Thread Rolling

- Thread Rolling Heads, Rolls Consumables and Spares
- Machine Rolls
- Replacement Competitive Machine Rolls
- Technical and Operational Support Information

For over a century, Landis has been providing ThreadMaking Answers™ by setting global standards for excellence in high volume thread cutting and thread rolling applications.

This product catalog highlights a broad range of threading rolling solutions. Landis® Threading offers a complete range of thread-making solutions including the following product lines:

- Thread Cutting
- Thread and Form Rolling Products
- Collapsible & Solid Adjustable Taps
- Oster Program
- Reamer Products
- Replacement Dies
- Hollow Milling Program
- Cutter Discs
- Machine Grips

Your on-site application and customer service support will be addressed by our techincal sales engineers who additionally are backed by an experienced customer service team.

Rely on Landis to achieve "Best in Class" threading solutions for your high performance applications.

Please contact us for additional information on any of the products illustrated in this catalog or any other part of Landis' comprehensive threading program.

CUSTOMER SERVICE

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We're On A Roll

"Nobody knows more about threading than Landis"

If you already machine threads then you will already know LANDIS.

What you may not know is that "LANDIS THREADING SYSTEMS" is a new, revitalized company with growth oriented programs, including rapidly expanding product lines, improved customer service and technical support internally and in the field to ensure that you get the best advice and service possible.

We still carefully select raw materials, and we still rely on over 95 years of design engineering, manufacture and heat treating experience. But when we add our experience, our commitment to develop new Landis products and our strict quality control procedures to our pride in the Landis name we are confident that LANDIS products stand head and shoulders above the rest.

As part of a major product development program we now have a **NEW** range of thread rolls for use on most makes of cylindrical die rolling machines.

Information on the new rolling products can be found on pages 39 - 41 of this catalogue.

Other new products include indexable and replaceable insert drilling systems, threadmilling and indexable carbide threading.

For information or assistance on any new or existing Landis products please call us.

Inquiries lines: Toll-free 1.888.565.0386 or 717.762.3151

Customer Services: Toll-free phone 1.800.358.3500

Toll-free fax 1.888.718.2922

In Canada call: Toll-free phone 1.888.828.6340

Our office hours are 8:00 A.M. to 5:00 P.M. Monday thru Friday EST. or ESTD.

Intent of This Publication

The intent of this publication is to help those using or considering using the thread rolling process.

Data provided includes features, ranges and dimensions of equipment, identification of consumable, spare and repair components.

Technical support includes reference material on When To Cut/When To Roll, Thread Roll Head/Thread Roll Management, Rollability of Materials and more. Day-to-day operational information includes operator's information; material rollability, troubleshooting, thread roll width of relief and recommended blank diameter information. Where it is possible to do so, all the information that pertains to a given type and size of tool is concentrated in one place for quick and handy reference.

Did You Know

Landis has a trade in policy that allows 10% if you trade in a Landis or competitive thread cutting or rolling head, collapsible tap body or tap head.

All equipment must have standard shanks.

Equipment traded in must be complete.

Landis Quality Thread Rolls

Landis offers thread rolls for ISPE, Kinifac, Landis, Reed, Tesker, and other types of cylindrical two die type machines.

Rolls are also offered for Alco, Fette, and Landis thread rolling heads.

Advantages of Rolling Threads

Chipless cold forming with Landis thread rolling heads offer many advantages over other methods of producing threads.

Produce threads and related forms at high threading speeds with longer comparable tool life. Obtain threads up to 20% stronger than cut threads with significant material savings possible.

Operate at speeds higher than those obtainable with comparable thread cutting tools. With cold forming there is no abrasive wear and rolls will operate throughout their useful life without the need for periodic sizing. And the last thread produced will be as precise and as good as the first.

Cold forming results in threads of excellent micro structure, smooth mirror finish and improved grain structure for higher strength.

Rolling flows the material upward and outward to produce the thread. Because the thread is formed by the material being flowed upward and outward, the prepared blank is smaller than that required for a cut thread. This can result in material savings.

Application requirements for thread rolling are more stringent than for thread cutting. See the separate side bar on "Application Considerations".

The preceding are but some of the considerations that must be evaluated. Where thread rolling can be used it can offer many decided advantages over thread cutting.

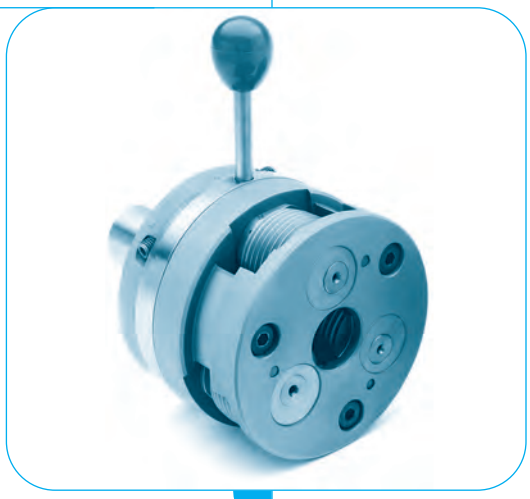
Landis offers heads for both rolling and cutting. If you wish to consider the use of a rolling tool, but are not familiar enough with the process to make a decision, consult the factory direct, or, consult your Landis representative.

Application Considerations

1. A good rule of thumb to remember is that materials that roll well do not cut well, those that cut well do not roll well. This holds true in the majority of instances.
2. To be suitable for rolling, the material should have an elongation factor of 12%. This is the element which allows material to be plastically and permanently deformed.
3. The design and/or end use of the workpiece may dictate the use of a certain material. For example, cast iron is not a rollable material and would require that the threads be cut.
4. Cut threading allows a certain amount of latitude in respect to the O.D. of the blank. When a blank is to be cut, the nominal oversize can be trimmed away by the throat section of the die head chaser. No harm done. However, thread roll dies will accept only a specific volume of flowed material. An oversize blank results in excessive material flow which overfills the dies and results in die breakage. Therefore, the blank O.D. must be tightly controlled and held within the specified limits.

Thread Rolling Heads

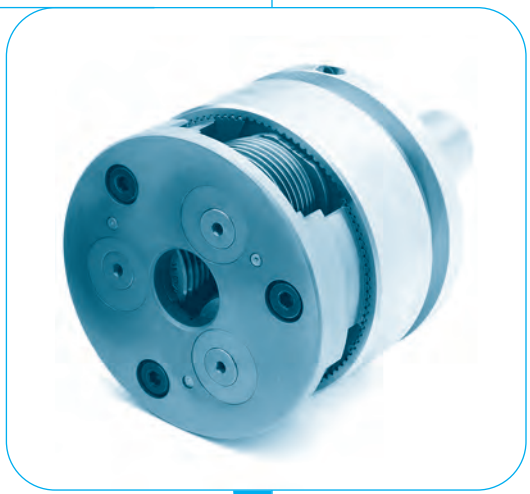
Model TRSB Stationary Head



For application where the part rotates and the threading tool is stationary.

Nonrevolving head is ideal for turret lathes, hand and automatic screw machines, and other stationary tool applications.

Model TRRB Revolving Head



A tool used on live spindle machines.

Revolving head for bar automatics and other live spindle machines, and for tapping, drilling, and threading machines.

Operation

TRSB Opening Action

Automatic opening of the TRSB Stationary Head is effected by interrupting the forward travel of the machine slide or carriage. Reset is done manually by handle or by cam.

TRRB Opening Action

Opening action of the TRRB Revolving Head is effected by interrupting the forward travel of the operating yoke. The yoke is also used to reset the head.

Positive Opening and Closing

Both styles of heads employ eccentric roll shafts keyed to the head's operating mechanism by shaft adjusting cranks.

Stationary Head Operation

Three hardened driving pins, mounted in the adjusting ring, secure the head in the closed position. As the head pulls off, the driving pins withdraw from the closing ring which is under spring tension.

Revolving Head Operation

Three hardened conical closing pins, mounted in the adjusting ring, engage the closing ring to lock the head closed.

Thread Rolling Heads

Operation

Eccentric Roll Shafts

Both the TRSB and TRRB style heads use three eccentric roll shafts operated by size adjusting cranks. As the heads open, the closing ring, under spring tension, causes the cranks to rotate the roll shafts and quickly clear the rolls from the completed thread.

Precision Rolls

Rolls, interchangeable between like sizes of TRSB and TRRB Heads, are reversible, end for end, to provide two wear sections. The same roll set can be used to produce both right and left-hand threads. However, right and left-hand helix angle bushings must be used, respectively.

Interchangeable Helix Angle Bushings

Interchangeable helix angle bushing sets allow the same head to be used to produce any diameter pitch and thread form combination that is within the capacity of the head. UNC, UNF, and "Sucker Rod" bushings sets are standard. Special bushing sets can be supplied where a more precise helix angle is required. Metric fine and coarse threads can be produced with UNF and UNC bushing sets. Certain metric diameter and pitch combination helix angles may vary sufficiently to require the use of metric bushing sets. Separate bushing sets are required for right and left-hand threading. However, the use of interchangeable bushing sets offers the decided advantage of allowing the same head to be used for right and left hand. With competitive equipment, two separate heads are required to do threads of different hand. With other types of rolling heads, excessive wear requires the replacement of major component parts. The interchangeable bushing feature can allow the Landis head to be reconditioned without replacing major parts.

Multiple Bushing Bearings

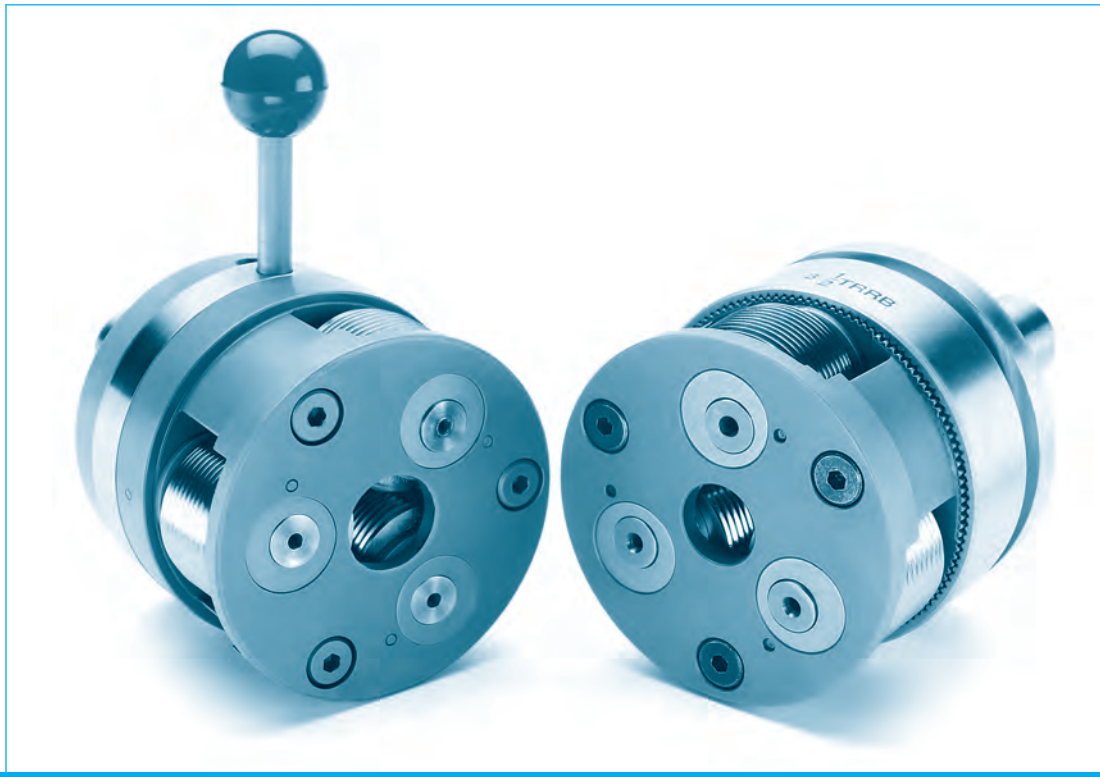
Multiple bushing roll bearings are supplied as standard equipment. This feature allows the heaviest cross section between the root of the thread form and the roll bore I.D. for maximum die strength. These bearings consist of three bushings telescoped one into the other. The outer and inner are bronze, the center one is steel finished to 16 micro-inch and hardened to 63-64 Rockwell "C". Installed to a running fit, the eight wear surfaces of the multiple bushings provide maximum uniform wear. The bearings are lubricated by the coolant which is circulated through the assembly by spiral grooves incorporated on each bushing.

Solid, one piece bronze or carbide bearings are available for more stringent operations.

Size Adjustment

Nominal size is obtained by installing the proper roll set. Fine, minute adjustments for final size are made by loosening and tightening two opposed set screws in the adjusting ring.

Specification information for No. 3½ thread rolling heads–stationary and revolving



Specifications for No. 3½ thread rolling heads–stationary and revolving

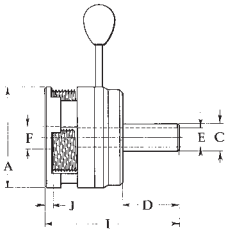
Specifications/Ranges

Head Model	Head Type*	Standard Range**	Maximum Oversize Range	Max. Thrd. Length Using Spec. Rolls & Std. Bore	Max. Thrd. Length Using Spec. Rolls & Spec. Bore	Weight***
3-1/2	TRSB Stationary	1/4" to 7/16"††—7 mm-11 mm	1/2"-20 Pitch—12 mm-1.25 mm P	5/8"-16 mm	7/8"-22 mm	3 lbs.
3-1/2	TRRB Revolving	1/4" to 7/16"††—7 mm-11 mm	1/2"-20 Pitch—12 mm-1.25 mm P	5/8"-16 mm	1"-25 mm	3 lb. 3 ozs.

*TRSB—Stationary head for turret lathes, etc. TRRB—Revolving head for multi-spindles, etc.

**Both left- and right-hand when proper helix angle bushings are used. ***Weight will vary slightly depending upon diameter and pitch rolls furnished.

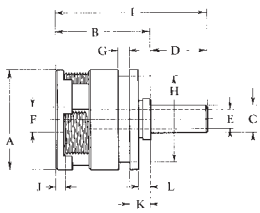
††Rolling 1/4" x 20 pitch U.N.C. is subject to factory review and recommendations. Please give pitch diameter, material and its hardness and whether right or left hand. Special rolls and helix angle bushings may be required.



TRSB Stationary Head

	A	C	D	E	F†	I	J*
No. 3-1/2	2-11/16"	3/4"	1-3/4"	15/32"	37/64"	4-3/16"	1/4"

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 9/16".



TRRB Revolving Head

	A	B	C	D	E	F†	G	H	I	J*	K	L
No. 3-1/2	2-3/4"	2-25/32"	3/4"	1-3/4"	15/32"	37/64"	.219"-.229"	2-3/8"	4-17/32"	1/4"	11/16"	13/32"

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 9/16".

Replaceable Helix Angle Bushing Sets††

UNC BUSHINGS	UNF BUSHINGS	STD. M/M COARSE BUSHINGS	STD. M/M FINE BUSHINGS	STD. LH BUSHING
FRT.	FRT.	FRT.	FRT.	FRT.
C58522	C63966	C128586	C119859	C58662
REAR	REAR	REAR	REAR	REAR
C58523	C63967	C128587	C119860	C58663
4° 0′	3° 0′	3° 15′	2° 30′	3° 0′

†† Bushings also available for special threads. Contact factory.

Roll Shaft/Bearing Sets

MULTIPLE BUSHING BEARINGS	MULTIPLE BUSHING SET	1 PC. BEARIUM BRONZE BUSHING	1 PC. CARBIDE	ROLL SHAFTS W/OIL GROOVE
INT. E61198 MID. E61199 EXT. E60732	} SE130525	D116818	D133737	D60711

3½ TRB Thread Rolls†

SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
1/4 - 20 UN/UNR *	B118583	B118807	B118821
1/4 - 20 UN/UNR **	B118801	B137314	
1/4 - 24 UN/UNR	B118833		
1/4 - 28 UN/UNR	B116027	B118811	B118823
1/4 - 32 UN/UNR	B118802	B118816	B118827
1/4 - 36 UN/UNR	B118832	B118846	
1/4 - 40 UN/UNR	B118831	B118845	
1/4 - 48 UN/UNR	B118830	B118844	
1/4 - 56 UN/UNR		B118843	
1/4 - 80 UN/UNR		B118842	
9/32 - 32 UN/UNR			B118855
9/32 - 40 UN/UNR	B118834	B118848	
9/32 - 48 UN/UNR		B118847	
5/16 - 13 UN/UNR	B118836		
5/16 - 18 UN/UNR	B118576	B118808	
5/16 - 20 UN/UNR	B118877	B118818	
5/16 - 24 UN/UNR	B116058	B118812	B118824
5/16 - 28 UN/UNR	B131072	B118849	
5/16 - 32 UN/UNR	B118803		B118828
5/16 - 40 UN/UNR	B118835		
3/8 - 16 UN/UNR	B118579	B118809	B118822
3/8 - 20 UN/UNR	B118805		
3/8 - 24 UN/UNR	B116059	B118813	B118825
3/8 - 28 UN/UNR	B117922	B118819	
3/8 - 32 UN/UNR	B118804	B118817	
3/8 - 40 UN/UNR	B118837		
3/8 - 48 UN/UNR		B118850	
7/16 - 14 UN/UNR	B118564	B118810	
7/16 - 16 UN/UNR	B118806		
7/16 - 20 UN/UNR	B118565	B118814	
7/16 - 24 UN/UNR	B118839	B118852	B118839
7/16 - 27 UN/UNR	B126537		
7/16 - 28 UN/UNR		B118815	
7/16 - 40 UN/UNR	B118838		

SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
1/4 - 28 UNJF	B115455		B063970
5/16 - 24 UNJF	B123628		B063971
3/8 - 24 UNJF	B123629		B067730
7/16 - 20 UNJF	B123630		
1/8 - 27 NPSM	B059339	B061669	
M6 - 1.0 I.S.O.	B129237	B121073	
M7 - 1.0 I.S.O.	B131088	B121074	
M8 - 1.25 I.S.O.		B121075	
M8 - 1.0 I.S.O.	B134902		
M10 - 1.50 I.S.O.	B125318	B119706	
M10 - 1.25 I.S.O.		B137776	
M10 - 1.0 I.S.O.	B137490		
M12 - 1.75 I.S.O.		B121076	
1/4 - 20 BSW *	B059390	B061673	
1/4 - 20 BSW **	B109327		
5/16 - 18 BSW	B059395	B061678	
3/8 - 16 BSW	B059399	B061682	
7/16 - 14 BSW	B059380	B061683	

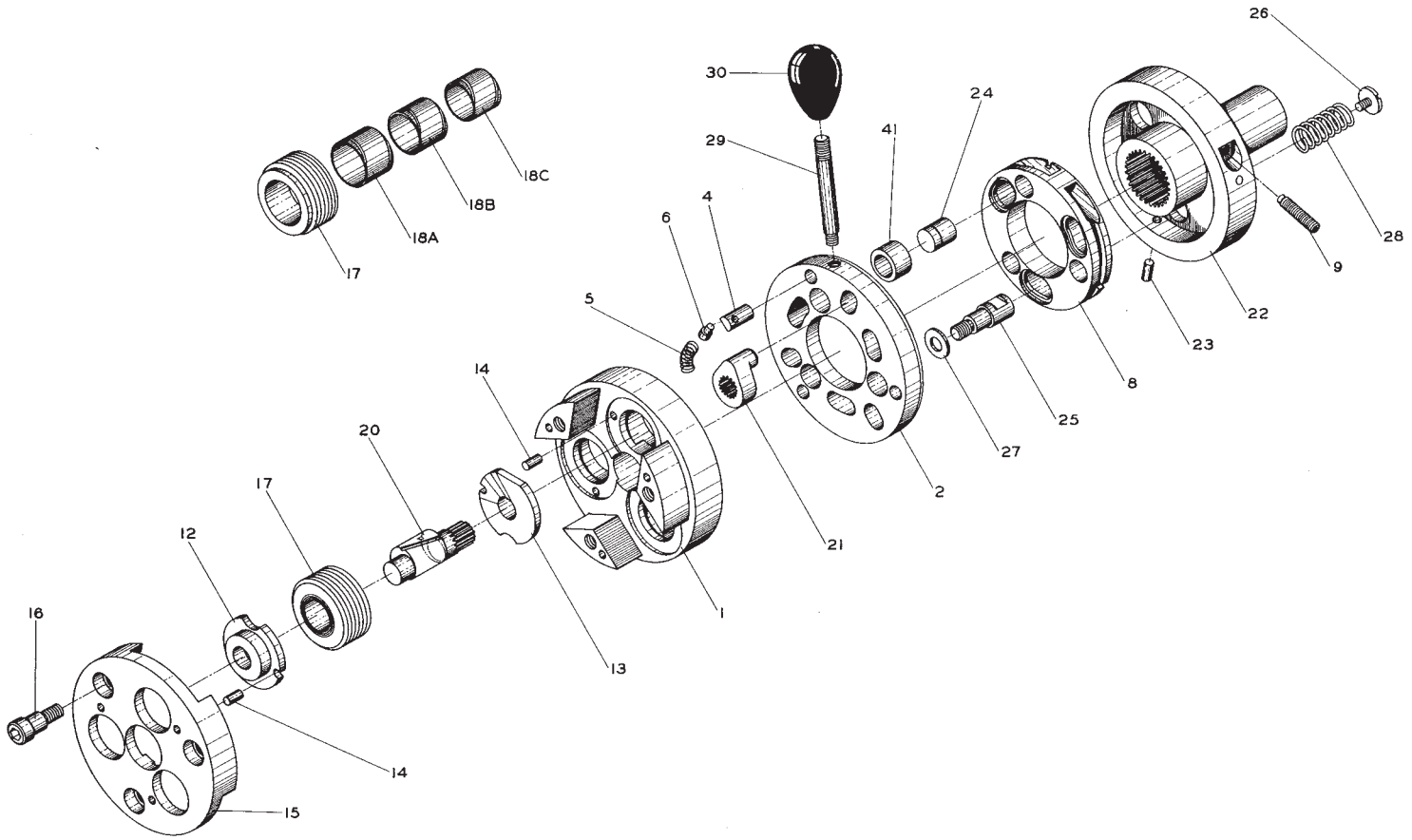
†For standard diameter and pitch combinations for UN, ISO and British thread forms. Rolls also available for other forms, or for special diameter, pitch and form threads. Contact factory application engineering department for details.

** Indicates special helix angle bushings required for RH and LH.

* Indicates RH only.

Ordering Example: One set of 1/4"-20 pitch UN/UNR, Identical Long Throat, Thread Rolls, No. B118583 for No. 3-1/2 TRB Head.

When a choice must be made between Identical Long, Identical Short, and No Throat Rolls, refer to the "Width of Relief" Chart for the No. 3-1/2 Head on page 69.

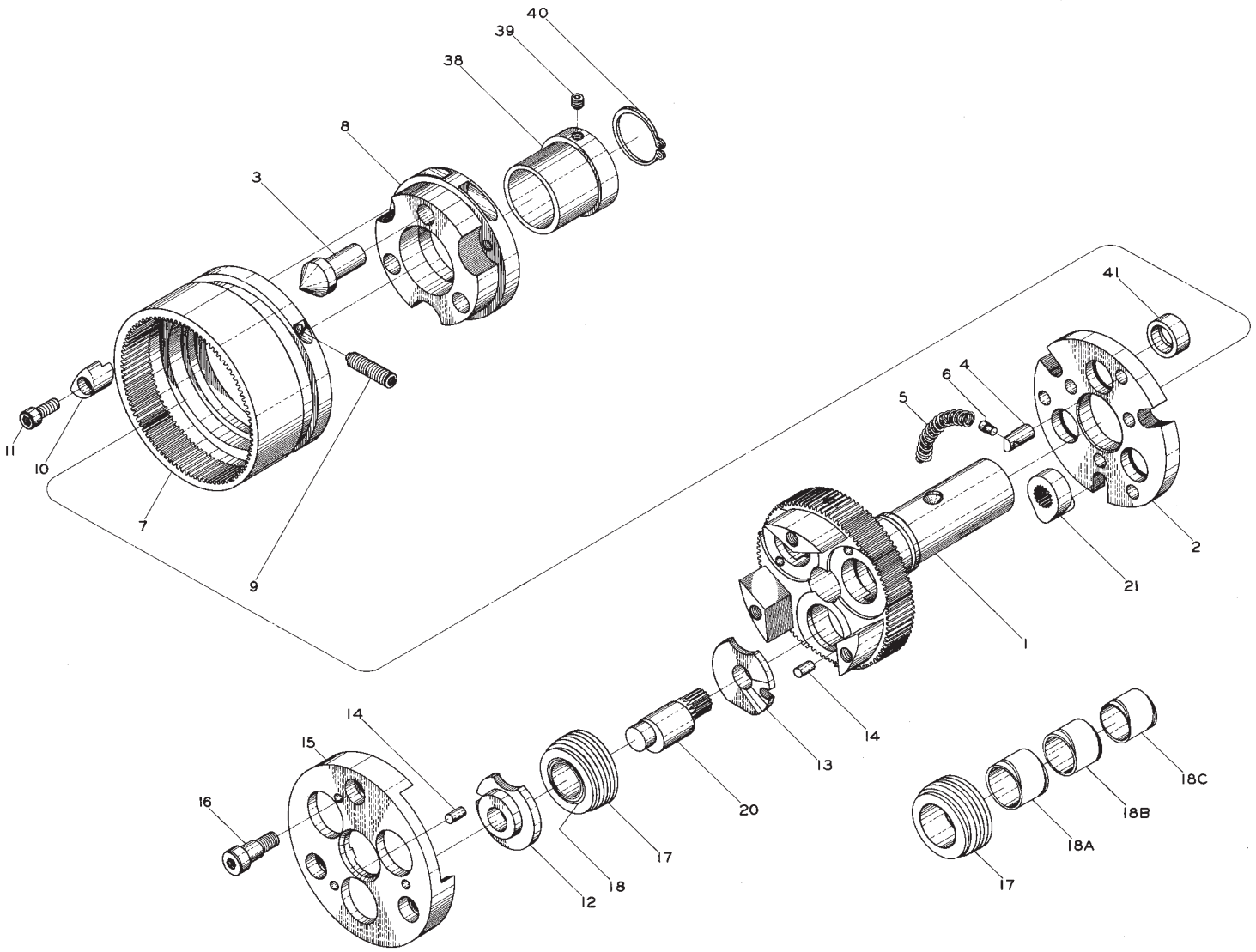


No. 3 1/2 TRSB Stationary Head

DR. NO.	PART NO.	NO. PCS.	NAME
TRS-1	A53559	1	Head Body
TRS-2	C67974	1	Closing Ring
TRS-4	E53550	3	Head Opening Pin
TRS-5	E53552	3	Head Opening Spring
TRS-6	E53551	3	Spring Retaining Pin
TRS-8	C53564	1	Adjusting Ring
TRS-9	18SF #10 x 1/2	2	Adjusting Screw
TRS-12	See Chart On Page 9	3	Front Bushing
TRS-13	See Chart On Page 9	3	Rear Bushing
TRS-14	1PH 3/32 x 3/16	6	Bushing Retaining Pin
TRS-15	B53544	1	Roll Retaining Cap
TRS-16	FA706	3	Retaining Cap Screw
TRS-17	Page 9	3	Thread Roll
TRS-18A*	E60732	3	External Bushing Bearing
TRS-18B*	E61199	3	Middle Bushing Bearing
TRS-18C*	E61198	3	Internal Bushing Bearing
TRS-20	D60711	3	Thread Roll Shaft
TRS-21	D53557	3	Shaft Adjusting Crank
TRS-22	A53560	1	Standard Hollow Shank
TRS-23	1PS 1/8 x 5/16	3	Adjusting Ring Retaining Pin
TRS-24	E53566	3	Driving Pin
TRS-25	E53567	3	Connecting Stud
TRS-26	E53570	3	Stud Screw
TRS-27	E53568	3	Stud Washer
TRS-28	E53569	3	Pull Back Spring
TRS-29	E53562	1	Handle
TRS-30	E53563	1	Knob

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.

IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/Bearing Sets Chart on page 9.



No. 3½ TRRB Revolving Head

DR. NO.	PART NO.	No. PCS.	NAME
TRR-1	A53543	1	Head Body
TRR-2	C53547	1	Closing Ring
TRR-3	E53554	3	Closing Pin
TRR-4	E53550	3	Head Opening Pin
TRR-5	E53552	3	Head Opening Spring
TRR-6	E53551	3	Spring Retaining Pin
TRR-7	B53549	1	Operating Ring
TRR-8	C53548	1	Adjusting Ring
TRR-9	18SF #10X1/2	2	Adjusting Screw
TRR-10	E53556	3	Retaining Segment
TRR-11	19S #6x1/2	3	Segment Screw
TRR-12	See Chart On Page 9	3	Front Bushing
TRR-13	See Chart On Page 9	3	Rear Bushing

DR. NO.	PART NO.	No. PCS.	NAME
TRR-14	1PH 3/32x3/16	6	Bushing Retaining Pin
TRR-15	B53544	1	Roll Retaining Cap
TRR-16	FA706	3	Retaining Cap Screw
TRR-17	See Chart On Page 9	3	Thread Roll (Specify Diam. Pitch-Thread Form)
TRR-18A*	E60732	3	External Bushing Bearing
TRR-18B*	E61199	3	Middle Bushing Bearing
TRR-18C*	E61198	3	Internal Bushing Bearing
TRR-20	D60711	3	Roll Shaft
TRR-21	D53557	3	Shaft Adjusting Crank
TRR-38	E53545	1	Truarc Retaining Ring
TRR-40	E53546	1	Shank Retaining Ring

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.
IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/Bearing Sets Chart on page 9.

Specification information for **No. 5** thread rolling heads–stationary and revolving

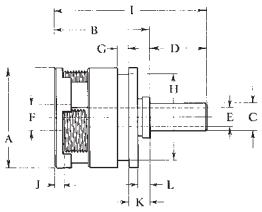
Specification information for No. 5 thread rolling heads–stationary and revolving

Specifications/Ranges

Head Model	Head Type*	Standard Range**	Maximum Oversize Range	Max. Thrd. Length Using Spec. Rolls & Std. Bore	Max. Thrd. Length Using Spec. Rolls & Spec. Bore	Weight***
5	TRSB Stationary	5/16" to 5/8"—8 mm-16 mm	3/4"-16 Pitch—20 mm-1.5 mm P	5/8"-16 mm	1- 1/8"-28 mm	6 lbs.
5	TRRB Revolving	5/16" to 5/8"—8 mm-16 mm	3/4"-16 Pitch—20 mm-1.5 mm P	5/8"-16 mm	2- 1/2"-63 mm	6 1/2 lbs.

*TRSB—Stationary head for turret lathes, etc. TRRB—Revolving head for multi-spindles, etc.

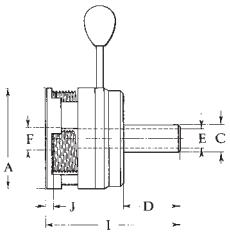
**Both left - and right-hand when proper helix angle bushings are used. ***Weight will vary slightly depending upon diameter and pitch rolls furnished.



TRSB Stationary Head

	A	C	D	E	F†	I	J*
No. 5	3-1/2"	1"	2"	11-16"	57/64"	4-11/16"	11/32"

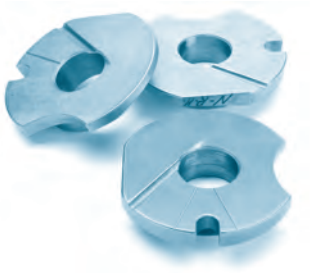
*To face of rolls. †Rolls up to shoulder unless diameter exceeds 7/8".



TRRB Revolving Head

	A	B	C	D	E	F†	G	H	I	J*	K	L
No. 5	3-1/2"	3-13/32"	1"	2"	11/16"	57/64"	.375"-.385"	3"	5-13/32"	11/32"	13/16"	1/2"

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 7/8".



Replaceable Helix Angle Bushing Sets††

UNC BUSHINGS	UNF BUSHINGS	STD. M/M COARSE BUSHINGS	STD. M/M FINE BUSHINGS	STD. LH BUSHING
FRT.	FRT.	FRT.	FRT.	FRT.
C64235	C113539	C119851	C119861	C58641
REAR	REAR	REAR	REAR	REAR
C64236	C113540	C119852	C119862	C58642
3° 40′	2° 45′	3° 15′	2° 30′	2° 40′

†† Bushings also available for special threads. Contact factory.

Roll Shaft/Bearing Sets

MULTIPLE BUSHING BEARINGS	MULTIPLE BUSHING SET	1 PC. BEARIUM BRONZE BUSHING	1 PC. CARBIDE	ROLL SHAFTS W/OIL GROOVE
INT. E55356 MID. E55357 EXT. E55358	} SE130526	D116819	D133738	D57811

5 TRB Thread Rollst

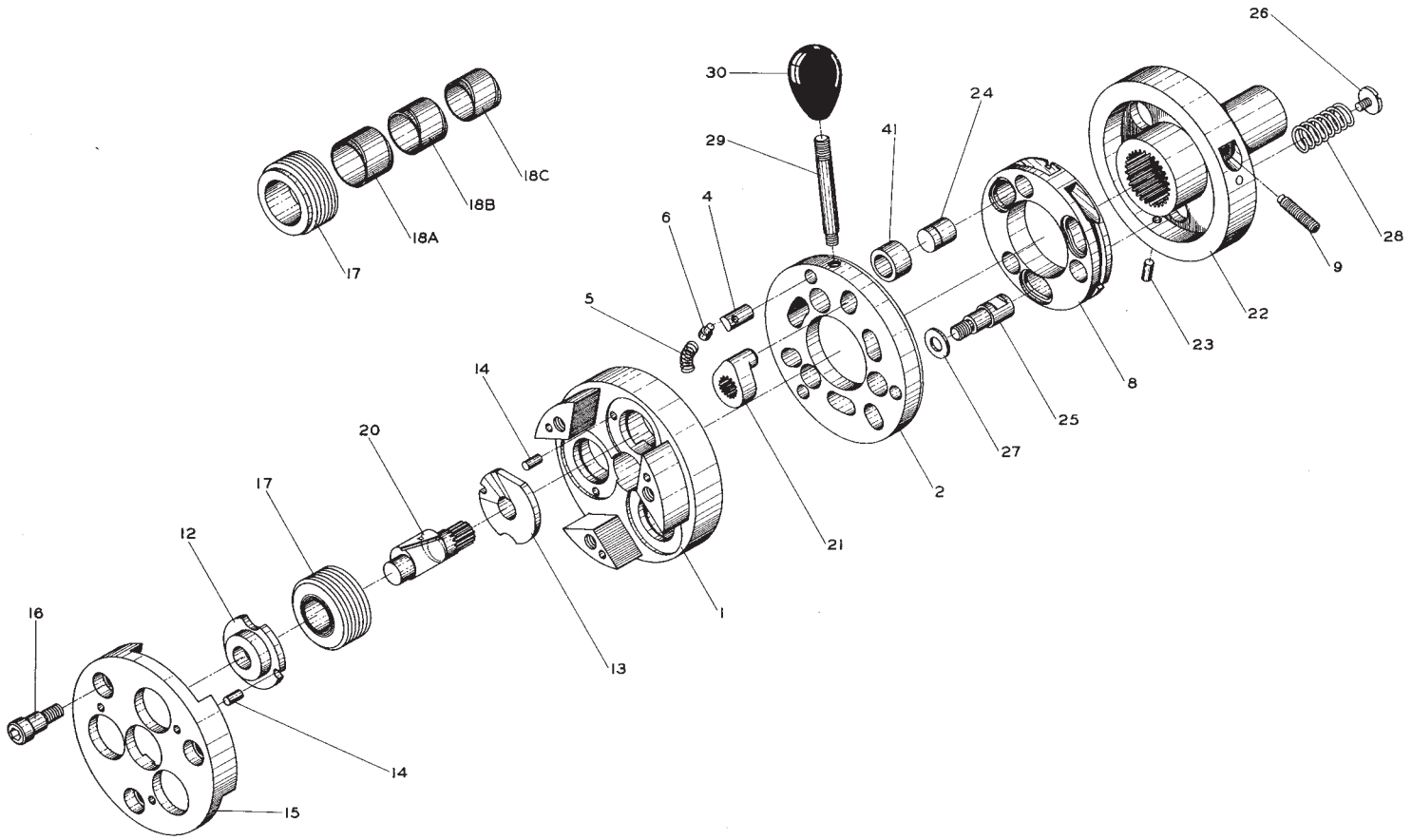
SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
5/16 - 18 UN/UNR	B118623	B118891	B118920
5/16 - 24 UN/UNR	B104624	B118897	B129681
5/16 - 32 UN/UNR	B118866		
3/8 - 16 UN/UNR	B118573	B118892	B118878
3/8 - 24 UN/UNR	B104625	B118898	B118921
3/8 - 32 UN/UNR	B118867	B118914	
3/8 - 40 UN/UNR	B118931		
7/16 - 14 UN/UNR	B118569	B118893	
7/16 - 16 UN/UNR	B119965		
7/16 - 20 UN/UNR	B118545	B118584	B118922
7/16 - 24 UN/UNR	B129834		B135455
7/16 - 27 UN/UNR	B118932		
7/16 - 28 UN/UNR	B118868	B118915	
7/16 - 32 UN/UNR			B118926
1/2 - 12 UN/UNR	B128228		
1/2 - 13 UN/UNR	B115110	B118894	B115252
1/2 - 16 UN/UNR	B118873		
1/2 - 18 UN/UNR	B118934	B118940	
1/2 - 20 UN/UNR	B104626	B118577	B118923
1/2 - 28 UN/UNR		B120078	
1/2 - 32 UN/UNR	B118872		B118919
1/2 - 40 UN/UNR	B118933		
9/16 - 12 UN/UNR	B118558	B118895	
9/16 - 18 UN/UNR	B118546	B118899	B118924
9/16 - 20 UN/UNR	B122847	B134403	
9/16 - 24 UN/UNR	B118869	B118916	
9/16 - 32 UN/UNR	B118874		
19/32 - 24 UN/UNR	B118935	B118941	
5/8 - 11 UN/UNR	B118566	B118896	B115251
5/8 - 18 UN/UNR	B118585	B118575	B118925
5/8 - 20 UN/UNR		B118918	
5/8 - 24 UN/UNR	B118870	B118917	
5/8 - 28 UN/UNR	B118876		
5/8 - 32 UN/UNR	B118875		

SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
5/16 - 24 UNJF	B123618		
3/8 - 16 UNJC		B138897	
3/8 - 24 UNJF	B123619		B067965
7/16 - 20 UNJF	B119799		
1/2 - 13 UNJC	B138176	B138177	
1/2 - 20 UNJF	B118880	B123617	B069813
9/16 - 18 UNJF	B123620		
5/8 - 18 UNJF	B123621	B108441	
5/8 - 24 UNJEF	B135783		
1/8 - 27 NPSM	B058221	B061688	B126568
1/4 - 18 NPSM	B058223	B061690	
3/8 - 18 NPSM	B058226	B061693	
M8 - 1.25 I.S.O.	B124008		B124811
M10 - 1.50 I.S.O.	B132498	B120613	B124812
M10 - 1.25 I.S.O.	B129117		B129588
M10 - 1.0 I.S.O.	B136045		
M12 - 1.75 I.S.O.		B125521	B124813
M12 - 1.50 I.S.O.	B137327		
M12 - 1.25 I.S.O.	B123571	B128899	
M14 - 2.0 I.S.O.		B120614	
M14 - 1.50 I.S.O.	B124687		
M16 - 2.0 I.S.O.		B139490	B124814
M16 - 1.50 I.S.O.	B132893		
5/16 - 18 BSW	B062427		B124815
3/8 - 16 BSW	B060721	B061698	B124816
3/8 - 20 BSF	B058230	B061697	
7/16 - 14 BSW	B062428		
1/2 - 12 BSW	B058236	B061806	B124817
1/2 - 16 BSF	B058237	B061807	
5/8 - 11 BSW	B058245	B061817	
1/2 - 27 GAS		B061809	

†For standard diameter and pitch combinations for UN, ISO and British thread forms. Rolls also available for other forms, or for special diameter, pitch and form threads. Contact factory application engineering department for details.

Ordering Example: One set of 5/16"-18 Pitch UN/UNR, Identical Long Throat, Thread Rolls, No. B118623 for No. 5 TRB Head.

When a choice must be made between Identical Long, Identical Short, and No Throat Rolls, refer to the "Width of Relief" Chart for the No. 5 Head on page 69.

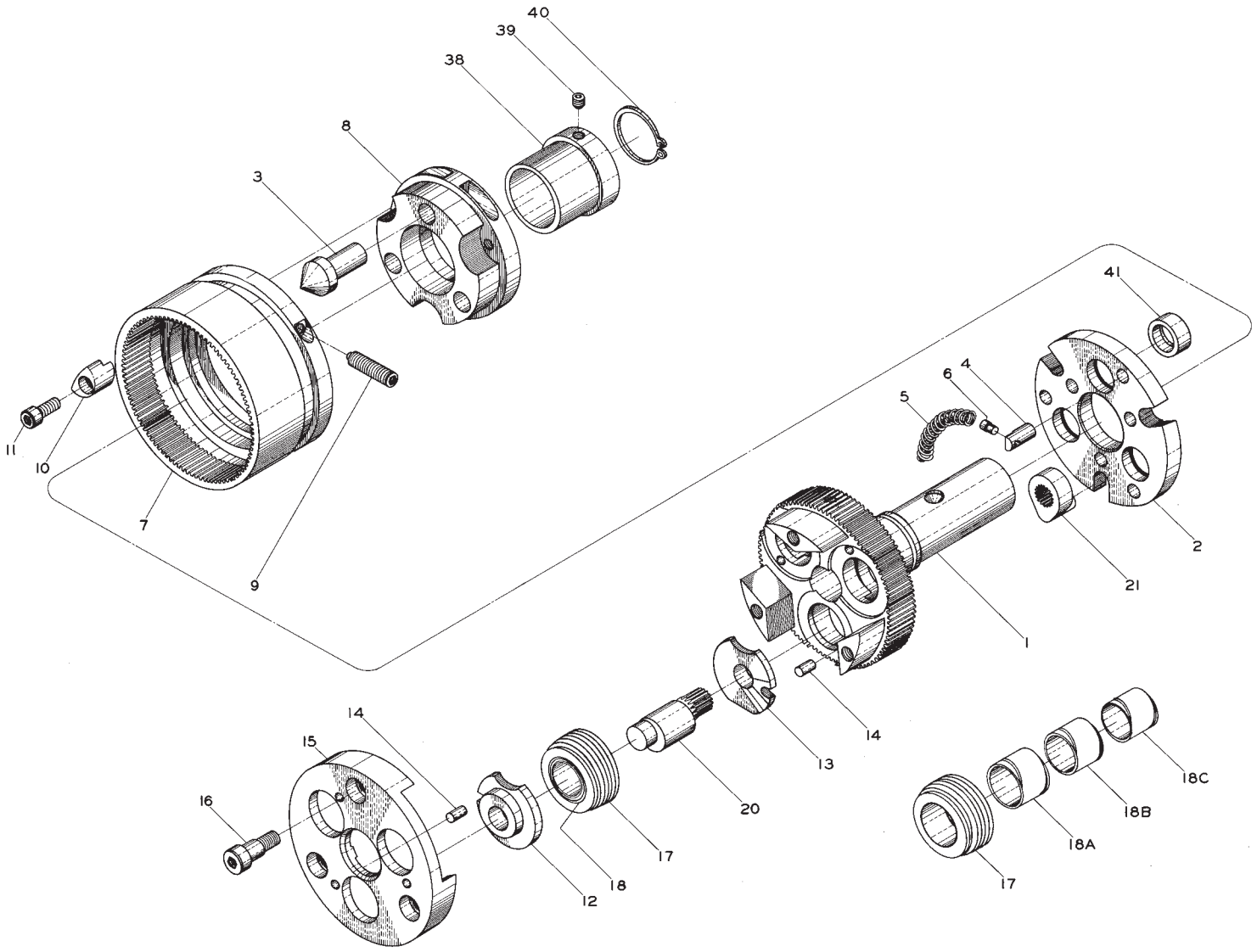


No. 5 TRSB Stationary Head

DR. NO.	PART NO.	NO. PCS.	NAME
TRS-1	A49868	1	Head Body
TRS-2	B49869	1	Closing Ring
TRS-4	E49835	3	Head Opening Pin
TRS-5	E66238	3	Head Opening Spring
TRS-6	E49841	3	Spring Retaining Pin
TRS-8	C49872	1	Adjusting Ring
TRS-9	18SF 1/4 x 1	2	Adjusting Screw
TRS-12	See Chart On Page 13	3	Front Bushing
TRS-13	See Chart On Page 13	3	Rear Bushing
TRS-14	1PH 5/32 x 1/4	6	Bushing Retaining Pin
TRS-15	A49829	1	Roll Retaining Cap
TRS-16	FA710	3	Retaining Cap Screw
TRS-17	See Chart On Page 13	3	Thread Roll
TRS-18A*	E55358	3	External Bearing Bushing
TRS-18B*	E55357	3	Middle Bearing Bushing
TRS-18C*	E55356	3	Internal Bearing Bushing
TRS-20	D57811	3	Thread Roll Shaft
TRS-21	D53093	3	Shaft Adjusting Crank
TRS-22	B49867	1	Standard Hollow Shank
TRS-23	1PS 1/8 x 3/8	3	Adjusting Ring Retaining Pin
TRS-24	E49871	3	Driving Pin
TRS-25	E52112	3	Connecting Stud
TRS-26	E52113	3	Stud Screw
TRS-27	E49874	3	Stud Washer
TRS-28	E52362	3	Pull Back Spring
TRS-29	E52253	1	Handle
TRS-30	E52257	1	Knob

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.

IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/ Bearing Chart on page 13.



No. 5 TRRB Revolving Head

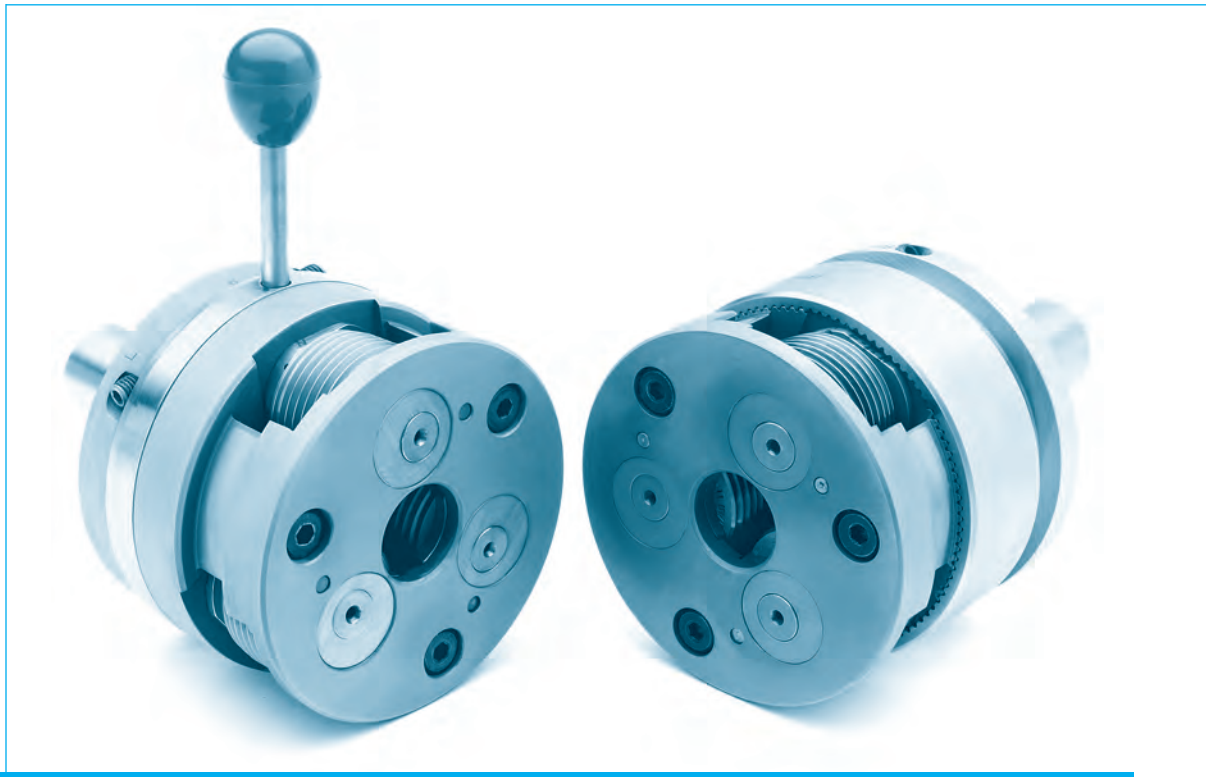
DR. NO.	PART NO.	No. PCS.	NAME
TRR-1	A54733	1	Head Body
TRR-2	C49832	1	Closing Ring
TRR-3	E49833	3	Closing Pin
TRR-4	E49835	3	Head Opening Pin
TRR-5	E52337	3	Head Opening Spring
TRR-6	E49841	3	Spring Retaining Pin
TRR-7	B49839	1	Operating Ring
TRR-8	C49836	1	Adjusting Ring
TRR-9	18SF 1/4 x 1	2	Adjusting Screw
TRR-10	E49838	3	Retaining Segment
TRR-11	1S #10 x 1/2	3	Segment Screw
TRR-12	See Chart On Page 13	3	Front Bushing
TRR-13	See Chart On Page 13	3	Rear Bushing
TRR-14	1 PH 5/32 x 1/4	6	Bushing Retaining Pin

DR. NO.	PART NO.	No. PCS.	NAME
TRR-15	A49829	1	Roll Retaining Cap
TRR-16	FA710	3	Retaining Cap Screw
TRR-17	See Chart On Page 13	3	Thread Roll
TRR-18A*	E55358	3	External Bearing Bushing
TRR-18B*	E55357	3	Middle Bearing Bushing
TRR-18C*	E55356	3	Internal Bearing Bushing
TRR-20	D57811	3	Thread Roll Shaft
TRR-21	D53093	3	Shaft Adjusting Crank
TRR-38	Specify Serial No. of Head	1	Retaining Ring (Specify Serial No. of Head)
TRR-39	17S #10 x 1/4	1	Retaining Screw
TRR-40	E54734	1	TRUARC Retaining Ring

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.

IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/Bearing Chart on page 13.

Specification information for No. 7 thread rolling heads–stationary and revolving



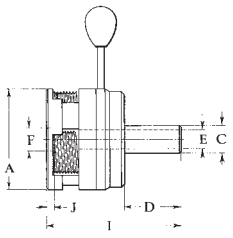
Specification information for No. 7 thread rolling heads–stationary and revolving

Specifications/Ranges

Head Model	Head Type*	Standard Range**	Maximum Oversize Range	Max. Thrd. Length Using Spec. Rolls & Std. Bore	Max. Thrd. Length Using Spec. Rolls & Spec. Bore	Weight***
7	TRSB Stationary	7/16" to 7/8"—11 mm-22 mm	1"-12 Pitch—24 mm-2.0 mm P	3/4"-19 mm	1-3/8"-35 mm	12-1/2 lbs.
7	TRRB Revolving	7/16" to 7/8"—11 mm-22 mm	1"-12 Pitch—24mm-2.0 mm P	3/4"-19 mm	3-1/4"-82 mm	13-1/2 lbs.

*TRSB—Stationary head for turret lathes, etc. TRRB—Revolving head for multi-spindles, etc.

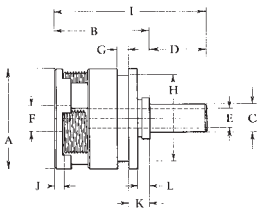
**Both left- and right-hand when proper helix angle bushings are used. ***Weight will vary slightly depending upon diameter and pitch rolls furnished.



TRSB Stationary Head

	I	A	C	D	E	F†	I	J*
No. 7	4-39/64"	1-1/2"	2-1/2"	15/16"	1-9/64"	6-1/16"	7/16"	

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 1-/18" for the No. 3-1/2, 7/8" for the No. 5, 1-1/8" for the No. 7, 1-3/4" for the No. 10 and 3-1/2" for the No. 16.



TRRB Revolving Head

	II	A	B	C	D	E	F†	G	H	I	J*	K	L
No. 7	4-39/64"	4-9/32"	1-1/2"	2-1/2"	15/16"	1-9/64"	.375"-.385"	4-1/8"	6-25/32"	7/16"	1-1/64"	41/64"	

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 1-1/8" for the No. 3-1/2, 7/8" for the No. 5,

Replaceable Helix Angle Bushing Sets††

UNC BUSHINGS	UNF BUSHINGS	STD. M/M COARSE BUSHINGS	STD. M/M FINE BUSHINGS	STD. LH BUSHING
FRT.	FRT.	FRT.	FRT.	FRT.
B58526	B113541	B119853	B119863	B58631
REAR	REAR	REAR	REAR	REAR
B58527	B113542	B119854	B119864	B58632
3° 20′	2° 20′	3° 0′	2° 20′	2° 20′

††Bushings also available for special threads. Contact factory.

Roll Shaft/Bearing Sets

MULTIPLE BUSHING BEARINGS	MULTIPLE BUSHING SET	1 PC. BEARIUM BRONZE BUSHING	1 PC. CARBIDE	ROLL SHAFTS W/OIL GROOVE
INT. E54464 MID. E54465 EXT. E54466	} SE130527	D116445	D133739	D57812

7 TRB Thread Rolls†

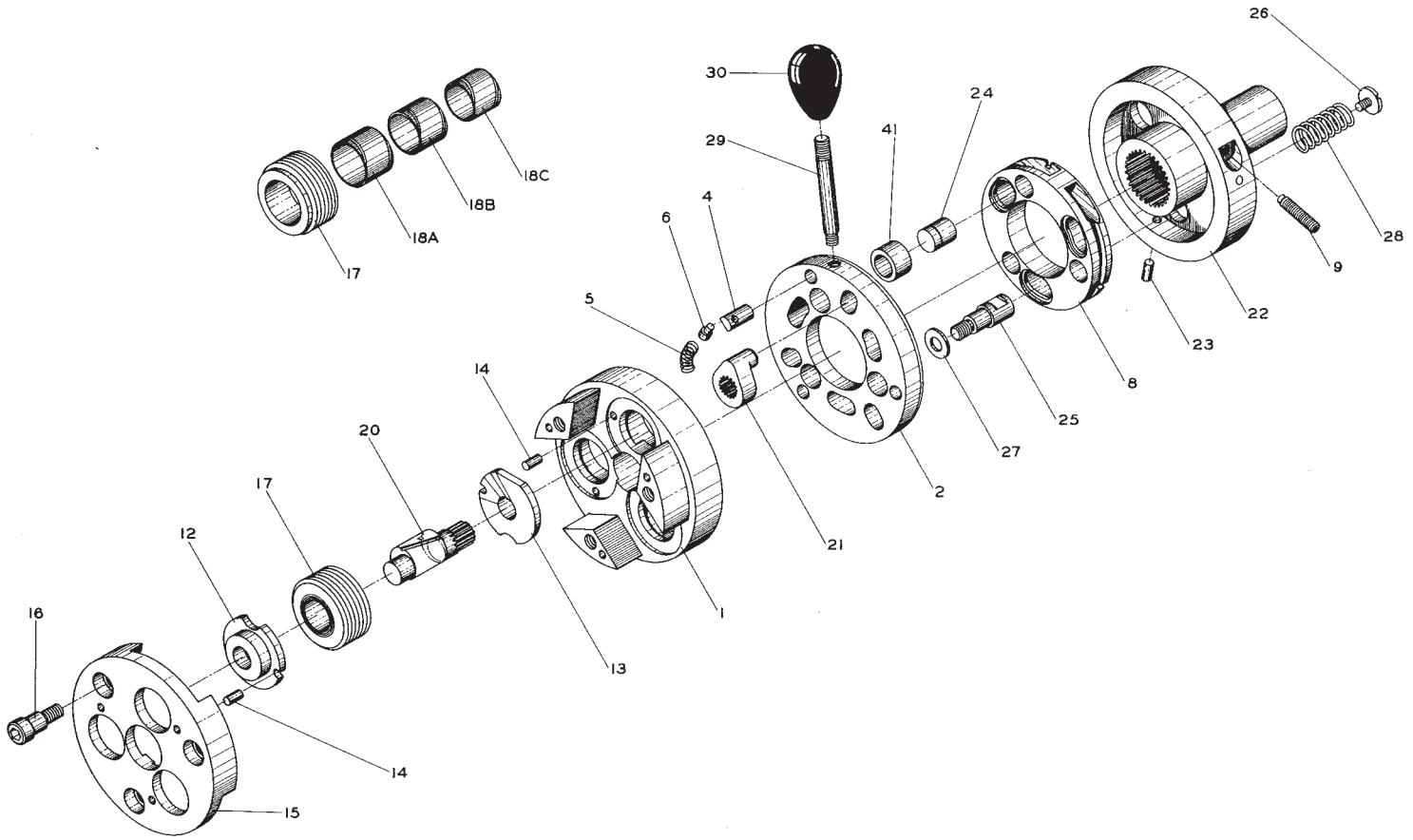
SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
7/16 - 14 UN/UNR	B118563	B118970	B118991
7/16 - 20 UN/UNR	B116060	B118976	B118992
7/16 - 32 UN/UNR	B118964	B118985	
1/2 - 13 UN/UNR	B115752	B118657	B134915
1/2 - 20 UN/UNR	B116061	B118977	B118993
1/2 - 28 UN/UNR		B118984	
9/16 - 12 UN/UNR	B118562	B118972	
9/16 - 13 UN/UNR	B118999	B119127	
9/16 - 18 UN/UNR	B116062	B118978	B118994
9/16 - 20 UN/UNR	B118965		
9/16 - 24 UN/UNR	B118961	B118980	
19/32 - 20 UN/UNR	B118971		
43/64 - 11 UN/UNR	B119100		
5/8 - 11 UN/UNR	B118567	B118973	B128344
5/8 - 12 UN/UNR	B118957		
5/8 - 18 UN/UNR	B112092	B118979	B118995
5/8 - 24 UN/UNR		B118981	
11/16 - 11 UN/UNR	B119102	B119129	
11/16 - 12 UN/UNR	B127332		
11/16 - 16 UN/UNR	B133962	B118986	
11/16 - 18 UN/UNR	B119101		
3/4 - 10 UN/UNR	B112091	B118974	
3/4 - 12 UN/UNR	B118958		
3/4 - 16 UN/UNR	B115236	B118578	B120021
3/4 - 18 UN/UNR	B119104	B125493	
3/4 - 20 UN/UNR	B118962	B118982	
3/4 - 24 UN/UNR	B119103		
3/4 - 28 UN/UNR	B118968	B118987	
3/4 - 32 UN/UNR	B118967		
13/16 - 10 UN/UNR	B119109	B119132	
13/16 - 12 UN/UNR	B127774		
13/16 - 16 UN/UNR	B118960	B124886	B125638
13/16 - 18 UN/UNR	B119108	B119131	
13/16 - 20 UN/UNR		B127234	B118998
13/16 - 24 UN/UNR	B119107	B119130	
13/16 - 32 UN/UNR	B118969		
27/32 - 28 UN/UNR	B119110	B119133	
7/8 - 9 UN/UNR	B118568	B118975	B118990

SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
7/8 - 12 UN/UNR	B118959		
7/8 - 14 UN/UNR	B112566	B118582	B118996
7/8 - 18 UN/UNR	B119105	B119134	B133923
7/8 - 20 UN/UNR	B118963	B118983	
7/8 - 32 UN/UNR		B118988	
9/16 - 18 UNJF	B127232	B107340	
5/8 - 18 UNJF		B098680	
11/16 - 24 UNJEF		B107341	
3/8 - 18 NPSM	B061898	B125330	
1/2 - 14 NPSM	B124009		
M12 - 1.75 I.S.O.	B129043		
M12 - 1.50 I.S.O.	B134222		
M12 - 1.25 I.S.O.	B133928		
M14 - 2.0 I.S.O.	B115468		
M14 - 1.50 I.S.O.	B134223		
M16 - 2.0 I.S.O.	B112592	B134219	B136757
M16 - 1.50 I.S.O.	B132163	B125329	
M16 - 1.25 I.S.O.		B126480	
M18 - 1.5 I.S.O.	B134224		
M20 - 2.5 I.S.O.	B123573	B137344	
M20 - 1.5 I.S.O.	B131276	B135799	
M22 - 1.5 I.S.O.	B131211	B130685	
7/16 - 14 BSW	B059383	B061822	
1/2 - 12 BSW	B059382	B061825	
1/2 - 16 BSF	B061170		
5/8 - 11 BSW	B058257	B061832	
5/8 - 14 BSF	B061169		
3/4 - 10 BSW	B058261	B061837	
3/4 - 12 BSF	B068074		
7/8 - 9 BSW	B059381	B061842	
7/8 - 11 BSF	B065222		
3/8 - 19 BSPP	B121626		
1/2 - 14 BSPP	B121099		

†For standard diameter and pitch combinations for UN, ISO and British thread forms. Rolls also available for other forms, or for special diameter, pitch and form threads. Contact factory application engineering department for details.

Ordering Example: One set of 7/16"-14 Pitch UN/UNR, Identical Long Throat, Thread Rolls, No. B118563 for No. 7 TRB Head.

When a choice must be made between Identical Long,Identical Short, and No Throat Rolls, refer to the "Width of Relief" Chart for the No. 7 Head on page 69.

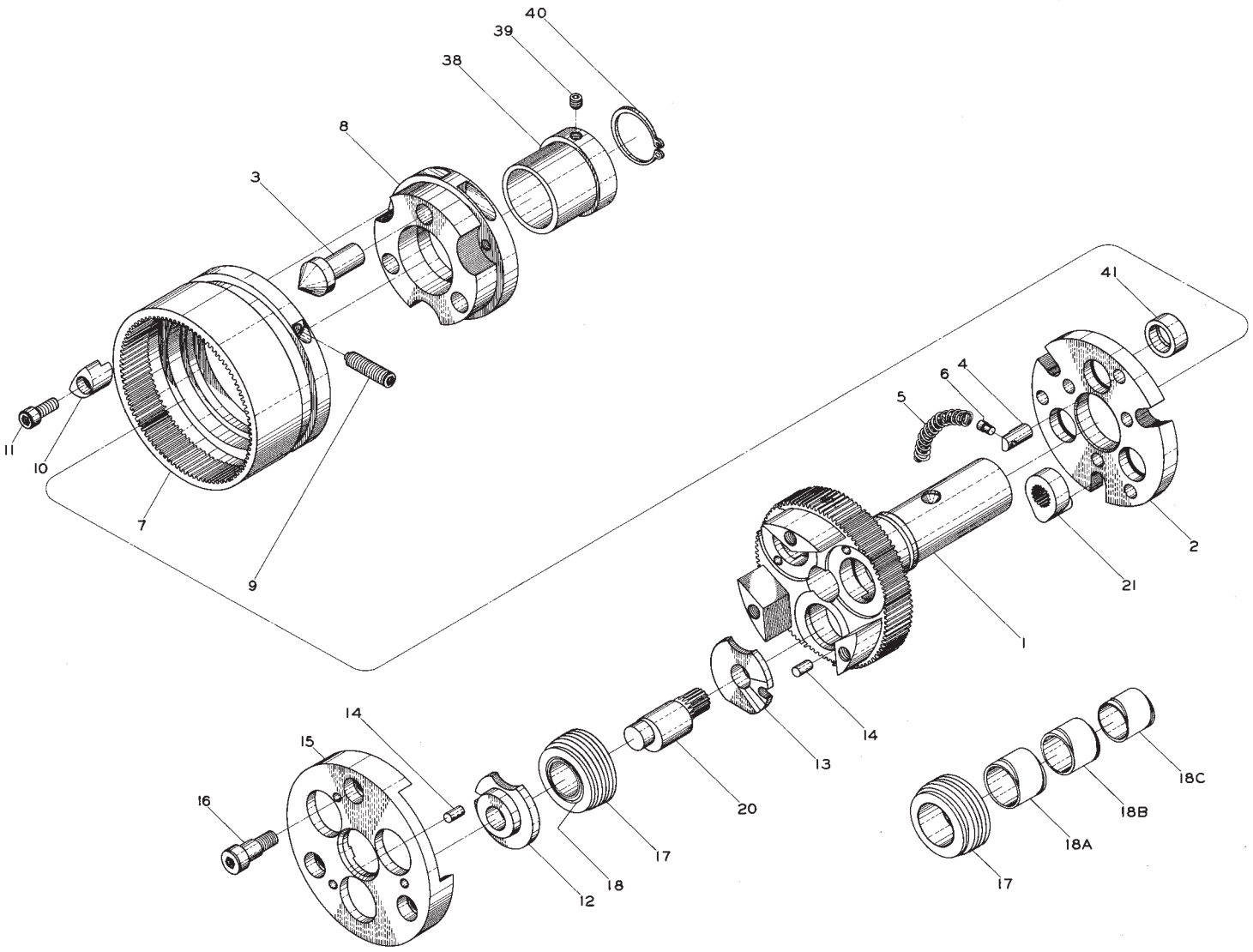


No. 7 TRSB Stationary Head

DR. NO.	PART NO.	NO. PCS.	NAME
TRS-1	A52450	1	Head Body
TRS-2	B52458	1	Closing Ring
TRS-4	E52463	3	Head Opening Pin
TRS-5	E52465	3	Head Opening Spring
TRS-6	E52464	3	Spring Retaining Pin
TRS-8	B52459	1	Adjusting Ring
TRS-9	18SF 5/16 x 1	2	Adjusting Screw
TRS-12	See Chart On Page 17	3	Front Bushing
TRS-13	See Chart On Page 17	3	Rear Bushing
TRS-14	1PH 3/16 x 3/8	6	Bushing Retaining Pin
TRS-15	A52454	1	Roll Retaining Cap
TRS-16	FA717	3	Retaining Cap Screw
TRS-17	See Chart On Page 17	3	Thread Roll
TRS-18A*	E54466	3	External Bearing Bushing
TRS-18B*	E54465	3	Middle Bearing Bushing

DR. NO.	PART NO.	NO. PCS.	NAME
TRS-18C*	E54464	3	Internal Bearing Bushing
TRS-20	D57812	3	Thread Roll Shaft
TRS-21	D53218	3	Shaft Adjusting Crank
TRS-22	A52455	1	Standard Hollow Shank
TRS-23	1PS 3/16 x 7/16	3	Adjusting Ring Retaining Pin
TRS-24	E52467	3	Driving Pin
TRS-25	E52472	3	Connecting Stud
TRS-26	E52475	3	Stud Screw
TRS-27	E52473	3	Stud Washer
TRS-28	E52474	3	Pull Back Spring
TRS-29	E52461	1	Handle
TRS-30	E52257	1	Knob
TRS-41	E52476	3	Driving Pin Bushing

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.
IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/ Bearing Chart on page 17.



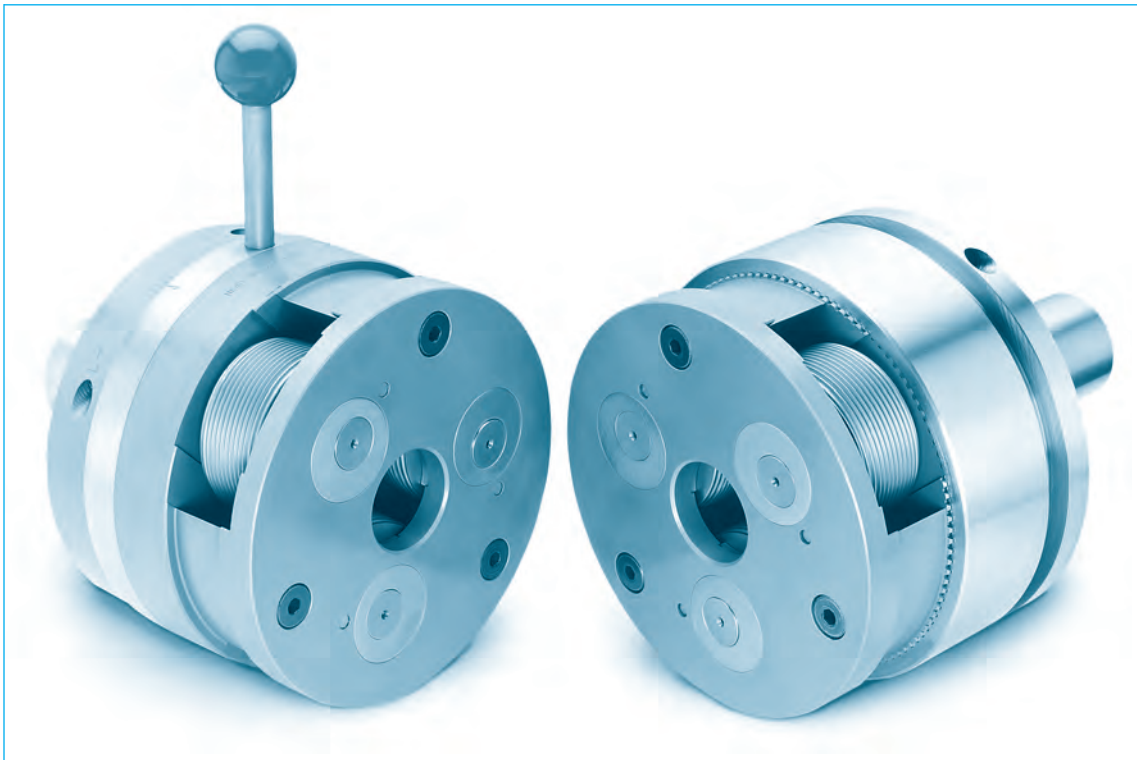
No. 7 TRRB Revolving Head

DR. NO.	PART NO.	No. PCS.	NAME
TRR-1	A54750	1	Head Body
TRR-2	B52457	1	Closing Ring
TRR-3	D52466	3	Closing Pin
TRR-4	E52463	3	Head Opening Pin
TRR-5	E52465	3	Head Opening Spring
TRR-6	E52464	3	Spring Retaining Pin
TRR-7	A52462	1	Operating Ring
TRR-8	B52460	1	Adjusting Ring
TRR-9	18SF 5/16 x 1	2	Adjusting Screw
TRR-10	E52469	3	Locking Segment
TRR-11	11S 1/4 x 5/8	3	Segment Screw
TRR-12	See Chart On Page 17	3	Front Bushing - N.C.

DR. NO.	PART NO.	No. PCS.	NAME
TRR-13	See Chart On Page 17	3	Rear Bushing - N.C.
TRR-14	1 PH 3/16 x 3/8	6	Bushing Retaining Pin
TRR-15	A52454	1	Roll Retaining Cap
TRR-16	FA717	3	Retaining Cap Screw
TRR-17	See Chart On Page 17	3	Thread Roll
TRR-18A*	E54466	3	External Bearing Bushing
TRR-18B*	E54465	3	Middle Bearing Bushing
TRR-18C*	E54464	3	Internal Bearing Bushing
TRR-20	D57812	3	Thread Roll Shaft
TRR-21	D53218	3	Shaft Adjusting Crank
TRR-38	D54749	1	Retaining Ring
TRR-40	E54751	1	TRUARC Retaining Ring

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.
IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/Bearing Chart on page 17.

Specification information for No. 10 thread rolling heads–stationary and revolving



Specification information for No. 10 thread rolling heads–stationary and revolving

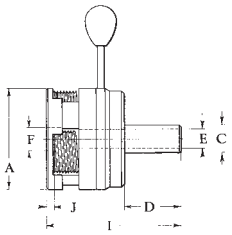
Specifications/Ranges

Head Model	Head Type*	Standard Range**	Maximum Oversize Range	Max. Thrd. Length Using Spec. Rolls & Std. Bore	Max. Thrd. Length Using Spec. Rolls & Spec. Bore	Weight***
10	TRSB Stationary	5/8" to 1-1/14"—16 mm-32 mm	1-3/8"-12 Pitch—33 mm-2.0 mm P	1"-25 mm	Unlimited	46 lbs.
			1-1/2"-12 Pitch†—36 mm-2.0 mm P	1"-25 mm	2"-51 mm	
10	TRRB Revolving	5/8" to 1-1/14"—16 mm-32 mm	1-3/8"-12 Pitch—33 mm-2.0 mm P	1"-25 mm	Unlimited	51 lbs. 4 ozs.
			1-1/2"-12 Pitch†—36 mm-2.0 mm P	1"-25 mm	4-1/2"-114 mm	

*TRSB—Stationary head for turret lathes, etc. TRRB—Revolving head for multi-spindles, etc.

**Both left- and right-hand when proper helix angle bushings are used. ***Weight will vary slightly depending upon diameter and pitch rolls furnished.

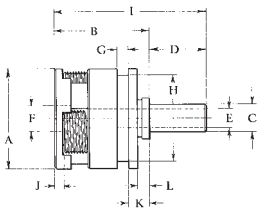
†Requires slight alteration to rear helix angle bushings.



TRSB Stationary Head

	A	C	D	E	F†	I	J*
No. 10	7-5/16"	2"	3-1/4"	1-5/16"	1-25/32"	8-3/8"	5/8"

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 1-3/4".



TRRB Revolving Head

	A	B	C	D	E	F†	G	H	I	J*	K	L
No. 10	7-5/8"	6-1/16"	2"	3-1/4"	1-5/16"	1-25/32"	.500"-.510"	6-3/4"	9-5/16"	5/8"	1-1/2"	15/16"

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 1-3/4".

Replaceable Helix Angle Bushing Sets††

UNC BUSHINGS	UNF BUSHINGS	STD. M/M COARSE BUSHINGS	STD. M/M FINE BUSHINGS	STD. LH BUSHING
FRT.	FRT.	FRT.	FRT	FRT.
C58528	C60718	C119855	C119865	C58645
REAR	REAR	REAR	REAR	REAR
C58529	C60719	C119856	C119866	C58646
2° 45′	1° 45′	2° 45′	1° 45′	2° 45′

††Bushings also available for special threads and sucker rod threads. Contact factory.

Roll Shaft/Bearing Sets

MULTIPLE BUSHING BEARINGS	MULTIPLE BUSHING SET	1 PC. BEARIUM BRONZE BUSHING	1 PC. CARBIDE	ROLL SHAFTS W/OIL GROOVE
INT. E55392 MID. E55393 EXT. E55394	} SE130528	D115458	D133740	D57813

10 TRB Thread Rolls†

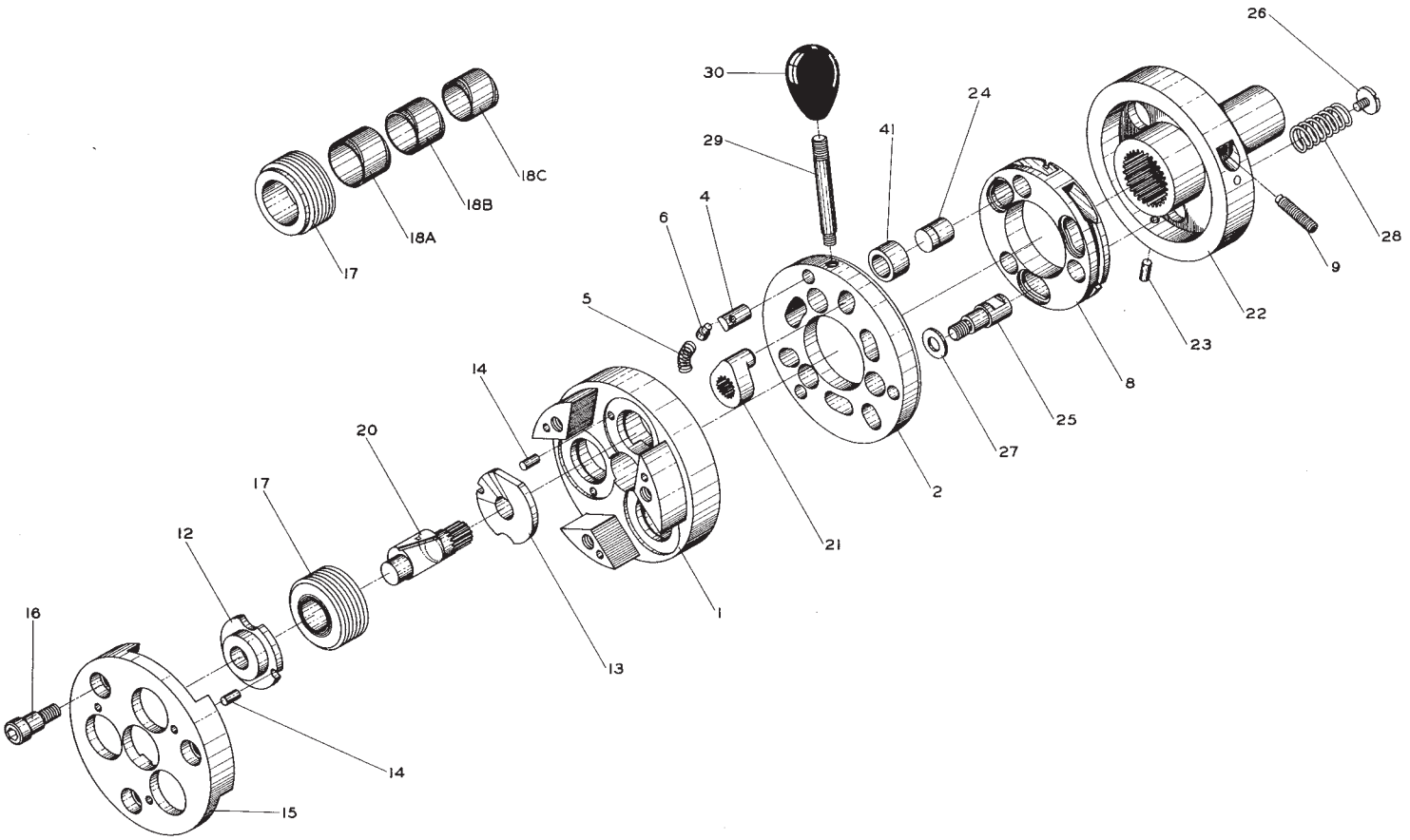
SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
5/8 - 11 UN/UNR	B118560	B119165	
5/8 - 18 UN/UNR	B118624	B119171	B119186
11/16 - 11 UN/UNR	B119190	B119013	
11/16 - 18	B123137		
3/4 - 10 UN/UNR	B118586	B119166	
3/4 - 12 UN/UNR	B119147	B119180	
3/4 - 16 UN/UNR	B118570	B119172	B119188
3/4 - 20 UN/UNR		B119177	B119189
3/4 - 28 UN/UNR	B126446		
13/16 - 16 UN/UNR	B119148		
13/16 - 20 UN/UNR	B119161		
7/8 - 9 UN/UNR	B118571	B119167	
7/8 - 12 UN/UNR			
7/8 - 14 UN/UNR	B118572	B119174	
7/8 - 18 UN/UNR	B131350	B131248	
7/8 - 20 UN/UNR		B119178	
7/8 - 32 UN/UNR			
15/16 - 9 UN/UNR	B119192	B119015	
15/16 - 10 UN/UNR	B119191	B119014	
15/16 - 12 UN/UNR	B128117		
1- 8 UN/UNR	B118550	B119168	B129868
1- 11 UN/UNR	B129875	B130289	
1- 12 UN/UNR	B118561	B119173	B119187
1- 14 UN/UNR	B119193	B119016	B116332
1- 16 UN/UNR	B119149	B119185	
1- 18 UN/UNR	B119194	B119017	
1- 20 UN/UNR	B119158		
1- 24 UN/UNR	B119089		
1- 32 UN/UNR	B119162	B119184	
1-1/16 - 10 UN/UNR	B119195	B119018	
1-1/16 - 12 UN/UNR	B119150		
1-1/16 - 18 UN/UNR		B119179	
1-3/32 - 8 UN/UNR	B119196	B119019	
1-1/8 - 7 UN/UNR	B118548	B119169	
1-1/8 - 8 UN/UNR	B119152	B119181	
1-1/8 - 12 UN/UNR	B114092	B119175	B124985
1-1/8 - 14 UN/UNR		B119020	
1-1/8 - 16 UN/UNR	B119151		
1-1/8 - 18 UN/UNR	B119160		
1-1/8 - 20 UN/UNR	B119163		
1-3/16 - 8 UN/UNR	B119154		
1-3/16 - 10 UN/UNR	B119198	B119021	
1-3/16 - 12 UN/UNR	B119153	B119182	
1-3/16 - 24 UN/UNR	B119197		
1-1/4 - 8 UN/UNR	B119156		
1-1/4 - 7 UN/UNR	B118547	B119170	
1-1/4 - 8 UN/UNR		B119183	
1-1/4 - 12 UN/UNR	B118559	B117921	

SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
1-1/4 - 14 UN/UNR		B129978	
1-1/4 - 16 UN/UNR	B119155		
1-1/4 - 18 UN/UNR	B119159		
9/16 - 18 UNJF			
5/8 - 11 UNJC		B138898	
5/8 - 18 UNJF	B123631		
5/8 - 24 UNJEF	B124638		
11/16 - 24 UNJEF		B132987	
3/4 - 10 UNJC	B138178		
3/4 - 16 UNJF	B111835		
7/8 - 14 UNJF	B123633		
7/8 - 20 UNJEF	B132080		
1 - 8 UNJC		B138899	
1 - 12 UNJF	B123634		
1-1/8 - 8 UNJ	B114392		
1-1/4 - 12 UNJF		B128893	
M16 - 2.0 I.S.O.	B139598		
M20 - 2.5 I.S.O.	B132225		
M20 - 2.0 I.S.O.	B119205		
M20 - 1.5 I.S.O.	B132127	B117950	B128921
M22 - 2.5 I.S.O.	B131595		
M22 - 1.5 I.S.O.	B125273		
M24 - 3.0 I.S.O.	B067483	B121882	
M24 - 2.0 I.S.O.	B135232		
M26 - 1.5 I.S.O.	B131053		
M27 - 2.0 I.S.O.	B134904	B135721	
M27 - 1.5 I.S.O.			B119204
M30 - 3.5 I.S.O.	B132298	B139580	
M30 - 2.0 I.S.O.	B118782		
M32 - 1.5 I.S.O.	B123958		
M33 - 2.0 I.S.O.		B135722	
1/2 - 14 NPSM	B099327		
3/4 - 14 NPSM	B069145		
1 - 11-1/2 NPSM	B117712		
5/8 - 11 BSW	B064991		
3/4 - 10 BSW	B064992	B111770	
13/16 - 10 BSW	B106844		
7/8 - 9 BSW	B064993		
1 - 8 BSW	B064994		B111446
1 - 10 BSF	B062947		
1-1/8 - 7 BSW	B065695		
1-1/4 - 7 BSW	B113524		
3/4 - 14 BSPP	B066915		

†For standard diameter and pitch combinations for UN, ISO and British thread forms. Rolls also available for other forms, or for special diameter, pitch and form threads. Contact factory application engineering department for details.

Ordering Example: One set of 1-1/4"-7 Pitch UN/UNR, Identical Long Throat, Thread Rolls, No. B118547 for No. 10 TRB Head.

When a choice must be made between Identical Long,Identical Short, and No Throat Rolls, refer to the "Width of Relief" Chart for the No. 10 Head on page 70.



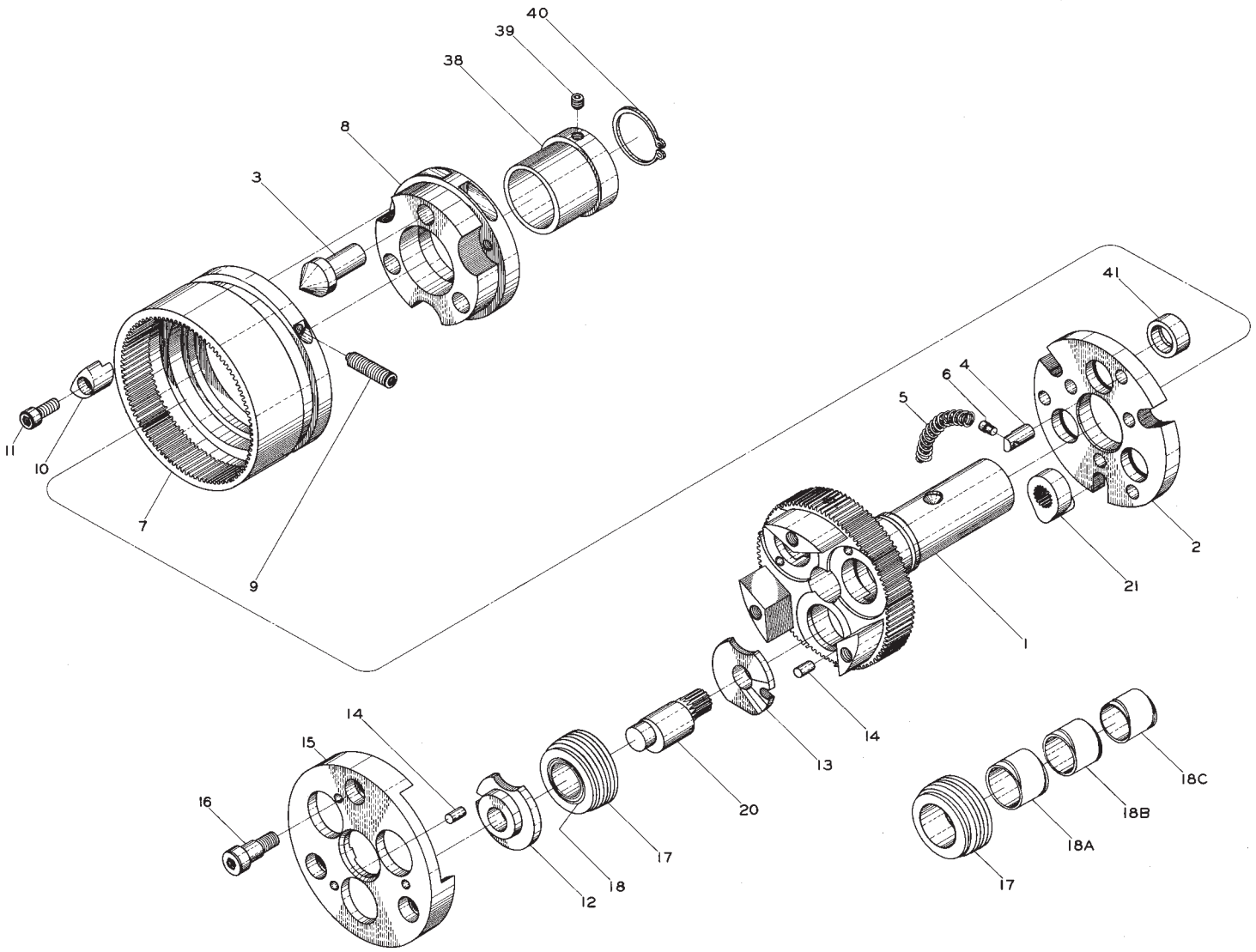
No. 10 TRSB Stationary Head

DR. NO.	PART NO.	NO. PCS.	NAME
TRS-1	A53697	1	Head Body
TRS-2	B53699	1	Closing Ring
TRS-4	E53689	3	Head Opening Pin
TRS-5	E53691	3	Head Opening Spring
TRS-6	E53690	3	Spring Retaining Pin
TRS-8	B53801	1	Adjusting Ring
TRS-9	18S 3/8 x 1	2	Adjusting Screw
TRR-12	See Chart On Page 21	3	Front Bushing
TRR-13	See Chart On Page 21	3	Rear Bushing
TRS-14	1PH 1/4 x 1/2	6	Bushing Retaining Pin
TRS-15	A53681	1	Roll Retaining Cap
TRS-16	FA722	3	Retaining Cap Screw
TRS-17	See Chart On Page 21	3	Thread Roll
TRS-18A*	E55394	3	External Bearing Bushing

DR. NO.	PART NO.	NO. PCS.	NAME
TRS-18B*	E55393	3	Middle Bearing Bushing
TRS-18C*	E55392	3	Internal Bearing Bushing
TRS-20	D57813	3	Thread Roll Shaft
TRS-21	D53695	3	Shaft Adjusting Crank
TRS-22	B53698	1	Standard Hollow Shank
TRS-23	1PS 1/4 x 5/8	3	Adjusting Ring Retaining Pin
TRS-24	E53803	3	Driving Pin
TRS-25	E53804	3	Connecting Stud
TRS-26	E53807	3	Stud Screw
TRS-27	E53805	3	Stud Washer
TRS-28	E53806	3	Pull Back Spring
TRS-29	E53800	1	Handle
TRS-30	E56452	1	Knob
TRS-41	E53802	3	Driving Pin Bushing

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.

IMPORTANT—Serial number and size of die head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/ Bearing Chart on page 21.



No. 10 TRRB Revolving Head

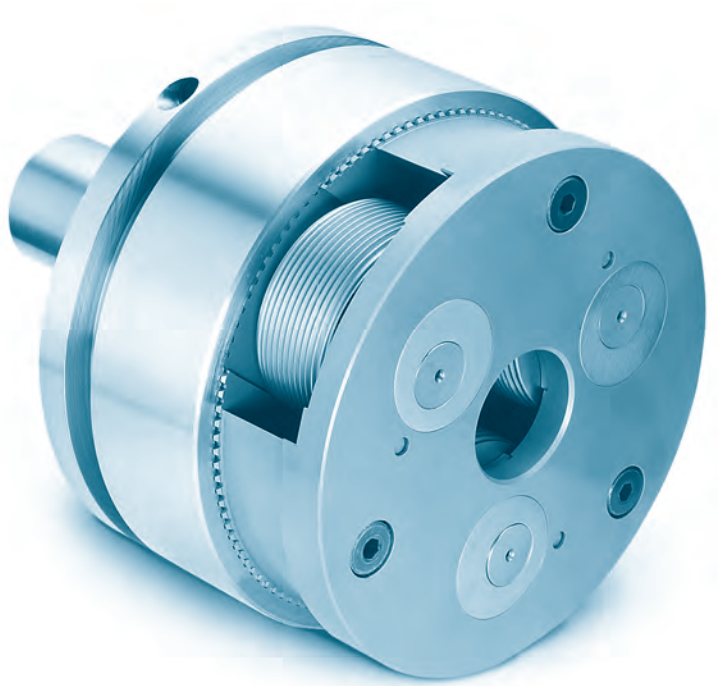
DR. NO.	PART NO.	No. PCS.	NAME
TRR-1	A53680	1	Head Body
TRR-2	B53684	1	Closing Ring
TRR-3	E53693	3	Closing Pin
TRR-4	E53689	3	Head Opening Pin
TRR-5	E53691	3	Head Opening Spring
TRR-6	E53690	3	Spring Retaining Pin
TRR-7	A53686	1	Operating Ring
TRR-8	B53685	1	Adjusting Ring
TRR-9	18S 3/8 x 1-1/4	2	Adjusting Screw
TRR-10	E53694	3	Retaining Segment
TRR-11	11S 5/16 x 3/4	3	Segment Screw
TRR-12	See Chart On Page 21	3	Front Bushing
TRR-13	See Chart On Page 21	3	Rear Bushing

DR. NO.	PART NO.	No. PCS.	NAME
TRR-14	1 PH 1/4 x 1/2	6	Bushing Retaining Pin
TRR-15	A53681	1	Roll Retaining Cap
TRR-16	FA722	3	Retaining Cap Screw
TRR-17	See Chart On Page 21	3	Thread Roll
TRR-18A*	E55394	3	External Bearing Bushing
TRR-18B*	E55393	3	Middle Bearing Bushing
TRR-18C*	E55392	3	Internal Bearing Bushing
TRR-20	D57813	3	Thread Roll Shaft
TRR-21	D53695	3	Shaft Adjusting Crank
TRR-38	E53682	1	Retaining Ring
TRR-40	E53683	1	TRUARC Retaining Ring
TRR-41	E53692	3	Closing Pin Bushing

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.

IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/Bearing Sets Chart on page 21.

Specification information for
No. 16
thread rolling head–revolving



Specification information for No. 16 thread rolling head–revolving

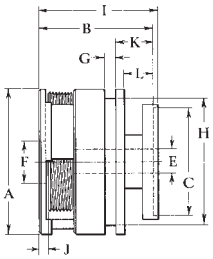
Specifications/Ranges

Head Model	Head Type*	Standard Range**	Maximum Oversize Range	Max. Thrd. Length Using Spec. Rolls & Std. Bore	Max. Thrd. Length Using Spec. Rolls & Spec. Bore	Weight***
16	TRRB Revolving	1/4" to 2"—32 mm-52 mm	2-1/2"-4 Pitch—64 mm-3.0 mm P	1-1/2"-38 mm	3-1/4"-82 mm	195 lbs.
			2-3/4"-4 Pitch†—68 mm-3.0 mm P	1-1/2"-38 mm	3-1/4"-82 mm	

*TRRB—Revolving head for threading machines, etc.

**Both left- and right-hand when proper helix angle bushings are used. ***Weight will vary slightly depending upon diameter and pitch rolls furnished.

†Requires slight alteration to rear helix angle bushings.



TRRB Revolving Head

	A	B	C	E	F†	G	H	I	J*	K	L
No. 16	12"	9-7/16"	8-3/4"	2-1/16"	3-9/16"	.875"-.885"	10-1/2"	9-3/4"	3/4"	3-3/2"	2-11/32"

*To face of rolls. †Rolls up to shoulder unless diameter exceeds 3-1/2".

Replaceable Helix Angle Bushing Sets††

UNC BUSHINGS	UNF BUSHINGS	STD. M/M COARSE BUSHINGS	STD. M/M FINE BUSHINGS	STD. LH BUSHING
FRT.	FRT.	FRT.	FRT.	FRT.
B58414	B113543	B119857	B119867	B111992
REAR	REAR	REAR	REAR	REAR
B58415	B113544	B119858	B119868	B111993
2° 15′	1° 20′	2° 15′	1° 45′	2° 15′

††Bushings also available for special threads. Contact factory.

Roll Shaft/Bearing Sets

MULTIPLE BUSHING BEARINGS	MULTIPLE BUSHING SET	1 PC. BEARIUM BRONZE BUSHING	1 PC. CARBIDE	ROLL SHAFTS W/OIL GROOVE
INT. D58421	} SD130923	D115745	D136188	C58416
MID. D58420				
EXT. D58419				

16 TRB Thread Rolls†

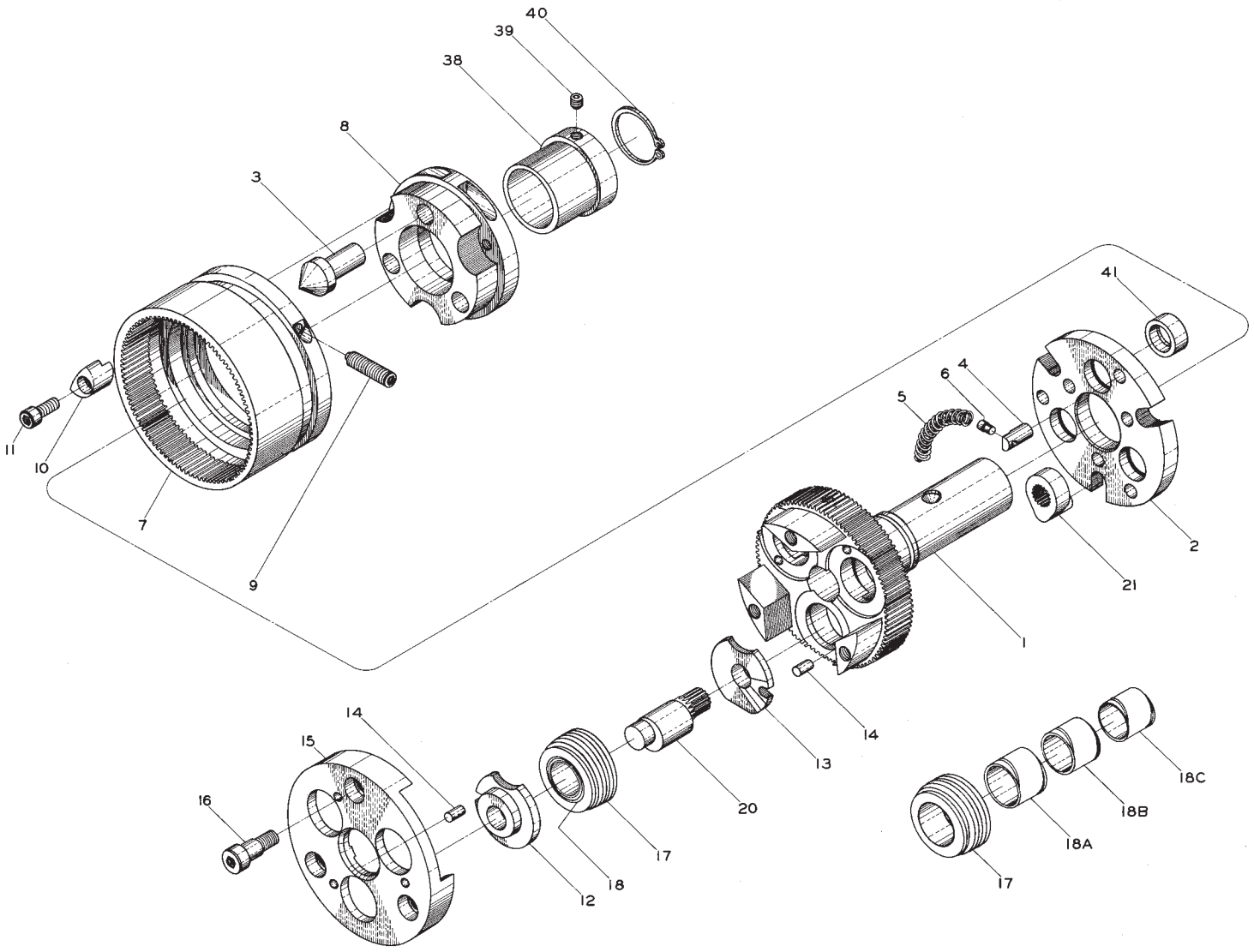
SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
1-1/4 - 7 UN/UNR	B118554		
1-1/4 - 8 UN/UNR	B136428		
1-1/4 - 12 UN/UNR	B118580		
1-5/16 - 12 UN/UNR	B119090		
1-3/8 - 6 UN/UNR	B118553		
1-3/8 - 8 UN/UNR	B121624		
1-3/8 - 12 UN/UNR	B118555		
1-7/16 - 12 UN/UNR	B119091		
1-1/2 - 6 UN/UNR	B118581	B119095	
1-1/2 - 8 UN/UNR	B118655		
1-1/2 - 12 UN/UNR	B118574	B117733	
1-9/16 - 12 UN/UNR	B119092		
1-5/8 - 8 UN/UNR	B137661	B137985	
1-5/8 - 12 UN/UNR	B118557		

SIZE	IDENTICAL LONG THROAT	IDENTICAL SHORT THROAT	NO THROAT
1-3/4 - 5 UN/UNR	B118552		
1-3/4 - 8 UN/UNR	B122074		
1-3/4 - 12 UN/UNR	B119093		
1-3/4 - 16 UN/UNR		B119096	
1-7/8 - 8 UN/UNR	B137662	B137986	
1-7/8 - 12 UN/UNR	B118556		
2 - 8 UN/UNR	B121840		
2 - 12 UN/UNR	B119094		
2 - 16 UN/UNR	B132652		
2 - 4-1/2 UN/UNR	B118549		
M39 - 4.0 I.S.O.	B127683		
M48 - 5.0 I.S.O.	B133927		

†For standard diameter and pitch combinations for UN, ISO and British thread forms. Rolls also available for other forms, or for special diameter, pitch and form threads. Contact factory application engineering department for details.

Ordering Example: One set of 2"-8 Pitch UN/UNR, Identical Long Throat, Thread Rolls, No. B121840 for No. 16 TRB Head.

When a choice must be made between Identical Long,Identical Short, and No Throat Rolls, refer to the "Width of Relief" Chart for the No. 16 Head on page 71.



No. 16 TRRB Revolving Head

DR. NO.	PART NO.	No. PCS.	NAME
TRR-1	A58412	1	Head Body
Not Shown	50021	1	Key Fits Head Body TRR-1
TRR-2	B58422	1	Closing Ring
TRR-3	E58408	3	Closing Pin
TRR-4	E58418	3	Head Opening Pin
TRR-5	E116585	3	Head Opening Spring
TRR-6	E116965	3	Spring Retaining Pin
TRR-7	B58413	1	Operating Ring
TRR-8	B58423	1	Adjusting Ring
TRR-9	104S 1/2 x 2-1/2	2	Adjusting Screw
TRR-10	D58411	3	Retaining Segment
TRR-11	11S 3/8 x 1-1/2	3	Segment Screw
TRR-12	See Chart On Page 25	3	Front Bushing
TRR-13	See Chart On Page 25	3	Rear Bushing

DR. NO.	PART NO.	No. PCS.	NAME
TRR-14	1 PH 3/8 x 5/8	3	Bushing Retaining Pin
TRR-14	1PH 3/8 x 3/4	3	Bushing Retaining Pin
TRR-15	A58410	1	Roll Retaining Cap
TRR-16	FA730	3	Retaining Cap Screw
TRR-17	See Chart On Page 25	3	Thread Roll
TRR-18A*	D58419	3	External Bearing Bushing
TRR-18B*	D58420	3	Middle Bearing Bushing
TRR-18C*	D58421	3	Internal Bearing Bushing
TRR-20	C58416	3	Thread Roll Shaft
Not Shown	B58424	1	Retaining Flange (Not Shown)
TRR-21	C58417	3	Shaft Adjusting Crank
TRR-40	FL5081	1	TRUARC Retaining Ring Fits Head Body A58412
TRR-41	E58409	3	Closing Pin Bushing

NOTE: When ordering repair parts always designate part by letter, number, and name, in sequence, as listed.

IMPORTANT—Serial number and size of roll head must accompany order. *Bronze and Carbide Bearings available. See Roll Shaft/Bearing Sets Chart on page 25.

Form 1

"Quik-Quote" Fax Form

Landis Solutions LLC
360 South Church Street
Waynesboro, PA 17268-2610
Toll Free:
USA: +1.800.358.3500
Fax: +1.888.718.2922
Canada: +1.888.828.6340
e-mail: info@Landis-Solutions.com

THREAD ROLLING HEADS & HEAD ROLLS
Customer Order/Quotation Data Sheet

When Requesting A Quotation Or Placing An Order, Please Complete And Return This Sheet With All Applicable Information.

Date: _____/_____/_____ **Customer Contact Name:** _____

Customer Name: _____

Customer Address: _____

City: _____ **State:** _____ **Zip:** _____

Customer Contact Phone Number: 1-_____-_____-_____ **ext.:** _____

Customer Contact Fax Number: 1-_____-_____-_____

WORKPIECE SPECIFICATIONS

(A) Thread Size , Pitch & Form: _____

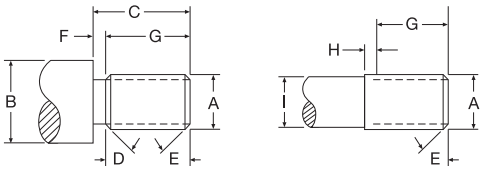
Class of Thread: _____ **Number of Starts:** _____

(B) Shoulder: _____ **(C) Length of Blank** _____

(D) Chamfer Angle _____ **(E) Chamfer Angle** _____ **(F) Width of Relief** _____

(G) Full Threads (S) _____ **(H) Imperfect Thread (S)** _____

Blank Diameter: _____ **Material & Hardness:** _____



THREAD ROLLING HEAD INFORMATION

Machine: _____

Feed: POSITIVE ❑ or MANUAL ❑

RPM: _____ **SFM:** _____

Production Required: _____

Head Type: STATIONARY ❑ or REVOLVING ❑

Shank Type & Size: _____

Operating Yoke: YES ❑ or NO ❑

Spindle Position: _____

Yoke Center Distance (Center of Trip Rod to Center of Head): _____

Diameter of Trip Rod: _____ **Thread Rolling Head S/N:** _____

Helix Angle Bushings: UNC, UNF, OTHER _____

Comments: _____

_____

_____

Form 1

"Quik-Quote" Fax Form

Landis Solutions LLC
360 South Church Street
Waynesboro, PA 17268-2610
Toll Free:
USA: +1.800.358.3500
Fax: +1.888.718.2922
Canada: +1.888.828.6340
e-mail: info@Landis-Solutions.com

THREAD ROLLING HEADS & HEAD ROLLS
Customer Order/Quotation Data Sheet

When Requesting A Quotation Or Placing An Order, Please Complete And Return This Sheet With All Applicable Information.

Date: _____/_____/_____ **Customer Contact Name:** _____

Customer Name: _____

Customer Address: _____

City: _____ **State:** _____ **Zip:** _____

Customer Contact Phone Number: 1-_____-_____-_____ **ext.:** _____

Customer Contact Fax Number: 1-_____-_____-_____

WORKPIECE SPECIFICATIONS

(A) Thread Size , Pitch & Form: _____

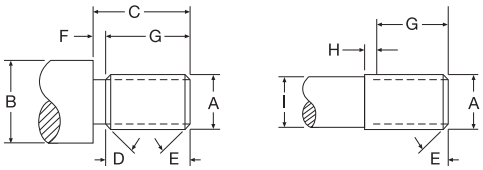
Class of Thread: _____ **Number of Starts:** _____

(B) Shoulder: _____ **(C) Length of Blank** _____

(D) Chamfer Angle _____ **(E) Chamfer Angle** _____ **(F) Width of Relief** _____

(G) Full Threads (S) _____ **(H) Imperfect Thread (S)** _____

Blank Diameter: _____ **Material & Hardness:** _____



THREAD ROLLING HEAD INFORMATION

Machine: _____

Feed: POSITIVE ❑ or MANUAL ❑

RPM: _____ **SFM:** _____

Production Required: _____

Head Type: STATIONARY ❑ or REVOLVING ❑

Shank Type & Size: _____

Operating Yoke: YES ❑ or NO ❑

Spindle Position: _____

Yoke Center Distance (Center of Trip Rod to Center of Head): _____

Diameter of Trip Rod: _____ **Thread Rolling Head S/N:** _____

Helix Angle Bushings: UNC, UNF, OTHER _____

Comments: _____

_____

_____

Operating

TRSB stationary and TRRB revolving thread rolling heads

How They Operate

STATIONARY TRSB heads are opened by the pull-off action generated between the rolls and completed thread when forward travel of the tool is stopped.

TRRB Revolving heads are opened by the rearward movement of the operating yoke.

In both styles, opening action causes the eccentric roll shafts to rotate and cam the rolls radially outward to clear the completed thread.

Lubrication

Rolling heads are supplied with multiple bushing bearings (standard), or one piece bronze or carbide bearings for more stringent operations.

Grooved channels in the helix angle bushings direct coolant to the bearings and all three types are sufficiently lubricated by the coolant used for the other machining operations.

For maximum wear qualities, the head should be periodically disassembled, thoroughly cleaned, and inspected for condition. Lubricate before reassembly with a light machine oil.

Lubricate the splines on the head body (1) and operating ring (7) of revolving heads and the head body (1) shank of stationary heads with Moly Kote "G".

Changing Thread Rolls and Helix Angle Bushings

Replaceable helix angle bushings give Landis heads versatility and maximum wear qualities. Separate bushing sets are used for UNC, UNF, millimeter coarse, millimeter fine, sucker rods, and L.H. threading.

Refer to the individual size head specifications on pages 9 through 25 for the appropriate part numbers for available bushing sets. Bushings also available for other threads, or for special diameter, pitch and form threads. Contact factory for details.

These same pages also list part numbers for the three styles of bearings.

To replace rolls, roll shafts, or helix angle bushing requires that roll retaining cap (15) be removed.

Place the head in copper clad vise jaws, gripping it by the shank. Remove the three retaining cap screws (16) and the cap can be removed.

Reference numbers referred to by these instructions can be identified by referring to the appropriate parts drawings on pages 18 through 26

TRSB stationary and TRRB revolving thread rolling heads

If the object is to just replace thread rolls, push down on the thread roll shafts as the cap is removed to prevent any unnecessary assembly.

If rolls of a different diameter and pitch or of a different form are to be used, then, further disassembly may be required.

Installing Helix Angle Bushings

Helix angle bushings consist of three front and three rear bushings, which are not interchangeable. Front bushings contain an oil groove only, rear ones contain an oil groove and two size reference marks.

Bushing sets must accommodate the particular thread form to be rolled. Bushings to be used for UNC are etched with "N", those for UNF with "F". For metric threading, bushings are marked mm-C and mm-F for metric coarse and fine, respectively. Bushings for left-hand threading are marked L.H.

To replace bushings, remove face cap (15) and roll shafts (20). Front bushings (12) can be removed from the cap by careful tapping. Rear bushings that resist removal by hand can be removed by lightly prying around the edge.

Note: Front helix angle bushings are identical to each other and can be installed in any hole in the face cap. The same is true of rear bushings.

Roll shafts (20) are also interchangeable with each other and can be installed in any position.

Front and rear bushings are properly located in their respective holes by a locating pin.

Exercise care that pins are not damaged or sheared during assembly. Either condition will prevent proper seating of the bushing.

First install rear bushings (13) in their respective seats.

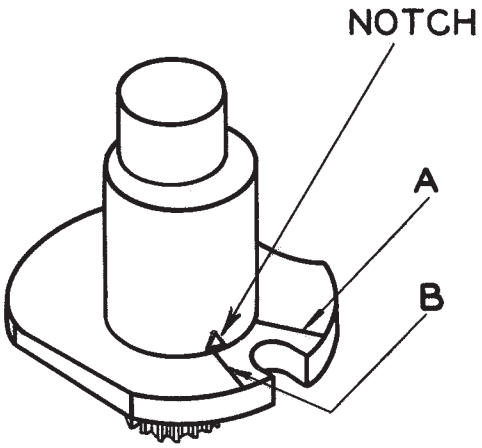
Close the head and insert the splined end of the roll shaft (20) into the splined end of the shaft adjusting crank (21) with the notch on the shaft aligned with the suitable reference line on the bushing.

Note: If reference lines are not visible, then one or more front bushings have been incorrectly installed in the rear position.

The correct rear helix angle bushing reference line to use depends upon the diameter to be rolled. Refer to Chart 1 for reference line positioning.

Reference numbers referred to by these instructions can be identified by referring to the appropriate parts drawings on pages 18 through 26

Chart 1



Size of Head	A	B
7/16"	1/4" to 5/16"	3/8" to 7/16"
5/8"	5/16" to 7/16"	1/2" to 5/8"
7/8"	7/16" to 9/16"	5/8" to 7/8"
1-1/4"	5/8" to 7/8"	1" to 1-1/4"
2"	1-1/4" to 1-5/8"	1-11/16 to 2"

It may be necessary to lightly tap roll shaft into place causing the shaft adjusting crank (21) to assume the correct position.

During installation, the two opposed size adjusting screws (9) in the operating ring (7) or shank (22) should be approximately central. If, after adjusting the head to size, this is not the case, reset all the roll shafts one tooth at a time in the correct direction.

Check that thread rolls and the type of bearings to be used are free of foreign matter. If multiple bushing bearings are being used, first assemble the three piece bearing. Then, place whatever type of bearing that is to be used into the rolls and position the rolls on the shafts.

IMPORTANT: Rolls must be assembled clockwise in sequence 1, 2 and 3 as numbered for right-hand threading and in counterclockwise position 1, 2 and 3 for left-hand. Failure to assemble rolls properly can damage rolls when placed in operation.

Also, foreign material between the helix angle bushing flange and seat can cause rolls to skid and ruin them. A line worn from the front to the rear of the rolls on the crest and both flanks of the individual forms indicates that this condition exists. This is, of course, the wrong time to detect this problem, so extra care should be taken at assembly to prevent it.

Install front helix angle bushings (12) in retaining cap (15) and position it over roll shafts (20). Replace cap screws (16), AT THIS POINT, CHECK ROLLS FOR FREE ROTATION. If rolls do not freely turn, determine why and correct.

Disassembling Stationary Heads

Grip head in vise with copper clad jaws by the retaining cap (15) with shank up. Take care not to buckle retaining cap. Do not grip over thread rolls.

Remove three stud screws (26) and springs (28) and remove shank (22) with attached adjusting ring (8). Remove two adjusting screws (9), then revolve adjusting ring (8) until "O" reference marks on it and shank are aligned. Pull adjusting ring forward and remove from shank.

Remove connecting studs (25) and washers (27). Revolve closing ring (2) slightly clockwise and pull rearward until spring pins (4) clear slots in rear of head body.

Allow head opening springs (5) to revolve closing rings until reaching their full free length. Remove closing ring with opening springs attached. Remove shaft adjusting cranks from roll shafts.

Operating

TRSB stationary and TRRB revolving thread rolling heads

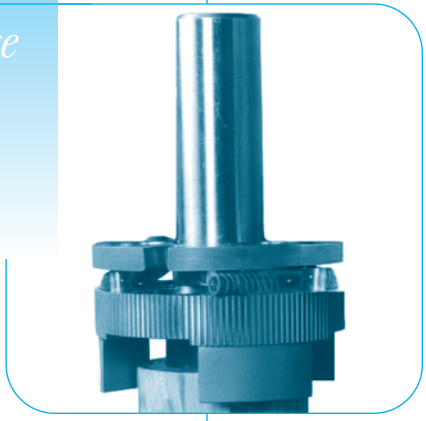
Assembling Stationary Heads

Place suitable rear helix angle bushings (13) in their respective seats. Place a block of wood with notched legs on head body (1), invert, and clamp in vise. Outside diameter of block must be small enough to fit between legs to hold bushings in place. See Figure 1.

Now, place three shaft adjusting cranks (21) in their respective recesses. Attach head opening springs (5) to spring retaining pins (6) and place closing ring (2) assembled with opening springs onto head body (1).

After assembling springs, position closing ring (2) close enough to allow free end of one spring to be placed in head body slot. Revolve closing ring to compress spring. Maintaining space between closing ring and head body, place remaining springs in their slots, then, slide ring forward until it contacts head body.

Figure 1



To retain closing ring, place stud washers (27) on connecting studs (25), pass studs through closing ring and screw into head body (1). Be sure closing ring moves freely before further assembly.

Assemble adjusting ring (8) to shank (22) with square slotted edge rearward.

Revolve adjusting ring until adjusting screws' (9) recesses are in line with tapped holes in shank.

Install adjusting screws and tighten all an equal amount.

Place assembled shank (22) and adjusting ring (8) on the head body (1) aligning "O" reference marks on both until splines mesh. Replace the three pull back springs (28) on connecting studs (25) and tighten stud screws (26).

Roll shafts, bearings, rolls, retaining cap, and all other front parts can now be assembled as described under "Changing Thread Rolls and Helix Angle Bushings".

Following assembly, grip shank in vise and push and pull open and close checking for proper functioning.

Disassembling Revolving Heads

Note: The instructions for disassembly and assembly will generally apply to all five sizes of revolving heads. However, the 2" No.16TRRB cannot be gripped in a vise because of the size and weight (approximately 200 lbs.) and the use of a flange instead of a shank. Therefore, it will be necessary to place the head on a sturdy work bench to accomplish tear down and build-up.

Grip head in vise with copper clad jaws by retaining cap (15) with shank up. Take care not to buckle retaining cap.

Do not grip over thread rolls.

With head closed, remove retaining snap ring (40), then, retaining ring (38). Older heads have screw (39) which must be taken out before retaining ring can be removed.

Insert head adjusting wrench or suitable piece of bar stock between bore of adjusting ring (8) and shank until it contacts closing ring (2).

Using wrench to hold closing ring stationary, pull operating ring (7) back and remove head body (1).

Remove adjusting screws (9) from operating ring (7) and segment screws (11) from adjusting ring (8). Revolve adjusting ring until "O" on the ring aligns with "O" on shank. Adjusting ring can now be removed.

The preceding instructions are not necessary for average disassembly.

Continuing with disassembly, turn closing ring (2) slightly clockwise and pull it axially rearward until spring pins (6) clear slots in rear of head body. Allow head opening springs (5) to revolve closing ring (2) until springs reach their free length. Remove closing ring and attached head opening springs from head body. Remove roll shaft adjusting cranks (21) from shafts.

Assembling Revolving Heads

Place suitable rear helix angle bushings (13) in their respective seats. Place a block of wood with notched legs on head body (1), invert, and clamp in vise. Outside diameter of block must be small enough to fit between legs to hold bushings in place. See Figure 1.

Now, place three shaft adjusting cranks (21) in their respective recesses. Attach head opening springs (5) to spring retaining pin (6) and place closing ring (2) assembled with opening springs onto head body (1).

After assembling springs, position closing ring (2) close enough to allow free end of one spring to be placed in head body slot. Revolve closing ring to compress spring. Maintaining space between closing ring and head body, place the remaining springs in their slots. Position shank adjusting cranks until they are in alignment with closing ring slots, then, slide ring forward until it contacts head body.

If it had been disassembled, now assemble operating ring (7) aligning pins (3) with mating recesses in operating ring bore. Drop retaining segments (10) into position and secure with screws. Revolve adjusting ring inside operating ring until recesses for adjusting screws (9) are aligned so screws can be threaded through their respective holes into operating ring.

Install two screws and tighten each an equal amount.

Place assembled operating and adjusting rings, (7) and (8), onto head body. With "O" reference marks on both parts aligned and splines meshed, slide operating ring forward until head is completely closed.

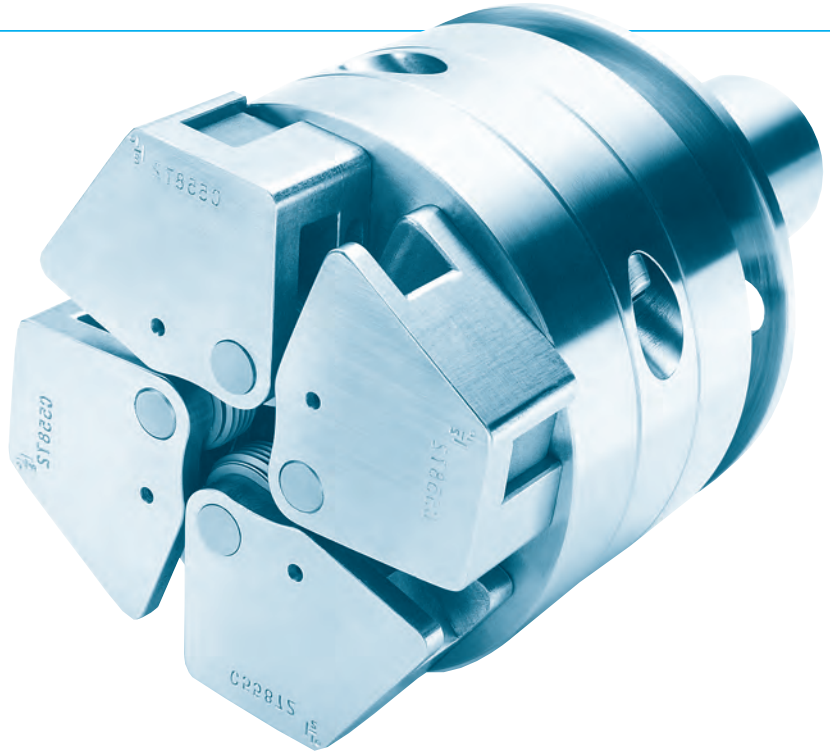
Slide retaining ring (38) forward over snap ring relief. Place snap ring (40) on shank and secure. On older No.5 heads, slide retaining ring forward aligning clamp screw (39) with shank section of head body (1) and tighten.

Roll shafts, bearings, rolls, retaining cap, and other front parts can now be assembled as described under "Changing Thread Rolls and Helix Angle Bushings".

Following assembly, grip shank in vise and push and pull open and close checking for proper functioning.

13JR Quadlan

thread rolling head for thin-wall tubing



THE 13JR Quadlan uses four rolls, instead of the customary three, which allows the rolling of NPSM threads on thin wall lamp tubing without collapsing or "lobing" of the work.

Essentially the same head as the 13/16″ 13 JN Landex, the Quadlan uses roll instead of chaser holders.

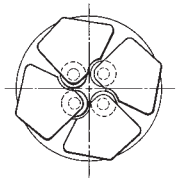
Standard range is 1/8″, 1/4″, and 3/8″ NPSM Pipe through the use of a single roll holder set. Comparable sizes of British Standard Parallel Pipe can be threaded. Other roll holder sets are available to produce 18TPI and finer pitches on larger diameters.

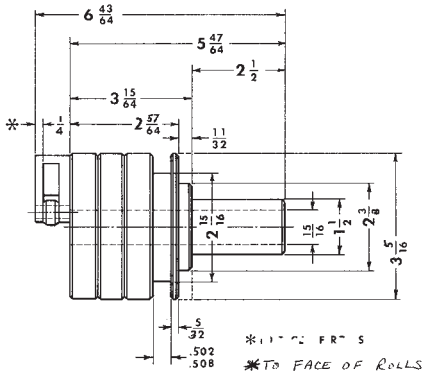
Quadlan Thread Rolling Head

The 13JR can be supplied with either straight or Morse taper shanks for application to Landis 10TRM, Hause, Grant double end, or similar units.

A spring loaded reamer can be incorporated in the head when the end of the tube must be reamed. However, such applications require that the head be yoke operated.

RANGE: 1/8", 1/4", and 3/8" NPSM Pipe



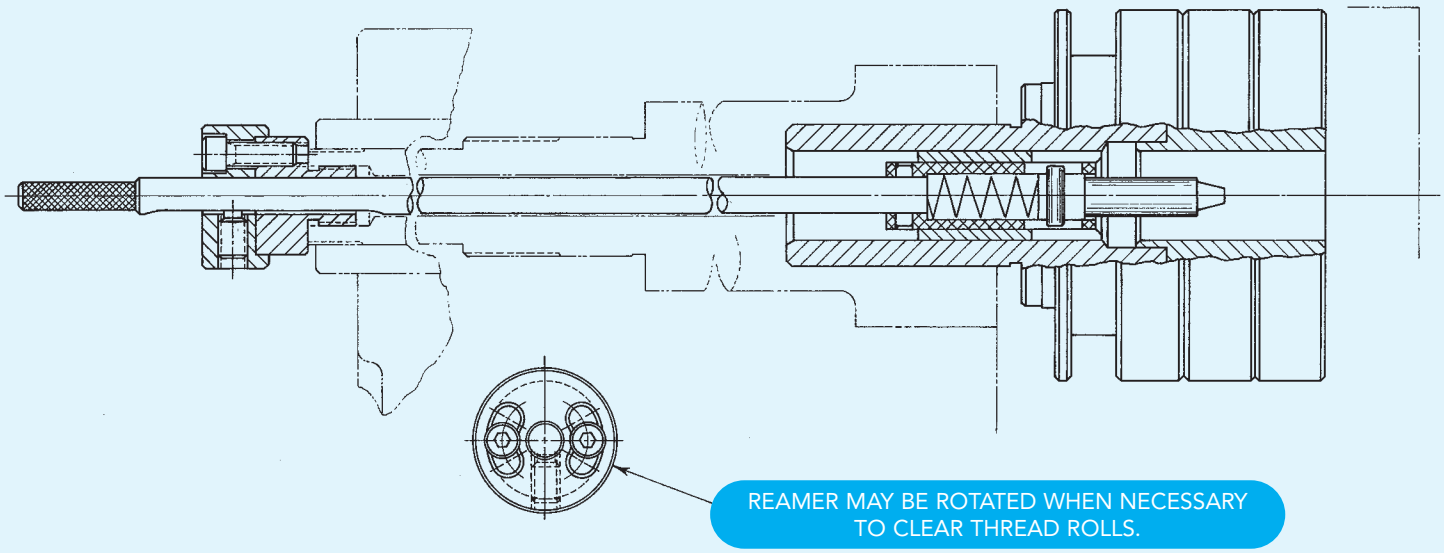


13JR QUADLAN Thread Rolling Head

DR. NO.	PART NO.	NO PCS.	NAME
JR-143	C55872	4	Stl.Roll Holder
JR-141	E53997	4	Stl.Roll Shaft
JR-140	E53996	4	Stl.Shaft Retaining Screw
JR-144	GC1014	4	O-Ring

13JR QUADLAN Straight Pipe Standard Thread Rolls

27 Pitch	NPSM	27P-B53798
18 Pitch	NPSM	B53799



13JR Quadlan thread rolling head for thin-wall tubing

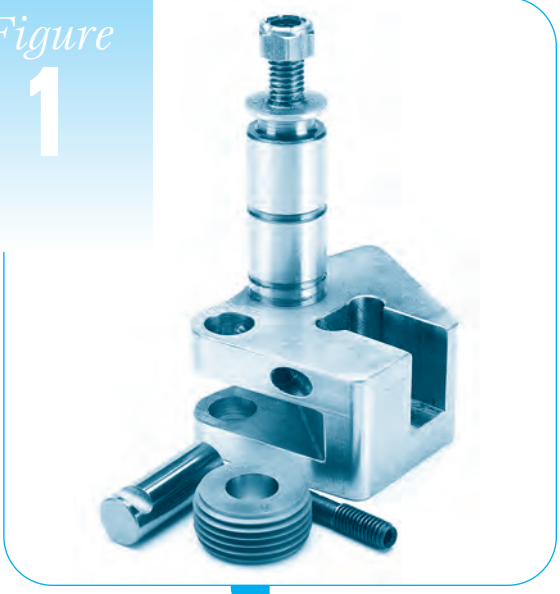
Operator's instructions for 13JR Quadlan Thread Rolling Head

Changing Rolls

To change rolls, push operating ring 18 rearward to open position.

Insert hex allen wrench into screw 140 in base of holders and back out completely. When all four screws have been removed (one from each holder) turn head upside down and tap on face of holders so that roll shafts 141 start to come out. Remove roll shaft with fingers and rolls are then free to come out of holder 143 slot (See Figure 1). If for any reason the rolls cannot be retrieved the head can be opened to a larger diameter to give more clearance between holders 143.

Figure 1



To install new rolls slide roll 142 into holder slot and push roll shaft 141 into holder making sure that the groove is at bottom and in line with screw hole for 140. Insert screw 140. Repeat for each holder. Be sure rolls are installed in order 1 - 2 - 3 - 4 clockwise when looking into face of roll head. Caution: Roll shafts are carbide and should not be hammered into place because of the danger of shattering.

Disassembly

Remove stop screws 21 and lift off the operating ring 18. Remove the connecting pin retaining screws 131 and lift off the shank 41. Remove head opening spring screw 16 and spring 15. Remove the trunnion locking nuts 7 then, remove the roll holders with integral trunnions 143 and the sliding blocks 31. Remove the retaining plate screws 124 followed by the retaining plate 132, shim 6, the connecting pins 116 and the connecting pin springs 119. Now remove the adjusting worm nut 13 and washer 12 and back out and remove the adjusting worm 10. Separate the adjusting ring 9, closing ring 26 and head body 1.

Assembly

Place the closing ring 26 onto the head body 1 followed by the adjusting ring 9. At this point the clearance between the closing ring (which rotates to open and close the head) and adjusting ring can be checked by laying a straight edge across the head body and opposite sides of the adjusting ring surface. Using a feeler gage, check the gap between the straight edge and the head body (See Figure 2) and place

shim slightly more than that amount onto the head body. Now replace the retaining plate 132 and secure with screws 124. The shim is correct if the closing ring can be rotated by hand and a .0015" feeler gage cannot be inserted between the rings. If the gage can be inserted, it will be necessary to reduce the shim. If the closing ring will not rotate and the gage will not fit between the rings the amount of shim must be increased until proper movement is obtained. After determining correct clearance, remove the retaining plate and continue assembly by installing the connecting pin springs 119 and the connecting pins 116. Install the retaining plate 132 and secure with the retaining plate screws 124. Install the adjusting worm 10, the adjusting worm washer 12 and secure with the adjusting worm nut 13. Replace the head opening spring 15 and screw 16. Place the sliding blocks 31 onto the closing pins 30 then replace the roll holders with integral trunnions 143 and secure with trunnion locking nuts 7 allowing .002" to .004" play (clearance)

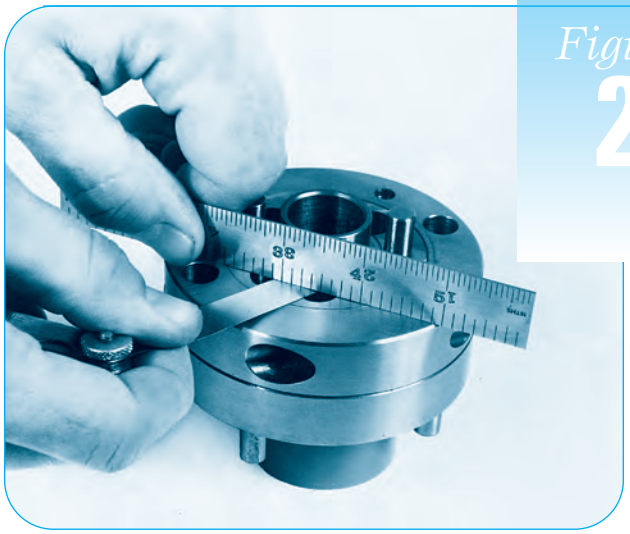


Figure 2

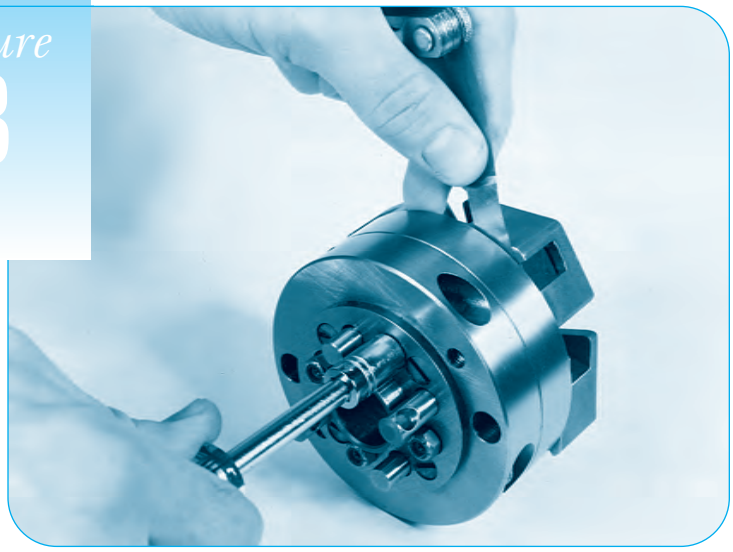
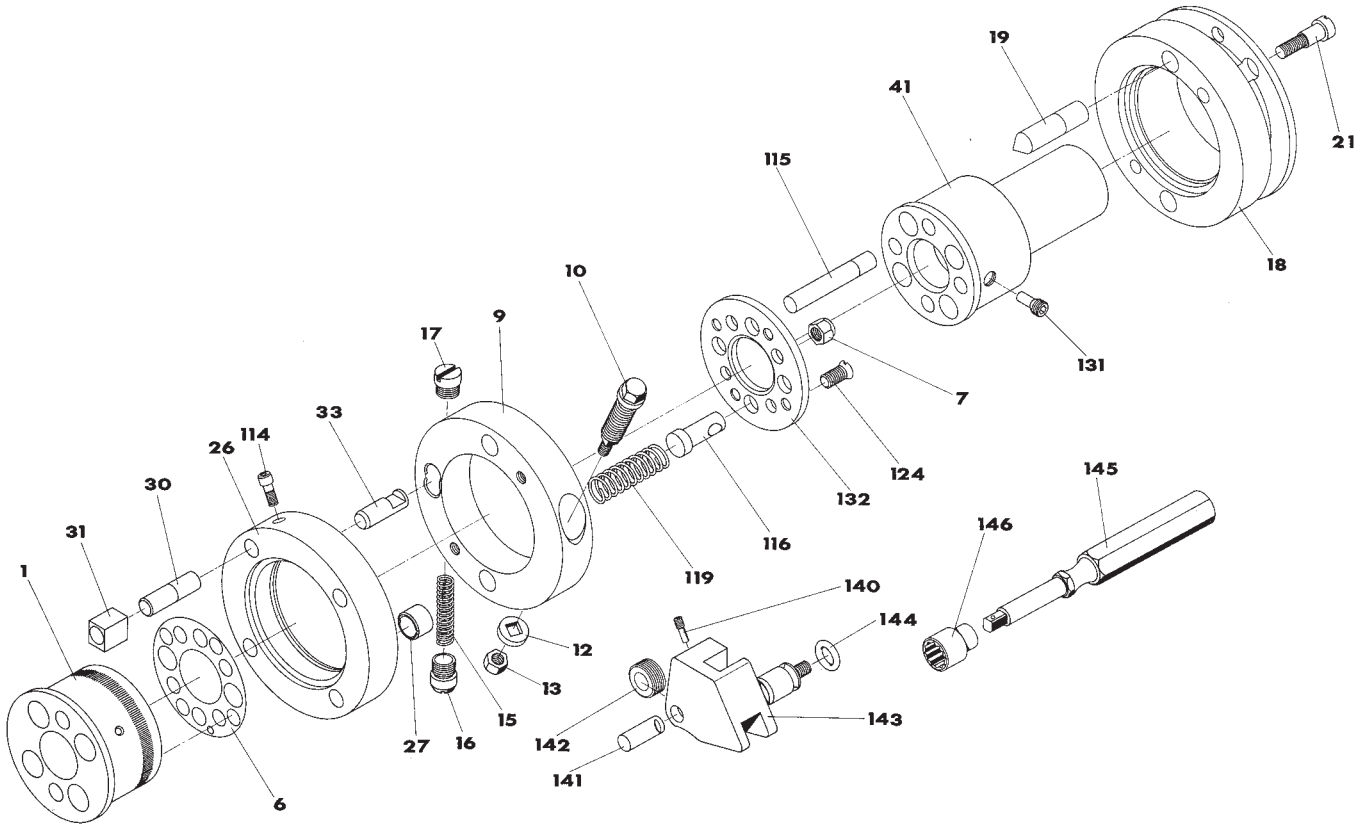


Figure 3

between the holder face and the closing ring surface (See Figure 3). Replace the shank 41 and secure it by installing the connecting pin retaining screws 131. Finally, replace the operating ring 18 and secure with stop screws 21.

Reference numbers referred to by these instructions can be identified by referring to the appropriate parts drawings on page 38



13 JR QUADLAN Thread Rolling Head

DR. NO.	PART NO.	NO. PCS.	NAME
JR-1	0B60077	1	Head Body
JR-6A	0E103424	1	Spacing Washer .002" THICK
JR-6B	0E103425	1	Spacing Washer .003" THICK
JR-6C	0E103426	1	Spacing Washer .005" THICK
JR-7	FA000371	4	1/4-24 ESNA Trunnion Stop Nut #3851-0424
JR-9	0C060079	1	Adjusting Ring
JR-10	0D057162	1	Adjusting Worm
JR-12	0E060089	1	Adjusting Worm Washer
JR-13	FA000371	1	1/4-24ESNA Adjusting Worm Nut#3851-0424
JR-15	0E60084	1	Head Opening Spring
JR-16	0E60085	1	Head Opening Screw
JR-17	0E060087	1	Spring Hole Screw
JR-18	0C60133	1	Operating Ring
JR-19	0E060091	2	Closing Pin
JR-21	0E60093	2	Stop Screw
JR-26	0C055873	1	Closing Ring
JR-27	0E060092	2	Closing Pin Bushing

DR. NO.	PART NO.	NO. PCS.	NAME
JR-30	0E060102	4	Sliding Block Pin
JR-31	0E060101	4	Sliding Block
JR-33	0E060086	1	Head Opening Spring Pin
JR-41	0B060508	1	STD. Hollow Shank
JR-114	GC001810	1	#1452Fitting
JR-115	0E060094	2	Driving Pin
JR-116	0E060509	2	Connecting Pin
JR-119	0E060503	2	Connecting Pin Spring
JR-124	0E060082	4	Retaining Zero Plate Screw
JR-131	0E060510	2	Connecting Pin Retaining Screw
JR-132	D108052	1	Retaining Plate
JR-140	E53996	4	Roll Shaft Retaining Screw
JR-141	E53997	4	Roll Shaft
JR-142	See Chart On Page 52	4	Thread Roll (Specify: Dia., Pitch and Thread Form)
JR-143	C55872	4	*Roll Holder with Integral Trunnion
JR-144	GC1014	4	O-Ring
JR-145	GD521	1	1/4" Socket Driver
JR-146	GD518	1	3/8" Socket - 1/4" Drive

*Special roll holders required for beaded tubing.

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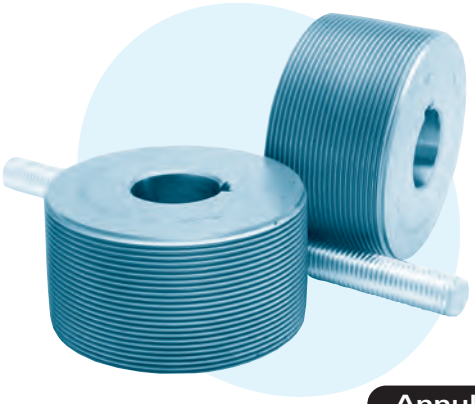
Landis Threading Systems Now Offers The Following Thread Rolls



Annular Groove

THRUFEED

Thrufeed Rolling — Where the workpiece thread length is longer than the width of the dies and the part axially feeds through held on fixed center distance.

Annular Groove — For today's popular standard "All Threaded" threaded rod applications.

Chart 1

Annular Groove Thrufeed Dies — Available From Stock
(Just A Sample Of What We Can Offer You!)

	1.500" Bore	1. 500" Bore	2.000" Bore	2.125" Bore	3.000" Bore
	4.375" OD	4.500" OD	5.000" OD	6.000" OD	8.625" OD
1/4 - 20P	B139887	B139872	B139898	B139899	
5/16 - 18P	B139868	B139865	B139869	B139874	
3/8 - 16P	B139853	B139857	B139854	B139851	
7/16 - 14P	B139888	B139875	B139879	B139884	
1/2 - 13P	B139870	B139866	B139871	B139878	B139911
9/16 - 12P	B139889	B139876	B139880	B139883	B139912
5/8 - 11P	B139890	B139867	B139897	B139881	B139913
3/4 - 10P	B139891	B139894	B139873	B139882	B139914
7/8 - 9P			B139885	B139886	B139915
1" To 2" 8P			B139895	B139896	B139855

Landis Threading Systems

Landis now offers you replaceable machine dies for:

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…and other similar cylindrical die machines

Helical Groove

Helical Groove Thrufeed Dies — For more specializing threads including Acme and Worm Threads used on linear control components and other long thread length work requiring accuracy.

Forced — For Spline applications.

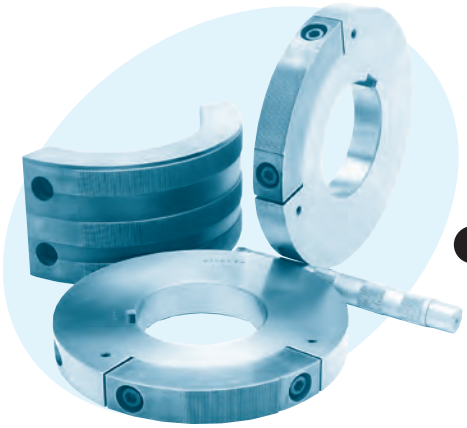
SEGMENTAL

Solid Cylindrical — For Thread, Worm, and Ball Form Applications.

Segmental Rolling — Uses Cam relieved dies on fixed center distance to roll part in one spindle revolution. Produces fractional H.P. motor worm shafts, automotive parts, headed parts and studs at high production rates.

Segments — For Knurling Motor Shafts and Annular Applications.

Solid Cylindrical



Knurling Segments

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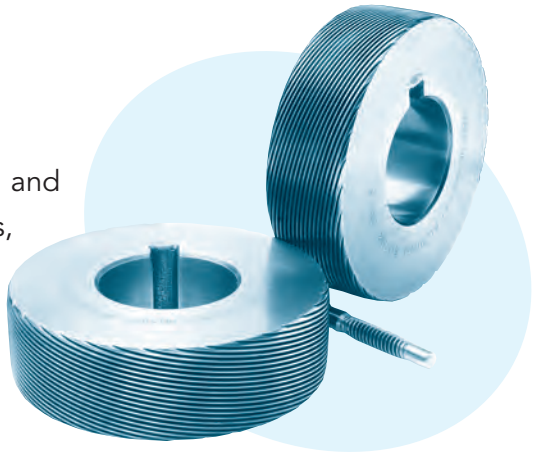
INFEED

Plain Cylindrical — For Threads, Acme, Worm, Gear and Splines Applications.

Plain Cylindrical Infeed Rolling — Where the left die is on a fixed center distance and the right cycles in and out or both dies cycle in and out. Thread length must be less than die width. Used to roll Motor Shafts, Worms, Threads, Gears and Splines.



Worm Small

Worm Large

Burnishing — For burnishing ball forms, motion control components, automotive parts and work requiring fine micro finish and accuracy.

Burnishing

Form 2

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e-mail: info@Landis-Solutions.com

MACHINE ROLLS
Customer Order/Quotation Data Sheet

When Requesting A Quotation Or Placing An Order, Please Complete And Return This Sheet With All Applicable Information.

Date: _____/_____/_____ **Customer Contact Name:** _____

Customer Name: _____

Customer Address: _____

City: _____ **State:** _____ **Zip:** _____

Customer Contact Phone Number: 1-_____-_____-_____ **ext.:** _____

Customer Contact Fax Number: 1-_____-_____-_____

TYPE OF MACHINE ROLLS
(Check One)

THRUFEED TYPES
- ❑ Annular Groove
- ❑ Helical Groove
- ❑ Forced Thrufeed

INFEED TYPES
- ❑ Plain Cylindrical
- ❑ Burnishing
- ❑ Special Form

SEGMENTAL TYPES
- ❑ Solid Cylindrical
- ❑ Knurling Segments

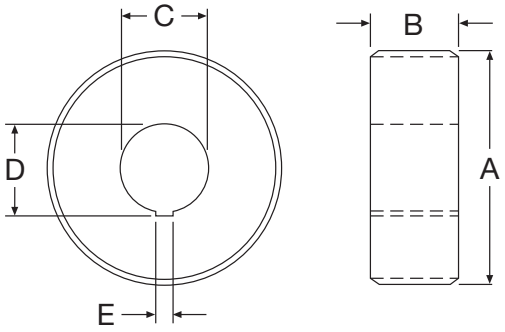
Thread Size & Pitch _____ **Number Of Dies Per Set:** _____

Form Of Thread: _____ **Class Of Thread:** _____ **Hand Of Thread:** _____

(A) O.D. Of Die: _____ **(B) Width Of Die:** _____ **(C) Bore Of Die:** _____

(D) Bore & Keyway Dimension: _____ **(E) Width Of Keyway:** _____

Number Of Starts: _____ **Quantity Of Rolls Needed:** _____



Material & Hardness Of Material To Be Rolled: _____

If Existing Part, Reference Part Number: _____

What Make Of Dies Is Customer Using Now, If Any: _____

Make & Model Of Thread Rolling Machine To Be Used On: _____

Comments: _____

_____

_____

Technical Support Information

When to Roll When to Cut Threads

WHY are some threads rolled and others cut? There are a great many reasons—some valid, some not. Some threads are cut that should be rolled because they have been done this way from time immemorial. Some are rolled only because someone is partial to rolling. Still others are rolled for finish; strength; speed; material savings; chipless operation; tool position; threading back of shoulder; dimensional constancy, etc.

When should you roll threads and when should you cut threads

Threads are cut, in addition to tradition, because of depth–where more than one pass is necessary; short runs (not discounting cutting capability for long runs); the lack of necessity for blank accuracy; proximity to shoulder in end threading; where workpiece material is not adaptable for rolling; capital expenditure, where machines are being considered; many tapered threads; lack of knowledge of thread rolling; fear or aversion to new processes, etc.

Roll Cut

Let's consider a few examples for comparison on cutting and rolling heads. We'll assume it's necessary to produce a thread on an aluminum die casting, or a piece of cast iron, or a zinc die casting or possibly one of the high-temperature space age metals. On some of these it is impossible to roll a thread–such as on the cast iron workpiece–because the metal will not flow. This is also true of some of the die castings; and the space age metals must have an opinion from the tool manufacturer as to their rollability. Chart 1 (supplied through the courtesy of American Society of Tool and Manufacturing Engineers) includes names of space age high strength, thermal resistant materials. Refer to Rollability of Material information beginning on page 50 and the Rollability Charts starting on page 62. This information concerns what can be expected in the way of material rollability and expected die life. A rule of thumb is the percentage of elongation. It shouldn't drop below 12%. This 12% figure can be misleading in the case of high work-hardening steels such as stainless, where in many cases the elongation as finished at the mill ranges from 20 to 40% and the hardness can range far below 20 Rc, but the cold forming of thread rolling will cause some grades to work-harden in the thread roots to 45 Rc and more. In cases of this kind where it is felt that the thread is too deep for a single

pass it would be better to cut rather than roll, because a second pass by rolling would greatly reduce roll life.

If finish is a consideration, rolling is far superior to cutting. Some workpiece prints specify a finish on the thread, but this is in most cases, especially in fine threads (finer than 8 TPI), practically impossible to check. It should be done radially in order to get the worst condition on the flank, but the average profilometer isn't capable of a reliable check over this short distance and the tracer can't get into a 60° angle. However, generally speaking the rolled thread will be as good or better than the rolling dies, which will be 32 microinches or less, while the cut thread will rarely be better than 63 microinches. The rolled thread will be as much as 20% stronger than the cut thread. This is largely due to the unbroken grain structure, while the cut thread shears the grain at every thread form, which results in a weakened tooth (see Figure 1).

In threading from the end of the workpiece it is often necessary to roll close to a shoulder; here, the cutting head is superior. The chaser contact (the cutting edge) lies at the helix angle on the center line of the work and tangentially stops right there. The thread roll also lies at the helix angle and also contacts the workpiece on the center line, but instead of stopping at the point of contact it must continue full circle and in so doing many times can't produce a full thread close enough to the shoulder (Figure 2), because of the curve of the roll beyond the point of contact is ahead of the center line and will strike the shoulder, especially if there is a sizeable difference between the diameters of the thread and the shoulder.

On certain types of non-ferrous metals (zinc and aluminum die castings, certain types of aluminum and brass bars) cutting can be done at fairly high speeds. However, on steels - especially the higher alloys - it will be necessary to stay in the 5 to 60 SFM range. In comparison, a rolled thread can be first tried at 100 SFM and in many instances taken higher. Some jobs run as high as 400 SFM. Here a bit of caution is required because at these high speeds the axial travel is very rapid and short threads or threads going up to a shoulder are difficult to control. Where the rolling head is being used on an automatic screw machine and the threading operation does not govern the cycle time, it is foolish to do the threading at some very high speed and have the head lie idle while some other operation is being completed. 100 SFM is usually sufficient.

Where very deep, coarse, or multiple threads are to be produced cutting is best in most cases for a number of reasons. It is possible in using cutting heads to take more than one pass, without damage to the tool and to distribute the chip load over more cutting edges, thus improving finish and tool life. This is not good practice in thread rolling, as mentioned before, because any tendency to work-harden on the first pass will cause the roll to work much harder on the second. Multiple threads introduce the problem of long throats and higher pressures than single starts and must be taken into account. Roll bearing life is jeopardized and it is impossible to roll anywhere close to a shoulder. In cutting, the second pass can be adjusted so that it

Chart 1

Nominal Compositions of Some High-Strength, Thermal-Resistant Materials

Designation	Composition (%)												
	C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Other
Martensitic High-Strength, Low-Alloy Steels													
AISI or SAE 3150	0.5	0.8	0.2	0.8	1.2							Bal.	
AISI or SAE 4130	0.3	0.5	0.3	1			0.2					Bal.	
AISI or SAE 4340	0.4	0.7	0.3	0.8	1.8		0.2					Bal.	
AMS 6434	0.4	0.9	0.5	0.8	1.8		0.4					Bal.	0.2V
AISI or SAE 8640	0.4	0.9	0.2	0.5	0.5		0.2					Bal.	
300-M	0.4	0.7	1.6	0.8	1.8		0.4					Bal.	0.1V
HS-260	0.4	0.7	0.6	1	2		0.5					Bal.	
D6AC (Crucible)	0.5	0.7	0.2	1	0.5		1					Bal.	0.08V
Airsteel X-200 (USS)	0.4	0.85	1.5	2			0.5					Bal.	
UCX-2 (Univ. Cyclops)	0.4	0.7	1	1.1		1	0.2					Bal.	0.15V
Hot-Work Die Steels (Modified AISI Type H-11)													
Halcomb 218 (Crucible)	0.4	0.4	1.1	5			1.3					Bal.	0.35V
Potomac A (Allegheny)	0.4	0.3	0.9	5				1.3				Bal.	0.5V
AISI 610	0.4	0.4	1.0	5			1.4					Bal.	0.5V
Vascojet 100 (Vanadium Alloys)	0.4	0.3	0.9	5			1.3					Bal.	0.4V
Austenitic Stainless Steels													
AISI 201 or 202	0.15	7		18	5							Bal.	
AISI 302	0.15	2	1	18	9							Bal.	
AISI 309	0.2	2	1	23	14							Bal.	
AISI 310	0.25	2	1.5	25	20							Bal.	
AISI 316	0.08	2	1	17	12		2.5					Bal.	
AISI 321	0.08	2	1	18	10					0.4		Bal.	
Martensitic Stainless Steels													
AISI 420	0.15	1	1	13								Bal.	
AISI 431	0.2	1	1	16	2							Bal.	
AISI 501 or 502	0.1	1	1	5			0.5					Bal.	
AISI 614	0.12	0.42	0.32	12								Bal.	
AISI 615 (Greek Ascoloy)	0.17	0.4	0.3	13	2		0.2	3				Bal.	
Ferritic Stainless Steels													
AISI 405	0.08	1	1	13							0.2	Bal.	
AISI 430	0.12	1	1	16								Bal.	
AISI 442	0.2	1	1	21								Bal.	
Precipitation-hardening Stainless Steels													
AISI 665 (W-545)	0.05	1.5	0.4	13.5	26		1.5			2.8	0.2	Bal.	0.08B
J1300 or M308 (General Electric)	0.08			14	33		4	6.5		2	0.25	Bal.	0.25Zr
Tinidur (Krupp)	0.08			15	30					1.75	0.4	Bal.	
AISI 631 (17-7PH)	0.07	0.5	0.3	17	7						1	Bal.	
AISI 632 (PH15-7Mo)	0.07	0.5	0.3	15	7		2.25				1	Bal.	
AISI 633 (AM-350)	0.1	0.75	0.3	16.5	4		2.75					Bal.	0.09N
AISI 634 (AM-355)	0.13	0.75	0.3	15.5	4		2.75					Bal.	0.1N
AISI 630 (17-4PH)	0.04	0.3	0.6	16	4		0.27					Bal.	3.3Cu
AISI 635 (Stainless W)	0.06	0.55	0.6	17	7					0.8	0.2	Bal.	
Iron-base Superalloys													
AISI 651 (19-9DL)	0.32	1.15	0.55	18.5	9		1.4	1.35	0.4	0.25		Bal.	
AISI 660 (A-286)	0.05	1.45	0.6	15	25		1.3			2	0.2	Bal.	0.28V
AISI 661 (N-155)	0.12	1.5	0.7	21	20		3	2.35	1			Bal.	0.13N
AISI 662 (Discaloy)	0.04	0.9	0.8	13.5	26		2.75			1.75	0.07	Bal.	
Incoloy 800	0.04	0.75	0.3	20.5	32							Bal.	
Unitemp 212	0.08	0.05	0.15	16	25					4	0.15	Bal.	0.5Cb&Ta
18%-Ni Maraging Steel	0.02	0.1	0.1		18.5	7	4.5			0.2		Bal.	
Nickel-base Superalloys													
AISI 664 (D-979)	0.06	0.25	0.2	15	44		4	3.6		3	1	Bal.	
AISI 680 (Hastelloy-X)	0.1	0.65	0.6	21	Bal.	1.5	9	0.6				18.5	
AISI 681 (Incoloy 901)	0.05	0.24	0.12	12.5	42.5		6			2.5	0.2	Bal.	
AISI 683 (René 41)	0.09			19	Bal.	11	10			3.1	1.5	1.8	
AISI 684 (Udimet 500)	0.1	0.1	0.1	17.5	Bal.	18	4.25			3	3	0.5	
AISI 685 (Waspaloy)	0.07	0.1	0.1	20	Bal.	13.5	4.45			3	1.4	0.75	
AISI 686 (R-235)	0.12			15	Bal.		5			2.5	2	10	
AISI 688 (Inconel-X)				15	73				0.85	2.5	0.8	6.75	
AISI 689 (M-252)	0.15			20	Bal.	10	10			2.6	1		
Inconel 718	0.04	0.2	0.2	19	52.5		3		5.2	0.8	0.6	18	
Cobalt-base Superalloys													
AISI 670 (L-605)	0.12	1.65	0.6	20	10	Bal.		15				1.6	
AISI 671 (S-816)	0.42	1	0.45	20	20	43.6	4	4	4				
V-36	0.3	1	0.5	25	20	Bal.	4	2	2			3	
Haynes 36	0.4			18.5	10	Bal.				15		2	
HS-31 or X-40	0.5			25	10	Bal.		8				2	
J-1650	0.2			20	27	Bal.		12		3.8			
HS-21	0.25	0.6	0.6	27	25	Bal.	5.5					2	

Nominal Composition continued on Page 47.

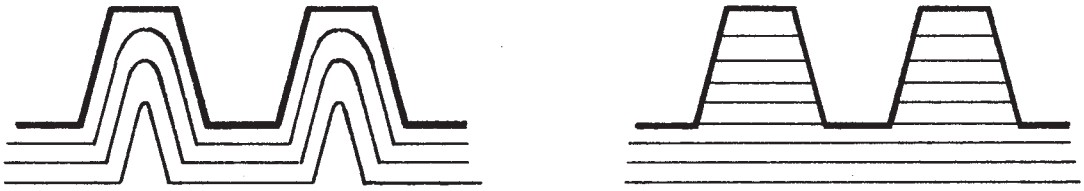
Chart 1

Nominal Compositions of Some High-Strength, Thermal-Resistant Materials

Designation	Composition (%)												
	C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Other
Refractory Metals and Alloys**													
Cb*									100				
D-14									Bal.				5 Zr
D-36									Bal.	10			5 Zr
D-43	0.01							10	Bal.				1 Zr
Cb-752								10	Bal.				2.5 Zr
FS-82									Bal.				33 Ta, 1 Zr
FS-85									Bal.				28 Ta, 1 Zr
Mo*							100						
Mo-.5 Ti	0.02						Bal.			0.45			
TZM	0.015						Bal.			0.5			0.08 Zr
Ta*													100 Ta
90Ta-10W								10					Bal. Ta
Ta-12.5W								12.5					Bal. Ta
Ta-8W-2Hf								8					Bal. Ta, 2Hf
T-222	0.01							9.6					2.4 Hf
GE-473								7.5					3 Re
W*								100					
													Bal. Cu
Gyromet								90					Mo, Ni, Fe
Titanium and Alloys													
Ti*										100			
Ti-8Mn		8								Bal.			
Ti-5Al-2.5Sn										Bal.	5		2.5 Sn
Ti-6Al-4V										Bal.	6		4V
Ti-7Al-4Mo							4			Bal.	7		
Ti-8Al-1Mo-1V							1			Bal.	8		1V
Ti-13V-11Cr-3Al				11						Bal.	3		13V
Ti-4Al-3Mo-1V							3			Bal.	4		1V
Ti-6Al-6V-2Sn										Bal.	6		2 Sn, 6V

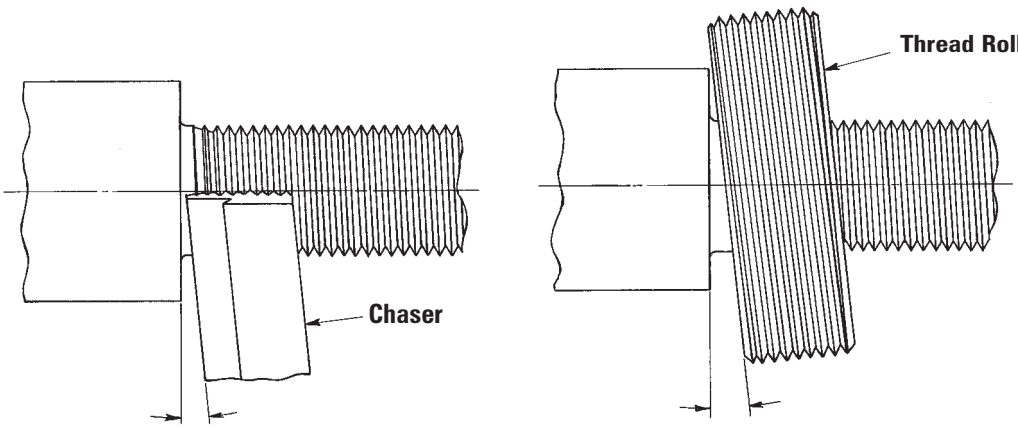
* Commercially pure, unalloyed.
** Maximum limits on C, H, N, and Fe specified by user.
This chart from "Machining the Space Age Metals" reprinted through the courtesy Society of Manufacturing Engineers.

Figure 1



Rolled Thread **Cut Thread**

Figure 2



Difference in Proximity to Shoulder

When to Roll When to Cut Threads

removes just enough metal to smooth up the thread, if it is so desired. On multiple start threads, especially Acme and Trapezoidal, where the helix angle is high and the rear flank on the chaser has a negative rake, the throat teeth can be ground individually to provide positive rake for better cutting action. With a rolling head the rolls cannot be turned to an angle great enough to accommodate many types of multiple threads.

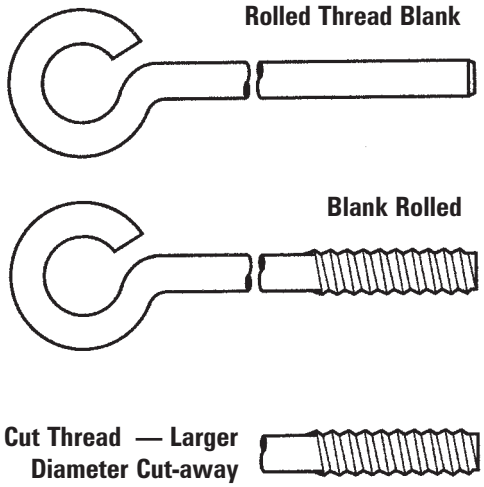
When should you roll threads and when should you cut threads

Threading behind the shoulder can be done using a straddle type thread rolling attachment. This tool operates generally from the cross slide of an automatic screw machine simultaneous with other operations being performed and is capable of rolling on the collet side of a shoulder even when the shoulder is larger than the thread. Attachments can roll very close to a shoulder, or, into a relatively small relief. They can roll either straight or taper threads and have all the advantageous characteristics of other roll threading procedures.

Although the cutting method is 100% acceptable for long runs it also requires less downtime in changeover for short runs. Also, there is a sizeable difference in the initial lower cost of the chaser as opposed to the greater cost of the roll. The workpiece for cut threads many times does not require the accuracy that a rolling blank does because the chaser can be made with a throat chamfer below the root of the thread that acts as a hollow mill to remove excess metal which the roll can't do.

Where it isn't necessary to have the full thread diameter on the workpiece back of the thread, such as bent bolts (Figure 3), etc., it is less expensive from a blank material standpoint to roll the threads. For instance, if rolling stock is purchased to blank diameter there is about a 20% savings in weight realized for 1/2-13 UNC and more than 15% for 1-8 UNC over the bar necessary for a cut thread.

Figure 3



Stock containing small amounts of lead have long been used, especially on automatic screw machines, for increasing their machinability– sometimes by as much as 25%. These steels do not work out well for roll threading. The lead inclusions have a tendency to be squeezed out of the parent material as flakes and not only foul the coolant, but also cause an inferior finish. This same result occurs in high sulphur steels. Sulphur is added for the same reason as lead–increased machinability.

These are some of the reasons for cutting in some instances and rolling in others. Where a question exists as to which method is best it is best to submit the application details to
Landis Threading Systems for an opinion.

Rollability *of* Materials

A MATERIAL'S yield strength and its percent of elongation factor determines whether it can be plastically and permanently deformed. To be rollable, a given material should have an elongation factor of 12%. Other influencing factors include hardness, its microstructure, and the degree and speed at which it work hardens. Also, its modulus of elasticity, the non-metallic content of steels, and the workpiece diameter and pitch.

Material yield point must be exceeded if it is to be permanently deformed. Obviously, the higher its yield point, the more a material will resist deformation. Higher yield points require that proportionately higher rolling pressures be employed.

What materials can be rolled?

Generally, the hardness and elongation factors are regarded as the routine indices of rollability. Being readily obtainable, hardness is used as comprehensive indicators of yield and reduction of area.

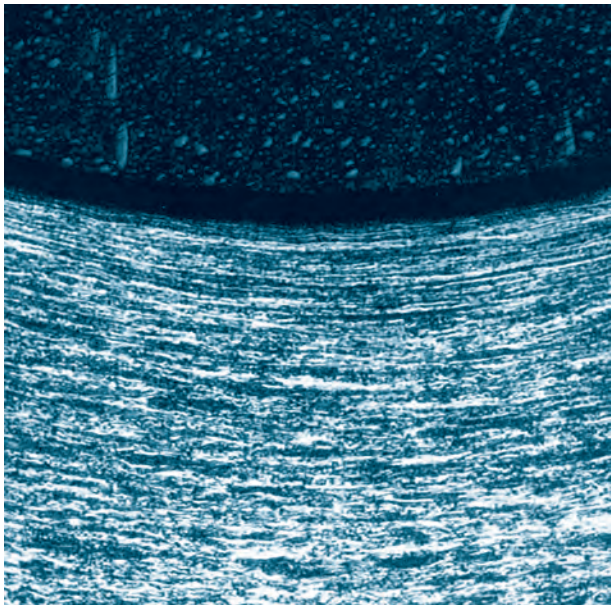
Basic open-hearth steels in the soft state are rollable providing carbon content does not exceed 1.5%. Sulfurized steels are rollable depending upon the severity of cold working to be done and the percentage of sulfur content. While sulfur additives will enhance the machinability of a cutting operation, they are not desirable for cold forming.

Sulfur content should not exceed 0.13%. Higher rates cause extremely hard sulfur inclusions which require higher rolling pressures. In addition to being detrimental to die life, inclusions resist cold forming, cause flaking, and can result in roll breakage.

Soft and malleable leaded steels are naturally thought to have good rollability. While desirable to enhance machinability, additives are not conclusive to cold forming. Softer than the base material, the lead inclusions result in intermittent and varying die loading which contributes to poorer die life. Lead content should be no more than 0.1%.

Rollable Materials

Figure 1



Cold or hot-working can result in hard spots, seams, laps, voids, and other defects. Refractory residues and other impurities have an abrasive effect on dies. Buying higher grade steels minimizes these conditions and their higher cost is offset by increased tool life and less downtime.

To what degree work-hardening will occur depends upon the analysis of the material, its initial hardness, the severity of deformation, and number of cold working cycles imposed on the workpiece.

The greatest amount of deformation with the greatest hardness increase occurs in the root area, the least on the flanks. Figure 1 shows a rolled thread cross section magnified 75X normal size. This shows that the grain structure has been flowed along the thread contour. An overall comparison of the entire thread profile would reveal that the structure is of deeper and finer grain in the root which reflects a higher degree of hardness in that area.

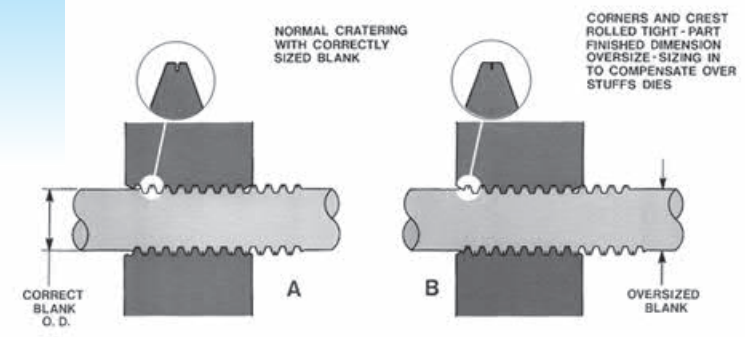
Work-hardening resulting from thread rolling is superficial and the material would be at core hardness .030" to .040" beneath the surface. Where a material has higher work hardening tendencies, hardening has been measured at .150" below the surface. Die life will proportionately decrease in direct ratio to the work hardening increase.

The charts on pages 62-64 list the rollability factor for various materials and what degree of die life can be expected.

Preparing *and* Controlling Blank Diameters

WHILE the principles of rolling techniques will vary somewhat depending upon whether a rolling head, attachment, or machine is being used, there are common considerations which are peculiar to all equipment types. One requirement is the need to maintain the blank diameter within specific limits. Failure to do so can result in premature wear or early failure of the dies. Rolling dies can be compared to a vessel which holds liquid, they can only hold an amount of flowed metal equal to but no more than their displacement. While a vessel can overflow, the same is not true of rolling dies. Since roll life is much greater than that of a cutting tool, the extra effort spent monitoring and controlling the blank to prevent breakage or premature die wear is more than offset by the performance obtained. Since material is caused to flow by the rolling process, and not machined away as with thread cutting, the blank must contain only enough material to fill the die cavity and form the thread. See Figure 1. When too much material is present, the die cavity is overfilled. Conversely, if too little material is provided, the thread will be incorrectly formed. An oversized blank exerts pressure against the dies forcing them outward which can cause die breakage or an

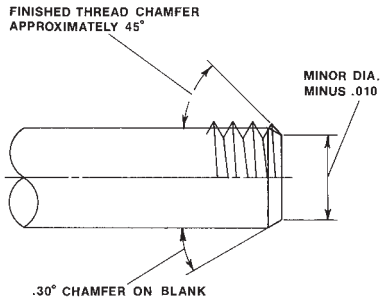
Figure 1



Controlling blank size is extremely important

oversized thread. An oversized thread cannot be corrected by sizing the head smaller. This simply aggravates the condition resulting in still greater pressure on the dies. Depending upon the amount of oversize, the dies can break or their life be drastically shortened. Bear in mind that the blank diameters given on pages 65 through 68 for UN and metric threads are recommended starting points. Depending upon the material and its metallurgical make-up, the final blank diameter must finally be established by actual rolling. Although not always visible to the naked eye, rolled threads have a seam which is the result of material being flowed from the root area up to and folded in at the crest. Depending upon the coarseness of the pitch and how tightly the thread is being rolled, the seam will be more visible on some threads than on others. Better die life will be realized by starting with the minimal acceptable blank diameter (which also advantageously allows for growth) and accepting a larger seam. Seams have no bearing on thread strength but often are objected to on the basis of appearance. Where appearance is a factor, there are alternatives that can be tried. Threads can be rolled tighter if the poorer resulting die life is acceptable, or, the thread can be rolled with an oversized addendum which is then ground away to remove the seam. When rolling a balanced thread such as a UN 60 degree included angle thread, the volume of thread above the P.D. will approximate that below. The volume below is that which is flowed and displaced upward to form the addendum. Thus, it is apparent that with a balanced form, the prepared blank O.D. will approximate the thread's pitch diameter. Starting

Figure **2**



at the minimum recommended blank diameter allows a certain amount of blank growth due to tool wear and allows the longest possible running time, before maximum allowable blank diameter is reached. Therefore, in practice, the blank diameter should be less than the maximum thread P.D. and tolerances on blank diameter should be as small as practical. When rolling shorter length threads, it may be necessary to increase blank diameter slightly to compensate for endwise stretching which occurs. Die thread form chipping can be minimized by beveling the end of the blank as shown in Figure 2. The small bevel diameter at the blank end should be equal to the thread minor diameter minus .010". Rolling will force the end threads outward and the finished bevel will approximate 45 degrees. Blanks should be produced as round and straight as possible, rolling will not entirely correct for these inaccuracies. Avoid variations in diameter along blank length. These cause uneven pressure distribution which can overload the rolls and result in premature failure. Maintain the very best finish possible. The smoother the blank finish, the smoother the final thread finish. Blank O.D. will vary according to material hardness. The recommended blank charts on pages 65 through 68 take this into account and list tolerances for various classes of UN and metric threads based on tolerance.

Troubleshooting tips

thread rolling heads– thread rolling management

THIS information is devoted to solving problems that are encountered when using thread rolling heads and what can be done to correct them. The "Cause and Correction" chart on page 61 can serve as a quick reference guide to correcting some of the more common problems. This information contains a more detailed explanation of problems and how to prevent them, along with maintenance tips, a pre-start check list, and material rollability factors.

Several references are made to preparing and holding blanks within recommended tolerances. Recommended blank diameter information and charts can be found starting on page 65 as well as in the 17th Edition and earlier Landis Handbooks.

Head Maintenance

1. Heads should be kept clean and well lubricated. A head should not be just superficially cleaned, but periodically completely disassembled, thoroughly cleaned, inspected, lubricated, and reassembled. Refer to the operator's information section beginning on page 29 for disassembly, lubricating and other pertinent information.

Figure 1

2. Thread rolling heads are generally equipped with multiple bushing type bearings as shown in Figure 1. Where more extreme pressures are involved, such as when producing coarse pitches or threading heat treated or stainless steels, these bushings will tend to mushroom or elongate endwise. Either of these conditions will sometimes cause the bearings to bind so that the rolls stall or skid and perhaps prevent the head from opening. When this occurs, the bearings can be honed or filed to relieve the condition. This should be done carefully to maintain a neat fit over the roll shafts and in the bore of the roll. As an alternative, single bronze or carbide bushings may be substituted for multiple bushing bearings.

3. The splined end of the roll shaft is inserted into a mating spline in the shaft adjusting crank, with the size reference notch on the shaft aligned with the desired diameter reference line on the rear helix angle bushing (Figure 2). It is important that all three roll shafts are set exactly the same, relative to the setting lines on the rear helix angle bushings. The shaft should also be installed with the head in the "closed position," and the size adjusting screws in a central position.

Figure 2

4. After completing the head assembly or changing rolls, make certain that the rolls turn freely by hand after the front retaining cap is installed and the retaining screws tightened. If the rolls do not freely turn, tap the end of the roll shafts lightly with a soft hammer. If this does not free them, disassemble the head and look for improperly seated helix angle bushings or dirt behind the bushing seat.

Pre-Start Check List

Here are some questions to consider before beginning the job. An ounce of prevention at start-up is worth a pound of cure when the job is running.

1. Is the blank diameter within specified tolerances? It is best to start with the recommended minimum tolerance to assure maximum running time before tool wear results in the blank "growing" over the maximum allowable blank O.D.

2. Does the blank have the recommended chamfer angle?

3. Has the head been aligned with the work?

4. Check that the rolls are installed in the proper rotation. Install in 1, 2, 3 clockwise sequence for right-hand threading, the opposite for left-hand.

Note that thread rolling heads require the use of left-hand helix angle bushings for left-hand threading.

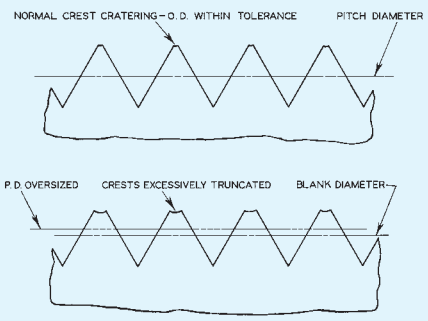
5. To prevent over-rolling and possible damage to the rolls and equipment, deliberately oversize the head for the first piece. Then size down on the next or subsequent pieces until the desired thread size is obtained.

6. Check R.P.M. One of the advantages of thread rolling is that it allows higher operating speeds. Use an R.P.M. rate that results in 100 or more surface feet per minute. Refer to page 161 of the 17th Edition Landis Handbook for surface speed, R.P.M. conversion information.

7. Be extra attentive when a thread is to be rolled into a relief or close to a shoulder. Check that the width of relief is sufficient, and that the allowance for the head trip point is correct. If these allowances are not correct, there is a very good chance that broken dies will result.

8. Make certain that the proper helix angle bushings are being used for the thread to be rolled.

Figure 3



Thread Rolling Problems

Excessive Truncation of the Thread Crests

When the P.D. is oversize and excessive truncation of the thread crest is visible as shown in Figure 3, you

Troubleshooting tips

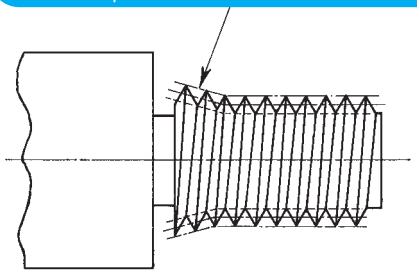
thread rolling heads– thread rolling management

should stop and investigate. A normal reaction is to first try sizing down the head in an attempt to eliminate the condition. A common reason for this condition is attempting to roll material that is too hard or that is prone to excessive work hardening. Such materials resist cold forming causing the head to spring. Thus, sizing-in will not help, but will aggravate the condition putting additional pressure on the tool. Roll breakage and possible tool damage can result. If hardness is the reason, it will be necessary to change to a softer material. Generally, 32 Rockwell C is the maximum hardness that is practical to roll. Problems can be expected at higher hardnesses.

Stainless steels are materials that can cause problems related to work hardening. Most of the 400-series steels are considered best for rolling, with 410 being the best of the series. The 300-series steels should be avoided if possible because they work harden. Sometimes, the 400 series cannot be used because they will magnetize, or the 300 series is preferred because it is more suitable for the job from the chemical analysis viewpoint. Refer to the Rollability of Materials information on page 50 and the Rollability Chart starting on page 62 on what can be expected from materials in the way of rollability as well as what can be expected in tool life.

Figure **4**

Incorrect Helix Angle and Worn Parts Result In Taper at Leave-Off End of Thread



Taper at Leave-off End of Thread

Taper at the leave-off end (Figure 4) is caused by presenting the rolls to the work at an improper helix angle. This can be caused by worn roll shafts or multiple bushing bearings, an enlarged roll bore, or the use of a bushing set with the wrong helix angle. Also, all of the bushings in the set must match, having the same helix angle. If there is no apparent reason involved, then the helix angle is probably not correct for the thread being produced.

Figure **5**

Marked or Highlighted Thread Flanks

Marking or highlighting of the flanks occurs when over-rolling is taking place (Figure 5). The excessive metal that is present during over-rolling has nowhere to go and is pushed up ahead in front of the rolls. As the rolls leave the work when the

head opens, they scoop out or mark the flanks. The blank can also be within the recommended minimum-maximum tolerance, and the head sized down too far. First check the blank for size. If it is too large, reduce the blank to suit; if not, open up the head increasing the pitch diameter. As stated earlier, an oversize blank should be corrected immediately to prevent damage due to over-rolling.

Enlarged and Burnished Root Radius

This condition is generally only discernable using a comparator and thread charts and is caused by the rolls not laying close enough to the helix angle of the thread. It can be corrected by using the proper helix angle bushings.

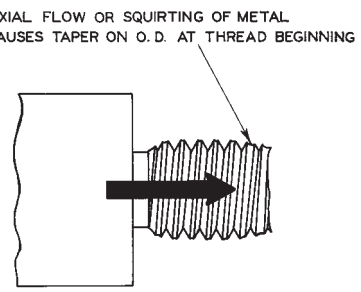
Thread O.D. Variations

Variations in the thread O.D. can be the result of variations in the blank O.D. or varying degrees of hardness from piece to piece. The importance of maintaining the blank within the recommended tolerance should be explained to personnel and every attempt made to consistently hold the size. If the hardness varies from piece to piece, the threads produced on the blanks that are within heat treating tolerance will be acceptable, while the threads produced on blanks hardened beyond the tolerance will show truncation and will be small on O.D. The solution again is to explain the importance of maintaining uniform heat treatment within specified limits.

O.D. Tapered at Beginning of Thread

Taper on the O.D. at the beginning of the thread (Figure 6) is due to the axial flow of surface metal toward

Figure 6



the end of work. This phenomenon occurs when using any end-rolling thread rolling head. The condition generally is not objectionable when a relatively long thread is being produced. However, it can be objectionable when extremely short threads are being rolled. The condition can be recognized by the fact that not enough material flows radially to fill up the crest and the beginning threads will appear partially complete. An unthreaded section in front of the thread to impede the flow can help (Figure 7a). Also, changing to a less ductile material can reduce the amount of flow. Or, the thread can be produced longer than required and the tapered section cut off later (Figure 7b). To cold form freely and permanently deform the material, it must have an elongation factor of 12% to 20%. The closer to 20% the more freely it will flow. Therefore, changing to a material with a lower elongation percentage will help.

P.D. Tapered at Beginning of Thread

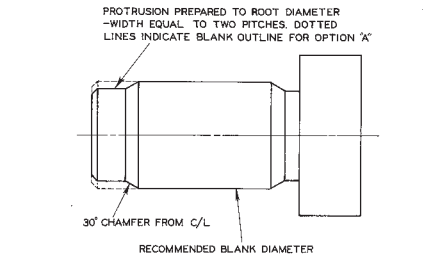
A tapered pitch diameter at the beginning of the thread is generally caused by deflection of the head resulting from rolling hard materials. In the majority of cases, this condition will show up on the first two or three threads. The obvious solution is to change to a softer material. Secondly, sometimes changing to a thread roll having a longer throat angle that will lessen the pressure by distributing it over a longer length will

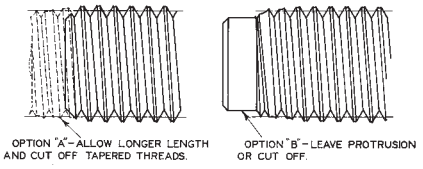
Troubleshooting tips

thread rolling heads– thread rolling management

solve the problem. Obviously, the lower throat angle results in a longer length of imperfect thread and this must be taken into consideration. Thread run-out dimensions are available from the factory.

Figure 7



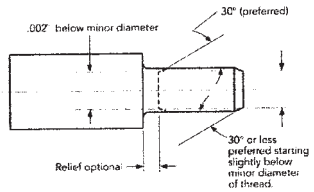


Cupped End on Work

"Cupped end" means that the first thread is forced over the end making a concaved appearance on the extreme end of the work (Figure 8). This results from the metal being flowed over an insufficient chamfer on the work. While it can occur with many materials, it is more prevalent with the softer ones that flow more readily. Landis recommends a chamfer angle of 30° from the centerline of the work, or 60° included angle, starting below the root (Figure 9). If a 30° chamfer does not correct the situation, then the angle can be changed to 15° to 12° starting even further below the root.

Figure 8

Figure 9



Metal Flakes Adhering to Flanks

Flaking usually occurs when rolling high sulphur content material, leaded steels, and some aluminum. Lead is added to steel to improve its cutting action but does not enhance rolling because the lead particles flake off. In general, all materials (not only the leaded ones) that cut well do not roll well, and materials that have a sufficient elongation factor to allow them to roll well are bad prospects for cutting. The solution is to select a material that is suitable for rolling if the application specifications permit. The previously mentioned Rollability of Materials information rates the various materials.

Excessive Truncation with Pitch Diameter to Correct Size

Higher ductile materials extrude more than others with some moving as much as 1/16" to the inch. Sometimes, the problem can be solved by increasing the blank

diameter; sometimes it cannot be cured except by changing materials. If the blank O.D. is increased, it should be done very gradually. Another condition that can cause the problem is a rough finish on the blank. Extremely rough blanks have deeper craters or valleys that are devoid of material. Thus, there is less material to roll up to finish out the thread, and while the pitch diameter is correctly rolled up to size, the crests are excessively truncated. The solution is to produce a finer finish on the blank. Note: Excessive truncation should not be confused with a normal amount of truncation or cratering. In addition, threads are sometimes intentionally rolled full or "tight" with little or no seam for cosmetic reasons. Where possible the thread should be rolled with some truncation or cratering to allow the very best roll life to be realized. It is recommended that the blank initially be prepared to the minimum blank tolerance to allow some "grow room" that results from tool wear before the blank reaches the maximum allowable blank diameter. Packing the material by rolling tight will result in poorer die life. Rolling oversize will cause premature wear or die breakage.

Rolls Break into Washer Segments

Rolls breaking into washer segments several threads thick (as shown in Figure 10) is a direct result of over-rolling of a blank that is too large in diameter. The excessive pressure generated causes the rolls to split at the weakest point — which is the root of the thread. The blank can be oversize from erroneously using the wrong recommended tolerance or from the blank growing from tool wear on the machine producing the blank. In the latter case, it is good practice to periodically check the blanks at the machine where the rolling is being done to make sure the blanks are within tolerance and have not grown from tool wear. It is also possible to over-roll on one side. This results from localized hard areas on a section of the workpiece. A good example of this is welded tubing with the weld and areas adjacent to it being harder than the rest of the workpiece. This can also cause over-rolling.

Premature Crest Breakdown and Chipping

The primary cause of premature wear and chipping is from attempting to roll excessively hard material. Other causes are using improper helix angle bushings (corrected by replacing the bushings) and the use of an incorrect starting lead rate for the workpiece or thread rolling head.

Head Overheating

Head overheating is often the result of an insufficient coolant supply or not applying the coolant at the point of roll contact with the workpiece. Coolant should not be applied to the rolls from the head periphery. Applying the coolant at the point of contact between the rolls and workpiece is especially important with revolving type heads which tend to sling the coolant away from the work. By its very nature, the thread rolling process generates a great deal of pressure and heat and the more coolant that can be flowed onto the operation the better. Sometimes, overall machine and workpiece considerations dictate what coolant must be used. Cutting oil lubricates the tools better and might work best for machining certain materials. Soluble oils do not lubricate as well but carry off heat better.

Troubleshooting tips

thread rolling heads– thread rolling management

Figure 10

Regardless of whether oil or water soluble is used, Moly-Kote G is recommended to lubricate the internal parts of the heads. It is especially good for protecting these against the corrosive effect of water solubles. In most cases, Landis recommends Moly-Kote G or an equivalent for lubrication, and water soluble as the coolant. When yoke-operated rolling heads are operated at higher R.P.M.s, the head may overheat from yoke friction. In such cases, the R.P.M. should be reduced. It is also possible for the yoke to bind on the trip rod causing the yoke to rub in the yoke slot or groove, or for the yoke to fit too snugly in the groove.

Broken Roll Shafts

Roll Shafts can be broken by rolling excessively hard material. Striking the shoulder can also break the shafts, and the head tripping point should be checked carefully at setup. Over-rolling can also cause this problem. Either the head is sized down too far, or the blank is not within the recommended tolerance.

Thread Eccentric with Workpiece

Eccentric threads can be caused by uneven hardness on opposite sides of the blank. This is often caused when induction heating is used and the part is not centrally positioned in the induction coil. Regardless of the reason, the heat treating operation should be controlled to give uniform, consistent hardness. Eccentric threads can also occur when the head and the workpiece are not in alignment. This is generally a machine, not a tool, problem; the machine should be realigned and/or rebuilt as required.

Chart 1

Trouble-Shooting Chart— Thread Rolling Heads

Common Application Problems, Their Cause and Correction

Problem	Cause	Correction
Excessive truncation on thread crest on work and P.D. oversized even after attempting to adjust to correct size	Material too hard, or too prone to workharden causing head to deflect excessively.	Use a softer material or material less prone to work harden.
Taper at leave-off end of full threads.	Using improper helix angle bushings, rolls too low at rear end.	Check helix angle bushings to be sure a matched set of bushings all having the same angle are being used. If bushings match, return head with work samples to factory.
Highlights or marks on crests and flanks of threads where rolls leave work several threads back of throat when head opens.	Due to over-rolling, metal is being piled and pushed ahead of the rolls and the material is left standing when the head opens.	1. If blank O.D. is correct, size head to increase P.D. 2. If blank O.D. is oversize, reduce blank to recommended tolerance.
Enlarged and burnished radius in root; (this usually is only discernable using a comparator and thread chart).	The rolls are not laying close enough to the helix angle of work.	Use correct helix angle bushings.
Variation in thread O.D.	1. Variable blank diameter. Finish thread diameter will vary on a ratio of as much as 4:1 to the blank. 2. Variable hardness.	1. Hold blank diameter to recommended O.D. tolerance. 2. Hold heat treatment to closer limits and assure uniformity.
Taper on O.D. at the beginning of the thread (difficult to improve).	Due to axial flow of surface metal toward end of work. The metal that flows axially is not there to roll up to finish the thread.	1. Change to a less ductile material. 2. Or, if there is to be an unthreaded section in front of the thread, cut off the thread after rolling.
Taper on P.D. at beginning of thread (difficult to improve). On a majority of jobs the condition will show up on the first two or three threads.	Head deflecting from hard materials.	1. Use a softer material. 2. Use rolls with different throat design.
Cupped end on work or first thread being forced over the end (more prevalent in softer materials).	Metal being flowed axially over a chamfer of insufficient angle.	A 30° chamfer angle starting below the thread root is recommended. Some materials may require 15° to 12° starting even further below root.
Metal flakes and adheres to thread flanks.	1. Due to using high sulphur content steels, leaded steels and some aluminum. 2. Over-rolling some materials.	1. Change to a more suitable material. 2. Decrease blank O.D.
Thread crests excessively truncated with P.D. down to size and O.D. of blank to correct, recommended diameter.	1. The more ductile the material, the more it will extrude with some moving as much as 1/16" per inch. 2. Rough turned finish on the blank.	1. Increase the blank diameter. This may or may not correct the problem, depending upon the material. 2. Produce a fine finish on the blank.
Rolls break and separate into washer type segments several threads thick.	1. Over-rolling. 2. Rolls laying at a higher than standard helix angle.	1. Reduce blank diameter. 2. Using helix angle bushings that are correct for application.
Premature thread crest breakdown and chipping.	1. Excessively hard material. 2. Incorrect helix angle. 3. Incorrect starting lead.	1. Reduce workpiece hardness. 2. Use suitable helix angle bushings. 3. Use correct lead means to get onto the work.
Head overheats.	1. Insufficient coolant supply. 2. Improper coolant application.	1. Increase coolant volume. 2. Apply coolant to workpiece at the point of roll contact — not to the rolls from the head periphery. This is especially true of revolving heads.
Thread eccentric to workpiece.	Improper alignment.	Check head and machine for misalignment.
Broken roll shafts	1. Excessively hard material. 2. Striking the shoulder. 3. Over-rolling.	1. Use softer material. 2. Reset head tripping point. 3. Use recommended blank diameter.

Chart 1

Rollability of Materials

CARBON AND ALLOY STEELS
Proportional Die Life

Material Designation	Thread Finish	Proportional Die Life: Soft	Rc 15-24	Rc 25-32	Rc 33 to	Remarks
AISI 1008 - 1095	E	H	H-M	M	L	Excellent Rollability
AISI 1108 - 1151 AISI 1211 - 1215 AISI B1111 - B1113	G F F	H M H	H-M	M		These are free machining steels with high sulphur content. The highest sulphur materials-1110,1144 and 1200 series should be avoided when possible.
AISI 1330 - 1345 AISI 4012 - 4047	E E	H H-M	M M	M-L M-L	L L	These are medium alloy steels such as manganese, molybdenum, chrome and nickel. Work hardening of material requires higher pressures and some reduction in roll life over the 1000-1200 series will be experienced.
AISI 4118 - 4161	E	H-M	M	M-L	L	
AISI 4320-4340 AISI 4419 AISI 4615 - 4626 AISI 4718 - 4720 AISI 4815 - 4820	E	H-M	M	M-L	L	
AISI 5015 - 5060 AISI 5115 - 5160 AISI E51100 - E52100	E	H-M	M	M-L	L	
AISI 6118 - 6150	E	H-M	M	M-L	L	
AISI 8615 - 8655 AISI 8720-8740 AISI 8822 AISI 9255 - 9260	E	H-M	M	M-L	L	
Stainless 302 304 309-317	E		M-L			These are non-hardenable austenitic steels containing higher quantities of nickel and chromium. High work hardening occurs with higher percent alloys. Also non-magnetic. Recommend Carpenter #10 wherever possible. Material does not seam.
Stainless 305, 321, 347, 348 Carpenter & 12 - 20CB	E		M	L		
Stainless Carpenter #10	E		H-M	M-L		
Stainless 329 - 430F - 446	E		M-L	L		Non-hardenable ferritic chromium stainless but magnetic. Lower work hardening but higher pressures required due to carbon.
Stainless 430 - 443	E		M	L		
Stainless 414 - 420F - 440F	E		M-L	L		Hardenable martensitic chromium steels, magnetic. Most suited for rolling of the stainless grades, low work hardening.
Stainless 410 - 431 - 440C - 501 - 502	E		H-M	L		
High Speed T1, M1, M2	E		M-L	L		Not generally recommended however can be rolled under proper conditions.
Nitralloy 135 - 230	E		M	M-L	L	Not rollable after nitriding.

Letter designations for Finish: E-excellent, G-good, F-fair, P-poor.

Letter designations for Die Life: H-high, M-medium, L-low.

Elongation factor: generally acceptable results can be achieved when percent elongation equals twelve (12) or more.

Chart 2

Rollability of Materials

WROUGHT COPPER AND COPPER ALLOYS

Material Designation						
SAE No.	ASTM No.	Alloy Name	Max. Hardness	Finish	Die Life	Remarks
CA102	B124 #12	Oxygen Free Copper	RF40	E	H	More than 90% copper. Excellent rollability.
CA110	B124 #12	Electrolytic Copper (ETP)	RF40	E	H	
CA122	B124 #12	Phosphorus Deoxidized (DHP)	RF45	E	H	
CA210	B36 #1	Gilding 95%	RB40	E	H	Copper-zinc alloys basically good for rolling except when zinc exceeds 30%. This tends to produce poor finish as indicated in CA270 CA280.
CA220	B36 #2	Commercial Bronze 90%	RB42	E	H	
CA230	B36 #3	Red Brass	RB55	E	H	
CA240	B36 #4	Low Brass 80%	RB55	E	H	
CA260	B36 #6	Cartridge Brass 70%	RB60	E	H	
CA270	B36 #8	Yellow Brass	RB55	F	H	
CA280	B135 #5	Muntz Metal	RB78	P	M	
CA314	B140-B	Leaded Comm. Bronze	RB65	P	M-H	Copper zinc alloys with lead added for improved machining characteristics. Poor to fair for rolling. Higher lead produces poorer thread finish and is not recommend for rolling.
CA335	B121 #2	Low Lead Brass	RB60	G	M-H	
CA340	B121 #3	Medium Leaded Brass	RB60	G	M-H	
CA342	B121 #5	High Leaded Brass	RB55	P	M	
CA345		Thread Rolling Brass	RB75	G	M-H	
CA353	B121 #5	High Leaded Brass 62%	RB55	P	M	
CA356	B121 #6	Extra High Leaded Brass	RB55	P	L-M	
CA360	B16	Free Cutting Brass	RB70	P	L	
CA365 to CA368	B171	Leaded Muntz Metal	RB70	P	M	
CA370	B135 #6	Free Cutting Muntz Metal	RB70	P	L	
CA377	B124 #2	Forging Brass	RB65	P	L	
CA385		Architectural Bronze	RB65	P	L	
CA443 to CA445	B171	Inhibited Admiralty	RB75	E	H	Copper zinc alloy with 1.0% tin excellent rollability.
CA464 to CA467	B124 #3	Naval Brass	RB75	P-F	M	Copper zinc alloy with lead and tin not conducive to good rolling characteristics. Alternate material should be used.
CA485	B21-C	Leaded Naval Brass	RB80	P	L	
CA502	B105	Phosphor Bronze E	RB50	G	H	Copper tin alloy generally good for rolling but increasing tin content reduces rollability. CA544 contains some lead & zinc thereby reducing its rollability.
CA510	B139-A	Phosphor Bronze A	RB65	G	H	
CA521	B139-C	Phosphor Bronze C	RB70	P-F	M-H	
CA524	B139-D	Phosphor Bronze D	RB70	P	M	
CA544	B139-B2	Free Cutting Phosphor Bronze	RB70	P	L	
CA606		Aluminum Bronze	RB70	G	M	Copper aluminum alloy fair to good rolling characteristics. Increased quantities of silicon nickel, introduce work hardening and reduce rollability.
CA614	B150-3	Aluminum Bronze D	RB70	G	M	
CA617	B150-1	Aluminum Bronze	RB70	P	L-M	
CA360	B150-2	Aluminum Bronze	RB70	P	L	
CA639		Aluminum Silicon Bronze	RB75	G	L	
CA651	B98-B	Low Silicon Bronze B	RB70	E	M	Copper with silicon as basic alloy. Average rollability.
CA655	B98-A	High Silicon Bronze A	RB75	FG	M	
CA675	B138-A	Manganese Bronze A	RB70	P	M	High zinc alloy, alternate material should be used.
CA706	B111	Copper Nickel - 10%	RB70	G	M-H	High nickel alloy reduces rollability proportionally.
CA715	B111	Copper Nickel - 30%	RP70	G	M	
CA745	B151-E	Nickel Silver 65 - 10	RB70	E	H	Copper with zinc and nickel as alloy-rollability good to excellent. As alloy increases, rollability decreases.
CA752	B151-A	Nickel Silver 65 - 18	RB70	G-E	H	
CA754		Nickel Silver 65 - 15	RB70	E	H	
CA757	B151-D	Nickel Silver 65 - 12	RP70	E	H	
CA770	B151-B	Nickel Silver 55 - 18	RB70	G	M	

COPPER CASTING ALLOYS, ANNEALED

Copper casting alloys, in the annealed condition, mostly are rated as poor rollability and poor die life. The copper alloys with basic quantities of tin, zinc or silicon rate slightly better in die life with poor to fair finish. It is recommended that these materials be avoided where possible and should only be considered for low production quantities.

Letter designations for Finish: E-excellent, G-good, F-fair, P-poor.

Letter designations for Die Life: H-high, M-medium, L-low.

Elongation factor: generally acceptable results can be achieved when percent elongation equals twelve (12) or more.

Chart 3

Rollability of Materials

WROUGHT ALUMINUM AND ALUMINUM ALLOYS

Material Designation							
SAE No.	ASTM No.	Condition	Max. Hardness	% Elongation	Finish	Die Life	Remarks
1100-0	990A	Annealed	RB23	45	E	H	99% aluminum recommended for rolling. Work hardens very slowly, cannot be heat treated. Major alloy is silicon.
1100-H12	990A	1/4 Hard	RB28	25	E	H	
110-H14	990A	1/2 Hard	RB32	20	G-E	H	
1100-H16	990A	3/4 Hard	RB38	17	G	H	
1100-H18	990A	Full Hard	RB44	15	FG	M	
2011-T3	CB60A	Heat treated and cold worked	RB95	15	FG	M-H	Lower quality finish is a result of lead and Bismuth alloys, not generally recommended for rolling.
2011-T6C	B60A	Heat treated and aged	RB97	17	F	M-H	
2011-T8	CB60A	Heat treated, cold worked & aged	RB100	12	P-F	M-H	
2014-0	CS41A	Annealed	RB45	18	G	M-H	Copper, silicon, manganese major alloys, higher strength requires greater roll pressure.
2014-T4	CS41A	Heat treated and aged	RB105	20	G-E	M-H	
2014-T6	CS41A	Heat treated and aged	RB135	13	F	M-H	
2017-0	CM41A	Annealed	RB45	22	E	H	Good rollability. Most commonly used for rolling.
2017-T4	CM41A	Heat treated and aged	RB105	22	E	H	
2024-0	CG42A	Annealed	RB47	22	E	H	
2024-T3	CG42A	Heat treated and cold worked	RB120	18	E	H	
2024-T4	CG42A	Heat treated and aged	RB120	18	E	H	
2117-T4	CG30A	Heat treated and aged	RB70	27	E	H	
3003-0	MIA	Annealed	RB28	40	E	H	99% aluminum, recommended for rolling. Work hardens very slowly, cannot be heat treated. Major alloy is manganese.
3003-H12	MIA	1/4 Hard	RB35	20	G-E	H	
3003-H14	MIA	1/2 Hard	RB40	16	G	H	
3003-H16	MIA	3/4 Hard	RB47	14	F	M	
3003-H18	MIA	Full Hard	RB55	10	P-F	L-M	
5052-0	CR20A	Annealed	RB47	30	E	H	Fair to good rollability in the lower hardness condition, major alloy manganese with chromium.
5052-H32	CR20A	1/4 Hard	RB60	18	G	M	
5052-H34	CR20A	1/2 Hard	RB68	14	F	M	
5052-H36	CR20A	3/4 Hard	RB73	10	P-F	L-M	
5053-H38	CR20A	Full Hard	RB77	8	P	L	
5056-0	GM50A	Annealed	RB65	35	E	H	Major alloy magnesium. Recommend rolling in annealed condition only.
5056-H18	GM50A	Strain Hardened	RB105	10	P	L-M	
5056-H38	GM50A	Strain Hardened and Stabilized	RB100	15	P-F	L-M	
6061-0	GS11A	Annealed	RB30	30	E	H	Good to excellent rollability in conditions.
6061-T4	GS11A	Heat treated and aged	RB25	65	G-E	H	
6061-T6	GS11A	Heat treated and aged	RB17	95	G	H	
7075-0	ZG62A	Annealed	RB60	16	F	H	Generally not recommended for rolling.
7075-T6	ZG62A	Heat treated and aged	RB150	11	P	M	

WROUGHT NICKEL AND NICKEL ALLOYS

The nickel alloys in general can be produced with a good to excellent thread finish. The "inconel" and "hastelloy" series result in a poor to fair finish. The higher tensile of nickel alloys requires high roll pressures and, therefore, medium to low die life can be expected. It is recommended that annealed material be used wherever possible.

Letter designations for Finish: E-excellent, G-good, F-fair, P-poor.

Letter designations for Die Life: H-high, M-medium, L-low.

Elongation factor: generally acceptable results can be achieved when percent elongation equals twelve (12) or more.

Chart 1

Recommended Blank Diameters

Blank Diameters for Parallel Rolled Threads UNF and UNC - Class 2

Size		Steel												Brass and Bronze		Aluminum Alloy			
		10-50 C Soft		30-50 C Soft		30-50 C or Alloy 15-25 RC		30-50 C or Alloy 26-32 RC		Stainless Chrome Nickel 300 Series*		Stainless Chrome 400 Series*				Soft		Hard	
O.D.	Pitch	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
#0	80	.0504	.0498	.0507	.0501	.0509	.0503	.0511	.0505	.0513	.0507	.0515	.0509	.0507	.0501	.0509	.0503	.0507	.0501
#1	72	.0623	.0617	.0627	.0621	.0629	.0622	.0631	.0625	.0633	.0626	.0635	.0628	.0627	.06321	.0629	.0622	.0627	0621
#1	64	.0612	.0605	.0616	.0609	.0618	.0611	.0620	.0613	.0622	.0615	.0624	.0617	.0616	.0609	.0618	.0611	.0616	.0609
#2	64	.0742	.0735	.0746	.0739	.0748	.0741	.0750	.0743	.0752	.0745	.0754	.0747	.0746	.0739	.0748	.0741	.0746	0739
#2	56	.0726	.0719	.0730	.0723	.0732	.0725	.0734	.0728	.0737	.0730	.0739	.0732	.0730	.0723	.0732	.0725	.0730	.0723
#3	56	.0855	.0847	.0859	.0852	.0861	.0854	.0863	.0856	.0866	.0858	.0868	.0860	.0859	.0852	.0861	.0854	.0859	.0852
#3	48	.0835	.0827	.0840	.0832	.0842	.0834	.0844	.0837	.0846	.0839	.0849	.0841	.0840	.0832	.0842	.0834	.0840	.0832
#4	48	.0964	.0956	.0969	.0961	.0971	.0964	.0974	.0966	.0976	.0968	.0979	.0971	.0969	.0961	.0971	.0964	.0969	.0961
#4	40	.0936	.0928	.0941	.0933	.0943	.09335	.0946	.0938	.0948	.0940	.0951	.0943	.0941	.0938	.0943	.0935	.0941	.0933
#5	44	.1081	.1073	.1086	.1078	.1088	.1080	.1091	.1082	.1093	.1085	.1096	.1088	.1086	.1078	.1088	.1080	.1086	.1078
#5	40	.1065	.1057	.1070	.1062	.1073	.1064	.1075	.1067	.1078	.1070	.1081	.1072	.1070	.1062	.1073	.1064	.1070	.1062
#6	40	.1195	.1187	.1200	.1192	.1203	.1194	.1205	.1197	.1208	.1200	.1211	.1202	.1200	.1192	.1203	.1194	.1200	.1192
#6	32	.1153	.1144	.1159	.1149	.1161	.1152	.1164	.1155	.1167	.1158	.1170	.1161	.1159	.1149	.1161	.1152	.1159	.1149
#8	36	.1436	.1427	.1442	.1432	.1444	.1435	.1447	.1438	.1450	.1441	.1453	.1444	.1442	.1432	.1444	.1435	.1442	.1432
#8	32	.1412	.1402	.1417	.1408	.1420	.1411	.1423	.1414	.1426	.1416	.1429	.1419	.1417	.1408	.1420	.1411	.1417	.1408
#10	32	.1671	.1661	.1677	.1667	.1680	.1670	.1683	.1673	.1686	.1676	.1689	.1679	.1677	.1667	.1680	.1670	.1677	.1667
#10	24	.1591	.1589	.1608	.1596	.1611	.1599	.1614	.1602	.1618	.1606	.1621	.1609	.1608	.1596	.1611	.1599	.1608	.1596
#12	28	.1900	.1889	.1907	.1896	.1910	.1899	.1913	.1902	.1916	.1905	.1920	.1908	.1907	.1896	.1910	.1899	.1907	.1896
#12	24	.1861	.1848	.1868	.1855	.1871	.1859	.1874	.1862	.1878	.1865	.1881	.1869	.1868	.1855	.1871	.1859	.1868	.1855
1/4	20	.2144	.2131	.2151	.2138	.2155	.2142	.2159	.2146	.2166	.2153	.2159	.2146	.2151	.2138	.2155	.2142	.2151	.2138
1/4	28	.2241	.2228	.2248	.2235	.2251	.2238	.2255	.2242	.2261	.2248	.2255	.2242	.2248	.2235	.2251	.2238	.2248	.2235
5/16	18	.2729	.2716	.2737	.2724	.2741	.2728	.2745	.2732	.2753	.2740	.2745	.2732	.2737	.2724	.2741	.2728	.737	.2724
5/16	24	.2823	.2810	.2830	.2817	.2834	.2821	.2837	.2824	.2845	.2832	.2837	.2824	.2830	.2817	.2834	.2821	.2830	.2817
3/8	16	.3306	.3291	.3315	.3300	.3320	.3305	.3324	.3309	.3333	.3318	.3324	.3309	.3315	.3300	.3320	.3305	.3315	.3300
3/8	24	.3448	.3434	.3455	.3441	.3459	.3445	.3463	.3449	.3471	.3457	.3463	.3449	.3455	.3441	.3459	.3445	.3455	.3441
7/16	14	.3871	.3855	.3880	.3864	.3885	.3869	.3890	.3874	.3899	.3883	.3890	.3874	.3880	.3864	.3885	.3869	.3880	.3864
7/16	20	.4012	.3999	.4021	.4008	.4025	.4012	.4029	.4016	.4037	.4024	.4029	.4016	.4021	.4008	.4025	.4012	.4021	.4008
1/2	13	.4458	.4440	.4468	.4450	.4473	.4455	.4478	.4460	.4488	.4470	.4478	.4460	.4468	.4450	.4473	.4455	.4468	.4450
1/2	20	.4637	.4623	.4646	.4632	.4650	.4636	.4655	.4641	.4663	.4649	.4655	.4641	.4646	.4632	.4650	.4636	.4646	.4632
9/16	12	.5039	.5021	.5050	.5032	.5055	.5037	.5060	.5042	.5070	.5052	.5060	.5042	.5050	.5032	.5055	.5037	.5050	.5032
9/16	18	.5225	.5210	.5234	.5219	.5238	.5223	.5243	.5228	.5252	.5237	.5243	.5228	.5234	.5219	.5238	.5223	.5234	.5219
5/8	11	.5614	.5595	.5625	.5606	.5630	.5611	.5636	.5617	.5647	.5628	.5636	.5617	.5625	.5606	.5630	5611	.5625	.5606
5/8	18	.5850	.5833	.5859	.5842	.5864	.5847	.5869	.5852	.5878	.5861	.5869	.5852	.5859	.5842	.5864	.5847	.5859	.5842
3/4	10	.6799	.6779	.6811	.6791	.6817	.6797	.6823	.6803	.6834	.6814	.6823	.6803	.6811	.6791	.6817	.6797	.6811	.6791
3/4	16	.7052	.7034	.7062	.7044	.7067	.7049	.7072	.7054	.7082	.7064	.7072	.7054	.7062	.7044	.7067	.7049	.7062	.7044
7/8	9	.7972	.7952	.7985	.7965	.7991	.7971	.7998	.7978	.8010	.7990	.7998	.7978	.7985	.7965	.7991	.7971	.7985	.7965
7/8	14	.8240	.8221	.8251	.8232	.8257	.8238	.8262	.8243	.8273	.8259	.8262	.8243	.8251	.8232	.8257	.8238	.8251	.8232
1	8	.9131	.9107	.9144	.9120	.9151	.9127	.9158	.9134	.9172	.9148	.9158	.9134	.9144	.9120	.9151	.9127	.9144	.9120
1	12	.9408	.9388	.9420	.9400	.9426	.9406	.9432	.9412	.9443	.9423	.9432	.9412	.9420	.9400	.9426	.9406	.9420	.9400
1-1/8	7	1.0262	1.0235	1.0276	1.0250	1.0283	1.0257	1.0290	1.0264	1.0304	1.0278	1.0290	1.0264	1.0276	1.0250	1.0283	1.0257	1.0276	1.0250
1-1/8	12	1.0657	1.0637	1.0669	1.0649	1.0675	1.0655	1.0681	1.0661	1.0693	1.0673	1.0681	1.0661	1.0669	1.0649	1.0675	1.0655	1.0669	1.0649
1-1/4	7	1.1510	1.1483	1.1525	1.1498	1.1533	1.1506	1.1540	1.1513	1.1555	1.1528	1.1540	1.1513	1.1525	1.1498	1.1533	1.1506	1.1525	1.1498
1-1/4	12	1.1906	1.1885	1.1919	1.1898	1.1925	1.1904	1.1931	1.1910	1.1943	1.1922	1.1931	1.1910	1.1919	1.1898	1.1925	1.1904	1.1919	1.1898
1-3/8	6	1.2601	1.2571	1.2617	1.2587	1.2625	1.2595	1.2633	1.2603	1.2649	1.2619	1.2633	1.2603	1.2617	1.2587	1.2625	1.2595	1.2617	1.2587
1-3/8	12	1.3153	1.3133	1.3166	1.3146	1.3171	1.3152	1.3178	1.3158	1.3191	1.3171	1.13178	1.3158	1.3166	1.3146	1.3172	1.3152	1.3166	1.3146
1-1/2	6	1.3850	1.3820	1.3866	1.3836	1.3874	1.3844	1.3882	1.3852	1.3898	1.3868	1.3882	1.3851	1.3866	1.3836	1.3874	1.3844	1.3866	1.3836
1-1/2	12	1.4402	1.4382	1.4415	1.4395	1.4422	1.4402	1.4428	1.4408	1.4441	1.4421	1.4428	1.4408	1.4415	1.4395	1.4422	1.4402	1.4415	1.4395
1-3/4	5	1.6124	1.6094	1.6142	1.6112	1.6150	1.6120	1.6159	1.6129	1.6177	1.6147	1.6159	1.6129	1.6142	1.6112	1.6150	1.6120	1.6142	1.6112
2	4-1/2	1.8474	1.8442	1.8493	1.8461	1.8503	1.8471	1.8512	1.8480	1.8531	1.8499	1.8512	1.8480	1.8442	1.8461	1.8503	1.8471	1.8442	1.8461

Note: These dimensions are for set-up reference. Diameters must be finally established by actual rolling.
*Only certain grades rollable.

Chart 2

Recommended Blank Diameters

Blank Diameters for Parallel Rolled Threads UNF and UNC - Class 3

Size		Steel														Aluminum Alloy			
		10-50 C Soft		30-50 C Soft		30-50 C or Alloy 15-25 RC		30-50 C or Alloy 26-32 RC		Stainless Chrome Nickel 300 Series*		Stainless Chrome 400 Series*		Brass and Bronze		Soft		Hard	
O.D.	Pitch	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
#0	80	.0512	.0507	.0514	.0510	.0515	.0511	.0517	.0513	.0519	.0515	.0517	.0513	.0514	.0510	.0515	.0511	.0514	.0510
#1	72	.0632	.0627	.0635	.0630	.0637	.0632	.0638	.0633	.0641	.0636	.0638	.0633	.0635	.0630	.0637	.0632	.0635	.0630
#1	64	.0621	.0616	.0624	.0619	.0625	.0620	.0627	.0622	.0630	.0625	.0627	.0622	.0624	.0619	.0625	.0620	.0624	.0619
#2	64	.0751	.0746	.0754	.0749	.0755	.0750	.0757	.0752	.0760	.0755	.0757	.0752	.0754	.0749	.0755	.0750	.0754	.0749
#2	56	.0735	.0730	.0738	.0733	0739	.0734	.0741	.0736	.0744	.0739	.0741	.0736	.0738	.0733	.0739	.0734	.0738	.0733
#3	56	.0865	.0860	.0868	.0863	.0869	.0864	.0871	.0866	.0874	.0869	.0871	.0866	.0868	.0863	.0869	.0864	.0868	.0863
#3	48	.0845	.0840	.0848	.0843	.0850	.0845	.0852	.0847	.0855	.0850	.0852	.0847	.0848	.0843	.0850	.0845	.0848	.0843
#4	48	.0975	.0969	.0978	.0972	.0980	.0974	.0982	.0976	.0986	.0980	.0982	.0976	.0978	.0972	.0980	.0974	.0978	.0972
#4	40	.0947	.0941	.0950	.0945	.0953	.0947	.0955	.0949	.0958	.0952	.0955	.0949	.0950	.0945	.0953	.0947	.0950	.0945
#5	44	.1091	.1085	.1095	.1088	.1097	.1091	.1099	.1093	.1102	.1096	.1099	.1093	.1095	.1088	.1097	.1091	.1095	.1088
#5	40	.1077	.1071	.1081	.1075	.1083	.1077	.1085	.1079	.1088	.1082	.1085	.1079	.1081	.1075	.1083	.1077	.1081	.1075
#6	40	.1207	.1200	.1211	.1204	.1213	.1206	.1215	.1208	.1219	.1212	.1215	.1208	.1211	.1204	.1213	.1206	.1211	.1204
#6	32	.1164	.1157	.1169	.1162	.1171	.1164	.1174	.1167	.1178	.1171	.1174	.1167	.1169	.1162	.1171	.1164	.1169	.1162
#8	36	.1448	.1441	.1452	.1445	.1454	.1447	.1457	.1450	.1461	.1454	.1457	.1450	.1452	.1445	.1454	.1447	.1452	.1445
#8	32	.1424	.1417	.1429	.1422	.1431	.1424	.1433	.1426	.1437	.1430	.1433	.1426	.1429	.1422	.1431	.1424	.1429	.1422
#10	32	.1683	.1676	.1688	.1681	.1690	.1683	.1693	.1686	.1697	.1690	.1693	.1686	.1688	.1681	.1690	.1683	.1688	.1681
#10	24	.1615	.1607	.1620	.1612	.1622	.1614	.1625	.1617	.1630	.1622	.1625	.1617	.1620	.1612	.1622	.1614	.1620	.1612
#12	28	.1913	.1906	.1918	.1911	.1921	.1914	.1923	.1916	.1928	.1921	.1923	.1916	.1918	.1911	.1921	.1914	.1918	.1911
#12	24	.1874	.1866	.1879	.1871	.1881	.1873	.1884	.1876	.1889	.1881	.1884	.1876	.1879	.1871	.1881	.1873	.1879	.1871
1/4	20	.2159	.2150	.2164	.2155	.2167	.2158	.2170	.2161	.2176	.2167	.2170	.2161	.2164	.2155	.2167	.2158	.2164	.2155
1/4	28	.2254	.2246	.2259	.2251	.2261	.2253	.2264	.2256	.2269	.2261	.2264	.2256	.2259	.2251	.2261	.2253	.2259	.2251
5/16	18	.2724	.2737	.2753	.2743	.2756	.2746	.2759	.2749	.2765	.2755	.2759	.2749	.2753	.2743	.2756	.2746	.2753	.2743
5/16	24	.2839	.2830	.2845	.2836	.2847	.2838	.2850	.2841	.2855	.2846	.2850	.2841	.2845	.2836	.2847	.2838	.2845	.2836
3/8	16	.3326	.3314	.3333	.3321	.3336	.3324	.3340	.3328	.3346	.3334	.3340	.3328	.3346	.3334	.3340	.3328	.3333	.3321
3/8	24	.3463	.3453	.3469	.3459	.3472	.3462	.3475	.3465	.3480	.3470	.3475	.3465	.3469	.3459	.3472	.3462	.3469	.3459
7/16	14	.3893	.3880	.3900	.3887	.3903	.3890	.3907	.3894	.3914	.3901	.3907	.3894	.3900	.3887	.3903	.3890	.3900	.3887
7/16	20	.4032	.4022	.4038	.4028	.4041	.4031	.4044	.4034	.4051	.4041	.4044	.4034	.4038	.4028	.4041	.4031	.4038	.4028
1/2	13	.4480	.4467	.4487	.4474	.4491	.4478	.4495	.4482	.4502	.4489	.4495	.4482	.4487	.4474	.4491	.4478	.4487	.4474
1/2	20	.4657	.4646	.4664	.4653	.4654	.4643	.4670	.4659	.4676	.4665	.4670	.4659	.4664	.4653	.4654	.4643	.4664	.4653
9/16	12	.5062	.5049	.5070	.5057	.5070	.5057	.5078	.5065	.5085	.5072	.5078	.5065	.5070	.5057	.5070	.5057	.5070	.5057
9/16	18	.5246	.5233	.5253	.5240	.5253	.5240	.5260	.5247	.5267	.5254	.5260	.5247	.5253	.5240	.5253	.5240	.5253	.5240
5/8	11	.5636	.5623	.5644	.5631	.5644	.5631	.5653	.5640	.5661	.5648	.5653	.5640	.5644	.5631	.5644	.5631	.5644	.5631
5/8	18	.5871	.5858	.5878	.5865	.5878	.5865	.5885	.5872	.5892	.5879	.5885	.5872	.5878	.5865	.5878	.5865	.5878	.5865
3/4	10	.6825	.6810	.6834	.6819	.6834	.6819	.6843	.6828	.6852	.6837	.6843	.6828	.6834	.6819	.6834	.6819	.6834	.6819
3/4	16	.7073	.7060	.7080	.7067	.7080	.7067	.7088	.7075	.7096	.7083	.7088	.7075	.7080	.7067	.7080	.7067	.7087	.7067
7/8	9	.8002	.7986	.8010	.7994	.8011	.7995	.8021	.8005	.8030	.8014	.8021	.8005	.8010	.7994	.8011	.7995	.8010	.7994
7/8	14	.8262	.8249	.8270	.8257	.8270	.8257	.8279	.8266	.8287	.8274	.8279	.8266	.8270	.8257	.8270	.8257	.8270	.8257
1	8	.9160	.9142	.9170	.9151	.9170	.9152	.9180	.9162	.9191	.9173	.9180	.9162	.9170	.9152	.9170	.9152	.9170	.9152
1	12	.9434	.9419	.9443	.9428	.9428	.9415	.9452	.9437	.9461	.9446	.9452	.9437	.9443	.9428	.9428	.9415	.9443	.9428
1-1/8	7	1.0292	1.0273	1.0303	1.0284	1.0303	1.0284	1.0314	1.0295	1.0325	1.0306	1.0314	1.0295	1.0303	1.0284	1.0303	1.0284	1.0303	1.0284
1-1/8	12	1.0684	1.0669	1.0693	1.0678	1.0693	1.0678	1.0693	1.0678	1.0711	1.0696	1.0693	1.0678	1.0693	1.0678	1.0693	1.0678	1.0693	1.0678
1-1/4	7	1.1542	1.1523	1.1553	1.1534	1.1553	1.1534	1.1553	1.1534	1.1575	1.1556	1.1553	1.1534	1.1553	1.1539	1.1553	1.1534	1.1553	1.1534
1-1/4	12	1.1933	1.1918	1.1942	1.1927	1.1942	1.1927	1.1951	1.1936	1.1960	1.1945	1.1951	1.1936	1.1942	1.1927	1.1942	1.1927	1.1942	1.1927
1-3/8	6	1.2633	1.2613	1.2645	1.2625	1.2651	1.2631	1.2657	1.2637	1.2665	1.2649	1.2657	1.2637	1.2645	1.2625	1.2651	1.2631	1.2645	1.2625
1-3/8	12	1.3182	1.3167	1.3191	1.3176	1.3196	1.3181	1.3200	1.3185	1.3210	1.3195	1.3200	1.3185	1.3191	1.3176	1.3196	1.3161	1.3191	1.3176
1-1/2	6	1.3883	1.3862	1.3894	1.3874	1.3900	1.3880	1.3906	1.3886	1.3918	1.3898	1.3906	1.3886	1.3894	1.3874	1.3900	1.3880	1.3894	1.3874
1-1/2	12	1.4433	1.4416	1.4442	1.4425	1.4447	1.4430	1.4451	1.4434	1.4461	1.4444	1.4451	1.4434	1.4442	1.4425	1.4447	1.4430	1.4442	1.4425
1-3/4	5	1.6165	1.6141	1.6178	1.6154	1.6185	1.6161	1.6191	1.6167	1.6205	1.6181	1.6191	1.6167	1.6178	1.6154	1.6185	1.6161	1.6178	1.6154
2	4-1/2	1.8518	1.8493	1.8532	1.8507	1.8539	1.8514	1.8546	1.8521	1.8561	1.8536	1.8546	1.8521	1.8532	1.8507	1.8539	1.8514	1.8532	1.8507

Note:These dimensions are for set-up reference.Diameters must be finally established by actual rolling.
*Only certain grades rollable.

Chart 3

Recommended Blank Diameters

Blank Diameters In Inches & MMs for Straight, Rolled Metric Threads

Size in M/M			Steel														Aluminum Alloy			
			10-15 C Soft		30-50 C Soft		30-50 C or Alloy 15-25 RC		30-50 C or Alloy 26-32 RC		Stainless Chrome Nickel 300 Series*		Stainless Chrome 400 Series*		Brass and Bronze		Soft		Hard	
Size	Pitch		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
3	35	M/M	2.756	2.743	2.764	2.751	2.769	2.756	2.771	2.758	2.779	2.766	2.771	2.758	2.764	2.751	2.769	2.756	2.764	2.751
		In.	.1085	.1080	.1088	.1083	.1090	.1085	.1091	.1086	.1094	.1089	.1091	.1086	.1088	.1083	.1090	.1085	.1088	.1083
3	.5	M/M	2.652	2.639	2.659	2.647	2.664	2.652	2.667	2.654	2.675	2.662	2.667	2.654	2.659	2.647	2.664	2.652	2.659	2.647
		In.	.1044	.1039	.1047	.1042	.1049	.1044	.1050	.1045	.1053	.1048	.1050	.1045	.1047	.1042	.1049	.1044	.1047	.1042
3.5	.35	M/M	3.256	3.244	3.261	3.249	3.266	3.254	3.269	3.256	3.277	3.264	3.269	3.256	3.261	3.249	3.266	3.254	3.261	3.249
		In.	.1282	.1277	1284	.1279	.1286	.1281	.1287	.1282	.1290	.1285	.1287	.1282	.1284	.1279	.1286	.1281	.1284	.1279
3.5	6	M//M	3.084	3.071	3.094	3.081	3.096	3.084	3.101	3.089	3.109	3.096	3.101	3.089	3.094	3.081	3.096	3.084	3.094	3.081
		In.	.1214	.1209	. 1218	.1213	.1219	.1214	.1221	.1216	.1224	.1219	.1221	.1216	.1218	.1213	.1219	.1214	.1218	.1213
4	.5	M/M	3.653	3.640	3.660	3.647	3.663	3.650	3.668	3.655	3.675	3.663	3.668	3.655	3.660	3.647	3.663	3.650	3.660	3.647
		In.	.1438	.1433	.1441	.1436	.1442	.1437	.1444	.1439	.1447	.1442	.1444	.1439	.1441	.1436	.1442	.1437	.1441	.1436
4	.7	M/M	3.520	3.505	3.528	3.513	3.533	3.518	3.538	3.523	3.548	3.533	3.538	3.523	3.528	3.513	3.533	3.518	3.528	3.513
		In.	.1386	.1380	.1389	.1383	.1391	.1385	.1393	.1387	.1397	.1391	.1393	.1387	.1389	.1383	.1391	.1385	.1389	.1383
4.5	.5	M/M	4.153	4.140	4.161	4.648	4.663	4.150	4.168	4.155	4.176	4.163	4.168	4.155	4.161	4.148	4.163	4.150	4.161	4.148
		In.	.1635	.1630	.1638	.1633	.1639	.1634	.1641	.1636	.1644	.1639	.1641	.1636	.1638	.1633	.1639	.1634	.1638	.1633
5	.5	M/M	4.651	4.638	4.661	4.148	4.163	4.651	4.666	4.653	4.676	4.663	4.666	4.653	4.661	4.648	4.663	4.651	4.661	4.648
		In.	.1831	.1826	.1835	.1830	.1836	.1831	.1837	.1832	.1841	.1836	.1837	.1832	.1835	.1830	.1836	.1831	.1835	.1830
5	.8	M/M	4.455	4.437	4.463	4.448	4.468	4.453	4.473	4.458	4.483	4.465	4.473	4.463	4.448	4.468	4.453	4.463	4.448	
		In.	.1754	.1747	.1757	.1751	.1759	.1753	.1761	.1755	.1765	.1758	.1761	.1755	.1757	.1751	.1759	.1753	.1757	.1751
6	.75	M/M	5.484	5.469	5.494	5.479	5.499	5.484	5.504	5.489	5.512	5.496	5.504	5.489	5.494	5.479	5.499	5.484	5.494	5.479
		In.	.2159	.2153	.2163	.2157	.2165	.2159	.2167	.2161	.2170	.2164	.2167	.2161	.2163	.2157	.2165	.2159	.2163	.2157
6	1.0	M/M	5.314	5.293	5.326	5.306	5.334	5.314	5.339	5.319	5.352	5.331	5.339	5.319	5.326	5.306	5.334	5.314	5.326	5.306
		In.	.2092	.2084	.2097	.2089	.2100	.2092	.2102	.2094	.2107	.2099	.2102	.2094	.2097	.2089	.2100	.2092	.2097	.2089
7	.75	M/M	6.485	6.469	6.495	6.480	6.500	6.485	6.505	6.490	6.513	6.497	6.505	6.490	6.495	6.480	6.500	6.485	6.495	6.480
		In.	.2553	.2547	.2557	.2551	.2559	.2553	.2561	.2555	.2564	.2558	.1561	.2561	.2557	.2551	.2559	.2553	.2557	.2551
7	1.0	M/M	6.314	6.294	6.327	6.307	6.335	6.314	6.340	6.320	6.353	6.332	6.340	6.320	6.327	6.307	6.335	6.314	6.327	6.307
		In.	.2486	.2478	.2491	.2483	.2494	.2486	.2496	.2488	.2501	.2493	.2496	.2488	.2491	.2483	.2494	.2486	.2491	.2483
8	1.0	M/M	7.315	7.295	7.328	7.308	7.336	7.315	7.341	7.320	7.353	7.333	7.341	7.320	7.328	7.308	7.336	7.315	7.328	7.308
		In.	.2880	.2872	.2885	.2877	.2888	.2880	.2890	.2882	.2895	2.887	2.890	.2882	.2885	.2877	.2888	.2880	.2885	.2877
8	1.25	M/M	7.150	7.130	7.163	7.142	7.168	7.148	7.176	7.155	7.188	7.168	7.176	7.155	7.163	7.142	7.168	7.148	7.163	7.142
		In.	.2815	.2807	.2820	.2812	.2822	.2814	.2825	.2817	.2830	.2822	.2825	.2817	.2820	.2812	.2822	.2814	.2820	.2812
9	1.0	M/M	8.313	8.293	8.326	8.306	8.334	8.313	8.339	8.319	8.352	8.331	8.339	8.319	8.326	8.306	8.334	8.313	8.326	8.306
		In.	.3273	.3265	.3278	.3270	.3281	.3273	.3283	.3275	.3288	.3280	.3283	.3275	.3278	.3270	.3281	.3273	.3278	.3270
9	1.25	M/M	8.151	8.131	8.164	8.143	8.169	8.148	8.176	8.156	8.189	8.169	8.176	8.156	8.164	8.143	8.169	8.148	8.164	8.143
		In.	.3209	.3201	.3214	.3206	.3216	.3208	.3219	.3211	.3224	.3216	.3219	.3211	.3214	.3206	.3216	.3208	.3214	.3206
10	1.0	M/M	9.314	9.294	9.327	9.307	9.335	9.314	9.340	9.319	9.352	9.332	9.340	9.319	9.327	9.307	9.335	9.314	9.327	9.307
		In.	.3667	.3659	.3672	.3664	.3675	.3667	.3677	.3669	.3682	.3674	.3677	.3669	.3672	.3664	.3675	.3667	.3672	.3664
10	1.5	M/M	8.984	8.956	8.999	8.971	9.007	8.979	9.014	8.989	9.030	9.004	9.014	8.989	8.999	8.971	9.007	8.979	8.999	8.971
		In.	.3537	.3526	.3543	.3532	.3546	.3535	.3549	.3539	.3555	.3545	.3549	.3539	.3543	.3532	.3546	.3535	.3543	.3532
11	1.5	M/M	9.982	9.954	9.997	9.970	10.005	9.977	10.012	9.987	10.027	10.003	10.012	9.987	9.997	9.970	10.005	9.977	9.997	9.970
		In.	.3930	.3919	.3936	.3925	.3939	.3928	.3942	.3932	.3948	.3938	.3942	.3932	.3936	.3925	.3939	.3928	.3936	.3925
12	1.5	M/M	10.983	10.955	10.998	10.970	11.006	10.978	11.013	10.988	11.029	11.003	11.013	10.988	10.998	10.970	11.006	10.978	10.998	10.970
		In.	.4324	.4313	.4330	.4319	.4333	.4322	.4336	.4326	.4342	.4332	.4336	.4326	.4330	.4319	.4333	.4322	.4330	.4319
12.	1.75	M/M	10.818	10.785	10.836	10.803	10.843	10.810	10.853	10.820	10.871	10.838	10.853	10.820	10.836	10.803	10.843	10.810	10.836	10.803
		In.	.4259	.4246	.4266	.4253	.4269	.4256	.4273	.4260	.4280	.4267	.4273	.4260	.4266	.4253	.4269	.4256	.4266	.4253
14	1.5	M/M	12.982	1.2954	12.997	12.969	13.005	12.977	13012	12.987	13.028	13.002	13.012	12.987	12.997	12.969	13.005	12.977	12.997	12.969
		In.	.5111	.5100	.5117	.5106	.5120	.5109	.5123	.5113	.5129	.5119	.5123	.5113	.5117	.5106	.5120	.5109	.5117	.5106
14	2	M/M	12.647	12.614	12.664	12.631	12.675	12.642	12.685	12.652	12.705	12.672	12.685	12.652	12.664	12.631	12.657	12.642	12.664	12.631
		In.	.4979	.4966	.4986	.4973	.4990	.4977	.4994	.4981	.5002	.4989	.4994	.4981	.4986	.4973	.4990	.4977	.4986	.4973
16	1.5	M/M	14.983	14.956	14.999	14.971	15.006	14.978	15.014	14.989	15.029	15.004	15.014	14.989	14.999	14.971	15.006	14.978	14.999	14.971
		In.	.5899	.5888	.5905	.5894	.5908	.5897	.5911	.5901	.5917	.5907	.5911	.5901	.5905	.5894	.5908	.5897	.5905	.5894
16	2	M/M	14.648	14.615	14.666	14.633	14.676	14.643	14.686	14.653	14.707	14.674	14.686	14.653	14.666	14.633	14.676	14.643	14.666	14.633
		In.	.5767	.5754	.5774	.5761	.5778	.5765	.5782	.5769	.5790	.5777	.5782	.5769	.5774	.5761	.5778	.5765	.5774	.5761
18	1.5	M/M	16.982	16.955	16.998	16.970	17.005	16.977	17.013	16.988	17.028	17.003	17.013	16.988	16.998	16.970	17.005	16.977	16.998	16.970
		In.	.6686	.6675	.6692	.6681	.6695	.6684	.6698	.6688	.6704	.6694	.6698	.6688	.6692	.6681	.6695	.6684	.6692	.6681
18	2.5	M/M	16.312	16.274	16.335	16.297	16.345	16.307	16.358	16.320	16.380	16.342	16.358	16.320	16.335	16.297	16.345	16.307	16.335	16.297
		In.	.6422	.6407	.6431	.6416	.6435	.6420	.6440	.6425	.6449	.6434	.6440	.6425	.6431	.6416	.6435	.6420	.6431	.6416
20	1.5	M/M	18.984	18.956	18.999	18.971	19.007	18.979	19.014	18.989	19.030	19.004	19.014	18.989	18.999	18.971	19.007	18.979	18.999	18.971
		In.	.7474	.7463	.7480	.7469	.7483	.7472	.7486	.7476	.7492	.7482	.7486	.7476	.7480	.7469	.7483	.7472	.7480	.7469
20	2.5	M/M	18.313	18.275	18.336	18.298	18.346	18.308	18.359	18.321	18.382	18.344	18.359	18.321	18.336	18.298	18.346	18.308	18.336	18.298
		In.	.7210	.7195	.7219	.7204	.7223	.7208	.7228	.7213	.7237	.7222	.7228	.7213	.7219	.7204	.7223	.7208	.7219	.7204
22	1.5	M/M	20.983	20.955	20.998	20.970	21.006	20.978	21.013	20.988	21.029	21.003	21.013	20.988	20.998	20.970	21.006	20.978	20.998	20.970
		In.	.8261	.8250	.8267	.8256	.8270	.8259	.8273	.8263	.8279	.8269	.8273	.8263	.8267	.8256	.8270	.8259	.8267	.8256

Note: These dimensions are for set-up reference. Diameters must be finally established by actual rolling.

* Only Certain Grades Rollable

Chart 4

Recommended Blank Diameters

Blank Diameters In Inches & MMs for Straight, Rolled Metric Threads

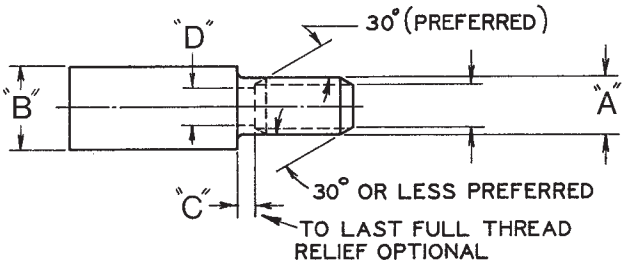
Size in M/M			Steel: 10-15 C Soft		Steel: 30-50 C Soft		Steel: 30-50 C or Alloy 15-25 RC		Steel: 30-50 C or Alloy 26-32 RC		Steel: Stainless Chrome Nickel 300 Series*		Steel: Stainless Chrome 400 Series*		Brass and Bronze		Aluminum Alloy: Soft		Aluminum Alloy: Hard	
Size	Pitch		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
22	2.5	M/M	20.312	20.274	20.335	20.297	20.345	20.307	20.358	20.320	20.381	20.343	20.358	20.320	20.335	20.297	20.345	20.307	20.335	20.297
		In.	.7997	.7982	.8006	.7991	.8010	.7995	.8015	.8000	.8024	.8009	.8015	.8000	.8006	.7991	.8010	.7995	.8006	.7991
24	2	M/M	22.647	22.614	22.664	22.631	22.675	22.642	22.685	22.652	22.705	22.672	22.685	22.652	22.664	22.631	22.675	22.642	22.664	22.631
		In.	.8916	.8903	.8923	.8910	.8927	.8927	.8914	.8918	.8939	.8926	.8931	.8918	.8923	.8910	.8927	.8914	.8923	.8910
24	3	M/M	21.979	21.930	22.004	21.958	22.017	21.971	22.029	21.984	22.055	22.007	22.029	21.984	22.004	21.958	22.017	21.971	22.004	21.958
		In.	.8653	.8634	.8663	.8645	.8668	.8650	.8673	.8655	.8683	.8664	.8673	.8655	.8663	.8645	.8668	.8650	.8663	.8645
27	2	M/M	25.646	25.613	25.664	15.631	25.674	25.641	25.684	25.651	25.705	25.672	25.684	25.651	25.664	25.631	25.674	25.641	25.664	25.631
		In.	1.0097	1.0084	1.0104	1.0091	1.0108	1.0095	1.0112	1.0099	1.012	1.0107	1.0112	1.0099	1.0104	1.0091	1.0208	1.0095	1.0104	1.0091
27	3	M/M	24.981	24.933	25.006	24.961	25.019	24.973	25.032	24.986	25.060	25.011	25.032	24.986	25.006	24.961	25.109	24.973	25.006	24.961
		In.	.9835	.9816	.9845	.9827	.9850	.9832	.9855	.9837	.9866	.9847	.9855	.9837	.9845	.9827	.9850	.9832	.9845	.9827
30	2	M/M	28.646	28.613	28.664	28.631	28.674	28.641	28.684	28.651	28.705	28.672	28.684	28.651	28.664	28.631	28.674	28.641	28.664	28.631
		In.	1.1278	1.1265	1.1285	1.1272	1.1289	1.1276	1.1293	1.1280	1.1301	1.1288	1.1293	1.1280	1.1285	1.1272	1.1289	1.1276	1.1285	1.1272
30	3.5	M/M	27.643	27.595	27.763	27.623	27.689	27.638	27.704	27.653	27.732	27.683	27.704	27.653	27.673	27.623	27.689	27.638	27.673	27.623
		In	.1.0883	1.0864	1.0895	1.0875	1.0901	1.0881	1.0907	1.0887	1.0918	1.0899	1.0907	1.0887	1.0895	1.0875	1.0901	1.0881	1.0895	1.0875
33	2	M/M	31.648	31.615	31.666	31.633	31.676	31.643	31.687	31.653	31.707	31.674	31.687	31.653	31.666	31.633	31.676	31.643	31.666	31.633
		In.	1.2460	1.2447	1.2467	1.2454	1.2471	1.2458	1.2475	1.2462	1.2483	1.2470	1.2475	1.2462	1.2467	1.2454	1.2471	1.2458	1.2467	1.2454
33	3.5	M/M	30.643	30.594	30.673	30.622	30.688	30.637	30.704	30.653	30.731	30.683	30.704	30.653	30.673	30.622	30.688	30.637	30.673	30.622
		In.	1.2064	1.2045	1.2076	1.2056	1.2082	1.2062	1.2088	1.2068	1.2099	1.2080	1.2088	1.2068	1.2076	1.2056	1.2082	1.2062	1.2076	1.2056
36	3	M/M	33.973	33.925	34.001	33.953	34.016	33.967	34.029	33.981	34.057	34.009	34.029	33.981	34.001	33.953	34.015	33.967	34.001	33.953
		In.	1.3375	1.3356	1.3367	1.3392	1.3373	1.3397	1.3378	1.3408	1.3389	1.3397	1.3378	1.3386	1.3367	1.3392	1.3373	1.3386	1.3386	1.3367
36	4	M/M	33.316	33.265	33.346	33.295	33.361	33.311	33.377	33.326	33.407	33.356	33.377	33.326	33.346	33.295	33.361	33.311	33.346	33.295
		In.	1.3116	1.3096	1.3128	1.3108	1.3134	1.3114	1.3140	1.3120	1.3152	1.3132	1.3140	1.3120	1.3128	1.3108	1.3134	1.3114	1.3128	1.3108
39	3	M/M	36.973	36.925	37.001	36.953	37.015	36.967	37.029	36.981	37.057	37.009	37.029	36.981	37.001	36.953	37.015	36.967	37.001	36.953
		In.	1.4556	1.4537	1.4567	1.4548	1.4573	1.4554	1.4578	1.4559	1.4589	1.4569	1.4578	1.4559	1.4567	1.4548	1.4573	1.4554	1.4567	1.4548
39	4	M/M	36.316	36.265	36.346	36.295	36.361	36.311	36.377	36.326	36.407	36.356	36.377	36.326	36.346	36.295	36.361	36.311	36.346	36.295
		In.	1.4297	1.4277	1.4309	1.4289	1.4315	1.4295	1.4321	1.4301	1.4333	1.4313	1.4321	1.4301	1.4309	1.4289	1.4315	1.4295	1.4309	1.4289
42	3	M/M	39.971	39.923	39.999	39.951	40.014	39.966	40.028	39.980	40.056	40.008	40.028	39.980	39.999	39.951	40.014	39.966	39.999	39.951
		In.	1.5848	1.5829	1.5860	1.5841	1.5865	1.5846	1.5591	1.5572	1.5882	1.5863	1.5591	1.5572	1.5860	1.5841	1.5865	1.5846	1.5860	1.5841
42	4.5	M/M	38.987	38.928	39.020	38.9613	9.036	38.978	39.053	38.994	39.086	39.027	39.053	38.994	39.020	38.961	39.036	38.978	39.020	38.961
		In.	1.5348	1.5325	1.5361	1.5338	1.5368	1.5345	1.5374	1.5351	1.5387	1.5364	1.5374	1.5351	1.5361	1.5338	1.5368	1.5345	1.5361	1.5338
45	3	M/M	42.971	42.923	42.999	42.951	43.014	42.966	43.028	42.980	43.056	43.008	43.028	42.980	42.999	42.951	43.014	42.966	42.999	42.951
		In.	1.7029	1.7010	1.7041	1.7022	1.7046	1.7027	1.6772	1.6753	1.7063	1.7044	1.6772	1.6753	1.7041	1.7022	1.7046	1.7027	1.7041	1.7022
45	4.5	M/M	41.987	41.928	42.020	41.961	42.036	41.978	42.053	41.994	42.086	42.027	42.053	41.994	42.020	41.961	42.036	41.978	42.020	41.961
		In.	1.6529	1.6506	1.6542	1.6519	1.6549	1.6526	1.6555	1.6532	1.6568	1.6545	1.6555	1.6532	1.6542	1.6519	1.6549	1.6526	1.6542	1.6519
48	3	M/M	45.971	45.921	46.000	45.950	46.015	45.964	46.029	45.979	46.058	46.008	46.029	45.979	46.000	45.950	46.015	45.964	46.000	45.950
		In.	1.8099	1.8079	1.8111	1.8091	1.8117	1.8097	1.8123	1.8103	1.8135	1.8115	1.8123	1.8103	1.8111	1.8091	1.8117	1.8097	1.8111	1.8091
48	5	M/M	44.655	44.592	44.691	44.628	44.709	44.645	44.727	44.663	44.762	44.699	44.727	44.663	44.691	44.628	44.709	44.645	44.691	44.628
		In.	1.7581	1.7556	1.7595	1.7570	1.7601	1.7577	1.7609	1.7584	1.7623	1.7598	1.7609	1.7584	1.7595	1.7570	1.7602	1.7577	1.7595	1.7570
52	3	M/M	49.969	49.918	49.999	49.948	50.013	49.963	50.028	49.977	50.058	50.007	50.028	49.977	49.999	49.948	50.013	49.963	49.999	49.948
		In.	1.9673	1.9653	1.9685	1.9665	1.9691	1.9671	1.9697	1.9677	1.9709	1.9689	1.9697	1.9677	1.9685	1.9665	1.9691	1.9671	1.9685	1.9665
52	5	M/M	48.643	48.592	48.678	48.628	48.696	48.645	48.714	48.663	48.749	48.699	48.714	48.663	48.678	48.628	48.696	48.645	48.678	48.628
		In.	1.9151	1.9131	1.9165	1.9145	1.9172	1.9152	1.9179	1.9159	1.9193	1.9173	1.9179	1.9159	1.9165	1.9145	1.9172	1.9152	1.9165	1.9145

Note: These dimensions are for set-up reference. Diameters must be finally established by actual rolling.

* Only Certain Grades Rollable

Chart 1

Width of Relief Required For 3-1/2, 5 and 7 TRB Head



3 1/2 TRB Head

	Identical Long Throat						Identical Short Throat						
	Diameter of Shoulder "B"						Diameter of Shoulder "B"						
	1/4	5/16	3/8	7/16	1/2	9/16	1/4	5/16	3/8	7/16	1/2	9/16	
THD. Size A	Width of Neck "C"						Width of Neck "C"						"D"
N.C. 1/4 20P	3/16	3/16	3/16	13/64	13/64	13/64	9/64	9/64	9/64	5/32	5/32	5/32	.1850
5/8-18P		3/16	13/64	13/64	13/64	13/64		9/64	5/32	5/32	5/32	5/32	.2403
3/8-16P			7/32	7/32	7/32	7/32			5/32	5/32	5/32	5/32	.2938
7/16-14P				15/64	15/64	15/64				11/64	11/64	11/64	.3447
N.F. 1/4 28P	5/32	5/32	5/32	5/32	5/32	5/32	1/8	1/8	1/8	1/8	1/8	1/8	.2036
5/16-24P		11/64	11/64	11/64	11/64	3/16		9/64	9/64	9/64	9/64	5/32	.2584
3/8-24P			11/64	11/64	11/64	11/64			9/64	9/64	9/64	9/64	.3209
7/16-20P				3/16	3/16	13/64				9/64	9/64	5/32	.3725

5 TRB Head

	Identical Long Throat										Identical Short Throat										
	Diameter of Shoulder "B"										Diameter of Shoulder "B"										
	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	
THD. Size A	Width of Neck "C"										Width of Neck "C"										"D"
N.C. 5/16 18P	3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64	9/64	9/64	9/64	9/64	5/32	5/32	5/32	5/32	5/32	5/32	.2403
3/8 16P		7/32	7/32	7/32	7/32	15/64	15/64	15/64	15/64	15/64		5/32	5/32	5/32	5/32	5/32	11/64	11/64	11/64	11/64	.2938
7/16 14P			15/64	15/64	15/64	15/64	15/64	15/64	15/64	15/64			11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	.3447
1/2 13P				1/4	1/4	1/4	1/4	1/4	17/64	17/64				11/64	11/64	11/64	11/64	11/64	3/16	3/16	.4001
9/16 12P					9/32	9/32	19/64	19/64	19/64	19/64					13/64	13/64	7/32	7/32	7/32	7/32	.4542
5/8 11P						9/32	9/32	9/32	9/32	9/32						3/16	3/16	3/16	3/16	3/16	.5069
N.F. 5/16 24P	11/64	11/64	11/64	11/64	3/16	3/16	3/16	3/16	3/16	3/16	1/8	1/8	1/8	1/8	5/32	5/32	5/32	5/32	5/32	5/32	.2584
3/8 24P		11/64	11/64	11/64	11/64	11/64	3/16	3/16	3/16	3/16		1/8	1/8	1/8	1/8	1/8	5/32	5/32	5/32	5/32	.3209
7/16 20P			3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64			9/64	9/64	5/32	5/32	5/32	5/32	5/32	5/32	.3725
1/2 20P				3/16	3/16	13/64	13/64	13/64	13/64	13/64				9/64	9/64	5/32	5/32	5/32	5/32	5/32	.4350
9/16 18P					3/16	13/64	13/64	13/64	13/64	13/64					9/64	5/32	5/32	5/32	5/32	5/32	.4903
5/8 18P						3/16	13/64	13/64	13/64	13/64						9/64	5/32	5/32	5/32	5/32	.5528

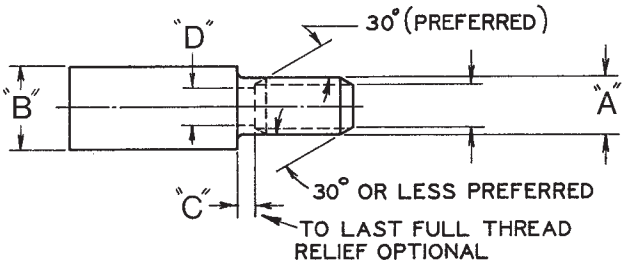
7 TRB Head

	Identical Long Throat												Identical Short Throat											
	Diameter of Shoulder "B"												Diameter of Shoulder "B"											
	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1-1/16	1-1/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1-1/16	1-1/8
THD. Size A	Width of Neck "C"												Width of Neck "C"											"D"
N.C. 7/16 14P	1/4	1/4	1/4	1/4	1/4	17/64	17/64	17/64	17/64	17/64	9/32	9/32	3/16	3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	7/32	7/32	.3447
1/2 13P		17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32		3/16	3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64	.4001
9/16 12P			19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	5/16	5/16			7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	15/64	15/64	.4542
5/8 11P				19/64	5/16	5/16	5/16	5/16	5/16	5/16	21/64	21/64				13/64	7/32	7/32	7/32	7/32	7/32	7/32	15/64	15/64	.5069
3/4 10P						19/64	19/64	19/64	5/16	5/16	5/16	5/16						13/64	13/64	13/64	7/32	7/32	7/32	7/32	.6201
7/8 9P								23/64	23/64	23/64	23/64	3/8								1/4	1/4	1/4	1/4	17/64	.7307
N.F. 7/16 20P	3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	9/64	9/64	9/64	9/64	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32	.3725
1/2 20P		3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64	13/64		9/64	9/64	9/64	9/64	5/32	5/32	5/32	5/32	5/32	5/32	5/32	.4350
9/16 18P			7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32			11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	.4903
5/8 18P				7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32				11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	.5528
3/4 16P						7/32	7/32	15/64	15/64	15/64	15/64	15/64						5/32	5/32	11/64	11/64	11/64	11/64	11/64	.6688
7/18 14P								1/4	1/4	1/4	1/4	17/64								3/16	3/16	3/16	3/16	13/64	.7822

For No Throat Rolls, subtract one pitch length from equivalent "C" dimension listed for "Identical Short" roll.

Chart 2

Width of Relief Required For 10 TRB Heads



10 TRB Head

Identical Long Throat

Diameter of Shoulder "B"

THD. Size A	5/8	11/16	3/4	13/16	7/8	15/16	1	1-1/16	1-1/8	1-3/16	1-1/4	1-5/16	1-3/8	1-7/16	1-1/2	1-9/16	1-5/8	1-11/16	1-3/4	"D"
	Width of Neck "C"																			
N.C. 5/8 11P	9/32	9/32	9/32	9/32	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	5/16	5/16	5/16	5/16	.5069
3/4 10P			19/64	19/64	19/64	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	21/64	21/64	21/64	21/64	.6201
7/8 9P					3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	25/64	25/64	25/64	25/64	25/64	25/64	.7307
1 8P							25/64	25/64	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	27/64	.8376
1-1/8 7P									27/64	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	29/64	.9394
1-1/4 7P											27/64	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	1.0644
N.F. 5/8 18P	3/16	3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	7/32	7/32	7/32	7/32	.5528
3/4 16P			7/32	7/32	7/32	7/32	15/64	15/64	15/64	15/64	15/64	15/64	15/64	15/64	15/64	15/64	1/4	1/4	1/4	.6688
7/8 14P					17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	19/64	19/64	19/64	19/64	.7822
1 12P							9/32	9/32	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	5/16	5/16	.8918
1-1/8 12P									9/32	9/32	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	1.0168
1-1/4 12P											9/32	9/32	19/64	19/64	19/64	19/64	19/64	19/64	19/64	1.1418

Identical Short Throat

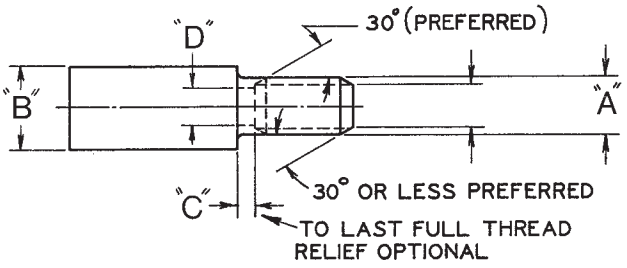
Diameter of Shoulder "B"

THD. Size A	5/8	11/16	3/4	13/16	7/8	15/16	1	1-1/16	1-1/8	1-3/16	1-1/4	1-5/16	1-3/8	1-7/16	1-1/2	1-9/16	1-5/8	1-11/16	1-3/4	"D"
	Width of Neck "C"																			
N.C. 5/8 11P	3/16	3/16	3/16	3/16	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	13/64	7/32	7/32	7/32	7/32	.5528
3/4 10P			13/64	13/64	13/64	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	15/64	15/64	15/64	15/64	.6201
7/8 9P					17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	.7307
1 8P							17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	19/64	.8376
1-1/8 7P									9/32	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	5/16	.9394
1-1/4 7P											9/32	19/64	19/64	19/64	19/64	19/64	19/64	19/64	19/64	1.0644
N.F. 5/8 18P	9/64	9/64	9/64	9/64	9/64	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32	11/64	11/64	11/64	11/64	.5528
3/4 16P			5/32	5/32	5/32	5/32	11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	11/64	3/16	3/16	3/16	.6688
7/8 14P					13/64	13/64	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	15/64	15/64	15/64	15/64	.7822
1 12P							13/64	13/64	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	15/64	15/64	.8918
1-1/8 12P									13/64	13/64	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	7/32	1.0168
1-1/4 12P											13/64	13/64	7/32	7/32	7/32	7/32	7/32	7/32	7/32	1.1418

For No Throat Rolls, subtract one pitch length from equivalent "C" dimension listed for "Identical Short" roll.

Chart 3

Width of Relief Required For 16 TRB Head



16 TRB Head

Identical Long Throat

Diameter of Shoulder "B"

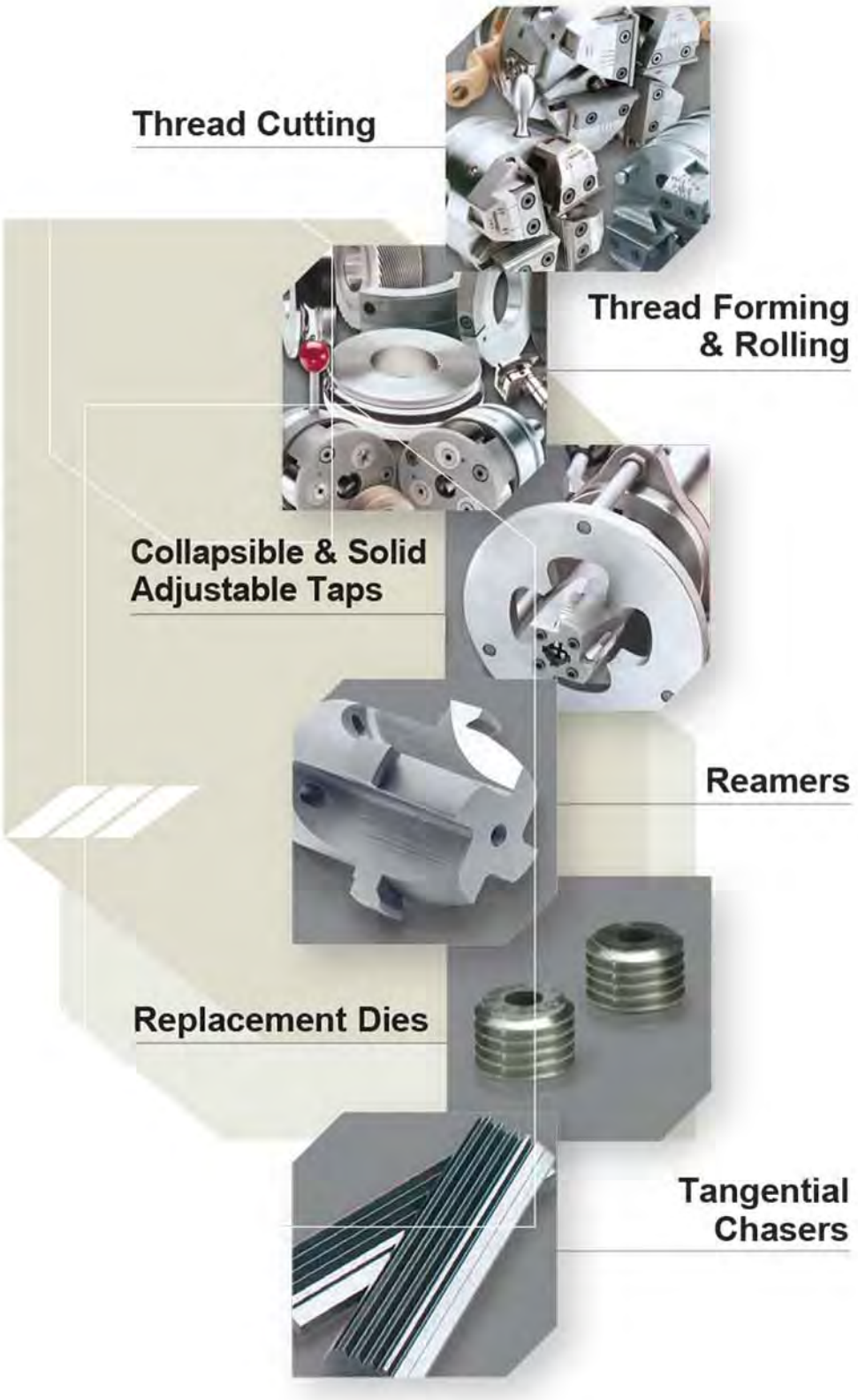
	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8	2	2-1/8	2-1/4	2-3/8	2-1/2	2-5/8	2-3/4	2-7/8	3	3-1/8	3-1/4	3-3/8	3-1/2	
THD. Size A	Width of Neck "C"																			"D"
U.N.C. 1-1/4 7P	15/32	15/32	15/32	31/64	31/64	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1/2	1/2	33/64	33/64	33/64	1-3/64
1-3/8 6P		39/64	5/8	5/8	5/8	5/8	5/8	5/8	41/64	41/64	41/64	41/64	41/64	41/64	21/32	21/32	21/32	21/32	21/32	1-9/64
1-1/2 6P			5/8	5/8	5/8	5/8	5/8	5/8	41/64	41/64	41/64	41/64	41/64	41/64	21/32	21/32	21/32	21/32	21/32	1-17/64
1-3/4 5P					47/64	47/64	47/64	47/64	47/64	3/4	3/4	3/4	3/4	3/4	3/4	3/4	49/64	49/64	49/64	1-15/32
2 4.5P							13/16	13/16	13/16	13/16	13/16	13/16	53/64	53/64	53/64	53/64	53/64	53/64	53/64	1-45/64
U.N.F .1-1/4 12P	11/32	11/32	11/32	11/32	11/32	11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-1/8
1-3/8 12P		11/32	11/32	11/32	11/32	11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-15/64
1-1/2 12P			11/32	11/32	11/32	11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-23/64
12P Series 1-5/8				11/32	11/32	11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-1/2
1-3/4					11/32	11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-39/64
1-7/8						11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-47/64
2							11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	1-55/64
8P Series 1-1/4	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1/2	1/2	33/64	33/64	33/64	33/64	33/64	33/64	17/32	17/32	1-1/16
1-3/8		31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1/2	1/2	33/64	33/64	33/64	33/64	33/64	33/64	17/32	17/32	1-3/16
1-1/2			31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1-5/16
1-5/8				31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1-7/16
1-3/4					31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1-9/16
1-7/8						31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1-11/16
2							31/64	31/64	31/64	31/64	31/64	31/64	31/64	31/64	1/2	1/2	1/2	1/2	1/2	1-13/16

Identical Short Throat

Diameter of Shoulder "B"

	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8	2	2-1/8	2-1/4	2-3/8	2-1/2	2-5/8	2-3/4	2-7/8	3	3-1/8	3-1/4	3-3/8	3-1/2	
THD. Size A	Width of Neck "C"																			"D"
U.N.C. 1-1/4 7P	21/64	21/64	21/64	21/64	11/32	11/32	11/32	11/32	11/32	11/32	11/32	23/64	23/64	23/64	23/64	23/64	23/64	23/64	3/8	1-3/64
1-3/8 6P		29/64	29/64	29/64	29/64	29/64	15/32	15/32	15/32	15/32	15/32	15/32	15/32	31/64	31/64	31/64	31/64	31/64	31/64	1-9/64
1-1/2 6P			29/64	29/64	29/64	15/32	15/32	15/32	15/32	15/32	15/32	15/32	31/64	31/64	31/64	31/64	31/64	31/64	31/64	1-17/64
1-3/4 5P					17/32	17/32	17/32	17/32	35/64	35/64	35/64	35/64	35/64	35/64	9/16	9/16	9/16	9/16	9/16	1-15/32
2 4.5P							37/64	19/32	19/32	19/32	19/32	19/32	19/32	39/64	39/64	39/64	39/64	39/64	39/64	1-45/64
U.N.F.1-1/4 12P	1/4	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-1/8
1-3/8 12P		17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-15/64
1-1/2 12P			17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-23/64
12P Series 1-5/8				17/64	17/64	17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-1/2
1-3/4					17/64	17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-39/64
1-7/8						17/64	17/64	17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-47/64
2 17/64								17/64	17/64	17/64	17/64	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	1-55/64
8P Series 1-1/4	23/64	23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	3/8	3/8	25/64	25/64	25/64	25/64	25/64	25/64	13/32	13/32	1-1/16
1-3/8		23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	3/8	3/8	25/64	25/64	25/64	25/64	25/64	25/64	13/32	13/32	1-3/16
1-1/2			23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	1-5/16
1-5/8				23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	1-7/16
1-3/4					23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	1-9/16
1-7/8						23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	1-11/16
2							23/64	23/64	23/64	23/64	23/64	23/64	23/64	23/64	3/8	3/8	3/8	3/8	3/8	1-13/16

For No Throat Rolls, subtract one pitch length from equivalent "C" dimension listed for "Identical Short" roll.



Landis' comprehensive Threading Products are supported by a wealth of technical knowledge and development across all products.

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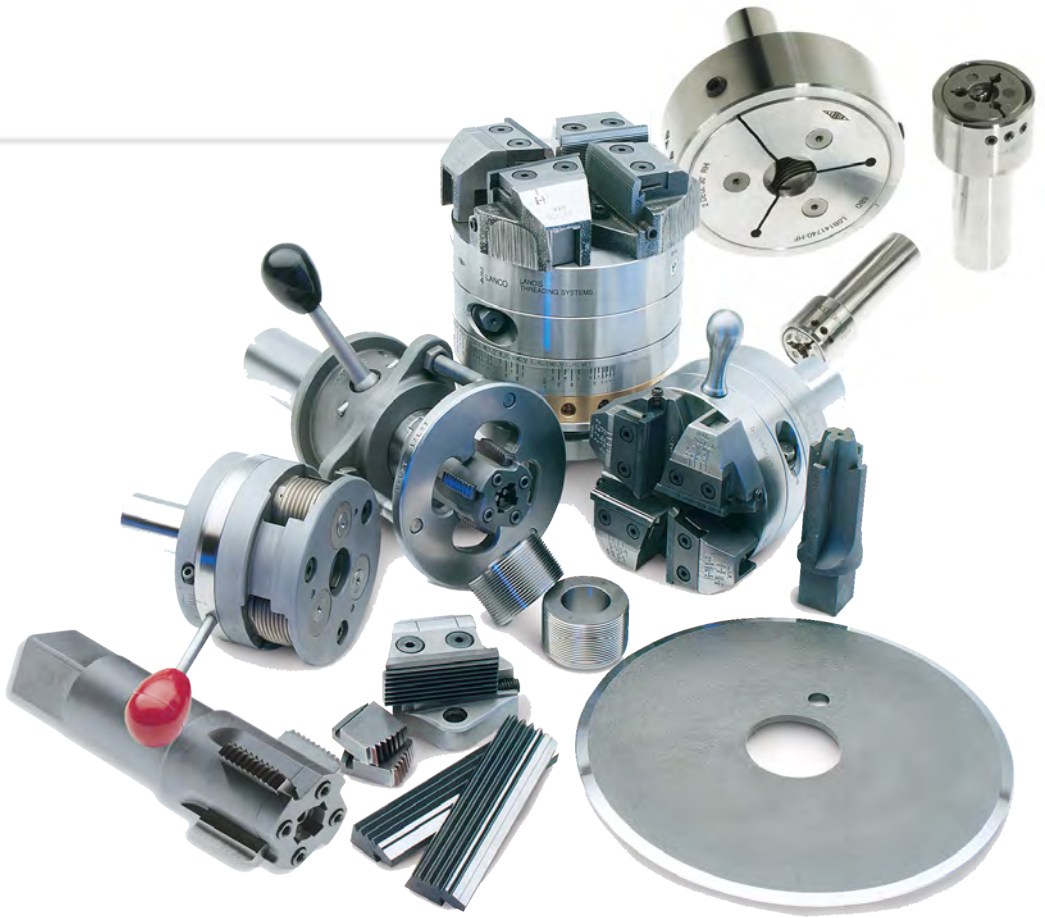

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