

SOFTENING POINT – RING AND BALL

EN 1427: Bitumen and bituminous binders – Determination of the Softening Point – Ring and Ball Method

Overview

The test results are used to determine the consistency of bitumen and bituminous binders at elevated service temperatures under defined conditions of heating.

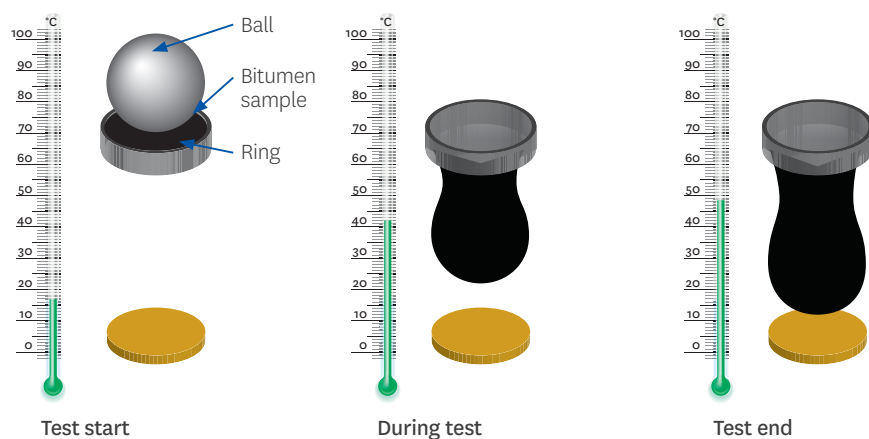
The test is usually applied to bituminous binders with softening points ring and ball between 28 °C and 150 °C.

Softening Point Ring and Ball is the second oldest test method applied to bitumen, after needle penetration. It is the temperature at which a bitumen sample in a ring has had a deformation of $25 \pm 0,4$ mm by a ball while heated.

Definition and Terminology

Softening Point Ring and Ball: Temperature at which bitumen and bituminous binders attains a specific consistency under standardised test conditions.

Softening Point Ring and Ball is the arithmetic mean of the results of two samples tested in parallel.



At the time of publication of this document, EN 1427:2015 'Bitumen and bituminous binders – Determination of Softening Point – Ring and Ball Method' was the reference for testing. This document does not overrule the test standard EN 1427, but is intended to help users of the standard to be aware of the important factors. However, the reference for testing remains EN 1427. Temperatures, times, and dimensions and their tolerances must be strictly observed, that is checked for accuracy and for maintaining the tolerance during application. From experience, tests should preferably be carried out by laboratory technicians trained in the individual procedures to be applied.

Practical Information:

The behaviour of bitumen is highly temperature-dependent, therefore precise temperature control of the bitumen sample and the stability of the heating rate are critical.

- Only test conditions, e.g. heating rates, which are exactly met result in comparable and reliable test results.
- The heating rate is described in Annex B of EN 1427.
- The temperature measuring device should be regularly verified and/or calibrated.
- The accuracy of the heating rate must be checked at regular intervals and, if necessary, adjusted.
- Some devices can record all data during testing, this enables the operator to check the heating rate every time and/or after every test.
- Water is used for expected softening points below 80 °C, and glycerol for those above 80 °C.
- Softening points tested in glycerol are in approximately 4°C higher than those when in water, which leads to ambiguities around 80°C.

The bitumen sample must adhere securely and completely within the rings.

- The sample must be poured into pre-heated rings, see section 7 of EN 1427.
- The rings must be clean, free of rust and, in particular, free of release agent.
- Rings are placed on pouring plates when preparing the samples; grease or release agents to cover the pouring plates should be used sparingly.
- Tests where the binder does not adhere to the ring before the test is completed must be discarded.

The sample needs to be prepared for testing.

- The sample preparation is described in EN 12594 and section 7 of EN 1427.
- While the ring must be heated before pouring, the pouring plate should not be.
- Trimming of the sample should be done carefully, to achieve an even sample surface, and thus sample thickness.
- Do not remove the filled rings from the pouring plate when trimming.
- Trimmed rings should not be further stored before testing, see section 7 of EN 1427; practical experience recommends not to remove the trimmed rings too quickly from the pouring plate in order to avoid deformation.
- Practical experience recommends being prepared for repeated testing by pouring four rings for both modified and unmodified binders.

The test results need to be calculated as arithmetic mean from two valid test data.

- Tests where the binder film breaks around the ball or does not adhere to the ring before the test is completed must be discarded.
- For softening points > 80 °C determined in a water bath: reject the result as invalid and repeat the determination in a glycerol bath.
- For softening points ≤ 84 °C determined in a glycerol bath, repeat the determination in a water bath. If the result determined in a water bath is 80 °C or lower, report this result, otherwise report the result obtained in the glycerol bath.
- Softening points ≤ 80 °C: two test data are valid if the difference between two tested rings does not exceed 1 °C.
- Softening points > 80 °C and for modified bitumen: two test data are valid if the difference between two tested rings does not exceed 2 °C.
- If the conditions above are not met, the test has to be repeated, see sections 8.8 and 9 of EN 1427.

Expression of results.

- For softening point results between 28 °C and 80 °C: calculate the arithmetic mean of the results of the two rings tested in parallel to the nearest 0,2 °C.
- For softening point results > 80 °C: calculate the arithmetic mean to nearest 0,5 °C.

