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CERTIFICATE N° **17253/2021**

Date 28/10/2021

Messrs

**MASINARA S.p.A.**

Via Einstein, 8

Loc. Monteveglio

40053 Valsamoggia (BO)

Attn Mr Antonio Isola

Subject: N°9 spring boxes for rolling shutters.

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### **TORSION TEST**

*Performed test, standard:*

*Used instrument:*

*Calibration:*

*Operating conditions:*

*Testing parameters:*

*Date*

*Torsion test*

*Digital torsionmeter LBG*

*mod. tds1000 – udi 14/2 matr. 071/001 – 071/042*

*cert. LBG N°07-369-L*

*room temperature*

*with a customized testing apparatus*

*26/10/2021*

The following spring boxes for rolling shutters are analysed (photo N°1)

1. Spring box 220x60 with Masinara steel bearing;
2. Spring box 220x60 with Masinara Nylon rollers;
3. Spring box 220x60 with Masinara POM bushing;
4. Spring box 200x60 with Nylon F bushing;
5. Spring box 220x60 with resin S bushing;
6. Spring box 200x60 with resin P bushing;
7. Spring box 280x101 with Masinara steel bearing;
8. Spring box 280x101 with Masinara nylon rollers;
9. Spring box 280x101 with resin S bushing.

The torque required to rotate the tube inserted in each of the tested spring boxes (diameter  $\varnothing 60$  mm and  $\varnothing 101$  mm), subjected to three different loads (10+10, 20+20, 30+30 kg), is measured (photo N°2).

Three measures are recorded for every combination load+spring box, making with the tube a complete turn and recording every time the maximum measured torque.

The measured values are reported in the following table:

| BOX<br>N° | LOAD 10+10 kg      |              | LOAD 20+20 kg      |              | LOAD 30+30 kg      |              | FOTO<br>N° |
|-----------|--------------------|--------------|--------------------|--------------|--------------------|--------------|------------|
|           | TORQUE (Nm)        | AVERAGE (Nm) | COPPIA (Nm)        | AVERAGE (Nm) | COPPIA (Nm)        | AVERAGE (Nm) |            |
| 1         | 0,36 – 0,34 – 0,34 | 0,35         | 0,46 – 0,50 – 0,52 | 0,49         | 0,62 – 0,64 – 0,62 | 0,63         | 3          |
| 2         | 0,38 – 0,36 – 0,38 | 0,37         | 0,44 – 0,50 – 0,48 | 0,47         | 0,62 – 0,68 – 0,62 | 0,64         | 4          |
| 3         | 1,57 – 1,57 – 1,61 | 1,58         | 2,74 – 2,70 – 2,86 | 2,77         | 3,62 – 3,98 – 4,08 | 3,89         | 5          |
| 4         | 1,75 – 1,67 – 1,81 | 1,74         | 3,12 – 3,24 – 3,38 | 3,25         | 4,26 – 4,59 – 4,59 | 4,48         | 6          |
| 5         | 1,89 – 1,81 – 1,85 | 1,85         | 3,22 – 3,20 – 3,20 | 3,21         | 4,45 – 4,47 – 4,39 | 4,47         | 7          |
| 6         | 1,93 – 1,99 – 1,97 | 1,96         | 3,52 – 3,60 – 3,58 | 3,57         | 5,09 – 5,09 – 5,13 | 5,10         | 8          |
| 7         | 0,62 – 0,58 – 0,60 | 0,60         | 0,80 – 0,76 – 0,80 | 0,79         | 1,04 – 1,04 – 0,96 | 1,01         | 9          |
| 8         | 1,45 – 1,23 – 1,06 | 1,25         | 2,15 – 2,05 – 2,13 | 2,11         | 2,17 – 2,35 – 2,27 | 2,26         | 10         |
| 9         | 2,41 – 2,29 – 2,17 | 2,29         | 3,78 – 3,58 – 3,82 | 3,73         | 5,23 – 4,57 – 5,18 | 4,99         | 11         |

For the Laboratory

Andrea Tesini



**PHOTOGRAPHIC DOCUMENTATION**

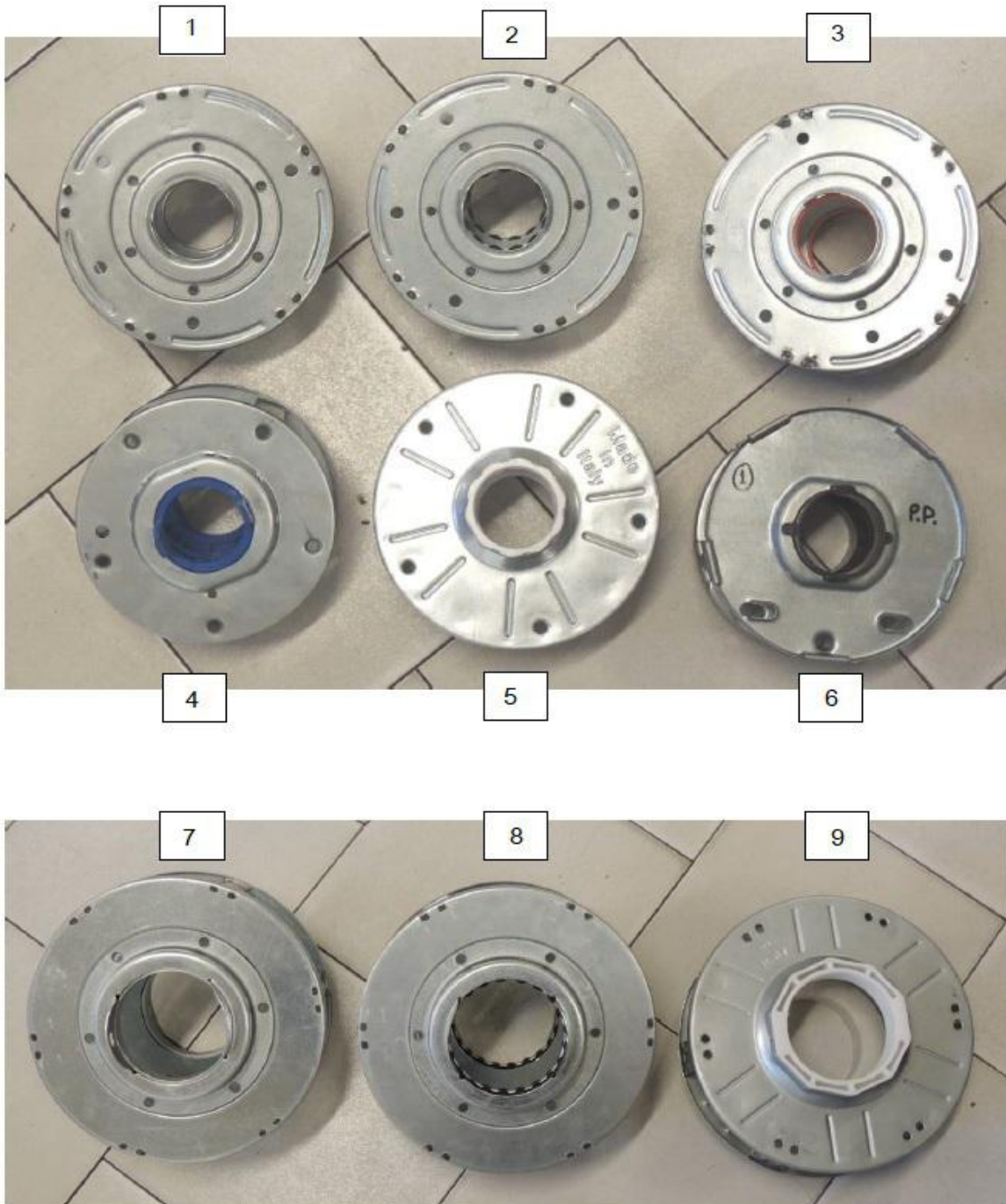


Photo N°1 – Examined spring boxes



Photo N°2 – Testing apparatus

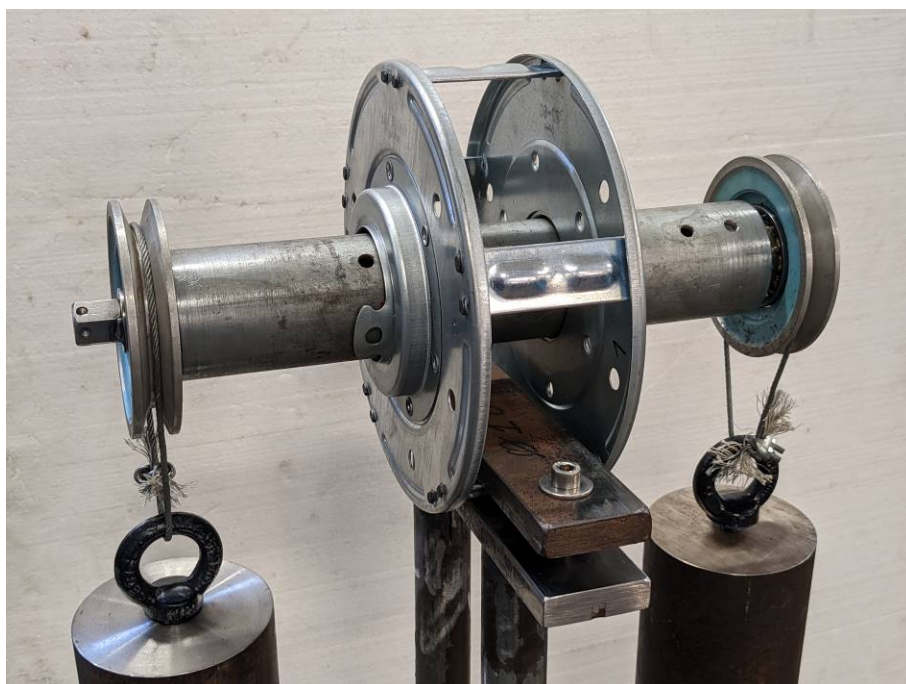


Photo N°3 – Spring box 220x60 with Masinara steel bearing



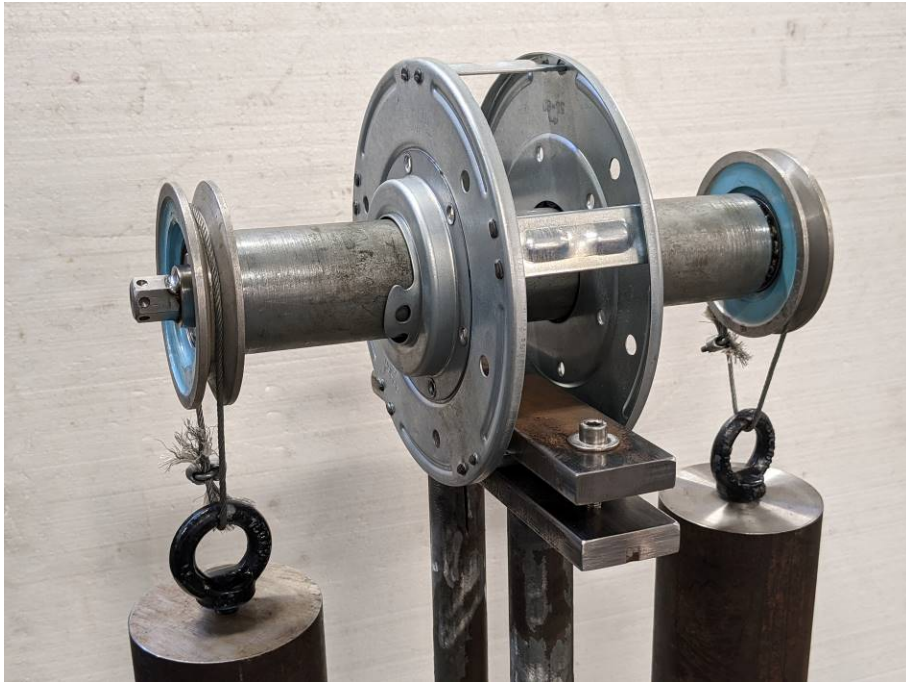


Photo N°4 – Spring box 220x60 with Masinara Nylon rollers

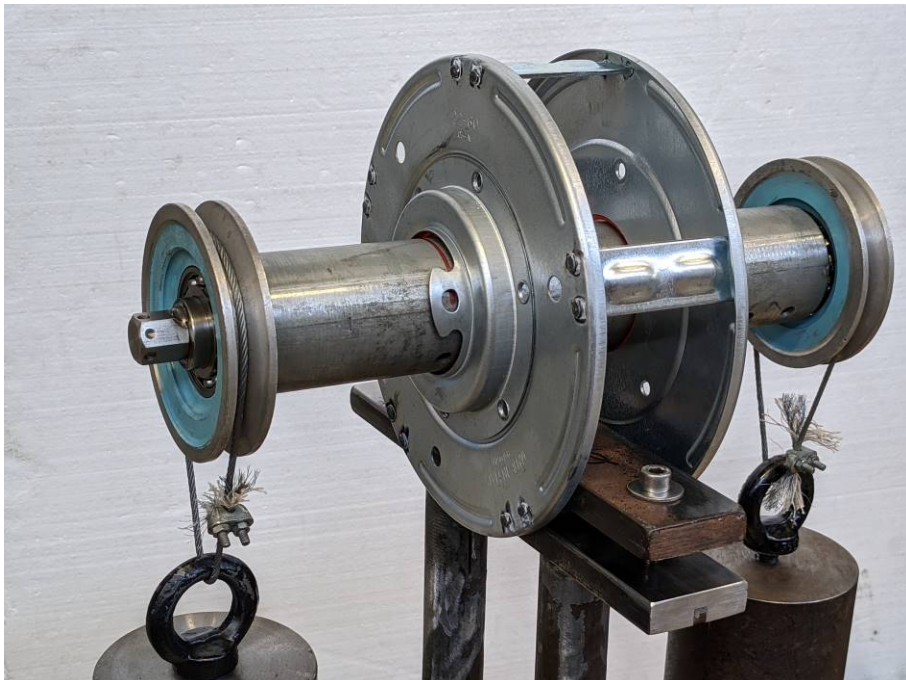


Photo N°5 – Spring box 220x60 with Masinara POM bushing

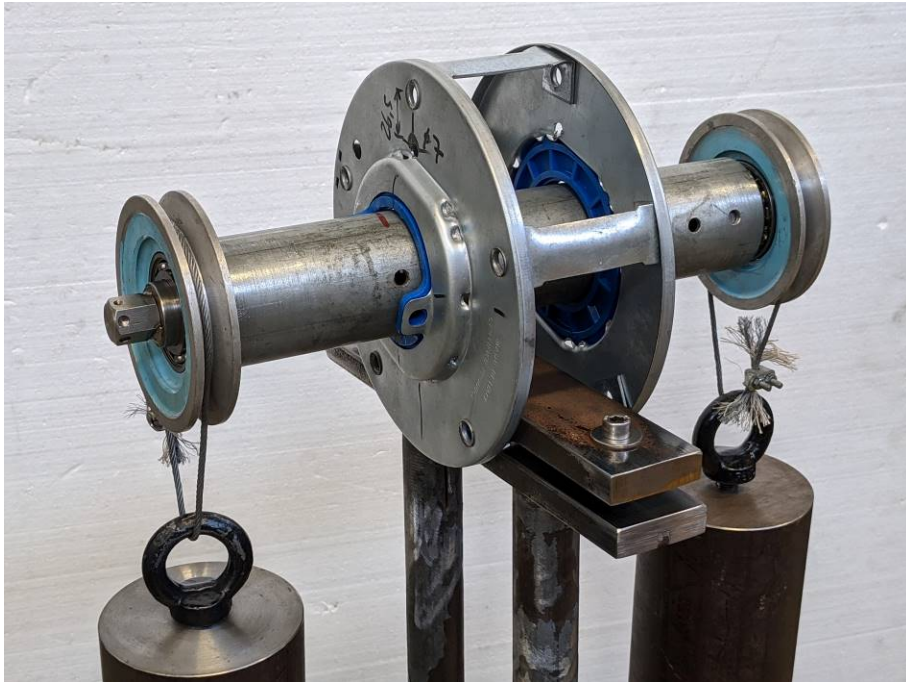


Photo N°6 – Spring box 200x60 with Nylon F bushing

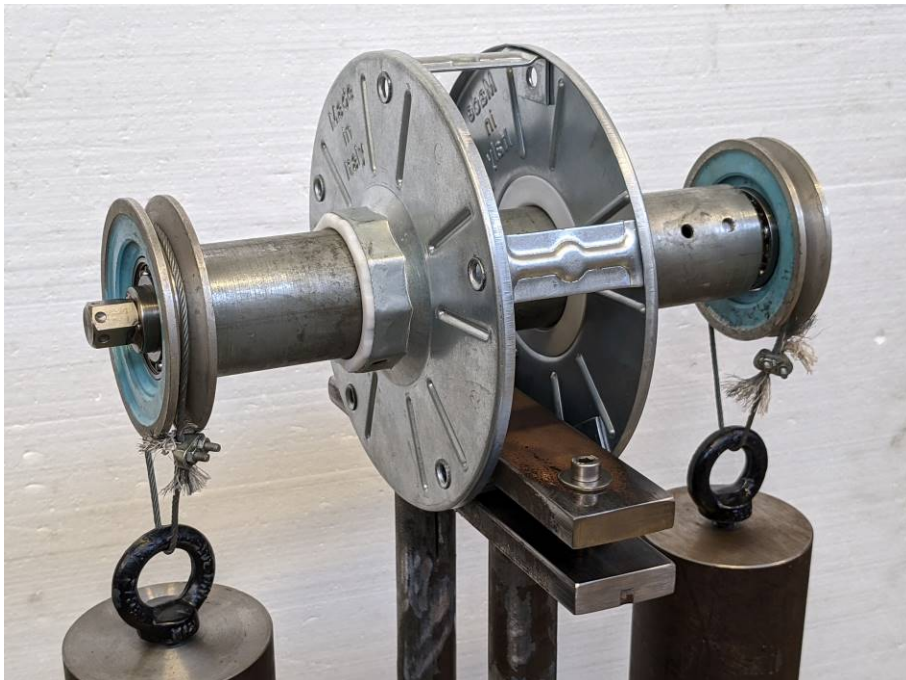


Photo N°7 – Spring box 220x60 with resin S bushing



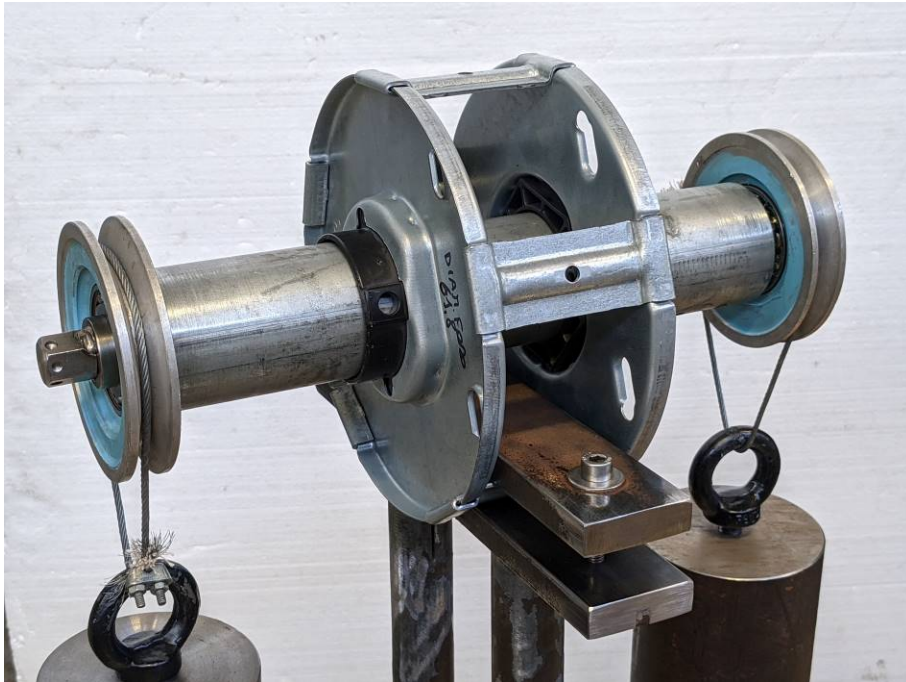


Photo N°8 – Spring box 200x60 with resin P bushing

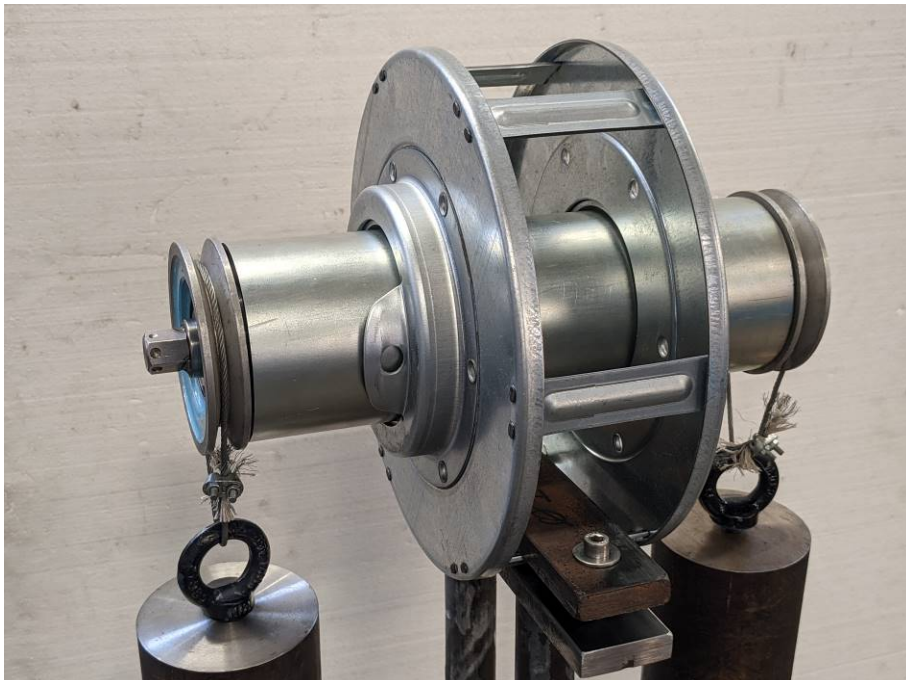


Photo N°9 – Spring box 280x101 with Masinara steel bearing



Photo N°10 – Spring box 280x101 with Masinara Nylon rollers

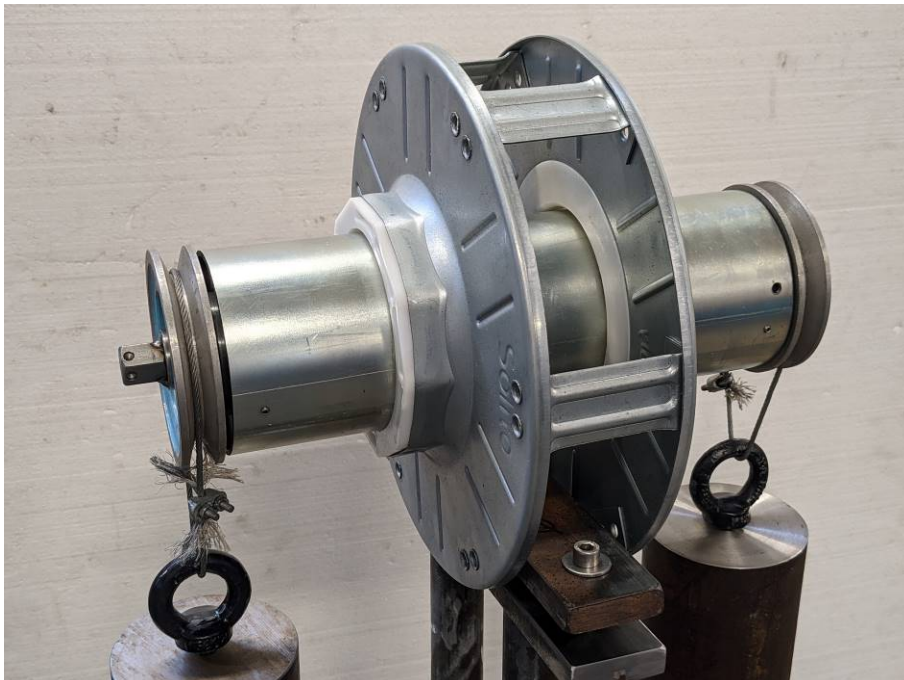


Photo N°11 – Spring box 280x101 with resin S bushing