

# Examine Scale Deposition and Blocking

## with the Differential Scale Loop

### Characteristics

- Tube system for scale deposition and blocking
- Fully automated with decreasing inhibitor concentrations
- Up to +250 / +300 °C (482 / 572 °F), 51 /170 /400 bar (740 /2.465 /5.800 psi)
- Overnight runs and repeated tests are possible
- Automated scale detection and cleaning procedure
- Sour setup available

The Differential Scale Loop (DSL) is a tube blocking system as fully automated laboratory device to examine the precipitation and deposition of scale and salt at simulated pipeline and water conditions.

The Differential Scale Loop was particularly developed to observe the process of barium sulphate and calcium carbonate (scale) forming under realistic conditions and to design counteractive measures. This is carried out in three steps:

1. Determine the risk of scale deposition
2. Selection or development of an inhibitor
3. Test the efficiency of the inhibitor and determine the minimal necessary inhibitor concentration.



### Mode of operation

To execute this process three HPLC-pumps are used. Two solutions - anionic and cationic - are mixed with a third fluid which contains a known concentration of inhibitor.

The mixed solutions are pumped through a test pipeline. By increase of pressure - measuring of differential pressure - the start of scale deposition is indicated.

### Small sample volumes

A sample volume of just 500 ml (17,5 fl.oz) is already sufficient for one measurement. To simulate different environment conditions,

measurements can be executed at temperatures up to 250 / 300 °C (482 / 572 °F) and pressures up to 51 /170 /400 bar (750 /2.465 /5.800 psi).

### Automated decreasing concentrations

The three pumps system makes automated measurements with decreasing inhibitor concentrations possible. The PSL software *WinDSL* permits scheduling and execution of complex test runs in steps with different inhibitor concentrations. The measuring data are visualised and stored in an ASCII-compatible format. An import of data to Excel

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for easy evaluation is possible. Beside measuring data further information is saved in a log-file.

Also the configuration of a test schedule can be saved and reloaded separately.

### Automated cleaning procedure

With the software a fully automated cleaning after every test is preset, so in general you do not have to exchange the test pipeline. Two cleaning fluids provide a short preparation for next test run. The scale solvent quickly removes the scale deposition and distilled water rinses the tubings to get pH value back to 7 to prepare for next test run.

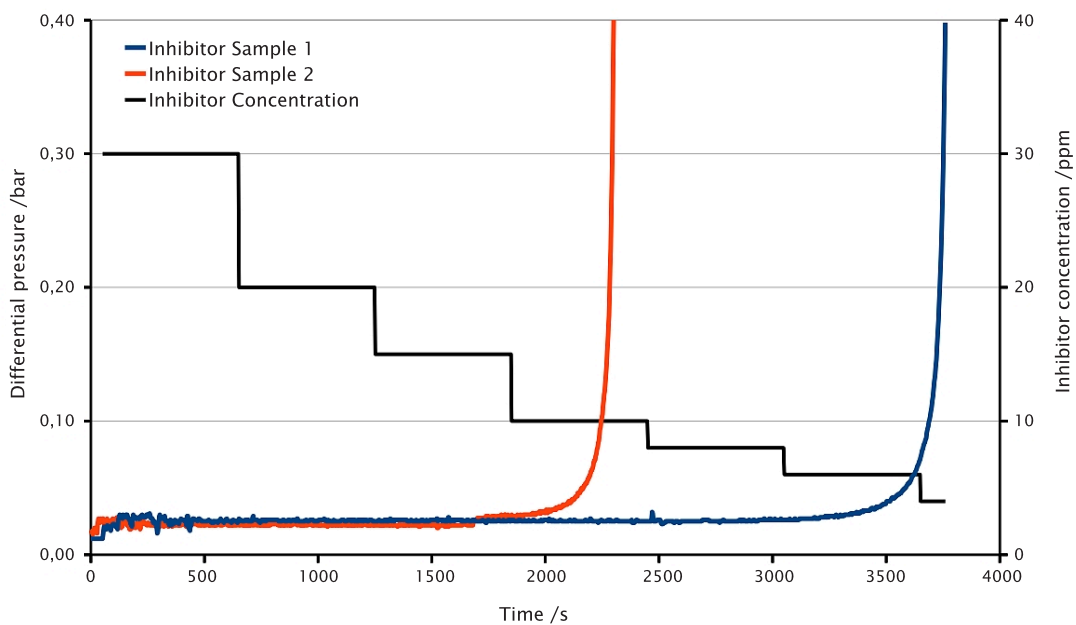
### Monel® for heated parts

A long lifespan and durability of the instrument is achieved by using Monel® for all parts exposed to heat except for the model pipeline. For sour water a model with Hastelloy® for all wetted parts is available.

### Exchangeable test pipeline

The test pipeline can be exchanged and is available with different length, inner diameters and materials to simulate different pipeline or water conditions.

The Differential Scale Loop can be adapted or extended to your requirements, e.g. for core flood testing.



Measurement example for test on critical inhibitor concentration

### Specifications:

Temperature range*:	+30 ... +250 °C (+ 86 ... 482 °F) or up to + 300 °C (572 °F)
Pressure range*:	3,4 bar ... 51 /170 /400 bar (50 psi ... 750 /2.465 /5.800 psi)
Flow rate*:	single pump: 0,001 ... 9,99 ml/min overall: max. 29,97 ml/min
Test pipeline*:	length: 2 m, material: stainless steel diam. outer: 1/16", inner: 0,75 mm
Power consumption:	max. 2.500 W
Voltage input:	230 V~ or 115 V~
Weight:	70 kg
Dimensions (WxDxH):	120 x 45 x 60 cm (without PC)

\* Alternative designs possible