ES TECHNOLOGY

USER AND INSTALLATION MANUAL

BSDE300

1. Revisions

Manual version	Data	Firmware version	Note
1.0	21/12/2012	1000	First draft.
1.1	04/06/2013	1005	New implementations and commands. Updates.
1.2	03/01/2014	1013	Updates.
1.3	03/02/2014	1022	Updates.
1.4	29/09/2014		Absolute encoder connection diagram update.
1.5	07/06/2016	1030	Updates.
1.6	25/01/2017		Serial Communication Driver Guidance
1.7	03/05/2018		Updates.
1.8	18/02/2020		Updates.

2. Attention!

BSDE series drives work in high voltage.
Even after removing the power to the drive, the internal capacitive circuits remain in voltage for a short period of time.
For this reason it is absolutely necessary to wait at least two minutes before operating inside the drive.
In addition, the drive is equipped with an internal recovery resistance that works in high voltage with very high operating temperature.
Therefore, do not touch the recovery resistance for any reason even when the drive is disabled.

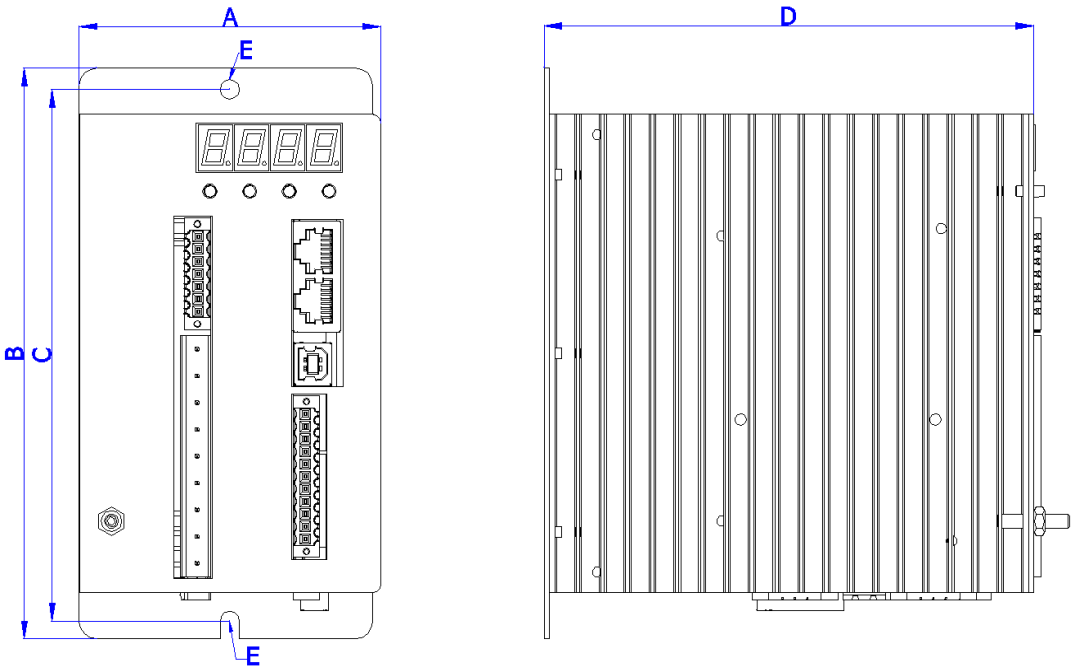
3. Warnings

1	Before installing and using the equipment, read the manual carefully.
2	We decline all responsibility for any improper use of the equipment other than those prescribed in the manual.
3	Commissioning and installation is allowed only to qualified personnel, who are responsible for compliance with the safety rules imposed by the current regulation.
4	In the specific case of use, the safety rules valid for the prevention of accidents must be considered. Installation, wiring and opening of the equipment and drive must take place in the absence of voltage.
5	Equipment and drives must be installed in a contact-proof housing with an IP protection degree according to the standards.
6	Position the equipment so that maintenance is facilitated and there is no danger of interference with moving parts.
7	Make sure that sufficient ventilation is always guaranteed to dispose of drive leaks.
8	In the event of a fire in the vicinity of the equipment, do not use extinguishing media containing water.
9	In any case, avoid the penetration of water or other fluids inside the equipment.
10	Any operation inside the equipment must be done in the absence of voltage. Since capacitors are present, wait at least 10 minutes before accessing for operations inside.

4. Summary

5. Drive

Dimensions



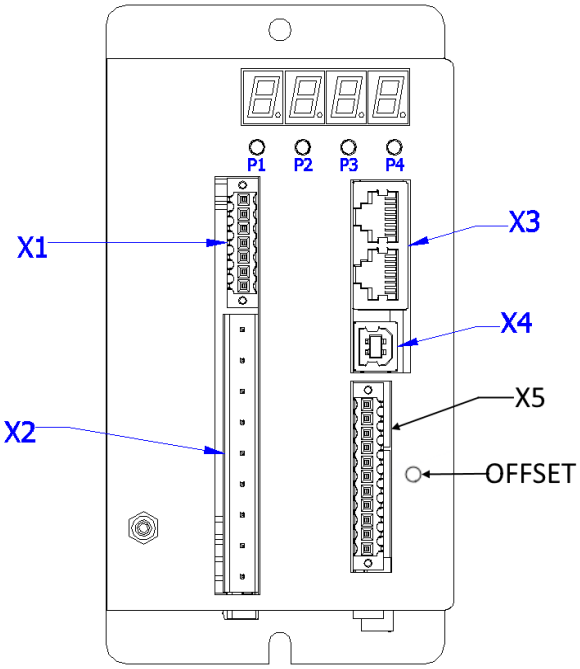
Dimension	Size (in mm)
A	85.10
B	160.00
C	149.00
D	138.00
And	5.50

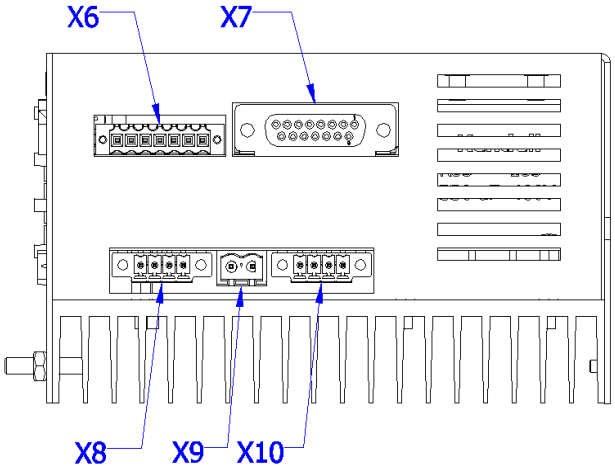
Currents that can be supplied

MODEL	POWER SUPPLY	RMS RATED CURRENT AT 40°C	MAXIMUM RMS CURRENT
BSDE300 / 2,5A	**Single/threephase 100 – 220 Vac Auxiliary power supply 24Vdc**	**2,5A**	**5A**
BSDE300 / 5A		**5A**	**10A**
BSDE300 / 7,5A		**7,5A**	**15A**
BSDE300 / 10A		**10A**	**20A**

Connectors description

Numbering from left to right and from top to bottom.

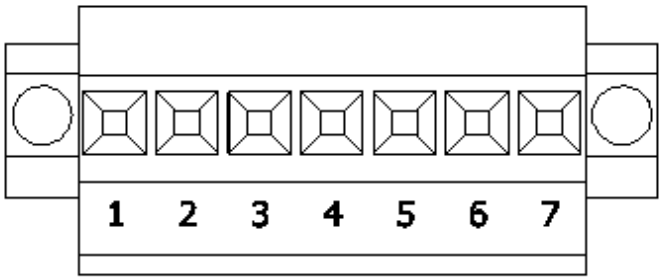




Connector	Description
X1	Resolver Feedback Input
X2	Power
X3	CanBus
X4	USB
X5	Commands
X6	IN / OUT
X7	Encoder input / output
X8	AUX output and unlocking
X9	Auxiliary power supply
X10	Drive power mode

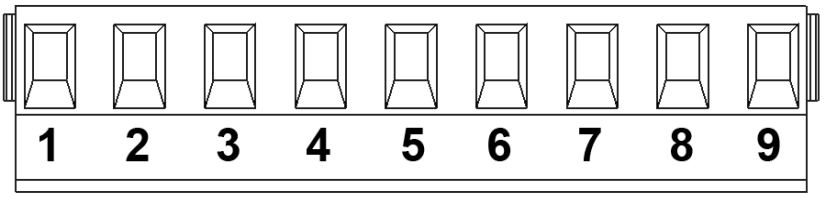
Buttons	Description
P1	Edit and view parameters
P2	
P3	
P4	

X1 connector: feedback input from resolver



Pin	Description
1	Resolver shield link. (0V adjustment board)
2	Resolver output –REF
3	Resolver output +REF
4	Resolve output -COS
5	Resolve output +COS
6	Resolve output -SEN
7	Resolve output +SEN

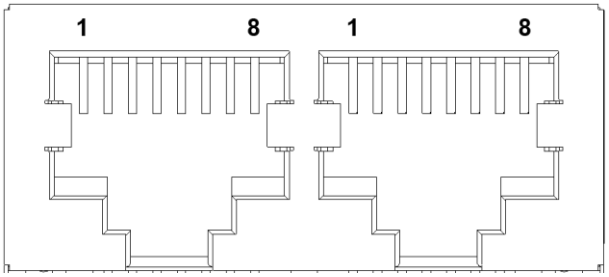
X2 connector: Power connector



Pin	Description
1	Motor U phase output
2	Motor V phase output
3	Motor W phase output
4	+AT output / external recovery resistance
5	-AT output / external recovery resistance
6	Clamp for ground connection
7	Power supply Input R
8	Power supply Input S
9	Power supply input T

Note: The connection of the external recovery resistance is to be made in case the drive without internal resistance is required.

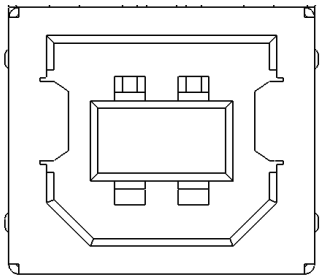
* X3 connector: RJ45 connector for CanBus



Pin	Description
1	CAN H signal connection
2	CAN L signal connection
3	Screen connection
4	Not connected
5	Not connected
6	Not connected
7	Screen connection
8	Not connected

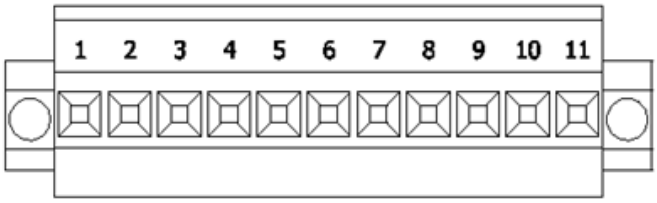
*** = INACTIVE**

X4 connector: STANDARD USB connector



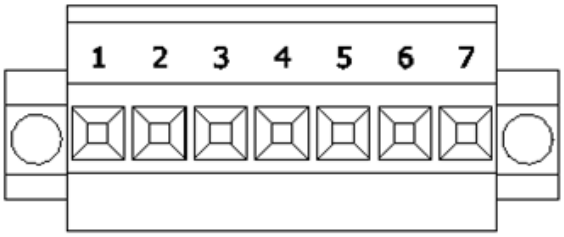
Connection between drive and PC for configuration and monitoring, use a standard USB A-B cable no longer than three meters in length.

X5 connector: Command connector



Pin	Description
1	Differential analog input +REF (0 to 10 Volts)
2	Differential analog input –REF (from 0 to 10 Volts)
3	0V adjustment board
4	ENABLE input (active for 0)
5	Analog input for torque limitation (values from 0 to 10V)
6	Output +10V max 100mA
7	Output -10V max 100mA
8	0V adjustment board
9	PTC signal input with GND
10	Relay contact DriveOk max 1A @ 24Vdc
11	Relay contact DriveOk max 1A @ 24Vdc

X6 connector: Digital input/output connector



Pin	Description
1	0V adjustment board
2	Programmable digital input 1 (see **note 1**)
3	Programmable digital input 2 (see **note 1**)
4	0V adjustment board
5	Output 1 digital programmable PNP open collector max 10mA (see **footnote 2**)
6	0V adjustment board
7	Programmable analog/digital output 2 with 0/+5V signal (see **footnote 2**)

Note 1: For events associated with digital inputs, see Digital **Input Event Configuration** and **Digital Input Level Configuration** (page 50).

Note 2: For events associated with digital outputs, see the chapter **Digital Output Event Configuration** (page 49).

X7 connector: Encoder input/output connector

Connector contacts can have different meanings depending on the configuration you set (see **Configuration Parameter**).

Resolver feedback configuration

Pin	Description
1	Simulated encoder output A+
2	Simulated encoder output B+
3	Simulated encoder output Z+
4, 5, 6	---
7	Output 5V max 150 mA
8	Output 0V
9	Simulated encoder output A-
10	Simulated encoder output B-
11	Simulated encoder output Z-
12, 13, 14	---
15	---

Configuration with absolute encoder feedback

Pin	Description
1	DATA input- for absolute encoder
2, 3	---
4	CLK- output for absolute encoder
5, 6	---
7	Output 5V max 150 mA
8	Output 0V
9	DATA+ input for absolute encoder
10, 11	---
12	CLK+ output for absolute encoder
13, 14, 15	---

* Configuration with feedback from incremental encoder and hall sensors

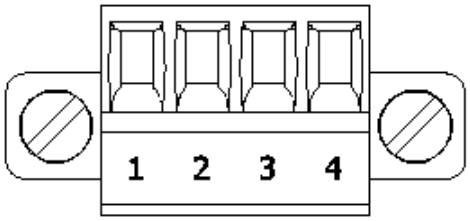
Pin	Description
1	Incremental encoder input A+
2	Incremental encoder input B+
3	Z+ incremental encoder input
4	Incremental encoder input with HALL U+ sensors
5	Incremental encoder input with HALL V+ sensors
6	Incremental encoder input with HALL W+ sensors
7	Output 5V max 150 mA
8	Output 0V
9	Incremental encoder input A+
10	Incremental encoder input B-
11	Incremental encoder input Z-
12	Incremental encoder input with HALL U- sensors
13	Incremental encoder input with HALL V- sensors
14	Incremental encoder input with HALL W- sensors
15	5V direction signal output

* Configuration with incremental encoder feedback

Pin	Description
1	Incremental encoder input A+
2	Incremental encoder input B+
3	Z+ incremental encoder input
4, 5, 6	---
7	Output 5V max 150 mA
8	Output 0V
9	Incremental encoder input A+
10	Incremental encoder input B-
11	Incremental encoder input Z-
12, 13, 14	
15	5V direction signal output

*** = INACTIVE**

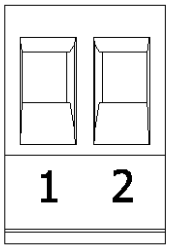
X8 connector: AUX output and unlock



Pin	Description
1	Drive Emergency Unlock Input (see Note)
2	Drive Emergency Unlock Input (see Note)
3	Output 0V
4	Output +24V max 150mA

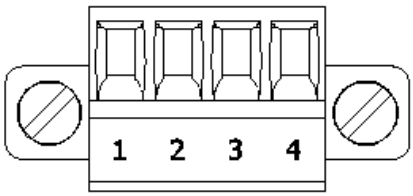
Note: When absent, the emergency release is used to remove power to the power module. The absence of the connection between pins 1 and 2 is reported in the alarm section of the drive.

X9 connector: auxiliary power input



Pin	Description
1	Input 0V
2	Input +24Vdc

X10 connector: Drive power mode selector



Pin	Description
1	To select the 24Vdc auxiliary power supply connect pins 1 and 2 together
2	

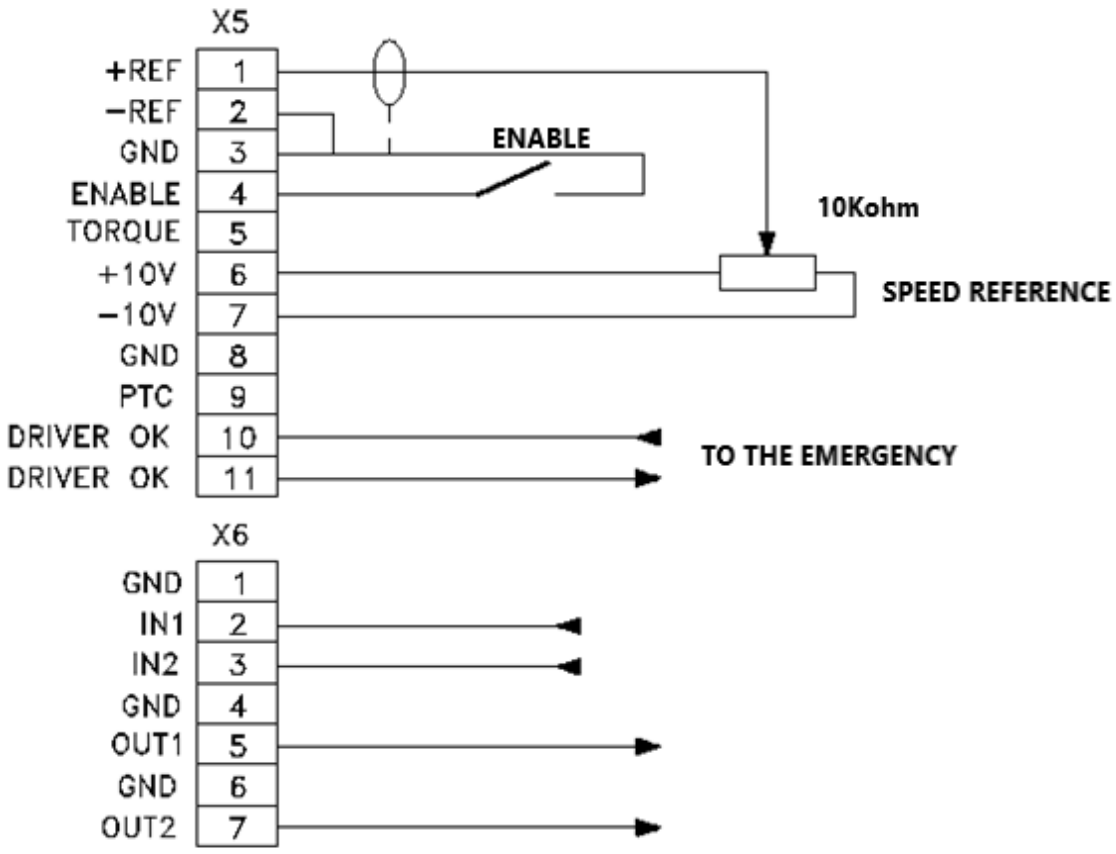
or

3	To select the power supply from the 220Vac mains connect pins 3 and 4 together
4	

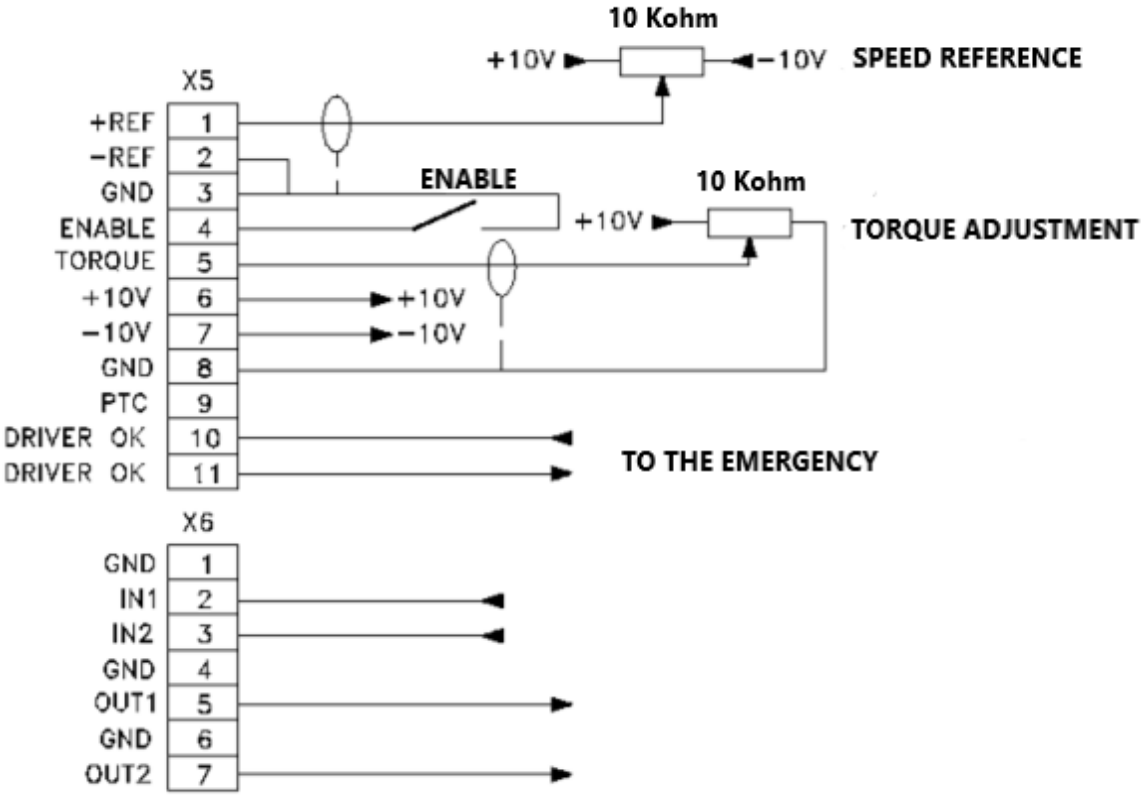
WARNING: It is important to select only one of the available options. Otherwise the drive will be damaged.

6. Connections

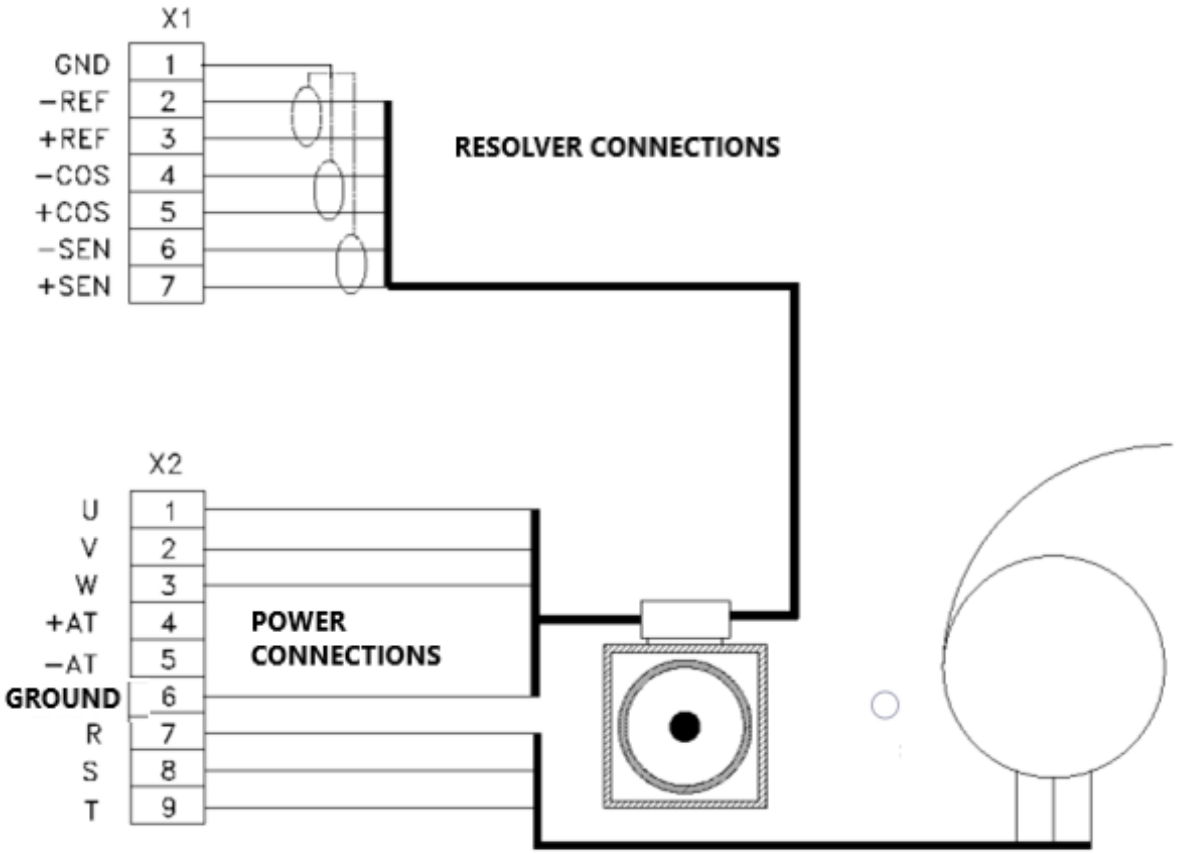
X5 and X6 connection diagram for analog speed reference



X5 and X6 connection diagram for analog speed reference and hardware torque limitation

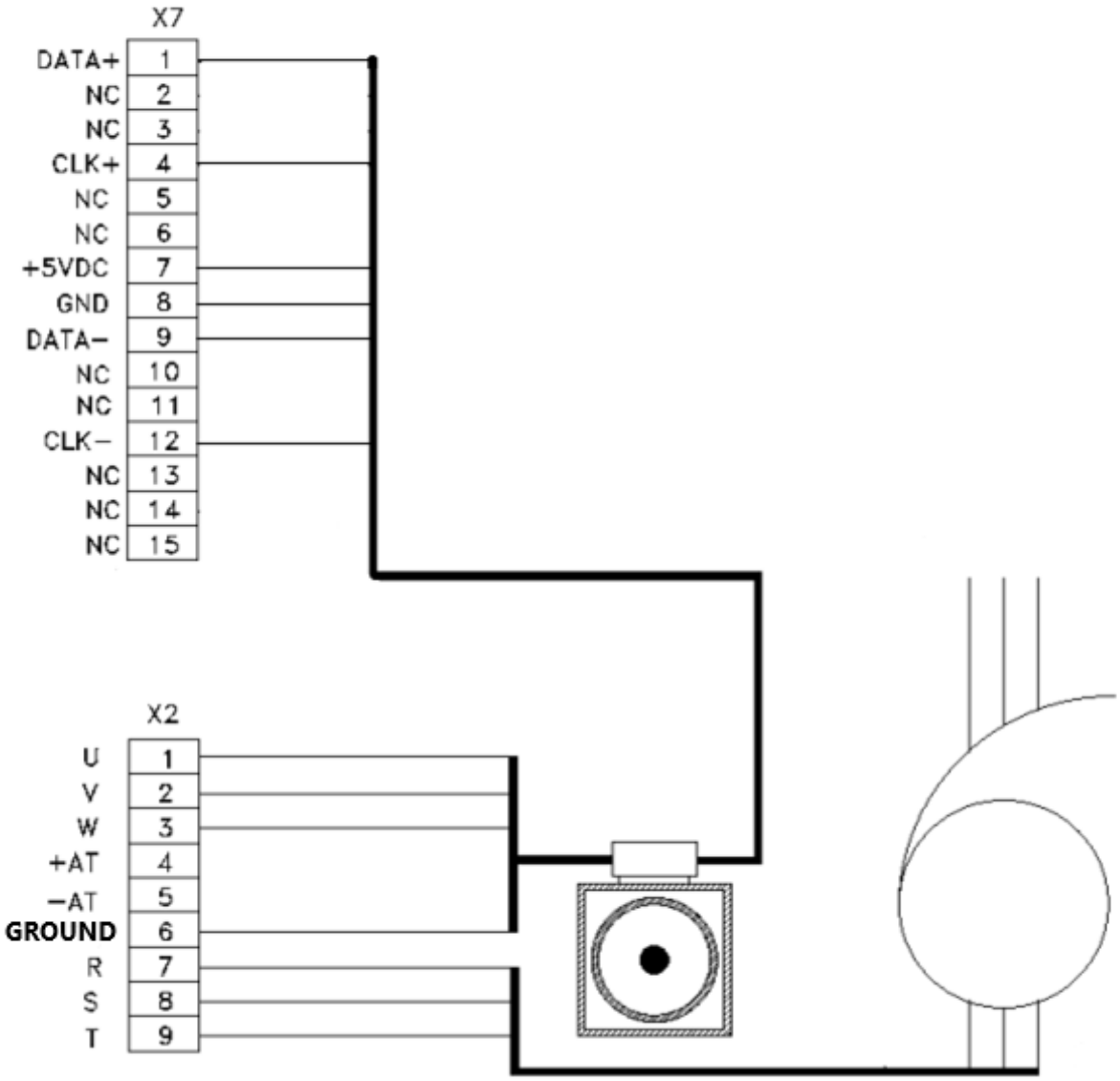


Resolver and power connections diagram



Attention: for the connection of the resolver and motor cables it is recommended to use shielded cables. If the connection is provided with cables longer than 10 meters, please contact ES TECHNOLOGY support.

Connection diagram with absolute Encoder SSI protocol



7. Modification of the Pid Value

The adjustment pids are divided according to the mode of operation:

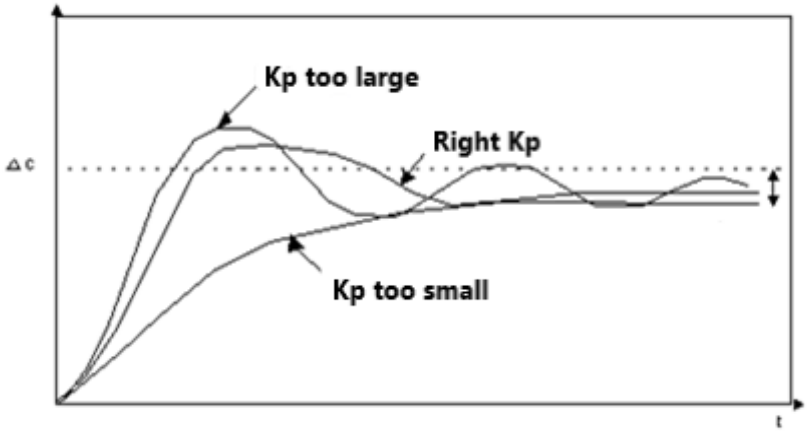
Way	Pid position	Pid speed	Pid current
Position Profiles	X	X	X
Position	X	X	X
Speed		X	X
Torque			X

The following table shows the position of the parameters.

Value	Parameter number
Pid Kp speed	53
Pid Ki speed	54
Pid Kd speed	55
Pid Kp position	56
Pid Ki position	57
Pid Kd position	58
Pid Kp current	59
Pid Ki current	60
Pid Kd current	61
Pid Id reference	62

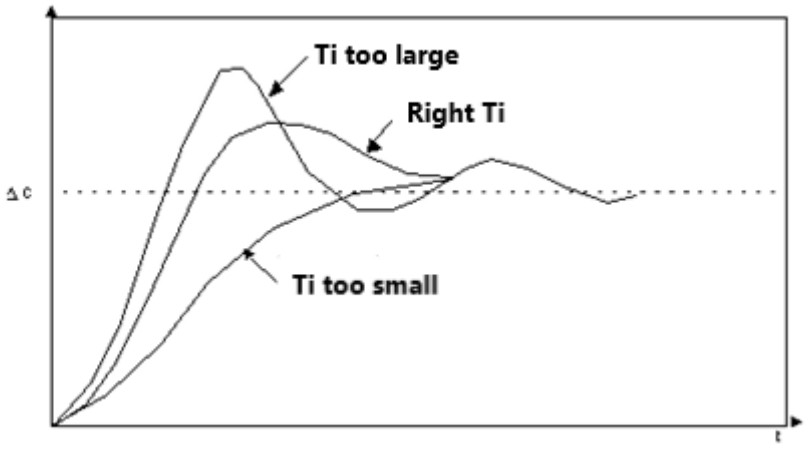
Influence of proportional action (Kp parameter)

Proportional action allows you to influence both the speed and the response of the process. The higher the gain, the faster the response, the more the static error decreases (proportionally), and the more stability degrades. The best compromise between speed and stability must be found.



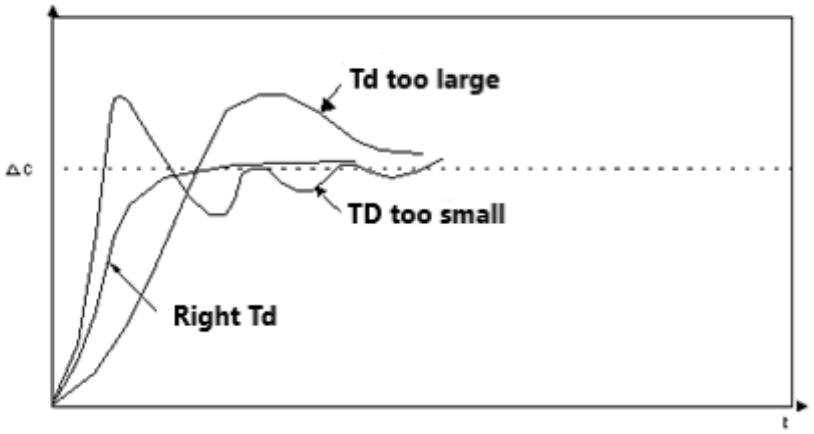
Influence of integral action (parameter Ki or Ti)

The integral action allows to cancel the static error between the measure and the setpoint. The higher the integral action (Ti small), the more the response accelerates and the more stability degrades. We also need to find a good compromise between speed and stability.



Influence of the derivative action (parameter Kd or Td)

The derivative action is anticipatory. In fact, it adds a term that takes into account the rate of variation of the deviation, and this allows to anticipate in acceleration the response to the process, when the deviation grows, and in deceleration when the deviation decreases. The higher the derived action (large Kd), the faster the response accelerates. Again, the best compromise between speed and stability must be found.



8. Enabling Drive

Enabling the drive is possible in both hardware and software mode.

In hardware mode, enablement is a signal (active for 0) on the **X5 connector**.

In software mode, enabling is allowed by setting the appropriate flash in the status word or by writing the command in **parameter 15**.

9. Torque limit

The torque limit is a feature available in all modes of operation except the torque mode.

This limit can be both software and hardware (with a value ranging from 0 to 10 Volts) through the setting of the configuration word or by command and is expressed as a percentage of the maximum current parameter set (**parameter 7**).

To set the torque level in software mode you have to change the **parameter 38**.

10. Analog torque limit calibration

For a better use of the analog input of torque limitation it is necessary to calibrate the maximum and minimum value that the signal can reach to take advantage of the maximum possible range of values. Calibration values can be verified in parameters 79 (minimum value) and 80 (maximum value).

To carry out the calibration it is necessary

- Bring the analog input to the maximum possible value (however not exceeding 10 Volts)
- In the **Status** word, place the **Max Torque Limit Calibration** parameter on ON , or type **command 25** in **parameter 15**.
- Wait for the activated flag to automatically return to OFF or for parameter 16 to report the value 0.
- Once the calibration was deactivated, it was carried out.

The calibration for the minimum value is very similar:

- Bring the analog input to the lowest possible value
- In the **Status** word, place the **Min Torque Limit Calibration** parameter on ON , or type command **24** in **parameter 15**.
- Wait for the activated flag to automatically return to OFF or for parameter 16 to report the value 0.
- Once the calibration was deactivated, it was carried out.

To make the calibration values permanent, it is recommended to perform the parameter storage operation.

11. Digital/analog reference

By selecting the digital reference you have the possibility to set the maximum motor speed required by **parameter 30** in the case of operation of the drive in speed mode or the maximum torque by means of parameter 38 in the case of operation in torque mode.

In analog mode the voltage range to be applied to the connector terminals has an excursion from -10 to +10 Volts.

12. Analog reference calibration

For a better use of the analog input it is necessary to calibrate the maximum and minimum value that the signal can reach to take advantage of the maximum possible range of values. Calibration values can be verified in parameters 77 (minimum value) and 78 (maximum value).

To carry out the calibration it is necessary

- Bring the analog input to the maximum possible value (however not exceeding 10 Volts)
- In the **Status** word, place the **Max Analog Input Calibration** parameter on ON , or type **command 27** in **parameter 15**.
- Wait for the activated flag to automatically return to OFF or for parameter 16 to report the value 0.
- Once the calibration was deactivated, it was carried out.

Similarly, for the calibration of the minimum value it is necessary:

- Bring the analog input to the minimum possible value (however not less than -10 Volts)
- In the **Status** word, place the **Min Analog Input Calibration** parameter on ON , or type command **26** in **parameter 15**.
- Wait for the activated flag to automatically return to OFF or for parameter 16 to report the value 0.
- Once the calibration was deactivated, it was carried out.

For the adjustment of the zero-reference speed offset use the trimmer on the front

13. Feedback from resolver

Setting the feedback from resolver you need to set parameter 35 with the value 12.

14. Enabling ramps

To enable ramps it is necessary to bring the Ramp Enable flag to the ON status.

The values set in parameters 42 and 44 refer to the time it takes to bring the motor to the maximum speed set in parameter 30.

Parameters 43 and 45 refer to the time it takes to bring the motor from the maximum speed to 0.

15. Drive parameters

Number parameter	Description	Units of measurement	Range	Type of access
1 P001	**Firmware version**			Reading
	Drive firmware version			
2 P002	**Identifier**		1 ÷ 32	Read / write
	Drive identifier			
3 P003	**Alarms**			Reading
	Active alarm mask			
4 P004	**Alarm history**			Read/write
	Mask of historical alarms			
5 P005	**Module current: maximum**	A		Reading
	Maximum value of current supplied by module			
6 P006	**Module current: nominal**	A		Reading
	Nominal value of current supplied by the module			
7 P007	**Set current: Maximum**	A	5 ÷ 20	Read / write
	Maximum value of current supplied set by the user. The set current cannot be higher than the maximum current of the module (parameter 5)			
8 P008	**Set current: Nominal**	A	0,1 ÷ 10	Read / write
	Nominal value of current supplied set by the user. The set current cannot be higher than the set maximum current			
9 P009	**Current: U phase**	A		Reading
	Current U-phase reading			
10 P010	**Current: Phase V**	A		Reading
	Current reading phase V			
11 P011	**Current: Phase W**	A		Reading
	Current reading phase W			
12 P012	**Configuration**			Read / write
	Drive Configuration Mask			
13 P013	**State**			Read / write
	Drive status mask			
14 P014	**Input**			Reading
	Drive Input Mask			
15 P015	**Drive: command**			Read / write
	Command given to the drive			
16 P016	**Drive: Outcome**			Reading
	Success of the command given to the drive			

Number parameter	Description	Units of measurement	Range	Type of access
17	**Drive: Status**			Reading
P017	Drive status: can take the value 0 (drive disabled) or 1 (drive enabled)			
18	**Module temperature: value**	°		Reading
P018	Value of the internal temperature of the module			
19	**Bus voltage: value**	In		Reading
P019	Bus voltage value			
20	**Bus voltage: calibration**	%	-100 ÷ +200	Read / write
P020	Bus voltage calibration value			
21	**Bus voltage: maximum**	In	100 ÷ 420	Read / write
P021	Maximum bus voltage value			
22	**Bus voltage: maximum hysteresis**	In	5 ÷ 20	Read / write
P022	Hysteresis value for maximum bus voltage			
23	**Bus voltage: minimum**	In	20 ÷ 250	Read / write
P023	Minimum bus voltage value			
24	**Bus voltage: minimum hysteresis**	In	5 ÷ 30	Read / write
P024	Hysteresis value for minimum bus voltage			
25	**Bus voltage: brake connection**	In	370 ÷ 420	Read / write
P025	Bus voltage value for braking activation			
26	**Bus voltage: brake hysteresis**	In	10 ÷ 30	Read / write
P026	Hysteresis value for brake activation voltage			
27	**Braking: time**	ms	1 ÷ 32767	Read / write
P027	Maximum braking actuation time			
28	**I2t: alarm time**	ms	1 ÷ 32767	Read / write
P028	Current limitation time delivered			
29	**Motor speed: current**	Rpm	-8000 ÷ +8000	Reading
P029	Motor rotation speed value			
30	**Motor speed: maximum**	Rpm	1 ÷ 8000	Read / write
P030	Value of the maximum speed set for the motor			
31	**Resolver: polar pairs**	n.	1 ÷ 8	Read / write
P031	Number of polar pairs of the resolver			
32	**Motor: polar pairs**	n.	1 ÷ 8	Read / write
P032	Number of polar torques of the motor			

N.B. Parameters 21-22-23-24 cannot be changed with the keyboard

Number parameter	Description	Units of measurement	Value range	Type of access
33	**Motor: timing angle**	n.	0 ÷ 4096	Read / write
P033	Motor timing angle			
34	**Encoder**	n.		Reading
P034	Value read by encoder			
35	**Encoder: number of bits**	n.	12 ÷ 32	Read / write
P035	Sets the number of bits read by encoder (**with resolver feedback set to 12)**			
36	**Encoder: simulated**	n.	0 ÷ 3	Read / write
P036	Simulated encoder resolution			
37	**Analog reference**	%	0 ÷ 100	Reading
P037	Analog reference value			
38	**SW Torque Limit Reference**	%	0 ÷ 100	Read / write
P038	Digital value of the torque limit			
39	**Torque limit reference HW**	%	0 ÷ 100	Reading
P039	Analog value of the torque limit			
40	**Couple required**	%	0 ÷ 100	Read / write
P040	Digital value of the required torque			
41	**Motor speed: required**	Rpm	-8000 ÷ +8000	Read / write
P041	Digital value of the required motor rotation speed. However, this limit is limited by the maximum motor speed parameter (parameter 26)			
42	**CW acceleration ramp**	s	0,01 ÷ 30,00	Read / write
P042	CW rotation acceleration ramp value			
43	**CW deceleration ramp**	s	0,01 ÷ 30,00	Read / write
P043	Value of the deceleration ramp with CW rotation			
44	**CCW acceleration ramp**	s	0,01 ÷ 30,00	Read / write
P044	CCW rotation acceleration ramp value			
45	**CCW deceleration ramp**	s	0,01 ÷ 30,00	Read / write
P045	Value of the deceleration ramp with CCW rotation			
46	**Initial parameter**	n.	1 ÷ 128	Read / write
P046	Parameter number displayed			
47	**Exit Event Configuration 1**	s	0 ÷ 32767	Read / write
P047	Event associated with exit 1			
48	**Exit Event Configuration 2**	s	0 ÷ 32767	Read / write
P048	Event associated with exit 2			

Number parameter	Description	Units of measurement	Value range	Type of access
49	**Input Event Configuration 1**	n.	0 ÷ 32767	Read / write
P049	Configuring the event associated with input 1			
50	**Input level 1 configuration**	n.	0 ÷ 1	Read / write
P050	Configuring Input Activation Level 1			
51	**Input Event Configuration 2**	n.	0 ÷ 32767	Read / write
P051	Configuring the event associated with input 2			
52	**Input level 2 configuration**	n.	0 ÷ 1	Read / write
P052	Configuring Input Activation Level 2			
53	**Pid speed Kp**	n.	0 ÷ 128	Read / write
P053	Speed pid Kp setting			
54	**Pid speed Ki**	n.	0 ÷ 128	Read / write
P054	Ki setting of the speed pid			
55	**Pid speed Kd**	n.	0 ÷ 128	Read / write
P055	Kd setting of the speed pid			
56	**Pid position Kp**	n.	0 ÷ 128	Read / write
P056	Setting Kp of the position pid			
57	**Pid position Ki**	n.	0 ÷ 128	Read / write
P057	Ki setting of the position pid			
58	**Pid position Kd**	n.	0 ÷ 128	Read / write
P058	Setting Kd of the position pid			
59	**Pid current Kp**	n.	0 ÷ 128	Read / write
P059	Kp setting of the current pid			
60	**Pid current Ki**	n.	0 ÷ 128	Read / write
P060	Ki setting of the current pid			
61	**Pid current Kd**	n.	0 ÷ 128	Read / write
P061	Setting Kd of the current pid			
62	**Pid Reference Id**	n.	0 ÷ 128	Read / write
P062	Reference for flow current			
63	**Not used**			
P063				
64	**Not used**			
P064				

Number parameter	Description	Units of measurement	Value range	Type of access
65	**Canbus: node number**	n.	0 ÷ 128	Read / write
P065	Canbus Node Number			
66	**Canbus: length id**	n.	0 ÷ 1	Read / write
P066	Id length			
67	**Canbus: bus speed**	n.	0 ÷ 7	Read / write
P067	Bus speed			
68	**Canbus: Status**	n.	0 ÷ 65535	Read / write
P068	Node status			
69	**Canbus: Rx Errors**	n.	0 ÷ 32767	Reading
P069	Number of receive errors			
70	**Canbus: Tx Errors**	n.	0 ÷ 32767	Reading
P070	Number of transmission errors			
71	**Key repetition time**	ms	10 ÷ 1000	Read / write
P071	Key repetition time			
72	**Refreshment time parameters**	ms	1 ÷ 65535	Read / write
P072	Initial parameter update delay			
73	**Alarm list scroll time**	ms	1 ÷ 65535	Read / write
P073	Scroll time of active alarms on the display			
74	**Menu timeout**	s	1 ÷ 100	Read / write
P074	Time to exit the menu in case of failure to press a button			
75	**Not used**	n.	0 ÷ 1	Read / write
P075				
76	**Not used**	n.	0 ÷ 1	Read / write
P076				
77	**Refer. Analog: Minimum calibration**	n.	0 ÷ 4096	Read / write
P077	Calibration of the analog reference against the minimum value			
78	**Refer. Analog: Maximum calibration**	n.	0 ÷ 4096	Read / write
P078	Calibration of the analog reference against the maximum value			
79	**Ref. torque limit: calibr. minimum**	n.	0 ÷ 4096	Read / write
P079	Calibration of the torque limit reference from the minimum value			
80	**Ref. torque limit: calibr. maximum**	n.	0 ÷ 4096	Read / write
P080	Calibration of the torque limit reference against the maximum value			

Number parameter	Description	Units of measurement	Value range	Type of access
81	**Homing: speed**	Rpm	-8000 ÷ +8000	Read / write
P081	Homing execution speed			
82	**Homing: reduced speed**	Rpm	-8000 ÷ +8000	Read / write
P082	Reduced homing execution speed			
83	**Homing: zero altitude speed**	n.	0 ÷ 65535	Read / write
P083	Zero altitude search speed			
84	**Homing: zero altitude laps**	n.	-32767 ÷ +32767	Read / write
P084	Number of revolutions at zero altitude			
85	**Homing: zero altitude angle**	n.	0x00 ÷ 0xFFFF	Read / write
P085	Angle at zero altitude			
86	**Homing: position 0 laps**	n.	-32768 ÷ +32767	Read / write
P086	Number of laps to be covered for position 0			
87	**Homing: angle position 0**	n.	0x00 ÷ 0xFFFF	Read / write
P087	Angle to reach for position 0			
88	**Positioner: sequence 1 - 4**	n.	0x00 ÷ 0xFFFF	Read / write
P088	Mask with the sequence of profiles to be executed			
89	**Positioner: sequence 4 - 8**	n.	0x00 ÷ 0xFFFF	Read / write
P089	Mask with the sequence of profiles to be executed			
90	**Posizionatore: consensus**	n.	0x00 ÷ 0xFFFF	Read / write
P090	Mask with profile chaining type			
91	**Number of revolutions**	n.	-32768 ÷ +32767	Read / write
P091	Number of revolutions positioner			
92	**Angle**	n.	0x00 ÷ 0xFFFF	Reading
P092	Current angle			
93	**Profile 1: Speed**	Rpm	0 ÷ +8000	Read / write
P093	Profile execution speed 1			
94	**Profile 1: Laps**	n.	-32768 ÷ +32767	Read / write
P094	Number of revolutions for the execution of the profile 1			
95	**Profile 1: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P095	Motor stop angle profile 1			
96	**Profile 1: Ramp**	s	0,01 ÷ 30,00	Read / write
P096	Profile acceleration/deceleration ramp time 1			

N.B. Parameters 81 through 128 cannot be changed with the keyboard

Number parameter	Description	Units of measurement	Value range	Type of access
97	**Profile 2: Speed**	Rpm	0 ÷ +8000	Read / write
P097	Profile execution speed 2			
98	**Profile 2: Laps**	n.	-32768 ÷ +32767	Read / write
P098	Number of revolutions for the execution of the profile 2			
99	**Profile 2: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P099	Motor stop angle profile 2			
100	**Profile 2: Ramp**	s	0,01 ÷ 30,00	Read / write
P100	Profile acceleration/deceleration ramp time 2			
101	**Profile 3: Speed**	Rpm	0 ÷ +8000	Read / write
P101	Profile execution speed 3			
102	**Profile 3: Laps**	n.	-32768 ÷ +32767	Read / write
P102	Number of revolutions for the execution of the profile 3			
103	**Profile 3: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P103	Motor stop angle profile 3			
104	**Profile 3: Ramp**	s	0,01 ÷ 30	Read / write
P104	Profile acceleration/deceleration ramp time 3			
105	**Profile 4: Speed**	Rpm	0 ÷ +8000	Read / write
P105	Profile execution speed 4			
106	**Profile 4: Laps**	n.	-32768 ÷ +32767	Read / write
P106	Number of revolutions for the execution of the profile 4			
107	**Profile 4: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P107	Motor stop angle profile 4			
108	**Profile 4: Ramp**	s	0,01 ÷ 30,00	Read / write
P108	Profile acceleration/deceleration ramp time 4			
109	**Profile 5: Speed**	Rpm	0 ÷ +8000	Read / write
P109	Profile execution speed 5			
110	**Profile 5: Laps**	n.	-32768 ÷ +32767	Read / write
P110	Number of revolutions for the execution of the profile 5			
111	**Profile 5: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P111	Motor stop angle profile 5			
112	**Profile 5: Ramp**	s	0,01 ÷ 30,00	Read / write
P112	Profile acceleration/deceleration ramp time 5			

Number parameter	Description	Units of measurement	Value range	Type of access
113	**Profile 6: Speed**	Rpm	0 ÷ +8000	Read / write
P113	Profile execution speed 6			
114	**Profile 6: Laps**	n.	-32768 ÷ +32767	Read / write
P114	Number of revolutions for the execution of the profile 6			
115	**Profile 6: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P115	Motor stop angle profile 6			
116	**Profile 6: Ramp**	s	0,01 ÷ 30,00	Read / write
P116	Profile acceleration/deceleration ramp time 6			
117	**Profile 7: Speed**	Rpm	0 ÷ +8000	Read / write
P114	Profile execution speed 7			
118	**Profile 7: Laps**	n.	-32768 ÷ +32767	Read / write
P118	Number of revolutions for the execution of the profile 7			
119	**Profile 7: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P119	Motor stop angle profile 7			
120	**Profile 7: Ramp**	s	0,01 ÷ 30,00	Read / write
P120	Profile acceleration/deceleration ramp time 7			
121	**Profile 8: Speed**	Rpm	0 ÷ +8000	Read / write
P121	Profile execution speed 8			
122	**Profile 8: Laps**	n.	-32768 ÷ +32767	Read / write
P122	Number of revolutions for the execution of the profile 8			
123	**Profile 8: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P123	Motor stop angle profile 8			
124	**Profile 8: Ramp**	s	0,01 ÷ 30,00	Read / write
P124	Profile acceleration/deceleration ramp time 8			
125	**Profile 9: Speed**	Rpm	0 ÷ +8000	Read / write
P125	Profile execution speed 9			
126	**Profile 9: Laps**	n.	-32768 ÷ +32767	Read / write
P126	Number of revolutions for the execution of the profile 9			
127	**Profile 9: Angle**	n.	0x00 ÷ 0xFFFF	Read / write
P127	Motor stop angle profile 9			
128	**Profile 9: Ramp**	S	0,01 ÷ 30,00	Read / write
P128	Profile acceleration/deceleration ramp time 9			

16. Parameters

Configuration (parameter 12)

What the configuration word bits mean		
Position Profiles Reference	How the drive works in position profile mode	

Speed Reference	Operation of the drive in speed mode	
Torque reference	Operation of the drive in torque mode	
Analog/Digital Reference	Reference type:	ON = digital OFF = analog
SW/HW torque limit	Type of torque limit:	ON = software OFF = hardware
Enable SW/HW	Type of qualification:	ON = software OFF = hardware
Tablet type Ptc/Ntc	Selection of the type of motor thermal pad	
Motor timing	Performs motor timing	
Parameter reading	Reads parameters from eeprom	
Parameter storage	Stores parameters in eeprom	
Parameter default	Place parameters with the default value	
Incremental encoder	Select the incremental encoder as feedback	
Hall + encoder	Select hall and incremental encoder sensors as feedback	
Absolute encoder	Select the absolute encoder as feedback	
Resolve	Select the resolver as the feedback.	

The Position **Profile Reference**, **Speed Reference**, and **Torque Reference** fields are exclusionary mortgages. Selecting one automatically deselects the others.

The Analog/Digital Reference field allows you to select the type of reference sent to the drive. In analog reference mode, the speed or torque reference is given by the analog reference input of the drive (value visible in **parameter 37**). In digital mode, the reference values are obtained by setting **parameter 41** for the speed reference mode and **parameter 40** for the reference mode in pairs.

The torque limit (hardware or software) is obtained by setting **parameter 38** for the digital format or in hardware mode the value can be read in **parameter 39**.

By setting this value to 100% the drive is able to deliver all the current set in **parameter 7**.

The torque limit is always available except in **torque reference** mode.

The enablement type (selectable hardware or software) allows you to select the type of enablement required by the drive.

With the hardware enablement, the input of the drive intended for this task must be activated, while for the software enablement you can do either by setting the Sw **TorqueEnable** bit in the **Status** word or by means of a special command in **parameter 15**.

If the enable operation is successful, the **Enabled Drive** field in the Word **Input** is set to active.

The Ptc/Ntc Pad Type parameter allows you to choose the type of motor thermal pad.

The **Motor Timing** parameter allows the calculation of the timing angle of the motor. The procedure is started only with the drive disabled and with no alarm active. During execution, the motor takes a sprint to the set position. At the end of the procedure, the timing flag is reset and you can proceed in normal operations.

The Parameter **Read**, **Store Parameters** and **Default Parameters parameters** allow respectively the reading of parameters from eeprom, the writing of all parameters and the restoration of parameters according to factory values.

The **Incremental Encoder**, **Hall + Encoder**, **Absolute Encoder**, and **Resolver** parameters (all mutually exclusive) allow you to select the desired feedback type.

Status (parameter 13)

Meaning of state word bits		
SW torqueenablement	Enabling drive:	ON = enablement request OFF = disabling request
Towards CW/CCW rotation	Set the rotation direction:	ON = CW OFF = CCW
Minimum torque limit calibration	Calibration of the minimum value of the analog input torque limit	
Max torque limit calibration	Calibration of the maximum value of the analog input torque limit	

Min analog input calibration	Calibration of the minimum value of the analog reference input	
Max analog input calibration	Calibration of the maximum value of the analog reference input	
Homing execution	Start running the homing process	
Encoder codifica Gray	Enable Gray encoding of the encoder value	
Encoder prot. SSI + ST	Enables the Encoder's SSI (Single Turn) protocol	

Enable Profile Execution	Start running profiles	
Enable Placement	Start positioning	

Enabling ramps	Enable ramps	

The **ENABLE SW Torque**parameter allows the drive to be enabled if there are no alarms and the software enablement of the drive has been previously selected.

The CW/CCW Rotation Direction parameter selects the direction of rotation of the motor.

Min torque limit calibration and **max torque limit calibration** allow you to calibrate, respectively, the minimum and maximum value of the analog torque limit input. The calibration of makes it necessary to have all the excursion of values from the analog. To perform this operation, the drive must be disabled and the analog input must be brought to the minimum value. Then you enable the flag. At the end of the reading the flag is automatically reset. Similarly, to calibrate the maximum reading, the value of the analog input must be brought to the maximum value and then the flag must be enabled.

Similarly, the **Min Analog Input** Calibration and **Max Analog Input Calibration** parameters allow analog input calibration.

Homing Execution allows the execution of the homing procedure set in the parameters.

Gray Encoding Encoder enables Gray encoding of the encoder to obtain a value in standard format.

Encoder prot. SSI selects the protocol type of the absolute encoder.

Enable Profile Execution enables the execution of placement profiles. To enable the flag it is necessary that the drive is set to work with reference to position profiles and enabled. As soon as the placement starts, the flag is reset.

Enable Placements allows you to start the placement process.

Enabling ramps allows the enabling of ramps during operation with speed reference. The ramp timing values can be set in parameters **42**, **43**, **44** and **45**.

In operation with reference to the position profiles, the ramps are always enabled.

All calibration procedures are not mandatory but are necessary to have the maximum excursion of the input values.

Input (parameter 14)

What word input bits mean		
Drive OK	The drive is ready to operate	
Drive enabled	Drive enablement status:	ON = enabled OFF = disabled
HW Enablement	Hardware Enablement Input Status:	ON = active input, enabling required OFF = inactive input, disabling request
Braking	Brake driving status:	ON = active braking resistance OFF = non-active braking resistance
Exit Event 1	Status of the event associated with Exit 1	ON = active output OFF = output disable
Exit Event 2	Status of the event associated with Exit 2	ON = active output OFF = output disable
Entrance Event 1	Status of the event associated with input 1:	ON = active input OFF = inactive input
Entrance Event 2	Status of the event associated with input 2:	ON = active input OFF = inactive input
Homing performed	Report that the homing procedure has been performed	
Key	Signal the press of one of the keys	

Hall 1	Hall 1 Sensor Status	
Hall 2	Hall 2 Sensor Status	
Hall 3	Hall 3 Sensor Status	
Positioner at height	Positioner Status:	ON = posizionatore in quota OFF = positioner not at height

Drive command (parameter 15)

The commands that can be given to the drive (via the parameter on the interface) are as follows:

Value	Way
0	Positioner profiles
1	Not used
2	Speed mode
3	Torque mode
4	Analog reference
5	Digital Reference
6	SW torque limit
7	Torque limit HW
8	SW Enable
9	HW Enable
10	Ptc motor pads
11	Ntc motor pads
12	Motor timing
13	Reading parameters from eeprom
14	Save parameters to eeprom
15	Set parameters with default values
16	Incremental encoder feedback
17	Feedback from Hall sensors and incremental encoder
18	Absolute encoder feedback
19	Resolver feedback
20	Enabling Drive (Software Enabled)
21	Disabling drive (software-enabled)
22	CW motor rotation
23	CCW motor rotation
24	Calibration of the minimum torque limit value
25	Calibration of the maximum torque limit value
26	Not used
27	Not used
28	Calibration of the minimum analog reference value
29	Calibration of the maximum analog reference value
30	Homing

with keypad, only values 1 through 23 are accepted

Value	Way
31	Enabling Gray encoder encoding
32	Disabling Gray encoder encoding
33	SSI encoder protocol selection
34	Enabling Profile Execution
35	Not used
36	Enabling ramps
37	Disabling ramps
38	Not used
39	Not used
40	Not used

Drive command outcome (parameter 16)

The command given through parameter 15 results in an outcome displayed in parameter 16.

For the results of the command, the following table applies:

Value	Description
0	No errors, successful
1	Operation not performed
2	Operation not performed, you need to disable the drive
3	Operation not performed, you need to enable the drive
4	Operation not performed, drive in alarm
5	Successful change
6	Wrong command
7	Operation not performed due to failure to select operating modes
8	Function not supported by the mode in use
9	Operation running

Drive status (parameter 17)

The parameter indicates the status of the drive:

Value	Outcome
0	Drive disabled
1	Drive enabled

Setting the simulated encoder (parameter 36)

In the case of feedback with resolver it is possible to have the simulated encoder output on the **X7 connector**.

Setting the parameter in the following table changes its resolution:

Value	Resolution (pulses per turn)
0	1024* Number of Polar Pairs Resolver
1	512 * Number of Polar Pairs Resolver
2	256* Number of Polar Pairs Resolver
3	128 * Number of Polar Pairs Resolver

Digital output event configuration (parameters 47 and 48)

The two outputs on the device can be associated with a series of events shown in the following table.

Any outputs driven are present on the **X6 Connector**.

Value	Event
0	No events
1	Drive Ok
2	Alarm
3	Brake connection
4	Drive ready
5	Drive operation in torque mode
6	Drive operation in speed mode
7	Drive operation in position mode
8	Drive enabled
9	Homing running
10	Homing performed
11	Drive at height
12	Fault power alarm
13	Module temperature alarm
14	Motor thermal pad alarm
15	Bus undervoltage alarm
16	Bus surge alarm
17	I2t alarm
18	Resolver alarm
19	Brake alarm
20	Disabling request alarm
21	Safety relay alarm
22	Encoder alarm
23	Current sensor alarm
24	Motor cable connection alarm
25	PWM speed (only available for output 2)
26	Current PWM (only available for output 2)

Digital input event configuration (parameters 49 and 51)

The two inputs can be associated with a series of events shown in the following table. The **parameters** to set the event associated with the inputs are the number **49** and **51** respectively.

Inputs are available on the **X6 Connector**.

Value	Event
0	No events
1	Micro of zero
2	Start positioning

Digital input level configuration (parameters 50 and 52)

You can configure the focus of digital inputs by setting parameter 50 for input 1 and 52 for input 2.

The possible values are as follows:

Value	Event
0	Active input for 0 Volts
1	Active input for 24 Volts

Alarms (parameters 3 and 4)

The following table describes the possible alarms reported by the drive

Alarms		
Fault power	Display on display:	
Description:	Indicates the general alarm status due to the intervention of the protection of the power section. In this case it is advisable to check the motor and the connections to it to check for any short circuits or insulation losses. An alarm of this type can also be caused by an incorrect calibration of the current ring.	
Bus overvoltage	Display on display:	
Description:	BUS surge alarm. The signal can occur following a sudden braking of the motor that causes an increase in the BUS voltage beyond the threshold set as the maximum bus voltage or following an increase in the power supply network.	
Sottotensione bus	Display on display:	
Description:	BUS undervoltage alarm. This alarm appears when the power supply is not present, check the status of the protective fuses on the power phases.	
I2t	Display on display:	
Description:	Alarm when the set current threshold has been exceeded. This alarm is triggered when the drive delivers a current higher than the nominal for too long a period.	
Disabling request	Display on display:	
Description:	The alarm indicates that the drive has been switched on with active hardware enablement or in the case of momentary intervention of an alarm. The report ceases when the hardware enablement request fails.	
Resolve	Display on display:	
Description:	Resolver stop alarm. Check the integrity and correctness of connections with the resolver.	

Motor thermal probe	Display on display: 
Description:	Motor overheating alarm. The drive is temporarily disabled as long as the anomaly persists and automatically restores itself as soon as the conditions of correct operation recur. In case of unjustified alarms, make sure that you have correctly set the type of thermal pad used by the motor.
Module temperature	Display on display: 
Description:	The alarm signals that the internal temperature of the power module has reached its maximum value. The drive is automatically disabled. The signal is retracted when the lower temperature threshold is reached.
Current sensor	Display on display: 
Description:	Signals the failure of one or more current sensors.
Braking time or breakage	Display on display: 
Description:	The alarm is triggered when, following an intervention of the braking resistance, the bus voltage does not fall within the normal levels or after the maximum driving time of the resistance is reached.
No security unlocking	Display on display: 
Description:	The alarm signals the absence of the release of the safety relay.
Encoder	Display on display: 
Description:	Encoder stop alarm. Check the integrity of the encoder and the correctness of its connections.

17. Drive keyboard

If you do not use the ESDRIVE2 interface for communication with the drive you can use the keyboard

On the front of the drive there are four buttons with which you can view and change the main operating parameters.

When switched on, the drive displays the firmware version for a few seconds.

When the drive is ready to operate on the display appears:

- The parameter value set in **parameter 46**
- The list of active alarms

During this state, pressing any of the keys allows access to the list of parameters.

The display appears as follows **P001**.

In this state the keys take on the following meaning:

P1 = previous parameter. In the case of the **P001** parameter the previous one will be the **P128**.

P2 = next parameters. In the case of the **P128** parameter, the next one will be **P001**.

P3 = displays or stores the parameter value

P4 = exit from the parameter list or confirm change of bit state (status column or historical reset alarms)

Once the desired parameter is selected, pressing the **P3** key displays the value of the parameter. This display can be in **decimal** or **hexadecimal** format depending on the type of parameter.

If the parameter is editable (i.e. it is not read-only) with the **P1** key it is possible to decrease its value, while with the P2 key it is incremented. The values have an internal limit (both minimum and maximum).

If you want **to confirm the value of the parameter,** you need to press the **P3** button.

with the **p4** key the change is canceled the parameter will remain set to the previous value and you return to the parameter list

For parameters 4, 12 and 13 which are bit fields the procedure differs.

Once the parameter is selected with the **P3** key, the value **01-0/1** is displayed. The first value represents the first pit of the affected column (or the first alarm) while the second is the state. A value **of 1** is associated with the focus and **0** is associated with the inactive state.

Once you have selected the bit to change, the **P3** key allows you to vary the state of the field (from **0** to **1** and vice versa). With the **P4** button you confirm the change of state and return to the parameter list

The drive keyboard allows you to view all the parameters but not to change them all

Parameter 15 Keyboard Command Drive goes up to a value of 23, no later than

Parameters 21-22-23-24 and 81 to 128 can only be changed using the ESDRIVE2 interface

18. Serial communication

The drive has the possibility to be connected via USB to a PC using a standard cable (see **connector X4**).

The characteristics of the serial channel are as follows:

Baud rate:	**115200**
Stop bits:	**1**
Data bits:	**8**
Parity:	**None**
Drive Selection:	**BDSE300**
Protocol selection:	**ES Technology**

N.B.=At the time of connection with the drive, the presence of an internet connection is required because the computer needs the FT232-FTDI UART serial driver.

For Windows 7, 8 and 10 operating systems the driver is automatically downloaded.

For older operating systems you may need to download the driver manually at https:www.ftdichip.com/Drivers/VCP.htm

19. Procedure for motor timing

For the timing of the drive with the motor the latter must be free, not charged, and the drive disabled

Using the ESDRIVE2 interface

-go to the first page of the parameters (F5)

-select parameter 31, enter the number of polar pairs of the resolver (value 1 by default) and press enter

-select parameter 32, enter the number of polar pairs of the motor (value 3 by default) and press enter

-go to the States page (F9)

-put the bit "timing" of the first column Configuration in "on" and click on "write" to perform operation

-the crankshaft moves until it finds the correct position and the timing bit returns to "off"

-enable the drive and check correct drive/motor operation

-disable the drive and save the new parameters in eprom with a special icon or by putting in "on" the bit "stores parameters" of the Configuration column states page and click on "write" to perform operation

Using the keyboard

-press P1/P2 to select parameter 31 on the display, press P3 to enter and with P1/P2 choose the number of polar pairs of the resolver (value 1 by default), press P3 to save

-press P4 to return to the parameter list

-press P1/P2 to select parameter 32 on the display, press P3 to enter and with P1/P2 choose the number of polar pairs of the motor (value 3 by default), press P3 to save

-press P4 to return to the parameter list

-press P1/P2 to select parameter 15 on the display, press P3 to enter and with P1/P2 select the value 12 and press P3 to perform the timing

-the crankshaft rotates until the correct position is found

-enable the drive and check the correct functioning of the drive/motor system

-deactivate the drive

-press P1/P2 to select parameter 15 on the display, press P3 to enter and with P1/P2 select the value 14 and press P3 to store the parameters in eprom

20. Procedure for moving the motor using the ESDRIVE2 interface

You can move the motor without having to connect unlocks or signals to the drive, after timing, using the ESDRIVE2 interface.

-power the drive, check that the drive is free of alarms and the display displays "diS" and connect with the ESDRIVE2

-open page STATES (F9)

-on the Configuration column put on the bit "Digital / analog reference" and click on the below "Write"

-on the Configuration column put on the bit "Enabling SW / HW" and click on the below "Write"

-to enable the drive go to the Status column and put on the bit "Enabling SW pair" and click on the below "Write"

-the display must go to the state " Abi. " and the motor remain stationary in pairs

-go to the second page of the parameters (F6) and write on parameter 41 "Motor speed required" the number of revolutions you want the motor to do and click send

-the motor must rotate at the set number of revolutions

-putting the negative sign before the number of revolutions the motor turns in the opposite direction

21. Note

The information contained in this document may be modified without notice by ES TECHNOLOGY s.r.l.

In the event of errors of any kind within this manual, please let us know to make the necessary changes, thus improving the service relationship of ES TECHNOLOGY towards its customers.

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