

Electrical Interface Control Document (EICD)

Project: W.I.D.M.O. Payload

Version 2.1

Authors: Bartosz Polak, Piotr Mamczura, Jacek Kudrys, Tymoteusz Walczak

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LIST OF CONTESTS

1. Introduction	3
2. Scope and Purpose	3
3. References.....	3
4. General Interface Description.....	3
4.1. Physical Layout Overview	4
5. Connector Descriptions.....	6
J02 (Driver Power Output)	6
J03 (UV Sensor Interface).....	6
J04 (IR Sensor Interface)	7
J05 (CAN Bus Interface 1).....	7
J07 (Debug/Telemetry).....	7
J08 (CAN Bus Interface 2).....	7
6. External Driver Interfaces (EPOS4 Compact)	8
J_DRV_01 (Driver Power Supply).....	8
J_DRV_02 (Motor Winding).....	8
J_DRV_03 (Encoder).....	9
J_DRV_04 (CAN Interface)	9
7. Notes and Remarks	9

1. Introduction

This document describes the electrical interfaces of the Space Payload WIDMO project. It is intended to provide a clear and standardized reference for all connections, ensuring compatibility and proper integration of modules in accordance with ECSS standards.

2. Scope and Purpose

The purpose of this document is to define the electrical interfaces between the Payload Motherboard (PCB), the Power Supply, and the External Motor Driver (EPOS4). It defines pinouts, signal levels, and functional descriptions for the updated PCB layout.

3. References

1. ECSS-E-ST-20C: Space engineering - Electrical and electronic
2. Maxon EPOS4 Compact 50/8 Hardware Reference

4. General Interface Description

The W.I.D.M.O. payload operates on a single 24V DC main bus. The Motherboard distributes power to the external driver and regulates voltage down to 5V and 3.3V for internal logic and optical sensors. Primary control is executed via a CAN Bus (ISO 11898) interface operating at 3.3V logic levels. The system employs a distributed control architecture: the Motherboard transmits high-level digital commands to the external Maxon EPOS4 driver rather than driving the motor directly.

4.1. Physical Layout Overview

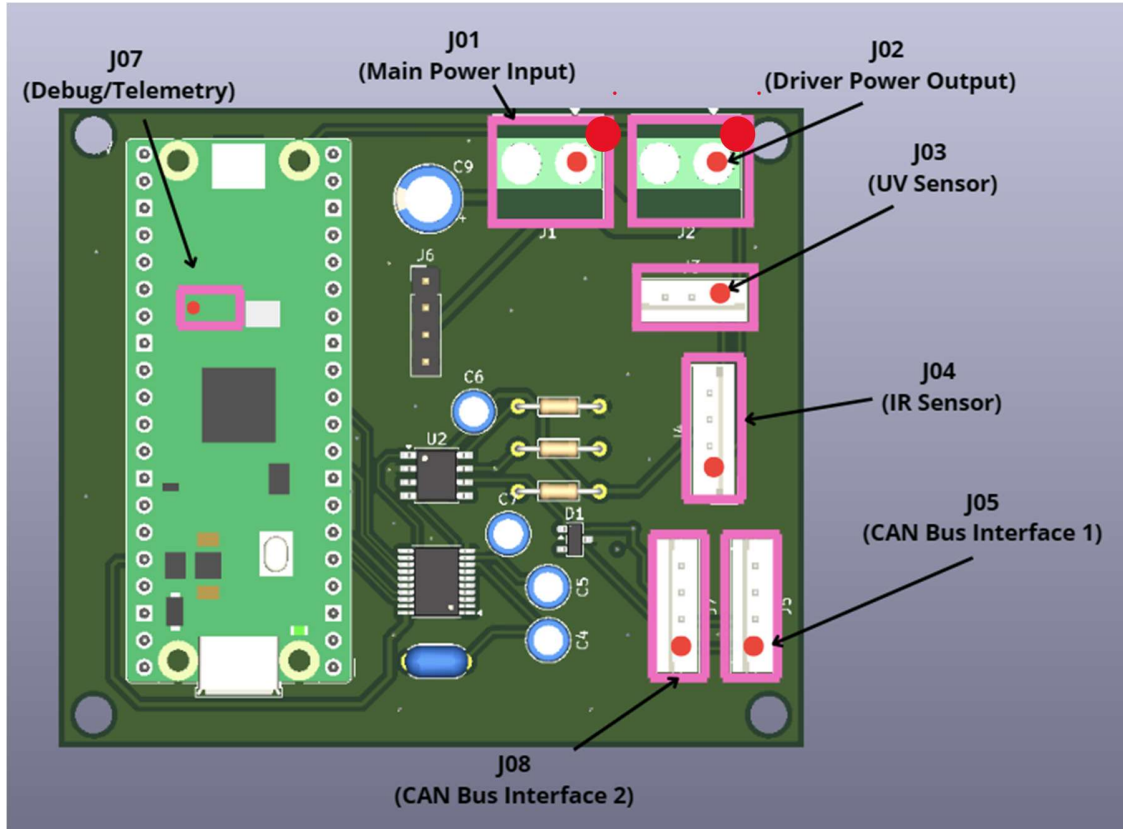


Figure 4.1 Payload Motherboard Assembly & Interface Map

Top view of the custom control PCB. The callouts correspond to the logical connectors defined in Chapter 5.

- **J01:** Main Power Input (24V Source)
- **J02:** Power Output to EPOS4 Driver
- **J03 & J04:** Internal Sensor Connectors (UV/IR)
- **J05:** CAN Bus Interface 1 (To Driver)
- **J07:** Debug & Telemetry Port
- **J08:** CAN Bus Interface 2 (To Driver)

Note: Red dot annotations on connectors J01 and J02 indicate Pin 1 (+24V) location; ensure correct polarity before powering the system.

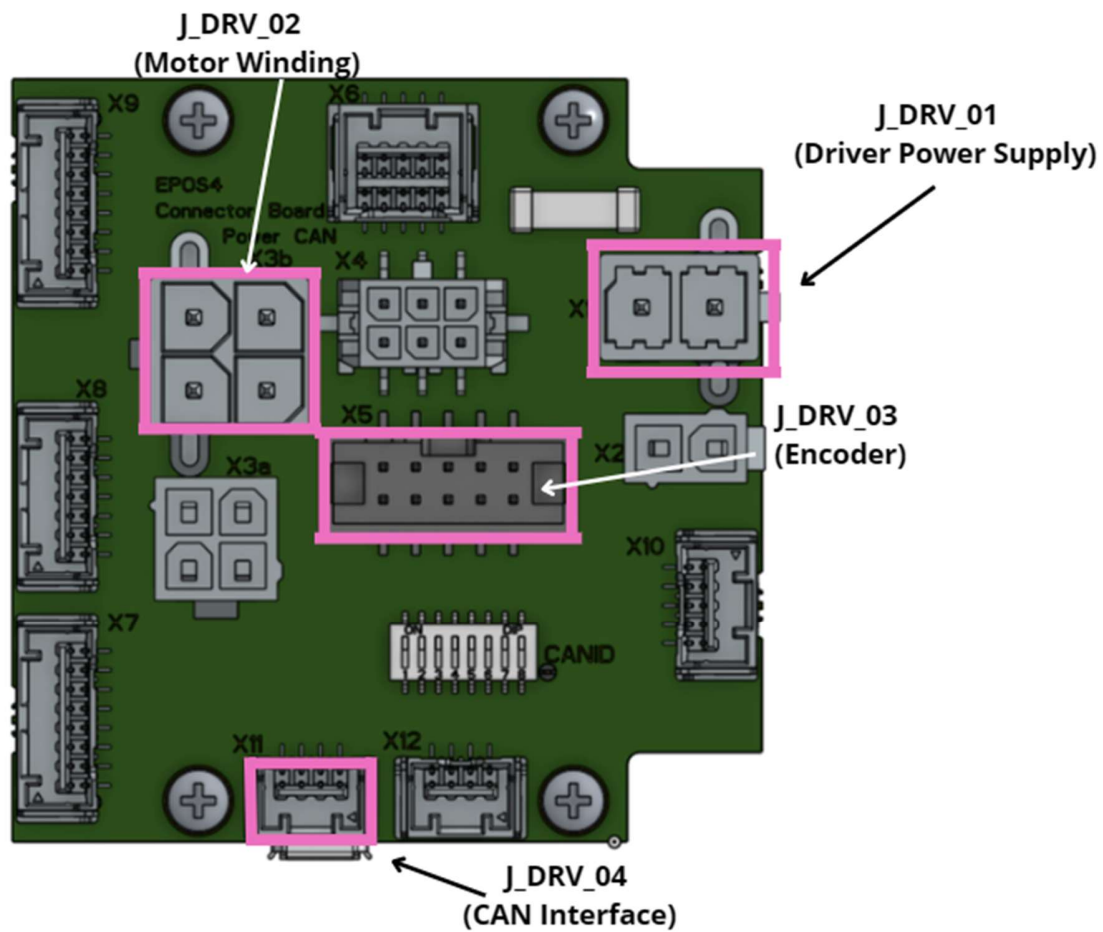


Figure 4.1 External Driver (Maxon EPOS4 Compact) Connector Map

Physical location of the interfaces on the motor driver unit.

- **J_DRV_01 (Port X1)**: Power Supply Input (From PCB J02)
- **J_DRV_02 (Port X2)**: Motor Winding Output
- **J_DRV_03 (Port X5)**: Encoder Interface (2x5 Pin Header)
- **J_DRV_04 (Port X11)**: CAN Bus Interface (To PCB J05)

5. Connector Descriptions

J01 (Main Power Input)

Primary power entry from the laboratory power supply or satellite bus.

- **Voltage:** 24V DC
- **Connector Type on PCB:** Screw Terminal (2-pin)

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	IN	VCC	RED
PIN 02	IN	GND	BLACK

J02 (Driver Power Output)

Pass-through power connector to supply the external Maxon EPOS4 Compact driver. This simplifies cabling by having one main power entry point.

- **Voltage:** 24V DC
- **Connector Type on PCB:** Screw Terminal (2-pin)

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	OUT	VCC_DRV	RED
PIN 02	OUT	GND	BLACK

J03 (UV Sensor Interface)

Interface for the internal Ultraviolet photodiode module (Waveshare UV Sensor). Provides 3.3V power to the sensor and receives an analog voltage signal.

- **Connector Type on PCB:** JST-XH (3-pin)

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	IN	Signal (Analog)	TBD
PIN 02	-	GND	BLACK
PIN 03	OUT	VCC (+3.3V)	RED

J04 (IR Sensor Interface)

Interface for the internal Infrared photodiode module (Iduino Flame Sensor).

- **Connector Type on PCB:** JST-XH (4-pin)

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	IN	Signal (Analog)	TBD
PIN 02	-	GND	BLACK
PIN 03	GND	VCC (+3.3V)	RED
PIN 04	-	NC	-

J05 (CAN Bus Interface 1)

Communication interface between the Raspberry Pi Pico (via MCP2515) and the EPOS4 Driver.

- **Signal Level:** Differential CAN
- **Connector Type on PCB:** JST-XH (4-pin)

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	BI-DIR	CAN_H	TBD
PIN 02	BI-DIR	CAN_L	TBD
PIN 03	-	GND	BLACK
PIN 04	-	NC	TBD

J07 (Debug/Telemetry)

Interface for programing the Raspberry Pi Pico and reading serial debug data.

- **Signal Level:** 3.3V UART
- **Connector Type on PCB:** 2.54mm Pin Header or USB C

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	OUT	TX	TBD
PIN 02	IN	RX	TBD
PIN 03	-	GND	BLACK

J08 (CAN Bus Interface 2)

Communication interface between the Raspberry Pi Pico (via MCP2515) and the EPOS4 Driver.

- **Signal Level:** Differential CAN
- **Connector Type on PCB:** JST-XH (4-pin)

Pinout	Wire Type (IN/OUT)	Function	Wire Color
PIN 01	BI-DIR	CAN_H	TBD
PIN 02	BI-DIR	CAN_L	TBD
PIN 03	-	GND	BLACK
PIN 04	-	NC	TBD

6. External Driver Interfaces (EPOS4 Compact)

This section defines the pinouts for the external motor driver unit. These connectors are physically located on the Maxon EPOS4 Compact housing. The wiring harness connects the Maxon Motor/Encoder cables directly to these ports.

J_DRV_01 (Driver Power Supply)

Power supply for the driver.

- **Physical Port on EPOS:** Connector X1
- **Connector Type:** Molex Mini-Fit Jr (4-pin)

Pinout	Wire Type (OUT)	Function	Wire Color
PIN 01	IN	+24V	RED
PIN 02	IN	GND	BLACK

J_DRV_02 (Motor Winding)

Interface for the 3-phase BLDC motor power.

- **Physical Port on EPOS:** Connector X3a
- **Connector Type:** Molex Mini-Fit Jr (4-pin)

Pinout	Wire Type (IN)	Function	Wire Color
PIN 01	OUT	Motor Winding 1 (U)	TBD
PIN 02	OUT	Motor Winding 2 (V)	TBD
PIN 03	OUT	Motor Winding 3 (W)	TBD
PIN 04	-	Shield / PE	TBD

J_DRV_03 (Encoder)

Interface for the incremental encoder (ENX 16 EASY) for position and speed control.

- **Physical Port on EPOS:** Connector X5
- **Connector Type:** Pin header 2.54 mm 2×5 poles

Pinout	Wire Type (IN)	Function	Wire Color
PIN 01	-	NC (Not Connected)	TBD
PIN 02	-	NC (Not Connected)	TBD
PIN 03	IN	Channel A	TBD
PIN 04	IN	Channel A\	TBD
PIN 05	IN	Channel B	TBD
PIN 06	IN	Channel B\	TBD
PIN 07	OUT	VCC_Encoder (+5V)	TBD
PIN 08	-	GND	TBD
PIN 09	-	NC (Index I - Optional)	TBD
PIN 10	-	NC (Index I\ - Optional)	TBD

J_DRV_04 (CAN Interface)

Interface for CAN bus communication with the Motherboard.

- **Physical Port on EPOS: Connector X11**
- **Connector Type:** Molex CLIK-Mate (4 poles)

Pinout	Wire Type (BI-DIR)	Function	Wire Color
PIN 01	BI-DIR	CAN_H	TBD
PIN 02	BI-DIR	CAN_L	TBD
PIN 03	-	GND	TBD
PIN 04	-	Shield	TBD

7. Notes and Remarks

Signal Direction: All signal directions specified in this document are relative to the described module (Motherboard or Driver). "IN" indicates a signal entering the device, "OUT" indicates a signal leaving the device.

Voltage Levels: Unless otherwise stated, logic signals on the PCB are 3.3V. The Motor Driver power bus is 24V.

Connector Polarization & Safety:

- Keying: All signal and logic connectors (J03, J04, J05, J07) utilize keyed housings (e.g., Molex, JST) that mechanically prevent reverse insertion.

- No Mechanical Protection: Connectors J01 and J02 are screw terminals and do not offer mechanical protection against reverse polarity.
- Pin 1 Identification: Extreme care must be taken during wiring. The PCB footprint indicates Pin 1 with a visible dot/mark on the silkscreen also visible on **Figure 4.1** with **red dot**.

- **Pin 1 (Dot) = VCC (+24V)**

- Pin 2 = GND

Warning: Connecting power with reversed polarity to J01 or J02 may cause permanent damage to the Motherboard and connected peripherals.