HUTCHINSON®

# Hutchinson Stop-Choc

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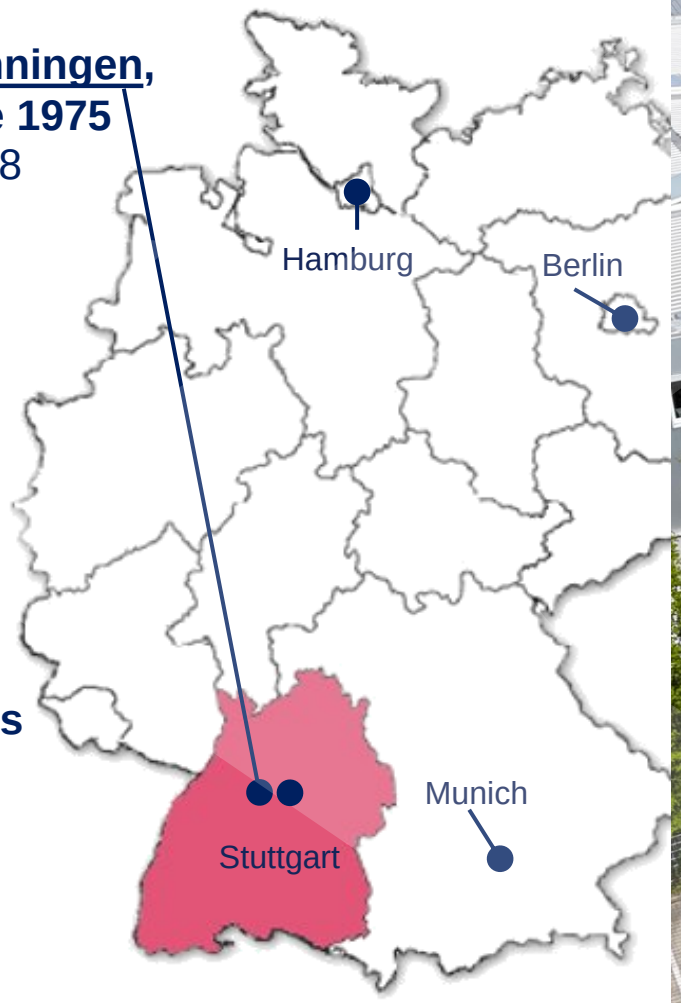
# Hutchinson Stop-Choc – A SUCCESS STORY

**Located in Renningen, Germany since 1975**
Founded in 1958




**25M € sales**

**110 employees**

**Research & Innovation Center**

# Hutchinson Stop-Choc - PRODUCTIVITY

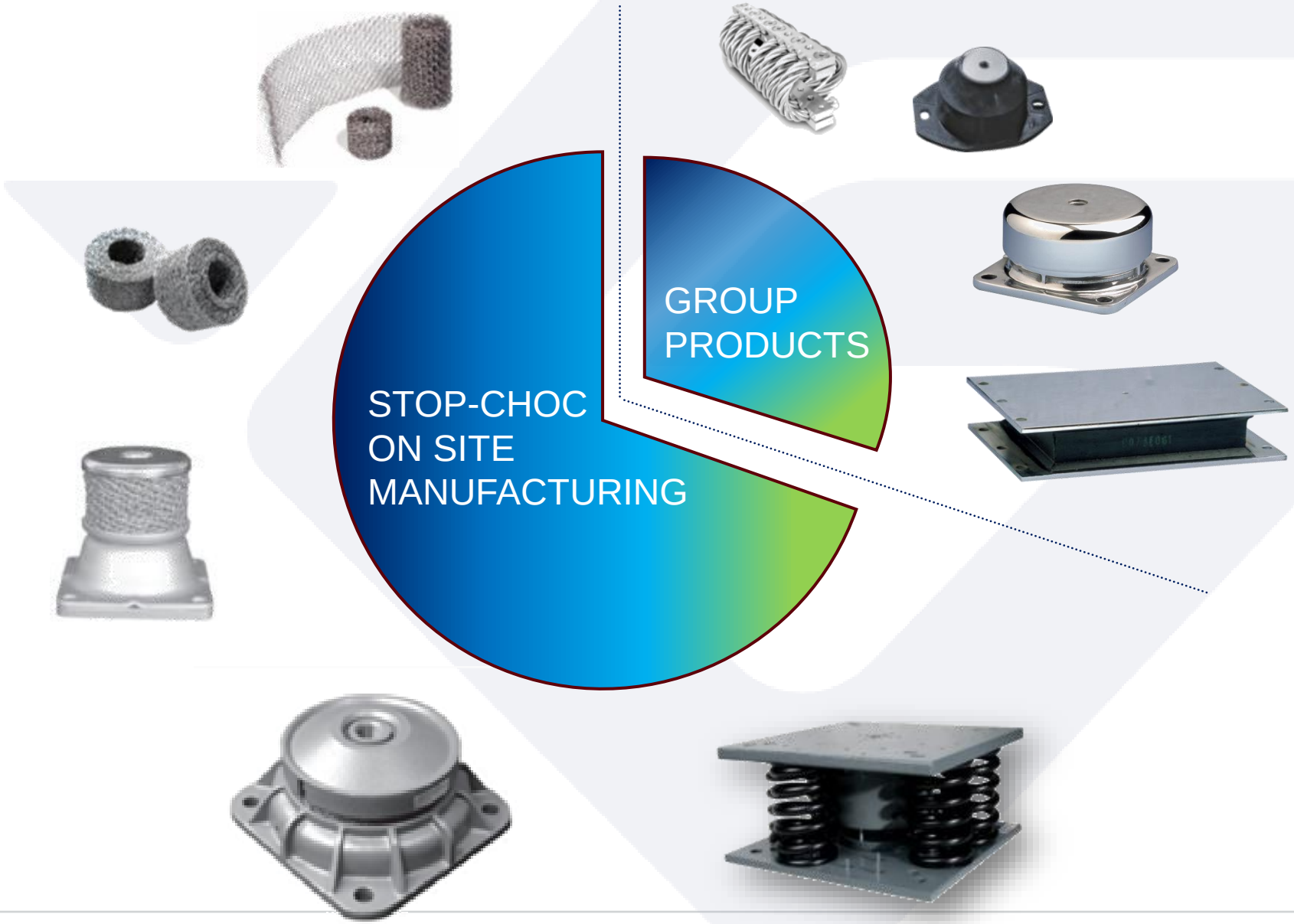
**Quality certificates**

- ✓ ISO 9001
- ✓ IATF 16949
- ✓ ISO 14001
- ✓ ISO 9100
- ✓ ISO 50001

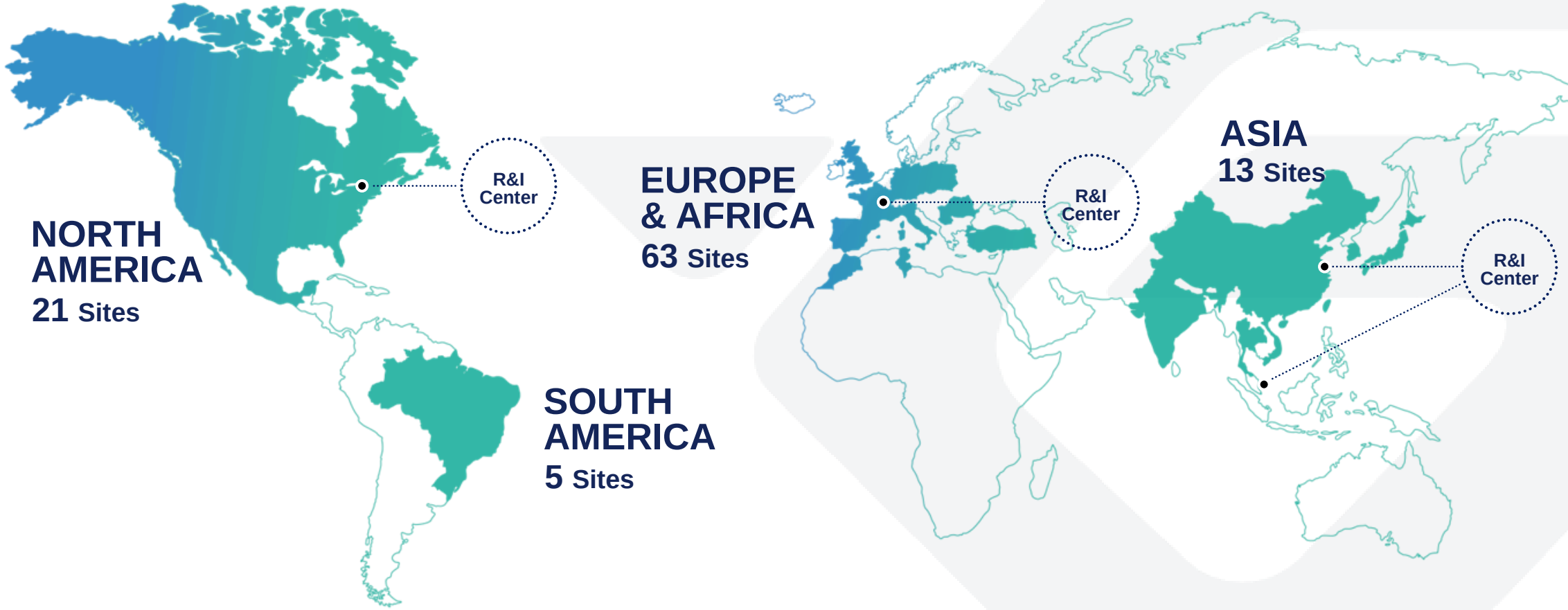
**full automatic operations**

**> 100.000.000 all metal cushions per year**

**more than 1.000 different dampers**



# The Hutchinson Group - A GLOBAL FOOTPRINT




**40,000** Employees

**25** Countries

**102** Sites

**4,4** Billion revenue

**5%** of our revenue invested in R&D

**4** Research & Innovation Centers

**40** Development Centers

# The Hutchinson Group - A PART OF TOTAL ENERGIES

The Hutchinson Group is a 100% subsidiary of Total Energies SA in the chemicals division.

TotalEnergies

To preserve the planet in the face of the climate challenge, TE moves forward, together, towards new energies

OIL GAS ELECTRICITY HYDROGEN BIOMASS WIND POWER SOLAR

A multienergies integrated major

World no.2 in liquefied natural gas

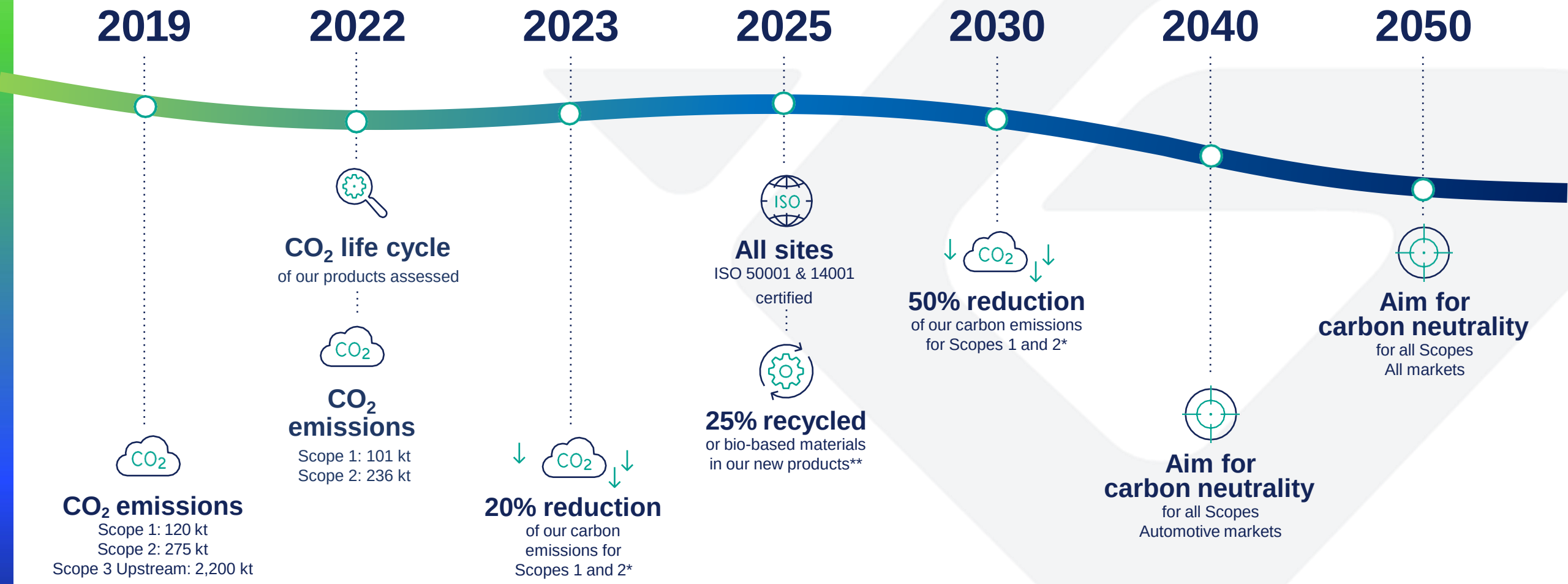
> 100 GW of production capacity for renewable electricity by 2030

More than 4,000 researchers in 18 R&D centers

More than 100 000 employees in 130 countries

# The Hutchinson Group - OUR PATH TOWARDS CARBON NEUTRALITY

*vs 2019
** upon request




## 2019

**$CO_2$ emissions**
Scope 1: 120 kt
Scope 2: 275 kt
Scope 3 Upstream: 2,200 kt

## 2022

**$CO_2$ life cycle**
of our products assessed

**$CO_2$ emissions**
Scope 1: 101 kt
Scope 2: 236 kt

## 2023

**20% reduction**
of our carbon emissions for Scopes 1 and 2*

## 2025

**All sites**
ISO 50001 & 14001 certified

**25% recycled**
or bio-based materials in our new products**

## 2030

**50% reduction**
of our carbon emissions for Scopes 1 and 2*

## 2040

**Aim for carbon neutrality**
for all Scopes
Automotive markets

## 2050

**Aim for carbon neutrality**
for all Scopes
All markets

# Hutchinson Stop-Choc – OUR VISION

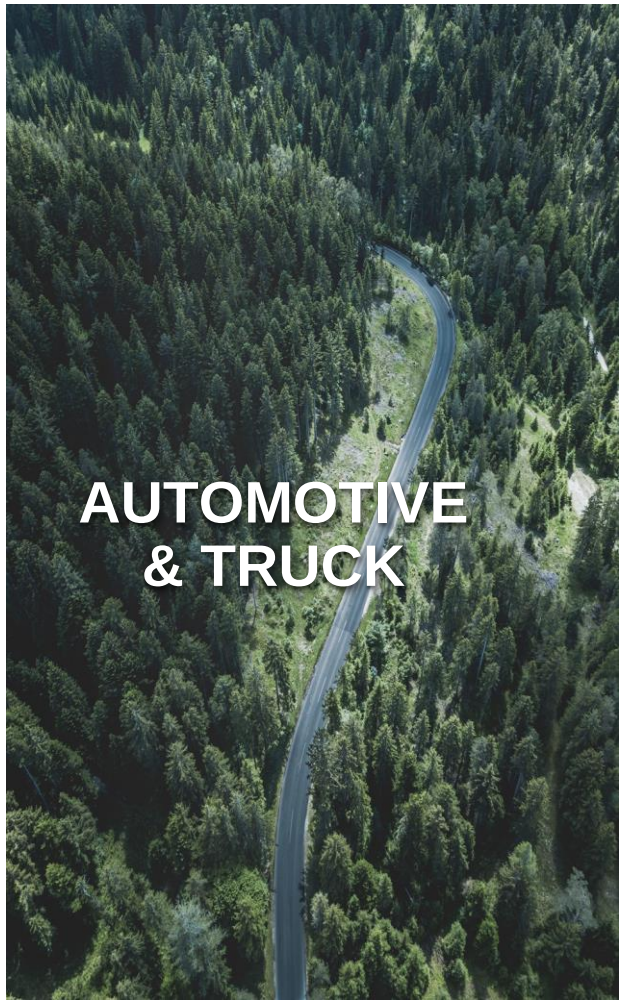
***Our KNOW-HOW is guided by four CHALLENGES:***

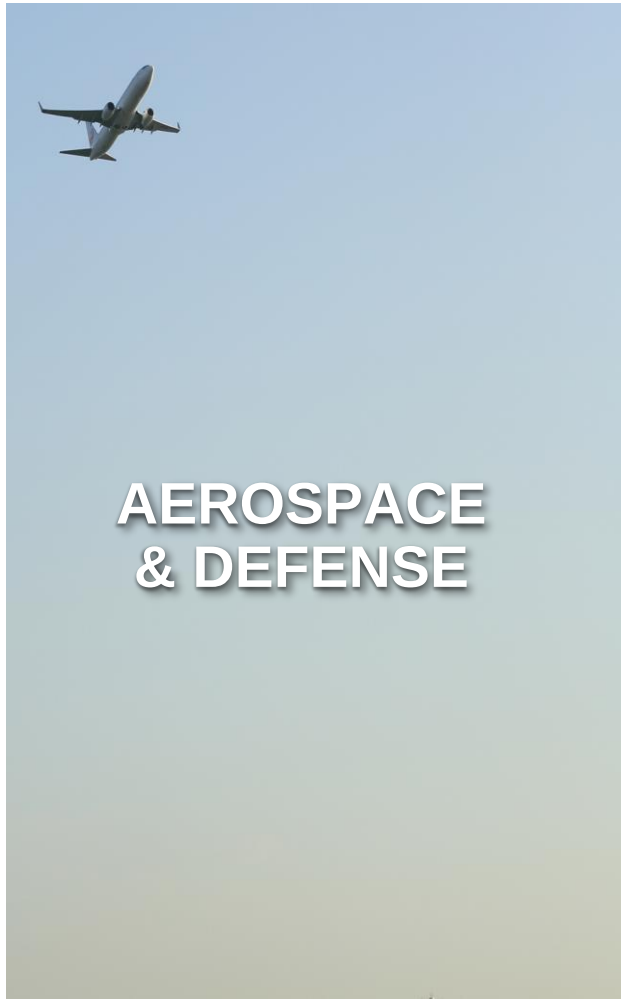
- ✓ ***High vibration and acoustic PERFORMANCE***
- ✓ ***High product QUALITY***
- ✓ ***RAPID development time***
- ✓ ***INNOVATIVE solutions to the NEEDS of our CUSTOMERS***

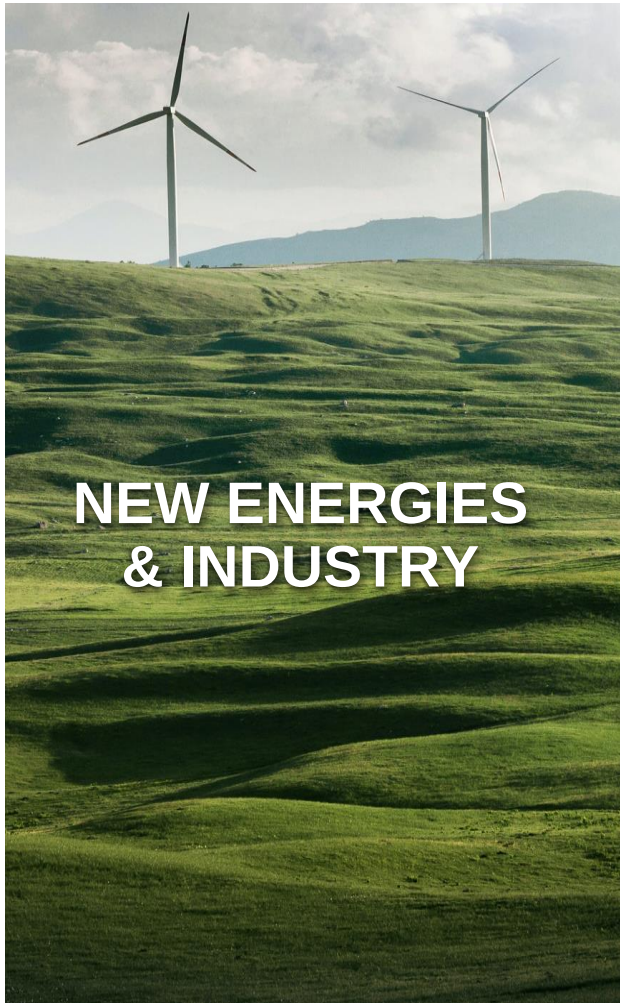
# THE APPLICATION FIELDS

AUTOMOTIVE & TRUCK | AEROSPACE & DEFENSE | INDUSTRY & RAILWAY

# Hutchinson Stop-Choc – THE APPLICATION FIELDS



# Hutchinson Stop-Choc – THE APPLICATION FIELDS

## AUTOMOTIVE & TRUCK

**Automotive**

**Trucks**

## AEROSPACE & DEFENSE

**Defense**

**Aerospace**

**Marine**

## NEW ENERGIES & INDUSTRY

**Railway**

**General Industry**

# Hutchinson Stop-Choc – THE APPLICATION FIELDS

**Automotive** | **Trucks** | Defense | Aerospace | Marine | Railway | General Industry

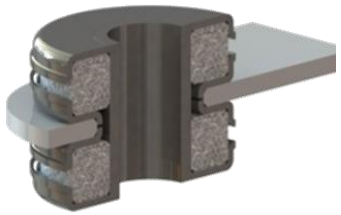


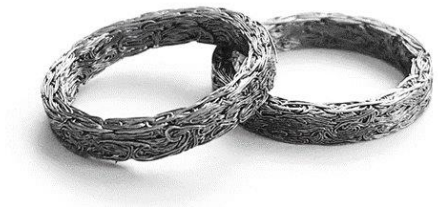




Electrical Auxiliary Units, Dashboard Fixation, Underbody Protection Shield for E-Drive, Electronic power steering pump, Decoupling Rings etc.







# Hutchinson Stop-Choc – THE APPLICATION FIELDS

Automotive | Trucks | Defense | Aerospac | Marine | Railway | General Industry







## Avionics suspension, Camera suspension, Suspension of avionics equipment, Cooling systems suspension






# Hutchinson Stop-Choc – THE APPLICATION FIELDS

Automotive | Trucks | Defense | Aerospac | Marine | **Railway** | **General Industry**

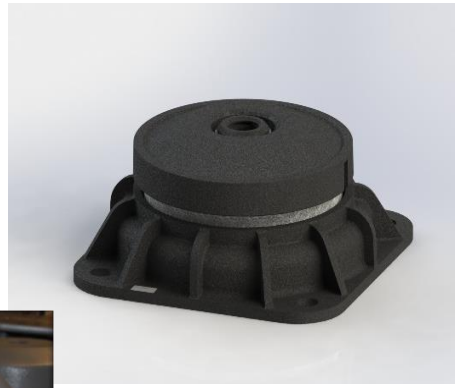


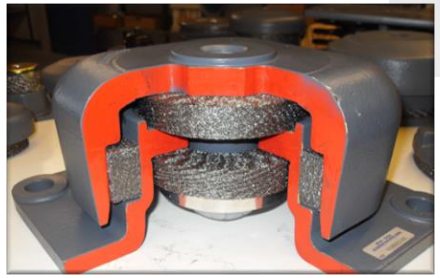




Exhaust systems, Elastic suspension of freshwater tank, Elastic suspension of silencer, Elastic suspension of the traction container, Secondary suspension

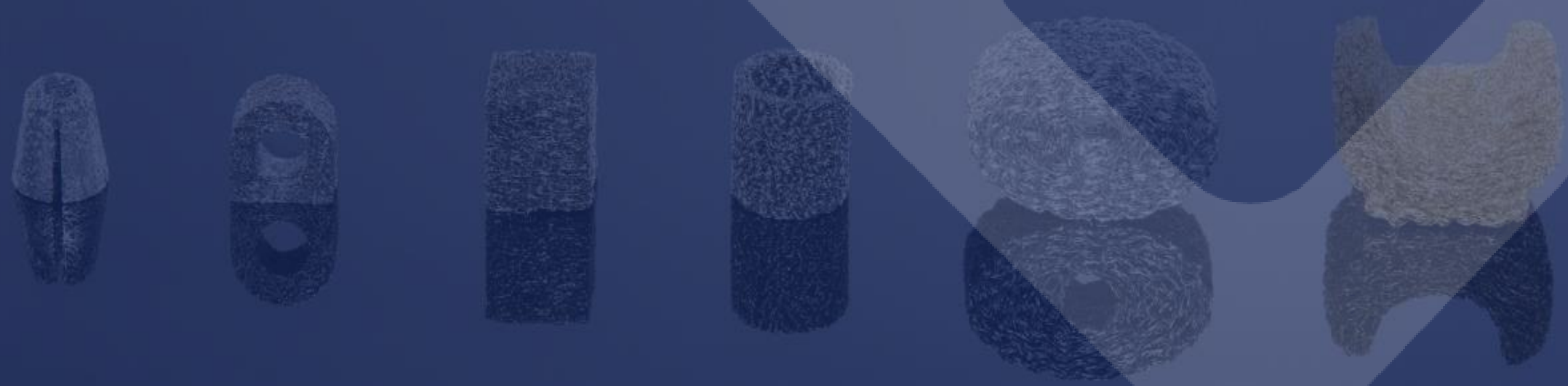


Hutchinson Stop-Choc – METAL MESH TECHNOLOGY

# „High variation of different shapes and wide range of adjustable stiffnesses possible“



# Hutchinson Stop-Choc – WIRE MESH CUSHION SPECIFICATIONS

## High static and dynamic loads

- ✓ Stiffness 500N/mm – 5.000N/mm
- ✓ 100N/mm – 10.000N/mm possible

## Weldable to other components

- ✓ Resistant against oils, gasoline, alkaline, …

## Excellent and adjustable damping properties

- ✓ Natural frequency 15Hz – 75Hz

## Reduce Life Cycle Cost

- ✓ Durability up to 30years +

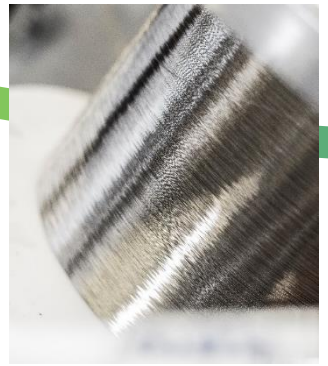
## Function over high range of temperatures

- ✓ From -70C up to 300°C+ no change in damping behaviour
- ✓ Resistant up to 900°C (Inconel steel)

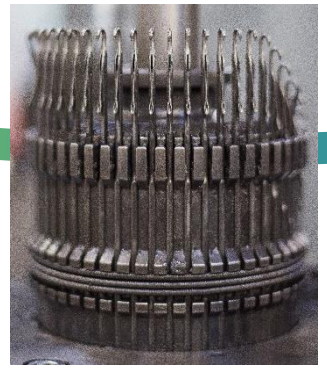
## Environmental benefit

- ✓ Recycable

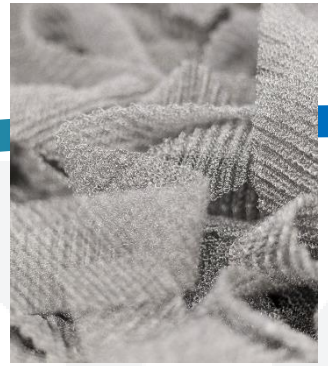
# Hutchinson Stop-Choc – METAL MESH TECHNOLOGY



Wire

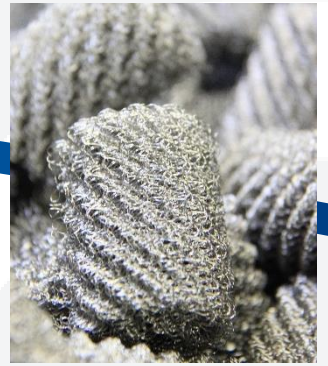


Knitting head



Sleeve

Sleeve, cutted



Sleeve, rolled

Cushion

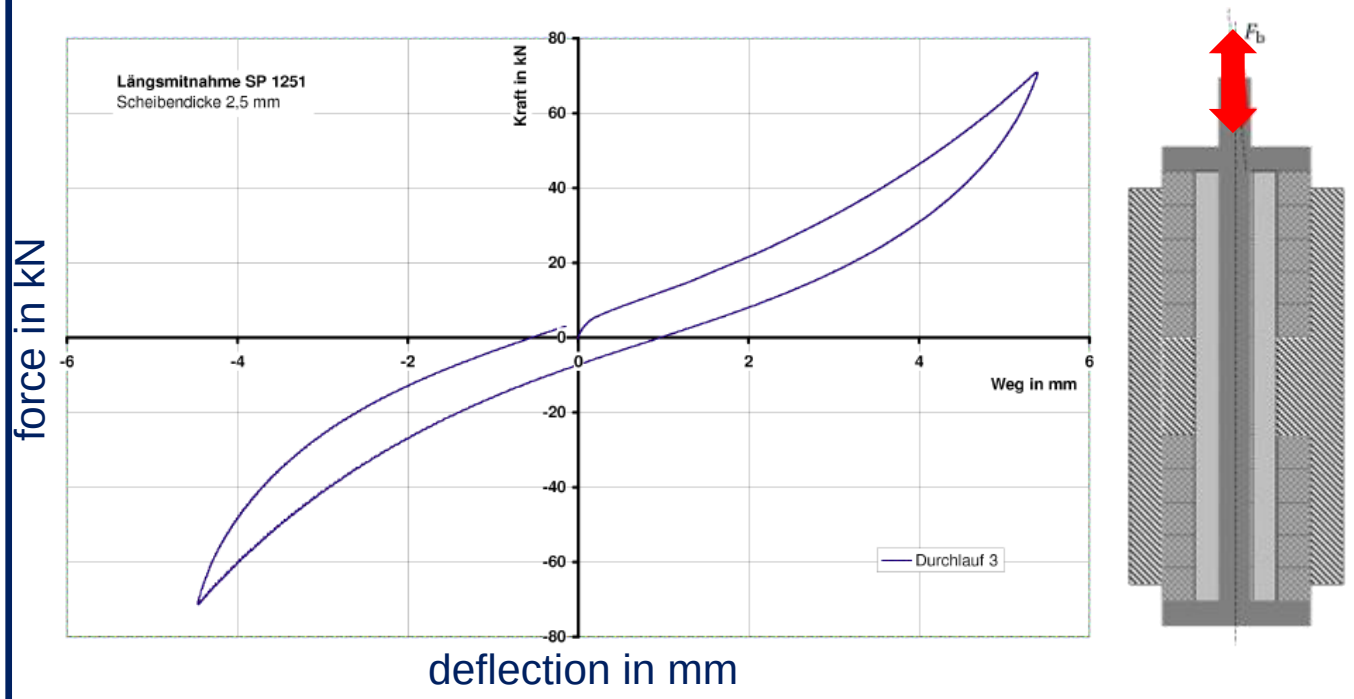
We use up to four metal wires, primarily stainless steel, and knit wire mesh. This compound is the basis for our metal mesh cushions.

The material is prepared in shapes of endless, sock-like sleeves. Those sleeves are cut in length before going through one of several preforming processes.

Several preshaping processes, like rolling, folding or pushing, are available to guarantee a smooth production. The preformed material is then pressed into the final cushion.

# Hutchinson Stop-Choc – WIRE MESH CUSHION PROPERTIES

- High static and dynamic loads
- Excelent damping properties due to frictional damping





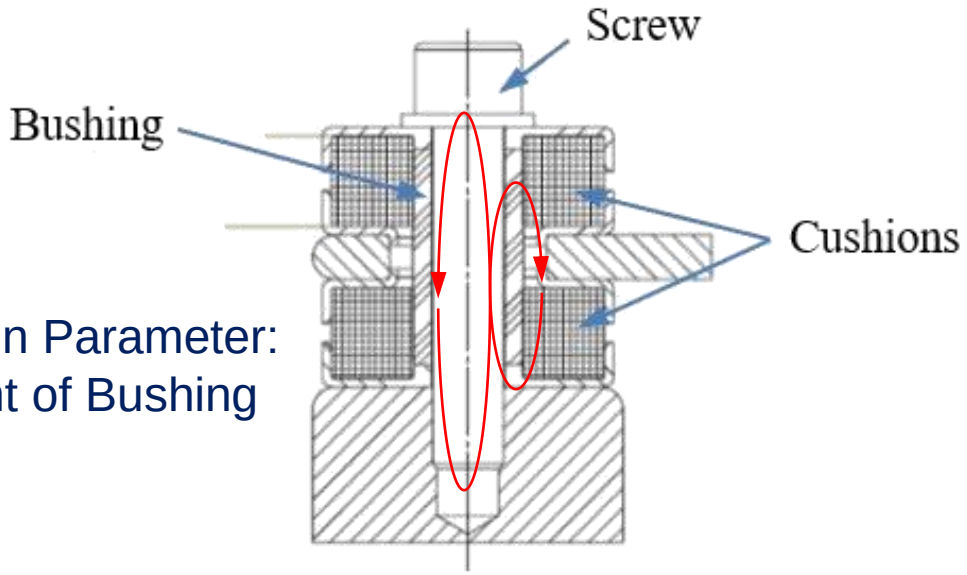


Diameters (Shape)
are defined by tooling

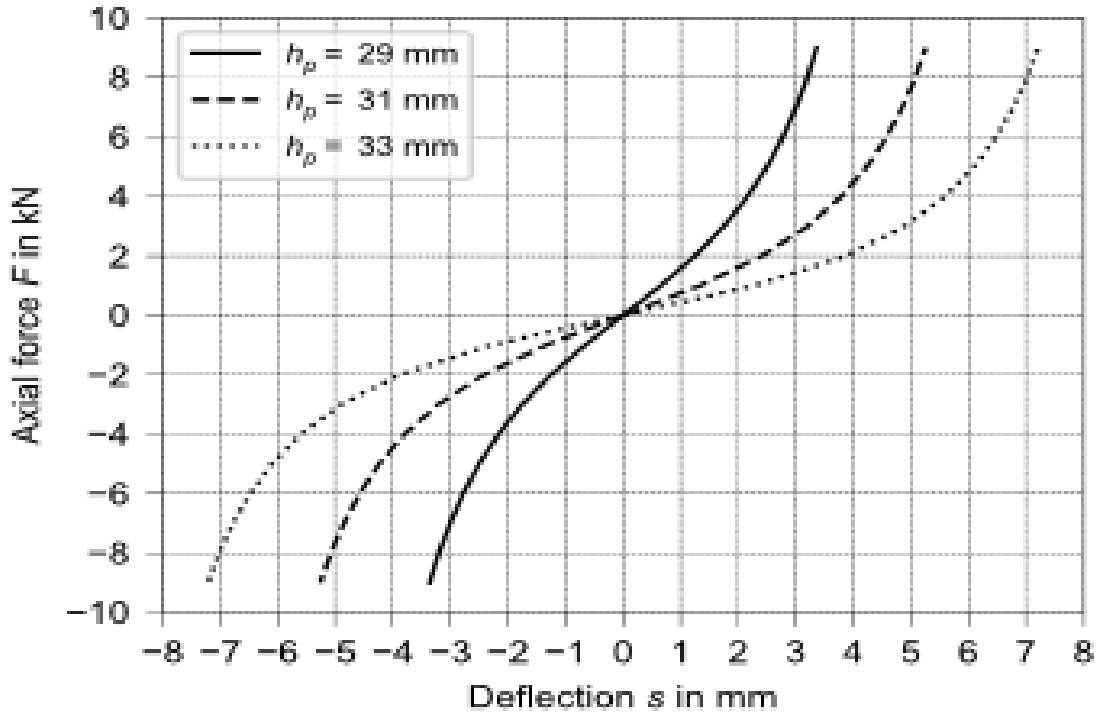

Height is defined by
press force


Mesh
defines further properties

# Hutchinson Stop-Choc – WIRE MESH CUSHION PROPERTIES

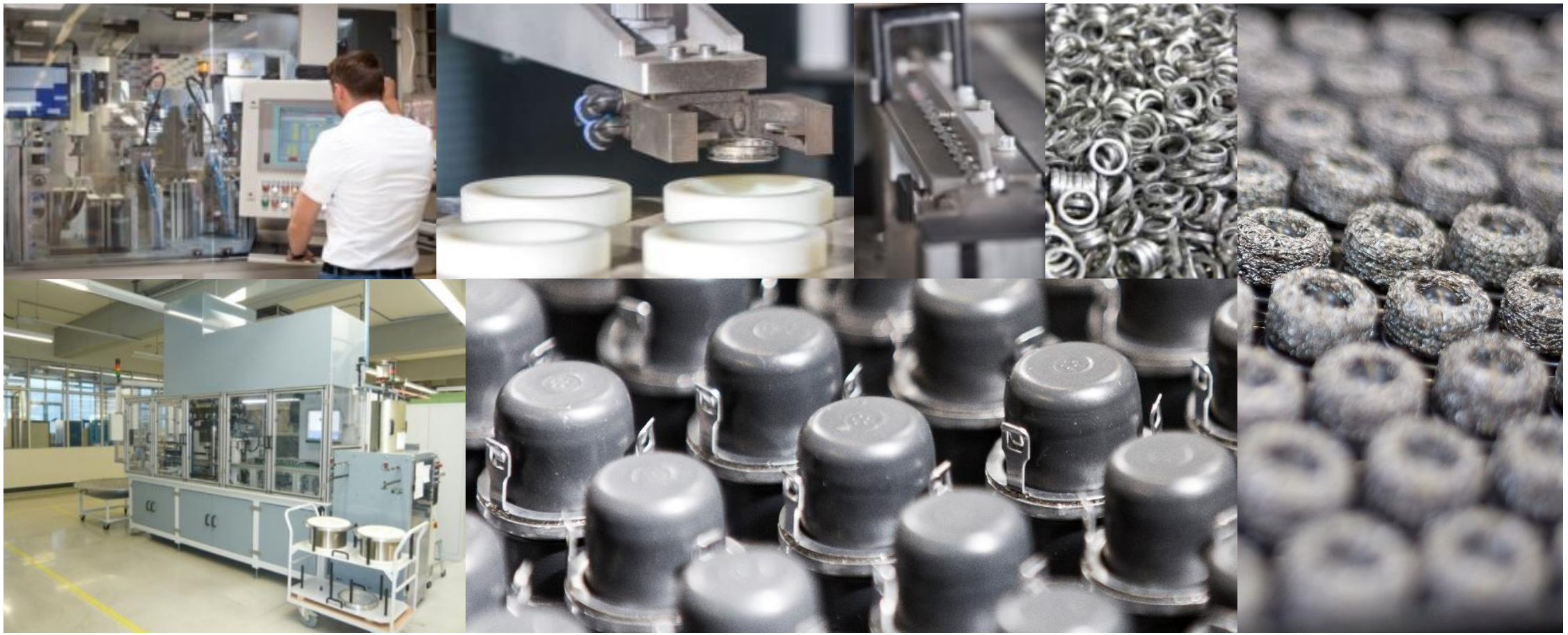



Design Parameter:
Height of Bushing




**Height $h_p$ of the bushing defines pretention $F_p$ and stiffness $k$**

# Hutchinson Stop-Choc – AUTOMATION, A KEY COMPETENCE



# TECHNICAL INFORMATION

# Hutchinson Stop-Choc – ELASTOMER VS. METAL MESH CUSHION

- High variation of sizes and shapes
- Diameter: Ø3,8mm ….  Ø310mm

# Hutchinson Stop-Choc – CHARACTERISTICS METAL MESH

Diameter: Ø0,07… Ø0,16; Ø0,23 … Ø0,6mm

Tensile strength: 750-1900N/mm²

Material: >95% stainless steel

- 1.4301 X5CrNi18-10 → Standard stainless steel
- 1.4401 X5CrNiMo17-12-2
- 1.4435 X2CrNiMo18-14-3
- 1.4571 X6CrNiMoTi17-12-2 → Increased corrosion resistance
- 1.4828 X15CrNiSi20-12 → Increased temperature range
- 2.0265 CuZn30 → Brass
- 2.4668 NiCr19NbMo → Alloy 718
- 2.4851 NiCr23Fe → Alloy 601

# Hutchinson Stop-Choc – CHARACTERISTICS METAL MESH

| Product properties | Elastomer | Metal Mesh |
|---|---|---|
| Compression loading capacity (extreme load) | 5 (10) N/mm$^2$ | 25 (40) N/mm$^2$ |
| Density | 0.9 .. 1.5 g/cm$^3$ | 0.9 .. 4 g/cm$^3$ |
| Damping (Lehr damping factor, max.) | 0.03 .. 0.07 | 0.15 .. 0.2 |
| Magnification at resonance | 3-4 | 8-10 |
| Type of damping | viscoelastic | Friktion |
| Frequency range (natural frequency spring-mass-damper-system) | from 6 Hz | from 15 Hz |
| Isolation frequency starting | from 6 Hz | from 15 Hz |
| Temperature resistance | -30 .. +150 °C | -50 .. +350 °C |
| Temperature/humidity independence of *k* and *d* | no | yes |
| Recycle (sustainability) | difficult | easy |
| Thermal conductivity (depends on density and load, 20°) | 0,16 W/(m*K) | 1-2 W/(m*K) |
| Compression set | high | low |
| Material aging (possible life-time) | No (30a) | Yes (6-8a) |

# Hutchinson Stop-Choc – CHARACTERISTICS METAL MESH

| Media | Elastomer | Metal Mesh |
|---|---|---|
| Acid | Not resistant | resistant |
| Salt Water | Not resistant | resistant |
| Mineral oil and grease | Not resistant | resistant |
| Gasoline, Diesel | Not resistant | resistant |
| Ozone | Not resistant, accelerated aging | resistant |
| UV. Light | Not resistant, accelerated aging | resistant |

# Hutchinson Stop-Choc – CHARACTERISTICS METAL MESH

| |  |  |
|---|---|---|
| **Behavior at…** | **Elastomer** | **Metal Mesh** |
| High temperature | Damping declined, stiffness declined, accelerated aging, post-cross linking and amplified setting behaviour, reduced life-time | Constant.<br>Recrystallization temperature of cold drawn wire must be considered (according material approx. 350-400°C) |
| Dynamic loads | Viscoelastic damping, heat dissipation very slow, resulting in heat build-up, overheating in the inner of the rubber volume. By the heat build-up the behaviour above amplified, which amplifies the heat build-up effect and leads to a shortened lift-time | Friction damping, heat dissipation by material, low heat build-up |
| High frequency | Very high dynamic stiffness values, caused by the viscoelastic damping which is proportional to the speed. Reduced vibration isolation. | Shift (amplitude dependant) from sliding friction to static friction (no movement in between wire), at high frequency only the material damping of the wire material (steel D= 0,005) takes effect which enables a very good isolation. |

# Hutchinson Stop-Choc – CHARACTERISTICS METAL MESH

| Behaviour at… | Metal Mesh | Elastomer |
|---|---|---|
| resonance | Maximum movement inside of the wire structure generates a maximum of damping. The magnification Q=3-4 is nearly constant over 2-3 mio. load cycles. | Damping depending on the compound and mostly relatively low leads to high amplitudes and a magnification of Q=8-10. Staying at resonance causes heat build-up and will end up in a very short lifetime. |
| alternating stress | Pre-load must be defined accordingly. | Pre-load must be defined accordingly. |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