Figure-8 device block testing report VERSION 1.0, 2021



Figure-8 Device Block Testing Report

Version 1.0 , 2021

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Introduction

Catching up with another canyoner recently, they showed me a failure method for a particular Releasable Figure-8 Device Block used as a releasable set up for canyon abseiling.



Correct rigging





Correct rigging Releasable-8 Block Version 1 (V1)

Incorrect rigging

This block is called Releasable-8 Block V1 (for reference purposes) – above left and middle. It's worth noting that rigged correctly and threaded through a small ring, rapide or chain, it works well and does its intended job. You can use a carabiner on the small hole (minimum) – above left. Alternatively, a quickdraw is attached to protect against accidentally abseiling on the wrong rope until the final canyoner – above middle.

The problem is if you accidentally or incorrectly clipped the figure-8 block by the small ring of the figure-8, with body weight, it would fail the Releasable-8 Block V1, and you would head downwards quickly – above right.

This issue is a lack of understanding of the purpose of a figure-8 block. Once loaded, you need to be able to release it. So the incorrect rigging loads the figure-8 block; you cannot drop a loop and lower the load.

'But this would never happen,' I hear you saying.

The reason for this article and testing is there was a near miss. Someone rigged the Releasable-8 Block V1, incorrectly clipping the small hole directly into the anchor, and had a short free fall, luckily into a deep pool.

Note: This article is about technical canyon rigging. It relates to specific canyoning techniques - the Releasable-8 Block - that requires lots of practice to master and judgment to use in the right place. This article does not constitute training of any sort.



What we set out to do

This near-miss prompted me to test various versions (and failure methods) of the figure-8 block compared to other baseline methods.

- Releasable-8 block normal loading
- Releasable-8 block forwards load small eye clipped if you accidentally clipped the small eye into the anchor, load the block during the abseil.
- Releasable-8 Block backwards load small eye clipped, e.g. when there is a quickdraw backup if you accidentally abseiled on the wrong rope, the one coming out of the bag.
- Figure-8 knot on a bight as a baseline knot for the rope
- Munter Mule overhand as a baseline for an alternative releasable system
- Biner block as a baseline for a non-releasable block

Context

Releasable systems (contingency anchors)

It is essential to have a pre-rigged lowering set up to release the abseil line in many canyoning situations.

Make sure you have enough rope left at the anchor to lower the person to the bottom, i.e. at least the length of the pitch.

When the pitch is longer than half the rope, you need to join another and set up for a big pitch. To have a releasable system, you need to either rig on the topside of the bend or be prepared to pass a bend.

A releasable system is an active risk management tool used for:

- When the abseiler has jammed their descender, clothing or hair, the system needs to be lowered however, in other circumstances, such as a foot entrapment or being stuck behind a waterfall, lowering the abseiler could worsen the situation.
- While a canyoner is abseiling, managing sharp edges by lowering the rope very slowly, 'bleeding the rope'. This lowering spreads any wear over a larger surface area. Re-setting the rope length between each canyoner is needed.
- While the first canyoner is abseiling, set the length by lowering the rope.

Releasable-8 block

The method uses a tied off figure-8 abseil device as a releasable block. It is ideal for lower anchors as the block is directly on the anchor ring. Very little re-rigging is needed for the last canyoner down. You need a spare (second) figure-8 device on your harness.



Releasable-8 block

Munter mule overhand (Italian hitch tied off)

The Munter is a releasable abseil method tied off with a Mule and finished with a carabiner or overhand knot. Ideally, the Munter mule needs to be used on a higher anchor as the method takes more space than the releasable-8 block.

Non-releasable systems

Non-releasable systems are fast and efficient methods to rig either smaller dry pitches or for the last person down.

As these systems cannot be released, rescue is much more difficult. For example, to lower someone from a biner block, you need to: apply a small raising system or counterbalance, remove the block and transfer the load to a lowering system.

Before using a non-releasable system, consider the pitch hazards and the experience of the canyoners. Sharp edges are more difficult to manage as the rope is fixed during an abseil. The two strands or stone knot abseil is a suitable solution as it shares any wear over two ropes.

Biner block

A biner block is a fast and efficient method of rigging smaller dry pitches. This method is standard for the last canyoner (pitch leader) with the Munter Mule. The biner block cannot be released, meaning rescue is more complicated. Only deploy the rope you need out of the pack. Use with caution on sharp edges due to the single fixed strand. Tie a clove hitch on the carabiner's spine on the opposite side to the abseil side.





Biner block

Methods and Materials

Methods

Slow pull tests

- As each test destroyed the rope, it was new for every test.
- Carabiners and rapides, where they were undamaged, were reused for multiple tests.
- All knots and hitches had hand tension with all strands pulled tight.
- Each testing series records the slow pull tests set up (see Appendix 1-2).
- The slow pull testing was in one location.
 - Aspiring Safety, 1/6 Burdale Street, Riccarton, Christchurch, New Zealand.
 - https://www.aspiring.co.nz/
- Vertical testbed 1.6m Electronic Universal Testing Machine, Model WDW-50
 - Maximum Test Force 50kN, sample rate 60 per second
 - Jinan Chuanbai Instrument Equipment Co Ltd

Practical use testing

Practical use testing (lowering) occurred at Over the Edge Rescue, 55 Mckenzie Street, Geraldine, New Zealand. https://overtheedgerescue.com

• 80kg test mass contained in a 70 litre PVC bags (Aspiring Safety) filled with four bags of 20kgs of gravel. The test mass is secured into each bag so it can't shift during testing.











Materials

Figure-8 device

Petzl Huit

- Manufactured by: Petzl (https://www.petzl.com/INT/en/ Professional/Descenders/HUIT)
- Material(s): aluminum
- Weight: 100 g
- Rope compatibility: 8 to 13 mm (single and half ropes)
- Working load limit: 100 kg

Korda's Dana 10

- Manufactured by: Korda's (https://www.sacidkordas.com/ en/producte/dana-10/)
- Type: Canyons rope semi-static A
- Diameter: 10 mm
- Weight: 68 g/m
- Breaking strength: 27.80 kN
- Static elongation: 2.7% (150kgs)
- Core proportion: 61%
- Sheath proportion: 39%
- Materials: Core/Sheath Nylon/ Nylon
- Standards: EN 1891:1998, type A

Korda's Dana 9

- Manufactured by: Korda's (https://www.sacidkordas.com/ en/producte/dana-9/)
- Type: Canyons rope semi-static B
- Diameter: 9 mm
- Weight: 54 g/m
- Breaking strength: 22.20 kN
- Static elongation: 3.8% (150kgs)
- Core proportion: 58%
- Sheath proportion: 42%
- Materials: Core/Sheath Nylon/Nylon
- Standards: EN 1891:1998, type B







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Variations tested

Figure-8 on a bight knot

1. Figure 8 on a bight – 9 and 10mm rope.



Biner Block

1

1. Clove hitch – 9 and 10mm rope.





Figure-8 Block V1

1. Figure-8 Block V1 – 10mm rope.

Munter Mule Overhand

1. Munter Mule Overhand – 9 and 10mm rope.



Figure-8 Block V2

1. Figure-8 Block V2 through an 8mm rapide -10mm rope



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Figure-8 Block V3

- 1. Figure-8 Block V3 through an 8mm rapide 9 and 10mm rope
- 2. Figure-8 Block V3 load forward small eye clipped 9 and 10mm rope
- 3. Figure-8 Block V3 load backward small eye clipped 9 and 10mm rope







Figure-8 Block Mule Overhand (MO)

- 1. Figure-8 Block MO through an 8mm rapide 9 and 10mm
- 2. Figure-8 Block MO load forward small eye clipped 9 and 10mm rope
- 3. Figure-8 Block MO load backward small eye clipped 9 and 10mm rope



1









How to tie the releasable-8 block versions

- 2
- Manuel Professional De Canyonisme, 2018, Page 142. CREPS Canyoning Technical Manual, 2021, Page 138. Over the Edge Rescue 3

¹ Originally from Commission Internationale de Canyon (CIC)

Mule overhand⁴



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⁴ Canyoneer LVL3 Manual, 2017, Page 106. ICOPRO.

Slow pull test results

Kordas Dana 10mm Semi-static rope

Slow pull tests (100mm/minute)

Items tested	Avg. kN	%	# Tests	Comment	Аррх. 1
Figure-8 on a bight knot	19.53	70	5	Broke at the knot	<u>pg. 22</u>
Munter mule overhand	15.35	55	3	Broke at the 12mm carabiner	<u>pg. 25</u>
Biner block	16.31	59	3	Broke at the 8mm rapide	<u>pg. 28</u>
Figure-8 device block V1	16.17	58	3	Broke at the 8mm rapide	<u>pg. 31</u>
Figure-8 device block V1 forward load small eye clipped	1.29	5	3	First Slip 0.88kN, kept on slipping	<u>pg. 34</u>
Figure-8 device block V2	3.56	13	3	First slip 3.08kN, kept on slipping	<u>pg. 37</u>
Figure-8 device block V3	16.12	58	3	Broke at the 8mm rapide	<u>pg. 40</u>
Figure-8 device block V3 forward load small eye clipped	3.95	14	3	First slip 2.43kN, kept on slipping	<u>pg. 43</u>
Figure-8 device block V3 backwards load small eye clipped	22.64	81	3	Broke at the Figure-8 device	<u>pg. 46</u>
Figure-8 device block mule overhand (MO)	16.58	60	3	First slip 10.13kN, MO unwound from the Fig-8 360 degrees. Broke at the 8mm rapide	<u>pg. 49</u>
Figure-8 device MO forward load small eye clipped	19.07	69	3	First slip 4.59kN, MO unwound from the Fig-8 720 degrees. Broke at one side of the fig-8 device	<u>pg. 52</u>
Figure-8 device block MO backwards load small eye clipped	7.70	28	3	First slip 7.44kN, kept on slipping, the overhand bight started to get pulled through and get smaller	<u>pg. 55</u>

	Thumb and finger	One hand	Two hands	
Figure-8 device friction lowering mode through 8mm rapide	0.75	1.15	2.39	<u>pg. 58</u>

Kordas Dana 9mm Semi-static rope

Slow pull tests (100mm/minute)

Items tested	Avg. kN	%	# Tests	Comment	Аррх. 1
Figure-8 on a bight knot	15.95	72	5	Broke at the knot	<u>pg. 60</u>
Munter mule overhand	12.98	58	3	Broke at the 12mm carabiner	<u>pg. 63</u>
Biner block	13.82	59	3	Broke at the 8mm rapide	<u>pg. 66</u>
Figure-8 device block V3	7.59	35	3	Kept on slipping	<u>pg. 69</u>
Figure-8 device block V3 forward load small eye clipped	2.98	13	3	Kept on slipping	<u>pg. 72</u>
Figure-8 device block V3 backwards load small eye clipped	19.08	86	3	Broke at the rope clamp (1), and figure-8 device (2)	<u>pg. 75</u>
Figure-8 device block MO	13.20	59	3	First slip 5.14kN, MO unwound from the Fig-8 360 degrees. Broke at the 8mm rapide	<u>pg. 78</u>
Figure-8 device MO forward load small eye clipped	16.87	76	3	First slip 2.06kN, MO unwound from the Fig-8 720 degrees. Broke at one side of the fig-8 device	<u>pg. 81</u>
Figure-8 device block MO backwards load small eye clipped	7.12	32	3	First slip 5.92kN, kept on slipping, the overhand bight started to get pulled through and get smaller	<u>pg. 84</u>

	Thumb and finger	One hand	Two hands	
Figure-8 device friction lowering mode through 8mm rapide	0.79	1.25	2.02	<u>pg. 87</u>



Analysis of slow pull testing

All the blocks/releasable systems should be the same when tested through the 8mm rapide or on a carabiner. Ideally, this is 15kN (or more) rope strength for 10mm and 13kN for 9mm rope or assessed to have a sufficient margin when it does not meet these numbers and slips.

When the figure-8 block is misused (for the forwards or backwards loading on the small eye), it should not fail dramatically and if it does slip, be at least 2kN or more.

Control Variations - 9 and 10mm

All the control variations tested, including the Figure-8 on a bight knot, Munter Mule Overhand, and biner block broke on average a minimum of 13kN for 9mm and 15kN for 10mm rope strength.

• The recommendation is all control variations are suitable for canyoning

Figure-8 Block V1 - 10mm

While the figure-8 Block V1 threaded through an 8mm rapide broke on average above 16kN, when loaded forward with the small eye clipped, however, it failed suddenly at around 1kN. This failure method demonstrates the near miss that occurred in the canyon.

• Recommendation: not suitable for canyoning

Figure-8 Block V2 - 10mm

The figure-8 Block V2 threaded through an 8mm rapide kept slipping on average at 3.5kN. This was assessed as not having sufficient margin for a figure-8 block when compared to other methods.

• The recommendation is the V2 is not suitable for canyoning.

Figure-8 Block V3 - 10mm

The figure-8 block V3, through an 8mm rapide, broke and loaded backwards small eye clipped on average was a minimum of 16kN rope strength.

The figure-8 block V3 loaded forward small eye clipped kept slipping on average at 4kN.

• The recommendation is the V3 is suitable for canyoning.

Figure-8 Block V3 - 9mm

The figure-8 block V3 threaded through an 8mm rapide kept slipping on average at 7kN. This was assessed as having sufficient margin for a figure-8 block.

The figure-8 block V3 loaded forward small eye clipped kept slipping on average at 4kN.

The figure-8 block V3 loaded backwards small eye clipped broke on average was a minimum of 19kN rope strength.

• The recommendation is the V3 is suitable for canyoning.



Figure-8 Block Mule Overhand - 10mm

The figure-8 block mule overhand threaded through an 8mm rapide broke and loaded forward small eye clipped at a minimum of 16kN rope strength.

The figure-8 block mule overhand loaded backwards small eye clipped, kept on slipping, the overhand bight started to get pulled through and get smaller, on average at 7kN.

• The recommendation is the mule overhand is suitable for canyoning.

Figure-8 Block Mule Overhand - 9mm

The figure-8 block mule overhand threaded through an 8mm rapide broke and loaded forward small eye clipped was a minimum of 13kN rope strength.

The figure-8 block mule overhand loaded backwards small eye clipped, kept on slipping, the overhand bight started to get pulled through and get smaller, on average at 7kN.

• The recommendation is the mule overhand is suitable for canyoning.



Efficiency tests

Now that we have established the figure-8 block V3 and figure-8 block mule overhand are suitable, we compared and contrasted how easy they are to use in reality. To make this relevant, I have compared this to tying Munter Mule Overhand and biner block

Initially tie - covert to lower - reinstate to tied off - convert to retrieve

- The gear taken from the harness is in time when initially tying
- Fig-8 blocks completed with a quick draw backup with carabiners closed
- The tying method is correctly <u>DRESSED</u> when finished
- Lowering setup rope charged with 5kg
- Time is the average of 3 attempts in seconds
- Each attempt is made smoothly at <u>NORMAL</u> speed if well-practiced (<u>Note:</u> I didn't set out to undertake the method as quickly as possible. I undertook a smooth speed that was not rushed (NORMAL) with a high-quality result (DRESSED), so I could <u>consistently compare methods.</u>)
- Done on flat ground with an anchor at head height with 9mm rope

Type tested	Time to tie initially (sec)	Time to convert to lower (sec)	Time to reinstate to tied off (sec)	Time to convert to retrieve (sec)
Figure-8 device block V3	19	10	14	5 (quick draw)
Figure-8 device block MO	33	9	26	6 (quick draw)
Munter mule overhand	23	9	12	25 (biner block)
				16 (biner block preloaded ⁵)
				13 (to double rope)

Analysis of the efficiency tests

When you consider time to tie initially, convert to lower, reinstate to tied off and convert to retrieve, there was very little in it. Not enough to argue one way or the other.

^{5.} When you don't need to bleed (slowly lower) the rope for sharp edge management, the biner block can be preloaded onto the standing part of the rope close to the ring as the last abseiler is descending.

Practical use

Convert to lower - lower the load - reinstate to tied off

- Figure-8 block versions (V3 and MO) and Munter Mule Overhand (MMO) were tied in both 9mm and 10mm rope.
- An 80kg load was lowered onto the Figure-8 blocks and MMO.
- The anchor was a free hanging 8mm oval rapide.
- The Figure-8 blocks and MMO untied and lowered then retied a minimum of 2 times over a 10m lower.

Type tested	Rope size	Comments
Figure-8 device block V3	10mm	 The block was easily untied, lowered and retied. The rope was easy to hold with one hand. There was noticeable twisting in the rope during lowering.
	9mm	 The block was easily untied, lowered and retied. The rope was easy to hold with one hand. There was noticeable twisting in the rope during lowering.
Figure-8 device block MO	10mm	 The block was easily untied, lowered and retied. The rope was easy to hold with one hand. The overhand had to be retied below the mule. The overhand took time, and it was challenging to get dressed. There was noticeable twisting in the rope during lowering.
	9mm	 Initially not easy to untie and lower the load. The second and third tries were easier as the overhand was below the mule. Difficult to retie with the smaller diameter rope. The overhand took time, and it was challenging to get dressed. There was noticeable twisting in the rope during lowering.
Munter mule overhand	10mm	 The Munter was easily untied, lowered and retied. The rope was easy to hold with one hand. There was no noticeable twisting in the rope during lowering.
	9mm	 The Munter was easily untied, lowered and retied. The rope was easy to hold with one hand. There was no noticeable twisting in the rope during lowering.

Analysis of conversion testing

<u>Figure-8 device block V3:</u> Was easy to untie, lower and retie. However, had to unclip the quickdraw to drop a loop and then reclip before lowering. Also twisted the rope when lowered.

Figure-8 device block MO: Was easy to untie, lower and retie in 10mm, didn't have to unclip the quickdraw. However more challenging to retie in 9mm due to less friction around the figure-8 device. Also twisted the rope when lowered. Recommend to tie the overhand below the mule which is different to that shown in the reference material⁶.

<u>Munter mule overhand:</u> Was easy to untie, lower and retie and didn't twist the rope.

6. Canyoneer LVL3 Manual, 2017, Page 106. ICOPRO.

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Retrieval

Our thoughts and practical experience observations of using these methods when retrieving the rope.

Figure-8 device block V3:

- Has lower profile for pulling over obstacles.
- Easy to untie once retrieved.

Figure-8 device block MO:

- It is not as low profile for pulling over obstacles due to the mule overhand left in place.
- Easy to untie once retrieved.

Biner block:

- Has lower profile for pulling over obstacles.
- The biner block (clove hitch on a carabiner) can be challenging to loosen and untie once retrieved.

Conclusions

Figure-8 device blocks

From a slow pull testing point of view, only two figure-8 blocks performed to a satisfactory level: Figure-8 block V3 and Figure-8 mule overhand (MO).

When you consider time to tie initially, convert to lower, reinstate to tied off and convert to retrieve, there was very little in it. Not enough to argue one way or the other.

When you convert to lower, lower the load and retie when loaded; both blocks performed well in 10mm rope. However, the mule overhand version in 9mm was more challenging to reinstate to tied off while this was easy in the V3. Also, there was noticeable twisting observed when lowering.

Considering all the things we have learned, we recommend both the V3 and MO figure-8 device blocks for 9mm and 10mm ropes.

Munter mule overhand and biner block

From a slow pull testing point of view, the Munter Mule Overhand (MMO) and biner block performed to a satisfactory level.

When you consider time to tie initially, convert to lower, reinstate to tied off and convert to retrieve, there was very little in it compared to the figure-8 blocks. Not enough to argue one way or the other.

When you convert to lower, lower the load and retie when loaded, the MMO performed well in both 9 and 10mm ropes. Also, there was no noticeable twisting observed when lowering.

Considering all the things we have learned, we recommend the MMO and biner block for 9mm and 10mm ropes.

Final thoughts

We set out to test various versions (and failure methods) of the figure-8 block compared to other baseline methods. We went quite a long way down the rabbit hole, but out the end came an understanding of the tools we use and how they perform.

There are many canyoners using the Figure-8 device block as they find it easier to tie, and it's quick to transition from abseil to retrieval modes.

The Munter Mule Overhand (MMO) is ideal for situations where you need to lower and then reset the rope. For aquatic canyons, especially with sharp edges, this is our go-to method. The MMO easily converts to a biner block and is less likely to get stuck on retrieval. Also, from time to time, for the last person down, we use double rope for sharp edge management or tricky retrievals where we want a clean rope. Converting the MMO to a double rope is straightforward.

In the end, both the figure-8 device block and MMO/biner block are tools in the toolkit to manage risk in the canyon environment. Using both methods and applying them in appropriate places is the recommended approach.

References

- 1. Petzl. https://www.petzl.com/
- 2. Korda's. https://www.sacidkordas.com/
- 3. Canyoning Technical Manual. 2021. Over the Edge Rescue
- 4. Manuel Professional De Canyonisme. 2018. CREPS.
- 5. Canyoneer LVL3 Manual. 2017. ICOPRO.

Disclaimer

- 1. Information contained in this test report is not an instructional guide—intended to supplement training from experienced and competent canyoning instructors.
- 2. Use at your own risk. The publisher and author assume no responsibility or liability for any accident, injury, loss or damage sustained while following any of the recommendations or techniques described.
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- 4. Testing was under controlled conditions with a limited set of equipment. Testing with different equipment or operating in different conditions may result in different outcomes.
- 5. The views, information, or opinions expressed in the test report are solely those of the author and do not necessarily represent those of other organisations or individuals listed.

Glossary of terms

Bends: Where two pieces of rope or webbing are tied together usually at their ends, with both playing an integral part. The load is pulling in line through the bend. An example is a double fisherman's bend.

Maximum Force (kN): Maximum amount of tensile stress that the material can withstand before failure (rupture), such as breaking or permanent deformation. Tensile strength specifies the point when a material goes from elastic to plastic deformation.

Force (kN): In physics, force is the push or pull on an object with mass that causes it to change velocity (to accelerate). Force represents as a vector, which means it has both magnitude and direction. The SI unit of force is the newton (N).

Knots: 'If it's not a bend or a hitch then it's a knot'. In the widest sense a generic name for all types of rope and cord entanglements but specifically where a connection is tied that is self-sustaining in rope or webbing.

Hitches: Where a rope is tied to an object where if the object is removed the hitch falls apart. An example is the Italian/Munter hitch.

Appendix 1: Testing Kordas Dana 10mm

Figure-8 on a bight 10mm

Materials

Ro	pes

- Korda's 10mm Dana (27.8kN)

Test setup

Knots

– Figure-8 on a bight

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	- Rope clamp and 12mm pin

Results

Date	#	Breaking force (kN)	%	Comments
5/06/20	19	19.87	71	Broke inside knot
5/06/20	20	19.54	70	
5/06/20	21	19.28	69	
5/06/20	22	20.15	72	
5/06/20	23	18.82	68	
Average		19.53	70	

* Sample 5/06/20 #19 shown on the following pages.

Test Date:	Friday, 5 June 2020	
Max Force (kN):	19.87	
Product Name:	Fig-8 oab	
Batch #:	19	
Material:	Kordas Dana 10mm	

Machine has a current calibration certificate. www.aspiring.co.nz

Appendix 1: Testing Kordas Dana 10mm

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Munter mule overhand 10mm

Materials

Rope	– Korda's 10mm Dana (27.8kN)
Hardware	 CT Snappy steel screwlock carabiner (40kN)

Test setup

Knots	– Figure-8 on a bight
Hitches	- Munter mule overhand on steel carabiner

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– 12mm pins

Results

Date	#	Max force (kN)	%	Comments
31/10/19	12*	15.51	56	Broke at the rope at the first cross
31/10/19	13	15.87	57	of the Munter
18/06/19	11	14.67	53	
Average		15.35	55	

* Sample 31/10/19 #12 shown on the following pages.

Test Date:	Thursday, 31 October 2019
Max Force (kN):	15.51
Product Name:	Munter Mule Overhand
Batch #:	12
Material:	10mm Kordas Dana

Machine has a current calibration certificate. www.aspiring.co.nz

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Biner block 10mm

Materials

Ropes	– Korda's 10mm Dana (27.8kN)		
Hardware	– CT Large steel screwlock carabiner (50kN)		
	– Maillon rapide 8mm steel oval (35kN)		

Test setup

Hitches	- Clove hitch on spine of steel carabiner
Attachments	- Threaded through rapide and clamped

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	- Rope clamp and 12mm pin

Results

Date	#	Max force (kN)	%	Comments
11/03/21	2*	15.21	55	Broke at the 8mm rapide
31/03/21	3	16.91	61	
31/03/21	4	16.80	60	
Average		16.31	59	

* Sample 11/03/21 #2 shown on the following pages.

Thursday, 11 March 2021
15.21
Biner Block
2
10mm Kordas Dana

	Tested by:	Grant Prattley
ECAAS		σ O .
iso 9001 CERTIFIED	Signed:	Srant Surale
Q U A L I T Y MANAGEMENT	- 0	-

Machine has a current calibration certificate. www.aspiring.co.nz

Appendix 1: Testing Kordas Dana 10mm

Figure-8 device block 10mm (V1)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)			
Hardware	– Petzl Huit Figure-8			
	– Maillon rapide 8mm steel oval (35kN)			

Test setup

Fig-8 blocks	- Version 1 on a figure-8 device
Attachments	 Clamped leg threaded through rapide

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	Max force (kN)	%	Comments
24/10/19	15	16.13	58	Broke at the 8mm rapide
24/10/19	16	16.08	58	
11/03/21	4*	16.31	59	
Average		16.17	58	

* Sample 11/03/21 #4 shown on the following pages.

Test Date:	Thursday, 11 March 2021
Max Force (kN):	16.31
Product Name:	Figure-8 Device Block V1
Batch #:	4
Material:	10mm Dana Kordas

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Appendix 1: Testing Kordas Dana 10mm

Canyoning: Figure-8 Device Block Testing Report 2021 (V1.0)

Figure-8 device block 10mm (V1 load forwards)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)			
Hardware	· CT Snappy steel screwlock carabiner (40kN)			
	– Petzl Huit Figure-8			

Test setup

Fig-8 blocks	- Version 1 on a figure-8 device		
Attachments	- Small eye clipped to steel carabiner		
	 Clamped leg load forwards 		

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
17/09/21	10*	0.76	1.37	5%	Kept on slipping
17/09/21	11	0.81	1.41	5%	
17/09/21	12	1.08	1.09	4%	
Average		0.88	1.29	5%	

* Sample 17/09/21 #10 shown on the following pages.

Test Date:	Friday, 17 September 2021
Max Force (kN):	1.37
Product Name:	Fig-8 block V1 forwards loading small eye clipped
Batch #:	10
Material:	10mm Kordas Dana

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Appendix 1: Testing Kordas Dana 10mm

Figure-8 device block 10mm (V2)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)
Hardware	– Petzl Huit Figure-8
	– Maillon rapide 8mm steel oval (35kN)

Test setup

Fig-8 blocks	- Version 2 on a figure-8 device			
Attachments	 Clamped leg threaded through rapide 			

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
17/09/21	1*	3.01	3.99	14	Kept slipping
17/09/21	2	2.60	2.94	11	
17/09/21	3	3.62	3.75	13	
Ave	rage	3.08	3.56	13	



* Sample 17/09/21 #1 shown on the following pages.













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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (V3)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)
Hardware	- CT D-Shaped steel screwlock carabiner (50kN)
	 Petzl Huit Figure-8
	 Maillon rapide 8mm steel oval (35kN)

Test setup

Fig-8 blocks	- Version 3 on a figure-8 device
Attachments	- Clamped leg threaded through rapide

Test parameters

Speed	– Slow pull 100mm/minute		
Tested between	– Rope clamp and 12mm pin		

Results

Date	#	Max force (kN)	%	Comments
31/03/21	5*	15.44	56	Broke at the 8mm rapide
31/03/21	6	16.41	59	
31/03/21	7	16.52	59	
Average		16.12	58	

* Sample 31/03/21 #5 shown on the following pages.







Test Date: Wednesday, 31 March 2021 15.44 Max Force (kN): Product Name: Fig-8 Block v3 Batch #: 5 Material: 10mm Kordas Dana



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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (V3 load forwards)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)
Hardware	- CT Snappy steel screwlock carabiner (40kN)
	– Petzl Huit Figure-8

Test setup

Fig-8 blocks	- Version 3 on a figure-8 device		
Attachments	– Small eye clipped to steel carabiner		
	- Clamped leg load forwards		

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
17/09/21	4*	2.69	4.91	18	Kept slipping
17/09/21	5	2.08	3.09	11	
17/09/21	6	2.52	3.86	14	
Average		2.43	3.95	14	

* Sample 17/09/21 #4 shown on the following pages.













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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (V3 load backwards)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)			
Hardware	– CT Snappy steel screwlock carabiner (40kN)			
	– Petzl Huit Figure-8			

Test setup

Fig-8 blocks	- Version 3 on a figure-8 device				
Attachments	- Small eye clipped to steel carabiner				
	– Clamped leg load backwards				

Test parameters

Speed	– Slow pull 100mm/minute			
Tested between	– Rope clamp and 12mm pin			

Results

Date	#	Max force (kN)	%	Comments
17/09/21	7*	23.06	83	Broke at the figure-8 block
17/09/21	8	22.84	82	
17/09/21	9	22.01	79	
Average		22.64	81	

* Sample 17/09/21 #7 shown on the following pages.











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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (MO)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)					
Hardware	– Petzl Huit Figure-8					
	– Maillon rapide 8mm steel oval (35kN)					

Test setup

Fig-8 blocks	- Mule overhand on a figure-8 device			
Attachments	 Clamped leg threaded through rapide 			

Test parameters

Speed	– Slow pull 100mm/minute			
Tested between	- Rope clamp and 12mm pin			

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
15/11/21	1*	11.34	16.54	59	Mule Overhand unwound
15/11/21	2	8.63	17.62	63	from the Fig-8 360 degrees.
15/11/21	3	10.43	15.57	56	
Average		10.13	16.58	60	



* Sample 15/11/21 #1 shown on the following pages.









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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (MO load forwards)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)		
Hardware	 CT Snappy steel screwlock carabiner (40kN) Petzl Huit Figure-8 		
	– Maillon rapide 8mm steel oval (35kN)		

Test setup

Fig-8 blocks	- Mule overhand on a figure-8 device			
Attachments	- Small eye clipped to steel carabiner			
	- Clamped leg load forwards			

Test parameters

Speed	– Slow pull 100mm/minute			
Tested between	Rope clamp and 12mm pin12mm pins			

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments	
15/11/21	4	4.22	18.21	66	MO unwound from the	
15/11/21	5*	4.47	19.91	72	Fig-8 720 degrees. Broke	
15/11/21	6	5.07	19.1	69	device.	
Average		4.59	19.07	69		

* Sample 15/11/21 #5 shown on the following pages.







Test Date:Wednesday, 17 November 2021Max Force (kN):19.91Product Name:Fig 8 Block mule overhand forwards loadBatch #:5Material:Kordas Dana 10mm



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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (MO load backwards)

Materials

Ropes	– Korda's 10mm Dana (27.8kN)
Hardware	 CT Snappy steel screwlock carabiner (40kN) Petzl Huit Figure-8
	– Maillon rapide 8mm steel oval (35kN)

Test setup

Fig-8 blocks	- Mule overhand on a figure-8 device
Attachments	- Small eye clipped to steel carabiner
	 Clamped leg load backwards

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	Rope clamp and 12mm pin12mm pins

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments	
15/11/21	7*	8.12	8.59	31	Kept slipping, the overhand	
15/11/21	8	6.19	6.19	22	bight started to get pulled	
15/11/21	9	8.01	8.31	30	through and get smaller.	
Average		7.44	7.70	28		

* Sample 15/11/21 #7 shown on the following pages.











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Appendix 1: Testing Kordas Dana 10mm



Figure-8 device block 10mm (friction)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)
Hardware	– Petzl Huit Figure-8
	– Maillon rapide 8mm steel oval (35kN)

Test setup

Fig-8 blocks	- Set up in lowering mode against rapide
Attachments	 Clamped leg threaded through rapide

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	- Rope clamp and 12mm pin

Results

Date	#	Thumb & finger (kN)	1 hand (kN)	2 hands (kN)
10/12/21	23*	0.75	1.15	2.39

* Sample 10/12/21 #23 shown on the following pages.







Test Date:	Friday, 10 December 2021
Max Force (kN):	2.39
Product Name:	Fig-8 block friction
Batch #:	23
Material:	Kordas Dana 10mm



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Appendix 2: Testing Kordas Dana 9mm

Figure-8 on a bight 9mm

Materials

– Korda's 9mm Dana (22.2kN)

Test setup

Knots	

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	 Rope clamp and 12mm pin

- Figure-8 on a bight

Results

Date	#	Max force (kN)	%	Comments
5/06/20	14*	16.35	74	Broke inside knot
5/06/20	15	15.30	69	
5/06/20	16	15.92	72	
5/06/20	17	16.05	72	
5/06/20	18	16.15	73	
Average		15.95	72	



* Sample 5/06/20 #14 shown on the following pages.





Test Date:	Friday, 5 June 2020
Max Force (kN):	16.35
Product Name:	Fig-8 oab
Batch #:	14
Material:	Kordas Dana 9mm



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Appendix 2: Testing Kordas Dana 9mm







Munter mule overhand 9mm

Materials

Ropes	– Korda's 9mm Dana (22.2kN)
Hardware	– CT Snappy steel screwlock carabiner (40kN)

Test setup

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	Max force (kN)	%	Comments
24/09/21	13*	12.97	58	Broke at the first cross of the
24/09/21	14	13.48	61	Munter
24/09/21	15	12.49	56	
Average		12.98	58	



* Sample 24/09/21 #13 shown on the following pages.





Test Date:	Friday, 24 September 2021
Max Force (kN):	12.97
Product Name:	Munter muler overhand
Batch #:	13
Material:	9mm Kordas Dana



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Appendix 2: Testing Kordas Dana 9mm





Biner block 9mm

Materials

Ropes	– Korda's 9mm Dana (22.2kN)
Hardware	– CT Snappy steel screwlock carabiner (40kN)
	 Maillon rapide 8mm steel oval (35kN)

Test setup

Hitches	- Clove hitch on spine of steel carabiner
Attachments	- Clamped leg threaded through rapide

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	Max force (kN)	%	Comments
24/09/21	1*	13.27	60	Broke at the 8mm rapide
24/09/21	2	13.65	61	
24/09/21	3	12.41	56	
Average		13.82	59	



* Sample 24/09/21 #1 shown on the following pages.





Test Date:	Friday, 24 September 2021
Max Force (kN):	13.27
Product Name:	Biner block
Batch #:	1
Material:	9mm Kordas Dana





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Appendix 2: Testing Kordas Dana 9mm



Figure-8 device block 9mm (V3)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)		
Hardware	– Petzl Huit Figure-8		
	– Maillon rapide 8mm steel oval (35kN)		

Test setup

Fig-8 blocks	- Version 3 on a figure-8 device	
Attachments	- Clamped leg threaded through rapide	

Test parameters

Speed	– Slow pull 100mm/minute		
Tested between	– Rope clamp and 12mm pin		

Results

Date	#	Max force (kN)	%	Comments
24/09/21	4*	7.80	35	Kept slipping
24/09/21	5	8.15	37	
24/09/21	6	6.83	31	
Average		7.59	35	



* Sample 24/09/21 #4 shown on the following pages.









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Appendix 2: Testing Kordas Dana 9mm



Figure-8 device block 9mm (V3 load forwards)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)		
Hardware	– CT Snappy steel screwlock carabiner (40kN)		
	– Petzl Huit Figure-8		

Test setup

Fig-8 blocks	- Version 3 on a figure-8 device	
Attachments	- Small eye clipped to steel carabiner	
	 Clamped leg load forwards 	

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	Max force (kN)	%	Comments
24/09/21	7*	3.01	14	Kept slipping
24/09/21	8	3.42	15	
24/09/21	9	2.51	11	
Average		2.98	13	

* Sample 24/09/21 #7 shown on the following pages.






Test Date:	Friday, 24 September 2021			
Max Force (kN):	3.01			
Product Name:	Fig-8 block v3 load foward small eye			
Batch #:	7			
Material:	9mm Kordas Dana			



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Figure-8 device block 9mm (V3 load backwards)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)			
Hardware	– CT Snappy steel screwlock carabiner (40kN)			
	– Petzl Huit Figure-8			

Test setup

Fig-8 blocks	- Version 3 on a figure-8 device			
Attachments	- Small eye clipped to steel carabiner			
	- Clamped leg load backwards			

Test parameters

Speed	– Slow pull 100mm/minute	
Tested between	– Rope clamp and 12mm pin	

Results

Date	#	Max force (kN)	%	Comments
24/09/21	10*	19.89	90	Broke at the rope grab
24/09/21	11	18.59	84	Broke at the figure-8 block
24/09/21	12	18.76	85	
Average		19.08	86	









Test Date:	Friday, 24 September 2021			
Max Force (kN):	19.89			
Product Name:	Fig-8 block v3 load backwards small eye			
Batch #:	10			
Material:	9mm Kordas Dana			





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Figure-8 device block 9mm (MO)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)				
Hardware	– Petzl Huit Figure-8				
	– Maillon rapide 8mm steel oval (35kN)				

Test setup

Fig-8 blocks	- Mule overhand on a figure-8 device		
Attachments	 Clamped leg threaded through rapide 		

Test parameters

Speed	– Slow pull 100mm/minute		
Tested between	– Rope clamp and 12mm pin		

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
24/11/21	1*	5.53	13.00	59	MO unwound from the Fig-
24/11/21	2	4.98	12.91	58	8 360 degrees. Broke at the
24/11/21	3	4.92	13.69	62	
Average	·	5.14	13.20	59	



* Sample 24/11/21 #1 shown on the following pages.











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Figure-8 device block 9mm (MO load forwards)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)			
Hardware	– CT Snappy steel screwlock carabiner (40kN)			
	– Petzl Huit Figure-8			

Test setup

Fig-8 blocks	- Mule overhand on a figure-8 device			
Attachments	- Small eye clipped to steel carabiner			
	- Clamped leg load forwards			

Test parameters

Speed	– Slow pull 100mm/minute		
Tested between	– Rope clamp and 12mm pin		
	– 12mm pins		

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
24/11/21	4*	2.48	17.30	78	MO unwound from the Fig-
24/11/21	5	1.60	17.31	78	8 720 degrees. Broke at one
24/11/21	6	2.10	16.01	72	
Average		2.06	16.87	76	

* Sample 24/11/21 #4 shown on the following pages.







Test Date:Wednesday, 24 November 2021Max Force (kN):17.30Product Name:Fig-8 Block MO foward load small eye clippedBatch #:4Material:Kordas Dana 9mm



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Figure-8 device block 9mm (MO load backwards)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)		
Hardware	– CT Snappy steel screwlock carabiner (40kN)		
	– Petzl Huit Figure-8		

Test setup

Fig-8 blocks	- Mule overhand on a figure-8 device	
Attachments	 Small eye clipped to steel carabiner 	
	 Clamped leg load backwards 	

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	First slip (kN)	Max force (kN)	%	Comments
10/12/21	1*	5.85	7.24	33	Kept slipping, the overhand
10/12/21	2	5.83	7.18	32	bight started to get pulled
10/12/21	3	6.09	6.95	31	
Average		5.92	7.12	32	



* Sample 10/12/21 #1 shown on the following pages.





Test Date:Friday, 10 December 2021Max Force (kN):7.24Product Name:Fig-8 Block MO backward load small eye clippedBatch #:1Material:Kordas Dana 9mm





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Figure-8 device block 9mm (friction)

Materials

Ropes	– Korda's 9mm Dana (22.2kN)		
Hardware	– Petzl Huit Figure-8		
	– Maillon rapide 8mm steel oval (35kN)		

Test setup

Fig-8 blocks	Set up in lowering mode against rapide	
Attachments	 Clamped leg threaded through rapide 	

Test parameters

Speed	– Slow pull 100mm/minute
Tested between	– Rope clamp and 12mm pin

Results

Date	#	Thumb & finger (kN)	1 hand (kN)	2 hands (kN)
10/12/21	22*	0.79	1.25	2.02

* Sample 10/12/21 #22 shown on the following pages.









Test Date:Friday, 10 December 2021Max Force (kN):2.02Product Name:Fig-8 block frictionBatch #:22Material:Kordas Dana 9mm



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