



**Universidad de Valladolid**



**ESCUELA DE INGENIERÍAS  
INDUSTRIALES**

## **ANEXO 2. Certificado de análisis**





# Specification

1.00983.1000 Ethanol absolute for analysis EMSURE® ACS,ISO,Reag. Ph Eur

|  | Specification |       |
|--|---------------|-------|
| Purity (GC)  | ≥ 99.9        | %     |
| Identity (IR)  | conforms      |       |
| Appearance   | conforms      |       |
| Color  | ≤ 10          | Hazen |
| Solubility in water                                  | conforms      |       |
| Acidity or alkalinity                                | ≤ 30          | ppm   |
| Titration acid                                       | ≤ 0.0002      | meq/g |
| Titration base                                       | ≤ 0.0002      | meq/g |
| Density (d 20 °C/20 °C)                              | 0.790 - 0.793 |       |
| UV absorption  | conforms      |       |
| Aldehydes (as Acetaldehyd)                           | ≤ 0.001       | %     |
| Fusel oils   | conforms      |       |
| Substances reducing potassium permanganate (as O)    | ≤ 0.0002      | %     |
| Substances reducing permanganate (ACS)               | conforms      |       |
| Carbonyl compounds (as CO)                           | ≤ 0.003       | %     |
| Readily carbonizable substances                      | conforms      |       |
| Acetone, Isopropyl Alcohol (ACS)                     | conforms      |       |
| Acetone (GC)   | ≤ 0.001       | %     |
| Ethylmethylketone (GC)                               | ≤ 0.02        | %     |
| Isoamyl alcohol (GC)                                 | ≤ 0.05        | %     |
| 2-Propanol (GC)                                      | ≤ 0.01        | %     |
| Higher alcohols (GC)                                 | ≤ 0.01        | %     |
| Volatile impurities (GC) (Acetaldehyde and Acetal)   | ≤ 10          | ppm   |
| Volatile impurities (GC) (Benzene)                   | ≤ 2           | ppm   |
| Volatile impurities (GC) (Methanol)                  | ≤ 100         | ppm   |
| Volatile impurities (GC) (Total of other impurities) | ≤ 300         | ppm   |
| Volatile impurities (GC) (disregard limit)           | ≤ 9           | ppm   |
| Chloride (Cl)  | ≤ 0.3         | ppm   |
| Nitrate (NO <sub>3</sub> )                           | ≤ 0.3         | ppm   |
| Phosphate (PO <sub>4</sub> )                         | ≤ 0.3         | ppm   |
| Sulfate (SO <sub>4</sub> )                           | ≤ 0.3         | ppm   |
| Ag (Silver)  | ≤ 0.000002    | %     |
| Al (Aluminium)                                       | ≤ 0.00005     | %     |
| As (Arsenic)   | ≤ 0.000002    | %     |
| Au (Gold)  | ≤ 0.000002    | %     |
| Ba (Barium)  | ≤ 0.00001     | %     |
| Be (Beryllium)                                       | ≤ 0.000002    | %     |
| Bi (Bismuth)   | ≤ 0.000002    | %     |
| Ca (Calcium)   | ≤ 0.00005     | %     |

# Specification

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1.00983.1000 Ethanol absolute for analysis EMSURE® ACS,ISO,Reag. Ph Eur

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|                     |            |   |
|---------------------|------------|---|
| Cd (Cadmium)        | ≤ 0.000005 | % |
| Co (Cobalt)         | ≤ 0.000002 | % |
| Cr (Chromium)       | ≤ 0.000002 | % |
| Cu (Copper)         | ≤ 0.000002 | % |
| Fe (Iron)           | ≤ 0.00001  | % |
| Ga (Gallium)        | ≤ 0.000002 | % |
| In (Indium)         | ≤ 0.000002 | % |
| Li (Lithium)        | ≤ 0.000002 | % |
| Mg (Magnesium)      | ≤ 0.00001  | % |
| Mn (Manganese)      | ≤ 0.000002 | % |
| Mo (Molybdenum)     | ≤ 0.000002 | % |
| Ni (Nickel)         | ≤ 0.000002 | % |
| Pb (Lead)           | ≤ 0.00001  | % |
| Pt (Platinum)       | ≤ 0.000002 | % |
| Sb (Antimony)       | ≤ 0.000002 | % |
| Sn (Tin)            | ≤ 0.00001  | % |
| Ti (Titanium)       | ≤ 0.000002 | % |
| Tl (Thallium)       | ≤ 0.000002 | % |
| V (Vanadium)        | ≤ 0.000002 | % |
| Zn (Zinc)           | ≤ 0.00001  | % |
| Zr (Zirconium)      | ≤ 0.000002 | % |
| Evaporation residue | ≤ 0.0005   | % |
| Water               | ≤ 0.1      | % |

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# Specification

1.00003.1000 Acetonitrile for analysis EMSURE® ACS, Reag. Ph Eur

|                           | Specification |         |
|---------------------------|---------------|---------|
| Purity (GC)               | ≥ 99.5        | %       |
| Identity (IR)             | conforms      |         |
| Appearance                | clear         |         |
| Color                     | ≤ 10          | Hazen   |
| Acidity                   | ≤ 0.0002      | meq/g   |
| Alkalinity                | ≤ 0.0001      | meq/g   |
| Density (d 20 °C/20 °C)   | 0.782 - 0.783 |         |
| Refractive index (n 20/D) | 1.343 - 1.345 |         |
| Boiling range (80-82°C)   | ≥ 95          | % (v/v) |
| Cyanide (CN)              | ≤ 0.005       | %       |
| Al (Aluminium)            | ≤ 0.00005     | %       |
| B (Boron)                 | ≤ 0.000002    | %       |
| Ba (Barium)               | ≤ 0.00001     | %       |
| Ca (Calcium)              | ≤ 0.00005     | %       |
| Cd (Cadmium)              | ≤ 0.000005    | %       |
| Co (Cobalt)               | ≤ 0.000002    | %       |
| Cr (Chromium)             | ≤ 0.000002    | %       |
| Cu (Copper)               | ≤ 0.000002    | %       |
| Fe (Iron)                 | ≤ 0.00001     | %       |
| Mg (Magnesium)            | ≤ 0.00001     | %       |
| Mn (Manganese)            | ≤ 0.000002    | %       |
| Ni (Nickel)               | ≤ 0.000002    | %       |
| Pb (Lead)                 | ≤ 0.00001     | %       |
| Sn (Tin)                  | ≤ 0.00001     | %       |
| Zn (Zinc)                 | ≤ 0.00001     | %       |
| Evaporation residue       | ≤ 0.001       | %       |
| Water                     | ≤ 0.1         | %       |

ACS, Ph Eur-reagent

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# Specification

1.09731.1000 Tetrahydrofuran for analysis EMSURE® ACS, Reag. Ph Eur

|  | Specification |       |
|--|---------------|-------|
| Purity (GC)                                  | ≥ 99.8        | %     |
| Identity (IR)                                | conforms      |       |
| Appearance                                   | clear         |       |
| Color  | ≤ 10          | Hazen |
| Density (d 20 °C/20 °C)                      | 0.885 - 0.895 |       |
| Acidity                                      | ≤ 0.0003      | meq/g |
| Alkalinity                                   | ≤ 0.0002      | meq/g |
| Peroxides                                    | conforms      |       |
| Peroxide (as H <sub>2</sub> O <sub>2</sub> ) | ≤ 0.005       | %     |
| Al (Aluminium)                               | ≤ 0.00005     | %     |
| B (Boron)                                    | ≤ 0.000002    | %     |
| Ba (Barium)                                  | ≤ 0.00001     | %     |
| Ca (Calcium)                                 | ≤ 0.00005     | %     |
| Cd (Cadmium)                                 | ≤ 0.000005    | %     |
| Co (Cobalt)                                  | ≤ 0.000002    | %     |
| Cr (Chromium)                                | ≤ 0.000002    | %     |
| Cu (Copper)                                  | ≤ 0.000002    | %     |
| Fe (Iron)                                    | ≤ 0.00001     | %     |
| Mg (Magnesium)                               | ≤ 0.000002    | %     |
| Mn (Manganese)                               | ≤ 0.000002    | %     |
| Ni (Nickel)                                  | ≤ 0.000002    | %     |
| Pb (Lead)                                    | ≤ 0.00001     | %     |
| Sn (Tin)                                     | ≤ 0.00001     | %     |
| Zn (Zinc)                                    | ≤ 0.00001     | %     |
| Evaporation residue                          | ≤ 0.0005      | %     |
| Water  | ≤ 0.03        | %     |

Stabilized with 2,6-Di-tert-butyl-4-methylphenol (BHT).

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