



Nafion™ NE1035

Ion Exchange Materials

Description

Nafion™ NE1035 is a low equivalent weight PFSA (perfluorinated sulfonic acid) membrane by Chemours. PFSA membranes are non-reinforced films based on acid/PTFE copolymer in the acid (H⁺) form. Nafion™ PFSA membranes are widely used for Proton Exchange Membrane (PEM) fuel cells and water electrolyzers. The membrane performs as a separator and solid electrolyte in a variety of electrochemical cells that require the membrane to selectively transport cations across the cell junction. The polymer is chemically resistant and durable.

Order and Packaging Information

The NE designation of NE1035 denotes an experimental product which is subject to change, may require a secrecy agreement, and for which data feedback may be expected. Also, size and availability may vary. Please contact your Chemours representative for details.

Membrane dimensions are based on dry product conditioned at 23 °C and 50% Relative Humidity before cutting. The membrane's water content will affect its dimensions, and the change may not be symmetrical in the length, width, and thickness directions. In addition, certain conditioning steps performed by the customer also may affect the dimensions. Customers may wish to review their membrane treatment steps and dimensional requirements with a Nafion™ technical representative before establishing membrane shipping dimensions.

Standard dry product dimensions for individual pieces include:

Width: 0.30 m (min.) to 1.22 m (max.)

Length: 0.30 m (min.) to 1.22 m (max.)

The membrane delivery package for cut pieces will depend on the size and quantity of the membrane order. Smaller-sized membranes are shipped flat, while longer lengths of individual pieces are shipped on a roll. The membranes are protected with a polyethylene wrap and inner packaging, then placed in shipping containers.

Standard dry product dimensions for roll goods include:

Width: 12-in (0.305-m) and 24-in (0.610-m) standard roll widths, and roll widths from 0.20-m (min.) up to 1.22-m (max.) on special order. Intermediate widths available in increments of 0.125-in.

Length: 50-meter standard roll length

There is a 100 m² minimum order requirement for non-standard roll widths and lengths. Membrane pieces or rolls can be cut to custom sizes, and special packaging provided at additional cost and/or delivery time. Please contact your Chemours representative for details.

Properties of Nafion™ PFSA Membranes

A. Thickness and Basis Weight Properties¹

| Membrane Type | Typical Thickness (microns) | Basis Weight (g/m ²) |
|--------------------|-----------------------------|----------------------------------|
| NE1035 | 89 | 175 |
| N115 (Comparison) | 127 | 250 |
| NR212 (Comparison) | 50.8 | 100 |

B. Physical and Other Properties²

| PHYSICAL PROPERTIES | TYPICAL VALUE (MD/TD Averaged) ³ | | | METHOD |
|--------------------------------|---|-------------------|--------------------|---------------------------|
| | NE 1035 | N115 (comparison) | NR212 (comparison) | |
| Tensile Modulus, MPa | | | | |
| 10 % RH, 23 °C | 369 | 386 | 352 | ASTM D 882 |
| water soaked, 23 °C | 90 | 103 | 138 | ASTM D 882 |
| Tensile Strength, MPa | | | | |
| 10 % RH, 23 °C | 38 | 36 | 31 | ASTM D 882 |
| water soaked, 23 °C | 19 | 22 | 23 | ASTM D 882 |
| Elongation at Break, % | | | | |
| 10 % RH, 23 °C | 148 | 175 | 201 | ASTM D 882 |
| water soaked, 23 °C | 133 | 140 | 145 | ASTM D 882 |
| OTHER PROPERTIES | TYPICAL VALUE | | | METHOD |
| | NE1035 | N115 (comparison) | NR212 (comparison) | |
| Specific gravity | 2 | 2 | 2 | |
| Conductivity, mS/cm | 106 | 94 | 102 | See footnote ⁴ |
| Available Acid Capacity, meq/g | 1.0 min | 0.9 min | 0.92 min | See footnote ⁵ |
| Total Acid Capacity, meq/g | 1.03 to 1.12 | 0.95 to 1.01 | .95 to 1.01 | |

capacity of equivalent weight of the membrane.

¹ Measurements taken with membrane conditioned to 23 °C, 50% relative humidity (RH).

² Physical properties measured at existing conditions, 21 °C and 10% RH, hence inclusion of N115 and NR212 for comparison.

³ MD (Machine Direction) and TD (Transverse Direction) differ slightly but were averaged for ease of comparison.

⁴ Conductivity measurement as described by Zawodzinski, et.al, J. Phys. Chem., 95 (15), 6040 (1991). Membrane conditioned in 100 °C water.

⁵ A base titration procedure measures the equivalents of sulfonic acid in the polymer and uses the measurement to calculate acid

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C. Hydrolytic Properties⁶

| OTHER PROPERTIES | TYPICAL VALUE | | | METHOD |
|------------------------|---------------|----------------------|-----------------------|------------|
| | NE1035 | N115 (comparison) | NR212 (comparison) | |
| Water content, percent | 7.7 | 7.0 | 6.1 | ASTM D 570 |
| Water uptake, % | 43 | 32 | 42 | ASTM D 570 |

Recommended Roll Storage Conditions

Unopened roll packages of Nafion™ PFSA membrane should be stored in the original shipping box, out of direct sunlight, and in a climate-controlled environment, maintained at 10 to 30°C, and 30 to 70% relative humidity. Before opening the package, pre-condition the membrane roll to the processing area temperature for 24 hours.

Once opened and exposed to the environment, the membrane will equilibrate to the ambient relative humidity, and change in dimensions accordingly. Membrane order dimensions are specified and measured at 23°C and 50% Relative Humidity.

Handling Practices

Ventilation should be provided for safe handling and processing of Nafion™ PFSA membrane. The amount of local exhaust necessary for processing Nafion™ PFSA membrane at elevated temperatures will depend on the combined factors of membrane quantity, temperature, and exposure time.

Scrap Disposal

Preferred disposal options are (1) recycling and (2) landfill. Incinerate only if incinerator is capable of scrubbing-out hydrogen fluoride and other acidic combustion products. Treatment, storage, transportation, and disposal must be in accordance with applicable federal, state/provincial and local regulations.

Safe Handling and Use of Nafion™ PFSA Membranes

The following information should be reviewed before handling and processing Nafion™ PFSA Membranes:

- Chemours Safety Data Sheet for Nafion™ PFSA Membranes (Ref. No.: 150000002917)
- "Safety and Handling in Use" Technical Bulletin T-01.
- "Guide to Safe Handling of Fluoropolymer Resins", Fourth Edition, November 2005, Published by the Fluoropolymers Di Society of the Plastics Industry, Inc.

⁶ Water Uptake is water soaked membrane compared to original weight which was cut and weighed after conditioning to 21 °C and 10% RH

Order Information

The NE designation of Nafion™ NE2050 denotes an experimental product that is subject to change, may require a secrecy agreement, and for which data feedback may be expected. The size availability of this product may vary; please contact your local Nafion™ representative for details.

The data listed here fall within the normal range of product properties, but they should not be used to establish specification limits nor used alone as the basis of design. This information is based on technical data that Chemours believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. This information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Because conditions of product use are outside our control, Chemours makes no warranties, express or implied, and assumes no obligation or liability in connection with any use of this information or for results obtained in reliance thereon. The disclosure of the information is not a license to operate under or a recommendation to infringe any patent of Chemours or others.

Medical Statement: Please contact your Chemours representative to discuss limitations regarding medical applications.

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