

Scope of the FT Quality Directive:

All data is applicable for non-mounted keyboards and/or systems with touch/membrane function. Deviations from this Quality Directive are possible upon consultation with the customer. In the case of hybrid systems, the weakest component is always definitive.

General Part

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Part A

(Page 5-6)

Part B

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Part C

(Page 9-11)

Concerns all components

Membrane keyboards

Additional and supplementary data on membranes and membrane keyboards.

Resistive Touch Systems (RT)

Additional and supplementary data on resistive touch systems

» Membrane / touch with window cutout

» Membrane / touch with continuous membrane (cont. mem.)

Projective-Capacitive Touch Systems (PCT)

Additional and supplementary data on projective capacitive touch systems and capacitive keyboards

General part

The printing processes screen- and digital-printing differ fundamentally in the printing result, due to the differences in the printing technologies, and are not directly comparable. With regard to decorative printing, the quality requirements relate to both, screen- and digital-printing. It is recommended to adapt the printing technology in advance to the respective requirements of the respective applications.

Inscriptions

Inscriptions must be easily legible (minimum line thickness 0.3 mm).

Characters

Characters must be clearly legible.

Lines and symbols

Interruptions are not permissible.

Evenness

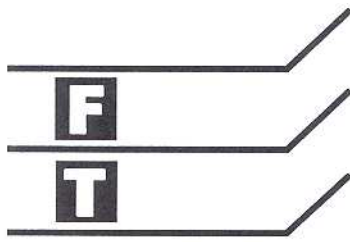
Kinks and pressure marks are not permissible. Noticeable elevations of the front membranes in the cable preparation area cannot be ruled out. Inclusions between the various layers must not be visible on the front.

Ink coverage

Ink coverage is adequate when underlying layers and structures are not visible.

General procedure in case faults not described

Permissible deviations must be agreed between customer and manufacturer. The overall impression must conform to the permissible faults.



1. Optical parameters:

Print quality of opaque colour, transparent colours and window prints:

Dirt and dust inclusions spots/fluff/score marks/ scratches	Touch (RT / PCT) <i>Class T</i>	standard optical requirements <i>Class 1</i>	increased optical requirements <i>Class 2</i>
» Max. size (mm ²)	0.32	0.25	0.16
» Weak colour contrast (max. size mm ²)	0.5	0.4	0.25
» Max. no. / 100 cm ²	3	2	1
» Minimum clearance (mm)	50	50	80

With windows smaller than 100 cm², the max. no. of defects applies for the entire window area and as a minimum clearance: Diagonal length (mm) / 2.

» Lower tolerance (mm²) 0.063

Scratches

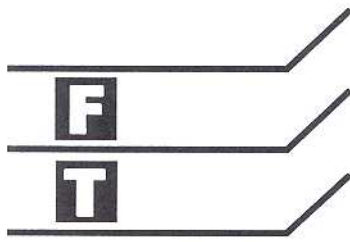
Assessment such as surface defects with weak colour contrast.

Other quality deviations

- » Colour deviations Defining reference sample / boundary sample between customer and supplier.
- » Gloss degree deviation Upon agreement.
- » Clouds (coloured shading) Optically undetectable in the usage position.

Opaque colour:

- » General requirements for opaque colour Definition of release sample between customer and supplier with reproducibility of the shades: $\Delta E < 2$ with comparable measurement geometry (45°/0° or d8°/0°; gloss incl. or excl.)
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2. Dimensional tolerances:

Print tolerances:

Contour sharpness / edge feathering (mm) ± 0.15

Print overlap Print overlaps are required for process reasons.
Possible colour deviations in the overlap area are permissible.

Permissible line thickness deviations $\pm 10\%$

Tolerances within the print

» Within a forming print (mm) To general tolerances DIN ISO 2768-1 fine:
< 120 mm: ± 0.15
 ≥ 120 mm < 400 mm: ± 0.2
 ≥ 400 mm: ± 0.3

» Between forming prints (mm) < 400 mm $\pm 0,3$ ≥ 400 mm ± 0.5

3. Climatic parameters: Technology-dependent, see special parts.

4. Mechanical parameters: Technology-dependent, see special parts.

5. Electrical parameters: Technology-dependent, see special parts.

6. Test criteria:

Inspection personnel trained, experienced, normally-sighted persons

Viewing distance (mm) 500

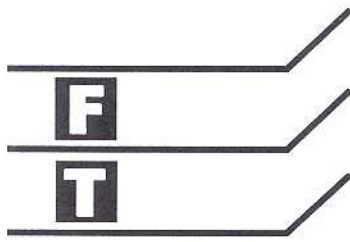
Viewing angle 90 °, mirroring not permitted.
(towards viewing direction)

Illumination

» Impinging light 800-1000 lx normal light D50 or D65

» Transmitted light Light table

Display window Inspection against black/white background or upon customer agreement.



Test conditions

Normal climate with 50% air humidity (non-condensing) and 1 bar atmospheric pressure.

Test conditions according to manufacturer's specification.

Expanded climatic parameters upon customer agreement.

Special environmental influences, e.g. harmful gases, high air humidity, chemical influences, UV-radiation etc. must be specified by the customer.

Testing scope

» Functional Test

100 %

(Limited to random sampling upon customer agreement)

» Optical Test

100 %

Assessment with FT sample table for surface defects

(Limited to random sampling upon customer agreement)

Observation time / 100 mm² (s)
(not longer than 15 seconds overall)

standard
optical requirements
Class 1

increased
optical requirements
Class 2

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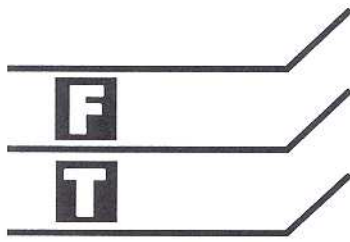
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7. Bonding:

For the bonding of input systems, the safety class S4

(according to DIN 2304) is generally assumed.

Higher requirements must be specified by the customer.



Part A (membrane keyboards)

1. Optical parameters: See general part.

2. Dimensional tolerances:

Embossment tolerances:

Embossing tolerance to print	< 400 mm	≥ 400 mm
» Surface embossing borderless (mm)	± 0.3	± 0.5
» Surface embossing with border (mm)	± 0.3	± 0.5
» Border embossing (mm)	± 0.3	± 0.5
» Dot embossing (mm)	± 0.3	± 0.5
» Special embossing form (mm)	± 0.3	± 0.5

Height tolerance of embossings

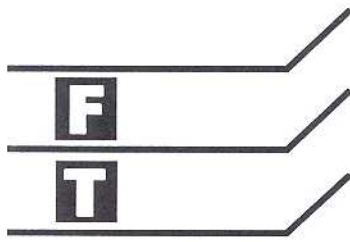
» Standard embossing (mm)	± 0.2
» Special embossing forms (mm)	Upon customer agreement.

Blank tolerances:

External contour and penetrations (mm)	± 0.3 (closer tolerances possible upon customer agreement.)
Blank to print (mm)	± 0.3

3. Climatic parameters: 50% air humidity (non-condensing).

Operating temperature	MIN	MAX
» Keyboards with embossing	0 °C	+ 45 °C
» Keyboards without embossing	- 20 °C	+ 70 °C



Transport/storage temperature	MIN	MAX
» Keyboards with embossing	- 30 °C	+ 45 °C
» Keyboards without embossing	- 40 °C	+ 80 °C

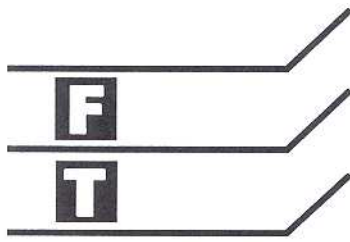
4. Mechanical parameters:

Actuation force	Design-dependent
Mechanical load-bearing capacity	Design-dependent
Lifespan	> 1 million switching cycles Inspection procedure to DIN 42115.

5. Electrical parameters (typical): **(snap disk and silver process control)**

	MIN	MAX
Switching voltage (DC)	100 mV	42 V
Switching current	0.5 mA	100 mA
Switching power	---	0.6 W
Conductor path resistance	Dependent on conductor path cross-section and length: typically 0.1Ω/mm in length, width 1mm.	
Insulation resistance	10 ⁸ Ω (inspected at 100 V)	
Voltage strength	To DIN 42115 Part 1	
Contact bounce time		
» Flat (incl. contact surface)	< 3 ms	
» Metallic dome	< 10 ms	
» Dome embossing	< 20 ms	
Minimum bending radius of cable	> R=2 mm	

<u>6. Test criteria</u>	See general part.
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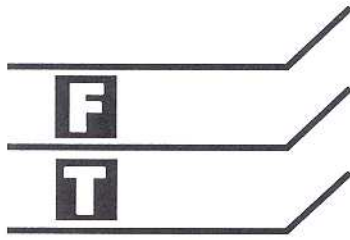
Part B: (resistive touch systems)

1. Optical parameters:

Active area offset to window	Not visible, function must be given.
Unevenness in cable (tail) - Outlet (optical)	Technical and design-related Cannot be avoided in every case.
Boundary area, touch, circumferential (optical)	Technical and design-related. Optically visible unevenness in the front membrane at the transition area between touch and carrier plate cannot be avoided in every case.
Newton rings	Not permitted
Transmission, opacity, clarity	Technical and design-related.
Boundary defects (shell defects, cracks)	Design-related, not permitted in the visible area.
Visible transition (printed surface to non-printed/bonded surface)	Depending on the design, there may be air pockets (irregularities) in the boundary area. The frame must be uniform.
Pillowing (inspection under normal climatic conditions)	Not permitted
Dirt and dust inclusions	See general part (Touch specifications apply for membrane/touch with window cutout).

2. Dimensional tolerances: See general part.

3. Climatic parameters: Technical and design-related (Touch specification).
Specified in the system by weakest component.



4. Mechanical parameters:

Actuation force	Technical and design-related (Touch specification). The actuation force can increase with a continuous membrane.
Lifespan (Touch)	Technical and design-related (Touch specification).

5. Electrical parameters:

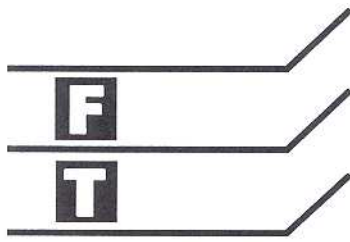
Linearity	Technical and design-related (Touch specification). The linearity can change with a continuous membrane (typical change $\pm 0.5\%$, in addition to Touch specification)
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6. Test criteria:

Functional check for Touch	Customer-specific.
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Note for the customer:

Unevenness of the carrier (Max. unevenness for the final installation / by customer)	Twist and stress-free installation must be guaranteed.
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Part C: (projective-capacitive touch systems, PCT)

1. Optical parameters:

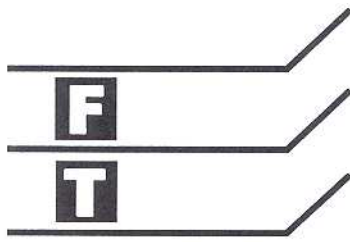
Active area offset to the window	Not visible, function must be given.
Newton rings	Not permitted.
Transmission, opacity, clarity	Technical and design-related.
Edge defect front material (shell defects, cracks)	Design-related (depending on type of processing): Ground: max. 0.16 mm ² Edged: max. 1.0 mm ² Minimum distance: 100 mm
Visible transition (printed surface to not printed/ bonded surface)	Depending on the design, there may be air pockets (irregularities) in the boundary area. The frame must be uniform
Dirt and dust inclusions (fluff, scores, scratches)	See general part.
Printing	See general part. Edge printing differs depending on dimensional tolerances. The colour difference depends on the manufacturer.

2. Dimensional tolerances:

Design-related
Typical values based on edge finishing:
Ground: +/- 0.2 mm
Edged: +/- 0.5 mm

3. Climatic parameters:

Technical and design-related (Touch specification).
Specified in the system by weakest component.



4. Mechanical parameters:

Actuation, activation system and feel

Technical and design-related.
(no mechanical actuation)

Lifespan/Function
(Touch)

No mechanical wear and tear expected.

Mechanical stress

Design-related.

5. Electrical parameters:

Activation system

Technical and design-related.

6. Test criteria:

Functional check Touch

Customer-specific.

Handling

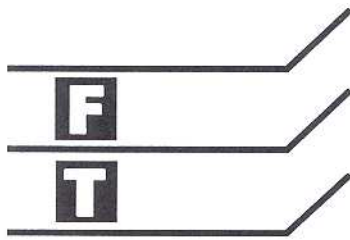
Specification by the customer up to what distance the function with the test finger must still be given and from what distance the function may no longer be given.

Test finger (design)

Material: brass / dimensions: $\varnothing=8\text{mm}$, $L=\text{min. } 50\text{mm}$ earth, end with conductive foam (drawing Fachgemeinschaft Eingabesysteme)

Distance measurement

Distance pieces (define insulation material, e.g. PMMA)



Note for the customer:

Unevenness of the carrier

(Max. unevenness for the final installation / by customer)

Twist and stress free installation must be guaranteed.

Calibration

The first calibration of the Touch has to be carried out on the complete unit.

Interferences

Environment variables such as:

- Liquids
- Change of climate / condensation
- EMV
- Gloves
- ...

must be noted and indicated by the customer.