



DTI 2.x Diagnostic Software for DM-*-*/* Turrets Equipped with TMC Electronic Units

INSTRUCTIONS FOR INSTALLATION AND USE

Issue 10/10/10

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Index

COPYRIGHT 2010 DIPLOMATIC AUTOMATION S.r.l ALL RIGHTS RESERVED	2
PRESENTATION OF DTI 2.X	4
HARDWARE & SOFTWARE REQUIREMENTS	5
Hardware requirements	5
Software requirements	5
Windows Tips & Tricks	6
INSTALLATION OF DTI	7
HOW TO USE DTI 2.X	10
How to connect to the TMC unit	12
The command menu	13
Autotest	14
Graphics	15
Info	16
Tools	17
Electrical	18
Events History	19
Virtualscope	20
Autotuning	22
AUTOMATIC SETUP.	23
Commutation angle detection (autotuning resolver).	23
Speed Loop Test	24
Autotuning of exact tool position.	24
ALARMS MANAGEMENT	25
Alarm list	26
TROUBLESHOOTING	28
NOTES:	29



Chapter 1

Presentation of DTI 2.x

The software [DTI 2.x](#) Lite has been developed by DIPLOMATIC in order to supply a simple and flexible basis for installation, configuration and diagnostics of the electronic [TMC](#) electronic unit, which is part of the turrets using direct direct drive servomotor technology (DM**).

This program enables access to the complete functions of the turret, to which extended operation modes have been added, thus offering a gradual operation sequence. This program allows access to the archive of extended alarms. The real condition of all input and output signals pertaining to the turret is displayed during use.

[Index](#)

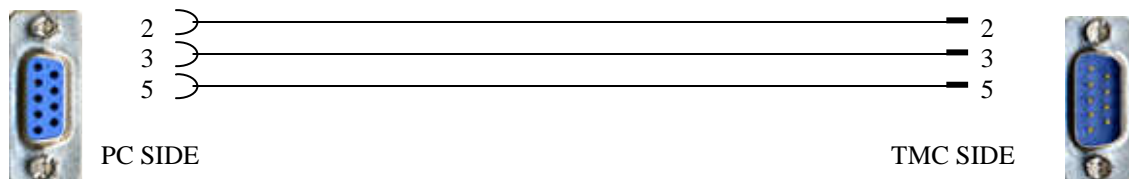


Chapter 2

Hardware & Software requirements

Hardware requirements

The software DTI 2.x Lite requires an IBM COMPATIBLE PC with at least one free RS232 serial port, at least 20 MBYTE free memory on the hard disk for the operating system, 1900 kbyte on the hard disk for applications and 20 MBYTE additional space for storing the temporary data for the installation. The system requires the use of a mouse. The serial connection consists of a DTE-DCE cable. Not all signals are necessary. For preparing the connection cables, the following diagrams must be taken into account.



Software requirements

The software DTI2.X Lite has been developed in the 32-bit technology and therefore runs under the operating systems Microsoft Windows 95, Microsoft Windows 98, Microsoft Windows 2000 and Microsoft Windows XP. The memory requirements depend on the operating system. These values are listed below as a guideline.

Normally the DTI2.x software runs without problems under all Microsoft Operating Systems, but it could be necessary to install and execute it with administrator privileges. Some problem can occur using a USB-to-RS232 adapter. In case of trouble install the most updated driver, and try to adjust the transmit and receive buffers in the advanced properties of the adapter..

Requirements on the RAM memory for the operating systems	
Windows 95	4 Mbytes
Windows 98	32 Mbytes
Windows 2000	32 Mbytes
Windows XP/ VISTA/WINDOWS7 (32 bit)	64 Mbytes



Windows Tips & Tricks

Microsoft Windows offers a simple user's surface, where however some users may have certain difficulties. Here in the following you can find the basic information about Windows.

- 1) *Window* : A part of the screen which is surrounded by a frame. The entire program takes place on the respective window.
- 2) Nearly every window has a *menu*, i.e. a list of options, which by selection via mouse will show another menu or enable another step. If the mouse is not being used, the Alt+Tab keys can be pressed.
- 3) *Keys, Text boxes, Check boxes* : The user can interact with the program by using either keys or icons. For example, the user can press a key and select it with the L.H. mouse key or move along by means of the keys or other objects using the Tab key and then press the SPACE BAR for confirming the step. At the same manner, a check box can either be highlighted or the text can be selected for being modified inside of the text box.
- 4) Therefore, when speaking about "*Click*", "*Double-Click*", "*Select*", "*Press*" in this Manual, we refer to one of the operation modes described before.

[Index](#)



Chapter 3

Installation of DTI

The software DTI is supplied on a CD-ROM or as an installation file of the CABINET type (*.CAB).

(Before carrying out the installation, make sure that all applications previously opened have been closed in order to avoid any conflict).

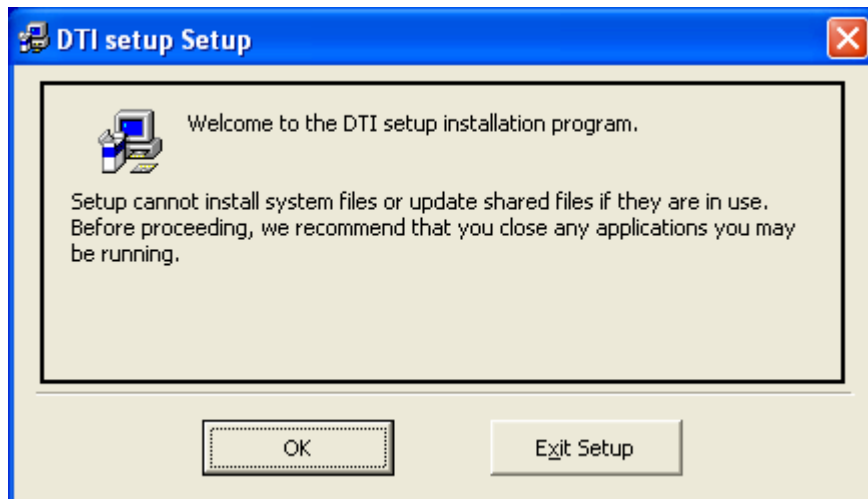
To begin the installation, put the CD into the respective drive. From the window "My computer", select the respective drive (normally D) and click the file which is called "Setup".

The file can be also be executed in the following manner. From the Start-menu bar, click "Start" and immediately after this click "Run". Then enter the following command line:

D:\Setup

Note: The letter "D" refers to the CD-ROM drive.

After a few seconds, the screen will show the first window, which enables the installation of the program.

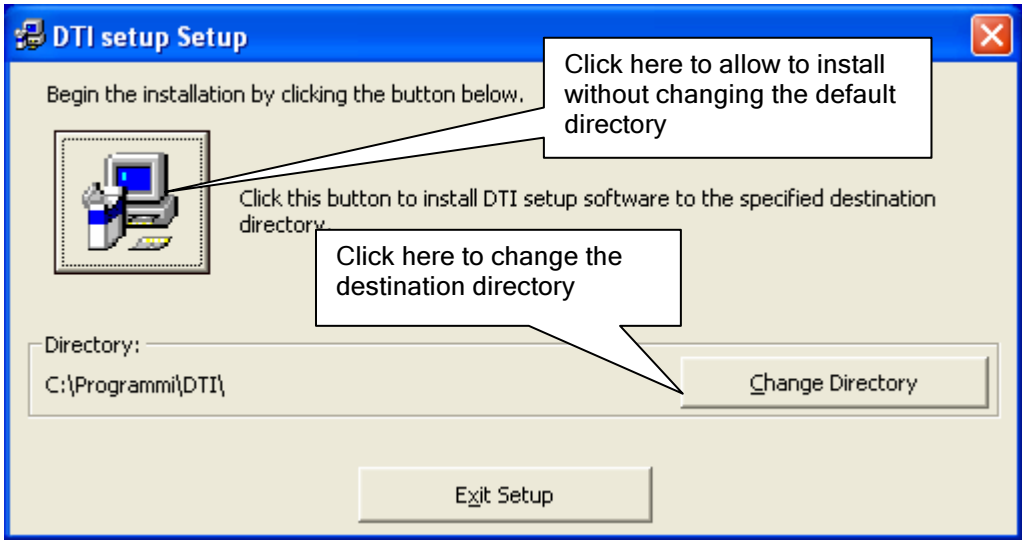


The user can decide whether to interrupt the installation by clicking the "Exit Setup" button or to continue the installation by clicking the "OK" button.

Note: If the message shown in this figure is displayed, please go on. This message means that the installation program has found some files which must be installed. In this case, by selecting "OK", the existing files will be replaced by the latest version.

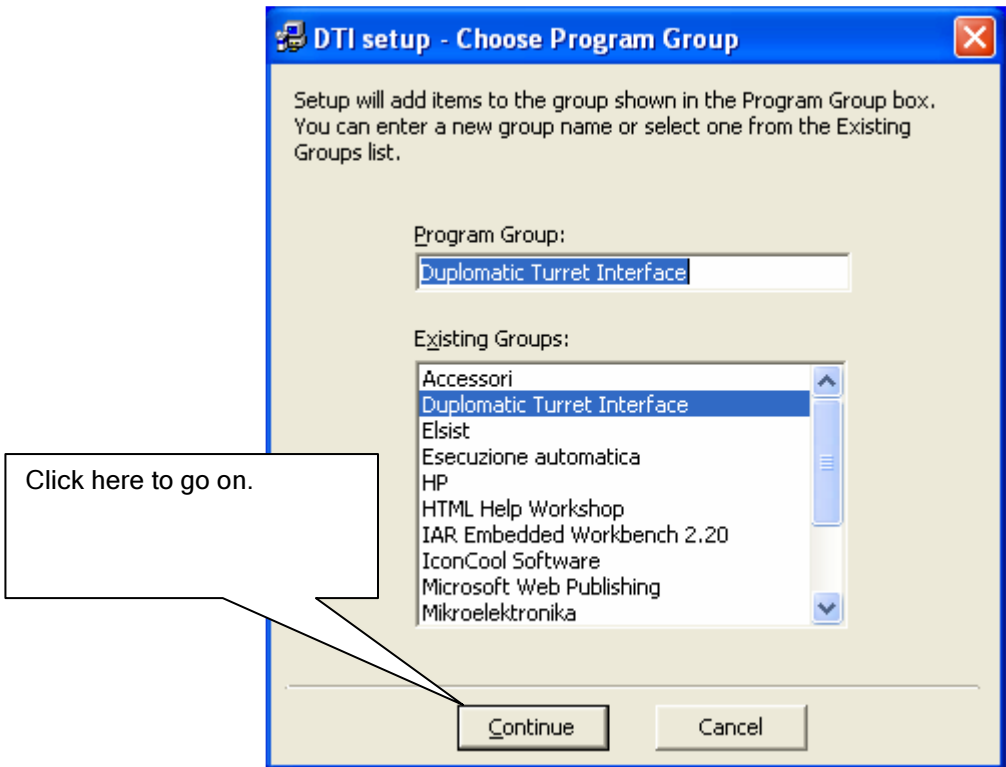


To accept the default directory, click on the big button with the picture of a PC.



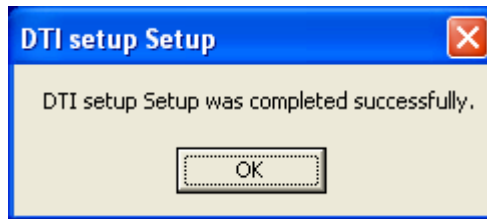
After a while, the setup program will ask in which 'program group' has to put the link of the program.

Even if it is possible to give a different group, it is suggested to keep the default selection. Click on 'continue' to go ahead in the setup process.





The setup process will end in few minutes and will show the following message.



Click on 'OK' to finish the installation.

If the setup has been performed using defaults, the program files are placed in “(disk):\program files\DTI” and the program can be started from menu “Start>programs->Diplomatic Turret Interface”.

[Index](#)

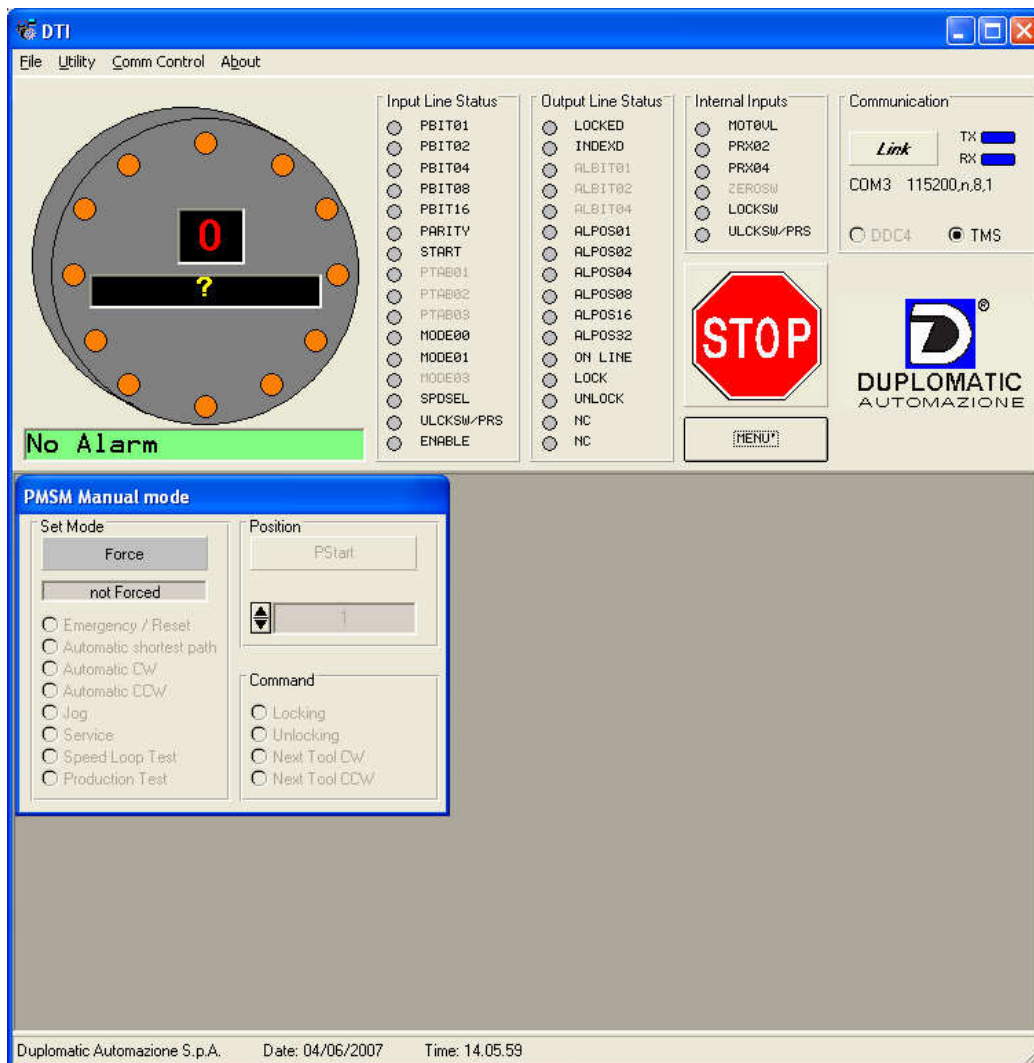


Chapter 4

How to use DTI 2.x

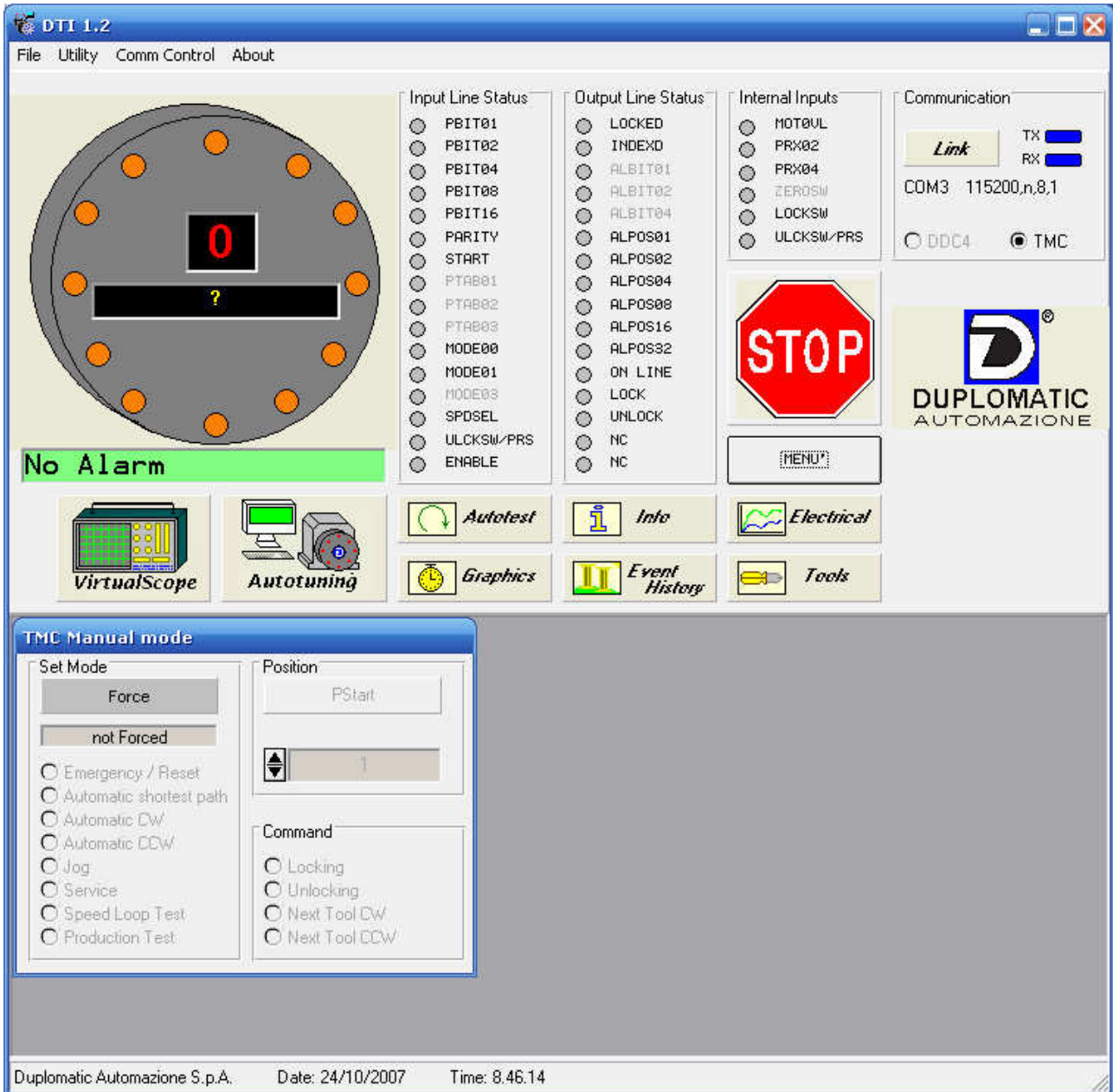
In this chapter it will be explained how to use in correct way the diagnosis software for TMC driver, how to handle Inputs and Outputs status, how to get information from alarms and how to take control of the turret by PC.

The main window at startup is the following.





By pressing the 'Menu' button it is possible to open the list of all commands windows of the software. Depending if the DTI is installed in 'Full' or in 'Lite' version, some command can be not present or with reduced functionality. To open a command windows, press the related button.

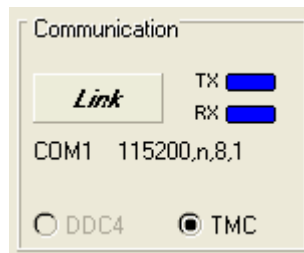




How to connect to the TMC unit

Before to connect to the TMC control unit, check if the serial cable is properly connected on both ends.

Select the right serial port from the “Comm. Control” menu.



At this point it is possible to initiate the communication by clicking the “Link” button.

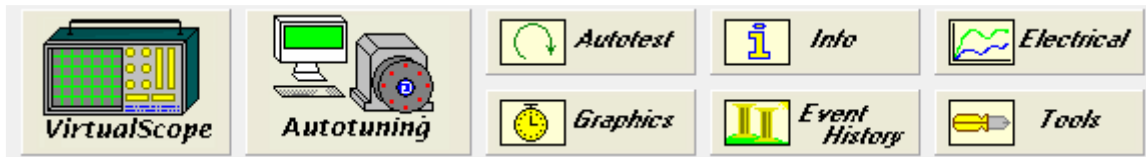
If ‘TX and ‘RX’ start to blink, the communication is established.

In case of error, the following message will appear and it needs to find the cause of the problem by checking cables and configuration.





The command menu



- [VirtualScope](#): is a virtual oscilloscope, it is possible to get from the controller the waveform of the most important signals (only for service).
- [Autotest](#): execute a series of tool change without the need of PLC/CNC.
- [Graphics](#): in this windows it is possible to get the most important timings related to the turret cycle.
- [Info](#): in this window it is possible to get information about the Firmware release loaded inside the TMC control unit.
- [Tools](#): it allows to manage (view, modify, load and save) the parameters stored inside the TMC control unit.
- [Electrical](#): it shows the relevant electrical measurements that can be supplied form the TMC control unit.
- [Events history](#): in this window it is possible to get the list of latest alarms and cycles from the non-volatile memory of the TMC controller.
- [Autotuning](#): this window give access to command to perform the autotuning of the turret. The autotuning is necessary any time a new TMC controller is connected to a turret. Once the tuning has been performed, there is no need to make it anymore unless the turret is disassembled and reassembled or the TMC driver is replaced by a new one.

[Index](#)



Autotest

Function not yet available.

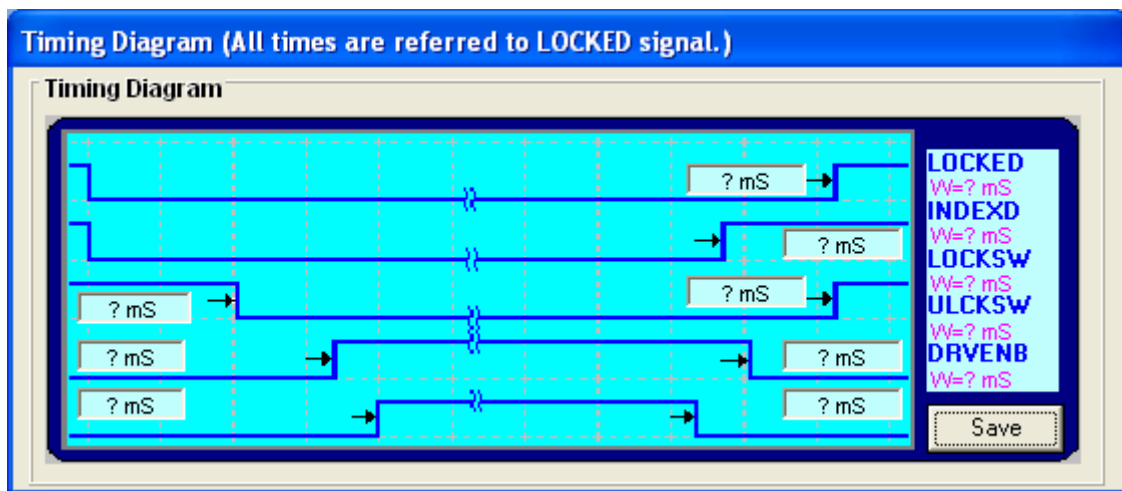


Graphics

This window shows the relevant timings of the turret cycle.

- LOCKED (END-OF CLAMPING SIGNAL);
- INDEXD (END-OF-ROTATION);
- LOCKSW (SIGNAL OF CLAMPING SWITCH);
- ULCKSW (NOT USED IN DM TURRETS);
- DRVENB (ROTATION TIME);

All timings are referred to the START Signal rising front.



It is possible to save the timings in a text file by pressing 'save'. The default directory is the one in which the program has been installed. The extension is 'tmr'. This file can be opened with a text editor like 'Notepad'.

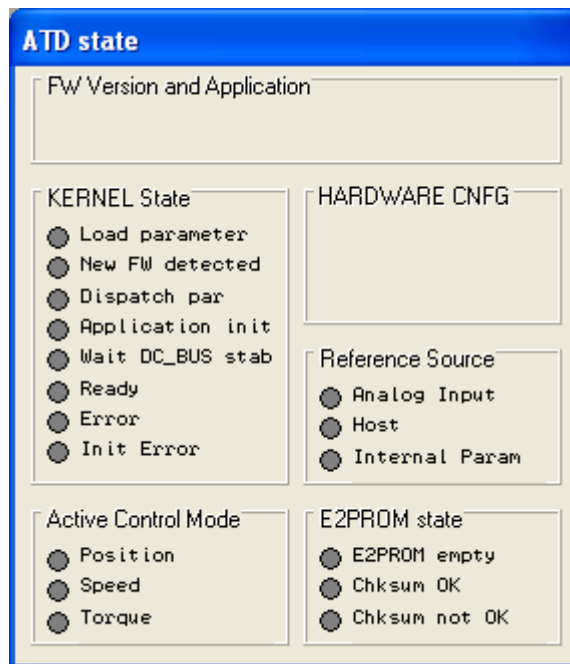
[Index](#)



Info

The Info window (ATD status) shows the Firmware release and other informations. These informations are not directly useful but can be important to have a better picture of the system in case of problems.

If the 'Wait DC_BUS stab' mark is RED, check the threephase supply.



[Index](#)



Tools

In this window it is possible to load, save, change parameter inside the TMC control unit. In DTI 'Lite' there are reduced functionalities, to avoid mistakes made by customer, so the parameter description is blanked, there is no possibility to modify a parameter, but just to save and/or load a complete set of parameters.

Code	Description	Units	Min. Value	Max. Value	Actual Value
0		-	0	3	4
1		-	0	1	0
2		-	0	2	0
5		-	0	0	0
4		-	0	16000	1000
5		-	0	0	0
6		Rpm	1	30000	10000
7		-	0	0	0
8		-	1	4096	4096
9		-	1	4096	256
10		-	1	4096	4096
11		ms	0	6000	3000
12		-	0	3	1
13		-	0	5	5
14		ms	1600	50000	3200
15		mA	1000	420000	54880
16		[1/1000 * Ifs]	100	1000	812
17		A^2/s	0	500000	0
18		1/10 °C	750	950	800
19		-	1	6	1
20		-	0	65535	1
21		x100 us	0	65535	0
22		x100 us	0	65535	0
23		ms	0	65535	0
24		-	0	65535	0
25		ms	0	65535	0
26		-	0	65535	0
27		ms	0	65535	0



Save file: the parameters read from the drive into a file.



Load parameters from a file and send them to the drive (into RAM memory, will be lost at power off if not saved).



Save in EEPROM the parameters to make them permanent.



Load parameters from drive (executed automatically when the tools window is opened).

Remarks: if there is some change in important parameter (e.g. the number of tools) between the one into the drive memory and the one loaded by file, after the copy into the EEPROM, some other parameter will be reset to avoid mistakes. So it is necessary to load and save parameters two times, specially after a firmware update.

[Index](#)

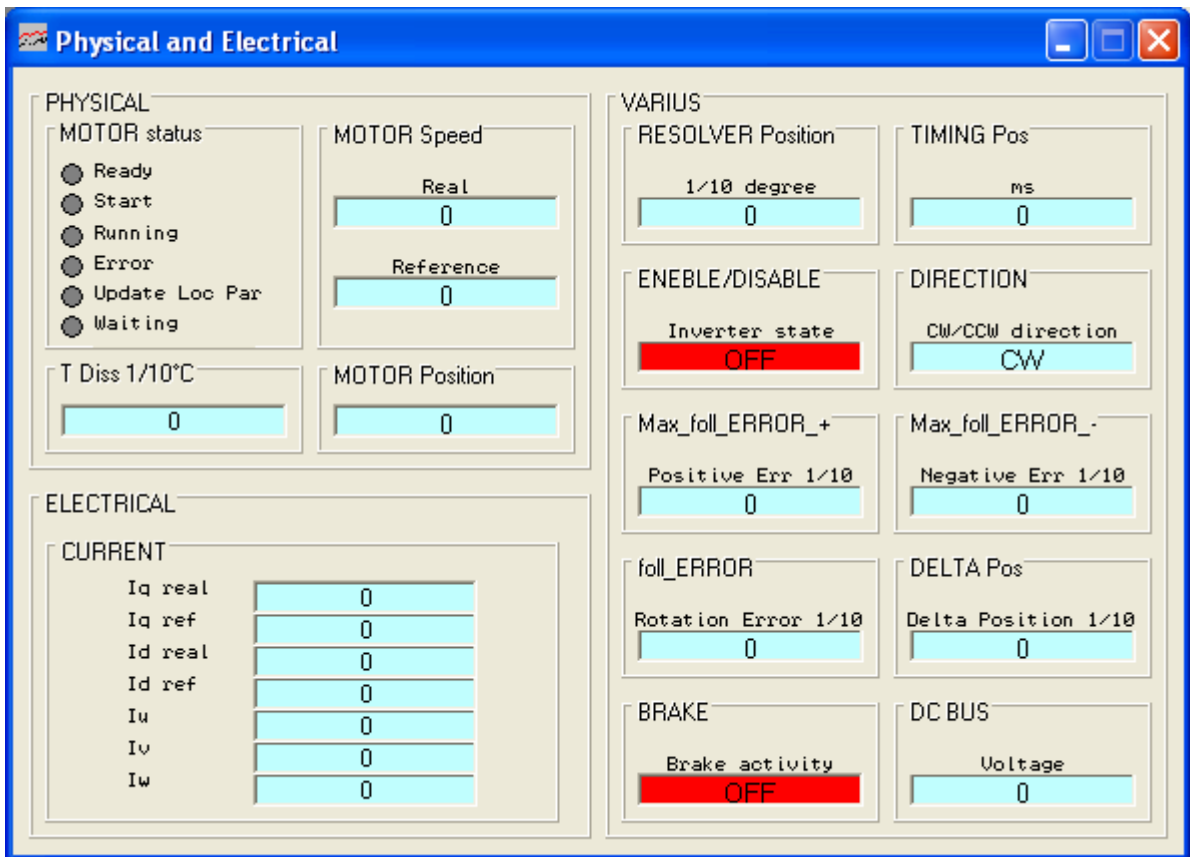


Electrical

In this window it is possible to have a look on the principal variables used during the turret rotation. Important are the current in each motor phase, (peak value), the motor position (in case of needing to adjust the resolver after extraordinary maintenance), the HEATSINK temperature.

Take care that the DC-BUS is not available on all controllers. If a fixed '0' is present, means that the value is not available.

See the 'Wait DC_BUS stab' mark in 'Info' window: if it is RED the threephase supply is OFF or there is failure inside the controller.



[Index](#)



Events History

The Events History windows can show the list of last 50 alarms and the list of last 440 cycles (350 from FW 2.9).

Records are stored in a permanent memory so can be retrieved also if the TMC unit has been switched off after the failure.

These information are useful in order to troubleshoot any problem related to the turret.

The ID cycle is the number of cycle made by TMC unit.

Due to a FW bug, this number restarts from 0 after 65535. FW 2.9 fixed this problem.

Data LOG

LOG ID	ID cycle	MODE	Start POS	End POS	Alarm Code
0	0	0	0	0	27
1	0	0	0	0	17
2	0	0	0	0	16
3	0	0	0	0	16
4	0	0	0	0	16
5	0	0	0	0	27
6	0	0	0	0	17
7	0	0	0	0	16
8	0	0	0	0	16
9	0	0	0	0	27
10	0	0	0	0	17
11	0	0	0	0	16
12	0	0	0	0	27
13	0	0	0	0	16

Control Panel:

- READ Cycles
- RESET Cycles
- READ Alarms
- RESET Alarms
- Cycle record: Max Log Cycle (440), nActual Cycle (0)
- Alarm record: Max Log Alarm (50), nActual Alarm (25)

It is also possible to clear the list of alarms and cycles. This operation should be performed only by Diplomatic Service.

[Index](#)



Virtualscope

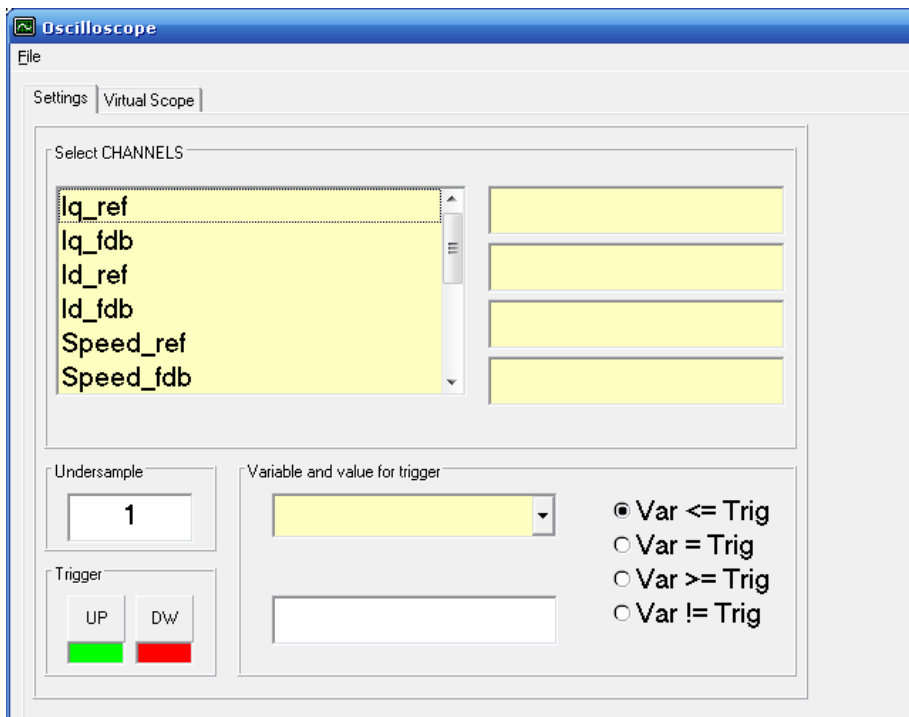
Virtualscope is a tool designed for developing new parameter set in Diplomatic facilities.

It can be used for service to troubleshoot problems that cannot be solved in other ways.

This tool allow to select up to 4 variables of TMC controller, a trigger event, and to collect up to 2048 samples (for 1 variable) and 512 (for 4 variables) at a sampling rate multiple of 125us.

At the end of sampling operation, data can be read by PC and traced on the screen.

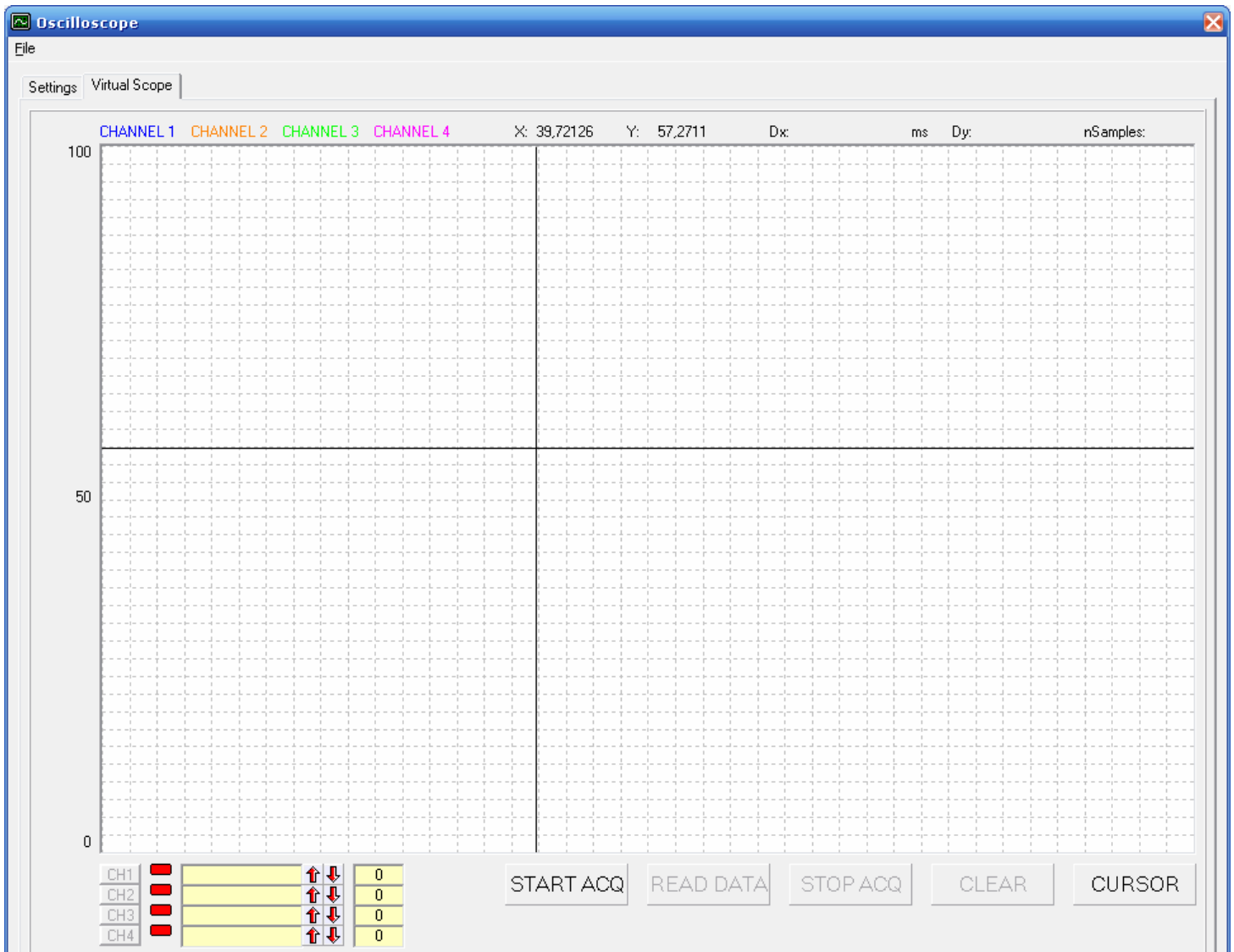
There are two pages: the configuration page (*settings*) looks like the following.



- Double click the variable to be traced from the list: it will be placed in the first free slot on the left. To delete, double click on the slot.
- Select the trigger variable from the drop-down list, check the trigger activation mode and the activation threshold. (suggested Inverter_state >1)
- Select the undersample value: this value must be chosen according to the last of the event and the frequency of the signal to be traced.
 - 1= samples every 0,125ms->256 ms max for 1 channel, 64 ms for 4 channels
 - 20 = samples every 2,5 ms>5 s max for 1 channel, 1,25 s for 4 channels



The Grapich page (*Virtualscope*) shows the commands to start the logging of data and print the collected waveforms.



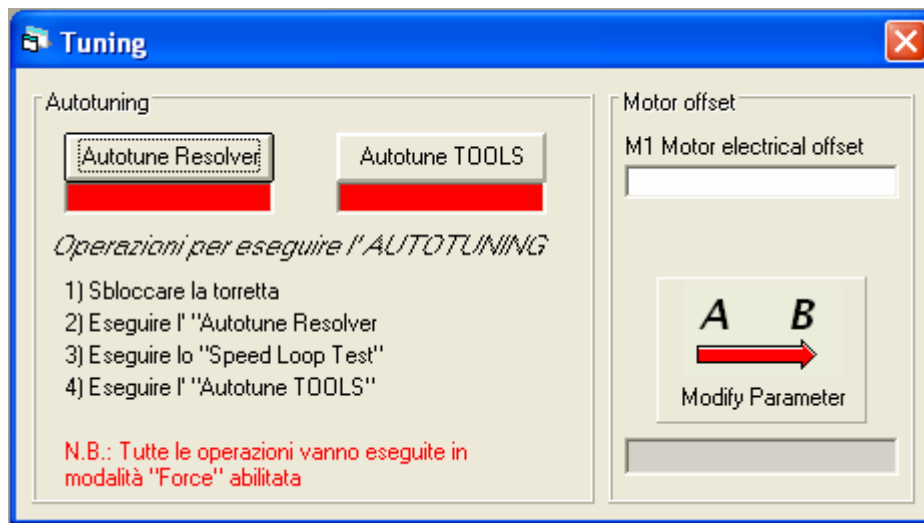
To get a waveform, press 'START ACQ', and wait until the trigger has been activated **“WAITING.....ON SAMPLING”**. At this point it is possible to get data from PC by pressing 'READ DATA' button **“WAITING.....DOWNLOADING SAMPLES”**

'CURSOR' button enable cursors in order to take measurements.

Buttons “CH1” to “CH4” allow to show/hide the related trace.
Arrow buttons close to each channel allow to shift horizontally the trace.



Autotuning



These functions must be used for first startup of the turret.

See the 'Automatic setup procedure' chapter.

[Index](#)



Chapter 5

Automatic setup.

The resolver (position transducer) mounted on the back of the turret has two important tasks:

- give the absolute position of the disk.
- give information in order to drive correctly the torque motor of the turret (commutation angle).

In order to simplify the adjustment of the resolver in case of factor assembly and in case of extraordinary maintenance, its electrical and mechanical zero is adjusted and fixed manually in order to be very close to the tool n° 1 of the disk when the turret is clamped.

In this way, there is no any mechanical alignment with the magnetic field of the motor, so it needs to perform a 'commutation angle detection'.

Commutation angle detection (autotuning resolver).

Preliminary tasks:

- The TMC driver is installed and connected properly as specified in instruction manual.
- The 24VDC and the three-phase supply are fed correctly to the TMC unit, the ENABLE input is at 24VDC.
- Hydraulic circuit connected and pressure available.
- TMC controller connected to a PC with the DTI software running.

Once the previous operations have been performed and checked, it is possible to start the commutation angle detection.

1. Press the **"Force"** button in *"TMC Manual mode"* window to take control from PC.
2. Select the **"Service"** operating mode.
3. Select **"Unlocking"** command.
4. Press **"Start"** to send the command to the controller.
5. If the turret unclamps without alarms, press the **"Autotuning"** button from command menu: the **Autotuning** window will open (see related chapter).
6. Press the **"Autotune RESOLVER"** button: the disc will make three rounds in one direction and three rounds in the other. Wait until the label under the button becomes green.



Speed Loop Test

In order to verify the effectiveness of the previous phase, it is possible to execute the *“Speed Loop Test”*: this command put the disc in rotation for about 10 seconds in both direction. If the disc rotates in a similar way in both direction, the resolver has been tuned correctly.

1. Open *“TMC Manual mode”* window and select *“Speed Loop Test”*.
2. Press *“Start”* button to send the command to the controller.
3. Wait the end of rotation.

At this point it is necessary to execute the third step.

Autotuning of exact tool position.

The last operation required for startup is the tuning of the exact tool position. This will compensate the small position mistake that can occur when the resolver is fixed manually to the turret. It also compensates the small non-linearity of the resolver, in order to get a more precise positioning before clamping. The values detected are stored inside the non-volatile memory of TMC controller and there is no need to set them again unless the turret is disassembled or the TMC is replaced.

Open the *“Tuning”* window and press the *“Autotune TOOLS”*.

1. Wait for the completion of the sequence
2. execute some tool change in manual mode by using the operating function *“Automatic shortest path”* in the ‘Manual mode’ window, by selecting the tool required and then by pressing the *“Start”* button.



Chapter 6

ALARMS MANAGEMENT

The TMC control unit executes every time self-diagnosis routines and set different alarm codes to give more information about the problem detected.

On the digital outputs of TMC controller, the working condition is signalled when READY is HIGH. In this case ALPOSXX signals show the current turret position.

If an alarm is present, the READY signal is LOW and there is at least one ALPOSXX signal HIGH. The alarm code is in binary format (with ALPOS01= LSB)

The alarm code and its description will appear on DTI screen.

The alarm can be reset form DTI by pressing the 'STOP' button. (it will take a while to complete the operation)



Alarm list

Please check the electrical instruction manual to have the latest issue of alarm list

Starting from FW 01.02 there is no more separation in group and subgroup.

OUTPUTS						Actual position (READY= ON)	ALARM CODE (READY= OFF)	ALARM DESCRIPTION (READY= OFF)
ALPOS32	ALPOS16	ALPOS08	ALPOS04	ALPOS02	ALPOS01			
0	0	0	0	0	0	Out of position	0.0	No alarm
0	0	0	0	0	1	1	0.1	Non consistent parameters in memory.
0	0	0	0	1	0	2	0.2	Failure in internal power supply.
0	0	0	0	1	1	3	0.3	External 24V DC supply is too low.
0	0	0	1	0	0	4	0.4	Thermal I ^t threshold reached.
0	0	0	1	0	1	5	0.5	Motor overspeed.
0	0	0	1	1	0	6	0.6	Overload: check inertia and friction, check motor and resolver wirings.
0	0	0	1	1	1	7	0.7	Short circuit on power stage: check servomotor wiring or internal damage. (1)
0	0	1	0	0	0	8	0.8	Ground leakage in power stage, check wirings to motor and servomotor. (1)
0	0	1	0	0	1	9	0.9	Internal braking resistor circuit error. (1)
0	0	1	0	1	0	10	1.0	Trouble on power stage control section. (1)
0	0	1	0	1	1	11	1.1	Overvoltage during motor braking. Reduce inertia on the disk. (1)
0	0	1	1	0	0	12	1.2	Undervoltage on threephase
0	0	1	1	0	1	13	1.3	Short circuit on resolver power line (RPOW+, RPOW-) or broken wire on (RSIN+, RSIN-, RCOS+, RCOS-).
0	0	1	1	1	0	14	1.4	Fault on digital outputs: check for external shorts or overloads.
0	0	1	1	1	1	15	1.5	Profile generator fault.
0	1	0	0	0	0	16	1.6	HW ENABLE is not present.
0	1	0	0	0	1	17	1.7	Positioning timeout
0	1	0	0	1	0	18	1.8	Heatsink overtemperature. (1)
0	1	0	0	1	1	19	1.9	Overvoltage on threephase line. Check main supply. (1)
0	1	0	1	0	0	20	2.0	Reached maximum positioning error.
0	1	0	1	0	1	21	2.1	Timeout in cycle execution.
0	1	0	1	1	0	22	2.2	Motor overtemperature. (1)
0	1	0	1	1	1	23	2.3	The signal of Locking switch does not go OFF during unclamping.
0	1	1	0	0	0	24	2.4	The signal of Locking switch has gone ON while turret is unclamped.
0	1	1	0	0	1	N.A.	2.5	Unclamping timeout.
0	1	1	0	1	0	N.A.	2.6	N.A.
0	1	1	0	1	1	N.A.	2.7	N.A.
0	1	1	1	0	0	N.A.	2.8	The signal of Locking switch has gone OFF while turret is clamped.
0	1	1	1	0	1	N.A.	2.9	Clamping timeout.
0	1	1	1	1	0	N.A.	3.0	N.A.
0	1	1	1	1	1	N.A.	3.1	Need to run the the setup procedure.
1	0	0	0	0	0	N.A.	3.2	Requested tool is not existing
1	0	0	0	0	1	N.A.	3.3	Parity error on tool number request.
1	0	0	0	1	0	N.A.	3.4	PBITXX are changed but PSTART did not came on time.
1	0	0	0	1	1	N.A.	3.5	PLC set EMERGENCY MODE during turret cycle
1	0	0	1	0	0	N.A.	3.6	Trouble during setup procedure execution
1	0	0	1	0	1	N.A.	3.7	Cannot clamp during setup procedure.
1	0	0	1	1	0	N.A.	3.8	Error in D current controller. Check motor and resolver wirings.
1	0	0	1	1	1	N.A.	3.9	Error in Q current controller. Check motor and resolver wirings.
1	0	1	0	0	0	N.A.	4.0	Error in speed controller.
1	0	1	0	0	1	N.A.	4.1	Error in position controller.



1	0	1	0	1	0	N.A.	4.2	N.A.
1	0	1	0	1	1	N.A.	4.3	N.A.
1	0	1	1	0	0	N.A.	4.4	N.A.
1	0	1	1	0	1	N.A.	4.5	N.A.
1	0	1	1	1	0	N.A.	4.6	N.A.
1	0	1	1	1	1	N.A.	4.7	N.A.
1	1	0	0	0	0	N.A.	4.8	N.A.
1	1	0	0	0	1	N.A.	4.9	N.A.
1	1	0	0	1	0	N.A.	5.0	N.A.
1	1	0	0	1	1	N.A.	5.1	N.A.
1	1	0	1	0	0	N.A.	5.2	N.A.
1	1	0	1	0	1	N.A.	5.3	N.A.
1	1	0	1	1	0	N.A.	5.4	N.A.
1	1	0	1	1	1	N.A.	5.5	N.A.
1	1	1	0	0	0	N.A.	5.6	N.A.
1	1	1	0	0	1	N.A.	5.7	N.A.
1	1	1	0	1	0	N.A.	5.8	N.A.
1	1	1	0	1	1	N.A.	5.9	N.A.
1	1	1	1	0	0	N.A.	6.0	N.A.
1	1	1	1	0	1	N.A.	6.1	N.A.
1	1	1	1	1	0	N.A.	6.2	N.A.
1	1	1	1	1	1	N.A.	6.3	N.A.

N/A = No alarm and/or position associated to this code.

[Index](#)



Chapter 7

Troubleshooting

No serial connection has been established:

- Make sure that the cable is connected to the correct PC serial port.
- Make sure that at least the 24V powering unit is connected to the electronic unit of the turret.
- Check the set-up values of the serial port:
 - Baud rate: 19200
 - Parity: none
 - Bits: 8
 - Stop bits: 1

The software is too slow:

On old PCs with little memory or slow processor there might be a slow-down during monitor refreshing.

Some signals (for example the EVLOCK signal) always remain off:

This is due to the reduced time available, at which the signal remains in the active state (less than 1 sec.).

As the software reads the information from the control unit at regular intervals, it may occur that the software is reading the data when these are not active. You must wait for the right moment in order to have the data read in.

The state 'Emergency' cannot be changed:

It must be taken into account that the mode must be different from 0 (mode 1,2,3,4,5,6,7) in order to work with the PC.

[Index](#)



Notes:



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