

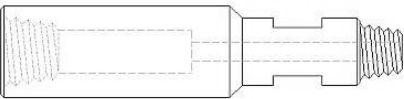
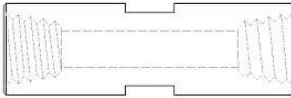
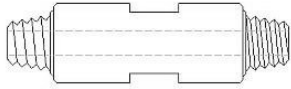


## Rotary Sub Adapters - Section 11

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Please call for custom options and other accessories.

## Overview



Mills Machine Rotary Substitute Adapters (Subs) are made from 4142 heat-treated alloy steel. They are made to any length, outside diameter (O.D.), inside diameter (I.D.), and thread combination. We stock the most common subs and carry a large inventory of steel to custom manufacture any sub you need.

Subs can be made with a breakout configuration for any rig. Unless otherwise specified our standard flat is 2" long and 3/8" deep per side. We can manufacture single flats, double depth flats, extra long flats, beveled flats, and custom flats. Breakout lugs are also available. Flats or lugs normally add to the length of the sub.

The outside and inside diameter of the sub should match up to the drill rod that you are using. Always be aware of the largest O.D. and the smallest I.D. in your drill string.

When going from a larger connection to a smaller connection, a bottleneck may be furnished to reduce the weight of the sub and make it easier to breakout. The bottleneck is normally cut on a 45° angle and may add length to the sub.

Any box thread can be bored out to accept a float (check) valve. The valve will add length to the sub depending on the length of the valve. The valves are sized to the box thread and can be seen in the last section of this catalog (Misc. Drilling Accessories). Bored-out subs can be furnished with a float valve installed.

Mills Machine stocks thread gages for over **600 different tool joint** connections for use in the water well, construction, mining, utility, horizontal, and environmental drilling industries. The threads are manufactured to meet the specifications of the American Petroleum Industry or the Diamond Core Drilling Manufacturers Association.

Please call for custom options and other accessories.

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## Undefined Tool Joint Measurements

Often we come across undefined tool joints. The thread identification is normally stamped on the tool joint. If that stamp is worn or is not present you need specific information to determine the tool joint identification. The way to define the pin tool joint (The box tool joint is hard to measure and measurement has often lead to errors) is to measure:

- A.** The diameter of the base of the pin where it meets the sub body (shoulder).
- B.** The thread length. Measured from shoulder to the end of the tool joint.
- C.** The number of threads per inch - put the 0 mark of a ruler on the center of the first thread, don't count that thread, then count the threads to the one inch mark (see sketch).
- D.** The thread form (taper, square, acme, special, etc.)
- E.** The material O.D. - this may differ within threads, but is a cross check.

Your free thread ruler is at the beginning of this catalog. It will assist you in determining the thread. If you need additional copies, please contact your sales representative.

If there are problems measuring the part, send it to our engineers who can match the tool joint with one of over 600 thread gages we have in stock or in the API reference books.

## Sub Measurements

Subs have two length measurements. The first is the **Over-All-Length (OAL)**, this is the length from the tip to tip of the sub - the longest dimension of the sub. The second is the **Shoulder-to-Shoulder (S to S)** or **Working Length (WL)**, the working dimension of the sub in the drill string. It is measured from the shoulder face of the pin to the shoulder face of a pin on pin to pin subs (1.). On a pin to box sub it is measured from the shoulder face of the pin end to the end of the box end (2). On a box to box sub the OAL and S to S are the same (3).

## Flat Measurements

Flats depths on subs may be measured in two different ways. The first, and most common, is by the depth of the flat from the diameter of the sub (1), how much material is removed. The second method of measurement is to measure the distance between the flat surface to flat surface (2), or the opening of the pipe-handling tool. If the flat has a taper, please give us the length at the top and again at the bottom of the flat.

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## Tool Joint Thread Chart

## Popular Sizes

The thread dimensions shown in the following chart are those that may be used to determine a thread type in the field. For specific details of the threads, please contact Mills Machine Co., Inc. or refer to the DCDMA Standards book.

## API REGULAR (Reg.)

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
2 3/8" Reg.	3 1/8"		3"	1"	2.625"	3 1/4"	1 3/4"	3"	5	TAPER
2 7/8" Reg.	3 3/4"		3 1/2"	1 1/4"	2.990"	3 3/4"	2"	3"	5	TAPER
3 1/2" Reg.	4 1/4"	4 1/2"	3 3/4"	1 1/2"	3.490"	4"	2 7/16"	3"	5	TAPER
4 1/2" Reg.	5 1/2"		4 1/4"	2 1/4"	4.600"	4 1/2"	3 1/4"	3"	5	TAPER
5 1/2" Reg.	6 3/4"		4 3/4"	2 3/4"	5.515"	5"	3 3/8"	3"	4	TAPER
6 5/8" Reg.	7 3/4"	8"	5"	3 1/2"	5.975"	5 1/4"	4 3/4"	2"	4	TAPER
7 5/8" Reg.	8 7/8"	9"	5 1/4"	3 1/2"	6.975"	5 1/2"	5 1/4"	3"	4	TAPER
8 5/8" Reg.	10"		5 3/8"	4"	7.951"	6 1/4"	6 5/8"	3"	4	TAPER

## API INTERNAL FLUSH (IF)

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
2" IF	2 3/8"		2 1/4"	1 1/8"	1.975"	2 3/4"	1 1/2"	2"	4	TAPER
2 3/8" IF	3 1/2"		3"	1 5/8"	2.860"	3 1/4"	2 1/8"	2"	4	TAPER
2 5/8" IF LH	3 3/4"		3 1/4"	1 3/4"	3.128"	3 5/8"	2 1/4"	2"	4	TAPER
2 7/8" IF	4 1/8"	4 1/2"	3 1/2"	2 1/8"	3.385"	3 3/4"	2 1/2"	2"	4	TAPER
3 1/2" IF	4 3/4"		4"	2 11/16"	4.000"	4 1/4"	3 1/4"	2"	4	TAPER
4" IF (4 1/2" XH)	6"		4 1/2"	3 1/4"	4.828"	4 3/4"	3 1/2"	2"	4	TAPER
4 1/2" IF (5" XH)	6 1/8"		4 1/2"	3 3/4"	5.250"	4 3/4"	4"	2"	4	TAPER
5 1/2" IF	7 3/8"		5"	4 13/16"	6.390"	5 1/2"	5 1/16"	2"	4	TAPER
6 5/8" IF	9"		5"	3 3/4"	7.459"	5 5/8"	6 1/4"	2"	4	TAPER

## API FULL HOLE (FH)

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
2 7/8" FH	4 1/4"	4 1/2"	3 1/2"	2 1/8"		3 7/8"	2 1/8"	3"	5	TAPER
3 1/2" FH	4 5/8"		3 3/4"	2 7/16"	3.990"	4"	2 7/8"	3"	5	TAPER
4" FH	5 1/4"		4 1/2"	2 13/16"	4.270"	4 3/4"	3 1/4"	2"	4	TAPER
4 1/2" FH	5 3/4"		4"	3"	4.782"	4 1/4"	3 1/4"	3"	5	TAPER
5 1/2" FH	7"		5"	4"	5.828"	5 1/2"	4 1/4"	2"	4	TAPER
6 5/8" FH	8"		5"	5"	6.740"	5 1/2"	5 1/2"	2"	4	TAPER

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**MAYHEW**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
JUNIOR (MJ)	2 3/4"		2 1/4"	1 1/4"	2.320"	2 1/2"	1 11/16"	2"	4	TAPER
REGULAR (MR)	3 1/4"		3"	1 1/2"	2.555"	3 1/4"	2"	1 1/2"	4	TAPER
FULLHOLE (MFH)	3 3/4"		3 3/8"	2"	3.045"	3 5/8"	2 3/8"	1 1/2"	4	TAPER

**FAILING EXPLORATION**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
2 3/8" FEDP	3 1/8"		2 3/4"	1 3/8"	2.480"	3"	1 3/4"	2"	4	TAPER
2 7/8" FEDP	3 3/4"		3 1/4"	1 7/8"	3.100"	3 1/2"	2 1/4"	2"	4	TAPER

**SQUARE THREAD & DCDMA THREADS**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
3 THREAD N ROD	2 3/8"		2 3/4"	1"	1.860"	3"	1 5/8"		3	SQUARE
4 THREAD N ROD	2 3/8"		2 3/4"	1"	1.865"	3"	1 5/8"		4	SQUARE
A ROD	1 5/8"		1 7/8"	9/16"	1.260"	2 1/8"	1 1/16"		3	SQUARE
AW ROD	1 3/4"		1 7/8"	5/8"	1.365"	2 1/8"	1 1/4"		3	SQUARE
AWJ (AWML)	1 3/4"		1 3/4"	5/8"	1.425"	1 7/8"	1"	2"	5	TAPER
E ROD	1.305"		1 3/4"	7/16"	0.996"	2"	7/8"		3	SQUARE
B W	2 3/8"		2 1/4"	3/4"	1.680"	2 5/8"	1 3/8"		3	SQUARE
BQ	2 3/16"		4 3/4"	1 13/16"		2"	1 13/16"	1/2"	3	TAPER
HW	3 1/2"		3 1/4"	2 1/4"		3 1/2"	2 13/16"		3	SQUARE
EW	1 3/8"		1 9/16"	7/16"	1.050"	1 3/4"	7/8"		3	SQUARE
NW	2 5/8"		2 3/4"	1 3/8"	2.210"	3"	2"		3	SQUARE
NWJ (NWML)	2 5/8"		2 3/8"	1 1/4"	2.240"	2 3/4"	1 1/2"	2"	4	TAPER

**Other Sizes****API X-HOLE (XH)**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
3 1/2" XH	4 7/8"		3 1/2"	2 7/16"	3.800"	3 7/8"	2 7/8"	2"	4	TAPER
4 1/2" XH	6"		4 1/2"	3 1/4"	4.828"	4 3/4"	3 1/2"	2"	4	TAPER
5" XH	6 1/8"		4 1/2"	3 3/4"	5.250"	4 3/4"	4"	2"	4	TAPER

**HACKER**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
JUNIOR	3 1/8"		2 1/4"	1 7/8"	2.685"	2 3/4"	2 1/8"	1 3/4"	5	TAPER
SENIOR	3 1/2"		2 1/2"	1 3/4"	2.895"	2 3/4"	2 1/4"	1 1/2"	4	TAPER
4" HACKER	5 7/8"		3 5/8"	3 3/4"	5.215"	4"	4 3/8"	1 1/2"	4	TAPER
6 5/8" HACKER	7 1/2"		3 1/16"	6"	6.935"	3 1/2"	6 1/4"	1 1/2"	4	TAPER
8 5/8" HACKER	10 1/2"		4 1/2"	7 1/2"	9.460"	5"	8"	2"	4	TAPER

Please call for custom options and other accessories.

**BECO**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
3 1/2" BECO	4 3/4"		3 3/4"	1 1/2"	3.970"	4 1/4"	2 1/4"	3"	2	TAPER
4 1/2" BECO	5 3/4" or 6 1/2"		4 1/4"	2 1/4"	5.000"	5"	3 1/4"	3"	2	TAPER
5 1/4" BECO	7"		5 3/4"	2 13/16"	5.750"	5 1/2"	3 3/4"	3"	2	TAPER
6" BECO	7 5/8" or 8 3/4"		6 1/2"	3"	6.500"	5 1/2"+	4 1/2"	3"	2	TAPER
8" BECO	10 3/4" or 12 3/4"		4 7/8"	5"	8.500"	5 1/2"+	6 1/4"	3"	2	TAPER

**CA-21 (DEEP ROCK)**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
CA 21	2 1/4"		1 1/4"	1 1/8"	1.765"	1 1/2"	1 1/2"	1 1/2"	6	TAPER

**E U E**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
3/4" (1.050" API)	1.560"		1 1/8"	1.315"	0.825"	1 3/8"		3/4"	10	TAPER
1" (1.315" API)	1.900"		1 1/4"	1.469"	1.049"	1 1/2"		3/4"	10	TAPER
1 1/4" (1.660" API)	2.200"		1 3/8"	1.825"	1.380"	1 3/4"	1 1/2"	3/4"	10	TAPER
1 1/2" (1.900" API)	2.500"		1 7/16"	2.093"	1.610"	1 7/8"	1 3/4"	3/4"	10	TAPER
2" (2 3/8" API)	3.063"		1 15/16"	2.625"	1.995"	2 3/8"	2 1/4"	3/4"	8	TAPER
2 1/2" (2 7/8" API)	3.668"		2 1/8"	3.113"	2.441"	2 1/2"	2 1/2"	3/4"	8	TAPER
3" (3 1/2" API)	4.500"	2 3/8"		3.795"	2.992"	2 3/4"	3 5/16"	3/4"	8	TAPER
3 1/2" (4" API)	5.000"		2 1/2"	4.250"	3.476"	2 7/8"		3/4"	8	TAPER
4" (4 1/2" API)	5.563"		2 5/8"	4.790"	3.958"	3"		3/4"	8	TAPER

**HACKER FAILING**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
6 5/8" HF	8"		3 1/2"	6"	7.310"	4 1/2"	6 1/2"	1.5"	4	TAPER

**MOBILE**

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
2 5/8" MOBILE	2 5/8"		2 1/2"	1 1/4"	2.240"	2 7/8"	1 3/4"	2"	5	TAPER

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## NATIONAL PIPE THREAD

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
1" NPT	1 3/4"		1"	1"	1.325"	1 1/4"	1 1/8"	3/4"	11 1/2	TAPER
1" NPT LH	1 3/4"		1"	1"	1.325"	1 1/4"	1 1/8"	3/4"	11 1/2	TAPER
1 1/4" NPT	2"		1"	1 1/4"	1.660"	1 1/4"	1 3/8"	3/4"	11 1/2	TAPER
1 1/2" NPT	2 1/4"		1 1/8"	1 1/2"	1.950"	1 3/8"	1 5/8"	3/4"	11 1/2	TAPER
2" NPT	2 3/4"		1 1/8"	2"	2.385"	1 5/8"	2 1/8"	3/4"	11 1/2	TAPER
2" NPT LH	2 3/4"		1 1/8"	2"	2.385"	1 5/8"	2 1/8"	3/4"	11 1/2	TAPER
2 1/2" NPT	3 1/4"		1 9/16"	2 1/2"	2.875"	1 3/4"	2 5/8"	3/4"	8	TAPER
3" NPT	4"		1 5/8"	3"	3.500"	1 7/8"	3 1/8"	3/4"	8	TAPER
3" NPT LH	4"		1 5/8"	3"	3.500"	1 7/8"	3 1/8"	3/4"	8	TAPER
3 1/2" NPT	4 5/8"		1 11/16"	3 1/2"	4.000"	2 1/16"	3 5/8"	3/4"	8	TAPER
3 1/2" NPT LH	4 5/8"		1 11/16"	3 1/2"	4.000"	2 1/16"	3 5/8"	3/4"	8	TAPER
4" NPT	5 1/4"		1 3/4"	4"	4.510"	2 1/4"	4 1/8"	3/4"	8	TAPER
4" NPT LH	5 1/4"		1 3/4"	4"	4.510"	2 1/4"	4 1/8"	3/4"	8	TAPER
4 1/4" NPT				4 1/4"	4.250"			3/4"	8	TAPER
5" NPT	6 5/16"		2"	5"	5.563"	2 1/2"	5 1/4"	3/4"	8	TAPER
6" NPT	7 3/8"		2"	6"	6.625"	2 1/2"	6 1/4"	3/4"	8	TAPER

## P K RED DEVIL

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
P K Red Devil	2 7/8"		3 7/8"	1 3/8"	2.300"	4 1/4"	1 7/8"	3/4"	8	TAPER

## ROCKMASTER

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
ROCKMASTER	2 3/4"		3"	1 1/8"	2.030"	3 1/4"	1 3/4"		3	ACME

## WINTER WEISS

Tool Joint Name & Nominal Size	Material		Pin Dimensions			Box Dimensions		Thread		
	O.D.	Make to Dia.	Pin Length	Pin ID	Pin Dia. @ Base	Box Length	Box Max ID	Taper	Thread / Inch	Thread Form
2 3/8" WW Mod.	3 1/4"		3"	1 1/2"	2.535"	3 1/4"	2"	1.5"	4	TAPER
2 7/8" WW Mod.	3 7/16"		3"	1 1/2"	2.535"	3 1/4"	2"	1.5"	4	TAPER

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## Stock Subs

The Subs listed below are what we consider to be stock standard sizes and the working length will accept standard break out flats.

All of our subs are manufactured from 4142 heat treated alloy steel on computerized lathes enabling us to offer better pricing and availability.

Many other sizes are available in a multitude of configurations from the over 600 thread gages we have in stock. For quantities of ten or more please call us for special pricing.

Description	Part #	O.D. X I.D.	Working Length	Weight	
				Lbs.	Kg.

### Pin to Pin

2 3/8" IF Pin to 2 3/8" IF Pin	SPPM238IF238IF	3 1/2" x 1 1/2"	3"	-	
2 7/8" FEDP Pin to 2 7/8" FEDP Pin	SPPM278FEDP278FEDP	3 3/4" x 1 3/4"	3 1/2"	-	
2 7/8" IF Pin to 2 7/8" IF Pin	SPPM278IF278IF		2 1/4"	-	
2 7/8" IF Pin to MR Pin	SPPM278IFMR	4" x 1 1/2"	2 1/2"	-	
3 1/2" IF Pin to 2 3/8" IF Pin	SPPM312IF238IF		12"	-	
MJR Pin to MJR Pin	SPPMMJRMJR	2 1/2" x 1 1/4"	3 1/2"	-	
MR Pin to MR Pin	SPPMMRMR	3 1/4" x 1 1/2"	3 1/4"	-	

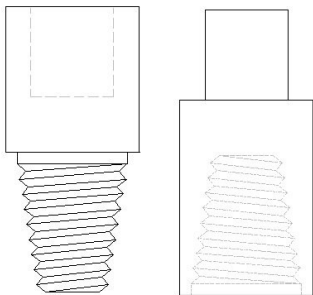
### Pin to Box

3 1/2" API Reg. Pin to 4 1/2" API Reg. Box	SPB312R412R	4 1/2" - 5 1/2" BN x 1 1/2"	9"	-	
4 1/2" API Reg. Pin to 6 5/8" API Reg. Box	SPBM412R658R	5 1/2" - 7 3/4" BN x 2 1/4"	10 3/4"	-	

### Box to Box

MJR Box to 2 3/8" API Reg. Box	SBBMJR238R	2 3/4" - 3 1/8" BN x 1 1/2"	10"	-	
MJR Box to 2 7/8" API Reg. Box	SBBMJR278R	2 3/4" - 3 3/4" BN x 1 1/2"	10"	-	
MJR Box to 3 1/2" API Reg. Box	SBBMJR312R	2 3/4" - 4 1/2" BN x 1 1/2"	10"	-	
MJR Box to 4 1/2" API Reg. Box	SBBMJR412R	2 3/4" - 5 1/2" BN x 1 1/2"	12"	-	
MR Box to 2 3/8" API Reg. Box	SBBMR238R	3 1/4" x 1 1/2"	10"	-	
MR Box to 2 7/8" API Reg. Box	SBBMR278R	3 1/4" - 3 3/4" BN x 2"	10"	-	
MR Box to 3 1/2" API Reg. Box	SBBMR312R	3 1/4" - 4 1/2" BN x 2"	10"	-	
MR Box to 4 1/2" API Reg. Box	SBBMR412R	3 1/4" - 5 1/2" BN x 2"	12"	-	
2 3/8" IF Box to 2 3/8" API Reg. Box	SBB238IF238R	3 1/2" x 1 1/2"	10"	-	
2 3/8" IF Box to 2 7/8" API Reg. Box	SBB238IF278R	3 1/2" - 3 3/4" BN x 2"	10"	-	
2 3/8" IF Box to 3 1/2" API Reg. Box	SBB238IF312R	3 1/2" - 4 1/2" BN x 2"	10"	-	
2 3/8" IF Box to 4 1/2" API Reg. Box	SBB238IF412R	3 1/2" - 5 1/2" BN x 2"	10"	-	
2 7/8" IF Box to 3 1/2" API Reg. Box	SBB278IF312R	4 1/2" x 2"	10"	-	
2 7/8" IF Box to 4 1/2" API Reg. Box	SBB278IF412R	4 1/2" - 5 1/2" BN x 2"	10"	-	

### Weld-on or Thread-on Tool Joint Subs



Weld-on or Thread-on Tool Joint Subs are designed with one end to shrink fit or screw onto the end of your drill tube and then be welded. The opposite end is the pin or box connection of your choice.

Pin or Box to Blank Subs are similar in use to the above subs. They have a blank face, either solid or with an I.D. on the end opposite the pin or box connection.

Please call for custom options and other accessories.

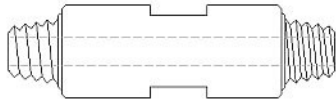
**11-8**

Toll-Free: 800-654-2703  
Local: 405-273-4900  
Fax: 405-273-4956

Mills Machine Co. Inc.  
P.O. Box 1514  
Shawnee, OK 74802

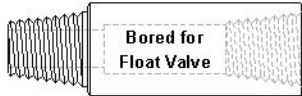
Visit our web site:  
[www.MillsMachine.com](http://www.MillsMachine.com)

### Kelly Saver Subs



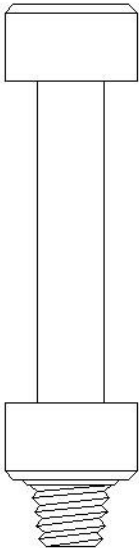
Kelly Saver Subs refer to a sub used between the Kelly or top head drive and the drill pipe. It is usually a pin to pin sub that takes the wear abuse to protect the drill pipe and the drive connection. Mills can furnish these subs along with the fluted, hex, or square Kelly Bar drive itself.

### Float Valve Subs



Float Valve Subs are bored to a larger I.D. to suit a Float Valve. They can be placed anywhere in the drill string to maintain the circulation in one direction.

### Elevator Lift Subs



Elevator Lift Subs are narrow-necked subs which provide a lifting area for use with standard pipe elevators. They are commonly used with internal flush (IF) pipe.

### Jet Subs



Jet Subs are designed with the water flow to jet out the sides of the sub to assist cleaning the perforated pipe or screen.

Please call for custom options and other accessories.

Visit our web site:  
[www.MillsMachine.com](http://www.MillsMachine.com)

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**11-9**

## Shock, Floating, Cushion, and Special I.D. Subs



Shock Subs are specialized subs designed to absorb the shock vibrations created by a down-hole hammer and to prevent damage to the drill string and the top head drive.

Floating or Cushion Subs absorb shock vibrations transmitted up through the drill string built to protect the pipe. Their construction is simpler with more vertical movement in the sub.

Special ID Subs are bored to a special I.D., either smaller or larger than the standard or for special cases with no I.D. bore.

Please call for custom options and other accessories.

**11-10**

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