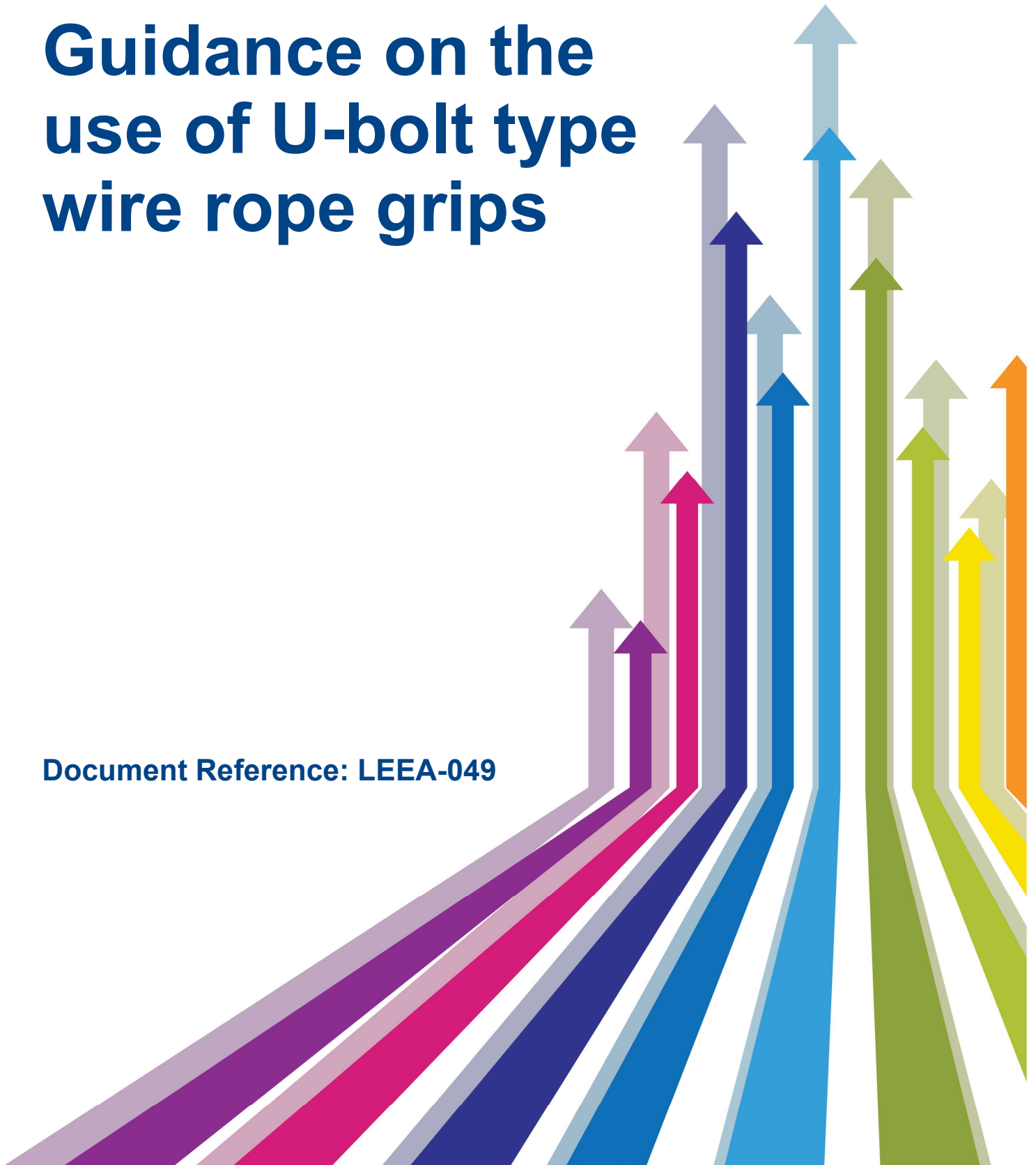


# Guidance on the use of U-bolt type wire rope grips

Document Reference: LEEA-049







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Document reference: LEEA-049; Version 2, Dated 08/02/2021**

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## 1.0 Introduction

Wire rope grips comprising a U-bolt, bridge and two nuts are used to form an eye termination or to act as a stopper to tidy or secure the wire rope tail on a crane hook wedge socket. However, their performance is dependent on several variables, each of which is significant. Considerable care is therefore required when using them for lifting applications.

They should only be used in temporary lifting applications where it is not practical to use a better option such as a ferrule secured eye termination, a metal or resin secured socket, a wedge socket or even a correctly hand-spliced eye.

As stated, wire rope grips should only be used to form an eye termination or to act as a stopper to tidy or secure the rope tail on a wedge socket. They should never be used to join two wire ropes in a long splice.

## 2.0 History

When terminating a wire rope by whatever means, the general expectation is that the minimum failure force of the terminated rope will be at least 80% of the minimum failure force of the rope.

During the 1980s, the UK's Health and Safety Executive Laboratories conducted a series of tests using this type of rope grip. Initially they found that many terminations were failing due to slippage at forces much less than the expected 80%.

### 2.1 Findings

The variables which were found to affect the performance of the termination are as follows:

1. The quality of the rope grip. The U-bolt legs of many unbranded grips were not parallel, the holes in the bridges were excessively large to allow for the misshapen U-bolts. The poor fit due to the shape reduced performance.
2. The design of the bridge. Many grooved bridges did not fit properly onto the rope. Smooth bridges performed better than those which did not fit properly.
3. The design of the nuts. Nuts without chamfered corners or a collar bit into the bridge and resisted tightening.
4. The lubrication of the screw threads. Lubricating the screw threads made tightening easier.
5. The orientation of the rope grip on the rope. The U-bolt must always be on the dead end of the rope. The practice of alternating them reduced performance.
6. The tightness of the fitted grip. A minimum torque value is usually specified. However, that value was often not achieved in practice due to a lack of facility to adequately restrain the grip.
7. The maintenance of the termination. After a short period, the rope relaxes whether tensioned or not. Therefore, a day after fitting and at regular intervals thereafter the torque must be checked, and the nuts re-tightened as necessary.
8. The number of grips fitted. It was often necessary to fit more than the minimum number specified to achieve the 80% performance target.
9. The spacing of the grips. The minimum specified distance between the grips is essential to allow the rope to maintain its full diameter between grips. It is the slope between the full rope diameter and the point crushed by the U-bolt which provides the resistance to slipping. For the same reason the tail end of the rope must be long enough to maintain its full diameter and be secured against un-laying by a soft wire binding.
10. The construction of the wire rope. Fibre core ropes crush easier than steel cored ropes and tend to slip easier. Other construction variables can affect the resistance to slipping.
11. The surface finish of the wire rope and rope grip. A zinc coating on either the rope or the rope grip generally reduces performance.

The combined effect of several of these variables not being correct can drastically reduce the efficiency of the termination.

### 3.0 LEEA Recommendations

In summary, LEEA strongly advises that the user should not use these and always consider whether there are better methods of terminating the wire rope for the particular application, e.g. a ferrule secured eye termination, a metal or resin secured socket, or a wedge socket or even a correctly hand spliced eye.

There are a number of national and international standards offering guidance on wire rope grips. Users selecting such grips should satisfy themselves that they will achieve the required performance when fitted in accordance with the manufacturer's instructions.

#### 3.1 Use of grips

1. Always consider whether there are better methods of terminating the wire rope for the particular application, e.g. a ferrule secured eye, a metal or resin secured socket, wedge socket or even a correctly hand-spliced eye.
2. Where a U-bolt type wire rope grip is considered the only option, only use grips to a nationally recognised standard. Secure the tail end of rope with a soft wire binding to prevent it un-laying.
3. Follow the manufacturer's fitting instructions, taking account of the construction of the wire rope. In particular:
  - a. the number of grips;
  - b. their spacing;
  - c. lubrication of the screw threads;
  - d. the torque value.
4. Consider also the facility required to restrain the grip to enable the required torque to be applied.
5. The bridge of the grip should always be on the live part of the rope and the U-bolt should be on the dead end.
6. Regularly inspect the termination, i.e. before each new use or at the start of each shift.

#### 3.2 Examination of existing terminations

1. Check for any signs of slippage, collapse of the thimble, if fitted, and any other damage.
2. Visually check the quality of the wire rope grips. If in doubt, replace them.
3. Check whether:
  - a. the correct number of grips has been used;
  - b. they are correctly spaced;
  - c. they are correctly fitted, i.e. with the bridge on the live end and the U-bolt on the dead end.
  - d. the tail end of the rope is long enough and is served with a binding to prevent it un-laying.
4. Examine the rope for broken wires paying particular attention to the area adjacent to the rope grips.
5. Check the torque of all nuts and if necessary, re-tighten them.