



The TB ... turrets are driven through a brushless motor and its servo amplifier type SA-01A-TB which has to be installed in the electrical cubicle (dimensions of the servo amplifier 325x210x80 mm). The servo amplifier can command the motor and can communicate, through its own "logic" directly with the machine "logic" and position the turret as per Numerical Control request.

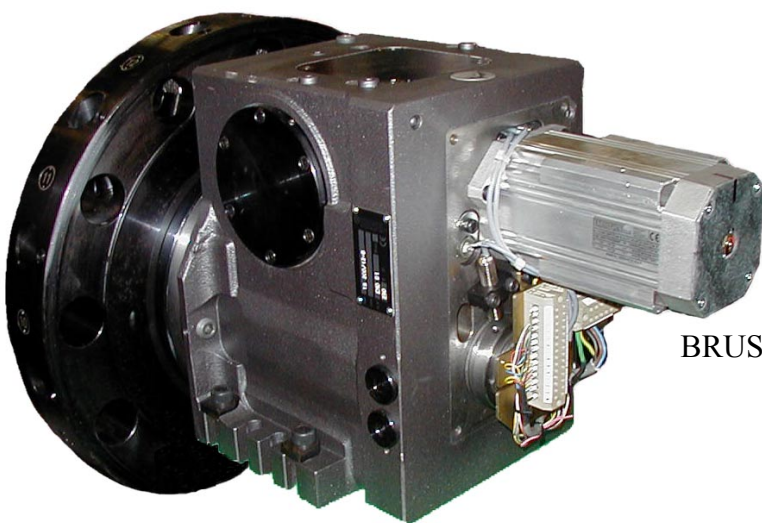
SERVO AMPLIFIER SA-01A-TB

sw. release **11.7**

**TURRETS
TB series...**
**Instructions manual
for the connections
and handling**



TURRET TB series ...



BRUSHLESS MOTOR



PRELIMINARY	Pag. 1
INDEX	Pag. 2
ELECTRICAL CONNECTIONS (TOPOGRAPHIC)	Pag. 3
ELECTRICAL CONNECTION SCHEME	Pag. 4
I/O SIGNAL CONNECTIONS	Pag. 5
TURRET TYPE SELECTION	Pag. 6
OPERATIVES MODES SETTING (0)	Pag. 7
OPERATIVES MODES SETTING (1)	Pag. 8
OPERATIVES MODES SETTING (1) example	Pag. 9
OPERATIVES MODES SETTING (2-3-4)	Pag. 10
OPERATIVES MODES SETTING (5-6)	Pag. 11
OPERATIVES MODES SETTING (7)	Pag. 12
STARTING - ZERO RESEARCH	Pag. 13
DIAGNOSTIC - ALARM HANDLING	Pag. 14

Before the “put in function”, read the instructions given in this manual.

It's forbidden to get into the internal parts of the servoamplifier.

In case it is necessary to get into the internal components, with qualified technicians, we remind to wait at least 5 minutes, before taking out the covers, in order to permit to discharge the condensers.

Responsabilty and warranties decline if the notices and instructions are not followed.

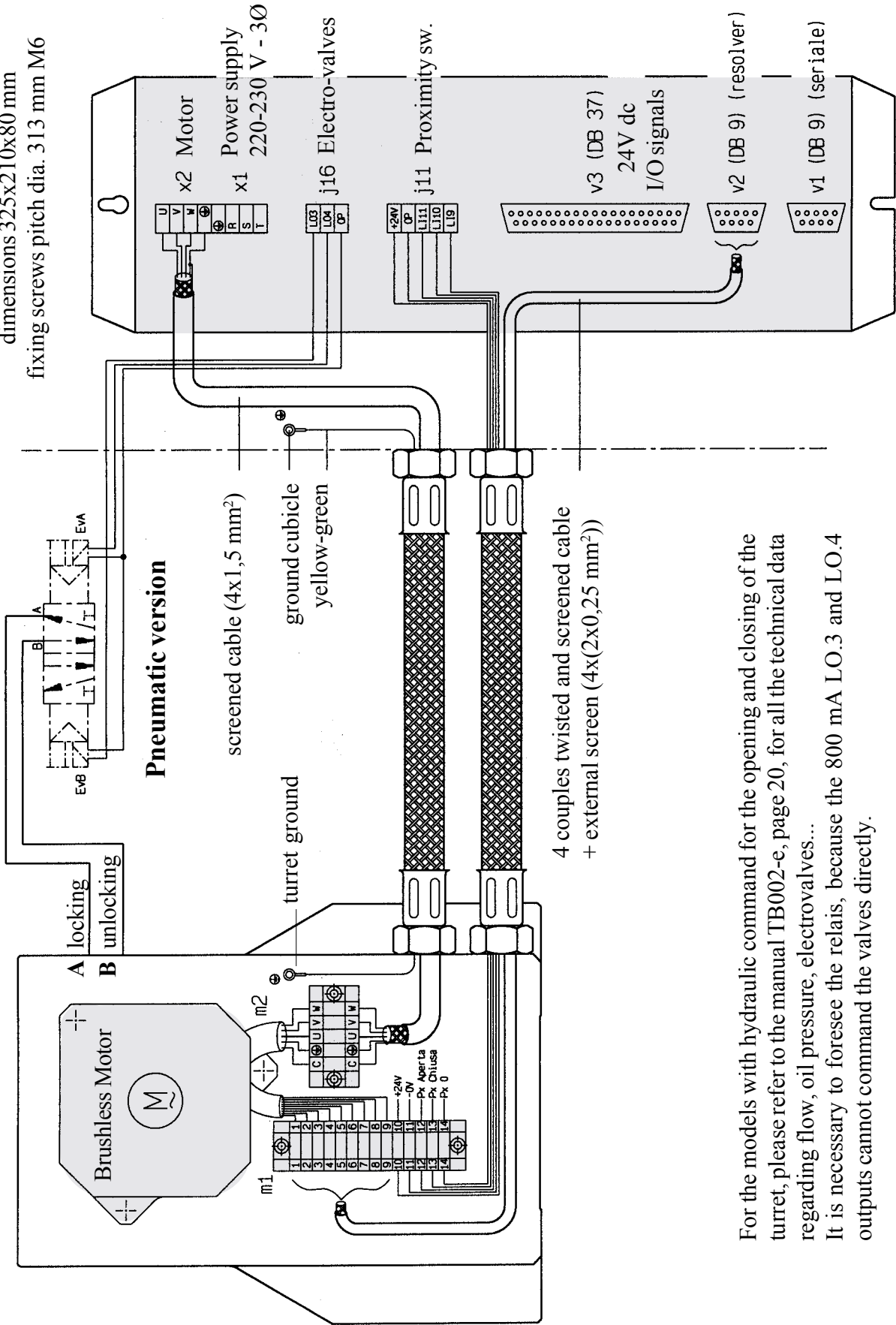


Electrical connections topographic scheme (turret – servoamplifier – valves)

Servoamplificatore SA-01A-TB

dimensions 325x210x80 mm

fixing screws pitch dia. 313 mm M6



For the models with hydraulic command for the opening and closing of the turret, please refer to the manual TB002-e, page 20, for all the technical data regarding flow, oil pressure, electrovalves...
It is necessary to foresee the relays, because the 800 mA LO.3 and LO.4 outputs cannot command the valves directly.

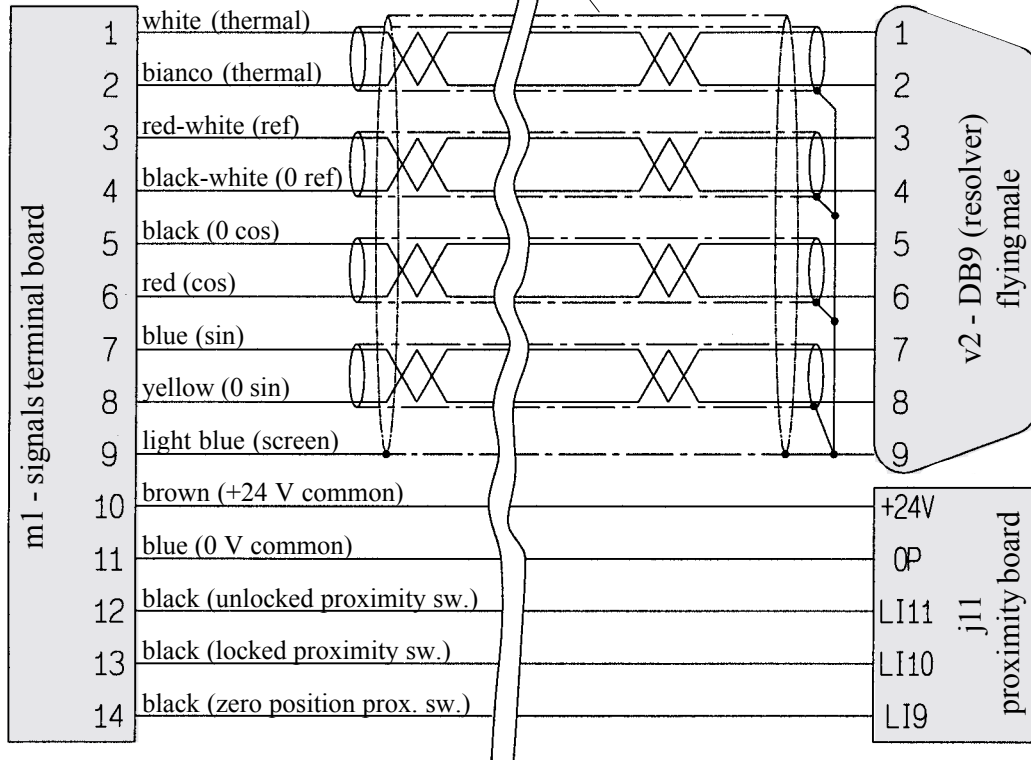


Power supply and connection between turret's terminal boards and servo amplifier's terminal boards

4 couples twisted and screened cable
+ external screen (4x(2x0,25 mm²))

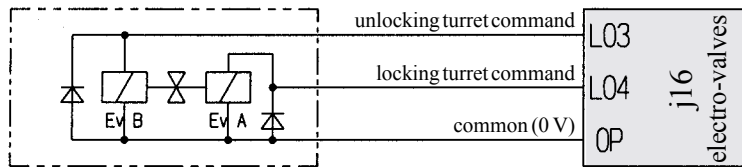
Turret terminal board

Servo-amplifier terminal board



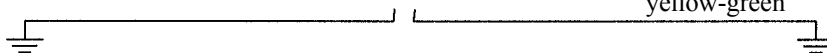
NOTA: The terminals j11 e j16 are the Phoenix series MSTB 2,5 step 5,08 respectively with 5 e 3 ways selfprotected inputs

Electro-valves Hydraulic or Pneumatic circuit

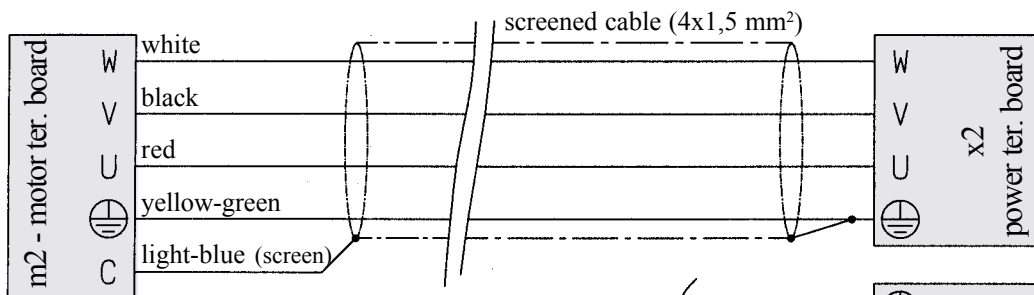


outputs protected with PTC - 24 V max. 800 mA

Turret ground

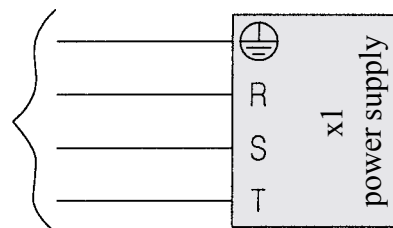


ground cubicle



protections against short-circuits phase to phase

Three phase power supply **220 – 230V 50/60Hz**
It's recommended to respect the limit of +10%.
 Protection through fuses and/or magnetthermic
 It's not necessary to foresee an EMC filter, because already present in the servo amplifier
 Foresee **1 kVA** transformer or autotransformer
 In case of using existing transformer $P_{max} = 6kVA$
 In case of using existing autotransformer $P_{max} = 3,8 kVA$



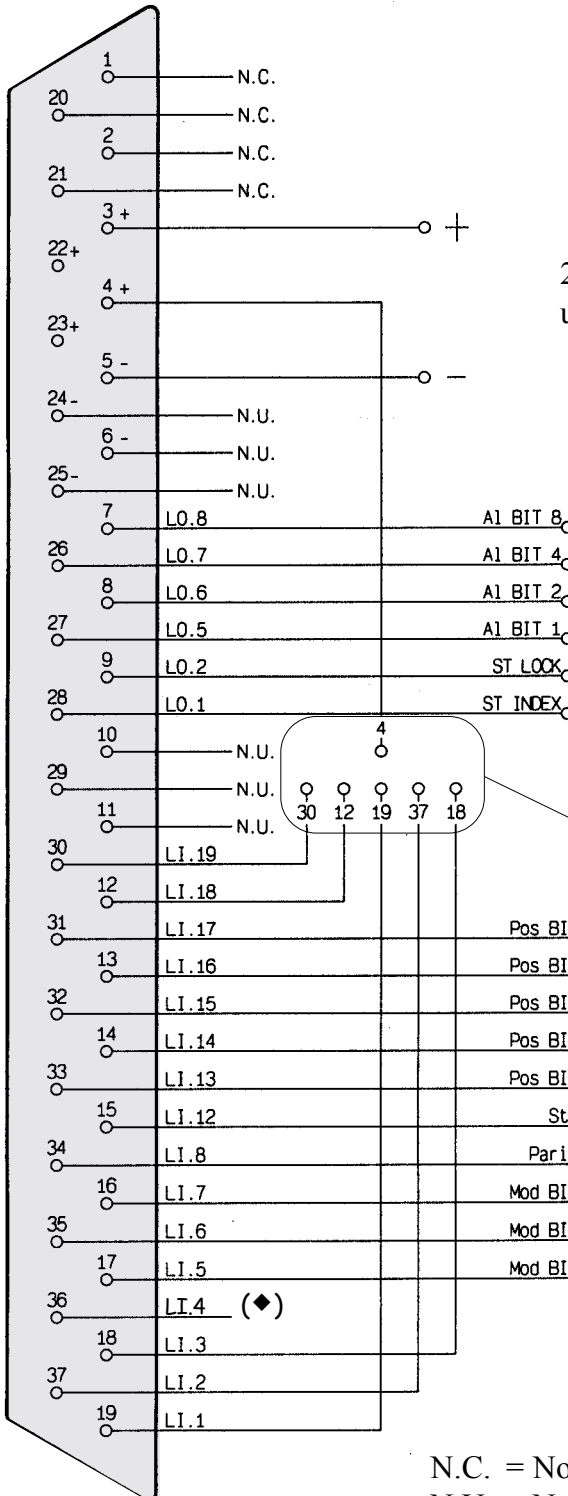
Warning: in order to guarantee a good contact, has to be assured that in the terminals x1 e x2 the wirings have to be fitted till the end



Wiring scheme I/O cable scheme (between servoamplifier and CNC)

N.B. The inputs require enable with positive signal + 24V

v3 - DB 37 female connector I/O 37 pin (welding side view)



24V DC +/- 10% levelled 50W max
use fuse 2 A

Outputs for alarm handling
24V 100mA max. (page 14)

Signal turret locked (24V-100mA max.)
Signal turret in position (24V-100mA max.)

Turret type selection
Execute the necessary jumpers with PIN 4 (+24V)
according to the connected turret (see page 6)

Code for position request with
parity control and Start
(pag. 8)

Operative's Mode selection
(pag. 7÷12)

N.C. = Not connected

N.U. = Not used

(◆) = In preparation for the parameters personalization



Turret type selection and relative number of positions, which have to be handled by the servo amplifier.

For the selection of the turret is necessary to make the necessary bridges between PIN 4 (+24V) and the respective setting bits (pin 19 – 37 – 18 – 12 – 30) according to the turret connected to the servoamplifier.

Between brackets, in the entry bits, are indicated the respective connector's (v3 – DB37) pins.

The column “decimal reference” is only given for information and it is equivalent to decimal representation of the setting bits.

Torretta tipo Turret type	Posizioni Positions	LI.1 (19) bit 1	LI.2 (37) bit 2	LI.3 (18) bit 4	LI.18 (12) bit 8	LI.19 (30) bit 16	ref. Dec.
TB 120	12	0	0	0	0	0	0
TB 120	8	1	0	0	0	0	1
TB 120	24	0	0	0	1	0	8
TB 120	16	1	0	0	1	0	9
TB 160	12	0	0	1	0	0	4
TB 160	8	1	0	1	0	0	5
TB 160	24	0	0	1	1	0	12
TB 160	16	1	0	1	1	0	13
TB 200	12	0	1	0	0	0	2
TB 200	8	1	1	0	0	0	3
TB 200	24	0	1	0	1	0	10
TB 200	16	1	1	0	1	0	11
TB 250	12	0	1	1	0	0	6
TB 250	8	1	1	1	0	0	7
TB 250	24	0	1	1	1	0	14
TB 250	16	1	1	1	1	0	15
TB 320	12	0	0	0	0	1	16
TB 320	8	1	0	0	0	1	17
TB 320	24	0	1	0	0	1	18
TB 320	16	1	1	0	0	1	19
TB 400	12	0	0	1	0	1	20
TB 400	8	1	0	1	0	1	21
TB 400	24	0	1	1	0	1	22
TB 400	16	1	1	1	0	1	23



The selection of the possible “operative modes” is given by the combination of the signals Mod BIT1 – ModBIT2 – ModBIT4, connected through the connector v3 – DB37 to the inputs of the internal logic of the servo amplifier LI 5 (pin17), LI.6 (pin 35) and LI.7 (pin 16) as per following data sheet.

The enable of the inputs has to occur with a positive signal 24Vdc

Operative modes selection data sheet

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
0	Emergency / Reset	0	0	0
1	Normal condition Automatic selection shortest way	1	0	0
2	Forced rotation in CW direction	0	1	0
3	Forced rotation in CCW direction	1	1	0
4	Positioning next tool	0	0	1
5	Services operation	1	0	1
6	Not used	0	1	1
7	Acquirement resolver's position	1	1	1

in brackets the nr of pins of the connector v3 - DB37

0 - Operative Mode “Emergency or Reset”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
0	Emergency / Reset	0	0	0

Setting to zero all the inputs Mod BIT it is possible to obtain two conditions:

- 1 EMERGENCY – If the turret is enabled to the position research, the setting of the Operative Mode “zero” stops all the movements of the turret and eliminates the signals ST-INDEX and ST-LOCK
- 2 RESET – This condition with the setting of the operative mode “zero” is normally used to cancel an alarm condition.

The setting of the operative mode “zero”has to have a duration of more than 300ms and does not need the OK through the START command.

It’s recommended therefore, not to select the operative mode “zero” during the changes of the operative modes in order to make again a “Zero research” (see page 13)

The conditions of EMERGENCY and of RESET can remain without any problem till a change in one of the inputs Mod BIT.



1 – Operative mode – normal function – “ Automatic shortest way selection”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
1	Normal condition Automatic selection shortest way	1	0	0

Setting, through the Mod BIT inputs, the operative mode “one”, the normal function condition is enabled, it means, that according to the positioning requests, through the positions codes with parity control, the servo amplifier will position the turret, into the requested one, through the shortest way.

The positions codes setting have to be given through the inputs:

PosBIT1 PosBIT2 PosBIT4 PosBIT8 PosBIT16 PARITY

Connected through the connector v3-DB37 to the inputs of the internal logic of the servoamplifier:

LI.13 (pin33) LI.14 (pin34) LI.15 (pin32) LI.16 (pin13) LI.17 (pin31) LI.18 (pin34)

as per following data sheet.

Position	Pos BIT 1 LI.13 (33)	Pos BIT 2 LI.14 (14)	Pos BIT 4 LI.15 (32)	Pos BIT 8 LI.16 (13)	Pos BIT 16 LI.17 (31)	PARITA' LI.8 (34)
1	1	0	0	0	0	1
2	0	1	0	0	0	1
3	1	1	0	0	0	0
4	0	0	1	0	0	1
5	1	0	1	0	0	0
6	0	1	1	0	0	0
7	1	1	1	0	0	1
8	0	0	0	1	0	1
9	1	0	0	1	0	0
10	0	1	0	1	0	0
11	1	1	0	1	0	1
12	0	0	1	1	0	0
13	1	0	1	1	0	1
14	0	1	1	1	0	1
15	1	1	1	1	0	0
16	0	0	0	0	1	1
17	1	0	0	0	1	0
18	0	1	0	0	1	0
19	1	1	0	0	1	1
20	0	0	1	0	1	0
21	1	0	1	0	1	1
22	0	1	1	0	1	1
23	1	1	1	0	1	0
24	0	0	0	1	1	0

The rotation is enabled through the signal START applied to the input LI.12 (15) of the v3-DB37 connector. For the correct sequence see example in page 9.

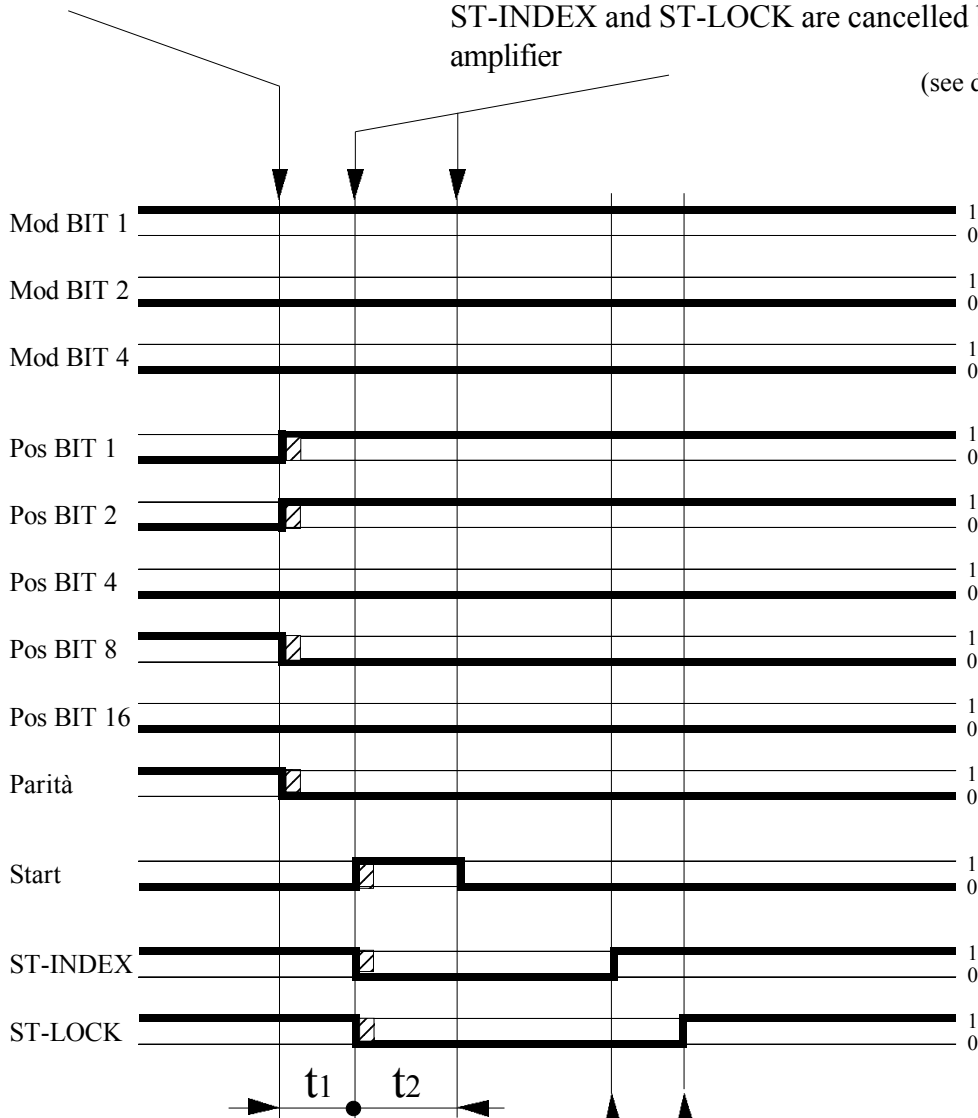


In the diagram we represent an example of positioning's sequence and the respective control to a position request nr 3 starting from position 8.

PosBIT setting as per data sheet
In page 8 for the position request 3

START signal which enables the position reasearch.
t1= delay time to enable START signal with regard
to the PosBIT setting $\geq 50 \text{ ms} \leq 5 \text{ sec}$.
t2= duration time of START signal $\geq 50 \text{ ms} \leq 200 \text{ ms}$
After having recognized the START signal, the signals
ST-INDEX and ST-LOCK are cancelled by the servo
amplifier

(see delay times)



ST-INDEX = Turret's signal – reached position
With this signal is already possible to enable the movements
of the axisto go in the working area

ST-LOCK = Turret's signal - turret closed in
the requested position
**To enable the working both signals ST-
INDEX and ST-LOCK have to be present.**

▨ Normal acceptable delays $\cong 30 \div 50 \text{ ms}$



2 – Operative mode “Forced Rotation in CW direction”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
2	Forced rotation in CW direction	0	1	0

Setting through the inputs ModBIT, the operative mode “two” is enabled the forced rotation in CW direction, it means, that according to the positioning requests, through the positions codes with parity control, the servo amplifier will position the turret, into the requested position, through the a rotation in “CW” direction even if it will be a longer way.

The rotation is enabled through the signal START as in the normal function.

3 – Operative mode “Forced Rotation in CCW direction”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
3	Forced rotation in CCW direction	1	1	0

Setting through the inputs ModBIT, the operative mode “three” is enabled the forced rotation in CCW direction, it means, that according to the positioning requests, through the positions codes with parity control, the servo amplifier will position the turret, into the requested position, through the a rotation in “CCW” direction even if it will be a longer way.

The rotation is enabled through the signal START as in the normal function.

4 - Operative Mode “Positioning next tool” (JOG)

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
4	Positioning next tool	0	0	1

Setting, through the inputs ModBIT, the operative mode “four”, is enabled the condition of positioning the turret to the next one in regards to the current.

It is possible to select the sense of positioning of the next tool setting the PosBIT1 and 2 as per following data sheet.

Pos BIT 1 LI.13 (33)	Pos BIT 2 LI.14 (14)
1	0
0	1

Positioning next tool in CW rotation
Positioning next tool in CCW rotation

The rotation is enabled through the signal START as in the normal function

NOTE: For the turrets sizes 320 / 400 the sense of rotation is in the opposite way



5 - Operative Mode “Services Operations”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
5	Services operation	1	0	1

Setting , through the inputs Mod BIT, the operative mode “five” is enabled the “service working condition”, which permits to carry out the operations indicated in the data sheet shown below, using the positions Pos BIT and the parity BIT.

The operation is enabled through the signal START as in the normal function.

Operations		Pos BIT 1 LI.13 (33)	Pos BIT 2 LI.14 (14)	Pos BIT 4 LI.15 (32)	Pos BIT 8 LI.16 (13)	Pos BIT 16 LI.17 (31)	PARITY LI.8 (34)
● (◆)	Continuous rotation in "CW" direction	1	0	0	0	0	0
● (◆)	Continuous rotation in "CCW" direction	0	1	0	0	0	0
○	Positioning next tool in "CW" direction	1	0	0	0	0	1
○	Positioning next tool in "CCW" direction	0	1	0	0	0	1
●	Turret locking	0	0	1	0	0	0
●	Turret unlocking	0	0	0	1	0	0

- Operations that can be carried out also without “Acquirement resolver’s position” and without “Zero research”
- Operations enabled only if the “Zero research” has been made
- ◆ In order to stop the continuous rotation is necessary to set the operative mode “zero” – (RESET/EMERGENCY)

NOTE: For the turrets sizes 320 / 400 the sense of rotation is in the opposite way.

6 - Operative Mode “Not used”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
6	Not used	0	1	1



7 - Operative Mode “Acquirement resolver’s position”

ref. Dec.	Operative mode	Mod BIT 1 LI.5 (17)	Mod BIT 2 LI.6 (35)	Mod BIT 4 LI.7 (16)
7	Acquirement resolver's position	1	1	1

Setting , through the inputs Mod BIT, the operative mode “seven”, is enabled the procedure for the acquirement of resolver’s position corresponding to the position”1” of the turret (condition at the delivery). All the turrets are linked to the own servo amplifier writing the respective part numbers in the Test Report.

Therefore the acquirement of the resolver’s position is made originally during the testing in BARUFFALDI workshop.

This procedure essential for the correct function of the turret, has to be made again:

- in case there is an exchange of servo amplifier
- in case of change of servo amplifier
- in case of substitution of the Brushless motor
- during a servicing, in case is not sure the correct re-assembly of the motor shaft in the original position

Operative sequence:

- Set the Operative Mode “seven”
- Set the PosBIT and the parity to Zero
- Give a START command in order to open the turret
- Verify the allignement of the marks on the “rotating” coupling and the “fixed” coupling (indicating the position “1” of the turret); if necessary rotate manually the rotating coupling or the disc to enable the marks to correspond.
- Wait 5 sec at least
- Give a new START command in order to close the turret and wait the signal of turret closed ST-LOCK

Note: without this procedure is not possible to make any position research



At the starting of the machine (servo amplifier inputs 24Vdc and 220Vac), is automatically carried out a turret's locking cycle, which if correctly made will enable the signal ST-LOCK, and therefore, after a wait of at least 5 seconds, it will be possible to make a "Zero research" necessary to enable the servo amplifier to research the resolver's initial position corresponding to the position "1" of the turret.

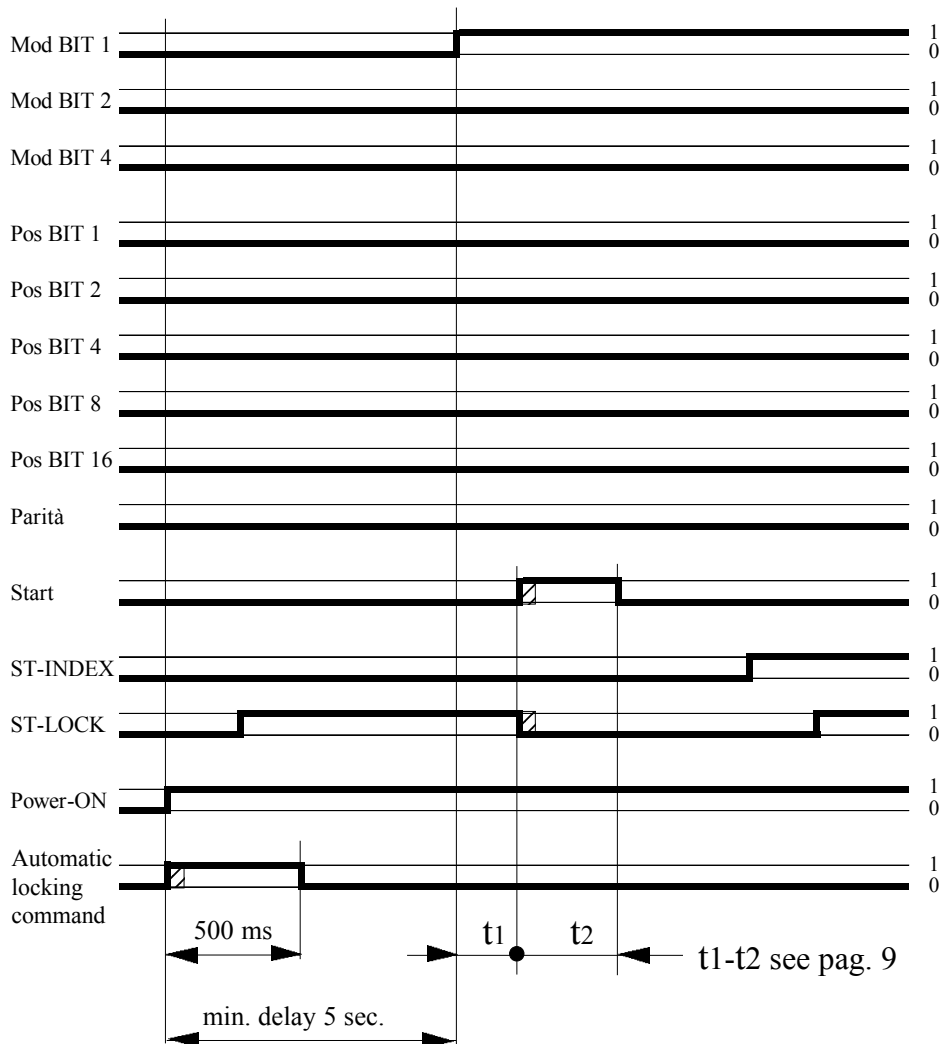
In case the turret should not complete regularly the locking cycle, it is anyway possible, without the ST-LOCK, to make a "Zero research"

ZERO RESEARCH

- Set the Operative Mode "one"
- Set the PosBIT and the Parity to zero
- Give a START command
- Wait that the turret (slow rotation) executes the research till stops in position "1"
- Wait the turret's locking signals ST-LOCK e ST-INDEX

At this point the turret and the servo amplifier are ready to execute the commands for the positioning of the turret

Example of the starting and zero research sequence:





ALARMS HANDLING

The handling of diagnostics according to the alarms informations is possible through the indications given by the following output signals

AI BIT1	AI BIT2	AI BIT4	AI BIT8
connected through the connector v3-DB37 to the respective outputs:			
LO.5 (27)	LO.6 (8)	LO.7 (26)	LO.8 (7)

ref. Dec.	Alarms description	AI BIT 1 LO.5 (27)	AI BIT 2 LO.6 (8)	AI BIT 4 LO.7 (26)	AI BIT 8 LO.8 (7)
1	Power Fault	1	0	0	0
2	Maximum voltage	0	1	0	0
3	Extracurrent (thermic)	1	1	0	0
4	Turret unlocking error	0	0	1	0
5	Turret locking error	1	0	1	0
6	ZERO search error	0	1	1	0
7	Zero/position search time out	1	1	1	0
8	Resolver alarm	0	0	0	1
9	Parity alarm	1	0	0	1

The alarms remain stored till the input voltage to the servo amplifier remains.

In order to delete and come out from an alarm condition is therefore necessary to set an operative mode "zero" corresponding to the condition RESET/EMERGENCY (see page 7)