

# Chemical Permeation Testing

Chemical permeation is the process by which chemicals migrate through protective glove material at the molecular level. It is important to note that chemical permeation can occur without any physical or observable changes to the glove material. To be better informed about selecting gloves when working with chemicals, it is important to understand how chemical permeation is tested and measured.

## TESTING OVERVIEW

Chemical permeation tests are completed in laboratory conditions where a sample of glove material is placed in a 2-sided chamber. One side of the chamber is filled with the test chemical, the other side with collection medium where measurements are taken to determine the level of chemical permeation over a period of time (480 minutes) and at a fixed temperature (~21°C/69°F).

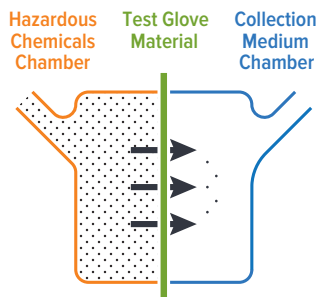


Illustration of chemical testing chamber

**Disclaimer:** Chemical permeation tests are conducted in controlled laboratory conditions and not in field conditions. Testing cannot replicate specific wear and tear environments under actual application conditions. The information included is provided as a guide only. Using the correct gloves, for specific applications can only be determined by testing in those applications by the purchaser.

## TESTING RESULTS KEY

Chemical Permeation (ANSI)		NewTrile™			
Model Number		NU11-RD-ECO-GR			
Palm Thickness		0.28 mm / 11 mil			
Test Method		BS EN 16523-1:A1:2018			
Chemical	CAS Number	Average BTT (min)	CE Rating	Degradation %	Recommendation
<b>ORGANIC ACIDS</b>					
Acetic Acid - Glacial	64-19-7	34	2	95.1	Not Recommended
Acetic Acid, 10%	64-19-7	>480	6	13.3	Recommended
Acetic Acid, 20%	64-19-7	>480	6	15.4	Recommended
Acetic Acid, 25%	64-19-7	>480	6	22.7	Recommended
<b>INORGANIC ACID</b>					
Hydrochloric Acid, 10%	7647-01-0	>480	6	10.8	Recommended
Hydrochloric Acid, 37%	7697-37-2	100	3	21.9	Recommended
Nitric Acid, 40%	7697-37-2	270	5	18.2	Recommended
Nitric Acid, 10%	7697-37-2	>480	6	3.8	Recommended
Nitric Acid, 65%	7664-38-2	32	2	98.7	Not Recommended
Sulphuric Acid, 40%	7664-93-9	>480	6	20.5	Recommended
Sulphuric Acid, 50%	7664-93-9	>480	6	22.5	Recommended
Sulphuric Acid, 96%	8007-56-5	31	2	88.1	Not Recommended
<b>ALKALIS</b>					
Ammonium Hydroxide, 25%	1336-21-6	134	4	46.7	Recommended
Potassium Hydroxide, 50%	1310-58-3	>480	6	-21	Recommended
Potassium Hydroxide, 40%	1310-58-3	>480	6	0.6	Recommended

**Breakthrough Times (BTT):** The *elapsed time* between initial contact of the test chemical with the outside surface of the glove and the time at which permeation rate reaches 1µg/cm<sup>2</sup>/min (BS EN 16523-1:2015+A1:2018). A higher number is better or longer.

**CE Rating:** The BS EN 16523-1:2015+A1:2018 numerical classification for chemical permeation.

**Degradation %:** The percentage change in the puncture resistance of the glove material after a continuous contact with the external surface with the challenge chemical compared to the puncture resistance of the glove material before exposure (EN ISO 374-4:2019). A lower number is better.

**Recommendation:** The destructive change in one or more properties of a material. These are rated on a *color-coded scale* (see table below).

### CE Rating is based on Breakthrough Time (BTT)

BTT Lowest (min)	CE Rating
34	2
>480	6
>480	6
>480	6
>480	6
100	3
270	5
>480	6

### Recommendation Criteria

Color Coding Criteria			
BTT (min)	Degradation %	Physical Changes	Recommendation
>30	0-60%	No	Recommended
>10	61-90%	No	Fair
<10	>90%	Yes	Not Recommended



**R** Recommended **F** Fair **NR** Not Recommended

Chemical Permeation (EN)		NewTrile™				NewTrile™				NewTrile™			
Model Number		NU11-RD-ECO-GR				NU15-RD-ECO-GR				NF15-RD-ECO-GR			
Palm Thickness		0.28 mm / 11 mil				0.38 mm / 15 mil				0.38 mm / 15 mil			
Test Method		BS EN 16523:1+A1:2018				BS EN 16523:1+A1:2018				BS EN 16523:1+A1:2018			
Chemical	CAS Number	BTT lowest (min)	CE Rating	Degradation %	Recommendation	BTT lowest (min)	CE Rating	Degradation %	Recommendation	BTT lowest (min)	CE Rating	Degradation %	Recommendation
<b>ORGANIC ACIDS</b>													
Acetic Acid - Glacial	64-19-7	34	2	95.1	NR	50	2	92.0	NR	87	3	91.9	NR
Acetic Acid, 10%	64-19-7	>480	6	13.3	R	>480	6	11.2	R	>480	6	11.2	R
Acetic Acid, 20%	64-19-7	>480	6	15.4	R	>480	6	13.8	R	>480	6	13.8	R
Acetic Acid, 25%	64-19-7	>480	6	22.7	R	>480	6	2.2	R	>480	6	2.2	R
<b>INORGANIC ACID</b>													
Hydrochloric Acid, 10%	7647-01-0	>480	6	10.8	R	>480	6	12.8	R	>480	6	12.8	R
Hydrochloric Acid, 37%	7697-37-2	100	3	21.9	R	>480	6	11.4	R	>480	6	11.4	R
Nitric Acid, 10%	7697-37-2	>480	6	3.8	R	>480	6	10.2	R	>480	6	10.2	R
Nitric Acid, 40%	7697-37-2	270	5	18.2	R	370	5	15.0	R	>240	5	14.1	R
Nitric Acid, 65%	7664-38-2	32	2	98.7	NR	40	2	98.7	NR	48	2	98.7	NR
Sulphuric Acid, 40%	7664-93-9	>480	6	20.5	R	>480	6	14.2	R	>480	6	14.2	R
Sulphuric Acid, 50%	7664-93-9	>480	6	22.5	R	>480	6	71	R	>480	6	71	R
Sulphuric Acid, 96%	8007-56-5	31	2	88.1	F	45	2	65.0	F	106	3	58.9	R
<b>ALKALIS</b>													
Ammonium Hydroxide, 25%	1336-21-6	134	4	46.7	R	185	4	25.0	R	>480	6	-5.8	R
Potassium Hydroxide, 50%	1310-58-3	>480	6	-21	R	>480	6	4.7	R	>480	6	4.7	R
Sodium Hydroxide, 20%	1310-73-2	>480	6	-28.5	R	>480	6	-2.4	R	>480	6	-2.4	R
Sodium Hydroxide, 40%	1310-73-2	>480	6	-9.6	R	>480	6	4.5	R	>480	6	4.5	R
Sodium Hydroxide, 50%	1310-73-2	>480	6	-13.4	R	>480	6	1.6	R	>480	6	1.6	R
<b>ALCOHOLS</b>													
Butanol	71-36-3	250	5	34.2	R	>480	6	36.1	R	>480	6	36.1	R
Ethanol, 96%	64-17-5	>480	6	54.1	R	>480	6	15.3	R	>480	6	15.3	R
Iso Propyl Alcohol (Propan-2-ol)	67-63-0	>480	6	20.2	R	>480	6	24.8	R	>480	6	24.8	R
Methanol	67-56-1	17	1	81.7	F	25	1	70.1	F	31	2	70.1	R
Propane - 1 - ol	71-23-8	>480	6	19.5	R	>480	6	26.5	R	>480	6	26.5	R
<b>KETONES</b>													
Acetone	67-64-1	<5	0	91.3	NR	<5	0	91.0	NR	<5	0	92.1	NR
Cyclohexanone	108-94-1	18	1	96.8	NR	30	1	96.0	NR	52	2	96.1	NR
Methyl ethyl ketone	78-93-3	<5	0	84.3	NR	<5	0	84.0	NR	<5	0	84	NR
Methyl Propyl ketone	107-87-9	<5	0	100.0	NR	<5	0	98.0	NR	8	0	97.2	NR
<b>ALDEHYDES</b>													
Formaldehyde, 37%	50-00-0	>480	6	12.0	R	>480	6	10.0	R	>480	6	-15.6	R
<b>ESTERS</b>													
Ethyl Acetate	141-78-6	<5	0	89.3	NR	<5	0	90.0	NR	<5	0	91.5	NR
<b>ALIPHATIC SOLVENTS</b>													
Cyclohexane	110-82-7	>480	6	20.4	R	>480	6	111	R	>480	6	111	R
n - Hexane	110-54-3	>480	6	4.8	R	>480	6	-10.2	R	>480	6	-10.2	R
n - Heptane	142-82-5	>480	6	30.4	R	>480	6	15.5	R	>480	6	15.5	R
<b>AROMATIC SOLVENTS</b>													
Toluene	108-88-3	<5	0	87.1	NR	<5	0	85.0	NR	12	1	81.8	F
Xylene	1330-20-7	9	0	74.3	F	15	1	78.0	F	24	1	80.5	F
Thinner	108-88-3	<5	0	90.82	NR	<5	0	95.0	NR	<5	0	96.4	NR
Turpentine	8006-64-2	250	5	5.7	R	>480	6	1.2	R	>480	6	1.2	R
White Spirit	64742-88-7	300	5	20	R	>480	6	15.0	R	>480	6	10	R
<b>AMINES</b>													
Diethyl Amine	109-89-7	<5	0	100	NR	<5	0	95.0	NR	<5	0	93.3	NR
<b>CHLORINATED SOLVENTS</b>													
Dichloromethane	75-09-2	<5	0	98.3	NR	<5	0	98.0	NR	<5	0	99.3	NR
<b>PEROXIDES</b>													
Hydrogen Peroxide, 30%	7722-84-1	>480	6	22.2	R	>480	6	10.0	R	>480	6	-11.7	R
<b>PETROLEUM DERIVATIVES</b>													
Kerosene	64742-81-0	>480	6	8.4	R	>480	6	8.4	R	>480	6	8.9	R
Diesel Fuel	68334-30-5	>480	6	8.9	R	>480	6	5.0	R	>480	6	-10.4	R
Petrol Unleaded	8006-61-9	130	4	34.5	R	170	4	30.0	R	130	4	19.6	R



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