DUPONT™ TYCHEM® 4000 S

TECHNICAL DATA SHEET

CAT III

T3

T4

T5

T6

EN 1073-2

EN 1149-5

EN 14126



PRODUCT INFORMATION

DuPont™ Tychem® 4000 S. Hooded coverall. Stitched and over-taped seams. Double cuffs. Thumb loops. Elastication at wrists, ankles, face and waist. Double zippers and double flaps with chin flap. White.

ATTRIBUTES

Full Part Number	SLCHZ5TWH00
Fabric/Materials	Tychem® 4000
Design	Hooded coverall, double cuffs, double zippers and double flaps
Seam	Stitched and over-taped
Color	White
Sizes	SM, MD, LG, XL, 2X, 3X
Quantity/Box	20 per box, individually packed.

FEATURES

- Certified according to Regulation (EU) 2016/425
- Chemical protective clothing, Category III, Type 3-B, 4-B, 5-B and 6-B
- EN 14126 (barrier to infective agents), EN 1073-2 (protection against radioactive contamination)
- Antistatic treatment (EN 1149-5) - on inside
- Stitched and over-taped seams with barrier tape for protection and strength
- Double cuffs for good glove compability

SIZETABLE

PRODUCT SIZE	ARTICLE NUMBER	ADDITIONAL INFO
SM	D15193449	
MD	D15193451	
LG	D15193467	
XL	D15193473	
2X	D15193481	
3X	D15193494	

PHYSICAL PROPERTIES

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Abrasion Resistance [7]	EN 530 Method 2	>2000 cycles	6/6 [1]
Basis Weight	DIN EN ISO 536	124 g/m^2	N/A
Colour	N/A	White	N/A
Flex Cracking Resistance [7]	EN ISO 7854 Method B	>1000 cycles	1/6 [1]
Flex Cracking Resistance at -30°C	EN ISO 7854 Method B	>1000 cycles	N/A
Puncture Resistance	EN 863	>10 N	2/6 [1]
Surface Resistance at RH 25%, inside [7]	EN 1149-1	< 2,5 • 10^9 Ohm	N/A
Surface Resistance at RH 25%, outside [7]	EN 1149-1	No antistatic treatment	N/A
Tensile Strength (MD)	DIN EN ISO 13934-1	>100 N	3/6 [1]

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Tensile Strength (XD)	DIN EN ISO 13934-1	>100 N	3/6 [1]
Trapezoidal Tear Resistance (MD)	EN ISO 9073-4	>20 N	2/6 [1]
Trapezoidal Tear Resistance (XD)	EN ISO 9073-4	>20 N	2/6 [1]

1 According to EN 14325 | 2 According to EN 14126 | 3 According to EN 1073-2 | 4 According to EN 14116 | 12 According to EN 11612 | 5 Front Tyvek ® / Back | 6 Based on test according to ASTM D-572 | 7 See Instructions for Use for further information, limitations and warnings | > Larger than | < Smaller than | N/A Not Applicable | STD DEV Standard Deviation |

GARMENT PERFORMANCE

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Nominal protection factor [7]	EN 1073-2	>5	1/3 [3]
Seam Strength	EN ISO 13935-2	>125 N	4/6 [1]
Shelf Life [7]	N/A	5 years [6]	N/A
Type 3: Resistance to Penetration by Liquids (Jet Test)	EN 17491-3	Pass [7]	N/A
Type 4: Resistance to Penetration by Liquids (High Level Spray Test)	EN ISO 17491-4, Method B	Pass	N/A
Type 5: Inward Leakage of Airborne Solid Particulates	EN ISO 13982-2	Pass [7]	N/A
Type 6: Resistance to Penetration by Liquids (Low Level Spray Test)	EN ISO 17491-4, Method A	Pass	N/A

1 According to EN 14325 | 3 According to EN 1073-2 | 12 According to EN 11612 | 13 According to EN 11611 | 5 Front Tyvek ® / Back | 6 Based on test according to ASTM D-572 | 7 See Instructions for Use for further information, limitations and warnings | 11 Based on the average of 10 suits, 3 activities, 3 probes | > Larger than | < Smaller than | N/A Not Applicable | * Based on lowest single value |

COMFORT

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Air Permeability (Gurley method)	ISO 5636-5	No	N/A
Moisture Vapour Permeability	EN ISO 12752 Klima C	Impermeable	N/A

2 According to EN 14126 | 5 Front Tyvek ® / Back | > Larger than | < Smaller than | N/A Not Applicable |

PENETRATION AND REPELLENCY

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Repellency to Liquids, o-Xylene	EN ISO 6530	>95 %	3/3 [1]
Repellency to Liquids, Butan-1-ol	EN ISO 6530	>95 %	3/3 [1]
Repellency to Liquids, Sodium Hydroxide (10%)	EN ISO 6530	>95 %	3/3 [1]
Repellency to Liquids, Sulphuric Acid (30%)	EN ISO 6530	>95 %	3/3 [1]
Resistance to Penetration by Liquids, Butan-1-ol	EN ISO 6530	<1 %	3/3 [1]
Resistance to Penetration by Liquids, Sodium Hydroxide (10%)	EN ISO 6530	<1 %	3/3 [1]
Resistance to Penetration by Liquids, Sulphuric Acid (30%)	EN ISO 6530	<1 %	3/3 [1]
Resistance to Penetration by Liquids, o-Xylene	EN ISO 6530	<1 %	3/3 [1]

1 According to EN 14325 | > Larger than | < Smaller than |

BIOLOGICAL BARRIER

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Resistance to Penetration by Biologically Contaminated Aerosols	ISO/DIS 22611	log ratio >5	3/3 [2]
Resistance to Penetration by Blood and Body Fluids using Synthetic Blood	ISO 16603	20 kPa	6/6 [2]
Resistance to Penetration by Blood-borne Pathogens using Bacteriophage Phi-X174	ISO 16604 Procedure C	20 kPa	6/6 [2]

PROPERTY	TEST METHOD	TYPICAL RESULT	EN
Resistance to Penetration by Contaminated Liquids	EN ISO 22610	>75 min	6/6 [2]
Resistance to Penetration by Contaminated Solid Particles	ISO 22612	log cfu <1	3/3 [2]

1 According to EN 14325 | > Larger than | < Smaller than |

PERMEATION DATA DUPONT™ TYCHEM® 4000 S

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
2-(2-Ethoxyethoxy) ethanol	Liquid	111-90-0	>480	>480	>480	6	<0.08	0.08	<38.4	>480	6
Acetic acid (>95%)	Liquid	64-19-7	>480	>480	>480	6	<0.02	0.02	<9.6	>480	6
Acetic acid 2 ethoxy ethyl ester	Liquid	111-15-9	67*/180	116*/238	>480	6	0.11	0.01	3.04	>480	6
Acetic acid 2 methoxy ethyl ester	Liquid	110-49-6	60	>480	>480	6	0.03	0.005	3.97	>480	6
Acetic acid ethenyl ester	Liquid	108-05-4	23	24	30	1	20.3	0.0139			
Acetic acid ethyl ester	Liquid	141-78-6	imm	imm	imm* /167		1.55	0.01			
Acetic anhydride	Liquid	108-24-7	imm*/23	12*/48	>480	6	na	0.006			
Acetic chloride	Liquid	75-36-5	23	39*/63	>480	6	0.146	0.006			
Acetone	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Acetonitrile	Liquid	75-05-8	56	60	>480	6	0.35	0.05			
Acetyl chloride	Liquid	75-36-5	23	39*/63	>480	6	0.146	0.006			
Acroleic acid	Liquid	79-10-7		>480	>480	6	<0.1	0.029			
Acrolein (90%)	Liquid	107-02-8		24	24	1	7.9	0.009			
Acrylamide (50%)	Liquid	79-06-1	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Acrylic acid	Liquid	79-10-7		>480	>480	6	<0.1	0.029			
Acrylic acid n-butyl ester	Liquid	141-32-2	>480	>480	>480	6	<0.05	0.05	>480	>480	6
Acrylicamide (50%)	Liquid	79-06-1	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Acrylonitrile	Liquid	107-13-1		36*/48	36*/48	2	3.2	0.0085			
Acryloyl Chloride	Liquid	814-68-6	imm	imm	imm		na	0.04	441/40 min	23	1
Allyl alcohol	Liquid	107-18-6	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Amino 3,4-dichlorobenzene, 1- (70 °C, molten)	Liquid	95-76-1	imm	imm	imm		17	0.001			
Amino benzene	Liquid	62-53-3	322	>480	>480	6	<0.025	0.005			
Amino ethylethanolamine	Liquid	111-41-1	imm	imm	>480	6	<0.3	0.005			
Amino ethylethanolamine (60%)	Liquid	111-41-1	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Amino ethylpiperazine	Liquid	140-31-8	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Amino pyridine, 2- (sat)	Liquid	504-29-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Ammonia (gaseous)	Vapor	7664-41-7	25	26	33	2	0.25	0.0024			
Ammonium hydroxide (2-3% in Householdcleaner)	Liquid	1336-21-6		>480	>480	6	<0.1	0.0027			
Ammonium hydroxide (32%)	Liquid	1336-21-6	24	>480	>480	6	0.04	0.01	20	>480	6
Aniline	Liquid	62-53-3	322	>480	>480	6	<0.025	0.005			
Antimony pentachloride	Liquid	7647-18-9	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Benzenamine	Liquid	62-53-3	322	>480	>480	6	<0.025	0.005			
Benzene	Liquid	71-43-2	imm	imm	imm		>300	0.0126			
Benzyl alcohol	Liquid	100-51-6	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Bis (4-(2,3-epoxypropoxy) phenyl)propane (80%)	Liquid	1675-54-3	>480	>480	>480	6	<0.05	0.05	<24	>480	6

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Bis phenol A diglycidyl ether (80%)	Liquid	1675-54-3	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Black Liquor (mix)	Liquid	mix	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Bromo methane	Vapor	74-83-9		>480	>480	6	<0.1	0.0153			
Butadiene, 1,3- (gaseous)	Vapor	106-99-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Butanal, n-	Liquid	123-72-8	22	41	>480	6	0.16	0.004			
Butanol, 1-	Liquid	71-36-3	>480	>480	>480	6	<0.004	0.004	<1.9	>480	6
Butanol, n-	Liquid	71-36-3	>480	>480	>480	6	<0.004	0.004	<1.9	>480	6
Butanone	Liquid	78-93-3		18	18	1	145	0.0116			
Butanone oxime, 2-	Liquid	96-29-7	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Butenal, 2-	Liquid	123-73-9		34	34	2	14	0.0113			
Butoxy ethanol, 2-	Liquid	111-76-2	>480	>480	>480	6	<0.005	0.005	<2.4		
Butyl acrylate, n-	Liquid	141-32-2	>480	>480	>480	6	<0.05	0.05	>480	>480	6
Butyl alcohol, n-	Liquid	71-36-3	>480	>480	>480	6	<0.004	0.004	<1.9	>480	6
Butyraldehyde, n-	Liquid	123-72-8	22	41	>480	6	0.16	0.004			
Carbon disulfide	Liquid	75-15-0	imm	imm	imm		15.5	0.05			
Carburant n° 2	Liquid	68476-30-2	87*/109	>480	>480	6	<0.1	0.005			
Caustic ammonia (2-3% in Householdcleaner)	Liquid	1336-21-6		>480	>480	6	<0.1	0.0027			
Caustic ammonia (32%)	Liquid	1336-21-6	24	>480	>480	6	0.04	0.01	20	>480	6
Caustic soda (50%)	Liquid	1310-73-2	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Cellosolve acetate	Liquid	110-80-5	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Chemidize 727 ND (mix)	Liquid	mix	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Chlorine (gaseous)	Vapor	7782-50-5	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Chloro 1-methylbenzene, 2-	Liquid	95-49-8		13	13	1	102	0.0204			
Chloro 2,3-epoxy propane, 1-	Liquid	106-89-8	15	15	15	1	>248	0.01			
Chloro acetic acid (80%)	Liquid	79-11-8	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Chloro acetone (95%)	Liquid	78-95-5	360	258	258	5	0.557	0.0149			
Chloro acetyl chloride	Liquid	79-04-9	100	120	150	4	>3.7	0.01			
Chloro aniline, p- (70 °C, molten)	Liquid	106-47-8	imm	imm	imm		90	0.001			
Chloro benzenamine, 4- (70 °C, molten)	Liquid	106-47-8	imm	imm	imm		90	0.001			
Chloro ethene	Vapor	75-01-4	>480	>480	>480	6	<0.06	0.06	<28.8	>480	6
Chloro form	Liquid	67-66-3	imm	imm	imm						
Chloro propan-2-one, 1- (95%)	Liquid	78-95-5	360	258	258	5	0.557	0.0149			
Chloro toluene, o-	Liquid	95-49-8		13	13	1	102	0.0204			
Chlorsulfonic acid	Liquid	7790-94-5		>480	>480	6	<0.1	0.038			
Chromic acid (CrO3) (44.9%)	Liquid	1333-82-0	>480	>480	>480	6	<0.07	0.07	<33.6	>480	6
Cresol o-	Liquid	95-48-7		>480	>480	6	<0.1	0.0174			
Cresols, mixed isomers	Liquid	1319-77-3	100	100	90*/130	3	1.14	0.01			
Cresylic acid	Liquid	1319-77-3	100	100	90*/130	3	1.14	0.01			
Croton aldehyde	Liquid	123-73-9		34	34	2	14	0.0113			
Crude oil	Liquid	8002-05-9	162*/286	>480	>480	6	<0.075	0.04			
Cyanoethylene	Liquid	107-13-1		36*/48	36*/48	2	3.2	0.0085			
Cyanomethane	Liquid	75-05-8	56	60	>480	6	0.35	0.05			

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Cyclo hexanone	Liquid	108-94-1		136	136	4	8	0.0158			
Cyclo hexyl isocanyte	Liquid	3173-53-3		36*/54			1.74	0.0202			
Diaminoethane, 1,2-	Liquid	107-15-3	>480	>480	>480	6	<0.0097	0.0097	<4.7	>480	6
Dichlorbenzen, 1,2-	Liquid	95-50-1	imm	76	>480	6	0.8	0.005	102.5	>480	6
Dichlorbenzen, 1,3-	Liquid	541-73-1	imm	45	57	2	1.8	0.005	251.7	nm	
Dichlorbenzen, 1,4- (50% in Ethanol)	Liquid	106-46-7	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Dichlorethane, 1.2.-	Liquid	107-06-2	imm	imm	imm		<80	0.04	676/20 min	10	
Dichloro -4,4'-methylenedianiline, 2,2'- (sat in Methanol)	Liquid	101-14-4		>480	>480	6	<0.1	0.043			
Dichloro aniline, 3,4- (70 ° C, molten)	Liquid	95-76-1	imm	imm	imm		17	0.001			
Dichloro methane	Liquid	75-09-2	imm	imm	imm		30.4	0.09			
Diesel Fuel Grade D-2	Liquid	mix	>480	>480	>480	6	<0.03	0.03	<14.4	>480	6
Diethyl amine	Liquid	109-89-7	15	15	15	1	11.5	0.05			
Diethyl aniline crude	Liquid	91-66-7		>480	>480	6	<0.1	0.024			
Diethyl benzene (95%)	Liquid	25340-17-4	30	31	42	2	19.7	0.0216			
Diethyl ethanamine, N,N-	Liquid	121-44-8	12	12*/22	>480	6	0.23	0.04			
Diethyl ether	Liquid	60-29-7	imm	imm	imm			0.002			
Diethyl m-toluidine, N,N-	Liquid	91-67-8	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Diethylene imide oxide	Liquid	110-91-8		158	>480	6	0.114	0.014			
Diethylene triamine	Liquid	111-40-0	imm	imm* /321	>480	6	<0.15	0.005	0.3	>480	6
Dimethyl acetamide, N,N-	Liquid	127-19-5	91	96	115	3	2.76	0.014			
Dimethyl dichlorosilane	Liquid	75-78-5		46	>480	6	0.131	0.0208			
Dimethyl formamide, N,N-	Liquid	68-12-2	86	90	>480	6	0.56	0.03	146	>480	6
Dimethyl hydrazine, N,N-	Liquid	57-14-7	13	13	11*/47	1	2.62	0.01			
Dimethyl ketal	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Dimethyl ketone	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Dimethyl maleate	Liquid	624-48-6		>480	>480	6	<0.1	0.0232			
Dimethyl sulfate	Liquid	77-78-1	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Diphenyl methane diisocyanate, 4,4'- (50 °C, molten)	Liquid	101-68-8	>480	>480	>480	6	<0.0403	0.0403	<19.3	>480	6
Disodium sulfide (60% (slurry))	Liquid	1313-82-2		>480	>480	6	<0.1	0.052			
Epichlorohydrin	Liquid	106-89-8	15	15	15	1	>248	0.01			
Epoxy ethane (gaseous)	Vapor	75-21-8	imm	imm	imm		21.8	0.01			
Ethane 1,2-diol	Liquid	107-21-1	>480	>480	>480	6	<0.006	0.006	<2.8	>480	6
Ethane diol dipropanoate, 1,2-	Liquid	123-73-9		34	34	2	14	0.0113			
Ethane nitrile	Liquid	75-05-8	56	60	>480	6	0.35	0.05			
Ethane thiol	Liquid	75-08-1	imm	imm	imm		498	0.01			
Ethanol	Liquid	64-17-5		>480	>480	6	<0.1	0.0074			
Ethanoyl chloride	Liquid	75-36-5	23	39*/63	>480	6	0.146	0.006			
Ethoxy ethanol, 2-	Liquid	110-80-5	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Ethoxy ethylacetat	Liquid	111-15-9	67*/180	116*/238	>480	6	0.11	0.01	3.04	>480	6
Ethyl Cellosolve®	Liquid	110-80-5	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Ethyl acetate	Liquid	141-78-6	imm	imm	imm* /167		1.55	0.01			
Ethyl alcohol	Liquid	64-17-5		>480	>480	6	<0.1	0.0074			

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Ethyl benzene	Liquid	100-41-4	imm	imm	>480	6	<0.25	0.005	8.7	>480	6
Ethyl ethanamine, N-	Liquid	109-89-7	15	15	15	1	11.5	0.05			
Ethyl ether	Liquid	60-29-7	imm	imm	imm			0.002			
Ethyl glycol acetate	Liquid	111-15-9	67*/180	116*/238	>480	6	0.11	0.01	3.04	>480	6
Ethyl mercaptan	Liquid	75-08-1	imm	imm	imm		498	0.01			
Ethyl nitrile	Liquid	75-05-8	56	60	>480	6	0.35	0.05			
Ethylene carboxylic acid	Liquid	79-10-7		>480	>480	6	<0.1	0.029			
Ethylene diamine	Liquid	107-15-3	>480	>480	>480	6	<0.0097	0.0097	<4.7	>480	6
Ethylene dichloride	Liquid	107-06-2	imm	imm	imm		<80	0.04	676/20 min	10	
Ethylene glycol	Liquid	107-21-1	>480	>480	>480	6	<0.006	0.006	<2.8	>480	6
Ethylene glycol mono ethyl ether acetate	Liquid	111-15-9	67*/180	116*/238	>480	6	0.11	0.01	3.04	>480	6
Ethylene glycol monobutyl ether	Liquid	111-76-2	>480	>480	>480	6	<0.005	0.005	<2.4		
Ethylene glycol monoethyl ether	Liquid	110-80-5	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Ethylene glycol monomethyl ether	Liquid	109-86-4	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Ethylene glycol monomethyl ether acetate	Liquid	110-49-6	60	>480	>480	6	0.03	0.005	3.97	>480	6
Ethylene oxide (gaseous)	Vapor	75-21-8	imm	imm	imm		21.8	0.01			
Ethylene tetrachloride	Liquid	127-18-4	imm	imm	imm		2.28	0.03			
Ethylene trichloride	Liquid	79-01-6	imm	imm	imm						
Ferric (III) chloride (50%)	Liquid	7705-08-0		>480	>480	6	<0.046	0.046			
Fluorobenzene	Liquid	462-06-6	imm	imm	imm		>500	0.1			
Fluoroboric acid (48-50%)	Liquid	16872-11-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Fluorosilicic acid (33-35%)	Liquid	16961-83-4	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Formaldehyde (37%)	Liquid	50-00-0	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Formalin (37% (10-15% Methanol))	Liquid	50-00-0	>480	>480	>480	6	<0.0048	0.0048	<2.3	>480	6
Formalin (37%)	Liquid	50-00-0	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Formic acid (88%)	Liquid	64-18-6		>480	>480	6	<0.1	0.019			
Fuel-oil no 2	Liquid	68476-30-2	87*/109	>480	>480	6	<0.1	0.005			
Furaldehyde, 2-	Liquid	98-01-1		198*/227			1.1	0.0155			
Furfural	Liquid	98-01-1		198*/227			1.1	0.0155			
Gasoline, unleaded	Liquid	86290-81-5	imm	imm	imm		4.8	0.03			
Gasoline, unleaded E10 (87 Octane)	Liquid	308066-70-8	imm	imm	imm		>13.83	0.04			
Glutaral (50%)	Liquid	111-30-8		>480	>480	6	<0.0161	0.0161			
Glutaraldehyde (50%)	Liquid	111-30-8		>480	>480	6	<0.0161	0.0161			
Glycol alcohol	Liquid	107-21-1	>480	>480	>480	6	<0.006	0.006	<2.8	>480	6
Green Liquor (mix)	Liquid	mix	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Hexamethyl disilazane	Liquid	999-97-3		>480	>480	6	<0.1	0.026			
Hexamethyl disilazane, 1,1,1,3,3,3-	Liquid	999-97-3		>480	>480	6	<0.1	0.026			
Hexamethylene diamine (50 °C, molten)	Liquid	124-09-4	60	80	120	3	>1.52	0.01			
Hexamethylene diisocyanate	Liquid	822-06-0	>480	>480	>480	6	<0.0271	0.0271	<13	>480	6
Hexane, n-	Liquid	110-54-3	imm	imm	>480	6	0.42	0.01			
Hexanone	Liquid	108-94-1		136	136	4	8	0.0158			
Hydrazine	Liquid	302-01-2		>480	>480	6	<0.1	0.0052			

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Hydriodic acid (47%)	Liquid	10034-85-2		>480	>480	6	<0.1	0.052			
Hydrochloric acid (37%)	Liquid	7647-01-0		>480	>480	6	<0.1	0.015			
Hydrofluoric acid (48-51%)	Liquid	7664-39-3		>480	>480	6	<0.1	0.008			
Hydrofluoric acid (70%)	Liquid	7664-39-3	98	143	>480	6	<0.5	0.04	84.8	>480	6
Hydrogen chloride (gaseous)	Vapor	7647-01-0		>480	>480	6	<0.1	0.015			
Hydrogen fluoride (20-27 ° C, gaseous)	Vapor	7664-39-3	93*/133	93*/134	94*/138	3	40.1	0.0008			
Hydrogen peroxide (30%)	Liquid	7722-84-1		>480	>480	6	<0.1	0.014			
Hydroxy 2-nitrobenzene, 1- (70 °C, molten)	Liquid	88-75-5		imm	imm		4.53	0.004			
Hydroxy toluene	Liquid	100-51-6	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Hydroxy toluene, o-	Liquid	95-48-7		>480	>480	6	<0.1	0.0174			
Iodine	Solid	7553-56-2		>480	>480	6	<0.1	0.0409			
Iodomethane	Liquid	74-88-4	imm	imm	imm		342	0.007			
Isoamyl alcohol	Liquid	123-51-3	>480	>480	>480	6	<0.006	0.006	<2.9	>480	6
Isopropanol	Liquid	67-63-0	>480	>480	>480	6	<0.0097	0.0097	<4.7	>480	6
Isopropanol (70%)	Liquid	67-63-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Isopropyl alcohol	Liquid	67-63-0	>480	>480	>480	6	<0.0097	0.0097	<4.7	>480	6
Isopropyl alcohol (70%)	Liquid	67-63-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Isopropylidenediphenol diglycidyl ether, 4,4'- (80%)	Liquid	1675-54-3	>480	>480	>480	6	<0.05	0.05	<24	>480	6
JP-4 Jet Fuel	Liquid	50815-00-4	imm	imm	imm*/22		>13	0.05			
JP-8 Jet Fuel	Liquid	94114-58-6	27	39*/67	>480	6	0.61	0.01			
Kerosene	Liquid	8008-20-6		69			0.185	0.0185			
Ketone propane	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Lewisite (L), MIL-STD-282 (10 g/m^2)	Liquid	541-25-3		>360[8]							
Maleic anhydride (66 °C, molten)	Liquid	108-31-6	12	13	18	1	9.2	0.016			
Mercuric II chloride (sat)	Liquid	7487-94-7		>480	>480	6	<0.1	0.087			
Mercury	Liquid	7439-97-6	>480	>480	>480	6	<0.09	0.09	<43.2	>480	6
Methanesulphonic acid (70%)	Liquid	75-75-2		>480	>480	6	<0.1	0.031			
Methanol	Liquid	67-56-1	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Methoxy 2-methylpropane, 2-	Liquid	1634-04-4	17	>480	>480	6	<0.1	0.004			
Methoxy ethanol, 2	Liquid	109-86-4	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Methoxy ethylacetate, 2-	Liquid	110-49-6	60	>480	>480	6	0.03	0.005	3.97	>480	6
Methyl 2-methyl-2-propenoate	Liquid	80-62-6		23	23	1	161	0.0161			
Methyl 2-pyrrolidon, N-	Liquid	872-50-4	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Methyl acetyl	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Methyl acrolein	Liquid	123-73-9		34	34	2	14	0.0113			
Methyl aniline, o-	Liquid	95-53-4	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Methyl benzol	Liquid	108-88-3	imm	imm	imm		5.87	0.03			
Methyl bromide	Vapor	74-83-9		>480	>480	6	<0.1	0.0153			
Methyl butan-1-ol, 3-	Liquid	123-51-3	>480	>480	>480	6	<0.006	0.006	<2.9	>480	6
Methyl chloride (-70 °C, liquid)	Vapor	74-83-9		>480	>480	6	<0.1	0.0153			
Methyl chloride (gaseous)	Vapor	74-87-3	>480	>480	>480	6	<0.02	0.02	<9.6	>480	6

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Methyl cyanide	Liquid	75-05-8	56	60	>480	6	0.35	0.05			
Methyl ethyl ketone	Liquid	78-93-3		18	18	1	145	0.0116			
Methyl ethyl ketoxime	Liquid	96-29-7	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Methyl iodide	Liquid	74-88-4	imm	imm	imm		342	0.007			
Methyl isocyanate	Liquid	624-83-9	imm	imm	imm		210	0.0081			
Methyl ketone	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Methyl methacrylate	Liquid	80-62-6		23	23	1	161	0.0161			
Methyl phenols	Liquid	1319-77-3	100	100	90*/130	3	1.14	0.01			
Methyl salicylate	Liquid	119-36-8	>480	>480	>480	6	<0.006	0.006	<2.9	>480	6
Methyl tert-butyl ether	Liquid	1634-04-4	17	>480	>480	6	<0.1	0.004			
Methylen Isocyclohexylamine, 4,4- (50 °C, molten)	Liquid	1761-71-3	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Methylene bis(2-Chloroaniline), 4,4- (sat in Methanol)	Liquid	101-14-4		>480	>480	6	<0.1	0.043			
Methylene chloride	Liquid	75-09-2	imm	imm	imm		30.4	0.09			
Methylene diphenyl diisocyanate, 4,4'- (50 °C, molten)	Liquid	101-68-8	>480	>480	>480	6	<0.0403	0.0403	<19.3	>480	6
Mineral oil	Liquid	8012-95-1	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Mineral spirit	Liquid	64475-85-0		190	>480	6	0.27	0.018			
Morpholine	Liquid	110-91-8		158	>480	6	0.114	0.014			
Naphthalene (25% in Diethylene glycol dimethylether)	Liquid	91-20-3	57	79	>480	6	<0.5	0.007	54	>480	6
Nitric acid (70%)	Liquid	7697-37-2		>480	>480	6	<0.1	0.025			
Nitro benzene	Liquid	98-95-3	55	59	78	3	na	0.05			
Nitro phenol, o- (70 °C, molten)	Liquid	88-75-5		imm	imm		4.53	0.004			
Nitro toluene, 2-	Liquid	88-72-2	95	95	141*/255	4	2	0.07			
Norflurane	Vapor	811-97-2		>480	>480	6	<0.1	0.0164			
Oleum (20% free SO3)	Liquid	8014-95-7	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Oleum (30% free SO3)	Liquid	8014-95-7	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
PCB 1254 (50% in Mineral Oil)	Liquid	11097-69-1		>480	>480	6	<0.1	0.0483			
PCB 1254 (90%)	Liquid	11097-69-1		>480	>480	6	<0.1	0.0483			
Pentachloroantimony	Liquid	7647-18-9	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Pentanedial, 1,5- (50%)	Liquid	111-30-8		>480	>480	6	<0.0161	0.0161			
Phenethylene	Liquid	100-42-5		16	16	1	na	83.6			
Phenol (45 °C, molten)	Liquid	108-95-2	41	44	79	3	na	0.05	<79, 120 min	148	4
Phenol (60 °C, molten)	Liquid	108-95-2	imm	imm	imm		<20	0.01	455/52 min	31	2
Phenol (85%)	Liquid	108-95-2	>480	>480	>480	6	<0.006	0.006	<2.9	>480	6
Phenyl amine	Liquid	62-53-3	322	>480	>480	6	<0.025	0.005			
Phenyl ethane	Liquid	100-41-4	imm	imm	>480	6	<0.25	0.005	8.7	>480	6
Phenyl ethanol, 1-	Liquid	98-85-1	>480	>480	>480	6	<0.06	0.06	<28.8	>480	6
Phenyl glycidyl ether	Liquid	122-60-1	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Phenyl trichlorosilane	Liquid	98-13-5		>480	>480	6	<0.1	0.0341			
Phosphoric acid (85%)	Liquid	7664-38-2		>480	>480	6	<0.1	0.039			
Phosphorus trichloride	Liquid	7719-12-2	imm	imm	imm		>1000	0.01			
Pimelic ketone	Liquid	108-94-1		136	136	4	8	0.0158			

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Polymethylene polyphenyle isocyanate (p-MDI)	Liquid	9016-87-9	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Potassium acetate (sat)	Liquid	127-08-2	>480	>480	>480	6	<0.02	0.02	<9.6	>480	6
Potassium chromate (sat)	Liquid	7789-00-6	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Potassium hydroxide (45%)	Liquid	1310-58-3	>480	>480	>480	6	<0.1	0.023	>480		
Prop-2-en-1-al (90%)	Liquid	107-02-8		24	24	1	7.9	0.009			
Propan -2-ol	Liquid	67-63-0	>480	>480	>480	6	<0.0097	0.0097	<4.7	>480	6
Propan -2-ol (70%)	Liquid	67-63-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Propan -2-one	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Propen 1-ol, 2-	Liquid	107-18-6	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Propenamide (50%)	Liquid	79-06-1	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Propene acid	Liquid	79-10-7		>480	>480	6	<0.1	0.029			
Propenenitrile, 2-	Liquid	107-13-1		36*/48	36*/48	2	3.2	0.0085			
Propenoic acid butyl ester, 2-	Liquid	141-32-2	>480	>480	>480	6	<0.05	0.05	>480	>480	6
Propenoic acid nitrile	Liquid	107-13-1		36*/48	36*/48	2	3.2	0.0085			
Propyl bromide, n-	Liquid	106-94-5		12	12	1	16.2	0.04			
Propylene aldehyde	Liquid	123-73-9		34	34	2	14	0.0113			
Pyridine	Liquid	110-86-1		31	31	2	63.5	0.0127			
Pyroacetic ether	Liquid	67-64-1	13	13	29*/258	1	0.9	0.01			
Sarin (GB), MIL-STD-282 (10 g/m^2)	Liquid	107-44-8		>480[8]							
Silicon tetrachloride	Liquid	10026-04-7	35	35	35	2	>43	0.01			
Sodium bisulphite (38-40%)	Liquid	7631-90-5	>480	>480	>480	6	<0.07	0.07	<33.6	>480	6
Sodium cyanide (sat)	Liquid	143-33-9	>480	>480	>480	6	<0.05	0.05	<24	>480	6
Sodium fluoride (sat)	Liquid	7681-49-4		>480	>480	6	<0.1	0.014			
Sodium hydroxide (50%)	Liquid	1310-73-2	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Sodium hypochlorite (15%)	Liquid	7681-52-9	>480	>480	>480	6	<0.03	0.03	<14.4	>480	6
Sodium metabisulphite (38%)	Liquid	7681-57-4		>480	>480	6	<0.1	0.052			
Spiritus	Liquid	64-17-5		>480	>480	6	<0.1	0.0074			
Styrene	Liquid	100-42-5		16	16	1	na	83.6			
Sulfur Mustard (HD), MIL-STD-282 (10 g/m^2)	Liquid	505-60-2		>480[8]							
Sulfur dioxide	Vapor	7446-09-5	>480	>480	>480	6	<0.02	0.02	<9.6	>480	6
Sulfuric acid (>95%)	Liquid	7664-93-9	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Sulfuric acid dimethyl ester	Liquid	77-78-1	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Sulfuric acid fuming (20% free SO3)	Liquid	8014-95-7	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6
Sulfuric acid fuming (30% free SO3)	Liquid	8014-95-7	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Tetrachloro ethane, 1,1,2,2,-	Liquid	79-34-5	25	25	37	2	75.4	0.027			
Tetrachloro ethylene, 1,1,2,2-	Liquid	127-18-4	imm	imm	imm		2.28	0.03			
Tetraethyl ammonium hydroxide (35%)	Liquid	77-98-5		>480	>480	6	<0.0237	0.0237			
Tetraethylene pentamine	Liquid	112-57-2	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Tetrafluoroethane, 1,1,1,2-	Vapor	811-97-2		>480	>480	6	<0.1	0.0164			

HAZARD / CHEMICAL NAME	PHYSICAL STATE	CAS	BT ACT	BT 0.1	BT 1.0	EN	SSPR	MDPR	CUM 480	TIME 150	ISO
Tetrahydrofuran	Liquid	109-99-9	imm	imm	imm		238.8	0.08			
Tetramethyl ammonium hydroxide (25%)	Liquid	75-59-2	>480	>480	>480	6	<0.025	0.025	<12	>480	6
Thioalkohol	Liquid	75-08-1	imm	imm	imm		498	0.01			
Titan(IV) chloride	Liquid	7550-45-0	imm	imm	45	2	>497	0.01			
Titanium tetrachloride	Liquid	7550-45-0	imm	imm	45	2	>497	0.01			
Toluene	Liquid	108-88-3	imm	imm	imm		5.87	0.03			
Toluene diisocyanate, 2,4-	Liquid	584-84-9	>480	>480	>480	6	<0.0281	0.0281	<13.5	>480	6
Toluene diisocyanate, 2,4- (80%)	Liquid	584-84-9		>480	>480	6	<0.1	0.0281			
Toluidine, m-	Liquid	108-44-1	201	>480	>480	6	0.08	0.005			
Toluidine, o-	Liquid	95-53-4	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Trichlor vinylsilane	Liquid	75-94-5	90	100	110	3	>1.2	0.01			
Trichloro benzene, 1,2,4-	Liquid	120-82-1	87	87	175	4	>2.5	0.1			
Trichloro ethanol, 2,2,2-	Liquid	115-20-8	>480	>480	>480	6	<0.008	0.008	<3.8	>480	6
Trichloro ethylene	Liquid	79-01-6	imm	imm	imm						
Trichloro methane	Liquid	67-66-3	imm	imm	imm						
Trichloro phenylsilane	Liquid	98-13-5		>480	>480	6	<0.1	0.0341			
Trichloro silane	Liquid	10025-78-2	45	60	60	2	>2.5	0.01			
Triethyl amine	Liquid	121-44-8	12	12*/22	>480	6	0.23	0.04			
Triethylentetramine (60%)	Liquid	112-24-3	>480	>480	>480	6	<0.005	0.005	<2.4	>480	6
Trifluoro acetic acid	Liquid	76-05-1	imm	>480	>480	6		0.004			
Trifluoro methansulfonic acid	Liquid	1493-13-6	66*/88	>480	>480	6		0.009			
Trimethyl phosphite	Liquid	121-45-9	208	210	229	4	na	0.02			
VM & P Naphtha	Liquid	8030-30-6	imm	imm	11*/15	1	21.7	0.0201			
VX Nerve Agent, MIL-STD-282 (10 g/m^2)	Liquid	50782-69-9		>480[8]							
Vinyl acetate	Liquid	108-05-4	23	24	30	1	20.3	0.0139			
Vinyl benzol	Liquid	100-42-5		16	16	1	na	83.6			
Vinyl carbinol	Liquid	107-18-6	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Vinyl chloride	Vapor	75-01-4	>480	>480	>480	6	<0.06	0.06	<28.8	>480	6
Vinyl cyanide	Liquid	107-13-1		36*/48	36*/48	2	3.2	0.0085			
Vinyl ethylene (gaseous)	Vapor	106-99-0	>480	>480	>480	6	<0.01	0.01	<4.8	>480	6
Vinyl magnesium chloride (15% in Tetrahydrofuran)	Liquid	3536-96-7	imm	imm	imm		3.27	0.01			
Vinyl pyridine, 4-	Liquid	100-43-6	15	15	45	2	>1.93	0.01			
White Liquor	Liquid	mix	>480	>480	>480	6	<0.04	0.04	<19.2	>480	6

BTAct (Actual) Breakthrough time at MDPR [mins] | BT0.1 Normalized breakthrough time at 0.1 µg/cm²/min [mins] | BT1.0 Normalized breakthrough time at 1.0 µg/cm²/min [mins] | EN Classification according to EN 14325 | SSPR Steady state permeation rate [µg/cm²/min] | MDPR Minimum detectable permeation rate [µg/cm²/min] | CUM480 Cumulative permeation mass after 480 mins [µg/cm²] | Time150 Time to reach cumulative permeation mass of 150 µg/cm² [mins] | ISO Classification according to ISO 16602 | CAS Chemical abstracts service registry number | min Minute | > Larger than | < Smaller than | imm Immediate (< 10 min) | nm Not tested | sat Saturated solution | N/A Not Applicable | na Not attained | GPR grade General purpose reagent grade | * Based on lowest single value | 8 Actual breakthrough time; normalized breakthrough time is not available | DOT5 Degradation after 5 min | DOT30 Degradation after 30 min | DOT60 Degradation after 60 min | DOT240 Degradation after 240 min | BT1383 Normalized breakthrough time at 0.1 µg/cm²/min [mins] acc. ASTM F1383 |

Important Note

The permeation data published have been generated for DuPont by independent accredited testing laboratories according to the test method applicable at that time (EN ISO 6529 (method A and B), ASTM F739, ASTM F1383, ASTM D6978, EN369, EN 374-3) The data is typically the average of three fabrics samples tested.

All chemicals have been tested at an assay of greater than 95 (w/w) % unless otherwise stated. The tests were performed between 20 °C and 27 °C and at environmental pressure unless otherwise stated. A different temperature may have significant influence on the breakthrough time. Permeation typically increases with temperature. Cumulative permeation data have been measured or have been calculated based on minimum detectable permeation rate. Cytostatic drugs testing has been performed at a test temperature of 27°C according to ASTM D6978 or ISO 6529 with the additional requirement of reporting a normalized breakthrough time at 0.01 µg/cm²/min. Chemical warfare agents (Lewisite, Sarin, Soman, Mustard, Tabun and VX Nerve Agent) have been tested according to MIL-STD-282 at 22°C or according to FINABEL 0.7 at 37°C. Permeation data for Tyvek® is applicable to white Tyvek® 500 and Tyvek® 600 only and is not applicable for other Tyvek® styles or colours. Permeation data are usually measured for single chemicals. The permeation characteristics of mixtures can often deviate considerably from the behaviour of the individual chemicals. The permeation data for gloves published have been generated according to ASTM F739 and to ASTM F1383. The degradation data for gloves published have been generated based on a gravimetric method. This degradation testing exposes one side of the glove material to the test chemical for four hours. The percent weight change after exposure is measured at four time intervals: 5, 30, 60 and 240 minutes.

Degradation Ratings:

- E: EXCELLENT (0-10% Weight Change)
- G: GOOD (11-20% Weight Change)
- F: FAIR (21-30% Weight Change)
- P: POOR (31-50% Weight Change)
- NR: NOT RECOMMENDED (Above 50% Weight Change)
- NT: NOT TESTED

Degradation is the physical change in a material after chemical exposure. Typical observable effects may be swelling, wrinkling, deterioration, or delamination. Strength loss may also occur.

Please use the permeation data provided as a part of the risk assessment to assist with the selection of a protective fabric, garment, glove or accessory suitable for your application. Breakthrough time is not the same as safe wear time. Breakthrough times are indicative of the barrier performance, but results can vary between the test methods and laboratories. Breakthrough time alone is insufficient to determine how long a garment may be worn once the garment has been contaminated. Safe user wear time may be longer orshorter than the breakthrough time depending on the permeation behaviour of the substance, the toxicity of the substance, working conditions and the exposure conditions (e.g. temperature, pressure, concentration, physical state).

Latest Update Permeation Data: 5/5/2020

The information provided herein corresponds to our knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relate only to the specific material designated; these data may not be valid for such material used in combination with any other materials or additives or in any process, unless expressly indicated otherwise. The data provided should not be used to establish specification limits or used alone as the basis of design; they are not intended to substitute for any testing you may need to conduct to determine for yourself the suitability of a specific material for your particular purposes. Since DuPont cannot anticipate all variations in actual end-use conditions DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent rights.

WARNING

For enhanced liquid protection, taping of outer cuff to glove is recommended. A double cuff is not a substitute for supplementary taping.

The garment does not protect against ionizing radiation.

The information provided herein corresponds to our knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relate only to the specific material designated; these data may not be valid for such material used in combination with any other materials or additives or in any process, unless expressly indicated otherwise. The data provided should not be used to establish specification limits or used alone as the basis of design; they are not intended to substitute for any testing you may need to conduct to determine for yourself the suitability of a specific material for your particular purposes. Since DuPont cannot anticipate all variations in actual end-use conditions DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent rights.

This garment and/or fabric are not flame resistant and should not be used around heat, open flame, sparks or in potentially flammable environments.

DuPont™ SafeSPEC™ - We're here to help

Our powerful web-based tool can assist you with finding the appropriate DuPont garments for chemical, controlled environment, thermal and mechanical hazards.



DuPont Personal Protection
dpp.dupont.com

DuPont Personal Protection

@DuPontPPE

Connect with us

CREATED ON: JANUARY 22, 2022

© 2021 DuPont. All rights reserved. DuPont™, the DuPont Oval Logo, and all trademarks and service marks denoted with ™,℠ or ® are owned by affiliates of DuPont de Nemours, Inc. unless otherwise noted.