
heightec®
with respect to gravity...™

# Technical Information Note
## Quantum Performance

heightec.com

## Quantum Performance

### Background

The high performance of the Quantum back-up device has been proven with over 400 dynamic tests. Many of these were outside the scope of European standards (ENs) but designed to test 'real life' scenarios and the limitations of the device.

### Tests

All tests were carried out using either 1 or 2, 100kg steel masses (as specified in EN 364 'Test Methods'). These were chosen in order to provide consistency and repeatability. Ropes were anchored with a single Figure-of-8 loop and pre-tightened with 100kg load. In each case, the Quantum was set up in accordance with the user instructions and the test masses released by a mechanical quick release.

### User Instructions

The worst case allowed within the scope of the user instructions is Fall Factor 2, 0.45m lanyard (total length), Quantum positioned 1m from the knot. (Tests have been carried out in excess of this in order to provide additional assurance/safety factor.)

### Test Parameters

Tests have been carried out with a number of variables:

| | |
|---|---|
| User | 100 - 200kg |
| Rope | 10.5 – 11.5mm diameter<br>new – wet, dry<br>used - worn, contaminated with paint, grit, grease/oil<br>(all recently quarantined by contractors)<br>different manufacturers (9 off)<br>different types (EN1891, ANSI/NFPA 1983-2006) |
| Lanyards | dynamic rope (sewn terminations and various knots), webbing (sewn) and wire.<br>Different lengths, from 1 karabiner to 0.9m |
| Rope load | 15 - 100kg |

Any of the following variables can improve the performance of the device and/or reduce the impact force.

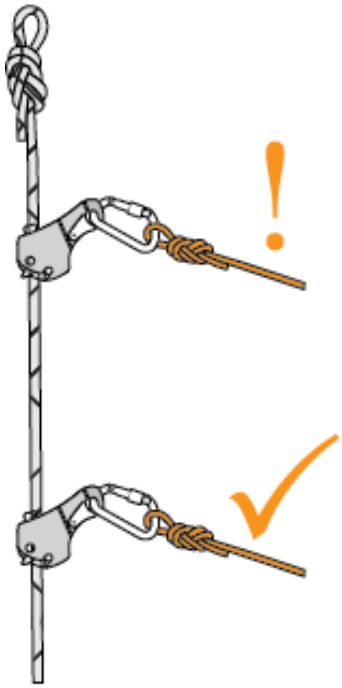

 

**Distance from the knot**

When tested up to 40m below the anchor knot the Quantum arrested the fall and did not slip significantly.

Any back-up device, and it's ground clearance distance, is affected by rope stretch (see Figure 1).

Even when connected directly to a rope (anchor line) via a knot the user will fall up to 10% of the rope length plus the length of the attachment lanyard.



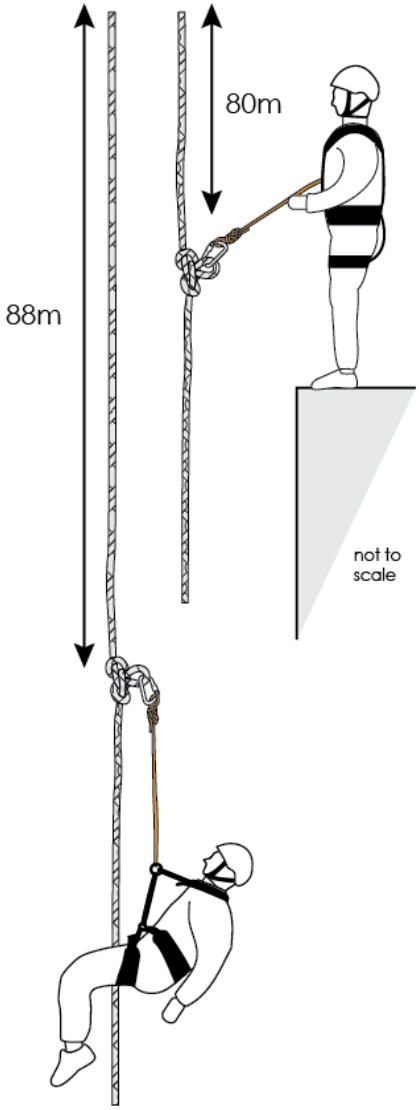
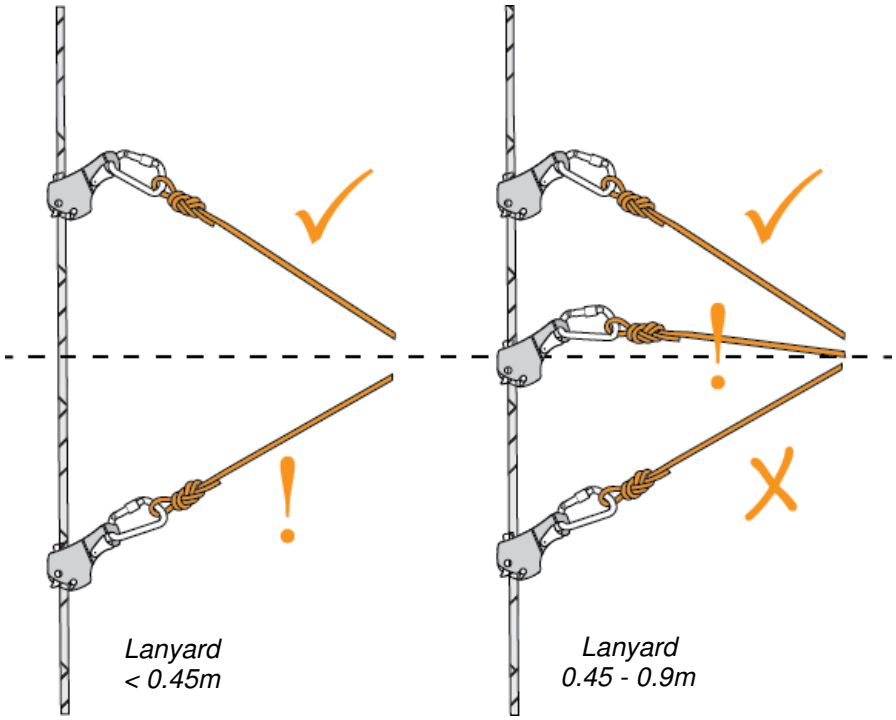



*Figure1: Rope stretch*

**Fall factor**



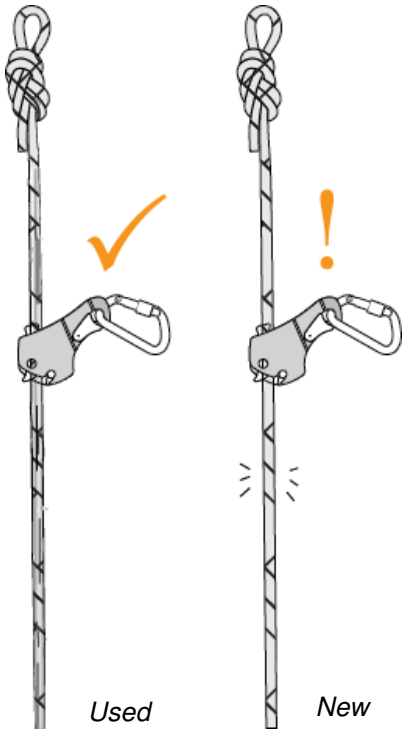

At fall factor 2, 1 m from the knot the impact force with 100kg can exceed 6kN – similar to a long cowstail at fall factor 1.

However, the impact force will be below 8kN (as permitted by ANSI standards and deemed not to cause injury).

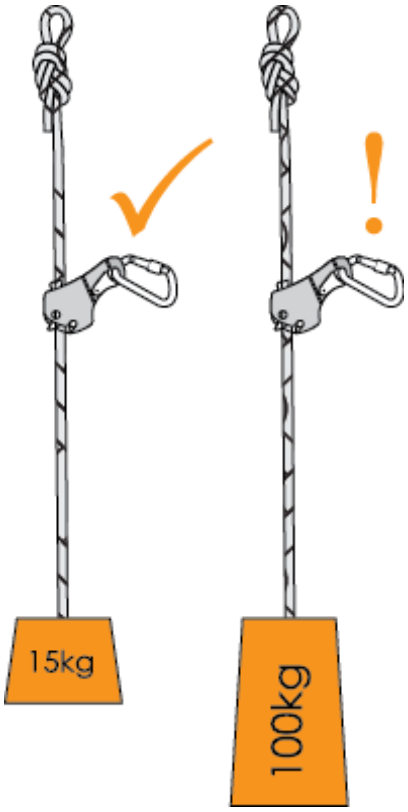
If the fall factor is reduced, or the distance from the knot increased, the impact force will be much less.

**Rope condition**




**Load on rope**




With a heavily loaded (100kg) new rope the Quantum will slide further before arresting the fall. However, the total fall distance may not be affected as any rope stretch will have been reduced due to the pre-load on the rope. If the rope is used/worn, or the fall factor less than 2, this distance will be reduced.

*Note: Committing two people to the same rope is at the bottom of the rescue hierarchy. As such this situation should be rare.*

**Other issues**

Out of control abseil

In tests the Quantum has arrested an out of control abseil (although using a double-braking descender, e.g. the heightec Prism, should be the primary means of protecting against this).

Grabbing

The Quantum will not function if it is held by the user (and there is no need for this in normal use). Some trials by others have shown that there is an instinct to 'grab' when falling, although it is felt very unlikely that someone will let go of what they are holding, e.g. their

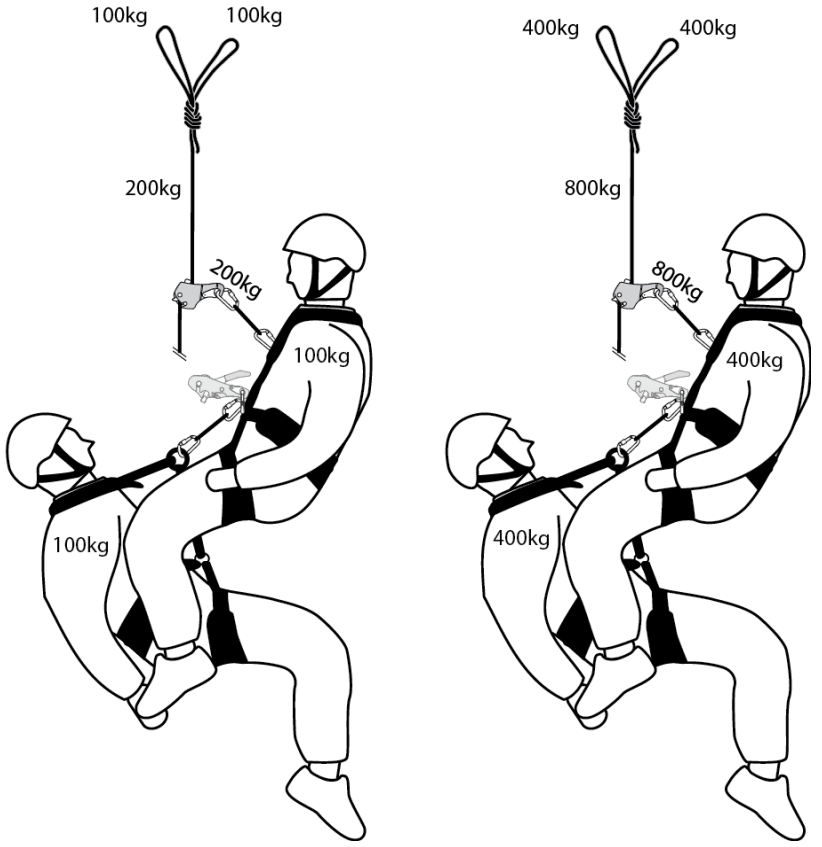
descender, to grab something else. In tests it has been shown not to be an issue with the Quantum.

Example:
A user is at a work position, with the Quantum 'parked' at fall factor 1 on a 0.45m lanyard. In the event of a free fall they will have 0.3 sec only before they are hanging from the Quantum. This is considered very little time to realize that you are falling and then to respond by grabbing the device.

(Human reaction time is around 0.2 seconds. ref: Industrial Rope Access: Backup Devices, A Review; The heightec Group; July 2013/ A literature Review on Reaction Time; Robert J. Kosinski, Clemson University)

Two person load

With a two person load, impact forces at the anchor can also be higher. This does not mean that each person experiences a higher force as, because each person is attached separately, the force is shared (just the same as in a multi-point anchor, or Y-hang (See Figure 6).




*Load at rest* *Potential peak Load in a fall*

*Figure 6: load distribution*