

## User manual RTU-ECT & GL20



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## 1 GENERAL DATA

Date: 28.03.2023

Hardware: RTU-ECT & GL20 modules

Software:

Info: RTU-ECT & GL20 user guide

## 2 PURPOSE OF THIS DOCUMENT

The purpose of this document is to facilitate the start-up and programming of the **GL20-RTU-ECT** EtherCAT bus coupler & GL20 I/O modules.

These modules allow to extend an EtherCAT network with digital and analog I/O, and temperature devices. It consists of an EtherCAT bus coupler where **up to 16 optional** modules can be added.

If a PLC that is not from INOVANCE is used, it is necessary to install the descriptive XML files of these modules.

## 3 REVISION HISTORY

| Revision | Date          | Author | Description               |
|----------|---------------|--------|---------------------------|
| 1.0      | 18 January 23 | RsR    | First release             |
| 1.1      | 28 March 23   | RsR    | GL20-0008R wiring updated |

## 4 PRODUCT INFORMATION

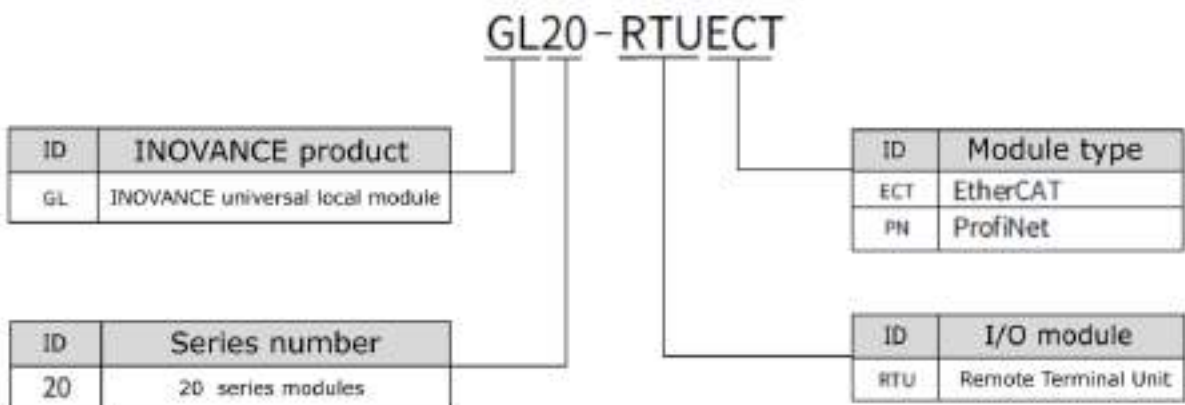
### 4.1 GL20-RTU-ECT

The GL20-RTU-ECT module is a EtherCAT bus IO coupler module with automatic scan function. Up to 16 expansion modules can be connected to the RTU-ECT module.

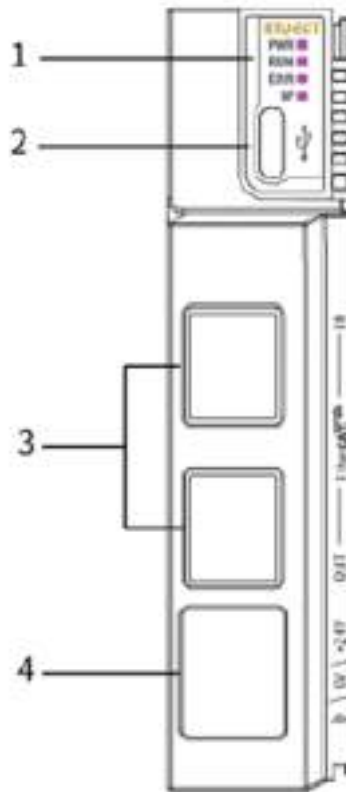
#### 4.1.1 APPEARANCE



#### 4.1.2 PRODUCT CODE



## 4.1.3 MODULE DESCRIPTION



| Interface |                  | Function Definition   |                               |       |  |
|-----------|------------------|---|-------------------------------|-------|--|
| 1         | I/O              | PWR   | Power Indicator               | Green | ON when the power is turned on                   |
|           |                  | RUN   | Operation indicator           | Green | ON when the module is operating normally         |
|           |                  | SF  | Fault indicator               | Red   | ON when module fails                             |
|           |                  | ERR   | State Machine Error Indicator | Red   | ON when state machine is not in OPERATIONAL mode |
| 2         | USB-C            | For firmware upgrade  |                               |       |  |
| 3         | EtherCAT         | IN: EtherCAT input port   |                               |       |  |
|           |                  | OUT: EtherCAT input port. Used to connect the next EtherCAT slave |                               |       |  |
| 4         | 24V power supply | Power module input terminal                                       |                               |       |  |

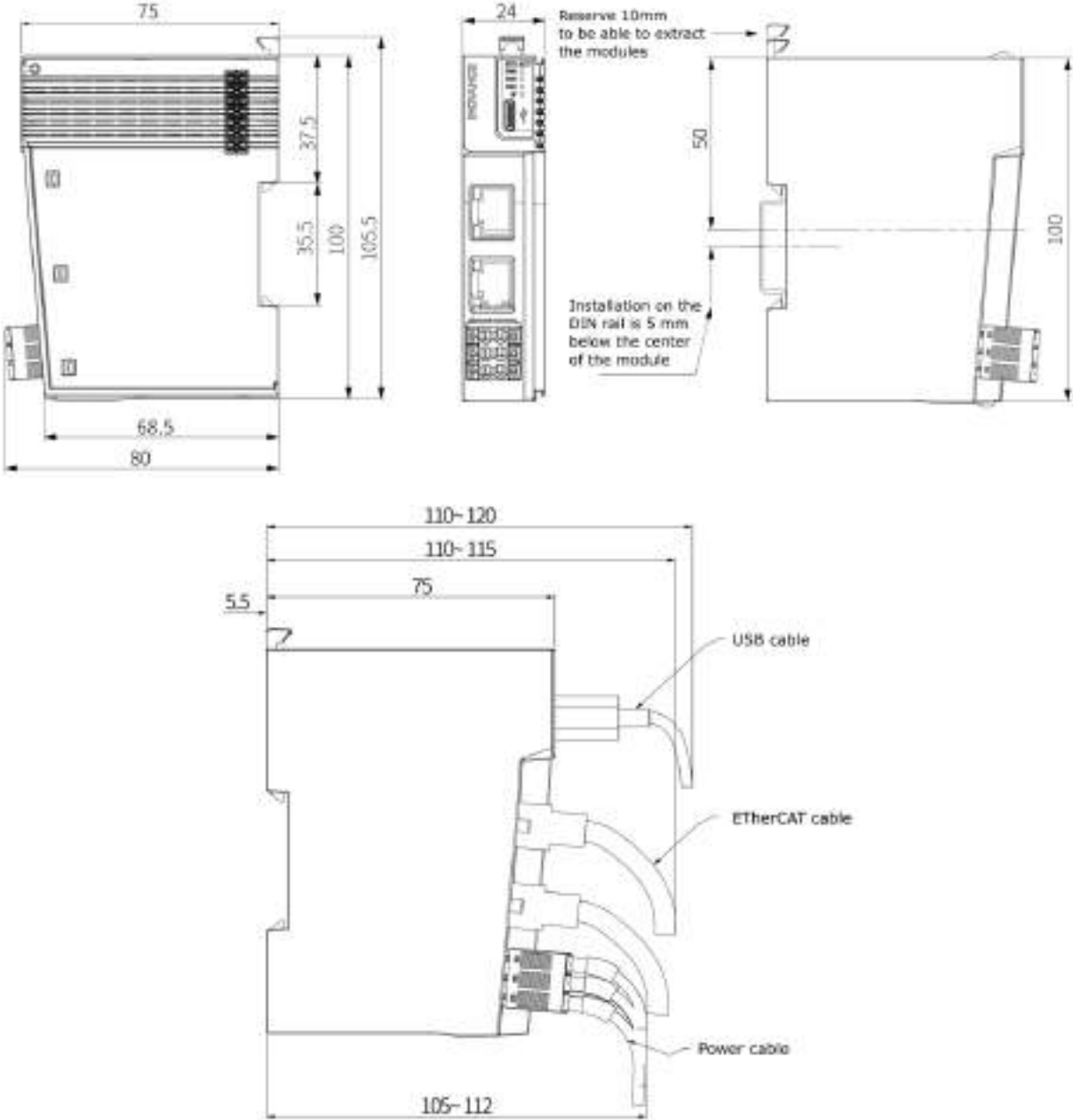
## 4.1.4 PRODUCT SPECIFICATIONS

|               | Specification |
|---------------|---------------|
| Material code | 01440286      |
| Model         | GL20-RTU-ECT  |
| IP rating     | IP20          |

|  |  |
|--|--|
| Certification                                | CE   |
| Rated voltage of terminal input power supply | 24 VDC (20.4 VDC to 28.8 VDC)  |
| Rated current of terminal input power supply | 0.6 A (typical value at 24 V)  |
| Rated voltage of bus output power supply     | 5 VDC (4.75 VDC to 5.25 VDC)   |
| Rated current of bus output power supply     | 2 A (typical value at 5 V)   |
| Power output derating                        | Derating by 75% when working at 55°C (output current does not exceed 1.5A), or derating by 10°C when outputting 2A                       |
| Power supply protection                      | Overcurrent protection, reverse connection proof, surge protection   |
| Ambient temperature                          | -20° C to +55° C   |
| Ambient humidity                             | < 95% RH (without condensation)  |
| Atmosphere                                   | Free from corrosive gas  |
| Storage temperature                          | -20° C to +60° C (< 90% RH, without condensation)  |
| Altitude                                     | Below 2000 m (80 kPa)  |
| Pollution degree                             | PD2  |
| Immunity                                     | Power cable 2 kV (IEC 61000-4-4)   |
| Overvoltage category                         | II   |
| EMC immunity level                           | Zone B, IEC61131-2   |
| Vibration resistance                         | IEC 60068-2-6  |
| Shock resistance                             | IEC 60068-2-27   |
| Protocol                                     | EtherCAT Industrial real-time bus protocol   |
| Maximum communication speed                  | Ethernet100Mbps  |
| Network port/cable                           | Standard Ethernet port and equipped with standard Ethernet cable (Category 5e network cable). The cable length does not exceed 100 meter |
| Station number range                         | 1-125, the internal address is automatically arranged by the network bus connection sequence   |
| IO Module expansion capability               | Expandable up to16 individual I/O modules  |



## 4.1.5 DIMENSIONS



## 4.2 GL20-1600 INTRODUCTION

**Name:** DI16 Module

**Module category:** Digital Input

**Module ID:** 0x10F41010

The GL20 modules of the 1600xxx series are 16 digital inputs



### 4.2.1 GENERAL SPECIFICATIONS

| General             | Description    |
|---------------------|----------------|
| Material code       | 01440291       |
| Model               | GL20-1600END   |
| IP rating           | IP20           |
| Certification       | CE             |
| Ambient temperature | -20°C to +55°C |

| Power supply                                 | Description                 |
|--|-----------------------------|
| Rated voltage of bus input power supply      | 5V DC (DC4.75V DC—5.25V DC) |
| Rated current of bus input power supply      | 100mA (typ. at 5V DC)       |
| Rated voltage of terminal input power supply | None                        |
| Rated current of terminal input power supply | None                        |
| Module hot swap function                     | Not supported               |

#### 4.2.1.1 SOFTWARE SPECIFICATIONS

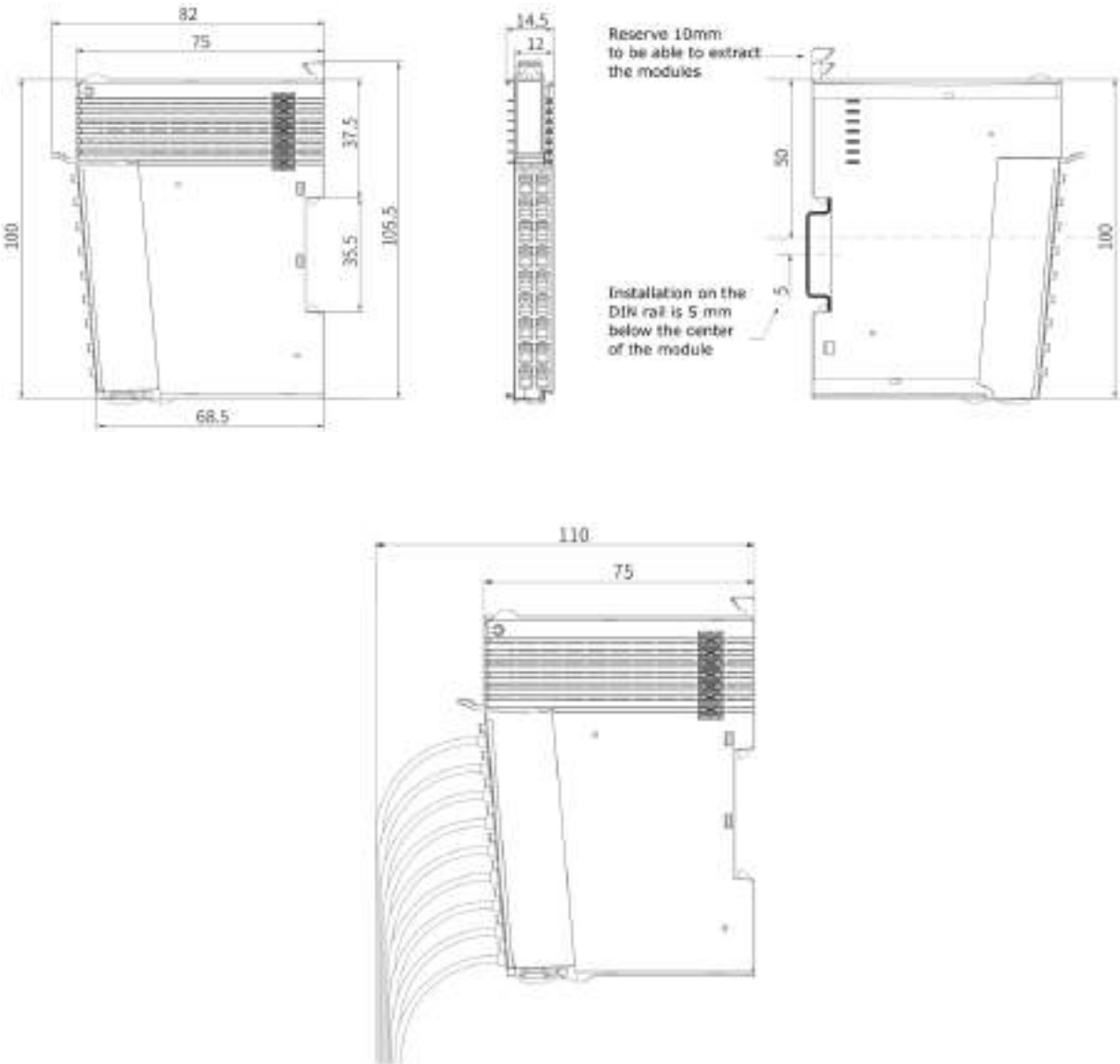
| Configuration                               | Description  |
|---|--|
| Software input filter time                  | No filter, 0.25ms, 0.5ms, 1ms (factory setting), 2ms, 4ms, 8ms, 16ms, 32ms.<br>2 groups of filter parameters can be set, one for every 8 channels. |
| Input port anomaly detection and indication | None   |
| Input Channel Logic Level Configuration     | Not support  |
| Independent channel enable configuration    | Not support  |

|  |  |
|--|--|
| Diagnostic report function configuration | Not support  |
| In stop mode                             | Output is not refreshed, input is refreshed in Safe-Operational                                  |
| IO mapping                               | Supports bit-wise access, byte-by-byte access, and word-by-word access. Three IO mapping methods |

#### 4.2.1.2 INPUT SPECIFICATIONS

| Input specification           | Description   |
|-------------------------------|---|
| Module type                   | Digital input   |
| Input type                    | Source/Sink (PNP/NPN)   |
| Input channel                 | 16  |
| Input voltage level           | 24V DC±10% (21.6V DC-26.4V DC)  |
| Input Current (Typical)       | 4mA (typ. at 24V)   |
| ON voltage                    | >15V DC   |
| OFF voltage                   | <5V DC  |
| Hardware response time ON/OFF | 100 μs /100 μs  |
| Software filter time          | Support   |
| Input resistance              | Reference value 5.3k-5.6k   |
| Isolation                     | Yes   |
| Input status display          | Indicate their signal status via green LED diodes (software control)  |
| Input derating                | Derating by 75% when working at 55°C (no more than 12 input points are ON at the same time), or derating by 10°C when all input points are ON |

## 4.2.2 DIMENSIONS

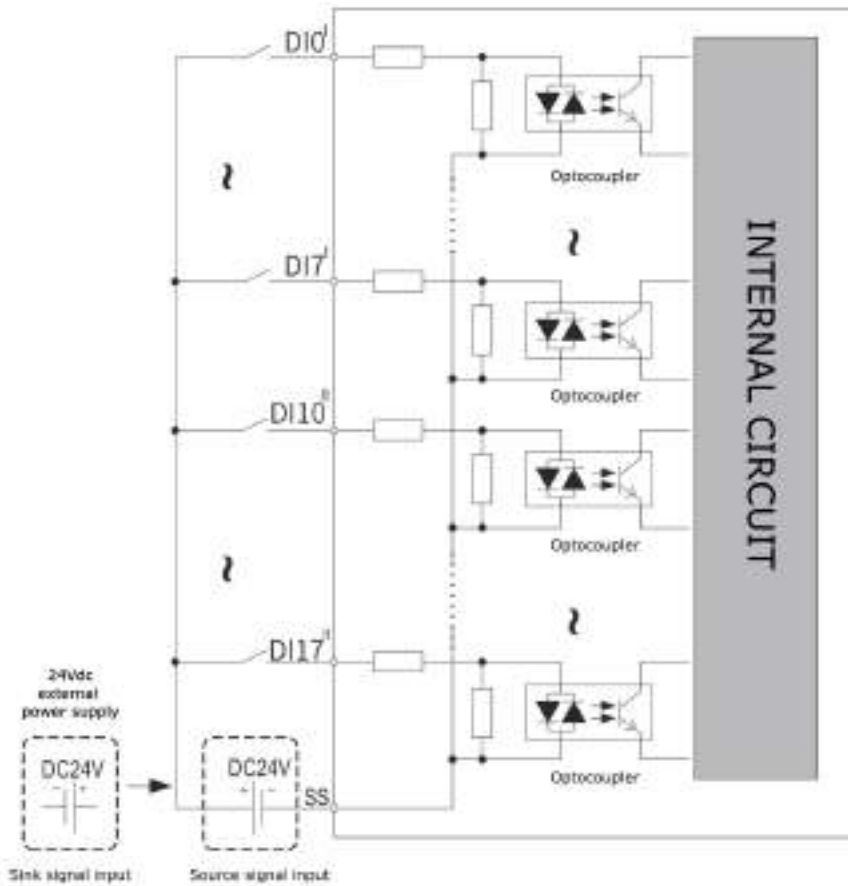


## 4.2.3 TERMINAL WIRING

### External wiring



| Signal | Terminal |    | Signal |
|--------|----------|----|--------|
| DI0    | A1       | B1 | DI10   |
| DI1    | A2       | B2 | DI11   |
| DI2    | A3       | B3 | DI12   |
| DI3    | A4       | B4 | DI13   |
| DI4    | A5       | B5 | DI14   |
| DI5    | A6       | B6 | DI15   |
| DI6    | A7       | B7 | DI16   |
| DI7    | A8       | B8 | DI17   |
| SS     | A9       | B9 | SS     |



## 4.3 GL20-0016 INTRODUCTION

**Name:** DO16 Module

**Module category:** Digital Output

**Module ID:** 0x10F41020

The modules GL20-0016xxx series are 16 digital outputs.



### 4.3.1 GENERAL SPECIFICATIONS

| General             | Description    |              |
|---------------------|----------------|--------------|
| Material code       | 01440292       | 01440293     |
| Model               | GL20-0016ETP   | GL20-0016ETN |
| IP rating           | IP20           |              |
| Certification       | CE             |              |
| Ambient temperature | -20°C to +55°C |              |

| Power supply                                 | Description                                 |  |
|--|---|--|
| Rated voltage of bus input power supply      | 5V DC (4.75V DC ~ 5.25V DC)                 |  |
| Rated current of bus input power supply      | 85mA (typical at 5V) for ETP, 100mA for ETN |  |
| Rated voltage of terminal input power supply | 24V DC (20.4V DC ~ 28.8V DC)                |  |
| Rated current of terminal input power supply | 100mA                                       |  |
| Module hot swap function                     | Not supported                               |  |

#### 4.3.1.1 SOFTWARE SPECIFICATIONS

| Configuration                                | Description   |
|--|---|
| Fail Shutdown Output Status Mode             | Clear, keep the current value, and output according to the preset value |
| Fault stop output preset value               | 0 or 1  |
| Output port anomaly detection and indication | None  |
| Output channel logic level configuration     | Not support   |

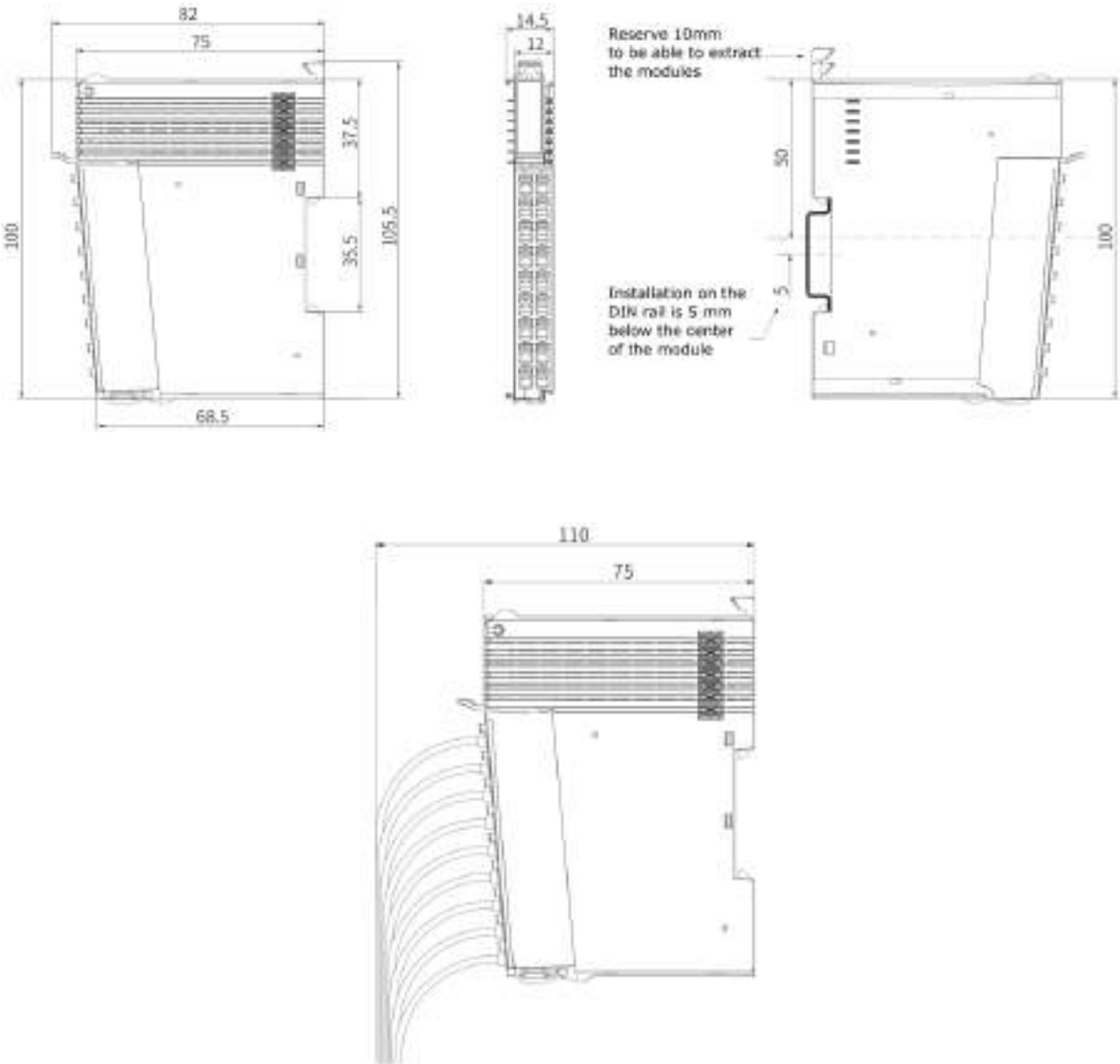


|  |  |
|--|--|
| Independent channel enable configuration   | Not support  |
| Diagnosis reporting function configuration | Not support  |
| Stop mode                                  | Output according to the fault shutdown state mode and preset value, no refresh |

#### 4.3.1.2 OUTPUT SPECIFICATIONS

| Output specification          | Description  |
|-------------------------------|--|
| Module type                   | Digital output, transistor high-side output  |
| Output type                   | Source type (PNP)  |
| Output channel                | 16   |
| Output voltage level          | 24V DC $\pm$ 10%(21.6V DC~26.4V DC)  |
| Output load (resistive load)  | 0.5A/point, 2A/module  |
| Output load (inductive load)  | 7.2W/point, 12W/module   |
| Output load (lamp load)       | 5W/point, 18W/module   |
| Hardware response time ON/OFF | 100us/100us  |
| Leakage current at OFF        | 10uA   |
| On-off level                  | Resistive load 100Hz, inductive load 0.5Hz, lamp load 10Hz   |
| Isolation                     | Yes  |
| Output action display         | When the output is in the driving state, the output indicator is on (software control)   |
| Output derating               | Derating 50% when working at 55°C (at the same time, the output current of ON is not more than 1A), or the output point<br>Derating 10°C when fully ON |
| Protective function           | Short circuit protection, over current protection  |

## 4.3.2 DIMENSIONS



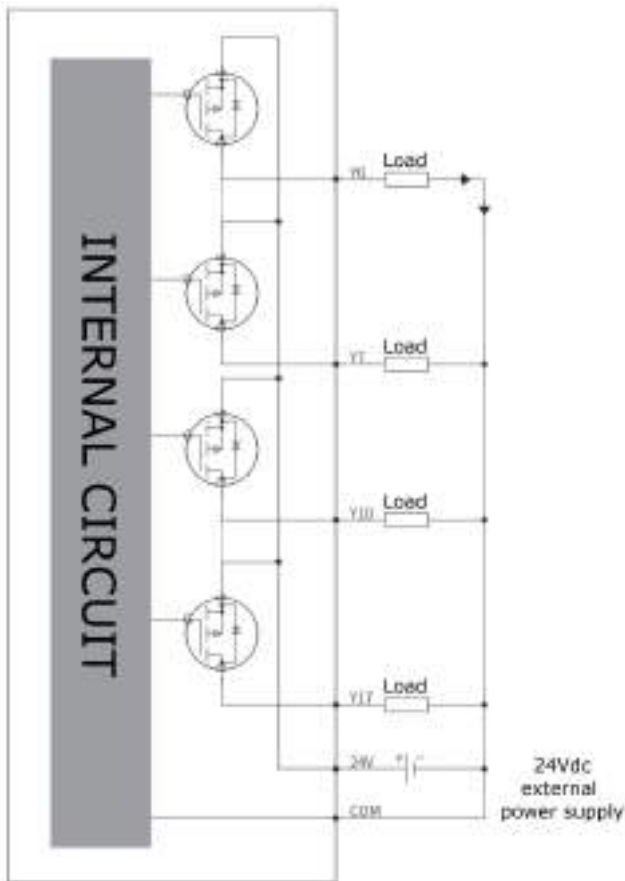


## 4.3.3 TERMINAL WIRING

### External wiring



| Signal | Terminal |    | Signal |
|--------|----------|----|--------|
| Y0     | A1       | B1 | Y10    |
| Y1     | A2       | B2 | Y11    |
| Y2     | A3       | B3 | Y12    |
| Y3     | A4       | B4 | Y13    |
| Y4     | A5       | B5 | Y14    |
| Y5     | A6       | B6 | Y15    |
| Y6     | A7       | B7 | Y16    |
| Y7     | A8       | B8 | Y17    |
| 24V    | A9       | B9 | COM    |



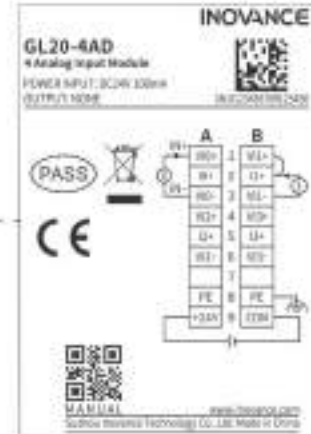
## 4.4 GL20-4AD INTRODUCTION

**Name:** 4AD Module

**Module category:** Analog Input

**Module ID:** 0x10F41030

GL20-4AD module is 4 channel analog input remote module. Use external 24VDC power supply, support voltage, current input mode, resolution up to 16 bits. Also input range level is optional.



### 4.4.1 GENERAL SPECIFICATIONS

| General             | Description    |
|---------------------|----------------|
| Material code       | 01440288       |
| Model               | GL20-4AD       |
| IP rating           | IP20           |
| Certification       | CE             |
| Ambient temperature | -20°C to +55°C |

| Power supply                                 | Description                |
|--|----------------------------|
| Rated voltage of bus input power supply      | 5V DC (4.75V DC—5.25V DC)  |
| Rated current of bus input power supply      | 120mA (typ. at 5V)         |
| Rated voltage of terminal input power supply | 24V DC (20.4V DC—28.8V DC) |
| Rated current of terminal input power supply | 50mA (typ. at 24V)         |
| Module hot swap function                     | Not supported              |

#### 4.4.1.1 SOFTWARE SPECIFICATIONS

| Configuration               | Description   |
|-----------------------------|---|
| Independent channel enable  | Support   |
| Diagnostic report function  | Support   |
| Diagnostic detection enable | Voltage measurement short-circuit, current measurement disconnection (the mode that the output range includes 0 is not supported) |
| Conversion mode             | ±10V, 0-10V, ±5V, 0-5V, 1-5V, ±20mA, 0-20mA, 4-20mA   |

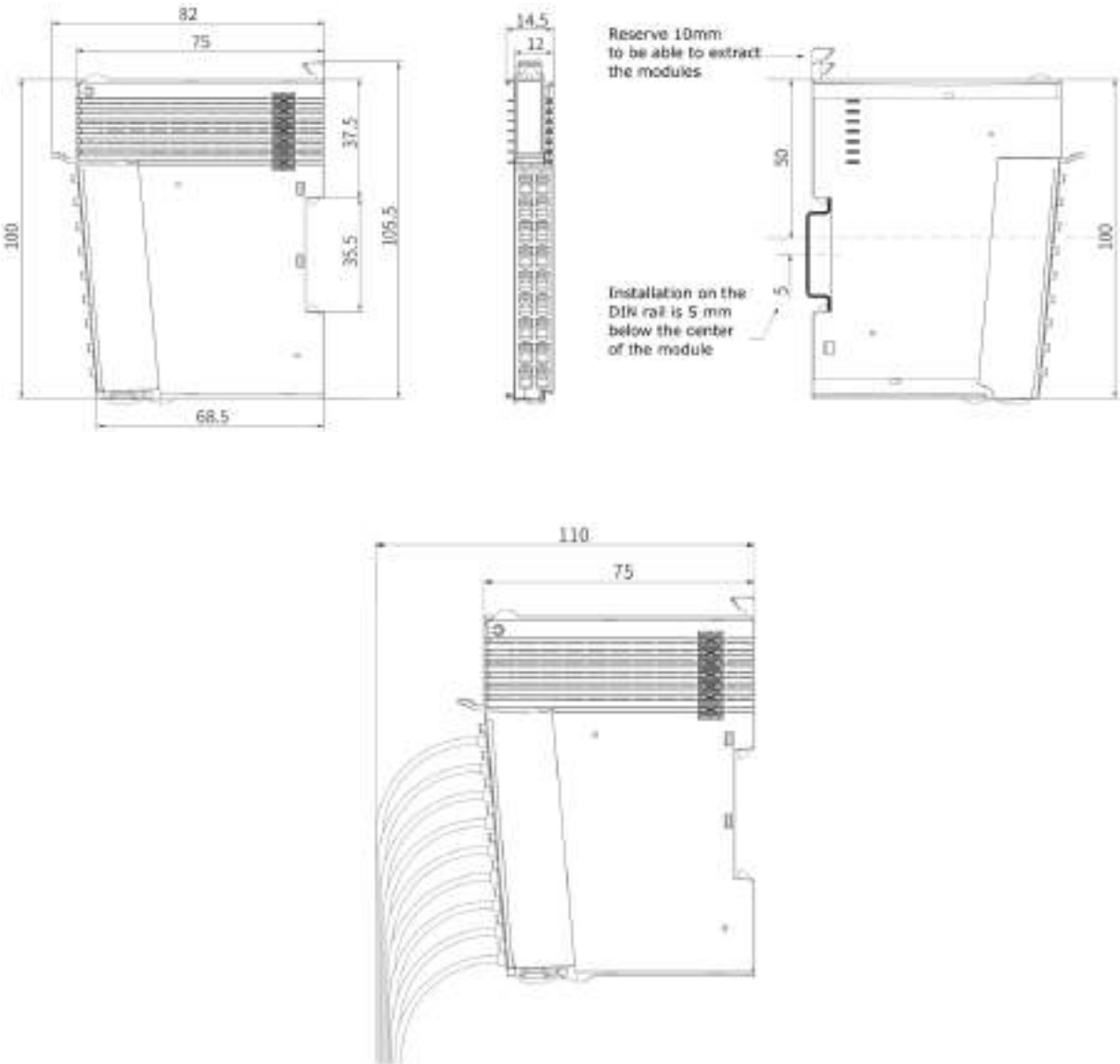


|                        |  |
|------------------------|--|
| Filter parameter       | The software filter time can be configured through the host computer, and the setting range is 0-65535. Bit is the sampling period |
| Out-of-limit detection | support  |
| Peak Hold              | support  |
| Convert digital range  | The default configuration remains the same as GL10 (-20000 to 20000), support $\pm 32000$  |
| Sampling time          | 4 channels 250 $\mu$ s   |
| Sample refresh         | Asynchronous refresh according to sampling time, not required to refresh synchronously according to bus cycle                      |
| Stop mode              | keep the current value, never refresh  |

#### 4.4.1.2 INPUT SPECIFICATIONS

| Input specification                             | Description  |
|---|--|
| Input type                                      | Analog input   |
| Input   | Voltage and current  |
| Input channel                                   | 4  |
| Resolution                                      | 16 bit   |
| Conversion time                                 | 60 $\mu$ s/channel   |
| Voltage input range                             | $\pm 10V$ , 0-10V, $\pm 5V$ , 0-5V, 1-5V   |
| Voltage input impedance                         | 1M $\Omega$  |
| Voltage input accuracy (25 $^{\circ}$ C)        | $\pm 0.1\%$ (full scale)   |
| Voltage Input Accuracy (Full Temperature Range) | $\pm 0.2\%$ (full scale)   |
| Voltage input limit                             | $\pm 15V$  |
| Voltage Input diagnostics                       | Does not support disconnection detection   |
| Current input range                             | $\pm 20mA$ , 0-20mA, 4-20mA  |
| Current sampling impedance                      | 250 $\Omega$   |
| Current input accuracy (25 $^{\circ}$ C)        | $\pm 0.1\%$ (full scale)   |
| Current Input Accuracy (Full Temperature Range) | $\pm 0.2\%$ (full scale)   |
| Current input limit                             | Instantaneous $\pm 30mA$ , Average $\pm 24mA$  |
| Current Input Diagnostics                       | Only when configured as 4-20mA, supports disconnection detection   |
| Isolation                                       | The interface channels are not isolated, the power supply is isolated from the interface, and the interface is isolated from the interface.<br>Bus isolation |
| Input action display                            | None   |
| Input derating                                  | None   |

## 4.4.2 DIMENSIONS



## 4.4.3 TERMINAL WIRING

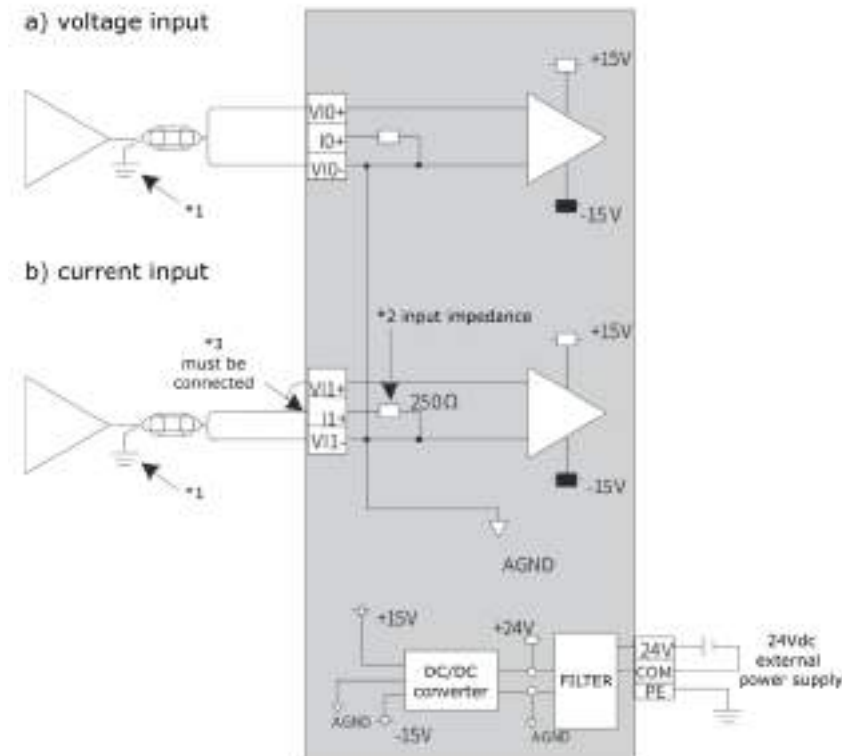
### Wiring Precautions

- When install the wiring, avoid bundling it with cables that carry strong interference signals, such as power lines (high voltage, high current).  
Since this can increase the effects of noise, surge, and induction, the runs should be separated and parallel runs should be avoided.
- Use the recommended cables and adapter plates for connection. It is recommended to use shielded cables for long lengths to improve immunity to interference.
- Make a single point ground connection for shielded cables and cable shields.

### External wiring



| Signal | Terminal | Terminal | Signal |
|--------|----------|----------|--------|
| VI0+   | A1       | B1       | VI1+   |
| I0+    | A2       | B2       | I1+    |
| VI0-   | A3       | B3       | VI1-   |
| VI2+   | A4       | B4       | VI3+   |
| I2+    | A5       | B5       | I3+    |
| VI2-   | A6       | B6       | VI3-   |
| -      | A7       | B7       | -      |
| PE     | A8       | B8       | PE     |
| 24V    | A9       | B9       | COM    |



\*1 Use two-core twisted-pair shielded wire for analog signal lines.

\*2 Indicates the input impedance of 4AD.

\*3 For current input, the (V+) and (I+) terminals must be connected.



## 4.5 GL20-4DA INTRODUCTION

**Name:** 4DA Module

**Module category:** Analog Out

**Module ID:** 0x10F41040

GL20-4DA module is 4Channel analog output remote module. Use external 24VDC power supply, support voltage and current output mode, resolution can reach 16 bits, and output range level can be selected at the same time.



### 4.5.1 GENERAL SPECIFICATIONS

| General             | Description    |
|---------------------|----------------|
| Material code       | 1440287        |
| Model               | GL20-4DA       |
| IP rating           | IP20           |
| Certification       | CE             |
| Ambient temperature | -20°C to +55°C |

| Power supply                                 | Description                  |
|--|------------------------------|
| Rated voltage of bus input power supply      | 5V DC (4.75V DC—5.25V DC)    |
| Rated current of bus input power supply      | 120mA (typical value at 5V)  |
| Rated voltage of terminal input power supply | 24V DC (20.4V DC—28.8V DC)   |
| Rated current of terminal input power supply | 100mA (typical value at 24V) |
| Module hot swap function                     | Not supported                |

#### 4.5.1.1 SOFTWARE SPECIFICATIONS

| Configuration                                    | Description   |
|--|---|
| Independent channel enable configuration         | Support   |
| Diagnosis reporting function configuration       | Support   |
| Diagnostic detection enable configuration        | Short circuit for voltage measurement, disconnection for current measurement, and the mode whose output range includes 0 is not supported |
| Conversion Mode Configuration                    | ±10V, 0-10V, ±5V, 0-5V, 1-5V, 0-20mA, 4-20mA  |
| Output state configuration after shutdown        | Clear, maintain current output, output preset value   |
| Output preset value configuration after shutdown | Support   |

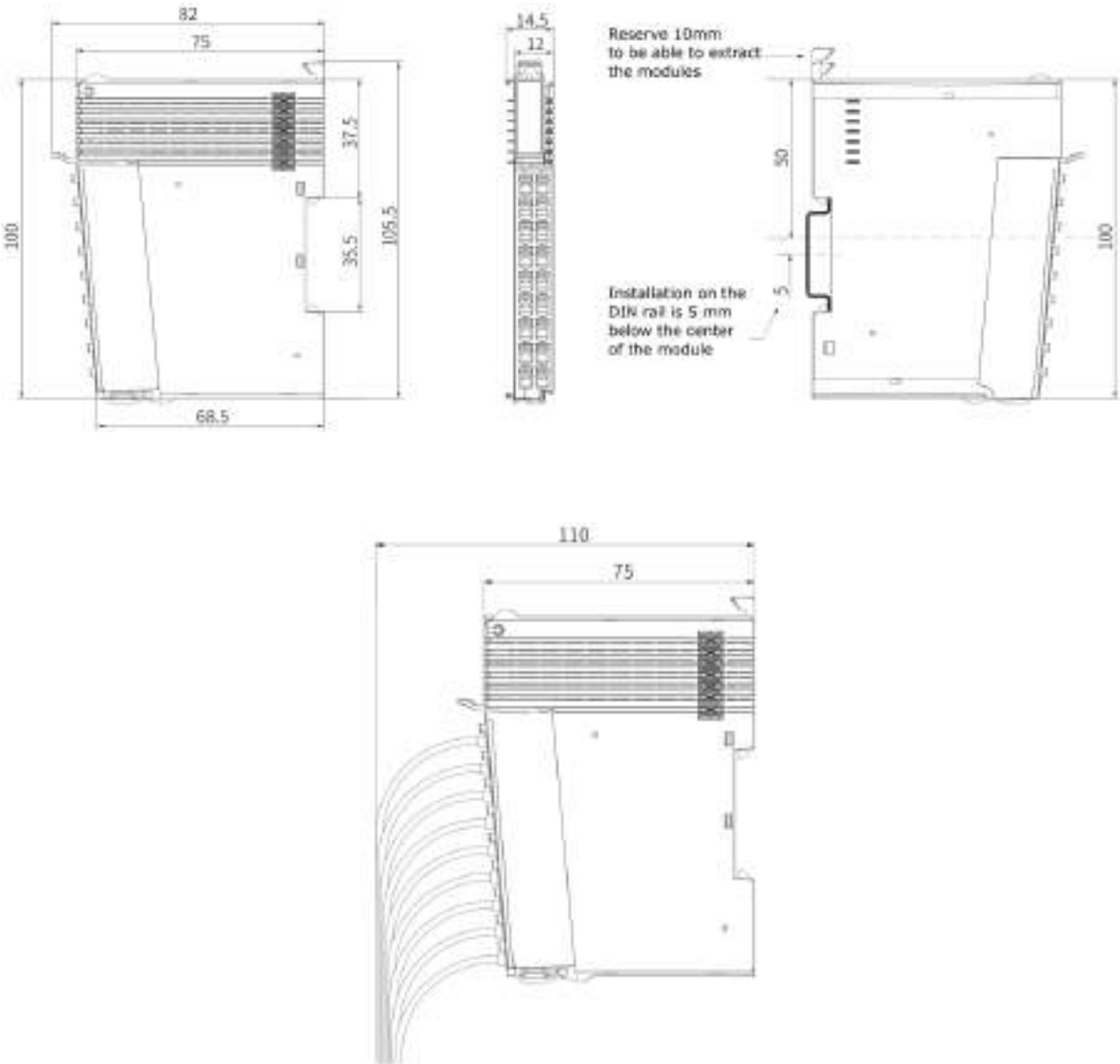


|                                     |  |
|-------------------------------------|--|
| Convert digital range configuration | The default configuration remains consistent with GL10 (-20000 to 20000), support $\pm 32000$                  |
| Sampling time                       | 4 channels 250 $\mu$ s   |
| Sample refresh                      | Refresh asynchronously according to sampling time, does not require synchronous refresh according to bus cycle |
| Stop mode                           | Output according to the fault shutdown state mode and preset value, no refresh                                 |

#### 4.5.1.2 OUTPUT SPECIFICATIONS

| Input specification                              | Description  |
|--|--|
| Output type                                      | Analog output  |
| Output method                                    | Voltage and current  |
| Output channel                                   | 4  |
| Resolution                                       | 16 bits  |
| Conversion time                                  | 60 $\mu$ s/channel   |
| Voltage output range                             | $\pm 10V$ , 0-10V, $\pm 5V$ , 0-5V, 1-5V   |
| Voltage output load                              | 1k $\Omega$  |
| Voltage output accuracy (25°C)                   | $\pm 0.1\%$ (full scale)   |
| Voltage output accuracy (full temperature range) | $\pm 0.5\%$ (full scale)   |
| Voltage output diagnostics                       | Support short circuit detection, support over temperature protection   |
| Current output range                             | 0-20mA, 4-20mA   |
| Current output load                              | 0-600 $\Omega$   |
| Current output accuracy (25°C)                   | $\pm 0.1\%$ (full scale)   |
| Current output accuracy (full temperature range) | $\pm 0.5\%$ (full scale)   |
| Current output diagnostics                       | Support open circuit detection, support over temperature protection  |
| Whether to isolate                               | The interface channels are not isolated, the power supply is isolated from the interface, and the interface is isolated from the bus isolation |
| Output action display                            | None   |
| Output derating                                  | None   |

## 4.5.2 DIMENSIONS





## 4.5.3 TERMINAL WIRING

### Wiring Precautions

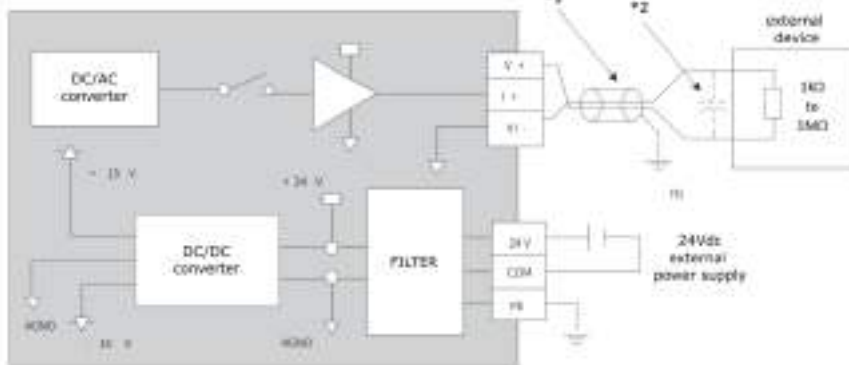
- When install the wiring, avoid bundling it with cables that carry strong interference signals, such as power lines (high voltage, high current).  
Since this can increase the effects of noise, surge, and induction, the runs should be separated and parallel runs should be avoided.
- Use the recommended cables and adapter plates for connection. It is recommended to use shielded cables for long lengths to improve immunity to interference.
- Make a single point ground connection for shielded cables and cable shields.

### External wiring

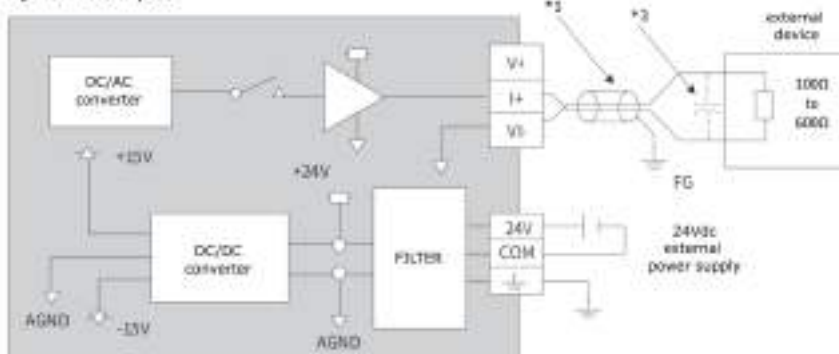


| Signal | Terminal | Terminal | Signal |
|--------|----------|----------|--------|
| V0+    | A1       | B1       | V1+    |
| I0+    | A2       | B2       | I1+    |
| V10-   | A3       | B3       | V11-   |
| V2+    | A4       | B4       | V3+    |
| I2+    | A5       | B5       | I3+    |
| V12-   | A6       | B6       | V13-   |
| -      | A7       | B7       | -      |
| PE     | A8       | B8       | PE     |
| 24V    | A9       | B9       | COM    |

a) voltage input



b) current input



\*1 Use two-core twisted-pair shielded wire for analog signal lines.

\*2 \*3 If there is noise or disturbance in the external wiring, connect a 0.1 to 0.47 mF 25 V capacitor between V+/I+ for voltage input or I+/VI- for current input.

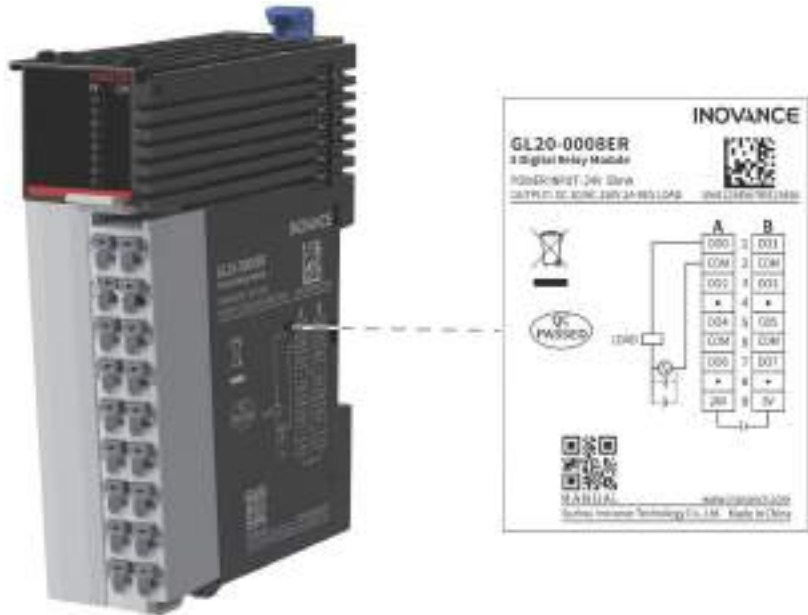
## 4.6 GL20-0008ER INTRODUCTION

**Name:** DO08 Module

**Module category:** Relay

**Module ID:** 0x10F41023

GL20-0008R module is 8 point relay output DO module.



### 4.6.1 GENERAL SPECIFICATIONS

| Power supply                                 | Description                  |
|--|------------------------------|
| Rated voltage of bus input power supply      | 5V DC (4.75V DC ~ 5.25V DC)  |
| Rated current of bus input power supply      | 85mA (typical at 5V)         |
| Rated voltage of terminal input power supply | 24V DC (21.6V DC ~ 26.4V DC) |
| Rated current of terminal input power supply | 50mA (typical value at 24V)  |
| Module hot swap function                     | Not supported                |

#### 4.6.1.1 SOFTWARE SPECIFICATIONS

| Configuration                                | Description  |
|--|--|
| Fail Shutdown Output Status Mode             | Clear, keep the current value, and output according to the preset value    |
| Fault stop output preset value               | 0 or 1   |
| Output port anomaly detection and indication | None   |
| Output Channel logic level configuration     | Not support  |
| Independent channel enable configuration     | Not support  |
| Diagnosis reporting function configuration   | Not support  |
| Stop mode                                    | Output according to the fault stop state mode and preset value, no refresh |

#### 4.6.1.2 OUTPUT SPECIFICATIONS

| Input specification  | Description                  |
|----------------------|------------------------------|
| Output type          | Digital output, relay output |
| Output method        | Dry contact                  |
| Output channel       | 8                            |
| Output voltage level | 250V AC/30V DC               |



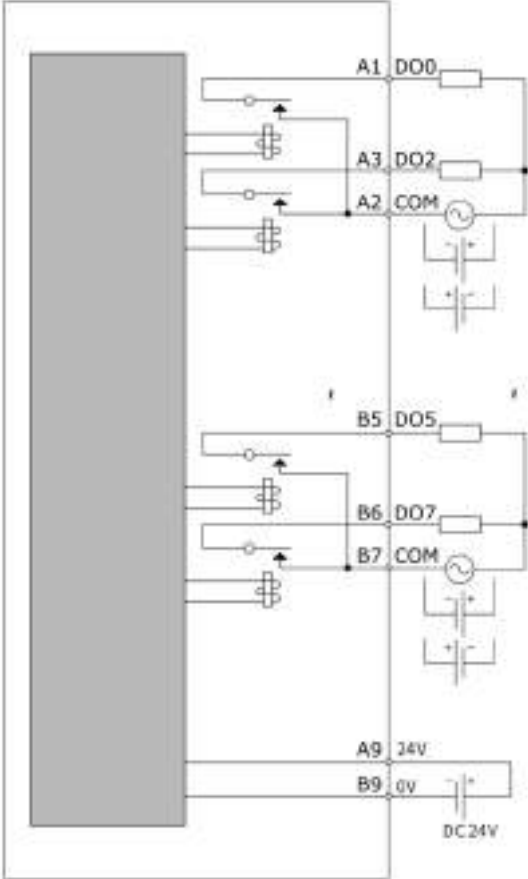
|                               |   |
|-------------------------------|---|
| Output load (resistive load)  | 2A/point, 8A/module   |
| Output load (inductive load)  | 1A/point, 4A/module   |
| Output load (lamp load)       | 30W/point, 120W/module  |
| Hardware response time ON/OFF | About 15ms  |
| Minimum load                  | 5V DC, 5mA  |
| On-off level                  | No more than 6 times per minute (exceeding will cause the switch to fail or even be damaged)  |
| Whether to isolate            | Yes   |
| Output action display         | When the output is in the driving state, the output indicator is on (software control)  |
| Output derating               | Derating 50% when working at 55°C (at the same time, the output current of ON does not exceed 4A), or derate 10°C when all output points are ON |
| Protective function           | None  |

## 4.6.2 TERMINAL WIRING

### External wiring



| Signal | Terminal |    | Signal |
|--------|----------|----|--------|
| DO0    | A1       | B1 | DO1    |
| COM    | A2       | B2 | COM    |
| DO2    | A3       | B3 | DO3    |
| .      | A4       | B4 | .      |
| DO4    | A5       | B5 | DO5    |
| COM    | A6       | B6 | COM    |
| DO6    | A7       | B7 | DO7    |
| .      | A8       | B8 | .      |
| 24V    | A9       | B9 | COM    |



## 4.7 GL20-4PT INTRODUCTION

**Name:** 4PT Module

**Module category:** Temperature measurement

**Module ID:** 0x 10F41050

The main function of the GL20-4PT module is to realize the temperature acquisition of the thermal resistance. The module is configured with 4 independent channels, which can be used for simultaneous acquisition. The configuration of each channel is independent and does not interfere with each other.



### 4.7.1 GENERAL SPECIFICATIONS

| Power supply                                 | Description                  |
|--|------------------------------|
| Rated voltage of bus input power supply      | 5V DC (4.75V DC ~ 5.25V DC)  |
| Rated current of bus input power supply      | 85mA (typical at 5V)         |
| Rated voltage of terminal input power supply | 24V DC (20.4V DC ~ 28.8V DC) |
| Rated current of terminal input power supply | 100mA (typical at 24V)       |
| Module hot swap function                     | Not support                  |
| 24V input anti-reverse                       | Support                      |

#### 4.7.1.1 SOFTWARE SPECIFICATIONS

| Configuration                              | Description  |
|--|--|
| Diagnosis reporting function configuration | Support  |
| Diagnostic detection enable configuration  | Support overrun and disconnection detection  |
| Overrun detection enable configuration     | Support  |
| Independent Channel Configuration          | Support  |
| Temperature Offset Enable Configuration    | Support  |
| Temperature setting range                  | -204.8 to +204.7 temperature units   |
| The sampling period                        | 250ms, 500ms, 1000ms/4 channels  |
| Display mode                               | Celsius (°C), Fahrenheit (°F)  |
| Sensitivity                                | 0.1°C, 0.1°F   |
| Sample refresh                             | Refresh asynchronously according to sampling time, does not require synchronous refresh according to bus cycle |
| Stop mode                                  | Continue to refresh according to the sampling time   |
| Disconnected or overrun                    | Output according to the maximum value, no longer refresh   |
| System diagnosis                           | Abnormal system power  |



|                           |   |
|---------------------------|---|
| Channel diagnostics       | Over-upper limit alarm, over-lower limit alarm, disconnection alarm       |
| Software diagnostics      | Not supported yet   |
| Configuration diagnostics | Configuration error identification, channel parameter configuration error |

#### 4.7.1.2 INPUT SPECIFICATIONS

| Input specification                       | Description   |
|---|---|
| Input channel                             | 4 way   |
| Digital resolution                        | 24 bit  |
| Display sensitivity                       | 0.1°C, 0.1°F  |
| Input terminal                            | 4 RTD inputs  |
| Sensor type                               | Pt100, Pt500, Pt1000, Cu100, KTY84, NTC5K, NTC10K,  |
| Wiring                                    | Two-wire/three-wire   |
| Accuracy (room temperature 25°C)          | Full scale* ( $\pm 0.1\%$ ), (0mV~1000mV full scale process), only the ADC sampling accuracy is defined here, and the specific temperature measurement accuracy degree see "Detection Range and Accuracy" on next table |
| Accuracy (ambient temperature -20°C-55°C) | Full scale* ( $\pm 0.3\%$ ), (0mV~1000mV full scale process), only the ADC sampling accuracy is defined here, and the specific temperature measurement accuracy degree see "Detection Range and Accuracy" on net table  |
| The sampling period                       | 250ms, 500ms, 1000ms/4 channels (configurable by software)  |
| Filter time                               | 0s...100s (configurable by software, default 5s)  |
| Isolation method                          | Isolation between I/O terminals and power supply<br>Isolation between channels  |
| System program upgrade method             | USB interface upgrade   |

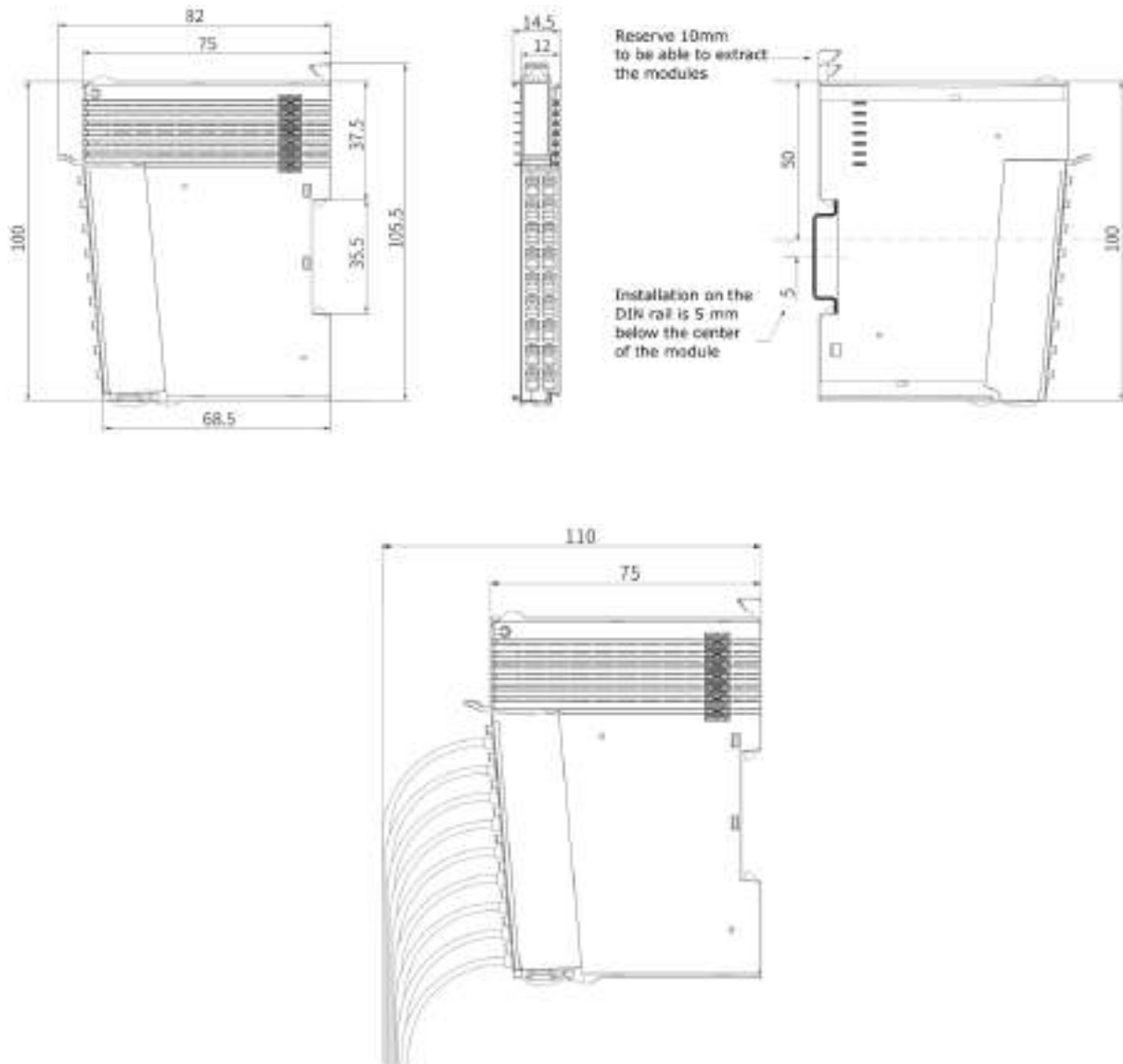
#### Detection range and accuracy

| Sensor Type          | Detection range                             | Precision   |
|----------------------|---|---|
| Pt100                | -200.0°C .. 850.0°C<br>-328.0°F .. 1562.0°F | $\pm 1^\circ\text{C}$ @ $T < 300^\circ\text{C}$<br>$\pm 2^\circ\text{C}$ @ $300^\circ\text{C} \leq T \leq 700^\circ\text{C}$<br>$\pm 2.5^\circ\text{C}$ @ $T > 700^\circ\text{C}$ |
| Pt500                | -200.0°C .. 850.0°C<br>-328.0°F .. 1562.0°F | $\pm 1^\circ\text{C}$ @ $T < 300^\circ\text{C}$<br>$\pm 2^\circ\text{C}$ @ $300^\circ\text{C} \leq T \leq 700^\circ\text{C}$<br>$\pm 2.5^\circ\text{C}$ @ $T > 700^\circ\text{C}$ |
| Pt1000               | -200.0°C .. 850.0°C<br>-328.0°F .. 1562.0°F | $\pm 1^\circ\text{C}$ @ $T < 300^\circ\text{C}$<br>$\pm 2^\circ\text{C}$ @ $300^\circ\text{C} \leq T \leq 700^\circ\text{C}$<br>$\pm 2.5^\circ\text{C}$ @ $T > 700^\circ\text{C}$ |
| Cu100                | -50.0°C .. 150.0°C<br>-58.0°F .. 302.0°F    | $\pm 1^\circ\text{C}$ @ $-50^\circ\text{C} \leq T \leq 150^\circ\text{C}$   |
| KTY84                | -0.0°C .. 200.0°C<br>32.0°F .. 392.0°F      | $\pm 1.5^\circ\text{C}$ @ $0^\circ\text{C} \leq T \leq 200^\circ\text{C}$   |
| NTC5K (B value 2000) | -30.0°C .. 200.0°C<br>-22.0°F .. 392.0°F    | $\pm 1.5^\circ\text{C}$ @ $-30^\circ\text{C} \leq T \leq 200^\circ\text{C}$   |
| NTC5K (B value 3950) | -15.0°C .. 100.0°C                          | $\pm 1.5^\circ\text{C}$ @ $-15^\circ\text{C} \leq T \leq 100^\circ\text{C}$   |



|                       |  |   |
|-----------------------|--|---|
|                       | 5.0°F .. 212.0°F                         |   |
| NTC5K (B value 6000)  | 0.0°C .. 100.0°C<br>32.0°F .. 212.0°F    | $\pm 1.5^{\circ}\text{C} @ 0^{\circ}\text{C} \leq T \leq 100^{\circ}\text{C}$   |
| NTC10K (B value 2000) | -25.0°C .. 200.0°C<br>-13.0°F .. 392.0°F | $\pm 1.5^{\circ}\text{C} @ -25^{\circ}\text{C} \leq T \leq 200^{\circ}\text{C}$ |
| NTC10K (B value 3950) | 0.0°C .. 150.0°C<br>32.0°F .. 302.0°F    | $\pm 1.5^{\circ}\text{C} @ 0^{\circ}\text{C} \leq T \leq 150^{\circ}\text{C}$   |
| NTC10K (B value 6000) | 6.0°C .. 100.0°C<br>42.8.0°F .. 212.0°F  | $\pm 1.5^{\circ}\text{C} @ 6^{\circ}\text{C} \leq T \leq 100^{\circ}\text{C}$   |

## 4.7.2 DIMENSIONS



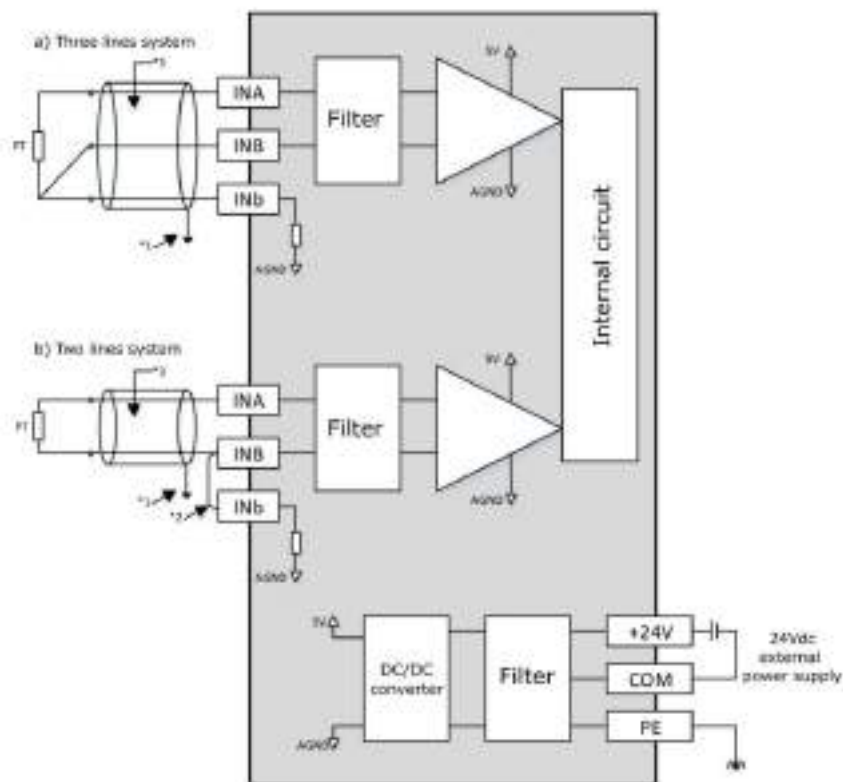


## 4.7.3 TERMINAL WIRING

### External wiring



| Signal | Terminal |    | Signal |
|--------|----------|----|--------|
| INO A  | A1       | B1 | IN1 A  |
| INO B  | A2       | B2 | IN1 B  |
| INO b  | A3       | B3 | IN1 b  |
| IN2 A  | A4       | B4 | IN3 A  |
| IN2 B  | A5       | B5 | IN3 B  |
| IN2 b  | A6       | B6 | IN3 b  |
| -      | A7       | B7 | -      |
| PE     | A8       | B8 | PE     |
| +24V   | A9       | B9 | COM    |



\*1 A shielded cable is required

\*2 If the two-wire connection method is used, the INB and INb channels need to be shorted together, and the resistance on the cable will affect the measured value

\*3 A cable with low lead resistance and no resistance difference between the three leads is required.

## 4.8 GL20-4TC INTRODUCTION

**Name:** 4TC Module

**Module category:** Temperature Measurement

**Module ID:** 0x10F41051

The main function of the GL20-4TC module is to achieve thermocouple temperature acquisition. The module is configured with 4 independent channels, which can be used for simultaneous acquisition. The configuration of each channel is independent and does not interfere with each other.



### 4.8.1 GENERAL SPECIFICATIONS

| Power supply                                 | Description                  |
|--|------------------------------|
| Rated voltage of bus input power supply      | 5V DC (4.75V DC ~ 5.25V DC)  |
| Rated current of bus input power supply      | 85mA (typical at 5V)         |
| Rated voltage of terminal input power supply | 24V DC (20.4V DC ~ 28.8V DC) |
| Rated current of terminal input power supply | 100mA (typical at 24V)       |
| Module hot swap function                     | Not support                  |
| 24V input anti-reverse                       | Support                      |

#### 4.8.1.1 SOFTWARE SPECIFICATIONS

| Configuration                              | Description  |
|--|--|
| Diagnosis reporting function configuration | Support  |
| Diagnostic detection enable configuration  | Support overrun and disconnection detection  |
| Sensor Type Configuration                  | Supported thermocouple types: B, E, N, J, K, R, S, T. Default is Type K thermocouple |
| Filter time                                | 0s~100s (configurable by software, default 5s)                                       |
| Overflow and underflow detection           | Support, not configurable  |
| Overrun detection enable configuration     | Support  |
| Independent Channel Configuration          | Support  |
| Temperature Offset Enable Configuration    | Support  |
| Temperature setting range                  | -204.8 to +204.7 temperature units   |
| The sampling period                        | 250ms, 500ms, 1000ms/4 channels  |
| Display mode                               | Celsius (°C), Fahrenheit (°F)  |
| Sensitivity                                | 0.1°C, 0.1°F   |

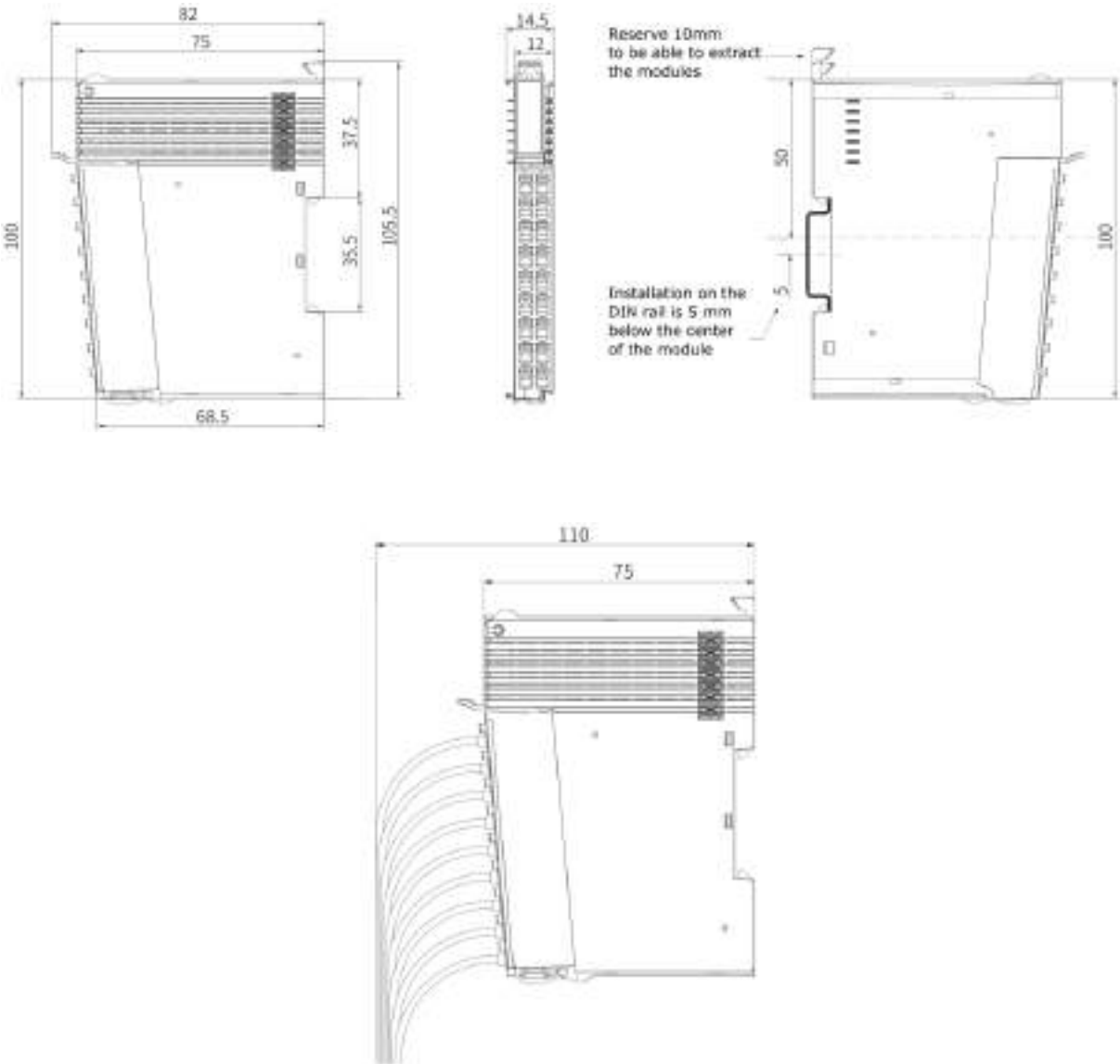


|   |  |
|---|--|
| Sample refresh                            | Refresh asynchronously according to sampling time, does not require synchronous refresh according to bus cycle   |
| Stop mode                                 | Output according to the maximum value and no longer refresh  |
| Disconnected or overrun                   | Output according to the maximum value and no longer refresh  |
| Module type and basic information reading | Support  |
| Module addressing                         | Support  |
| Module configuration writing and reading  | Support  |
| Module state machine control              | Support, the host or gateway can check the status of the module through commands<br>Switching, including: initialization state (Init), configuration state (configure), running state (Run), stop state (Stop) |
| Module status acquisition                 | Support, the host or gateway can obtain the status information of the module for the host<br>Management of station control sequences   |
| Cyclic data access                        | Support, after entering the running state, the host or gateway can communicate with the module<br>Agreed periodic data access  |
| Index data access                         | Support  |
| Register Data Access                      | Support  |
| Memory block data access                  | Not support  |
| Read exception code                       | Support  |
| Stop the module from running              | Support  |
| Module Firmware Upgrade                   | Not support  |
| Diagnostic report function                | Support  |

#### 4.8.1.2 OUTPUT SPECIFICATIONS

| Input specification                       | Description   |
|---|---|
| Input channel                             | 4 way   |
| Digital resolution                        | 24 bit  |
| Display sensitivity                       | 0.1°C, 0.1°F  |
| Input terminal                            | Thermocouple input, thermocouple type: B, E, N, J, K, R, S, T               |
| Compensation method                       | Internal cold junction compensation   |
| Accuracy (room temperature 25°C)          | (±0.1%)±1°C (±100mV full scale)   |
| Accuracy (ambient temperature -20°C-55°C) | (±0.3%)±1°C (±100mV full scale)   |
| Isolation                                 | I/O terminals are isolated from the power supply, and channels are isolated |
| Input action display                      | None  |
| Input derating                            | None  |
| Overrun disconnection detection           | Support   |

## 4.8.2 DIMENSIONS

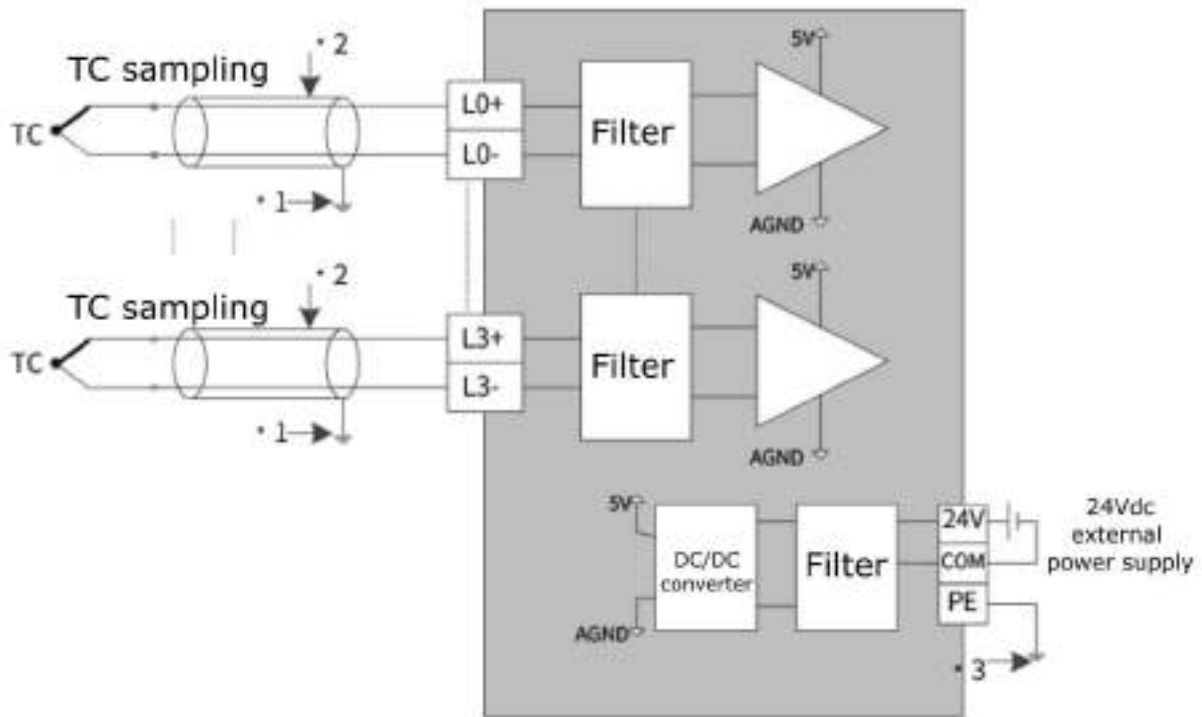


## 4.8.3 TERMINAL WIRING

### External wiring



| Signal | Terminal |    | Signal |
|--------|----------|----|--------|
| L0+    | A1       | B1 | L0-    |
| L1+    | A2       | B2 | L1-    |
| L2+    | A3       | B3 | L2-    |
| L3+    | A4       | B4 | L3-    |
| -      | A5       | B5 | -      |
| -      | A6       | B6 | -      |
| -      | A7       | B7 | -      |
| PE     | A8       | B8 | PE     |
| +24V   | A9       | B9 | COM    |



\*1 Cables must use shielded compensating wires.

\*2 When there is a gap between the cold junction compensation and the end of the thermocouple, if the compensation wire is not used, the temperature measurement value will be abnormal.

## 5 FUNCTION INTRODUCTION

### 5.1 BASIC INFORMATION

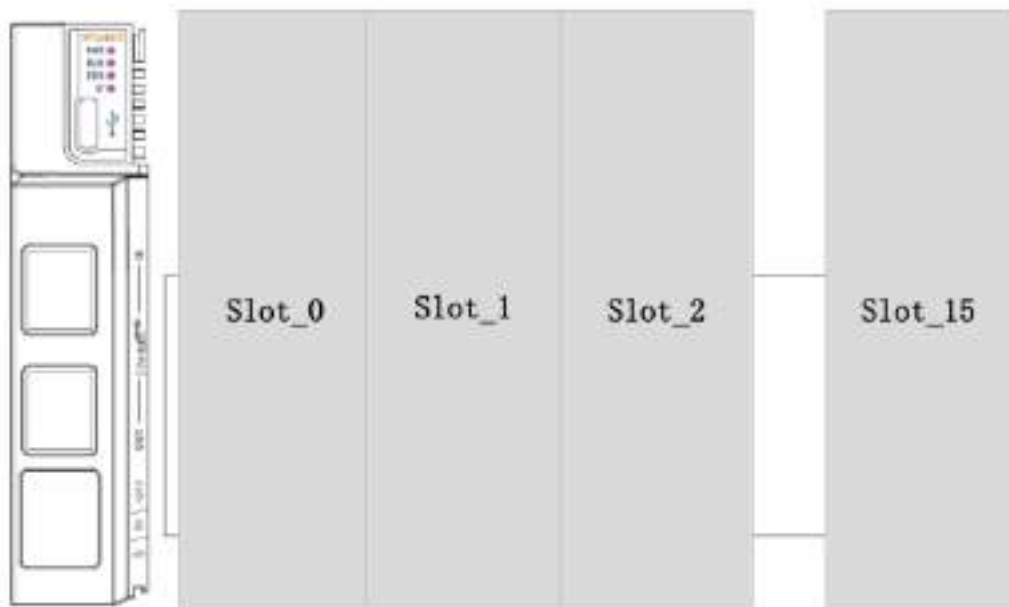
The GL20-RTU-ECT EtherCAT bus coupler can be installed with Inovance GL20 series local modules.

The bus coupler is connected to the high speed EtherCAT network. Therefore, it is possible to configure different types of GL20 series modules as a single EtherCAT slave. Each bus coupler can connect up to 16 modules of the GL20 series.

### 5.2 DEVICE MODEL

This module uses a modular design, designed according to the standard protocol of ETG5001, using the concept of slots for install local modules.

According to the ETG5001 protocol, 16 slots are virtualized behind the GL20-RTU-ECT module bus coupler. Each GL20 series expansion module can be placed in the slot, so that up to 16 expansion modules can be connected behind the bus coupler.

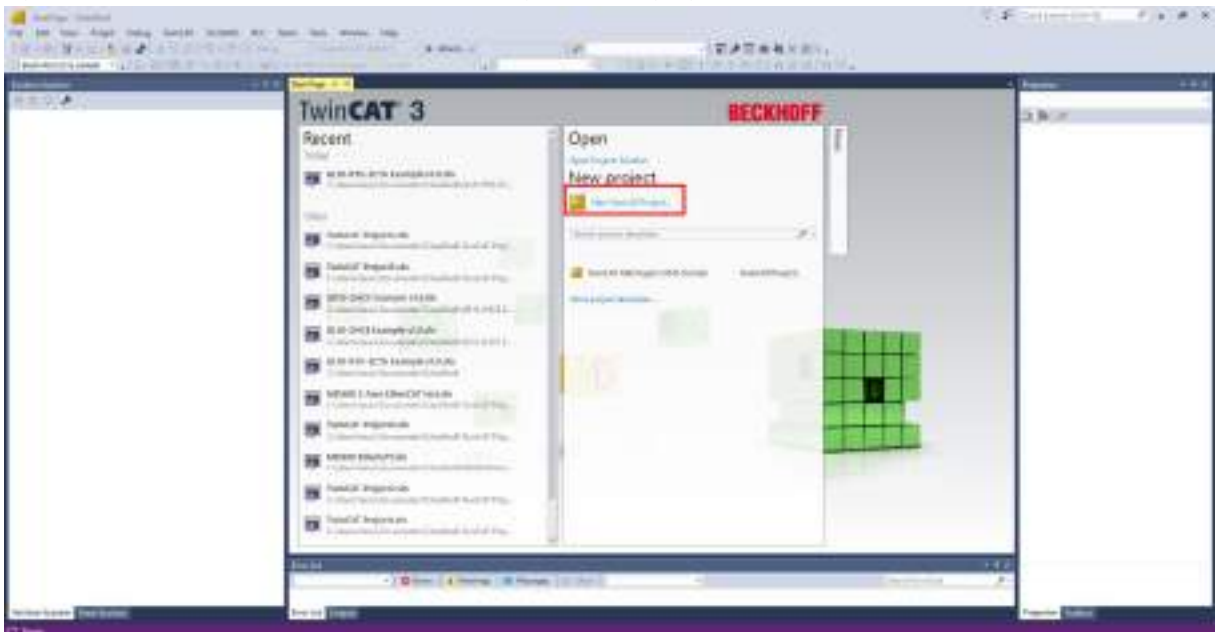


## 6 THIRD-PARTY CONTROLLERS

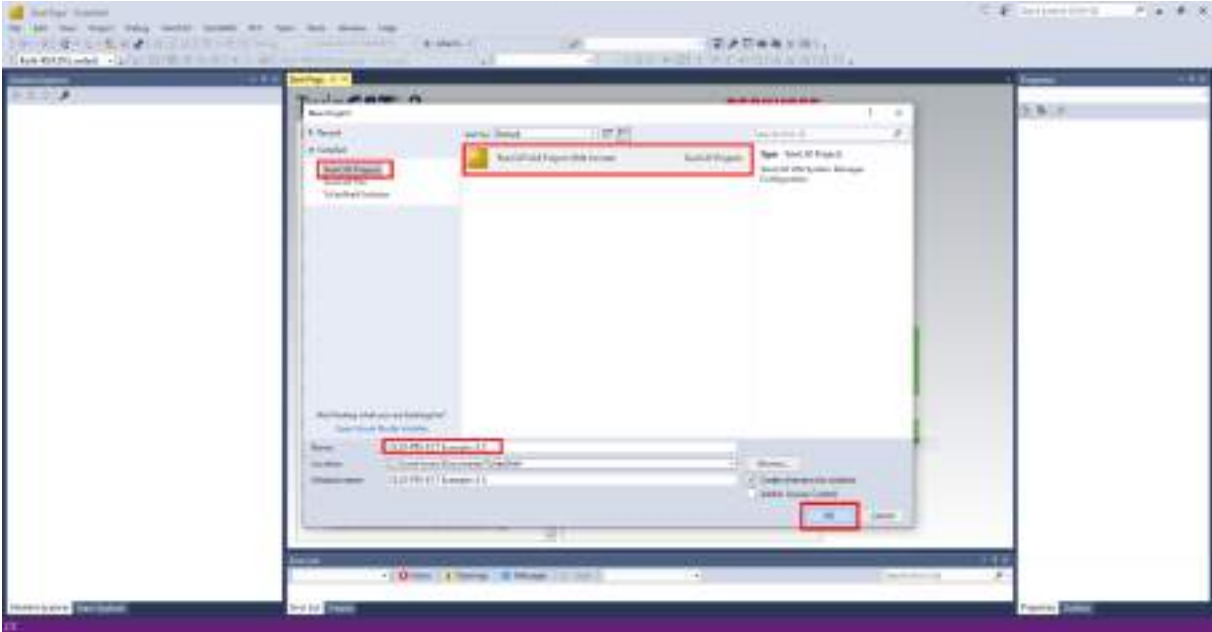
### 6.1 BECKHOFF TWINCAT

#### 6.1.1 BECKHOFF TWINCAT CONFIGURATION

- 1) Install TwinCAT software  
 TC3 can work on both 32-bit operating system and 64-bit operation.  
 Download the latest TC3 software from the Beckhoff file system: TwinCAT V3.1.4024.25 is recommended.  
 Path: TwinCAT3/install/InstallationPackage/4020.32/
- 2) Copy the EtherCAT configuration file (.xml) to C:\TwinCAT\3.1\Config\Io\EtherCAT, then restart the TwinCAT software.
- 3) Open TwinCAT software, click New TwinCAT Project or new project in FILE



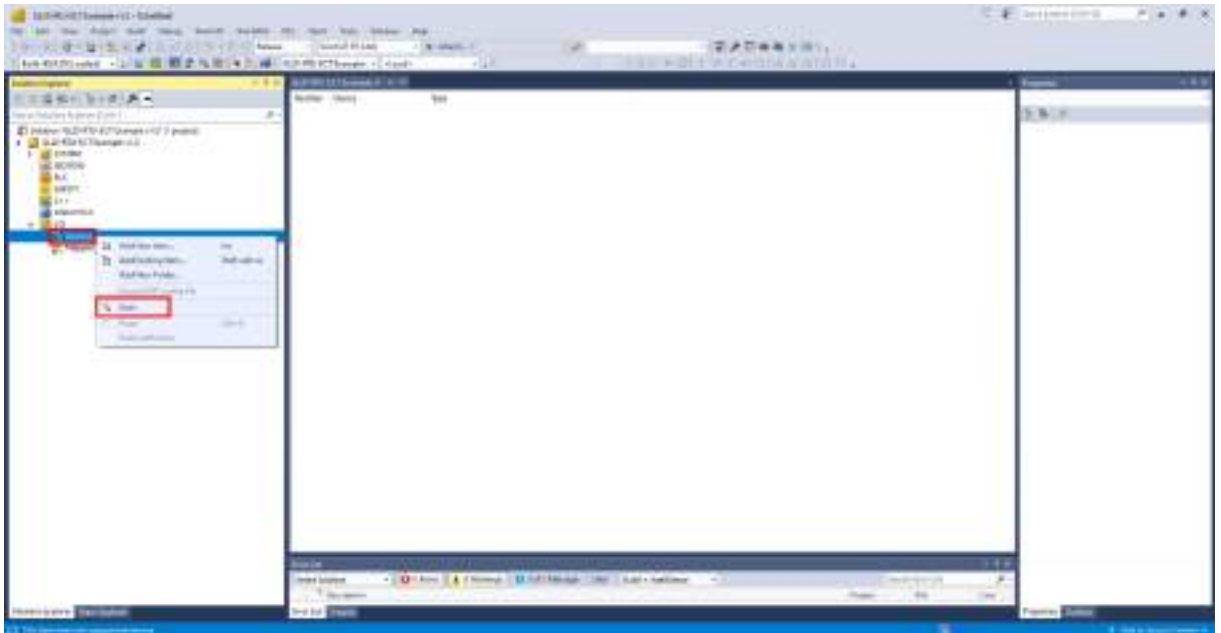
- 4) Select TwinCAT XAE Project (XML format) in TwinCAT Projects, enter the project name, set the project save path, and click OK



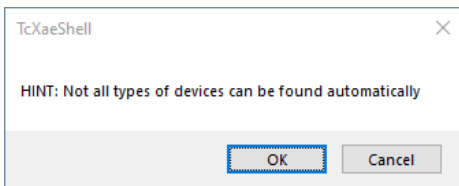


## 6.1.2 SCAN DEVICES

- 1) Scan the devices



- 2) Click OK



- 3) Select the right EtherCAT interface, and click OK



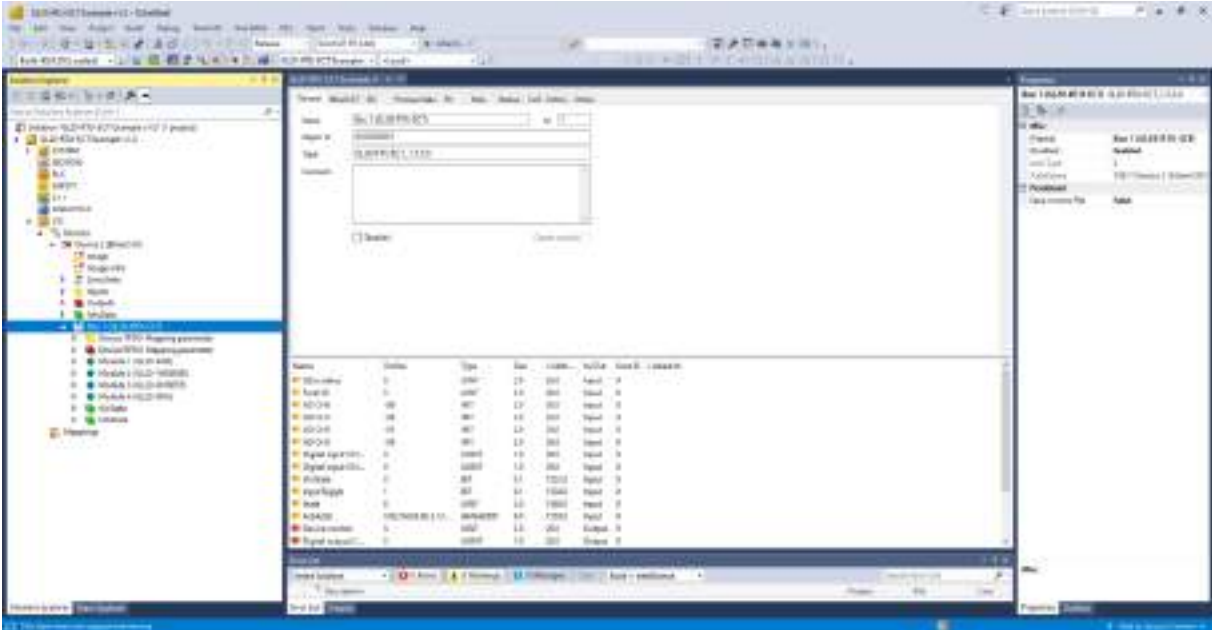
- 4) Scan for boxes. Click yes.



- 5) Activate Free Run. Click Ok



- 6) The current configuration is:
  - GL20-RTU-ECT
    - GL20AD
    - GL20-1600END
    - GL20-0016ETP
    - GL20-4DA



## 6.1.3 CREATE PLC PROGRAM

- 1) Right-click the PLC and select Add New Item...



- 2) Select Standard PLC Project in plc Templates. Enter the PLC project name, and click Add to create a PLC project.



- 3) After creating the PLC project, create a global variable list to define the I/O variables, as shown in the figure below:

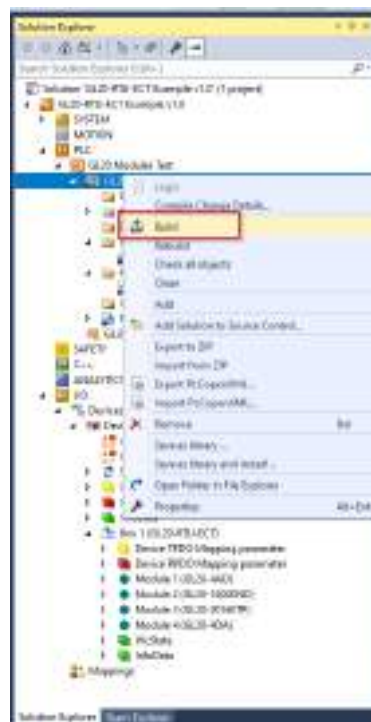


- 4) Create the necessary variables to link them with the remote I/O modules. To assign variables in the input or output area, the **AT** code must be used with the following declaration `<identifier> AT <address>:<data type>`. Example: **AT %I\***, **AT %Q\***

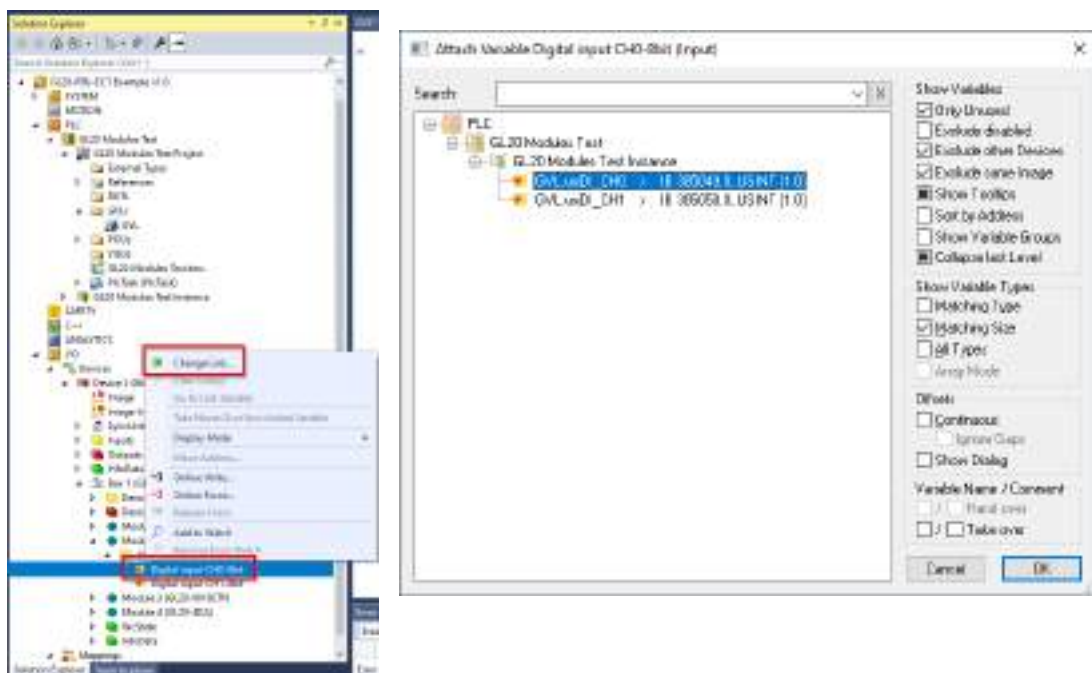
```



1  (attribute 'qualified_only')
2  VAR_GLOBAL
3  //Inputs
4  Qs1DI_CH0 AT %I+ : USINT;
5  Qs1DI_CH1 AT %I+ : USINT;
6
7  //Output
8  Qs1DO_CH0 AT %Q+ : USINT;
9  Qs1DO_CH1 AT %Q+ : USINT;
10
11 END_VAR
    
```

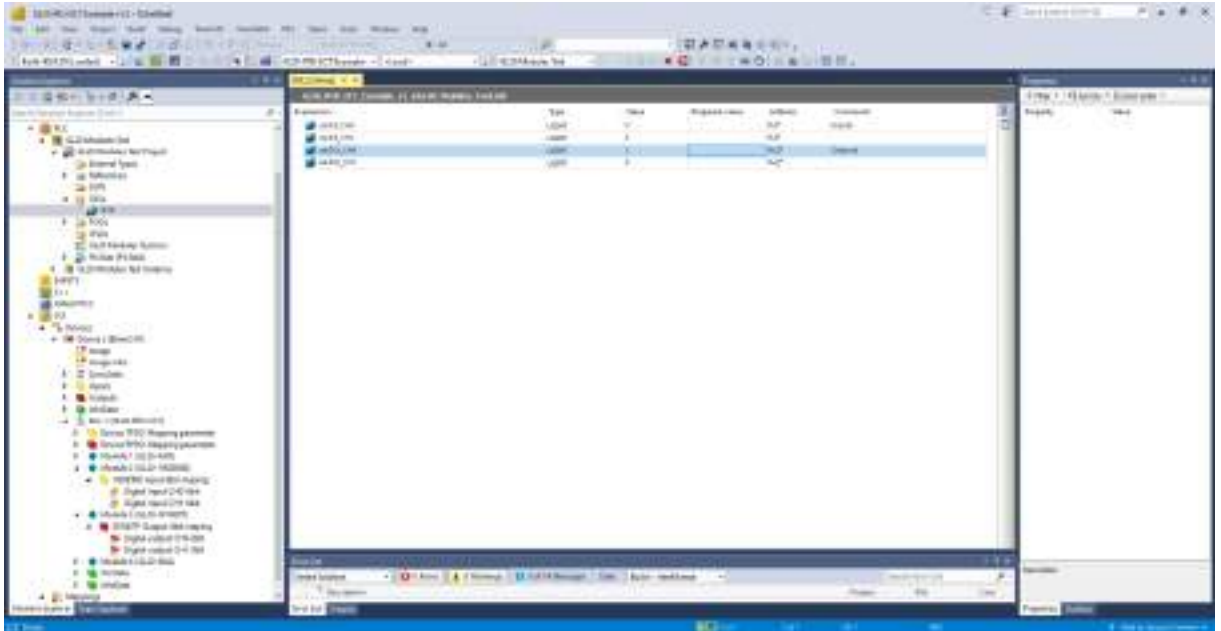
5) Compile and generate



6) Bind the corresponding variable



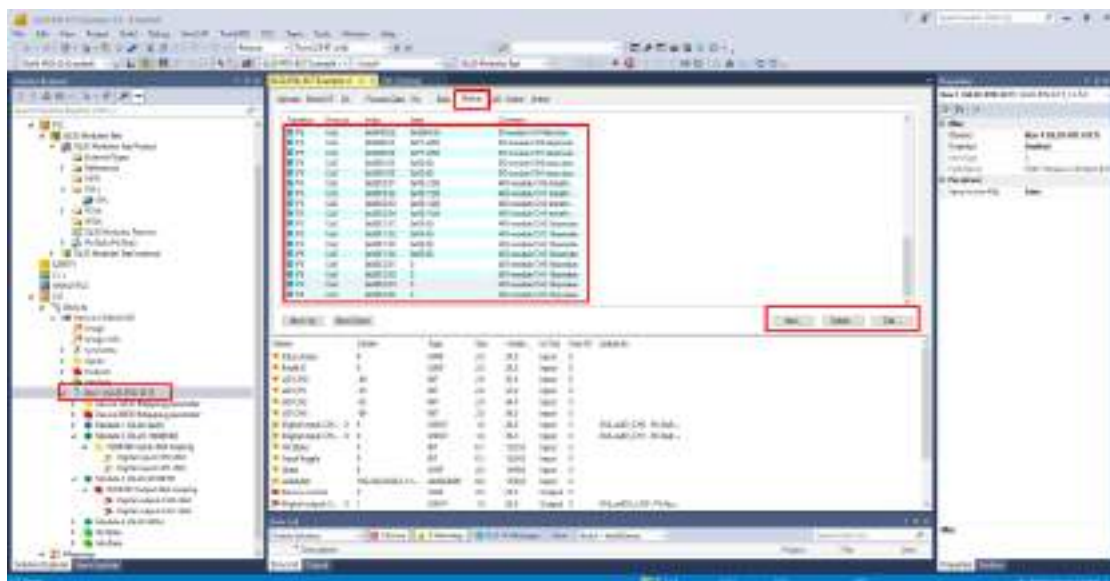
- 7) Download the configuration 
- 8) Change to run mode 
- 9) Login and check the I/O status



## 6.1.4 INITIAL SDO CONFIGURATION

In the "Startup" interface, the functionality of the extension modules can be configured through the SDO startup parameters. For specific configuration parameters, see: 9 Appendix A Extension Module Object Dictionary Definition.

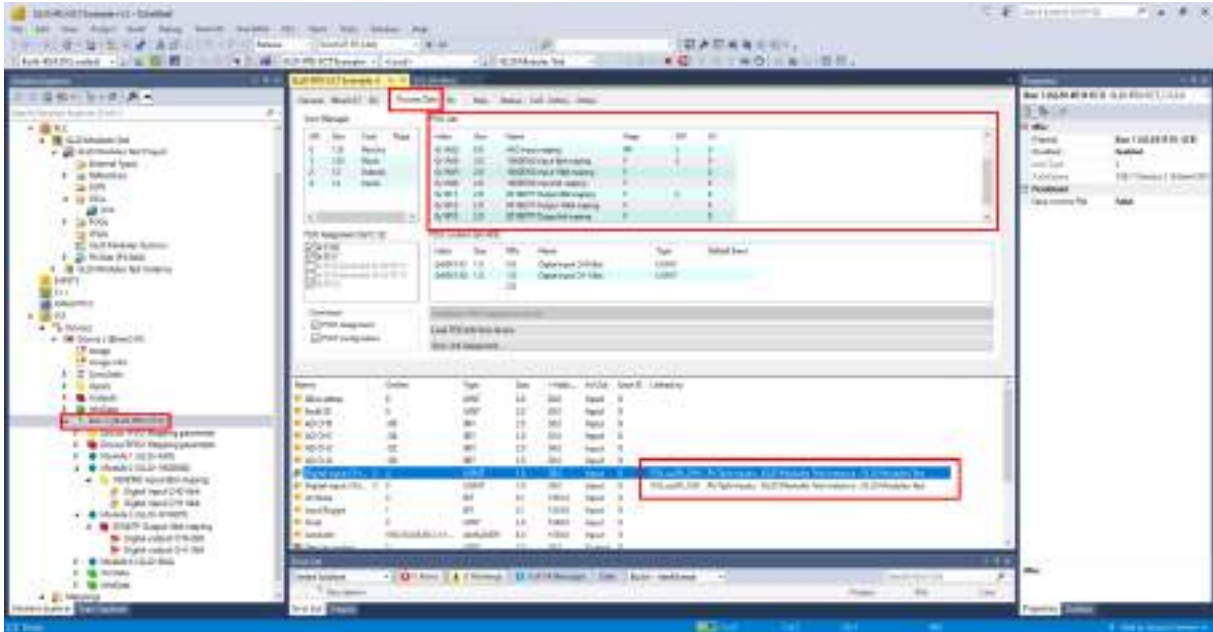
When adding the modules in the project a default configuration is established. From this configuration interface you can modify, add or delete the respective SDOs of each module.



## 6.1.5 CONFIGURING PROCESS DATA (PDO)

When adding modules to the project, a configuration is generated by default in the PDO interface.

From this interface you can modify, add or delete the PDOs configured by default. In addition, the variable of the PLC program with which each PDO is linked can be modified.



For example, the following image shows how the configuration of the GL20-1600END module is changed to be able to map one BIT per input instead of mapping all the inputs to a UINT.

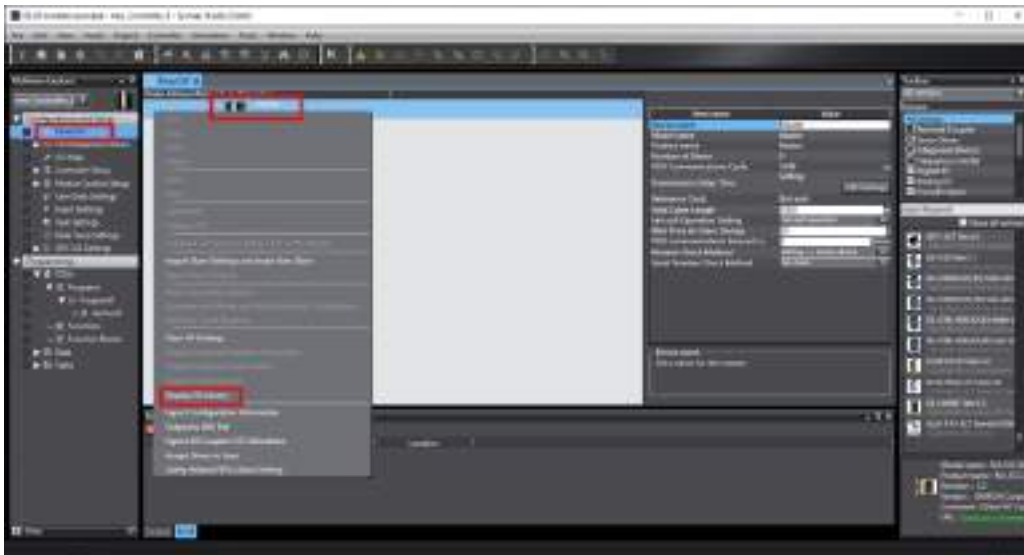


## 6.2 OMRON SYSMAC

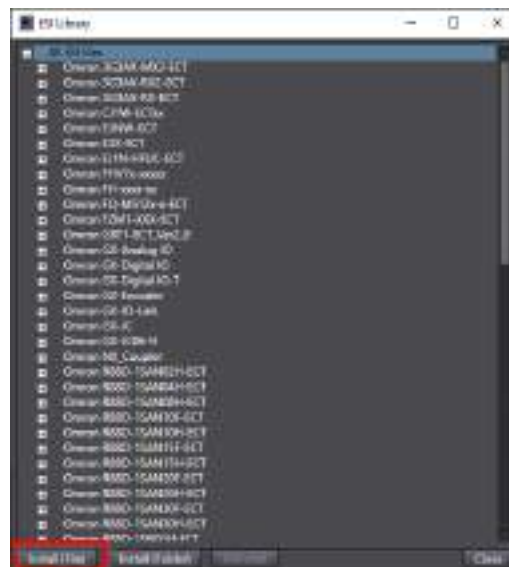
### 6.2.1 INSTALL XML FILE

First of all it is necessary to install the XML file of the modules in the SYSMAC studio.

1. Create a new project
2. Open the EtherCAT configuration
3. Click with the right mouse button on the master the EtherCAT, and in the contextual menu click on the option "Display ESI library"



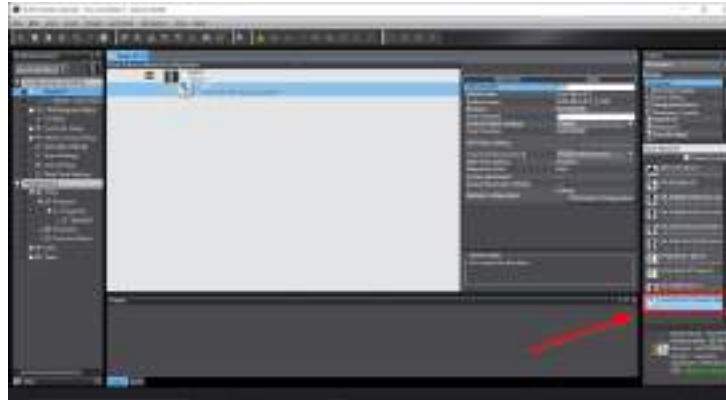
4. The ESI library dialog opens. At the bottom click on the "Install" button



5. Copy the XML file into the folder that has been opened.



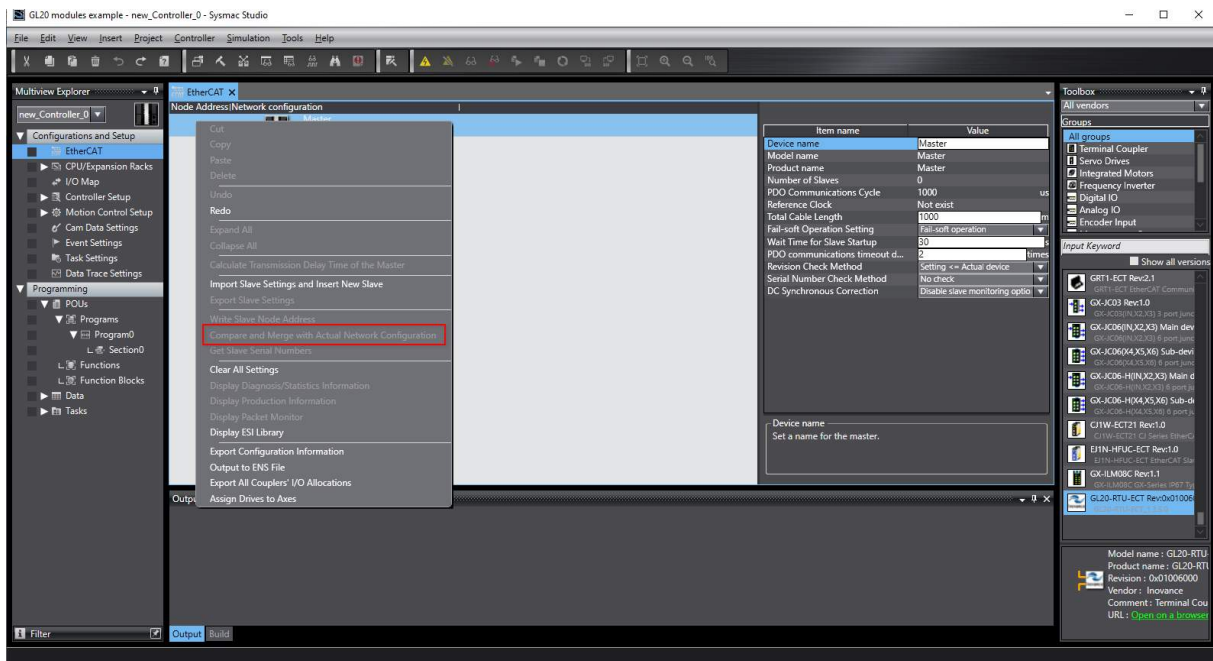
6. Now the GL20 modules already appear in the device list.



## 6.2.2 SCAN MODULES

SYSMAC studio has an option that allows you to scan the EtherCAT network to find which modules are installed. This tool automatically detects the different modules and adds them to the project configuration.

For an offline or manual installation of the modules see the next section 6.2.3 Add modules manually

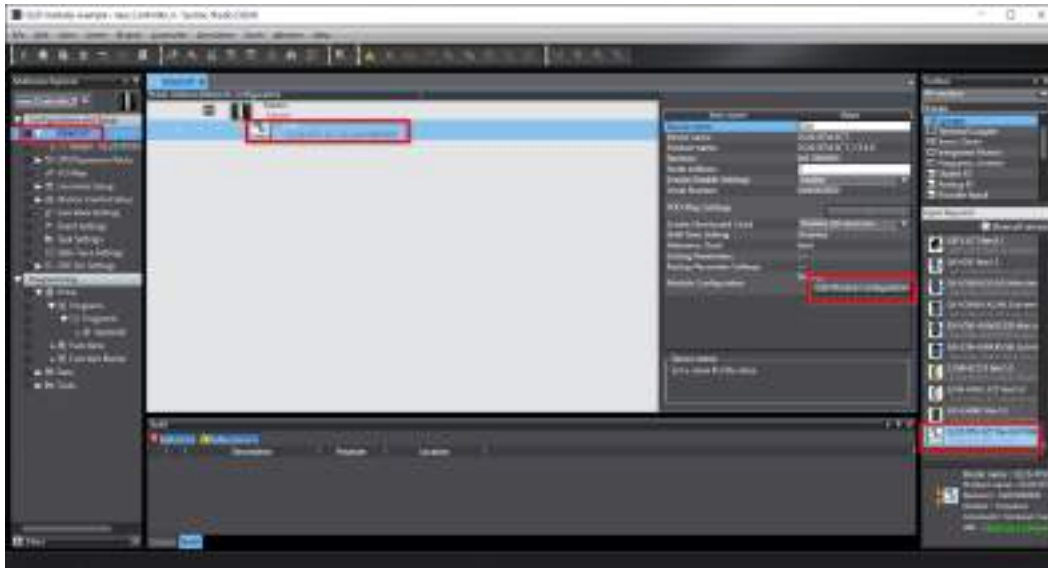


## 6.2.3 ADD MODULES MANUALLY

To add modules manually, select the EtherCAT master and drag the modules from the Toolbox where the GL20-RTU-ETC module appears. This action adds the EtherCAT bus coupler as EtherCAT slave in the network configured in the project.

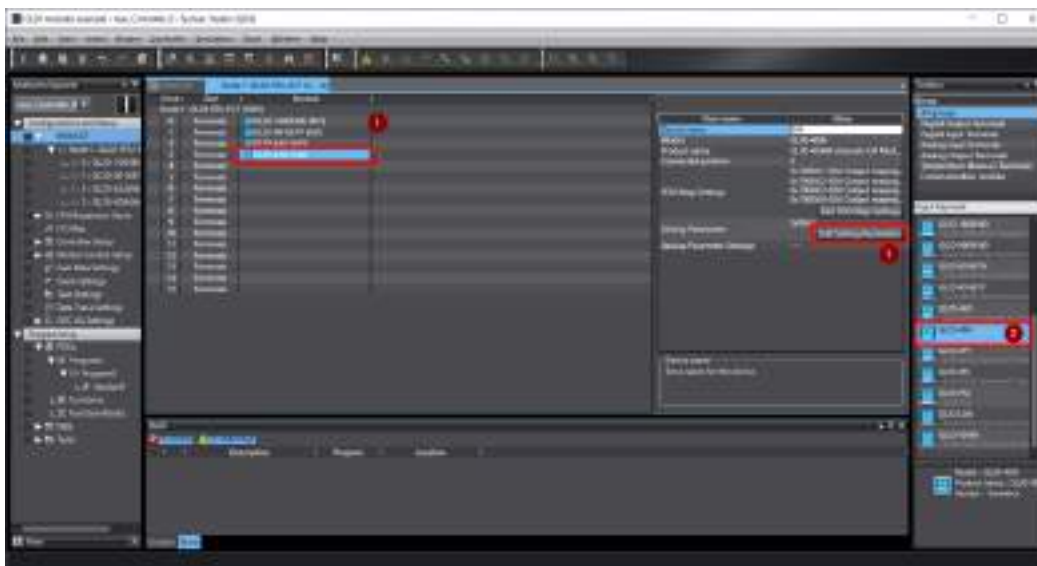
To add the I/O modules to the bus coupler, click on the "Edit module configuration" button in the configuration section of the bus coupler.





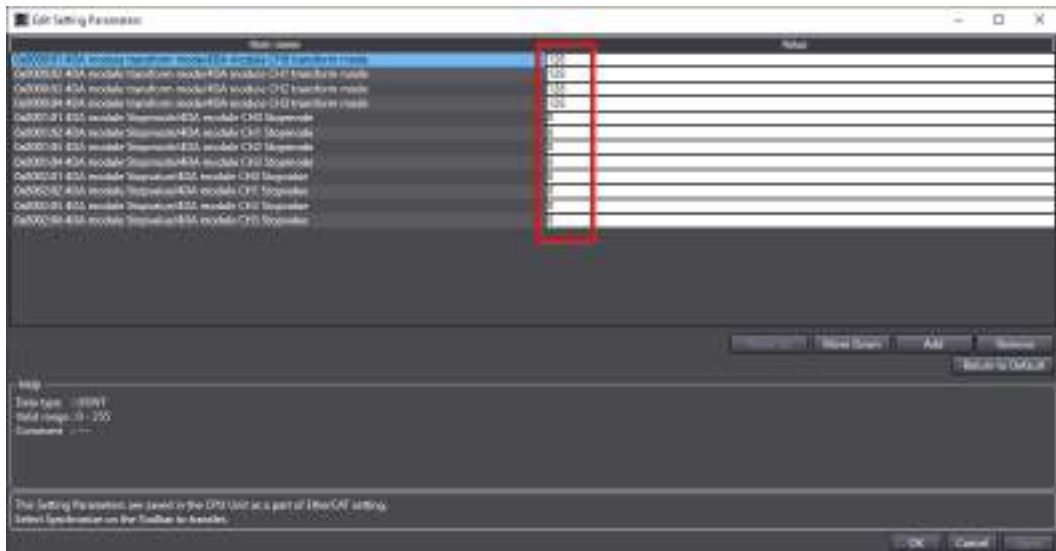
From the GL20-RTU-ETC bus coupler configuration screen you can add the necessary I/O modules.

1. Select the slot where you want to add or modify a module
2. Select the corresponding module in the list of available modules.
3. Click on the "Edit Setting Parameters" button to change the configuration of each module.



Each module has certain parameters to modify its behavior. For example, in the analog I/O modules it is possible to configure the type of I/O, the ranges, filters,...

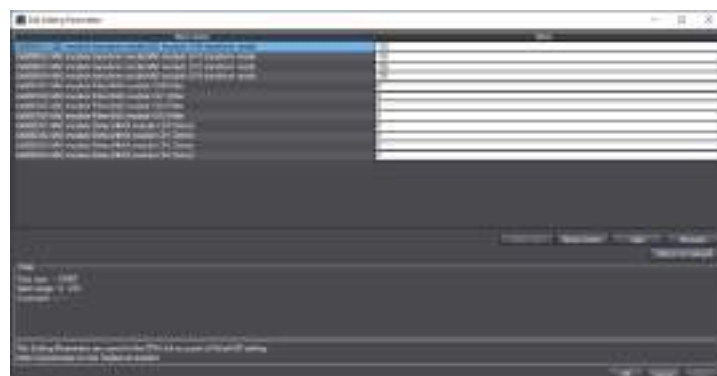
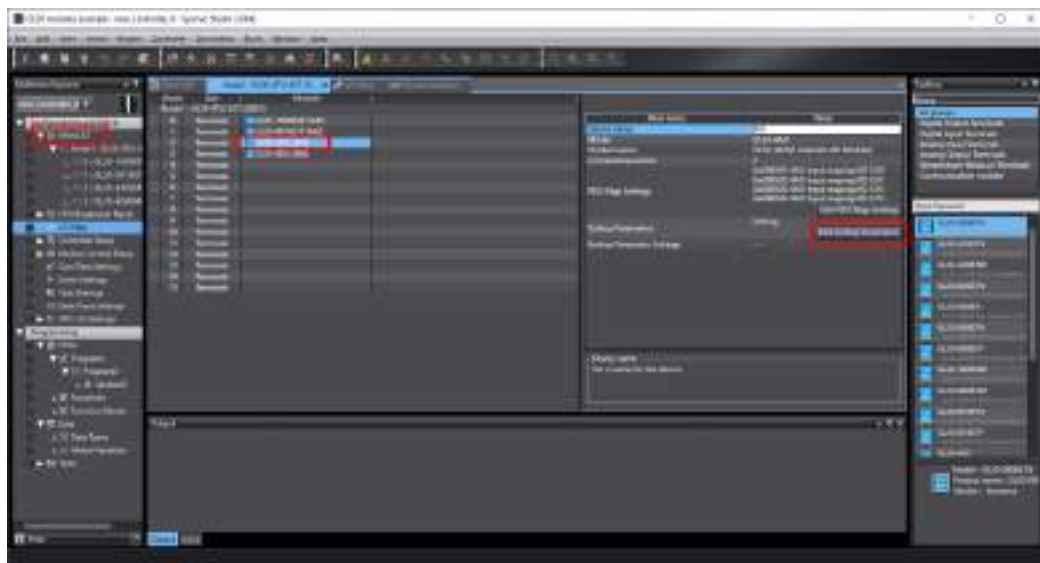
All this configuration can be modified through the initial configuration screens of each module:



## 6.2.4 INITIAL SDO CONFIGURATION

In the latest versions of SYSMAC studio it is possible to configure the remote EtherCAT modules from the programming interface. In the properties of each module, its initial configuration can be accessed through the "Edit Configuration Parameters" button.

Each module has a default configuration. For example, the default mode of the analog module is that all 4 channels are on by default, the conversion method is -10v-10v, and the upper and lower limits are +-20000.



The default configuration of each module is described in the "Configuration Data" section of each module in Appendix A. This is the default configuration of the GL20-4AD module:

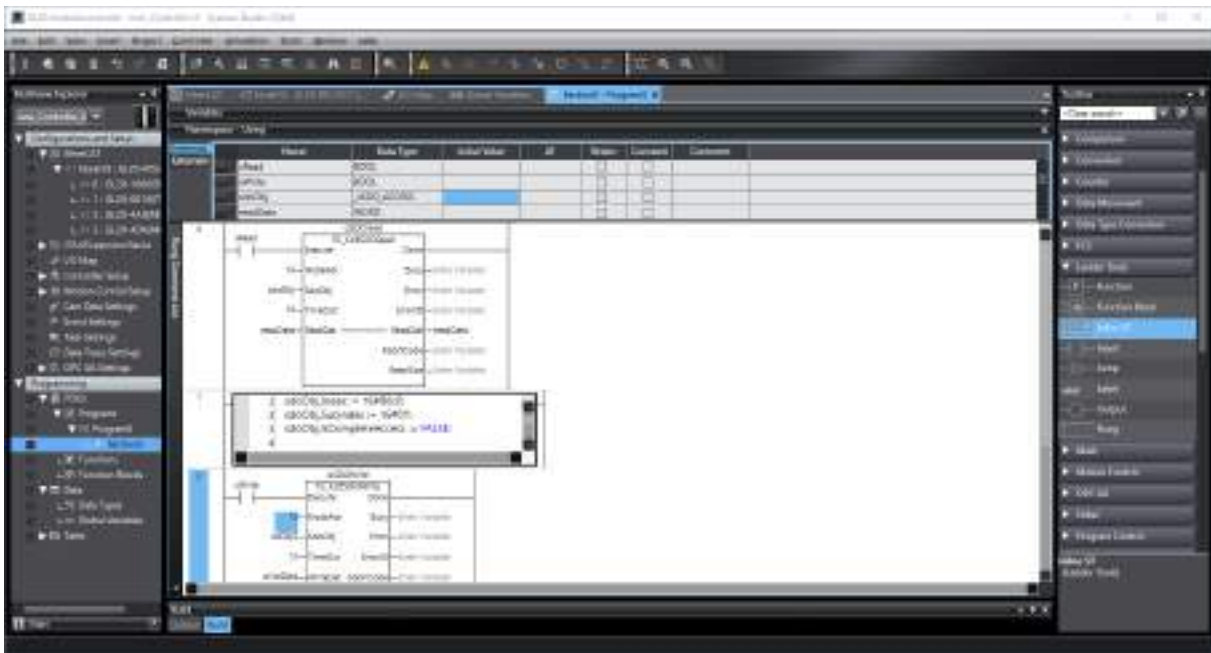
| Index     | 0x8000+0x40*n: 4ADMODE |              |             |                  |            |
|-----------|------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                   | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000          | USINT        | RO          | NO               | 4          |
| 1         | Analog input CH0-mode  | USINT        | RW          | NO               | 0x80 (128) |
| 2         | Analog input CH1-mode  | USINT        | RW          | NO               | 0x80 (128) |
| 3         | Analog input CH2-mode  | USINT        | RW          | NO               | 0x80 (128) |
| 4         | Analog input CH3-mode  | USINT        | RW          | NO               | 0x80 (128) |

Sub-index 1: Analog input CH0-mode (sub-index 2, 3, 4 use the same sub-index 1)

|        |   |
|--------|---|
| Bit0-3 | CH0 conversion method<br>0: -10V...10V<br>1: 0V...10V<br>2: -5V...5V<br>3: 0V...5V<br>4: 1V...5V<br>5: -20mA...20mA<br>6: 0mA...20mA<br>7: 4mA...20mA |
| Bit4   | Reserved (add other voltage and current conversion methods)   |
| Bit5   | CH0 digital range<br>0: ±20000<br>1: ±32000   |
| Bit6   | Reserved  |
| Bit7   | Ch0 channel enable<br>0: disabled<br>1: enabled   |

#### 6.2.4.1 EC\_COESDORREAD AND EC\_COESDOWRITE

If the controller or the software does not allow to initialize the configuration of the modules, these can be configured with the C\_CoESDORread and C\_CoESDOWrite. With these FBs it is possible to read or write any object of the EtherCAT slave.



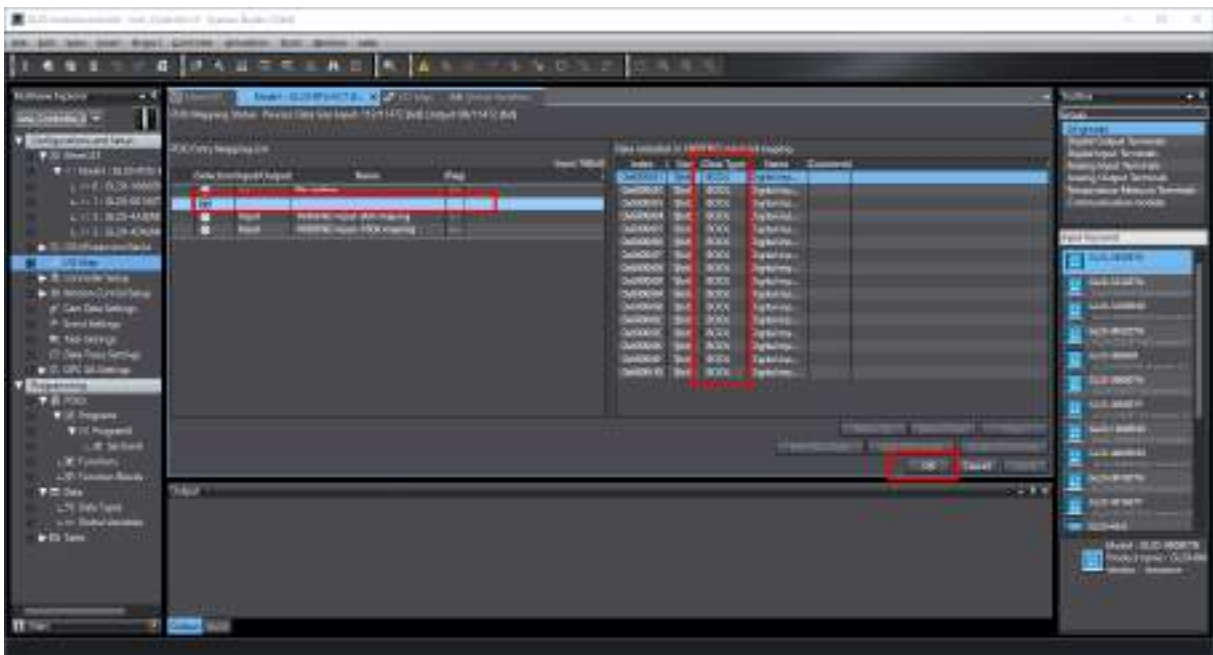
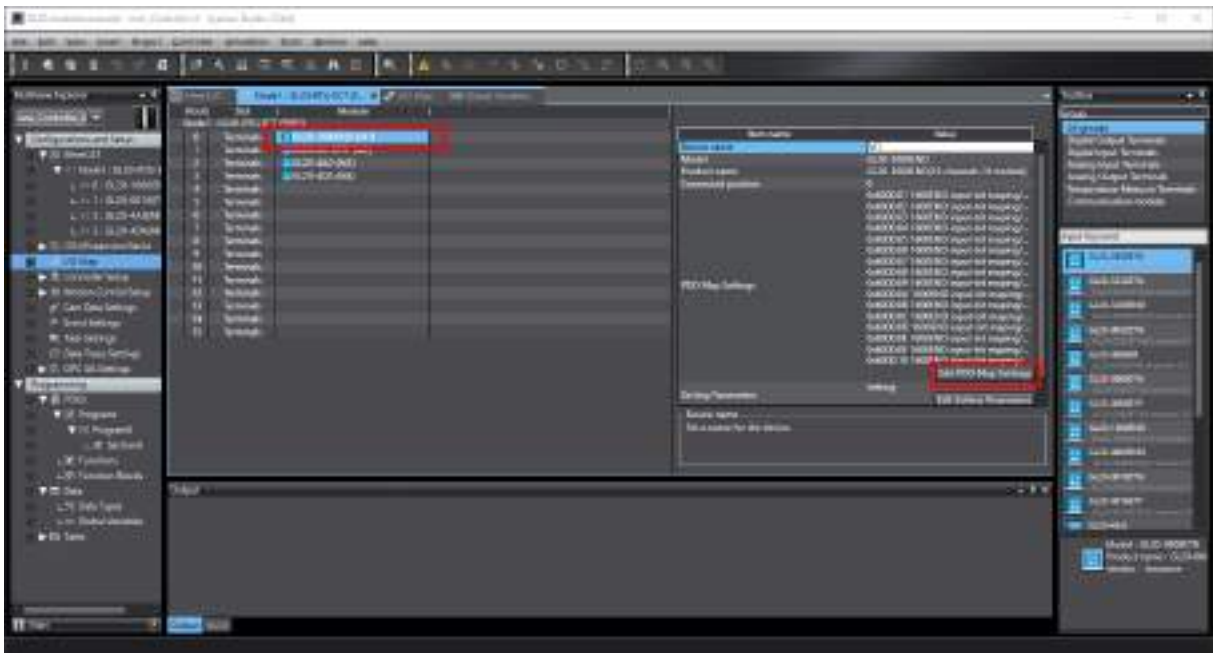
#### 6.2.5 CONFIGURING PROCESS DATA (PDO)

The cyclic configuration determines which module values are cyclically read/written by the EtherCAT master.

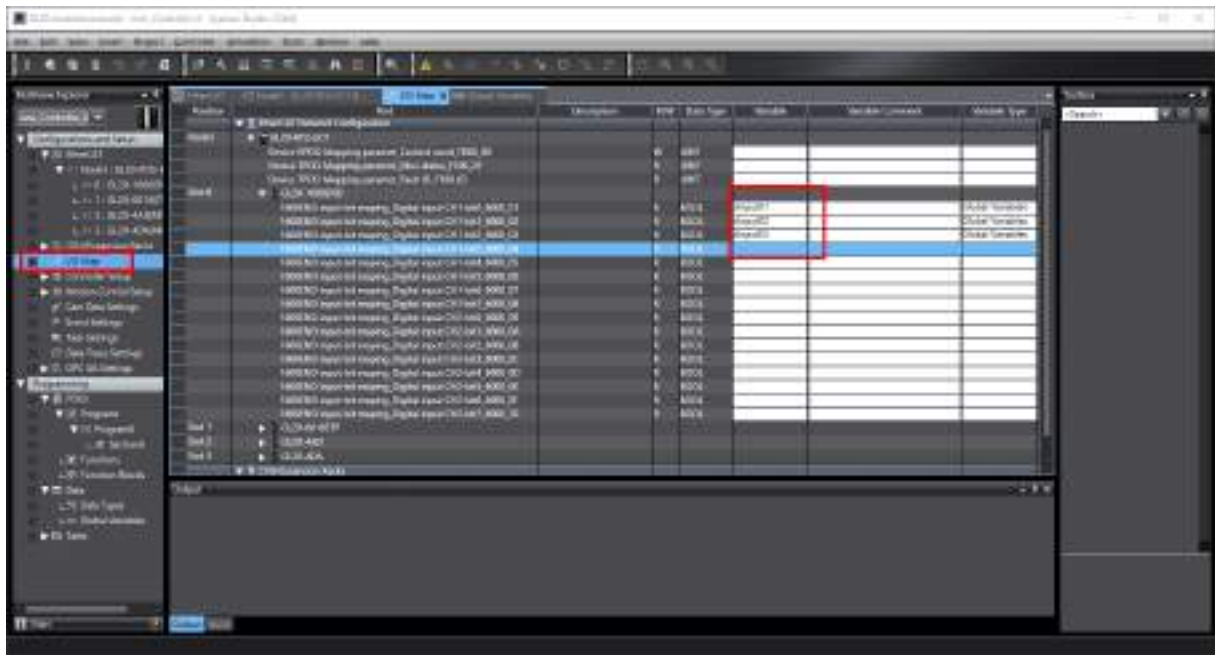
The XML has defined by default the PDOs necessary to interact with the modules. Some modules have the possibility to edit the PDO configuration. For example, in the digital input module we can modify what type of data we use to interact with this BOOL module, 8bits or 16bits.



The images below show the process to modify the configuration of a GL20-1600END module to be able to read the inputs as boolean values..



To link the objects configured as PDOs with the PLC program, it is necessary to configure the I/O mapping. From the I/O Map configuration screen you can link the PDOs with the variables of the PLC program. Finally, from the PLC program you can read/write the variables to interact with the functions of the remote modules.



## 7 MODULE TROUBLESHOOTING

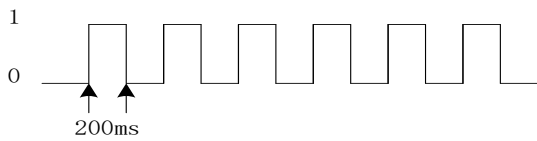
### 7.1 HARDWARE DIAGNOSTICS

#### 7.1.1 DEFINITION OF LED STATUS

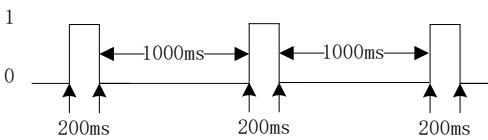
OFF



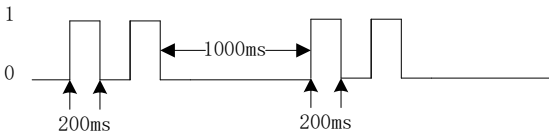
Blinking



Single flash



Double Flash



ON



#### 7.1.2 INDICATOR LIGHT FUNCTION DEFINITION

| Name    | Function Definition  |
|---------|--|
| POWER   | Power Indicator: Always on when the module is powered by 24V                             |
| RUN     | Module Status Indicator: Indicates the state of the EtherCAT communication state machine |
| SF      | Module Status Indicator: Indicates the module fault status                               |
| BF(ERR) | Module Status Indicator: Indicates EtherCAT communication failure status                 |

## RUN

| RUN LED      | Description                             |
|--------------|---|
| OFF          | ECT module is in INIT state             |
| Blinking     | ECT module is in Pre-Operational state  |
| Single Flash | ECT module is in Safe-Operational state |
| ON           | ECT module is in Operational state      |

## BF(ERR)

| ERR LED      | Description  |
|--------------|--|
| OFF          | EtherCAT communication is in normal state                              |
| Blinking     | EtherCAT communication receives an unexecuted state transition command |
| Single Flash | ECT module synchronization error                                       |
| Double Flash | A watchdog error occurs in EtherCAT communication                      |

## SF

| SF LED       | Description  |
|--------------|--|
| OFF          | Device is normal   |
| Blinking     | Configuration error<br>EtherCAT network port disconnection |
| Single Flash | Module error   |
| ON           | ECT module error   |

### 7.1.3 FAULT INDICATION AND POSSIBLE SOLUTIONS

| RUN LED |          | Description  | Solution   |
|---------|----------|--|--|
| RUN     | Off      | There is no connection between EtherCAT master and slave.  | Check configuration and parameter assignment<br>Check the correspondence address<br>Check whether the specification and length of the network cable are consistent with the regulations. |
|         | Blinking | The EtherCAT slave is in a state other than OP.  | Check the slave configuration to see if a module is missing, faulty or not<br>There is an unconfigured module.   |
| BF      | Blinking | No data exchange between EtherCAT master and slave;<br>EtherCAT communication received a state transition that could not be executed instruction;<br>ECT module synchronization error;<br>A watchdog error occurred in EtherCAT communication. | Check whether the crystal head has been inserted correctly;<br>Check whether the network cable is damaged;<br>restart the power supply;<br>Check that the PDO configuration is correct.  |

|    |          |                                       |  |
|----|----------|---------------------------------------|--|
| SF | Blinking | Configuration error.<br>Module error. | Check whether the configuration of the host computer is consistent with the configuration of the module<br>Check whether the module is disturbed, whether it is not connected to 24V, etc. |
|----|----------|---------------------------------------|--|

## 7.2 SOFTWARE DIAGNOSTICS (FAULT AND DIAGNOSTICS)

### 7.2.1 FAULT TYPE

All faults are accessible through the object dictionary. When a fault occurs, the relevant fault information can be queried through the object dictionary 0xF100, 0xF110 and the module's diagnostic object dictionary 0xAnnn. The 0xF100 object dictionary shows the current state of the local bus, the configuration and other related error information. The 0xF110 shows the slot of the expansion module, and then the detailed expansion module error information according to the 0xAnnn object dictionary.

| Index     | 0xF100: Device Status |              |             |                  |          |
|-----------|-----------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                  | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Device status         | USINT        | RO          | NO               | 0        |
| 1         | LBus status           | UINT         | RO          | YES              | 0        |
| 2         | Cfg Fault ID          | UINT         | RO          | YES              | 0        |

Description:

#### Sub-index 1: LBus Status Expansion Module Status

| status value | definition                                   | Remark |
|--------------|--|--------|
| 0x01         | Local bus initialization                     |        |
| 0x02         | Local bus pre-operational state              |        |
| 0x04         | Local bus safe operating state               |        |
| 0x08         | Local bus operating status                   |        |
| 0x10         | Safe operation to operational state          |        |
| 0x20         | Operating to safe operating state transition |        |
| 0x80         | Local bus error                              |        |

#### Sub-index 2: Cfg Fault ID Configuration Configuration Error ID

| ID     | Definition   | Remark |
|--------|--|--------|
| 0x0000 | Consistent configuration   |        |
| 0x1000 | Expansion module not scanned   |        |
| 0x1001 | The configuration module is redundant with the actual scan module              |        |
| 0x1002 | The configuration configuration module is less than the actual scan module     |        |
| 0x1003 | The configuration module type is inconsistent with the actual scan module type |        |

| Index     | 0xF110: Device Diagnostics |              |             |                  |          |
|-----------|----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                       | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000              | USINT        | RO          | NO               | 2        |
| 1         | Error Solt 1               | UDINT        | RO          | NO               |          |



|   |            |       |    |    |  |
|---|------------|-------|----|----|--|
| 2 | ErrorSolt2 | UDINT | RO | NO |  |
|---|------------|-------|----|----|--|

Description: Indicates the module slot that has a fault. Each digit represents an expansion module:

0: the expansion module has no fault,

1: the expansion module is faulty. 0x0005 indicates that the module in slot 1 and slot 3 is faulty

**Sub-index 1:** ErrorSolt1 (position 0-31 of the faulty module in this group of modules).

**Sub-index 2:** ErrorSolt2 (positions 32-63 of the faulty module in this group of modules). (reserved)

## 7.2.2 TROUBLESHOOTING

| Fault type          | Possible cause of failure   | Solution   |
|---------------------|---|--|
| ETC error counter   | Due to external reasons such as interference or network cable falling off, the ESC itself detects a communication error.  | <ol style="list-style-type: none"> <li>1. Check whether the system power supply is abnormal</li> <li>2. Check whether the network cable is good.</li> <li>3. Check whether the network cable insertion port is firm and reliable</li> </ol>  |
| Module error        | An exception was detected in the extension module itself.   | <ol style="list-style-type: none"> <li>1. Is the external 24V power supply stable and reliable?</li> <li>2. Is there any abnormality in the wiring?</li> <li>3. Check the 0xAxxx diagnostic object dictionary of the module for detailed fault location, see Appendix A for details.</li> </ol>  |
| Device error        | The main reason for the failure is due to an abnormal SPI communication between the connector and the expansion module.   | <ol style="list-style-type: none"> <li>1. Check whether the expansion modules are connected in place and whether the position buckle is fastened.</li> <li>2. Whether the module type matches.</li> <li>3. Whether the power supply system of the system is normal.</li> <li>4. Contact the manufacturer for technical support</li> </ol>  |
| Configuration error | The connection configuration of the expansion module configured by the host is inconsistent with the connection configuration of the actually connected module. | <ol style="list-style-type: none"> <li>1. Delete the manually configured configuration, and use the scanning method to add modules.</li> <li>2. Change the configuration of the host to be consistent with the configuration of the actually connected expansion module.</li> <li>3. After the connector is newly connected to the expansion module, the connector must be powered on and off again.</li> <li>4. Check 0xF100 object dictionary index 2 to check the specific error cause</li> </ol> |

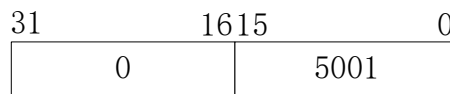
## 8 DETAILED EXPLANATION THE OBJECT DICTIONARY

### 8.1 COMMUNICATION PARAMETERS

| Index     | 0x1000: Device type |              |             |                  |          |
|-----------|---------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Device type         | UDINT        | RO          | NO               | 5001     |

Description:

The lower 15 bits indicate that the device adopts the 5001 protocol. The upper 15 bits are 0, which means that the device sub-module adopts a custom protocol, and all are 0 here.



| Index     | 0x1001: Error Register |              |             |                  |          |
|-----------|------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                   | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Error Register         | USINT        | RO          | NO               | 0        |

Description

0: No fault occurred.

1: A fault has occurred.

| Index     | 0x1008: Device name |              |             |                  |          |
|-----------|---------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Device name         | STRING       | ro          | No               |          |

Description:

The device name is "GL20-RTU-ECT".

| Index     | 0x100A: Software version |              |             |                  |          |
|-----------|--------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                     | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Software version         | STRING       | ro          | No               | -        |

Description:

The description format adopts XX.XX.XX.XX, which means V version, B version, D version and F version respectively.

| Index     | 0x1018: Identity |              |             |                  |            |
|-----------|------------------|--------------|-------------|------------------|------------|
| Sub-index | Name             | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000    | USINT        | RO          | NO               | 4          |
| 1         | Vendor ID        | UDINT        | RO          | NO               | 0x00100000 |
| 2         | Product code     | UDINT        | RO          | NO               |            |
| 3         | Revision         | UDINT        | RO          | NO               | -          |
| 4         | Serial number    | UDINT        | RO          | NO               | -          |

Description:

GL20-RTU-ECT of Product code is: 0x10F41000

| Index     | 0x16nm: RxPDO-Map |              |             |                  |          |
|-----------|-------------------|--------------|-------------|------------------|----------|
| Sub-index | Name              | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000     | USINT        | RW          | NO               | -        |
| 1         | Sub-index 1       | UDINT        | RW          | NO               | -        |
| 2         | Sub-index 2       | UDINT        | RW          | NO               | -        |
| ...       | ...               | ...          | ...         | ...              | ...      |
| 255       | Sub-index 255     | UDINT        | RW          | NO               | -        |

Description:

Referring to Chapter 3, each slot (slot) occupies at most 0x08 RxPDO-Maps, the starting index address of the slot is calculated as  $0x1600 + n * 0x08$ , n represents the position of the slot (slot). The specific number of indexes occupied by the slot and the data amount of sub-indexes included in each index are determined by the type of modules placed in the slot (slot). See Appendix A of Chapter 6 for the allocation of PDOs for different types of modules.

| Index     | 0x1Anm: TxPDO-Map |              |             |                  |          |
|-----------|-------------------|--------------|-------------|------------------|----------|
| Sub-index | Name              | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000     | USINT        | RW          | NO               | -        |
| 1         | Sub-index 1       | UDINT        | RW          | NO               | -        |
| 2         | Sub-index 2       | UDINT        | RW          | NO               | -        |
| ...       | ...               | ...          | ...         | ...              | ...      |
| 255       | Sub-index 255     | UDINT        | RW          | NO               | -        |

Description:

Referring to Chapter 3, each slot (slot) occupies at most 0x08 TxPDO-Maps, the starting index address of the slot is calculated as  $0x1A00 + n * 0x08$ , n represents the position of the slot (slot). The specific number of indexes occupied by the slot and the data amount of sub-indexes included in each index are determined by the type of modules placed in the slot (slot). See Appendix A of Chapter 6 for the allocation of PDOs for different types of modules.

| Index     | 0x1C00: Sync manager type |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sync manager type         | USINT        | RO          | NO               | 4        |



|   |               |       |    |    |   |
|---|---------------|-------|----|----|---|
| 1 | Sub-index 001 | UDINT | RO | NO | 1 |
| 2 | Sub-index 002 | UDINT | RO | NO | 2 |
| 3 | Sub-index 003 | UDINT | RO | NO | 3 |
| 4 | Sub-index 004 | UDINT | RO | NO | 4 |

Description:

Indicates how the SM channel is used. SM0 and SM1 are used for mailbox communication, and SM2 and SM3 are used for process data communication.

| Index     | 0x1C12: RxPDO assign |              |             |                  |          |
|-----------|----------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                 | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000        | USINT        | RW          | NO               | -        |
| 1         | Sub-index 001        | UDINT        | RW          | NO               | -        |
| ...       | ...                  | ...          | ...         | ...              | ...      |
| 16        | Sub-index 016        | UDINT        | RW          | NO               | -        |

Description:

Each Sub-index represents a Module's RxPDO allocation

| Index     | 0x1C13: TxPDO assign |              |             |                  |          |
|-----------|----------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                 | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000        | USINT        | RW          | NO               | -        |
| 1         | Sub-index 001        | UDINT        | RW          | NO               | -        |
| ...       |                      |              |             |                  |          |
| 16        | Sub-index 016        | UDINT        | RW          | NO               | -        |

Description:

Each Sub-index represents a Module's TxPDO allocation

| Index     | 0x1C32: SM output parameter |              |             |                  |          |
|-----------|-----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                        | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000               | USINT        | RO          | NO               | 32       |
| 1         | Sync mode                   | UINT         | RW          | NO               | -        |
| 2         | Cycle time                  | UDINT        | RW          | NO               | -        |
| 4         | Sync modes supported        | UINT         | RO          | NO               | -        |
| 5         | Minimum cycle time          | UDINT        | RO          | NO               | -        |
| 6         | Calc and copy time          | UDINT        | RO          | NO               | -        |
| 9         | delay time                  | UDINT        | RO          | NO               | -        |
| 11        | SM event missed counter     | UDINT        | RO          | NO               | -        |
| 32        | Sync error                  | BOOL         | RO          | NO               | -        |

Description:

Please refer to the standard protocol of EtherCAT for usage.

| Index     | 0x1C33:SM input parameter |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 32       |
| 1         | Sync mode                 | UINT         | RO          | NO               | -        |
| 2         | Cycle time                | UINT         | RO          | NO               | -        |
| 4         | Sync modes supported      | UINT         | RO          | NO               | -        |
| 5         | Minimum cycle time        | UINT         | RO          | NO               | -        |
| 6         | Calc and copy time        | UINT         | RO          | NO               | -        |
| 9         | delay time                | UINT         | RO          | NO               | -        |
| 11        | SM event missed counter   | UINT         | RO          | NO               | -        |
| 32        | Sync error                | BOOL         | RO          | NO               | -        |

Description:

Please refer to the standard protocol of EtherCAT for usage.

## 8.2 MANUFACTURER PARAMETERS

| Index     | 0x3010: Port 0 error counter      |              |             |                  |          |
|-----------|-----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                              | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                     | USINT        | RO          | NO               | 4        |
| 1         | Port 0 invalid frame counter      | USINT        | RO          | NO               | -        |
| 2         | Port 0 Rx error counter           | USINT        | RO          | NO               | -        |
| 3         | Port 0 forwarded Rx error counter | USINT        | RO          | NO               | -        |
| 4         | Port 0 lost link counter          | USINT        | RO          | NO               | -        |

Description:

For usage, refer to the ET1100 datasheet.

| Index     | 0x3011: Port 1 error counter      |              |             |                  |          |
|-----------|-----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                              | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                     | USINT        | RO          | NO               | 4        |
| 1         | Port 1 invalid frame counter      | USINT        | RO          | NO               | -        |
| 2         | Port 1 Rx error counter           | USINT        | RO          | NO               | -        |
| 3         | Port 1 forwarded Rx error counter | USINT        | RO          | NO               | -        |
| 4         | Port 1 lost link counter          | USINT        | RO          | NO               | -        |

Description:

For usage, refer to the ET1100 datasheet.

| Index | 0x3012:ESC error counter |  |  |  |  |
|-------|--------------------------|--|--|--|--|
|-------|--------------------------|--|--|--|--|

| Sub-index | Name                               | Type of data | Access type | Can it be mapped | Defaults |
|-----------|------------------------------------|--------------|-------------|------------------|----------|
| 0         | Sub-index 000                      | USINT        | RO          | NO               | 4        |
| 1         | ECAT Processing unit error counter | USINT        | RO          | NO               | -        |
| 2         | PDI error cunter                   | USINT        | RO          | NO               | -        |
| 3         | Watchdog counter process data      | USINT        | RO          | NO               | -        |
| 4         | Watchdog counter PDI               | USINT        | RO          | NO               | -        |

Description:

For usage, refer to the ET1100 datasheet.

| Index     | 0x3016: Station address       |              |             |                  |          |
|-----------|-------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                          | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                 | USINT        | RO          | NO               | 4        |
| 1         | Rotary switches value         | UINT         | RO          | NO               | 0        |
| 2         | Configuration station address | UINT         | RO          | NO               | 0        |
| 3         | Configuration station alias   | UINT         | RO          | NO               | 0        |
| 4         | Alias in eeprom               | UINT         | RW          | NO               | 0        |

Description:

Sub-index 1:Rotary switches value(reserved)

Sub-index 2:Configuration station address(Site address, read the value of ET1100 register 0x0010/0x0011)

Sub-index 3:Configuration station alias(Site alias, read the value of ET1100 register 0x0012/0x0013)

Sub-index 4:Alias in eeprom(Stored site aliases, locally saved site aliases)

## 0x6nnn:Module Inputs

Description: Indicates the PDO parameters of the module, see Appendix A for details.

## 0x7nnn:ModuleOutputs

Description: Indicates the PDO parameters of the module, see Appendix A for details.

## 0x8nnn:Configuration Area

Description: Indicates the configuration parameters of the module (written by the master), see Appendix A for details.

## 0xAxxx: Diagnostics

Description: Indicates the diagnostic information of the module, see Appendix A for details.

| Index     | 0xF000: Module Device Profile |              |             |                  |          |
|-----------|-------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                          | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                 | USINT        | RO          | NO               | 2        |
| 1         | Index distance                | UINT         | RO          | NO               | 0x40     |
| 2         | Maximum number of modules     | UINT         | RO          | NO               | 16       |

Description:

Sub-index 1: Index distance (represents the maximum number of object dictionaries occupied by each module, here is 16#40)

Sub-index 2: Maximum number of modules (indicates the maximum number of modules that can be connected, here is 16 modules)

| Index     | 0xF010:Module Profile List |              |             |                  |          |
|-----------|----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                       | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000              | USINT        | RO          | NO               | -        |
| 1         | Module 1 Profile           | UDINT        | RO          | NO               | 0        |
| 2         | Module 2 Profile           | UDINT        | RO          | NO               | 0        |
| ...       | ...                        | ...          | ...         | ...              | ...      |

Description:

The modules connected by the connector are all custom protocols, so the sub-indexes of the object dictionary are all 0.

| Index     | 0xF030:Configured Module Ident List |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                       | USINT        | RW          | NO               | -        |
| 1         | Download Module 1 Ident             | UDINT        | RW          | NO               | -        |
| 2         | Download Module 2 Ident             | UDINT        | RW          | NO               | -        |
| ...       | ...                                 | ...          | ...         | ...              | ...      |
| 16        | Download Module 16 Ident            | UDINT        | RW          | NO               | -        |

Description:

It is used by the master station to issue the device identification code of the module in each slot.

| Index     | 0xF050: Detected Module Ident List |              |             |                  |          |
|-----------|------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                               | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                      | USINT        | RO          | NO               | -        |
| 1         | Module 1 Ident                     | UDINT        | RO          | NO               | -        |
| 2         | Module 2 Ident                     | UDINT        | RO          | NO               | -        |
| ...       | ...                                | ...          | ...         | ...              | ...      |
| 16        | Module 16 Ident                    | UDINT        | RO          | NO               | -        |

Description:

After the connector module is powered on and self-tested, the device identification code that automatically identifies the actually connected local module is written into the object dictionary.

| Index     | 0xF100: Device Status |              |             |                  |          |
|-----------|-----------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                  | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Device status         | USINT        | RO          | NO               | 0        |
| 1         | LBusStatus            | UINT         | RO          | YES              | 0        |
| 2         | Cfg Fault ID          | UINT         | RO          | YES              | 0        |

Description:

### Sub-index 1: LBus Status Expansion Module Status

| status value | definition                                   | Remark |
|--------------|--|--------|
| 0x01         | local bus initialization                     |        |
| 0x02         | Local bus pre-operational state              |        |
| 0x04         | Local bus safe operating state               |        |
| 0x08         | local bus operating status                   |        |
| 0x10         | Safe operation to operational state          |        |
| 0x20         | Operating to safe operating state transition |        |
| 0x80         | local bus error                              |        |

### Sub-index 2: Cfg Fault ID Configuration Configuration Error ID

| ID     | definition   | Remark |
|--------|--|--------|
| 0x0000 | Consistent configuration   |        |
| 0x1000 | Expansion module not scanned   |        |
| 0x1001 | The configuration module is redundant with the actual scan module              |        |
| 0x1002 | The configuration configuration module is less than the actual scan module     |        |
| 0x1003 | The configuration module type is inconsistent with the actual scan module type |        |

| Index     | 0xF110: Device Diagnostics |              |             |                  |          |
|-----------|----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                       | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000              | USINT        | RO          | NO               | 2        |
| 1         | ErrorSolt1                 | UDINT        | RO          | NO               |          |
| 2         | ErrorSolt2                 | UDINT        | RO          | NO               |          |

Description: The actual slot of the faulty module, each digit represents an expansion module, 0: the expansion module has no fault, 1: the expansion module is faulty

Sub-index 1: ErrorSolt1 (position 0-31 of the faulty module in this group of modules).

Sub-index 2: ErrorSolt2 (positions 32-63 of the faulty module in this group of modules). (Reserved)



| Index     | 0xF800: Device configuration data |              |             |                  |          |
|-----------|-----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                              | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index000                      | USINT        | RO          | NO               | 2        |
| 1         | Unused                            | USINT        | RW          | NO               | 0        |
| 2         | Slave and module error run state  | USINT        | RW          | NO               | 0        |
| 3         | EtherCAT communication error mode | USINT        | RW          | NO               | 1        |
| 4         | ESC error counter behavior        | USINT        | RW          | NO               | 0        |

Description:

Sub-index 2: Slave and module Error run state

| bit    | Description  |
|--------|--|
| Bit7-0 | How the Expansion Module behaves when it is wrong<br>0: self-processing (keep current state)<br>1: stop output |

Sub-index 3: ECT Communication error mode (state machine processing method after ECT connector Port0 is disconnected)

| bit    | Description   |
|--------|---|
| Bit7-0 | ECT module Port0 disconnection ECT state machine processing method<br>0: Automatically switch according to the state type, if it is the op state, switch to the preop state.<br>1: If the current mode is OP state, keep it |

Sub-index 4: ESC error counter behavior (the way the ET1100 detects an error)

| bit    | Description   |
|--------|---|
| Bit7-0 | ESC module internal error counter has counting processing method<br>0: no alarm<br>1: Alarm |

| Index     | 0xFB00 : Control word |              |             |                  |          |
|-----------|-----------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                  | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Control word          | UINT         | RW          | YES              | 0        |

Description:

| bit  | Description   |
|------|---|
| Bit0 | Expansion Module State Machine Control Bits<br>0: Automatic control according to EtherCAT state machine<br>1: Forcibly stop the operation of the expansion module |
|      |   |

## 9 APPENDIX A EXTENSION MODULE OBJECT DICTIONARY DEFINITION

### 9.1 GL20-1600 INTRODUCTION

**Name:** DI16 Module

**Module category:** Digital Input

**Module ID:** 0x10F41010

The GL20 modules of the 1600xxx series are 16 digital inputs

#### 9.1.1 PROCESS DATA

Map data:

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x1A00+0x08*n$ :

| Index     | 0x1A00+0x08*n: 1600ND TPDO bit mapping |              |             |                  |            |
|-----------|--|--------------|-------------|------------------|------------|
| Sub-index | Name                                   | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                          | USINT        | RO          | NO               | 16         |
| 1         | Sub-index 001                          | UDINT        | RO          | NO               | 0x6xx00101 |
| 2         | Sub-index 002                          | UDINT        | RO          | NO               | 0x6xx00201 |
| 3         | ...                                    | ...          | ...         | ...              | ...        |
| 16        | Sub-index 016                          | UDINT        | RO          | NO               | 0x6xx01001 |

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x1A01+0x08*n$ :

| Index     | 0x1A01+0x08*n: 1600ND TPDO byte mapping |              |             |                  |            |
|-----------|---|--------------|-------------|------------------|------------|
| Sub-index | Name                                    | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                           | USINT        | RO          | NO               | 2          |
| 1         | Sub-index 001                           | UDINT        | RO          | NO               | 0x6xx00108 |
| 2         | Sub-index 002                           | UDINT        | RO          | NO               | 0x6xx00208 |

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x1A02+0x08*n$ :

| Index     | 0x1A02+0x08*n: 1600ND TPDO word mapping |              |             |                  |            |
|-----------|---|--------------|-------------|------------------|------------|
| Sub-index | Name                                    | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                           | USINT        | RO          | NO               | 1          |
| 1         | Sub-index 001                           | UDINT        | RO          | NO               | 0x6xx00110 |

Process data:

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x6000+0x40*n$ :

| Index     | 0x6000+0x40*n: 1600ND Input |              |             |                  |          |
|-----------|-----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                        | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000               | USINT        | RO          | NO               | 2        |
| 1         | Digital input CH0-8bit      | USINT        | RO          | YES              | 0        |
| 2         | Digital input CH1-8bit      | USINT        | RO          | YES              | 0        |

## 9.1.2 CONFIGURATION DATA

For the module in slot n (n=0...62), the index is 0x8000+0x40\*n:

| Index     | 0x8000+0x40*n: 1600NDFilter time |              |             |                  |          |
|-----------|----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                             | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                    | USINT        | RO          | NO               | 2        |
| 1         | Digital input Filter timeCH0     | UINT         | RO          | NO               | 0x04     |
| 2         | Digital input Filter timeCH1     | UINT         | RO          | NO               | 0x04     |

The 1600 module input filter parameters have a total of 11 options. 10 bits to indicate the filter time. Each bit indicates a different time. If the bit is at 0 it means no filtering and the maximum filtering time is 128ms. The meaning of the bit position is shown in the following table. If several bits are active, the highest bit is selected (if the parameter is set to 0x300, both bit 9 and bit 8 are set, and bit 9 is selected, i.e. the filter time is 128ms):

| Bit              | 0    | 1   | 2 | 3 | 4 | 5 | 6  | 7  | 8  | 9   |
|------------------|------|-----|---|---|---|---|----|----|----|-----|
| Filter time (ms) | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |

## 9.1.3 DIAGNOSTIC DATA

For the module in slot n (n=0...16), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 1600Diagnosis        |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Number of Diagnostics 1600          | USINT        | RO          | NO               | 3        |
| 1         | 1600 Module Diagnostics information | UINT         | RO          | NO               | 0        |
| 2         | 1600 CH0 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 3         | 1600 CH1 Diagnostics information    | UINT         | RO          | NO               | 0        |

Description: The digital input module has no fault information temporarily

## 9.2 GL20-0016 INTRODUCTION

**Name:** DO16 Module

**Module category:** Digital Output

**Module ID:** 0x10F41020

The modules GL20-0016xxx series are 16 digital outputs.

### 9.2.1 PROCESS DATA

**Map data:**

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x1600+0x08*n$ :

| Index     | 0x1600+0x08*n: 0016XX RPDO bit mapping |              |             |                  |            |
|-----------|--|--------------|-------------|------------------|------------|
| Sub-index | Name                                   | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                          | USINT        | RO          | NO               | 16         |
| 1         | Sub-index 001                          | UDINT        | RO          | NO               | 0x7xx00101 |
| 2         | Sub-index 002                          | UDINT        | RO          | NO               | 0x7xx00201 |
| 3         | ...                                    | ...          | ...         | ...              | ...        |
| 16        | Sub-index 016                          | UDINT        | RO          | NO               | 0x7xx01001 |

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x1601+0x08*n$ :

| Index     | 0x1601+0x08*n: 0016XX RPDO byte mapping |              |             |                  |            |
|-----------|---|--------------|-------------|------------------|------------|
| Sub-index | Name                                    | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                           | USINT        | RO          | NO               | 2          |
| 1         | Sub-index 001                           | UDINT        | RO          | NO               | 0x7xx00108 |
| 2         | Sub-index 002                           | UDINT        | RO          | NO               | 0x7xx00208 |

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x1602+0x08*n$ :

| Index     | 0x1602+0x08*n: 0016XX RPDO word mapping |              |             |                  |            |
|-----------|---|--------------|-------------|------------------|------------|
| Sub-index | Name                                    | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                           | USINT        | RO          | NO               | 1          |
| 1         | Sub-index 001                           | UDINT        | RO          | NO               | 0x7xx00110 |

Process data:

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x7000+0x40*n$ :

| Index     | 0x7000+0x40*n: 0016XX Output |              |             |                  |          |
|-----------|------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                         | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                | USINT        | RO          | NO               | 2        |
| 1         | Digital output CH0-8bit      | USINT        | RW          | YES              | 0        |
| 2         | Digital output CH1-8bit      | USINT        | RW          | YES              | 0        |

### 9.2.2 CONFIGURATION DATA

For the module in slot  $n$  ( $n=0\dots62$ ), the index is  $0x8000+0x40*n$ :

| Index     | 0x8000+0x40*n: 0016XX Stop mode |              |             |                  |          |
|-----------|---------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                            | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                   | USINT        | RO          | NO               | 2        |
| 1         | Digital output CH0 stop mode    | USINT        | RW          | NO               | 0xFF     |
| 2         | Digital output CH1 stop mode    | USINT        | RW          | NO               | 0xFF     |

**Sub-index 1: Digital output CH0 stop mode (Sub-index 2 uses the same sub-index 1)**

|        |   |
|--------|---|
| Bit0-7 | Output mode when stopped, each bit corresponds to an output port<br>0: keep the current output state<br>1: By default 8001 object dictionary value output |
|--------|---|

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| Index     | 0x8001+0x40*n: 0016XX Stop value |              |             |                  |          |
|-----------|----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                             | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                    | USINT        | RO          | NO               | 2        |
| 1         | Digital output CH0 stop value    | USINT        | RW          | NO               | 0        |
| 2         | Digital output CH1 stop value    | USINT        | RW          | NO               | 0        |

**Sub-index 1: Digital output CH0 stop value (Sub-index 2 uses the same sub-index 1)**

|        |  |
|--------|--|
| Bit0-7 | Stop output preset value. Each bit corresponds to an output port preset value<br>0: Output OFF<br>1: Output ON |
|--------|--|

### 9.2.3 DIAGNOSTIC DATA

For the module in slot n (n=0...16), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 0016 Diagnostics     |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Number of Diagnostics 0016          | USINT        | RO          | NO               | 3        |
| 1         | 0016 Module Diagnostics information | UINT         | RO          | NO               | 0        |
| 2         | 0016 CH0 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 3         | 0016 CH1 Diagnostics information    | UINT         | RO          | NO               | 0        |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B

## 9.3 GL20-4AD INTRODUCTION

**Name:** 4AD Module

**Module category:** Analog Input

**Module ID:** 0x10F41030

GL20-4AD module is 4 channel analog input remote module. Use external 24VDC power supply, support voltage, current input mode, resolution up to 16 bits. Also input range level is optional.

### 9.3.1 PROCESS DATA

Map data:

For the module in slot n (n=0...62), the index is  $0x1A02+0x08*n$ :

| Index     | 0x1A02+0x08*n: 4AD TPDO word mapping |              |             |                  |            |
|-----------|--------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                        | USINT        | RO          | NO               | 4          |
| 1         | Sub-index 001                        | UDINT        | RO          | NO               | 0x6xx00110 |
| 2         | Sub-index 002                        | UDINT        | RO          | NO               | 0x6xx00210 |
| 3         | Sub-index 003                        | UDINT        | RO          | NO               | 0x6xx00310 |
| 4         | Sub-index 004                        | UDINT        | RO          | NO               | 0x6xx00410 |

Process data:

For the module in slot n (n=0...62), the index is  $0x6000+0x40*n$ :

| Index     | 0x6000+0x40*n: 4AD Input |              |             |                  |          |
|-----------|--------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                     | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000            | USINT        | RO          | NO               | 4        |
| 1         | Analog input CH0-16bit   | UINT         | RO          | YES              | 0        |
| 2         | Analog input CH1-16bit   | UINT         | RO          | YES              | 0        |
| 3         | Analog input CH2-16bit   | UINT         | RO          | YES              | 0        |
| 4         | Analog input CH3-16bit   | UINT         | RO          | YES              | 0        |

## 9.3.2 CONFIGURATION DATA

For the module in slot n (n=0...62), the index is 0x8000+0x40\*n:

| Index     | 0x8000+0x40*n: 4AD Mode |              |             |                  |            |
|-----------|-------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                    | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000           | USINT        | RO          | NO               | 4          |
| 1         | Analog input CH0-mode   | USINT        | RW          | NO               | 0x80 (128) |
| 2         | Analog input CH1-mode   | USINT        | RW          | NO               | 0x80 (128) |
| 3         | Analog input CH2-mode   | USINT        | RW          | NO               | 0x80 (128) |
| 4         | Analog input CH3-mode   | USINT        | RW          | NO               | 0x80 (128) |

**Sub-index 1: Analog input CH0-mode (sub-index 2, 3, 4 use the same sub-index 1)**

|        |   |
|--------|---|
| Bit0-3 | CH0 conversion method<br>0: -10V...10V<br>1: 0V...10V<br>2: -5V...5V<br>3: 0V...5V<br>4: 1V...5V<br>5: -20mA...20mA<br>6: 0mA...20mA<br>7: 4mA...20mA |
| Bit4   | Reserved (add other voltage and current conversion methods)   |
| Bit5   | CH0 digital range<br>0: ±20000<br>1: ±32000   |
| Bit6   | Reserved  |
| Bit7   | Ch0 channel enable<br>0: Disabled<br>1: Enabled   |

Digital to analog comparison table

|                      | Input range  | Digital value  | Input limit range  | Limit digital value             |
|----------------------|--------------|----------------|--------------------|---------------------------------|
| Analog voltage input | -10V...10V   | -20000...20000 | -10.24V...10.24V   | -20400...20400 (-32640...32640) |
|                      | 0V...10V     | 0...20000      | -0.5V...10.24V     | -1000...20400 (-1600...32640)   |
|                      | -5V...5V     | -20000...20000 | -5.12V...5.12V     | -20400...20400 (-32640...32640) |
|                      | 0V...5V      | 0...20000      | -0.25V...5.12V     | -1000...20400 (-1600...32640)   |
|                      | 1V...5V      | 0...20000      | 0.8V...5.12V       | -1000...20400 (-1600...32640)   |
| Analog current input | -20mA...20mA | -20000...20000 | -20.56mA...20.56mA | -20400...20400 (-32640...32640) |
|                      | 0mA...20mA   | 0...20000      | -1mA...20.56mA     | -1000...20400 (-1600...32640)   |
|                      | 4mA...20mA   | 0...20000      | 3.2mA...20.56mA    | -1000...20400 (-1600...32640)   |

In 0V...10V, 0V...5V, 1V...5V, 0mA...20mA, 4mA...20mA The corresponding code value of exceeding the lower limit is -200, only less than -200It is considered that the lower limit is exceeded, which is greater than 20000 For the upper limit, other modes As long as it exceeds the rated range, it is considered to exceed the upper and lower limits. Exceeding the limit data is considered to overflow or underflow.

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| Index     | 0x8001+0x40*n: 4ADFilter |              |             |                  |          |
|-----------|--------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                     | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000            | USINT        | RO          | NO               | 4        |
| 1         | Analog input CH0-Filter  | USINT        | RW          | NO               | 0x08     |
| 2         | Analog input CH1-Filter  | USINT        | RW          | NO               | 0x08     |
| 3         | Analog input CH2-Filter  | USINT        | RW          | NO               | 0x08     |
| 4         | Analog input CH3-Filter  | USINT        | RW          | NO               | 0x08     |

**Sub-index 1: Analog input CH0-Filter(Sub-index 2, 3, 4 use the same sub-index 1)**

| bit    | Description                   |
|--------|-------------------------------|
| Bit7-0 | Ch0 channel filter parameters |

For the module in slot n (n=0...62), the index is 0x8002+0x40\*n:

| Index     | 0x8002+0x40*n: 4ADDetect |              |             |                  |          |
|-----------|--------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                     | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000            | USINT        | RO          | NO               | 4        |
| 1         | Analog input CH0-Detect  | USINT        | RW          | NO               | 0        |
| 2         | Analog input CH1-Detect  | USINT        | RW          | NO               | 0        |
| 3         | Analog input CH2-Detect  | USINT        | RW          | NO               | 0        |
| 4         | Analog input CH3-Detect  | USINT        | RW          | NO               | 0        |

**Sub-index 1: Analog input CH0-Detect(Sub-index 2, 3, 4 use the same sub-index 1)**

| bit    | Description  |
|--------|--|
| Bit0   | Ch0 peak hold function. Read and store the maximum value on the analog input<br>0: Disable 1:Enable                                |
| Bit1   | Ch0 disconnection detection function. It detects when the cable is broken. It only works in the 4-20mA mode<br>0: Disable 1:Enable |
| Bit2   | Ch0 overrun flag. It detects when the analog signal exceeds the upper limit and lower limit<br>0: Disable 1:Enable                 |
| Bit7-3 | Reserved   |

### 9.3.3 DIAGNOSTIC DATA

For the module in slot n (n=0...16), the index is 0xA000+0x40\*n:



| Index     | 0xA000+0x40*n: 4ADDiagnosis        |              |             |                  |          |
|-----------|------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                               | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Number of Diagnostics 4AD          | USINT        | RO          | NO               | 5        |
| 1         | 4AD Module Diagnostics information | UINT         | RO          | NO               | 0        |
| 2         | 4AD CH0 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 3         | 4AD CH1 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 4         | 4AD CH2 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 5         | 4AD CH3 Diagnostics information    | UINT         | RO          | NO               | 0        |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B

## 9.4 GL20-4DA INTRODUCTION

**Name:** 4DA Module

**Module category:** Analog Out

**Module ID:** 0x10F41040

GL20-4DA module is 4Channel analog output remote module. Use external 24VDC power supply, support voltage and current output mode, resolution can reach 16 bits, and output range level can be selected at the same time.

### 9.4.1 PROCESS DATA

Map data:

For the module in slot n (n=0...62), the index is 0x1602+0x08\*n:

| Index     | 0x1602+0x08*n: 4DA RPDO word mapping |              |             |                  |            |
|-----------|--------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                        | USINT        | RO          | NO               | 4          |
| 1         | Sub-index 001                        | UDINT        | RO          | NO               | 0x7xx00110 |
| 2         | Sub-index 002                        | UDINT        | RO          | NO               | 0x7xx00210 |
| 3         | Sub-index 003                        | UDINT        | RO          | NO               | 0x7xx00310 |
| 4         | Sub-index 004                        | UDINT        | RO          | NO               | 0x7xx00410 |

Process data:

For the module in slot n (n=0...62), the index is 0x7000+0x40\*n:

| Index     | 0x7000+0x40*n: 4DA Output |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4        |
| 1         | Analog output CH0-16bit   | UINT         | RO          | YES              | 0        |
| 2         | Analog output CH1-16bit   | UINT         | RO          | YES              | 0        |
| 3         | Analog output CH2-16bit   | UINT         | RO          | YES              | 0        |
| 4         | Analog output CH3-16bit   | UINT         | RO          | YES              | 0        |

### 9.4.2 CONFIGURATION DATA

For the module in slot n (n=0...62), the index is 0x8000+0x40\*n:

| Index     | 0x8000+0x40*n: 4DAMODE |              |             |                  |          |
|-----------|------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                   | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000          | USINT        | RO          | NO               | 4        |
| 1         | Analog output CH0-mode | USINT        | RW          | NO               | 0x80     |
| 2         | Analog output CH1-mode | USINT        | RW          | NO               | 0x80     |
| 3         | Analog output CH2-mode | USINT        | RW          | NO               | 0x80     |
| 4         | Analog output CH3-mode | USINT        | RW          | NO               | 0x80     |

**Sub-index 1: Analog output CH0-mode(Sub-index 2, 3, 4 use the same sub-index 1)**

| Bit    | Description  |
|--------|--|
| Bit3-0 | CH0 conversion method<br>0: -10V...10V<br>1: 0V...10V<br>2: -5V...5V<br>3: 0V...5V<br>4: 1V...5V<br>5: 0mA...20mA<br>6: 4mA...20mA |
| Bit4   | Reserved (add other voltage and current conversion methods)  |
| Bit5   | 0: ±20000<br>1: ±32000   |
| Bit6   | Reserved   |
| Bit7   | Ch0 channel enable<br>0: Disabled<br>1: Enabled  |

Different measurement ranges have different corresponding digital ranges. For details, please refer to the following analog to digital comparison table:

|                       | Output range | Digital value  | Output limit range | Limit digital value             |
|-----------------------|--------------|----------------|--------------------|---------------------------------|
| Analog voltage output | -10V...10V   | -20000...20000 | -11V...11V         | -22000...22000 (-32767...32767) |
|                       | 0V...10V     | 0...20000      | -0.5V...10.5V      | -1000...21000 (-1600...32767)   |
|                       | -5V...5V     | -20000...20000 | -5.5V...5.5V       | -22000...22000 (-32767...32767) |
|                       | 0V...5V      | 0...20000      | -0.25V...5.25V     | -1000...21000 (-1600...32767)   |
|                       | 1V...5V      | 0...20000      | 0.8V...5.2V        | -1000...21000 (-1600...32767)   |
| Analog current output | 0mA...20mA   | 0...20000      | 0mA...21mA         | 0...21000 (-1600...32767)       |
|                       | 4mA...20mA   | 0...20000      | 3.2mA...20.8mA     | -1000...21000 (-1600...32767)   |

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| Index     | 0x8001+0x40*n: 4DA Stop mode |              |             |                  |          |
|-----------|------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                         | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                | USINT        | RO          | NO               | 4        |
| 1         | Analog CH0-Stop mode         | USINT        | RW          | NO               | 0        |
| 2         | Analog CH1-Stop mode         | USINT        | RW          | NO               | 0        |
| 3         | Analog CH2-Stop mode         | USINT        | RW          | NO               | 0        |
| 4         | Analog CH3-Stop mode         | USINT        | RW          | NO               | 0        |

**Sub-index 1: Analog CH0- Stop mode (Sub-index 2, 3, 4 use the same sub-index 1)**

|        |  |
|--------|--|
| Bit7-0 | Ch0 Input status in channel stop mode<br>0: Clear output to 0<br>1: Keep output<br>2: Output sub-index 4 to set the preset value |
|--------|--|

For the module in slot n (n=0...62), the index is 0x8002+0x40\*n:

| Index     | 0x8002+0x40*n: 4DA Stop value |              |             |                  |          |
|-----------|-------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                          | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                 | USINT        | RO          | NO               | 4        |
| 1         | Analog CH0-Stop value         | UINT         | RW          | NO               | 0        |
| 2         | Analog CH1-Stop value         | UINT         | RW          | NO               | 0        |
| 3         | Analog CH2-Stop value         | UINT         | RW          | NO               | 0        |
| 4         | Analog CH3-Stop value         | UINT         | RW          | NO               | 0        |

**Sub-index 1: Analog CH0- Stop value (Sub-index 2, 3, 4 use the same sub-index 1)**

| Bit     | Description                                     |
|---------|---|
| Bit15-0 | Ch0In channel stop mode output value after stop |

### 9.4.3 DIAGNOSTIC DATA

For the module in slot n (n=0...16), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 4DA Diagnostics     |              |             |                  |          |
|-----------|------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                               | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Number of Diagnostics 4DA          | USINT        | RO          | NO               | 5        |
| 1         | 4DA Module Diagnostics information | UINT         | RO          | NO               | 0        |
| 2         | 4DA CH0 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 3         | 4DA CH1 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 4         | 4DA CH2 Diagnostics information    | UINT         | RO          | NO               | 0        |
| 5         | 4DA CH3 Diagnostics information    | UINT         | RO          | NO               | 0        |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B

## 9.5 GL20-0008R INTRODUCTION

**Name:** DO08 Module

**Module category:** Relay

**Module ID:** 0x10F41023

GL20-0008R module is 8 point relay output DO module.

### 9.5.1 PROCESS DATA

Map data:

For the module in slot n (n=0...62), the index is  $0x1600+0x08*n$ :

| Index     | 0x1600+0x08*n: 0008R RPDO bit mapping |              |             |                  |            |
|-----------|---------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                  | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                         | USINT        | RO          | NO               | 8          |
| 1         | Sub-index 001                         | UDINT        | RO          | NO               | 0x7xx00101 |
| 2         | Sub-index 002                         | UDINT        | RO          | NO               | 0x7xx00201 |
| 3         | ...                                   | ...          | ...         | ...              | ...        |
| 8         | Sub-index 008                         | UDINT        | RO          | NO               | 0x7xx00801 |

For the module in slot n (n=0...62), the index is  $0x1601+0x08*n$ :

| Index     | 0x1601+0x08*n: 0008R RPDO byte mapping |              |             |                  |            |
|-----------|--|--------------|-------------|------------------|------------|
| Sub-index | Name                                   | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                          | USINT        | RO          | NO               | 1          |
| 1         | Sub-index 001                          | UDINT        | RO          | NO               | 0x7xx00108 |

Process data:

For the module in slot n (n=0...62), the index is  $0x7000+0x40*n$ :

| Index     | 0x7000+0x40*n: 0008R Output |              |             |                  |          |
|-----------|-----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                        | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000               | USINT        | RO          | NO               | 1        |
| 1         | Digital output CH0-8bit     | USINT        | RW          | YES              | 0        |

### 9.5.2 CONFIGURATION DATA

For the module in slot n (n=0...62), the index is  $0x8000+0x40*n$ :

| Index     | 0x8000+0x40*n: 0008R Stop mode |              |             |                  |          |
|-----------|--------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                           | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                  | USINT        | RO          | NO               | 1        |
| 1         | Digital output CH0 stop mode   | USINT        | RW          | NO               | 0xFF     |

**Sub-index 1: Digital output CH0 stop mode**

|        |  |
|--------|--|
| Bit0-7 | Output mode when stopped, each bit corresponds to an output port<br>0: keep the current output state<br>1: By default 8001object dictionary value output |
|--------|--|

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| Index     | 0x8001+0x40*n: 0008R Stop value |              |             |                  |          |
|-----------|---------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                            | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                   | USINT        | RO          | NO               | 1        |
| 1         | Digital output CH0 stop value   | USINT        | RW          | NO               | 0        |

#### Sub-index 1: Digital output CH0 stop value

|        |  |
|--------|--|
| Bit0-7 | Stop outputting preset value, each bit corresponds to an output port preset value<br>0: Output OFF<br>1: Output ON |
|--------|--|

### 9.5.3 DIAGNOSTIC DATA

For the module in slot n (n=0...16), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 0008R Diagnostics    |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Number of Diagnostics 0016          | USINT        | RO          | NO               | 3        |
| 1         | 0016 Module Diagnostics information | UINT         | RO          | NO               | 0        |
| 2         | 0016 CH0 Diagnostics information    | UINT         | RO          | NO               | 0        |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B

## 9.6 GL20-INTRODUCTION TO 0808

**Name:** DO08 Module

**Module category:** Digital Outputs And Inputs

**Module ID:** 0x10F41060

GL20-0808xxx modules are 8 point input DI module and 8 point output. Hybrid module, includes GL20-0808ETN, GL20-0808ETP.

### 9.6.1 PROCESS DATA

Map data:

For the module in slot n (n=0...62), the index is 0x1A00+0x08\*n:

| Index     | 0x1A00+0x08*n: 0808 TPDO bit mapping |              |             |                  |            |
|-----------|--------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                        | USINT        | RO          | NO               | 8          |
| 1         | Sub-index 001                        | UDINT        | RO          | NO               | 0x6xx00101 |
| 2         | Sub-index 002                        | UDINT        | RO          | NO               | 0x6xx00201 |
| 3         | ...                                  | ...          | ...         | ...              | ...        |
| 8         | Sub-index 008                        | UDINT        | RO          | NO               | 0x6xx00801 |

For the module in slot n (n=0...62), the index is 0x1A01+0x08\*n:

| Index     | 0x1A01+0x08*n: 0808 TPDO byte mapping |              |             |                  |            |
|-----------|---------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                  | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                         | USINT        | RO          | NO               | 1          |
| 1         | Sub-index 001                         | UDINT        | RO          | NO               | 0x6xx00108 |

For the module in slot n (n=0...62), the index is 0x1600+0x08\*n:

| Index     | 0x1600+0x08*n: 0808 RPDO bit mapping |              |             |                  |            |
|-----------|--------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                        | USINT        | RO          | NO               | 8          |
| 1         | Sub-index 001                        | UDINT        | RO          | NO               | 0x7xx00101 |
| 2         | Sub-index 002                        | UDINT        | RO          | NO               | 0x7xx00201 |
| 3         | ...                                  | ...          | ...         | ...              | ...        |
| 8         | Sub-index 008                        | UDINT        | RO          | NO               | 0x7xx00801 |

For the module in slot n (n=0...62), the index is 0x1601+0x08\*n:

| Index     | 0x1601+0x08*n: 0808 RPDO byte mapping |              |             |                  |            |
|-----------|---------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                  | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                         | USINT        | RO          | NO               | 1          |
| 1         | Sub-index 001                         | UDINT        | RO          | NO               | 0x7xx00108 |

Process data:

For the module in slot n (n=0...62), the index is 0x6000+0x40\*n:

| Index     | 0x6000+0x40*n: 0808 Input |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 1        |
| 1         | Digital input CH0-8bit    | USINT        | RO          | YES              | 0        |

For the module in slot n (n=0...62), the index is 0x7000+0x40\*n:

| Index     | 0x7000+0x40*n: 0808 Output |              |             |                  |          |
|-----------|----------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                       | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000              | USINT        | RO          | NO               | 1        |
| 1         | Digital output CH0-8bit    | USINT        | RW          | YES              | 0        |

## 9.6.2 CONFIGURATION DATA

For the module in slot n (n=0...62), the index is 0x8000+0x40\*n:

| Index     | 0x8000+0x40*n: 0808 Filter time |              |             |                  |          |
|-----------|---------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                            | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                   | USINT        | RO          | NO               | 2        |
| 1         | Digital input filter timeCH0    | UINT         | RO          | NO               | 0x04     |

0808 module filter parameters have a total of 11 options, 10 bits are 1 and 0, 0 means no filtering, the maximum filtering time is 128ms, and the meaning of the bit is shown in the table below. If there are multiple bits set, select the highest bit (If the parameter is set to 0x300, both bit9 and bit8 are set, and bit9 is selected, that is, the filter time is 128ms):

| Bit              | 0    | 1   | 2 | 3 | 4 | 5 | 6  | 7  | 8  | 9   |
|------------------|------|-----|---|---|---|---|----|----|----|-----|
| Filter time (ms) | 0.25 | 0.5 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 |

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| Index     | 0x8000+0x40*n: 0808 Stop mode |              |             |                  |          |
|-----------|-------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                          | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                 | USINT        | RO          | NO               | 1        |
| 1         | Digital output CH0 stop mode  | USINT        | RW          | NO               | 0xFF     |

### Sub-index 1: Digital output CH0 stop mode

|        |  |
|--------|--|
| Bit0-7 | Output mode when stopped, each bit corresponds to an output port<br>0: keep the current output state<br>1: By default 8002object dictionary value output |
|--------|--|

For the module in slot n (n=0...62), the index is 0x8002+0x40\*n:

| Index     | 0x8001+0x40*n: 0808 Stop value |              |             |                  |          |
|-----------|--------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                           | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                  | USINT        | RO          | NO               | 1        |
| 1         | Digital output CH0 stop value  | USINT        | RW          | NO               | 0        |
|           |                                |              |             |                  |          |



## Sub-index 1: Digital output CH0 stop value

|        |  |
|--------|--|
| Bit0-7 | Stop outputting preset value, each bit corresponds to an output port preset value<br>0: Output OFF<br>1: Output ON |
|--------|--|

### 9.6.3 DIAGNOSTIC DATA

For the module in slot n (n=0...16), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 0808 Diagnostics      |              |             |                  |          |
|-----------|--------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Number of Diagnostics 0016           | USINT        | RO          | NO               | 3        |
| 1         | 0808 Module Diagnostics information  | UINT         | RO          | NO               | 0        |
| 2         | 0808 CH0-In Diagnostics information  | UINT         | RO          | NO               | 0        |
| 3         | 0808 CH0-Out Diagnostics information | UINT         | RO          | NO               | 0        |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B

## 9.7 GL20-4PT INTRODUCTION

**Name:** 4PT Module

**Module category:** Temperature measurement

**Module ID:** 0x 10F41050

The main function of the GL20-4PT module is to realize the temperature acquisition of the thermal resistance. The module is configured with 4 independent channels, which can be used for simultaneous acquisition. The configuration of each channel is independent and does not interference with each other.

### 9.7.1 PROCESS DATA

Map data:

For the module in slot n (n=0...62), the index is 0x1A03+0x08\*n:

| Index     | 0x1A03+0x08*n: 4PT TPDO word mapping |              |             |                  |            |
|-----------|--------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                        | USINT        | RO          | NO               | 4          |
| 1         | Sub-index 001                        | UDINT        | RO          | NO               | 0x6xx00120 |
| 2         | Sub-index 002                        | UDINT        | RO          | NO               | 0x6xx00220 |
| 3         | Sub-index 003                        | UDINT        | RO          | NO               | 0x6xx00320 |
| 4         | Sub-index 004                        | UDINT        | RO          | NO               | 0x6xx00420 |

For the module in slot n (n=0...62), the index is 0x6000+0x40\*n:

| Index     | 0x6000+0x40*n: 4PT Input |   |             |                  |            |
|-----------|--------------------------|---|-------------|------------------|------------|
| Sub-index | Name                     | Type of data  | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000            | USINT   | RO          | NO               | 4          |
| 1         | Sensor input CH0-32bit   | REAL (32 bits, displays 0.1°C or the corresponding Fahrenheit ) | RO          | YES              | 0x00000000 |
| 2         | Sensor input CH1-32bit   | REAL  | RO          | YES              | 0x00000000 |
| 3         | Sensor input CH2-32bit   | REAL  | RO          | YES              | 0x00000000 |
| 4         | Sensor input CH3-32bit   | REAL  | RO          | YES              | 0x00000000 |

Description:

Detected PT RTD temperature sampling input value, each sub-index corresponds to a channel.

## 9.7.2 CONFIGURATION DATA

For the module in slot n (n=0...62), the index is 0x8000+0x40\*n:

| Index     | 0x8000+0x40*n: 4PT Sampling Time |              |             |                  |          |
|-----------|----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                             | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                    | USINT        | RO          | NO               | 4        |
| 1         | Sampling Time                    | USINT        | RW          | NO               | 0x0000   |
| 2         | Reserve0                         | USINT        | RW          | NO               | 0x0000   |
| 3         | Reserve1                         | USINT        | RW          | NO               | 0x0000   |
| 4         | Reserve2                         | USINT        | RW          | NO               | 0x0000   |

Description:

|               |  |
|---------------|--|
| Sampling Time | <b>0:50ms (default)</b><br>1:125ms<br>2:250ms<br>3:500ms<br>4:1000ms |
|---------------|--|

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| Index     | 0x8001+0x40*n: 4PT Temperature unit |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                       | USINT        | RW          | NO               | 0x0000   |
| 1         | Temperature Unit                    | USINT        | RW          | NO               | 0x0000   |
| 2         | Reserve0                            | USINT        | RW          | NO               | 0x0000   |
| 3         | Reserve1                            | USINT        | RW          | NO               | 0x0000   |
| 4         | Reserve2                            | USINT        | RW          | NO               | 0x0000   |

Description:

|                  |  |
|------------------|--|
| Temperature Unit | <b>0: Celsius (default)</b><br>1: Fahrenheit |
|------------------|--|

For the module in slot n (n=0...62), the index is 0x8002+0x40\*n:

| Index     | 0x8002+0x40*n: 4PT Mode |              |             |                  |          |
|-----------|-------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                    | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000           | USINT        | RO          | NO               | 4        |
| 1         | Sensor input CH0-mode   | USINT        | RW          | NO               | 0xC1     |
| 2         | Sensor input CH1-mode   | USINT        | RW          | NO               | 0xC1     |
| 3         | Sensor input CH2-mode   | USINT        | RW          | NO               | 0xC1     |
| 4         | Sensor input CH3-mode   | USINT        | RW          | NO               | 0xC1     |

Description:

Temperature detection channel enable and thermal resistance sensor type setting. The default value is **0xC1**, corresponding to enable **Pt100** mode, and when a fault occurs a fault error will be reported and shutdown will be triggered. The setting rules are as follows:

| Bit    | Description  |
|--------|--|
| Bit0-5 | <b>Thermal resistance sensor model</b><br>0: Reserved<br>1: <b>Pt100 (default)</b><br>2: Pt500<br>3: Pt1000<br>4: Reserved<br>5: Reserved<br>6: Cu100<br>7: KTY84<br>8: NTC5K<br>9: NTC10K |
| Bit6   | <b>Fault error report</b><br>0: Continue running<br>1: <b>Stop (default)</b>   |
| Bit7   | <b>Channel enable</b><br>0: Disabled<br>1: <b>Enabled (default)</b>  |

For the module in slot n (n=0...62), the index is 0x8003+0x40\*n:

| Index     | 0x8003+0x40*n: 4PT Filter |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4        |
| 1         | Sensor input CH0-Filter   | USINT        | RW          | NO               | 0x05     |
| 2         | Sensor input CH1-Filter   | USINT        | RW          | NO               | 0x05     |
| 3         | Sensor input CH2-Filter   | USINT        | RW          | NO               | 0x05     |
| 4         | Sensor input CH3-Filter   | USINT        | RW          | NO               | 0x05     |

Description:

Temperature detection channel input filter parameters. The range is 0-100. The unit is s, and the default value is 0x05 (5s).

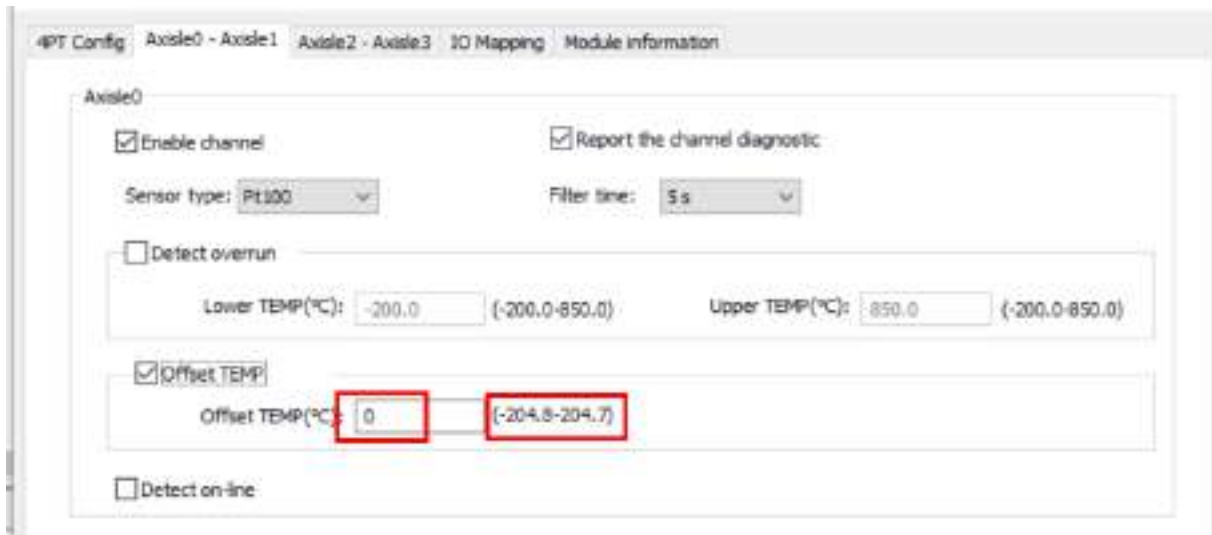
For the module in slot n (n=0...62), the index is 0x8004+0x40\*n:

| Index     | 0x8004+0x40*n: 4PT Offset |              |             |                  |            |
|-----------|---------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-Offset   | INT16        | RW          | NO               | 0x00000000 |
| 2         | Sensor input CH1-Offset   | INT16        | RW          | NO               | 0x00000000 |
| 3         | Sensor input CH2-Offset   | INT16        | RW          | NO               | 0x00000000 |
| 4         | Sensor input CH3-Offset   | INT16        | RW          | NO               | 0x00000000 |

Description:

The temperature offset parameter of the temperature detection channel, the range is -204.8...204.7, the unit is 0.1°C temperature unit (or equivalent in degrees Fahrenheit). The default value is 0.

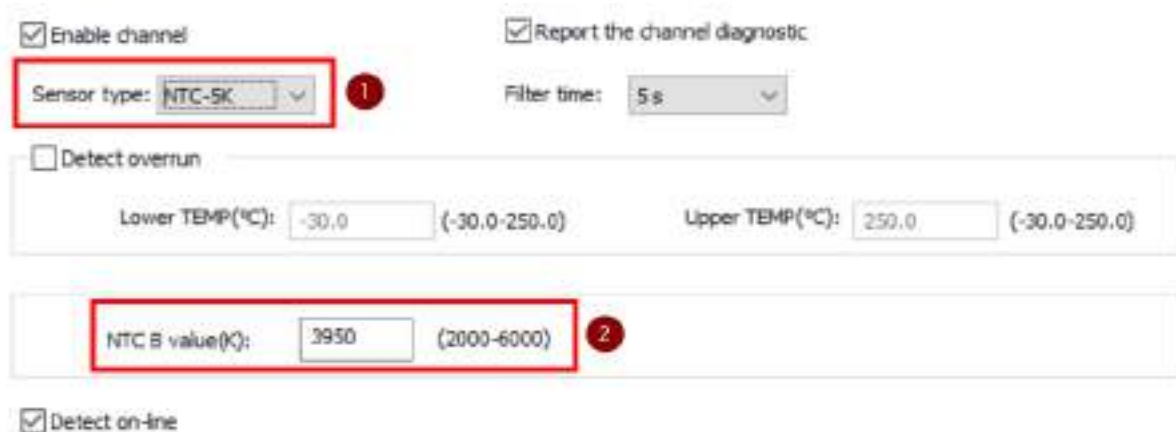
For example to set -204.8°, the set value for the SDO should be -2048.



When **NTC-5K**, **NTC-10K** type sensors are used, object 0x8004 refers to the value of NTC material constant B

This item is displayed only when **NTC-5K** or **NTC-10K** is selected, and the temperature offset and temperature offset enable selection are not displayed at the same time. Temperature offset remains when other sensor types are selected.

Input data range: 2000...6000. The default value is 3950. As shown below.



For the module in slot n (n=0...62), the index is 0x8005+0x40\*n:

| Index     | 0x8005+0x40*n: 4PT Upper limit |              |             |                  |            |
|-----------|--------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                           | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                  | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-UpLimit       | INT16        | RW          | NO               | 0x00002134 |
| 2         | Sensor input CH1-UpLimit       | INT16        | RW          | NO               | 0x00002134 |
| 3         | Sensor input CH2-UpLimit       | INT16        | RW          | NO               | 0x00002134 |
| 4         | Sensor input CH3-UpLimit       | INT16        | RW          | NO               | 0x00002134 |

Description:



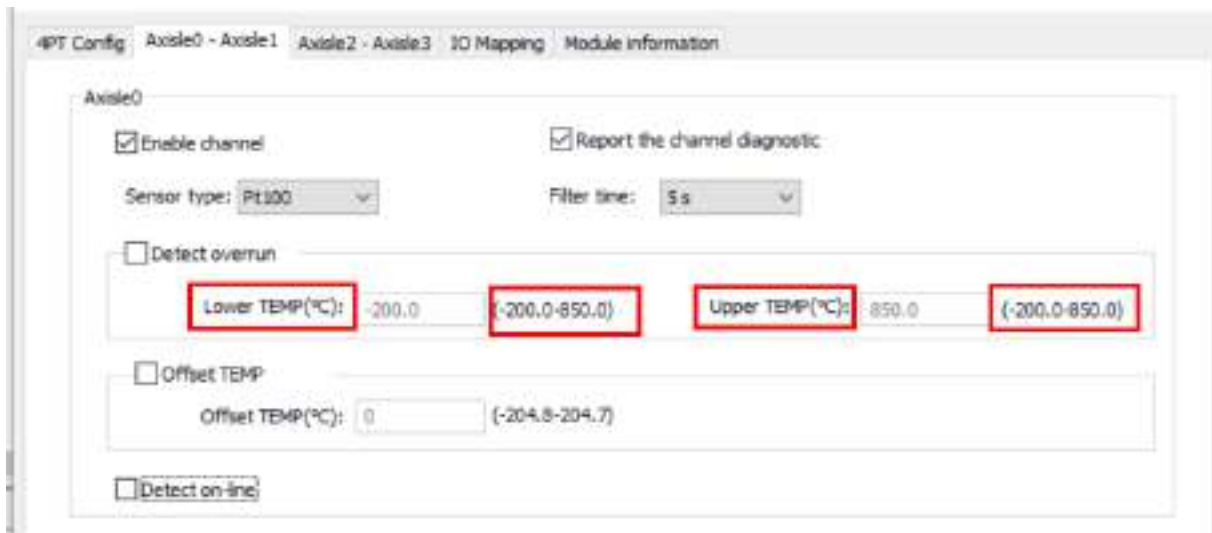
Upper temperature limit of the temperature detection channel. The maximum and minimum values are the temperature setting range of the current mode, and the unit is 0.1 temperature units. The default value is the maximum value of the temperature setting range of the current mode.

**Pt100, Pt500, Pt1000** The lower limit is -200°, the actual configuration is -2000. The upper limit is 850° and the actual configuration is 8500.

**Cu100** The lower limit is -50°. The actual configuration is -500. The upper limit is 150°. The actual configuration is 1500.

**KTY84** sets the upper and lower temperature limits. The lower limit is -40° and the actual configuration is -400. The upper limit is 300°. The actual configuration is 3000.

As shown in the picture: the interface is set to -200°, and the actual SDO is actually -2000(or the corresponding Fahrenheit Celsius).



For the module in slot n (n=0...62), the index is 0x8006+0x40\*n:

| Index     | 0x8006+0x40*n: 4PT Down Limit |              |             |                  |            |
|-----------|-------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                          | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                 | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-Down Limit   | INT16        | RW          | NO               | 0xFFFFF830 |
| 2         | Sensor input CH1-Down Limit   | INT16        | RW          | NO               | 0xFFFFF830 |
| 3         | Sensor input CH2-Down Limit   | INT16        | RW          | NO               | 0xFFFFF830 |
| 4         | Sensor input CH3-Down Limit   | INT16        | RW          | NO               | 0xFFFFF830 |

Description:

The temperature lower limit parameter of the temperature detection channel. The range is the temperature setting range of the current mode, and the unit is the temperature unit of 0.1°C (or the corresponding Fahrenheit Celsius). The default value is the minimum value of the current mode temperature setting range.

For the module in slot n (n=0...62), the index is 0x8007+0x40\*n:

| Index     | 0x8007+0x40*n: 4PT Detect |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4        |
| 1         | Sensor input CH0-Detect   | USINT        | RW          | NO               | 0x0000   |
| 2         | Sensor input CH1-Detect   | USINT        | RW          | NO               | 0x0000   |
| 3         | Sensor input CH2-Detect   | USINT        | RW          | NO               | 0x0000   |
| 4         | Sensor input CH3-Detect   | USINT        | RW          | NO               | 0x0000   |

Description:

Temperature detection input function and diagnostic option parameters. The default value is 0x0000, temperature offset disabled, disconnection detection disabled, and over-limit detection disabled. The setting values are as follows:

| Bit    | Description  |
|--------|--|
| Bit0   | Temperature offset function:<br>0: Disabled<br>1: Enabled      |
| Bit1   | Disconnection detection function:<br>0: Disabled<br>1: Enabled |
| Bit2   | Over-limit detection function:<br>0: Disabled<br>1: Enabled    |
| Bit7-3 | Reserved   |

### 9.7.3 DIAGNOSTIC DATA

Diagnostic data:

For the module in slot n (n=0...62), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 4PT Diagnostics data |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                       | USINT        | RO          | NO               | 5        |
| 1         | Module Error Code                   | UINT         | RO          | NO               | 0x0000   |
| 2         | Channel Error Code CH0              | UINT         | RO          | NO               | 0x0000   |
| 3         | Channel Error Code CH1              | UINT         | RO          | NO               | 0x0000   |
| 4         | Channel Error Code CH2              | UINT         | RO          | NO               | 0x0000   |
| 5         | Channel Error Code CH3              | UINT         | RO          | NO               | 0x0000   |

Description:

PT RTD input supports module and channel fault detection.

Module exception diagnostic codes are defined as follows:

| Diagnostic code | Fault definition                                  | Solution   |
|-----------------|---|--|
| 0x5003          | The 24V power supply of the module is powered off | Check external power wiring, verify power supply voltage |

The channel exception diagnostic codes are defined as follows:

| Diagnostic code | Fault definition                 | Solution   |
|-----------------|----------------------------------|--|
| 0x6001          | Channel break                    | Check signal wiring  |
| 0x6002          | Channel short circuit            | None   |
| 0x6003          | Channel data exceeds upper limit | Check for proper sensor, wiring, or configuration overruns |
| 0x6004          | Channel data exceeds lower limit | Check for proper sensor, wiring, or configuration overruns |
| 0x6005          | Overflow                         | Out of sensor range  |
| 0x6006          | Underflow                        | Below sensor range   |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B



## 9.8 GL20-4TC INTRODUCTION

**Name:** 4TC Module

**Module category:** Temperature Measurement

**Module ID:** 0x10F41051

The main function of the GL20-4TC module is to achieve thermocouple temperature acquisition. The module is configured with 4 independent channels, which can be used for simultaneous acquisition. The configuration of each channel is independent and does not interference with each other.

### 9.8.1 PROCESS DATA

Map data:

For the module in slot n (n=0...62), the index is 0x1A03+0x08\*n:

| Index     | 0x1A03+0x08*n: 4TC TPDO word mapping |              |             |                  |            |
|-----------|--------------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                                 | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                        | USINT        | RO          | NO               | 4          |
| 1         | Sub-index 001                        | UDINT        | RO          | NO               | 0x6xx00120 |
| 2         | Sub-index 002                        | UDINT        | RO          | NO               | 0x6xx00220 |
| 3         | Sub-index 003                        | UDINT        | RO          | NO               | 0x6xx00320 |
| 4         | Sub-index 004                        | UDINT        | RO          | NO               | 0x6xx00420 |

Process data:

For the module in slot n (n=0...62), the index is 0x6000+0x40\*n:

| Index     | 0x6000+0x40*n: 4TC Input |              |             |                  |            |
|-----------|--------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                     | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000            | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-32bit   | REAL         | RO          | YES              | 0x00000000 |
| 2         | Sensor input CH1-32bit   | REAL         | RO          | YES              | 0x00000000 |
| 3         | Sensor input CH2-32bit   | REAL         | RO          | YES              | 0x00000000 |
| 4         | Sensor input CH3-32bit   | REAL         | RO          | YES              | 0x00000000 |

Description:

Detected TC thermocouple temperature sample input value, each sub-index corresponds to a channel.

### 9.8.2 CONFIGURATION DATA

Configuration Data:

For the module in slot n (n=0...62), the index is 0x8000+0x40\*n:

| Index     | 0x8000+0x40*n: 4TC Sampling Time |              |             |                  |          |
|-----------|----------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                             | Type of data | Access type | Can it be mapped | Defaults |

|   |               |       |    |    |        |
|---|---------------|-------|----|----|--------|
| 0 | Sub-index 000 | USINT | RO | NO | 4      |
| 1 | Sampling Time | USINT | RW | NO | 0x0000 |
| 2 | Reserved      | USINT | RW | NO | 0x0000 |
| 3 | Reserved      | USINT | RW | NO | 0x0000 |
| 4 | Reserved      | USINT | RW | NO | 0x0000 |

Description:

|               |   |
|---------------|---|
| Sampling Time | 0:50ms<br>1:125ms<br>2:250ms<br>3:500ms<br>4:1000ms |
|---------------|---|

For the module in slot n (n=0...62), the index is 0x8001+0x40\*n:

| index     | 0x8001+0x40*n: 4TC Temperature Unit |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                       | USINT        | RW          | NO               | 0x0000   |
| 1         | Temperature Unit                    | USINT        | RW          | NO               | 0x0000   |
| 2         | Reserved                            | USINT        | RW          | NO               | 0x0000   |
| 3         | Reserved                            | USINT        | RW          | NO               | 0x0000   |
| 4         | Reserved                            | USINT        | RW          | NO               | 0x0000   |

Description:

|                  |   |
|------------------|---|
| Temperature Unit | 0:Celsius<br>1: Fahrenheit(Default Celsius) |
|------------------|---|

Configuration Data:

For the module in slot n (n=0...62), the index is 0x8002+0x40\*n:

| Index     | 0x8002+0x40*n: 4TC Mode |              |             |                  |          |
|-----------|-------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                    | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000           | USINT        | RO          | NO               | 4        |
| 1         | Sensor input CH0-mode   | USINT        | RW          | NO               | 0xC0     |
| 2         | Sensor input CH1-mode   | USINT        | RW          | NO               | 0xC0     |
| 3         | Sensor input CH2-mode   | USINT        | RW          | NO               | 0xC0     |
| 4         | Sensor input CH3-mode   | USINT        | RW          | NO               | 0xC0     |

Description:

Temperature detection channel enable and thermocouple sensor type setting. The default value is 0xC0, corresponding to enabling K-type thermocouple. When a fault occurs, a fault error will be reported and the module shutdown will be triggered. The setting rules are as follows:

| Bit    | Description   |
|--------|---|
| Bit0-5 | Thermocouple Sensor Model<br>0: K<br>1: J<br>2: E<br>3: B<br>4: N<br>5: R<br>6: S<br>7: T |
| Bit6   | Fault error report:<br>0: Continue running<br>1: Stop                                     |
| Bit7   | Channel enable:<br>0: Disabled<br>1: Enabled  |

For the module in slot n (n=0...62), the index is 0x8003+0x40\*n:

| Index     | 0x8003+0x40*n: 4TC Filter |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4        |
| 1         | Sensor input CH0-Filter   | USINT        | RW          | NO               | 0x05     |
| 2         | Sensor input CH1-Filter   | USINT        | RW          | NO               | 0x05     |
| 3         | Sensor input CH2-Filter   | USINT        | RW          | NO               | 0x05     |
| 4         | Sensor input CH3-Filter   | USINT        | RW          | NO               | 0x05     |

Description:

The temperature detection channel input filter parameter, the range is 0-100, the unit is s, and the default value is 0x05.

For the module in slot n (n=0...62), the index is 0x8004+0x40\*n:

| Index     | 0x8004+0x40*n: 4TC Offset |              |             |                  |            |
|-----------|---------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-Offset   | INT16        | RW          | NO               | 0x00000000 |
| 2         | Sensor input CH1-Offset   | INT16        | RW          | NO               | 0x00000000 |
| 3         | Sensor input CH2-Offset   | INT16        | RW          | NO               | 0x00000000 |
| 4         | Sensor input CH3-Offset   | INT16        | RW          | NO               | 0x00000000 |

Description:

The temperature offset parameter of the temperature detection channel. The range is -204.8-204.7, the unit is 0.1 temperature unit, and the default value is 0.

For the module in slot n (n=0...62), the index is 0x8005+0x40\*n:

| Index     | 0x8005+0x40*n: 4TC Up Limit |              |             |                  |            |
|-----------|-----------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                        | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000               | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-UpLimit    | INT16        | RW          | NO               | 0x00003584 |
| 2         | Sensor input CH1-UpLimit    | INT16        | RW          | NO               | 0x00003584 |
| 3         | Sensor input CH2-UpLimit    | INT16        | RW          | NO               | 0x00003584 |
| 4         | Sensor input CH3-UpLimit    | INT16        | RW          | NO               | 0x00003584 |

Description:

The temperature upper limit parameter of the temperature detection channel. The range is the temperature setting range of the current mode, the unit is 0.1 temperature unit, and the default value is the maximum value of the temperature setting range of the current mode.

For the module in slot n (n=0...62), the index is 0x8006+0x40\*n:

| Index     | 0x8006+0x40*n: 4TC Down Limit |              |             |                  |            |
|-----------|-------------------------------|--------------|-------------|------------------|------------|
| Sub-index | Name                          | Type of data | Access type | Can it be mapped | Defaults   |
| 0         | Sub-index 000                 | USINT        | RO          | NO               | 4          |
| 1         | Sensor input CH0-DownLimit    | INT16        | RW          | NO               | 0xFFFFF574 |
| 2         | Sensor input CH1-DownLimit    | INT16        | RW          | NO               | 0xFFFFF574 |
| 3         | Sensor input CH2-DownLimit    | INT16        | RW          | NO               | 0xFFFFF574 |
| 4         | Sensor input CH3-DownLimit    | INT16        | RW          | NO               | 0xFFFFF574 |

Description:

The temperature lower limit parameter of the temperature detection channel. The range is the temperature setting range of the current mode, the unit is 0.1 temperature unit, and the default value is the minimum value of the temperature setting range of the current mode.

For the module in slot n (n=0...62), the index is 0x8007+0x40\*n:

| Index     | 0x8007+0x40*n: 4TC Detect |              |             |                  |          |
|-----------|---------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                      | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000             | USINT        | RO          | NO               | 4        |
| 1         | Sensor input CH0-Detect   | UINT         | RW          | NO               | 0x0000   |
| 2         | Sensor input CH1-Detect   | UINT         | RW          | NO               | 0x0000   |
| 3         | Sensor input CH2-Detect   | UINT         | RW          | NO               | 0x0000   |
| 4         | Sensor input CH3-Detect   | UINT         | RW          | NO               | 0x0000   |

Description:

Temperature detection input function and diagnostic option parameters, the default value is 0x0000, prohibit temperature offset, prohibit disconnection detection, prohibit over-limit detection. The setting rules are as follows:

| Bit    | Description  |
|--------|--|
| Bit0   | Temperature offset function:<br>0: Disabled<br>1: Enabled      |
| Bit1   | Disconnection detection function:<br>0: Disabled<br>1: Enabled |
| Bit2   | Over-limit detection function:<br>0: Disabled<br>1: Enabled    |
| Bit7-3 | Reserved   |

### 9.8.3 DIAGNOSTIC DATA

Diagnostic data:

For the module in slot n (n=0...62), the index is 0xA000+0x40\*n:

| Index     | 0xA000+0x40*n: 4TC Diagnostics data |              |             |                  |          |
|-----------|-------------------------------------|--------------|-------------|------------------|----------|
| Sub-index | Name                                | Type of data | Access type | Can it be mapped | Defaults |
| 0         | Sub-index 000                       | USINT        | RO          | NO               | 5        |
| 1         | Module Error Code                   | UINT         | RO          | NO               | 0x0000   |
| 2         | Channel Error Code CH0              | UINT         | RO          | NO               | 0x0000   |
| 3         | Channel Error Code CH1              | UINT         | RO          | NO               | 0x0000   |
| 4         | Channel Error Code CH2              | UINT         | RO          | NO               | 0x0000   |
| 5         | Channel Error Code CH3              | UINT         | RO          | NO               | 0x0000   |

Description:

The TC thermocouple input supports module and channel fault detection.

Module exception diagnostic codes are defined as follows:

| Diagnostic code | Fault definition                                  | Solution   |
|-----------------|---|--|
| 0x5003          | The 24V power supply of the module is powered off | Check external power wiring, verify power supply voltage |

The channel exception diagnostic codes are defined as follows:

| Diagnostic code | Fault definition      | Solution            |
|-----------------|-----------------------|---------------------|
| 0x6001          | Channel break         | Check signal wiring |
| 0x6002          | Channel short circuit |                     |

|        |                                  |   |
|--------|----------------------------------|---|
| 0x6003 | Channel data exceeds upper limit | Check sensors, wiring, or configuration data ranges           |
| 0x6004 | Channel data exceeds lower limit | Check sensors, wiring, or configure configuration data ranges |
| 0X6005 | Overflow                         | Out of sensor range   |
| 0X6006 | Underflow                        | Below sensor range  |

**NOTE:** For the detailed meaning of the fault code, please refer to Appendix B

## 10 APPENDIX B GL20 SLAVE FAULT ALLOCATION TABLE

| Fault classification                             | Diagnostic alarms (fault overview)   | Error code |
|--|--|------------|
| Communication protocol conversion module failure | The number of expansion modules scanned is 0   | 0x1000     |
|  | The number of configured IO modules is more than the actual number of IO modules scanned | 0x1001     |
|  | The number of configured IO modules is less than the actual number of IO modules scanned | 0x1002     |
|  | The configuration IO module type is inconsistent with the actual scanned IO module type  | 0x1003     |
|  | IO module configuration failed   | 0x1004     |
|  | IO module status switch failed   | 0x1005     |
|  | IO module disconnected   | 0x1006     |
| IO module failure                                | Power supply overvoltage   | 0x5001     |
|  | Power supply undervoltage  | 0x5002     |
|  | The external 24V power supply of the module is powered off                               | 0x5003     |
|  | Chip temperature overheating   | 0x5011     |
|  | Module ADC device failure  | 0x5021     |
|  | Module DAC device failure  | 0x5022     |
|  | Reference channel failure  | 0x5031     |
| IO channel failure                               | Channel break  | 0x6001     |
|  | Channel short circuit  | 0x6002     |
|  | Channel data exceeds the upper limit   | 0x6003     |
|  | Channel data exceeds lower limit   | 0x6004     |
|  | Channel data overflow  | 0x6005     |
|  | Channel data underflow   | 0x6006     |

## 10.1 APPENDIX C AL STATUS CODE

### Register ESC 0x134 AL status code

| Code   | Description                        | Current state (state change)         | Result status     |
|--------|------------------------------------|--------------------------------------|-------------------|
| 0x0000 | No errors                          | Any                                  | current state + E |
| 0x0001 | Unspecified error                  | Any                                  | any + E           |
| 0x0002 | No memory                          | Any                                  | any + E           |
| 0x0011 | Invalid request state change       | I->S, I->O, P->O<br>O->B, S->B, P->B | current state + E |
| 0x0012 | Unknown request status             | Any                                  | current state + E |
| 0x0013 | Boot is not supported              | I->B                                 | I + E             |
| 0x0014 | No valid firmware                  | I->P                                 | I + E             |
| 0x0015 | Invalid mailbox configuration      | I->B                                 | I + E             |
| 0x0016 | Invalid mailbox configuration      | I->P                                 | I + E             |
| 0x0017 | Invalid sync manager configuration | P->S,S->O                            | current state + E |
| 0x0018 | No valid input                     | O,S->O                               | S + E             |
| 0x0019 | No valid output                    | O,S->O                               | S + E             |
| 0x001A | Sync error                         | O,S->O                               | S + E             |
| 0x001B | Synchronization Manager Watchdog   | O,S                                  | S + E             |
| 0x001C | Invalid sync manager type          | O,S,P->S                             | S + E             |
| 0x001D | Invalid output configuration       | O,S,P->S                             | S + E             |
| 0x001E | Invalid input configuration        | O,S,P->S                             | S + E             |
| 0x001F | Invalid watchdog configuration     | O,S,P->S                             | S + E             |
|        | Slave needs a cold start           | Any                                  | current state + E |
| 0x0021 | Slave requires INIT                | B,P,S,O                              | current state + E |
| 0x0022 | Slave needs PREPOP                 | S,O                                  | S + E, O + E      |
| 0x0023 | Slaves require SAFEOP              | O                                    | O + E             |
| 0x0024 | Invalid input mapping              | P->S                                 | P + E             |
| 0x0025 | Invalid output map                 | P->S                                 | P + E             |
| 0x0026 | Inconsistent settings              | P->S                                 | P + E             |
| 0x0027 | FreeRun is not supported           | P->S                                 | P + E             |
| 0x0028 | SyncMode not supported             | P->S                                 | P + E             |
| 0x0029 | FreeRun requires 3 buffer modes    | P->S                                 | P + E             |
| 0x002A | Background watchdog                | S,O                                  | P + E             |
| 0x002B | No valid input and output          | O,S->O                               | S + E             |
| 0x002C | Fatal sync error                   | O                                    | S + E             |
| 0x002D | No sync errors                     | S->O                                 | S + E             |
| 0x0030 | Invalid DC SYNCH configuration     | O,S->O,P->S                          | P + E, S + E      |
| 0x0031 | Invalid DC lock configuration      | O,S->O,P->S                          | P + E, S + E      |
| 0x0032 | PLL error                          | O,S->O                               | S + E             |
| 0x0033 | DC sync IO error                   | O,S->O                               | S + E             |
| 0x0034 | DC sync timeout error              | O,S->O                               | S + E             |
| 0x0035 | DC invalid sync cycle time         | P->S                                 | P + E             |
| 0x0036 | DC Sync0 cycle time                | P->S                                 | P + E             |
| 0x0037 | DC sync1 cycle time                | P->S                                 | P + E             |
| 0x0041 | MBX_AOE                            | B,P,S,O                              | current state + E |
| 0x0042 | MBX_EOE                            | B,P,S,O                              | current state + E |
| 0x0043 | MBX_COE                            | B,P,S,O                              | current state + E |
| 0x0044 | MBX_FOE                            | B,P,S,O                              | current state + E |
| 0x0045 | MBX_SOE                            | B,P,S,O                              | current state + E |
| 0x004F | MBX_VOE                            | B,P,S,O                              | current state + E |





|                      |                        |     |         |
|----------------------|------------------------|-----|---------|
| 0x0050               | EEPROM no access       | Any | any + E |
| 0x0051               | EEPROM error           | Any | any + E |
| 0x0060               | Slave restarts locally | Any | I       |
| Other codes < 0x8000 | Reserved               |     |         |
| 0x8000-0xFFFF        | Specific supplier      |     |         |

## 11 APPENDIX D SDO ABORD CODE

| Value         | Description   |
|---------------|---|
| 0x05 03 00 00 | Toggle bit does not change  |
| 0x05 04 00 00 | SDO protocol timeout  |
| 0x05 04 00 01 | Invalid or unknown client/server command qualifier  |
| 0x05 04 00 05 | Memory overflow   |
| 0x06 01 00 00 | Unsupported access object   |
| 0x06 01 00 01 | Attempt to read a write-only object   |
| 0x06 01 00 02 | Attempt to write to a read-only object  |
| 0x06 02 00 00 | The object does not exist in the object directory   |
| 0x06 04 00 41 | The object cannot be mapped to PDO  |
| 0x06 04 00 42 | The number and length of mapped objects will exceed the PDO length                                |
| 0x06 04 00 43 | Reasons for general parameter incompatibility   |
| 0x06 04 00 47 | General internal incompatibility in the device  |
| 0x06 06 00 00 | Access failed due to hardware error   |
| 0x06 07 00 10 | Data type mismatch, service parameter length mismatch   |
| 0x06 07 00 12 | Data type mismatch, service parameter length is too long  |
| 0x06 07 00 13 | Data type mismatch, service parameter length is too short   |
| 0x06 09 00 11 | Sub-index does not exist  |
| 0x06 09 00 30 | Parameter value out of range (write access only)  |
| 0x06 09 00 31 | The parameter value written is too large  |
| 0x06 09 00 32 | The parameter value written is too small  |
| 0x06 09 00 36 | The maximum value is less than the minimum value  |
| 0x08 00 00 00 | General error   |
| 0x08 00 00 20 | Data cannot be transferred or stored to the application   |
| 0x08 00 00 21 | Due to local control, data cannot be transferred or stored to the application                     |
| 0x08 00 00 22 | Due to the current device state, data cannot be transferred or stored to the app                  |
| 0x08 00 00 23 | The dynamic generation of the object dictionary failed or there is currently no object dictionary |