Discom Basic Training

Production Testing for Beginners

www.discom.de

HBK
HOTTINGER BRÜEL & KJÆR

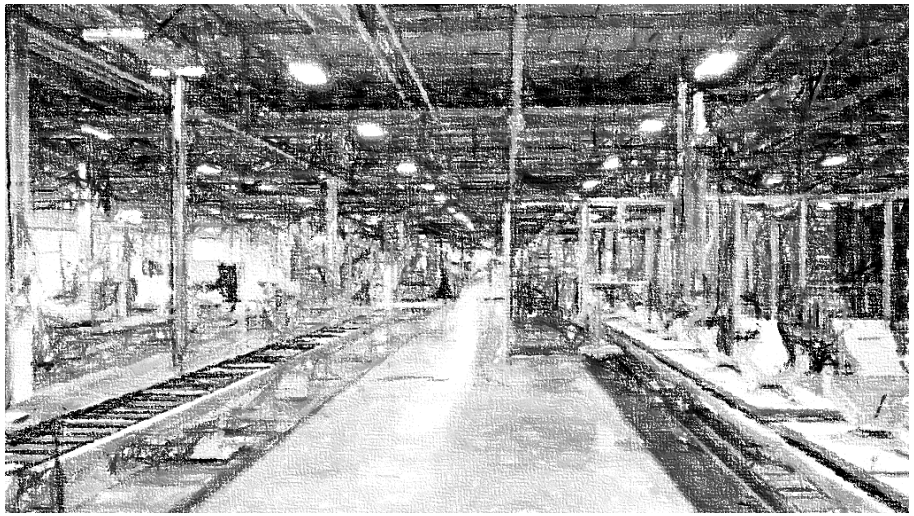
Overview

- What is Production Testing
- Components of Discom system
- Sensors, hardware and data acquisition
- TasWavEditor
- Signal processing, metrics and names
- Production statistics and evaluation tools
- TasAlyser basic operation
- Limit Generation and Parameter database primer
- Result storage, Collector and production database
- Maintenance: project backups

What is Production Testing?

Production testing requirements are different from R&D lab testing:

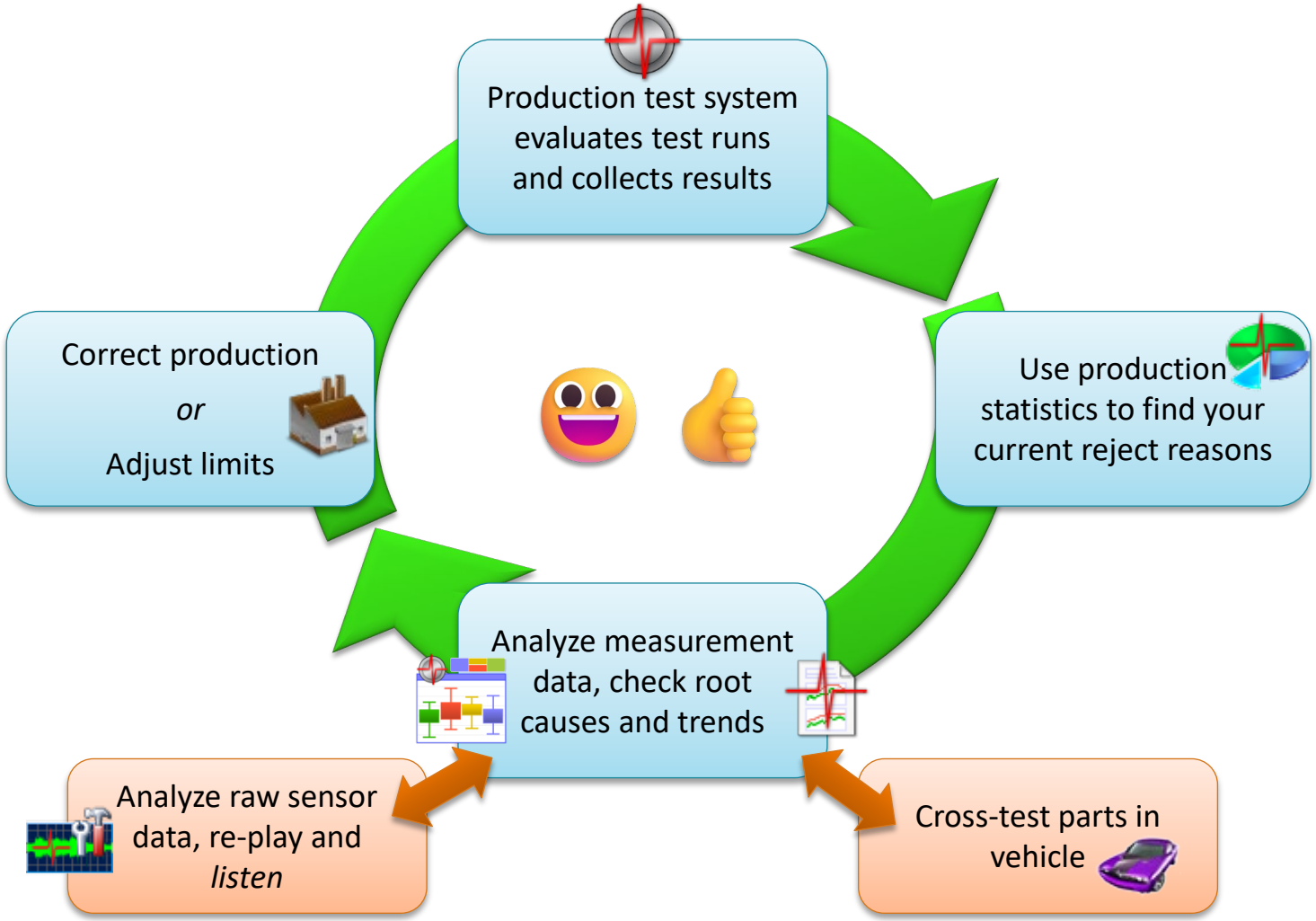
- Robust and fast measurement in production environment
- Quality relevant values, pass/fail limit evaluation
- Root cause analysis for production defects
- Communication with production line control (PLC)
- Handling of parameters for multiple types, test stands, test steps
- Store all results for all tests (hundreds of tests per day per line)
- Result data base, production statistics, production monitoring
- Trend analysis, problem hotspot analysis
- *Control the whole production, not just evaluate individual measurements*



→ Production testing goes beyond only measuring, and also beyond measuring and setting limits.

The Discom system with all it's parts – sensors, front end, PC, signal processing software, evaluation tools – has been designed with the production environment in mind.

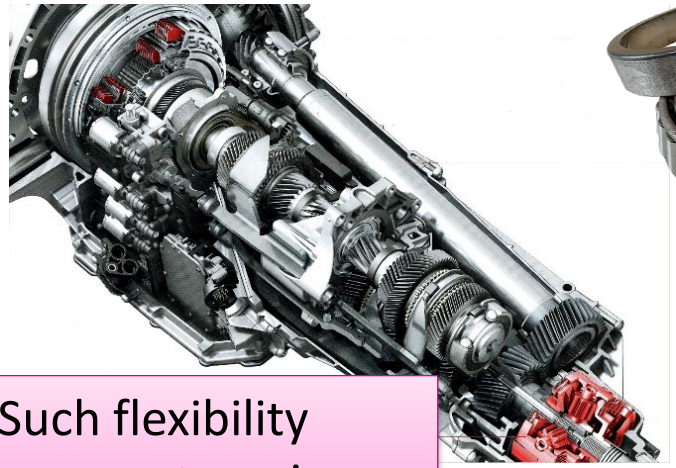
How to do Production Testing



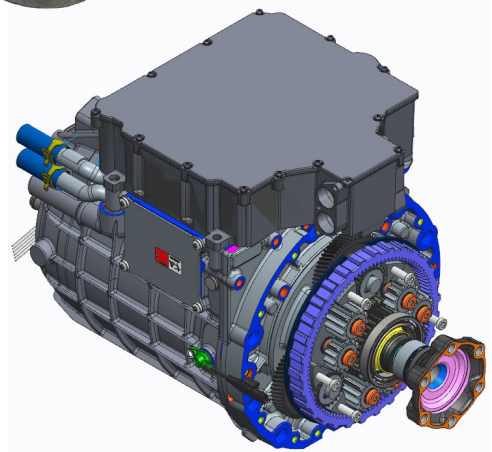
Discom Applications

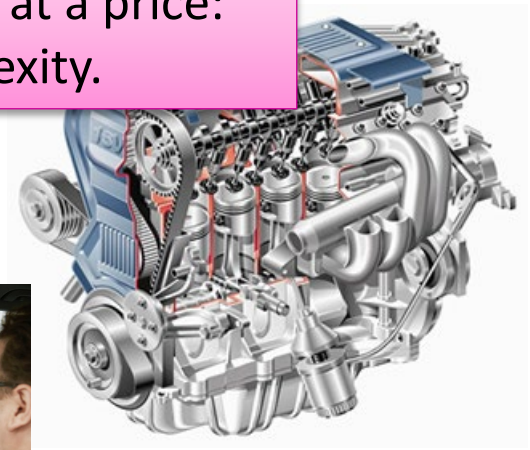
Discom End-of-Line test systems are used worldwide for a large variety of applications including

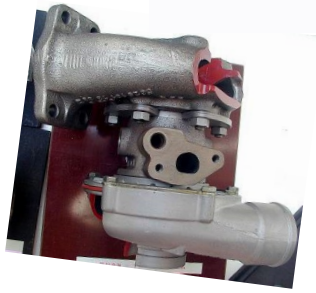
- Transmissions and gearboxes of all kind
- E-Drives and E-Motors
- Combustion Engines
- Actuators and small devices
- Bearings
- Gear Testing
- Turbochargers
- Oil pumps and other pumps
- Durability of transmissions and E-Drives
- Mobile testing in cars

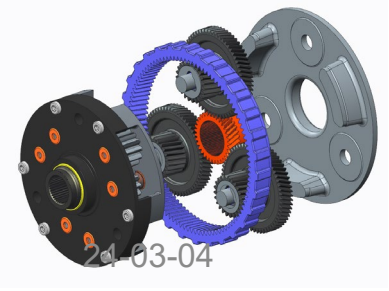


Such flexibility comes at a price: complexity.







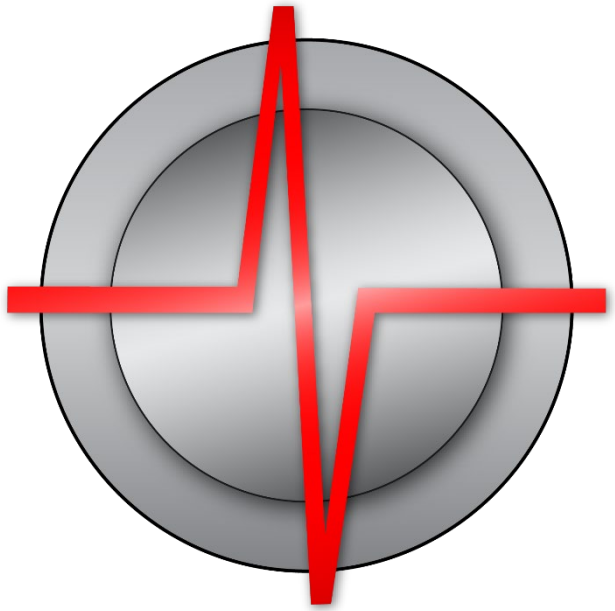


COMPONENTS OF THE DISCOM SYSTEM

Test Stand Environment

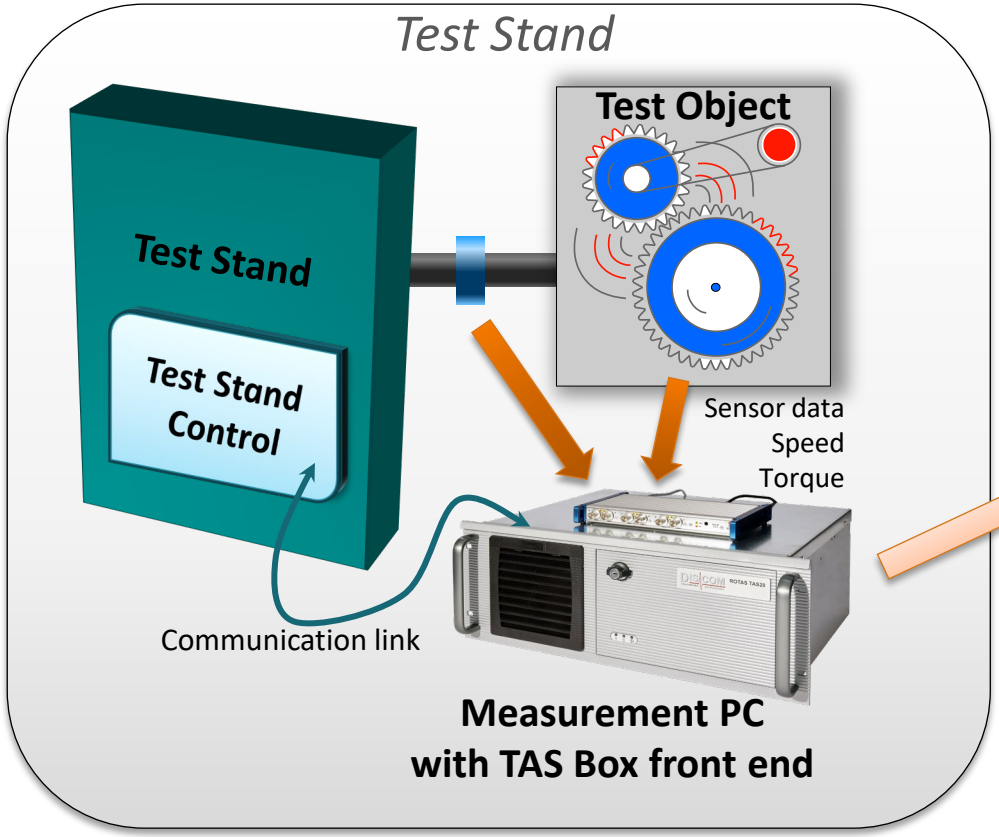
Tools Map

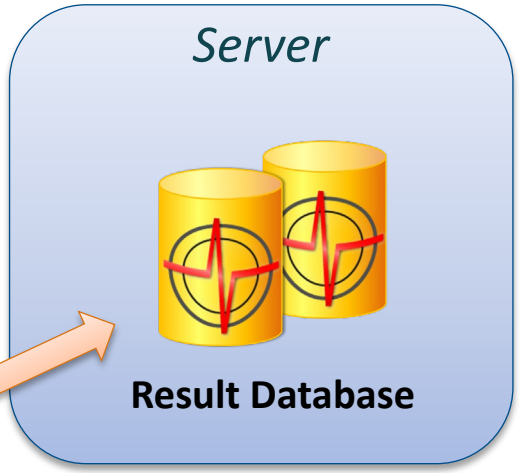
Your Typical Measurement PC



Test Stand Environment

The measurement PC in the test stand processes the sensor data and communicates with test stand control.
All results are transferred into the central result database (which can be on a server or the measurement PC).
The Discom evaluation software tools can be used in any place.





For single test stand projects, the measurement PC can also take the role of the server.

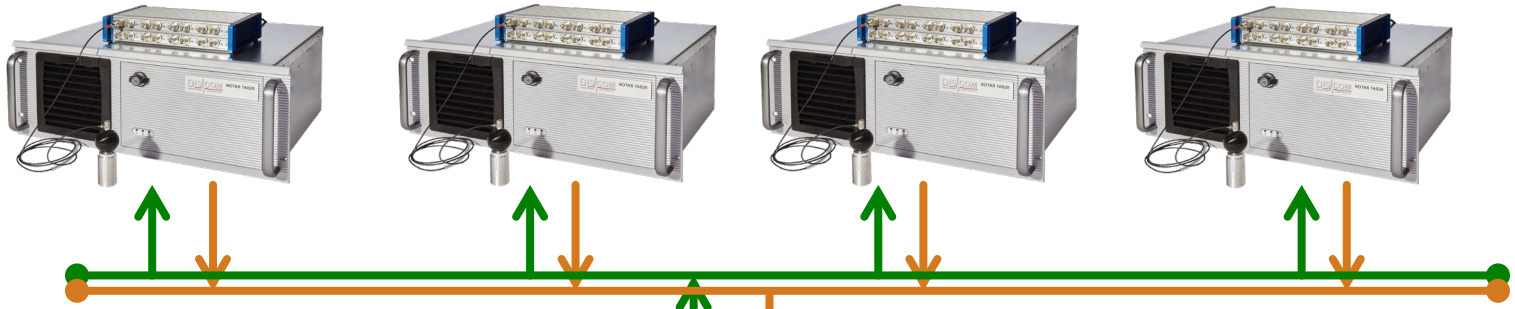
Evaluation software
Production statistics
Central parametrization

The Discom software suite consists not only of the measurement application, but also includes a suite of evaluation and administration tools.

Keep Systems at Bay, Collect All Results

Discom's system is designed to be working on multiple test stands in parallel.

All test stands use the same parameter and result data base and are managed from the central server.
Parameter setting and result evaluation is done remotely from the user's desktop.



Distribution of parameter data base

Acquisition of measurement results and data

Office workstation (engineer)

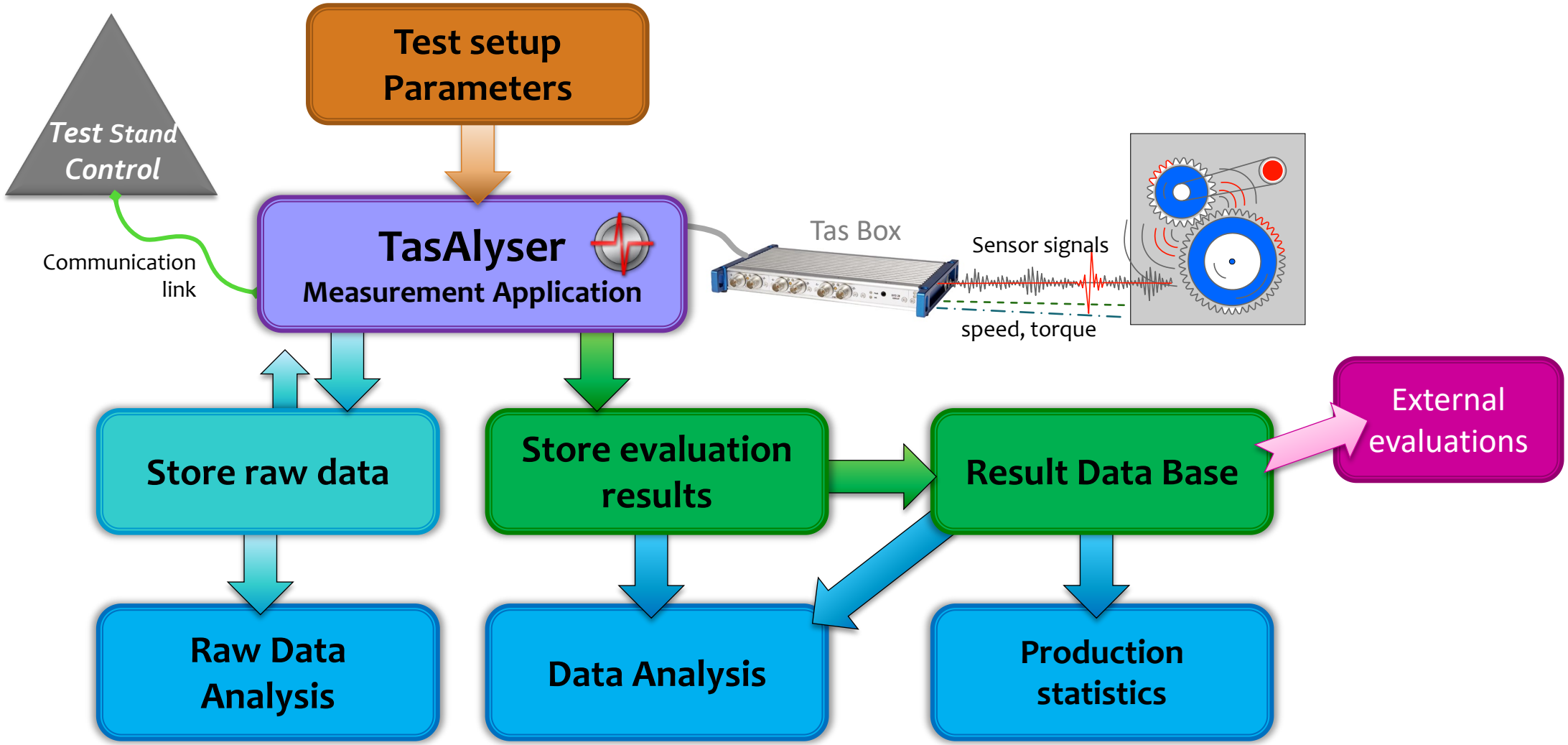
Access for evaluation and parametrization

Cloud Server for parameter data base and result data base

Production Statistics Dashboard
Cloud Data Interface
Remote Assistance

Discom Software Landscape

The *TasAlyser* measurement application running on the measurement PC is part of a software suite covering the whole production testing process.



Discom Apps on Measurement PC

On your measurement PC's desktop, you will find shortcuts to Discom applications:

TasAlyser measurement application.
Is automatically started after PC restart.

The TasAlyser measurement application loads a **measurement project** which defines the processing and parametrization (like the Excel application loads a spreadsheet which contains the actual data and calculation rules).

Parameter Database user interface **TasForms**.

WebPalViewer app for production statistics.

Presentation App for measurement data analysis.

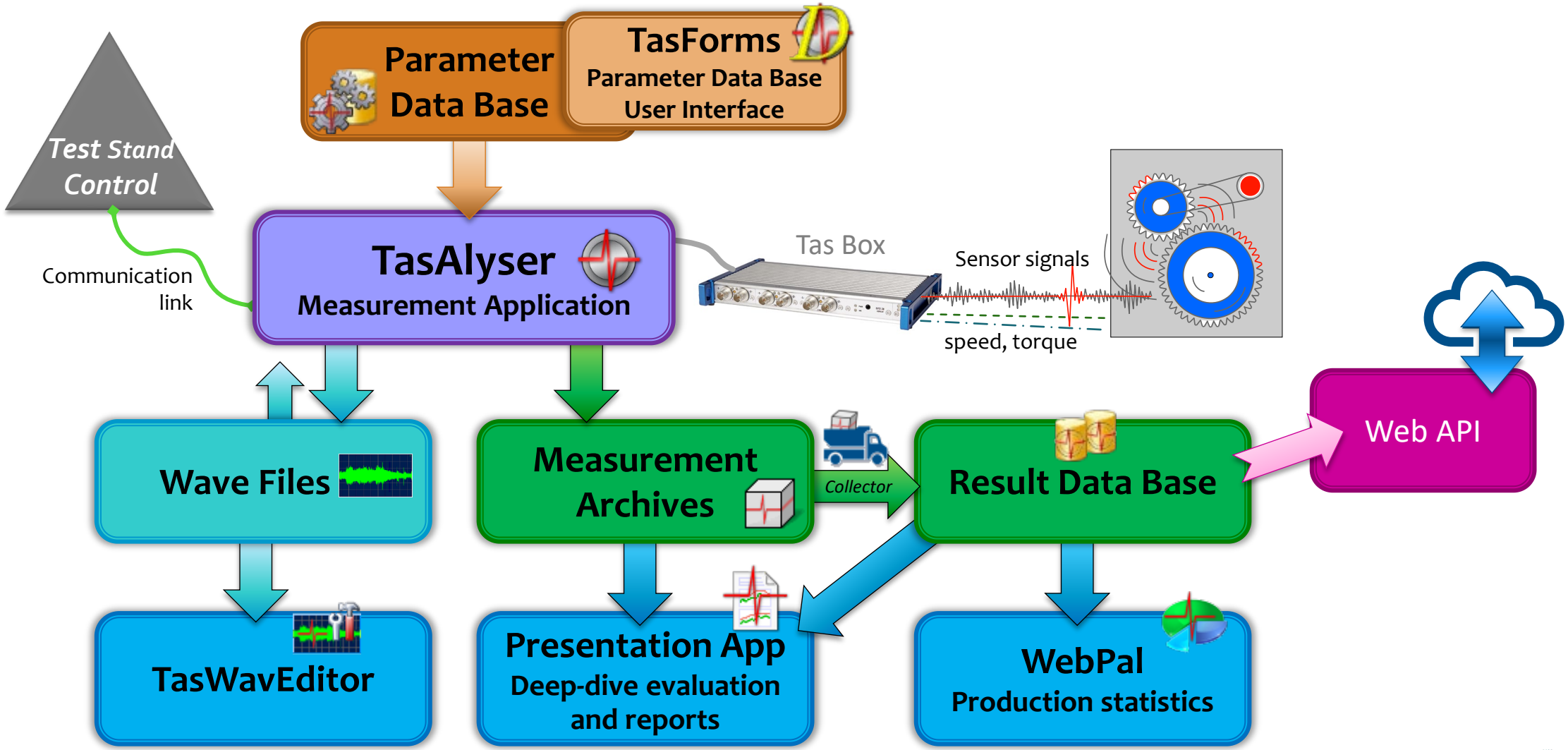
TasWavEditor for checking recorded sensor data.

Backup tool for easy project backup.

Some or all of these shortcuts may be located in a desktop folder called **Rotas for Experts**

Discom Software Suite

Putting landscape and app names together:

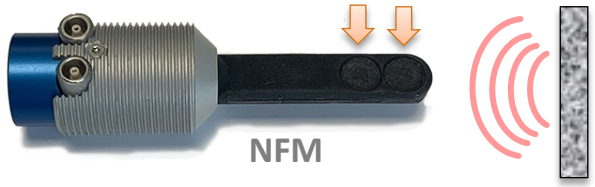


SENSORS, HARDWARE AND DATA ACQUISITION

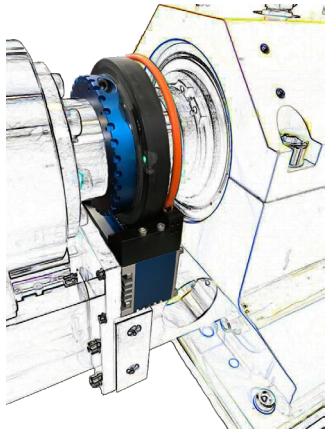
Sensors

For robust, automatic and fast measurement in production environment, you need robust sensors for fast adaptation.

BKS sensors are pressed onto the test object surface. The silicone elastic element ensures good contact on rough or tilted surfaces and decouples accelerometer from test stand.



NFM near-field microphone is positioned close to the surface. It uses two microphones to separate surface emitted vibrations from background noise.



TAC torsional accelerometer is mounted onto a rotating shaft. Accelerometers inside the ring measure torsional vibrations (which are linked to torque fluctuations).
Power supply is by induction, data is transmitted optically.

BKS03 has a ball shaped elastic element which is more stable against tilting.
BKS10 is for smaller spaces with the cable running inside the elastic element.
BKS23 combines the ball shaped elastic element and the inside cable routing.

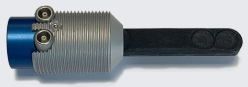
The **MVS** is a magnetically attachable accelerometer suitable for moving test objects or mobile measurements.

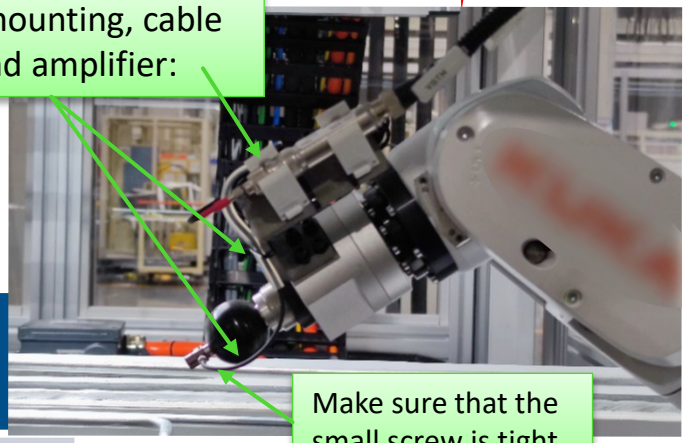
The TAC rotor can be split for mounting on a shaft.

BKS usage

BKS sensors are pressed onto the test object housing. Please ensure:

- Correct press-on force / press-in depth
- Press on perpendicular
- Smooth, machined surfaces work better
- Avoid rounded surfaces and ridges

	Recommended press-on depth and force	Deviation from fixed sensor < 2dB up to	Tolerable tilting angle
BKS03 	3 mm / 30 N	19 kHz	4°
BKS23 	3.5 mm / 30 N	19 kHz	3°
BKS10HD 	3 mm / 28 N	18 kHz	1°
NFM19 	distance 5-10 mm	16 kHz	10°



Please note:

- The table shows the frequencies up to which the deviation from a fixed mounted sensor is less than 2 dB. The **actual measurement range of the BKS sensors is much larger** (verified up to 80 kHz).
- **Human hearing range** for adults reaches at best **about 16 kHz**.

Tas Box Front End

The Tas Box is a sturdy data acquisition front end designed for the needs of industrial production testing.

Tas Box front ends, connected via USB, are designed for low power consumption and flexible channel configuration.

The standard **Tas28 Box** has four module slots which can be equipped with different data input modules like A/D channels, linear/angular encoder or optical (TAC) input.

The smartphone-sized **TasNano** is equipped with four A/D input channels.

Tas48 has eight module slots for applications which need more sensors.

Tas Box technical data:

- ✓ Sampling rates up to 200 kHz, 24 Bit A/D converters
- ✓ Sensor inputs: AC, DC or IEPE coupling, input voltage up to 30V
- ✓ On-board Rpm speed module for pulsed speed signals with up to 10 MHz pulse rates
- ✓ Modular system, can be extended for up to 16 A/D channels (+ 4 pulse channels for rpm speed)
- ✓ Low power consumption (up to 5 sensors only per USB power)

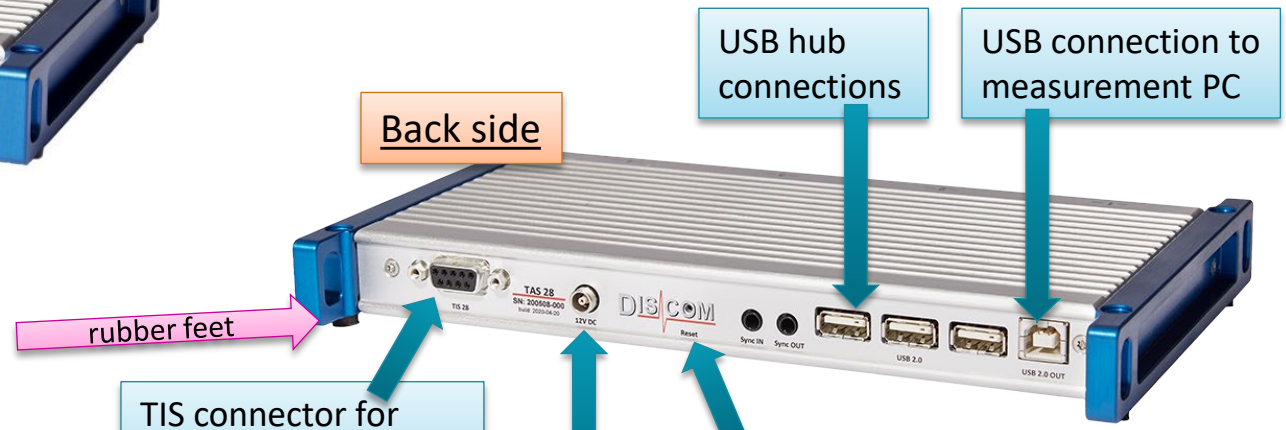
Tas Box Operation

During normal operation, there is no interaction needed with the Tas Box.

In case of USB communication problems (TasAlyser reports Tas Box errors), close TasAlyser, disconnect the Tas Box from USB and power supply, reconnect and then restart TasAlyser.

Front side:
Module number 1 – 4
Channel number 1 / 2

Back side

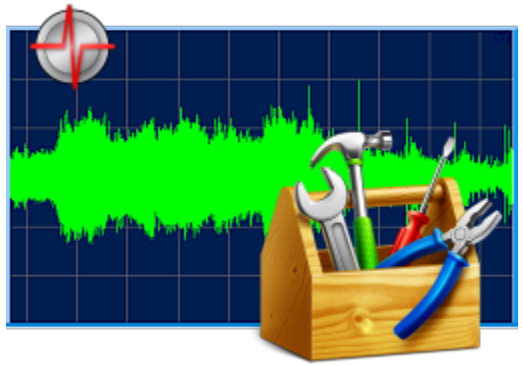


The Tas Box should be placed electrically isolated in the cabinet.

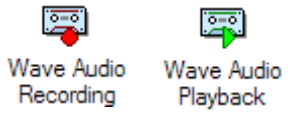
Connect preferably to USB 2.0 sockets (not USB 3.0). In the case of repeated communication issues, try a different USB socket or cable.

Power adapter should be connected to the same outlet as measurement PC.

WAVE RECORDING AND TASWAVEDITOR



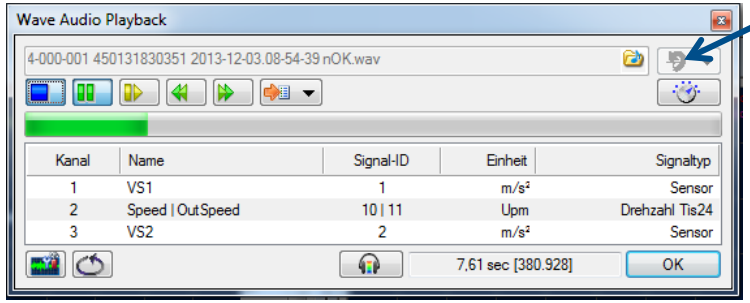
Wave File Recording



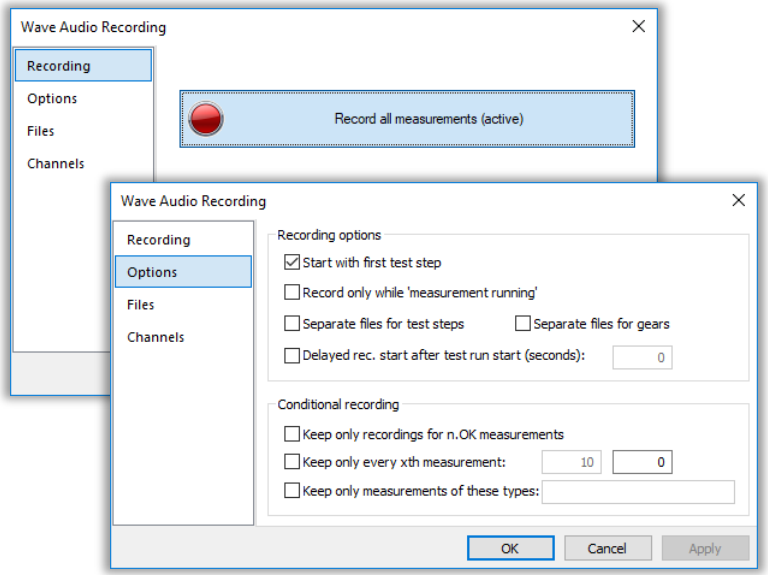
TasAlyser application records all sensor data directly into a wave file. Channel information and test sequence cue points are stored in the wave file header.

From such a wave file, the complete test run can be re-played.

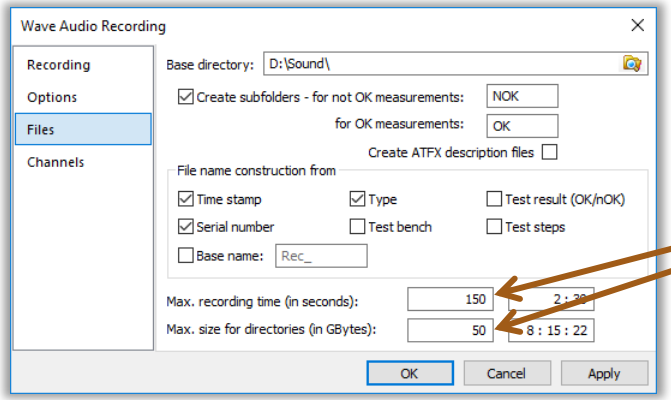
Press this button to recall the last recorded measurement



Typically, you will record the complete test runs of all measurements, but other settings are available.



Wave files cannot be larger than 2 GB, which limits the maximum recording time. If needed, the recording can be split up into parts.



Max. recording time and max. directory size for the recording folders (see remarks below)

Recordings can be placed in separate folders for OK and nOK measurements.

Recording uses a round-robin storage strategy. When the given directory size is reached for a folder, the oldest recordings in that folder get deleted.

Wave Playback and TasWavEditor

TasAlyser records the raw sensor data to Wave files. The recordings include metadata for channel descriptions, test information and test run events (“cue points”).

Wave recordings can be played back in TasAlyser and examined in TasWavEditor.

Download TasWavEditor and manual here:

https://download.discom.de/TasWavEditor

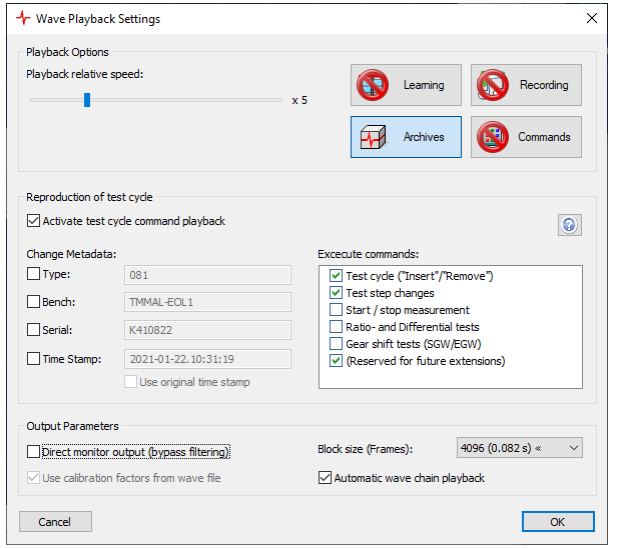
Wave Audio Playback

In TasAlyser, a test run can be exactly re-played.

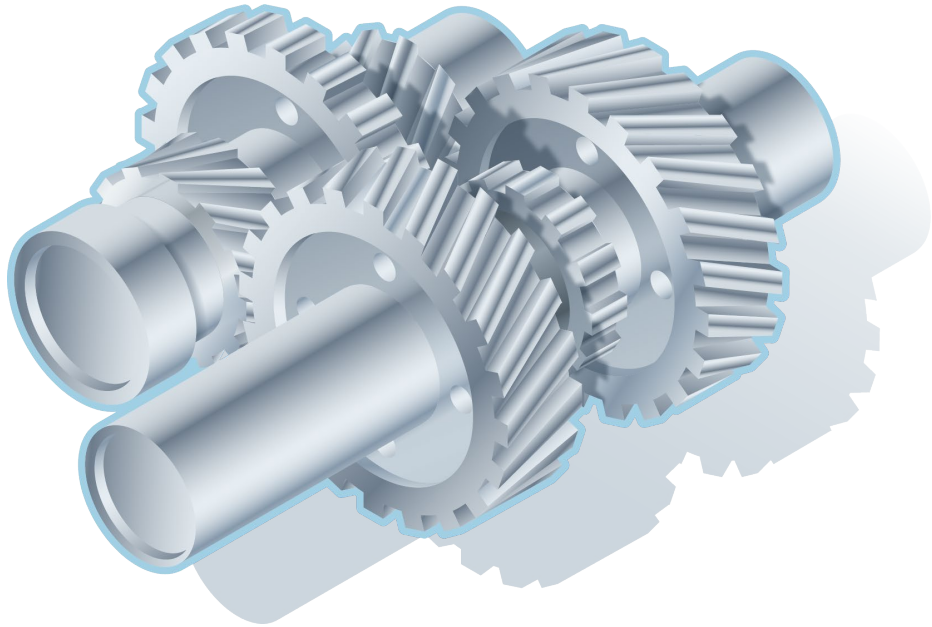
For the processing and evaluation in TasAlyser, there is no difference between a real measurement and a wave playback. (You can even use wave playback for limit learning.)

Wave Playback has additional options like playback speed, like storing new result files.

Wave playback can be useful e.g. for trying out new parametrization.



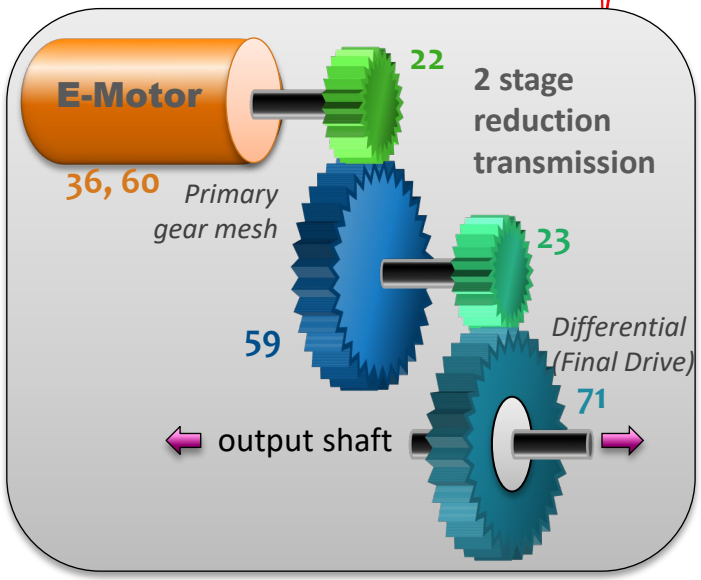
Signal Processing, Metrics and Naming Convention



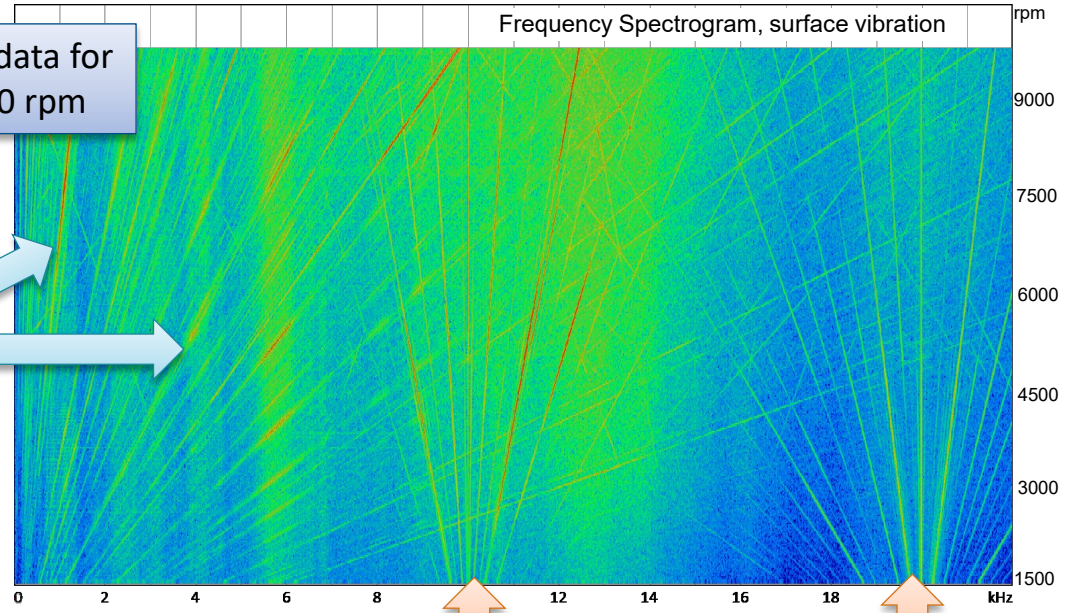
Root Cause Analysis

In production testing, the analysis system must be able to identify the source of abnormal noise components and pinpoint the root cause.

This requires that the system knows the internal structure (kinematics) of the device under test and derives the expected frequencies automatically from the construction data. By using rotor synchronous analysis, it is possible to separate the shaft noise sources.



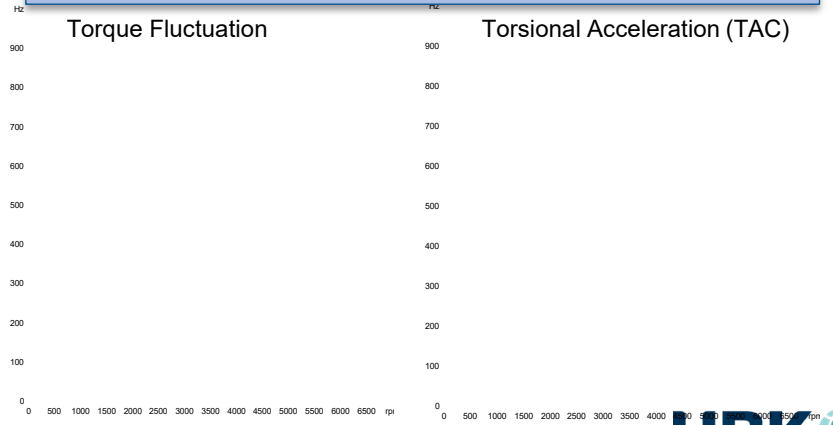
Typical E-Drive vibration data for a speed ramp up to 10000 rpm



Order components:
Motor slot orders
Primary gear mesh
Final drive gear mesh
Bearings
Imbalance

Inverter frequency components:
Base frequency 10kHz, 2nd harmonic at 20 kHz, modulation side bands

Measuring at the output shaft emphasizes final drive gear quality and E-motor torque ripples.

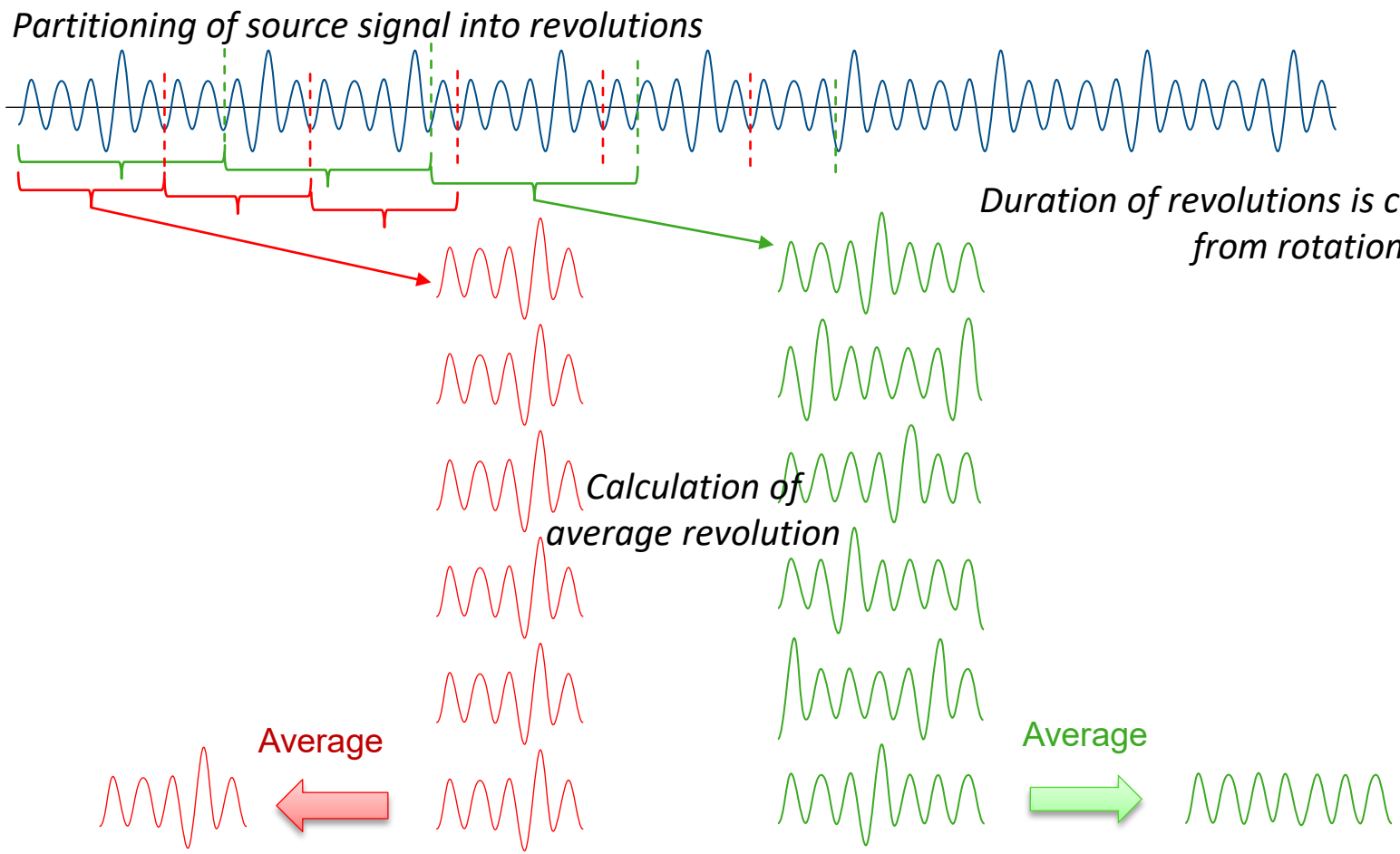


Rotationally Synchronous Analysis

Transmission noise is composed of noises originating from the individual mechanical and electrical components. The most prominent noise source is the gear mesh.

For the gear noise components, the individual sources can be isolated by **rotationally synchronous analysis**.

Example: gear mesh with 5 and 7 teeth

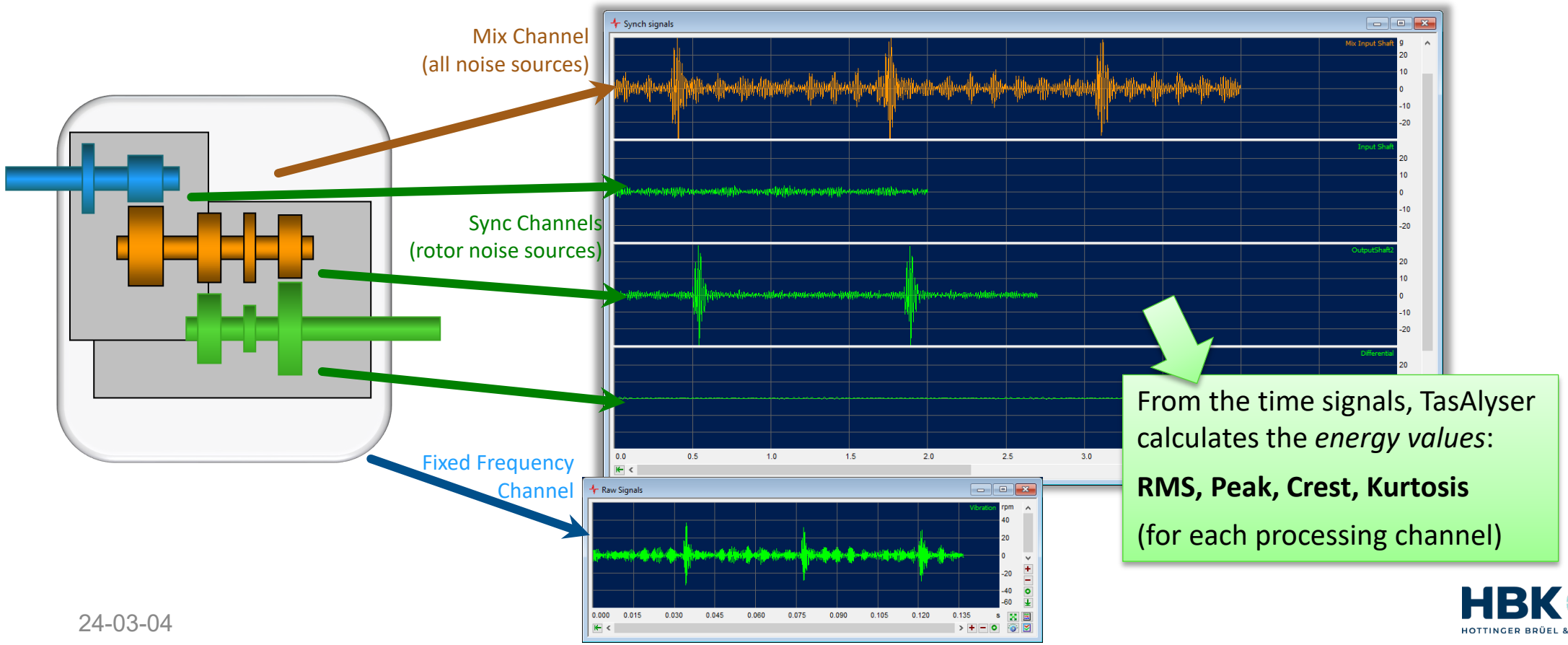


Processing Channels

TasAlyser computes for each rotor (and each sensor) one **rotor synchronous channel**, which shows the acoustical properties and defects of that shaft.
These channels are labelled for example „Input Shaft Sync“.

The **Mix channel** is processed as a rotor channel, but without rotational averaging, so it contains the contributions of all noise sources, with time measured in revolutions.

In addition, TasAlyser also uses a **Fixed Frequency channel** “FixFs” to detect noises which are not dependent on the rotational speed.



Orders, Frequencies, Harmonics

What is **Order Analysis**?

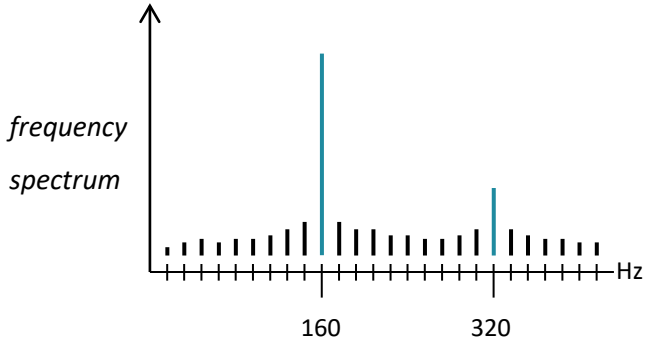
Measuring time in *revolutions* instead of seconds transforms frequencies into *orders = events per revolution*.

Example: Gear with 16 teeth:

rotating at 600 rpm = 10 rotations per second = 10 Hz

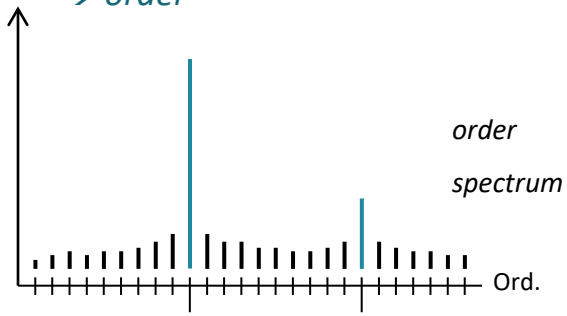
Gear mesh frequency = no. teeth × rotational frequency = 160 Hz

How many events per second?
→ frequency



divide by rotational speed

How many events per revolution?
→ order



The position of an order in the order spectrum is independent from the rotational speed!

Order spectra are independent of the rotational speed, peaks in order spectra stay in place also in speed ramps.

The order corresponding to the teeth number is called „first harmonic“, labelled „H1“. Double teeth number is „second harmonic“ or „H2“ and so on.

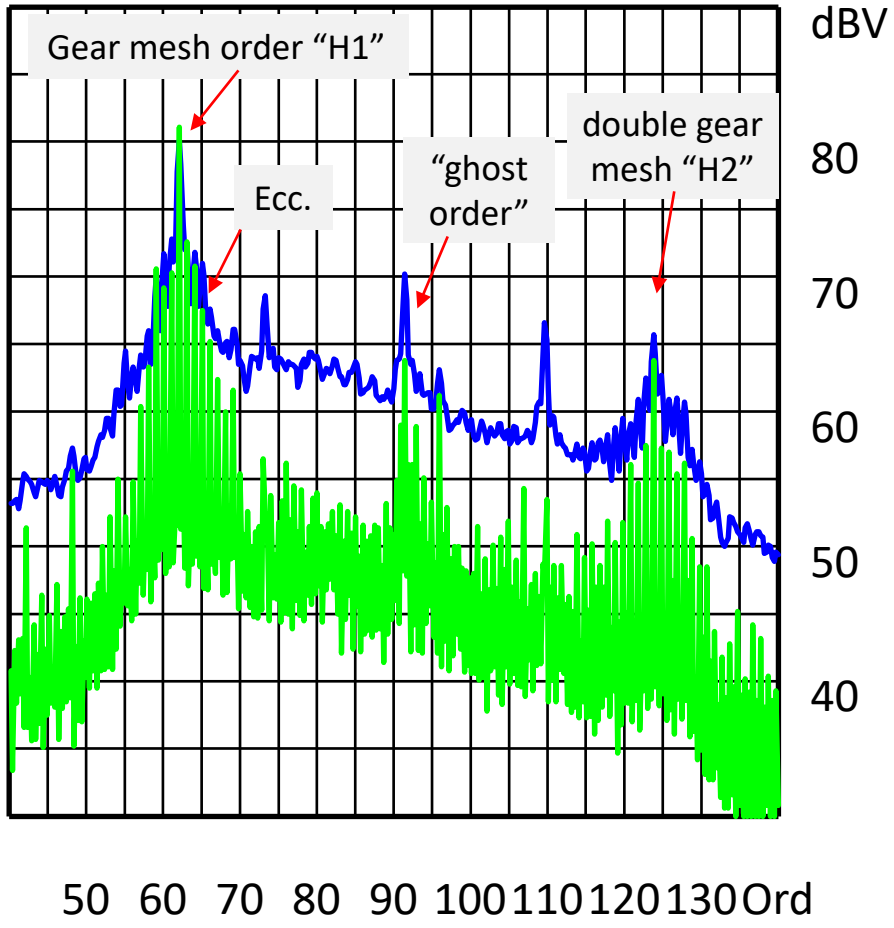
Spectral Domain

The rotationally synchronous analysis generates periodic (cyclic) signals. This corresponds to the cyclic nature of the gear sets. These signals can be transformed into the spectral domain without any time domain windowing, thus giving exact order spectra.

This allows for high spectral resolution with up to 60 dB SNR. Eccentricities (Ecc) can be easily distinguished from the gear mesh orders. All kinds of modulation can be detected. The noise components can be traced to their origins.

Blue: Conventional spectrum with Kaiser Bessel Window.
Green: Rotationally synchronous order spectrum without windowing function.

As with the time signals, there are order spectra for each synchronous channel and for Mix, and a frequency spectrum for the FixFs channel.

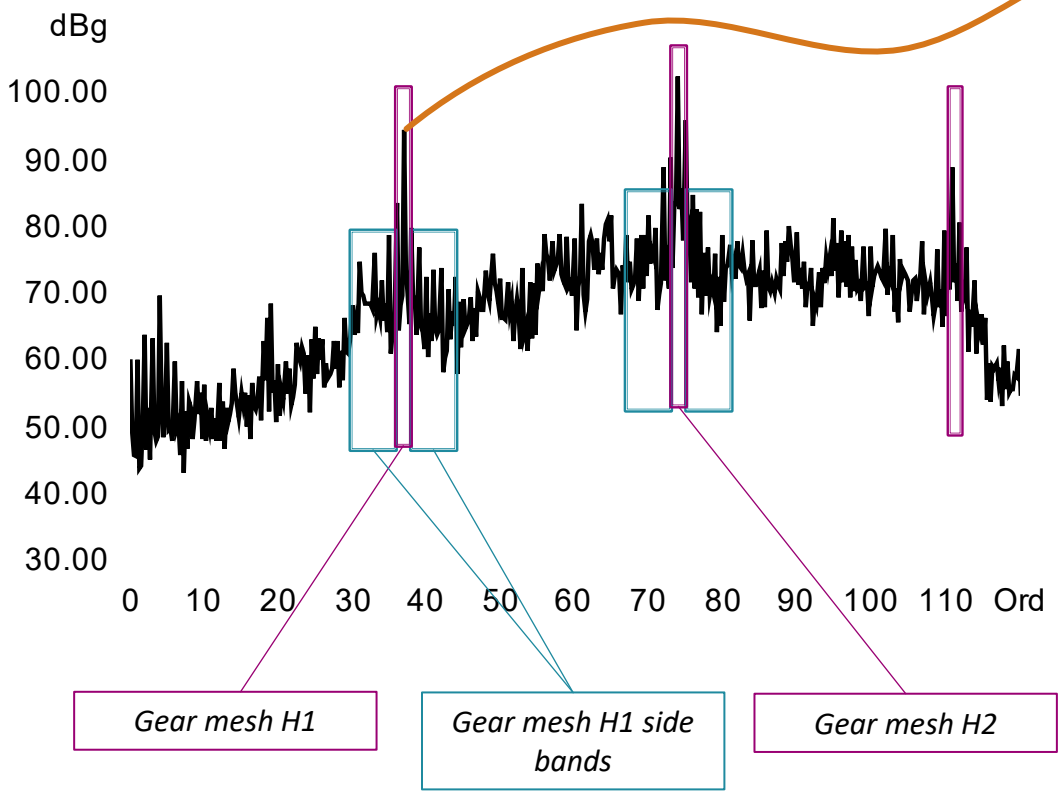


Order Values, Order Tracks

TasAlyser calculates an order spectrum for each revolution of a rotor. These spectra are recorded in **spectrograms** and are the base for producing **order tracks**.

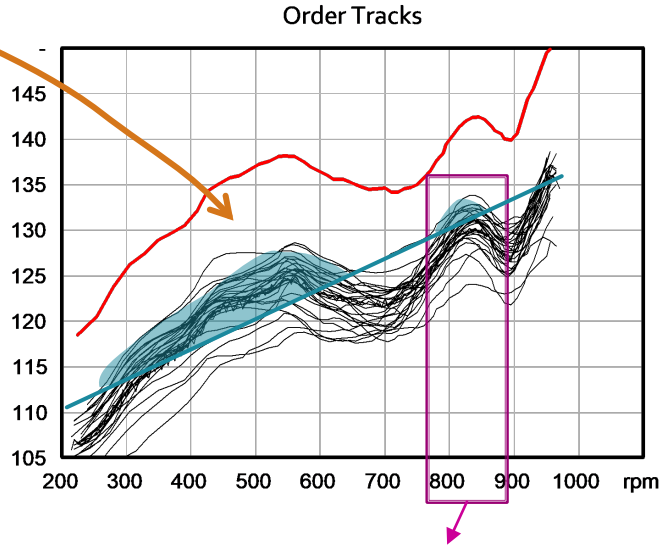
In addition, a **peak hold order spectrum** is calculated and compared to a limit curve.

From the peak hold order spectra, at positions of interest (e.g. gear mesh orders, side bands) **spectral values** are extracted. These values generate their own statistics, and separate limits can be applied.



For setting up the spectral values in the data base, positions are given relative to gear mesh frequencies (H1, H2 and so on).
The measurement program calculates the resulting order positions using the kinematics model of the transmission.

For order bands there is the choice between extracting the maximum or the energetic sum.

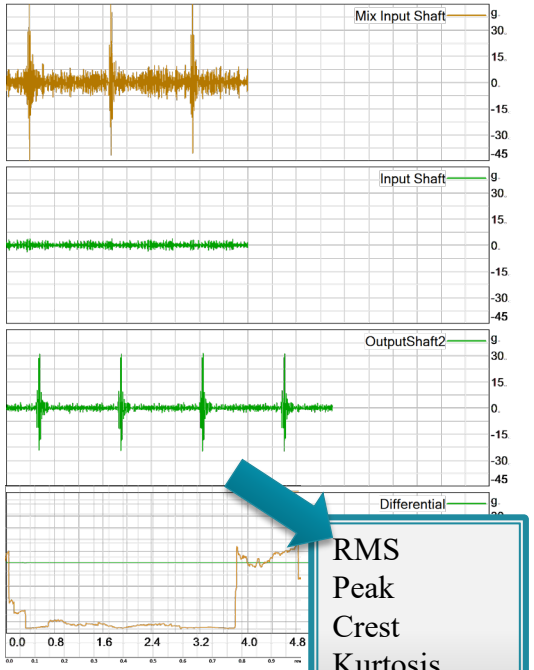


Based on the order tracks, further values can be defined, for example the maximum within a certain speed interval (“speed band evaluation”).
Or the area above a reference polygon (“Track-Polygon evaluation”)

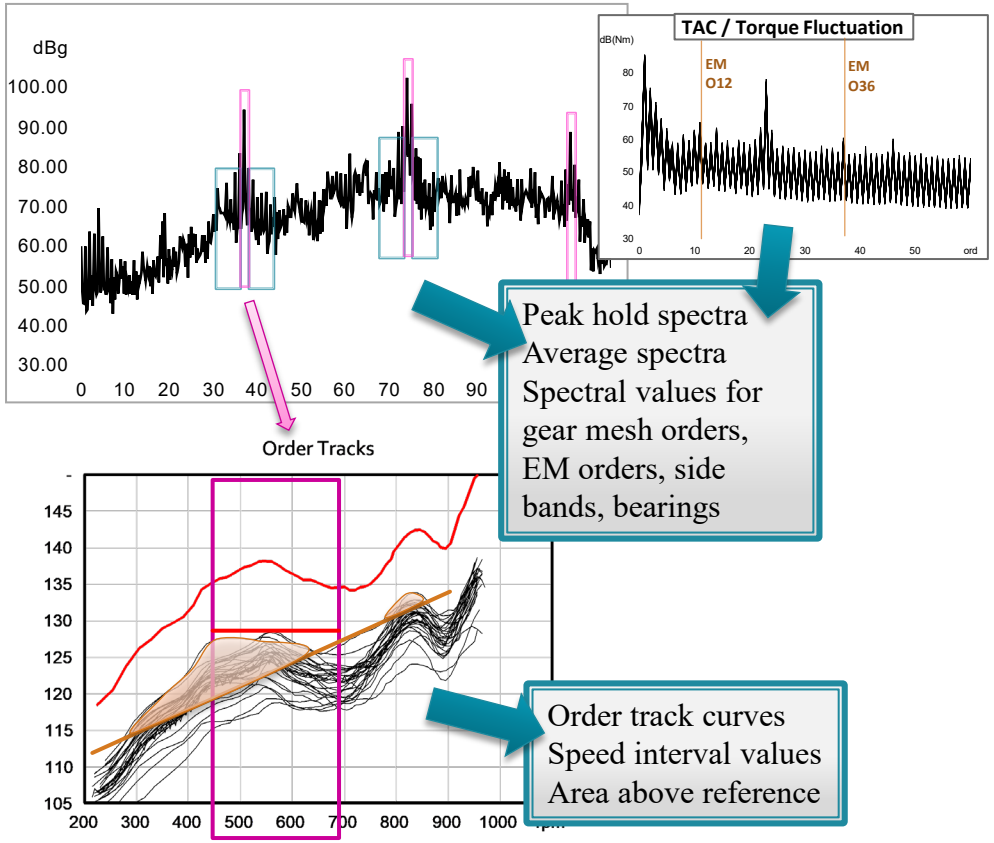
Overview of Metrics

Identifying the root cause requires a broad set of acoustical tools and metrics.
We call these different metrics '**Instruments**'.
This is an overview of the most frequently used metrics:

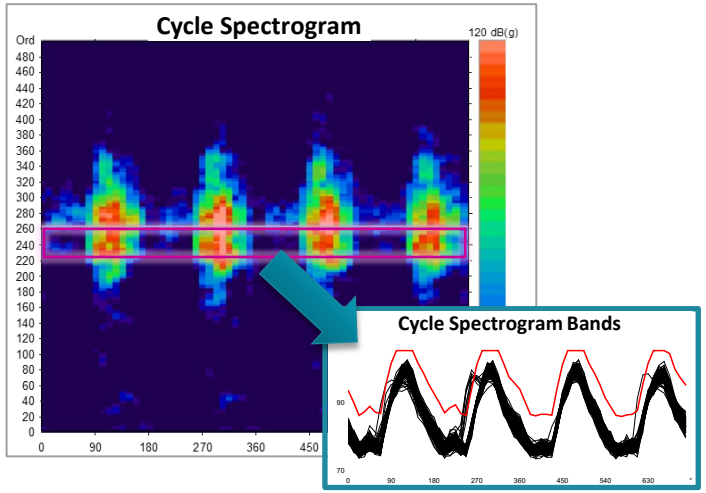
Time signal energy values. Rotationally synchronous analysis can identify the shaft which generates ticking noises.



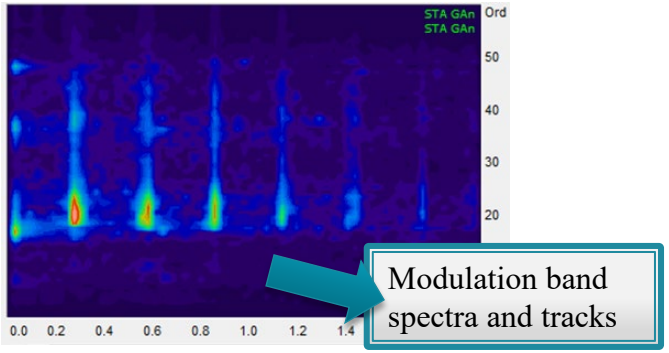
Spectra, order spectra (including torque fluctuation) and **order tracks** are key elements in every analysis.



Cycle spectrogram and Band Extraction are used for non-stationary noise like combustion engines



Modulation analysis for rumbling and ticking noises



Naming the Values

Each value needs a unique name, a way of addressing it and finding it in results and parametrization

The **Clavis** is this unique identification of a measurement value in the measurement application, the parameter database, and in all evaluation tools.

It consists of 6 elements:

- **Test Step** (= „Mode“, e.g. 3-rD, Stdy, …)
- **Instrument** (e.g. order spectrum, RMS, spectral value)
- **Object/Location** (e.g. input shaft, pinion gear, oil pump)
- **Processing Channel** (Synchronous, Mix, Fixed frequency)
- Instrument **Measurement Parameter** (e.g. H1, Main Order Band)
- **Sensor** (e.g. vibration sensor VS-1, Microphone Mic)

“Clavis” is Latin and means “key”: the unique key to find a value.

Because limits are distinct for types and test stands, the unique identification for a limit value has 8 elements: **Clavis** + **type** + **test bench**.

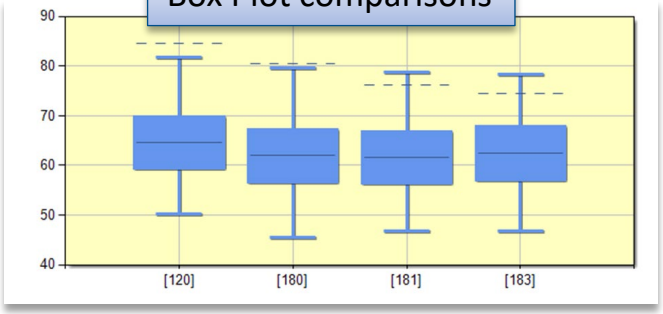
Production Statistics and Presentation App

Which Trouble Will Hit Me Today?

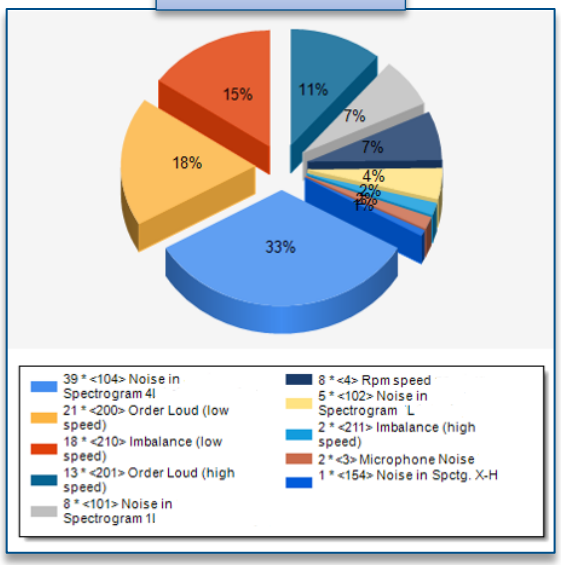
Having all results collected in a central database opens insights into production statistics.

Which defects are occurring most frequently? Where are my current problems?
How do test stands compare, or models, or sensors?
Do I have trends in my production?

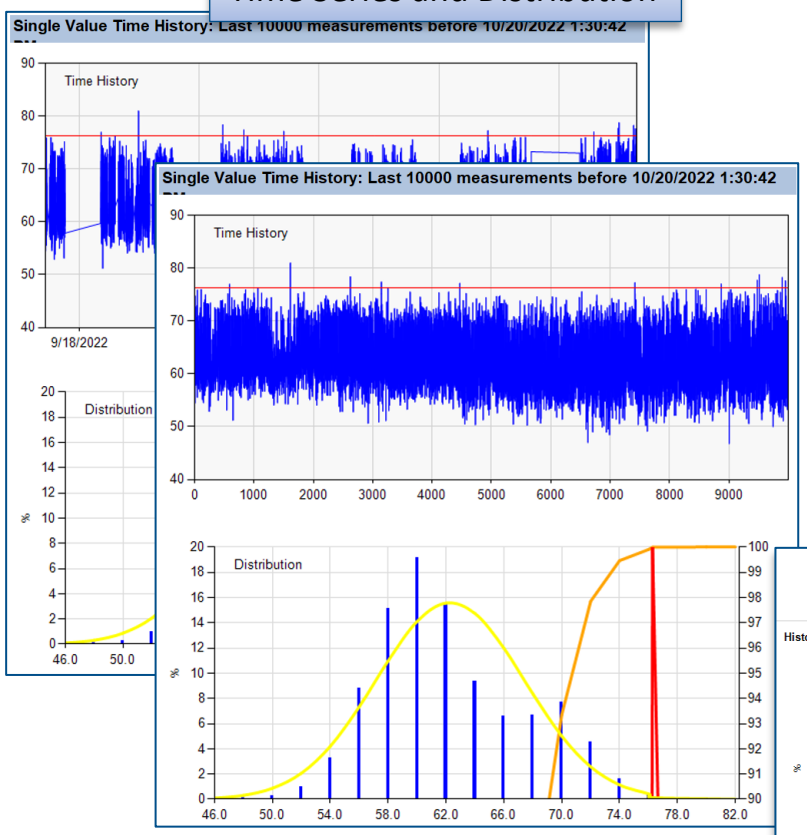
Box Plot comparisons



Top N Defects

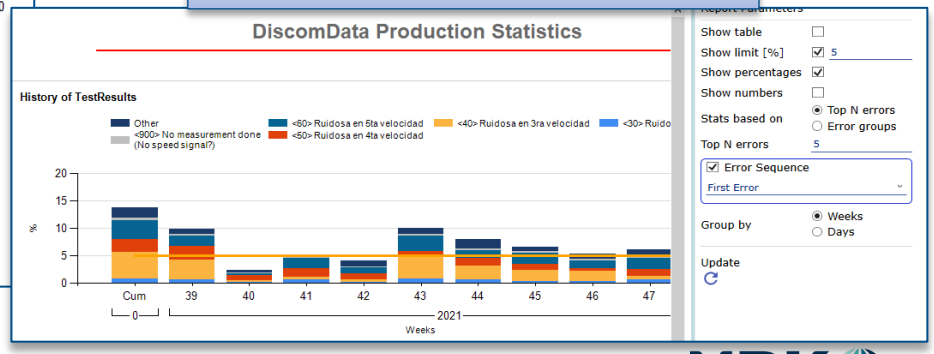


Time Series and Distribution



Smartphone Dashboard

NOK rate and root cause per week



Productions statistics with many different angles of view enables setting proper limits, detecting trends and identify actions to take.

Production Analysis: WebPal

WebPal is a server-based service. Using the **WebPalViewer** app, you can check production statistics, NOK rates, top N defect reasons, value statistics, trend analysis and more.

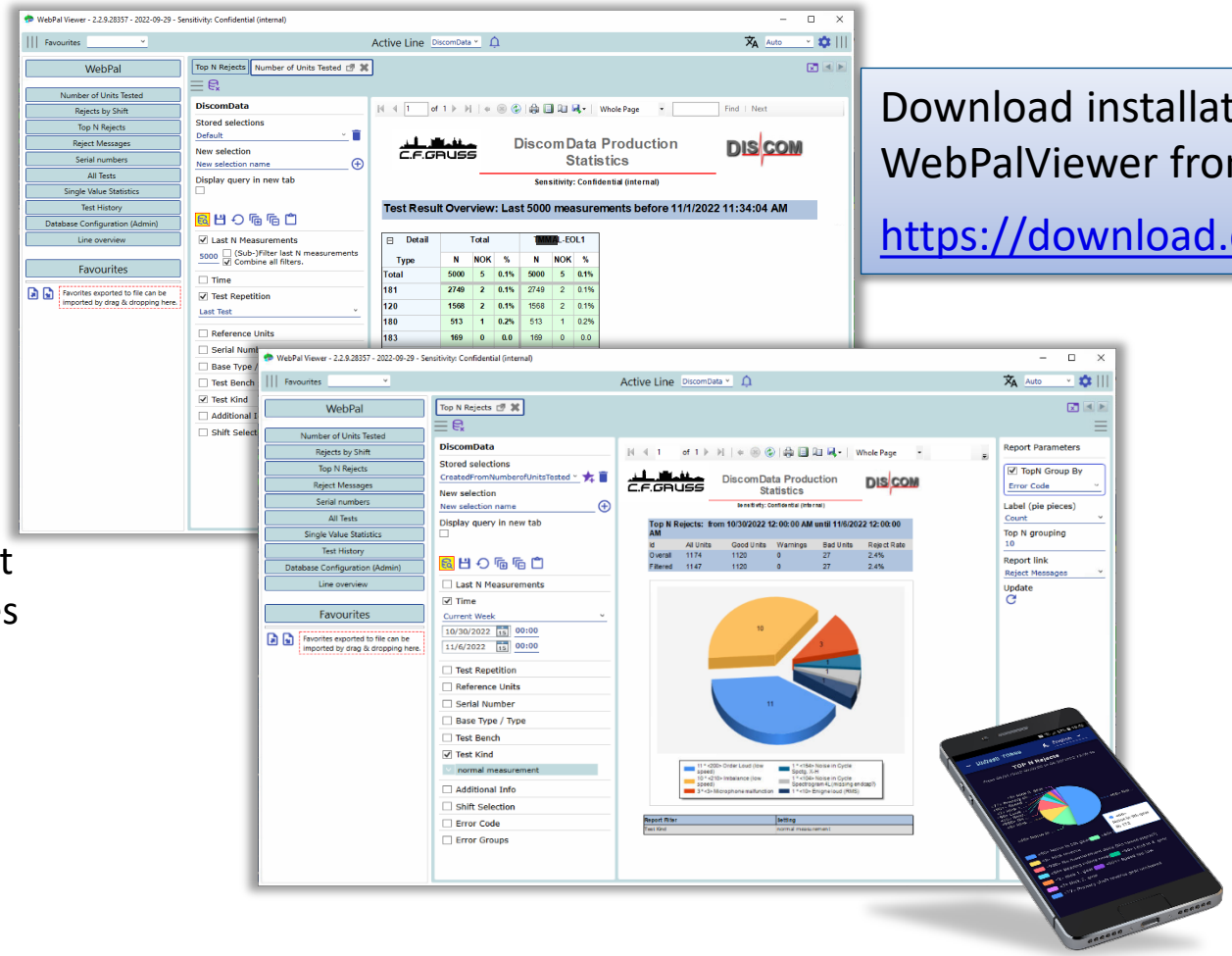
The **WebPal back end** runs on a server computer, which is in many cases identical to the result database server.

WebPal was designed to assist you in identifying and solving all kinds of production problems.

The starting point for different ways of analysis is the ‘number of units tested’ and ‘top N rejects’ statistics, which displays for all test stands and types the production numbers and fault rates.

From there, you can proceed to reject messages, time series and other types of analysis.

A broad set of filter options enables further specification of analysis.



Download installation package for WebPalViewer from our web server at

https://download.discom.de/Presentation

WebPalViewer Basics

Use the Three-Lines-Buttons to show/hide options panes.

You can have multiple evaluations open in different tabs.

Zoom selector

"Close all tabs" button

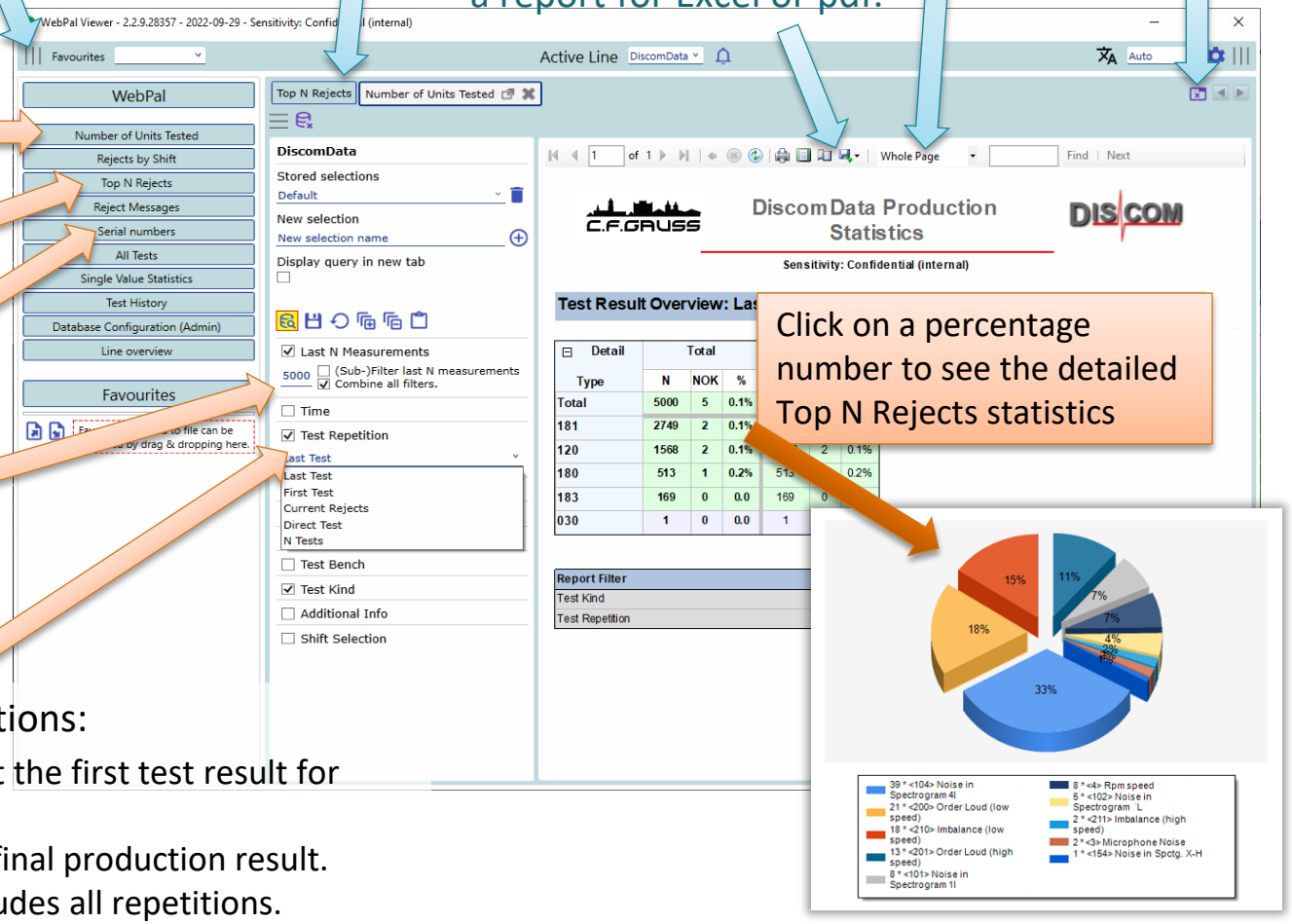
Use button to export a report for Excel or pdf.

[**Number of units tested**] gets you to the production statistics tabular overview.

[**Top N Rejects**] directly links to the reject statistics pie chart.

[**Serial Number**] lets you find all results for a certain serial number.

Set the **Last N** and/or **Time range** filters first, and more filters if desired, then press [Requery] button.

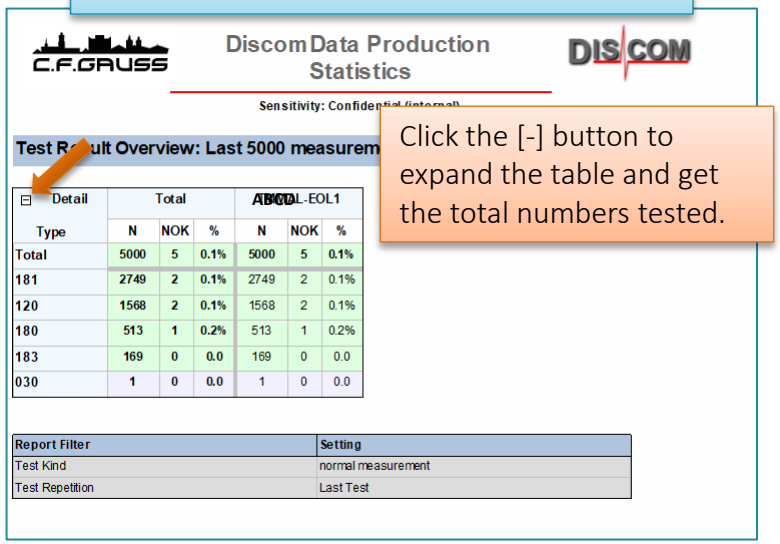


Test Repetition Options:

First Test: this looks at the first test result for each serial number.
Last Test: this is your final production result.
Filter unchecked: includes all repetitions.

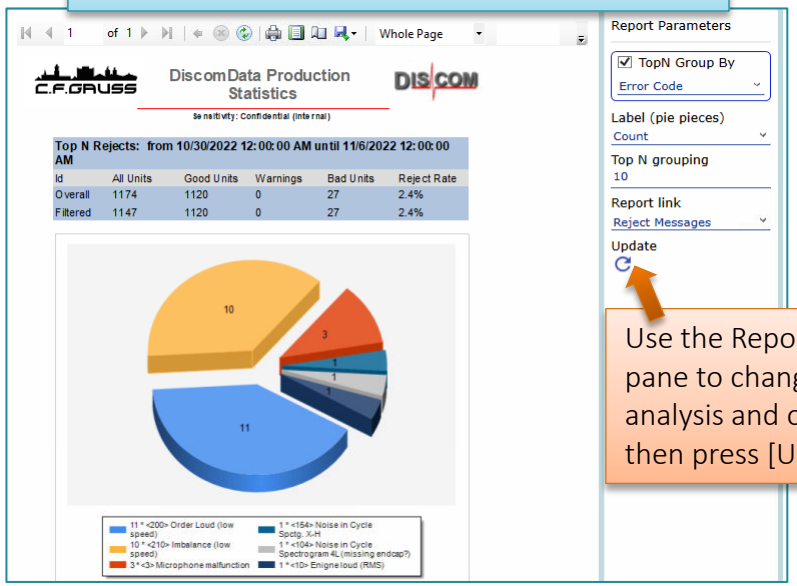
WebPalViewer: Most Used Reports

Number of Units Tested



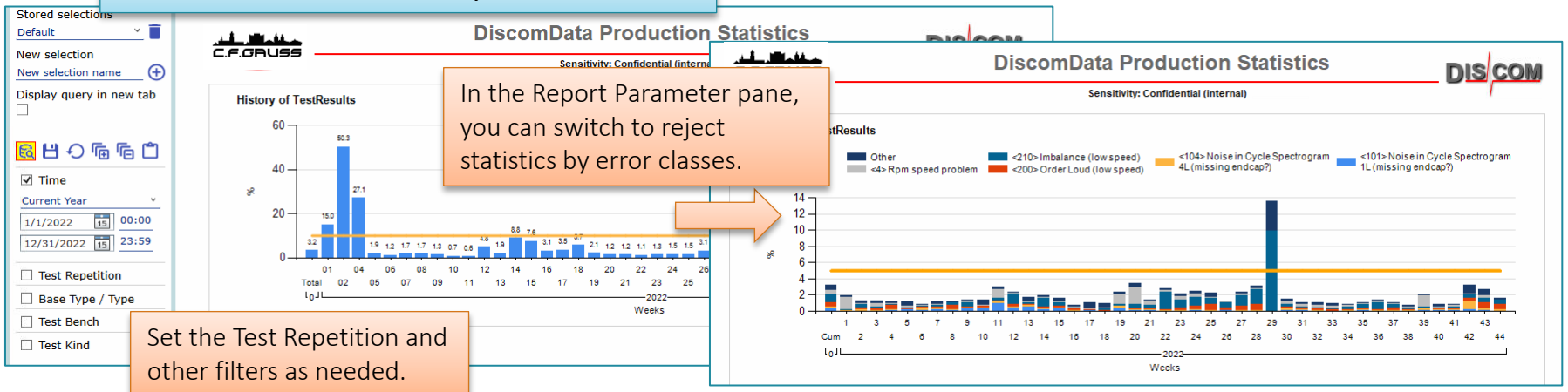
Click the [-] button to expand the table and get the total numbers tested.

Top N Defects



Use the Report Parameter pane to change category analysis and other options, then press [Update] button.

Test History



In the Report Parameter pane, you can switch to reject statistics by error classes.

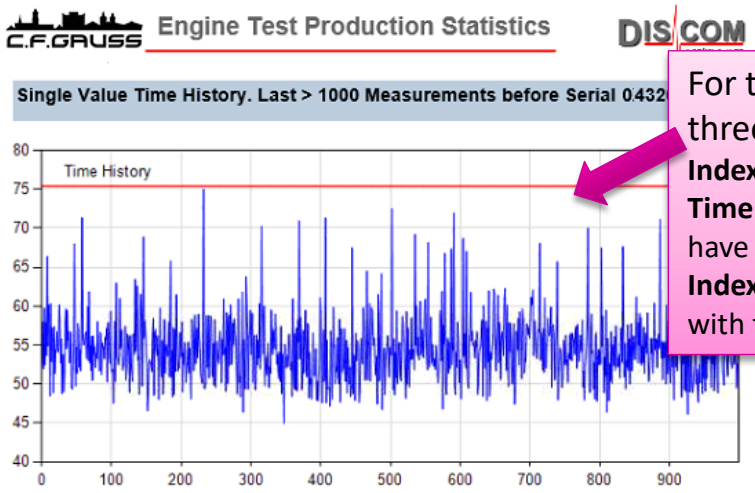
Set the Test Repetition and other filters as needed.

Single Value Statistics

WebPalViewer single value statistics shows the time series and distribution of the selected value(s).

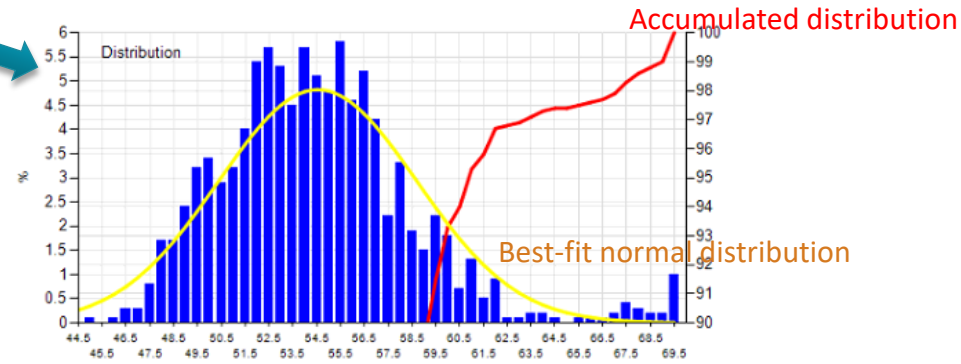
You can get there by calling it directly or by clicking on an error code in the measurement report window. If you come from a defect code, the filters are pre-selected as in the report you come from.

The side panel offers display and customization options.



For the x axis of time series, there are three basic options:
Index: shows the count of measurements
Time: shows the measurement time. Curve will have jumps at times with no production.
Index-Time: curve as for 'Index', but labelled with times.

Distribution of values.
Can in addition show distribution of limit value, which in many cases is only a single peak.
Accumulated distribution uses the percentage scale on right side.



Data information.
Shows the Clavis of current value(s), min, max, mean value and standard deviation.
Use this information to adjust limit settings in parameter database.

Test Stand	Model	Mode	Instrument	Param	Location	Channel	Sensor
[Gauss-EOL1]	[081]	5-Rd	Spectral Value	Order4	Input Shaft	Mix.VSFront	

Curve Data	Average	Standard Dev.	Minimum	Maximum	Color
Value	54.54	4.166	44.98	75.89	0
Limit	75.42	8.35E-06	75.42	75.42	1

Report Filter	Setting
Show Measurements	All Tests
Show Reference Units	On

Links within WebPal Report

The list of defects in Web.Pal contains clickable links which lead to more information

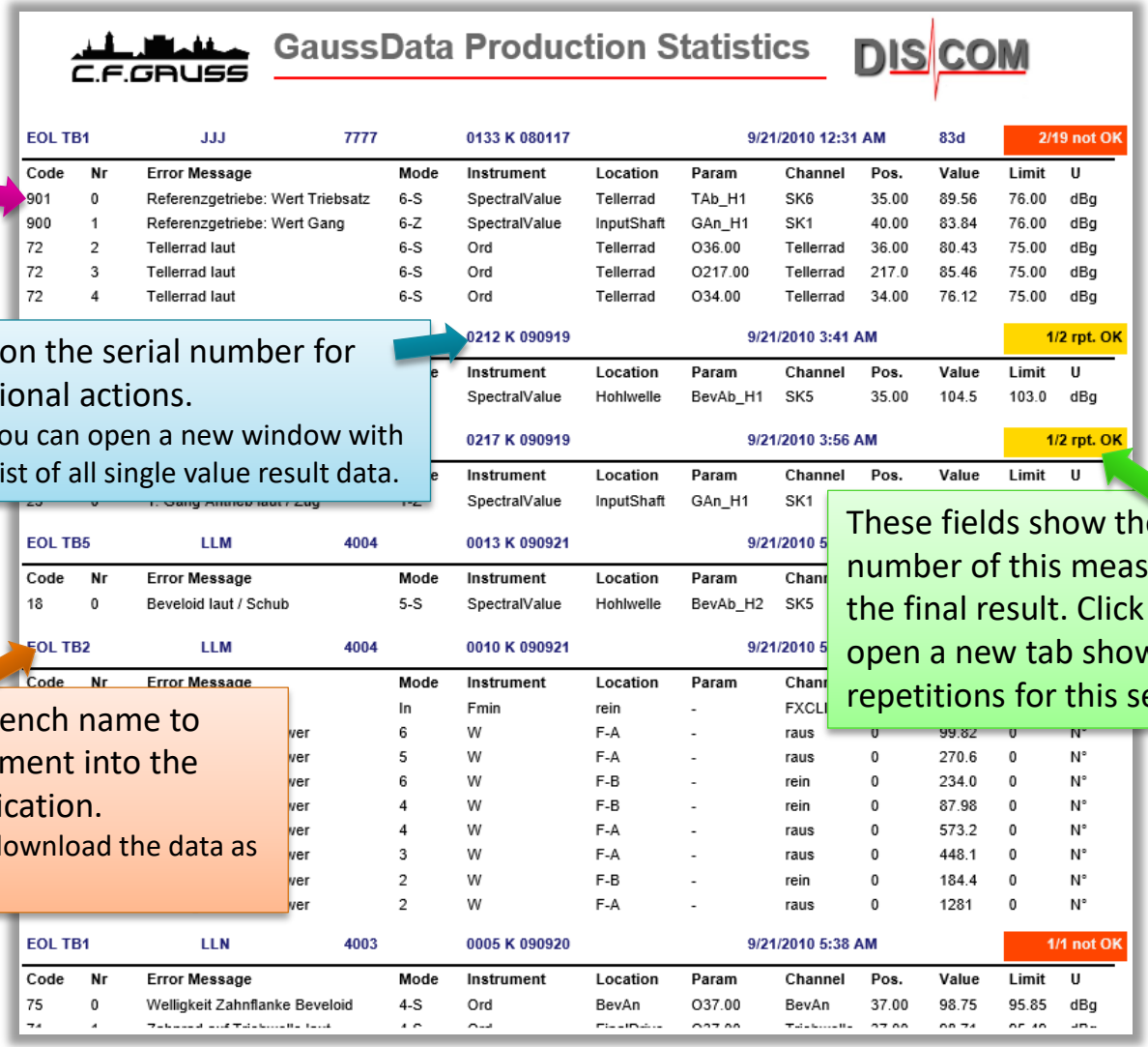
Click on the error code for a single value (like Spectral Value) to get to the single value statistics for this value.

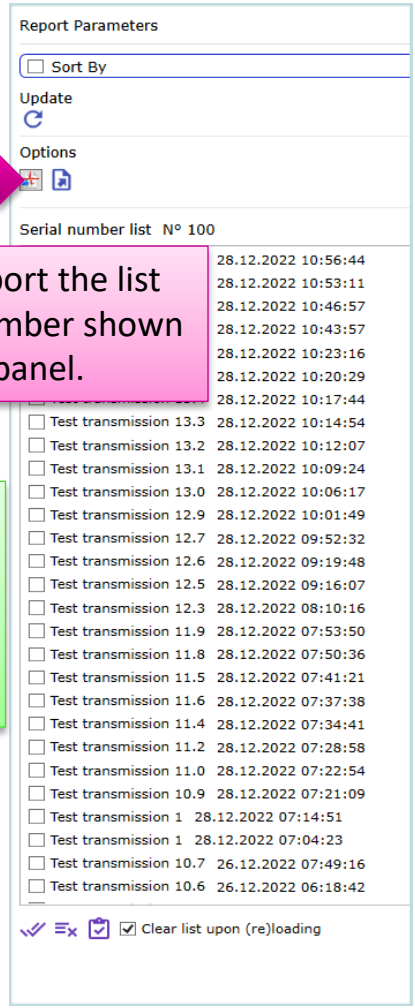
Click on the serial number for additional actions.
E.g., you can open a new window with a full list of all single value result data.

Click on the test bench name to load this measurement into the Presentation application.
(WebPalViewer will download the data as a file and save it.)

These fields show the repetition number of this measurement and the final result. Click on the field to open a new tab showing all repetitions for this serial number.

You can export the list of serial number shown in the side panel.





Presentation App

Using the Presentation application, you can display and analyze measured curves, spectra and other results. You generate reports which can be printed or exported.

Presentation can load data for many measurements, so you can compare measurements and evaluate differences.

You can load measurements from the result data base, or directly from archive files which store the measured data.

Download installation packages for Presentation from our web server at

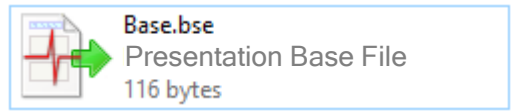
https://download.discom.de/Presentation

You will also find installation instructions and manuals there.

To use Presentation, you need sample data and a Presentation project.

The Microsoft Word application works on a Word document, Excel on a spreadsheet. Similarly, Presentation works on a *Project*. A Presentation project consists of a collection of files collected in a folder, called the project folder.

The Project Base File is also located in the project folder. When you want to load a project, you open the base file with Presentation. The file extension of Presentation project base files is `bse`; in most cases the base file will have the name `Base.bse`.

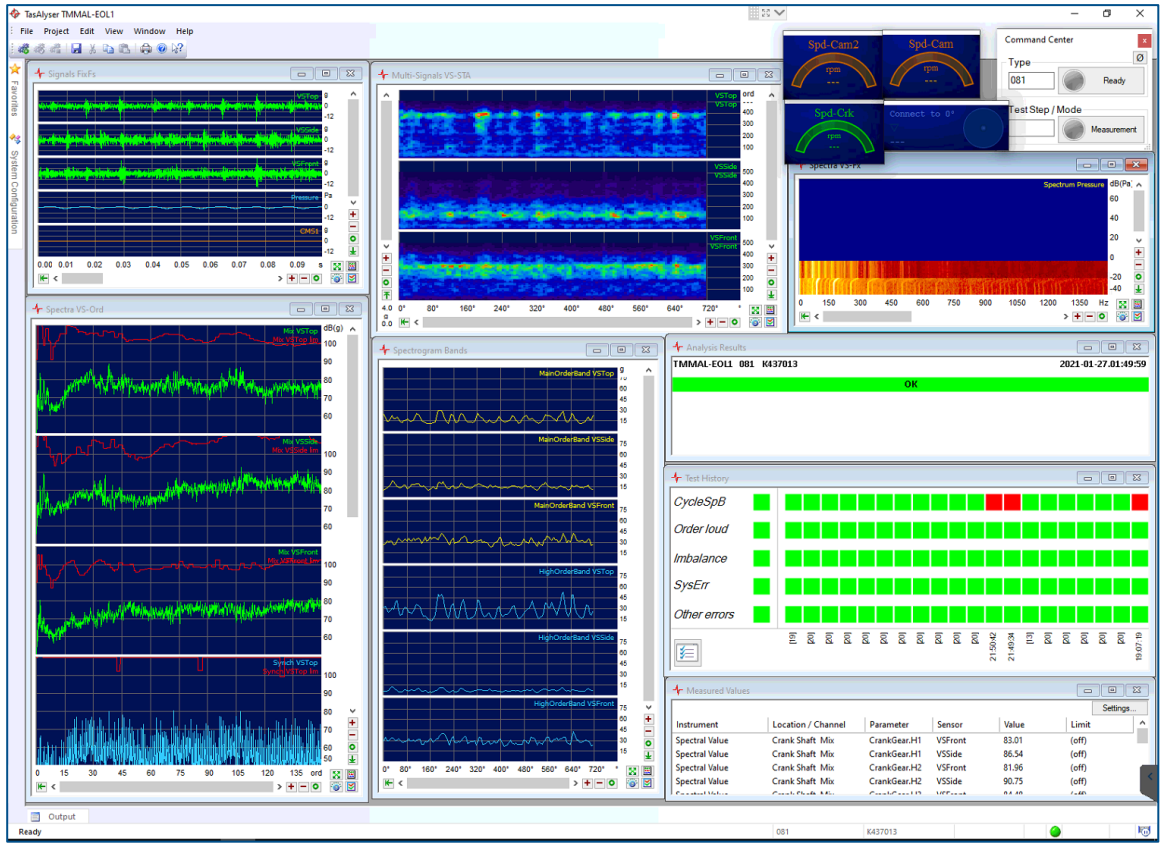


TASALYSER

Although the TasAlyser measurement application is a central component of the Discom production test system, after the initial setup users interact with it rather little.

TasAlyser Measurement Application

The TasAlyser measurement application loads a **measurement project** which defines the processing and display modules (like the Excel application load a spreadsheet which contains the actual data and calculation rules).



Because of the modular structure, a TasAlyser project can be adapted to various measurement and evaluation requirements.

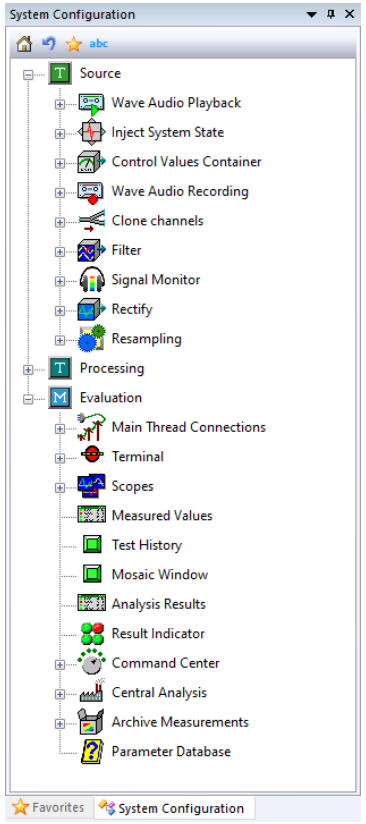
Internally, TasAlyser uses multi-processor parallel computing and can process the sensor data faster than real-time.

Changes in settings and window positions are not saved automatically; you have to press the Save button in the toolbar.

In menu Project you find the option User Rights to protect against unauthorized changes.

System Configuration and Favorites

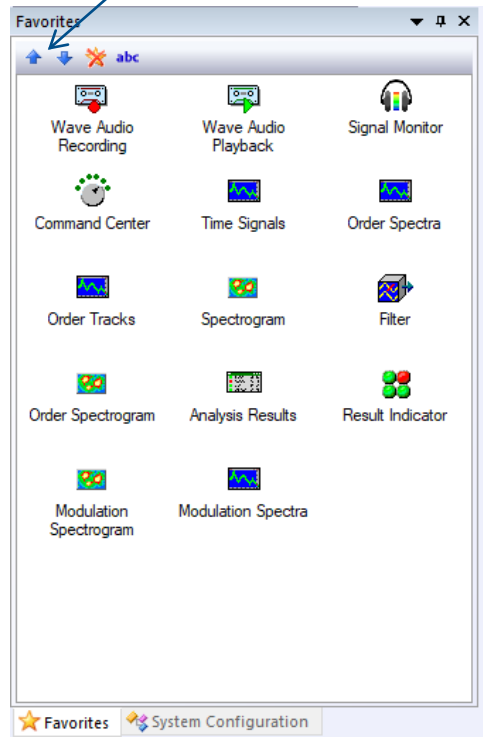
The System Configuration window provides access to all processing and display modules and settings.

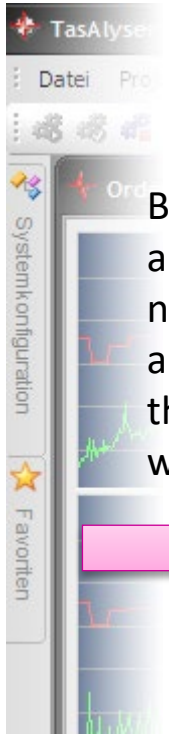


The docking window **System Configuration** provides access to all software modules of the TasAlyser application. Double-click on an item opens the associated display or settings window.

Those modules which are needed most often can be added to the **Favorites** docking window.

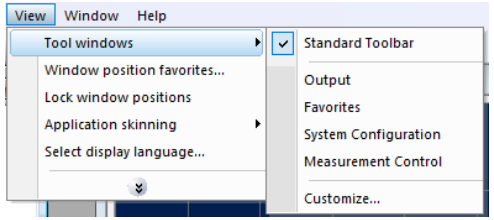
sort favorites here





Because both windows are not needed during normal operation, they are folded to the edge of the TasAlyser main window.

If a docked window was closed, you can re-open it from menu View – Tool windows.



Test Stand Communication

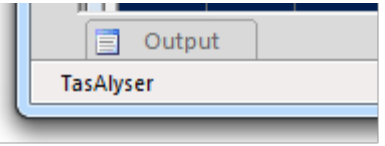
TasAlyser uses a **text-based command protocol** for communication with test stand control.

The commands are exchanged via **UDP (network)**, **serial RS232** interface or Profibus/Profinet buffer. (Profibus uses text messages, too. Bit-parallel communication is only supported for special applications.)

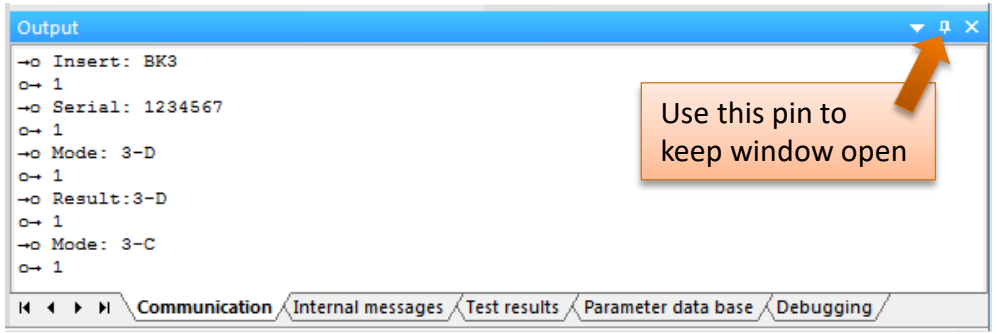
TasAlyser provides a wide range of commands, which can be extended for special purposes.

Examples for commands:

Command	Description
Insert: [Type]	Get ready for a new test run with gearbox [Type]
Mode: [A]	Select test step [A]
Measure: 1/0	Measurement start/stop
Remove:	End test run.
Result:	1 = OK, 0 = not OK, …



In the Output window (usually docked at the bottom of the main window) the communication can be monitored.



The communication is recorded in a log file, which is stored in your project folder:
C:\Discom\Measurement\MulitRot\(ProjectName)\Locals\Logs\

Get the full test stand communication protocol documentation at
https://download.discom.de/Manuals

Limit Generation and Parameter Database Primer

Evaluation Limits Double Feature

In EOL testing, there are two major objectives:

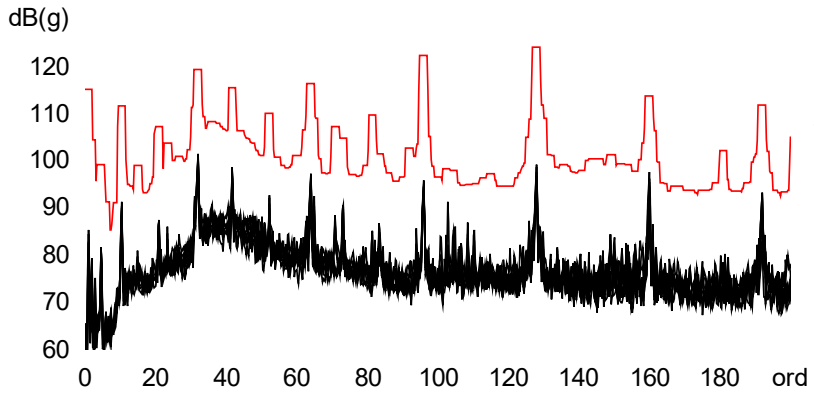
- Find parts which will be audible inside the car
- Find defects in parts that limit the lifetime

This requires two limit strategies:

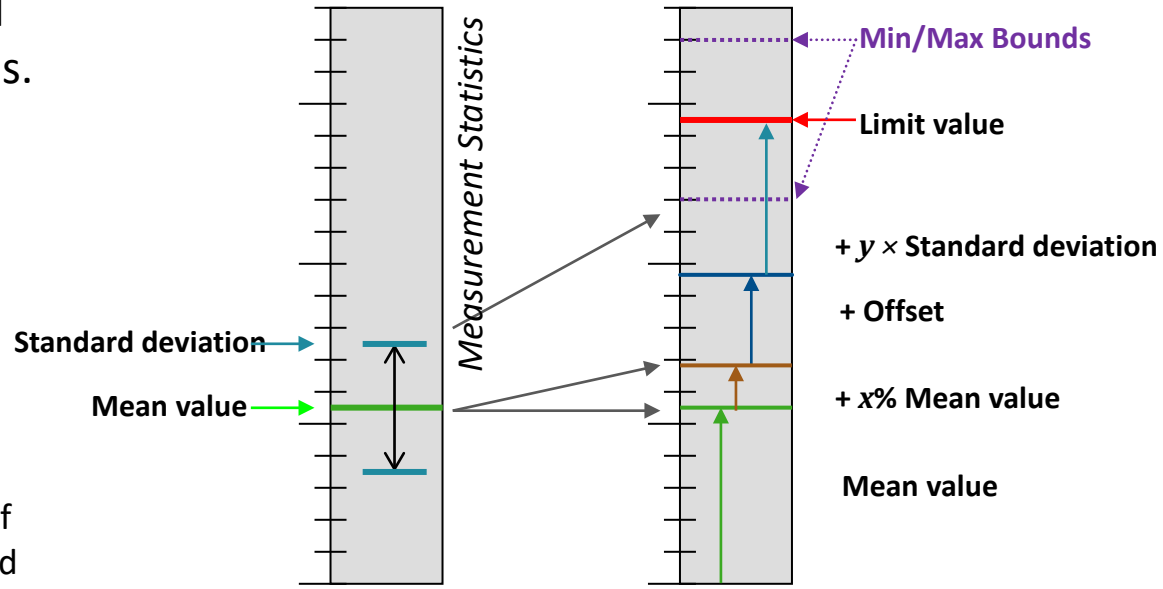
- Fixed limits confirmed by drive tests in car
- Automatically learned limits, based on statistics

The Discom system uses a combination of learned and fixed limits which provide a high flexibility for all kind of situations.

The limit parameters are controlled in the parameter database, allowing easy management even for many different types and test steps.



The combination of automatic and fixed limits also applies to limit curves



Calculation of the limit value:

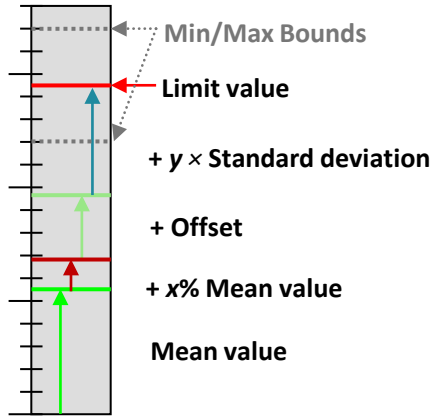
(1) Limit = Mean + x % Mean + Offset + y × Std.Dev.

(2) apply bounds: *Min* ≤ Limit ≤ Max

Limit Calculation Examples

Calculation of the limit value:

1. Limit = *Mean* + ***x*** *% Mean* + *Offset* + ***y*** × *Standard deviation*
2. apply bounds: *Min* ≤ Limit ≤ Max



Parameter	Offset	% mean	Factor Std.Dev	Formula result (1)	Min bound	Max bound	Resulting limit (2)
for Order Value with mean = 79.4, standard deviation = 1.8							
Example 1	5	0	3	**89.8**	70	120	**89.8**
Example 2	5	0	3	**89.8**	95	95	**95.0**
Example 3	10	0	0	**89.4**	95	105	**95.0**
Example 4	0	35	1	**108.99**	95	105	**105.0**
for RMS with mean = 5.2, standard deviation = 1.8							
Example 5	1	0	3	**11.6**	5	20	**11.6**
Example 6	0	100	0	**10.4**	5	20	**10.4**

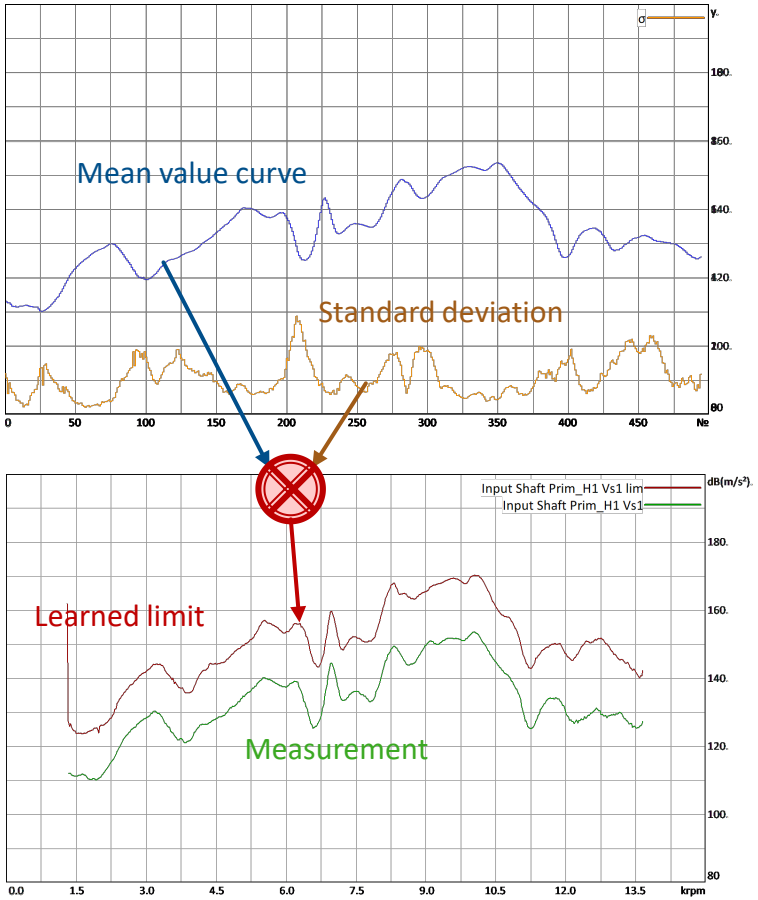
Fixed limit

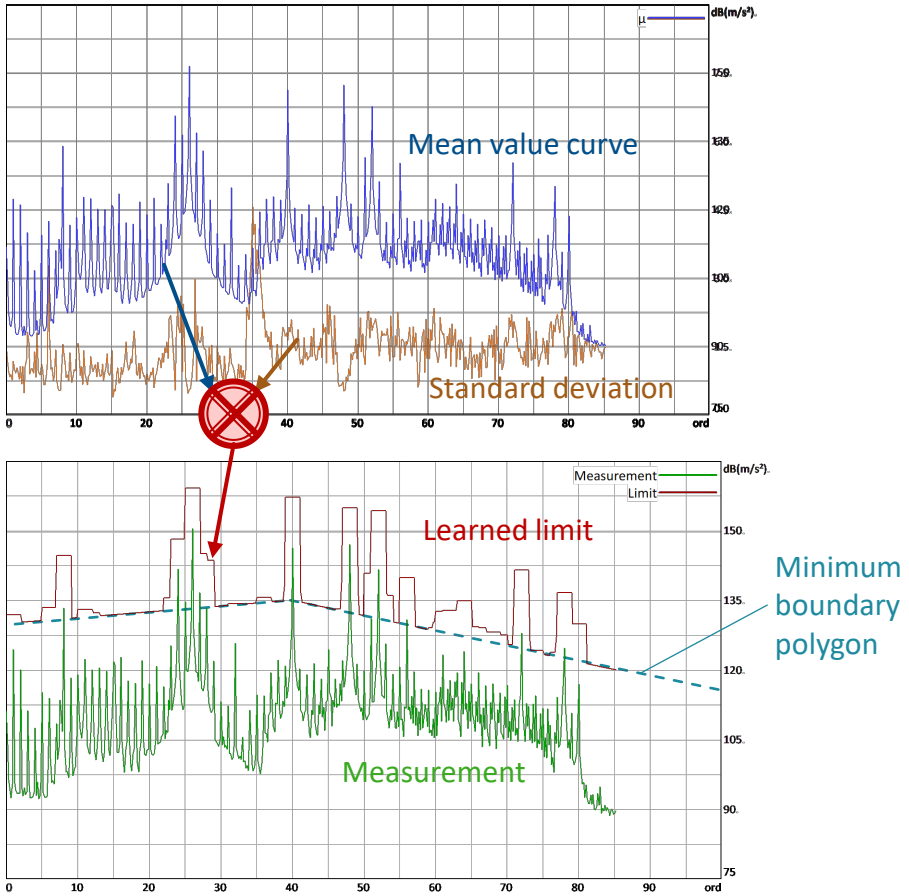
Limit Curves

For curves (spectra, tracks), the limit is learned for each position individually.

Each curve point has it's own mean value and standard deviation, and the learned limit curve is constructed point-wise according to the same method as for single values.

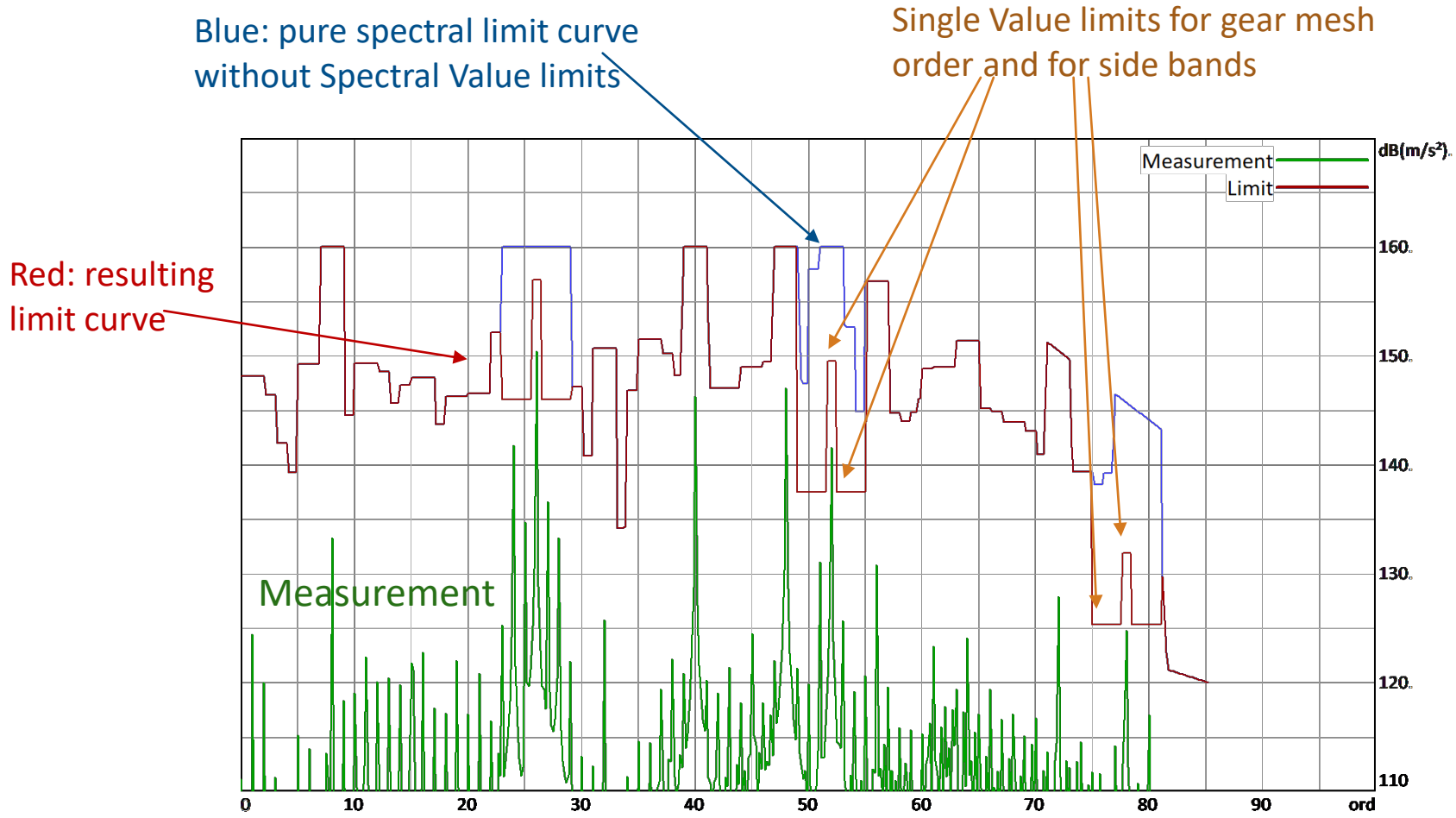
The Minimum and Maximum bounds are defined as polygons.





Order Spectra Limits

For order spectra, the limit curve combines the learned spectral limit and the single value limits which are defined for gear mesh orders and side bands.



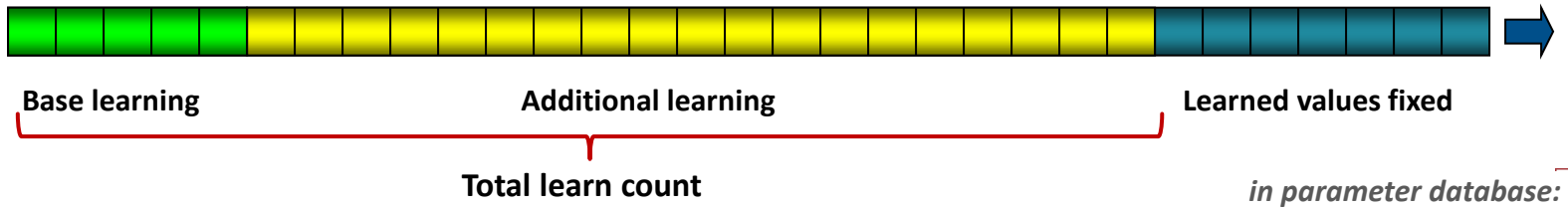
The limit curve and the spectral value limits can have different calculation parameters!

Learning Process

The learning of the limits is done in two steps: **base learning** und **additional learning**.

The base learning encompasses only a few transmissions (e.g. 5). During base learning the measured value is compared to the *Maximum boundary* from the parameter database. At the end of base learning the preliminary limits are set.

The additional learning encompasses a lot of transmissions (e.g. 200 in total). Each one is tested against the limit values calculated from the previous tests. If it is found to be ok it is added to the statistics. This way the limit values are fine tuned.



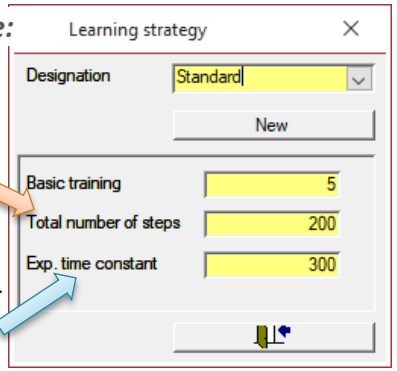
The automatic learning also permits the unattended start of a new test type at a test bench and provides “reasonable“ starting limit values that can be refined through the parameter database.

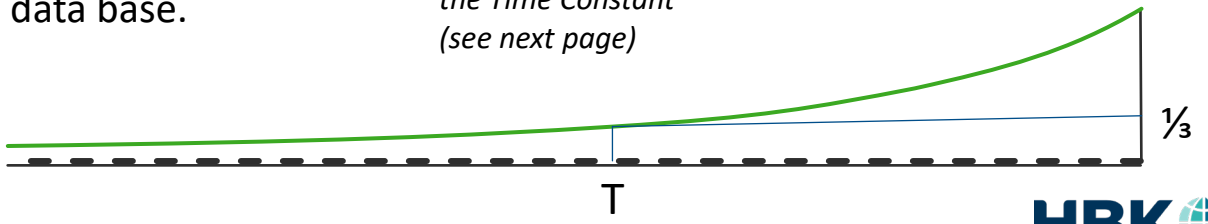
The learning process can be restarted or extended at any time – also for single test steps or specific values. It is controlled from the parameter data base.

in parameter database:

Set total learn count to -1 for continuous, infinite learning.

Learning uses exponential averaging. The third parameter for the learning strategy is the Time Constant (see next page)

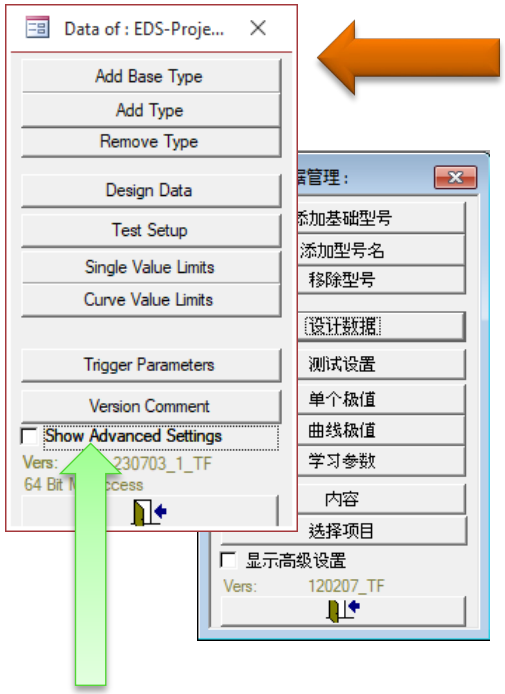




Parameter Database User Interface

The parameter data base is a Microsoft Access data base. Thus, the data base file can be handled as a normal file (for creating backups, copying between test stands etc.)

The user interface TasForms is also based on Microsoft Access.
It can be switched to multiple languages.

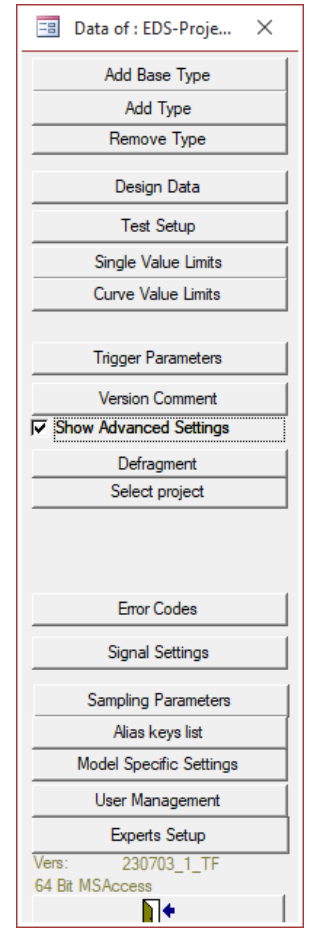


The start form of the parameter database offers access to the most frequently used functions: managements of types and limit settings.

In the advanced settings, measurement setup, sensor configuration and other parameters can be changed.

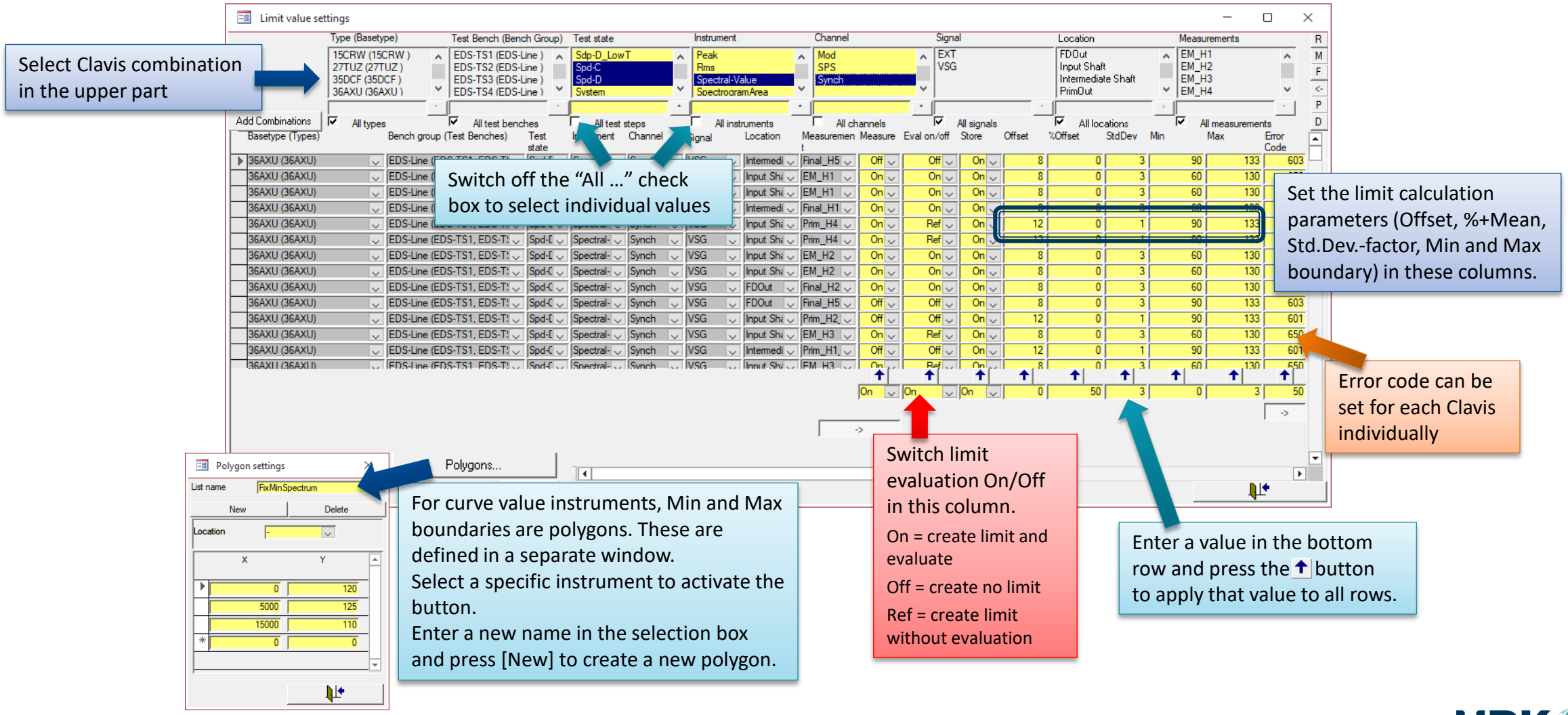
TasForms automatically stores backups of previous versions when you leave the data base and confirm the changes.

Check "Advanced Settings" to expand the start form and get access to all functions:



Limit Settings Form

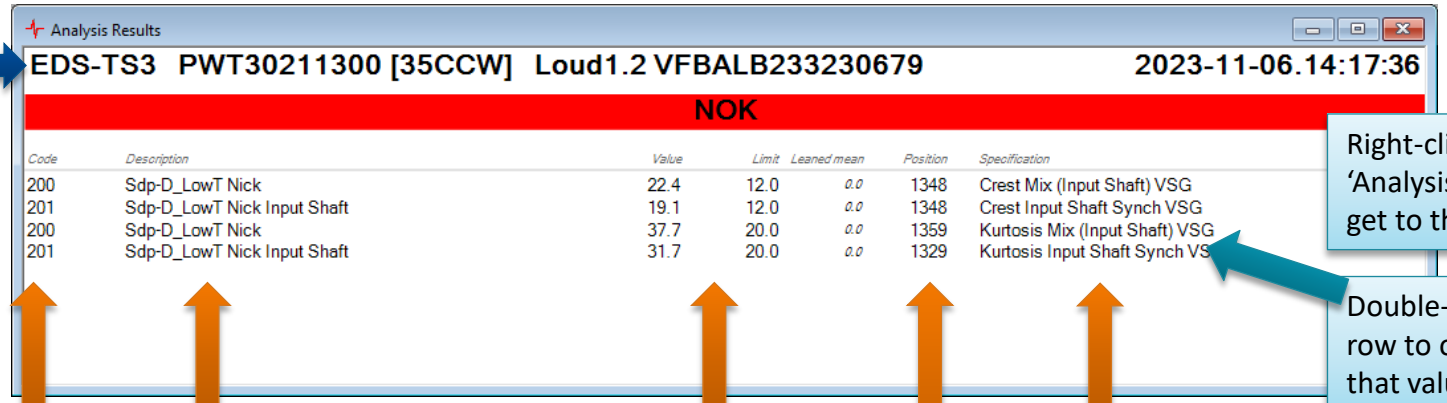
In the Limit Settings form, start by selecting the Clavis combination for which you want to review or change settings.



Understanding Defect Messages

The defect messages shown in TasAlyser, WebPal and Presentation contain the Clavis information which provides the key to parametrization and statistics.

Top line shows test stand, type name, [base type], serial number and timestamp.



Right-click in TasAlyser 'Analysis Results' window to get to the display settings.

Double-click on a message row to open Inspector Q for that value.

Defect Code

Defect Message

Measured value and limit value

Position value

Clavis specification

Defect Code and Defect Message text can be defined and changed by the user; see next page.

The meaning of the Position value depends on the instrument shown in the Clavis specification. For spectra, it is the order where the measured curve passed the limit; for tracks, it is the rpm speed (control value).

Clavis specification shows *Instrument* and *Parameter*, *Location*, analysis *Channel* and *Sensor*. (Test step is shown optionally.)

Defect Codes

Defect codes and defect messages can be freely defined in the parameter database.

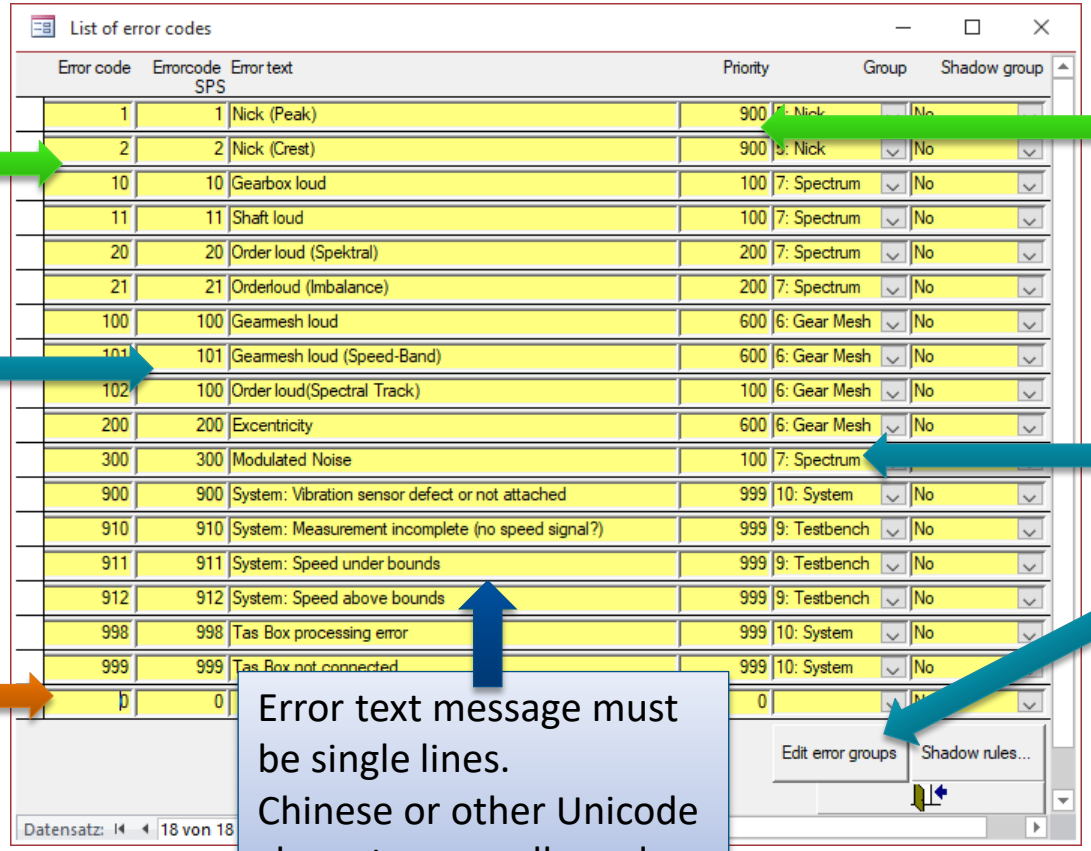
Error Codes

The defect codes are then assigned to measured values in the [Measurement Value Setup] or [Single/Curve Values Limits] forms.

Error code numbers can be chosen freely
(0 is not allowed, no upper limit).

The “External error code” (or PLC error code) is the number sent as a result to the PLC. Multiple errors can use the same “external” code.

Add a new defect code definition in the last line of the list.



Error text message must be single lines.
Chinese or other Unicode characters are allowed.

“Priority” defines the sorting of defect messages. The defect with highest priority is listed first and is used for standard production statistics.

Errors are sorted into groups, which are defined in a separate form.
The error group of the error with highest priority defines the overall result code.

Overall result codes:
1 = OK, 0 = NOK,
2 = no evaluation,
3 = system error

Initiate new learning of limits

There are two ways of initiating a re-learning of all limits:

- The direct way: delete the learn files
- The delicate way: use the parameter data base (next page)

The direct way

On the measurement computer(s), quit the measurement application. Go to the folder

`C:\Discom\Measurement\MultiRot\(Project name)\Locals\LearnData\`

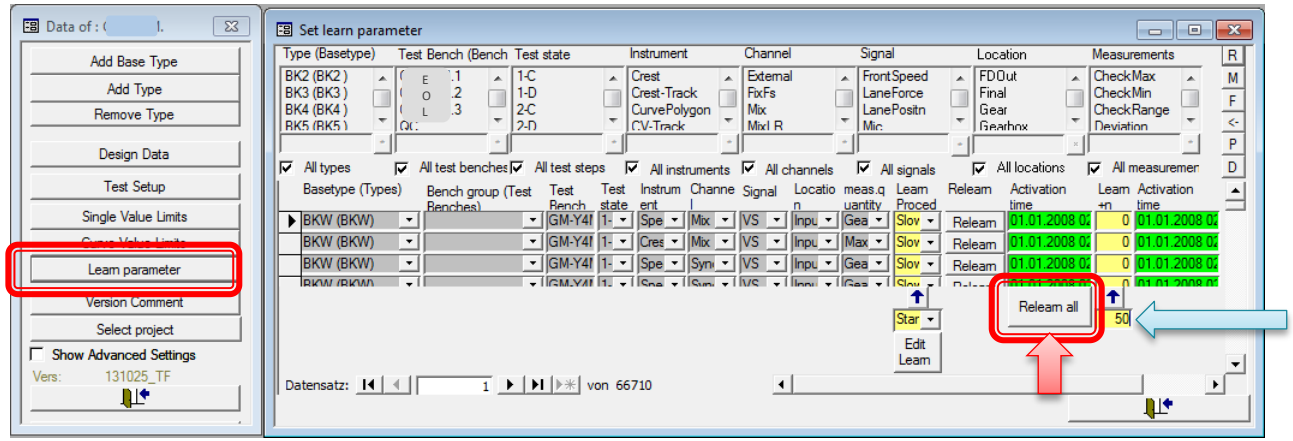
Delete all files in there (or only those for the base types you wish to re-learn), then start TasAlyser again.

The delicate way

Although the learn data are saved locally on the measurement computer in the LearnData folder, learning is managed in the parameter database (see next page).
This allows initiating a new learn for several test stands at once (if a central parameter database is used), re-learning only specific limits (e.g. only for a specific test step), or refining the learned limits with additional learn data (instead of starting all over).

Initiate new learning in Parameter Database

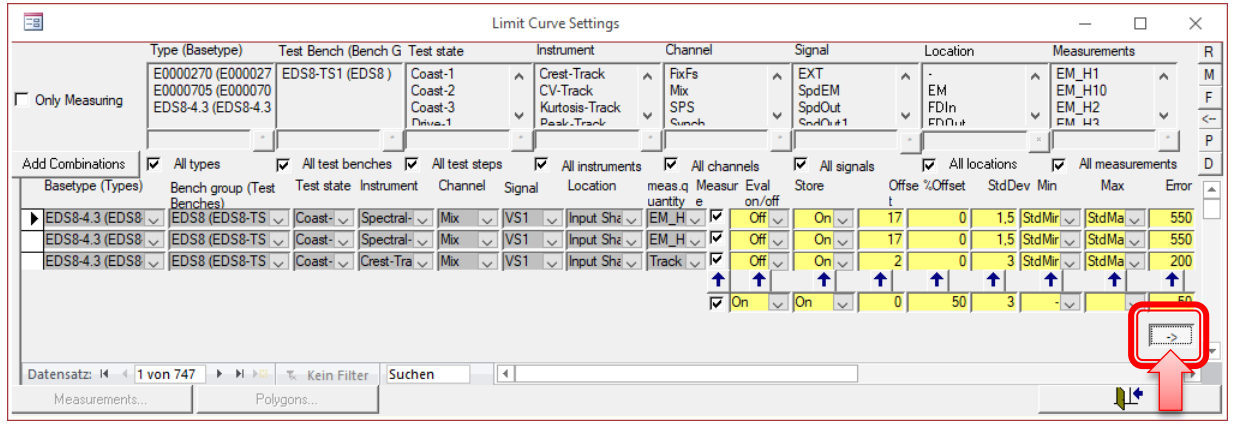
In the parameter data base, open the “Learn Parameter” form and press “Relearn all”:



You can select specific types, test stands, test steps or measured values in the upper part in order to re-learn only specific limits.

To refine some limits, enter a number (e.g. 50) into the “Learn +n” column.

If you do not have the “Learn Parameter” button in your project, go to the Limit Forms and press the “Expand” button in the lower right corner to get the learn parameter settings:



Since the learn parameter are associated with the limit parameters, if you want to re-learn all limits, you have to initiate this twice: for the single value and for the curve limits.

Learning (of mean value and standard deviation) is done even when evaluation is switched off for a Clavis.

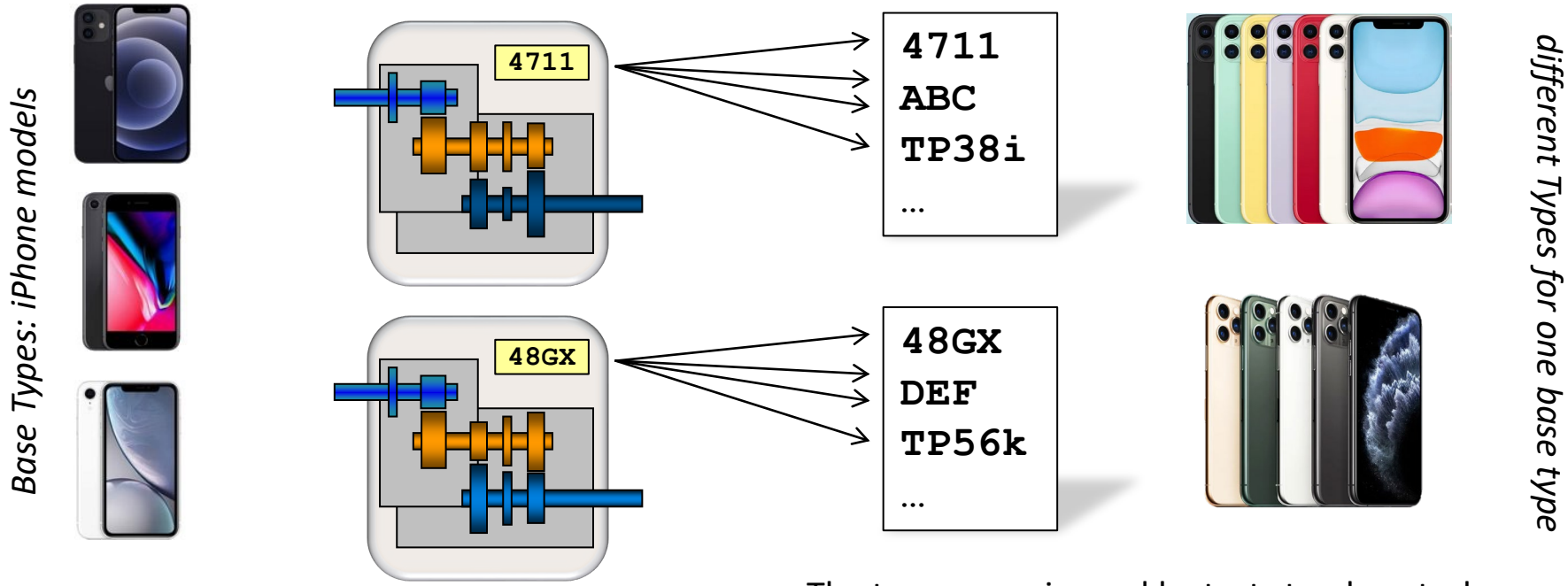
When a new metric is created, it will automatically start learning (independent of whether it is currently evaluated against a limit or not).

Types and Base Types

The parameter data base uses **types** and **base types**.

Base types differ in their kinematics (ratios, gears, …).

Each base type can have additional *names* associated. These names are Types.



Limits, testing parameters and the like are linked to base type.

The type name is used by test stand control and appears in measurement reports, result data base and production statistics.

In the same manner **test stand groups** can have multiple **test stand** names.

How To Create a New Base Types

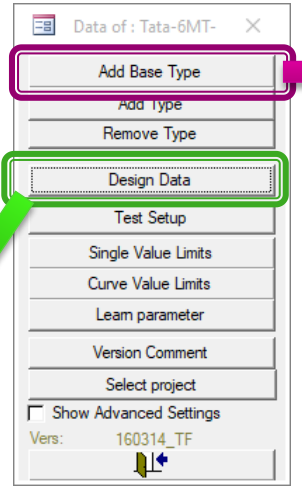
A **Base Type** is different from other types by teeth numbers or other kinematic properties. All limit and measurement parameters are linked to base types.

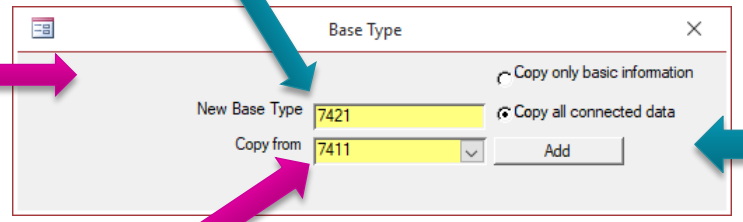
Each base type can have more than one associated **Type Names**. Type names are used for production statistics and PLC communication.

A new base type is always **created as a copy of an existing** base type. Afterwards, the teeth numbers ("Design Data") and other properties are modified as needed.

To create a new base type, in TasForms press the [Add Base Type] button.

Enter the name of your new base type





Keep the choice "Copy all connected data" and press [Add]

For "Copy from", select an existing base type with similar properties.

After you have created the new base type, open [Design Data] to enter the correct teeth number information.

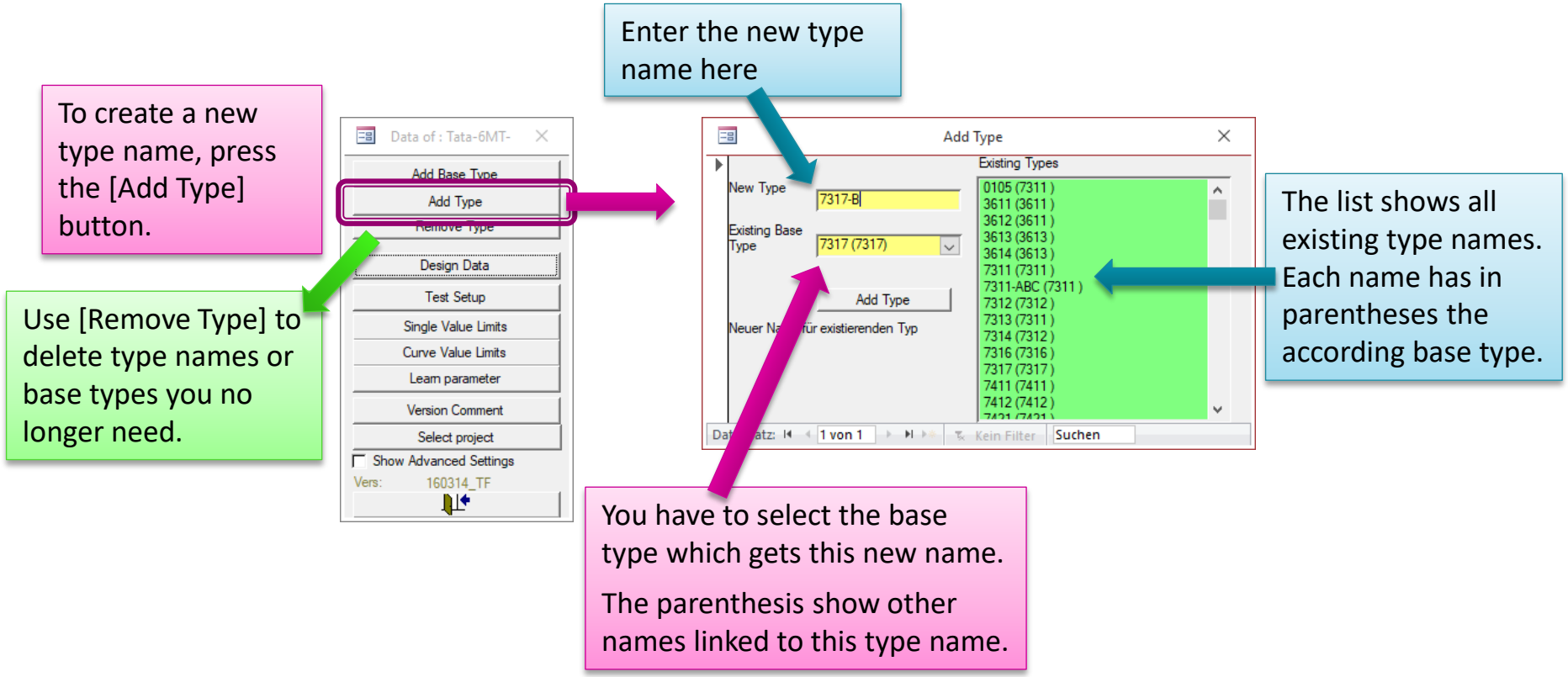
It may take some time for TasForms to create all table entries for the new type. After completion, you get a confirmation message:

Additional Type Names

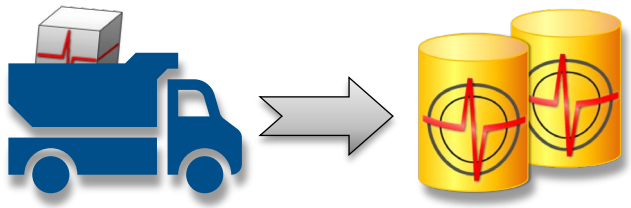
Each base type can have more than one associated type name.

Production statistics and evaluation use type names by default, but limits are linked to base types.

Every base type also appears as a type name.

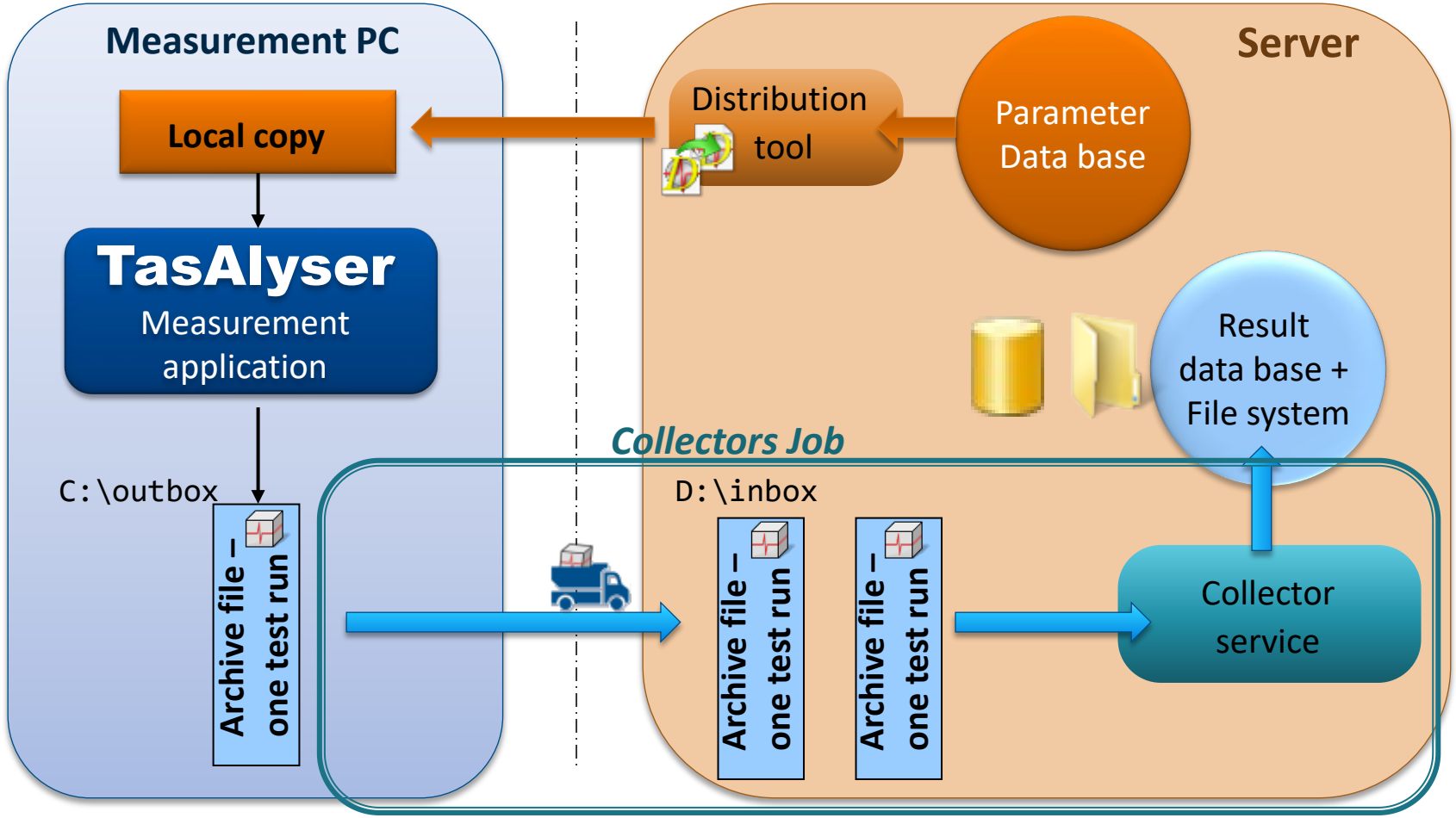


Result Database and Collector



Server File Exchange and Collector

Information exchange between measurement PCs and server uses shared folders and file transfer. The Collector Service retrieves the result files from the test stands, moves them to the local inbox folder on the server and then inserts them into the result database.
The Parameter Distribution Tool copies the parameter database file to the test stands.

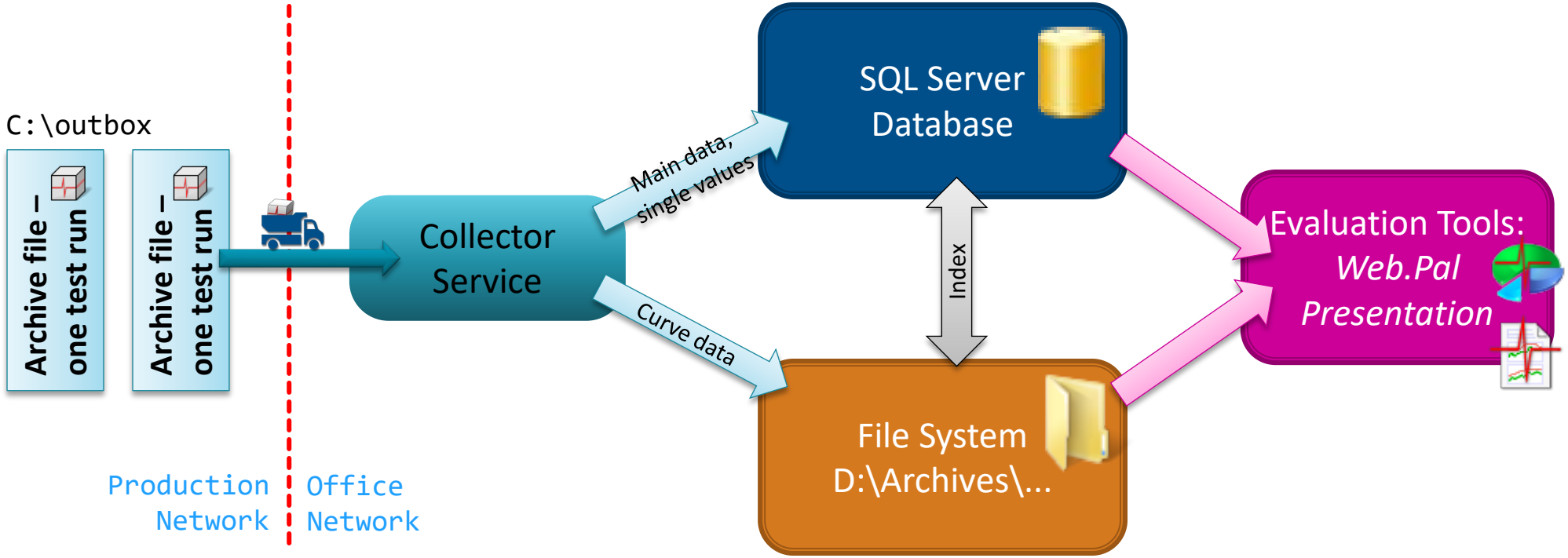


In **single-PC-setups**, the measurement PC also has the role of the server. Everything works the same as with a separated server, including the Collector.
The only difference: there is no Parameter Distribution Tool.

Result Database + File System

The result database contains for each test run all general information (serial number, time stamp, result, defect messages etc.) and all single value measurement data.

Large binary data like curves (spectra, order tracks) and spectrograms are stored in files in rdt format, which are sorted into week folders and daily files. The database contains an index into these files, so that any specific curve can be found and loaded efficiently.



How to Track Collector Problems

Things to check:

- Is the Collector Service running?
  (Open the Computer Management console and check the services.)
- Can all Outbox folders on the measurement PCs be accessed from the server?
  (Each network folder which cannot be accessed will slow down Collector operation considerably.)
- Are the Outbox folders mostly empty while Collector is running?
  (If files assemble in the Outboxes, the Collector might not have the rights to really move them.)
- Do you see a lot of files of type .rdt or .rd$ in the Inbox?
- Is the server volume (D:\ drive) full, so no additional files can be stored?

Ask your IT team for support in resolving network connection and access rights issues!

For a fast problem check, you may first want to have a look into the text file

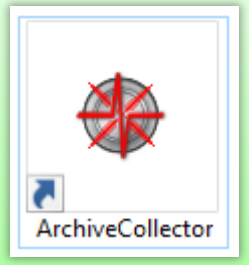
C:\Discom\Analysis\DbCollector*(ProjectName)**\Status.sea

The Collector Service writes some records of problems into the Windows System Event log. Since it is not easy to read messages there, and only important messages are logged there, it is much easier to track Collector problems using the “Collector App” instead of the Service.

Here is how to switch to the Collector App:

1. Open Computer Management and stop the Collector Service
2. Go to C:\Discom\Analysis\DbCollector*(ProjectName)**
3. Start the Collector App using the shortcut.

Close the App before you re-start the Service.
Running App and Service in parallel may cause confusion!



*(*ProjectName*): the default name is “DiscomData”, but you might have a different project name in your installation.

Parameter Database Distribution

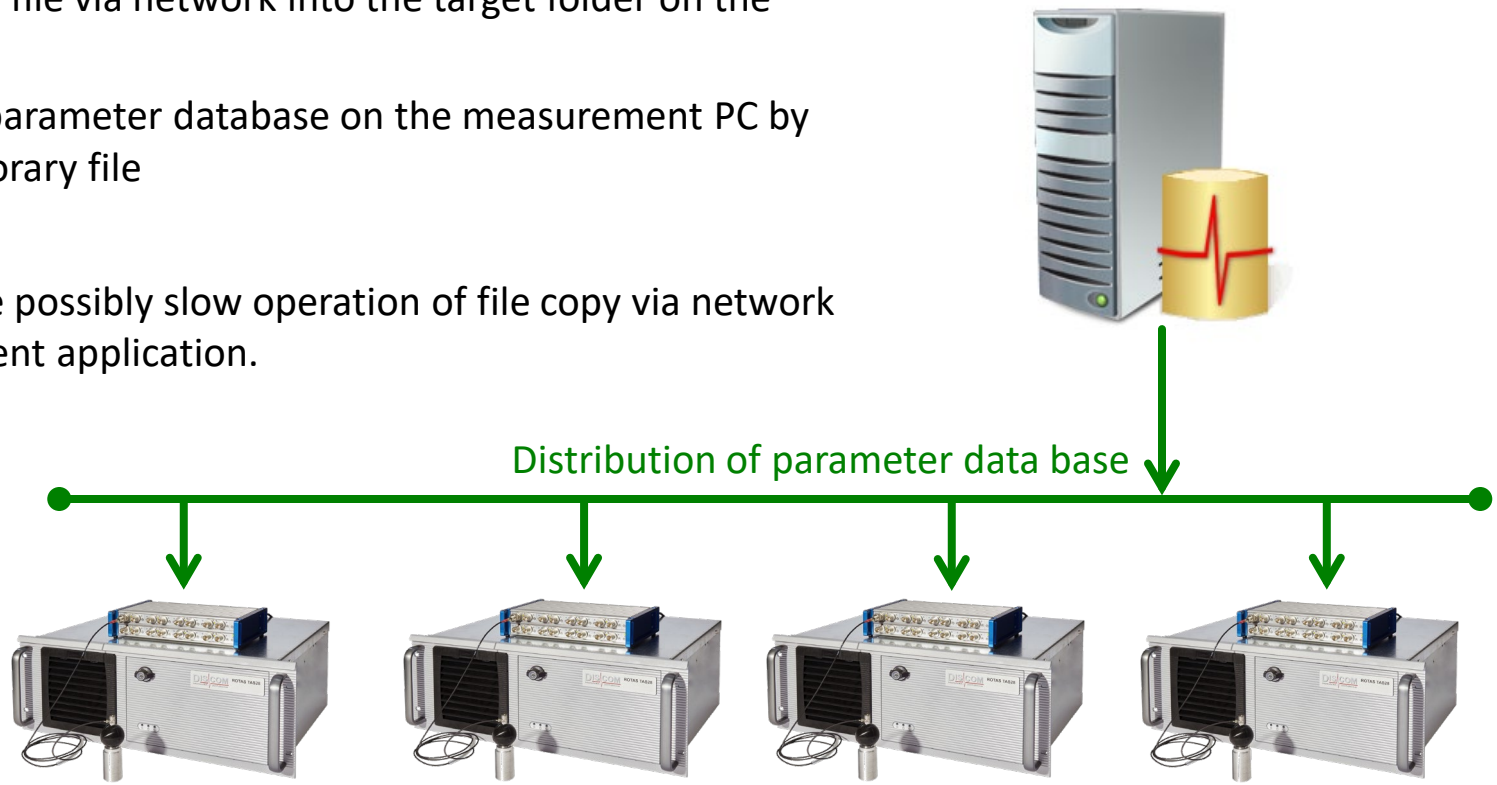
Parameter database distribution is triggered manually by the engineer after making changes to the master copy (e.g. limit settings).

The Distribution tool uses a set of batch scripts for these steps:

- Make a temporary copy of the parameter database mdb file
- For each test stand:
  - Copy the temporary file via network into the target folder on the measurement PC
  - Replace the actual parameter database on the measurement PC by renaming the temporary file
- Delete the temporary file

By using a temporary file, the possibly slow operation of file copy via network will not block the measurement application.

Execution of the DistributeParamDb tool requires entering a password blindly.



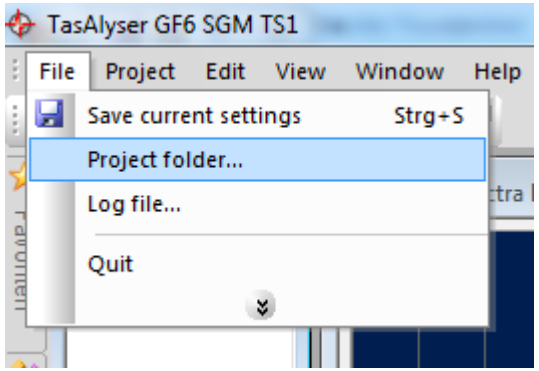
MAINTENANCE

Projects and Project Folder

Similar to using the Excel *application* to open an Excel *spreadsheet*, the TasAlyser *application* loads a **measurement project**.

The TasAlyser application is installed in `C:\Program Files\Discom`,

The projects are located within `C:\Discom\Measurement\MultiRot`.



Each project has it's own project folder. Typical measurement PCs only have one project.

You can very easily open a Windows file explorer for your project folder by using the according command from the File menu.

The project folder contains all information and settings for your project, including the parameter data base, but no test results or measurement data.

To make a simple backup of a project, just duplicate the project folder. The easiest way to do this is using the Tas Backup Tool (Software Maintenance Tool).

The Presentation project folders are located in `C:\Discom\Analysis\Presentations`. You can make duplicates of these folders – as a backup, or to transfer the project to a different computer (like your desktop workstation).

Project Backup

The **Tas Backup Tool** (also called **Software Maintenance Tool**) assists you in creating project backups.
It is located in the “Rotas for Experts” folder on the measurement computer’s desktop. Use it to

- Create a backup copy of the measurement project including all settings and learned limits
- Create a backup of the software executables (TasAlyser etc.)
- Schedule automatic backups

Usage:

(1) Start Tas Backup Tool from *Rotas for Experts* folder.

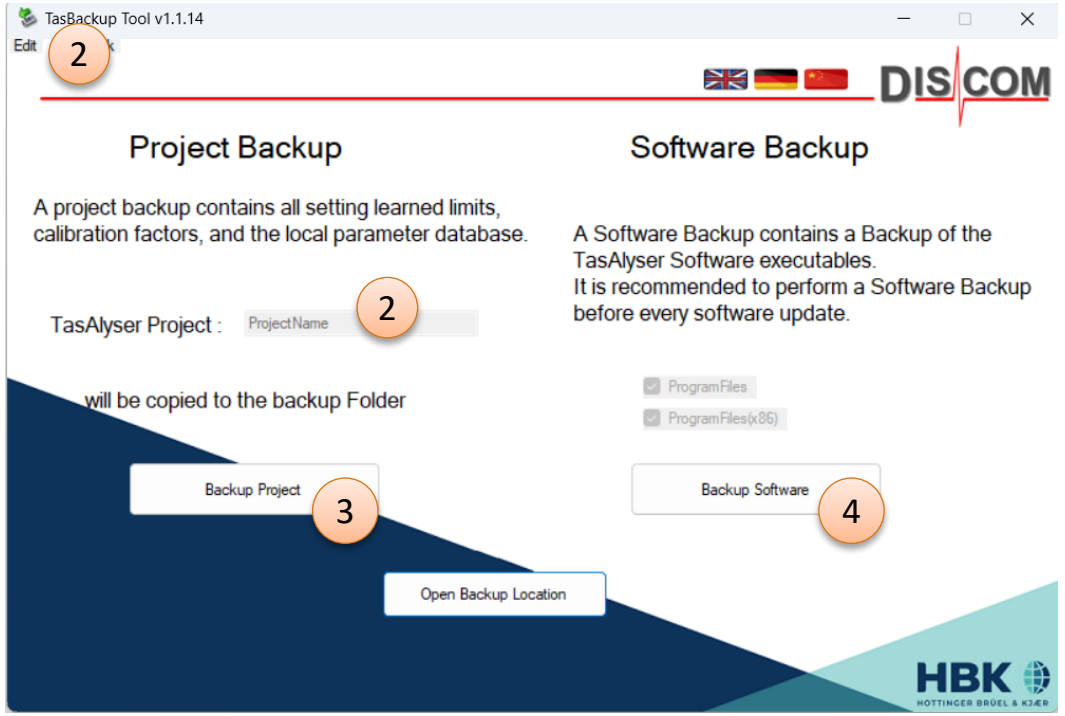
(2) Optionally change project and backup name using menu Edit.
The backup is created as a sub-folder of D:\Backup\Discom.

(3) Press [**Perform Project Backup**] if you want to save the current settings, learned limits, parameter database, Presentation project etc.

(4) Press [**Perform Software Backup**] to copy the software executables. This is only needed before installing a new software version.

(5) Done. Close the Backup Tool.

There are a few different versions of the Backup Tool which have alternate layouts, but all operate in the same way.



Use the [**Open Backup Location**] button to get to the backup folder in Windows file explorer.

To **restore** a backup: locate the according sub-folder and copy it back to C:\Discom.

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System Recovery

Each Discom measurement PC has an additional backup hard disk built in, and an additional boot device with Macrium or Acronis software internally connected.

To create a new system recovery image:

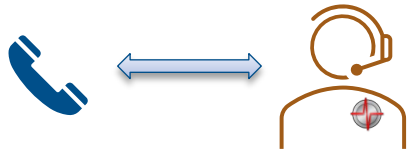
1. Turn off the computer.
2. Open the lid on the computer front and switch on the backup HDD.
3. Restart computer.
4. Use Macrium or Acronis software (pre-installed, run as administrator) to create a system image stored on the backup HDD. (If you create an image including D:\ partition, you should exclude .wav and .rdt files in Acronis.)
5. Turn off computer, switch off backup HDD, restart computer.

To restore the computer from an image (in case of total system failure):

1. Turn off the computer.
2. Open the lid on the computer front and switch on the backup HDD.
3. Restart computer.
4. During boot process, watch screen and press according key to use Acronis boot loader instead of normal Windows.
5. Use Acronis software (starts automatically) to restore system image from backup HDD.
6. Turn off computer, switch off backup HDD, restart computer.

Calling for Help

If you are having problems with your measurement projects or if you need help with noise phenomena, please contact us.



If possible, prepare to send to us these files:

- ✓ **Project folder** (C:\Discom\Measurement\MultiRot\(Project name)

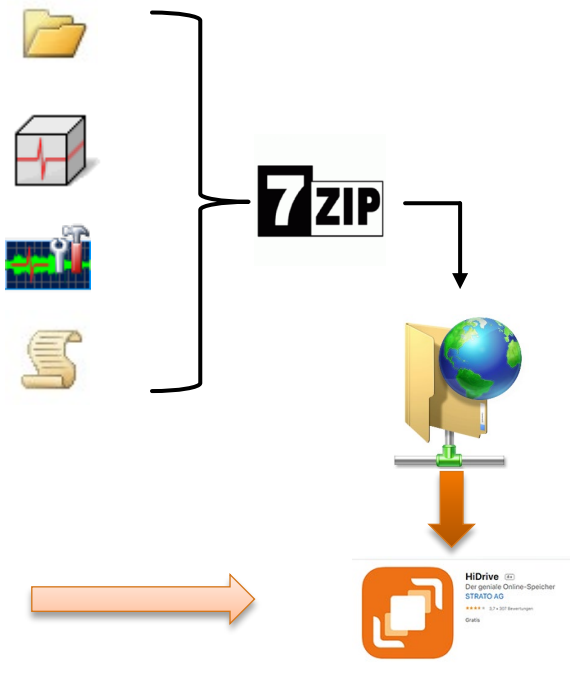
  Use the Backup Tool to create a project backup. Then compress the backup folder (from D:\Backup\Discom) using Zip or better 7zip.

- ✓ **Archive files** (from single test runs or a complete day)
- ✓ **Wave files** of problematic measurement(s) *and from normal measurements*

  Archives and wave files should be compressed, too.

- ✓ **Communication log file**.

  If you are having communication problems or see error messages in TasAlyser, get the log file from (Project Folder)\Local\Log, *7zip* it and send it to us.



https://www.strato.de/cloud-speicher/

Discom has a cloud storage space where you can upload the data to your dedicated, protected customer folder. Please ask us for your access link.

The most efficient help tool: **Remote Access**
(Discom uses *TeamViewer*)

DISCOM

Find more information on

download.discom.de/Manuals

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