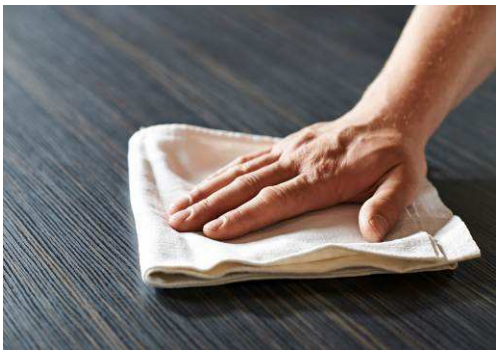
Aug. 2016

PRODUCT INFORMATION

Chemical Resistance of Duropal Laminates



High-pressure laminates with melamine surfaces are predestined for areas with high hygiene standards. Because they are distinguished by being easy to clean, maintain, and disinfect. They are hygienic, environmentally friendly, nontoxic, and food safe. Besides, they are also very robust and durable.

Cleaning and disinfection

Duropal laminates are highly resistant to most chemicals and disinfectants. This allows for regular and thorough cleaning which, for example, supports the hygiene schedules applicable on site.

The cleanability and good disinfectability is supported by the fact that laminates are made of duroplast resins which create a stable, resistant and reactivatable material. In addition, the surface is completely sealed, which means that it is free of pores. Dirt and germs cannot settle on it sustainably.

There is variety of surface disinfectants available on the market which differ distinctively in their ingredients, their modes of action and application, for example, as far as their frequency of use and surface retention times are concerned.

Duropal laminates are resistant to disinfectants based on:

Alcohols :	e.g. ethanol 70%
Aldehydes:	e.g. Formalin 1% und 5%
Phenols:	e.g. p-chloro-m-cresol 0.3%

In the event that other chemicals than those mentioned here and in the following are supposed to come into contact with Duropal laminate, the compatibility of each must be tested individually.

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Stain resistance according to EN 438:2005

The applicable product specification for high-pressure laminates describes the method according to which the properties stain resistance of laminate surfaces are tested by means of an exposure various substances. The surface is brought into contact with substances which they might be exposed to in daily use. The duration and conditions of this contact is specifically defined for each single substance.

Table 1:

Stain-producing substances		**Exposure time**
Group 1 • Acetone • Other organic solvents • Toothpaste • Hand cream • Urine • Alcoholic beverages • Natural fruit and vegetable juices • Lemonade and fruit drinks • Meats and sausages • Animal and vegetable fats and oils • Water • Yeast suspension in water	• Salt (NaCl) solutions • Mustard • Lyes, soap solutions • Cleaning solution consisting of: • 23 % dodecylbenzene sulfonate • 10 % alkyl aryl polyglycol ether • 67 % water • Commercial disinfectants • Stain or paint removers based on organic solvents • Citric acid (10% solution)	16 h
Group 2 • Coffee (120g of coffee per litre of water) • Black tea (9g of tea per litre of water) • Milk (all types) • Cola beverages • Wine vinegar • Alkaline-based cleaning agents (to 10% concentration with water) • Hydrogen peroxide (3% solution)	• Ammonia (10% solution of commercial concentrate) • Nail varnish • Nail varnish remover • Lipstick • Water colours • Laundry marking inks • Ball point inks	16 h
Group **3** • Sodium hydroxide (25% solution) • Hydrogen peroxide (30% solution) • Concentrated vinegar (30% acetic acid) • Bleaching agents and sanitary cleaners containing them • Hydrochloric acid based cleaning agents (≤ 3% HCl) • Acid-based metal cleaners • Iodine • Hair colouring and bleaching agents	• Shoe polish • Boric acid • Lacquers and adhesives (except fast curing materials) • Amidosulfonic acid descaling agents (< 10% solution) • Mercurochrome® (2,7-dibromo-4-hydroxymercurifluoresein, disodium salt)	10 min

At the end of the exposure time the laminate surface is washed off and examined for traces that remain on the surface:

Grade 5: No visible damage/alteration.
Grade 4: Minor alteration/damage of gloss level and/or color which is only visible under certain viewing angles.
Grade 3: Moderate alteration/damage of gloss level and/or color.
Grade 2: Significant alteration/damage of gloss level and/or color.
Grade 1: Surface alteration/damage and/or blistering.

Please refer to the respective technical data sheet in order to look up the grade of stain resistance that applies to a specific Duropal product.

Chemical Resistance

Application in laboratory settings puts high demands on the resistance of surfaces, as the latter often come into direct contact with a great diversity of chemical substances.

Duropal laminates are resistant to organic solvents. Cleaners like acetone and substances like vinegar, coffee and blood do not leave any residues on the surface. Neither can diluted alkali or acid solutions harm the laminate surface if the permissible exposure times are observed. However, caution is advised in case of strong dyes or strong oxidizing agents.

As the properties and the composition of chemicals may not always be known, it is categorically advisable to remove chemical substances from the decorative laminate surface without delay.

The substances mentioned in Table 2 do not cause any damage to melamine surfaces even after a prolonged exposure time (16 hours):

Table 2:

Substances not causing any alteration on laminate surfaces	
A	Amyl acetate $CH_3COOC_5H_{11}$
Acetic acid CH_3COOH	Amyl alcohol $C_5H_{11}OH$
Acetic acid ethyl ester $CH_3COOC_2H_5$	A-naphthole $C_{10}H_7OH$
Acetic acid iso-amyl ester $CH_3COOC_5H_{11}$	A-naphthylamine $C_{10}H_7NH_2$
Acetone CH_3COCH_3	Arabinose $C_5H_{10}O_5$
Alcoholic beverages ROH	Ascorbic acid $C_6H_8O_6$
Alcohols (any) ROH	Asparagine $C_4H_8O_3N_2$
Aldehydes RCHO	Aspartic acid $C_4H_7O_4N$
Alum solution $KAI(SO_4)_3$	**B**
Aluminium sulphate $Al_2(SO_4)_3$	Barium chloride $BaCl_2$
Amides $RCONH_2$	Barium sulphate $BaSO_4$
Amines (any)	Benzaldehyde C_6H_5CHO
Ammonia NH_4OH	Benzene C_6H_6
Ammonium chloride NH_4CL	Benzidine $NH_2C_6H_4C_6H_4NH_2$
Ammonium sulphate $(NH_4)_2SO_4$	Benzoic acid C_6H_5COOH
Ammonium thiocyanate NH_4SCN	Blood group test Sera

Boric acid H_3BO_3
Butyl acetate $CH_3COOC_4H_9$
Butyl alcohol C_4H_9OH

C

Cadmium acetate $Cd(CH_3COO)_2$
Cadmium sulphate $CdSO_4$
Calcium carbonate $CaCO_3$
Calcium chloride $CaCl_2$
Calcium hydroxide $Ca(OH)_2$
Calcium nitrate $Ca(NO_3)_2$
Calcium oxide CaO
cane sugar $C_{12}H_{22}O_{11}$
Carbolic acid C_6H_5OH
Carbol-xylene C_6H_5OH-$C_6H_4(CH_3)_2$
Cement
Chloral hydrate $CCl_3CH(OH)_2$
Chlorobenzene C_6H_5Cl
Cholesterol $C_{27}H_{45}OH$
Citric acid $C_6H_8O_7$
Cocaine $C_{17}H_{21}O_4N$
Copper sulphate $CuSO_4$
Cresol $CH_3C_6H_4OH$
Cresylic acid $CH_3C_6H_4COOH$
Cyclohexane C_6H_{12}

D

Digitonine $C_{56}H_{92}O_{29}$
Dimethylformamide $HCON(CH_3)_2$
Dimethyl sulfoxide $(CH_3)_2SO$
Dioxane $C_4H_8O_2$
Dulcite $C_6H_{14}O_6$

F

Formaldehyde $HCHO$
Formic acid up to 10% $HCOOH$
Fructose/Galactose $C_6H_{12}O_6$

G

Gelatin
Glacial acetic acid CH_3COOH
Glucose $C_6H_{12}O_6$
Glycerine $CH_2OH\ CHOH\ CH_2OH$
Glycocoll NH_2CH_2COOH
Glycol (any) $HOCH_2\ CH_2OH$
Graphite (carbon) C
Gypsum $CaSO_4\ 2H_2O$

H

Heptanol $C_7H_{15}OH$
Hexane C_6H_{14}
Hexanol $C_6H_{13}OH$
Hydrogen peroxide 3% H_2O_2
Hydroquinone HOC_6H_4OH

I

Ink
Inorganic salts and their mixtures (Exceptions: s. Table 3)
Inositol $C_6H_6(OH)_6$
Isopropanol C_3H_6OH

K

Ketones (any) $RCOR$

L

Lactic acid $CH_3CHOHCOOH$
Lactose $C_{12}H_{22}O_{11}$
Levulose $C_6H_{12}O_6$
Lead acetate $Pb(CH_3COO)_2$
Lead nitrate $Pb(NO_3)_2$
Lithium carbonate Li_2CO_3
Lithium hydroxide up to 10% $LiOH$

M

Magnesium carbonate $MgCO_3$
Magnesium chloride $MgCl_2$
Magnesium hydroxide $Mg(OH)_2$
Magnesium sulphate $MgSO_4$
Maltose $C_{12}H_{22}O_{11}$
Mannite $C_6H_{14}O_6$
Mannose $C_6H_{12}O_6$
Mercury Hg
Meso inosite $C_6H_6(OH)_6$
Methanol CH_3OH
Methylene chloride CH_2CL_2
Mineral oils
Mineral salts (Exceptions: s. Table 3)

N

Nail polish
Nail polish remover
Nickel sulphate $NiSO_4$
Nicotine $C_{10}H_{14}N_2$

O

Octanol (octyl alcohol) $C_8H_{18}O$
Oleic acid $CH_3(CH_2)_7CH{:}CH(CH_2)_7COOH$
Olive oil

P

P-aminoacetophenone $NH_2C_6H_4COCH_3$

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Paraffin oil
Paraffin C_nH_{2n+2}
Pentanol $C_5H_{12}OH$
Percaulic acid $HCLO_4$
Phenol & phenolic derivatives C_6H_5OH
Phenolphthalein $C_{20}H_{14}O_4$
p-Nitrophenol $C_6H_4NO_2OH$
Potassium chloride KCl
Potassium hydroxide up to 10% KOH
Potassium iodate KIO_3
Potassium nitrate KNO_3
Potassium Sodium tartrate $KNaC_4H_4O_6$
Potassium sulphate K_2SO_4
Potassium tartrate $K_2C_4H_4O_6$
Potassium aluminium sulphate $KAI(SO_4)_2$
Potassium bromate $KBrO_3$
Potassium bromide KBr
Potassium carbonate K_2CO_3
Potassium hexacyanoferrate $K_4Fe(CN)_6$
Propanol C_3H_7OH
1,2-Propylenglycol $CH_3CHOHCH_2OH$
Pyridine C_5H_5N

R

Raffinose $C_{18}H_{32}O_{11}$ $5H_20$
Rhamnose $C_6H_{12}O_5$ H_20

S

Salicylic acid $C_6H_4OHCOOH$
Salicylic aldehyde C_6H_4OH CHO
Sodium acetate CH_3COONa
Sodium carbonate Na_2CO_3
Sodium chloride NaCl
Sodium citrate $Na_3C_6H_5O_7$ $5H_20$
Sodium diethyl barbiturate $NaC_8H_{11}N_2O_3$
Sodium hydrogen carbonate $NaHCO_3$
Sodium bisulfite $NaHSO_3$
Sodium hydroxide up to 10% NaOH
Sodium hyposulphite $Na_2S_2O_4$
Sodium nitrate $NaNO_3$
Sodium phosphate Na_3PO_4
Sodium silicate Na_2O_3Si
Sodium sulphate Na_2SO_4
Sodium sulphide Na_2S
Sodium sulphite Na_2SO_3
Sodium tartrate $Na_2C_4H_4O_6$
Sodium thiosulfate $Na_2S_2O_3$
Sorbitol $C_6H_{14}O_6$
Starch
Stearic acid $C_{17}H_{35}COOH$
Styrene C_6H_5 $CH:CH_2$
Sugar and sugar derivatives $H_{22}O_{11}$
Sulphur S

T

Talcum Mg3[Si4O10 (OH)2]
Tannin $C_{76}H_{52}O_{46}$
Tartaric acid $C_4H_8O_6$
Tetrachloromethane CCl_4
Tetrahydrofuran C_4H_8O
Tetralin $C_{10}H_{12}$
Thiourea NH_2CSNH_2
Thymol $C_{10}H_{14}O$
Toluene $C_6H_5CH_3$
Trehalose $C_{12}H_{22}O_{11}$
Trichloroethylene C_2HCl_3
Tryptophan $C_{11}H_{12}O_2N_2$
Turpentine

U

Urea solution $CO(NH_2)_2$
Uric acid $C_5H_4N_4O_3$

V

Vanillin $C_8H_8O_3$

W

Water H_2O

X

Xylene $C_6H_4(CH_3)_2$

Z

Zinc chloride $ZnCl_2$
Zink sulfate $ZnSO_4$

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Some chemicals might cause damage to melamine surfaces depending on their pH value, exposure time, and temperature. The following substances must therefore be allowed to act for only a short period of time, at maximum for 10 to 15 minutes. in this time, the surface must first be wiped clean with a moist cloth and then wiped dry.

Table 3:

Substances causing laminate surface damage after prolonged exposure	
Aluminium chloride $AlCl_3$	Millon's reagent OHg_2NH_2Cl
Amidosulfonic acid NH_2SO_3H	Nitric acid up to 10% HNO_3
Ammonium hydrogen sulphate NH_4HSO_4	Oxalic acid COOH COOH
Arsenic acid up to approx. 10% H_3AsO_4	Phosphoric acid up to 10% H_3PO_4
Crystal violet (Gentian violet) $C_{25}H_{30}N_3Cl$	Picric acid $C_6H_2OH(NO_2)_3$
Dyes and bleaching agents	Potassium chromate K_2CrO_4
Ferric chloride $FeCl_2$	Potassium di-chromate $K_2Cr_2O_7$
Ferrous chloride $FeCl_3$	Potassium hydrogen sulphate $KHSO_4$
Formic acid up to 10% HCOOH	Potassium hydroxide over 10% KOH
Fuchsine $C_{19}H_{19}N_3O$	Potassium iodide KI
Hydrochloric acid up to 10% HCl	Potassium permanganate $KMnO_4$
Hydrogen peroxide 3-30% H_2O_2	Silver nitrate $AgNO_3$
Inorganic acids up to 10%	Sodium hydrogen sulphate $NaHSO_4$
Iodine I_2	Sodium hydroxide over 10% NaOH
Lithium hydroxide over approx.. 10% LiOH	Sodium hypochlorite (chlorine bleach) NaOCl
Mercuric di-chromate $HgCr_2O_7$	Sulphuric acid up to 10% H_2SO_4
Methylene Blue $C_{16}H_{18}N_3CIS$	

The chemicals listed in Table 4 cause irreversible laminate surface damage. Any contact, no matter how brief, should therefore be avoided.

Table 4:

Substances causing irreversible laminate-surface damage	
Adhesives (chemically hardened)	Hydrochloric acid* HCl
Amidosulfonic acid* NH_2SO_3H	Hydrofluoric acid* HF
Inorganic acids* eg	Hydrogen bromide* HBr
Aqua regia* HNO_3 + HCl = 1:3	Nitric acid* HNO_3
Arsenic acid H_3AsO_4	Phosphoric acid* H_3PO_4
Chrome sulphuric acid* $K_2Cr_2O_7 + H_2SO_4$	Sulfuric acid* H_2SO_4
Formic acid* HCOOH	

* in concentrations over 10%

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Aggressive gases

Aggressive gases might take an negative effect on the optical appearance of Duropal laminate surfaces. Normally, however, their functional characteristics will not be affected.

Table 5:

Substances causing laminate-surface damage
Acid fumes
Bromine Br_2
Chlorine Cl_2
Nitrous fumes NO_x / N_xO_y
Sulphur dioxide SO_2

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