EZSLAMX
Training Program

CHAPTER 7
Measurement Strategies

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Measurement Strategies

A. Definition
B. Expectation and Optimization
C. Acquisition
D. Reporting and Analysis
E, Review

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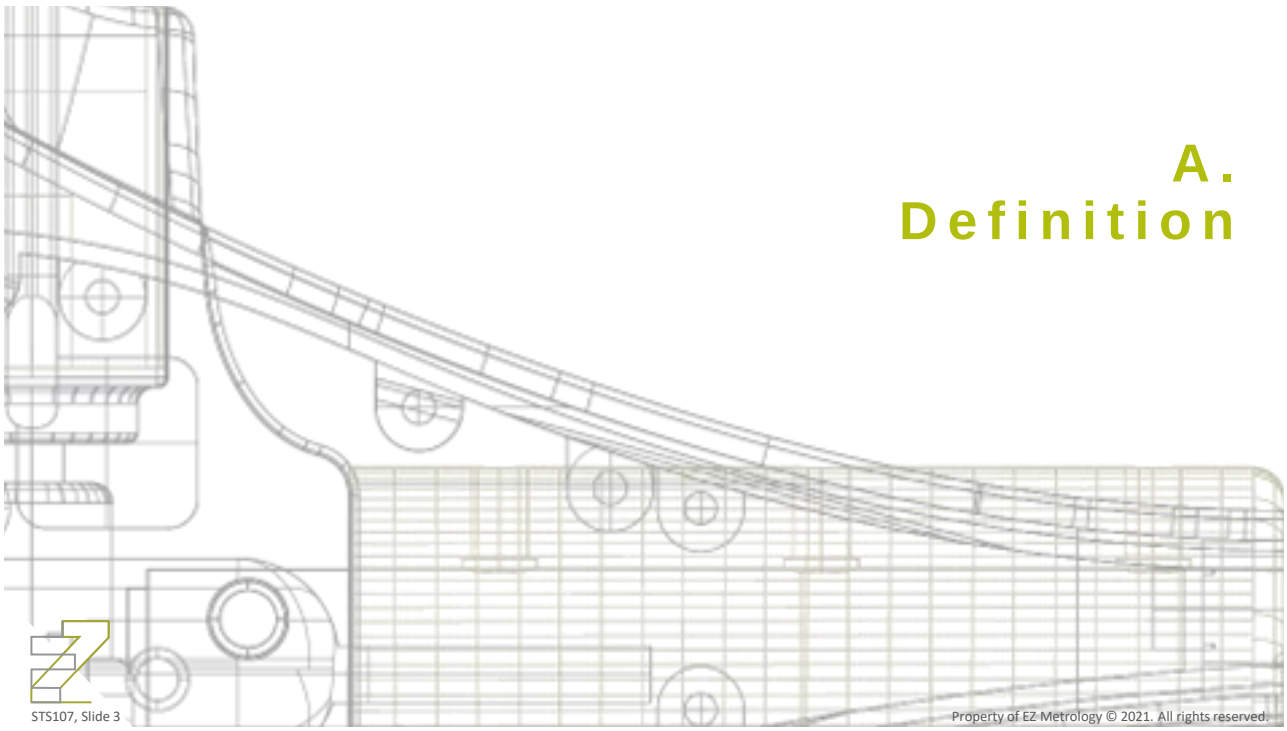

A. Definition

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A. Definition

1. Timeline

Benchmark
Extensive objective study of a larger group of doors collection to understand the available parameters and establish design criteria.

Specification
Define component specification and resulting overall performance. Evaluate multiple components to evaluate their performance with respect to target.

Launch
During a rapid changing launch process, identify as soon as possible faulty or off specification components.

Quality
Verify current production output using original design targets.
Associate out of tolerance situation to specific cause at component level.

Vehicle Life Cycle

Design
Compile the data to establish a desired feel of the door closing event.

Pilot
Review the first samples to identify variation and pinpoint the tolerance level on all aspects of closing efforts topic.

Process
Review the process capability and identify specific process variation that contributes to closing efforts.

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A. Definition

2. Project Objectives

Benchmarking

5 different vehicles, Vehicles with similar layout (SUV, Coupe, Truck…). Document the different design choices and performance.

Trouble Shooting

2 bad, 2 medium, 2 good. Are there different body styles, options that might influence performance (sunroofs…)

Component Analysis

Which component will be swapped? Can it be swapped easily?
What metrics will the component affect?
A door check alternative will not change seal compression.

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A. Definition

3. Samples

Sample Size

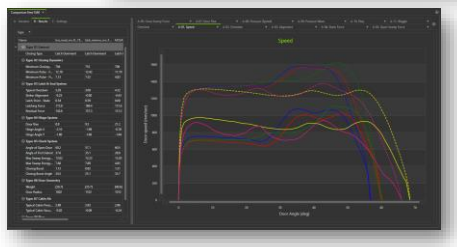
Cable free operation.

Sample Type

Results are shown immediately following the measurement.

Expected Outcome

Results are compared to nominal or target values.



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B. Expectation and Optimization

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B. Expectation and Optimization

1. Reflection

It is a good habit to reflect on the upcoming tests and reflect on the options in the interest of:

Saving Time

Understanding what data to collectable, limiting the number of runs or repeat runs.

Improve Uncertainty

If certain values are expected not to change, they might as well be frozen during the testing. Less variables means less noise on the data.

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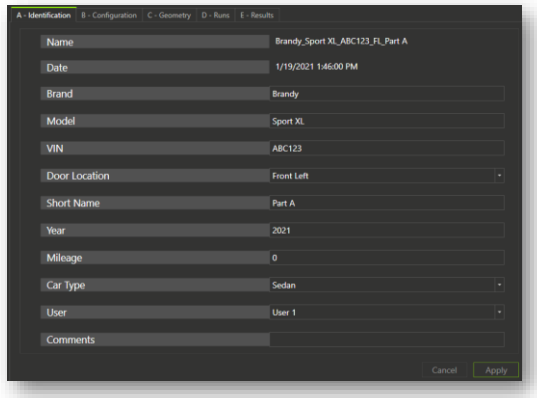
B. Expectation and Optimization

2. Session Identification

How will the collected data be organized so that it can be located or identified in the future.

- Naming: Brand, Program, Build number, Vin…
- Comment: Special setup, Particular part…
- Identification: Enable sorting of the database.

The exact meaning and content of Test_1, Test_2, Test_3 will quickly fade away.



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B. Expectation and Optimization

3. Door Geometry

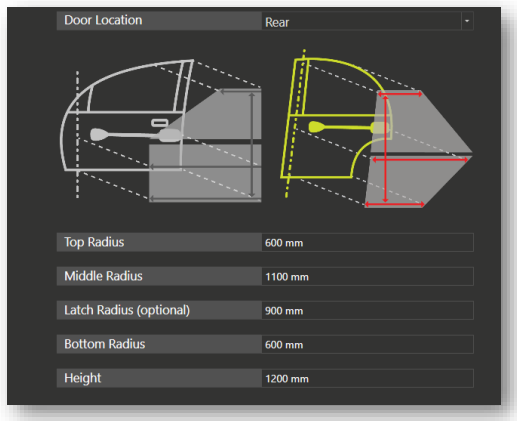
The door Geometry can be determined in two locations:

Per Sessions

Each individual session will require to enter the specific values in the boxes. This is preferable if all samples would have different values anyway. Example different doors.

As Profile

A profile can be generated for a particular door and the profile can be re-used on all sessions that are using this door. Guarantee that all sessions have identical settings for Geometry.



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B. Expectation and Optimization

4. Metrics

A number of metrics might be constant for all samples. Especially when measuring the same type of vehicle multiple times.

As Profile

Open Angle:

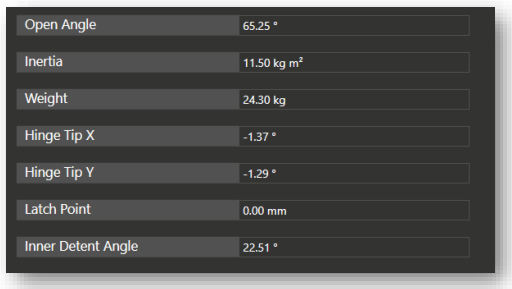
Inertia, Weight: often constant for a model, maybe worth investigating if different packages influence the outcome.

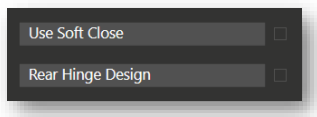
Hinge Tip: If all measurements are performed on the same body, the hinge will not be modified. Between identical models but different serial, this may vary. In that case leave the value at '0'.

Latch Point: Only of seals and latch are untouched during the course of the test plan.

Inner Detent Angle: Contact Check.

Note that certain special use cases might have to be activated via a door profile.





B. Expectation and Optimization

5. Conventions

Are the standard conventions in line with my sample choice and expectations.

Measured vs Calculated Minimum

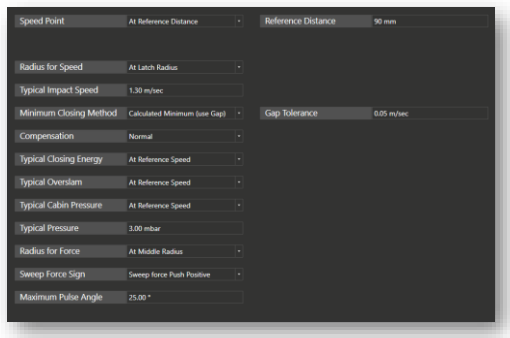
Are the door system in a normal operating condition where the minimum closing calculation will be valid?

Typical Speed

Define a reference speed that is in the expected speed range.

Compensation

It might be interesting to active a compensation or not. Is it a relative comparison or an absolute?



B. Expectation and Optimization

6. Import Runs / Profile

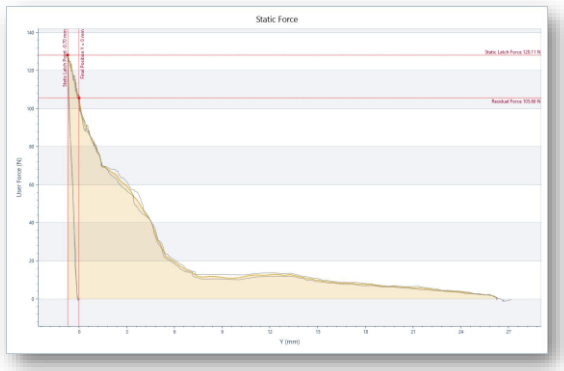
Are there any runs that would not change during all sample collections. This applies often only when the same vehicle is used for different evaluations

As Profile (skip runs)

If values are entered via profile, the numerical outcome will be updated but some graphs might not be populated.

Merge

This method will copy all shared runs between the session, showing each session as a complete acquisition with all metrics and subgraphs.



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B. Expectation and Optimization

7. Runs Type

The following runs need to be recorded in the following cases:

Slams

Almost always required to test. Only for a partial compression breakdown where a sequence of push test can provide the answer.

Wiggle

Only when the weight/inertia will change. The wiggle test can also be replaced by using a profile and entering geometry, inertia and, optionally, weight.

Sweep

Only when a modification is expected at the level of hinge or door check.

Push

Only when a modification is expected at the seal, seal gap or latch.

Plop

Only when a modification is expected at the seal, seal gap or latch.

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C. Acquisition

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C. Acquisition
1. Sample Preparation

Unless the topics are part of the study, we recommend to observe:

Temperature

Unless the temperature is part of the study make sure the vehicles are soaked in the applicable temperature.

Location

Make sure the vehicles are in the similar location and same level.

Vehicle Setup

Understand the re-circ/evac system, settings.

Green seals

Seals evolve quickly in the first day(s). For longer term testing make sure seals are set and past accommodation period.

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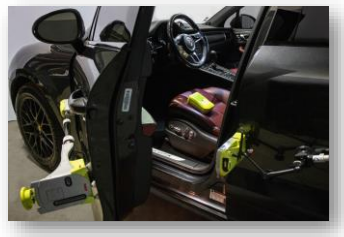
C. Acquisition

2. Data Acquisition

Follow the standard acquisition instruction and methods for EZSlam.



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C. Acquisition

3. Data Validation

When a session is near completion, it is recommended to review the outcome prior of moving onto the next session.

Red Flags

There should not be any red flags in the table. This indicates an important uncertainty. It is worth the reflection on why it is flagged, and if it can be corrected.

Yellow Flags

This needs attention, when the value is in the lower half (<7%) it might just be door variation, above 8% should be investigated and additional data might be helpful in determining the optimal value.

Green Flags

No Problem!

Accept

Indicate the completion of the reflection. The button 'accept runs' will clear the question mark, indicating it has been validated as correct.

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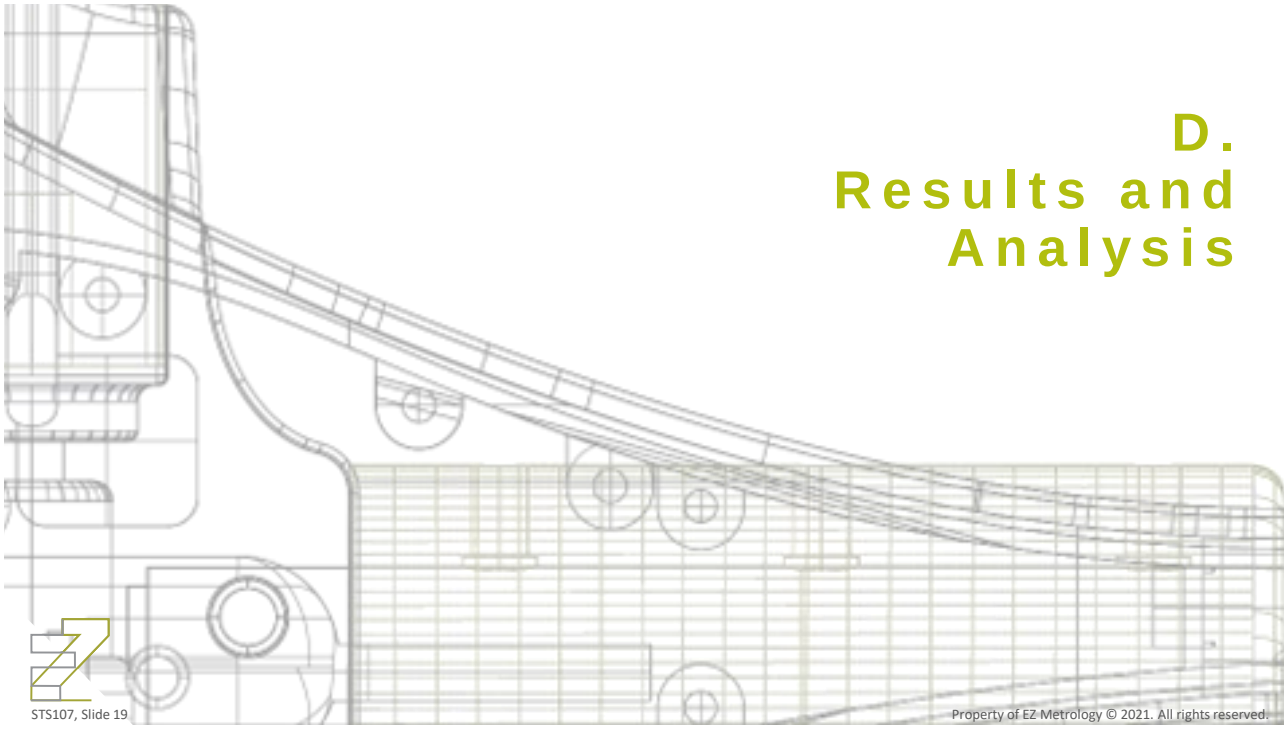

D. Results and Analysis

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D. Results and Analysis

1. Wealth of Data

Upon completion of the acquisition, the task remains ahead to compile or analyze the data.

Graphical Review

The comparison function in the software will allow to overlay all data on top of each other in the familiar graphs.

This helps to establish an overview and identify any outliers.

If there are too many sessions, the comparison however becomes slightly overcrowded.

Numerical Review

As a second step or in case of a significant number of samples, numerical review is the optimal choice.

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D. Results and Analysis

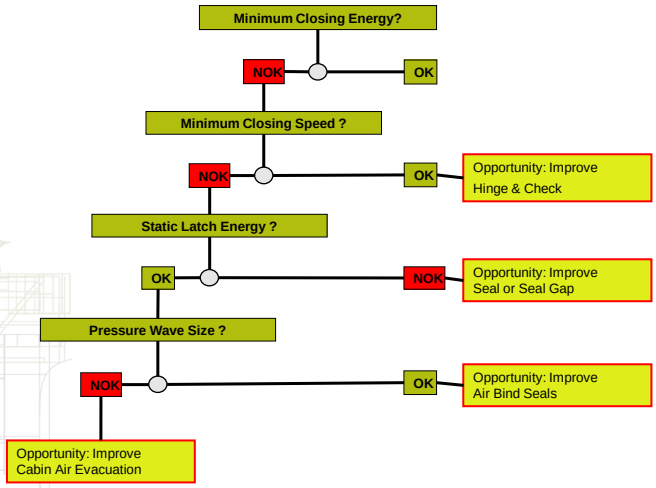
2. Systematic Analysis

To simplify analysis, differences and characteristics are evaluated in the sequence they would occur during a closing process.

Each consecutive event is associated with a specific metric and can therefore be compared or evaluated between all test doors.

In case of a difference is observed in the specific set of metrics, the component in question can be identified as being different.

The difference can be caused by a design choice, assembly tolerance, dynamic effect, tolerance build up...



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D. Results and Analysis

3. Graph Export

As a first fast and easy way of reporting :

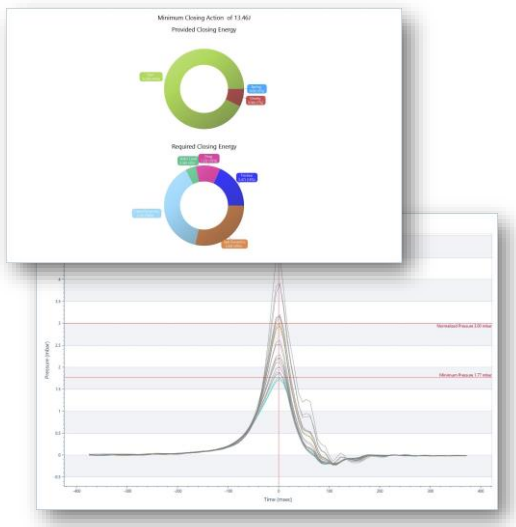
Graph

Copy and paste the graph in the desired PowerPoint or message.

Tables

Can also be exported as tables.

The limiting factor is that graphs are generated as images (so the numerical information is left behind.



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D. Results and Analysis

4. Quick Reports

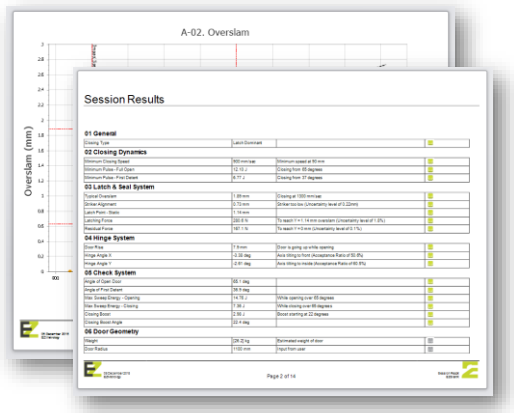
Both individual sessions and comparison have quick report functions.

Advantage

Pre-formatted and includes all graphs from the current view settings.

Downside

As the graphs are represented as pictures, they cannot be zoomed, rescaled.



D. Results and Analysis

5. Excel Reports

The export of the session to excel can bring the data in an easy to manipulate work environment:

Raw data

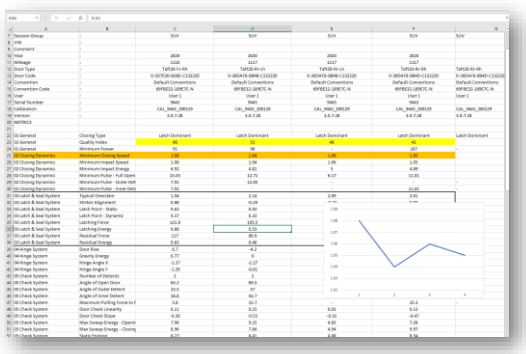
Any recording can output the raw data of the recording. This is mostly for research purposes.

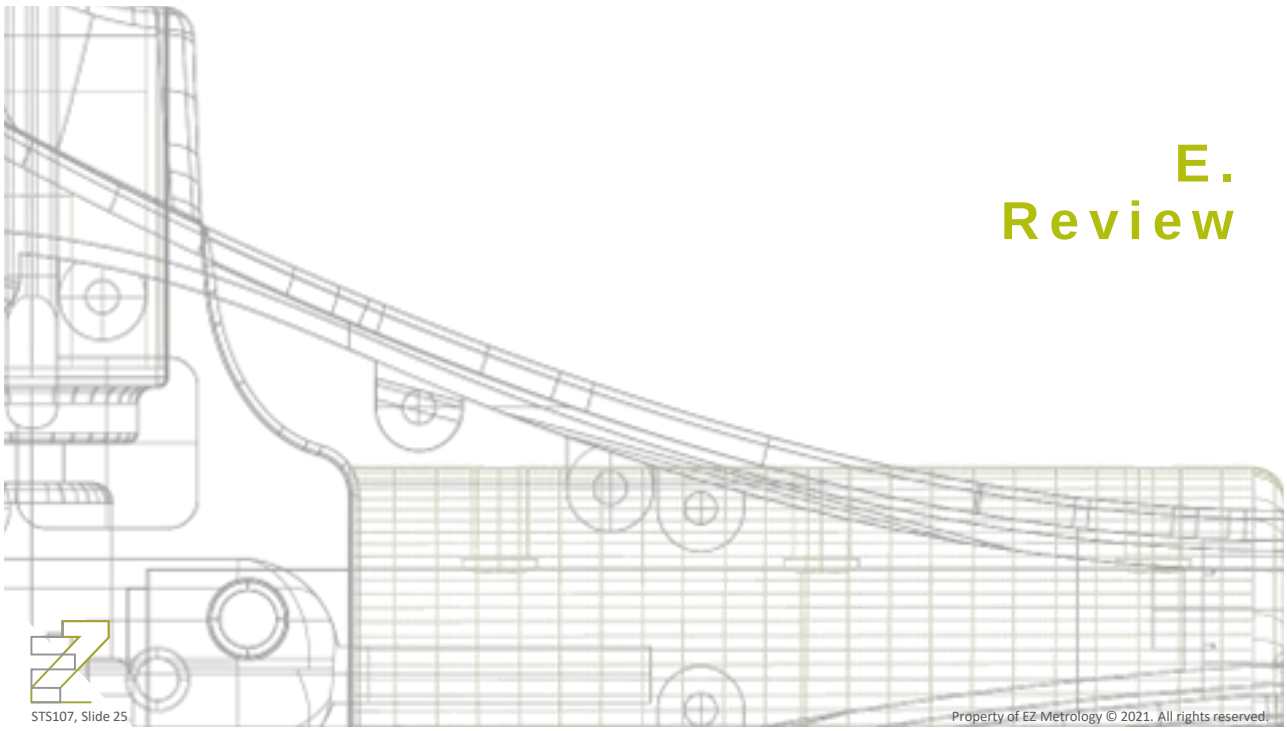
Session

Each session can be saved as an Excel file, with or without the graphical information.

Multi-Session

When the study requires multiple session to be compared, they can be exported in one function and provide an easy-to-read side-by-side overview of all values and graphs.





E. Review

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E. Review

1. Topics Discussed

You should be able to

- Establish a strategy.
- Define what parameters you can put into a profile.
- Define what runs can be shared or imported between sessions.
- Create adapted reports based on the objectives.

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