PAS100Di
Switching-mode 4-Quadrant Power Amplifier

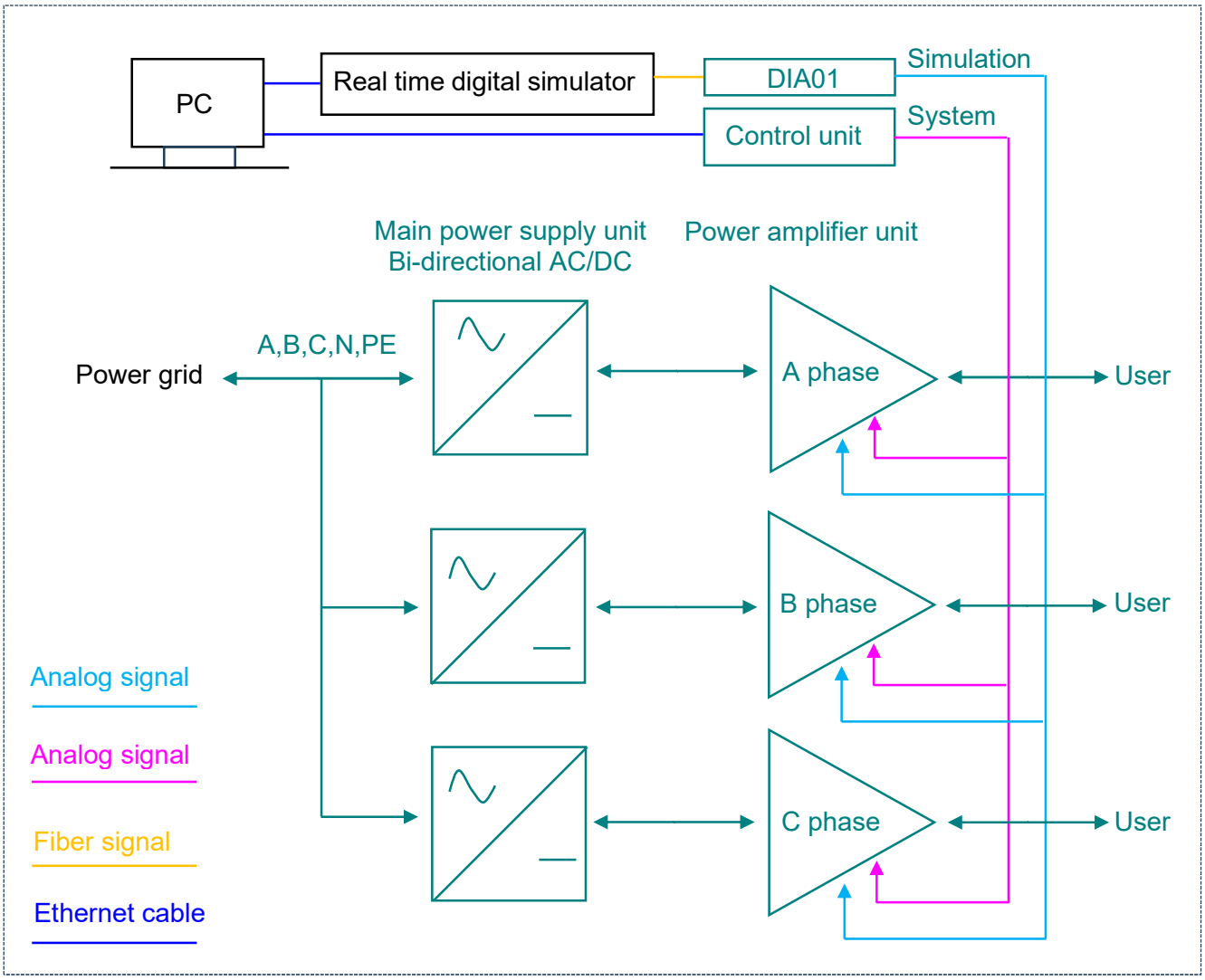
PONOVO POWER CO., LTD.
www.ponovo.net

Introduction

PAS100Di Switching-mode 4-Quadrant Power Amplifier (Hereinafter referred to as **PAS100Di**) is the important equipment used for PHIL (Power Hardware in Loop) solution, which can be vastly used for different industry application, such as electrical power system testing, new energy, aerospace, railway transportation, PV, EV, microgrid, large power charging system, distribute energy, etc.

PAS100Di are equipped with independent four-quadrant digital power amplifiers that can be operated from DC up to 1kHz (small signal 10kHz) output voltage.

PAS100Di offers various AC, DC and Hardware-In-the-Loop (HIL) operation modes.



PAS100Di series system block diagram

PAS100Di supports analog and digital communication with simulator system. Digital interface support Aurora protocol communication.

PAS100Di support both source mode and sink mode (80%) and ability to feedback energy to the grid.

With high power level, accuracy and slew rate, PAS100Di could be used for various kinds of experiments by users for power simulation application.

PAS100Di Switching-mode 4-Quadrant Power Amplifier

PAS100Di cabinets

Power amplifier cabinet　　Main power supply cabinet

Power amplifier cabinet	Main power supply cabinet
System monitoring unit	Bi-directional AC/DC-A
AURORA Digital Interface DIA01(rear panel)	Bi-directional AC/DC-B
Power amplifier-A 33kW	Bi-directional AC/DC-C
Power amplifier-B 33kW	Main power control panel
Power amplifier-C 33kW	

PAS100Di components

Power amplifier cabinet

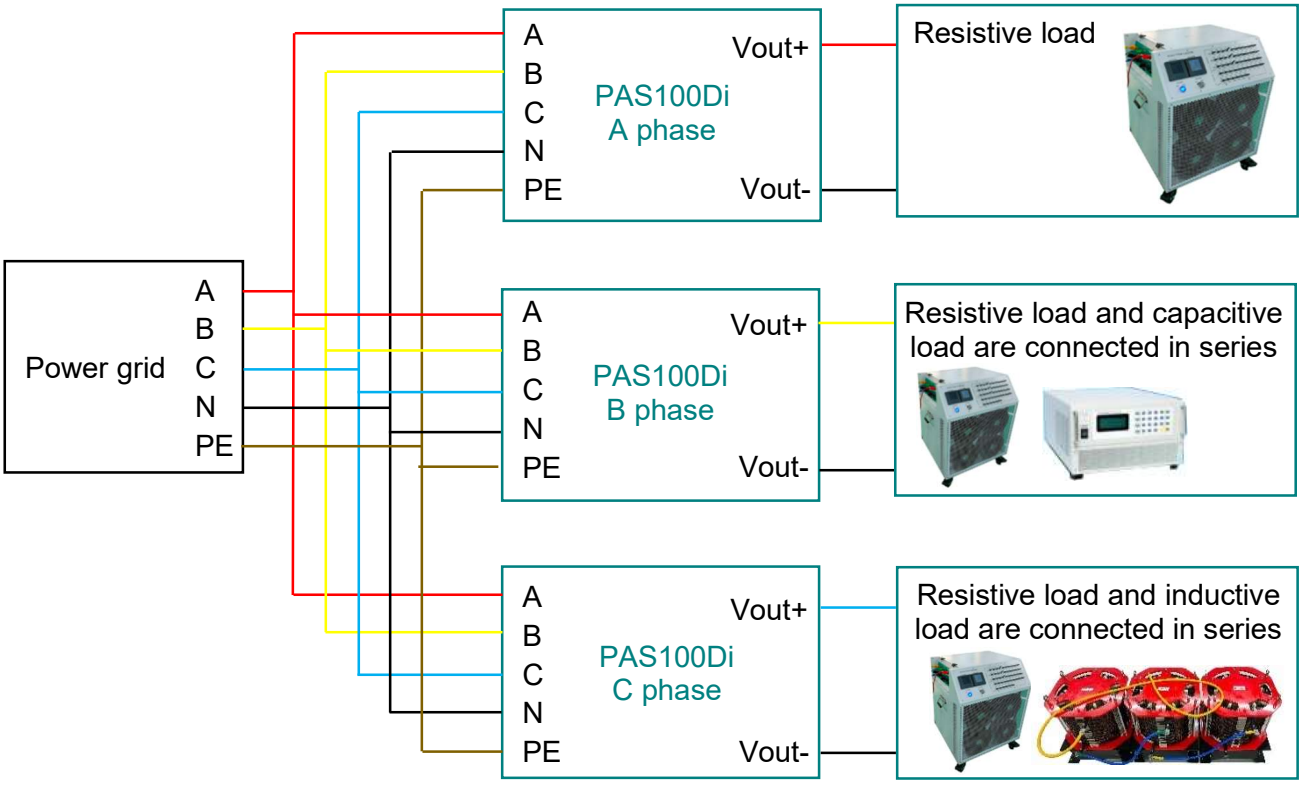
- System monitoring unit
- Power amplifier control unit – A phase
- Power amplifier A phase-1
- Power amplifier A phase-2
- Capacitor unit-A phase
- Power amplifier control unit – B phase
- Power amplifier B phase-1
- Power amplifier B phase-2
- Capacitor unit-B phase
- Power amplifier control unit – C phase
- Power amplifier C phase-1
- Power amplifier C phase-2
- Capacitor unit-C phase

Main power supply cabinet

- Bi-directional AC/DC-A-1
- Bi-directional AC/DC-A-2
- Bi-directional AC/DC-A-3
- Bi-directional AC/DC-A-4
- Bi-directional AC/DC-B-1
- Bi-directional AC/DC-B-2
- Bi-directional AC/DC-B-3
- Bi-directional AC/DC-B-4
- Bi-directional AC/DC-C-1
- Bi-directional AC/DC-C-2
- Bi-directional AC/DC-C-3
- Bi-directional AC/DC-C-4
- Circuit breaker
- Contactor-A
- Contactor-B
- Contactor-C

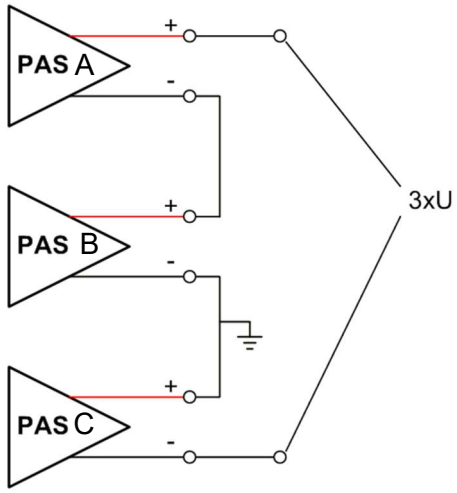
Application 1-output mode

PAS100Di system is operation in rated output mode, the load can be resistive load, capacitive load and inductive load.



Application 2-voltage series connection

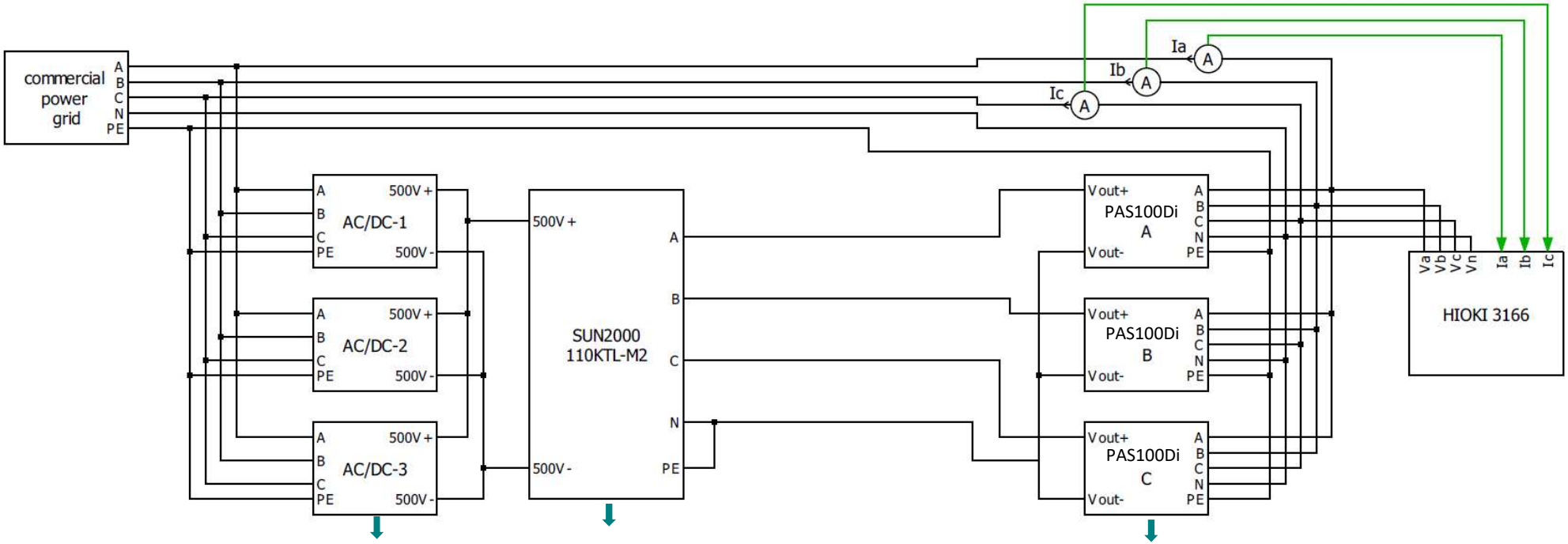
For PAS100Di system, the voltage output of A phase, B phase and C phase can be series connected and the negative of B phase is ground as follow diagram:



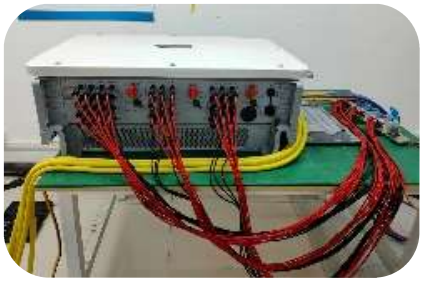
Power amplifier	DC output	AC output
A+	764V	540Vrms
A-	382V	270Vrms
B+	382V	270Vrms
B-	0V	0V
C+	0V	0V
C-	-382V	-270Vrms

Application 3-sink mode (without isolation transformer, 80% sink power)

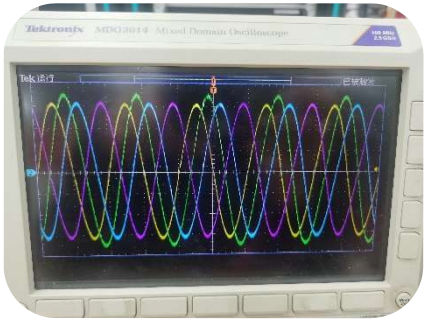
In the photovoltaic system simulation test, PAS100Di system is operation in 80% sink power mode.



AC/DC: for converting AC to DC, simulating solar panels, or battery systems.



SUN2000: inverter in PV system, converts DC into AC power (can track grid frequency and phase)



PAS100Di (rated power 100kW) is operation in 80% sink power mode
purple Vc: 220V green Ic: 121A

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Specifications

Nominal power output	
Total nominal power output	100kW/kVA
Total phases	3 phases
1 phase nominal power output	33kW/kVA
1 phase power amplifier output	
Nominal voltage output-AC	270Vrms
Nominal current output-AC	124A
Nominal voltage output-DC	±382V
Nominal current output-DC	87.5A
2 phases power amplifiers output in series	
Nominal voltage output-AC	540Vrms
Nominal current output-AC	124A
Nominal voltage output-DC	±764V
Nominal current output-DC	87.5A
2 phases power amplifiers output in parallel (optional)	
Nominal voltage output-AC	270Vrms
Nominal current output-AC	235A
Nominal voltage output-DC	±382V
Nominal current output-DC	165A
3 phases power amplifiers output in parallel (optional)	
Nominal voltage output-AC	270Vrms
Nominal current output-AC	350A
Nominal voltage output-DC	±382V
Nominal current output-DC	240A
Accuracy	
Voltage output accuracy	0.1%RD±300mV
Current output accuracy	0.5%RD±500mA
Frequency accuracy	1mHz
Accuracy of voltage measurement	0.5%RG
Accuracy of current measurement	0.5%RG

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Specifications (continuous)

General	
Switching frequency	125kHz
Peak efficiency	90%
Slew rate	≤4V/μs
Load regulation	<1%
Nominal sink power	80% of nominal power output (support connection with inverter directly)
Overload capacity	120%-60s
Communication interface	Fiber optic interface, Ethernet interface, Analog interface
Bandwidth	DC-1kHz(-3dB)
Small signal bandwidth	DC-10kHz(10%FS)
Gain	50V/V
Input signal	
Analog signal input	0~±10V
Digital signal interface	Communication interface with fiber optic ports, supporting AURORA protocol
Selectable waveforms	DC, sine, square, triangle, sawtooth, slope step
Cabinets	
Permissible power supply range	3-Phase, AC324V_{LL}~530V_{LL}, 45Hz~65Hz
Protection	Overheat, overload, over current, short circuit
Operation temperature	0°C to 40°C
Relative humidity	20%RH~75%RH
Overview	2 cabinets (1 Main power supply cabinet, 1 power amplifier cabinet)
1 cabinet dimension (HxWxD)	2090mm ×650mm×900mm
Weight Main power supply cabinet Power amplifier cabinet	 430kg 470kg

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