



P2 Series - Solar Pump

Dedicated AC Drive for pumping applications isolated from the commercial grid using photovoltaic arrays (PV)



1HP-350HP / 0.75kW-250kW
185-410Vdc / 345-800Vdc input

Applications:

Watering, irrigation, agriculture, swimming pools, water supplies, water treatment and others.

Maximum power point tracking (MPPT) algorithm significantly boosts system efficiency

Advanced PI set up, built in dual PI set point, dead-band and PI transition error

Extended DC operative voltage range
345-800Vdc HV
185-410Vdc LV



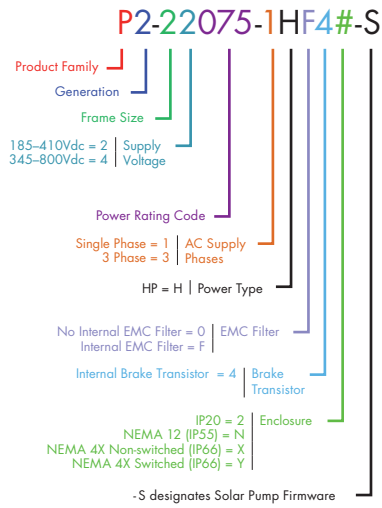
Key Features

- **Maximum power point tracking (MPPT)** algorithm continuously adapts the system load for maximum system output power under varying conditions of irradiance and temperature. MPPT is the best choice for getting the maximum pumping delivery from your PV array under all conditions.
- **Extended DC operative voltage range**, 345–800Vdc HV, 185–410Vdc LV which increases the system operational time per day and reducing unnecessary stoppages caused by the low array voltages present during dawn and dusk.
- **Advanced PI set up** built in dual PI set point, dead-band and PI transition error, creating very stable system control that responds slowly to small changes in irradiance but responds quickly to large changes in solar irradiance.
- **Advanced pump protection functions**, dry run protection, pipe-burst detection, pump clean function and pump stir function. These protection functions are designed for a reliable system while reducing the risk of damage to the pump.
- **Pipe-Fill function**, allows a configurable period for the pipe to fill slowly before operating normally and pipe-burst detection can be activated.
- **Remote monitoring**. All data can be accessed using Modbus RTU or CANopen communications on board or Ethernet pluggable option modules.
- **3 different methods for PID Sleep and wake up**. An optional external irradiance sensor could be selected to re-start the pump when sufficient energy is available from the sun.
- **Dual supply mode**. The P2 Solar pump can be powered by a DC voltage coming from PV arrays or the traditional commercial grid.
- **PLC integrated** to customize the more demanding applications where the user may need to control for example, valve actuators or monitor system water pressure to stop the drive above defined limits. The on-board PLC provides a high degree of flexibility.
- **Compatibility with all types of motors**, the P2 Solar Pump is compatible with AC induction motors, Permanent Magnet (PM) motors, Synchronous Reluctance (SynRM) motors, Brushless DC (BLDC) motors.
- **Digital inputs for tank high water level and well low water detection**, forcing the drive to stop when the destination tank is full or the water well is empty.
- **Second analog input for pressure monitoring**, this can be used just to monitor system pressure locally or remotely or to stop the pump if the water pressure exceeds a configured level.
- **Irradiance level can be monitored on the drive display**
- **Optional Sine-Wave filters**
- **Available in different IP enclosures IP20, NEMA 12 (IP55), NEMA 4X (IP66)**

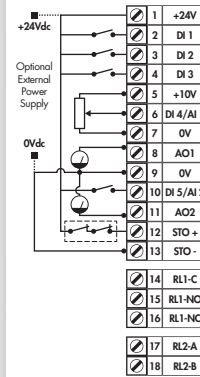
Drive Specification

Input Ratings	Supply Voltage	185–410Vdc 345–800Vdc	Fieldbus Connectivity	Built-in	BACnet Application Specific Controller 9.6 - 76.8 kbps selectable Data Format: 8N1, 8N2, 8O1, 8E1
	Phase Imbalance	3% Maximum allowed			
	Inrush Current	< rated current			
	Power Cycles	120 per hour maximum, evenly spaced			Modbus RTU 9.6 - 115.2 kbps selectable 8N1, 8N2, 8E1, 8O1
Output Ratings	Output Power	230V; 0.75-75kW (1-100HP) 400V; 0.75-250kW	Optional	Other	PROFIBUS DP (DPV1) PROFINET IO DeviceNet EtherNet/IP EtherCAT Modbus TCP
	Overload Capacity	110% for 60 seconds			
	Output Frequency	0 – 500Hz, 0.1Hz resolution			
	Typical Efficiency	> 98%			
Ambient Conditions	Temperature	Storage: –40 to 60°C Operating: –10 to 50°C	I/O Specification	Power Supply	24 Volt DC, 100mA, Short Circuit Protected 10 Volt DC, 10mA for Potentiometer
	Altitude	Up to 1000m ASL without derating Up to 2000m maximum UL Approved Up to 4000m maximum (non UL)		Programmable Inputs	5 Total as standard (Optional additional 3) 3 Digital (Optional additional 3) 2 Analog / Digital Selectable
	Humidity	95% Max, non condensing		Digital Inputs	Opto - Isolated 8 – 30 Volt DC, internal or external supply Response time < 4ms
	Vibration	Sinusoidal Vibration Conforms to IEC 60068-2-6 Random Vibration Conforms to IEC 60068-2-64 10 - 57Hz @ 0.075mm Pk 57 - 150Hz @ 1g Pk		Analog Inputs	Resolution: 12 bits Response time: < 4ms Accuracy: < 1% full scale Parameter adjustable scaling and offset
Enclosure	Ingress Protection	IP20, NEMA 12 (IP55), NEMA 4X (IP66)		PTC Input	Motor PTC / Thermistor Input Trip Level : 3kΩ
	Key pad	Built-in keypad as standard Optional remote mountable keypad <i>drive.web savvy</i> software		Programmable Outputs	4 Total (Optional additional 3) 2 Analog / Digital 2 Relays (Optional additional 3)
	Display	Built-in multi language OLED (IP55 & IP66) 7 Segment LED (IP20)		Relay Outputs	Maximum Voltage: 250 VAC, 30 VDC Switching Current Capacity: 5A
				Analog Outputs	0 to 10 Volt 0 to 20mA 4 to 20mA
Control Specification	Control Method	ECO Vector Control PM Vector Control BLDC Vector Control Synchronous Reluctance Vector Control	Application Features	PID	In-built MPPT mode MPPT Optimization Dual PID Set-point Dual PID Gains
	PWM Frequency	4–32kHz Effective		Pump Features	Pipe-Fill function Pipe Burst detection Dry Run detection Blocked Pump detection/clean Pump Stir
	Stopping Mode	Ramp to Stop: User Adjustable 0.01–600 secs Coast to Stop		Fault Memory	Last 4 Trips stored with time stamp
	Skip Frequency	Single point, user adjustable		Data Logging	Logging of data prior to trip for diagnostic purposes: Output Current Drive Temperature DC Bus Voltage
Setpoint Control	Analog Signal	MPPT 0 to 10 Volts 10 to 0 Volts –10 to +10 Volts 0 to 20mA 20 to 0mA 4 to 20mA 20 to 4mA	Maintenance & Diagnostics	Maintenance Indicator	Maintenance Indicator with user adjustable maintenance interval Onboard service life monitoring
	Digital	Motorised Potentiometer (Keypad) Modbus RTU BACnet MS/TP		Monitoring	Hours Run Meter Resettable & Non Resettable kWh meters Cooling Fan Run Time
				Standards Compliance	Low Voltage Directive 2014/35/EU
					EMC Directive 2014/30/EU
					Additional Conformance UL, cUL, EAC, RCM
					Marine Certification DNV Type Approval
					Environmental Conditions Designed to meet IEC 60721-3-3, in operation: IP20 Drives: 3S2/3C2 NEMA 12 & 4X Drives (IP55 & 66): 3S3/3C3

Model Code Guide



Connection Diagram



Function	Default Setting
24 Volt DC Output, 100mA max / 24 Volt DC Input	
Digital Input 1	Drive Enable
Digital Input 2	Forward/Reverse Select
Digital Input 3	Preset Speed 1 Select
+10 Volt Power Supply 5mA	
Analog Input 1	Speed Reference 0–10 Volt
0 Volt	
Analog Output 1	Motor Speed
0 Volt	
Analog Input 2	
Analog Output 2	Motor Current
Safe Torque Off Input	
Safe Torque Off Input	
Output Relay 1	Drive Healthy / Fault
Output Relay 2	Drive Running

NOT TO SCALE



		IP20							NEMA 4X / IP66		NEMA 12 / IP55			
Size		2	3	4	5	8			2	3	4	5	6	7
in / mm	Height	8.7" / 221	10.3" / 261	16.5" / 418	19.2" / 486	39.2" / 995	10.2" / 257	12.2" / 310	17.3" / 450	21.3" / 540	34.1" / 865	50.4" / 1280		
in / mm	Width	4.4" / 110	5.2" / 131	6.3" / 160	8.8" / 222	19.0" / 482	7.4" / 188	8.3" / 211	6.8" / 171	9.3" / 235	13.0" / 330	13.0" / 330		
in / mm	Depth	7.3" / 185	8.1" / 205	9.5" / 240	10.3" / 260	18.9" / 480	9.5" / 239	10.5" / 266	10.0" / 252	10.7" / 270	13.0" / 330	14.2" / 360		
lb / kg	Weight	4.0 / 1.8	7.7 / 3.5	20.3 / 9.2	39.9 / 18.2	282.2 / 128	10.6 / 4.8	16.8 / 7.7	25.4 / 11.5	50.7 / 23	121.2 / 55	196.2 / 89		

P2 Series Models & Ratings

Standard IP20 Packages

With EMC Filter & DB transistor

200-240V ± 10%, 1-ph in, 230V, 3-ph motor

Model	HP	Amps	Size
P2-22010-1HF42-S	1	4.3	2
P2-22020-1HF42-S	2	7	2
P2-22030-1HF42-S	3	10.5	2

200-240V ± 10%, 3-ph in, 230V, 3-ph motor

Model	HP	Amps	Size
P2-22010-3HF42-S	1	4.3	2
P2-22020-3HF42-S	2	7	2
P2-22030-3HF42-S	3	10.5	2
P2-32050-3HF42-S	5	18	3
P2-32075-3HF42-S	7.5	24	3

380-480V ± 10%, 3-ph in, 460V, 3-ph motor

Model	HP	Amps	Size
P2-24010-3HF42-S	1	2.2	2
P2-24020-3HF42-S	2	4.1	2
P2-24030-3HF42-S	3	5.8	2
P2-24050-3HF42-S	5	9.5	2
P2-34075-3HF42-S	7.5	14	3
P2-34100-3HF42-S	10	18	3
P2-34150-3HF42-S	15	24	3

NEMA12 (IP55) Packages

With EMC Filter, DB transistor

200-240V ± 10%, 3-ph in, 230V, 3-ph motor

Model	HP	Amps	Size
P2-42075-3HF4N-S	7.5	24	4
P2-42100-3HF4N-S	10	30	4
P2-42150-3HF4N-S	15	46	4
P2-52020-3HF4N-S	20	61	5
P2-52025-3HF4N-S	25	72	5
P2-62030-3HF4N-S	30	90	6
P2-62040-3HF4N-S	40	110	6
P2-62050-3HF4N-S	50	150	6
P2-62060-3HF4N-S	60	180	6
P2-72075-3HF4N-S	75	202	7
P2-72100-3HF4N-S	100	248	7
P2-72125-3HF4N-S	125	302	7

380-480V ± 10%, 3-ph in, 460V, 3-ph motor

Model	HP	Amps	Size
P2-44150-3HF4N-S	15	24	4
P2-44200-3HF4N-S	20	30	4
P2-44250-3HF4N-S	25	39	4
P2-44300-3HF4N-S	30	46	4
P2-54040-3HF4N-S	40	61	5
P2-54050-3HF4N-S	50	72	5
P2-64060-3HF4N-S	60	90	6
P2-64075-3HF4N-S	75	110	6
P2-64120-3HF4N-S	120	150	6
P2-64150-3HF4N-S	150	180	6
P2-74175-3HF4N-S	175	202	7
P2-74200-3HF4N-S	200	240	7
P2-74250-3HF4N-S	250	302	7

IP20 units to 350HP

P2-84300-3H042-S	300	370	8 (not UL)
P2-84350-3H042-S	350	480	8 (not UL)

For single phase supply derate to 50%

NEMA 4X (IP66) Indoor Rated

P2 Open/Closed Loop Vector Drives

With EMC filter, brake transistor +/- DC bus

SIZE	HP	AMPS	UNSWITCHED	SWITCHED
230V, SINGLE PHASE IN, 230V, 3-PHASE MOTOR				
2	1	4.3	P2-22010-1HF4X-S	P2-22010-1HF4Y-S
2	2	7	P2-22020-1HF4X-S	P2-22020-1HF4Y-S
2	3	10.5	P2-22030-1HF4X-S	P2-22030-1HF4Y-S
230V, 3-PHASE IN, 230V, 3-PHASE MOTOR				
2	1	4.3	P2-22010-3HF4X-S	P2-22010-3HF4Y-S
2	2	7	P2-22020-3HF4X-S	P2-22020-3HF4Y-S
2	3	10.5	P2-22030-3HF4X-S	P2-22030-3HF4Y-S
3	5	18	P2-32050-3HF4X-S	P2-32050-3HF4Y-S
380/460V, 3-PHASE IN, 380/460V, 3-PHASE MOTOR				
2	1	2.2	P2-24010-3HF4X-S	P2-24010-3HF4Y-S
2	2	4.1	P2-24020-3HF4X-S	P2-24020-3HF4Y-S
2	3	5.8	P2-24030-3HF4X-S	P2-24030-3HF4Y-S
2	5	9.5	P2-24050-3HF4X-S	P2-24050-3HF4Y-S
3	7.5	14	P2-34075-3HF4X-S	P2-34075-3HF4Y-S
3	10	18	P2-34100-3HF4X-S	P2-34100-3HF4Y-S
500/600V, 3-PHASE IN, 500/600V, 3-PHASE MOTOR				
2	1	2.1	P2-26010-3HF4X-S	P2-26010-3HF4Y-S
2	2	3.1	P2-26020-3HF4X-S	P2-26020-3HF4Y-S
2	3	4.1	P2-26030-3HF4X-S	P2-26030-3HF4Y-S
2	5	6.5	P2-26050-3HF4X-S	P2-26050-3HF4Y-S
2	7.5	9	P2-26075-3HF4X-S	P2-26075-3HF4Y-S
3	10	12	P2-36100-3HF4X-S	P2-36100-3HF4Y-S
3	15	17	P2-36100-3HF4X-S	P2-36100-3HF4Y-S

Encoder feed back option T2-ENCOD-IN

Ethernet networking & smart programmable control option dw224-00

600VAC DRIVES

Standard IP20 Packages to 20 HP

500-600V ± 10%, 3-ph in, 500-600V, 3-ph motor

Model	HP	Amps	Size
P2-26010-3H042-S	1	2.1	2
P2-26020-3H042-S	2	3.1	2
P2-26030-3H042-S	3	4.1	2
P2-26050-3H042-S	5	6.5	2
P2-26075-3H042-S	7.5	9	2
P2-36100-3H042-S	10	12	3
P2-36150-3H042-S	15	17	3
P2-36200-3H042-S	20	22	3

NEMA12 (IP55) Packages to 250 HP

500-600V ± 10%, 3-ph in, 500-600V, 3-ph motor

Model	HP	Amps	Size
P2-46200-3H04N-S	20	22	4
P2-46250-3H04N-S	25	28	4
P2-46300-3H04N-S	30	34	4
P2-46400-3H04N-S	40	43	4
P2-56050-3H04N-S	50	54	5
P2-56060-3H04N-S	60	65	5
P2-66075-3H04N-S	75	78	6
P2-66100-3H04N-S	100	105	6
P2-66125-3H04N-S	125	130	6
P2-66150-3H04N-S	150	150	6

P2 OPTIONS

T2-ENCOD-IN Encoder feedback module

T2-OPORT-IN Remote keypad & display

T2-OPPAD-IN Remote keypad w/OLED display

For more about the P2 Series:

bardac.com/p2-series/



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