

# HYPERION OPERATING INSTRUCTION EN

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Thank you for choosing the Hyperion sensor from Sentinum. Please read the following operating instructions carefully to prevent damage to the sensor, yourself and the environment.



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## 1. VERSION HISTORY

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Version	Date	Change
<b>1.0.0</b>	09.01.2025	Creation
<b>1.0.1</b>	25.03.2026	<ul style="list-style-type: none"><li>• Formatting</li><li>• Single-phase operation, update to section 8.1, update to section 3, addition of section 9.5</li><li>• Added 13.3 mioty factory settings</li><li>• Added FAQ</li></ul>

## 2. GENERAL WARNINGS AND SAFETY INSTRUCTIONS

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Warnings and important information about potential hazards or damage

Important information required for smooth operation of the devices

Please note:

- Observe the safety instructions and installation instructions in the manual and the installation list.
- Ensure that the installation environment complies with the prescribed application area guidelines. Observe the temperature and other limit values at all times.
- The device may only be used in the areas specified in the technical specifications.
- The device may only be used for the purposes and in the areas described.
- Safety and functionality can no longer be guaranteed if the device is modified or extended.
- The sensor must not be mounted on ceilings or floors
- Operation of the sensor is only permitted up to a maximum of 2000 meters above sea level.
- Operation is only permitted at a maximum room height of 2 meters.
- Due to human exposure regulations, a minimum distance of 20 cm must be maintained between the appliance and persons.
- Ensure that the installation environment complies with the prescribed guidelines for the area of application. Observe the temperature and other limit values at all times.
- Ensure that the installation environment complies with the prescribed guidelines for the area of application. Observe the temperature and other limit values at all times.

If the device is installed **incorrectly**:

- Could it not be working properly.
- Could it be permanently damaged?
- Could it pose a risk of injury.

Please note:

- Improper handling, e.g. improper mechanical stress, such as dropping the appliance, can result in damage.
- If battery cells other than those recommended are used, performance and product safety may be negatively affected.
- The appliance may only be installed and put into operation if it can be removed from its original packaging undamaged. A visual inspection for damage must be carried out immediately after removal. If the product is damaged, it must not be put into operation.

### 3. GENERAL INFORMATION

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- The Hyperion is a multifunctional, compact bidirectional energy meter with a width of just 90 mm (5TE), offering excellent flexibility and precision.
- Through direct connection or current transformers, it assists in analyzing and monitoring a wide range of parameters in demanding residential, commercial, or industrial applications.
- It combines the functions of an energy meter, a data logger, and provides additional measurements such as current, voltage, power, and more.
- Data transmission is available via mioty or LoRaWAN (depending on the version).

#### 3.1. FEATURES

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- MID B + D approval for billing purposes (only in 3-phase operation)
- Environmental conditions mechanical: M2
- 1 A and 5 A current transformer connection for up to 20,000/5 or 4,000/1 A; the transformer ratio can be configured multiple times via sealable buttons
- Direct connection up to 100 A
- 2 or 4 tariffs (configurable on the meter)
- High-load opto power MOSFET
- S0 pulse output, 5-60 V AC and V DC
- Graphic LC display (38 × 28 mm) with backlight
- Dynamic 8-digit display with up to three decimal places
- Wireless interface mioty® or LoRaWAN®

#### 3.2. MID CERTIFICATION FOR BILLING PURPOSES

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The **Hyperion** is certified according to MID Module B + D (Measurement Instrument Directive 2004/22/EC of the European Commission) and comes with the required declaration of conformity. With additional certification under Module D, which includes a quality management system for manufacturing and final testing, all Hyperion energy meters can be used for billing purposes within the European Union and the European Economic Area (EEA).

### 3.3. DISPLAY OPERATION:

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A 38x28 mm graphic LC display with backlight allows readings and settings to be viewed even under challenging lighting conditions. The menu language can be selected via buttons. The clear and intuitive user interface simplifies commissioning and daily operation of the energy meters.

### 3.4. ACCURACY IN PHOTOVOLTAIC SYSTEMS:

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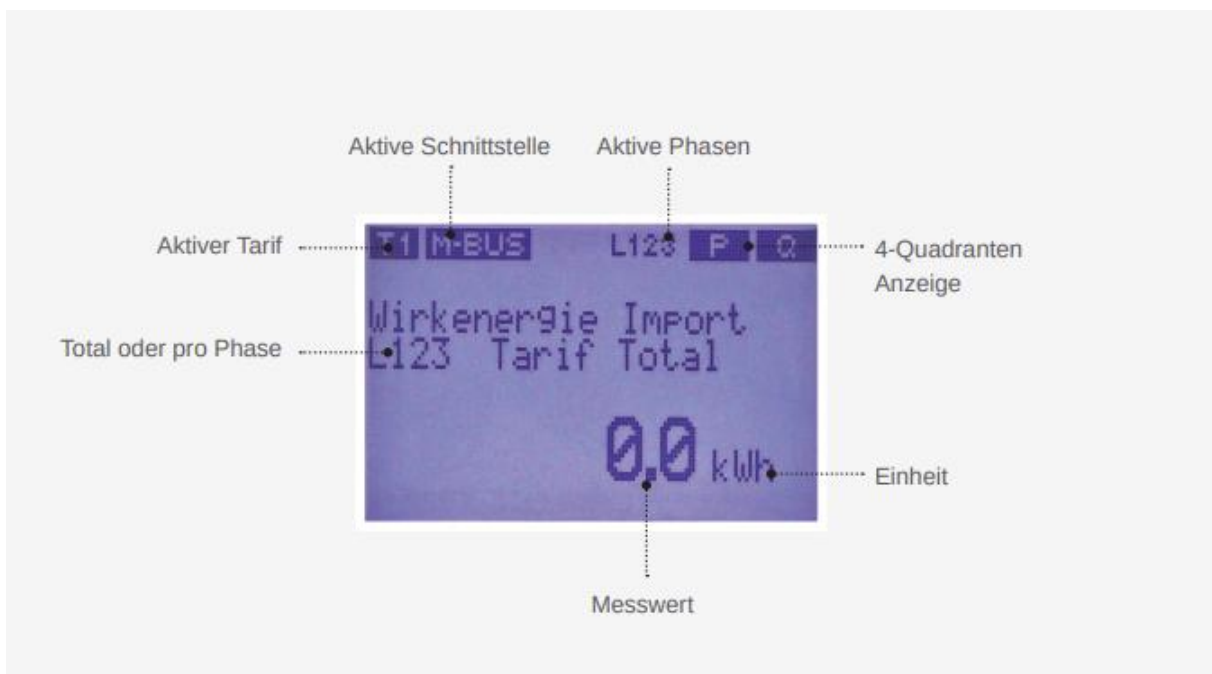
The **Hyperion** has been specially tested for use with inverters in photovoltaic systems. This additional testing guarantees that the Hyperion energy meters deliver accurate measurements in the unregulated frequency range between 2 kHz and 150 kHz. Studies by renowned trade publications have highlighted the issue that measurement errors of up to 18% can occur in such systems.

## 4. CURRENT TRANSFORMERS:

The transformer ratio on the **Hyperion** with MID certification can be configured multiple times via buttons, from 5/5 A to 20,000/5 A or from 1/1 A to 4,000/1 A. The service button is sealable to prevent tampering. Additionally, configuration changes are logged and archived for security.

### Highlights:

- MID B+D certification
- Bidirectional meter
- Certified for frequency-independent measurement in the range of 2 kHz to 150 kHz
- Integrated tamper detection



	<b>Total/3 Phases</b>	<b>Per Phase</b>	<b>Per Tariff</b>
<b>Active energy consumption (kWh)</b>	✓	✓	✓
<b>Active energy delivery (kWh)</b>	✓	✓	✓
<b>Reactive energy consumption (kvarh)</b>	✓	✓	✓
<b>Reactive energy delivery (kvarh)</b>	✓	✓	✓
<b>Active power (kW)</b>	✓	✓	-
<b>Reactive power (kvar)</b>	✓	✓	-

<b>Apparent power (kVA)</b>	✓	✓	-
<b>Current (A)</b>	✓	✓	-
<b>Voltage (V) L-N</b>	-	✓	-
<b>Voltage (V) L-L</b>	-	✓	-
<b>Power factor (Cos Phi)</b>	-	✓	-
<b>Frequenz (Hz)</b>	✓	-	-
<b>Voltage drop count</b>	✓	-	-
<b>Load profile storage</b>	-	-	✓

#### 4.1. DISPLAYED MEASUREMENTS:

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The table of available measurements is not exhaustive. More values are continuously being integrated and can be accessed via the graphical display or the reading interface.

##### **Additional Features:**

- Logbook for legal events and configuration changes
- Modification of time or date
- Adjustment of the transformer ratio
- Configuration of the pulse rate and duration
- Adjustment of the voltage transformer ratio

Buffered internal clock: The internal clock is supported in case of power failure, and the load profile is stored every 15 minutes. The memory can be read via the interface or viewed on the display.

## 5. LORAWAN AND MIOTY WIRELESS INTERFACE:

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### 5.1. LORAWAN AND MIOTY TECHNOLOGY

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The LoRaWAN or mioty wireless technology enables communication between meters, sensors, and actuators via free radio frequencies. mioty and LoRa are designed for long-range transmission while adhering to current security standards, and they are specially developed for the Internet of Things (IoT).

- The Hyperion features an optional integrated LoRa interface, designed as a Class C device, allowing it to receive LoRa commands at any time. The transmitted measurements can be freely configured and flexibly adapted to local conditions and needs.
- The mioty version only supports uplink and does not receive downlink commands (upcoming feature).

### 5.2. LORA AND MIOTY NETWORK OPERATION:

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The Hyperion Energy Meter can be integrated into:

- Existing LoRa or mioty networks
- Self-operated LoRa or mioty networks
- DIEHL-provided mioty networks

This allows for cost-effective operation of private LoRa networks.

### 5.3. TECHNICAL FEATURES:

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- Internal built-in antenna, optimized for the 863-870 MHz frequency band
- Model with optional SMA socket for external antenna connection
- Both antennas have 14dBm attenuation
- Class C device, can also be operated as a Class A device
- Automatic time synchronization via the LoRa network
- Supports OTAA and ABP as join procedures
- Uplink message interval and content are flexibly adjustable
- De- and encoder are already available on The Things Network (TTN)
- For integration into other systems, de- and encoder are freely available
- LoRa and mioty status display on the LC display

## 6. ORDERING INFORMATION (TBD) AND PRODUCT INFORMATIONS

### 6.1. ORDERING INFORMATION

Version	Type	Part No.
<b>Hyperion Energy Meter with direct measurement up to 100A</b>	LoRaWAN, internal antenna	S-HYPE-LOEU-D-INT
<b>Hyperion Energy Meter with direct measurement up to 100A</b>	LoRaWAN, external antenna	S-HYPE-LOEU-D-EXT
<b>Hyperion Energy Meter with direct measurement up to 100A</b>	mioty, internal antenna	S-HYPE-MIOTY-D-INT
<b>Hyperion Energy Meter with direct measurement up to 100A</b>	mioty, external antenna	S-HYPE-MIOTY-D-EXT
<b>Hyperion Energy Meter with current transformer connection</b>	LoRaWAN, internal antenna	S-HYPE-LOEU-W-INT
<b>Hyperion Energy Meter with current transformer connection</b>	LoRaWAN, external antenna	S-HYPE-LOEU-W-EXT
<b>Hyperion Energy Meter with current transformer connection</b>	mioty, internal antenna	S-HYPE-MIOTY-W-INT
<b>Hyperion Energy Meter with current transformer connection</b>	mioty, external antenna	S-HYPE-MIOTY-W-EXT

## 6.2. PRODUCT INFORMATION

<b>Feature</b>	<b>Details</b>
<b>Active Energy</b>	Class B (1%) according to EN50470-3 for direct connection meters, Class B (1%) according to EN50470-3 for transformer meters
<b>Reactive Energy</b>	Class 2 (2%) according to EN62053
<b>Operating Voltage</b>	L-L: 400VAC +/- 20%, L-N: 230VAC +/- 20%
<b>Maximum Current</b>	Direct connection meters: 100A, Transformer meters: 6A
<b>Starting Current</b>	Direct connection meters: 20mA at power factor 1, Transformer meters: 1mA at power factor 1
<b>Network Frequency</b>	Nominal frequency: 50Hz, 60Hz available on request, Frequency limits: 40 - 65 Hz
<b>Power Consumption</b>	Voltage path: 0.8 VA / 0.8W per phase, Current path (transformer meters): 0.075 VA per phase
<b>Current and Voltage Connections</b>	Direct connection meters: 1.5-35 mm <sup>2</sup> , torque: 2 Nm, max. 3 Nm, Transformer meters: 1-6 mm <sup>2</sup> , torque: 0.8 Nm, max. 1 Nm
<b>Tariff Switching</b>	2 or 4 tariffs (configurable on the meter), tariff switching: 230VAC
<b>Transformer Ratios</b>	Transformer ratio on Hyperion 3/5 is configurable multiple times, Transformer /5 A: from 5/5 A to 20,000/5 A in 5 A steps, Transformer /1 A: from 1/1 A to 4,000/1 A in 1 A steps
<b>Display (LCD)</b>	Dynamic 8-digit display with up to three decimal places, Graphic LC display with backlight (LxH) 38x28 mm
<b>S0 Pulse Output</b>	Standard EN62053-31, Potential-free output, Pulse rate per kWh/kVarh: 1, 10, 100, 1,000, or 10,000 pulses, Pulse length: 2ms, 10ms, 30ms, 40ms, or 120ms, Pulse rate and length configurable on the meter
Optional Data Interfaces	LoRa or mioty (optional SMA socket for external antenna)
Optical (IR) D0 Interface	EN 62056-21

Data Retention	EEPROM without power, minimum 10 years
Optional	IOTA Tangle (Blockchain Technology)
Clock	Buffered clock (up to 18 days)
Time Synchronization	Possible via interfaces
Mounting / Installation	Position independent, On 35 mm DIN rail or with front panel frame
Weight	Approximately 350g
Housing Material	Polycarbonate, halogen-free, recyclable
Housing Protection Class	IP51 for the housing, IP20 for terminal protection
Protection Class	II
Dimensions (LxWxD)	90x91x72 mm, 5 modules wide
Approvals	CE and MID B + D, PTB-A 20.1, PTB-A 50.7, Suitable for energy management according to ISO 50001
Environmental Conditions	Mechanical: M2, Electromagnetic: E2, Operating temperature: -25°C to +70°C, Storage temperature: -30°C to +70°C, Relative humidity: Average 75%, temporarily 90%, non-condensing
Safety Note	The energy meters must only be installed by a qualified electrician. Current transformers must not be operated open, as high voltages can occur. These can cause personal injury and/or property damage.
Device Selection	To ensure easy maintenance or replacement (e.g., due to verification validity) of the Hyperion energy meter, it is recommended for applications where a simple and cost-effective shutdown of the system is not possible.
Device Selection	To ensure easy maintenance or replacement (e.g., due to verification validity) of the Hyperion energy meter, it is recommended for applications where a simple and cost-effective shutdown of the system is not possible.

### Disclaimer

This documentation may contain forward-looking statements based on the current assumptions and assessments of the company's management. Such statements are marked accordingly. These statements are not guarantees that these expectations will prove correct. The future development and the actual results achieved by Sentinum GmbH and its affiliated companies depend on various risks and uncertainties and may therefore differ significantly from the forward-looking statements. Many of these factors are beyond

the company's control and cannot be precisely predicted, such as the future economic environment and the behavior of competitors, other market participants, and legislators. An update of the forward-looking statements is neither planned nor does the company assume any specific obligation to do so.

## 7. SAFETY INSTRUCTIONS

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Please read these operating instructions, as well as all other documents issued by Sentinum GmbH.

When using the Hyperion energy meter and these operating instructions, please carefully observe safety regulations and warnings. Failure to comply may result in significant personal injury and/or property damage.

Use the Hyperion only within the approved application range. Failure to comply with these limits may result in significant personal injury and/or property damage. Unauthorized modifications to the Hyperion exclude any warranty or damage coverage by Sentinum GmbH.

Local safety and operational regulations must be adhered to. Installation of the Hyperion energy meter must only be carried out by qualified and appropriately trained personnel. Be sure to follow the installation instructions in this document.

### **The following symbols indicate potential hazards:**

**!** This symbol combined with the word "Note" describes important information, procedures, or handling instructions.

**!** This symbol indicates situations that may result in property damage and/or severe injury or death.

#### Maintenance

The Hyperion is maintenance-free. In case of damage (for example, due to incorrect connection or improper storage), repairs may only be carried out by Sentinum.

#### Disclaimer

The selection of the meter and the determination of the meter's suitability for a specific application are solely the responsibility of the buyer. No liability or warranty is assumed for this. The information in the catalogs and data sheets does not represent a guarantee of specific properties but is based on experience and measurements. Liability for damages caused by incorrect operation/project planning or malfunctions of the energy meter is excluded. The operator/planner is responsible for ensuring that incorrect operation, project planning, or malfunctions do not cause further damage. No guarantee is provided for defects or damage resulting from improper use of the Hyperion energy meter or failure to follow the operating instructions.

### 7.1. CUSTOMER OBLIGATIONS

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#### Data Security & Backups

The customer is solely responsible for securing data, regardless of the type of installation of the Hyperion energy meters. The risks and efforts of operation lie with the customer. As part of additional services, Sentinum can support the customer in developing possible concepts. The customer must create the necessary data readings and backups for secure operation. Backups must be securely stored by the customer.

### Monitoring Duty

The customer is required to monitor the system to detect any failure of metering points immediately, or at the latest within 24 hours.

### Access Permissions

The customer is responsible for protecting the Hyperion from unauthorized access through technical and organizational measures.

### Responsibility for IT Environment

The customer is responsible for their IT environment and ensuring access. The customer acknowledges that the Hyperion energy meter and potential firmware updates have certain system requirements. The customer is solely responsible for meeting these requirements. It is the sole responsibility of the customer to provide the necessary hardware and personnel with appropriate expertise for the Sentinum firmware. The customer must take appropriate precautions in case the Hyperion energy meter does not function properly, either partially or completely (e.g., through daily data backups, fault diagnosis, regular review of results, and contingency planning). It is the sole responsibility of the customer to provide the necessary infrastructure and to ensure the functionality and technical performance of the working environment. The originally specified system requirements may change during operation and with updates. The customer is obligated to regularly verify and ensure that the requirements are met before applying updates. The data logger entries in the Hyperion must be read daily and archived.

## 7.2. SCOPE OF DELIVERY AND INCOMING INSPECTION

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### Scope of Delivery:

- A quick start guide, which describes the most important points of the meter. Please read it carefully.
- One Hyperion energy meter

If your delivery shows obvious damage, please contact us immediately by email at [sentinum@info.de](mailto:sentinum@info.de). Please provide the serial number and the corresponding delivery note and/or invoice number for each affected meter.

## 8. FURTHER INFORMATION ON THE STRUCTURE, PRODUCT, MEASUREMENT PROCEDURE AND USE

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### 8.1. PRODUCT DESCRIPTION

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The Hyperion is:

- MID compliance exists exclusively during three-phase operation; in single-phase operation the meter **is not MID-compliant**.
- In single-phase operation, the wiring diagram in Section 9.5 must be strictly followed
- Designed for static 3-phase measurement of active energy drawn and delivered according to EN50470-3:2006 in residential, commercial, and industrial environments.
  - These measurements can be used for billing purposes.
- Designed for static 3-phase measurement of reactive energy drawn and delivered according to EN62053 in residential, commercial, and industrial environments.
  - These measurements can be used for billing purposes.
- Suitable for installation in static, weather-protected electrical cabinets in buildings.
- Usable in 4-wire systems and in TN (Terre Neutre Combiné) networks.
- In the 3/100 version, it is suitable for direct current measurements up to 100A.
- For measurements in medium- and high-voltage networks, it is only suitable with current and voltage transformers.
  - Not certified for the use of voltage transformers, meaning the measurements are not legally valid for billing purposes.
  - Can only be set for voltage transformers in the ratio  $\dots/100$ .
- In the 3/5 version, it is intended for current measurement via external  $\dots/1A$  or  $\dots/5A$  current transformers.
- Suitable for use in residential, commercial, and industrial environments.
- Certified in the LP version for load profile logging according to PTB-A 20.1 and PTB-A 50.7.

The measurement data can be displayed on the screen and, depending on the model, read out and processed via the corresponding interface of the device.

**Note:** In the LP version of the Hyperion energy meter, only active energy measurements can be used for billing purposes!

**Note:** A special chapter has been added at the end of this document for the LP versions. Information in the chapter "Additional

Information on Load Profile Logging According to PTB-A 50.7" replaces the corresponding information in this document.

**Warning:** Improper use of the Hyperion energy meter can result in serious personal injury and/or property damage.

## 8.2. MEASUREMENT METHOD

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The measurement of current and voltage by the Hyperion operates according to the following principle:

The Hyperion measures the current and voltage for 1 second, after which a new measurement starts. During this second, the following procedure occurs:

- The Hyperion captures 8192 data points for voltage  $U_{UU}$  and current  $I_{II}$ . These data points have a 32-bit resolution.
- All measured values for voltage  $U_{UU}$  and current  $I_{II}$  are squared, summed, and divided by the number of data points (8192) at the end of the second. The square root of the result provides the effective value of the voltage and current:

$$\sqrt{\frac{U_1^2 + U_2^2 + \dots + U_{8192}^2}{8192}} = U_{eff}$$

$$\sqrt{\frac{I_1^2 + I_2^2 + \dots + I_{8192}^2}{8192}} = I_{eff}$$

The power factor  $\lambda$  ( $\cos \phi$ ) is calculated as:

$$\lambda = \frac{\int U \times I dt}{S} = \frac{\int U \times I dt}{U_{eff} \times I_{eff}}$$

The active power  $P$  is calculated as:

$$P = P_F \cdot S$$

Because an integral is always formed over the voltage  $U_{UU}$ , the current  $I_{II}$ , and the power  $U \cdot I$ , even non-sinusoidal currents up to the 7th harmonic are captured.

### 8.3. USER INTERFACE CONCEPT

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The following explains the user controls of the Hyperion energy meter.



#### Buttons

The operation of the meter is carried out via two touch buttons and a service button (SRVC):

- **Right Arrow** (Button 1)
  - A short press (<2s) scrolls through the main menu pages to the right.
  - A long press (>2s) scrolls through the main menu pages to the left (for devices with firmware version 1.3.0 and newer).
- **Down Arrow** (Button 2)
  - A short press (<2s) changes the submenu on the respective main menu page.
  - A long press (>2s) executes the special function in the respective submenu.
- **Service Button** (3)
  - The service button is recessed into the housing and must be operated with a thin non-conductive screwdriver or similar tool.
  - A short press (<2s) activates the edit mode in the "Settings" menu.
  - A second short press (<2s) exits the edit mode without saving the selected setting.
  - A long press (>2s) saves any configuration changes made in the "Settings" menu.

- **Sealing (4):** The service button (SRVC) is covered after installation with the cover of the rear connection row. This cover can then be sealed with lead to prevent unnoticed interference with the settings by third parties. The cover of the current and voltage connections can also be sealed.

## 8.4. OVERVIEW OF THE FRONT VIEW OF HYPERION

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On the front of the Hyperion energy meter, you can find the following primary elements:



1. Type designation
2. Active energy certification
3. D0 interface
4. Navigation button 'Arrow right'
5. Navigation button 'Arrow down'
6. QR code with serial number and website
7. Number of phases, number of wires
8. Serial number
9. Class designation
10. Reference voltage, reference frequency
11. Operating temperature
12. Current range

Additionally, the front plate displays the following secondary elements:

- Company logo

## 8.5. OVERVIEW OF THE HYPERION DISPLAY

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1. **Current Tariff**
2. **Active communication interface** (depending on model)
3. **Phase sequence**
4. **Four-quadrant display** together with number 5:
  - a. <<P: Active power is being delivered.
  - b. P>>: Active power is being consumed.
5. **Four-quadrant display** together with number 4:
  - a. <<Q: Reactive power is being delivered (inductive).
  - b. Q>>: Reactive power is being consumed (capacitive).
6. **Measurement value / menu item**
7. **Sub-menu item**
8. **Current measurement value**
9. **Unit of the current measurement**

The following table lists all the symbols that may appear on the display:

Symbol	Description
T1	The current tariff setting. The number indicates the active tariff.
MODBUS	The meter's interface is Modbus.
ETH	The meter's interface is TCP/IP.
M-BUS	The meter's interface is M-Bus.
LORA	The meter's interface is LoRa.
L1 L2 L3	All phases are connected. If one or more phases are replaced by a -, then those phases are disconnected.
<<P	The meter is currently measuring delivered active power.
P>>	The meter is currently measuring consumed active power.
<<Q	The meter is currently measuring delivered reactive power (capacitive).
Q>>	The meter is currently measuring consumed reactive power (inductive).
OF	One or more energy registers have overflowed.
MEM	The meter's internal memory is defective. Please create a support ticket at: <a href="https://www.emuag.ch/support/formulare/">https://www.emuag.ch/support/formulare/</a> .

The following symbols appear only in the LP version of the Hyperion energy meter:

Symbol	Description
TNV	The time on the meter is not valid. Synchronize the meter with the current date and time.
TNS	The time on the meter is not correctly synchronized.
NTP	Applies only to the TCP/IP interface. The meter has not received a time synchronization for at least one hour.
PTB NV	The meter is in a legally invalid state. Further measurements are no longer valid for billing purposes.

## 8.6. COMPATIBLE DEVICES INTERFACES

- MBus
- TCP/IP, Modbus TCP
- Modbus RTU
- LoRa

## 9. INSTALLATION

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The Hyperion can be installed independently of position. The meter is designed for a DIN rail according to EN 50022. The meter can also be mounted using a front installation frame. To remove the meter from a DIN rail, pull on the spring-loaded latch on the front of the meter. The wiring of the transformer meter should be kept as short as possible.

If the Hyperion shows significant measurement discrepancies after installation, please take note of the following points:

- The use of Rogowski coils is not recommended for the transformer meter due to the multiple current/voltage transformations with external amplification. Each transformation and amplification adds a multiplicative measurement error.
- Self-consumption

Each meter has an inherent energy consumption. A main meter will therefore measure more consumed energy than the sum of the individual sub-meters. Depending on the model, a Hyperion consumes up to 2W per phase. Over a year, this results in an average self-consumption of 36kWh/year with a maximum self-consumption of 52.5kWh/year.

### Starting Current

- The Hyperion 3/5 only starts counting at a phase current of 1 mA, while the Hyperion 3/100 only starts counting at a phase current of 20 mA. For transformer meters, the current transformers must be dimensioned accordingly.

### Accuracy

- The Hyperion has accuracy class B (active energy) and class 2 (reactive energy) according to EN50470. Thus, a maximum measurement error of 1% (active energy) and 2% (reactive energy) per meter can occur. The total energy for a potential main meter is only affected by this error once, while the total energy of the added sub-meters includes this error multiple times.
- Example: A main meter has 20 sub-meters. Each sub-meter measures 0.2% too little energy. The main meter measures 0.2% too much energy. The total energy of the 20 sub-meters at a real consumption of 100kWh would be  $100\text{kWh} * 20 \text{ meters} * -0.2\% = 4\text{kWh}$  too little energy. The main meter, on the other hand, will show  $100\text{kWh} * 1 \text{ meter} * +0.2\% = 0.2\text{kWh}$  too much. The energy difference measured between the sub-meters and the main meter would thus be 4.2kWh out of 100kWh or 4.2%.

### Energy Direction (Transformer Meter)

- If all currents are expected to have a positive sign (the meter only measures energy consumption) and one or more currents still have a negative sign, the current transformer is incorrectly connected.

### Transformer Factor (Transformer Meter)

- The transformer factors on the meter must be set according to the installed current/voltage transformer.

### Correct Phase Assignment

- Current L1 and Voltage L1 must be connected to the same measuring system. Refer to the transformer meter connection diagram.

The weight of a meter is approximately 350g.

## 9.1. SAFETY INSTRUCTIONS

---

### **Safety Note:**

Electric meters should only be installed by qualified electrical personnel. Current transformers must not be operated openly as high voltages can occur. These can lead to personal injury and/or property damage.

### **DANGER:**

When installing, removing, or replacing the meter, all conductors to which the meter is connected must always be de-energized. Touching live parts is life-threatening!

### **DANGER:**

The Hyperion 3/5 transformer meter has voltage on the current path! Ensure that the voltage paths are also de-energized before connecting the current transformers! Touching live parts is life-threatening!

### **Attention:**

According to DIN VDE 0100-557, point 5.3.1, the secondary terminals of current transformers in low-voltage switchgear must not be grounded.

### **Note:**

Only the designated screw and spring terminals should be used for connecting the meter. It is recommended to use ferrules.

### **Note:**

The device can be damaged or destroyed by not following the installation instructions. Always adhere strictly to the installation instructions.

## 9.2. COMMISSIONING / VERIFICATION

---

During commissioning, the following points must be checked:

- Direction of rotation
- Current per phase, negative energy direction
- Order of phases -> L1 L2 L3
- Current transformer ratio

- Voltage transformer ratio
- Terminals properly tightened / torque
- For readout interface: correct address

The Hyperion energy meter is only intended for measuring electrical energy and must not be operated outside of the specified technical data.

### 9.3. FACTORY DEFAULT SETTINGS

---

**S0 Output:** Active energy consumption (Pin 6 +7)

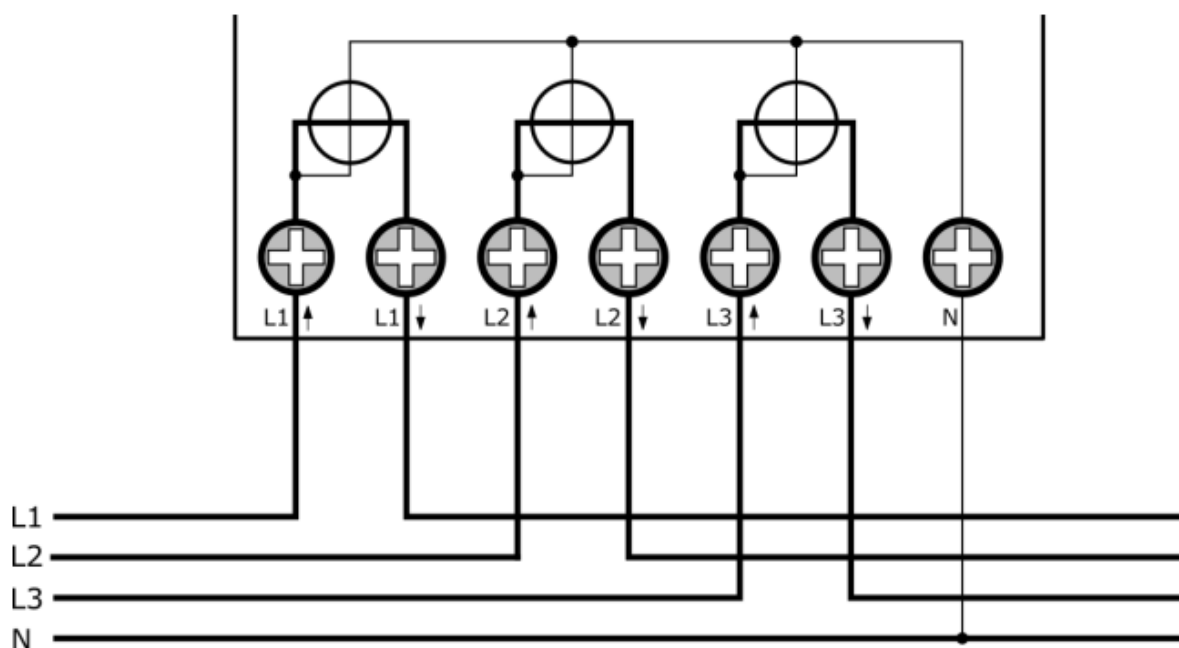
**Transformer Meter:** 10 pulses / kWh

**Direct Connection Meter:** 1000 pulses / kWh

**Dimensions:** For the dimensions, please consult the document "Dimensional Drawing Hyperion" Doc.Ref: 1420.

### 9.4. DIRECT CONNECTION WIRING DIAGRAM (3-PHASES OPERATION)

---



For direct connection meters, the voltage is tapped internally. The neutral conductor is connected at terminal "N."

When connecting the power line, pay attention to the arrows on the connection terminals of the meter. "Lx↑" indicates the grid-side connection, and "Lx↓" indicates the consumer/producer side connection.

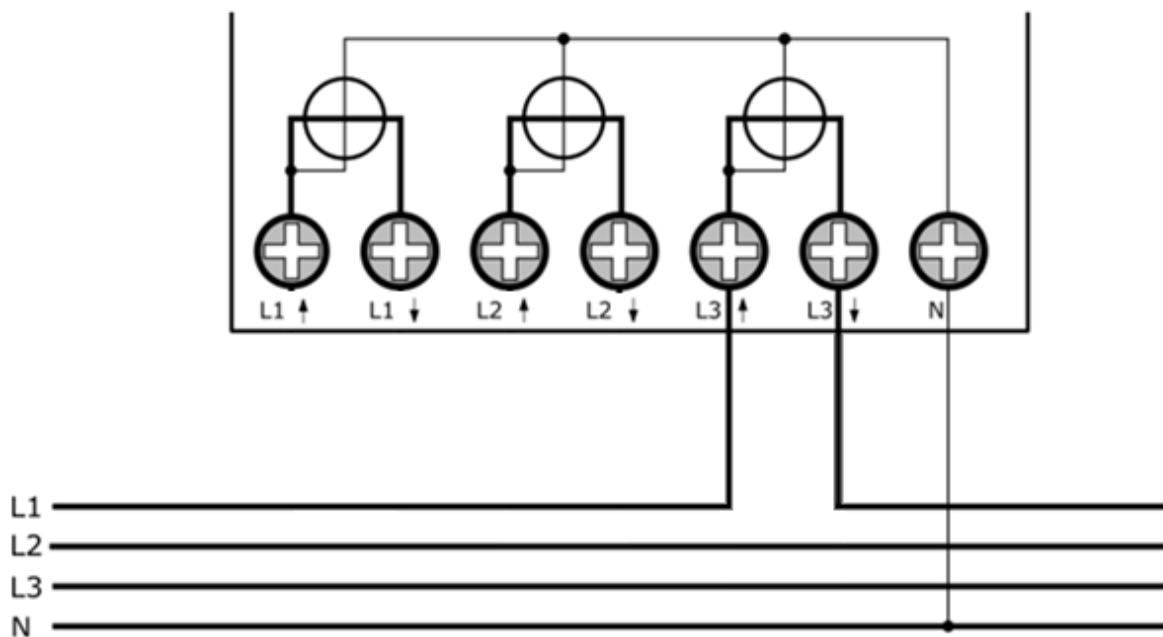
**Note:** This also applies if the Hyperion is only meant to measure delivered energy! The Hyperion measures both consumption and delivery accurately.

The following table provides the key specifications of the connections.

$I_{st}$	$I_{min}$	$I_{tr}$	$I_{ref}$	$I_{max}$
0.02A	0.15A	0.5A	5A	100A

**DANGER:** Ensure that all connected cables are de-energized before checking or modifying them. Touching live components can cause severe physical injuries, up to and including death!

### 9.5. DIRECT CONNECTION WIRING DIAGRAM (1-PHASE OPERATION)



The energy meter is suitable for both single-phase and three-phase operation. However, MID compliance exists exclusively during three-phase operation; in single-phase operation the meter is not MID-compliant.

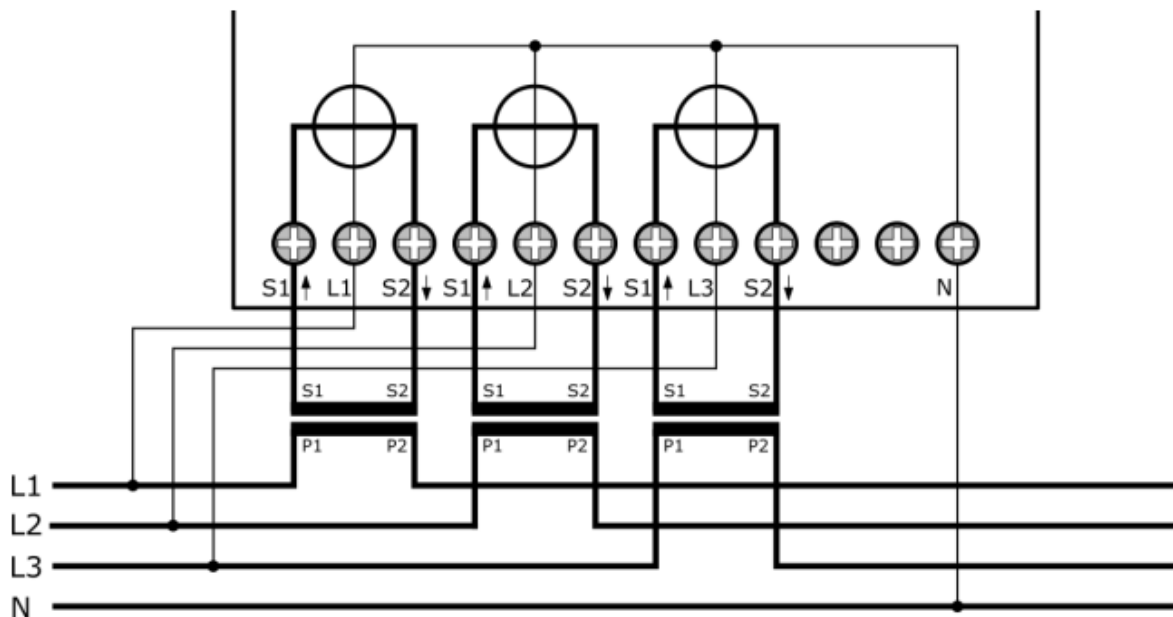
For single-phase operation, the wiring diagram shown must be followed exactly. The terminals must be connected exactly as illustrated, especially the correct assignment of Phase (L) and Neutral conductor (N). Any deviation from the prescribed wiring diagram may lead to incorrect measurements or operational faults.

During single-phase operation, **phase L1 must be routed through the terminals of L3.** In practice, this means:

- **The supply (L1)** is connected to the **L3 input terminal (↑)**
- **The output to the load** is taken from the **L3 output terminal (↓)**
- **The neutral conductor (N)** is connected normally to its designated terminal

**The terminals for L1 and L2 remain unused in this operating mode.**

## 9.6. Connection Scheme for Transformer Meter



In the case of transformer meters, the voltage is tapped externally. Connect the phase to the respective "Lx". The neutral conductor is connected at terminal "N".

Pay attention to the arrows at the connection terminals of the current transformer when connecting. "S1↑" denotes the network-side connection, and "S2↓" denotes the load/producer-side connection.

**Note:** This also applies if the Hyperion is only measuring delivered energy! The Hyperion accurately measures both consumption and delivery.

**Warning:** Due to the voltage on the current path of the Hyperion Energy Meter 3/5, the connected current transformer must not be grounded!

**Danger:** The two connections between the "S2↓" of the third phase and the neutral conductor are intended for features under development. Do not connect anything to these two pins. Incorrect connections to these pins may destroy the meter.

The following table provides the **key specifications of the two transformer connections:**

	<b>CT/5A</b>	<b>CT/1A</b>
<b>I<sub>st</sub></b>	0.005A	0.001A
<b>I<sub>min</sub></b>	0.05A	0.01A
<b>I<sub>tr</sub></b>	0.25A	0.05A
<b>I<sub>ref</sub></b>	5A	1A
<b>I<sub>max</sub></b>	6A	1.2A

**DANGER:** Ensure that all connected cables are de-energized before checking or modifying them. Contact with energized components can lead to severe physical injury or even death!

### 9.7. TIGHTENING TORQUE

<b>Connection / Network</b>	<b>Direct Connection up to 35 mm<sup>2</sup> (stranded)</b>	<b>Transformer Connection up to 6 mm<sup>2</sup> (stranded)</b>
<b>Supply L1/L2/L3</b>	2 - 3 Nm	0.8 - 1 Nm
<b>Neutral conductor N</b>	2 - 3 Nm	0.8 - 1 Nm

**Note:** It is recommended to use ferrules.

**Note:** All rear pins are equipped with spring clamp.

### 9.8. SPRING CLAMP CONNECTIONS WIRE DIAMETER

<b>Connection</b>	<b>Conductor Diameter</b>	<b>Stripping Length</b>
<b>S0 Pulse Output</b>	1.5 mm <sup>2</sup> stranded wire	12 mm
<b>Tarifansteuerung</b>	1.5 mm <sup>2</sup> stranded wire	12 mm
<b>M-Bus / Modbus</b>	1.5 mm <sup>2</sup> stranded wire	12 mm

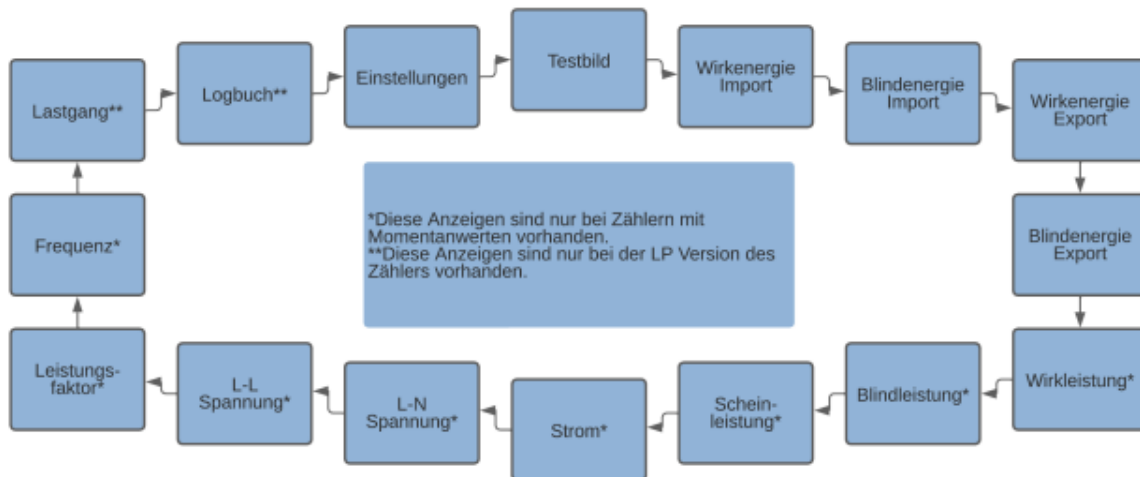
**Attention:** Ensure sufficient conductor cross-section when connecting cables carrying currents greater than 65A.

## 10. OPERATION

The following section explains how to navigate through the various menus and submenus.

### 10.1. MAIN MENU PAGES

When the power supply is first applied to the meter, a test image appears first. After about 2 seconds, the main menu page "Active Energy Import" appears. By pressing the "Right Arrow" button, the following main menu pages are displayed in a circular menu:



By holding down the "Right Arrow" button for more than 2 seconds, the circular menu can also be navigated backwards. (FW version 1.3.0 and newer)

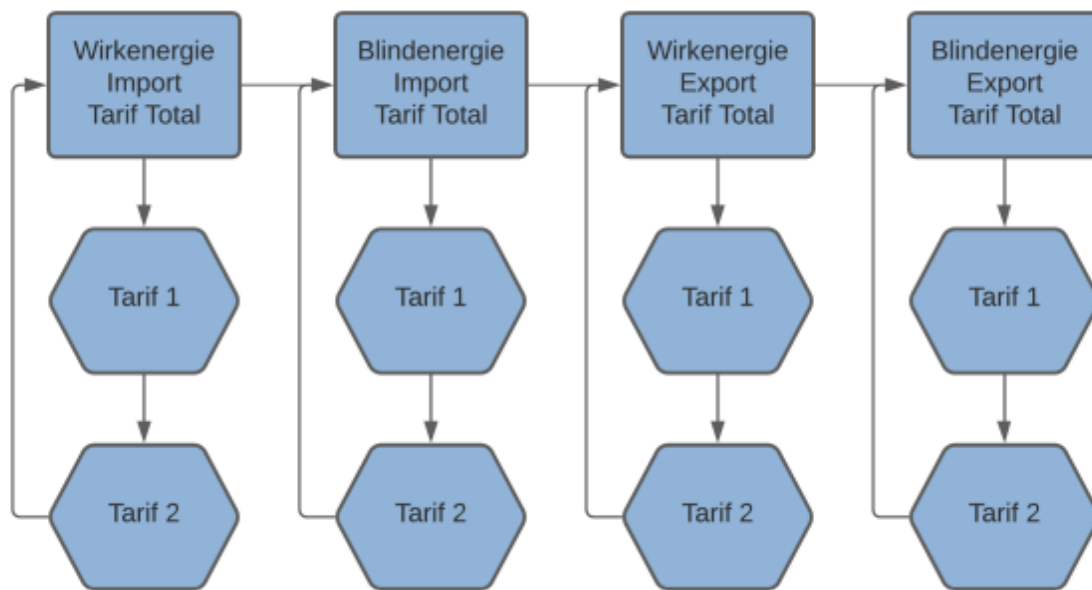
Note: Depending on the meter configuration, one or more of the main menu pages may not be available. Refer to the image above for more details.

### 10.2. SUBMENU PAGES

The following are the submenu pages.

#### Energy Displays

The main menu pages "Active Energy Import / Export" and "Reactive Energy Import / Export" display the total import/export of the respective energies by default. The following scheme generally applies to the submenu pages:



**Note:** Deviating displays can be configured. Please refer to the "Display Settings" chapter for more details.

To ensure the most accurate display of energy values, without missing large consumers, the Hyperion is equipped with an autorange function. If the display exceeds its range, the OF flag will appear on the display. However, the registers that can be read via the interfaces only overflow much later (around 18 billion GWh) compared to the display (99 million MWh). The display shows the energy values as follows:

Energy Register (Wh) Range	Divisor (Prescaler)	Divisor (Decimal Shift)	Divisor (Decimal Shift)	Display Range End	Unit	Change
<b>1</b>	100	10	0.0	0.0	kWh	
<b>10</b>	100	10	0.0	0.0	kWh	
<b>100</b>	100	10	0.1	0.9	kWh	
<b>1000</b>	100	10	1.0	9.9	kWh	
<b>10 000</b>	100	10	10.0	99.9	kWh	
<b>100 000</b>	100	10	100.0	999.9	kWh	
<b>1 × 10<sup>6</sup></b>	100	10	1000.0	9999.9	kWh	
<b>10 × 10<sup>6</sup></b>	100	10	10000.0	99999.9	kWh	
<b>100 × 10<sup>6</sup></b>	100	10	100000.0	999999.9	kWh	
<b>1 × 10<sup>9</sup></b>	100	10	1000000.0	9999999.9	kWh	
<b>10 × 10<sup>9</sup></b>	1000	1000	10000.000	99999.999	MWh	3 decimal places; unit changed
<b>100 × 10<sup>9</sup></b>	10 000	100	100000.00	999999.99	MWh	2 decimal places
<b>1 × 10<sup>12</sup></b>	100 000	10	1000000.0	9999999.9	MWh	1 decimal place

Energy Register (Wh) Range	Divisor (Prescaler)	Divisor (Decimal Shift)	Display Range Start	Display Range End	Unit	Change
$10 \times 10^{12}$	1 000 000	1	10000000	99999999	MWh	no decimal places
$100 \times 10^{12}$	-	-	Overflow display	Display Overflow	MWh	Display overflow, restart from 0
$1 \times 10^{15}$	-	-	Overflow display	Display Overflow	MWh	-
$10 \times 10^{15}$	-	-	Overflow display	Display Overflow	MWh	-
$100 \times 10^{15}$	-	-	Overflow display	Display Overflow	MWh	-
$1 \times 10^{18}$	-	-	Overflow display	Display Overflow	MWh	-
$10 \times 10^{18}$	-	-	Overflow display	Display Overflow	MWh	Overflow counter

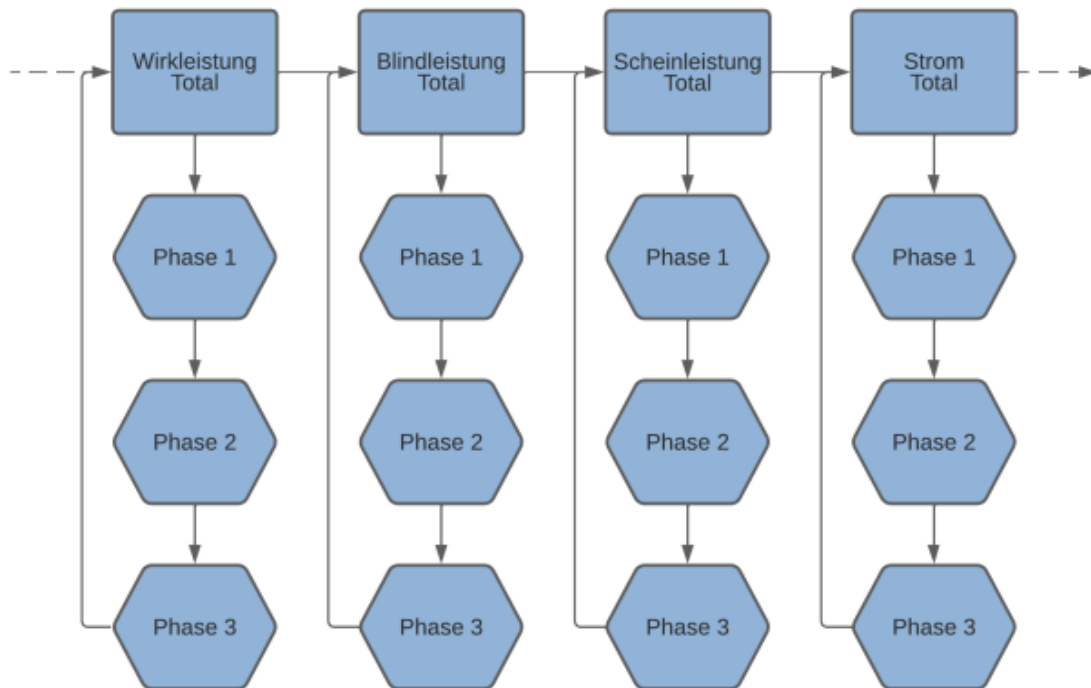
**Maximum energy register value:** 18,446,744,073,709,600,000 Wh = 18,446.7 PWh

### 10.3. POWER AND CURRENT CONSUMPTION

---

The main menu pages for "active / reactive / apparent power" each show the total current power consumption. By pressing the "Arrow Down" button, you can switch to the power consumption of individual phases.

On the main menu page "Current", the total current across all 3 phases is also displayed by default. By pressing the "Arrow Down" button, you can switch to the current of the individual phases.



The 4-quadrant diagram shows the relationship between positive and negative active and reactive power. When the active power is negative, the displayed current is also negative. The diagram also lists the energy directions ( $P \gg$ ,  $Q \gg$ , etc.) that are shown on the display.

#### Quadrant I

- Active power is positive, the active energy consumption register increases.
- Reactive power is positive, the reactive energy consumption register increases.

#### Quadrant II

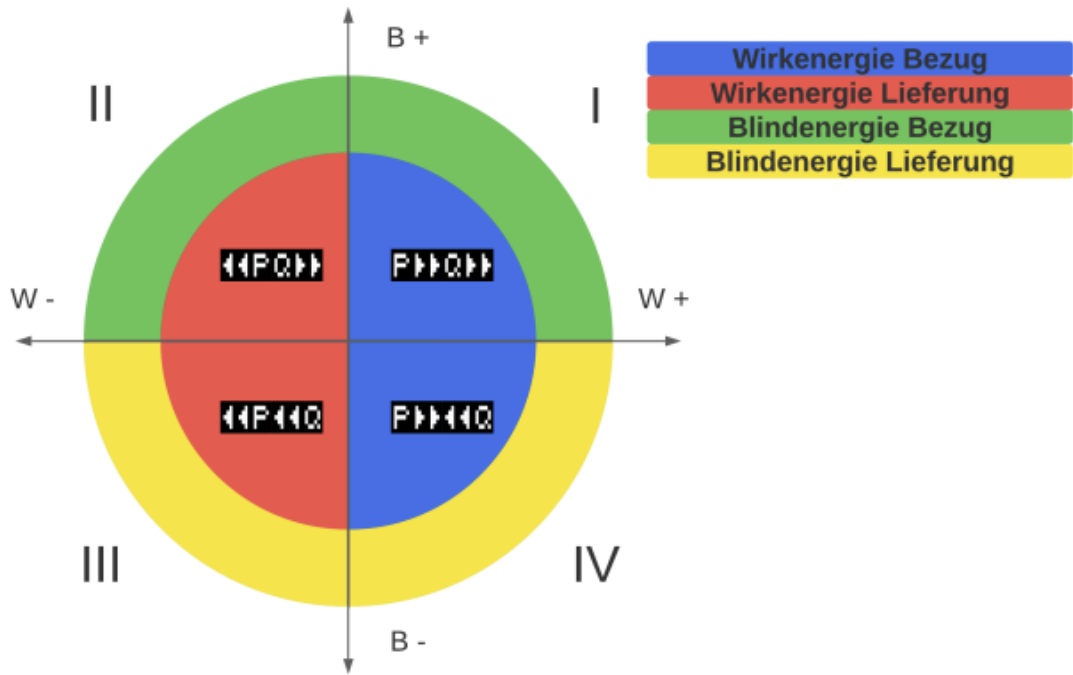
- Active power is negative, the active energy delivery register increases.
- Reactive power is positive, the reactive energy consumption register increases.

#### Quadrant III

- Active power is negative, the active energy delivery register increases.
- Reactive power is negative, the reactive energy delivery register increases.

#### Quadrant IV

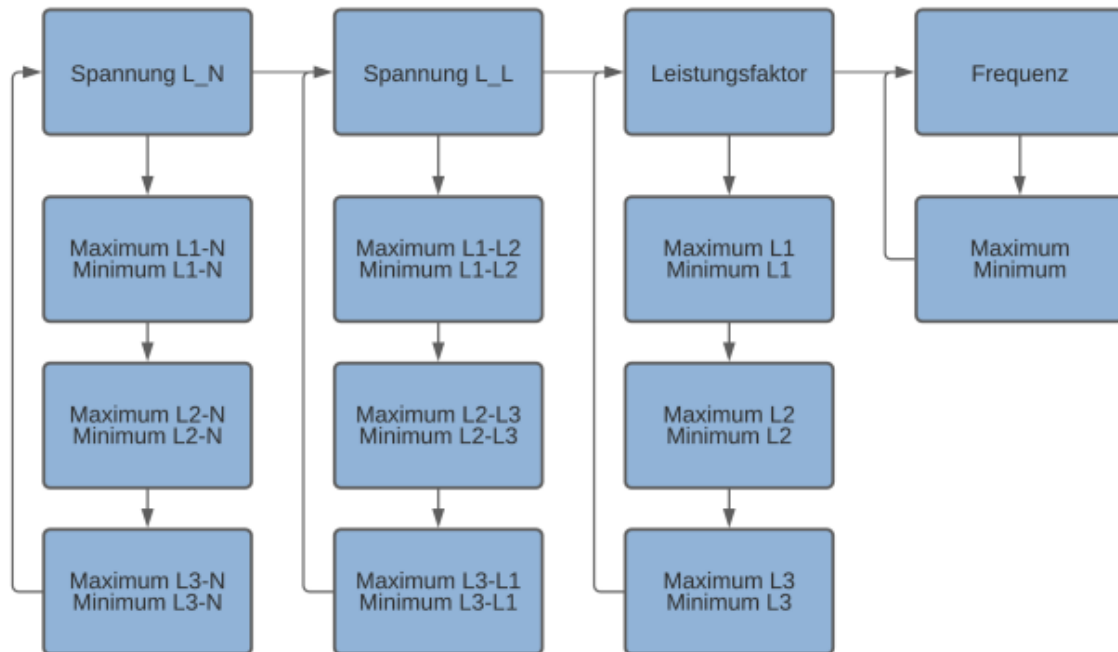
- Active power is positive, the active energy consumption register increases.
- Reactive power is negative, the reactive energy delivery register increases.



## 10.4. VOLTAGE, POWER FACTOR, AND FREQUENCY

These menu pages display the current values for voltage, power factor, and frequency. The values are updated at 1-second intervals.

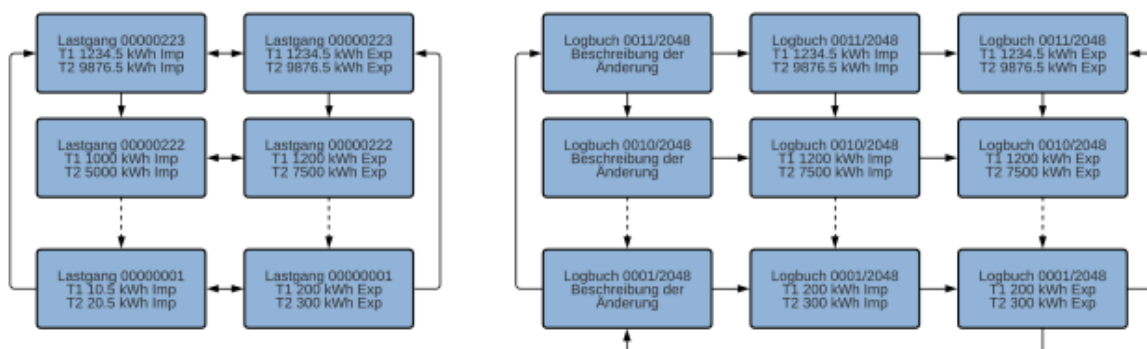
If the "Min/Max values" setting is activated, you can view the maximum and minimum values of the respective instantaneous values by briefly (<1s) pressing the "Down Arrow" button. The timestamp of the maximum/minimum value is also visible.



### Load Profile and Logbook

By briefly (<1s) pressing the "Down Arrow" button, you can switch through the stored load profiles and logbook entries. The directories always start with the most recent entry.

By pressing the "Down Arrow" button for a longer period (>2s), you can switch between consumption and delivery in the load profiles. In the logbook, this allows you to switch between the changes and the meter readings at the time of the change.



## 11. CONFIGURATION SETTINGS

### Sprache | Language

Language Switch between the languages "German" (default) and "English".

- "Right Arrow" until you reach Settings ("Settings" in English)
- "Down Arrow" until you reach Language ("Language" in English)
- Press the "Service Button" briefly (<2 seconds)
- "Down Arrow" selects between "German" and "English"
- To save: Press the "Service Button" for >2 seconds until the LCD screen blinks.

### Tariff Switching

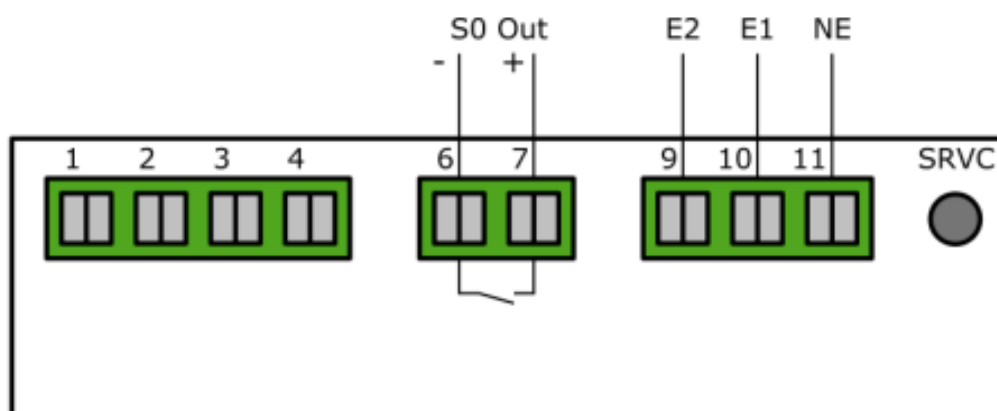
A change in tariff is applied immediately, meaning the tariff applied to terminals 9-11 at that moment is valid from that point onward. The tariff signal consists of an alternating voltage of 230VAC applied between NE (terminal 11) and E2 (terminal 9) / E1 (terminal 10). The tariffs are applied according to the following truth table, where "0" represents 0VAC and "1" represents 230VAC relative to NE (terminal 11).

E2 (Terminal 9)	E1 (Terminal 10)	Tariff
0	0	1
0	1	2
1	0	3
1	1	4

By default, Tariff 1 is always set.

The tariff inputs are galvanically isolated internally through optocouplers.

**Note:** A change in the tariff in the LP version of the Hyperion energy meter is applied at the start of a new recording period, meaning the tariff applied to terminals 9-11 at that moment will be valid at least until the next recording period begins.



## Setting the number of tariffs

In the settings, you can define the number of tariffs. Choose between dual-tariff (2) and quadruple-tariff (4).

- Press "Right Arrow" until Settings
- Press "Down Arrow" until Number of Tariffs
- Press "Service Button" briefly (<2 seconds)
- Use the "Down Arrow" to select between 2 and 4 tariffs
- Save: Press the "Service Button" for >2 seconds until the LCD screen blinks

**Note:** All images in this documentation only show 2 tariffs. The display works the same for 4 tariffs.

**Note:** The LP variant of the Hyperion energy meter is permanently set to a 2-tariff mode. This cannot be changed.

## Real-time clock

The real-time clock of the Hyperion energy meter can be configured either directly on the meter or via optional interfaces. The interfaces (TCP/IP, M-Bus, Modbus, LoRa) also allow you to connect the meter to a time server, enabling automatic synchronization. The Hyperion has an internal clock with a daily deviation of  $\pm 0.4$  seconds. The LP version of the Hyperion energy meter displays special messages related to the real-time clock. For more specific information on the LP version, please consult the PTB-A 50.7-specific chapter at the end of this user manual.

## Configuration on the device

The real-time clock can be directly set on the Hyperion. The internal clock is backed up for at least 18 days without power, after which the time must be reset. **!** Note: The meter must have been in operation for at least 2 hours for the energy storage to fully charge.

- "Right Arrow" until Settings
- "Down Arrow" until Real-time clock
- Press "Service Button" briefly (<2 seconds)
- "Right Arrow" selects the digit
- "Down Arrow" increments the digit
- Save: Press "Service Button" for >2 seconds until the LCD screen blinks

## Automatic time synchronization

Time synchronization is performed via M-Bus using a defined command over the meter's chosen interface. Time and date information are sent to the meter, and synchronization occurs immediately, confirmed by an "ACK" message. Meters with TCP/IP and LoRa interfaces can automatically synchronize if a time server is specified. The meter sends a request to the time server every 1-2 minutes until the initial synchronization occurs. Afterward, the meter only requests synchronization once an hour.

**Note:** For projects requiring mandatory PTB-A 50.7 certification: You are allowed only 2048 entries for time changes (or changes to the transformer ratio, S0 pulse value, or S0 pulse length) before the meter becomes invalid for legal metrology purposes. Time synchronization can only be performed once per load profile interval.

### Load profile interval

In the settings, you can set the load profile interval. Choose between an interval of 1 min, 5 min, 15 min (default), 30 min, 1h, 6h, 12h, or 24h.

- Press "Right Arrow" until Settings
- Press "Down Arrow" until Load profile interval
- Press the "Service Button" briefly (<2 seconds)
- Use the "Down Arrow" to select the interval times
- Save: Press the "Service Button" for >2 seconds until the LCD screen blinks

**Note:** This setting is only available for meters with an activated load profile. TCP/IP and LoRa meters are delivered with an active load profile by default.

**Note:** The LP version of the Hyperion energy meter has a fixed load profile interval of 15 minutes. This cannot be changed.

### Setting the Transformer Ratios

The transformer ratio can be directly set on the Hyperion energy meter using the control buttons.

- Press "Right Arrow" until Settings
- Press "Down Arrow" until CT/VT Ratio
- Press the "Service Button" briefly (<2 seconds)
- Use the "Right Arrow" to select digits
- Use the "Down Arrow" to increment the digit
- Save: Press the "Service Button" for >2 seconds until the LCD screen blinks

The current transformer ratio (CT Ratio) can be adjusted from 5A:5A to 20,000A:5A in 5A steps, and 1A:1A to 4,000A:1A in 1A steps. The voltage transformer ratio (VT Ratio) can be set from 100V:100V to 36,000V:100V in 100V steps. It is mandatory to specify both the primary and secondary currents of the current transformer. A set ratio of 100:1 means that a primary current of 100A produces a secondary current of 1A.

**Note:** Ensure that the transformer ratio is properly matched to your transformer and is defined according to the application. Incorrect settings and/or incorrectly sized transformers will distort the energy measurement.

**Note:** For projects with mandatory load profile certification PTB-A 50.7: You have only 2048 entries for a transformer factor change (or time change, S0 pulse value change, or S0 pulse length change) before the meter falls into a legally invalid state. Transformer ratios can only be changed once per load profile interval.

### **S0 Pulse Value**

In the settings, the pulse value can be set.

- Press "Right Arrow" until Settings
- Press "Down Arrow" until S0 Pulse Value
- Press the "Service Button" briefly (<2 seconds)
- Use the "Down Arrow" to choose between 1, 10, 100, 1000, and 10000 Imp / kWh
- Save: Press the "Service Button" for >2 seconds until the LCD screen blinks

**Note:** For projects with mandatory load profile certification PTB-A 50.7: You have only 2048 entries for a pulse value change (or time change, transformer factor change, or S0 pulse length change) before the meter falls into a legally invalid state. S0 pulse value changes can only be made once per load profile interval.

### **Energy Display Settings**

You can configure what is displayed on the screen. You can choose between the following settings:

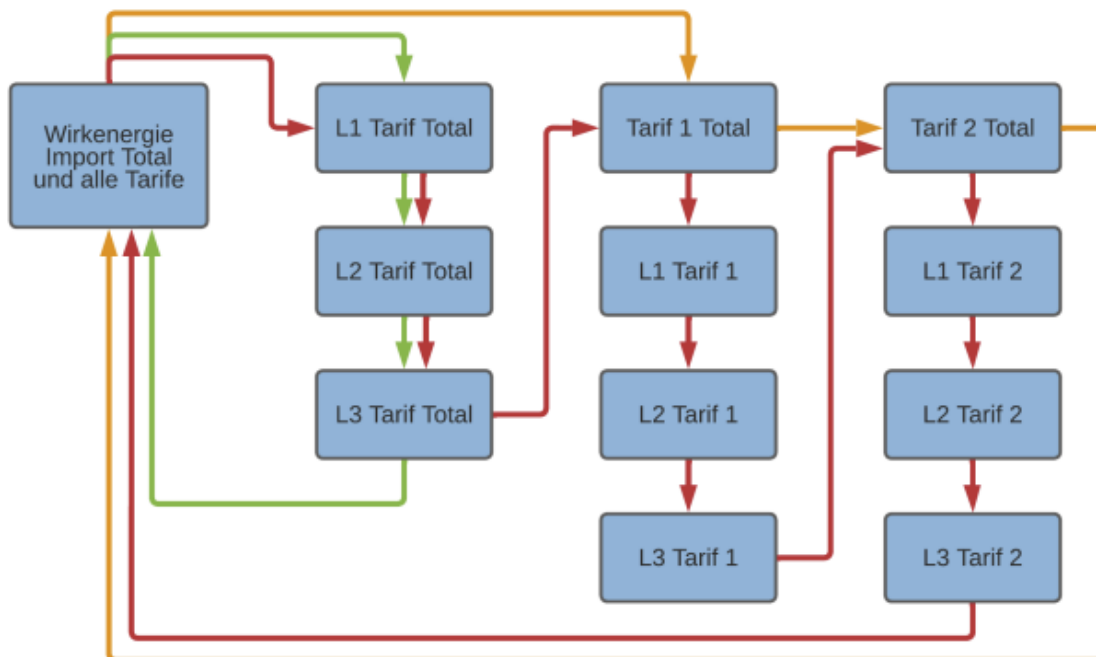
#### **Energy per Tariff:**

- On: The Hyperion displays the imported/exported energy for each tariff on the main menu pages "Active Energy Import", "Active Energy Export", "Reactive Energy Import", and "Reactive Energy Export."
- Off: Only the total for all tariffs and the selected "Energy per Phase" setting is shown on the named main menu pages.

#### **Energy per Phase:**

- On: The Hyperion shows the imported/exported energy for each phase on the main menu pages "Active Energy Import", "Active Energy Export", "Reactive Energy Import", and "Reactive Energy Export."
- Off: Only the total for all tariffs and the selected "Energy per Tariff" setting is shown on the named main menu pages.

**Overview** Depending on the settings for displaying energy imports/exports, the submenu for energy displays is structured as follows.



#### The following legend applies:

- **Green:** Only the “Energy per Phase” option is enabled.
- **Orange:** Only the “Energy per Tariff” option is enabled.
- **Red:** Both options are enabled.

#### Configuration Interfaces

The Hyperion can be equipped with various interfaces, but only one interface is possible per meter.

#### Interfaces

The Hyperion optionally offers one of the following interfaces:

- LoRaWAN®
- mioty

**Note:** A Hyperion energy meter has only one of these interfaces. The Hyperion can be configured directly on the meter using the touch-sensitive buttons.

#### M-Bus

The M-Bus interface is built according to the EN 13757-2, -3 (formerly EN1434-3) standard. The Hyperion M-Bus can therefore communicate with all M-Bus-compatible devices. The

M-Bus interface is integrated into the energy meter and protected from contamination and tampering. The interface is located at the back of the meter on Pin 1[3] (+) and Pin 2[4] (-).

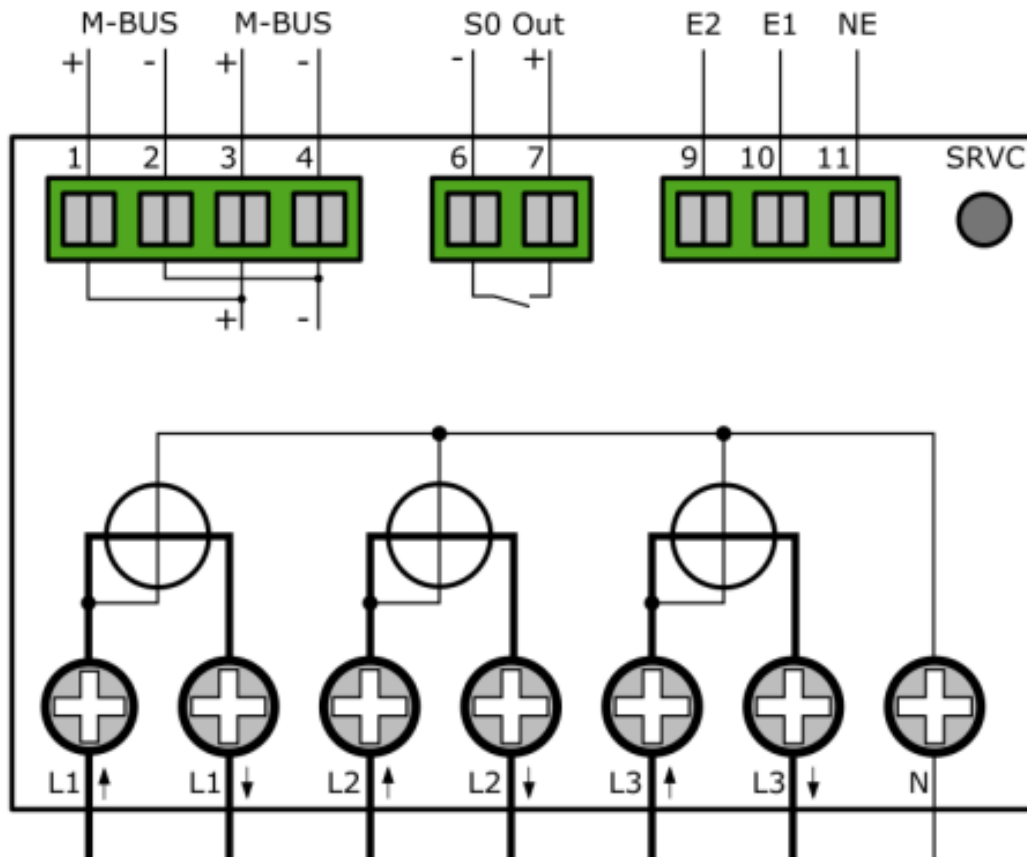
### Factory Settings

Setting	Value
Secondary Address	Serial number of the device
Primary Address	0
Baud Rate	2400

## 12. WIRING DIAGRAM M-BUS

The Hyperion energy meter M-Bus is equipped with two internally connected M-Bus terminals. This allows for easier serial connection during installation.

**Note:** The M-Bus interface is the same for the Hyperion 3/100 M-Bus and the Hyperion 3/5 M-Bus.



## 13. ADDITIONAL CONFIGURATIONS, COMMUNICATION, AND ERROR HANDLING

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### 13.1. CONFIGURATIONS

---

#### **Configuration of the Primary Address on the Device**

- Press "Right Arrow" until **Settings**
- Press "Down Arrow" until **M-Bus Pri. Address**
- Press the **Service Button** briefly (<2 seconds)
- Press "Right Arrow" to select the digit
- Press "Down Arrow" to increment the digit
- Save: Press the **Service Button** for >2 seconds until the LCD screen blinks

#### **Configuration of the Secondary Address on the Device**

- Press "Right Arrow" until **Settings**
- Press "Down Arrow" until **M-Bus Sec. Address**
- Press the **Service Button** briefly (<2 seconds)
- Press "Right Arrow" to select the digit
- Press "Down Arrow" to increment the digit
- Save: Press the **Service Button** for >2 seconds until the LCD screen blinks

#### **Configuration of Baud Rate on the Device**

- Press "Right Arrow" until **Settings**
- Press "Down Arrow" until **M-Bus Baud Rate**
- Press the **Service Button** briefly (<2 seconds)
- Press "Right Arrow" to choose between 300, 600, 1'200, 2'400 (default), 4'800, and 9'600 Baud.
- Save: Press the **Service Button** for >2 seconds until the LCD screen blinks

#### **Configuration via MB-Conect**

The Hyperion M-Bus can also be configured using our proprietary software MB-Connect.

#### **S0 Pulse Output**

The S0 pulse output complies with the EN 62053-31 (DIN 83864) standard. Every Hyperion has an S0 pulse output, allowing communication with devices that can receive and process such pulses. The interface is located at the back of the meter on Pin 6 and Pin 7. The switch is a high-performance Opto Power MOSFET rated at 5-60VAC or VDC. The S0 pulse output is potential-free.

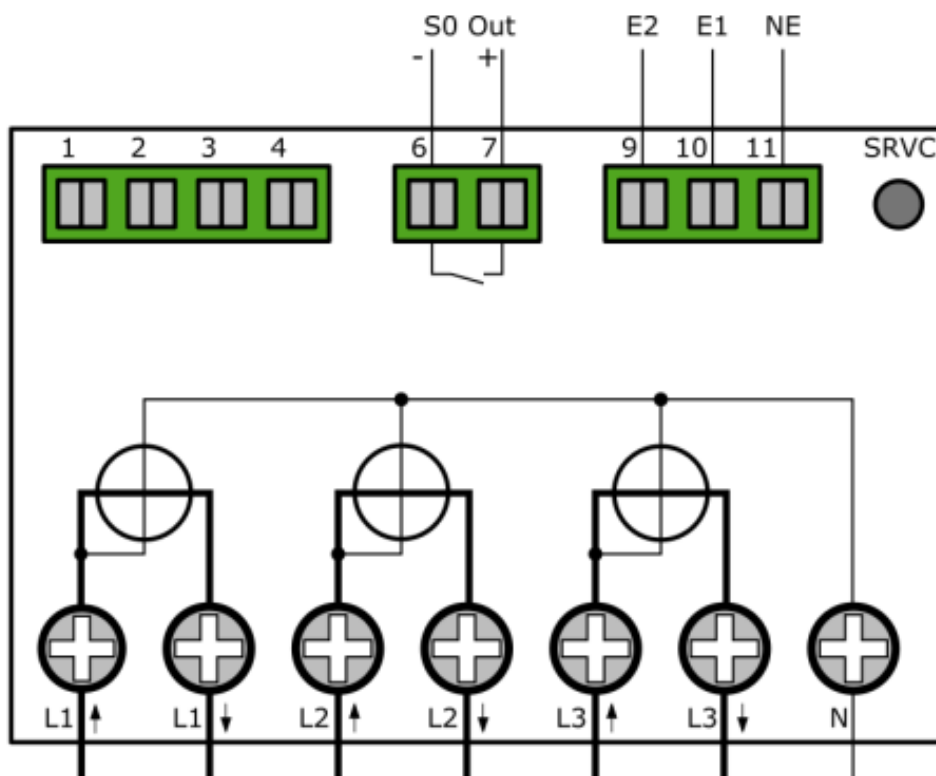
**Note:** Ensure proper polarity.

### Factory Settings

Anschluss	Beschreibung
S0 Ausgang	Wirkernergie Bezug (Pin 6 + 7)
Wandlerzähler	10 Impulse pro kWh / kvarh @ 120 ms Impulslänge
Direktanschlusszähler	1000 Impulse pro kWh / kvarh @ 40 ms Impulslänge

### Wiring Diagram for S0 Pulse Output

**Note:** The S0 interface is the same for the Hyperion 3/100 and the Hyperion 3/5.



### Configuration of Readout Type

- Press "Right Arrow" until "Settings"
- Press "Down Arrow" until "S0 Pulse Type"
- Press "Service Button" briefly (< 2 seconds)
- Press "Right Arrow" to choose between:

- **Active Energy Diff:** All active energy, whether import or export, will be output without distinction.
- **Reactive Energy Diff:** All reactive energy, whether import or export, will be output without distinction.
- **Active Energy Import:** Only imported active energy is output via S0. All other energies are ignored.
- **Reactive Energy Import:** Only imported reactive energy is output via S0. All other energies are ignored.
- **Active Energy Export:** Only exported active energy is output via S0. All other energies are ignored.
- **Reactive Energy Export:** Only exported reactive energy is output via S0. All other energies are ignored.
- Save: Press "Service Button" for > 2 seconds until the LCD screen blinks.

### Configuration of S0 Pulse Rate

In the settings, the pulse rate can be defined.

- Press "Right Arrow" until "Settings"
- Press "Down Arrow" until "S0 Pulse Value"
- Press "Service Button" briefly (< 2 seconds)
- Press "Down Arrow" to select between 1, 10, 100, 1000, and 10000 impulses/kWh
- Save: Press "Service Button" for > 2 seconds until the LCD screen blinks.

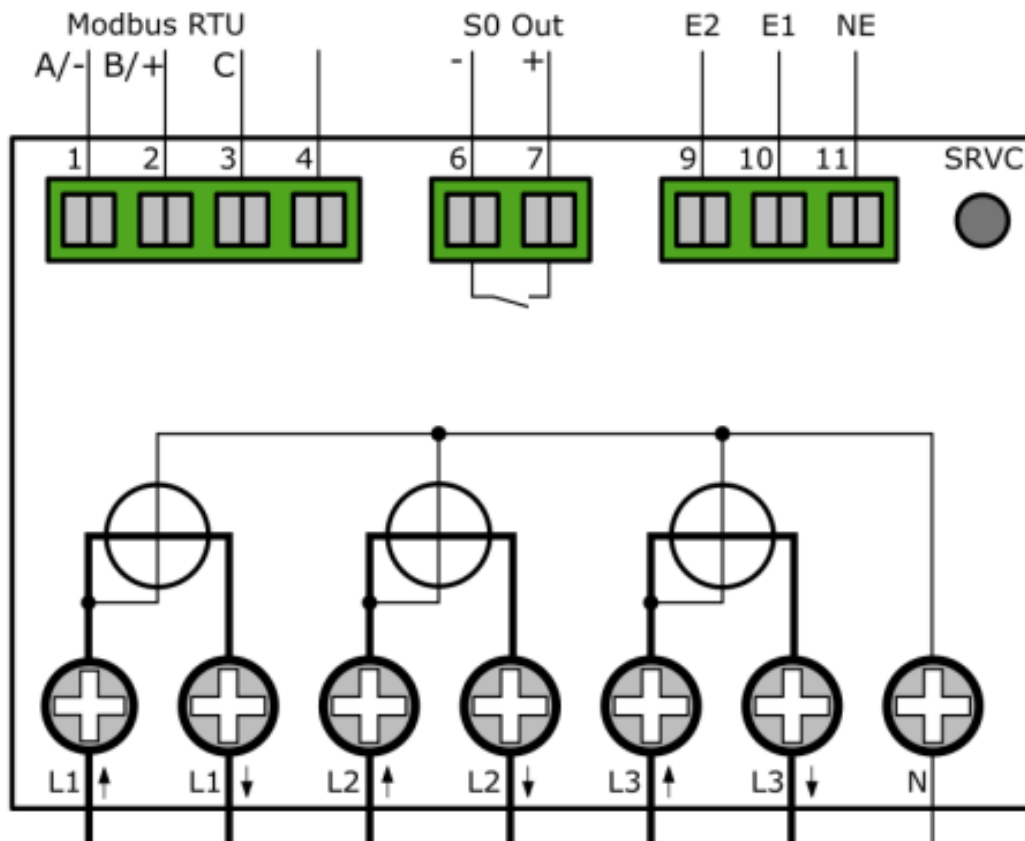
### Configuration of S0 Pulse Width

In the settings, the pulse width can be defined. Choose between 2ms, 10ms, 30ms, 40ms, and 120ms.

- Press "Right Arrow" until "Settings"
- Press "Down Arrow" until "S0 Pulse Width"
- Press "Service Button" briefly (< 2 seconds)
- Press "Down Arrow" to select between 2ms, 10ms, 30ms, 40ms, and 120ms
- Save: Press "Service Button" for > 2 seconds until the LCD screen blinks.

### Wiring Diagram for Modbus

**Note:** The Modbus interface is the same for the Hyperion 3/100 Modbus and the Hyperion 3/5 Modbus.



## 13.2. LORA® FACTORY SETTINGS

The Hyperion supports communication via LoRa.

### Factory Settings

By default, the Hyperion LoRa transmits the following values every 15 minutes:

- Timestamp
- Active Energy Import for Tariff 1 & 2
- Active Energy Export for Tariff 1 & 2
- Error Code

## 13.3. MIOTY® FACTORY SETTINGS

The Hyperion supports communication via mioty®.

### Factory settings

Profile 0 is used as the factory default.

### Profile 0: Complete data:

Comprehensive measurement values: power, current, voltage, energy, power quality.

- Power (W): p\_l1\_a, p\_l2\_a, p\_l3\_a, p\_l123\_a
- Current (mA): i\_l1, i\_l2, i\_l3, i\_l123
- Voltage (V ÷ 10): u\_l1, u\_l2, u\_l3, u\_l12, u\_l23, u\_l31
- Energy (Wh): e\_ta\_a\_i, e\_ta\_a\_e, e\_ta\_r\_i, e\_ta\_r\_e
- Power Quality: pf\_l1-3 (÷ 100), f (Hz ÷ 10)
- Status: pwr\_fail

For further configuration options for profiles, please refer to the document HYPERION MIOTY PROFILE DE.

### Nomenclature:

- Voltage: u\_lX (phase/line)
- Current: i\_lX (phase/total)
- Power: p\_lX\_a (active, phase/total)
- Energy: e\_t{a|1|2}{a|r}{i|e} (e.g., e\_ta\_a\_i)
- Power factor: pf\_lX
- Frequency: f
- Transformer ratio: {ct|vt}{act|old}{prim|sec}

## 13.4. Error case

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If you encounter an error with the Hyperion, refer to the following list of the most common issues.

### **Inconsistencies in the Energy Measurement of the Hyperion Energy Meter**

**Situation:** One or more phase currents show a negative sign.

**Solution:** Check whether the connections "S1↑" and "S2↓" ("Lx↑" and "Lx↓" for the direct meter) are correctly connected for the respective phases. "S1↑" ("Lx↑") must always be connected to the network side, and "S2↓" ("Lx↓") to the consumer/producer side.

**DANGER:** During the inspection and possible adjustment of the phase connections, all conductors to which the meter is connected must be de-energized. Touching live parts is life-threatening!

**Situation:** The meter measures too much/too little energy

**Solution 1:** Check the set current transformer ratio and the voltage transformer ratio.

These ratios must match the installed current/voltage transformers.

**Solution 2:** Check the correct connection of the meter. A phase that carries a negative current will count the energy in the export register.

**Note:** Keep in mind that when the meter is used as a summary meter, the total energy may deviate from the sum of the following energy meters. The sum energy includes the multiple errors of the individual meters.

### **Incorrect consumption display on the transformer meter**

**Situation:** The Hyperion shows a consumption that is higher/lower by a factor

**Solution 1:** Ensure that the current transformer ratio on the Hyperion matches your chosen current transformer. The current transformer ratio can be configured on the Hyperion via the arrow keys.

5 / 5 to 20,000 / 5 A, in 5 A increments.

1 / 1 to 4,000 / 1 A, in 1 A increments.

**Solution 2:** Check if the short-circuit bridge has been correctly removed in the secondary measurement circuit.

### **Behavior for consumption and delivery**

The Hyperion records the energy in negative (delivery) and positive (consumption) directions in separate registers. The consumption and delivery registers are not reduced. The "Active Energy Consumption" register refers to the energy delivered or consumed by the utility. The customer will receive an energy bill from the utility for this.

The "Active Energy Delivery" register refers to the energy fed back into the grid (e.g., photovoltaic system).

#### **Practical example:**

How the two registers behave on the Hyperion:

Current consumption of a residential complex at 13:00

Phase L1: 10 kW

Phase L2: 20 kW

Phase L3: 30 kW

Total ==> 60 kW

#### **Power generated by the PV system in the residential complex at 13:00**

Phase L1: 25 kW

Phase L2: 25 kW

Phase L3: 25 kW

Total ==> 75kW

In this case, 15 kW is currently being fed back into the grid, and the "Active Energy Consumption" register for L1 and L2 remains at a standstill and does not increase. The "Active Energy Delivery" register is currently counting up for L1 and L2, as energy is being fed back into the grid. For L3, energy is still being consumed, so "Active Energy Delivery" remains at a standstill, and "Active Energy Consumption" is counting up.

### **The Hyperion delivers incorrect values via the pulse output**

Check whether the pulse rate and pulse duration of the Hyperion energy meter match your pulse receiver. The pulse rate and pulse duration can be configured on the Hyperion via the buttons.

Possible pulse rates/duration:

**Pulse rates:** 1, 10, 100, 1000, and 10,000 pulses per kWh/kvarh.

**Pulse durations:** 2 ms, 10 ms, 30 ms, 40 ms, and 120 ms.

Factory default settings are as follows

Connection	Description
S0 Output	Active energy import (Pin 6 + 7)
Transformer Meter	10 pulses per kWh / kvarh @ 120 ms pulse length
Direct Connection Meter	1000 pulses per kWh / kvarh @ 40 ms pulse length

**The tariff switching is not working.**

By default, tariff 1 is active. Check whether you have connected the tariff switching correctly.

E2 (Terminal 9)	E1 (Terminal 10)	Tariff
0	0	1
0	1	2
1	0	3
1	1	4

**Note:** For the load profile according to PTB-A 50.7, only the dual tariff is available. Tariff changes will be applied at the next logging interval.

**DANGER: When modifying the tariff connections, all conductors connected to the meter must be de-energized. Touching energized parts is life-threatening!**

**The LoRa communication interface is not working:**

- Ensure that the meter is registered on your LoRa network server.
- Make sure the LoRa reading interval matches the available bandwidth. Many LoRa devices in the same network may interfere with each other's communication.
- Ensure that the meter can synchronize time via LoRa.

## 14. EXTENDED INFORMATION FOR LOAD PROFILE ACCORDING TO PTB-A 50.7:

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### 14.1. ACCURACY OF MEASUREMENT INFORMATION: OBLIGATIONS FOR THE USER UNDER § 23 OF THE MEASUREMENT AND CALIBRATION ORDINANCE

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The Measurement and Calibration Ordinance obliges those who are users of a measuring device in the sense of metrological law to ensure that measurements are performed correctly and that measuring devices are handled in a way that ensures measurement accuracy. Users of measuring devices under the metrological law, taking into account the rules of market roles according to the Metering Point Operation Act, include:

- Measuring Device Users:
  - Measuring device users are the metering point operators as defined by the Metering Point Operation Act.
- Measurement Value Users:
  - Measurement value users are those who, according to the Metering Point Operation Act, carry out measurements and forward measurement values to authorized third parties, as well as those who handle billing for network usage and energy delivery.

It is the responsibility of the measuring device users to provide the measurement value users with the opportunity to become aware of the obligations outlined below.

#### **Transparency of Usage**

The measurement value user must make the calculation of the billed energy and, if applicable, power values transparent for the electricity customers where the devices are used. 'Making transparent' means providing the electricity customers with the information necessary to understand how the billing items on their electricity bill are calculated, using the legally compliant displays of the devices used at their premises. In particular, it is important to inform them about:

- Which values displayed by the devices can be used for billing purposes.
- That values not displayed cannot be used for billing purposes, and that values displayed as results of functions not relevant to legal metrology are purely informative and cannot be used for billing purposes either.

Furthermore, the devices must be used in such a way that the readability of billing-relevant measurement results and error messages is ensured for the electricity customers.

#### **Tariffing**

For legally compliant use of the meter reading data, only the tariffs T1 and T2 can be used. In this context, § 33 of the MessEG (Measurement and Calibration Act) must be observed:

In this regard, the measurement value user must ensure that bills, as far as they are based on measured values, can be easily verified by the person for whom the bills are intended. For this purpose, appropriate tools must be provided if necessary. It must always be ensured that all registers used for billing are also displayed on the screen.

## 14.2. ERROR MESSAGES / TIME ADJUSTMENTS

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### **Error Messages:**

The accompanying documents describe the functional errors that the meters mentioned here can self-diagnose and display. If one or more of the events labeled as "Legally Relevant Error Messages" occur, the legally compliant use is no longer guaranteed, and the stored measurement results are considered dubious. The devices must be removed, repaired if necessary, and recalibrated if they are to continue being used for billing purposes.

### **Time Adjustments:**

For meters with remotely adjustable internal clocks, technical measures must ensure that it can be verified, via legally compliant displays, whether time adjustments that affect the accuracy of measurement and billing have occurred during a billing period. This is achieved in the following way for the meters mentioned here:

- A command to adjust the meter's clock via any of the available interfaces always leads to an entry in the legal-technical logbook. The current recording period after the clock adjustment is marked as invalid.
- The newly started recording period after the time adjustment ends at the next integer multiple of the recording period length (at xx:15, xx:30, xx:45, or xx:00) based on the newly set meter time.

### **Use of Communication Interfaces:**

The communication interfaces of the meters are not legally compliant. Measurement values read via these interfaces can only be used for billing purposes to the extent that they represent an unchanged repeat of the measurement results displayed on the meter's display, as stipulated in Appendix 2, Section 8.1 of the Measurement and Calibration Ordinance.

### **Time Synchronization**

The meters mentioned here synchronize via the available communication interface. For legally compliant use of meter readings, the user must ensure that the meter's clock is synchronized with the legal time. For the meters mentioned here, the following conditions must be met before the data telegram with date and time is sent:

- The M-Bus must be available for communication.
- The Ethernet connection must be available for communication.
- The legal time must be used as the time source. If these conditions cannot be met, the meter readings cannot be used for billing purposes.

If the requirements cannot be met, the meter readings may not be used for billing purposes.

### **Measurement results that cannot be used for billing purposes**

Measurement values other than those specified in the type approval certificate cannot be used for billing purposes.

### **Logbook Function**

The meters mentioned here always have a technical logbook that can only be deleted by breaching manufacturer-provided access security.

### **Hyperion**

The following section describes the menu items of the Hyperion energy meter relevant for load profile operation. The load profile of the Hyperion energy meter is certified for PTB-A 50.7. The following information applies to the tariff switching, time synchronization, transformer settings, and S0 pulse output for the LP version of the Hyperion energy meter.

### **Current or Voltage Transformer Ratio**

These ratios determine the applied factor when measuring energy and must correspond to the used current or voltage transformers. Changing the current and voltage transformer ratios is only possible via the SRVC button. The SRVC button can be secured with a seal to prevent unauthorized access.

### **Real-Time Clock**

The real-time clock displays the current device time. If the meter is not automatically synchronized, we recommend setting the UTC time, as local daylight saving time is not supported. Changing the real-time clock is possible via the SRVC button. The SRVC button can be secured with a seal to prevent unauthorized access.

### **S0 Pulse Output**

The pulse output can be switched between the following settings:

- **Active Energy Diff:** All active energy, whether consumption or delivery, is output without distinction.
- **Reactive Energy Diff:** All reactive energy, whether consumption or delivery, is output without distinction.
- **Active Energy Import:** Only consumed active energy is output via S0. All other energies are ignored.
- **Reactive Energy Import:** Only consumed reactive energy is output via S0. All other energies are ignored.
- **Active Energy Export:** Only delivered active energy is output via S0. All other energies are ignored.

- **Reactive Energy Export:** Only delivered reactive energy is output via S0. All other energies are ignored.

The interface outputs an electrical pulse for each set energy consumption. Based on these pulses, the amount of energy can be calculated. The interface can be configured as follows:

- **Pulse Rate:** Set how many pulses per energy unit should be output.
- **Pulse Length:** Set how long the pulse should be.

Changing the S0 pulse output settings is only possible via the SRVC button. The SRVC button can be sealed to prevent unauthorized access.

### Use for billing purposes

In the LP version of the Hyperion energy meter, only active energy measurements are approved for billing purposes. These measurements can be accessed at any time via the display or the meter's interface.

All other displayed measurements on the display are for informational purposes only and cannot be used for billing purposes. Any measurements that are not displayed and can be read via an interface are also purely informational and cannot be used for billing purposes.

### Description

The load profile functionality according to PTB-A 50.7 consists of two sub-functionalities:

- The actual load profile memory for recording the measured values. This is designed as a "circular buffer," meaning after reaching the maximum number of entries, the oldest 27 entries are overwritten. Overwriting occurs in groups of 27 entries due to technical conditions.
- The logbook memory (technical logbook) for recording changes to parameters that influence the load profile. This logbook cannot be altered without destroying the sealing labels. The recorded changes include:
  - Change of time/date
  - Change of voltage or current transformer factor
  - Change of S0 impulse value, S0 impulse duration

Each of the above parameters can only be changed once per recording period. A new change is only possible after the start of the next interval. A maximum of 2048 logbook entries are available. These cannot be deleted or overwritten. If the logbook capacity is exhausted, the meter will enter an invalid metrological state after another change to any of the above parameters.

This will be indicated by the "PTB NV" icon on the display. Additionally, all subsequent load profile entries will have the "NG" (invalid) status.

**Note:** The "PTB-NV" status cannot be reversed for legal reasons.

## Recording Interval

The recording interval of the load profile in the LP versions of the Hyperion energy meter is set to 15 minutes and cannot be changed.

## Time Synchronization

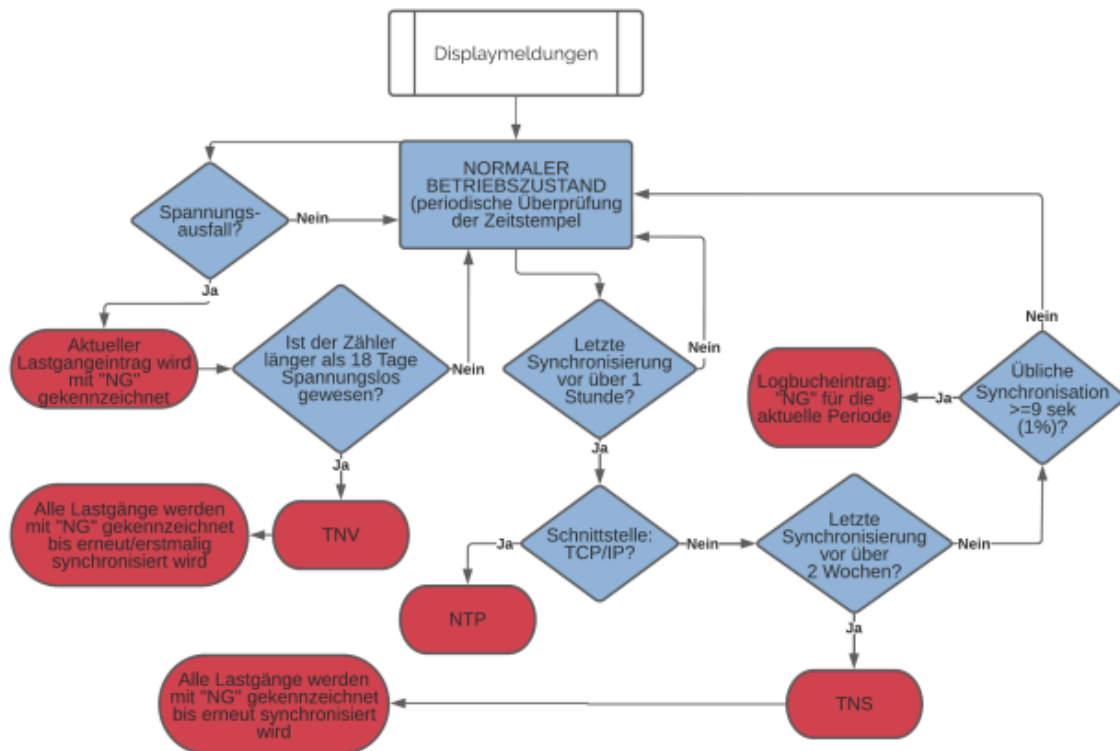
Time synchronization is performed via a defined command over the M-Bus / TCP-IP interface of the meter, by setting a legally recognized time server with the official time, or by using the buttons on the meter. Time and date information are sent to the meter, and synchronization takes place immediately. If done over the M-Bus interface, the meter confirms it with an "ACK" message. The time can only be synchronized or set once per recording period (15 minutes). The official time must be set. Time adjustments are distinguished as follows:

- **Time Synchronization:** Any time setting that deviates by less than 9 seconds from the previously valid time is considered a regular time synchronization. In this case, the meter does not create a logbook entry.
- **Time Setting:** If the real-time clock is set for the first time or the deviation is more than 9 seconds from the previous time, a logbook entry is created, and the current load profile is marked as "NG" (invalid).

The internal buffer (reserve) for maintaining the system time during a power outage lasts for at least 18 days (the meter must have been in operation for at least 2 hours for this).

**Note:** The Hyperion LP has internal time stamps that are reset with each new synchronization of the real-time clock. If the meter is turned on after more than 2 weeks without power and the internal buffer is not yet exhausted, the meter will still detect the missing bi-weekly synchronization and mark all subsequent load profile entries as invalid ("NG").

The messages TNV, TNS, or NTP can appear on the display. The following chart shows when these messages appear and what they mean for the validity of the measurement data.



**Note:** According to the PTB-A 50.7 certification, the time on meters with an interface must be synchronized at least once every 2 weeks. If the meter is not synchronized within 2 weeks, all load profile entries after the expiration of the 2 weeks will be marked with "NG" until the next synchronization occurs. Additionally, the message "TNS" will appear on the display.

**Note:** By default, the internal Hyperion LP real-time clock buffer is always uncharged and should therefore be considered as "without power for more than 18 days" (TNV).

### Tariff Switching

A change in the tariff for the LP version (PTB 50.7 certified) of the Hyperion energy meter will only take effect at the start of a new recording period, meaning the tariff set at terminals 9 - 11 at that time will be applied from that moment until at least the beginning of the next recording period. Only the dual-tariff is available for the LP version. The tariff is controlled via the 3 tariff inputs (connections 9-11) located at the back of the meter.

**Note:** After a power failure, it is possible that the incorrect tariff will be displayed during the first recording interval. This first record will be marked as "NG" in any case, and the correct tariff setting will be taken over from the tariff inputs NE, E1, E2 in the next regular interval.

**Note:** For the load profile according to PTB-A 50.7, only the dual-tariff is available. Tariff changes will only take effect at the next recording interval.

### External Interface Reading

The reading via the external interface can be used for billing purposes. The interfaces transmit the same information that is displayed on the meter's display.

### Memory Capacity

The device's memory can hold:

- Continuous entries for the load profile: 105,378

This corresponds to a period of approximately 3 years at a 15-minute interval. Once the last entry is made, the meter deletes the first 26 entries and starts again at the beginning of the memory register. After these 26 entries are written, the next 26 entries are deleted, and so on. Thus, only the most recent 105,352 entries are available, and older entries are lost.

- Logbook entries: 2,048

Each change in the transformer ratio, real-time clock, or S0 pulse value/pulse length results in an entry. Once all entries are used, the Hyperion enters a legally invalid state (as required by PTB-A 50.7) after any further change of the above factors and must be replaced.

## 14.3. POWER OUTAGE AND RESTART

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### Power Outage

All load profile values are stored in a fixed 15-minute pattern (i.e., XX:00, XX:15, XX:30, and XX:45). After a power outage, recording continues accordingly.

Example:

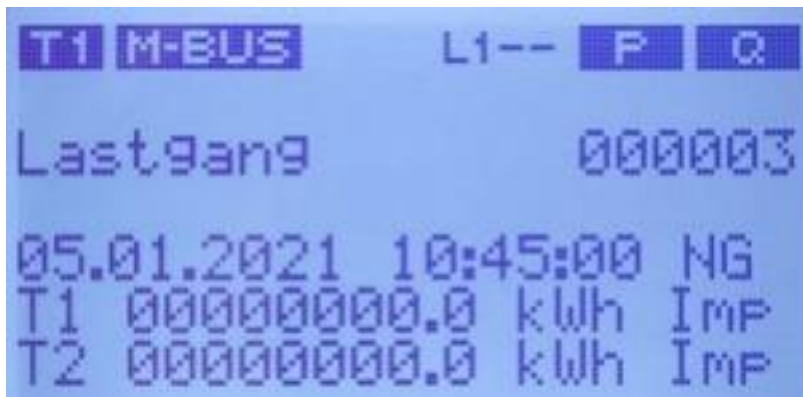
- Current time 07:37 => the last entry was made at 07:30
- Power outage until 08:12
- The next entry occurs at 08:15 (this entry is automatically marked as "NG")
- Entries for 07:45 and 08:00 are missing

After every power outage, the first load profile entry is marked as "NG." If the internal clock buffer has preserved the time (reserve not depleted), all subsequent load profile entries are not marked with "NG."

### Restart

In rare cases, an internal restart of the meter may occur. In such an event, the corresponding load profile entry will be marked as "NG."

### Display Load Profile



The load profile display shows the last entry when called. If all 105,378 entries of the load profile are ever used, the Hyperion automatically deletes the oldest 26 entries. However, the numbering of the next saved load profile entry does not reset to 0 but continues sequentially.

**Example:** Your Hyperion has already stored 200,000 load profiles. When you scroll through the load profile entries, you first see load profile 200,000. However, if you go back 105,378 entries, you will return to load profile 200,000. The data of load profiles 1-94,622 has been deleted in the meantime.

#### The following information is displayed:

**000003:** Index of the displayed entry. The entries start with index 1 and can be scrolled through chronologically by pressing the "Down Arrow" button (in descending order).

**05.01.2021 10:45:00:** Timestamp of the entry. Current date/time according to the device's time settings.

**NG:** Validity flag. A load profile entry is marked as invalid "NG" in the following situations:

When manipulations of the described device parameters are made, the corresponding recording interval is marked as invalid "NG."

The first load profile entry after the meter restarts is always invalid due to the assumption of a power failure (Powerfails).

Entries are marked as "NG" if no new time synchronization occurs within two weeks of the last time synchronization.

#### Valid entries have no markings.

T1 / T2 00000000.0 kWh: Energy register reading per tariff. The status of the active energy register at the time of entry creation.

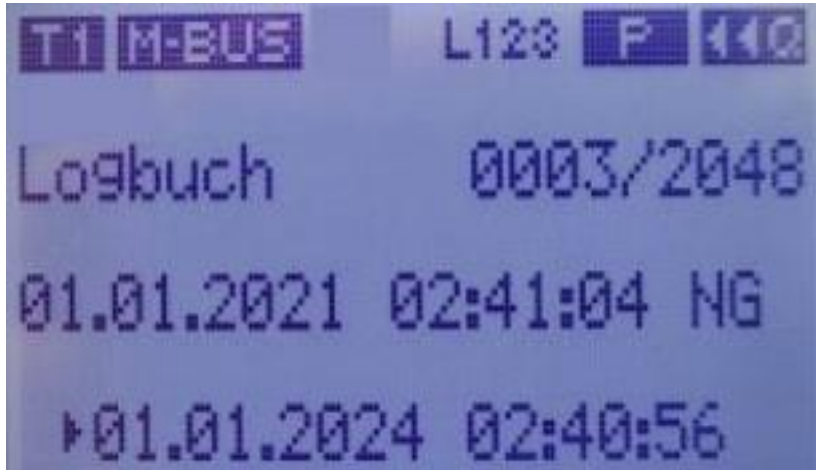
**Note:** Only the dual tariff is available for the load profile according to PTB-A 50.7. Tariff changes are only adopted at the next recording interval.

**Imp / Exp:** Switch between import and export register display. A long press (>2s) on the "Down Arrow" button toggles between the display of import (consumption) and export (delivery) registers.

## Logbook Display

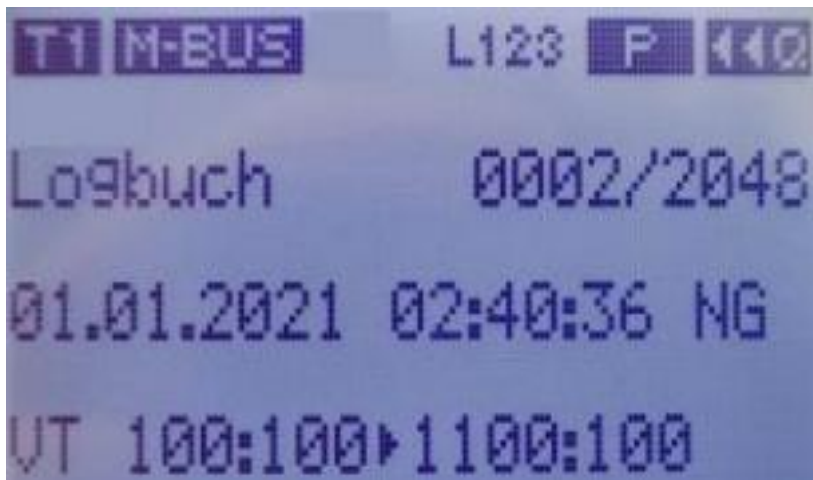
The logbook display always shows the last entry when called. The following information is displayed on the screen:

### In the case of a time adjustment:



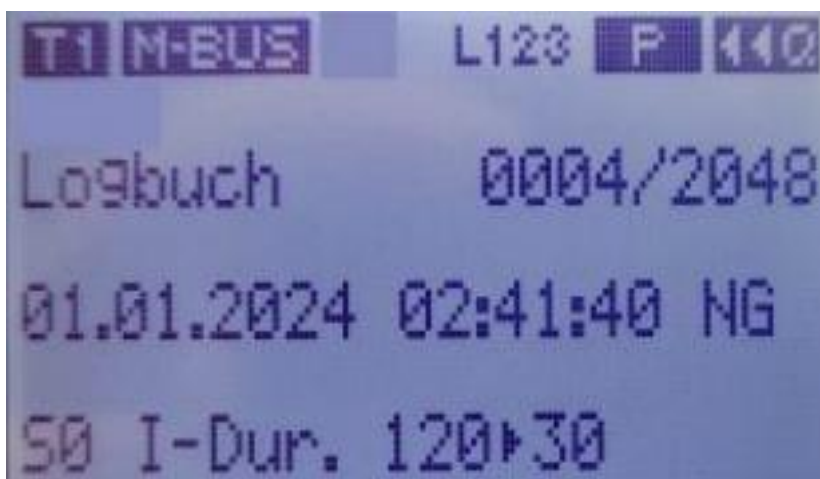
- 0003 / 2048: Index of the current entry. The entries start with index 1 and can be scrolled through by pressing the "Down Arrow" button (in reverse chronological order).
- 01.01.2021 02:41:04: Previously valid time (this also corresponds to the time of the time adjustment).
- 01.01.2024 02:40:56: Newly set time.
- By pressing the "Down Arrow" button briefly (<1s), you can scroll through the saved logbook entries. The directory always starts with the most recent entry.
- By pressing the "Down Arrow" button for a longer time (>2s), you can switch between the change and the meter readings at the time of the change in the logbook.

### In the event of a change in a transformer factor



- 0002 / 2048: Index of the current entry. The entries start with index 1 and can be scrolled through by pressing the "down arrow" button (chronologically descending).
- 01.01.2021 02:40:36: Time of the change.
- VT 100:100 → 1100:100: Previous (left) and newly set (right) factor.
- By briefly pressing the "down arrow" button (<1s), the stored logbook entries can be scrolled through. The list always starts with the most recent entry.
- By holding the "down arrow" button for a longer time (>2s), you can toggle between the changes and the meter readings at the time of the change.

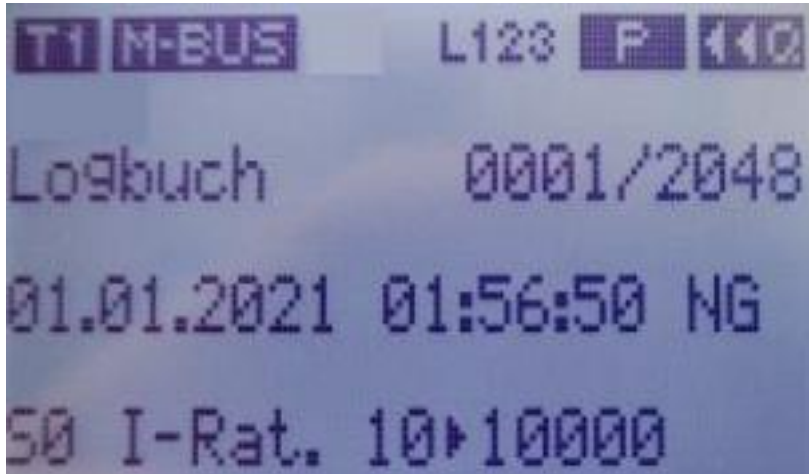
### In case of a change in the pulse duration



- 0004 / 2048: Index of the current entry. The entries start at index 1 and can be scrolled through by pressing the "Arrow Down" button (chronologically descending).
- 01.01.2024 02:41:40: Timestamp of the change.

- S0 I-Dur. 120 -> 30: Previous (left) and newly set (right) factor in ms.
- A short press (<1s) of the "Arrow Down" button allows you to scroll through the stored log entries. The list always starts with the most recent entry.
- A long press (>2s) of the "Arrow Down" button switches between the change and the meter readings at the time of the change in the logbook.

### In case of a change in the pulse value



- 0001 / 2048: Index of the current entry. The entries start with index 1 and can be scrolled through (in reverse chronological order) by pressing the "Down Arrow" button.
- 01.01.2021 01:56:50: Time of the change.
- S0 I-Rat. 10 → 10000: Previous (left) and newly set (right) value in Imp / kWh.
- A short (<1s) press of the "Down Arrow" button allows you to scroll through the stored log entries. The directory always starts with the latest entry.
- A longer (>2s) press of the "Down Arrow" button switches between the log entry and the meter readings at the time of the change.