ETRTO®
European Tyre & Rim Technical Organisation

In coordination with

ETRMA
EUROPEAN TYRE & RUBBER manufacturers' association

# Tyre abrasion testing
## Regulatory advances

# Background

**EURO 7**

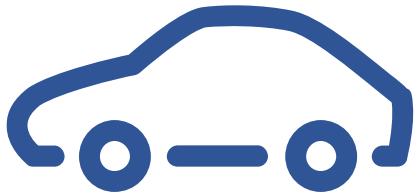
Tyre Abrasion Rate timeline requirements

UNECE

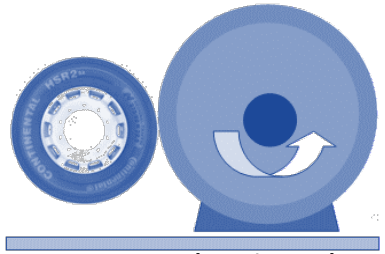
Test methods description
Threshold definition

## Two test methods initiated by UNECE GRBP Task Force Tyre Abrasion

**Cochairs**: European Commission & UK
**Technical Secretary**: ETRTO



Vehicle (outdoor)



Drum (indoor)

# Background

- **European Tyre Industry committed to contribute to the development of a standard Tyre Abrasion Rate test method, for C1, C2 and C3 tyres within UNECE GRBP to respect EURO 7 timeline**
- Reliable, reproducible and representative test methods are the foundation of any meaningful regulatory initiative

| | UNECE GRBP | | EURO 7 Implementation | |
|---|---|---|---|---|
| | Test method Working Document adoption | Threshold Working Document adoption | New Type Approvals | All tyres placed on the market |
| C1 | February 2024 | February 2026 | July 2028 | July 2030 |
| | | | | |
| C2 | February 2026 | September 2027 | April 2030 | April 2032 |
| | | | | |
| C3 | February 2027 | September 2029 | April 2032 | April 2034 |

# Requirements on test method


- **Representative** of real driving environment in the European market
- **Repeatable**, **reproducible** and **reliable**
- **Cost efficient** and **practicable**
- **Open to anybody** worldwide

- Suitable for **regulatory purpose** (including market surveillance)

# Brief description and status


➔ ***C1 method description**: currently in UN Regulation No. 117 Annex 10 and ISO 18511-1*

- **Vehicle-based** method on **public roads**
- **Convoy** of up to 4 vehicles
- Versus **standard reference tyre**
- **Abrasion Rate** of all 4 tyres (C1 & C2) reported in **mg/km/ton**


- Activities started in 2018
- Market assessment of 177 tyres completed in Q1 2025 for threshold definition in UNECE GRBP

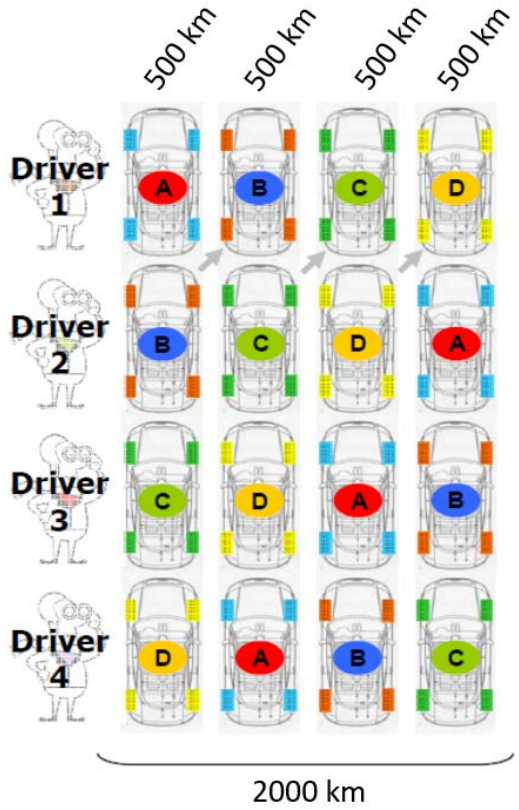

- Activities started in 2023
- Continuing validation testing in 2025


- Activities started in 2023
- Parameter studies starting in 2025

# Convoy method & reference tyre

**Convoy** idea to **minimize non-tyre influencing factors**:

- The same predefined route
- The same traffic/road conditions
- The same weather conditions
- The same speed and accelerations (long/lat), because :
  - Driving in convoy
  - Vehicles are exchanging positions in the convoy each shift
  - Vehicles and drivers are rotating each shift

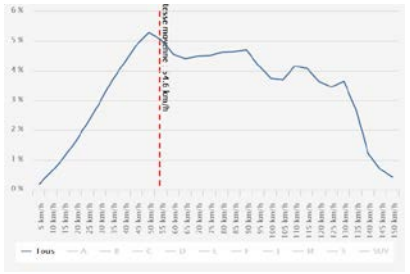



➔The usage of **reference tyre** allows to compensate the effect of “external” influencing factors

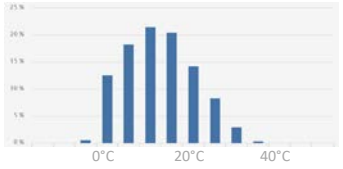
# What is the representative usage?

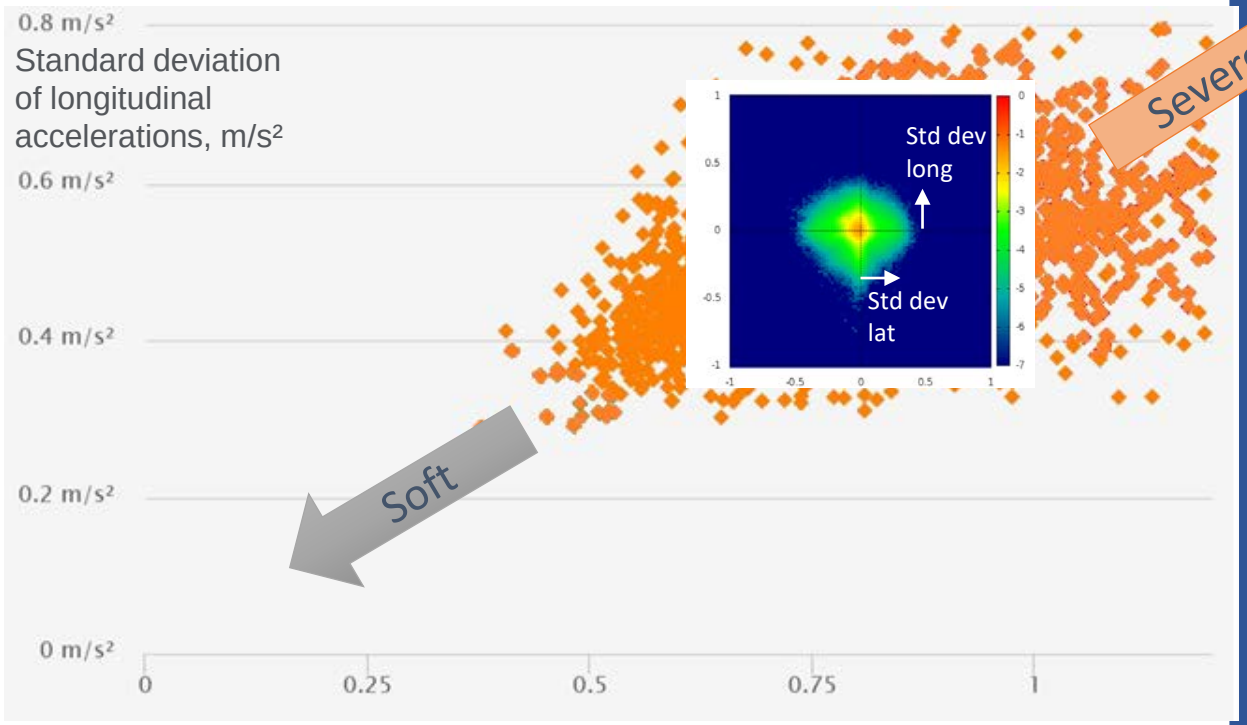
- Collecting European **vehicle usage tracking database** from Tyre Manufacturers
  - Most covered countries are F+E+I+D+GB+S
  - 3555 vehicles, all passenger car market segments
  - Since 2015, 15 Millions of trips
  - 150 Millions of kilometers

- **Driving Style** Statistics
  - Speed
  - Accelerations



- **Weather Statistics**
  - Temperatures & Wetness
    (77 % dry, 15.8% wet)




Standard deviation of lateral accelerations, m/s²

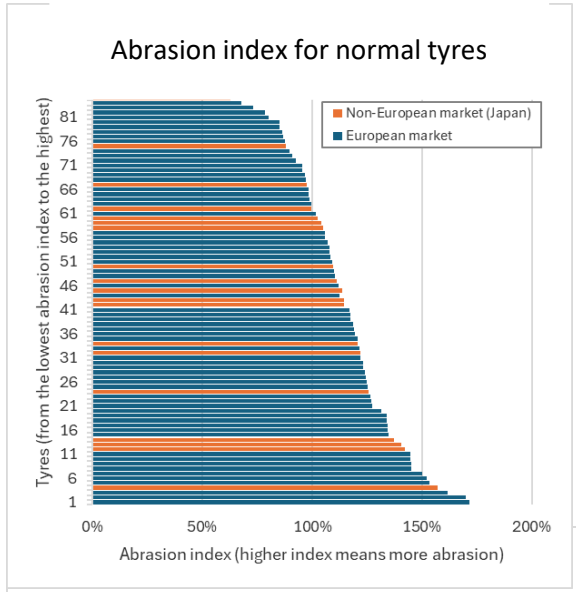
# C1: Market Assessment : Objective and scope

- **Objective** : support the determination of the regulatory tyre abrasion threshold
- **13 tyre sizes** defined for testing on convoy : 177 tyres in total
  - Normal tyres Panel: 110 SKUs tested
  - 3PMSF tyres Panel : 67 SKUs tested

# C1: Market Assessment : results

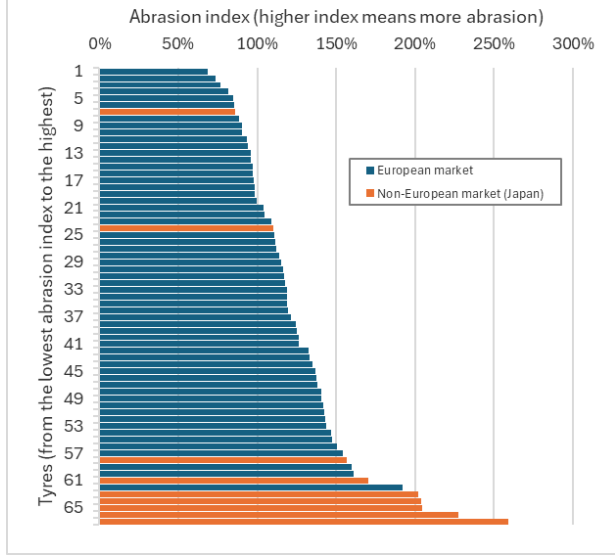
## Normal tyres

- MAX/MIN in “abrasion index “ = **3.7**
  - (best = 46%, worst = 171%)
- No statistical difference between the observed different UN markets (EU market and non-EU market (Japan))




## 3PMSF

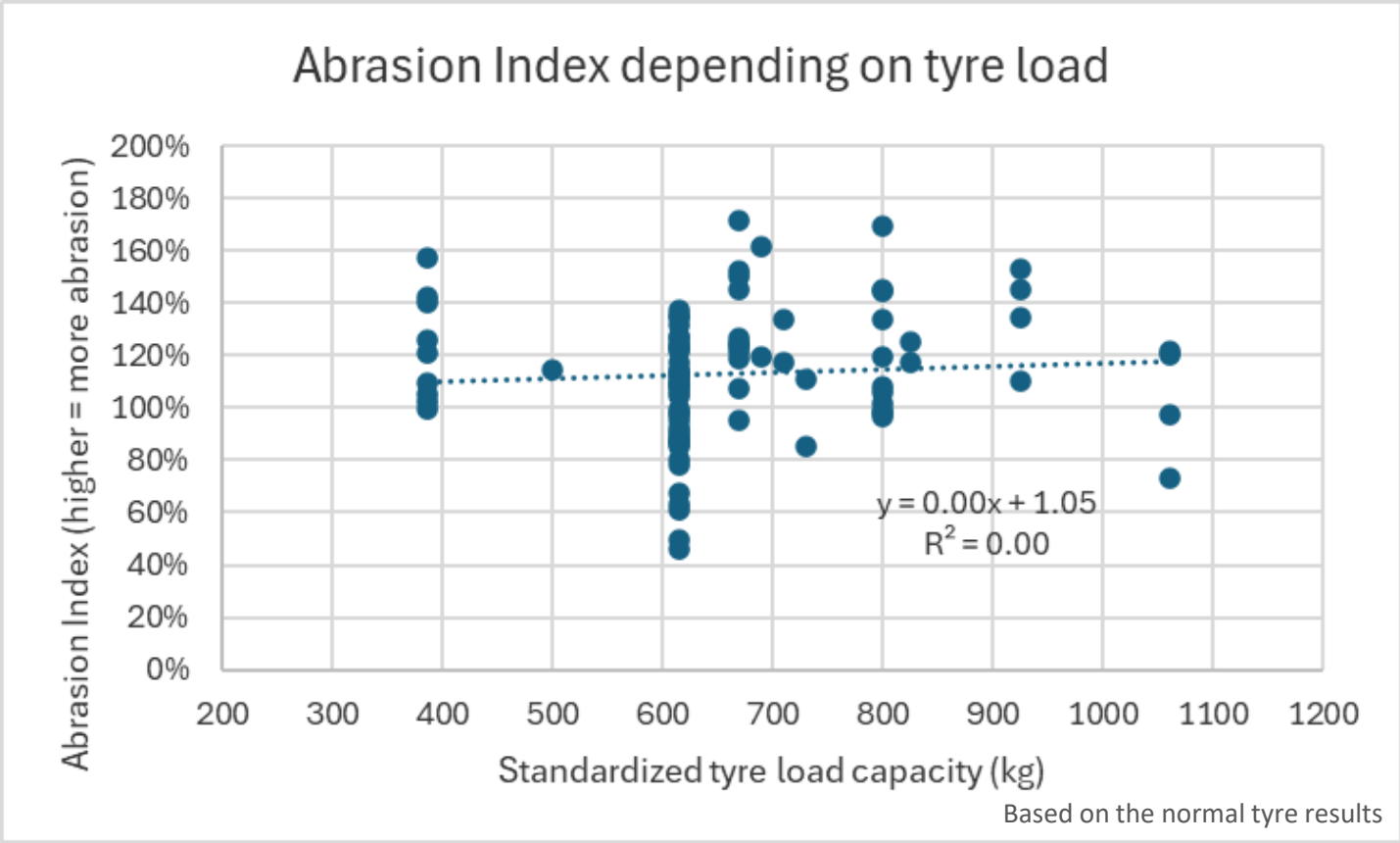
- MAX/MIN in “abrasion index “ = **3.8**
  - (best = 69%, worst = 259%)




$$\text{Abrasion Index (AI)} = \frac{\text{Abrasion rate candidate tyre}}{\text{Abrasion rate reference tyre}}$$

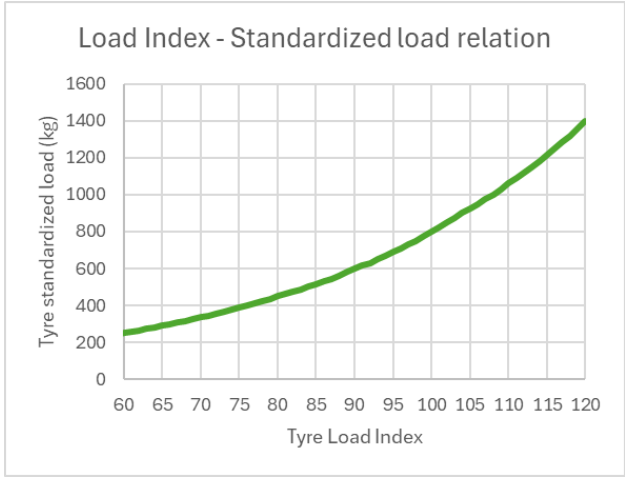
**GRBP TFTA is finalising the C1 tyre abrasion threshold determination**

# C1: Assessment over tyre load index




Based on the normal tyre results

- Load Index have no impact on Abrasion index
- Load Normalization approach is effective



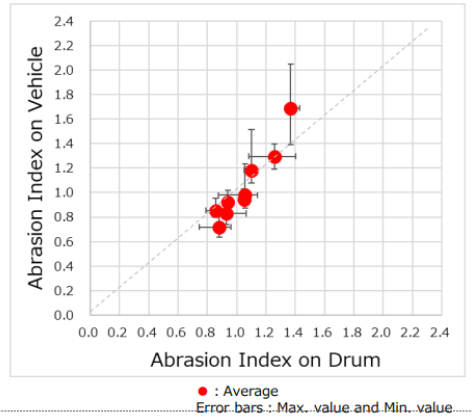
VEHICLE METHOD

DRUM METHOD

# C1: Comparison of test methods

## Two test methods initiated by UNECE GRBP Task Force Tyre Abrasion

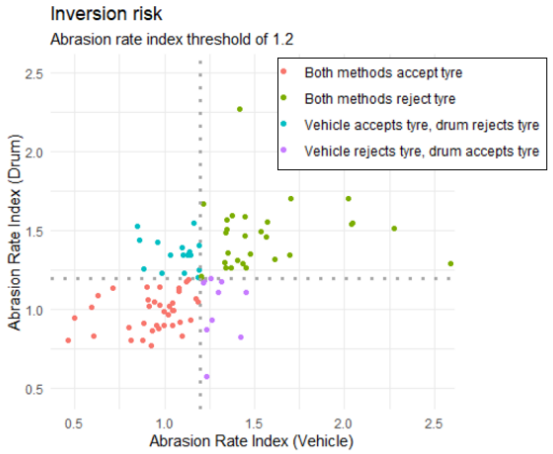
**Testing methods – correlation study**




- Correlation $R^2 = 0.91$
- Variation

| | Vehicle | Drum |
|---|---|---|
| Standard deviation | 0.12 | 0.08 |
| Coefficient of Variation | 11% | 8% |

**Testing methods – market assessment data**

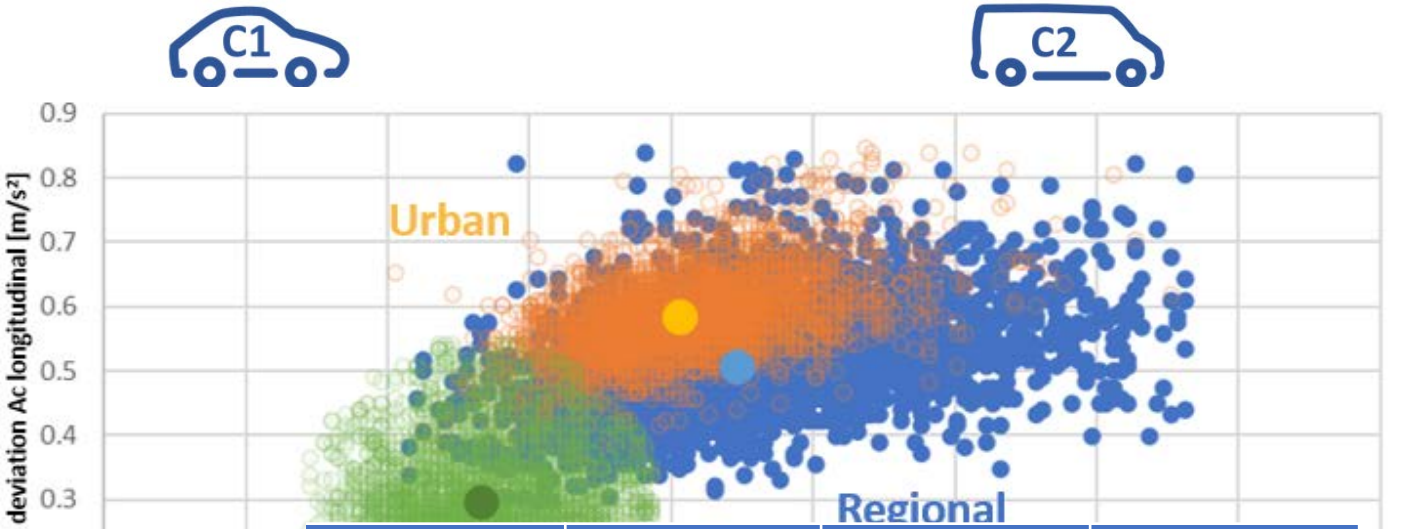



- **The Market Assessment data (right figure, 100 tyre models) showed a poor correlation while the dedicated correlation study (left figure, 9 tyre models, 4 repetitions) indicated a good correlation between the 2 methods**

- **Study is ongoing in UNECE GRBP TF TA to further assess the available data**

# C2: Representativeness of vehicle test method


- **Vehicle-based** test method based on real driving behavior
- Input: real world acceleration driving profiles




| | avg std dev Acc. long | avg std dev Acc. Lat. | # Vehicles tracked | tracked mileage |
|---|---|---|---|---|
| C1 | **100%** | **100%** | 15 547 | 233 Mio km |
| C2 | **98%** | **94%** | 4 384 | 119 Mio km |

- Similar average driving profiles C1 and C2

➔**Same route layout for C1 and C2 appears applicable**

- First tests in 2024
- Reference tyre and method definition in 2025
- Aim is GRBP Working document February 2026

# Conclusion


- **The on-road vehicle approaches are representative** of the usage (C1, C2 and C3).
- **Market assessment** tests C1 are **representative** for threshold setting.
- Introduced improvements for reducing **Test uncertainty** C1 on-road vehicle test under analysis.
- Further **C2** and **C3** tyre Abrasion Rate method development ongoing to ensure high representativeness and lowest possible test dispersion.

# Thanks

More details on ETRTO's test method development and additional information could be found on the UN GRBP Task Force Tyre Abrasion (TF TA) website:

https://wiki.unece.org/pages/viewpage.action?pageId=160694352