# User Manual
# GT-3911 Analog Input Module

1 ch 3-phase AC measurement, Lx-Ly 500 VAC, 5 A, 12 bit resolution, cage clamp, not removable terminal

Doc ID: 81810
2025-02-20

Beijer ELECTRONICS
People & Technology Connected

**Head Office**
Beijer Electronics AB
Box 426
201 24 Malmö, Sweden
www.beijerelectronics.com / +46 40 358600

# Table of Contents

# 1. About This Manual

This manual contains information on the software and hardware features of the Beijer Electronics GT-3911 Analog Input Module. It provides in-depth specifications, guidance on installation, setup, and usage of the product.

## 1.1. Symbols Used in This Manual

This publication includes Warning, Caution, Note and Important icons where appropriate, to point out safety-related, or other important information. The corresponding symbols should be interpreted as follows:

**WARNING**
The Warning icon indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury, and major damage to the product.

**CAUTION**
The Caution icon indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, and moderate damage to the product.

**NOTE**
The Note icon alerts the reader to relevant facts and conditions.

**IMPORTANT**
The Important icon highlights important information.

# 2. Safety

Before using this product, please read this manual and other relevant manuals carefully. Pay full attention to safety instructions!

In no event will Beijer Electronics be responsible or liable for damages resulting from the use of this product.

The images, examples and diagrams in this manual are included for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Beijer Electronics cannot take responsibility or liability for actual use based on the examples and diagrams.

## 2.1. Product Certifications

The product has the following product certifications.

CE FC

## 2.2. General Safety Requirements

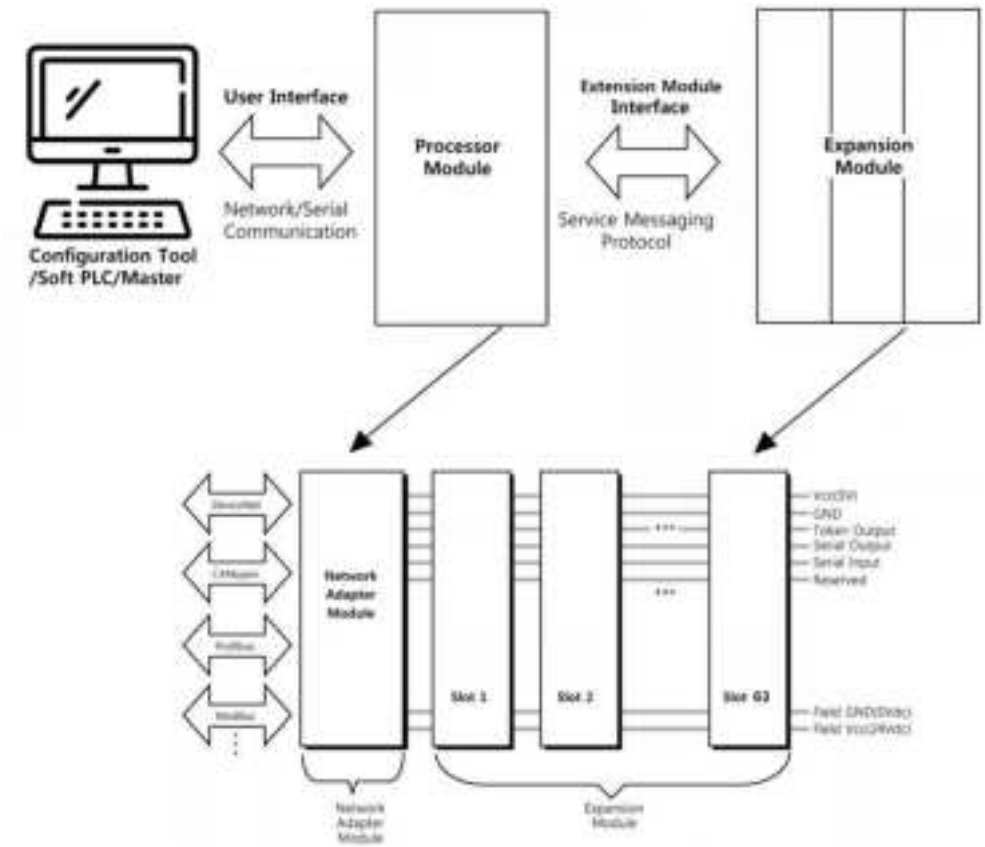
**WARNING**

- Do not assemble the products and wires with power connected to the system. Doing so cause an "arc flash", which can result in unexpected dangerous events (burns, fire, flying objects, blast pressure, sound blast, heat).
- Do not touch terminal blocks or IO modules when the system is running. Doing so may cause electric shock, short circuit or malfunction of the device.
- Never let external metallic objects touch the product when the system is running. Doing so may cause electric shock, short circuit or malfunction of the device.
- Do not place the product near inflammable material. Doing so may cause a fire.
- All wiring work should be performed by an electrical engineer.
- When handling the modules, ensure that all persons, the workplace and the packing are well grounded. Avoid touching conductive components, the modules contain electronic components that may be destroyed by electrostatic discharge.

**CAUTION**

- Never use the product in environments with temperature over 60°C. Avoid placing the product in direct sunlight.
- Never use the product in environments with over 90% humidity.
- Always use the product in environments with pollution degree 1 or 2.
- Use standard cables for wiring.

# 3. About the G-series System

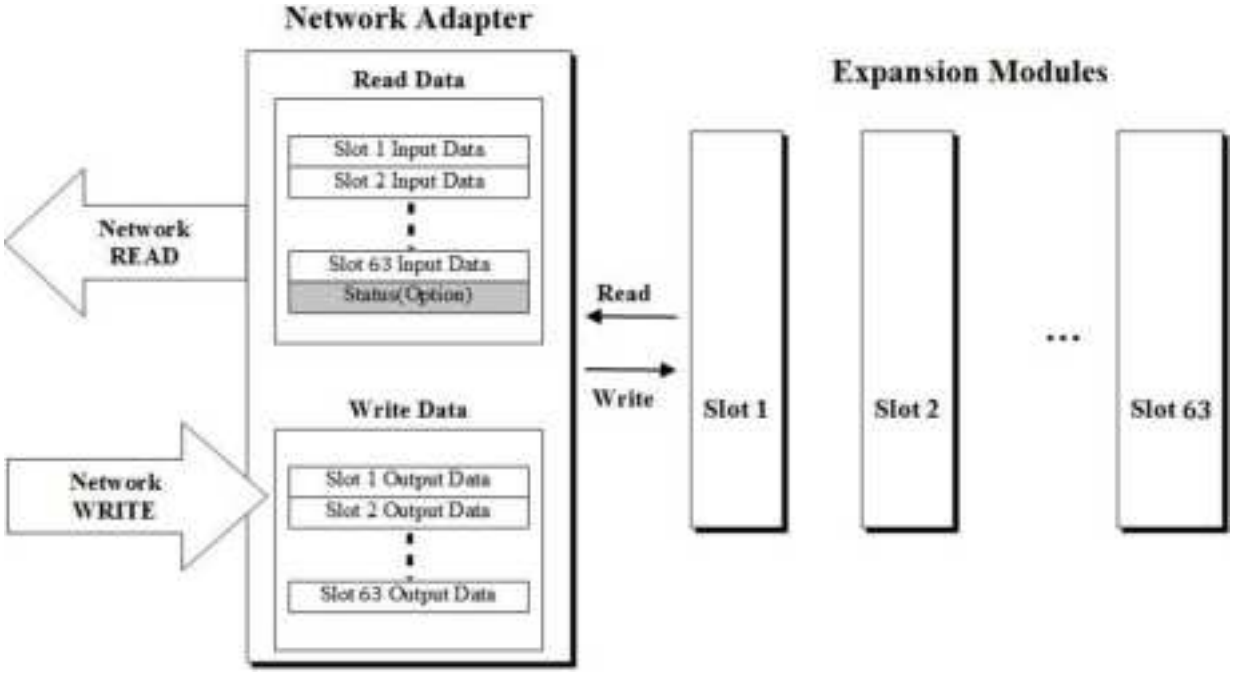



*System overview*

- **Network Adapter Module** - The network adapter module forms the link between the field bus and the field devices with the expansion modules. The connection to different field bus systems can be established by each of the corresponding network adapter module, e.g., for MODBUS TCP, Ethernet IP, EtherCAT, PROFINET, CC-Link IE Field, PROFIBUS, CANopen, DeviceNet, CC-Link, MODBUS/Serial etc.
- **Expansion Module** - Expansion module types: Digital IO, Analog IO, and Special modules.
- **Messaging** - The system uses two types of messaging: Service messaging and IO messaging.

## 3.1. IO Process Data Mapping

An expansion module has three types of data: IO data, configuration parameter, and memory register. The data exchange between the network adapter and the expansion modules is made via IO process image data by internal protocol.




*Data flow between network adapter (63 slots) and expansion modules*

The input and output image data depend on the slot position and the data type of the expansion slot. The ordering of input and output process image data is based on the expansion slot position. Calculations for this arrangement are included in the manuals for network adapter and programmable IO modules.

Valid parameter data depends on the modules in use. For example, analog modules have settings of either 0-20 mA or 4-20 mA, and temperature modules have settings such as PT100, PT200, and PT500. The documentation for each module provides a description of the parameter data.

# 4. Specifications

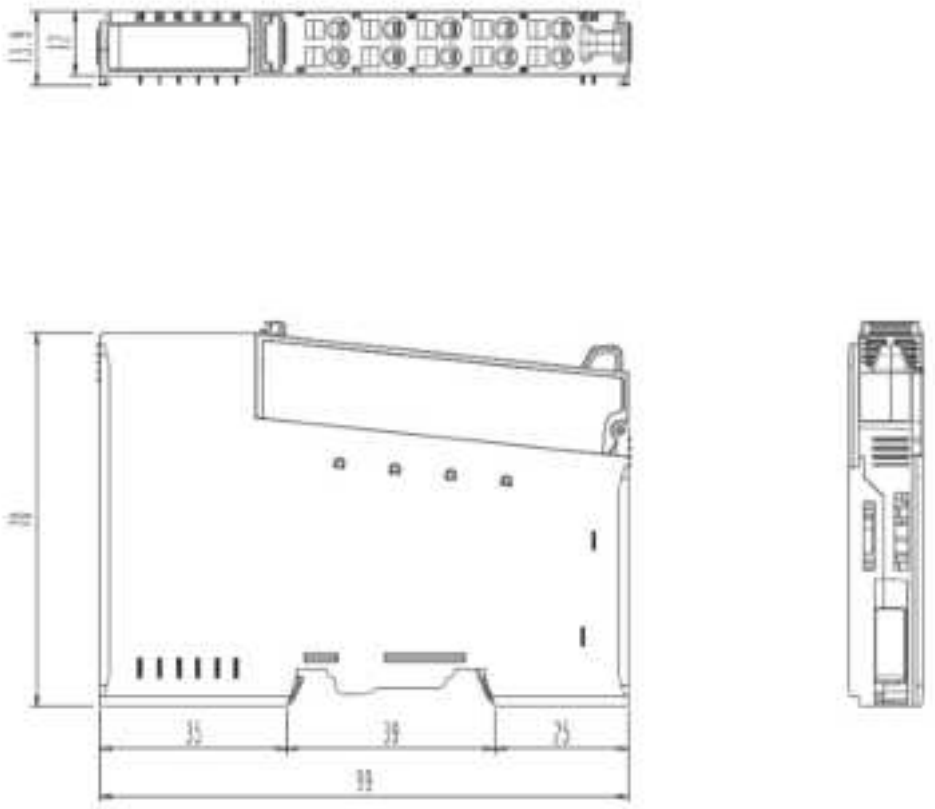
## 4.1. Environment Specifications

| | |
|---|---|
| **Operating temperature** | -20°C - 60°C |
| **UL temperature** | -20°C - 60°C |
| **Storage temperature** | -40°C - 85°C |
| **Relative humidity** | 5% - 90% non-condensing |
| **Mounting** | DIN rail |
| **Shock operating** | IEC 60068-2-27 (15G) |
| **Vibration resistance** | IEC 60068-2-6 (4 g) |
| **Industrial emissions** | EN 61000-6-4: 2019 |
| **Industrial immunity** | EN 61000-6-2: 2019 |
| **Installation position** | Vertical and horizontal |
| **Product certifications** | CE, FCC |

## 4.2. General Specifications

| | |
|---|---|
| **Power dissipation** | Max. 125 mA @ 5 VDC |
| **Isolation** | I/O to Logic: Photocoupler isolation<br>Field power: Non-isolation |
| **Field power** | Supply voltage: 24 VDC nominal<br>Voltage range: 18 - 26.4 VDC<br>Power dissipation: 0 mA @ 24 VDC |
| **Wiring** | I/O cable max. 2.0mm$^2$ (AWG 14) |
| **Weight** | 63 g |
| **Module size** | 12 mm x 99 mm x 70 mm |

### 4.2.1. Dimensions



*Module dimensions (mm)*

## 4.3. Input Specifications

**WARNING**
As a product used for high voltage and high current, RTB is not removable for safety purposes.

| | |
|---|---|
| **Number of channels** | 3 Ch voltage input, 3 Ch current input via CT |
| **Indicators** | Status, VL1, VL2, VL3, IL1, IL2, IL3 |
| **Maximum input voltage range** | $V_{LN}$= 288 VAC<br>$V_{LL}$= 500 VAC |
| **Input resistance voltage path** | 1200 kΩ |
| **Measuring current** | 5 A (max.)<br>CT 1: 4000 (max.) |
| **Input resistance current path** | 30 mΩ |
| **Resolution** | 24 bits |
| **Input frequency range** | 45 - 65 Hz |
| **Measured values** | Angle, Voltage, Current, Power, Energy, Frequency, Power Factors |

| | |
|---|---|
| **Measuring error** | Voltage & current: 0.3 % @ 25 °C<br>Voltage & current: 0.5 % @ -20 - 40 °C<br>Voltage & current: 1 % @ -20 - 50 °C<br>Voltage & current: 1.5 % @ -40 - 60 °C<br>Frequency: ±0.1 Hz<br>Phase angle: ±0.6 ° |

**NOTE**

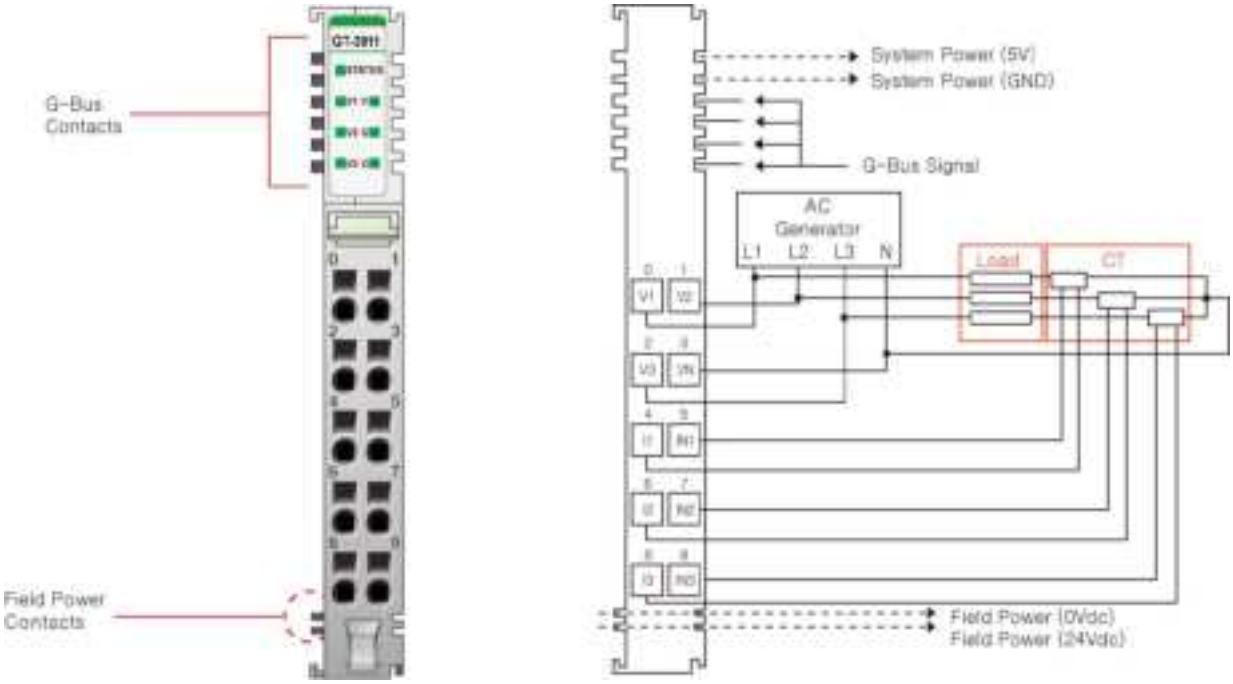
The measuring accuracy is reduced, if the extended temperature range is used (-40 - 60 °C).

If the input value is small, the error of calculation value can be large (please input 10% or more of the whole range).

## 4.4. Update Cycle of Process Data

| **Read data** | **Update time** |
|---|---|
| | **Max** |
| RMS voltage | 300 us |
| Max. RMS voltage | 300 us |
| Min. RMS voltage | 300 us |
| RMS current | 300 us |
| Max. RMS current | 300 us |
| Min. RMS current | 300 us |
| Apparent power | 250 us |
| Active power | 350 us |
| Max. active power | 350 us |
| Min active power | 350 us |
| Reactive power | 2000 us |
| Apparent energy | 100 ms |
| Total apparent energy | 100 ms |
| Active energy | 100 ms |
| Total active energy | 100 ms |
| Reactive energy | 100 ms |
| Total reactive energy | 100 ms |
| cos phi | 200 us |
| Supply network frequency | 200 us |
| Max. supply network frequency | 200 us |
| Min. supply network frequency | 200 us |
| Phase angle phi | 300 us |

# 5. Wiring Diagram




| Pin no. | Signal description |
|---|---|
| 0 | Voltage input 0 (L1) |
| 1 | Voltage input 1 (L2) |
| 2 | Voltage input 2 (L3) |
| 3 | Voltage input common (neutral) |
| 4 | Current input L1 |
| 5 | Current input N1 |
| 6 | Current input L2 |
| 7 | Current input N1 |
| 8 | Current input L3 |
| 9 | Current input N3 |

# 6. LED Indicator


| LED no. | LED function / description | LED color |
|---|---|---|
| 0 | Status | Green |
| 1 | Voltage input channel 1 | Green |
| 2 | Current input channel 1 | Green |
| 3 | Voltage input channel 2 | Green |
| 4 | Current input channel 2 | Green |
| 5 | Voltage input channel 3 | Green |
| 6 | Current input channel 3 | Green |

## 6.1. LED Channel Status

| Status | LED | Indicates |
|---|---|---|
| Over voltage | Voltage input LED: Off | Error occurred |
| | Voltage input LED: Green | Normal operation |
| Under voltage | Voltage input LED: Off | Error occurred |
| | Voltage input LED: Green | Normal operation |
| Over current | Current input LED: Off | Error occurred |
| | Current input LED: Green | Normal operation |
| No signal | Voltage input LED: Off<br>Current input LED: Off | Error occurred |
| | Voltage input LED: Green<br>Current input LED: Green | Normal operation |
| G-Bus status | Status LED: Off | Disconnection |
| | Status LED: Green | Connection |

* Please refer to Input Image Data.(Error Byte)

# 7. Mapping Data Into the Image Table

| Byte | Output data | Input data |
|---|---|---|
| 0 | Control byte 0 | Status byte 0 |
| 1 | Control byte 1 | Status byte 1 |
| 2 | Control byte 2 | Status byte 2 |
| 3 | Control byte 3 | Status byte 3 |
| 4 | Not used | Error byte 0 |
| 5 | | Error byte 1 |
| 6 | | Error byte 2 |
| 7 | | Reserved |
| 8 | | Process value 1 |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | Process value 2 |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | Process value 3 |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | Process value 4 |
| 21 | | |
| 22 | | |
| 23 | | |

# 7.1. Input Image Value

## Status bytes

| Status byte 0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **RES** | **Measure select** | | | **CON_ID** | | | |
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved | | | | | | |
| **RES** | Resetting all min / max / energy values | | | | | | |
| **CON_ID** | CON_ID | | | | | | |
| **Status byte 1** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved** | **Measure select** | | | **CON_ID** | | | |
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved | | | | | | |
| **CON_ID** | CON_ID | | | | | | |
| **Status byte 2** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved** | **Measure Select** | | | **CON_ID** | | | |
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved | | | | | | |
| **CON_ID** | CON_ID | | | | | | |

| Status byte 3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved** | **Measure select** | | | **CON_ID** | | | |
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved | | | | | | |
| **CON_ID** | CON_ID | | | | | | |

## Error bytes

| Error byte 0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **ERR_VL2** | **VL2_Error code** | | | **ERR_VL1** | **VL1_Error code** | | |
| **ERR_VL1** | Phase 1 voltage input ERROR<br>0 = OK<br>1 = Error occurred | | | | | | |
| **ERR_VL2** | Phase 2 voltage input ERROR<br>0 = OK<br>1 = Error occurred | | | | | | |
| **Error byte 1** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **ERR_IL1** | **IL1_Error code** | | | **ERR_VL3** | **VL3_Error code** | | |
| **ERR_VL3** | Phase 3 voltage input ERROR<br>0 = OK<br>1 = Error occurred | | | | | | |
| **ERR_IL1** | Phase 1 current input ERROR<br>0 = OK<br>1 = Error occurred | | | | | | |
| **Error byte 2** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **ERR_IL3** | **IL3_Error code** | | | **ERR_IL2** | **IL2_Error code** | | |
| **ERR_IL2** | Phase 2 current input ERROR<br>0 = OK<br>1 = Error occurred | | | | | | |

| | |
|---|---|
| **ERR_IL3** | Phase 3 current input ERROR<br>0 = OK<br>1 = Error occurred |
| **Error code** | 0 = No error<br>1 = Over input<br>2 = Under input<br>3 = No connect |

## Process value bytes

| **Process value 0-0 byte** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc0[7 : 0]** | | | | | | | |
| **Proc0[7 : 0]** | Process value 0 of status byte 0 | | | | | | |
| **Process value 0-1 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc0[15 : 8]** | | | | | | | |
| **Proc0[15 : 8]** | Process value 0 of status byte 0 | | | | | | |
| **Process value 0-2 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc0[23 : 16]** | | | | | | | |
| **Proc0[23 : 16]** | Process value 0 of status byte 0 | | | | | | |
| **Process value 0-3 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc0[31 : 24]** | | | | | | | |
| **Proc0[31 : 24]** | Process value 0 of status byte 0 | | | | | | |
| **Process value 1-0 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc1[7 : 0]** | | | | | | | |
| **Proc1[7 : 0]** | Process value 1 of status byte 1 | | | | | | |
| **Process value 1-1 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc1[15 : 8]** | | | | | | | |
| **Proc1[15 : 8]** | Process value 1 of status byte 1 | | | | | | |
| **Process value 1-2 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc1[23 : 16]** | | | | | | | |
| **Proc1[23 : 16]** | Process value 1 of status byte 1 | | | | | | |
| **Process value 1-3 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc1[31 : 24]** | | | | | | | |
| **Proc1[32 : 24]** | Process value 1 of status byte 1 | | | | | | |

| Process value 2-0 byte | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc2[7 : 0]** | | | | | | | |
| **Proc2[7 : 0]** | Process value 2 of status byte 2 | | | | | | |
| **Process value 2-1 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc2[15 : 8]** | | | | | | | |
| **Proc2[15 : 8]** | Process value 2 of status byte 2 | | | | | | |
| **Process value 2-2 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc2[23 : 16]** | | | | | | | |
| **Proc2[23 : 16]** | Process value 2 of status byte 2 | | | | | | |
| **Process value 2-3 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc2[31 : 24]** | | | | | | | |
| **Proc2[31 : 24]** | Process value 2 of status byte 2 | | | | | | |
| **Process value 3-0 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc3[7 : 0]** | | | | | | | |
| **Proc3[7 : 0]** | Process value 3 of status byte 3 | | | | | | |
| **Process value 3-1 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc3[15 : 8]** | | | | | | | |
| **Proc3[15 : 8]** | Process value 3 of status byte 3 | | | | | | |
| **Process value 3-2 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc3[23 : 16]** | | | | | | | |
| **Proc3[23 : 16]** | Process value 3 of status byte 3 | | | | | | |
| **Process value 3-3 byte** | | | | | | | |
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Proc3[31 : 24]** | | | | | | | |
| **Proc3[31 : 24]** | Process value 3 of status byte 3 | | | | | | |

## 7.2. Output Image Value

| Control byte 0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **RESET** | **Measure select** | | | **CON_ID** | | | |

| | |
|---|---|
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved |
| **RESET** | Resetting all of the min/max energy values |
| **CON_ID** | CON_ID |

| **Control byte 1** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved** | **Measure select** | | | **CON_ID** | | | |

| | |
|---|---|
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved |
| **CON_ID** | CON_ID |

| **Control byte 2** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved** | **Measure select** | | | **CON_ID** | | | |

| | |
|---|---|
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved |
| **CON_ID** | CON_ID |

| **Control byte X3** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved** | **Measure select** | | | **CON_ID** | | | |

| | |
|---|---|
| **Measure select** | 0 = Voltage<br>1 = Current<br>2 = Power<br>3 = PF<br>4 = Phase angle<br>5 = Frequency<br>6 = Energy<br>7 = Reserved |
| **CON_ID** | CON_ID |

| **CON_ID** | **Measured value** | **Data type** | **Scaling** |
|---|---|---|---|
| **Measure select = Voltage** | | | |
| **00** | RMS voltage L1-N | uint32 | 0.01 V |
| **01** | RMS voltage L2-N | uint32 | 0.01 V |
| **02** | RMS voltage L3-N | uint32 | 0.01 V |
| **03** | Max. RMS voltage L1-N | uint32 | 0.01 V |
| **04** | Max. RMS voltage L2-N | uint32 | 0.01 V |
| **05** | Max. RMS voltage L3-N | uint32 | 0.01 V |
| **06** | Min. RMS voltage L1-N | uint32 | 0.01 V |
| **07** | Min. RMS voltage L2-N | uint32 | 0.01 V |
| **08** | Min. RMS voltage L3-N | uint32 | 0.01 V |
| **09** | Reserved | | |
| **0A** | | | |
| **0B** | | | |
| **0C** | | | |
| **0D** | | | |
| **0E** | | | |
| **0F** | | | |
| **CON_ID** | **Measured value** | **Data type** | **Scaling** |
| **Measure select = Current** | | | |
| **00** | RMS Current L1-N | uint32 | 0.001 A |
| **01** | RMS Current L2-N | uint32 | 0.001 A |
| **02** | RMS Current L3-N | uint32 | 0.001 A |
| **03** | Max. RMS Current L1-N | uint32 | 0.001 A |
| **04** | Max. RMS Current L2-N | uint32 | 0.001 A |
| **05** | Max. RMS Current L3-N | uint32 | 0.001 A |
| **06** | Min. RMS Current L1-N | uint32 | 0.001 A |
| **07** | Min. RMS Current L2-N | uint32 | 0.001 A |
| **08** | Min. RMS Current L3-N | uint32 | 0.001 A |
| **09** | Reserved | | |
| **0A** | | | |

| | | | |
|---|---|---|---|
| **0B** | | | |
| **0C** | | | |
| **0D** | | | |
| **0E** | | | |
| **0F** | | | |
| **CON_ID** | **Measured value** | **Data type** | **Scaling** |
| **Measure select = Power** | | | |
| **00** | Apparent power L1 | uint32 | 0.01VA |
| **01** | Apparent power L2 | uint32 | 0.01VA |
| **02** | Apparent power L3 | uint32 | 0.01VA |
| **03** | Active power L1 | int32 | 0.01W |
| **04** | Active power L2 | int32 | 0.01W |
| **05** | Active power L3 | int32 | 0.01W |
| **06** | Max. active power L1 | int32 | 0.01W |
| **07** | Max. active power L2 | int32 | 0.01W |
| **08** | Max. active power L3 | int32 | 0.01W |
| **09** | Min. active power L1 | int32 | 0.01W |
| **0A** | Min. active power L2 | int32 | 0.01W |
| **0B** | Min. active power L3 | int32 | 0.01W |
| **0C** | Reactive power L1 | int32 | 0.01VAR |
| **0D** | Reactive power L2 | int32 | 0.01VAR |
| **0E** | Reactive power L3 | int32 | 0.01VAR |
| **CON_ID** | **Measured value** | **Data type** | **Scaling** |
| **Measure select = Energy** | | | |
| **00** | Apparent energy L1 | uint32 | Set the parameter |
| **01** | Apparent energy L2 | uint32 | |
| **02** | Apparent energy L3 | uint32 | |
| **03** | Total apparent energy | uint32 | |
| **04** | Active energy L1 | int32 | |
| **05** | Active energy L2 | int32 | |
| **06** | Active energy L3 | int32 | |
| **07** | Total active energy | int32 | |
| **08** | Reactive energy L1 | int32 | |
| **09** | Reactive energy L2 | int32 | |
| **0A** | Reactive energy L3 | int32 | |
| **0B** | Total reactive energy | int32 | |
| **0C** | Reserved | | |
| **0D** | | | |
| **0E** | | | |
| **0F** | | | |
| **CON_ID** | **Measured value** | **Data type** | **Scaling** |

| **Measure select = Power factor** | | | |
|---|---|---|---|
| **00** | Power factor L1 | int32 | 0.01 |
| **01** | Power factor L2 | int32 | 0.01 |
| **02** | Podwr factor L3 | int32 | 0.01 |
| **03** | Reserved | | |
| **04** | | | |
| **05** | | | |
| **06** | | | |
| **07** | | | |
| **08** | | | |
| **09** | | | |
| **0A** | | | |
| **0B** | | | |
| **0C** | | | |
| **0D** | | | |
| **0E** | | | |
| **0F** | | | |
| **CON_ID** | **Measured value** | **Data type** | **Scaling** |
| **Measure Select = Frequency** | | | |
| **00** | Supply network frequency L1 | uint32 | 0.01 Hz |
| **01** | Supply network frequency L2 | uint32 | 0.01 Hz |
| **02** | Supply network frequency L3 | uint32 | 0.01 Hz |
| **03** | Max. supply network frequency L1 | uint32 | 0.01 Hz |
| **04** | Max. supply network frequency L2 | uint32 | 0.01 Hz |
| **05** | Max. supply network frequency L3 | uint32 | 0.01 Hz |
| **06** | Min. supply network frequency L1 | uint32 | 0.01 Hz |
| **07** | Min. supply network frequency L2 | uint32 | 0.01 Hz |
| **08** | Min. supply network frequency L3 | uint32 | 0.01 Hz |
| **09** | Reserved | | |
| **0A** | | | |
| **0B** | | | |
| **0C** | | | |
| **0D** | | | |
| **0E** | | | |

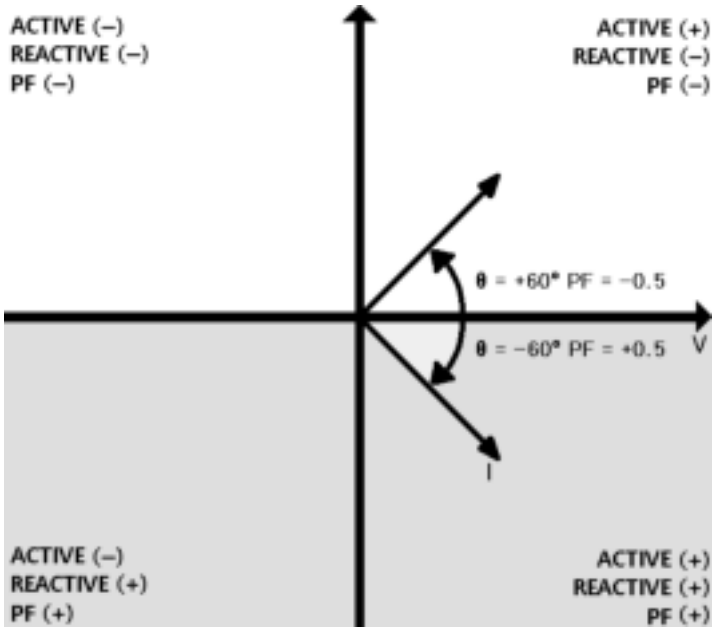
# 8. Parameter Data

Valid Parameter length: 5 Bytes

| | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
|---|---|---|---|---|---|---|---|---|
| **Byte#0** | CT sensor 1 : x | | | | | | | |
| | Value for the current transformer ratio divisor | | | | | | | |
| **Byte#1** | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
| | Frequency | Scaling for energy values | | | CT sensor 1 : x | | | |
| | 0 = 45 - 55 Hz | 0 = 1m Wh/VARh/VAh | | | Value for the current transformer ratio divisor | | | |
| | 1 = 55 - 65 Hz | 1 = 0.01 Wh/VARh/VAh | | | | | | |
| | | 2 = 0.1 Wh/VARh/VAh | | | | | | |
| | | 3 = 1 Wh/VARh/VAh | | | | | | |
| | | 4 = 0.01k Wh/VARh/VAh | | | | | | |
| | | 5 = 0.1k Wh/VARh/VAh | | | | | | |
| | | 6 = 1k Wh/VARh/VAh | | | | | | |
| | | 7 = Reserved | | | | | | |
| **Byte#2** | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
| | Overvoltage threshold Lx (value) resolution 0.2 V | | | | | | | |
| | Overvoltage threshold = 250 V + value * 0.2 V (max. 300 V) | | | | | | | |
| **Byte#3** | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
| | Undervoltage threshold Lx (value) resolution 0.5 V | | | | | | | |
| | Undervoltage threshold = 0 V + value * 0.5 V (max. 125 V) | | | | | | | |
| **Byte#4** | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
| | Overcurrent threshold Lx (value) Resolution 2 mA | | | | | | | |
| | Overcurent threshold = 0.8 A + value * 0.002 A (max. 1.3 A) | | | | | | | |

**NOTE**

Set frequency to get the correct power factor and energy.




**NOTE**

The reactive power measurement is negative when the load is capacitive, and when the load is inductive. The sign of the reactive power can therefore be used to reflect the sign of the power factor.

**Power factor = (Sign fundamental reactive power) * (abs (Active power)) / Apparent power)**

## Example of setting

Read data: Phase1 RMS Voltage / RMS Current / Apparent power / Active power.

Input value: 220 V, 1000 A, PF 0.5.

Parameter: CT 1: 1000, input frequency 55-65 Hz, overvoltage threshold 260 V, other is Default(0).

Overvoltage threshold = (260 V (user setting value) – 250 V (default setting value)) / 0.2 V. Resolution: 0.2 V.

Overcurrent threshold = 1000 A (user setting CT 1: 1000) = ((1 A (user setting value) - 0.8 (default setting value)) / 0.001) * 1000 (CT). Resolution: 0.001 A.

All of default value is 0.

1. Set the Parameter.

| Parameter | Value |
|---|---|
| CT sensor 1 : x (12 bit) | 001111101000 (bit) Set CT 1000 |
| Scaling for energy values (3 bit) | 000 (bit) Set 1m Wh/VARh/VAh |
| Frequency (1 bit) | 1 (bit) Set 55-65 Hz |
| Overvoltage threshold Lx (8 bit) | 00110010 (bit) Set 260 V |
| Undervoltage threshold Lx (8 bit) | 00000000 (bit) Set 0 V (default) |
| Overcurrent threshold Lx(8 bit) | 00000000 (bit) Set 0.8 A (default) |
| All of parameter | E8 83 32 00 00 (Byte hex) |

2. Set the Control byte (see chapter Output image value).

| | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
|---|---|---|---|---|---|---|---|---|
| **Control byte #0** | **RES** | **Measure select (Voltage)** | | | **CON_ID (RMS voltage L1-N)** | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Control byte #1** | **Reserved** | **Measure select (Current)** | | | **CON_ID (RMS current L1-N)** | | | |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **Control byte #2** | **Reserved** | **Measure select (Power)** | | | **CON_ID (Apparent power L1)** | | | |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **Control byte #3** | **Reserved** | **Measure select (Power)** | | | **CON_ID (Active power L1)** | | | |
| | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |

3. Check the Status byte. When Status byte and Control byte are the same, the Process value is updated.

| | Bit#7 | Bit#6 | Bit#5 | Bit#4 | Bit#3 | Bit#2 | Bit#1 | Bit#0 |
|---|---|---|---|---|---|---|---|---|
| **Status byte #0** | **RES** | **Measure select (Voltage)** | | | **CON_ID (RMS voltage L1-N)** | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Status byte #0** | **Reserved** | **Measure select (Current)** | | | **CON_ID (RMS current L1-N)** | | | |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **Status byte #0** | **Reserved** | **Measure select (Power)** | | | **CON_ID (Apparent power L1)** | | | |
| | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **Status byte #0** | **Reserved** | **Measure select (Power)** | | | **CON_ID (Active power L1)** | | | |
| | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |

4. Check the Process value.

| | |
|---|---|
| Process value#0 (RMS Voltage) | 000055F0(Dword hex) 22000(Dec) 220 V |
| Process value#1 (RMS Current) | 000F4240(Dword hex) 1000000(Dec) 1000 A |
| Process value#2 (Apparent power) | 014FB180(Dword hex) 22000000(Dec) 220 kVA |
| Process value#3 (Active power) | 00A7D8C0(Dword hex) 11000000(Dec) 110 kW |

# 9. Hardware Setup

**CAUTION**

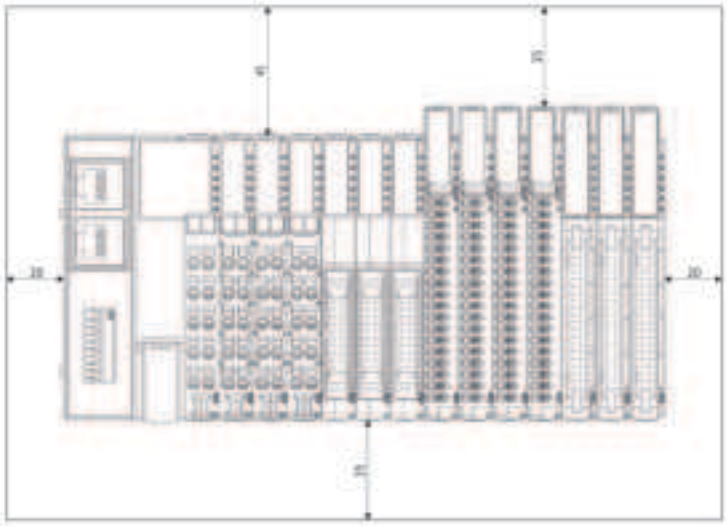
- Always read this chapter before installing the module!
- Hot surface! The surface of the housing can become hot during operation. If the device is used in high ambient temperatures, always let the device cool down before touching it.
- Working on energized devices can damage the equipment! Always turn off the power supply before working on the device.

## 9.1. Space Requirements

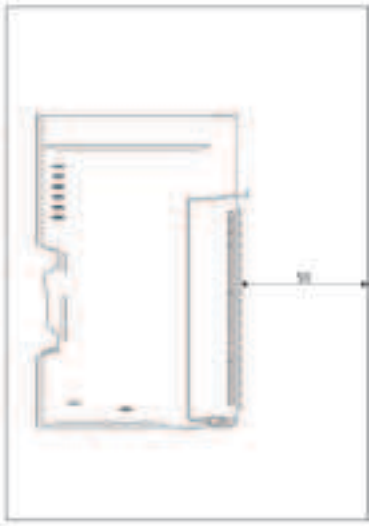
The following drawings show the space requirements when installing the G-series modules. The spacing creates space for ventilation, and prevents conducted electromagnetic interference from influencing the operation. Installation position is valid vertical and horizontal. The drawings are illustrative and may be out of proportion.

**CAUTION**

NOT following the space requirements may result in damaging the product.



*Vertical and horizontal space requirements*



*Required distance to door*

## 9.2. Mount Module to DIN Rail

The following chapters describe how to mount the module to the DIN rail.

> **CAUTION**
> The module must be fixed to the DIN rail with the locking levers.

### 9.2.1. Mount GL-9XXX or GT-XXXX Module

The following instructions apply to these module types:

- **GL-9XXX**
- **GT-1XXX**
- **GT-2XXX**
- **GT-3XXX**
- **GT-4XXX**
- **GT-5XXX**
- **GT-7XXX**

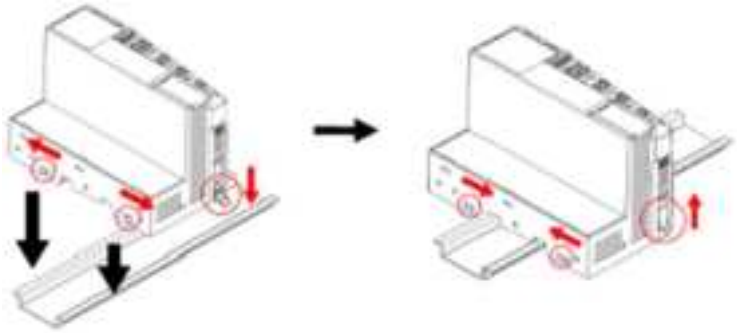
**GN-9XXX** modules have three locking levers, one at the bottom and two on the side. For mounting instructions, refer to Mount GN-9XXX Module.


*Mount to DIN rail*

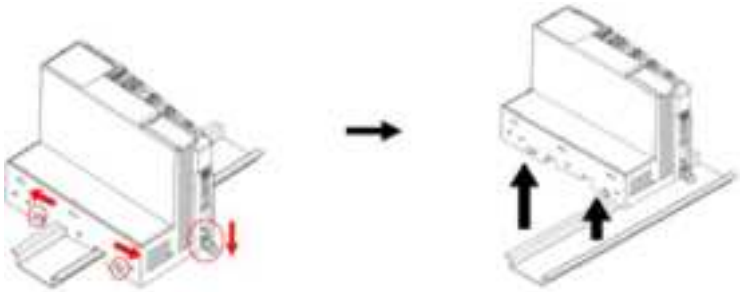

*Dismount from DIN rail*

### 9.2.2. Mount GN-9XXX Module

To mount or dismount a **network adapter** or **programmable IO** module with the product name **GN-9XXX**, for example GN-9251 or GN-9371, see the following instructions:



*Mount to DIN rail*

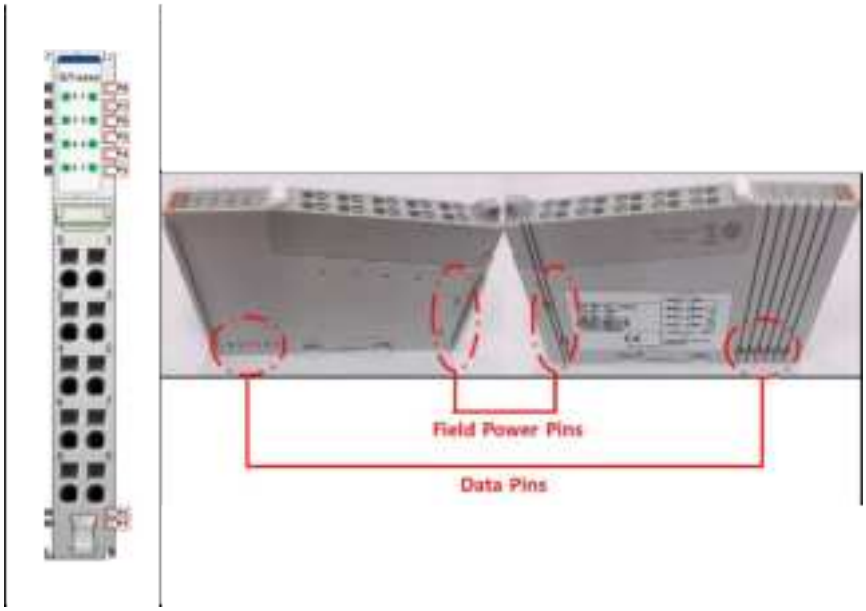


*Dismount from DIN rail*

## 9.3. Field Power and Data Pins

Communication between the G-series network adapter and the expansion module, as well as system / field power supply of the bus modules is carried out via the internal bus. It is comprised of **2 Field Power Pins** and **6 Data Pins**.

**WARNING**
Do not touch the data and field power pins! Touching can result in soiling and damage by ESD noise.




| Pin no. | Name | Description |
|---|---|---|
| P1 | System VCC | System supply voltage (5 VDC) |
| P2 | System GND | System ground |
| P3 | Token output | Token output port of processor module |
| P4 | Serial output | Transmitter output port of processor module |
| P5 | Serial input | Receiver input port of processor module |
| P6 | Reserved | Reserved for bypass token |
| P7 | Field GND | Field ground |
| P8 | Field VCC | Field supply voltage (24 VDC) |