1. Introduction

TBM INOX: The revolution in the vibratory field has arrived. To create this new AV mount series, we have gone further than ever, we have improved to the smallest detail, we have taken the new “TBM-INOX” range to a new dimension, in its most advanced version.

The New Split / TBM-INOX Range provides higher elegance and performance than the previous version.

2. Model Information

It is a unique AV mount that stands out for its simplicity. These are Hybrid AV mounts designed for Semi-industrial machines and specially, for the domestic sector. Its hybrid system provides us the best of the “helical steel spring” properties for a proper performance in eradicating low frequencies Hz while the great quality polymer “MEGOL” provides us the damping power, for a proper performance in the
low and medium frequencies regime Hz. The juxtaposition of these two components makes possible launching an unique AV mount to the market, avoiding the spread of waves across the structure, and reducing vibrations in the whole **exciter frequencies range** Hz. Ideal for machines working from 450 rpm.

**Application field:** Cooling machines, condensers, ventilators, air processing units, air conditioning units, pumps, etc. Through a bank or directly installed on the system it is intended to isolate.

### 3. Colors Code

Generally, the gravity center is not coincident with its geometric center. As we can see in the picture, the unit is formed by the following components; Compressor, condenser, controls, batteries, etc. These elements are located in one end of the chassis, being the heaviest zone of the unit, reaching the 65% or 70% of the machine total mass. In the opposite side of the chassis, we can find the radiator and the ventilator, reaching the 30% or 35% of the unit total mass. Thus, it is necessary to differentiate these two zones, placing AV mounts according to the weight they will support.
**TBM INOX**: It has the advantage of combining 4 colors in the polymeric component, (MEGOL Grey, Green, Blue and Red). This will make it easier when choosing the proper AV mount, according to the load range.

*Hybrid + Grey MEGOL*: It will show us the AV mount of lowest load range between 60N up to 200N. Maximum dynamic load accepted is of 250N. The optimal load recommended by SENOR will be between 120N and 200N.

**STEEL HELICAL SYSTEM**: With EPOXY treatment in red ral-330.

*Hybrid + Green MEGOL*: For load ranges between 150N and 450N. The maximum accepted dynamic load is 500N. The optimal load recommended by SENOR is between 250N and 450N.

**STEEL HELICAL SYSTEM**: With EPOXY treatment in red ral-330.

*Hybrid + Blue MEGOL*: For load ranges between 400N and 800N. The maximum accepted dynamic load is 750N. The optimal load recommended by SENOR is between 500N and 750N.

**STEEL HELICAL SYSTEM**: With EPOXY treatment in red ral-330.
Hybrid + Red MEGOL: For loads between 600N and 1250N. The maximum accepted dynamic load is 1250N. The optimal load recommended by SENOR is between 750 and 1200N.

STEEL HELICAL SYSTEM; With EPOXY treatment in red ral-330.


It is about determining the static deflection of the spring when subjected to different loads.

The elastic constant of the springs is determined through these data, and under the assumption of linear systems.

A spring performs a proportional force to its experienced deformation:

\[ F = k \delta \]

Where:

- \( F \) = Spring force.
- \( k \) = Rigidity.
- \( \delta \) = spring deformation or deflection.

Note: For systems with linear behavior (steel springs) dynamic rigidity equals the elastic rigidity. However, in case of polymeric viscoelastic materials (Polyurethane, EPDM, Polystyrene, Polyethylene, etc.) they are not the same, and its dynamic behavior can only be determined through a lab essay.

Generally, steel springs have an optimal behavior in the frequency range between 300 and 2500 rpm.

The spring resonance frequency + machine comes given by the expression:

\[ w_0 = \sqrt{\frac{K}{m}} \]

Where:

- \( w_0 \) = system resonance frequency (rad/s).
- \( k \) = spring rigidity (N/m).
- \( m \) = system mass (machine).

If \( k \) and \( m \) are unknown when calculating the system resonance frequency, it is calculated through its static flexion.

From the spring equation:

\[ m \, g = K \delta \Rightarrow \frac{K}{m} = \frac{g}{\delta} \]

Introducing such result in the expression:

\[ w_0^2 = \frac{K}{m} \Rightarrow w_0 = \sqrt{\frac{K}{m}} = \sqrt{\frac{g}{\delta}} \]

\[ (w_0 = 2 \pi f) \]

By having a negligible damping

(approximation: \( \gamma \approx 0 \)), the transmission factor for a spring has the form:

\[ FT = \frac{F_t}{F_0} = \frac{1}{|1 - \rho^2|} \]

Vibration isolation degree in %

\[ G = (1 - FT)100 \quad (\%) \]

The spring behavior will depend on how they are placed.
5. Maximum results chart.

<table>
<thead>
<tr>
<th>REFERENCIAS</th>
<th>FUERZA máxima (N)</th>
<th>REFERENCES</th>
<th>Fuerza (N)</th>
<th>Frecuencia Propia (Hz)</th>
<th>Flecha (mm)</th>
<th>Rigidez (N/mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-TBM-INOX 20G</td>
<td>200</td>
<td></td>
<td>3.78</td>
<td></td>
<td>11.30</td>
<td>17.70</td>
</tr>
<tr>
<td>SE-TBM-INOX 45V</td>
<td>450</td>
<td></td>
<td>3.95</td>
<td></td>
<td>11.90</td>
<td>37.70</td>
</tr>
<tr>
<td>SE-TBM-INOX 75A</td>
<td>750</td>
<td></td>
<td>4.00</td>
<td></td>
<td>11.90</td>
<td>62.80</td>
</tr>
<tr>
<td>SE-TBM-INOX 120R</td>
<td>1200</td>
<td></td>
<td>3.86</td>
<td></td>
<td>11.40</td>
<td>105.70</td>
</tr>
</tbody>
</table>

SEÑOR reserves the right to change the technical specifications of the product without previous notification. The user is the final responsible for knowing and using the updated last version of data sheets of products. A copy will be sent to anyone who request it. This information and, in particular, the application recommendations and final usage of the product, are given in good faith, based on our current knowledge and the experience of “SEÑOR” of its products, when these are properly installed in normal circumstances and within its useful life.

6. Technical data Hybrid + Grey MEGOL.

Product: MEGOL 1 A 25 C UG/UVI GREY F761 P1250SPE25  
Density - ASTM D 792 - g/cm³ - 1.15 / 1.19  
Hardness “I5sec” - ASTM D 2240 - Shore A - 20 / 25  
Extreme force - ASTM D 624 - KN/m - 11 / 19  
Ultimate tensile strength - ASTM D 638 - MPa - >3.5  
Elongation % break - ASTM D 638 - % - >800

A Core formed by a steel spring of 3.66 mm thick (Standard DIN 2095-UNI EN 10270), with EPOXY Red RAL 330 treatment. It provides a high isolation degree from vibrations in the range of low/medium frequencies Hz.

Procedure

- Determination of dynamic behavior.
- Load Curve and Deformation

Determination of the dynamic behavior.

It is about determining the natural frequency (Hz) and the deformation for different load values, over the AV mount. A frequency sweep 0-100 Hz is done for each load state at a given acceleration level (0.2 g). Placing an accelerometer at the rigid part of the structure which serves us for control and other on a rear point to the action of the AV mount, where we will get the results which determine the AV mount performance.

Used Equipment:

- Accelerometers signal amplifier.
- PCB / Code ME 084030  
  Accelerometer  
- PCB / Code ME 072021  
  Vibratory table  
- NOGREN / Code ME 035002  
  LDS / Code ME 075001  
  Essays machine  

The Future of Damping, in Your Hands...
The performance line shows the beginning and the end of the work performed by the system HYBRID + GREY MEGOL, 6 Kg and 20 Kg respectively. Vertical bars in dark Grey color provide the following information:

- Deformation in millimeters.
- Load process in each deformed point.
- Optimal degree of elasticity.

**Conclusion:** The AV mount TBM-INOX 20G is placed on the hydraulic piston for its compression test, applying the load in a progressive way at a speed of 2 mm/min, until a maximum of 0.25 kN. Load and movement data are obtained.

When data is transferred to the dynamic graph, it shows that vertical bars which surpass the performance line in a higher level are bars no. 2, 3, 4, and 5. These bars show us the optimal degree of elasticity. Therefore, the recommended loads to be used.
7. Technical data Hybrid + Green MEGOL.

Product: MEGOL I A 30 C UG/UVI GREEN F084/E P1250SPE25
Density - ASTM D 792 - g/cm³ - 1.19
Hardness “15sec” - ASTM D 2240 - Shore A - 27 / 35
Extreme force - ASTM D 624 - KN/m - 13
Ultimate tensile strength - ASTM D 638 - MPa - >5.1
Elongation % break - ASTM D 638 - % - >817

A Core formed by a steel spring of 4,20 mm thick (Standard DIN 2095-UNI EN 10270), with EPOXY Red RAL 330 treatment. It provides a high isolation degree from vibrations in the range of low/medium frequencies Hz.

Procedure
- Determinación of dynamic behavior.
- Load Curve and Deformation

Determination of dynamic behavior.

It is about determining the natural frequency (Hz) and the deformation for different load values, over the AV mount. A frequency sweep 0-100 Hz is done for each load state at a given acceleration level (0.2 g). Placing an accelerometer at the rigid part of the structure which serves us for control and other on a rear point to the action of the AV mount, where we will get the results which determine the AV mount performance.

Used Equipment:
Accelerometers signal amplifier.
PCB / Code ME 084030
Accelerometer
PCB / Code ME 072021
Essays machine
NOGREN / Code ME 035002
Vibratory table
LDS / Code ME 075001
**Conclusion:** The AV mount **TBM-INOX 45V** is placed on the hydraulic piston for its compression test, applying the load in a progressive way at a speed of 2 mm/min, until a maximum of 0.50 kN. Load and movement data are obtained.

When data is transferred to the dynamic graph, it shows that vertical bars which surpass the performance line in a higher level are bars no. 3, 4, 5, 6, 7, 8 and 9. These bars show us the optimal degree of elasticity. Therefore, the recommended loads to be used.
8. Technical data Hybrid + Blue MEGOL.

Product: MEGOL IA 40 C UG/UV1 BLUE F085/E P1250SPE25
Density - ASTM D 792 - g/cm³ - 1.25
Hardness “15sec” - ASTM D 2240 - Shore A - 36 / 42
Extreme force - ASTM D 624 - KN/m - 16
Ultimate tensile strength - ASTM D 638 - MPa - >5.6
Elongation % break - ASTM D 638 - % - >960

A Core formed by a steel spring of 5.25 mm thick (Standard DIN 2095-UNI EN 10270), with EPOXY Red RAL 330 treatment. It provides a high isolation degree from vibrations in the range of low/medium frequencies Hz.

Procedure

- Determinación de dynamic behavior.
- Load Curve and Deformation

Determination of dynamic behavior.

It is about determining the natural frequency (Hz) and the deformation for different load values, over the AV mount. A frequency sweep 0-100 Hz is done for each load state at a given acceleration level (0.2 g). Placing an accelerometer at the rigid part of the structure which serves as for control and other on a rear point to the action of the AV mount, where we will get the results which determine the AV mount performance.

Used Equipment:
Accelerometers signal amplifier.
PCB / Code ME 084030
Accelerometer
PCB / Code ME 072021
Essays machine
NOGREN / Code ME 035002
Vibratory table
LDS / Code ME 075001
The performance line shows the beginning and the end of the work performed by the system **HYBRID + BLUE MEGOL**, 40 Kg and 80 Kg respectively. Vertical bars in dark Blue color provide the following information:

- Deformation in millimeters.
- Load process in each deformed point.
- Optimal degree of elasticity.

**Conclusion:** The AV mount **TBM-INOX 75A** is placed on the hydraulic piston for its compression test, applying the load in a progressive way at a speed of **2 mm/min**, until a maximum of 1,0 kN. Load and movement data are obtained.

When data is transferred to the dynamic graph, it shows that vertical bars which surpass the **performance line** in a higher level are bars **no. 4, 5, 6, 7, and 8**. These bars show us the optimal degree of elasticity. Therefore, the recommended loads to be used.
9. Technical data Hybrid + Red MEGOL

**Product:** MEGOL 1 A 50 C UG/UVI RED F762/E P1250SPE25  
**Density** - ASTM D 792 - g/cm³ - 1.35  
**Hardness “15sec”** - ASTM D 2240 - Shore A - 47 / 53  
**Extreme force** - ASTM D 624 - KN/m - 21.8  
**Ultimate tensile strength** - ASTM D 638 - MPa - >5.9  
**Elongation % break** - ASTM D 638 - % - >875

A Core formed by a steel spring of 5.80 mm thick (Standard DIN 2095-UNI EN 10270), with EPOXY Red RAL 330 treatment. It provides a high isolation degree from vibrations in the range of low/medium frequencies Hz.

**Procedure**
- Determinación de dynamic behavior.
- Load Curve and Deformation

**Determination of dynamic behavior.**

It is about determining the natural frequency (Hz) and the deformation for different load values, over the AV mount. A frequency sweep 0-100 Hz is done for each load state at a given acceleration level (0.2 g). Placing an accelerometer at the rigid part of the structure which serves us for control and other on a rear point to the action of the AV mount, where we will get the results which determine the AV mount performance.

**Used Equipment:**
- Accelerometers signal amplifier.
- PCB / Code ME 084030  
- Accelerometer  
- PCB / Code ME 072021  
- Essays machine  
- NOGREN / Code ME 035002  
- Vibratory table  
- LDS / Code ME 075001
The performance line shows the beginning and the end of the work performed by the system HYBRID + RED MEGOL, 60 Kg and 125 Kg respectively. Vertical bars in dark Red color provide the following information:

- Deformation in millimeters.
- Load process in each deformed point.
- Optimal degree of elasticity.

Conclusion: The AV mount TBM-INOX 120R is placed on the hydraulic piston for its compression test, applying the load in a progressive way at a speed of 2 mm/min, until a maximum of 1,5 kN. Load and movement data are obtained.

When data is transferred to the dynamic graph, it shows that vertical bars which surpass the performance line in a higher level are bars no. 4, 5, 6, 7, and 8. These bars show us the optimal degree of elasticity. Therefore, the recommended loads to be used.
10. Composition.

It is featured by the following elements:

A Core formed by 1 steel spring (Standard DIN 2095-UNI EN 10270), with EPOXY Red RAL 330 treatment. It provides a high isolation degree from vibrations, in the range of low/medium frequencies.

Polymer (MEGOL-IA 25, 30, 40 and 50 C-UG/UVI F/ P1250 SPE25“according to standard UNE EN 13964). It provides the necessary damping to the system, in the resonance zone of medium-high frequencies Hz. In addition, it provides an improvement in the spring placement.

Physical-mechanical features: Very resistant to weathering, ozone, organic oils, salt fog, detergents, UV, low and high temperatures from -50° up to +120°.

Screws: All fastening elements are supplied in AISI 304 stainless steel. (Nuts and washers)

Plate ZAMAK-5 (it is a zinc with aluminium alloy, magnesium and copper. It has hardness, a high resistance to traction, density 6.6 g/cm³ and fusion temperature of 386 °. According to UNE-EN 12844. Coated with INTERPON 700 (polyester and epoxy resins) providing durability to oxidation of more than 2000 salt hours.

Sheet BEC-3: It is a microcellular sheet of EPDM

Resistance to Compression: ASTM D1056-07 ASTM D1056-07 Kg./m³. 150 ± 30. Resistance to tear: ASTM D 624-00 (Die C) KN/m 1,3. Resistance to traction: ASTM D412-06 ae2 kPa 500. Free of CFC & HCFC
11. DIMENSIONS

MODELO
TBM-INOX

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