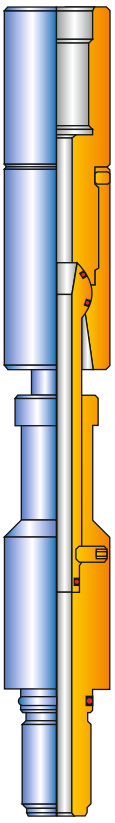
KNUCKLE JOINT

The Knuckle Joint, when incorporated between the jars and the manipulation tool, provides additional flexibility in the tool string.

The Knuckle Joint allows a full 360° rotation of the toolstring and provide a full 15° angular deviation and internal pressure sealing throughout the full rotation of the tool.

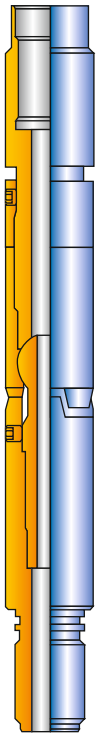
The ball and socket of the knuckle joint provide the rotation and angular deviation of the tool. Seals in the ball provide the sealing capability.



KNUCKLE JOINT

KNUCKLE JOINT					
Maximum O.D. (in)	**Minimum I.D. (in)**	**Tensile Strength (Standard Service)**	**Make-up Length (in)**	**Internal Ball Clearance (in)**	**Angle Of Deviation**
1.687	0.500	40,000 LBS	10.461	7/16	15°
1.750	0.500	60,000 LBS	10.461	7/16	15°
2.125	0.500	56,000 LBS	9.260	7/16	15°
2.375	0.750	60,000 LBS	9.604	11/16	15°
3.125	1.000	100,000 LBS	11.000	15/16	15°

TORQUE THRU KNUCKLE JOINT



TORQUE THRU KNUCKLE JOINT

The Torque Thru Knuckle Joint, when incorporated between the jars and the manipulation tool, provides additional flexibility in the tool string.

The torque thru knuckle joint is used when rotation of the tool string is not required. The top sub and housing of the knuckle joint have keys that prevent rotation but still allows full angular movement.

TORQUE THRU KNUCKLE JOINT						
Max. O.D. (in)	**Min. I.D. (in)**	**Tensile Strength (Standard Service)**	**Make-up Length (in)**	**Internal Ball Clearance (in)**	**Angle Of Deviation**	**Min. Torque FT/LBS**
1.687	0.500	40,000 LBS	10.461	7/16	15°	500FT/LBS
1.750	0.500	60,000 LBS	10.461	7/16	15°	500FT/LBS
2.125	0.750	50,000 LBS	10.669	11/16	15°	600FT/LBS
2.250	0.750	55,000 LBS	10.669	11/16	15°	600FT/LBS
2.375	0.750	60,000 LBS	11.115	11/16	15°	600FT/LBS
3.125	1.000	100,000 LBS	12.100	15/16	15°	750FT/LBS