**SZJ-C Multi-Parameter Drilling Instrumentation System**

**Technical Proposal**

1. General description

Model SZJ-C Multi-Parameter Drilling Instrumentation System consists of driller’s console (including hydraulic gauges and wide-temperature 15″ touching screen), sensors, DAQ Unit, process center in the duty office, cables, hydraulic hoses, etc. Parameters can be displayed directly on the driller’s console. It is used to measure and display as required by the end user the hook load，weight on bit，standpipe pressure，casing pressure, tong torque，Rotary RPM，rotary torque, SPM #1, #2 and #3, , mud return flow, mud pit volume 1#~6#, total mud pit volume, position of traveling block, well depth, H2S gas detection, combustible gas detection, and other parameters. The key parameters can be alarmed and controlled. The system is featured with: The key parameters can be alarmed and controlled. The system is featured with:

1. Modulation design makes the system apt to be extended and various parameter can be selected and assembled as required；
2. The system has built-in industrial CPU as its core and acquires and processes data with high reliability；
3. Human-centered design of monitoring software enables the operators to select freely emulation gauge, digital display or curve display interface and real-time display, storage and print are also supported；
4. Wide-temperature touching screen is employed with stable performance and excellent visual effect; it can simulate dial/table/curve to display data of all the parameters and support touching settings of key parameters on the drill floor.
5. High and low threshold alarm values can be set for key parameters and alarm can also be controlled;
6. Signals from all the sensors are collected and enters the DAQ unit. So that communication disorder caused by data concurrent is prevented. Proper wiring design makes well site installation, commission and maintenance simpler and easier.
7. The system meets HSE standards with its waterproof, shock-resistance, explosion-proof and erosion proof design. Key sensors and DAQ and communication modules are all imported. Well selected components can be used in wide-temperature environment. Multiple anti-interference design and high stability work together to ensure long-time no-fault operation；
8. Multi-language selection, metric and English system display, life-time maintenance and upgrading to guarantee you a satisfactory system.
9. The multi-parameter drilling instrumentation system uses its own proprietary monitoring software V1.0.

**2. Schematic diagram**

J-box

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J-box

Weight indicator (optional)

Hookload sensor

Rotary torque gauge

Rotary torque sensor

**Driller’s console**

Standpipe pressure sensor

Standpipe pressure sensor

Tong torque sensor (optional

Tong torque sensor

Pressure transducer

Press. Trans.1

Press. Trans.2

Press. Trans.3

Alarm

Press. Trans.4,5

Mud pit area J- box

1-7# Mud pit volume sensor

**Touching screen display unit**

**DAQ**

**Doghouse**

J-box

1#SPM sensor

2#SPM sensor

3#SPM sensor

Ex-UPS

220VAC

RPM sensor

Printer

UPS

**Wireless communication**

PC in the duty office

Mud flow sensor

Depth sensor

220V power supply

**Duty Office**

**3. Technical Specification**

**3.1** Parameters Monitored

3.1.1 Measured parameters：hookload, rotary torque, standpipe pressure, casing pressure, tong torque, RPM, 1#SMP, 2#SPM, 3# SPM, Mud Return Flow, 1#-6# Mud pit volume, total tank volume, travelling block height, well depth, H2S detection and combustible gas detection, and others.

3.1.2 Calculated Parameters: WOB, accumulated SPM, mud in, total mud in, ton-km and etc.

3.1.3 Alarm: audible and visual alarm setup for all the parameters; mud gain /loss alarm.

3.1.4 Data on the computer: real-time print of various parameters and curves, screen playback and printing playback, and different reports.

3.2 Environmental technical specifications

3.2.1 Working temperature：-20℃～60℃

3.2.2 Relative humidity：0～90%。

3.2.3 Power Supply：

* + Voltage range：220VAC±20%
  + Frequency range：50Hz±10%
  + Lasting time of UPS：≥15min
  + Output power：1000W

3.2.4 Explosion-proof Conditions：

* + Intrinsically safe type explosion proof for DAQ unit and touching screen unit；
  + All the sensors meet corresponding explosion-proof requirements.

**4. Driller’s Console**

**Includes:**

1. 15″wide temperature, industrial touching screen (display hookload, WOB, rotary torque, rotary table RPM, standpipe pressure, mud flow, tong torque, 1# SPM, 2#SPM, 3# SPM, 1#~7# Mud Pit Volume, total mud volume, travelling block height, well depth on it) Quantity: 1set

2. Two-system weight indicator (optional) QTY: 1

3. Two-system standpipe pressure gauge QTY: 1

4. Two-system rotary torque gauge QTY: 1

5. Three pressure transducers (24VDC）and one adapter box of pressure transducer

6. Alarm one set

7. Waterproof and erosion-resistance connection parts;

8. Damper valve, quick connector and etc.

9. Nameplate and standard installation parts

**5. Processing center in tool pusher’s office**

Processing center should have the following functions:

* Integrated display of parameters and curves in stimulated analogue indicators and all the parameters can be stored, printed out and retrieved. Metric and Imperial units can be exchanged.
* Parameter setting, sensor calibration, alarm value and threshold value setting can be realized in on-line condition.
* Import and export various kinds of engineering parameter reports in different data formats so as to improve compatibility of data formats.

Generally the unit provided by the supplier include the following components:：

● Brand commercial computer 2sets

* WINDOWS operation software in Chinese and English (not lower than Version 3.06A)
* A4 color ink-jet printer one set
* 500W UPS one set
* Communication box

**6. DAQ Unit**

DAQ unit is the core of the whole drilling instrumentation system, which is used for process of all the parameter and provides multi-path communication. The whole unit is installed inside a sealed, explosion-proof stainless steel box and mounted in the dog house.

Includes:

1. Wide-voltage & wide-frequency switch power supply

2. Switch with safety fuse

3. Power board（including DC-DC switch power supply and self-recovering safety, etc.）

4. Pre-processing board one piece

5. DAQ board one piece

6. Isolated safety barrier

7. Waterproof and erosion-resistance parts

8. Restriction breathing explosion proof, stainless steel sealing box

9. One piece of 10-meter power cable, cable tray, etc.

10. UPS（1000VA） 1set

**7. Sensors**

**7.1 Hookload and WOB:**

The max. deadline load: \_\_\_\_\_\_\_\_\_\_

Measuring range: \_\_\_\_\_\_\_\_\_\_\_\_\_

Accuracy: ±1.5%。

The system includes:

* One set of 10MPa pressure transducer（installed in the driller’s console）

Working principle：

The transducer transfers the hydraulic signal derived from sensor into electrical signal and then transmits it to DAQ Unit.

**7.2 Standpipe pressure (diaphragm cup type):**

Measuring range: 0 ～ 70MPa

Accuracy:±1.5%。

Includes:

* One set of diaphragm cup-type standpipe pressure sensor
* One piece of 20-meter high pressure hydraulic hose
* One set of 70MPa pressure transducer（installed in the driller’s console）

Working principle：

The transducer transfers the hydraulic signal derived from standpipe pressure sensor into electrical signal and then transmits it to DAQ.

The connection of standpipe sensor is 2″NPT female threads. There should be 2″NPT male thread on the standpipe. The sensor should be vertically installed.

**7.4** Mechanical Idler（installed inside the chain box）

Measuring range：0 ～ 40kN•m（0 ～ 500scale）

Accuracy：±5%

Includes：

* Dual chain idler type rotary torque sensor 1 set (The specific size of the idler shall be determined when the purchaser informs the size of the chain)
* Rotary torque gauge 1piece（installed in the driller’s console）；
* One piece of 15-meter common hydraulic hose

The sensor measures the tension of the chains. Party B provides Party A installation drawing (Refer to the attached drawing) of the sensor and Party A modifies the chain box according to the drawing.

**7.5 Tong Torque(optional)：**

Measuring range：0 ～ 100kN（tail line pull）

Accuracy：±2.5%

Includes：

* One set of pulling-type piston sensor (with one piece of 20-meter high-pressure hydraulic hose.
* One set of 25MPa pressure transducer（installed in the driller’s console）。

Working Principle:

The hydraulic pressure introduced from the tong torque sensor via high-pressure hose is transmitted into electrical signal and sent to the DAQ unit.

**7.6 1# ~3 # SPM（Proximity type）：**

Measuring range：0 ～ 300s/min

Accuracy：±1.5%

Includes：

* Three sets of SPM sensors
* One piece of 120-meter SPM sensor bus cable
* One set of junction box
* Three pieces of 1-meter sensor cable

Working Principle:

Electrical signals produced by SPM sensor are transmitted to DAQ unit.

**7.7 RPM（Proximity type）**

Measuring range：0 ～ 300r/min

Accuracy：±1.5%

Includes：

* One set of RPM sensor
* One piece of 35-meter sensor cable

Working Principle:

The electrical signals produced by the RPM sensor are transmitted to the DAQ unit.

**7.8 Mud Return Flow（paddle type）:**

Measuring range：0 ～ 100%

Accuracy：±2%

Includes：

* One set of paddle type flow sensor
* One piece of 60-meter sensor cable

Working Principle:

Electrical signals produced by the sensor are transmitted to DAQ unit.

**7.9 Mud Pit Volume (including the trip tank)：**

Measuring range：0 ～ 99.9m3（single pit）

Accuracy：±1.5%

Includes：

* Six sets of ultrasonic sensors
* Six pieces of 20-meter sensor cables
* Two pieces of 10-conductor 120-meter sensor cable
* Six sets of mounting brackets
* Two pieces of J-boxes.

Working Principle:

Electrical signals produced by ultrasonic sensor are transmitted to DAQ unit.

**7.10 Well Depth（photoelectrical code type）：**

**Part No.: SZJ-SD.1**

Measuring range：0 ～ 9999.9m

Accuracy：±1%

Includes：

* One set of depth sensor（installed on the drum）
* One piece of 40-meter sensor cable

Working principle：

The system utilizes a sensor of photoelectrical coder. The sensor is installed at the end area of the drum shaft, the connection size is: G3/4″. Electrical signal from depth sensor is transmitted to DAQ Unit.

Derived parameters: ton-km, bit time and ROP

7.11 H2S gas detectors**：**

Measuring range：0 ～ 100ppm

Accuracy：±5% F·S。

Include：

* Three sets of H2S gas detectors (with cables)

Working principle：

Electrical signal from H2S detector is transmitted to the DAQ unit.

**7.12 Combustible gas detectors**

Measuring range：0 ～ 100% LEL

Accuracy：±5% LEL F·S。

Includes：

* Three sets of combustible gas detectors (with cables)

Working principle：

Electrical signal from combustible gas detector is transmitted to the DAQ unit.

8. Necessary cables, accessories and documents

8.1 20-meter cable for the drilling floor Two pieces

8.2 Documents

| No. | Part No. | | Description | | Unit | Qty | | Remarks | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1.1 |  | Operation manual | | Copy | | | 5 | |  |
| 1.2 |  | Packing list | | Copy | | | 2 | |  |
| 1.3 |  | Quality certificate | | Copy | | | 5 | |  |