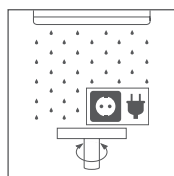




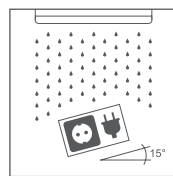
# IP TESTING WATER ACCORDING TO DIN EN 60529 & ISO 20653



**Drip water**

## **IP X1**

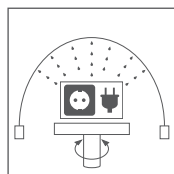
- DIN EN 60529 / ISO 20653: Drip rate: 1mm/min
- Ø 0.4mm drip nozzle
- Position of DUT: Turntable (1rpm), eccentricity 100 mm
- Test duration: 10min



**Drip water**

## **IP X2**

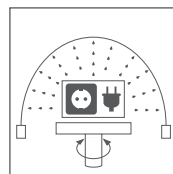
- DIN EN 60529 / ISO 20653: Drip rate: 3mm/min
- Ø 0.4mm drip nozzle
- Position of DUT: In 4 fixed positions of 15° tilt
- Test duration: 10min (4 x 2.5min per position)



**Spray water**

## **IP X3**

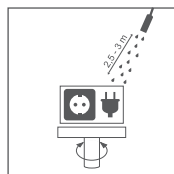
- DIN EN 60529: 0.07l/min per nozzle
- ISO 20653: 0.1l/min per nozzle at approx. 0.8bar water pressure
- Swivel angle: +/-60°
- Ø 0.4mm nozzles distributed over 120°
- Position of DUT in the centre of the turntable, max. 200mm distance to the swivel tube
- DIN EN 60529: Rotation of the turntable after 5min / test duration 10min
- ISO 20653: Turntable 1-3rpm, support not perforated, test duration 10min



**Splash water**

## **IP X4**

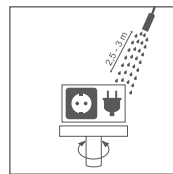
- DIN EN 60529: 0.07l/min per nozzle
- ISO 20653: 0.1l/min per nozzle at approx. 0.8bar water pressure
- Swivel angle: +/-180°
- Ø 0.4mm nozzles distributed over 180°
- Position of DUT in the centre of the turntable, max. 200mm distance to the swivel tube
- DIN EN 60529: Test duration 10min
- ISO 20653: Turntable 1-3rpm, perforated support, test duration 10min



**Jet water**

## **IP X5**

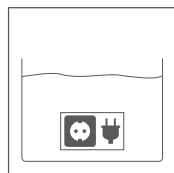
- DIN EN 60529 / ISO 20653: 12.5l/min at approx. 0.3bar water pressure
- Ø 6.3mm nozzle
- Position of DUT: 2.5-3m distance to the nozzle
- Test duration: 1min/m² DUT surface, min. 3min



**Jet water**

## **IP X6**

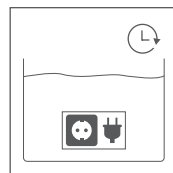
- DIN EN 60529 / ISO 20653: 100l/min at approx. 1bar water pressure
- Ø 12.5mm nozzle
- Position of DUT: 2.5-3m distance to the nozzle
- Test duration: 1min/m² DUT surface, min. 3min



**Temporary immersion**

## **IP X7**

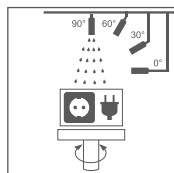
- DIN EN 60529 / ISO 20653: Water level above the enclosure: 0.15m from top edge, 1m from bottom edge
- Test duration: 30min



**Continuous immersion**

## **IP X8**

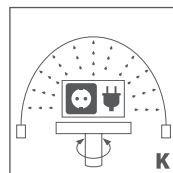
- DIN EN 60529 / ISO20653: Water level above the enclosure: according to application (stricter than IPX7)
- Test duration: according to application (stricter than IPX7)



**Water jets with high pressure and high water temperature**

## **IP X9**

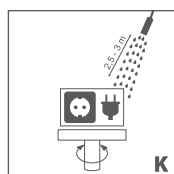
- DIN EN 60529: 15l/min
- Small housings (< 250mm) centred on turntable / Align spray nozzles with outer contour / Distance nozzle - DUT: 125mm +/- 25
- Turntable: 5rpm
- Water temperature: 80°C +/- 5
- Test duration: 30s per position (0/30/60/90°)



**Splash water with increased pressure**

## **IP X4K**

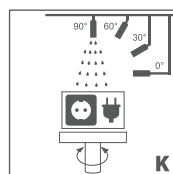
- ISO 20653: 0.6l/min per nozzle at approx. 4bar water pressure
- Swivel angle: +/-180°
- Ø 0.8mm nozzles distributed over 180°
- Position of DUT in the centre of the turntable, max. 200mm distance to the swivel tube
- Test duration 10min, turntable 1-3rpm, perforated support



**Jet water with increased pressure**

## **IP X6K**

- ISO 20653: 75l/min per nozzle at approx. 10bar water pressure
- Ø 6.3mm nozzle
- Position of DUT: 2.5-3m to the nozzle
- Test duration: min. 3min



**Water jets with high pressure and high water temperature**

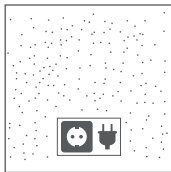
## **IP X9K**

- ISO 20653: 14-16l/min at approx. 80-100bar water pressure
- Distance nozzle - DUT: 100-150mm / Align spray nozzles to outer contour
- Turntable: 5rpm
- Water temperature: 80°C +/- 5
- Test duration: 30s per position (0/30/60/90°)



# IP TESTING DUST

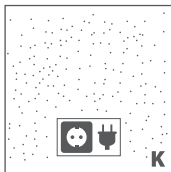
## ACCORDING TO DIN EN 60529 & ISO 20653



dust-protected

### IP 5X

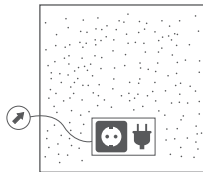
- DIN EN 60529: Talcum dust 2kg/m<sup>3</sup> for enclosures cat. 1 and 2 for test duration: min. 2h / max. 8h, with negative pressure on the test specimen (cat. 1): 20mbar
- No dust ingress in harmful quantities for function and safety



dust-protected

### IP 5XK

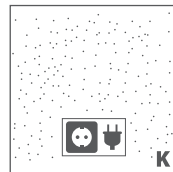
- ISO 20653: Arizona dust (A2 or equivalent): 2kg/m<sup>3</sup> with test duration 20 cycles (6s dust swirling and 15min rest period)
- No dust ingress in harmful quantities for function and safety



dust-tight

### IP 6X

- DIN EN 60529: Talcum dust 2kg/m<sup>3</sup> for enclosure cat. 1 (cat. 2 is added to 1) for test duration: min. 2h / max. 8h, with negative pressure on the test specimen: 20mbar
- No dust deposits in the enclosure



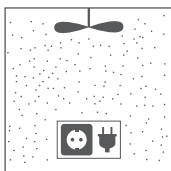
dust-tight

### IP 6XK

- ISO 20653: Arizona dust (A2 or equivalent): 2kg/m<sup>3</sup> with test duration 20 cycles (6s dust swirling and 15min rest period)
- No dust deposits in the enclosure



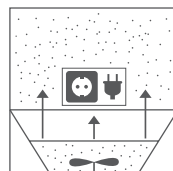
## OTHER TESTS WITH DUST & WATER



Dust Exposure Test

### SAE J575

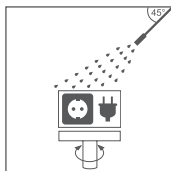
- Dust according to ISO 12103-1, A3 medium or finely pulverised Portland cement (ASTM C150-84)
- Dust swirling via SAE nozzles / blower
- Dust quantity: 3-5kg
- Position of DUT: Min. 150mm distance to the chamber walls
- Test duration: 5h (2-15s dust swirling and 15min rest period)



Dust Test F

### JIS D0203

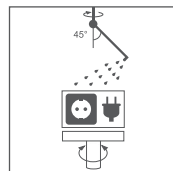
- Dust according to JIS Z8901 (class 8/6)
- Dust swirling via JIS nozzles / blower
- F1: Dust quantity 60g/m<sup>3</sup>
- F2: Dust quantity 3g/m<sup>3</sup>
- F3: Dust quantity 0.1g/m<sup>3</sup>
- Test duration: 5h (F1) - 8h (F2/3) (2/5s dust swirling and 10/15min rest period)



Water Spray Test Type A

### SAE J575

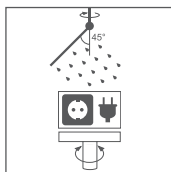
- Precipitation rate: 2.5-4.1mm/min (on Ø140mm)
- Cone spray nozzle at 45°
- Position of DUT: In the centre of the turntable at approx. 4rpm
- Test duration: 12h + 1h draining time



Raintest R

### JIS D0203

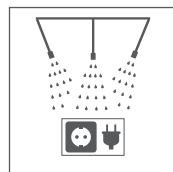
- R1/R2: 1.9/3.2l/min at approx. 0.1/0.3bar
- Rotating JIS nozzle (approx. 23rpm) at 45°
- Position of DUT: In the centre of the turntable at approx. 17rpm, approx. 400mm from the nozzle
- Test duration: 10min



Spray Test S

### JIS D0203

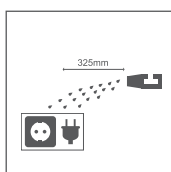
- S1/S2: 24.5/39.2l/min at approx. 1/3bar
- Rotating perforated JIS nozzles (approx. 23rpm) at 45°
- Position of DUT: In the centre of the turntable at approx. 17rpm, approx. 400mm from the nozzle
- Test duration S1/S2: 30/60min



Raintest

### UL 50E

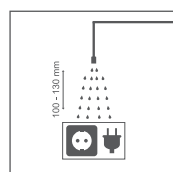
- Min. 3 UL spray nozzles at 0.345 bar water pressure per nozzle
- Position of DUT: Centred under nozzles
- Test duration: 1h



Splash Water Test

### ISO 16750

- 3-4l/3s splash duration
- Water temperature: 0-4°C De-ionized water (Salt, Arizona dust, or colours maybe added)
- Chamber temperature: max. 160°C
- Distance between DUT and nozzle 325 mm, align DUT to nozzle according to as-installed position
- Test duration: 100 cycles (splash + holding time)



Pressure water-jetting test for coatings

### DIN EN ISO 16925

- 11.3l/min at approx. 67-69bar water pressure
- Water temperature: 60°C
- Distance between DUT and nozzle: 100/100/130mm (depending on test method A/B/C)
- Test duration: 30/60/60s (A/B/C)