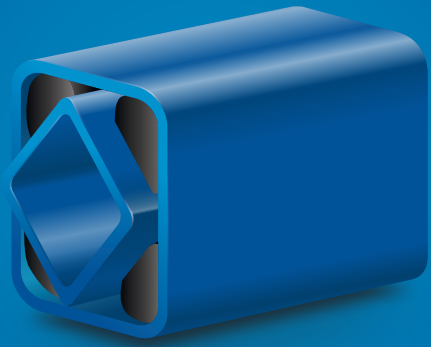


# **THE BLUE ONES FROM ROSTA**

**Components for increased output**





**Simple and clever**

# DEAR READER

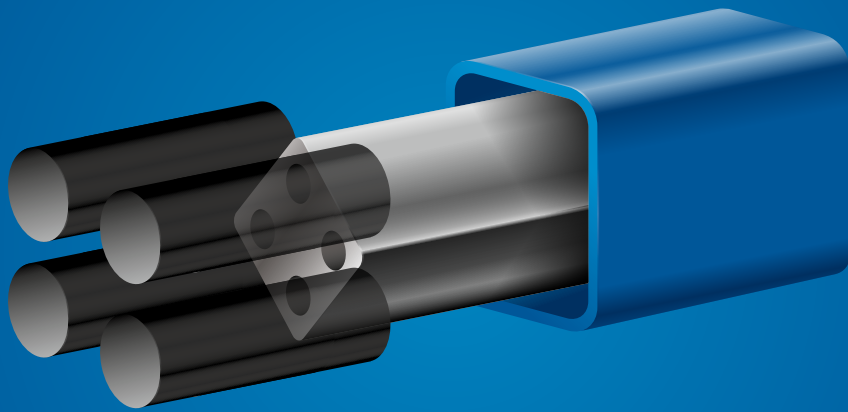
## A unique success story for 75 years

Thanks to an innovative product idea, ROSTA is the world's leading manufacturer of rubber spring and damping systems. Since 1944, our consistent customer-centric approach has had top priority and contributes significantly to the sustained success of the company – enabling us to celebrate the 75<sup>th</sup> anniversary of our success story in 2019.

In addition to our headquarters and production site in Switzerland, ROSTA has 6 subsidiaries in Germany, Italy, Canada, the USA, China and Australia with over 120 employees. Our global network with over 30 partners in more than 40 countries positioning us to serve our customers far beyond our borders swiftly and promptly.

Many customers from all industries already benefit from our comprehensive know-how, becoming more profitable and competitive thanks to ROSTA products.

Our components are maintenance-free, noiseless, have a long service life and are used for a wide range of applications. Many years of experience in research and development in our own laboratory and the collaborative work with our partners and customers form an important knowledge base from which we can continue to offer innovative solutions.



**Perfect combination**

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# ROSTA GROUP

## ROSTA – yesterday, today, tomorrow

It began in the mid-1940s with the construction of rubber-mounted trailer axles. This laid the foundation for the ROSTA success story.

Over the years, ROSTA has developed components that have found countless uses in mechanical and plant engineering.

Even today, new applications for the ROSTA rubber suspension element are constantly being realised.

New technologies and an innovative culture at ROSTA will enable the future development of new components with new materials.

# OVERVIEW OF ROSTA

## History

It began with the search for a simple and inexpensive solution for a trailer: to absorb, dampen and support the axle.

## Production

In the end, the ROSTA rubber suspension element is only as good as the rubber inside. Many new possibilities are developing for the improvement of the quality and production of rubber inserts for specific and/or customized applications. This is possible through collaboration with our «own» rubber manufacturer.

## Functions

Let yourself be inspired by the wide range of application possibilities for our rubber suspension elements! Tensioning, dampening and supporting are characteristics that require a solution in almost every technical design.

## Employees

At ROSTA, we have the best employees. Mutual respect and a friendly atmosphere make our company one big family.

## Industries

It started with the axle suspension for a single industry. Today, ROSTA elements are used for countless applications in many different industrial branches. Every day we find new solutions that make our customers more competitive and profitable.

## Distribution

Over 30 sales partners advise and support our customers worldwide. Our aim is to work with the best distributors around the world. We train them professionally so they can support their customers in the respective country without delay.



- 1944: Foundation
- 1968: First machine components
- 1978: Own laboratory
- 1992: ISO certification
- 2007: Acquisition Compounds AG
- 2019: Automated manufacturing



**75** years of customer-oriented innovation

- Own rubber manufacturer
- The ability to adapt to changing customer and market needs
- Consistently high quality
- Lean Management / 5S
- Core competence in developing complex customer solutions



**1.5** million elements sold each year

- Tensioning
- Dampening
- Supporting
- and many more



**3** key functions in 1 element

- 35 % women in management positions
- 20 different nations
- Average 10 years of service
- Support of development and internal change



**120** competent and motivated employees

- Industry
- Mining
- Food
- Agriculture



**4** core markets

- Head office in Switzerland
- 6 subsidiaries
- Over 30 distribution partners in 40 countries



**5** continents, over 40 countries

# TECHNICAL COMPETENCE

## Focus for continuous success

In our efforts to make use of our products in countless processing plants and machinery worldwide in an efficient and safe manner, we provide the world market with our know-how, our experience and with our high quality products.

In addition to standard components, we develop custom-made solutions in cooperation with our customers. With our elements, our customers are able to generate added value by designing their products with fewer components. We furthermore assist our customers and partners with the layout of systems using stress simulations.

## Trainings

We are happy to pass on our expertise and many years of experience.



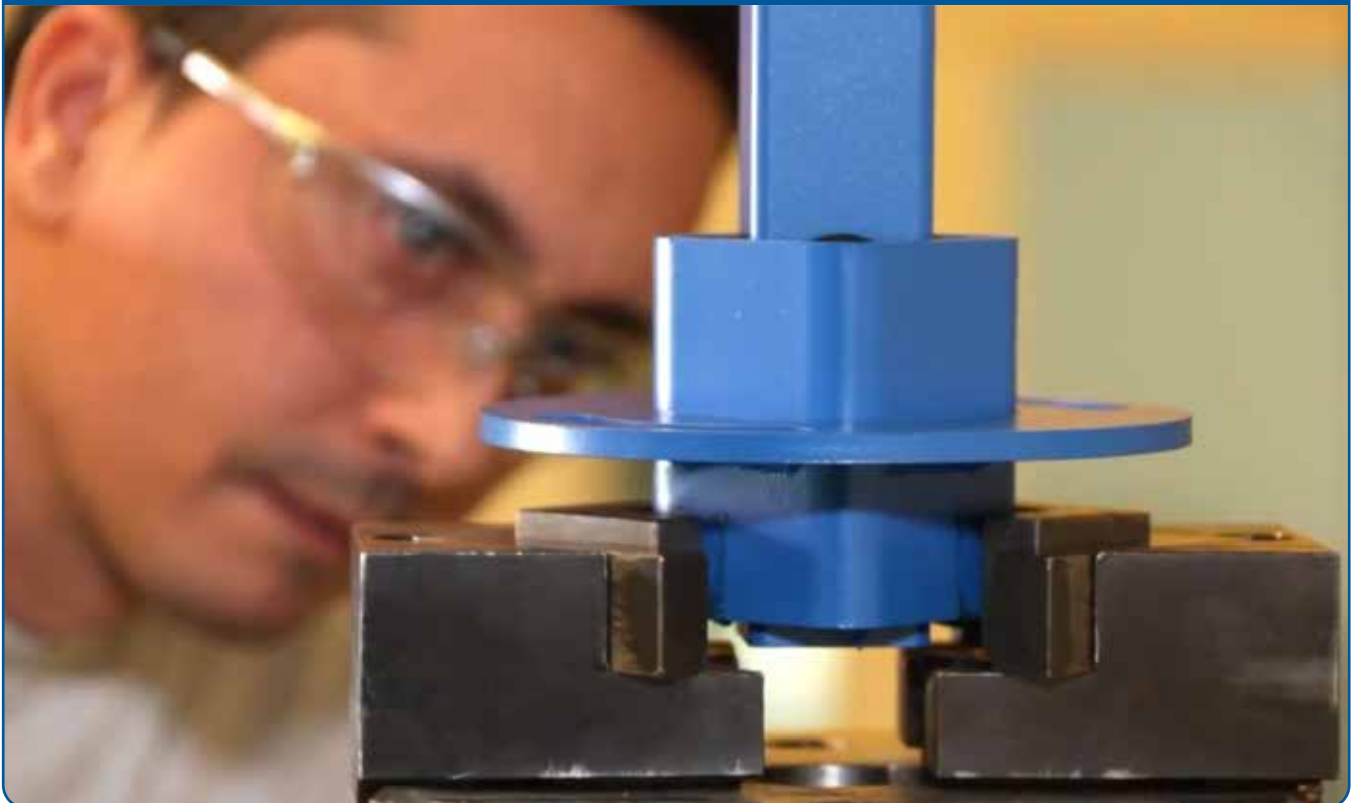
## Service

Ensuring the optimum use of ROSTA solutions.

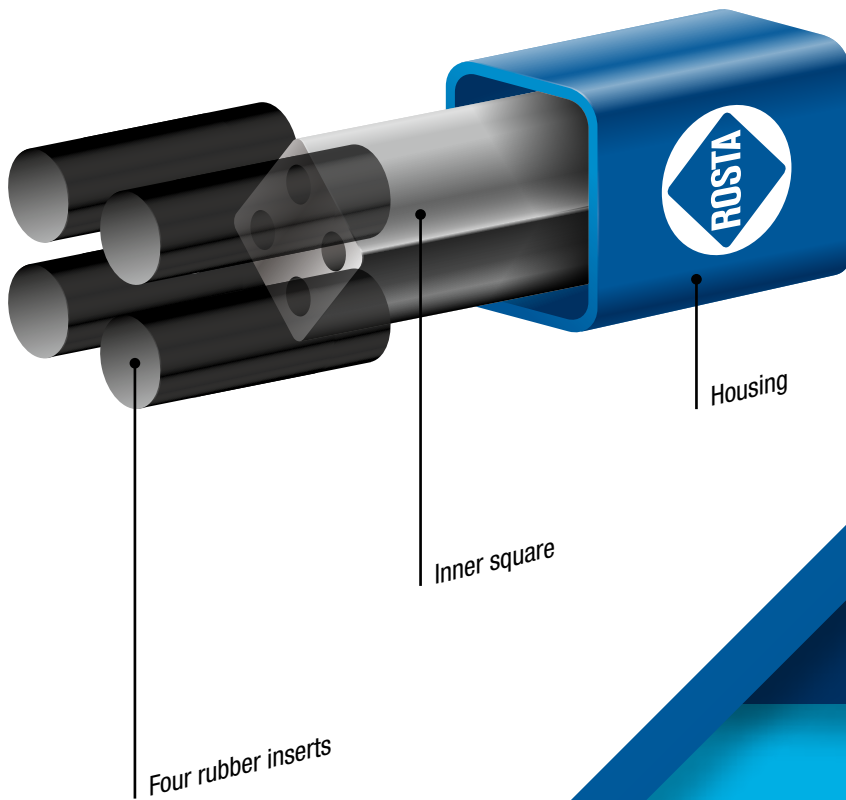
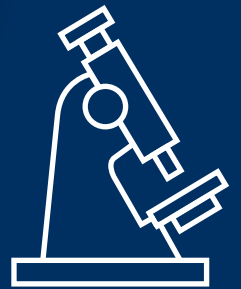
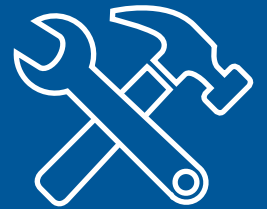


## In-house laboratory

High and constant quality is the base of our success.



# THE CORE OF OUR PRODUCT



1

## DEVELOPMENT

Our development team works closely with our application engineers and customers. We always focus on the customer's needs. New components and services ensure that ROSTA has a competitive advantage.

2

## WORKMANSHIP

Production machines, handling equipment, tooling machines and processing systems equipped with state-of-the-art technology can only function perfectly if reliable and motivated employees stand fully behind even the smallest structural components. It is their competence, quality considerations and their great willingness to work that lay the foundations for the production of high quality goods.

3

## QUALITY CONTROL

For our customers ISO standards are a guarantee of constant quality and performance. ROSTA is an ISO 9001 and ISO 14001 certified company.  
The material tests that take place before and during production are the guarantee for a comprehensive and high quality standard.

4

## VARIABILITY

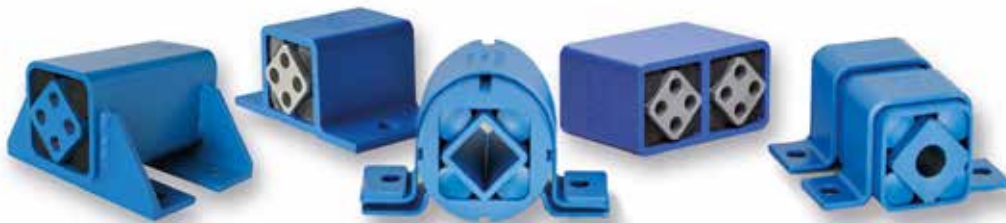
Whether in terms of size, requirement and/or application, our elements from ROSTA are very flexible and customisable, which is why they are used in numerous applications.

1

# OUR PORTFOLIO

## Rubber suspension elements

Multifunctional elements



## Oscillating mountings

Elastic suspensions for screening and conveying



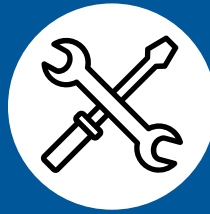
## Vibration dampers

Components for shock and vibration absorbing

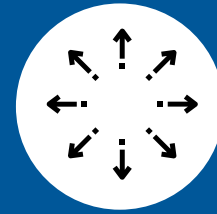




long life cycle



maintenance-free



versatile

## Tensioner devices

Tensioner systems for belt and chain drives



## Motorbases

Self-tensioning motor mounts for all friction belt drives

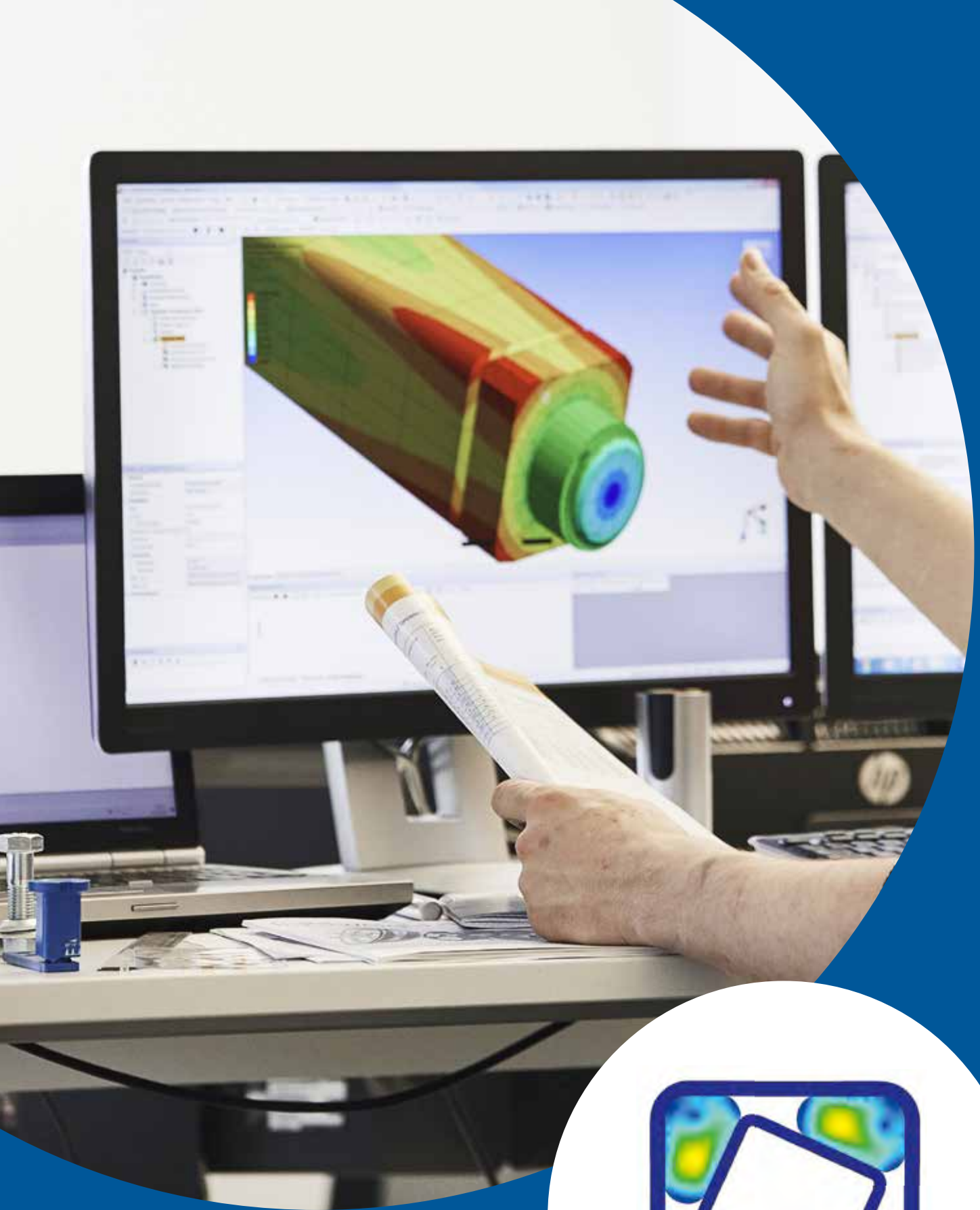


## ROSTA HIVE

Condition / Process Monitoring & Predictive Maintenance



See separate  
ROSTA HIVE brochure





# TECHNOLOGY

## **A unique spring system from experienced specialists**

We at ROSTA have experienced the needs and solved the problems of our customers for more than 75 years. Together with our customers, we analyse their applications and concerns based on decades of experience. We help them to optimise their products and plants and improve their process safety. The result is higher productivity and a true competitive advantage.

Who doesn't want that?



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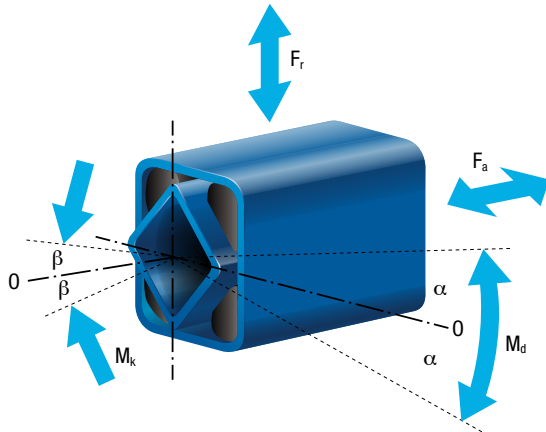
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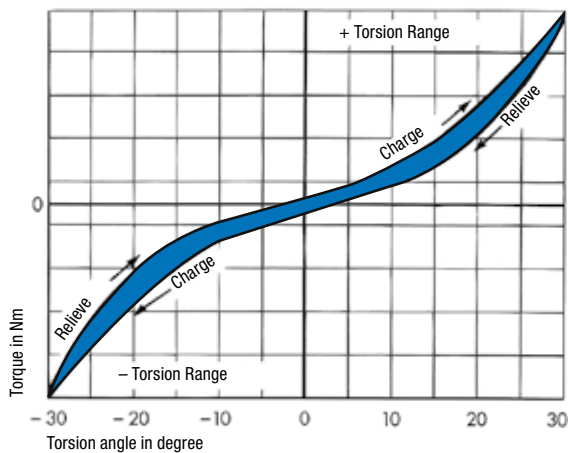
# ROSTA Basics

## Function



The ROSTA rubber suspension elements are mainly designed for applications as torsional spring devices offering operation angles of  $\pm 30^\circ$ . Depending on the particular function, not only torsional moments are generated by pivoting the spring device. According to the specific application additional radial  $F_r$ , axial  $F_a$  and / or cardanic  $M_k$  forces have usually to be taken in consideration. The occurring torques of the different elements and the additional load characteristics are indicated in the respective chapter.

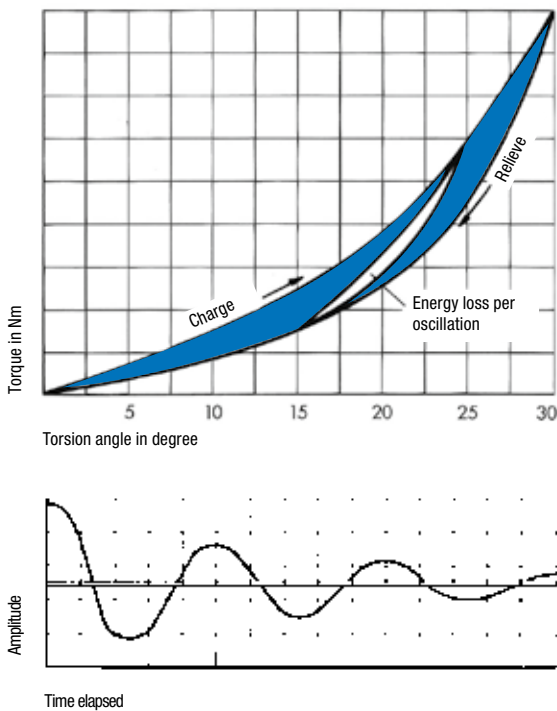
## Spring characteristic



Due to the specific construction characteristics of the ROSTA rubber suspension element, pivoting the device  $\pm$  results in a slightly progressive spring characteristic. The torsion angle is limited to  $\pm 30$  for most elements.

# ROSTA Basics

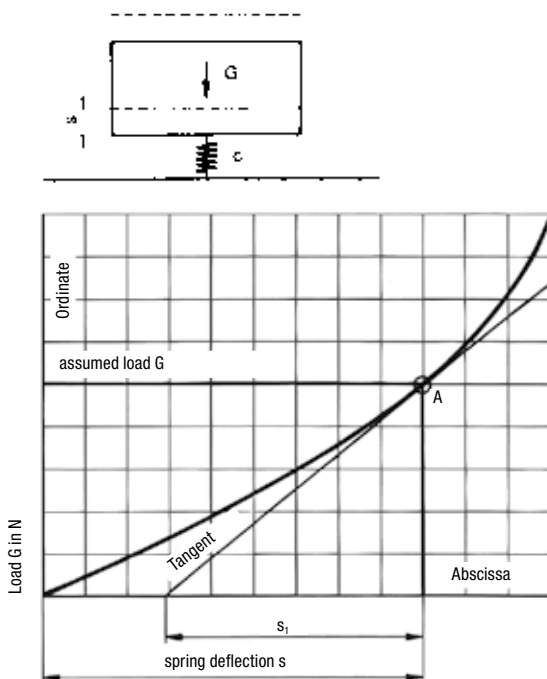
## Damping



The occurring hysteresis in the ROSTA element is added to the resulting energy loss work in the rubber inserts during the pivoting activity of the spring device. In the process of the element actuation a part of the resulting energy is transformed into frictional work generating heat. The shaded surface between load and relieve headline indicates the effective energy loss. At element actuation out of the zero position up to 30°, the resulting average energy loss is at 15 to 20%. At the actuation of a pre-tensioned element, the resulting ± working angle is usually only a few degrees, therefore the energy loss reduces within a limit (see graph).

Uniquely animated element oscillations fade within short term, due to the occurring energy loss at each following post-pulse oscillation. (Very important at the use of ROSTA screen mountings – during the operation procedure of the screen the resulting power loss in the ROSTA mountings is neglectable; during the running down phase, close to the resonance frequency of the suspensions, an important amplitude exaggeration occurs. The high energy loss in the ROSTA screen mountings dampens and absorbs these exaggerations within only a few post-pulse oscillations.)

## Natural frequency

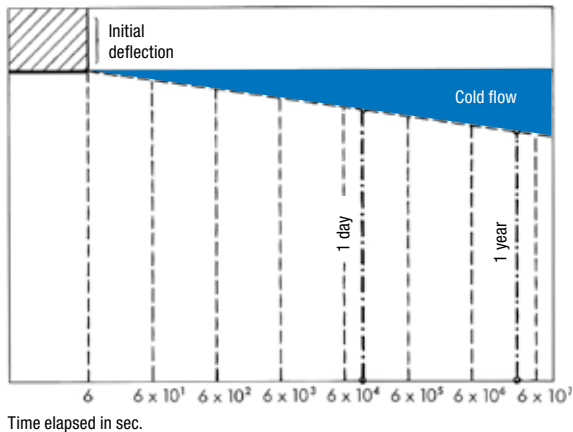


The determination of the natural frequency of a ROSTA suspension has to be carried out by spreading the tangent at the loading point «A» on the parabolic arc of the load deflection curve. The resulting distance  $s_1$  on the axis of abscissa comes up to the arithmetical spring deflection in mm, required for the determination of the natural frequency.

$$\text{Natural frequency } n_e = \frac{300}{\sqrt{s_1 \text{ (in cm)}}} = \text{min}^{-1}$$

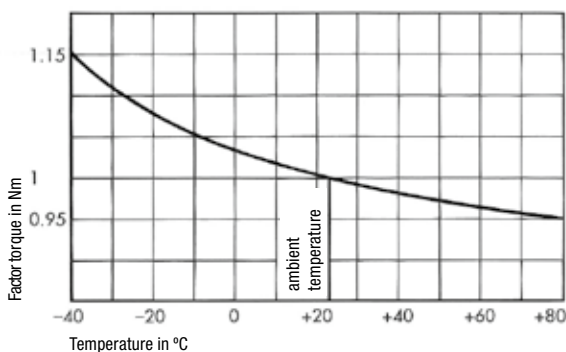
$$\text{or } f_e = \frac{5}{\sqrt{s_1 \text{ (in cm)}}} = \text{Hz}$$

## Cold flow and settling of the rubber suspensions



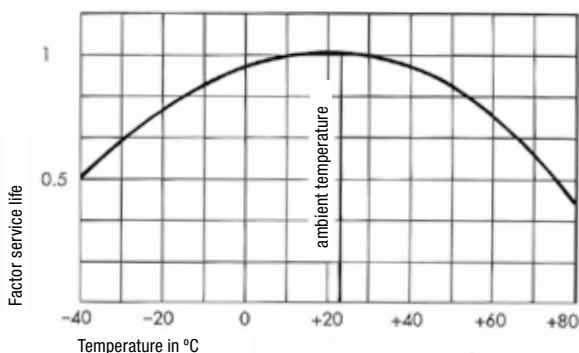
All elastic materials show more or less permanent measurable deformation over time when subjected to a load. This is noticeable in a relatively small additional deflection, the cold flow. This cold flow runs over a linear logarithmic time scale. The illustration shows that after being under a load for one day, already compensates for more than half of the flow deformation of a year; after one year of use, the overall element settling is largely compensated (depending on the temperature and frequency). Empirical findings show that the settling factor lies within a  $3^\circ$  to  $5^\circ$  loss of the element to the neutral  $0^\circ$  position, with combined vibrating bearings at approx.  $+10\%$  of the respective nominal deflection according to the catalogue specification.

## Temperature influence



The ROSTA rubber suspension elements are designed in the standard rubber quality «Rubmix 10» for use in the temperature range of  $-40^\circ\text{C}$  to  $+80^\circ\text{C}$ . As the temperature rises, the mechanical torque strength decreases. This decrease is at a low approx. 5% in the upper temperature range ( $+80^\circ\text{C}$ ). At lower ambient temperatures, i.e. in the minus range, the mechanical torsional stiffness increases (at  $-40^\circ\text{C}$  up to 15%). The internal damping of the elements undergoes a similar process: when the temperature drops, the damping percentage increases and then falls again when the temperature rises. Due to the internal friction (energy loss work), the rubber inserts in the suspension elements warm up with every movement, meaning the effective element temperature may vary in relation to the ambient temperature.

## Service life



Provided the rubber suspension elements are selected according to the technical specifications, i.e. are operating within the given frequencies and oscillation angles and under the mentioned surrounding conditions, no loss of performance and functionality can be expected for many years. Extremely low or high permanent surrounding temperatures considerably shorten the lifetime expectancy of the rubber suspension elements. The opposite service life curve indicates the relevant life deduction at extreme  $\pm$  temperatures from factor 1 at room temperature of  $+22^\circ\text{C}$ .

# ROSTA Basics

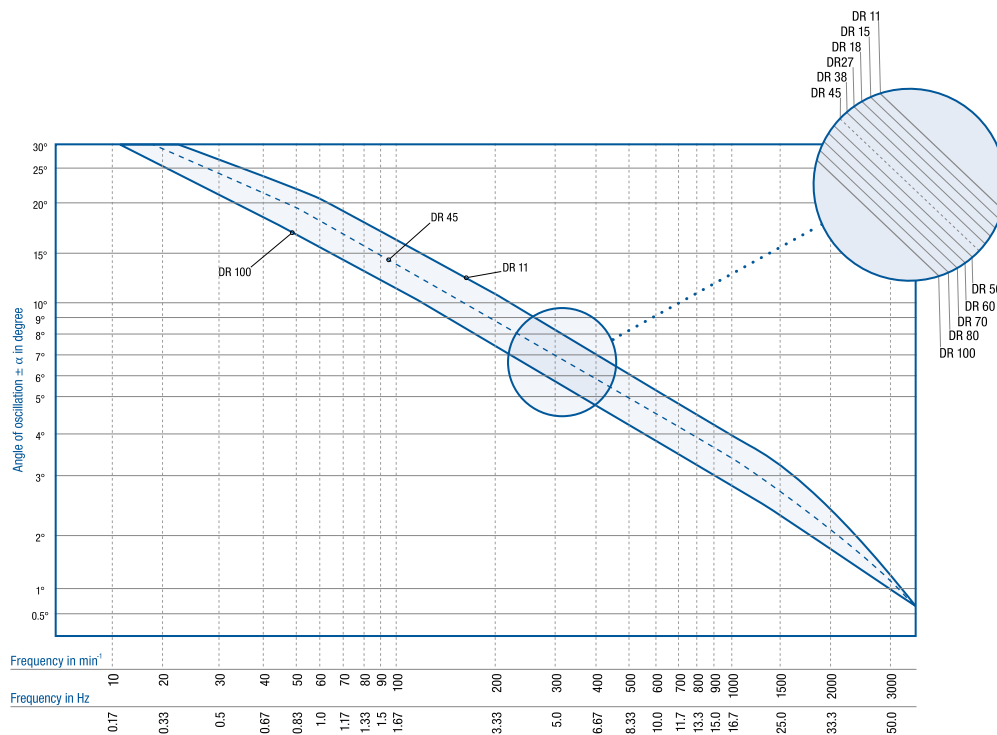
## Quality control and tolerances

Since December 1992 ROSTA AG has been an ISO 9001 standard certified development, manufacture and distribution company. All products undergo regular functional and quality testing. The rubber inserts are continuously tested and controlled on the test machines of the in-house laboratory with regard to Shore A hardness, compression set, abrasive wear, rebound resilience, tensile strength, breaking elongation and aging behaviour. The dimensional tolerance of the rubber inserts is defined according DIN 7715 standard and the Shore A hardness according to DIN 53505 standard. The inner-core profiles and housings of the rubber suspension elements are subject to the tolerance guidelines of the relevant production process and respective supplier (e.g.

cast, extruded, edge rolled) and the individual material consistence (e.g. aluminium casting, steel tube, nodular cast iron part, etc.). The resulting torsional moments and spring deflections of the ROSTA rubber suspension elements are within a tolerance range of  $\pm 15\%$  at the most, but usually lie in a much narrower range!



## Permissible frequencies



Alignment chart for determining the permissible frequencies and oscillation angles in relation to the respective rubber suspension element type (DR 11, 15, 18, etc.). The higher the frequency in  $\text{min}^{-1}$ , the lower the oscillation angle should be and vice versa.

Example: (see blue indication on chart) A rubber suspension of type DR 50 may be rotated from the neutral position ( $0^\circ$ ) to an oscillation angle of  $\pm 6^\circ$  by a max. frequency of  $340 \text{ min}^{-1}$ . For applications of «pre-tensioned» elements working, e.g. under  $15^\circ$  of pre-tension and describing oscillation angles of  $\pm 5^\circ$  at  $250 \text{ min}^{-1}$ , it is absolutely necessary to consult ROSTA.

## Rubber qualities

The majority of all ROSTA rubber suspension elements are equipped with the standard quality «Rubmix 10» rubber inserts. This rubber quality is based on a high content of natural rubber, offers good shape memory, low settling factors (cold flow), high mechanical strength and moderate aging behaviour (little embrittlement/hardening of the rubber inserts).

Where high oil consistency, heat resistance or even greater torques are required, other resilient inserts with the corresponding characteristics can be installed in the rubber suspension elements.

Special qualities on request.

Rubber quality	Factor in relation to the list «torque and loads» (chapter 2 rubber suspension elements)	Working temperature	Material	Comments
<b>Rubmix 10</b>	1.0	–40° to +80°C	NR	– Standard quality – Highest elasticity – Lowest cold flow
<b>Rubmix 20</b>	approx. 1.0	–30° to +90°C	CR	– Good oil-resistance – Elements marked with yellow dot or R20
<b>Rubmix 40</b>	approx. 0.6	–35° to +120°C	EPDM-Silicone	– High temperature resistance – Elements marked with red dot or R40
<b>Rubmix 50</b>	approx. 3.0	–35° to +90°C	PUR	– Max. oscillation angle ±20° – Limited oscillation frequencies – No permanent water contact – Elements marked with green dot or R50

## Chemical resistance

The standardised ROSTA rubber suspension elements are equipped with «Rubmix 10» elastic inserts. These have a high chemical resistance compared to many media. For specific applications, however, the elements must be provided with additional protection or synthetically constructed elastomer inserts should be used («Rubmix 20», «Rubmix 40» or «Rubmix 50»), which will slightly change the characteristics compared to the standard quality (see Rubber qualities).

The resistance table below is only a guideline and is incomplete. In practical use, data for the concentration of the respective medium and the operating temperature are required to determine the resistance. Please contact us in this regard.

Rubmix	10	20	40	50
Acetone	+	00	++	00
Alcohol	++	++	++	0
Benzene	00	00	00	00
Caustic soda solution up to 25% (20°)	++	++	++	00
Citric acid	++	+	0	00
Diesel	00	+	00	+
Formic acid	+	+	0	00
Glycerine	+	+	++	00
Hydraulic fluid	0	+	00	00
Hydrochloric acid up to 15%	++	+	0	00
Javelle water	0	+	++	00
Lactic acid	++	++	++	+

Rubmix	10	20	40	50
Liquid ammonia	+	+	++	00
Lubricating grease and oil	00	+	00	+
Nitric acid up to 10%	00	+	+	00
Nitro thinner	00	00	00	00
Petrol (fuel)	00	0	00	++
Petroleum	00	+	00	++
Phosphoric acid up to 85%	00	00	00	00
Seawater	++	+	++	00
Sulphuric acid up to 10%	+	0	0	00
Tannic acid	++	+	++	00
Toluene	00	00	00	00
Treacle	++	++	++	0

++ excellent consistency, + good consistency, 0 sufficient consistency, 00 insufficient consistency