DRAWN	DATE			
DN	05-22-02	Kalmar	Kalmar Industries Corp. 415 E. Dundee Ottawa, Ks. 66067, USA. PHONE (785) 242-2200	SHEET 1 OF 5
EO	REV			
042250	B			
APPROVED		ENGINEERING SPECIFICATIONS OR INSTRUCTIONS		ESN-0032
HK	6-24-02			

TOLERANCES ON DRAWINGS

GENERAL CONSIDERATIONS

1. MANUFACTURING LIMITS ARE EXPRESSED IN MAXIMUM TERMS AND SHOULD NOT BE CONSTRUED AS BEING THE NORMAL OR AVERAGE CONDITION. IN MOST CASES, THE ACTUAL FEATURE WILL FALL WELL WITHIN THE MAXIMUM LIMIT.

2. WHEN A COMBINATION OF CONTROLS EXISTS, THE MORE RESTRICTIVE VALUE SHOULD BE APPLIED.

3. IF THE SIZE TOLERANCE OF A PART IS MORE RESTRICTIVE THAN THIS ESN, THE DRAWING TOLERANCE SHALL APPLY.

4. UNLESS OTHERWISE NOTED, ALL DIMENSIONS IN INCHES.

FORM DIMENSIONS:

SCOPE: DIMENSIONS DEFINING SHAPE OF PART, SIZE OF FILLETS, SIZE OF ROUNDS AND LOCATION OF HOLES, SLOTS, ETC...

TOLERANCES:		INCHES	METRIC
X.X	=	± 0.125	± 3 mm
X.XX	=	± 0.063	± 1.5mm
X.XXX	=	± 0.031	± 0.7mm
X.XXXX	=	± 0.015	
ANGULAR			
X.X°	=	± 1°	
X.XX°	=	± 0.5°	

HOLE & SLOT DIMENSIONS:

SCOPE: DIMENSIONS DEFINING SIZE OF HOLES AND SLOTS. ALL HOLE DIAMETER, SLOT WIDTH AND LENGTH DIMENSIONS ARE TO BE THREE PLACE DECIMALS (X.XXX).

DRILLED HOLES ARE TO MEET TOLERANCES SPECIFIED IN TABLE 1.

PUNCHED HOLES SHALL BE WITHIN THE FOLLOWING LIMITS OF ACCEPTABILITY. THE CUT SURFACE (DIMENSION B IN FIGURE 1) SHALL BE AT LEAST 1/3 OF THE MATERIAL THICKNESS (DIMENSION A). DIAMETER THROUGH THIS THICKNESS SHALL BE WITHIN HOLE TOLERANCE ESTABLISHED IN TABLE 1. THE REMAINING SURFACE (A MINUS B) MAY BREAK AWAY AN ADDITIONAL AMOUNT AS SHOWN, WITHIN TOLERANCE C VALUES IN TABLE 2.

HOLE & SLOT DIMENSIONS CONTINUED ON SHEET 2

TOLERANCES ON DRAWINGS

HOLE & SLOT DIMENSIONS (CON'T):

DRILLED HOLES, PUNCHED HOLES & PUNCHED SLOTS

THIS ON THE DRAWING: MEANS THIS:

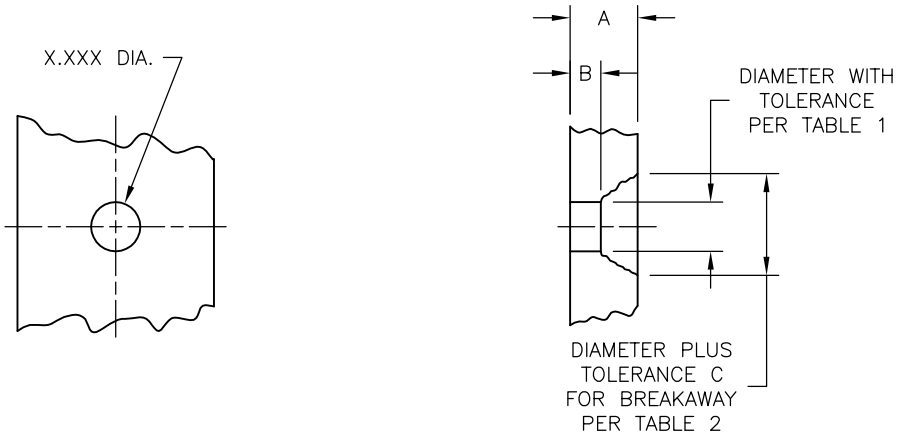

FIGURE 1

TABLE 1
HOLE AND SLOT TOLERANCE

DIAMETER		TOLERANCE	
OVER	THRU	(INCHES)	(mm)
0	0.125	+0.005 −0.002	+0.127 −0.051
0.125	0.250	+0.006 −0.002	+0.152 −0.051
0.250	0.500	+0.008 −0.002	+0.203 −0.051
0.500	0.750	+0.009 −0.002	+0.229 −0.051
0.750	1.000	+0.010 −0.002	+0.254 −0.051
1.000	2.000	+0.016 −0.002	+0.406 −0.051
2.000	3.500	+0.025 −0.002	+0.635 −0.051

TABLE 2
PUNCHED HOLE SURFACE TOLERANCE

THICKNESS		TOLERANCE C (INCHES)	TOLERANCE C (mm)
OVER	THRU		
0	0.015	+0.006	+0.152
0.015	0.040	+0.008	+0.203
0.040	0.125	+0.020	+0.508
0.125	0.250	+0.030	+0.762
0.250	0.500	+0.040	+1.016
0.500	0.750	+0.063	+1.600

HOLE & SLOT DIMENSIONS CONTINUED ON SHEET 3

TOLERANCES ON DRAWINGS

HOLE & SLOT DIMENSIONS CONTINUED:

TORCHED OR PLASMA CUT HOLES

1. HOLE SIZE TO MEET FORM DIMENSION TOLERANCES.

2. THE PIERCE POINT IS TO BE LOCATED AS FAR AWAY FROM THE EDGE OF THE PART AS PRACTICAL AND SHOULD BE INSIDE OF THE MATERIAL TO BE REMOVED. A LOCAL PROTRUBERANCE AT THE PIERCE OR FINISH OF THE CUT IS NOT TO EXCEED 0.063. SEE FIGURE 2.

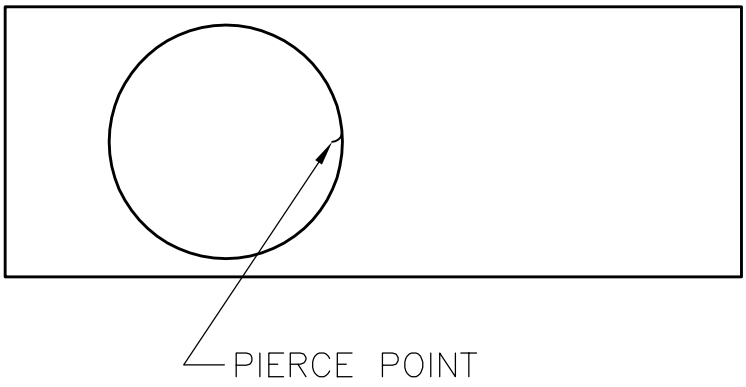

FIGURE 2

FORMED SIDES

CUT SURFACE TO BEND

SURFACES SHOWN AT A RIGHT ANGLE (90°) TO A BEND SHALL BE PERPENDICULAR TO THE BEND WITHIN THESE LIMITS, AS SHOWN IN FIGURE 3:

PERPENDICULARITY TOLERANCE ZONE F:

THRU FIRST 6 INCHES OF LENGTH E.....0.03
OVER 6 INCHES THROU 12 INCHES.....0.06
FOR EVERY INCH OVER 12, ADD.....0.002

TOLERANCES ON DRAWINGS

FORMED SIDES (CON'T)

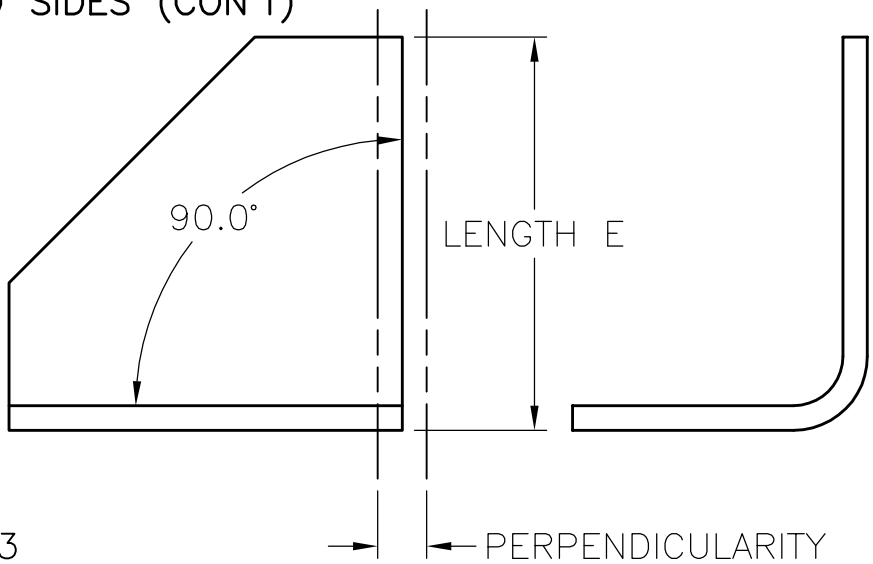

FIGURE 3

BEND TO BEND

TWO BENDS SHOWN AT A RIGHT ANGLE (90°) TO A BEND SHALL BE PERPENDICULAR TO THE BEND WITHIN THESE LIMITS, AS SHOWN IN FIGURE 4:

PERPENDICULARITY ZONE H:

THRU FIRST 6 INCHES OF LENGTH G.....0.03
OVER 6 INCHES THROUGH 12 INCHES.....0.06
FOR EVERY INCH OVER 12, ADD.....0.002

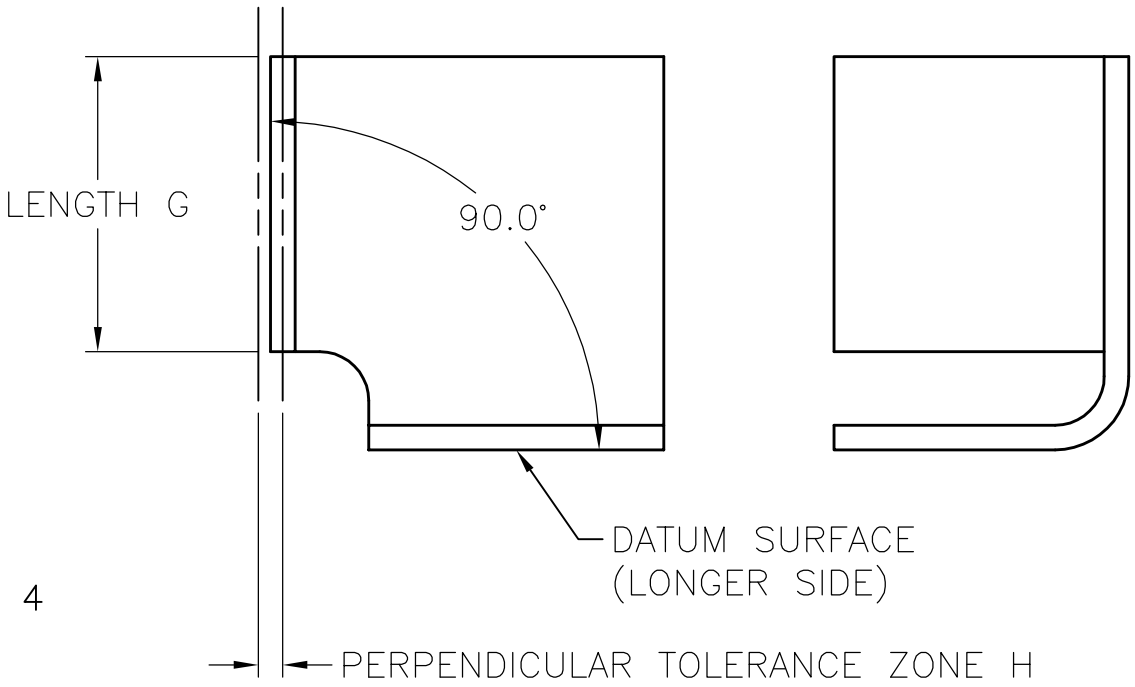

FIGURE 4

TOLERANCES ON DRAWINGS

PERPENDICULARITY TOLERANCE – RIGHT ANGLE BENDS

J LENGTH SHORT LEG		MATERIAL THICKNESS					
OVER	THRU	THRU 0.015	OVER 0.015 THRU 0.035	OVER 0.035 THRU 0.083	OVER 0.083 THRU 0.125	OVER 0.125 THRU 0.250	OVER 0.250 THRU 0.500
0	2	0.02	0.02	0.02	0.03	0.03	0.04
2	4	0.03	0.03	0.03	0.04	0.04	0.05
4	6	0.04	0.04	0.05	0.05	0.06	0.07
6	10	0.05	0.06	0.07	0.08	0.08	0.09
10	20	0.07	0.07	0.08	0.09	0.09	0.10
		TOLERANCE K					

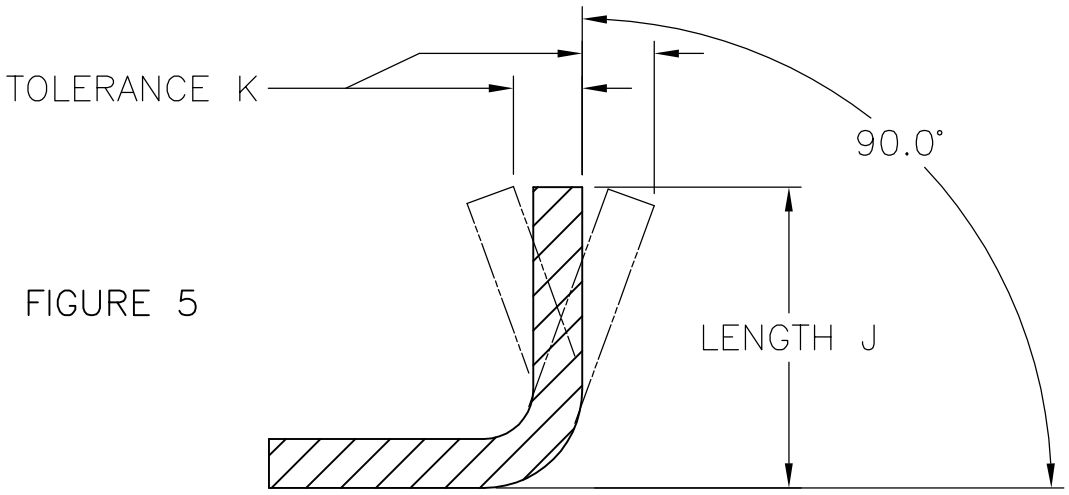

FIGURE 5