







## 1 Start-up document

This document is a simple start-up guide describing basic functionality of the drive BFI-E3, firmware 3.08. Detailed explanations are to be read in User Manual BFI-E3 and is attached with the drive itself. but also possible to download from [www.beijerelectronics.se](http://www.beijerelectronics.se) or [.no](http://no) or [.dk](http://dk) or [.de](http://de) or [.com](http://com) or [.com.tr](http://com.tr) or [.tw](http://tw) or [.co.uk](http://co.uk)

## 2 Important Safety Information

Read IMPORTANT SAFETY INFORMATION below, especially Warnings and Caution.

	<b>Danger :</b> Indicates a risk of electric shock, which, if not avoided, could result in damage to the equipment and possible injury or death.		<b>Danger :</b> Indicates a potentially hazardous situation other than electrical, which if not avoided, could result in damage to property.
	<p>This variable speed drive product is intended for professional incorporation into complete equipment or systems as part of a fixed installation. If installed incorrectly it may present a safety hazard. The BFI uses high voltages and currents, carries a high level of stored electrical energy, and is used to control mechanical plant that may cause injury. Close attention is required to system design and electrical installation to avoid hazards in either normal operation or in the event of equipment malfunction. Only qualified electricians are allowed to install and maintain this product.</p> <p>System design, installation, commissioning and maintenance must be carried out only by personnel who have the necessary training and experience. They must carefully read this safety information and the instructions in this Guide and follow all information regarding transport, storage, installation and use of the BFI, including the specified environmental limitations.</p> <p>Do not perform any flash test or voltage withstand test on the BFI. Any electrical measurements required should be carried out with BFI disconnected.</p> <p>Electric shock hazard! Disconnect and ISOLATE the BFI before attempting any work on it. High voltages are present at the terminals and within the drive for up to 10 minutes after disconnection of the electrical supply. Always ensure by using a suitable multimeter that no voltage is present on any drive power terminals prior to commencing any work.</p> <p>Where supply to the drive is through a plug and socket connector, do not disconnect until 10 minutes have elapsed after turning off the supply.</p> <p>Ensure correct earthing connections. The earth cable must be sufficient to carry the maximum supply fault current which normally will be limited by the fuses or MCB. Suitably rated fuses or MCB should be fitted in the mains supply to the drive, according to any local legislation or codes.</p> <p>Do not carry out any work on the drive control cables whilst power is applied to the drive or to the external control circuits.</p>		
	<p>Within the European Union, all machinery in which this product is used must comply with Directive 98/37/EC, Safety of Machinery. In particular, the machine manufacturer is responsible for providing a main switch and ensuring the electrical equipment complies with EN60204-1.</p> <p>The level of integrity offered by the BFI control input functions – for example stop/start, forward/reverse and maximum speed is not sufficient for use in safety-critical applications without independent channels of protection. All applications where malfunction could cause injury or loss of life must be subject to a risk assessment and further protection provided where needed.</p> <p>The driven motor can start at power up if the enable input signal is present.</p> <p>The STOP function does not remove potentially lethal high voltages. ISOLATE the drive and wait 10 minutes before starting any work on it. Never carry out any work on the Drive, Motor or Motor cable whilst the input power is still applied.</p> <p>The BFI can be programmed to operate the driven motor at speeds above or below the speed achieved when connecting the motor directly to the mains supply. Obtain confirmation from the manufacturers of the motor and the driven machine about suitability for operation over the intended speed range prior to machine start up.</p> <p>Do not activate the automatic fault reset function on any systems whereby this may cause a potentially dangerous situation.</p> <p>The BFI has an Ingress Protection rating of IP20 or IP66 depending on the model. IP20 units must be installed in a suitable enclosure.</p> <p>When mounting the drive, ensure that sufficient cooling is provided. Do not carry out drilling operations with the drive in place, dust and swarf from drilling may lead to damage. BFI are intended for indoor use only.</p> <p>The entry of conductive or flammable foreign bodies should be prevented. Flammable material should not be placed close to the drive</p> <p>Relative humidity must be less than 95% (non-condensing).</p> <p>Ensure that the supply voltage, frequency and no. of phases (1 or 3 phase) correspond to the rating of the BFI as delivered.</p> <p>Never connect the mains power supply to the Output terminals U, V, W.</p> <p>Do not install any type of automatic switchgear between the drive and the motor</p> <p>Wherever control cabling is close to power cabling, maintain a minimum separation of 100 mm and arrange crossings at 90 degrees</p> <p>Ensure that all terminals are tightened to the appropriate torque setting</p> <p>Do not attempt to carry out any repair of the BFI. In the case of suspected fault or malfunction, contact your local Beijer Electronics office for further assistance.</p>		

### 3 Contents

<b>1</b>	<b>START-UP DOCUMENT</b>	<b>1</b>
<b>2</b>	<b>IMPORTANT SAFETY INFORMATION</b>	<b>1</b>
<b>3</b>	<b>CONTENTS</b>	<b>2</b>
<b>4</b>	<b>INSTALLATION</b>	<b>3</b>
4.1	PHYSICAL DIMENSIONS IP20 .....	3
4.2	PHYSICAL DIMENSIONS IP66 .....	4
4.3	FUSES, CABLE DIMENSIONS AND POWER LOSSES .....	5
4.4	OVERVIEW POWER INPUT AND OUTPUT TERMINALS .....	5
4.5	INSTALLATION OF POWER SUPPLY, GROUNDING AND MOTOR CABLE .....	6
4.6	BRAKE TRANSISTOR AND EXTERNAL BRAKE RESISTOR .....	7
4.7	OVERVIEW CONTROL INPUTS/OUTPUTS .....	8
<b>5</b>	<b>BASIC PARAMETER SETTING</b>	<b>9</b>
5.1	DIGITAL START IN 2 DIRECTIONS AND 4 FIXED PRESET SPEEDS .....	9
5.2	DIGITAL START IN 2 DIRECTIONS AND ANALOG FREQUENCY SET POINT .....	10
5.3	DIGITAL MOTOR POTENTIOMETER .....	10
5.4	DIGITAL START SIGNAL AND FREQUENCY SET POINT BY LED DISPLAY .....	11
5.5	START/STOP BY INDIVIDUAL SIGNALS .....	11
5.6	CONTROL FROM LED DISPLAY .....	11
5.7	ANALOG OUTPUT, 0-10 VDC .....	12
5.8	DIGITAL OUTPUTS .....	12
5.9	STYRNING AV MEKANISK HÅLLBROMS I MOTORN .....	12
5.10	PTC-THERMISTOR .....	12
5.11	VECTOR CONTROL WITH STANDARD INDUCTION MOTOR .....	13
5.12	CURRENT LIMIT CONTROL .....	13
5.13	TUNING OF PM-MOTOR .....	13
5.14	MODBUS RTU .....	14
5.15	CANOPEN .....	15
5.16	PI-CONTROL .....	16
5.17	ENERGY OPTIMIZATION FUNCTION .....	16
5.18	SPIN START .....	17
5.19	BFI-SMARTSTICK .....	17
<b>6</b>	<b>KEYPAD</b>	<b>18</b>
6.1	MONITORING FROM KEYPAD .....	19
6.2	IP66, MAIN SWITCH, START/STOP SWITCH AND POTENTIOMETER .....	20
6.3	EMC-FILTER .....	20
<b>7</b>	<b>SPECIFICATION</b>	<b>21</b>
<b>8</b>	<b>WARNING AND ALARM CODES</b>	<b>22</b>

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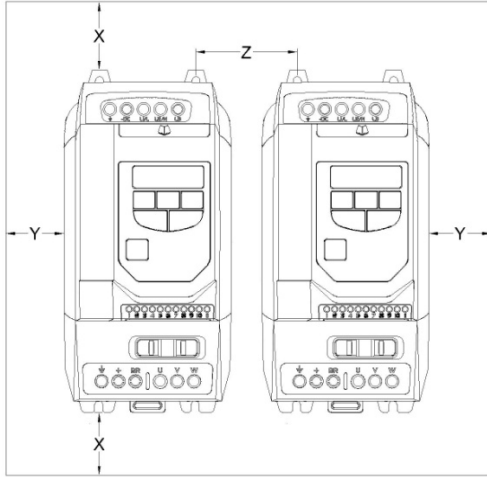
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## 4 Installation

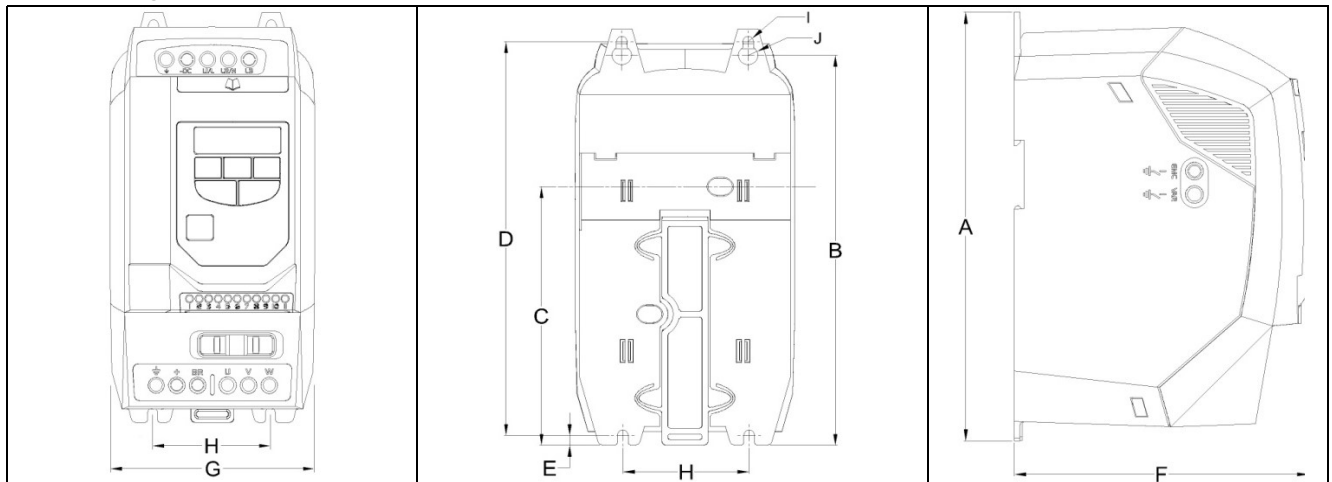
The drive should be mounted in a vertical position only on a flat, flame resistant vibration free mounting using the integral holes. IP66 is allowed for outdoor mounting. But it is recommended having an external roof to avoid snow directly on drive. BFI will not start if ambient temperature is below -20°C. See User Manual BFI-E3 for more details.



Drive IP-class and Size	X [mm] Above & Below	Y [mm] Either Side	Z [mm] Between drives	Minimum Airflow [m3/min]
IP20, size 1	50	50	33	0,14
IP20, size 2	75	50	46	0,27
IP20, size 3	100	50	52	0,74
IP20, size 4	100	50	52	1,48
IP20, size 5	200	25	70	1,28
IP66, All sizes	200	10	0	0

Z means that BFI can be mounted side-by-side. Minimum airflow is based on maximum output power at 50°C for IP20 and 40°C for IP66.

### 4.1 Physical dimensions IP20



BFI-E3- IP20		Drive size	A Height [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F Depth [mm]	G Width [mm]	H [mm]	I [mm]	J [mm]	Weight [kg]
1 x 230 V	3 x 380-480 V												
0023-0070 [0,37-1,5 kW]	0022-0041 [0,75-1,5kW]	1	173	160	109	162	5	123	83	50	5,5	10	1,0
0070- 0105 [1,5-2,2 kW]	0041-0095 [1,5-4,0 kW]	2	221	207	137	209	5.3	150	110	63			1,7
0153/ 4,0 kW	0140-0240 [5,5-11kW]	3	261	246	-	247	6	175	131	80			3,2
No	0300-0460 [15-22kW]	4	420	400	-	400	8	212	171	125	8,2	14,8	9,1
No	0610-0720 [30-37kW]	5	486	463				226	222	175			18,1

## NOTE

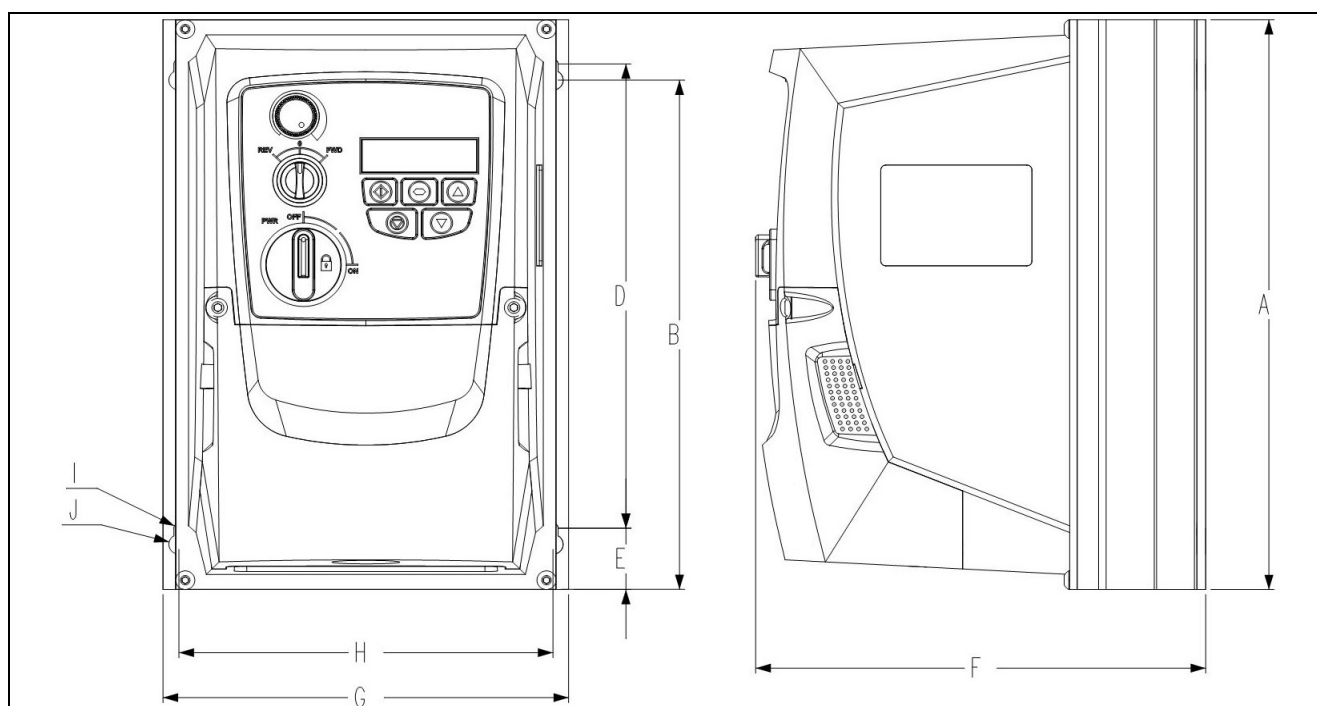
1x230 BFI-E3-0070 and BFI-E3-0041 are without brake transistor for Size 1 and Size2 with.

Mounting bolts for Size1 to Size 3 are 4xM4 and 4xM8 for Size4 and Size5.

Control Terminal Torque Settings of 0.8Nm.

Power Terminal Torque Settings: Size1-3 = 1 Nm, Size4=2.0 Nm, Size5=4.0 Nm.

## 4.2 Physical dimensions IP66



BFI-E3- -IP66		Drive size	A Height [mm]	B [mm]	D [mm]	E [mm]	F Depth [mm]	G Width [mm]	H [mm]	I [mm]	J [mm]	Weight [kg]
1 x 230 V	3x380-480 V											
0023-0070 [0,37-1,5 kW]	0022-0041 [0,75-1,5 kW]	1	232	207	189	25.0	162	161	149	4.0	8.0	2,5
0070- 0105 [1,5-2,2 kW]	0041-0095 [1,5-4,0 kW]	2	257	220	200	28.5	182	188	176	4.2	8.5	3,5
0153 [4,0 kW]	0140-0240 [5,5-11 kW]	3	310	277	251,5	33.4	238	210	197.5	4.2	8.5	7,0
	0300-0180 [15-18 kW]	4	360		300	33.4	275	240				9,5

### NOTE

1x230 V BFI-E3-0070 and 3x400 V BFI-E3-0041 are without brake transistor for Size 1 and Size2 with.

Mounting bolts for Size1 to Size 3 are 4xM4 and 4xM8 for Size 4.

Control Terminal Torque Settings of 0.8Nm. Power Terminal Torque Settings is of 1 Nm.

IP66 drives are fitted with 3 knockout holes for cable inlet and outlet. If more than 3 cables are to enter the drive it is possible to have two or more cables going through one gland. This is to ensure IP66.

Holes and recommended glands are listed in table below. The motor cable does not have to be attached to the drive with an EMC-gland.

Cable Gland, IP66 Hole Size & recommended glands		
	Hole sizes	Gland PG
Size 1	3 x 22mm	3 x PG13,5
Size 2 & 3	1 x 22mm and 2 x 27 mm	1 x PG13,5 and 2 x PG21
Size 4	1 x 22mm and 2 x 40 mm	1 x PG13,5 and 2 x PG29

### 4.3 Fuses, cable dimensions and power losses

200-240V $\pm 10\%$ - Single Phase Input – 3 Phase Output									
Output Power [kW]	BFI-E3 model	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size, A1 40°C	Supply Cable Size, E 30°C	Nominal Output Current	Motor Cable Size, E 30°C	Max Motor Cable Length	Power losses
		Amps	Amps	mm <sup>2</sup>	mm <sup>2</sup>	Amps	mm <sup>2</sup>	m	W
0.37	0023	3,7	10	1,5	1,5	2,3	1,5	100	12
0.75	0043	7,5	10	2,5	1,5	4,3	1,5	100	22,5
1.5	0070	12,9	16	2,5	2,5	7,0	1,5	100	50
2.2	0105	19,2	25	6	2,5	10,5	1,5	100	66
4,0	0153	29,2	32	6	4	15,3	1,5	100	120
380-480V $\pm 10\%$ - 3 Phase Input – 3 Phase Output									
Output Power [kW]	BFI-E3 model	Nominal Input Current	Fuse or MCB (type B)	Supply Cable Size, A1 40°C	Supply Cable Size, E 30°C	Nominal Output Current	Motor Cable Size, E 30°C	Max Motor Cable Length	Power losses
		Amps	Amps	mm <sup>2</sup>	Amps	Amps	mm <sup>2</sup>	m	W
0.75	0022	3,5	6	1.5	1.5	2.2	1.5	100	22,5
1.5	0041	5,6	6	1.5	1.5	4.1	1.5	100	50
2.2	0058	7,5	10	1.5	1.5	5.8	1.5	100	50
4	0095	11,5	16	2.5	1.5	9.5	1.5	100	120
5.5	0140	17,2	25	4	2,5	14	1.5	100	165
7.5	0180	21,2	25	4	2,5	18	2,5	100	225
11	0240	27,5	32	6	4	24	4	100	330
15	0300	34.2	50	16	6	30	6	100	450
18.5	0390	44.1	50	16	6	39	10	100	550
22	0460	51.9	63	25	10	46	16	100	660
30	0610	64	80	35	16	61	16	100	900
37	0720	76	80	35	16	72	16	100	1110

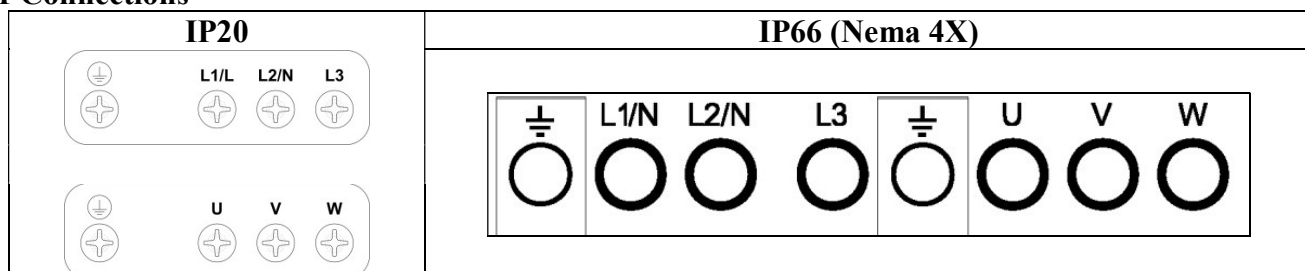
Recommended choice of cable sizes and fuses follows DIN VDE 0100 paragraph 430

Appendix 1, motor cable is copper, way of wiring A1 and E is following SS 424 24 24 edition.

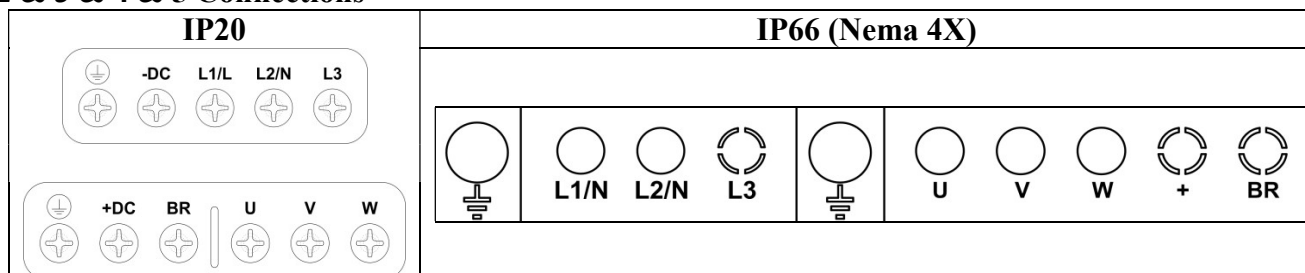
A1 means cable/conductors in some kind of duct in a maximum temperature of 40°C. E means cable/conductors mounted on a ladder. Calculated at 30°C with 9 or several cables (correction factor 0,78). All recommended sizes of cable sizes and fuses are recommendations. National laws and recommendations are to be considered.

### 4.4 Overview power input and output terminals

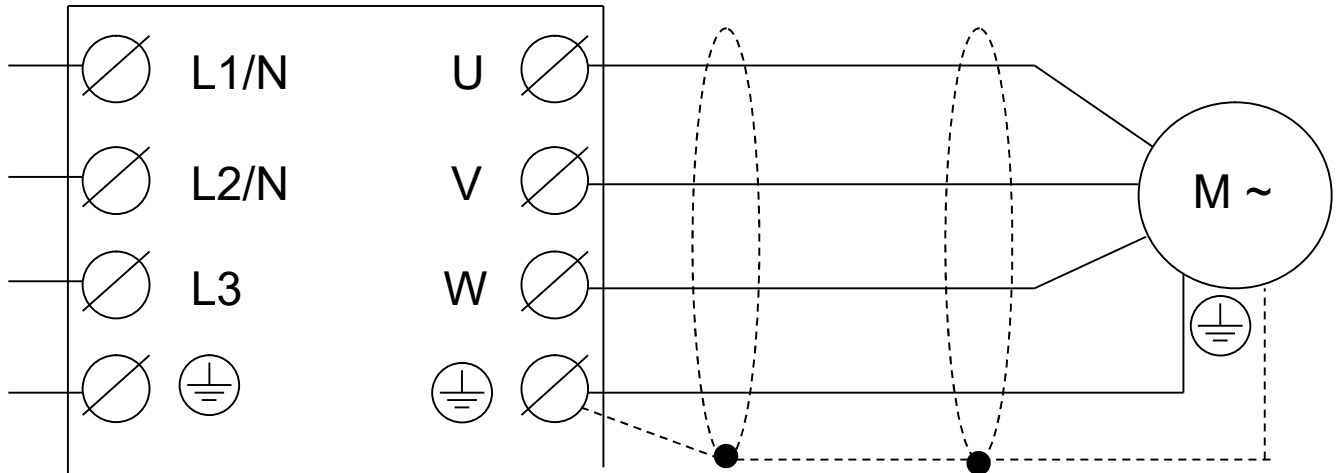
#### Size 1 Connections



#### Size 2 & 3 & 4 & 5 Connections



## 4.5 Installation of power supply, grounding and motor cable



- Drive is to be connected with ground/PE by separate grounding wire.
- 1-phase power supply should be connected to L1/L, L2/N.
- 3-phase power supply should be connected to L1, L2 and L3.
- Phase sequence of power supply is not important and cable doesn't have to be a shielded.
- Protective grounding of motor is connected to drive
- Motor cable should be connected to U, V, W.

➤ Inverter Power supply 3\*400 VAC:

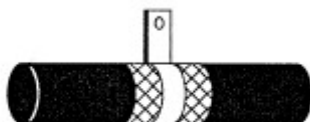
- Rated voltage of motor 230/400, Star connection
- Rated voltage of motor 400/660, Delta connection

➤ Inverter Power supply 1\*230 VAC

- Rated voltage of motor 230/400, Delta connection

Y	Δ
400V	230V
690V	400V
STAR	DELTA

- Motor cable must be a shielded cable to fulfill EMC requirements. Example of cables to be used are RKFK, Ölflex Classic 100 CY, FKKJ-EMC, or similar.
- Shield of the motor cable should be connected to ground/earth in both ends. On motor side an EMC-gland is to be used.
- Shield of motor cable is to be connected to ground terminal in the drive itself. For IP20 drives the shield can instead be clamped to the mounting plate with a clip.



- Motor must also be well attached into the mechanical frame of the machinery and have the same potential as the electrical cabinet. Separate earth connection might be necessary.
- Motor cable should avoid to be installed close to telephone-, network- or signal wiring. Minimum distance is 30 cm.



## 4.6 Brake transistor and external brake resistor

If a larger amount of regenerate power is being produced than the BFI can handle at stop function AC Flux Braking can be used. Means that motor is being over excited during stop and used as brake resistor. Note that heat of motor will increase and it only works during deceleration. Put parameter P-05=3 to activate AC Flux braking.

If AC Flux braking is not enough BFI from Size2 has a dynamic brake transistor and an optional external braking resistor can be connected to +DC and BR when required. The brake resistor circuit should be protected by a suitable thermal protection circuit. The –DC, +DC and BR connections are blanked off by plastic tabs when sent from the factory. The plastic tabs can be removed if/when required.

Table shows models with built-in brake transistor suggestion of brake resistors.

- Internal resistor, OD-BR100-BFI is mounted inside BFI IP20 and is activated and protected from overload by setting of P34=1.
- External resistor must always be used together with a slow external overload protection and P34=2. Table shows setting current of the external overload protection.

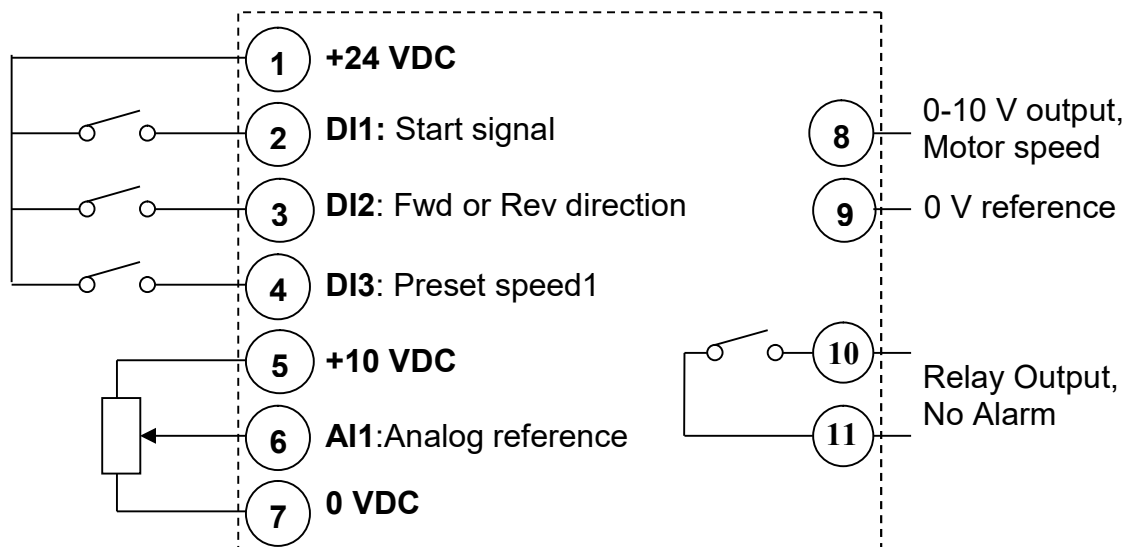
Drive model		Minimum resistance when regenerated power is equal with BFI power [ohm]	Brakeresistor to be used				
Voltage	BFI-E3		Name	Setting overload protection	Power resistor [kW]		Resistans [ohm]
					Medel	Peak for 0,125 sec	
1-phase 230 VAC	0070[1,5kW]	101	OD-BR100-BFI	P34=1	0,2	12	100
	0105[2,2kW]	69	OD-BR100-BFI	P34=1	0,2	12	100
	0153[4,0kW]	25	BSD600R75-4	2,8 A	0,6		75
3-phase 400 VAC	0041[1,5kW]	406	OD-BR100-BFI	P34=1	0,2	12	100
			2 BSD600R140-4 connected in serial	2,1 A	1,2	-	280
	0058[2,2kW]	277	OD-BR100-BFI	P34=1	0,2	12	100
			2 BSD600R82-4 connected in seriell	2,7 A	1,2	-	164
	0095[4,0kW]	152	OD-BR100-BFI	P34=1	0,2	12	100
			BSD600R140-4	2,1 A	0,6	-	140
	0140[5,5kW]	111	OD-BR100-BFI	P34=1	0,2	12	100
			BSD600R82-4	2,7A	0,6	-	82
	0180[7,5kW]	81	OD-BR100-BFI	P34=1	0,2	12	100
			BSD600R75-4	2,8 A	0,6	-	75
	0240[11 kW]	55	OD-BR100-BFI	P34=1	0,2	12	100
			2 BSD-600R140-4 connected in parallel	4,1 A	1,2	-	70
	0300 [15kW]	41	2 pieces of BSD-2000R13-4 connected in serial	12,4 A	4,0	-	26
	0390 [18kW]	33					
	0460[22kW]	28					
	0610[30kW]	21					
	0720[37kW]	17					

If other brake resistor than OD-BR100-BFI is used an external overload protection must be connected between BFI and resistor. Put parameter P34=2 and design the protection using below formula:

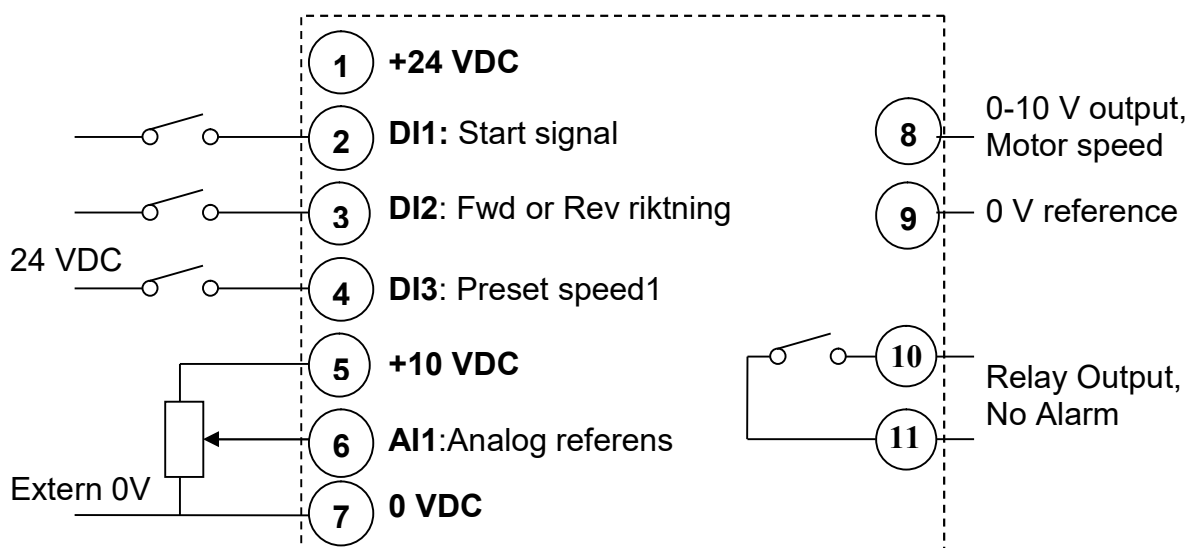
$$\text{Setting of external overload protection} = I = \sqrt{P/R}$$

## 4.7 Overview control inputs/outputs

Picture below shows an overview of control signals for the drive and factory set functionality when the internal 24 VDC of the BFI is being used.



Picture below shows an overview of control signals for the drive and factory set functionality when an external 24 VDC is being used.



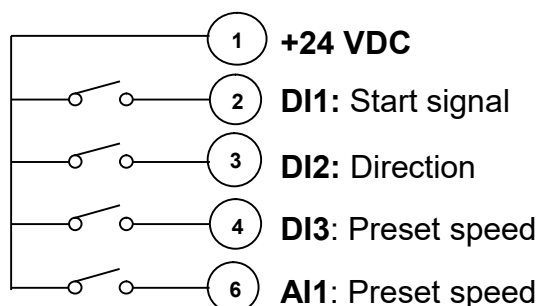


## 5 Basic Parameter setting

The basic parameter setting that always is to be checked or modified is listed below:

Parameter	Name	Default setting	To be set	Function
P-01	Maximum Frequency	50 Hz		If P-10, Motor rated speed, ≠ 0 unit is rpm instead of Hz.
P-02	Minimum Frequency	0 Hz		Set to some few Hz to ensure torque in motor. If P-10, Motor rated speed, ≠ 0 unit is rpm instead of Hz.
P-03	Acceleration Time	5,0 sec		Acceleration ramptime from 0 to 50 Hz.
P-04	Deceleration Time	5,0 sec		Deceleration ramptime from 50 to 0 Hz.
P-07	Motor Rated Voltage	230/400 V		Put rated voltage of motor from motor nameplate in unit V.
P-08	Motor Rated Current	-		Put rated current of motor from motor nameplate in unit A.
P-09	Motor Rated Frequency	50 Hz	50 Hz	Put rated frequency of motor from motor nameplate in unit Hz.
P-12	Command Source	0	0	0: Control by digital and/or analog signals. 1: Control from Keypad.
P-13	Operating Mode select	0		0: Industrial Mode => 150% overload and constant torque. 1: Pump mode => 110 % overload and variable torque. 2: Fan mode => 110 % overload, Spin start, variable torque.
P-14	Parameter Access	0	201	Normally only parameters P-01 to P-14 are accessible. All other parameters are accessible with this P14=201.
P-17	Switching Frequency	8 or 16 kHz		Keep as low as possible. Higher value decreases audible noise in motor but increase losses in drive.

### 5.1 Digital start in 2 directions and 4 fixed Preset speeds

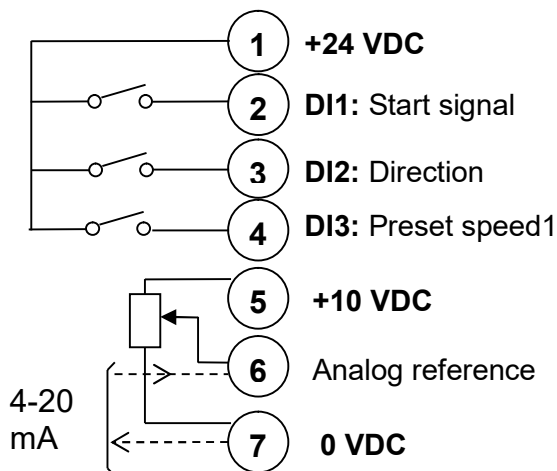


Status				Action	
DI1	DI2	DI3	AI1	P15 = 8	P15 = 9
0	0	any	any	No output from drive	
0	1	0	0	No output from drive	Reverse & PreSpeed 1
0	1	1	0		Reverse & PreSpeed 2
0	1	0	1		Reverse & PreSpeed 3
0	1	1	1		Reverse & PreSpeed 4
1	0	0	0	Forward & PreSpeed 1 (P-20)	
1	0	1	0	Forward & PreSpeed 2 (P-21)	
1	0	0	1	Forward & PreSpeed 3 (P-22)	
1	0	1	1	Forward & PreSpeed 4 (P-23)	
1	1	0	0	Reverse & PreSpeed 1	No output from drive
1	1	1	0	Reverse & PreSpeed 2	
1	1	0	1	Reverse & PreSpeed 3	
1	1	1	1	Reverse & PreSpeed 4	

Parameter	Name	Default setting	To be set	Function
P-12	Command Source	0	0	0= Control by digital and analog signals.
P-15	Input Selection	0	8 or 9	8 = Startsignal / Direction signal / Digital setspeed. 9 = Start Forward / Start Reverse / Digital setspeed.
P-20	Preset Speed 1	5,0 Hz		Can be set between P-02 (Minimum speed) and P-01 (Maximum speed). If P10=0 then values are entered in Hz. If P10>0 values are entered as rpm.
P-21	Preset Speed 2	25,0 Hz		
P-22	Preset Speed 3	40,0 Hz		
P-23	Preset Speed 4	50,0 Hz		

## 5.2 Digital start in 2 directions and analog frequency set point

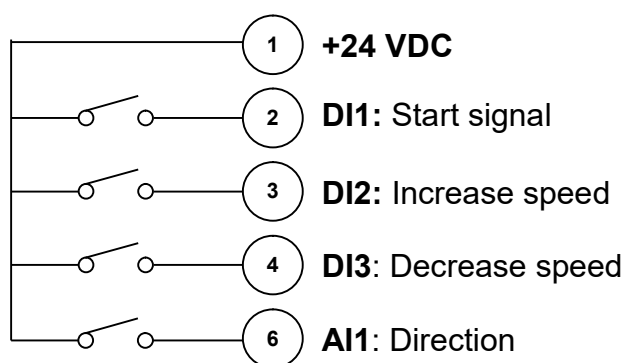
Start of drive is done by either Start- and Direction signals or Start Forward/Start Reverse. Third digital input decides whether Preset speed1, P-20 or analog input is valid. If 4-20 mA is to be used current must flow into terminal 6 and out on terminal 7.



Status			Action	
DI1	DI2	DI3	P15 = 0	P15 = 5
0	0	any	No output from drive	
0	1	0	No output from drive	Reverse & Analog speed
0	1	1		Reverse & PreSpeed 1
1	0	0	Forward & Analog speed	Forward & Analog speed
1	0	1	Forward & PreSpeed 1	Forward & PreSpeed 1
1	1	0	Reverse & Analog speed	No output from drive
1	1	1	Reverse & PreSpeed1	

Parameter	Name	Default setting	To be set	Function
P-01	Maximum Frequency	50 Hz		Maximum output frequency. If P-10 Motor rated speed, ≠ 0 unit is rpm.
P-02	Minimum Frequency	0 Hz		Minimum output frequency. If P-10, Motor rated speed, ≠ 0 unit is rpm instead of Hz. P-02 will be output frequency at 0 V or 4 mA setpoint.
P-12	Command Source	0	0	0= Control by digital and analog signals.
P-15	Input Selection	0		0 = Digital Startsignal / Digital Direction signal / Analog setspeed. 5 = Start Forward / Start Reverse / Analog setspeed.
P-16	Analog Input 1 Configuration	U 0-10	Type of analog input decides	U 0-10 = 0 to 10 VDC, R 0-20 = 0 to 20mA. b- 10-10 = -10 to 10 VDC. Sign decides rotation/direction. t 4-20 = 4 to 20mA. Trip if signal level < 3mA. r 4-20 = 4 to 20mA, Stop and Trip if signal level < 3mA. t 20-4 = 20 to 4mA, Trip if signal level falls < 3mA.
P-20	Preset Speed 1	5,0 Hz		Can be set between 0 to P-02 setting ( Maximum speed) .
P-35	Analog Input Scaling	100 %		Output frequency = P1 * (P35/100) * (Analog input value/ max input of P-16) . Exampel: P-01=50 Hz, P-35=100 %, P-16= 0-10 V and Actual voltage input is 7,5 V. Output frequency = 50 x (100/100) x (7,5/10) = 37,5 Hz.

## 5.3 Digital motor potentiometer



Status				Action
DI1	DI2	DI3	AI1	P12=2 & P15 = 0
0	any	any	any	No output from drive
1	0	0	0	Forward & Latest speed
1	1	0	0	Forward & Increase speed
1	0	1	0	Forward & Decrease speed
1	0	0	1	Reverse & Latest speed
1	1	0	1	Reverse & Increase speed
1	0	1	1	Reverse & Decrease speed

Digital motor potentiometer will work if P31 is put to 2, 3, 6 or 7.

## 5.4 Digital start signal and frequency set point by LED display

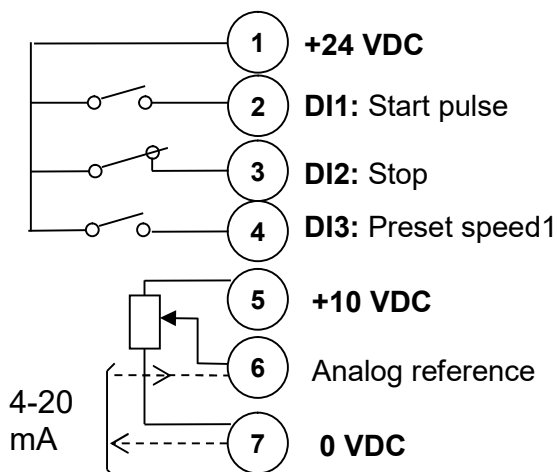
Connect terminal 2 with terminal 1 to give digital start signal forward and terminal 3 to 1 for digital start signal reverse.

Output frequency can be increased and decreased by push button "Up" and "Down". In parameter P-31 the start speed can be decided either latest speed or minimum speed.

Parameter	Name	Default setting	To be set	Function
P-12	Primary Command	0	1	Start by connecting terminal 1 and 2.
P-15	Digital Input function selection	0	8	8: Start signal forward on terminal 2 och start signal reverse on terminal 3. If both terminal 2 and 3 are on deceleration time in P-24 is used.
P-30	Terminal restart mode	Ed9P-r		Ed9P-r: Startsignal on terminal 2 is activated by positive edge. After power on must terminal go from 0 VDC to 24 VDC. Rutö-□ = Jumper between 1 and 2 or 1 to 3 starts always the motor.
P-31	Keypad function	1		2: Motor accelerete to minimal frequency, P-02, at start. 3: Motor accelerete to latest speed before stop.

## 5.5 Start/stop by individual signals

Start is done by a pulse on one terminal and stop on a second one. Third input decides if frequency set point is to be analogue or a PresetSpeed in P-20. If 4-20 mA signals is to be used current must enter terminal 6 and back from terminal 7.



Status			Action
DI1	DI2	DI3	P12 = 0 and P15=10
-	0	-	No output from drive or deceleration to 0 Hz.
1 ↑	1	0	Running with analogue frequency set point.
1 ↑	1	1	Running with PresetSpeed 1 in P-20.

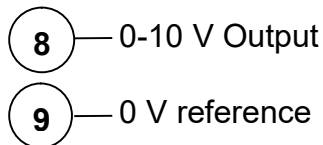
## 5.6 Control from LED display

Connect terminal 2 with terminal 1 to give digital start signal. Then set parameters as below:

Parameter	Name	Default setting	To be set	Function
P-12	Primary Command	0		Start activated by green start button and stop by red Stop button. Speed is increased by "Up-button" and decreased by "Down-button". 1: Motor can only run in one direction. 2: Motor can run in two directions. Rotation direction is changed by pushing green start button twice.
P-31	Keypad function	1		0: Motor accelerete to minimal frequency, P-02, at start. 1: Motor accelerete to latest speed before stop.

## 5.7 Analog output, 0-10 VDC

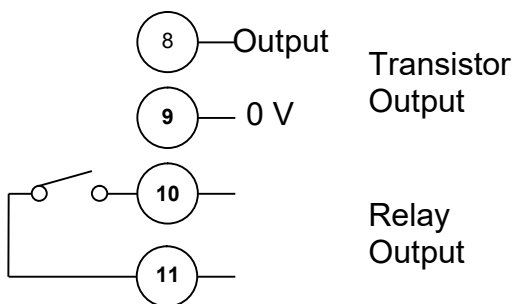
Between terminal 8 and 9 an analog output of 0-10 VDC is generated. Maximum load is 20 mA.



Parameter	Name	Default setting	Function
P-25	Analog Output Function	8	8: <b>Output Frequency:</b> 0 to 100% = 0-10 V => 0 to P-01 Hz. 9: <b>Output Motor Current:</b> 0 to 200% = 0-10V => 0 to P-08 A. 10: <b>Motor Power:</b> 0 to 200% = 0-10V => 0 to Rated inverter power kW. 11: <b>Load current:</b> 0-200% = 0-10V => 0 till P-08, Current used producing torque on motor shaft.

## 5.8 Digital outputs

Terminal 8 generates 0 or 24 VDC output without any external 24 VDC power supply.



Parameter	Default setting	Function
P-18: Relay Output Function Terminal 10 and 11	P-18=1	0: <b>Drive Enabled or running.</b> 1: <b>Drive Healthy.</b> Power applied to the drive and no fault. 2: <b>At Target Frequency.</b> Output frequency matches the set frequency. 3: <b>Drive Tripped</b> and in a fault condition 4: <b>Output Frequency &gt;= Limit.</b> Logic 1 when the output frequency is > limit set in P-19. 5: <b>Output Current &gt;= Limit.</b> Logic 1 when the motor current is > limit set in P-19.
P-25: Analog Output Function Terminal 8 and 9	P-25=8	6: <b>Output Frequency &lt; Limit.</b> Logic 1 when the output frequency is < limit set in P-19. 7: <b>Output Current &lt; Limit.</b> Logic 1 when the motor current is < limit set in P-19. 8: <b>Analog input2 &gt; Limit</b> Logic 1 when analog input2 > P-19 (not available in P-25). 9: <b>Drive ready to run</b> Logic 1 when BFI is ready to run (not available in P-25)

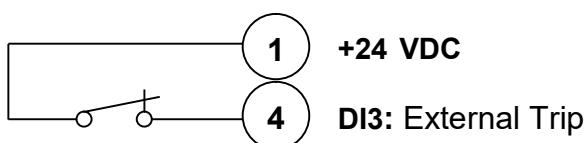
## 5.9 Styrning av mekanisk hållbroms i motorn

A mechanical brake inside the motor should be controlled directly from the inverter.

- If relay output on terminal 10 and 11 is used: Set P-18=4 and frequency release level in P-19. P-19 is set in % of P-01, Maximum frequency.
- If transistor output on terminal 8 and 9 is used: Set P-25=4 and frequency release level in P-19. P-19 is set in % of P-01, Maximum frequency.

For example if P-01=50: P-19=5 % means break release at  $50 \times 0,05 = 2,5$  Hz.

## 5.10 PTC-thermistor



A motor thermistor, PTC Type 2,5 kΩ, is to be connected between terminals 1 and 4. BFI will trip with open contact or a resistance above 2.5 kOhm.

Set P-15=3 and P-47 = "PTC-Enh".  
Input is not ATEX approved.

### 5.11 Vector control with standard induction motor

Vector control is a built in function that gives additional torque at low speed and also makes motor speed constant even though load of the motor fluctuates.

Vector control is based on a mathematical description of motor characteristic. BFI-E3 can by this calculated actual speed of the motor. Vector control is activated by default and based on a motor with the same kW as the BFI. With another motor type or if the performance is to be optimized an auto tuning can be done. This is done by setting of parameters below:

- Open up parameters P-14=201
- Rated motor voltage in P-07 [V].
- Rated motor current in P-08 [A].
- Rated motor frequency in P-09 [Hz].
- Industrial application in P-13=0.
- Standard Induction motor with P-51=0.
- Start auto tuning by setting P-52=1, it starts immediately when parameter is changed.

**Autotuning can ONLY be started by setting P52=1 on the Keypad!**

When auto tuning is done measured values are stored in parameter P-55, P-56 and P-57. Auto tuning only needs to be done once.

If motor creates strange sound, weak torque performance and speed is not stable, change Gain of the speed controller, P-53. Increased value gives faster response but increase risk for instability.

### 5.12 Current limit control

Parameter P-54 (default setting is 150%) contain the maximum amount of current to be sent to motor. If current limit is reached BFI will try to decrease motor current by adjusting output frequency. During constant speed output frequency will automatically decrease and during acceleration the acceleration time will automatically increase.

A too large setting of P-54 might cause trip of BFI because it does not get enough time to make the output frequency adjustment.

### 5.13 Tuning of PM-motor

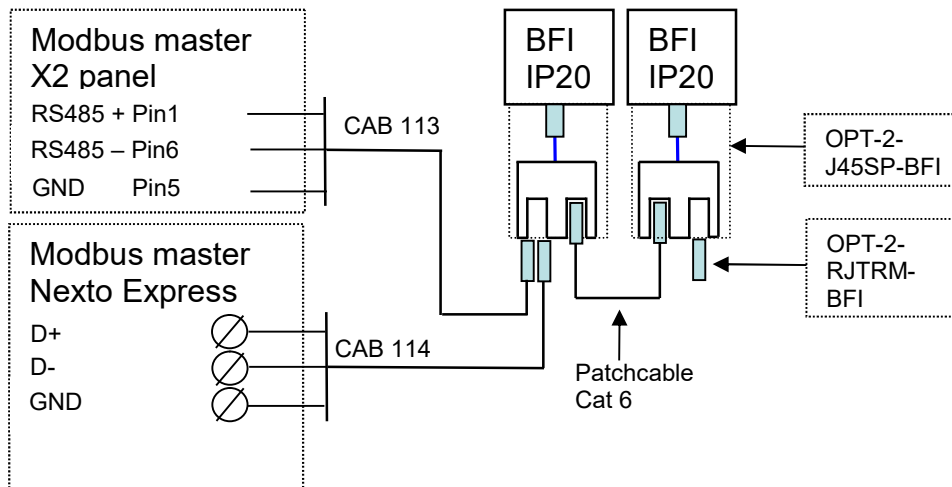
Always make an auto tuning of a PM-motor, see Vector control, 5.10. Also set following parameters:

- Open up parameters P-14=201
- Rated motor frequency in P-09 [Hz]=Rated speed [rpm] x Number of poles/120
- PM-motor Speed control, P-51=2
- Start auto tuning by setting P-52=1, it starts immediately when parameter is changed.

Check after auto tuning that measured resistance and inductance values correspond towards datasheet of the motor. To improve torque performance at low speed, increase P-11 carefully.

## 5.14 Modbus RTU

A Modbus RTU network with BFI-E3, BFI-H3 or BFI-P2 is connected as below:

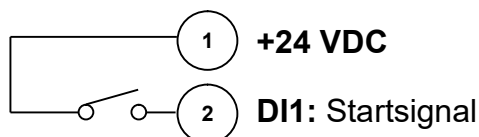


BFI-E3 IP66 has two RJ45 female built-in and by that does not need OPT-2-J45SP-BFI.

Settings in BFI-E3 are speed setting is 115 200 bit/sec, 8 data bits, 1 stop bit, No Parity.

Hardware	Function	Comment
CAB 114	Shielded cable with one RJ45 and 3 wires marked SDA, SDB and SG for screwterminals.	Cable length 3 m. Modbus RTU- pin7 and Modbus RTU+ pin8 in BFI.
CAB 113	Shielded cable with one RJ45 for BFI and one 9-pole D-sub for X2 panels.	Cable length 3 m. Built-in 120 ohm resistor in D-sub between pin7 and pin8.
OPT-2-J45SP-BFI	T-Connection of 2 serial cables into one drive.	RJ45 male to BFI and 2 female RJ45 for network connection
OPT-2-RJTRM-BFI	RJ45 with a 110 ohm resistor.	To be put in the last BFI-splitter.

*DI1 must always be closed to start*

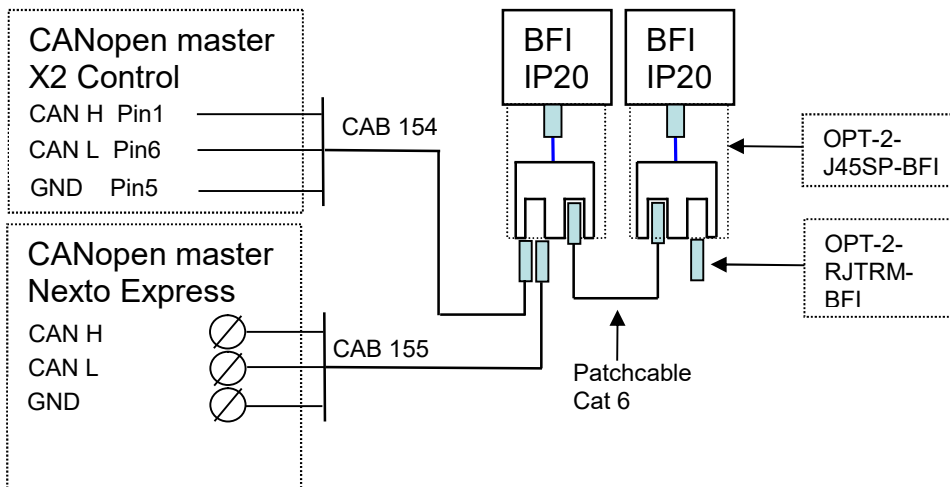


Parameter	Name	Default setting	Recommended setting	Function
P-12	Command Source	0	3	3= Control by Modbus RTU and ramptime in P-03 and P-04. 4= Control by Modbus RTU and ramptime sendt by Modbus.
P-14	Parameter Access	0	201	201 = Parameters above P-14 accessable.
P-24	Fast Deceleration time	0		Fast Deceleration ramptime from 0 to 50 Hz.
P-36	Communication Setting (Power off/on when parameter has been changed)	1 Modbus 115,2k 3000	115,2k	3 settings in one parameter. - Stationnumber 0-63. First Drive should be stationnumber 1. - Communication speed, 115,2=115.200 bits/sec. - Communication timeout. 0 = No timeout [msec].

## 5.15 CANopen

BFI-E3 should have firmware version 3.08 (from August 2019) for full functionality. Eds-file to be used for BFI-E3 is called *BFI-E3.eds* and is to be downloaded from [www.beijerelectronics.com](http://www.beijerelectronics.com).

A CANopen network with BFI-E3 IP20 are connected as below.

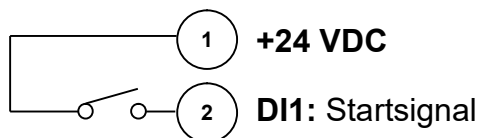


BFI-E3 IP66 has two RJ45 females built-in which means no use for OPT-2-J45SP-BFI.

Default settings in BFI and project is 500 kbits/sec.

Hardware	Function	Comment
CAB 154	3 m shielded cable with one RJ45 for BFI and one 9-pole D-sub for X2 panels.	Built-in 120 ohm resistor in D-sub between CANopen- pin1 and CANopen+ pin2.
CAB 155	Shielded 3 m cable with one RJ45 and 3 wires for screwterminals marked H(+), L(-) and Shield.	A separate 120 ohm resistor for bus termination included.
OPT-2-J45SP-BFI	T-Connection of 2 serial cables into one drive.	RJ45 male to BFI and 2 female RJ45 for network
OPT-2-RJTRM-BFI	RJ45 with a 120 ohm resistor.	To be put in the last BFI-splitter.

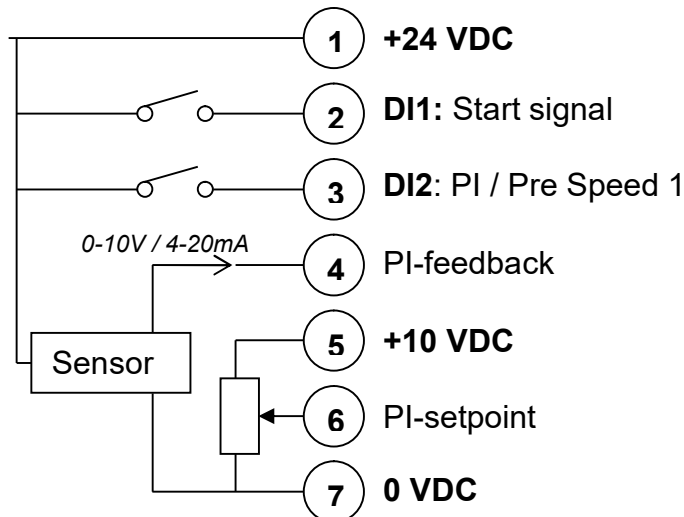
*DI1 must always be closed to start*



Parameter	Name	Default setting	Recommended setting	Function
P-12	Command Source	0	7	7= Control by CANopen och ramptime in P-03 and P-04. 8= Control by CANopen och ramptime sent by CANopen.
P-14	Parameter Access	0	201	201 = Parameters above P-14 accessible.
P-24	Fast Deceleration time	0		Fast Deceleration ramptime from 0 to 50 Hz.
P-36	Communication Setting ( <i>Efter ändring måste spänning slås av och på igen</i> )	CANopen 1, 500 k, 3000	500 kbit/sec	3 settings in one parameter. - Stationnummer 0-63. First Drive should be stationnummer 1. - Communication speed, 125-1000 kbit/sek. - Communication timeout. 0 = No timeout [msec].



## 5.16 PI-control



Status		Action
DI1	DI2	
0	any	No output from drive
1	0	Run with PI-control
1	1	Run with PreSpeed in P-20
P-44=0 : Set point in P-45		
P-44=1 : Analog set point on Terminal 6		

Parameter	Name	Default setting	Recommended setting	Function
P-12	Command Source	0	5	5: PI-control with external feedback signal.
P-15	Input Selection	0	0	0 = PI-feedback Terminal 4. PI or Preset speed Terminal 3.
P-16	Analog Input Format , terminal 4	U 0-10		U 0-10 = 0 to 10 VDC.
P-47	2nd Analog Input Format , terminal 6			A 0-20 = 0 to 20mA. I 4-20 = 4 to 20mA. Trip if signal level < 3mA. r 4-20 = 4 to 20mA. Preset Speed 1 if signal level < 3mA.
P-20	Preset Speed 1	0		Can be set between 0 to P-02 setting ( Maximum speed)
P-41	PI Controller Proportional Gain	1,0		PI Proportional Gain. Higher values provide a greater change in the drive output frequency. Too high value cause instability.
P-42	PI Controller Integral Time	1,0		PI Integral Time. Larger values provide a more damped response for systems where the overall process responds slowly.
P-43	PI Controller Operating Mode	0		0 : Increased motor speed gives increased feedback signal. 1 : Increased motor speed gives decreased feedback signal.
P-44	PI Digital Setpoint	0		0 : Digital Preset PI-Setpoint in P-45. 1 : Analog Input 1, Terminal 6 PI-setpoint.
P-45	PI Digital Setpoint	0,0		When P-44 = 0, PI-setpoint for PI-Controller.
P-46	PI Feedback Source Select	0	0	0 : Analog Input 2 (Terminal 4), 1 : Analog Input 1 (Terminal 6). 2 : Motor Current.
P-48	Standby mode Timer	0 sec		0: Function off Time to run with minimal speed , P-02, until PI-controller enter Sleep mode and motor stops.
P-49	Motor thermal Memory Retention	5,0 %		Level off error between PI-controllers setpoint and feedback signal when motorn is to restart.

## 5.17 Energy Optimization function

The Energy Optimization function is designed to maximize the energy savings achievable when the motor and drive is not operating at its rated load. Function works best at constant speed, as the motor voltage is reduced, the slip of the motor may increase, resulting in a small drop in motor speed, which can make the PI control unstable.

Parameter	Name	Default setting	Function
P-06	Energy Optimization	0	0 = Disbaled      1 = Enabled

## 5.18 Spin start

On start the drive will attempt to determine motor speed and control the motor from its current speed. This gives a few seconds of start delay. Very useful in fan applications.

In size 1 drives a DC-current is injected in the motor to ensure it is stopped.

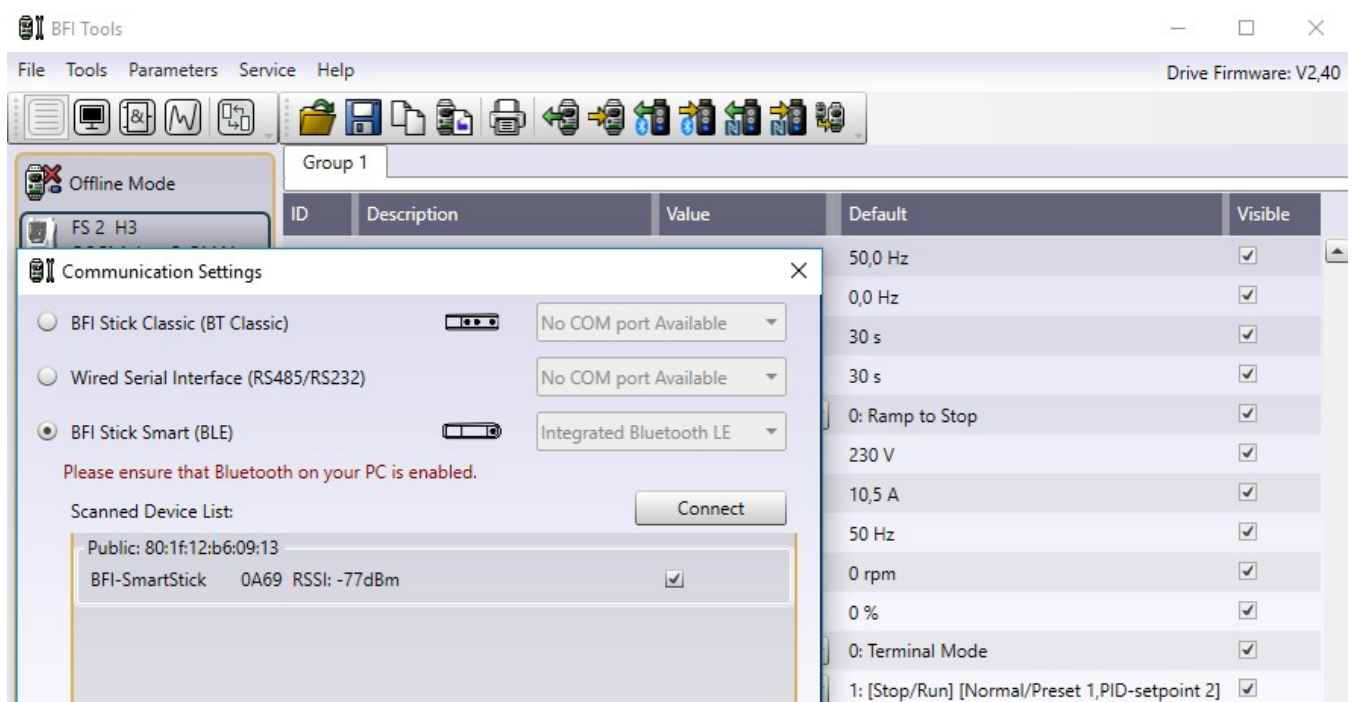
Parameter	Name	Default setting	Function
P-33	Spin Start	0	0 = Disbaled. 1 = Enabled. 2 = Activ on Trip, Brown out and Coast stop.

## 5.19 BFI-Smartstick

Communication between BFI Drive and PC-software BFI-Tools or app BFI-Tools Mobile is done by Bluetooth through BFI-Smartstick. Bluetooth is not built into BFI but in BFI-Smartstick, see picture below. BFI-Smartstick is connected to BFI through it's RJ45 connector. BFI-Smartstick also has a memory for parameter settings that can be read or written by it's buttons.



Chose BFI-Smartstick in Communication Settings. Scan Devices and when BFI-Smartstick is found, connect.



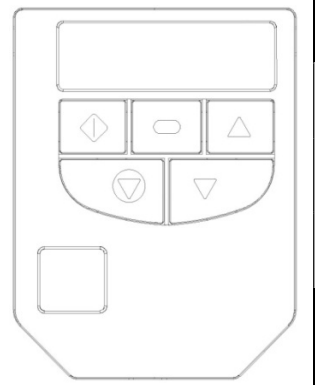
P-14 must be set to 201 to access all parameters in the drive.

Cable CAB115 can also be used, USB connection to PC and RJ45 to BFI. Choose "Wired Serial Interface(RS485/RS232)" in picture above.

## 6 Keypad

The drive is configured and its operation monitored via the keypad and display.

	NAVIGATE	Used to display real-time information, to access and exit parameter edit mode and to store parameter changes
	UP	Used to increase speed in real-time mode or to increase parameter values in parameter edit mode
	DOWN	Used to decrease speed in real-time mode or to decrease parameter values in parameter edit mode
	RESET / STOP	Used to reset a tripped drive. When in Keypad mode is used to Stop a running drive.
	START	When in keypad mode, used to Start a stopped drive or to reverse the direction of rotation if bi-directional keypad mode is enabled



Operating Displays		Changing Parameters		Read Only Parameter Access		Resetting Parameters	
	Drive Stopped/ Disabled		Press and hold the Navigate key > 2 seconds		Press and hold the Navigate key > 2 seconds		To reset parameter values to their factory default settings, press and hold Up, Down and Stop buttons for > 2 seconds. The display will show P-def
	Drive is enabled / running, display shows output frequency (Hz)		Use the up and down keys to select the required parameter		Use the up and down keys to select P-00		
	Press the Navigate key for < 1 sec. The display will show motor current (A)		Press the Navigate key for < 1 second		Press the Navigate key for < 1 second		Press the Stop key. The display will show "Stop"
	Press the Navigate key for < 1 second. The display will show the motor power (kW)		Adjust the value using the Up and Down keys		Use the up and down keys to select the required Read Only parameter		
	If P-10 > 0, pressing the Navigate key for < 1 second will display the motor speed (RPM)		Press for < 1 second to return to the parameter menu		Press the Navigate key for < 1 second to display the value	<b>Resetting a Fault</b>	
			Press for > 2 seconds to return to the operating display		Press and hold the Navigate key > 2 seconds to return to the operating display		Press the Stop key. The display will show "Stop"

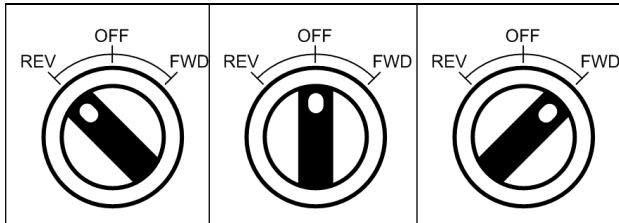
## 6.1 Monitoring from Keypad

Put P14=201 to access monitor values in parameter group P0.

Par	Description	Display range	Explanation
P0-01	1st Analog Input Value	0 ... 100%	100% = max input voltage
P0-02	2nd Analog Input Value	0 ... 100%	100% = max input voltage
P0-03	Speed Reference Input	-P-01 ... P-01	Displayed in Hz if P-10 = 0, otherwise displayed in RPM
P0-04	Digital Input Status	Binary value	Drive digital input status
P0-05	User PI output (%)	0 ... 100%	User PI output (%)
P0-06	DC bus ripple (V)	0 ... 100%	DC bus ripple (V)
P0-07	Applied Motor Voltage	0 ... 600V AC	Value of RMS voltage applied to motor
P0-08	DC Bus Voltage	0 ... 1000V dc	Internal DC bus voltage
P0-09	Heatsink temperature	-20 ... 120 °C	Temperature of heatsink in °C
P0-10	Hours Run Meter	0 to 99 999 hours	Not affected by resetting factory default parameters
P0-11	Run Time Since Last Trip1	0 to 99 999 hours	Run-time clock stopped by drive disable or trip.
P0-12	Run Time Since Last Trip2	0 to 99 999 hours	Run-time clock stopped by drive disable or trip. Not reseted by power down / power up cycling.
P0-13	Trip Log	0 to 99 999 hours	Displays most recent 4 trips with time stamp
P0-15	DC Bus Voltage Log	0 ... 1000V	8 most recent values prior to trip, updated every 256ms
P0-16	Heatsink Temperature Log	-20 ... 120 °C	8 most recent values prior to trip, updated every 30s
P0-17	Motor Current	0 to 2x rated current	8 most recent values prior to trip, updated every 256ms
P0-18	DC bus ripple log (V)	0 ... 100%	8 most recent values prior to trip, 22ms sample time
P0-19	Internal drive temperature log	-20 ... 120 °C	8 most recent values prior to trip, 30 s sample time
P0-20	Internal drive temperature	-20 ... 120 °C	Actual internal ambient temperature in °C
P0-23	Temperature log cooling fin	Hours:min	Total time of operation above heatsink temp of 85°C
P0-24	Temperatur log internally	Hours:min	Total time of operation with drive internal temperatur above 80°C
P0-25	Estimated rotor speed	0 ... 500 Hz	In vector control modes, estimated rotor speed in Hz
P0-26	kWh meter / MWh meter	0.0 kWh / 0 MWh	Total number of kWh / MWh consumed by the drive.
P0-27	Total run time of drive fans	Hours:min:sec	First value displays time in hrs, press up to display mm:ss.
P0-28	Software version	e.g. "1.00", "47AE"	"1": Indicates I/O processor, "2" : Indicates power stage
P0-29	Drive type identifier		BFI type, Drive rating, input phases, voltage, firmware
P0-30	Drive serial number	xxxxxx / yy / zzz	Unique drive serial number
P0-31	Motor current Id / Iq	0 to 2x rated current	Displays magnetising current (Id) and torque current (Iq).
P0-32	Actual PWM switching frequency (kHz)	4 to 32 kHz	Actual switching frequency used by drive
P0-33	Critical fault counter – O-I	Number of times	Number of trips due to overcurrent
P0-34	Critical fault counter – O-Volts	Number of times	Number of trips due to over voltage
P0-35	Critical fault counter – U-Volts	Number of times	Number of trips due to under voltage
P0-36	Critical fault counter – O-temp	Number of times	Number of trips due to over temperature heatsink
P0-38	Error counter – O-hEAt	Number of times	Number of trips due to internal over temperature
P0-39	Error counter – Modbus	Number of times	Number of trips due to Modbus error
P0-47	Fire mode running Hours	Hours	Number of Hours in Fire mode
P0-48	Scope channel 1 & 2		Displays value for Scope channel 1 & 2
P0-49	Scope channel 3 & 4		Displays value for Scope channel 3 & 4
P0-50	Bootloader and motor control		Internal value

## 6.2 IP66, Main switch, start/stop switch and potentiometer

By adjusting the parameter settings the drive can be configured for multiple applications and not just for Forward or Reverse. This could typically be for Hand/Off/Auto applications (also known and Local/Remote) for HVAC and pumping industries.



Switch Position			Parameters to Set		Notes
			P-12	P-15	
Run Reverse	STOP	Run Forward	0	0	Factory Default Configuration Run Forward or Reverse with speed controlled from the Local POT
STOP	STOP	Run Forward	0	5, 7	Run forward with speed controlled from the local POT. Run Reverse - disabled
Pre-set Speed 1	STOP	Run Forward	0	1	Run Forward with speed controlled from the Local POT. pre-set Speed 1 provides a 'Jog' Speed in P-20
Run Reverse	STOP	Run Forward	0	6, 8	Run Forward or Reverse with speed controlled from the Local POT
Run in Auto	STOP	Run in Hand	0	4	Run in Hand – Speed controlled from the Local POT Run in Auto 0 Speed controlled using Analog input 2 e.g. from PLC with 4-20mA signal.
Run in Speed Control	STOP	Run in PI Control	5	1	In Speed Control the speed is controlled from the Local POT In PI Control, Local POT controls PI set point
Run in pre-set Speed Control	STOP	Run in PI Control	5	0, 2, 4, 5, 8..12	In pre-set Speed Control, P-20 sets the pre-set Speed In PI Control, POT control the PI set point P-44=1
Run in Hand	STOP	Run in Auto	3	6	Hand – speed controlled from the Local POT Auto – Speed Reference from Modbus
Run in Hand	STOP	Run in Auto	3	3	Hand – Speed reference from pre-set Speed 1 (P-20) Auto – Speed Reference from Modbus

## 6.3 EMC-filter

BFI contains an internal EMC-filter connected to earth. BFI with built-in EMC-filter must never be used in systems where the 3-phase supplying net don't have a neutral connected to earth, normally called IT-net. The BFI can be damaged. IT-net is normally being used in all types of boats and also some parts of Norway.

In the rest of Europe TN-net is most common where EMC-filter can be used.

The EMC-filter on BFI IP20 can be disconnected by removing a screw on the left side of the BFI. For BFI IP66 the screw to be removed is located on right side of input terminals L1, L2 and L3 and is marked "EMC".

## 7 Specification

	BFI-E3 (1 x 230 V)						BFI-E3 (3 x 400 V)											
Drive Model	023	043	070	105	153		022	041	058	095	140	180	240	300	390	460	610	720
Output power, kW	0,37	0,75	1,5	2,2	4,0		0,75	1,5	2,2	4,0	5,5	7,5	11	15	18	22	30	37
Output current A,	2,3	4,3	7,0	10,5	15,3		2,2	4,1	5,8	9,5	14	18	24	30	39	46	61	72
Overload rating, A	175 % av märkström i 2,0 sek; 150 % i 1 min																	
Output voltage	3-fas, 0 V upp till ansluten nätspänning																	
Output frequency	0 – 500 Hz																	
Input voltage	1-fas, 200 – 240 VAC						3-fas, 380-480 VAC											
Voltage fluctuations	180 – 264 VAC						342 – 528 VAC											
Input frequency	48-62 Hz																	
Input current A	3,7	7,5	13	19	29		3,5	5,6	7,5	12	17	21	27	34	44	52		
Internal Braketransitor	No		Option		Yes			No	Optio	Yes								
Control methods	Linear U/f-reglering, Adjustable linear, Vector control, Energy Optimised																	
Motors	Induction motors, PM-motor, BLDC, Synchronus reluctance motor																	
Start methods	Digital, Push button Fwd/Rev/Stop, Keypad, Modbus RTU, CANopen																	
Frequency setpoint	Digital Preset speed, Digital motorpotentiometer, Analog 4–20 mA, 0–5 V, Keypad, Modbus RTU, CANopen																	
Digital input	2 x Programmable Digital Input and 2 x User-selectable Digital or Analog Inputs,																	
Analog input	2 x User-selectable Digital or Analog Inputs. 4-20 mA or 0-10 V or -10 to 10. 12 bit																	
Transistor output	1 x User-selectable Digital or Analog Output. Maximum current 20 mA.																	
Relay output	1 x Progammable Relay (single pole), Maximum load 6,0 A with 230 V or 5A with 30 VDC.																	
Analog output	1 x User-selectable Digital or Analog Output, 0-10 V DC. Maximum current 20 mA. 10 bit.																	
Communication	Modbus RTU or CANopen																	
Acc/Deceration time	0 to 600 sec, 2:nd deceleration ramp																	
Stop mode	Ramping / Fast stop / Coasting / DC-brake																	
Motor overload protection	Internal control of output current in combination with motor current setting. Digital or analog overload signal connectable as standard. Trip level for is a resistance above 2,5 kOhm.																	
Functions	PI-control with Sleep mode, Spin start, Automatic restart, Skip frequency, Stop method at Voltage interruption, Enery Optimiser, Parameter access lock, Firemode																	
Protection class	IP20 or IP66																	
Ambient temperature	IP20: -20 °C to +50 °C, IP66: -20 °C to +40 °C, Storage temperature -40 °C to +60 °C																	
Maximum humidity	Max. 95 % non-condensing																	
Environment	No airborne dust, corrosive gases or liquids, conductive contaminants (such as condensation, carbon dust, and metallic particles), high moisture, salt or chemical content environments. 3C3/3S3 conformal coated PCBs.																	
Maximum altitude	2000 meter bove sea level, Derate above 1000 m: 1 %/100m																	
Vibrations	IEC 60068-2-29, IEC 60068-2-64, IEC 60068-2-6																	
Earth leakage current	1-fas 230 VAC: < 2,5 mA; 3-fas 400 VAC: < 4,65 mA																	
EMC	2014/30/EU, Built-in EMC-filter, All models fullfill EN61800-3:2004, Class C1, C2, C3 och C4																	
Machinery Directive	2006/42/EC																	
Low Voltage Directive	Adjustable speed electrical power drive systems																	
Approvals	CE, UL, RoHS, Carbon Trust																	
Max motorcable length	100 m						100 m											
Cooling fans IP66	Nej	Internal fan					Internal fan								Not in IP66			
Cooling fans IP20	Nej	Fan in cooling fin					Fan in cooling fin											
Frame size	1	1	1 / 2	2	3		1	1 / 2	2	2	3	3	3	4	4	4	5	5
Weight IP20 [kg]	1,0			1,7	3,2		1,0		1,7		3,2			9,1			18,1	
Weight IP66 [kg]	3,0			4,2	7,7		2,5		3,5		7,0			9,5			Not	



## 8 Warning and Alarm codes

Drive Display Fault Code	Fault Number	Description	Corrective Action
Stop	0	Drive is healthy and in stop condition. Motor is not energized. No enable signal is present to start drive	
OL-b	1	Brake resistor over current	Check cabling to the brake resistor and the brake resistor for short circuits. Ensure the resistance of the brake resistor is > minimum allowed value.
OL-br	2	Brake resistor thermal overload.	Only occurs if P-34 = 1. The internal brake transistor software protection is activated to prevent damage to the brake resistor. <b>If a standard braking resistor is being used, P-34 MUST be 1</b> Increase deceleration time in P-04, decrease load or speed <b>For Other Brake Resistors</b> Ensure the resistance of the brake resistor is > minimum allowed value. Use an external thermal protection and set P-34=2.
OC-1	3	Instantaneous Over current on the drive output. Excess load or shock load on the motor.	<b>Fault occurs immediately on drive enable or run command</b> Check the output wiring connections to the motor and the motor for short circuits phase to phase and phase to earth. <b>Fault occurs during motor starting then check</b> <ul style="list-style-type: none"> <li>Motor is free to rotate and there are no mechanical blockages.</li> <li>If the motor has a brake fitted, check the brake is releasing correctly.</li> <li>Increase the acceleration time in P-03. Reduce the motor boost voltage P-11</li> </ul> <b>Fault occurs when motor operating at constant speed</b> Investigate overload or malfunction.
IC-trP	4	Motor thermal overload protection trip. The drive has tripped after delivering >100% of value in P-08 for a period of time	<ul style="list-style-type: none"> <li>Ensure the correct motor nameplate current value is entered in P-08.</li> <li>Check for correct Star or Delta wiring.</li> <li>Check if decimal points are flashing (which indicates the output current &gt; P-08 value). Increase acceleration ramp (P-03) or decrease motor load. Check the total motor cable length is within the drive specification. Check the load mechanically to ensure that no jams, blockages or mechanical faults exist.</li> </ul>
PS-trP	5	Hardware Over Current	Check the wiring to motor for phase to phase and phase to earth short circuits. Disconnect motor and cable. Retest. If the drive trips with no motor connected, replace drive. Test for insulation failure.
OV-VoLt	6	Over voltage on DC bus	Check the supply voltage is within the allowed tolerance. If the fault occurs on deceleration or stopping, increase the deceleration time in P-04 or install a suitable brake resistor and activate the dynamic braking function with P-34.
UV-VoLt	7	Under voltage on DC bus	Incoming supply voltage is too low. This trip occurs routinely when power is removed from the drive. If it occurs during running, check the incoming power supply voltage and all components in the power feed line to the drive.
OT	8	Heat sink over temperature	The drive is too hot. Check that ambient temperature around the drive is within the specification. Ensure sufficient cooling air is free to circulate around the drive. Increase the panel ventilation if required. Ensure sufficient cooling air can enter the drive, and that the bottom entry and top exit vents are not blocked.
UT	9	Under temperature	Trip occurs when ambient temperature is less than -20°C. Temperature must be raised over -20°C in order to start the drive.
P-DEF	10	Factory Default done	Press the STOP key, drive is ready to configure for particular application
E-trIP	11	External trip	E-trip requested on digital input 3. Normally closed contact has opened for some reason. If motor thermistor is connected check if the motor is too hot.
SC-trP	12	Comms loss trip	Check communication link between drive and external devices. Make sure each drive in the network has its unique address.
FLT-dc	13	DC bus ripple too high	Check incoming supply phases are all present and balanced
P-LOSS	14	Input phase loss trip	Drive intended for use with a 3 phase supply has lost one input phase.
h OC-1	15	Output Over Current	Check for short circuits on the motor and connection cable
th-FLT	16	Temperature too high	Heat sink temperature too high, check adequate cooling air is provided
drAtr F	17	Internal memory fault.	Parameters not saved correct, defaults reloaded. Try again.
4-20 F	18	Analog input error	Analog input out of range. Check input current in range defined by P-16.
drAtr-E	19	Internal memory fault	DSP fault. Press the stop key. If the fault persists, consult your supplier.
F-Ptc	21	Motor thermistor trip	Connected motor thermistor over temperature, check wiring and motor
FAN-F	22	Cooling Fan Fault	Check / replace the cooling fan. Only IP66 drives
OH-Err	23	Temperature too high	Drive ambient temperature too high, check adequate cooling air is provided
OUT-F	26	Fel efter utgångssteget	Internt fel i utgångssteg, en fas till motorn saknas, strömmen i alla tre faserna till motorn ojämn. Kontrollera installation från U, V och W på BFI.



AEF-01	40	Auto tune Fault	The motor parameters measured through the auto tune are not correct. Check the motor cable and connections for continuity. Check all three phases of the motor are present and balanced. Check motor rated data put into parameters.
AEF-02	41		
AEF-03	42		
AEF-04	43		
AEF-05	44		
SC-F01	50	Modbus comms fault	Check the incoming communication connection cable. Check that at least one register is being polled cyclically within the limit set in P-36 Index 3
SC-F02	51	CANopen comms fault	

## About Beijer Electronics

Beijer Electronics is a high technology company active in 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 with sales of 1,375 MSEK 2015. The company is listed on the NASDAQ OMX Nordic Stockholm Small Cap list under the ticker BELE. [www.beijerelectronics.com](http://www.beijerelectronics.com)

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