Northstar Polymers (Div. of Tandem Products, Inc.)
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MPA-F03A

3.5 Pound-Per-Cubic-Foot Density
High-Resiliency Flexible Foam
Variable Ratio/Variable Softness

This foam formulation is designed to make molded flexible foam parts/sheets/dies/blocks. A small quantity may possibly be processed manually. The components are low-viscosity stable liquid at room temperature.

The free-rise density of the foam is approximately 3.3 pounds per cubic foot. The cell structure is mostly open-cell. It is recommended to physically crushing soon after foam is made to stabilize the molded shape.

This is an MDI base water-blown polyether system, and it does not use auxiliary blowing agents.

The pot life for this formulation is very short. For molding larger parts, meter mixing equipment and automated molding line setup is required.

Physical Properties of the Cured Foam (Data at 100:179 Mixing Ratio by Weight)

Property	Typical Value
Foam Density (Free Rise)	3.3 LBS/Cuft
Typical Compression Density	3.6 LBS/Cuft
Foam Consistency	Flexible
Apparent Surface Hardness (Shore OO)	Cut Surface: OO 20 Open Top Skin: OO 50
Foam Color	Off white*

*Note: The foam color is expected to turn to dark yellow from light, heat, and oxidation after exposure to ambient condition for a while.

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Component Properties (Typical Values)

	Prepolymer (Part-A)	Curing Agent (Part-B)
Code Number:	MNA-014	PAB-024
Specific Gravity:	1.218	1.024
Equivalent Weight:	145	235
%NCO	29.0 %	n/a
Viscosity (@72F)	50 cps	950 cps

Note: In the cold season, part-A component (MNA-014) may freeze during the shipping. If the material arrives frozen, it must be thawed immediately. To thaw MNA-014, the entire content needs to be heated to about 140 ˚F. After the material is thawed to homogeneously smooth liquid consistency, the container top space needs to be purged with nitrogen gas and kept in an air tight container to store. The storage temperature should be within the range of 72 to 90 ˚F. Northstar Polymers disclaim the responsibility on damaged material when it is caused by cold temperature and/or mishandling by the customer. Part-B component (PAB-024) is not likely to freeze in normal weather condition in winter.

Mixing Ratio	(A)	(B)
Volume Ratio:	**47**	**100**
Weight Ratio:	100	179
Stoichiometry:	100	110
NCO Index	0.91	

Softer foam products can be yielded by increasing the part-B mixing ratio. The tested ratio ranges are:

Part-A: Part-B = 100: 179 to 100: 269 by weight
Part-A: Part-B = 30: 100 to 47: 100 by volume

As you increase the part-B ratio, softer foam is produced within the above mixing ratio ranges. The following are the Shore Durometer hardness measurements at bottom surfaces of free-risen foam specimens. The cut surfaces will be softer, and the skinned top surface of free-risen foam will be harder. This data is reference only.

Hardness (Shore OO Durometer)	Mixing Ratio (Part-A: Part-B By Weight)
40	100: 179

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20	100: 235
10	100: 251
5	100: 269

A higher part-B mixing ratio may create higher closed-cell rate. The foam may need to be crushed about 30 minutes after the pour to ensure the sufficient open-cell structure.

Processing Temperature:

Part-A	Room Temperature (72 – 85 ˚F)
Part-B	Room Temperature (72 – 85 ˚F)
Mold/Substrate	Room Temperature (72 – 85 ˚F)

* Substrate can be at ambient temperature if it is made of plastic, resin, wood, or paper. When casting on metal or other heat-absorbing materials, the substrate may need to be heated to 100 – 140 ˚F range.

Cure Pattern:

Pot life (pour within)	10 seconds
Demolding time	20 to 30 minutes

Standard Packaging Sizes:

5-gallon pail (40 LBS per pail)
55-gallon drums (450 LBS per drum)

Hints for Foam Compression Molding

Foam needs to fill the mold space from its expansion pressure by putting a slightly larger amount of foam resin into the mold. The mold, therefore, needs to be a closed mold and has to have a capacity to retain the internal pressure. A simplest compression mold will be an open-top box with a lid. The lid needs to be clamped to hold the pressure.

The air trapped in the mold could make large voids if it is not vented. For this purpose, you need to have very small holes to let the trapped air escape from the mold. Determine the mold position so that trap air is pushed toward a corner or sections where the vent holes are. Small amounts of the foam may squeeze out from the vent holes, which you can machine off after the part is cured.

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The mold material can be metal, plastic, or elastomeric material. Mold surface needs to be slick as foam could stick to any porous surface. Metal molds tend to absorb heat. The heat created from urethane reaction is required for foam to cure properly. If mold is cold, this heat is absorbed and the foam does not cure properly. The mold needs to be heat to 100 to 120 ºF range in case of using metal molds. If your mold is made of a plastic or elastomeric material, such as silicone rubber, epoxy, and urethane, this may not be necessary. Please test and determine the optimal temperature for your mold. Higher mold temperature increases the shrinkage rate. For tight shrinkage variation, controlling temperature parameters is very important.

The "compression rate" describes the additional amount of material you would put into the closed mold to create the internal pressure so that the foam fills the entire inside space of the mold. Typically, about 5 to10 % compression should give enough pressure to distribute the foam within the mold. Using higher rate makes the foam denser and stronger. However, it will increase the chance of closed-cell/shrinkage problem described below.

About 20 to 30 minutes after casting the foam resin, the foam should be solid enough to de-mold. At this point, foam should have mostly open-cell structure and may have some regions of closed-cell structure. Closed cells cannot balance pressures between inside and outside of foam, and will cause large deformation as the foam cools after demolding.

In order to avoid the deformation, the foam cells must be opened. Certain mold shape tends to create more compressed regions and prone to make closed-cell structure. If your molded foam part has some closed-cell structure, the foam needs to be crushed down physically to force the internal cell structure to be open-cell. Closed-cell foam feels like a balloon when you press. If you find some regions of closed-cells, you should crush the foam by hands, elbows, knees, or feet to force the cells to open. As you push down the foam, you will hear popping sounds and deflection from the foam will be reduced.

Other Information

Applications that requires fire-retardant property:

This foam is not fire-retardant foam, and it is not recommended for applications, which require or should be using fire-retardant grade materials. The applications such as automotive interior, building material, and components for some electronic parts often require fire-retardant grade materials by law. It is the user's responsibility to conform to the applicable regulations. We also do not recommend this foam to be used to the applications in which the foam can be exposed to high temperature or being near an ignition source.

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By adding fire retardant additives, this foam may be modified to fire-retardant grade foam. The user must test the foam modified with the fire retardant additives for the fire-retardant property and the conformance to the applicable regulations.

Storage:

Part-A component (prepolymer) contains isocyanate component, which is very much sensitive to moisture. If it is left in air, part-A will react with atmospheric moisture and will be ruined. This reaction is non-reversible. Soon after opening a can and dispensing the content, nitrogen gas or argon gas needs to be injected to the can to blanket the material. Silica gel or calcium chloride desiccant filter should be installed to 55 gallon drum-vent for your drum feeding system. The storage temperature should be at a room temperature between 72 and 90 °F.

If a large amount of water mixes with a large amount of isocyanate base materials, the chemical reaction may produce a large amount of CO2 gas and heat to create a hazardous condition. Keep the storage area free of water.

Under a certain combination of heat, catalyst (basic chemicals), amounts of reactive materials, and some other favorable conditions for the reaction, the water (or alcohol/glycol) to isocyanate reaction can reach a dangerous state of accelerated reaction. The accelerated reaction may create a very high temperature condition. The thermal decomposition of isocyanate based material by extremely high temperature or fire can produce toxic gasses and smokes. Please be sure that the containers are stored in dry indoor storage, away from source of water, alcohol, glycol, and other reactive chemicals.

If a leak is found in a drum, please place the drum in such a position that the leaking part is at a higher part of drum so that the content no longer leaks out. Cover the leaking area with dry towel to prevent air from entering. If possible, transfer the material into new container(s) with nitrogen purge. If moisture enters into an isocyanate container from a small leakage, CO2 gas may be produced to gradually pressurize the container. If pressure built up is suspected, open the bung (or cap) very slowly to release the pressure before you change the drum position.

Part-B component is hygroscopic. If the material is exposed to ambient air, it may absorb moisture. Moisture contaminated part-B material may become source of degradation or excessive bubbles in the product. Avoid exposure of the material to air. Purging the empty space in the container with nitrogen gas or negative-40-degree-due-point dry air is also recommended to prevent moisture contamination of part-B as well. The storage temperature should be at a room temperature between 72 and 90 °F.

Safety:

The component materials are industrial-grade chemicals. Please keep them in a secure place and prevent access from any unauthorized individual. The personnel who handle these materials need to read the Material Safety Data Sheet (MSDS) for detail information on safety and handling of the material. The MSDS for each component is sent with the shipment of the material.

Whenever using this material, please be sure to operate in a wide-open area with good air movement or in a well-ventilated area. Wear rubber gloves, long sleeves, and protective eyeglasses to prevent skin/eye contact of the material. When your operation involves heating or spraying of the material, we recommend, in addition to the above, installation of a proper ventilation system and using a half-face respirator recommended for the use to prevent inhalation of the fume.

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Direct contact of polyurethane raw materials to skin/eye, as well as ingestion may lead to health problems. No eating or smoking should be permitted at the working area. The operator should wash hands well with soap and water after handling the materials. Please refer to the MSDS for each component for the detailed health information.

For any questions, please contact Northstar Polymers.

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