Bardac drives

P² SERIES

P² SERIES

AC Variable Speed Drive

Powerful Performance

Advanced Motor Control

1HP–400HP / 0.75kW–250kW

200–600V Single & 3 Phase Input

Powerful Performance

World leading control for the latest generation of permanent magnet and standard induction motors

Manufacturing Conveyer Systems Processing Plants Chemical Pumping Machine Tools Plastics Rubber Elevators Cranes

World Leading Motor Control

The P2 Series offers the perfect combination of high performance together with ease of use to allow even the most demanding applications to be tackled easily.

Designed for fast installation and commissioning, the P2 Series provides the most cost effective solution for industry.

All P2 Series drives provide 150% overload for 60 seconds as standard, ensuring each drive is suitable for Heavy Duty applications, whilst the IP55 enclosed versions ensure the drive is tough enough to survive in industrial environments.

Extensive I/O and communications interface capabilities ensure the drive can be integrated quickly and efficiently into a wide variety of control systems with the minimum commissioning time, ensuring rapid start up. Bardac's simple parameter structure, and carefully selected factory parameter settings, ensure that commissioning time is kept to a minimum.

Compliant with international standards.

150% overload for 60 seconds

P² SERIES

IP20

Up to 400HP

IP55

Up to 400HP

IP66

Up to 40HP

Advanced Motor Control

The P2 Series has been uniquely developed to allow a wide range of different motor types to be used, with only parameter changes being required. This technology allows the same drive to be used in a wide range of applications, allowing OEMs and end user alike to take advantage of the energy saving provided by using the latest motor technologies.

AC Induction Motors

The majority of AC motors in use today around the world are standard induction motors. These motors are relatively low cost, readily available and provide good performance with long service life. With the ever increasing focus on energy efficiency, motor manufacturers have refined and improved their designs in recent years.

The P2 Series has been developed to provide optimum control and maximum efficiency when operating with older motors designs, or newer high efficiency designs.

Operation can be in simple V/F control mode or in High Performance Third Generation Vector Mode, which provides up to 200% torque from zero speed without requiring an encoder.

Permanent Magnet AC Motors

Permanent magnet AC motors provide improved efficiency compared to standard induction motors. Using permanent magnets in the motor construction eliminates the need for any magnetising current, reducing electrical losses. PM motors have been used for many years in high performance applications, however this has always required the use of a feedback device, such as a resolver or encoder. The P2 Series has been designed to operate with AC PM motors without requiring any feedback device, allowing them to be used for their energy efficiency benefits without incurring extra cost and complexity in applications which do not require position feedback.

Brushless DC Motors

BLDC motors are similar to AC PM motors, however the design requires a slightly different control method to optimize the performance. The P2 Series has the flexibility to control this type of motor, requiring only simple parameter changes. This provides much greater flexibility for OEMs, allowing P2 Series drives to be used in a variety of applications, with various motor types.

Synchronous Reluctance Motors

Synchronous Reluctance Motors (SynRM), not to be confused with Switched Reluctance Motors, share a similar stator construction to standard induction motors, however the rotor is substantially different, in order to improve the overall efficiency of the motor. SynRM motors are ideally suited to variable torque applications.

P2 Series drives can control synchronous reluctance motors, allowing the energy saving benefits to be realised.

At a Glance...

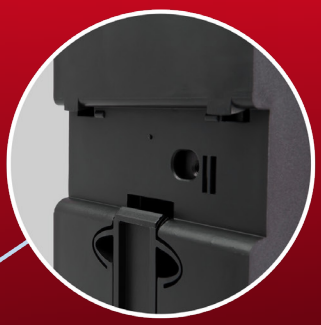
High performance, excellent usability and flexible to meet the needs of your application

P² SERIES

Contactor-style Power Wiring Arrangement

Keyhole Mounts for fast installation

Convenient Reference Card



DIN Rail Mount

dw224 speedy
Enhanced Function Blocks
Ethernet EIP/PCC
ModbusTCP/IP
USB

Modbus RTU and CANopen onboard as standard

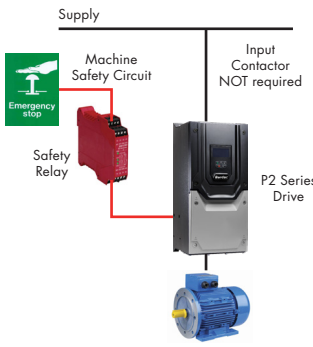
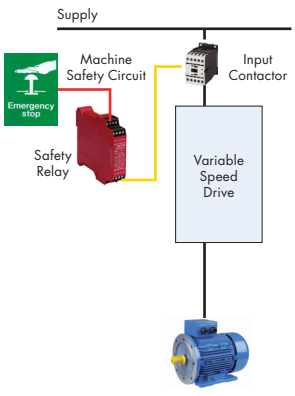
Optional comms & encoder interface

Safe Torque Off (provided as standard)

The P2 Series features a safe torque off function to allow simple integration into machine critical safety circuits.

- Simple machine design reduces component costs, saves panel space and minimises installation time
- Faster shut down and reset procedures reduce system maintenance time
- Better safety standard compared to mechanical solution
- Better motor connection. Single cable with no interruption.

Functional Safety Type Approved TÜVRheinland FS

With	Without
	

Applications

High performance, accurate motor control for even the most demanding of applications

Mining & Quarrying

- Feed conveyers
- Crushers
- Cranes

Metals & Processing

- Grinding
- Cutting
- Polishing
- Drilling
- Rolling

Rubber & Plastics

- Extruders
- Moulding
- Mixers
- Winding

Food & Beverage

- Conveyers
- Pumps
- Mixers
- Palletisers

Powerful, versatile and easy to use

P² SERIES

Cranes

Requirements:

- High starting torque
- Smooth motor operation throughout starting and stopping phases
- Motor holding brake control
- Avoidance of load droop and sag
- Regeneration and braking capability during load lowering

P2 Series drives provide:

- Dedicated Hoist Mode Operation with motor holding brake control algorithm
- Up to 200% torque from zero speed in vector operation without encoder feedback
- Multiple Preset Speed or variable speed operation
- Built in dynamic braking transistor, requires only an external resistor

Compressors

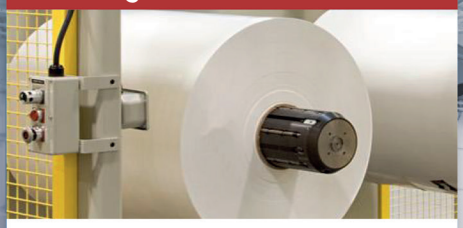
Requirements:

- Precise regulation of speed to ensure a consistent end product
- High starting torque demand in many applications
- Maximum efficiency under all conditions
- Safe operation to prevent accidents and injuries

P2 Series drives provide:

- PM Motor control mode to allows open loop operation with Permanent Magnet motors for maximum efficiency
- Maximum starting torque with standard AC motors
- Better than 0.5% speed holding accuracy in Open Loop Vector Operation
- Dedicated Safe Torque Off input complies with EN62061 SIL Level 2 for safe operation

Winding

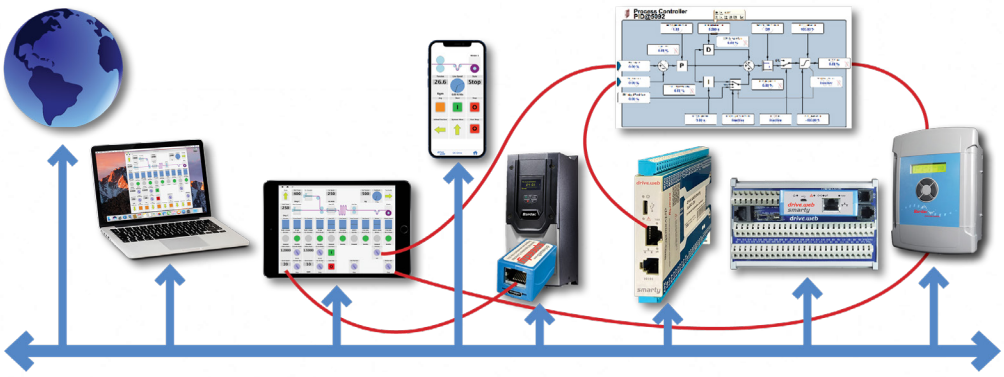


Requirements:

- Precise control of motor torque over a broad speed range
- Accurate control of material tension under all conditions
- Open or closed loop control capability, based on tension feedback or winding diameter
- Web break protection in case of material breakage

P2 Series drives provide:

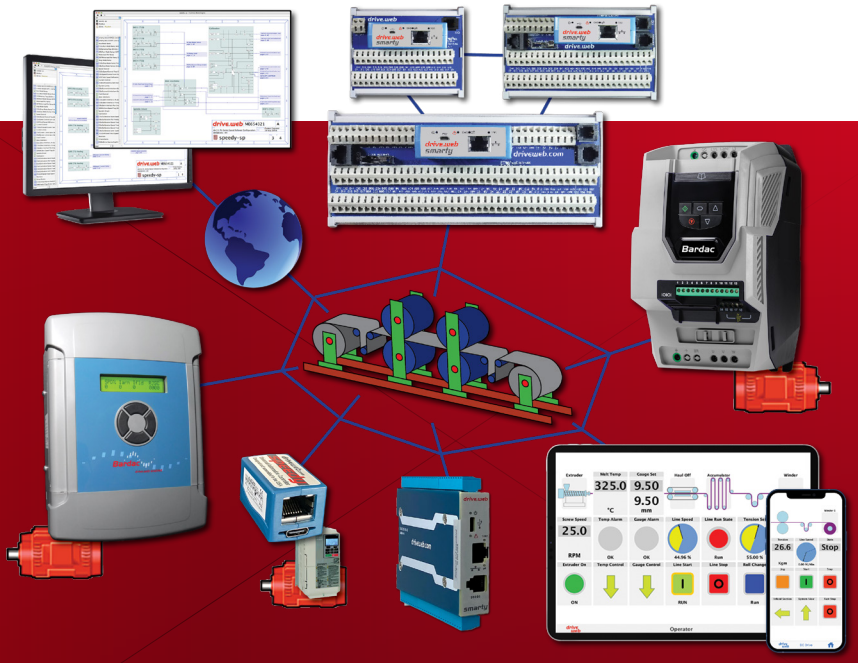
- PID Closed Loop Tension Control with feedback from a load cell or dancer arm
- Open Loop Vector control provides optimum control of the output torque level
- Encoder feedback option allows for a very wide speed range, even down to zero speed
- Safe Torque Off input immediately disables the drive in Emergency conditions



All P2 Series drives are
***drive.web* ready**

drive.web uses distributed control over Ethernet to provide cost effective, high performance integration of drives & controls in systems of any size or complexity.

drive.web automation



drive.web uses distributed control over Ethernet to provide cost effective, high performance integration of drives and controls in systems of any size or complexity.

smarty

controllers with a wide range of I/O

Used for all programmable control, peer-to-peer Ethernet networking and system integration tasks.

- DIN mount controllers with flexible analog, logic, and encoder I/O
- 16 points of high resolution I/O
- Includes gateway to ModbusTCP/IP, ModbusRTU, EIP/PCCC, etc.
- USB port for easy system-wide programming

speedy

miniature, full-featured controllers

Tiny, full-featured, programmable controllers for embedding into drives, sensors, HMIs, etc.

- The easiest, affordable way to get all your drives & devices up onto peer-to-peer Ethernet
- Includes gateway to ModbusTCP/IP, ModbusRTU, EIP/PCCC, etc.
- USB port for easy system-wide programming

savvy

the smart automation tool

Smart, intuitive graphical tools for device programming, system design, and monitoring.

Also available on PC and iOS devices

savvyPanel

smart, touch screen operator station technology

Provides unprecedented flexibility in instrumentation, control, and monitoring.

Options & Accessories

Installation options, plug-in modules and commissioning tools

Installation & Peripheral Options

A range of external EMC Filters, Brake Resistors, Input Chokes and Output Filters are available, to suit all installation requirements

Encoder Feedback

T2-ENCOD-IN (5 Volt)
T2-ENCHT-IN (15 – 30 Volt)

Closed loop encoder feedback, compatible with a wide range of incremental encoders

Extended I/O

T2-EXTIO-IN

- Additional 3 Digital Inputs
- Additional Relay Output

Extended Relay

T2-CASCD-IN

Additional 3 Relay Outputs:

Relay 3 – Drive Healthy Indication
Relay 4 – Drive Fault Indication
Relay 5 – Drive Running Indication

Functions are programmable / adjustable

Profibus DP

T2-PROFB-IN

DeviceNet

T2-DEVNT-IN

Ethernet IP

T2-ETHNT-IN

Modbus TCP

T2-MODIP-IN

Profinet

T2-PFNET-IN

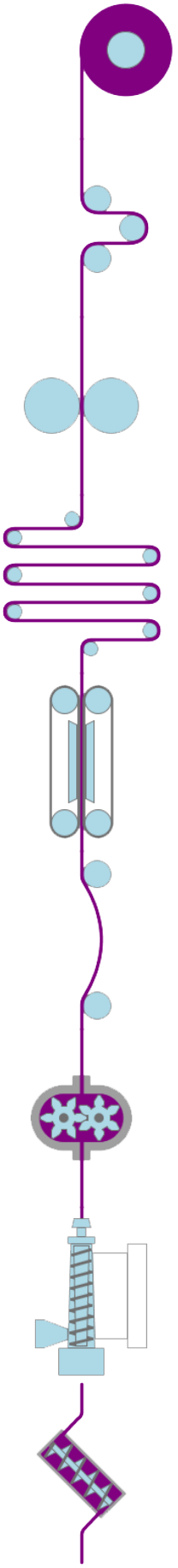
EtherCat

T2-ETCAT-IN

Rapid Commissioning

- Allows rapid copying of parameters between multiple drives
- Backup and restore of drive parameters

T3-STICK-IN



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	1	4.3	2
P2-22020-1HF42	2	7	2
P2-22030-1HF42	3	10.5	2

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

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

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

Model	HP	Amps	Size
P2-24010-3HF42	1	2.2	2
P2-24020-3HF42	2	4.1	2
P2-24030-3HF42	3	5.8	2
P2-24050-3HF42	5	9.5	2
P2-34075-3HF42	7.5	14	3
P2-34100-3HF42	10	18	3
P2-34150-3HF42	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‡	7.5	24	4
P2-42100-3HF4N‡	10	30	4
P2-42150-3HF4N‡	15	46	4
P2-52020-3HF4N‡	20	61	5
P2-52025-3HF4N‡	25	72	5
P2-62030-3HF4N‡	30	90	6
P2-62040-3HF4N‡	40	110	6
P2-62050-3HF4N‡	50	150	6
P2-62060-3HF4N‡	60	180	6
P2-72075-3HF4N	75	202	7
P2-72100-3HF4N	100	248	7
P2-72125-3HF4N	125	302	7

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

Model	HP	Amps	Size
P2-44150-3HF4N‡	15	24	4
P2-44200-3HF4N‡	20	30	4
P2-44250-3HF4N‡	25	39	4
P2-44300-3HF4N‡	30	46	4
P2-54040-3HF4N‡	40	61	5
P2-54050-3HF4N‡	50	72	5
P2-64060-3HF4N‡	60	90	6
P2-64075-3HF4N‡	75	110	6
P2-64120-3HF4N‡	120	150	6
P2-64150-3HF4N‡	150	180	6
P2-74175-3HF4N	175	202	7
P2-74200-3HF4N	200	240	7
P2-74250-3HF4N	250	302	7
P2-84300-3H04N‡	300	370	8
P2-84400-3H04N‡	400	480	8

Drives marked ‡ are available in IP20 enclosures with 50°C rating

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	P2-22010-1HF4A	P2-22010-1HF4B
2	2	7	P2-22020-1HF4A	P2-22020-1HF4B
2	3	10.5	P2-22030-1HF4A	P2-22030-1HF4B
230V, 3-PHASE IN, 230V, 3-PHASE MOTOR				
2	1	4.3	P2-22010-3HF4A	P2-22010-3HF4B
2	2	7	P2-22020-3HF4A	P2-22020-3HF4B
2	3	10.5	P2-22030-3HF4A	P2-22030-3HF4B
3	5	18	P2-32050-3HF4A	P2-32050-3HF4B
380/460V, 3-PHASE IN, 380/460V, 3-PHASE MOTOR				
2	1	2.2	P2-24010-3HF4A	P2-24010-3HF4B
2	2	4.1	P2-24020-3HF4A	P2-24020-3HF4B
2	3	5.8	P2-24030-3HF4A	P2-24030-3HF4B
2	5	9.5	P2-24050-3HF4A	P2-24050-3HF4B
3	7.5	14	P2-34075-3HF4A	P2-34075-3HF4B
3	10	18	P2-34100-3HF4A	P2-34100-3HF4B
500/600V, 3-PHASE IN, 500/600V, 3-PHASE MOTOR				
2	1	2.1	P2-26010-3HF4A	P2-26010-3HF4B
2	2	3.1	P2-26020-3HF4A	P2-26020-3HF4B
2	3	4.1	P2-26030-3HF4A	P2-26030-3HF4B
2	5	6.5	P2-26050-3HF4A	P2-26050-3HF4B
2	7.5	9	P2-26075-3HF4A	P2-26075-3HF4B
3	10	12	P2-36100-3HF4A	P2-36100-3HF4B
3	15	17	P2-36100-3HF4A	P2-36100-3HF4B

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	1	2.1	2
P2-26020-3H042	2	3.1	2
P2-26030-3H042	3	4.1	2
P2-26050-3H042	5	6.5	2
P2-26075-3H042	7.5	9	2
P2-36100-3H042	10	12	3
P2-36150-3H042	15	17	3
P2-36200-3H042	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	20	22	4
P2-46250-3H04N	25	28	4
P2-46300-3H04N	30	34	4
P2-46400-3H04N	40	43	4
P2-56050-3H04N	50	54	5
P2-56060-3H04N	60	65	5
P2-66075-3H04N	75	78	6
P2-66100-3H04N	100	105	6
P2-66125-3H04N	125	130	6
P2-66150-3H04N	150	150	6

P2 OPTIONS

T2-ENCOD-IN Encoder feedback module
T2-OPORT-IN Remote keypad & display
T3-OPPAD-IN Remote keypad w/TFT display

Drive Specification

Input Ratings	Supply Voltage	200 – 240V ± 10% 380 – 480V ± 10% 500 – 600V ± 10%
	Supply Frequency	48 – 62Hz
	Displacement Power Factor	> 0.98
	Phase Imbalance	3% Maximum allowed
	Inrush Current	< rated current
	Power Cycles	120 per hour maximum, evenly spaced
Output Ratings	Output Power	230V 1Ph. Input: 1–3HP (0.75–2.2kW) 230V 3Ph. Input: 1–100HP (0.75–75kW) 400V 3Ph. Input: 0.75–250kW 460V 3Ph. Input: 1–400HP 575V 3Ph. Input: 1–150HP (0.75–110kW)
	Overload Capacity	150% for 60 seconds
	Output Frequency	0 – 500Hz, 0.1Hz resolution
	Acceleration Time	0.01 – 600 seconds
	Deceleration Time	0.01 – 600 seconds
	Typical Efficiency	> 98%
Ambient Conditions	Temperature	Storage: –40 to 60°C Operating: –10 to 50°C
	Altitude	Up to 1000m ASL without derating Up to 2000m maximum UL Approved Up to 4000m maximum (non UL)
	Humidity	95% Max, non condensing
	Vibration	Conforms to IEC 60068-2-6 Sinusoidal Vibration 10 - 57Hz @ 0.075mm Pk 57 - 150Hz @ 1g Pk
Enclosure	Ingress Protection	IP20, NEMA 12 (IP55), NEMA 4X (IP66)
Programming	Keypad	Built-in keypad as standard Optional remote mountable keypad Optistick memory stick ***drive.web savvy*** software
	Display	Built-in multi language TFT Display
Control Specification	Control Method	V/F Voltage Vector Energy Optimsied V/F 3GV Sensorless Vector Speed Control 3GV Sensorless Vector Torque Control Closed Loop (Encoder) Speed Control Closed Loop (Encoder) Torque Control PM Vector Control BLDC Control Synchronous Reluctance
	PWM Frequency	4–32kHz Effective
	Stopping Mode	Ramp to Stop: User Adjustable 0.01–600 secs Coast to Stop
	Braking	Motor Flux Braking Built-in Braking Transistor
	Skip Frequency	Single point, user adjustable
	Setpoint Control	Analog Signal: 0 to 10 Volts; 10 to 0 Volts; –10 to +10 Volts; 0 to 20mA; 20 to 0mA; 4 to 20mA; 20 to 4mA Digital: Motorised Potentiometer (Keypad); Modbus RTU; CANopen

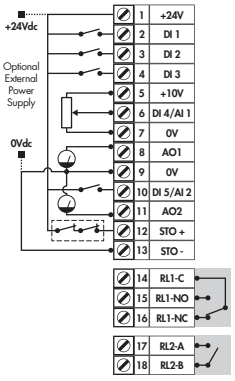
Fieldbus Connectivity	Built-in	CANopen: 125 – 1000kbps Modbus RTU: 9.6 - 115.2 kbps selectable 8N1, 8N2, 8E1, 8O1
	Optional	PROFIBUS DP (DPV1) PROFINET IO DeviceNet EtherNet/IP EtherCAT Modbus TCP
I/O Specification	Power Supply	24 Volt DC, 100mA, Short Circuit Protected 10 Volt DC, 5mA for Potentiometer
	Programmable Inputs	5 Total as standard (Optional additional 3) 3 Digital (Optional additional 3) 2 Analog / Digital Selectable
	Digital Inputs	Opto - Isolated 8 – 30 Volt DC, internal or external supply Response time < 4ms
	Analog Inputs	Resolution: 12 bits Response time: < 4ms Accuracy: < 1% full scale Parameter adjustable scaling and offset
	PTC Input	Motor PTC / Thermistor Input Trip Level : 3kΩ
	Programmable Outputs	4 Total (Optional additional 3) 2 Analog / Digital 2 Relays (Optional additional 3)
	Relay Outputs	Maximum Voltage: 250 VAC, 30 VDC Switching Current Capacity: 5A AC , 5A DC
	Analog Outputs	0 to 10 Volt 0 to 20mA 4 to 20mA
Application Features	PID Control	Internal PID Controller Multi Setpoint Select Standby / Sleep Mode Boost Function
	Hoist Mode	Dedicated Hoist Mode Motor Holding Brake Pre-Torque & Control Over Limit Protection
Maintenance & Diagnostics	Fault Memory	Last 4 Trips stored with time stamp
	Data Logging	Logging of data prior to trip for diagnostic purposes: Output Current Drive Temperature DC Bus Voltage
	Maintenance Indicator	Maintenance Indicator with user adjustable maintenance interval Onboard service life monitoring
	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 (IP55) Drives: 3S3/3C3 NEMA 4X (IP66) Drives: 3S3/3C3

Model Code Guide

P 2-22075-1KF4#

- Product Family
- Generation
- Frame Size
- 200–240V = 2, 380–480V = 4, 480–525V = 5, 500–600V = 6 | Supply Voltage
- Power Rating Code
- Single Phase = 1, 3 Phase = 3 | Supply Phases
- kW = K, HP = H | Power Type
- No Internal EMC Filter = 0, Internal EMC Filter = F | EMC Filter
- Internal Brake Transistor = 4 | Brake Transistor
- IP20 = 2, NEMA 12 / IP55 = N, NEMA 4X / IP66 Nonswitched = A, NEMA 4X / IP66 Switched = B | Enclosure

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

	Size	IP20 2	IP20 3	IP20 4	IP20 5	IP20 8	NEMA 4X / IP66 2	NEMA 4X / IP66 3	NEMA 12 / IP55 4	NEMA 12 / IP55 5	NEMA 12 / IP55 6	NEMA 12 / IP55 7	NEMA 12 / IP55 8
in / mm	Height	8.7" / 221	10.3" / 261	16.5" / 418	19.1" / 486	38.3" / 974	10.1" / 257	12.2" / 310	17.7" / 450	21.3" / 540	34.1" / 865	50.4" / 1280	52.5" / 1334
in / mm	Width	4.3" / 110	5.2" / 131	6.8" / 172	9.2" / 233	17.5" / 444	7.4" / 188	8.3" / 211	6.7" / 171	9.3" / 235	13.0" / 330	13.0" / 330	17.5" / 444
in / mm	Depth	7.2" / 185	8.1" / 205	9.4" / 240	10.2" / 260	16.7" / 423	6.8" / 172	9.3" / 235	9.9" / 252	10.7" / 270	13.1" / 332	14.1" / 358	16.7" / 423
lb / kg	Weight	4.0 / 1.8	7.7 / 3.5	20.3 / 9.2	39.9 / 18.1	276 / 125	7.7 / 3.5	14.6 / 6.6	25.4 / 11.5	50.7 / 23	121.2 / 55	196.2 / 89	TBC

P² SERIES

Bardac drives

Innovation
From products that shine to procedures that flow, we always look for new ideas and a better way.

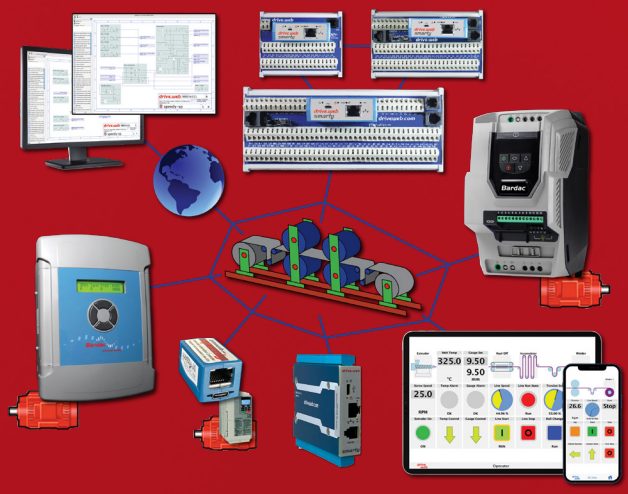
Perserverence
We never give up the effort to be the very best in the automation business.

Vision
Planning well into the future and managing the long term goals to ensure continuity of purpose that we can all buy into.

Investment
Persuing the vision takes investment in development, inventory, tools and above all, the team.

Know-how
Constant attention to training and skill building keeps everyone on top.

bardac.com

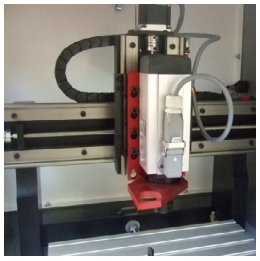


(410) 604-3400

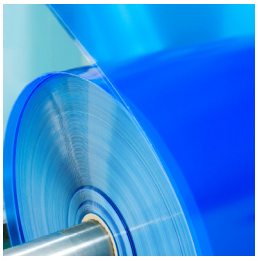
Global Drive Solutions

Bardac Drives operate at the heart of automated systems around the world

Crane Control
Demanding application at South African mine



Machine Tool OEM
UK machine tool supplier specifies P2 Series drives



Film Manufacturing
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Bardac Drives P2 Series User Guide

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