

PEWorks



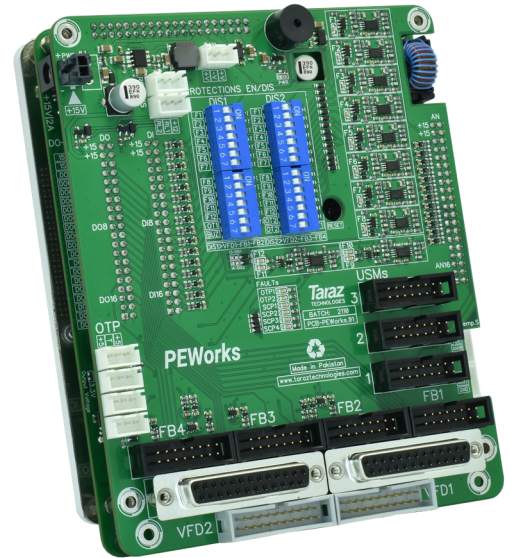
Power Electronics Development Modules Interface Card

OVERVIEW

The PEWorks is an interface card made to interface the PEController and PE-RCP controller modules to Taraz gate drivers, power modules and the USM-3IV voltage and current sensor module. It can interface up to 16 PWM signals and 16 analog inputs consisting of 8 voltage and 8 current channels from 3 USM-3IV sensor modules.

Additionally, robust hardware protections are incorporated on the board which includes Over-Current Protection (OCP) on all 8 current channels, Over-Voltage Protection (OVP) on 4 voltage channels and Over-Temperature Protection (OTP) using external thermostats. These protections can be configured and mapped using DIP switches to turn off the power modules according to user application circuit requirements to protect the hardware in case of OC, OV and OT faults.

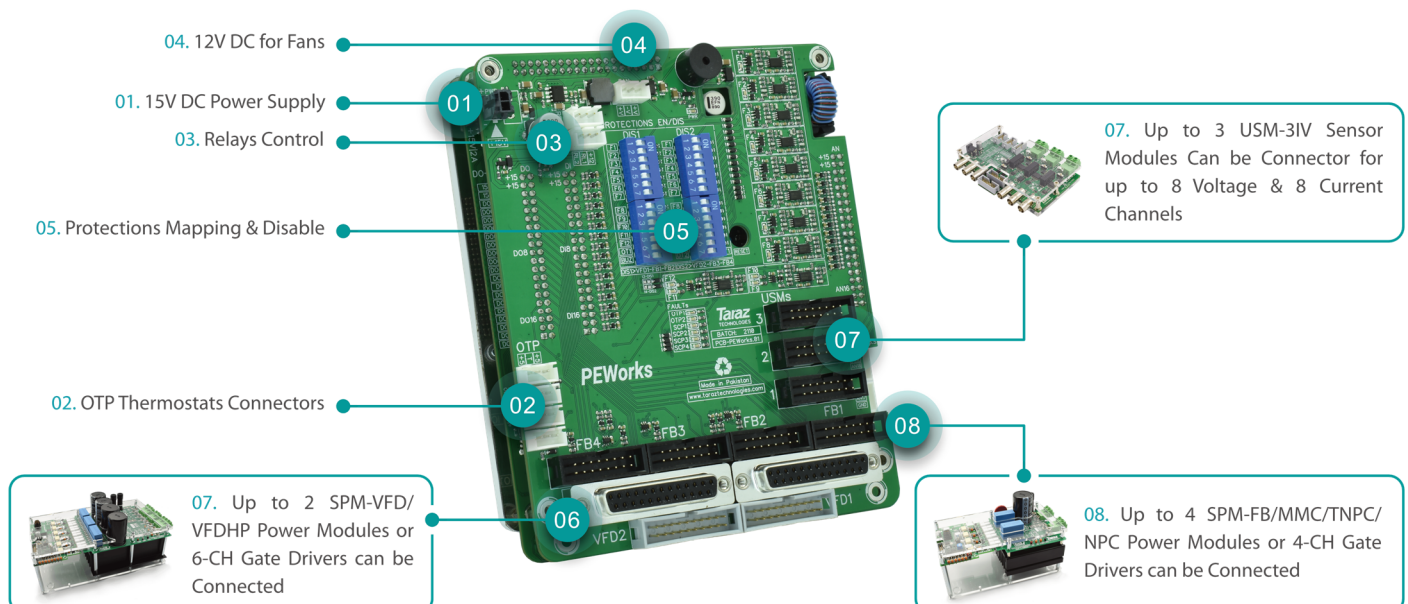
Finally, the PEWorks also includes auxiliary circuits such as Relays control, 12V Fan power supply, fault indication LEDs and a buzzer. In addition, the PEWorks distributes the required 15V power supply to all connected devices and modules which simplifies wiring of the final system.



Features

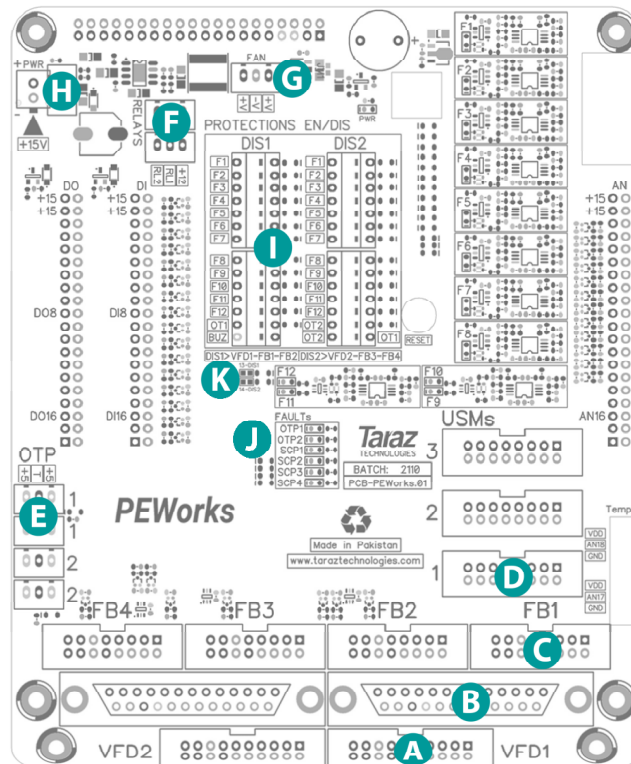
- ✓ Can Control up to 16 Switches
- ✓ Can Interface to Quad Full Bridge, TNPC and NPC Power Modules
- ✓ Up to 8 OCP and 4 OVP Fault Channels
- ✓ 12V Power Supply to Fans
- ✓ Faults Indication LEDs and Buzzer
- ✓ OC, OV and OT Hardware Based Protections
- ✓ Can Interface to Dual Three-Phase Inverter Power Modules
- ✓ Dual OTP Fault Channels
- ✓ Dual 12V Relays Control
- ✓ 15V Power Distribution to all Interfaced Modules

Connections Overview



DETAILED DESCRIPTION

Board Features



- A** IDC20M Connectors to Interface SPM-VFD Power Modules & 6 Channel Gate Drivers
- B** DB25F Connectors to Interface SPM-VFDHP Power Modules
- C** IDC16M Connectors to Interface SPM-FB/MMC/TNPC/MMC Power Modules & 4 Channel Gate Drivers
- D** IDC16M Connectors to Interface USM-3IV Sensor Modules
- E** 3 Pin Header to Interface Thermostats (Recommended Thermostat Model: 67F085, Plug Model: XHP-3)
- F** 3 Pin Header to Interface Relays (12V Open Connector Output, Plug Model: XHP-3)
- G** 3 Pin Header to Power 12V Fans (Plug Model: XHP-3)
- H** 2 Pin Header 15V DC Input Power Header (Plug Model: 0430250200, Crimp Model: 0430300038)
- I** Protection Configuration DIP Switches
- J** Fault Indication LEDs
- K** D013,14 Configuration Jumpers

Pin Mapping

Analog Pin Mapping

Controller Module Analog Input	USM-3IV Measurement Channel ($\pm 10V$)	Protection Channel	Protection Channel Type
CH1	USM1 Current Channel 1	F1	Bipolar OCP
CH2	USM1 Current Channel 2	F2	Bipolar OCP
CH3	USM1 Current Channel 3	F3	Bipolar OCP
CH4	USM2 Current Channel 1	F4	Bipolar OCP
CH5	USM2 Current Channel 2	F5	Bipolar OCP
CH6	USM2 Current Channel 3	F6	Bipolar OCP
CH7	USM3 Current Channel 1	F7	Bipolar OCP
CH8	USM3 Current Channel 2	F8	Bipolar OCP
CH9	USM1 Voltage Channel 1	F9	Unipolar OVP
CH10	USM1 Voltage Channel 2	F10	Unipolar OVP
CH11	USM1 Voltage Channel 3	F11	Unipolar OVP
CH12	USM2 Voltage Channel 1	F12	Unipolar OVP
CH13	USM2 Voltage Channel 2	-	
CH14	USM2 Voltage Channel 3	-	
CH15	USM3 Voltage Channel 1	-	
CH16	USM3 Voltage Channel 2	-	

* Notes: Bipolar OCP protection channel triggers at 80% of the range (by default) in both positive and negative. For example, a USM-3IV current channel having $\pm 100A$ range will trigger at both $+80A$ and $-80A$ ranges. While the Unipolar OVP protection will trigger only at the positive value, which is suitable for protection of DC-Links against over voltage.

Digital Input Connectors Pin Mapping

Controller Module Digital Input	Feedback Signal	Description
DI1	SCP1	Short Circuit Fault on VFD1/VFDHP1/FB1
DI2	SCP2	Short Circuit Fault on VFD2/VFDHP2/FB2
DI3	SCP3	Short Circuit Fault on FB3
DI4	SCP4	Short Circuit Fault on FB4
DI5	F1	OCP on USM1 Current Channel 1
DI6	F2	OCP on USM1 Current Channel 2
DI7	F3	OCP on USM1 Current Channel 3
DI8	F4	OCP on USM2 Current Channel 1
DI9	F5	OCP on USM2 Current Channel 2
DI10	F6	OCP on USM2 Current Channel 3
DI11	F7	OCP on USM3 Current Channel 1
DI12	F8	OCP on USM3 Current Channel 2
DI13	F9	OVP on USM1 Voltage Channel 1
DI14	F10	OVP on USM1 Voltage Channel 2
DI15	F11	OVP on USM1 Voltage Channel 3
DI16	F12	OVP on USM2 Voltage Channel 1
DIO1 (DIO-B Connector)	OTP1	OTP on OTP1 Connectors, VFDHP1
DIO2 (DIO-B Connector)	OTP2	OTP on OTP2 Connectors, VFDHP2
DIO3 (DIO-B Connector)	DIS1	Disable Feedback on VFD1/VFDHP1/FB1/FB2
DIO4 (DIO-B Connector)	DIS2	Disable Feedback on VFD2/VFDHP2/FB3/FB4

Digital Output Connectors Pin Mapping

Controller Module Digital Output	Power Modules Pin Mapping
DO1	Q1 (VFD1/VFDHP1/FB1)
DO2	Q2 (VFD1/VFDHP1/FB1)
DO3	Q3 (VFD1/VFDHP1/FB1)
DO4	Q4 (VFD1/VFDHP1/FB1)
DO5	Q5 (VFD1/VFDHP1) Q1 (FB2)
DO6	Q6 (VFD1/VFDHP1) Q2 (FB2)
DO7	Q1 (VFD2/VFDHP2) Q3 (FB2)
DO8	Q2 (VFD2/VFDHP2) Q4 (FB2)
DO9	Q3 (VFD2/VFDHP2) Q1 (FB3)
DO10	Q4 (VFD2/VFDHP2) Q2 (FB3)
DO11	Q5 (VFD2/VFDHP2) Q3 (FB3)
DO12	Q6 (VFD2/VFDHP2) Q4 (FB3)
DO13	DIS1 (Jumper Enabled) Q1 (FB4)
DO14	DIS2 (Jumper Enabled) Q2 (FB4)
DO15	RL1 Q3 (FB4)
DO16	RL2 Q4 (FB4)

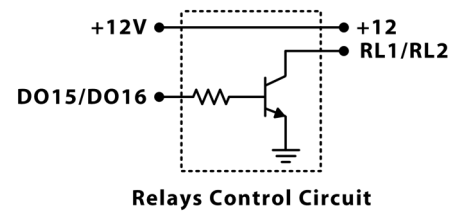
APPLICATION INFORMATION

Power Modules

The PEWorks card interfaces 16 PWM/DO signals from the DO-A connector of the controller modules to the available power module connectors. These connectors include 4 IDC 16-pin male connectors that can be connected to 4 SPM-FB/MMC/TNPC/NPC power modules having a total of 16 switches. In addition, IDC 20-pin male connectors and DB25F connectors can interface to dual SPM-VFD/VFDHP power modules having a total of 12 switches. Since the same input signals are shared between multiple output connectors, the user must ensure each signal is routed to a single output only.

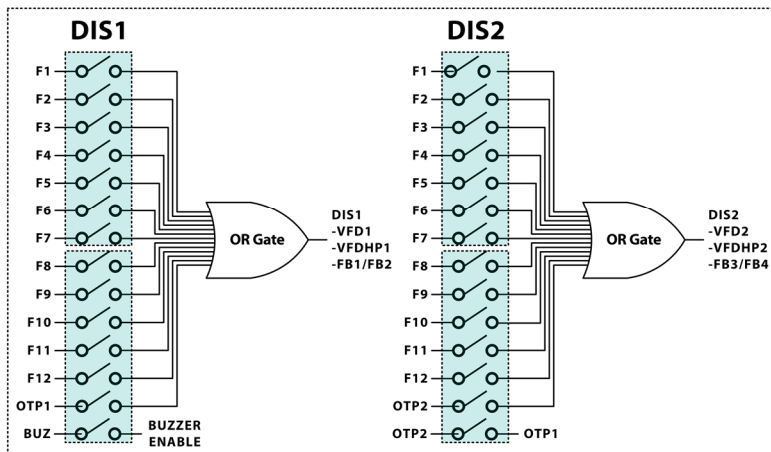
Relays Control & Jumper Configuration

The PEWorks card can also interface to dual external relays. The control signals going to these relays are DO15 and DO16 which are also shared with the FB4 connector switch signals. The relays can be used only when 12 switches are interfaced to the PEWorks card such as 2 SPM-VFD/VFDHP or 3 SPM-FB/MMC/TNPC/NPC power modules. In this case, the DO13 and DO14 can also be connected to DIS1 and DIS2 signals respectively by shorting the SMD jumpers highlighted in (K) of board features. The relays control output is an open collector configuration with a 12V power supply.



Protections Configuration

PROTECTIONS EN/DIS



The PEWorks hardware protections can be configured using the DIP switches illustrated above. The protection logic consists of 2 sets of disable signals (DIS1 and DIS2). The DIS1 signal disables the SPM-VFD1, SPM-VFDHP1, SPM-FB1, and SPM-FB2 power modules, while the DIS2 signal disables the SPM-VFD2, SPM-VFDHP2, SPM-FB3, and SPM-FB4 power modules. The OCP, OVP, and OTP faults can be routed to each disable signal, determining whether a full or partial shutdown will occur in case of fault. In addition, OTP signals can be combined to disable all modules in case of over-temperature, while the buzzer can be enabled and disabled using the BUZ channel of the DIP switches.

Generally, all output legs must have OCP which can be ensured by assigning each leg a current sensor channel. In addition, it is very important that all DC-Links are protected against overvoltage. This can happen if the power circuit is operating in boost converter mode and the control system gets unstable. The OVP protection can then turn off the PWM signals and therefore save the hardware. Since there are only 4 OVP-enabled voltage sensor channels, the user must use these channels for DC-Link voltage measurement.

Generally, the trigger level for the protection is set at 80% of the range, or 8V input from the USM. This can either mean 80A OCP if CT-100 had only a single turn, or 20A if it had 4 turns. The OCP level can be adjusted indirectly by changing the number of turns on the current sensor. Similarly, with a voltage channel, OVP will occur at 800V if set at 100X, however, if set at 10X then OVP will occur at 80V. The OTP can only be triggered if the OTP connectors are connected to an appropriate thermostat installed on the power modules heatsink such as the 67F085 from Sensata-Airpax.

SPECIFICATIONS

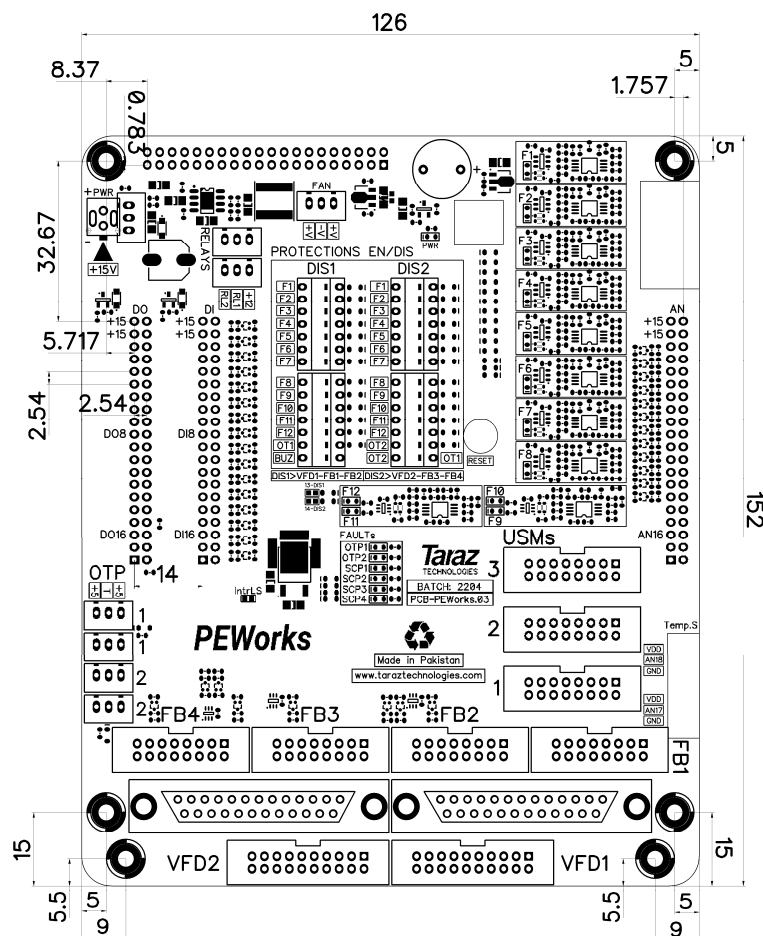
Electrical Characteristics

*All ratings are given at 15V power supply and 25°C ambient temperature unless otherwise specified.

Parameter	Test Conditions/Notes	Minimum	Typical	Maximum	Unit
Power Supply Voltage		14.5	15	17	V
Power Supply Current		-	-	4.5	A
Logic High Output	Faults Feedback	3	-	5	V
Logic Low Output	Faults Feedback	0	-	0.55	V
Analog Input Voltage		-10	-	+10	V
Max. Relays Drive Current		-	-	1	A
Max. Fan 12V Supply Current		-	-	1	A
Operating Temperature		-20	-	50	°C
Storage Temperature		-40	-	70	°C

*Note: PWM/DO inputs from the controller module are routed directly to the power modules without additional circuitry, therefore, electrical characteristics of the controller module outputs to be considered.

Mechanical



*Note: All dimensions in mm.

ABOUT TARAZ TECHNOLOGIES

Taraz Technologies has been providing research-oriented power electronics solutions to customers in more than 30 countries. Our products include DC/DC Converters, Gate Drivers, Power Modules, Embedded Controllers, Isolated Sensors, Smart Probes, Data Acquisition devices as well as fully integrated Power Electronics Systems. Our product design philosophy focuses on easy-to-use, research-friendly, and modular solutions that can accelerate the research and development cycle while providing maximum versatility for research. Furthermore, our finished product portfolio includes Programmable Power Supplies and Solar Inverters for the domestic market.

Founded in 2012, Taraz was nominated among the top most innovative technology startups in Pakistan. Our research and manufacturing facility is located in Islamabad, the green capital city of Pakistan.

TARAZ WARRANTY

Taraz Technologies warrants its Products against defects in material, workmanship, and design for a period of twelve (12) months. The defective Products will be repaired or replaced, free of charge, as per our standard terms and conditions. For more information on warranty and terms, please visit our website at www.taraztechnologies.com.

SAFETY NOTICE

This Device is ESD Sensitive and Needs to be Handled with Care. High Voltage Condition May Occur During Operation of the Device, and Hence User is Solely Responsible for Equipment and Personnel Safety. Taraz Technologies Shall Not be Hold Liable for any Damage to Personnel and/or Properties as a Result of Using this Device. User Must Take Adequate Steps to Ensure Electrical and Mechanical Safety of the Device in Use.

CONTACT

TARAZ TECHNOLOGIES

21-X, 2nd Floor, DHA Business Avenue, DHA Phase 1,
Bahria Expressway, Rawalpindi 46000, Pakistan.

Phone: +92 (51) 5400335

Fax: +92 (51) 5400155

E-Mail: sales@taraztechnologies.com

Website: www.taraztechnologies.com

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