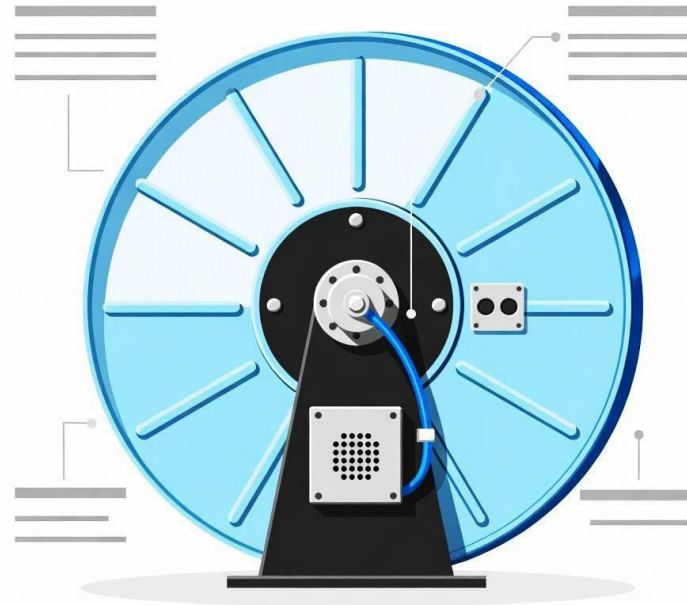


SATURN

CONTINUOUS INSULATION
RESISTANCE MONITORING
SYSTEM FOR ESP CABLE
DURING RIH/POOH
OPERATIONS



Challenges

Power cable failure ranks among the **top three causes** of ESP system failures, along with pump stage wear and submersible motor burnout.

High-quality cable insulation testing is therefore a **critical step** during ESP installation (running into the well).



Current Manual Measurement Practice – Key Issues

Extended workover duration (+4–5 crew-hours for manual insulation resistance checks)

Delayed response to downhole equipment damage during RIH (round cable armour / insulation damage)

Waiting for field electrical engineer (ESP-specialist) to confirm $R = 0$

TMS sensor failure during manual measurement

Residual voltage on cable after manual testing (risk of injury or fatality)

Lack of qualified electricians in well workover crews

Solution – SATURN Continuous Insulation Monitoring Device (CIMD)

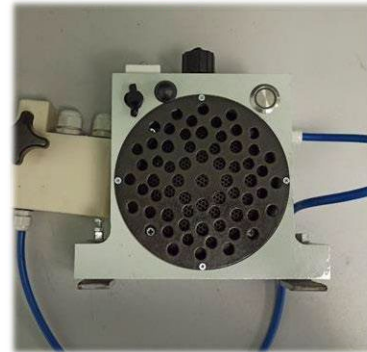
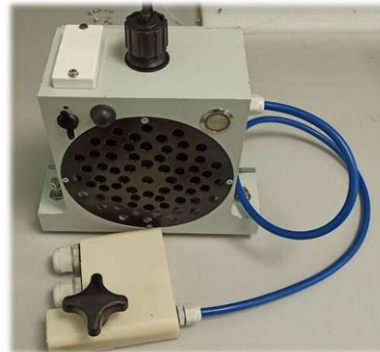


SATURN Continuous Insulation Monitoring Device

Designed for real-time monitoring of insulation resistance of downhole ESP equipment during running operations.

When monitored values exceed allowable limits, the device instantly alerts the crew via audio alarm.

All measurement data is archived in non-volatile internal memory.



Key features CIMD SATURN



1. Continuous Insulation Resistance Monitoring

- Fully automatic operation: the device works completely autonomously
- Measurement range: 0–1000 M Ω (megohms)
- Test voltage: 300–1000 V DC (user-configurable)
- Measurement accuracy: $\pm 5\%$ (high data reliability)
- Maximum short-circuit current in measuring circuit: ≤ 1 mA (ensures electrical safety)

2. Real-time Running Parameters Monitoring

The device simultaneously records and displays:

- Real-time ESP running depth
- Equipment running speed
- Operation duration (start and end timestamps)
- Well identification data (field, field, location, well number)

3. Key Advantages of the SATURN Device:

- Built-in self-diagnostics with automatic verification of measuring circuits (maximum data reliability)
- Automatic check of correct connection to the cable core (eliminates human error)
- Automatic verification of secure mounting on the cable drum (increased electrical safety)
- Voice annunciator for immediate alerts (fast response and ease of use)
- Built-in web interface for remote access and control (convenience and real-time monitoring)
- Live data transmission to driller's display console (ДЭЛ) (instant visibility for the crew)
- Charging via standard USB-C (5 V / 2 A) from any charger (universal and field-friendly)
- Automatic archiving of all measurements in non-volatile internal memory with USB-A download capability

Alarm System



1. Local alarms

- Audible alarm ≥ 100 dB (audible in high industrial noise)

2. Crew notification & integration

- Immediate alerting enables instant stop of running operations

3. Integration with corporate information systems

- Seamless interface with corporate RTU/dispatch systems
- Data transfer to ERA-Repairs information system
- Data download via USB or Wi-Fi

Technical Specifications

№	PARAMETER	UNIT	VALUE
1	DC test voltage	V	300...1000
2	Max. short-circuit current in measuring circuit	mA	1
3	Insulation resistance measurement range	MΩ	0...1000
4	Measurement accuracy	%	±5
5	Audible alarm level (min)	dB	100
6	Continuous operation (without recharge) (min)	hrs	24
7	Rechargeable battery voltage	V	7,4
8	Interfaces		USB,Wi-Fi
9	Dimensions (max): – measuring unit; – RTU interface unit	mm	200×110×110; 85×45×90
10	Measuring cable length (min)	mm	1000
11	Weight (max): – measuring unit with battery & cable; – RTU interface unit	kg	2,4

Implementation Benefits

Guaranteed outcomes from **SATURN** deployment:

- **Fully automatic** insulation resistance monitoring **during RIH/POOH.**
- Technological effect - Reduced crew-hours and overall workover time
- Economics effect – Lower repair costs
- **Complete elimination of downhole equipment failures caused by undetected cable insulation defects**



THANK YOU FOR WATCHING!

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