

# 60 CASE™ SHAFTING

August 2004

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**THOMSON™**

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MOTION

Solutions by

# Mechanical and Electro-Mechanical Product Solutions by Danaher Motion

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In addition, Danaher Motion, through Motion Engineering (MEI), offers powerful integrated motion control solutions with its industry-leading, multi-axis motion platforms and SynqNet-Æ communications network for ultra-reliable machine performance. From software and controller, through the communications network to drives and I/O devices, to mechanical and electro-mechanical products, Danaher Motion differentiates itself in the marketplace by designing standard and custom solutions to satisfy the most demanding application requirements.

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- Broad & Innovative Motion Control Products and Systems
- Customer Focus
- Customizable Products and Services
- Motion Control Pioneers with Global Staying Power
- Operational Excellence

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**THOMSON**<sup>™</sup>

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### Standard 60 Case Shaft Size and Availability Chart

Material	Carbon Steel										440 C Stainless Steel				52100 Tubular		316 SS		
	60 min										50 min		55 min		58 min		20-25		
Tolerance Class	L					S	N	D	XL	G	L	S	G	Instrument	L	S	L		
Optional Features	DC	PD CPPE	CPPE	PD		DC					PD								
1/8"																			
3/16"	•																		
1/4"	•					•		•		•		•	•	•					
3/8"	•					•		•		•		•	•	•				•	
1/2"	•		•	•	•	•		•		•	•	•	•	•				•	
5/8"	•		•	•	•	•		•		•	•	•	•	•					
3/4"	•	•	•	•	•	•	•	•		•	•	•	•	•		•	•	•	
7/8"	•	•					•	•											
1"	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	
1 1/8"	•	•					•	•											
1 1/4"	•	•	•	•	•	•	•	•	•		•	•	•						
1 3/8"	•							•											
1 1/2"	•	•	•	•	•	•	•	•	•		•	•	•			•	•	•	
1 5/8"	•							•											
1 3/4"	•	•					•	•											
2"	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	
2 1/4"	•	•					•	•											
2 1/2"	•	•				•	•	•				•	•			•	•		
2 3/4"	•	•					•												
3"	•	•				•	•	•		•		•				•	•		
3 1/2"	•	•					•												
4"	•	•				•			•							•	•		
Catalog Page	10	12	11	11	11	10	12	10	10	10	12	13	13	13	14	14	15	15	15

Material	Carbon Steel		440 C SS	
Hardness	60 min		50 min	
Tolerance Class	MM (ISO H6)		MM (ISO H6)	
Optional Features	T1	T2		
5 mm	•			•
8 mm	•			•
10 mm	•			•
12 mm	•	•	•	•
16 mm	•	•	•	•
20 mm	•	•	•	•
25 mm	•	•	•	•
30 mm	•	•	•	•
40 mm	•	•	•	•
50 mm	•			•
60 mm	•			•
80 mm	•			•
Catalog Page	22	22	21	23

Thomson 60 Case shafting is sold as cut-to-length (CTL), random length (RL), special machined (SM), and as quick shaft (QS).

Since Danaher Motion grinds and hardens all of its own shafting, diameters and tolerances not listed are available as special grind and are made to order. Minimum lots may apply.

**Tolerance Classes:**

**L** - For use with XA, Open and Adjustable Ball Bushing bearings and Pillow Blocks as well as Super Ball Bushing\* bearings and Super Smart Ball Bushing\* bearings.

**S** - For use with A type ball bushings

**N** - For use with needle roller bearings

**D** - For use with Thomson Die Set Ball Bushing bearings

**G** - Ball Grooved for use with Thomson Super Ball bushing

**XL** - For use with XR bearing Soft (Carbon Steel)

**Optional Features:**

**PD** - Predrilled

**CPPE** - Chrome Plated Plain Ends

**DC** - Deep Case

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## Standard 60 Case Support Rail Size and Availability Chart

Type	SR	SR-PD	SRA	SRA-SS	SRA-TU	LSR	LSR-PD	LSRA	LSRA-CR	XSR	XSRA
<b>Description</b>	Aluminum Support Rail	Aluminum Support Rail with Predrilled Holes	Aluminum Support Rail Carbon Steel Shaft	Aluminum Support Rail Assembly 440C SS Shaft	Aluminum Support Rail 51200 Tubular Shaft	Steel Lower Support Rail	Steel Lower Support Rail with Predrilled Holes	Steel Lower Support Rail Assembly Carbon Steel Shaft	Corrosion Resistant Steel Lower Support Rail Assembly 440C SS Shaft	Extra Rigid Cast Steel Support Rail	Extra Rigid Cast Steel Support Rail Assembly
1/2"	•	•	•	•		•	•				
5/8"	•	•	•	•		•	•	•	•		
3/4"	•	•	•	•	•	•	•	•	•		
1"	•	•	•	•	•	•	•	•	•		
1 1/4"	•	•	•	•	•	•	•	•	•		
1 1/2"	•	•	•	•	•	•	•	•	•		
2"	•	•	•	•	•	•	•			•	•
2 1/2"						•	•				
3"						•	•			•	•
4"						•	•				
Catalog Page	17	17	18	18	18	17	17	18	18	17	18

Type	SRM	SRM T1	SRM T2	SRAM T1	SRAM T2	LSRM	LSRM T2	LSRA M	LSRA M CR
<b>Description</b>		Steel Lower Support Rail Assembly Carbon Steel Shaft	Steel Lower Support Rail with Predrilled Holes T2 Hole Pattern	Aluminum Support Rail Assembly with Predrilled Holes T1 Hole Pattern	Aluminum Support Rail Assembly with Predrilled Holes T2 Hole Pattern	Steel Lower Support Rail	Steel Lower Support Rail with Predrilled Holes T2 Hole Pattern	Steel Lower Support Rail Assembly Carbon Steel Shaft	Corrosion Resistant Steel
12mm	•	•	•	•	•	•	•		
16mm	•	•	•	•	•	•	•	•	•
20mm	•	•	•	•	•	•	•	•	•
25mm	•	•	•	•	•	•	•	•	•
30mm	•	•	•	•	•	•	•	•	•
40mm	•	•	•	•	•	•	•	•	•
Catalog Page	25	25	25	26	26	25	25	26	26

Type	ASB	FSB	SB	WM
<b>Description</b>	Aluminum Support Block	Flanged Aluminum Support Block	Steel Support Block	Waymount Support
1/4"	•		•	
3/8"	•		•	
1/2"	•	•	•	•
5/8"			•	
3/4"	•	•	•	
1"	•	•	•	•
1 1/4"		•	•	
1 1/2"	•		•	
2"				•
3"				•
4"				•
Catalog Page	19	20	19	20

Type	ASBM	SBM
<b>Description</b>	Aluminum Support Block	Steel Support Block
8mm	•	•
12mm	•	•
16mm	•	•
20mm	•	•
25mm	•	•
30mm	•	•
40mm	•	•
Catalog Page	27	27

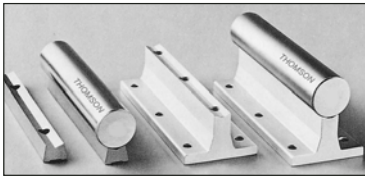
For over 50 years Danaher Motion has been producing Precision Linear Shafting for the Thomson Linear Ball Bushing and various other applications.

- We are one of a few Linear Motion component suppliers producing their own shafting.
- We offer the largest selection of linear shafting, not just the popular sizes.
- We offer a complete Linear Motion solution not just one component of a linear system.
- We offer the widest range of inch and metric shafting, support rails and support blocks in the market today.
- We continually optimize our processes to ensure optimal bearing performance and extended life.
- We perform thousands of hours of laboratory testing per year to continually evaluate our products.

While Shafts may appear the same to the untrained eye on the surface, there are significant performance differences due to the manufacturer's selected standards and the manufacturing processes used to achieve them. Thomson 60 Case was developed and is continually enhanced because of our goal to provide a consistent finish, roundness, straightness, cylindricity case hardness and depth on all shafting for the demands of a linear bearing. Unlike common shafting, Thomson 60 Case shafting is manufactured to the highest quality standards in an ISO 9000:2000 registered facility. Our techniques have been continuously upgraded with proprietary know-how gained from over 50 years of manufacturing experience. Using Thomson 60 Case with Thomson Ball Bushing\* bearings ensures optimal bearing performance and travel life.

### Assortment

Thomson 60 Case is available from stock in Carbon Steel, 440 C Stainless Steel, 52100 Tubular, 316 Stainless Steel, Carbon Steel Chrome Plated, Carbon Steel Pre-drilled, and 440 C Stainless Pre-drilled from 3/16 to 4". Thomson 60 Case can be mounted or pre-delivered pre-assembled, in three configurations: type SR standard support rails, type LSR low profile support rails and type XSR extra rigid support rails. Contact Danaher Motion or review the catalog datasheets to see available diameters for the different materials. Danaher Motion has the widest range of materials and diameters available on the market from one source.



### Material

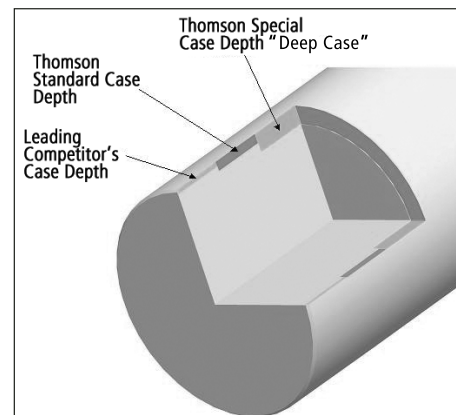
Thomson 60 Case carbon steel shafting is made of high quality specially developed alloy steel produced in the US. When it comes to linear shafting no other manufacturers have set such high standards or specifications for the raw steel used in the production of linear shafting. The chemical properties of the steel are customized to provide consistent, homogenous microstructure and proper response to thermal processing. When you use Thomson 60 Case you can be confident you get consistent meteorology from shaft to shaft.

### Case Hardness

All Thomson 60 Case is induction hardened and the hardness varies by material type. Thomson 60 Case carbon steel shaft is induction hardened to a Rc of 60 min. The Thomson 440C "corrosion resistant" Stainless steel shafting is hardened to Rc 50-55. The 316 Thomson "corrosion proof" stainless is not hardened. The Thomson 52100 Tubular shafting is hardened to a Rc 58 Min.

### Case Depth

The case depth on all Thomson 60 Case Shafting is precisely controlled for consistent quality and optimal performance. The extremely hard surface minimizes wear when acting as an inner race of a linear bearing, is resistant to seal lip wear, nicks and scratches for whatever your application needs are. The Thomson 60 Case standard case depth is in some cases double competitor shafting. This deeper standard case depth provides a stronger, more consistent homogenous microstructure for a linear bearing to run on leading to an increase in shaft life. For special applications Danaher Motion offers Deep case in carbon steel, where the case depth is two times the normal depth. For specific case depths refer to catalog datasheets.

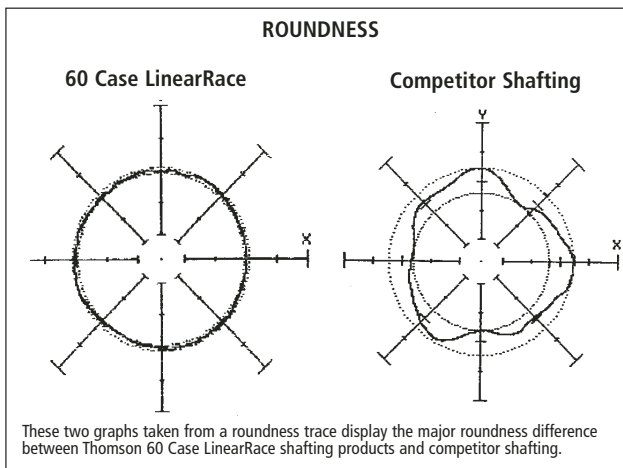


### Surface Finish

Surface is the key factor affecting travel life, load levels, frictional resistance, and smoothness of travel. Thomson 60 Case shafting is center less ground for a consistent smooth and industry leading cataloged surface finish of 8 Ra max. Excellent surface finish and hardness maximize the efficiency and life of linear bearings, shaft riding seals, and overall visual appearance. When 8 Ra is not good enough we can provide 4 to 6 Ra surface finishes at an additional cost. Smoother equals longer bearing life.

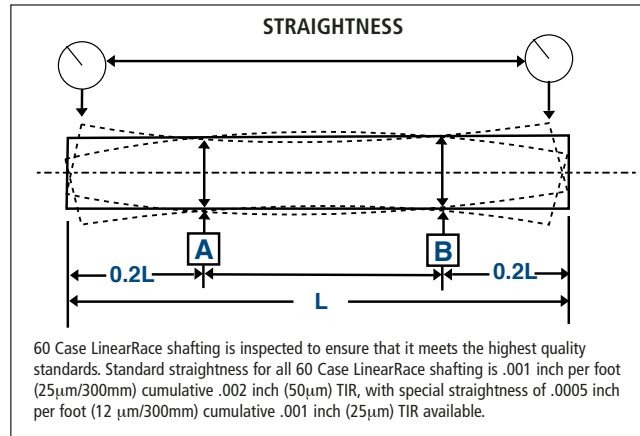
### Roundness

Shaft roundness is vital for liner race applications such as spindles and guide rods where accuracy, life or precision is paramount. Roundness ensures uniform distribution of bearing loads for maximized bearing life, longer travel life and improved positional accuracy. Shafts that look round can be deceiving to the eye and anything but round when properly evaluated, using precision tracing techniques. Thomson 60 Case shafts roundness is within 0.000080" for Class L, S, D, M and .000050" for Class N. Our leading competitors don't catalog roundness or some are .0002". Rounder equals longer bearing life.



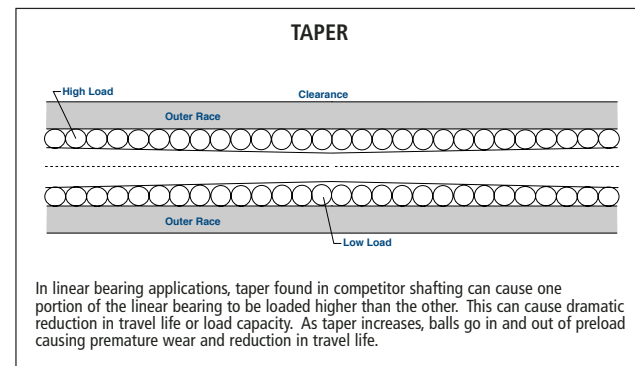
### Straightness

Straightness is the most vital parameter to positioning accuracy for a linear ball bushing system. Thomson 60 Case shafts are straight within 0.001" per foot cumulative (TIR .002") when shipped from the factory. Handling or machining of shafting can cause the material to bend once they leave the factory. When straightness is critical let Thomson provide the special machined shaft; let us machine and straighten the shaft for you using our proprietary straightening and measurement techniques. Our leading competitor does not catalog straightness. Straighter equals higher precision.



### Cylindricity

Cylindricity is a measure of the degree of conformance of the outside surface (diameter along the length of the shaft) to a true cylinder. True conformance (high cylindricity) ensures the benefits of roundness, diameter and straightness are present over the shaft length, or working surface, and not just in a particular location. This ensures uniform distribution of bearing loads, increase load capacity in the working area of the bearing, maximizes bearing life, and increases travel life. Taper is a component of cylindricity and all Thomson 60 Case shafts are produced with a maximum taper of .0001" over the entire length of the shaft.



### Length Tolerance

Thomson 60 Case shafting can be cut to your specified length. It will have a standard length tolerance of  $\pm 1/32$ " for diameters less than 2 inches and  $\pm 1/16$ " for all larger diameters. Special length tolerances are available for an additional charge. Chamfered ends are standard on all cut shafting of  $1/32$ " x 45 degrees for all diameters less than 1" and  $1/16$ " x 45 degrees for 1" and up.

### Predrilled and Tapped Holes

Thomson 60 Case shafting is stocked with radial holes drilled and tapped to accept a continuous shaft support rail in both carbon steel and 440 C stainless steel. Continuous support prevents shaft deflection when used to support heavy loads or for long travel lengths.

### Precision Special Machining

Thomson 60 Case can be supplied specially machined to your drawing and or application requirements. Leave your special machining needs to us. With over 50 years of experience we can provide with a high quality special machined shaft to your specifications allowing you to focus on your core competency. Fax us a detailed sketch or drawing and let our engineers provide you with a quotation. See page "33" for a sample of machining offered.



### Special Coatings

Thomson offers a variety of corrosion resistant products to meet the needs of specific corrosive environments. Thomson 60 Case is available thin dense chrome plated with plain ends from stock or 100% thin dense chrome plated, black oxide, Armoloy™ plated to name a few. Contact our application engineering team or see page 35 for more information.

## How does Thomson 60 Case stack up against our leading competitor's?:

	Thomson*	Competitor 1*	Competitor 2*
Materials	Carbon Steel 440 C SS 316 SS 52100 Tubular	Carbon Steel 440 C SS	Carbon Steel 440 C SS or equiv 52100 Tubular
Tolerance Classes:	L, N, S, D, G, MM	L, S, MM	L, S, MM
Case Depth*	.080"	.080"	.035"
Surface Finish*	8 Ra Max	10-12 RMS	12 RMS
Roundness (L class)*	.000080"	not cataloged	.0002"
Straightness*	.001"/foot	.001 - .002"/foot	not cataloged
Taper*	.0001"	not cataloged	.0004"

\*Based on 1" diameter and competitor cataloged information

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## Part Number Description - Inch

## 60 Case Precision Shafting

Nominal Shaft Diameter	Class	Description	Option	Material	Type
	L	For use with XA, Open and Adjustable Ball Bushing bearings and Pillow Blocks as well as Super Ball Bushing* bearings and Super Smart Ball Bushing* bearings	PD - Predrilled	- - Carbon Steel	CTL - Cut to length*
	S	For use with A type ball bushings	CPPE - Chrome Plated Plain Ends (Carbon Steel Only)	SS - 440C Stainless Steel	RL - Random Length**
	N	For use with needle roller bearings	DC - Deep Case (Carbon Steel only - Random Length)	TU - 52100 Tubular	RLL - Random Length Long
	D	For use with Thomson Die Set Ball Bushing bearings		SS316 - 316 Stainless Steel	SM - Special Machined (see page 33)
	XL	For use with XR bearing Soft (Carbon Steel)			
	G	Ball Groove Shafting for use with Thomson Super Ball bushing			

\*CTL = Cut to length is Thomson 60 Case cut to your specified length.

\*\* RL = Random length is full bar or long length shafting. It is called random length because we start with a raw bar 4" to 6" longer than the min usable but guarantee only the min. usable. We mark the ends of what is out of our own tolerance. This is the result of the manufacturing process and tightly controlled roundness specifications.

## Look for the Logo

If you specify Thomson, look for the logo. Do not be fooled when ordering linear shafting. All Thomson 60 Case LinearRace shafting is etched with the Thomson logo as shown in the picture. If the shaft you have does not have the logo, it may not be a true Thomson 60 Case. Thomson 60 Case is etched approximately every 18 to 22 inches.



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## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Inch

### Solid Carbon Steel

Hardness: 60 ROCKWELL C Min  
 Roundness: .000080" Class L and S / .000050" Class N  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Class L				Class S				Class N				Min Hardness Depth (in)	Weight Per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)	Basic Part Number	Diameter Tolerance	Surface Finish	Max Length (in)	Basic Part Number	Diameter Tolerance	Surface Finish	Max Length (in)		
3/16"	3/16 L	.1870 .1865	8 Ra Max	22	—	—	—	—	—	—	—	—	.027	.008
1/4"	1/4 L	.2495 .2490	8 Ra Max	94	1/4 S	.2490 .2485	8 Ra Max	94	1/4 N	.2500 .2498	8 Ra Max	94	.027	.014
3/8"	3/8 L	.3745 .3740	8 Ra Max	166	3/8 S	.3740 .3735	8 Ra Max	166	3/8 N	.3750 .3748	8 Ra Max	166	.027	.031
1/2"	1/2 L	.4995 .4990	8 Ra Max	166	1/2 S	.4990 .4985	8 Ra Max	166	1/2 N	.5000 .4998	8 Ra Max	166	.040	.055
5/8"	5/8 L	.6245 .6240	8 Ra Max	178	5/8 S	.6240 .6235	—	178	—	.6250 .6248	—	178	.040	.086
3/4"	3/4 L	.7495 .7490	8 Ra Max	178/202*	3/4 S	.7490 .7485	8 Ra Max	178	1/4 N	.7500 .7498	8 Ra Max	178	.060	.125
7/8"	7/8 L	.8745 .8740	8 Ra Max	178	7/8 S	.8745 .8750	8 Ra Max	—	3/8 N	.8750 .8748	8 Ra Max	178	.060	.170
1"	1 L	.9995 .9990	8 Ra Max	178/202*	1 S	.9990 .9985	8 Ra Max	178	1/2 N	1.0000 .9998	8 Ra Max	178	.080	.222
1 1/8"	1 1/8 L	1.1245 1.1240	8 Ra Max	178	—	—	—	—	—	1.1250 1.1248	—	178	.080	.281
1 1/4"	1 1/4 L	1.2495 1.2490	8 Ra Max	178/202*	1 1/4 S	1.2490 1.2485	8 Ra Max	178	1 1/4 N	1.2500 1.2498	8 Ra Max	178	.080	.348
1 3/8"	1 3/8 L	1.3745 1.3740	8 Ra Max	178	1 3/8 S	—	8 Ra Max	—	1 3/8 N	1.3750 1.3747	8 Ra Max	178	.080	.420
1 1/2"	1 1/2 L	1.4994 1.4989	8 Ra Max	178/202*	1 1/2 S	1.4989 1.4984	8 Ra Max	178	1 1/2 N	1.5000 1.4997	8 Ra Max	178	.080	.500
1 5/8"	1 5/8 L	1.6245 1.6240	8 Ra Max	178	—	—	—	—	1 5/8 N	1.6250 1.6247	—	178	.080	.587
1 3/4"	1 3/4 L	1.7495 1.7490	8 Ra Max	178	—	—	—	—	1 3/4 N	1.7500 1.7497	8 Ra Max	178	.100	.681
2"	2 L	1.9994 1.9987	8 Ra Max	178/202*	2 S	1.9987 1.9980	8 Ra Max	178	2 N	2.000 1.9997	8 Ra Max	178	.100	.890
2 1/2"	2 1/2 L	2.4993 2.4985	8 Ra Max	178/202*	2 1/2 S	2.4985 2.4977	8 Ra Max	178	2 1/2 N	2.5000 2.4996	8 Ra Max	178	.100	1.391
3"	3 L	2.9992 2.9983	8 Ra Max	178/202*	3 S	2.9983 2.9974	8 Ra Max	178	3 N	3.000 .29996	8 Ra Max	178	.100	2.003
3 1/2"	3 1/2 L	3.4990 3.4980	8 Ra Max	202	—	—	—	—	—	—	—	—	.100	2.726
4"	4 L	3.9988 3.9976	8 Ra Max	202	4 S	3.9976 3.9964	8 Ra Max	202	—	—	—	—	.100	3.560

\* Standard random length (RL) min usable length is 178", optional extra long random length (RL) min usable length is 202"

### Solid Carbon Steel

Hardness: 60 ROCKWELL C Min  
 Roundness: .000080" Class D, .0002" 2" and 3" Class XL, .0003" for 4" Class XL  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Class D				Min Hardness Depth (in)	Weight Per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)		
1"	1 D	1.0003 1.0000	8 Ra Max	178	.080	.222
1 3/8"	1 3/8 D	1.2503 1.2500	8 Ra Max	178	.080	.420
1 1/2"	1 1/2 D	1.5003 1.5000	8 Ra Max	178	.080	.500
2"	2 D	2.0003	8 Ra Max	178	.100	.890

Nominal Dia (in)	Class XL				Min Hardness Depth (in)	Weight Per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)		
2"	2 XL	1.9994 1.9991	4-8 Ra	178	.100	.890
3"	3 XL	2.9992 2.9989	4-8 Ra	178	.100	2.003
4"	4 XL	3.9988 3.9983	6-10 Ra	202	.100	3.560

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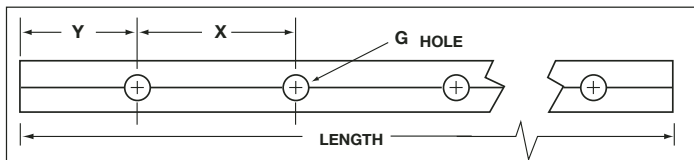
## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Inch

### Standard Options for Carbon Steel Shafting Chrome Plated Plain Ends (CPPE), Predrilled (PD), Predrilled Chrome Plated Plain Ends (PD CPPE), Solid Steel (AISI 1566 Carbon Steel)

Hardness: 60 ROCKWELL C MIN  
 Surface Finish: 8 Ra Max  
 Roundness: .00080"  
 Straightness .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Chrome Plated Plain Ends			Min Hardness Depth (in)	Weight Per Inch (lb)
	Part Number	Tolerance Class L (in)	Max Length (in)		
1/2"	1/2 L CPPE	.4995 .4990	166	.040	.055
5/8"	5/8 L CPPE	.6245 .6240	178	.040	.086
3/4"	3/4 L CPPE	.7495 .7490	178	.060	.125
1"	1 L CPPE	.9995 .9990	178	.080	.222
1 1/4"	1 1/4 L CPPE	1.2495 1.2490	178	.080	.348
1 1/2"	1 1/2 L CPPE	1.4994 1.4989	178	.080	.500
2"	2 L CPPE	1.9994 1.9987	178	.100	.890

CPPE - chrome plated plain ends which means ends and chamfers are not plated. Completely plated chamfers are available as a special machine part. See page 34



Nominal Dia (in)	Predrilled		Predrilled Chrome Plated		Hole Spacing		G Standard Thread Size	Length Tolerance (in)	Max Length (in)	Min Hardness Depth (in)	Weight per Inch (lb)
	Part Number Predrilled	L PD Tolerance Class	Part Number Predrilled Chrome Plated Ends	L PD Tolerance Class	X (inch +/- 1/64) (noncumulative)	Standard Y (in)					
1/2"	1/2 L PD	.4995 .4990	1/2 L PD CPPE	.4995 .4990	4	2	6-32	+/- 1/32	166	.040	.055
5/8"	5/8 L PD	.6245 .6240	5/8 L PD CPPE	.6245 .6240	4	2	8-32	+/- 1/32	178	.040	.086
3/4"	3/4 L PD	.7490 .7485	3/4 L PD CPPE	.7490 .7485	6	3	10-32	+/- 1/32	178	.060	.125
1"	1 L PD	.9995 .9990	1 L PD CPPE	.9995 .9990	6	3	1/4-20	+/- 1/32	178	.080	.222
1 1/4"	1 1/4 L PD	1.2490 1.2485	1 1/4 L PD CPPE	1.2490 1.2485	6	3	5/16-18	+/- 1/32	178	.080	.348
1 1/2"	1 1/2 L PD	1.4994 1.4989	1 1/2 L PD CPPE	1.4994 1.4989	8	4	3/8-16	+/- 1/32	178	.080	.500
2"	2 L PD	1.9994 1.9987	2 L PD CPPE	1.9994 1.9987	8	4	1/2-13	+/- 1/16	178	.100	.890

Holes are drilled and tapped to the center of the shaft. Different 'Y' dimensions are available upon request. Please specify when ordering. Chrome plating is thin dense chrome with an average thickness of .0005".

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## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Inch

### Solid Steel Deep Case - Available in Random Length Only

Hardness: 60 ROCKWELL C Min  
 Roundness: .000080" Class L and S / .000050" Class N  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Class L Deep Case				Class N Deep Case				Min Hardness SS Depth (in)	Weight per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)	Basic Part Number	Diameter Tolerance	Surface Finish	Max Length (in)		
3/4"	3/4 L DC	.7495 .7490	8 Ra Max	178/202*	3/4 N DC	.7500 .7498	8 Ra Max	178	.120	.125
7/8"	7/8 L DC	.8745 .8740	8 Ra Max	178	7/8 N DC	.8750 .8748	8 Ra Max	178	.120	.170
1"	1 L DC	.9995 .9990	8 Ra Max	178/202*	1 N DC	1.0000 .9998	8 Ra Max	178	.160	.222
1 1/8"	1 1/8 L DC	1.1245 1.1240	8 Ra Max	178	1 1/8 N DC	1.1250 1.1248	8 Ra Max	178	.160	.281
1 1/4"	1 1/4 L DC	1.2495 1.2490	8 Ra Max	178/202*	1 1/4 N DC	1.2500 1.2498	8 Ra Max	178	.180	.348
1 1/2"	1 1/2 L DC	1.4994 1.4989	8 Ra Max	178/202*	1 1/2 N DC	1.5000 1.4997	8 Ra Max	178	.180	.500
1 3/4"	1 3/4 L DC	1.7495 1.7490	8 Ra Max	178	1 3/4 N DC	1.7500 1.7497	8 Ra Max	178	.250	.681
2"	2 L DC	1.9994 1.9987	8 Ra Max	178/202*	2 N DC	2.0000 1.9997	8 Ra Max	178	.250	.890
2 1/2"	2 1/2 L DC	2.4993 2.4985	8 Ra Max	178/202*	2 1/2 N DC	2.5000 2.4996	8 Ra Max	178	.250	1.391
3"	3 L DC	2.9992 2.9983	8 Ra Max	178/202*	3 N DC	3.0000 2.9996	8 Ra Max	178	.250	2.003
3 1/2"	3 1/2 L DC	3.4990 3.4980	8 Ra Max	202	—	—	—	—	.250	2.726

\* Standard random length (RL) min usable length is 178", optional extra long random length (RLL) min usable length is 202"

### Ball Groove LinearRace Shaft - Solid Carbon Steel

Hardness: 60 ROCKWELL C Min  
 Roundness: .000080"  
 Straightness: Shaft Groove .002" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Class G				Min Hardness Depth (in)	Weight Per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)		
1/4"	1/4 G	.2495 .2490	8 Ra Max	45	.027	.014
3/8"	3/8 G	.3745 .3740	8 Ra Max	45	.027	.031
1/2"	1/2 G	.4995 .4990	8 Ra Max	45	.040	.055
5/8"	5/8 G	.6245 .6240	8 Ra Max	45	.040	.086
3/4"	3/4 G	.7495 .7490	8 Ra Max	45	.060	.125
1"	1G	.9995 .9990	8 Ra Max	45	.080	.222

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## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Inch

### 440 C Stainless Steel

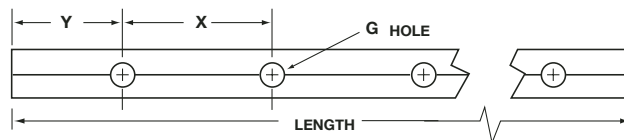
Hardness: 50 ROCKWELL C Min  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Class L				Class S				Min Hardness SS Depth (in)	Weight per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)	Basic Part Number	Diameter Tolerance	Surface Finish	Max Length (in)		
1/4"	1/4 L SS	.2495 .2490	8 Ra Max	54	1/4 S SS	.2490 .2485	8 Ra Max	54	.027	.014
3/8"	3/8 L SS	.3745 .3740	8 Ra Max	166	3/8 S SS	.3740 .3735	8 Ra Max	166	.027	.031
1/2"	1/2 L SS	.4995 .4990	8 Ra Max	166	1/2 S SS	.4990 .4985	8 Ra Max	166	.040	.055
5/8"	5/8 L SS	.6245 .6240	8 Ra Max	178	5/8 S SS	.6240 .6235	8 Ra Max	178	.040	.086
3/4"	3/4 L SS	.7495 .7490	8 Ra Max	178	3/4 S SS	.7490 .7485	8 Ra Max	178	.060	.125
1"	1 L SS	.9995 .9990	8 Ra Max	178	1 S SS	.9990 .9985	8 Ra Max	178	.080	.222
1 1/4"	1 1/4 L SS	1.2495 1.2490	8 Ra Max	178	1 1/4 S SS	1.2490 1.2485	8 Ra Max	178	.080	.348
1 1/2"	1 1/2 L SS	1.4994 1.4989	8 Ra Max	178	1 1/2 S SS	1.4989 1.4984	8 Ra Max	178	.080	.500
2"	2 L SS	1.9994 1.9987	8 Ra Max	178	2 S SS	1.9987 1.9980	8 Ra Max	178	.100	.890
2 1/2"	2 1/2 L SS	2.4993 2.4985	8 Ra Max	178	2 1/2 S SS	2.4985 2.4977	8 Ra Max	178	.100	1.391

440C stainless is "corrosion resistant" it contains some carbon which allows for hardening but carbon can result in corrosion over time.

### Standard Options for 440C Stainless Steel, Predrilled (PD)

Hardness: 50 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"



Nominal Dia (in)	Predrilled		Hole Spacing		G Standard Thread Size	Length Tolerance (in)	Max Length (in)	Min Hardness Depth (in)	Weight per Inch (lb)
	Part Number Predrilled	L PD Tolerance Class	X (inch +/- 1/64) (noncumulative)	Standard Y (in)					
1/2"	1/2 L SS PD	.4995 .4990	4	2	6-32	+/- 1/32	166	.040	.055
5/8"	5/8 L SS PD	.6245 .6240	4	2	8-32	+/- 1/32	178	.040	.086
3/4"	3/4 L SS PD	.7490 .7485	6	3	10-32	+/- 1/32	178	.060	.125
1"	1 L SS PD	.9995 .9990	6	3	1/4-20	+/- 1/32	178	.080	.222
1 1/4"	1 1/4 L SS PD	1.2490 1.2485	6	3	5/16-18	+/- 1/32	178	.080	.348
1 1/2"	1 1/2 L SS PD	1.4994 1.4989	8	4	3/8-16	+/- 1/32	178	.080	.500
2"	2 L SS PD	1.9994 1.9987	8	4	1/2-13	+/- 1/16	178	.100	.890

\*Holes are drilled and tapped to the center of the shaft. Different "Y" dimensions are available upon request. Please specify when ordering.

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## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Inch

### Ball Groove LinearRace Shaft

#### 440C - Stainless Steel

Hardness: 50 ROCKWELL C Min

Roundness: .000080"

Straightness Shaft Groove .002" Per Foot Cumulative

Taper: .0001"

Nominal Dia (in)	Class G				Min Hardness (in)	Weight per Inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)		
1/4"	1/4 G	.2495 .2490	8 Ra Max	45	.027	.014
3/8"	3/8 G	.3745 .3740	8 Ra Max	45	.027	.031
1/2"	1/2 G	.4995 .4990	8 Ra Max	45	.027	.055
5/8"	5/8 G	.6245 .6240	8 Ra Max	45	.027	.086
3/4"	3/4 G	.7495 .7490	8 Ra Max	45	.027	.125
1"	1 G	.9995 .9990	8 Ra Max	45	.027	.222

### Instrument 440C Stainless Steel Linear Race shafting for use with Thomson Instrument Ball \*bushing bearings

Hardness: 55 ROCKWELL C Min

Roundness: .000080"

Straightness .001" Per inch Cumulative

Taper: .0001"

Nominal Dia (in)	INST Class				Max Hardness (in)	Min Hardness (in)	Weight Per inch (lb)
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Length Tolerance (in)			
1/8"	1/8 INST	.1248 .1247	4 Ra Max	+/- .005	12	.027	.004
3/16"	3/16 INST	.1873 .1872	4 Ra Max	+/- .005	12	.027	.008
1/4"	1/4 INST	.2498 .2497	4 Ra Max	+/- .005	12	.027	.014

## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Inch

### 52100 Tubular

Hardness: 58 ROCKWELL C Min  
 Roundness: .000080" Class L and S  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Nominal I.D. (in)	Class L				Class S				Min Hardness (lb)	Weight per Inch
		Basic Part Number (in)	Diameter Tolerance	Surface Finish (in)	Max Length	Basic Part Number	Diameter Tolerance	Surface Finish (in)	Max Length SS Depth (in)		
3/4"	.438+/-5%	3/4 L TU	.7495 .7490	8 Ra Max	142	3/4 S TU	.7490 .7485	8 Ra Max	142	.060	.125
1"	.599+/-5%	1 L TU	.9995 .9990	8 Ra Max	173	1 S TU	.9990 .9985	8 Ra Max	173	.080	.222
1 1/2"	.890+/-5%	1 1/2 L TU	1.4994 1.4989	8 Ra Max	173	1 1/2 S TU	1.4989 1.4984	8 Ra Max	173	.080	.500
2"	1.250+/-5%	2 L TU	1.9994 1.9987	8 Ra Max	173	2 S TU	1.9987 1.9980	8 Ra Max	173	.100	.890
2 1/2"	1.750+/-5%	2 1/2 L TU	2.4993 2.4985	8 Ra Max	173	2 1/2 S TU	2.4985 2.4977	8 Ra Max	173	.100	1.391
3"	2.000+/-10%	3 L TU	2.9992 2.9983	8 Ra Max	173	3 S TU	2.9983 2.9974	8 Ra Max	173	.100	2.003
4"	3.000+/-10%	4 L TU	3.9988 3.9978	8 Ra Max	173	4 S TU	3.9978 3.9964	8 Ra Max	173	.100	3.560

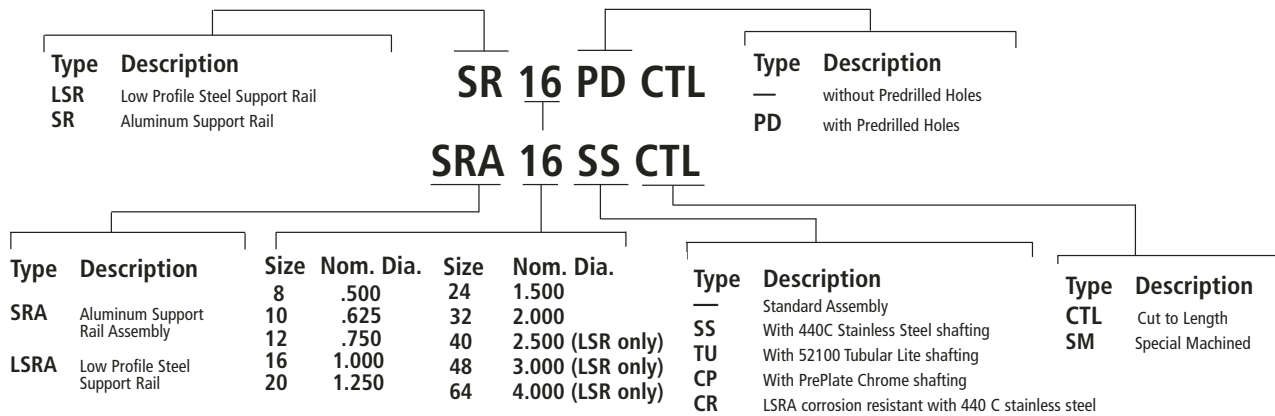
### 316 Stainless Steel

Hardness: 20-25 ROCKWELL C Min  
 Roundness: .00008"  
 Straightness: .001" Per Foot Cumulative (.002" TIR)  
 Taper: .0001"

Nominal Dia (in)	Class L					
	Basic Part Number	Diameter Tolerance (in)	Surface Finish	Max Length (in)	Min Hardness SS Depth (in)	Weight per Inch (lb)
3/8"	3/8 L SS 316	.3745 .3740	8 Ra Max	166	.027	.031
1/2"	1/2 L SS 316	.4995 .4990	8 Ra Max	166	.040	.055
5/8"	5/8 L SS 316	.6245 .6240	8 Ra Max	178	.040	.086
3/4"	3/4 L SS 316	.7495 .7490	8 Ra Max	178	.060	.125
1"	1 L SS 316	.9995 .9990	8 Ra Max	178	.080	.222
1 1/4"	1 1/4 L SS 316	1.2495 1.2490	8 Ra Max	178	.080	.348
1 1/2"	1 1/2 L SS 316	1.4994 1.4989	8 Ra Max	178	.080	.500

316 Stainless Steel is corrosion proof steel and has no carbon content which will result in corrosion.

## Inch Support Rails and Assemblies Part Number Description for Continuously Supported Applications



### Shaft Rail Supports Type SR & SR-PD

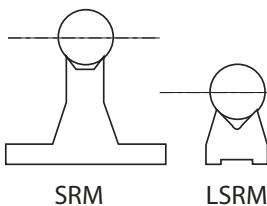
**The low cost way of mounting Thomson 60 Case Shafts**  
 Shaft supports simplify mounting of Thomson 60 Case shafts. Users of Thomson 60 Case shafting should carefully consider the use of these low cost shaft supports. They are standard, available from stock, and simplify shaft mounting. In addition to many other benefits, they eliminate many problems encountered in designing and manufacturing shaft supporting devices. These versatile mounts can be used horizontally or vertically, and in many different arrangements. Shaft support rails are available without pre-drilled holes (SR) or pre-drilled (SR-PD) shaft rails to support 1/2 inch through 2 inch diameter shafts are available in standard 24 and 48 inch lengths. Where shorter lengths are needed, rails are easily cut to length. For longer shafts they can be mounted end to end, using shims or grout, if necessary, to compensate for slight variation within manufacturing tolerance. Thomson offers shaft support rails with pre-drilled holes to simplify shaft mounting.

### Low Shaft Support Rails Type LSR & LSR-PD.

#### For compact designs.

Low Shaft Rails allow the design of more compact linear motion systems. The height from the base to the mean shaft center ranges from 9/16 inch for supporting a 1/2 inch diameter shaft to a maximum 3 1/2 inches when supporting a 4 inch diameter shaft – 40% lower than standard support rails. Low Shaft Rails are made of steel to maintain optimum shaft rigidity. Either continuous or intermittent support is possible when using Thomson open-type linear ball bearings. Low Shaft Rails are furnished in standard 4-foot lengths. Where shorter lengths are required, rails can

easily be cut. For supporting longer shafts, rails can be mounted end-to-end without limit. Low Shaft Rails are available without pre-drilled mounting holes (LSR) or with pre-drilled mounting holes (LSR-PD) to match Thomson drilled and tapped shafts (PD). When using LSR-PD, the attachment bolts



are from underneath, so you must have access under your machine base plate. The LSRA assemblies highlighted below utilize a attachment bolts from above. If one of the standard pre-drilled Low Shaft Rails is not appropriate for your design needs, Low Shaft Rails can be custom drilled by Thomson to your specifications. Send a print with all required dimensions, tolerances, and quantities needed to our application engineering team.

### Extra-Rigid Shaft Support Rails.

#### For XR\* Ball Bushing\* bearing systems.

Extra-rigid shaft support rails (XSR) are designed specifically for use with our extra-rigid Series XR\* Ball Bushing\* bearings. XSR support rails are available in nominal 24 inch lengths and are made of ductile iron and powder epoxy coated to provide the most deflection-resistant shaft support of all Thomson supports. To facilitate quick and easy installation, each extra-rigid shaft support is drilled and counter-bored for securing a drilled and tapped shaft into it and for bolting it to a flat, rigid base. For supporting long shafts, XSR support rails can be mounted end-to-end. For shorter lengths, XSR support rails can be supplied cut to required length.

### Pre-Assembled Shaft Rail Assemblies Type SRA & LSRA

Thomson 60 Case steel shafts mounted on shaft support rails are now available for instant bolt-down installation. Assemblies are supplied cut to any length, with no limit on the overall length (long lengths are butt jointed together unless specified otherwise). Either solid or light-weight tubular shafting can be assembled to the standard Thomson support rails, which come with base mounting holes spaced evenly along the overall length of the assembly. The LSRA uses a special shaft unlike the LSR-PD. The attachment bolts for the LSRA are from the top down so you can easily mount into a machine base plate. The LSRA bolt pattern closely matches Profile Rail Linear Guides and can easily be used as a drop in substitute to replace linear guides (ensure you review loading requirements).

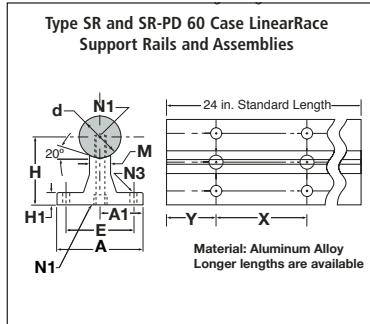


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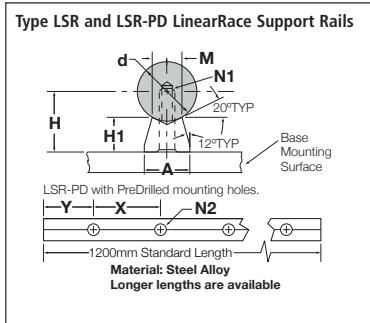
### 60 Case LinearRace Support Rails for Continuously Supported Applications - Inch

60 Case Shafting Inches



SR Without Holes	SR-PD with Predrilled Holes	Nom. LinearRace Dia. d	H ±.002	H1	A	A1	E	M	N3		LinearRace Mounting Bolt N1* (PD Only)	X	Y	SR Mass lb/ft
									Hole	Bolt				
SR-8	SR-8-PD	.500	1.125	.19	1.50	.750	1.00	.25	.17	#6	#6-32 x .88	4	2	.60
SR-10	SR-10-PD	.625	1.125	.25	1.63	.813	1.13	.31	.19	#8	#8-32 x .88	4	2	.80
SR-12	SR-12-PD	.750	1.500	.25	1.75	.875	1.25	.38	.22	#10	#10-32 x 1.25	6	3	1.00
SR-16	SR-16-PD	1.000	1.750	.25	2.13	1.063	1.50	.50	.28	1/4	1/4-20 x 1.25	6	3	1.40
SR-20	SR-20-PD	1.250	2.125	.31	2.50	1.250	1.88	.56	.34	5/16	5/16-20 x 1.5	6	3	2.10
SR-24	SR-24-PD	1.500	2.500	.38	3.00	1.500	2.25	.69	.34	5/16	3/16-18 x 1.75	8	4	2.60
SR-32	SR-32-PD	2.000	3.250	.50	3.75	2.750	2.75	7/8	.406	3/8	1/2-13 x 2.50	8	4	4.20

\* N1 Hole Dia. includes counterbore for socket head cap screw. Alignment and location of holes are are ± .010, noncumulative.



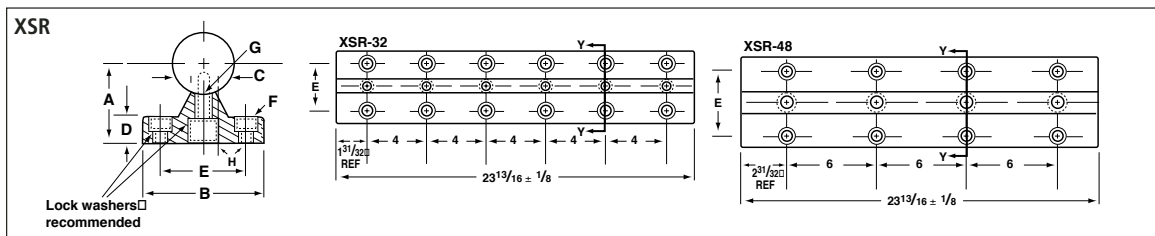
LSR Standard Without Holes	LSR-PD Standard w/Pre drilled Holes	Nom. LinearRace Dia. d	H ±.002	H1	A	M	N2* N1*		X	Y	LSR Mass lb/ft
							Hole	Bolt			
LSR-8	LSR-8-PD	.500	.562	.34	.37	.25	.17	#6-32	4	2	.32
LSR-10	LSR-10-PD	.625	.687	.41	.45	.31	.19	#8-32	4	2	.49
LSR-12	LSR-12-PD	.750	.750	.42	.51	.38	.22	#10-32	6	3	.59
LSR-16	LSR-16-PD	1.000	1.000	.56	.69	.50	.28	1/4-20	6	3	1.01
LSR-20	LSR-20-PD	1.250	1.187	.63	.78	.56	.34	5/18-18	6	3	1.27
LSR-24	LSR-24-PD	1.500	1.375	.70	.93	.69	.41	3/8-16	8	4	1.68
LSR-32	LSR-32-PD	2.000	1.750	0.845	1.180	0.875	0.531	1/2-13	8	4	2.59
LSR-40	LSR-40-PD	2.500	2.250	1.125	1.500	1.125	1.125	5/8-11	8	4	4.48
LSR-48	LSR-48-PD	3.000	2.750	1.404	1.875	1.375	1.375	3/4-10	8	4	6.68
LSR-64	LSR-64-PD	4.000	3.500	1.750	2.500	1.875	1.875	1-8	8	4	11.8

#### Type XSR Shaft Support Rails (dimensions in inches)

Extra Rigid Support Rail Part No.	Nom. Shaft Dia. (inches)	A† ±.000 - .001	B*	C	D	E	Screw Dia.	F Hole	C Bore	Recommended Screw	G Hole	C Bore	H Degrees	wt/ft (lbs.)
XSR-32	2	2.750	4-1/2	7/8	1	3-1/8	1/2	9/16	1 x 5/8 DP	1/2-13 x 2	9/16	1 x 3/4 DP	15	16
XSR-32	2	2.750	4-1/2	7/8	1	3-1/8	1/2	11/16	1-1/4 x 3/4 DP	3/4-10 x 2-3/4	13/16	1-7/16 x 1-1/8 DP	25	31

† Centerline of shaft will be parallel to base within .0005.

\* Surface dimensions as cast



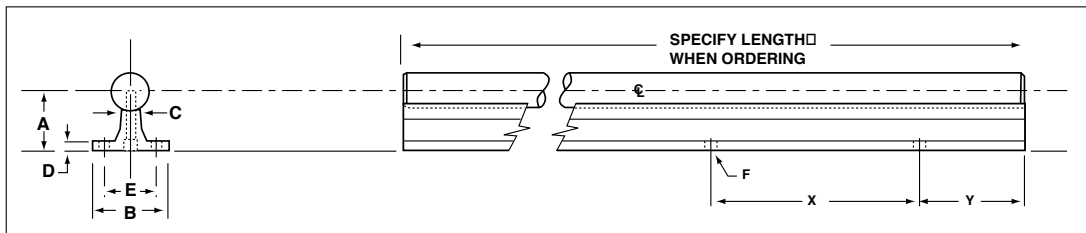
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## 60 Case LinearRace Support Rail Assemblies for Continuously Supported Applications - Inch

Thomson Standard Shaft Rail Assemblies (dimensions in inches)														
Assembly Number			Nominal Linear Bearing Race Diameter ±.002	Dimensions (inches)							Base Holes		Wt per Foot (lbs.)	
With Solid Carbon Steel Shaft	With Solid Stainless Steel Shaft	With Tubular 52100 (inches)		A	B	C	D	E	F		X	Y	SRA and SRA-SS	SRA-TU
SRA-8	SRA-8-SS	—	1/2	1.125	1-1/2	1/4	3/16	1	6	.169	4	2	1.26	—
SRA-10	SRA-10-SS	—	5/8	1.125	1-5/8	5/16	1/4	1-1/8	8	.193	4	2	1.83	—
SRA-12	SRA-12-SS	SRA-12-TU	3/4	1.500	1-3/4	3/8	1/4	1-1/4	10	.221	6	3	2.50	1.90
SRA-16	SRA-16-SS	SRA-16-TU	1	1.750	2-1/8	1/2	1/4	1-1/2	1/4	.281	6	3	4.06	3.30
SRA-20	SRA-20-SS	—	1-1/4	2.125	2-1/2	9/16	5/16	1-7/8	5/16	.343	6	3	6.28	—
SRA-24	SRA-24-SS	SRA-24-TU	1-1/2	2.500	3	11/16	3/8	2-1/4	5/16	.343	8	4	8.60	6.54
SRA-32	SRA-32-SS	SRA-32-TU	2	3.250	3-3/4	7/8	1/2	2-3/4	3/8	.406	8	4	14.88	10.70

Support Rail Material: Aluminum alloy extrusion. Base mounting hole locations are within ±.010 (noncumulative)

\*Notes: Lengths longer than 48" will use end to end support rails.



**Type LSRA 60 Case\* Smart Rail Assemblies (Bolt down from top)**

Material: Steel Alloy  
Longer lengths are available

Type LSRA Smart Rail* Guides (dimensions in inches)									
Part Number <sup>(3)</sup>		LinearRace shafting Diameter	H +/-0.002	A	A1	M	Mounting Holes		Weight lb/ft
Smart Rail Assembly <sup>(1)</sup>	Smart Rail Assembly <sup>(2)</sup>						X1	N1	
LSRA10	LSRA10CR	0.625	0.687	0.45	0.225	.31	2	#5	1.57
LSRA12	LSRA12CR	0.750	0.750	0.51	0.255	.38	3	#6	2.09
LSRA16	LSRA16CR	1.000	1.000	0.69	0.345	.5	3	#10	3.67
LSRA20	LSRA20CR	1.250	1.187	0.78	0.390	.56	3	5/16	5.86
LSRA24	LSRA24CR	1.500	1.375	0.93	0.465	.69	4	3/8	7.68

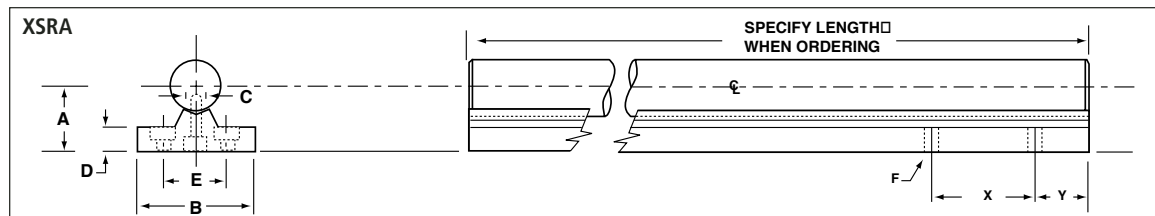
- (1) = Consists of black oxide steel rail and high carbon steel LinearRace shafting (HRC 60 min).
- (2) = Consists of zinc plated steel rail and 440C stainless steel LinearRace shafting (HRC 50 min).
- (3) = Specify length of assembly when ordering. For example, LSRA12CR x 24.00 inches.

Y dimension is equal on each end unless specified by customer.

NOTE: LSRA's do not use standard "PD" shafting. The shafting requires a different hole pattern and configuration

Thomson XSRA Extra Rigid Shaft Rail Assemblies (dimensions in inches)																
Assembly Number		Nominal LinearRace shafting Diameter (inches)	Dimensions (inches)							Base Holes		Weight per Foot (lbs.)				
With Solid Carbon Steel Shaft	With Tubular Carbon Steel Shaft		A +.000 -.001	B	C	D	E	F			X	Y	XSRA	XSRA-TU		
XSRA-32	XSRA-32-TU	2	2.750	4-1/2	7/8	1	3-1/8	1/2	9/16	1 x 5/8 DP			4	1-31/32	40.04	22.50
XSRA-48	XSRA-48-TU	3	4.000	6	1-1/4	1-5/16	4-1/4	5/8	11/16	1-1/4 x 3/4 DP			6	2-31/32	73.72	49.70

\*Note: Lengths longer than 24" will use end to end support rails



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## Inch Support Block Part Number Description for End Supported Applications

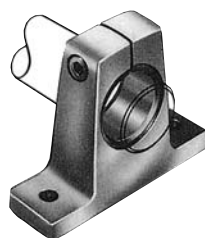
### ASB - 16

Type	Description	Size	Nominal Dia. (in)	Size	Nominal Dia. (in)
ASB	Low Profile 60 Case LinearRace End Support Block	4	.250	20	1.250
SB	Standard 60 Case LinearRace End Support Block	6	.375	24	1.500
FSB	Flanged 60 Case LinearRace End Support Block	8	.500	32	2.000
WM	Waymount Support	10	.625	48	3.000
		12	.750	64	4.000
		16	1.000		

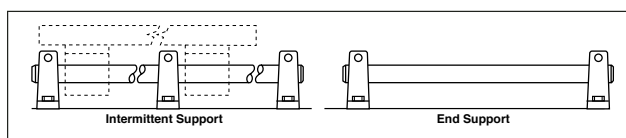
#### Shaft Support Blocks – Type SB and ASB.

##### For end support or intermittent support.

Shaft support blocks are used for end or intermittent support where loads are light and deflection between supports is not a problem. Unlike shaft support rails, blocks do not permit longitudinal passage of open-type Ball Bushing bearings. Shaft support blocks enable clamping of shafts, type SB and eliminate the need for bolts, etc. to maintain shaft position. Shimming is suggested for high precision applications to eliminate the effect of variations in surface of base or manufacturing tolerances between supports.



Type ASB shaft blocks, manufactured from high strength extruded aluminum, provide either end or intermittent support in applications where loads are designed with a reference edge on one side of the base. This provides a surface parallel to the center of the shaft within  $\pm .001$ " that can be used to simplify shaft alignment.



**Type ASB LinearRace Support Block**

Material: Aluminum Alloy

Part <sup>(2)</sup> Number	Nominal LinearRace Diameter d	H $\pm .0001$	H1	A	A1 $\pm .001$	B	E	N3		Mass lb
								Hole	Bolt	
ASB-4	.250	.500	1.125	1.50	.750	.50	1.12	.16	#6	.06
ASB-6	.375	.562	1.00	1.62	.813	.56	1.25	.16	#6	.08
ASB-8	.500	.875	1.48	2.00	1.000	.63	1.50	.19	#8	.11
ASB-12	.750	1.125	1.95	2.50	1.250	.75	2.00	.22	#10	.22
ASB-16	1.000	1.375	2.48	3.25	1.625	1.00	2.50	.28	1/4	.44
ASB-24	1.500	2.000	3.50	4.75	2.375	1.25	3.50	.34	5/16	1.16

**Type SB LinearRace Support Block**

Material: Malleable Iron for sizes .5 to 2 in.  
Aluminum Alloy for sizes .25 and .375 in.

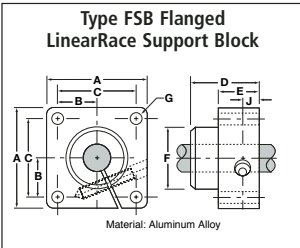
Part <sup>(2)</sup> Number	Nominal LinearRace Diameter d	H $\pm .002$	H1	H2	A	A1	B	E $\pm .010$	N3		Mass lb
									Hole	Bolt	
SB-4	.250	.687	1.06	.25	1.50	.63	.50	1.125	.16	#6	.03
SB-6	.375	.750	1.19	.25	1.63	.69	.56	1.250	.16	#6	.05
SB-8	.500	1.000	1.63	.25	2.00	.75	.63	1.500	.19	#8	.30
SB-10	.625	1.000	1.75	.31	2.50	.88	.69	1.875	.22	#10	.40
SB-12	.750	1.250	2.13	.31	2.75	1.00	.75	2.000	.22	#10	.50
SB-16	1.000	1.500	2.56	.38	3.25	1.38	1.00	2.500	.28	1/4	1.00
SB-20	1.250	1.750	3.00	.44	4.00	1.75	1.13	3.000	.34	5/16	2.00
SB-24	1.500	2.000	3.50	.50	4.75	2.00	1.25	3.500	.34	5/16	2.60
SB-32	2.000	2.000	4.50	.63	6.00	2.63	1.50	4.500	.41	3/8	4.80

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## Support Blocks - Inch

### Thomson Flanged Shaft Support Blocks Offer:

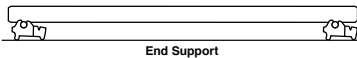
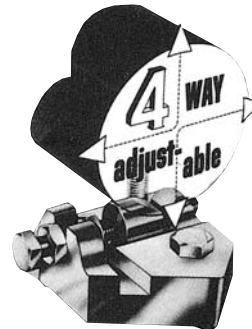
- Perpendicular mounting without the need for special adaptor brackets



Part <sup>(2)</sup> Number	Nominal LinearRace Diameter d	A ±.001	B	C ±.010	D	E	F	G (dimensions in inches)		J	Mass lb
								Hole	Bolt		
FSB-8	.500	1.63	.81	1.250	.88	.50	1.00	.18	#8	.25	.3
FSB-12	.750	2.38	1.19	1.750	1.00	.63	1.25	.21	#10	.31	.6
FSB-16	1.000	2.75	1.38	2.125	1.25	.63	1.50	.27	1/4	.31	.8
FSB-20	1.250	3.13	1.56	2.375	1.38	.75	1.75	.27	1/4	.38	.9

### Waymount Support. For adjustable support.

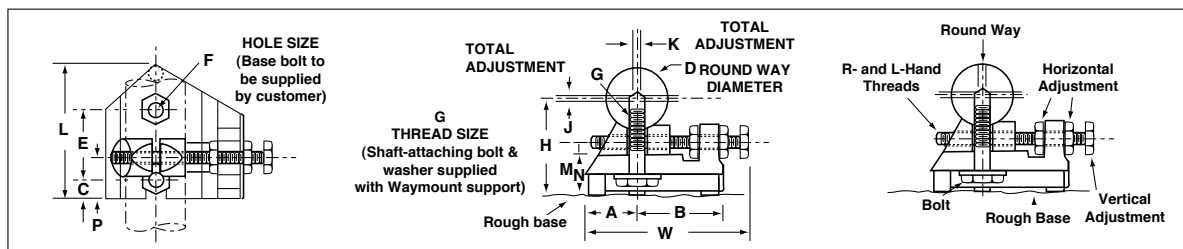
Designed for use with Roundway\* bearings. Two or more can be used to provide intermittent support and adjustment along the length of the shaft. Unlike shaft support rails, Waymount supports do not permit longitudinal passage of open-type Ball Bushing\* bearings. When it is necessary to travel over Waymount supports, Roundway bearings should be used. Open-type Ball Bushing bearings can be used only if side loads are light and an adaptor block is used (consult factory for recommendation).



Waymount Supports (dimensions in inches)																
Waymount Number	D RoundWay Diameter	L	H <sup>1</sup>	W	A	B	C	E	F	G	J	K	M	N	P	Weight (lbs)
WM-8	1/2"	1-1/2"	1-1/16"	1-3/4"	1/2"	7/8"	1/4"	3/4"	7/32"	8-32	3/64"	3/32"	11/16"	1/2"	7/16"	.2
WM-16	1"	2"	1-1/2"	2-1/2"	3/4"	1-1/4"	5/16"	1-1/16"	9/32"	1/4"-28	1/16"	1/8"	13/16"	11/16"	11/16"	.5
WM-24	1-1/2"	2-1/2"	2"	3-1/2"	1-3/16"	1-5/8"	7/16"	1-3/16"	11/32"	5/16"-24	1/8"	1/8"	1"	3/4"	3/4"	1.1
WM-32	2"	3"	2-1/2"	4"	1-7/16"	1-7/8"	1/2"	1-3/8"	13/32"	3/8"-24	1/8"	1/8"	1-1/4"	15/16"	1"	1.8
WM-48	3"	5"	4-5/16"	6-3/4"	2-3/8"	3-3/8"	3/4"	2-5/8"	21/32"	5/8"-18	1/8"	1/8"	2-1/4"	1-5/8"	1-1/2"	10.2
WM-64	4"	6-1/2"	5-7/16"	8-1/2"	3"	4-1/4"	1"	3-1/8"	25/32"	3/4"-16	1/8"	1/8"	2-3/4"	2"	2"	21.2

In-Between Shaft Sizes: Waymount supports will accommodate all shaft sizes from approximately 3/8" to 6" diameter. Use the Waymount support size nearest to your particular shaft diameter. Favor the next largest Waymount support if the shaft size falls midway between two of them. The mean centering height "H" will vary somewhat with different diameter shafts.

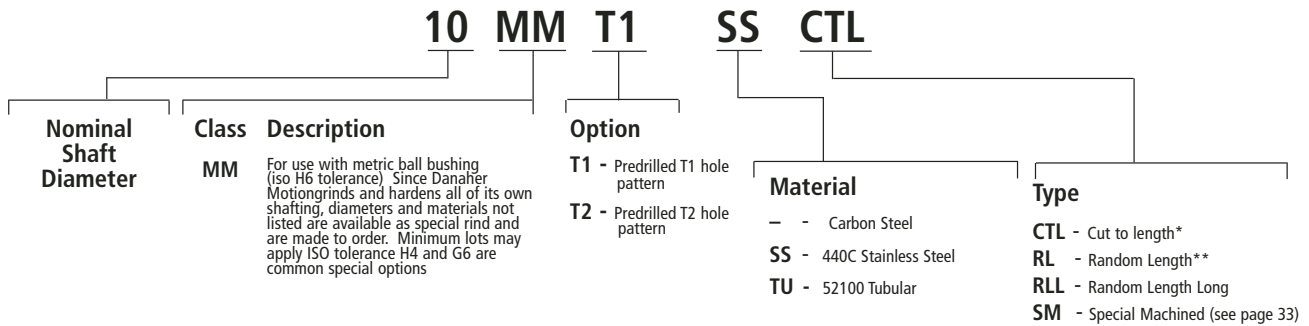
<sup>1</sup>Please note difference in dimension between shaft centerline of rails, blocks and Waymount supports. Shimming or blocking is suggested when these are used on a single shaft.



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## Part Number Description

### 60 Case Metric Precision Shafting



\*CTL = Cut to length is Thomson 60 Case cut to your specified length.

\*\* RL = Random length is full bar or long length shafting. It is called random length because we start with a raw bar 4" to 6" longer than the min usable but guarantee only the min. visible. We mark the ends of what is out of our own tolerance. This is the result of the manufacturing process and tightly controlled roundness specifications.

### Solid Carbon Steel

Hardness: 60 ROCKWELL C Min  
 Roundness: .0020mm (.000080") Class MM  
 Straightness: .0254mm (.001") Per Foot Cumulative (.051mm (.002") TIR)  
 Taper: .0025mm (.001")

Nominal Dia (mm)	Basic Part Number	Diameter Tolerance		Surface Finish	Min Usable Length		Min Hardness Depth		Wt per mm (kg)	Weight per Inch (lb)
		(mm)	(inch)		(mm)	(inch)	(mm)	(in)		
5	5 MM	5.00 4.49	0.1969 0.1965	8 Ra Max	1905	75	0.69	0.027	0.001	0.009
8	8 MM	8.00 7.99	0.3150 0.3146	8 Ra Max	4216	166	0.69	0.027	0.003	0.022
10	10 MM	10.00 9.99	0.3937 0.3932	8 Ra Max	4216	166	0.69	0.027	0.0035	0.035
12	12 MM	12.00 11.99	0.4742 0.4720	8 Ra Max	4216	166	1.02	0.04	0.0050	0.050
16	16 MM	16.00 15.99	0.6299 0.6295	8 Ra Max	4521	178	1.02	0.04	0.0096	0.088
20	20 MM	20.00 19.99	0.7874 0.7869	8 Ra Max	4521/5130*	178/202*	1.52	0.06	0.012	0.138
25	25 MM	25.00 24.99	0.9843 0.9838	8 Ra Max	4521/5130*	178/202*	2.03	0.08	0.019	0.216
30	30 MM	30.00 29.99	1.1811 1.1806	8 Ra Max	4521	178	2.03	0.08	0.027	0.311
40	40 MM	40.00 39.99	1.5748 1.5743	8 Ra Max	4521	178	2.03	0.08	0.048	0.553
50	50 MM	50.00 49.98	1.9685 1.9679	8 Ra Max	4521/5130*	178/202*	2.54	0.1	0.075	0.864
60	60 MM	60.00 59.98	2.3622 2.3615	8 Ra Max	4521	178	2.54	0.1	0.108	1.240
80	80 MM	80.00 79.97	3.1496 3.1486	8 Ra Max	5130	202	2.54	0.1	0.192	2.210

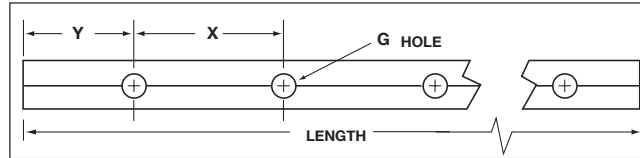
\*Standard random length (RL) min usable length is 4521mm (178"), optional extra long random length (RLL) min usable length 5130 (202")

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## Thomson Hardened and Ground 60 Case Precision LinearRace Shafting - Metric

### Standard Options for Carbon Steel Shafting Predrilled (T1 and T2)

Hardness: 60 ROCKWELL C MIN  
 Surface Finish: 8 Ra Max  
 Roundness: .0020mm (.00080") Class MM  
 Straightness: .0254mm (.001") Per Foot Cumulative (.051mm (.002) TIR)  
 Taper: .0025mm (.001")



### T1 Predrilled

Nominal DiaNumber (mm)	Basic Part	MMT1 Diameter Tolerance		X		Standard Y		G Standard size	Min Usable Length		Min Hardness Depth		Wt per mm (kg)	Wt per in (lb)
		(mm)	(inch)	(mm)	(inch)	(mm)	(inch)		(mm)	(in)	(mm)	(in)		
12	12 MMT1	12.00 11.99	0.4724 0.4720	75	2.95	37.5	1.48	M4	4216	166	1.02	0.04	0.0050	0.050
16	16 MMT1	16.00 15.99	0.6299 0.6295	100	3.94	50	1.97	M5	4521	178	1.02	0.04	0.0096	0.088
20	20 MMT1	20.00 19.99	0.7874 0.7869	100	3.94	50	1.97	M6	4521	178	1.52	0.06	0.012	0.138
25	25 MMT1	25.00 24.99	0.9843 0.9838	120	4.72	60	2.36	M8	4521	178	2.03	0.08	0.019	0.216
30	30 MMT1	30.00 29.99	1.1811 1.1806	150	5.91	75	2.95	M10	4521	178	2.03	0.08	0.027	0.311
40	40 MMT1	40.00 39.99	1.5748 1.5743	200	7.87	100	3.94	M10	4521	178	2.03	0.08	0.048	0.553

### T2 Predrilled

Nominal DiaNumber (mm)	Basic Part	MMT2 Diameter Tolerance		X		Standard Y		G Standard size	Min Usable Length		Min Hardness Depth		Wt per mm (kg)	Wt per in (lb)
		(mm)	(inch)	(mm)	(inch)	(mm)	(inch)		(mm)	(in)	(mm)	(in)		
12	12 MMT2	12.00 11.99	0.4724 0.4720	120	4.72	60.0	2.36	M4	4216	166	1.02	0.04	0.0050	0.050
16	16 MMT2	16.00 15.99	0.6299 0.6295	150	5.91	75	2.95	M5	4521	178	1.02	0.04	0.0096	0.088
20	20 MMT2	20.00 19.99	0.7874 0.7869	150	5.91	75	2.95	M6	4521	178	1.52	0.06	0.012	0.138
25	25 MMT2	25.00 24.99	0.9843 0.9838	200	7.87	100	3.94	M8	4521	178	2.03	0.08	0.019	0.216
30	30 MMT2	30.00 29.99	1.1811 1.1806	200	7.87	100	3.94	M10	4521	178	2.03	0.08	0.027	0.311
40	40 MMT2	40.00 39.99	1.5748 1.5743	300	11.81	150	5.91	M10	4521	178	2.03	0.08	0.048	0.553

**440 C Stainless**

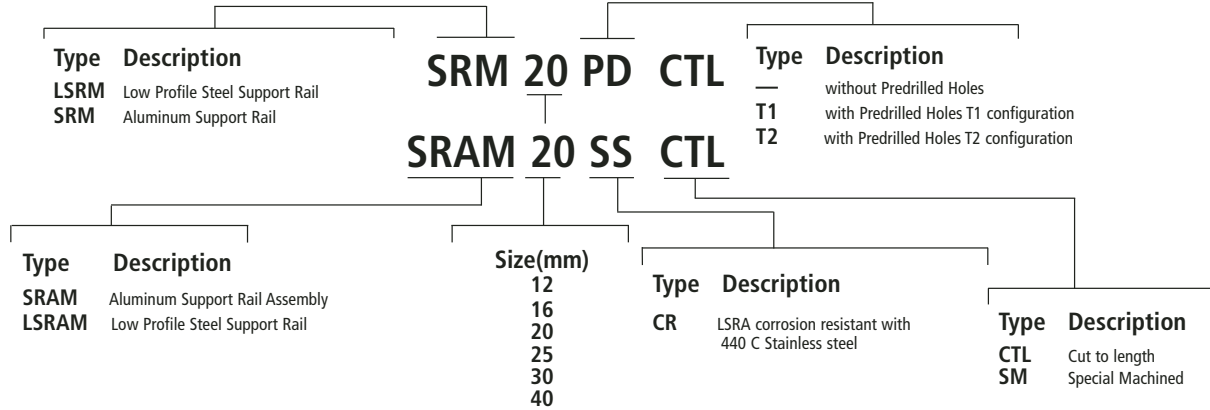
Hardness: 50 ROCKWELL C Min  
 Roundness: .0020mm (.000080") Class MM  
 Straightness: .0254mm (.001") Per Foot Cumulative (.051mm (.002") TIR)  
 Taper: .0025mm (.001")

Nominal Dia (mm)	Basic Part Number	Diameter Tolerance		Surface Finish	Min Usable Length		Min Hardness Depth		Wt per mm (kg)	Weight per Inch (lb)
		(mm)	(inch)		(mm)	(inch)	(mm)	(in)		
5	5 MM	5.00 4.49	0.1969 0.1965	8 Ra Max	1905	75	0.69	0.027	0.001	0.009
8	8 MM	8.00 7.99	0.3150 0.3146	8 Ra Max	4216	166	0.69	0.027	0.003	0.022
10	10 MM	10.00 9.99	0.3937 0.3932	8 Ra Max	4216	166	0.69	0.027	0.0035	0.035
12	12 MM	12.00 11.99	0.4742 0.4720	8 Ra Max	4216	166	1.02	0.04	0.0050	0.050
16	16 MM	16.00 15.99	0.6299 0.6295	8 Ra Max	4521	178	1.02	0.04	0.0096	0.088
20	20 MM	20.00 19.99	0.7874 0.7869	8 Ra Max	4521/5130*	178/202*	1.52	0.06	0.012	0.138
25	25 MM	25.00 24.99	0.9843 0.9838	8 Ra Max	4521/5130*	178/202*	2.03	0.08	0.019	0.216
30	30 MM	30.00 29.99	1.1811 1.1806	8 Ra Max	4521	178	2.03	0.08	0.027	0.311
40	40 MM	40.00 39.99	1.5748 1.5743	8 Ra Max	4521	178	2.03	0.08	0.048	0.553
50	50 MM	50.00 49.98	1.9685 1.9679	8 Ra Max	4521/5130*	178/202*	2.54	0.1	0.075	0.864
60	60 MM	60.00 59.98	2.3622 2.3615	8 Ra Max	4521	178	2.54	0.1	0.108	1.240

60 Case  
Shafting Metric

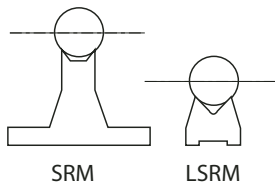
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## Metric Support Rails and Assemblies Part Number Description for Continuously Supported Applications



**Shaft Rail Supports Type SRM, SRM-T1 & SRM-T2.**  
**The low cost way of mounting Thomson 60 Case shafts.**  
 Shaft supports simplify mounting of Thomson 60 Case shafts. Users of Thomson 60 Case shafting should carefully consider the use of these low cost shaft supports. They are standard, available from stock, and simplify shaft mounting. In addition to many other benefits, they eliminate many problems encountered in designing and manufacturing shaft supporting devices. These versatile mounts can be used horizontally or vertically, and in many different arrangements. Shaft support rails are available without pre-drilled holes (SR) or pre-drilled (SR-PD) shaft rails to support 12mm to 40mm diameter shafts are available in standard 600mm where shorter lengths are needed, rails are easily cut to length. For longer shafts they can be mounted end to end, using shims or grout, if necessary, to compensate for slight variation within manufacturing tolerance. Thomson offers shaft support rails with pre-drilled holes to simplify shaft mounting.

**Low Shaft Support Rails Type LSR, LSR-T2.**  
**For compact designs.**  
 Low Shaft Rails allow the design of more compact linear motion systems. The height from the base to the mean shaft center ranges from 14mm for supporting a 12mm diameter shaft to a maximum 39mm when supporting a 40mm diameter shaft – 40% lower than standard support rails. Low Shaft Rails are made of steel to maintain optimum shaft rigidity. Either continuous or intermittent support is possible when using Thomson open-type linear ball bearings. Low Shaft Rails are furnished in standard 1200mm lengths. Where shorter lengths are required, rails can easily be cut. For supporting longer shafts, rails can be mounted end-to-end without limit. Low Shaft Rails are available without



pre-drilled mounting holes (LSR) or with pre-drilled mounting holes (LSR-T2) to match Thomson drilled and tapped shafts (T2).

**Note:** When using LSRM-T2, the attachment bolts are from underneath, so you must have access under your machine base plate. The LSRAM assemblies highlighted below utilize a attachment bolts from above. If one of the standard pre-drilled Low Shaft Rails is not appropriate for your design needs, Low Shaft Rails can be custom drilled by Thomson to your specifications. Send a print with all required dimensions, tolerances, and quantities needed to our application engineering team.

**Extra-Rigid Shaft Support Rails.**  
**For XR\* Ball Bushing\* bearing systems.**  
 Extra-rigid shaft support rails (XSR) are designed specifically for use with our extra-rigid Series XR\* Ball Bushing\* bearings. XSR support rails are available in nominal 24 inch lengths and are made of ductile iron and powder epoxy coated to provide the most deflection-resistant shaft support of all Thomson supports. To facilitate quick and easy installation, each extra-rigid shaft support is drilled and counter-bored for securing a drilled and tapped shaft into it and for bolting it to a flat, rigid base. For supporting long shafts, XSR support rails can be mounted end-to-end. For shorter lengths, XSR support rails can be supplied cut to required length.

**Pre-Assembled Shaft Rail Assemblies Type SRAM & LSRAM**  
 Thomson 60 Case steel shafts mounted on shaft support rails are now available for instant bolt-down installation. Assemblies are supplied cut to any length, with no limit on the overall length (long lengths are butt jointed together unless specified otherwise). Either solid or light-weight tubular shafting can be assembled to the standard Thomson support rails, which come with base mounting holes spaced evenly along the overall length of the assembly. The LSRAM uses a special shaft unlike the LSRM-T2. The attachment bolts for the LSRA are from the top down so you can easily mount into a machine base plate. The LSRAM bolt pattern closely matches Profile Rail Linear Guides and can easily be used as a drop in substitute to replace linear guides (ensure you review loading requirements).



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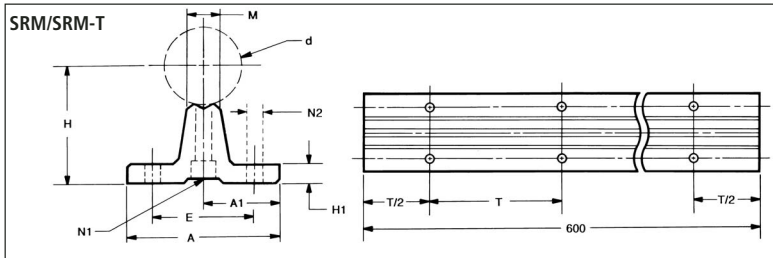


### 60 Case LinearRace Support Rails for Continuously Supported Applications

Type SR/SR-PD LinearRace* Support Rails and Assemblies (dimensions in mm)													
Without Holes	with T1 Hole Spacing	with T2 Hole Spacing	D h6	H ±.02	H1	A	M	E ±.015	Bolt Hole				Shaft <sup>(1)</sup> Rail Mass
									Spacing		Sizes		
									T1 (mm)	T2 (mm)	N1	N2	
SR M12	SR M12 T1	SR M12 T2	12	28	5	43	9	29	75	120	M4	4.5	1.9
SR M16	SR M16 T1	SR M16 T2	16	30	5	48	10	33	100	150	M5	5.5	2.8
SR M20	SR M20 T1	SR M20 T2	20	38	6	56	11	37	100	150	M6	6.6	4.2
SR M25	SR M25 T1	SR M25 T2	25	42	6	60	14	42	120	200	M8	6.6	5.9
SR M30	SR M30 T1	SR M30 T2	30	53	8	74	14	51	150	200	M10	8.6	8.7
SR M40	SR M40 T1	SR M40 T2	40	60	8	78	18	55	200	300	M10	8.6	13.6

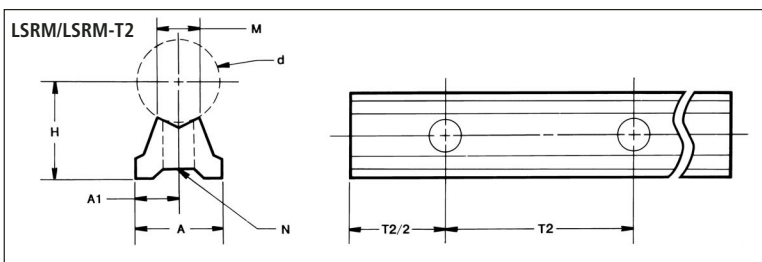
\* N1 Hole Dia. includes counterbore for socket head cap screw.  
Mounting hole patterns for various sizes. Alignment and location of holes are ± .010, noncumulative.

1- Standard Length 600mm



Part Number		Dimensions (mm)					Bolt Hole		
Without Holes	with T2 Hole Spacing	d h6	H ±.02	A ±.02	A1 ±.15	M ±.15	Bolt Hole		Shaft <sup>(1)</sup> Rail Mass
							Spacing (mm)	Size N	
LSR M12	LSR M12 T2	12	14	12	6.0	6.0	120	M4	1.5
LSR M16	LSR M16 T2	16	18	14	7.0	7.0	150	M5	2.4
LSR M20	LSR M20 T2	20	22	17	8.5	8.3	150	M6	3.7
LSR M25	LSR M25 T2	25	26	21	10.5	10.8	200	M8	5.6
LSR M30	LSR M30 T2	30	30	23	11.5	11.0	200	M10	9.0
LSR M40	LSR M40 T2	40	40	30	15.0	15.0	300	M12	13.3

2- Standard Length 1200mm

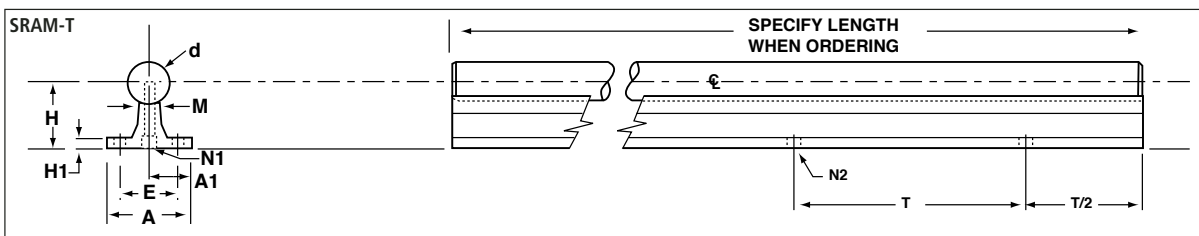


60 Case  
Shafting Metric

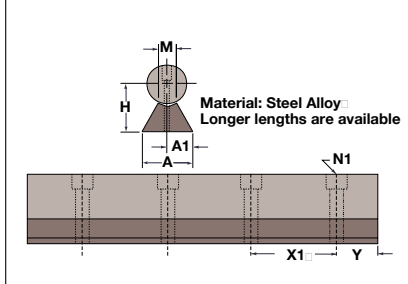
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### 60 Case LinearRace Support Rail Assemblies for Continuously Supported Applications - Metric

Type SRAMT1 and SRAMT2 LinearRace shafting Support Rail Assemblies													
Part Number		d	H ±.002	H1	A	A1 ±.012	M	E ±.015	N1	N2	T1	T2	mass kg/m
SRAMT1 Assembly with LinearRace shafting	SRAMT2 Assembly with LinearRace shafting												
SR M12	SR M12 T1	12	28	5	43	21.5	9	29	M4	4.5	75	120	4.06
SR M16	SR M16 T1	16	30	5	48	24	10	33	M5	5.5	100	150	6.24
SR M20	SR M20 T1	20	38	6	56	28	11	37	M6	6.6	100	150	10.44
SR M25	SR M25 T1	25	42	6	60	30	14	42	M8	6.6	120	200	13.69
SR M30	SR M30 T1	30	53	8	74	37	14	51	M10	8.6	150	200	20.02
SR M40	SR M40 T1	40	60	8	78	39	18	55	M10	8.6	150	300	32.54



#### Type LSRAM 60 Case\* Smart Rail Assemblies



Type LSRAM Smart Rail Assemblies									
Part Number <sup>(3)</sup>		LinearRace Diameter h6	H +/-0.002	A	A1 +/-0.002	M +/-0.15	Mounting Holes		Mass kg/m
Smart Rail Assembly <sup>(1)</sup> shafting	Smart Rail Assembly <sup>(2)</sup> Shafting						T4	N1	
LSRA M16	LSRA M16 CR	16	18	14	7.0	7.0	40	M3	3.6
LSRA M20	LSRA M20 CR	20	22	17	8.5	8.3	60	M4	5.5
LSRA M25	LSRA M25 CR	25	26	21	10.5	10.8	60	M5	8.5
LSRA M30	LSRA M30 CR	30	30	23	11.5	11.7	80	M6	13.0
LSRA M40	LSRA M40 CR	40	39	30	15.0	15.0	105	M10	21.0

- (1) = Consists of black oxide steel rail and high carbon steel LinearRace shafting (HRC 60 min).
- (2) = Consists of zinc plated steel rail and 440C stainless steel LinearRace shafting (HRC 50 min).
- (3) = Specify length of Smart Rail when ordering. For example, LSRA M20 x 1200mm.  
S dimension is equal on each end unless specified by customer.

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## Metric Support Block Part Number Description for End Supported Applications

### ASBM - 16

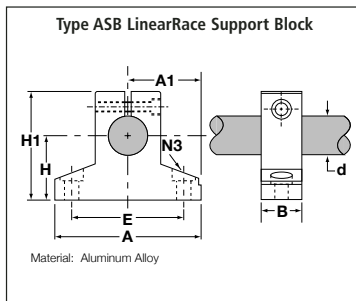
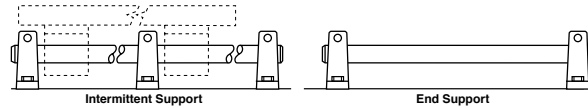
Type	Description	Size(mm)
ASBM	Low Profile 60 Case LinearRace End Support Block	8 12 6 20
SBM	Standard 60 Case LinearRace End Support Block	20 25 30 40

### Shaft Support Blocks – Type SB and ASB. For end support or intermittent support.

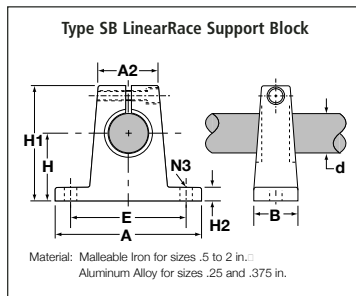
Shaft support blocks are used for end or intermittent support where loads are light and deflection between supports is not a problem. Unlike shaft support rails, blocks do not permit longitudinal passage of open-type Ball Bushing bearings. Shaft support blocks enable clamping of shafts, type SB and eliminate the need for bolts, etc. to maintain shaft position. Shimming is suggested for high precision applications to eliminate the effect of variations in surface of base or manufacturing tolerances between supports.



Type ASB shaft blocks, manufactured from high strength extruded aluminum, provide either end or intermittent support in applications where loads are designed with a reference edge on one side of the base. This provides a surface parallel to the center of the shaft within  $\pm 0.01$  " that can be used to simplify shaft alignment.



Aluminum Type											
Part Number	Dimensions (mm)										Shift Block Mass (kg)
	d	H	H1	H2	A	A1	B	E	N	N2	
ASB M08	8	15	28	9	32	16.0	18	22	3.5	M4	0.04
ASB M12	12	20	36	13	43	21.5	20	30	5.3	M60	0.10
ASB M16	16	25	43	18	53	26.5	24	38	6.6	M8	0.15
ASB M20	20	30	51	22	60	30.0	30	42	8.4	M10	0.23
ASB M25	25	35	61	26	78	39.0	38	56	10.5	M12	0.41
ASB M30	30	40	71	26	87	43.5	40	64	10.5	M12	0.53
ASB M40	40	50	88	34	108	54.0	48	82	13.5	M160	0.99



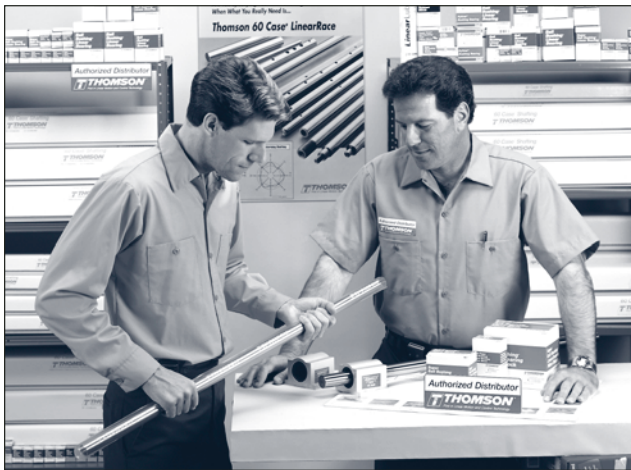
Steel Type											
Part Number	Dimensions (mm)										Shift Block Mass (kg)
	d	H	H1	H2	A	A1	B	E	N	N2	
SB M08	8	15	27	5.2	32	16	10	25	4.5	0.03	
SB M12	12	20	35	5.5	40	21	12	32	5.5	0.06	
SB M16	16	25	42	6.5	50	25	16	40	5.5	0.11	
SB M20	20	30	50	8.0	60	30	20	45	5.5	0.21	
SB M25	25	35	58	9.0	74	37	25	60	6.6	0.35	
SB M30	30	40	68	10.0	84	42	28	68	9.0	0.52	
SB M40	40	50	86	12.0	108	54	32	86	11.0	0.92	

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## Thomson 60 Case Quick Shaft

"Quick Shaft" is precut and packaged stock length shafting in the popular:

- Inch and metric sizes
- L tolerance class and MM tolerance class
- Materials (carbon steel, 440C stainless steel, lightweight 51200 tubular)
- Standard options (predrilled and chrome plated plain ends)

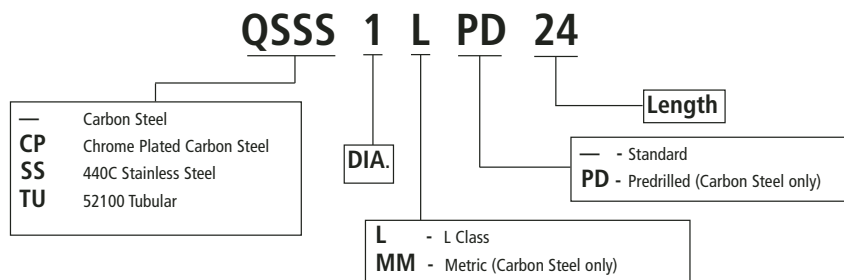


Allowing for easy stocking by authorized DanaherMotion distributors or end user stock rooms.

You may want to have a few pieces of Thomson Quick Shaft in your stock room if you are not sure of the exact length you may need for that potential 3rd shift breakdown, or perform your own special machining of various lengths and do not want to carry lots of different cut to length sizes.

All Thomson Quick Shaft shafting are oil preserved and placed in a VCI bag for long-term storage and labeled for your convenience.

## Quick Shaft Part Numbering



## Thomson 60 Case Quick Shaft

### Carbon Steel - Inch

Hardness: 60 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness .001" Per Foot Cumulative  
 Taper: .0001"

Part Number	Stock Lengths (inch)	Diameter Tolerance (inch)	Min Hardness (inch)	Weight (lb)
QS 1/4 L	6, 9, 12, 15, 18, 24, 30, 36, 42, 48, 54, 60	.2495 .2490	.027	.014
QS 3/8 L	6, 12, 18, 24, 30, 36, 48, 60	.3745 .3740	.027	.031
QS 1/2 L	6, 9, 12, 15, 18, 24, 30, 36, 42, 48, 54, 60	.4995 .4990	.040	.055
QS 5/8 L	12, 15, 18, 24, 30, 36, 42, 48, 54, 60	.6245 .6240	.040	.086
QS 3/4 L	12, 15, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72	.7495 .7490	.060	.125
QS 1 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72	.9995 .9990	.080	.222
QS 1 1/4 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 72	1.2495 1.2490	.080	.348
QS 1 1/2 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72	1.4994 1.4989	.080	.500
QS 1 3/4 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 72	1.7495 1.7490	.100	.681
QS 2 L	12, 18, 24, 30, 36, 42, 48, 60, 72	1.9994 1.9987	.100	.890

### Carbon Steel - Metric

Hardness: 60 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness .001" Per Foot Cumulative  
 Taper: .0001"

Part Number	Stock Lengths (inch)	Diameter		Min Hardness		Weight/mm	Weight/in
		(mm)	(inch)	(mm)	(inch)	(kg)	(lb)
QS10MM	500, 1000	10.00 9.99	0.3937 0.3932	0.69	0.027	0.0035	0.035
QS12MM	250, 500, 750, 1000, 1200, 1500, 2000	12.00 11.99	0.4742 0.4720	1.02	0.040	0.005	0.05
QS16MM	250, 500, 750, 1000, 1200, 1500, 2000	16.00 15.99	0.6299 0.6295	1.02	0.040	0.0096	0.088
QS20MM	250, 500, 750, 1000, 1200, 1500, 2000	20.00 19.99	0.7874 0.7869	1.52	0.060	0.012	0.13
QS25MM	500, 750, 1000, 1200, 1500, 2000	25.00 24.99	0.9843 0.9838	2.03	0.080	0.019	0.216
QS30MM	500, 750, 1000, 1500, 2000	30.00 29.99	1.1811 1.1806	2.03	0.080	0.027	0.311
QS40MM	500, 750, 1000, 1500, 2000	40.00 39.99	1.5748 1.5743	2.03	0.080	0.048	0.553

## Thomson 60 Case Quick Shaft

### 440C Stainless Steel

Hardness: 50 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative  
 Taper: .0001"

Part Number	Stock Lengths (inch)	Diameter Tolerance (inch)	Min Hardness (inch)	Weight (lb)
QSSS 1/4 L	6, 12, 18, 24, 30, 36, 48	.2495 .2490	.027	.014
QSSS 3/8 L	6, 12, 18, 24, 30, 36, 48, 60	.3745 .3740	.027	.031
QSSS 1/2 L	12, 18, 24, 30, 36, 42, 48, 54, 60	.4995 .4990	.040	.055
QSSS 5/8 L	12, 18, 24, 30, 36, 42, 48, 54, 60	.6245 .6240	.040	.086
QSSS 3/4 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72	.7495 .7490	.060	.125
QSSS 1 L	18, 24, 30, 36, 42, 48, 54, 60, 66, 72	.9995 .9990	.080	.222
QSSS 1 1/4 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 72	1.2495 1.2490	.080	.348
QSSS 1 1/2 L	18, 24, 30, 36, 42, 48, 54, 60, 66, 72	1.4994 1.4989	.080	.500

### 52100 Tubular - Inch

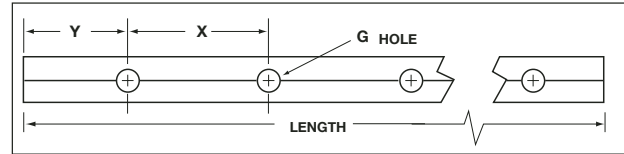
Hardness: 58 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative  
 Taper: .0001"

Part Number	Stock Lengths (inch)	Diameter Tolerance (inch)	Min Hardness (inch)	Weight (lb)
QSTU 1 L	12, 18, 24, 30, 48, 60	.9995 .9990	.080	.222
QSTU 1 1/2 L	12, 18, 24, 30, 48, 60	1.4994 1.4989	.080	.500
QSTU 2 L	12, 18, 24, 30, 48, 60	1.9994 1.9987	.100	.890

## Thomson 60 Case Quick Shaft

### Carbon Steel Predrilled - Inch

Hardness: 60 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative  
 Taper: .0001"



Part Number	Stock Lengths (inch)	Diameter Tolerance (inch)	X (inch)	Y (inch)	G Thread Size	Min Hardness Depth (inch)	Weight per inch (lb)
QS 1/2 L PD	12, 18, 24, 30, 36, 42, 48, 54, 60, 72	.4495 .4490	4	2	6-32	.040	.055
QS 5/8 L PD	12, 18, 24, 30, 36, 42, 48, 54, 60, 72	.6245 .6240	4	2	8-32	.040	.086
QS 3/4 L PD	12, 18, 24, 30, 36, 42, 48, 54, 60, 72	.7490 .7485	6	3	10-32	.060	.125
QS 1L PD	18, 24, 30, 36, 42, 48, 54, 60, 72	.9995 .9990	6	3	1/4-20	.080	.222
QS 1 1/4 L PD	18, 24, 30, 36, 42, 48, 54, 60, 72	1.2490 1.2485	6	3	5/16-18	.080	.348
QS 1 1/4 L PD	18, 24, 30, 36, 42, 48, 54, 60, 72	1.4994 1.4989	8	4	3/8-16	.080	.500

### 440C Stainless Steel Predrilled - Inch

Hardness: 55 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative  
 Taper: .0001"

Part Number	Stock Lengths (inch)	Diameter Tolerance (inch)	X (inch)	Y (inch)	G Thread Size	Min Hardness Depth (inch)	Weight per inch (lb)
QSSS 1/2 L PD	24, 30, 36, 42, 48, 60, 72	.4495 .4490	4	2	6-32	.040	.055
QSSS 5/8 L PD	24, 30, 36, 42, 48, 54, 60, 72	.6245 .6240	4	2	8-32	.040	.086
QSSS 3/4 L PD	24, 30, 36, 42, 48, 54, 60, 72	.7490 .7485	6	3	10-32	.060	.125
QSSS 1L PD	18, 24, 30, 36, 42, 48, 54, 60, 72	.9995 .9990	6	3	1/4-20	.080	.222
QSSS 1 1/4 L PD	18, 24, 30, 36, 42, 48, 54, 60, 72	1.2490 1.2485	6	3	5/16-18	.080	.348
QSSS 1 1/4 L PD	18, 24, 30, 36, 42, 48, 54, 60, 72	1.4994 1.4989	8	4	3/8-16	.080	.500

### Chrome Plated Plain Ends - Carbon Steel Carbon Steel Predrilled - Inch

Hardness: 60 ROCKWELL C Min  
 Surface Finish: 8 Ra Max  
 Roundness: .000080"  
 Straightness: .001" Per Foot Cumulative  
 Taper: .0001"

Part Number	Stock Lengths (inch)	Diameter Tolerance (inch)	Min Hardness (Depth)	Weight per inch
QSCP 1/2 L	6, 12, 18, 24, 30, 36, 48	.4495 .4490	.040	.055
QSCP 5/8 L	6, 12, 18, 24, 30, 36, 48, 60	.6245 .6240	.040	.086
QSCP 3/4 L	12, 18, 24, 30, 36, 42, 48, 54, 60	.7595 .7490	.060	.125
QSCP 1 L	12, 18, 24, 30, 36, 42, 48, 54, 60	.9995 .9990	.080	.222
QSCP 1 1/4 L	12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72	1.2495 1.2490	.080	.348
QSCP 1 1/2 L	18, 24, 30, 36, 42, 48, 54, 60, 66, 72	1.4994 1.4989	.080	.500



## Special Machining

For over 50 years Danaher Motion 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 Danaher Motion, or utilize a copy of the request for quotation and template found on page 38-54.

### Special Length Tolerances

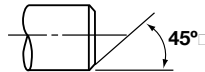
Standard length tolerance is for  $\pm 1/32"$  for shafts less than 2" diameter and  $\pm 1/16"$  for 2" diameter and larger. Special length tolerances of  $\pm .010$ ,  $\pm .005$  and  $\pm .002$  can be achieved on shafts up to 4" in diameter.

### Special Straightness Tolerances

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

### Special Chamfer

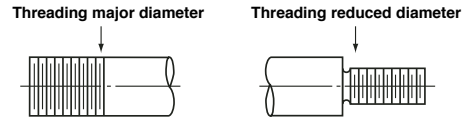
Standard chamfer is  $1/16" \times 45^\circ$ . Chamfer of  $1/32" \times 45^\circ$  can be supplied at no extra charge. Special chamfer (any angle can be supplied)



### Machining Shaft Ends

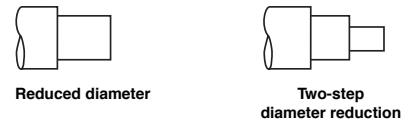
For all machining requirements with turned ends, Danaher Motion will anneal the end. The annealing process may cause approximately 1/4" to 1/2" of heat travel from machined area (depending on major shaft O.D.). Hardness of major shaft diameter near the machined area will be below the Rockwell for the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

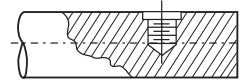
### Reduced Shaft Diameter



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

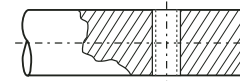
### Radial Holes Drilled and Tapped to Center of Shaft

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



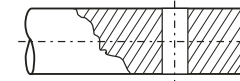
### Radial Holes Drilled and Tapped thru Shaft.

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 thru Shaft.

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



**For requests for quotation and ordering custom machined 60 Case LinearRace shafting see the convenient templates on pages 38 through 54**

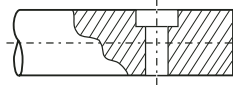
**Radial Holes Drilled and Renamed thru Shafts.**

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



**Radial Holes Drilled thru 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).

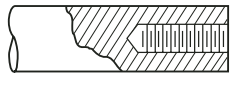


**Radial Hole Location Tolerance**

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.

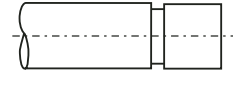
**Coaxial Holes Drilled and Tapped in Center of end of Shaft.**

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  $.010"$ .



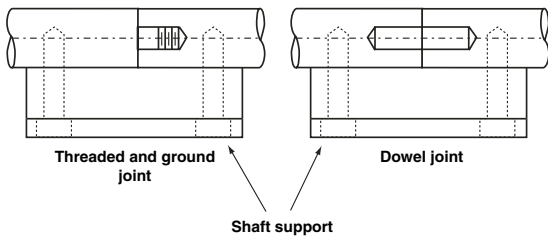
**Retaining Ring Groove.**

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



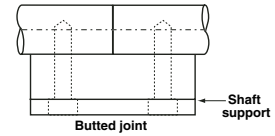
**Joining Shafts to Obtain Longer Lengths.**

Threaded and ground joints for  $3/4"$  thru  $4"$  and  $20\text{mm}$  thru  $80\text{mm}$  diameter shaft for lengths up to 20 feet. Dowled joints with concentricity  $\pm .010"$  for  $1/2"$  thru  $4"$  and  $12\text{mm}$  thru  $80\text{mm}$  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.

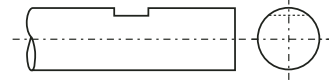


**Flats.**

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.

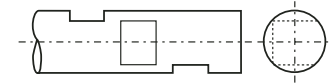
**One Flat on a Shaft.**

Location tolerance  $\pm .015"$ .



**Multiple Flats on a shaft**

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



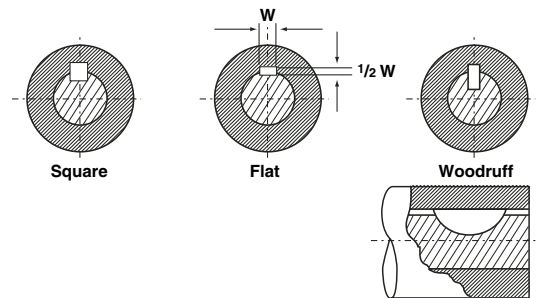
**Drilled Spot for Set crews.**

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  $1/2"$  thru  $4"$



**For requests for quotation and ordering custom machined 60 Case LinearRace shafting see the convenient templates on pages 38 through 54**

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## Example of our popular plating options:

### Thin Dense Chrome Plating:

The benefits of thin dense chrome plating are a 68-72RC surface hardness, reduction of wear and friction in moving parts, and appearance. The Chrome Plating Thickness of plating .0005" thick. Final plated shaft is within specified tolerance class.

As a result of the plating process and need to hold parts during plating coaxial holes\* maybe 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.

Military and industrial specifications satisfied with out Thin Dense Chrome plating are class 2, MIL-S-13165 and MIL-R-81841.

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

### Black Oxide

The benefit of black oxide is corrosion resistance and black color. Military and industrial specifications satisfied with our Black Oxide are Mil-C13924C and AMS-2485.

### ARMOLOY™

The benefit 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, crack, 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 need to hold parts during plating coaxial holes\* maybe 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 times, 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.

## Special Machining Quoting

Danaher Motion 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. Our Application Engineering team will contact you if they have any questions, require more information, or a better drawing or sketch. It 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 one time manufacturing lot quantity not blanket order unless otherwise stated. Danaher Motion reserves the right to requote if quantity ordered is less than quoted quantity. Upon receipt of order Danaher Motion assumes you have read and understand the quotation and Danaher Motion will assume no responsibility of exceptions on quotation and failure by customer to read.

Our standard quotations are in the format shown below.

### QUOTATION

**Customer Information**

*Danaher Motion  
43-45 Channel Drive  
Port Washington, NY 11050 USA  
Phone: 516 883-8000 Fax: 800-445-0329  
Internet: www.DanaherMotion.com*

**Customer**      Customer #  
                         Customer Name  
                         Customer Address  
**Attention**      Contact Person  
**Phone No.**      Phone  
**Fax No.**          Fax

**Quote Number**      20080XXX  
**Quote Date**          01/01/2004  
**Valid From**          01/01/2004  
**Valid To**              01/01/2004

**District Manager**      District Manager's Name  
                                 00000000000000  
**Payment Terms**          Payable 30 days net  
**Delivery Terms**          FOB from plant

**DANAHER MOTION IS PLEASED TO SUBMIT THE FOLLOWING QUOTATION  
SUBJECT TO OUR STANDARD TERMS AND CONDITIONS**

I am pleased to quote Thomson 60 Case LinearRace shafting, the specified inner race for Thomson Ball Bushing\* bearings, providing superior smoothness, hardness, and straightness. Use of 60 Case will preserve your bearing warranty and significantly extend life. When used with: Thomson SuperSmart Ball Bushing\* bearings, shaft life is extended up to five times.

LINK	PART NUMBER	DESCRIPTION	QUANTITY	U/M	UNIT PRICE
		FINISH OF 8Ra OR SMOOTHER AND STRAIGHT TO WITHIN .001/.002" PER FOOT CUMULATIVE			
10	7/8 L SM	7/8 L SM X 1.560" Customer Part: PER TEMPLATE	88	EA	16.00
	Length	3.500 in.		SET-UP CHARGE	25.00

**\*\* SHAFT DIAMETER MAY BE OUT OF TOLERANCE OR DISTORTED ALONG THE LENGTH OF THE 1/2"**  
**COAXIAL BORED HOLE**  
**\*\* BORED HOLE DIAMETER TOLERANCE WILL BE +/- .005"**

ESTIMATED SHIPMENT: 3-4 WK

Notes:  
 1. Quoted lead items are based on current factory backlog and are subject to change. Please contact Danaher Motion for current lead time.  
 2. Price is net to Customer Name  
 3. Price valid for releases through 01/01/2004

**If you need any further information, please contact me immediately. Thank You.**

**Engineer's Name**  
Applications Engineer

---

IMPORTANT: QUOTATION NO. MUST APPEAR ON ORDER TO INSURE PROPER BILLING. PRICES QUOTED ARE CONSIDERED FIRM FOR 30 DAYS.  
 Prices apply to quantities of each size released for shipment at one time one destination. No returns or cancellations accepted without consent. The terms and conditions set forth herein shall constitute the entire agreement between the Buyer and the Seller. In the event you receive this information by facsimile only, please refer to our Standard Terms and Conditions appearing on the reverse side of our invoices, quotations, order acknowledgements, and product literature. Any provision or condition of Buyer's order which is in any way different from or in addition to these Standard Terms and Conditions is expressly rejected by Seller unless negotiated as part of this quotation and so noted hereon.  
 SEE REVERSE SIDE FOR TERMS AND CONDITIONS  
 \*Trademark of Danaher Motion. Danaher Motion is a trademark.  
 WORLD'S LARGEST MANUFACTURER OF LINEAR BEARINGS AND SHAFTS

QC FORM 063 Rev. A PAGE 1

**Line Item Information**

**Customer Drawing Number**

**Noted Item Quoted and Possible Exceptions**

**Estimated Lead Time**

**Additional Notes**

**Engineer who Created Quote**

**Quotation Number**

**Quote Date**

**Validity Period of Quote**

**Your Danaher Motion Territory Manager**

**Standard Payment and Delivery Terms**

**Unit Price**

**Set-Up Charges**

**Length**

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## 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: Fax: 1-877-597-0775

For any questions or help in determining the best solution to your Thomson 60 Case LinearRace\* shafting requirements, please contact Application Engineering at:  
 Phone: 1-800-554-8466  
 E-mail: [appeng@thomsonmail.com](mailto:appeng@thomsonmail.com)

1	2	3	4																
A	B	C	D																
<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>ANGLE 'C':</td> <td></td> </tr> <tr> <td>CHAMFER 'B':</td> <td></td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>				LENGTH 'A':		DIAMETER 'D':		CLASS:		ANGLE 'C':		CHAMFER 'B':							
LENGTH 'A':																			
DIAMETER 'D':																			
CLASS:																			
ANGLE 'C':																			
CHAMFER 'B':																			
<p>DEFAULT PRINT TOL: (INCH)                  FRACTIONS: <math>\pm 1/32"</math>                  .X= <math>\pm .015"</math>                  .RX= <math>\pm .010"</math>                  .RXX= <math>\pm .005"</math>                  ANGLES: <math>\pm 1/2^\circ</math></p>		<p>DEFAULT PRINT TOL: (METRIC)                  FRACTIONS: <math>\pm 1mm</math>                  .X= <math>\pm .25mm</math>                  .RX= <math>\pm .13mm</math>                  ANGLES: <math>\pm 1/2^\circ</math></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: _____</p>		<p>APPROVAL DATE _____                  DRAWN BY DATE _____</p>																	
<p>DO NOT SCALE DRAWING</p>		<p>TITLE: <b>MACHINED TO LENGTH 60 CASE TEMPLATE 1</b>                  DRWG NO. _____</p>																	
A	B	C	D																
<p><b>DANAHER MOTION</b>  <i>Part Washington, NY</i></p>																			

FAX A COPY OF THIS FORM TO QUOTATION DEPARTMENT, THOMSON 1-877-597-0775

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LENGTH 'A':	
DIAMETER 'D':	
CLASS	
THREAD 'C':	
MIN. DEPTH 'E':	
THREAD 'F':	
MIN. DEPTH 'G':	
ANGLE 'H':	
CHAMFER 'B':	

MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST)  
 1566  440C  52100 TUBING  
 OTHER:

PLATING TYPE: \_\_\_\_\_ DATE \_\_\_\_\_  
 APPROVAL \_\_\_\_\_ DRAWN BY \_\_\_\_\_ DATE \_\_\_\_\_

DO NOT SCALE DRAWING

CUSTOMER AUTHORIZATION: \_\_\_\_\_

DANAHER MOTION  
 Part Washington, NY  
 CO-AXIAL DRILL and TAP  
 60 CASE TEMPLATE 2  
 DRAWG NO. \_\_\_\_\_

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Special Machining

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**HOLE PATTERN**

LENGTH 'A':	LENGTH 'Y':	
DIAMETER 'D':	LENGTH 'X':	
CLASS:	LENGTH 'R':	
THREAD 'E':	No. of REPEATS for 'R':	
ANGLE 'C':		
CHAMFER 'B':		

**DANAMOTION**  
Part Washington, NY

**MATERIAL:** (OTHER MATERIALS AVAILABLE UPON REQUEST)  
 1566  440C  52100 TUBING  
 OTHER: \_\_\_\_\_

**DEFAULT PRINT TOL: (METRIC) FRACTIONS:**  
 .H= ±.25mm  
 .R= ±.13mm  
 .RH= ±.13mm

**DEFAULT PRINT TOL: (INCH) FRACTIONS:**  
 .H= ± 1/32"  
 .R= ±.015"  
 .RH= ±.010"  
 .RHH= ±.005"

**ANGLES:** ± 1/2°

**PLATING TYPE:** \_\_\_\_\_ **APPROVAL:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**TITLE:** RADIAL DRILL & TAP 60 CASE TEMPLATE 3

**DO NOT SCALE DRAWING** **DRAWN BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**CUSTOMER AUTHORIZATION:** \_\_\_\_\_

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1	2	3	4	F	E	D	C	B	A												
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; border: 1px solid black;">LENGTH 'A':</td> <td style="width: 25%; border: 1px solid black;">DIAMETER 'D':</td> <td style="width: 25%; border: 1px solid black;">CLASS:</td> <td style="width: 25%; border: 1px solid black;">DIAMETER 'C':</td> </tr> <tr> <td style="border: 1px solid black;">MIN. DEPTH 'E':</td> <td style="border: 1px solid black;">DIAMETER 'F':</td> <td style="border: 1px solid black;">MIN. DEPTH 'G':</td> <td style="border: 1px solid black;">ANGLE 'H':</td> </tr> <tr> <td colspan="4" style="border: 1px solid black;">CHAMFER 'B':</td> </tr> </table>										LENGTH 'A':	DIAMETER 'D':	CLASS:	DIAMETER 'C':	MIN. DEPTH 'E':	DIAMETER 'F':	MIN. DEPTH 'G':	ANGLE 'H':	CHAMFER 'B':			
LENGTH 'A':	DIAMETER 'D':	CLASS:	DIAMETER 'C':																		
MIN. DEPTH 'E':	DIAMETER 'F':	MIN. DEPTH 'G':	ANGLE 'H':																		
CHAMFER 'B':																					
DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .H= ±.015" .HH= ±.010" .HHH= ±.005" ANGLES: ± 1/2°			DEFAULT PRINT TOL: (METRIC) FRACTIONS: ± 1mm .H= ±.25mm .HH= ±.13mm ANGLES: ± 1/2°			MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER: _____															
CUSTOMER AUTHORIZATION: _____			PLATING TYPE: _____ APPROVAL _____ DATE _____ DRAWN BY _____ DATE _____			DO NOT SCALE DRAWING															
CUSTOMER AUTHORIZATION: _____																					
DO NOT SCALE DRAWING																					



**CO-AXIAL DRILLED HOLES**  
**60 CASE TEMPLATE 4**  
 DRUG NO.

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STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F' (TYP)

VIEW -A-

VIEW A

.015 RAD. TYP.

LENGTH 'A':	
DIAMETER 'D':	
CLASS	
DIAMETER 'C':	
LENGTH 'Y':	
WIDTH 'E':	
ANGLE 'F':	
CHAMFER 'B':	

DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .H= ±.015" .HH= ±.010" .HHH= ±.005" ANGLES: ± 1/2°

DEFAULT PRINT TOL: (METRIC) FRACTIONS: ± 1mm .H= ±.25mm .HH= ±.13mm ANGLES: ± 1/2°

CUSTOMER AUTHORIZATION: \_\_\_\_\_

MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST)  1566  440C  52100 TUBING  OTHER: \_\_\_\_\_

PLATING TYPE: \_\_\_\_\_

DO NOT SCALE DRAWING

**DANAHER**  
MOTION  
Part Washington, NY  
TITLE: SNAP RING GROOVE 60 CASE TEMPLATE 5

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LENGTH 'A':			
DIAMETER 'D':			
CLASS:			
DIAMETER 'C':			
LENGTH 'G':			
DIAMETER 'E':			
LENGTH 'F':			
ANGLE 'H':			
CHAMFER 'B':			

**STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'H'**

**.015 RAD. TYP.**

DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .X= ±.015" .XX= ±.010" .XXX= ±.005" ANGLES: ± 1/2°	DEFAULT PRINT TOL: (METRIC) FRACTIONS: ± 1mm .X= ±.25mm .XX= ±.13mm ANGLES: ± 1/2°	MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> OTHER: _____	<b>DANAHER MOTION</b> <i>Part Washington, NY</i> TITLE: <b>SHAFT REDUCTION 60 CASE TEMPLATE 6</b> DRAWING NO. _____
CUSTOMER AUTHORIZATION: _____		PLATING TYPE: _____ APPROVAL: _____ DATE: _____ DRAWN BY: _____ DATE: _____ DO NOT SCALE DRAWING	

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1	2	3	4	F	E	D	C	B	A														
<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F' (TYP.)</p> <p>.015 RAD. TYP.</p> <p>B (TYP)</p> <p>A</p> <p>D</p> <p>C</p> <p>E</p> <p>F</p>																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">LENGTH 'A':</td> <td style="width: 20%;">DIAMETER 'D':</td> <td style="width: 20%;">CLASS:</td> <td style="width: 20%;">DIAMETER 'C':</td> <td style="width: 20%;">LENGTH 'E':</td> <td style="width: 20%;">ANGLE 'F':</td> <td style="width: 20%;">CHAMFER 'B':</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>										LENGTH 'A':	DIAMETER 'D':	CLASS:	DIAMETER 'C':	LENGTH 'E':	ANGLE 'F':	CHAMFER 'B':							
LENGTH 'A':	DIAMETER 'D':	CLASS:	DIAMETER 'C':	LENGTH 'E':	ANGLE 'F':	CHAMFER 'B':																	
<p>DEFAULT PRINT TOL: (INCH)</p> <p>FRACTIONS: ± 1/32"</p> <p>.X= ±.015"</p> <p>.HX= ±.010"</p> <p>.HH= ±.005"</p> <p>ANGLES: ± 1/2°</p>			<p>DEFAULT PRINT TOL: (METRIC)</p> <p>FRACTIONS: ± 1mm</p> <p>.X= ±.25mm</p> <p>.HX= ±.13mm</p> <p>ANGLES: ± 1/2°</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><b>DANAHER MOTION</b> Part Washington, NY</p> <p>TITLE: <b>SHAFT REDUCTION 60 CASE TEMPLATE 7</b></p>													
<p>CUSTOMER AUTHORIZATION: _____</p>			<p>PLATING TYPE: _____</p> <p>APPROVAL _____ DATE _____</p> <p>DRAWN BY _____ DATE _____</p> <p>DO NOT SCALE DRAWING</p>			<p>DRUG NO. _____</p>																	
<p>FAX A COPY OF THIS FORM TO QUOTATION DEPARTMENT, THOMSON 1-877-597-0775</p>																							

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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">LENGTH 'A':</td> <td style="width: 25%;">DIAMETER 'D':</td> <td style="width: 25%;">CLASS:</td> <td style="width: 25%;">MIN. KEYWAY LENGTH 'C':</td> </tr> <tr> <td>WIDTH 'E':</td> <td>KEYWAY DEPTH 'F':</td> <td>ANGLE 'G':</td> <td>CHAMFER 'B':</td> </tr> </table>										LENGTH 'A':	DIAMETER 'D':	CLASS:	MIN. KEYWAY LENGTH 'C':	WIDTH 'E':	KEYWAY DEPTH 'F':	ANGLE 'G':	CHAMFER 'B':				
LENGTH 'A':	DIAMETER 'D':	CLASS:	MIN. KEYWAY LENGTH 'C':																		
WIDTH 'E':	KEYWAY DEPTH 'F':	ANGLE 'G':	CHAMFER 'B':																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">                 DEFAULT PRINT TOL: (INCH)                  FRACTIONS: <math>\pm 1/32"</math>                  .X= <math>\pm .015"</math>                  .HH= <math>\pm .010"</math>                  .HHH= <math>\pm .005"</math>                  ANGLES: <math>\pm 1/2^\circ</math> </td> <td style="width: 25%;">                 DEFAULT PRINT TOL: (METRIC)                  FRACTIONS: <math>\pm 1\text{mm}</math>                  .X= <math>\pm .25\text{mm}</math>                  .HH= <math>\pm .13\text{mm}</math>                  ANGLES: <math>\pm 1/2^\circ</math> </td> <td style="width: 25%;">                 MATERIAL:  <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING  <input type="checkbox"/> OTHER:             </td> <td style="width: 25%;">                 (OTHER MATERIALS AVAILABLE UPON REQUEST)             </td> </tr> <tr> <td colspan="2">                 CUSTOMER AUTHORIZATION: _____             </td> <td colspan="2">                 PLATING TYPE: _____             </td> </tr> <tr> <td colspan="2">                 DO NOT SCALE DRAWING             </td> <td colspan="2">                 APPROVAL DATE                  DRAWN BY DATE             </td> </tr> </table>										DEFAULT PRINT TOL: (INCH) FRACTIONS: $\pm 1/32"$ .X= $\pm .015"$ .HH= $\pm .010"$ .HHH= $\pm .005"$ ANGLES: $\pm 1/2^\circ$	DEFAULT PRINT TOL: (METRIC) FRACTIONS: $\pm 1\text{mm}$ .X= $\pm .25\text{mm}$ .HH= $\pm .13\text{mm}$ ANGLES: $\pm 1/2^\circ$	MATERIAL: <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER:	(OTHER MATERIALS AVAILABLE UPON REQUEST)	CUSTOMER AUTHORIZATION: _____		PLATING TYPE: _____		DO NOT SCALE DRAWING		APPROVAL DATE DRAWN BY DATE	
DEFAULT PRINT TOL: (INCH) FRACTIONS: $\pm 1/32"$ .X= $\pm .015"$ .HH= $\pm .010"$ .HHH= $\pm .005"$ ANGLES: $\pm 1/2^\circ$	DEFAULT PRINT TOL: (METRIC) FRACTIONS: $\pm 1\text{mm}$ .X= $\pm .25\text{mm}$ .HH= $\pm .13\text{mm}$ ANGLES: $\pm 1/2^\circ$	MATERIAL: <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER:	(OTHER MATERIALS AVAILABLE UPON REQUEST)																		
CUSTOMER AUTHORIZATION: _____		PLATING TYPE: _____																			
DO NOT SCALE DRAWING		APPROVAL DATE DRAWN BY DATE																			
DANAHER MOTION Part Washington, NY TITLE: KEYWAY SLOT 60 CASE TEMPLATE 8 DRWG NO.																					

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DIAMETER 'D':																									
CLASS:																									
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MIN. THREAD LENGTH 'E':																									
ANGLE 'F':																									
CHAMFER 'B':																									
DEFAULT PRINT TOL: (INCH) FRACTIONS: $\pm 1/32"$ .X= $\pm .015"$ .XX= $\pm .010"$ .XXX= $\pm .005"$ ANGLES: $\pm 1/2^\circ$			DEFAULT PRINT TOL: (METRIC) FRACTIONS: $\pm 1\text{mm}$ .X= $\pm .25\text{mm}$ .XX= $\pm .13\text{mm}$ ANGLES: $\pm 1/2^\circ$			MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER: _____																			
CUSTOMER AUTHORIZATION: _____			PLATING TYPE: _____ DATE: _____ APPROVAL: _____ DATE: _____ DRAWN BY: _____ DATE: _____			DO NOT SCALE DRAWING																			
TITLE: <b>EXTERNAL THREAD 60 CASE TEMPLATE 9</b> DRWG NO. _____																									
<b>FAX A COPY OF THIS FORM TO QUOTATION DEPARTMENT, THOMSON 1-877-597-0775</b>																									

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1	2	3	4	E	F
<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'H'</p> <p>.015 RAD. TYP.</p> <p>STD.</p>					
<p>LENGTH 'A':</p> <p>DIAMETER 'D':</p> <p>CLASS:</p> <p>DIAMETER 'C':</p> <p>LENGTH 'G':</p> <p>THREAD 'E':</p> <p>MIN. THREAD LENGTH 'F':</p> <p>ANGLE 'H':</p> <p>CHAMFER 'B':</p>					
<p>DEFAULT PRINT TOL: (INCH)</p> <p>FRACTIONS: <math>\pm 1/32"</math></p> <p>.X= <math>\pm .015"</math></p> <p>.HX= <math>\pm .010"</math></p> <p>.HH= <math>\pm .005"</math></p> <p>ANGLES: <math>\pm 1/2^\circ</math></p>			<p>DEFAULT PRINT TOL: (METRIC)</p> <p>FRACTIONS: <math>\pm 1mm</math></p> <p>.X= <math>\pm .25mm</math></p> <p>.HX= <math>\pm .13mm</math></p> <p>ANGLES: <math>\pm 1/2^\circ</math></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"/> OTHER: _____</p>		
<p>PLATING TYPE: _____</p>			<p>APPROVAL DATE</p> <p>DRAWN BY DATE</p>		
<p>DO NOT SCALE DRAWING</p>			<p>SHAFT REDUCTION WITH THREAD 60 CASE TEMPLATE 10</p> <p>DRWG NO.</p>		
<p>DANAHER MOTION Part Washington, NY</p>					

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1	2	3	4	F	E	D	C	B	A																																								
<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'H' (TYP.)</p> <p>.015 RAD. (TYP.)</p>																																																	
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**STD. MACHINE CHAMFER UNLESS NOTED IN ANGLE 'H' (TYP.)**

LENGTH 'A':	
DIAMETER 'D':	
CLASS:	
DIAMETER 'E':	<b>HOLE PATTERN</b>
DEPTH 'C':	LENGTH 'Y':
DIAMETER 'F':	LENGTH 'X':
ANGLE 'H':	NO. OF REPEATS FOR 'H':
CHAMFER 'B':	

DEFAULT PRINT TOL: (INCH) FRACTIONS: $\pm 1/32"$ .X= $\pm .015"$ .HX= $\pm .010"$ .RHH= $\pm .005"$ ANGLES: $\pm 1/2^\circ$	DEFAULT PRINT TOL: (METRIC) FRACTIONS: $\pm 1mm$ .X= $\pm .25mm$ .HX= $\pm .13mm$ ANGLES: $\pm 1/2^\circ$	MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> OTHER: _____	<b>DANAHER</b> MOTION Part Washington, NY
CUSTOMER AUTHORIZATION: _____		PLATING TYPE: _____ DO NOT SCALE DRAWING	TITLE: <b>DRILL &amp; COUNTER BORE</b> <b>60 CASE TEMPLATE 12</b> DRAWG NO. _____
APPROVAL: _____ DATE: _____		DRAWN BY: _____ DATE: _____	

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LENGTH 'A':	DIAMETER 'D':	CLASS:	DIAMETER 'C':	LENGTH 'Y':	ANGLE 'E':	CHAMFER 'B':																	
DEFAULT PRINT TOL: (INCH) FRACTIONS: ± 1/32" .X= ±.015" .XX= ±.010" .XXX= ±.005" ANGLES: ± 1/2°			DEFAULT PRINT TOL: (METRIC) FRACTIONS: ± 1mm .X= ±.25mm .XX= ±.13mm ANGLES: ± 1/2°			MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST) <input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING <input type="checkbox"/> OTHER: _____																	
CUSTOMER AUTHORIZATION: _____			PLATING TYPE: _____ DO NOT SCALE DRAWING			DANAHER MOTION Part Washington, NY TITLE: THRU PIN HOLE 60 CASE TEMPLATE 13 DRUG NO. _____																	
APPROVAL DATE _____ DRAWN BY DATE _____			APPROVAL DATE _____ DRAWN BY DATE _____																				
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CHAMFER 'B':																									
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CUSTOMER AUTHORIZATION: _____			PLATING TYPE: _____   APPROVAL: _____   DATE: _____ DO NOT SCALE DRAWING   DRAWN BY: _____   DATE: _____				<b>DANAHER MOTION</b> Port Washington, NY TITLE: <b>DRILL &amp; TAP 60 CASE TEMPLATE 14</b> DRAWG NO. _____																		
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	<p><b>STANDARD CHAMFER</b> UNLESS NOTED ANGLE 'F' (TYP.)</p> <p><b>.030 RAD. (TYP.)</b></p>	
<p>LENGTH 'A':</p> <p>DIAMETER 'D':</p> <p>CLASS:</p> <p>LENGTH 'Y':</p> <p>LENGTH 'C':</p> <p>DEPTH 'E':</p> <p>ANGLE 'F':</p> <p>CHAMFER 'B':</p>		
<p>DEFAULT PRINT TOL: (INCH)</p> <p>FRACTIONS: <math>\pm 1/32</math>"</p> <p>.X= <math>\pm .015</math>"</p> <p>.XX= <math>\pm .010</math>"</p> <p>.XXX= <math>\pm .005</math>"</p> <p>ANGLES: <math>\pm 1/2^\circ</math></p>	<p>DEFAULT PRINT TOL: (METRIC)</p> <p>FRACTIONS: <math>\pm 1\text{mm}</math></p> <p>.X= <math>\pm .25\text{mm}</math></p> <p>.XX= <math>\pm .13\text{mm}</math></p> <p>ANGLES: <math>\pm 1/2^\circ</math></p>	<p>CUSTOMER AUTHORIZATION:</p>
<p>MATERIAL:</p> <p><input type="checkbox"/> 1566 <input type="checkbox"/> 440C <input type="checkbox"/> 52100 TUBING</p> <p><input type="checkbox"/> OTHER:</p>	<p>(OTHER MATERIALS AVAILABLE UPON REQUEST)</p>	<p>DANAHER MOTION Part Washington, NY</p> <p>TITLE: <b>MACHINED SLOTS</b> <b>60 CASE TEMPLATE 15</b></p> <p>DRUG NO.</p>
<p>PLATING TYPE:</p> <p>APPROVAL DATE</p> <p>DRAWN BY DATE</p> <p>DO NOT SCALE DRAWING</p>		

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1	2	3	4	<table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 50%;">LENGTH 'A':</td> <td style="width: 50%;">HOLE PATTERN</td> </tr> <tr> <td>DIAMETER 'D':</td> <td>SPLICE LOCATION(S)</td> </tr> <tr> <td>CLASS:</td> <td></td> </tr> <tr> <td>THREAD 'E':</td> <td></td> </tr> <tr> <td>LENGTH 'Y':</td> <td>1)</td> </tr> <tr> <td>LENGTH 'R':</td> <td>2)</td> </tr> <tr> <td>ANGLE 'F':</td> <td>No. of REPEATS for 'R':</td> </tr> <tr> <td>CHAMFER 'B':</td> <td></td> </tr> </table>	LENGTH 'A':	HOLE PATTERN	DIAMETER 'D':	SPLICE LOCATION(S)	CLASS:		THREAD 'E':		LENGTH 'Y':	1)	LENGTH 'R':	2)	ANGLE 'F':	No. of REPEATS for 'R':	CHAMFER 'B':		F
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<p>STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F' (TYP.)</p> <p>Y    R    E</p> <p>D</p> <p>B (TYP)</p> <p>A</p> <p>SPLICE LOCATION(S)</p>				F																	
<p>LENGTH 'A':</p> <p>DIAMETER 'D':</p> <p>CLASS:</p> <p>THREAD 'E':</p> <p>LENGTH 'Y':</p> <p>LENGTH 'R':</p> <p>ANGLE 'F':</p> <p>CHAMFER 'B':</p>				F																	
<p>DEFAULT PRINT TOL: (INCH)    ± 1/32"</p> <p>FRACTIONS:    .H= ±.015"    .R= ±.25mm</p> <p>                  .HX= ±.010"    .RX= ±.13mm</p> <p>                  .HHX= ±.005"    .RXH= ±.13mm</p> <p>ANGLES:    ± 1/2°</p>				F																	
<p>DEFAULT PRINT TOL: (METRIC)    ± 1mm</p> <p>FRACTIONS:    .H= ±.015"    .R= ±.25mm</p> <p>                  .HX= ±.010"    .RX= ±.13mm</p> <p>                  .HHX= ±.005"    .RXH= ±.13mm</p> <p>ANGLES:    ± 1/2°</p>				F																	
<p>CUSTOMER AUTHORIZATION: _____</p>				F																	
<p>MATERIAL: (OTHER MATERIALS AVAILABLE UPON REQUEST)</p> <p><input type="checkbox"/> 1566    <input type="checkbox"/> 440C    <input type="checkbox"/> OTHER: _____</p>				F																	
<p>PLATING TYPE: _____    APPROVAL    DATE</p> <p>DO NOT SCALE DRAWING    DRAWN BY    DATE</p>				F																	
<p>DAHAHER MOTION    Port Washington, NY</p> <p>TITLE: BUTTED JOINTS</p> <p>60 CASE TEMPLATE 16</p> <p>DRAWG NO. _____</p>				F																	

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Special Machining

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**STD. MACHINED CHAMFER UNLESS NOTED IN ANGLE 'F' (TYP.)**

**STD. RELIEF**

**SPLICE LOCATION(S)**

**HOLE PATTERN**

LENGTH 'A':	
DIAMETER 'D':	
CLASS:	
THREAD 'E':	
LENGTH 'Y':	1)
LENGTH 'X':	2)
NO. OF REPEATS FOR 'X':	3)
ANGLE 'F':	
CHAMFER 'B':	

**DEFAULT PRINT TOL: (INCH)**  
 FRACTIONS:  $\pm 1/32"$   
 .H =  $\pm .015"$   
 .HX =  $\pm .010"$   
 .HXX =  $\pm .005"$   
 ANGLES:  $\pm 1/2^\circ$

**DEFAULT PRINT TOL: (METRIC)**  
 FRACTIONS:  $\pm 1\text{mm}$   
 .H =  $\pm .25\text{mm}$   
 .HX =  $\pm .13\text{mm}$   
 ANGLES:  $\pm 1/2^\circ$

**MATERIAL:** (OTHER MATERIALS AVAILABLE UPON REQUEST)  
 1566  440C  
 OTHER: \_\_\_\_\_

**PLATING TYPE:** \_\_\_\_\_  
**APPROVAL:** \_\_\_\_\_  
**DATE:** \_\_\_\_\_

**CUSTOMER AUTHORIZATION:** \_\_\_\_\_

**DO NOT SCALE DRAWING**

**DANAHER MOTION**  
 Port Washington, NY

**TITLE:** DOWEL JOINT  
**60 CASE TEMPLATE 17**  
 DRUG NO. \_\_\_\_\_

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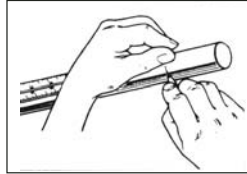
## How to Cut 60 Case LinearRace Shafting:

Genuine 60 Case\* LinearRace\* shafting has an extremely hard outer surface, HRC 60, and a soft core. The following steps can guide you when you cut 60 Case shafts. Remember: Always use goggles and normal shop safety precautions.

### With an abrasive cut-off saw . . . (preferred method)

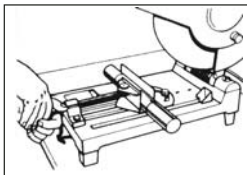
#### Step 1:

Mark the shaft at the desired length.



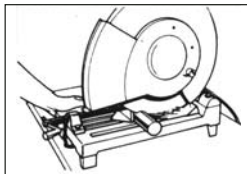
#### Step 2:

Secure shaft in vise with longer end clamped.



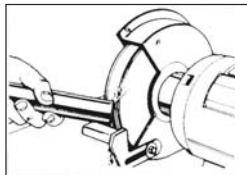
#### Step 3:

Cut the shaft at the mark.



#### Step 4:

Chamfer the shaft by rotating it by hand while holding it against an abrasive wheel at approximately 45°. Use an emery cloth to remove burrs and discoloration.

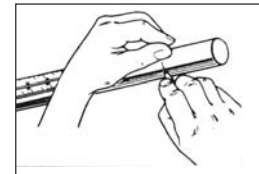


### With a lathe. . .

(using a collet type or standard 3-jaw chuck)

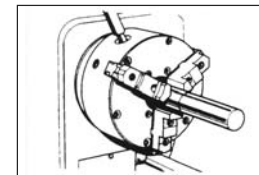
#### Step 1:

Mark the shaft at the desired length.



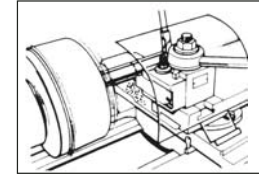
#### Step 2:

Secure shaft in lathe with longer end in spindle.



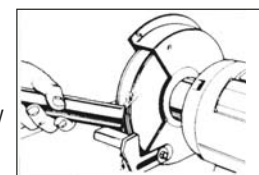
#### Step 3:

Use a sharp, carbide cut-off tool with shaft turning at approx. the following speeds: 400 rpm for dia. 1/4" - 1", and 300 rpm for dia. 1" or larger



#### Step 4:

Chamfer the shaft using a standard carbide turning tool or an abrasive wheel. Use an emery cloth to remove burrs and discoloration.

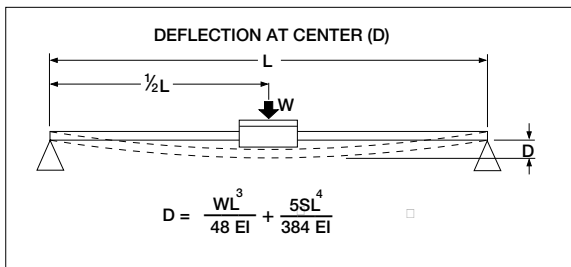


### 60 Case\* LinearRace\* Shaft Deflection

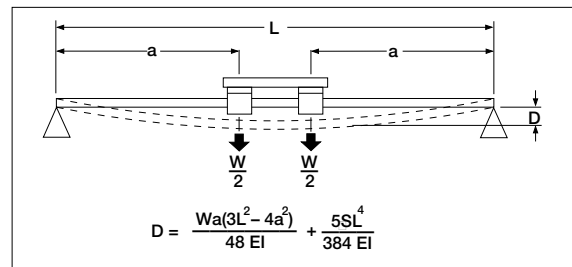
When Thomson 60 Case LinearRace\* shafting is used in an end supported configuration it is important to ensure that 60 Case LinearRace shaft deflections at the bearing locations are kept within performance limitations. These equations give the deflection at the center of an end supported 60 Case LinearRace shaft. Systems with continuous 60 Case LinearRace shaft support are not subject to the same types of deflection. For more detailed information of the deflection characteristics of Thomson linear motion products contact application engineering.

LinearRace Shaft Diameter (In)	Values for Thomson 60 Case LinearRace shafting			
	Solid		Tubular	
	EI (lb <sub>f</sub> •in <sup>2</sup> )	S (lb <sub>f</sub> /in)	EI (lb <sub>f</sub> •in <sup>2</sup> )	S (lb <sub>f</sub> /in)
.187	1.8 x 10 <sup>3</sup>	.008	—	—
.250	5.8 x 10 <sup>3</sup>	.014	—	—
.375	2.9 x 10 <sup>4</sup>	.031	—	—
.500	9.2 x 10 <sup>4</sup>	.055	—	—
.625	2.3 x 10 <sup>5</sup>	.086	—	—
.750	4.7 x 10 <sup>5</sup>	.125	4.6 x 10 <sup>5</sup>	.075
1.000	1.5 x 10 <sup>6</sup>	.222	1.3 x 10 <sup>6</sup>	.158
1.250	3.6 x 10 <sup>6</sup>	.348	—	—
1.500	7.5 x 10 <sup>6</sup>	.500	6.3 x 10 <sup>6</sup>	.328
2.000	2.4 x 10 <sup>7</sup>	.890	1.9 x 10 <sup>7</sup>	.542
2.500	5.8 x 10 <sup>7</sup>	1.391	4.2 x 10 <sup>7</sup>	.749
4.000	3.8 x 10 <sup>8</sup>	3.560	2.5 x 10 <sup>8</sup>	1.558

Simply Supported 60 Case LinearRace Shafting with One Block



Simply Supported 60 Case LinearRace Shafting with Two Blocks





















**LEGEND:**

- D** = Deflection (in)
- W** = Load (lb<sub>f</sub>)
- L** = Length of unsupported 60 Case LinearRace shaft (in)
- a** = Distance to first bearing with carriage at center position (in)
- S** = Unit weight of LinearRace shaft (lb<sub>f</sub>/in)
- E** = Modulus of Elasticity (lb<sub>f</sub>/in<sup>2</sup>)
- I** = Moment of inertia of area through diameter of LinearRace shaft (in<sup>4</sup>)

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Material	Class	Random Length	Cut to Length
Carbon Steel	S	Painted 	No Color 
Carbon Steel	L	1/2 Black 1/2 Red 	1/2 Black 1/2 Red 
Carbon Steel	N	Gray 	Green 
Carbon Steel	D	1/2 Gray 1/2 Green 	1/2 Green 
Carbon Steel	Metric H6	Orange 	Orange 
Carbon Steel	Metric H4	1/2 Blue 1/2 Orange 	1/2 Blue 1/2 Orange 
Carbon Steel	Metric G6	1/2 Green 1/2 Orange 	1/2 Green 1/2 Orange 
Carbon Steel Chrome	All	1/2 Blue 	1/2 Blue 
440C Stainless Steel	S	Without Color 	Red 
440C Stainless Steel	L	1/2 Orange 	1/2 Orange 
316 Stainless Steel	L	1/2 Cyan 	1/2 Cyan 
440C Stainless Steel	Metric	1/2 Yellow 	1/2 Yellow 
52100 Tubular	S	Without Color 	Without Color 
52100 Tubular	L	1/2 Black 1/2 Red 	1/2 Black 1/2 Red 
Carbon Steel Deep Case	L	1/2 Beige 1/2 Pink 	1/2 Beige 1/2 Pink 
Carbon Steel Deep Case	N	1/2 Gray 1/2 Pink 	1/2 Gray 1/2 Pink 
Carbon Steel Deep Case	Metric H6	Pink 	Pink 



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MOTION**

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