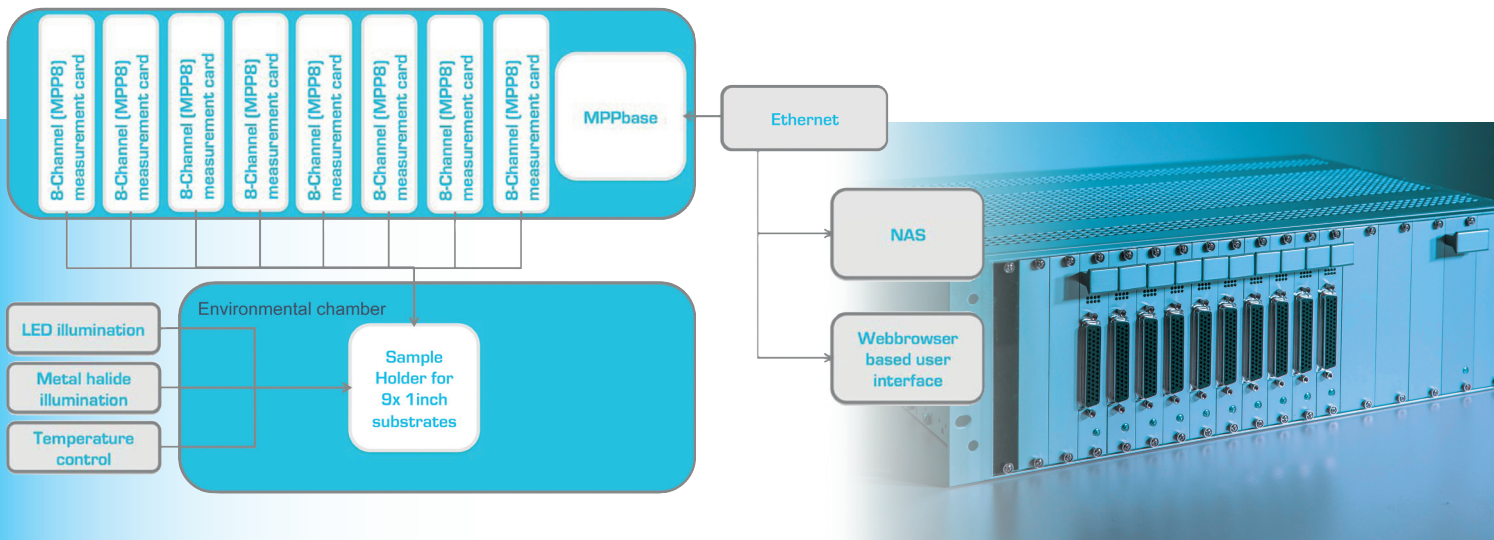


MPP degradation setup

Maximum power point (MPP) tracking for stability tests of many small research devices



Applications

Full compatibility to ISOS test protocols for perovskite and organic solar cells

Aging in selectable electrical conditions: MPP, j_{SC} and V_{OC}

Accurate control of illumination, atmosphere and temperature

Degradation studies need statistics – degrade many devices at once

Functions

Fully automated stability tests

Up to 96 measurement channels per base unit, many base units can be combined

Every channel can be configured individually

1 sun LED or metal halide lamp illumination

Temperature controlled with electrical heaters or water cooling

Key features

Every channel between $\pm 3.5\text{ V} / 100\text{ mA}$ with a resolution of $< 10\ \mu\text{V} / 100\text{ nA}$, MPP mode with selectable tracking algorithm or fixed parameter: j_{SC} , V_{OC} , defined voltage

Selectable MPP tracking algorithm

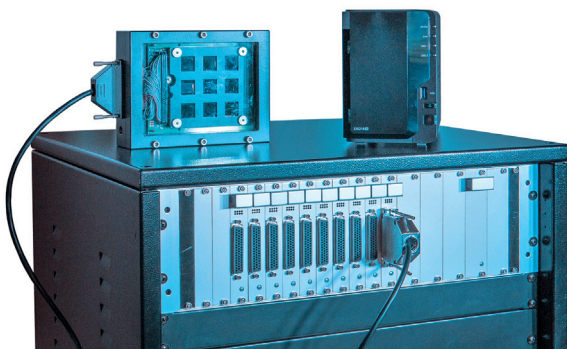
Base system configured with a web based graphical user interface

Storing data to a network location or preconfigured NAS

Illumination with white LEDs, metal halide lamps, LEDs with selectable wavelengths

Environmental chambers for aging in controlled atmosphere e. g. nitrogen or dry air

Temperature control unit for each environmental chambers to degrade at elevated temperatures or with constant water cooling



MPP Options

Art.No.	Description
MPPbase	Degradation base system <ul style="list-style-type: none"> • 19 inch rack format case • Browser based graphical user interface • Ethernet connection to store measurement data in a network location • 12 slots for measurement cards (up to 96 measurement channels) • Multiple base systems can be used together
MPP8	8 channel measurement card <ul style="list-style-type: none"> • Up to 12 per MPPbase • Each measurement channel can be configured for different degradation modes individually: j_{sc}, V_{oc}, set bias or MPP tracking • MPP tracking modes can be selected for each channel individually • Regular jV sweeps can be configured for each channel • Source range: +/- 3.5 V / 100 mA • Measurement range: +/- 3.5 V / 100 mA, resolution < 10 μV / 100 nA • Two measurement channels for temperature and irradiation sensors
SH3x3	Sample holder for 3x3 1-inch substrates with up to 8 contacts each incl. a temperature and an irradiation sensor
CustomSH	Design of sample holder for custom substrate layouts (Only applies to first order) <ul style="list-style-type: none"> • Up to 8 cells per substrate
EC3x3	Environmental chamber for sample holders without glass cover <ul style="list-style-type: none"> • Hermetically sealable chamber made from Aluminum • 2 Valves for connection to a gas supply (low pressure) • Loadable in a Glovebox, fits in a "standard" small antechamber (150 mm diameter) • Electric feedthroughs • Prepared for sample temperature control
wLED for EC3x3	White LED illumination for EC3x3 <ul style="list-style-type: none"> • Array with 9 LEDs, 1 for each substrate in the EC3x3 • Up to 1 sun intensity • Intensity controlled by variable distance between LED and substrate • Active air cooling
MH for EC3x3	Metal halide lamp illumination for EC3x3 <ul style="list-style-type: none"> • Metal halide lamp with reflector to achieve homogeneous illumination • Up to 1 sun intensity • Intensity controlled by variable distance between lamp and substrate • Active air cooling
eTC for EC3x3	Electrical temperature control unit for EC3x3 <ul style="list-style-type: none"> • Heated ground plate for EC3x3 • Temperature controller • Up to 80 °C • PT100 for temperature control can be installed in EC3x3 close to the samples
wTC for EC3x3	Water-based temperature control unit for EC3x3 <ul style="list-style-type: none"> • Heated ground plate for EC3x3 • PT100 for temperature control can be installed in EC3x3 close to the samples
NAS	Network attached storage for measurement data <ul style="list-style-type: none"> • 2x4 TB hard drives in RAID 1 mode • Preconfigured for plug and play