Performance Inverter

Performance Inverter P2

Excellent usability, high performance inverters for advanced motor control

Beijer
ELECTRONICS

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

- IP55

- Multi language OLED display for instance Swedish
- Keyhole mounts for fast installation
- Integrated EMC filter
- Modbus RTU and CANopen on board as standard
- Pluggable control terminals

- Integrated brake transistor

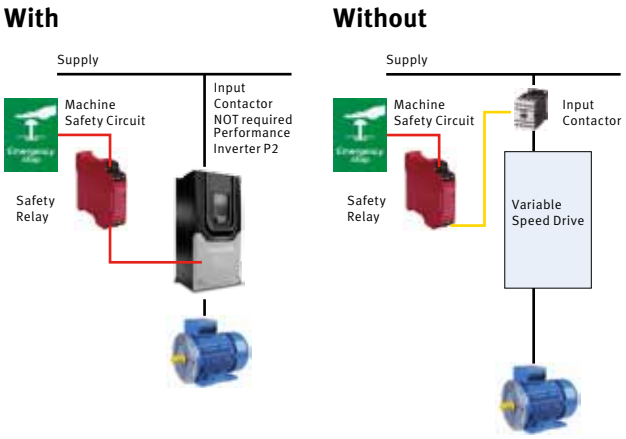
- High-quality long-life fans

- Integrated cable management
- Plug-in modules

Safe torque off (provided as standard)

Performance Inverter P2 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 minimizes 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



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

World leading motor control

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

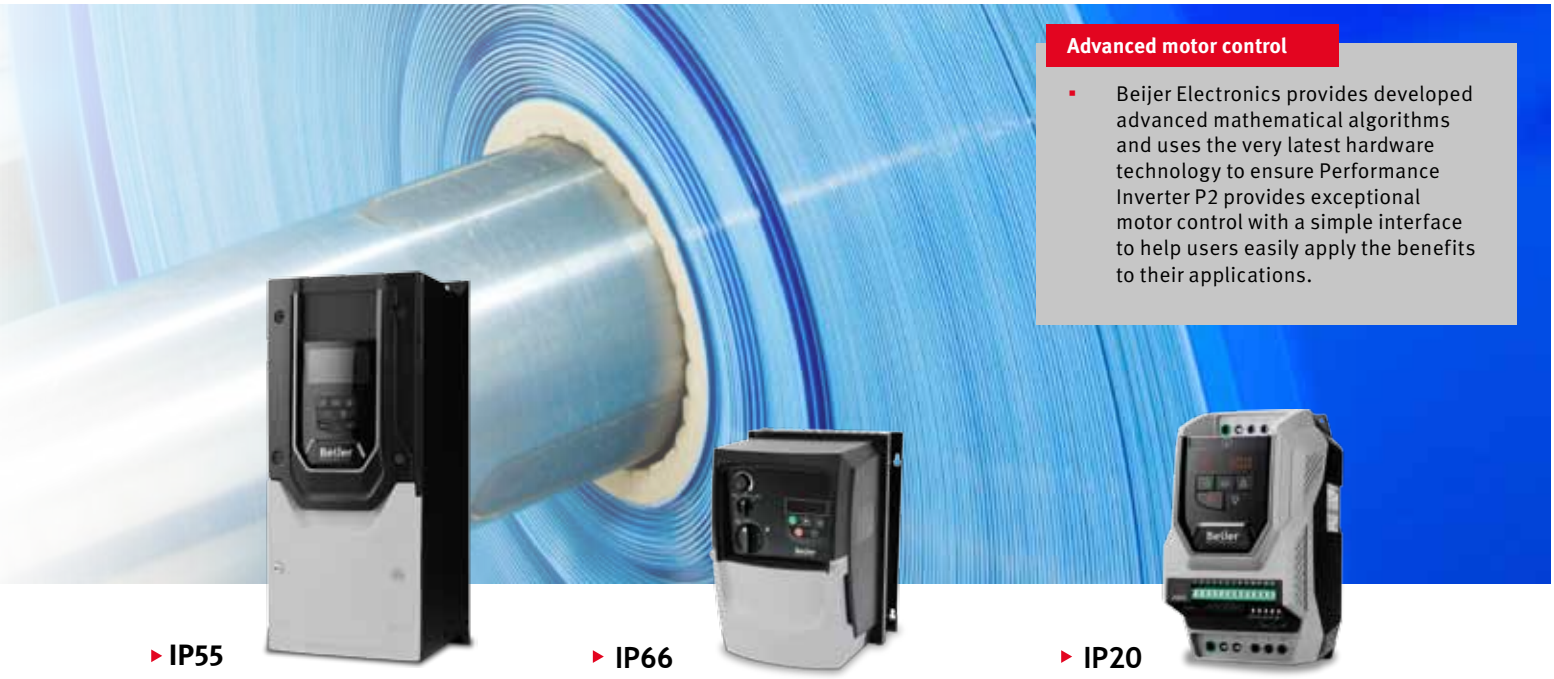
- Designed for fast installation and commissioning, Performance Inverter P2 provides the most cost effective solution for industry.
- All Performance Inverter P2 units provide 150% overload for 60 seconds as standard, 200% overload for 2 seconds, ensuring each drive is suitable for heavy duty applications, whilst the IP55/IP66 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. The simple parameter structure and carefully selected factory parameter settings ensure that commissioning time is kept to a minimum.

Compliant with international standards.

Drive system efficiency

The blue line represents what will be considered a “high efficiency” solution using an efficient IM motor, a modern AC drive and efficient gearbox.
The purple line represents efficiency of a typical PM motor and drive solution. Efficiency is improved at high speeds and loads, however it is actually reduced at very low loads, and output torque cannot be maintained at low speeds.

The green line represents the Performance Inverter P2 controlling the same PM motor. Efficiency is improved at all speeds and loads.
In simple terms, Performance Inverter P2 PM motor control produces the maximum amount of output shaft torque per electrical kW consumed across all speed and torque ranges.



Advanced motor control

- Beijer Electronics provides developed advanced mathematical algorithms and uses the very latest hardware technology to ensure Performance Inverter P2 provides exceptional motor control with a simple interface to help users easily apply the benefits to their applications.

IP55
Wall mount units available up to 160 kW

IP66
Wall mount units available up to 7.5 kW

IP20
Din-rail units available up to 11 kW

Drive system efficiency

With today's ever increasing energy costs, efficiency is a key factor in relation to drive system component selection. In many cases, an efficiency figure can be arrived at by simply multiplying the efficiencies of the various components together to find a combined efficiency figure, however this may not tell the whole story. The efficiency of components such as drives, motors and gearboxes can vary considerably with speed and load, hence simply combining the 'head-line' efficiency figures can often be very misleading. In reality, the efficiency curves for the whole system should be overlaid, to provide a true efficiency figure for the system across the desired speed and load range.

Modern AC inverters will typically have an electrical efficiency of around 98%, which represents the difference between the electrical output power compared to electrical input power only. A further factor that is often overlooked is the efficiency of the motor control strategy employed by the drive. This can have a significant effect on the overall system efficiency and is often not considered when energy saving calculations are made.

Future-proof energy efficiency

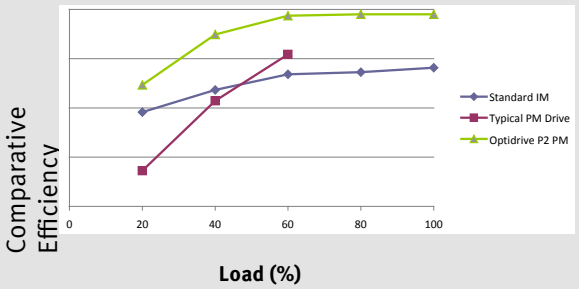
Performance Inverter P2 has been designed and developed to work with both standard induction motors, which typically meet the IE2 efficiency standards currently in place in Europe, and the latest generation of high efficiency PM motors designed to meet the future IE4 requirements. This means that an efficient drive can now be purchased, allowing for a future update of the motor without requiring a change to the installed drive.

Performance Inverter P2 works with all PM motors, controlling them with optimum efficiency for the most efficient PM motor control available.

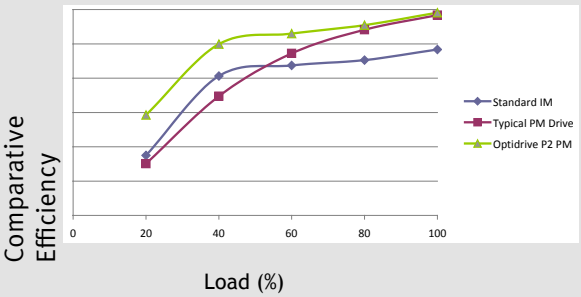
The graphs below clearly demonstrate these factors:

- The overall efficiency of the system varies with speed and load and is not a constant.
- Motor control efficiency significantly affects overall system efficiency.
- The graphs are generated by measuring the electrical power drawn from the mains supply compared to the torque generated at the output shaft. These are based on a system requirement of 2.2kW motor power generated at the output shaft. These are based on a system requirement of 2.2kW motor power.

Improvement in efficiency at 10% rated speed output



Improvement in efficiency at 100% rated speed output



“ 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
- Palletizers

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

Performance Inverter P2 provides:

- 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

Performance Inverter P2 provides:

- PM motor control mode to allow 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

Performance Inverter P2 provides:

- 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

“ Modbus RTU and CANopen on board as standard

Plug-in option modules

Expansion modules

Extended functionality

Encoder feedback

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

Extended I/O

- Additional 3 digital inputs and 1 digital output
- Additional 3 relay output

Fieldbus interfaces - Communication options

Profibus DP

Profinet

CC-link

DeviceNet

Modbus TCP

Ethernet IP

Ethercat

“ A range of external EMC filters, brake resistors, input chokes and output filters are available, to suit all installation requirements

BFI Tools

Powerful PC software

Drive commissioning and parameter backup

- Real-time parameter editing
- Drive network communication
- Parameter upload, download and storage
- Simple PLC function programming

Compatible with Windows XP, Windows Vista & Windows 7

Optistick

Rapid commissioning

- Allows rapid copying of parameters between multiple drives
- Provides Bluetooth wireless interface to a PC running BFI Tools
- Backup and restore of drive parameters

Order number	Description	Part Number
BFI-P2, 1-phase 230 V AC, IP20, EMC-filter, LED, Braketransistor		
BFI-P2-22-0043-1F42-SN	0,75kW, 4,3A, Size 2	60100
BFI-P2-22-0070-1F42-SN	1.5kW, 7A, Size 2	60101
BFI-P2-22-0105-1F42-SN	2,2kW, 10,5A, Size 2	60102
BFI-P2, 1-phase 230 V AC, IP66, EMC-filter, OLED, Braketransistor		
BFI-P2-22-0043-1F4X-TN	0,75kW, 4,3A, Size 2	60111
BFI-P2-22-0070-1F4X-TN	1,5kW, 7A, Size 2	60113
BFI-P2-22-0105-1F4X-TN	2,2kW, 10,5A, Size 2	60115
BFI-P2, 1-phase 230 V AC, IP66, EMC-filter, OLED, Braketransistor, Mainswitch and Handcontrol		
BFI-P2-22-0043-1F4YTN	0,75kW, 4,3A, Size 2	60121
BFI-P2-22-0070-1F4Y-TN	1,5kW, 7A, Size 2	60123
BFI-P2-22-0105-1F4Y-TN	2,2kW, 10,5A, Size 2	60125
BFI-P2, 3-phase 230 V AC, IP20, EMC-filter, LED, Braketransistor		
BFI-P2-22-0043-3F42-SN	0,75kW, 4,3A, Size 2	60130
BFI-P2-22-0070-3F42-SN	1.5kW, 7A, Size 2	60131
BFI-P2-22-0105-3F42-SN	2,2kW, 10,5A, Size 2	60132
BFI-P2-32-0180-3F42-SN	4,0kW, 18A, Size 3	60133
BFI-P2-32-0240-3F42-SN	5,5kW, 24A, Size 3	60134
BFI-P2, 3-phase 230 V AC, IP66, EMC-filter, OLED, Braketransistor		
BFI-P2-22-0043-3F4X-TN	0,75kW, 4,3A, Size 2	60141
BFI-P2-22-0070-3F4X-TN	1.5kW, 7A, Size 2	60143
BFI-P2-22-0105-3F4X-TN	2,2kW, 10,5A, Size 2	60145
BFI-P2-32-0180-3F4X-TN	4,0kW, 18A, Size 3	60147
BFI-P2, 3-phase 230 V AC, IP66, EMC-filter, OLED, Braketransistor, Mainswitch and Handcontrol		
BFI-P2-22-0043-3F4Y-TN	0,75kW, 4,3A, Size 2	60191
BFI-P2-22-0070-3F4Y-TN	1,5kW, 7A, Size 2	60193
BFI-P2-22-0105-3F4Y-TN	2,2kW, 10,5A, Size 2	60195
BFI-P2-32-0180-3F4Y-TN	4,0kW, 18A, Size 3	60197
BFI-P2, 3-phase 230 V AC, IP55, EMC-filter, OLED		
BFI-P2-42-0240-3F4N-TN	5,5kW, 24A, Size 4, Braketransistor	60149
BFI-P2-42-0300-3F4N-TN	7,5kW, 30A, Size 4, Braketransistor	60151
BFI-P2-42-0460-3F4N-TN	11kW, 46A, Size 4, Braketransistor	60153
BFI-P2-52-0610-3F4N-TN	15kW, 61A, Size 5, Braketransistor	60155
BFI-P2-52-0720-3F4N-TN	18,5kW, 72A, Size 5, Braketransistor	60157
BFI-P2-62-0900-3F1N-TN	22kW, 90A, Size 6, No Braketransistor	60159
BFI-P2-62-0900-3F4N-TN	22kW, 90A, Size 6, Braketransistor	60161
BFI-P2-62-1100-3F1N-TN	30kW, 110A, Size 6, No Braketransistor	60163
BFI-P2-62-1100-3F4N-TN	30kW, 110A, Size 6, Braketransistor	60165
BFI-P2-62-1500-3F1N-TN	37kW, 150A, Size 6, No Braketransistor	60167
BFI-P2-62-1500-3F4N-TN	37kW, 150A, Size 6, Braketransistor	60169
BFI-P2-62-1800-3F1N-TN	45kW, 180A, Size 6, No Braketransistor	60171
BFI-P2-62-1800-3F4N-TN	45kW, 180A, Size 6, Braketransistor	60173
BFI-P2-72-2020-3F1N-TN	55kW, 202A, Size 7, No Braketransistor	60175
BFI-P2-72-2020-3F4N-TN	55kW, 202A, Size 7, Braketransistor	60177
BFI-P2-72-2480-3F1N-TN	75kW, 248A, Size 7, No Braketransistor	60179
BFI-P2-72-2480-3F4N-TN	75kW, 248A, Size 7, Braketransistor	60181
BFI-P2, 3-phase 400 V AC, IP20, EMC-filter, LED, Braketransistor		
BFI-P2-24-0022-3F42-SN	0,75kW, 2,2A, Size 2	60200
BFI-P2-24-0041-3F42-SN	1,5kW, 4,1A, Size 2	60201
BFI-P2-24-0058-3F42-SN	2,2kW, 5,8A, Size 2	60202
BFI-P2-24-0095-3F42-SN	4kW, 9,5A, Size 2	60203
BFI-P2-34-0140-3F42-SN	5,5kW, 14A, Size 3	60204
BFI-P2-34-0180-3F42-SN	7,5kW, 18A, Size 3	60205
BFI-P2-34-0240-3F42-SN	11kW, 24A, Size3	60206
BFI-P2, 3-phase 400 V AC, IP66, EMC-filter, OLED, Braketransistor		
BFI-P2-24-0022-3F4X-TN	0,75kW, 2,2A, Size 2	60211
BFI-P2-24-0041-3F4X-TN	1,5kW, 4,1A, Size 2	60213
BFI-P2-24-0058-3F4X-TN	2,2kW, 5,8A, Size 2	60215
BFI-P2-24-0095-3F4X-TN	4kW, 9,5A, Size 2	60217
BFI-P2-34-0140-3F4X-TN	5,5kW, 14A, Size 3	60219
BFI-P2-34-0180-3F4X-TN	7,5kW, 18A, Size 3	60221

Order number	Description	Part Number
BFI-P2, 3-phase 400 V AC, IP66, EMC-filter, OLED, Braketransistor, Mainswitch and Handcontrol		
BFI-P2-24-0022-3F4Y-TN	0,75kW, 2,2A, Size 2	60271
BFI-P2-24-0041-3F4Y-TN	1,5kW, 4,1A, Size 2	60273
BFI-P2-24-0058-3F4Y-TN	2,2kW, 5,8A, Size 2	60275
BFI-P2-24-0095-3F4Y-TN	4kW, 9,5A, Size 2	60277
BFI-P2-34-0140-3F4Y-TN	5,5kW, 14A, Size 3	60279
BFI-P2-34-0180-3F4Y-TN	7,5kW, 18A, Size 3	60281
BFI-P2, 3-phase 400 V AC, IP55, EMC-filter, OLED		
BFI-P2-44-0240-3F4N-TN	11kW, 24A, Size 4, Braketransistor	60223
BFI-P2-44-0300-3F4N-TN	15kW, 30A, Size 4, Braketransistor	60225
BFI-P2-44-0390-3F4N-TN	18kW, 39A, Size 4, Braketransistor	60227
BFI-P2-44-0460-3F4N-TN	22kW, 46A, Size 4, Braketransistor	60229
BFI-P2-54-0610-3F4N-TN	30kW, 61A, Size 5, Braketransistor	60231
BFI-P2-54-0720-3F4N-TN	37kW, 72A, Size 5, Braketransistor	60233
BFI-P2-64-0900-3F1N-TN	45kW, 90A, Size 6, No Braketransistor	60235
BFI-P2-64-0900-3F4N-TN	45kW, 90A, Size 6, Braketransistor	60237
BFI-P2-64-1100-3F1N-TN	55kW, 110A, Size 6, No Braketransistor	60239
BFI-P2-64-1100-3F4N-TN	55kW, 110A, Size 6, Braketransistor	60241
BFI-P2-64-1500-3F1N-TN	75kW, 150A, Size 6, No Braketransistor	60243
BFI-P2-64-1500-3F4N-TN	75kW, 150A, Size 6, Braketransistor	60245
BFI-P2-64-1800-3F1N-TN	90kW, 180A, Size 6, No Braketransistor	60247
BFI-P2-64-1800-3F4N-TN	90kW, 180A, Size 6, Braketransistor	60249
BFI-P2-74-2020-3F1N-TN	110kW, 202A, Size 7, No Braketransistor	60251
BFI-P2-74-2020-3F4N-TN	110kW, 202A, Size 7, Braketransistor	60253
BFI-P2-74-2400-3F1N-TN	132kW, 240A, Size 7, No Braketransistor	60255
BFI-P2-74-2400-3F4N-TN	132kW, 240A, Size 7, Braketransistor	60257
BFI-P2-74-3020-3F1N-TN	160kW, 302A, Size 7, No Braketransistor	60259
BFI-P2-74-3020-3F4N-TN	160kW, 302A, Size 7, Braketransistor	60261
Internal Options		
ABCC-DEV-2	Devicenet Module	63120
ABCC-ECT	EtherCat 2-port Module	63163
ABCC-DPV1-2	Profibus DP D-sub Module	63142
ABCC-PRT_2P	ProfiNet 2 port Module	63164
ABCC-EIT_2P	Modbus TCP 2 port Module	63165
ABCC-CCL	CC-Link Module	63250
ABCC-EIPT_2P	Ethernet IP 2 port Module	63122
OPT-2-EXTIO-BFI	Extended I/O	63123
OPT-2-CASCD-BFI	Extended Relay	63119
OPT-2-ENCOD-BFI	TTL Encoder Module	63121
OD-BR100-BFI	Internal Brakeresistor for IP20, 100ohm, 200W	63101
External Options		
OPT-2-ISOL4-BFI	Isolator Switch Box, Size 4	63150
OPT-2-ISOL5-BFI	Isolator Switch Box, Size 5	63151
OD-BRES4-BFI	External Brakeresistor 33ohm, 500W	63230
OPT-2-CANIO-BFI	Extended IO Module by CanOpen	63200
OPT-2-OPPAD-BFI	OLED Remote External Keypad	63201
OPT-2-STICK-BFI	Optistick Bluetooth communication, loading parameters	63143
OPT-J4505-BFI	RS-485 Data Cable 0,5m	63144
OPT-J4510-BFI	RS-485 Data Cable 1,0m	63145
OPT-J4530-BFI	RS-485 Data Cable 3,0m	63146
OPT-2-J45SP	RS-485 2-port Data Cable Splitter	63148
OPT-2-RJTRM-BFI	RJ45 Termination Plug	63202
CAB113	Serial communication cable between TxA/B/C and BFI-H2/P2/E2	660000290
CAB114	Serial communication cable between PLC and BFI-H2/P2/E2	660000291
BFI-Tools PLC-licence	BFI-Tools PLC-licence	63300

NOT TO SCALE

Size	2	2	3	3	4	5	6	7
Enclosure	**IP20**	**IP66**	**IP20**	**IP66**	**IP55**	**IP55**	**IP55**	**IP55**
Height (mm)	221	257	261	310	440	540	865	1280
Width (mm)	112	188	131	211	171	235	330	330
Depth (mm)	185	238	205	256	240	270	330	360
Weight (kg)	1.8	4.8	3.5	7.3	11.5	22.5	50	80

Drive specification

Input ratings	**Supply voltage**	200 – 240V ± 10% 380 – 480V ± 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 1 phase input: 0.75–2.2kW 230V 3 phase input: 0.75–75kW 400V 3 phase input: 0.75–250kW
	Overload capacity	150% for 60 seconds 200% for 2 seconds
	Output frequency	0 – 500Hz, 0.1Hz resolution
	Typical efficiency	98%
Ambient Conditions	**Temperature**	Storage : –40 to 60°C Operating : –10 to 40°C, IP55/66
	Altitude	Up to 1000m ASL without derating Up to 2000m maximum UL approved Up to 4000m maximum (non UL) Above 1000m : derate by 1% per 100m
	Humidity	95% max, non-condensing
Enclosure	**Ingress Protection**	IP20 (size 2, 3) IP40 (size 8) IP55 (size 4, 5, 6, 7) IP66 (size 2, 3)
Programming	**Keypad**	Built-in keypad as standard Optional remote mountable keypad
	Display	Built-in multi language OLED display (except IP20) LED display (IP20 only)
	PC	BFI-Tools

Control specification	**Control method**		V/F voltage vector Energy optimised V/F Sensorless vector speed control Sensorless vector torque control Closed loop (encoder) speed control Closed loop (encoder) torque control Open loop PM vector control
	PWM frequency		4 – 32kHz effective
	Stopping mode		Ramp to stop : user adjustable 0.1– 600 seconds Coast to stop
	Braking		Motor flux braking Built-in braking transistor (optional for frame sizes 6 & 7)
	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 4 mA
		Digital	Motorised potentiometer (keypad) Modbus RTU CANopen
	Supported protcols		Fieldbus or ethernet
Communca-tion			Modbus RTU - standard CANopen - standard Profibus DP - option Ethernet IP - option Modbus TCP - option EtherCAT - option DeviceNet - option CC-Link - option Profinet - option
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		10 – 30 Volt DC, internal or external supply, NPN Response time : ‹ 4ms
	Analog inputs		Resolution : 12 bits Response time : ‹ 4ms Accuracy : ‹ 1% full scale Parameter adjustable scaling and offset
	Safety		Safe torque off SIL2/pld
	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 : 6A AC, 5A DC
	Analog outputs		0 to 10 Volt 0 to 20mA 4 to 20mA

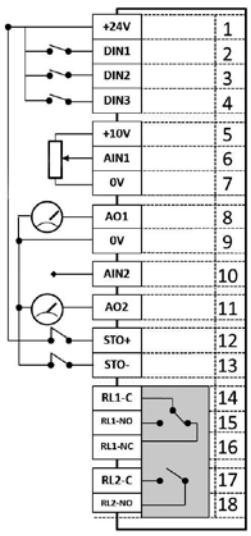
Control features	**Hoist operation**	Dedicated hoist operation mode
	PID control	Internal PID control with feedback display
Maintenance & diagnostics	**Fault memory**	Last 4 trips stored with time stamp
	Data logging	Logging of data prior to trip for diagnostic purposes : Output current, drive temperature, 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
Standards Compliance	**EN 61800-3:2004**	Adjustable speed electrical power drive systems. EMC requirements.
	IEC 61508 SIL2 **IEC 61800-5-2 Type2** **IEC 62061 SIL2** **ISO 13849 PL"d"**	Safe torque off.
	Standards	CE, UL, cUL, RoHS, Carbon Trust, C Tick, SGS, GOST
	EN61800-5-1	Safety requirements - electrical, thermal and energy
	EN55011	Limits and methods of measurement of radio interference characteristics of industrial equipment (EMC)
Other Standards	**UL / cUL**	America (UL 508C) and Canada C22.2 NO 14
	C-tick	Australia
	RoHS	Restrictions on Hazardous Substances

Model code guide

BFI-P2-24-0023-3F1N-TN

- Product family
- Product typ and generation
- Frame Size 2, 3, 4, 5, 6, 7
- Input voltage rating: 2=200–240V 4=380–480V
- Current rating code E.g 23=2.3A
- Input phases: 1= Single phase input 3= 3 phase input
- EMC-filter: F= filtered
- Braking 1= No braking 4= braking
- Enclosure: 2=IP20 N= IP55 X= IP66 non-switched Y= IP66 switched
- Display type T= OLED (Text) S= LED (7 Seg)
- Conformal coating: N= standard coating

Connection diagram



Function	Default setting
12 Volt DC output, 100mA max / 24 Volt DC Input	
Digital input 1	Drive start / enable
Digital input 2	Forward or reverse
Digital input 3	Analog or preset speed
+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

About Beijer Electronics

Beijer Electronics is a fast growing technology company with extensive experience of industrial automation and data communication. The company develops and markets competitive products and solutions that focus on the user. Since its start-up in 1981, Beijer Electronics has evolved into a multinational group present in 22 countries and sales of 1,367 MSEK 2012. The company is listed on the NASDAQ OMX Nordic Stockholm Small Cap list under the ticker BELE.

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