
## HANWHA Q CELLS QUALITY

# BUILT TO WEATHER ANY STORM

## Our modules prove their strength once again.

**We always go to the extreme to prove the safety and reliability of our modules. In 2012 we commissioned the renowned Cyclone Testing Station at James Cook University in QLD to put our G2 module series to the test for the first time. The strength of our modules impressed even the sternest of engineers. This time, we wanted to prove that our G3 module is at least as strong. The latest in frame technology did not disappoint – our new 35 mm frame proved without doubt that size does not matter. Instead it turns out that our G3 modules are even stronger!**

### THE PRESSURE TEST

- Performed at Cyclone Testing Station at James Cook University, QLD.
- Tested modules: Q.PRO-G3 and Q.PEAK-G3.
- Two types of tests are used to determine module strength: a static and a dynamic test. The first applies increasing pressure onto the back of a module until it breaks, while the second simulates the effects of dynamic loads by alternately pushing and releasing pressure onto the back of a module with increasing pressure.
- These tests highlight that IEC testing according to 61215 only provides limited information about module strength. Yet, at Q CELLS we do not leave anything to chance and therefore decided to test the actual strength of our modules.

### THE RESULTS

Q CELLS solar modules:

- passed pressure testing above and beyond IEC standard testing requirements, even when taking safety factors into account.
- are strong enough to survive a 1 in 500 year cyclone in wind region C - the most severe region for all major Australian cities, including Darwin.
- are strong enough to have survived infamous cyclones Larry and Yasi.

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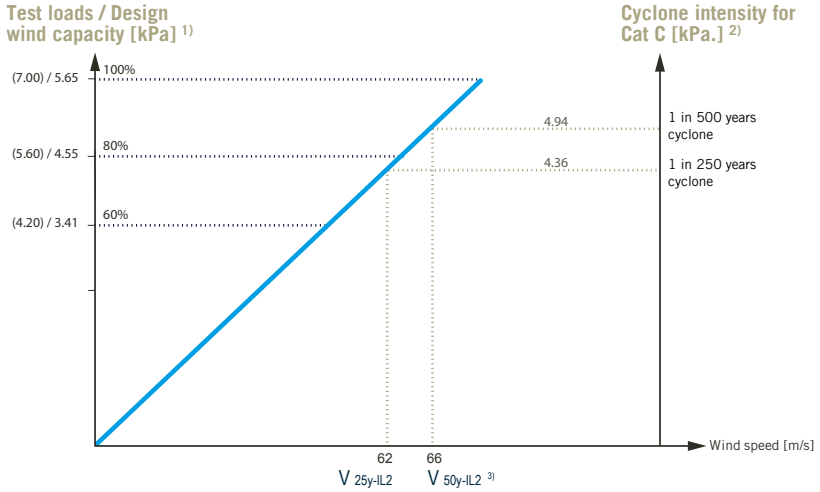
# RESULTS FOR STATIC TEST

| STATIC TEST LOAD | 2400Pa | 5400Pa | 8300Pa |
|---|---|---|---|
| TEST PROCEDURE | according to IEC 61215 | according to IEC 61215 | According to Cyclone Testing Station JCU Townsville |
| REAL ULTIMATE STRENGTH LIMIT INCLUDING SAFETY FACTOR AS PER AUSTRALIAN STANDARDS | Actual strength including safety factor not specified in IEC test | Actual strength including safety factor not specified in IEC test | 5650Pa |

**Most reputable module manufacturers claim that their modules can withstand 5400Pa based on IEC standards. However, IEC fails to take the safety factor into account – unlike the test we did at James Cook University. Based on those results, you can be confident that Q CELLS modules are strong enough for any wind region in Australia.**

* The IEC 61215 test only verifies that the modules still produce the required electricity after being subjected to above mentioned mechanical loads, but does not consider any safety factors.

# RESULTS FOR DYNAMIC TEST WIND REGION C




Our modules were tested with increasing pressure to a maximum of 7kPa and subjected to a total of 10360 cycles to simulate a cyclone as best as possible. Accordingly, our modules survived pressure that is equivalent to a 1 in 500 year cyclone in wind region C.

**The Safety Factor: The y-axis shows two values - the test pressure (i.e. 7kPa) and the equivalent pressure considering the safety factor of 1.238 (i.e. 5.65kPa). You can think of the safety factor as a precautionary measurement to ensure that any unforeseen high risk/low probability events are still accounted for without affecting the safety of the installation.**

1) Suction load testing carried out by the Cyclone Testing Station at James Cook University with module clamps 245 mm in from the corners
2) $C_p$ value of -2.1 (PV module installation in open area, roof edge-zone, tilt 25-30°) in accordance with the wind tunnel test
e.g.: $C_p$ = -1.0 for rooftop, tilt 15°, h/d > 1.0 in accordance with AS 1170.2 table 5.3(B): Boundary Conditions: Md = 1.0; Mz,cat = 0.9; Terrain cat. = 1
3) PV installations are Important Level 1 or 2 in accordance with AS 1170.0 table 3.1 and 3.2
e.g.: Design working life is 25 years; therefore the wind speed is to design for 1/250 (v250)
Design working life is 50 years; therefore the wind speed is to design for 1/500 (v500) in accordance with AS 1170.0 table 3.3

For other allowable static loads (other clamping positions or pressure loads) please refer to the table in the installation and manual.


**Hanwha Q CELLS Australia Pty Ltd**
Level 2, 56 Berry Street, North Sydney, NSW 2060, Australia I **TEL** 1800 QCELLS I **FAX** +61 (0)2 9455 0873 I **EMAIL** q-cells-australia@q-cells.com I **WEB** www.q-cells.com.au



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