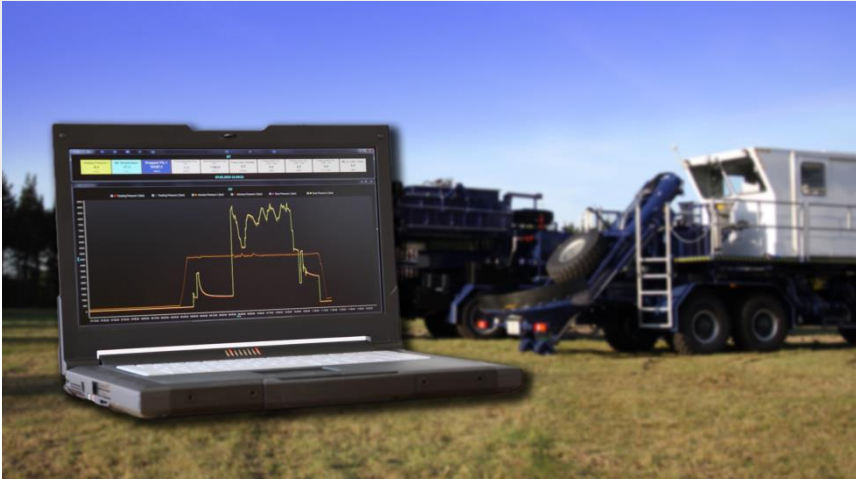


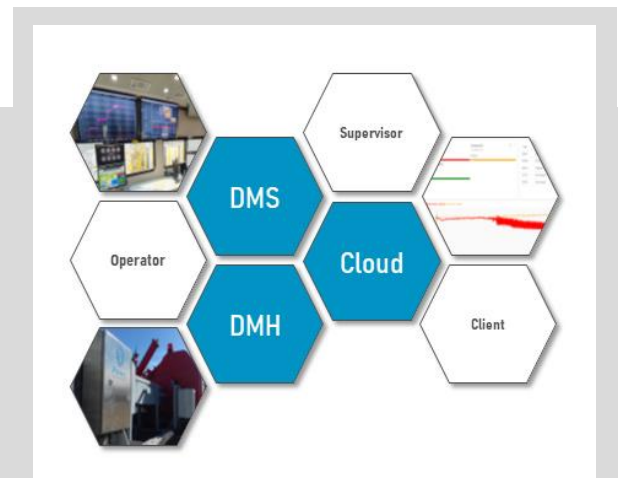


**PRIME** WELL  
SERVICE  
INSTRUMENTATION



## Prime Well Service Instrumentation

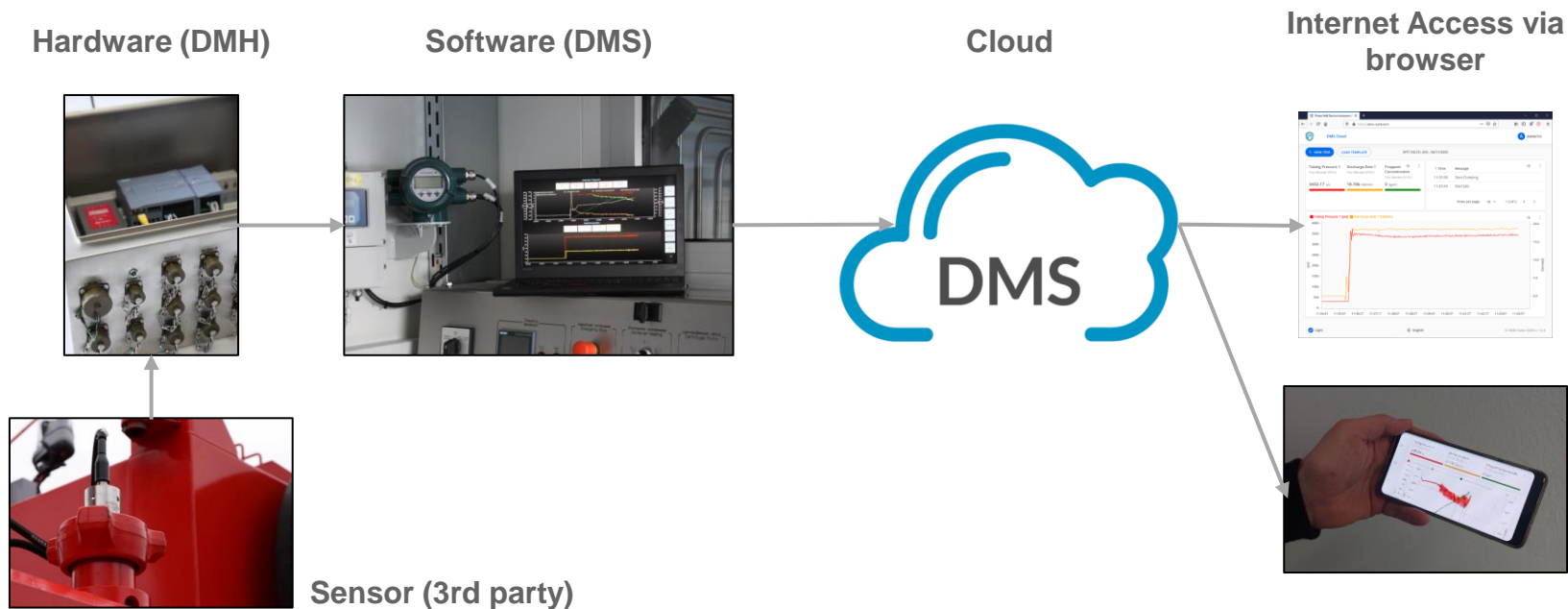
DMS / DMH - Oilfield Data Acquisition System





## DAQ - System Overview

**Data Acquisition** is the process of sampling signals that measure real world physical conditions and converting the resulting samples into digital numeric values that can be manipulated by a computer.\* The Prime system consists of sensors, a sensor junction box (DMH) and a PC-software (DMS) for recording, visualization, simulation and reporting. The cloud adds an easy-to-use remote transmit option for access via any web browser. The hardware can be configured and troubleshooted by using a dedicated configuration software, local and remotely.



\* Source: [https://en.wikipedia.org/wiki/Data\\_acquisition](https://en.wikipedia.org/wiki/Data_acquisition)



## DMS – Data Management Software

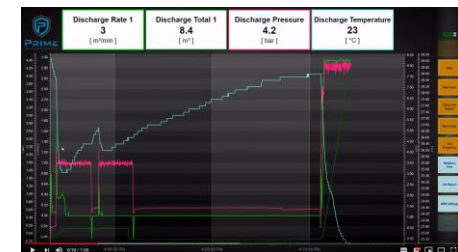
The Prime DMS is a real-time Data Acquisition software suite. It is designed to meet the operator’s and engineer’s needs, by integrating an intuitive interface with advanced function for analyzing and reporting of the well treatment on site, or post job in the office. ASCII job data can be also imported from separate acquired CSV-files or read from 3<sup>rd</sup> party equipment.

The online monitoring function is used to observe ongoing jobs in real time. Automatic unit detection simplifies the start-up in the field to a few clicks. Saved configurations can start automatically.

The advanced reporting functions include data optimization like filtering or graphical formatting, as well as automatically generated post job reports with a clear focus on intuitive handling and time savings.

The use of digital gauges, charts, tables and other windows can be set up to the specific needs of the customer and saved in recallable templates.

DMS can run on any typical MS Windows PC like laptops, workstations, tablets and vehicle PCs.





## DMS – Stimulation / 3D Bottom Hole Pressure Tool

The 3D BHP Tool provides an accurate calculation of the pressure at the bottom of the well. It incorporates the surface pressure, the hydrostatic pressure and the friction pressure loss into a dynamic calculation depending on the well-, fluid- and proppant properties. Wellbore survey data or an approximation of this is used for a representative incorporation and visualization of the well. Fluids and proppants are taken from a data base into a pumping schedule steps.

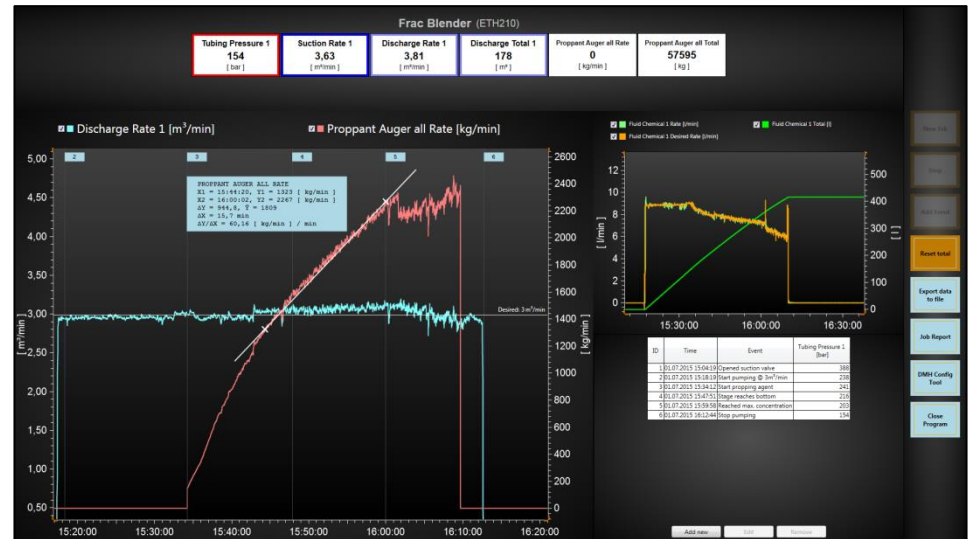
The screenshot displays the DMS software interface with several key components:

- Job data:** Includes well parameters (MD, TVD, INC, AZI, NS, EW) and tubular data (Top/Bottom, OD, ID, Weight).
- Wellbore:** A 3D visualization of the wellbore path through geological layers, showing depth (MD, TVD) and proppant placement.
- Friction data:** A table showing fluid density, diameter, and pressure loss (P1, P2, P3) in various units (bb/min, psi/100ft).
- Wellbore Properties:** A table listing stage, zone, slurry total, tubing pressure, annulus pressure, proppant concentration, and proppant volume.
- Wellbore Schedule:** A table detailing stage, zone, stage slurry total, slurry total, flow rate, and fluid type.
- Wellbore Pressure:** A table showing BH Slurry Total, BH Proppant Concentration, BH Pressure (no proppant), BH Pressure (no proppant), and BH Pressure Difference.
- Wellbore Schedule Table:** A detailed table for pumping schedule steps, including stage, zone, slurry total, flow rate, proppant concentration, fluid, and proppant.



## DMS – Key Features

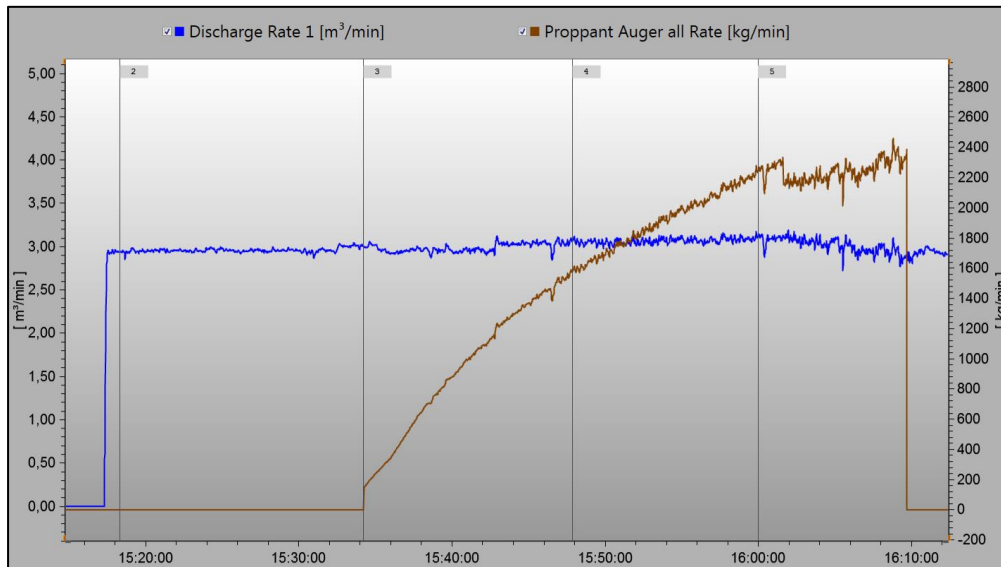
- Intuitive and modern interface
- Real-time recording
- Multiple charts and digital displays
- Import and export data (CSV/Excel)
- Visual and audible alarms
- Multiscreen usage
- Connects to any compatible hardware (TCP via Ethernet or Wifi, Serial)
- Data processing (filter, offset, ...)
- Recallable window templates
- Logging of event with current timestamp
- Exporting of pictures
- Generation of automatic post job reports
- Mathematical function in real-time or post-job
- Collection and combination of data from different sources in once (e.g. Frac- or CT-fleets)





## Event logging

DMS provides a tool for logging events with the current timestamp to the database. These events can be shown in charts and attached to the automatic post job report.

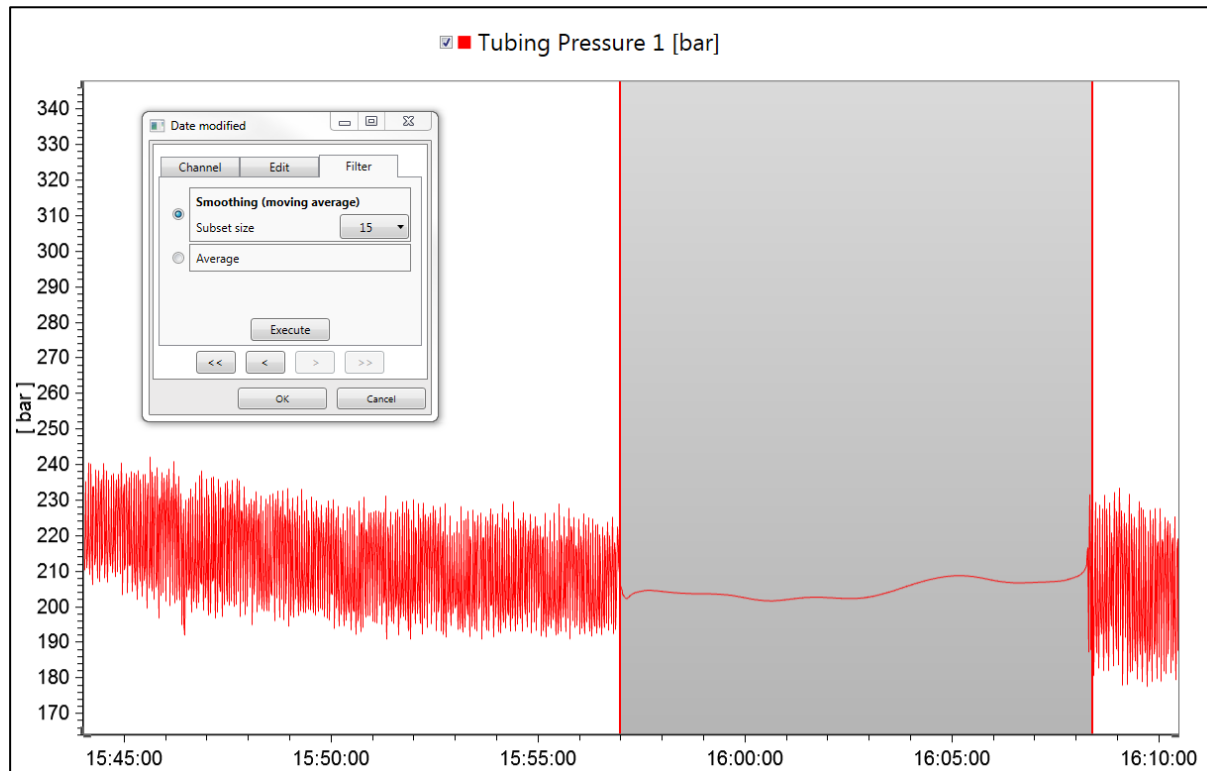


ID	Time	Event	Tubing Pressure 1 [bar]
1	01.07.2015 15:04:19	Opened suction valve	388
2	01.07.2015 15:18:19	Start pumping @ 3m <sup>3</sup> /min	238
3	01.07.2015 15:34:12	Start propping agent	241
4	01.07.2015 15:47:51	Stage reaches bottom	216
5	01.07.2015 15:59:58	Reached max. concentration	203
6	01.07.2015 16:12:44	Stop pumping	154



## Filtering

DMS provides an easy way for filtering fluctuating data to create presentable reports. The modified values are saved additionally as a second set of data and the original data will always be kept in the database.







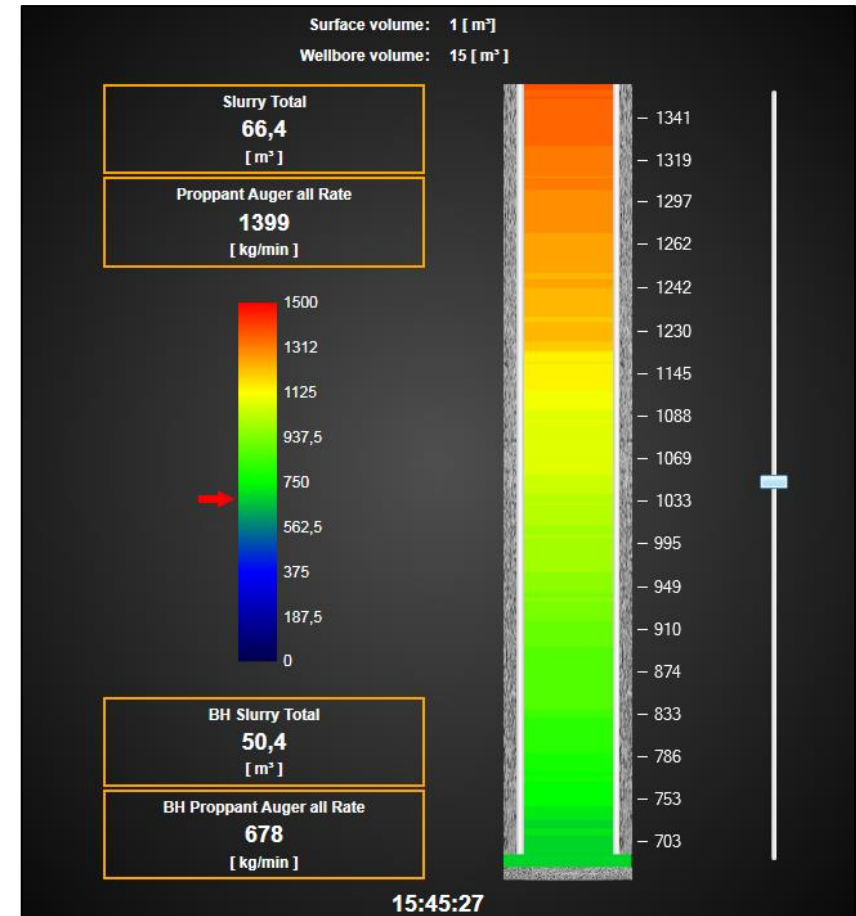
## DMS – 2D Bottom Hole Concentration Tool

DMS has a dedicated tool for the calculation and visualization of a currently appearing concentration along the entire wellbore. Typical shown values are acid- or proppant concentration.

It uses a concentration value as well as a discharge totalizer channel as input values and calculates the movement of the slurry down to the bottom.

There is no sensor needed to show the currently appearing concentration value on any depth.

Depending on the reliability of the used sensors, this tool gives a good and intuitive feedback for the operator to doublecheck the currently ongoing operation.







## Reporting tool

DMS provides a simple but customizable reporting tool that can create automatic post job reports within a few clicks. The report is based on a pre-defined word template that can be customized by the user. This template allows operators to customize header information, automatically generated screenshots and tables. All the necessary information can be fed into the system while the job is running. Preliminary or final job reports can be generated within seconds at any time.

ID	Time	Frac Interval (min)
1	01.07.2015 14:50:00	21.508
2	01.07.2015 14:50:00	81.791
3	01.07.2015 14:50:00	24.171
4	01.07.2015 14:50:00	24.172
5	01.07.2015 14:50:00	1.981
6	01.07.2015 14:50:00	21.437
7	01.07.2015 14:50:00	21.131
8	01.07.2015 14:50:00	21.131
9	01.07.2015 14:50:00	21.131
10	01.07.2015 14:50:00	21.131
11	01.07.2015 14:50:00	21.131
12	01.07.2015 14:50:00	21.131
13	01.07.2015 14:50:00	21.131
14	01.07.2015 14:50:00	21.131
15	01.07.2015 14:50:00	21.131
16	01.07.2015 14:50:00	21.131
17	01.07.2015 14:50:00	21.131
18	01.07.2015 14:50:00	21.131
19	01.07.2015 14:50:00	21.131
20	01.07.2015 14:50:00	21.131
21	01.07.2015 14:50:00	21.131
22	01.07.2015 14:50:00	21.131
23	01.07.2015 14:50:00	21.131
24	01.07.2015 14:50:00	21.131
25	01.07.2015 14:50:00	21.131
26	01.07.2015 14:50:00	21.131
27	01.07.2015 14:50:00	21.131
28	01.07.2015 14:50:00	21.131
29	01.07.2015 14:50:00	21.131
30	01.07.2015 14:50:00	21.131
31	01.07.2015 14:50:00	21.131
32	01.07.2015 14:50:00	21.131
33	01.07.2015 14:50:00	21.131
34	01.07.2015 14:50:00	21.131
35	01.07.2015 14:50:00	21.131

ID	Time	Fracturing Pressure (bar)
1	01.07.2015 13:04:19	Start
2	01.07.2015 15:18:19	Start
3	01.07.2015 15:40:00	Start
4	01.07.2015 15:40:00	Start
5	01.07.2015 15:59:59	Reached
6	01.07.2015 16:12:44	Stop



## Software editions

### DMS Lite

- Realtime recording from one unit at a time
- Charts and digital displays
- Fast Reporting tool for local storage
- Set up audible and visual alarms
- Multi screen usage
- Connects to any compatible hardware (TCP or Serial)

### DMS Pro

- Realtime recording from multiple units at the same time
- Charts and digital displays
- Fast and Advanced Reporting tools with E-mail function
- Set up audible and visual alarms
- Multi screen usage
- Connects to any compatible hardware (TCP or Serial)
- Logging of events with timestamp to data base
- Detailed data export to CSV
- Send ASCII data via Serial Port and Ethernet

### DMS Add-Ons

DMS Pro can be extended by several add-ons to specific applications such as:

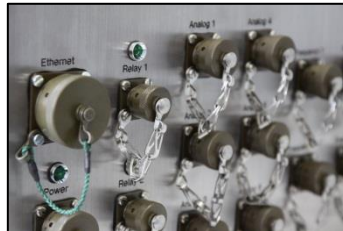
- 3D tubing visualization and pumping schedule with fluids and proppants database for realistic real-time calculation of the Bottom Hole Pressure (BHP Tool)
- 2D tubing concentration value visualization (Wellbore View 2D)
- Coiled Tubing specific software functions (FACT / TAS)
- Wireline interface
- Customer specific functions can be implemented on request

**System requirements:** Windows 7, 8 or 10, Intel compatible 32 bit or 64 bit CPU, 4 GB RAM, 20 GB free space on hdd. Reporting requires MS Word. E-mailing requires MS Outlook.



## DMH - Data Management Hardware

The Prime DMH is built on the Siemens platform. The hardware converts electrical signals from the sensors to numeric values. Prime offers many different hardware configurations to suite many applications. Prime can provide suitcase versions as well as systems for permanent installation. The system can be equipped with cold- or hot-weather package. A variety of connections and also the use of intrinsic safe sensors in Ex zones is available. The system also provides digital relay outputs for the auxiliary equipment like alarm notification or overpressure shutdown. As an option, a 7" outdoor touch panel is available.





## Features

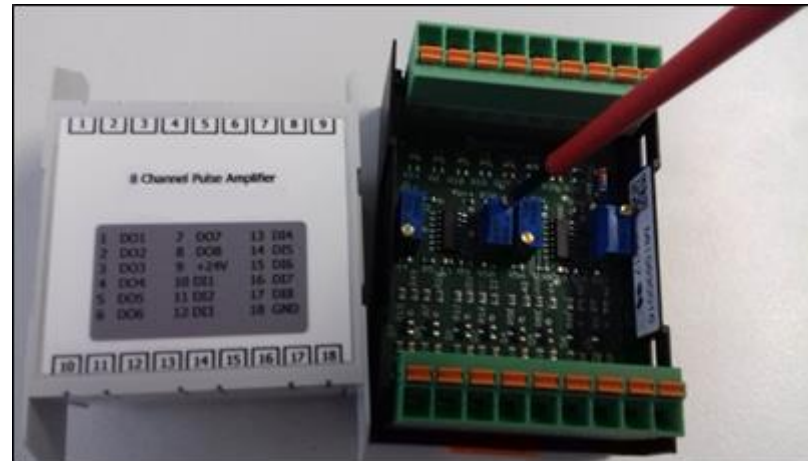
- Siemens PLC
- Waterproof IP65
- Cold- and hot-weather package
- Analog channels for pressure, temperature, electronic flowmeter, level, density, ...
- Frequency/counter channels for pump shaft pickup, turbine, revolutions, ...
- Encoder channels for depth and speed in CT-application or similar
- Relay outputs for external signaling or control functions
- Totalizer function
- Optional Siemens touch display with local storage and USB export
- Fit for purpose build in solutions available
- TCP-ASCII output
- Configuration utility for MS Windows free available
- 3-Year Warranty



## Specialized for oilfield applications

DMH is equipped with special engineered input conditioning modules. These modules are amplifying and limiting the inputs signals to be in the desired range without changing the transmitted value. All signal inputs are protected against shortcut to ground or supply voltage.

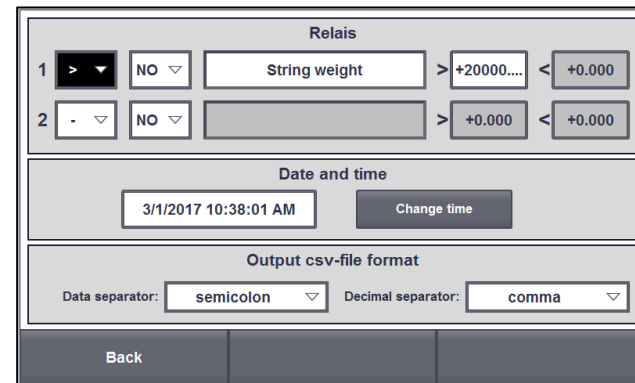
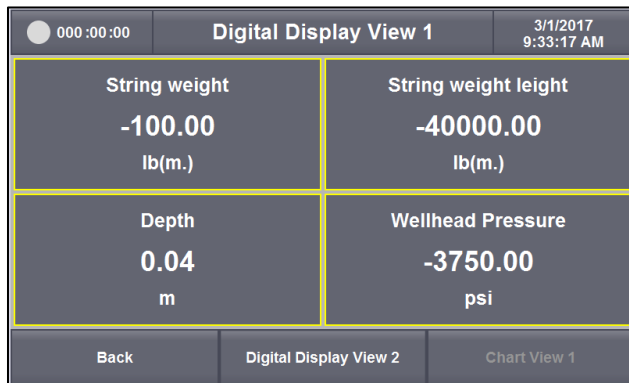
Due to this conditioning modules, the hardware is reliably able to read flow signals from high pressure turbines with two pin magnetic pickup sensors.





## Optional touch display features

- Siemens SIMATIC HMI TP700 Comfort Outdoor
- Available as add-on set for any DMH channel configuration
- 7" display
- Waterproof IP66 (Nema4x)
- Shows 4 or 9 channels simultaneously
- Provides internal recording for 50 jobs on an internal SD-card
- Export of acquired data to USB stick
- Easy access to DMH relay settings, totalizer resetting and others









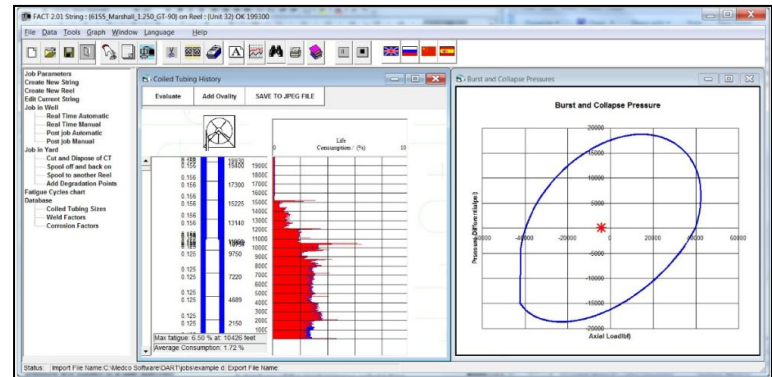
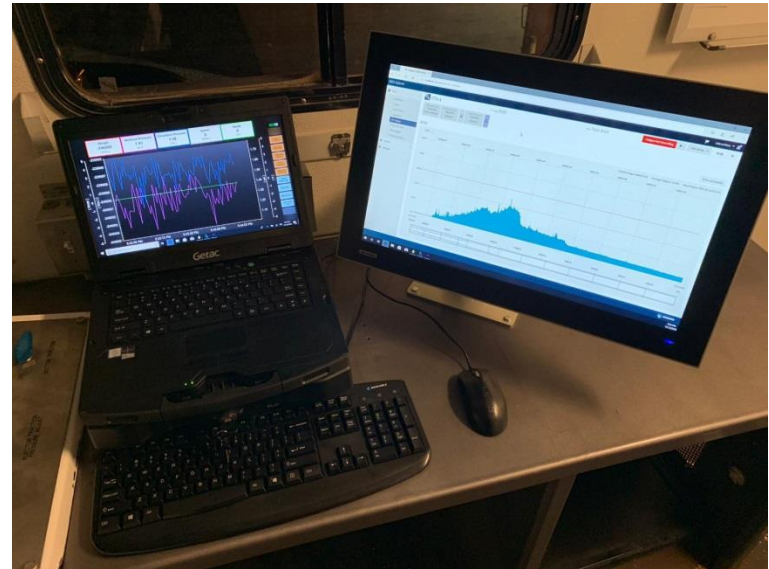
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## Use case Coiled Tubing

To perform Coiled Tubing jobs, at least two different units are required. This is the Coiled Tubing unit as well as the pump. Depending on the job task, there can be also additional equipment such as an Acid- or Chemical system, a Nitrogen unit or a Datavan.

Each unit can be connected via Ethernet or Wifi to the main Data Acquisition System to reduce the wiring, or via individual signals from each single sensor to keep the costs for the DAS small.

Since the string is damaged due to bending during the job, additional software that calculates the fatigue of the string is common. The main DAS is equipped with a Laptop/PC device that runs DMS as well as a job design and fatigue software. DMS is compatible to the cost effective solution FACT and TAS from Medco and it is also compatible to the modern distributed online systems from Stimline and CoilData.





## Use case Nitrogen

Some Nitrogen jobs are very cost sensitive and the Data Acquisition should fulfill only the main purpose of documenting the used amount of nitrogen. In this case, a simple system with a digital display and a USB export function is very suitable. If needed, a laptop can be used to get a more advanced Data Acquisition System.

If the nitrogen job is performed in conjunction with Coiled Tubing, the Data Acquisition should send the Nitrogen related data to the CTU or maybe a Datavan since the main display as well as the supervisor are located here.

To fulfill the entire range of Nitrogen applications, a simple build-in hardware with a digital values display and USB export can be used. In conjunction with a laptop or a CTU, the data is transferred via Ethernet or Wifi.



## Contact



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