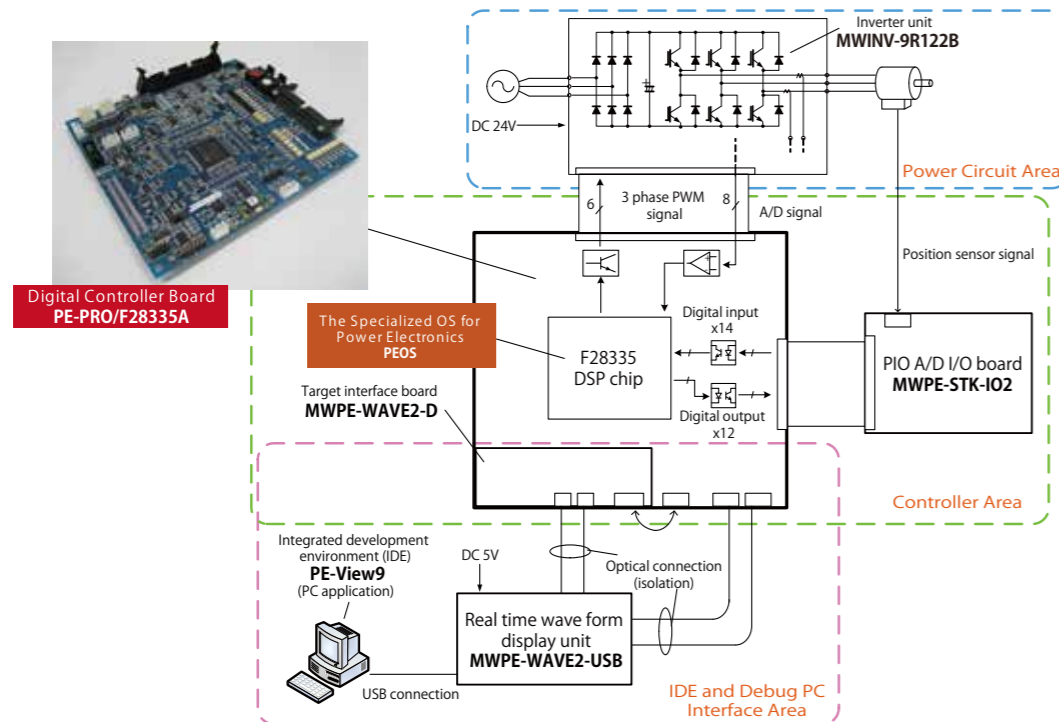


Digital Control Board: PE-PRO/F28335A

Features

- High-speed 32bit floating DSP TMS S320F28335 (150MHz)
- For car application function: CAN bus communication port
- For 2 motor control function: ABZ encoder signal input (32bit / 2port)
- Easy to use: PE-View9 / WAVE2 interface, 8 channels real time wave monitor



Specification

Item	Spec
Model	PE-PRO/F28335A (MWPRO-F28335A)
Processor	TMS320F28335PGFA
Clock	150 MHz
On-Chip RAM	34 k x 16 bit
On-Chip Flash Memory	256 k x 16 bit
Serial EEPROM	64 k x 8 bit (24LC32A) (12C)
3-phase PWM	2 ports (12 output)
General PWM	2 ports (2 output)
Digital input	Photo coupler: 14 input, CMOS: 2 input
Digital output	Photo coupler: 12 output, CMOS: 2 output, LED: 2 output
ABZ counter	32 bit / 2 ports
Interval timer	32 bit / 3 ch
Serial communication port	2 ch / RS-232C / start-stop synchronization / 9600, 19200, 38400, 57600, 115200 bps
CAN communication port	1 ch / CAN standards 2.0B (Insulated to DSP)
Remote debugger port	1 ch / optical connector (using to the communication with PE-View9)
WAVE 2 function	Correspondence to target interface board MWPE-WAVE2-D
A/D input	12 bit 16 ch / ±5 V / Simultaneous sampling 2 ch / Conversion time 80 ns
D/A output	4 ch / 12 bit
Size	170 mm x 155 mm
Input power	+/- 5 V (2A max)

Integrated develop environment PE-View9



Real time waveform monitor WAVE2



Attention about Safety

To use the product safely, read the user manual before operation.

Do not store the product in environments with high humidity, temperature, dust, oil and etc. Death or injury might result from fire, electric shock, damage and etc.

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Yokohama hanasaki bldg.6-145 Hanasaki-cho
Nishi-ku, Yokohama-shi, KANAGAWA, 220-0022 JAPAN

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Myway
it's a passion way

PE-Expert4

Digital Control and Measurement Bench

DSP / FPGA Control and Measurement Platform for Power Electronics

PE-Expert4

Digital platform dedicated for advanced Power Electronics application, including scalable architecture supporting over 144 PWM control and sensor inputs, coming with visualized software development bench for easy C programming.

Ready to use over 144 PWM control,
over 300kHz carrier frequency



Integrated Development Environment

PE-ViewX

PE-Expert4 Specialized Library

PEOS

Integrated Power Analyzer

PE-Meter

PSIM RCP Interface

SimCoder NEW

The configuration example includes MWPE4-RACK12, MWPE4-C6657, MWPE4-PEV, MWPE4-FPGA6, MWPE4-FPGA24, MWPE4-DAC, MWPE4-PIO, MWPE4-ADC, MWPE4-METER

Myway Plus Latest Updates

www.myway.co.jp/en

Building your own DSP/FPGA platform within a day!

Over 300 kHz carrier frequency → p. 3

TI6657 DSP + FPGA architecture enables high speed control system.

Over 144 PWM control → p. 4

Supporting multilevel application, "MMC Turnkey" allowing direct link from PSIM.

Ready to use FPGA control → p. 5

Supporting FPGA design supported by sample and IPs (functional module). Partially customized FPGA allow you to focus on your own function.

Generate C code from PSIM → p. 6

PSIM SimCoder PE-Expert4 target option enabling advanced RCP (Rapid Control Prototyping).

Learning control programming → p. 6

Basic template and sample program are prepared. PEOS (C library for control) helps your own control design.

Integrate control, Measurement and Debugging → p. 8, 10

PE-Meter, the integrated power analyzer, enabling automated testing, unique feedback control and others. PE-ViewX allowing run-time debug with full visibility of inside of your control.

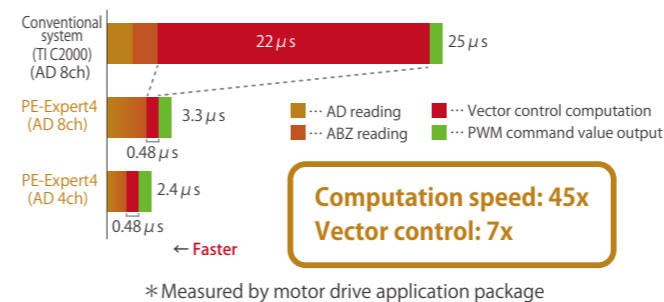
About Myway Plus Corporation

Founded 1993, targeting advanced power electronics research equipment and high-end power supply system. Over 25 years, Myway has accomplished 1500 PE project with major university and companies. In addition to R&D equipment, Myway introduces Japanese well-known brand pCUBE series, the regenerative power supply, PV/Battery emulator and testing system and motor evaluation system (including SiC and over 200kW system).



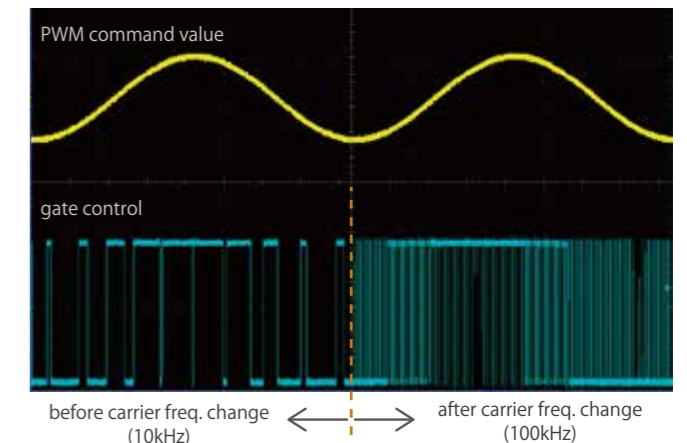
Over 300kHz carrier vector control

TI 1.25GHz dual core DSP (TMS320C6657) enables high speed vector control. Standard system (PEV board) can support over 300kHz carrier frequency (3.3us control period).

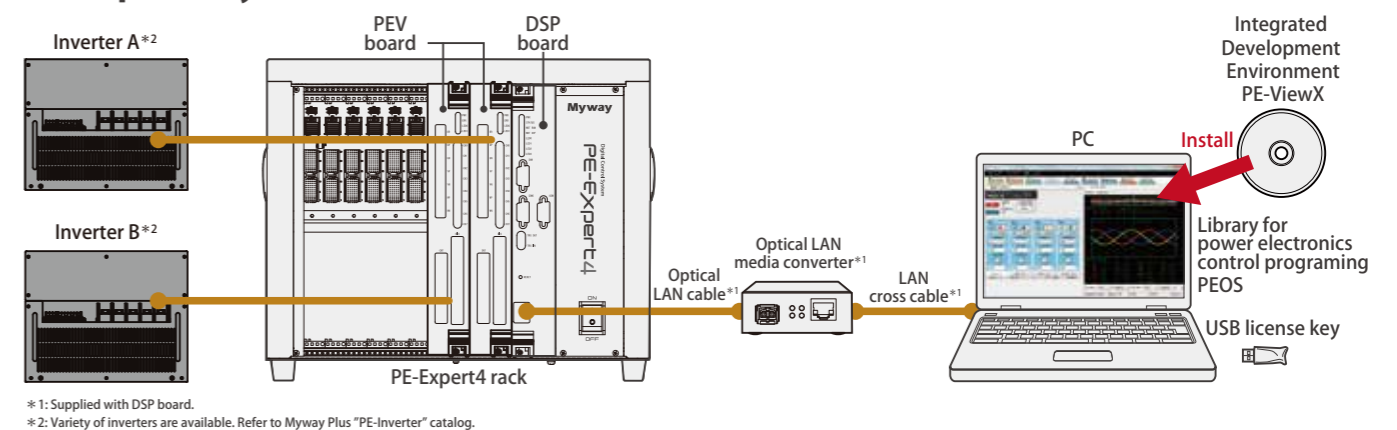


Runtime parameter editing

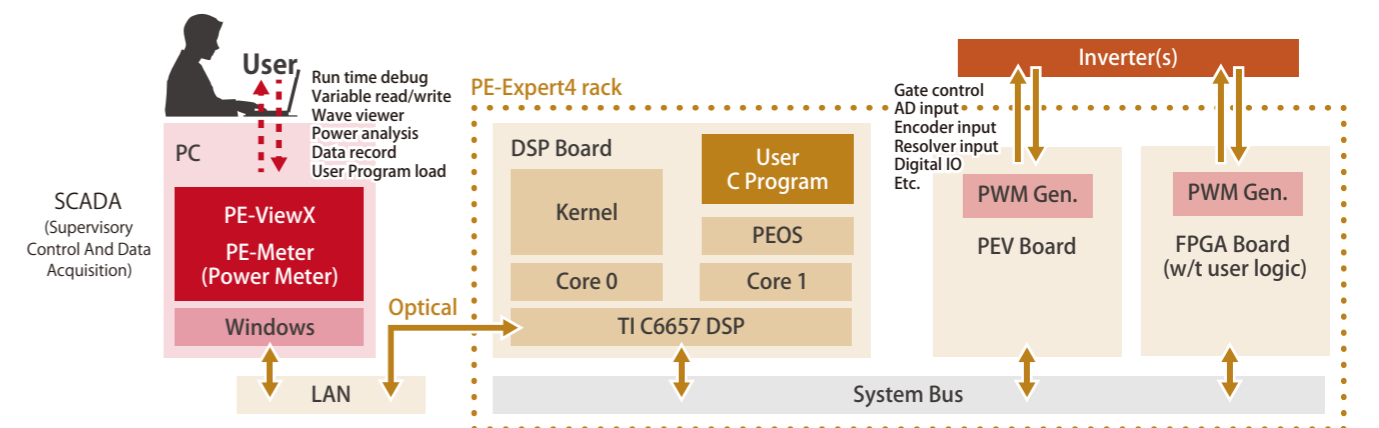
Without interfering control program operation, any parameter can be modified safely. In the following example, carrier frequency is modified during operation.



PE-Expert4 System overview



System hardware and software architecture



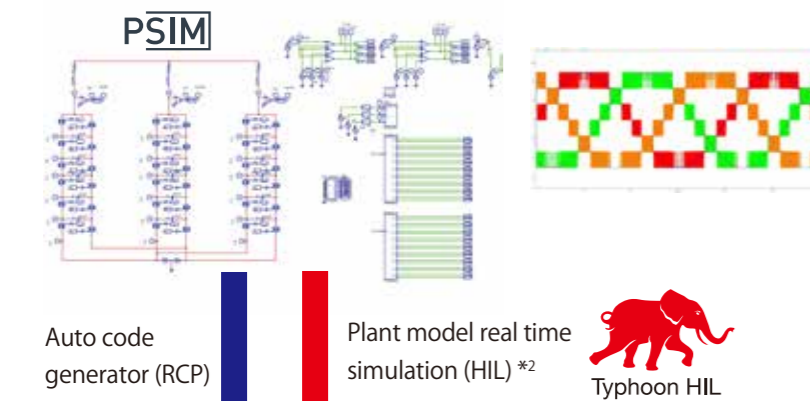
PE-Expert4 system provides universal hardware and software platform with integration of control and measurement by TI C6657 1.25GHz dual core. DSP board orchestrates all interface boards (up to 10) such as PEV board and FPGA board, in which PWM is generated, or ADC board. This scalable architecture enables user to build variety of advanced application at minimum effort.

MMC Turnkey

Direct Tool Chain PSIM to PE-Expert4 and TyphoonHIL Model Base Development for Multi-level Topology

Multi-level converter is one of the major research topics, however, the control algorithm and implementation have been a challenge due to the complexity. Introducing MMC Turnkey, user can start with PSIM simulation with PE-Expert4 elements then convert the control block to C code. The generated C code is compiled and downloaded to PE-Expert4 with PSPWM144 board consisting of pre-programmed FPGA for various multi-level topology application up to 144 PWM channels (refer to FPGA Platform section). This MMC Turnkey tool chain provide seamless control design.

PSIM simulation (example: 7 level-3 ph Flying Cap.)

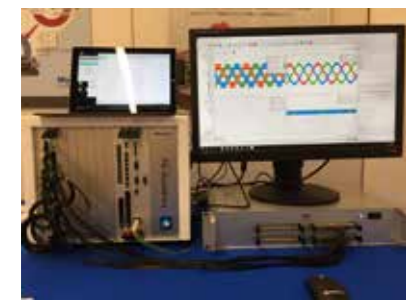


Supporting Topology*1
 Cascade (full bridge cell)
 Diode-clamped
 Flying capacitor
 MMC (Bridge-cell/Chopper-cell)

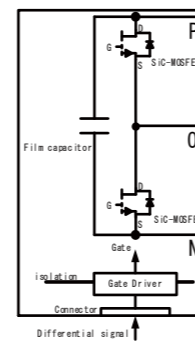
PSIM Parameters*1
 Level, Phase, Dead time
 Phase Shift / Level Shift
 Comparator (All-cell/Once-cell)
 Start-up mode (C charge)

*1 Detail specification is TBD.
 *2 PSIM netlist can be converted to TyphoonHIL plant model.

PE-Expert4 + HIL (7level-3ph Flying Cap.)



Example hardware
 SiC Switching pole (Chopper-cell module)
 700V/30A



Message from Prof. Hirofumi Akagi, one of the MMC pioneers



Prof. Hirofumi Akagi (right), CEO: Yang Zhongqing (left)

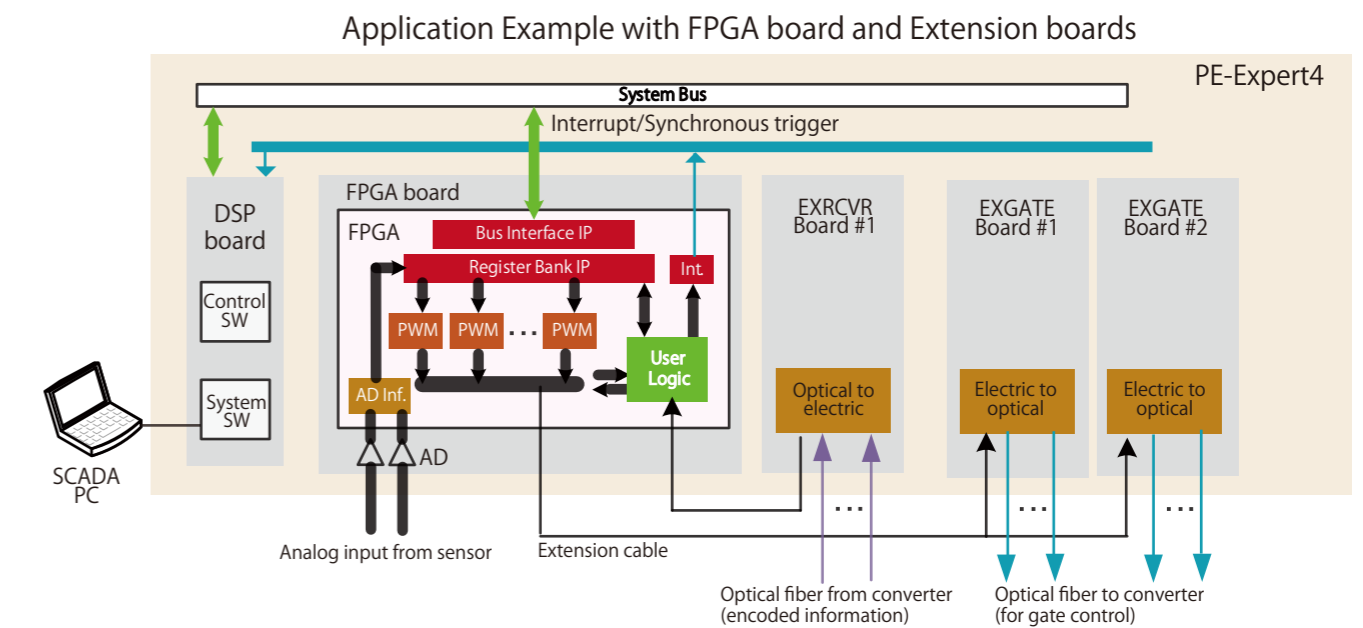
Prof. Akagi is an influential expert in the field of Power Electronics, and has since received numerous academic awards from IEEE and IEEJ (Institute of Electrical Engineers of Japan) for various research achievements.

FPGA has become more essential in modern power electronics system. Novel concept in architecture and implementation has been required by urge of renewable energy and electric mobility. Dr. Yang Zhongqing received doctoral degree from Tokyo Institute of Technology in 1990 and founded Myway in 1993. I feel proud that Myway has been contributing academia and industry in Japan by the latest digital technology over 25 years. I expect further contribution globally and growth of power electronics industry.
 (Hirofumi Akagi, Professor Emeritus of Tokyo Institute of Technology, the technical advisor of Myway)

FPGA Platform

Ready to use FPGA Platform Over 144PWM, High resolution phase control (DAB), Super high speed feedback

Introducing PE-Expert4 FPGA option board, consisting of common part (IP: Intellectual Property) such as bus interface, register bank, AD interface, basic PWM generator and commonly used logic, so that user can focus on their own user logic. Once build your own FPGA system, user can access to register bank from DSP by using function call, fpga_read and fpga_write to access inside of FPGA.

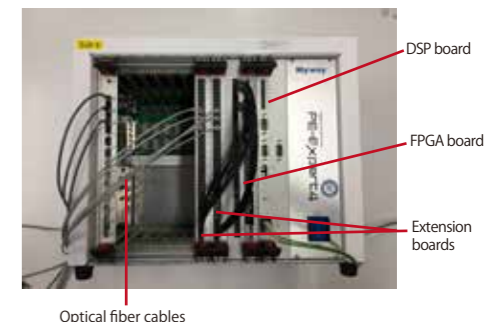


Board menu is listed below. Note that PSPWMxx board is pre-programmed FPGA, supporting MMC/Multi-level converter control directly from PSIM without FPGA user logic.

FPGA Board Type	Function	PWM Gen.	PSIM SimCoder	Optical Interface	Common Feature
MWPE4-PSPWM72	Pre-programmed FPGA (no user logic)*1	72	Yes	On board 6ch (output)	FPGA: Xilinx XC7K70T-1FBG676C AD: 8ch (14bit -5V to +5V) Digital I/O: in 4ch, out 4ch (RS-422)
MWPE4-PSPWM144		144	Yes	Max. 144ch (output) by Extension board (max 8 extension board)	
MWPE4-PSPWM144-IP	Pre-programmed FPGA (IP) with user logic*2	144	Yes	Receiver Extension board (EXRCVR) can be used instead.	
MWPE4-IPFPGAEX	Blank FPGA with sample and common logic	User logic	No		
MWPE4-IPFPGA24				On board 24ch (output)	

Extension Board	Function	# of Inf.
MWPE4-EXGATE	Optical Output Interface*3	18 (out)
MWPE4-EXRCVR	Optical Input Interface*4	18 (in)

*1 PWM Generator logic is burned in FPGA already, no user logic can be added.
 *2 PWM Generator logic is provided in module (binary) with i/o specifications, so that user can add logic working with.
 *3 Optical interface board (MWPE-IFRX4-PRO or equivalent) is required at converter side for gate drive interface.
 *4 Decode logic for communication is required in FPGA user logic.



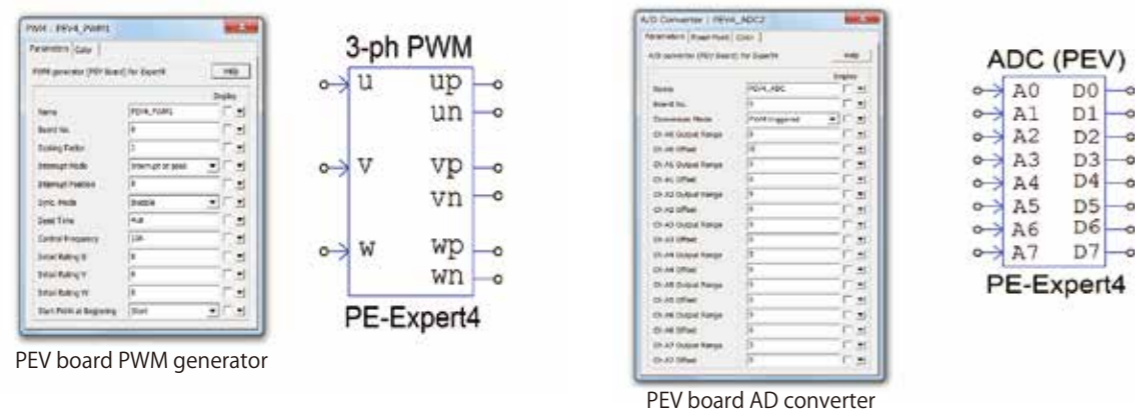
Optical fiber cables

Design Flow

- **PSIM SimCoder : the RCP (Rapid Control Prototyping) targeting PE-Expert4**
- **Easy C programming: supported by PEOS (C library) Quick start with full control**
- **Other tool chain: other vender's RCP (such as SimuLink Embedded Coder)**

PSIM the power electronics simulator can be the start point for RCP. PE-Expert4 control block elements are prepared, such as PWM generator, AD converter and others corresponding real hardware in PE-Expert4. Once your control design is validated by PSIM, SimCoder can generate C coded with project files targeting PE-Expert4.

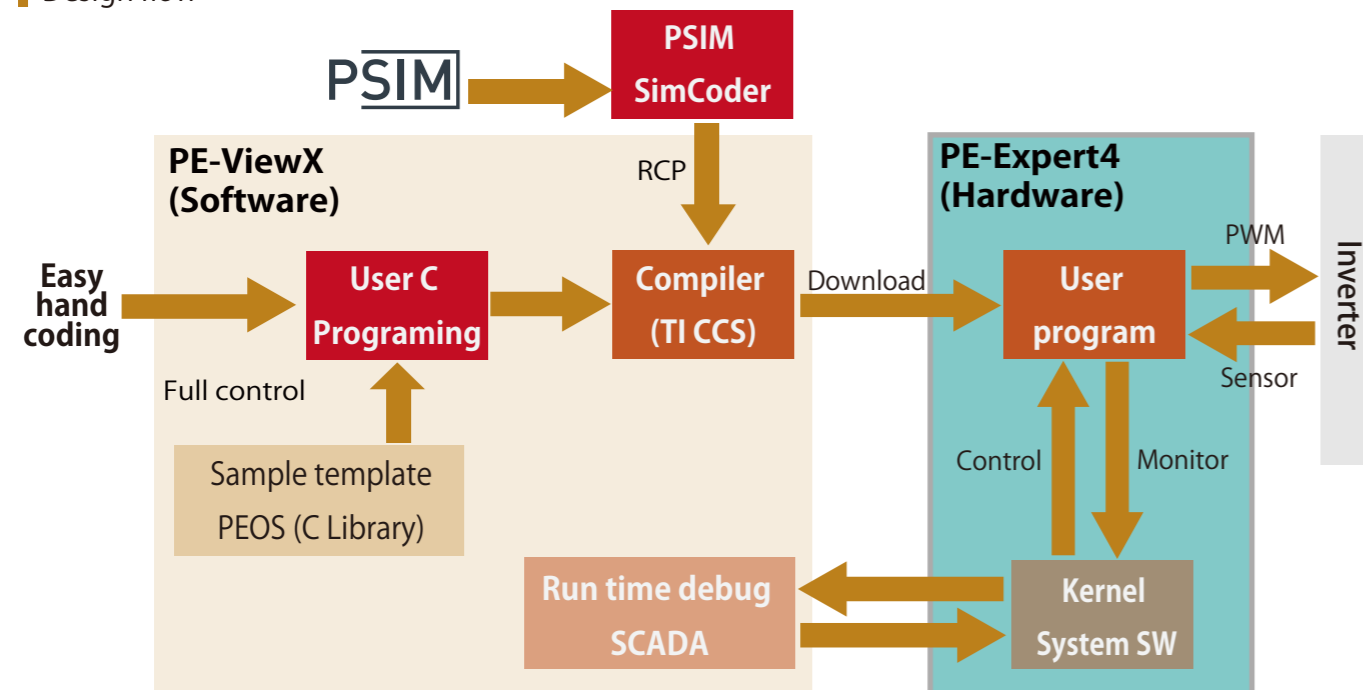
Example of PE-Expert4 PSIM element



Alternatively, user can write C code directly supported by inverter control sample code (templates) and PEOS, the C library set, so that user may have the easy and full direct control to all hardware resources. When C code is ready, it is compiled and the binary is downloaded to the flash memory on DSP board. Then it's ready to be executed.

PE-ViewX, the SCADA (Supervisory Control And Data Acquisition) software on Windows, can execute, debug, monitor and measure (refer page 8 and 10).

Design flow

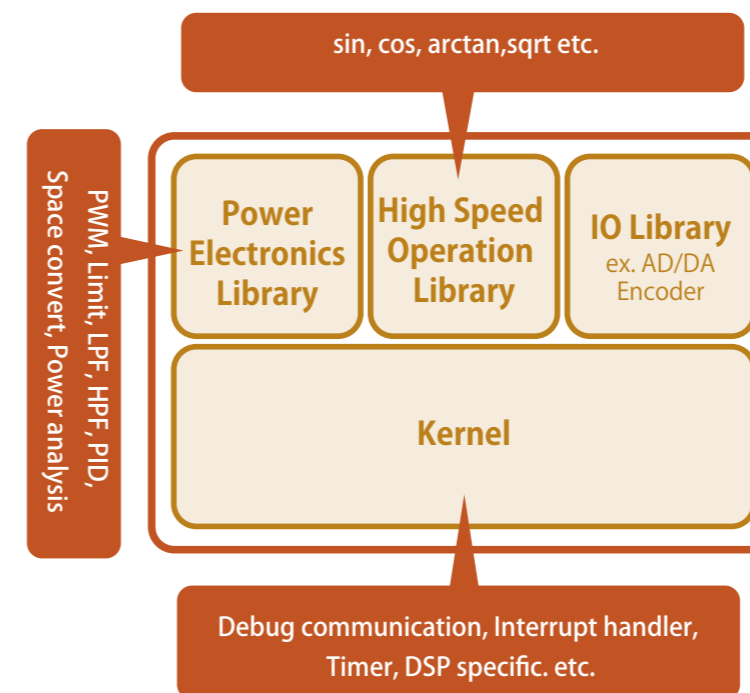


PEOS, the Power Electronics Specialized C Library set

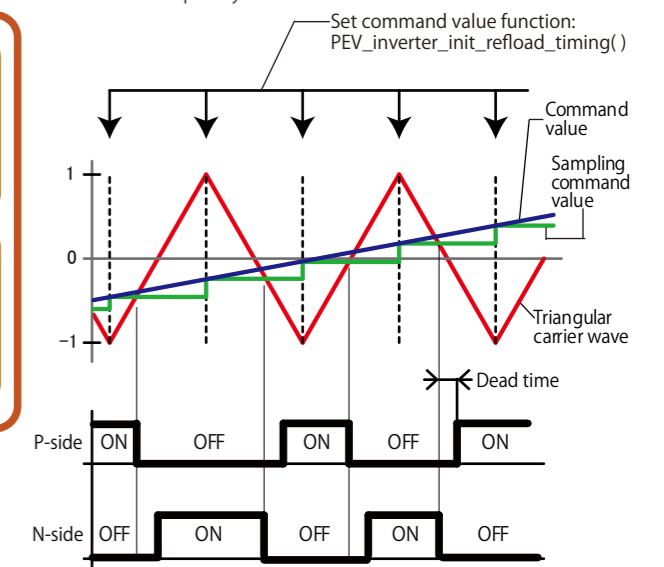
PEOS is the easiest way to translate your own algorithm into C source code in the most of power electronics application without writing C code from scratch, consisting of over 150 functions covering almost all tasks used in major power electronics control design. For efficient or advanced experiment, C language programming is preferable since programmer has full controllability and visibility of gate control, observed input value (ex. Voltage or current) for feedback control and computation, while higher level language may not provide this level of freedom or precision.

Function examples

Over 150 functions for any application



- **Triangle wave modulation command value setting for 3-phase PWM generator**
`INT32 PEV_inverter_set_uvw (INT32 bdn, FLOAT32 u, FLOAT32 v, FLOAT32 w, INT32 fs);`
 - **u, v, w:** Modulation factor
 - **fs:** Carrier frequency



- **PWM generator initialization**
`INT32 PEV_inverter_init (INT32 bdn, INT32 fs, INT32 dt);`
 - **bdn:** Board number (0 - 4)
 - **fs:** Carrier frequency [Hz] (1kHz - 500kHz)
 - **dt:** Dead time [ns] (0ns - 20000ns)

- **PID function initialization**
`INT32 mwPIDinit (mwPID *pid, FLOAT32 kp, ki, kd, T, Ts, x0, y0);`
 - **pid:** Pointer for PID structure
 - **kp/ki/kd:** Proportional/integrated/differential gain constant
 - **T:** LPF time constant [sec]
 - **Ts:** Time step [sec]
 - **x0/y0:** Input/output initial value

- **Acquiring AD converter value and encoder count**
`PEV_ad_abz_read (INT32 bdn, FLOAT32 data[8], INT32 *abz);`
 - **bdn:** Board number (0 - 4)
 - **data:** Pointer for the address in which AD converter results are stored
 - ***abz:** Value of ABZ counter from encoder

- **CAN communication interface initialization**
`C6657_can_init (UINT32 ch, UINT32 bps);`
 - **ch:** Channel number
 - **bps:** Transmission speed (125kpbs - 1Mbps)

PE-ViewX, the runtime control and monitor

SCADA (Supervisory Control And Data Acquisition) for the system

PE-ViewX supports series of software programming process, such as coding, compiling, linking, debugging and handling design projects. User software can be downloaded to target which is PE-Expert4 DSP. Then user can run the program and debug.

PE-ViewX IDE (Integrated Development Environment) overview

A Main window
B Project
 • Project file management
 • Compiler link setting
 • Library link setting

C Tool button

D Kick editor

E Project explorer
Listing all related files

F Console window
Displaying compile message and "printf" output

G Sub window
User can arrange any sub window in main window

a Compile
Compile user program

b Download
Download binary data to target

c Execute, Stop
Execute and stop program

d Verify
Verify downloaded program

e Inspector
Read and write global variables during run time

f Memory
Read and write memory value during run time

g WAVE
Wave form viewer for global variables

h Data Rec
Data logger for global variables

Power of Real Time Debugging

PE-Expert4 consists of dual core DSP. One is assigned for user program and the other is for debugging. Therefore, there is zero intervention even during run time for accessing any variables. You will have full visibility just like "Virtual oscilloscope". Those variables can be also edited during operation for parameter change or control.

1 Read and write variables by Inspector

Up to 3 Inspector windows at a time

Global variables can be searched, re-ordered, copy&pasted

Comments can be written

2 Setting monitoring variables by WAVE

Just like an oscilloscope! Easy operation

3 Check waveform by WAVE

Waveform display for any global variables

WAVE specification

Item	Spec
Visible variable	global variables
Maximum number of visible variables	16 variables
Sampling rate	10μs (16 variables), 5μs (8 variables)

Simple Debug Functions: X-Y graph, MATH function, FFT analysis and etc.

X-Y Graph

1 Select variables into x-axis and y-axis. In this example, U-phase current is set as x-axis and W-phase current in y-axis.

2 A Lissajous figure will be displayed.

MATH Function

1 Input equation into MATH1-4 tab.

A maximum of 8 channels will be displayed. Equations involving circular or trigonometrical functions will also be calculated.

2 Calculated result will be displayed as a new variable.

FFT Analysis

1 FFT analysis is displayed under FFT tab.

2 FFT and THD can be displayed.

Data Rec

1 Set the desired sampling frequency and record data.

A maximum of 32 channels with sampling frequency from 10ms - 10s can be automatically saved.

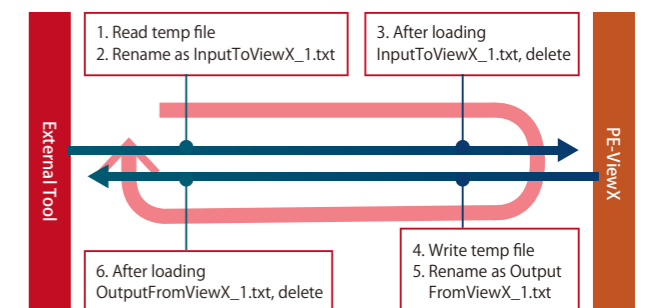
2 Settings are available under "Log Settings".

Waveform of sampled data

External Tool Coupling Function

Automation from design, control to evaluation

Simple script file enables PE-Expert4 and other test set communication.



PE-Meter, the Integrated Power Analyzer

The window of PE-Meter, the Integrated Power Analyzer as follow:

*MWPE4-METER is necessary



PE-Meter

MWPE4-METER

Power Analysis, Torque Measurement, Temperature Logger – all in 1 board

The newly developed PE-Meter, PE-Expert4 and PE-ViewX acts as a control system and a power analyzer which is capable of performing power calculation, temperature measurement and torque measurement. The operating window is customised to each user's requirement and graphical data is also available in "PE-Meter Graph Window".

Characteristics:

- Power calculations, analogue values of current and voltage are displayed.
- Torque meter output, encoder values can be calculated.
- Thermocouple temperature measurement serves as a trigger for control.
- High flexibility and customizable GUI



No additional measuring equipment necessary

PE-Meter occupies only 2 slots in PE-Expert4 and does not require further measuring equipment, freeing up space for work area.

Collective measurement data

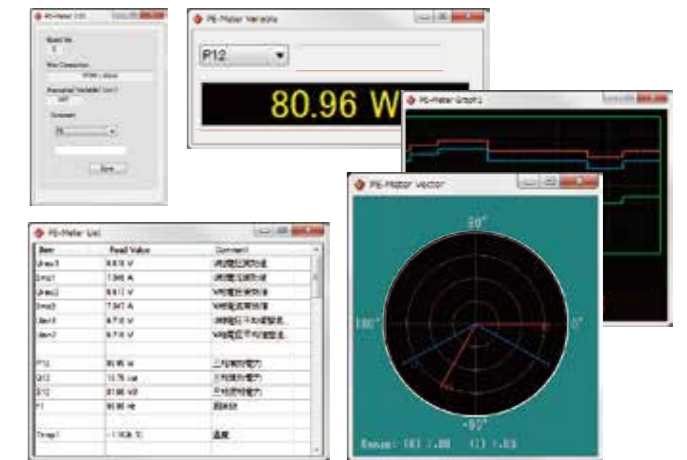
It is necessary to collate all data from different measuring equipment, but with PE-Meter, all data are displayed on the same time axis. This reduces the effort to collate all data.

Two independent entities – Power Analysis, Control Algorithm

Display window

Window	Function
PE-Meter Info	Displays various measurement conditions set by the user.
PE-Meter Variable	Displays the measured value of each item.
PE-Meter List	Displays the list of measured items and measured values of global variables registered for monitoring.
PE-Meter FFT	Displays the measured value of the selected unit in the FFT format.
PE-Meter Graph	Displays the measured items and measured values of global variables registered for monitoring in a graph.
PE-Meter Instant	Displays the instantaneous value of the selected measured item in a graph.
PE-Meter Vector	Displays the phase relationship between the voltage and current in a vector.

Global variables can be displayed in the control program. By displaying the measurement result and the control variable (defined as a global variable) together on the graph, it is possible to intuitively grasp the correlation between the control variable and the measurement result.



Temperature Measurement Function

The PE-Meter uses both the K type and T type thermocouples. After connection, select the thermocouple on the GUI of PE-Meter and deploy the dedicated function in PE-ViewX.

Thermocouple I/P
Ch: 10
Type: K, T
Connector: SPT-THR1.5/10-H-3.5 P26
Temp range: -100°C to +200°C

Thermistor I/P
Ch: 2
Connector: B3PS-VH
Voltage range: 0V to +5V
Others: +5V P/S

Encoder, Resolver I/F
Ch: 2
Same I/F as MWPE4-PIO (and sensor box)

Power Analog I/P
Ch: 12
(1 unit: 1ch voltage + 1ch current)
(6 units in all)
Voltage range: -5V to +5V
Connector: SMB-J

Torque Analog I/P
Ch: 2
Voltage range: -5V to +5V or -10V to +10V
(interchangeable)
Connector: SMB-J

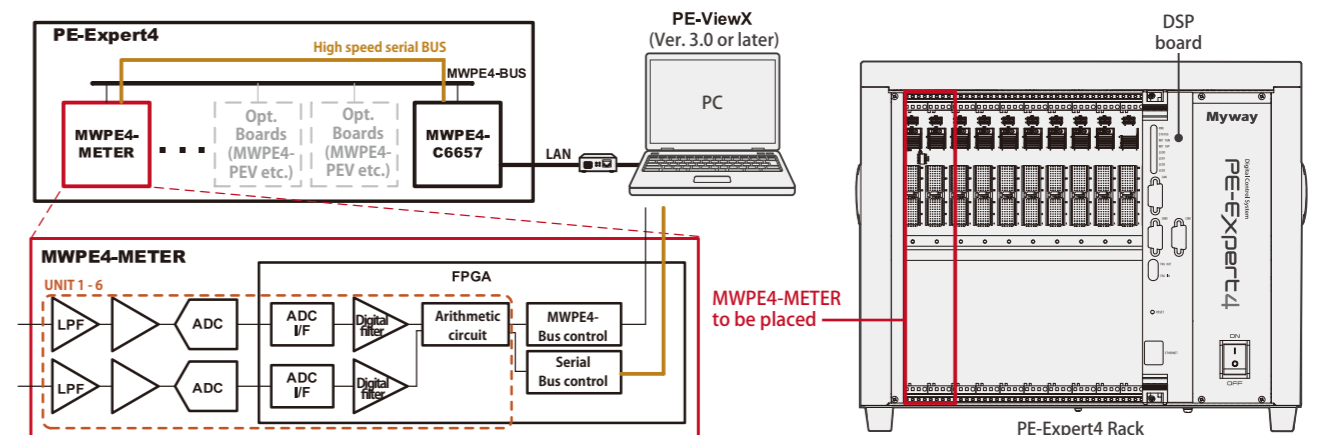
Auxiliary Analog I/P
Ch: 2
Voltage range: -5V to +5V

PE-Meter Board Terminal



PE-Meter System Configuration

The system shows the configuration of MWPE4-METER in PE-Expert4. PE-ViewX to be above Ver 3.0 and MWPE4-C6657 to be above Ver 3.0.



PE-Inverter

Ready-to-use inverter and quick connection to PE-Expert4.
Bring up your whole system "within a day."

MWINV-5R022
5kVA, 14.4Arms



MWINV-9R144
9.1kVA, 13.2Arms



MWINV-2044-SIC
20kVA, 30Arms

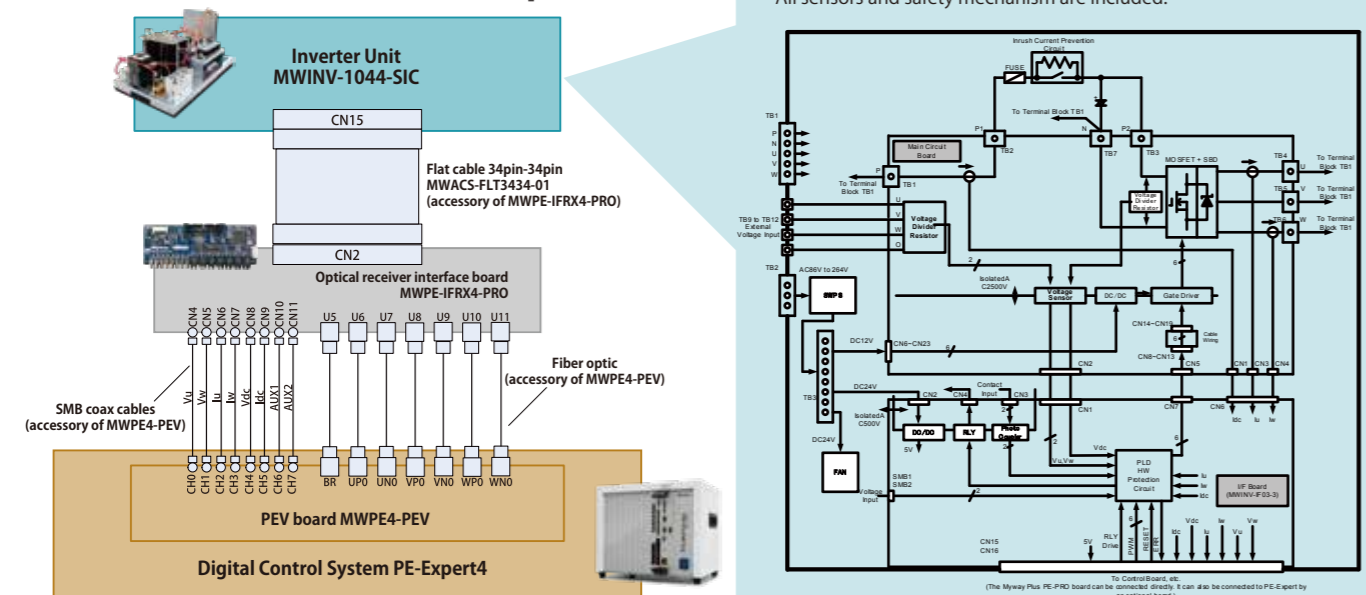


Selection map

Circuit Schematics							
Maximum Input Voltage	AC	230 [Vrms]	440 [Vrms]	230 [Vrms]	-	-	-
	DC	400 [V]	700 [V]	400 [V]	850 [V]	60 - 80 [V]	800 [V]
Capacity (Rated O/P current)	1 [kVA]	MWINV-1R022 2.88 Arms					
	5 [kVA]	MWINV-5R022 14.4 Arms					
	7 [kVA]					MWINV-7R006A 100 Arms	
	9.1 [kVA]	MWINV-9R122C 26.3 Arms	MWINV-9R144 13.2 Arms				
	10 - 12.5 [kVA]					MWINV-1203 300 Arms	MWINV-1044-SIC 14.5 Arms
	20 [kVA]				MWINV-2022A 58.4 Arms		MWINV-2044-SIC 30 Arms
	50 [kVA]				MWINV-5022B 146 Arms		MWINV-5044-SIC 72.2 Arms
	340 [kVA]				MWINV-34044 450 Arms		

For more information : https://www.myway.co.jp/en/products/pe_inverter.html

Seamless connection to PE-Expert4



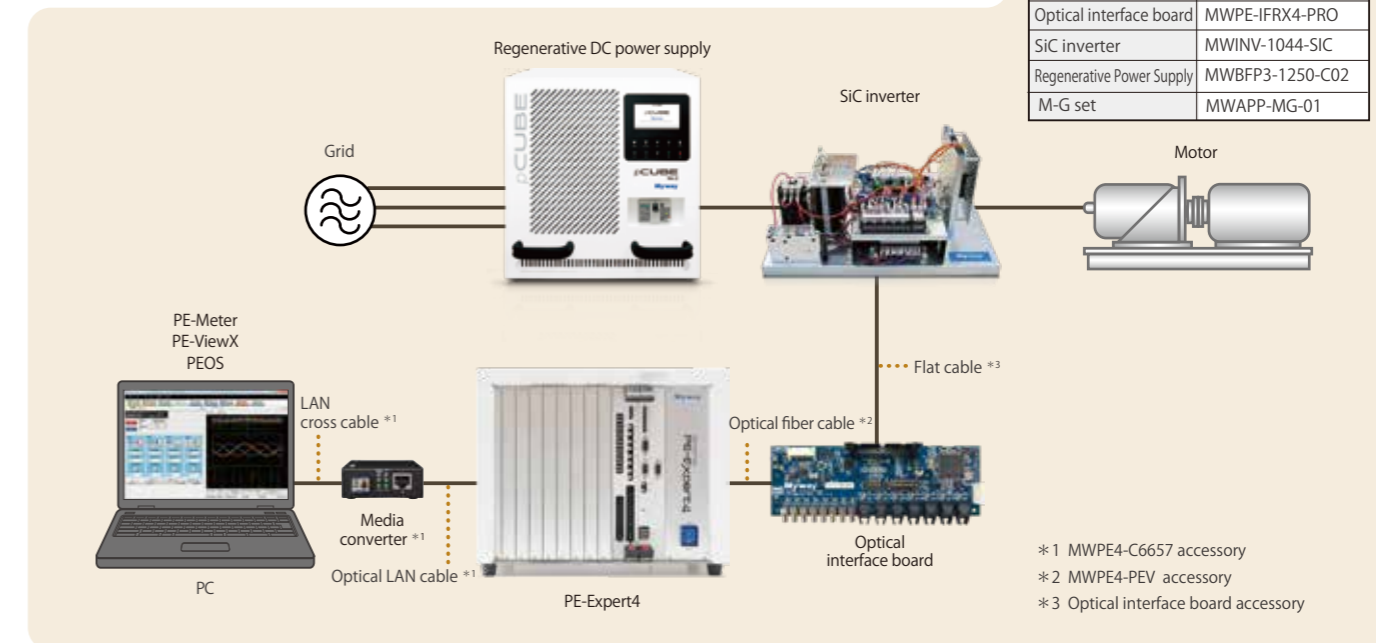
Application Examples

Motor Drive Package (PMSync Motor & SiC Inverter)

The following is an experimental bench with SiC device. All equipment are prepared as a package, such as pCUBE, the power supply, inverter, controller, debugger and power meter. The system comes with safety circuit, easy connection cable harness, noise free optical gate control cables, sample C source code, PEOS, C programing library, and etc. This provides robust, easy-to-use/maintenance, and all visible/controllable platform.

Hardware

Products	Type
PE-Expert4 rack	MWPE4-RACK12
DSP board	MWPE4-C6657
PEV board	MWPE4-PEV
Optical interface board	MWPE-IFRX4-PRO
SiC inverter	MWINV-1044-SIC
Regenerative Power Supply	MWBFP3-1250-C02
M-G set	MWAPP-MG-01

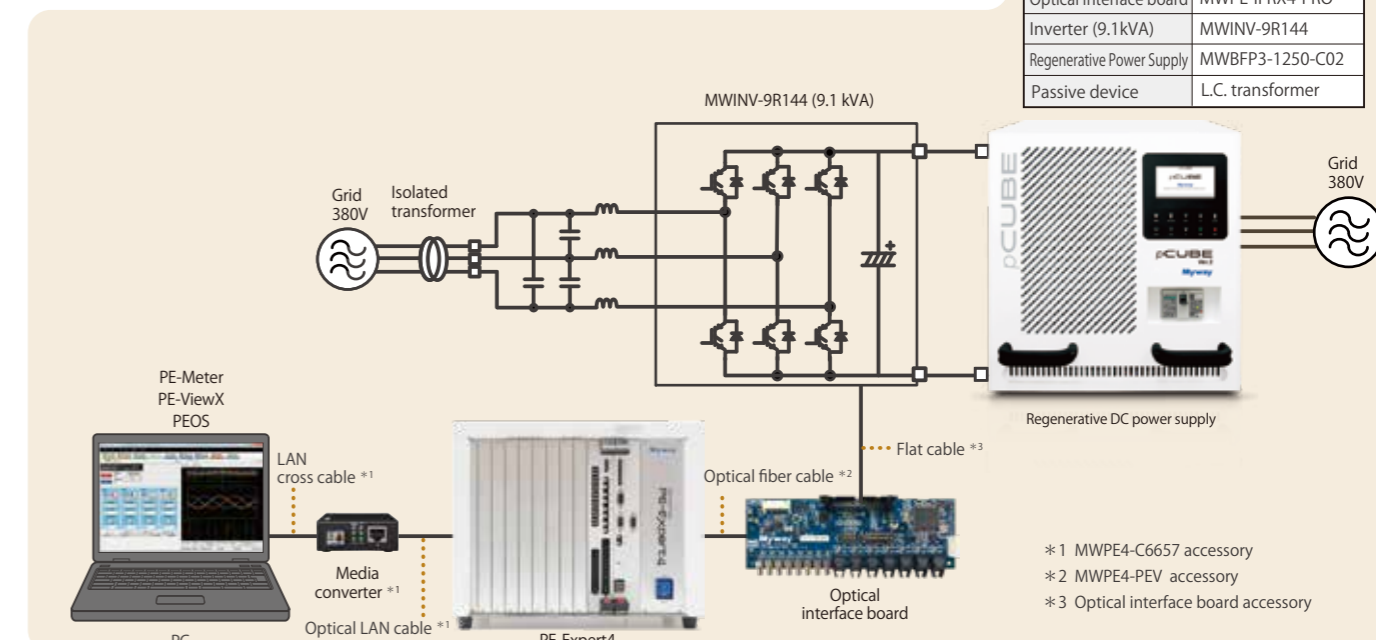


Grid link 3 phase inverter with PQ control

This example is simple grid connected inverter application, consisting of isolated transformer, Myway PE-inverter (ex. MWINV-9R144), pCUBE and PE-Expert4 as controller. The control program allow for real and reactive power to flow from the DC bus to the grid or from the grid to the DC bus.

Hardware

Products	Type
PE-Expert4 rack	MWPE4-RACK12
DSP board	MWPE4-C6657
PEV board	MWPE4-PEV
Optical interface board	MWPE-IFRX4-PRO
Inverter (9.1kVA)	MWINV-9R144
Regenerative Power Supply	MWBFP3-1250-C02
Passive device	L.C. transformer



Board List

For various applications and scalability, variety of interface boards are available.

	Board type	Size in slot	Max# in rack*1	Interface type								
				Communication	PWM	AD	DA	DI	DO	Others		
basic	1 DSP board MWPE4-C6657	2	—*2	CAN 1ch	RS232C 2ch							
	2 PEV board MWPE4-PEV	2	5			Opt. out 6ch	8ch		16ch	16ch	Enc. ABZ Resolver 1ch	Up/down count 2ch
w/ gate output	3 6 gate FPGA board MWPE4-IPFPGA6	1	5*3			Opt. out 6ch	8ch		4ch	4ch		
	4 24 gate FPGA board MWPE4-IPFPGA24	2	5*3			Opt. out 24ch	8ch		4ch	4ch		
	5 Extendable FPGA main board MWPE4-IPFPGAEX	2	5*3			Opt. out 6ch	8ch		4ch	4ch		
	6 Optical output extension board MWPE4-EXGATE	1	8			Opt. out 18ch						
	7 Optical input extension board MWPE4-EXRCVR	1	8								Opt. input 18ch*5	
w/o gate output	8 DA board MWPE4-DAC	1	5						12ch			
	9 PIO board MWPE4-PIO	1	5						16ch	16ch	Up/down count 2ch	Enc. ABZ Resolver 2ch
	10 AD board MWPE4-ADC	1	5						12ch			
	11 PE-Meter board MWPE4-METER	2	1						16ch*4		Enc. ABZ Resolver 2ch	Thermocouple 10ch Thermistor 2ch

*1 Maximum number of the same type of the board in single rack.

*2 One DSP board must be installed in a dedicated slot for system management.

*3 Up to 5 boards can be installed in a rack for any type of FPGA board.

*4 4ch are used for torque measurement or general purpose interface.

*5 Decode logic for communication is required in FPGA user logic.

1 DSP board MWPE4-C6657



Feature

One DSP board must be installed for system management. This board executes control program and communicate with PC and all other interface boards.

Accessories

- LAN cross cable 1
- Optical LAN media converter 1
- Optical LAN cable 1

Specification

Item	Spec	
#of slots used	2 slots	
DSP	TMS320C6657 (1.25GHz), dual core	
On chip RAM	1024KB/32KB(fast) (partially used) for system	
Ext. RAM	512MB (partially used) for system	
EEPROM	128KB	
PC interface	Ethernet (optical)	
Isolated RS232C	2 sets Dsub-9pin	
CAN port	Protocol	CAN2.0B
	#ch	1ch
	Speed	125kbps to 1Mbps
	#mail box	15 (one for rx only)
	Isolation	2500Vrms (ADM3053 like)
	Controller	CC770
	Driver	ADM3053
Connector	1set Dsub-9pin	

2 PEV board MWPE4-PEV



Feature

Interface board including all commonly used interfaces supports high speed carrier such as over 300kHz. Combination of DSP board and PEV board can support almost any type of basic power electronics application.

Accessories

- Optical fiber cable 7
- Co-axial SMB cable 8
- Flat cable (26pin and 40pin) 1 each
- 26pin and 40pin terminal board 1 each

*1 For resolver interface, Sensor signal interface and isolation box (provided by Myway Plus Corp.) is needed.

Specification

Item	Spec	
#of slot used	2 slots	
3-phase PWM	one set (6 gates and 1 brake)	
Modulation	Voltage triangular wave modulation, Voltage space vector modulation, Direct gate control	
Carrier (Dead time)	1kHz to 500kHz (0 to 20 μs)	
PWM precision	14bit (10kHz carrier)	
ADC	14bit 8ch simultaneous sample	
Digital input/output	16ch ea.	
Input capture	32bit 4ch (shared with Digital input pin)	
Up/Down counter	32bit 1set (shared with Digital input pin)	
ABZ encoder	32bit count 1set(A,B,Z) OC or differential	
Resolver*1	R/D IC	AU6803 compatible
	Interface	Serial (RS422) 1ch
	Electrical level	AM26LS31C (in) / AM26LS32A (out) compatible

3 6 gate FPGA Board MWPE4-IPFPGA6



Feature

A board embedded with FPGA delivering gate signals of 6 channels. Perfect for logic development through RTL for arbitrary waveform generation. By combining Intellectual Property (IP), logic development of FPGA will be simplified. Sample VHDL sources code is included.

Accessories

- SMB conversion board 1
- TTL-differential conversion board 1
- Optical fiber cable 6
- Co-axial SMB cable 8
- Flat cable (26pin and 16pin) 1 each

Specification

Item	Spec	
#of slot used	1 slot	
User's FPGA *1	XC7K70T-1FBG676C	
User's PROM	N25Q128A13ESF40E	
AD Converter	Channel Count	8ch
	Resolution	14bit
	Input Voltage Range	+/- 5V
	Conversion Time	500nsec
Digital Input	4ch	
Digital Output	4ch	
PWM	6ch	
JTAG Connector *2	Front panel	

*1 Xilinx USB Platform Cable or equivalent is not included.
*2 Xilinx compiler (Vivado or equivalent) is not included.

4 24 gate FPGA Board MWPE4-IPFPGA24



Feature

A board embedded with FPGA delivering gate signals of 24 channels. Real time gate control of up to 120 signals (5 boards) and perfect for developing controller for multiple outputs or inverters. By combining Intellectual Property (IP), logic development of FPGA will be simplified. Sample VHDL sources code is included.

Accessories

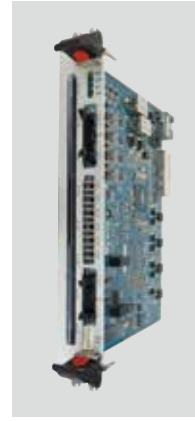
- SMB conversion board 1
- TTL conversion board 1
- Optical fiber cable 24
- Co-axial SMB cable 8
- Flat cable (26pin and 16pin) 1 each

Specification

Item	Spec	
#of slot used	2 slots	
User's FPGA *1	XC7K70T-1FBG676C	
User's PROM	N25Q128A13ESF40E	
AD Converter	Channel Count	8ch
	Resolution	14bit
	Input Voltage Range	+/- 5V
	Simultaneous Sampling	8ch
Digital Input	4ch	
Digital Output	4ch	
PWM	24ch	
JTAG Connector *2	Front panel	

*1 Xilinx USB Platform Cable or equivalent is not included.
*2 Xilinx compiler (Vivado or equivalent) is not included.

5 Extendable FPGA main board MWPE4-IPFPGAEX



Feature

This FPGA board consists of the same hardware as IPFPGA6/24, but this can be connected with up to 8 extension boards. If eight EXGATE boards are connected, 150 PWM optical output can be supported (144 from extension boards, 6 on this board). Optical input board can be connected as well (in total 8 boards).

Accessories*1

- SMB conversion board 1
- TTL conversion board 1
- Flat cable (26pin and 16pin) 1 each
- Extension board interface cable 8

*1 Optical fiber cable and co-axial SMB cable are NOT included. Order separately if necessary (refer to page.19, "Accessories" section.)

Refer to page 5 "FPGA Platform" for pre-customized FPGA.

Specification

Item	Spec	
#of slot used	1slot	
User's FPGA *2	XC7K70T-1FBG676C	
User's PROM	N25Q128A13ESF40E	
AD Converter	Channel Count	8ch
	Resolution	14bit
	Input Voltage Range	+/- 5V
	Simultaneous Sampling	8ch
Digital Input	4ch	
Digital Output	4ch	
PWM	6ch	
JTAG Connector *3	Front panel	
Extension board connector	8 ports on front panel (input or output)	

*2 Xilinx USB Platform Cable or equivalent is not included.

*3 Xilinx compiler (Vivado or equivalent) is not included.

6 Optical output extension board MWPE4-EXGATE



Feature

This is extension board connected to IPFPGAEX board, having 18 PWM optical output. The pwm signal generated by FPGA on IPFPGA board is converted to optical signal on this board.

Specification

Item	Spec
#of slot used	1slot
#of output	12ch (SMB connector)

7 Optical input extension board MWPE4-EXRCVR



Feature

This is extension board connected to IPFPGAEX board, having 18 PWM optical input. The optical signal coming from outside is converted to electric signal and passed to FPGA on IPFPGAEX board. There need to be decode logic (provided by user) in FPGA on IPFPGAEX board.

Specification

Item	Spec
#of slot used	1slot
#of input	12ch (SMB connector)

8 DA board MWPE4-DAC



Feature

Analog signal output board. PEOS, ready-to-use C function can be used for DAC (digital-to-analog conversion) to build up Function generator (wave form generator) or analog monitor for internal variables.

Accessories

- Co-axial SMB cable 12

Specification

Item	Spec
#of slot used	1slot
#of output	12ch (SMB connector)
Output range	+/-10V
Output resolution	16bit

9 PIO board MWPE4-PIO



Feature

This board provides general purpose digital signal interface with counter, encoder and resolver interface. PEOS, ready-to-use C function can be used for all interface and counter function controlled by DSP board.

Accessories

- Flat cable (40pin-20pin) 2
- Flat cable (40pin) 1
- Extension board (20pin) 2
- Extension board (40pin) 1

*1 For resolver interface, Sensor signal interface and isolation box (provided by Myway Plus Corp.) is needed.

Specification

Item	Spec	
#of slot used	1slot	
Digital interface	#of input	16ch (6ch are high-speed)
	Electric level	+12V~24V (+5V high-speed)
	Interrupt	1set
Up/Down counter	#of output	16ch
	#of channel	2ch
	Resolution	32bit
ABZ encoder	Type	Up/Down or Plus/DIR
	#of channel	2ch
	Resolution	32bit
	Electrical level	Differential or OC
Resolver input *1	Z interrupt	Yes
	R/D IC	AU6803 compatible
	Interface	Serial (RS422)
	Electrical level	AM26LS31C (in) / AM26LS32A (out) compatible

10 AD board MWPE4-ADC



Feature

Analog signal input extension board. Up to 12 analog inputs can be captured and converted, then those values are available in DSP board by PEOS, ready-to-use C function.

Accessories

- Co-axial SMB cable 12
- VH connector cable 1

Specification

Item	Spec
#of slot used	1slot
#of input	12ch (SMB connector)
Input range	+/-5V
Input resolution	14 bit

11 PE-Meter board MWPE4-METER



Feature

Board for PE-Meter, the integrated power analysis extension. Without interfering user control software operation, power meter function is performed.

Accessories

- Co-axial SMB cable 16
- BNC-SMB conversion connector 16
- Flat cable (40pin-20pin) 2
- Extension board (20pin) 4

Specification

Item	Spec	
#of slot used	2 slots	
#of input ch.	Power analysis	6 sets (12ch for V and I)
	Torque sensor inf.	2ch
	General purpose AD input	2ch
Input range	Power analysis	-5V to 5V
	Torque sensor inf.	-5V to 5V or -10V to 10V
	General purpose AD input	-5V to 5V
Frequency	500kHz	
LPF	500Hz, 1kHz, 5kHz, 10kHz, off	
ADC sample rate	3 MHz	
ADC resolution	14 bit	
Multiple conversion	Simultaneous conversion for all ch.	
Temperature logger	Thermocouple type	K, T
	Range	-100°C to 200°C
ABZ encoder	#of channel	2ch
	Resolution	32bit
	Electrical level	Differential or OC
	Z interrupt	Yes
Resolver input	R/D IC	AU6803 compatible
	Interface	Serial (RS422) x2ch AM26LS31C (in)/AM26LS32C (out) compatible

* Probe is not included in this board. Myway PE-Inverter series include sensors connecting with PE-Meter board directly.

Accessories

System Rack

System rack : MWPE4-RACK12



All boards are fit in this rack.

Accessories

- Power cable
- Blank panel × 10

Specification

Item	Spec
#of slots	12 slots
Input voltage	AC100 - 240V 50Hz / 60Hz
Input current	4A / 2A
Dimension	372mm(W) × 312mm(H) × 260mm(D)

Interface board

Optical receiver interface board : MWPE-IFRX4-PRO



This board converts optical input into electric signal for PWM control. In this board dead time can be added and gate control signal is passed to gate drive circuit.

Accessories

- Flat cable (34pin-34pin)

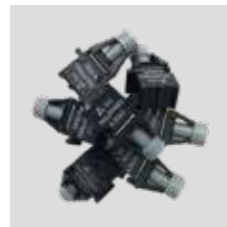
Specification

Item	Spec	
Optical inputs	6 × 1ch + brake1ch	
Analog output	8ch	
Digital input	2ch	
Digital output	3ch	
Dead time	Range	20n - 10.22 μs
	Resolution	20ns

● Dead time period can be configured and enabled/disabled by dipswitch on board.

Connectors

Optical receiver module (7 pieces) : MWACS-AFBR-2624Z



Optical receiver device for PCB mount (IMD). This is to be used for gate control signal receiver.

Optical transmitter module (7 pieces) : MWACS-AFBR-1624Z



Optical transmitter device for PCB mount (IMD). This is to be used for gate control signal transmitter.

SMB Coax connector (8 pieces) : MWACS-CON3150-BN



Coax cable terminal for PCB mount (IMD) for A/D input or D/A output.

BNC to SMD adaptor (8 pieces) : MWACS-BNC-SMB



SMD cable can be connected with BNC by this adaptor.

Flat cable connector 34pin : HIF3BA-34PA-2.54DSA(71)



34pin straight type flat cable socket.

Flat cable connector 50pin : HIF3BA-50PA-2.54DSA(71)



50pin straight type flat cable socket.

Cables

Optical LAN cable



2m : MWACS-DLPC2G/CSD2M
5m : MWACS-DLPC2G/CSD5M
10m : MWACS-DLPC2G/CSD10M

Optical LAN cable connecting PC/media converter with the system.

Reach : 2m / 5m / 10m

Flat cable



34pin-34pin : MWACS-FLT3434-01
34pin-50pin : MWACS-FLT3450-01
50pin-50pin : MWACS-FLT5050-01

Interface cable connecting Myway inverter with MWPE-IFRX4-PRO, the interface board. Then inverter can be controlled by PE-Expert4.

Controller

Type	Pin
MWPE-IFRX4-PRO	34 pin

Inverter

Type	Pin
MWINV-1R022	34 pin
MWINV-5R022	34 pin
MWINV-9R122B	34 pin
MWINV-2022A	34 pin
MWINV-5022B	34 pin
MWINV-7R006A	50 pin
MWINV-9R144	34 pin
MWINV-34044	34 pin

Co-axial SMB cable (8 pieces)



2m : MWACS-CON3200-BNX2
5m : MWACS-CON3200-BNX5
10m : MWACS-CON3200-BNX10

Cable for A/D input or D/A output with SMB connector.

Reach : 2m / 5m / 10m

Optical fiber cable (7 pieces)



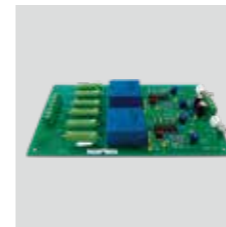
2m : MWACS-APOF03-001-2M
5m : MWACS-APOF03-001-5M
10m : MWACS-APOF03-001-10M

Optical cable for gate control optical interface.

Reach : 2m / 5m / 10m

Option units

Voltage sensor unit : MWPE-VS-01



The unit includes two voltage sensors with SMB output interface for each. Each has off-set and gain adjustment. Input/output ratio : +/-400V/+/-5V Response : 40 μs

Accessories

- Double ended SMB coax cable × 2

Current sensor unit : MWPE-IS-03



The unit includes three current sensors with SMB output interface for each. Each has off-set and gain adjustment.

Accessories

- Double ended SMB coax cable × 3

LC filter unit : MWPE-STK-LC2



Three phase LC filter unit for experimental use.

C = 2.2[μF]
L = 4[mH]

OC-CARD (Differential-Open collector converter board) : MWACS-OC-01



PCB to convert differential signals to open-collector output.

PIO/AD input/output kit : MWPE-STK-IO2



General purpose interface board for inverter or motor control. This board includes digital input (switch), output (LED) and analog output (volume). This board can be connected with PE-Expert4 system for simple user interface.

Feature

- Digital output (14 switches)
- Digital input (12 LEDs)
- Analog output (2 volumes)

Isolated sensor signal converter BOX : MWACS-PSIF-01



Motor rotor location sensor signal interface.

Sensor type

- Differential output ABZ encoder
- Resolver
- Open collector output ABZ encoder

Resolver type

- Make: Tamagawa Seiki
- Series: Singlsyn/Smartsyn*
- Input power : AC4Vrms/AC7Vrms 10kHz
- Transformer ratio : 0.200/0.230/0.286/0.500
- Input impedance : approx. 50 - 160Ω
- Output impedance : approx. 250 - 430Ω

* TS2620N271E14 is not supported