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## SERIES 150 OVERSHOT

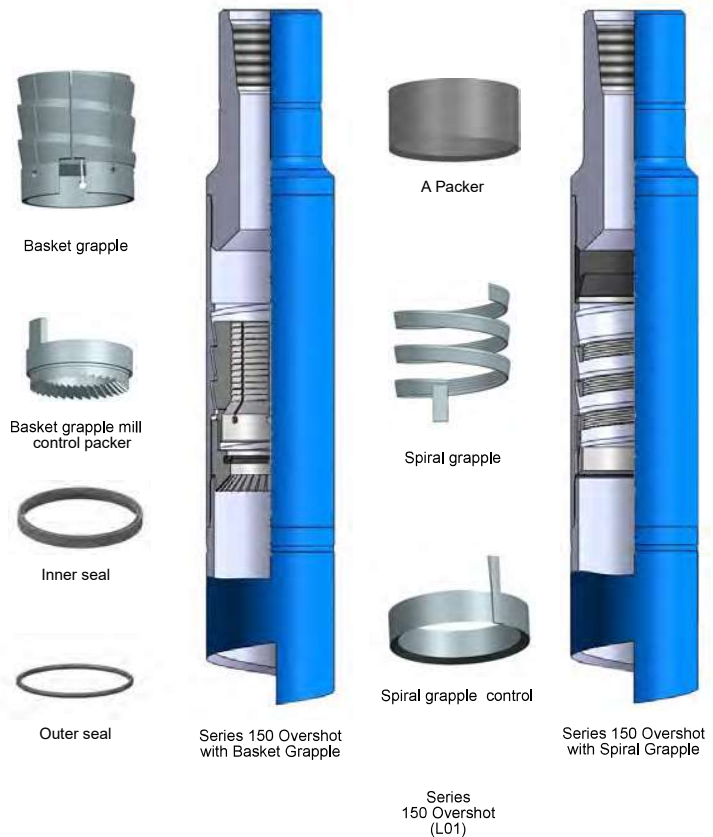
BOT Series 150 Releasing and Circulating Overshot is an external fishing tool for engage, pack off and retrieve tubular fish, especially for fishing drill collar and drill pipe. The grapple of the overshot can be designed for different sizes of fish, so one overshot can be dressed with different size of grapple components for fishing different sizes of fish.

### Construction

BOT Series 150 Overshot consists of three outside parts: Top Sub, Bowl, and Standard Guide. The Basic Overshot may be dressed with either of two sets of internal parts, if the fish diameter is near the maximum catch of the Overshot, a Spiral Grapple, Spiral Grapple Control, and Type "A" Packer are used. If the fish diameter is considerably below maximum catch size ( $\frac{1}{2}$ " or more) a Basket Grapple and a Mill Control Packer are used.

### When order please specify:

- The model of the overshot
- The hole, casing size or o.d. of overshot
- Top connection
- O.D of the fish



FS = Full Strength  
SH = Slim Hole

### Specifications - series 150 overshot

Model	Product Code	O.D (in)	Max.catch size(in)		API Connection	Model	Product Code	O.D (in)	Max.catch size(in)		API Connection
			Spiral grapple	Basket grapple					Spiral grapple	Basket grapple	
LT-T89	L01-1100	3.504	2.374	1.874	NC26	LT-T194	L01-2400	7.638	6.260	5.551	NC50
LT-T92	L01-1200	3.622	2.874	2.500	NC26	LT-T200	L01-2500	7.874	6.260	5.551	NC50
LT-T95	L01-5100	3.740	3.000	2.622	NC26	LT-T206	L01-2600	8.110	7.008	6.417	NC50
LT-T102	L01-1300	4.016	2.874	2.374	NC26	LT-T206A	L01-2700	8.110	6.614	5.984	NC50
LT-T105	L01-1400	4.134	3.374	2.874	NC31	LT-T219	L01-2900	8.622	7.008	6.260	NC50
LT-T114	L01-1500	4.488	3.504	2.953	NC31	LT-T232	L01-3000	9.134	7.992	7.362	NC50
LT-T117	L01-3800	4.606	3.504	3.071	NC31	LT-T244	L01-3100	9.606	7.992	7.244	6 5/8 REG
LT-T127	L01-1600	5.000	3.740	3.150	NC38	LT-T260	L01-3200	10.236	8.622	7.874	6 5/8 REG
LT-T143	L01-1700	5.630	4.748	4.252	NC38	LT-T270	L01-3300	10.630	9.000	8.252	6 5/8 REG
LT-T152	L01-2000	5.984	5.039	4.488	NC38	LT-T273	L01-3400	10.748	9.500	8.504	6 5/8 REG
LT-T168	L01-2100	6.614	5.000	4.488	NC50	LT-T286	L01-3500	11.260	9.626	8.874	6 5/8 REG
LT-T168B	L01-2200	6.614	5.500	4.748	NC50	LT-T298A	L01-3600	11.732	10.118	9.374	6 5/8 REG
LT-T181	L01-2300	7.126	5.748	5.000	NC50	LT-T340	L01-3700	13.386	11.260	10.354	6 5/8 REG

## SERIES 150 OVERSHOT ACCESSORIES

BOT Series 150 Releasing and Circulating Overshot can be equipped with a wide range of accessories to meet a variety of complex fishing environmental.

### Extension Sub

An extension sub is assembled between the top sub and the bowl. It is used when the upper portion of the fish is damaged or cannot be engaged. This accessory will permit the overshot to be lowered far enough over the fish to ensure secure engagement and pack off. They are available in lengths from 24 to 60 inches. When ordering, specify overshot O.D. Unless otherwise specified Extension Subs will be furnished in a standard 36-inch length.



Extension Sub



Wall Hook Guide

### Wall Hook Guide

If the fish is positioned in a washed out section of the hole, it may be difficult to engage the top of the fish using a conventional overshot guide. A wall hook guide can be used to capture the neck of the fish, centralize it, and then properly guide the fish into the bowl.

### Oversize Guide

Oversized Guide properly guides the fish into the overshot when the hole size is considerably larger than the diameter of the fish and the overshot may pass alongside the fish without engaging it. Installation of an oversized guide instead of a standard guide will ensure alignment of the fish with the overshot.



Oversize Guides

### Mill Extension

Overshot Mill Extension interiors are faced with Itcoloy to a size that will mill away a flared or jagged fish to enable it to pass up into and be engaged by the Grapple in the Bowl. Mill Extensions are installed between the Bowl and the standard, oversized or wall hook guides.

### Mill Guide

Overshot Mill Guides are designed to remove badly flared or jagged metal from the top of the fish. Mill Guides are used in place of the Standard or Oversized Guide to trim the fish so it can enter the overshot.



Mill Guide



Mill Extension

## SERIES 70 SHORT CATCH OVERSHOT

The BOT Series 70 Short Catch Overshot is an external fishing tool designed to retrieve tubular fish when the top of the fish is too short to be engaged with other overshot. The Grapple Control is positioned above the Basket Grapple rather than below it to allow the Basket Grapple to occupy the lowest position in the Bowl. This enables the overshot to firmly engage and retrieve a very short fish.

### Construction

The BOT Series 70 Short Catch Overshot assembly consists of a Top Sub, Bowl, Basket Grapple Control, and a Basket Grapple. Although the Series 70 Overshot has no Guide, the components function in the same manner as the standard Series 150 Releasing and Circulating Overshot.

### Catching the Fish

Attach the Overshot to the bottom end of the fishing string and run it into the hole. Series 70 Overshot assembly is rotated to the right and lowered as the fish enters the expandable grapple. With the fish in the Grapple, stop right-hand rotation and exert an upward pull to fully capture the fish.

### Releasing the Fish

A sharp downward force (bump) is applied to the Overshot to break the hold of the grapple within the bowl. The Overshot is then rotated to the right while it is slowly elevated to release the Grapple from the fish.

### When order please specify:

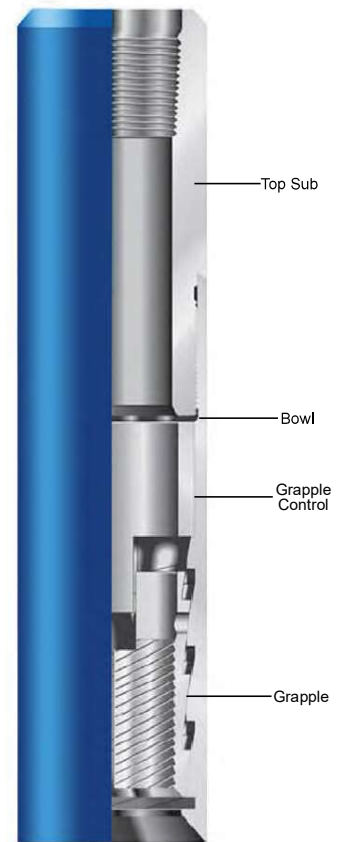
The model of the overshot.

The hole, Casing size or O.D. of overshot

Top connection

O.D of the fish

Note: We can design overshot according to customers' request



Series 70 Short  
Catch Overshot  
(L04)

### Specifications - Series 70 Short Catch Overshot

Model	Product Code	O.D. (in)	Max. fishing size (in)	Connection BOX	Type
DYLT-T92	L04-9200	3.622	2.500	2 3/8REG	S.H.
	L04-9210			NC26	
DYLT-T95	L04-9500	3.740	2.622	2 3/8REG	S.H.
	L04-9510			NC26	
DYLT-T105	L04-10500	4.134	3.059	2 7/8REG	S.H.
	L04-10510			NC26	
DYLT-T111	L04-11100	4.370	3.374	2 7/8REG	S.H.
	L04-11110			NC31	
DYLT-T117	L04-11700	4.606	3.059	2 7/8REG	F.S.
	L04-11710			NC31	
DYLT-T119	L04-11900	4.685	3.654	2 7/8REG	S.H.
	L04-11910			NC31	
DYLT-T121	L04-12100	4.764	3.748	NC31	S.H.
	L04-12110			NC38	
DYLT-T133	L04-13300	5.236	4.126	NC31	F.S.
	L04-13310			NC38	
DYLT-T143	L04-14300	5.630	3.654	NC31	F.S.
	L04-14310			NC38	
DYLT-T150	L04-15000	5.906	4.748	NC38	S.H.
DYLT-T159	L04-15900	6.260	5.248	4 1/2REG	S.H.
	L04-15910			NC38	
DYLT-T200	L04-20000	7.874	6.248	NC50	F.S.
DYLT-T210	L04-21000	8.268	6.500	NC50	F.S.
	L04-21010			6 5/8REG	
DYLT-T247	L04-24700	9.724	8.000	6 5/8REG	F.S.
DYLT-T254	L04-25400	10.000	8.252	6 5/8REG	F.S.
DYLT-T286	L04-28600	11.260	9.000	6 5/8REG	F.S.



## SERIES 10 OVERSHOT

BOT Series 10 Sucker Rod Overshot is a professional fishing tool, designed for engaging and retrieving sucker rods, couplings, and other tubular from inside tubing strings.

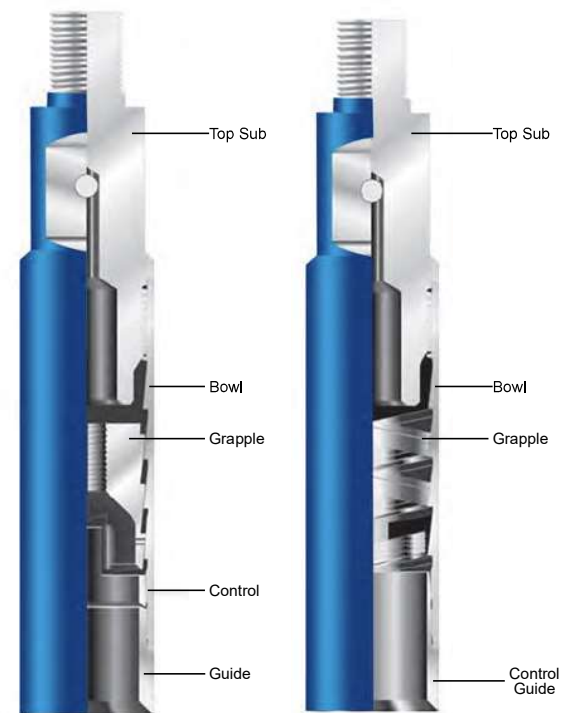
BOT Series 10 Sucker Rod Overshot consists of a Top Sub, Bowl, Grapple, and a Guide. According to the size of the fish, there are two types of grapples available: Basket Grapple or Spiral Grapple. BOT Series 10 is a simply tool to use, no matter engaging or releasing operation, in fact just need to rotate the fishing string on right hand.

### Engaging a Fish

When overshot nears the top of the fish, slowly rotate to the right as the overshot is lowered over the fish. After the fish is engaged, allow right-hand torque to release from the fishing string. Then raise the fish by pulling upward on the fishing string.

### Releasing a Fish

Bump down or drop the weight of the fishing string against the Overshot to break the hold of the grapple within the Bowl. Elevate the fishing string while slowly rotating it to the right until the Overshot has cleared the fish.



Series 10 Overshot  
with Basket Grapple

Series 10 Overshot  
with Spiral Grapple

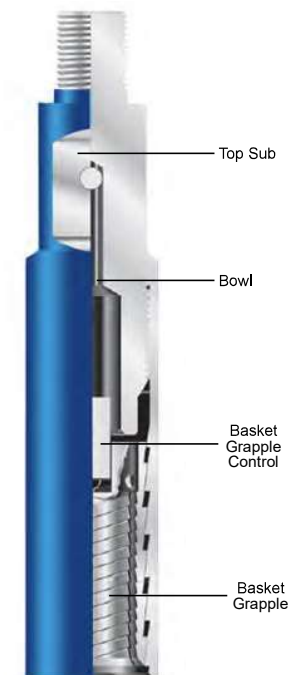
Series 10 Overshot  
(L03)

## SERIES 20 OVERSHOT

BOT Series 20 Short Catch Sucker Rod Overshots are designed for conditions when sucker rods, couplings, and other portions of a fish are too short for retrieval with a standard overshot.

The BOT Series 20 Short Catch Sucker Rod Overshot consists of a Top Sub, Bowl, Basket Grapple Control, and a Basket Grapple. The Grapple Control is located at the top end of the tool between the Top Sub and the Basket Grapple. The position of the Grapple Control above the Basket Grapple rather than below it allows the Basket Grapple to occupy the lowest position in the Bowl.

This permits the exposed part of the fish to enter the Basket Grapple where it can be firmly and securely grasped. Operation of the BOT Series 20 Short Catch Sucker Rod Overshot is the same as the BOT Series 10 Sucker Rod Overshot.



Series 20  
Overshot  
(L22)

## DLT-T RELEASING AND REVERSING OVERSHOT

Type DLT-T Releasable Reversing Overshot, a new type of fishing tool, has many advantages owned by various overshot, box tap and the like, Its distinguishing features are as follows: to unscrew and recover the stuck fish: To release the fish down hole if necessary, to circulate the washing fluid as one of the accessories for reversing tools, it is widely used in well servicing.

### Structure and application

Is consisting of top sub, spring, bowl, retaining seat, slip, control key, seal ring, seal seat, guide and so on. The upper end of top sub is connected with other tools and drill tool: The lower end of top sub is connected with bowl equipped with spring in the interior, There are three control keys uniformly distributed in the inner wall of the upper end of bowl, the control keys are used to control the position of retaining seat, Three keys are inserted separately in three grooves in the tapered interior section of lower end in bowl where three keys are used to transmit torque, The tapered interior section produces a pinch force against the slip to effect the fishing operation. The reversed operation can be effected when three keys transfer the torque from bowl to slip. The inclined angle among three control keys play an important role in retaining of slip conforming with bowl to ensure that the tools can be released easily from fish.

The retaining seat is installed at the upper end of external bowl where three keys are placed, the retaining seat not only can slide axially but also rotate round axial line so as to move with slip which is installed in internal circular recess.



Releasing and Reversing  
Overshot  
(L07)

### Specifications - Table 1 connection LH

Model	O.D. (in)	Max. fishing size (in)	Allowed pull(KN)	Releasing pull & allowed torque		Connection (BOX LH)	Product Code
				Pull (KN)	Torque (N.m)		
DLT-T95×48	3.740	1.902	250	120	3100	2 7/8REG	L07-4800
DLT-T105×60	4.134	2.500	350	150	5750	NC31	L07-6000
DLT-T114×73	4.488	3.094	420	180	7750	NC31	L07-7300
DLT-T134×89	5.276	3.669	500	180	10250	NC38	L07-8900
DLT-T145×102	5.709	4.000	700	200	11050	NC38	L07-10200
DLT-T160×114	6.299	4.500	900	200	12150	NC38	L07-11400
						2 7/8REG	L07-11410
DLT-T185×127	7.283	5.000	1200	240	13500	NC50	L07-12700
DLT-T200×140	7.874	5.500	1500	240	15300	NC50	L07-14000

### Specifications - Table 2 connection RH

Model	O.D. (in)	Max. fishing size (in)	Allowed pull(KN)	Releasing pull & allowed torque		Connection (BOX LH)	Product Code
				Pull (KN)	Torque (N.m)		
DLT-T105×60F	4.134	2.500	350	150	5750	NC31	L07-6010
DLT-T114×73F	4.488	3.094	420	180	7750	NC31	L07-7310
DLT-T134×89F	5.276	3.669	500	180	10250	NC38	L07-8910
						NC31	L07-8920
DLT-T160×114F	6.299	4.500	900	200	12150	NC38	L07-11420



# LIFTING-LOWERING AND RELEASING OVERSHOT

Lifting-Lower and releasing overshot is a fish tool in the casing which fishes fractured tubing and drill string. If fish drill string is stuck heavily and hard to complete fish work, while need to release fish, may get back the tool by bumping drill string down and lift directly.

The excellent advantage of the product is no need rotating, only through lift and lower, complete catching and releasing fish, It is convenient for the mini-maintenance.

## Structure

Lifting-lower and releasing overshot is composed of top sub, bowl, guide pin, guide sleeve, joint sleeve, plug, roller pin, slip, guide, as shown in the figure. Box thread of top sub is connected with drill stem, pin thread is connected with the bowl, The bottom of bowl is connected with guide, An inner cone in the bowl matches the slip, Box thread of guide sleeve is connected with joint sleeve, track trenches are milled on another outer surface: three long trenches and three short trenches act as guiding and reversing ,When guide pin locates in long trench is in the condition of fish ,When guide pin locates in short trench is in the condition of release, Joint sleeve is two petals formation ,It makes slip and guide sleeve connection and by roller pin act as bearing, The inner surface of slip has fish thread, guide is on the bottom and can make fish introduce into slip successfully.

## Working Principle

The tool complete fishing and releasing fish through long, short track trenches. When the tool reaches the top of fish, lower and let it enter the fish, Through lift or lower, guide pin is in the position of long or short trench, slip is in the situation of fishing or releasing, in the condition of non-rotating complete fishing and releasing fish.



Lifting-lowering and Releasing Overshot (L05)

## Specifications - Lifting-Lowering and Releasing Overshot

Model	Product Code	O.D. (in)	Connection	Catch Size(in)
TFLT48	L05-4800	3.740	NC26	1.9
TFLT60	L05-6000	4.134	NC31	2 3/8
TFLT73	L05-7300	4.528	NC31	2 7/8
TFLT89	L05-8900	5.276	NC38	3 1/2
TFLT114	L05-11400	5.906	NC38	4 1/2

## RELEASING SPEAR

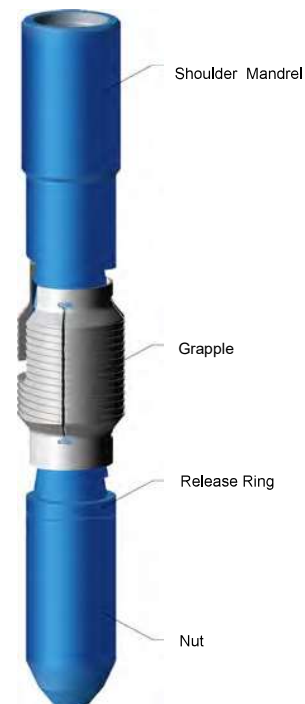
BOT Releasing Spear provide a positive means to engage and retrieve an internal fish from the well. It is ruggedly built to withstand severe jarring and pulling strains. It engages the fish over a large area without damage of the fish. The simple design avoids the problem of small parts lost or damaged in the hole when operation. It may be used with other equipment such as pack-off assemblies and internal cutters. If the fish cannot be pulled, the spear may easily be released and disengaged.

### Construction

The Releasing Spear consists of a mandrel, grapple, releasing ring, and a bull nose nut. The mandrel is made of specially heat treated high strength alloy steel; and may be ordered either as a flush type to enter completely into a fish or as a shoulder type to provide a positive landing position on top of the fish. Size and type of the upper box connection is provide according to customer's exact specification.

### When order please specify:

- The model of the releasing spear.
- Top connection
- The exact size and weight of the fish
- Flush or shoulder type mandrel



Spear Assembly  
with Shoulder Type Mandrel

### Specifications - Releasing Spear

Model	Product Code	Mandrel O.D (in)	Catch size (in)	Thread Conn.	Allowed Load (KN)
LM-T60	L02-110	3.386	1.866-2.039	NC26	270
LM-T73	L02-120	4.134	2.260-2.441	NC31	380
LM-T89	L02-130	4.764	2.756-3.063	NC38	650
LM-T102	L02-140	4.764	3.228-3.547	NC38	800
LM-T114	L02-150	4.764	3.638-4.091	NC38	1000
LM-T127	L02-160	6.496	4.016-4.559	NC50	1300
LM-T140	L02-170	6.496	4.669-5.012	NC50	1500
LM-T168	L02-180	6.496	5.512-6.051	NC50	2200
LM-T178	L02-190	6.496	5.921-6.539	NC50	2200
LM-T194	L02-200	6.496	6.626-7.028	NC50	2300
LM-T219	L02-210	7.756	7.512-8.098	6 5/8 REG	2300
LM-T245	L02-220	7.756	8.535-9.004	6 5/8 REG	2500
LM-T273	L02-230	7.756	9.449-10.193	6 5/8 REG	2500
LM-T340	L02-240	7.756	12.346-12.717	6 5/8 REG	2500



Spear Assembly  
with Flush Type Mandrel

## RELEASING SPEAR ACCESSORYS

### Segment-Type Spear Grapple

The Segment-Type Spear Grapple enhances the spear's usefulness by providing an extended catching range beyond the maximum range of the standard one-piece grapple. BOT Segment-Type Spear Grapple is used in place of the standard one-piece Grapple on the 9 5/8" Spears to convert them to spears capable of engaging up to 20" Casing

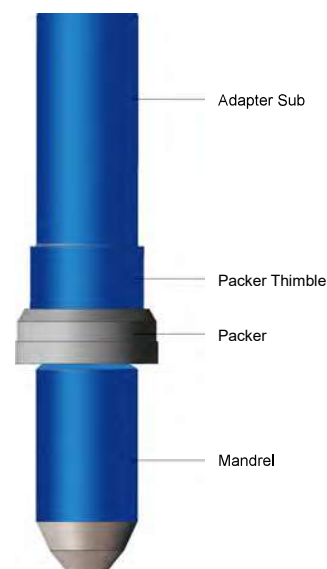
Segment-Type Spear Grapple consists of a grapple body, eight grapple segments, two retainer rings, six retainer ring screws, six retainer ring spacers, and sixteen grapple segment screws.



Segment-Type  
Spear Grapple

### Pack-off Assembly

Pack-off Assembly is available for all BOT Spear Assemblies and is designed to efficiently pack-off all sizes of tubing and casing. Circulation through the fish is enabled by attaching the Spear Pack-off Assembly to the bottom of the spear with a sub type nut.



Spear Pack-off Assembly

### Spear Stop Sub

The BOT Releasing Spear Stop Sub Assembly is an accessory designed to convert a releasing spear with a flush-type mandrel into a shouldered type spear. It is installed in the box connection at the top of the mandrel when the use of a positive stop is desired or required. A stop ring can be added to increase shoulder diameter. All stop rings are furnished with left-hand threads.

### Optional Nuts

Mill Type to mill away burrs, Sub Type to connect and run other tools below the Spear, and Side hill Type to center the spear in greatly oversize holes to assure entry of the Spear into the fish.



Sub Type Nut



Mill Type Nut



Sidehill Type Nut



Stop Sub



Stop Ring

## REVERSING SUB

The reversing subs is also called reversing spear which is a special tool for reversing stuck drill stem above stuck point in drilling and work over operation. In treatment of stuck drill stem, it can work as a fishing pin tap in reversing operation, When fish is stuck or can not be reversed in fishing or reversing operation, the fish can be reversed from reversing sub and the fishing drill tool is tripped out.

### Specifications - Reversing sub

Model	O.D (in)	I.D. (in)	Thread Conn (LH)	Catch Thread (RH)	Product Code
DKJ105	4.134	0.551	NC31	NC31	L08-10500
DKJ105	4.134	0.709	NC31	2 7/8NU	L08-10510
DKJ121	4.764	0.787	NC38	NC38	L08-12100
DKJ140	5.512	0.787	NC40	NC40	L08-14000
DKJ159	6.260	1.102	NC46	NC46	L08-15900
DKJ165	6.496	1.102	NC50	NC46	L08-16500
DKJ165	6.496	1.102	NC50	NC50	L08-16510
DKJ165	6.496	1.260	NC50	5 1/2FH	L08-16520
DKJ178	7.008	1.260	5 1/2FH	5 1/2FH	L08-17800
DKJ190	7.480	1.260	NC50	6 5/8REG	L08-19000
DKJ203	7.992	1.260	NC50	NC61	L08-20300
DKJ203	7.992	1.260	NC50	6 5/8FH	L08-20310
DKJ203	7.992	1.260	NC50	7 5/8REG	L08-20320



Reversing Sub (L08)

### Specifications - Reversing sub

Model	O.D (in)	I.D. (in)	Thread Conn (RH)	Catch Thread (LH)	Product Code
DKJ105A	4.134	0.551	NC31	NC31	L08-10520
DKJ121A	4.764	0.787	NC38	NC38	L08-12110
DKJ146A	5.748	0.984	4 1/2FH	4 1/2FH	L08-14600
DKJ168A	6.614	1.102	NC50	NC50	L08-16800
DKJ168A	6.614	1.102	NC50	NC46	L08-16810
DKJ178A	7.008	1.260	5 1/2FH	5 1/2FH	L08-17810
DKJ178A	7.008	1.260	NC50	NC56	L08-17820

### Specifications - Reversing sub

Model	O.D (in)	I.D. (in)	Thread Conn (RH)	Catch Thread (RH)	Product Code
DKJ93B	3.661	0.709	2 7/8EU	2 7/8EU	L08-9300
DKJ105B	4.134	0.551	NC31	NC31	L08-10530
DKJ114B	4.488	1.102	3 1/2EU	3 1/2EU	L08-11400
DKJ121B	4.764	0.709	NC38	NC38	L08-12120
DKJ140B	5.512	0.787	NC40	NC40	L08-14010
DKJ165B	6.496	1.102	NC50	NC46	L08-16530
DKJ165B	6.496	1.102	NC50	NC50	L08-16540
DKJ178B	7.008	1.260	5 1/2FH	5 1/2FH	L08-17830
DKJ178B	7.008	1.260	NC50	NC56	L08-17840
DKJ210B	8.268	1.260	6 5/8FH	6 5/8FH	L08-21000

## REVERSING SPEAR

In drilling and work over operation, the reversing spear is a tool mainly used for fishing of drill pipe, oil pipe and casing from fish hole. It can be used with internal cutter, bumper jar etc.

### Specifications - Reversing Spear

Model	O.D. (in)	Connection BOX LH	ID (in)	Min. fishing size (in)	Lead-in diameter of spear rod (in)	Product Code
DLM-T48	3.740	NC26	0.276	1.563	1.457	L10-4800
	3.386					L10-4810
DLM-T60	4.134	NC31	0.315	1.957	1.831	L10-6000
	3.752	2 7/8 REG				L10-6010
DLM-T73	4.134	NC31	0.315	2.441	2.205	L10-7300
	5.000	NC38				L10-7310
	3.752	2 7/8 REG				L10-7320
DLM-T89	4.134	NC31	0.630	2.953	2.795	L10-8900
DLM-T102	4.764	NC38	0.630	3.472	3.268	L10-10200
	4.134	NC31				L10-10210
DLM-T114	4.764	NC38	0.630	3.929	3.661	L10-11400
DLM-T127	5.000	NC38	0.787	4.213	3.858	L10-12700
		NC31				L10-12710
DLM-T140	5.512	NC31	0.984	4.646	4.213	L10-14000
		NC38				L10-14010
	6.299	NC50				L10-14020
DLM-T178	7.008	NC50	1.181	5.921	5.591	L10-17800
		NC38				L10-17810
DLM-T245	9.646	6 5/8 REG	2.756	8.406	8.071	L10-24500
DLM-T273	10.748	6 5/8 REG	2.756	9.157	8.465	L10-27300
		NC50				L10-27310
DLM-T340	13.543	6 5/8 REG	2.992	12.346	9.961	L10-34000
		NC50				L10-34010



Reversing Spear (L10)

## CABLE FISHING HOOK

The cable fishhook is used not only to catch electric pump cables or wirelines but also to catch bent sucker rods broken in casings.

### Specifications - Cable Fishhook

Outside size (in)	Product Code	Connection	Catch	For Casing size (in)
4.724 x 70.866	L16-14000	NC31	Electric cables	5 1/2 Casing
5.512 x 70.866	L16-16800	NC31	Electric cables	6 5/8 Casing
5.906 x 70.866	L16-17800	NC38	Electric cables	7 Casing



cable fishhook  
(L16)

## SLIDING BLOCK SPEAR

The Sliding Block Spear is an internal fishing tool which is not only used for fishing of fallen objects perforated such as drill pipe, tubing, wash pipe, liner, packer, water distributor etc but also for reversing of stuck fallen objects or used with other tools such as jar and back-off tool.

### Specifications - Sliding Block Spear

Model	Product Code	O.D. (in)	Connection (Box)	I.D. (in)	Dia. of spear rod (in)	I.D. of fish (in)	O.D. of fish (in)	Length (in)
HLM-SS60	L12-4600	4.764	NC38	0.472 (Side bore)	1.811	1.955	2 3/8	47.244
	L12-4610	3.504	NC26	0.472 (Side bore)	1.811	1.955		31.496
	L12-4700	3.110	2 3/8 REG	0.472 (Side bore)	1.850	1.996		39.370
HLM-SS73	L12-5100	4.134	NC31	0.472 (Side bore)	2.008	2.150	2 7/8	47.244
	L12-5500	3.110	2 3/8 REG	0.472 (Side bore)	2.165	2.441		110.236
	L12-5700	4.764	NC38	0.472 (Side bore)	2.244	2.441		47.244
	L12-5710	4.134	NC31	0.472 (Side bore)	2.244	2.441		47.244
	L12-5720	3.504	NC26	0.472 (Side bore)	2.244	2.441		39.370
HLM-SS89	L12-6500	4.764	NC38	0.591 (Side bore)	2.559	2.764	3 1/2	47.244
	L12-6510	4.134	NC31	0.591 (Side bore)	2.559	2.764		47.244
	L12-7000	4.764	NC38	0.591 (Side bore)	2.756	3.000		47.244
	L12-7010	4.134	NC31	0.591 (Side bore)	2.756	3.000		47.244
HLM-SS114	L12-8600	4.803	NC31	0.709 (Side bore)	3.386	3.543-3.740	4 1/2	47.244
	L12-8800	6.614	NC50	0.709 (Side bore)	3.465	3.642-3.827		47.244
	L12-9100	4.803	NC31	0.709 (Side bore)	3.583	3.827-4.091		47.244
	L12-9110	4.803	NC31	0.709 (Side bore)	3.583	3.827-4.091		59.055
	L12-9120	6.614	NC50	0.709 (Side bore)	3.583	3.827-4.091		47.244
HLM-SS127	L12-9700	6.614	NC50	0.709	3.819	4.000-4.567	5	47.244
HLM-SS140	L12-10800	5.551	NC31	0.709	4.252	4.500-4.780	5 1/2	47.244
	L12-11200	6.614	NC38	0.787	4.409	4.669-4.894		49.803

note: Unless required specially, the length is 47.244 inch.



Sliding Block Spear  
(L12)



## TAPER TAP & DIE COLLARS

The taper tap is a special fishing tool making thread in tubular dropped objects such as drill pipe and tubing. It is a high effective tool in fishing of tubular dropped objects especially with union. The taper tap can be used for different fishing operation when equipped with left hand thread or right hand thread drill pipes and other tools. The taper taps are made from high strength alloy steel forging materials and heat treated. It is made with chip groove so as to make threads.

### Specifications - Taper Tap

Model	Product Code	Fishing OD of big end (in)	Fishing OD of small end (in)	ID (in)	OD (in)	Overall length (in)	Overall length (in)
GZ47×28-NC26	L19-02000	1.850	1.102	0.394	3.386	22.244	1.9 Tubing
GZ60×38-NC26	L19-02001	2.362	1.496	0.472	3.386	25.000	2 3/8 Tubing
GZ70×45-NC26	L19-02002	2.756	1.772	0.630	3.386	26.772	2 7/8 Tubing
GZ86×56-NC31	L19-03000	3.386	2.205	0.787	4.134	29.921	3 1/2 Tubing
GZ98×65-NC38	L19-05000	3.858	2.559	0.984	4.764	31.890	4 Tubing
GZ110×77-NC50	L19-09000	4.331	3.031	0.984	6.614	31.890	4 1/2 Tubing
GZ62×40-NC26	L19-02003	2.441	1.575	0.630	3.386	25.000	2 3/8 Drill pipe 2 7/8 Drill pipe
GZ85×60-NC31	L19-03001	3.346	2.362	0.984	4.134	26.772	3 1/2 Drill pipe
GZ109×79-NC50	L19-09001	4.291	3.110	0.984	6.614	29.921	4 Drill pipe 4 1/2 Drill pipe
GZ130×95-NC50	L19-09002	5.118	3.740	1.496	6.614	33.071	5 Drill pipe 5 1/2 Drill pipe
GZ160×145- NC50	L19-09003	6.299	5.709	2.008	6.614	20.472	6 5/8 Drill pipe
GZ122×92-NC50	L19-09004	4.803	3.622	1.496	6.614	29.921	4 1/2 Casing 5 Casing
GZ135×109-NC50	L19-09005	5.315	4.291	2.008	6.614	27.559	5 1/2 Casing
GZ162×137- NC50	L19-09006	6.378	5.394	2.008	6.614	26.772	6 5/8 Casing
GZ172×147-6 5/8 REG	L19-19000	6.772	5.787	2.008	7.756	26.772	7 Casing
GZ187×161-6 5/8 REG	L19-19001	7.362	6.339	2.008	7.756	27.559	7 5/8 Casing 7 3/4 Casing
GZ215×185-7 5/8 REG	L19-20000	8.465	7.283	2.008	9.016	29.921	8 5/8 Casing
GZ237×211-75/8 REG	L19-20001	9.331	8.307	2.008	9.016	27.559	9 5/8 Casing
GZ85×52-NC31	L19-03002	3.346	2.047	0.787	4.134	31.890	Φ3-Φ2.252



Taper Tap  
(L19)

## INTEGRAL BLADE STABILIZER

The die collar is a special external fishing tool which is tapping on the outside wall of tubing objects such as tubing and drill pipe.

The die collar is long cylindrical integral structure which is consisting of sub and tap body with threads in interior of cone as shown in the fig I. The die collar is made of high strength alloy and is made with a cutting groove in the fishing threads.



Taper Tap  
(L19)

### Specifications - Die Collar

Model	Product Code	Fishing OD of big end (in)	Fishing OD of small end (in)	Max. OD (in)	OD of joint (in)	Overall length (in)
Mz55×40-NC26	L20-02000	2.165	1.575	3.386	3.386	16.142
Mz68×50-NC26	L20-02001	2.677	1.969	3.740	3.386	21.654
Mz80×62-NC26	L20-02002	3.150	2.441	4.488	3.386	22.047
Mz96×74-NC31	L20-03000	3.780	2.913	5.000	4.134	25.197
Mz110×90-NC38	L20-05000	4.331	3.543	5.630	4.764	24.016
Mz122×102-NC38	L20-05001	4.803	4.016	6.378	4.764	24.409
Mz135×110-NC50	L20-09000	5.315	4.331	6.890	6.614	27.165
Mz148×128-NC50	L20-09001	5.827	5.039	7.480	6.614	24.803
Mz167×140-NC50	L20-09002	6.575	5.512	7.992	6.614	29.134
Mz178×153-6 5/8 REG	L20-19000	7.008	6.024	8.307	7.992	28.346
Mz190×166-6 5/8 REG	L20-19001	7.480	6.535	8.622	7.992	28.346
Mz210×185-6 5/8 REG	L20-19002	8.268	7.283	9.724	7.992	29.921
Mz239×216-7 5/8 REG	L20-20000	9.409	8.504	11.024	9.488	28.346
Mz251×229-7 5/8 REG	L20-20001	9.882	9.016	11.417	9.488	28.346

## INTERNAL HOOK & EXTERNAL HOOK

The internal hook is a fishing tool used for fishing of all kinds of ropes and others fishes such as wireline, cable, logging wireline and paraffin cutler from inside casing or oil tube.

The internal hook is available in different structure according to different fish to be caught, generally it has two types: dead hook and live hook type.

### Specifications - Internal Hook

Model	Product Code	O.D.(in)	Connection	For Casing/Tubing Size(in)
nG73	L23-7300	2.874	2 3/8 Tubing coupling	3 1/2 Tubing
nG95	L23-9500	3.740	NC26	4 1/2 Tubing
nG114	L23-11400	4.488	NC31	5 1/2 Casing
nG136	L23-13600	5.354	NC31	6 5/8 Casing
nG150	L23-15000	5.906	NC38	7 Casing
nG176	L23-17600	6.929	NC38	8 5/8 Casing
nG190	L23-19000	7.480	NC38	9 5/8 Casing



Internal Hook (L23)

The External Hook is used inside casings or tubings to catch all kinds of ropes, lifting bails, hollow short cylinders, short rope slings such as wirelines, logging steel pieces, cables, etc.

### Specifications - External Hook

Model	Product Code	O.D.(in)	Connection	For Casing/Tubing Size(in)
WG73	L24-7300	2.874	2 3/8 Tubing coupling	3 1/2 Tubing
WG95	L24-9500	3.740	NC26	4 1/2 Tubing
WG114	L24-11400	4.488	NC31	5 1/2 Casing
WG136	L24-13600	5.354	NC31	6 5/8 Casing
WG150	L24-15000	5.906	NC38	7 Casing
WG176	L24-17600	6.929	NC38	8 5/8 Casing
WG190	L24-19000	7.480	NC38	9 5/8 Casing



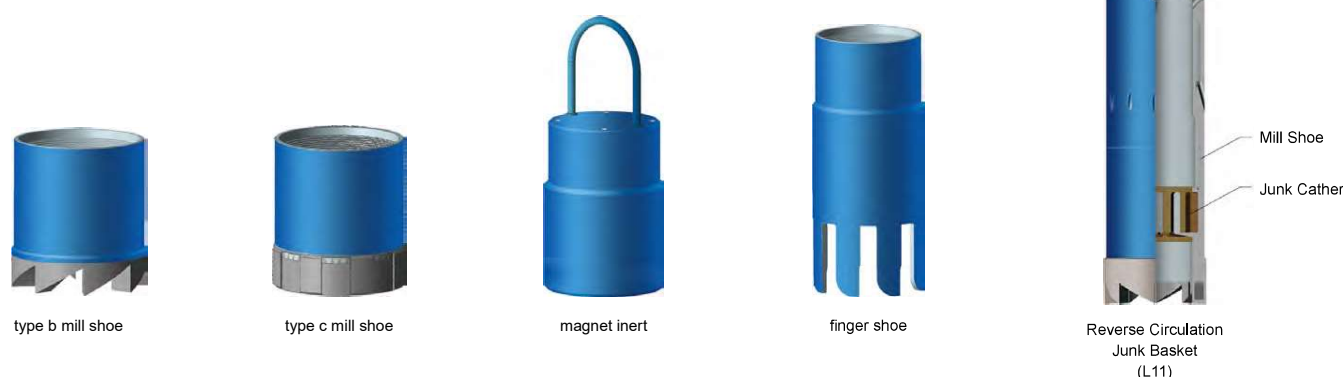
External Hook (L24)

## REVERSING CIRCULATION JUNK BASKET

BOT Reverse Circulation Junk Basket (RCJB) is designed to remove all types of small junk objects from the hole. The tool's main feature eliminates pulling a wet string. Even when the tool is fitted with a magnet insert, reverse circulation is maintained.

### Operation

BOT RCJB is made up to the bottom of the fishing string and lowered to a point within several feet from the bottom of the hole. Begin circulation to wash the hole. Stop circulation and drop the steel ball. (When the steel ball is dropped into the valve seat, circulation fluid travels outward and downward through the inner passage of the barrel and out through the vents in the lower end. The fluid is then deflected to the center of the tool and up through the return holes in the upper end of the barrel. This reverse fluid circulation carries the junk into the barrel above the junk catcher.) Begin circulation again, slowly rotating while lowering the tool until a 10-inch core has been cut. Stop rotation and circulation and pull the tool from the hole.



### Specifications - Reverse Circulation Junk Basket

Model	OD of barrel (in)	Max. fishing size (in)	OD of steel ball (in)	Connection (Box)	Hole size (in)	Product Code
LL-F381	15.000	10.984	2.244	6 5/8 REG	15.984-17.480	L11-381000
LL-F330	12.992	9.803	2.244	6 5/8 REG	13.740-15.984	L11-330000
LL-F301	11.850	8.504	2.244	6 5/8 REG	12.598-13.622	L11-301000
LL-F279	10.984	8.307	2.244	6 5/8 REG	11.732-12.480	L11-279000
LL-F257	10.118	7.638	2.244	6 5/8 REG	10.748-11.614	L11-257000
LL-F232A	9.134	7.047	2.244	NC50	9.606-10.630	L11-232000
				6 5/8 REG		L11-232100
LL-F206	8.110	6.181	1.772	NC50	8.504-9.488	L11-206000
LL-F200A	7.874	6.063	1.654	NC50	8.346-9.488	L11-200000
				4 1/2 REG		L11-200100
LL-F200	7.874	5.787	1.654	NC50	8.346-9.488	L11-200200
LL-F178	7.008	5.118	1.654	NC50	7.480-8.268	L11-178000
				4 1/2 REG		L11-178100
LL-F159	6.260	4.748	1.339	4 1/2 REG	6.614-7.362	L11-159000
LL-F146A	5.748	4.370	1.339	NC38	6.102-6.496	L11-146000
				3 1/2 REG		L11-146100
LL-F146	5.748	4.134	1.575	NC38	6.102-6.496	L11-146200
LL-F130	5.118	3.748	1.339	NC31	5.630-5.984	L11-130000
				3 1/2 REG		L11-130100
LL-F123	4.843	3.563	1.102	NC31	5.118-5.512	L11-123000
LL-F121	4.764	3.543	1.339	2 7/8 REG	5.118-5.512	L11-123100
				NC31		L11-121000
LL-F114	4.488	3.063	1.102	NC31	4.626-5.000	L11-114000
				2 7/8 REG		L11-114100
LL-F102	4.016	2.500	0.906	NC26	4.134-4.488	L11-102000
				2 3/8 REG		L11-102100
LL-F97	3.819	2.441	1.181	NC26	4.252-4.488	L11-97000
LL-F92	3.622	2.244	0.906	NC26	3.748-4.016	L11-92000
				2 3/8 REG		L11-92100
LL-F89	3.504	2.244	0.906	NC26	3.740-4.016	L11-89000

## STANDARD FISHING MAGNET

The BOT S-Fishing Magnet is a junk retrieval tool designed to retrieve small metal, oddly-shaped objects such as milling shavings, bit cones, cutters, bearings, slips, tong pins, and hand tools from the bottom of the hole. Typically, these objects are the result of bit failures, an accumulation of mill cuttings, or simply accidental droppings of unmillable objects. In almost all of these cases, the fish cannot be engaged in the normal manner. Fishing magnets can successfully remove these objects from the hole. The tool's design features generous circulation ports that wash away cuttings and other debris that might interfere with or prevent contact with the magnet. A variety of guides are available to accommodate any retrieval situation.

### Construction

The BOT Fishing Magnet Assembly consists of top sub, housing, magnet element, pole plate, and standard flush guide. The body is manufactured from high strength alloy steel. The magnet element is a powerful permanent magnet. Used properly, it will never lose its charge. The magnet body, housing, and pole plate are threaded and welded together during assembly with the magnet element in place. The standard flush bottom guide is threaded and easily removed.

### Operation

BOT Fishing Magnets are usually run on tubing or drill pipe, but can be run on wireline. Wireline adapters are available. The BOT Fishing Magnet is made up to the bottom of the fishing string and lowered into the hole to within six to twelve inches of the fish. Circulate to wash the fish. Reduce circulation and lower the fishing magnet to the fish. Slowly rotate to ensure positive contact. Discontinue circulation and lift the fishing magnet from the hole.



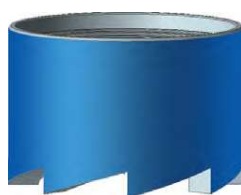
Standard  
Fishing Magnet  
(L25)

### Optional Accessories

A flush guide is standard. Lipped guides and mill guides are also available. The lipped guide centralizes the fish to assure contact with the magnet. The mill guide enables milling of any soft formation or settling to free debris at the bottom of the hole.



Cut-Lipped Guide



Mill-Type Guide



Wireline Adapter

## REVERSE CIRCULATION FISHING MAGNET

BOT Reverse Circulation Fishing Magnet is a new fishing tool based on BOT Standard Fishing Magnet. It combines advantages of Reverse Circulation Fishing Basket and Fishing Magnet. Its unique reverse-circulation design brings better performance on cleaning bottom hole.

### Construction

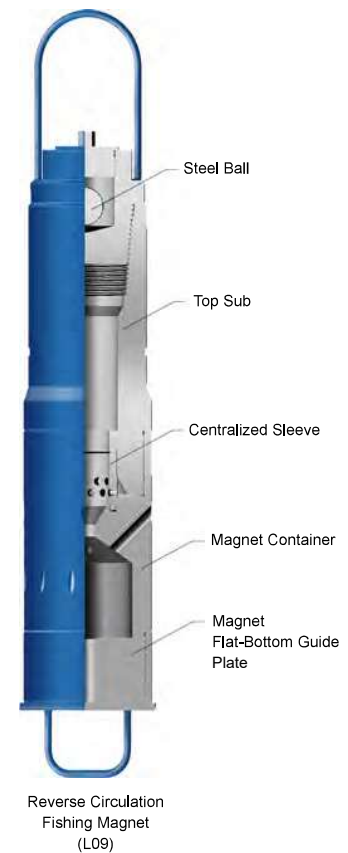
BOT Reverse Circulation Fishing Magnet Assembly consists of lifting bail, top sub, housing, magnet element, pole plate, standard flush guide, and steel ball. When using we can select appropriate guide.

### Operation

Run the fishing magnet in a place which approximate 40 inches from the bottom of hole. Circulate to wash the fish, reduce circulation and lower the fishing magnet to the bottom of hole to attach the fish. Slowly rotate to ensure positive contact. Lift up 10 to 20 inches, drop the steel ball into the fishing string, and pump the steel ball into ball seat. Rotate and circulate for a moment, discontinue circulation and lift the fishing magnet from the hole.

### Optional Accessories

A flush guide is standard. Lipped guides and mill guides are also available.



### Specifications - Reverse Circulation Fishing Magnet

Model	Product Code	O.D. (mm)	Thread Connection	Attracted Weight (kg/cm <sup>2</sup> )	Temperature In well (°C)	Hole Size (in)
CLF89	L0903100	3.504	NC26	9.8	210	3.740~4.331
CLF100	L0905100	3.937	NC26	9.8	210	4.331~5.315
CLF125	L0912100	4.921	NC38	9.8	210	5.315~6.496
CLF140	L0914100	5.512	NC38	8.5	210	5.906~6.890
CLF146	L0915100	5.748	NC38	8.5	210	6.299~7.283
CLF152	L0916100	5.984	NC38	8.5	210	6.299~7.283
CLF178	L0918100	7.008	NC50	7.8	210	7.283~8.268
CLF190	L0919100	7.480	NC50	7.8	210	7.874~8.858
CLF200	L0920100	7.874	NC50	7.6	210	8.268~9.252
CLF203	L0921100	7.992	NC50	7.6	210	8.465~9.449
CLF225	L0923100	8.858	NC50	7.5	210	9.252~10.630
CLF254	L0927100	10.000	6 5/8 REG	7.0	210	10.433~12.244
CLF265	L0928100	10.433	6 5/8 REG	6.9	210	10.827~12.992
CLF292	L0933100	11.496	6 5/8 REG	6.9	210	11.811~17.402
CLF317	L0935100	12.480	7 5/8 REG	6.9	210	13.386~14.764
CLF356	L0937100	14.016	7 5/8 REG	6.9	210	17.500
CLF406	L0940100	15.984	7 5/8 REG	6.9	210	17.500~25.984



## DITCH MAGNET

The ditch magnet is the best available and most effective means of trapping and removing metal particles from the drilling mud that the shale shaker will not get. This unit will capture all metals having magnetic attraction and hold them until they can be removed from the mud stream. The magnet is particularly valuable during milling operations. Removal of mill cuttings and debris reduces wear of mud pumps and other equipment, as well as eliminating problems caused by the return downhole of harmful debris. They are equally effective during washover and fishing jobs.

### Structure

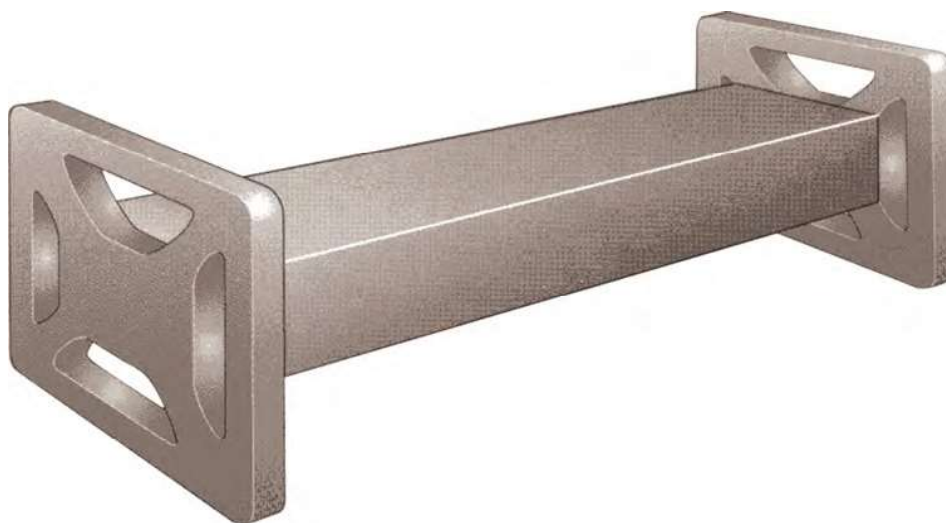
The ditch magnet is made of a highly performance magnet. It features simplicity, strong magnet field, ruggedness and high power to weight ratio.

### Operation

No special instructions are required to operate the ditch magnet. It is most effective when suspended by soft line in the mud ditch. It may also be suspended by soft line in the shaker discharge. When the cuttings or debris are enough and need to be removed, take off the magnet and open the inserting plate from the end with pull rod, pull out the magnet pole body, the cuttings and debris will drop down. The magnet body shall be cleaned with fresh water and assemble again for use.

### Maintenance

The unit should be cleaned several times per day depending on millings rate. Just remove the Magnet and clean with fresh or salt water hose. Wipe all cuttings from the unit and return it to duty. The unit may be cleaned less often during other operations when return cuttings come slower.



Ditch Magnet  
(L26)

### Specifications - Ditch Magnet

Model	Outside Dimension (in)	Magnetic Effective Area (in)	Strength In Magnetic Pole Surfaced (Gs)	Strength From 10mm To Magnet Pole Surface (Gs)	Weight (Kg)
DDM18	7-7/8 x 10 x 18	4.92 x 15.74	>1400	>800	15
DDM24	7-7/8 x 10 x 24	4.92 x 19.69	>1400	>800	19
DDM30	7-7/8 x 10 x 30	4.92 x 25.59	>1400	>800	24
DDM36	7-7/8 x 10 x 36	4.92 x 31.5	>1400	>800	30

## JUNK MILLS

### Flat Bottom Junk Mill

BOT Reverse Circulation Fishing Magnet Assembly consists of lifting bail, top The Flat Bottom Junk Mill is the most commonly used milling tool. It is designed to milling a wide variety of junk such as squeeze tools, packers, tubing, bridge plugs and similar objects.



Flat bottom junk mill  
(M08)

### Tapered Mills

The Tapered Mill is designed for milling through various types of downhole obstructions, and for reaming out liners and whipstock windows. It works well in collapsed casing as well as tight spots.



Tapered Mill  
(M11)

### Concave Junk Mills

The Concave Mill designed for milling bit cones and other loose objects where it is necessary to keep the fish centered under the mill for greater effectiveness.



Concave Bottom  
Junk Mill  
(M04)

### Economill

The Economill is a effective tool for light duty milling jobs such as packers, bridge plug, and cement. This mill can be easily made up and broken out with standard bit breakers.



Econo mill  
(M25)

### Bladed Junk Mill

Bladed junk mills are dressed with high-quality tungsten carbide to ensure optimal performance in all applications. They are suitable for all types of general junk milling, as well as for removing packers, retainers, and squeeze tools.



Bladed Junk Mill  
(M26)

### String Junk Mill

The String Mill is designed to clean out casing and whipstock windows. Their short leading and trailing angles, allow the mill to clean "bird nest" and other obstructions in the string, while the bottom hole tool is milling. This string mill assures that the milled section maintains full gage.



String Junk Mill  
(M27)

### Pilot Mill

The Pilot Mill is best used for milling stuck tubular, such as liner, liner hanger, wash pipe, rotary shoe or drill pipe. The pilot assembly maintains a centered position on the tubular, while the milling blades mill the product away.



Pilot Mill  
(M12)

### Skirted Junk Mill

The Skirted Junk Mill is designed to milling tubular fish, either inside casing or in open hole. Should the fish be plugged, it is far better to use a shoe-type guide with a flat mill to avoid sidetracking.



Skirted Junk Mill  
(M22)

## JUNK SUB

During drilling process, drilling fishing cup is applied mainly for fishing of shivers and fallen objects such as carbide tooth, drill bit and bearing which can not be carried out of hole by conventional fluid circulation, etc. It possesses important functions to keep hole toe cleaning, increase bit service life, reduce and prevent drill bit from unexpected damage.

### Structure

Due to the fact that the O.D. of external bowl of fishing cup is bigger and a smaller circular space is available between external bowl of fishing cup and well hole; the mandrel diameter at cup mouth is larger so that it has a bigger annular space, therefore, the fluid at the cup mouth forms swirls and suddenly fall down so as to reduce the carrying capacity. By this way, some heavy objects will drop in cup and be fished out so that the purpose of cleaning of hole toe is carried out.



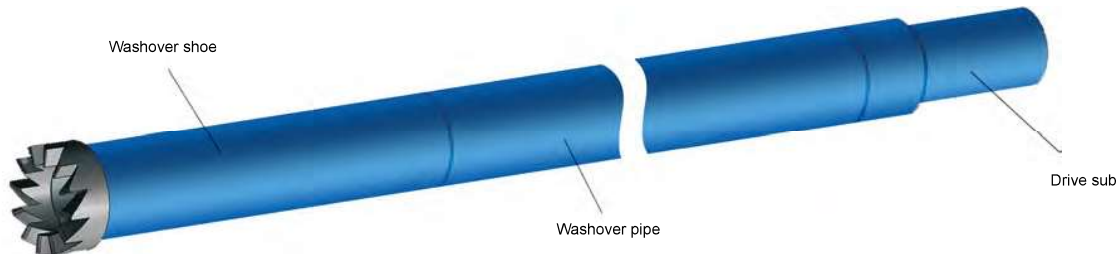
Junk Sub  
(L14)

### Specifications - Junk Sub

Model	OD of lower end × OD of upper end (in)	Bottom Conn. × Top Conn.	ID (in)	L of cup (in)	OAL (in)	Hole size (in)	Product Code
LB79	3.110×3.110	2 3/8 REG B*P	0.748	9.843	33.268	3.500-387.4	L14-7900
LB89	3.504×3.071	2 3/8 REG B*P	0.748	9.843	33.268	4.252-4.626	L14-8900
LB94	3.701×3.110	2 3/8 REG B*P	0.748	9.843	33.465	4.252-4.626	L14-9400
LB102	4.016×3.661	2 7/8 REG B*P	1.252	9.843	33.465	4.626-4.882	L14-10200
LB114	4.528×4.134	3 1/2 REG B*P	1.500	9.843	36.024	5.118-5.866	L14-11400
LB118	4.646×4.134	3 1/2 REG B*P	1.500	9.843	34.449	5.500-5.866	L14-11800
LB127	5.000×4.252	3 1/2 REG B*B	1.500	9.843	33.465	6.000-6.378	L14-12700
LB127	5.000×4.252	3 1/2 REG B*P	1.500	9.843	36.024	6.000-6.378	L14-12710
LB133	5.236×4.764	3 1/2 REG B*NC38 B	1.500	9.843	30.512	6.000-6.378	L14-13300
LB133	5.236×4.252	3 1/2 REG B*P	1.500	9.843	36.024	6.000-6.378	L14-13310
LB133	5.236×4.764	3 1/2 REG B*NC38 P	1.500	9.843	34.449	6.000-6.378	L14-13320
LB133	5.236×4.764	NC38 P*B	1.500	9.843	34.449	6.000-6.378	L14-13330
LB140	5.512×4.764	3 1/2 REG B*NC38 B	1.500	9.843	30.512	6.496-7.500	L14-14000
LB140	5.512×4.252	3 1/2 REG B*P	1.500	9.843	33.465	6.496-7.500	L14-14010
LB140	5.512×4.764	NC38 B*P	2.000	9.843	36.024	6.496-7.500	L14-14020
LB146	5.748×4.764	3 1/2 REG B*NC38 B	1.500	9.843	36.024	6.496-7.500	L14-14600
LB146	5.748×4.252	3 1/2 REG B*P	1.500	9.843	34.449	6.496-7.500	L14-14610
LB165	6.496×5.984	4 1/2 REG B*NC46 B	2.252	9.843	36.024	7.500-8.504	L14-16500
LB165	6.496×5.512	4 1/2 REG B*P	2.252	9.843	36.024	7.500-8.504	L14-16510
LB168	6.614×5.748	4 1/2 REG B*B	2.252	9.843	36.024	7.500-8.504	L14-16800
LB168	6.614×5.984	4 1/2 REG B*NC46 B	2.252	9.843	36.024	7.500-8.504	L14-16810
LB168	6.614×5.512	4 1/2 REG B*P	2.252	9.843	36.024	7.500-8.504	L14-16820
LB178	7.008×6.260	4 1/2 REG B*NC50 B	2.252	9.843	36.024	8.622-9.626	L14-17800
LB178	7.008×6.496	4 1/2 REG B*NC50 B	2.252	9.843	36.024	8.622-9.626	L14-17810
LB178	7.008×6.260	4 1/2 REG B*NC46 B	2.252	9.843	36.024	8.622-9.626	L14-17820
LB178	7.008×5.748	4 1/2 REG B*P	2.252	9.843	36.024	8.622-9.626	L14-17830
LB178	7.008×6.496	NC50 P*B	2.252	9.843	37.008	8.622-9.626	L14-17840
LB194	7.008×6.496	4 1/2 REG B*NC50 P	2.811	9.843	37.402	9.016-10.748	L14-19400
LB219	8.622×7.008	6 5/8 REG B*NC50 B	3.000	9.843	36.024	9.606-11.378	L14-21900
LB219	8.622×7.756	6 5/8 REG B*P	3.000	9.843	36.024	9.606-11.378	L14-21910
LB219	8.622×7.992	6 5/8 REG B*P	3.000	9.843	36.024	9.606-11.378	L14-21920
LB241	9.488×7.992	6 5/8 REG B*P	3.000	9.843	37.402	11.496-12.992	L14-24100
LB245	9.646×7.992	6 5/8 REG B*B	3.000	9.843	36.024	11.496-12.992	L14-24500
LB245	9.646×7.992	6 5/8 REG B*P	3.000	9.843	37.402	11.496-12.992	L14-24510
LB245	9.646×7.992	6 5/8 REG P*B	3.000	9.843	37.008	11.496-12.992	L14-24520
LB273	10.748×7.992	6 5/8 REG B*P	3.000	9.843	37.205	12.992-14.764	L14-27300
LB327	12.874×9.488	7 5/8 REG B*B	3.000	9.843	37.402	14.764-17.500	L14-32700
LB327	12.874×9.488	7 5/8 REG B*P	3.000	9.843	37.992	14.764-17.500	L14-32710
LB327	12.874×9.488	7 5/8 REG P*B	3.000	9.843	40.945	14.764-17.500	L14-32720

## WASHOVER PIPE

Washover pipe is a special tool to release the stuck section of drillstring in the well bore. BOT offers a complete range of washover pipe in the industry. BOT unique FJWP thread is a two-step double shoulder thread which assure quick make up and high torsion strength.



### Specifications - Washover Pipe

Model	Product Code	O.D	I.D	Wall Thickness	Min. Hole Size	Max. Mill Size	Max. Tensile Load kN	Connection Field Torque N.m	Seal Pressure MPa.
		inch							
TXG114.30-8.56	L21-190	4.500	3.826	0.337	4.750	3.185	390	9490	20
TXG127-9.19	L21-230	5.000	4.276	0.362	5.750	4.000	440	12202	20
TXG139.70-9.17	L21-270	5.500	4.778	0.361	6.000	4.625	500	14914	20
TXG146.05-7.92	L21-300	5.750	5.126	0.312	6.375	5.000	500	14914	20
TXG146.05-9.00	L21-320	5.750	5.041	0.354	6.375	4.750	560	16269	20
TXG168.28-8.94	L21-380	6.625	5.921	0.352	7.375	5.625	600	21693	15
TXG177.80-9.19	L21-420	7.000	6.276	0.362	7.875	6.000	640	24404	15
TXG193.68-9.53	L21-490	7.625	6.875	0.375	8.375	6.625	700	31183	15
TXG193.68-10.92	L21-500	7.625	6.765	0.430	8.375	6.500	810	36607	15
TXG193.68-12.70	L21-510	7.625	6.625	0.500	8.375	6.375	1060	43386	15
TXG203.20-9.53	L21-530	8.000	7.250	0.375	8.500	6.969	820	32539	15
TXG206.38-9.40	L21-540	8.125	7.385	0.370	8.500	7.000	830	32539	15
TXG219.07-11.43	L21-600	8.625	7.725	0.450	9.625	7.375	1100	47453	15
TXG219.07-12.70	L21-610	8.625	7.625	0.500	9.625	7.250	1220	54232	15
TXG228.60-10.80	L21-620	9.000	8.150	0.425	9.875	7.875	1260	47453	15
TXG244.48-11.99	L21-690	9.625	8.681	0.472	10.500	8.375	1460	67791	15
TXG244.48-13.84	L21-700	9.625	8.535	0.545	10.500	8.125	1560	81349	15
TXG273.05-11.43	L21-720	10.750	9.850	0.450	11.435	9.375	1620	81349	15
TXG273.05-12.57	L21-730	10.750	9.760	0.495	11.750	9.250	1640	88128	15
TXG298.44-12.42	L21-750	11.750	10.772	0.489	12.750	10.375	1800	108465	10
TXG339.72-13.06	L21-760	13.375	12.346	0.514	14.375	11.875	2020	149140	10
TXG406.40-16.66	L21-770	16.000	14.688	0.656	17.500	14.000	2500	254894	7.0

# WASHOVER PIPE ACCESSORIES

## Drive Sub

Drive Subs provide the crossover connection between fishing string and the washover pipe. Each is machined from high-grade alloy steel and heat treated to provide maximum strength and durability.

## Lift Plug

Lift Plug is designed to provide an economical method of handling washover strings. It is available in all thread types and size, has sufficient shoulder diameter to support handling the washover string.

## Washover Safety Joint

Washover safety joint is manufactured to provide safe and easy release and make-up whenever disengagement from the washover string becomes necessary. This dependable, field-tough tool is designed to transmit torque in either direction when placed in the washover string.

## Rotary Shoes

Rotary Shoe are manufactured from specially heat treated alloy to provide the ultimate in toughness and durability. They are used to cut a clearance between the fish and the wall of the well bore.



Drive sub



Lift Plug



Washover Safety Joint



Rotary Shoe

## MECHANICAL INTERNAL CUTTER

The ND-J type internal cutter is a down-hole cutting tool designed to cut casings, tubings and drill pipes mechanically. It owns some advantages of simple structure, reliable performance, high cutting efficiency. In order not to cut casings, tubing couplings, before run in hole, the cutter shall be kept away from collar position, if condition is allowed, it can be used with collar finder. It can be used with releasing spear, the cut off pipe strings can be either pulled out of hole with cutter or caught out by fishing tools alone.

### Working principle

When internal cutter is run in estimated depth down-hole, right to rotate mandrel of cutter for three circles so that sliding sleeve separates off sliding sheet. At the time, the friction block closes against pipe wall due to the function of spring, the parts on centralizing body and slips don't rotate in pace with mandrel but move up due to engagement of sliding sleeve and sliding sheet, also at the time, down the drill string the slip diameter is expanded due to sloping function of slip cone-shaped body, the slip bites the inner wall of pipe, then cutter is anchor bolted on pipe wall. In this case, lift up mandrel about 10mm, then lower and rotate mandrel slowly, so that three cutters radial open up depending on cutter push block, cutting operation can be done. The cutting operation is not finished until mandrel press against end Face of thrust ring. When lift up mandrel, under double functions of blade spring and its self-weight, three cutters separate off inclined Face and take back blade edges, additionally, sliding sleeve and slip sheet come back to original engagement depending on slip sheet spring and structure of tooth threads. Meanwhile, the slip cone moves up in pace with mandrel so that slip looses cutting tools bolted on pipe wall and continues to move up until upper cone-shaped face of guide nut with draw against tooth face of locking ring before pull out of tools cut.



Mechanical Internal Cutter  
(X04)

### When ordering please specify:

- Pipe size and weight to be cut.
- top connection.

### Specifications - Mechanical Internal Cutter

Model	Product Code	O.D. (in)	Connection Box	ID (in)	ID of cut pipe (in)	OD of cut pipe (in)
ND-J73×55	X04-73000	2.165	1.9 NU	0.315	2.323-2.441	2 7/8
ND-J89×67	X04-89000	2.638	1.9 EU	0.512	2.756-3.071	3 1/2
ND-J114×91	X04-114000	3.583	NC26	0.630	3.819-4.094	4 1/2
ND-J127×102	X04-127000	4.016	NC26	0.709	4.213-4.528	5
	X04-127100		2 7/8 REG			
ND-J140×112	X04-140000	4.409	NC31	0.591	4.646-5.039	5 1/2
	X04-140100		2 7/8 REG			
ND-J178×145	X04-178000	5.709	NC38	1.496	5.906-6.535	7
	X04-178100		NC31			
	X04-178200		3 1/2 REG			
ND-J245×210	X04-245000	8.268	NC50	1.969	8.504-8.976	9 5/8



# MECHANICAL EXTERNAL CUTTER

WD-J type is are automatic spring-fed cutters that provide fast, efficient, External cutting and recovery of long sections of tubing, drill pipe, casing, and the corresponding size pipe fish. The spring-fed feature prevents excessive strain from being applied from the rig floor, which could cause the knives to burn or break.

## Work Principle

After the tool connected with the wash over pipe under to the predetermined cutting position, lift the cutter, the spring dog inside the cutter on the preload sleeve withstands the shoulder of fish sub.

If we continue to lift, the body through shear pins impels feed ring together upward movement, the spring stress compression, When the lift force over shear pins load, shear pins cut off .The spring impels the feed link downward movement: and it could let the knives rotary to the cutter center. Rotary tool, the spring impels the feed ring gradually downward to feed knives with the function the spring elastic potential energy, until the fish cut off, after cut off the fish, the preload sleeve card tight wrap catches the fish which cuts off to extract together.

## When ordering please specify

- Hole size;
- Pipe O.D to be cut;
- Top connection.



Mechanical  
External Cutter  
(X05)

## Specifications - Mechanical External Cutter

Model	Product Code	O.D. (in)	Dimension of cutting fish (in)	Max. joint O.D. of cutting fish (in)	Recommend connection Box	Lifting fish capacity KN	Shear force of shear pin KN	Axial force of push knife KN
WD-J102×154	X05-102100	6.063	4.000	4.764	5 1/2 LCSG	20	10-20	10-30
WD-J140×206	X05-140100	8.110	5.500	6.496	Users homemade	20	10-20	10-30

## MULTI-STRING CUTTER

BOT Multi-string Cutter is built to withstand extreme shock encountered in cutting multiple strings of uncategorized conductor pipe. Due to the unique construction of this tool, the rugged cutter arms expand outward up to 5 times the diameter of the tool body and achieve maximum stability under all types of adverse cutting conditions, including hard spots, eccentricity, interrupted cuts, etc.

For example, the 13 3/8" casing cutter measures only 11 3/4" diameter and cuts all ranges and weights of pipe through 60".

### Features and Benefits

- Cuts multiple strings smoothly, even the strings are not concentric;
- Affords maximum expansion of blades up to 5 times body diameter;
- Rugged 3-blade construction provides fast cut at high speeds;
- Cutter arms can be changed on rig floor.

### When ordering please specify

- Casing size or range to be cut;
- Top connection;
- Body OD.

### Specifications - Multi-String Cutter

Model	Product Code	Body O.D (in)	Connection	Casing Range	Optional knives
GD127	G01 127 00	4"	2-7/8 REG	5"-9 5/8"	5"
					5"-7"
					5"-9 5/8"
GD140	G01 140 00	4 3/8"	3-1/2 REG	5 1/2"-9 5/8"	5 1/2"
					5 1/2"-7"
					5 1/2"-9 5/8"
GD178	G01 178 00	5 3/4"	NC38	7"-16"	7"
					7 5/8"-8 5/8"
					8 5/8"-11 3/4"
					11 3/4"-16"
GD210	G01 210 00	8 1/4"	6 5/8 REG	9 5/8"-30"	9 5/8"
					10 3/4"-13 3/8"
					10 3/4"-16"
					13 3/8"-20"
GD298	G01 298 00	11 3/4"	6 5/8 REG	13 3/8"-60"	20"-30"
					13 3/8"-16"
					13 3/8"-20"
					13 3/8"-30"
					20"-30"
					20"-36"
					30"-60"



Multi-String Cutter  
(G01)

## SECTION MILL

Section mills are primarily used to mill sections in the casing for: Sidetracking, gravel packing, and/or perforation zones. BOT section mill is available in a variety of Casing sizes, ranging from 4 1/2" to 13 3/8". The blades are dressed so that all blades simultaneously mill the casing, with the milling rates usually limited by the ability of the fluids to remove the cuttings from the hole.

### When ordering please specify:

- Tool model
- Size and weight of Casing to be milled
- Top connection



Section mill

### Specifications - Section Mill

Model	DXG114	DXG127	DXG140	DXG168	DXG178
Product Code	D111400	D112700	D114000	D116800	D117800
Casing Size (in)	4 1/2	5	5 1/2	6 5/8	7
Body O.D (in)	3 3/4	4 1/8	4 1/2	5 1/2	6
Fishing Neck O.D (in)	2-3/8 REG	2-7/8 REG	2-7/8 REG	3-1/2 REG	3-1/2 REG

Model	DXG194	DXG219	DXG245	DXG273	DXG298	DXG340
Product Code	D119400	D121900	D124500	D127300	D129800	D134000
Casing Size (in)	7 5/8	8 5/8	9 5/8	10 3/4	11 3/4	13 3/8
Body O.D (in)	6 1/2	7 3/8	8 1/4	9 1/4	10	11 1/2
Fishing Neck O.D (in)	3-1/2 REG	4-1/2 REG	4-1/2 REG	6-5/8 REG	6-5/8 REG	6-5/8 REG

## TYPE H SAFETY JOINT

H type safety joint, which is installed on the position required for subsurface drill stem and can bear in fishing operation all kinds of loads for pulling or pressing and used to transmit torque, is a subsurface safety equipment. In down hole operation, in case of being needed, the safety joint is easy to be discharged off so as to take out the drill stem above it. It is easy to butt the safety joint to go on fishing operation when running in hole again.



Type H Safety Joint  
(A02)

### Specifications - H Type Safety Joint

Model	Product Code	O.D. (in)	I.D. (in)	Thread Connection
HAJ89	A020890	3.504	0.591	NC26
HAJ95	A020950	3.740	0.787	NC26
HAJ105	A021050	4.134	1.181	NC31
HAJ121	A021210	4.764	1.496	NC38
HAJ159	A021590	6.260	1.969	NC46 , NC50
HAJ165	A021650	6.496	1.969	NC46 , NC50
HAJ178	A021780	7.008	2.244	NC50 , 5 1/2 FH
HAJ203	A022030	7.992	2.811	6 5/8 REG

## TYPE AJ SAFETY JOINT

AJ type safety joint is a specialized joint consisting of two parts. The specialized joint takes protective effect for drilling stem in drilling, repairing and test oil (gas) engineering, etc. It is used to treat well bottom accident and used to be on-the-way test in drilling and coring operation. It is connected to the required position of drilling stem to protect drilling stem without any influence on the normal working of drilling tool.



Type AJ Safety Joint  
(A01)

### Specifications - AJ Type Safety Joint

Model	Product Code	O.D. (in)	I.D. (in)	Thread Connection
AJ-C86	A010860	3.386	1.496	NC26
AJ-C95	A010950	3.740	1.732	NC26
AJ-C105	A011050	4.134	2.008	NC31, 2 7/8 NU, 2 7/8 EUE
AJ-C121	A011210	4.764	2.244	NC38
AJ-C159	A011590	6.260	2.811	NC46 , NC50
AJ-C165	A011650	6.496	2.811	NC50
AJ-C178	A011780	7.008	2.811	NC50 , 5 1/2 FH
AJ-C203	A012030	7.992	2.992	6 5/8 REG
AJ-C228	A012280	8.976	2.992	7 5/8 REG

# IMPRESSION BLOCK

Impression Block is an effective tool used to determine dimensions, configuration, condition, and location of the top end of a fish in the hole.

## Construction

BOT Impression Blocks are manufactured with a high strength alloy steel body and a soft lead insert at the lower end. All impression blocks are provided with a watercourse for flushing the top of the fish before lowering the tool against it. Impression blocks without a watercourse can be furnished upon request.

## Operation

Make up the impression block to the bottom of the fishing string and run into the hole. Do not rotate. Slowly lower the impression block to the point of contact with the fish. Apply weight to the impression block and lift it from the hole.

When ordering, please specify:

- Complete assembly or part number
- Top connection
- Lead O.D.

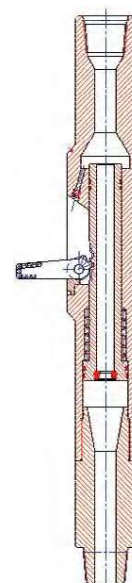


Impression Block  
(X03)

## Specifications - Impression Blocks

Specification	Product Code	Thread Connection		I.D. of Lead Die (in)	Total Length (in)
		O.D. (in)	Thread Model (in)		
270	x03-27000	7.992	6 5/8 REG	1.575	14.961
225	x03-22500	6.496	4 1/2 IF	1.575	14.961
195	x03-19500	6.260	4 IF	1.181	14.567
170	x03-17000	4.764	3 1/2 IF	1.181	14.567
120	x03-12000	4.134	2 7/8 IF	0.787	13.780
100	x03-10000	3.504	2 3/8 IF	0.787	13.780

## UR-I UNDER REAMER



UR-1 Under reamer is used for enlarging the hole size under the casings.

### Specification:

Model	Ream Range (inch)	ID mm(inch)	Conn.	OAL mm(inch)
UR- I 241	(5-7/8"~9-1/2")	38.1(1 1/2)	3-1/2REG	1369(54)
UR- I 609	(12"~24")	71.4(2 13/16)	6-5/8REG	1977(78)

## UR-II Drilling Type Variable Diameter Hole Openers



UR-II Drilling type variable diameter hole opener is a tool to enlarge the hole size in drilling operation, and save the trip times. It can expediently control the cutters to expand and shrink. It has the advantages of exquisite structure, convenient control and flexible action.

Features: According to different requirements, it could be adjusted to relevant diameter in maintenance workshop.

### Specification:

Model	Ream Range (inch)	ID mm(inch)	Conn.	OAL mm(inch)
UR- II 184	(8-1/4"~13")	44.5(1 3/4)	4-1/2REG	2418(95)



## Interchangeable Blades Stabilizer



SJ-TY Interchangeable blades stabilizer is the new generation production of integral blade stabilizer. It has sixteen diameters by changing the blades in different height and the spacers in different thickness. Its oriented and stability can be improved by changing the blades. It is an ideal tool for the drilling operation which has no based installation and located faraway place. We can change the blades quickly and easily, so that reduce the stock and delivery cost. All sizes stabilizers with this kind of design have successfully used in various wells. Our SJ-TY interchangeable blades stabilizers are produced according to API and NS-1.

### Specification:

Model	Fishing Neck OD mm(inch)	Body OD mm(inch)	ID mm(inch)	Conn.	OAL mm(inch)	Interchangeable Diameters mm(inch)
SJ-TY17"	864(34)	241.3(9 1/2)	76.2(3)	7 5/8 REG	2650(104)	417.50(16 7/16)~444.50(17 1/2)

### How to order:

Because of the difference in blade hard facing thickness, above sizes will have small changes. We suggest that you should measure the stabilizer's sizes before installed on drill-stem. The stabilizer should be used under gauge 1/4". Please specify specification, connections and other requirements.

## Hydraulic Adjustable Stabilizer



Hydraulic adjustable stabilizer is a new type downhole tools which have new and originality structure. In directional well drilling process, using the extended of bearing block to contact the wall of well. It will insure that the hydraulic variable diameter stabilizer worked with different drilling tools to increase and stabilize the hole angle. It is suitable for deviated and horizontal wells. The features are easy operation, small friction, stable drilling, easy screw off and smoothly tripping. It is an ideal stabilizer in directional well.

### Specification:

Model	Diameter Changing Range mm(inch)	ID mm(inch)	Conn.	OAL mm(inch)
WLB216	196.9(7 3/4)~215.9(8 1/2)	38.1(1 1/2)	NC50	3038(119 1/2)

## MCCS



The Multi-cycle circulating sub is a sub to provide cycle and cooperate by dropping the ball several times. The operating steps of this tool is to achieve "shift" of product structure by dropping ball operation. It can generate a definite open or close position when dropping.

The drop ball cannot be pumped thru the tool during the cycle open function.

Advantage:

- 1) The Multi-cycle circulating sub is the perfect tool for use in high angle and horizontal wells.
- 2) According to the standard, all tools have two large circulating ports which greatly reduce the risk of plugging.
- 3) The Multi-cycle circulating sub is the only tool that permits full TFA reverse circulation.
- 4) Due to the unique design of the Multi-cycle tool, the flow ports are open before the activating ball reaches the catcher seat, in order to prevent the ball into the process being crushed.
- 5) The Multi-cycle circulating sub can be opened in a fixed position when it has run into the well bore.
- 6) The Multi-cycle circulating sub permit open and close at least six times, this number can be increased on request.

Our MCCS is widely use in Middle-East and Russia.



### Specification:

Model	OD mm(inch)	ID mm(inch)	Conn.	OAL mm(inch)
MCCS121	121(4-3/4)	45(1-3/4)	NC38	2705(106-1/2)
MCCS165	165(6-1/2)	63.5(2-1/4)	NC50	3445(135-5/8)
MCCS178	178(7)	63.5(2-1/4)	NC50	3445(135-5/8)

## High Speed Bypass Valve

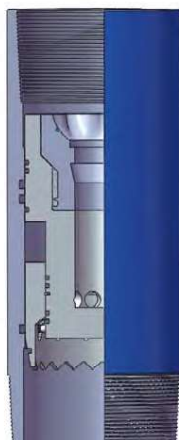


High speed bypass valve provides the circulating cooperation by pressure difference to control the bypass orifice open and close. It is an ideal tool in large displacement well and horizontal well.

### Specification:

Model	OD mm(inch)	ID mm(inch)	Upper Conn.	Lower Conn.	OAL mm(inch)
TPF121	121(4-3/4)	25.4(1)	NC38	3-1/2REG	1270(50)
TPF159	159(6-1/4)	38.1(1 1/2)	NC50	4-1/2REG	1270(50)

## Floatation Collar

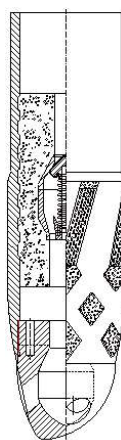


Floatation collar is used for completion in extended reach well. It seals the light weight liquid and gas in casings by the sealing device to reduce the casing string weight in drilling fluid, so that the friction between casings and well bore can be reduced effectively. It can solve the difficult problems in completion operation of extended reach well. Its advantages are simple and practical structure, low cost in completion operation, reduce the friction to running the casings to the point. It widely used in completion operation of extended reach well. It can work with our float collar, float shoe and cementing plugs, and successfully used in North Sea Oilfield.

### Specification:

Model	OD mm(inch)	OAL mm(inch)
PFG5-1 /2	153.7	662(26)
PFG 7	195.5(7-11/16)	662(26)
PFG 9-5/8	270(10-5/8)	715(28)

## Reamer Shoes



Reamer shoes overcome wellbore obstructions and guid the casing or liner to total depth. Our reamer shoe designs use an eccentric guide nose to negotiate ledges and other obstructions while its integrated cutting structures simultaneously ream out tight spots. Our reamer shoe is a economical and practical tool. It has short shape and best cutting structure. So it can relieve the expectable and unexpectable difficulties in running casing process.

### Specification:

Model	Upper Conn.	OD mm(inch)	OAL mm(inch)
KYFX270	According to client's requirments	304.8(12)	1056(41 1/2)

## DMS Casing Anchor



DMS Casing anchor can anchor the casing bottom and formation together in well bore. It can give the prestressing force to casings in well cementing operation after installing this device. This prestressing force can be kept after the solidification of cement, so that it can avoid or reduce the damage of casing in high temperature drilling. It is the necessary downhole tool to lift the casing prestressing force in high temperature well. It used more reliably in loose expanding formation, deep shrinkage hole and irregular hard hole.

### Structure

Our casing anchor has two stages structure. It mainly consists of main body, double check valve assembly, center pipe and pipe connecting group, first stage anchoring hand, second anchoring hand and guid shoe.

**Specification:** For 5-1/2" ~ 9-5/8" casing

## Top drive Floating Cushion Sub



Top drive floating cushion sub is an important tool in drilling operation. It is suit to the drilling process in oil, gas and geological exploration. Mainly used for top drive drilling operation. It can increase the working life of bearing and gear in top drive rotary box.

### Specification:

OD mm(inch)	Upper Conn.	Lower Conn.	Lifting force (T)	Torque (KN.m)	Stroke mm(inch)	OAL mm(inch)
DQJT381(15)	6-5/8REG	NC50	150	30	76(3)	798(31 3/8)

## JQ-YS Double Way Hydraulic Shock Absorber



JQ-YS double way hydraulic shock absorber is worked with cone bit or abrasiveness core bit to absorb the shock force in vertical and axial direction. It can not only absorb and reduce the vertical shock force and load, and also can absorb and reduce the axial shock loading, so that keep the normal bit pressure and torque. It will realize the best bit pressure and rotate speed in drilling or coring operation. It is better than normal shock absorber on increasing bit working life, protecting the drilling tools and ground equipments, reducing the drilling costs and increasing the drilling efficiency. It is an ideal shock absorber for drill string.

### Specification:

Model	OD mm(inch)	ID mm(inch)	Max. Stroke mm(inch)	Conn.
JQ-YS178	178(7)	50(2)	100(4)	NC50

## Single-arm Bucking Unit



Single-arm bucking unit is used for breaking out, making up and repairing the connections of pipes, tubular and downhole drilling tools. It is also used for assembling the IBOP for top drive. It is designed on the base of foreign similar equipments technology, and produced according to clients' actual requirements. The advantages are high automaticity and easy operation.

### Main property

Max. Torque: 120KN • m  
Rated Pressure: 20Mpa  
Application Diameter: 150-280mm



## CERTIFICATION AND QUALIFICATION

BOT has distinct department for the quality inspection, metering and material testing. There are many metalloscopes, profile projectors and carbon and sulfur analyzers which were made in Germany, Japan and Taiwan. all the facilities keep our quality control system's leading position in China and abroad.



① Rockwell hardometer can be used to test material samples' Rockwell hardness.(Left). Brinell hardness tester can be used to test material samples' Brinell hardness.(Right)

② Global performance 12.30.10 moving bridge three-coordinate measuring machine.

③ Metalloscopes are used for the test and analysis of the metal's metallurgical structure. Before and after heat treatment, the metalloscopes are used to analyze the microstructure of the metal and the quality of carburization.



④ Impact testing machine are necessary in testing mechanical properties of the products and impact value of KA.

⑤ Universal testing machine is used to test the tensile strength, yield strength, compressive strength, extensibility and shrinkage of materials. Universal tester can also provide different type of bending or flex test.

⑥ Micro-full-automatic Carbon & Sulfur Analyzer provides test and analysis of material sample for reagent.



⑦ Magnetic powder flaw detector provides surface inspection of material with fluorescent magnetic particle. It detects and highlights any defects on the surface.

⑧ Profile Projector in the lab provides geometry test for inspection tools and cutters. They are regarded as a precision measuring device in quality control.

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