Non-Magnetic Drill Collars

Schoeller-Bleckmann is committed to on time delivery of high quality products continually seeking both cost reductions and technological improvements.

The company's core values are efficiency, commitment to quality and flexibility to meet customer demands.

Schoeller-Bleckmann Non-Magnetic Drill Collars are manufactured through higher contents of Chromium, Molybdenum, Nitrogen and other alloy elements to increase of pitting corrosion resistance and stress corrosion resistance.

Pitting Corrosion Test Procedure

The test specimen is tested in a test cell at a controlled temperature (20°C/68°F) and in a test solution of chlorides (e.g. 1000 ppm Cl).

The test temperature and the chloride content of the test solution are principally variable.

The measurement of the Pitting Corrosion Potential of the specimen is carried out against a reference electrode (Kalomel-Electrode_. The steady increase in the applied potential is regulated by a motor potentiometer. The amount of increase of the potential is given with 150 mV/hr (comparable ASTM G5/87: 720mV/hr)

The Potential at which first a deviation from a constant current level can be examined is stated as the "Pitting Corrosion Potential".

Stress Corrosion Resistance

All Schoeller-Bleckmann Non-magnetic materials basically show a very good resistance against stress corrosion.

For the application of these materials in high chloride muds a surface treatment as an additional protection against stress corrosion is strongly recommended.

Schoeller-Bleckmann provides following special processes to apply a uniform compressive surface layer :

- Hammer Peening
- Roller Burnishing
- Shot Peening

Tests carried out on each bar during production of drill collars & MWD-Parts

- Tensile Test
- Impact Test
- Hardness Test
- Metallographic Test (grain size)
- Oxalic Acid Test (acc. To ASTM A262 – Pract.E)
- Ultrasonic Test over whole length of the bar
- Probe Test over whole length of the bar

Tests carried out on each melt

- Chemical Analysis

Relative Magnetic Permeability

Non-Magnetic Drill Collars

Standard Certification Package

- Certification Sheet
- Ultrasonic Report
- Probe Testing Report

Additional reports based on product (mainly for MWD / LWD – Parts)

- Dimensional Report
- Surface Treatment Report
- Welding Report

Magnetic Properties

Relative Permeability : ≤ 1.001

Corrosion Resistance

- *Transgranular SCC*
  Prevented by special surface treatments ("PLUS" treatment, roller burnishing, shot peening)
- *Intergranular SCC*
  Quenching after warm forging prevents the occurrence of material sensitization. Each collar is tested according to ASTM A 262, Pract.A and E latest edition.

Non-Destructive Testing

- *Magnetic Inspection*
  Drill collars are 100% tested by a proprietary probe-testing process ("Hot Spot" –test). Magnetic permeability of each collar is certified with the printout of probe testing.
- *Ultrasonic Inspection*
  Each collar is ultrasonically inspected accordingly to ASTM E 114, latest edition as a minimum level.

Please see the next page for Non-magnetic Material Mechanical Properties and Chemical Composition

Non-Magnetic Drill Collars

Mechanical Properties of NMDC Materials

	P 530	P 530 HS	P 550	P 580	P 750
Yield Strength min. (ksi) 3 1/2" to 6 7/8" OD 7" OD to 11" OD	 110 100	 120 110	 140 130	 140 130	 140 130
Tensile Strength min. (ksi)	120	130	150	150	150
Elongation (%)	25	25	20	20	15
Reduction of area (%)	50	50	50	50	50
Impact Energy min. (ft./lb.) **ISO-$_V$ longitudinal**	90	90	60	60	80
Hardness – Brinell	260-350	285-365	300-400	350-450	300-400
Endurance Strength min. (ksi) **N = 10^7**	--	50	60	60	50

Chemical Composition

BRAND	WEIGHT PERCENT (%)							PRE
	C	Si	Cr	Mn	Ni	Mo	N	
P 530 P 530 HS	Max. 0,05	Max. 0,5	13,0 14,0	18,5 20,0	Max. 1.5	0,3 0,6	0,25 0,35	20
P 550	Max. 0,05	Max. 0,5	17,5 19,0	18,5 20,0	Max. 1.5	Max. 0,8	0,50 0,60	28
P 580	Max. 0,05	Max. 0,5	20,5 22,0	22,0 24,0	Max. 2.5	Max. 1,0	0,75 0,90	36
P 750	Max. 0,03	Max. 0,5	26,5 29,5	1,50 3,00	28,00 31,50	2,0 4,0	0,20 0,35	42

Pitting Resisting Equivalent PRE = Cr + 3,3 Mo + 16 N