Nafion™ NC700

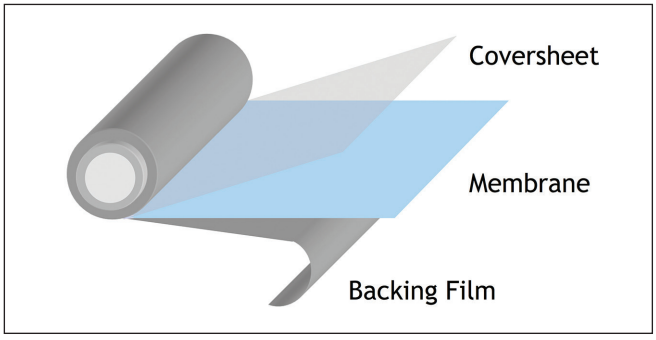
Reinforced PFSA Membrane

Product Information

Nafion™ NC700 membrane is based on chemically stabilized perfluorosulfonic acid (PFSA)/polytetrafluoroethylene (PTFE) copolymer in the acid (H+) form, which is reinforced and exhibits substantially lower fluoride ion release compared to non-stabilized polymers—a sign of improved chemical durability. Nafion™ PFSA membranes are proton exchange membranes (PEMs) that are used for various applications, including but not limited to fuel cells, water electrolyzers, and flow batteries. 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.

The membrane is positioned between a backing film and coversheet. This composite is wound on a 6 in ID plastic core, with the backing film facing out, as shown in Figure 1. A 6 in ID plastic roll core is standard.

Figure 1. Roll Unwind Orientation (Base Film Facing Out)



The 3.0 mil backing film facilitates transporting the membrane into automated fabrication processes, while the 0.92 mil coversheet protects the membrane from exposure to the environment during intermediate handling and processing. In addition, the coversheet (in combination with the backing film) eliminates rapid changes in the membrane's moisture content and stabilizes the dimensions of the membrane as it is removed from the roll.

Order and Packaging Information

Nafion™ NC700 membrane is available in roll form.

Product dimensions for membrane rolls include:

Width:

- Standard roll widths are 305 mm and 610 mm
- Special order intermediate widths available in 3.175 mm increments from 200 mm (min.) up to 610 mm (max.)

Length:

- Standard roll length is 100 m
- Special order intermediate lengths of 10 m, 20 m, and 50 m are available

There is a 100 m^2 minimum order requirement for *non-standard* roll widths and a per roll packaging surcharge for standard widths in nonstandard lengths less than 100 m. A roll core leader is available at a nominal charge per roll. Please contact Nafion™ Customer Service for details and availability.

Rolls are splice-free when ordered in standard 100 m lengths. Nonstandard roll lengths may contain splices under the following conditions: a 5 m minimum distance between splices and a maximum of 3 splices per roll that is less than 100 m in length.

The water content and conditioning of the membrane will affect its dimensions, and the change may not be symmetrical in the length, width, and thickness directions. Once the coversheet is removed, the membrane will respond to the environmental conditions of the workplace. If the membrane remains on the backing film, the membrane's response to relative humidity (RH) conditions, for example, may cause the combination of membrane/backing film to curl. In addition, certain manufacturing steps performed by the customer also may affect the membrane's dimensions and flatness.

If specified in the purchase order, a roll core leader is attached to the membrane as shown in Figure 2. The roll core leader material is the same as the backing film and the length specified in the purchase order.

Figure 2. Splice Design for Attaching Roll Core Leader to Membrane

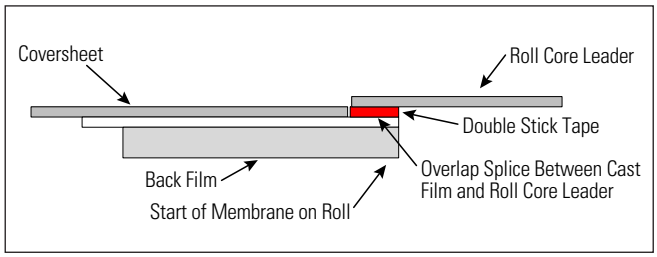


Table 1. Properties of Nafion™ PFSA Membrane

Thickness and Basis Weight Properties[1]			
Membrane Type	Typical Thickness (µm)		Basis Weight (g/m²)
Nafion™ NC700	15		29.5
Physical Properties[1]			
	Typical Values Nafion™ NC700		
Property[2]	MD	TD	Test Method
Tensile Strength, Max., MPa	45	45	ASTM D882
Modulus, MPa	446	421	ASTM D882
Elongation to Break, %	105	61	ASTM D882
Other Properties			
Specific Gravity	1.97		See footnote[1]
Area Specific Resistance, mΩ▪cm²	<20 (90% RH)		See footnote[3]
	<30 (40% RH)		
Hydrogen Crossover Current, mA/cm²	<2.0		See footnote[4]
Hydrolytic Properties			
Water Content, % water[5]	5.0 ± 3.0		ASTM D570
Water Uptake, % water[6]	50.0 ± 5.0		ASTM D570
Linear Expansion, % increase			
from 50% RH, 23 °C (73 °F)	MD	TD	
to water soaked, 23 °C (73 °F)	2	2	ASTM D756
to water soaked, 100 °C (212 °F)	4	4	ASTM D756

[1] Measurements taken with membrane conditioned to 23 °C (73 °F), 50% RH.
[2] Where specified, MD—machine direction, TD—transverse direction. Condition state of membrane given.
[3] Measured in MEA at 80°C, 1.5 A/cm², stoichiometric ratios $1.5H_2$ / 1.8air, and 250 kPa_a
[4] Hydrogen crossover measured in MEA on H_2, 80 °C, fully humidified gases, and 1 atm total pressure. This is not a routine test.
[5] Water content of membrane conditioned to 23 °C (73 °F) and 50% RH (dry weight basis).
[6] Water uptake from dry membrane to conditioned in water at 100 °C (212 °F) for 1 hr (dry weight basis).

Product Labeling

A self-adhesive product label, with information content similar to Figure 3, is located on the inside of the roll core and the outside over-wrap of each roll. The label indicates the product roll's width and length in both English and metric units.

Figure 3. Finished Product Roll Label

GMC: D13278258
Product: Nafion™ NC700
Width: 12 IN x Length: 328 FT
Width: 305 MM x Length: 100.0 M
Manufacture Date: 01/2019

- GMC is a product setup code specific to the thickness, roll width, length, and other packaging features.
- Manufacture Date is the wide-stock roll's slit date (mm/yyyy).

Recommended Roll Storage Conditions

Unopened roll packages of Nafion™ PFSA membrane should be stored in the original shipping box, out of direct sunlight, in a climate-controlled environment maintained at 10–30 °C (50–86 °F) and 30–70% RH. Before opening the package, pre-condition the membrane roll to the processing area temperature for 24 hr.

Once opened and exposed to the environment, the membrane will equilibrate to the ambient RH and change in dimensions accordingly. Membrane order dimensions are specified and measured at 23 °C (73 °F) and 50% RH.

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.

Static Discharges

The composite structure and individual layers can pick up a strong charge of static electricity because of the good dielectric properties of the membrane, backing film, and coversheet. Unless this charge is dissipated as it forms, by using ionizing radiation devices or special conducting metal tinsel, it can build to thousands of volts and discharge to people or metal equipment. In dust- or solvent-laden air, a flash fire or explosion could follow. Extreme caution is needed to prevent static accumulation when using flammable solvents while coating membrane surfaces. Solvent-coating equipment should incorporate the means for detecting and extinguishing fire.

Safe Handling and Use of Nafion™ PFSA Membranes

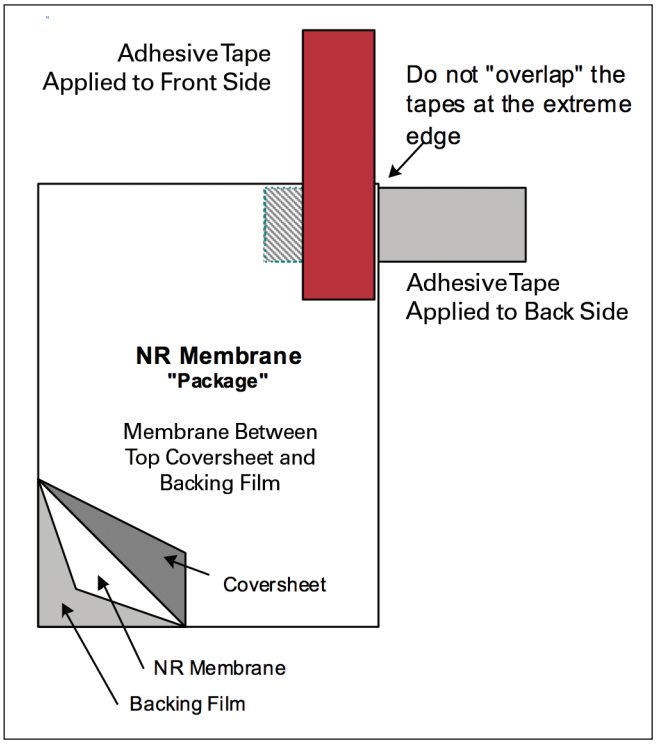
The following information should be reviewed before handling and processing Nafion™ PFSA membranes:

- Safety Data Sheet (SDS) for Nafion™ NC700
- Nafion™ "Safety in Handling and Use" technical bulletin, T-01
- "Guide to Safe Handling of Fluoropolymer Resins", Fourth Edition, November 2005, Published by the Fluoropolymers Division of the Society of the Plastics Industry, Inc.

Separating NR Membrane from the Coversheet and Backing Film

- Attach tapes to the front and back sides of the NR membrane "package" at one corner, as shown in Figure 4. To prevent the tapes from sticking to each other, do not "overlap" the adhesive surfaces at the extreme edges.
- Pull the tapes apart to separate the coversheet from the membrane/backing film. The membrane typically adheres to the backing film during this step. The coversheet is 0.92 mil polyester film.
- Attach tapes to the membrane side and backing film side at one corner, as shown in Figure 4. To prevent the tapes from sticking to each other, do not "overlap" the adhesive surfaces at the extreme edges.
- Pull the tapes apart to separate the membrane from the backing film. The backing film is 3.0 mil polyester film.

Figure 4.



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