# India E20 fuel status and way forward

Bosch Ltd, India | 29.07.2024

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# India E20 fuel
## Agenda

1. Fuel specification comparison
2. Bosch communication to BIS
3. IS 17021 : 2018 Fuel dip stick market survey
4. Impact on components

# India E20 fuel

## Fuel specification comparison

- E100 IS 15464 : 2022 (Anhydrous ethanol used for blending with Gasoline)

| | | 1G | 2G | |
|---|---|---|---|---|
| xiv) | Inorganic chloride, mg/kg, *Max.* | – | 3.0 | ASTM D7319[3)]/EN 15492 |
| xv) | Sulfur content, mg/kg, *Max.* | 10 | 10 | (Part 180) /(Part 160) ASTM D7039/EN 15485/ EN 15486/ASTM D 5453[3)] |
| xvi) | Sulphate content, mg/kg *Max.* | – | 4 | ASTM D7318[3)]/D7319/ D7328/EN 15492 |
| xvii) | Water content, percent *v/v*, *Max.* | To Report (Note 2) | 0.3 | ASTM D7923[3)]/ASTM E1064 |

- E100 DIN EN 15376 : 2014 (Anhydrous ethanol used for blending with Gasoline)

| | | | | |
|---|---|---|---|---|
| Water content [d] | % (*m/m*) | | 0,300 | EN 15489<br>EN 15692 |
| Total acidity (expressed as acetic acid) | % (*m/m*) | | 0,007 | EN 15491 |
| Electrical conductivity [e] | µS/cm | | 2,5 | EN 15938 |
| Appearance | | clear and colourless | | EN 15769 |
| Inorganic chloride content | mg/kg | | 1,5 | EN 15492 |
| Sulfate content | mg/kg | | 3,0 | EN 15492 |

Note:
Values for Inorganic Chloride & Sulphate for E20 are mathematically derived from the Ethanol used as a blending component, when limit values for Inorg. Chloride, Sulphate are achieved in Anhydrous Ethanol, it becomes suitable when E20 is prepared.

Information already submitted by Bosch Ltd to BIS for 1G.
Request to extend the same for 2G also.

1. IS 15464 : 2022 Water content [0.3% (m/m)] being in line with DIN EN 15376 : 2014 standard for 2G, same to be considered for 1G.
2. Inorganic Chloride and Sulphate content is higher in IS 15464 : 2022 ; request to consider the limits in line with DIN EN 15376 : 2014 standard i.e. 1.5 mg/kg (inorganic chloride) and 3.0 mg/kg (Sulphate) for 1G and also for 2G of E100 IS 15464 : 2022.



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# India E20 fuel

Re sending as per direction from PCD 03 Technical Convenor: Meeting date 29-07-2024.

## Bosch requirements communicated to BIS directly (Jan 2022)

**FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS**

**(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clauses/sub-clauses/table/fig. etc be started on a fresh box. Information in Column 4 should include reasons for the comments and suggestions for modified wording of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work)**

**TITLE: IS 17021 | E20 Fuel – Admixture of Anhydrous Ethanol and Gasoline – As Fuel for Spark Ignited Engine powered vehicles - Specification**

LAST DATE OF COMMENTS: Jan 2022

NAME OF THE COMMENTATOR/ ORGANIZATION: BOSCH LIMITED

| Sl. No. | Clause/ Sub-clause/ para/ table/ fig. No. commented | Type of Comments (General/ Editorial/ Technical) | Proposed change | Justification |
|---|---|---|---|---|
| 1 | Table, Motor Gasoline BS VI grade | Water content, mg/kg, max | Max. value of 2000 to be included in the table. | This limit protects our products from corrosion & premature failure, Ref. DIN E20 proposal, dated Aug 2021 |
| | | | | |
| | | | | |
| | | | | Values for Inorganic Chloride & Sulphate for E20 are mathematically derived from the Ethanol used as a blending component |

E20 Water content : max. 2000 mg\kg

**FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS**

**(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clauses/sub-clauses/table/fig. etc be started on a fresh box. Information in Column 4 should include reasons for the comments and suggestions for modified wording of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work)**

**TITLE: IS 15464 | Anhydrous Ethanol Specification For use as a blending component in Motor Gasoline, 1G**

LAST DATE OF COMMENTS: Jan 2022

NAME OF THE COMMENTATOR/ ORGANIZATION: BOSCH LIMITED

| Sl. No. | Clause/ Sub-clause/ para/ table/ fig. No. commented | Type of Comments (General/ Editorial/ Technical) | Proposed change | Justification |
|---|---|---|---|---|
| 1 | Table, 1G | Water content, m/m, max | Max. value of 0.3 to be included in the table ( max 3000 mg/kg ) | This limit protects our products from corrosion & premature failure, Ref. EN 15376 |
| | Table, 1G | Inorganic Chloride, mg/kg max | Max. value of 1.5 to be included in the table | Today the max volumes of Ethanol are 1G, higher Chlorides adversely affect our components, eg. Corrosion, Ref. EN 15376, when it is blended for the preparation of E20 |
| | Table, 1G | Sulphate, mg/kg max | Max. value of 3.0 to be included in the table | This limit protects our products from deposit formation & premature component failure, Ref. EN 15376, when used to prepare E20 |
| | | | | Note : Values for Inorganic Chloride & Sulphate for E20 are mathematically derived from the Ethanol used as a blending component, when limit values for Inorg. Chloride, Sulphate are achieved in Anhydrous Ethanol, it becomes suitable when E20 is prepared. |

E100 Chloride content : max. 1.5 mg\kg, Sulphate content : max. 3.0 mg/kg

# India E20 fuel

Jul 2024 (as per PCD 03 directive from the meeting dtd. 29-07-2024)

## Bosch requirements communication for 2G inline with 1G to BIS (Jul 2024)

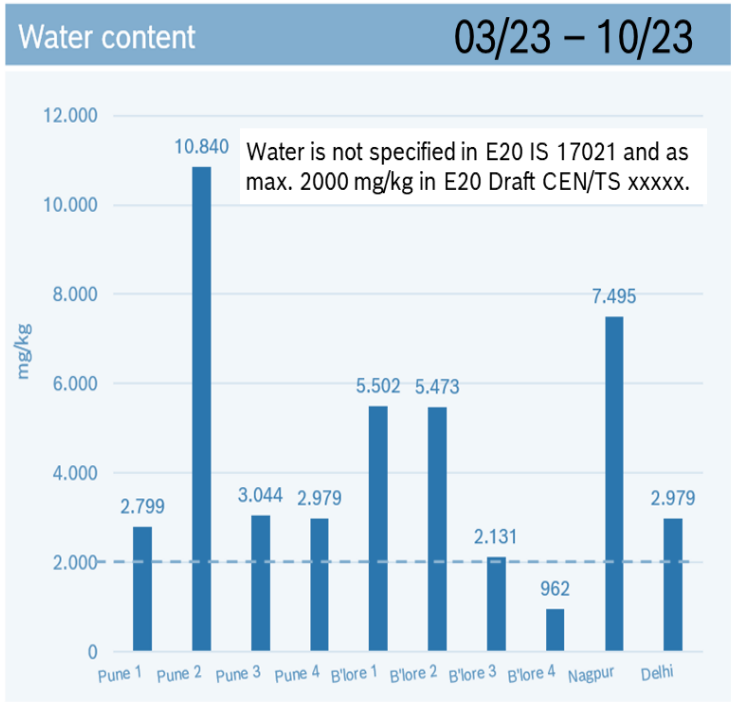
Title: IS 15464 : 2022 | Anhydrous Ethanol Specification for use as a Blending Component in Motor Gasoline - Specification, 2G/OGF

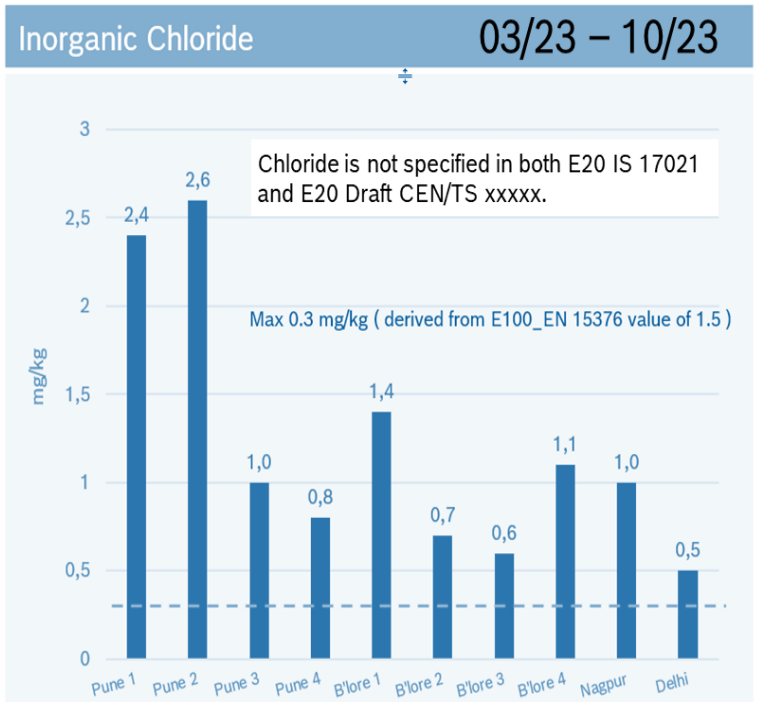
| Sl. No. | Clause/ Sub-clause/ para/ table/ fig. No. commented | Type of Comments (General/ Editorial/ Technical) | Proposed change | Justification |
|---|---|---|---|---|
| 1 | Table, 2G | Inorganic Chloride, mg/kg max | Max. value of 1.5 to be included in the table | Today the max volumes of Ethanol are 1G, higher Chlorides adversely affect our components, eg. Corrosion, Ref. EN 15376, when it is blended for the preparation of E20 |
| | Table, 2G | Sulphate, mg/kg max | Max. value of 3.0 to be included in the table | This limit protects our products from deposit formation & premature component failure, Ref. EN 15376, when used to prepare E20 |
| | | | | Note :<br>Values for Inorganic Chloride & Sulphate for E20 are mathematically derived from the Ethanol used as a blending component, when limit values for Inorg. Chloride, Sulphate are achieved in Anhydrous Ethanol, it becomes suitable when E20 is prepared. |

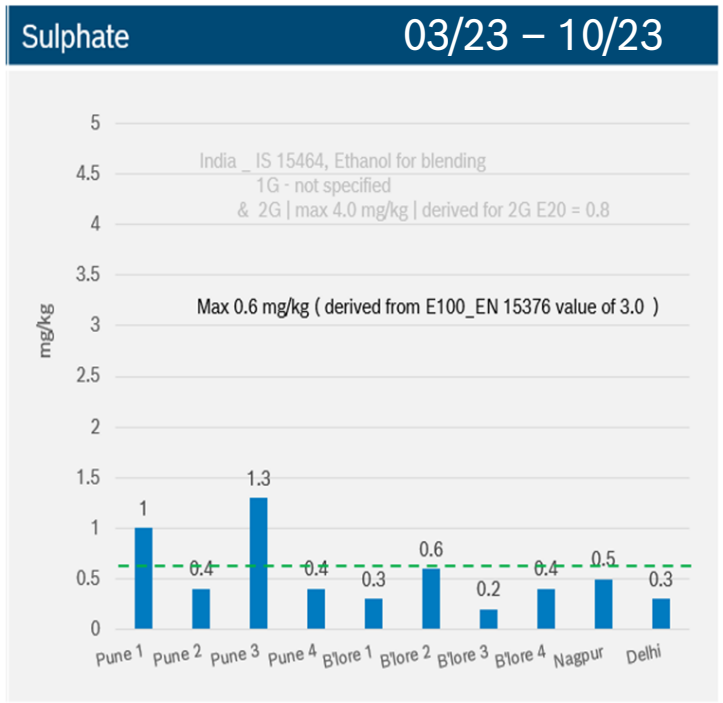
E100 Chloride content : max. 1.5 mg\kg, Sulphate content : max. 3.0 mg/kg

# India E20 fuel

## IS 17021: 2018 | Fuel Dip Stick Survey 2023*




E20 Field survey fuel data show very high-water levels up to 10,800 mg/kg, high chloride contamination up to 2.6 mg/kg and sulphate level up to 1.3 mg/kg. These values are not covered by standard FIE component validation using specified test fuels (e.g., CEN/TS xxxxx) and may impose a serious risk of corrosion/cavitation/increased wear resulting in significantly reduced service lifetime.

* Survey through SGS India

# India E20 fuel

## IS 17021: 2018 Dip Stick Survey 2023* | Summary and analysis

| Characteristics | E20 IS 17021 | E20 _VDA Document | Local gas stations (10 Samples) |
|---|---|---|---|
| Ethanol content, % v/v | 19 - 20 | 20 ± 2 | 13,5 - 21,0 |
| Water content, max, mg/kg, | Not specified | 2000 | 962 - 10840 |
| Inorganic Chloride content, max mg/kg | Not specified in IS 15464 1G | Indirect limit of 0.3, derived from E100, EN 15376 value of 1.5 | 0,5 – 2,6 |
| Sulphate content max mg/kg | Not specified in IS 15464 1G | Indirect limit of 0.6, derived from E100 value of 3.0 | 0,2 – 1,3 |

- **E20 India Market Fuel shows high scattering and very high content of Cl** (mean 1,2 ppm, 90-percentile 2,5 ppm), and **high content of Water** (up to 10.000ppm ), level is not acceptable for fuel injection components.
- E20 India fuel standard **IS 17021 : 2018** has no thresholds regulating critical ingredients like water content, inorganic chloride & sulphate.
- Bosch requirement :
  Indian E20 market fuels are covered by DIN E20 draft fuel standard (CEN/TS xxxxx).

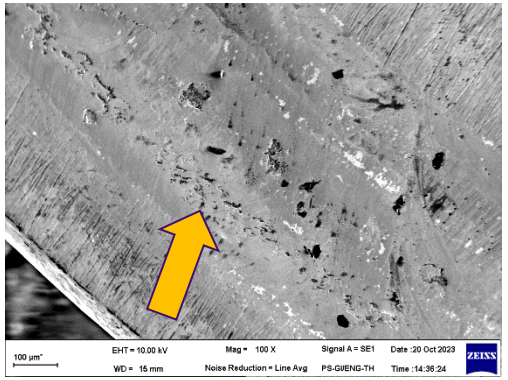
- Chloride ions may have a corrosive effect on fuel injection components leading to corrosion and acceleration of wear especially in the presence of moisture or water.
- Sulphate may lead to formation of deposits and corrosion
  - High wear, corrosion and deposition may affect product function and deterioration of intended useful lifetime.

* Survey through SGS India

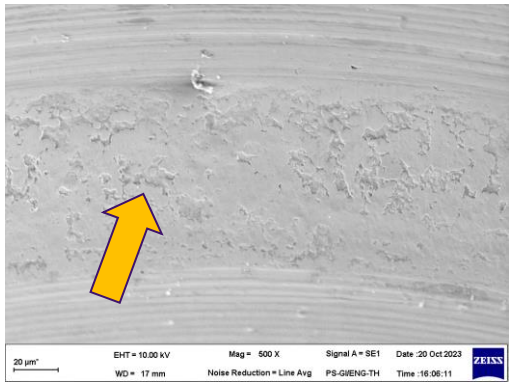
# India E20 fuel

## Impact on components : High water, Inorganic chloride and Sulphate content

Wear at mechanical stop areas

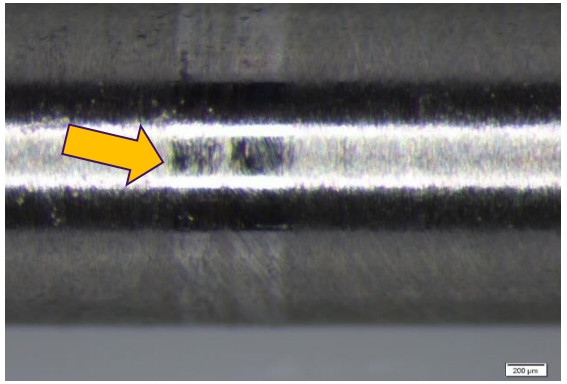



tribo-corrosion



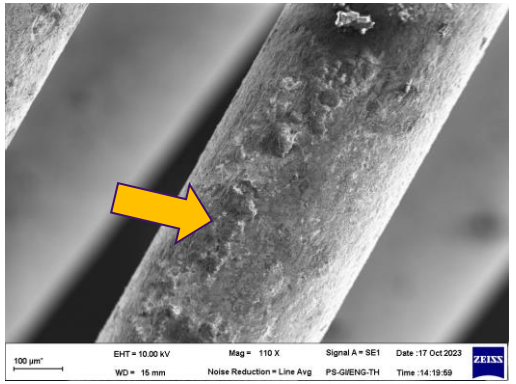

tribo-corrosion

Wear at sliding contacts




tribo-corrosion

Corrosion effects




corrosion

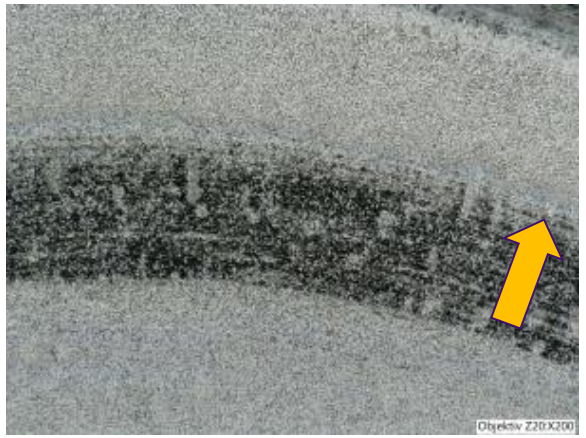
Areas affected by high water and chloride contamination

Higher wear at stop areas, sliding contacts and corrosion

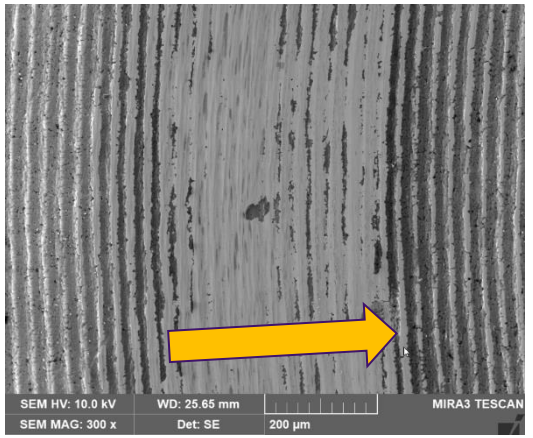
# India E20 fuel

## Impact on components : High water, Inorganic chloride and Sulphate content

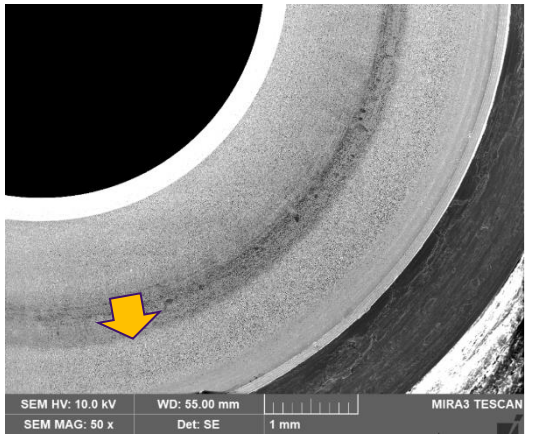
Wear at injector stop(Contact) areas:



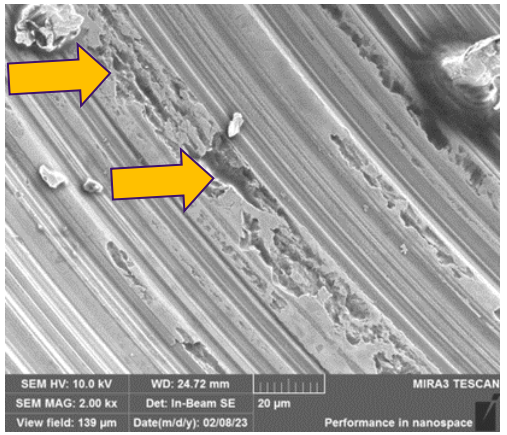
tribo-corrosion




tribo-corrosion and wear




tribo-corrosion




corrosion / cavitation

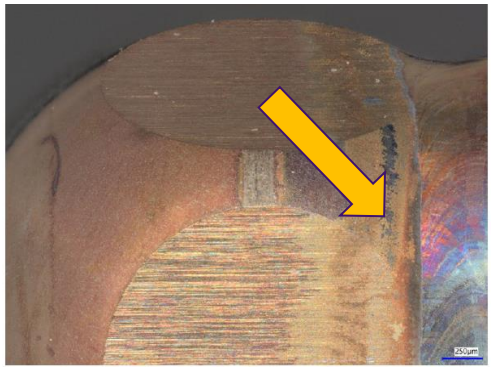
Areas affected by high water and chloride contamination

Higher wear and corrosion at stop areas

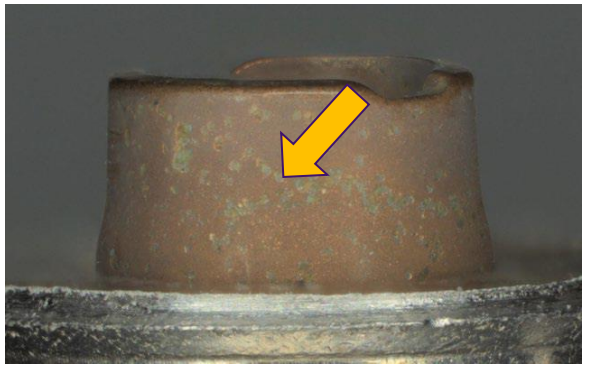
# India E20 fuel

## Impact on components : High water, Inorganic chloride and Sulphate content

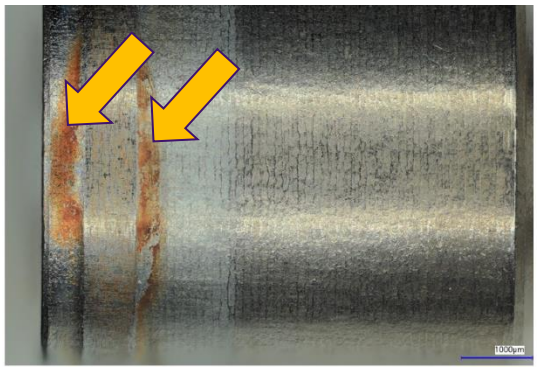
Wear and deposits at injector stop & guiding areas:



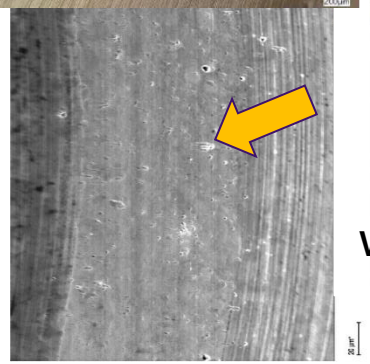
beginning corrosion



corrosion



deposits



wear

Areas affected by high water and chloride contamination

Higher wear and deposits at the end stop & guiding areas

# India E20 fuel

## Summary

- Products verified and validated for E20 fuel inline with Global standards (DIN E20 proposal, ANP N807 2020 E27)
- Market fuel shows scattering & high amount of critical ingredients for fuel system such; chloride /sulphate, water etc.
- E20 India fuel standard IS 17021: 2018 has no thresholds regulating critical ingredients like water content, Inorganic Chloride and Sulphate, *which may impose a serious risk of corrosion/cavitation/increased wear resulting in functional deterioration, accelerated wear leading to reduced useful lifetime.*

## Way forward request

- Proposed modifications for IS 15464 : 2022 (E100): Same requirements & same limit values for 1G, 2G generation ethanol
  - Water content max. [% (m/m)] : 0,3 (source : E100, DIN EN 15376 : 2014)
  - Chloride content max. [mg/kg] : 1,5 (source : E100, DIN EN 15376 : 2014)
  - Sulphate content max. [mg/kg] : 3.0 (source : E100, DIN EN 15376 : 2014)
- Proposed modifications for IS 17021 : 2018 (E20) and IS 17586 (E12, E15)
  - Water content max. [% (m/m)]: 0,2  (2000 mg/kg, source : DIN draft proposal : prCEN/TS xxxxx)