to read and further process them.

Paessler BitDecoder is a software-as-a-service application that serves as middleware between the physical IoT devices that collect data and the IoT platform that you use for further data processing.

Paessler BitDecoder supports you in structuring, marking, and decoding complex payloads. Using device templates, Paessler BitDecoder decodes payloads delivered by your IoT devices into the JavaScript Object Notation (JSON) format and sends them to the endpoint of your choice. This can be, for example, an Azure IoT Hub, an AWS IoT Core, or PRTG Network Monitor. You can also create a custom HTTP or Message Queue Telemetry Transport (MQTT) integration endpoint of your choice.

To use Paessler BitDecoder, you do not need to have any programming knowledge because Paessler BitDecoder makes use of visual programming language (VPL). This means that Paessler BitDecoder visualizes the payload so that you can select the bits from the payload that you want to decode. Of course, you can also use custom JavaScript functions to decode payloads.



Example of how Paessler BitDecoder works

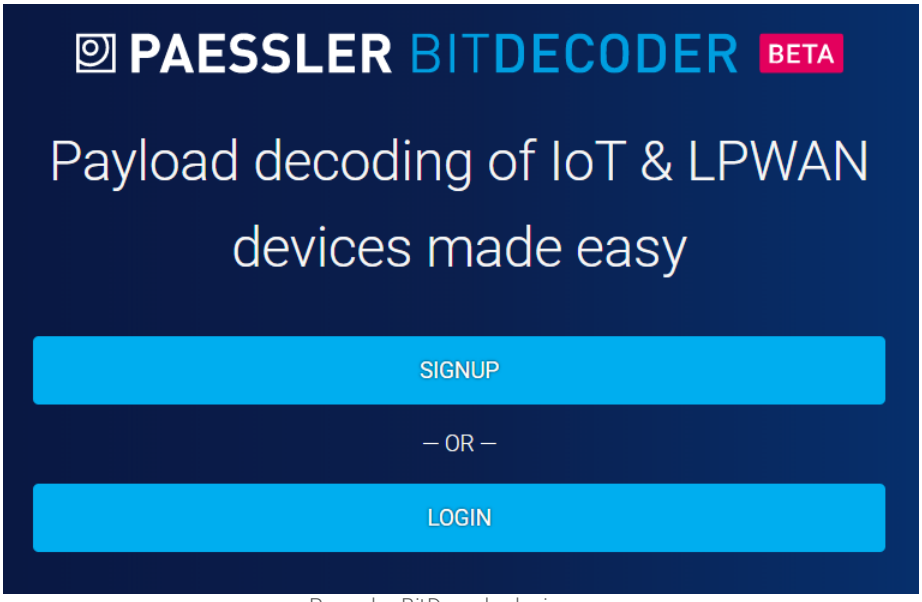
Part 2
Getting started

2 Getting started

The following sections show you how to Create a Paessler BitDecoder account 8 and how to Manage your Paessler BitDecoder account 11.

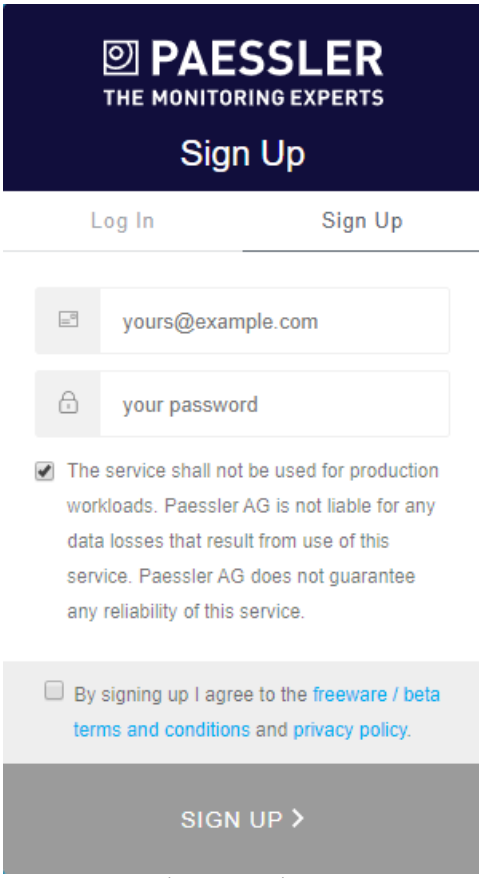
2.1 Create a Paessler BitDecoder account

To create a Paessler BitDecoder account, open your web browser and go to https://bitdecoder.paessler.io.



Paessler BitDecoder login page

Click **Signup** to sign up to Paessler BitDecoder.



Paessler BitDecoder signup

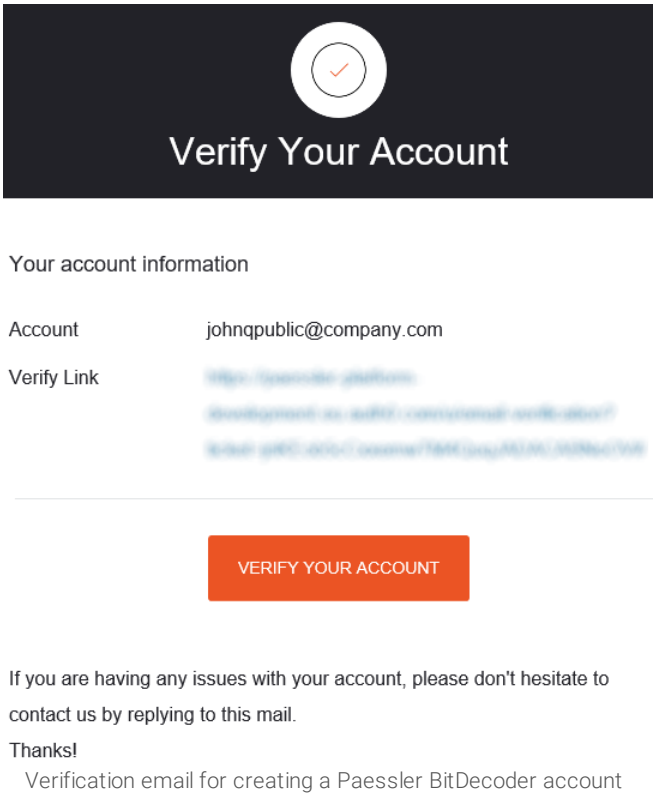
Sign up via email by entering a valid email address and a password. The password must be at least 8 characters long and must contain at least 3 of the following 4 types of characters:

- Lowercase letter
- Uppercase letter
- Number
- Special character

ⓘ You cannot change your username and email address once you have created your Paessler BitDecoder account.

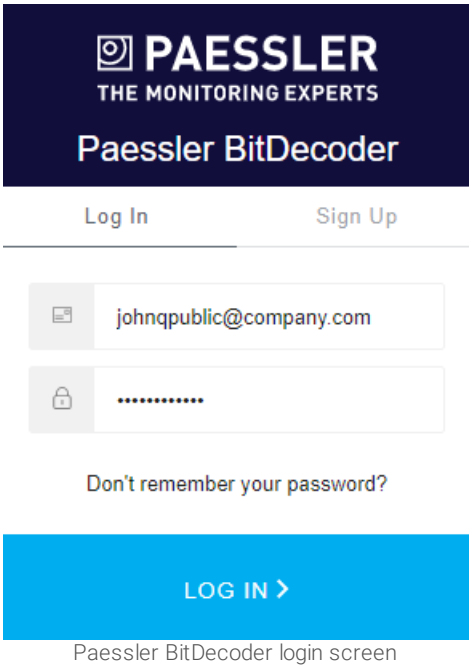
Make sure that you agree to the terms and conditions and privacy policy. Click **Sign Up** to create your Paessler BitDecoder account. Paessler BitDecoder then sends a verification email to your inbox.

Go to your inbox and open the email.



Verification email for creating a Paessler BitDecoder account

Click **Verify Your Account** to verify your email address and go to the login screen.



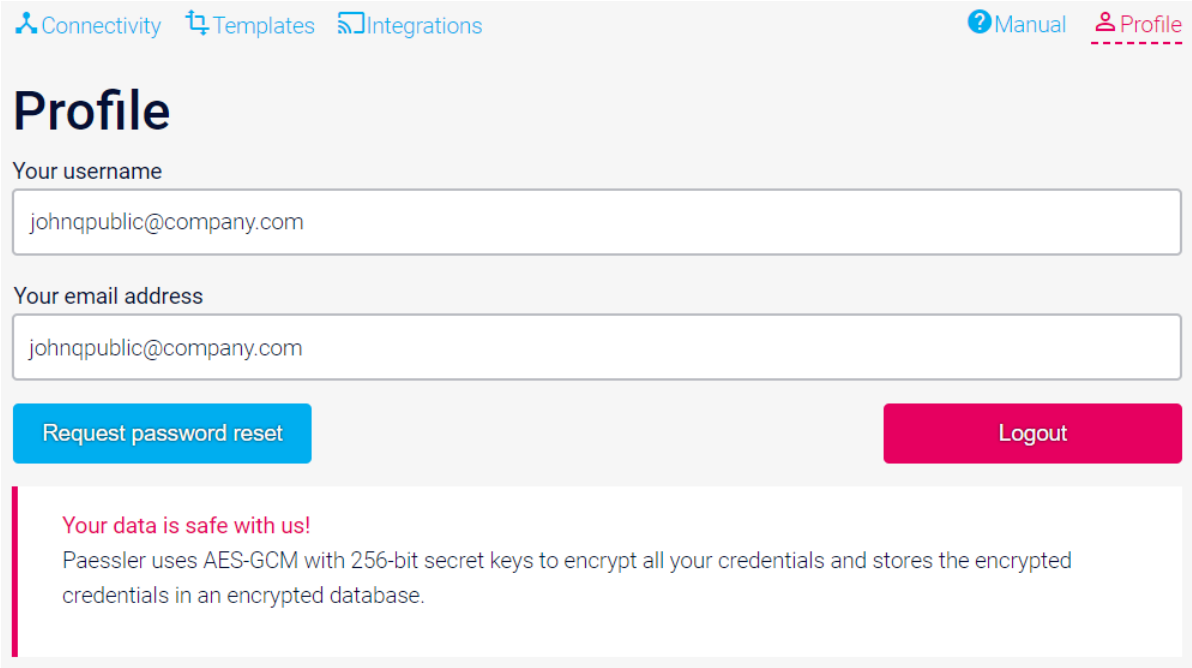
Paessler BitDecoder login screen

Enter your credentials and click **Log In** to log in to Paessler BitDecoder.

2.2 Manage your Paessler BitDecoder account

Go to https://bitdecoder.paessler.io and log in to your Paessler BitDecoder account. Click **Profile** to see your username and email address and to log out of Paessler BitDecoder.

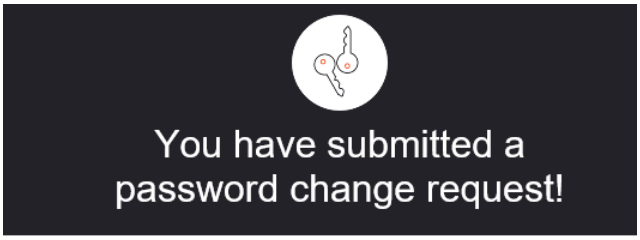
ⓘ You cannot change your username and email address once you have created your Paessler BitDecoder account.



Managing your Paessler BitDecoder account

To change your password, click **Request password reset**. Paessler BitDecoder then sends an email to your inbox to confirm the password change request.

Go to your inbox and open the email.



If it was you, confirm the password change

URL [redacted]

CONFIRM

If you are having any issues with your account, please don't hesitate to contact us by replying to this mail.
Thanks!

Confirmation email for password reset

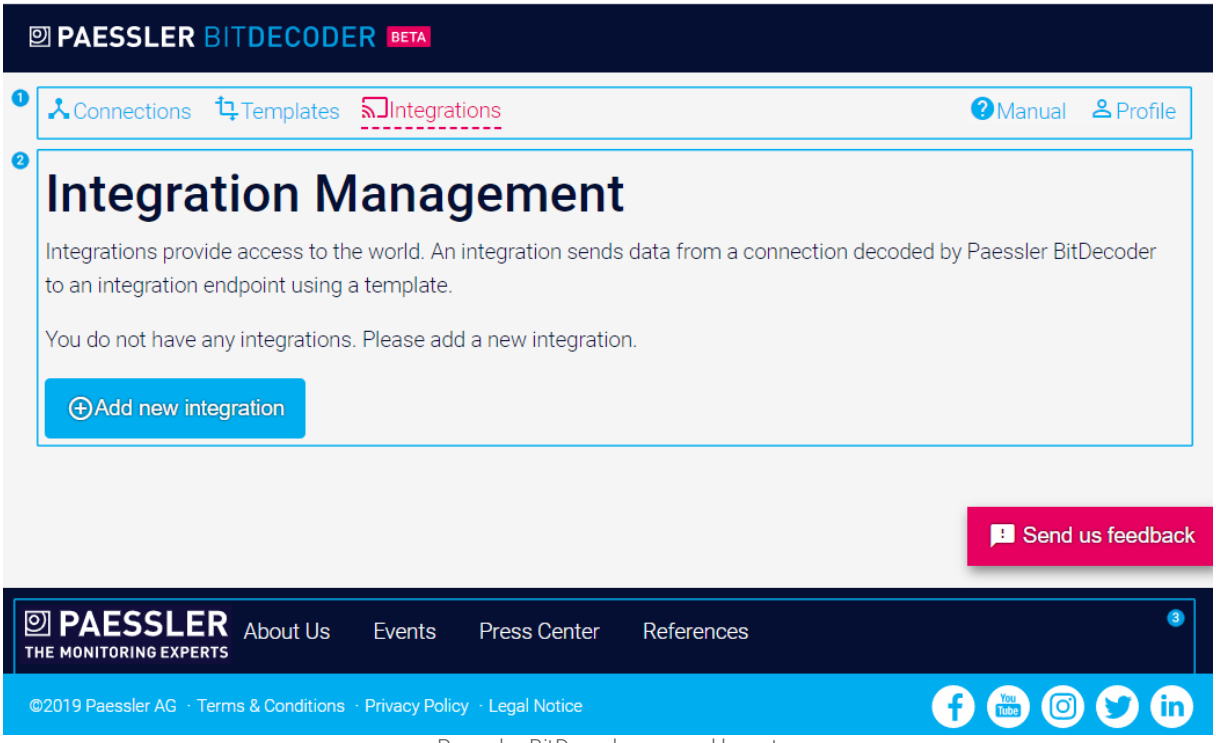
Click **Confirm** to go to the **Change Password** screen.

Enter your new password, then enter it again to confirm it.

Part 3
Using Paessler BitDecoder

3 Using Paessler BitDecoder

Go to https://bitdecoder.paessler.io and log in to your Paessler BitDecoder account. Paessler BitDecoder opens to the **Integration Management** page.



Paessler BitDecoder general layout

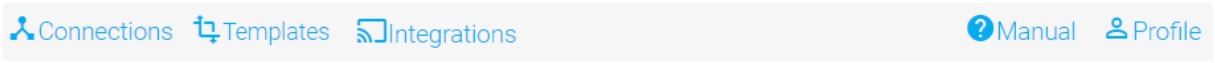
General layout

From top to bottom, the main layout of Paessler BitDecoder consists of:

Screen number	Page area name	Description
1	Menu tabs bar	This area contains the main navigation tabs.
2	Page content	This area contains different content depending on the tab you select.
3	Page footer	This area contains links to the Paessler web page and to legal information such as the terms and conditions, the privacy policy, and the legal notice. You can also find social media icons for quick links to the respective social media platforms.

Menu tabs bar

With the menu tabs bar, you can navigate Paessler BitDecoder.



Paessler BitDecoder menu tabs bar

Documentation is available for the following tabs:

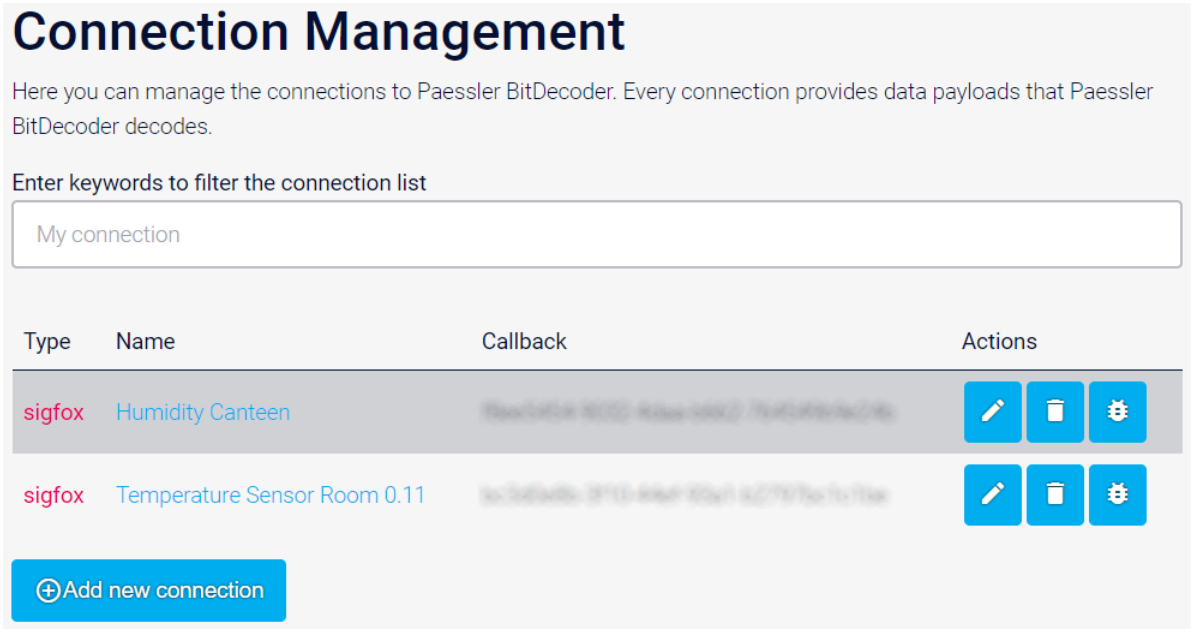
Tab name	Description
Connections 16	Add new connections to Paessler BitDecoder and manage your existing connections.
Templates 20	Add new templates to Paessler BitDecoder and edit existing templates.
Integrations 30	Add new integrations with Paessler BitDecoder and manage existing integrations.

Furthermore, you can view your **Profile** where you can manage your Paessler BitDecoder account 11 and log out of Paessler BitDecoder.

3.1 Connection management

On the **Connections** tab, you can add new connections from Sigfox or connections via HTTP to Paessler BitDecoder, or you can manage existing connections.

Click the **Connections** tab to see a list of all your created connections. Enter keywords to filter the connection list for the name of a connection.



List of connections in the connection management

The connection list is structured as follows:

Table header	Description
Type	Show the type of connection like sigfox or http. ⓘ Paessler BitDecoder currently only supports connections from Sigfox.
Name	Show the name that you entered for the connection.
Callback	Show the callback to Sigfox that Paessler BitDecoder created for the respective device. With this callback, Sigfox calls up Paessler BitDecoder when the respective device sends data.
Actions	▪ To edit a connection, click . ▪ To delete a connection, click .

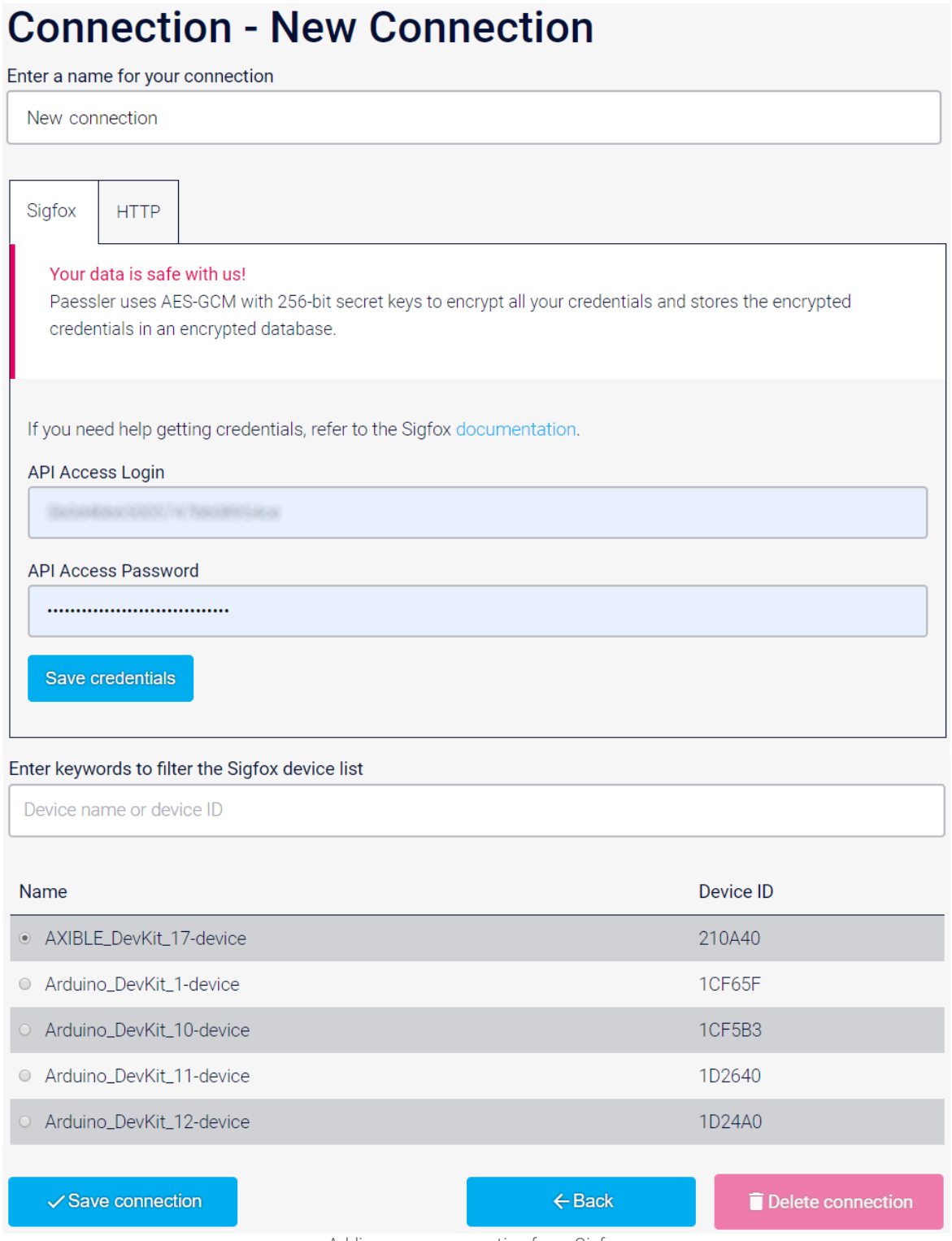
Table header	Description
	▪ To test a connection 19, click .

Add a new connection

Click **Add new connection** to create a new connection to Paessler BitDecoder.

ⓘ Paessler BitDecoder currently only supports connections from Sigfox.

ⓘ For Sigfox connections, you need to enter valid API credentials so that Paessler BitDecoder can scan your Sigfox account for available IoT devices and create or remove callbacks to Sigfox.



Adding a new connection from Sigfox

Take the following steps to create a new connection:

1. Enter a meaningful name for your connection, for example, Temperature Sensor Room 0.11. This can be any string.
2. On the **Sigfox** tab, enter your **API Access Login** and your **API Access Password** and click **Save credentials**. A list of all available Sigfox devices appears.
3. Enter keywords to filter the device list for a specific device. Enter either the device name or the device ID. The device ID is unique for each device. You can find it printed on your physical device.
4. Select a device for which you want to add a connection and click **Save connection**. Paessler BitDecoder then automatically creates a callback to Sigfox for this device. With this callback, Sigfox calls up Paessler BitDecoder when the respective device sends data.

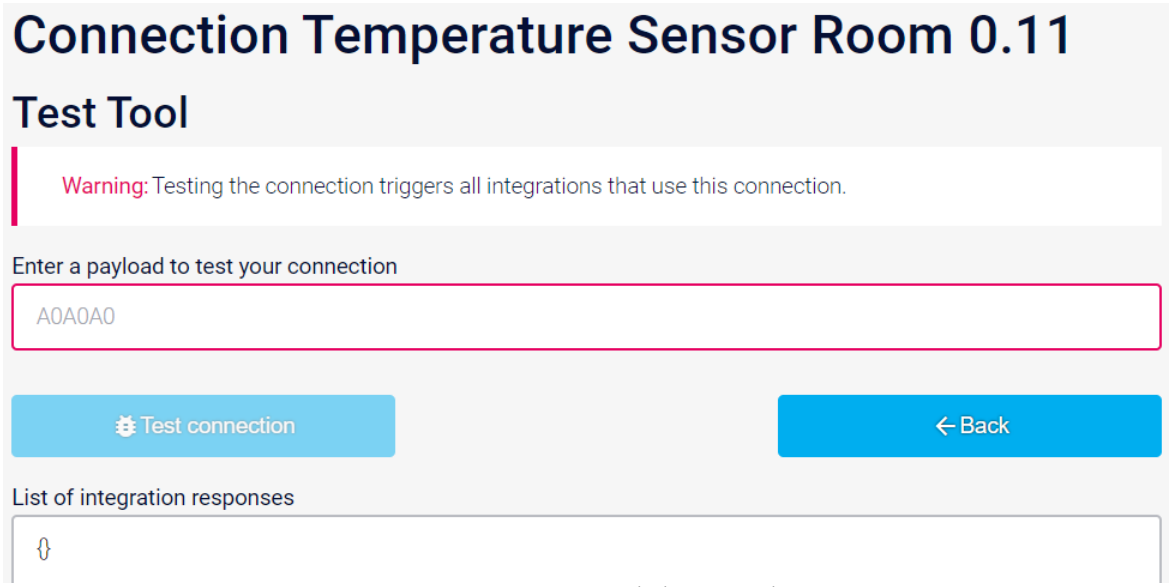
ⓘ You need to add a new connection for each device.

Test a connection

Click  to open the test tool and to test a connection.

ⓘ To test a connection, you first need to create an integration 30 for the connection.

ⓘ Testing the connection triggers all integrations that use this connection.



Testing a connection with the test tool

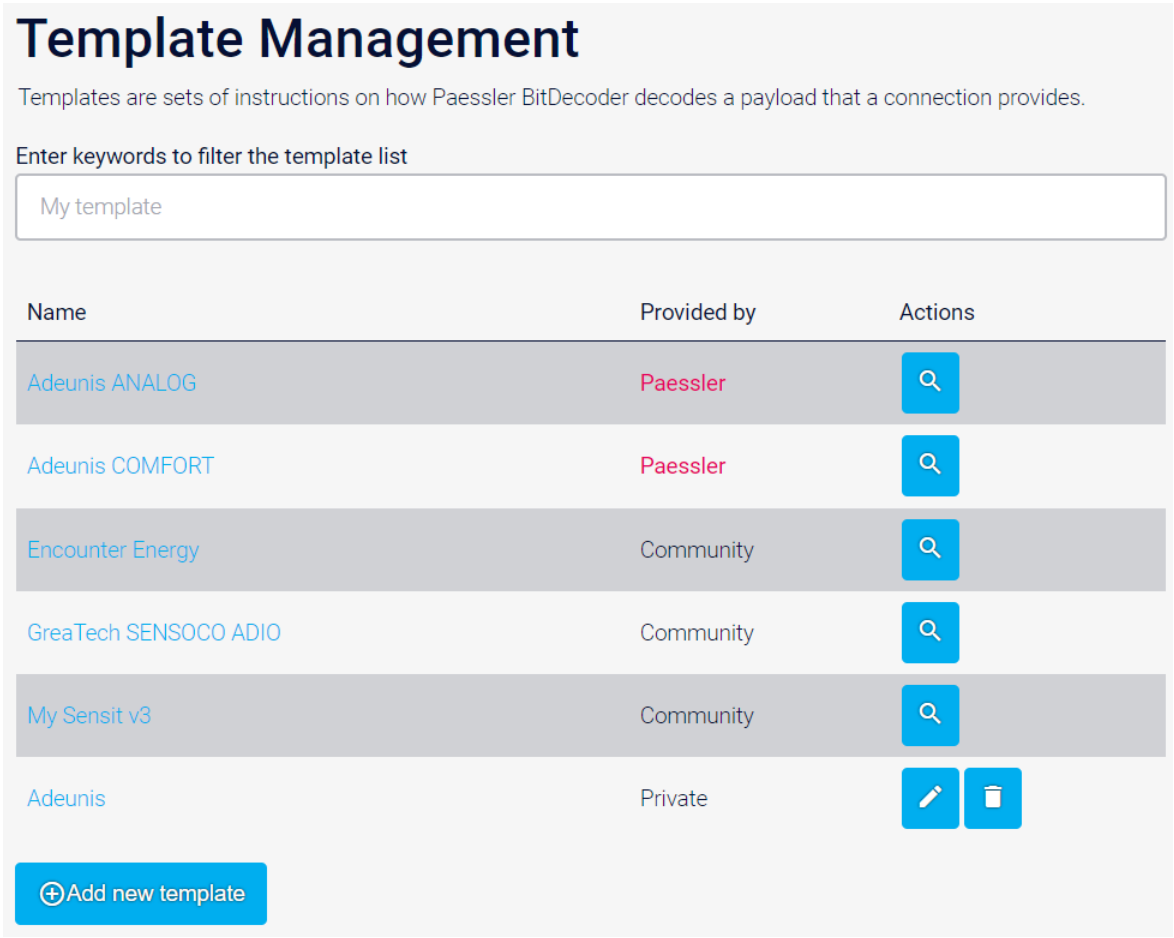
Take the following steps:

1. Enter any payload that a connection may deliver to test your connection.
   ⓘ The payload must be in hexadecimal notation.
2. Click **Test connection**.
3. In the field **List of integration responses**, you then see which data Paessler BitDecoder sends to which integration.

3.2 Template management

On the **Templates** tab, you can add new templates or manage existing templates. Templates are sets of instructions on how Paessler BitDecoder decodes a payload that a connection 16 provides.

Click the **Templates** tab to see a list of all templates that are available for use. Enter keywords to filter the template list for the name of a template.



List of available templates in the template management

The template list is structured as follows:

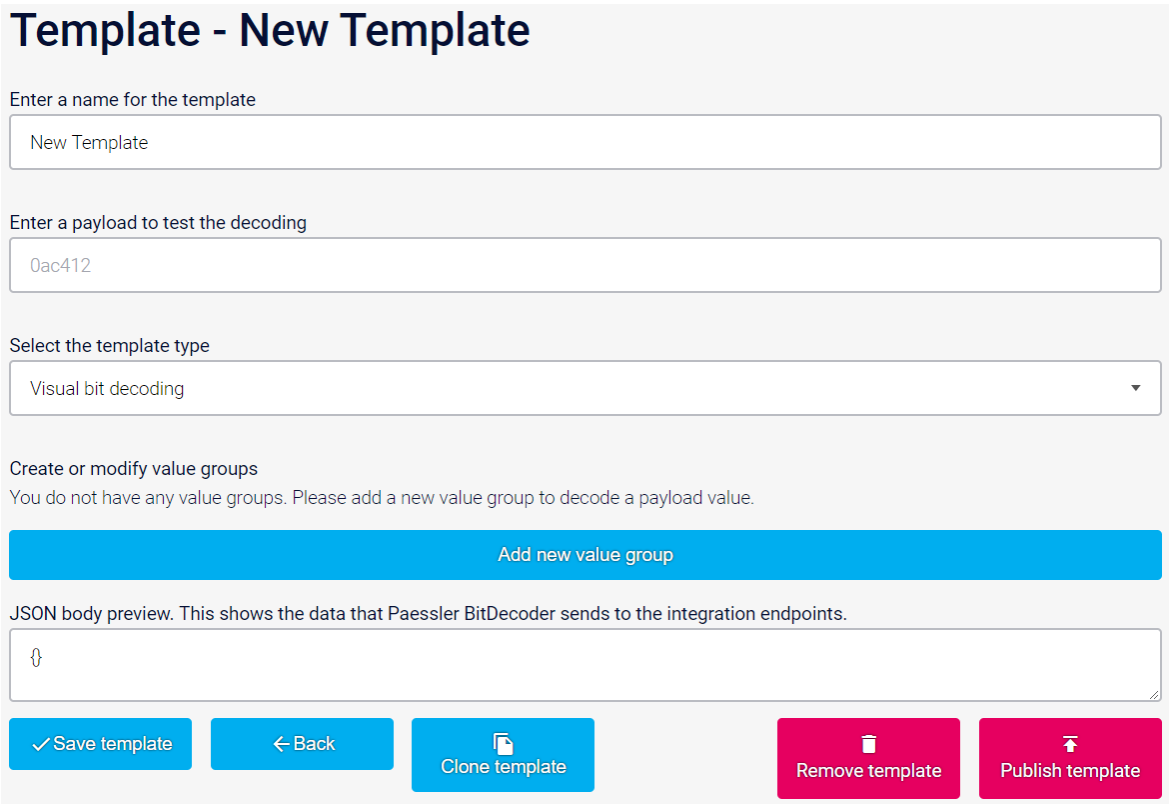
Table header	Description
Name	Show the name of the template.
Provided by	Show the source of the template. Templates can be provided by:

Table header	Description
	▪ **Paessler**: Templates provided by Paessler have been thoroughly tested. They are available for every user of Paessler BitDecoder and you can only view them. ▪ **Community**: Community templates are provided by the community of Paessler BitDecoder users. They are available for every user of Paessler BitDecoder and you can only view them. ⓘ Community templates have not been tested by Paessler and might not work correctly. ▪ **Private**: Private templates are for your use only. You can edit, delete, and publish them so that they become available for the community. ⓘ If you want to edit a template provided by Paessler or the community, you need to create a clone 23 of this template.
Actions	▪ To view a template, click 🔍. ▪ To edit a template, click ✎. ▪ To delete a template, click 🗑.

Here are quick links for ease of use:

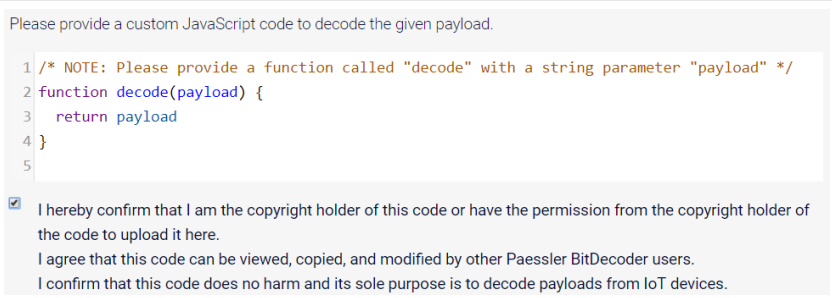
Add a new template

Click **Add new template** to create a new template.



Adding a new template

Field or option name	Description
Enter a name for the template	Enter a meaningful template name. For example, enter the name of the device for which you created a connection and whose payload you want to decode. ⓘ If you want to publish a template, make sure that the template name is unique and that it describes the device.
Enter a payload to test the decoding	Enter any payload that a connection may deliver. This test payload helps you if you want to use **Visual bit decoding** as a decoding method. ⓘ The payload must be in hexadecimal notation.
Select the template type	Select if you want to use **Visual bit decoding** or provide a **Custom JavaScript function** for decoding a payload. ⓘ If you want to provide a custom JavaScript code, make sure that you agree to the terms and conditions for uploading custom code to Paessler BitDecoder.

Field or option name	Description
	 Providing a custom JavaScript function
Create or modify value groups	For each value that you want to extract from the payload to decode, you need to create a value group. Show a list of value groups that you have already created. Click  to edit a value group.
Add new value group	Click to open the value group editor 24 and to create a new value group.

Do not forget to save new templates or any changes to already existing templates.

Further options in the template editor

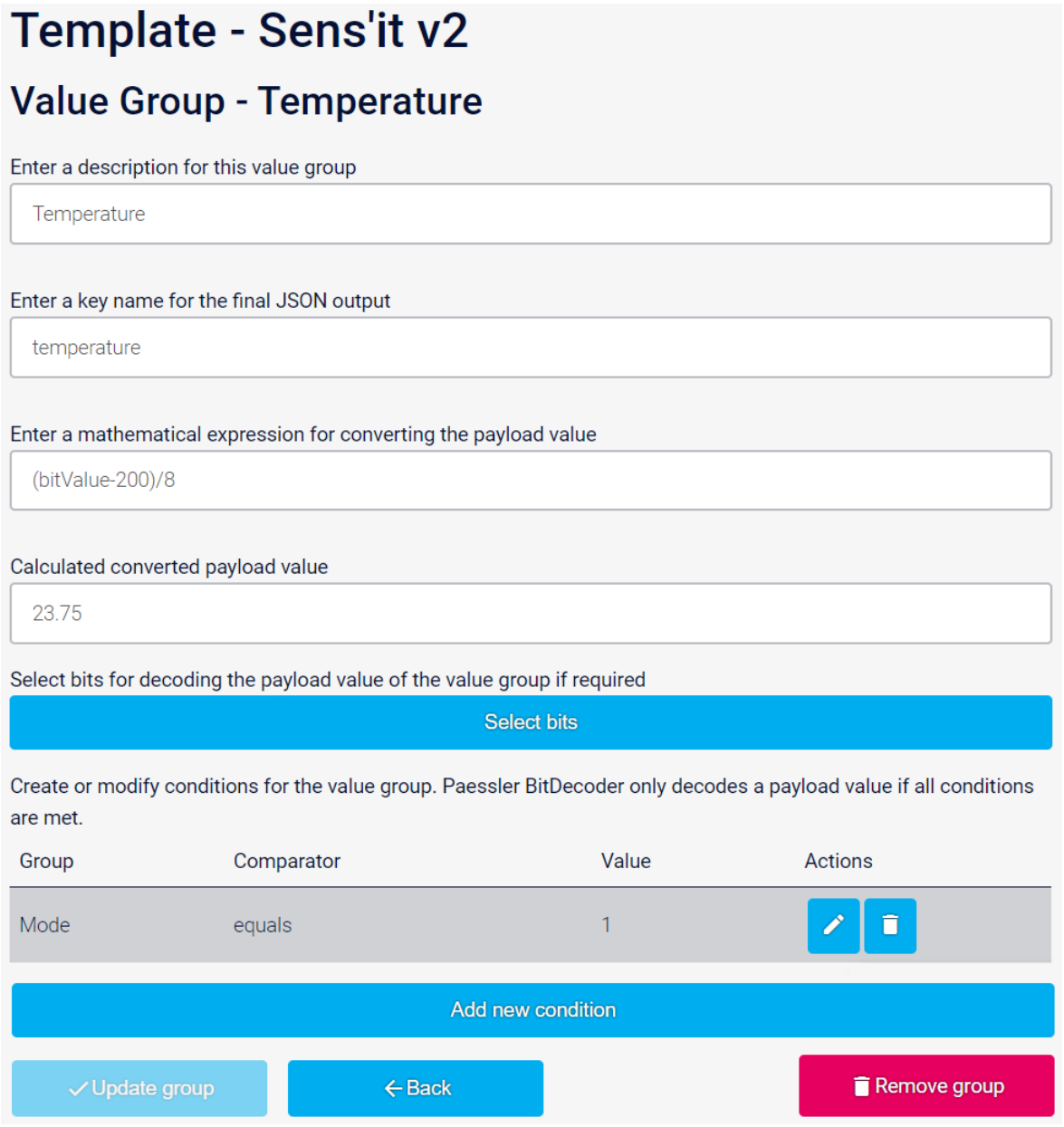
In addition to adding new templates, the template editor provides further options like deleting, publishing, or cloning templates.

Field or option name	Description
JSON body preview	Show a preview of the generated JavaScript Object Notation (JSON) output that Paessler BitDecoder sends to the integration endpoint of your choice.
Remove template	Click to delete a template.
Publish template	Click to make your template available to the public as a community template. Paessler BitDecoder automatically saves the template before publishing it. Once you have published a template, you cannot edit or delete it anymore. To edit the according template, you need to clone it.

Field or option name	Description
Clone template	Click to edit a public template. Paessler BitDecoder then creates a copy of the respective template that you can change as needed.

Value group editor

With the value group editor, you can create a value group for a specific value that you want to extract from the payload to decode. You can only open the value group editor from the template editor 21.



Adding a value group with the value group editor

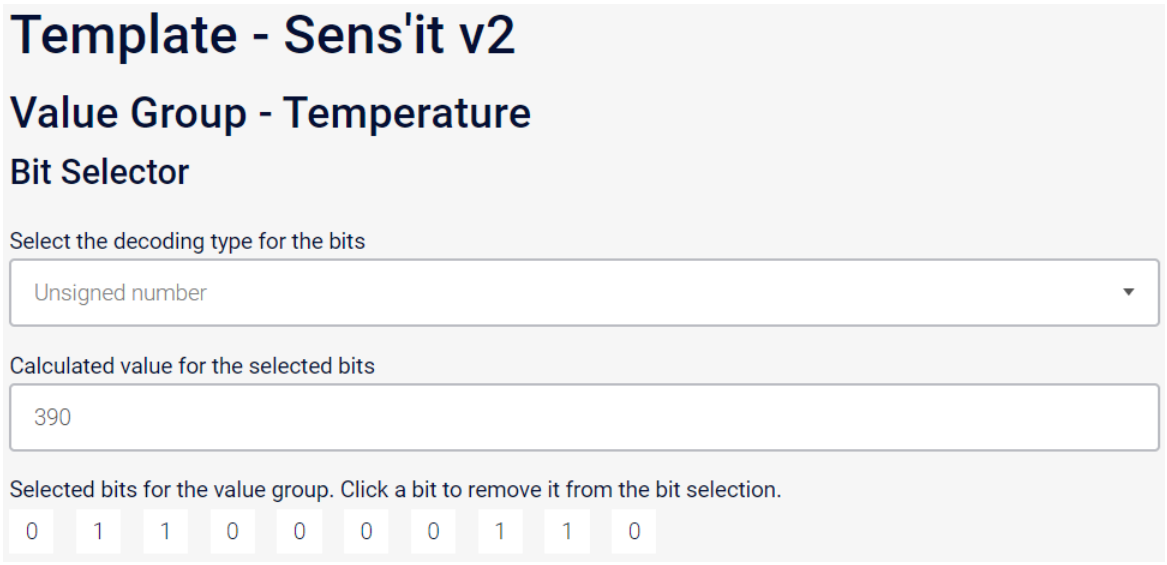
Field or option name	Description
Enter a description for this value group	Enter a meaningful description for the value group, for example, Temperature. This can be any string.

Field or option name	Description
Enter a key name for the final JSON output	Paessler BitDecoder decodes the payload value into JSON format. For this purpose, enter a short name that is shown as the field name for the value group in the JSON output, for example, temperature.
Enter a mathematical expression for converting the payload value	Enter a mathematical expression, for example, (bitValue-200)/8, for converting the extracted payload value into a human-readable format. bitValue is the variable that represents the selected bit value from the payload. ⓘ Refer to the device manual issued by the vendor for the respective mathematical expression.
Calculated converted payload value	Show the value calculated for this group with the mathematical expression that you entered above.
Select bits	Click if you want to use visual bit decoding. The Bit Selector 26 opens.
Create or modify conditions for the value group	Some devices attach conditions to certain bit fields in the payload that they send. Such conditions can be different operating modes of a device, for example. ⓘ Refer to the device manual issued by the vendor for possible conditions that some bit fields depend on. Show a list of conditions that you have already created for the value group. Click ✎ to edit a condition. ⓘ Paessler BitDecoder only decodes the payload value of a value group if all conditions are met.
Add new condition	Click to create a new condition for the group. The condition editor 29 opens.

ⓘ Do not forget to click **Update group** after entering or adapting any settings.

Bit Selector

With the **Bit Selector**, you can visually decode a specific payload value by selecting and deselecting single bits. You can only open the **Bit Selector** from the value group editor 24.

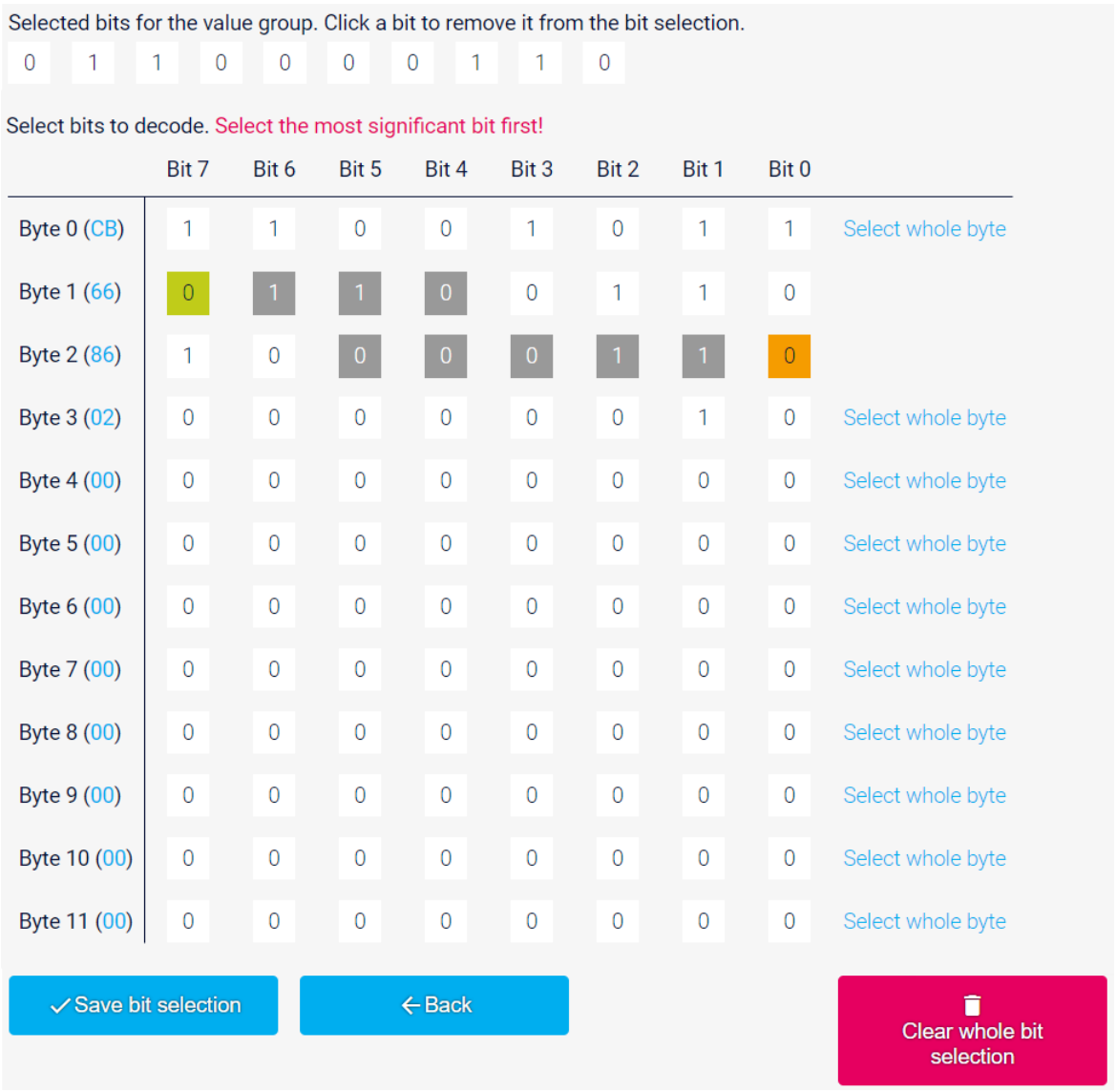


Example of Bit Selector settings

Field or option name	Description
Select the decoding type for the bits	Select the decoding type that defines how Paessler BitDecoder interprets the selected bits: ▪ **Signed number**: The selected bits are interpreted as positive or negative integers. ▪ **Unsigned number**: The selected bits are interpreted as positive integers. ▪ **IEEE 754 32-bit floating point**: The selected bits are interpreted as decimals. ⓘ Refer to the device manual issued by the vendor for the decoding type you need.
Calculated value for the selected bits	Show the raw value calculated for the bits that you selected from the payload below.
Selected bits for the value group	You can only see bits here if you selected the bits for the respective payload value from the payload below. Click a bit to remove it from the selection.

From the payload, select the bits for the payload value that you want to decode.

ⓘ Refer to the device manual issued by the vendor for the bits you need to select.



Example of selecting bits to decode from the payload

Select the most significant bit (MSB) first, then proceed sequentially to the least significant bit (LSB). The MSB is highlighted in green and the LSB is highligted in orange. If required, you can also select a whole byte by clicking the according option next to the respective byte.

ⓘ It is important that you select the bits and bytes in the correct order from MSB to LSB.

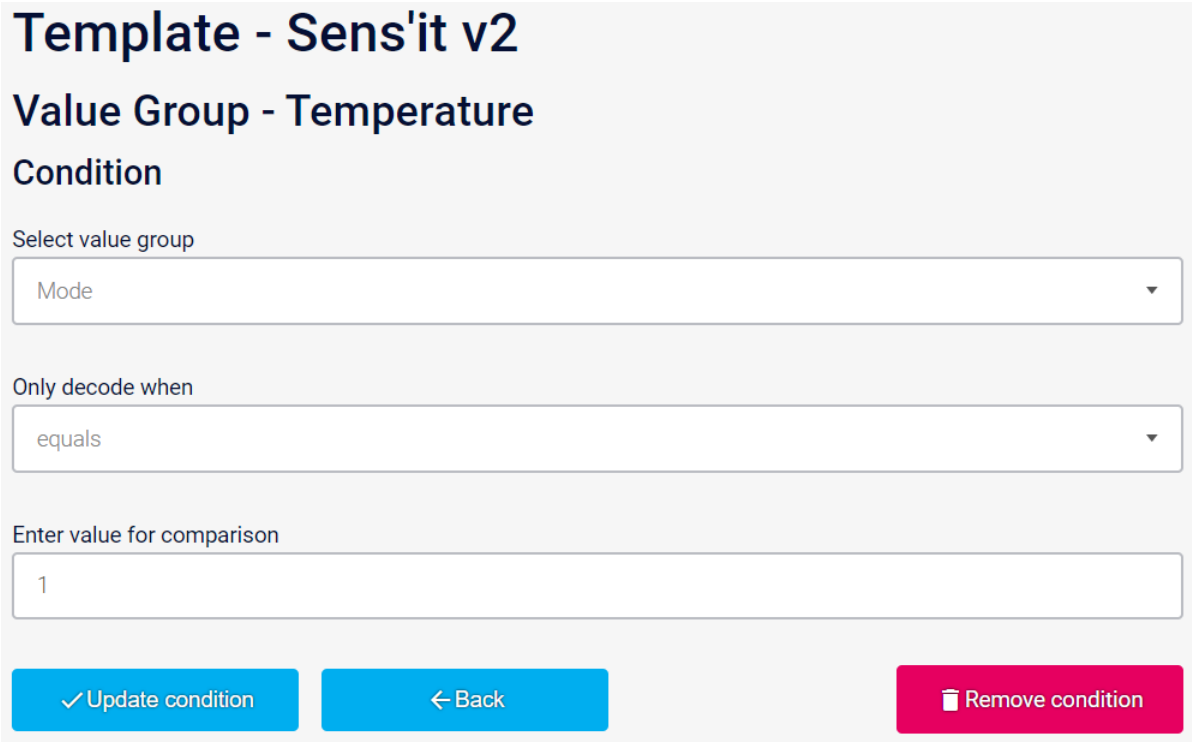
To remove all bits that you selected, click **Clear whole bit selection**, or use the option **Selected bits for this group** to remove single bits from the bit selection.

ⓘ Do not forget to save the bit selection.

Condition editor

With the condition editor, you can create or modify conditions that must be met for Paessler BitDecoder to decode the payload value of a value group. You can only open the condition editor from the value group editor 24.

ⓘ You need to have at least two value groups to create a condition.



Example of creating a condition

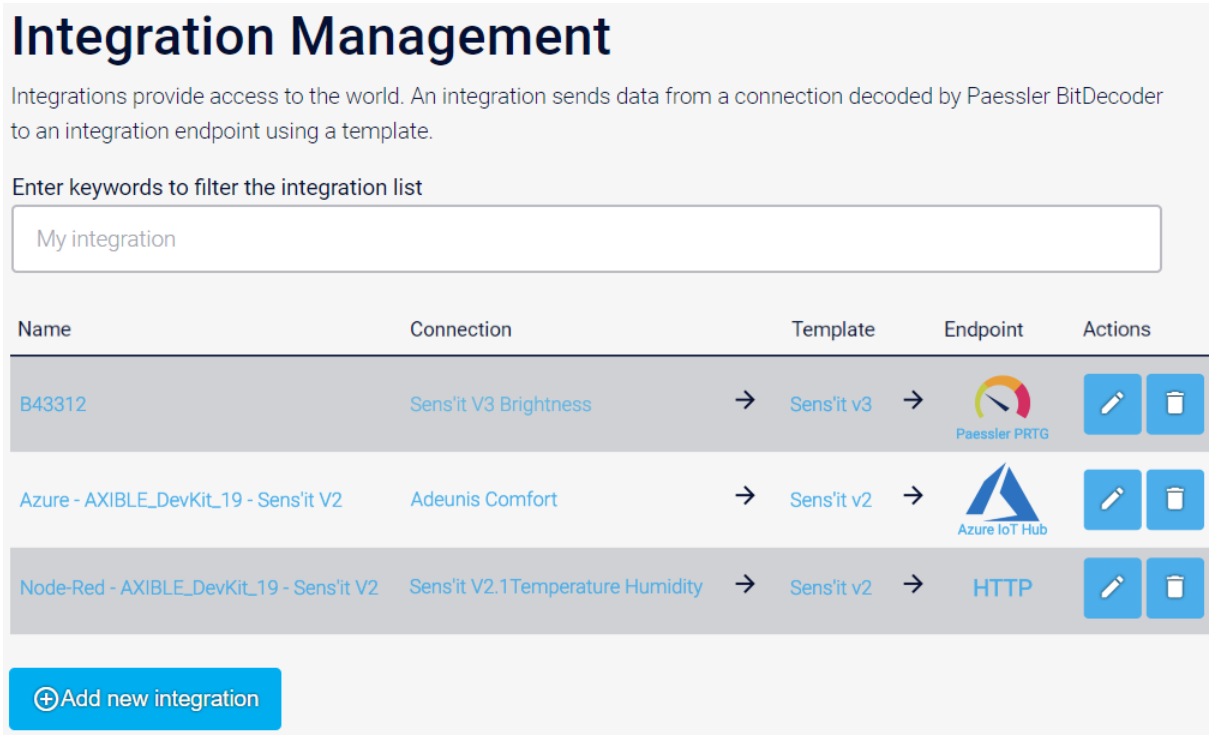
Field name	Description
Select value group	Select the value group that the condition is based on.
Only decode when	Select a comparator for the condition. Choose between **equals**, **not equals**, **lower than**, **lower or equal**, **greater than**, or **greater or equal**. The default is **equals**.
Enter value for comparison	Enter a value for the comparison of the according value groups. ⓘ Refer to the device manual issued by the vendor for the respective value.

ⓘ Do not forget to click **Update condition** to save your settings.

3.3 Integration management

On the **Integrations** tab, you can add new integrations or manage existing integrations that forward decoded payloads to the post-processing endpoint of your choice.

Click the **Integrations** tab to see a list of all your created integrations. Enter keywords to filter the integrations list for the name of an integration.



List of integrations in the integration management

The integration list is structured as follows:

Table header	Description
Name	Show the name that you entered for the integration.
Connection	Show the connection 16 that you selected for the integration.
Template	Show the template 20 that you selected for the integration.
Endpoint	Show the integration endpoint that you set up 31 for the integration.

Table header	Description
Actions	▪ To edit an integration, click  . ▪ To delete an integration, click  .

Add a new integration

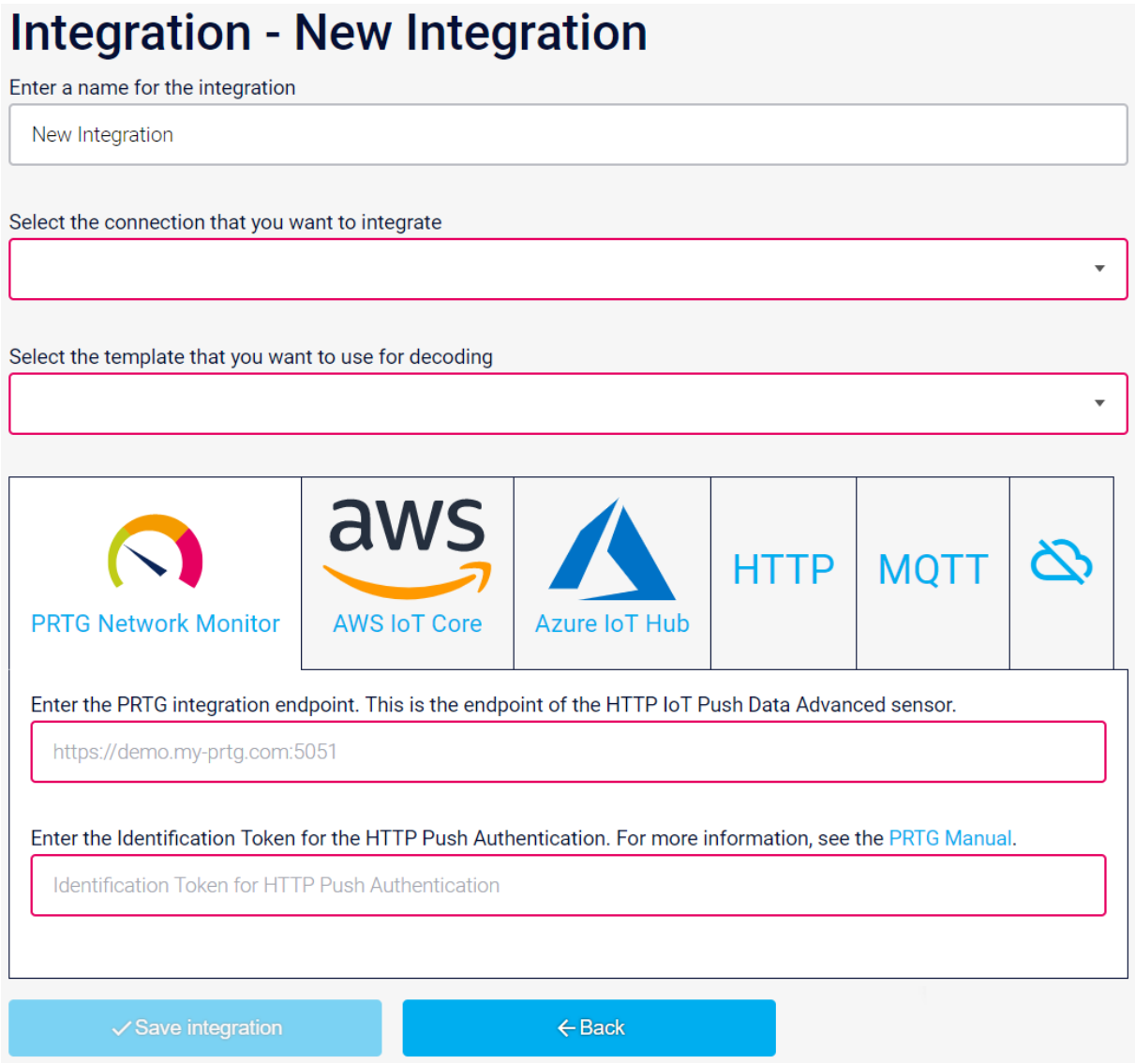
Click **Add new integration** to create a new integration.

At the moment, you can create integrations with the following integration endpoints:

- PRTG Network Monitor 33
- AWS IoT Core
- Azure IoT Hub

You can also create a custom HTTP endpoint or Message Queue Telemetry Transport (MQTT) integration endpoint of your choice.

ⓘ One connection can send data to several different integration endpoints. Create a new integration for every integration endpoint to which you want to send the data from a specific connection.



Creating a new integration with the integration editor

Take the following steps:

1. **Enter a name for the integration**: Enter a meaningful name for your integration. This can be any string.
2. **Select the connection that you want to integrate**: Select one of the connections 16 you created.
3. **Select the template that you want to use for decoding**: Select a suitable template 20 to decode the payload sent from a device via a connection you created.
4. Select an integration endpoint by clicking the respective tab.
   ⓘ Setting up an integration varies depending on the integration endpoint you choose. Closely follow the respective steps in the Paessler BitDecoder web interface.

ⓘ Do not forget to save new integrations or any changes to already existing integrations.

Example of setting up PRTG Network Monitor as integration endpoint

Here you can find an example of how to set up PRTG Network Monitor as an integration endpoint.

To use PRTG as an integration endpoint, your PRTG installation must be accessible from the internet. Make sure that the necessary ports are opened or forwarded in your firewall. Create respective network address translation (NAT) rules if necessary.

Take the following steps:

1. In PRTG, set up an HTTP IoT Push Data Advanced sensor.
2. In Paessler BitDecoder, go to the **Integrations** tab and add a new integration 31.
3. Enter a name for the integration, select the connection that you want to integrate, and select the template that you want to use for decoding.
4. Click the **PRTG Network Monitor** tab.
5. Enter the URL for the PRTG integration endpoint. This is the endpoint of your HTTP IoT Push Data Advanced sensor. You can optionally add a custom port. The default port on which the sensor listens for incoming requests is 5051.
6. In the PRTG web interface, go to the sensor settings of your HTTP IoT Push Data Advanced sensor. Under **HTTP Push Authentication**, you find the **Identification Token** that PRTG uses to find the matching sensor. Enter the token in the respective field of Paessler BitDecoder.
7. Click **Save integration**.