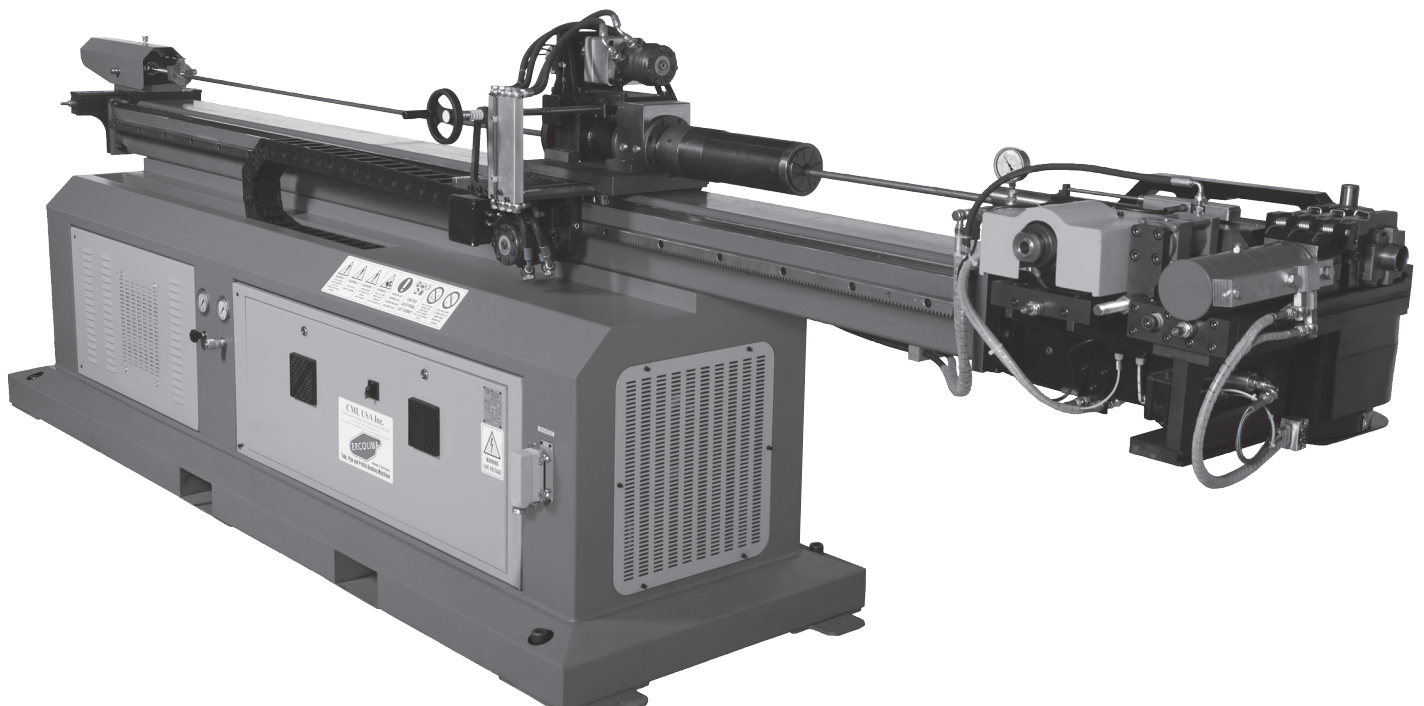


Erco Bender®

Rotary Draw 3 Axis CNC Mandrel Bender for Pipe, Tube and Profile Bending

Operator's Manual



WARNING!

BEFORE USE, BE SURE EVERYONE USING THIS MACHINE READS AND THOROUGHLY UNDERSTANDS ALL SAFETY AND OPERATING INSTRUCTIONS IN THIS MANUAL

Model ERCO _____

Serial # _____

Important Safety Instructions



When using electric tools, basic safety precautions should always be followed to reduce the risk of fire, shock and personal injury.

- 1. Keep Work Area Clean**
Cluttered areas and benches invite injuries.
- 2. Consider Work Area Environment**
Do not expose power tools to rain.
Do not use the power tools in damp or wet locations.
Keep work area well lit.
Do not use a tool in presence of flammable liquids or gases.
- 3. Guard Against Electric Shock**
Prevent body contact with grounded surfaces. For example; pipes radiators, ranges, refrigerator enclosures.
- 4. Keep Children Away**
Do not let visitors contact tool or extension cord.
All visitors should be kept away from work area.
- 5. Store Idle Tools**
When not in use, tools should be stored in a dry and high or locked-up place out of reach of children.
- 6. Do Not Force Tool**
It will do the job better and safer at the rate for which it was intended.
- 7. Use The Right Tool**
Do not force small tool or attachment to do the job of a heavy-duty tool.
Do not use the tool for purpose not intended, for example; do not use a circular saw for cutting tree limbs or logs.
- 8. Dress Properly**
Do not wear loose clothing or jewelry; they can be caught in moving parts.
Rubber gloves and non-skid footwear are recommended.
- 9. Use Safety Glasses**
Also use face mask or dust mask if operation is dusty.
- 10. Do Not Abuse Electric Cord**
Never yank electrical cord.
Keep electric cord from heat, oil and sharp edges.
- 11. Do Not Overreach**
Maintain proper footing and balance at all times.
- 12. Maintain Tools With Care**
Keep clean for better and safer performance.
Follow instructions for lubricating and changing accessories.
Inspect tool cords periodically and if damaged, have repaired by authorized service facility.
Inspect electrical cords periodically and replace if damaged.
Keep handles dry and clean and free from oil and grease

13. Disconnect Tools

Disconnect machine from power source when not in use, before servicing and changing accessories.

14. Remove Adjusting Keys and Wrenches

Form a habit of checking to see that keys and adjusting wrenches are removed from machine before turning it on.

15. Avoid Unintentional Starting

Always disconnect from power source before moving.

16. Stay Alert

Watch what you are doing. Use common sense, do not operate tool when you are tired. (Do not use when taking medications that may cause drowsiness.)

17. Check Damaged Parts

Before further use of the machine, guard or other part that is damaged should be carefully checked to determine that it would operate and perform its intended function. Check alignment of moving parts, binding of parts, breakage of parts mounting and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced by an authorized service center. Do not use this machine if switches do not turn it on and off. Have defective switches replaced by authorized service center.

Special Instructions

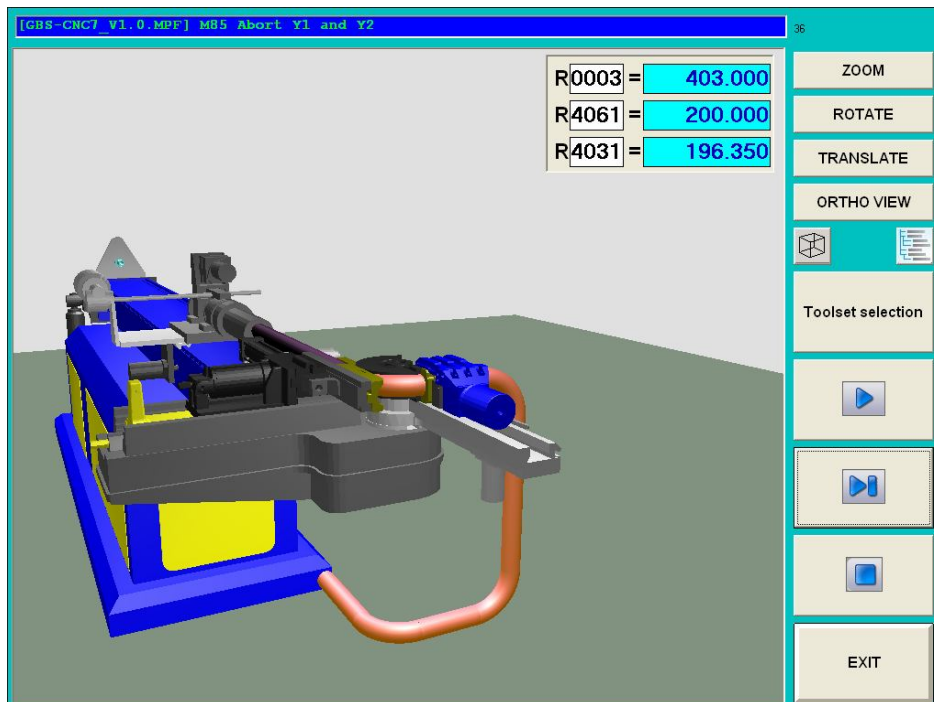
1. Read and follow operators manual thoroughly. If you require an additional manual please contact CML USA Ercolina® at **563-391-7700** or email **info@ercolina-usa.com**.
2. Due to size and weight, it is recommended that qualified professionals transport, position and install the bending machine. Use proper equipment for installation including lift truck safety straps, chains binders and bars. Machine must be balanced evenly at all times.
3. Never place hands, finger gloves or clothing near rotation machine parts.
4. Always disconnect machine from power source before changing accessories.
5. Always use eye and hearing protection.
6. Never wear loose clothing, gloves or jewelry when working near machine.
7. Stand in a safe position when operating machine.
8. Always wear safety approved steel toe footwear.
9. Make provision for safe handling of heavy and/or awkward materials.
10. Use only proper tooling, keep tooling securely fastened.
11. Keep machine and tooling free and clear of chips and debris.
12. Keep all safety features functioning and working properly.
13. Do not alter or modify machine. Use only OEM approved parts and accessories.

Operation and Programming 05/2011 Edition

Code : W56OPPRGE5.1



English



CML USA

EB CNC6 – CNC8

W6 RAINBOW touch line.

W56 system
Rainbow
Touch screen

Operation & Programming

	EB CNC
Introduction	1
Service	2
Turning On and Reference Point Approach	3
Manual Mode	4
Automatic Mode	5
Cycles	6
File manager	7
Programming tools	8
Programming tubes Polar	9
Programming tubes Cartesian	10
Programming springback	11
Simulation	12
About programming a tube shape	13
Diagnostic	14

Safety Guidelines

This manual contains notices intended to ensure your personal safety, as well as to protect products and connected equipment against damage. Safety notices are highlighted by a warning triangle and presented in the following category depending on the degree of risk involved:



Danger

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury or in substantial property damage.



Warning

Indicates a potentially hazardous situation which if not avoided, could result in death or serious injury or in substantial property damage.



Caution

Used with safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Caution

Used without safety alert symbol indicates a potentially hazardous situation which if not avoided, may result in property damage.

Notice

Indicates important information relating to the product or highlight parts of the documentation for special attention.

Qualified person

The unit may only be started and operated by qualified person or persons.

Qualified personnel as referred to in the safety notices provided in this document are those who are authorized to start up, earth and label units, system and circuits in accordance with relevant safety standards.

Proper use

Please observe the following:



The unit may be used only for the applications described in the catalog or the technical description, and only in combination with the equipment, components and devices of the other manufacturers as far as this is recommended or permitted by CML International S.p.A.. This product must be transported, stored and installed as intended, and maintained and operated with care to ensure that it functions correctly and safely.

1. Introduction

W65 system rainbow touch screen is the latest system develop by CML.

The W65 system was develop including all CML experience on tube bending process :

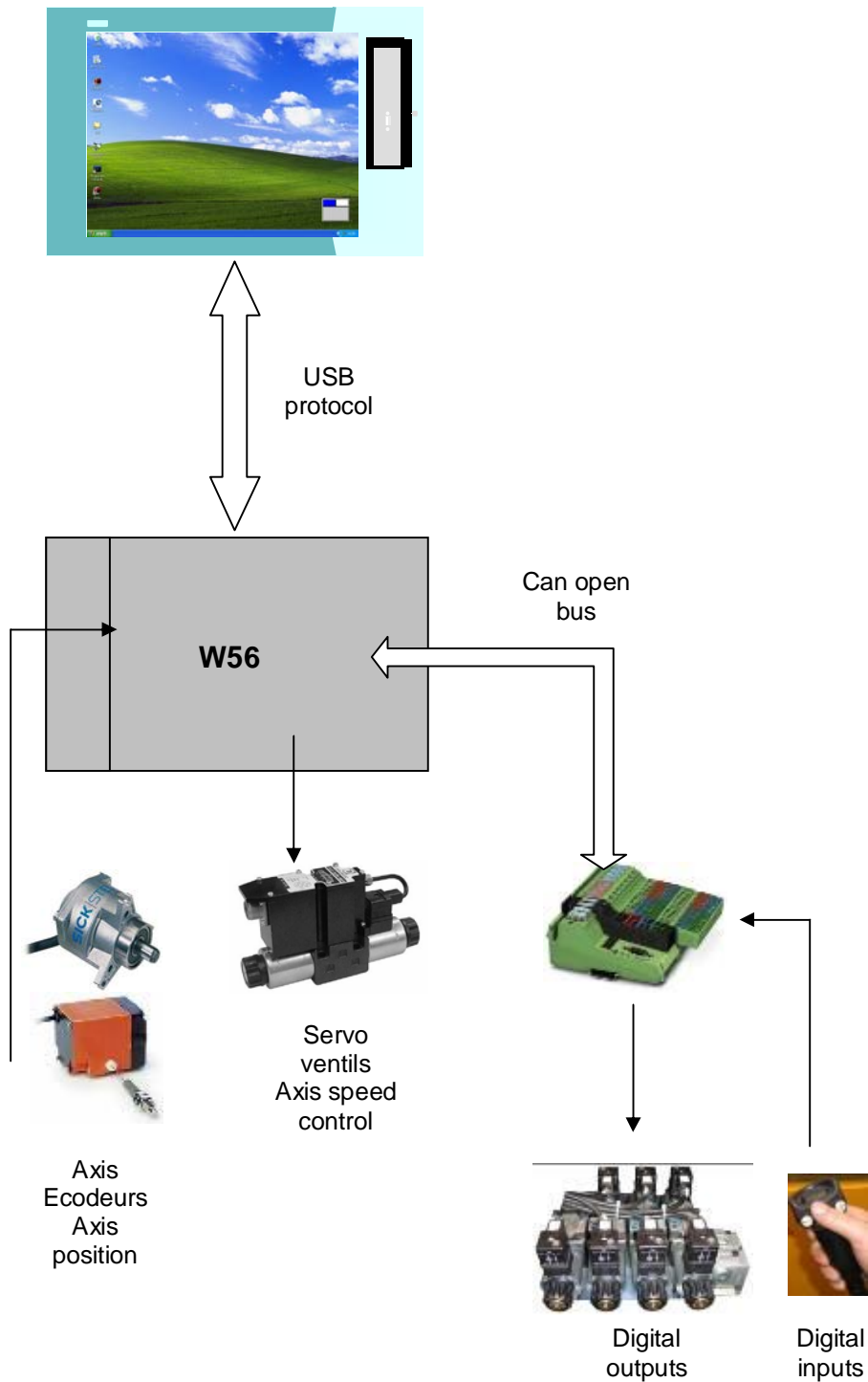
This system is easy to use and offer various possibility on bending field.

A strong simulation software permit to realize virtually the part very close to reality to detect program incompatibility with machine possibility.

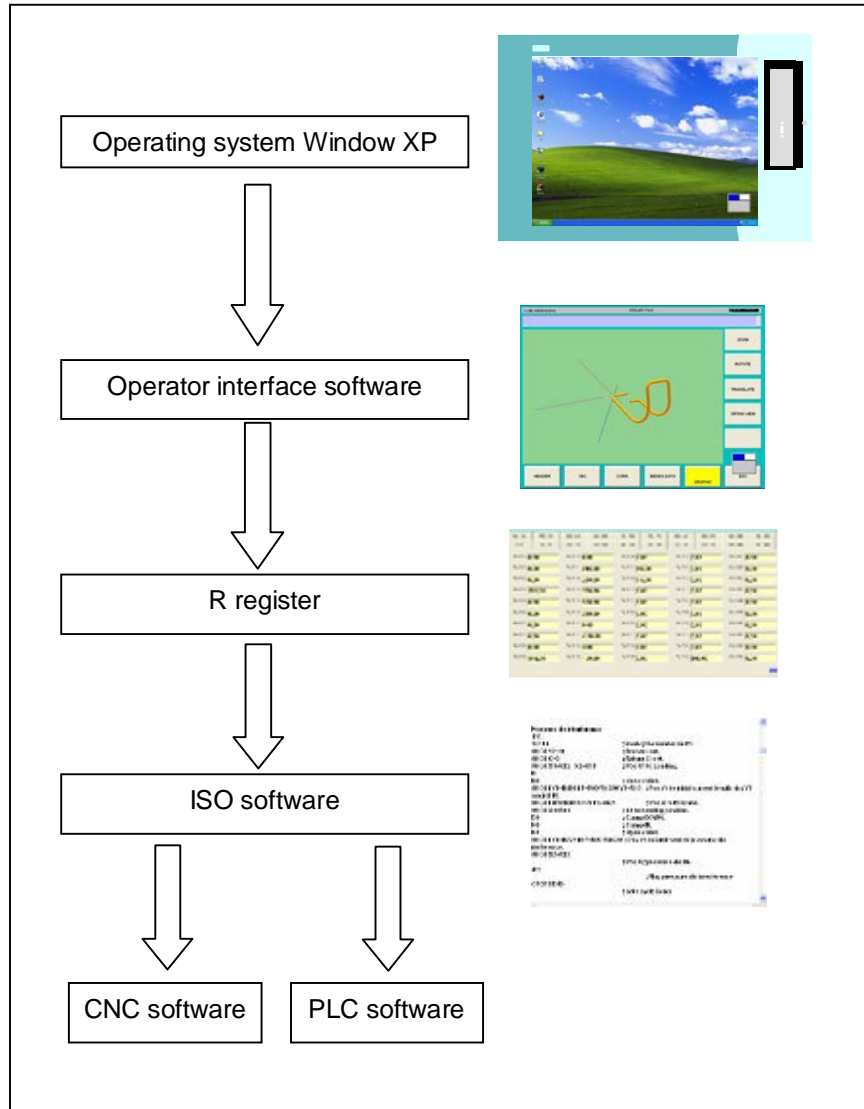
Spring back software calculation allow to realize a right first part (save material and time).

Managing files using widows™ operating system guaranty compatibility with external system.

1.1 System hardware



1.2 System software



1.3 Start up and shut down system.

1.3.1 Start up

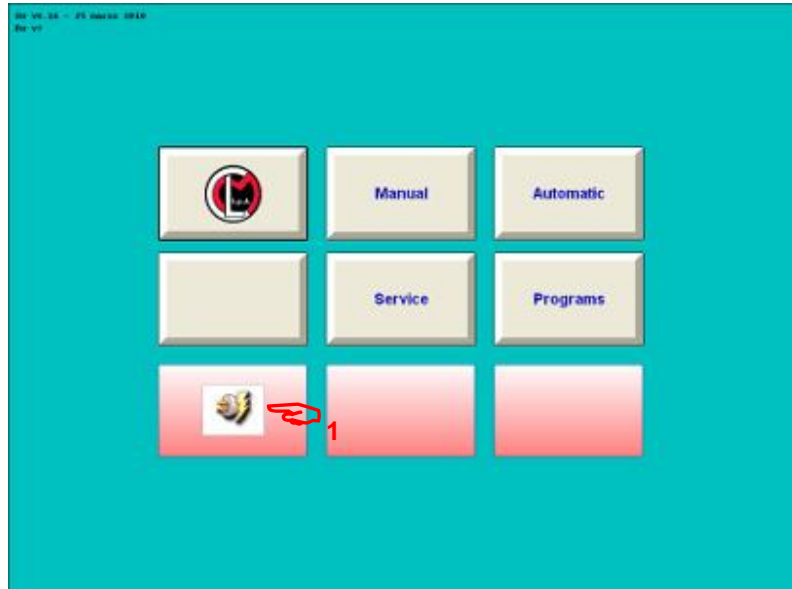
Switch power on (main)

Wait until CML main screen appears.



1.3.2 shut down

On main screen :



1 – Press shut down soft key.

Wait until screen become dark

2 – Switch off power

1.4 Screen layout and operating areas

Main screen

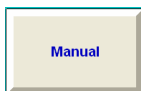
After **cml2006.exe** program loading main screen appear, press according key for the desiderate function.



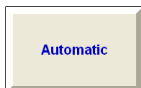
Soft key functions :



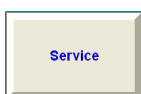
: Access to protect area



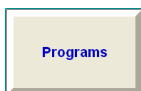
: Access to manual area
Jog mode individual axis or function motion



: Access to automatic area
Automatic cycle



: Access to service area
Change language, change unit, i/o test, diagnostic

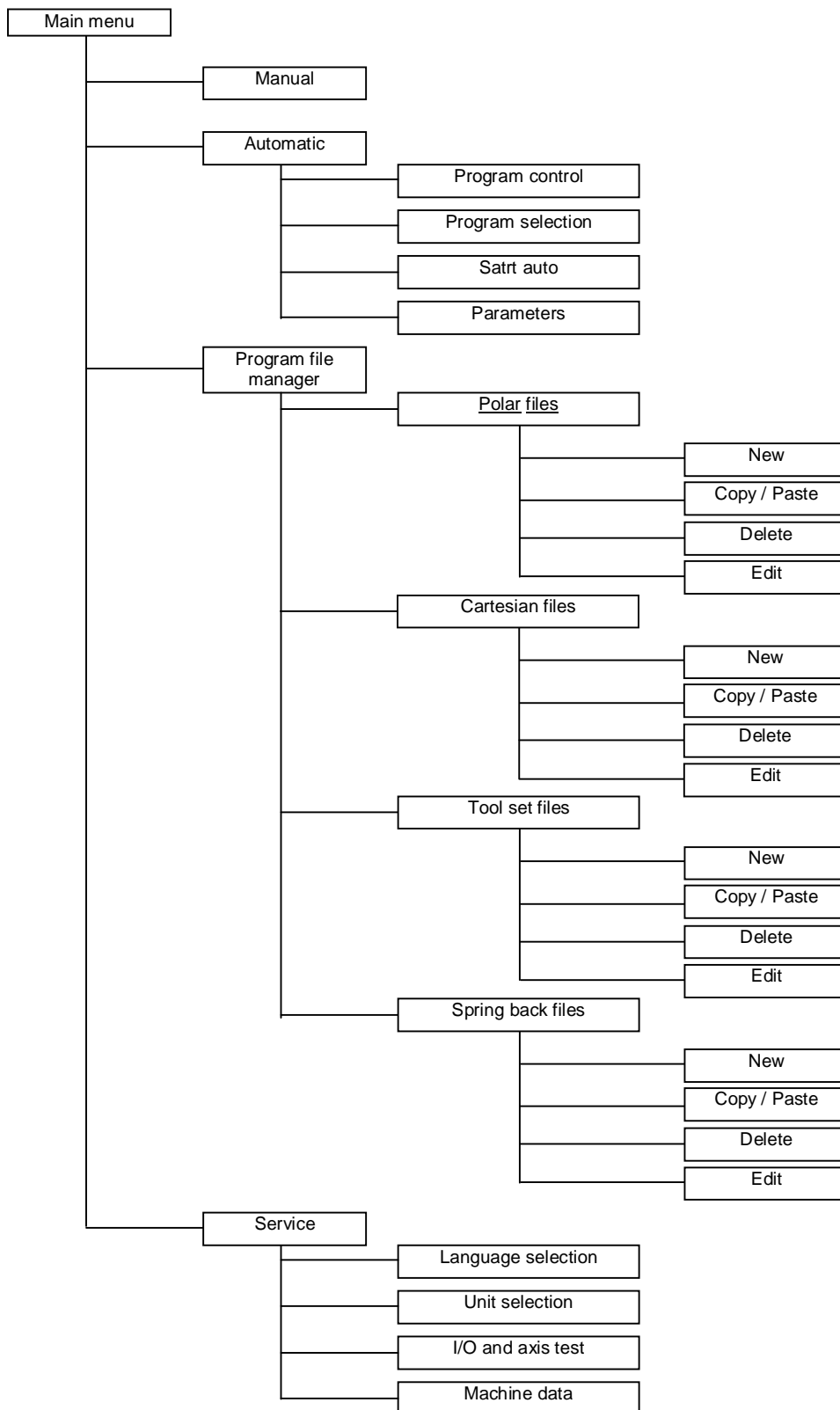


: Access to programs are area
Program and simulation.



: Exit

1.5 Overview of the most important soft key functions



1.6 Files over view.

The system utilize 4 files types :

Polar files (.POL)
Cartesian Files (.CAR)
Tool set files (.DIE)
Spring back files (.SPB).

Polar files contain Part geometry description, tube specification, and some technologic parameters (speed, etc...). this is the file used to feed parameters on cycle (work cycle).

Cartesian files contain tube geometry description in Cartesian mode. Cartesian files must be convert in polar files to bend the part.

Tool set files contain tool parameter to adjust it on machine. Machine can run only with an appropriate tool set file.

Spring back files contain information on tube elasticity to correct automatically geometric polar values to obtain a right part geometry.

Note : Polar file and toolset file must be present to perform a bend cycle.

1.7 Soft key and keyboard.

1.7.1 Soft keys

Soft keys are area on touch screen each soft key is affected to one function, to execute soft key function press on area on touch screen.

Soft key function are mainly jump to an other screen or menu, execute one operation (create, delete, calculate, select etc ...).

On following screen there is 9 soft keys, 6 are associate to a function (jump to).



On menu selection actual soft key menu is displayed in Yellow.

C:\CML56\JOB\PART2.POL POLAR FILE 16.04.10 - 11.07.11

Comment MY TUBE

Calculated tube length 4364,318

Bends corrections								
#	DBB/SB	DOB/SB	DBB	POB	DOB	Σ DBB	Σ POB	Σ DOB
1	0	0,00	0	0,00	0,00	0	0,00	0,00
2	0	0,00	0	0,00	0,00	0	0,00	0,00
3	0	0,00	0	0,00	0,00	0	0,00	0,00
4	0	0,00	0	0,00	0,00	0	0,00	0,00
5	0	0,00	0	0,00	0,00	0	0,00	0,00
6	0	0,00	0	0,00	0,00	0	0,00	0,00
7	0	0,00	0	0,00	0,00	0	0,00	0,00
8	0	0,00	0	0,00	0,00	0	0,00	0,00
9	0	0,00	0	0,00	0,00	0	0,00	0,00
10	0	0,00	0	0,00	0,00	0	0,00	0,00
11	0	0,00	0	0,00	0,00	0	0,00	0,00
12	0	0,00	0	0,00	0,00	0	0,00	0,00
13	0	0,00	0	0,00	0,00	0	0,00	0,00

Spring Back Calculation

Reset S.B. Corr.

Calculate All Corr

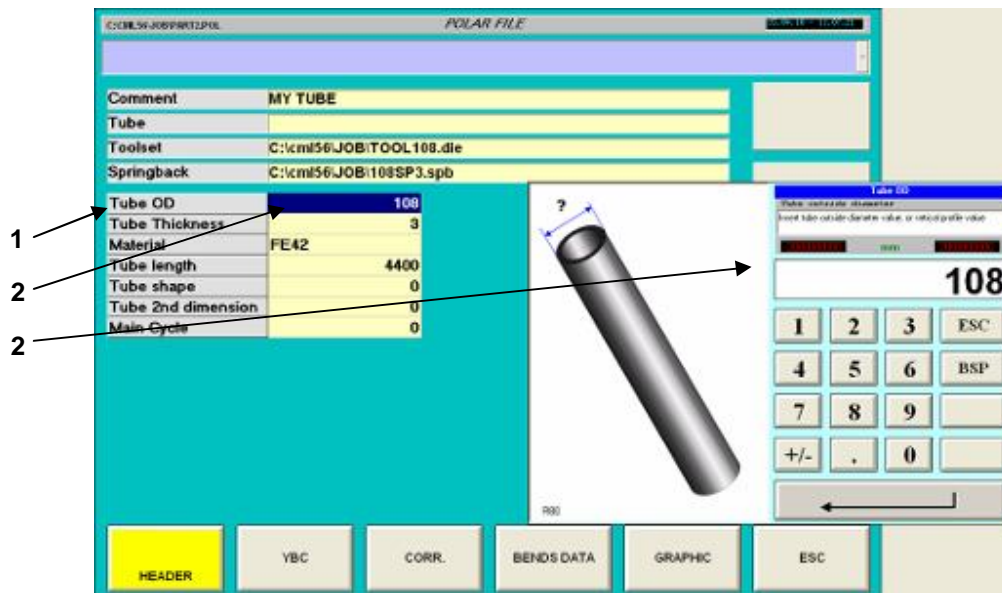
Reset All Corr.

Save

HEADER YBC **CORR.** BENDS DATA GRAPHIC ESC

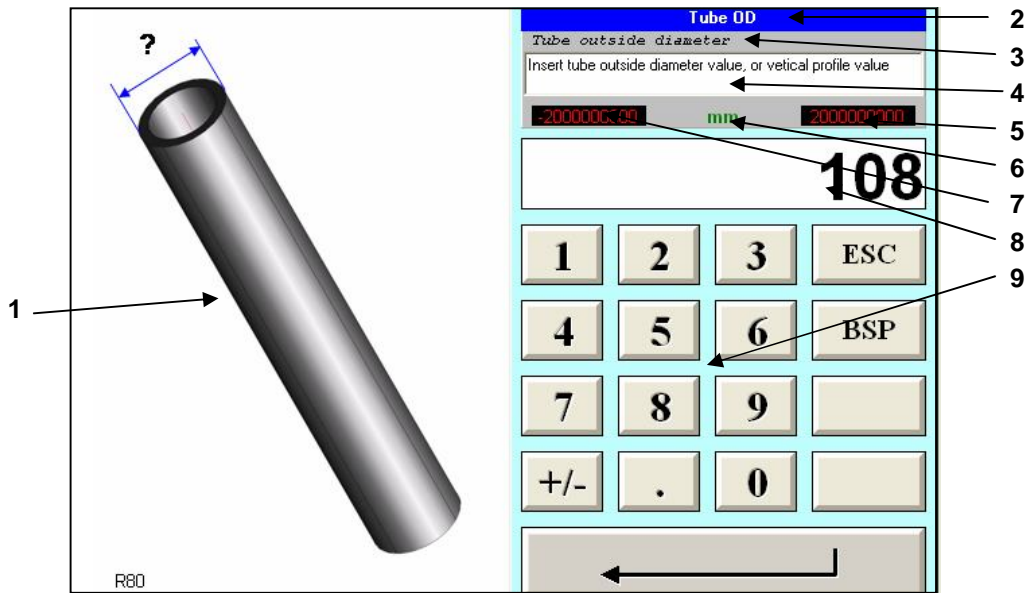
1.7.2 Introducing numerical values

To introduce a numerical value on a field, “double click” on numeric field a pop up keyboard will appear.



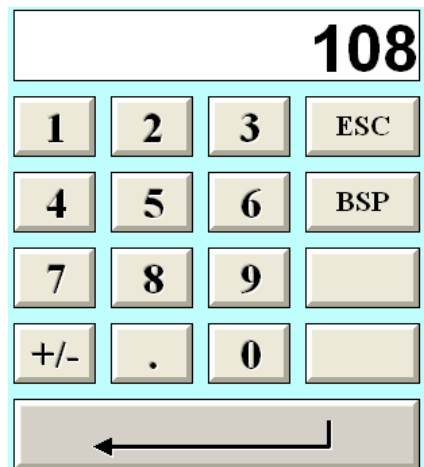
- 1 – Parameter name
- 2 – Numeric field
- 3 – Pop up window.

Pop up windows



- 1 – Picture for parameter explanation.
- 2 – Parameter name.
- 3 – Parameter short description.
- 4 – Parameter description.
- 5 – Max value.
- 6 – Current unit.
- 7 – Min value.
- 8 – Introduction field.
- 9 – Keyboard.

Numerical keyboard :



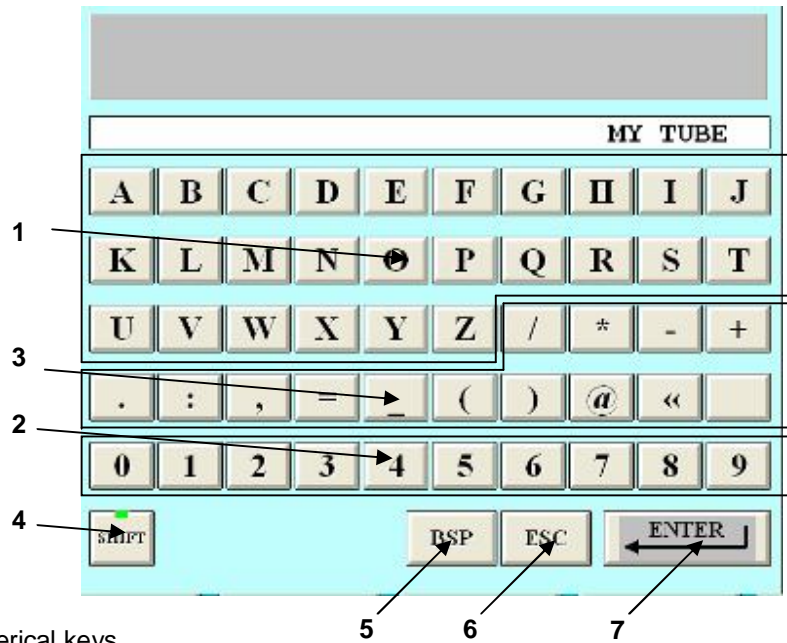
- 1 – Numeric keys
- 2 – decimal point.
- 3 – Switch positive to negative value (or inverse).
- 4 – BSP back space erase last right character.
- 5 – ESC escape Close windows without modification.
- 6 – Confirm introduction vale displayed in introduction field is transfer to parameter.

Ex : 108.3 -> **1** | **0** | **8** | **.** | **3** |

Ex : -25.4 -> **+/-** | **2** | **5** | **.** | **4** |

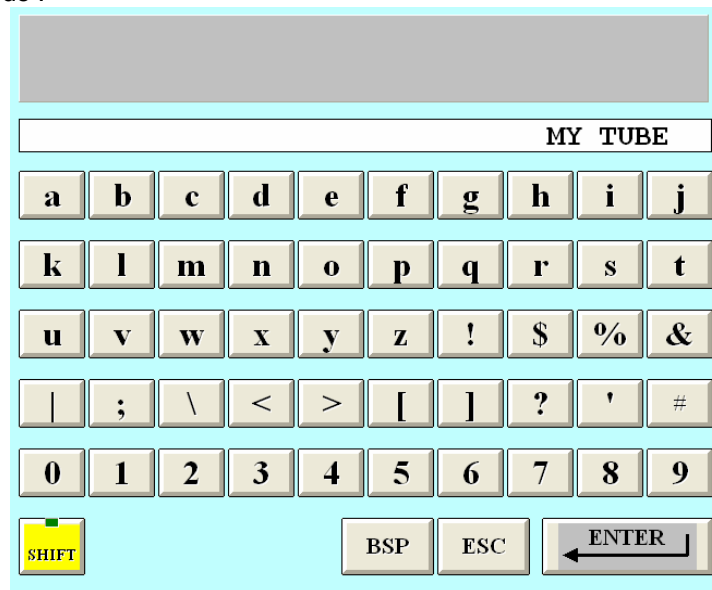
1.7.3 Introducing alpha numerical values

To introduce a alpha numerical value on a field, “double click” on numeric field a pop up keyboard will appear.



- 1 – Alpha Numerical keys
- 2 – Numerical keys.
- 3 – Characters.
- 4 – Shift function.
- 5 – BSP back space erase last right character.
- 6 – ESC escape Close windows without modification.
- 7 – ENTER Confirm introduction vale displayed in introduction field is transfer to parameter.

Key board in shift mode :



1.8 Coordinate systems

Right-handed, rectangular coordinate systems are used for machine tools. Such systems describe the movements on the machine as a relative motion between tool and work piece.

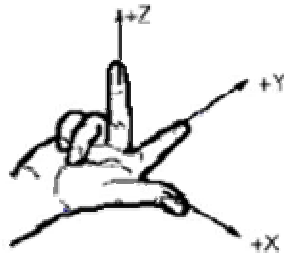
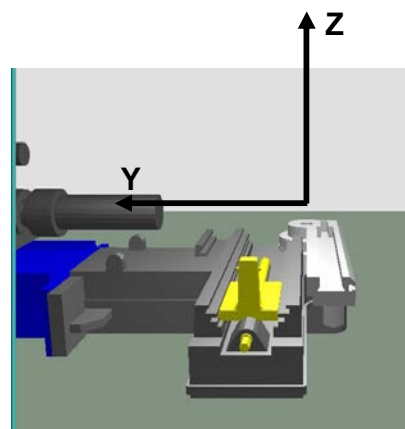
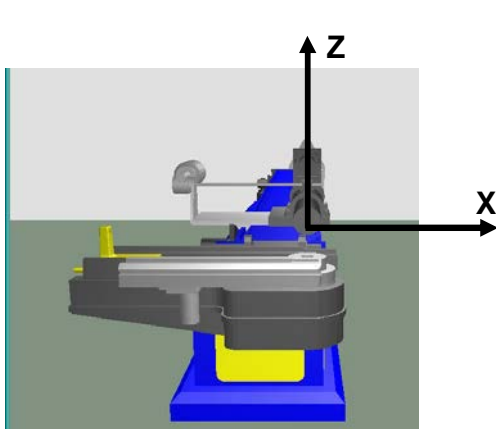
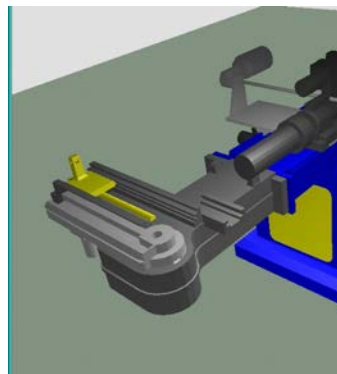
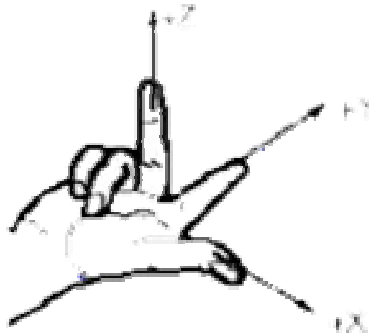
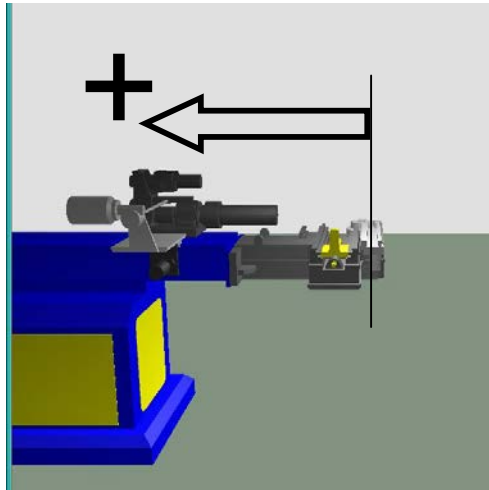


Fig.1-8 Specification of the axis directions to one another



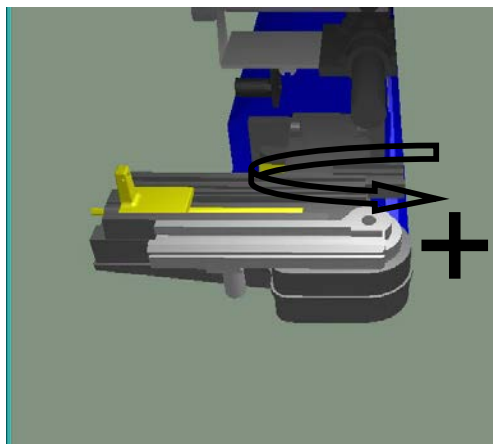
1.8.1 Machine coordinate system (MCS).

Axis : Y1 (Carriage linear).



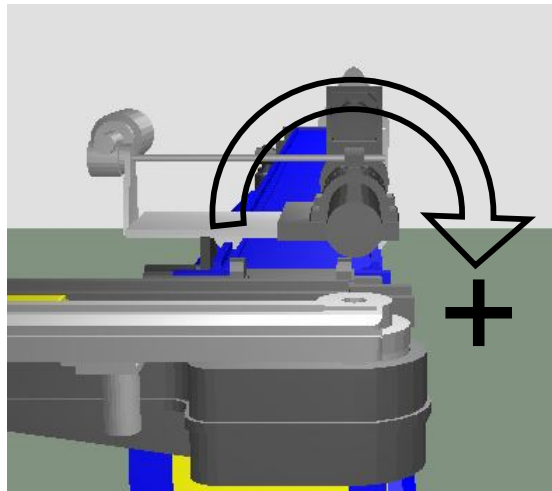
- Origin : Y1 axis , 0 position : carriage front part is tangent to machine axis (as show on picture).
 - o Note : This position 0 is mechanically impossible to reach.
- Type : linear
- Unit : mm or inches.
- Direction (as show on picture).

Axis : C (bend).



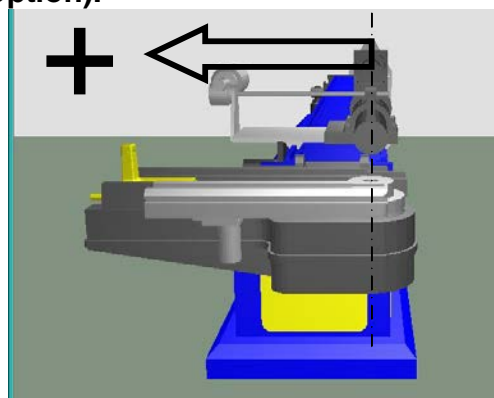
- Origin : C axis , 0 position : bend die keys are parallel to machine axis (carriage) (as show on picture).
- Type : Circular
- Unit : Degrees.
- Direction (as show on picture).

Axis : B (rotation).



- Origin : B axis , no 0 position : B axis motion are always in relative.
 - o Note : 0 value is loaded after turning on.
- Type : Circular
- Unit : Degrees.
- Direction (as show on picture).

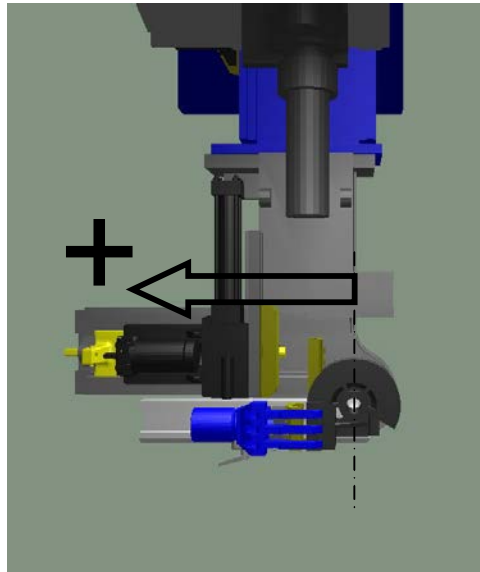
Axis : X1 (bend radius Option).



- Origin : X1 axis , 0 position : bend axis is perpendicular to machine axis (carriage) (as show on picture).
 - o Note : This position 0 is mechanically impossible to reach.
- Type : linear
- Unit : mm or inches.
- Direction (as show on picture).

Note : With this coordinate system, X1 axis position correspond to centerline tooling radius.
 Example : for a die CLR 152 mm corresponding X1 axis position is 152 mm.

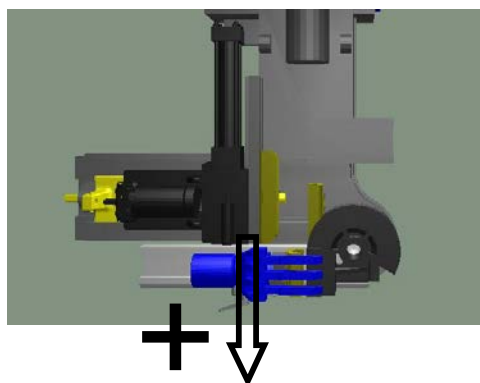
Axis : X2 (Pressure die).



- Origin : X2 axis , 0 position : Front part of booster plate is on bend axis (as show on picture).
 - o Note : This position 0 is mechanically impossible to reach.
- Type : linear
- Unit : mm or inches.
- Direction (as show on picture).

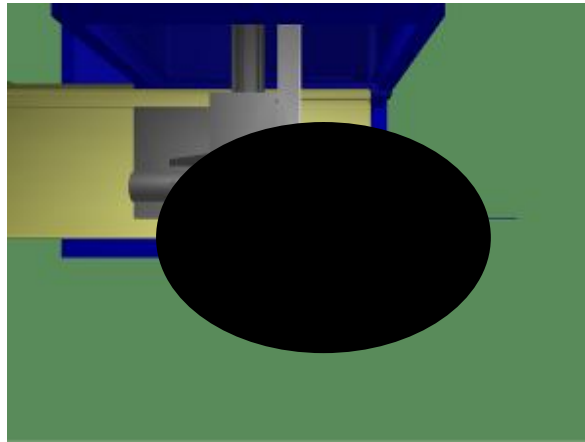
Note : there is a relation between tooling (centerline bending radius) and X2 position. The closing value of pressure die is equal to Bend die centerline radius plus pressure die horizontal dimension.

Axis : Y2 (Booster).



- Origin : Y2 axis , 0 position : Front part of booster plate is on bend axis (as show on picture).
 - o Note : This position 0 is mechanically impossible to reach.
- Type : linear
- Unit : mm or inches.
- Direction (as show on picture).

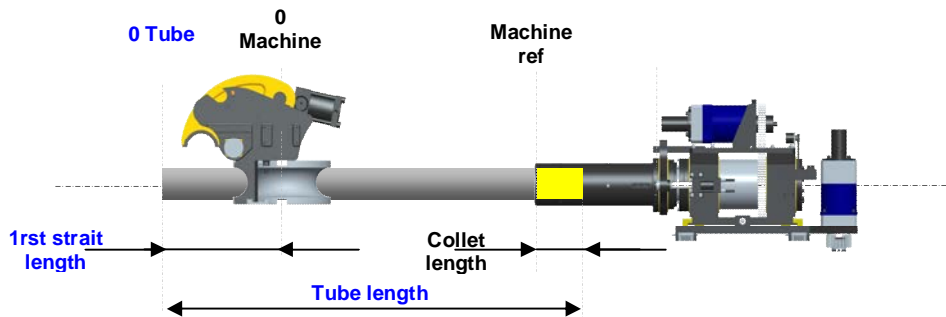
Axis : Y3 (Mandrel).



- Origin : Y2 axis , 0 position : Front part of booster plate is on bend axis (as show on picture).
 - o Note : This position 0 is mechanically impossible to reach.
- Type : linear
- Unit : mm or inches.
- Direction (as show on picture).

1.8.2 Piece coordinate system (PCS).

Conventional drawing place part origin at tube end on first bend side.
 The machine realize bend one after an other starting by a end of a strait part. First bend is always at the opposite end of machine tube origin inside collet.
 The real tube reference for tube bending machine is tube end inside collet (on axis Y1).



As length of tube inside collet is not constant (mainly depending of tube diameter) it is nessecar to inform machine what tube length is inside carriage. We call this parameter "Collet length".

For easy programming all distance between bend are programmed in absolute from end of one bend to start of next one. That is not corresponding to machine coordinated system.

For 2nd and next bend we can easily save programming problem using relative mode.

For first bend machine can't know where to position Y1 axis if tube length is not define.

That mean that first strait length (distance between bends 1 DBB1) is depending of 3 parameters :

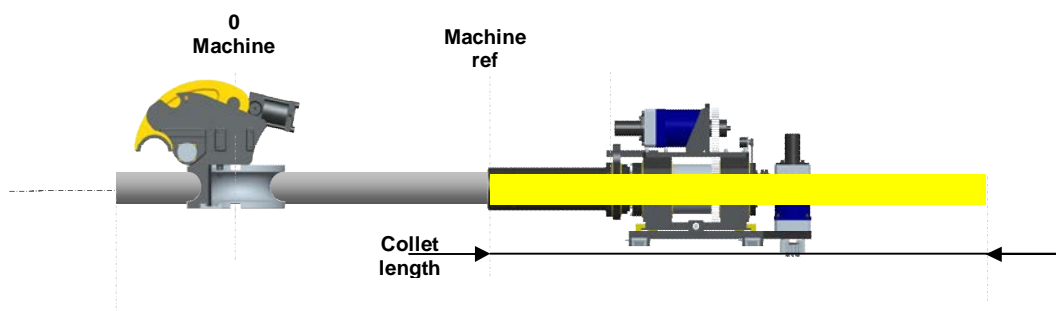
- DBB1 length 1.
- Tube length.
- Collet length.

An other way to program is to program 1rst length in absolute mode (for Y1 axis).

$$1\text{rst absolute Y1 position} = \text{Tube length} - 1\text{rst strait length} - \text{Collet length.}$$

This calculation is done automatically by CML software.

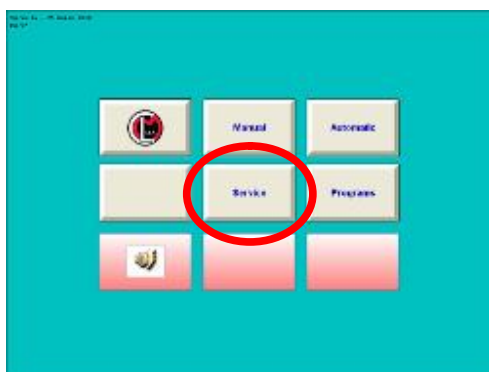
During cycle according to program (tube length etc ..) machine perform length recapture cycles, collet length change (PCS change) , this calculation is done automatically by CML software



2 . Service

2.1 Language selection

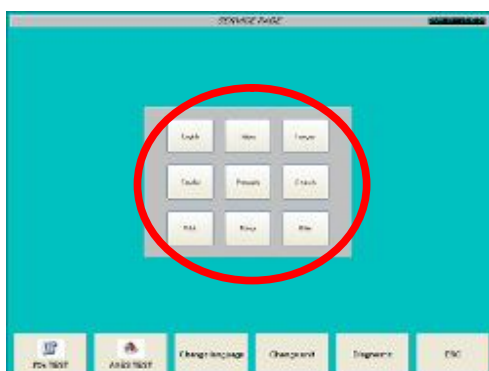
From main menu press service :



On service menu press change language :



On language selection menu press on desired language :



New language is immediately active.

Note : Current language is memorized, selected language will be always active until new language selection.

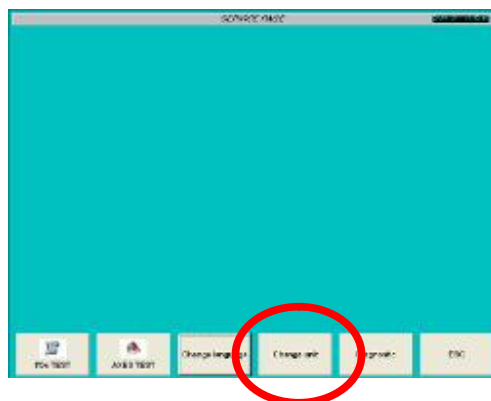
2.2 Unit selection.

Change programming and display values from mm to inches or inches to mm.

From main menu press service :



On service menu press change unit :



On Unit selection menu press on desired unit (mm or inches) :



New unit is immediately active.

Note : a program generate in one unit is not convert to other unit (stay in creating unit).

Note : the system can store and use programs in different units, but unit selection according to programs is not automatic

Other service function :

- I/O test.
- Axis test.
- Diagnostic.

Those functions are used for maintenance and trouble shooting.

See more information on Diagnostic section §14.

3. Turning On and Reference Point Approach.

Notice

Before to turn on system, read machine specific documentation , reference point approach is specific for each machine.

3.1 Turn system on.

Operating sequence Switch on the power supply of the CNC and of the machine. After the control system has booted, you are in the main operating area,



3.2 Turn system off.



Operating sequence

- 1 – from main menu Press on turn off button 
Wait until screen become black
- 2 – Turn off main switch

3.3 Reference point approach.

On our machine ref point are memorized on turning off.

Meaning after turning on the machine is immediately ready for operate.

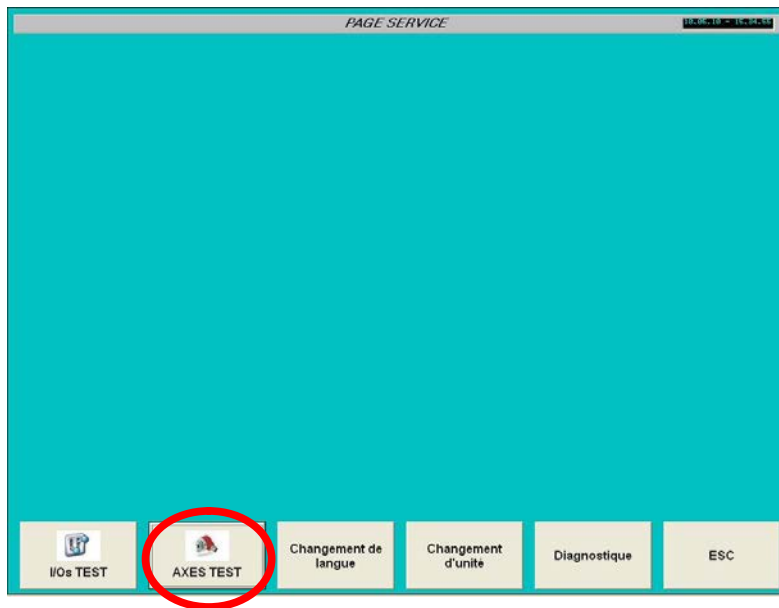
Reference point must to be modify only after mechanical or electrical operation (for maintenance).

Ref point approach principle is to introduce current axis position (mechanical) in axis counter (electrical)

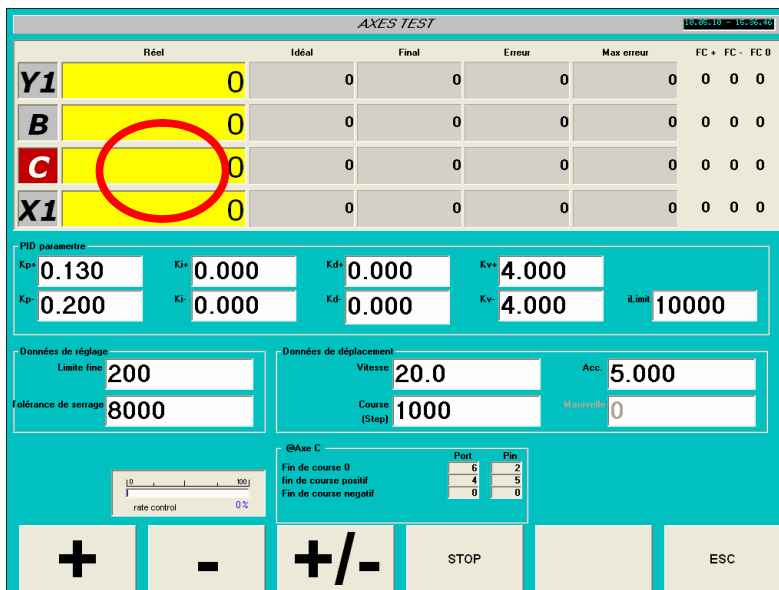
The axis stopped (without hydraulic power) measure current axis position from axis origin and introduce this value on axis counter.

From main menu :

« Diagnostic »

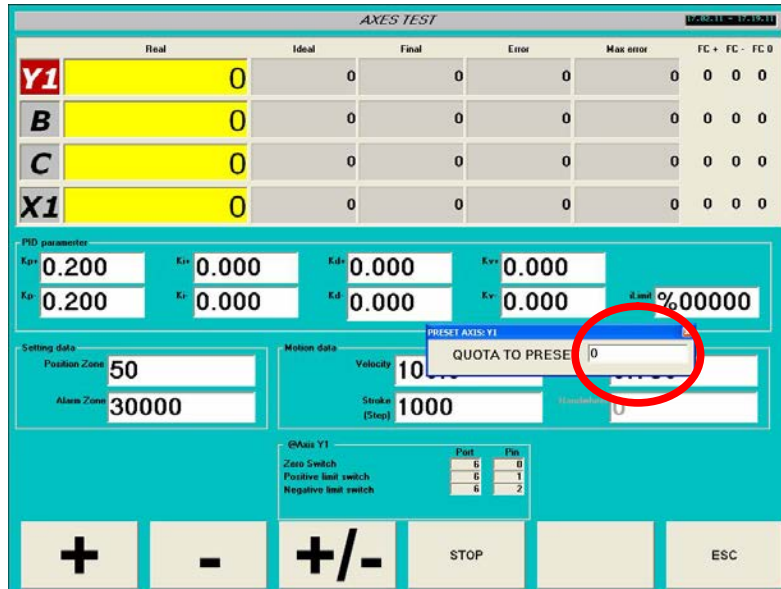


1 –Touch « AXES TEST »

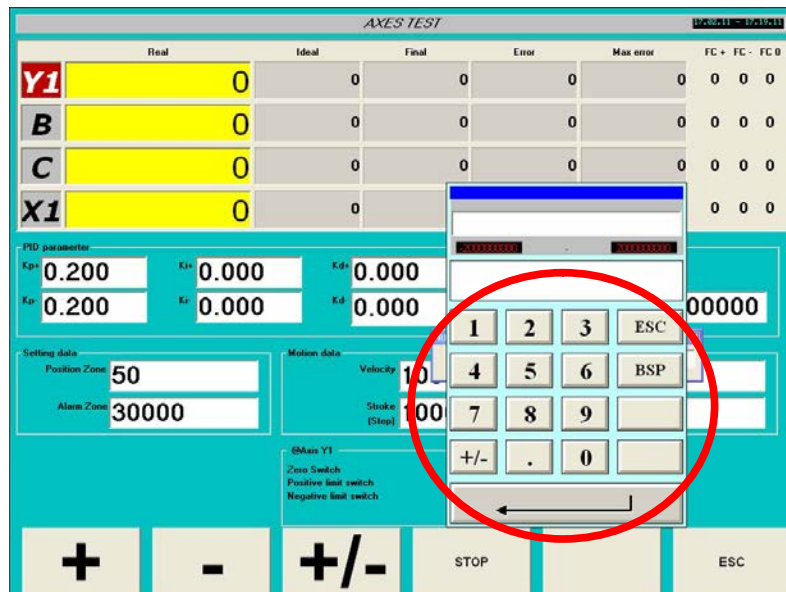


Double click on axis reel position (yellow field).

A pop up widow appears.



Double click on numerical field



Insert current axis value in mm or degrees, confirm by enter.

The value is convert automatically in encoder pulses

Press escape to return to previous menu.

Note: you can control your set up in manual model (§4).

4. Manual Mode

Functionality

The manually operated mode, is possible in the Jog mode select the axes and actuator desiderate for the movement.

Notice

Before to use manual mode, read the machine documentation, manual mode is machine-dependent functions.

Preconditions

The preconditions for executing part programs are:

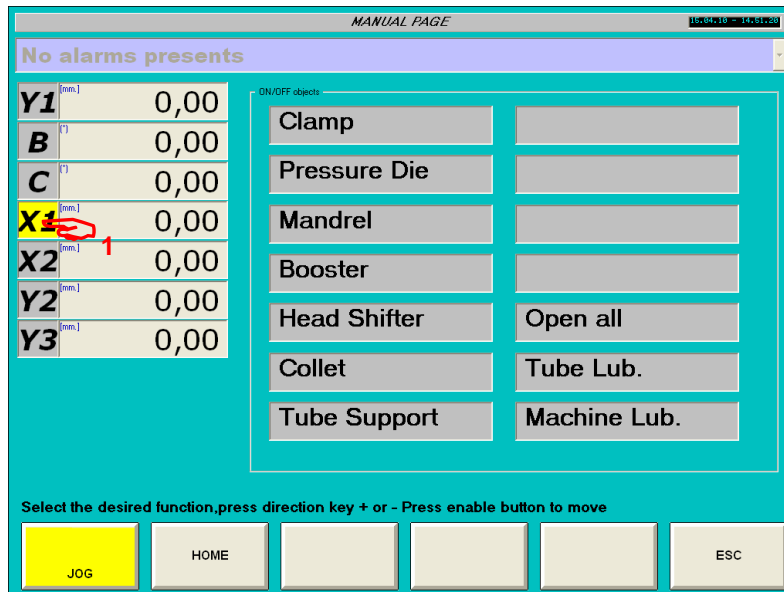
- Reference point approached.
- The required safety interlocks are activated.
- Hydraulic pumps are on

Operating sequence :

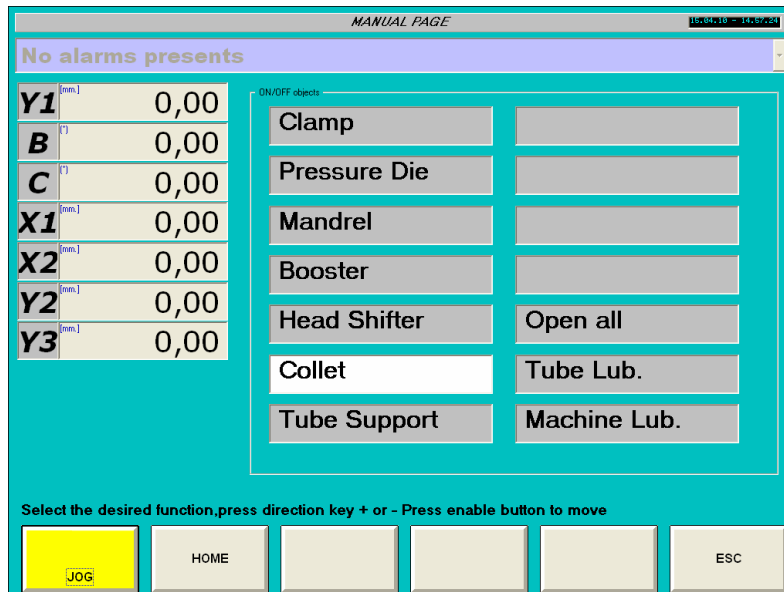


1 – From main screen, press “Manual” soft key

Manual screen appears :



On screen select desired motion active axis or object select is display in Yellow.
 According to machine system select direction and activate safety unit.
 For more information see Machine User manual.



5. Automatic Mode

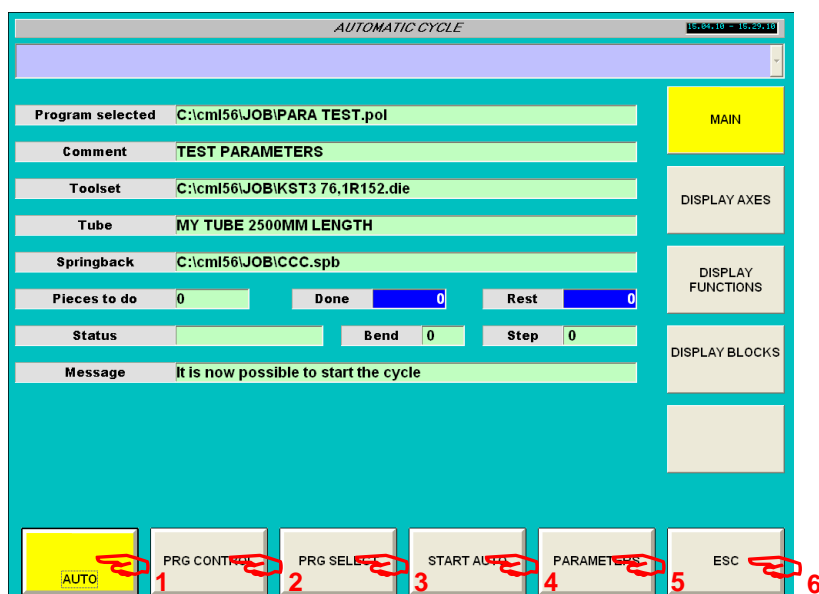
Functionality In the Automatic mode, part programs can be executed fully automatically, i.e. this is the operating mode for standard processing of part programs.

Preconditions The preconditions for executing part programs are:

- Reference point approached.
- Hydraulic pump are on.
- You have already stored the required part program in the control system.
- You have checked or entered the necessary tool offsets.
- The required safety interlocks are activated.

Operating sequence Use the Automatic key to select the Automatic mode.
The Automatic basic screen appears that displays.

5.1 Automatic

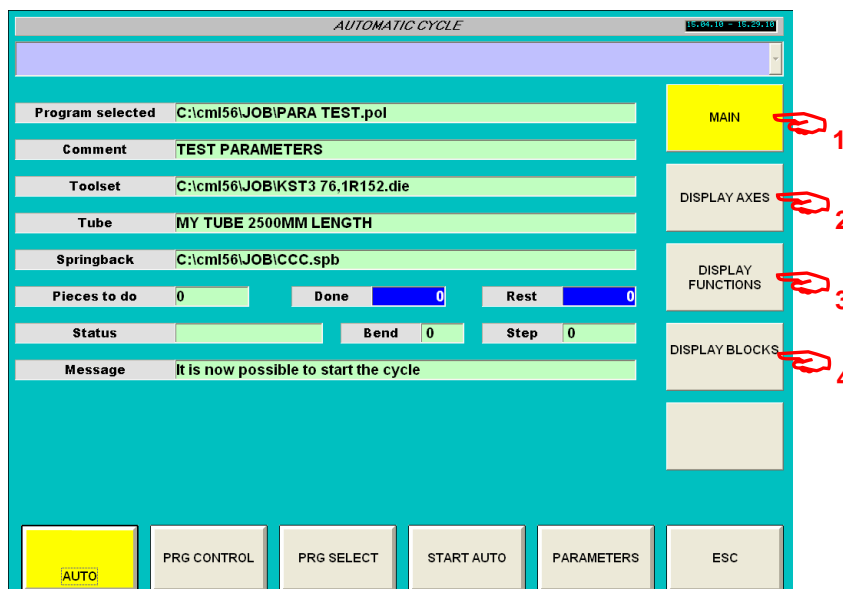


Soft keys :

- 1 – Auto (main page)
- 2 – Program control.
- 3 – Program select.
- 4 – Start stop auto cycle
- 5 – Parameters
- 6 – Escape return to main menu.

5.1.1 Auto (main page).

This menu display main information about current active program and cycle status.



Soft keys :

- 1 – Main
- 2 – Display axis
- 3 – Display functions
- 4 – Display blocks

Parameters :

Program selected : name and path of active polar file.
 Comment : Comment associate to active program.
 Toolset : name and path of active tool set file.
 Tube : Tube comment associate to active program.
 Spring back : name and path of active spring back file.

Pieces counters :

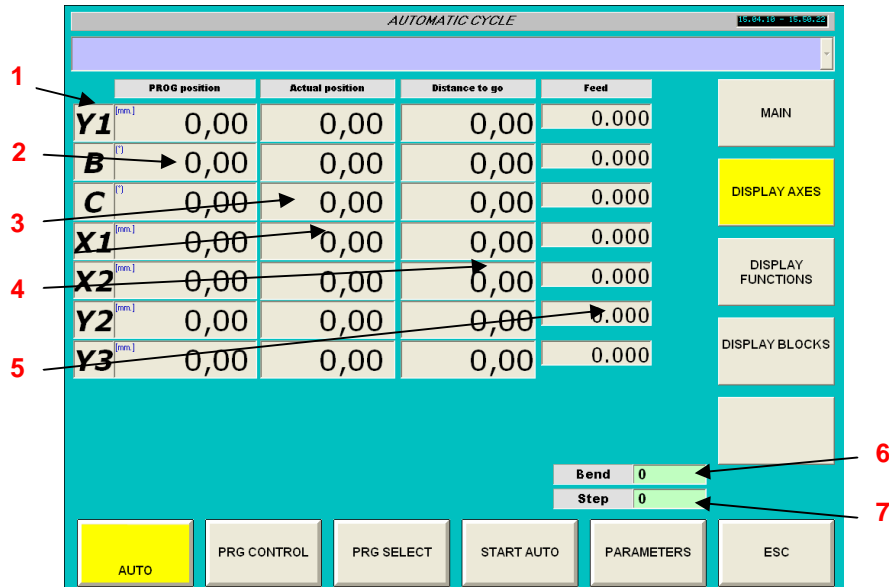
Pieces to do : Enter number of parts to do.
 Done : Counter incremented a each program end.
 Rest : Difference between pieces to do and pieces done.

Status :

Bend : Current active bend
 Step : Current active step on a bend.
 Message : Operators information messages.

5.1.2 Auto (Display axes).

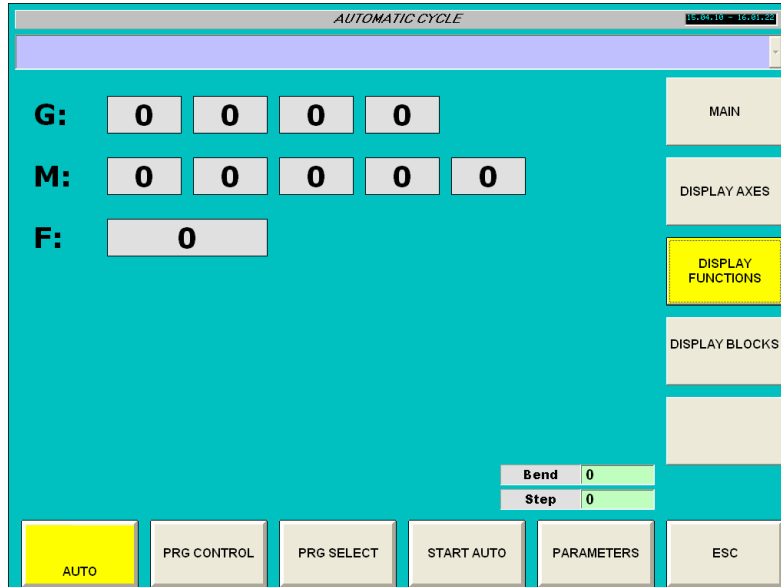
This menu display axes position according to program value and the difference (distance to go).



- 1 – axis name
- 2 – Programmed position (target)
- 3 – Actual position.
- 4 – Distance to go (difference between target and actual position).
- 5 – Feed Current speed.
- 6 – Actual bend number.
- 7 – Actual step number.

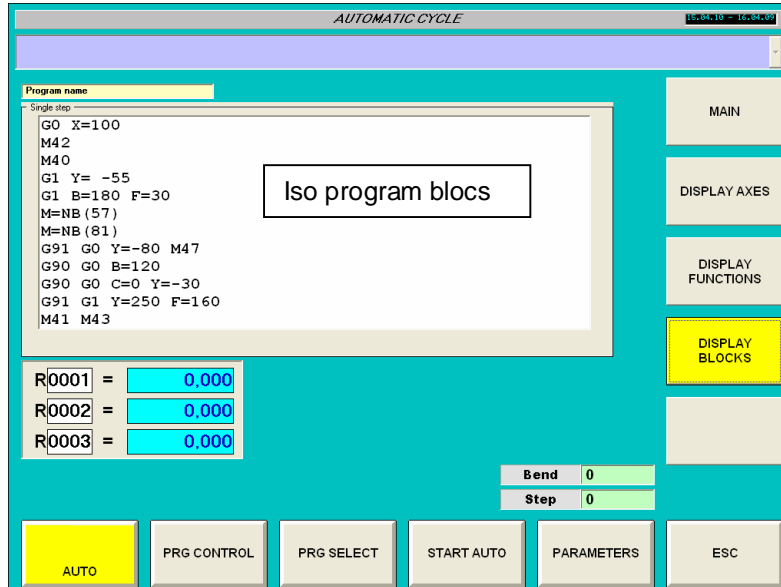
5.1.3 Auto (Display functions).

This menu display active G, M and F functions.



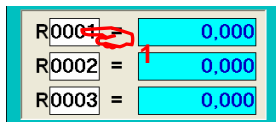
5.1.4 Auto (Display blocs).

This menu display program ISO blocs.



3 R parameters values can be displayed.

R parameters display :



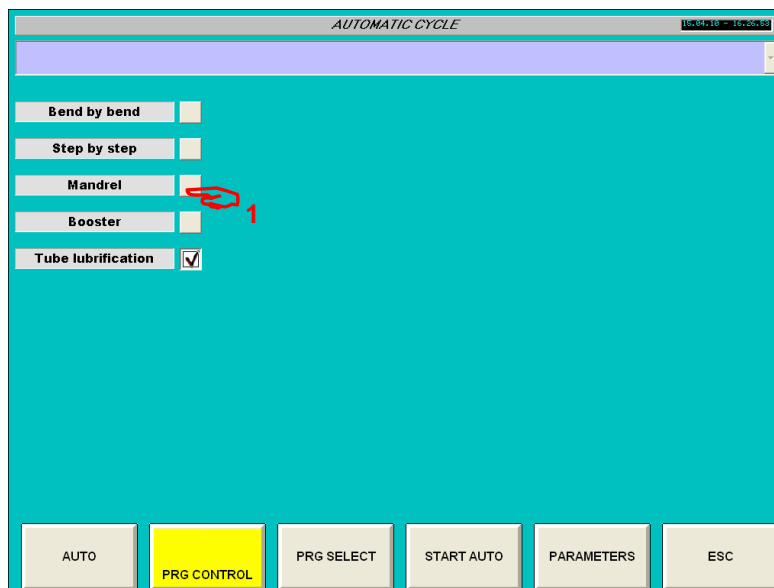
- 1- Click on parameter number (numerical pop up menu appears)
- 2 – Insert parameter number you want to display (from 0 to 4999)
- 3 – Confirm by enter.

Numerical value of selected parameter is displayed.

Note : this function is useful only using customer ISO program, on general application display R parameters value will be use only for service.

5.1.5 Program control (Function of software version).

This menu allow to select some function on cycle (activate or deactivate).



- 1 – Bend by bend (After each bend cycle wait a cycle start action).
- 2 – Step by step (After each step cycle wait a cycle start action).
- 3 – Mandrel on / off.
- 4 – Booster on / off.
- 5 – Tube lubrication on / off.

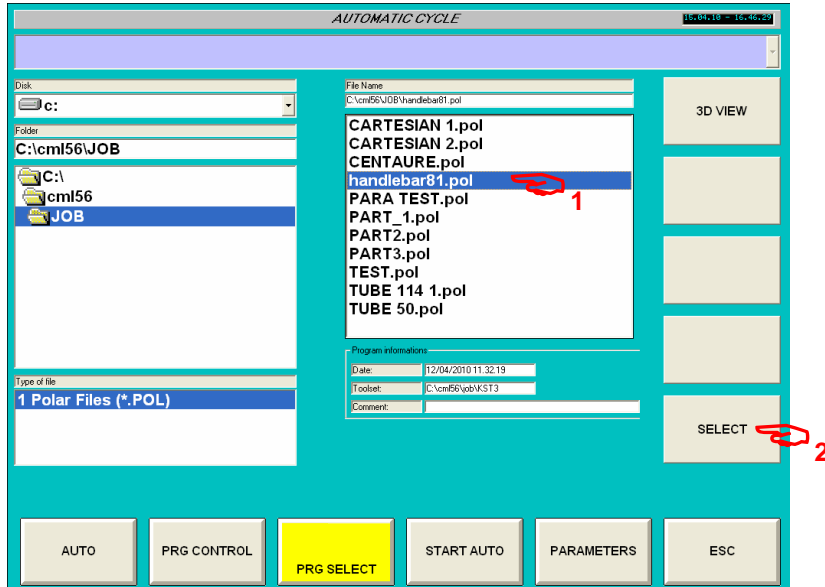
Press on screen (1) to activate or deactivate function.

- Function is active.
- Function is not active.

Note : Selection are memorized.

5.1.6 Program select.

This menu allow to select a polar file.



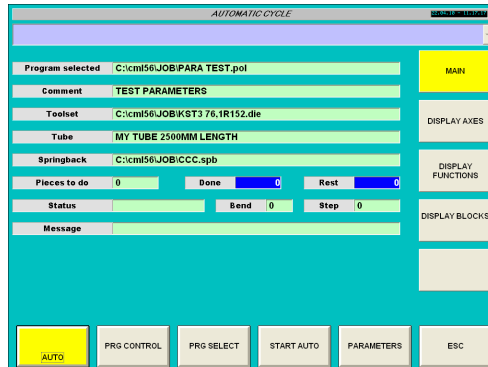
Operating sequence :

- 1 – Select program on list.
- 2 – Press soft key select.

Program is selected

Use “3D view” soft key to display selected program in 3D view.

5.1.7 Start auto cycle.



On auto menu "MAIN"

1 – Press "START AUTO" soft key.

Operations :

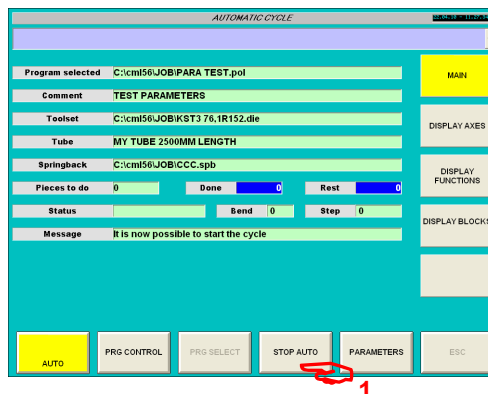
- R parameter are transmit to CNC
- CNC turn in automatic mode.
- Cycle start is enable.

After operation complete Message display "It is now possible to start cycle".

Start cycle begin operation.

5.1.8 Stop auto cycle.

Note : only possible after cycle start.



1 – Press "STOP AUTO" soft key.

Operations :

- CNC turn in Manual mode.

Enable to select a other program.

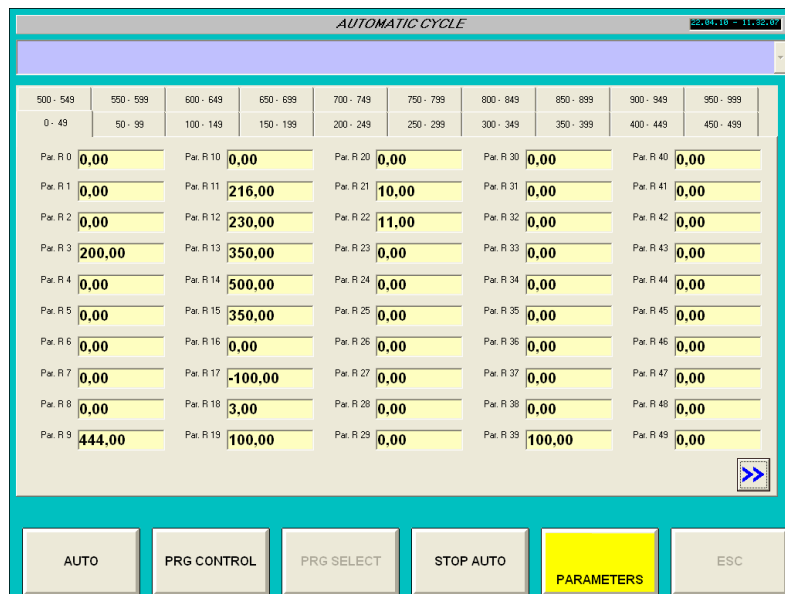
5.1.8 Parameters R.

This page display R parameters current values.

Those parameters are used by CNC in ISO program.

Parameters range from R0 to R4999.

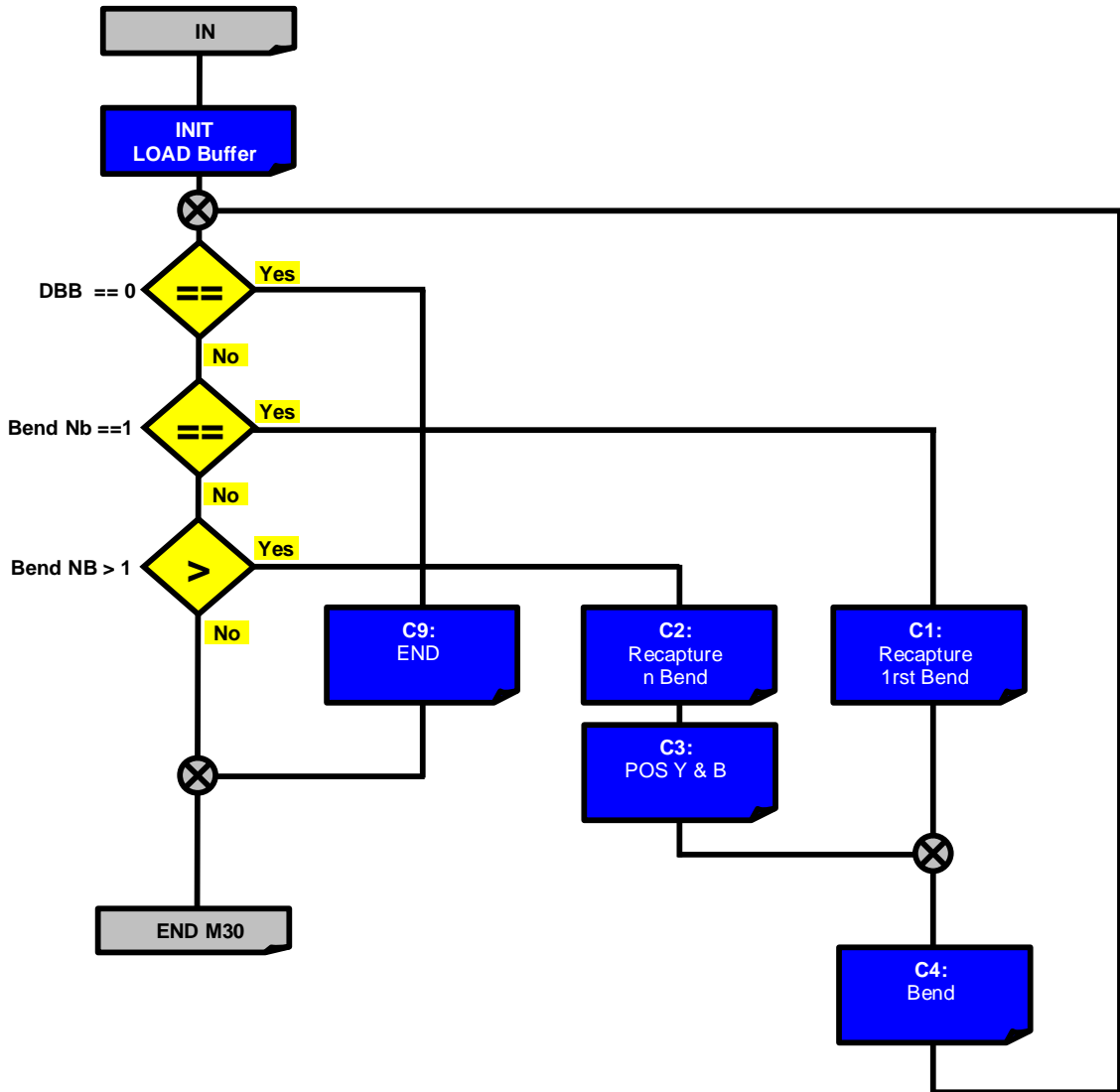
Note : this function is useful only using customer ISO program, on general application display R parameters value will be use only for service.



50 parameters are display in a page.

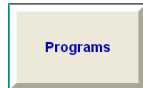
Change page using soft key >>

6. Cycles.

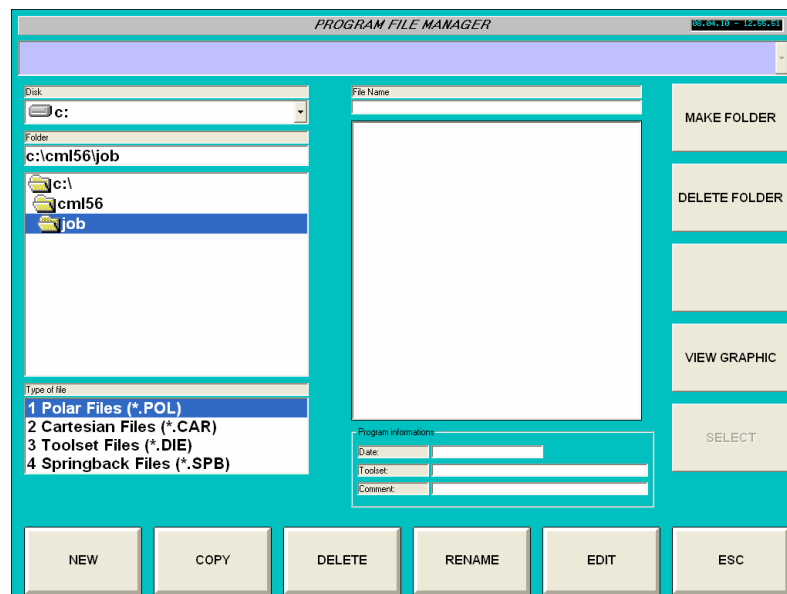


7. File manager.

From main menu



Program file manager menu appears :

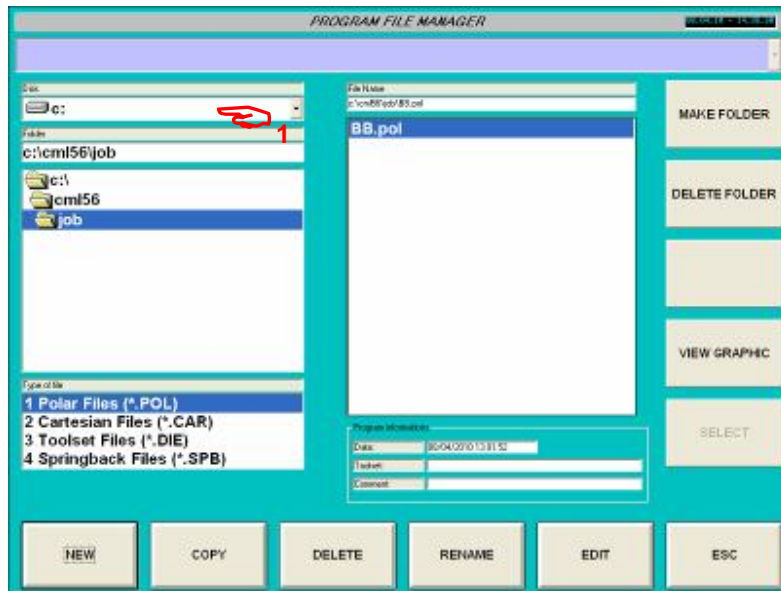


Using this menu you can :

- Select drive.
- Select folder on a drive.
- Select file type on a folder (filter).
- Display file (by type) on a folder.
- Create a new folder.
- Delete an existing folder.
- Create a new file on current folder.
- Copy an paste an existing file on current folder.
- Delete an existing file on current folder.
- Rename an existing file on current folder.
- Edit an existing file on current folder.
- View in 3D an existing Cartesian file on current folder.

5 – 1 Select drive.

You can select any drive for file manipulation by :



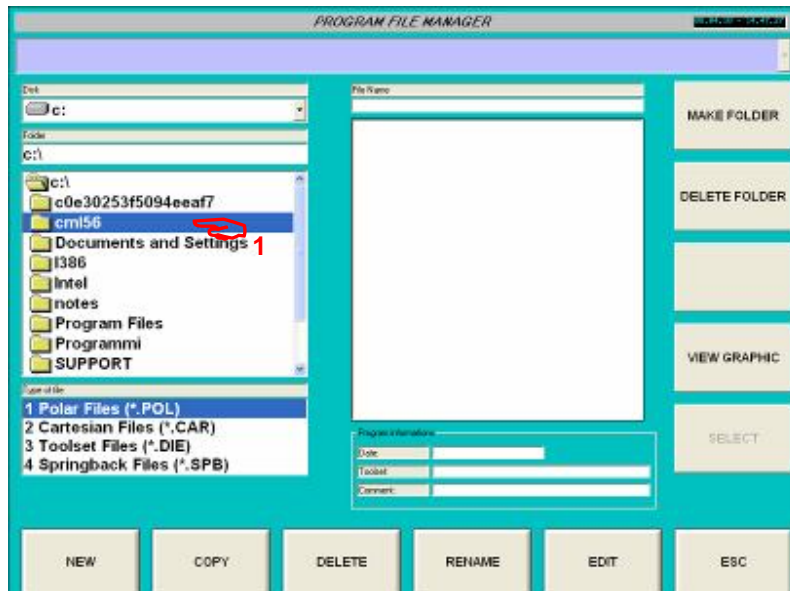
1 – Click on disk
Available disk list appears



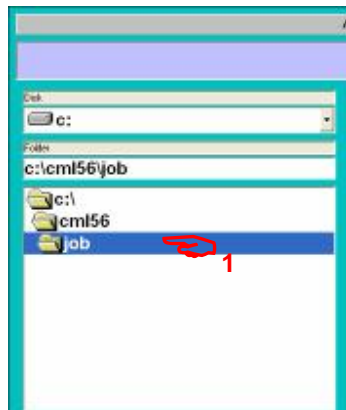
2 – On list click on desired one
New drive is selected



5 – 2 Select folder on a drive.



1 – Double click on folder name to open it.



Note : by defect program files are stored on C:\cml56\job\

5 – 3 Select file type on a folder (filter).

As soon as you have select a drive and a folder existing file list is displayed on file list area, according to file filter.



1 – Click on file type to show.


- 1 Polar Files (*.POL) file to define part geometry in polar mode.
- 2 Cartesian Files (*.CAR) file to define geometry in Cartesian mode.
- 3 Toolset Files (*.DIE) file to define tooling datas.
- 4 Spring back Files (*.SPB) file to define parameters for automatic tube spring back compensation.

5 – 4 Display file (by type) on a folder.

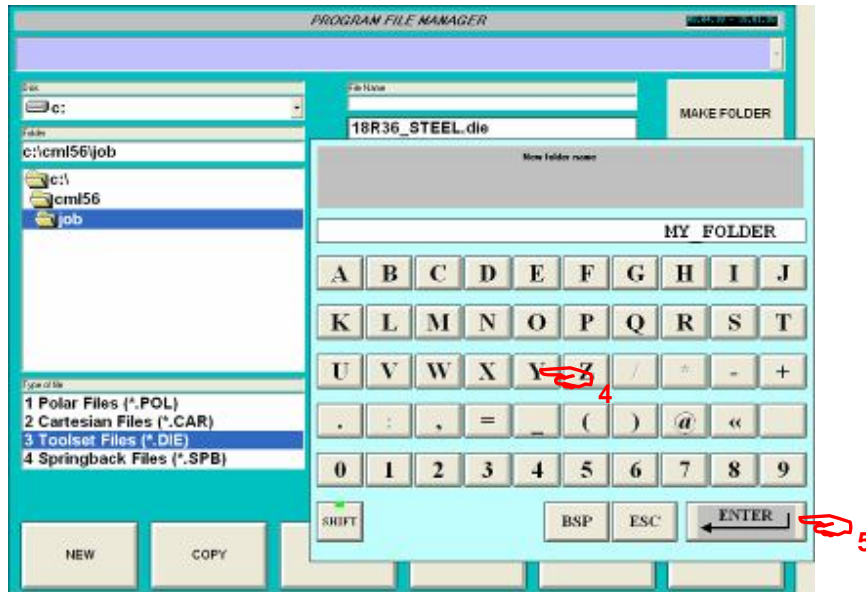
As soon as you have select file type corresponding existing files are displayed on file list area

5 – 5 Create a new folder.

1 – Select the desired place where you want to create a new folder

2 – Press soft key 

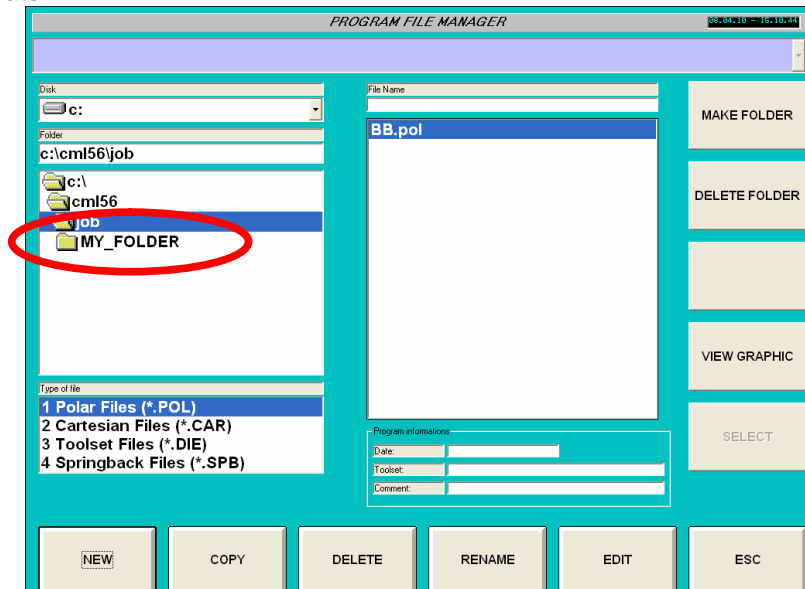
3 – Pop up window appears with alpha numeric keyboard.



4 – Insert folder name (in this example folder name is “MY_FOLDER”).

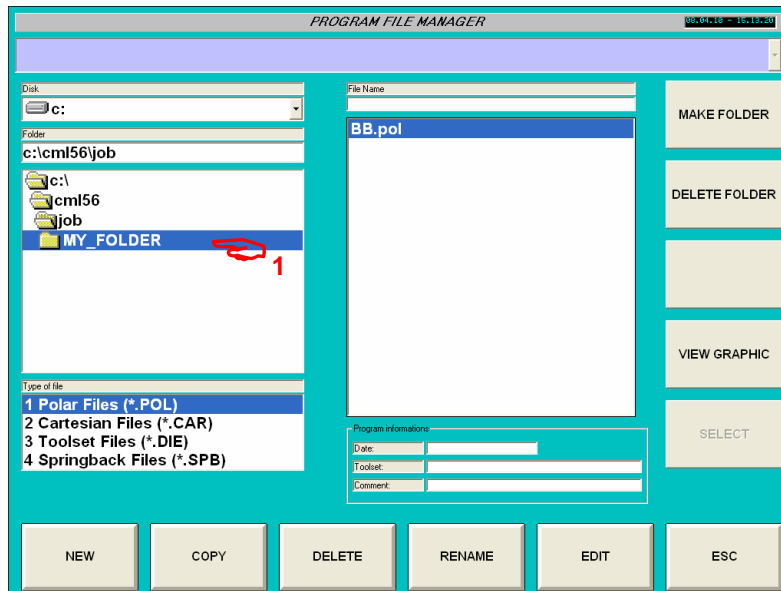
5 – Confirm by enter.

New folder is create.

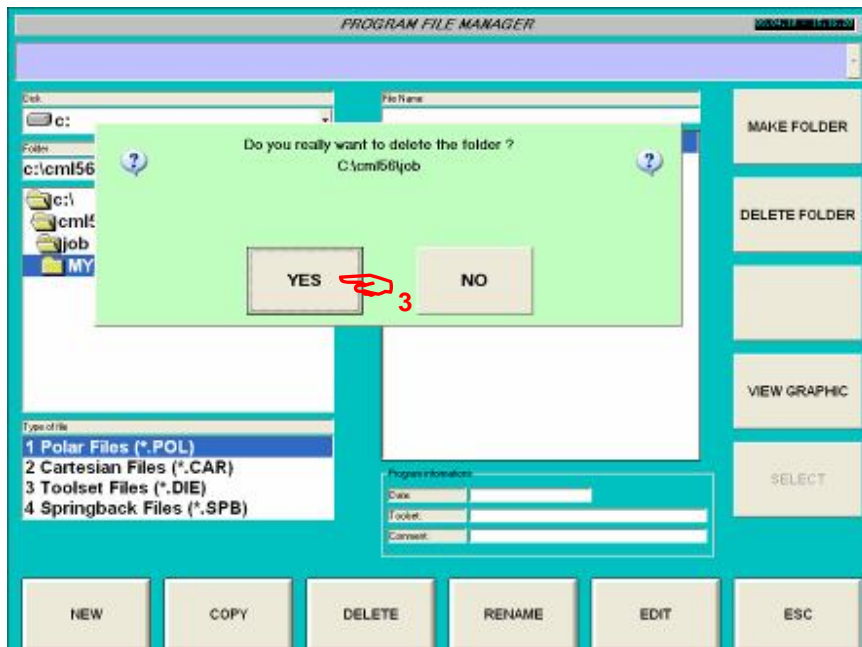


5 – 6 Delete an existing folder.

1 – Select folder you want to delete.

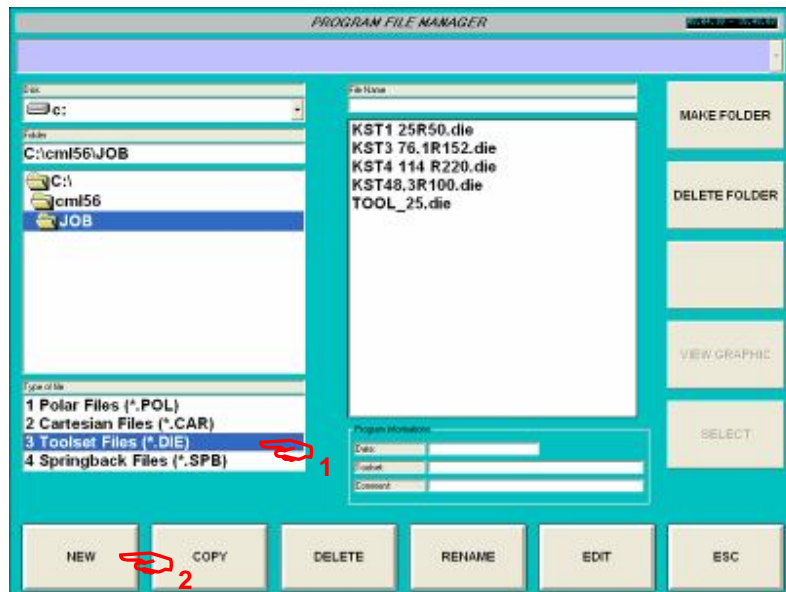


2 – Press soft key



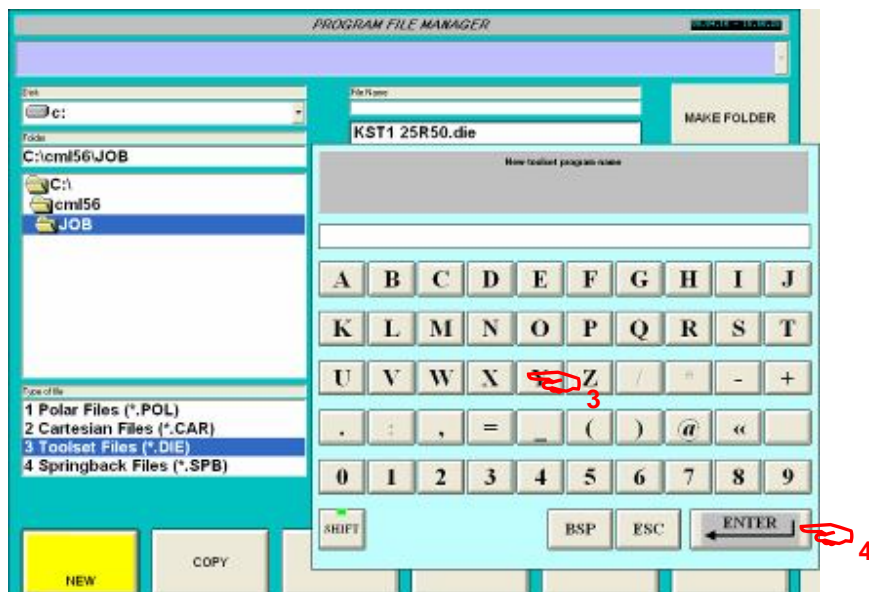
3 – Confirm or abort delete folder operation.

5 – 7 Create a new file on current folder.



1 – Select type of file you want to create.

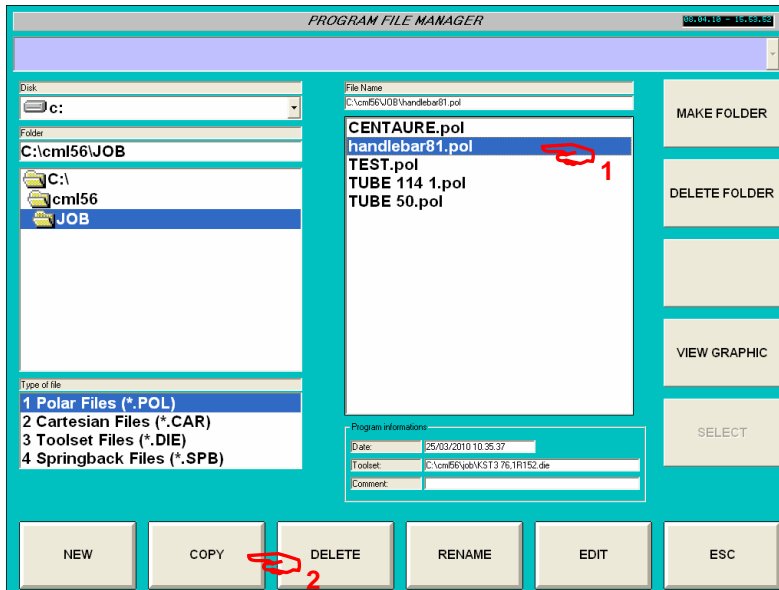
2 – Press soft key “NEW”



3 – Insert desired file name.

4 – Confirm by enter.

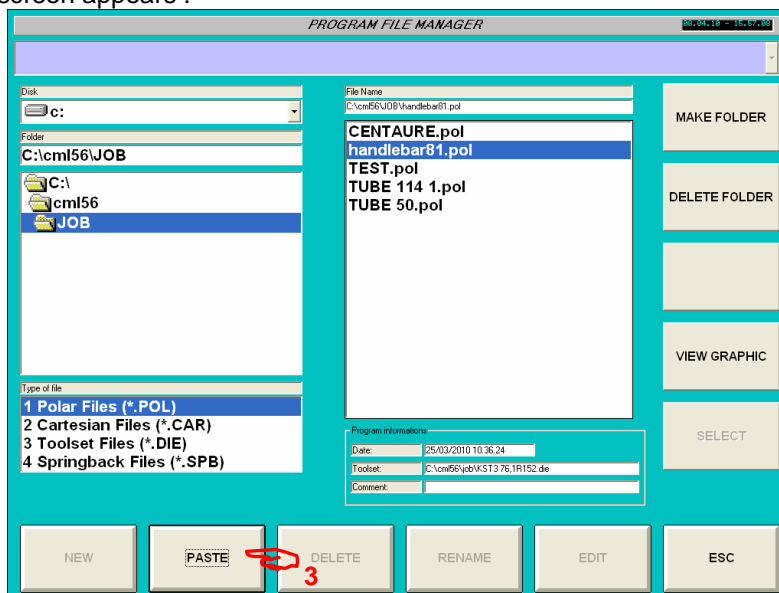
5 – 8 Copy an paste an existing file on current folder.



1 – Select file to copy.

2 – Press soft key copy.

Following screen appears :



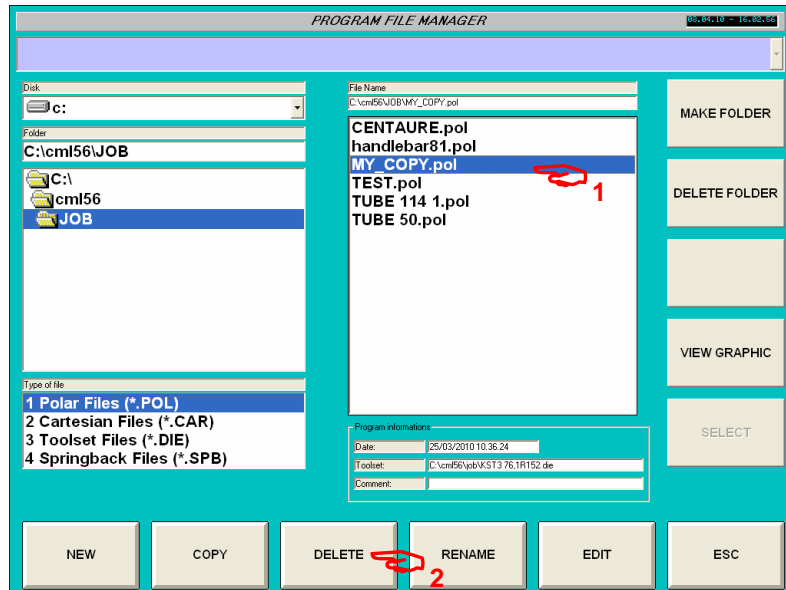
3 – press soft key “PASTE”

New file is create with characters [1] on file name.

Note : 1 is the first copy, 2 is the second etc..

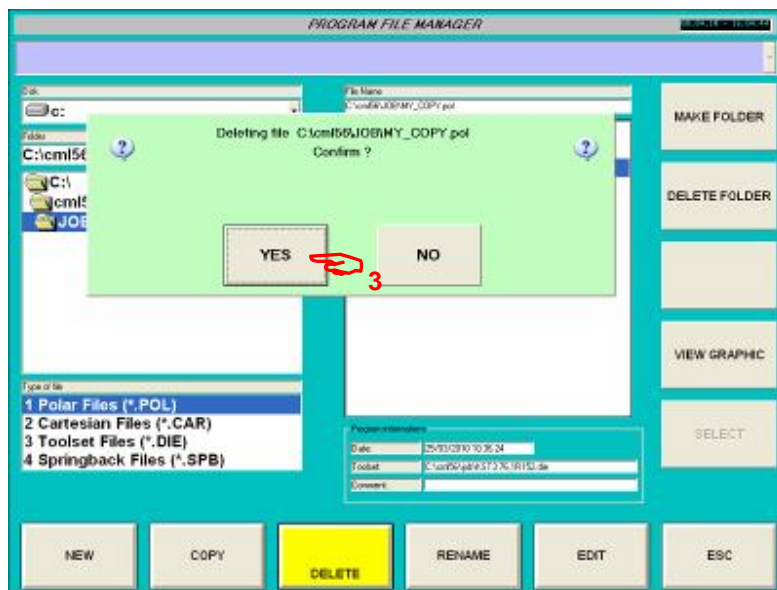
Use rename function for change file name.

5 – 9 Delete an existing file on current folder.



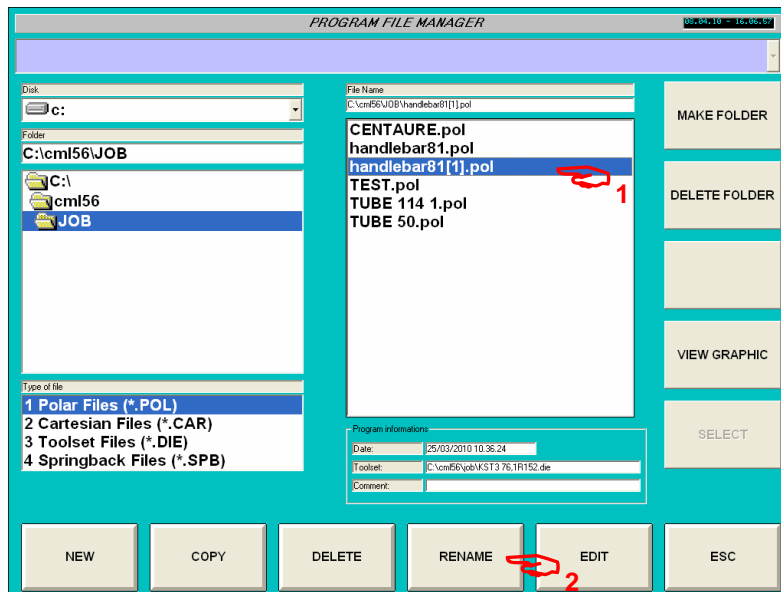
1 – Select file to delete.

2 – Press soft key “DELETE”.



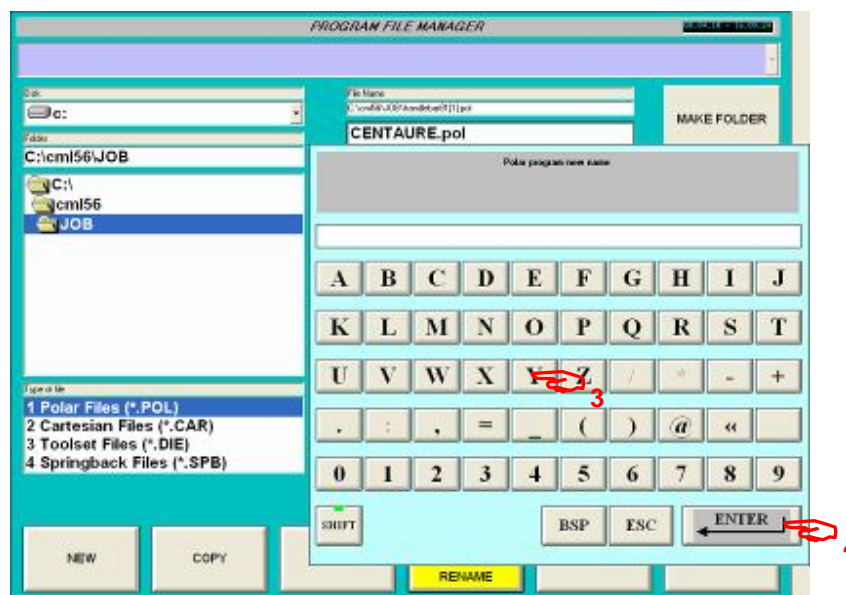
3 – Confirm delete operation.

5 – 10 Rename an existing file on current folder.



1 – Select file to rename

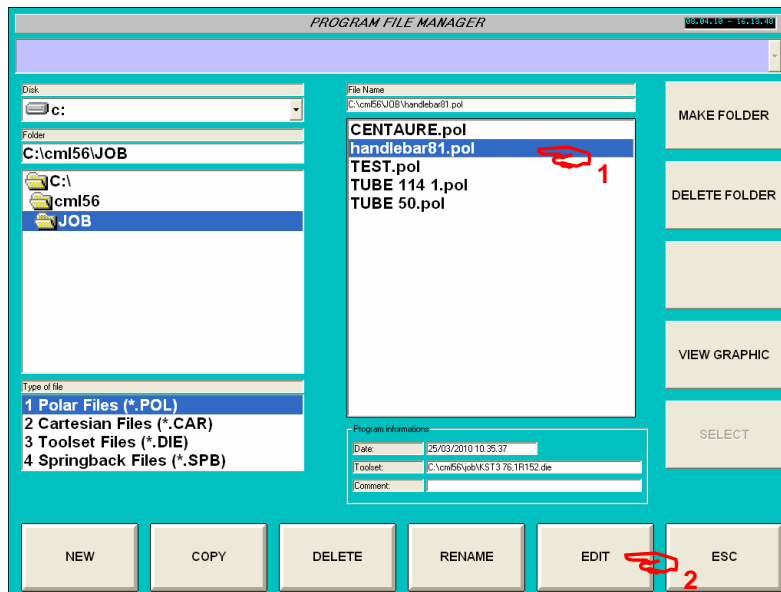
2 – Press soft key rename.



3 – Insert new name.

4 – Confirm by enter.

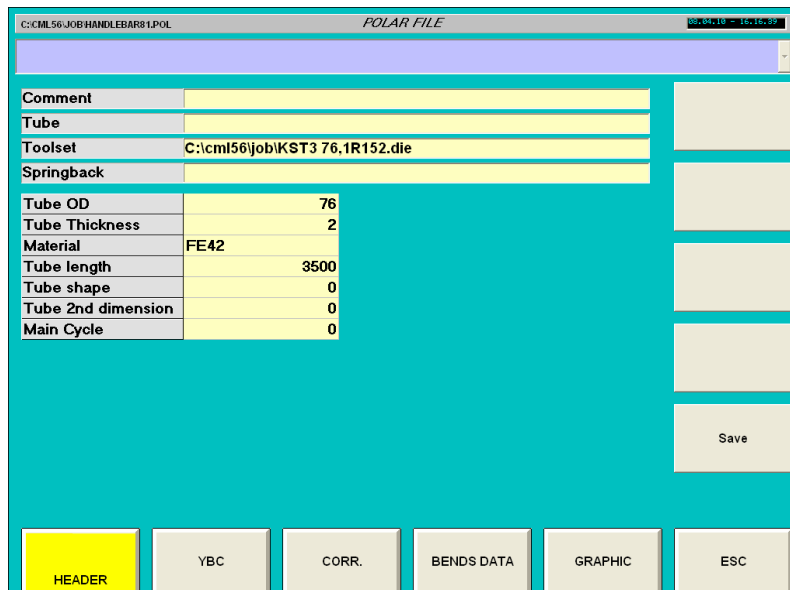
5 – 11 Edit an existing file on current folder.



1 – Select file to edit

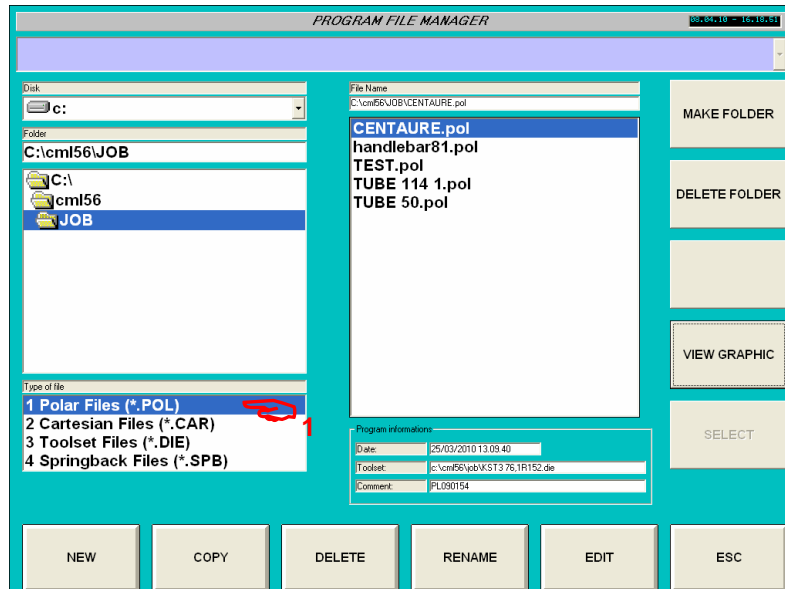
2 – press soft key “EDIT”

According to file type selection Editing page will appear :



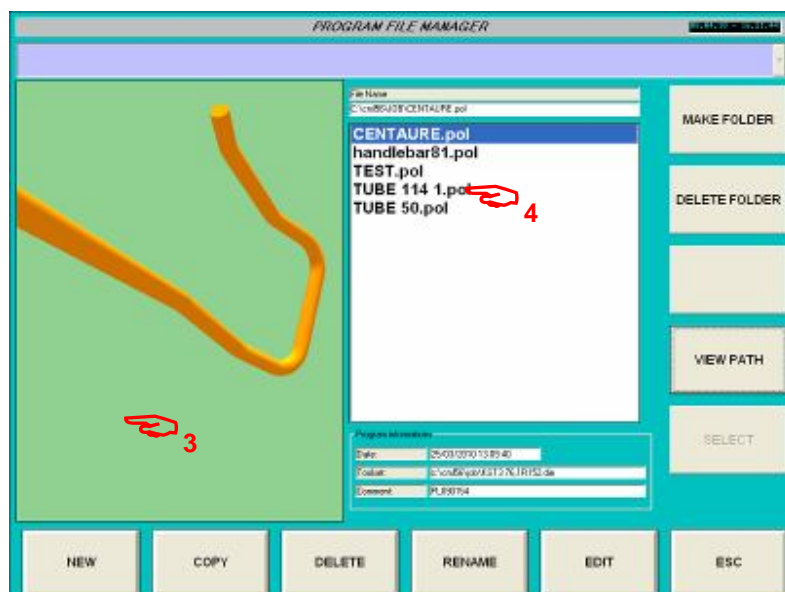
5 – 12 View in 3D an existing polar file on current folder.

Note : this function is only for POLAR files



1 – Select “ 1 Polar Files (*.POL) “ on file type

2 – Press soft key “VIEW GRAPHIC”.



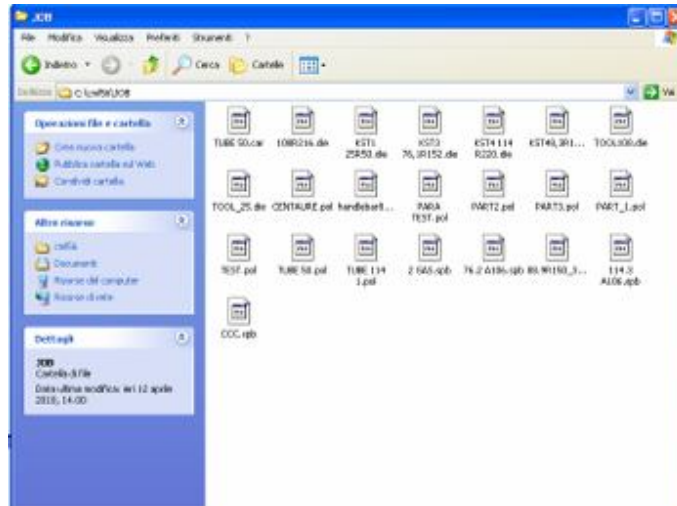
3D display of selected file is show instead of path.

Note : rotation is active touching the screen in 3d field (3).

4 – Select an other file to display according view.

Using Window® to manipulate file.

Using windows software, open directory in according to path you chose on file manager. Files are displayed wit extension (.POL, .CAR, .DIE, .SPB).

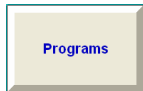


5. Programming tool set parameters

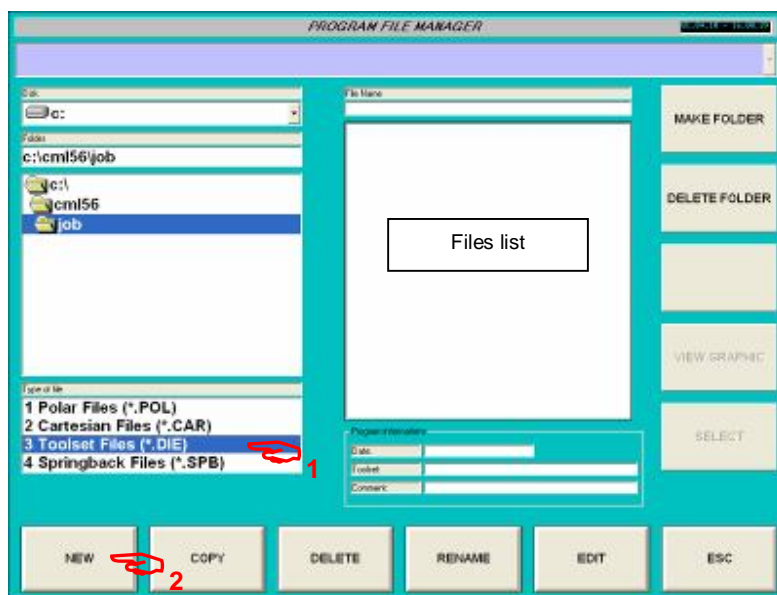
Tool set parameters are use to adapt machines data to mechanical and technological value of a toolset. Those parameter are stored in a file with .die extension (ex : 18R36_STEEL.die)

5.1 Creating a new toolset file.

From main menu



Program file manager menu appears :



Program file manager menu.

Operations :

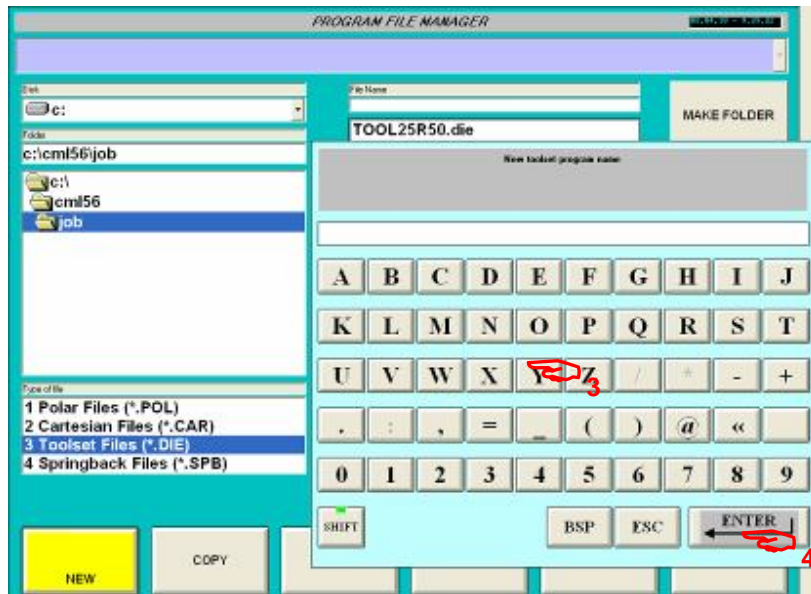
1 - Select " 3 Toolset Files (*.DIE) on File type area.

List of present files appear on list.

2 - Press soft key "New" to create a new file



The alpha numeric keyboard appears for introduce file name.

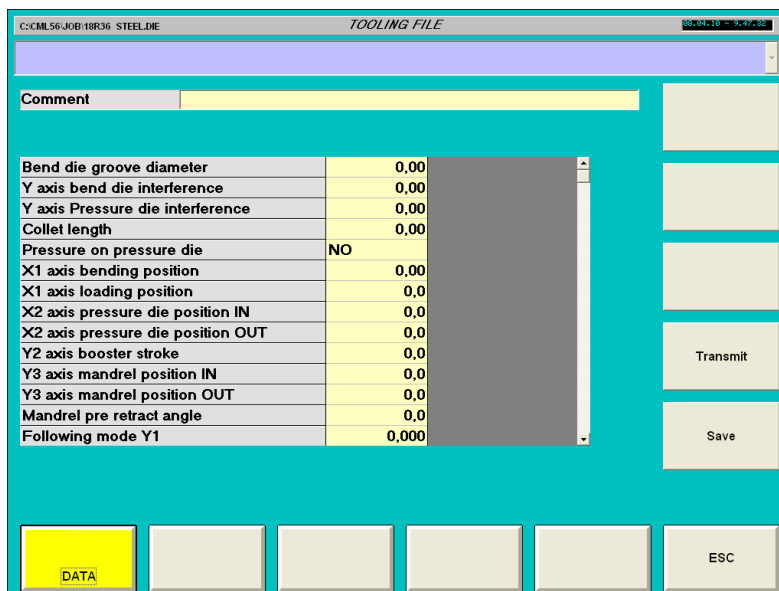


3 – Dial file name (ex : 18R36_STEEL)

4 – Introduce by enter.

Note : extension .DIE is automatically ad to file name.

Following page appears :



Soft keys function :



Transmit current parameters to ISO register (R parameters) for machine cycles.



Save current parameters on file.



Return to previous menu (File manager).

Parameters :

Access to edit parameters double click (or touch) on according field.
After selection a pop up window appears, allow to program value

Comment :

Unit : -

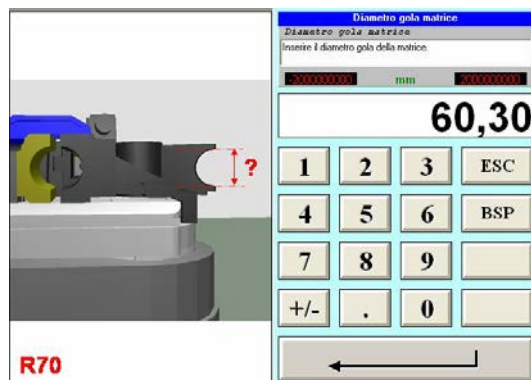
Bend die grove diameter :

Description : Bend die grove diameter, this value is stamped on bend die

Unit : mm or inches

R parameter location : R70

Pop up windows :



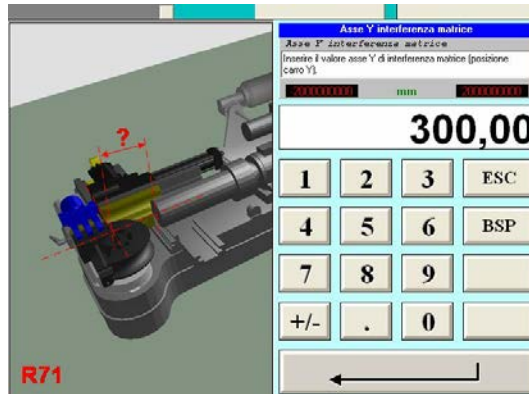
Y axis bend die interference

Description : Software limit switch for Y axis interference with wiper die (if exist for current tooling) or bend die. This position is absolute according to Y axis origin. It's a limitation of Y axis working area

Unit : mm or inches

R parameter location : R71

Pop up windows :

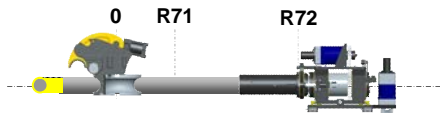


Y axis Pressure die interference

Description : Software limit switch for Y axis interference with pressure die in closed position. This position is absolute according to Y axis origin. This position must be greater than “Y axis bend die interference” .
 If according to geometric program, tube as to come in position between this 2 limit switch, pressure die interference cycles are automatically called :

Pressure die interference cycle :

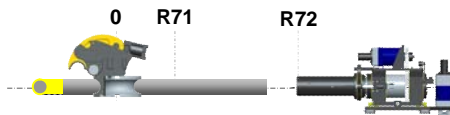
1 – Y axis position between limit switch.



2 – Close clamp.

3 – Open collet.

4 – Y axis position to Pressure die interference limit switch.

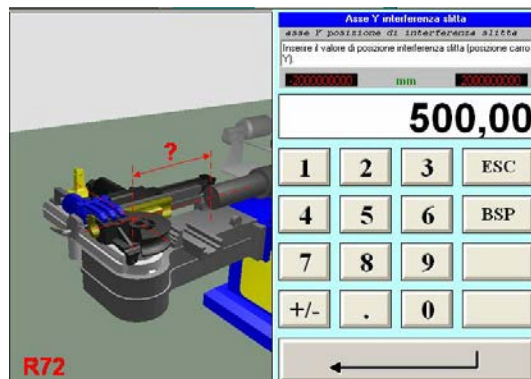


5 – Bend cycle.

Unit : mm or inches

R parameter location : R72

Pop up windows :



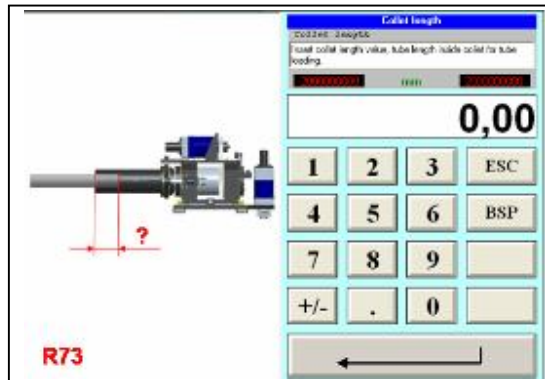
Collet length

Description : Length of tube inside collet at cycle origin (loading). This value is used for carriage positioning (Y axis) for the first bend.

Unit : mm or inches

R parameter location : R73

Pop up windows :



Pressure on pressure die :

Description : Insert 1 for YES, 0 for NO.

Selection YES, hydraulic pressure is apply on pressure die cylinder during bending.

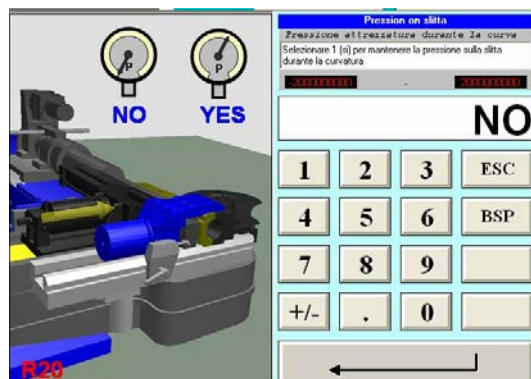
Selection NO, hydraulic pressure is not apply on pressure die cylinder during bending.

In general case using a wiper die Select YES, select NO if wiper die is not used.

Unit : -

R parameter location : R10

Pop up windows :



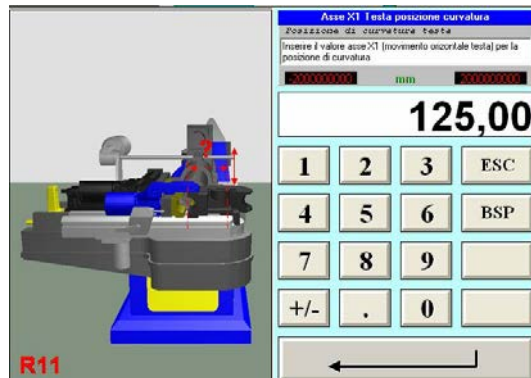
X1 axis bending position :

Description : Position of X1 axis for bending. This position is generally equal to bend die centerline radius.

Unit : mm or inches

R parameter location : R11

Pop up windows :



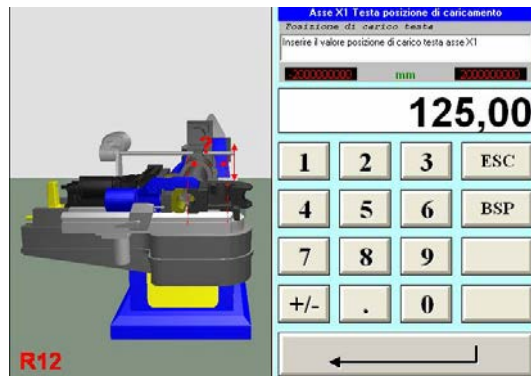
X1 axis Loading position :

Description : Position of X1 axis for tube loading . This position must be greater or equal to R11 X1 bending position.

Unit : mm or inches

R parameter location : R12

Pop up windows :



X2 pressure die position IN

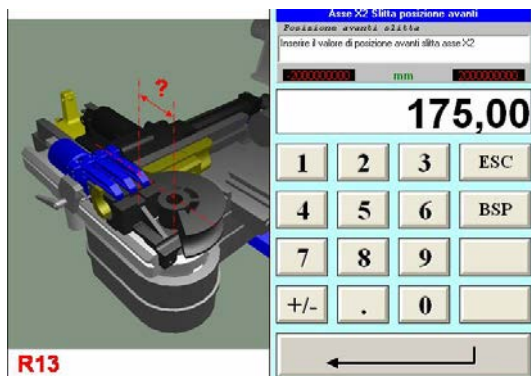
Description : Position of X2 axis, pressure die for bending (CLOSE).

To get this position one solution is to move pressure die in manual mode with a low pressure as pressure die touch the tube. On this position note X2 axis position and insert this value on "X2 pressure die position IN"

Unit : mm or inches

R parameter location : R13

Pop up windows :



X2 pressure die position OUT

Description : Position of X2 axis, pressure die for tube positioning (OPEN).

This position must be greater than R13 "X2 pressure die position IN" .

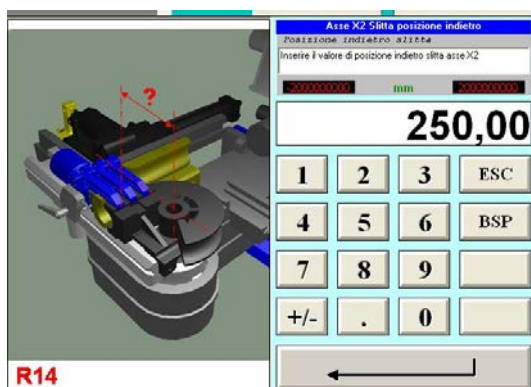
Pressure die position for tube positioning. This position must allow carriage to pass on pressure die area.

If this position is too small, Carriage must collapse pressure die.

Unit : mm or inches

R parameter location : R14

Pop up windows :



Y2 axis booster stroke.

Description : Booster Stroke limitation.

According to pressure die length, booster stroke can be limited.

A length of pressure die must always maintain tube in machine axis, this pressure die length must be minimum of 1,5 tube outside diameter.

That means Booster stroke must be program to “pressure die length minus 1,5 tube outside diameter”.

Example : Pressure die length 350 mm tube OD 76.2 mm

$$76.2 \times 1.5 = 114.3 \text{ mm}$$

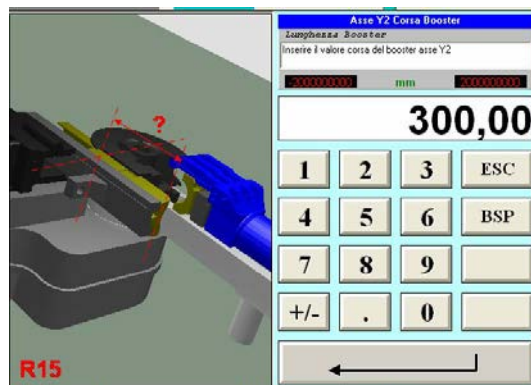
Booster stroke must be program : $350 - 114.3 = 235.7$ (235)

If this stroke is not enough to perform a complete bend, booster recapture cycle are automatically called

Unit : mm or inches

R parameter location : R15

Pop up windows :



Y3 axis Mandrel position in

Description : Mandrel position for bending.

Front mandrel position, in general case use 0 value.

Unit : mm or inches

R parameter location : R16

Pop up windows :



Y3 axis Mandrel position OUT

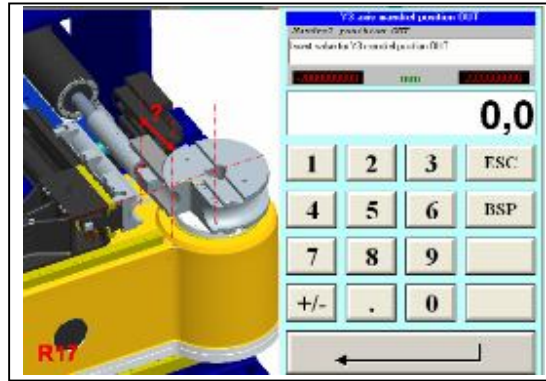
Description : Mandrel position for tube positioning.

Back mandrel position.

Unit : mm or inches

R parameter location : R17

Pop up windows :



Mandrel pre retract angle.

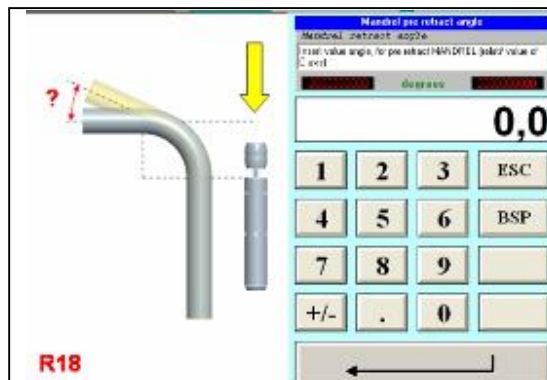
Description : Angle relative in C axis to retract mandrel before bending angle end.

This function allow to retract mandrel before bending final position to decrease deformation caused by mandrel body on tube extrados.

Unit : Degrees

R parameter location : R18

Pop up windows :



Y1 following mode coefficient.

Description : coefficient of tube following according to bend radius.

According to bending radius and bend angle tube have to move in linear off a value equal to $(2 \times \pi / 360) \times \text{Bend radius} \times \text{bend angle}$.

This distance can be corrected by this coefficient in function of tube elongation.

Programming 1.000 The carriage stroke (Y! axis) is equal to bend developed length.

Programming 0.900 The carriage stroke is 10% less than bend developed length.

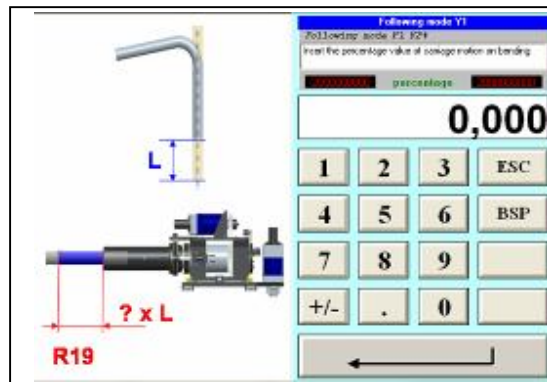
Programming 1.100 The carriage stroke is 10% more than bend developed length.

By defect use 1.000

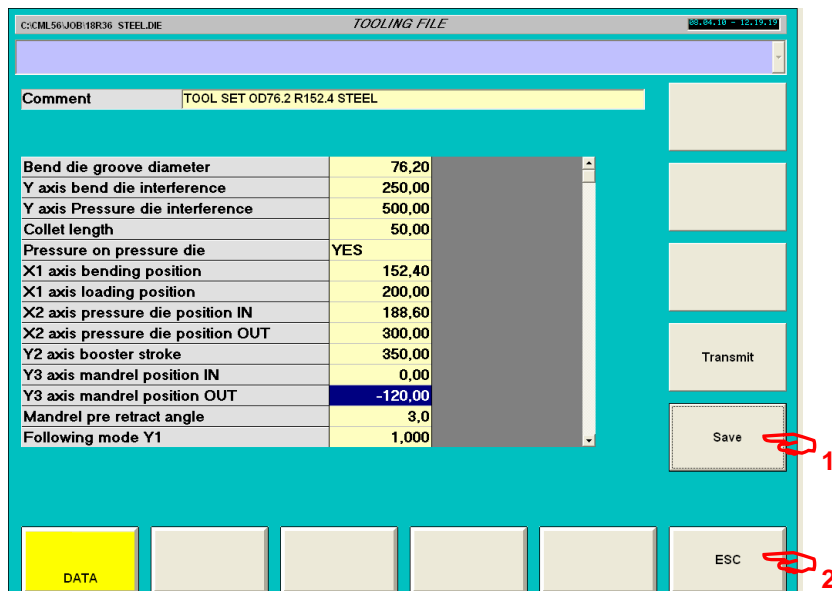
Unit : -

R parameter location : R19

Pop up windows :



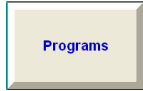
When data entry are complete press "Save" store this value on current file (1).



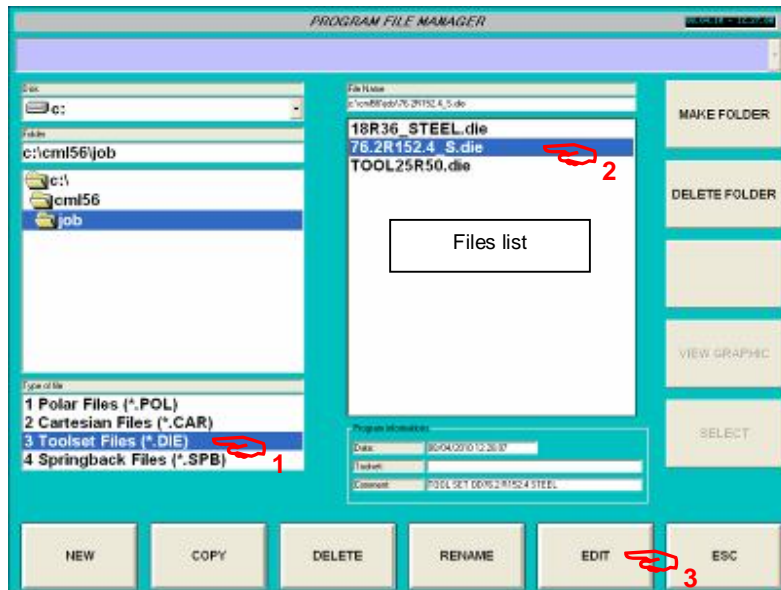
Press "ESC" to return to previous menu "File manager" (2)

5.2 Editing an existing toolset file.

From main menu



Program file manager menu appears :




Program file manager menu.

Operations :

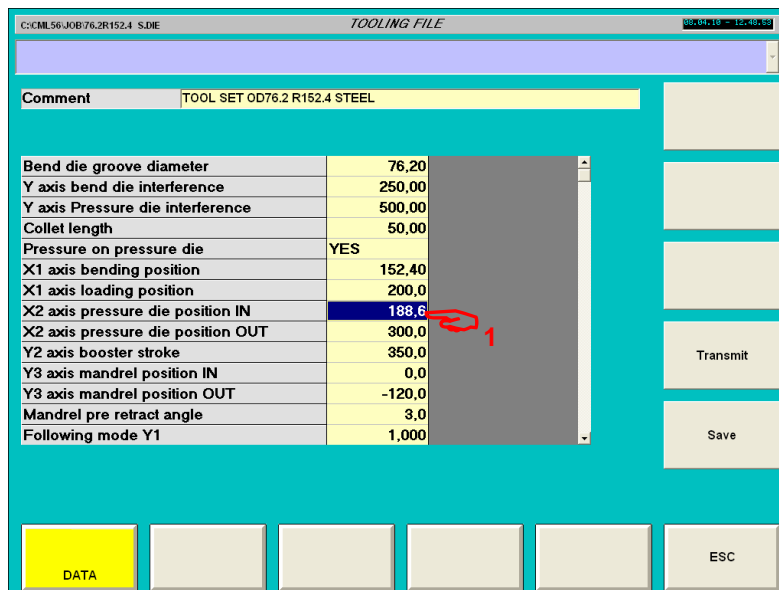
1 - Select " 3 Toolset Files (*.DIE) on File type area.

List of present files appear on list.

2 – On file list select file to edit

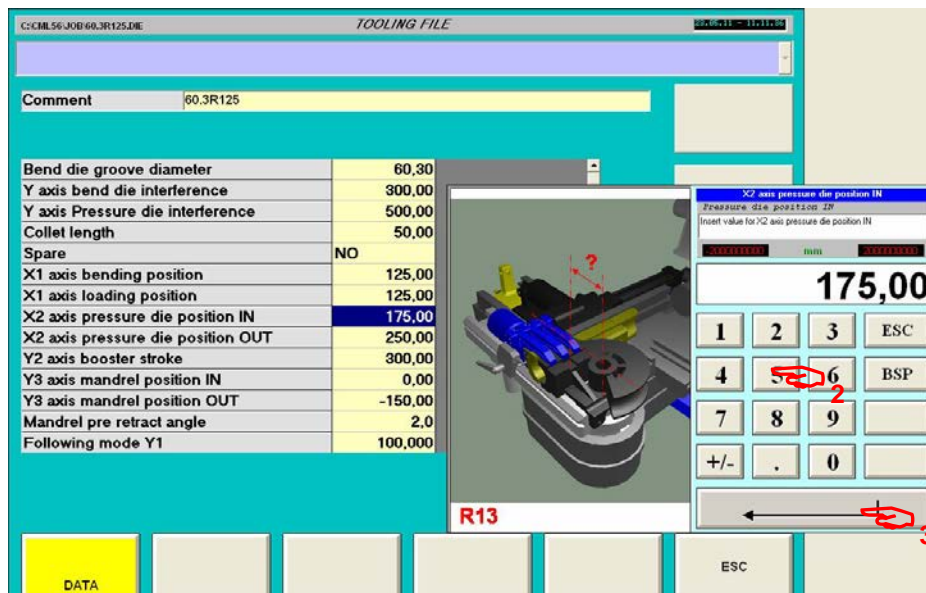
3 – Press soft key 

Following page appears with previous values :



1 - Double click on desired data to display keyboard on pop up window

Example : X2 pressure die position in :



Previous value is displayed on input field.

2 – insert new value with numerical keyboard

3 – Confirm by enter

4 - Save the file :

C:\CML56\JOB\76.2R152.4 S.DIE TOOLING FILE 8:21:10 - 12/30/20


Comment TOOL SET OD76.2 R152.4 STEEL

Bend die groove diameter	76,20
Y axis bend die interference	250,00
Y axis Pressure die interference	500,00
Collet length	50,00
Pressure on pressure die	YES
X1 axis bending position	152,40
X1 axis loading position	200,0
X2 axis pressure die position IN	188,80
X2 axis pressure die position OUT	300,0
Y2 axis booster stroke	350,0
Y3 axis mandrel position IN	0,0
Y3 axis mandrel position OUT	-120,0
Mandrel pre retract angle	3,0
Following mode Y1	1,000

Transmit

Save

DATA ESC

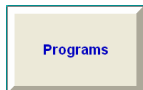


7. Programming a part using Polar coordinate

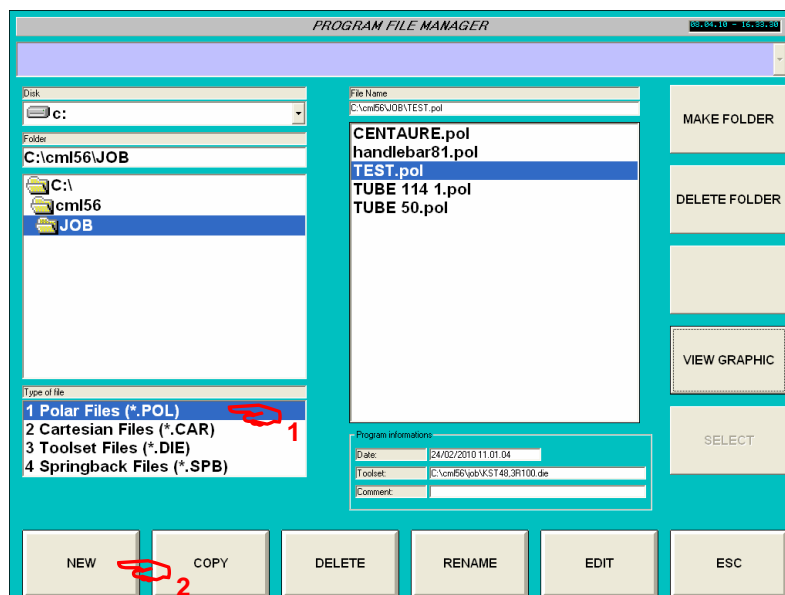
Note : a polar file must always be associate to a toolset file.

7.1 Creating a new Part.

From main menu



Program file manager menu appears :



Program file manager menu.

Operations :

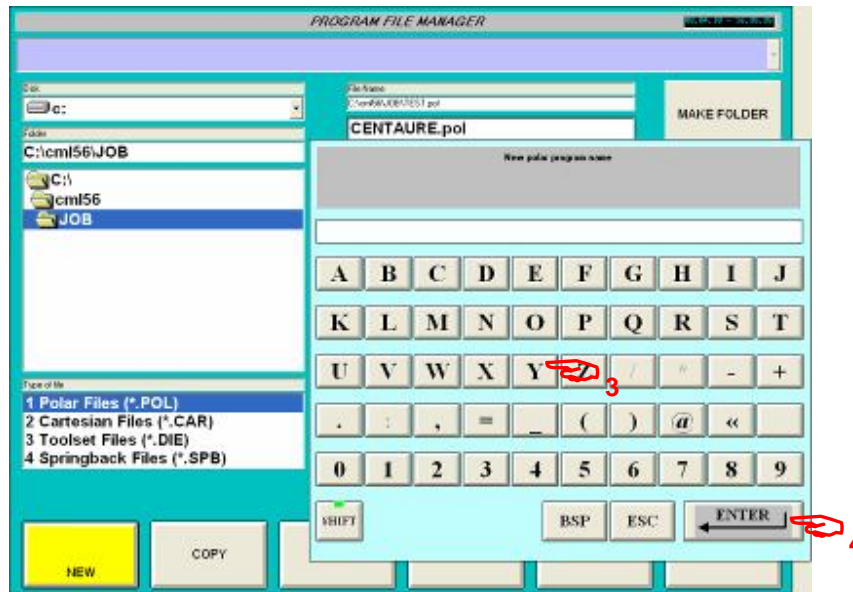
1 - Select " 1 Polar Files (*.POL) " on File type area.

List of present files appear on list.

2 - Press soft key "New" to create a new file



The alpha numeric keyboard appears for introduce file name.

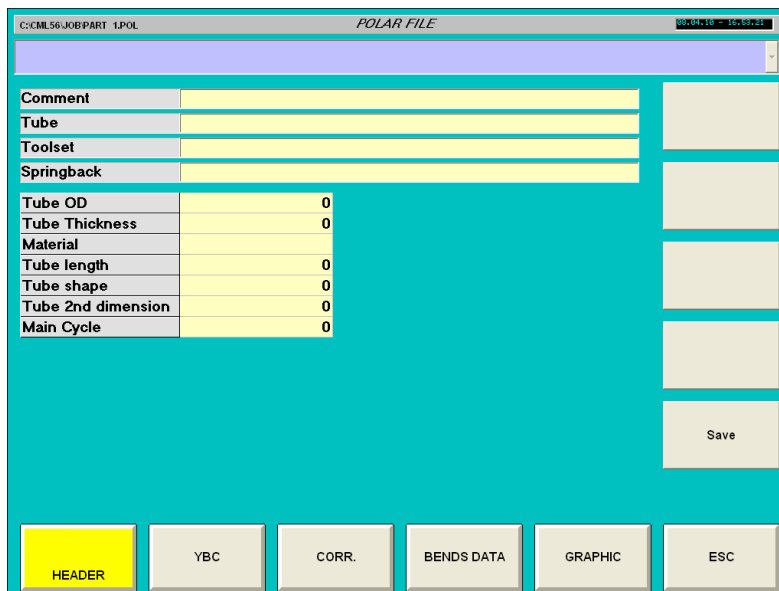


3 – Dial file name (ex : PART_1)

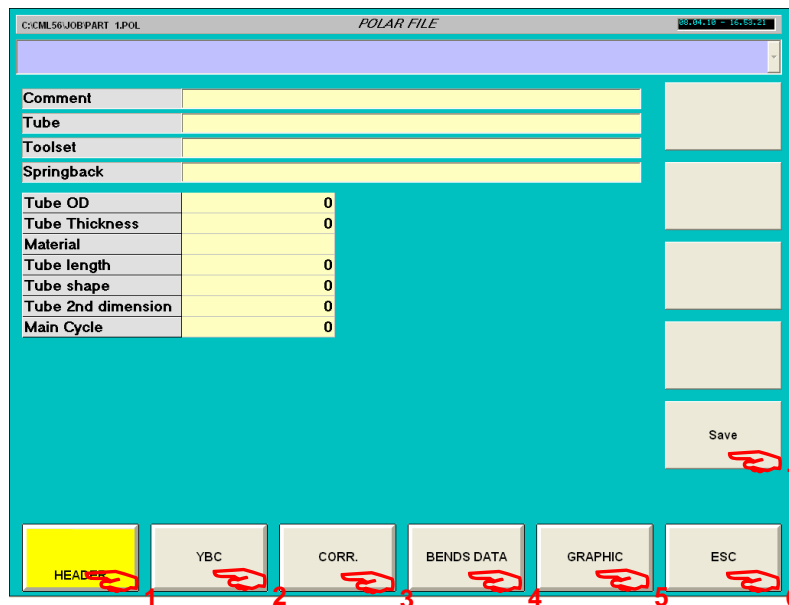
4 – Introduce by enter.

Note : extension .POL is automatically ad to file name.

Following page appears :

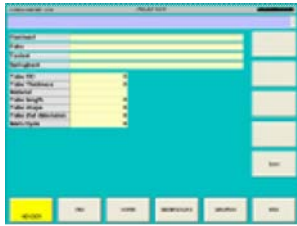


Soft key :



- 1 - Header : General part information (current).
- 2 - YBC : Geometric part definition using Length, Rotation, Angles.
- 3 - Corr. : Correction added on geometric definition to compensate tube elasticity.
- 4 - Bends data : Parameters associate to each bend, like speed, over travel, etc ...
- 5 - Graphic : Graphic display, simulation and anti-collision.
- 6 - ESC : escape return to previous menu.
- 7 - Save : Save file on current folder.

Parameters Header :



Comment :

Description : Comment.

This field allow to introduce a comment associate to the file.

Unit : -

R parameter location : -

Pop up windows : Alpha numeric keyboard

Tube :

Description : Tube comment.

This field allow to introduce a comment associate to the file.

Unit : -

R parameter location : -

Pop up windows : Alpha numeric keyboard

Toolset :

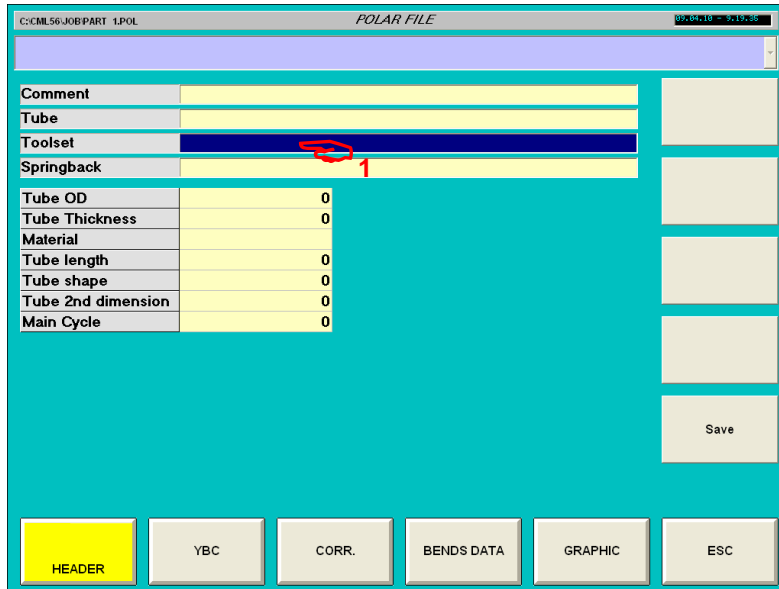
Description : Name and location of associate toolset file.

This field allow to select associate tool set file used for the current part.

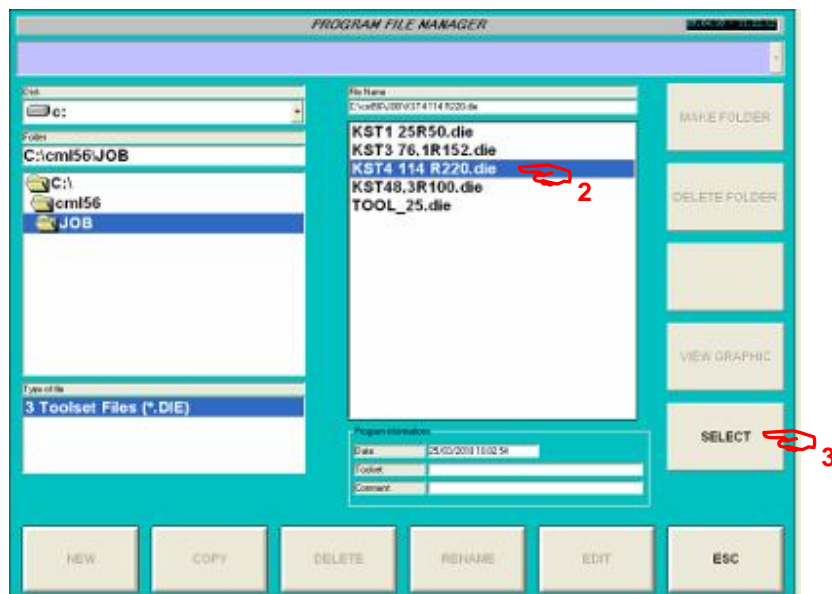
Unit : -

R parameter location : -

Pop up windows : -



- 1 - Double click on Toolset field :
- Following page appears :



- 2 – Select desired Toolset in list
- 3 – Press soft key “SELECT”

Fine name and path are displayed on toolset file selection. :

POLAR FILE	
Comment	
Tube	
Toolset	C:\cml56\JOB\KST4 114 R220.die
Springback	
Tube OD	0
Tube Thickness	0
Material	
Tube length	0
Tube shape	0
Tube 2nd dimension	0
Main Cycle	0

Save

HEADER YBC CORR. BENDS DATA GRAPHIC ESC

Spring back :

Description : Name and location of associate spring back file.

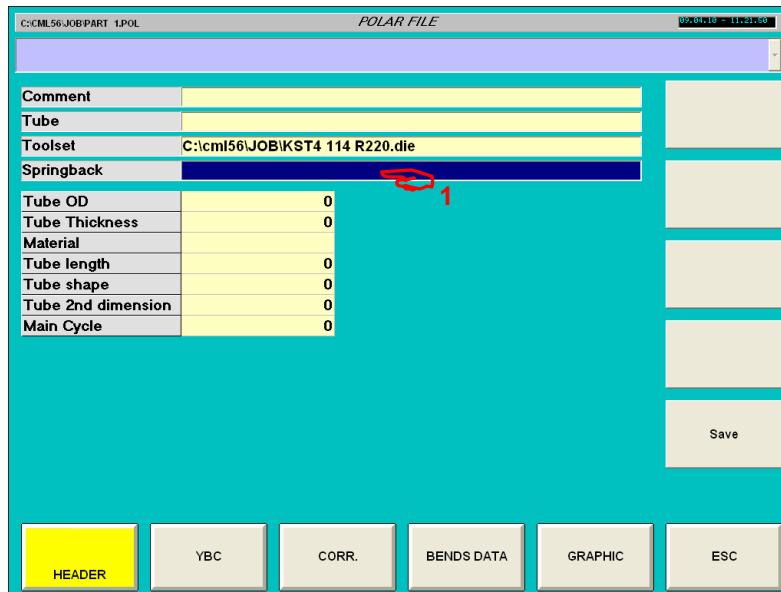
This field allow to select associate tool spring back used for the current part.

Note : if no spring back file are selected, or if spring back file is empty, spring back corrections are null.

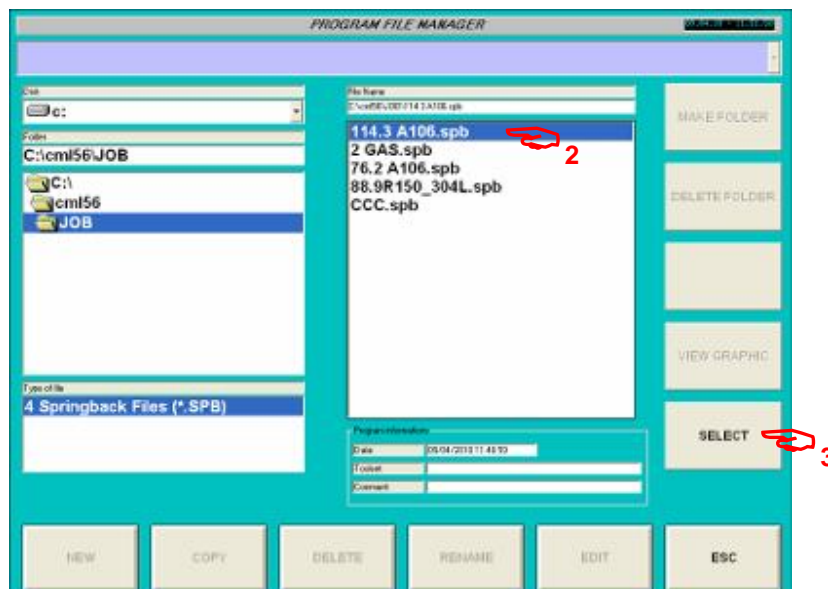
Unit : -

R parameter location : -

Pop up windows : -

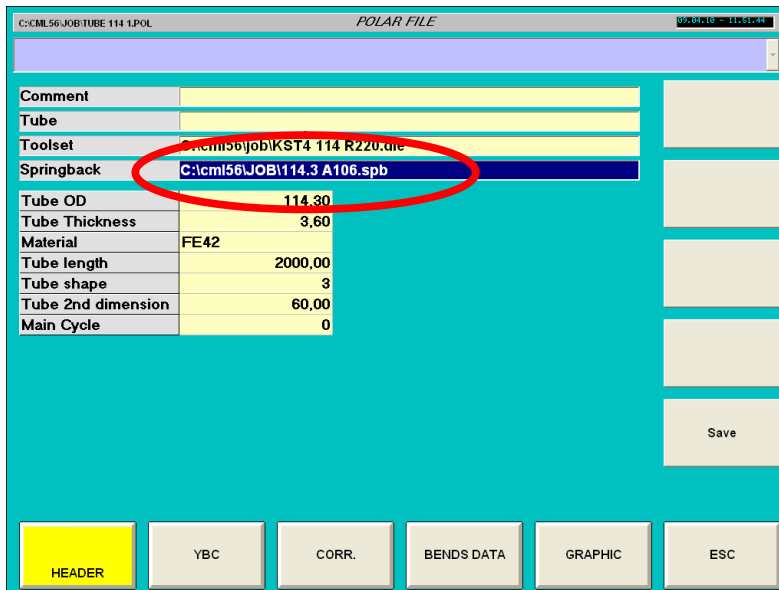


1 - Double click on Spring back field :
Following page appears :



2 – Select desired Toolset in list
3 – Press soft key “SELECT”

Fine name and path are displayed on toolset file selection. :



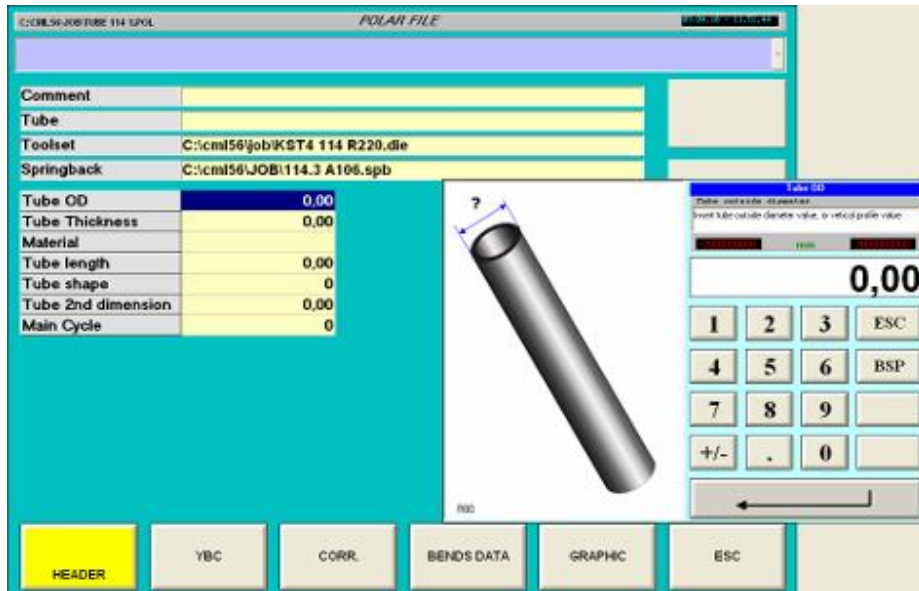
Tube OD :

Description : Tube outside diameter.

Unit : mm or inches

R parameter location : R80

Pop up windows :



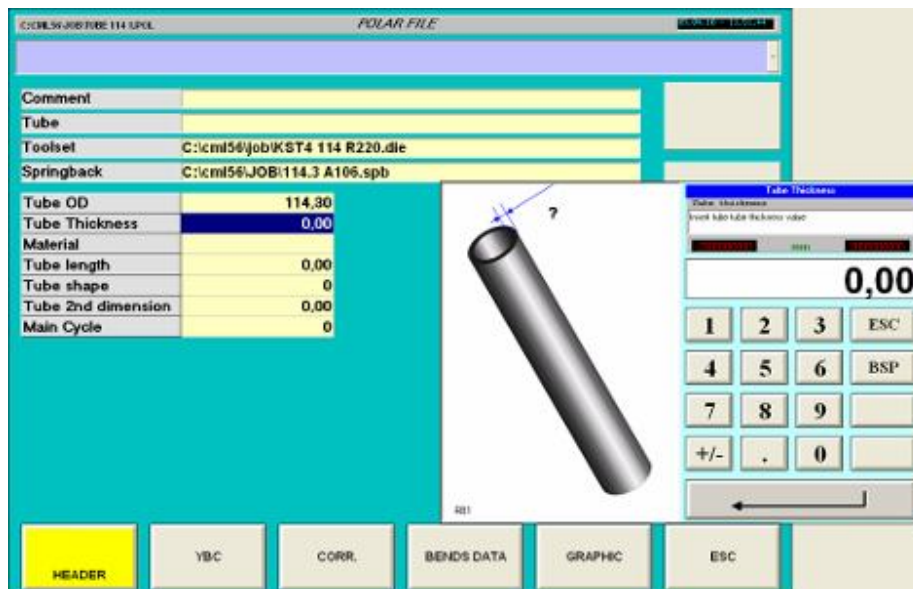
Tube Thickness :

Description : Tube thickness.

Unit : mm or inches

R parameter location : R81

Pop up windows :



Material :

Description : Tube material.

You can on this field insert material name or specification (comment)

Unit : -

R parameter location : -

Pop up windows : Alpha numeric keyboard

Tube length :

Description : Tube length you will insert on machine (cutting length).

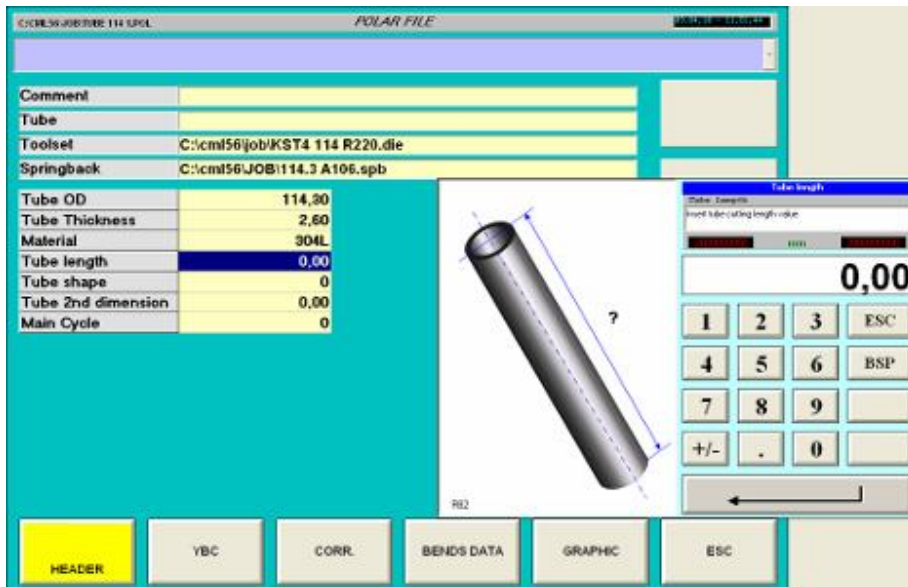
This value is used for first bend position :

First bend absolute position = Tube length – Collet length – First strait length

Unit : mm or inches

R parameter location : R82

Pop up windows :



Tube shape :

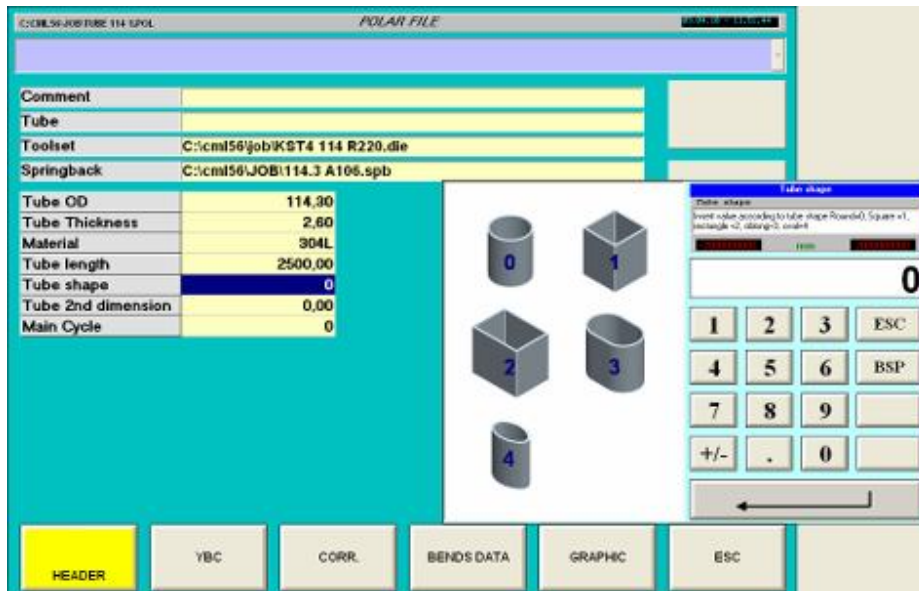
Description : tube shape selection, insert number according to tube shape.

0 – Round, 1 – Square, 2 – Rectangular, 3 – Oblong, 4 – Oval.

Unit : -

R parameter location : -

Pop up windows :



Tube 2nd dimension :

Description : for tube shape 2 – Rectangular, 3 – Oblong, 4 – Oval, a second dimension is needed.

For those tube OD mean tube horizontal dimension.

Tube 2nd dimension mean tube vertical dimension.

Unit : mm or inches.

R parameter location : R82

Pop up windows :

Main cycle :

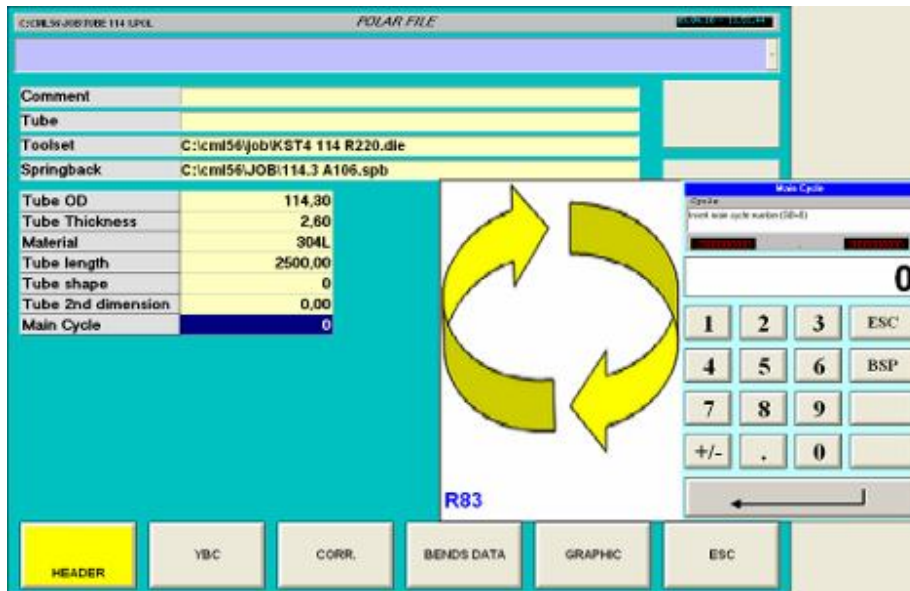
Description : Main cycle selection.

Used for special application, in standard use main cycle 0.

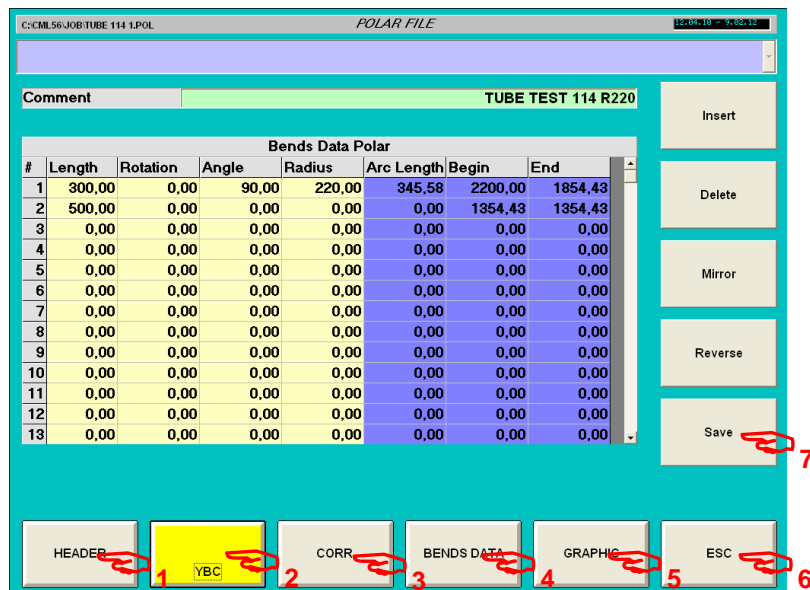
Unit : -

R parameter location : R83

Pop up windows :



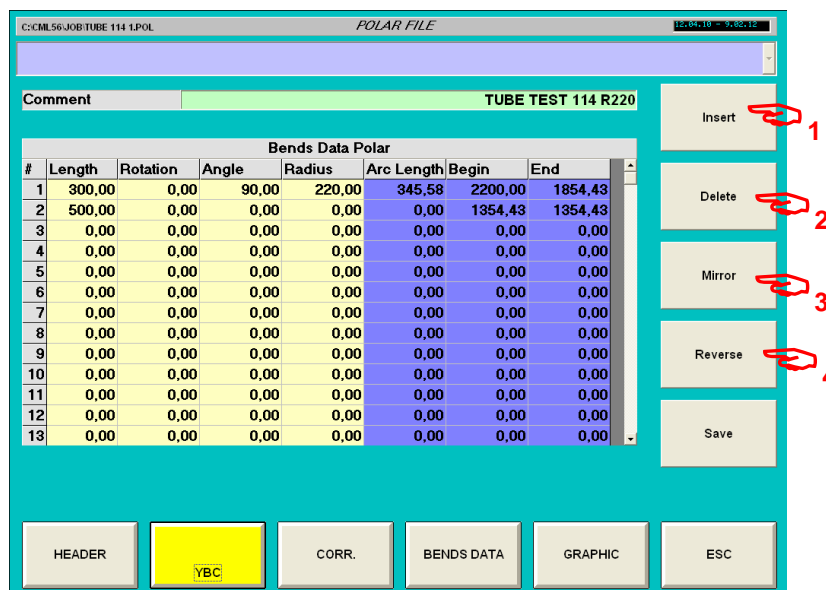
Polar files YBC



Soft keys general polar file :

- 1 - Header : General part information.
- 2 - YBC : Geometric part definition using Length, Rotation, Angles (current).
- 3 - Corr. : Correction added on geometric definition to compensate tube elasticity.
- 4 - Bends data : Parameters associate to each bend, like speed, over travel, etc ...
- 5 - Graphic : Graphic display, simulation and anti-collision.
- 6 - ESC : escape return to previous menu.
- 7 - Save : Save file on current folder.

Soft key specifics YBC menu :



- 1 – Insert (insert a bend).
- 2 – Delete (delete a bend)
- 3 – Mirror (symmetric piece invert rotation direction).
- 4 – Reverse (Reverse bend order)

Parameters :

Length :

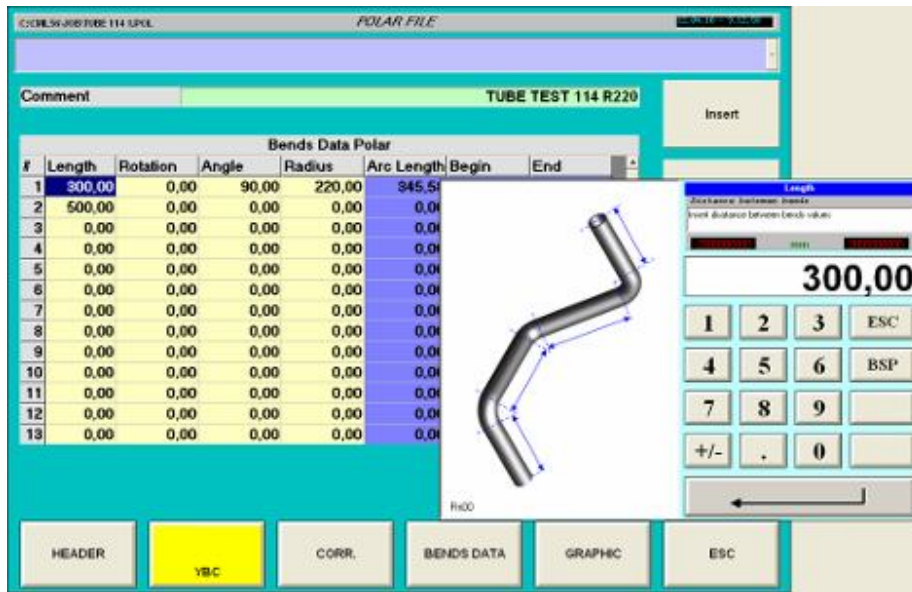
Description : Length between bends or between tube end and bend.

This value correspond to Y axis, Carriage linear motion.

Unit : mm or inches

R parameter location : Rn00

Pop up windows :



Rotation :

Description : Rotation between bends, define angle between plan off 2 successive bends.

Note for first bend the angle is only a tube rotation can be used for seam welding positioning.

Unit : Degrees.

R parameter location : Rn01

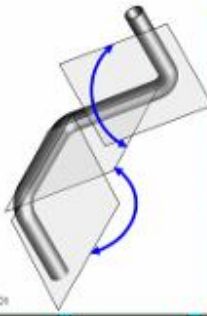
Pop up windows :

C:\CML56-108\TUBE 114 LPOL POLAR FILE

Comment: TUBE TEST 114 R220

Insert

Bends Data Polar						
#	Length	Rotation	Angle	Radius	Arc Length	Begin End
1	300,00	0,00	90,00	220,00	345,54	
2	500,00	0,00	0,00	0,00	0,00	
3	0,00	0,00	0,00	0,00	0,00	
4	0,00	0,00	0,00	0,00	0,00	
5	0,00	0,00	0,00	0,00	0,00	
6	0,00	0,00	0,00	0,00	0,00	
7	0,00	0,00	0,00	0,00	0,00	
8	0,00	0,00	0,00	0,00	0,00	
9	0,00	0,00	0,00	0,00	0,00	
10	0,00	0,00	0,00	0,00	0,00	
11	0,00	0,00	0,00	0,00	0,00	
12	0,00	0,00	0,00	0,00	0,00	
13	0,00	0,00	0,00	0,00	0,00	



345,54

0,00

1 2 3 ESC

4 5 6 BSP

7 8 9

+/- . 0

←

HEADER YBC CORR BENDS DATA GRAPHIC ESC

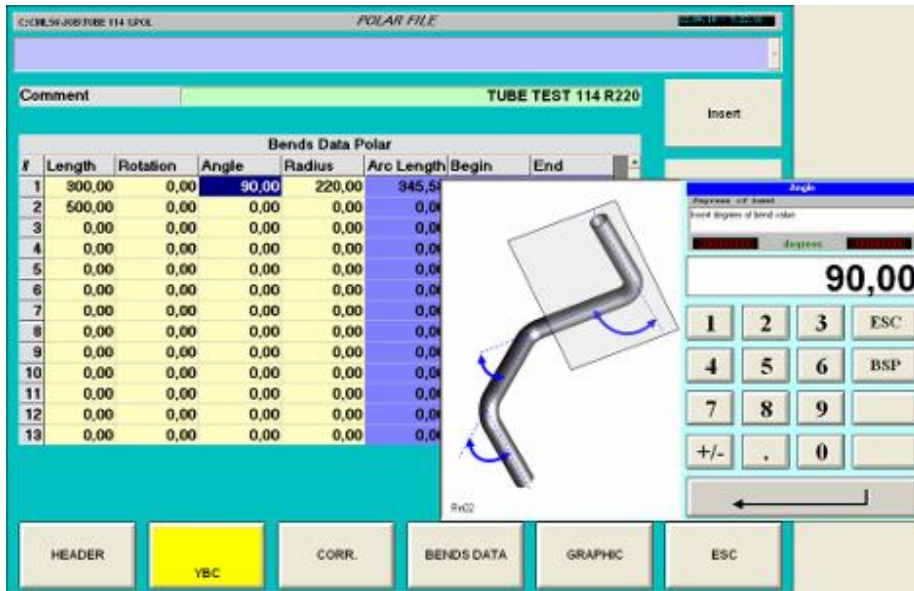
Angle :

Description : Bend angle.

Unit : Degrees.

R parameter location : Rn02

Pop up windows :



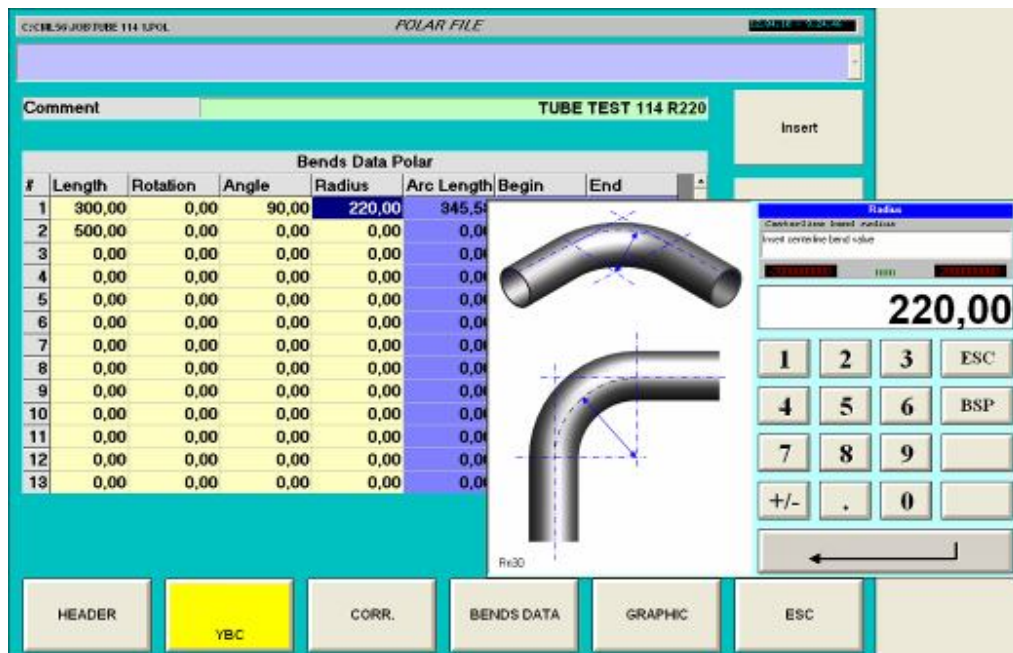
Radius :

Description : Centerline bending radius, in general case this value is equal to tooling radius.

Unit : mm or inches

R parameter location : Rn03

Pop up windows :



Arc length (display only) :

Description : Length of bend arc, on centerline radius.

Arc length = $(2 \times \text{Pi} / 360) \times \text{Radius} \times \text{Bend angle}$

Unit : mm or inches

R parameter location : Rn31

Pop up windows : -

Begin (display only) :

Description : Absolute position of bend start origin on tube end on collet.

Unit : mm or inches

R parameter location : Rn32

Pop up windows : -

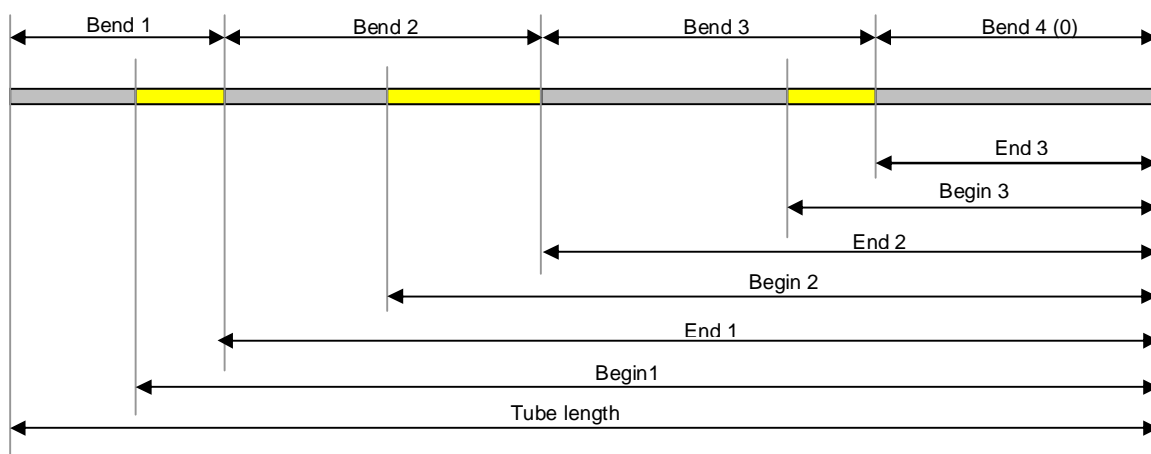
Begin (display only) :

Description : Absolute position of bend end origin on tube end on collet.

Unit : mm or inches

R parameter location : Rn33

Pop up windows : -



Those positions correspond nearly to carriage absolute position.

Note : For last bend Begin and end values are equal.

Note : For last bend if strait length (with bend at 0) is not defined, begin and end are at 0.

Note : according to tube length if last strait length is not correct, the values are positive if last strait length is too short, negative if last strait length is too long. 0 if tube length correspond exactly to part developed length.

Polar files COR.

Effect of elasticity on the bending angles.

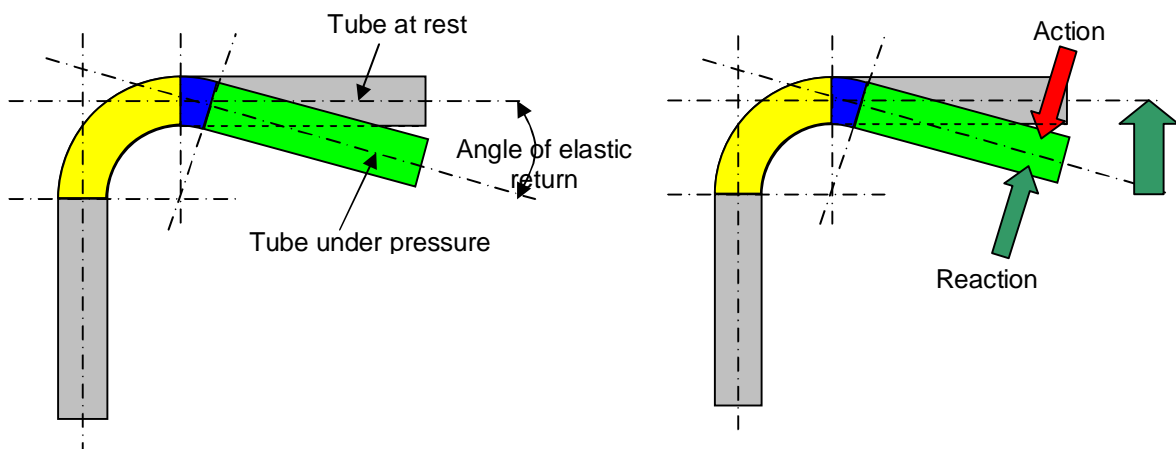
Having created the bend, the tube is under pressure. The action applied to the tube generates a reaction that opposes the action that has created it.

Once freed (opening of the vice) it tends to return to its original shape (straight).

In this way the bending corner created on the tube is still lower than the deformation that has caused it.

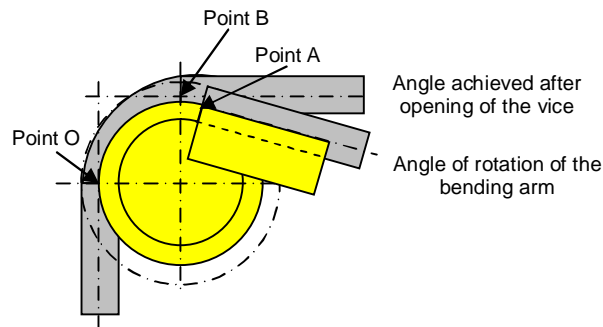
The yellow bending area is an area of plastic deformation.

The blue bending area is in an area of elastic deformation (and therefore it tends to return to its initial shape).



The elastic return angle on the bends is always negative

Effects of elasticity on the bending radius.



Hypothesis of the neutral fibre on the tube remains constant :

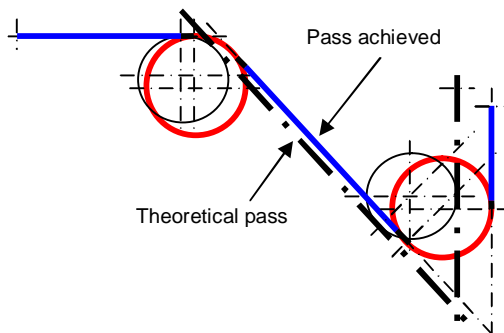
OA : arc length tube under pressure.

OB : arc length tube at rest.

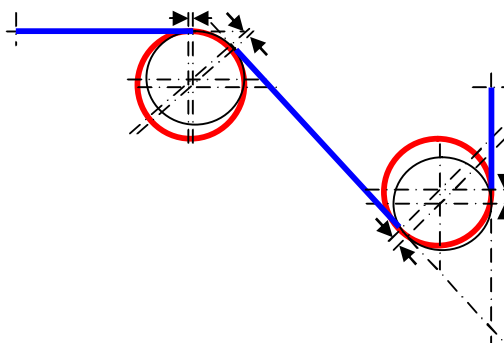
There is 2 arcs with same length with different angles, that mean 2 different radius.

THE BENDING RADIUS ACHIEVED IS STILL HIGHER THAN THE RADIUS OF THE TOOL

This difference of radius affect tube geometry.



It is necessary for respect a geometry to modify (correct) straight length to compensate the radius difference. By applying corrections to the lengths, therefore a reduction to the straight parts, the following result is achieved:



Polar CORR parameter allow to ad some values (positive or negative) to lengths, angles and rotations. Those corection can be included directly to YBC values but on this case tube definition is lost (YBC values are not exact tube definition).

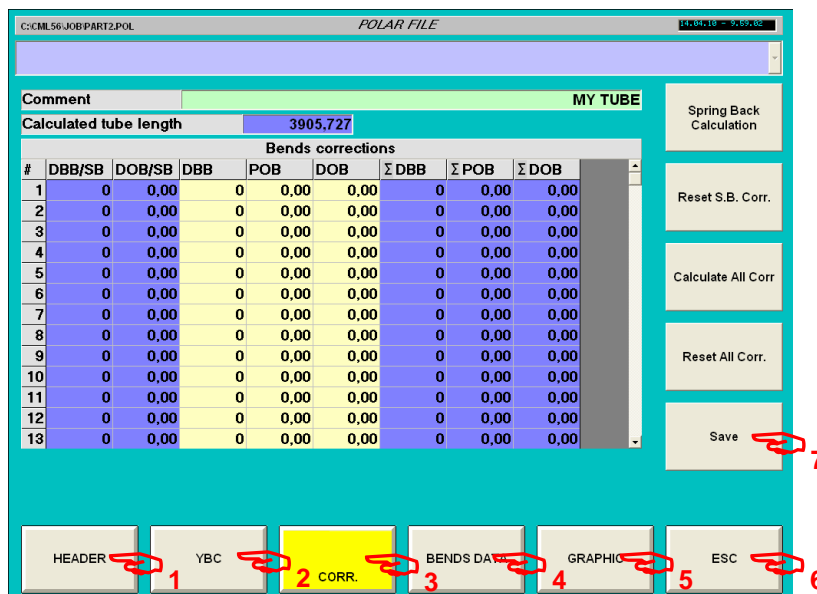
Using corrections, YBC values are according to theoretical geometry, corrections are apply to compensate tube elasticity.

Spring back function calculate automaticaly thoses correction according to a bending test.

This function is usefull because defining one time tube reaction, elasticity calculated parameters can be use for several tube geometry.

Also if tube reaction change (new batch, new material), modify only one spring back file all part using corresponding spring back file will be modify.

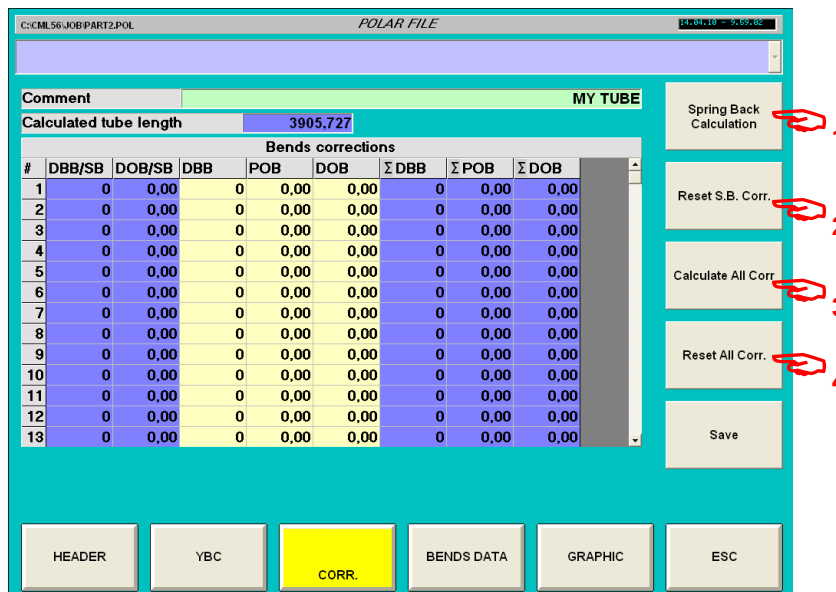
Polar files COR.



Soft keys general polar file :

- 1 - Header : General part information.
- 2 - YBC : Geometric part definition using Length, Rotation, Angles.
- 3 - Corr. : Correction added on geometric definition to compensate tube elasticity (current).
- 4 - Bends data : Parameters associate to each bend, like speed, over travel, etc ...
- 5 - Graphic : Graphic display, simulation and anti-collision.
- 6 - ESC : escape return to previous menu.
- 7 - Save : Save file on current folder.

Soft key specifics YBC menu :



- 1 – Spring back calculation.
- 2 – Reset spring back calculation.
- 3 – Calculate all corrections.
- 4 – Reset all corrections.

Specific soft key function :

1 – Spring back calculation.

Pressing this key, DBB/SB and DOB/SB will be automatically calculated in function of current parameters of selected sprig back file (define on header).

DBB : Distance Between Bends (strait length)

DOB : Degrees Of Bend (Bend angle)

SB : Spring back.

2 – Reset spring back calculation.

Pressing this key will delete all parameters DBB/SB and DOB/SB

DBB : Distance Between Bends (strait length)

DOB : Degrees Of Bend (Bend angle)

SB : Spring back.

3 – Calculate all corrections.

Pressing this key will add spring back correction to manual correction and display in Σ (sum) area

Note : is those correction are apply to bending program.

4 – Reset all corrections.

Put all correction at 0.

Parameters :

DBB/SB (Display only) :

Description : Calculated length correction of spring back function.

Unit : mm or inches.

R parameter location : -

Pop up windows : -

DOB/SB (Display only) :

Description : Calculated bend correction of spring back function.

Unit : Degrees.

R parameter location : -

Pop up windows : -

DOB :

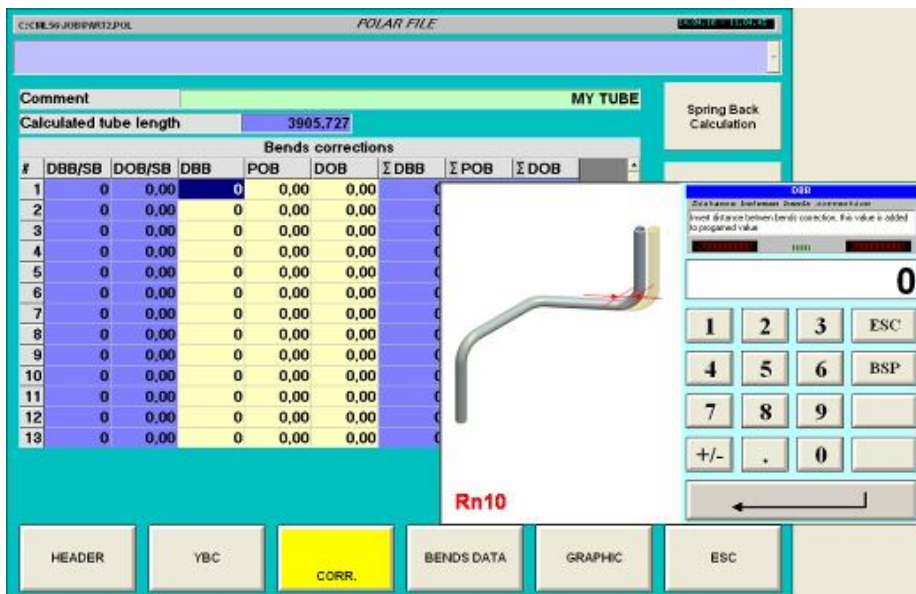
Description : Manual length correction.

Note : correction is added to length value, insert a positive value to increase length a negative value to decrease length.

Unit : mm or inches.

R parameter location : -

Pop up windows :



POB :

Description : Manual rotation correction.

Note : correction is added to rotation value.

Rotation value is signed (from 180 to +180°).

If rotation is positive, a positive value increases absolute angle a negative decreases absolute angle.

If rotation is negative, a positive value decreases absolute angle a negative increases absolute angle.

Unit : Degrees.

R parameter location : -

Pop up windows :

The screenshot displays the EB CNC software interface. At the top, the file path is C:\CML59\JOB\PART2.POL and the title is POLAR FILE. A comment field contains 'MY TUBE' and the calculated tube length is 3905.727. A 'Spring Back Calculation' button is visible. The main table is titled 'Bends corrections' and contains the following data:

#	DBB/SB	DOB/SB	DBB	POB	DOB	Σ DBB	Σ POB	Σ DOB
1	0	0,00	0,00	0,00	0,00	0	0	0
2	0	0,00	0	0,00	0,00	0	0	0
3	0	0,00	0	0,00	0,00	0	0	0
4	0	0,00	0	0,00	0,00	0	0	0
5	0	0,00	0	0,00	0,00	0	0	0
6	0	0,00	0	0,00	0,00	0	0	0
7	0	0,00	0	0,00	0,00	0	0	0
8	0	0,00	0	0,00	0,00	0	0	0
9	0	0,00	0	0,00	0,00	0	0	0
10	0	0,00	0	0,00	0,00	0	0	0
11	0	0,00	0	0,00	0,00	0	0	0
12	0	0,00	0	0,00	0,00	0	0	0
13	0	0,00	0	0,00	0,00	0	0	0

A pop-up window titled 'Rn11' is overlaid on the table. It contains a small diagram of a bent tube and a numeric keypad. The keypad has buttons for digits 1-9, 0, +/-, ., and a left arrow. The display shows '0,00' and the unit 'degrees'. At the bottom of the software interface, there are buttons for 'HEADER', 'YBC', 'CORR.', 'BENDS DATA', 'GRAPHIC', and 'ESC'. The 'CORR.' button is highlighted in yellow.

DOB :

Description : Manual bend correction.

Note : correction is added to bend value.

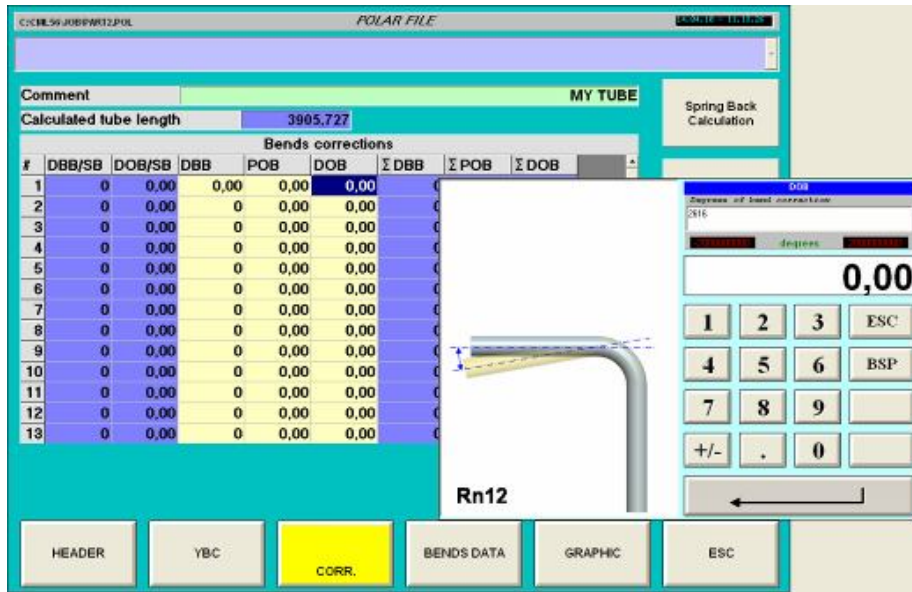
Rotation value is signed (from 180 to +180°).

A positive value increase absolute angle a negative decrease absolute angle.

Unit : Degrees.

R parameter location : -

Pop up windows :



DBB (Display only) :

Description : Length correction sum.

Note : is this correction active for bend program.

Unit : mm or inches.

R parameter location : -

Pop up windows : -

POB (Display only) :

Description : Rotation correction sum.

Note : is this correction active for bend program.

Unit : Degrees.

R parameter location : -

Pop up windows : -

DOB (Display only) :

Description : Bend angle correction sum.

Note : is this correction active for bend program.

Unit : Degrees.

R parameter location : -

Pop up windows : -

Polar files Bend data.

The screenshot shows the 'POLAR FILE' software interface. At the top, it displays the file path 'C:\CML56\JOB\PART2.POL' and the title 'POLAR FILE'. Below this, there is a 'Comment' field containing 'MY TUBE' and a 'Calculated tube length' field showing '3905.727'. The main area is a table titled 'Bends data' with the following columns: '#', 'Y speed', 'B speed', 'C speed', 'Over Y', 'Over B', 'Cycle', 'ST tool', and 'Y repos'. The table contains 13 rows of data, all with 'Y speed', 'B speed', and 'C speed' set to 1, and 'Over Y', 'Over B', 'Cycle', 'ST tool', and 'Y repos' set to 0. To the right of the table are buttons for 'Bend / Calendering' and 'Save'. At the bottom, there is a row of navigation buttons: 'HEADER', 'YBC', 'CORR.', 'BENDS DATA', 'GRAPHIC', and 'ESC'. Red circles with numbers 1 through 7 highlight these buttons: 1 (HEADER), 2 (YBC), 3 (CORR.), 4 (BENDS DATA), 5 (GRAPHIC), 6 (ESC), and 7 (Save).

#	Y speed	B speed	C speed	Over Y	Over B	Cycle	ST tool	Y repos
1	1	1	1	0	0,00	0	1	0
2	1	1	1	0	0,00	0	1	0
3	1	1	1	0	0,00	0	1	0
4	1	1	1	0	0,00	0	1	0
5	1	1	1	0	0,00	0	1	0
6	1	1	1	0	0,00	0	1	0
7	1	1	1	0	0,00	0	1	0
8	1	1	1	0	0,00	0	1	0
9	1	1	1	0	0,00	0	1	0
10	1	1	1	0	0,00	0	1	0
11	1	1	1	0	0,00	0	1	0
12	1	1	1	0	0,00	0	1	0
13	1	1	1	0	0,00	0	1	0

Soft keys general polar file :

- 1 - Header : General part information.
- 2 - YBC : Geometric part definition using Length, Rotation, Angles.
- 3 - Corr. : Correction added on geometric definition to compensate tube elasticity.
- 4 - Bends data : Parameters associate to each bend, like speed, over travel, etc ... (current).
- 5 - Graphic : Graphic display, simulation and anti-collision.
- 6 - ESC : escape return to previous menu.
- 7 - Save : Save file on current folder.

Parameters:

Y speed :

Description : Y axis linear speed.

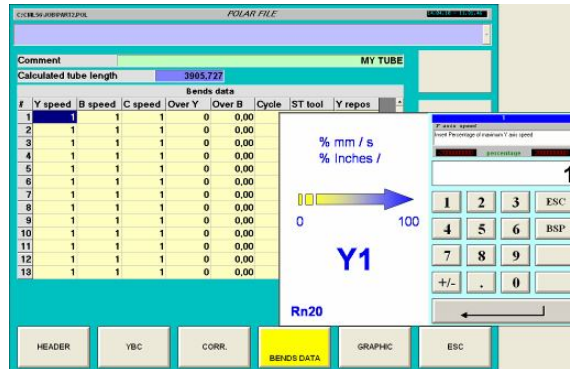
Note : percentage of maximum axis speed.

Note : By defect Y speed is set at maximum speed.

Unit : percent.

R parameter location : Rn20

Pop up windows :



B speed :

Description : B axis rotation speed.

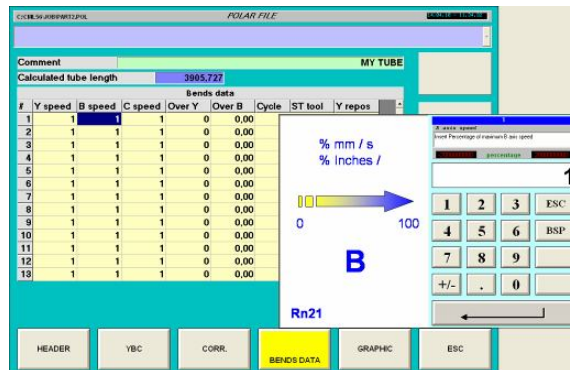
Note : percentage of maximum axis speed.

Note : By defect B speed is set at maximum speed.

Unit : percent.

R parameter location : Rn21

Pop up windows :



C speed :

Description : C axis bending speed.

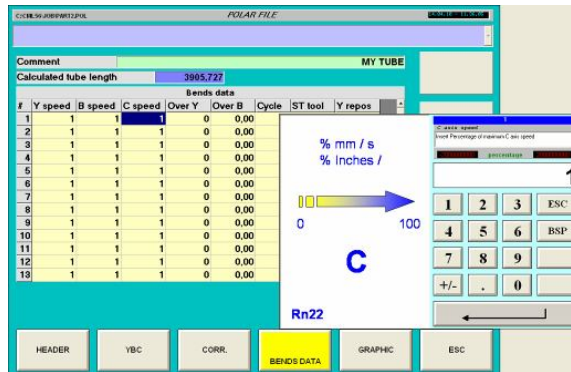
Note : percentage of maximum axis speed.

Note : By defect C speed is set at maximum speed.

Unit : percent.

R parameter location : Rn22

Pop up windows :



Over Y :

Description : Over travel axis Y linear.

This value is added to linear motion before tube rotation. After tube rotation tube return in linear of "Over Y" value.

R parameter location : Rn40

Pop up windows :



Over B :

Description : Over travel axis B rotation.

Note : not active for this software.

R parameter location : Rn41

Pop up windows :

Cycle :

Description : Specific bend cycle.

Note : not active for this software.

R parameter location : Rn50

Pop up windows :

Cycle :

Description : Specific bend cycle.
Note : not active for this software.
R parameter location : Rn50
Pop up windows : -

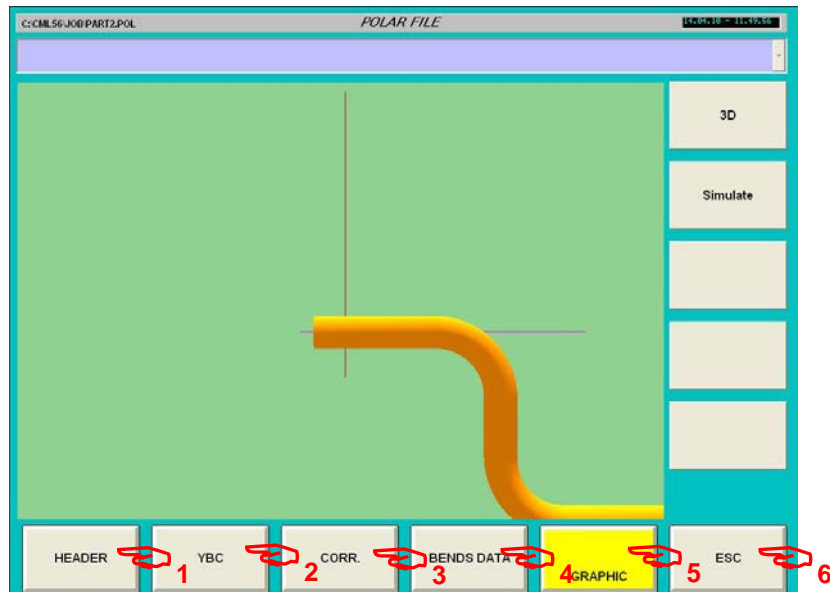
ST tool :

Description : Stack tool selection.
Note : not active for this software.
R parameter location : Rn51
Pop up windows : -

Y repos :

Description : Repositioning Y axis linear.
Note : not active for this software, length recapture cycle are automatic.
R parameter location : Rn52
Pop up windows : -

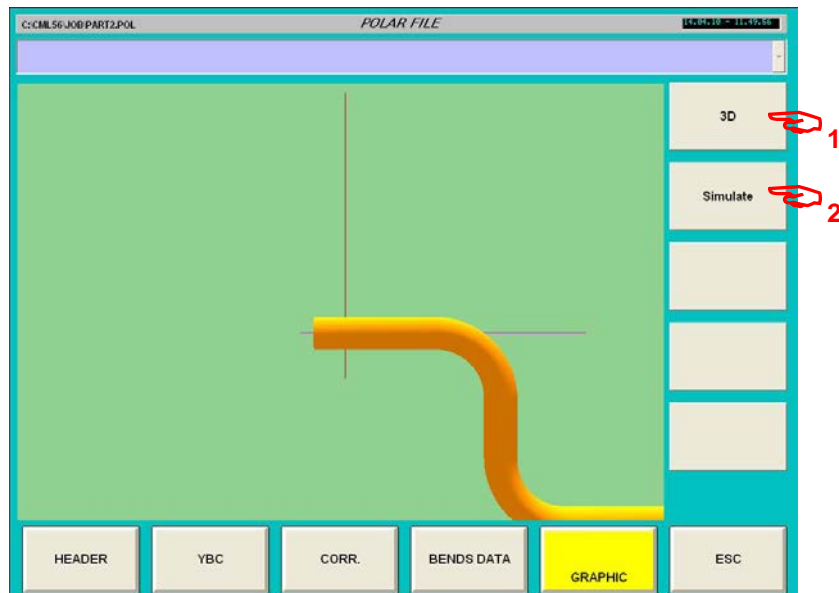
Polar files Graphic 3D.



Soft keys general polar file :

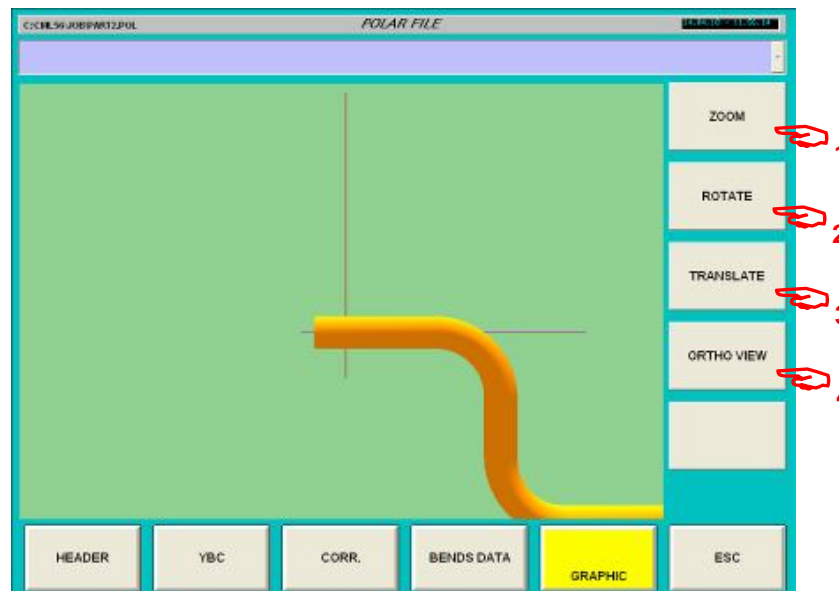
- 1 - Header : General part information.
- 2 - YBC : Geometric part definition using Length, Rotation, Angles.
- 3 - Corr. : Correction added on geometric definition to compensate tube elasticity.
- 4 - Bends data : Parameters associate to each bend, like speed, over travel, etc ... (current).
- 5 - Graphic : Graphic display, simulation and anti-collision (current).
- 6 - ESC : escape return to previous menu.

Soft keys Specific graphic :



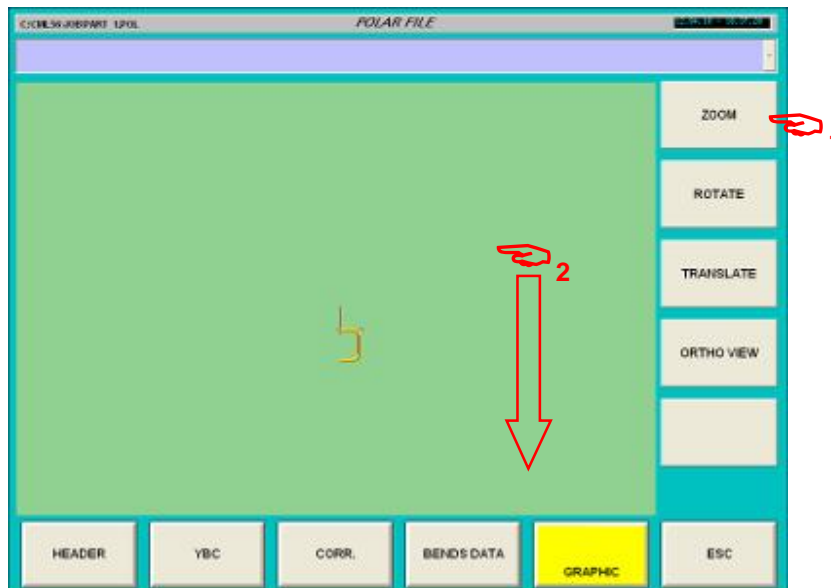
- 1 – 3D display tube in 3D.
- 2 – Simulate : simulate tube execution on machine with collision detection..

Polar files / Graphic / 3D.

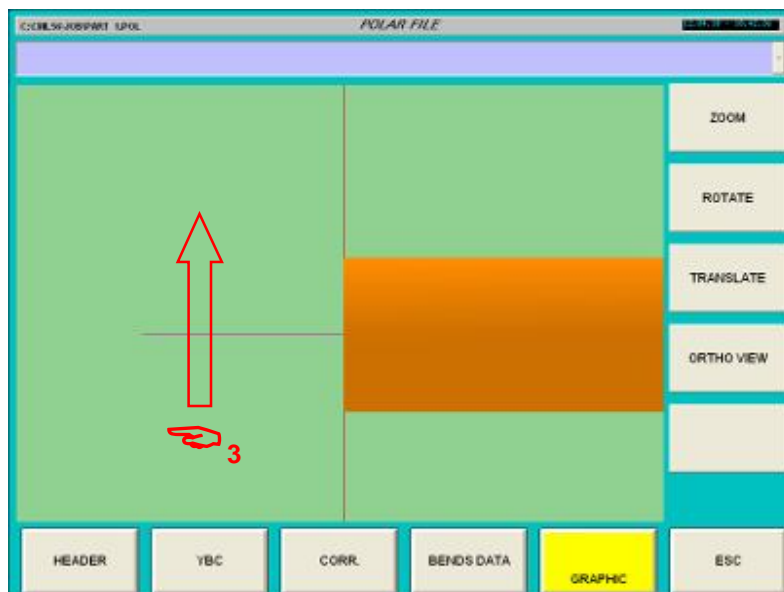


- 1 - Press Zoom to zoom in or out.
- 2 - Press Rotate to turn part in space.
- 3 - Press Translate to translate part in space.
- 4 - Press Ortho view to display part in orthogonal view

Zoom function :

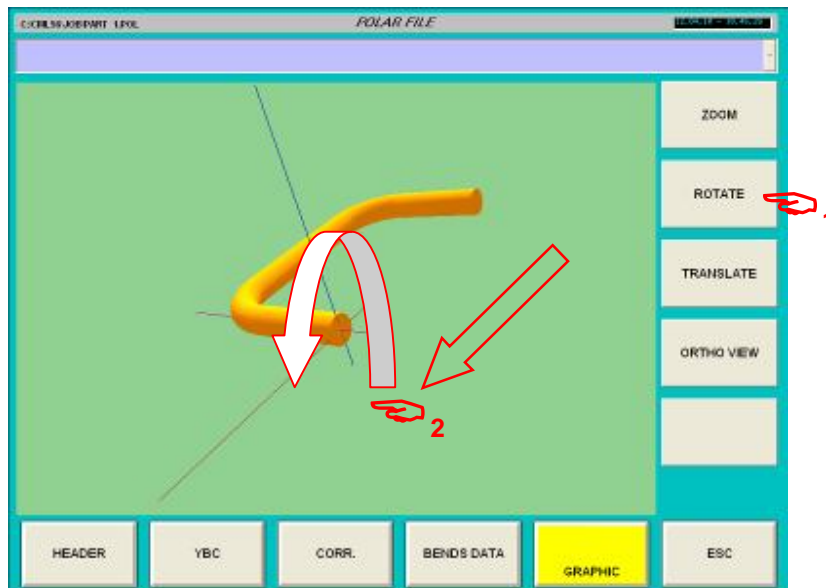


- 1 – Press Zoom
- 2 – Touch screen and move vertically from top to bottom to zoom OUT.

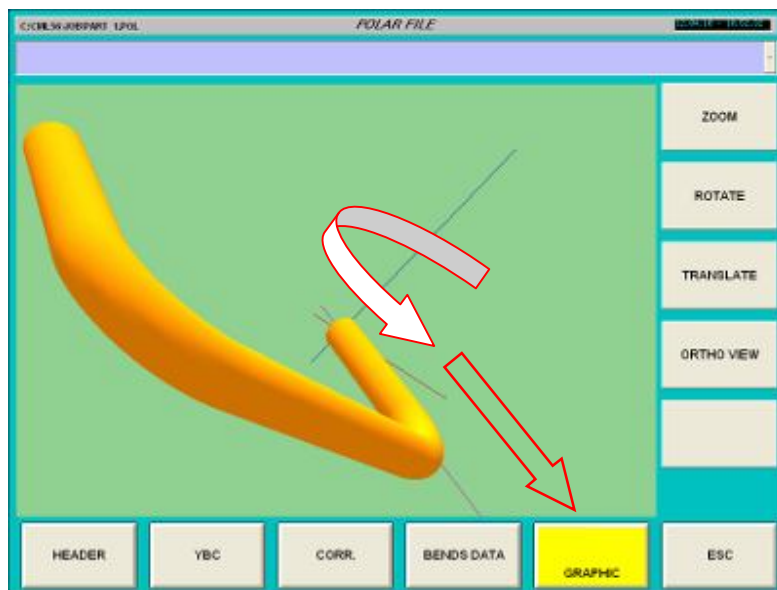


- 3 – Touch screen and move vertically from bottom to top to zoom IN.

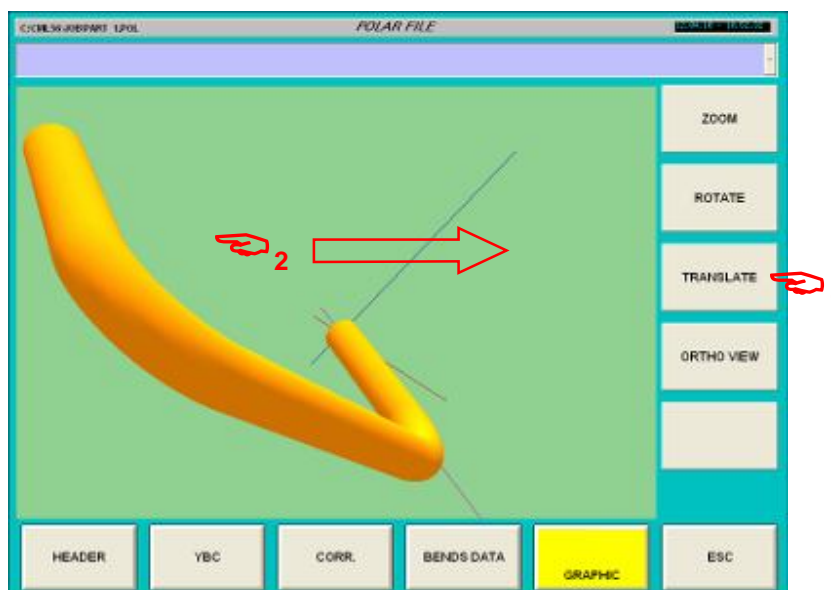
Rotate function :



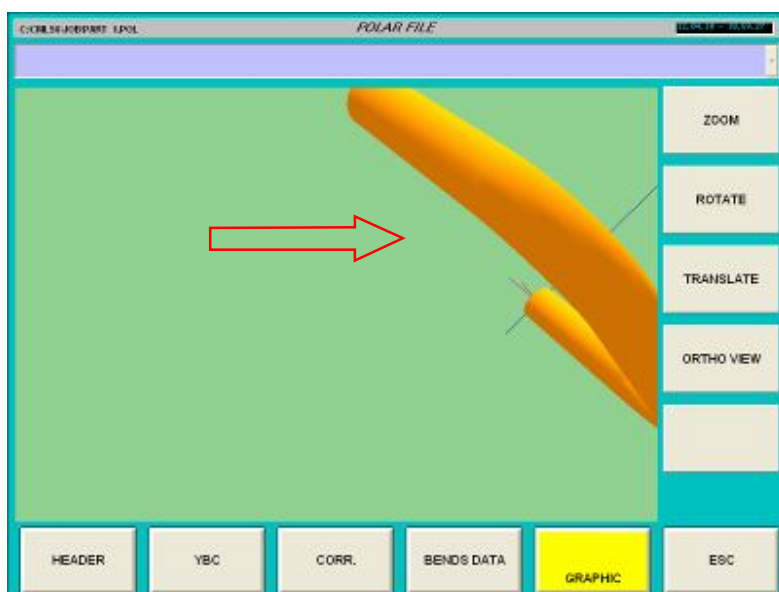
- 1 – Press Rotate
- 2 – Touch screen and move on direction of coordinate axis origin to rotate in direction linked to actual axis system display.



Translate function :



- 1 – Press translate.
- 2 – Touch screen and move on desired direction to translate part on actual position system.



Orthogonal view function :

On Each action or "Ortho View" soft key, the system display part on one origin axis system direction (X then Y then Z etc...).



Simulation function

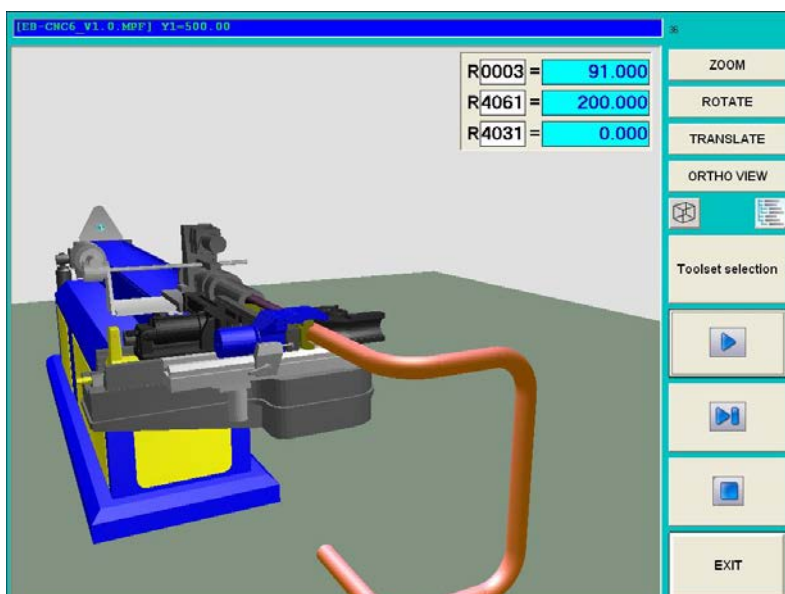
Simulation principle is to create a virtual machine, a virtual tool, a virtual tube, and assembly this 3 component on the same display to create a video of machine cycle.

The virtual tube is generate operation by operation (program line by line) as the reel machine do.

Virtual machine and reel machine use the same ISO cycle, if virtual cycle is correct, reel cycle will be correct.

Virtual machine and tooling are issue of our cad file, the volume definition is reel.

The system detect collision and, if a collision is detected stop simulation and a message is displayed.

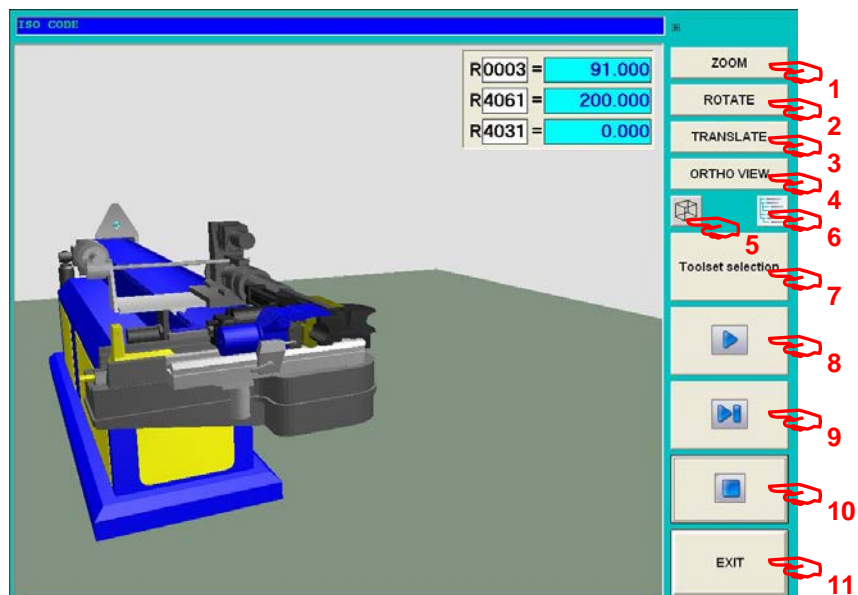


For simulate a part :

- 1 – Tool set file must correspond to simulation selected tool.
- 2 – Polar file must be complete.

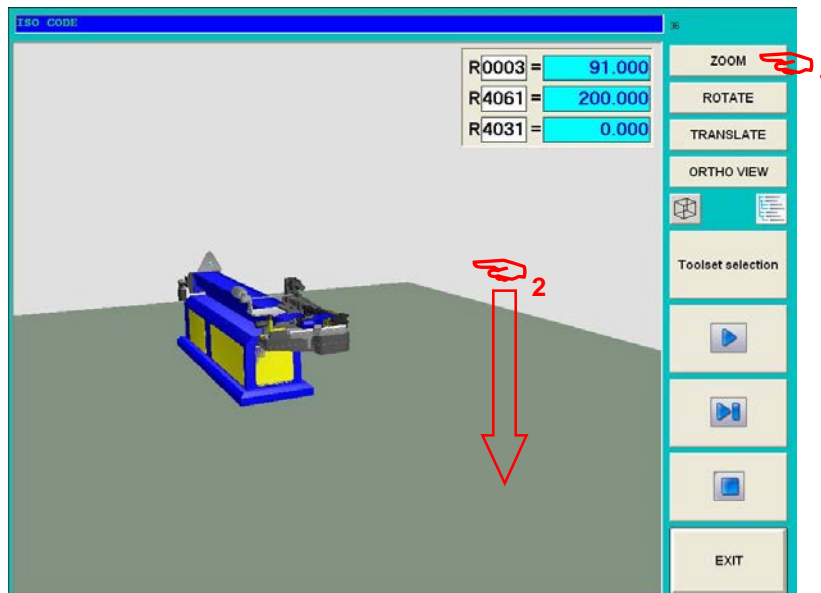
Note : on simulation spring back effect is not display, the only difference between simulation and reel bending is effect of tube elasticity.

Polar files / Graphic / Simulation.

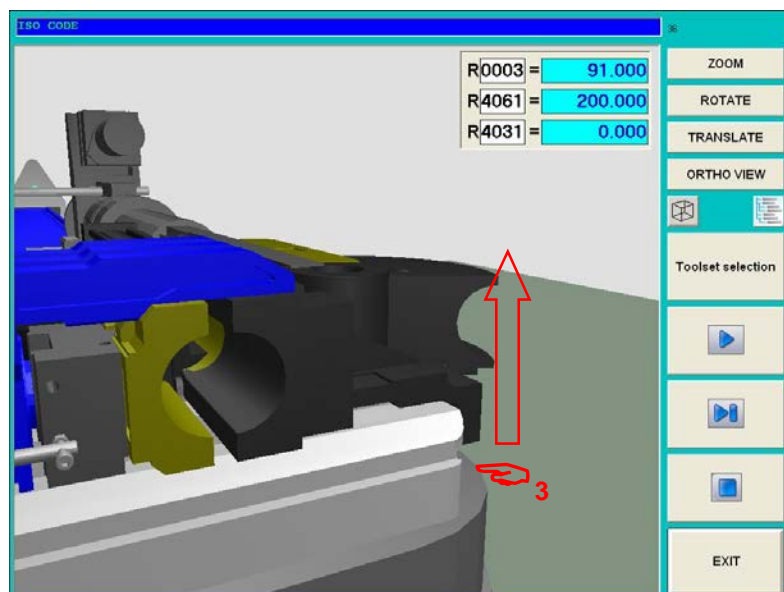


- 1 – Zoom function.
- 2 – Rotate function.
- 3 – Translate function.
- 4 – Ortho view function.
- 5 – Display mode solid or wire frame.
- 6 – Machine component display selection.
- 7 – Tool set selection.
- 8 – Auto play (start cycle).
- 9 – Step by step play (start cycle).
- 10 – Stop play (reset).
- 11 – Exit.

1 – Zoom function.

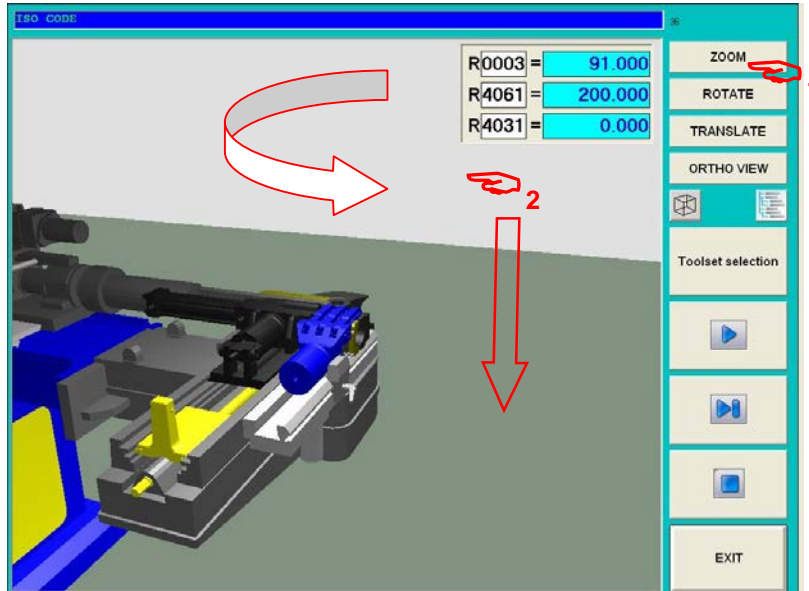


- 1 – Press Zoom
- 2 – Touch screen and move vertically from top to bottom to zoom OUT.

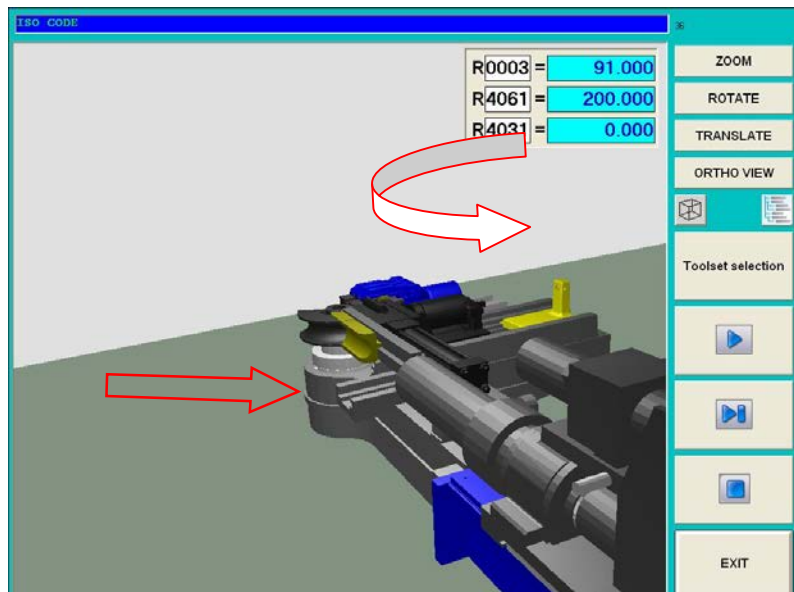


- 3 – Touch screen and move vertically from bottom to top to zoom IN.

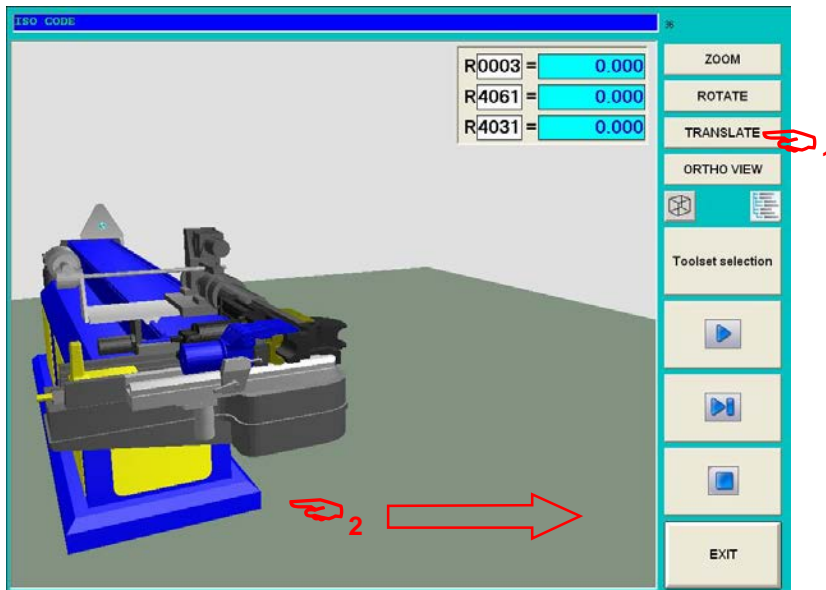
2 – Rotate function.



- 1 – Press Rotate
- 2 – Touch screen and move on direction of coordinate axis origin to rotate in direction linked to actual axis system display.

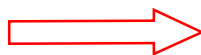
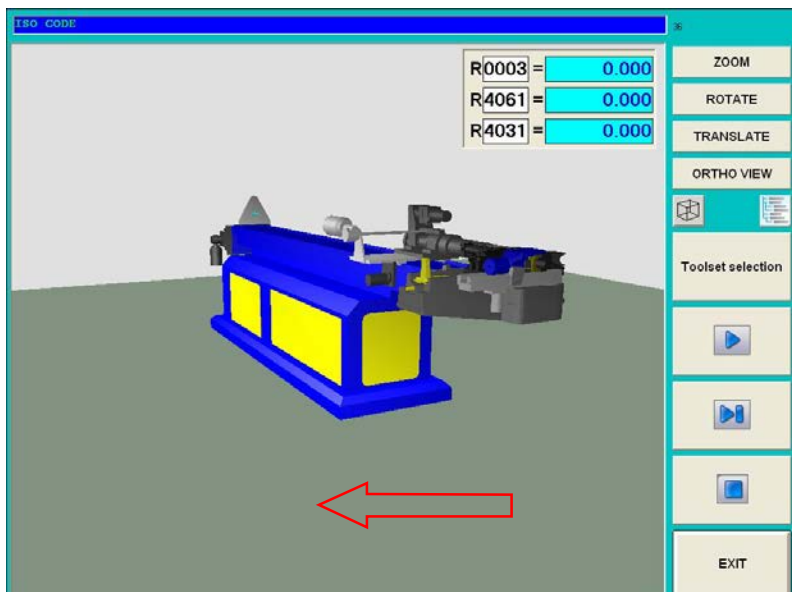


3 – Translate function.



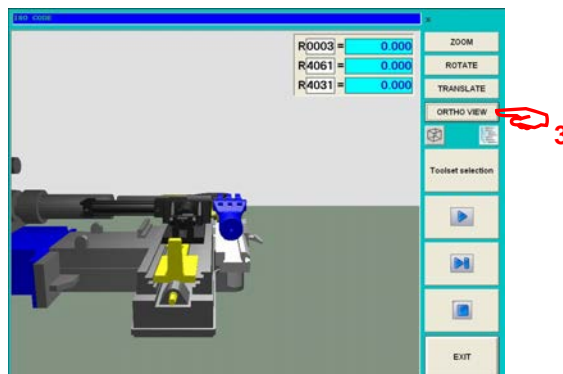
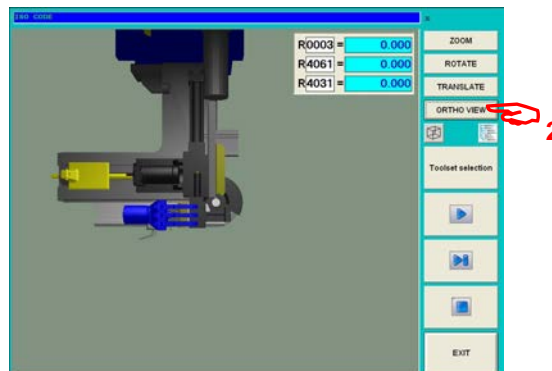
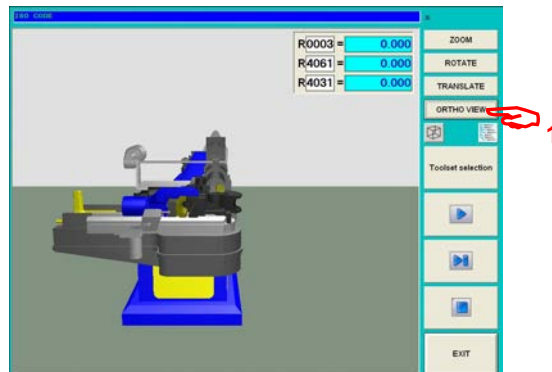
1 – Press translate.

2 – Touch screen and move on desired direction to translate part on actual position system.




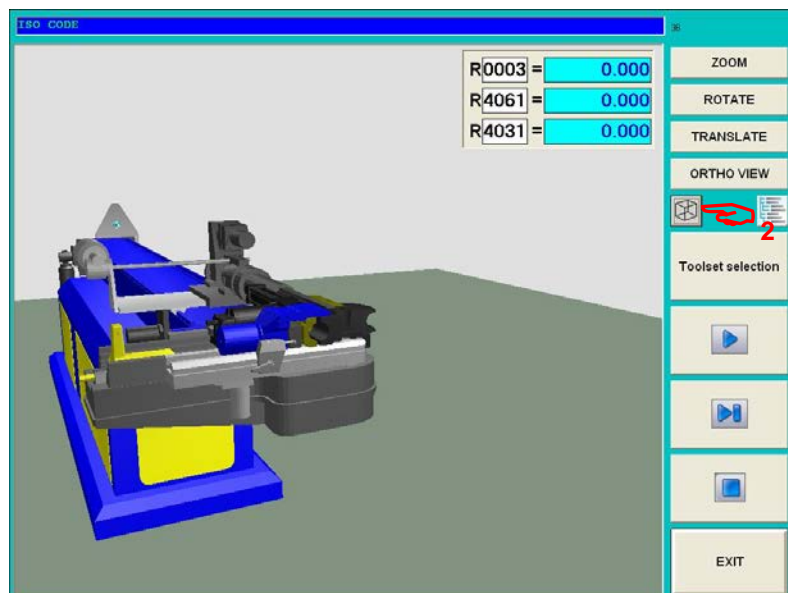
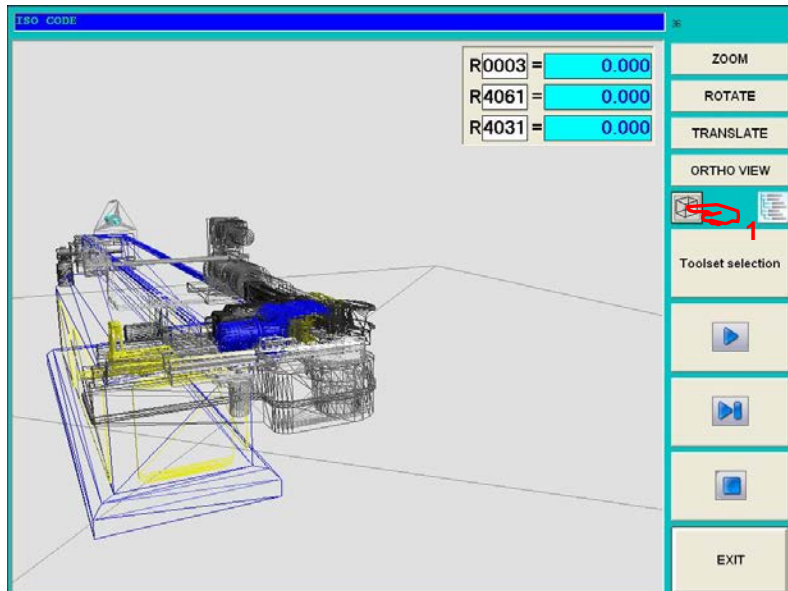
4 – Ortho view function.

On Each action or “Ortho View” soft key, the system display part on one origin axis system direction (X then Y then Z etc...).



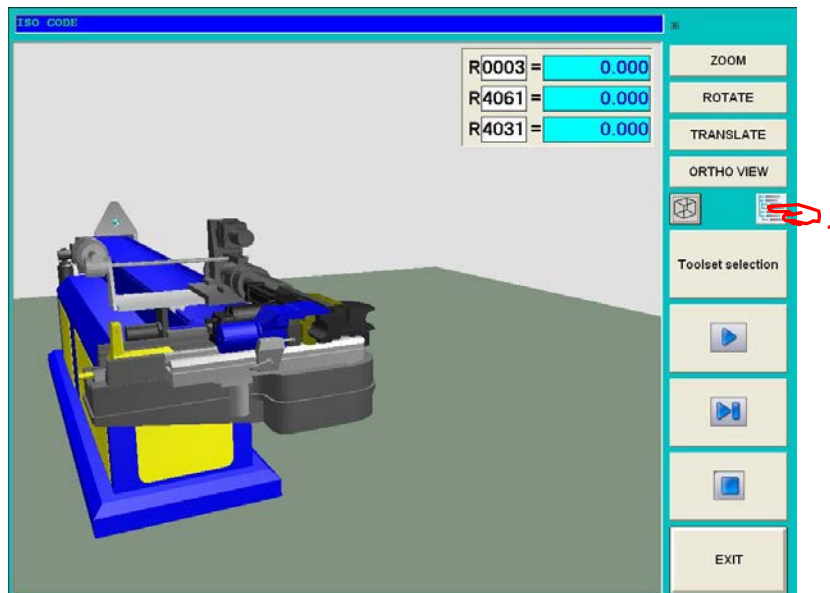
5 – Display mode solid or wire frame.

On Each action on  soft key, the system switch display in mode “solid” or “wire frame”.

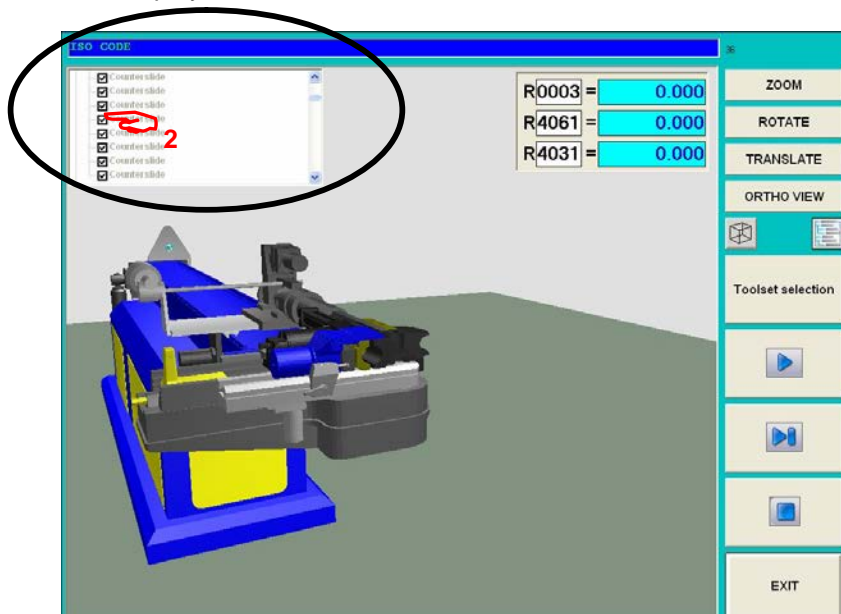


6 – Machine component display selection.

1 – Press on soft key machine structure.

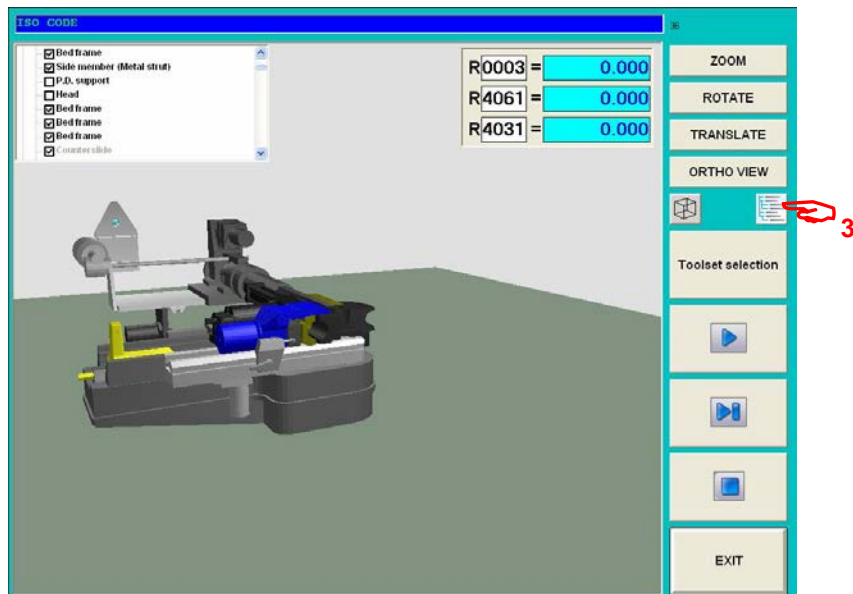


Machine architecture is display.

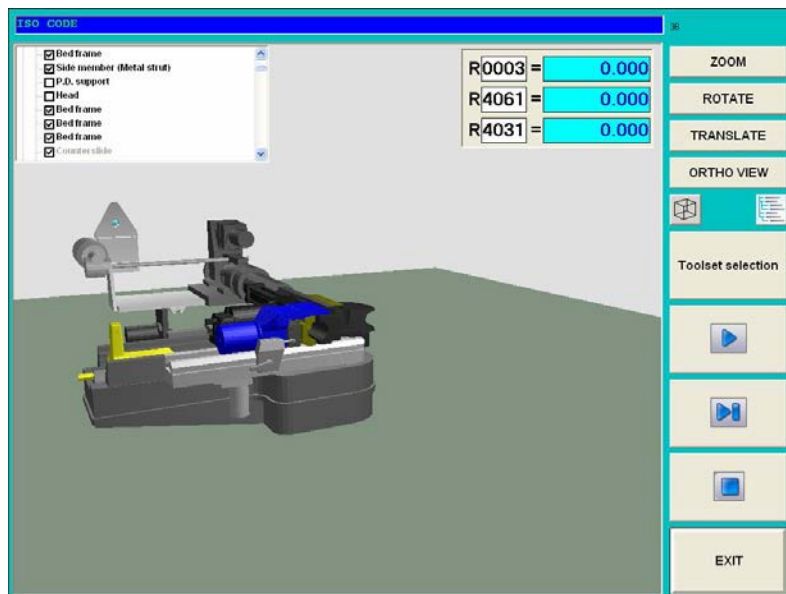


Select on list component to hide and select desired status hide or show:

- Component hided.
- Component show.

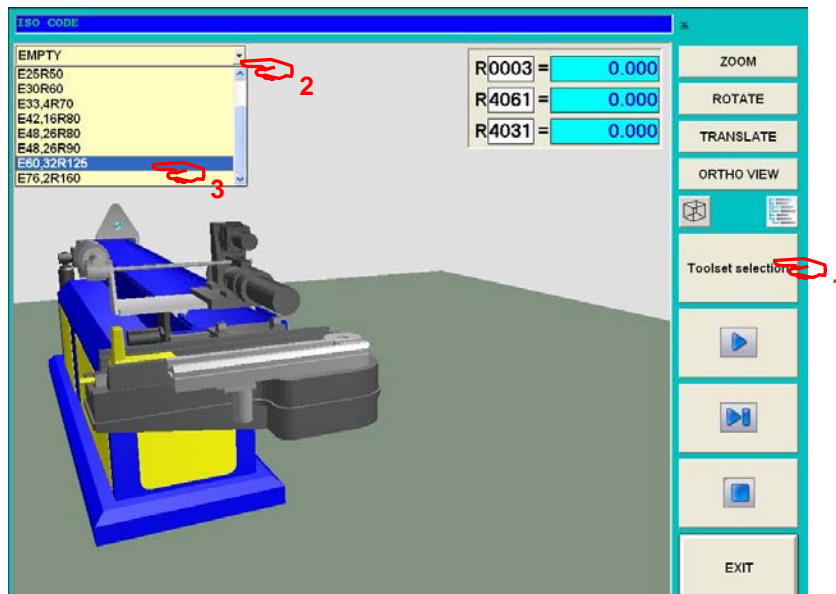


Press again soft key machine structure to exit of machine display components.

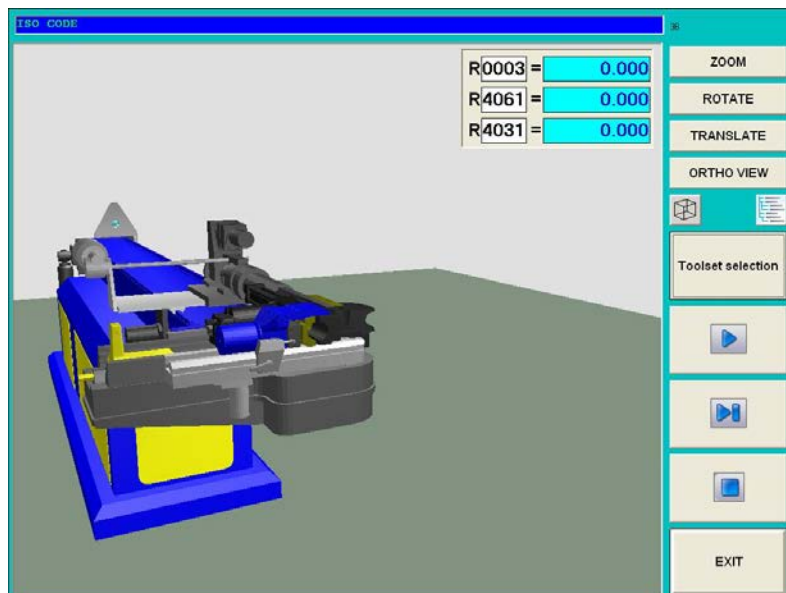


Note : Exiting of this menu all components will automatically return to status show.

7 – Tool set selection.

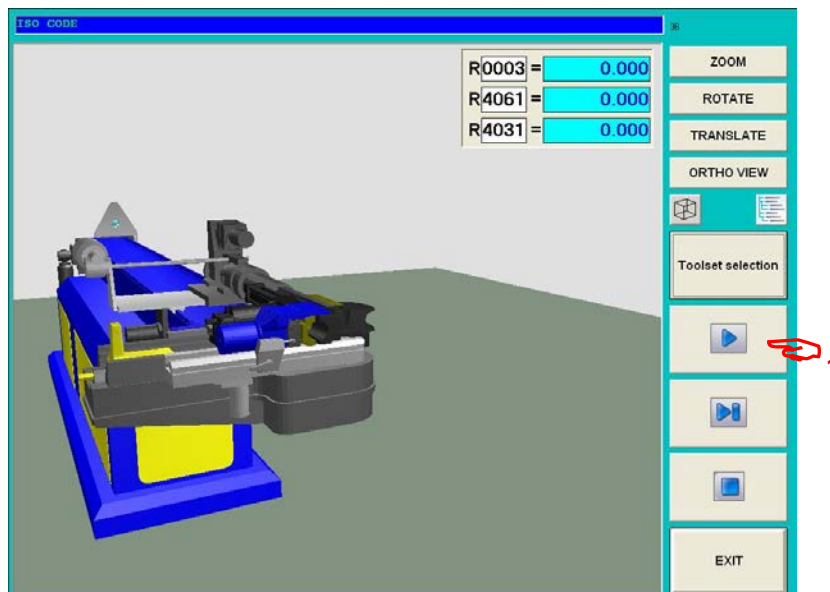


- 1 – Press “Tool set selection” soft key.
 - 2 – Open tool set list.
 - 3 – Select desired tool set.
- Note : Empty mean empty tooling.

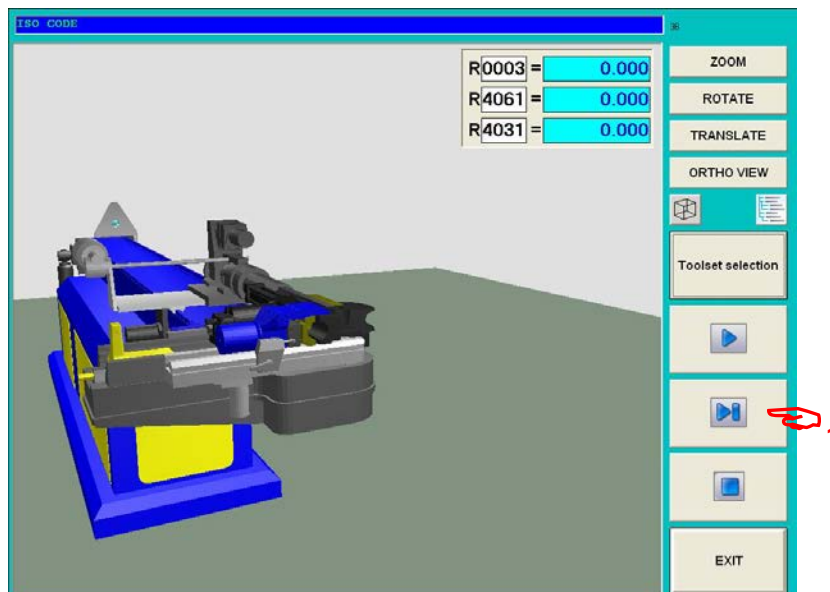


Tool selected is assembly on machine.

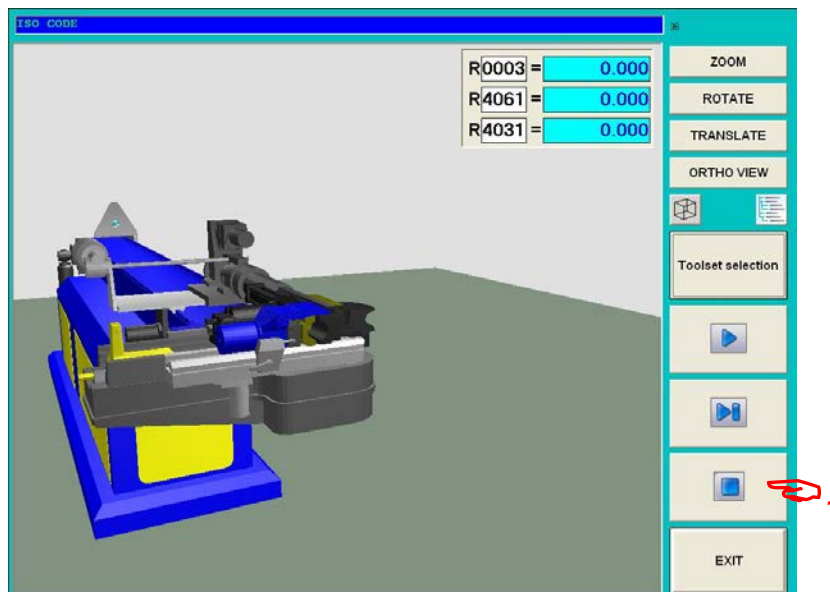
8 – Auto play (start cycle).



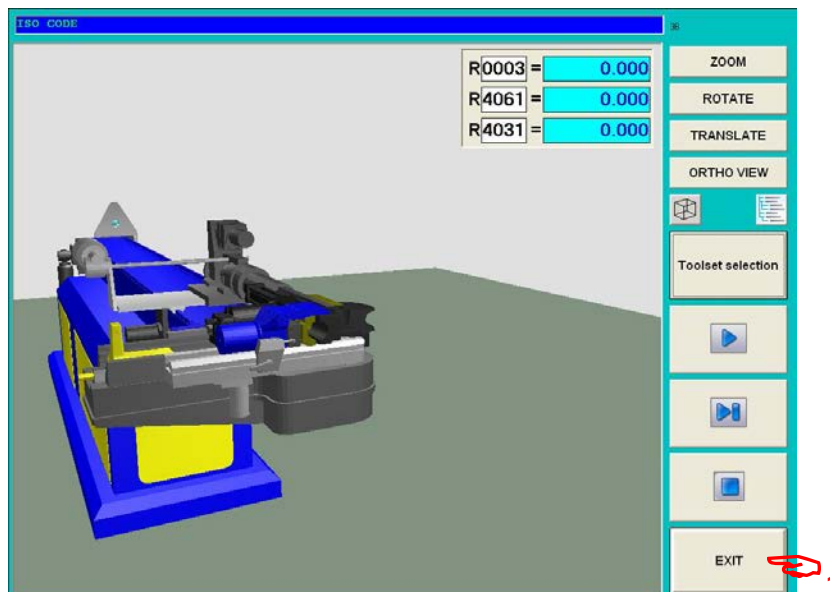
9 – Step by step play (start cycle).



10 – Stop play (reset).

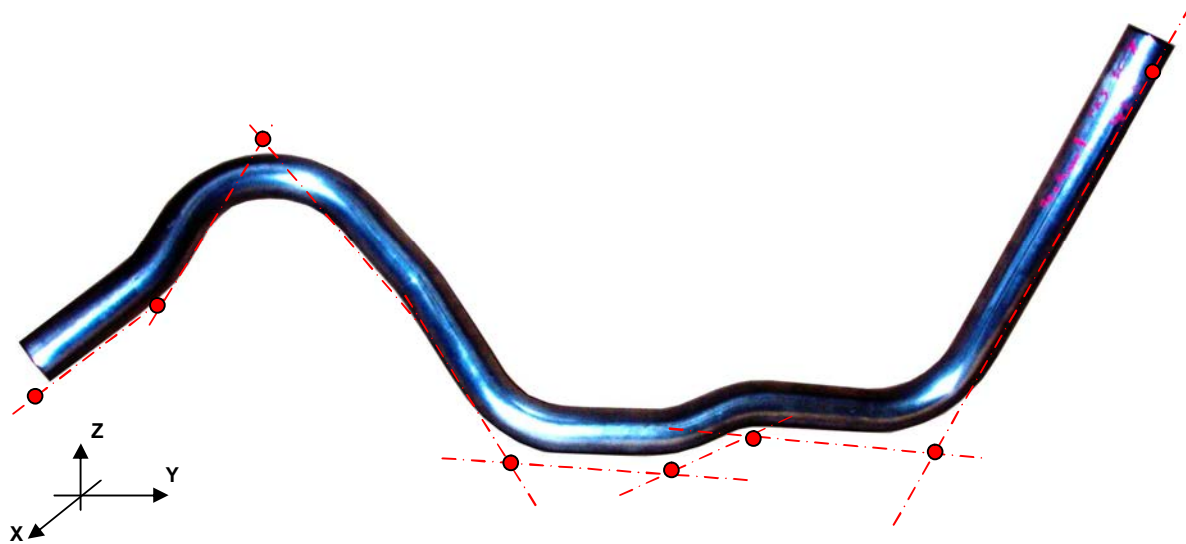


11 – Exit.



7. Programming a part using Cartesian coordinate

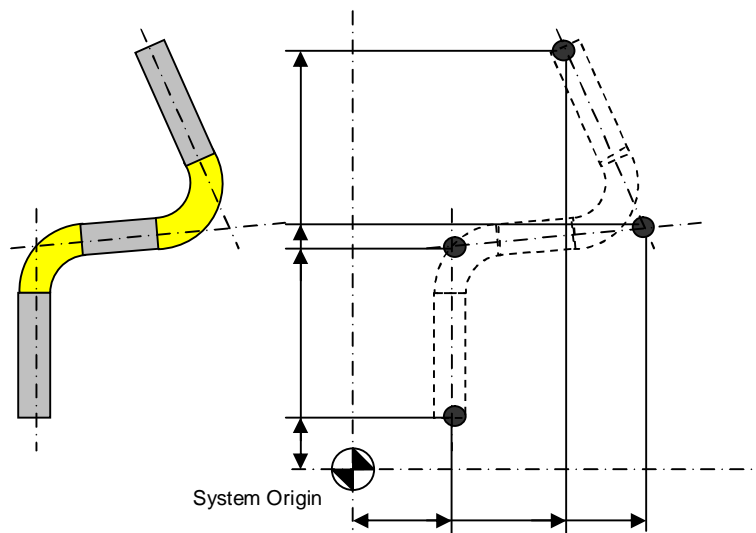
Cartesian system is a geometric definition of segments in space
 Those segment are created by intersection of strait length on a part.
 Segment intersection are points.
 Those point are define on a coordinate system XYZ.



This method of definition is correct in mechanics but it cannot be used by a machine bender.

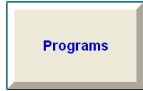
Classical machine benders create bends one after another, a positioning system (carriage) positions the tube in a polar mode length and rotation.

It is necessary to convert Cartesian definition to polar definition understandable by bending machine.

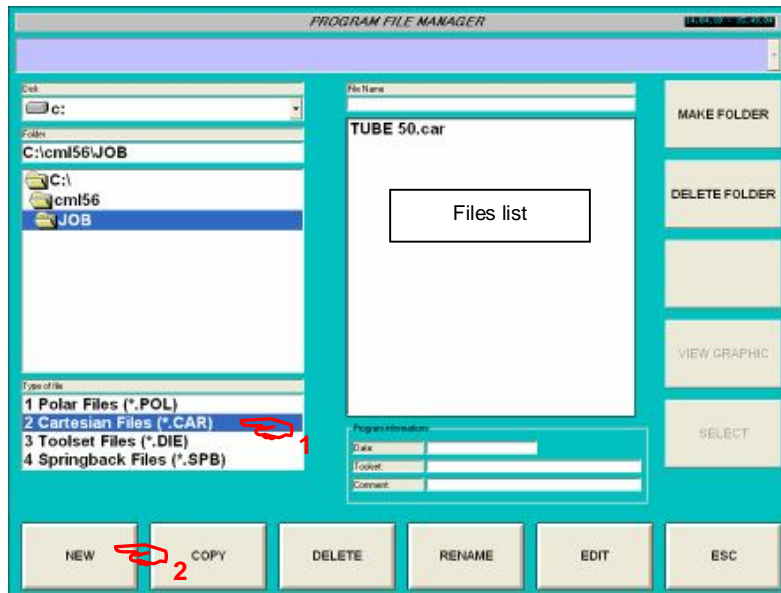


5.1 Creating a new Cartesian file.

From main menu



Program file manager menu appears :



Program file manager menu.

Operations :

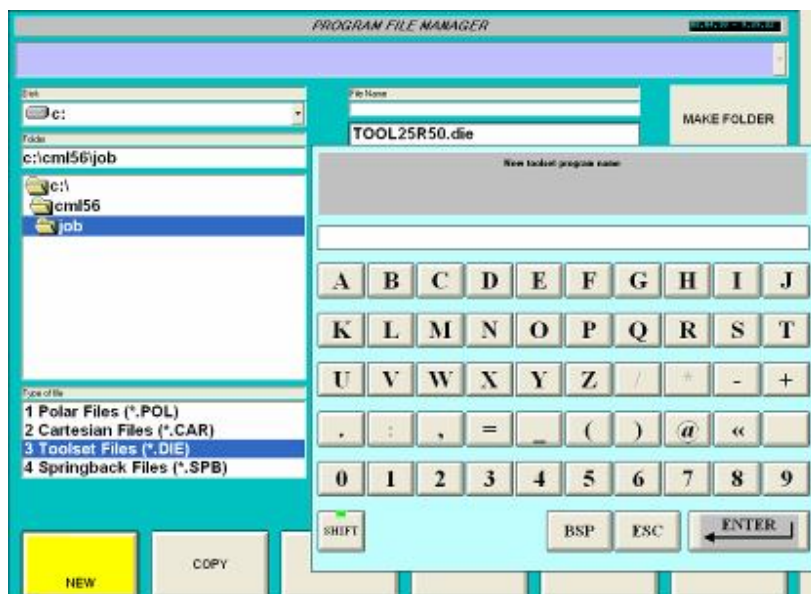
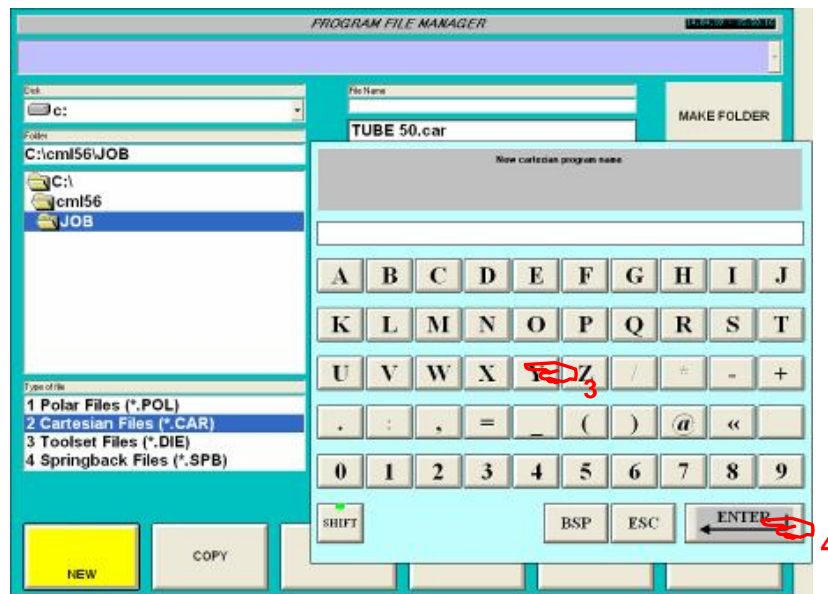
1 - Select " 2 Cartesian Files (*.CAR) on File type area.

List of present files appear on list.

2 - Press soft key "New" to create a new file



The alpha numeric keyboard appears for introduce file name.

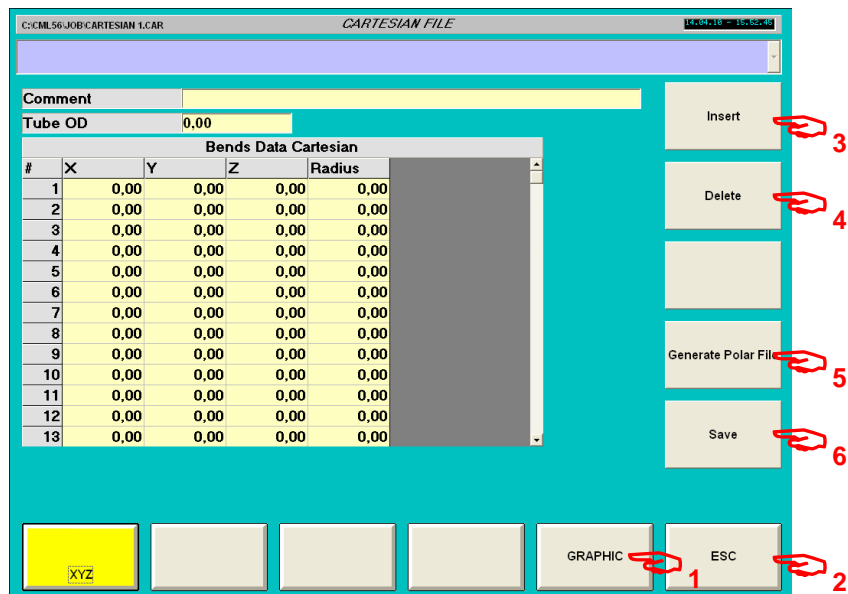


3 – Dial file name (ex : Cartesian 1)

4 – Introduce by enter.

Note : extension .CAR is automatically ad to file name.

Following page appears :



Soft keys :

- 1 – Graphic.
- 2 – ESC.
- 3 – Insert.
- 4 – Delete.
- 5 – Generate polar file.
- 6 – Save.

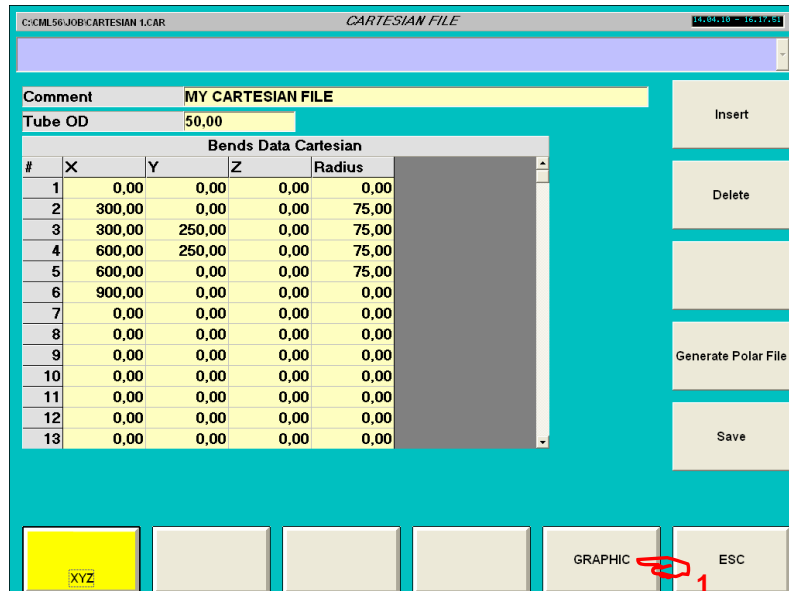
Parameters :

Comment : comment.
 Tube OD: tube outside diameter (mm or inches).

 X : Coordinate of point on X axis (mm or inches).
 Y : Coordinate of point on Y axis (mm or inches).
 Z : Coordinate of point on Z axis (mm or inches).
 Radius : Centerline bending radius (mm or inches).
 Note : at tube ends radius must be null.

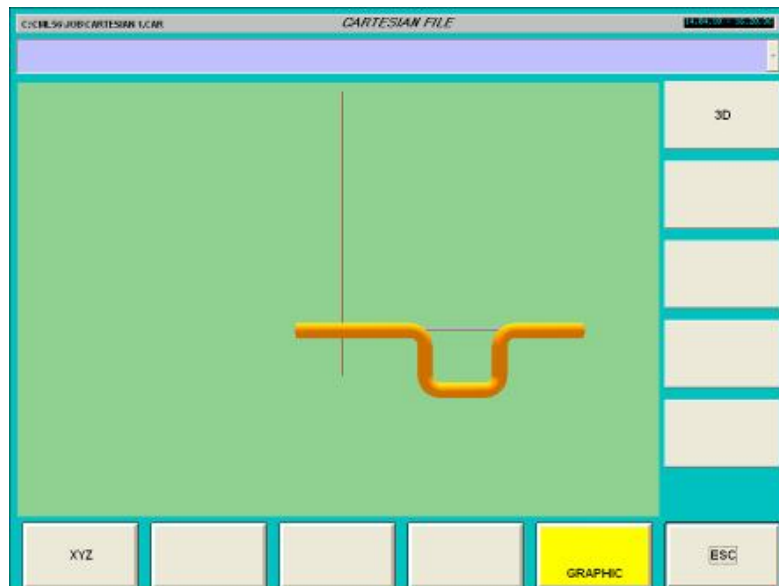
Operation sequence :

Insert Comment
 Insert tube OD value.
 Insert XYZ coordinate and centerline bending radius on appropriate points.



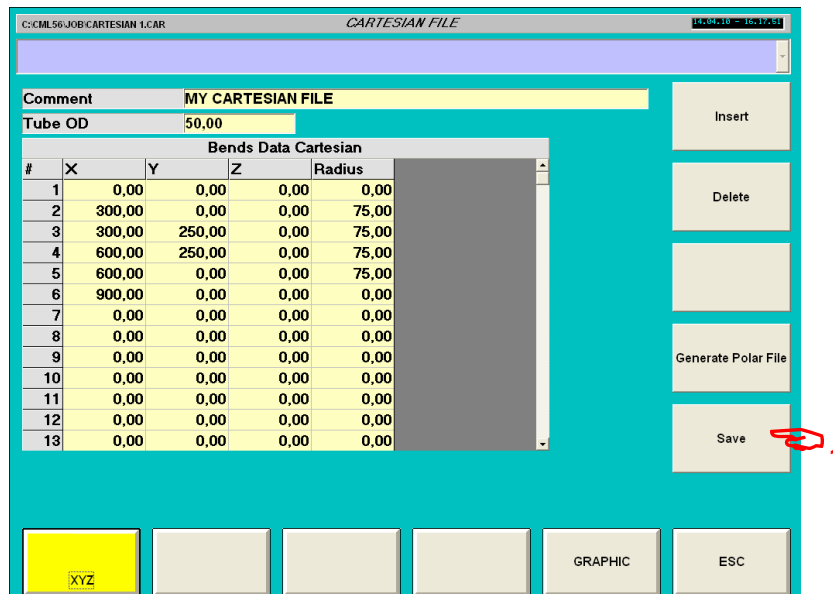
Display part in Graphic mode .

Press soft key graphic (1).



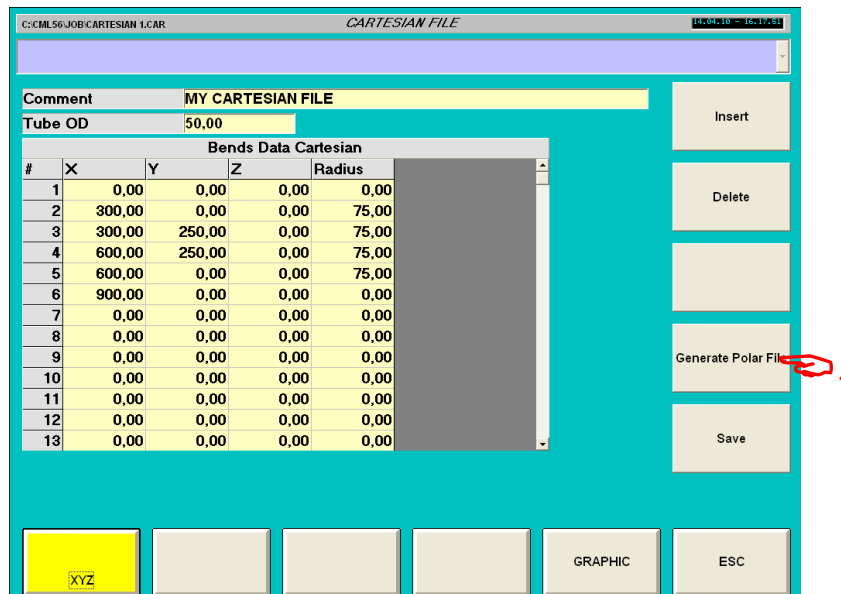
Note : Graphic display function are equal to Polar files.

Save .

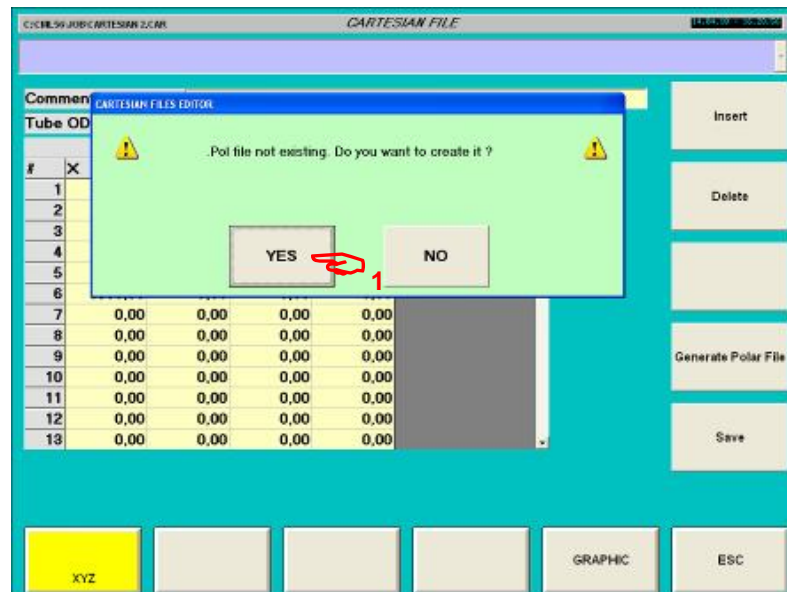


1 – Press soft key Save.

Generate polar file.

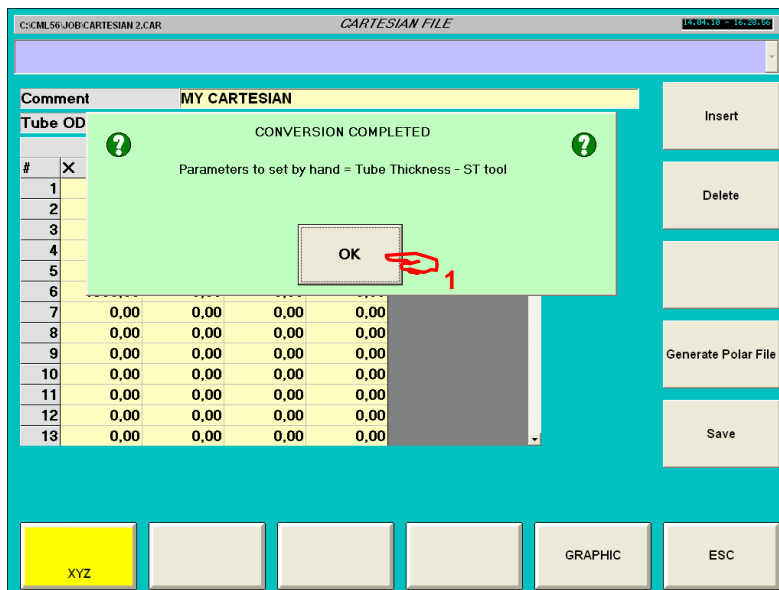


1 – Press soft key generate polar file.



Pop up widows ask you if you want to create polar file answer YES (1)

A new pop up window inform you that some parameter must be set.



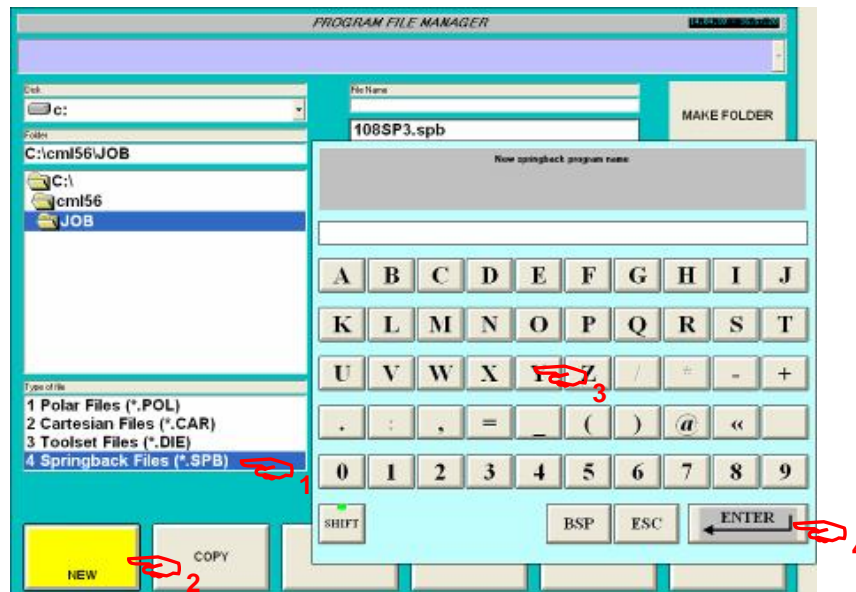
Answer OK (1)

Polar file is create with the same name but with extension .POL.

7. Programming spring back file.

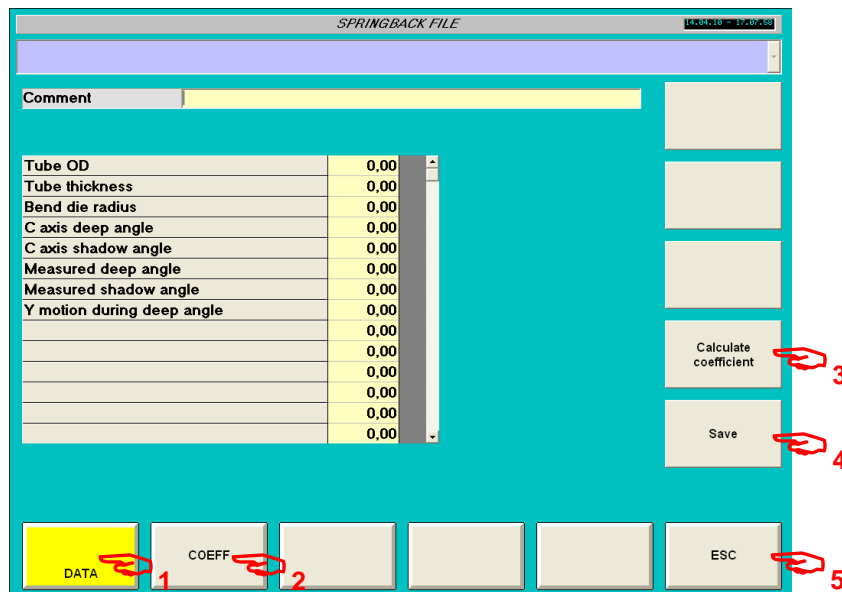
Creating a new spring back file

From file manger :



- 1 – Select spring back files (4 Spring back files (*.SPB))
- 2 – Press soft key NEW.
- 3 – Insert file name.
- 4 – Press enter.

Following page appears :



Soft keys :

- 1 – Data
- 2 – Coefficient
- 3 – Calculate coefficient
- 4 – Save
- 5 – Escape.

Parameters :

Comment :

Description : Comment.
 This field allow to introduce a comment associate to the file.
 Unit : -
 R parameter location : -
 Pop up windows : Alpha numeric keyboard

Tube OD :

Description : Tube outside diameter.

Unit : mm or inches

R parameter location : -

Pop up windows :



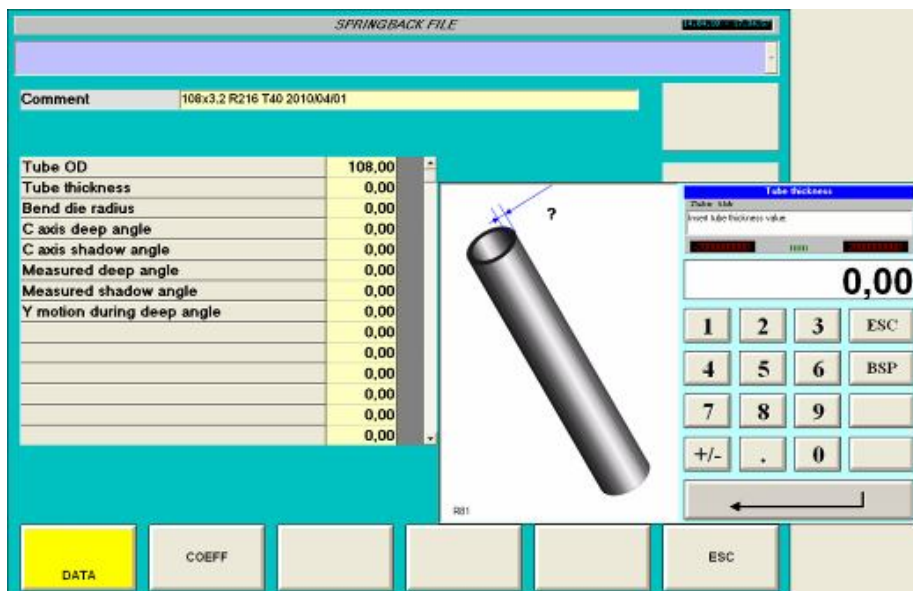
Tube Thickness :

Description : Tube thickness.

Unit : mm or inches

R parameter location : -

Pop up windows :



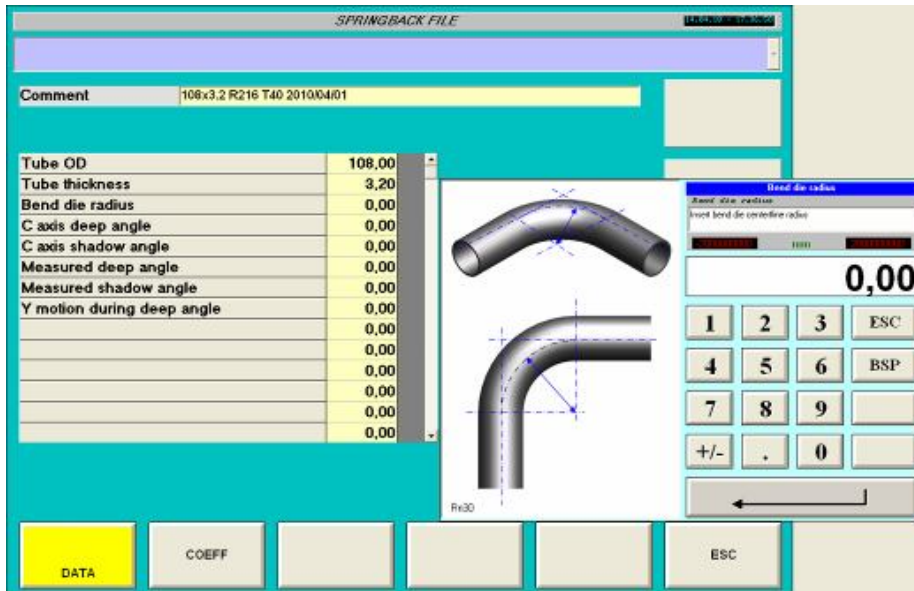
Bend die radius :

Description : Centerline bend die radius.

Unit : mm or inches

R parameter location : -

Pop up windows :



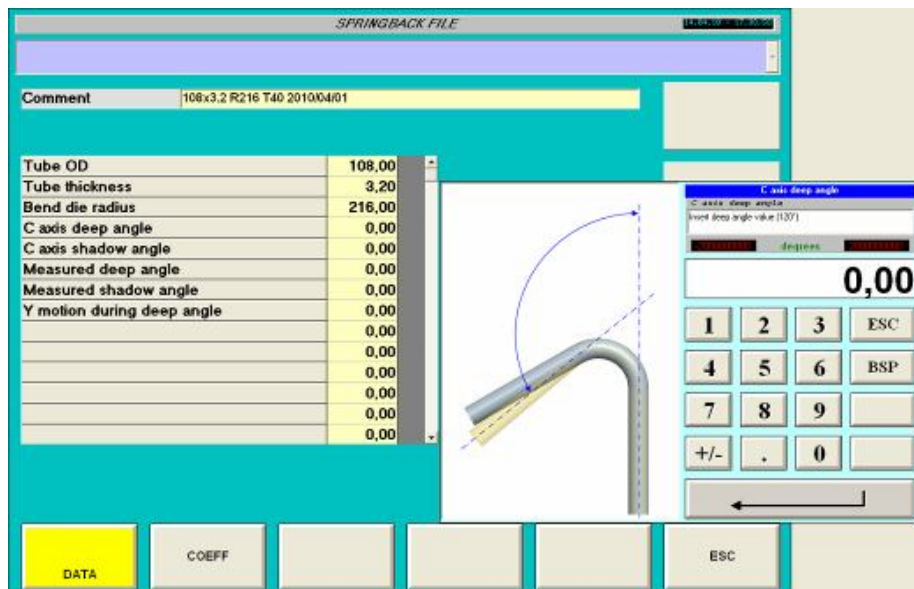
C axis deep angle :

Description : Deep angle for spring back test, C axis rotation (generally 120°).

Unit : Degrees

R parameter location : -

Pop up windows :



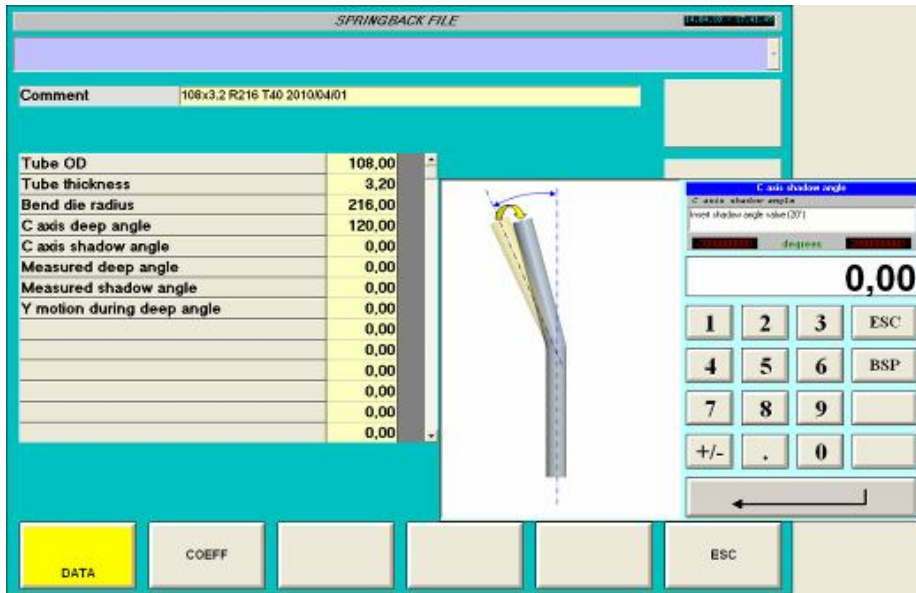
C axis shadow angle :

Description : shadow angle for spring back test, C axis rotation (generally 20°).

Unit : Degrees

R parameter location :-

Pop up windows :



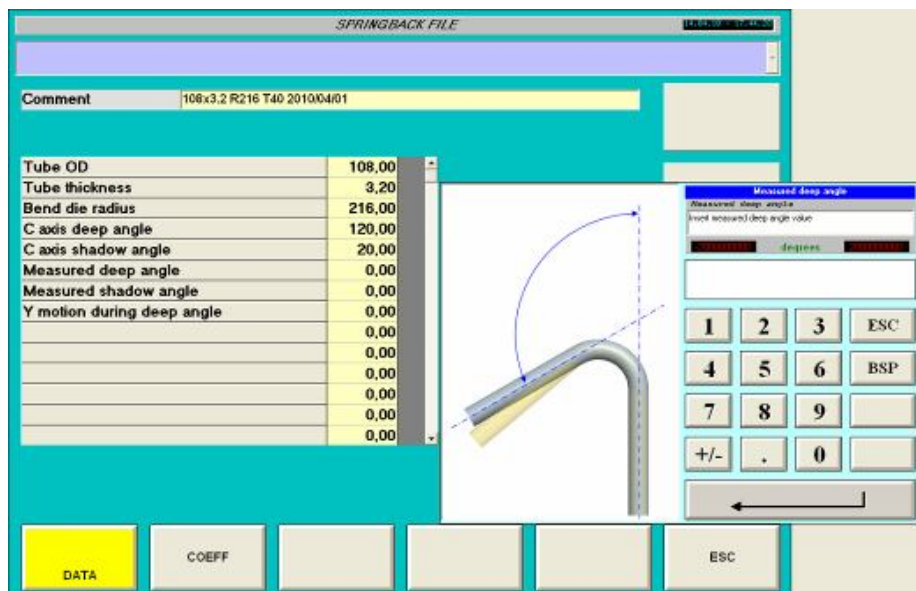
Measured deep angle :

Description : Measured deep angle for spring back test, result of a angle deformation of value programmed in C axis deep angle.

Unit : Degrees

R parameter location :-

Pop up windows :



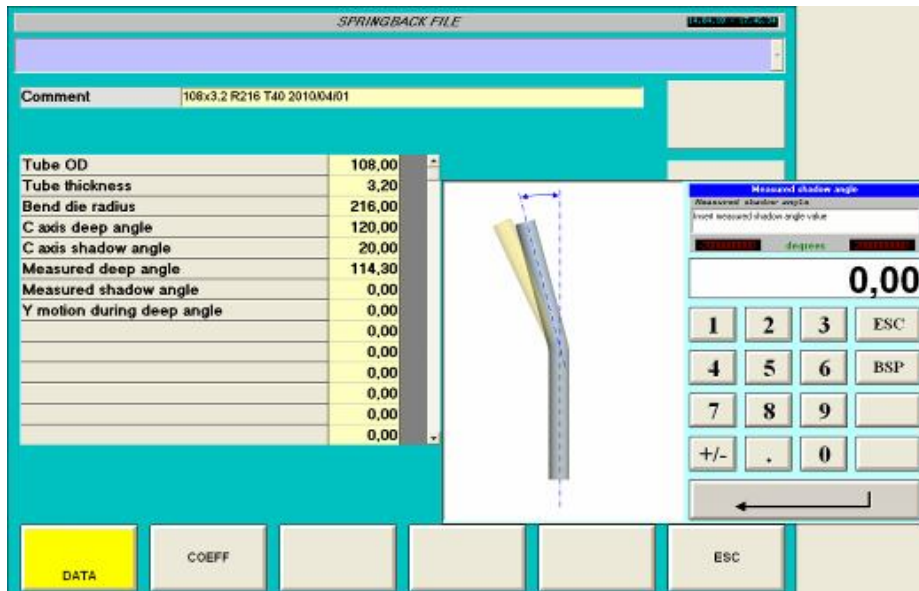
Measured shadow angle :

Description : Measured shadow angle for spring back test, result of a angle deformation of value programmed in C axis shadow angle.

Unit : Degrees

R parameter location : -

Pop up windows :



Y motion during deep angle :

Description : Tube consumption during deep angle test. Best way is to measure length carriage motion during bending deep angle.

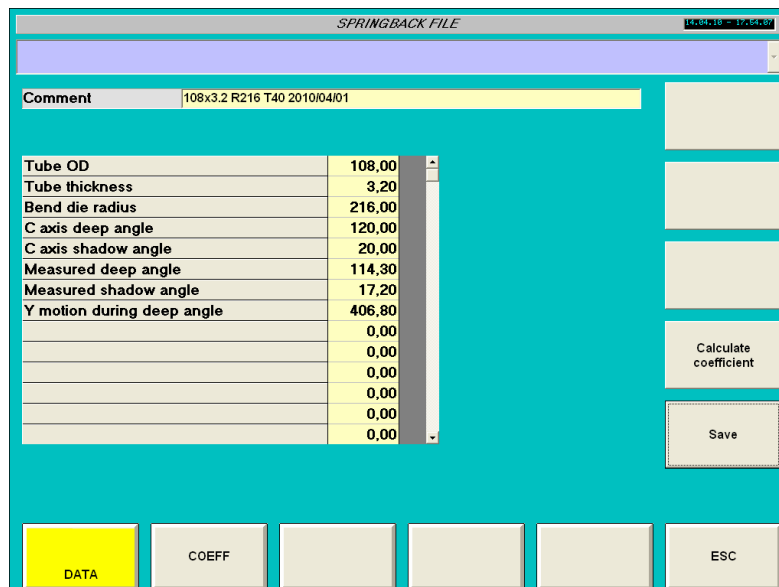
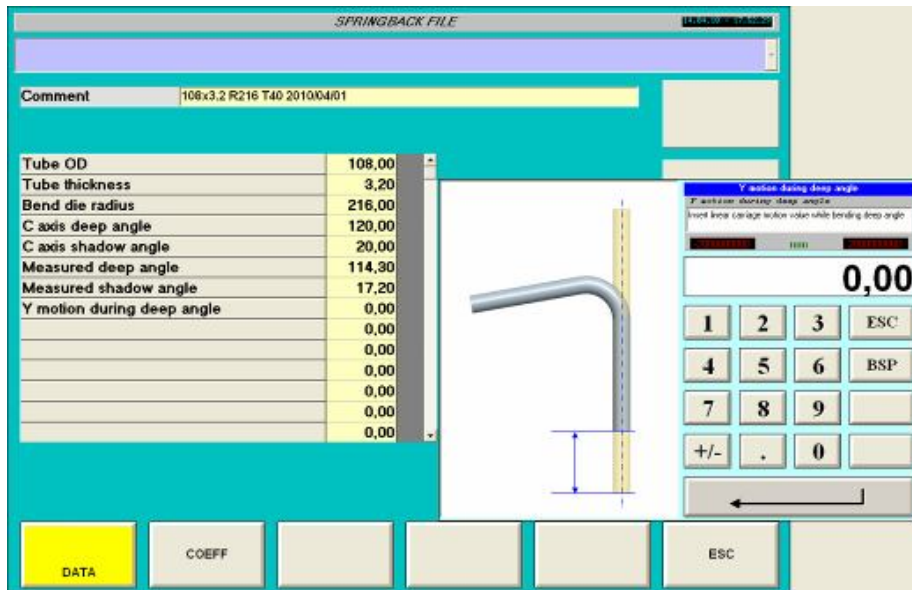
How to measure :

- Note carriage absolute position on display before deep angle (bend start).
- Note carriage absolute position on display after deep angle (bend end).
- Calculate difference between two values insert this value on parameter.

Unit : mm or inches

R parameter location : -

Pop up windows :

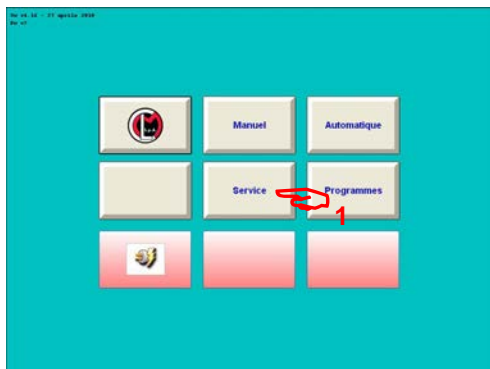


3 – Calculate coefficient.

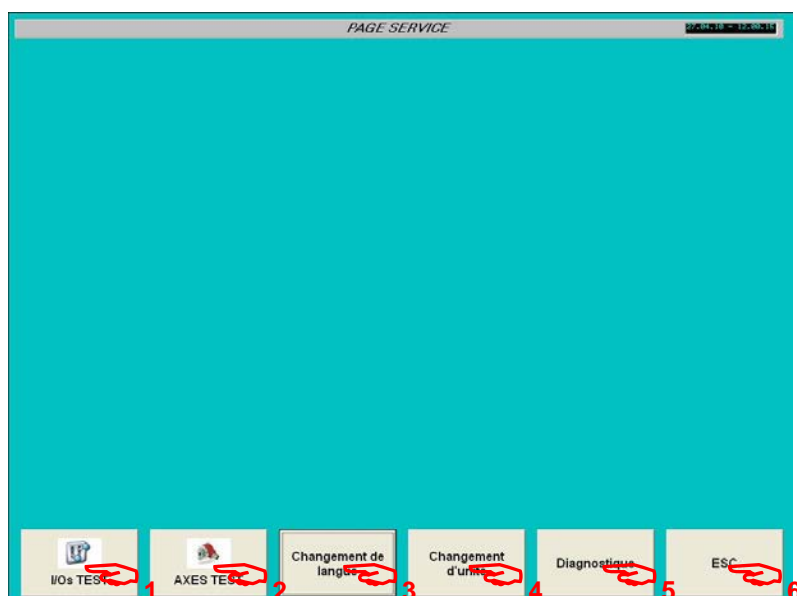
4 – Save.

13. Diagnostics.

Acces to diagnostics area :



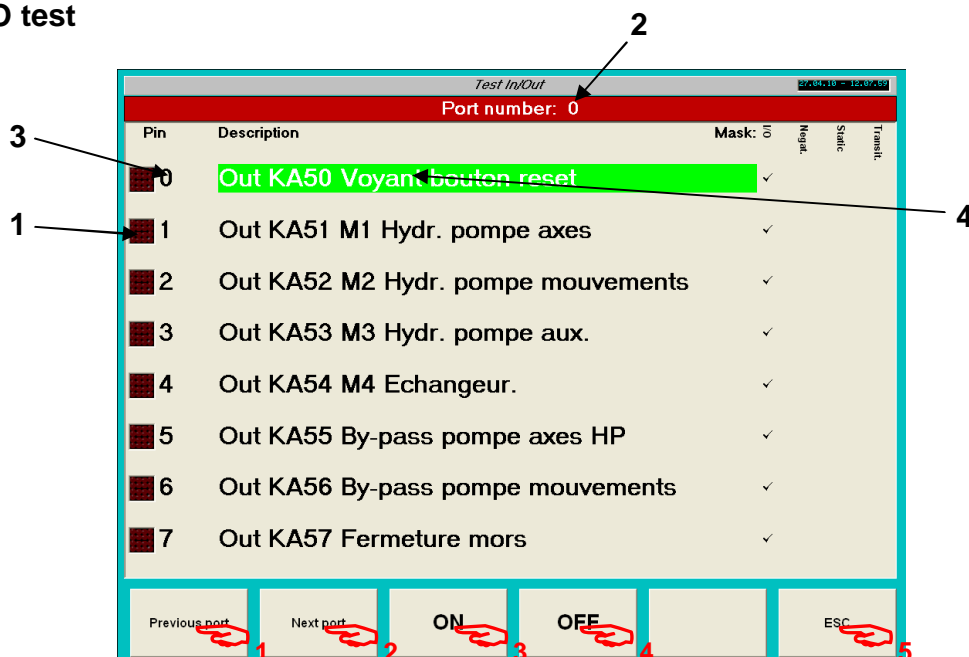
1 – Press on « SERVICE »



Soft keys :

- 1 – Input / Output test
- 2 – Axis test
- 3 – Change language
- 4 – Change unit
- 5 – Diagnostics
- 6 – Back to main menu

13.1 I/O test



- 1 – Led (green = 1, red = 0)
- 2 – Port number.
- 3 – Pin in port number (0 to 7).
- 4 – Signal description.

Note : Output use prefix OUT (output).
Inputs use prefix Inp (Input).

Touches logicielles :

- 1 – « Previous port ».
- 2 – « Next port » .
- 3 – « ON » Fix output a 1.
- 4 – « OFF » Fix output at 0.
- 5 – « ESC » Bck to previous screen.

Signal state 0 :



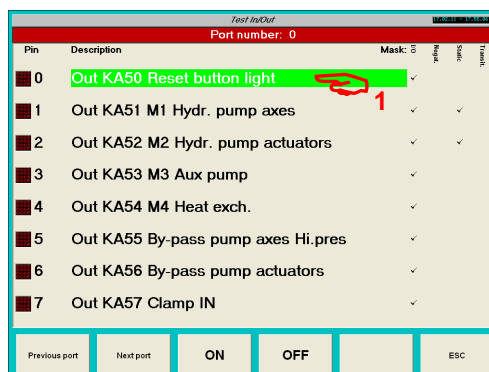
Signal state 1 :



Forçage d'une sortie :



Warning.
 Fix one output at 1 can occur machine damage. The operator must know actions occurred by fixing an output at 1 .



1 – Select signal.

Fix at 1 : Press on key 3 « ON ».

Fix at 0 : Press on key 4 « OFF ».

Note : The corresponding output is fixed a 1, but safety circuit are still active.

Port 0 Outputs :

Test In/Out					
Port number: 0					
Pin	Description	Mask:	0	1	2
0	Out KA50 Reset button light		✓		
1	Out KA51 M1 Hydr. pump axes		✓	✓	
2	Out KA52 M2 Hydr. pump actuators		✓	✓	
3	Out KA53 M3 Aux pump		✓		
4	Out KA54 M4 Heat exch.		✓		
5	Out KA55 By-pass pump axes Hi.pres		✓		
6	Out KA56 By-pass pump actuators		✓		
7	Out KA57 Clamp IN		✓		

Previous port Next port ON OFF ESC

Port 1 Outputs :

Test In/Out					
Port number: 1					
Pin	Description	Mask:	0	1	2
0	Out KA58 Clamp OUT		✓		
1	Out KA59 Pressure die IN		✓		
2	Out KA5A Pressure die OUT		✓		
3	Out KA5B Booster IN		✓		
4	Out KA5C Booster OUT		✓		
5	Out KA5D Tube support UP		✓		
6	Out KA5E Tube support DOWN		✓		
7	Out KA5F Collet IN		✓		

Previous port Next port ON OFF ESC

Port 2 Outputs :

Test In/Out					
Port number: 2					
Pin	Description	Mask:	0	1	2
0	Out KA60 Collet OUT		✓		
1	Out KA61 Mandrel IN		✓		
2	Out KA62 Mandrel OUT		✓		
3	Out KA63 Following mode		✓		
4	Out KA64 Lubrification		✓		
5	Out KA65 By-pass pump axis Lo.pres		✓		
6	Out KA66 Clamp DOWN		✓		
7	Out KA67 Clamp UP		✓		

Previous port Next port ON OFF ESC

Port 3 Outputs :

Test In/Out					
Port number: 3					
Pin	Description	Mask:	0	1	2
0	Out spare		✓		
1	Out spare		✓		
2	Out spare		✓		
3	Out spare		✓		
4	Out spare		✓		
5	Out spare		✓		
6	Out spare		✓		
7	Out spare		✓		

Previous port Next port ON OFF ESC

Port 4 Inputs :

Test In/Out		
Port number: 4		
Pin	Description	Mask:
0	Inp FS1 24Vdc OK	✓ ✓
1	Inp E1 3-phases sequence controller	✓ ✓
2	Inp M1 Motor protection (Axes group)	
3	Inp M2 Motor protection (Actuators group)	
4	Inp M3 Motor protection (Aux pump)	
5	Inp M4 Motor (Heat exchange)	
6	Inp SL1 Oil level	
7	Inp ST1 Oil temperature	

Previous port Next port ON OFF ESC

Port 5 Inputs :

Test In/Out		
Port number: 5		
Pin	Description	Mask:
0	Inp spare	
1	Inp E-STOP	
2	Inp 2-Hands Control	
3	Inp T2+	
4	Inp T1-	
5	Inp SQ31 Clamp UP	
6	Inp SQ32 Clamp DOWN	
7	Inp SQ33 Clamp IN	

Previous port Next port ON OFF ESC

Port 6 Inputs :

Test In/Out		
Port number: 6		
Pin	Description	Mask:
0	Inp spare	
1	Inp SQ200 Y1 Axis LS+	✓
2	Inp SQ201 Y1 Axis LS-	✓
3	Inp spare	
4	Inp spare	
5	Inp spare	
6	Inp Tube Support UP	
7	Inp spare	

Previous port Next port ON OFF ESC

Port 7 Inputs :

Test In/Out		
Port number: 7		
Pin	Description	Mask:
0	Inp spare	
1	Inp spare	
2	Inp SQ209 X2 Axis PD interference	
3	Inp spare	
4	Inp spare	
5	Inp spare	
6	Inp FR5 Aux line 24Vdc protection	✓ ✓
7	Inp spare	

Previous port Next port ON OFF ESC

Port 8 virtual Inputs:

Test In/Out		
Port number: 8 [Virtual]		
Pin	Description	Mask:
0	In Error counter axis Y1	✓
1	In Error counter axis B	✓
2	In Error counter axis C	✓
3	In Error counter axis X1	✓
4	In -	✓
5	In -	✓
6	In -	✓
7	In -	✓

Previous port Next port ON OFF ESC

Port 9 virtual Inputs:

Test In/Out		
Port number: 9 [Virtual]		
Pin	Description	Mask:
0	In Encoder fail axis Y1	✓
1	In Encoder fail axis B	✓
2	In Encoder fail axis C	✓
3	In Encoder fail axis X1	✓
4	In Encoder fail axis X2	✓
5	In Encoder fail axis Y2	✓
6	In Encoder fail axis Y3	✓
7	In -	✓

Previous port Next port ON OFF ESC

Port 10 virtual Inputs:

Test In/Out		
Port number: 10 [Virtual]		
Pin	Description	Mask:
0	In Division by zero	✓
1	In Operation code not existing	✓
2	In Variable not existing	✓
3	In G function not existing	✓
4	In M function not existing	✓
5	In Stack overrun	✓
6	In Vector overrun	✓
7	In Axis overrun	✓

Previous port Next port ON OFF ESC

Notes :

TERMS AND CONDITIONS OF WARRANTY

1. Definitions. CML USA, Inc. ("CML") hereunder; the term "End-User" means the ultimate user of the Goods; the term "Dealer" means an independent contractor of CML whom purchased the Goods from CML to sell to the End-User; and the term "Goods" means the goods, equipment, products, parts, services, labor, or other items or work provided.

2. Warranty. CML hereby disclaims any warranty regarding speed of production or output or economics of operation with respect to the Goods. If such matters are set forth or described in the specifications applicable to the Goods such statement or description shall be deemed to be an estimate only. Any warranties of CML with respect to the Goods shall be null, void and without effect if such Goods have been altered or repaired by persons or entities other than CML, unless otherwise agreed to (in writing) by CML. Notwithstanding any contrary provision contained herein, the warranties of CML hereunder shall become effective and valid only for one year from the date of the bill of lading issued by the carrier at the designated FOB point. **THE WARRANTIES ATTACHED TO THIS ARE CML'S CURRENT EXCLUSIVE WARRANTIES AND CML EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES (WHETHER WRITTEN, ORAL, IMPLIED OR STATUTORY), INCLUDING (BUT NOT LIMITED TO) ANY WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** Any claim for breach of CML's warranties must be demonstrated to CML's satisfaction to have existed at the time of delivery of the Goods and shall be deemed waived by the End-User unless written notice of such claim is actually received by CML within twelve (12) months after CML has shipped the Goods (FOB, CML's Factory) to which such claim relates. CML's liability shall be expressly limited (at CML's option) to the replacement or repair of non-conforming or defective Goods or to the credit for the purchase price of non-conforming Goods. Prior to said repair, replacement, or credit, CML has the right to inspect the Goods claimed to be defective or non-conforming, and, if requested by CML, End-User shall return such Goods to CML at CML's direction and expense. No Goods are to be returned to CML without CML's prior written authorization. THE REMEDIES SET FORTH HEREUNDER SHALL CONSTITUTE THE EXCLUSIVE REMEDIES AVAILABLE TO THE END-USER AND ARE IN LIEU OF ALL OTHER REMEDIES.

3. End-User's Materials. All materials required by CML to test the operation of the Goods shall be furnished by the End-User (at its sole cost and expense). All materials and equipment furnished by the End-User for the construction, remodeling, or testing of Goods (or for any other purpose) shall be delivered to CML at no cost to CML, FOB CML's warehouse floor. The End-User shall bear the risk and cost of returning all such materials and equipment to the End-User. The End-User shall pay all applicable crating and delivery costs and expenses for samples and parts delivered to the End-User and, except as may be required for testing purposes, the End-User shall pay all costs and expenses pertaining to producing parts or samples requested by the End-User.

4. Tolerance and Variations. Except as specified by the End-User and expressly agreed to by CML (in writing), the Goods shall be produced in accordance with CML's standard business practices. All Goods (including, but not limited to, Goods produced to meet an exact specification) shall be subject to tolerances and variations consistent with good manufacturing practice in respect to dimensions, weight, section, chemistry and mechanical properties, the normal variations in surface and internal conditions and in quality, and to deviations from tolerances and variations consistent with practical testing and inspection methods.

5. Limitation of Liability. IN NO EVENT SHALL CML BE LIABLE FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE FURNISHING, PERFORMANCE, OR USE OF THE GOODS SOLD HEREUNDER (IF AT ALL), WHETHER AS A RESULT OF BREACH OF CONTRACT, BREACH OF WARRANTY, THE NEGLIGENCE OF CML OR OTHERWISE. CML's liability under no circumstances will exceed the purchase price for the Goods for which liability is claimed.

6. Indemnification; Assumption of Risk. To the extent permitted by law, the End-User agrees to indemnify and hold CML (and its respective agents and employees) harmless from and against any and all liabilities, damages, losses, actions, causes of action, claims (including, but not limited to, claims of patent infringements), expenses, costs (including, but not limited to, attorney's fees), fines, penalties and any other expenses directly or indirectly arising from End-User's actual use or intended use of the Goods. The End-User agrees to assume all risk of loss or damage to person or property while on the premises of CML or of CML's related corporations. To the extent permitted by law, the End-User (on behalf of itself and all of its agents and employees) hereby releases and forever discharges CML (and its respective employees and agents) from any and all claims, demands, causes of action, liabilities, losses or damages resulting or arising from the End-User's presence (or the presence of the End-User's employees and agents) on the premises of CML. The End-User warrants to CML that the End-User has the authority to grant this release on behalf of the End-User's agents and employees.

7. Non-Waiver. No waiver, alteration or modification of any of the provisions hereof shall be binding on CML unless such waiver is expressed in writing by CML. Waiver by CML of any breach or default by End-User hereunder shall not be deemed a waiver by CML of any default or breach by End-User which may thereafter occur.

8. Assignment. CML reserves the right to subcontract all or any part of the work to be performed hereunder, without obtaining the consent of the End-User. No notice to the End-User of any subcontracting by CML is required. The rights and obligations of the End-User hereunder may not be assigned without the prior written consent of CML.

9. Governing Law; Jurisdiction; Venue. The laws of the State of Iowa shall govern all disputes, controversies, interpretive matters and litigation arising under this warranty. PROPER AND EXCLUSIVE JURISDICTION AND VENUE for all disputes, controversies, interpretive matters and litigation arising hereunder (or otherwise between the parties) lies with the Iowa District Court located in Scott County, Iowa or the United States District Court for the Southern District of Iowa, Davenport Division. The End- User hereby submits to the personal jurisdiction of such courts.

10. Limitations for Suits. Any cause of action or claim arising out of or relating to CML's performance or failure to perform hereunder or the furnishing, performance, or use of the Goods hereunder must be commenced within one (1) year after the claim or cause of action has accrued.

CALL
563-391-7700
TO REQUEST A CURRENT CATALOG

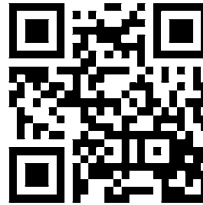


SCAN QR Code for:

PROGRAMMING
VIDEOS



ONLINE
SHOPPING



Download a QR Code Reader app on your phone. Open the app, focus on the code you wish to view; Programming Videos or Online Shopping.



CML USA Inc. Ercolina®

3100 Research Parkway Davenport, IA 52806 Phone 563-391-7700 or Fax 563-391-7710

www.ercolina-usa.com • info@ercolina-usa.com