

INSTALLATION AND USE MANUAL

Servo Drive type DB-21

Suitable for turrets models:

Linea Archimede: TB/TBMA/TBMR

Linea Michelangelo: TAB

Linea Leonardo: TC/TCMA/TCMR

Linea Galileo: TBHMA-C/TBHMR-C

Linea Ecoline: TBH/TBHMA

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GENERAL WARNINGS



Before setting at work, carefully read instructions for use and follow them!

Only qualified personnel, that has carefully read instructions, is allowed to operate on tool holder turrets.

Responsibility and warranty are excluded if:

- Instructions for use are not followed.
- The turret is not operated in a correct way.
- Maintenance is not performed correctly and regularly.
- Functional changes of any type are brought without manufacturer's consent.
- Original spare parts are not used.

This symbol highlights critical operations:



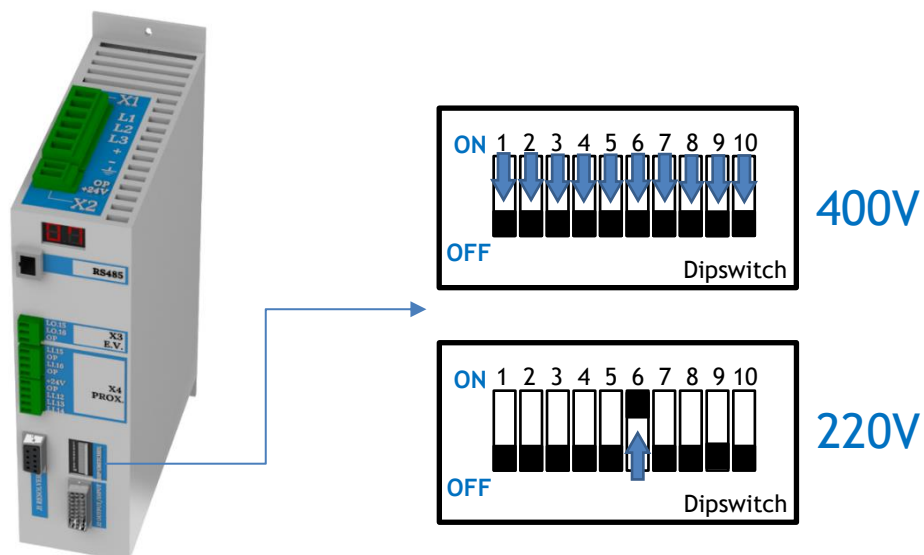
- a wrong procedure can cause damages to the turret
- nonobservance can determine wrong settings at work
- nonobservance can impair operator's safety

INSTALLATION WARNING



The Drive is pre-set for an input voltage of 400V.

If might be necessary to switch the input voltage to 220V before to turn ON the drive/machine follow the instructions at the chapter 9.



1 SAFETY AND INSTALLATION

1.1 SAFETY CONSIDERATION AND INSTALLATION CONSTRAINS

It is important to ensure that cable and connection are carried out by a qualified technician. Wrong connections can cause damage to the device or generate dangerous situations for the user.



Dangerous voltages can be found inside the drive and on the external clamps, therefore maximum attention should be paid during all phases of installation and/or maintenance so that people are not placed in dangerous situations.

- ▶ After switching off the drive, the internal components and the output connectors can still be powered for several seconds. Before doing anything, check with a Voltmeter that there are no dangerous voltages on the external clamps.
- ▶ Between the control signals and the main power supply the insulation is guaranteed only for functional purposes and not for user safety.
- ▶ All the logic signals, besides the power lines, must be protected against the user direct contact.
- ▶ During installation or normal operation, do not use damaged cables or spoiled ones.
- ▶ Connect to the ground all the shields and the ground cables. Avoid untidy or twisted cables.
- ▶ The converter must be installed in vertical position into the cabinet. **Ventilation conditions and surrounding atmosphere must be settled in a way that the converter cannot work without nominal temperature range (0÷40 °C).**
- ▶ Relative air humidity must be kept below 90%, with no condensation
- ▶ **A 150mm clearance area must be considered over and under the driver, the drives and 50mm on the sides** in order to guarantee a high cooling efficiency to the fan.
- ▶ The converter heat sink can reach high temperature during normal operations. Avoid direct contacts and remove inflammable components into the closeness of the converter.
- ▶ Before proceeding with the setup of the device it is necessary to check the ground connections, network voltage and the correct connection (according to this manual) of the control signal connections

1.2 EMC ADVICES



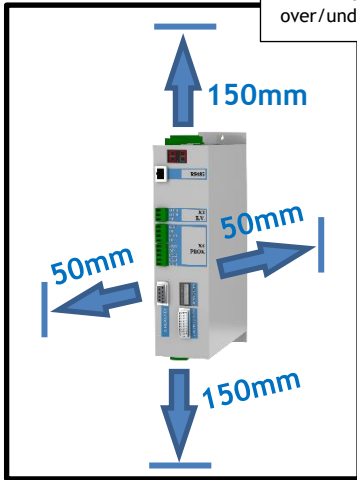
All the cables connected to the Drive must be shielded and grounded.

- ▶ An insulation transformer on the power line decoupling the drives from the grid is always a high efficiency EMC barrier.
- ▶ Where it is necessary to intersect the lay out between signal cables and power cables, it is better that the intersections are made with cross angles of 90.
- ▶ With cables length over 8/10m is not guarantee a full protection from EMC.
In case of this over length it is necessary to adapt all the measure to guarantee the complete elimination of EMC and interference in the machine cables, e.g.:
 - It is necessary separate the turret cables from other machines cables, using per example separate canalisations (with a distance of at least 30cm one from the other cable).
 - The using of an external shielded wiring harness on the turret cables.
 - External line filters are recommended (ie: Arctoronics F.LL.D3.016A.BN.R1 for 10A)

► It is advisable to install the power parts of the motor control unit (drive, transformer, filters and resistances) in metallic divisions separate from those assigned to command and control devices. If the power supplies of the power groups are the same as the control apparatus, they should be connected in the same position (entrance point of the electronic device) in a star configuration.

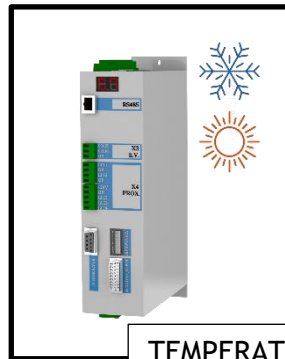
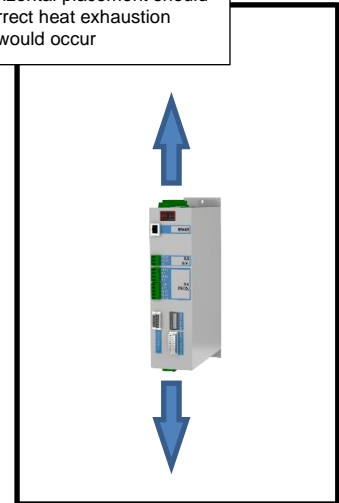
DRIVE CLEARANCE

The Drive must have a clearance of **50mm** on the side and **150mm** over/under the drive



VERTICAL POSITION

Servo amplifier module must be installed in **vertical position only**. Sideways or horizontal placement should not be made, as in this way correct heat exhaustion is not guaranteed, and failures would occur

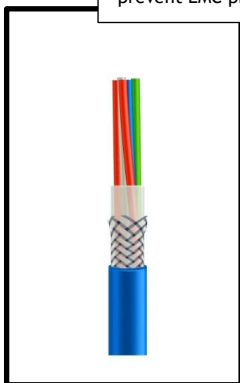


TEMPERATURE RANGE

Smooth operations and life of Servo amplifier module rely on keeping temperature at all times within the **operating range of 0 °C to +40 °C**. Temperature should then regularly be checked

ALL SHIELDED CABLES

All the cables must be shielded and connected to the ground in order to prevent EMC problems



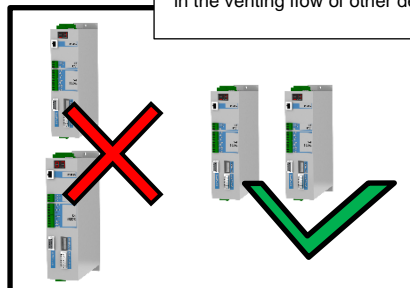
TURRET CABLE INSTALLATION

It is necessary to separate the turret cables from other machines cables (e.g separate canalizations) or the use of an external shielded wiring harness on the turret cables



WITH OTHER DRIVE

The servo amplifiers must not be install in the venting flow of other devices



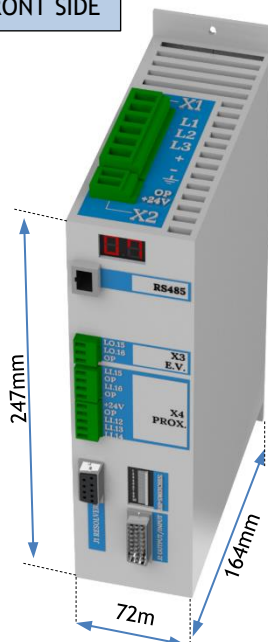
1.3 SPECIFICATIONS

PARAMETERS	
Power supply	3x230V 3x400V +10/-15% 50÷60Hz 2KW
Logic power supply	24VDC ±10%
Nominal Current	6Arms
Method of current control	SPWM, chopper frequency 3÷10 KHz
Motor control method	Torque control, speed control, angular position control
Clamp resistance	47Ω/50W
Protection grade	IP 20

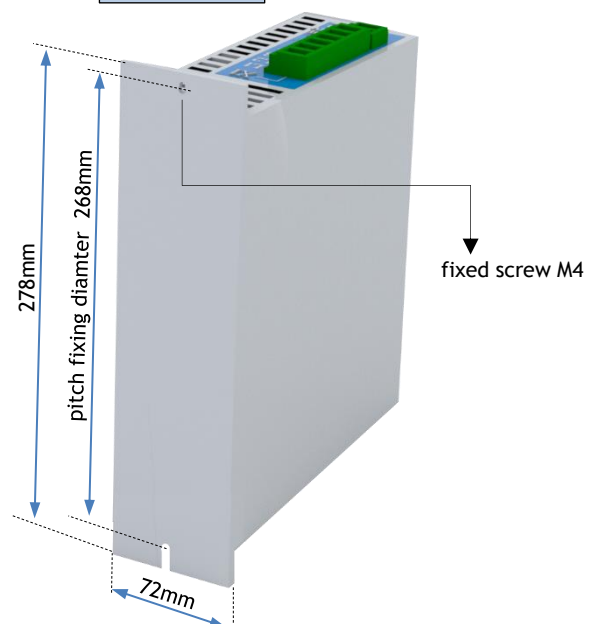
LIMITS OF USE	
Atmospheric temp.	0/+40° C
Storage	0° C/+60° C
Relative humidity	5-95% *
Altitude	<1000m slm

VOLUME AND WEIGHT	
Width	72 mm
Height	278 mm
Depth	164 mm
Weight	2 Kg

FRONT SIDE



REAR SIDE



2. ELECTRICAL CONNECTIONS

X1 (INPUT)

POWER SUPPLY

Power net (L1-L2-L3)

Voltage option 1: 230Vac 3 phase +10/-15%
Voltage option 2: 400Vac 3 phase +10/-15%
Pmin power transformer (for input with 230V) 2KVA
4Arms / 16Arms peak Class S3
Size cable $\varnothing_{min}=1,5mm^2$

- + DB BUS OUTPUT - not is use
- DB BUS OUTPUT - not is use

Protection device RCD (with differential protection $I_d= 300mA$) type F

- + Thermal magnetic circuit breaker (16A) type C

shielded cable

X2 (INPUT)

LOGIC SUPPLY

Pin (+24 OP)
24Vdc $\pm 5\%$ I
max 3A

shielded cable

X3 (OUTPUT)

ELECTROVALVES OUTPUT

Lo15 Unlocking command
Lo16 Locking command
OP Com 0V
24Vdc I
max 3A.

We recommend the use of auxiliary relays for supply the solenoid valves

shielded cable

X4 (OUTPUT)

EXTRA PORTS

Li.15 - not is use

OP - not is use

Li.15 - not is use

OP - not is use

INDUCTIVE SENSORS

+24 Proximities supply (out)

OP Common (out)

Li.12 Unlocked turret prox.switch

Li.13 Locked turret prox.switch

Li.14 Zero proximity switch

shielded cable

J2 (INPUT)

ANGULAR POSITION TRANSDUCER

Use cable with shielded twisted pairs and external shield $\varnothing_{min}=0,22mm^2$ up to 25m, more than 25m: 0,50mm².

We recommend to use only high quality cable in order to prevent electromagnetic noise issues

shielded cable

J1 (OUTPUT/INPUT)

DIGITALS INPUT/OUTPUT

Out 24Vdc x 100mA

In sink 24Vdc $\leq 5mA$

Level H (min): 20VDC (typ.7mA@24VDC,

Vin(max)=30VDC Level L (max): 12VDC

D26sub connector pin used for dialogue between plc and drives (details page 6)

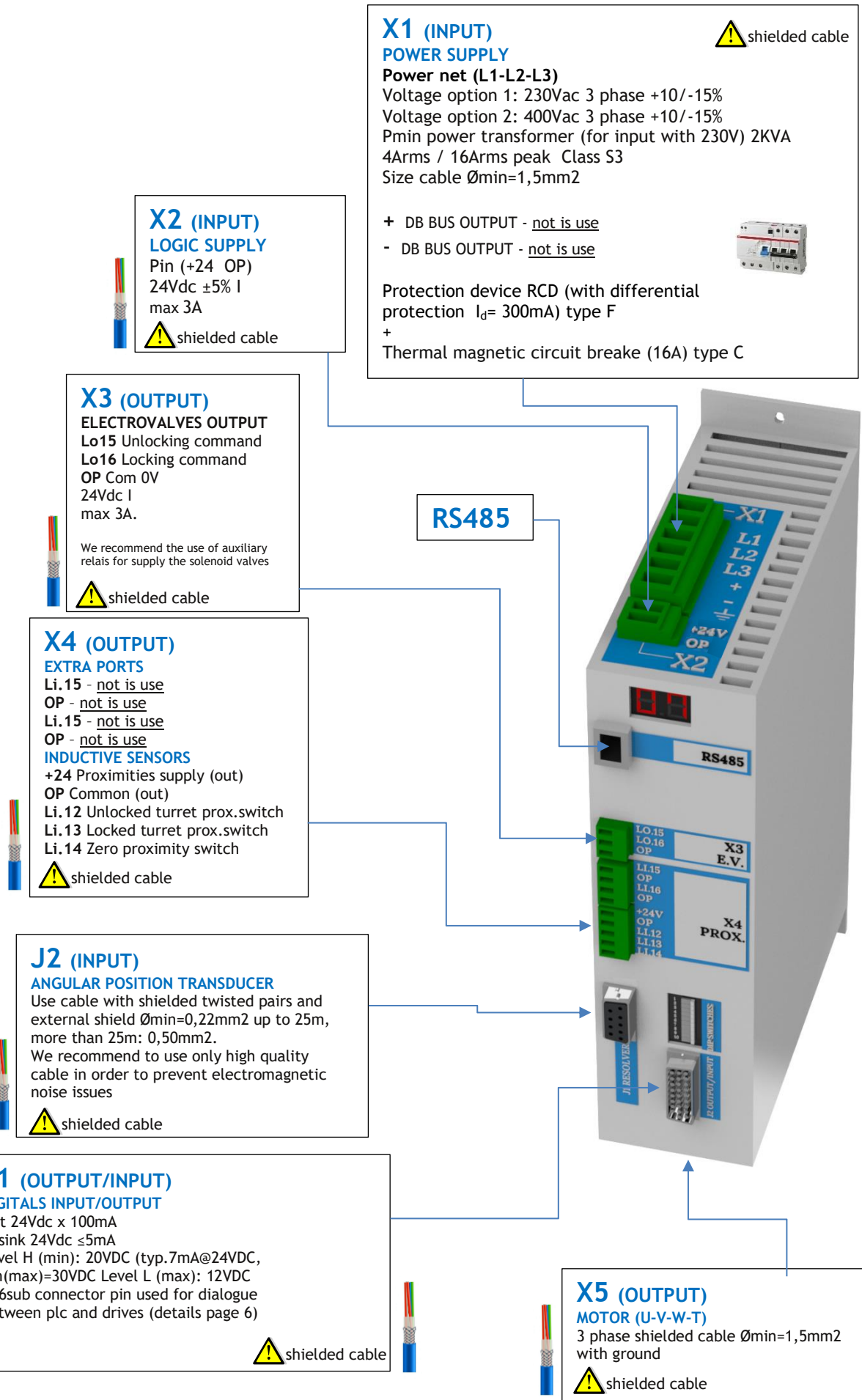
shielded cable

X5 (OUTPUT)

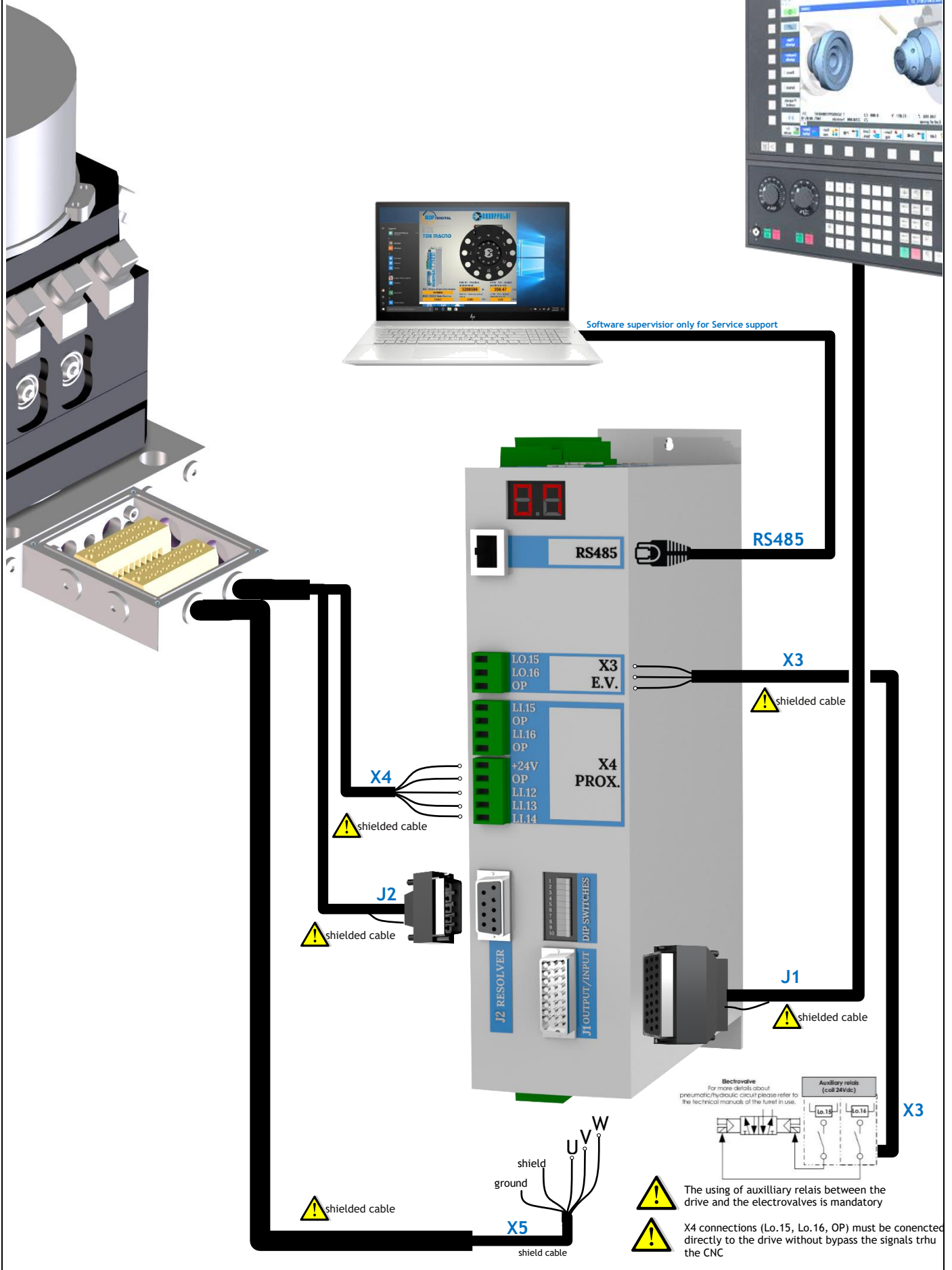
MOTOR (U-V-W-T)

3 phase shielded cable $\varnothing_{min}=1,5mm^2$ with ground

shielded cable

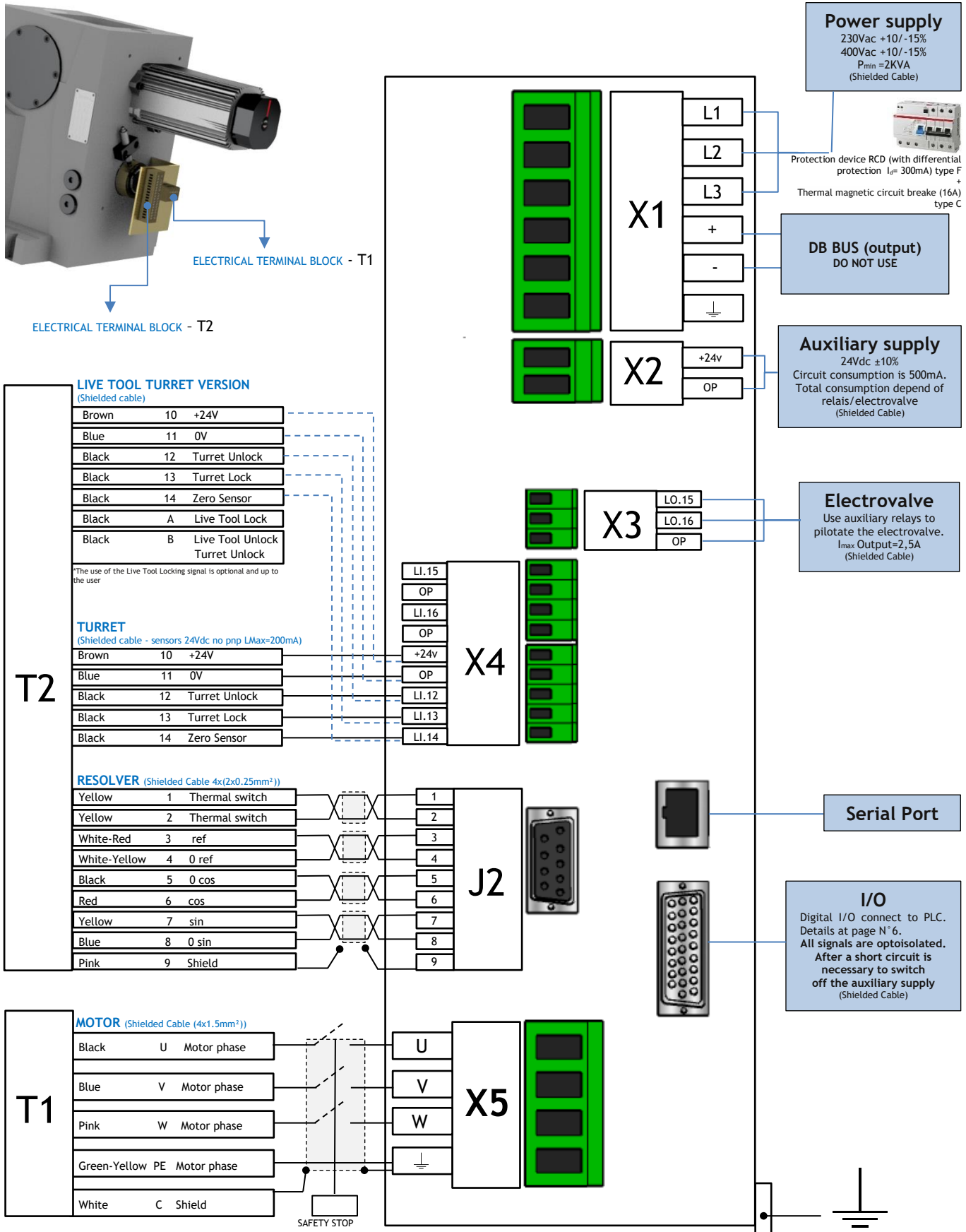


3. DRIVE AND TURRET LAYOUT



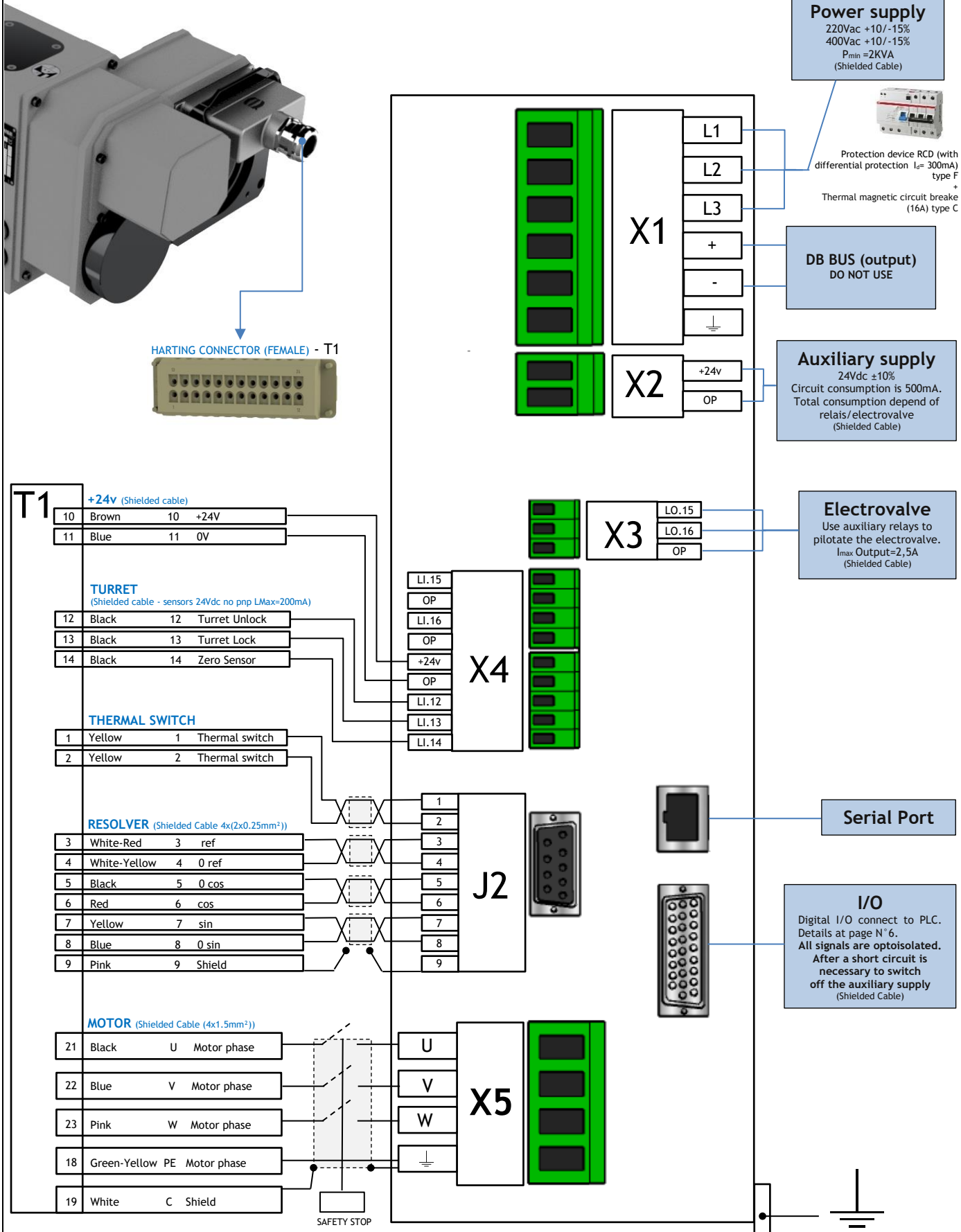
4. TURRET CONNECTIONS

4.1 LINEA ARCHIMEDE - TB/TBMA/TBMR/TBYA/TBYR (STANDARD ELECTRICAL BOARD ON THE TURRET) LINEA ECO-LINE - TBH/TBHMA (STANDARD ELECTRICAL BOARD ON THE TURRET)



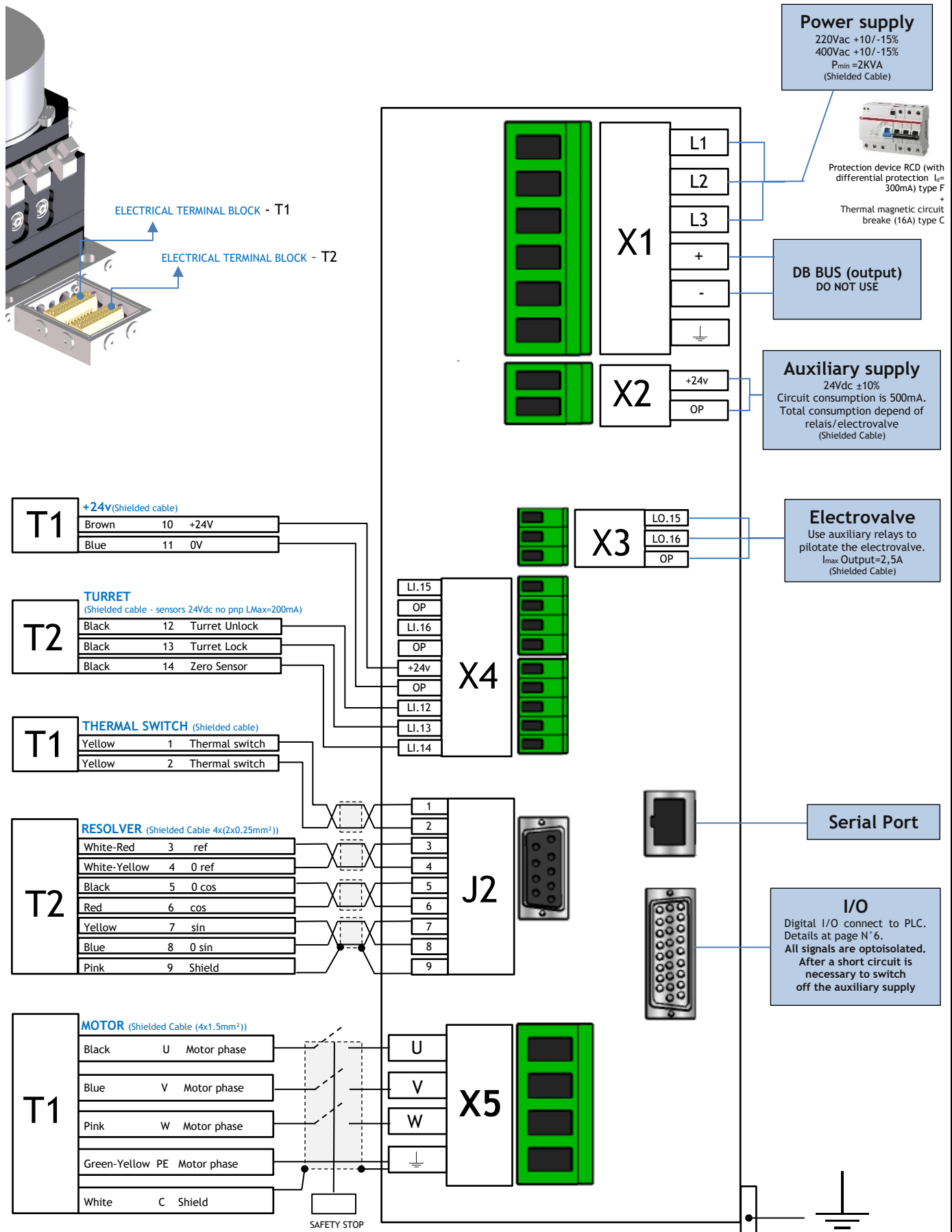
Do not install power contactor (or relays) on the input voltage of the drive (L1-L2-L3), it generates alarm on the drive.
For safety reasons it might be possible to put power contactor (or relays) on the phases between the motor and the drive (U-V-W), (e.g. to cut the power during machine open door or emergency situation)

4.2 LINEA ARCHIMEDE - TBMR/TBYR (HARTING CONNECTOR)



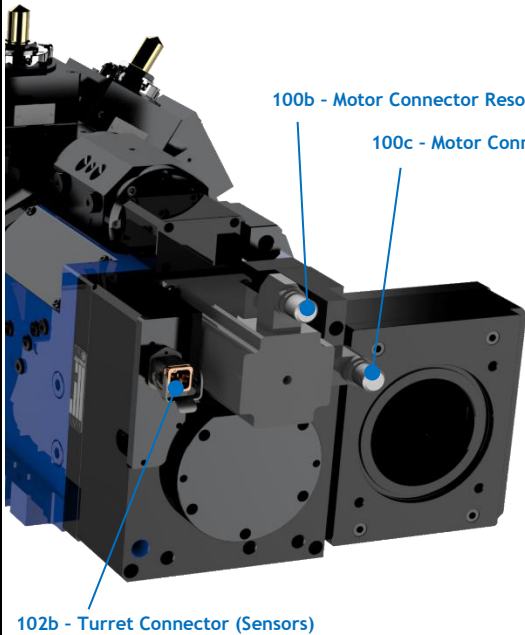
Do not install power contactor (or relays) on the input voltage of the drive (L1-L2-L3), it generates alarm on the drive.
For safety reasons it might be possible to put power contactor (or relays) on the phases between the motor and the drive (U-V-W), (e.g. to cut the power during machine open door or emergency situation)

4.3 LINEA MICHELANGELO - TAB (STANDARD ELECTRICAL BOARD ON THE TURRET)



Do not install power contactor (or relays) on the input voltage of the drive (L1-L2-L3), it generates alarm on the drive.
 For safety reasons it might be possible to put power contactor (or relays) on the phases between the motor and the drive (U-V-W), (e.g. to cut the power during machine open door or emergency situation)

4.4 LINEA LEONARDO - TC/TCMA/TCMR/TCMQ (STANDARD WITH PLUG-IN CONNECTORS)



Power supply
220Vac +10/-15%
400Vac +10/-15%
P_{min} = 2KVA
(Shielded Cable)



Protection device RCD (with differential protection I_{Δn} = 300mA) type F +
Thermal magnetic circuit breaker (16A) type C

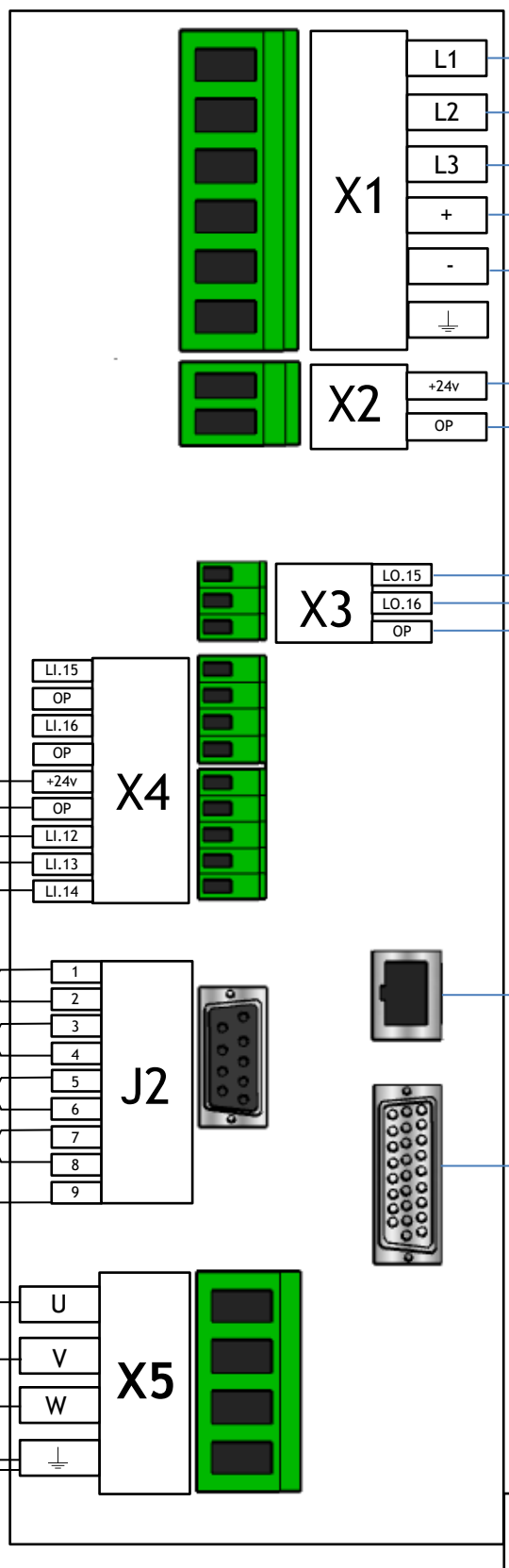
DB BUS (output)
DO NOT USE

Auxiliary supply
24Vdc ±10%
Circuit consumption is 500mA.
Total consumption depend of relays/electrovalve
(Shielded Cable)

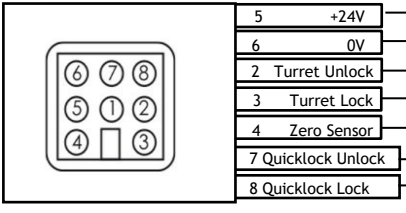
Electrovalve
Use auxiliary relays to pilotate the electrovalve.
I_{max} Output = 2,5A
(Shielded Cable)

Serial Port

I/O
Digital I/O connect to PLC.
Details at page N°6.
All signals are optoisolated.
After a short circuit is necessary to switch off the auxiliary supply

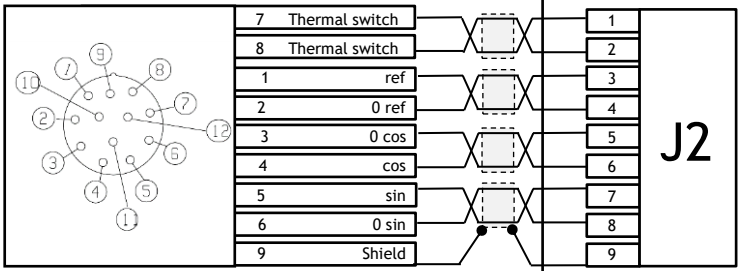


102b-TURRET (Shielded Cable - sensors 24Vdc no pnp LMax=200mA)

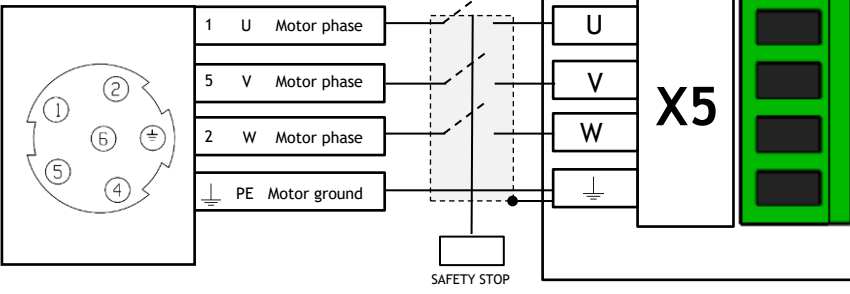


Only for TCMQ version: Direct connection to the Machien PLC ⚠

100b-RESOLVER & THERMAL SWITCH (Shielded Cable 4x(2x0.25mm²))



100c-MOTOR (Shielded Cable (4x1.5mm²))



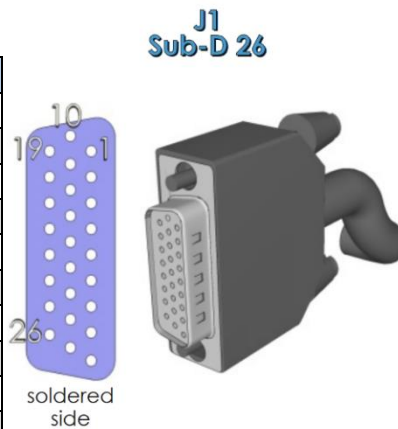
⚠ Do not install power contactor (or relays) on the input voltage of the drive (L1-L2-L3), it generates alarm on the drive.
For safety reasons it might be possible to put power contactor (or relays) on the phases between the motor and the drive (U-V-W), (e.g. to cut the power during machine open door or emergency situation)

MACHINE GROUND

5. J1 INPUT/OUTPUT

INPUT
+24VDC - MAX 100Ma

PIN	DESCRIPTION
3	Mode bit 1
12	Mode bit 2
20	Mode bit 3
13	Position bit 1
21	Position bit 2
5	Position bit 3
14	Position bit 4
22	Position bit 5
23	Parity bit
25	Start



OUTPUT
+24VDC - MAX 100Ma

PIN	DESCRIPTION
1	Feedback bit 1
10	Feedback bit 2
2	Feedback bit 3
11	Feedback bit 4
19	Feedback bit 5
6	Alarm bit 1
15	Alarm bit 2
7	Alarm bit 3
16	Alarm bit 4
24	Alarm bit 5
8	Turret in position
17	Turret Locked

5.1 CONSENT TO WORK

It is possible to start to work only when both signals are active:

- ST INDEX (J1pin.8) = turret in position
- ST LOCK (J1pin.17) = turret closed

In addition to these two signals is possible using the binary outputs of the POSITION FEEDBACK to make sure that the turret is in the position required.

Outputs are reset:

- in case of alarm
- during rotation of the turret
- drive reset (mode = 0)

5.2 POSITION FEEDBACK

n° 5 binary outputs communicate the position of the turret. The position can be seen on display in the front of the drive.

The outputs are only active with turret indexed ie has already been done a positioning or zero search (even hidden).

The outputs are active when:

- the turret is closed in the position
- no alarms are present
- the drive is not in reset mode (mode bit off)

The position feedback is in binary code (see table at left) without the parity bit

5.3 ALARMS

N° 5 binary outputs communicate the presence of an active alarm. In order to facilitate the diagnosis, the active alarm is displayed on the front display.

The activation determines:

- rotation stop
- deactivation of outputs St index, St lock and position feedback.

To perform a new positioning is necessary to reset the alarm by setting the operating mode zero.

5.4 START COMMAND

Should be: min 100ms /Max 200ms

It 'important that the command is given with a delay of at least 50ms after the setting of the required position.

5.5 OPERATIVE MODE

	Bit		
	1	2	3
0-Reset/Emergency			
1-Auto shortest way and Zero search			
2-Auto force clock-wise rotation			
3-Auto force counterclock-wise rotation			
4-Next/Previous tool			
5-Service			
6-Autotest			
7-Resolver acquisition			

5.6 POSITION REQUIRED

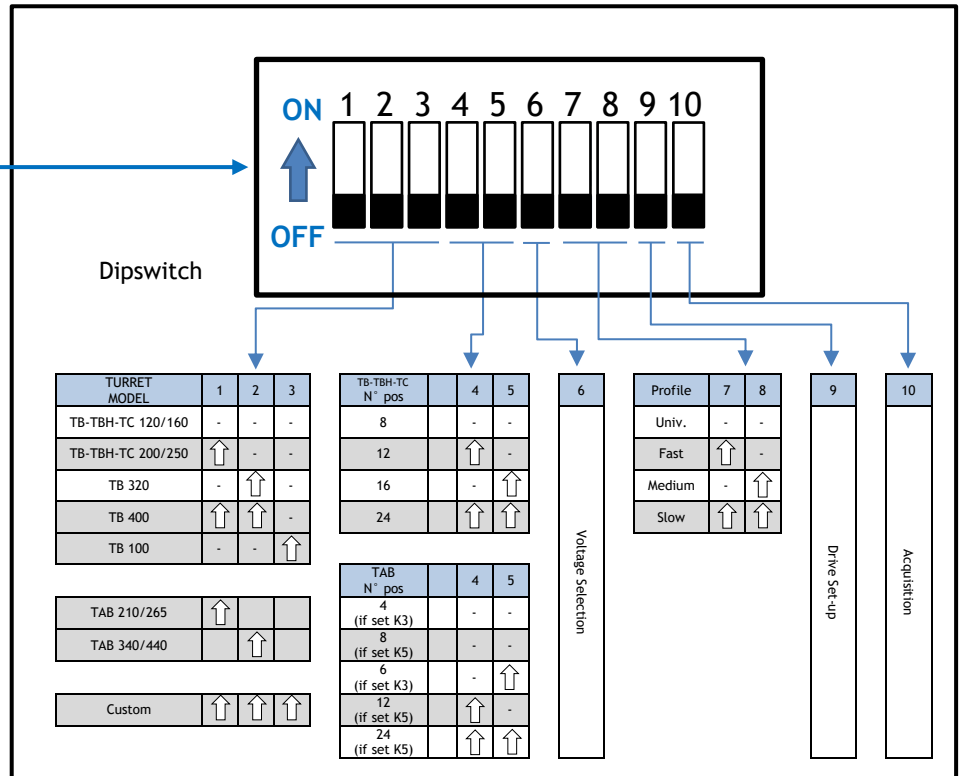
	Bit					
	1	2	3	4	5	P
0*						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

*Zero search

	Bit					
	1	2	3	4	5	P
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						

It is recommended to manage the parity bit using the Boolean function EXOR (available in all PLCs) applied to the position bit.

6. DIPSWITCH SETTING (FOR TURRET TYPE SELECTION)



TURRET SELECTION

The setting of the turret type, the number of positions and dynamic profile must be performed before starting the drive (24Vdc).

CUSTOM PROFILE

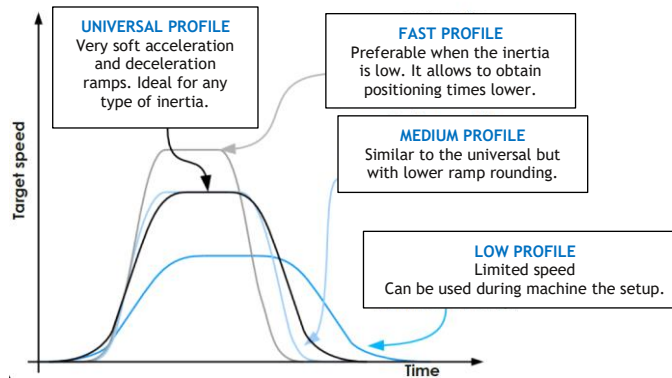
For nonstandard applications can be set via software a specific profile setting manually the transmission ratio (T.R.), number of stations and dynamic profile, in this case a red label will be applied on the drive.

In order to replace the drive will be necessary reset the profile via p.c. on the new one. The custom profile is added to the standard profiles.

DYNAMIC PROFILE

It is possible to optimize the dynamic response of the drive according to the real load condition and unbalance applied to the turret.

The dynamic profile acts on the values of rounding ramp, target speed, acceleration, deceleration and compensation of inertia.



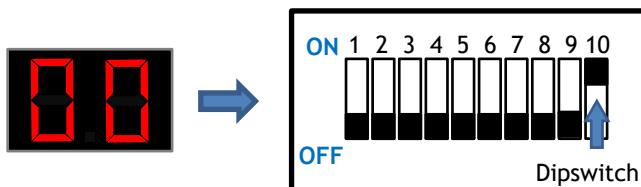
RESOLVER ACQUISITION

With this operation will be stored in the drive the value of the resolver when the turret is in position 1, this value will be used to verify that the required station is reached by the turret at the end zero research (also hidden zero research).

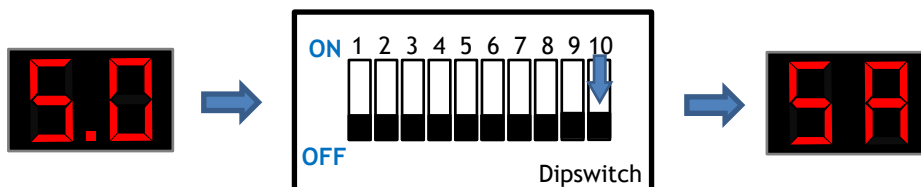
This procedure is performed in the factory during the test drive turret and need to be repeated only in the case that the drive or the motor are substituted or when the motor is removed from the turret.

Sequence:

- Make sure the turret is closed in position 1
- Switch on the drive
- Set to ON the dipswitch n° 10



- At the end of 5" counting re-set the pin n° 10 OFF



- The "SA" letters on the display means that the acquisition is finished
- The Drive is now ready to work

7. WORKING LOGIC AND POSITIONING INQUIRY



During the start it is important that the operative mode 1 (see chapter 5) is selected so any possible alarm will be displayed.

TURN ON THE CNC
Supply the Drive

Display Shows
SET UP DRIVE
(10")

EV Locking Comand

DISPLAY
00

DRIVE READY

Setup ZERO REASERACH

Positioning Frame

DISPLAY
01

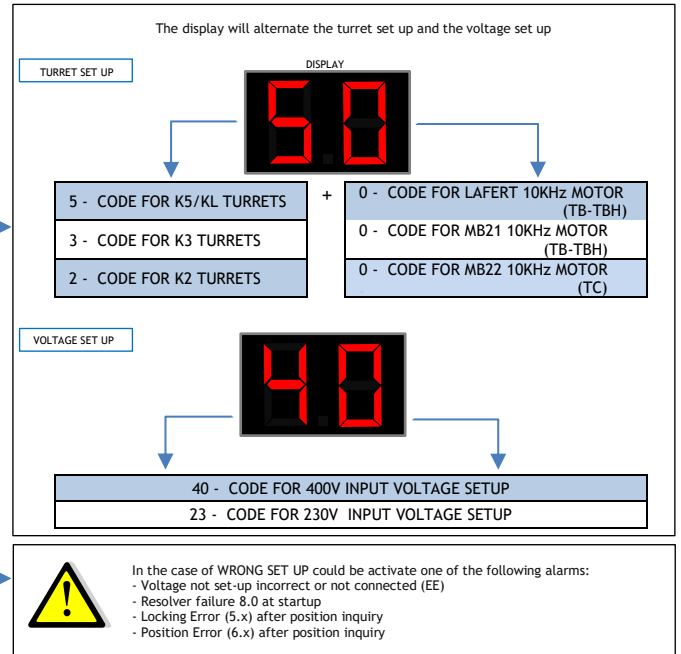
Setup Positioning Inquiry

Positioning Frame

DISPLAY
07

Start to work

Work Complete



Operative mode	1
Position required	0
Delay start	≥50ms
START (duration)	≥100ms <500ms

EV unlocking	ON
Px switch turr.unlock	ON
Motor rotation	Clockwise
Arrival in the position	OK
EV locking	ON
Px switch turr.lock	ON

ST INDEX	ON
ST LOCK	ON
Output FEEDBACK	1

Operative mode	1
Position required	>0(i.e.7)
Delay start	≥50ms
START (duration)	≥100ms

TOOL CHANGE COMPLETED

DISPLAY	Turret in Position
Motor status	disabled
ST INDEX	ON
ST LOCK	ON
FEEDBACK POSITION	1

TOOL CHANGE NOT COMPLETED

DISPLAY	Alarm
Motor status	disabled
ST INDEX	OFF
ST LOCK	OFF
FEEDBACK POSITION	0

ZERO SEARCH*
Zero search (also hidden) has to be performed after switch on the drive or a reset.

ZERO SEARCH

- Operative mode 1
- Position required = 0
- Wait ≥50ms
- START (≥100ms)

The turret will rotate in the CW direction at low speed and will stop in the mechanical station 1.

HIDDEN ZERO SEARCH

- Operative mode 1
- Position required ≥ 2
- Wait ≥50ms
- START (≥100ms <500ms)

The turret will rotate in the CW direction at low speed, pass over through the mechanical

8. OPERATIVE MODE

By setting the bit on the J2 connector you can select one of the following operatives mode:

MODE 0 - RESET/ EMERGENCY [Li.1, Li.2, Li.3 = Off]

RESET duration \geq 300ms

Setting Off all bits the drive is disabled, in this condition the engine and outputs st. index, st. lock and position feedback are reset. This mode is necessary to reset an alarm. After a reset to recall a position you must repeat the zero search or hidden zero search.



The operative mode n° 2-3-4 are enabled only after a positioning in the operating mode 1

MODE 1- AUTOMATIC POSITIONING IN THE SHORTEST WAY AND ZERO SEARCH [Li.1=On Li.2,Li.3 = Off]

Use this modality by default.

When the mode 1 is selected the turret will reach the required position by choosing the shortest way. The mode 1 is necessary also to perform a zero search or hidden zero search. It is recommended to set this mode already at switch on otherwise an alarm is not displayed.

MODE 2 - AUTOMATIC POSITIONING WITH FORCED CLOCKWISE ROTATION [Li.2=On Li.1,Li.3 = Off]

MODE 3 - AUTOMATIC POSITIONING WITH FORCED COUNTERCLOCKWISE ROTATION [Li.1,Li.2=On Li.3 = Off]

The turret will reach the required position respecting the direction of rotation chosen even though this means a greater distance.

MODE4 - NEXT/PREVIOUS TOOL REQUEST (JOG MODE) [Li.3=On Li.1,Li.2 = Off]

With this modality the user is able to change the turret position without a program. This function is useful for manual operations (pre-setting, tool replacement).

For each START command the turret will perform a jump of 1 station in the direction of rotation set:

Mod.4 + 1 position clockwise rotation

Mod.4 + 2 position counter-clockwise rotation

MODE 5 - SERVICE MODE [Li.1,Li.3=On Li.2 = Off]

Use this function for understand if the electrovalve system it's ok or evaluate the turret noise.

These operations are only possible if st index, st lock and feedback are disabled.

For each START command the turret will do one of the following:

Mod.5 + Position 1 - fast continuous rotation clockwise

Mod.5 + Position 2 - fast continuous rotation counter-clockwise

Mod.5 + Position 5 - slow continuous rotation clockwise

Mod.5 + Position 6 - slow continuous rotation counter-clockwise

Mod.5 + Position 4 - EV locking turret

Mod.5 + Position 8 - EV unlocking turret

Set RESET (mod.bit = 0) to stop continuous rotation.

The parity bit should be managed according to the required position.

MODE 6 - AUTOTEST [Li.2,Li.3=On Li.1 = Off]

Use the autotest to skip the plc program and check if the turret works correctly.

Set the mode to 6, give the START command , wait 5" after the turret will search for zero and at intervals of 5" recall some positions.

Set RESET (mod.bit = 0) to break the cycle.

MODE7 - RESOLVER ACQUISITION [Li.1,Li.2,Li.3=On]

This is an alternative procedure to the one made with dipswitch pin n° 10, with the difference of the unlocking turret.

Set the turret locked in the position 1.

Set mode 7

Give the 1st START - EV unlocking command will be executed

Give the 2nd START - EV locking command will be executed.

9. DRIVE SET-UP (NEW TURRET INSTALLATION)



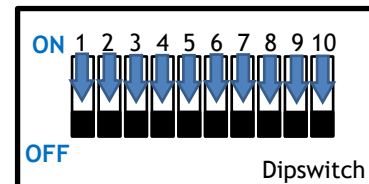
CAREFULLY CHECK THE SERVO DRIVE **INPUT VOLTAGE** SETTING.
 A WRONG SETTING OF THE INPUT VOLTAGE WOULD DAMAGE IRREVERSIBLY THE UNIT.

THE DRIVE ARRIVE WITH THE TURRET PRE-SET, IN CASE OF WRONG PRESELECTION OF THE TURRET SIZE AND TYPE CONTACT BARUFFALDI.

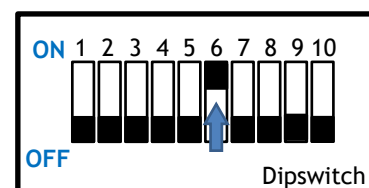
Sequence of operations N° 2

(VOLTAGE SETTING)

1. Drive OFF (24Vdc Off)
2. Set OFF dipswitch n°6 if the input voltage is 400V, set ON dipswitch n°6 if input voltage is 230V.
3. Drive ON



400V



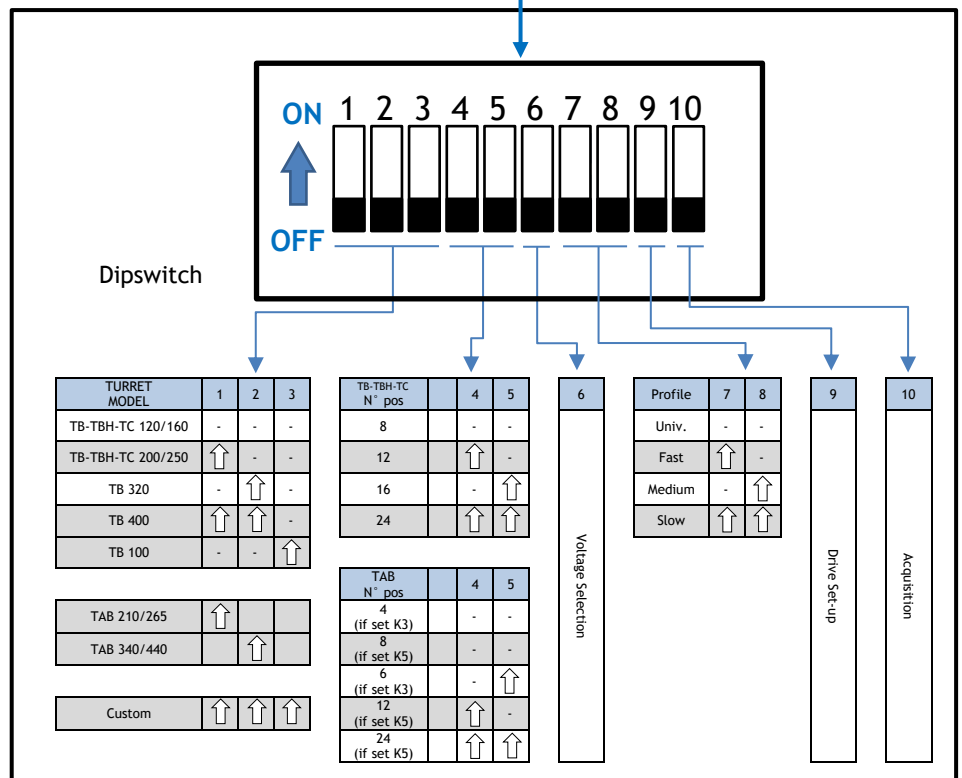
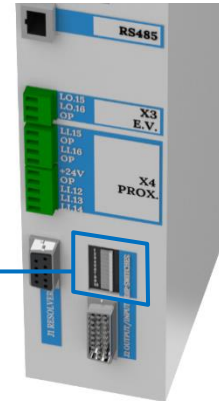
220V

Sequence of operations N° 3*



*The drive arrives pre-set for the turret. Perform this procedure only in case of any error, and contacting Baruffaldi first

1. Drive OFF (24Vdc Off)
2. Turret Locked on the first position
4. Select the turret voltage (see operations sequence 1.) , type and number of positions as the table below

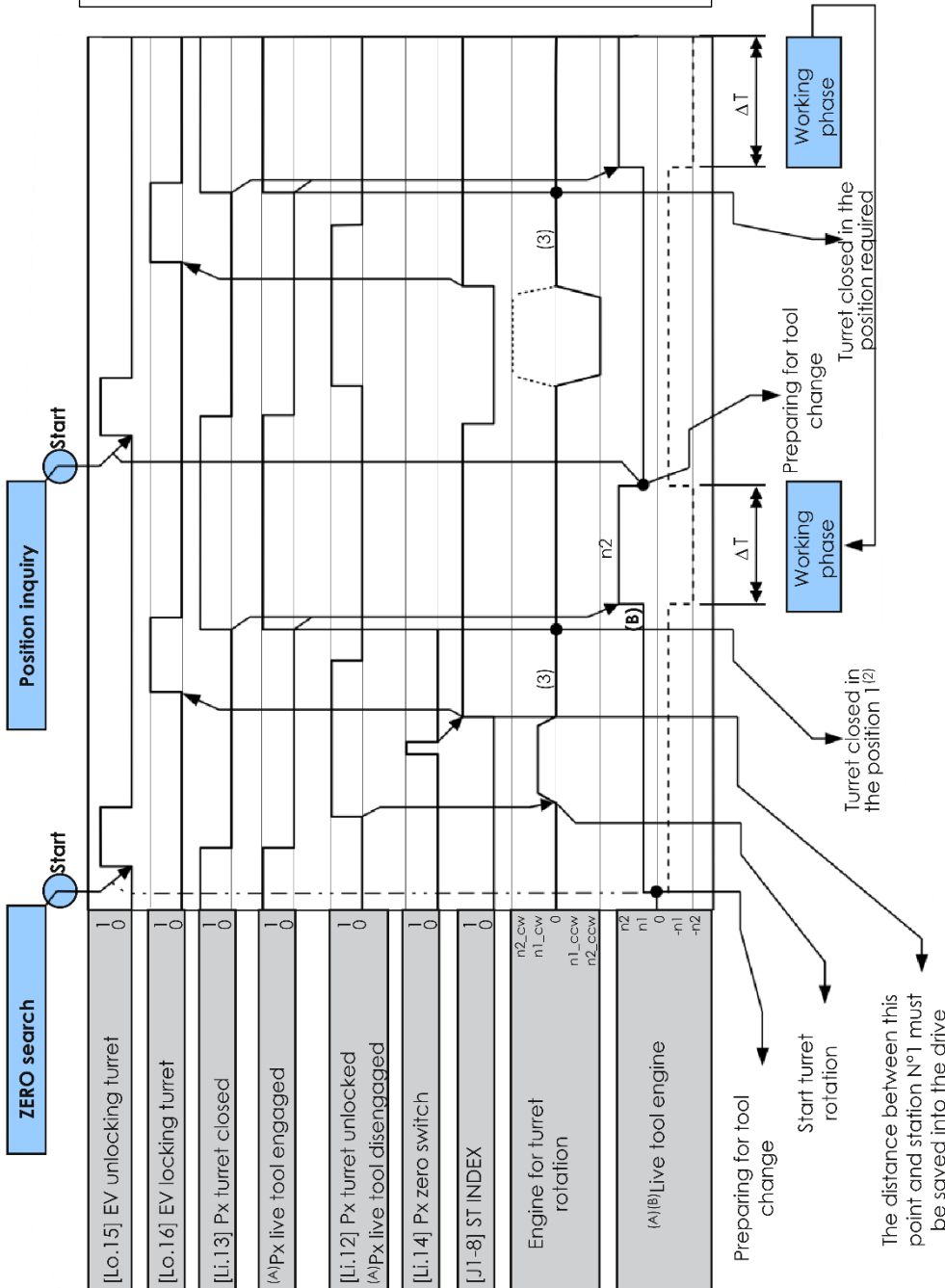


5. Turn ON the drive (auxiliary supply 24V dc)
6. Set to ON the dipswitch n° 10, the drive counts upto 5, then re-set OFF the dipswitch n° 10 the drive counts down and will displays 01.
7. Make a Zero reference
8. Turret is ready to work

10. DUTY CYCLE (BARUFFALDI/DIN5482 LIVE TOOL TOOLING SYSTEM)

(A) Only motorized turrets
 (B) Keep the live tool engine at 100÷150rpm during the closing of the turret
 (2) Hidden Zero search: with turret not indexed (for ie after start up or a reset) you can directly call a station, the turret will rotate in the CW direction at low speed, pass over through the mechanical station 1 without stops and goes straight to the position required.
 (3) Engine stays in position control ΔT Minimum time before the new position request

TB/TBH/TC 120/160	$\Delta T \geq 2''$
TB/TBH/TC 200/250	$\Delta T \geq 4''$
TAB 210/265	
TB320/400	$\Delta T \geq 5$
TAB 340/440	



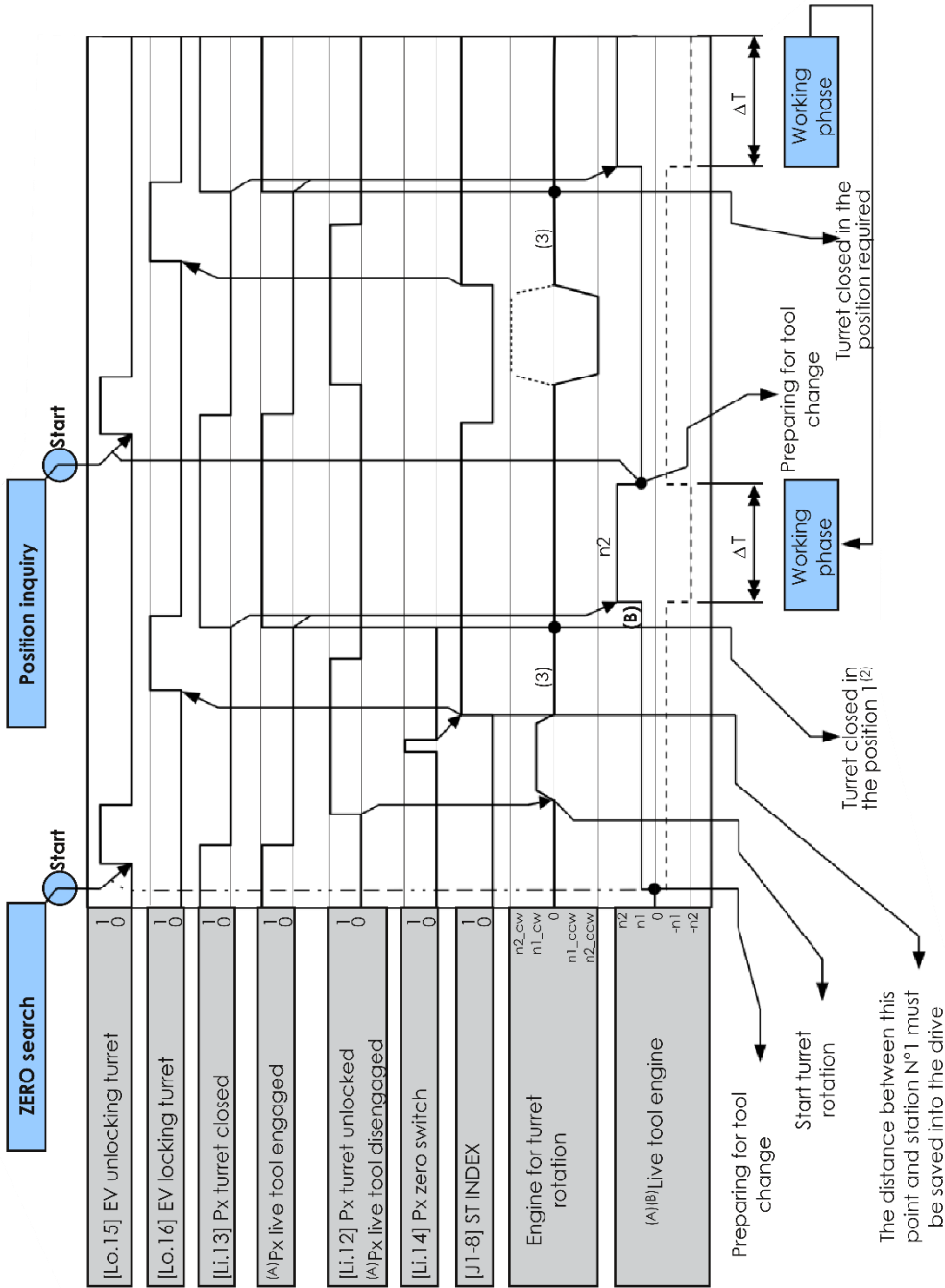
(1) Engagement of the proximity live tool switch engaged
 The use of the signal of the live tool engaged is optional and at the discretion of the manufacturer of the CNC. If you wish to handle the signal of live tool engaged, keep in mind that the live tool may not be engaged even if the turret is closed due to the fact that the teeth of the motor and live tool are attested. This condition is provided, the effective coupling and therefore also the signal from the proximity switch will arrive as soon as the tool will lean to the workpiece

11. DUTY CYCLE (BMT/DIN5480/DIN1809 LIVE TOOL TOOLING SYSTEM)

(A) Only motorized turrets
(B) Keep the motor in zero position

(1) Px switch live tool engaged: with management borne by the manufacturer of CNC.
(2) Hidden Zero search: with turret not indexed (for ie after start up or a reset) you can directly call a CW direction at low speed, pass over through the mechanical station 1 without stops and goes straight to the position required.
 ΔT Minimum time before the new position request

TB/TBH/TC 120/160	$\Delta T \geq 2''$
TB/TBH/TC 200/250	$\Delta T \geq 4''$
TAB 210/265	
TB320/400	$\Delta T \geq 5$
TAB 340/440	



(2) Management of the proximity live tool switch engaged

The use of the signal of the live tool engaged is optional and at the discretion of the manufacturer of the CNC. If you wish to handle the signal of live tool engaged, keep in mind that the live tool may not be engaged even if the turret is closed due to the fact that the teeth of the motor and live tool are atted. This condition is provided, the effective coupling and therefore also the signal from the proximity switch will arrive as soon as the tool will lean to the workpiece.

12. DRIVE ALARM

When malfunctioning occurs:

- are disabled the outputs ST INDEX, ST LOCK and POSITION FEEDBACK
- the display shows the active alarm
- are activated the alarm bit in the J1 connector (binary coded)



In the table the CODE field is the sum of all bits of alarm active.
 Example: All.7.0 Time out rotation
 Code 7, on connector J1 will be activated the output: Lo.6 (1), Lo.7 (2), Lo.8 (4) = 1 +2 +4 = 7

Display	Description	Code	alarm generation delay
---------	-------------	------	------------------------

Voltage Alarm			
1.0	Undervoltage (only with turret unlocked)	1	3"
1.1	Voltage dipswitch selection (dipswitch n°6) has been changed while the drive is ON		
2.0	(A3.x) Power Error		

Hardware Alarm			
3.0	(A1.2) Failed attempt to save data in EEPROM	3	3"
3.1	(A1.1) EEPROM contains altered data		
3.2	(A2.0) Absolute sensor alarm		
3.4	(A5.1) Radiator thermal alarm		
3.6	(A6.0) Radiator thermal alarm		
3.7	(A7.0) Auto calibration not completed		

Turret Unlocking Alarm			
4.0	During unlocking the turret stays closed [Li.12=Off, Li.13=On]	4	15"
4.1	No signal from unlock proximity switch [Li.12=Off, Li.13=Off]	10	
4.2	Lock proximity switch in short circuit [Li.12, Li.13=On]	11	
4.3	The unlock proximity switch signal has been lost during rotation [Li.12=Off]	12	

Turret Unlocking Alarm			
5.0	During locking the turret stays unlocked [Li.12=On, Li.13=Off]	5	10"
5.1	No signal from lock proximity switch [Li.12=Off, Li.13=Off]	16	15"
5.2	Unlock proximity switch in short circuit [Li.12, Li.13=On]	17	0"
5.3	The lock Px switch signal has been lost during work (turret indexed) [Li.13=Off]	18	
5.7	Turret not locked at the start up [Li.13=Off]	30	3"

Turret Positioning Alarm			
6.3	Zero search error	22	30"
6.4	Positioning error	23	5"
7.0	Time out rotation	7	30"
7.1	Time out rotation	25	
7.2	Time out rotation	26	

Resolver Alarm			
8.0	Resolver malfunctioning	8	3"
8.1	Motor PTC	13	

Positioning Alarm			
9.0	Parity error	9	0"
9.1	A non-existing position has been called	28	
9.2	Zero search in operative mode different from 1	29	

13. SERVICE

13.1 TROUBLESHOOTING

Display	Description	Code
1.0	Undervoltage (only with turret unlocked) The power supply voltage on the M1 connector is less than selected voltage	1
	- Check with a multimeter the voltage on the L1-L2-L3 connector. If the alarm occurs during the rotation the reason could be that the power supply is not powerful enough	
2.0	Power Error -High Current peak. -Input voltage over the range. -Due to excessive regeneration during breaking the bus voltage has risen (collision) -Motor or Resolver problem	2
	- Check with a multimeter the voltage on the L1L2-L3 connector (230V +10% / 400V +10%). - Check that the inertia and unbalancing applied to the turret does not exceed the stated limits and also the profile selected with the dipswitch is appropriate to the load condition. -or other problems contact our service -Check motor resistance (instruction in the alaerm 8.0) -Check the resolver resistance (instruction in the alaerm 8.0)	
3.0	(A1.2) Failed attempt to save data in EEPROM Contact Baruffaldi service	3
3.1	(A1.1) EEPROM contains altered data Contact Baruffaldi service	
3.2	(A2.0) Absolute sensor alarm Contact Baruffaldi service	
3.4 /3.6	(A5.1/A6.0) Radiator thermal alarm Contact Baruffaldi service	
4.0	During unlocking the turret stays closed [Li.12=Off, Li.13=On] After 30" from the unlocking command (Lo.15) there isn't the signal from the unlock proximity switch (Li.12) and the turret remains closed (Li.13 = On)	
	Check the functionality of proximity switch. - Check the hydraulic/pneumatic circuit. - Check the electro valve/auxiliary relays connection	4
4.1	No signal from unlock proximity switch [Li.12=Off, Li.13=Off] After 30" from the unlocking command (Lo.15) there isn't the signal from the unlock proximity switch (Li.12) and the lock proximity switch is Off (Li.13)	10
	- Check the functionality of proximity switch. Remove the upper cover and verify that the movement of the pin is not hindered. - Check the hydraulic/pneumatic circuit. If present - Check the live tool disengaging and the live tool disengaged signal functionality	
4.2	Lock proximity switch in short circuit [Li.12, Li.13=On] During unlocking sequence, the lock proximity switch remains On (Li.13)	11
	- Check the functionality of lock proximity switch	
4.3	The unlock proximity switch signal has been lost during rotation [Li.12=Off] During the rotation the unlock proximity switch(Li.12) is lost	12
	- Check the functionality of unlock proximity switch - Check the connection on turret pin 12 (both side client and turret) and on M4 connector	

5.0	During locking the turret stays unlocked [Li.12=On, Li.13=Off]		5
	After 30" from the locking command (Lo.16) there isn't the signal from the lock proximity switch (Li.13) and the turret remains unlock (Li.12 = On)	<ul style="list-style-type: none"> - Check the functionality of proximity switch. - Check the hydraulic/pneumatic circuit - Check the electrovalve/auxiliary relais connection 	
5.1	No signal from lock proximity switch [Li.12=Off, Li.13=Off]		16
	After 30" from the locking command (Lo.16) there isn't the signal from the lock proximity switch (Li.13) and the unlock proximity switch is Off (Li.12)	<ul style="list-style-type: none"> - Check the functionality of proximity switch. Remove the upper cover and verify that the movement of the pin is not hindered. - Check the hydraulic/pneumatic circuit. - Check the turret setup made with the dipswitch - Check the drive configuration K2/K5 	
5.2	Unlock proximity switch in short circuit [Li.12, Li.13=On]		17
	During locking sequence the unlock proximity switch remains On (Li.12)	Check the functionality of unlock proximity switch	
5.3	The lock Px switch signal has been lost during work (turret indexed) [Li.13=Off]		18
	During working phase, the lock proximity switch (Li.13) has been lost.	Check the functionality of lock proximity switch	
5.7	Turret not locked at the start up [Li.13=Off]		30
	At the start up the drive gives a command for locking the turret, if the lock proximity switch (Li.13) is off the alarm is activated	<ul style="list-style-type: none"> - Check the functionality of proximity switch. - Check the hydraulic/pneumatic circuit. - Check the electrovalve/auxiliary relais connection 	
6.3	Zero search error		22
	This alarm occurs when at the end of zero search also hidden, the turret is closed and the resolver value is different from the value stored with the resolver acquisition sequence	If the turret has reached the station N° 1 to repeat the acquisition of position resolver otherwise remove the back cover of the turret and with turret locked in station N° 1, verify that the mechanical position of the zero using the instruction of the proper turret manual	
6.4	Positioning error		23
	This alarm occurs at the end of a position inquiry with turret locked in a position different from that expected. The value of the resolver calculated on the basis of the acquisition value differs from the final position resolver	Check at start up that the drive SETUP matches the turret in use (K2/K5/K3). Be sure the proper setup of the dipswitch according to the turret in use (transmission ratio and number of stations page 7)	
7.0	Time out rotation		7
	After to call a zero research (hidden too) Zero proximity switch (Li.14) is always Off Turret has not reached called position	<ul style="list-style-type: none"> - Check the functionality of zero proximity switch - Check the calibration of zero cam - Make sure there are no mechanical interferences that prevent the rotation of the turret. - Check the wired connections between drive and turret (M1 UVW and J2) 	

7.1	Time out rotation							
	After to call a zero research (hidden too) Zero proximity switch (Li.14) is always Off Turret has not reached called position	<ul style="list-style-type: none"> - Check the functionality of zero proximity switch - Check the calibration of zero cam - Make sure there are no mechanical interferences that prevent the rotation of the turret. - Check the wired connections between drive and turret (M1 UVW and J2) 	25					
7.2	Time out rotation							
	After to call a zero research (hidden too) Zero proximity switch (Li.14) is always Off Turret has not reached called position	<ul style="list-style-type: none"> - Check the functionality of zero proximity switch - Check the calibration of zero cam - Make sure there are no mechanical interferences that prevent the rotation of the turret. - Check the wired connections between drive and turret (M1 UVW and J2) 	26					
8.0	Resolver malfunctioning							
	This alarm is activated when the signal from the resolver is low or absent.	Check wiring of connector J2 and connections in the terminal block signals on the turret. <ul style="list-style-type: none"> - Check the integrity and continuity of the cable. - Check that the Drive is set to the motor in use 	8					
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #d9e1f2;"> <th style="padding: 5px;">-LAFERT MOTOR 10KHz B5602P01121</th> <th style="padding: 5px;">BARUFFALDI MB-21</th> <th style="padding: 5px;">BARUFFALDI MB-22</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px; text-align: center;"> <ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω </td> <td style="padding: 5px; text-align: center;"> <ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω </td> <td style="padding: 5px; text-align: center;"> <ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω </td> </tr> </tbody> </table>	-LAFERT MOTOR 10KHz B5602P01121	BARUFFALDI MB-21	BARUFFALDI MB-22	<ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω 	<ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω 	<ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω 	
-LAFERT MOTOR 10KHz B5602P01121	BARUFFALDI MB-21	BARUFFALDI MB-22						
<ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω 	<ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω 	<ul style="list-style-type: none"> ▶ Resolver value 34 40Ω 56 60Ω 78 60Ω ▶ Motor phases value UV/ VW/ UW 4,5Ω 						
8.1	Motor PTC							
	This alarm is activated when is not detected the continuity between pin 1 and 2 of J2. The temperature sensor (PTC) of the motor indicates an excessive winding temperature	<ul style="list-style-type: none"> - Make sure that the ambient temperature (near the motor) is within the limits allowed. - If the alarm persists even when the engine is cold, check the wires connecting the sensor (pins 1 and 2 of J2 on board and the terminal turret) 	13					
9.0	Parity error							
	This alarm occurs before the turret is unlocked when the START command is sent and the parity bit is not set correctly	<ul style="list-style-type: none"> - Check the connection J1 pin 23 with the plc - Ensure that the program plc correctly handles the parity bit - Check that there is a delay in the plc of at least 50ms between the setting of the position and parity to the START command 	9					
9.1	A non-existing position has been called							
	Has been requested a position higher than the number of station provided	<ul style="list-style-type: none"> - Check the setting of dipswitch. - Check code management of the position in the plc. - Check wiring of connector J1. - Check/Reset the drive setup (page n° 10) 	28					
9.2	Zero search in operative mode different from 1							
	The alarm is activated after the START command, before unlocking the turret when: <ul style="list-style-type: none"> - Operation Mode ≥ 2 - Position code = 0 	<ul style="list-style-type: none"> - Check code management of the position in the plc. - Check wiring of connector J1 	29					

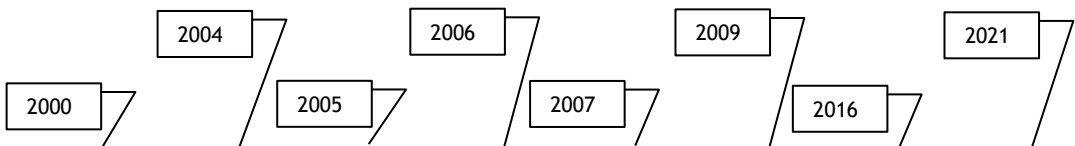
13.2 COMPATIBILITY WITH PREVIOUS VERSIONS

The drive DB-21 is compatible with all drives and motors previously used with brushless turrets. In case of replacing an old drive where the turret or motor are different from the current it's necessary execute the SETUP configuration following the procedure explained in the next chapters.

The sequence of steps for the position request and general management of the dialogue between plc and drive is common and compatible among all drives.

The installation of the new drive on CNC instead of a drive of previous versions to the model DMS08BF requires rewiring the connector J1 or the adoption of an adapter DB37 to DB26: ask details and price to Baruffaldi service or commercial department.

13.2.1 DRIVE AND MOTOR TIMELINE

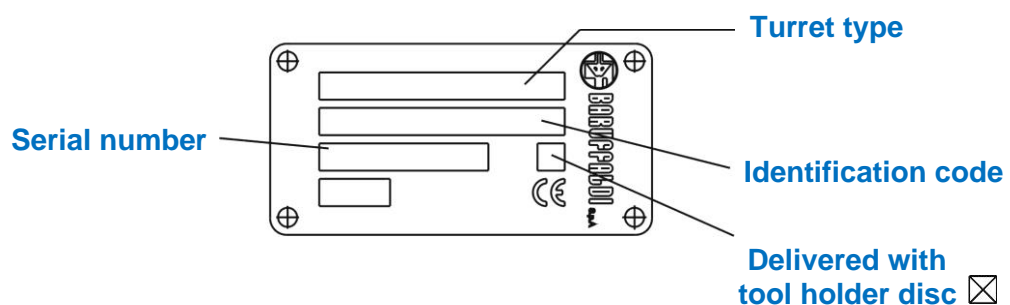


Drive Model	SA.01A.TB		SA.02A.TB		DMS08-BF			BD21
TB-Series serial n°	0-1837 (K2 model)	1838-2330 (K2 model)	2331-3122 (K2 model)	3123-4272 (K2 model)	4273-6459 (K5 model)	6460-9952 (K5 model)	9952-14500 (K5 model)	14501→ (K5-KL model)
TAB-Series serial n°					0-55 (K3 model)			56→ (K3 model)
TC-Series serial n°								0→ (KL model)
Motor type	Magnetic 5KHz	Lafert 5KHz	Lafert 10KHz			Baruffaldi MB21 10KHz Lafert 10KHzKL Baruffaldi MB22 10KHz (For TC series)		



In case of drive replacement to DB-21 it is necessary also to replace the motor in case the turret has a Magnetic 5KHz or Lafert 5KHz motor

13.2.2 TURRET SERIAL NUMBER IDENTIFICATION



13.3 DRIVE REPLACEMENT (SET-UP AND SETTING)

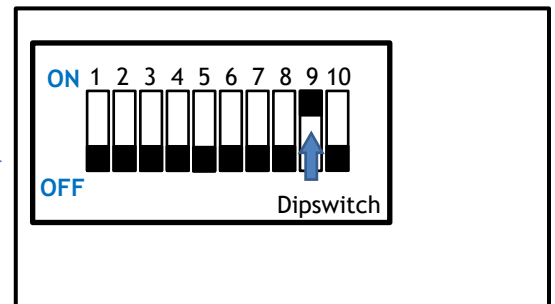
This procedure is used to change the setting of the drive in order to use it with all turrets type and motor produced. Follow the timeline (chapter 13.2.1) for understand the correct setup to apply to the drive:



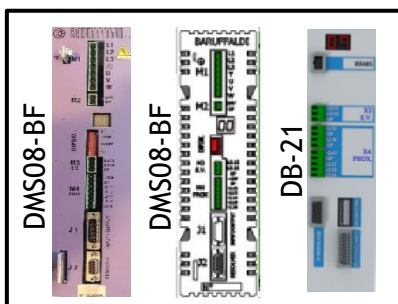
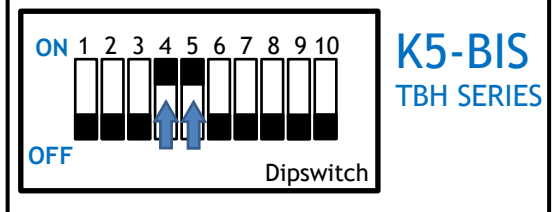
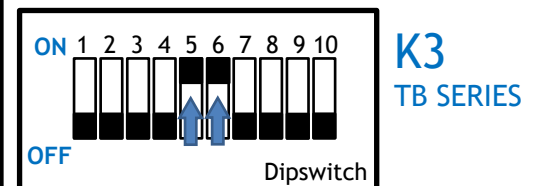
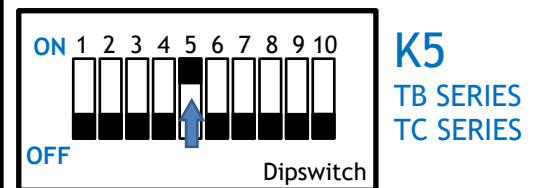
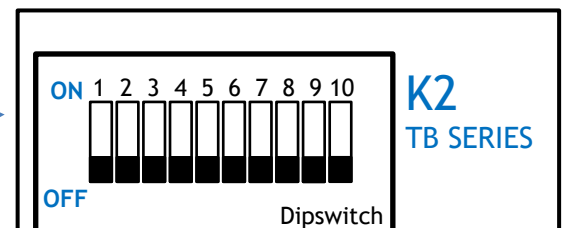
Before indexing the turret complete all the step here below, included the input voltage selection, turret is supplied with its own drive already pre-set and ready to work with **400 V VOLTAGE**.

Sequence of operations N° 1:

1. Drive OFF (24Vdc Off)
2. Set to OFF all dipswitch
3. Set to ON dipswitch n° 9 (turret setting mode)
4. Set the input motor and turret type as the tables below.



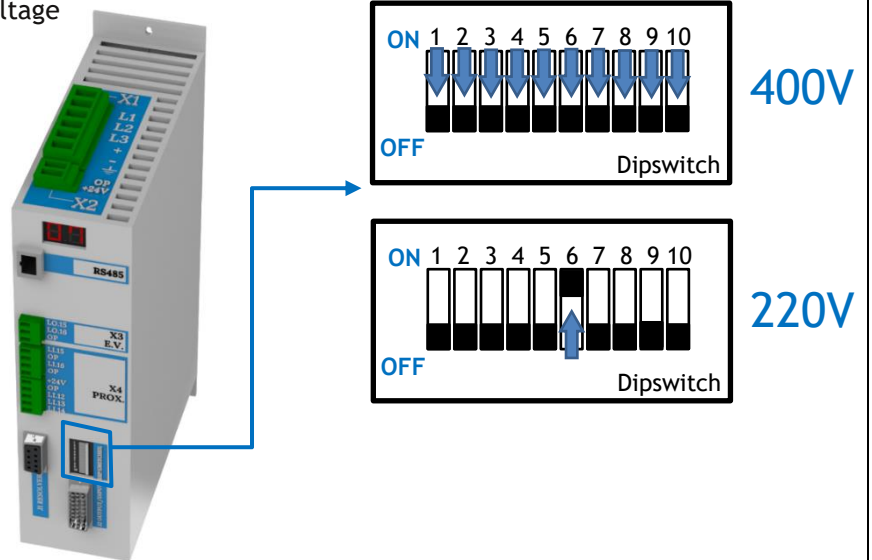
5. Turn ON the drive (auxiliary supply 24V dc) Display shows ="AF"
6. Set to ON the dipswitch n° 10, the drive counts upto 5, then re-set OFF the dipswitch n° 10 the drive counts down and will displays 01.
7. The message on the display "SA" means that the setup has been saved
8. Switch OFF the drive



Sequence of operations N° 2

(VOLTAGE SETTING)

1. Drive OFF (24Vdc Off)
2. Set OFF dipswitch n°6 if the input voltage is 400V, set ON dipswitch n°6 if input voltage is 230V.



Sequence of operations N° 3:

1. With the drive still power OFF (24Vdc Off)
2. Set ON the dipswitches according to the turret characterist (see table below)

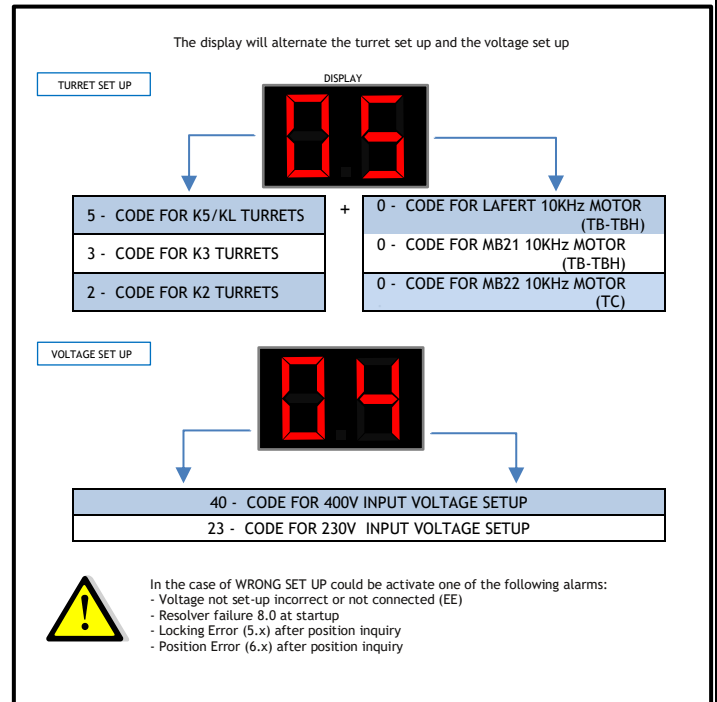
Dipswitch	1	2	3	4	5	6	7	8	9	10	
TURRET MODEL	1	2	3	4	5	Voltage Selection	7	8	Drive Set-up	Acquisition	
TB-TBH-TC 120/160	-	-	-	-	-		Univ.	-			-
TB-TBH-TC 200/250	↑	-	-	-	-		Fast	↑			-
TB 320	-	↑	-	-	↑		Medium	-			↑
TB 400	↑	↑	-	-	↑		Slow	↑			↑
TB 100	-	-	↑	-	-						
TAB N° pos	4	5									
TAB 210/265	↑	-	-	-	-						
TAB 340/440	-	↑	-	-	-						
Custom	↑	↑	↑	-	-						
	4	5									
(if set K3)	-	-	-	-	-						
(if set K5)	-	-	-	-	-						
(if set K3)	-	-	-	↑	-						
(if set K5)	-	-	-	↑	-						
(if set K5)	-	-	-	↑	↑						

3. Switch ON the drive

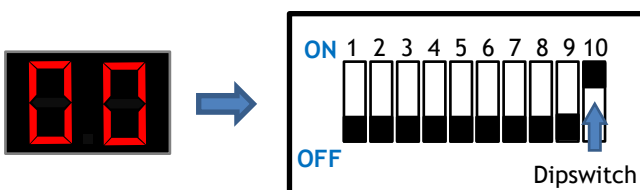
4. Check on the display if the drive setup correctly.

The display will flash for 10 seconds shown:

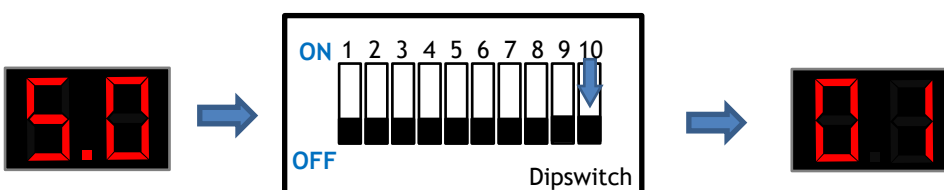
- as a first indication the turret series and motor setup
 - as second indication the input voltage selected
- (see tables below)



5. **ACQUISITION PROCEDURE** : Set to ON the dipswitch n° 10 for a count to 5 on the drive display



then re-set the dipswitch n° 10 OFF for a countdown to 0.



The Drive/Turret is ready to work

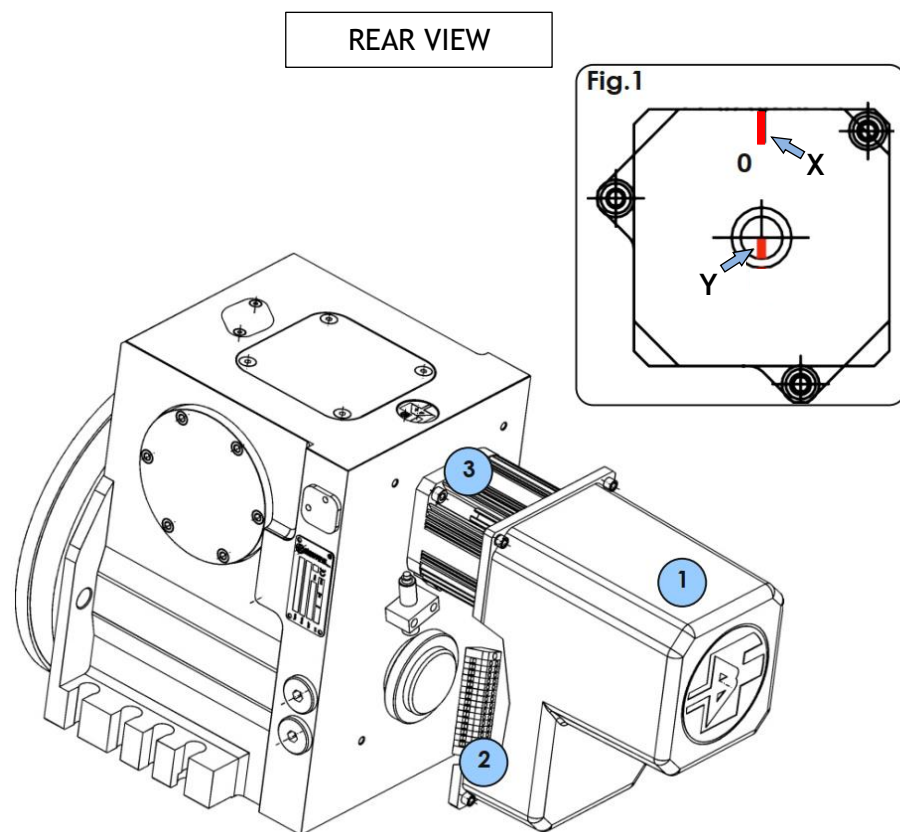
13.4 MOTOR REPLACEMENT FOR LINEA ARCHIMEDE (TB/TBMA/TBMR) AND LINEA ECOLINE (TBH/TBHMA)



This operation must be carried out with locked turret in POSITION 1 no pressure in all circuits and motor+drive power off!
 Instructions below refer to turrets equipped with Baruffaldi motor; for different motors, please contact our Technical Department.

➤ Disassembling the motor

- Lock the turret on the 1st position and Power OFF the machine, the hydraulic pressure must be zero.
- Remove the cover of the motor (1)
- Disconnect the motor wires from the terminal block (2)
- Remove the motor (3)



➤ Putting on new motor

- Before to fit the new motor into the turret rotate the motor gear aligning Y mark, as shown in the picture below, opposite to the X mark
- Fit new motor (3) on turret housing and check that O-ring is properly fitted in its own seat
- While locking screws, slightly turn motor housing clockwise, in order to reduce clearance between motor pinion and gear inside turret housing
- Re-connect the cables to terminal block (2)
- Make a zero acquisition (chapter 13.6)

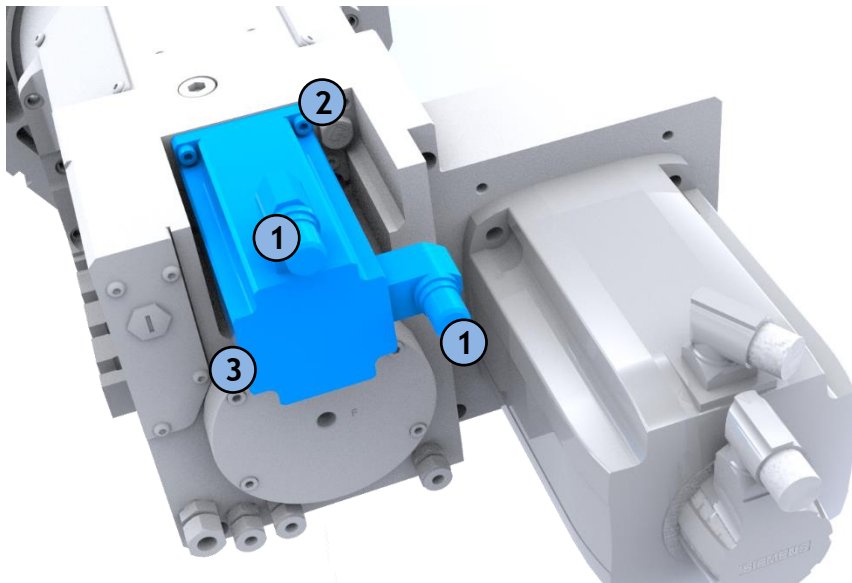
13.5 MOTOR REPLACEMENT FOR LINEA LEONARDO (TC/TCMA/TCMR/TCMQ)



This operation must be carried out with locked turret in POSITION 1 no pressure in all circuits and motor+drive power off!
 Instructions below refer to turrets equipped with Baruffaldi motor; for different motors, please contact our Technical Department.

➤ Disassembling the motor

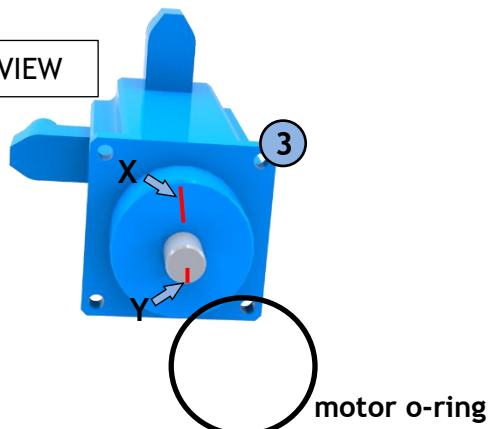
- Lock the turret on the 1st position and Power OFF the machine, the hydraulic pressure must be zero.
- Remove the machine cables disconnecting connectors (1)
- Remove the bolts (2)
- Remove the Motor (3) and it's o-ring



➤ Putting on new motor

- Before to fit the new motor into the turret rotate the motor gear aligning Y mark, as shown in the picture below, opposite to the X mark
- Fit new motor (3) on turret housing and check that O-ring is properly fitted in its own seat
- While locking screws (2), slightly turn motor housing clockwise, in order to reduce clearance between motor pinion and gear inside turret housing
- Re-connect the connectors (1)
- Make a zero acquisition (chapter 13.6)

FRONTAL VIEW



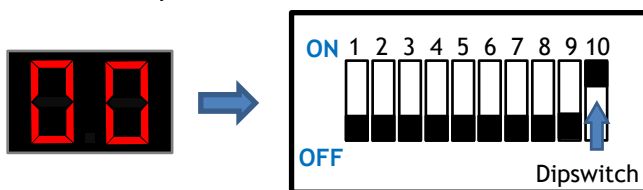
13.6 RESOLVER ACQUISITION FOR LINEA ARCHIMEDE (TB/TBMA/TBMR) / LINEA ECOLINE (TBH/TBHMA)/ LINEA LEONARDO (TC/TCMA/TCMR/TCMQ)

With this operation will be stored in the drive the value of the resolver when the turret is in position 1, this value will be used to verify that the required station is reached by the turret at the end zero research (also hidden zero research).

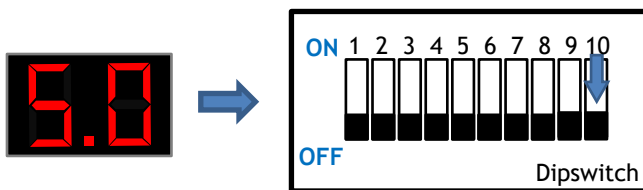
This procedure is performed in the factory during the test drive turret and need to be repeated only in the case that the drive or the motor are substituted or when the motor is removed from the turret.

Sequence:

- Make sure the turret is closed in position 1
- Switch on the drive
- Set to ON the dipswitch n° 10



- At the end of 5" counting re-set the pin n° 10 OFF



- The "SA" letters on the display means that the acquisition is finished



- The Drive is now ready to work

14 CABLE ADAPTER FOR OLD DRIVE INTERFACING

The installation of the new drive (Model DB-21) on CNC instead of the previous versions* requires rewiring the connector J1 or the adoption of an adapter DB37 to DB26: ask details and price to Baruffaldi service or sales department.

*not valid for Drive model DMS-08

PINOUT BARUFFALDI ADAPTER

Db 26 pin n°	DESCRIPTION	WIRE COLOR	Db 37 PIN N°
1	Feedback bit 1	black	1
2	Feedback bit 4	orange-blue	2
3	Mode bit 1	green-blue	17
4	Not used	gray-blue	
5	Position bit 4	yellow-green	32
6	Alarm bit 1	orange	27
7	Alarm bit 4	red-blue	26
8	St Index	pink	28
9	Not connected		
10	Feedback bit 2	white-blue	20
11	Feedback bit 8	green-brown	21
12	Mode bit 2	yellow-red	35
13	Position bit 1	white-red	33
14	Position bit 8	red-black	13
15	Alarm bit 2	red-brown	8
16	Alarm bit 8	yellow-blue	7
17	St Lock	black-blue	9
18	Not connected		
19	Feedback bit 16	red	6
20	Mode bit 4	purple	16
21	Position bit 2	cyan	14
22	Position bit 16	gray	31
23	Parity	blue	34
24	Alarm bit 16	brown	
25	Start	white	15
26	Not connected		

New Drive	LOGIC SUPPLY 24VDC	Old Drive
X2	+24	DB37 3-22-4
X2	0V	DB37 5

POSITION FEEDBACK
The outputs of the position feedback are not present in the drive before type DMS08-BF. These outputs communicate the station of the turret and gives a supplementary information. However it's possible to the turret signals ST INDEX and ST LOCK as permission to work, so it is not necessary modify the PLC program.

ALARM BIT 16
In the new drive has been added 1 bit to the alarm list. Might be possible that the alarm feedback description on CNC screen generate a wrong message, in case of turret alarm always check the error number on the Drive screen.

