

**13Cr
CO₂ corrosion-resistant series
tubing and casing**

Product Manual

**13Cr
耐CO₂腐蚀油套管
产品手册**



www.baosteel.com





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Company profile 公司简介

宝山钢铁股份有限公司（简称“宝钢股份”）是中国最大、最现代化的钢铁联合企业。宝钢股份以其诚信、人才、创新、管理、技术诸方面综合优势，奠定了在国际钢铁市场上世界级钢铁联合企业的地位。《世界钢铁业指南》评定宝钢股份在世界钢铁行业的综合竞争力为前三名，认为也是未来最具发展潜力的钢铁企业。

公司钢管产业拥有 50 年的钢管制造经验，包括中小口径热轧无缝管、特种合金无缝钢管、冷轧和冷拔无缝钢管、中大口径高频电阻焊管、大口径直缝埋弧焊管等产品，集科研、产品开发、加工检验、产品销售于一体，实行从炼铁、炼钢（转炉、电炉）、热轧钢卷、厚板、条钢到制管及管加工的一贯制质量管理，具有特大型钢铁联合企业综合生产的规模化优势，目前已成为中国包括无缝、焊管的大型精品钢管研发生产基地。

本手册中系列产品是宝钢根据国内外石油天然气不同 CO₂、H₂S 腐蚀环境相继开发出的能满足于不同 CO₂ 腐蚀工矿环境的 L80-13Cr、BG13Cr95、BG13Cr110、BG13Cr110U、BG13Cr110S 等 13Cr 系列油套管产品，用户可根据不同的井况条件选择不同的产品类型。

公司以其先进技术、设备、管理、良好的信誉，保证提供高质量的产品和服务，令客户满意。

公司全体员工衷心感谢您对我们产品的关注和使用，竭诚欢迎您对公司产品和服务提出宝贵意见。

如果您所需产品的品种、规格或者特殊要求在本手册中未覆盖，请与我们联系，我们将予以及时答复。

Baoshan Iron & Steel Co., Ltd. (“Baosteel Co., Ltd.” for short) is the largest and most modernized integrated steelmaker in China. Baosteel Co., Ltd. has secured its standing as a world class integrated steelmaker in the international steel market with its comprehensive strengths in credit standing, talent, innovation, management and technology, etc. World Steel Dynamics (WSD) ranks Baosteel Co., Ltd. within the top 3 places in terms of comprehensive competitiveness in the global steel industry, and also believes that ,and it is believed to be the most promising player in the steel world.

The company's tube sector has 50 years-long experience in steel tube production. Its products include medium and small diameter hot-rolled seamless tube, specially alloyed seamless tube, cold-rolled and cold drawing seamless tube, medium and large diameter high frequency ERW pipe, large diameter SAWL pipe, etc. It integrates R&D, product development, processing and inspection, products sales, etc., implements the through-going quality control from iron-making, steel-making (BOF, EAF), hot-rolled coil, heavy plate, bar steel to tube making and throughout-process quality control, is superior in scale with regard to the comprehensive production of the giant steel complex and has become a large-sized premium tube R&D and manufacture base for both seamless tube and welded pipes.

The series products indicated in this booklet consist of L80-13Cr, BG13Cr95, BG13Cr110, BG13Cr110U, BG13Cr110S and other 13Cr series oil casing and tubing that can run under different CO₂ corrosive environment of industry and mining business. They are developed by Baosteel in succession according to different CO₂ & H₂S corrosive environment of petroleum and natural gas both at home and abroad. The customer can select various product types based on different well conditions.

With its leading technologies, equipment, management and favorable reputation, customers are ensured to enjoy the quality products and satisfactory service.

We thank you very much for your attention and use of our products and warmly welcome your comments and suggestions.

We should be glad to give you a prompt response, if you contact us for any things about grade, specification or special requirement beyond this catalog.

Manufacture quality guarantee 制造质量保证

宝钢股份采用国际先进的质量管理体系，主要产品均获得国际权威机构认可。公司获得了英国 BSI 公司颁发的质量、环保和安全综合管理体系证书 IMS(ISO 9001、ISO/TS 16949、ISO 14001、ISO 18001)、华夏认证中心 (CCCI) 颁发的 ISO14001 环境管理体系证书以及国家质量监督检验检疫总局颁发的完善计量检测体系证书。

钢管有关产品获得的认可证书主要有：

- 油管、套管、钻杆和管线管等油田用管材获得美国石油协会 API 颁发的 5CT、5D、7、5L 会标使用许可证；
- 船用管获得英国 LR、法国 BV、德国 GL、挪威 DNV、韩国的 KR 和中国 CCS 等六国船级社的认可证书；
- 锅炉管和结构管获得德国 TÜV 公司颁发的 TÜV 认证证书和 PED 认证证书；
- 结构管获得德国 TÜV 公司颁发的 Ü-Mark 证书。

Baosteel has been granted the IMS certificate for quality, safety, environment by British Standard Institution (BSI), the certificate of ISO14001 Environmental Management System by China Certification Center, Inc., and the certificate for perfecting the measuring and detecting System by the State General Administration of Quality Supervision and Inspection.

And its steel tube and pipe products have got the following certificates:

- Certificates of Authority to Use Official Monogram on its tubing, casing, drill pipe (with tool joint) and line pipe complying with API Specification 5CT, 5D, 7 and 5L issued by American Petroleum Institute;
- Certificates of works and material approval given to tubes & pipes for ships by Lloyd's Register of Shipping (LR), Bureau Veritas France (BV), Germanischer Lloyd (GL), DET NORSKE VERITAS (DNV), KOREAN REGISTER OF SHIPPING (KR), and China Classification Society (CCS);
- A certificate according to AD-MERKBLATT W0/TRD100 and a certificate of Quality Assurance System in accordance with the Pressure Equipment Directive 97/23/EC (PED) issued to boiler tube and tube for structural purpose by TÜV SÜDDEUTSCHLAND;
- A Testing Certificate about Initial Type Testing of Construction Products (ÜHP) issued by TÜV.



先进的试验设备 State-of-the-art testing equipment



拉伸试验机
Tensile tester



压溃试验机
Collapse tester



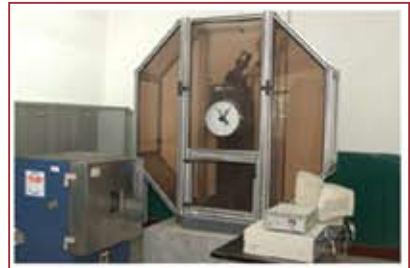
实体拉伸试验机
Full body tensile tester



上卸扣试验机
Makeup and breakout tester



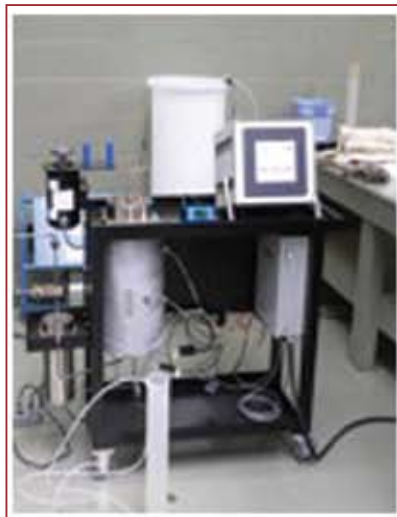
金相试验设备
Metallographic testing equipment



冲击试验机
Impact tester



慢应变速率试验机
Lonsant extension rate tester system

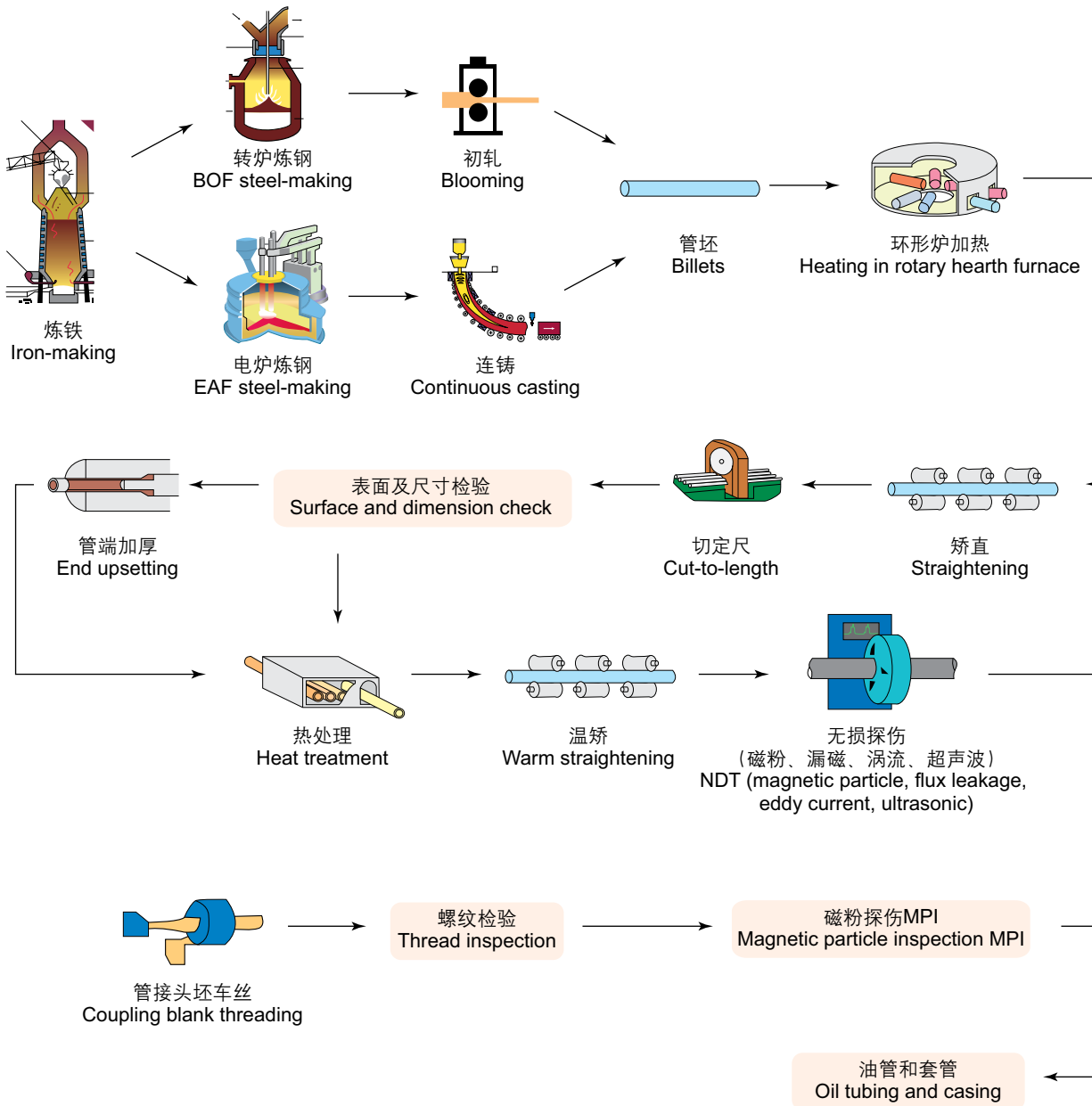


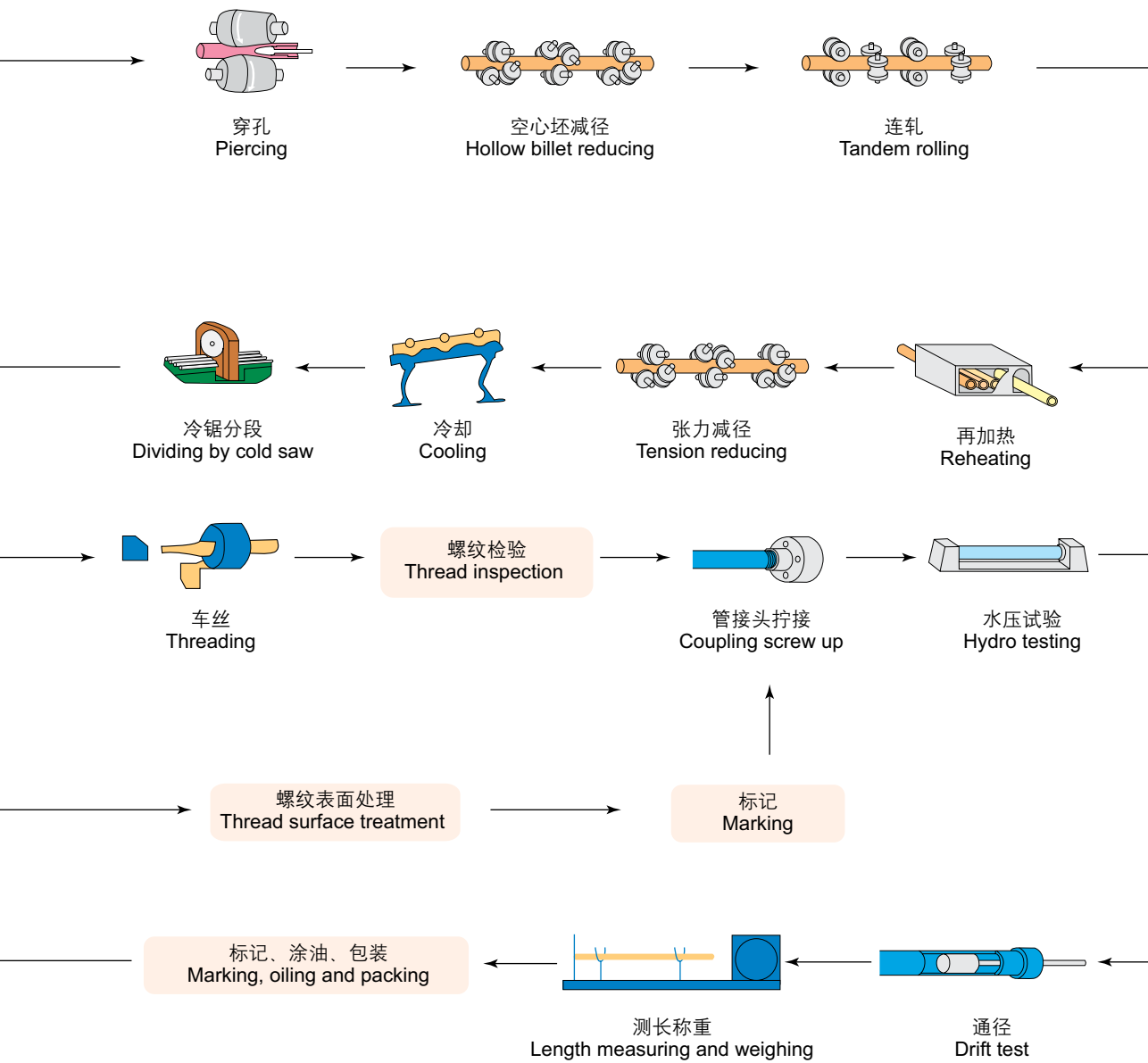
高温高压釜
High temperature and high pressure autoclave



应力环试验机
stress ring tester

Process flow chart 制造工艺流程





Process description 制造工艺



Manufacture process characteristics

1



300 吨氧气顶底复吹转炉
300t combined top and bottom oxygen
blowing converter

300 吨氧气顶底复吹转炉冶炼,LF 精炼,RH 真空脱气,解决了转炉冶炼高铬低磷低硫高质量合金钢的技术难题,磷、硫、气体含量低,钢质纯净。

The process including the smelting by 300t combined top and bottom oxygen blowing converter, LF refining and RH vacuum degassing has offered a technological solution to the difficult smelting of high quality high-chrome, low-phosphorus and low-sulfate alloy by converter, and kept low the phosphorus, sulfate and gas, so as to make clean steel.

2



管坯连轧机
Tubular billet tandem rolling mill



管坯剥皮机
Tubular billet peeling machine

模铸钢锭热装热送,通过初轧开坯、连轧机轧成管坯,管坯经退火、剥皮、荧光磁粉探伤,获得优质管坯。

Ingot is hot-transferred and hot-charged, turned into bloom by blooming mill, and rolled into round billet by the tandem mill. Then, the material goes through annealing, peeling and fluorescent magnetic powder inspection so as to become high-grade tubular billet.

3



4000 吨快锻机
4000t quick forging press

在 4000 吨快锻机上锻造开坯,适合于高合金大圆坯的生产,变形比大,组织成分均匀。

The blooming by 4000t quick forging press is applicable for high alloy steel bloom production, with high reduction rate and good structural homogeneity.

4



穿孔机
Piercing mill



连轧管机
Tube tandem rolling mill

在 $\phi 140$ 连轧管机组上轧制，解决了高铬合金钢高温强度高、轧制力大，轧制温度范围窄，容易轧卡和粘钢等难题。

The rolling by $\phi 140$ tandem mill has offered the solution to such difficulties as high temperature and high strength, high rolling force, narrow rolling temperature range, risky jamming and dead burning for the high Cr. alloy steel.

5



光亮退火炉
Bright annealing furnace

在含 99.99% 氮气保护的光亮退火炉进行热处理，钢管氧化轻微，内外表面质量好。

As the heat treatment is processed in the bright annealing furnace under protection by 99.99% nitrogen, the oxidation on tube is slight and both interior and exterior surface quality is excellent.

6



超声波探伤机组
Ultrasonic inspection line



管端磁粉探伤机组
Tube ends magnetic powder
inspection line

钢管经涡流探伤、超声波探伤、超声波测厚、管端磁粉探伤，产品质量十分可靠。

The quality of tube is rather stable as it passes through eddy current inspection, ultrasonic inspection, ultrasonic thickness measurement and magnetic powder inspection on tube ends.

7



接箍拧接机
Coupling screw-on machine



高精度数控机床
High-precision numerically
controlled machine

高精度数控机床加工螺纹，带扭矩图形控制的接箍拧接机拧接箍，确保螺纹的高精度和高密封性能。

The threads are processed on high-precision numerically controlled machine, and the coupling is screwed up by the coupling screw-on machine with torque graph control, which ensure high precision and high sealing performance of threads.

Product specification 产品规格

■ 钢级 : Grade:

- L80-13Cr
- BG13Cr95
- BG13Cr110
- BG13Cr110U
- BG13Cr110S

■ a 套管 (所有钢级): Casing (applicable to all grades):

尺寸规格 Dimensional specification		公称重量/Nominal weight				壁厚 Wall thickness	
		不加厚带螺纹和接箍 Non-upset T&C		外加厚带螺纹和接箍 Ex-upset T&C			
in	mm	lb/ft	kg/m	lb/ft	kg/m	in	mm
2 ³ / ₈	60.32	4.00	5.95	-	-	0.167	4.24
		4.60	6.85	4.70	6.99	0.190	4.83
		5.80	8.63	5.95	8.85	0.254	6.45
2 ⁷ / ₈	73.02	6.40	9.52	6.50	9.67	0.217	5.51
		7.80	11.61	7.90	11.76	0.276	7.01
		8.60	12.80	8.70	12.95	0.308	7.82
		9.35	13.91	9.45	14.06	0.340	8.64
3 ¹ / ₂	88.90	7.70	11.46	-	-	0.216	5.49
		9.20	13.69	9.30	13.84	0.254	6.45
		10.20	15.18	-	-	0.289	7.34
		12.70	18.90	12.95	19.27	0.375	9.52
4	101.60	9.50	14.14	-	-	0.226	5.74
		-	-	11.00	16.37	0.262	6.65
4 ¹ / ₂	114.30	12.60	18.75	12.75	18.97	0.271	6.88

■ **b 套管 (所有钢级):**
Casing (applicable to all grades):

尺寸规格 Dimensional specification		带螺纹和接箍公称重量 Nominal weight with thread and coupling		壁厚 Wall thickness	
in	mm	lb/ft	kg/m	in	mm
4 1/2	114.30	11.60	17.26	0.250	6.35
		13.50	20.09	0.290	7.37
		15.10	22.47	0.337	8.56
5	127.00	15.00	22.32	0.296	7.52
		18.00	26.79	0.362	9.19
5 1/2	139.70	17.00	25.30	0.304	7.72
		20.00	29.76	0.361	9.17
		23.00	34.23	0.415	10.54
7	177.80	23.00	34.23	0.317	8.05
		26.00	38.69	0.362	9.19
		29.00	43.16	0.408	10.36

■ **扣型:**
Type of coupling:

除提供采用API SPEC 5CT和5B标准中所列的圆螺纹、 偏梯形螺纹和特殊间隙螺纹外,还提供采用以下螺纹型式连接的非API油套管: Connected by round threads, buttress threads and threads with special clearance listed in API SPEC 5CT and 5B standards, the non-API oil tubing and casings connected by following threads are available as well:	
BGT1	宝钢特殊螺纹油管 Baosteel's tubing with premium
BGC	宝钢特殊螺纹套管 Baosteel's tubing casing with premium
BGXC	宝钢直连型螺纹套管 Baosteel's casing with straight threads
SMAX	代替加厚油管的不加厚SUPERMAX特殊螺纹 Non-upset SUPERMAX premium instead of upsetting tubing
SMAX-TS	带台肩密封的不加厚SUPERMAX特殊螺纹 SUPERMAX premium with shoulder seal

注: 具体扣型可参阅相关手册

Remark: Please refer to the booklets for the specific type of premium.

Product lengths ready for supply 产品供货长度

	范围1/Range 1	范围2/Range 2	范围3/Range 3
油管/Tubing	6.10-7.32m	8.53-9.75m	11.58-12.80m
套管/Casing	4.88-7.62m	7.62-10.36m	10.36-14.63m

Product chemical composition 产品化学成分

钢级牌号 Grade		化学成分/Chemical Composition %								
		C	Si	Mn	P	S	Cr	Ni	Mo	Cu
L80-13Cr BG13Cr-95	Min	0.15	-	-	≤0.025	≤0.010	12	-	-	-
	Max	0.25	1.00	1.00			14	-	-	-
BG13Cr110	Min	0.15	-	-			12	0.5	0.4	-
	Max	0.25	1.00	1.00			14	1.5	0.7	-
BG13Cr110U	Min	-	-	-			12	3.5	0.8	-
	Max	0.05	1.00	1.00			14	4.5	1.2	-
BG13Cr110S	Min	-	-	-			12	4.5	1.8	1.0
	Max	0.05	1.00	1.00			14	5.5	2.2	2.0

product corrosion resistance 产品机械性能

钢级 Grade	屈服强度 Yield strength		抗拉强度 Tensile Strength	硬度 Hardness	夏比冲击功 Charpy impact energy
	max	max	min	max	
	MPa	MPa	MPa	HRC	
L80-13Cr	552	655	655	23	按照API 5CT 对应钢级控制 It will be controlled according to corresponding steel grades in API 5CT.
BG13Cr95	655	758	724	27	
BG13Cr110	758	965	862	35	
BG13Cr110U	758	965	862	35	
BG13Cr110S	758	862	862	33	



Product corrosion resistance 产品抗腐蚀性能

■ 抗 CO₂ 腐蚀性能： Anti- CO₂ corrosion performance:

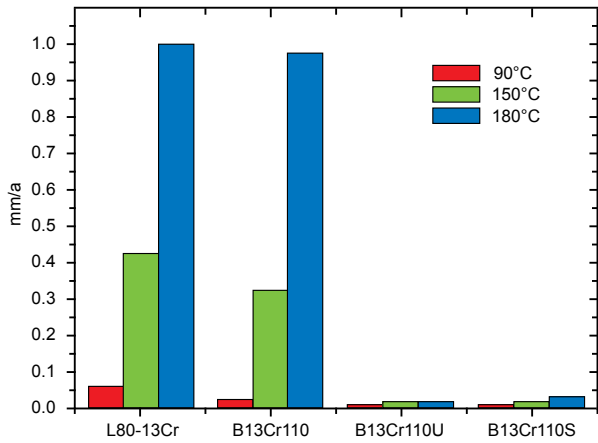
不同钢级的 13Cr 系列油套管由于其成分不同，抗 CO₂、Cl⁻ 腐蚀性能有一定差异，宝钢 13Cr 系列油套管产品抗 CO₂ 腐蚀性能全面通过西安管材研究所的评估试验，其抗腐蚀性能与国外同类产品相比处于同一水平上。表 1 为不同温度条件下 13Cr 油井管的静态和动态腐蚀模拟试验结果，图 1 为部分钢种静态腐蚀后的典型表面腐蚀形态，图 2 则为部分钢种动态腐蚀后的典型表面腐蚀形态。

The 13Cr series tubing and casing of different grades have different CO₂ and Cl⁻ corrosion resistances, due to different chemical analysis. Baosteel's 13Cr series tubing and casing have completely passed the evaluation test of CO₂ corrosion resistance conducted by Xian Tubular Goods Research Center. It is as good as the equivalents of foreign suppliers. Table 1 shows the static and dynamic corrosion simulation test results for 13Cr oil-well tubing under different temperature conditions. Graph 1 shows the typical surface status after static corrosion for partial steel grades, while Graph 2 shows the typical surface status after dynamic corrosion for partial steel grades.

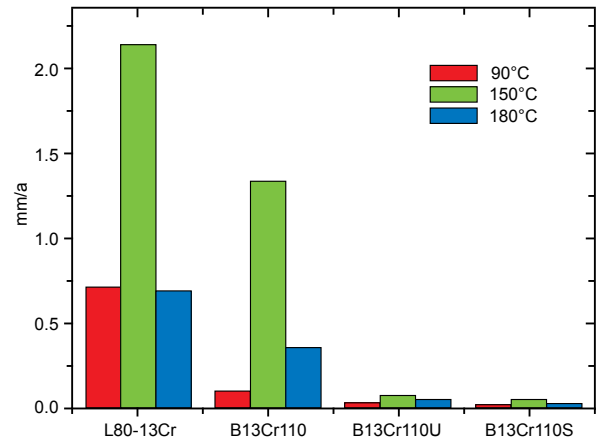
表1 不同温度下静态和动态高压釜腐蚀试验结果(mm/a)

Table 1 Static and dynamic corrosion test results for autoclaves under different temperature conditions (mm/a)

钢种 Grade		90 °C	150 °C	180 °C	备注
静态 Static	L80-13Cr	0.0587	0.4263	0.9964	L80-13Cr在各试验温度下均出现点蚀；BG13Cr-110在180 °C出现点蚀和选择性腐蚀；其余状态下各钢种腐蚀试样表面均光滑 Pitting corrosion occurs at L80-13Cr under various test temperatures; and pitting corrosion and selective corrosion occur at BG13Cr-110 at 180 °C; while the sample surface of various steel grades keeps glossy under all other status.
	BG13Cr110	0.0252	0.3158	0.9704	
	BG13Cr110U	0.0053	0.0117	0.0140	
	BG13Cr110S	0.0042	0.0128	0.0160	
试验条件 Testing conditions		CL- :33687 mg/l; PH:6.0; CO ₂ 分压:2.5Mpa; 运行时间:240h CL-:33687 mg/l; PH:6.0; CO ₂ partial pressure: 2.5Mpa; running duration: 240h			
动态 Dynamic	L80-13Cr	0.6918	2.1271	0.6713	L80-13Cr在90 °C时表面光滑，150 °C、180 °C表面均有针孔状点蚀；其余钢种在各试验条件下腐蚀试样表面均光滑 For L80-13Cr, the surface keeps glossy at 90 °C, and has pinhole type pitting corrosion at 150 °C and 180 °C; for other steel grades, the surface of test samples keeps glossy at various testing conditions.
	BG13Cr110	0.0967	1.3643	0.3837	
	BG13Cr110U	0.0288	0.0610	0.0360	
	BG13Cr110S	0.0138	0.0318	0.0184	
试验条件 Testing conditions		Cl- :33687 mg/l; PH:6.0; 介质流速:2.0m/s; CO ₂ 分压:2.5Mpa; 运行时间:240h Cl-: 33687 mg/l; PH: 6.0; flow rate of media: 2.0m/s; CO ₂ partial pressure: 2.5Mpa; running duration: 240h			



静态高压釜腐蚀速率比较
Comparison of static corrosion rate on autoclave



动态高压釜腐蚀速率比较
Comparison of dynamic corrosion rate on autoclave

图 1 典型静态腐蚀形貌 (8X)
Graph 1 Typical surface status after static corrosion (8X)

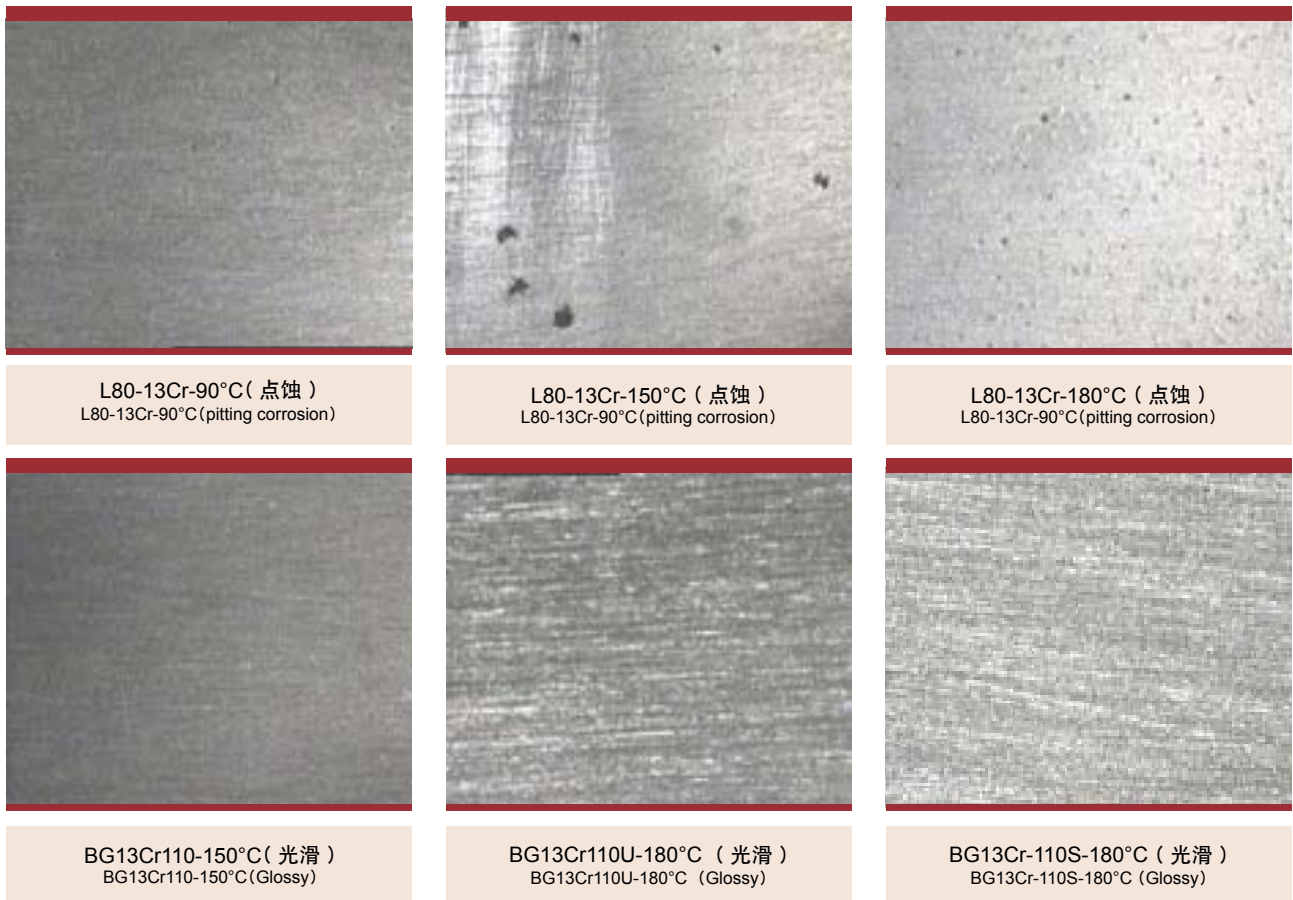














图 2 动态腐蚀试验后试样典型表面形貌：
Graph 2 Typical surface status on test samples after dynamic corrosion:

钢种 Steel Grade	90°C
L80-13Cr(光滑) L80-13Cr(Glossy)	
BG13Cr110(光滑) BG13Cr110(Glossy)	
BG13Cr110U(光滑) BG13Cr110U(Glossy)	
BG13Cr110S(光滑) BG13Cr110S(Glossy)	
钢种 Steel Grade	150°C
L80-13Cr(点蚀) L80-13Cr(pitting corrosion)	
BG13Cr110(光滑) BG13Cr110S(Glossy)	
BG13Cr110U(光滑) BG13Cr110U(Glossy)	

钢种 Steel Grade	150°C
BG13Cr110S(光滑) BG13Cr110S(Glossy)	

钢种 Steel Grade	180°C
L80-13Cr(点蚀) L80-13Cr(pitting corrosion)	
BG13Cr110(光滑) BG13Cr110(Glossy)	
BG13Cr110S(光滑) BG13Cr110S(Glossy)	
BG13Cr110S(光滑) BG13Cr110S(Glossy)	

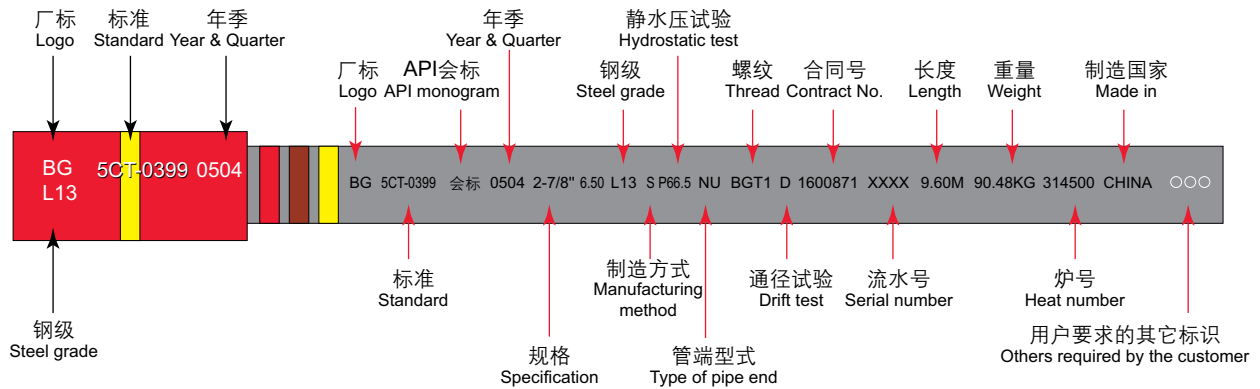
■ 抗 H₂S 应力腐蚀性能：
Anti-H₂S stress corrosion property:

BG13Cr110S 产品按 NACE TM 0177-2001 标准在 B 溶液中加载 80%Ysmin 经 720 小时不断裂, H₂S 最大分压为 0.01Mpa。

As per NACE TM 0177-2001 standard, BG13Cr110S is loaded with 80% Ysmin in solution B and it does not crack after 720 hours with max. 0.01Mpa H₂S partial pressure.

Product marking 产品标识

序号 Grade	钢级 Grade	管体颜色标记 Color marking on pipe body	接箍颜色标记 Color marking on coupling	
1	L80-13Cr	一条红色带+一条棕色带+一条黄色带 One red ribbon + one brown ribbon + one yellow ribbon	整个接箍外表红色+一条黄色带 Red on the whole coupling outside + one yellow ribbon	
2	BG13Cr95	一条银色带+一条棕色带+一条黄色带 One silver ribbon + one brown ribbon + one yellow ribbon	整个接箍外表银色+一条棕色带+一条黑色带 + one black ribbon Silver on the whole coupling outside + one brown ribbon + one black ribbon	
3	BG13Cr110	一条白色带+一条黄色带 One white ribbon + one yellow ribbon	整个接箍外表白色+一条黄色带 White on the whole coupling outside + one yellow ribbon	
4	BG13Cr110U	一条白色带+一条粉红色带+一条黄色带 One white ribbon + one pink ribbon + one yellow ribbon	整个接箍外表白色+一条棕色带+一条黄色带 + one yellow ribbons White on the whole coupling outside silver + one brown ribbon + one yellow ribbons	
5	BG13Cr110S	一条白色带+一条酞青蓝色带+一条黄色带 One white ribbon + one Phthalocyanine blue ribbon + one yellow ribbon	整个接箍外表白色+一条酞青蓝+一条蓝色 + one blue ribbon White on the whole coupling outside + one Phthalocyanine blue ribbon + one blue ribbon	



Product packing 产品包装

螺纹保护器	Thread protector
采用钢塑螺纹保护器，提高保护环强度，保护器钢质部份不与管子或接箍螺纹接触，以保护管端和螺纹不受损伤和腐蚀。	The steel-plastic thread protectors are used to increase the strength of protection ring. The steel part of protector does not contact with tube or coupling thread, so as to protect tube ends and threads against damage and corrosion.
包装	Packing
采用塑钢架包装，牢固整齐，避免在运输和贮存中钢管之间接触、碰撞，给钢管表面以最好的保护，塑料表面不积水，水份易蒸发，可避免钢管因受湿而引起腐蚀。	The tubes are packed by plastic-steel stand firmly and regularly to avoid contact and collision between tubes during transportation and storage, which protects the tube surface at the best. The water does not accumulate on the plastic surface and is easy to evaporate, so that the tubes are prevented from corrosion by damp.
运输和贮存	Transportation and storage
管子在运输和贮存时应避免受湿，13Cr 系列油套管在潮湿的环境中容易产生局部点蚀	Damp should be avoided during transportation and storage, as 13Cr series oil tubing and casing are easy to have local pitting corrosion under humid environment.

Recommended use 用户使用推荐范围

BG13Cr95、L80-13Cr: 适用于 150°C 以下高含 CO ₂ 腐蚀井况	BG13Cr95, L80-13Cr: applicable to high CO ₂ corrosion well condition lower than 150°C
BG13Cr110: 适用于 160°C 以下高含 CO ₂ 腐蚀井况	BG13Cr110: applicable to high CO ₂ corrosion well condition lower than 160°C
BG13Cr110U: 适用于 170°C 以下高含 CO ₂ 腐蚀井况	BG13Cr110U: applicable to high CO ₂ corrosion well condition lower than 170°C
BG13Cr110S: 适用于 180°C 以下高含 CO ₂ 和微量 H ₂ S 腐蚀井况	BG13Cr110S: applicable to high CO ₂ corrosion and slight H ₂ S corrosion well condition lower than 180°C

User's technical guide 用户使用技术指南

■ 油管使用性能： Pipeline performance:

尺寸 外径 Size OD	名义重量 Nominal weight		钢级 Grade	壁厚 Wall thickness	内径 Internal diameter	螺纹和接箍 Thread and coupling			
	带螺纹和接箍 With thread & coupling (T&C)					通径直径 Drift diameter	接箍外径 Coupling OD		
	不加厚 Non-upset	加厚 Upsetting					不加厚 Non-upset	加厚/Upsetting	
								常规 Regular	特殊间隙 Special clearance
in. D	lb/ft	lb/ft	in. t	in. d	in. in.	in. W	in. W	in. Wc	
2 3/8	4.00	-	BG80-3Cr	.167	2.041	1.947	2.875	-	-
2 3/8	4.60	4.70		.190	1.995	1.901	2.875	3.063	2.910
2 3/8	5.80	5.95		.254	1.867	1.773	2.875	3.063	2.910
2 3/8	4.00	-	BG13Cr95	.167	2.041	1.947	-	-	-
2 3/8	4.60	4.70		.190	1.995	1.901	2.875	3.063	2.910
2 3/8	5.80	5.95		.254	1.867	1.773	2.875	3.063	2.910
2 3/8	4.60	4.70	BG13Cr110 BG13Cr110U BG13Cr110S	.190	1.995	1.901	2.875	3.063	2.910
2 3/8	5.80	5.95		.254	1.867	1.773	2.875	3.063	2.910
2 7/8	6.40	6.50		.217	2.441	2.347	3.500	3.668	3.460
2 7/8	7.80	7.90	L80-13Cr	.276	2.323	2.229	3.500	3.668	3.460
2 7/8	8.60	8.70		.308	2.259	2.165	3.500	3.668	3.460
2 7/8	9.35	9.45		.340	2.195	2.101	-	3.668	3.460
2 7/8	6.40	6.50		.217	2.441	2.347	3.500	3.668	3.460
2 7/8	7.80	7.90		.276	2.323	2.229	3.500	3.668	3.460
2 7/8	8.60	8.70	BG13Cr95	.308	2.259	2.165	3.500	3.668	3.460
2 7/8	9.35	9.45		.340	2.195	2.101	-	3.668	3.460

	抗压溃 Anti-collapse	内压 Inner pressure				连接强度 Joint strength			
		平端 Plain end	带螺纹和接箍 With thread & coupling (T&C)			管体屈服 Tube body yield	带螺纹和接箍 With thread & coupling (T&C)		
			不加厚 Non-upset	加厚/Upsetting			不加厚 Non-upset	加厚/Upsetting	
				常规 Regular	特殊间隙 Special clearance			常规 Regular	特殊间隙 Special clearance
psi	psi	psi	psi	psi	lb	psi	lb	lb	
9,980	9,840	9,840	-	-	92,600	60,200	-	-	
11,780	11,200	11,200	11,200	11,200	104,300	71,800	104,300	104,300	
15,280	14,970	14,970	14,860	11,440	135,400	102,900	135,400	135,400	
11,410	11,690	-	-	-	110,000	-	-	-	
13,980	13,300	13,300	13,300	13,300	123,900	85,300	123,900	123,900	
18,150	17,780	17,780	17,650	13,580	160,700	122,200	160,700	160,700	
16,130	15,400	15,400	15,400	15,400	143,400	98,800	143,400	143,400	
21,010	20,590	20,590	20,430	15,730	186,100	141,500	186,100	186,100	
11,170	10,570	10,570	10,570	10,570	145,000	105,400	145,000	145,000	
13,890	13,440	13,440	13,440	11,030	180,300	140,700	180,300	180,300	
15,300	15,000	15,000	14,940	11,030	198,700	159,200	198,700	193,100	
16,680	16,560	-	14,940	11,030	216,600	-	216,600	193,100	
12,940	12,550	12,550	12,550	12,550	172,100	125,200	172,100	172,100	
16,490	15,960	15,960	15,960	13,100	214,100	167,100	214,100	214,100	
18,170	17,810	17,810	17,740	13,100	236,000	189,100	236,000	229,400	
19,810	19,660	-	17,740	13,100	257,300	-	257,300	229,400	

■ 油管使用性能：
Pipeline performance:

尺寸 外径 Size OD	名义重量 Nominal weight		钢级 Grade	壁厚 Wall thickness	内径 Internal diameter	螺纹和接箍 Thread and coupling			
	带螺纹和接箍 With thread & coupling (T&C)					通径直径 Drift diameter	接箍外径 Coupling OD		
	不加厚 Non-upset	加厚 Upsetting					不加厚 Non-upset	加厚/Upsetting	
								常规 Regular	特殊间隙 Special clearance
in. D	lb/ft	lb/ft	in. t	in. d	in. in.	in. W	in. W	in. Wc	
2 7/8	6.40	6.50	BG13Cr110 BG13Cr110U BG13Cr110S	.217	2.441	2.347	3.500	3.668	3.460
2 7/8	7.80	7.90		.276	2.323	2.229	3.500	3.668	3.460
2 7/8	8.60	8.50		.308	2.259	2.165	3.500	3.668	3.460
3 1/2	7.70	-	L80-13Cr	.216	3.068	2.943	4.250	-	-
3 1/2	9.20	9.30		.254	2.992	2.867	4.250	4.500	4.180
3 1/2	10.20	-		.289	2.922	2.797	4.250	-	-
3 1/2	12.70	12.95		.375	2.750	2.625	4.250	4.500	4.180
3 1/2	7.70	-	BG13Cr95	.216	3.068	2.943	4.250	-	-
3 1/2	9.20	9.30		.254	2.992	2.867	4.250	4.500	4.180
3 1/2	10.20	-		.289	2.922	2.797	4.250	-	-
3 1/2	12.70	12.95		.375	2.750	2.625	4.250	4.500	4.180
3 1/2	9.20	9.30	BG13Cr110 BG13Cr110U BG13Cr110S	.254	2.992	2.867	4.250	4.500	4.180
3 1/2	12.70	12.95		.375	2.750	2.625	4.250	4.500	4.180
4	9.50	-	L80-13Cr	.226	3.548	3.423	4.750	-	-
4	-	11.00		.262	3.476	3.351	-	5.000	-
4	9.50	-	BG13Cr95	.226	3.548	3.423	4.750	-	-
4	-	11.00		.262	3.476	3.351	-	5.000	-
4 1/2	12.60	12.75	BG80-3Cr	.271	3.958	3.833	5.200	5.563	-
4 1/2	12.60	12.75	BG13Cr95	.271	3.958	3.833	5.200	5.563	-

	抗压溃 Anti-collapse	内压 Inner pressure				连接强度 Joint strength			
		平端 Plain end	带螺纹和接箍 With thread & coupling (T&C)			管体屈服 Tube body yield	带螺纹和接箍 With thread & coupling (T&C)		
			不加厚 Non-upset	加厚/Upsetting			不加厚 Non-upset	加厚/Upsetting	
				常规 Regular	特殊间隙 Special clearance			常规 Regular	特殊间隙 Special clearance
psi	psi	psi	psi	psi	lb	psi	lb	lb	
	14,550	14,530	14,530	14,530	14,530	199,300	145,000	199,300	199,300
	19,090	18,480	18,480	18,480	15,160	247,900	193,500	247,900	247,900
	21,040	20,620	20,620	20,540	15,160	273,200	218,900	273,200	265,600
	7,870	8,640	8,640	-	-	178,200	130,000	-	-
	10,540	10,160	10,160	10,160	10,160	207,200	158,900	207,200	207,200
	12,120	11,560	11,560	-	-	233,200	185,000	-	-
	15,310	15,000	15,000	15,000	10,660	294,600	246,200	294,600	273,100
	8,850	10,260	10,260	-	-	211,700	154,400	-	-
	12,080	12,070	12,070	12,070	12,070	246,000	188,700	246,000	246,000
	14,390	13,730	13,730	-	-	276,900	219,600	-	-
	18,180	17,810	17,810	17,810	12,660	349,800	292,400	349,800	324,300
	13,530	13,970	13,970	13,970	13,970	284,900	218,500	284,900	284,900
	21,050	20,630	20,630	20,630	14,660	405,000	338,600	405,000	375,500
	6,590	7,910	7,910	-	-	214,400	144,000	-	-
	8,800	9,170	-	9,170	-	246,200	-	246,200	-
	7,310	9,390	9,390	-	-	254,600	171,000	-	-
	9,980	10,890	-	10,890	-	292,300	-	292,300	-
	7,500	8,430	8,430	8,430	-	288,000	208,700	288,000	-
	8,410	10,010	10,010	10,010	-	342,000	247,900	342,000	-

■ 套管使用性能：
Casing's use performance:

尺寸 外径 Size OD	名义重量 Nominal weight	钢级 Grade	壁厚 Wall thickness	内径 Internal diameter	螺纹和接箍 Thread and coupling			抗压溃 Anti-collapse	管体屈服 Tube body yield 1000lb	平端 Plain end
					带螺纹和接箍 With thread & coupling (T&C)	通径直径 Drift diameter	接箍外径 Coupling OD			
	in. D						lb/ft			in. t
4 1/2	11.60	L80-13Cr	.250	4.000	3.875	5.000	4.875	6,350	267	7,780
4 1/2	13.50		.290	3.920	3.795	5.000	4.875	8,540	307	9,020
4 1/2	11.60	BG13Cr95	.250	4.000	3.875	5.000	4.875	7,030	317	9,240
4 1/2	13.50		.290	3.920	3.795	5.000	4.875	9,660	364	10,710
4 1/2	11.60	BG13Cr110 BG13Cr110U BG13Cr110S	.250	4.000	3.875	5.000	4.875	7,580	367	10,690
4 1/2	13.50		.290	3.920	3.795	5.000	4.875	10,690	422	12,410
4 1/2	15.10		.337	3.826	3.701	5.000	4.875	14,340	485	14,420
5	15.00	L80-13Crr	.296	4.408	4.283	5.563	5.375	7,250	350	8,290
5	18.00		.362	4.276	4.151	5.563	5.375	10,490	422	10,140
5	15.00	BG13Cr95	.296	4.408	4.283	5.563	5.375	8,110	416	9,840
5	18.00		.362	4.276	4.151	5.563	5.375	12,030	501	12,040
5	15.00	BG13Cr110 BG13Cr110U BG13Cr110S	.296	4.408	4.283	5.563	5.375	8,850	481	11,400
5	18.00		.362	4.276	4.151	5.563	5.375	13,470	580	13,940
5 1/2	17.00	L80-13Cr	.304	4.892	4.767	6.050	5.875	6,290	397	7,740
5 1/2	20.00		.361	4.778	4.653	6.050	5.875	8,830	466	9,190
5 1/2	23.00		.415	4.670	4.545	6.050	5.875	11,160	530	10,560
5 1/2	17.00	BG13Cr95	.304	4.892	4.767	6.050	5.875	6,940	471	9,190
5 1/2	20.00		.361	4.778	4.653	6.050	5.875	10,020	554	10,910
5 1/2	23.00		.415	4.670	4.545	6.050	5.875	12,930	630	12,540
5 1/2	17.00	BG13Cr110 BG13Cr110U BG13Cr110S	.304	4.892	4.767	6.050	5.875	7,480	546	10,640
5 1/2	20.00		.361	4.778	4.653	6.050	5.875	11,100	641	12,640
5 1/2	23.00		.415	4.670	4.545	6.050	5.875	14,540	729	14,530
7	23.00	L80-13Cr	.317	6.366	6.241	7.656	7.375	3,830	532	6,340
7	26.00		.362	6.276	6.151	7.656	7.375	5,410	604	7,240
7	29.00		.408	6.184	6.059	7.656	7.375	7,030	676	8,160
7	23.00	BG13Cr95	.317	6.366	6.241	7.656	7.375	4,140	632	7,530
7	26.00		.362	6.276	6.151	7.656	7.375	5,890	717	8,600
7	29.00		.408	6.184	6.059	7.656	7.375	7,840	803	9,690
7	26.00	BG13Cr110 BG13Cr110U BG13Cr110S	.362	6.276	6.151	7.656	7.375	6,230	830	9,960
7	29.00		.408	6.184	6.059	7.656	7.375	8,530	929	11,220

		内压/Inner pressure					连接强度, 1000l b Joint strength					
圆螺纹 Round thread		带螺纹和接箍 With thread & coupling (T&C)				圆螺纹 Round thread		带螺纹和接箍 With thread & coupling (T&C)				
		常规接箍 Regular coupling		特殊间隙接箍 Special clearance coupling				常规接箍 Regular coupling		特殊间隙接箍 Special clearance coupling		
短 Short	长 Long	同钢级 Same steel grade	高钢级 High steel grade	同钢级 Same steel grade	高钢级 High steel grade	短 Short	长 Long	同钢级 Same steel grade	高钢级 High steel grade	同钢级 Same steel grade	高钢级 High steel grade	
-	7,780	7,780	-	7,780	-	-	211	291	-	291	-	
-	9,020	9,020	-	7,990	-	-	256	334	-	319	-	
-	9,240	9,240	-	9,240	-	-	234	325	-	325	-	
-	10,710	10,710	-	9,490	-	-	283	373	-	353	-	
-	10,690	10,690	10,690	10,690	10,690	-	278	385	385	385	385	
-	12,410	12,410	12,410	10,990	12,410	-	337	443	443	420	443	
-	14,420	13,460	14,420	10,990	12,490	-	405	509	509	420	454	
-	8,290	8,290	-	7,460	-	-	295	379	-	363	-	
-	10,140	9,910	-	7,460	-	-	376	457	-	363	-	
-	9,840	9,840	-	8,850	-	-	326	424	-	402	-	
-	12,040	11,770	-	8,850	-	-	416	512	-	402	-	
-	11,400	11,400	-	10,250	-	-	388	503	-	478	-	
-	13,940	13,620	13,940	10,250	11,650	-	495	606	606	478	517	
-	7,740	7,740	-	6,880	-	-	338	428	-	402	-	
-	9,190	8,990	-	6,880	-	-	416	503	-	402	-	
-	9,880	8,990	-	6,880	-	-	488	550	-	402	-	
-	9,190	9,190	-	8,170	-	-	373	480	-	444	-	
-	10,910	10,680	-	8,170	-	-	460	563	-	444	-	
-	11,730	10,680	-	8,170	-	-	540	608	-	444	-	
-	10,640	10,640	10,640	9,460	10,640	-	444	568	568	529	568	
-	12,640	12,360	12,640	9,460	10,740	-	547	667	667	529	571	
-	13,580	12,360	14,050	9,460	10,740	-	642	724	759	529	571	
-	6,340	6,340	-	5,740	-	-	435	565	-	533	-	
-	7,240	7,240	-	5,740	-	-	511	641	-	533	-	
-	8,160	8,160	-	5,740	-	-	587	718	-	533	-	
-	7,530	7,530	-	6,810	-	-	505	636	-	589	-	
-	8,600	8,600	-	6,810	-	-	593	722	-	589	-	
-	9,690	9,690	-	6,810	-	-	683	808	-	589	-	
-	9,960	9,960	9,960	7,890	8,970	-	693	853	853	701	757	
-	11,220	11,220	11,220	7,890	8,970	-	797	955	955	701	757	

User's operation guide 用户使用作业指南

13Cr 系列油套管的用途与特点： 13Cr casing and tubing's use and features:

13Cr 油套管具有良好的耐 CO₂ 腐蚀性能，一般采用特殊密封螺纹接头，适用于含 CO₂ 和 CL⁻ 的酸性介质的油气井。13Cr 系列油套管含 Cr 量高达 14%，属于马氏体不锈钢，硬度低，质地软，很容易因碰撞而受损伤。此外 L80-13Cr 油套管虽然为马氏体不锈钢，但在潮湿的环境里很容易产生点状腐蚀。为此 API SPEC 5CT 标准特别注明：“马氏体铬钢表面容易划伤，因此可能需要特别注意对螺纹表面处理和 / 或涂润滑油，使其在静水压试验（装卸堵头）过程中表面损伤减少到最小程度。”“在潮湿环境中贮存时，13Cr 类管子易产生局部点蚀，在涂层、装运和贮存时值得特别关注。”因而对 13Cr 系列油套管的运输、储存及作业有特别严格的要求。

L80-13Cr casing and tubing have good CO₂ corrosion resistance, which are used normally with premium connection. So, they are used for oil well or gas well subject to CO₂ and CL⁻ acid medium. With a Cr. content as high as 14%, they are made up of martensite stainless steel, however, they are not hard enough to avoid damage by collision. Stainless as they are, this kind of oil casing and tubing is vulnerable by pitting corrosion in dampness. Therefore, it is specially specified in API SPEC 5CT: that "The surface of martensitic chrome steel is easy to get scratched, so probably it needs special attention to have the thread surface treated and/or lubricated, minimizing the surface damage during hydrostatic test (assembling/disassembly plugs)." "During transportation and storage under humid environment, 13Cr series tubing and casing are easy to get pitting corrosion. So special attention is needed during coating, loading & transportation and storage." So extra-strict requirements for L80-13Cr casing and tubing during transportation, storage and running should be met.

运输： Transportation:

- 1 13Cr 类油套管应在包装成捆的条件下运输，管子应采用生产厂的塑钢包装架或类似包装架，不允许散捆或散装运输。
- 2 运输器具应该专门设计，以便使 13Cr 类油套管不与运输器具直接接触，管捆应牢固地绑扎在运输器具内，防止管捆与运输器具、管捆与管捆之间碰撞。
- 3 任何金属绑扎带不能与 13Cr 类油套管直接接触，中间应垫有橡胶垫或类似物品。
- 4 13Cr 类油套管应用尼龙绳带吊运，不允许用钢丝绳直接吊运。
- 5 人工移动或拨动 13Cr 类管子时，辅助工具要用木棒或包裹橡胶类物品的铁棒，不能用裸露铁棒。
- 6 起吊和下放 13Cr 类管子时，要轻吊轻放，减少碰撞。
- 7 13Cr 类油套管运输过程中应用塑料防雨布遮盖，防止管子受湿。

- 1 13Cr casing and tubing should be transported after they are packed in bundles. The tubes should be packed by plastic-steel stand or similar packing stands. Transportation in loose bundle or bulk is prohibited.
- 2 The transportation carrier should be designed dedicatedly, so as to isolate direct contact between 13Cr casing and tubing. The tube bundle should be fixed in the carrier, to avoid collision between tube bundle and carrier and collision between bundles.
- 3 Any metal fixing belt cannot directly contact with 13Cr oil casing and tubing, and rubber mat or something similar should be filled up in between.
- 4 13Cr casing and tubing should be lifted and transported by nylon cord and steel strip is prohibited.
- 5 When manually moving or handling 13Cr tubes, please use wood bar or metal bar wrapped under rubber as the assistant tools. The naked iron bar is prohibited.
- 6 Please lift and lower 13Cr tubes carefully to minimize collision.
- 7 13Cr oil casing and tubing should be covered by plastic rain cloth, to avoid being affected by damp.

■ 储存：
Storage:

13Cr 类油套管储存期间必须采取特殊的预防措施，因为在潮湿环境中，容易受到局部斑点腐蚀。在储存期间腐蚀可能在下列条件下发生：

- * 氯的存在 (海水的存在)。
- * 随温度变化的炎热天气。
- * 高湿度。
- * 碳钢粒子或薄片表面的污染。

为了防止腐蚀和储存过程中出现的其它问题，13Cr 类油套管应防止：

- * 潮湿。
- * 变形。
- * 震动。
- * 与其它钢级的金属混合。
- * 受碳钢粉末的污染。

下列指南包括 API RP 5C1(油套管的使用和注意事项)中规定的内容，同时包含对 13Cr 类油管管的附加特殊要求。

- 1 13Cr 类油套管不能直接堆放在地面、铁轨、钢板或混凝土地板上，底层离地面或地板应至少保持 2 英尺的距离。
- 2 13Cr 类油套管每一层下面应至少放 3 排非金属支撑物(硬的木材、塑料或塑料涂层的金属条)，这样油套管就不会下陷，引起水在油套管内积存。
- 3 13Cr 类油套管堆放高度不应超过 10 英尺。
- 4 储存仓库应尽可能远离腐蚀性环境(高温、高湿度或酸性大气中)如果可能，将 13Cr 类油套管储存在通风货棚内。
- 5 不要将 13Cr 类油套管放在有可能发生洪水或易溅到水的地方。

As 13Cr oil casing and tubing are easy to get pitting corrosion under humid environment, the special precautions must be taken during storage. During storage, the corrosion will possibly occur under following conditions:

- * Existing of chlorine (seawater)
- * Hot temperature
- * High humidity
- * Carbon steel particle or flake contamination on surface

In order to avoid corrosion and other problems arising from storage, 13Cr oil casing and tubing should be prevented from:

- * Humidity
- * Distortion
- * Vibration
- * Mixing with other steel grades
- * Pollution by carbon steel powder

The following part of the guide includes both the instructions on use of oil casing and tubing and relevant precautions in API RP 5C1 and the specific requirement for 13Cr oil casing and tubing.

- 1 13Cr oil casing and tubing cannot be directly placed on the ground, rail, steel plate or concrete floor. At least 2-foot distance should be kept from the bottom layer to the ground or floor.
- 2 At least 3 rows of non-metal supports (hard wood, plastics or plastic-coated metal strip) should be laid under each layer of 13Cr oil casing and tubing, so that the oil casing and tubing will not sink, which will avoid water accumulation in the casing or tubing as well.
- 3 The stacking height of 13Cr oil casing and tubing should not exceed 10 feet.
- 4 The storage warehouse should be as far as possible away from corrosive environment (high temperature, high humidity or acid atmosphere). If possible, 13Cr oil casings and tubes should be stored in the ventilated shed.
- 5 Keep 13Cr oil casing and tubing away from wherever it is likely to have flood or water splash.



User's operation guide

■ 13Cr 类油套管作业： Operation Procedure:

13Cr 类油套管作业前的准备：

Preparation before operation

- 1 检查 13Cr 类油套管本体和接箍表面有无碰撞伤痕（特别是横向刻痕）和变形，否则不能入井。
- 2 清洗 13Cr 类油套管丝扣时，只能用非金属（如尼龙）的刷子清洗，绝对不能用钢丝刷清洗丝扣或上涂料。在清洗丝扣时用高效能清洗剂并用布和毛刷仔细清洗所有的公扣端和母扣端。同时要检查丝扣特别是丝扣的密封面（公扣与母扣），如果发现磨损或有刮伤痕迹一律不得使用。清洗完毕之后要用压缩空气吹干公扣、母扣和护丝，然后重新安装干净和干燥的护丝到公扣和母扣上，丝扣油暂不使用，直到下井。
- 3 通径。使用尼龙通径规通径，应由接箍端放入通径规，绝对不要反方向通径，否则会造成母扣螺纹的损坏。
- 4 检查下 13Cr 类油套管用的工具，特别是单根吊卡与单门吊卡，与 13Cr 类油套管的接触有没有凹凸现象，如果发现，应及时处理解决。因为这些凹凸现象可能会在下 13Cr 类油套管时对管体造成刮伤，入井后遇到腐蚀性气体，可能导致 13Cr 类油套管应力断裂。

- 1 Check 13Cr oil casing and tubing body and coupling surface, to ensure there are no collision scars (especially horizontal nicks) or distortions, before they are installed in the hole.
- 2 Only non-metal (such as nylon) brush can be used to clean 13Cr oil casing and tubing threads, while steel brush is strictly forbidden for thread cleaning or coating. The high efficient detergent is used for cleaning threads, and the cloth and brush are used for cleaning all pin and box thread ends. Meanwhile, the thread especially its seal face (pin and box threads) should be checked, and the threads with any wearing or scratch marks found cannot be used. After cleaning, the pin thread, box thread and thread protector should be dried by compressed air, and then place the clean and dry thread protectors on pin and box threads. Don't apply the thread oil until tubing and casing are introduced into hole.
- 3 Drift. The nylon drift mandrel is used for drift. Put the coupling end in the drift mandrel. Do not drift inversely, otherwise, the thread of box coupling will get damaged.
- 4 Check the handling tools for 13Cr oil casing and tubing, such as single elevator and mono-elevator, to ensure there's no convex-concave contacting with 13Cr oil casing and tubing. If such contacting is found out, immediate solution should be applied. Otherwise, it could lead to the scratches on the tube body when running the tubes and to the stress crack of the tubes to be exposed to the corrosive gas after introduction into the hole.

13Cr 类油套管作业前的准备：

Preparation before operation

甲板方面：

- 1 所有的 13Cr 类油套管的吊卸都必须用尼龙吊带。
- 2 需要滚动 13Cr 类油套管时，要用人手推动或有橡胶裹着的铁棒撬动，绝不可用铁棒撬。
- 3 要求在甲板上用尼龙通径规通径。
- 4 13Cr 类油套管吊卸时要平稳、缓慢，要求有两条尾绳拉紧，绝对防止碰撞。
- 5 13Cr 类油套管拉上钻台前要戴好母扣护丝和公扣快卸护丝。
- 6 13Cr 类油套管作业前，在钻台、斜坡、滑道辅好橡胶垫。

钻台方面：

- 1 司钻要平稳，缓慢的把 13Cr 类油套管提起。提起过程中若发现快卸护丝脱落，停止提升，放下重新装好快卸护丝。
- 2 钻台大门拦绳要拉好，绝对防止拦绳脱落而致使油套管有快速向前冲撞现象。
- 3 对扣时，司钻要缓慢，平稳的下放通过对扣器对扣，防止顿扣、错扣。
- 4 油套管座卡瓦时要缓慢下放到位停止，座好卡瓦后才下放重量，卡瓦尽可能的座放平衡。
- 5 司钻提起或下放要缓慢。

油套管作业人员：

- 1 负责油套管作业设备和所有油套管附件的准备。
- 2 负责现场指导钻台钻工组合油套管作业工具及组装油套管附件。
- 3 仔细检查油套管扣型正确及丝扣的良好。
- 4 扶正员配合司钻负责油套管的扶正工作，并指挥司钻下放游车，确保扣好吊卡。
- 5 正确平稳操作 13Cr 类油套管钳，配合油套管扶正员正确给油套管上扣。防止井口落物。
- 6 电脑操作员正确使用扭矩监控系统，严格控制油套管上扣标准及扭矩质量。

Deck

- 1 All 13Cr oil casing and tubing should be lifted up and down with nylon cord.
- 2 When rolling 13Cr oil casing and tubing is needed, please push it manually or pry it up by rubber-wrapped iron bar. The iron bar is prohibited for prying.
- 3 Drift is required by nylon drift mandrel on the deck.
- 4 13Cr oil casing and tubing must be lifted and discharged stably and slowly with two tail ropes tightening to avoid collision absolutely.
- 5 Place the thread protector for box coupling and fast dismounting thread protector for pin coupling before 13Cr oil casing and tubing is lifted to the derrick floor.
- 6 Lay rubber pad on the derrick floor, slope and slide-way before running 13Cr oil casing and tubing.

Derrick floor

- 1 The drill operator should lift 13Cr oil casing and tubing stably and slowly. Stop lifting if the fast dismounting thread protector is found breaking off. And re-assembly the fast dismounting thread protector.
- 2 Fix the guy rope at the gate of derrick floor. Strictly prevent the rope from breaking off, which will cause the oil casing and tubing dash forward rapidly.
- 3 At stabbing, the drill operator should lower down stably and slowly for stabbing via stabling pilot, to avoid sudden threading or cross threading.
- 4 The slips for oil casing and tubing should be gently lowered down and stopped at the desired position. Only with the slip well seated, can the weight be released. The slip is required to be highly balanced at the seat.
- 5 The drill operator should gently lift up and down the drill.

Operators of oil casing and tubing

- 1 Prepare the devices for oil casing and tubing running and all accessories.
- 2 Supervise the derrick floor and drill operators' tools combination for oil casing and tubing and assembly of accessories.
- 3 Check whether the coupling type and threads of oil casing and tubing are right.
- 4 Supporting persons work with the drill operator to hold the oil casing and tubing straight, and guide the latter to lower the traveling block and ensure fixing the elevator.
- 5 Properly and steadily run 13Cr oil casing and tubing tongs, cooperate with supporting persons to make up the oil casing and tubing, and prevent anything from falling into the hole.
- 6 The computer operator runs properly the torque monitoring system, and strictly controls the oil casing and tubing makeup standard and torque quality.

■ 13Cr 类油套管作业： Operation Procedure:

- 1 准备动力装置，铬管大钳及扭矩监控系统并连接好，要求处于良好的工作状态。
- 2 吊卡的准备。换上带有铬面的单门吊卡和单根吊卡、重量补偿器。
- 3 接好自动灌浆工具。
- 4 在钻台上安装卡盘，确保卡盘的中心线和井口同一垂线并进行正确对扣操作，能确保卡瓦均匀和自如地打开与关闭。
- 5 从钻台到坡道底铺上一层防碰胶皮。
- 6 在钻台大门处装上一条挡绳。
- 7 13Cr 类油套管拉上钻台及对扣。吊起油套管到滑道，用单根吊卡提到钻台。13Cr 类油套管拉上时用挡绳拉住，避免碰撞，公扣应戴上快卸护丝。用毛刷将丝扣油涂到公扣上，如果能看见油套管本体，说明涂得太少了；如果能看见刷印，说明涂得太多了；如果看不到丝扣根部，说明涂得太厚了。对扣时要使用对口导向器然后慢慢地下放油套管，从井口及管子扶正台上协同配合扶正，对扣后开始阶段用手或用布带板慢慢地转动油套管，使上下连接的两根管子保持同一轴线上，避免错扣。在对扣和上扣均不要摇晃管子，否则，会对丝扣造成擦伤。上扣时如果发现摇摆过大，应立即降低上扣转速，摇摆过大会造成粘扣。
- 8 对扣后，移开对扣器、重量补偿器在自动位置，将大钳推到套管上，并立即将背钳扣好，夹紧后让主钳上扣。操作铬管大钳时操作员应控制好大钳的速度及背钳的压力。上扣时以 5 ~ 10RPM 的转速将扭矩上至预定值，在预定参考扭矩，将油套管钳转至低档，以 1 ~ 5RPM 的转速上完剩余扣，当扭矩达到最佳值时，扭矩监控系统自动启动，止动阀切断动力源，停止上扣，从而防止产生过大扭矩，并记录连接情况
- 9 扶正员扣吊卡一定要等油套管上完扭矩停止转动时方可指挥司钻慢慢下放吊卡并扣好，避免吊卡碰撞到 13Cr 类油套管。
- 10 提起油套管，移开卡瓦，下放管柱，直到母扣端刚好在油套管钳的钳牙下部位置，停止下放管柱，座好卡瓦。确保卡瓦完整地、均匀地卡住油套管，松开吊卡并上提，进行下一根油套管作业
- 11 控制下放 13Cr 类油套管的速度。
- 12 13Cr 类管子的下放速度不宜过快，特别是在斜井内一般控制在 0.23 ~ 0.46m/s。在下放套管的同时可利用自动灌浆装置给套管灌浆，以减少管子在井底的静止时间。
- 13 13Cr 类管吊卡在接近转盘时应慢慢下放，避免冲击载荷对丝扣造成损伤或对管体造成损伤。

- 1 Prepare the power device, chrome tube tongs and torque monitoring system and connect them. It is required that they should run under excellent conditions.
- 2 Prepare the elevator. Replace the mono elevator and single elevator with chrome face and weight compensator.
- 3 Connect automatic grouting device.
- 4 Erect the spider on the derrick floor and ensure the spider centerline and hole are on the same vertical line, and stab correctly. The slips shall open and close uniformly and freely.
- 5 Put a layer of collision-resistant rubber from the derrick floor to ramp.
- 6 Fix a guy rope at the gate of derrick floor.
- 7 Lift 13Cr oil casing and tubing to the derrick floor and stab. Lift oil casing and tubing to the slide way and lift them to the derrick floor by single elevator. Pull the oil casing and tubing by guy rope when they are lifted so as to avoid collision, and place fast dismounting thread protector on the pin coupling. Paint the thread protector oil on the pin coupling by brush. If the oil casing and tubing body can be seen, it indicates too less oil; if the brushing mark can be seen, it indicates too much oil; if the root of thread protector cannot be seen, it indicates too much and too heavy oil. Use the stabbing pilot for stabbing, and then lower the oil casing and tubing slowly. The cooperative supporting is needed on wellhead and tube stabbing board. Firstly after stabbing, the oil casing and tubing will be rotated slowly by hand or tape wrench, to keep two tubes connected on the same axis to avoid thread crossing. Do not shake tubes during stabbing and making up, otherwise, the thread protector will be scratched. If it swings too seriously at making up, please lower rotation speed immediately. Otherwise, too serious swing will cause galling.
- 8 After stabbing, move the stabbing pilot and weight compensator to the automatic position. Push the tongs to the casing and fix the back-up tongs immediately. Make up the main tongs after clamping. The operator should control the speed of main tongs and pressure of back-up tongs when running the chrome tube tongs. At making up, tighten the torque to the set value at the speed of 5~10RPM. When reaching the set torque, switch the oil casing & tubing tongs to low speed, and make up the remaining threads at the speed of 1~5RPM. When the torque reaches optimal, the torque monitoring system will start automatically and cut off the power of stop valve to stop making up, so as to avoid too large torque. The connection situation will be recorded as well.
- 9 Only when the oil casing and tubing are tightened at certain torque and rotation is stopped, the supporting person can command the drill operator to lower the elevator slowly and fix it, to avoid the collision with 13Cr oil casing and tubing.
- 10 Lift the oil casing and tubing, remove the slip and lower the casing string, till the box coupling end is just at the lower position of oil casing tongs dies. Then stop lowering the string and seat the slip. Ensure that the slip has completely and uniformly blocked the oil casing and tubing, release the elevator and lift it. Run the next oil casing and tubing.
- 11 Control the lowering speed of 13Cr oil casing and tubing.
- 12 13Cr oil casing and tubing cannot be lowered too quickly. Normally the speed should be controlled at 0.23~0.46m/s especially in the inclined shaft. When lowering the casing, meanwhile, the casing can be grouted by automatic grouting device, to reduce the duration of tubes at the bottom hole.
- 13 13Cr tube elevator should be lowered slowly when reaching the rotary table, so as to prevent the impact load from damaging the thread protector or tube body.

■ 附表：推荐拧接力矩 Attached table: Recommended tightening torque

■ 油管：
Tubing:

规格 Size		公称重量 (1b/ft带螺纹和接箍) Nominal weight (1b/ft with threads and coupling)		钢级 Grade	扭矩/Torque (ft-lb) ①②									
					不加厚 Non-upset			加厚 Upsetting			BGT1			
in	mm	NU	EU		最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum	
2 3/8	60.32	4.00	-	L80-13Cr	830	620	1040	-	-	-	-	-	-	
		4.60	4.70		990	740	1240	1760	1320	2200	1660	1530	1790	
		5.80	5.95		1420	1070	1780	2190	1640	2740	1840	1690	1990	
		4.00	-	BG13Cr95	960	720	1200	-	-	-	-	-	-	-
		4.60	4.70		1140	860	1430	2030	1520	2540	1690	1550	1820	
		5.80	5.95		1640	1230	2050	2520	1890	3150	1940	1780	2090	
		4.00	-	BG13Cr110 BG13Cr110U BG13Cr110S	1120	840	1400	-	-	-	-	-	-	-
		4.60	4.70		1340	1010	1680	2380	1790	2980	1950	1790	2100	
		5.80	5.95		1920	1440	2400	2950	2210	3690	2340	2150	2520	
2 7/8	88.9	6.40	6.50	L80-13Cr	1430	1070	1790	2250	1690	2810	2070	1900	2240	
		7.80	7.90		1910	1430	2390	2710	2030	3390	2390	2200	2580	
		8.60	8.70		2160	1620	2700	2950	2210	3690	2660	2450	2870	
		6.40	6.50	BG13Cr95	1650	1240	2060	2600	1950	3250	2190	2010	2370	
		7.80	7.90		2200	1650	2750	3120	2340	3900	2580	2370	2790	
		8.60	8.70		2490	1870	3110	3400	2550	4250	2900	2670	3130	
		-	9.45		-	-	-	3670	2750	4590	-	-	-	
		6.40	6.50	BG13Cr110 BG13Cr110U BG13Cr110S	1930	1450	2410	3040	2280	3800	2660	2440	2870	
		7.80	7.90		2580	1940	3230	3660	2750	4580	3010	2770	3250	
8.60	8.70	2920	2190		3650	3980	2990	4980	3300	3030	3560			
3 1/2	73.02	7.70	-	L80-13Cr	1660	1250	2080	-	-	-	-	-	-	
		9.20	9.30		2030	1520	2540	3130	2350	3910	3150	2900	3400	
		10.20	-		2360	1770	2950	-	-	-	3390	3120	3660	
		12.70	12.95		3140	2360	3930	4200	315	5250	3790	3490	4090	
3 1/2	88.9	7.70	-	BG13Cr110 BG13Cr110U BG13Cr110S	920	1440	2400	-	-	-	-	-	-	
		9.20	9.30		2340	1760	2930	3620	2720	4530	3240	2980	3500	
		10.20	-		2720	2040	3400	-	-	-	3490	3210	3770	
		12.70	12.95		3630	2720	4540	4850	3640	6060	4380	4030	4730	
		9.20	9.30		2740	2060	3430	4230	3170	5290	3940	3620	4250	
		12.7	12.95		4240	3180	5300	5680	42600	7100	5610	5160	6060	

■ 油管：
Tubing:

规格 Size		公称重量 (1b/ft带螺纹和接箍) Nominal weight (1b/ft with threads and coupling)		钢级 Grade	扭矩/Torque (ft-1b) ①②								
					不加厚 Non-upset			加厚 Upsetting			BGT1		
in	mm	NU	EU		最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum
4	101.60	9.50	-	L80-13Cr	1710	1280	2140	-	-	-	3300	3040	3560
		-	11.00		-	-	-	3530	2650	4410	-	-	-
		9.50	-	BG13Cr95	1970	1480	2460	-	-	-	3640	3350	3930
		-	11.00		-	-	-	4080	3060	5100	-	-	-
		9.50	-	BG13Cr110 BG13Cr110U BG13Cr110S	2310	1730	2890	-	-	-	4170	3840	4500
		-	11.00		-	-	-	4770	3580	5960	-	-	-
4 1/2	114.30	12.60	12.75	L80-13Cr	2400	1800	3000	3940	2960	4930	4010	3690	4330
		12.60	12.75	BG13Cr95	2780	2090	3480	4560	3420	5700	4200	3860	4540
		12.60	12.75	BG13Cr110 BG13Cr110U BG13Cr110S	3250	2440	4060	5340	4010	6680	5040	4630	5440

力矩换算: 1ft-1b=1.355818N-M。

拧紧力矩应按最佳力矩控制, 当按最佳力矩接后出现外露扣或J值超差, 可适当调整拧紧力矩, 但调整后的拧紧力矩应在所列的最大、最小力矩范围内
Conversion of torque: 1ft-1b=1.355818N-M.

The tightening torque shall be controlled according to optimal torque. If there's any threads remain is uncovered or J value is out of tolerance it is tightened by optimal torque, the tightening torque can be adjusted adequately, however, the adjusted tightening torque shall be in range of max. and min torques.

■ 套管：
Casing:

规格 Size		公称重量 (1b/ft带螺纹和接箍) Nominal weight (1b/ft with threads and coupling)		钢级 Grade	扭矩/Torque (ft-1b) ①②								
					短圆螺纹 Short round thread			长圆螺纹 Long round thread			BGC		
in	mm				最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum
4	114.30	11.60		L80-13Cr	2120	1590	2650	2230	1670	2790	-	-	-
		13.50			2570	1930	3210	2710	2030	3390	-	-	-
		15.10			3090	2320	3860	4800	3600	6000	-	-	-
		11.60		BG13Cr95	2460	1850	3080	2580	1940	3230	-	-	-
		13.50			2980	2240	3730	3130	2350	3910	-	-	-
		15.10			3580	2690	4480	5550	4160	6940	-	-	-
		11.60		BG13Cr110	2870	2150	3590	3020	2270	3780	-	-	-
		13.50		BG13Cr110U	3480	2610	4350	3660	2750	4580	-	-	-
		15.10		BG13Cr110S	4180	3140	5230	6490	4870	8110	-	-	-

■ 套管：
Casing:

规格 Size		公称重量 (1b/ft带螺纹和接箍) Nominal weight (1b/ft with threads and coupling)	钢级 Grade	扭矩/Torque (ft-lb) ①②								
				短圆螺纹 Short round thread			长圆螺纹 Long round thread			BGC		
in	mm			最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum	最佳 Optimal	最小 Minimum	最大 Maximum
5	127.00	15.00	L80-13Cr	2860	2150	3580	3080	2310	3850	3590	3380	3810
		18.00		3640	2730	4550	3930	2950	4910	4620	4340	4890
		15.00	BG13Cr95	3310	2480	4140	3560	2670	4450	4230	3970	4480
		18.00		4220	3170	5280	4550	3410	5690	5100	4800	5410
		15.00	BG13Cr110 BG13Cr110U	3870	2900	4840	4170	3130	5210	4620	4340	4890
		18.00	BG13Cr110S	4930	3700	6160	5310	3980	6640	5750	5410	6100
5 1/2	139.70	17.00	L80-13Cr	3170	2380	3960	3410	2560	4260	4330	4070	4590
		20.00		3910	2930	4890	4200	3150	5250	5580	5250	5920
		23.00		4590	3440	5740	4930	3700	6160	6070	5710	6430
		17.00	BG13Cr95	3680	2760	4600	3960	2970	4950	4960	4670	5260
		20.00		4530	3400	5660	4870	3650	6090	6390	6000	6770
		23.00		5320	3990	6650	5720	4290	7150	7030	6610	7450
		17.00	BG13Cr110	4300	3230	5380	4620	3470	5780	5360	5040	5680
		20.00	BG13Cr110U	5290	3970	6610	5690	4270	7110	6800	6390	7210
		23.00	BG13Cr110S	6210	4660	7760	6680	5010	8350	7450	7000	7900
7	177.80	23.00	L80-13Cr	3960	2970	4950	4350	3260	5440	6390	6000	6770
		26.00		4650	3490	5810	5110	3830	6390	7670	7210	8130
		29.00		5350	4010	6690	5870	4400	7340	9590	9010	10160
		23.00	BG13Cr95	4600	3450	5750	5050	3790	6310	7030	6610	7450
		26.00		5410	4060	6760	5930	4450	7410	8850	8320	9380
		29.00		6220	4670	7780	6830	5120	8540	11060	10400	11730
		23.00	BG13Cr110	5370	4030	6710	5900	4430	7380	7400	6950	7840
		26.00	BG13Cr110U	6310	4730	7890	6930	5200	8660	10330	9710	10950
		29.00	BG13Cr110S	7260	5450	9080	7970	5980	9960	11800	11090	12510

References 用户使用业绩

年份 Year	用户 User	产品名称 Designation of products
2004年	宝美 Baosteel America INC.	油管: $\phi 88.90 \times 6.45\text{mm}$ BGT8 Tubing: $\phi 88.90 \times 6.45\text{mm}$ BGT8
	宝新 Baosteel Singapore PTE Ltd	油管: $\phi 73.02 \times 5.51\text{mm}$ $\phi 88.90 \times 6.45\text{mm}$ Tubing: $\phi 73.02 \times 5.51\text{mm}$ $\phi 88.90 \times 6.45\text{mm}$
	中石化江苏六普油田 Jiangsu Liupu Oilfield of Sinopec	油管: $\phi 73.02 \times 5.51\text{mm}$ 套管: $\phi 139.70 \times 9.17\text{mm}$ Tubing: $\phi 73.02 \times 5.51\text{mm}$ Casing: $\phi 139.70 \times 9.17\text{mm}$
2005年	宝欧 Baosteel Trading Europe GmbH	油管: $\phi 114.30 \times 6.88\text{mm}$ HSC Tubing: $\phi 114.30 \times 6.88\text{mm}$ HSC 套管: $\phi 127.00 \times 9.19\text{mm}$ HSC Casing: $\phi 127.00 \times 9.19\text{mm}$ HSC
	宝新 Baosteel Singapore PTE Ltd	油管: $\phi 88.90 \times 6.45\text{mm}$ Tubing: $\phi 88.90 \times 6.45\text{mm}$
2006年	中海油春晓钻井项目组 Chunxiao Well-drilling Project Group of CNOOC	油管: $\phi 73.02 \times 5.51\text{mm}$ $\phi 88.90 \times 6.45\text{mm}$ BGT1 Tubing: $\phi 73.02 \times 5.51\text{mm}$ $\phi 88.90 \times 6.45\text{mm}$ BGT1
	宝新 Baosteel Singapore PTE Ltd	油管: $\phi 73.02 \times 5.51\text{mm}$ $\phi 88.90 \times 6.45\text{mm}$ Tubing: $\phi 73.02 \times 5.51\text{mm}$ $\phi 88.90 \times 6.45\text{mm}$
	中石化江苏六普油田 Jiangsu Liupu Oilfield of Sinopec	油管: $\phi 88.90 \times 6.45\text{mm}$ BGT1 Tubing: $\phi 88.90 \times 6.45\text{mm}$ BGT1
2007年	宝新 Baosteel Singapore PTE Ltd	油管: $\phi 73.02 \times 5.51\text{mm}$ Tubing: $\phi 73.02 \times 5.51\text{mm}$
	中海油春晓钻井项目组 Chunxiao Well-drilling Project Group of CNOOC	油管: $\phi 73.02 \times 5.51\text{mm}$ 套管: $\phi 139.70 \times 7.72\text{mm}$ Tubing: $\phi 73.02 \times 5.51\text{mm}$ Casing: $\phi 139.70 \times 7.72\text{mm}$
	中石化东北新区 Northeast New Area of Sinopec	油管: $\phi 73.02 \times 5.51\text{mm}$ BGT1 Tubing: $\phi 73.02 \times 5.51\text{mm}$ BGT1 套管: $\phi 139.70 \times 9.17\text{mm}$ BGC Casing: $\phi 139.70 \times 9.17\text{mm}$ BGC
	四川油田 Sichuan Oilfield	油管: $\phi 73.02 \times 5.51\text{mm}$ BGT1 Tubing: $\phi 73.02 \times 5.51\text{mm}$ BGT1
2008年	大庆油田 Daqing Oilfield	套管: $\phi 139.70 \times 9.17\text{mm}$ BGC Casing: $\phi 139.70 \times 9.17\text{mm}$ BGC
	中石化东北新区 Northeast New Area of Sinopec	套管: $\phi 139.70 \times 9.17\text{mm}$ BGC Casing: $\phi 139.70 \times 9.17\text{mm}$ BGC
	四川油田 Sichuan Oilfield	油管: $\phi 88.90 \times 7.34\text{mm}$ BGT1 Tubing: $\phi 88.90 \times 7.34\text{mm}$ BGT1

注: 截止日期: 2008年8月。
Remark: till August of 2008.

Attachment 附录

在文中有些数据采用了英制单位。英制与米制单位的换算系数如下：

1 in=25.4 mm (准确值)

1 in²=645.16 mm² (准确值)

1 ft=0.3048 m (准确值)

1 lb=0.454 kg

1 lb/ft= 1.4895 kg/m

1 psi=0.0703kg/cm²=0.006895MPa (应力)

1 ft-lb=1.355818 J (冲击功)

=1.355818 N·m (扭矩)

British system is applied to some of the data in the text.

Conversion between the British system and the Metric system are as follows:

1 in=25.4 mm (accurate value)

1 in²=645.16 mm² (accurate value)

1 ft=0.3048 m (accuracy)

1 lb=0.454 kg

1 lb/ft= 1.4895 kg/m

1 psi=0.0703kg/cm²=0.006895MPa (stress)

1 ft-lb =1.355818 J (ballistic work)

=1.355818 N·m (torque)

宝山钢铁股份有限公司
http://www.baosteel.com

BAOSHAN IRON & STEEL CO., LTD.
http://www.baosteel.com

钢管条钢事业部
Tube, Pipe and Bar Business Unit

地址: 上海宝山同济路333号
邮编: 200940
电话: 021-26643011 26642432
传真: 021-26648647

宝钢服务热线
Baosteel Service Hot-line

800-820-8590
021-26648888

宝钢在线
http://www.baosteel.net.cn

国内贸易公司

上海宝钢钢材贸易有限公司 电话: 021-50509696 传真: 021-68404618	广州宝钢南方贸易有限公司 电话: 020-32219999 传真: 020-32219555	天津宝钢北方贸易有限公司 电话: 022-84905800 传真: 022-84905806	成都宝钢西部贸易有限公司 电话: 028-85335388 传真: 028-85335680
武汉宝钢华中贸易有限公司 电话: 027-84298800 传真: 027-84298224	上海宝钢商贸有限公司 电话: 021-56121212 传真: 021-56126584	上海宝钢浦东国际贸易有限公司 电话: 021-36014655 传真: 021-51266522 51266533	上海宝钢宝山钢材贸易有限公司 电话: 021-36014688 传真: 021-51266500
长春宝钢钢材贸易有限公司 电话: 0431-85889320 传真: 0431-85889317	沈阳宝钢钢材贸易有限公司 电话: 024-62220699 传真: 024-88210198		

亚澳地区 Asia and Australia

宝和通商株式会社 HOWA TRADING CO., LTD. TEL: 0081-3-3237-9121 FAX: 0081-3-3237-9123	宝和通商首尔事务所 HOWA TRADING CO., LTD., SEOUL OFFICE TEL: 0082-2-5080893 FAX: 0082-2-5080891	宝钢澳大利亚贸易有限公司 BAO AUSTRALIA PTY LTD. TEL: 0061-8-94810535 FAX: 0061-8-94810536
宝钢新加坡贸易有限公司 BAOSTEEL SINGAPORE PTE LTD. TEL: 0065-63336818 FAX: 0065-63336819	越南代表处 VIETNAM REPRESENTATIVE OFFICE TEL: 0084-8-39100126 FAX: 0084-8-39100124	泰国代表处 THAILAND REPRESENTATIVE OFFICE TEL: 0066-2-6543008 FAX: 0066-2-6543010

欧非地区 Europe and Africa

宝钢欧洲有限公司 BAOSTEEL EUROPE GMBH TEL: 0049-40-41994101 FAX: 0049-40-41994120	宝钢西班牙有限公司 BAOSTEEL ESPAÑA, S.L. TEL: 0034-93-4119325 FAX: 0034-93-4119330	宝钢中东公司 BAOSTEEL MIDDLE EAST FZE TEL: 00971-4-8810788 FAX: 00971-4-8810789
宝钢意大利钢材集散中心有限公司 BAOSTEEL ITALIA DISTRIBUTION CENTER SPA TEL: 0039-010-5308872 FAX: 0039-010-5308895	宝钢东欧代表处 BAOSTEEL CENTRAL AND EASTERN EUROPE OFFICE TEL: 0048-32-7315012 FAX: 0048-32-7315011	

美洲地区 America

宝钢美洲贸易有限公司 BAOSTEEL AMERICA INC. TEL: 001-201-3073355 FAX: 001-201-3073358	底特律代表处 DETROIT REPRESENTATIVE OFFICE TEL: 001-248-2089918 FAX: 001-248-2080999	休斯顿代表处 HOUSTON REPRESENTATIVE OFFICE TEL: 001-281-4847333 FAX: 001-281-4842655
洛杉矶代表处 LOS ANGELES REPRESENTATIVE OFFICE TEL: 001-949-7526789 FAX: 001-949-7521234	里约代表处 BAOSTEEL DO BRAZIL LTDA. TEL: 0055-21-25311363 FAX: 0055-21-25310298	

