HYSON™

# Guardian™ High Density Fabric

HDF User Manual
8200-1808


Made for the Challenge™

# Table of Contents

# Introduction

This User Manual gives detailed instructions on how to size, mount, and use the High Density Fabric, hereafter referred to as the HDF.

## Illustration Disclaimer

The illustrations in this manual are intended for illustration purposes only and may not necessarily depict the shown items and products as they appear in real life.

## Original Language

The original language of this manual is English. In case of discrepancies between a translated version of this manual and the original, it is the original version that is valid.

# Safety

It is important to read, understand, and follow the instructions carefully. The safety precautions are there to prevent:

- Personal injury
- Damage to the product or other property
- Product malfunction

Throughout this manual the following symbols will be used:

Warning: Indicates that an accident may or will occur if the instructions are not followed. The accident may result in personal injury.

Caution: Indicates that an accident may occur if the instructions are not followed. The accident may result in material and/or product damage or product malfunction.

Note: Indicates important information and may indicate a risk of product malfunction.

# General Information

## Intended Use

The HDF is designed for use together with Hyson Gas Springs having a threaded hole (often denoted as a service thread) in the center of the piston rod top. The purpose of the HDF is to protect the piston rod and the seals from particle contamination. It provides a barrier that significantly reduces the number of particles that can reach the piston rod and the piston rod seals.

The HDF is not designed to protect the Gas Spring or the piston rod from liquid contamination, corrosive gases, or very hot debris or particles, such as droplets of molten metal.

## Operating Temperature & SPM

The ambient operating temperatures of the HDF are for practical purposes limited to the max and min operating temperatures of the Gas Spring. The HDF itself can withstand ambient temperatures up to 150°C (302°F), but the limiting factor to consider is the operating temperature of the Gas Spring.

However, provided that the ambient temperature is within the specified limits for the Gas Spring, the HDF can be used to protect the piston rod from dirt, debris, and particles with a temperature of up to 150°C (302°F), Occasional, short term contact with particles that are even hotter (up to approximately 200°C or 392°F) is most often no problem as long at the particles do not have a tendency to stick to the HDF cover fabric.

Caution: The min and max operating temperatures for the Gas Spring must always be observed.

The HDF can be used at whatever stroke rate (Strokes Per Minute, SPM) the Gas Spring is being operated at.

## Gas Spring Parts Naming

Throughout this manual some parts of the Gas Spring will be referenced frequently. These parts are shown in the figure below.

Note that illustrations are general and that not all Gas Springs look like the one in figure 1.

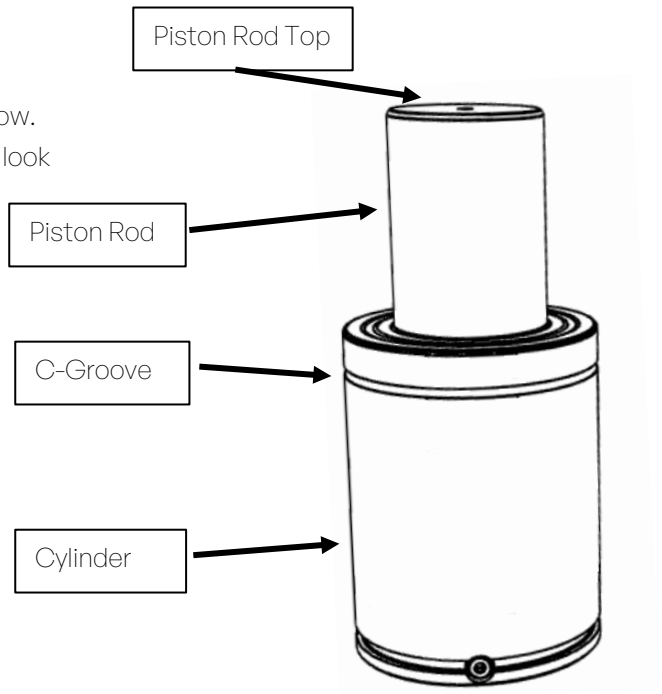


Figure 1 - Naming parts of the Gas Springs

# HDF Parts & Required Tools

This section explains what is included in the HDF delivery and what tools and consumables are necessary for sizing and mounting the HDF onto a Gas Spring.

## Included

Upon delivery, the following items are included:

- The HDF Cover (1)
- A Striker Plate (2)
- A Shoulder Screw with an O-Ring (3)
- One Metal Cable Tie (not shown)

The HDF cover fabric and the shoulder screw with its O-ring are pre-mounted onto the striker plate.

In addition to the items listed above, the mounting of the HDF may also require a Flange adapter which is ordered separately. The Flange adapter is needed when the HDF is to be used with a Gas Spring that is mounted using an FCS Flange to the upper C-groove.

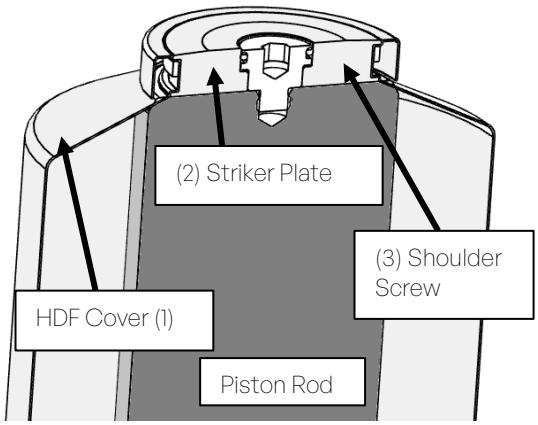


*Figure 2- Diagram*

### Striker Plate Thickness

The striker plate is 10 mm thick, meaning that the total height of the Gas Spring onto which the HDF is mounted will increase by 10 mm.

Caution: the added height (+10 mm) of the Gas Spring assembly must be considered to avoid collisions in the tool or machine.

### Striker Plate Diameter

For some combinations of Gas Springs and HDF covers, the diameter of the striker plate intentionally does not match the diameter of the piston rod. The striker plate diameter may, for some combinations of Gas Spring and HDF covers, be either slightly larger than or slightly smaller than the piston rod diameter. In those cases where the striker plate diameter is smaller than the piston rod diameter it is still recommended that the contact piece in the tool or machine has at least the same contact area as the piston rod top (i.e. as prescribed in the mounting instructions for the Gas Spring).

## Required Tools

The following is a list of tools required for installation but are not included in the delivery.

### Tools

- A pair of scissors. The HDF cover fabric is delivered in one length and needs to be cut to the appropriate length, depending on the stroke length of the Gas Spring to which it is to be fitted.
- Allen keys (hex keys) for tightening the HDF shoulder screw.
- If the HDF uses the Flange Adapter, tools are also required for tightening the screws used for the Flange.
- Torque wrench for tightening screws to the appropriate torque.
- Gas charging equipment may also be required if the Gas Spring is not charged when the HDF is to be mounted.
- Optional: A Cable Tie Tightening Tool for metal cable ties, available as an accessory (see “accessories” section).

## Consumables

- Soft lint-free cloth for cleaning the piston rod.
- Cotton swabs (Q-tip) or similar to clean the thread in the piston rod top.
- Mild solvent (for example rubbing alcohol or similar) to clean grease or oil from the thread in case the thread is very oily or greasy.
- Thread locking compound (Loctite 2700 or similar).

Caution: Thread locking compound (Loctite 2700 or similar) is necessary to prevent the shoulder screw from getting loose.

# Sizing

The HDF cover is always delivered in its full length and should be cut to a length that suits the stroke length of the Gas Spring. The cover should be cut slightly below the markings as indicated by the table below. Cutting below the marking is especially important for stroke lengths that coincide with or are very close to the marking. For stroke lengths that coincide with or are very close to the marking the cut should be made approximately halfway between the coinciding marking and the next higher marking.

See the examples for more details.

| Gas Spring stroke length [mm] | Cut below marking |
|---|---|
| 10-25 | 25 |
| 26-50 | 50 |
| 51-75 | 75 |
| 76-100 | 100 |
| 101-125 | 125 |
| 126-150 | 150 |
| 151-175 | 175 |
| 176-200 | 200 |
| 201-225 | 225 |
| >226 | no cutting needed |

*Table 1 - Sizing Guide*

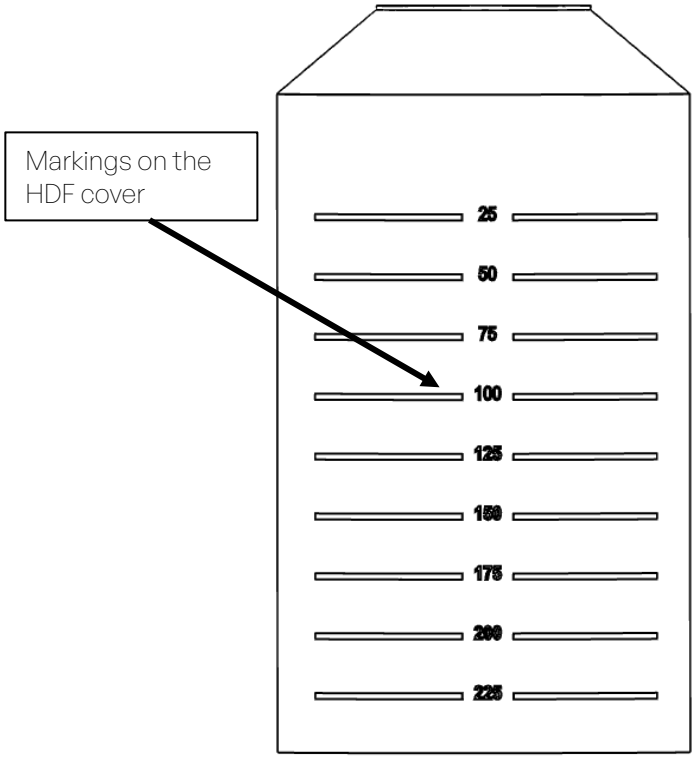


*Figure 3 - HDF Markings Diagram*

# Example 1

The stroke length of the Gas Spring is 38 mm. This stroke length lies in between 26-50 mm and according to Table 1, the appropriate cut should be made just below the “50” marking on the HDF cover.

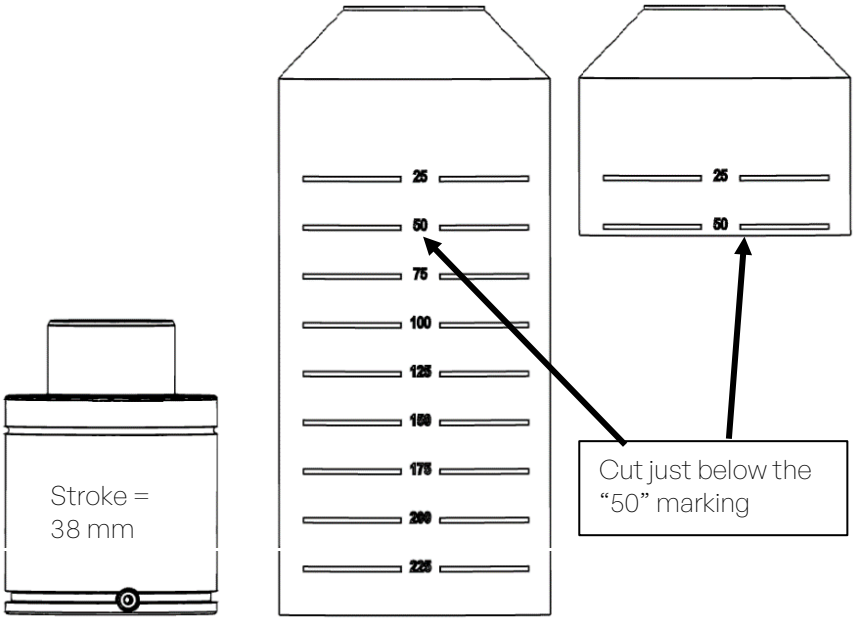


*Figure 4 – Example 1, stroke – 38 mm*

# Example 2

The stroke length of the Gas Spring is 175 mm. This stroke length coincides with the marking “175”, and then the cut in the HDF cover should be made approximately halfway between the “175” and the “200” markings.

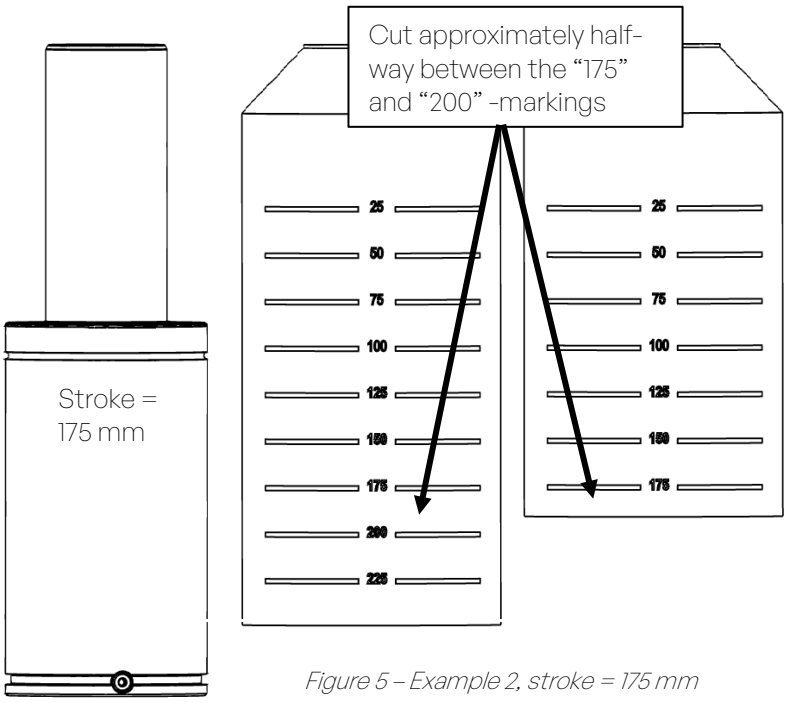


*Figure 5 – Example 2, stroke = 175 mm*

Note: The HDF cover should have a tight fit to ensure proper function and to avoid risk of operational disturbances. A loose fit means an increased risk of the excess fabric forming pockets that might collect dirt and possibly even get stuck in moving parts.

# Mounting Instructions

## Mounting Without Flange Adapter

If the application does not require a HDF Flange adapter, i.e. if the upper C-groove on the cylinder is not used for fastening the Gas Spring, follow the procedure described below.

1. Carefully wipe clean the piston rod and especially the piston rod top using the lint-free cloth. There should be no residues of solid particles, oil, or grease on the piston rod top.
2. Clean thoroughly the threaded center hole in the piston rod top, there should be no traces of grease or oil or sold particles left in the threads. If necessary, use a small amount of rubbing alcohol on a cotton bud to clean oil or grease from the thread.
3. If necessary, clean the thread on the shoulder screw.
4. Apply a small amount of thread locking compound (Loctite 2700 or similar) to the thread in the piston rod top, not to the threads on the shoulder screw.
    a. Applying thread locking compound to the shoulder screw introduces a risk of getting thread locking compound on the top surface of the piston rod, gluing the striker plate to the piston rod. If the striker plate is glued to the piston rod, the striker plate is unable to rotate relative to the piston rod which introduces a risk of operational disturbances because of the HDF cover becoming twisted.

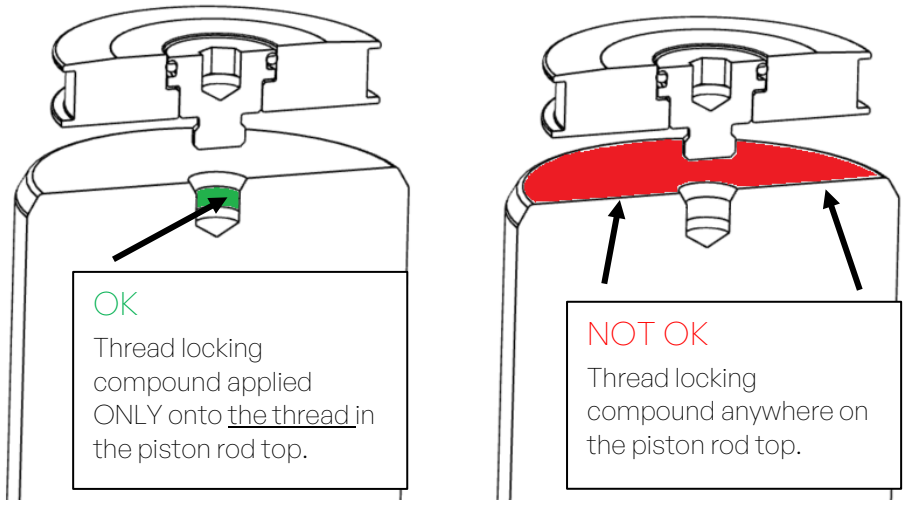


*Figure 6 – Only apply thread locking compound directly to the threads in the piston rod top.*

Caution: be careful not to get any thread locking compound between the striker plate and the piston rod top, since this could prevent the striker plate from rotating.

Caution: should any thread locking compound get on the outside of the piston rod it must immediately be wiped off completely, otherwise there is a significant risk of damage to the Gas Spring.

5. Place the striker plate on top of the piston rod and tighten the shoulder screw. The shoulder screw should be tightened to the torque corresponding to its thread size according to the table on the next page.

| Shoulder Screw Thread Size | Recommended Torque [Nm] |
|---|---|
| M6 | 4 |
| M8 | 8 |
| M16 | 40 |

In case the piston rod starts to rotate before the recommended tightening torque is reached do not try to grip the piston rod with anything other than your bare hands. If it is not possible to reach the recommended torque with only your hands grip strength, then just tighten the shoulder screw as much as possible. Using tools to grip the piston rod to prevent it from rotate means a very high risk of damaging the piston rod.

Caution: never grip the piston rod with a tool when tightening the shoulder screw since this may severely damage the piston rod.

6. After having tightened the shoulder screw, let the thread locking compound cure for a few minutes. Then check that the striker plate has not been glued to the piston rod by rotating the striker plate by hand.
    a. It should be possible to rotate the striker plate without much resistance. If it is not possible to rotate the striker plate by hand, then the striker plate might have been glued to the piston rod. If the striker plate has been glued to the piston rod, the striker plate must be removed and the glue removed before restarting the mounting procedure starting at step 1.
7. Gently pull the HDF cover over the cylinder. The HDF cover should be draped over the cylinder as straight, evenly, and wrinkle-free as possible.

Note: The HDF cover should have a tight fit. A loose fit means an increased risk of the excess fabric forming pockets that might collect dirt and possibly even get stuck in moving parts.

8. Attach the cable tie over the HDF cover fabric so that the cable tie sits in the C-Groove on the cylinder and tighten the cable tie firmly, preferably using a cable tie tightening tool. Cut off the excess cable tie.
9. The HDF mounting procedure is now finished.

# Mounting With Flange Adapter

In applications where the C-groove on the cylinder is already used for fastening the Gas Spring with an FCS Flange, a Flange Adapter is required for fastening the HDF. The Flange Adapter is ordered separately.

The Flange Adapter is available in several different sizes. All sizes of the Flange Adapter have the same basic design consisting of a plastic Flange and four metal washers.

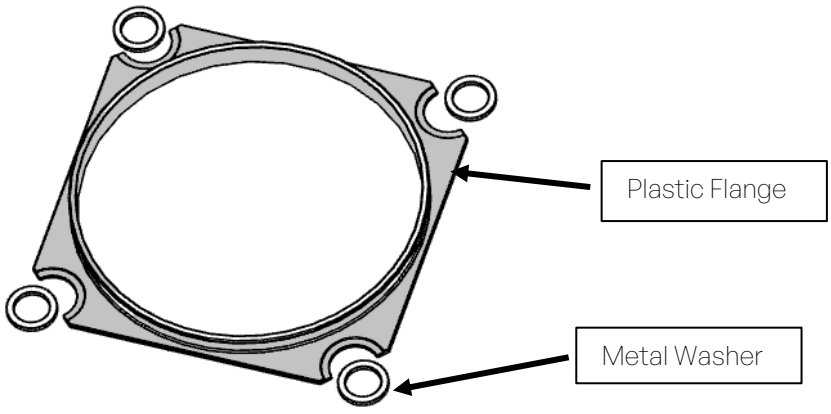


*Figure 7 - The Flange Adapter*

When mounting the Flange Adapter, it is important to use the metal washers included in the delivery of the Flange Adapter and also to use a screw head size that is slightly larger than the washer. The thickness of the washer is 2 mm, meaning that the screw will be displaced 2 mm compared to when not using the Flange Adapter.

Caution: the diameter of the head of the screws used to fasten the FCS Flange must be larger than the outer diameter of the metal washers in the Flange Adapter, but the screw head must also not be so large that it touches the Flange.

The plastic Flange has a slightly recessed portion next to the cut-out for the washer. The recess provides a gap between the screw head and the plastic Flange, this gap is needed to prevent the screw head to crush the Flange.

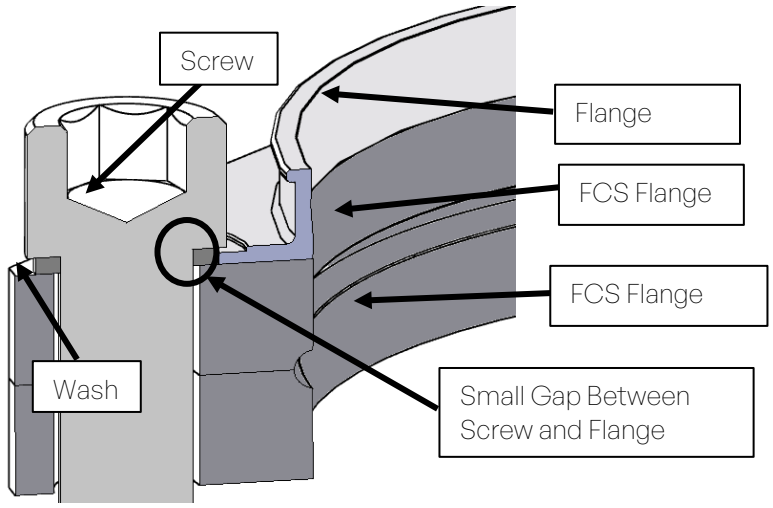


*Figure 8 – Cross-section view of Flange Adapter, washer, screw, and FCS Flange*

As a consequence of the small gap, the Flange Adapter may sometimes appear a bit loose since it can move a fraction of a millimeter between the FCS Flange and the screw head, but this is normal and as designed.

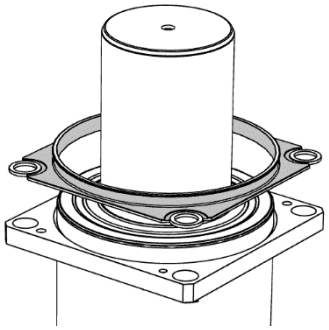

*Figure 9 - Place adapter and washers on the top of the FCS Flange*

Follow the procedure below when mounting the HDF using the Flange Adapter.

1. If the Gas Spring is already mounted using the FCS Flange, the screws holding the FCS Flange have to be unscrewed.
2. Place the Flange and the washers on top of the FCS Flange so that the screw holes match.
3. Insert the screws through the washers and through the holes in the FCS Flange.
4. Ensure that all parts align and that the screw heads do not touch the plastic Flange.
5. Cross-tighten the screws according to the FCS Flange mounting guidelines. Tighten the screws according to the recommended tightening torque for the particular screw types used.
6. Mount the striker plate following steps 1 to 7 in the previous example.
7. Attach the cable tie over the HDF cover so that the cable tie sits in the groove in the Flange Adapter and tighten the cable tie firmly, preferably using a cable tie tightening tool. Cut off the excess cable tie.
8. The HDF mounting procedure with the Flange Adapter is now finished.

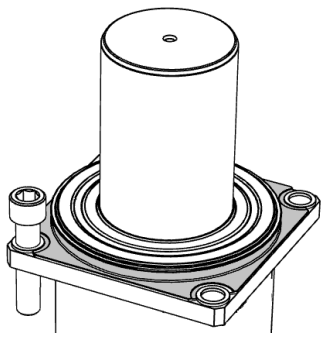

*Figure 10 - Insert screws*

### Notes Regarding Cable Tie

Make sure that the cable tie is clean before mounting it. Dirt in the locking mechanism may potentially impair the locking mechanism during tightening of the cable tie.

When cutting the cable tie, make the cut perpendicular to the length direction of the cable tie to avoid creating very sharp edges of the remaining piece of the cable tie, and cut as close to the lock as possible to reduce the risk of the remaining piece to get stuck in the HDF cover.

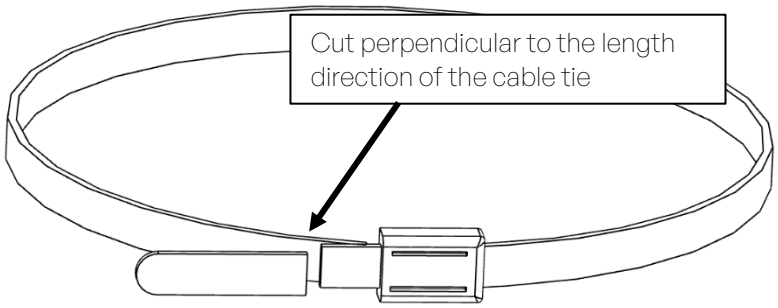


*Figure 11 – Cut the excess cable tie perpendicular and close to the lock*

Caution: An incorrectly cut cable tie increases the risk of damaging the HDF cover fabric.

# Spare Parts & Accessories

## Spare Parts

The shoulder screws and metal cable ties are available as spare parts for the HDF.

There are four different shoulder screw models. Table 2 (next page) shows the different shoulder screws. Below each shoulder screw are the corresponding Gas Spring models and sizes listed.

The shoulder screw spare part includes the O-ring.

| Table 2 - Shoulder Screw Model Description | | | |
|---|---|---|---|
| M6<br>#1034847 | M8 short<br>#1034848 | M8 long<br>#1034849 | M16<br>#1034850 |
|  |  |  |  |
| Gas Spring | Gas Spring | Gas Spring | Gas Spring |
| T3 750 | T4 2400 | NP 750 | NP 7500 |
| T4 750 | T3 4200 | LCF 750 | LCF 7500 |
| T3T 750 | T4 4200 | NP 1500 | NP 10000 |
| T3F 750 | T3T 4200 | LCF 1500 | CS2 / CS2-A 7500 |
| T3 1000 | T3 6600 | NP 3000 | |
| T4 1000 | T4 6600 | LCF 3000 | |
| T3T 1000 | T3T 6600 | CS2 /CS2-A 1500 | |
| T3F 1000 | T3 9500 | NP 5000 | |
| T3 1500 | T4 9500 | LCF 5000 | |
| T4 1500 | T3 20000 | CS2 /CS2-A 3000 | |
| T3T 1500 | T4 20000 | CS2 /CS2-A 5000 | |
| T3F 1500 | | | |
| T3 2400 | | | |
| T3T 2400 | | | |
| T3F 2400 | | | |

*Table 2 - Spare part shoulder screw determined from Gas Spring model and size*

Alternatively, if the order number for the particular HDF model is known, the corresponding spare part shoulder screw can also be determined using the table below:

| Table 3 - HDF Order Number | | | |
|---|---|---|---|
| HDF-45-250X<br>HDF-50-250X<br>HDF-63-250X<br>HDF-75-250X | HDF-75-250S<br>HDF-95-250S<br>HDF-120-250S<br>HDF-150-250S<br>HDF-195-250S | HDF-50-250C<br>HDF-75 -250C<br>HDF-95 -250C<br>HDF-120 -250C<br>HDF-150 -250C | HDF-150-250L<br>HDF-195 -250L |
| Spare Shoulder Screw | Spare Shoulder Screw | Spare Shoulder Screw | Spare Shoulder Screw |
| 1034847 | 1034848 | 1034849 | 1034850 |

*Table 3 - Spare part shoulder screw determined from HDF order number.*

Additional metal cable ties can be ordered in packs of 10.

The order number for the pack of 10 metal cable ties is 1032103.

## Accessories

A Cable Tie Tightening Tool for metal cable ties is available as an accessory. The order number for the Metal Cable Tie Tightening Tool is 1031124.

# Version Record

| Issue No. | Change Description | Release Date | Issued By | Approved By |
|---|---|---|---|---|
| | | | | |
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