



# Drilling Monitoring Sub (DMS)

## Overview

CNPCUSA DMS monitors down-hole drilling parameters for improved efficiency and drilling performance. Measurements are simultaneously recorded and transmitted to surface in real time with MWD Telemetry for optimized drilling and improved ROP. DMS allows you to know at-bit dynamics allowing mitigation of shock and vibration: the primary causes of downhole tool failure.

## Key Features

- Real-time BHA diagnostics
- Real-time and recorded mode measurements
- Compact design, scalable architecture
- Real time clock

## Sour Service

The DMS uses 3 high-strength corrosion resistant alloys; INC718, P550, and Beryllium Copper(BeCu). INC718 is a Nickel-Chromium alloy which gives resistance to many media. Nickel contributes to its resistance to many inorganic/organic compounds through a wide range of pH. The chromium is known to add resistance to oxidizing and sulfur compounds and molybdenum adds resistance to pitting. P550 is a Manganese-chromium steel with high nitrogen content. High Nitrogen reduces pitting and protects against stress corrosion cracking and supports the benefits of chromium. BeCu is known for its ability resistance to stress corrosion cracking and maintaining Strength in H2S.

\*H2S Standard Elastomer is partially H2S resistant but for higher H2S content above 20ppm special elastomer material is available.

## General Specifications

Borehole Size Range	8-3/8 in. to 9-7/8 in.
Nominal O.D.	6 3/4 in
Maximum O.D.	7 3/8 in
Nominal I.D.	2 in
Length	114 in
Collar Material	P550 Non-Mag SST
Auxiliary materials	INC 718, BeCu
Elastomer material (standard)	FluoroCarbon 90D - Parker V0709
Elastomer for H2S* <sup>H2S</sup>	FluoroCarbon 95D - Parker V1238
Weight	818 lbs
Operating flow range	0-800gal/min
Operating Temperature	32-347°F / 0- 175°C
Max. Operating Pressure	25,000 psi / 172mPa
Max Overpull (tension)	500,000lbs / 2224kN
Max WOB	1,000,000 lbs / 4448kN
Max DLS	10°/ 100ft
Max Torque	30,000 ft-lbs / 40,675Nm

## Electronics

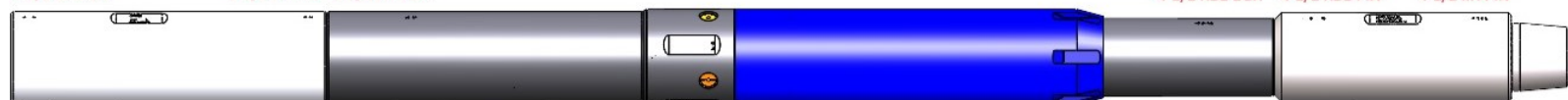
Memory life	200hrs
Voltage Input	20-36 Volts
Power consumption	90mA / < 5 Watts
Downhole Memory	16 Gb
Interface to MWD	RS485/232, or Custom

## Mud Content

Max lost circulation material	No limit
Max sand content %	1

## Uphole

4-1/2 I.F. BOX 5-1/2 FH PIN 5-1/2 FH BOX



## Downhole

4-1/2 REG BOX 4-1/2 REG PIN 4-1/2 I.F. PIN



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## Sensors

CNPCUSA utilizes P & T and drilling dynamics sensors housed in a specialized collar. The measurements signals are captured, recorded and processed using a propriety methodology, with operational flexibility to provide both low-res real-time and/or high res post-run data.

## Uses

- Actual WOB can be used to maximize ROP
- WOB,TOB, BOB with vibrational and RPM can be used to identify and reduce Whirl, stick slip, bit bounce, and excessive vibrations to all data driven improvements.
- Differential pressure can help understand mud motor operating condition.
- WOB Can increase sliding efficiency during Motor sliding operation with
- BOB can identify localized dog leg severity not in surveys.

## Benefits

- Reduced operational Risks
- Maximized drill efficiency and performance
- Real-time detection of down-hole drilling dynamics problems

### Measurements Performance

#### Weight On Bit( WOB)

Design Range	±80,000 lbs
Operating Range	±100,000 lbs
Accuracy	±5%
Repeatability	±1%
Resolution	100 lbs

#### Torque On Bit (TOB)

Design Range	±24,000 ft-lbs
Operating Range	±30,000 ft-lbs
Accuracy	±5%
Repeatability	±1%
Resolution	200 ft- lbs

#### Bending On Bit (BOB)

Design Range	±100,000 ft-lbs
Operating Range	±85,000 ft-lbs
Operating DLS	10°/100 ft
Accuracy	±5%
Repeatability	±1%
Resolution	100 ft-lbs

#### Pressure - Bore & Annulus

Operating Range	0-25 ksi
Sample Rate	5s
Resolution	0.38 psi

#### Temperature - Bore & Annulus

Operating Range	0-175°C
Accuracy	±1%
Resolution	0.01°C

#### Vibration - 3 Axial

Operating Range	±30 g
Sample Rate	1,000Hz

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#### RPM

Range	±333
Accuracy	±1

#### Data Acquisition

Sample rate	1,000Hz
Process time	3s
Update frequency	5s

