BSD450BN

TECHNICAL FEATURES AND INSTALLATION INSTRUCTIONS



REVISION				
New version code	Date	Note	Release Firmware	Interface
BSD450BN-GB-0.1	24/02/24	BSD450BN Manual	1A1	ESDRIVE 1.2





ATTENTION!

The converters series BSD450BN work under high voltage. Even after switching off the converter, the internal capacitive circuits remain power supplied for a short period of time. For this reason, it is necessary to await at least two minutes before operating inside the converter.

Furthermore, the converter is equipped with an external recovery resistance which works in high voltage with a very high operating temperature. Do not touch then, for no reason, the recovery resistance, even while the converter is disabled.



1 G	ENERAL FEATURES	6
1.1	Overall dimensions	7
1.2	Current supplied	9
1.3	Power supply	9
1.4	Way of use	
1.5	Cable recommendations	
1.6	Functional Scheme	11
2 C	ONNECTIONS	12
2.1	Alarm signals display	
2.2	Connector X1: analog I/O	
2.	.2.1 Analog output configurations	14
2.3	Connector X2 A-B: digital I/O.	15
2.4	Connector X3: output simulator encoder	
2.5	Connector X4: serial RS 485: (option)	
2.6	Connector X4: serial RS 232: (standard)	
2.7	Connector X5: resolver and thermal probe connections	
2.8	Connector X6: input for master encoder	
2.9	Connector X7: power connections	
2.10	Connector X8: auxiliary power supply +24Vcc:	
3 C	ONNECTIONS AND DISPLAY FOR 17 TO 50 [A] DRIVE SIZES	19
3.1	Alarm signal display	20
3.2	Connector X1: analog I/O	20
3.	.2.1 Analog output configurations	21
3.3	Connector X2 A-B: digital I/O.	22
3.4	Connector X3: output simulator encoder	23
3.5	Connector X4: serial RS 485: (option)	23
3.6	Connector X4: serial R5 232: (standard)	23
3.7	Connector X5: resolver and thermal probe connections	24
3.8	Connector X6: input for master encoder	24
3.9	Top Size Connector P IN: power connections	25
3.	.9.1 Bottom Size Connector P OUT: motor cable	25
3.	.9.2 Connector X8: auxiliary power supply +24Vcc:	25
4 E	XAMPLE OF CONNECTIONS	26
4.1	Digital output connections	26
4.2	Connector X1 e X2: connections with reference by potentiometer	27
4.3	Connector X1 e X2: connection with reference by CNC	28
4.4	Connector X4: serial RS 485	28
4.5	Connector X5: resolver and motor thermal probe NTC\PTC	29
4.6	Connector X7: power connections	29
5 S	EQUENCES OF IGNITION AND EXTINCTION	30
6 C	ONNECTION WITH MOTOR CABLE	31





6.1	Cables motor with length > 10 m	31
6.2	Cables motor with length < 10 m	32
7 5	ETUP SOFTWARE OF DRIVE	33
7.1	Getting started	34
7.2	Modifying a parameter	35
7.3	Saving and loading one configuration	35
7.4	Description of the parameters	36
7.5	"Stati" page	39
7.6	Meanings of "CONFIGURATION" bits	40
7.7	Meanings of "STATO" bits	42
7.8	Alarms	43
7.	8.1 Description of the alarms	44
7.9	"Comandi" page	46
8 D	IGITAL INPUTS	47
9 IN	NSTALLATION AND SETTING PROCEDURE	49
9.1	Electric connections	49
9.2	Automatic motor timing (to be performed with the motor released from mechanical load)	49
9.3	Phase sequence check	49
9.4	Setting options	50
9.5	Current loop setting	50
9.6	Speed offset setting	51
9.7	Maximum speed setting	51
9.8	Speed loop gain setting	

1 GENERAL FEATURES

The sinusoidal brushless converters with four frames series BSD450BN belong to the new generation of power servoamplifiers in IPM technology and digital adjust with DSP.

In the compact performance they include the feeder, circuit of recovery and braking resistances. The design and engineering of the product mostly aim to test each converter to obtain maximum quality and reliability.

The converters series BSD450BN are forecast for the speed control of the synchronous sinusoidal motors in alternate current in those applications where, besides a high dynamical response, also an excellent precision and uniformity in positioning is required.

The drives are perfectly compatible with the version of previous drives, BSD450B, with the difference that communication no longer uses the "ES Technology" communication protocol but only "Modbus RTU"

- Bandwidth 200 Hz
- Switching Frequency PWM: 10 KHz
- Diagnostic via serial RS232, optional RS485 (9600 baud)
- Settable simulator encoder output (1024 standard imp/rev)
- \square Input of speed reference: ± 9 V (input impedance 10 KΩ)
- **□** Input of torque reference: \pm 9 V (input impedance 10 KΩ)



1.1 Overall dimensions

Unit=[mm]

239 36,75 36,75 223 Ð 0 180 190 0 0 0 0 0 0 0 0 0 0 0 0 17,25 40 16,25

Standard Drive (size from 3 to 11 [A])





Drive with filter box (size from 3 to 11 [A])





standard Drive (size from 35 to 50 [A])



1.2 Current supplied

SIZE	RATED CURRENT RMS A 40 °C	MAXIMUM CURRENT FOR 1.5 sec.
BSD 450 B / 3A	3 [A]	6 [A]
BSD 450 B / 5A	5 [A]	10 [A]
BSD 450 B / 8A	8 [A]	16 [A]
BSD 450 B / 11A	11 [A]	22 [A]
BSD 450 B / 17A	17 [A]	34 [A]
BSD 450 B / 25A	25 [A]	50 [A]
BSD 450 B / 35A	35 [A]	70 [A]
BSD 450 B / 50A	50 [A]	100 [A]

1.3 Power supply

	unit	Note
Power	Three-phase from 160 (- 10%) a 400 (+10%) [V] 50/60 Hz	For different power supply voltages contact ES- Technology
Auxiliary	24 VCC ± 10% (1A)	



1.4 Way of use

Temperature:	From 0 , 40°C
Humidity:	90% maximum without condensation
Altitude:	1000 m.
Protections degree:	IP 20

1.5 Cable recommendations

To avoid problems during the operation it is recommended to use having cables characteristic following:

	Cable type	Sections	Note
Three-phase power supply	Three-phase + earth	1.5 at 2.5 mm ²	
Motor cable	Three-phase + earth with shield	1 at 2.5 mm ²	For cables with advanced length to 15 meters motor side is advised to the installation of the inductances (chapter 6)
Resolver cable	3 pairs (4 if the thermal probe of the motor is previewed) twisted and shielded	0.25 mm ²	Max length 100 meters

Internal protections:

- Against short circuits among motor terminals. Permanent fault: it is necessary to switch off the power supply, eliminated the cause of short circuit and switch on again the power.
- □ Against mains voltage overload. The fault is reset when the voltage is restored to the rated value.
- □ Against mains under voltage. The fault is reset when the voltage is restored to the rated value.
- □ Against overheating of power. The fault is reset after the cooling of the power unit.
- Against motor current overabsorption via I2t function.
- □ Against breakage of the resolver or connections: once the connection is reestablished or the resolver is repaired, the fault disappears and it is possible to re-enable the converter



1.6 Functional Scheme





2 CONNECTIONS

In front of converter there are 5 connectors and 1 display (see figure). In bottom face there are 3 connectors (see figure)



CONNECTOR X1: Analog INPUT\OUTPUT available on extractable terminal board.

CONNECTOR X2: Digital INPUT\OUTPUT available on extractable terminal board.

- **CONNECTOR X3:** Simulator encoder output.
- CONNECTOR X4: Connection of serial interface RS 232, optional RS485.
- **CONNECTOR X5:** Connection for resolver and NTC/PTC motor thermal probe.
- **CONNECTOR X6:** Input for master encoder.
- **CONNECTOR X7:** Power connector.
- **CONNECTOR X8:** Auxiliary power supply +24Vcc.
- DISPLAY: Display.



SYMBOL	TYPE OF ALARM	
0	Phase-failure	
1	<u>No alarm</u>	
2	Thermal power	
3	Thermal probe	
4	I ² T motor	
5	Under voltage	
7	I ² T driver	
8	resolver	
9	Over voltage	
L	Limit switch	
U	System initializations	
C	Over current	
F	Motor Short circuit	

The converter's front panel provides an alarm signal display:

N.B. The illumination of the decimal point indicates that the converter has been enabled (T.Enable).

A detailed description of the single alarms can be found at chapter 7.8.

2.2 Connector X1: analog I/O

pin	name	type	description	
1	+10V	OUT	Auxiliary voltage at +10V (max. 5mA)	
2	-REF	IN	Differential input of analog reference +/- 9V (speed or torque)	
3	+REF	IN	Differential input of analog reference +/- 9V (speed or torque)	
4	0_OUT	IN	Zero of the signals of analog reference	
5	TORQUE	IN	Input for signal + 9V of adjustment torque	
6	0_TRQ	IN	Zero of the signals of adjustment of torque	
7	-10V	OUT	Auxiliary voltage at -10V (max. 5mA)	
8	OUT_1	OUT	Programmable analog output, settings in the table below.	
9	OUT_2	OUT	Programmable analog output, settings in the table below.	
10	0_OUT	IN	Common for programmable analog outputs	
11	N.C.			
12	0_OUT	IN	Common for programmable analog outputs	



MONITOR 1	OUT_1 A	MONITOR 2	OUT_2 A
0	lq Continuous current signal	0	l phase Phase current signal
1	θ Electric angle position	1	ω Speed signal

2.2.1 Analog output configurations

N.B. The MONITOR 1 and MONITOR 2 fields are located on the user interface on the "Stati" page and in the "STATO" column. Once the bit configuration has been selected desired, it must be sent to the converter using the **ENTER** key.

The offset and full scale of each signal can be calibrated at parameters 125-126-127-128. Below is a table with indicative values for the **Iq** and ω outputs

Value parameter 128	ω Speed signal	Value parameter 126	lq Current signal
-200	2V	-100	2V
-160	2,5V	-80	2,5V
-80	5V	-40	5V
-50	8V	-25	8V



2.3 Connector X2 A-B: digital I/O.

CONNECTOR X2-A

pin	name	type	description	
1	DRIVE OK		Output for the contact without voltage of the internal relay of block. The contact is normally closed under correct operation of the converter and is opened at the intervention of the protections. (max. 24V, 100 mA)	
2	DRIVE OK		Output for the contact without voltage of the internal relay of block. The contact is normally closed under correct operation of the converter and is opened at the intervention of the protections. (max. 24V, 100 mA)	
3	OUT_1	OUT	Programmable digital output (see example for digital output connections at chapter 4.1) <i>N.B.: Max output current 100mA</i>	
4	0 OUT 1	OUT	Common for the digital output 1	
5	OUT_2	OUT	Programmable digital output (see example for digital output connections at chapter 4.1) <i>N.B.: Max output current 100mA</i>	
6	0_OUT_2	OUT	Common for the digital output 2	
7	+13V	OUT	Voltage for enabling	
8	V.ENABLE	IN	Input for enabling of the speed reference to the converter	
9	T. ENABLE	IN	Input for enabling of torque of the converter	
10	D_AUX1	IN	Programmable digital input (standard used as reference inversion)	
11	D_AUX2	IN	Programmable digital input (standard used as digital reference selection)	

CONNECTOR X2-B

pin	name	type	description	
1	D_AUX3	IN	Programmable digital input (standard used as digital reference selection)	
2	D_AUX4	IN	Programmable digital input (standard used as digital reference selection)	
3	D_AUX5	IN	Programmable digital input (standard used as digital reference selection)	
4	0_EN	IN	Common for the digital inputs to the terminals 7,8,9,10,11 (X2-A) and 1,2,3 (X2-B)	

pin	name	type	description
1	CH Z -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL Z -".
2	CH Z +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL Z +".
3	CH A -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL A -".
4	CH A +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL A +".
5	CH B -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL B -".
6	CH B +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL B +".

2.4 Connector X3: output simulator encoder.

2.5 Connector X4: serial RS 485: (option)

pin	name	type	description
1	GND		
2	N.C.		
3	RS 485 – (B)	IN/OUT	
4	N.C.		
5	СОМ		
6	N.C.		
7	N.C.		
8	RS 485 + (A)	IN/OUT	
9	+5V		

2.6 Connector X4: serial RS 232: (standard)

pin	name	type	description
1	N.C.		
2	ТХ	OUT	Connect to the pin 2 of the serial of the P.C.
3	RX	IN	Connect to the pin 3 of the serial of the P.C.
4	N.C.		
5	GND		Connect to the pin 5 of the serial of the P.C.
6	N.C.		
7	N.C.		
8	N.C.		
9	N.C.		



pin	name	type	description		
1	+RIF	OUT	Terminal of connection to the winding EXC of the <i>RESOLVER</i>		
2	-RIF	OUT	Terminal of connection to the winding EXC of the <i>RESOLVER</i>		
3	-SIN	IN	Terminal of connection to the winding SIN of the RESOLVER		
4	+SIN	IN	Terminal of connection to the winding SIN of the RESOLVER		
5	-COS	IN	Terminal of connection to the winding COS of the RESOLVER		
6	+COS	IN	Terminal of connection to the winding COS of the RESOLVER		
7	PTC/NTC	IN	Motor thermal probe connection terminal		
8	PTC/NTC	IN	Motor thermal probe connection terminal		
9	GND		0V common of the circuits of adjustment		

2.7 Connector X5: resolver and thermal probe connections

N.B. <u>The resolver connection must be performed using a shielded cable with three</u> pairs of individually shielded conductors. The shield must be welded to the metal casing of the DB9 connector.

2.8 Connector X6: input for master encoder

pin	name	type	description		
1	CH A +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL A +".		
2	CH A -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL A -".		
3	CH B -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL B -".		
4	CH B +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL B +".		
5	CHZ+	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL Z +".		
6	CH Z -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL Z -".		
7	N.C.				
8	+5 V		+5V for encoder LINE DRIVER.		
9	0 V		0V for encoder LINE DRIVER.		



pin	name	type	description
1	+AT	OUT	Internal bus positive terminal
2	RR		Terminal for external regen resistor
3	-AT	OUT	Internal bus negative terminal
4	U2	OUT	Terminal for the connection of the motor's U phase
5	V2	OUT	Terminal for the connection of the motor's V phase
6	W2	OUT	Terminal for the connection of the motor's W phase
7	U1	IN	Terminal for the connection of one power supply phase
8	V1	IN	Terminal for the connection of one power supply phase
9	W1	IN	Terminal for the connection of one power supply phase

2.9 Connector X7: power connections.

\WARNING: <u>The accidental connection of is made of feeding on clips 1-2-3 or 4-5-6</u> <u>can provoke damages to the section of power of the system</u>

2.10 Connector X8: auxiliary power supply +24Vcc:

pin	name	type	description
1	+24V	IN	Auxiliary power supply
2	0 V		0V for the auxiliary power supply



3 CONNECTIONS AND DISPLAY FOR 17 TO 50 [A] DRIVE SIZES



Front

Bottom size

Top size

Front connection

- **X1:** Analog INPUT\OUTPUT available on extractable terminal board.
- **X2:** Digital INPUT\OUTPUT available on extractable terminal board.
- X3: OUTPUT available on the extractable connector "ENCODER SIMULATOR".
- **X4:** Connection of serial interface RS 232, optional RS485.
- **X8:** Auxiliary power supply +24Vcc.
- **DISPLAY:** Display

Bottom size connection

- **X5:** Connection for resolver and NTC/PTC motor thermal probe.
- **X6:** Input for master encoder.
- POUT: Motor Cable

Top size connection

P IN: Three-phase power supply



SYMBOL	TYPE OF ALARM
0	Phase-failure
1	<u>No alarm</u>
2	Thermal power
3	Thermal probe
4	I ² T motor
5	Under voltage
7	I ² T driver
8	resolver
9	Over voltage
\mathbf{L}	Limit switch
U	System initializations
С	Over current
F	Motor Short circuit

The converter's front panel provides an alarm signal display:

N.B. The illumination of the decimal point indicates that the converter has been enabled (T.Enable).

A detailed description of the single alarms can be found at chapter 7

3.2 Connector X1: analog I/O

pin	name	type	description	
1	+10V	OUT	Auxiliary Voltage at +10V (max. 5mA)	
2	-REF	IN	Differential input of analog reference +/- 9V (speed or torque)	
3	+REF	IN	Differential input of analog reference +/- 9V (speed or torque)	
4	0_OUT		Zero of the signal of analog reference	
5	TORQUE	IN	Input for signal + 9V of adjustment torque	
6	0_TRQ		Zero of the signal of adjustment of torque	
7	N.A.	OUT		
8	OUT_1	OUT	Programmable analog output, settings in the table below.	
9	OUT_2	OUT	Programmable analog output, settings in the table below.	
10	0_OUT		Common for programmable analog outputs	
11	N.A.	OUT		
12	0_OUT		Common for programmable analog outputs	



5.2.1 Analog output configurations					
MONITOR 1	MONITOR 1 OUT_1 A		OUT_2 A		
0	lq Continuous current signal	0	Ip Phase current signal		
1	θ Electric angle position	1	ω Speed signal		

3.2.1 Analog output configurations

N.B. The MONITOR 1 and MONITOR 2 fields are located on the user interface on the "Stati" page and in the "STATO" column. Once the bit configuration has been selected desired, it must be sent to the converter using the **ENTER** key.

The offset and full scale of each signal can be calibrated at parameters 125-126-127-128. Below is a table with indicative values for the **Iq** and ω outputs

Value parameter 128	ω Speed signal	Value parameter 126	lq Current signal
-200	2V	-100	2V
-160	2,5V	-80	2,5V
-80	5V	-40	5V
-50	8V	-25	8V



3.3 Connector X2 A-B: digital I/O.

CONNECTOR X2-A

pin	name	type	description	
1	DRIVE OK		Output for the contact without voltage of the internal relay of block. The contact is normally closed under correct operation of the converter and is opened at the intervention of the protections. (max. 24V, 100 mA)	
2	DRIVE OK		Output for the contact without voltage of the internal relay of block. The contact is normally closed under correct operation of the converter and is opened at the intervention of the protections. (max. 24V, 100 mA)	
3	OUT_1	OUT	Programmable digital output (see example for digital output connections at chapter 4.1) <i>N.B.: Max output current 100mA</i>	
4	0_OUT_1	OUT	Common for the digital output 1	
5	OUT_2	OUT	Programmable digital output (see example for digital output connections at chapter 4.1) <i>N.B.: Max output current 100mA</i>	
6	0_OUT_2	OUT	Common for the digital output 2	
7	+13V	OUT	Voltage for enabling	
8	V.ENABLE	IN	Input for enabling of the speed reference to the converter	
9	T.ENABLE	IN	Input for enabling of torque of the converter	
10	D_AUX1	IN	Programmable digital input (standard used as reference inversion)	
11	D_AUX2	IN	Programmable digital input (standard used as digital reference selection)	

CONNECTOR X2-B

pin	name	type	description			
1	D_AUX3INProgrammable digital input (standard as digital reference selection)					
2	D_AUX4	IN Programmable digital input (standard as digital reference selection)				
3	D_AUX5 IN Programmable digital input (stan as digital reference selection)		Programmable digital input (standard used as digital reference selection)			
4	0_EN	IN	Common for the digital inputs to the terminals 7,8,9,10,11 (X2-A) and 1,2,3 (X2-B)			

pin	name	type	description
1	СН Z -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL Z -".
2	CH Z +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL Z +".
3	CH A -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL A -".
4	CH A +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL A +".
5	CH B -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL B -".
6	CH B +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL B +".

3.4 Connector X3: output simulator encoder.

3.5 Connector X4: serial RS 485: (option)

pin	name	type	description
1	GND		
2	N.C.		
3	RS 485 – (B)	IN/OUT	
4	N.C.		
5	СОМ		
6	N.C.		
7	N.C.		
8	RS 485 + (A)	IN/OUT	
9	+5V		

3.6 Connector X4: serial RS 232: (standard)

pin	name	type	description	
1	N.C.			
2	ТХ	OUT	Connect to the pin 2 of the serial of the P.C.	
3	RX	IN	Connect to the pin 3 of the serial of the P.C.	
4	N.C.			
5	GND		Connect to the pin 5 of the serial of the P.C.	
6	N.C.			
7	N.C.			
8	N.C.			
9	N.C.			



pin	name	type	description	
1	+RIF	OUT	Terminal of connection to the winding EXC of the	
			RESOLVER	
2	-RIF	OUT	Terminal of connection to the winding EXC of the	
			RESOLVER	
3	-SIN	IN	Terminal of connection to the winding SIN of the	
			RESOLVER	
4	+SIN	IN	Terminal of connection to the winding SIN of the	
			RESOLVER	
5	-COS	IN	Terminal of connection to the winding COS of the	
			RESOLVER	
6	+COS	IN	Terminal of connection to the winding COS of the	
			RESOLVER	
7	PTC/NTC	IN	Motor thermal probe connection terminal	
8	PTC/NTC	IN	Motor thermal probe connection terminal	
9	GND		0V common of the circuits of adjustment	

3.7 Connector X5: resolver and thermal probe connections

N.B. <u>The resolver connection must be performed using a shielded cable with three</u> pairs of individually shielded conductors. The shield must be welded to the metal casing of the DB9 connector.

3.8 Connector X6: input for master encoder

pin	name	type	description	
1	CH A +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL A +".	
2	СН А -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL A -".	
3	СН В -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL B -".	
4	СН В +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL B +".	
5	CHZ+	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL Z +".	
6	СН Z -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL Z -".	
7	N.C.			
8	+5 V		+5V for encoder LINE DRIVER.	
9	0 V		0V for encoder LINE DRIVER.	



Pin	NOME	TIPO	DESCRIZIONE			
1	GND	IN	Terminal for the power shield connections			
2	U1	IN	Terminal for the connection of one power supply phase			
3	V1	IN	Terminal for the connection of one power supply phase			
4	W1	IN	Terminal for the connection of one power supply phase			
5	+AT	OUT	Internal bus positive terminal			
6	RIN	IN	Terminal for internal regen resistor.			
U			or use internal brake resistor cable pin 7 (RR) with pin 6 (RIN)			
RR OUT Terminal for external regen resistor		Terminal for external regen resistor				
/			Connected the external brake resistor from pin 7 (RR) and pin 5 (+AT)			
8	-AT	OUT	Internal bus negative terminal			

3.9 Top Size Connector P IN: power connections.

WARNING: <u>The accidental connection of is made of feeding on clips 1-5-6-7-8 can</u> <u>provoke damages to the section of power of the system</u>

3.9.1 Bottom Size Connector P OUT: motor cable.

Pin	NOME	TIPO	DESCRIZIONE
1	U2	OUT	Terminal for the connection of the motor's U phase
2	V2	OUT	Terminal for the connection of the motor's V phase
3	W2	OUT	Terminal for the connection of the motor's W phase

WARNING: <u>The accidental connection of is made of feeding on clips 1-2-3 can</u> <u>provoke damages to the section of power of the system</u>

3.9.2 Connector X8: auxiliary power supply +24Vcc:

pin	name	type	description
1	+24V	IN	Auxiliary power supply
2	0 V		0V for the auxiliary power supply



4 EXAMPLE OF CONNECTIONS

4.1 Digital output connections



NB: The digital output can be used in Pnp or Npn configuration.

At parameters 3 and 4 you can configure the OUT_1 D and OUT_2 D outputs by entering the value from the table below based on your needs

VALUE	OUT1D / OUT2D	
1	Shaft direction	
2	Cumulative alarm	
3	I2t drive	
4	I2 motor	
5	Drive disabled Resolver alarm Maximum speed reached *	
6		
7		
8	Minimum speed reached *	
9	Torque reached *	
10	Brake release	

* In the case of values 7,8 and 9 it is necessary to report the desired current or rpm value to the following parameters for the output to activate

- Maximum torque reached: enter the value as a percentage of the desired current (I max 200%) in parameter 122

- Minimum speed reached: enter the desired engine rpm in the parameter 123

- Maximum speed reached: enter the desired engine rpm in the parameter 124



4.2 Connector X1 e X2: connections with reference by potentiometer







4.3 Connector X1 e X2: connection with reference by CNC



4.4 Connector X4: serial RS 485.







4.5 Connector X5: resolver and motor thermal probe NTC\PTC.

For the NTC/PTC connections see the table of connector X5

4.6 Connector X7: power connections.



The drive must be connected to earth through the screw present implantation on the facade.



5 SEQUENCES OF IGNITION AND EXTINCTION

The brought back temporal diagrams under illustrate the corrected sequences to respect during are made of ignition, qualification and extinction of the drive.



6 CONNECTION WITH MOTOR CABLE

6.1 Cables motor with length > 10 m

As reported in paragraph 1.5, particular attention must be paid to the type of motor cable used: if this has too high a parasitic capacitance, the alarm shown on the display with the letter "F" may trip.

To solve this problem, simply install the appropriate box containing three inductors.



In case of particular need, if the cables are not long, it is possible to obtain a good decoupling between the drive and the parasitic capacitances of the cable/motor system with three toroids mounted as per the drawing





6.2 Cables motor with length < 10 m

If the length of the cable is less than 10 meters, a single toroid may be sufficient on which to wind all three phases of the motor, keeping it as close as possible to the drive:





7 SETUP SOFTWARE OF DRIVE

The BSD450BN drive can be configured using the appropriate ESDRIVE software interface compatible with Windows versions.

The software can be downloaded directly from https://www.es-technology.com/download or use the CD supplied with the drive, select the "setup.exe" file and follow the instructions.

SIMBOLO DESCRIPTION F CARICA PARAMETRI Allows you to load a previously stored parameter file SALVA PARAMETRI Allows you to save a parameter file in a specific folder RICERCA IDENTIFICATORE Allows you to identify the drive identification number V 12 STATI Opens the Stati page 2 ALLARMI Opens the Allarms page **COMANDI** Opens the Comandi page **MEMORIZZA PARAMETRI** Allows you to store the parameters inside the EEprom **HOME** Interface presentation page **PARAMETRI PRECEDENTI** Allows you to scroll through the 4 pages of 128 << parameters PARAMETRI SUCCESSIVI Allows you to scroll through the 4 pages of 128 >> parameters Ident.: 20 **IDENT.** Number assigned to the drive OFF LINE **COMMUNICATION STATUS** No communication between drive and PC ON LINE **COMMUNICATION STATUS** Communication between drive and PC ENTER Confirms sending of the selected bit on the States page

MEANING OF THE MAIN ESDRIVE INTERFACE SYMBOLS



7.1 Getting started

After to have installed the software:

- Connect the serial cable (male/female not inverting to 9 pin) between com of the PC and the serial port of the drive.
- Switch on the drive with the 24 V dc
- Open the ES DRIVE software via the shortcut icon on the desktop. Select the BSD450BN product under "Drives", then select the "Serial parameters" from "Impostazioni" and verify the correct selection of the serial port (com =? Baud rate = 9600, stop bit = 1, data bit = 8, parity = none). Always under "Impostazioni" and Selezione protocollo" choice the Modbus RTU



To select a com various from that one set up it is necessary:

- Select with the appropriate arrows the wished door
- Click on the field to make it to return gray (you see figure)
- Click on "ok"
- If the communication is active, the "ON / OFFLINE" window on the top right must be green and with the writing inside "ONLINE". If this window is red and "OFFLINE" it means that communication is not active.



• The number shown at the top right is the identifier of the converter with which the data are exchanged. If this number is not the same as the converter identifier, connected to the PC, no response will be obtained. To communicate with a converter identified by a different number and you know what it is, just write this number in place of the current one and press the Enter key. While if you do not know the converter number, click on the button with on the toolbar and it will start the automatic search. If you want to assign a new identifier to the drive connected to the PC, you must insert the desired number in line "38" on the page "PARAMETERS 2" and then, as described above, report the same number on the window at the top right and press "enter".

7.2 Modifying a parameter

The PARAMETER SCROLL keys display the 4 pages with the 128 parameters.

To modify a decimal/hexadecimal parameter, simply select it with the mouse, delete the present value (the field becomes yellow), write the desired value and then press "enter" on the keyboard (the field returns to white).

To modify a parameter displayed as a sequence of bits (parameters 39 and 40) you need to go to the states page and click with the left mouse button on the column of bits you want to change and then press the **ENTER** key under the column in examination.

The parameters are normally displayed in decimal form, if you want to see them in hexadecimal format simply double click on the parameter description field.

7.3 Saving and loading one configuration

For saving or loading configurations you apply the auxiliary power supply 24Vdc

Save one configuration on EEPROM:

- Remove the enable through the pin T_ENABLE
- On the "Stati" page, set the Store EEprom bit to 1.
- Press ENTER key and wait for the bit to return to 0.

Save one configuration on file:

- 1. Select the button from the command bar.
- 2. Give a name with a maximum of 8 characters and select "salva"

Load one configuration from file:

- 1. Select the CARICA PARAMETRI key from the command bar
- 2. Select the desired file wished and press "apri" or simply double click with the left mouse key on the selected file.
- 3. Answer the request to send parameters "si"



7.4 Description of the parameters

		-	
Parameter	Description	U.M.	Range
P1	Firmware version	N	0 ÷ FFFF
	View the firmware version in the drive		
Parameter	Description	U.M.	Range
P3	OUT1 digital output configuration	N	0 ÷ 10
	Selection of the type of signal shown in the table in chapter 4.1		
Devenator	Description	11.84	Dense
Parameter	Description	U.IVI.	Range
P4	Selection of the type of signal shown in the table in chapter 4.1	IN	0 ÷ 10
	Selection of the type of signal shown in the table in chapter 4.1		
Parameter	Description	IIM	Rango
P5	Selection of simulator encoder imp. /rev. number	N	$0 \div 16384$
10	Determines the numbers of pulses/revolution of the encoder sin	nulator See	chapters 2.4
	and 3.4		
Parameter	Description	U.M.	Range
P7	Level I2t	Ν	0 ÷ 50
	View the filter level that calculates I2t protection		
Parameter	Description	U.M.	Range
P8	Temperature	N	0 ÷ 50
	View the temperature of the power module		
-			5
Parameter	Description	U.M.	Range
P9	Memo alarms	N	0 ÷ 50
	view the alarm history since the drive was powered on		
Parameter	Description	IIM	Rango
P15	KP speed regulator proportional gain	N	0 ± 255
1 10	Determines the speed regulator proportional gain: the higher th	is value is 1	he higher
	system's speed loop bandwidth will be.		
Parameter	Description	U.M.	Range
P16	KI speed regulator integral gain	N	0 ÷ 255
	Increasing this value increases the speed regulator's integral co	omponent.	
-	— • · · ·		_
Parameter	Description	U.M.	Range
P17	It time constant of the low pass filter's speed regulator	N	0 ÷ 5
	I have a substantial internal in the signal coming from the internal intern	speed regu	lator and can
	be used whenever smoother motor rotation is required.		
Daramatar	Description		Dango
	Pated current of the motor in percent	0.IVI.	
F 10	Aleu current of the motor's rated current according to the converters rates	70	U ÷ IUU
	Toels the motor's rated current according to the converters fated	i cuirent (e.	y. motor rated

We show below a brief description of the main parameters managed by the drive.

Parameter	Description	U.M.	Range
P19	Motor I2t alarm intervention time	SEC	0 ÷ 32767
	Determines the time in seconds beyond which the current limita protect the motor	tion comes	into action to

current 5A, drive rated current 10A, set 50%)



Parameter	Description	U.M.	Range
P20	Torque limitation input offset	N	0 ÷ 32767
	It can compensate for any offset values present at the analog in (5-6 of connector X1)	put for torq	ue limitation

Parameter	Description	U.M.	Range
P21	I2t drive alarm intervention time	0,1SEC	0 ÷ 32767
	Determines the time in tenths of a second beyond which the cur action to protect the drive	rrent limitati	on comes into

Parameter	Description	U.M.	Range
P24	Kpi proportional gain for current loop regulators	Ν	0 ÷ 50
	Sets the gain of the converter's current loops		

Parameter	Description	U.M.	Range
P25	Ti time constant for the current loop regulators	N	0 ÷ 50
	Sets the time constant for the converter's current loops		

Parameter	Description	U.M.	Range
P29	Electrical angle for engine timing	Ν	0 ÷ +/-32767
	Value reported after the engine timing operation. The standard	value for 2	pole pairs is
	20400, 101 3 pole pairs it is 10100, 101 4 pole pairs it is 13500		

Parameter	Description	U.M.	Range
P33	Motor polar torque number	Ν	0 ÷ 8
	Sets the motor polar torque number. (e.g. 6-pole motor = 3 pola	ar torque)	

Parameter	Description	U.M.	Range
P34	Resolver polar torque number	Ν	0 ÷ 8
	Sets the number of resolver polar torque number, which in most	cases is e	qual to 1.

Parameter	Description	U.M.	Range
P37	Speed offset fine setting	Ν	0 ÷ ±32535
	This parameter can be modified after first performing the autom correction procedure. If, after performing this procedure, the movalue keeps turning, modify the value pre-set for this parameter offset.	atic speed otor will at 0 to cancel t	offset reference he speed

Parameter	Description	U.M.	Range
P38	Identification number	Ν	0 ÷ 32
	Select the drive identification number. The standard value is 20		

Parameter	Description	U.M.	Range
P43	Maximum engine rpm	RPM	0 ÷ 20000
	Sets the maximum motor speed when 9V is applied to the analogue input.		

Parameter	Description	U.M.	Range
P44	Maximum converter current in percent	%	0 ÷ 200
	Determines the maximum current that can be supplied by the co its rated current. (If the drive has a nominal current of 10A by setting 200% you have	nverter in p ave a peak	ercentage of current of 20A)

Parameter	Description	U.M.	Range
P45	Acceleration ramp in counterclockwise direction	SEC	0.01 ÷ 30
	Determines the acceleration ramp time in counterclockwise rotation		



Parameter	Description	U.M.	Range
P46	Deceleration ramp in clockwise direction	SEC	0.01 ÷ 30
	Determines the deceleration ramp time in clockwise rotation		

Parameter	Description	U.M.	Range
P47	Acceleration ramp in counterclockwise direction	SEC	0.01 ÷ 30
	Determines the acceleration ramp time in counterclockwise rota	tion	

Parameter	Description	U.M.	Range
P48	Deceleration ramp in counterclockwise direction	SEC	0.01 ÷ 30
	Determines the deceleration ramp time in counterclockwise rotation.		

Parameter	Description	U.M.	Range
P49	Digital speed reference	%	0 ÷ 100
	This parameter can be use in speed and current loop setting, it is combined with parameter P50 and bit "Onda quadra" in the "stato" column. Allow motor rotation when disable analog speed ref. reading. It is expressed in percent of max. speed P43		d with tation when P43

Parameter	Description	U.M.	Range
P50	Period of the speed digital reference square wave.	ms	0.01 ÷ 30
	Determines the period of square wave setting by bit "Onda quad	dra" in the "	stato" column

Parameter	Description	U.M.	Range
P122	Value in % of the current to activate OUT1/2D output	%	0 ÷ 200
	See paragraph 4.1		

Parameter	Description	U.M.	Range
P123	Minimum engine rpm to activate OUT1/2D output	RPM	0 ÷ 10000
	See paragraph 4.1		

Parameter	Description	U.M.	Range
P124	Maximum engine rpm to activate OUT1/2D output	RPM	0 ÷ 10000
	See paragraph 4.1		

Parameter	Description	U.M.	Range
P125	Offset OUT 1A	Ν	0 ÷ +/-200
	Offset compensation of the selected signal		

Parameter	Description	U.M.	Range
P126	Gain OUT 1A	Ν	-25 ÷ -200
	Determines the full scale of the selected signal		

Parameter	Description	U.M.	Range
P127	Offset OUT 2°	Ν	0 ÷ +/- 200
	Offset compensation of the selected signal		

Parameter	Description	U.M.	Range
P128	Gain OUT 2A	Ν	-50 ÷ -200
	Determines the full scale of the selected signal		





7.5 "Stati" page

The BSD450BN drive has several operating modes and some automatic calibration functions. To access these properties, select the "Stati" page. The various commands are given by modifying the single bits by clicking on the mouse. The changes made are reversible as with each click of the mouse the selected bit is inverted.



Once the desired bit configuration has been selected, it must be sent to the drive using the **ENTER** key.



7.6 Meanings of "CONFIGURATION" bits

Posizionatore	By setting this bit to 1, operation as a positioner is enabled.
Read Off_set	By setting this bit to 1, the automatic offset correction procedure is begun as described in the speed loop setting procedure (run with reference signal at zero).
N.A.	Not available
Asse elettrico	By setting this bit to 1, operation as an electric axis is enabled (option).
Rif. coppia	By setting this bit to 1, operation with torque reference is enabled. In this operational mode, the speed loop is not active and the motor is controlled trough reference to the torque applied between terminals 2 and 3 of X1.
Vel *rif Cop	By setting this bit to 1, the motor works with speed control but the maximum torque delivered is controlled through the torque reference applied between terminals 5 and 6 of X1.
STM Ptc/Ntc	This informs the drive whether the motor's thermal probe is normally closed or normally open.
Fasatura	By setting this bit to 1, the automatic procedure for the phasing of the motor is begun as described in the installation procedure.
Read EEProm	By setting this bit to 1, the drive is ordered to load the parameters from the EEProm. This operation must be performed with the drive disabled and the operator must wait until the bit returns to 0 prior to re-enabling the drive or sending other commands.
Store EEProm	By setting this bit to 1, the drive is ordered to save the parameters on the EEProm. This operation must be performed with the drive disabled and the operator must wait until the bit returns to 0 prior to re-enabling the drive or sending other commands.

Read Default	By setting this bit to 1, the drive is ordered to load the EEProm default values. This operation must be performed with the drive disabled and the operator must wait until the bit returns to 0 prior to re-enabling the drive or sending other commands. The default parameters are generic and might not be suited to the motor being used. The default parameters are used only whenever the parameters for the motor used are lost and only to conduct the tests necessary to establish which parameters are correct.
Swap FC	Reverses the direction of the FC1 and FC2 limit switches
FC1 CW	By setting this bit to 1, management with limit-switch 1 is enabled. This limit-switch can be considered to have been reached when its contact is opened while the motor is running clockwise.
FC1 CCW	By setting this bit to 1, management with limit-switch 1 is enabled. This limit-switch can be considered to have been reached when its contact is opened while the motor is running counter-clockwise.
FC2 CW	By setting this bit to 1, management with limit-switch 2 is enabled. This limit-switch can be considered to have been reached when its contact is opened while the motor is running clockwise.
FC2 CCW	By setting this bit to 1, management with limit-switch 2 is enabled. This limit-switch can be considered to have been reached when its contact is opened while the motor is running counter-clockwise.



7.7 Meanings of "STATO" bits

Sel_profili	Not available
Abili_invers	By setting this bit to 1 you can reverse the direction of rotation of the motor with digital input D AUX1 (if not used as a limit switch)
Rampe on/off	By setting the bit to 1 it is possible to select/deselect the ramps using the digital input D AUX2
Config.	By setting the bit to 1 it is possible to change the drive configuration using some digital inputs (contact assistance for any use)
Verso	By setting this bit to 1, the motor's rotation direction is inverted at the same speed reference.
N.A.	Not available
T_Enable	Torque enable sw
V_Enable	Speed enable sw (external reference)
N.A.	Not available
N.A.	Not available
Onda quad.	Enables the square wave function used in combination with the digital reference with the time determined by the value in parameter 50
Monitor 1	Selection of output OUT_1 (chapter 3.2.1)
Monitor 2	Selection of output OUT_2 (chapter 3.2.1)

7.8 Alarms

The drive manages a series of alarms that allow to safeguard the system in case of anomalies. It codifies of the display is brought back to paragraph 2.1. In this page they come it visualizes (circles to you red greens or) and memorizza you (squares red greens or), the states of alarm of the converter.





7.8.1 Description of the alarms

Power fault F Over voltage	Indicates the general alarm status caused by the triggering of the power section protection. In this case, we also recommend checking the respective motor and connections for any short-circuits or interruptions in insulation. An alarm of this type can also be caused by an erroneous setting of the current loop.
9	increase in BUS voltage of over 410V. This alarm can also be triggered if the power supply network rises suddenly in voltage.
Under voltage 5	Indicates the BUS under voltage alarm and can appear when the power supply is not present. Check the conditions of the safety fuses on the power phases.
I ² T driver	Indicates that the driver's temperature threshold has been exceeded. This alarm is triggered whenever the converter supplies a current that is higher than the rated value for a prolonged period.
I ² T motor	Indicates that the motor current threshold has been exceeded. This alarm is triggered whenever the motor absorbs a current that is higher than the rated value for a prolonged period of time. This alarm can also be triggered by the simultaneous occurrence of other conditions that lead to the disabling of the converter. When the alarm is triggered, the converter reduces the maximum current delivered to the motor's rated value. If this alarm is triggered frequently, make sure that the load on the motor is not too high. The intervention threshold of this protection can be adjusted by the setting of the Inom Motor (P18) and Tau I ² T (P19) parameters.
Resolver 8	Resolver interruption alarm. Make sure that all resolver connections are complete and correct.
Thermal probe	Motor overheating alarm. The converter is momentarily disabled for as long as the fault exists and resets automatically as soon as normal operating conditions are restored. In case of unjustified alarms, make sure that the STM Ptc/Ntc Flag in the Configuration column on Page 2 of the software interface supplied with the driver has been set correctly.
NTC modulo	Power module overheating alarm: check the ventilation and internal temperature of the electrical cabinet.

Fine corsa 1	This alarm indicates the triggering of Limit-switch 1. This alarm is triggered when the Limit-switch 1 contact opens. The motor is stopped and therefore the converter is disabled. To restore normal operating conditions, the converter must be disabled and then re-enabled after first inverting the speed reference.
Fine corsa 2	This alarm indicates the triggering of Limit-switch 2. This alarm is triggered when the Limit-switch 2 contact opens. The motor is stopped and therefore the converter is disabled. To restore normal operating conditions, the converter must be disabled and then re-enabled after first inverting the speed reference.
Tracking error	This alarm indicates that the maximum positioning error permitted for operation as an electric axis or as a positioner has been exceeded.
Mancanza fase	Alarm active when one or more phases on the three-phase power supply are missing



7.9 "Comandi" page

The "Comandi" page of the user interface allows you to perform some operations usually used to verify the correct functioning of the drive combined with the motor. Via software it is thus possible to give torque to the motor (T_ Enable) and with a digital reference (in percentage) make the motor turn. By turning the square wave switch ON you can invert the digital reference by setting the time in the window alongside. By enabling V_ Enable you can use an external reference. By clicking on the start button, you obtain the calibration of the speed offset (shown in parameter 37)





8 DIGITAL INPUTS

To enable operation with digital reference, simply activate the "T_enable" hw input (pin 9 of X2-A) or set the corresponding bit on the "STATI" column and deactivate the "V_enable" input (pin 8 of TO).

In this mode the drive reads the digital reference in % reported to parameter 49 selected between parameters 51 and 66

The selection is made via the digital inputs D_aux2, D_aux3, D_aux4, D_aux5 according to the coding shown below (0=not active; 1=active).

The D_aux1 input allows you to invert the sign of the selected digital reference.

The user can enter a delay (in milliseconds) in parameter 67 "Selection Filter" useful for masking any bounces on the contacts of a mechanical selector.

The user can see at parameter 68 the reference selected at that moment.

All references are expressed as a percentage of the maximum speed set in parameter 43.

Please remember that it is possible to set active ramps (parameters P45, P46, P47 and P48) with both an analogue and digital reference.

It is recommended to check that the "Onda quad." bit in the "STATI" column is set to zero.

1 1 1 1 V 1	4	21-	- 60	anotz	10	ONL	The separations discovered visualizes	1 101	
		Pana	metri 2						remetri 3
The Motors	78.	P 1		an manute		*		-	
In the feature	1	*		Per, Seators	-	100	AL AUC IN	- 01	Inter Canada (Anadoli Dynamic 1) in results for the
10 Math Rates		1		10.045.0		1		-	
Inca. d Ben	74	Nut		No. out, 1	98			_	
11 Ethert, ret.				10.000.0	10	*		-	
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A Partyle dec.	189			10,000,00		5			MA B
MILT				-			Anna 1 March		



Below is a table with the combination of digital inputs for selecting the parameters dedicated to the settable speeds.

d_aux5	d_aux4	d_aux3	d_aux2	Selected reference	Parameter	
0	0	0	0	Rif_digit_0	P51	
0	0	0	1	Rif_digit_1	P52	
0	0	1	0	Rif_digit_2	P53	
0	0	1	1	Rif_digit_3	P54	
0	1	0	0	Rif_digit_4	P55	
0	1	0	1	Rif_digit_5	P56	
0	1	1	0	Rif_digit_6	P57	
0	1	1	1	Rif_digit_7	P58	
1	0	0	0	Rif_digit_8	P59	
1	0	0	1	Rif_digit_9	P60	
1	0	1	0	Rif_digit_10	P61	
1	0	1	1	Rif_digit_11	P62	
1	1	0	0	Rif_digit_12	P63	
1	1	0	1	Rif_digit_13	P64	
1	1	1	0	Rif_digit_14	P65	
1	1	1	1	Rif_digit_15	P66	

9 INSTALLATION AND SETTING PROCEDURE

This chapter provides the installation and setting procedures that must be performed before using the drive.

9.1 Electric connections

- Connect the motor cable, the resolver cable and the power cable.
- Prepare the enabling and control connections.
- Connect a personal computer that has been loaded with the drive's program using an RS232 serial interface cable.
- At this point you are ready to supply the converter with 24V auxiliary power: if all the connections are correct the display will turn on and show the number 5.Communication towards the computer will be enabled and the main parameters will be displayed (**note**: it is not necessary to connect the personal computer to work with a drive, provided that the motor to be used has already been set).
- If you supply three-phase power the display will show the number 1 (no alarm).

IMPORTANT: Starting MUST <u>always</u> be performed with the drive DISABLED. The drive does not work if it is switched on with the enable already active

9.2 Automatic motor timing (to be performed with the motor released from mechanical load)

This procedure, to be carried out with the motor freed from the mechanical load, allows the drive to automatically calculate the resolver position:

N.B. This operation is not necessary if the timing has already been performed by the Company for the requested motor.

- Go to the "Stati" page.
- Set the "Fasatura" bit to 1 (eighth bit of the "CONFIGURAZIONE" word).
- Click on the ENTER key under the column.
- Enable the converter with the T_ENABLE input.
- The motor should rotate slowly until it stops. Wait until the "Fasatura" bit has returned to zero.
- Remove the enable.
- The drive should now have loaded the new electrical angle to parameter 29.
- Save the new angle value in EEprom.

9.3 Phase sequence check

After the motor has been timed, the motor phases must be checked to make sure that they have been connected correctly by proceeding as follows:

- Reduce the maximum current that can be delivered by the drive to 10% (Parameter 44).
- Provide enabling on Pins 8 and 9 of connector X1 and provide a low speed reference.



• Make sure that the rotor rotates. If the rotor is blocked, check the number of motor poles and the phase sequence. If the parameters are correct, it is necessary to invert 2 phases of the motor and repeat the timing procedure.

• If the drive can rotate the motor, restore the maximum current to the desired value.

9.4 Setting options

To set up the current loop and the speed loop must be used "Onda quadra" option together with analog output 1 (out_1) and 2 (out_2).

For using the function "Onda quadra" it is necessary to set a reference value of parameter P51 (digital speed reference) and P50 (period of the Onda quadra).

N.B. In this working mode enable "torque reference" (connector X1, input 18).

MONITOR 1	OUT_1 A	MONITOR 2	OUT_2 A
0	lq Continuous current signal	0	I phase Phase current signal
1	θ Electric angle position	1	ω Speed signal

N.B. The MONITOR 1 and MONITOR 2 fields are located on the user interface on the "Stati" page and in the "STATO" column. Once the desired bit configuration has been selected, it must be sent to the converter using the ENTER key.

The offset and full scale of each signal can be calibrated at parameters 125-126-127-128. Below is a table with indicative values for the **Iq** and ω outputs.

The offset and full scale of each signal can be calibrated at parameters 125-126-127-128. Below is a table with indicative values for the Iq and ω outputs.

Parameter value 128	ω Speed signal	Parameter value 126	lq Current signal	
200	2)/	100	2) (
-200	2V	-100	2V	
-160	2,5V	-80	2,5V	
-80	5V	-40	5V	
-50	8V	-25	8V	

9.5 Current loop setting

The current loops gain can be modified by proceeding as follows:

- Disable the drive.
- Modify PARAMETER 24 "KP corrente" (typical value: from 6 to 12).
- Enable the drive, perform a few rapid motor accelerations and decelerations (otherwise use option "Onda quadra") and monitor the current by using the appropriate analogue output on connector X1.
- Disable the drive and save the parameters on EEProm.

IMPORTANT: the setting of excessive values for PARAMETER 24 "KP corrente" can lead to excessive motor noise or fault alarms from the power module.



9.6 Speed offset setting.

- Enable drive torque and speed (Pin 8 and 9 terminal board X2).
- Provide a zero-speed analogue reference.
- Position the cursor on the "Stati" page of the communication software.
- Set to 1 bit "Read Off_set" (the second bit in the "CONFIGURAZIONE" word).
- Click on the **ENTER** key.
- Save the setting on EEProm.

This procedure permits the offset automatic compensation on the speed analogue reference. Under some circumstances, it might be necessary to adjust this datum manually by modifying PARAMETER 37 "Offset_vel.".

9.7 Maximum speed setting

- Change the value of parameter 43 "Vel_Max" to have the desired maximum speed with maximum reference.
- Please remember that as the speed full scale varies, the weight of parameters 15 and 16 varies: it is therefore necessary to modify them by the same percentage by which the maximum speed was modified.
- Save the setting on EEProm.

9.8 Speed loop gain setting

When the motor is connected to its mechanical load, the proportional and integral factors in the P.I. Speed regulator may require some adjustment by proceeding as follows:

- Disable the drive.
- Modify PARAMETER 15 "KP speed" (proportional gain).
- Modify PARAMETER 16 "KI speed" (integral gain).
- Set the "Square wave" bit to 1 on the "STATI" word and set the period and speed using Parameters 50 and 51. Enable the drive (Pin 9 on X2).
- Monitor system response using the analogue outputs OUT_1A and OUT_2A (response in speed and torque request).
- Save on EEProm if necessary.

IMPORTANT: Before switching the drive off, the parameters must be first saved on EEPROM, otherwise the setting procedure must be repeated.



All the information included in this USER'S MANUAL can be modified by ES-TECHNOLOGY S.R.L. without notice.

If you will find some mistakes inside the manual, please let us know to make changes in it

ES TECHNOLOGY S.R.L.

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