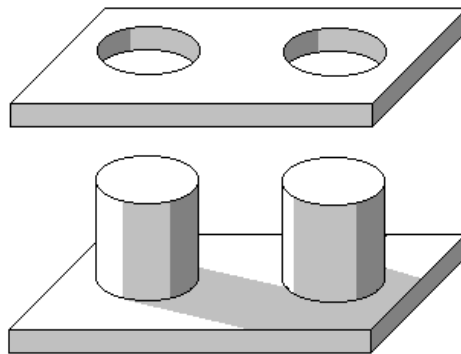


MDM Metrosoft S.a.s.
di DENI Ing. M. & C.



USER GUIDE
TOLERANCES OF
POSITION

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TOLERANCES OF POSITION

GENERALITY

Often mechanical drawings of work-pieces that must be mated (f.e. flanges with holes) include a geometrical tolerance called “Tolerance of position” that connect the location of points that belong to the work-piece. If the specification of this kind of tolerance is verified, the work-pieces that can be mated.

To give an answer to different configurations of this kind of tolerance it has been necessary to produce a specific software.

Measurements of the work-piece will be done using MIX software in the configuration suitable for the recording of data for statistic elaborations.

The possibility of using MIX in the individuation and memorisation in files of geometric substitute features of the work-piece is very important.

Software TOLL-POS. will read in files results of measurements , will compute them in accordance with specifications and will print a certificate.

We will give in a first time some short notions regarding Tolerance of Position, and after will explain how to access to statistic files recorded through MIX.

Tolerance of position:

The tolerance of position (t) for a point is the zone limited by a circle of diameter ‘t’, the centre of which is in the theoretically exact position of the considered point.

The tolerance requirements are shown in a rectangular frame which is divided in two or more compartments.

Here we give an example of tolerance of position.



Software TOLL.POS enables to verify if actual points are inside circles (tolerance circles) having respectively as centre the theoretically co-ordinates and a diameter of ‘t’ value.

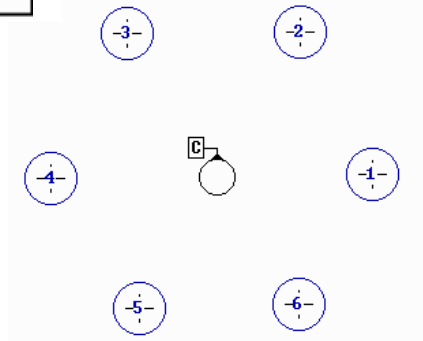
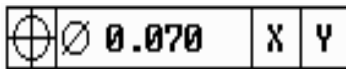
The set of theoretical points is called “theoretical mask”, and the set of actual points is called “actual mask”.

In conformance with the specification of mechanical drawing, software TOLL.POS will make a “rotation & translation” of actual mask, to have the best overlap of the two masks.

Constraints specified by the drawing can limit the rotation & translation .

Central datum :

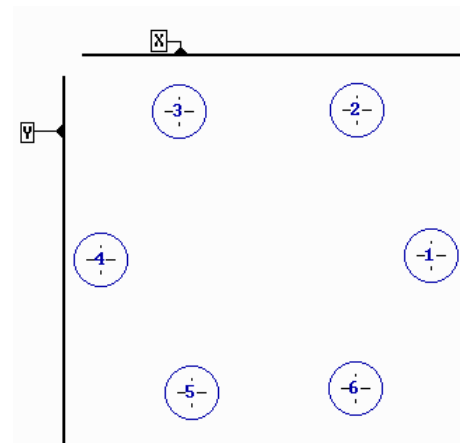
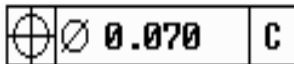
On the drawing is specified as constraint of the mask a point (generally in central position in comparison with theoretical mask) whose co-ordinates are known; software TOLL.POS will translate actual point on theoretical point and after, making only rotations around the constrained point, will compute the position with the lowest distance between theoretical and the corresponding actual point.



Lateral datum (X, or Y, or XY) :

On the drawing is specified as constraint of the mask one axis; in this case software TOLL.POS, making only translations along the datum axis, will compute the position with the lowest distance between the actual and the corresponding theoretical point.

If both axis X and Y are specified as constraint, none computation of lowest distance will be done : the two masks will be only compared.



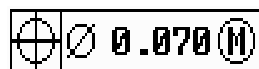
Maximum material principle :

The free assembly of components depends on the combined effect of the actual finished sizes and the errors of position of the mating features.

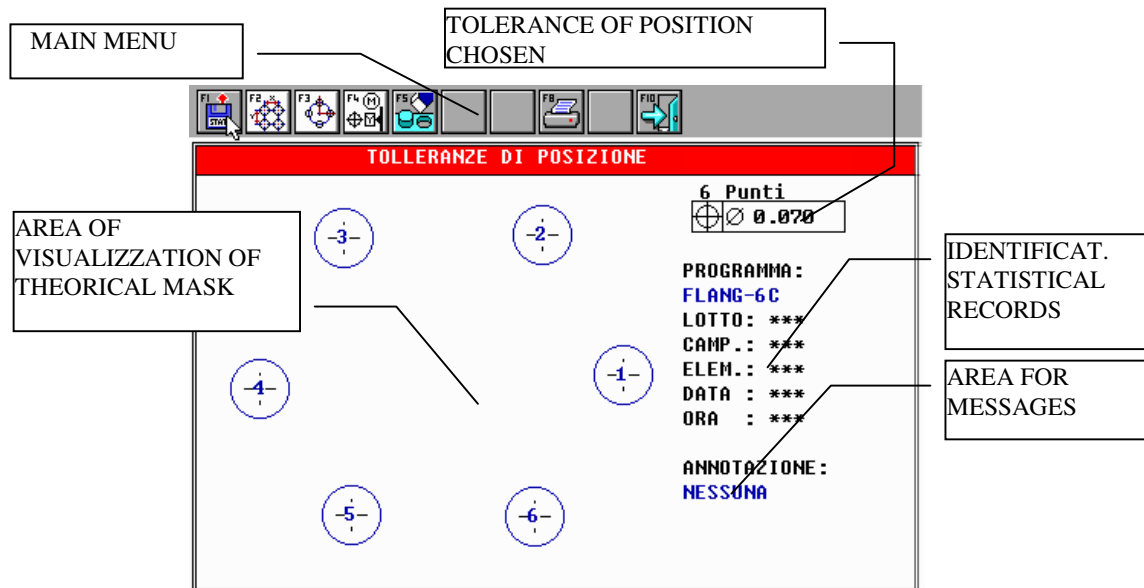
The minimum clearance for assembly occurs when the features are in their maximum material conditions of size (maximum for pins and minimum for holes) and the most disadvantageous permissible errors of position are present.

It follows, therefore, that if the actual sizes of the mating features are away from the maximum material limits of size, the specified tolerance of position can be exceeded without endangering the possibility of assembly.

The specified tolerance of position may be increased as permitted by the difference between the actual size of the feature and its maximum material limit of size. Obviously the amount of this increase can never exceed the amount of the size tolerance of the feature.



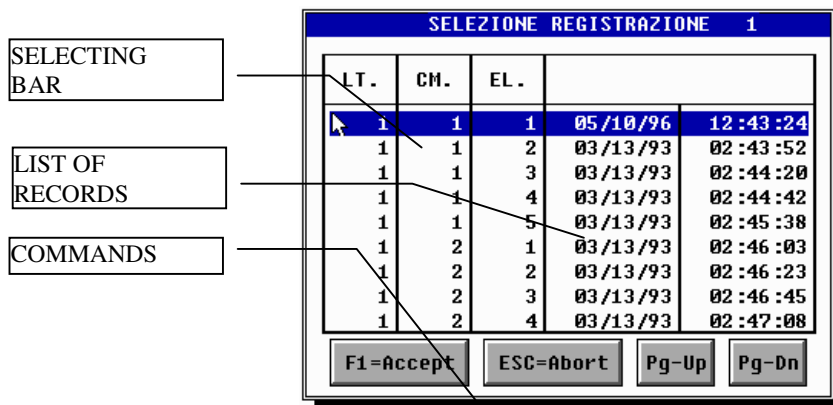
OPTIONS OF TOLL.POS SOFTWARE



ACCESS TO STATISTICAL RECORDS (MEASUREMENTS SELECTION)

This option, activated pressing F1 key, permits the selection of statistical records containing results of measurement. The desired measurements can be chosen through the selection of Lot, Sample, and Element (of Sample) or through the date and hour of the measurement. Position selecting bar on desired field, then press F1 key = ACCEPT

It is possible, when desired, to select a different statistical record, in case it is necessary to certify more work-pieces of the same type .



CREATION OF THE THEORETICAL MASK

In order to have a quick creation of theoretical mask, there are 2 options.

F2 Linear array of points.

SELECTION OF KIND OF FEATURE (HOLE OR PIN)

VALUES OF TOLERANCE FOR DIAMETERS

CO-ORDINATE "X" AND "Y" OF THE BASIC POINT OF THE ARRAY

SELECTION OF THE NUMBER OF COLUMNS OF THE ARRAY

SELECTION OF THE NUMBER OF ROWS OF THE ARRAY

NOMINAL DIAMETER OF HOLES / PINS

INTERAXIS BETW. THE ROWS (DY), & THE COLUMNS (DX)

MATRICE FORI / SPINE

2 COLONNE F2 3 RIGHE F3

FORI F4 DIAM: 12.000

TOL.SUP.: 0.010 TOL.INF.: -0.010

BASE X: 0.000 BASE Y: 0.000

INT.RIGA: 30.000 INT.COL.: 30.000

F1=Accept ESC=Abort

F3 Circular array of points.

NUMBER OF ELEMENTS OF THE CIRCULAR ARRAY

RADIUS OF THE CIRCLE ON CONTAINING THE CENTRES OF THE FEATURES

VALUES OF TOLERANCE FOR DIAMETERS

ANGULAR POSITION OF 1° FEATURE

SELECTION OF KIND OF FEATURE (HOLE OR PIN)

NOMINAL DIAMETER OF HOLES / PINS

CO-ORDINATE "X" AND "Y" OF THE CENTRAL POINT OF THE ARRAY

ANGULAR STEP BETWEEN CONTIGUOUS FEATURES

ARRAY CIRCOLARE FORI / SPINE

6 ELEMENTI F2 FORI F3

RAG.ARRAY: 52.360 DIAM: 12.220

TOL.SUP.: 0.040 TOL.INF.: -0.040

BASE X: 0.000 BASE Y: 0.000

ANG.INIZ.: 0.000 ANG.INC.: 60.000

F1=Accept ESC=Abort

It is possible, for a single measurement, to create a mask through both options; it is also possible to insert features in several times; the insertion of new features does not erase features previously inserted.

In case of a theoretical mask composed with 5 holes / pins with a dislocation different from the two described, it will be necessary to choose 5 times option F2, setting for X and Y basis the co-ordinates of theoretical point, and choosing every time an array of 1 row and 1 column.

Points inserted will be automatically and subsequently numbered in function of the insertion. At the end of the insertion points will be graphically displayed in the dedicated window.

SELECTION OF DATUM AND OF MAXIMUM MATERIAL CONDITION

This option, activated through F4 key, enables to choose the desired datum, the value of tolerance of position, and if must operate under maximum material conditions.

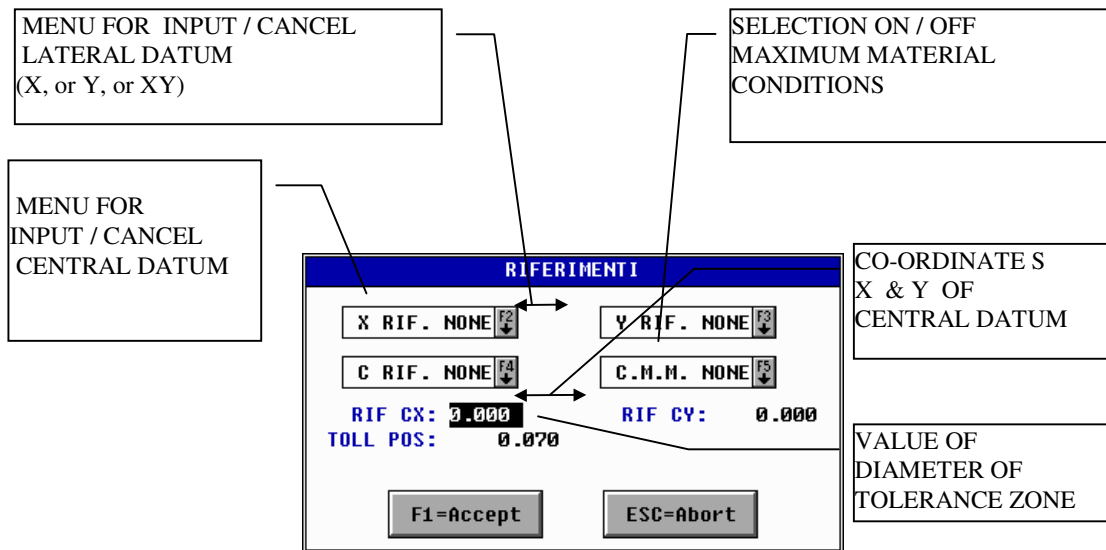
If ‘Central datum’ is used, measurements results, recorded through MIX, regarding the features under examination and the point connected to datum must be expressed in the same reference system; this point should not identify with axis origin.

Obviously all points must lie on xy plane of the reference system.

‘Central datum’ cannot co-exist with a ‘Lateral datum’.

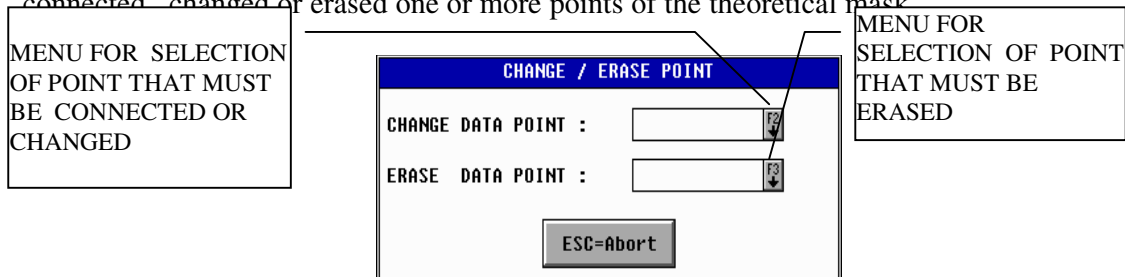
If ‘Lateral datum’ is used, obviously the work-piece reference system adopted by MIX must be in conformance with theoretical co-ordinates, so that it is possible to have a good overlap.

In any case, also if datum are not specified, co-ordinates of points measured from MIX must be expressed in the same work-piece reference system, whose xy plane is the plane where points lie.



CONNECTION OF THEORETICAL MASK TO ACTUAL MASK CHANGE OF THEORETICAL DATA ASSIGNED TO POINTS OF MASK

Selecting this option through F5 key, will be displayed a window through which can be connected, changed or erased one or more points of the theoretical mask.

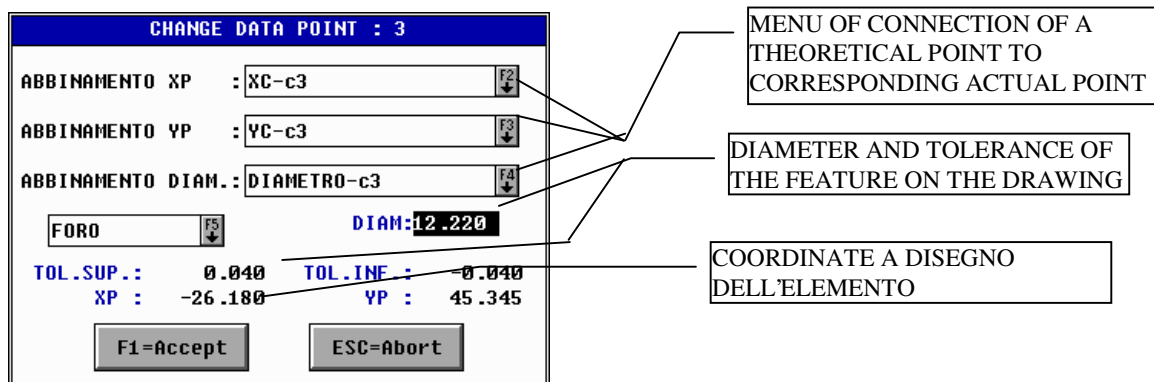


CONNECTION OR CHANGE DATA

This possibility is offered by selecting “change data point” in the preceding window, or by “clicking” left key of mouse in correspondence of the specific point of theoretical mask; it will be displayed a window through which it will be possible to connect, or change a connection of a theoretical point to an actual point.

If the connection has not done for all points, a message will be displayed.

Connection shall be done also for eventual datum.



It is possible to erase a point of the mask also by “clicking” right key of mouse in correspondence of the specific point of theoretical mask.

PRINTING OF THE CERTIFICATE

This option is activated through F8 key.

If messages of error are not displayed, it will be possible to print the certificate with values of the type of measurements , in conformance with the certificate printed through MIX.

EXIT FROM TOLL. POS.

This option is activated through F10 key.

Going out from Toll.Pos. all data of theoretical mask will be automatically saved, so that for similar work-pieces this mask can be used.