



## AUTOMOTIVE VALIDATION

### TESTING ELECTRIC POWERTRAIN

#### What is PISTE 2 E ?

**PISTE2E** is a validation method for quality monitoring, anticipative customer satisfaction, functionality & reliability focussed on electrical vehicles.

#### EUROPE

**40.000 km Spain** – hot, mountain

**25.000 km Germany** – city, high way

**25.000 km Slovakia** – severe hesitations

**10.000 km Sweden** – cold, high humidity

#### 2E Stress conditions adapted to electric vehicle

- **10% trailer towing** in each country
- **Stop & go** city driving
- **Special mountain routes**



**New technology needs new testing methods**, by using PISTE 2 E tool thanks to :

- Anticipated complete vehicle results
- European average
  - ⇒ **increased efficiency**
  - ⇒ **reduced costs**
  - ⇒ **increased customer satisfaction**

**Project management** by experienced engineers.

Mix of **professional drivers** representing European average : 30% female, age distribution.

Daily safety check & visual inspection, driving pre-defined routes & filling out logbook with comments & complaints.

**Country & road distributions** defined using number of vehicle registrations and road stress and scale factors for each area.

**Subjective evaluations** of powertrain & total vehicle brakes, chassis, according to Subjective Evaluation Index.

**Test run control**  
**100% by GPS**

## MODUS "PISTE 2 E"

#### What do we measure ?

measurements & engineering analysis:

#### Specific electric measurements:

- Electrical current
- Battery voltage
- Battery charge status
- Battery density
- Temperatures (motor, battery)
- Motor revolution
- Brake events : frequency & duration

#### Standard measurements & tests:

- Suspension alignment & body level
- Tyre wear & expected lifetime
- Brake wear, runout & expected lifetime
- Dust penetration
- Stone chipping impacts
- Interior noise
- Tightening torque of bolts
- Climate data
- GPS data & brake events at 1 Hz
- Dealer service evaluation

#### Special tests:

- Mountain & highway brake test
- Slalom & lane change
- Acceleration & max. speed
- Power & emissions
- TÜV general inspections

## What do we report ?

**Daily reporting** in case of urgent issues or break-down.

**Weekly report** using FTP server:

- Daily shift data : driven routes & mileage
- Detailed description of new complaints illustrated with pictures & measurement data

**Final report & presentation of results**

at end of test:

- Conclusion
- Main complaints & strong points
- List of all complaints
- List of disassembled parts
- Subjective evaluation results
- All measurement results
- All special test results
- Product improvement recommendations

## Driving conditions

Driving conditions are specially adapted to electric vehicle durability testing :

- **10% trailer towing** for increased driving with high load
- **Stop & go** city driving, with controlled amount of brake events
- **Mountain driving** in southern Spain on mountain roads up to 2000 m all year round available
  - Uphill : severe high load driving**
  - Downhill : regenerative braking**

