

1. Jackets and pants

The MotoCAP five-star protection rating was developed in 2017 based on evidence from peer-reviewed crash injury research and the test protocols of the current industry standards. The ratings for protection were based on a garment’s combined scores for impact abrasion resistance, impact energy attenuation and seams burst resistance. Scores on each measure were weighted according to the types of garment damage and injuries reported in crash studies. Due to the high prevalence of open wound injuries, abrasion resistance scores were weighted to account for 50% of the final product score and subsequent star rating for protection. Impact energy attenuation accounted for 30% and seams burst resistance for 20%.

Recent on-road impact abrasion trials were funded by the Victorian Department of Transport to evaluate the validity of the Cambridge impact abrasion resistance test rig for MotoCAP ratings. The trials used a replica of the Cambridge test rig to test motorcycle clothing materials on actual road surfaces. A range of the most commonly used motorcycle clothing materials were tested on the major road surface types and grades in Australian and New Zealand.

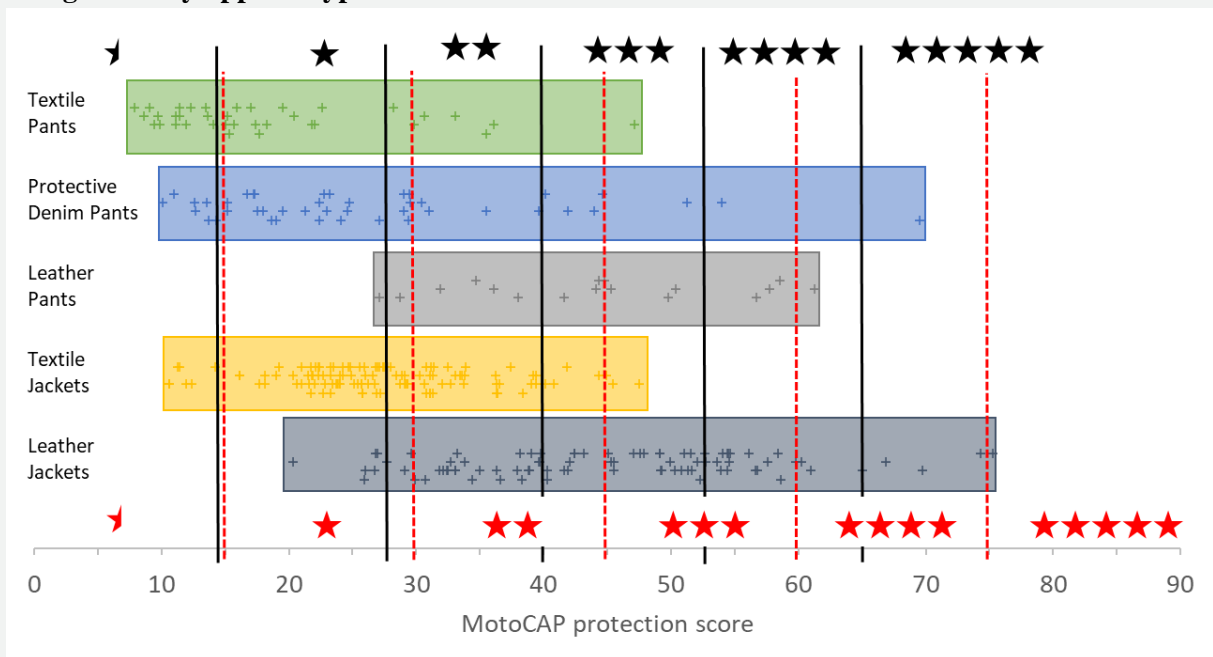
The results have validated the use of the Cambridge test rig to simulate real world crashes, and also indicated that the steps in the rating scale for abrasion resistance were set too high at the upper level of the star ratings for protection. Table 1 presents the current and proposed score ranges to be applied to each level of star rating based on these findings.

Table 1. Changes to the performance levels on protection required for each star rating

Star rating	Protection scores	
	Old	New
★★★★★ (5)	> 78.5	> 64.0
★★★★ (4)	78.4 – 60.5	63.9 – 52.0
★★★ (3)	60.4 – 45	51.9 – 40.0
★★ (2)	44.9 – 29.5	39.9 – 28.0
★ (1)	29.4 – 13.5	27.9 – 13.5
□ (½)	< 13.5	< 13.5

The figure below illustrates the protection scores of all garments tested over the past three years against the current and proposed revised MotoCAP test criteria for star ratings. The previous criteria are shown by the red dotted lines and red stars. The revised criteria are shown by the black solid lines and black stars.

Figure 1. Changes to the performance levels on protection required for each star rating, categorised by apparel type



Note: Red indicates the previous rating system, while black represents the new rating system.

These changes will increase the protection ratings of forty garments. Individual reports on the MotoCAP website will be re-generated and replaced to reflect the changes of rating.

Protection score increases

- Three products go from four stars to five stars
- 10 products go from three stars to four stars
- 15 products go from two stars to three stars
- 12 products go from one star to two stars

2. Gloves

MotoCAP has also changed the way motorcycle gloves are assessed. The changes are based on new research investigating the evidence of impact damage to gloves and rider's hand injuries, together with data from the test performances of 117 types of gloves for MotoCAP. The findings have enabled us to refine the parameters for measuring and rating gloves to be more relevant to mitigating the actual causes of hand injuries for MotoCAP. The details of each of the changes is explained below.

Impact

The number of impact protection zones has been reduced from three to two zones. The two zones are the knuckles and palm of the hand. The wrist impact protection zone was dropped as a study of wrist strains and fractures found that fractures predominately occurred from force directed through the palm of the hand rather than the side of the wrist. This change may see some gloves improving in impact and protection ratings.

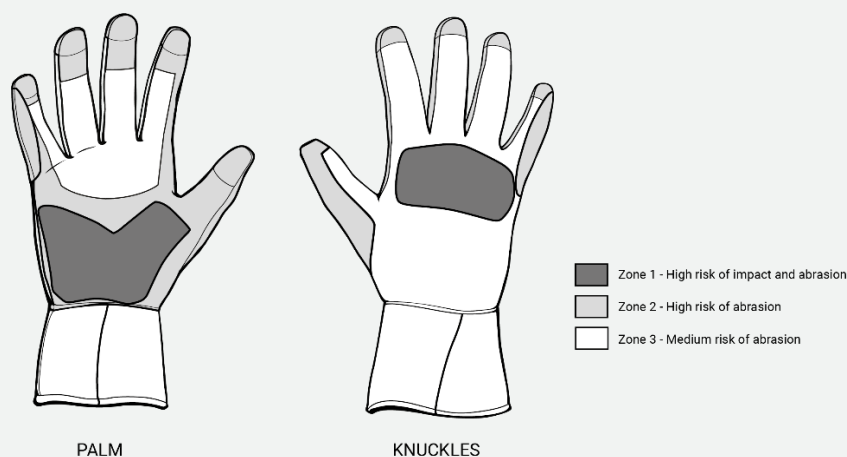
Wrist retention force

The force required to hold the glove on a hand during a crash has been lowered from 400 newtons (N) to 200 N. Review of retention test results together with crash study evidence that few rider's gloves were torn off in crashes, suggested lower force of 200 N could be justified. The new requirement equates to applying 20kg weight to the end of the glove. This change will see some of the higher performing gloves improving in their burst and protection ratings.

Abrasion

The injury risk zones for gloves have been modified based on analysis of the impact evidence on injuries and crash damaged gloves, which found that major injury impacts in crashes were sustained by the back of the hand and lower palm. The figure below illustrates the revised injury risk zones for hands. This changes how the score for abrasion resistance is calculated and may result in changes to the current abrasion scores for all gloves already on MotoCAP with consequences for their overall protection rating.

Figure 2. Injury risk zones for gloves



Seam strength

The optimum seam strength force has been lowered from 20 newtons per millimetre (N/mm) to 13 N/mm. Our review of the distribution of seam strength results over three years of MotoCAP testing showed that 13 N/mm was a more realistic value that could be achieved by manufacturers. Gloves with seams strengths above the median value of 8 N/mm will now perform better on the ratings.

Water resistance

Gloves have previously been rated for water resistance using the percentage wetting of cotton undergarments metric used for jackets and pants. The new metric is based on the volume of water, in millilitres, entering the glove. This method was found to more accurately reflect the discomfort a rider will feel and appropriately delineate glove performance. This change will see a number of gloves improve their water resistance rating.