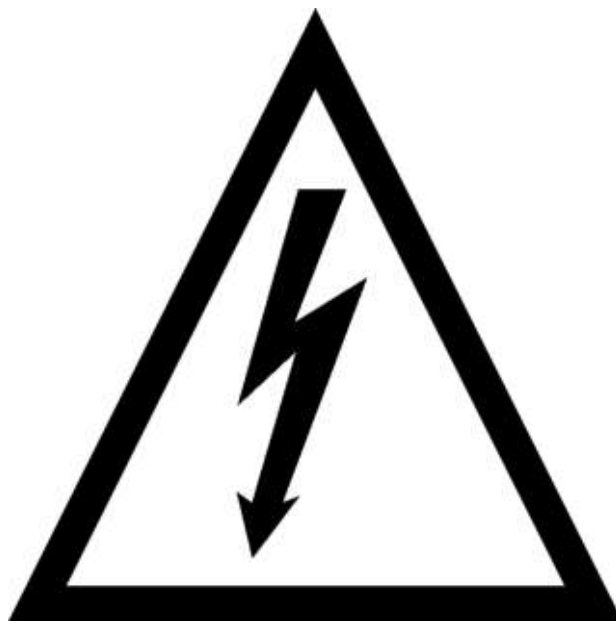




**TECHNICAL FEATURES AND  
INSTALLATION INSTRUCTIONS**

**BSD300BN**





## **ATTENTION!**

The drives series BSD300BN work under high voltage. Even after switching off the drive, the internal capacitive circuits remain power supplied for a short period of time. For this reason, it is absolutely necessary to await at least two minutes before operating inside the drive. Furthermore, the drive 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 drive is disabled.

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## 1. GENERAL FEATURES

The sinusoidal brushless drives with four frames series BSD300BN belong to the new generation of power servo amplifiers in ASIPM 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 and strictly "burnize" each drive to obtain maximum quality and reliability.

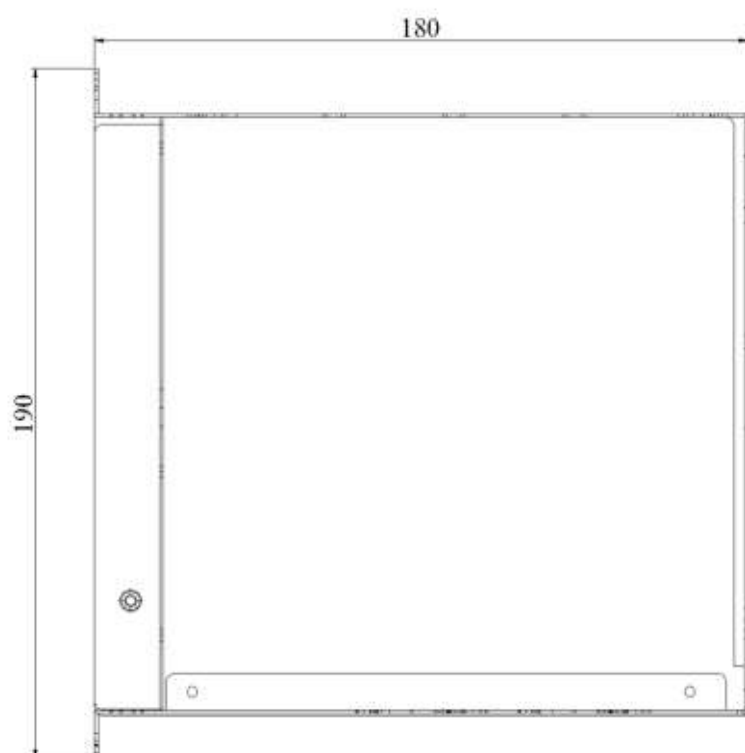
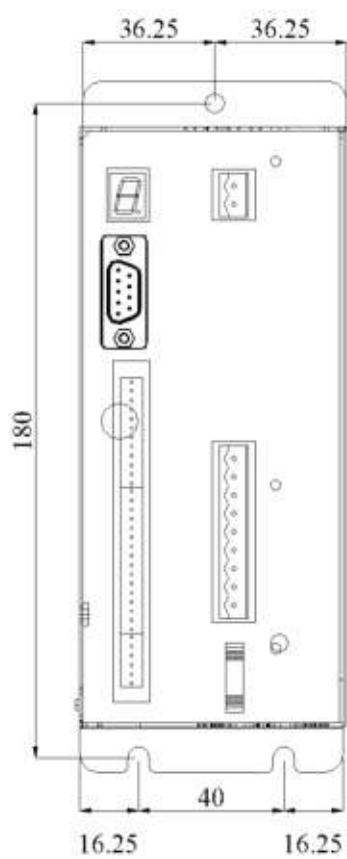
The drives series BSD300BN are forecast for the speed control of the synchronous sinusoidal motors in alternate current in those applications where, besides a high dynamical response, also an excellent precision and uniformity in positioning is required.

**The drives are perfectly compatible with the version of previous drives, BSD300BN, with the difference that communication no longer uses the "ES Technology" communication protocol but only Modbus RTU**

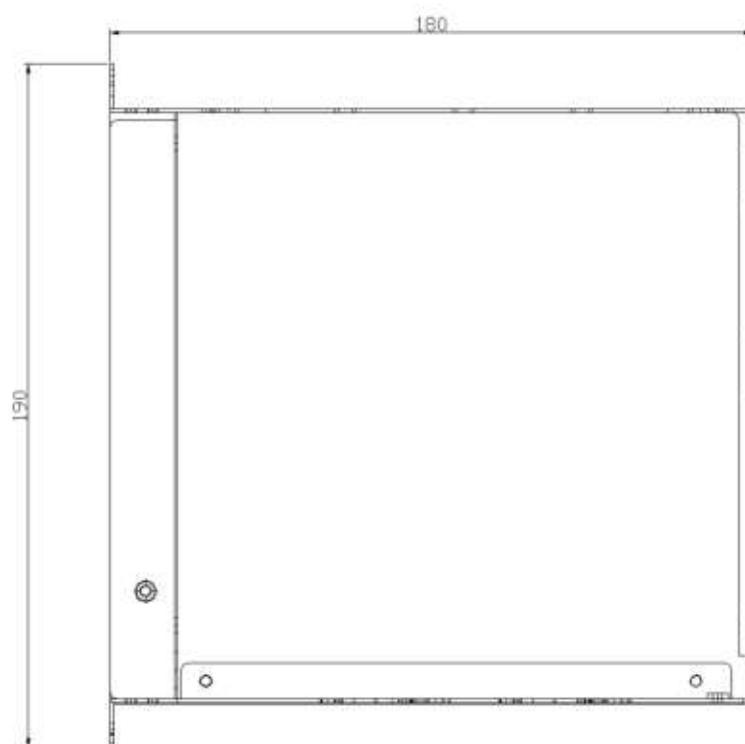
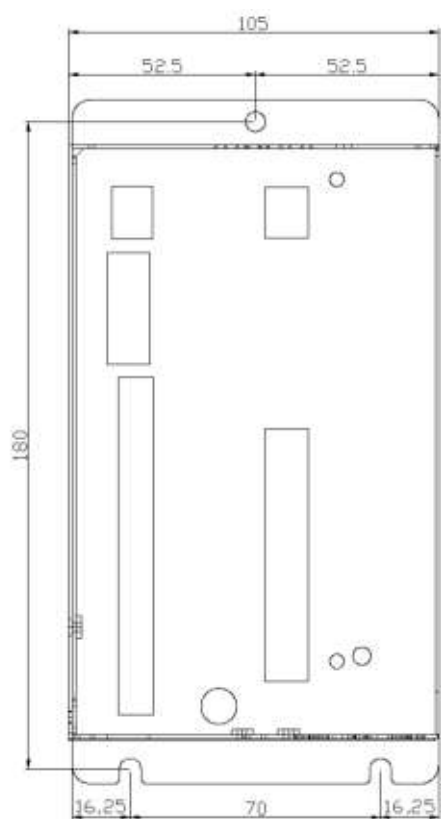
## 1.1 Overall dimensions

unit=[mm]

### BSD300BN (1,5 ÷ 10A)



**BSD300BN (17A)**



## 1.2 Technical characteristic

TYPE	POWER SUPPLY	RATED CURRENT RMS A 40 °C	MAXIMUM CUR- RENT FOR 1.5 sec.
BSD300BN / 1,5A	MOMOPHASE / TRI- PHASE 140 ÷ 230 VAC± 10% 50 - 60 Hz  AUXILIARY 24V <sub>cc</sub> (max 500mA) <b>OPTIONAL</b>	1,5A	3A
BSD300BN / 3A		3A	6A
BSD300BN / 5A		5A	10A
BSD300BN / 10A		7.5A	15A
BSD300BN / 10A		10A	20A
BSD300BN / 17A		17A	35A

## 1.3 General characteristics

- Bandwidth  $\leq 200$  Hz
- Switching Frequency PWM: 10 KHz
- Diagnostic via serial RS232, optional RS485 (9600 baud)
- Setup simulator encoder output
- Input of speed reference:  $\pm 9$  V (input impedance 10 K $\Omega$ )
- Input of torque reference:  $\pm 9$  V (input impedance 10 K $\Omega$ )



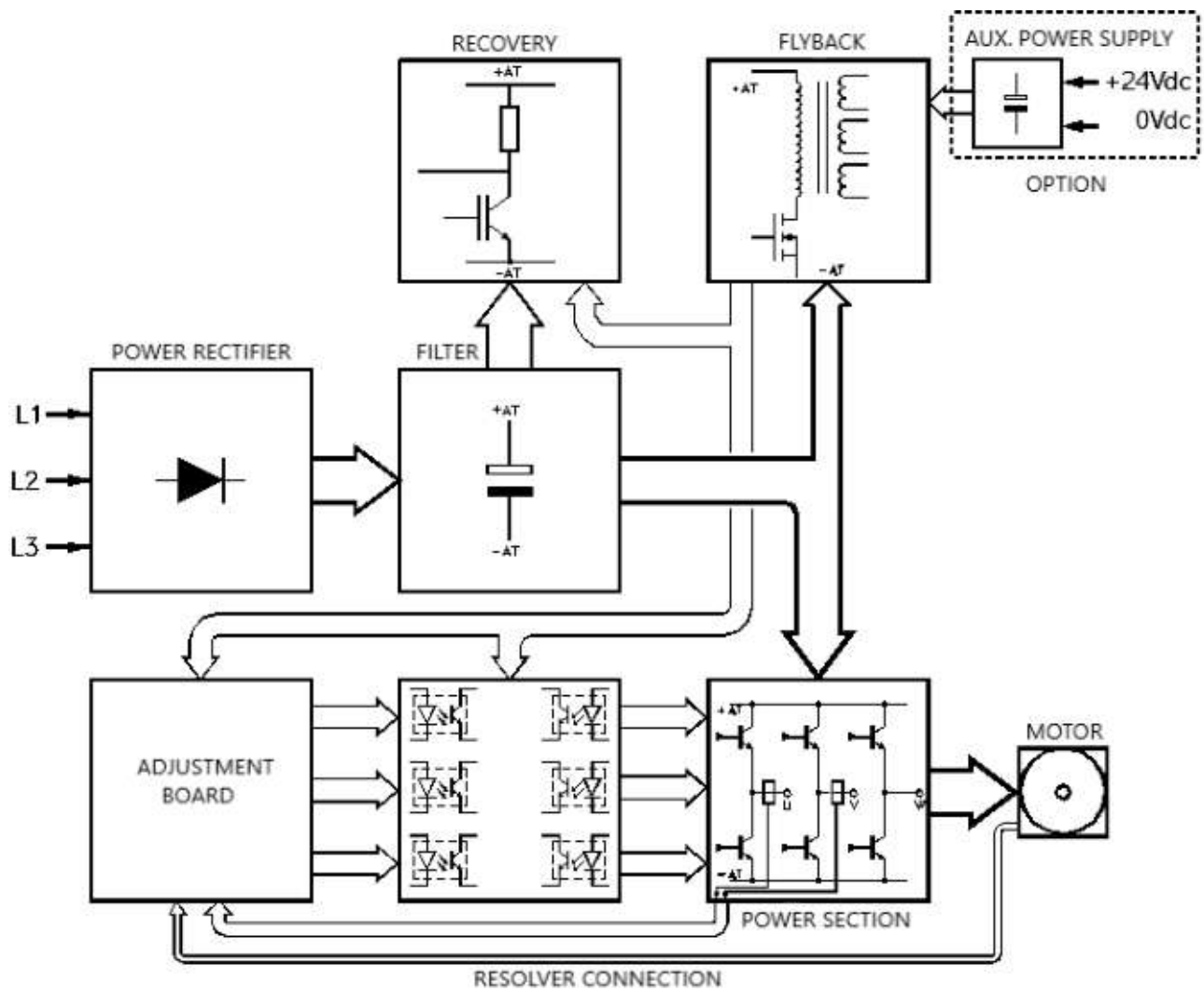
## 1.4 Internal protections:

- 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 the breakage of the resolver or of the connections: once reestablished the connection, the fault disappears and it is possible to enable again the drive

## 1.5 Way of use:

<i>Temperature:</i>	from 0 ÷ 40°C
<i>Humidity:</i>	90% maximum without condense
<i>Altitude:</i>	1000 m.
<i>Protection degree:</i>	IP 20 (Panel version)

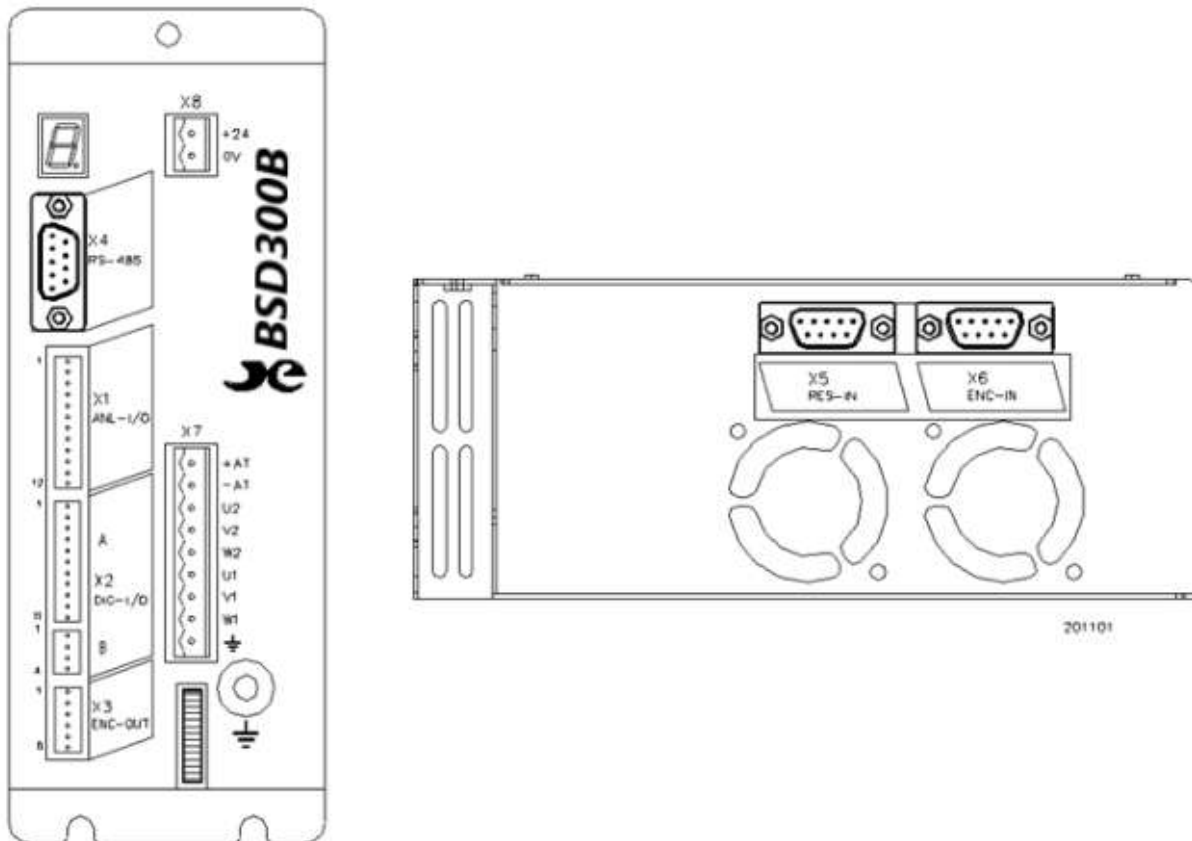
## 1.6 Functional diagram



## 2. CONNECTIONS

In front of drive there are 7 connectors and 1 display (see figure).

In bottom face there are 2 connectors (see figure)



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

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

**CONNETTORE X3:** Simulator encoder output.

**CONNETTORE X4:** Connection of serial interface RS 232, optional RS485.

**CONNETTORE X5:** Connection for resolver and NTC/PTC motor thermal probe

**CONNETTORE X6:** Input for master encoder.

**CONNETTORE X7:** Power connector.

**CONNETTORE X8:** Auxiliary power supply +24Vcc

**DISPLAY**

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

TERMINAL	NAME	TYPE	DESCRIPTION
1	+10V	OUT	Auxiliary voltage at +10V (max. 5mA)
2	-REF	IN	Referential input of analog reference +/- 9V (speed or torque)
3	+REF	IN	Referential 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	-10V	OUT	Auxiliary voltage at -10V (max. 5mA)
8	OUT_1 A	OUT	Programmable analog output, settings in the table below.
9	OUT_2 A	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

MONITOR 1	OUT_1 A	MONITOR 2	OUT_2 A
0	<b>I<sub>q</sub></b> Continuous current signal	0	<b>I phase</b> Phase current signal
1	<b>θ</b> Electric angle position	1	<b>ω</b> 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 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 **I<sub>q</sub>** and **ω** outputs

Value parameter 128	ω Speed signal	Value parameter 126	I <sub>q</sub> Current signal
-200	2V	-100	2V
-160	2,5V	-80	2,5V
-80	5V	-40	5V
-50	8V	-25	8V

## 2.2 CONNECTOR X2 A-B: Digital INPUT\OUTPUT available on extractable terminal board.

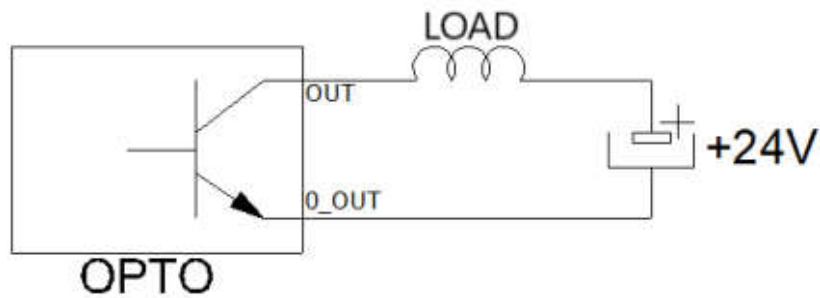
### CONNECTOR X2-A

TERMINAL	NAME	TYPE	DESCRIPTIONS
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 drive 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 drive and is opened at the intervention of the protections. (max. 24V, 100 mA)
3	OUT_1 D	OUT	Programmable digital output (see <b>Example for digital output connections</b> ) <b>N.B. Max output current 100mA</b>
4	0_OUT_1	OUT	Common for the digital output 1
5	OUT_2 D	OUT	Programmable digital output (see <b>Example for digital output connections</b> ) <b>N.B. Max output current 100mA</b>
6	0_OUT_2	OUT	Common for the digital output 2
7	+12V	OUT	+12V for enable and digital input
8	V.ENABLE	IN	Input for enabling of the speed reference to the drive
9	T.ENABLE	IN	Input for enabling of torque of the drive
10	D_AUX1	IN	Programmable digital Input ( <b>standard used as reference inversion</b> )
11	D_AUX2	IN	Programmable digital Input ( <b>standard used as digital reference selection</b> )

### CONNECTOR X2-B

TERMINAL	NAME	TYPE	DESCRIPTIONS
1	D_AUX3	IN	Programmable digital Input ( <b>standard used as digital reference selection</b> )
2	D_AUX4	IN	Programmable digital Input ( <b>standard used as digital reference selection</b> )
3	D_AUX5	IN	Programmable digital Input ( <b>standard used as digital reference selection</b> )
4	0_EN	IN	Common for the digital inputs to the terminals 8, 9, 10, 11 (X2-A) and 1, 2, 3 (X2-B)

## 2.2.1 EXAMPLE FOR DIGITAL OUTPUT CONNECTIONS



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

**DIGITAL OUTPUTS CONFIGURATION TABLE**

VALUE	OUT1D / OUT2D
1	Shaft direction
2	Cumulative alarm
3	I2t drive
4	I2 motor
5	Drive disabled
6	Resolver alarm
7	Maximum speed reached *
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

### 2.3 CONNECTOR X3: OUTPUT available on the extractable connector "ENCODER SIMULATOR".

TERMINAL	NAME	TYPE	DESCRIPTION
1	CH Z -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL TOP Z -". It is connected to the input of the numerical control or positioner
2	CH Z +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL TOP Z +". It is connected to the input of the numerical control or positioner
3	CH A -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL A -". It is connected to the input of the numerical control or positioner
4	CH A +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL A +". It is connected to the input encoder of the numerical control or positioner
5	CH B -	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL B -". It is connected to the input of the numerical control or positioner
6	CH B +	OUT	Terminal of connection "SIMULATOR ENCODER CHANNEL B +". It is connected to the input encoder of the numerical control or positioner

**Please note: The number of pulses/revolution available are 256, 1024, 4096 or 16384. It is therefore necessary to report the desired value to parameter 5. In the case of different values from the above, contact the ES-TECHNOLOGY assistance.**

### 2.4 CONNECTOR X4: RS 485 serial interface connection (option)

Connector J3 (DB9 female)

TERMINAL	NAME	TYPE	DESCRIPTION
1	GND		
2	N.C.		
3	RS 485 - (B)	IN/OUT	
4	N.C.		
5	COM		
6	N.C.		
7	N.C.		
8	RS 485 + (A)	IN/OUT	
9	+5V		

Baud rate 9600

## 2.5 CONNECTION X4: RS 232 serial interface connection (standard)

Connector X3 (DB9 J1 male)

TERMINAL	NAME	TYPE	DESCRIPTION
1	N.C.		
2	<b>TX</b>	<b>OUT</b>	Connect to the pin 2 of the serial of the P.C.
3	<b>RX</b>	<b>IN</b>	Connect to the pin 3 of the serial of the P.C.
4	N.C.		
5	<b>GND</b>		Connect to the pin 5 of the serial of the P.C.
6	N.C.		
7	N.C.		
8	N.C.		
9	N.C.		

Speed of transmission 9600 BAUD

## 2.6 CONNECTOR X5: Connection for resolver and NTC/PTC motor thermal probe

(DB9 J8 male)

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

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



## 2.7 CONNETTORE X6: input for master encoder.

(DB9 J7 male)

TERMINAL	NAME	TYPE	DESCRIPTION
1	CH A +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL A +". For the master drive or the encoder of the master motor
2	CH A -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL A -". For the master drive or the encoder of the master motor
3	CH B -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL B -". For the master drive or the encoder of the master motor
4	CH B +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL B +". For the master drive or the encoder of the master motor
5	CH Z +	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL Z +". For the master drive or the encoder of the master motor
6	CH Z -	IN	Terminal of connection "SIMULATOR ENCODER CHANNEL Z -". For the master drive or the encoder of the master motor
7	N.C.		
8	+5 V		+5V for encoder LINE DRIVER.
9	0 V		0V for encoder LINE DRIVER.

## 2.8 CONNECTOR X7: Power connector.

TERMINAL	NAME	TYPE	DESCRIPTION
1	+AT	OUT	Internal BUS DC positive terminal
2	-AT	OUT	Internal BUS DC negative terminal
3	U2	OUT	Terminal for the connection of the motor's U phase
4	V2	OUT	Terminal for the connection of the motor's V phase
5	W2	OUT	Terminal for the connection of the motor's W phase
6	U1	IN	Terminal for the connection of one 230V AC power supply phase.
7	V1	IN	Terminal for the connection of one 230V AC power supply phase
8	W1	IN	Terminal for the connection of one 230V AC power supply phase
9	GND		Terminal for the ground connection

## 2.9 CONNECTOR X8: Auxiliary power supply +24Vcc

TERMINAL	NAME	TYPE	DESCRIPTION
1	+24V	IN	Auxiliary power supply
2	0V		0V for auxiliary power supply

### 3. ALARM SIGNAL DISPLAY

The drive's front panel provides an alarm signal display.

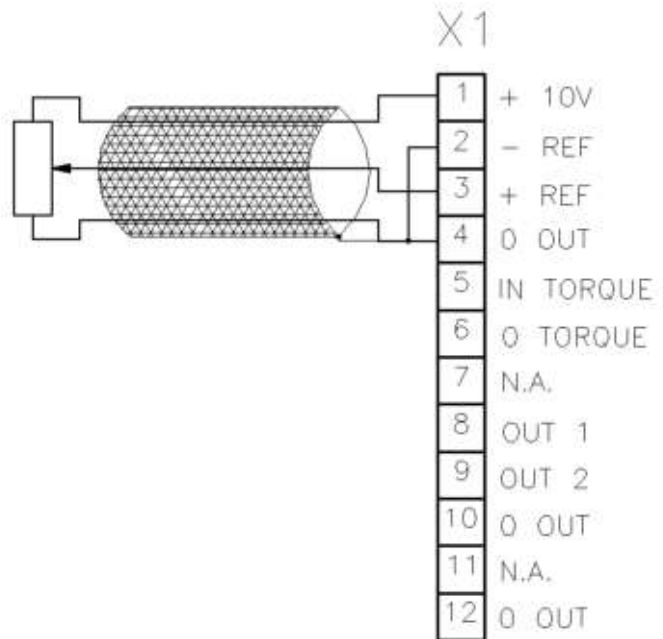
SYMBOL ON DISPLAY	TYPE OF ALARM
1	No alarm
3	Thermal probe
4	I <sup>2</sup> T motor
5	Under voltage
6	Power fault
7	I <sup>2</sup> T driver
8	Resolver
9	Over voltage
L	Limit switch
U	System initializations

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

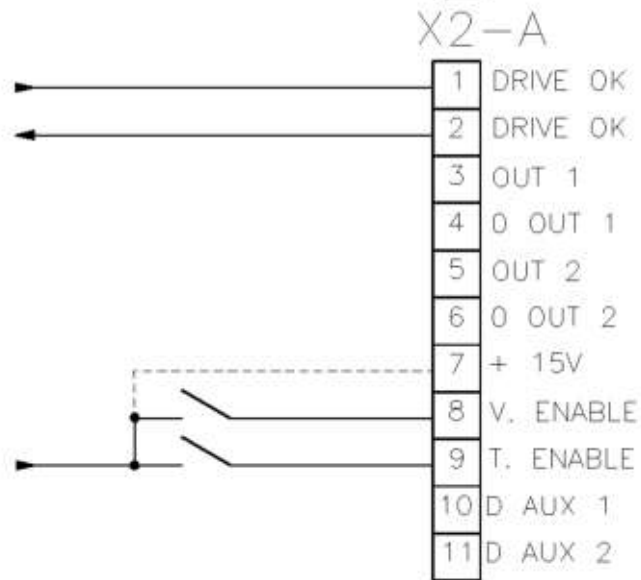
## 4. EXAMPLES OF CONNECTION

### 4.1 Connectors X1 e X2: Connection with reference by potentiometer

Speed reference potentiometer, 10KΩ linear



Drive OK contact to be connected to the emergencies



+24V for enabling; if not available, use +12V (terminal 7)

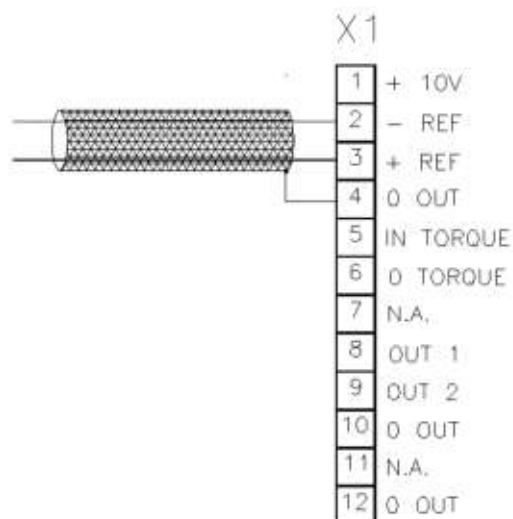
Common 0V connection. Connect to power supply 0V for 24V digital enabling



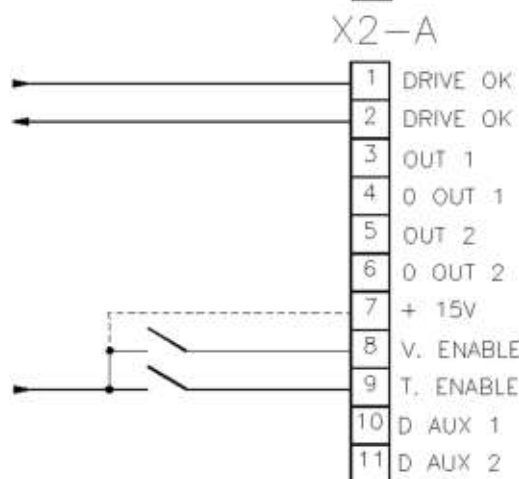
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**4.2 Connectors X1 e X2:** Connection with reference by numerical control and reading by encoder simulator

Numerical control speed analogue reference



Drive OK contact to be connected to emergencies

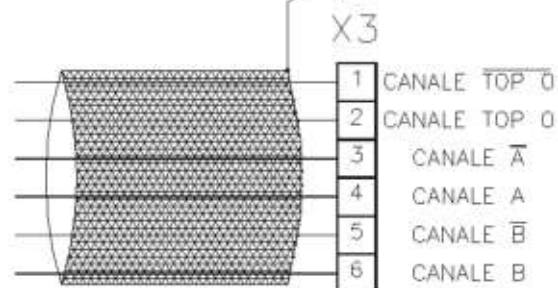


+24V for enabling; if not available, use +12V (terminal 7)

Common 0V connection. Connect to power supply 0V for 24V digital enabling

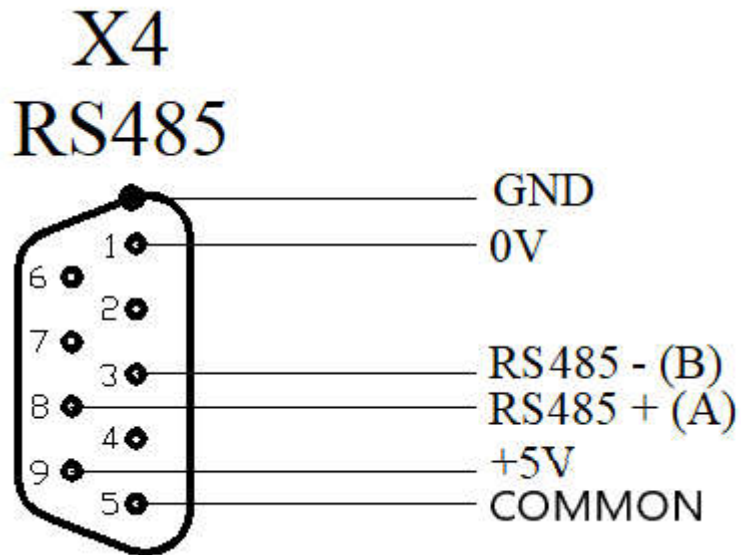


Connect to Numerical Control's LINE DRIVER encoder output.



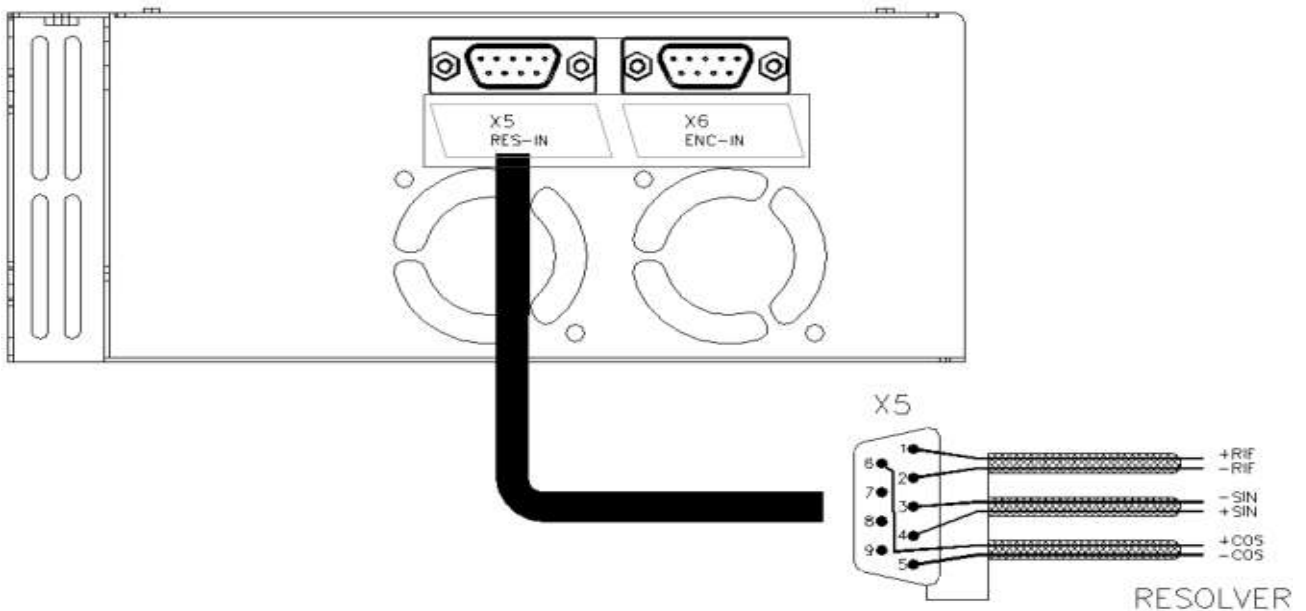
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#### 4.3 Connector X4: Serial interface RS485 connection.

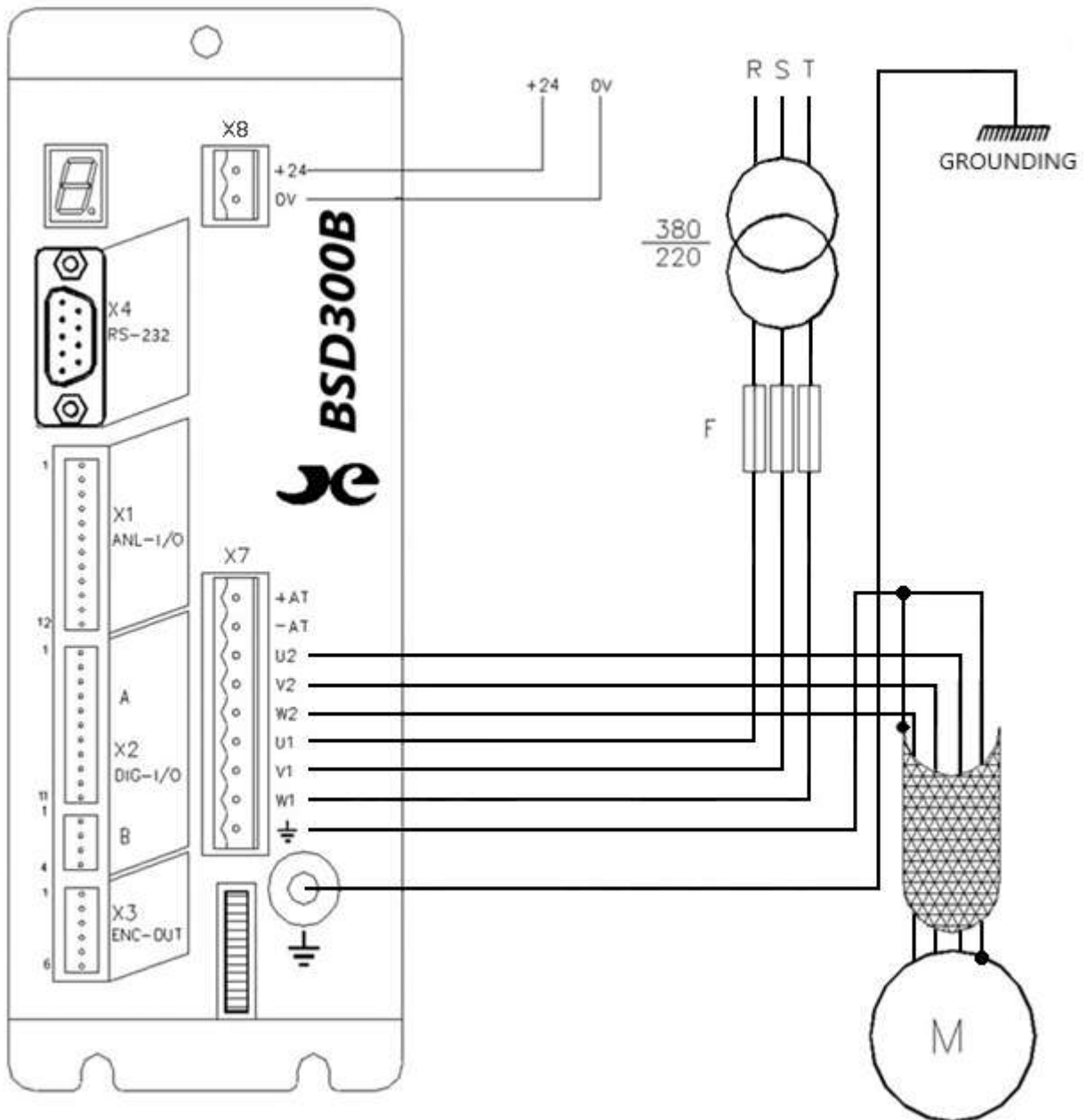


#### 4.4 Connector X5: Resolver and motor thermal probe (PTC/NTC) connection

(For NTC/PTC connections go to pag.15)



**4.5 Connector X7: Power connection.**











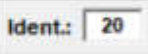





## 5. DRIVE CONFIGURATION

The BSD300BN 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

### MEANING OF THE MAIN ESDRIVE INTERFACE SYMBOLS

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

### 5.1. User interface

After installing the software:

1. Connect the serial cable (9-pin non-inverting male female) between the PC com and the drive serial port.
2. Turn on the drive by supplying the 24 V on the auxiliary power supply.
3. Open the ES DRIVE software via the shortcut icon on your desktop. Select the **BSD300BN** product under "Drives", then select the "Serial parameters" from "Impostazioni" and check the correct selection of the serial port (com =? baud rate = **9600**, stop bit = **1**, data bit = **8**, parity = **none**). Always under "Impostazioni" choice the **Modbus RTU** communication protocol.

4. To select a com other than the one set, you need to:
5. Select the desired door from the drop-down menu.
6. Click on "ok"
7. If the communication is active, the communication window at the top right must be green and with the writing "ON LINE". If this window is red and "OFF LINE" it means that the communication is not active.
8. The number displayed at the top right is the identifier of the drive with which the messages are exchanged. 20 is the standard value. If this number does not match the identifier of the drive connected to the PC, no response will be obtained. To communicate with a drive 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 drive number, click on the **RICERCA IDENTIFICATORE** key on the toolbar and the automatic search will start. If you want to assign a new identifier to the drive connected to the PC, you must: first enter the desired number in line "38" on the "PARAMETERS 2" page and then, as described above, enter the same number on the window at the top right and press enter.
9. On the configuration package, a parameter can be displayed as a decimal / hexadecimal integer or as a sequence of bits.
10. 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 (the field becomes white again).



11. To modify a parameter displayed as a sequence of bits (parameters 39 and 40), simply go to the "Stati" page and click the left key of the mouse on the column of the bits to be changed and then click on the key **ENTER** under the column in exam.
12. The << and >> keys allow you to scroll through the parameter pages
13. The parameters are normally displayed in decimal form, if you want to see them in hexadecimal format just double click on the parameter description field.
14. If automatic reading is disabled, the value of a single parameter can be read from the drive by double clicking on the unit of measure field.
15. Please note that all changes made to the parameters must be saved in EEPROM, otherwise the data will be lost when the 24V auxiliary power supply is turned off.

### Save a configuration on EEPROM:

1. Remove the enable on T Enable
2. On the Stati page, set the Store EEprom bit to 1
3. Press **ENTER** key and wait for the bit to return to 0.

### Save a configuration to file:

1. Select the **SALVA PARAMETERI** key from the command bar.
2. Give a name with a maximum of 8 characters and select "salva"

### Load a configuration from file:

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

#### 5.1.1. Description of parameters

Below is a brief description of the main parameters managed by the drive:

Parameter	Description	U.M.	Range
P1	Firmware version	N	0 ÷ FFFF
	Displays the version of the firmware present 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		

Parameter	Description	U.M.	Range
P4	OUT2 digital output configuration	N	0 ÷ 10
	Selection of the type of signal shown in the table in chapter 4.1		

Parameter	Description	U.M.	Range
P5	Selection of simulator encoder imp. /rev. number	N	0 ÷ 16384
	Determina il numero di impulsi/giro del simulatore encoder. Vedi capitoli 2.4 e 3.4		

Parameter	Description	U.M.	Range
P7	I2t level	%	0 ÷ 200
	Displays the level of current absorbed in %		

Parameter	Description	U.M.	Range
P8	Temperature	° C	0 ÷ 100
	Displays the power module temperature		

Parameter	Description	U.M.	Range
P9	Stored allarms	N	0 ÷ FFFF
	View the alarm history since the drive was turned on.		

Parameter	Description	U.M.	Range
P15	KP proportional gain of the speed regulator	N	0 ÷ 255
	Determines the proportional gain of the speed regulator, the higher the value the greater the bandwidth of the system		

Parameter	Description	U.M.	Range
P16	KI integral gain of the speed regulator	N	0 ÷ 255
	Increasing the value increases the integral component of the speed regulator		

Parameter	Description	U.M.	Range
P17	Tf time constant of the low pass filter's speed regulator	N	0 ÷ 200
	This permits the filtration of the signal coming from the internal speed regulator and can be used whenever smoother motor rotation is required. Typical value 1		

Parameter	Description	U.M.	Range
P18	Rated current of the motor in percent	%	0 ÷ 100
	Sets the motor's rated current according to the drives rated current (e.g. motor rated current 5A, drive rated current 10A, set 50%)		

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

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

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 current limitation comes into action to protect the drive		

Parameter	Description	U.M.	Range
P24	Kpi proportional gain for current loop regulators	N	0 ÷ 250
	Sets the gain of the drive'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 drive's current loops		

Parameter	Description	U.M.	Range
P29	Electrical angle for engine timing	N	0 ÷ +/-32767
	Value reported after the engine timing operation. The standard value for 2 pole pairs is 26400, for 3 pole pairs it is 18100, for 4 pole pairs it is 13500		

Parameter	Description	U.M.	Range
P33	Number of motor pole pairs	N	0 ÷ 32
	Sets the motor polar torque number. (E.g. 6 motor poles = 3 polar pair)		

Parameter	Description	U.M.	Range
P34	Number of resolver pole pairs	N	0 ÷ 32
	Sets the number of resolver polar pairs, which in most cases is equal to 1.		

Parameter	Description	U.M.	Range
P37	Speed offset fine setting	N	0 ÷ +/- 32767
	This parameter can be modified after first performing the automatic speed offset correction procedure. If, after performing this procedure, the motor will at 0 reference value keeps turning, modify the value pre-set for this parameter in order to cancel the speed offset.		

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

Parameter	Description	U.M.	Range
P43	Maximum engine rpm	RPM	0 ÷ 10000
	Sets the maximum motor speed when 9V is applied to the analogue input. For speeds above 10000 rpm contact ES-Technology		

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

Parameter	Description	U.M.	Range
P45	Acceleration ramp in clockwise direction	SEC	0.01 ÷ 30
	Determines the acceleration ramp time in the clockwise rotation. Same value as parameter 47		

Parameter	Description	U.M.	Range
P46	Deceleration ramp in clockwise direction	SEC	0.01 ÷ 30
	Determines the deceleration ramp time in clockwise rotation. Same value as parameter 48		

Parameter	Description	U.M.	Range
P47	Acceleration ramp in counterclockwise direction	SEC	0.01 ÷ 30
	Determines the acceleration ramp time in counterclockwise rotation. Same value as parameter 45		

Parameter	Description	U.M.	Range
P48	Deceleration ramp in counterclockwise direction	SEC	0.01 ÷ 30
	Determines the deceleration ramp time in counterclockwise rotation. Same value as parameter 46		

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		

Parameter	Description	U.M.	Range
P50	Period of the speed digital reference square wave.	SEC	0.01 ÷ 30
	Determines the period of square wave setting by bit "Onda quadra" 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	N	0 ÷ +/-200
	Offset compensation of the selected signal		

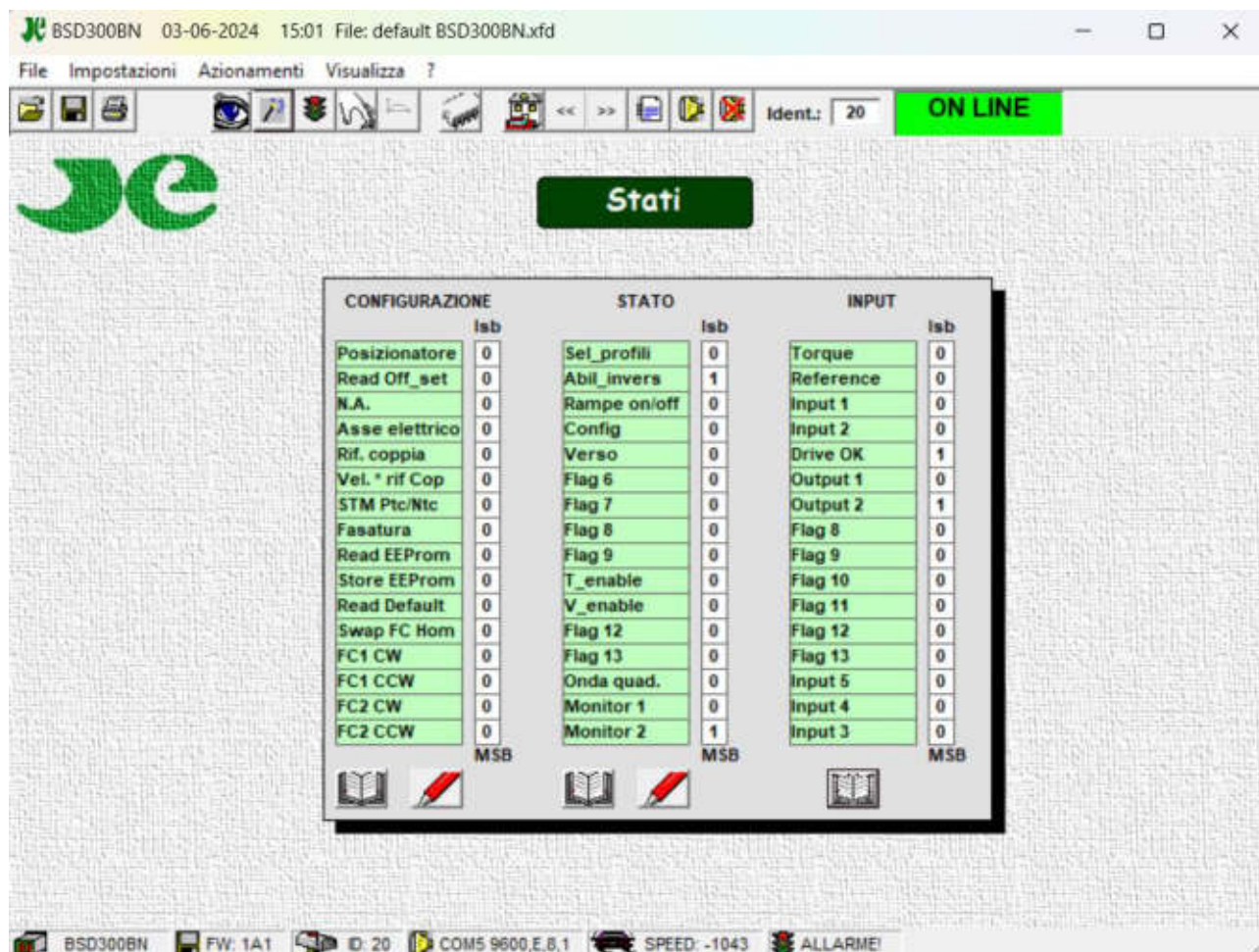
Parameter	Description	U.M.	Range
P126	Gain OUT 1A	N	-25 ÷ -200
	Determines the full scale of the selected signal		

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

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

## 5.2. “Stati” page

The BSD300BN 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.

### 5.2.1. Meanings of “CONFIGURAZIONE” bits

<b>Posizionatore</b>	By setting this bit to 1, operation as a positioner is enabled.
<b>Read Off_set</b>	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).
<b>N.A.</b>	Not available
<b>Asse elettrico</b>	By setting this bit to 1, operation as an electric axis is enabled (option).
<b>Rif. coppia</b>	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 through reference to the torque applied between terminals 2 and 3 of X1.
<b>Vel *rif Cop</b>	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.
<b>STM Ptc/Ntc</b>	This informs the drive whether the motor's thermal probe is normally closed or normally open.
<b>Fasatura</b>	By setting this bit to 1, the automatic procedure for the phasing of the motor is begun as described in the installation procedure.
<b>Read EEPROM</b>	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.
<b>Store EEPROM</b>	<b>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.</b>
<b>Read Default</b>	<b><u>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.</u></b> 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.
<b>Swap FC</b>	Reverses the direction of the FC1 and FC2 limit switches
<b>FC1 CW</b>	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 <b>clockwise</b> .
<b>FC2 CCW</b>	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 <b>counter-clockwise</b> .

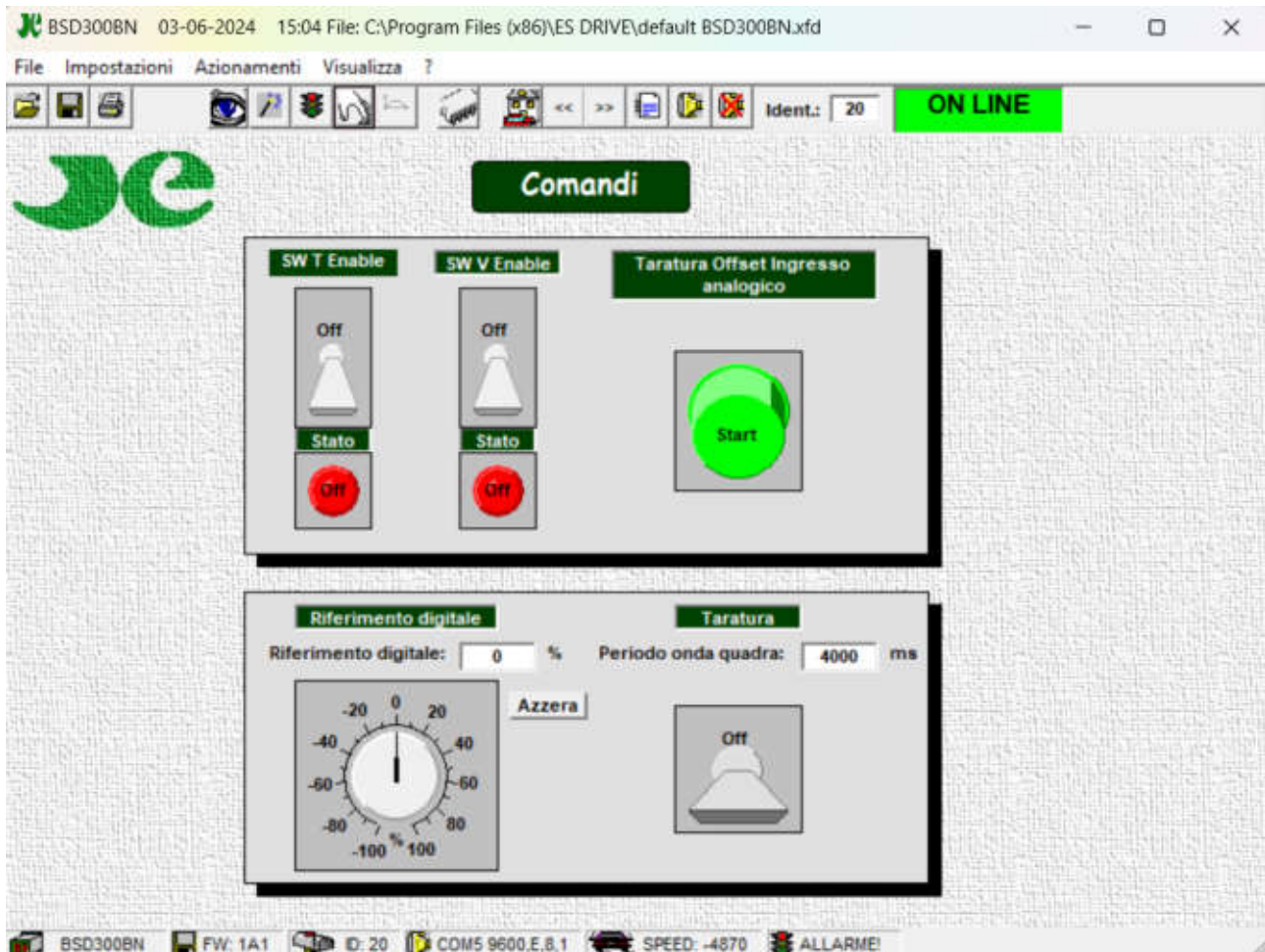
### 5.2.2. Meanings of “STATO” bits

<b>Sel_profil</b>	Not available
<b>Abili_invers</b>	By setting this bit to 1 you can reverse the direction of rotation of the motor with digital input D AUX1 (if it not used as a limit switch)
<b>Rampe on/off</b>	By setting the bit to 1 it is possible to select/deselect the ramps using the digital input D AUX2
<b>Config.</b>	By setting the bit to 1 it is possible to change the drive configuration using some digital inputs (contact assistance for any use)
<b>Verso</b>	By setting this bit to 1, the motor's rotation direction is inverted at the same speed reference.
<b>N.A.</b>	Not available
<b>N.A.</b>	Not available
<b>N.A.</b>	Not available
<b>N.A.</b>	Not available
<b>T_Enable</b>	Torque enable sw
<b>V_Enable</b>	Speed enable sw (external reference)
<b>N.A.</b>	Not available
<b>N.A.</b>	Not available
<b>Onda quad.</b>	Enables the square wave function used in combination with the digital reference with the time determined by the value in parameter 50
<b>Monitor 1</b>	Selection of output OUT_1 (chapter 2.1)
<b>Monitor 2</b>	Selection of output OUT_2 (chapter 2.1)

### 5.3. "Comandi" page

The "Comandi" page of the user interface allows you to perform some operations usually used to check the correct operation of the drive combined with the motor. Via software it is possible to give torque to the motor (T. Enable) and with a digital reference to parameter 49, turn the connected motor or also enable V.Enable and use an external reference

By clicking on the "Start" key it is possible to calibrate the speed offset at zero reference

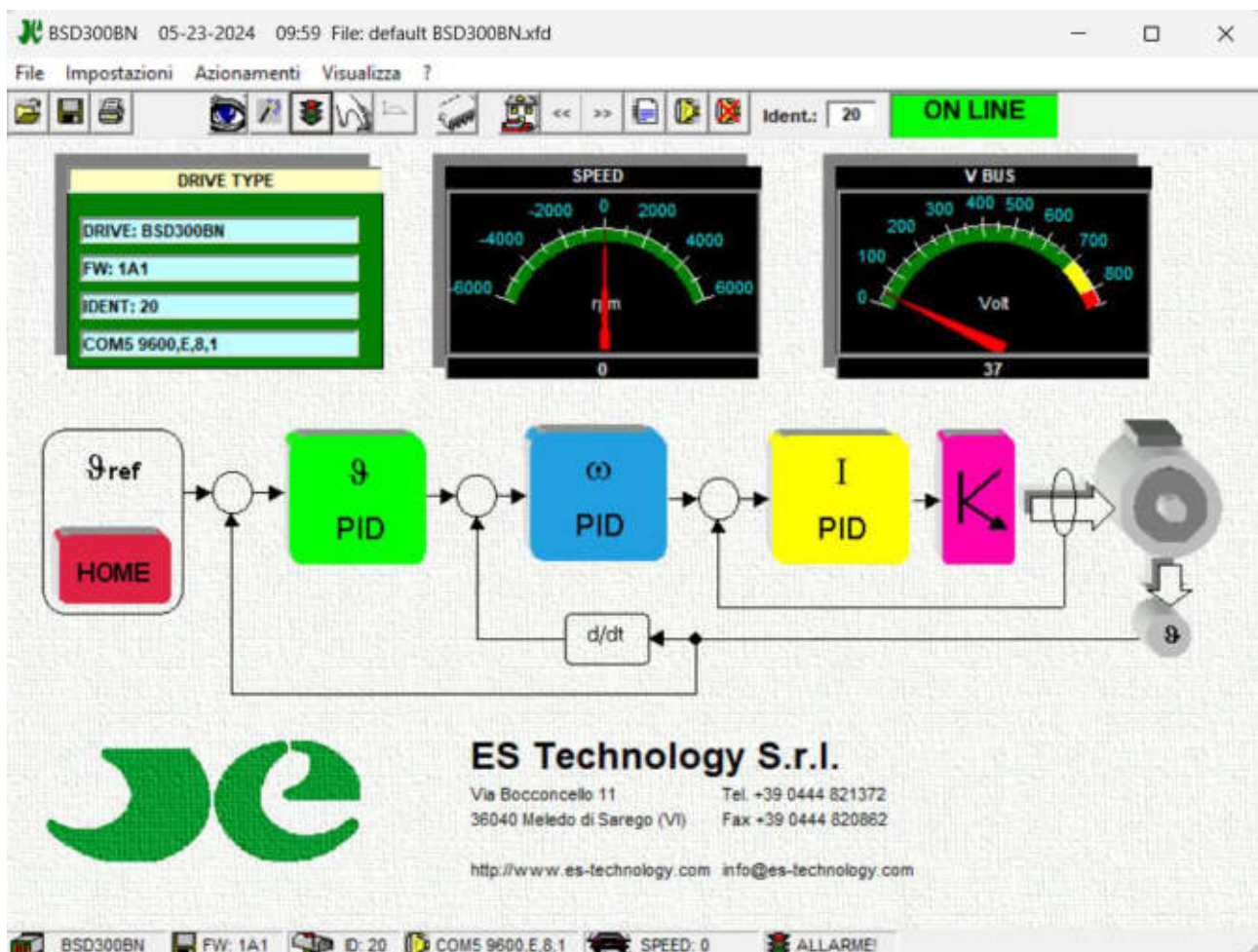




## 5.4. “Allarmi” page

The alarm statuses of the drive are displayed (green or red circles) and memorized (green or red squares) on the alarms page.

The memory is carried out by the interface and therefore is active only in the period of communication with the computer or with another device suitable for supervising the drive.



All alarms, except POWER FAULT, reset when the alarm clears. The POWER FAULT requires the drive to be switched off to be reset.

The “Reset” key on the side of the alarms page allows the cancellation of the alarm memories.

### 5.4.1. Description of the alarms

<b>Power fault</b>	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 incorrect calibration of the current loop, by a lack or incorrect wiring of the earth and shields or by noises.
<b>Over voltage</b>	Indicates the BUS over voltage alarm. This alarm can occur with sudden engine braking which produces a dangerous increase in voltage on the BUS above 410V. This alarm can also occur if the power supply network rises suddenly in voltage.
<b>Under voltage</b>	Indicates the BUS under voltage alarm and it appears when the power supply is not present or too low, check the status of the protection fuses on the power phases.
<b>I<sup>2</sup>T driver</b>	Indicates that the driver's temperature threshold has been exceeded. This alarm is triggered whenever the drive supplies a current that is higher than the rated value for a prolonged period. The intervention time of this protection can be adjusted by acting on parameter 21 Tau Term Az
<b>I<sup>2</sup>T motor</b>	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. This alarm can also be triggered by the simultaneous occurrence of other conditions that lead to the disabling of the drive. When the alarm is triggered, the drive 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 parameter 18 (Inom Motor) and 19 (Tau I <sup>2</sup> T)
<b>Resolver</b>	Resolver interruption alarm. Make sure that all resolver connections are complete and correct.
<b>Thermal probe</b>	Motor overheating alarm. The drive 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 "Configurazioni" column on Page "Stati" of the es Drive interface.

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<b>Limit switch 1</b>	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 drive is disabled. To restore normal operating conditions, the drive must be disabled and then re-enabled after first inverting the speed reference.
<b>Limit switch 2</b>	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 drive is disabled. To restore normal operating conditions, the drive must be disabled and then re-enabled after first inverting the speed reference.
<b>Tracking error</b>	This alarm indicates that the maximum positioning error permitted for operation as an electric axis or as a positioner has been exceeded.

## 6. INSTALLATION AND SETTING PROCEDURE

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

### 6.1 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 always be performed with the drive DISABLED. The drive does not work if it is switched on with the enable already active

### 6.2 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.

### 6.3 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.

### 6.4 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	I <sub>q</sub> 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 I<sub>q</sub> 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 I<sub>q</sub> and ω outputs.

Parameter value 128	ω Speed signal	Parameter value 126	I <sub>q</sub> Current signal
-200	2V	-100	2V
-160	2,5V	-80	2,5V
-80	5V	-40	5V
-50	8V	-25	8V

## 6.5 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.

## 6.6 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.”.

## 6.7 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.

### 6.7.1. 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.**

## 6.8 Operation with digital reference

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 X2-A).

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.



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

<b>D_AUX5</b>	<b>D_AUX4</b>	<b>D_AUX3</b>	<b>D_AUX2</b>	<b>Selected reference</b>	<b>Parameter number</b>
0	0	0	0	Ref_digit_0	51
0	0	0	1	Ref_digit_1	52
0	0	1	0	Ref_digit_2	53
0	0	1	1	Ref_digit_3	54
0	1	0	0	Ref_digit_4	55
0	1	0	1	Ref_digit_5	56
0	1	1	0	Ref_digit_6	57
0	1	1	1	Ref_digit_7	58
1	0	0	0	Ref_digit_8	59
1	0	0	1	Ref_digit_9	60
1	0	1	0	Ref_digit_10	61
1	0	1	1	Ref_digit_11	62
1	1	0	0	Ref_digit_12	63
1	1	0	1	Ref_digit_13	64
1	1	1	0	Ref_digit_14	65
1	1	1	1	Ref_digit_15	66









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



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