Material resistance

Device platform EAGLE

ET-xx6-A / MT-xx6-A

THE STRONGEST LINK.

Valid for HW Revision 3 - all version

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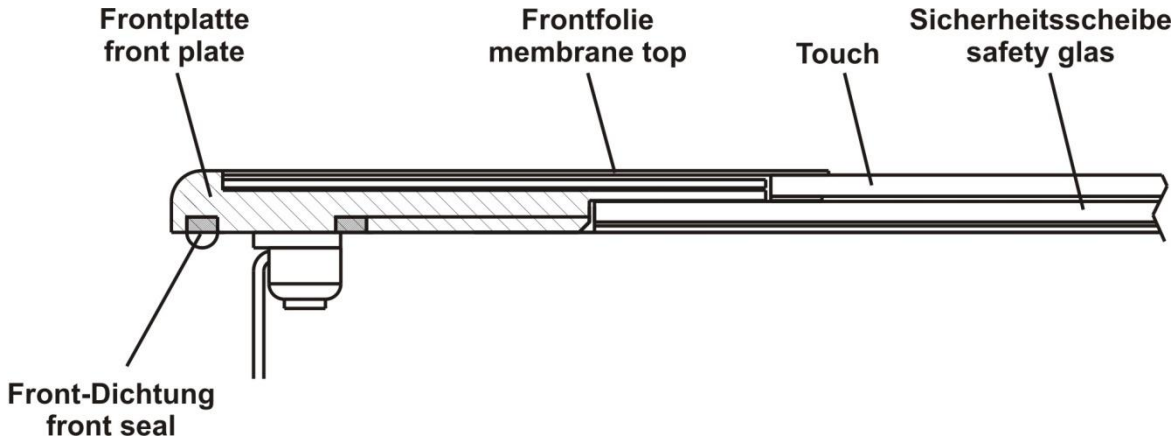
1 General

This manual contains information on the resistance of the HMI devices to various environmental factors. These have an impact on the mechanical, thermal, chemical and corrosive stability of the HMI devices.

The resistance to chemicals was tested according to DIN 42115 Part 2, i.e. the stability over 24 hours without visible changes to the HMI devices.

For the corrosion test the HMI units were tested in an artificial atmosphere and a very low concentration of corrosive gas, according to EN 60068-2-60.

2 Design



3 Materials

Application	Material
Membrane top	Polyester or stainless steel
Touch screen	Polyester
Display window	Safety glas
Front plate	Aluminum
Housing	Stainless steel
Front panel seal	Polyurethane
Back cover seal (not visible)	Silicone

3.1 Material properties

NOTICE	The selection of chemicals listed here is not exhaustive. Further information can also be found on the following homepage: http://macdermidautotype.com/

3.1.1 Entire device

NOTICE	The chemical substances and resistances are the lowest common denominator of all materials used in the HMI device. Thus, the entire device has a somewhat lower chemical resistance than the individual materials.

Property	Chemical material class / group	Chemical substances	Test method
Chemical • Chemical resistance	Alcohols	Glycerin	DIN 42115 DIN 53461
	Aldehydes	Formaldehyde 37 - 42 %	
	Household chemicals	Detergents	
	Oils	Petrol	
Property	**Resistance**		**Test method**
Mechanical • Service life after imprint • Operating force • MIT folding resistance	5 million touches max. 50 N >20000 folding operations		Autotype method ASTM D2176
Thermal • Dimensional • Dimension stability	Max. 0.2 % at 120° longitudinal Typically 0.1 %		Autotype method

3.1.2 Front foil (Polyester)

Property	Chemical material class / group	Chemical substances	Test method
Chemical • Chemical resistance	Alcohols	1,3 Butanediol 1,4 Butanediol Cyclohexanol Diacetone alcohol Ethanol Glycol Glycerol Isopropyl alcohol Methanol Neopentyl glycol Octanol 1,2 Propylene glycol Triacetin Dowandol DRM/PM	DIN 42115 DIN 53 461 Oder ASTM-F-1598-95
	Aldehydes	Acetaldehyde Formaldehyde 37 - 42 %	
	Amines	Ammonia < 2 %	
	Esters	Amyl acetate Ethylacetate N-Butyl acetate	
	Ethers	1.1.1. Trichloroethane Ether Dioxane Diethyl ether 2-Methyltetrahydrofuran (2-ME-THF)	

Aromatic hydrocarbons	Benzene Toluene Xylene Paint thinner (white spirit)
Ketones	Acetone Methyl ethyl ketone Cyclohexanone Methyl isobutyl ketone (MIBK) Isophorone
Diluted acids	Formic acid <50 % Acetic acid < 5 % Phosphoric acid <30 % Hydrochloric acid <10 % Nitric acid <10 % Trichloroacetic acid <50 % Sulfuric acid <30 %
Diluted alkaloids (bases)	Caustic soda <40 %
Household chemicals	Ajax Ariel Domestos Downey Fantastic Formula 409 Gumption Jet Dry Lenor Persil Tenside Top Jop Vim Vortex Washing powder Fabric conditioner Whis Windex
Oils	Petrol Drilling muds Braking fluid Decon foam Diesel oil Varnish Keroflux Paraffin oil Castor oil Silicone oil Solvent naphta Mineral turpentine Kerosene

	No specific material class	Acetonitrile Alkali carbonate Dichromates Potassium dichromate Caustic soda <20 % Dibutyl phthalate Dioctyl phthalate Iron II chloride ($FeCl_2$) Iron II chloride ($FeCl_3$) Haloalkanes Potassium soap Potassium hydroxide <30 % Sodium bisulfate Tetrachloroethylene Salt water Trichloroethylene Water Hydrogen peroxide >25 %	

Property	Resistance	Test method
Mechanic (keyboard) • Service life after imprint • Operating force • MIT folding resistance	5 million touches max. 50 N >20000 folding operations	Autotype method ASTM D2176
Mechanic (touch screen) • point activation	1 million activations at any single point	3M method
Thermal • Dimensional • Dimension stability	max. 0.2 % at 120° longitudinal typically 0.1 %	Autotype method

3.1.3 Touch screen

Property	Chemical material class / group	Chemical substances	Test method
Chemical • Chemical resistance	(see front membrane)	(see front membrane)	(see front membrane)
Property	**Resistance**		**Test method**
Mechanical • Service life after imprint • MIT folding resistance	(see front membrane)		(see front membrane)
Thermal • Dimensional • Dimension stability	(see front membrane)		(see front membrane)

3.1.4 Front panel seal

Property	Chemical material class / group	Chemical substances	Test method
Chemical • Chemical resistance	Alcohols	Glycerol	DIN 53461
	Aldehydes	Formaldehyde	
	Ketones	Acetone	
	Household chemicals	Detergents Soap suds	
	Oils	Petrol Diesel oil Heizöl Hydrauliköl Leinöl	
Property	**Resistance**		**Test method**
Mechanical	(No information available at present)		
Thermal • Installation area	-30 °C to 80 °C		DIN 53461

3.1.5 Back cover seal

Property	Chemical material class / group	Chemical substances	Test method
Chemical • Chemical resistance	Alcohols	Methanol Glycerol	DIN 53461
	Aldehydes	Formaldehyde	
	Amines	Ammonia	
	Diluted acids	Sulfuric acid 25 %	
	Household chemicals	Detergents Soap suds	
	Oils	Petrol Braking fluid Mineral oils Engine oils Lube oil	
Property	**Resistance**		**Test method**
Mechanical	(No information available at present)		
Thermal • Installation area	-60 °C to 200 °C		DIN 53461

4 Corrosion test

- with flowing mixed gas

The HMI units are resistant to corrosive chemicals according to the table below:

Property	Chemical substances	Concentration	Test method
• Corrosive resistance	H_2S Hydrogen sulfide NO_2 Nitrogen dioxide CL_2 Chlorine (gas) SO_2 Sulfur dioxide	10 ppb (±5) 200 ppb (±20) 10 ppb (±5) 200 ppb (±20)	EN 60068-2-60 method 4
Condition			
• Temperature	25 °C (±1)		
• Relative humidity	75 % (±3)		
• Duration	21 days		

5 Release notes

The chapter entitled "Release Notes" contains all the changes made in every version of this document.

Version 03.00.00

- First edition of the manual
- Addition of the information from the operating instructions
- Addition of corrosion test with flowing mixed gas
- Text and layout corrections

Version 03.00.01

- Changing address and phone numbers
- Formal changes

Version 03.00.02

- Changing title into material resistance
- Changing document name from "FR" into "MR"
- Including disclaimer
- Formal changes

Version 03.00.03

- Changing layout cover
- Changing disclaimer
- Adaption address field verso
- Formal changes

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