ALPHA SERIES vs Waverider robots / MCS

WHAT'S NEW?

GmbH

DOSIEREN • LÖTEN • ESD-SCHUTZ

ALPHA SERIES vs Waverider robots / MCS

HARDWARE DIFFERENCES

ALPHA CU4

ALPHA IO16

ALPHA SD05

ALPHA SD10

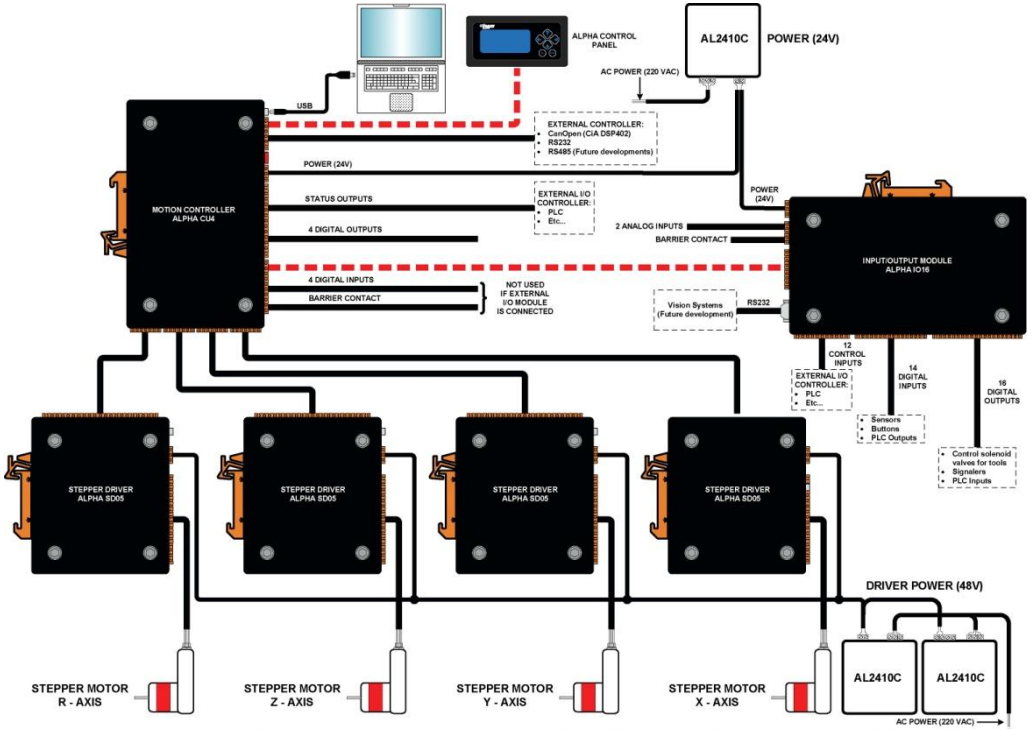
ALPHA CP

ALPHA vs Waverider/MCS | HARDWARE DIFFERENCES

DESCRIPTION	WAVERIDER ROBOTS OR MOTION CONTROL SYSTEM (MCS)	ALPHA ROBOTS OR ALPHA SYSTEMS
CONTROL UNIT FOR 4-AXES INTERPOLATED SYSTEM	RBT3	**ALPHA CU4**
STEPPER MOTOR DRIVER, 48Vdc, 5 Apk	RBT4	**ALPHA SD05**
STEPPER MOTOR DRIVER, 120Vdc, 10Apk MAX		**ALPHA SD10**
EXTERNAL I/O DEVICE	RBT2 or RBT2-16/16	**ALPHA IO16** or **RBT2-16/16** (*optional)
CONTROL PANEL / TEACHING PENDANT	215RBT	**ALPHA CP**

Main hardware differences [1/2]

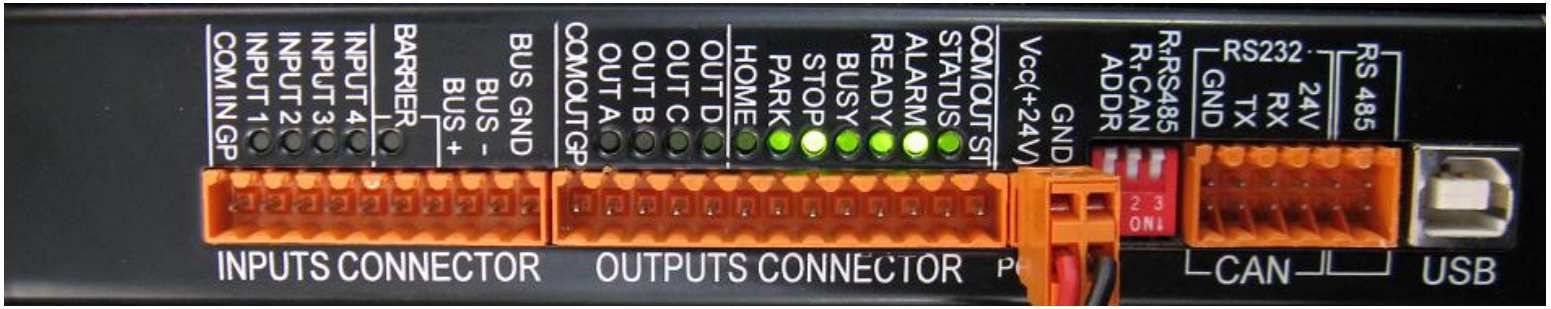
- Control and logic devices powered to **+24V** (the +12V power supply is not necessary).
- Two models of stepper drivers are available: **ALPHA SD05** (+48Vdc, 5Apk) or **ALPHA SD10** (10Apk, +120Vdc). Both drivers can be used in the same ALPHA system. Big machines can be realized.
- Management of optional **external brake** (electromagnetic or air pneumatic), which locks the vertical axes in static conditions, when the robot is powered off.



SYSTEM OVERVIEW

Main hardware differences [2/2]

- Design oriented to the **automation environment**.
- Easy installation in robots or electric cabins, thanks to removable connectors and a new DIN rail mounting.
- **Screen print** on the box makes connections easier.
- Inputs and outputs status and barrier contact indicated by **LEDs** (easier system diagnostics).
- Standard **USB connection** to the PC to set-up and program the robot (no USB-RS232 adapter is necessary).
- **CAN Bus** (CANopen® protocol) and **RS232** port available



ALPHA CU4 (front view)

Inputs and outputs solutions [1/2]

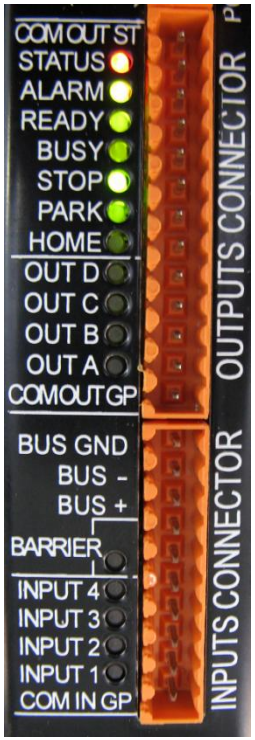
- The control unit **ALPHA CU4** has 4 inputs and 4 outputs “general purpose”. The external I/O device is optional.

- External I/O devices available: **ALPHA IO16** device, or previous version **RBT2-16/16**

	GENERAL PURPOSE INPUTS	CONTROL INPUTS	GENERAL PURPOSE OUTPUTS	Notes
ALPHA CU4	4	0	4 (“fast” outputs, to create square waves during the motion)	Input and output status indicated by LEDs
RBT2-16/16	16 (14 digital)	11	16 (1 relay)	No leds available
ALPHA IO16	16 (16digital)	11	16 (2 relay)	Input and output status indicated by LEDs

Inputs and outputs solutions [2/2]

ALPHA CU4

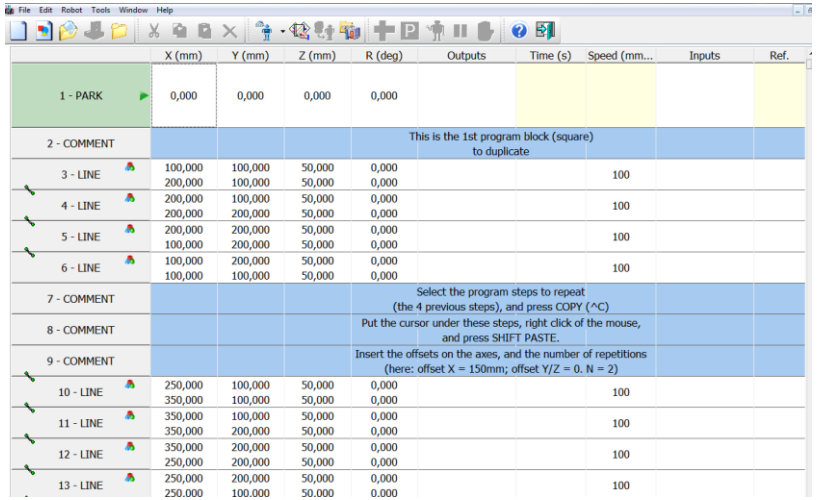


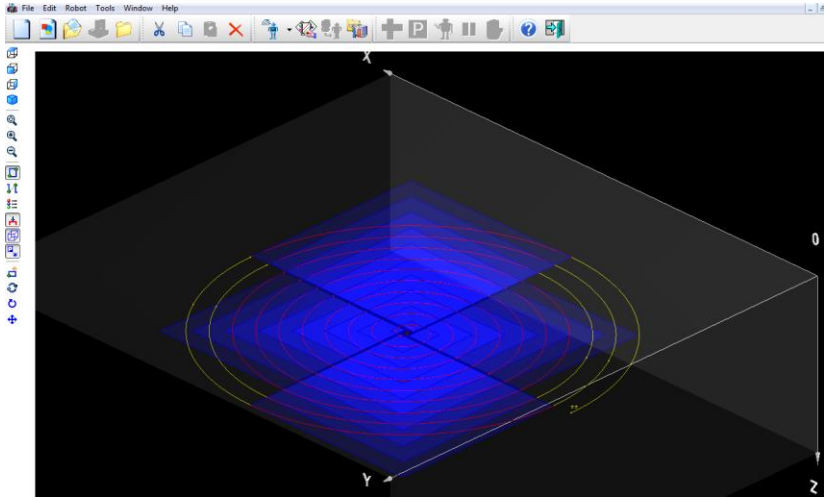
RBT2-16/16

ALPHA IO16

ALPHA SERIES vs Waverider robots / MCS

SOFTWARE & FIRMWARE DIFFERENCES

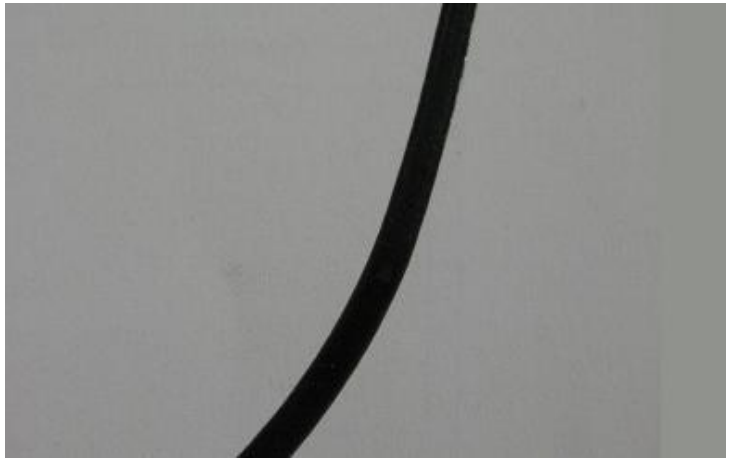




Point-to-point movement and *Continuous path* movement

- “Point-to-point” or “Continuous path” movement can be selected by the user.
- “Continuous path” movement between LINES, ARCHES and CIRCLES in 3D space (if properly jointed), also at high speed.
- Reduced mechanical vibration during continuous path movement.
- Reduced stop time in point-to-point movement.
- Ideal in dispensing application, to solve the problem of product accumulation in the points between consecutive movements

WAVERIDER / MCS SYSTEM



ALPHA SYSTEM

New program steps [1/3]

List of the program steps of an ALPHA robot, and new developments (not present in the previous Waverider/MCS system):

PARK. Programming of the outputs status. Disable PARK option.

POINT. New outputs options.

LINE. Anticipated output change at the arrival point (useful in dispensing application). Trigger output function. More options during inputs test.

ARC, CIRCLES. Anticipated output change at the arrival point (useful in dispensing application).

4TH AXIS MOVEMENT. The 4th axis (optional) can be moved independently.

NEW

AREA.

New program steps [2/3]

List of the program steps of an ALPHA robot, and new developments (not present in the previous Waverider/MCS system):

WAIT INPUT. Selected inputs are tested, before continuing; timeout options are implemented. NEW

BRANCH. Selected inputs are tested, in order to continue or to jump to another step. It is possible to jump to every step. No more “red” and “green” paths.

JUMP. Jump to a every program step, infinite or finite times (the number of jumps can be set).

SET OUTPUTS / PULSE GENERATION. NEW

DELAY. NEW

CALIBRATION LINE. See next pages for details. NEW

New program steps [3/3]

List of the program steps of an ALPHA robot, and new developments (not present in the previous Waverider/MCS system):

SUBPROGRAM. See next pages for details. NEW

COMMENT. A user message can be inserted everywhere in the program. NEW

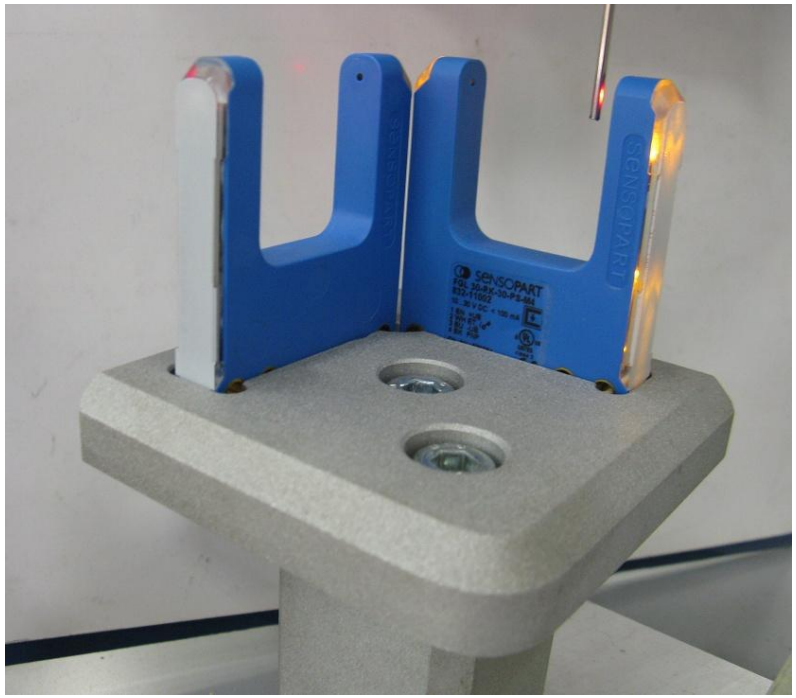
END OF PHASE.

END PROGRAM. It can be inserted everywhere in the program.

Automatic program calibration [1/2]

- Useful in case of tool change (needle of a dispenser, etc.) or whenever the product (PCB, …) must be positioned inside the working area in a translated position, over X and/or Y and/or Z axis

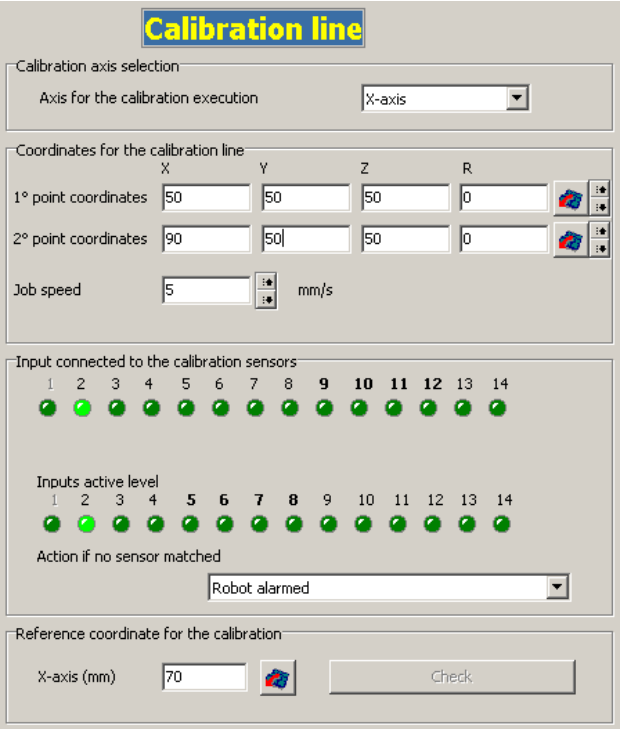
- A calibration system (with sensors used to detect the positions of the tool or of the piece to work) is required. Use our new laser calibration system for X-Y calibration (see figure).



X-Y LASER CALIBRATION SYSTEM

Automatic program calibration [2/2]

- Easy to program: insert a "Calibration Line" into the program, for every axis that needs to be translated.
- This line allows to calculate a "translation offset" that will be applied to all the following program steps.
- Calibration line can be cleared, in order to implement dynamic translation only in blocks of a program



Subprograms [1/2]

- Each program can be executed in another program, as a sub-program.
- The sub-program can be executed at its native coordinates, or “attached” to a specific point of the main program (“relative” coordinates).
- Option: call a subprogram several times, by defining a translation offset for each axis.
- Option: call a subprogram by applying a rotation angle around the Z-axis.

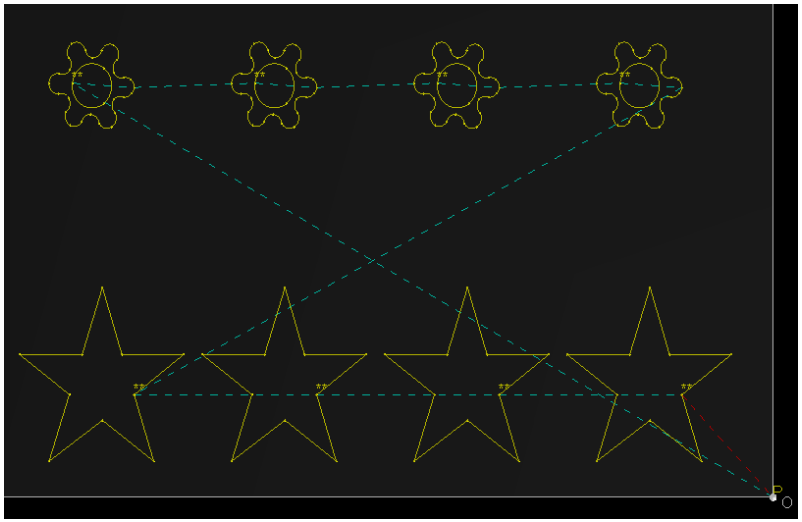
Main advantages

- Save time in programs modifications: if the subprogram is modified, automatically all the main programs are modified.
- Reduced program length (fewer number of steps)
- Very useful when repetitive operations must be done (i.e. matrix of pieces to work, etc.)

Subprograms [2/2]

1 - PARK	0,000	0,000	0,000	
2 - COMMENT				*** EXECUTION MODE: RELATIVE TO THE APPLICATION POINT *** (the application point must be at the beginning of a row)
3 - COMMENT				Repeat the following subprogram 'STAR' 4 times, with offsets Dy = 100mm; Dx = Dz = 0mm.
4 - SUBPROGRAM	50,000	50,000	50,000	Execution of the program "Star"
5 - COMMENT				Repeat the following subprogram 'FLOWER' 4 times, with offsets Dy = 100mm; Dx = Dz = 0mm.
6 - SUBPROGRAM	200,000	50,000	50,000	Execution of the program "Flower"
7 - END THE PROGRAM				

Example: Table of the main program (the subprograms 'Star' and 'Flower' are called and repeated 4 times each)



Example: Graph of the main program

Table visualization

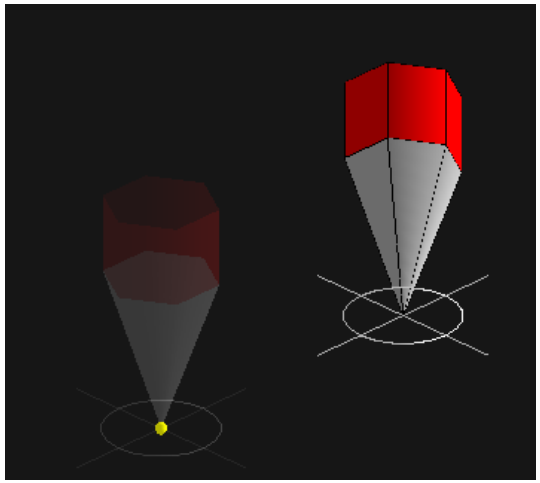
- Comments into the program.
- Visualization by leds of outputs status and inputs levels programmed.
- Delays and timeouts visualization, in the “Time” column.
- Jump visualization: the jumps for the selected job are showed as arrows in the “Ref.” column of the table (if the step is selected), with optional symbols.
- Different colors for comments, sub-programs, invalidated programs, and translated program blocks.

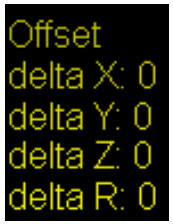
1 - PARK	0,000	0,000	0,000					
2 - COMMENT	The robot moves to this point							
3 - POINT	100,000	100,000	50,000					
4 - COMMENT	It waits until Input 1 is ON, before continuing. No timeout management.							
5 - WAITING FOR INPUTS							1	
6 - LINE	100,000 200,000	100,000 100,000	50,000 50,000	A	(0,200) (0,100)	100		
7 - LINE	200,000 200,000	100,000 200,000	50,000 50,000	A		100		
8 - COMMENT	The robot tests input 1 and 2. If no input is detected in 10" (timeout), the robot continues with the next step							
9 - COMMENT	If Input 1 is detected, the robot continues with the next step If Input2 is detected, the robot jumps to step 6.							
10 - BRANCH				A	(10,000)		1 2	
11 - LINE	200,000 100,000	200,000 200,000	50,000 50,000	A		100		
12 - LINE	100,000 100,000	200,000 100,000	50,000 50,000	A		100		
13 - COMMENT	It waits until Input 1 OR Input 2 are ON, before ending. If they remain OFF for 10" (timeout), the robot goes in Alarm status							
14 - WAITING FOR INPUTS					(10,000)		1 2	
15 - END THE PROGRAM								*

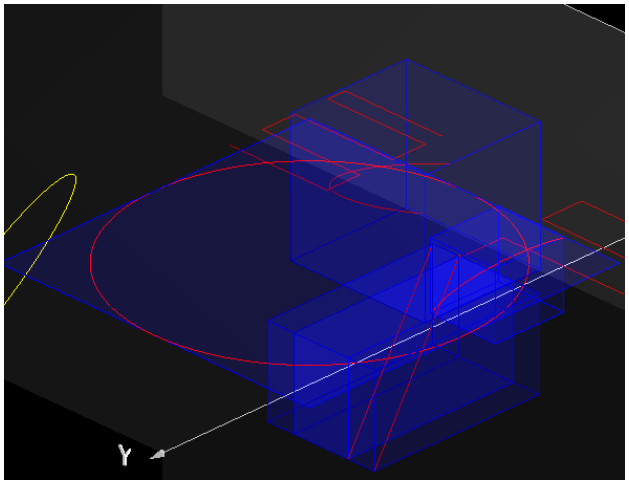
TABLE

3D graph evolution

- Visualization of execution point when the program is translated.
- Visualization of the translation offsets (due to calibration lines or translation commands).
- Visualization of the 3D size of multiple paths.
- Visualization of the 4th axis rotation.

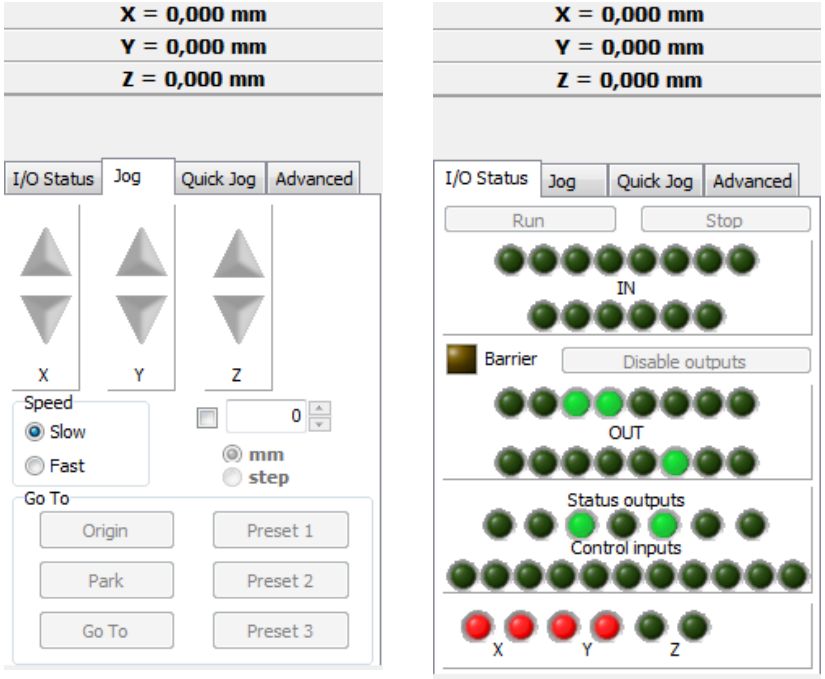






Control panel window

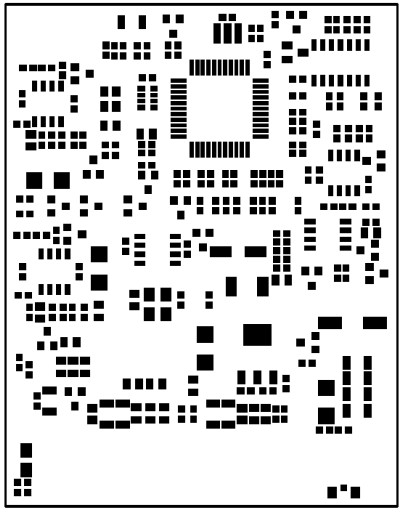
- Used to control the robot (Jog, Quick Jog, Advanced) and monitor the I/O status
- No program opening is required to move the robot in Jog mode
- Visualization of all the inputs and outputs of the robot (general purpose inputs and outputs, control inputs, status outputs, barrier status and homing sensors)



CONTROL PANEL

File import: Gerber

- Gerber is a standard format for PCBs: importing PCBs layout would save time and errors in electronic soldering and dispensing applications
- An import wizard imports Gerber files with most of the standards layouts and cells.



File import: XLS

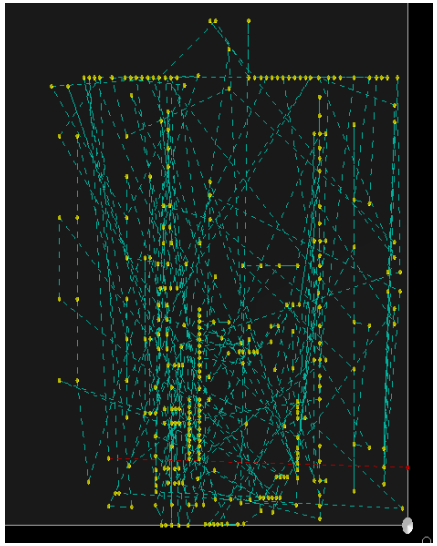
- Some Electronic design suite can export excel files. It can be also useful to edit long files and import clouds of points.
- As for Gerber files, a wizard can drive user to a quick and easy import

	A	B	C	D
1				
2		RefDesignator	X	Y
3				
4		C1	2,15	105,8
5		C3	90,95	112,75
6		C4	-9,2	97,65
7		C5	-9,05	105,8
8		C7	44,5	68,05
9		C8	5,05	77,3
10		C9	6,35	77,3
11		C10	7,65	77,3
12		C11	47,5	78,45
13		C12	0,3	98,55
14		C13	11,55	77,3
15		C15	12,85	77,3
16		C16	14,15	77,3
17		C19	15,85	77,3
18		C20	10,4	86,05
19		C22	91	114,55
20		C23	-4,15	89,1
21		C24	47,5	88,35
22		C25	78,75	84,75
23		C27	90,95	92,05
24		C29	90,95	99,95
25		C30	90,95	97,95
26		C31	90,95	96,05
27		C35	3,35	77,3
28		C36	2,05	77,3
29		C37	-7,05	52,25
30		C38	-0,6	68,35

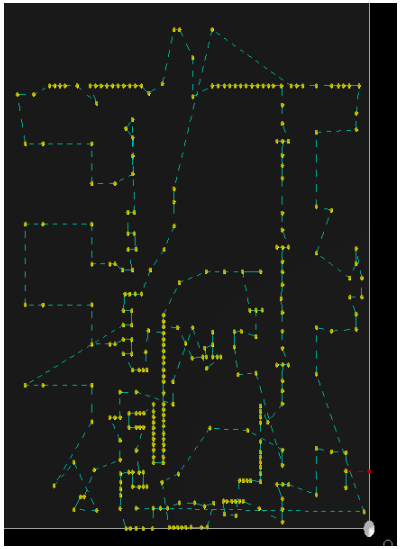
Path optimization alghoritm

When DXF, XLS or Gerber files are imported, the robot paths and transfers created are not optimized.

A “path optimization” alghoritm can be used, in order to minimize the running time of the program.



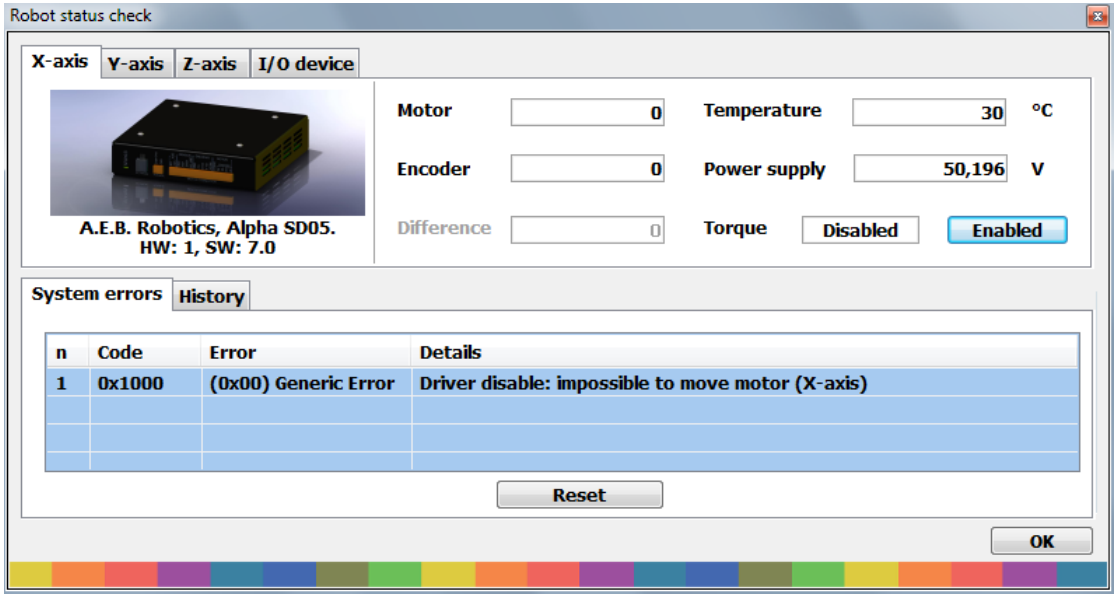
BEFORE



AFTER

Robot diagnosis windows

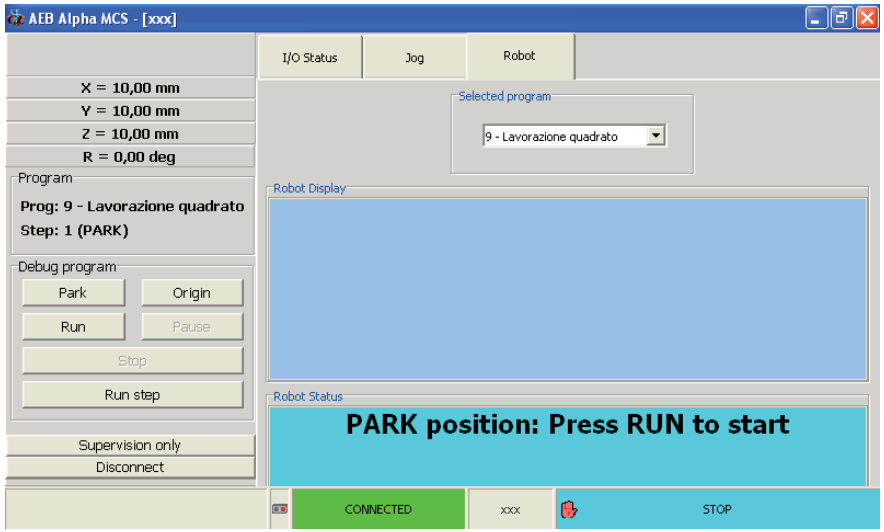
- Diagnostic error codes and motors drivers status always available in the new diagnostic window.
- More error details and an error history list allows to save trouble-shooting time in problem solving.



Operator panel

- Launch the software PC without USB hardware key: the PC software is an “operator panel”.
- The user can select two operating mode:

  1. **Robot control.** The software is used to control the robot, setting the tasks the robot must execute. Optional external devices (CAN Master, PLCs) are ignored.
  2. **Supervision only.** The software is connected to the system just to check and display its status, and not to control or modify it.
- No risks of programs modifications by the user!
- Costumer logo can be showed in the operator panel.



Robot control by RS232 serial port

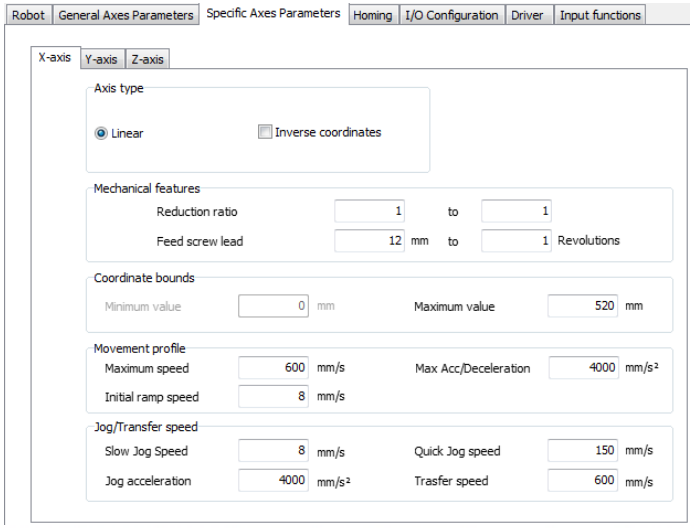
- Command list compatible with the commands of Waverider/MCS system
- Baud Rate up to 115.200bit/s
- New commands implemented:
  - ✓ Set arrival target and profile velocity, and start movement. Queue of movements is possible (load the next movement during the current movement)
  - ✓ Program translation and rotation (around Z-axis) commands
  - ✓ I/O management
  - ✓ Diagnostic errors management
  - ✓ Etc.

Robot control by *CANOpen*® bus

- Standard device, compliant to standard CiA® (CAN in Automation) DS402 (Motion Control).
- Up to 126 robots can be inserted in the bus
- “Homing mode” and “Interpolated position mode” implemented
- Main commands implemented:
  - ✓ Set arrival target and profile velocity, and start movement (compliant to standard CiA® DS402). Queue of movements is possible (load the next movement during the current movement)
  - ✓ Program management: selection, run, stop, …
  - ✓ Program translation and rotation (around Z-axis) commands
  - ✓ I/O management
  - ✓ Diagnostic errors management
  - ✓ Etc.

Robot configuration

- New configuration windows, with the list of all the configuration parameters:
  - ✓ General Settings (number of axis, etc…)
  - ✓ Specific Axis settings (axis length, maximum speeds, etc…)
  - ✓ Parameters for homing procedures
  - ✓ Input and Output settings (optional I/O device, etc…)
  - ✓ Motor drivers settings
  - ✓ General purpose input functions
- Easy to set-up: it is possible to show just the main parameters.
- The range of admitted values is showed; bad parameters are colored by red.
- Copy parameters from an axis to another is possible.



System improvement

- **Connection of the PC to the robot**, while in running, without interrupt the operations.
- **Multiple robot selection**: If more than one robots are connected to different USB ports of the PC, the software detects all the robots connected to the machine, and select the desired robot. The connection is still made to one robot at a time.
- **Dynamic position control:** if the robot has a collision, the motors stops the movement immediately (not at the end of the movement).
- Connection of a **signal tower** to the machine, without any other PLC or external logic
- New **input functions** available: Pause/Hold, STOP, JOG, Start homing, Start program execution, Alarm reset.
- **Clone-axis function**: The R axis can be set-up as a “clone” of a cartesian axis (X or Y or Z), in order to move big machines with heavy loads (for system integrators only).

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