Protection Tests (IP Code)

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- Nomenclature
- Figures
- Test chambers
  ST1000/ST2000
- Configuration ST1000
- Options
- Technical data
- Principle
- Dust test with wind
  Type ST 600
- Standards

Dust Test
IP = International Protection-Code

First figure
Ingress of solid substances, dust

Second figure
Ingress of water

• Ingress of a wire (A, B, C, D)
• Mobile substances in operation during the spray and splash water test (M, S, or H, M, S, W)

Nomenclature

Ingress of a wire (A, B, C, D)
Mobile substances in operation during the spray and splash water test (M, S, or H, M, S, W)
# Dust Tests, 1st figure: IP XX

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## Figures

<table>
<thead>
<tr>
<th>1st figure</th>
<th>Protection against ...</th>
<th>1st figure</th>
<th>Protection against ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≥ Ø 50 mm</td>
<td>4</td>
<td>≥ Ø 1 mm</td>
</tr>
<tr>
<td>2</td>
<td>≥ Ø 12,5 mm</td>
<td>5</td>
<td>dust protected</td>
</tr>
<tr>
<td>3</td>
<td>≥ Ø 2,5 mm</td>
<td>6</td>
<td>dust tight</td>
</tr>
</tbody>
</table>
Dust Test Chambers

- Reproducible testing of the resistibility of electro-technical products against dust
- Determination of IP-protection types

Advantages

- Chambers meet important test standards
- Ready for connection
- Compact design
- Easy to operate
- Easy to service
Type ST 1000, ST 2000

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Test chambers

ST1000/ST2000

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Dust test with wind

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2011
Type ST 1000 - Configuration

ST 1000 for standard SAE J575
ST 1000U for DIN/VDE 470 part 1 (EN 60529)
IEC 68-2-68, La2 (DIN EN 60068-2-68)

Design features

- Waste air exhaust via dust filter
- Abrasion resistance of all components in contact with the dust
- Transparent doors for easy charging, with surrounding special gaskets
- Dust collecting section below the test chamber
- Wiper
- Vertical air flow
Options and Technical Data

Additional equipment
• Test room lighting, mobile design
• Low pressure system for specimen
• Ports 50 and 100 mm Ø

Technical Data ST1000

<table>
<thead>
<tr>
<th>Options and Technical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
</tr>
<tr>
<td>Nomenclature</td>
</tr>
<tr>
<td>Figures</td>
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<tr>
<td>Test chambers</td>
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<tr>
<td>ST1000/ST2000</td>
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<tr>
<td>Configuration ST1000</td>
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<tr>
<td>Options</td>
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<tr>
<td>Technical data</td>
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<tr>
<td>Principle</td>
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<tr>
<td>Dust test with wind</td>
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<tr>
<td>Type ST 600</td>
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<tr>
<td>Standards</td>
</tr>
</tbody>
</table>

Test space volume 900 l, aluminium
Exterior finish: front violet-blue, housing light-grey and white,
Weight 220 kg
Connected load 1,5 kVA, power supply 400 V; 3 Ph + N + PE; 50 Hz
# Technical Data ST2000

## Dimensions

<table>
<thead>
<tr>
<th></th>
<th>Interior dimensions</th>
<th>Exterior dimensions</th>
<th>Door dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height [mm]</td>
<td>950</td>
<td>1.900</td>
<td>860</td>
</tr>
<tr>
<td>Width [mm]</td>
<td>1900</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td>Depth [mm]</td>
<td>950</td>
<td>1.050</td>
<td></td>
</tr>
</tbody>
</table>

Test space volume 2000 l, aluminium
Exterior finish: front violet-blue, housing light-grey and white,
Weight 450 kg, Weight of specimen on shelf max. 120 kg,
Connected load 2,5 kVA, power supply 400 V; 3 Ph + N + PE; 50 Hz
Type ST 1000 – Schematic Diagram

Design

- Vertical air flow
- Cubic vessel with collection funnel
- Dust is blown into the test space from the top by means of a circulation fan
- Dust parts are collected in the collection funnel
- Star-shaped rotating slide to bring dust into the opening

1 dust circulation pump
2 specimen
3 pressure display
4 dust filter
5 air flow meter
6 valve
7 vacuum pump
8 collection funnel

Nomenclature Technical data

Configuration ST1000

Options

Test chambers ST1000/ST2000

Technical data

Dust test with wind Type ST 600

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Type ST 600

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Type ST 600 - Configuration

**Design features**

- Housing made of galvanised sheet steel, lacquered
- Ring duct with integrated test space
- Horizontal air flow with temperature conditioning system
- Uniform and steered air flow
- Air velocity control (speed controllable recirculating air fan)
- Abrasion resistance of all components in contact with the dust
- Large doors for easy loading, with surrounding special gaskets
- Dust measurement and control by means of a dust dosage device
- Dehumidification system (compressed air dryer)
- Operating hour counter

**Content**

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Additional equipment

- Digital time programme controller
- Ports 50 and 100 mm Ø
- Low pressure system for specimen
- Registration of temperature, air velocity and dust density
- Rotary table, 300 mm Ø
# Type ST 600 – Technical Data

<table>
<thead>
<tr>
<th>Content</th>
<th>Test space</th>
<th>steel, lacquered, volume 640 l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomenclature</td>
<td>Interior dimensions</td>
<td>H 800 x W 1000 x D 800 mm</td>
</tr>
<tr>
<td>Figures</td>
<td>Exterior dimensions</td>
<td>H 2400 x W 4350 x D 1500 mm</td>
</tr>
<tr>
<td>Test chambers ST1000/ST2000</td>
<td>Test room door</td>
<td>H 740 x W 740 mm</td>
</tr>
<tr>
<td>Configuration ST1000</td>
<td>Temperature range</td>
<td>5 - 40°C</td>
</tr>
<tr>
<td>Options</td>
<td>Specimen weight</td>
<td>max. 100 kg</td>
</tr>
<tr>
<td>Technical data</td>
<td>Air velocity</td>
<td>1,5 / 3 / 5 m/s</td>
</tr>
<tr>
<td>Principle</td>
<td>Constancy in time</td>
<td>+/- 0,2 to 0,5 m/s (test space center)</td>
</tr>
<tr>
<td>Dust test with wind Type ST 600</td>
<td>Dust reservoir</td>
<td>20 kg contents</td>
</tr>
<tr>
<td>Standards</td>
<td>Compressed air connection</td>
<td>max. 6 bar</td>
</tr>
<tr>
<td></td>
<td>Power supply</td>
<td>400 V, 3 Ph + N + PE, 50 Hz</td>
</tr>
<tr>
<td></td>
<td>Connected load</td>
<td>approx. 25 kVA</td>
</tr>
<tr>
<td></td>
<td>Dust concentration</td>
<td>2 - 10 g/m³ fine dust</td>
</tr>
</tbody>
</table>
**Type ST 600 – Schematic Diagram**

**Content**

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Test chambers

ST1000/ST2000

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Dust test with wind

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**Design**

- Horizontal air flow
- Ring duct for air circulation
- Large door
- Observation window with wiper
- Uniform suction of dusty air
- Uniform temperature conditioning
- High temperature constancy (spatial)
- No cooling!
- Option dust density control 0-100%
Type ST 600 – Schematic Diagram

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Dust dosage device
## Dust Test – Test Specifications

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<thead>
<tr>
<th>No.</th>
<th>Test Specification</th>
<th>Protection Grade</th>
<th>Test Duration</th>
<th>Temperature (°C)</th>
<th>Rel. Humidity (%)</th>
<th>Air - velocity (m/sec.)</th>
<th>Dust Density</th>
<th>Dust Composition</th>
<th>Particle Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DIN/VDE 470 part 1 picture 2 (EN 60529)</td>
<td>IP 5 X dust protected resp. IP 6 X dust-tight</td>
<td>2 - 8 h depending on the air flow rate</td>
<td>vert. to achieve slowest possible down-ward settling</td>
<td></td>
<td>2 kg per m³ chamber volume</td>
<td>100 % dry fine grained talcum</td>
<td>wire diameter 50 µm, mesh size 75 µm, square mesh</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>IEC 68-2-68, L a2 (DIN EN 60068-2-68)</td>
<td></td>
<td>2 - 8 h depending on the air flow rate</td>
<td>vert. to achieve slowest possible down-ward settling</td>
<td>&lt;25 %</td>
<td>2 kg per m³ chamber volume</td>
<td>100 % dry fine grained talcum</td>
<td>wire diameter 50 µm, mesh size 75 µm, square mesh</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>IEC 68-2-68, L c1 (DIN EN 60068-2-68)</td>
<td></td>
<td>2 - 24 h</td>
<td>1.5 - 10 horizontal</td>
<td>1 ± 0.3</td>
<td>2 ± 0.5, 5 ± 1.5, 10 ± 3</td>
<td>Olivin, quartz or felspar</td>
<td>fine dust 2-75 µm dust 2-150 µm</td>
<td></td>
</tr>
</tbody>
</table>
## Dust Test – Test Specifications

### Content

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**Dust test with wind**

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<thead>
<tr>
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<th>Test Duration</th>
<th>Temperature (°C)</th>
<th>Rel. Humidity (%)</th>
<th>Air – velocity (m/sec.)</th>
<th>Dust Density</th>
<th>Dust Composition</th>
<th>Particle Size</th>
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<tbody>
<tr>
<td>4</td>
<td>DIN 40050 part 9,</td>
<td>IP 5KX IP 6KX</td>
<td>20 cycles</td>
<td></td>
<td></td>
<td>2 kg per m³ chamber</td>
<td>50 % limestone</td>
<td>33 weight parts</td>
<td>≤ 32 μm</td>
</tr>
<tr>
<td></td>
<td>May 1993 picture 1</td>
<td></td>
<td>15 min Pause</td>
<td></td>
<td></td>
<td>volume</td>
<td>50 % flue dust</td>
<td>≤ 67 weight parts; ≥ 32 μm; ≤ 250 μm</td>
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<tr>
<td></td>
<td>vertically</td>
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<td>6 sec. dust</td>
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<td></td>
<td></td>
<td></td>
<td>whirl up</td>
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<tr>
<td>5</td>
<td>DIN 40050 part 9,</td>
<td>IP 5K X IP 6K X</td>
<td>0.5 - 24 h</td>
<td>1.5</td>
<td>5 ± 2</td>
<td></td>
<td>50 % limestone</td>
<td>33 weight parts</td>
<td>≤ 32 μm</td>
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<tr>
<td></td>
<td>May 1993 picture 2</td>
<td></td>
<td>24 h</td>
<td></td>
<td></td>
<td></td>
<td>50 % flue dust</td>
<td>≤ 67 weight parts; ≥ 32 μm; ≤ 250 μm</td>
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<td></td>
<td>horizontal</td>
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</tr>
<tr>
<td>6</td>
<td>MIL-STD-810D</td>
<td></td>
<td>6 + 16 h</td>
<td>23 °C</td>
<td>max. 9 and 1.5</td>
<td>97-99 % SiO₂</td>
<td></td>
<td></td>
<td>US standard 100 % No. 100 98±2 No. 140 90±2 No. 200 75±2 No. 325</td>
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<td></td>
<td>Method 510.2</td>
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<td>(flue dust)</td>
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<tr>
<td></td>
<td>SAE standard J 575</td>
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<td>5 h</td>
<td></td>
<td></td>
<td>Portland cement acc. to ASTM C 150-77, Type 1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>15 min Pause</td>
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<td>2 - 15 sec</td>
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<td></td>
<td></td>
<td></td>
<td>whirl up dust</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>