TECHNICAL SPECIFICATIONS

Drilling Engineering Parameters

TS DATA SHEETS

- DR -

Continuing development sometimes necessitates specification changes without notice

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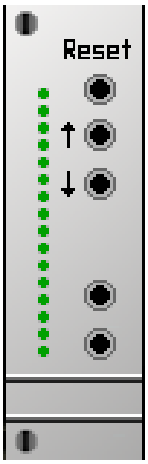
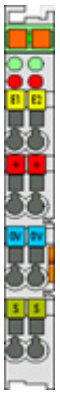
RATE OF PENETRATION

Frequency Converter



Barrier Amplifier

Encoder Interface



Rotary Encoder to Register Travelling Block Movements

- **Hook position**
- **Depth**
- **ROP per m / 0.2m**
- **Drilling rate**
- **Travelling block speed**
- **Acceleration**
- **Bit run time**
- **Bit depth**
- **Draw-works speed**
- **Time for tripping operations**

Parameter Specifications

Measuring range	25 pulses per rotation
System accuracy	± 1cm vertical movement of the travelling block
System resolution	1/25th of the draw-works drum revolution

Principle of Operation

The rotary encoder is fitted to the main drive shaft of the draw-works. The encoder produces pulse signals in correspondence to the drum rotation and speed. The rotations of two separate pulse discs are registered inductively by proximity switches. A 90° signal phase shift enables the indication of the actual state of motion.

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily); check the sensor positioning weekly or after each tripping operation, re-adjust if necessary

Data Processing

The powerful DMS software records, visualizes and displays data on different locations on the well site.

The DMS submits the setting of individual alarms for “High“ and “Low“ limits.
Acoustic alarms can be set at selected intervals, e.g. to indicate that a lag corrected cuttings sample is due.

Technical Specifications

SENSOR B-10

▪ **Type or model:**	Two-channel rotary encoder
▪ **Certified for hazardous area:**	Intrinsically safe to EEx ia IIC T6
▪ **Certificate of conformity:**	PTB No. Ex-83/2022X
▪ **Operating temperature range:**	-25°C … +100°C
▪ **Supply voltage:**	8V DC
▪ **Installation point :**	Fitted to the main drive shaft of the draw-works drum

Evaluation Unit

	Impulse Counter B10	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Two-channel rotary encoder – Inputs [EEx ia] IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	BASEEFA No. Ex-93C2412	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20mA	4 – 20mA
▪ **Supply voltage:**	8 V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independent connectors
▪ **Installation:**	Logging unit; plugged into 19-inch frame (DMS rack)	

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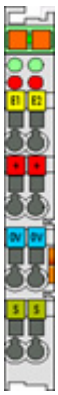
HOOK LOAD
(hydraulic)

Frequency Converter

Barrier Amplifier

Encoder Interface



Pressure transmitter for monitoring the hook load

- **Current hook load / drill string weight**
- **Weight on bit**

Parameter Specifications

- Measuring range — Depending on rig specification – normally 0 – 100bar
- System accuracy — ≤ 1% of full scale
- System resolution — 0.1bar

Principle of Operation

A diaphragm separates a micro-machined silicon sensor with temperature compensation from the pressure medium. Silicon oil serves as pressure transmitter. An integrated amplifier converts the output test current, which is proportional to the pressure density, into a corresponding DC signal (4 – 20mA).

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily) shall include the observation of possible leaks in the sensor hydraulic system.

Data Processing

The powerful DMS software records, visualizes and displays data on different locations on the well site.

The DMS submits the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

SENSOR

▪ **Type or model:**	Pressure transmitter
▪ **Certified for hazardous area:**	Intrinsically safe to EEx ia IIC T4
▪ **Certificate of conformity:**	BASEEFA No. Ex-89.C.2251
▪ **Operating temperature range:**	-20°C … +80°C
▪ **Supply voltage:**	24V DC
▪ **Installation point :**	Connected to the load cell of the hook load indicator at the deadline anchor (process connection e.g. 1/4" NPT HANSEN)

Evaluation Unit

	Transmitter / Repeater Unit	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	BASEEFA Nr. Ex-90.C.2358X	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20mA	4 – 20mA
▪ **Supply voltage:**	24 V DC	24 V DC
▪ **Bus System:**	Not applicable	Not applicable
▪ **Installation:**	Logging unit; connected to 19-inch frame (DMS rack)	

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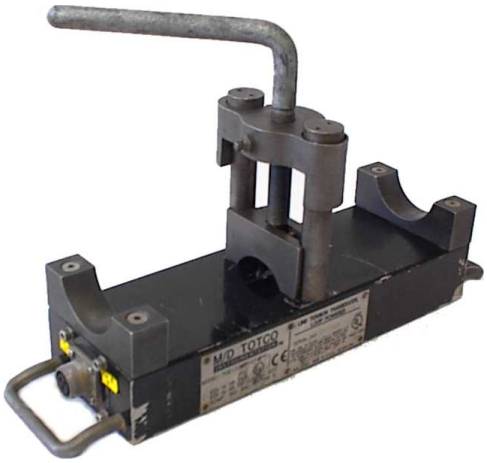
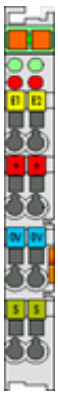
HOOK LOAD
(electrical)



Frequency Converter

Barrier Amplifier

Encoder Interface



Line Tension Transducer for Monitoring the Hook Load

- **Current hook load / drill string weight**
- **Weight on bit**

Parameter Specifications

- Measuring range 0 – 45to (450to with 10 lines)
- System accuracy ± 2% of full scale
- System resolution 0.5to

Principle of Operation

The drilling line is fixed at the centre of the transducer body between two deflection blocks at the deadline. When additional load is applied to the drilling line, the drilling line tends to straighten at the deflection point and creates a strain on the transducer body, which the strain gauges detect. The strain gauge wheatstone bridge and the signal converter combine to produce a 4 – 20mA output signal proportional to the tension in the drilling line.

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily); check the sensor positioning weekly or after each tripping operation, readjust if necessary.

Data Processing

Display, output, recording and storage of the measurements are determined by the Drill Monitoring System developed by GEO-data GmbH.
The DMS submits the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

	SENSOR	
▪ **Type or model**	Line tension transducer	
▪ **Certified for hazardous area**	Intrinsically safe to EEx ia IIB T6	
▪ **Certificate of conformity**	ISSeP No. 94C.101.199X	
▪ **Operating temperature range**	-40°C … +80°C	
▪ **Supply voltage**	24V DC	
▪ **Installation point**	Clamped to the anchored wire rope (deadline)	
	Evaluation Unit	
	Transmitter / Repeater Unit	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier EEx ia IIC
▪ **Certificate of conformity**	BASEEFA No Ex 90.C.2358X	TÜV 99 ATEX 1499 X
▪ **Signal output**	4 – 20mA	4 – 20 mA
▪ **Supply voltage**	24V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independent connectors
▪ **Installation point**	Logging unit; plugged into 19-inch frame (DMS rack)	

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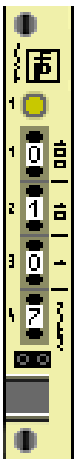
ROTARY SPEED (R.P.M.)

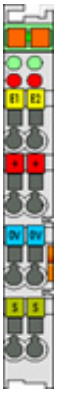
(Rotary table / Top drive)

Frequency Converter



Barrier Amplifier

Encoder Interface



Incremental encoder to monitor the rotary speed

- **Actual RPM rotary table / top drive**
- **Total RPM**
- **Accumulated bit revolutions**

Parameter Specifications

- Measuring range — 25 pulses per revolution
- System accuracy — – / –
- System resolution — 1/25 of a total sensor revolution

Principle of Operation

The rotary encoder is linked to the drive unit of the rotary table or the top-drive. The pulse disc generates, in correspondence to the rotary speed, a sequence of pulses. Inductive proximity switches convert the pulses into proportional electrical signals.

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily); check the sensor positioning weekly or after each tripping operation, readjust if necessary.

Data Processing

The powerful DMS software records, visualizes and displays data on different locations on the well site.

The DMS supports the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

	SENSOR
▪ **Type or model:**	Incremental encoder
▪ **Certified for hazardous area:**	Intrinsically safe to EEx ia IIC T6
▪ **Certificate of conformity:**	PTB No. Ex-83/2022X
▪ **Operating temperature range:**	-10°C … +60°C
▪ **Supply voltage:**	8V DC
▪ **Installation point :**	Linked to the drive unit of the rotary table or the top drive

	Evaluation Unit	
	Transmitter / Repeater Unit	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	PTB No. Ex-81/2065X	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20 mA	4 – 20 mA
▪ **Supply voltage:**	24 V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independent connectors
▪ **Installation:**	Logging unit; connected to 19-inch frame (DMS rack)	

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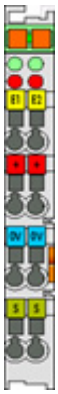
ROTARY TORQUE
(hydraulic)

Frequency Converter

Barrier Amplifier

Encoder Interface



Pressure transmitter to monitor the rotary torque

- High stability
- High accuracy
- High shock and vibration compliance
- Individual types and pressure ranges

Parameter Specifications

▪ Measuring range	Depending on rig specification Normally 0 to 400bar
▪ System accuracy	≤ 1% of full scale
▪ System resolution	0.1bar

Principle of Operation

A diaphragm separates a micro-machined silicon sensor with temperature compensation from the pressure medium. Silicon oil serves as pressure transmitter. An integrated amplifier converts the output test current, which is proportional to the pressure density, into a corresponding DC signal (4 – 20mA).

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily) shall include the observation of possible leaks in the sensor hydraulic system.

Data Processing

The powerful DMS software records, visualizes and displays data on different locations on the well site.

The DMS supports the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

	SENSOR
▪ **Type or model:**	Pressure transmitter
▪ **Certified for hazardous area:**	Intrinsically safe to EEx ia IIC T4
▪ **Certificate of conformity:**	BASEEFA No. Ex-89.C.2251
▪ **Operating temperature range:**	-20°C … +80°C
▪ **Supply voltage:**	24V DC
▪ **Installation point :**	Connected to the load cell of the rotary torque indicator (process connection e.g. 1/4" NPT HANSEN)

	TRANSMITTER / REPEATER UNIT	
	Transmitter / Repeater Unit	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	BASEEFA No. Ex-90.C.2358X	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20mA	4 – 20 mA
▪ **Supply voltage:**	24V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independant connectors
▪ **Installation:**	Logging unit; plugged into 19-inch frame (DMS rack)	

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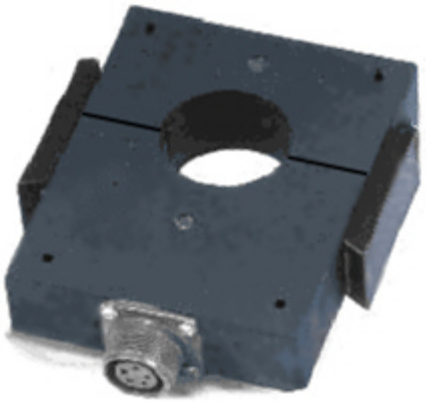
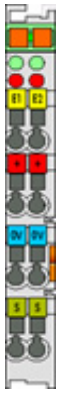
ROTARY TORQUE
(electrical)





Current transformer to monitor the rotary torque

- For use on electrically-driven rotary tables or top drives
- Non-contact technique with fast response to input changes
- 5000 Volt isolation
- Stability maintained during severe vibrations (< 1%
- Low temperature effects

Parameter Specifications

- Measuring range 0 – 2000A (AC/DC)
- System accuracy ± 0,5% of full scale

Principle of Operation

The signal pickup for the measurement of the rotary torque is a Hall-effect clamp-on current transformer, attached to the power feed cable of the rotary drive/top drive motor. The measured magnetic field strength of the electric current drawn to the motor is proportional to the rotary torque applied to the drill string.

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily) must include the inspection of a correct sensor positioning, readjust if necessary.

Data Processing

Display, output, recording and storage of the measurements are determined by the Drill Monitoring System developed by GEO-data GmbH.
The DMS submits the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

	SENSOR
▪ **Type or model**	Clamp-on current transformer
▪ **Certified for hazardous area**	– / --
▪ **Certificate of conformity**	– / –
▪ **Operating temperature range**	-40°C … +65°C
▪ **Supply voltage**	115 V AC / 50 – 400 Hz/2 VA
▪ **Installation point**	Clamped to the power feed cable of the electric rotary table or top drive motor

	Evaluation Unit	
	Transmitter / Repeater Unit	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	PTB No. Ex-81/2065X	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20 mA	4 – 20 mA
▪ **Supply voltage:**	24 V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independent connectors
▪ **Installation:**	Logging unit; connected to 19-inch frame (DMS rack)	

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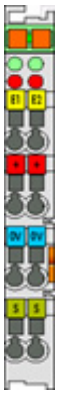
MAKE-UP TORQUE

(Tong / Iron roughneck)

Frequency Converter

Barrier Amplifier

Encoder Interface



Pressure transmitter to monitor the make-up torque

- High stability
- High accuracy
- High shock and vibration capacity
- Individual types and pressure ranges

Parameter Specifications

▪ Operating pressure ranges	depending on rig specification Normally to 400bars
▪ System accuracy	≤ 1% of full scale
▪ System resolution	0.1bars

Principle of Operation

A diaphragm separates a micromachined silicon sensor with temperature compensation from the pressure medium. Silicon oil serves as pressure transmitter. An integrated amplifier converts the output test current, which is proportional to the pressure density, into a corresponding DC signal (4 – 20mA).

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily) shall include the observation of possible leaks in the sensor hydraulic system.

Data Processing

Display, output, recording and storage of the measurements are determined by the Drill Monitoring System developed by GEO-data GmbH.
The DMS submits the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

	SENSOR	
▪ **Type or model:**	Pressure transmitter	
▪ **Certified for hazardous area:**	Intrinsically safe to EEx ia IIC T4	
▪ **Certificate of conformity:**	BASEEFA No. Ex-89.C.2251	
▪ **Operating temperature range:**	-20°C … +80°C	
▪ **Supply voltage:**	24V DC	
▪ **Installation point :**	Connected to the load cell of the make-up torque indicator (process connection e.g. 1/4" NPT HANSEN)	

	Evaluation Unit	
	Transmitter / Repeater Unit	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	BASEEFA No. Ex-90.C.2358X	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20mA	4 – 20 mA
▪ **Supply voltage:**	24V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independent connectors
▪ **Installation:**	Logging unit; plugged into 19-inch frame (DMS rack)	

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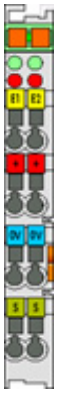
ANNULAR (CASING) PRESSURE

Frequency Converter

Barrier Amplifier

Encoder Interface



Pressure transmitter for monitoring Annular Pressure

- High stability
- High accuracy
- High shock and vibration capacity
- Individual types and pressure ranges

Parameter Specifications

▪ Operating pressure ranges	from 0 to 700bar
▪ System accuracy	≤ 1% of full scale
▪ System resolution	1bar

Principle of Operation

A diaphragm separates a micromachined silicon sensor with temperature compensation from the pressure medium. Silicon oil serves as pressure transmitter. An integrated amplifier converts the output test current, which is proportional to the pressure density, into a corresponding DC signal (4 – 20mA).

Maintenance

Once the system is set up and calibrated, generally no maintenance will be required.

Visual routine checks (daily) shall include the observation of possible leaks in the sensor hydraulic system.

Data Processing

The powerful DMS software records, visualizes and displays data on different locations on the well site.

The DMS supports the setting of individual alarms for “High“ and “Low“ limits.

Technical Specifications

	SENSOR	
▪ **Type or model:**	Pressure transmitter	
▪ **Certified for hazardous area:**	Intrinsically safe to EEx ia IIC T4	
▪ **Certificate of conformity:**	BASEEFA No. Ex-89.C.2251	
▪ **Operating temperature range:**	-20°C … +80°C	
▪ **Supply voltage:**	24V DC	
▪ **Installation point :**	Connected to the load cell of the annular pressure indicator (process connection e.g. 1/4" NPT HANSEN)	
	Evaluation Unit	
	Impulse Counter B10	**Ex-Barrier Amplifier with BUS System**
▪ **Type or model**	Isolating amplifier – inputs EEx ia IIC	Barrier Amplifier - EEx ia IIC
▪ **Certificate of conformity:**	BASEEFA No. Ex-90.C.2358X	TÜV 99 ATEX 1499 X
▪ **Signal output :**	4 – 20mA	4 – 20 mA
▪ **Supply voltage:**	24V DC	24 V DC
▪ **Bus System:**	Not applicable	Field bus independant connectors
▪ **Installation:**	Logging unit; plugged into 19-inch frame (DMS rack)	

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