



**FEEL THE SW
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SINGLE-USE CHEMICAL PERMEATION TESTING GUIDE

EN 16523-1

Minimum Breakthrough Times

Permeation Rates

Performance Levels

Ratings

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 glove the 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).

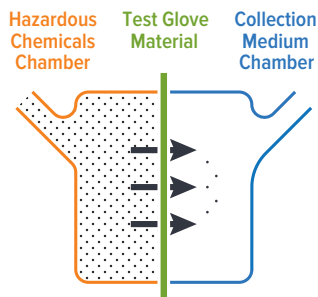


Illustration of chemical testing chamber

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 (EN)		TrueForm®			
Model Number		TF-036-095-LB			
Item Number		N09130X			
Palm Thickness		0.06mm / 2.5mil			
Compliance Requirement		EN 374-1:2016			
Test Method		EN 16523-1:2015			
Chemical	CAS Number	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating
ACIDS					
Acetic Acid (glacial)	64-19-7	<5	2.1		NR
Hydrochloric Acid (37%)	7647-01-0	<5	2.6		NR
Nitric Acid (70%)	7697-37-2	<5	1.0		NR
Sulfuric Acid (96%)	7664-93-9	<5	1.0		NR
Phosphoric Acid (85%)	7664-38-2	>240	0.0	5	HR

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 1.0 µg/cm²/min (EN 16523-1). A higher number is better or longer.

Permeation Rate (PR): The *average rate* at which chemicals pass through barrier layer once BTT is achieved. Measured in 0.1µg/cm²/min (EN 16523-1). A lower number is better.

Performance Level: The EN 16523-1 numerical classification for chemical permeation.

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

Performance Level is based on Breakthrough Time (BTT)

Minimum BTT (min)	Performance Level
> 10	1
> 30	2
> 60	3
> 120	4
> 240	5
> 480	6

Ratings are based on Breakthrough Time (BTT) in relation to Permeation Rate (PR)

Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Rating
> 31	< 10	HR
> 31	> 10	R
11-30	< 10	R
11-30	> 10	F
< 10	< 1	F
< 10	1-100	NR
< 10	> 100	NR
11-30	> 1000	NR

HR	Highly Recommended
R	Recommended
F	Fair
NR	Not Recommended



Chemical Permeation (EN)		TrueForm®				TrueForm®				TrueForm®			
Model Number		TF-95RB				TF-95LG				TF-12LG			
Item Number		N30134X				N12840X				N02740X			
Palm Thickness		0.08mm / 3.1mil				0.09mm / 3.6mil				0.16mm / 6.3mil			
Compliance Requirement		EN 374-1:2016				EN 374-1:2016				EN 374-1:2016			
Test Method		EN 16523-1:2015				EN 16523-1:2015				EN 16523-1:2015			
Chemical	CAS Number	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating
ACIDS													
Acetic Acid (Glacial)	64-19-7	<5	11.8		NR	<5	5.9		NR	13	129.1	1	F
Hydrochloric Acid (37%)	7647-01-0	<5	3.5		NR	13	10.1	1	F	18	3.3	1	F
Nitric Acid (70%)	7697-37-2	7	1.0		NR	7	1.0		NR	16	93.2	1	F
Sulfuric Acid (96%)	7664-93-9	<5	112.5		NR	5	7.3		NR	12	196.8	1	F
Phosphoric acid (85%)	7664-38-2	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR
ALKALIS/BASES													
Ammonium Hydroxide (25%)	1336-21-6	50	1.0	2	HR	56	1	2	HR	108	1	3	HR
Sodium Hydroxide (40%)	1310-73-2	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR
AROMATICS & HYDROCARBONS													
Benzene	71-43-2	0	4771.3		NR	0	5393.8		NR	<5	11285.1		NR
Butyl Acetate	123-86-4	0	63.6		NR	0	55.4		NR	<5	513.2		NR
Chloroform	67-66-3	0	84672.9		NR	0	81170.0		NR	0	99765.9		NR
DMSO	67-68-5	0	302.5		NR	<5	232.0		NR	<5	218.0		NR
Heptane	142-82-5	41	2.5	2	HR	47	1.4	2	HR	76	1.7	3	HR
Hexane	110-54-3	16	2.9	1	R	38	1.1	2	HR	56	1.5	2	HR
Petroleum ether	8032-32-4	23	1.9	1	R	39	1.7	2	HR	47	1.5	2	HR
Stoddard Solvent	68797-94-4	<5	5.5		NR	11	2.8	1	R	18	4.2	1	R
Xylene	1330-20-7	<5	318.8		NR	<5	946.7		NR	<5	503.6		NR
CARBONYLS													
Acetone	67-64-1	0	13759.6		NR	0	13816.3		NR	0	17110.6		NR
Acetonitrile	75-05-8	0	7182.7		NR	0	5656.5		NR	0	4716.4		NR
Cyclohexanone	108-94-1	<5	211.6		NR	<5	235.0		NR	<5	84.6		NR
ALCOHOLS													
2-butoxyethanol	111-76-2	<5	20.3		NR	26	4.4	1	R	24	9.1	1	R
Diacetone alcohol	123-42-2	12	82.9	1	F	24	46.4	1	F	11	100.9	1	F
Ethyl alcohol	64-17-5	<5	1855.3		NR	<5	234.0		NR	<5	383.1		NR
Isopropyl alcohol	67-56-1	<5	5856.0		NR	24	5.8	1	R	50	2.1	2	HR
Methanol	67-63-0	<5	638.2		NR	<5	168.5		NR	<5	184.5		NR



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Chemical Permeation (EN)		PowerForm®				PowerForm®				PowerForm®				PowerForm®				PowerForm®							
Model Number		PF-95BK				PF-95TL				PF-95GW				PF-95LG				PF-95GY				PF-12TL			
Item Number		N71688X				N20036X				N18947X				N12940X				N26050X				N12736X			
Palm Thickness		0.13mm / 5mil				0.13mm / 5mil				0.12mm / 4.9mil				0.13mm / 5.1mil				0.16mm / 6.2mil				0.18mm / 6.2mil			
Compliance Requirement		EN 374-1:2016				EN 374-1:2016				EN 374-1:2016				EN 374-1:2016				EN 374-1:2016							
Test Method		EN 16523-1:2015				EN 16523-1:2015				EN 16523-1:2015				EN 16523-1:2015				EN 16523-1:2015							
Chemical	CAS Number	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating				
ACIDS																									
Acetic Acid (Glacial)	64-19-7	11	10.1	1	F	15	36.7	1	F	5	1.0		NR	9	1.0		NR	12	36.9	1	F	13	36.9	1	F
Hydrochloric Acid (37%)	7647-01-0	17	1.0	1	R	34	11.0	2	R	17	3.2	1	R	18	4.4	1	R	22	3.2	1	R	25	3.2	1	R
Nitric Acid (70%)	7697-37-2	9	1.0		NR	16	14.0	1	F	9	1.0		NR	10	1.0	1	NR	12	15.0	1	F	14	15.0	1	F
Sulfuric Acid (96%)	7664-93-9	7	10.5		NR	11	190371	1	NR	7	9.7		NR	7	10.5		NR	9	13.0		NR	10	14.6		NR
Phosphoric acid (85%)	7664-38-2	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR
ALKALIS/BASES																									
Ammonium Hydroxide (25%)	1336-21-6	74	1.0	3	HR	70	1.4	3	HR	74	1	3	HR	80	1	3	HR	99	1	3	HR	111	1	3	HR
Sodium Hydroxide (40%)	1310-73-2	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR	>240	0.0	5	HR
AROMATICS & HYDROCARBONS																									
Benzene	71-43-2	0	5393.8		NR	<5	16562		NR	0	5393.8		NR	0	5393.8		NR	0	5393.8		NR	0	5393.8		NR
Butyl Acetate	123-86-4	0	55.4		NR	<5	708		NR	0	55.4		NR	0	55.4		NR	0	55.4		NR	0	55.4		NR
Chloroform	67-66-3	0	81170.0		NR	0	103941		NR	0	81170.0		NR	0	81170.0		NR	0	81170.0		NR	0	81170.0		NR
DMSO	67-68-5	<5	232.0		NR	8	182		NR	<5	232.0		NR	<5	232.0		NR	<5	232.0		NR	<5	232.0		NR
Heptane	142-82-5	63	1.4	3	HR	30	2.3	2	R	63	1.2	3	HR	68	1.2	3	HR	84	1.4	3	HR	94	1.2	3	HR
Hexane	110-54-3	22	1.5	1	R	21	8.7	1	R	29	1.7	1	R	32	1.7	2	HR	39	1.7	2	HR	44	1.7	2	HR
Petroleum ether	8032-32-4	51	1.7	2	HR	22	1.0	1	R	51	1.2	2	HR	56	1.2	2	HR	68	1.7	3	HR	77	1.2	3	HR
Stoddard Solvent	68797-94-4	15	2.0	1	R	5	3.6		NR	15	1.9	1	R	16	2.8	1	R	20	2.8	1	R	22	2.8	1	R
Xylene	1330-20-7	<5	946.7		NR	<5	376.1		NR	<5	946.7		NR	<5	946.7		NR	<5	946.7		NR	<5	946.7		NR
CARBONYLS																									
Acetone	67-64-1	0	13816.3		NR	0	23929.6		NR	0	13816.3		NR	0	13816.3		NR	0	13816.3		NR	0	13816.3		NR
Acetonitrile	75-05-8	0	5656.5		NR	0	23847.8		NR	0	5656.5		NR	0	5656.5		NR	0	5656.5		NR	0	5656.5		NR
Cyclohexanone	108-94-1	<5	235.0		NR	9	463.8		NR	<5	235.0		NR	<5	235.0		NR	5	235.0		NR	6	235.0		NR
ALCOHOLS																									
2-butoxyethanol	111-76-2	35	4.4	2	HR	48	8.8	2	HR	35	4.4	2	HR	38	4.4	2	HR	46	3.9	2	HR	52	4.4	2	HR
Diacetone alcohol	123-42-2	32	46.4	2	R	16	131.4	1	F	32	30.9	2	R	35	46.4	2	R	43	46.4	2	R	48	46.4	2	R
Ethyl alcohol	64-17-5	<5	234.0		NR	16	6.4	1	R	<5	234.0		NR	<5	234.0		NR	<5	234.0		NR	<5	234.0		NR
Isopropyl alcohol	67-56-1	13	144.9	1	F	58	2.5	2	HR	11	10.6		F	15	11.5	1	F	15	14.1	1	F	17	15.9	1	F
Methanol	67-63-0	<5	168.5		NR	6	1088.7		NR	<5	168.5		NR	<5	168.5		NR	<5	168.5		NR	<5	168.5		NR



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Chemical Permeation (EN)		PowerChem®				PowerChem®			
Model Number		PC-95GR				PC-115GR			
Item Number		K00140X				K07140X			
Palm Thickness		0.12mm / 4.7mil				0.15mm / 5.9mil			
Compliance Requirement		EN 374-1:2016				EN 374-1:2016			
Test Method		EN 16523-1:2015				EN 16523-1:2015			
Chemical	CAS Number	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating
ACIDS									
Acetic Acid (Glacial)	64-19-7	27	37.2	1	F	18	37.2	1	F
Hydrochloric Acid (37%)	7647-01-0	17	4.9	1	R	21	4.9	1	R
Nitric Acid (70%)	7697-37-2	12	15.2	1	F	15	15.2	1	F
Sulfuric Acid (96%)	7664-93-9	7	1.2		NR	9	1.5		NR
Phosphoric acid (85%)	7664-38-2	>240	0.0	5	HR	>240	0.0	5	HR
ALKALIS/BASES									
Ammonium Hydroxide (25%)	1336-21-6	39	1	2	HR	49	1	2	HR
Sodium Hydroxide (40%)	1310-73-2	>240	0.0	5	HR	>240	0.0	5	HR
AROMATICS & HYDROCARBONS									
Benzene	71-43-2	0	4768.0		NR	0	5960.1		NR
Butyl Acetate	123-86-4	0	238.9		NR	0	298.6		NR
Chloroform	67-66-3	0	63053.1		NR	0	78816.4		NR
DMSO	67-68-5	0	187.2		NR	0	234.0		NR
Heptane	142-82-5	5	2099.2		NR	6	2624.0		NR
Hexane	110-54-3	0	1571.5		NR	0	1571.5		NR
Petroleum ether	8032-32-4	0	48.9		NR	0	61.2		NR
Stoddard Solvent	68797-94-4	<5	2.4		NR	<5	2.9		NR
Xylene	1330-20-7	<5	434.1		NR	<5	542.7		NR
CARBONYLS									
Acetone	67-64-1	0	8915.2		NR	0	11144.0		NR
Acetonitrile	75-05-8	<5	726.0		NR	<5	907.5		NR
Cyclohexanone	108-94-1	<5	268.5		NR	<5	335.6		NR
ALCOHOLS									
2-butoxyethanol	111-76-2	29	5.3	1	R	36	6.7	2	HR
Diacetone alcohol	123-42-2	14	47.6	1	F	18	59.5	1	F
Ethyl alcohol	64-17-5	16	1.9	1	R	20	2.4	1	R
Isopropyl alcohol	67-56-1	0	55.0		NR	22	3.5	1	R
Methanol	67-63-0	<5	38.4		NR	<5	48.0		NR

Chemical Permeation (EN)		MegaMan®			
Model Number		MM-11BK			
Item Number		N26088X / N26488X (VP)			
Palm Thickness		0.22mm / 8.5mil			
Compliance Requirement		EN 374-1:2016			
Test Method		EN 16523-1:2015			
Chemical	CAS Number	Minimum BTT (min)	Permeation Rate (ug/min/cm²)	Performance Level	Rating
ACIDS					
Acetic Acid (Glacial)	64-19-7	15	19.4	1	F
Hydrochloric Acid (37%)	7647-01-0	11	7.3	1	NR
Nitric Acid (70%)	7697-37-2	12	105.9	1	F
Sulfuric Acid (96%)	7664-93-9	10	11543.6		NR
Phosphoric acid (85%)	7664-38-2	>240	0.0	5	HR
ALKALIS/BASES					
Ammonium Hydroxide (25%)	1336-21-6	143	1	4	HR
Sodium Hydroxide (40%)	1310-73-2	>240	0.0	5	HR
AROMATICS & HYDROCARBONS					
Benzene	71-43-2	0	1707.4		NR
Butyl Acetate	123-86-4	0	22.8		NR
Chloroform	67-66-3	0	88412.9		NR
DMSO	67-68-5	<5	269.5		NR
Heptane	142-82-5	64	1.5	3	HR
Hexane	110-54-3	18	3.7	1	R
Petroleum ether	8032-32-4	49	1.2	2	HR
Stoddard Solvent	68797-94-4	21	1.8	1	R
Xylene	1330-20-7	<5	177.0		NR
CARBONYLS					
Acetone	67-64-1	<5	24792.0		NR
Acetonitrile	75-05-8	0	2230.1		NR
Cyclohexanone	108-94-1	<5	104.9		NR
ALCOHOLS					
2-butoxyethanol	111-76-2	36	5.0	2	HR
Diacetone alcohol	123-42-2	<5	179.2		NR
Ethyl alcohol	64-17-5	5	265.7		NR
Isopropyl alcohol	67-56-1	58	2.5	2	HR
Methanol	67-63-0	<5	108.0		NR



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