# Certificate

Validation of mobile measuring equipment for performance assessment of road markings

**Validation date:** 2026-04-16

**Company:** Reflective Measurement Systems **Contact person:** Joe Turley

**Instrument:** RetroTek-D/QD, ID 3013/Q10100 **Phone, contact person:** +353-872 555 376

Validation has been carried out according to *Mobil kontroll av vägmarkering, TDOK 2013:0461, Version 2.0 2017-02-14 (*published by *The Swedish Transport Administration)* with the addition of examination of measurement data from regular assessment surveys. The performance requirements can be found in Annex 1. The results are given by the table below:

| **Part 1: Accuracy and precision** | |
|---|---|
| Coefficient of retroreflected luminance, dry, $RI_{dry}$: | ☒ Passed ☐ Not passed ☐ Not tested |
| *The accuracy is 9.1 % and the precision is 1.4 %. The instrument meets the requirements, after revision.* | |
| Coefficient of retroreflected luminance, wet, $RI_{wet}$: | ☐ Passed ☐ Not passed ☒ Not tested |
| *The accuracy is - % and the precision is - %. The instrument was not validated for this parameter.* | |
| Luminance coefficient under diffuse illumination, *Qd*: | ☒ Passed ☐ Not passed ☐ Not tested |
| *The accuracy is 6.4 % and the precision is 1.1 %. The instrument meets the requirements, after revision.* | |
| Skid resistance, $\mu_{PFT}$: | ☐ Passed ☐ Not passed ☒ Not tested |
| *The accuracy is - % and the precision is - %. The instrument was not validated for this parameter.* | |
| **Part 2: Examination of measurement data from regular assessment surveys** | |
| Examination of measurement data: | ☒ Passed ☐ Not passed ☐ Not tested |
| *Measurement data are approved, after revision.* | |

Test result details are presented on the following pages.

The certificate was issued on 2026-05-20 by:

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# Part 1: Accuracy and precision

**Notes and faults for part 1:**

$RI_{dry}$: Systematic deviations compared to the reference instrument.

*Qd*: Systematic deviations compared to the reference instrument.

Corrective action: The data processing algorithms were updated to match the measurement methods of the reference instrument.

Data for part 1 was submitted 3 hours late.

Measurement results are presented in the following pages.

# Part 2: Examination of measurement data from regular assessment surveys

**Notes and faults for part 2:**

$RI_{dry}$: Systematic deviations compared to other mobile instruments.

*Qd*: Systematic deviations compared to other mobile instruments.

Corrective action: The data processing algorithms were updated, see above.

# Coefficient of retroreflected luminance of dry road markings

**Requirements:** The accuracy, i.e. the average absolute deviation between the measurement result obtained with the reference instrument and the measurement result obtained from the first measurement with the mobile equipment shall be ≤ 15.0%. The precision, i.e. the average deviation between two repeated measurements shall be ≤ 5.0 %.

**Result:** The accuracy is 9.1% and the precision is 1.4%. The instrument meets the requirements, after revision.

Measurement data, accuracy and precision per object are presented in the table below.

| Object | $R_{\text{L-dry-mobile}}$, 1 | $R_{\text{L-dry-mobile}}$, 2 | $R_{\text{L-dry-ref.}}$ | Accuracy (%) | Precision (%) |
|---|---|---|---|---|---|
| 1 | 130 | 132 | 139 | 6.4 | 1.7 |
| 2 | 200 | 199 | 233 | 14.2 | 0.6 |
| 7 | 113 | 115 | 165 | 31.7 | 2.4 |
| 8 | 156 | 154 | 154 | 1.8 | 1.5 |
| 9 | 148 | 148 | 193 | 23.0 | 0.1 |
| 10 | 207 | 212 | 200 | 3.6 | 2.2 |
| 11 | 235 | 239 | 237 | 0.7 | 1.8 |
| 12 | 252 | 250 | 254 | 0.8 | 0.7 |
| 14 | 217 | 220 | 227 | 4.4 | 1.0 |
| 20 | 297 | 303 | 309 | 3.9 | 1.9 |
| *Average* | | | | *9.1* | *1.4* |

# Luminance coefficient under diffuse illumination of dry road markings

**Requirements:** The accuracy, i.e. the average absolute deviation between the measurement result obtained with the reference instrument and the measurement result obtained from the first measurement with the mobile equipment shall be ≤ 15.0%. The precision, i.e. the average deviation between two repeated measurements shall be ≤ 5.0 %.

**Result:** The accuracy is 6.4% and the precision is 1.1%. The instrument meets the requirements, after revision.

Measurement data, accuracy and precision per object are presented in the table below.

| Object | $Qd_{\text{mobile}}$, 1 | $Qd_{\text{mobile}}$, 2 | $Qd_{\text{ref.}}$ | Accuracy (%) | Precision (%) |
|---|---|---|---|---|---|
| 1 | 150 | 150 | 148 | 1.3 | 0.1 |
| 2 | 167 | 168 | 193 | 13.5 | 0.4 |
| 7 | 134 | 133 | 130 | 2.9 | 0.6 |
| 8 | 150 | 152 | 153 | 2.0 | 1.5 |
| 9 | 126 | 122 | 134 | 5.6 | 3.3 |
| 10 | 129 | 131 | 149 | 13.6 | 1.7 |
| 11 | 167 | 168 | 176 | 4.8 | 0.6 |
| 12 | 156 | 153 | 167 | 6.8 | 1.4 |
| 14 | 128 | 129 | 139 | 8.1 | 0.9 |
| 20 | 177 | 179 | 187 | 5.5 | 0.7 |
| *Average* | | | | *6.4* | *1.1* |

# Annex 1: About the validation

The validation of mobile measuring equipment for performance assessment road markings is carried out annually by VTI on behalf of the Swedish Transport Administration. The validation consists of two parts:

- Part 1: Examination of *accuracy*, i.e. agreement with a reference instrument, and *precision*, i.e. agreement between repeated measurements. For each parameter to be tested, measurements are carried out on 10 road marking objects with a length of 100 m. The test is conducted according to the method described in Appendix 1 of *Mobile Control of Road Markings*, TDOK 2013:0461, Version 2.0, 2017-02-14, but with requirement levels as stated below.
- Part 2: Review of measurement data from a regular assessment survey. The test includes measurements on 2–3 road marking objects with lengths of 2–5 km. Measurement data is processed and reported in the same way as in a regular assessment survey. Part 2 usually includes a review of both measurement data and report content, but during the 2026 validation a new joint report template was tested, where the main purpose was to gather input for continued development work. Therefore, in 2026 the assessment of Part 2 consisted solely of a review of the measurement data.

This certificate presents the results for a specific instrument, specified by manufacturer and ID number on page 1 as well as in the header on the other pages. The certificate shows whether the tested instrument met the requirements at the specific validation occasion. The certificate does not constitute a type approval or equivalent.

## Requirement levels for accuracy and precision

The requirement levels applied for accuracy and precision are given in the table below. These requirements imply a deviation from the current version of the method statement TDOK 2013:0461 (ver 2017), as decided by the Swedish Transport Administration. The same requirements have been applied since 2019.

| **Parameter** | **Requirements** | | | | | |
|---|---|---|---|---|---|---|
| | **Accuracy** | | | **Precision** | | |
| | Approved | Action required | Not approved | Approved | Action required | Not approved |
| $R_{L\text{-}dry}$ | ≤ 15.0 % | > 15.0 %<br>≤ 20.0 % | > 20.0 % | ≤ 5.0% | > 5.0 %<br>≤ 8.0 % | > 8.0 % |
| $R_{L\text{-}wet}$ | ≤ 30.0 % | > 30.0 %<br>≤ 40.0 % | > 40.0 % | ≤ 5.0% | > 5.0 %<br>≤ 8.0 % | > 8.0 % |
| *Qd* | ≤ 15.0 % | > 15.0 %<br>≤ 20.0 % | > 20.0 % | ≤ 5.0% | > 5.0 %<br>≤ 8.0 % | > 8.0 % |
| Skid resistance | ≤ 15.0 % | > 15.0 %<br>≤ 20.0 % | > 20.0 % | ≤ 5.0% | > 5.0 %<br>≤ 8.0 % | > 8.0 % |

Action required: Some action is required to be able to pass the test. Re-validation is not required.

Not approved: Re-validation is required.

The requirements above relate to results after rounding to 1 decimal.

$RI_{wet}$ and skid resistance cannot be approved if $RI_{dry}$ is not approved

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Carina Fors Rosdahl: Senior Researcher 2026-05-20

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