

# TERMINOLOGY

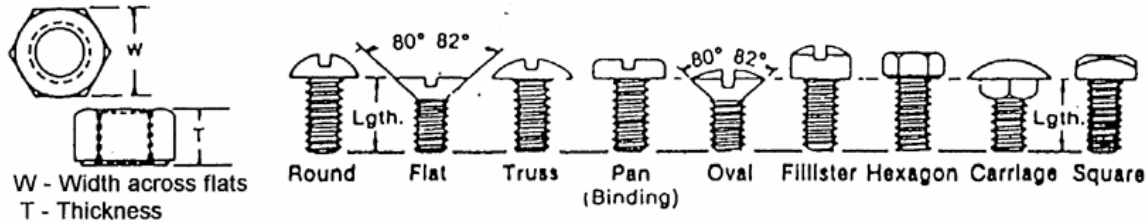
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<u>TERMINOLOGY</u>	<u>DEFINITION</u>
HFPO	Hold for PO#, Do not ship.
HFOK	Hold for ok, Do not ship.
HIFPO	Ship order, Hold invoice for PO #.
SHIP/HFPO/ADD	Ship order, hold for PO# (Additions must be stock items only).
INV ON "DATE"	Ship order, invoice on date specified. (If order has specials, we may not be able to invoice that day but will invoice ASAP after date specified).
QUOTE/DELETE	Fax price quote to customer then delete quote. It will never be an order.
DS	Dropship from vendor direct to customer
SBD	Supplied by distributor. You already delivered. (Show delivery date and source).
TO BE SBD	You will bring to us to ship (show source).
DIST WILL SHIP	Don't bring to us, but will deliver with the rest of order. We will fill in as shipped on the pick ticket (usually an OT and show source).
SBD FROM WHSE	Item is here at warehouse for us to ship out. (Give source or leave copy with the item).
AFAD	Add Freight After Discounted. Divide freight by # of pieces, then add to the selling price. Still charge freight at bottom of order as usual.
FPCT	Fax priced copy to:
OSSO	One single shipment only. Don't ship until every item either here or scratched.

# FASTENER FACTS

## MEASUREMENT OF FASTENERS

- The length of all screws and bolts is measured from the plane of the largest diameter of the bearing surface to the extreme point.



## MINIMUM THREAD LENGTHS

Cap Screws, Carriage, Machine, Elevator, Step and Countersunk Head Bolts

DIAMETER	LENGTHS THRU 6"	OVER 6" LENGTH
1/4	3/4	1
5/16	7/8	1-1/8
3/8	1	1-1/4
7/16	1-1/8	1-3/8
1/2	1-1/4	1-1/2
5/8	1-1/2	1-3/4
3/4	1-3/4	2
7/8	2	2-1/4
1	2-1/4	2-1/2

DIAMETER	LENGTHS THRU 6"	OVER 6" LENGTH
1-1/8	2-1/2	2-3/4
1-1/4	2-3/4	3
1-3/8	3	3-1/4
1-1/2	3-1/4	3-1/2
1-5/8	3-1/2	3-3/4
1-3/4	3-3/4	4
1-7/8	4	4-1/4
2	4-1/4	4-1/2

### FORMULA:

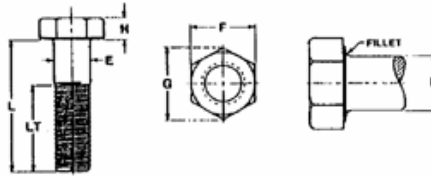
- For bolts up to and including 6" long - twice the diameter + 1/4" = thread length ( $2D + 1/4"$ ).
- For bolts over 6" long - twice the diameter + 1/2" = thread length ( $2D + 1/2"$ ).
- When bolts are too short for formula thread length, the thread will extend as close to neck as practicable. Shoulder dimensions will be furnished upon request.

## USS CAP SCREW DIMENSIONS

SCREW DIAMETER	HEAD DIAMETER	HEAD HEIGHT	USS THREAD PER INCH	SAE THREAD PER INCH
1/4	7/16	5/32	20	28
5/16	1/2	13/64	18	24
3/8	9/16	15/64	16	24
7/16	5/8	9/32	14	20
1/2	3/4	5/16	13	20
9/16	13/16	23/64	12	18
5/8	15/16	25/64	11	18
3/4	1-1/8	15/32	10	16
7/8	1-5/16	35/64	9	14
1	1-1/2	39/64	8	14



# HEX CAP SCREWS



Nominal or Basic Product	E		F			G		H			R	LT		
	Body Diameter		Width Across Flats			Width Across Corners		Head Height			Radius of Fillet	Thread For Screw Lengths 6 in.	Length For Screw Lengths >6 in.	
	Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Min	Basic	Basic	
1/4	0.250	0.250	0.245	7/16	0.438	0.428	0.505	0.48	5/32	0.16	0.150	0.015	0.750	1.000
	0	0	0					8		3				
5/16	0.312	0.312	0.306	1/2	0.500	0.489	0.577	0.55	13/64	0.21	0.195	0.015	0.875	1.125
	5	5	5					7		1				
3/8	0.375	0.375	0.369	9/16	0.562	0.551	0.650	0.62	15/64	0.24	0.226	0.015	1.000	1.250
	0	0	0					8		3				
7/16	0.437	0.437	0.430	5/8	0.625	0.612	0.722	0.69	9/32	0.29	0.272	0.015	1.125	1.375
	5	5	5					8		1				
1/2	0.500	0.500	0.493	3/4	0.750	0.736	0.866	0.84	5/16	0.32	0.302	0.015	1.250	1.500
	0	0	0					0		3				
9/16	0.562	0.562	0.554	13/16	0.812	0.798	0.938	0.91	23/64	0.37	0.348	0.020	1.375	1.625
	5	5	5					0		1				
5/8	0.625	0.625	0.617	15/16	0.938	0.922	1.083	1.05	25/64	0.40	0.378	0.020	1.500	1.750
	0	0	0					1		3				
3/4	0.750	0.750	0.741	1-1/8	1.125	1.100	1.299	1.25	15/32	0.48	0.455	0.020	1.750	2.000
	0	0	0					4		3				
7/8	0.875	0.875	0.866	1-5/16	1.312	1.285	1.516	1.46	35/64	0.56	0.531	0.040	2.000	2.250
	0	0	0					5		3				
1	1.000	1.000	0.990	1-1/2	1.500	1.469	1.732	1.67	39/64	0.62	0.591	0.060	2.250	2.500
	0	0	0					5		7				
1-	1.125	1.125	1.114	1-11/16	1.688	1.631	1.949	1.85	11/16	0.71	0.658	0.060	2.500	2.750
1/8	0	0	0					9		8				
1-	1.250	1.250	1.239	1-7/8	1.875	1.812	2.165	2.06	25/32	0.81	0.749	0.060	2.750	3.000
1/4	0	0	0					6		3				
1-	1.375	1.375	1.363	2-1/6	2.062	1.994	2.382	2.27	27/32	0.87	0.810	0.060	3.000	3.250
3/8	0	0	0					3		8				
1-	1.500	1.500	1.488	2-1/4	2.250	2.175	2.598	2.48	15/16	0.97	0.902	0.060	3.250	3.500
1/2	0	0	0					0		4				

## HEX HEAD CAP SCREWS

Grades 2, 5, & 8

Grade Designation	Products	Nominal Size Dia., In.	Full Size Bolts, Screws Studs, Sems		Machine Test Specimens of Bolts, Screws and Studs				Surface Hardness	Core Hardness		Grade Identification
			Proof Load (Stress) psi	Tensile Strength (Stress) Min., psi	Yield Strength (Stress) Min., psi	Tensile Strength (Stress) Min., psi	Elongation Min., %	Reduction of Area Min. %	Rockwell 30N Max.	Rockwell		Marking L
										Min	Max	
2	Bolts, Screws, Studs	1/4 thru 3/4 over 3/4 to 1-1/2	55,000	74,000	57,000	74,000	18	35		B80	B100	None
			33,000	60,000	36,000	60,000	18	35		B70	B100	
5	Bolts, Screws, Studs	1/4 thru 1 over 1 to 1-1/2	85,000	120,000	92,000	120,000	14	35	54	C25	C34	
			74,000	105,000	81,000	105,000	14	35	50	C19	C30	
8	Bolts, Screws, Studs	1/4 thru 1-1/2	120,000	150,000	130,000	150,000	12	35	58.6	C33	C39	



# TORQUE CHART

## HI-STRENGTH FASTENER

- Torque bolts to foot/pounds (ft./lbs.) value shown

### GRADE 8

SAE 1541 Steel  
Tensile Strength: 150,000 PSI



### SAE GRADE 5

SAE 1038 Steel  
Tensile Strength: 120,000 PSI



Bolt Dia.	Coarse Thread		Fine Thread	
	Dry *	Lubricated **	Dry *	Lubricated **
1/4	11	7	13	8
5/16	23	14	25	15
3/8	40	24	45	27
7/16	64	38	72	43
1/2	98	59	110	66
9/16	140	84	160	96
5/8	195	120	220	135
3/4	330	200	365	220
7/8	530	320	580	350
1	795	480	870	530
1-1/8	1120	670	1250	750
1-1/4	1550	930	1750	1050
1-3/8	2050	1230	2350	1410
1-1/2	2750	1650	3100	1850

Bolt Dia.	Coarse Thread		Fine Thread	
	Dry *	Lubricated **	Dry *	Lubricated **
1/4	9	5	10	6
5/16	17	10	20	12
3/8	31	19	35	21
7/16	50	30	55	33
1/2	75	45	85	51
9/16	110	66	120	72
5/8	150	90	170	100
3/4	265	160	300	180
7/8	400	240	435	260
1	600	360	650	390
1-1/8	800	480	900	540
1-1/4	1120	670	1240	745
1-3/8	1470	880	1670	1000
1-1/2	1950	1170	2200	1320

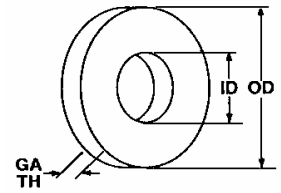
\* **Dry Threads:** Use this number when no lubrication (oil, grease, etc.) is present.

\*\* **Lubricated:** Use this value where anti-seize compound or lock nuts are used.

# FLAT WASHERS

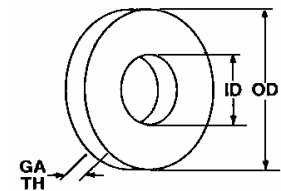
## USS WASHERS

BOLT SIZE, IN.	OUTSIDE DIAM., IN.	INSIDE DIAM., IN.	AMERICAN STANDARD GAUGE	APPROX. LBS. PER M PCS.	APPROX. NO./PCS. PER LB.
3/16	9/16	1/4	18 (3/64)	2.8	361
1/4	3/4	5/16	16 (1/16)	6.7	149
5/16	7/8	3/8	14 (5/64)	11.5	87
3/8	1	7/16	14 (5/64)	14.9	67
7/16	1-1/4	1/2	14 (5/64)	24.4	41
1/2	1-3/8	9/16	12 (7/64)	38.5	26
9/16	1-1/2	5/8	12 (7/64)	45.5	22
5/8	1-3/4	11/16	10 (9/64)	77	13
3/4	2	13/16	9 (5/32)	110	9.1
7/8	2-1/4	15/16	8 (11/64)	153	6.5
1	2-1/2	1-1/16	8 (11/64)	188	5.3
1-1/8	2-3/4	1-1/4	8 (11/64)	220	4.5
1-1/4	3	1-3/8	8 (11/64)	260	3.8
1-3/8	3-1/4	1-1/2	7 (3/16)	333	3
1-1/2	3-1/2	1-5/8	7 (3/16)	385	2.6
1-5/8	3-3/4	1-3/4	7 (3/16)	448	2.3
1-3/4	4	1-7/8	7 (3/16)	500	2
1-7/8	4-1/4	2	7 (3/16)	569	1.8
2	4-1/2	2-1/8	7 (3/16)	630	1.6
2-1/4	4-3/4	2-3/8	5 (7/32)	826	1.2
2-1/2	5	2-5/8	4 (15/64)	961	1
2-3/4	5-1/4	2-7/8	3 (1/4)	1100	.9
3	5-1/2	3-1/8	2 (5/32)	1300	.8



## SAE WASHERS

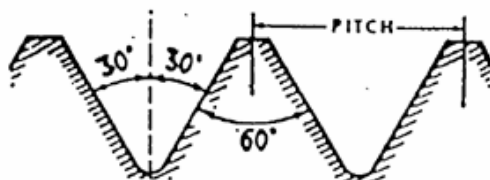
BOLT SIZE, IN.	OUTSIDE DIAM. IN.	INSIDE DIAM., IN.	AMERICAN STANDARD GAUGE	APPROX. LBS. PER M PCS.	APPROX. NO./PCS. PER LB.
4	5/16	1/8	21 (1/32)	.58	1650
6	3/8	5/32	18 (3/64)	1.26	790
8	7/16	3/16	18 (3/64)	1.7	585
3/16	1/2	7/32	18 (3/64)	2.3	435
12	9/16	1/4	16 (1/16)	3.4	280
1/4	5/8	9/32	16 (1/16)	4.5	222
5/16	11/16	11/32	16 (1/16)	5.2	192
3/8	13/16	13/32	16 (1/16)	7.2	140
7/16	59/64	15/32	16 (1/16)	9.5	105
1/2	1-1/16	17/32	13 (3/32)	18.3	55
9/16	1-3/16	19/32	13 (3/32)	23.4	43
5/8	1-5/16	21/32	13 (3/32)	27.7	36
3/4	1-1/2	13/16	10 (9/64)	47.4	21
7/8	1-3/4	15/16	10 (9/64)	63	16
1	2	1-1/16	10 (9/64)	83	12
1-1/8	2-1/4	1-3/16	10 (9/64)	109	9.2
1-1/4	2-1/2	1-5/16	9 (5/32)	160	6.25
1-3/8	2-3/4	1-7/16	9 (5/32)	190	5.25
1-1/2	3	1-9/16	9 (5/32)	240	4.25



# METRIC

## METRIC WRENCH SYSTEM

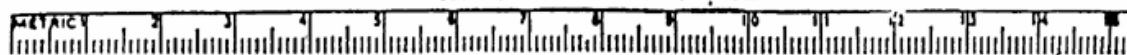
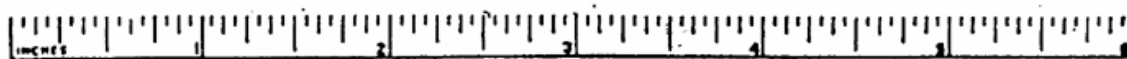
**BASIC METRIC FORM:**



ISO COARSE THREAD			
DIAMETER MAX. MM	PITCH MM	APPROX. THREADS PER INCH AMERICAN	RECOMMENDED DRILLS MM
M4	0.70	36	3.30
M5	0.80	32	4.20
M6	1.00	25	5.00
M7	1.00	25	6.00
M8	1.25	20	6.75
M10	1.50	17	8.50
M12	1.75	14-1/2	10.25
M14	2.00	12-1/2	12.00
M16	2.00	12-1/2	14.00
M20	2.50	10-1/2	17.50

DIAMETER MAX. MM	PITCH MM	APPROX. THREADS PER INCH AMERICAN	RECOMMENDED DRILLS MM
M8	1.00	25	7.00
M10	1.25	20	8.75
M10	1.00	25	9.00
M12	1.50	17	10.50
M12	1.25	20	10.75
M14	1.50	17	12.50
M16	1.25	20	15.00
M20	1.50	17	18.50

WRENCH SIZE	METRIC DIAMETER
7MM	4MM
8MM	5MM
10MM	6MM
11MM	7MM
13MM	8MM
17MM	10MM
19MM	12MM
22MM	14MM
24MM	16MM
30MM	20MM



# METRIC THREAD PITCH CHART

## METRIC BOLTS AND NUTS

SIZE	STANDARD THREAD		FINE THREAD		EX. FINE THREAD	
	PITCH	THREADS PER INCH	PITCH	THREADS PER INCH	PITCH	THREADS PER INCH
2 mm	0.40	63				
3 mm	0.50	51				
4 mm	0.70	36				
5 mm	0.80	32				
6 mm	1.00	25				
7 mm	1.00	25				
8 mm	1.25	20	1.00	25		
10 mm	1.50	17	1.25	20	1.00	25
12 mm	1.75	14.5	1.50	17	1.25	20
14 mm	2.00	12.5	1.50	17	1.25	20
16 mm	2.00	12.5	1.50	17	1.25	20
18 mm	2.50	10	1.50	17		
20 mm	2.50	10	2.00	12.5	1.50	17
22 mm	2.50	10	2.00	12.5		
24 mm	3.00	8.5	2.00	12.5		
27 mm	3.00	8.5				
30 mm	3.50	7				
33 mm	3.50	7				
36 mm	4.00	6				





# METRIC

## METRIC COARSE THREAD FASTENERS (Recommended Tightening Torques)

- The \*torque values are expressed in foot-pounds so that special metric torque wrenches will **not** be required for tightening.

### ISO METRIC STRENGTH GRADE 8.8

DIAMETER	TORQUE - FOOT POUNDS	CLAMP LOAD - POUNDS
6mm (M6)	9	2100
8mm (M8)	22	3900
10mm (M10)	43	6200
12mm (M12)	77	9000
14mm (M14)	120	12300
16mm (M16)	187	16700
20mm (M20)	358	25000

- \* Torque values based on dry, zinc-plated capscrews. These values will vary down-ward 20% to 30% if lubricated capscrews are used.

# PIPE FITTINGS

## STANDARD MALLEABLE PIPE FITTINGS CLASS 150

Pressure – Temperature Ratings

PSIG = pounds per square inch gauge

TEMP F = Farenheit

TEMP F	PSIG (max)
-20 to 150	300
200	265
250	225
300	185
350	150
366	150

## EXTRA HEAVY MALLEABLE PIPE FITTINGS CLASS 300 A.A.R.

Pressure – Temperature Ratings

Temp F	Maximum PSIG		
	1/4" - 1"	1-1/4" - 2"	2-1/2" - 3"
-20 to 150	2000	1500	1000
200	1785	1350	910
250	1575	1200	825
300	1360	1050	735
350	1150	900	650
400	935	750	560
450	725	600	475
500	510	450	385
550	300	300	300

## PIPE UNIONS

Pressure – Temperature Ratings









Temp F	Maximum PSIG		
	Class 150	Class 250	Class 300
-20 to 150	300	500	600
200	265	455	550
250	225	405	505
300	185	460	460
350	150	315	415
400	110	270	370
450	75	225	325
500	-	180	280
550	-	130	230



# ALLEN HEX KEYS

## DIMENSION STANDARDS









- Allen Hex Key Fit Selector - Keys Fit These Products:

							
NOMINAL KEY SIZE, INCHES	SOCKET HEAD CAP SCREWS	FLAT HEAD CAP SCREWS	BUTTON HEAD CAP SCREWS	SET SCREWS	SHOULDER SCREWS	PRESSURE PLUGS	LOW HEAD CAP SCREWS
	1960 SERIES						
.028				0			
.035		0	0	1, 2			
.050	0	1, 2	1, 2	3, 4			4
1/16	1	3, 4	3, 4	5, 6			5, 6
5/64	2, 3	5, 6	5, 6	8			8
3/32	4, 5	8	8	10			10
7/64	6						
1/8		10	10	1/4	1/4		1/4
9/64	8						
5/32	10	1/4	1/4	5/16	5/16	1/16	5/16
3/16	1/4	5/16	5/16	3/8	3/8	1/8	3/8
7/32		3/8	3/8	7/16			7/16
1/4	5/16	7/16		1/2	1/2	1/4	1/2
5/16	3/8	1/2		5/8	5/8	3/8	5/8
3/8	7/16, 1/2	5/8		3/4	3/4	1/2	
7/16							
1/2	5/8	3/4		7/8	1		
9/16		7/8		1, 1-1/8		3/4	
5/8	3/4	1		1-1/4, 1-3/8	1-1/4	1	
3/4	7/8, 1	1-1/8		1-1/2		1-1/4	
7/8	1-1/8, 1-1/4	1-1/4, 1-3/8			1-1/2		
1	1-3/8, 1-1/2	1-1/2		1-3/4, 2	1-3/4	1-1/2, 2	
1-1/4	1-3/4				2		
1-1/2	2						
1-3/4	2-1/4, 2-1/2						
2	2-3/4						

# ALLEN METRIC HEX KEYS

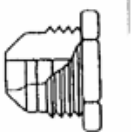
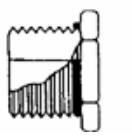


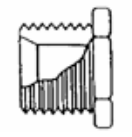
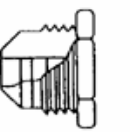
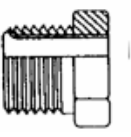

## DIMENSION STANDARDS

- Allen Metric Hex Key Fit Selector - Keys Fit These Products:

							
NOMINAL KEY SIZE, MM	SOCKET HEAD CAP SCREWS	FLAT HEAD CAP SCREWS	BUTTON HEAD CAP SCREWS	SET SCREWS	SHOULDER SCREWS	ALLENUTS	LOW HEAD CAP SCREWS
0.7				M1.4, M1.6, M1.7			
0.9				M2, M2.3			
1.3	M1.4			M2.5, M2.6			
1.5	M1.6, M1.7, M2			M3			
2	M2.3, M2.5, M2.6	M3	M3	M4			
2.5	M3	M4	M4	M5			
3	M4	M5	M5	M6	6mm	M3	M4
4	M5	M6	M6	M8	8mm	M4	M5
5	M6	M8	M8	M10	10mm	M5	M6
6	M8	M10	M10	M12, M14	12mm	M6	M8
8	M10	M12	M12	M16	16mm	M8	M10
10	M12	M14, M16		M20	20mm	M10	M12
12	M14	M20		M24		M12	M14
14	M16						M16
17	M20					M16	M20, M22
19	M24						M24

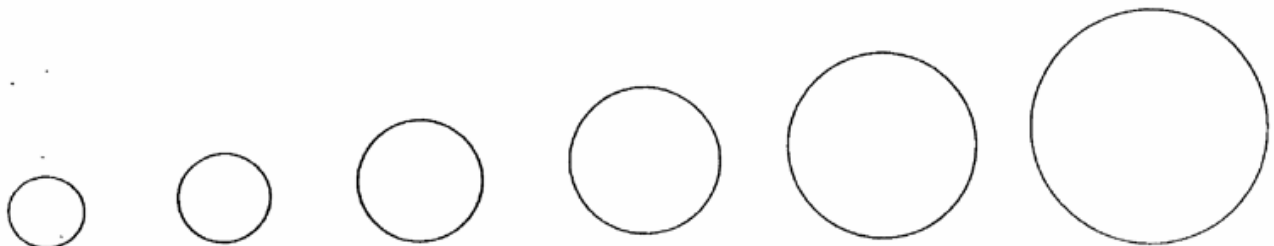
# THREAD DATA

## THREAD GUIDE

								
DASH SIZE	SAE (JIC) 37° FLARE THREAD SIZE	"O" RING STYLE STRAIGHT THREAD SIZE	SAE FLARELESS THREAD SIZE	PIPE SWIVEL NPSM SIZE	NPTF PIPE THREAD SIZE	PTT 30° FLARE THREAD SIZE	SAE INVERTED FLARE THREAD SIZE	SEAL-LOK THREAD SIZE
2	5/16-24	5/16-24	5/16-24	1/8-27	1/8-27			
3	3/8-24	3/8-24	3/8-24				3/8-24	
4	7/16-20	7/16-20	7/16-20	1/4-18	1/4-18		7/16-24	9/16-18
5	1/2-20	1/2-20	1/2-20				1/2-20	
6	9/16-18	9/16-18	9/16-18	3/8-18	3/8-18		5/8-18	11/16-16
8	3/4-16	3/4-16	3/4-16	1/2-14	1/2-14		3/4-18	13/16-16
10	7/8-14	7/8-14	7/8-14				7/8-18	1-14
12	1 1/16-12	1 1/16-12	1 1/16-12	3/4-14	3/4-14			1 3/16-12
14	1 3/16-12	1 3/16-12	1 3/16-12					
16	1 5/16-12	1 5/16-12	1 5/16-12		1-11 1/2	1 5/16-14		1 7/16-12
20	1 5/8-12	1 5/8-12	1 5/8-12	1 1/4-11 1/2	1 1/4-11 1/2	1 5/8-14		1 11/16-12
24	1 7/8-12	1 7/8-12	1 7/8-12	1 1/2-11 1/2	1 1/2-11 1/2	1 7/8-14		2-12
32	2 1/2-12	2 1/2-12	2 1/2-12	2-11 1/2	2-11 1/2	2 1/2-12		

## TAPER PIPE THREADS

- Actual outside diameters at small end:



1/8" P.T.

1/4" P.T.

3/8" P.T.

1/2" P.T.

3/4" P.T.

1" P.T.