

Drilling products and solutions



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A Reliable Partner Offering Solutions for All Drilling Environments

With the days of easily accessible oil & gas fields becoming numbered, exploration and production is moving to even harsher environments. Drillers today contend with tougher operating conditions, greater technological challenges and increased risks. All the more reason to choose a partner with a proven track record of providing innovative solution packages that secure reliable operation and availability day in and day out, even under the most challenging conditions.

With experience in the world's most complex wells,

- COMMAND SMFI solutions to meet challenges head on in: → Offshore environments with products capable of drilling:
- > in water depths exceeding 12,000 ft (3,700 m)
- > on platforms, jackups, drillships, and semisubmersibles
- > in extended reach, deviated, and deep wells
- > despite unexpected pressure variations and low pressures in reservoir

> while withstanding corrosion, storms, high seas, and strong currents

-> Conventional and unconventional onshore environments

with products that either provide resistance or mitigate risks associated to:

- > excessive drill string buckling
- > high side forces
- > high drag and low torque
- > reduced rate of penetration
- > lost circulation
- > ineffective hole cleaning
- > excessive pipe belly wear
- > vibrations and stick-slip
- > short tubular life
- > difficulty getting weight on bit

→ Sour Service environments with specially designed drill pipe and BHA grades guaranteeing the necessary resistance to H_2S . Whatever the environment, COMMAND SMFI has the solutions to guarantee exceptional performance.



Your One Stop Shop for All Products from the Rig Floor to the BHA

COMMAND SMFI offers the following standard product lines:

Drill Pipe 2-3/8" to 6-5/8" OD, Range 2 and 3

Heavy Weight 2-7/8" to 6-5/8" OD, welded or integral

Drill Collars 2-7/8" to 11" OD, slick or spiral

API and High-Performance Connections

> API connections

> Proprietary connections upon request

Steel Grades

API, Sour Service, high strength and non-mag material grades.

Drill Stem Accessories

Square or hexagonal kellys, RDCV, Kelly Cocks, I-BOP, valve repair kits, valve spare parts, pup joints, crossovers, bit subs, lifting subs, saver subs, pump-in subs, side entry subs, and circulating subs. COMMAND SMFI is more than a manufacturer of drilling tubulars, supplying a complete range of proprietary drill stem products. We also design and provide tailormade solutions to help clients succeed in increasingly challenging well profiles and drilling programs.



Onshore Drilling

Application

Onshore or land base drilling is defined as drilling with rigs that are moved in by ground transportation and the drilling site is not over water. Many of these wells are now being drilled using a technique called pad drilling where multiple wells are drilled from the same site in very close proximity of each other by shifting the rig slightly. Typically, these are mature fields, pushing the drilling envelope farther to more challenging well formations like new shale fields or very deep wells.

Challenges

Onshore drilling has many different challenges related to industry economics, equipment used, location of the field, well profile and formations.

> Rig day rates make running a rig expensive, which means that the speed of rigging down, moving and rigging up is crucial to guarantee project success. Drilling equipment has to be reliable and easy to handle on the rig floor.

> The physical location of the well site sets limits on the size and type of drilling equipment and sometimes the drill string. Well sites in Arctic areas, for example, have surface equipment and downhole equipment that are exposed to extreme surface temperatures for long periods before use, which can impact their performance.

> Well profiles and formations determine drill string requirements:

- H₂S wells require use of special steels to resist Sulfide Stress Cracking.
- ERD or deep wells require the drill pipe in the upper part of the string to have high tensile strength.
- Extended reach wells and ultra-extended reach wells can be difficult to drill because they may be limited by the increased torque and drag of the drill string.
- Small clearance wells will drive Equivalent Circulating Density (ECD) higher, put additional stress on formations and increase circulation pressures.

Products & Solutions

COMMAND SMFI offers custom drill strings to meet onshore challenges head-on:

> High performance proprietary connections that can be matched with ODs and IDs to provide optimized torque, tensile and hydraulic impact for the particular program.

- > Multiple grades and weights
- > Drill string products for H₂S environments

Application

"Sour Service" refers to a well environment containing Hydrogen Sulfide (H_2S), which can significantly impact steel drilling tubular performance. It is also well known that H_2S is hazardous to human health, living organisms and generally to the environment.

Historically, this is the reason wells found with Sour gas were often carefully plugged and abandoned. With the increasing demand for domestic gas worldwide, some major Sour fields are now being explored and developed.

Challenges

The physical phenomenon associated with Sour Service environments and affecting steel based products under applied or residual stress is known as H_2S embrittlement or more specifically as Sulfide Stress Cracking (SSC).

 H_2S in combination with water and low pH will react with pipe surface, releasing free hydrogen, which can be absorbed through the steel's surface. At this point, hydrogen particles diffuse further into the steel matrix and interact with the steel itself, making it brittle.

The key factors leading to SSC are elevated H_2S content, low temperatures, low pH, and the high stress state of the material (tensile stress). When these factors are combined, a crack can initiate in the material and propagate until catastrophic failure, even when stresses are substantially inferior to the yield limit of the material.

Specially designed grades are essential to guarantee the necessary H_2S resistance and to ensure the safety of those working in such harsh environments.

Products & Solutions

COMMAND SMFI's Sour Service proprietary grades are renowned for their performance. Our extensive research, development facilities, and our internationally recognized expertise have combined to produce outstanding critical service material.

Today, COMMAND SMFI is able to guarantee the superior performance of its material in the toughest sour environments around the world. Due to the astringency of the Sour environment, particular attention needs to be paid when selecting and characterizing adapted Sour Service steel grades. Controlling critical manufacturing parameters is also a requirement to ensure superior product performance. Steel microstructure, chemical composition, cleanliness, and heat treatment process controls are essential for high sulfide stress cracking resistance.

Geothermal Drilling

Application

Geothermal energy uses the earth's thermal energy generated and stored in the earth's geology from the core to the surface. Steam, hot water and minerals are some of the most important direct products of geothermal resources. Convenient access to this energy source is concentrated at the margins of the earth's tectonic plates where conventional drilling techniques and equipment can best be exploited. Geothermal drilling is used to access this stored energy through a process of creating boreholes in the earth to extract the earth's heat. Most of today's geothermal drilling projects are located in continental Europe, the Philippines, Indonesia, New Zealand, and the Americas.

Challenges

Geothermal well profiles are characterized as challenging. Hydrogen sulphide, high torsion, high temperatures and punishing wear are a few of the extreme conditions, which may be experienced during geothermal drilling. The extremely hard and abrasive rock formations found in geothermal wells result in torsion levels and equipment wear which may be higher than those found in oil and gas drilling.

Products & Solutions

COMMAND SMFI offers custom drill strings to meet geothermal challenges head-on :

high performance connections – high torque double shoulder connections offered upon request.

Hardbanding products are applied to tool joints and upsets/wear pads as a hard and extremely abrasion-resistant sacrificial layer. We offer alloy steel and tungsten carbide hardband products to suit the drilling conditions and specific client requirements from our portfolio of proprietary hardband products and specialist manufacturers.



Sour Service Grades

Operational Challenges

The physical phenomenon associated with Sour Service environments and affecting steel based products under applied or residual stress is known as H_2S embrittlement or more specifically as Sulfide Stress Cracking (SSC). H_2S in combination with water and low pH will react with pipe surface, releasing free hydrogen, which can be absorbed through the steel's surface. At this point, hydrogen particles diffuse further into the steel matrix and interact with the steel itself, which becomes brittle. The key factors leading to SSC are elevated H_2S content, low temperatures, low pH, and the high stress state of material (tensile stress). When these factors are combined, a crack can initiate in the material and propagate causing catastrophic failure, even when stresses are substantially inferior to the yield limit of the material.

Specially designed grades are essential to guaranteeing the necessary H₂S resistance within the steel and to ensure the safety of those working in such harsh environments.

The Solution: Specific Drill String Components Providing Higher Performance and Safety Margins

COMMAND SMFI's Sour Service proprietary grades are renowned for their performance. Our extensive research and development facilities, and our internationally recognized expertise combine to produce outstanding critical service material. We are able to guarantee the superior performance of our material in the toughest sour environments around the world.

Due to the astringency of sour environments, particular attention needs to be paid when selecting and characterizing adapted Sour Service steel grades. Controlling critical manufacturing parameters is also a requirement to ensure superior product performance. Steel microstructure, chemical composition, cleanliness, and heat treatment process controls are essential for high sulfide stress cracking resistance. Such proprietary grades largely exceed the resistance of API grades to SSC, and are being manufactured according to several industry standards such as NACE TM0177 and IRP 1.8.



Our Sour Service HWDP is compliant with API specifications and is more resistant to H₂S than standard grade HWDP.

	Construction	Ys Min KSI	UTI Min KSI	Hardness Single Max HRC	Min Single Impact Charpy Test ft-Ibs@+20C	Material Type	NACE Test
		65	95	22	24	H ₂ S resistant	No
HWDP-65 HW MS	Welded	110	140	36	48	H ₂ S resistant	No
HWDP-110 HW MS	Integral	110	140	36	48	H ₂ S resistant	No

COMMAND SMFI can maximize safety margins in H_2S environments with Sour Service drill collars, pup joints and accessories using ASCOWELL C material.

	Construction	Ys Min KSI	UTI Min KSI	Hardness Single Max HRC	Min Single Impact Charpy Test ft-Ibs@+20C	Material Type	NACE Test
PJ	Integral	110	140	36	48	H ₂ S resistant	No
Drill collars and accessories	Integral	110	140	36	48	H ₂ S resistant	No







Drill Pipe

The Solution: Drill Pipe Designed to Go Deep

COMMAND SMFI, through its mother company Command Tubular Products located in Houston (US) is able to supply Drill Dipesdesigned to provide superior technical performance and a service lifetime exceeding most current industry standards.

Drill Pipe are in conformance with API 5DP, 7-1 & 7-2 specifications:

- > Pipe body OD from 2-3/8" to 6-5/8"
- > Range 2 and 3 lengths
- > And a variety of steel grades:
- > API: E-75, X-95, G-105, S-135, Sour Service Connections
- > API
- > Proprietary high torque double shoulder connections (CET, CDS & others upon request)

Drill pipes are available with:

- > Pipe body OD from 2-3/8" to 6-5/8"
- > 87.5 or 95% minimum wall
- > All tubes/Grades full length ultrasonic inspected (flut)
- > All tool joints exceed API requirements
- > Connection threading is performed to API Spec 7-2
- > Tool joint markings are applied to customer or API RP7G specifications
- > Factory 3 cycle make and break
- Internal Plastic Coating (upon request)
- > High quality hardbanding solutions upon request
- > Full documentation packages provided
- > Phosphate-coated threads
- > NS-1, DS-1 specifications

COMMAND SMFI also has its own tool joint manufacturing capabilities and our tool joints meet or exceed API specifications and tolerance requirements. Each joint is inspected to guarantee visual and dimensional properties and tested to ensure proper mechanical characteristics.

All our tool joints are:

- > 100% magnetic-particle inspected
- Phosphate-coated (anti-galling treatment)
- > Hardness-tested

Operational Benefits

Drill Pipe Internal and External Upset Profile



One of the most critical sections in welded drill pipe is the transition zone between the tool joint and the pipe body. A smooth, gradual transition linked to the superior nature of the purity of our steel ensures minimum stress concentration and greatly improves the fatigue life of the pipe.

Heavy Weight Drill Pipe

The Solution: Transitional and Compressive Load Member

COMMAND SMFI's Heavy Weight Drill Pipe (HWDP) features a tool joint pin and box and a thick-walled tube with a raised central section for wellbore protection of the tube. The central section comes in various designs; slick, spiral, full spiral, or tri-spiral. HWDP can be manufactured as a welded assembly or machined integral from bars.

HWDP in the bottom-hole assembly (BHA) provide a gradual transition between drill pipe and drill collars. Its main function is to transfer surface weight-on-bit (WOB) and pipe rotation to the drilling assembly. It also mitigates drill string fatigue and provides directional control of the BHA. In addition, Heavy Weight Drill Pipe can be used to push or force liners/screens down hole during drilling operations.

Applications

Vertical Drilling

- > Weight-on-bit and compressive load member
- > Transitional and fatigue resistant member
- > Replacement of drill collars

Directional, Horizontal, and Extended Reach Drilling

- > Weight-on-bit and compressive load member
- > Differential sticking and drill string lock-up prevention
- > Directional control of BHA

Remedial Operations

> Provide the weight required for milling, under-reaming, and hole-opening operations









Product Performance

COMMAND SMFI's HWDP conforms to API Spec 7-1 (ISO 10424-1) and API Spec 7-2 (ISO 10424-2).



Product Range and Features

Standard

- > Pipe body OD from 2-7/8" to 6-5/8"
- > API 7.1 & 7.2 specifications
- > Welded and integral constructions
- Slick central section
- Central upset with two bands each of 3" of hardbanding material to protect casing and prevent wear
- > Range 2
- > API & H90 connections

➤ Fatigue resistance features (threads cold rolled, API pin stress relief groove, and API box bore-back)

> Phosphate or zinc coating on threads and shoulders

Options

Central section design: Spiral,
 Full-Spiral or Tri-Spiral

- > Extra-length tool joints for additional re-cuts
- > Sour Service steel grades
- > Internal plastic coating
- > Range 2 and 3
- > NS-1 or DS-1

or customers specifications

> High-performance double shoulder connections upon request

▶ 4" of casing-friendly hardbanding on box and pin

> ID customization





Heavy Weight Spiral Drill Pipe (HWSP)

COMMAND SMFI 's Heavy Weight Spiral Drill Pipe (HWSP) is designed to address differential sticking in vertical and directional drilling environments. Different central upset designs and spiraling configurations are available (spiral, full spiral and tri-spiral) to reduce buckling, risks of differential sticking, improve hole cleaning, and BHA stiffness.

Materials

COMMAND SMFI provides HWDP in standard, Sour Service, or non-magnetic grades.

Standard heavy weight drill pipe (HWDP) is supplied with AISI 1340 steel or equivalent in the pipe body and AISI 4145H or AISI 4140H-modified tool joints. The welded assembly is the standard offer whereas the integral version is considered optional due to plant availability.

ASCOWELL C steel bar grade has been developed to provide resistance to Sulfide Stress Cracking (SSC) for BHA products improving impact strength and fracture toughness. The resistance to sulfide stress cracking significantly surpasses the resistance of AISI 4145H-modified/4140H-modified steel as shown in NACE test TM0177. The ASCOWELL C HWDP provides superior performance in Sour Service applications and continues to be used around the world.

Integral non-magnetic HWDP made of Amagnit[™] 501 is also offered for directional drilling applications.

Application	Material	Size	Yield Strength	Ultimate Strength	Hardness (Brinell)	Elongation	Reduction of Area	Min Charpy
			Min (KSI)	Min (KSI)	(HB)	(A%)	(%)	(ft-lbs @+20°C)
Standard Integral & NS-1	AISI 4145H-modified	All	110	140	285 to 340	13	45	40
Standard welded (central part)	AISI 1340-modified	All	65	95	235 (max)	18	N/A	30
NS-1 welded (central part)	AISI 4140H-modified	All	120	140	285 to 340	13	45	40
Standard welded & NS-1 (tool joint)	AISI 4140H-modified	Up to 7 1/4"	120	140	285 to 340	13	45	40
		Above 7 1/4"	100	135				0
HWDP-110 HW MS	ASCOWELL C	Up to 6 3/4"	110	140	285 to 340	13	45	55
		Above 6 3/4" (up to 8 1/4)	100	135				
HWDP-65 HW MS (tool joint)	ASCOWELL C	Up to 6 3/4"	110	140	285 to 340	13	45	55
		Above 6 3/4" (up to 8 1/4)	100	135				
HWDP-65 HW MS (central part)	AISI 1340-modified	All	65	95	235 (max)	18	N/A	30

Operational Benefits

COMMAND SMFI has been producing high quality Heavy Weight Drill Pipe for over 60 years and is one of the few global suppliers that can offer both HWDP products manufactured from solid bars or assembled from tubes. Our quality standards, manufacturing processes, internal sourcing of green tubes and tool joints, premium connections and product traceability guarantee product performance and reliability.

Heavy Weight Drill Pipe Manufacturing Flow Chart

Central Body







Heavy weight drill pipe is manufactured to customer requirements and, where applicable, to specifications such as API, ISO, NS1, DS1, etc.

Heavy Weight Drill Pipe Data

			Pipe Body	/			Ţ	ool Joint		
Tube OD	Construction	Tube ID	Central Upset Ø	Tube Yield	Torsional Strength	Tensile Strength	Connection	TJ OD	TJ ID	TJ Yield
in		in	in	ksi	ft-lbs	lbs		in	in	ksi
0.7/0	lute avel	1 1/0	0.0/0	110	00.000	F00.000	0.7/0.040	0.1/0	1 1/0	110
2-1/8	Integral	1-1/2	3-3/8	110	22,900	520,000	2 7/8 PAC	3-1/8	1-1/2	110
2-1/8	Integral	1-1/2	3-3/8	110	22,900	520,000	NG26	3-5/8	1-1/2	110
2-1/8	Integral	2-1/16	3-3/8	110	18,100	347,000	NU31	4-1/8	2-1/16	110
2-1/8	Integral	2-1/8	3-3/8	110	17,300	324,000	2 7/8 UH	3-1/8	2-1/8	110
2-1/8	Integral	2-1/8	3-3/8	110	17,300	324,000	2 7/8 SL H-90	4	2-1/8	110
2-1/8	Integral	2-1/8	3-3/8	110	17,300	324,000	2 7/8 SL H-90	4-1/8	2-1/8	110
2-1/8	Integral	2-1/8	3-3/8	110	17,300	324,000	NG31	4-1/8	2-1/8	110
3-1/2	welded	2-1/16	4	55	19,600	345,000	NG31	4–1/8	2-1/16	120
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-11/16	120
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-1/16	120
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2–1/8	120
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-3/16	120
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2–1/4	120
3–1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	43/4	25/16	120
3–1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	4-3/4	23/8	120
3–1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	43/4	2–7/16	120
3–1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	43/4	2–9/16	120
3–1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	5	2-7/16	120
3–1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	5	2–1/4	120
3–1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	5	2–1/8	120
3-1/2	Welded	2–1/16	4	55	19,600	345,000	NC38	5	2–1/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC31	4-1/8	2–1/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2–11/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2–1/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2–1/8	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	23/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2–1/4	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2-5/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2–3/8	120
3–1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-7/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	43/4	2-9/16	120
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	5	2-7/16	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	5	2–1/4	120
3–1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	5	2–1/8	120
3–1/2	Welded	2–1/4	4	55	18,500	310,000	NC38	5	2–1/16	120

2-7/8" - 3-1/2"

		Slick			Spiraled						
Recommended Make-Up Torque	Torsional Strength	Tensile Strength	Box Length	Pin Length	Central Upset	Total Weight	Weight per foot	Unspiraled Upset	Total Weight	Weight per foot	
ft-lbs	ft-lbs	lbs	in	in	in	lbs	lbs/ft	in	lbs	lbs/ft	
											-
4,150	5,220	250,000	21	27	24	532	17.26	25	634	20.60	
4,670	8,220	358,000	21	27	24	565	18.38	25	668	21.72	
6,500	11,400	432,000	21	27	24	440	14.33	25	543	17.68	
4,690	8,260	328,000	21	27	24	399	12.98	25	502	16.32	
6,050	10,600	362,000	21	27	24	409	13.31	25	512	16.65	
6,050	10,600	362,000	21	27	24	420	13.66	25	523	17.00	
6,140	10,800	410,000	21	27	24	419	13.63	25	521	16.98	
7,490	12,500	472,000	21	27	24	729	23.75	25	859	27.98	
10,800	18,100	587,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	867,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	842,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	817,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	791,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	764,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	736,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	708,000	21	27	24	785	25.60	25	915	29.83	
11,500	19,200	649,000	21	27	24	785	25.60	25	915	29.83	
13,200	22,000	708,000	21	27	24	811	26.44	25	941	30.67	
14,900	24,800	791,000	21	27	24	811	26.44	25	941	30.67	
15,900	26,500	842,000	21	27	24	811	26.44	25	941	30.67	
16,100	26,800	867,000	21	27	24	811	26.44	25	941	30.67	
7,490	12,500	472,000	21	27	24	663	21.60	25	793	25.82	
10,800	18,100	587,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	867,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	842,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	817,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	791,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	764,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	736,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	708,000	21	27	24	719	23.44	25	849	27.67	
11,500	19,200	649,000	21	27	24	719	23.44	25	849	27.67	
13,200	22,000	708,000	21	27	24	745	24.28	25	874	28.51	
14,900	24,800	791,000	21	27	24	745	24.28	25	874	28.51	
15,900	26,500	842,000	21	27	24	745	24.28	25	874	28.51	
16,100	26,800	867,000	21	27	24	745	24.28	25	874	28.51	

Heavy Weight Drill Pipe Data

	Pipe Body						Tool Joint				
Tube OD	Construction	Tube ID	Central Upset Ø	Tube Yield	Torsional Strength	Tensile Strength	Connection	TJ OD	TJ ID	TJ Yield	
in		in	in	ksi	ft-lbs	lbs		in	in	ksi	
4	Welded	2_1/2	4_1/2	55	28 200	421 000	NC38	4_3/4	2_9/16	120	
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	4-7/8	2-9/16	120	
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	5	2-9/16	120	
4	Welded	2-1/2	4-1/2	55	28,200	421.000	NC38	4-7/8	2-7/16	120	
4	Welded	2-1/2	4-1/2	55	28,200	421.000	NC38	5	2-7/16	120	
4	Welded	2-1/2	4-1/2	55	28,200	421.000	NC38	5	2-1/4	120	
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC40	5-1/2	2-7/16	120	
4	Welded	2–1/2	4-1/2	55	28,200	421,000	NC46	6	3–1/4	120	
4	Welded	2–1/2	4-1/2	55	28,200	421,000	NC46	6	3	120	
4	Welded	2-9/16	4-1/2	55	27,600	408,000	NC38	43/4	2-9/16	120	
4	Welded	2-9/16	4-1/2	55	27,600	408,000	NC38	4-7/8	2-9/16	120	
4	Welded	2-9/16	4-1/2	55	27,600	408,000	NC38	5	2-9/16	120	
4–1/2	Welded	2–1/2	5	55	42,800	605,000	NC40	5–1/2	2–13/16	120	
4-1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	3–1/4	120	
4–1/2	Welded	2–1/2	5	55	42,800	605,000	NC50	6-5/8	33/4	120	
4-1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	3	120	
4–1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	2–7/8	120	
4-1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	2–13/16	120	
4–1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	23/4	120	
4-1/2	Welded	2–1/2	5	55	42,800	605,000	NC50	6-5/8	3–1/2	120	
4–1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	2–1/2	120	
4-1/2	Welded	2–1/2	5	55	42,800	605,000	NC46	6–1/4	2–1/4	120	
4-1/2	Welded	2–1/2	5	55	42,800	605,000	NC50	6-5/8	3	120	
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC40	5-1/2	2-13/16	120	
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC50	6-5/8	33/4	120	
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC46	6–1/4	3	120	
4-1/2	Welded	2-13/16	5	55	40.100	533.000	NC46	6–1/4	2-13/16	120	
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC46	6–1/4	2-3/4	120	
4-1/2	Welded	2-13/16	5	55	40.100	533.000	NC50	6-5/8	3-1/2	120	
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC50	6-5/8	3	120	
5	Welded	3	5-1/2	55	56,500	691,000	NC50	6-5/8	3	120	
5	Welded	3	5-1/2	55	56,500	691,000	5 1/2 FH	7	3-3/4	120	
5	Welded	3	5-1/2	55	56,500	691.000	NC50	6-5/8	2-3/4	120	
5	Welded	3	5-1/2	55	56,500	691,000	5 1/2 FH	7-1/4	3–1/2	120	

		Тоо	l Joint				Slick			Spiraled	
R	Recommended Make-Up	Torsional Strength	Tensile Strength	Box Length	Pin Length	Central Upset	Total Weight	Weight per foot	Unspiraled Upset	Total Weight	Weight per foot
	ft-lbs	ft-lbs	lbs	in	in	in	lbs	lbs/ft	in	lbs	lbs/ft
4	11,500	19,200	649,000	21	2/	24	893	29.13	25	1,045	34.07
4	12,100	20,100	649,000	21	2/	24	906	29.53	25	1,057	34.47
4	12,100	20,100	649,000	21	27	24	918	29.94	25	1,070	34.88
4	13,200	22,000	708,000	21	27	24	906	29.53	25	1,057	34.47
4	13,200	22,000	708,000	21	27	24	918	29.94	25	1,070	34.88
4	14,900	24,800	791,000	21	27	24	918	29.94	25	1,070	34.88
4	17,900	29,800	897,000	21	27	24	971	31.69	25	1,122	36.64
4	19,900	33,200	901,000	21	27	24	1,032	33.69	25	1,183	38.64
4	23,400	10,200	640.000	21	27	24	1,032	33.09	20	1,103	30.04
4	10,000	19,200	649,000	21	27	24	007	20.20	20	1,019	33.22
4	12,100	20,100	649,000	21	27	24	000	20.00	20	1,031	33.02
4	14,000	20,100	712 000	21	27	24	1 277	29.10	25	1,044	34.04 17.27
4-1/2	10,000	23,300	001 000	21	27	24	1,277	41.70	25	1,431	50.38
4-1/2	22 400	33,200	030,000	21	27	24	1,309	44.71	25	1,545	52.07
4-1/2	22,400	30,000	1 050 000	21	27	24	1,421	40.40	25	1,595	50.38
4-1/2	25,400	41 700	1 120 000	21	27	24	1,369	44.71	25	1,543	50.38
4-1/2	25,800	43 100	1 150 000	21	27	24	1,369	44 71	25	1,543	50.38
4-1/2	26,600	44 400	1 180 000	21	27	24	1,369	44 71	25	1,543	50.38
4-1/2	26,700	44.500	1.110.000	21	27	24	1,421	46.40	25	1.595	52.07
4-1/2	29,600	49,300	1.310.000	21	27	24	1,369	44.71	25	1,543	50.38
4-1/2	32,300	53,800	1.420.000	21	27	24	1,369	44.71	25	1,543	50.38
4-1/2	34,500	57,500	1.420.000	21	27	24	1,421	46.40	25	1.595	52.07
4-1/2	14,000	23,300	712.000	21	27	24	1,141	37.27	25	1.315	42.94
4-1/2	22,400	37,300	939,000	21	27	24	1,285	41.97	25	1,459	47.64
4-1/2	23,400	39,000	1,050,000	21	27	24	1,233	40.28	25	1,407	45.94
4-1/2	25,800	43,100	1,150,000	21	27	24	1,233	40.28	25	1,407	45.94
4-1/2	26,600	44,400	1,180,000	21	27	24	1,233	40.28	25	1,407	45.94
4-1/2	26,700	44,500	1,110,000	21	27	24	1,285	41.97	25	1,459	47.64
4-1/2	34,500	57,500	1,420,000	21	27	24	1,285	41.97	25	1,459	47.64
5	34,500	57,500	1,420,000	21	27	24	1,536	50.17	25	1,732	56.56
5	37,700	62,900	1,450,000	21	27	24	1,587	51.88	25	1,782	58.28
5	38,000	63,400	1,550,000	21	27	24	1,536	50.17	25	1,732	56.56
5	43,300	72,200	1,620,000	21	27	24	1,625	53.13	25	1,821	59.53

Heavy Weight Drill Pipe Data

			Pipe Body	y		Tool Joint					
Tube OD	Construction	Tube ID	Central Upset Ø	Tube Yield	Torsional Strength	Tensile Strength	Connection	TJ OD	TJ ID	TJ Yield	
in		in	in	ksi	ft-lbs	lbs		in	in	ksi	
5–1/2	Welded	3-5/8	6	55	70,100	739,000	5 1/2 FH	7-1/4	3–1/2	120	
5–1/2	Welded	3-5/8	6	55	70,100	739,000	5 1/2 FH	7–1/2	3	120	
5–1/2	Welded	3–7/8	6	55	65,100	658,000	5 1/2 FH	7-1/4	3–1/2	120	
5–1/2	Welded	3-7/8	6	55	65,100	658,000	5 1/2 FH	7–1/2	3	120	
6–5/8	Welded	5	7	55	102,000	816,000	6 5/8 FH	8–1/4	43/4	120	
6-5/8	Welded	5	7	55	102,000	816,000	6 5/8 FH	8–1/2	4-1/4	120	

5-1/2" - 6-5/8"

	Тоо	l Joint			Slick			Spiraled		
Recommended Make-Up	Torsional Strength	Tensile Strength	Box Length	Pin Length	Central Upset	Total Weight	Weight per foot	Unspiraled Upset	Total Weight	Weight per foot
ft-lbs	ft-lbs	lbs	in	in	in	lbs	lbs/ft	in	lbs	lbs/ft
43,300	72,200	1,620,000	21	27	24	1,662	54.34	25	1,880	61.47
52,100	86,800	1,930,000	21	27	24	1,701	55.62	25	1,919	62.75
43,300	72,200	1,620,000	21	27	24	1,509	49.33	25	1,727	56.47
52,100	86,800	1,930,000	21	27	24	1,548	50.61	25	1,766	57.75
51,300	85,500	1,680,000	21	27	24	1,822	59.58	25	2,031	66.40
65,000	108,000	2,100,000	21	27	24	1,866	61.03	25	2,075	67.85

Heavy Weight Drill Pipe Data Sour Service

	Pipe Body						Tool Joint				
Tube OD	Construction	Tube ID	Central Upset Ø	Tube Yield	Torsional Strength	Tensile Strength	Connection	TJ OD	TJ ID	TJ Yield	
in		in	in	ksi	ft-lbs	lbs		in	in	ksi	
3–1/2	HWDP-110 HW MS	23/16	4	110	37,700	645,000	NC38	4-3/4	23/16	110	
3–1/2	HWDP-110 HW MS	2–1/16	4	110	39,200	691,000	NC38	4-3/4	2–1/16	110	
3–1/2	HWDP-110 HW MS	2–1/16	4	110	39,200	691,000	NC38	5	2–1/16	110	
4–1/2	HWDP-110 HW MS	2–13/16	5	110	80,200	1,070,000	NC46	6–1/4	2–13/16	110	
5	HWDP-110 HW MS	3	5–1/2	110	113,000	1,380,000	NC50	6–1/2	3	110	
5	HWDP-110 HW MS	3	5–1/2	110	113,000	1,380,000	NC50	6-5/8	3	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	43/4	2–1/16	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	43/4	2–1/8	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	43/4	23/16	110	
3–1/2	HWDP-65 HW MS	2–3/16	4	65	22,300	381,000	NC38	4-3/4	2–3/16	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	43/4	2–3/16	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	43/4	2–1/4	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	43/4	2–1/4	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	4-3/4	2-5/16	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	4-3/4	2–3/8	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	43/4	2–3/8	110	
3–1/2	HWDP-65 HW MS	2–3/8	4	65	20,700	337,000	NC38	4-3/4	2–3/8	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	4-7/8	2–1/16	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	4-7/8	2–1/4	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	4-7/8	2-5/16	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	5	2–1/16	110	
3–1/2	HWDP-65 HW MS	23/16	4	65	22,300	381,000	NC38	5	23/16	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	5	2–3/16	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	5	2–1/4	110	
3–1/2	HWDP-65 HW MS	2–1/4	4	65	21,800	367,000	NC38	5	2–1/4	110	
3–1/2	HWDP-65 HW MS	2–1/16	4	65	23,100	408,000	NC38	5	2–7/16	110	
4	HWDP-65 HW MS	2–1/2	4–1/2	65	33,300	498,000	NC38	5	2-9/16	110	
4	HWDP-65 HW MS	2-1/2	4–1/2	65	33,300	498,000	NC40	5-1/4	2-1/2	110	
4-1/2	HWDP-65 HW MS	2-13/16	5	65	47,400	630,000	NC46	6–1/4	2-13/16	110	
4-1/2	HWDP-65 HW MS	2-3/4	5	65	48,100	648,000	NC46	6–1/4	2-7/8	110	
4-1/2	HWDP-65 HW MS	2–13/16	5	65	47,400	630,000	NC46	6–1/2	2-13/16	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6-1/2	3	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6–1/2	3-1/16	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6–1/2	3–1/8	110	
5	HWDP-65 HW MS	3–1/8	5-1/2	65	65,000	778,000	NC50	6–1/2	3–1/8	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6-1/2	3-1/8	110	
5	HWDP-65 HW MS	2-3/4	5-1/2	65	69,700	890,000	NC50	6-5/8	2-3/4	110	
5	HWDP-65 HW MS	2-13/16	5-1/2	65	69,000	872,000	NC50	6-5/8	2-13/16	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6-5/8	3	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6-5/8	3-1/16	110	
5	HWDP-65 HW MS	3-1/16	5-1/2	65	65,900	/9/,000	NC50	6-5/8	3-1/16	110	
5	HWDP-65 HW MS	3	5-1/2	65	66,800	817,000	NC50	6-5/8	3–1/8	110	
5	HWDP-65 HW MS	3	5–1/2	65	66,800	817,000	NC50	6-5/8	3–1/4	110	

Tool Joint				Slick			Spiraled				
Recommended Make-Up Torque	Torsional Strength	Tensile Strength	Box Length	Pin Length	Central Upset	Total Weight	Weight per foot	Unspiraled Upset	Total Weight	Weight per foot	
ft-lbs	ft-lbs	lbs	in	in	in	lbs	lbs/ft	in	lbs	lbs/ft	
9 990	17 600	749 000	21	27	25	742	24 19	25	871	28 41	
9,990	17,600	795.000	21	27	25	785	25.60	25	915	29.83	
13,900	24,600	795,000	21	27	25	811	26.44	25	941	30.67	
22,400	39,500	1.050.000	21	27	25	1,233	40.28	25	1.407	45.94	
29.700	52,200	1.300.000	21	27	25	1,519	49.60	25	1.715	56.00	
30.000	52,700	1.300.000	21	27	25	1.536	50.17	25	1.732	56.56	
9,990	17,600	795,000	21	27	25	785	25.60	25	915	29.83	
9,990	17,600	772,000	21	27	25	785	25.60	25	915	29.83	
9,990	17,600	749,000	21	27	25	785	25.60	25	915	29.83	
9,990	17,600	749,000	21	27	25	742	24.19	25	871	28.41	
9,990	17,600	749,000	21	27	25	719	23.44	25	849	27.67	
9,990	17,600	725,000	21	27	25	785	25.60	25	915	29.83	
9,990	17,600	725,000	21	27	25	719	23.44	25	849	27.67	
9,990	17,600	700,000	21	27	25	785	25.60	25	915	29.83	
9,990	17,600	675,000	21	27	25	785	25.60	25	915	29.83	
9,990	17,600	675,000	21	27	25	719	23.44	25	849	27.67	
9,990	17,600	675,000	21	27	25	672	21.90	25	801	26.13	
11,900	21,000	795,000	21	27	25	798	26.02	25	927	30.24	
11,900	21,000	725,000	21	27	25	732	23.86	25	861	28.08	
11,900	21,000	700,000	21	27	25	732	23.86	25	861	28.08	
13,900	24,600	795,000	21	27	25	811	26.44	25	941	30.67	
13,400	23,500	749,000	21	27	25	767	25.02	25	897	29.25	
13,400	23,500	749,000	21	27	25	745	24.28	25	874	28.51	
12,900	22,700	725,000	21	27	25	811	26.44	25	941	30.67	
12,900	22,700	725,000	21	27	25	745	24.28	25	874	28.51	
11,500	20,200	649,000	21	27	25	811	26.44	25	941	30.67	
10,500	18,400	595,000	21	27	25	918	29.94	25	1,070	34.88	
15,000	26,300	796,000	21	27	25	943	30.78	25	1,094	35.73	
22,400	39,500	1,050,000	21	27	25	1,233	40.28	25	1,407	45.94	
21,700	38,300	1,020,000	21	27	25	1,262	41.20	25	1,435	46.87	
22,400	39,500	1,050,000	21	27	25	1,268	41.39	25	1,441	47.06	
29,700	52,200	1,300,000	21	27	25	1,519	49.60	25	1,715	56.00	
29,200	51,300	1,270,000	21	27	25	1,519	49.60	25	1,715	56.00	
28,300	49,900	1,230,000	21	27	25	1,519	49.60	25	1,715	56.00	
28,300	49,900	1,230,000	21	27	25	1,456	47.56	25	1,652	53.95	
28,300	49,900	1,230,000	21	27	25	1,519	49.60	25	1,715	56.00	
33,000	58,100	1,420,000	21	27	25	1,654	54.00	25	1,850	60.40	
32,300	56,800	1,390,000	21	27	25	1,625	53.08	25	1,821	59.47	
30,000	52,700	1,300,000	21	27	25	1,536	50.17	25	1,732	56.56	
29,200	51,300	1,270,000	21	27	25	1,536	50.17	25	1,732	56.56	
29,200	51,300	1,270,000	21	27	25	1,505	49.15	25	1,701	55.55	
28,300	49,900	1,230,000	21	27	25	1,536	50.17	25	1,732	56.56	
26,700	46,900	1,160,000	21	27	25	1,536	50.17	25	1,732	56.56	

Heavy Weight Drill Pipe Data Sour Service

	Pipe Body						Тс	ool Joint		
Tube OD	Construction	Tube ID	Central Upset Ø	Tube Yield	Torsional Strength	Tensile Strength	Connection	TJ OD	TJ ID	TJ Yield
in		in	in	ksi	ft-lbs	lbs		in	in	ksi
F 1/0		0.1/0	C	05	01 500	1 050 000	NOCO	0.7/0	0 1/4	110
5-1/2		3-1/8	6	00	91,500	1,050,000		0-1/8	3-1/4	110
5-1/2 5-1/2		3-1/2	0	00 65	80,400	919,000	5 1/2 FH	7	3-1/Z	110
5 1/2		১–৩/০ ০ 7/০	6	00 65	02,000	779,000	5 1/2 FH	7	3-5/0 2 E/0	110
5 1/2		3-1/0	6	65	76,900	770,000	5 1/2 FH	7	აე/0 ე7/0	110
5-1/2		3-1/0	0	00	70,900	1 010 000	5 1/2 FH	7 1/4	3-1/0	100
5-1/2 5-1/2	HWDP-65 HW WS	3-1/4	0	00 65	89,700	1,010,000	5 1/2 FH	7-1/4	3-1/4	100
5-1/2		3-1/4	0	00	09,700	1,010,000	5 1/2 FH	7-1/4	3-5/10	100
5-1/2		3-1/4	0	00	09,700	1,010,000	5 1/2 FH	7-1/4	3-1/2	100
5-1/2	HWDP-65 HW WS	3-1/2	6	00	85,400	919,000	5 1/2 FH	7-1/4	3-1/2	100
5-1/2	HWDP-65 HW WIS	3-1/8	6	65	76,900	778,000	5 1/2 FH	7-1/4	3-1/2	100
5-1/2		3-5/8	0	00	82,800	873,000	5 1/2 FH	7-1/4	3-5/8	100
5-1/2	HWDP-65 HW MS	3-1/8	6	65	76,900	778,000	5 1/2 FH	7-1/4	3-1/8	100
5-1/2	HWDP-65 HW MS	3-1/8	6	65	76,900	778,000	5 1/2 FH	7-1/4	3-1/8	100
5-1/2	HWDP-65 HW MS	3-1/8	6	65	76,900	778,000	5 1/2 FH	7-1/2	3-1/4	100
5-1/2	HWDP-65 HW MS	3-1/2	6	65	85,400	919,000	5 1/2 FH	7-1/2	3-1/2	100
5-1/2	HWDP-65 HW MS	3-1/8	6	65	76,900	//8,000	5 1/2 FH	7-1/2	3-1/8	100
6-5/8	HWDP-65 HW MS	4	7-1/8	65	155,000	1,420,000	6 5/8 FH	8	4	100
6-5/8	HWDP-65 HW MS	4	7-1/8	65	155,000	1,420,000	6 5/8 REG	8	4	100
6-5/8	HWDP-65 HW MS	4-1/2	7-1/8	65	140,000	1,210,000	6 5/8 FH	8	4-1/2	100
6-5/8	HWDP-65 HW MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8	4-3/4	100
6-5/8	HWDP-65 HW MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8	5	100
6-5/8	HWDP-65 HW MS	4-1/2	7-1/8	65	140,000	1,210,000	6 5/8 FH	8-1/4	3-1/2	100
6-5/8	HWDP-65 HW MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8-1/4	4-1/2	100
6-5/8	HWDP-65 HW MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8-1/4	5	100
6-5/8	HWDP-65 HW MS	4	7-1/8	65	155,000	1,420,000	6 5/8 FH	8-1/2	4	100
6-5/8	HWDP-65 HW MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8-1/2	4	100
6-5/8	HWDP-65 HW MS	4-1/4	/-1/8	65	148,000	1,320,000	6 5/8 FH	8-1/2	4-1/4	100
6-5/8	HWDP-65 HW MS	5	/-1/8	65	121,000	964,000	6 5/8 FH	8-1/2	4-1/4	100
6-5/8	HWDP-65 HW MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8–1/2	4-1/2	100
6–5/8	hwdp-65 hw MS	5	7-1/8	65	121,000	964,000	6 5/8 FH	8–1/2	5	100

5-1/2" - 6-5/8"

			Slick		Spiraled					
Recommended Make-Up	Torsional Strength	Tensile Strength	Box Length	Pin Length	Central Upset	Total Weight	Weight per foot	Unspiraled Upset	Total Weight	Weight per foot
ft-lbs	ft-lbs	lbs	in	in	in	lbs	lbs/ft	in	lbs	lbs/ft
26,700	46,900	1,160,000	21	27	25	1,886	61.59	25	2,104	68.72
32,800	57,700	1,480,000	21	27	25	1,697	55.49	25	1,915	62.63
32,800	57,700	1,410,000	21	27	25	1,624	53.11	25	1,843	60.25
32,800	57,700	1,410,000	21	27	25	1,471	48.11	25	1,690	55.25
31,200	55,000	1,250,000	21	27	25	1,471	48.11	25	1,690	55.25
41,000	65,600	1,480,000	21	27	25	1,872	61.22	25	2,091	68.36
40,600	64,900	1,450,000	21	27	25	1,872	61.22	25	2,091	68.36
37,600	60,200	1,350,000	21	27	25	1,872	61.22	25	2,091	68.36
37,600	60,200	1,350,000	21	27	25	1,735	56.71	25	1,953	63.85
37,600	60,200	1,350,000	21	27	25	1,509	49.33	25	1,727	56.47
35,600	56,900	1,280,000	21	27	25	1,662	54.34	25	1,880	61.47
31,200	50,000	1,130,000	21	27	25	1,509	49.33	25	1,727	56.47
31,200	50,000	1,130,000	21	27	25	1,509	49.33	25	1,727	56.47
41,500	66,500	1,480,000	21	27	25	1,548	50.61	25	1,766	57.75
37,600	60,200	1,350,000	21	27	25	1,774	58.00	25	1,992	65.13
31,200	50,000	1,130,000	21	27	25	1,548	50.61	25	1,766	57.75
45,800	73,200	1,910,000	21	27	25	2,525	82.58	25	2,795	91.38
34,000	54,400	1,200,000	21	27	25	2,525	82.58	25	2,795	91.38
45,800	73,200	1,580,000	21	27	25	2,178	71.23	25	2,448	80.03
44,500	71,200	1,400,000	21	27	25	1,791	58.55	25	2,060	67.35
38,100	61,000	1,210,000	21	27	25	1,791	58.55	25	2,060	67.35
56,500	90,400	2,210,000	21	27	25	2,221	72.61	25	2,490	81.42
50,600	81,000	1,580,000	21	27	25	1,833	59.93	25	2,102	68.74
38,100	61,000	1,210,000	21	27	25	1,833	59.93	25	2,102	68.74
62,000	99,100	1,910,000	21	27	25	2,612	85.41	25	2,881	94.21
62,000	99,100	1,910,000	21	27	25	1,877	61.38	25	2,146	70.18
56,400	90,300	1,750,000	21	27	25	2,444	79.90	25	2,713	88.71
56,400	90,300	1,750,000	21	27	25	1,877	61.38	25	2,146	70.18
50,600	81,000	1,580,000	21	27	25	1,877	61.38	25	2,146	70.18
38,100	61,000	1,210,000	21	27	25	1,877	61.38	25	2,146	70.18

Heavy Weight Drill Pipe Performance Datasheet

Overview

The Heavy Weight Drill Pipe Performance Datasheet is an easy-to-use document summarizing the performances and other technical characteristics of HWDPs manufactured by COMMAND SMFI. This document provides key performance characteristics such as tensile strength, torsional strength and make-up torque range, as well as other product-specific performance data.

An overview of some additional information available in the HWDP Performance Datasheet is shown below. Useful datasheet definitions:

> Torsional Ratio: The ratio of the connection torsional strength divided by the pipe body torsional strength. API recommends a ratio of 0.80 or larger.

> Balance OD: The tool joint OD where the yield of the box is equal to the yield of the pin for a given tool joint ID.

> Bending Strength Ratio (BSR): This bending criteria is defined in the API spec RP7G as an inertia ratio between pin and box connection. A rotary shouldered connection that has a BSR of 2.5 (or 2.5:1) is generally accepted as an average balanced connection.

Combined Load Chart: Chart used to determine the operation zone for tool joint in tension and torque.

> Wear Chart: Chart used to determine the recommended make-up torque for worn products.





Drill Collars

The Solution: Transitional and Compressive Load Member

COMMAND SMFI drill collars are thick-walled tubulars machined from solid steel bars and manufactured to specifications to meet and/or exceed API or NS-1 requirements. The quality of the heat treatment is critical in the production of raw materials and must be uniform and deep enough through the thickness of the bar to ensure the mechanical properties.

Drill collars are used as a component of the bottom-hole assembly (BHA) and provide the following:

- > Drilling weight-on-bit (WOB)
- > BHA directional control
- > Hole size integrity
- > Stiffness to maintain hole straightness
- > Clearance for the drill string
- > Compressive and torsional loads
- > Mitigate differential sticking and stuck pipe thanks to spiraled grooves



Product Performance

Drill collars come in slick and spiral-grooved designs with additional features for safe surface-handling and trouble-free operations. We provide the full range of collars manufactured in AISI 4145H-modified steel with mechanical properties guaranteed 1 inch below steel surface at ambient temperature.

Product range and features

Standard

- > ODs from 2-7/8" to 11"
- > API Specification 7.1 & 7.2
- > Slick
- > API connections
- > Enhanced fatigue resistance with thread cold rolling
- > Phosphate or zinc coated threads
- > Slip and elevator recess
- > API stress-relief on pin and box bore back
- > Pressed steel thread protectors

Options

>Spiral

- >Hardbanding
- > Internal plastic coating with ODs <6 1/2"

> High-performance double shoulder connections upon request

- Customized elevator and slip recess
- > NS-1 or DS-1 or customers specifications

> Premium grades and materials: Sour Service and non-magnetic alloys

> Range 2 and 3

Spiral Design

In order to reduce differential pressure sticking and wellbore contact, the surface of Drill Collars can be spiral-grooved. Spiral Drill Collars are the perfect solution for deep, directional or deviated drilling. Cross sections of the drill collars reduce the contact area with the wall of the hole.



Slip & Elevator Recess

Slip and elevator recesses improve handling efficiency and safety. These features are machined in accordance with API standard RP7G. The upper radius of the elevator recess is cold rolled to increase the product service life. Slip and elevator recesses can be manufactured together or separately.



Slip & Elevator Recess

Connection	API	N	S1	DS1 common / DS1 critical
API	All	0D < 9 1/2"	0D >= 9 1/2"	All
	4145H-modified	4145H-modified	4145H-modified	4145H-modified
	110 KSI	110 KSI	100 KSI	110 KSI
Connection		Sour S	Service	

Drill Collar Material Table

Connection		Sour S	ervice	
API	<= 6 3/4" 0D (with NACE test 45% SMYS)	> 6 3/4" 0D (with NACE test 45% SMYS) 45% SMYS guaranteed)	<= 6 3/4" 0D (No NACE test 45% SMYS guaranteed)	> 6 3/4" 0D (No NACE test
	ASCOWELL C 110 KSI	ASCOWELL C 100 KSI	ASCOWELL C 110 KSI	ASCOWELL C 100 KSI

Hardbanding (flush or raised)





recommended on drill collars with slip and elevator recesses and is applied in a 4" long wear pad above the elevator recess, a 1" long wear pad above the slip recess and a 10" long wear pad under the slip recess. For drill collars with a slip recess only, type C hardbanding is applied to a 10" long wear pad under the slip recess and a 4" long wear pad above the slip recess. For drill collars without any recess, type A hardbanding is applied in a 10" long wear pad located

Operational Benefits

COMMAND SMFI has been producing high quality drill collars for over 60 years and we were the first company to manufacture small diameter drill collars from solid bars. Bars are trepanned in-house using specialty equipment to guarantee product performance and reliability. Our experience in material specification, mechanical properties, heat treatment, machining connections, and inspection are reflected in our product performance.

Drill Collar Manufacturing Flow Chart





Drill collars are manufactured to customer requirements and, where applicable, to specifications such as API, ISO, NS1, DS1, etc.

Drill Collar Data

			Pipe	e Body		
OD	ID	Connection	Bevel Diameter	Overall Length	Recommended Make-Up Torque*	
(in)	(in)		(in)	(ft)	(ft-lbs)	
2–7/8	1-1/2	2 3/8 PAC	2-45/64	31	2,070	
3–1/8	1	2 3/8 REG	3–1/64	31	3,030	
3–1/8	1–1/8	2 3/8 REG	3–1/64	31	3,030	
3–1/8	1-1/4	NC23	3	31	3,330	
3–1/8	1-1/4	2 3/8 REG	3–1/64	31	3,030	
3–1/8	1_1/4	NC26	3	31	1,690	
3–3/8	1-1/2	NC26	3–21/64	31	3,580	
3–1/2	1-1/2	NC26	3–21/64	31	4,610	
3–3/4	1-1/2	NC26	3–29/64	31	4,670	
4–1/8	2	NC31	3-61/64	31	6,850	
4-1/4	1-3/4	NC31	3-61/64	31	8,160	
4-1/4	2	NC31	3-61/64	31	6,850	
4-3/4	1-3/4	NC38	4-41/64	31	9,990	
4-3/4	2	NC35	4–33/64	31	10,800	
4-3/4	2	NC38	4-41/64	31	9,990	
4-3/4	2-1/4	NC38	4-41/64	31	9,990	
4-3/4	2-1/4	NC35	4-33/64	31	9,200	
4-3/4	2–1/2	NC38	4-41/64	31	9,990	
4-7/8	2–1/4	NC38	4-41/64	31	11,900	
5	2–1/4	NC38	4-49/64	31	12,900	
5–1/4	2-1/4	NC38	4-61/64	31	12,900	
5–3/4	2-1/4	NC46	55/8	31	17,700	
5-3/4	2–1/4	NC40	5-25/64	31	17,000	
6	2-1/4	NC46	5-23/32	31	23,400	
6	2-13/16	NC46	5-23/32	31	22,400	
6–1/4	2-1/4	4 1/2 H-90	6	31	28,700	
6–1/4	2–1/4	NC46	5–29/32	31	28,000	
6–1/4	2–1/2	NC46	5–29/32	31	25,700	
6–1/4	2-3/4	NC46	5-29/32	31	23,100	
6–1/4	2-13/16	NC46	5-29/32	31	22,400	
6–1/4	2-13/16	NC50	6–1/16	31	23,000	
6–1/4	3	NC46	5-29/32	31	20,300	
6–1/2	2–1/4	NC46	6-3/32	31	28,000	
6–1/2	2–1/4	4 1/2 H–90	6	31	28,700	
6–1/2	2–1/4	NC50	6–11/32	31	29,700	
6–1/2	2–1/2	NC46	6–3/32	31	25,700	
6–1/2	2-13/16	NC46	6–3/32	31	22,400	
6–1/2	2-13/16	NC50	6–11/32	31	29,700	
6–1/2	2-7/8	NC50	6–11/32	31	29,700	
6–1/2	3	4 1/2 H–90	6	31	21,100	
6–3/4	2–1/4	NC50	6–11/32	31	36,700	
6–3/4	2–1/2	NC50	6–11/32	31	35,800	
6–3/4	2–1/2	NC46	6–11/32	31	25,700	
6–3/4	2-13/16	NC50	6–11/32	31	32,300	
6–3/4	2–7/8	NC50	6–11/32	31	31,500	
6-3/4	3	NC50	6–11/32	31	30,000	

*Performances calculated for products manufactured as per API.

2-7/8" - 6-3/4"

Pipe Body		S	lick		Spiraled	
Torsional Strength*	Bending Strength Ratio	Total Weight Slick	Weight/Foot Slick	Total Weight Spiral	Weight/Foot Spiral	OD
(ft-lbs)		(lbs)	(Ibs/ft)	(Ibs)	(Ibs/ft)	(in)
3,640	2.58	495	16	N/A	N/A	
5,330	2.57	720	23	681	22	
5,330	2.65	698	23	660	21	
5,860	2.57	674	22	635	21	
5,330	2.75	674	22	635	21	
2,970	1.33	674	22	635	21	
6,300	2.07	750	24	711	23	
8,110	2.42	821	27	780	25	
8,220	3.18	970	32	928	30	
12,100	2.44	1,070	35	1,010	33	
14,400	2.51	1,230	40	1,170	38	
12,100	2.75	1,150	38	1,090	36	
17,600	1.73	1,600	52	1,520	50	
19,100	2.58	1,520	50	1,440	47	
17,600	1.80	1,520	50	1,440	47	
17,600	1.92	1,430	47	1,360	44	
16,200	2.82	1,430	47	1,360	44	
17,600	2.10	1,340	44	1,260	41	
21,000	2.14	1,530	50	1,450	47	
22,700	2.38	1,630	53	1,550	51	
22,700	2.88	1,840	60	1,740	57	
31,200	1.68	2,290	75	2,190	71	
30,000	3.04	2,290	75	2,190	71	
41,200	2.02	2,530	83	2,410	79	
39,500	2.24	2,300	75	2,170	71	
56,200	2.31	2,780	91	2,650	87	
49,300	2.38	2,780	91	2,650	87	
45,200	2.47	2,680	88	2,560	83	
40,700	2.60	2,580	84	2,450	80	
39,500	2.64	2,550	83	2,420	79	
40,500	1.71	2,550	83	2,420	79	
35,700	2.79	2,460	80	2,330	76	
49,300	2.77	3,040	99	2,890	94	
56,200	2.69	3,040	99	2,890	94	
52,200	1.89	3,040	99	2,890	94	
45,200	2.87	2,940	96	2,790	91	
39,500	3.07	2,810	92	2,660	87	
52,200	2.03	2,810	92	2,660	87	
52,200	2.05	2,780	91	2,630	86	
41,200	3.14	2,720	89	2,570	84	
64,700	2.21	3,310	108	3,160	103	
63,000	2.26	3,210	105	3,060	100	
45,200	3.30	3,210	105	3,060	100	
56,800	2.37	3,080	101	2,920	95	
55,500	2.39	3,050	100	2,890	95	
52,700	2.46	2,990	98	2,830	93	

Drill Collar Data

		Pipe Body				
OD	ID	Connection	Bevel Diameter	Overall Length	Recommended Make-Up Torque*	
(in)	(in)		(in)	(ft)	(ft-lbs)	
7	2-1/4	NC50	6–31/64	31	38,400	
7	2-1/2	NC50	6–31/64	31	35,800	
7	2–13/16	NC50	6–31/64	31	32,300	
7	2–13/16	5 1/2 H–90	6-5/8	31	36,500	
7	2-13/16	5 1/2 H-90	6-5/8	31	36,500	
7	2–13/16	5 1/2 FH	6–23/32	31	32,800	
8	2–1/4	6 5/8 REG	7–33/64	31	60,300	
8	2–1/2	6 5/8 REG	7–33/64	31	57,400	
8	2–13/16	6 5/8 REG	7–33/64	31	53,300	
8	2–13/16	NC56	7–31/64	31	48,200	
8	3	6 5/8 REG	7–33/64	31	50,700	
8	3	6 5/8 H–90	7–1/2	31	53,600	
8	3–1/4	6 5/8 REG	7–33/64	31	46,900	
8	33/8	6 5/8 REG	7–33/64	31	44,900	
8–1/4	2–13/16	6 5/8 REG	7-45/64	31	53,300	
8–1/4	3	6 5/8 REG	7-45/64	31	50,700	
8–1/4	3–3/16	6 5/8 REG	7-45/64	31	47,900	
8–1/4	3-1/4	6 5/8 REG	7-45/64	31	46,900	
8–1/2	2–13/16	6 5/8 REG	7-45/64	31	53,300	
8–1/2	2–13/16	NC61	8	31	68,400	
8–1/2	3	6 5/8 REG	7-45/64	31	50,700	
8–1/2	3-1/4	6 5/8 REG	7-45/64	31	46,900	
9	2–13/16	7 5/8 REG	8–1/2	31	84,400	
9	2–13/16	6 5/8 FH	8–29/64	31	84,000	
9	3	7 5/8 REG	8–1/2	31	84,400	
9	3	6 5/8 FH	8–29/64	31	81,000	
9	3–1/2	6 5/8 FH	8–29/64	31	72,100	
9–1/2	2-3/4	7 5/8 REG	8–13/16	31	92,600	
9–1/2	2–13/16	7 5/8 REG	8–13/16	31	91,600	
9–1/2	3	7 5/8 REG	8–13/16	31	88,600	
9–1/2	3	NC70	8–31/32	31	102,000	
9–1/2	3–1/16	7 5/8 REG	8–13/16	31	87,500	
9–1/2	3-1/2	7 5/8 REG	8–13/16	31	79,500	
9–3/4	3	7 5/8 REG LT	9–1/4	31	91,800	
10	3	8 5/8 REG	9–23/32	31	109,000	
10	3	7 5/8 REG LT	9–1/4	31	91,800	
11	3	8 5/8 REG LT	10–1/2	31	131,000	

*Performances calculated for products manufactured as per API.

Pipe Body		SI	lick		Spiraled	
Torsional Strength*	Bending Strength Ratio	Total Weight Slick	Weight/Foot Slick	Total Weight Spiral	Weight/Foot Spiral	OD
(ft-lbs)		(lbs)	(Ibs/ft)	(lbs)	(Ibs/ft)	(in)
61,400	2.54	3,590	117	3,380	110	
57,300	2.61	3,500	114	3,290	107	
51,600	2.73	3,360	110	3,150	103	
64,900	2.40	3,360	110	3,150	103	
64,900	2.40	3,360	110	3,150	103	
52,400	1.72	3,360	110	3,150	103	
96,500	2.50	4,810	157	4,560	149	
91,800	2.54	4,720	154	4,460	146	
85,400	2.60	4,580	150	4,330	142	
77,200	3.02	4,580	150	4,330	142	
81,100	2.66	4,490	147	4,240	139	
95,400	2.50	4,490	147	4,240	139	
75,100	2.75	4,360	143	4,110	134	
71,900	2.81	4,300	140	4,040	132	
85,400	2.93	4,910	161	4,630	151	
81,100	2.99	4,820	158	4,540	148	
76,600	3.07	4,730	155	4,440	145	
75,100	3.10	4,700	154	4,410	144	
85,400	3.27	5,250	172	4,960	162	
109,000	2.59	5,250	172	4,960	162	
81,100	3.34	5,160	169	4,870	159	
75,100	3.46	5,040	165	4,750	155	
135,000	2.28	5,960	195	5,430	178	
134,000	2.41	5,970	195	5,440	178	
135,000	2.31	5,880	192	5,340	175	
130,000	2.44	5,880	192	5,350	175	
115,000	2.56	5,610	184	5,080	166	
148,000	2.78	6,750	221	6,200	203	
147,000	2.78	6,720	220	6,170	202	
142,000	2.81	6,630	217	6,080	199	
164,000	2.34	6,620	217	6,070	199	
140,000	2.83	6,600	216	6,050	198	
127,000	2.93	6,370	208	5,820	190	
147,000	3.09	7,020	230	6,470	212	
175,000	1.98	7,420	243	6,800	222	
147,000	3.38	7,430	243	6,800	222	
209,000	2.84	9,140	299	8,410	275	

Drill Collar Performance Datasheet

Overview

The Drill Collar Performance Datasheet is an easy-to-use document summarizing the performances and other technical characteristics of drill collars manufactured by COMMAND SMFI.

This document provides key performance characteristics such as tensile strength, torsional strength, and make-up torque range, as well as other product specific performance data.

An overview of some additional information available in the Drill Collar Performance Datasheet is shown below.

Useful datasheet definition:

> Bending Strength Ratio (BSR): This bending criteria is defined in the API spec RP7G as an inertia ratio between pin and box connection. A rotary shouldered connection that has a BSR of 2.5 (or 2.5:1) is generally accepted as an average balanced connection.

Stip recess dimenter 5,500 in State and Stip recess dimenter 5,500 in Grade 100 KSI DRILL COLLAR ASSEMBLY DATA HYDERALUS HYDERALUS HYDERALUS HYDERALUS Machina displacement HYDERALUS HYDERALUS HYDERALUS HYDERALUS Machina displacement HYDERALUS Machina disp	Normality 1,500 in Grade 1.00 1.00 DRULL COLLAR ASSEMBLY DATA HANCENNO HANCENNO HANCENNO HANCENNO HANCENNO Weight?/Langn HANCENNO Den and deplacement 1.05 M.50 M.50 Weight?/Langn HANCENNO Den and deplacement 1.05 M.50 M.50 Weight?/Langn HANCENNO Den and deplacement 1.05 M.50 Meight?/Langn HANCENNO Den and deplacement 1.05 M.50 Meight 2000 M.50 M.50 M.50 M.50 Meight 2000 HANCEN HANCEN HANCEN HANCEN Meight 2000 HANCEN HANCEN	CO ID Section Overall Elevato	Dimension	scalar dimension	laterial
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Kelly Cock Valves

Application and General Use

Kelly Cock Valves are devices that allow for shutting the internal bore of the drill string keeping the mud column in the top drive or the Kelly when disconnecting from the drill string. It controls the flow of the mud during normal drilling operations and is operated from the rig floor. Standard configurations include two Kelly Cock Valves; an upper Kelly Valve and lower Kelly Valve.

Product Description

The Kelly Cock Valve is designed and manufactured as a one-piece or a two-piece Kelly Valve for free-passage and maximum circulation of the drilling fluid minimizing pressure loss.

Kelly Cock Valves are supplied with either API or proprietary connections upon request.

All Kelly Cock Valves are manufactured according to the latest edition of the API 7-1 or NS1 specification.

KC2S Kelly Valves are available in either standard or H_2S resistant versions and are supplied according to Class 1 construction.

Main Features

Simple construction for trouble-free operations and easy servicing

Sealed lubrication packing

10,000 or 15,000 PSI working pressure (testing pressure 15,000 and 22,500 PSI respectively)

KC2S Kelly Valves are delivered with an operating wrench and disassembly tool

Other configurations available upon request, subject to engineering department approval.

Hydraulic Testing

Each Kelly Valve is hydraulically bench tested according to API spec 7-1 (latest edition) and delivered with its individual pressure test records.

The tests are carried out in two steps:

> SHELL TESTING during which the valve is pressurized to the test pressure for 3 minutes, then depressurized and pressurized again for at least 10 minutes.

> SEAT TESTING during which the valve is pressurized from the pin end to its working pressure for at least 5 minutes.

During the pressure-holding period timing starts when pressure stabilization is achieved. No visually detectable leakage is permitted during the test time period and the pressure drop shall be no greater than maximum 1% of the pressure test value with a zero leak rate.

The KC2S product range is available in 9 different series allowing the following passage IDs:

SERIES	ID (IN)
201	1-1/4
202	1-3/4
203	2-1/8
204	2-1/4
205	2-7/16
206	2-13/16
207	3-1/16
208	3-1/4
209	4-1/4

Valve Compatibility

In case the Retrievable Drop-in Check Valve (RDCV) has to be dropped into the drill string, the compatibility of RDCV OD and KC2S free ID passage is a critical factor. The table to the right shows shows the compatibility between KC2S Kelly Cocks and Drop-in Check Valves.

KELLY COC	KELLY COCK REQUIRED				
KC2S SERIES	ID (IN.)	SERIES			
202	1-3/4 ID	901			
203	2-1/8 ID	902			
204	2-1/4 ID	903			
204/205	2-1/4 / 2-7/16 ID	904			
206	2-13/16 ID	905			
207	3-1/16 ID	906			
207	3-1/16 ID	907			
208	3-1/4 ID	908			



Figure 2 – Kelly Cock

Exploded View

One Piece Kelly Cock								
TYPE OF KIT	DESCRIPTION	STANDARD VERSION	H2S TRIM VERSION					
Seal Kit	Includes all parts needed for replacement each time the Valve is disassembled; i.e. O-Ring Seals, Springs, Knob Plate and Snap Ring or Screw Set.	ltems 2, 6, 8, 9, 11, 13 & 14	ltems 6, 8, 9, 11, 13, 14 & 17					
Complete Repair Kit with Tooling	Includes all inside Valve components plus its Operating Wrench and Disassembling Tool.	Items 2 to 16	Items 3 to 14 &17					
Complete Repair Kit without Tooling	Includes all KC2S Inside Valve components.	Items 2 to 14	Items 3 to 17					

One Piece Kelly Cock Valve

Figure 1 – Kelly Cock Cutaway View

One Piece Kelly Cock



Figure 1 – Kelly Cock Cutaway View



Figure 2 – Kelly Cock Exploded View

Two Piece Kelly Cock

Two Piece Kelly Cock							
TYPE OF KIT	DESCRIPTION	STANDARD VERSION	H2S TRIM VERSION				
Seal Kit	Includes all parts needed for replacement each time the Valve is disassembled; i.e. O-Ring Seals, Springs, Knob Plate and Snap Ring or Screw Set.	ltems 2, 6, 8, 9, 11, 13, 14 & 18	ltems 6, 8, 9, 11, 13, 14,17 &18				
Complete Repair Kit with Tooling	Includes all internal parts plus Operating Wrench and Disassembling Tool.	Items 2 to 16 & 18	Items 3 to 14 &17-18				
Complete Repair Kit without Tooling	Includes all internal parts.	Items 2 to 14 & 18	Items 3 to 18				

Spare Parts and References

Standard Repair Kit									
ITEM	001	000	000	004	SERIES	000	007	000	000
	201	202	203	204	205	206	207	208	209
Seal kit for One Piece Kelly Cock	KCK201S021	KCK202S021	KCK203S021	KCK204S021	KCK205S021	KCK206S021	KCK207S021	KCK208S021	KCK209S021
Seal kit for Two Piece Kelly Cock	KCK201S106	KCK202S103	KCK203S106	KCK204S102	KCK205S104	KCK206S103	KCK207S136	KCK208S104	KCK209S100
Complete repair kit without tooling for One Piece Kelly Cock	KCK201S023	KCK202S025 Valve 0D < 4 1/4 KCK202S023 Valve 0D >= 4 1/4	KCK203S102 Valve 0D < 5 3/8 KCK203S023 Valve 0D >= 5 3/8	KCK204S100 Valve 0D < 6 KCK204S023 Valve 0D >= 6	KCK205S023	KCK206S023	KCK207S125 Valve 0D < 7 3/8 KCK207S023 Valve 0D >= 7 3/8	KCK208S023	KCK209S023
Complete repair kit without tooling for Two Piece Kelly Cock	KCK201S108	KCK202S111 Valve 0D < 4 1/4 KCK202S105 Valve 0D >= 4 1/4	KCK203S108 Valve 0D < 5 3/8 KCK203S110 Valve 0D >= 5 3/8	KCK204S103 Valve 0D < 6 KCK204S104 Valve 0D >= 6	KCK205S105	KCK206S105	KCK207S138 Valve 0D < 7 3/8 KCK207S140 Valve 0D >= 7 3/8	KCK208S105	KCK209S101
Complete repair kit with tooling for One Piece Kelly Cock	KCK201S022 Valve 0D < 4 3/4	KCK202S024 Valve 0D < 4 1/4 KCK202S022 4 1/4 =< Valve 0D < 6 1/4	KCK203S101 Valve 0D < 5 3/8 KCK203S022 5 3/8 =< Valve 0D < 5 7/8	KCK204S101 Valve OD < 6	KCK205S022	KCK206S022	KCK207S124 Valve 0D < 7 3/8	KCK208S022	KCK209S022
	KCK201S109 Valve 0D >= 4 3/4	KCK202S112 Valve 0D >= 6 1/4	KCK203S100 Valve 0D >= 5 7/8	KCK204S022 Valve 0D >= 6			KCK207S022 Valve 0D >= 7 3/8		
Complete repair kit with tooling for Two Piece Kelly Cock	KCK201S107 Valve 0D < 4 3/4	KCK202S113 Valve 0D < 4 1/4 KCK202S104 4 1/4 =< Valve 0D < 6 1/4	KCK203S107 Valve 0D < 5 3/8 KCK203S109 5 3/8 =< Valve 0D < 5 7/8	KCK204S105 Valve OD < 6	KCK205S106	KCK206S104	KCK207S137 Valve 0D < 7 3/8	KCK208S106	KCK209S102
	KCK201S110 Valve 0D >= 4 3/4	KCK202S114 Valve 0D >= 6 1/4	KCK203S110 Valve 0D >= 5 7/8	KCK204S106 Valve 0D >= 6			KCK207S139 Valve 0D >= 7 3/8		
H ₂ S TRIM Repair Kit									
ITEM			_		SERIES				
	201	000							
		202	203	204	205	206	207	208	209
Seal kit for One Piece Kelly Cock	KCK201H021	202 KCK202H021	203 KCK203H021	204 KCK20	205 4H021	206 KCK206H024	207 KCK207H021	208 KCK208H024	209 Not created
Seal kit for One Piece Kelly Cock Seal kit for Two Piece Kelly Cock	KCK201H021 KCK201H101	KCK202H021 KCK202H104	203 KCK203H021 KCK203H105	204 KCK20 KCK20	205 4H021 4H100	206 KCK206H024 KCK206H103	207 KCK207H021 KCK207H104	208 KCK208H024 KCK208H100	209 Not created Not created
Seal kit for One Piece Kelly Cock Seal kit for Two Piece Kelly Cock Complete repair kit without tooling for One Piece Kelly Cock	KCK201H021 KCK201H101 KCK201H023	Z02 KCK202H021 KCK202H104 KCK202H109 Valve 00 < 4 1/4	203 KCK203H021 KCK203H105 KCK203H109 Valve 0D < 5 3/8 KCK203H023 Valve 0D > 5 3/8	204 KCK20 KCK20 / KCK204H023 Valve 0D >= 6	205 4H021 4H100 KCK205H023	206 KCK206H024 KCK206H103 KCK206H026	207 KCK207H021 KCK207H104 KCK207H112 Valve 0D < 7 3/8 KCK207H023 Valve 0D > 7 3/8	208 KCK208H024 KCK208H100 KCK208H026	209 Not created Not created Not created
Seal kit for One Piece Kelly Cock Seal kit for Two Piece Kelly Cock Complete repair kit without tooling for One Piece Kelly Cock Complete repair kit without tooling for Two Piece Kelly Cock	KCK201H021 KCK201H101 KCK201H023 KCK201H102	$\frac{202}{KCK202H021}$ $\frac{KCK202H104}{KCK202H109}$ $\frac{Valve 0D < 4 1/4}{Valve 0D > 4 1/4}$ $\frac{KCK202H023}{Valve 0D > 4 1/4}$ $\frac{KCK202H108}{Valve 0D < 4 1/4}$ $\frac{KCK202H105}{Valve 0D > 4 1/4}$	$\begin{array}{c} 203 \\ \\ \text{KCK203H021} \\ \\ \text{KCK203H105} \\ \\ \text{KCK203H109} \\ \\ \text{Valve 0D < 5 3/8} \\ \\ \text{KCK203H023} \\ \\ \text{Valve 0D > 5 3/8} \\ \\ \\ \text{KCK203H110} \\ \\ \\ \text{Valve 0D > 5 3/8} \\ \\ \end{array}$	204 KCK20 KCK20 / KCK204H023 Valve 0D >= 6 / KCK204H101 Valve 0D >= 6	205 4H021 4H100 KCK205H023 KCK205H100	206 KCK206H024 KCK206H103 KCK206H026	207 KCK207H021 KCK207H104 KCK207H112 Valve 00 < 7 3/8 KCK207H102 Valve 00 > 7 3/8 KCK207H106 Valve 00 < 7 3/8 KCK207H109 Valve 00 > 7 3/8	208 KCK208H024 KCK208H100 KCK208H026	209 Not created Not created Not created
Seal kit for One Piece Kelly Cock Seal kit for Two Piece Kelly Cock Complete repair kit without tooling for One Piece Kelly Cock Complete repair kit without tooling for Two Piece Kelly Cock Complete repair kit with tooling for One Piece Kelly Cock	KCK201H021 KCK201H101 KCK201H023 KCK201H102 KCK201H102 Valve 0D >= 4 3/4	$\begin{array}{c} 202 \\ \hline \\ KCK202H021 \\ \hline \\ KCK202H104 \\ \hline \\ KCK202H109 \\ Valve 0D < 41/4 \\ \hline \\ KCK202H023 \\ Valve 0D > 41/4 \\ \hline \\ KCK202H108 \\ Valve 0D > 41/4 \\ \hline \\ KCK202H105 \\ Valve 0D > 41/4 \\ \hline \\ KCK202H111 \\ Valve 0D < 41/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ \hline \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 = <00 \\ < 61/4 \\ \hline \\ KCK202H022 \\ Valve 41/4 \\ \hline \\ KCK202H02 \\ \hline \\ KCK20H02 \\$	$\begin{array}{c} 203 \\ \hline \\ KCK203H021 \\ \hline \\ KCK203H105 \\ \hline \\ KCK203H109 \\ valve 0D < 5 3/8 \\ \hline \\ KCK203H023 \\ valve 0D > 5 3/8 \\ \hline \\ KCK203H110 \\ valve 0D > 5 3/8 \\ \hline \\ KCK203H110 \\ valve 0D > 5 3/8 \\ \hline \\ KCK203H02 \\ 5 3/8 \\ \hline \\ KCK203H022 \\ 5 3/8 \\ - < Valve 0D \\ < 5 7/8 \\ \hline \\ KCK203H022 \\ 5 3/8 \\ - < Valve 0D \\ < 5 7/8 \\ \hline \\ KCK203H022 \\ 5 3/8 \\ - < Valve 0D \\ < 5 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H022 \\ - < S 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - \\ KCK203H02 \\ - < K 7/8 \\ \hline \\ KCK203H02 \\ - \\ KCK$	204 KCK20 KCK20 / KCK204H023 Valve 0D >= 6 / KCK204H101 Valve 0D >= 6 /	205 4H021 4H100 KCK205H023 KCK205H100	206 KCK206H024 KCK206H026 KCK206H025	207 KCK207H021 KCK207H104 KCK207H112 Valve 00 < 7 3/8 KCK207H023 Valve 0D >= 7 3/8 KCK207H106 Valve 0D >= 7 3/8 KCK207H13 Valve 0D < 7 3/8 KCK207H13	208 KCK208H024 KCK208H026 KCK208H025	209 Not created Not created Not created Not created Not created
Seal kit for One Piece Kelly Cock Seal kit for Two Piece Kelly Cock Complete repair kit without tooling for One Piece Kelly Cock Complete repair kit without tooling for Two Piece Kelly Cock Complete repair kit with tooling for One Piece Kelly Cock	KCK201H021 KCK201H101 KCK201H023 KCK201H102 Valve 0D >= 4 3/4 KCK201H100 Valve 0D <4 3/4	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 203 \\ \\ \hline KCK203H021 \\ \\ \hline KCK203H105 \\ \\ \hline KCK203H023 \\ \\ Valve 0D < 5 3/8 \\ \\ \hline KCK203H023 \\ \\ Valve 0D > 5 3/8 \\ \\ \hline KCK203H104 \\ \\ Valve 0D > 5 3/8 \\ \\ \hline KCK203H104 \\ \\ \hline S 7/8 \\ \\ \hline KCK203H104 \\ \\ Valve 0D > 5 3/8 \\ \end{array}$	204 KCK20 KCK204 KCK204H023 Valve 0D >= 6 / KCK204H101 Valve 0D >= 6 / KCK204H022 Valve 0D >= 6	205 4H021 4H100 KCK205H023 KCK205H100 KCK205H022	206 KCK206H024 KCK206H026 KCK206H026	207 KCK207H021 KCK207H104 KCK207H138 KCK207H023 Valve 0D > 7 3/8 KCK207H106 Valve 0D > 7 3/8 KCK207H109 Valve 0D > 7 3/8 KCK207H109 Valve 0D > 7 3/8	208 KCK208H024 KCK208H100 KCK208H025	209 Not created Not created Not created Not created Not created
Seal kit for One Piece Kelly Cock Seal kit for Two Piece Kelly Cock Complete repair kit without tooling for One Piece Kelly Cock Complete repair kit without tooling for Two Piece Kelly Cock Complete repair kit with tooling for One Piece Kelly Cock	KCK201H021 KCK201H101 KCK201H023 KCK201H102 KCK201H100 Valve 0D >= 4 3/4 KCK201H103 Valve 0D >= 4 3/4	$\begin{array}{c} 202 \\ \hline \\ \mbox{KCK202H021} \\ \hline \mbox{KCK202H109} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H023} \\ \mbox{Valve 0D} > 41/4 \\ \hline \mbox{KCK202H108} \\ \mbox{Valve 0D} > 41/4 \\ \hline \mbox{KCK202H105} \\ \mbox{Valve 0D} > 41/4 \\ \hline \mbox{KCK202H105} \\ \mbox{Valve 0D} > 41/4 \\ \hline \mbox{KCK202H102} \\ \mbox{Valve 0D} > 61/4 \\ \hline \mbox{KCK202H103} \\ \mbox{Valve 0D} > 61/4 \\ \hline \mbox{KCK202H110} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H103} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H110} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H110} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H110} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H103} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{Valve 0D} < 41/4 \\ \hline \mbox{KCK202H100} \\ \hline \mbox{KCK202H100} \\ \hline \mbox{KCK20H10} \\ \hline KCK20$	$\begin{array}{c} 203 \\ \\ \text{KCK203H021} \\ \text{KCK203H105} \\ \text{KCK203H109} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H023} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H023} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H110} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H106} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H106} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H106} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 0D > 5 3/8} \\ \text{KCK203H112} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H112} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H112} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H111} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H112} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H111} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 5 3/8} \\ \text{KCK203H107} \\ \text{Valve 0D < 5 3/8} \\ \text{KCK203H107} \\ Valve 0D < 5 3/$	204 KCK20 KCK204H023 Valve 0D >= 6 / KCK204H101 Valve 0D >= 6 / KCK204H022 Valve 0D >= 6 /	205 4H021 4H100 KCK205H023 KCK205H100 KCK205H022	206 KCK206H024 KCK206H026 KCK206H025 KCK206H025	$207 \\ KCK207H021 \\ KCK207H104 \\ KCK207H172 \\ Valve 0D < 7 3/8 \\ KCK207H023 \\ Valve 0D > 7 3/8 \\ KCK207H106 \\ Valve 0D < 7 3/8 \\ KCK207H109 \\ Valve 0D > 7 3/8 \\ KCK207H109 \\ Valve 0D > 7 3/8 \\ KCK207H109 \\ Valve 0D < 7 3/8 \\ KCK207H105 \\ K$	208 KCK208H024 KCK208H026 KCK208H025 KCK208H025	209 Not created

Operational Benefits

COMMAND SMFI offers KC2S Kelly Valves with PTFE rings inserted in both upper and lower seats, which provide high sealing capability, even at low pressures. KC2S internal parts are made of high grade heat treated stainless steel. The design of the body limits plug rotation to 90° between open and closed positions. Two KC2S versions are offered to suit drilling environments:

> The standard version for normal drilling conditions with an inside surface treated to enhance mud corrosion resistance and maintenance operations.

The H₂S trim version which has been designed for H₂S environments with internal parts made of corrosion resistant materials matching the NACE MR0175 standard (latest edition), fitted in a standard body.

> Full NACE available upon request.

Application and General Use

Wells can at times experience unpredictable pressure differentials causing flow into the well bore that can potentially be catastrophic for the rig and rig personnel, if uncontrolled. Safety Valves are an essential component to maintaining the safety of the well and drilling operations. Safety Valves are configured in the drill string and used on the rig floor and down-hole to manage safe operations while controlling kicks and preventing back flow of the drilling mud during the drilling process.

Product Description

The Inside Blowout Preventer (I-BOP) Valve is a heavy duty check valve connected to the drill string for use on the rig floor level to protect from kicks at surface. It can be left in the drill string as long as necessary to reestablish well control with over-balanced pressure.

I-BOP valves are supplied with either API or with proprietary connections upon request. All I-BOP valves are manufactured to API 7-1 or NS1 latest edition.

I-BOP values are available in both standard or H_2S resistant versions and supplied according to Class 1 construction.

Main Features

> OD sizes ranging from 3-3/8" to 9-1/2"

> ID sizes ranging from 1-1/2" to 2-13/16"

10,000 or 15,000 PSI working pressure (testing pressure 15,000 or 22,500 PSI respectively)

Other configurations available upon request, subject to engineering department approval.

Hydraulic Testing

Each I-BOP valve is hydraulically bench tested according to API spec 7-1 (latest edition) and delivered with its individual pressure record sheets.

The pressure test is carried out in two steps:

> SHELL TESTING during which the valve is pressurized to the test pressure for 3 minutes, then depressurized and pressurized again for at least 10 minutes (see figures 1 & 2).

> SEAT TESTING during which the valve is pressurized from the pin end to its working pressure for at least 5 minutes (see figures 1 & 2).

During the pressure-holding period, timing starts when pressure stabilization is achieved. No visually detectable leakage is permitted during the test time period and pressure drop shall be no greater than maximum 1% of the pressure test value with a zero leak rate.

Operational Benefits

I-BOP body and internal parts are made of high grade heat treated steel. The I-BOP valve sealing is achieved through a PTFE ring inserted in the valve. Two I-BOP construction versions are available:

> The standard version which is suitable for normal drilling conditions. The standard body inner surface is surface treated to improve resistance against mud corrosion and maintenance operations.

The H_2S trim version which has been designed for H_2S environments. Internal parts are made of corrosion resistant materials matching NACE MR0175 standard (latest edition) and fitted in a standard body.

The I-BOP product range comes with 4 sizes corresponding to internal part dimensions as follows:

INTERNAL TRIM SERIES	VALVE SEAT ID (IN)
Trim 1	1-1/2
Trim 2	1-3/4
Trim 3	2-1/4
Trim 4	2-13/16

Inside BOP



Figure 1 – Inside BOP Cutaway View



Figure 2 – Inside BOP Exploded View

Spare Parts and References

ITEM		STANDARD	VERSION	
	Trim 1	Trim 2	Trim 3	Trim 4
1 Valve Release Screw	BVP100S001	BVP200S001	BVP200S001	BVP400S001
5 Valve Head with Insert	BVP100S005	BVP200S005	BVP300S005	BVP400S005
6 Valve Seat	BVP100S006	BVP200S006	BVP300S006	BVP400S006
7 Valve Spring	BVP100S007	BVP200S007	BVP300S007	BVP400S007
9 Large O-Ring	JOIN044V01	JOIN053V01	JOINR41V01	JOINR50V01
10 Small O-Ring	JOINR33V01	JOINR36V01	JOINR36V01	JOINR41V01
Seal Kit	BVK100S001	BVK200S001	BVK300S001	BVK400S001
Complete Repair Kit	BVK100S002	BVK200S002	BVK300S002	BVK400S002
ITEM	STANDARD VERSION			
	Trim 1	Trim 2	Trim 3	Trim 4
2 Plug				
3 Release Rod	Part numbers depend on valve configuration			
4 Upper Valve Body		will be supply	upon request	
8 Lower Valve Body				

ITEM	H ₂ S SERVICE VERSION				
	Trim 1	Trim 2	Trim 3	Trim 4	
1 Valve Release Screw	BVP100S001	BVP200S001	BVP200S001	BVP400S001	
5 Valve Head with Insert	BVP100H005	BVP200H005	BVP300H005	BVP400H005	
6 Valve Seat	BVP100H006	BVP200H006	BVP300H006	BVP400H006	
7 Valve Spring	BVP100S007	BVP200S007	BVP300S007	BVP400S007	
9 Large O-Ring	JOIN044V01	JOIN053V01	JOINR41V01	JOINR50V01	
10 Small 0-Ring	JOINR33V01	JOINR36V01	JOINR36V01	JOINR41V01	
Seal Kit	BVK100S001	BVK200S001	BVK300S001	BVK400S001	
Complete Repair Kit	BVK100H002	BVK200H002	BVK300H002	BVK400H002	

ITEM	H ₂ S SERVICE VERSION								
	Trim 1	Trim 2	Trim 3	Trim 4					
2 Plug									
3 Release Rod		Part numbers depend	on valve configuration						
4 Upper Valve Body		will be supply	upon request						
8 Lower Valve Body									

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Retrievable Drop in Check Valve (RDCV)

Product Description

The Retrievable Drop-in Check Valve (RDCV) is used to control back flow from high pressure formations into the well and through the drill string back to the surface. It also allows for downward fluid circulation within the drill string. When the back flow is under control, the Drop-in Check Valve can be retrieved using a wire line.

If a kick or back flow starts while tripping out the pipes, it can be controlled with a drill pipe Safety Valve or Kelly Cock to close the flow through the drill pipe before reconnecting the Kelly and for pumping the RDCV down to its landing sub.

By design, the Check Valve is equipped with a self-locking (under down hole pressure) feature.

Main Features

- Landing Sub OD ranging from 3-3/8" to 8-1/2"
- > Check Valve OD sizes ranging from 1-9/32" to 3-7/64"
- > Check Valve ID sizes ranging from 3/8" to 1-11/16"
- > 10,000 or 15,000 PSI working pressure (testing pressure 15,000 or 22,500 PSI respectively)
- > Supplied with API or proprietary connections

Other configurations available upon request, subject to engineering department approval.

The RDCV product range has 8 Valve series corresponding to different Check Valve outside diameters (OD):

SERIES	CHECK VALVE OD (IN)
901	1-9/32
001	1 0,02
902	1-25/32
903	2-5/32
904	2-15/64
905	2-15/32
906	2-27/32
907	3-3/64
908	3-7/64





Figure 1 – Landing Sub Cutaway View Figure 2 – Landing Sub Exploded View



Hydraulic Testing

Each RDCV is hydraulically bench tested according to API spec 7-1 (latest edition) and delivered with its individual pressure test records.

The tests are carried out in two steps:

SHELL TESTING during which the valve is pressurized to the test pressure for 3 minutes, then depressurized and pressurized again for at least 10 minutes.

> SEAT TESTING during which the valve is pressurized from the pin end to its working pressure for at least 5 minutes.

During the pressure-holding period, timing shall start when pressure stabilization is achieved. No visually detectable leakage is permitted during the test time period and the pressure drop shall be no greater than maximum 1% of the pressure test value with a zero leak rate.

Valve Compatibility

In case the Check Valve has to be dropped into the drill string, the compatibility of Check Valve OD and Kelly Cock Valve free ID passage is a critical factor. The table to the right shows the compatibility between KC2S Kelly Cock Valves and Retrievable Drop-in Check Valves:

RDCV	KELLY COCK REQUIRED							
SERIES	KC2S SERIES	KC2S ID PASSAGE (in.)						
901	202	1-3/4 ID						
902	203	2-1/8 ID						
903	204	2-1/4 ID						
904	204/205	2-1/4 ID						
905	206	2-13/16 ID						
906	207	3-1/16 ID						
907	207	3-1/16 ID						
908	208	3-1/4 ID						

Operational Data

Standard Version								
ITEM	SERIES							
	901	902	903	904	905	906	907	908
Check Valve OD	1 9/32	1 25/32	2 5/32	2 15/64	2 15/32	2 27/32	3 3/64	3 7/64
Requested Drill String ID	1 11/32	1 27/32	2 7/32	2 19/64	2 17/32	2 29/32	3 7/64	3 11/64
Check Valve ID	3/8	5/8	3/4	7/8	1 1/8	1 3/8	1 9/16	1 11/16
Check Valve weight (lbs/kg)	5.3 / 2.4	6.6 / 3.0	15.4 / 7.0	19.0 / 8.6	24.4 / 11.0	28.2 / 12.8	32.7 / 14.8	38.0 / 15.8
Landing Sub Drift diameter	1 7/ 64	1 29/64	1 27/32	2 7/64	2 1/8	2 33/64	2 11/16	2 25/32
Overshot weight (lbs/kg)	1.3 / 0.6	3.8 / 1.7	4.8 / 2.2	5.8 / 2.6	8.8 / 4.0	9.3 / 4.2	10.1 / 4.6	11.0 / 5.0

Spare Parts and References

Standard Version									
ITEM		SERIES							
	901 902 903 904 905 906 907 908								
Overshot	RD0901S001	RD0902S001	RD0903S001	RD0904S001	RD0905S001	RD0906S001	RD0907S001	RD0908S001	
Check Valve	RDV901S001	RDV902S001	RDV903S001	RDV904S001	RDV905S001	RDV906S001	RDV907S001	RDV908S001	
Landing Sub Sleeve Kit includes items L2 to L5	RDS901S001	RDS902S001	RDS903S001	RDS904S001	RDS905S001	RDS906S001	RDS907S001	RDS908S001	
Seal Kit includes items V6x2, V7x2, V9	RDK901S001	RDK902S001	RDK903S001	RDK904S001	RDK905S001	RDK906S001	RDK907S001	RDK908S001	

H ₂ S Service Version									
ITEM	SERIES								
	901 902 903 904 905 906 907 908								
Overshot	RD0901S001	RD0902S001	RD0903S001	RD0904S001	RD0905S001	RD0906S001	RD0907S001	RD0908S001	
Check Valve	RDV901H001	RDV902H001	RDV903H001	RDV904H001	RDV905H001	RDV906H001	RDV907H001	RDV908H001	
Landing Sub Sleeve Kit includes items L2,L3,L4,L6	RDS901T001	RDS902T001	RDS903T001	RDS904T001	RDS905T001	RDS906T001	RDS907T001	RDS908T001	
Seal Kit Includes items V6x2, V7x2, V9	RDK901H001	RDK902H001	RDK903H001	RDK904H001	RDK905H001	RDK906H001	RDK907H001	RDK908H001	

Operational Benefits

RDCVs body and internal parts are made of high grade heat treated steel. Sealing is achieved through a metal to metal contact between a ball and a seat.

Two RDCV versions exist to suit all drilling environments:

> The standard version which is suitable for normal drilling conditions.

➤ The H₂S trim version which has been designed for H₂S environments in which the internal parts are made of corrosion resistant materials matching the NACE MR0175 standard (latest edition), fitted in a standard steel landing sub.



Product Performance

COMMAND SMFI collar-based non-magnetic drilling products are made from Amagnit[™]501, a chrome manganese carbon austenitic alloy. Amagnit[™] 501 is specifically designed for extreme service. This alloy ensures non-magnetic steel, which is resistant to stress corrosion cracking, providing superior mechanical properties with

low magnetic permeability, excellent machineability and no tendency for galling. Consistent non-magnetic behavior as well as material that is free of hot spots is essential in this special alloy steel. Laboratory tests and actual field use confirm that Amagnit[™] 501 provides very good resistance to stress corrosion cracking in an aggressive chloride environment. For specific downhole applications where higher mechanical properties are required as can often be the case with MWD/LWD housings, a high strength corrosion resistant steel Amagnit[™] 601 as well as other specific client alloys are available upon request.



Operational Benefits

COMMAND SMFI has over 30 years of experience manufacturing non-magnetic tools for the drilling industry. A dedicated plant based in France with state of the art equipment and specialized engineers is able to offer our clients the tools needed for all directional drilling applications.

Rotary Substitutes (Subs)

The Solution: Rotary Substitutes (Subs)

Subs are generally part of most drill strings and have two main functions:

- >To crossover connections
- > To extend the life of a more expensive drill stem item and/or as a disposable component

This means that subs have to be manufactured from selected bars of alloy steel, heat-treated to provide the strength and toughness required to carry the entire weight of the drill string or to withstand high torque differentials. Generally, subs exceed API specifications for drill pipe tool joint mechanical properties.



Subs are classified into four main categories:

> Bit subs or **crossover subs** are used to connect the drill bit to the first piece of BHA equipment or to crossover connections in the drill string. Drill bits are manufactured with a pin, making make-up impossible without a bit sub.

> Lift subs or handling subs are used to lift BHA components from the catwalk to the rig floor.

Top drive subs or **saver subs** serve as the sacrificial element between the drill string and the top drive, reducing repair and maintenance costs.

> Workover subs or circulating subs are used to limit the allowable fluid-circulation rates.

Product Performance

Bit subs or **crossover subs** are manufactured from AISI 4145H-modified alloy, heat-treated to a Brinell Hardness range of 285-341 with a Charpy "V" notch minimum impact strength of 40 ft/lb at 70° F and one inch below the surface. Connections can be cold rolled after machining, if requested. All connections are phosphate coated to impede galling during initial make-up. They are available in standard lengths of 36" and 48" with other configurations upon request.

Crossover subs come with a minimum yield strength of 110 KSI and are manufactured integral with the following connections:

- > box x pin
- > box x box
- > pin x pin

Lift subs and **lift plugs** are made of AISI 4145H-modified steel and manufactured to the same specifications used for drill collars. They are available in sizes from 3-1/8" to 11".



Lift Plug



Lift Subs



Operational Benefits

COMMAND SMFI offers a wide range drill string products and accessories with standard API or proprietary high-performance connections to meet the most demanding drilling requirements.



COMMAND SMFI drill stem subs are available in any size or configuration required.

The Solution: Pup Joints for Easy Surface Handling & Drilling Practices

Pup Joints are commonly used to adjust the length of the drill string to the elevation of rotary table for easy surface handling and drilling practices. They undergo the same stresses as drill pipe and their performance depends primarily on their superior mechanical properties.

Pup Joints are short drill pipe used to adjust the length of the drill string and are ordered to match all drill pipe dimensions.

Product Performance

Pup Joints are manufactured from AISI 4145H or 4140H-modified alloy, heat-treated to a Brinell Hardness range of 285-341 with a Charpy "V" notch



minimum impact strength of 40 ft/lb at 70° F and one inch below the surface. Pup Joints are heat-treated to 110,000 PSI minimum yield. All connections are phosphate coated to impede galling during initial make-up. They are available in standard lengths of 5', 10', 15' and 20' with other configurations upon request.

Integral **Pup Joints** dedicated to Sour Service applications are available. PJ -110 PUP S are Sour Service Pup Joint using ASCOWELL C material providing improved resistance to Sulfide Stress Cracking with high yield strength.

Operational Benefits

COMMAND SMFI offers a wide range drill string products and accessories with standard API or proprietary high-performance connections to meet the most demanding drilling requirements.



Nominal Size A (in)	Tool Joint OD B (in)	Tool Joint ID (in)	TJ Pin Tong C (in)	TJ Box Tong D (in)	Connection
2-3/8	3-3/8	1-1/2	9	12	NC26
2-7/8	4-1/8	2-1/8	9	11	NC31
3-1/2	4-3/4	2-9/16	10	12-1/2	NC38
3-1/2	5	2-1/8	10	12-1/2	NC38
4	5-1/4	2-11/16	9	12	NC40
4-1/2	6-1/4	3	9	12	NC46
5	6-1/2	3-1/4	9	12	NC50
5	6-5/8	2-3/4	9	12	NC50
5	6-5/8	3-1/4	9	12	NC50
5-1/2	7-1/4	3-1/2	8	10	5-1/2 FH
5-1/2	7-1/2	3-1/2	10	12	5-1/2 FH
6-5/8	8-1/2	4-1/4	8	10	6-5/8 FH
6-5/8	8	5	8	10	6-5/8 FH

Sour Service grades and equivalent to G–105 and S–135 are available upon request

Other configurations are available upon request

All hardbanding and coating options available upon request.

Length L(ft): 5; 10; 15; 20

The Solution: Preventing Undesirable Deviation with Stabilizers

Stabilizers are used to prevent undesirable deviation of the drill string. Typically, one or two stabilizers are placed in the bottom-hole assembly (BHA) to increase drill string stability. Additional stabilizers can be added to the drill string to further improve BHA solidness and minimize wellbore deviation.



Dimensions	Fishin	g Neck	Wall Contact	Overall I	_ength	Blade Angle		Blade Width	Approx Weight
Hole Size	Length	OD	Length	Near Bit	String	Open Design	Tight Design	BW	(lbs)
(in)	(in)	(in)	(in)	(in)	(in)		360° Coverage	(in)	
6	28	43/4	16	69	72	15°	15°	2–3/16	320
8–1/2	28	6–1/2	16	69	73	15°	23°	2–3/8	717
12–1/4	30	8	18	77	82	15°	27°	3–1/2	1,146
12-1/4	30	9–1/2	18	77	82	15°	27°	3–1/2	1,477
16	30	9–1/2	18	87	92	15°	35°	4–1/2	2,227
17–1/2	30	9–1/2	18	89	93	15°	38°	4–1/2	2,315
26	30	9–1/2	18	98	103	15°	43°	5	3,417

Client Specs

The Solution: Products Built According to Spec to Guarantee Performance

Specifications are needed to guarantee product performance in the most demanding environments. They are vital in understanding and agreeing upon all product requirements. In addition to COMMAND SMFI design specifications, our products adhere to the most demanding industry standards or individual client specifications and are immediately suitable for use on the rig site upon delivery.

Performance

Where applicable, COMMAND SMFI manufactures products in compliance with the following API standards:

- > API Specification 5DP (ISO 11961:2008)
- API Specifications 7-1 & 7-2 (ISO 10424-1:2004 & ISO 10424-2:2007)
- > API Recommended Practice 7G (ISO 10407:1993)

COMMAND SMFI products can also be supplied with the following specifications:

- > NS1
- > DS1
- > IRP 1.8
- > Customer supplied specification

When a client requires unique specifications, a team of dedicated engineers reviews the specification to ensure it is feasible and that the manufacturing process is modified accordingly to guarantee client satisfaction.

COMMAND SMFI facilities meet the following quality standards:

- > API Specification Q1
- > ISO 9001
- > ISO 11961

Benefits

COMMAND SMFI works together with its clients to develop unique specs to answer specific challenges. We ensure that products meet specified requirements every time.



Hardbanding

The Solution: Increase Drill String Service Life & Reduce Casing Wear with Hardband Application

The large diameters of drill string products are susceptible to wear due to the rotation and sliding of the drill string. Various hardband alloys are used to address a variety of issues related to the durability of the products and the protection of the casing.

COMMAND SMFI plants are qualified by wire suppliers and follow application procedures accordingly. Hardbanding is applied by automatic arc-welding methods. The application process is closely monitored and controlled resulting in a uniform, low porosity, wear-resistant surface.

Performance

Hardbanding is available in raised, semi-raised or flush configurations and in open hole and casing friendly compounds.

COMMAND SMFI is a qualified applicator of the following casing friendly products:

- > Duraband NC
- > Arnco 100XT, 150XT & 350XT
- > Tuboscope TCS Ti and 8000

COMMAND SMFI Procasing is a hard chromium alloy free of tungsten carbide used primarily on the center wear pads of Heavy Weight Drill Pipe.

Castolin OTW-12Ti, OTW-13CF

COMMAND SMFI Procasing*

> Armacor M Star

Additionally, COMMAND SMFI has the following proprietary tungsten carbide products (typically for open hole):

- > CF 500 (20-45 mesh) general
- > CF 1000 (20-30 mesh) large
- > CF 2000 (CF 1000 with metal overlay)

Standard Application:

→ Heavy Weight Drill Pipe – COMMAND SMFI offers hardbanding on tool joint pin and box sections and the center wear pad. Special requests for tool joint box elevator taper are also available. Several bands of hardbanding (generally 4" in length) is applied to the pin and box tool joints. An optional band (approximately 3/4" in length) may be applied to the box elevator taper. Two areas of hardbanding (generally 3" long each) are applied to the center wear pad.

→ Drill Collar – Recommendations for the amount and placement of hardband depends upon the geometry of the drill collar. These recommendations may be found in the earlier section on drill collars in this catalog and are designated as Type A, B or C.

Benefits

Whether for the Drilling Contractor or the Oil Company, hardbanding plays a significant role in extending the service life and improving the performance of the drill string and casing.

The Solution: Pipe ID Protection with Internal Plastic Coating

Internal Plastic Coating (IPC) is an epoxy resin that is applied on the ID of Drill Pipe and Heavy Weight Drill Pipe as a thin layer (0.1 to 0.4 μ m or 5 to 15 mils). Coating takes place at the end of the manufacturing process. The internal coating plays a key role in protecting against corrosion and improving the hydraulic efficiency of the drill string, lowering operational costs of drilling and extending the life of the drill string.

Corrosion related fatigue failures are known to be the biggest cause of fatigue failures for Drill Pipe, followed by pure and notch fatigue. While external pits on the drill pipe surface are harmless, since they are immediately polished off during downhole operation, internal notches can grow and become stress-concentration points.

Internal Plastic Coating provides a protective barrier against corrosion and extends the useful life of Drill Pipe. It also acts as an effective stress coat giving a reliable visible indicator of an over-torqued connection when IPC is missing from under the pin.

We have identified industry accepted coating suppliers and applicators near all of our manufacturing plants.

Performance

IPC solutions include:

- NOV Tuboscope TK-34, TK-34 P, TK-34 XT
- > other coating materials are available upon request

These products withstand high temperatures encountered in most drilling environments provided circulation is maintained.

Benefits

Operational benefits include:

- > Corrosion barrier
- > Mechanical and abrasion wear resistance
- > Chemical and organic acids resistance
- > Improved hydraulics
- > Prevention against scale deposits



Make and Break

The Solution: Save Time & Money with Make and Break

Time is money on the drilling rig. It takes about 10 minutes per joint to break-in pipe at the rig site. A 15,000-foot drill string (about 500 joints), takes 5,000 minutes (or 83 hours) of rig and crew time. Non-productive time (NPT) can be avoided by making and breaking connections before they reach the rig floor.

Proper initial make-up is probably the most important factor affecting the life of the tool joint connections. By using controlled initial factory make-up/break-out drill pipe, galling of the threads can be minimized.



Make-up/Break-out Costs At Rig

Performance

COMMAND SMFI's make-up/break-out is consistently performed using the same procedure for each tool joint, thus avoiding material handling mishaps and the potential variability of procedure used on different rig sites. Should galling occur during the process, it can be immediately addressed and repaired at the plant prior to shipping.

Procedure for make-up/break-out:

- > Joints are finish-machined, inspected and phosphate coated prior to operation.
- > Threads of each box and pin member are cleaned thoroughly to remove any oil, grease or other matter.
- > Box and pin threads are coated with drill pipe thread compound.

> Joints are made-up hand tight and then power-tightened to 100% of recommended make-up torque and broken-out to hand-tight condition for three successive make and break cycles.

> Joints are finally broken apart, cleaned thoroughly, and inspected to ensure that no galling of the threads and sealing shoulders has occurred.

Benefits

Factory make-up/break-out at COMMAND SMFI provides insurance against damage to connections and reduces NPT on the rig floor.

Thread Protectors

The Solution: Avoid Thread Damage with Thread Protectors

Threads can be subject to damage during transport, storage, and surface handling. These damages can reduce the life expectancy of the drill string. It is a safe and standard practice to place hard plastic thread protectors on every connection of Drill Pipe, BHA and accessories whenever these products are to be transported, stored or submitted to other surface handling.

Performance

Thread protectors, when properly used, offer a guaranteed thread protection and are available for all standard oilfield connections. COMMAND SMFI products are generally shipped with plastic protectors and are available with pressed steel protectors.

We also offer cast-steel (with lift bail and certification on request) thread protectors.

Cast-steel thread protectors are ideal for safe handling and protecting swivels, drill collars, tool joints, and wear subs. These protectors feature API precision machined shoulders and threads.

We offer all standard oilfield size thread protectors including for proprietary connections.



Pressed Steel Thread Protectors

Weight

per Set

(lbs)

Benefits

Far less expensive than the cost of re-cutting threads, COMMAND SMFI thread protectors offer protection against damage during transportation, storage and handling.

Leader in Drilling Solutions



FOR GENERAL INFORMATION

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