idt Mekatronik

idt IO-M HSPWS
Technical User Manual

idt Mekatronik

Table of contents

1. Notes

1.1. Structure of the Manual

This manual is organized so that the chapters complement each other.

- **Chapter 2:** Basic safety information.
- **Chapter 3:** Main steps for the installation of the device.
- **Chapter 4:** Technical data.

1.2. Typographic Rules

The following typographic rules are used in this manual:

- **Lists:** Displayed in list format with bullet points.
- **Actions:** Action instructions are indicated by an arrow/triangle in front of them, and the result of the action is shown.
- **Cross-References:** Indicates where additional information on the subject can be found.

1.3. Symbols

Note: This symbol indicates general notes.

Attention! This symbol indicates a safety warning that must be strictly observed.

2. Safety

2.1. Intended Use

The idt IO-M HSPWS serves as a decentralized output module for driving pneumatic, hydraulic, and proportional valves that require high current without straining standard PLC outputs.

2.2. Commissioning

Attention!

- Installation and commissioning procedures must only be carried out by trained specialists.
- Qualified personnel refers to persons who are familiar with the installation and use of the product and possess the necessary qualifications for this activity.
- Damages resulting from unauthorized intervention or improper use will void the manufacturer's warranty and liabilities.
- The operator is responsible for ensuring compliance with applicable safety and accident prevention regulations.

2.3. General Safety Notes

ⓘ Read this User Manual carefully before commissioning.

ⓘ The device must not be used on its own in applications where the safety of persons depends on the function of the device (except for its own STO hardware infrastructure).

ⓘ In the event of unresolvable malfunctions and device errors, the device must be taken out of operation and protected against unauthorized use.

2.4. Hazardous Voltage

⚠ **Attention!** Disconnect all power connections before servicing the equipment.

3. Getting Started

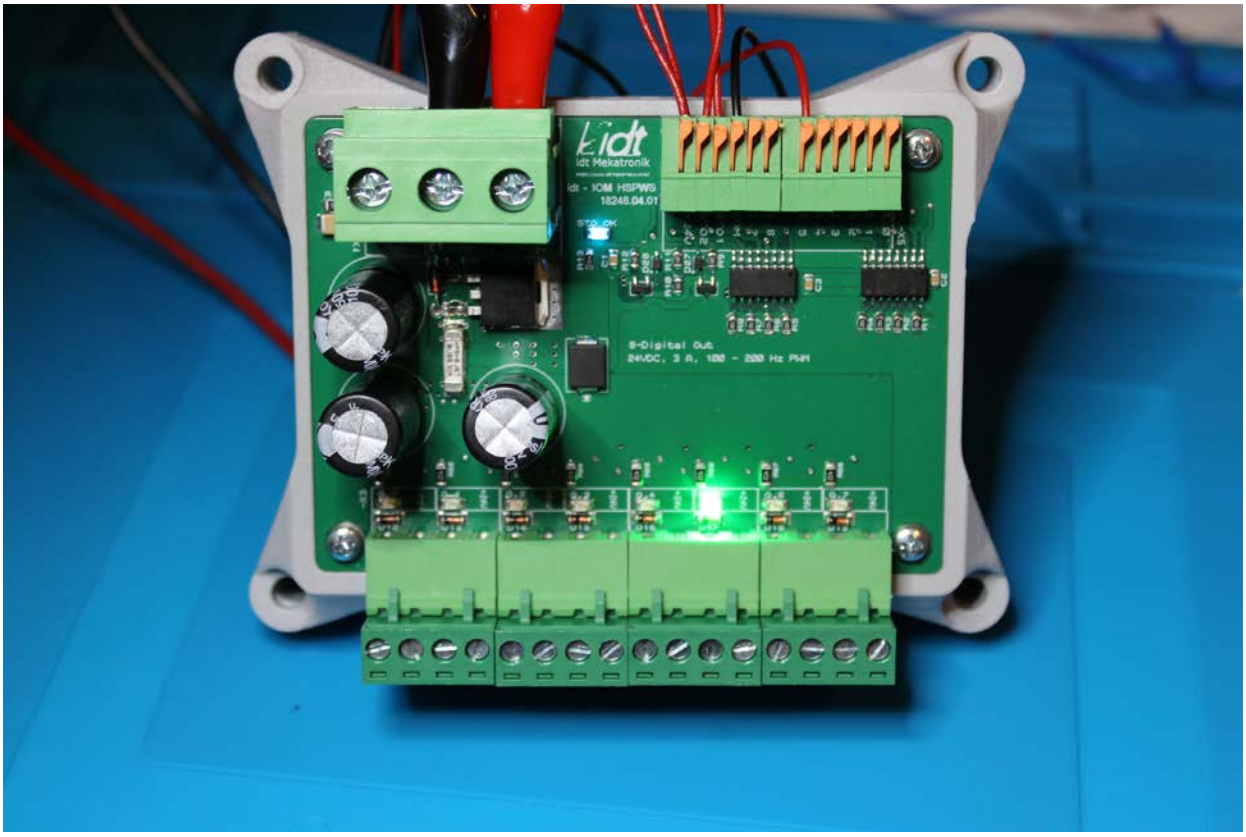

Figure.1

3.1. Mechanical Connection

The module can be mounted inside the panel using two different methods depending on your intended use and infrastructure. The mounting options are described below:

3.1.1. Standard DIN Rail Mounting

It can be quickly attached to a standard 35mm DIN rail using the spring-loaded seating feet located under the device housing. During the assembly and especially the disassembly process, you must flex the spring clip mechanism at the bottom using a flat-blade screwdriver, as shown in **Figure 2.**

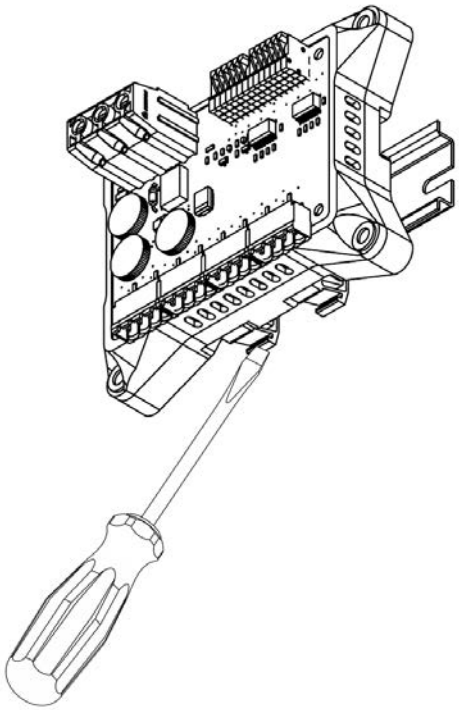

Figure.2

- It is mounted on a standard DIN Rail (35mm) using the self-springing seating feet located under the housing, as shown in **Figure 3.**

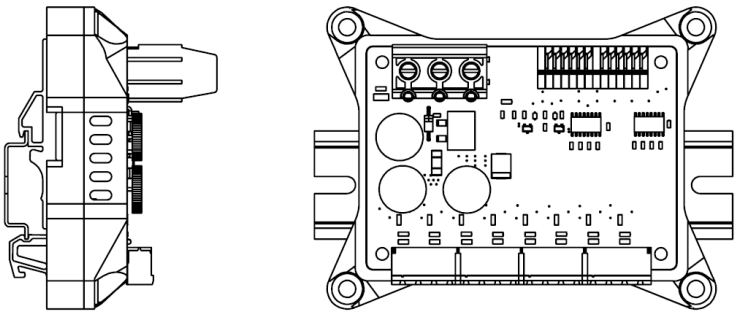

Figure.3

3.1.2. Direct Mounting on Panel Plate

If your system does not have a DIN rail or if a more rigid mounting is preferred, the device can be screwed directly to the panel plate. For this procedure, the 4 pieces of M3x10 mm Phillips head screws on the self-springing seating feet, the dimensions and positions of which are specified in **Figure 4,** must be removed.

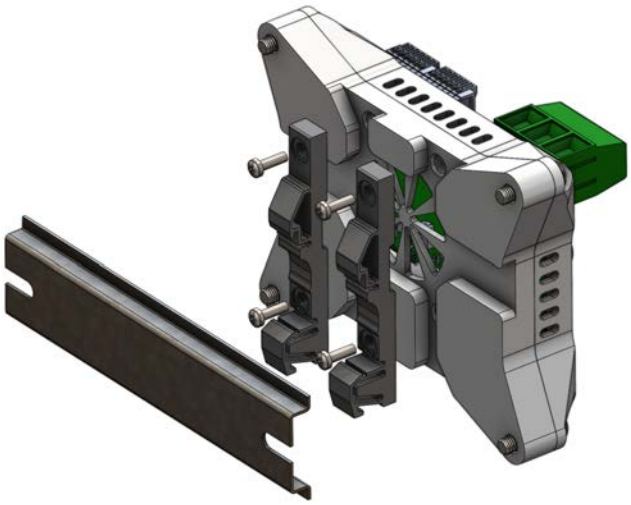

Figure.4

- Fixing must be done using 4 M5 screws through the mounting holes marked in blue at the four corners of the housing, as shown in **Figure 6 and Figure 5,** whose dimensions and positions are specified.

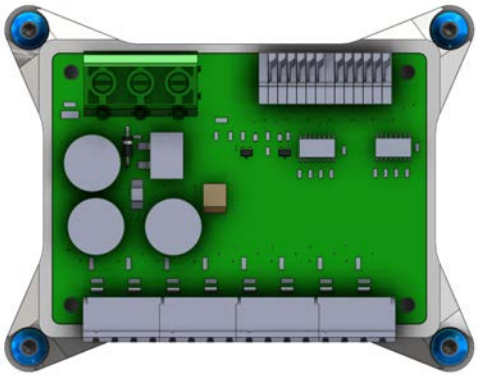

Figure5

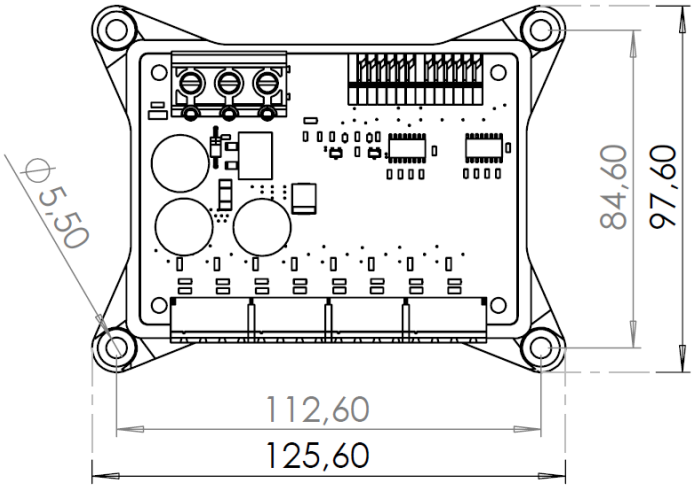

Figure.6

3.2. Electrical Connection

Insulated terminal blocks are used for connections.

3.2.1. Power Supply (Main Input)

The main power supply of the module operates at a nominal voltage of 24VDC. Insulated terminal blocks (Terminal 1: +24VDC, Terminal 2: 0VDC) are used for connections (See Figure 7). The energy provided through this terminal not only feeds the internal control circuits of the module (MCU, optocouplers, etc.); it is also the main energy source for all field loads (valves, relays, contactors, etc.) connected to the module. Therefore, the supply infrastructure must be dimensioned to carry the total current of the field loads.

Current Capacity and Load Distribution

The module hardware is designed to drive high-current loads at industrial standards and is equipped with appropriate protection components:

- **Main Fuse and Maximum Capacity:** There is a 30A capacity SMD type main protection fuse (FU1) at the power input of the device. This value is the absolute maximum limit of the module.
- **Continuous Current Limit (SOA):** In order not to exceed thermal limits and for the system to operate safely, it is recommended to limit the total continuous current drawn by all connected loads simultaneously to a maximum of 24A - 25A levels.
- **Load Per Channel:** When all 8 digital outputs on the board operate simultaneously at full load, drawing an average of 3A current per channel is within safe operating limits.

Power Supply (PSU) Selection and Inrush Current

When selecting the 24VDC power supply (SMPS) to be used in the panel, not only the nominal (continuous) current of the system but also the peak currents (Inrush Current) at the moment of initial start-up must be taken into account:

- **Capacitive Charge Inrush:** At the power input of the module, there is a total capacity bank of 3000uF (3 pieces of 1000uF) to filter voltage fluctuations. When energy is first applied, a high instantaneous current is drawn in the order of milliseconds due to the charging of these capacitors.
- **Inductive Load Inrush:** At the first moment the valve or contactor coils in the field are energized, they draw an inrush current of approximately 1.5 to 2 times their normal holding currents. If all 8 outputs are energized at the same time, the instantaneous load on the power supply will increase significantly.
- **PSU Recommendation:** In order to prevent these peak currents from putting the power supply into protection (hiccup / overload mode); it is mandatory to use an industrial DIN rail type power supply capable of providing a minimum of 30A (720W) continuous current and having a high peak load capability.

Internal Hardware Protections

Against errors that can be made during installation and industrial electrical noises, the module has the following integrated protections:

- **Reverse Polarity Protection:** In case the +24VDC and 0VDC supply cables are connected in reverse, the P-Channel MOSFET (Q1) based protection circuit activates, blocking the reverse current and preventing the device from burning out.

- ***Overcurrent and Short Circuit Protection:*** *The 30A fuse (FU1) on the supply line protects the module components in overload situations. (Note: This main fuse is a hardware component; if it blows, technical service intervention is required.)*
- **Overvoltage (Surge) Protection:** Sudden voltage spikes (transients) that may occur on the line are quickly damped by the 36V TVS Diode (D11) at the power input, ensuring system safety.

⚠ **Electrical Installation Warning (Cable Cross-Section):**

Considering that currents at levels of 25A can pass through the supply terminals (Terminal 1 and 2), it is recommended to use a multi-core industrial copper cable with a minimum cross-section of **2.5 mm² or 4 mm²,** depending on the distance between the power supply and the module. Thin-section cables can cause voltage drops and overheating, creating a fire risk.

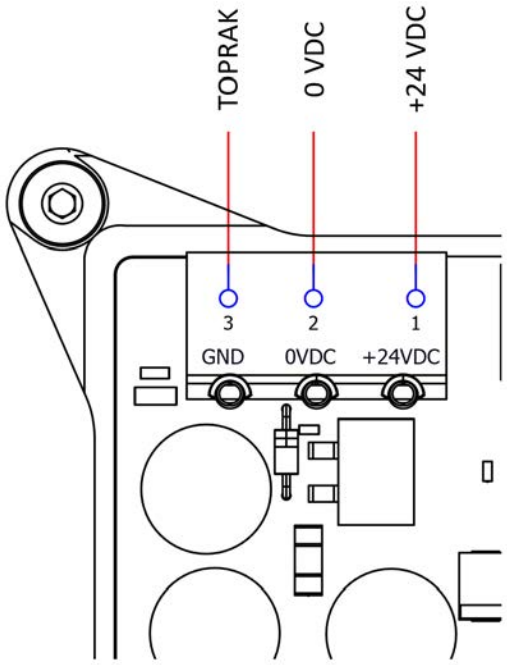

Figure.7

Terminal	Function	Description
+24VDC	+24 V	Module and Valve power supply
0VDC	0 V	Module and Valve grounding (GND)
GND	FE	Functional Grounding (Chassis/Shielding)

3.2.2. Signal Inputs (PLC Direction)

The module has eight digital inputs from I.0 to I.7 (Terminal 4-11). Since these inputs have bidirectional optocoupler isolation, they support both Sink (NPN - Current Sinking) and Source (PNP - Current Sourcing) type wiring diagrams. This flexibility allows different sensor types and switch configurations to be directly connected to the module.
The main factor determining the connection type (Sink or Source) is which potential of the power supply the COM (Terminal 12) pin is connected to.

3.2.2.1. PNP / Current Sourcing (Source) Type Device Connection (Figure 8)

In this connection type, the external device (switch or PNP sensor) connected to the module provides a positive (+) potential (+24VDC) to the digital input terminal when active. In this diagram, the internal structure of the module input behaves as a "Sink" (Current Sinking), but to avoid confusion in the manual, it is recommended to focus on the logic of the device (PNP).

- **Connection Details (According to Figure 8):**
  - **COM (Terminal 12):** Connected to the negative (-) terminal (0V/GND) of the external 24VDC power supply.
  - **Digital Inputs (I.0 - I.7):** Connected to the positive (+) terminal (+24VDC) of the power supply via external switches or PNP type sensor outputs.
- **Operating Principle:** When a switch is closed or a PNP sensor provides an output, the current flowing from the (+) terminal of the power supply enters the relevant digital input (I.x) via the switch/sensor. It passes through the internal optocoupler and returns from the COM terminal to the (-) terminal of the power supply. In this case, the relevant input channel is considered active.

Important Note: The external +24V (Terminal 15), STO1 (Terminal 13), and STO2 (Terminal 14) terminals shown in Figure 7 are independent of the digital input connections and must be used for their own functions.

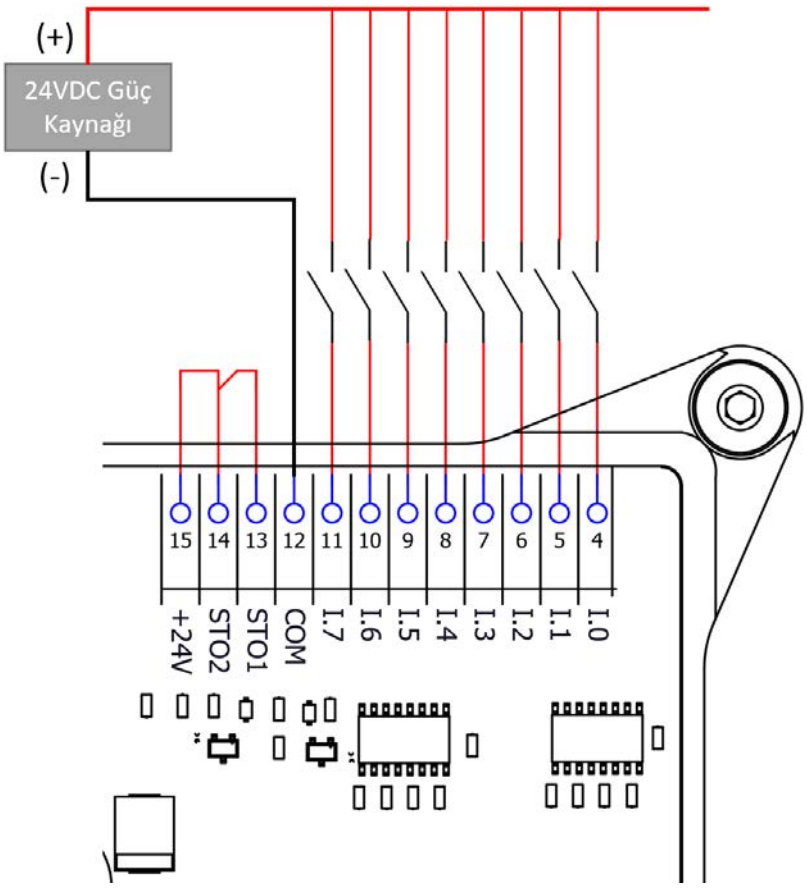

Figure.8

3.2.2.2. NPN / Current Sinking (Sink) Type Device Connection (Figure 9)

In this connection type, the external device (switch or NPN sensor) connected to the module pulls the digital input terminal to the negative (-) potential (0V/GND) pin when active. In this diagram, the internal structure of the module input behaves as a "Source" (Current Sourcing), but to avoid confusion in the manual, it is recommended to focus on the logic of the device (NPN).

- **Connection Details (According to Figure 9):**
  - **COM (Terminal 12):** Connected to the positive (+) terminal (+24VDC) of the external 24VDC power supply.
  - **Digital Inputs (I.0 - I.7):** Connected to the negative (-) terminal (0V/GND) of the power supply via external switches or NPN type sensor outputs.
- **Operating Principle:** When a switch is closed or an NPN sensor provides an output, the current flowing from the (+) terminal of the power supply enters the COM terminal. It passes through the internal optocoupler, exits from the relevant digital input terminal (I.x), and returns to the (-) terminal of the power supply via the switch/sensor. In this case, the relevant input channel is considered active.

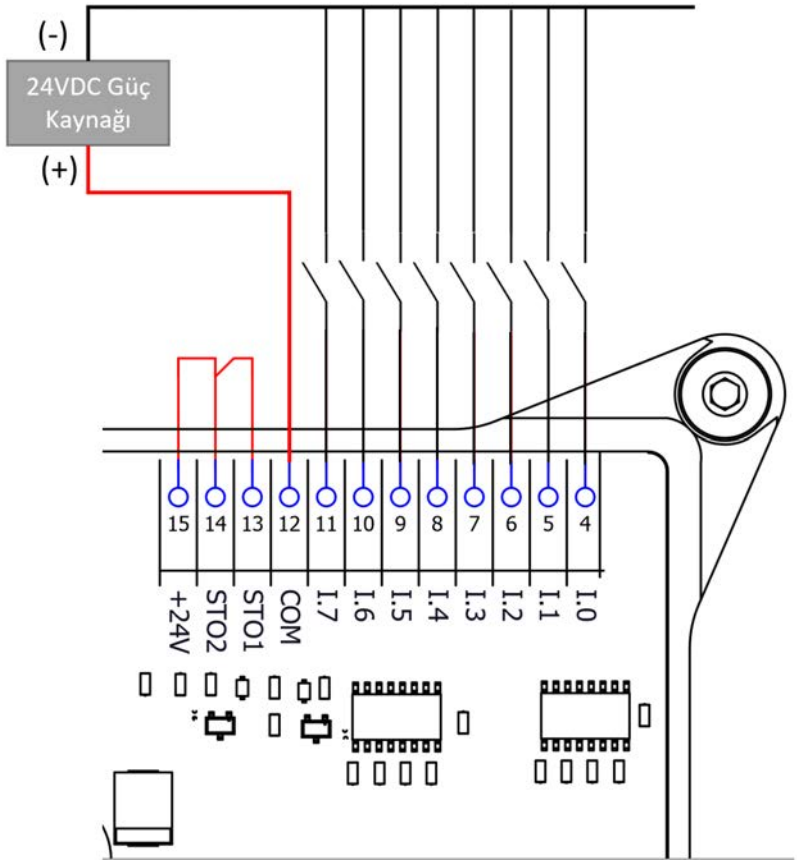

Figure.9

Terminal	Function	Description
I.0 - I.7	Digital Input	+24V trigger signals from the PLC
COM	Common Pin	Common reference (0V) point for PLC signals
STO1 / STO2	Safety Input	Hardware emergency stop (Safe Torque Off) inputs
+24V	Output	Internal +24V supply available for STO inputs

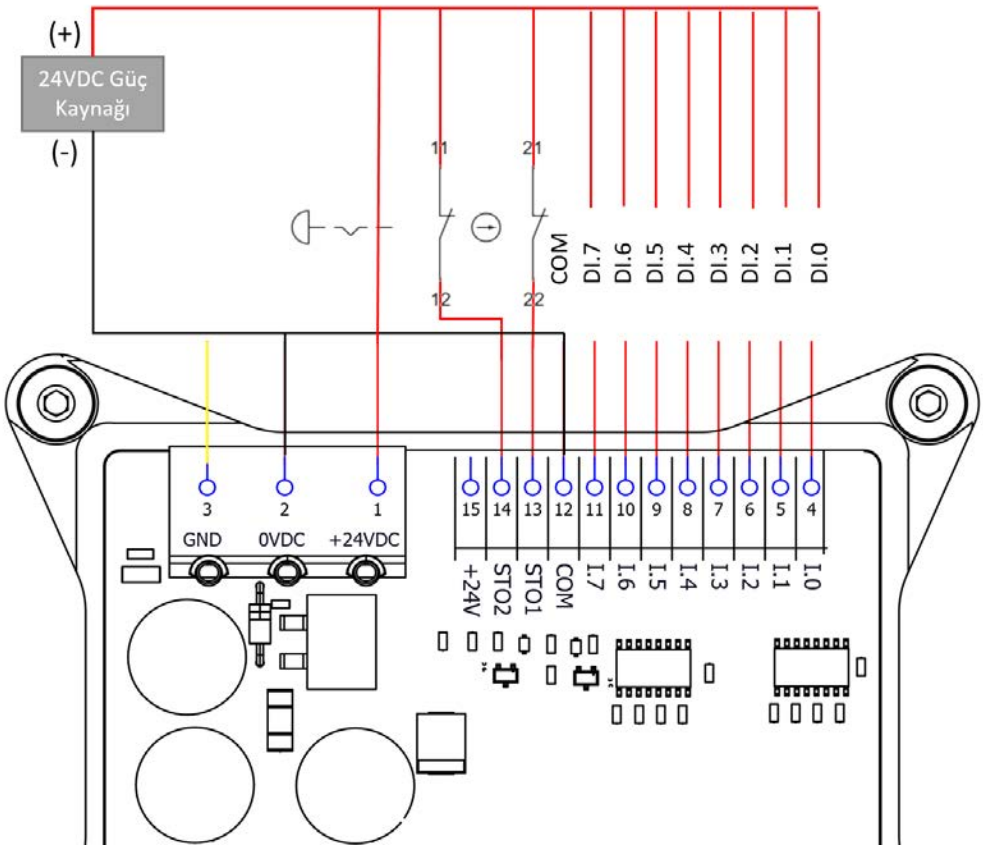

Figure.10

STO (Safe Torque Off) Input Connections

The STO (Safe Torque Off) hardware safety function on the module can be wired in two different ways depending on your system's safety requirements (risk assessment). The figures below show how the STO pins should be configured in addition to the standard connections of the input terminals (DI.0 - DI.7).

1. Dual Channel Safety Connection (STO Active) Figure 10 (Bottom picture) shows the standard connection type where the hardware STO safety function is actively used.

- **Connection Type:** The STO1 (13) and STO2 (14) terminals on the module are connected to independent safety signals (STO-IN1 and STO-IN2) coming from an external safety relay or a Safety PLC.
- **Function:** This dual-channel structure ensures that the device safely cuts off generating torque to the motor in an emergency situation in accordance with international safety standards.

2. Disabling the STO Function (Bridging/Bypass) Figures 8 and 9 (Top pictures) show the connection that must be made in cases where an external STO safety layer is not required in the system design.

- **Connection Type:** The STO1 (13) and STO2 (14) terminals are bridged to each other and connected directly to the internal +24V (15) supply terminal on the module.
- **Function:** This connection allows the device to operate normally (produce torque) by keeping the STO inputs continuously at the "High" (Active) logic level.

⚠ **Important Safety Warning:** Bridging the STO terminals to the +24V pin (Figures 8 and 9) completely disables the hardware safety function of the module. This procedure must only be applied if it is confirmed that the STO function is absolutely not needed in the machine as a result of the risk assessment performed.

Field Outputs (Valve Direction)

There are isolated terminal blocks for each channel (Q.0 - Q.7).

Terminal	Function	Description
Q.0 - Q.7	Output (Signal)	YSwitched output pin going to the load (Solenoid/Valve)
+24V	Output (Power)	Supply point for the load

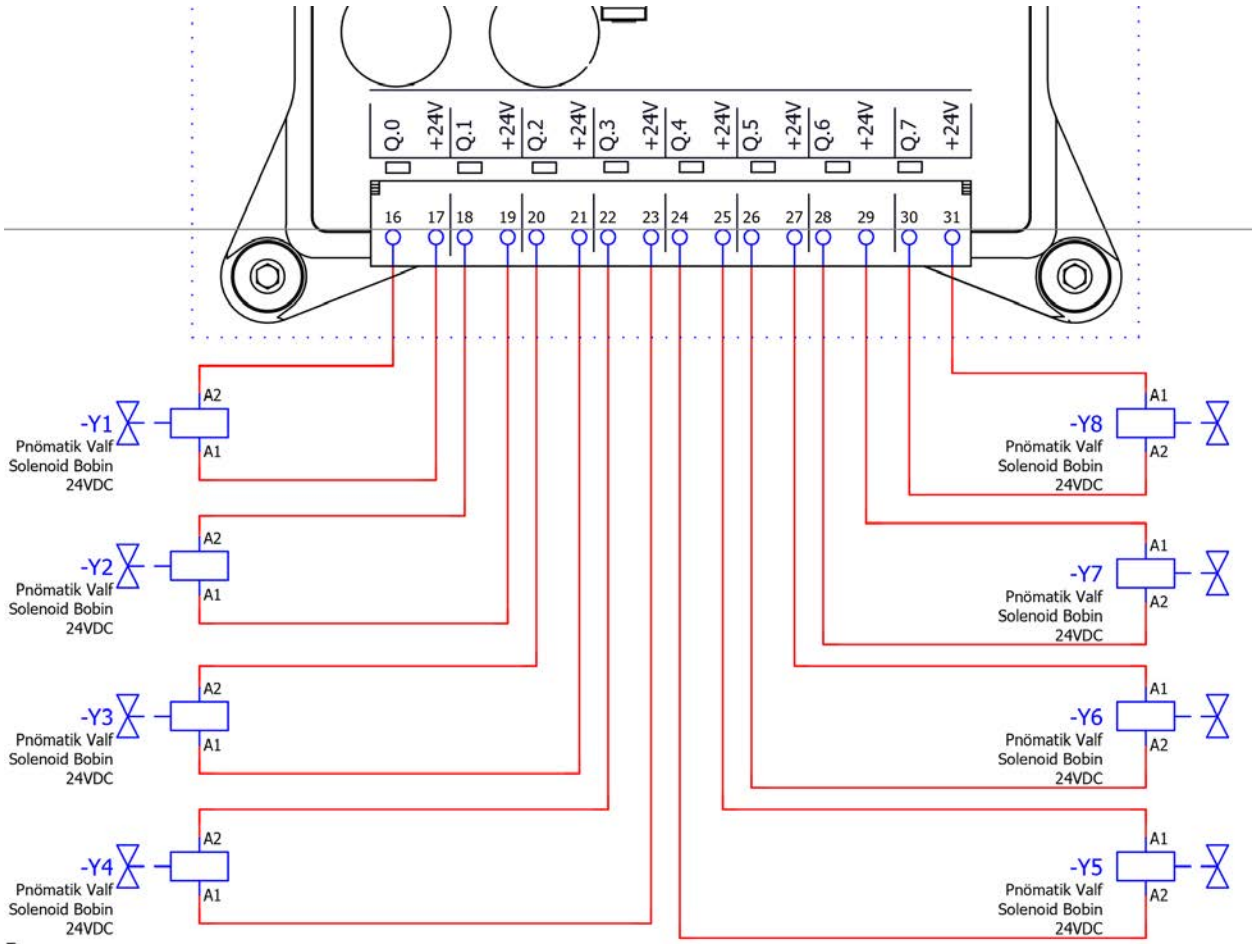

Figure.11

4. Technical Data

4.1. Mechanical Data

Feature	Value
Housing Material	Glass Fiber Reinforced Industrial Polymer (PETG GF15)
Mounting Type	DIN Rail or 4-hole screw mounting
Protection Class	IP20

4.2. Operating Conditions

Feature	Value
Operating Temperature	-20°C ... +85°C (Component Tolerance)
Thermal Management	Internal 45°C Thermostat and Automatic Cooling Fan

4.3. Electrical Data

Özellik	Değer
Operating Voltage	24 VDC
Number of Channels	8 Digital Outputs
Maximum Current	3 Amperes per channel
Short Circuit Protection	Yes (E Smart MOSFET)
Optical Isolation	Yes (Integrated Optocouplers)
PWM Support	100-200 Hz (For proportional valve control)
Main Fuse	30A SMD