

DSM2

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Investigation and Monitoring of Torsional Vibration



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Overview DSM2

The DSM2 is used in the investigation and monitoring of torsional vibration emitted by rotating machinery. It provides real-time calculation of quantities such as Vibration Angle, Angular Velocity and Angular Acceleration.

Main Signals / Functions

- Rotational Speed Input
- Analogue Output
 - OUT1 – Mean Rotational Speed / Angular Velocity
 - OUT2 – Speed Fluctuation, Vibration Angle, Angular Acceleration. Time and Spectral Domain Data.
- Alarm Output
 - Enables output of an emergency stop signal to the dynamometer control system if user-defined limiting values of the input speed signal are exceeded.

Block Diagram DSM2

Inputs

SENSOR Speed signal.
TTL pulse train from magnetic sensor / toothed wheel, rotary encoder, etc.

IN Analogue,
for alarm (3-D map)

DISABLE TTL,
blocks the limit output

USB
Read/write of parameters
Online graphics on PC
Download of raw test data



Outputs

OUT1 Analogue $\pm 10V$ scalable, 16 bits.
Mean speed or angular velocity [rpm, rad/s, deg/s].

OUT2 Analogue $\pm 10V$ scalable, 16 bits.
Speed fluctuation,
Vibration angle, angular acceleration.
Time histories, discrete orders or order summations.

REF TTL, index pulse of rotary encoder

CLOCK TTL, frequency of data acquisition

LIMIT TTL alarm signal. Limits exceeded.

Setup

The following settings may be made either locally on the module's front panel or via USB from a PC.

- **Sensor:**

- Number of teeth or encoder line count, divider.

- **OUT2 calculations in time domain**

- Cut-off order of high-pass filter used in calculating the speed fluctuation *or* cut-off order of low-pass filter when calculating the angular acceleration

- Ordinate: Angular velocity, vibration angle or angular acceleration

- Unit: rpm, degrees or radians

- Block length in revolutions

- Current value, arithmetic mean, difference, max or min value (over block length)

- **OUT2 calculations in spectral domain**

- Ordinate: Angular velocity, vibration angle or angular acceleration

- Unit: rpm, degrees or radians

- One discrete order or order summation (FFT calculation)

- **Output**

- Scaling of OUT1 and OUT2

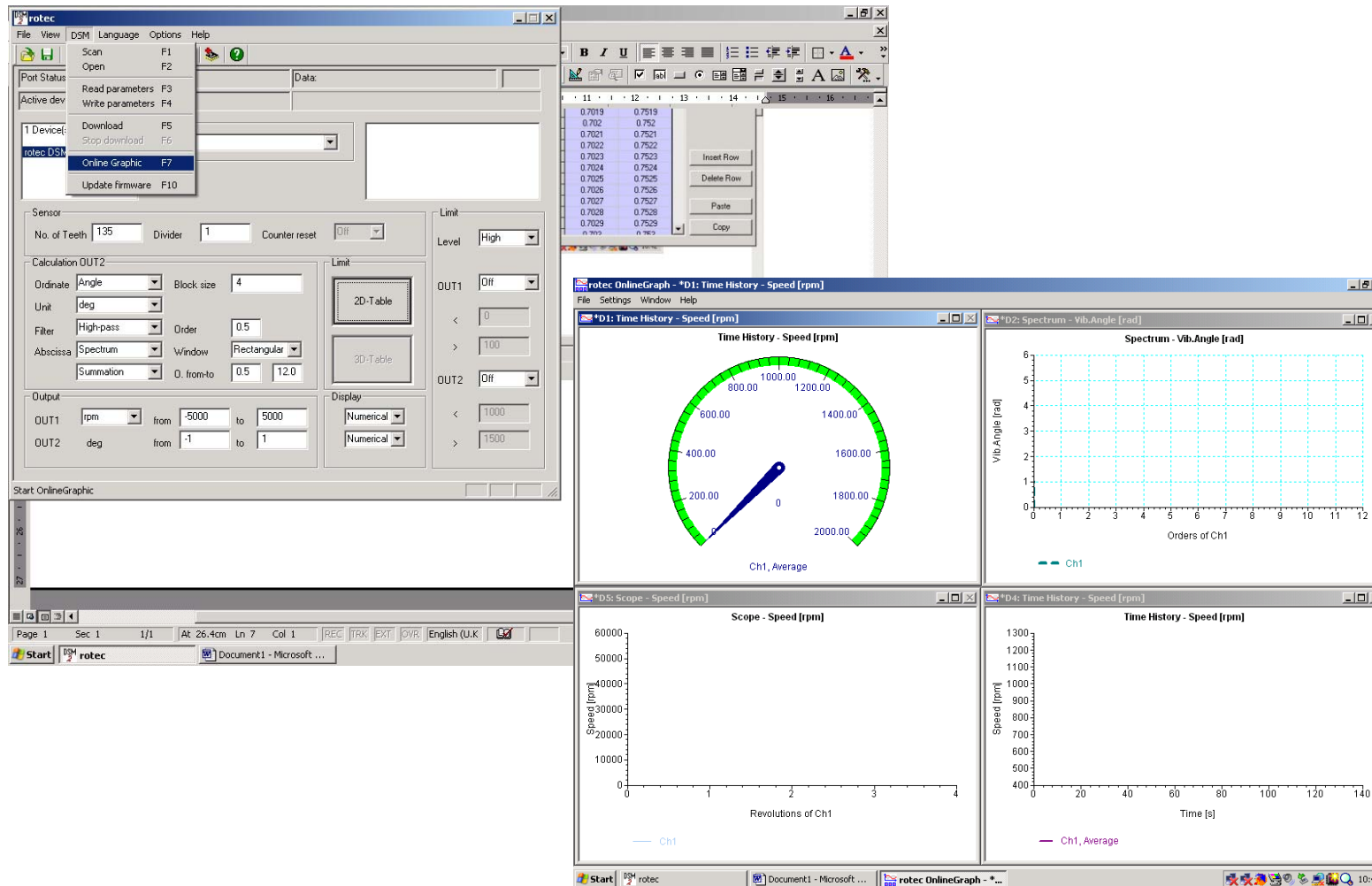
- **Display (locally during the measurement)**

- The OUT1 and OUT2 data may be displayed either numerically or graphically on the internal display

Measurement

- **When automatic mode is selected, the measurement starts immediately. Measurement data are continuously written to the internal circular memory buffer. The mean speed and calculated quantity are shown on the 4-line display. All outputs are driven according to the selected scaling.**
- **When manual mode is selected, several consecutive measurements may be made and saved separately. The calculated quantities are shown in the display's upper lines, the third line shows the filled memory space and the bottom line indicates the operation of the display's buttons.**
- **If the alarm has been activated and a limit is exceeded then the LIM signal is output and the reason for the alarm is shown on the display. The measurement is stopped.**
- **When the measurement is finished the raw time data may be uploaded via USB to the PC for more detailed analysis with the RAS software.**

Online Graphics



Setting Limits

LIM outputs an emergency stop signal when user-defined signal levels are exceeded.

The '*Disable*' input may be used to suppress the LIM output.

This function is useful e.g. for temporary suppression of the Limit output during switching operations on the dynamometer.

- **Generation of an Emergency Stop Signal during Endurance Testing**
- **High or Low Level**
- **User-defined values of OUT1 or OUT2 are exceeded (above or below)**
- **Speed-dependent limits based on a table (2D)**
- **Limits which are dependent on both speed and a 2nd parameter analogue IN (3D Table, RAM expansion required)**

Monitoring of Limits (2D Table)

OUT2 is a function of the Rotational Speed (OUT1)
e.g. Vibration Angle Summation versus Speed

The screenshot shows the 'rotec' software interface with a '2D-Table' dialog box open. The main window displays device configuration for 'rotec DSM2 No. 004'. The '2D-Table' dialog is configured with the following settings:

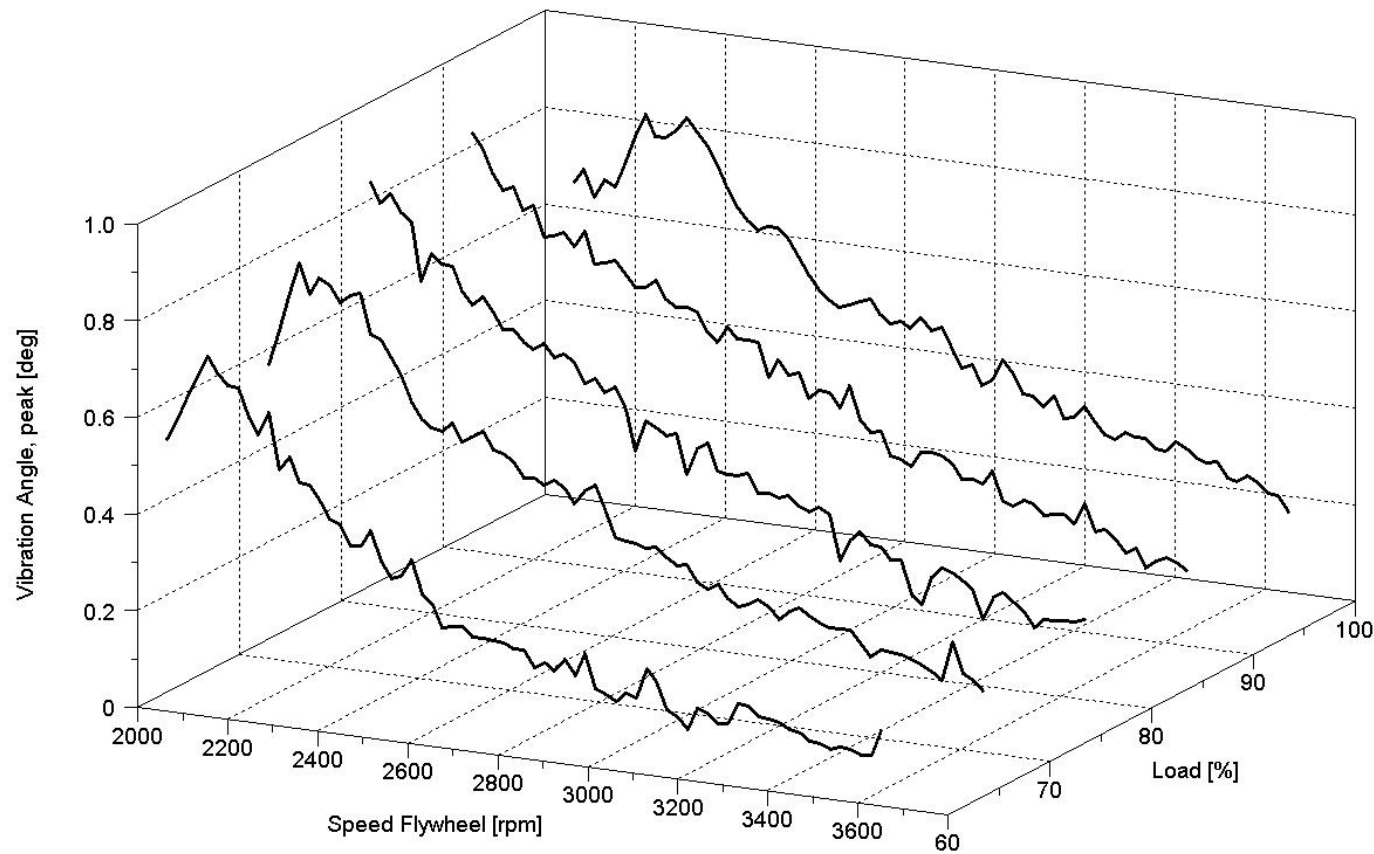
- Level: High
- OUT1: Off
- OUT2: Off
- Limit: 1000
- Display: Numerical

The '2D-Table' dialog contains a table with the following data:

	OUT1	OUT2
1	0.7	0.75
2	0.7001	0.7501
3	0.7002	0.7502
4	0.7003	0.7503
5	0.7004	0.7504
6	0.7005	0.7505
7	0.7006	0.7506
8	0.7007	0.7507
9	0.7008	0.7508
10	0.7009	0.7509
11	0.701	0.751
12	0.7011	0.7511
13	0.7012	0.7512
14	0.7013	0.7513
15	0.7014	0.7514
16	0.7015	0.7515
17	0.7016	0.7516
18	0.7017	0.7517
19	0.7018	0.7518
20	0.7019	0.7519
21	0.702	0.752
22	0.7021	0.7521
23	0.7022	0.7522
24	0.7023	0.7523
25	0.7024	0.7524
26	0.7025	0.7525
27	0.7026	0.7526
28	0.7027	0.7527
29	0.7028	0.7528
30	0.7029	0.7529
31	0.703	0.753

Monitoring of Limits (3D Table)

OUT2 is a function of both the speed (OUT1) and an analogue signal IN, e.g. speed- and load-dependent limits of vibration angle.



[linear interpolation between data points]