



Special Machining

For more than 70 years, Thomson has been providing custom special machining on 60 Case® linear shafting. Our skilled machinists can perform a wide variety of special machining operations on the ends or along the length of the 60 Case shaft to provide exactly the part needed for your application.

Standard 60 Case shafting, which is available from stock, can be cut with special length tolerances. 60 Case shafting may also be drilled with a variety of radial holes and tapped if needed. Shafts can be supplied with flats, keyways and reduced diameters. Shafts can also be plated.

There is an extra charge for all special machining operations. For specific prices, send your drawing or technical description to Thomson or utilize a copy of the request for quotation and templates found on pages 206 - 223.

Special Length Tolerances

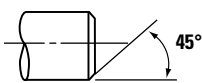
Standard length tolerance is for $\pm 1/32"$ for shafts less than 2" diameter and $\pm 1/16"$ for 2" diameter and larger. Special length tolerances of $\pm .010"$, $\pm .005"$ and $\pm .002"$ can be achieved on shafts up to 4" in diameter.

Special Straightness Tolerances

Standard straightness is $.001"$ per foot., cumulative ($.002"$ TIR). Special straightness tolerance is $.0005"$ per foot, cumulative ($.001"$ TIR), for all diameters.

Special Chamfer

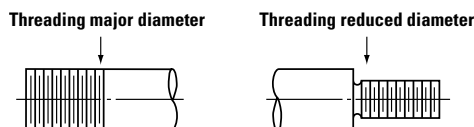
$1/32" \times 45^\circ$ for diameters less than 1" and $1/16" \times 45^\circ$ for diameters 1" and larger. Special chamfers at any angle can be supplied for an additional charge.



Machining Shaft Ends

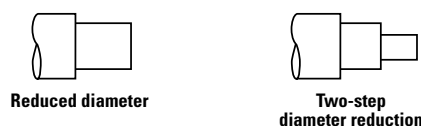
For all machining requirements with turned ends, Thomson will anneal the end. The annealing process may cause approximately $1/4"$ to $1/2"$ of heat travel from machined area (depending on major shaft O.D.). Hardness of major shaft diameter near the machined area will be below the Rockwell hardness for the material. If annealing effects are objectionable, alternate machining processes can be used which prevent major diameter softening. Contact Thomson Customer Support for special options. See relevant sections following.

Threaded Shaft Diameter



Standard threads are either Unified National Coarse or Unified National Fine, Class 2-A fit. Shafts will be annealed and soft around the circumference of threaded areas within the case.

Reduced Shaft Diameter



Standard diameter tolerance on turned down diameters is $\pm .001"$. Special tolerance of $\pm .0001"$ is available. Runout is within $.001"$ total indicator reading. Shafts are annealed and soft in turned down sections within case. Two-step shaft diameter reduction is also available.

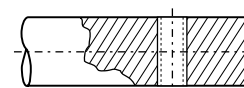
Radial Holes Drilled and Tapped to Center of Shaft

U.N.C. or U.N.F. Class 2-B thread. Tolerances for hole alignment and location are $\pm 1/64"$, $\pm .010"$ and $\pm .005"$.



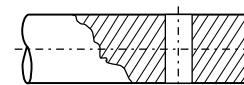
Radial Holes Drilled and Tapped thru Shaft

U.N.C. or U.N.F. Class 2-B thread. Alignment and location tolerance $\pm .010"$ shaft annealed and soft around circumference in hole area.



Radial Holes Drilled through Shaft

Alignment and location tolerance $\pm .010"$.

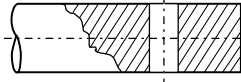


For requests for quotation and ordering custom machined 60 Case LinearRace® shafting, see the convenient templates on pages 206 - 223.

Thomson RoundRail Linear Guides and Components

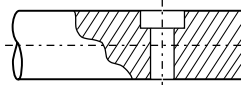
Radial Holes Drilled and Reamed through Shafts

Alignment and location tolerance $\pm .010"$. Hole diameter tolerance $\pm .001"$. Shaft annealed and soft around circumference in hole area.



Radial Holes Drilled through Shaft and Counterbored for Cap Screw

Alignment and location tolerance $\pm .010"$. Tolerance for body diameter and head diameter for American Std. cap screw is $+ 1/32"$. Shaft remains hard in hole area (not annealed).



Radial Hole Location Tolerance

Unless specified standard location tolerance between holes is $\pm 1/64"$, optional $\pm .010"$ capability exists for all through hole $\pm .005"$ for hole to center.

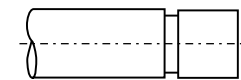
Coaxial Holes Drilled and Tapped in Center of End of Shaft

U.N.C. or U.N.F. Class 2-B thread. Concentricity $\pm .005"$. Certain diameters and materials will be annealed and remain soft around the circumference. Note: Holes may also be located on a "bolt" circle. Location tolerance is $.010"$.



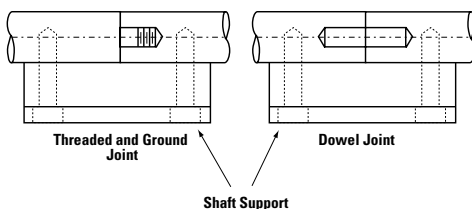
Retaining Ring Groove

Location tolerances between grooves $\pm 1/64"$ or $\pm .005"$. Tolerance of $\pm .005"$ for maximum ring groove spacing is $96"$.



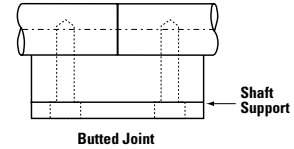
Joining Shafts to Obtain Longer Lengths

Threaded and ground joints for $3/4"$ through $4"$ and 20mm thru 80mm diameter shaft for lengths up to 20 feet. Dowled joints with concentricity $\pm .010"$ for $1/2"$ thru $4"$ and 12mm thru 80mm diameter shaft. The feasibility of butted joints should be considered as possibly the most economical solution before considering either of the previous alternatives.



Butted Joints

Ends machined square, no chamfer. Available for all nominal shaft diameters.



Flats

Flats are available. Flats extending over large portion or entire length of shaft are not available. Cutting into hardened layer would cause considerable warping and subsequent straightening cost is prohibitive.

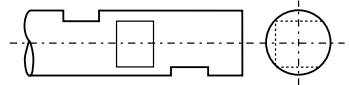
One Flat on a Shaft

Location tolerance $\pm .015"$.



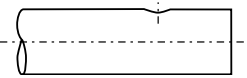
Multiple Flats on a Shaft

Alignment and location tolerance $\pm .005"$.



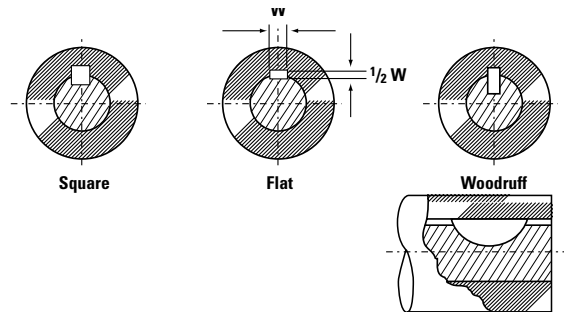
Drilled Spot for Set Screws

Location tolerance $\pm 1/64"$. Capability exists for $\pm .002"$. Drill sizes $1/8"$ thru $3/4"$.



Keyways

Keyways may be square, flat or American Standard Woodruff. Available for nominal shaft diameters from $1/2"$ through $4"$.



For requests for quotation and ordering custom machined 60 Case LinearRace shafting, see the convenient templates on pages 206 - 223.



Example of Our Popular Plating Options

Chrome Plating

The Thomson standard chrome option is pure chrome with a thickness of .00005" - .0001". (Process per AMS 2460, Class 1 (Corrosion Protective Plating), Type II (Satin finish), but with no nickel underlayer.) Other plating options are available for quote, including but not limited to Thin Dense Chrome plating per MIL-S-13165 and MIL-R-81841.

As a result of the plating process and the need to hold parts during plating, coaxial holes may be added as follows:

Up to 1 1/4" diameter shaft any length over 72".

Over 1 1/4" to 2" diameter shaft any length over 48".

Over 2" diameter shaft all lengths.

Note: Our chrome plated with plain ends (CPPE) do not have coaxial holes in any length, but the chamfered edges are not plated.

Black Oxide

The benefits of black oxide is corrosion resistance and black color. The Thomson standard black oxide option meets MIL-DTL-13924D Class 1.

ARMOLOY™

The benefits of Armoloy plating are a 78 RC surface finish, reduction of wear and friction in moving parts, and absolute adhesion to base metal (no chipping, cracking, flaking or peeling will occur). The Armoloy thickness is .0001". Final plated shaft is within specified tolerance class.

As a result of the plating process and the need to hold parts during plating, coaxial holes may be added as follows:

Up to 1 1/4" diameter shaft any length over 66".

Over 1 1/4" all lengths.

Military and industrial specifications satisfied with Armoloy plating are AMS-2438, AMS QQ-C-320 and AMS-2406.


Each supplier used for plating has different capabilities to hold the parts, so requirements for coaxial holes may change over time. These should be used as a rule of thumb with an understanding that longer lengths may have coaxial holes. These holes allow the plater to hold the shaft during the plating process. When a coaxial hole is not used, it means special tooling is available or the ability exists to pinch the part. If coaxial holes are a problem, please contact us and we can work with our supplier to determine what options exist.

Thomson RoundRail Linear Guides and Components

Special Machining Quoting

Thomson will be happy to quote any of your special machining needs. In order for us to properly quote the product, we will require an original product drawing or technical description to be sent to our Application Engineering support team at thomson@thomsonlinear.com (email) or 1-540-639-4162 (fax). Our Application Engineering team will contact you if they have any questions, require more information, or a better drawing or sketch. This drawing is important to us to ensure we quote exactly what is required at time of quotation instead of when you place your order. Upon ordering, it is important that you reference the quotation number listed at the top right of the quote and have reviewed the entire quotation, including all the notes associated and exceptions to the line item you are ordering. Quantity quoted and price listed is based on one time manufacturing lot quantity not blanket order unless otherwise stated. Thomson reserves the right to requote if quantity ordered is less than quoted quantity. Upon receipt of order, Thomson assumes you have read and understand the quotation and Thomson will assume no responsibility of exceptions on quotation and failure by customer to read.

Our standard quotations are in the format shown below.



203A West Rock Road
Radford, VA 24141
United States

Contact Info: CONTACT PERSON
PHONE
CUSTOMER NAME
CUSTOMER ADDRESS
ANYWHERE, VA, 55555

QUOTATION

Quote No : 196522 - 1
Page : 1 of 1
Date : 01-JAN-2016
Customer No : 37721
Expiration Date : 31-DEC-2016

Internal Sales Contact:
First and Last Name
FirstName.LastName@thomsonlinear.com
Tel: 540-633-3549
Fax: 540-639-4162

Line	Product	Qty	Units	UNIT Net Price (USD)
10.000	1 L SM 1 L SM X 24.000IN Reference Item: 60_CASE * Shaft diameter may be out of tolerance along the length of the axial hole(s).	16	EA	67.79

Typical Lead Time ARO (Subject to availability): 5 DAYS
Customer Part # / Drawing #, Rev #: *PER TEMPLATE
Overall Length: 24.000
Shaft Material: CS
Axial Holes - Total Depth (in): 2.000

Noted Item Quoted and Possible Exceptions

Customer Drawing Number

Quote and General Terms and Conditions

QUOTATION NUMBER MUST APPEAR ON ORDER TO INSURE PROPER BILLING. Prices quoted are considered firm for 30 days. The Buyer and Seller agree to be bound by the terms and conditions of sale referenced in the next sentence in connection with the sale of the Goods. These terms and conditions are located at http://www.thomsonlinear.com/terms_conditions. These terms and conditions are subject to change and the Buyer is advised to review Sellers website from time to time when it places a new order for Goods.

60 Case Special Machining

www.thomsonlinear.com

205

Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com



Request for Quotation

Custom Machined Thomson 60 Case® LinearRace® Shafting

Customer: _____

Address: _____

City: _____ State: _____ Zip: _____

Contact Name: _____

Phone: _____ Fax: _____

E-mail: _____

Template Number	Quantity
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

1. Send a copy of your drawing or sketch. If you do not have one, select the Thomson 60 Case LinearRace shaft template that best matches your requirements.

- A. Fill in all available data with tolerances in either inch or metric units.
- B. If a feature is not on the template that you are using, add it, and the applicable dimensions.
- C. If a feature is not required but is on the template, draw a line through the feature, and mark the dimension block with a line or N/A.
- D. Make any additional notes to the template to aid in quoting and manufacturing.

2. Fax this information with the template drawing to: Quotation Department at 1-540-639-4162.

For any questions or help in determining the best solution to your Thomson 60 Case LinearRace shafting requirements, please contact Application Engineering at:
Phone: 1-540-633-3549
E-mail: thomson@thomsonlinear.com

Thomson RoundRail Linear Guides and Components

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60 Case Special Machining



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Thomson RoundRail Linear Guides and Components

	<p>LENGTH 'A':</p> <p>DIAMETER 'D':</p> <p>CLASS:</p> <p>THREAD 'E':</p> <p>ANGLE 'C':</p> <p>CHAMFER 'B':</p>	<p>HOLE PATTERN</p> <p>LENGTH 'Y1': 'Y2':</p> <p>LENGTH 'R':</p> <p>No. of Holes for 'R':</p>	<p>DEFAULT PRINT TOL: (INCH) FRACTIONS: $\pm 1/32"$ R= $\pm 015"$ XR= $\pm 010"$ XX= $\pm 005"$ ANGLES: $\pm 1/2^\circ$</p> <p>DEFAULT PRINT TOL: (METRIC) FRACTIONS: $\pm 1mm$ R= $\pm 25mm$ XR= $\pm 13mm$ ANGLES: $\pm 1/2^\circ$</p> <p>CUSTOMER AUTHORIZATION:</p>	<p>MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER:</p> <p>PLATING TYPE: APPROVAL DATE DRAWN BY DATE</p> <p>DO NOT SCALE DRAWING</p> <p>TITLE: RADIAL DRILL & TAP 60 CASE TEMPLATE 3 DRAWG NO.</p>
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Thomson RoundRail Linear Guides and Components

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CUSTOMER AUTHORIZATION: _____		PLATING TYPE: _____		APPROVAL DATE		DRAWN BY DATE										
				DO NOT SCALE DRAWING												

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Thomson RoundRail Linear Guides and Components

<p>1</p> <p style="text-align: center;">A B C D E F</p> <p style="text-align: center;">2</p>	<p>3</p> <p style="text-align: center;">A</p> <p style="text-align: center;">E</p> <p style="text-align: center;">F</p>	<p>4</p> <p style="text-align: center;">A B C D E F</p>
<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F' (TYP.)</p> <p style="text-align: right;">.015 RAD. TYP.</p> <p style="text-align: center;">D</p> <p style="text-align: center;">B (TYP)</p> <p style="text-align: center;">C</p> <p style="text-align: center;">E</p>		<p>DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .X= ±.015" .XX= ±.010" .XXX= ±.005" ANGLES: ± 1/2°</p> <p>DEFAULT PRINT TOL: (METRIC) FRACTIONS: ± 1mm .X= ±.25mm .XX= ±.13mm ANGLES: ± 1/2°</p> <p>CUSTOMER AUTHORIZATION: _____</p>
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60 Case Special Machining



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<p>THOMSON® Linear Motion. Optimized.™</p> <p>TITLE: KEY WAY SLOT 60 CASE TEMPLATE 8</p> <p>DRWG NO.</p>			<p>OTHER MATERIALS AVAILABLE UPON REQUEST</p> <p>MATERIAL: <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER:</p> <p>PLATING TYPE: APPROVAL DATE DRAWN BY DATE</p> <p>DO NOT SCALE DRAWING</p>																		
<p>DEFAULT PRINT TOL: (METRIC)</p> <p>FRACTIONS: ± 1mm .R= ±.25mm .RH= ±.13mm</p> <p>ANGLES: ± 1/2°</p>			<p>DEFAULT PRINT TOL: (INCH)</p> <p>FRACTIONS: ± 1/32" .R= ±.015" .RH= ±.010" .RHH= ±.005" ANGLES: ± 1/2°</p>																		
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Thomson RoundRail Linear Guides and Components

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<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F'</p> <p>STD.</p>					
<p>LENGTH 'A':</p> <p>DIAMETER 'D':</p> <p>CLASS:</p> <p>THREAD 'C':</p> <p>MIN. THREAD LENGTH 'E':</p> <p>ANGLE 'F':</p> <p>CHAMFER 'B':</p>					
<p>DEFAULT PRINT TOL: (INCH)</p> <p>FRACTIONS: $\pm 1/32"$</p> <p>.H= $\pm 015"$</p> <p>.HH= $\pm 010"$</p> <p>.HHH= $\pm 005"$</p> <p>ANGLES: $\pm 1/2^\circ$</p>			<p>DEFAULT PRINT TOL: (METRIC)</p> <p>FRACTIONS: $\pm 1mm$</p> <p>.H= $\pm 25mm$</p> <p>.HH= $\pm 13mm$</p> <p>ANGLES: $\pm 1/2^\circ$</p>		
<p>CUSTOMER AUTHORIZATION: _____</p>			<p>MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST)</p> <p><input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING</p> <p><input type="checkbox"/> OTHER: _____</p>		
<p>PLATING TYPE: _____</p>			<p>APPROVAL DATE</p> <p>DRAWN BY DATE</p>		
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STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'H'			.015 RAD. TYP.																				
(OTHER MATERIALS AVAILABLE UPON REQUEST)			THOMSON Linear Motion. Optimized.™																				
MATERIAL:			SHAFT REDUCTION WITH THREAD 60 CASE TEMPLATE 10																				
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Thomson RoundRail Linear Guides and Components

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CUSTOMER AUTHORIZATION: _____																									
PLATING TYPE: _____			APPROVAL DATE _____			TITLE: DRILL & COUNTER BORE 60 CASE TEMPLATE 12																			
DO NOT SCALE DRAWING																									
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PLATING TYPE: _____ APPROVAL: _____ DATE: _____ DRAWN BY: _____ DATE: _____			DO NOT SCALE DRAWING																				
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MATERIAL: <input type="checkbox"/> 1 5 6 6 <input type="checkbox"/> 4 4 0 C <input type="checkbox"/> OTHER: _____ (OTHER MATERIALS AVAILABLE UPON REQUEST)			MATERIAL: <input type="checkbox"/> 5 2 1 0 0 <input type="checkbox"/> TUBING PLATING TYPE: _____ DO NOT SCALE DRAWING																				
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Thomson RoundRail Linear Guides and Components

1	2	3	4	F	E	D	C	B	A																
<p>.030 RAD. (TYP.)</p> <p>STD. MACHINED CHAMFER UNLESS NOTED ANGLE 'F' (TYP.)</p>																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">LENGTH 'A':</td> <td style="width: 50%;"></td> </tr> <tr> <td>DIAMETER 'D':</td> <td></td> </tr> <tr> <td>CLASS:</td> <td></td> </tr> <tr> <td>LENGTH 'y':</td> <td></td> </tr> <tr> <td>LENGTH 'C':</td> <td></td> </tr> <tr> <td>DEPTH 'E':</td> <td></td> </tr> <tr> <td>ANGLE 'F':</td> <td></td> </tr> <tr> <td>CHAMFER 'B':</td> <td></td> </tr> </table>										LENGTH 'A':		DIAMETER 'D':		CLASS:		LENGTH 'y':		LENGTH 'C':		DEPTH 'E':		ANGLE 'F':		CHAMFER 'B':	
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<p>FAX A COPY OF THIS FORM TO QUOTATION DEPARTMENT, THOMSON 1-540-639-4162</p>																									



1	2	3	4	E	F
HOLE PATTERN					
LENGTH 'A':		LENGTH 'Y1':		1)	
DIAMETER 'D':		LENGTH 'X':		2)	
CLASS:		No. of Holes for 'X':		3)	
THREAD 'E':					
ANGLE 'F':					
CHAMFER 'B':					
DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .X= ±.015" .XX= ±.010" .XXX= ±.005" ANGLES: ± 1/2°		MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> OTHER: _____		TITLE: BUTTED JOINTS 60 CASE TEMPLATE 16	
CUSTOMER AUTHORIZATION: _____		PLATING TYPE: _____ DO NOT SCALE DRAWING		APPROVAL DATE DRAWN BY DATE DRUG NO.	
A	B	C	D	E	F

FAX A COPY OF THIS FORM TO QUOTATION DEPARTMENT, THOMSON 1-540-639-4162

Thomson RoundRail Linear Guides and Components

1		2		3		4	
<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F' (TYP.)</p> <p>STD. RELIEF</p> <p>SPLICE LOCATION(S)</p> <p>B (TYP)</p> <p>HOLE PATTERN</p> <p>SPLICE LOCATION(S)</p>		<p>LENGTH 'A':</p> <p>DIAMETER 'D':</p> <p>CLASS:</p> <p>THREAD 'E':</p> <p>LENGTH 'Y1': 'Y2':</p> <p>LENGTH 'X':</p> <p>ANGLE 'F':</p> <p>CHAMFER 'B':</p>		<p>LENGTH 'Y1': 'Y2':</p> <p>LENGTH 'X':</p> <p>No. of Holes for 'X':</p>		<p>THOMSON Linear Motion. Optimized. TITLE: DOWEL JOINT 60 CASE TEMPLATE 17 DRAWING NO.</p> <p>MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1 566 <input type="checkbox"/> 440 C <input type="checkbox"/> OTHER:</p> <p>PLATING TYPE: APPROVAL DATE DRAWN BY DATE</p> <p>DO NOT SCALE DRAWING</p>	
<p>DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .R= ±.015" .RR= ±.010" .RRR= ±.005" ANGLES: ± 1/2°</p>		<p>DEFAULT PRINT TOL: (METRIC) FRACTIONS: ± 1mm .R= ±.25mm .RR= ±.13mm ANGLES: ± 1/2°</p>		<p>CUSTOMER AUTHORIZATION:</p>		<p>CUSTOMER AUTHORIZATION:</p>	
a		b		c		d	
A		B		C		D	
E		F		E		F	

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60 Case Special Machining