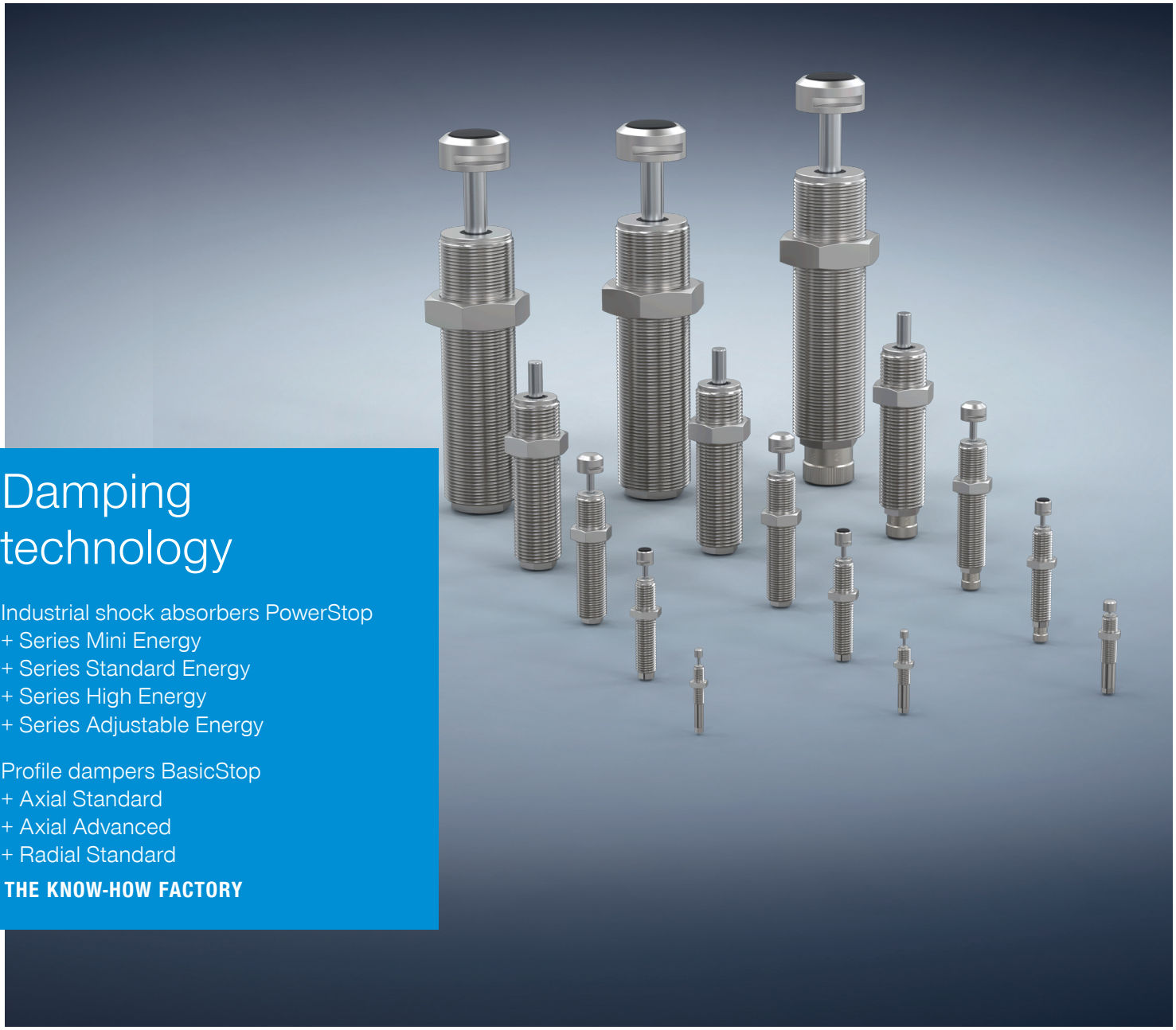








Damping technology

Industrial shock absorbers PowerStop
+ Series Mini Energy
+ Series Standard Energy
+ Series High Energy
+ Series Adjustable Energy

Profile dampers BasicStop
+ Axial Standard
+ Axial Advanced
+ Radial Standard

THE KNOW-HOW FACTORY

www.zimmer-group.com

ZIMMER group

THE KNOW-HOW FACTORY

ZIMMER GROUP
COMMITTED TO OUR CUSTOMERS

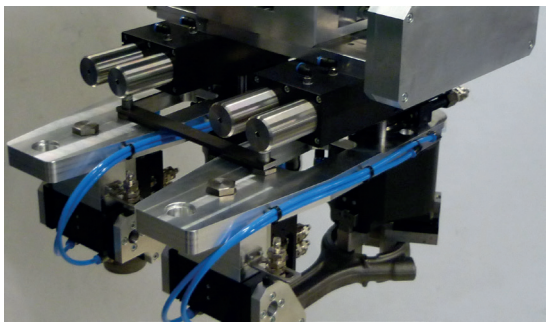
WE HAVE SUCCEEDED FOR YEARS BY OFFERING OUR CUSTOMERS INNOVATIVE AND INDIVIDUALIZED SOLUTIONS. ZIMMER HAS GROWN CONTINUOUSLY AND TODAY WE HAVE REACHED A NEW MILESTONE: THE ESTABLISHMENT OF THE KNOW-HOW FACTORY. IS THERE A SECRET TO OUR SUCCESS?

Foundation. Excellent products and services have always been the foundation of our company's growth. Zimmer is a source of ingenious solutions and important technical innovations. This is why customers with high expectations for technology frequently find their way to us. When things get tricky, Zimmer Group is in its best form.

Style. We have an interdisciplinary approach to everything we do, resulting in refined process solutions in six technology fields. This applies not just to development but to production. Zimmer Group serves all industries and stands ready to resolve even the most unique and highly individualized problems. Worldwide.

Motivation. Customer orientation is perhaps the most important factor of our success. We are a service provider in the complete sense of the word. With Zimmer Group, our customers have a single, centralized contact for all of their needs. We approach each customer's situation with a high level of competence and a broad range of possible solutions.





TECHNOLOGIES



HANDLING TECHNOLOGY

MORE THAN 30 YEARS OF EXPERIENCE AND INDUSTRY KNOWLEDGE: OUR PNEUMATIC, HYDRAULIC AND ELECTRICAL HANDLING COMPONENTS AND SYSTEMS ARE GLOBAL LEADERS.

Components. More than 2,000 standardized grippers, swivel units, robotic accessories and much more. We offer a complete selection of technologically superior products that are ready for rapid delivery.

Semi-standard. Our modular approach to design enables custom configurations and high rates of innovation for process automation.





DAMPING TECHNOLOGY

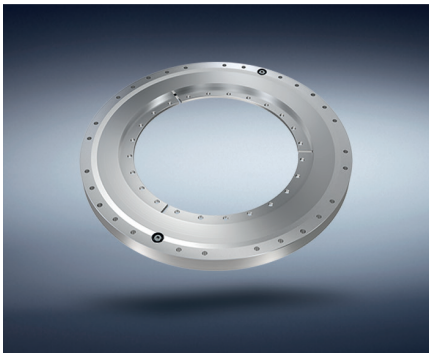
INDUSTRIAL DAMPING TECHNOLOGY AND SOFT CLOSE PRODUCTS EXEMPLIFY THE INNOVATION AND PIONEERING SPIRIT OF THE KNOW-HOW FACTORY.

Industrial damping technology. Whether standard or customized solutions, our products stand for the highest cycle rates and maximum energy absorption with minimal space requirements.

Soft Close. Development and mass production of pneumatic and fluid dampers with extraordinary quality and rapid delivery.

OEM and direct. Whether they need components, returning mechanisms or complete production lines – we are the trusted partner of many prestigious customers.





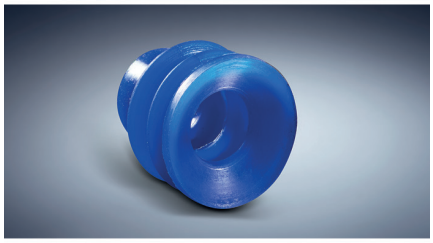
LINEAR TECHNOLOGY

WE DEVELOP LINEAR COMPONENTS AND SYSTEMS THAT ARE INDIVIDUALLY ADAPTED TO OUR CUSTOMERS' NEEDS.

Clamping and braking elements. We offer you more than 4,000 types for profiled and round rails as well as for a variety of guide systems from all manufacturers. It makes no difference whether you prefer manual, pneumatic, electric or hydraulic drive.

Flexibility. Our clamping and braking elements ensure that movable components such as Z-axes or machining tables maintain a fixed position and that machines and systems come to a stop as quickly as possible in an emergency.







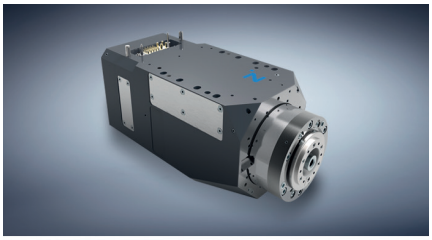
PROCESS TECHNOLOGY

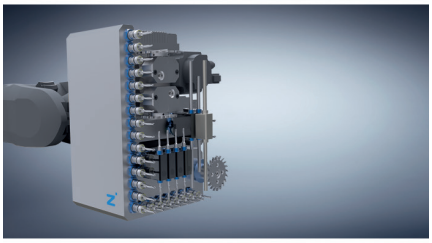
MAXIMUM EFFICIENCY IS ESSENTIAL FOR SYSTEMS AND COMPONENTS USED IN PROCESS TECHNOLOGY. HIGH-LEVEL CUSTOM SOLUTIONS ARE OUR TRADEMARK.

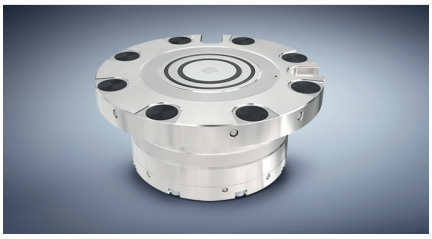
A rich reservoir of experience. Our know-how ranges from the development of materials, processes and tools through product design to production of series products.

Deep production capabilities. The Zimmer Group pairs these capabilities with flexibility, quality and precision, even when making custom products.

Series production. We manufacture demanding products out of metal (MIM), elastomers and plastics with flexibility and speed.







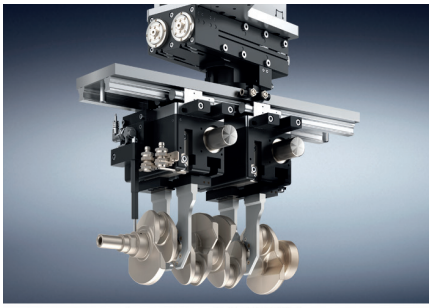
MACHINE TECHNOLOGY

ZIMMER GROUP DEVELOPS INNOVATIVE METAL, WOOD AND COMPOSITE MATERIAL PROCESSING TOOL SYSTEMS FOR ALL INDUSTRIES. NUMEROUS CUSTOMERS CHOOSE US AS THEIR SYSTEMS AND INNOVATION PARTNER.

Knowledge and experience. Industry knowledge and a decades-long development partnership in exchangeable assemblies, tool interfaces and systems make us bound for new challenges around the world.

Components. We deliver numerous standard components from stock and develop innovative, customized systems for OEM and end customers – far beyond the metal and wood processing industries.

Variety. Whether you have machining centers, lathes or flexible production cells, the power tools, holders, assemblies and drilling heads of Zimmer Group are ready for action.





SYSTEM TECHNOLOGY

ZIMMER GROUP IS ONE OF THE LEADING SPECIALISTS IN THE DEVELOPMENT OF CUSTOMIZED SYSTEM SOLUTIONS WORLDWIDE.

Customized. A team made up of more than 20 experienced designers and project engineers develop and produce customized solutions for special tasks in close collaboration with end customers and system integrators. It doesn't matter if it is a simple gripper and handling solution or a complex system solution.

Solutions. These system solutions are used in many industries, from mechanical engineering to the automotive and supplier industries to plastics engineering and consumer goods industries, all the way to foundries. The Know-how Factory helps countless companies to thrive competitively by increasing automation efficiency.




ZIMMER

COMPLETE PROGRAM
IN OVERVIEW

INDUSTRIAL DAMPING TECHNOLOGY



INTRODUCTION

INTRODUCTION

Page 10



PRODUCT FINDER

A HIGH-PERFORMANCE TOOL

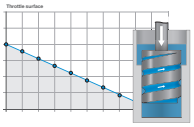
Page 11



OVERVIEW

PRODUCT PORTFOLIO

Page 12 - 13



INDUSTRIAL SHOCK ABSORBER POWERSTOP

TECHNICAL INFORMATION

Page 15 - 28



INDUSTRIAL SHOCK ABSORBER POWERSTOP

COMPONENTS

Page 29 - 93



INDUSTRIAL SHOCK ABSORBER POWERSTOP

CUSTOM SOLUTIONS AND SYSTEMS

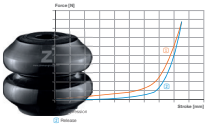
Page 94 - 96



INDUSTRIAL SHOCK ABSORBER POWERSTOP

PRESS

Page 97



PROFILE DAMPERS BASICSTOP

TECHNICAL INFORMATION

Page 99 - 106



PROFILE DAMPERS BASICSTOP

COMPONENTS

Page 107 - 113

$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1^2 = \frac{1}{2} \cdot m \cdot v_1^2$$

$$W_2 = m \cdot g \cdot s - \frac{M}{R} \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

GENERAL

CALCULATION

Page 117 - 123

PLEASE MARK:

GENERAL

CHECKLIST

Page 124 - 125

GENERAL

TIPS AND TRICKS

Page 126 - 129

INTRODUCTION
INTRODUCTION

Use and advantages of shock absorbers

Machines carry out increasingly complex tasks today. The systems are also pushed to their limits in order to increase productivity and profitability. For the machinery this means that, in addition to the number of moving parts, their velocities and thus their kinetic energy also increase. However, in order to avoid collisions, high impact forces and strong vibrations, which could lead to damage and consequently to the reduction of the service life, the surplus energy must be removed from the system. The solution lies in the use of energy dissipation, in the context of which kinetic energy is transformed into thermal energy (heat) through friction, which is better known under the term damping.

In order to reduce wear and increase the effectiveness of a machine during a process, friction is reduced to a minimum with the help of tribological (friction technology) knowledge. Energy and raw material resources can in this way be saved in the course of cost reduction and environmental protection. However, this has the consequence that special components, such as the products of the Zimmer Group from the Industrial Damping Technology division, are required to remove kinetic energy in a targeted fashion at those points and in those situations at which damage could be caused. In the case of shock absorption, this serves to brake and stop moving masses prior to end stops.

This is how the shock absorbers from Zimmer Group provide the following advantages for your machines and systems:

- Increased machine service life thanks to a reduction of damaging force peaks and vibrations, which reduces downtimes and maintenance costs
- Increased operational speeds of the machine
- Increased safety for collisions and stops caused by emergencies
- Increased productivity and efficiency of the machinery
- Reduction of noise exposure by reducing noise emissions in production
- Highly focused damping with positioning to an end stop (PowerStop industrial shock absorber)

The integration of the shock absorbers results in safer operation due to a reduction of loads with a simultaneous increase in machinery utilization. Dynamics and velocities can be controlled with the help of the shock absorbers.

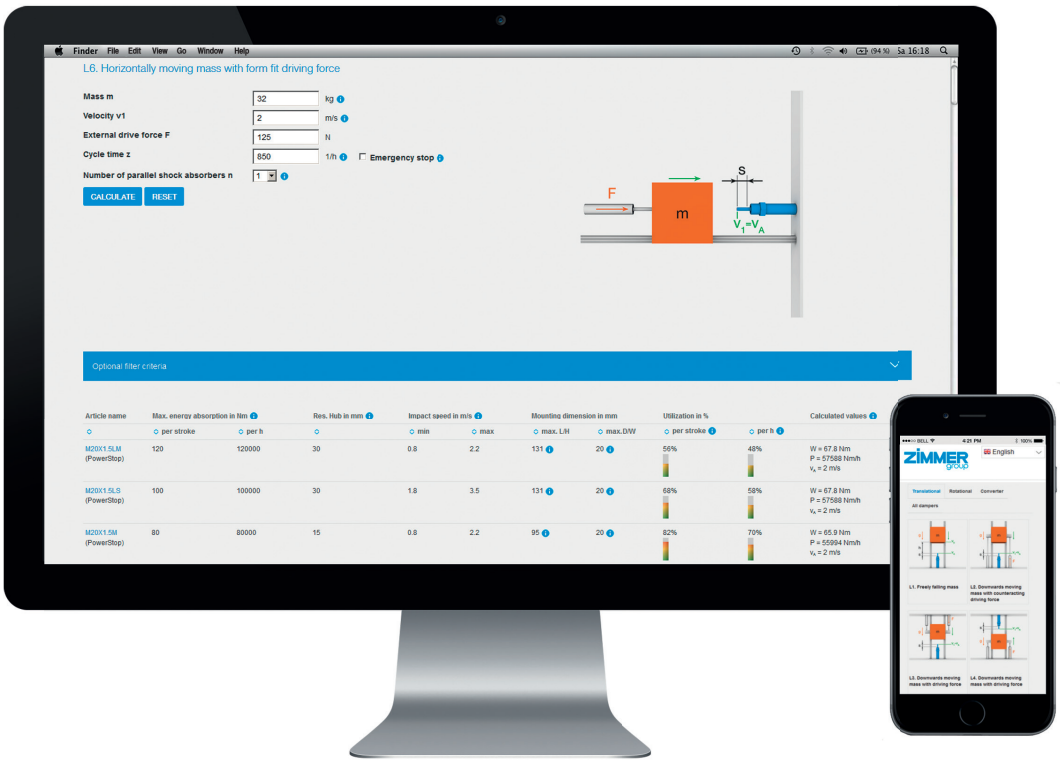


Operating modes of shock absorbers: Continuous operation and emergency stop operation

There are two different operating modes for shock absorbers. Continuous operation represents regular loading of the shock absorber with a certain number of cycles per unit of time. This results in the heating up of the shock absorber, which results in a certain operating temperature prevailing from the thermal balance between heat absorption due to damping and heat dissipation to the surroundings.

With emergency stop operation, the shock absorber is only used in exceptional situations or emergencies, e.g. a failure of the machine control system. In this case there is no number of cycles per time unit, but instead, in the best case scenario the load does not even occur, or comes at irregular or unpredictable intervals. Some shock absorbers are conceived such that they can absorb even more energy per stroke in emergency stop operation than they can in continuous operation.

PRODUCT FINDER
A HIGH-PERFORMANCE TOOL



Calculate and select shock absorbers more quickly

Users receive a high-performance tool that allows them to make well-founded selection decisions quickly and combines calculation, selection guide and configurator functions in one tool.

Convenient calculation delivers fast results

A choice between a large number of different load cases appropriate to the case can be selected very easily.
The procedure is very simple: All one has to do is select the right load case and then specify the required values to obtain a reliable result.

Clearly arranged selection guide

The available dampers that meet these specifications are shown to the user in an overview table.
The energy absorption for each damper is individually calculated in the table and its load is displayed.

Advanced search using a filter

Using filters, additional marginal conditions can be entered. These include especially high or low temperatures, use in the pressure chamber, contaminated environments or large angles for the impact of the load.
The software returns suitable versions and necessary accessories or equipment options based on the selected filter.

Appealing solution, available as a mobile application

Since the calculation program is available online, customers do not have to install any software and can access it using any computer or laptop, as well as with any smartphone or tablet.

OVERVIEW
PRODUCT PORTFOLIO

► INDUSTRIAL SHOCK ABSORBER

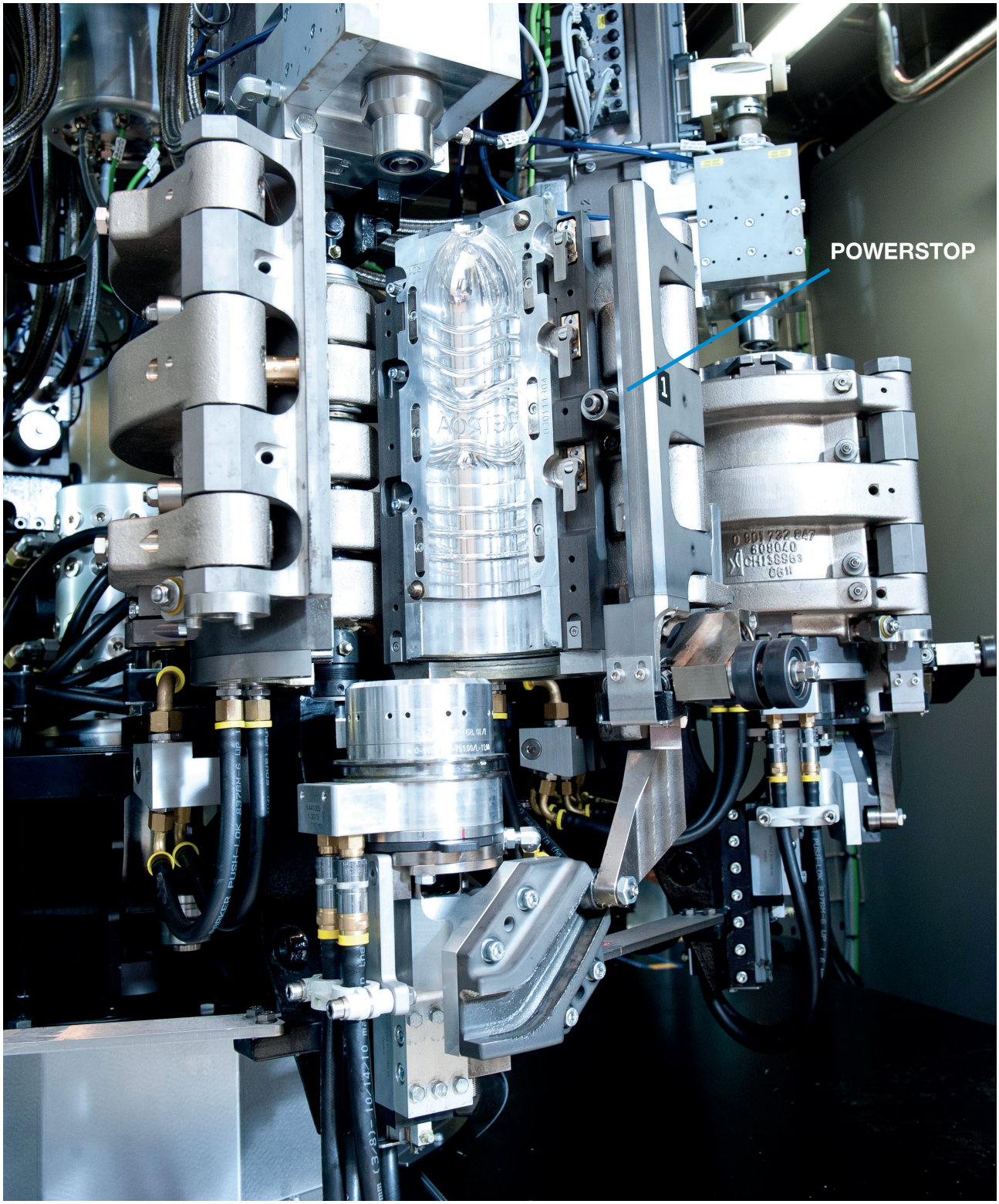


Brand:	PowerStop
Damping type:	Hydraulic
Know-how:	Spiral groove technology Oil reserve Bio-oil
Series:	Mini Energy – The slender Standard Energy – The economical High Energy – The powerful Adjustable Energy – The Adjustable
Thread diameter:	M4 – M36
Degree of hardness (speed range):	Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s) Medium (0.8 - 2.2 m/s) Soft (1.8 - 3.5 m/s) Supersoft (3 - 5 m/s)

► PROFILE DAMPER



Brand:	BasicStop
Damping type:	Viscoelastic
Know-how:	Material TPC Conditioning process Structure design
Series:	Axial Standard – Axial design Axial Advanced – Axial design for heavy load Radial Standard – Radial design
Degree of hardness (Shore hardness):	Hard H (Shore 55D) Medium M (Shore 40D)



▶ Gentle closing of the stretch-blow molds by PowerStop HighEnergy dampers in Krones systems for the manufacture of PET bottles

INDUSTRIAL SHOCK ABSORBERS
POWERSTOP



INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THE SERIES AT A GLANCE

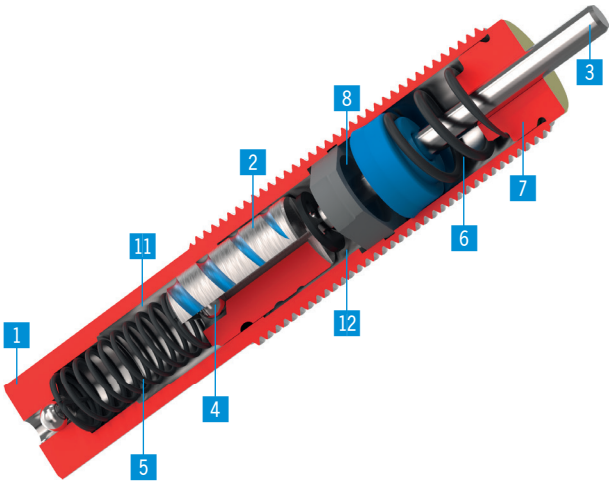
▶ MINI ENERGY

The slender

The Mini Energy provides a high rate of energy absorption when it comes to precision damping in miniature areas. Also installed in the cylinder for even greater space savings.

PRODUCT ADVANTAGES

- ▶ Highest performance in a minimal space
- ▶ Integrated oil volume reservoir
- ▶ Increased guide length



	▶ Technical data
Thread	M4 - M6
Pressure max. (abs.) [bar]	10
Stroke variant	Standrad stroke
Protection	no protection, wiper (NBR)
Volume compensation	Spring

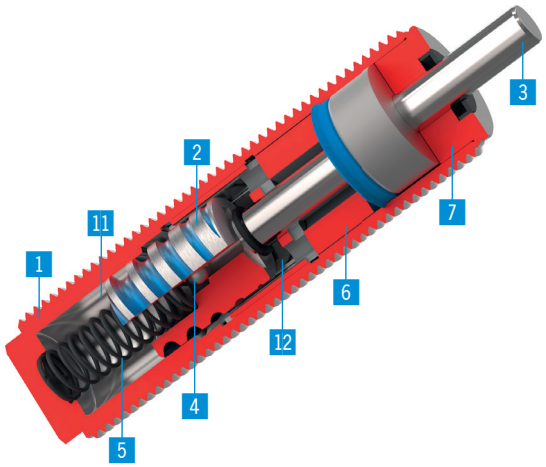
▶ STANDARD ENERGY

The economical

The number one among standard dampers. Efficient damping at common energy absorption levels. This makes the Standard Energy series the winner in price/performance value.

PRODUCT ADVANTAGES

- ▶ Price/performance winner
- ▶ Low-vibration damping thanks to spiral groove
- ▶ Low counterforce



	▶ Technical data
Series	**Standard Energy**
Thread	M8 - M36
Pressure max. (abs.) [bar]	1
Stroke variant	Standrad stroke
Protection	no protection, wiper (NBR), felt ring, bellow (TPE)
Volume compensation	Cellular rubber

1 **Housing (stainless steel)**

2 **Damping piston with spiral groove**

3 **Piston rod (stainless steel)**

4 **Return valve**

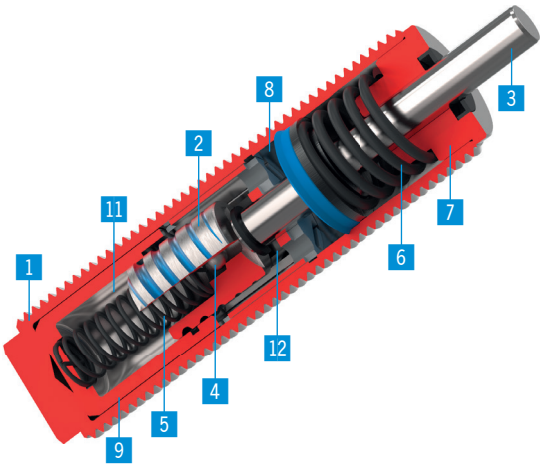
5 **Return spring**

6 **Volume compensation / Seal**

▶ HIGH ENERGY

The powerful

The high-end damper for the highest demands. Thanks to the spiral groove in combination with the pressure sleeve and the oil reserve, the High Energy series achieves a number of cycles that exceeds everything else on the market, with extreme energy absorption levels. All this with minimal space requirements.



PRODUCT ADVANTAGES

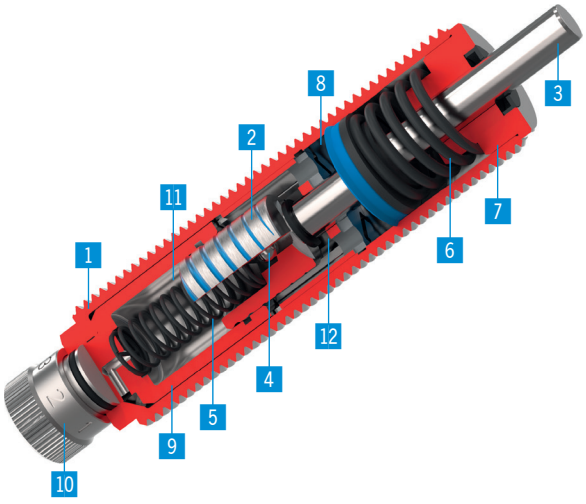
- For the highest demands and maximum energy absorption
- Integrated oil reserve
- Hardened and precision-ground guide
- Cycle counts that outperform everything else on the market

	▶ Technical data
Series	**High Energy**
Thread	M8 - M36
Pressure max. (abs.) [bar]	10
Stroke variant	Standrad stroke / Long stroke
Protection	no protection, wiper (NBR), felt ring, bellow (TPE)
Volume compensation	Spring

▶ ADJUSTABLE ENERGY

The adjustable

Can the High End series be surpassed? Yes, with the new adjustable series, the high energy absorption levels can be precisely adjusted to the entire stroke. Thus, the force is reduced and the damping is even softer.



PRODUCT ADVANTAGES

- Optimally adjustable damping across the entire stroke
- Reduced supporting force – decreased load on the design
- For the highest demands and maximum energy absorption
- Hardened and precision-ground guide

	▶ Technical data
Series	**Adjustable Energy**
Thread	M8 - M36
Pressure max. (abs.) [bar]	10
Stroke variant	Standrad stroke / Long stroke
Protection	no protection, wiper (NBR), felt ring, bellow (TPE)
Volume compensation	Spring

7 Fix stop

8 Oil reserve storage

9 Pressure sleeve

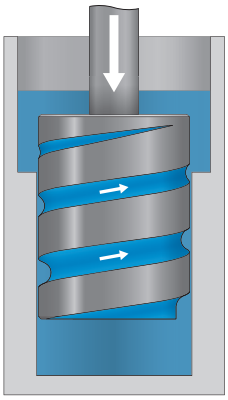
10 Adjusting screw

11 High-pressure chamber

12 Low-pressure chamber

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
KNOW-HOW

The unique spiral groove technology is a defining feature of PowerStop brand industrial shock absorbers.
In contrast with conventional industrial shock absorbers with throttle bores, the constantly tapering spiral groove causes precise, low-vibration shock absorption. This means that PowerStop achieves maximum energy absorption with the smallest space.



Our expertise – your advantages:

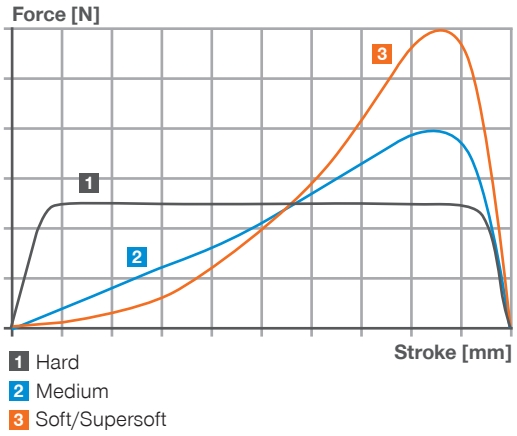
- Highest quality for the most extreme requirements and loads
- High energy absorption thanks to maximum utilization in each piston position
- Low-vibration and precise braking due to the constantly narrowing spiral groove
- Less wear thanks to the hydrostatic piston guide
- High level of operational safety and reliability
- Corrosion protection from using stainless steel
- Individual configuration for customized solutions

Function

- An industrial shock absorber absorbs the energy of a moving mass and transforms the kinetic energy 100% into heat through the friction of the internal oil flow (**hydraulic damping**).

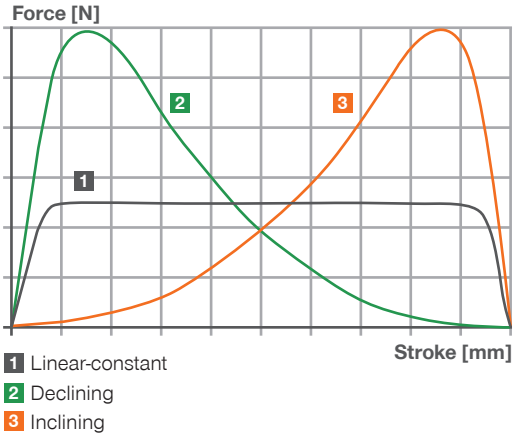
Degree of hardness and adjustability – optimal damping adapted to velocity and utilization

- The degree of hardness of a hydraulic shock absorber represents the range of impact velocity for which the shock absorber is optimally designed for. The shock absorber reaches its maximum energy absorption per stroke within this velocity range.
- The throttle cross-section, and thus the flow of the oil from the high-pressure chamber to the low-pressure chamber, are primarily determined by the depth of the spiral groove and also by the annular surface between the piston and the running surface. This throttle behavior determines the force curve as a function of the velocity.
- Below the minimum speed, the shock absorber functions at a reduced energy absorption capacity due to the reduced throttle effect. There is a risk of bouncing when the impact velocity is exceeded. This means that the mass lifts slightly or recoils upon impact, because the oil at the throttle point cannot flow away quickly enough.
- The configurable Adjustable Energy series additionally features an integrated bypass, which has a throttle cross-section that softens the damper. Based on the degree of hardness H in the closed position at level 0, the bypass is opened to level 5 for a maximum velocity of up to 5 m/s.



Characteristics of the shock absorber curve

- As a default, the individual degrees of hardness tend to demonstrate the following characteristics in the force over stroke shock absorber curve.
- Due to the throttling, the characteristic depends upon the impact velocity and can thus only be indicated as a trend.



Individual damping characteristics

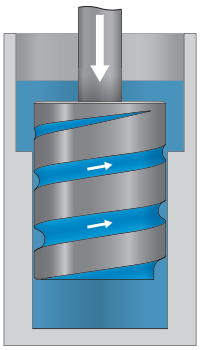
- The spiral groove makes it possible for the shock absorber to demonstrate unique, customized characteristics. This means that the force curve can be configured progressively for a gentle increase in force, linear-constantly for a constant force curve with the lowest possible maximum force or on a diminishing scale for a weak end position force. By adjusting the spiral groove curve, the shock absorber can be optimally configured for your application when necessary.

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
KNOW-HOW

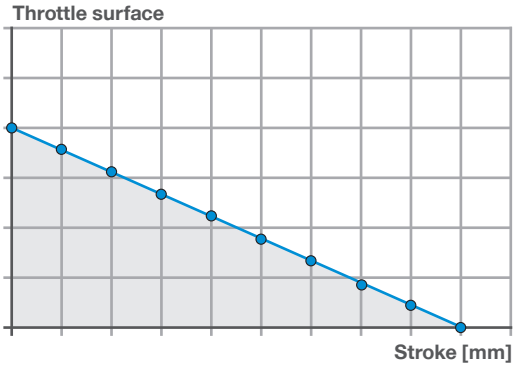
POWERSTOP INDUSTRIAL SHOCK ABSORBERS

THROTTLE MECHANISM

Spiral groove technology as a damping principle.
In the case of the PowerStop industrial shock absorbers, the throttle effect necessary for damping is provided optimally and free of vibration by the circumferential, tapering spiral groove in the piston.

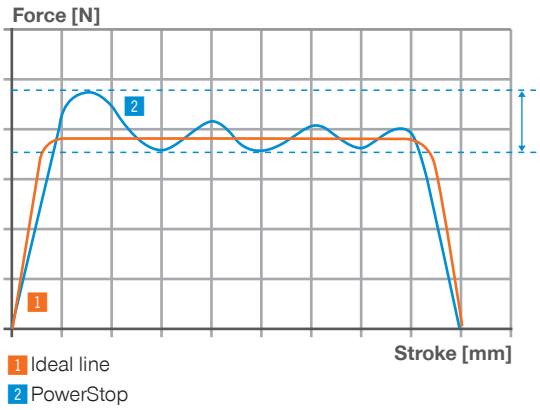


Throttle characteristic



- The spiral groove tapers toward the top in the depth. With a retracting piston, the throttle cross-section affecting the trailing edge lessens.
- A constant decrease of the throttle surface results from the continuous progression of the spiral groove depth. This means that the shock absorber adapts ideally to the velocity reducing through the stroke and is optimally utilized for maximum energy absorption capacity in every piston position. In addition, the stress on the oil is reduced to a minimum.

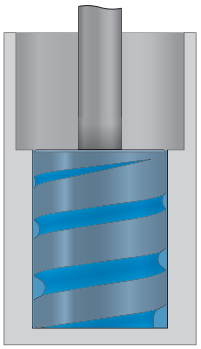
Shock absorber curve



- The constant throttle characteristic results in a low-vibration, almost ideal force-stroke curve. The prevention of vibrations upon impact not only preserves the relevant components and systems, but also ensures jerk-free braking of the moving masses.

Hydrostatic piston guide

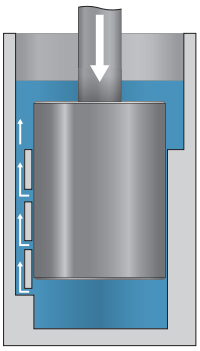
- In addition to jerk-free damping, the spiral groove technology also provides reduced wear hydrostatic piston movement. Thanks to the spiral groove, oil is located between the piston and the running surface during the entire stroke. The relatively moving parts are separated by an anti-friction film, which minimizes wear. This guarantees a high degree of reliability.

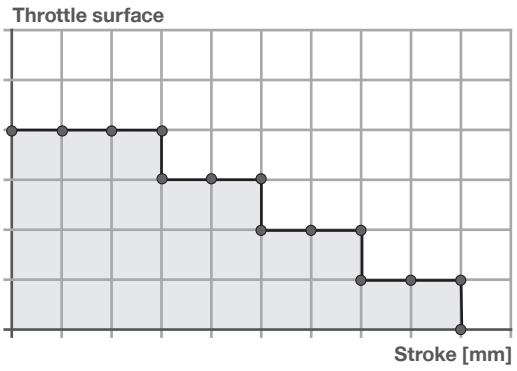


CONVENTIONAL INDUSTRIAL SHOCK ABSORBERS

THROTTLE MECHANISM

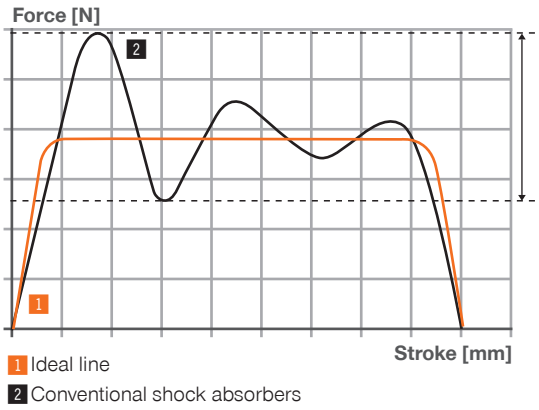
In the case of conventionally designed industrial shock absorbers, the throttle effect necessary for damping is provided in steps and burdened with vibrations by the throttle bores positioned in a sleeve.





Throttle characteristic

- The retracting piston gradually wears away the throttle bores laid out in the stroke direction, which reduces the throttle cross-section step by step.
- This results in an unsteady reduction of the throttle surface. This results in the shock absorber adapting only in certain areas to the velocity being reduced through the stroke. The oil is also greatly stressed by the forced detour.



Shock absorber curve

- The force-stroke characteristic curve is characterized by the inconsistent throttle characteristics that cause vibrations in the force curve. This in turn leads to vibrations and thus to damage to the machines, which is precisely what should be prevented by a shock absorber.

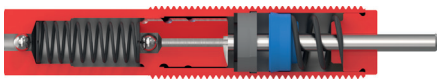
INDUSTRIAL SHOCK ABSORBERS POWERSTOP
FUNCTIONAL SEQUENCE

► 1. HOME POSITION

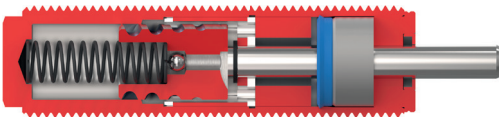
The ball check valve is opened and the oil volume reservoir is under light pre-load
When the Adjustable Energy series is used, the adjustment screw can be turned in order to open or close the bypass.

This can be done to adapt the energy absorption capacity or to adapt the impact velocity.

MINI ENERGY



STANDARD ENERGY

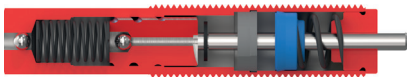


► 2. RETRACTION WITH DAMPING UP TO THE FIXED STOP

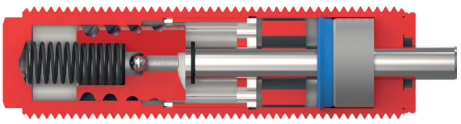
An external force or kinetic energy (impact) pushes the piston rod in together with the piston

- Pressure build-up in the high-pressure chamber
- The ball check valve closes
- The oil flows from the high-pressure chamber into the low-pressure chamber and the oil reserve storage via the spiral groove
- Due to the throttle effect of the spiral groove, a counter-force is generated via the stroke to the retracting piston to counteract the movement. When the Adjustable Energy series is used, this force can be reduced by opening the bypass
- Due to the friction of the throttled oil flow, the kinetic energy is converted into heat (hydraulic damping), whereby 100% of the kinetic energy is damped

MINI ENERGY



STANDARD ENERGY

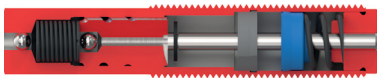


► 3. RETURNING

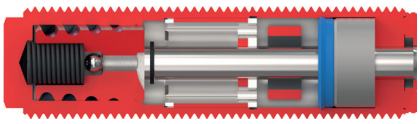
Removal of external force from the piston rod

- The return spring pushes the piston with the piston rod back into home position
- For a quick return, the ball check valve opens for a quick oil return flow
- The oil flows from the low-pressure chamber back into the high-pressure chamber through the ball check valve and the spiral groove

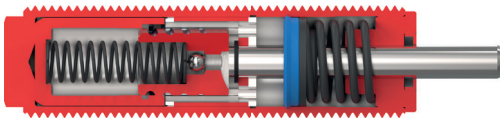
MINI ENERGY



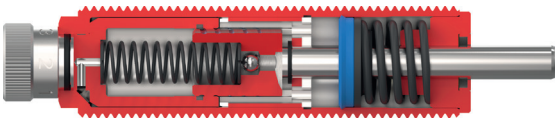
STANDARD ENERGY



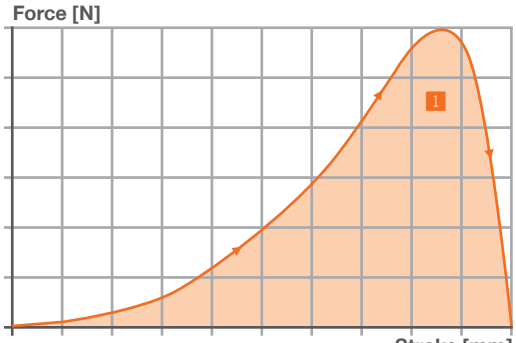
HIGH ENERGY



ADJUSTABLE ENERGY

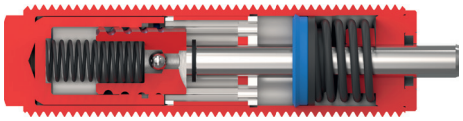


- The volume of the retracting piston rod is compensated by increasing the pre-load of the volume compensation
- When using the damping stroke, the piston rod is completely sunk into the damper and the moving mass rests on (and makes full-surface contact with) the top side of the damper, either directly or by means of the head. Here, the max. force in the end position must be observed

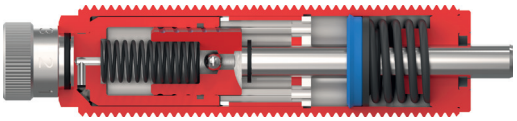


1 Energy absorption = Damping energy

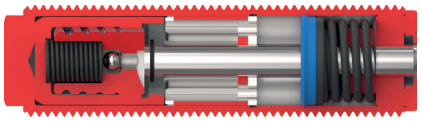
HIGH ENERGY



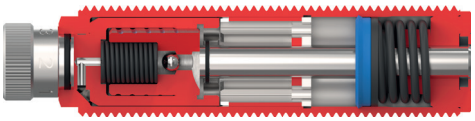
ADJUSTABLE ENERGY



HIGH ENERGY



ADJUSTABLE ENERGY



INDUSTRIAL SHOCK ABSORBERS POWERSTOP
MAXIMUM FLEXIBILITY

A modular system that leaves nothing to be desired

The new assembly set makes it possible to combine highly versatile application-specific variants from four series, each with a stroke variant, speed range, protection and head. Everything comes from standard elements, delivering the shortest time to availability and ideal pricing. The new Mini Energy, Standard Energy, High Energy and Adjustable Energy series offer a number of refinements, significant improvements and enhancements.

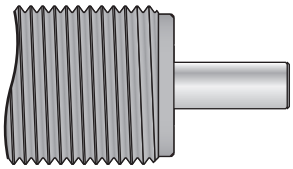
STROKE VARIANT

Softer energy absorption

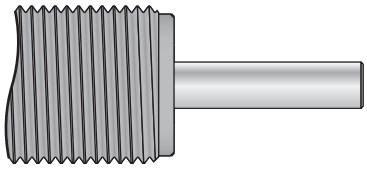
Thanks to the stepless taper, the invention of the spiral groove enabled the highest energy absorption levels in the smallest installation space and thus the smallest (N) strokes. However, not every machine is equipped for these kinds of loads, and not every design can handle such decelerations.

With the long stroke versions (L) the same respective energy absorption levels can be decelerated over a longer damping stroke, whereby the counterforce is reduced significantly for the softest possible damping.

N Normal stroke



L Long stroke



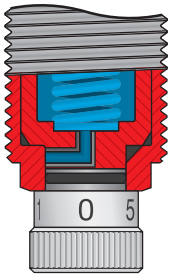
DEGREE OF HARDNESS

Degree of hardness and adjustability – optimal damping adapted to velocity

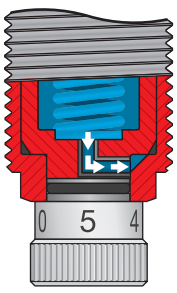
The flow of the organic oil from the high-pressure chamber to the low-pressure chamber is determined by the depth of the spiral groove, and the desired throttling is achieved. At low velocities, the flow through a flat spiral groove is low in order to achieve high throttling and high energy absorption. At high velocities, a deeper spiral groove ensures a sufficient flow to reduce the impact force and to prevent bouncing.

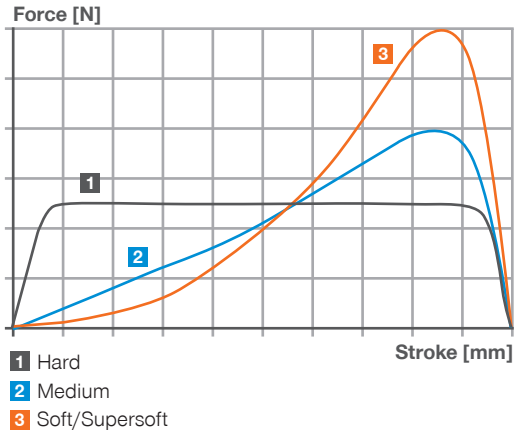
The Adjustable Energy series features an additional bypass that allows the flow to be adjusted with infinite variability. As a result, the damping can be optimally adapted to the speed.

1 Closed position
0% Flow / Hard



3 Opened position
100% Flow / Supersoft





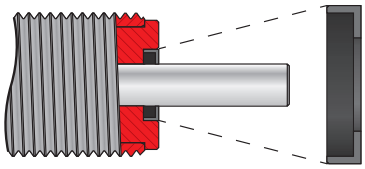
1 Hard
2 Medium
3 Soft/Supersoft

PROTECTION

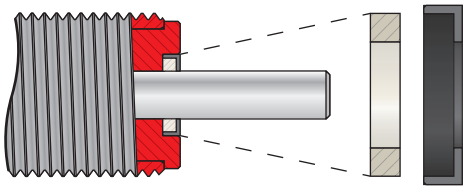
Ideal protection in any environment

Thanks to the broad-ranging modular system, the PowerStop offers the right protection for any condition. In a clean environment, such as that of an assembly process, the damper does its job cost-effectively without any special protection (D). With the optional wiper (A) made of NBR, it is resistant to any kind of liquid or oil. The best way to keep dust and chips outside the damper, even when working with wood, is with a felt ring (F). Last but not least, the bellow (B) made of TPE provides the ultimate protection against adverse conditions such as grinding dust or use within a liquid. At the same time, it does not allow any particles to escape from the damper and can thus be used in cleanrooms and the food industry.

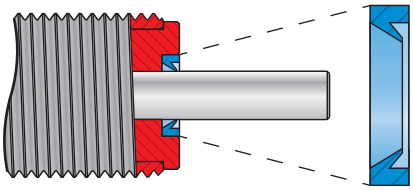
D **Without protection**
in a clean environment



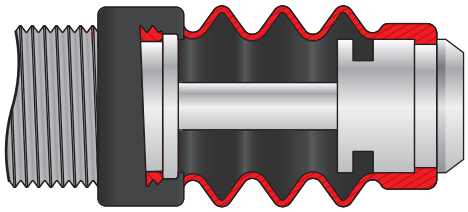
F **Felt ring**
against dust and chips



A **Wiper (NBR)**
against liquid and oil



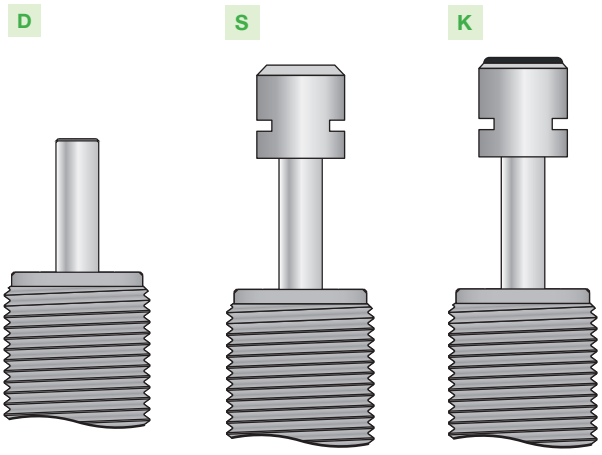
B **Bellow (TPC)**
sealed



HEADS

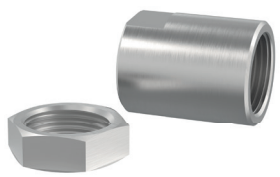
Material-friendly and low-noise force absorption

For even greater durability at inclined angles of impact, all heads are rounded in order to absorb the load with reduced transverse force. A longer fastener for the heads ensures a firm support. In addition to adhesion, these are crimped via lateral recesses to ensure a reliable fit.
Whether with head or without (D), the new PowerStop features an integrated fixed stop that can absorb residual energy or static force in the end position. Thanks to the enlarged steel head area (S) , the surface pressure upon impact is reduced, which is ideal for soft opposing materials. Using a plastic head (K) is recommended for reducing the amount of noise that is generated.



POWERSTOP INDUSTRIAL SHOCK ABSORBER
ACCESSORIES

STOP SLEEVE | PAH



Available for M04-M36

It is advisable to use a stop sleeve for optimal damping stroke adjustment. In this process, the end stop and the damping stroke can be adjusted individually by screwing the sleeve on the shock absorber external thread using the additional locknut.
It is advisable to start by setting the ideal utilization of the damper by reducing the damping stroke. The end stop can subsequently be set using the position of the damper in the mounting piece.
The stop sleeve works either with or without a steel and plastic head, but not in conjunction with the bellow. The stop sleeve, including the additional locknut contained in the scope of delivery, is made of stainless steel.

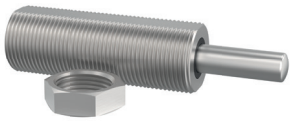
SENSOR STOP SLEEVE | PSH



Available for M08-M33 (with the exception of M16, M22 and M27)

In addition to the stop sleeve features, the sensor stop sleeve features inductive sensor with highly compact integration for sensing the end position of the set damping stroke.
Using the sensor stop sleeve requires the use of an industrial shock absorber with a steel or plastic head (excluding the bellow).
Inductive sensor, PNP NO contact (Normally Open), 2 m PUR cable, IP65 degree of protection.
See separate data sheet for additional information.

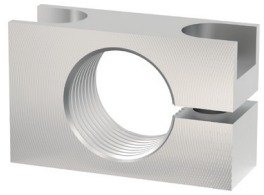
SIDE LOAD ADAPTER | PBV



Available for M08-M36 for normal and long stroke

If the industrial shock absorber is actuated with a higher angle of impact than the permissible misalignment of 2°, then a side load adapter must be provided. This increases the permissible angle of impact to 30°, which is especially advantageous for rotative applications.
The side load adapter can only be used in combination with an industrial shock absorber without a head. Here, the damper can alternatively be screwed on using the external thread of the side load adapter.
Consisting of a piston rod and housing made of stainless steel, the side load adapter is available in two protection configurations.
Protection: Wiper
Against liquids and oil
Protection: Felt ring
Against dust and chips

CLAMPING FLANGE SCREWED ON ORTHOGONALLY | PKS



Available for M8-M36

You can use a clamping flange made of nickel-plated steel to connect the shock absorber to the structure more easily. After being fully screwed in, the shock absorber is clamped tightly to the clamping flange by screwing at a right angle to the shock absorber and fastened to the structure, which makes the locknut unnecessary.

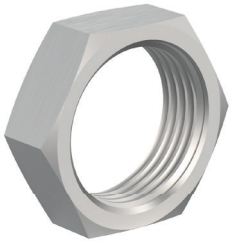
CLAMPING FLANGE SCREWED PARALLEL | PKP



Available for M8-M36

You can use a clamping flange made of nickel-plated steel to connect the shock absorber to the structure more easily. After being fully screwed in, the shock absorber is clamped tightly to the clamping flange by screwing in the screwing direction of the shock absorber and fastened to the structure, which makes the locknut unnecessary.

LOCKNUT | PVM



Available for M04-M36

A nut made of stainless steel is supplied for each industrial shock absorber. When installing in a drilled hole with no threading, an additional nut for attachment on both sides can be ordered at the same time.

PRESSURE CHAMBER SEAL | PDD

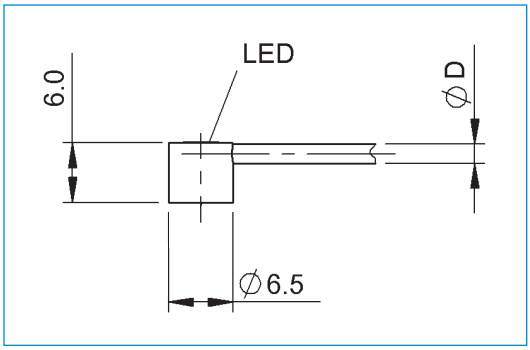


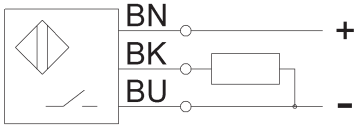
Available for M04-M36

If the industrial shock absorber is being used within a pressure chamber, for instance in a pneumatic cylinder or a swivel unit, then a pressure chamber seal is required for sealing the outer contour of the shock absorber. For ideal sealing, the seal must make full-surface contact on both sides. The seal itself is made of NBR, which is applied to corrosion-protected chromated steel for stabilization purposes.

INDUCTIVE PROXIMITY SWITCH
SENSOR STOP SLEEVE | PSH

Accesories	
General data	
Certification	CE
Basic standard	IEC 60947-5-2
Protection to IEC 60529	IP65
Function display	Yes
Protected against polarity reversal	Yes
Power indicator	No
Short-circuit-proof	Yes
Electrical data	
Connection type	Cable
Effective operating voltage [V DC]	24
Rated insulation voltage [V DC]	75
Load current capacity [mA]	150
Rated short circuit current [A]	100
Supply voltage min. [V DC]	10
Supply voltage max. [V DC]	30
Electrical version	DC, direct current
Minimum operating current [mA]	1
Load capacitance max. [µF]	0.200
No-load current damped max. [mA]	9
Max. no-load current undamped [mA]	3
Ripple max. [%]	10
Switching output	PNP
Switching frequency [Hz]	3000
Switching function	Normally open (NO)
Voltage drop [V]	2.5
Mechanical data	
Nr. of wires x diameter [mm²]	3x0.073
Rated operating distance Sn [mm]	1.50
Installation type	flush
Housing Material	PBT
Assured switching distance Sa [mm]	1.20
Cable-Ø D [mm]	2.1
Cable length [m]	2
Effective operating distance Sr [mm]	1.50
Depth [mm]	6
Ambient temperature range [°C]	-25 ... +70
Active surface material	PBT
Cable sheath material	PUR





INDUSTRIAL SHOCK ABSORBERS POWERSTOP
OVERVIEW OF PRODUCTS

	Design	Series	Thread	Stroke variant	Stroke	Impact velocity		Energy absorption max.			Without protection	Felt ring	Wiper (NBR)	Bellow (TPE)	Page
								Continuous operation		Emergency stop operation					
					max.	min.	max.	per stroke	per hour	per stroke					
					[mm]	[m/s]		[J]	[J/h]	[J]					
 MINI ENERGY	P	ME	04X05	N	4	0,1	2,2	0,8	2.100	0,8	D		A		30
	P	ME	05X05	N	4	0,1	2,2	0,8	2.100	0,8	D		A		34
	P	ME	06X05	N	5	0,1	1,2	1,8	5.000	1,8	D		A		38
 STANDARD ENERGY	P	SE	08X10	N	6	0,1	5	1,5	10.000	1,5	D	F	A	B	42
	P	SE	10X10	N	8	0,1	5	3	22.000	3	D	F	A	B	46
	P	SE	12X10	N	10	0,1	5	9	33.000	9	D	F	A	B	50
	P	SE	14X10	N	12	0,1	5	20	50.000	20	D	F	A	B	54
	P	SE	14X15	N	12	0,1	5	20	50.000	20	D	F	A	B	58
	P	SE	16X10	N	12	0,1	5	20	50.000	20	D	F	A	B	62
	P	SE	16X15	N	12	0,1	5	20	50.000	20	D	F	A	B	66
	P	SE	20X15	N	15	0,1	5	41	90.000	41	D	F	A	B	70
	P	SE	22X15	N	15	0,1	5	41	90.000	41	D	F	A	B	74
	P	SE	25X15	N	25	0,1	5	105	120.000	105	D	F	A	B	78
	P	SE	27X30	N	25	0,1	5	105	120.000	105	D	F	A	B	82
	P	SE	33X15	N	30	0,1	5	185	140.000	185	D	F	A	B	86
	P	SE	36X15	N	30	0,1	5	185	140.000	185	D	F	A	B	90
 HIGH ENERGY	P	HE	08X10	N	6	0,1	5	3,5-4	10.000	4-5	D	F	A	B	42
	P	HE	10X10	N	8	0,1	5	9-10	22.000	11-13	D	F	A	B	46
	P	HE	12X10	N	10	0,1	5	16-18	33.000	21-25	D	F	A	B	50
	P	HE	14X10	N/L	12/20	0,1	5	28-34	50.000	30-42	D	F	A	B/-	54
	P	HE	14X15	N/L	12/20	0,1	5	28-34	50.000	30-42	D	F	A	B/-	58
	P	HE	16X10	N/L	12/20	0,1	5	28-34	50.000	30-42	D	F	A	B/-	62
	P	HE	16X15	N/L	12/20	0,1	5	28-34	50.000	30-42	D	F	A	B/-	66
	P	HE	20X15	N/L	15/25	0,1	5	65-80	90.000	75-150	D	F	A	B/-	70
	P	HE	22X15	N/L	15/25	0,1	5	65-80	90.000	75-150	D	F	A	B/-	74
	P	HE	25X15	N/L	25/40	0,1	5	160-220	120.000	190-400	D	F	A	B/-	78
	P	HE	27X30	N/L	25/40	0,1	5	160-220	120.000	190-400	D	F	A	B/-	82
	P	HE	33X15	N/L	30/50	0,1	5	280-400	140.000	350-800	D	F	A	B/-	86
	P	HE	36X15	N/L	30/50	0,1	5	280-400	140.000	350-800	D	F	A	B/-	90
 ADJUSTABLE ENERGY	P	AE	08X10	N	6	0,1	5	4	10.000	4	D	F	A	B/-	42
	P	AE	10X10	N	8	0,1	5	10	22.000	13	D	F	A	B/-	46
	P	AE	12X10	N	10	0,1	5	18	33.000	18	D	F	A	B/-	50
	P	AE	14X10	N/L	12/20	0,1	5	34	50.000	34	D	F	A	B/-	54
	P	AE	14X15	N/L	12/20	0,1	5	34	50.000	34	D	F	A	B/-	58
	P	AE	16X10	N/L	12/20	0,1	5	34	50.000	34	D	F	A	B/-	62
	P	AE	16X15	N/L	12/20	0,1	5	34	50.000	34	D	F	A	B/-	66
	P	AE	20X15	N/L	15/25	0,1	5	80	90.000	80	D	F	A	B/-	70
	P	AE	22X15	N/L	15/25	0,1	5	80	90.000	80	D	F	A	B/-	74
	P	AE	25X15	N/L	25/40	0,1	5	220	120.000	220	D	F	A	B/-	78
	P	AE	27X30	N/L	25/40	0,1	5	220	120.000	220	D	F	A	B/-	82
	P	AE	33X15	N/L	30/50	0,1	5	400	140.000	400	D	F	A	B/-	86
	P	AE	36X15	N/L	30/50	0,1	5	400	140.000	400	D	F	A	B/-	90

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M04X0.5

▶ SERIES

PowerStop®

MINI ENERGY



The slender

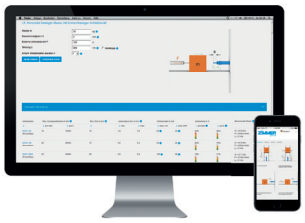
▶ **Mini Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	0.2 [kN]
▶ **Angle of Impact max.**	2 [°]	▶ **Material**	Stainless steel
▶ **Max. piston return time**	0.15 [s]	▶ **Material fixed stop**	Ecobrass
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **PWIS-free**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **RoHS compliant**	Yes
▶ **Locknut tightening torque max.**	1 [Nm]	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
MINI ENERGY	P	ME	04X05	N	4	H	0,1	1,2	0,8	2.100	0,8	D	1	2	D	-B
						M	0,8	2,2	0,8	2.100	0,8	A	1	2	S	

▶ HOW TO ORDER CORRECTLY

P | ME | 04X05 | N | M | D | S | -B



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

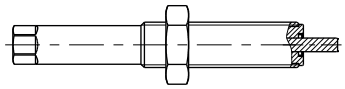
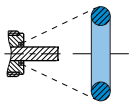
www.zimmer-group.de/en/pdti

Example order no.

PowerStop Mini Energy 04X05

- ▶ Stroke variant: standard (N)
- ▶ Hardness degree: medium (M)
- ▶ Protection: without (D)
- ▶ Head: steel head (S)

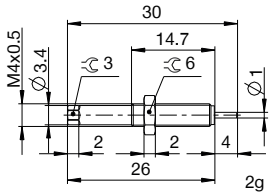
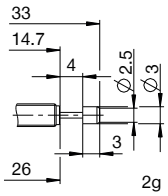
▶ PROTECTION

no protection	Wiper (NBR)
D -B	A -B
	
in a clean environment	against liquid, oil, ...

▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -B

MINI ENERGY

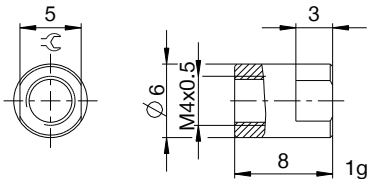
no head	with steel head
D -B	S -B
	

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M04X0.5

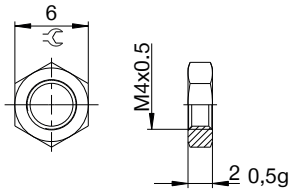
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH04X05-A**	Stop sleeve	Including 1x PVM04X05-A
2	**PVM04X05-A**	Stainless steel locknut	Included with the industrial shock absorber.
3	**PDD04X05-A**	Pressure chamber seal	Recommended fixation with PVM04X05-A. Seal must be in full contact on both sides.

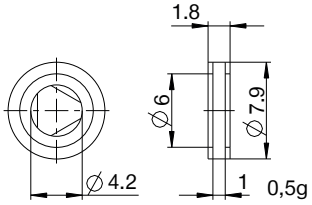
1



2



3



▶ CLASSIFICATION

P ME 04X05 N M D S -B

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

04 Thread nominal diameter

X

05 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M05X0.5

▶ SERIES

PowerStop®

MINI ENERGY



The slender

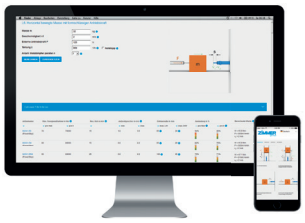
▶ **Mini Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	0.2 [kN]
▶ **Angle of Impact max.**	2 [°]	▶ **Material**	Stainless steel
▶ **Max. piston return time**	0.15 [s]	▶ **Material fixed stop**	Ecobrass
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **PWIS-free**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **RoHS compliant**	Yes
▶ **Locknut tightening torque max.**	1 [Nm]	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
MINI ENERGY	P	ME	05X05	N	4	H	0,1	1,2	0,8	2.100	0,8	D	1	2	D	-B
						M	0,8	2,2	0,8	2.100	0,8	A	1	2	S	

▶ HOW TO ORDER CORRECTLY

P | ME | 05X05 | N | H | A | D | -B



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

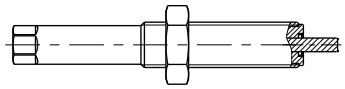
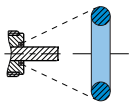
www.zimmer-group.de/en/pdti

Example order no.

PowerStop Mini Energy 05X05

- ▶ Stroke variant: standard (N)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: wiper (A)
- ▶ Head: without (D)

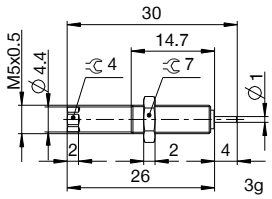
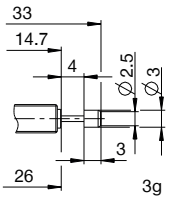
▶ PROTECTION

no protection	Wiper (NBR)
D -B	A -B
	
in a clean environment	against liquid, oil, ...

▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -B

MINI ENERGY

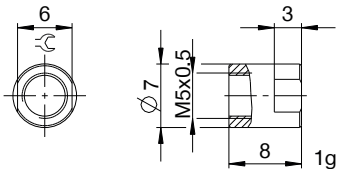
no head	with steel head
D -B	S -B
	

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M05X0.5

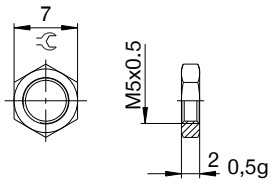
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH05X05-A**	Stop sleeve	Including 1x PVM05X05-A
2	**PVM05X05-A**	Stainless steel locknut	Included with the industrial shock absorber.
3	**PDD05X05-A**	Pressure chamber seal	Recommended fixation with PVM05X05-A. Seal must be in full contact on both sides.

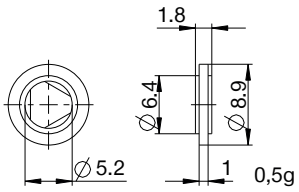
1



2



3



▶ CLASSIFICATION

P ME 05X05 N H A D -B

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

05 Thread nominal diameter

X

05 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M06X0.5

▶ SERIES

PowerStop®

MINI ENERGY



The slender

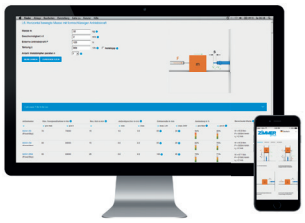
▶ **Mini Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	0.5 [kN]
▶ **Angle of Impact max.**	2 [°]	▶ **Material**	Stainless steel
▶ **Max. piston return time**	0.15 [s]	▶ **Material fixed stop**	Ecobrass
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **PWIS-free**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **RoHS compliant**	Yes
▶ **Locknut tightening torque max.**	2 [Nm]	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation per stroke	Energy absorption max. Continuous operation per hour	Energy absorption max. Emergency stop operation per stroke	Protection	Return force		Head	Version
							min.	max.					min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
MINI ENERGY	P	ME	06X05	N	5	H	0,1	1,2	1,8	5.000	1,8	D	1,5	2,5	D	-A
						M	0,8	2,2	1,8	5.000	1,8		1,5	2,5		
						S	1,8	3,5	1,8	5.000	1,8	A	1,5	2,5	S	

▶ HOW TO ORDER CORRECTLY

P | ME | 06X05 | N | S | D | S | -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

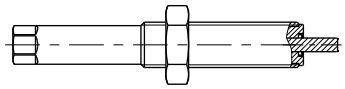
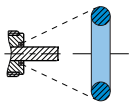
www.zimmer-group.de/en/pdti

Example order no.

PowerStop Mini Energy 06X05

- ▶ Stroke variant: standard (N)
- ▶ Hardness degree: soft (S)
- ▶ Protection: without (D)
- ▶ Head: steel head (S)

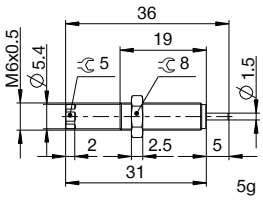
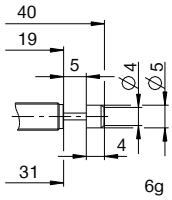
▶ PROTECTION

no protection	Wiper (NBR)
D -A	A -A
	
in a clean environment	against liquid, oil, ...

▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

MINI ENERGY

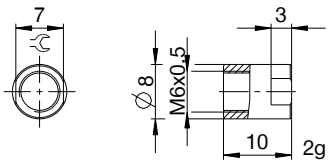
no head	with steel head
D -A	S -A
	
5g	6g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M06X0.5

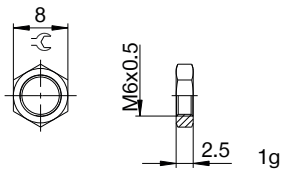
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH06X05-A**	Stop sleeve	Including 1x PVM06X05-A
2	**PVM06X05-A**	Stainless steel locknut	Included with the industrial shock absorber.
3	**PDD06X05-A**	Pressure chamber seal	Recommended fixation with PVM06X05-A. Seal must be in full contact on both sides.

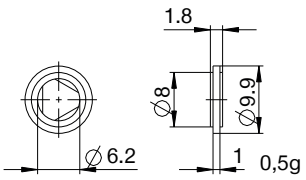
1



2



3



▶ CLASSIFICATION

P ME 06X05 N S D S -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

06 Thread nominal diameter

X

05 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M08X1.0

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

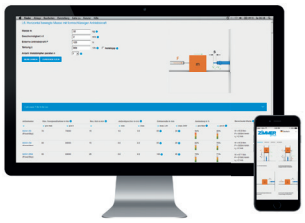
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** 0.15 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 3 [Nm]
- **Force in end position max.** 1 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max.			Protection	Return force		Head	Version
									Continuous operation		Emergency stop operation					
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	08X10	N	6	H	0,1	1,2	1,5	10.000	1,5	D	1,5	3	D	-A
						M	0,8	2,2	1,5	10.000	1,5	A	1,5	3	S	
						S	1,8	3,5	1,5	10.000	1,5	F	1,5	3		
						W	3	5	1,5	10.000	1,5	B	1,5	4,5	K	
HIGH ENERGY	P	HE	08X10	N	6	H	0,1	1,2	4	10.000	5	D	2,5	4,5	D	-A
						M	0,8	2,2	4	10.000	5	A	2,5	4,5	S	
						S	1,8	3,5	3,5	10.000	4	F	2,5	4,5		
						W	3	5	3,5	10.000	4	B	2,5	6	K	
ADJUSTABLE ENERGY	P	AE	08X10	N	6	H	0,1	5	4	10.000	4	D	2,5	4,5	D	-A
												A	2,5	4,5	S	
												F	2,5	4,5		
												B	2,5	6	K	

▶ HOW TO ORDER CORRECTLY

P | SE | 08X10 | N | W | A | K | -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

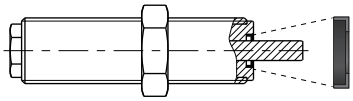
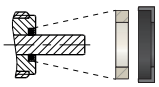
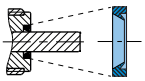
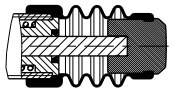
www.zimmer-group.de/en/pdti

Example order no.

PowerStop Standard Energy 08X10

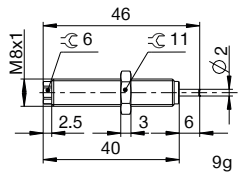
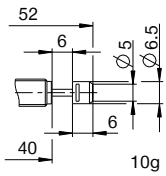
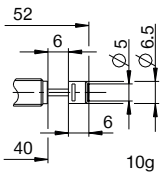
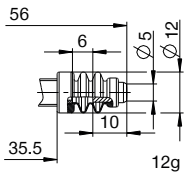
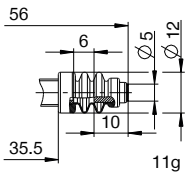
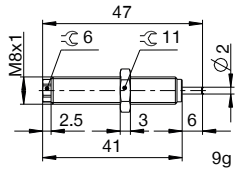
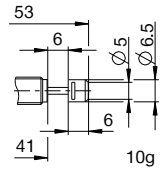
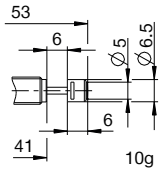
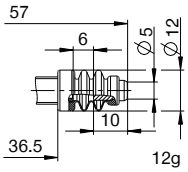
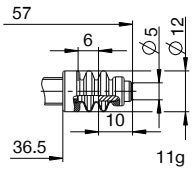
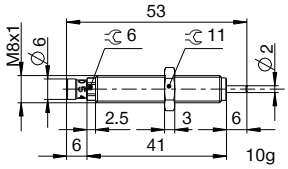
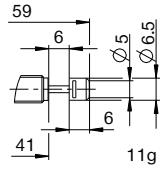
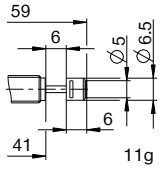
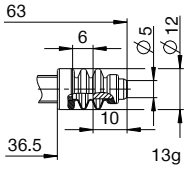
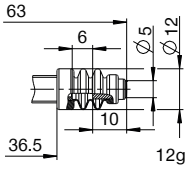
- Stroke variant: standard (N)
- Hardness degree: supersoft (W)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

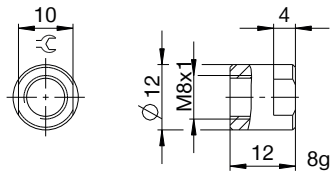
	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY	 9g	 10g	 10g	 12g	 11g
HIGH ENERGY	 9g	 10g	 10g	 12g	 11g
ADJUSTABLE ENERGY	 10g	 11g	 11g	 13g	 12g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M08X1.0

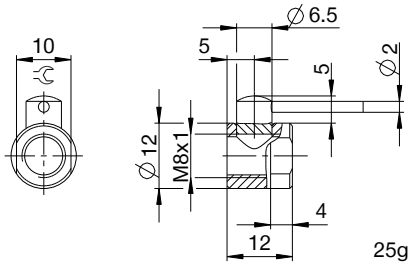
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH08X10-A**	Stop sleeve	Including 1x PVM08X10-A
2	**PSH08X10-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV08X10NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM12X10-A suitable for external thread of the side load adapter.
4	**PBV08X10NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM12X10-A suitable for external thread of the side load adapter.
5	**PKS08X10-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 2.5 Nm.
6	**PKP08X10-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 2.5 Nm.
7	**PVM08X10-A**	Stainless steel locknut	Included with the industrial shock absorber.
8	**PDD08X10-A**	Pressure chamber seal	Recommended fixation with PVM08X10-A. Seal must be in full contact on both sides.

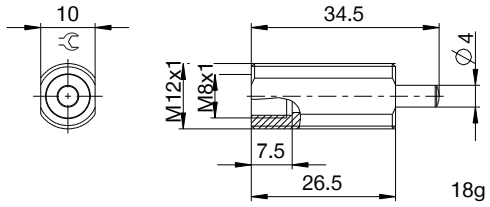
1



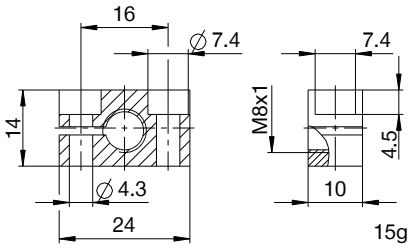
2



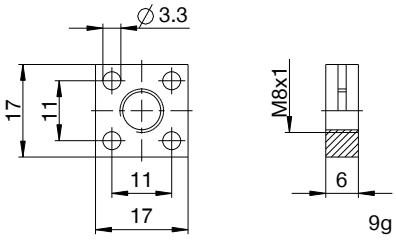
3 4



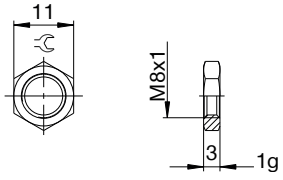
5



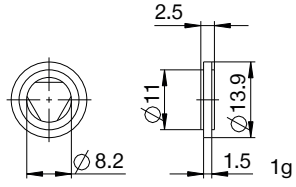
6



7



8



▶ CLASSIFICATION

P SE 08X10 N W A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

08 Thread nominal diameter

X

10 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M10X1.0

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

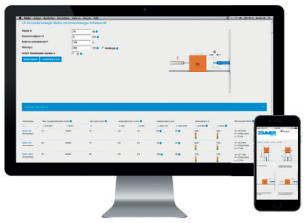
▶ **Standard Energy pressure max. (abs.)**	1 [bar]	▶ **Locknut tightening torque max.**	5 [Nm]
▶ **High Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	2 [kN]
▶ **Adjustable Energy pressure max. (abs.)**	10 [bar]	▶ **Material**	Stainless steel
▶ **Angle of Impact max.**	2 [°]	▶ **Material fixed stop**	Aluminum nickel plated
▶ **Max. piston return time**	0.15 [s]	▶ **PWIS-free**	Yes
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **RoHS compliant**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max.			Protection	Return force		Head	Version
									Continuous operation		Emergency stop operation					
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	10X10	N	8	H	0,1	1,2	3	22.000	3	D	2	4	D	-A
						M	0,8	2,2	3	22.000	3	A	2	4	S	
						S	1,8	3,5	3	22.000	3	F	2	4		
						W	3	5	3	22.000	3	B	2	9	K	
HIGH ENERGY	P	HE	10X10	N	8	H	0,1	1,2	10	22.000	13	D	3,5	6	D	-A
						M	0,8	2,2	10	22.000	13	A	3,5	6	S	
						S	1,8	3,5	9	22.000	11	F	3,5	6		
						W	3	5	9	22.000	11	B	3,5	11	K	
ADJUSTABLE ENERGY	P	AE	10X10	N	8	H	0,1	5	10	22.000	10	D	3,5	6	D	-A
												A	3,5	6	S	
												F	3,5	6		
												B	3,5	11	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 10X10 | N | H | B | S | -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

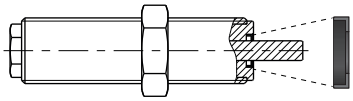
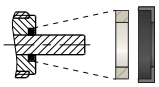
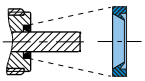
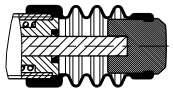
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 10X10

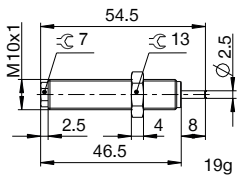
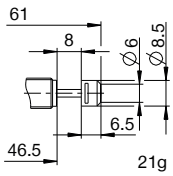
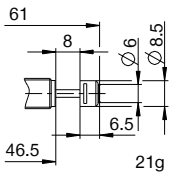
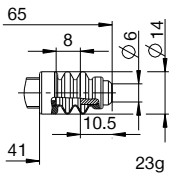
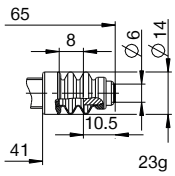
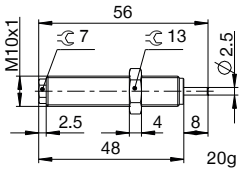
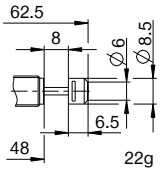
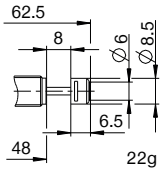
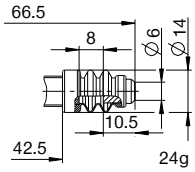
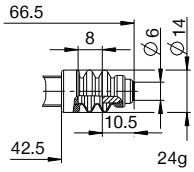
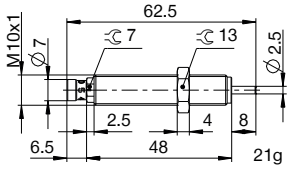
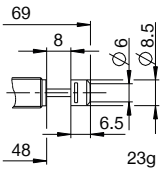
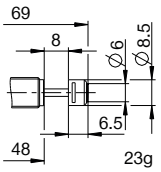
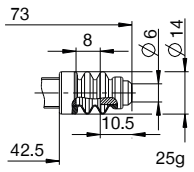
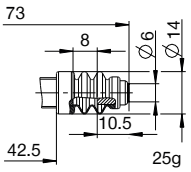
- ▶ Stroke variant: standard (N)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: bellow (B)
- ▶ Head: steel head (S)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

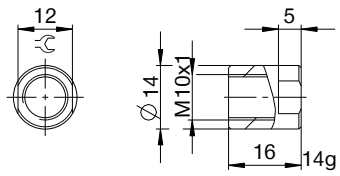
	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY	 19g	 21g	 21g	 23g	 23g
HIGH ENERGY	 20g	 22g	 22g	 24g	 24g
ADJUSTABLE ENERGY	 21g	 23g	 23g	 25g	 25g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M10X1.0

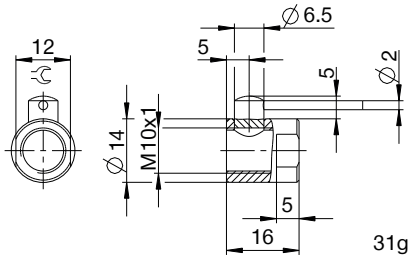
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH10X10-A**	Stop sleeve	Including 1x PVM10X10-A
2	**PSH10X10-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV10X10NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM14X15-A suitable for external thread of the side load adapter.
4	**PBV10X10NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM14X15-A suitable for external thread of the side load adapter.
5	**PKS10X10-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 2.5 Nm.
6	**PKP10X10-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 2.5 Nm.
7	**PVM10X10-A**	Stainless steel locknut	Included with the industrial shock absorber.
8	**PDD10X10-A**	Pressure chamber seal	Recommended fixation with PVM10X10-A. Seal must be in full contact on both sides.

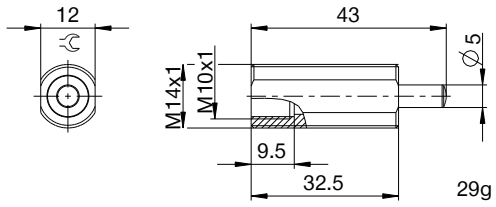
1



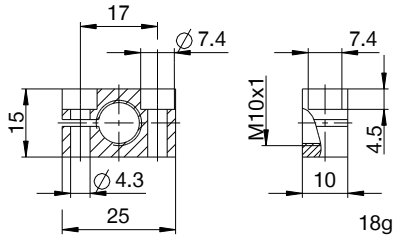
2



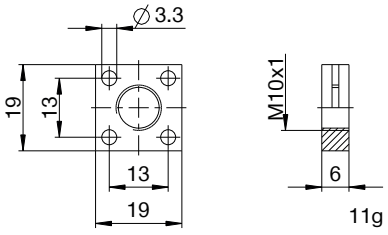
3 4



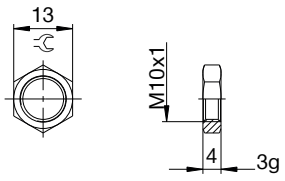
5



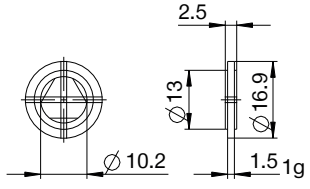
6



7



8



▶ CLASSIFICATION

P HE 10X10 N H B S -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

10 Thread nominal diameter

X

10 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M12X1.0

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

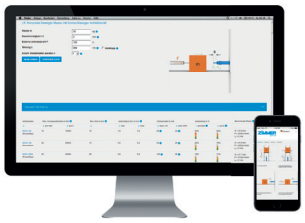
▶ **Standard Energy pressure max. (abs.)**	1 [bar]	▶ **Locknut tightening torque max.**	7 [Nm]
▶ **High Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	3 [kN]
▶ **Adjustable Energy pressure max. (abs.)**	10 [bar]	▶ **Material**	Stainless steel
▶ **Angle of Impact max.**	2 [°]	▶ **Material fixed stop**	Aluminum nickel plated
▶ **Max. piston return time**	0.15 [s]	▶ **PWIS-free**	Yes
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **RoHS compliant**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max.			Protection	Return force		Head	Version
									Continuous operation		Emergency stop operation					
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	12X10	N	10	H	0,1	1,2	9	33.000	9	D	2,5	5	D	-A
						M	0,8	2,2	9	33.000	9	A	2,5	5	S	
						S	1,8	3,5	9	33.000	9	F	2,5	5		
						W	3	5	9	33.000	9	B	2,5	17	K	
HIGH ENERGY	P	HE	12X10	N	10	H	0,1	1,2	18	33.000	25	D	4,5	7,5	D	-A
						M	0,8	2,2	18	33.000	25	A	4,5	7,5	S	
						S	1,8	3,5	16	33.000	21	F	4,5	7,5		
						W	3	5	16	33.000	21	B	4,5	19	K	
ADJUSTABLE ENERGY	P	AE	12X10	N	10	H	0,1	5	18	33.000	18	D	4,5	7,5	D	-A
												A	4,5	7,5	S	
												F	4,5	7,5		
												B	4,5	19	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 12X10 | N | H | A | K | -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

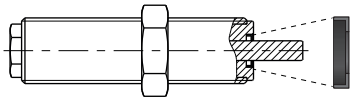
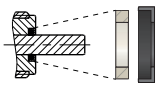
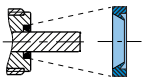
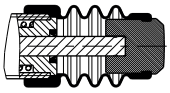
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 12X10

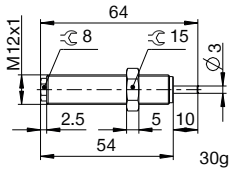
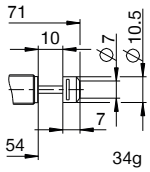
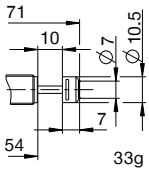
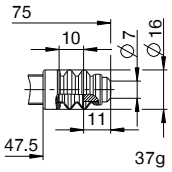
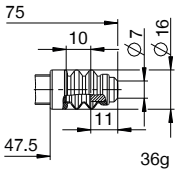
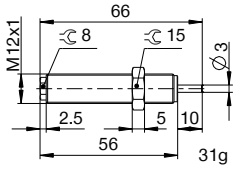
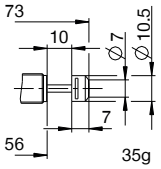
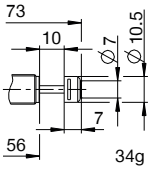
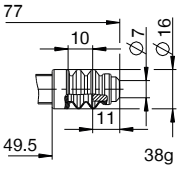
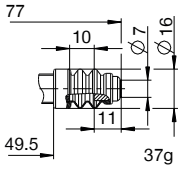
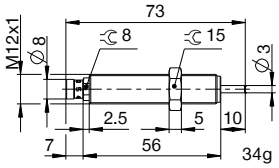
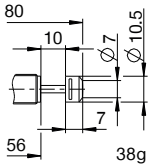
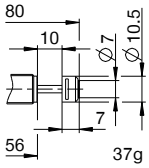
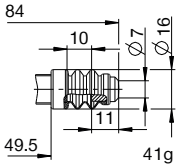
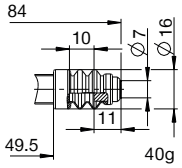
- ▶ Stroke variant: standard (N)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: wiper (A)
- ▶ Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

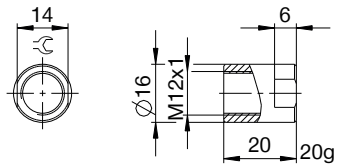
	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY	 30g	 34g	 33g	 37g	 36g
HIGH ENERGY	 31g	 35g	 34g	 38g	 37g
ADJUSTABLE ENERGY	 34g	 38g	 37g	 41g	 40g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M12X1.0

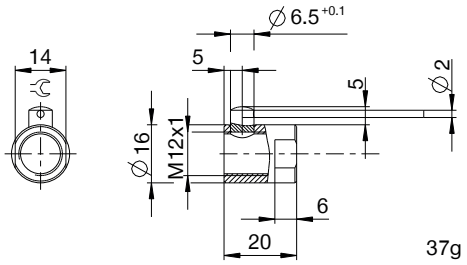
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH12X10-A**	Stop sleeve	Including 1x PVM12X10-A
2	**PSH12X10-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV12X10NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM16X15-A suitable for external thread of the side load adapter.
4	**PBV12X10NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM16X15-A suitable for external thread of the side load adapter.
5	**PKS12X10-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 5 Nm.
6	**PKP12X10-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 5 Nm.
7	**PVM12X10-A**	Stainless steel locknut	Included with the industrial shock absorber.
8	**PDD12X10-A**	Pressure chamber seal	Recommended fixation with PVM12X10-A. Seal must be in full contact on both sides.

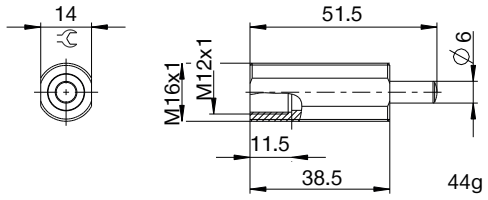
1



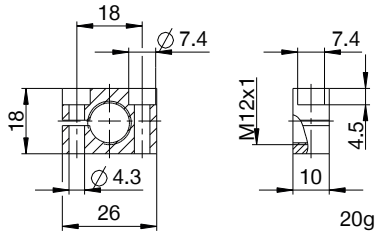
2



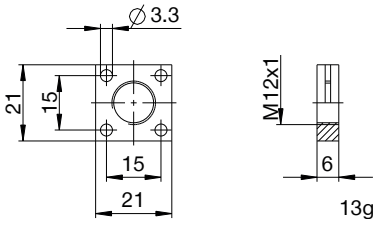
3 4



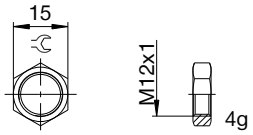
5



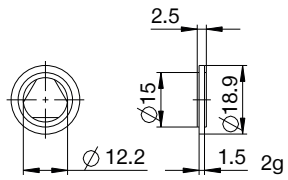
6



7



8



▶ CLASSIFICATION

P HE 12X10 N H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

12 Thread nominal diameter

X

10 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M14X1.0

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

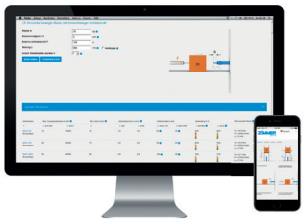
▶ **Standard Energy pressure max. (abs.)**	1 [bar]	▶ **Locknut tightening torque max.**	20 [Nm]
▶ **High Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	3.5 [kN]
▶ **Adjustable Energy pressure max. (abs.)**	10 [bar]	▶ **Material**	Stainless steel
▶ **Angle of Impact max.**	2 [°]	▶ **Material fixed stop**	Aluminum nickel plated
▶ **Max. piston return time**	N: 0.2 / L: 0.4 [s]	▶ **PWIS-free**	Yes
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **RoHS compliant**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	14X10	N	12	H	0,1	1,2	20	50.000	20	D	3	6	D	-A
						M	0,8	2,2	20	50.000	20	A	3	6	S	
						S	1,8	3,5	20	50.000	20	F	3	6		
						W	3	5	20	50.000	20	B	3	15	K	
HIGH ENERGY	P	HE	14X10	N	12	H	0,1	1,2	34	50.000	42	D	7	11	D	-A
						M	0,8	2,2	32	50.000	38	A	7	11	S	
				L	20	S	1,8	3,5	30	50.000	34	F	7	11		
						W	3	5	28	50.000	30	B	7	20	K	
ADJUSTABLE ENERGY	P	AE	14X10	N	12	H	0,1	5	34	50.000	34	D	7	11	D	-A
												A	7	11	S	
				L	20							F	7	11		
												B	7	20	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 14X10 | L | H | A | K | -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

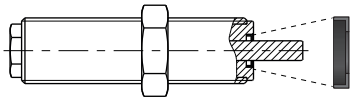
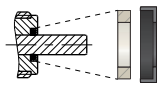
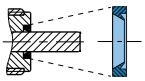
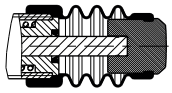
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 14X10

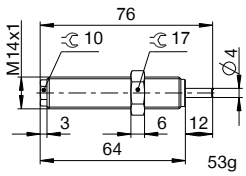
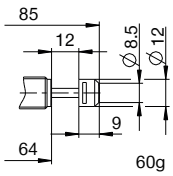
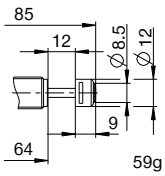
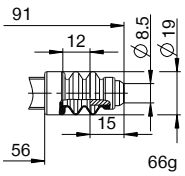
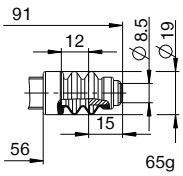
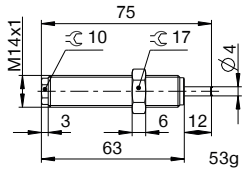
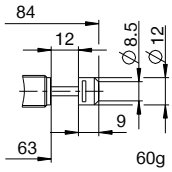
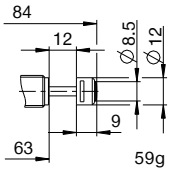
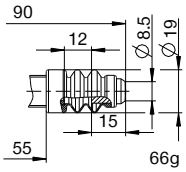
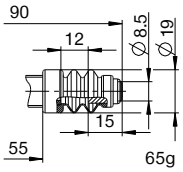
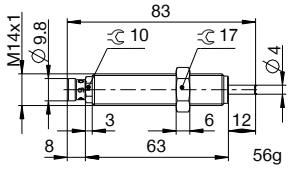
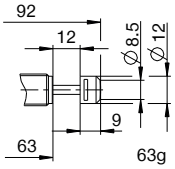
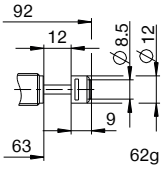
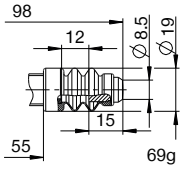
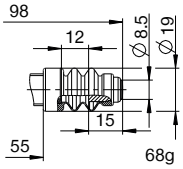
- ▶ Stroke variant: long (L)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: wiper (A)
- ▶ Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

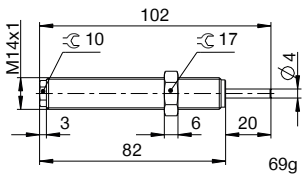
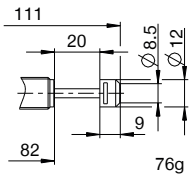
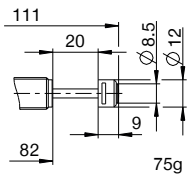
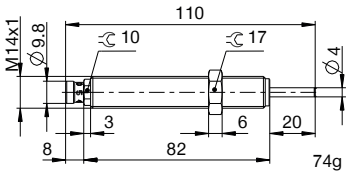
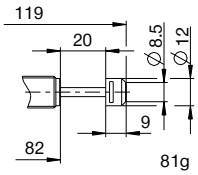
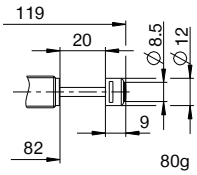
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY	 53g	 60g	 59g	 66g	 65g
HIGH ENERGY	 53g	 60g	 59g	 66g	 65g
ADJUSTABLE ENERGY	 56g	 63g	 62g	 69g	 68g

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

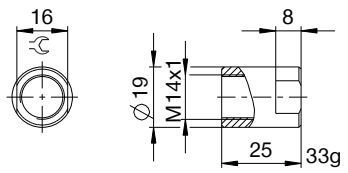
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY	 69g	 76g	 75g
ADJUSTABLE ENERGY	 74g	 81g	 80g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M14X1.0

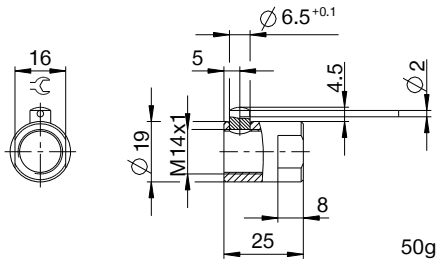
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH14X10-A**	Stop sleeve	Including 1x PVM14X10-A
2	**PSH14X10-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV14X10NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
4	**PBV14X10NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
5	**PBV14X10LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
6	**PBV14X10LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
7	**PKS14X10-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 5 Nm.
8	**PKP14X10-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 5 Nm.
9	**PVM14X10-A**	Stainless steel locknut	Included with the industrial shock absorber.
10	**PDD14X10-A**	Pressure chamber seal	Recommended fixation with PVM14X10-A. Seal must be in full contact on both sides.

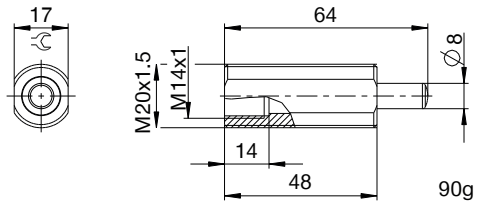
1



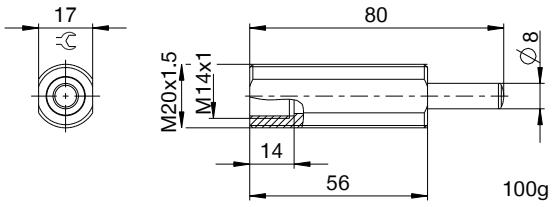
2



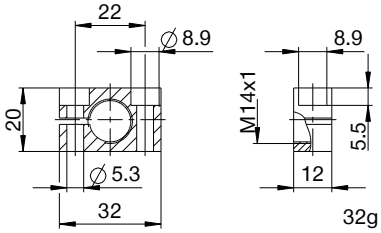
3 4



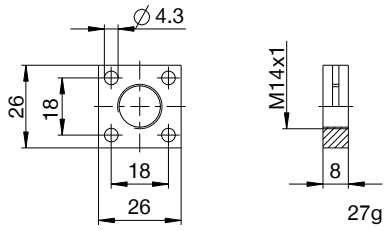
5 6



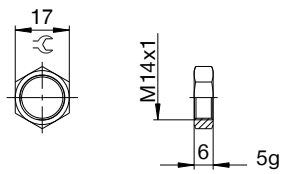
7



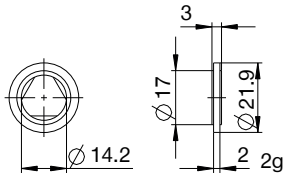
8



9



10



▶ CLASSIFICATION

P HE 14X10 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

14 Thread nominal diameter

X

10 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M14X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

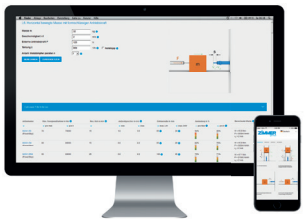
▶ **Standard Energy pressure max. (abs.)**	1 [bar]	▶ **Locknut tightening torque max.**	20 [Nm]
▶ **High Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	3.5 [kN]
▶ **Adjustable Energy pressure max. (abs.)**	10 [bar]	▶ **Material**	Stainless steel
▶ **Angle of Impact max.**	2 [°]	▶ **Material fixed stop**	Aluminum nickel plated
▶ **Max. piston return time**	N: 0.2 / L: 0.4 [s]	▶ **PWIS-free**	Yes
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **RoHS compliant**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	14X15	N	12	H	0,1	1,2	20	50.000	20	D	3	6	D	-A
						M	0,8	2,2	20	50.000	20	A	3	6	S	
						S	1,8	3,5	20	50.000	20	F	3	6		
						W	3	5	20	50.000	20	B	3	15	K	
HIGH ENERGY	P	HE	14X15	N	12	H	0,1	1,2	34	50.000	42	D	7	11	D	-A
						M	0,8	2,2	32	50.000	38	A	7	11	S	
				L	20	S	1,8	3,5	30	50.000	34	F	7	11		
						W	3	5	28	50.000	30	B	7	20	K	
ADJUSTABLE ENERGY	P	AE	14X15	N	12	H	0,1	5	34	50.000	34	D	7	11	D	-A
												A	7	11	S	
				L	20							F	7	11		
												B	7	20	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 14X15 | L | H | A | K | -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

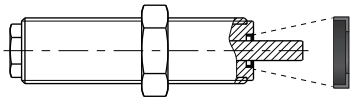
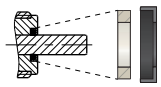
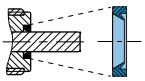
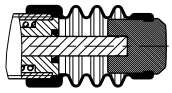
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 14X15

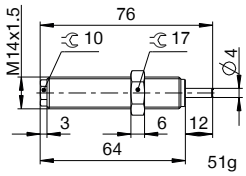
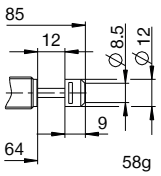
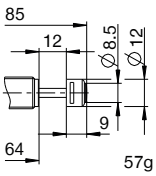
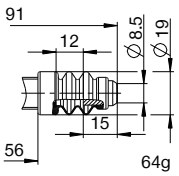
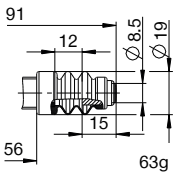
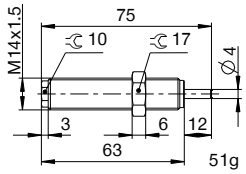
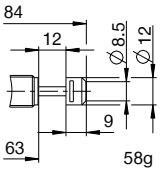
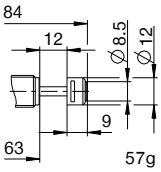
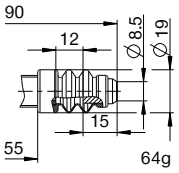
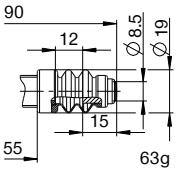
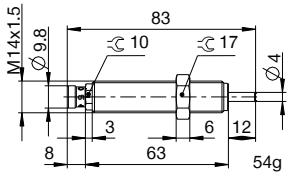
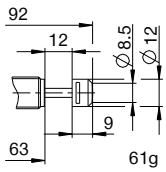
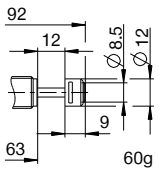
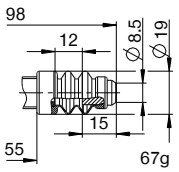
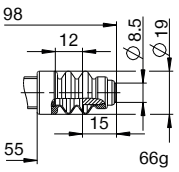
- ▶ Stroke variant: long (L)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: wiper (A)
- ▶ Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

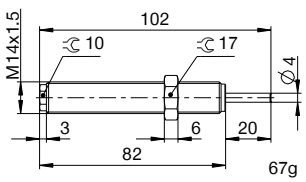
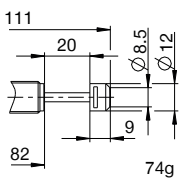
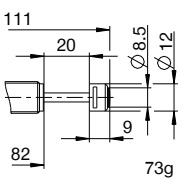
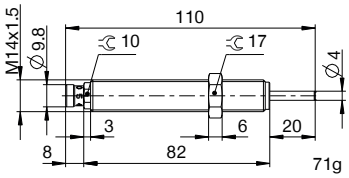
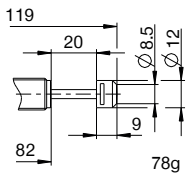
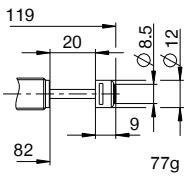
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY	 51g	 58g	 57g	 64g	 63g
HIGH ENERGY	 51g	 58g	 57g	 64g	 63g
ADJUSTABLE ENERGY	 54g	 61g	 60g	 67g	 66g

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

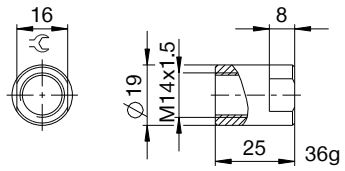
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY	 67g	 74g	 73g
ADJUSTABLE ENERGY	 71g	 78g	 77g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M14X1.5

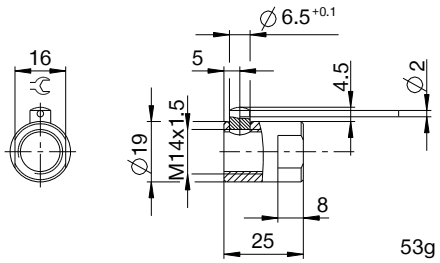
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH14X15-A**	Stop sleeve	Including 1x PVM14X15-A
2	**PSH14X15-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV14X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
4	**PBV14X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
5	**PBV14X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
6	**PBV14X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM20X15-A suitable for external thread of the side load adapter.
7	**PKS14X15-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 5 Nm.
8	**PKP14X15-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 5 Nm.
9	**PVM14X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
10	**PDD14X15-A**	Pressure chamber seal	Recommended fixation with PVM14X15-A. Seal must be in full contact on both sides.

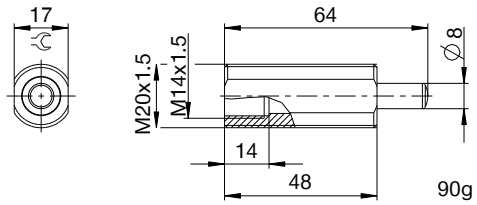
1



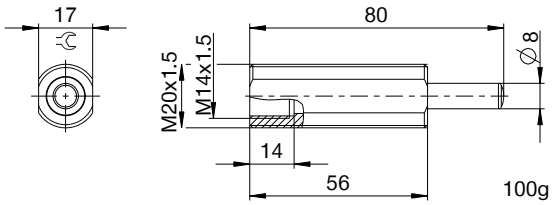
2



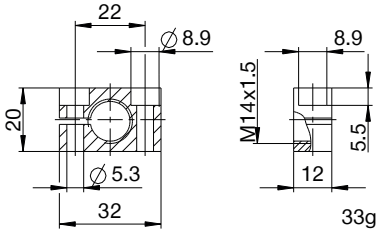
3 4



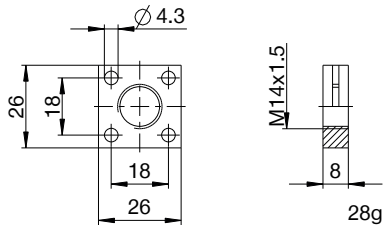
5 6



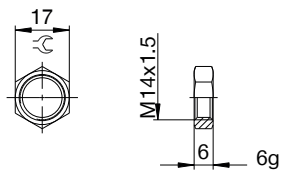
7



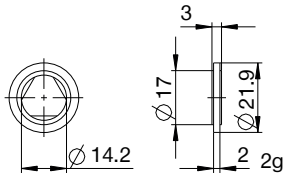
8



9



10



▶ CLASSIFICATION

P HE 14X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

14 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M16X1.0

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

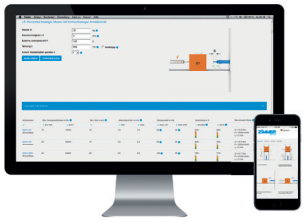
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** N: 0.2 / L: 0.4 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 20 [Nm]
- **Force in end position max.** 3.5 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity min.	Impact velocity max.	Energy absorption max. Continuous operation per stroke	Energy absorption max. Continuous operation per hour	Energy absorption max. Emergency stop operation per stroke	Protection	Return force min.	Return force max.	Head	Version
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	16X10	N	12	H	0,1	1,2	20	50.000	20	D	3	6	D	-A
						M	0,8	2,2	20	50.000	20	A	3	6	S	
						S	1,8	3,5	20	50.000	20					
						W	3	5	20	50.000	20	F	3	6	K	
HIGH ENERGY	P	HE	16X10	N	12	H	0,1	1,2	34	50.000	42	D	7	11	D	-A
						M	0,8	2,2	32	50.000	38	A	7	11	S	
				L	20	S	1,8	3,5	30	50.000	34					
						W	3	5	28	50.000	30	F	7	11	K	
ADJUSTABLE ENERGY	P	AE	16X10	N	12	H	0,1	5	34	50.000	34	D	7	11	D	-A
				L	20							A	7	11	S	
												F	7	11	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 16X10 | L | H | A | K | -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

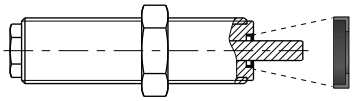
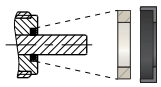
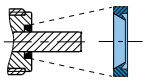
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 16X10

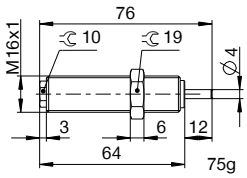
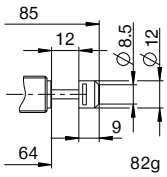
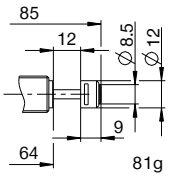
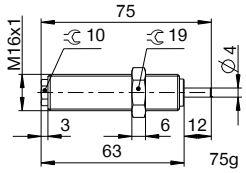
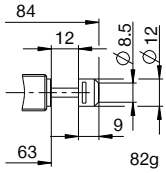
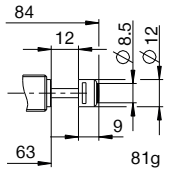
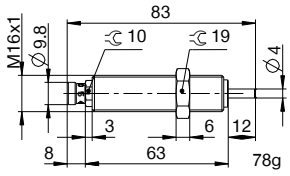
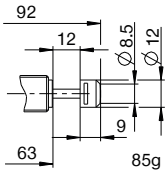
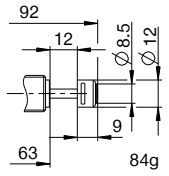
- Stroke variant: long (L)
- Hardness degree: Hard (H)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)
D -A	F -A	A -A
		
in a clean environment	against dust, chips, ...	against liquid, oil, ...

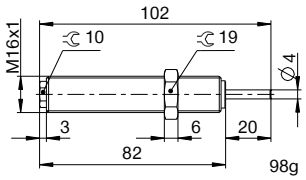
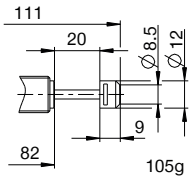
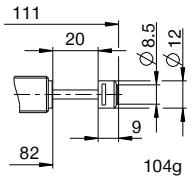
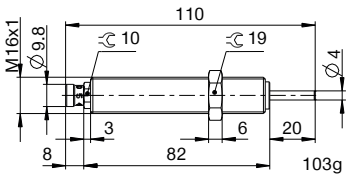
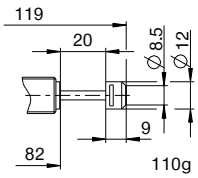
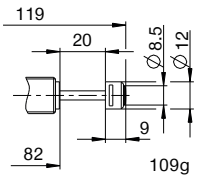
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head
	D -A	S -A	K -A
STANDARD ENERGY			
	75g	82g	81g
HIGH ENERGY			
	75g	82g	81g
ADJUSTABLE ENERGY			
	78g	85g	84g

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

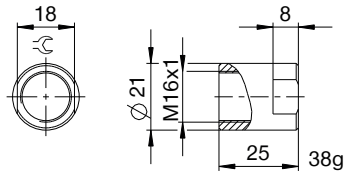
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
	98g	105g	104g
ADJUSTABLE ENERGY			
	103g	110g	109g

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M16X1.0

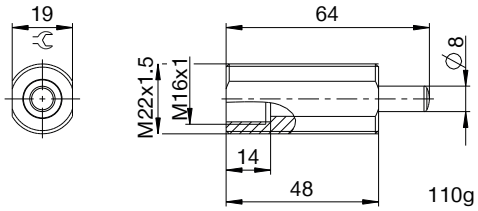
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH16X10-A**	Stop sleeve	Including 1x PVM16X10-A
2	**PBV16X10NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
3	**PBV16X10NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
4	**PBV16X10LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
5	**PBV16X10LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
6	**PKS16X10-A**	Clamping flange orthogonal screwed	On request.
7	**PKP16X10-A**	Clamping flange screwed in parallel	On request.
8	**PVM16X10-A**	Stainless steel locknut	Included with the industrial shock absorber.
9	**PDD16X10-A**	Pressure chamber seal	On request.

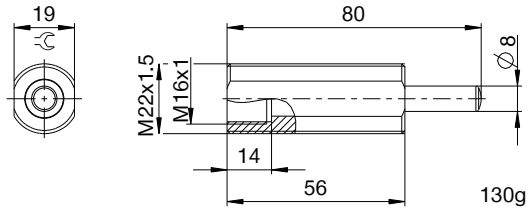
1



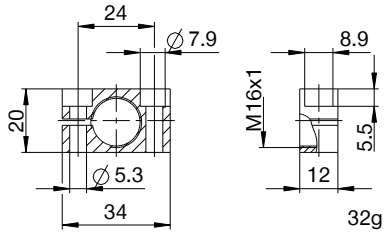
2 3



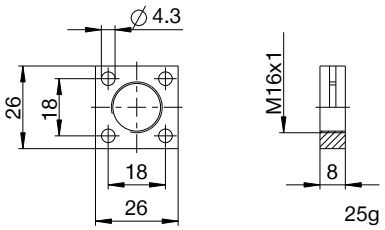
4 5



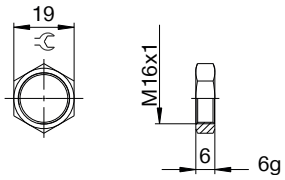
6



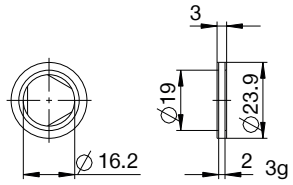
7



8



9



▶ CLASSIFICATION

P HE 16X10 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

16 Thread nominal diameter

X

10 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M16X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

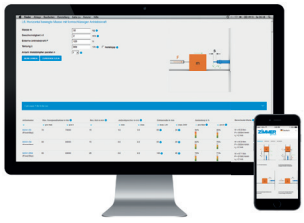
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** N: 0.2 / L: 0.4 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 20 [Nm]
- **Force in end position max.** 3.5 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity min.	Impact velocity max.	Energy absorption max. Continuous operation per stroke	Energy absorption max. Continuous operation per hour	Energy absorption max. Emergency stop operation per stroke	Protection	Return force min.	Return force max.	Head	Version
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	16X15	N	12	H	0,1	1,2	20	50.000	20	D	3	6	D	-A
						M	0,8	2,2	20	50.000	20	A	3	6	S	
						S	1,8	3,5	20	50.000	20					
						W	3	5	20	50.000	20	F	3	6	K	
HIGH ENERGY	P	HE	16X15	N	12	H	0,1	1,2	34	50.000	42	D	7	11	D	-A
						M	0,8	2,2	32	50.000	38	A	7	11	S	
				L	20	S	1,8	3,5	30	50.000	34					
						W	3	5	28	50.000	30	F	7	11	K	
ADJUSTABLE ENERGY	P	AE	16X15	N	12	H	0,1	5	34	50.000	34	D	7	11	D	-A
				L	20							A	7	11	S	
												F	7	11	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 16X15 | L | H | A | K | -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

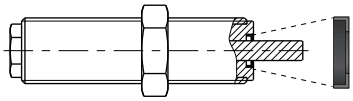
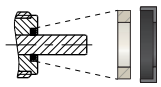
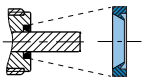
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 16X15

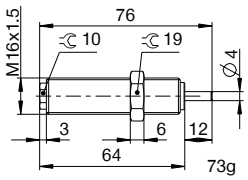
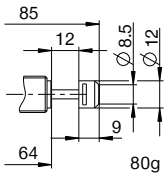
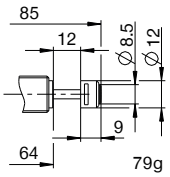
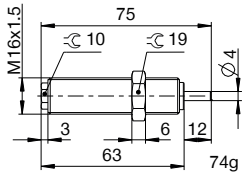
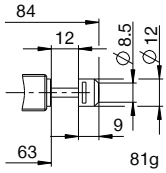
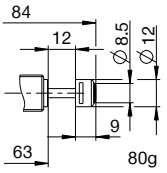
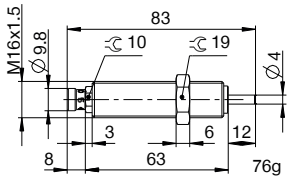
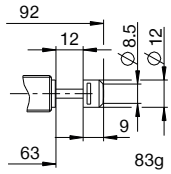
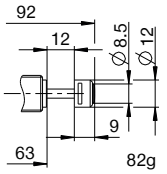
- Stroke variant: long (L)
- Hardness degree: Hard (H)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)
D -A	F -A	A -A
		
in a clean environment	against dust, chips, ...	against liquid, oil, ...

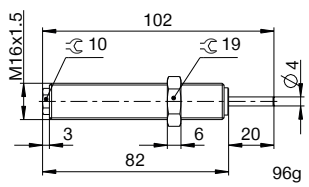
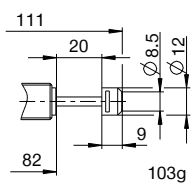
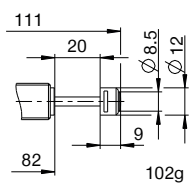
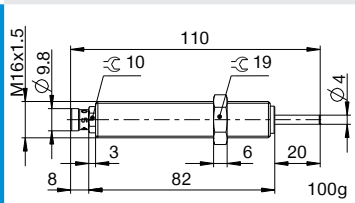
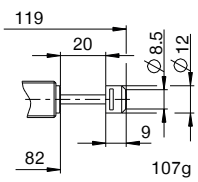
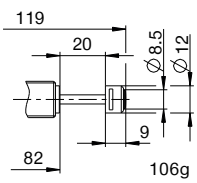
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head
	D -A	S -A	K -A
STANDARD ENERGY			
HIGH ENERGY			
ADJUSTABLE ENERGY			

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

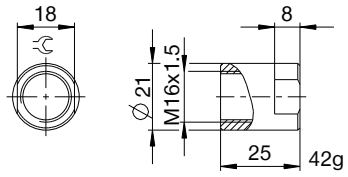
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M16X1.5

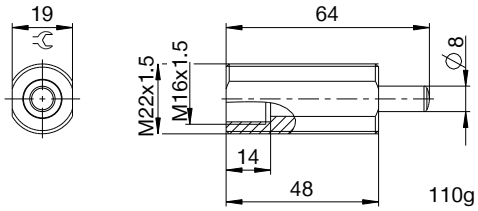
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH16X15-A**	Stop sleeve	Including 1x PVM16X15-A
2	**PBV16X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
3	**PBV16X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
4	**PBV16X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
5	**PBV16X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM22X15-A suitable for external thread of the side load adapter.
6	**PKS16X15-A**	Clamping flange orthogonal screwed	On request.
7	**PKP16X15-A**	Clamping flange screwed in parallel	On request.
8	**PVM16X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
9	**PDD16X15-A**	Pressure chamber seal	On request.

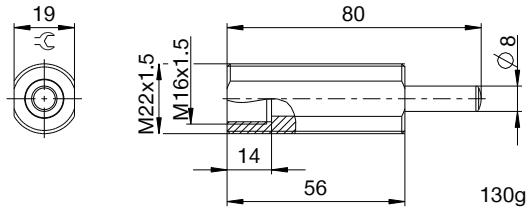
1



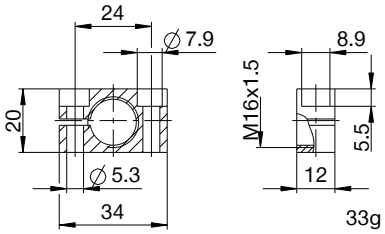
2 3



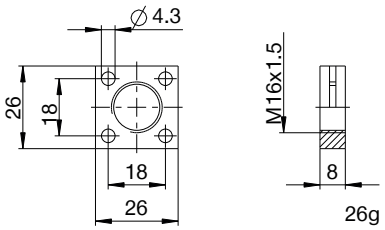
4 5



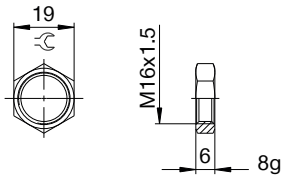
6



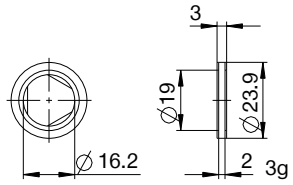
7



8



9



▶ CLASSIFICATION

P HE 16X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

16 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M20X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

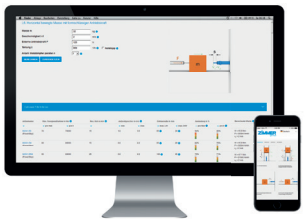
▶ **Standard Energy pressure max. (abs.)**	1 [bar]	▶ **Locknut tightening torque max.**	40 [Nm]
▶ **High Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	10 [kN]
▶ **Adjustable Energy pressure max. (abs.)**	10 [bar]	▶ **Material**	Stainless steel
▶ **Angle of Impact max.**	2 [°]	▶ **Material fixed stop**	Aluminum nickel plated
▶ **Max. piston return time**	N: 0.3 / L: 0.5 [s]	▶ **PWIS-free**	Yes
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **RoHS compliant**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	20X15	N	15	H	0,1	1,2	41	90.000	41	D	7	15	D	-A
						M	0,8	2,2	41	90.000	41	A	7	15	S	
						S	1,8	3,5	41	90.000	41	F	7	15		
						W	3	5	41	90.000	41	B	7	52	K	
HIGH ENERGY	P	HE	20X15	N	15	H	0,1	1,2	80	90.000	150	D	16	26	D	-A
						M	0,8	2,2	75	90.000	125	A	16	26	S	
				L	25	S	1,8	3,5	70	90.000	100	F	16	26		
						W	3	5	65	90.000	75	B	16	62	K	
ADJUSTABLE ENERGY	P	AE	20X15	N	15	H	0,1	5	80	90.000	80	D	16	26	D	-A
												A	16	26	S	
				L	25							F	16	26		
												B	16	62	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 20X15 | L | H | A | K | -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

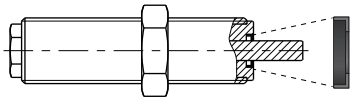
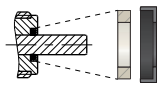
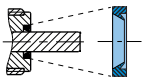
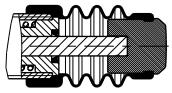
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 20X15

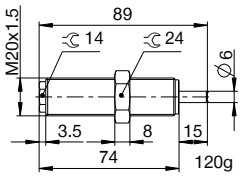
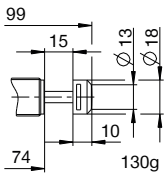
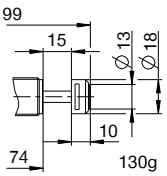
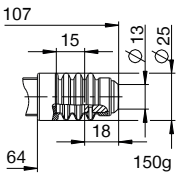
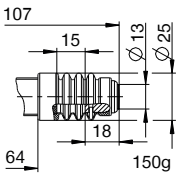
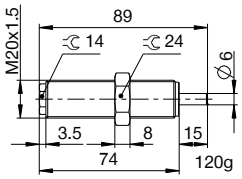
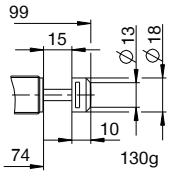
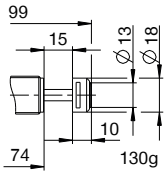
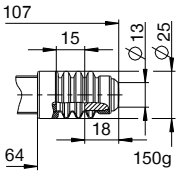
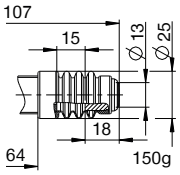
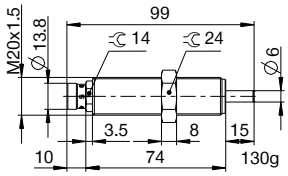
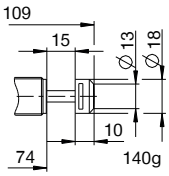
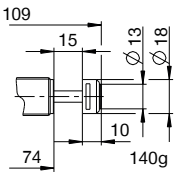
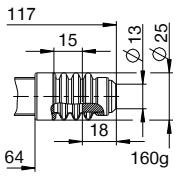
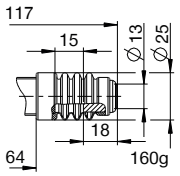
- ▶ Stroke variant: long (L)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: wiper (A)
- ▶ Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

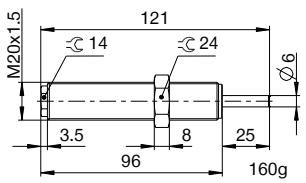
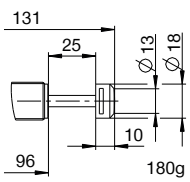
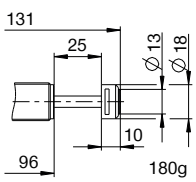
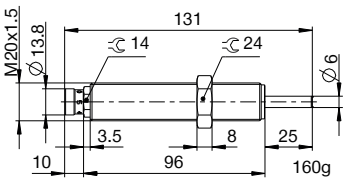
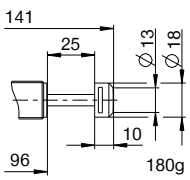
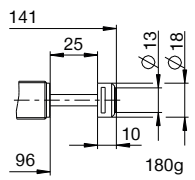
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY					
HIGH ENERGY					
ADJUSTABLE ENERGY					

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

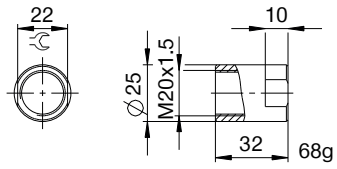
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M20X1.5

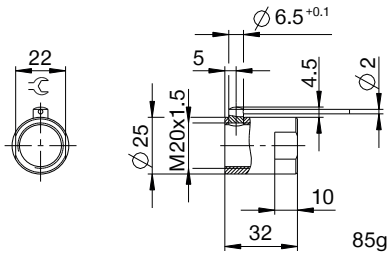
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH20X15-A**		Including 1x PVM20X15-A
2	**PSH20X15-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV20X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM25X15-A suitable for external thread of the side load adapter.
4	**PBV20X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM25X15-A suitable for external thread of the side load adapter.
5	**PBV20X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM25X15-A suitable for external thread of the side load adapter.
6	**PBV20X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM25X15-A suitable for external thread of the side load adapter.
7	**PKS20X15-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 9 Nm.
8	**PKP20X15-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 9 Nm.
9	**PVM20X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
10	**PDD20X15-A**	Pressure chamber seal	Recommended fixation with PVM20X15-A. Seal must be in full contact on both sides.

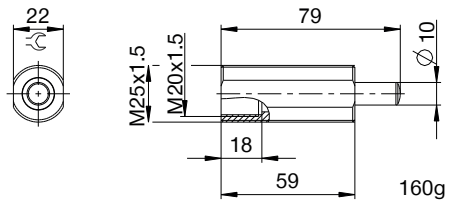
1



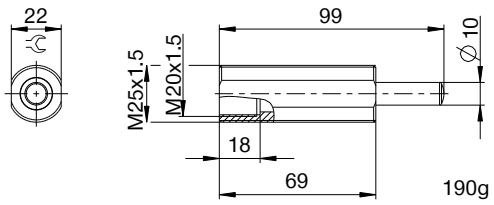
2



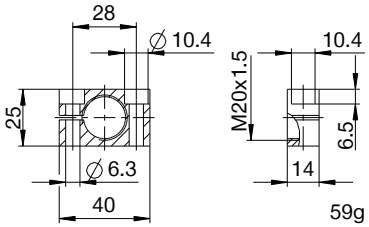
3 4



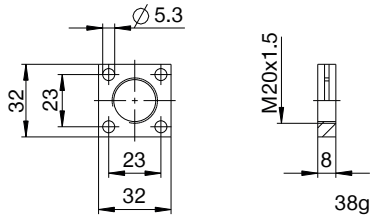
5 6



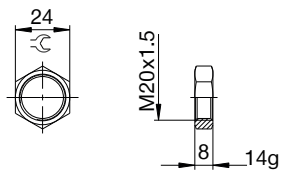
7



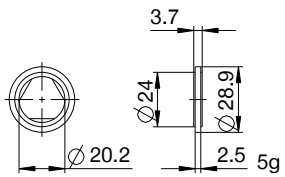
8



9



10



▶ CLASSIFICATION

P HE 20X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

20 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M22X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

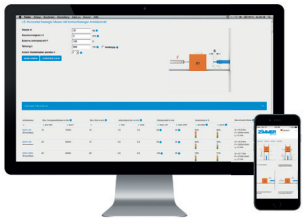
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** N: 0.3 / L: 0.5 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 40 [Nm]
- **Force in end position max.** 10 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity min.	Impact velocity max.	Energy absorption max. Continuous operation per stroke	Energy absorption max. Continuous operation per hour	Energy absorption max. Emergency stop operation per stroke	Protection	Return force min.	Return force max.	Head	Version
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	22X15	N	15	H	0,1	1,2	41	90.000	41	D	7	15	D	-A
						M	0,8	2,2	41	90.000	41	A	7	15	S	
						S	1,8	3,5	41	90.000	41					
						W	3	5	41	90.000	41	F	7	15	K	
HIGH ENERGY	P	HE	22X15	N	15	H	0,1	1,2	80	90.000	150	D	16	26	D	-A
						M	0,8	2,2	75	90.000	125	A	16	26	S	
				L	25	S	1,8	3,5	70	90.000	100					
						W	3	5	65	90.000	75	F	16	26	K	
ADJUSTABLE ENERGY	P	AE	22X15	N	15	H	0,1	5	80	90.000	80	D	16	26	D	-A
				L	25							A	16	26	S	
												F	16	26	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 22X15 | L | H | A | K | -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

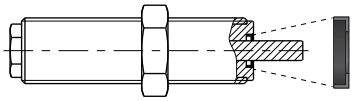
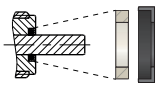
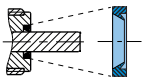
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 22X15

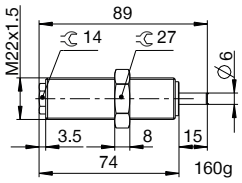
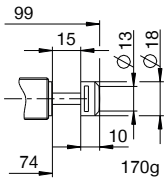
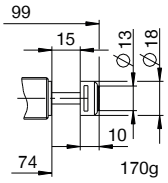
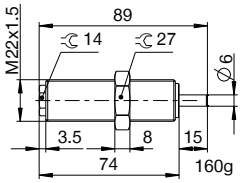
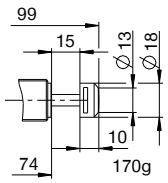
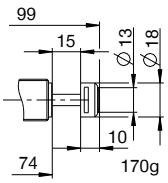
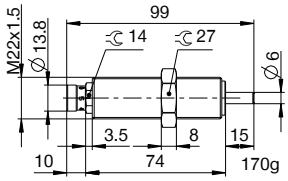
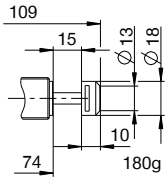
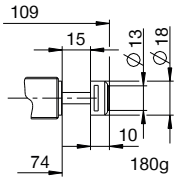
- Stroke variant: long (L)
- Hardness degree: Hard (H)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)
D -A	F -A	A -A
		
in a clean environment	against dust, chips, ...	against liquid, oil, ...

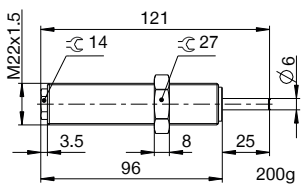
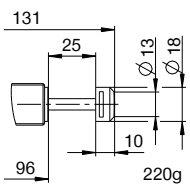
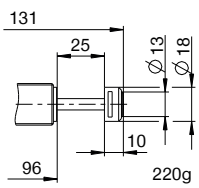
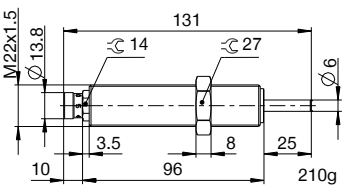
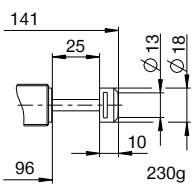
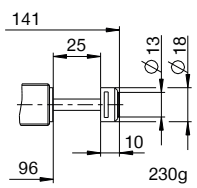
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head
	D -A	S -A	K -A
STANDARD ENERGY			
HIGH ENERGY			
ADJUSTABLE ENERGY			

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

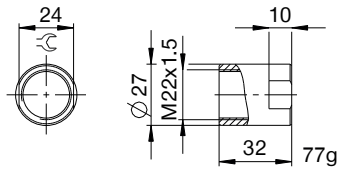
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M22X1.5

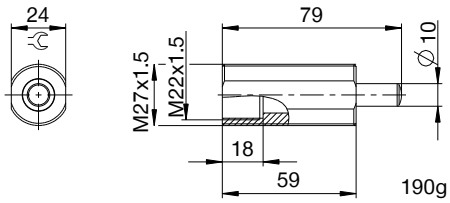
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH22X15-A**	Stop sleeve	Including 1x PVM22X15-A
2	**PBV22X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM27X15-A suitable for external thread of the side load adapter.
3	**PBV22X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM27X15-A suitable for external thread of the side load adapter.
4	**PBV22X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM27X15-A suitable for external thread of the side load adapter.
5	**PBV22X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM27X15-A suitable for external thread of the side load adapter.
6	**PKS22X15-A**	Clamping flange orthogonal screwed	On request.
7	**PKP22X15-A**	Clamping flange screwed in parallel	On request.
8	**PVM22X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
9	**PDD22X15-A**	Pressure chamber seal	On request.

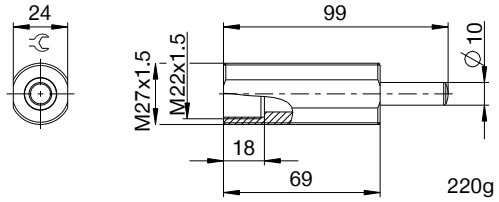
1



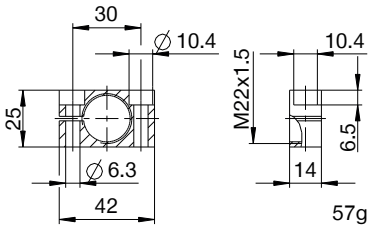
2 3



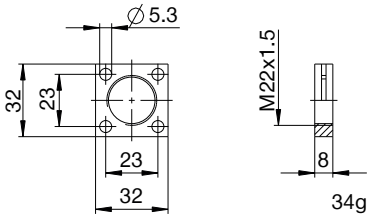
4 5



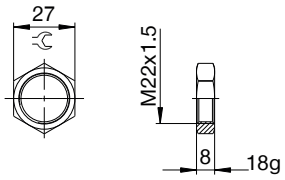
6



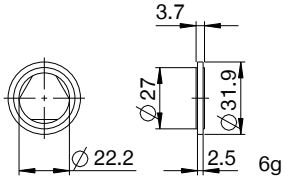
7



8



9



▶ CLASSIFICATION

P HE 22X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

22 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M25X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

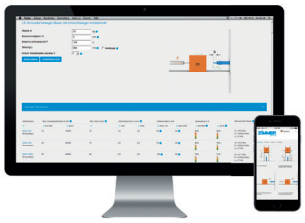
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** N: 0.4 / L: 0.6 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 60 [Nm]
- **Force in end position max.** 17 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity min.	Impact velocity max.	Energy absorption max. Continuous operation per stroke	Energy absorption max. Continuous operation per hour	Energy absorption max. Emergency stop operation per stroke	Protection	Return force min.	Return force max.	Head	Version
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	25X15	N	25	H	0,1	1,2	105	120.000	105	D	11	26	D	-A
						M	0,8	2,2	105	120.000	105	A	11	26	S	
						S	1,8	3,5	105	120.000	105	F	11	26		
						W	3	5	105	120.000	105	B	11	95	K	
HIGH ENERGY	P	HE	25X15	N	25	H	0,1	1,2	230	120.000	400	D	26	45	D	-A
						M	0,8	2,2	210	120.000	330	A	26	45	S	
				L	40	S	1,8	3,5	190	120.000	260	F	26	45		
						W	3	5	170	120.000	190	B	26	115	K	
ADJUSTABLE ENERGY	P	AE	25X15	N	25	H	0,1	5	230	120.000	230	D	26	45	D	-A
												A	26	45	S	
				L	40							F	26	45		
												B	26	115	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 25X15 | L | H | A | K | -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

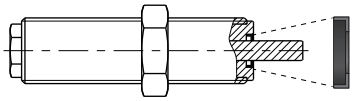
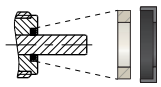
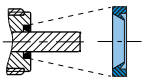
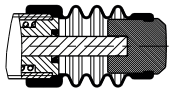
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 25X15

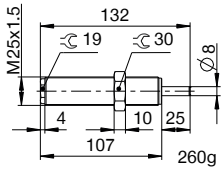
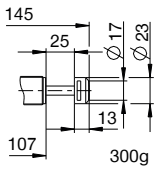
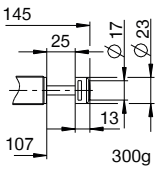
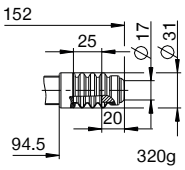
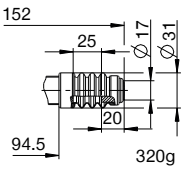
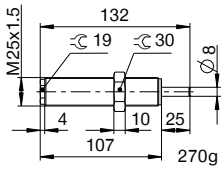
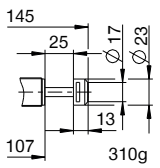
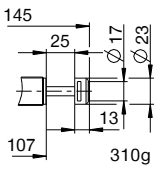
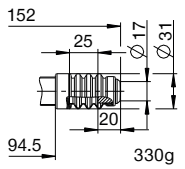
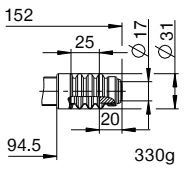
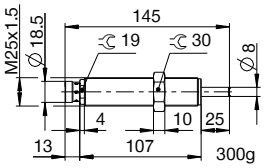
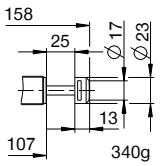
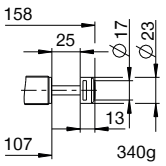
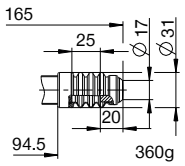
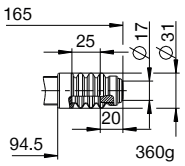
- Stroke variant: long (L)
- Hardness degree: Hard (H)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

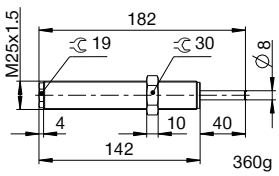
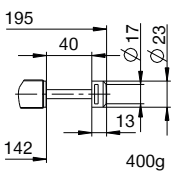
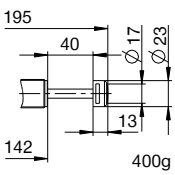
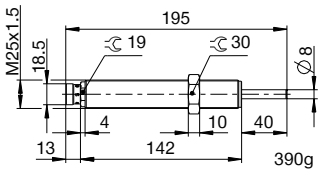
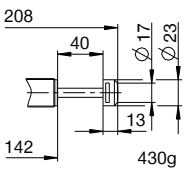
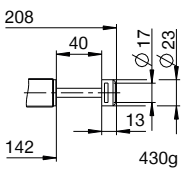
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY					
HIGH ENERGY					
ADJUSTABLE ENERGY					

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

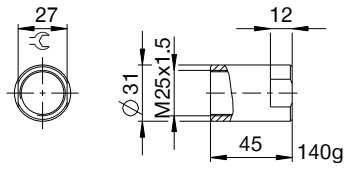
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M25X1.5

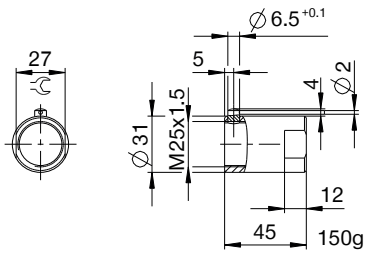
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH25X15-A**	Stop sleeve	Including 1x PVM25X15-A
2	**PSH25X15-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV25X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM33X15-A suitable for external thread of the side load adapter.
4	**PBV25X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM33X15-A suitable for external thread of the side load adapter.
5	**PBV25X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM33X15-A suitable for external thread of the side load adapter.
6	**PBV25X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM33X15-A suitable for external thread of the side load adapter.
7	**PKS25X15-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 22 Nm.
8	**PKP25X15-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 22 Nm.
9	**PVM25X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
10	**PDD25X15-A**	Pressure chamber seal	Recommended fixation with PVM25X15-A. Seal must be in full contact on both sides.

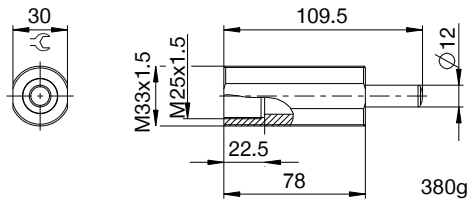
1



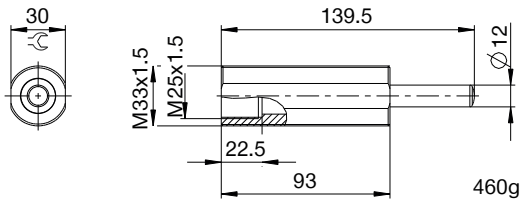
2



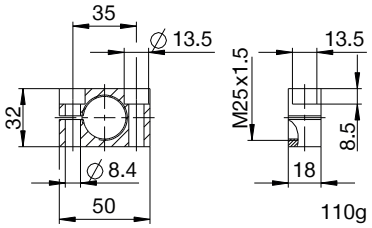
3 4



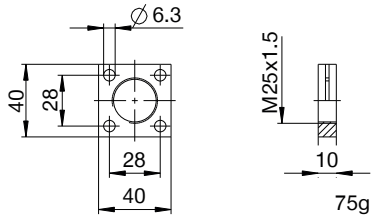
5 6



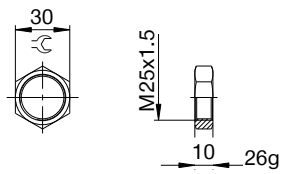
7



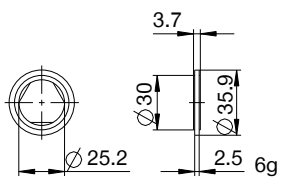
8



9



10



▶ CLASSIFICATION

P HE 25X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

25 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M27X3.0

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

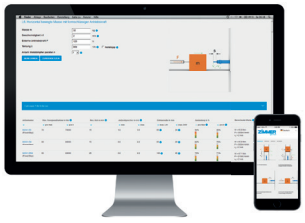
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** N: 0.4 / L: 0.6 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 60 [Nm]
- **Force in end position max.** 17 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	27X30	N	25	H	0,1	1,2	105	120.000	105	D	11	26	D	-A
						M	0,8	2,2	105	120.000	105	A	11	26	S	
						S	1,8	3,5	105	120.000	105					
						W	3	5	105	120.000	105	F	11	26	K	
HIGH ENERGY	P	HE	27X30	N	25	H	0,1	1,2	230	120.000	400	D	26	45	D	-A
						M	0,8	2,2	210	120.000	330	A	26	45	S	
				L	40	S	1,8	3,5	190	120.000	260					
						W	3	5	170	120.000	190	F	26	45	K	
ADJUSTABLE ENERGY	P	AE	27X30	N	25	H	0,1	5	230	120.000	230	D	26	45	D	-A
				L	40							A	26	45	S	
												F	26	45	K	

▶ HOW TO ORDER CORRECTLY

P HE 27X30 L H A K -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

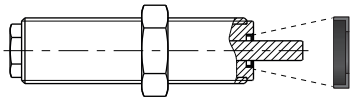
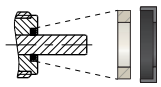
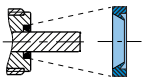
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 27X30

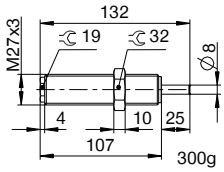
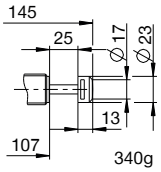
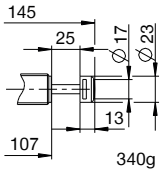
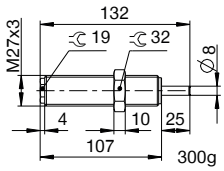
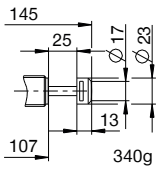
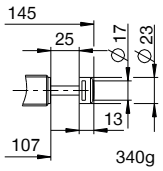
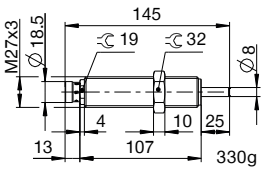
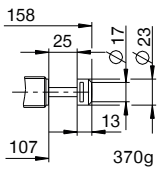
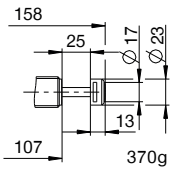
- Stroke variant: long (L)
- Hardness degree: Hard (H)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)
D -A	F -A	A -A
		
in a clean environment	against dust, chips, ...	against liquid, oil, ...

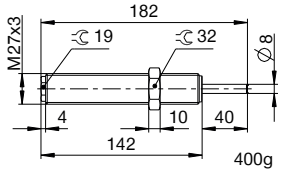
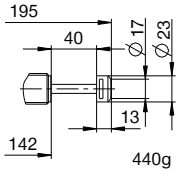
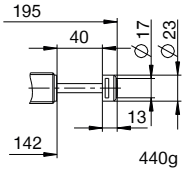
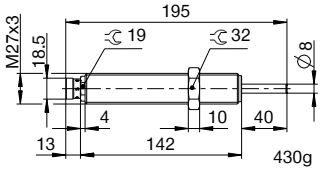
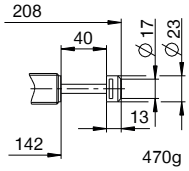
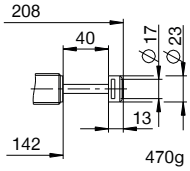
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head
	D -A	S -A	K -A
STANDARD ENERGY			
HIGH ENERGY			
ADJUSTABLE ENERGY			

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

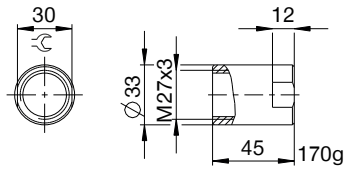
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M27X3.0

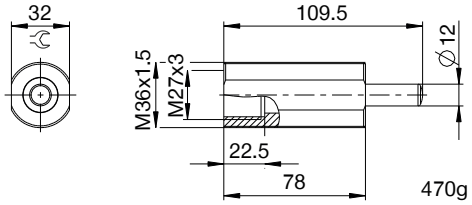
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH27X30-A**	Stop sleeve	Including 1x PVM27X30-A
2	**PBV27X30NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM36X15-A suitable for external thread of the side load adapter.
3	**PBV27X30NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM36X15-A suitable for external thread of the side load adapter.
4	**PBV27X30LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM36X15-A suitable for external thread of the side load adapter.
5	**PBV27X30LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM36X15-A suitable for external thread of the side load adapter.
6	**PKS27X30-A**	Clamping flange orthogonal screwed	On request.
7	**PKP27X30-A**	Clamping flange screwed in parallel	On request.
8	**PVM27X30-A**	Stainless steel locknut	Included with the industrial shock absorber.
9	**PDD27X30-A**	Pressure chamber seal	On request.

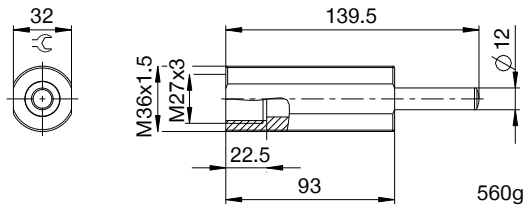
1



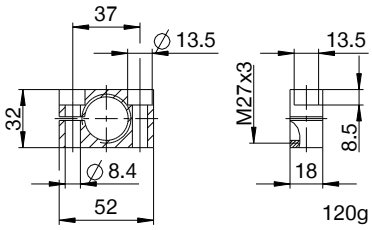
2 3



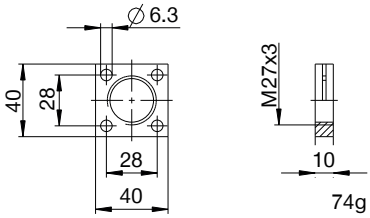
4 5



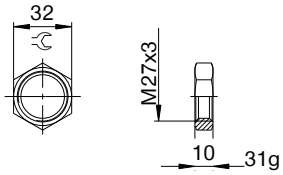
6



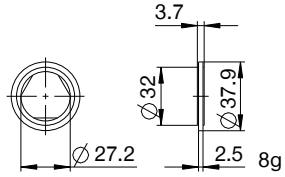
7



8



9



▶ CLASSIFICATION

P HE 27X30 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

27 Thread nominal diameter

X

30 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M33X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

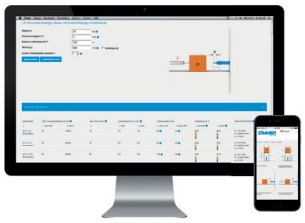
- **Standard Energy pressure max. (abs.)** 1 [bar]
- **High Energy pressure max. (abs.)** 10 [bar]
- **Adjustable Energy pressure max. (abs.)** 10 [bar]
- **Angle of Impact max.** 2 [°]
- **Max. piston return time** N: 0.5 / L: 0.8 [s]
- **Permitted temperature range** -10 ... +70 [°C]
- **Organic oil (biodegradable)** H1-certified
- **Locknut tightening torque max.** 80 [Nm]
- **Force in end position max.** 30 [kN]
- **Material** Stainless steel
- **Material fixed stop** Aluminum nickel plated
- **PWIS-free** Yes
- **RoHS compliant** Yes
- **REACH compliant** Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity min.	Impact velocity max.	Energy absorption max. Continuous operation per stroke	Energy absorption max. Continuous operation per hour	Energy absorption max. Emergency stop operation per stroke	Protection	Return force min.	Return force max.	Head	Version
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	33X15	N	30	H	0,1	1,2	185	140.000	185	D	15	35	D	-A
						M	0,8	2,2	185	140.000	185	A	15	35	S	
						S	1,8	3,5	185	140.000	185	F	15	35		
						W	3	5	185	140.000	185	B	15	230	K	
HIGH ENERGY	P	HE	33X15	N	30	H	0,1	1,2	400	140.000	800	D	40	65	D	-A
						M	0,8	2,2	360	140.000	650	A	40	65	S	
				L	50	S	1,8	3,5	320	140.000	500	F	40	65		
						W	3	5	280	140.000	350	B	40	260	K	
ADJUSTABLE ENERGY	P	AE	33X15	N	30	H	0,1	5	400	140.000	400	D	40	65	D	-A
				L	50							A	40	65	S	
												F	40	65		
												B	40	260	K	

▶ HOW TO ORDER CORRECTLY

P | HE | 33X15 | L | H | A | K | -A



Product finder

- Calculate shock absorbers quicker
- Clearly arranged selection guide
- Smart solution – available on mobile devices

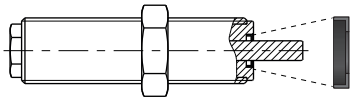
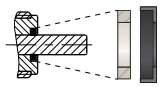
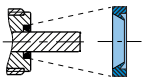
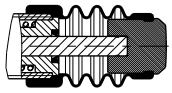
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 33X15

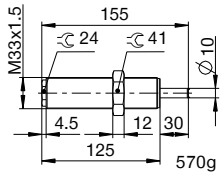
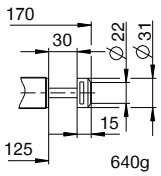
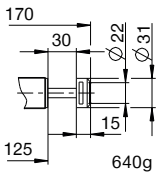
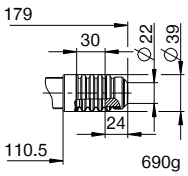
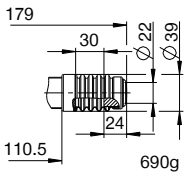
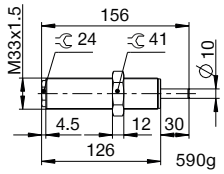
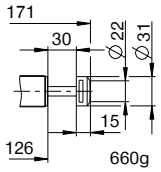
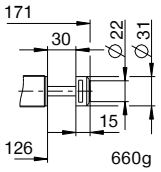
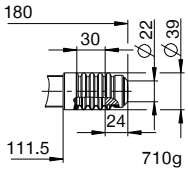
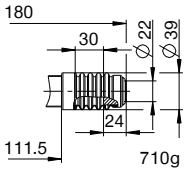
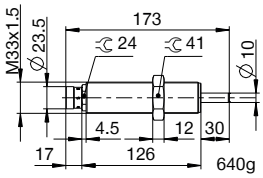
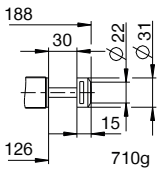
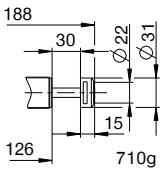
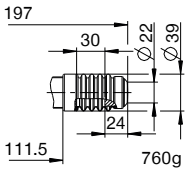
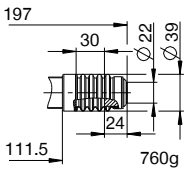
- Stroke variant: long (L)
- Hardness degree: Hard (H)
- Protection: wiper (A)
- Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)	Bellow (TPE)
D -A	F -A	A -A	B -A
			 on request
in a clean environment	against dust, chips, ...	against liquid, oil, ...	sealed

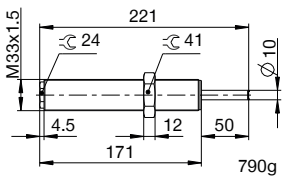
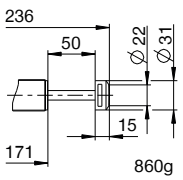
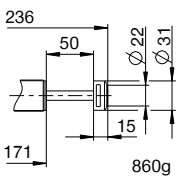
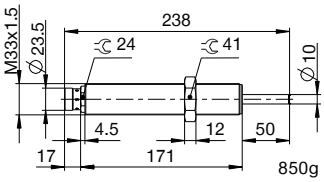
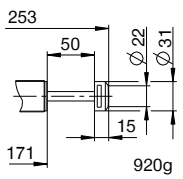
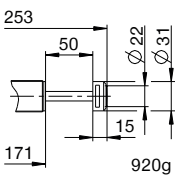
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head	with bellow and steel head	with bellow and plastic head
	D -A	S -A	K -A	B S -A	B K -A
STANDARD ENERGY					
HIGH ENERGY					
ADJUSTABLE ENERGY					

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

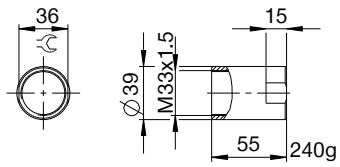
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M33X1.5

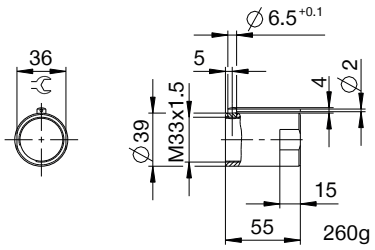
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH33X15-A**	Stop sleeve	Including 1x PVM33X15-A
2	**PSH33X15-A**	Sensor stop sleeve	Query only possible via damper with steel or plastic head (except for bellows). Inductive sensor, PNP closer (NO), PUR cable 2 m, degree of protection IP65. For further information see separate data sheet.
3	**PBV33X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM42X15-A suitable for external thread of the side load adapter.
4	**PBV33X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM42X15-A suitable for external thread of the side load adapter.
5	**PBV33X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM42X15-A suitable for external thread of the side load adapter.
6	**PBV33X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM42X15-A suitable for external thread of the side load adapter.
7	**PKS33X15-A**	Clamping flange orthogonal screwed	Tightening torque of the screws max. 9 Nm.
8	**PKP33X15-A**	Clamping flange screwed in parallel	Tightening torque of the screws max. 9 Nm.
9	**PVM33X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
10	**PDD33X15-A**	Pressure chamber seal	Recommended fixation with PVM33X15-A. Seal must be in full contact on both sides.

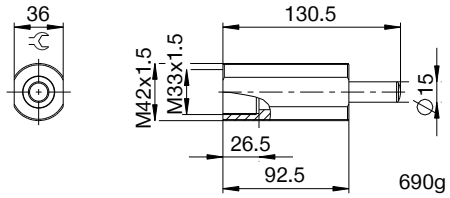
1



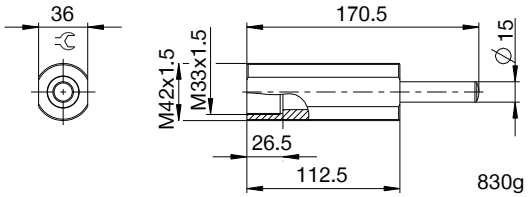
2



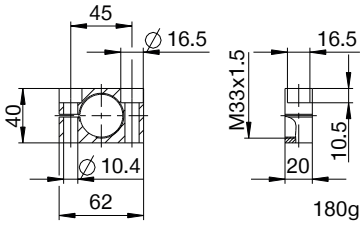
3 4



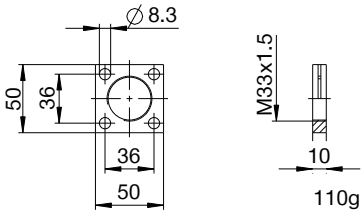
5 6



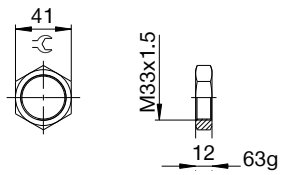
7



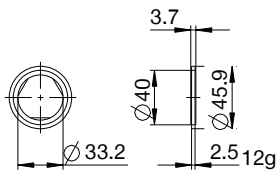
8



9



10



▶ CLASSIFICATION

P HE 33X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

33 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M36X1.5

▶ SERIES

PowerStop®

STANDARD ENERGY	HIGH ENERGY	ADJUSTABLE ENERGY
		
The economical	The powerful	The Adjustable

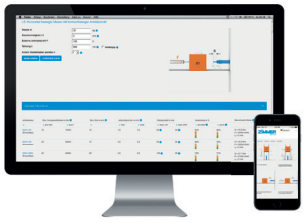
▶ **Standard Energy pressure max. (abs.)**	1 [bar]	▶ **Locknut tightening torque max.**	80 [Nm]
▶ **High Energy pressure max. (abs.)**	10 [bar]	▶ **Force in end position max.**	30 [kN]
▶ **Adjustable Energy pressure max. (abs.)**	10 [bar]	▶ **Material**	Stainless steel
▶ **Angle of Impact max.**	2 [°]	▶ **Material fixed stop**	Aluminum nickel plated
▶ **Max. piston return time**	N: 0.5 / L: 0.8 [s]	▶ **PWIS-free**	Yes
▶ **Permitted temperature range**	-10 ... +70 [°C]	▶ **RoHS compliant**	Yes
▶ **Organic oil (biodegradable)**	H1-certified	▶ **REACH compliant**	Yes

▶ TECHNICAL DATA

	Design	Series	Thread	Stroke variant	Stroke	Hardness degree	Impact velocity		Energy absorption max. Continuous operation		Energy absorption max. Emergency stop operation	Protection	Return force		Head	Version
							min.	max.	per stroke	per hour	per stroke		min.	max.		
					[mm]		[m/s]		[J]	[J/h]	[J]		[N]	[N]		
STANDARD ENERGY	P	SE	36X15	N	30	H	0,1	1,2	185	140.000	185	D	15	35	D	-A
						M	0,8	2,2	185	140.000	185	A	15	35	S	
						S	1,8	3,5	185	140.000	185					
						W	3	5	185	140.000	185	F	15	35	K	
HIGH ENERGY	P	HE	36X15	N	30	H	0,1	1,2	400	140.000	800	D	40	65	D	-A
						M	0,8	2,2	360	140.000	650	A	40	65	S	
				L	50	S	1,8	3,5	320	140.000	500					
						W	3	5	280	140.000	350	F	40	65	K	
ADJUSTABLE ENERGY	P	AE	36X15	N	30	H	0,1	5	400	140.000	400	D	40	65	D	-A
				L	50							A	40	65	S	
												F	40	65	K	

▶ HOW TO ORDER CORRECTLY

P HE 36X15 L H A K -A



Product finder

- ▶ Calculate shock absorbers quicker
- ▶ Clearly arranged selection guide
- ▶ Smart solution – available on mobile devices

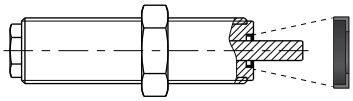
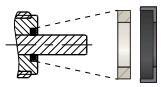
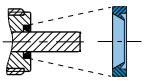
www.zimmer-group.de/en/pdti

Example order no.

PowerStop High Energy 36X15

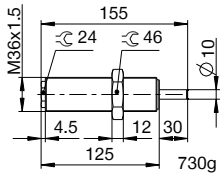
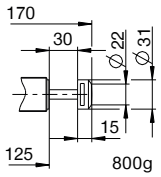
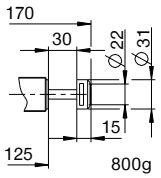
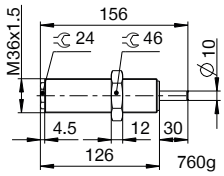
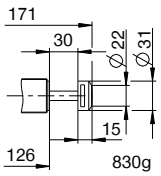
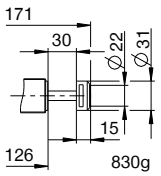
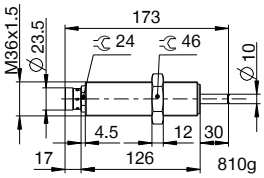
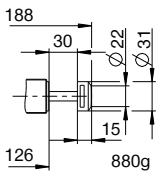
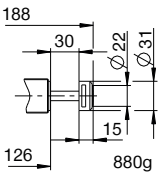
- ▶ Stroke variant: long (L)
- ▶ Hardness degree: Hard (H)
- ▶ Protection: wiper (A)
- ▶ Head: plastic head (K)

▶ PROTECTION

no protection	Felt ring	Wiper (NBR)
D -A	F -A	A -A
		
in a clean environment	against dust, chips, ...	against liquid, oil, ...

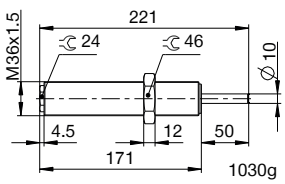
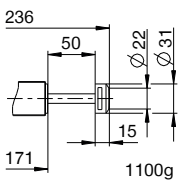
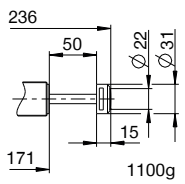
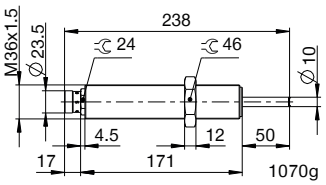
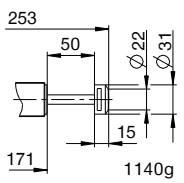
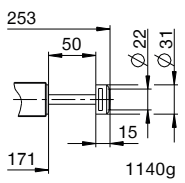
▶ TECHNICAL DRAWINGS – STANDARD STROKE

N -A

	no head	with steel head	with plastic head
	D -A	S -A	K -A
STANDARD ENERGY			
HIGH ENERGY			
ADJUSTABLE ENERGY			

▶ TECHNICAL DRAWINGS – LONG STROKE

L -A

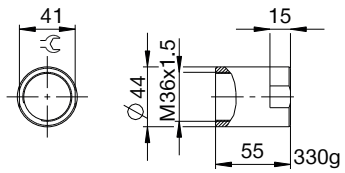
	no head	with steel head	with plastic head
	D -A	S -A	K -A
HIGH ENERGY			
ADJUSTABLE ENERGY			

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
THREAD M36X1.5

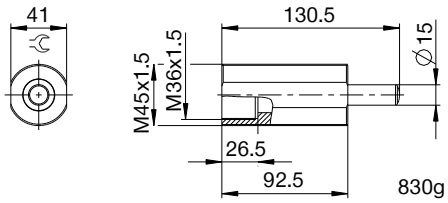
► ACCESSORIES

Pos.	Order no.	Accessories	Remarks
1	**PAH36X15-A**	Stop sleeve	Including 1x PVM36X15-A
2	**PBV36X15NA-A**	Side load adapter standard stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM45X15-A suitable for external thread of the side load adapter.
3	**PBV36X15NF-A**	Side load adapter standard stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM45X15-A suitable for external thread of the side load adapter.
4	**PBV36X15LA-A**	Side load adapter long stroke Protection: wiper (NBR)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM45X15-A suitable for external thread of the side load adapter.
5	**PBV36X15LF-A**	Side load adapter long stroke Protection: felt ring (felt)	Impact angle max. 30°. Can only be used in combination with industrial shock absorbers without head. Locknut PVM45X15-A suitable for external thread of the side load adapter.
6	**PKS36X15-A**	Clamping flange orthogonal screwed	On request.
7	**PKP36X15-A**	Clamping flange screwed in parallel	On request.
8	**PVM36X15-A**	Stainless steel locknut	Included with the industrial shock absorber.
9	**PDD36X15-A**	Pressure chamber seal	On request.

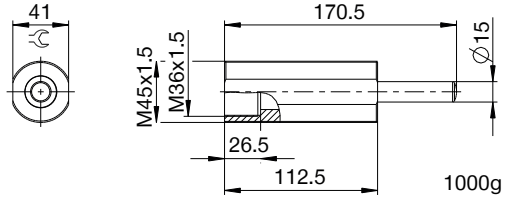
1



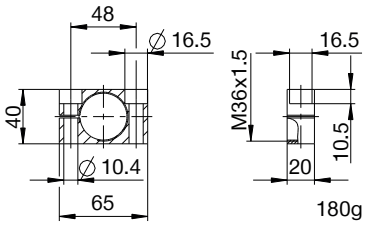
2 3



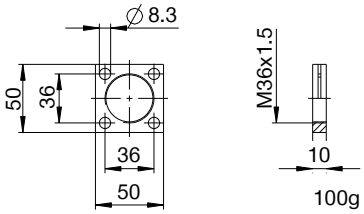
4 5



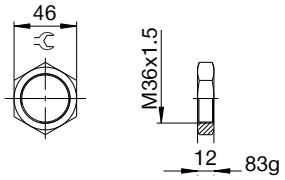
6



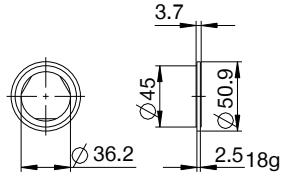
7



8



9



▶ CLASSIFICATION

P HE 36X15 L H A K -A

Design

P Industrial shock absorbers PowerStop

Series

ME Mini Energy

SE Standard Energy

HE High Energy

AE Adjustable Energy

Thread

36 Thread nominal diameter

X

15 Thread pitch (factor 10)

Stroke variant

N Standrad stroke

L Long stroke

V Extra long stroke

Hardness degree

H Hard (0.1 - 1.2 m/s; Adjustable Energy: 0.1 - 5 m/s)

M Medium (0.8 - 2.2 m/s)

S Soft (1.8 - 3.5 m/s)

W Supersoft (3 - 5 m/s)

Protection

D no protection

F Felt ring

A Wiper (NBR)

B Bellow (TPE)

Head

D no head

S with steel head

K with plastic head

Version

-A Versioning from a to z

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
CUSTOM SOLUTIONS AND SYSTEMS

▶ SPECIAL SOLUTIONS

Certifications and approvals



- Upon customer request, we develop components and systems that meet various approval specifications, certification requirements or standards classifications.
- Examples of these include CE marking or EC type examination, explosion protection, electric protection type, RoHS conformity, REACH conformity, freedom from paint-wetting impairment substances, cleanroom classification, medical product approval, suitability for foodstuffs, sea water resistance.

Shock absorbers for pallet circulation systems



- Specially tailored shock absorbers for applications with greatly varying, moving masses and/or velocities, whereby, however, the end position should always be reached.
- Integrated valve connections make it possible to cover large energy and velocity ranges with independent adjustment so that the mass reaches the end position safely
- Ideal for use in pallet circulation systems.

Heavy load emergency stop damper



- Customer-specific special solutions for robot portal systems.
- Dampers made from coated steel with an energy absorption of 6,500 Nm per stroke.
- The damper has a damping stroke of 100 mm and an outer diameter of 60 mm.

Sliding door dampers



- Customer-specific special solutions for sliding glass doors.
- Dampers made from high-strength aluminum with an energy absorption of 100 Nm per stroke.
- The damper has a damping stroke of 30 mm and an outer diameter of 20 mm.

I-Class emergency stop shock absorber



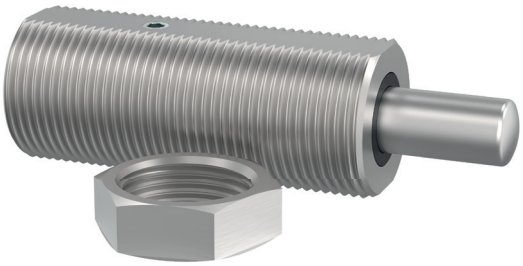
- The intelligent solution for emergency stop applications where the shock absorber is operated constantly but damping only occurs in an emergency.
- Damping is triggered only after reaching a preset velocity.
- For example, use on machine tool axles that do not require damping during workpiece machining, but which move with rapid traverse in the event of an emergency stop.

Twin damping as accessory



- Installation of a shock absorber in the twin damping accessory enables the activation of the shock absorber from both sides.
- This space- and cost-saving solution transforms a single-action into a dual-action shock absorber.
- For a representation of the principle see Tip 5 page 126.

Air barrier adapter



- An air barrier adapter is recommended if there is increased dirt buildup.
- Connecting a compressed air supply enables an air cushion to protect the shock absorbers from the ingress of dirt particles.
- The basis for this is the PBV side load adapter, which increases the permissible angle of impact to 30°.

Hinge dampers



- For the gentle damping of doors, folding tables or other rotational applications.
- Industrial shock absorber with spiral groove integrated into the hinge.
- Converts the rotational movement into linear damping.

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
SPECIAL SOLUTIONS AND SYSTEMS

► SYSTEMS

Dampers for Ottobock prosthetic knee and hip joints

The medical technology company Ottobock, with its head office in Duderstadt, Germany, is the global market leader in the prosthetics segment. The goal of returning mobility to people with handicaps and protecting the functions they still have encompasses the entire product world of the company.







For many years now, the "Knee and Hip Development" department of Ottobock has been working together closely with the "Industrial Damping Technology" division of Zimmer Group. Zimmer is active here as an innovative development partner. Many dampers have been developed together and are used in leg external prosthetic devices from Ottobock.





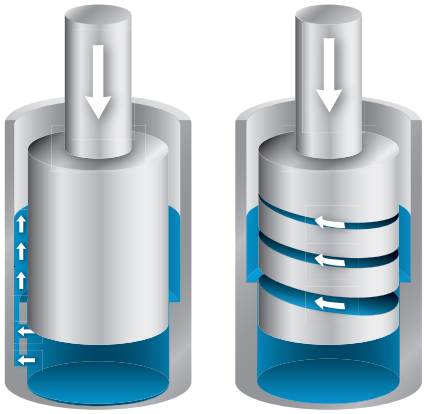
- Use in prosthetic knee and hip joints for damping swing and standing phases
- Individually adjustable dampers in pull and push directions
- Adjustment of the curve to movement processes
- High energy absorption for the smallest space

Appeared in abridged form in the industry periodical **Konstruktion** July/August 7/8-2014

INDUSTRIAL SHOCK ABSORBERS POWERSTOP
SHOCK ABSORBERS WITH A DNA STRUCTURE

When James Watson and Francis Crick revealed the structure of human DNA in 1953, they answered the question of how so much genetic information can be stored biologically in such a small space: the simple, yet ingenious, helix structure. From a geometric perspective, a helix is a strand of material wound around a cylinder to create a spiral shape. Everyday examples include pressure springs or the threads of a screw. Today, the same structure that fascinated biochemical researchers at that time is revolutionizing the way industrial shock absorbers work. This industrial helix structure is called a spiral groove.

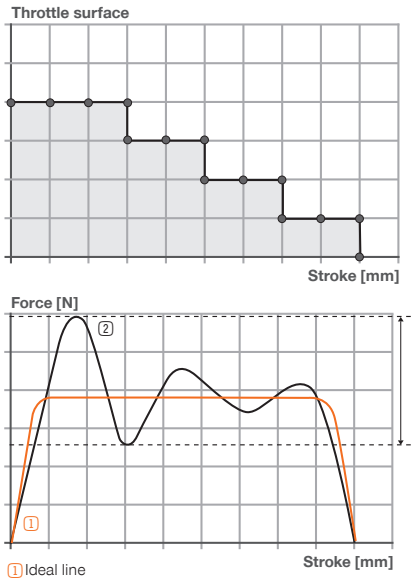
Technologies: Spiral groove vs. throttle bores



Confronted with the question of how to overcome the drawbacks of conventional throttle bore shock absorbers used in industry, researchers at Zimmer Group developed spiral groove technology, which provides the necessary throttling of an oil flow in a completely new way. This innovative technology, which has since been used in the “PowerStop” shock absorbers from Zimmer Group (technology area: Industrial Damping Technology), places competitor products in the shade with regard to the highest energy absorption in the smallest space and low-vibration damping of moving masses.

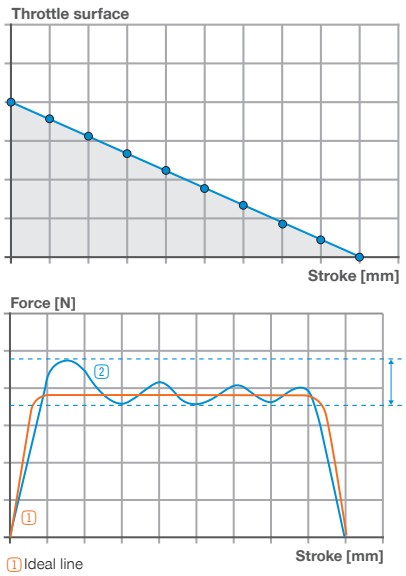
Conventional industrial shock absorbers work according to the throttle bore principle, which utilizes holes to throttle the flow of oil. The damping effect is produced as the retracting piston causes openings arranged above the stroke to close one at a time. Unfortunately, this design creates a multi-step damping characteristic, resulting in oscillation. These vibrations can cause damage to the system and result in uneven breaking of the mass. Of course, this defeats the purpose of dampers, which are used specifically to avoid damage to components and achieve smooth stopping of an object.

Throttle bores:
Throttle type and characteristics



1 Ideal line
2 Conventional shock absorbers

Spiral groove:
Throttle type and characteristics



1 Ideal line
2 PowerStop

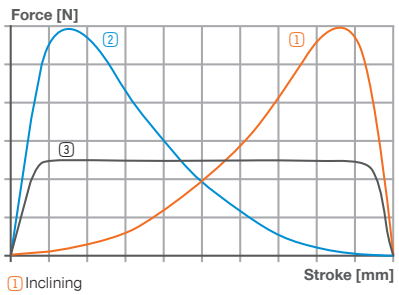
Even throttle behavior

Only PowerStop shock absorbers with the unique spiral groove technology can achieve these goals. In the process, a spiral groove around the circumference of the piston ensures even throttle behavior. The groove itself tapers as it moves up the piston, resulting in smooth and even damping characteristics. Only this design can achieve low-oscillation damping and smooth braking of an object in motion.

At the same time, optimized loads at every piston position enable maximum energy absorption with low space requirements. On top of this, the flow of oil in the spiral groove ensures that there is always a film of oil between the moving piston and the housing. This hydrostatic piston movement lays the foundation for low-wear components that maximize service life.

A wide variety of standard components for the most varied damping requirements is available for your systems and equipment. In addition, through flexible adaptation of the spiral groove, a special damper designed for particular uses can be provided as a semi-standard component. Developers from the Industrial Damping Technology division can also create complete, customized system solutions for you.

Individual damping characteristics



1 Inclining
2 Declining
3 Linear-constant

Zimmer Group has the experience and know-how to support its customers as a development partner in the field of damping technology. Its PowerStop series of industrial shock absorbers provides users with complete solutions for virtually any set of requirements and operating conditions, ensuring that the customer always has the optimal damping tool possible, true to the motto, “When in doubt, damp it out!”

PROFILE DAMPERS
BASICSTOP



PROFILE DAMPERS BASICSTOP
KNOW-HOW

The BasicStop profile dampers feature high-performance plastic and a specifically developed profile.
It acquires its unique properties after receiving a special treatment. These properties allow it to absorb maximum amounts of energy even under the toughest conditions, while also achieving high damping rates.



Our expertise – your advantages:

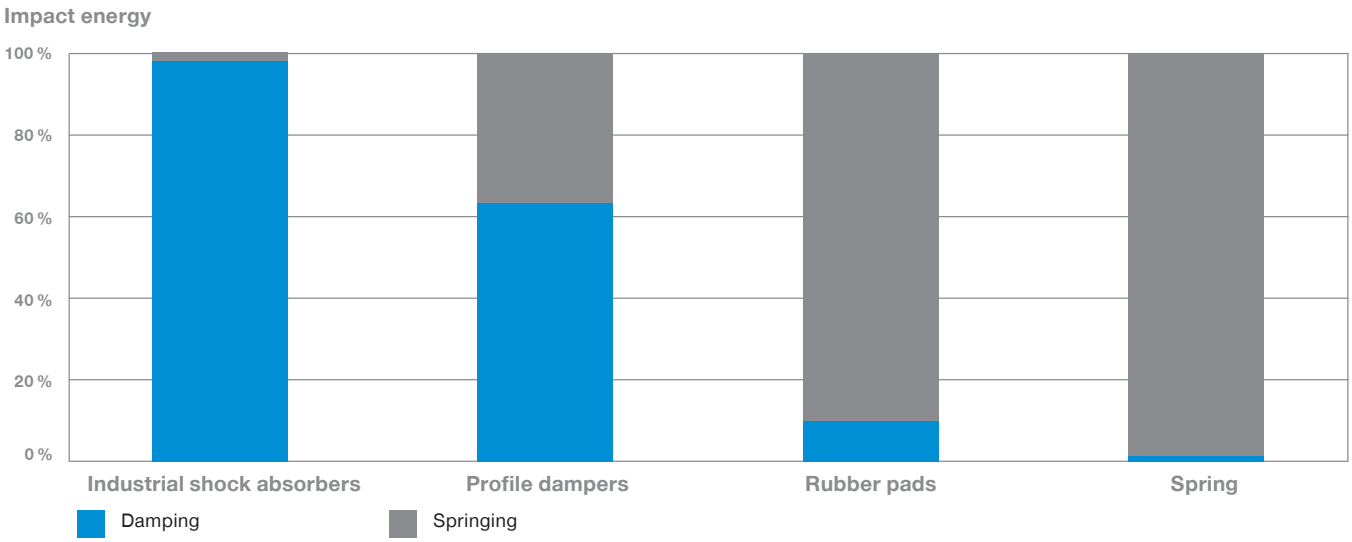
- TPC high-performance plastic:
  Thermoplastic elastomer on a copolyester basis
  High durability and resistance to media*
  No swelling, embrittlement or decomposition of the material, as is the case with rubber*
  Large temperature range
- Special process for conditioning the material:
  High damping percentage and high energy absorption in the smallest space
  Reliable return behavior
  Increased service life in comparison to rubber pads
- Design of the structure:
  Standard product portfolio with 3 series x 2 degrees of hardness
  Individual configuration for customized solutions possible
- Expertise in design and production at Zimmer
- Usability independent of velocity
- 100% recyclable due to thermoplastic properties

* For chemical and media resistance see page 104

Function

- Unlike hydraulic industrial shock absorbers, material dampers do not damp 100% of the absorbed energy. Instead, they convert only a specific percentage of the kinetic energy into heat. This is called the damping percentage. The residual energy, on the other hand, is stored in the material as spring energy, which is released again when the damper is reset.
- Conventional rubber pads only have a very small damping percentage and are more of a spring than a damper. Use of these pads hardly takes any kinetic energy from the system, which in turn can lead to damage to the system.
- This is where the BasicStop brand profile dampers are setting new standards in the realm of material damping with their high damping percentage. Through the friction in the material, a large part of the kinetic energy is converted into heat, whereupon the structural damper returns to its original form (viscoelastic damping).

Damping vs. springing



Service life

- Rubber materials fail after certain intervals of time due to settling losses, creep behavior, media incompatibility or overloading, which results in high maintenance costs for the user. With BasicStop, long service life is achieved even under the toughest conditions, which dispenses with unnecessary maintenance costs.

Characteristics and damping percentage of the shock absorber curve

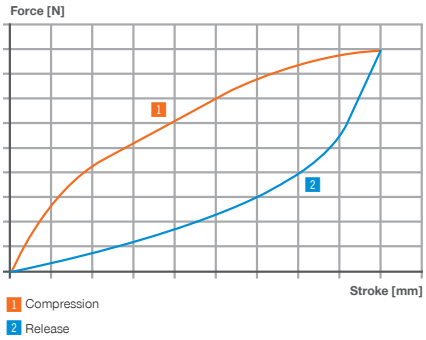
- The characteristic of the shock absorber curve for force over stroke is dependent upon the structural design of the respective series, but, in contrast with hydraulic shock absorbers, the impact velocity has no effect on the characteristic. This is why material dampers can be used irrespective of the velocity.
- However, the damping percentage depends upon the impact velocity. This increases in certain areas with increasing velocity, until it reaches its maximum. The damping percentage also increases with an increasing degree of hardness of the TPC.

PROFILE DAMPERS BASICSTOP
THE SERIES AT A GLANCE



Axial Standard

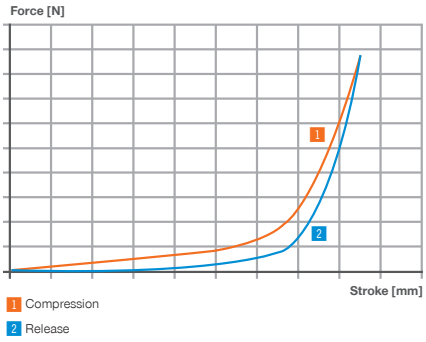
- Design: Axial
- Degrees of hardness: 55D, 40D
- Energy absorption per stroke: 2 - 2,951 Nm
- Damping percentage: up to 75%





Axial Advanced

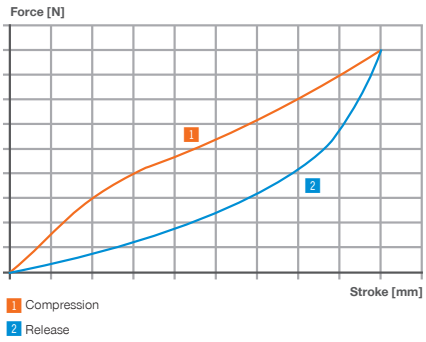
- Design: Axial
- Degrees of hardness: 55D, 40D
- Energy absorption per stroke: 450 - 17,810 Nm
- Damping percentage: up to 65%



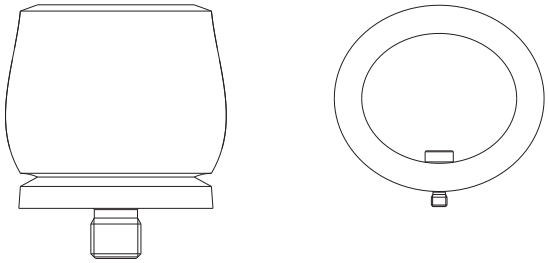


Radial Standard

- Design: Radial
- Degrees of hardness: 55D, 40D
- Energy absorption per stroke: 1.2 - 427 Nm
- Damping percentage: up to 60%

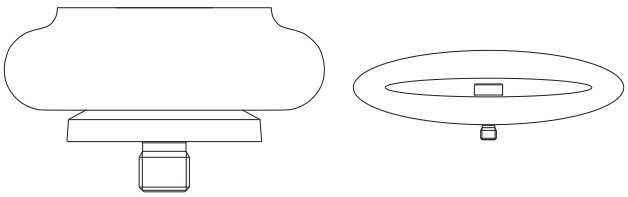


PROFILE DAMPERS BASICSTOP
FUNCTIONAL SEQUENCE



1. Home position

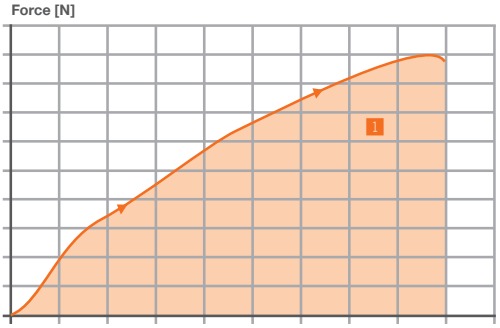
Unstressed in unshaped state.



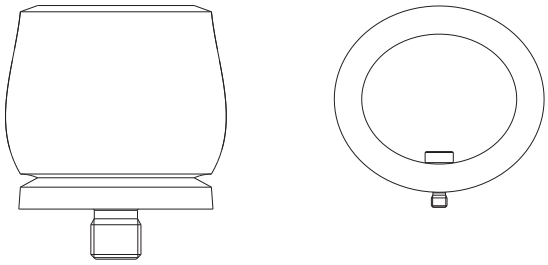
2. Compression with damping

External force or kinetic energy (impact) compresses the profile damper

- Walls are deformed by the stroke and expand or curve outward due to the structural design.
- Due to the structural structure of the material body, a force (damping or supporting force) is generated via the stroke that counters the movement.
- Due to the friction inside the TPC material, a large proportion of the kinetic energy is transformed into heat (**viscoelastic damping**).

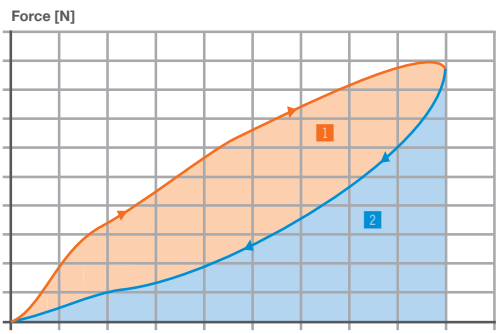


1 Energy absorption



3. Returning

- The part of the kinetic energy that is not damped during the stroke is stored as spring energy in the material body (**viscoelastic damping**).
- This spring energy causes a return of the body to the starting position via the return stroke (**viscoelastic damping**).
- Rebound of the mass as long as the acting force of the mass is less than the return force of the structural damper.
- Ratio of damping energy to kinetic energy in the impact is designated as damping percentage.



1 Damping energy
2 Spring energy

PROFILE DAMPERS BASICSTOP
CHEMICAL AND MEDIA RESISTANCE

Chemicals	Effect
Acetone	Weak
Acetylene	None
Formic acid (diluted)	Weak
Aniline	Strong
ASTM oil No. 1 (149°C)	None
ASTM oil No. 3 (149°C)	None
ASTM reference fuel A	None
ASTM reference fuel B (70°C)	None
ASTM reference fuel C (70°C)	Weak
ASTM reference fuel C	None
Gasoline	None
Benzene	Weak
Beer	None
Bromine, liquid free of water	Strong
Butane	None
Butyl acetate	Weak
Calcium chloride solutions	None
Chlorine gas, wet and dry	Strong
Chloroacetic acid	Strong
Chlorobenzene	Strong
Chloroform	Strong
Chlorosulfuric acid	Strong
Citric acid solutions	None
Cyclohexane	None
Steam (110°C)	Strong
Dibutyl phthalate	None
Diethyl sebacate	None
Dioctyl phthalate	None
Iron(III)-chloride solutions	Weak
Glacial acetic acid	None
Epichlorohydrin	Strong
Acetic acid, 20% - 30%	None
Ethanol	None
Ethyl acetate	Weak
Ethyl chloride	Strong
1,2-dichloroethane	Strong
Ethylene glycol	None
Ethylene oxide	None
Fluoric acid, 48%	Strong
Fluoric acid, 75%	Strong
Fluoric acid, free from water	Strong
Formaldehyde, 40%	Weak
Freon 11, 12, 114	None
Freon 113 (54°C)	None
Glycerin	None
Isooctane	None
Isopropanol	None
Jet Fuel JP-4	None
Potassium hydroxide solutions (diluted)	None
Kerosene	Weak
Carbon dioxide	None
Carbon monoxide	None
Copper chloride solutions	None
Copper sulfate solutions	None
Paint solvent	Weak
Linseed oil	Strong
Magnesium chloride solutions	Strong

Chemicals	Effect
Magnesium hydroxide solutions	Strong
Sea water	None
Methanol	None
Methylene chloride	Strong
Butanone	Weak
Mineral oil	None
Naphtha	None
Naphthalene	Weak
Sodium chloride solutions	None
Sodium hydroxide, 20%	None
n-hexane	None
Nitrobenzene	Strong
Oil SAE 10	None
Oleum, 20% - 25%	Strong
Oleic acid	None
Palmitic acid	None
Perchlorethylene	Strong
Phenol	Strong
Pyridine	Strong
Nitric acid, 10%	Weak
Nitric acid, 30% - 70%	Strong
Nitric acid, strong/red fuming	Strong
Hydrochloric acid, 20%	Weak
Hydrochloric acid, 37%	Strong
Sulfuric acid, 50%	Strong
Sulfurous acid	Weak
Soap solutions	None
Silicone grease	None
Skydrol 500B	None
Tannin, 10%	None
Carbon tetrachloride	Strong
Tetrahydrofuran	Weak
Toluene	Weak
Trichlorethylene	Strong
Triethanolamine	Strong
Trisodium phosphate solution	None
Tung oil	Weak
Water (70°C)	Weak
Hydrogen	None
Xylene	Weak
Zinc chloride solutions	None

Classification of effect:

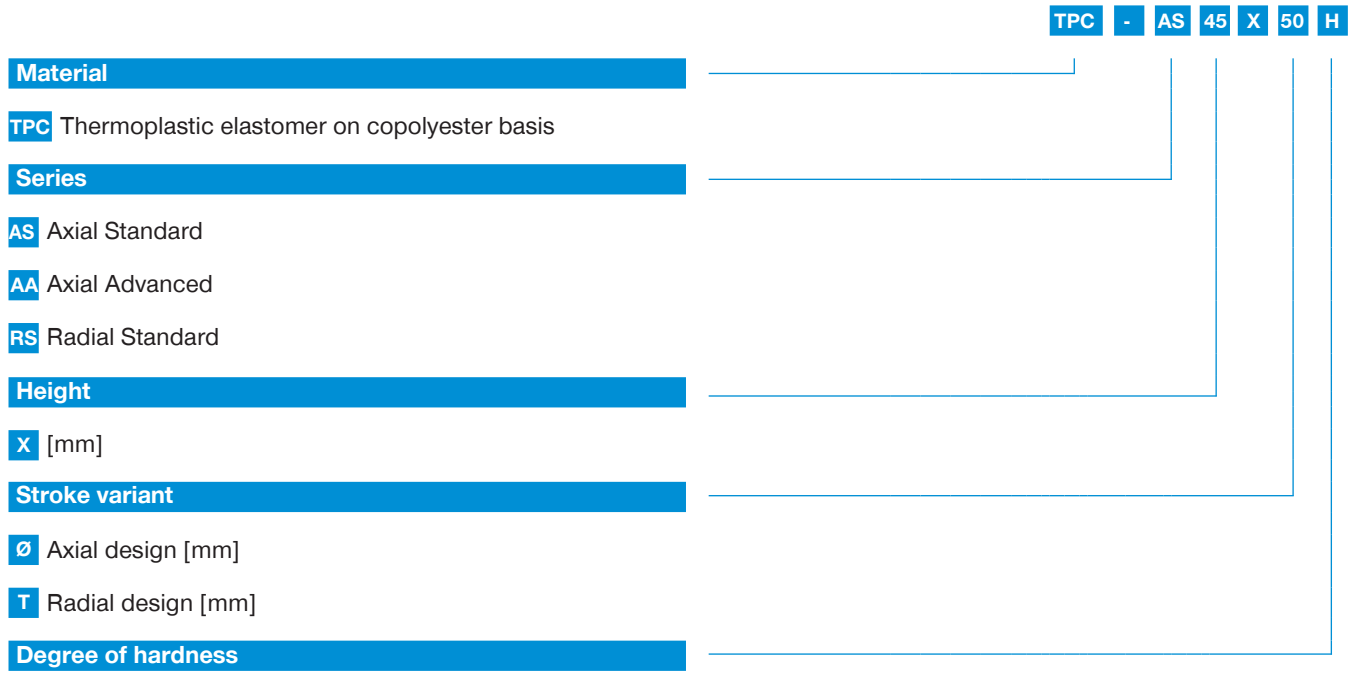
- **None:** No sustained reaction, as almost no absorption and almost no effect on mechanical properties.
- **Weak:** Minor effect due to a certain absorption with slight swelling and slight worsening of the mechanical properties.
- **Strong:** Use not recommended, as material changes for the worse in a short time.

No guarantee or liability is provided or assumed for this chemical and media resistance list. It is only meant as a point of reference. Other chemical and media resistances upon request or checking through own tests.

PROFILE DAMPERS BASICSTOP
PRODUCT KEY

Selection of profile dampers

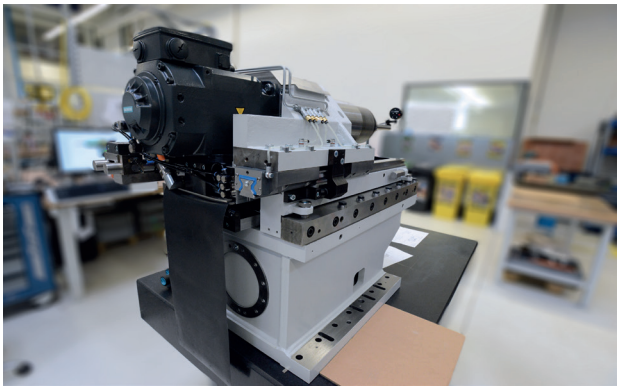
- by series, installation size and degree of hardness

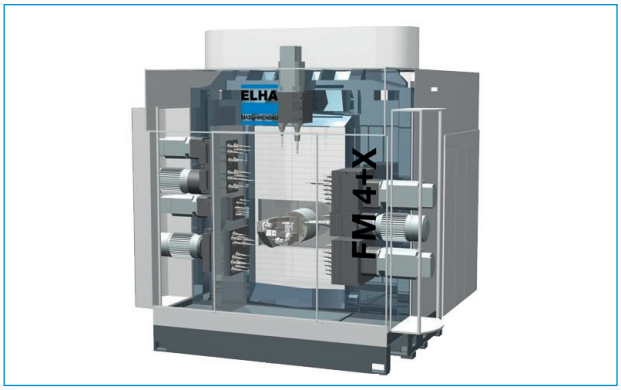


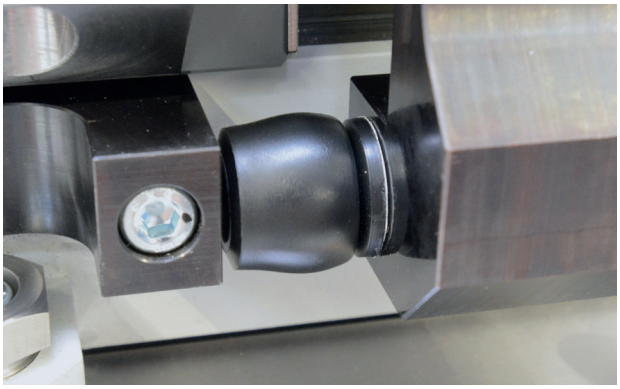
Notes:

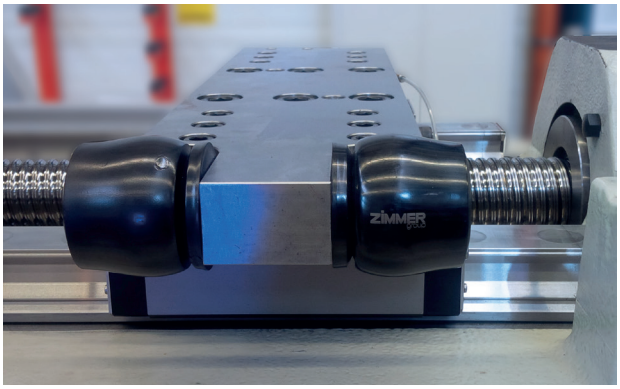
- Delivery including a nickel-plated special screw for simple and safe installation.
- The energy absorption and the impact velocity can be determined with the help of the shock absorber selection guide online at **www.zimmer-group.com/pdti** or with the formulas and calculations listed in the catalog.
- For the installation space, use the dimensions without loads and at complete deformation.

PROFILE DAMPERS BASICSTOP
APPLICATIONS





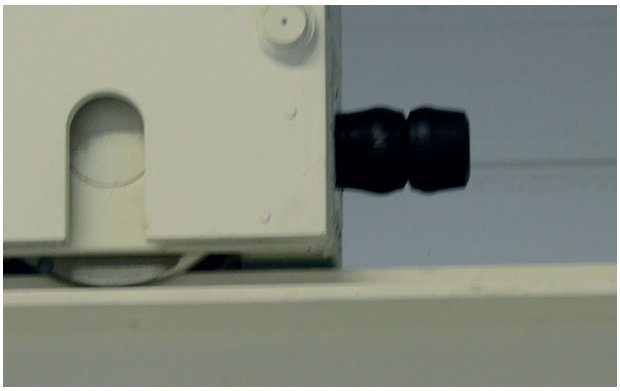




▶ Emergency stop protection in the movement axis of a spindle tailstock

▶ End-position damping in the linear axes of production modules from ELHA







▶ Emergency stop damping on a portal crane

▶ Machine door damping in a machining center

PROFILE DAMPERS BASICSTOP
OVERVIEW OF PRODUCTS

	Series	Degree of hardness	Max. energy per stroke [Nm]		Stroke	Thread M	Page
			Duration	Emergency stop	[mm]		
	AXIAL STANDARD	Shore 55D	2-2014	3-2951	5-47	M3-M16	108
		Shore 40D	2-902	3-966	7-56	M4-M16	108
	AXIAL ADVANCED	Shore 55D	1640-8330	2295-11660	30-67	M12-M16	110
		Shore 40D	450-12725	630-17810	30-198	M12-M16	110
	RADIAL STANDARD	Shore 55D	2,7-290	5,7-427	15-56	M5-M8	112
		Shore 40D	1,2-115	1,8-146	17-60	M5-M8	112

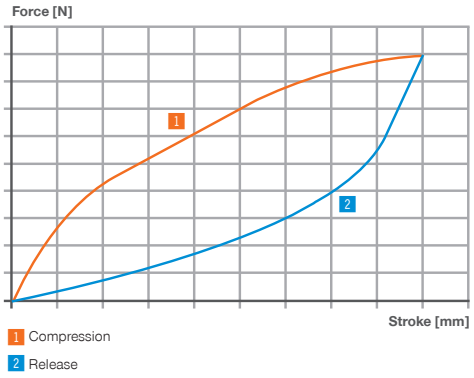
PROFILE DAMPERS BASICSTOP
SERIES AXIAL STANDARD

▶ PRODUCT SPECIFICATIONS



▶ **Design**	Axial
▶ **Shore hardness, hard**	55D
▶ **Shore hardness, medium**	40D
▶ **Damping proportion Hard**	up to 75 %
▶ **Damping proportion Medium**	up to 65 %
▶ **Impact speed**	0 ... 10 [m/s]
▶ **Permitted temperature range**	-50 ... +90 [°C]
▶ **Angle of Impact max.**	15 [°]
▶ **PWIS-free**	Yes
▶ **RoHS compliant**	Yes
▶ **REACH compliant**	Yes

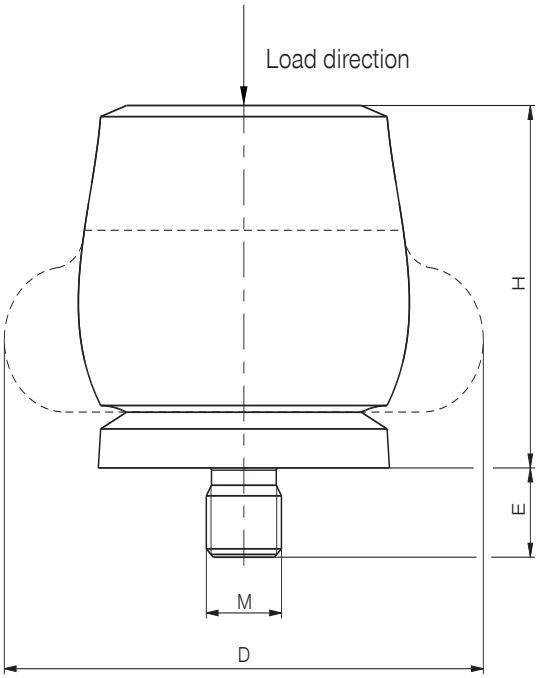
▶ TECHNICAL DATA



▶ **Installation instructions**

Order No.	Thread M	Wrench size [mm]	Max. tightening torque [Nm]	Weight [g]
TPC-M3-A	M3	2	1.3	0.4
TPC-M4-A	M4	2.5	2.9	1
TPC-M5-A	M5	3	4.5	2
TPC-M6-A	M6	5	7	4
TPC-M8-A	M8	6	17	13
TPC-M12-A	M12	10	60	29
TPC-M16-A	M16	14	180	94

The profile dampers must completely contact the underside.
The screws are included in the scope of delivery of the respective BasicStop structural damper. These can also be ordered individually.



▶ TECHNICAL DATA

▶ Axial Standard

		Energy absorption max.			Stroke max.	Height H	Diameter D		Screw-in depth max. E	Thread M	Weight
		Continuous operation		Emergency stop operation							
		per stroke	per hour	per stroke		Stroke=0	Stroke=0	Stroke=max.			(incl. screw)
	Order No.	[J]	[J/h]	[J]	[mm]	[mm]	[mm]	[mm]	[mm]		[g]
HARD	TPC-AS11X12H	2	60	3	5	11	12	15	3	M3	2
	TPC-AS16X17H	6	180	9	6	16	17	21	4	M4	4
	TPC-AS18X21H	10	300	16	9	18	21	26	5	M5	7
	TPC-AS19X22H	11.5	345	21	9	19	22	27	6	M6	9
	TPC-AS26X28H	29	870	46	12	26	28	36	6	M6	15
	TPC-AS30X34H	48	1,440	87	14	30	34	43	6	M6	22
	TPC-AS33X37H	65	1,950	112	16	33	37	48	6	M6	28
	TPC-AS35X39H	82	2,460	130	16	35	39	50	8	M8	41
	TPC-AS38X43H	112	3,360	165	18	38	43	55	8	M8	53
	TPC-AS41X46H	140	4,200	173	19	41	46	59	12	M12	77
	TPC-AS45X50H	170	5,100	223	22	45	50	64	12	M12	86
	TPC-AS47X53H	201	6,030	334	22	47	53	68	12	M12	100
	TPC-AS51X57H	242	7,260	302	24	51	57	73	12	M12	117
	TPC-AS54X62H	304	9,120	361	25	54	62	77	12	M12	131
	TPC-AS57X65H	374	11,220	468	27	57	65	82	12	M12	152
	TPC-AS60X69H	421	12,630	524	29	60	69	86	12	M12	174
	TPC-AS65X71H	482	14,460	559	31	65	71	91	16	M16	258
	TPC-AS69X79H	570	17,100	831	32	69	79	100	16	M16	312
	TPC-AS74X82H	683	20,490	921	35	74	82	105	16	M16	352
	TPC-AS76X85H	797	23,910	1043	36	76	85	109	16	M16	395
	TPC-AS80X89H	934	28,020	1249	38	80	89	114	16	M16	431
	TPC-AS86X97H	1147	34,410	1555	40	86	97	123	16	M16	516
	TPC-AS101X116H	2014	60,420	2951	48	101	116	146	16	M16	803
	Order No.										
MEDIUM	TPC-AS15X14M	2	60	3	7	15	14	19	4	M4	2
	TPC-AS19X17M	4	120	6	8	19	17	24	5	M5	6
	TPC-AS21X20M	6	180	7	11	21	20	27	6	M6	8
	TPC-AS28X26M	11.5	345	15	14	28	26	37	6	M6	13
	TPC-AS32X31M	23	690	26	16	32	31	44	6	M6	20
	TPC-AS36X35M	30	900	36	19	36	35	48	6	M6	25
	TPC-AS38X37M	34	1,020	42	19	38	37	51	6	M6	31
	TPC-AS41X41M	48	1,440	63	21	41	41	55	12	M12	63
	TPC-AS45X44M	63	1,890	72	23	45	44	60	12	M12	69
	TPC-AS49X48M	81	2,430	91	25	49	48	64	12	M12	80
	TPC-AS52X51M	92	2,760	114	27	52	51	69	12	M12	91
	TPC-AS55X54M	122	3,660	158	29	55	54	73	12	M12	107
	TPC-AS59X58M	149	4,470	154	31	59	58	78	12	M12	123
	TPC-AS62X61M	163	4,890	169	32	62	61	83	16	M16	200
	TPC-AS66X64M	208	6,240	254	34	66	64	87	16	M16	227
	TPC-AS69X68M	227	6,810	272	35	69	68	92	16	M16	247
	TPC-AS75X75M	291	8,730	408	38	75	75	101	16	M16	292
	TPC-AS79X77M	352	10,560	459	40	79	77	105	16	M16	335
	TPC-AS84X82M	419	12,570	620	44	84	82	110	16	M16	372
	TPC-AS85X84M	475	14,250	635	43	85	84	115	16	M16	395
	TPC-AS92X90M	580	17,400	778	47	92	90	124	16	M16	463
	TPC-AS109X107M	902	27,060	966	56	109	107	147	16	M16	698

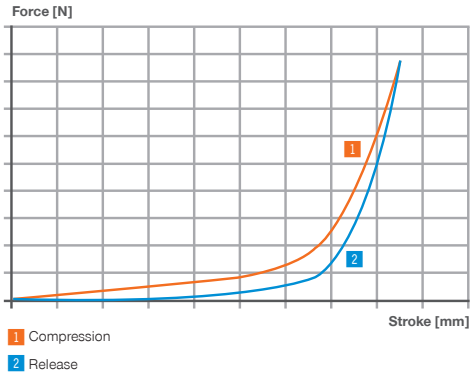
PROFILE DAMPERS BASICSTOP
SERIES AXIAL ADVANCED

▶ PRODUCT SPECIFICATIONS



▶ **Design**	Axial
▶ **Shore hardness, hard**	55D
▶ **Shore hardness, medium**	40D
▶ **Damping proportion Hard**	up to 65 %
▶ **Damping proportion Medium**	up to 65 %
▶ **Impact speed**	0 ... 10 [m/s]
▶ **Permitted temperature range**	-50 ... +90 [°C]
▶ **Angle of Impact max.**	15 [°]
▶ **PWIS-free**	Yes
▶ **RoHS compliant**	Yes
▶ **REACH compliant**	Yes

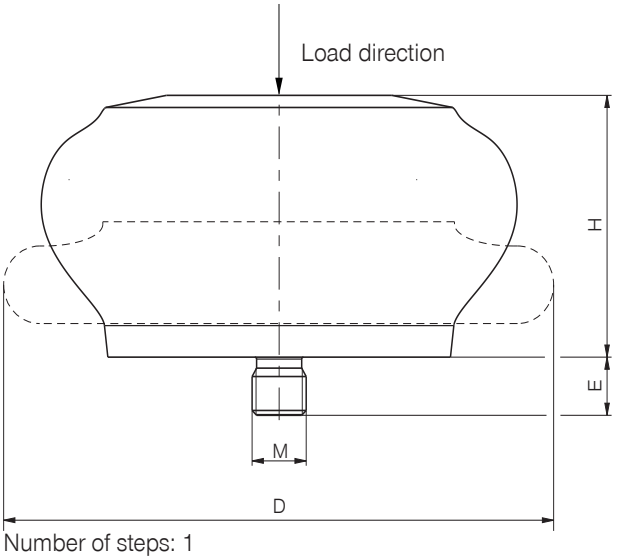
▶ TECHNICAL DATA



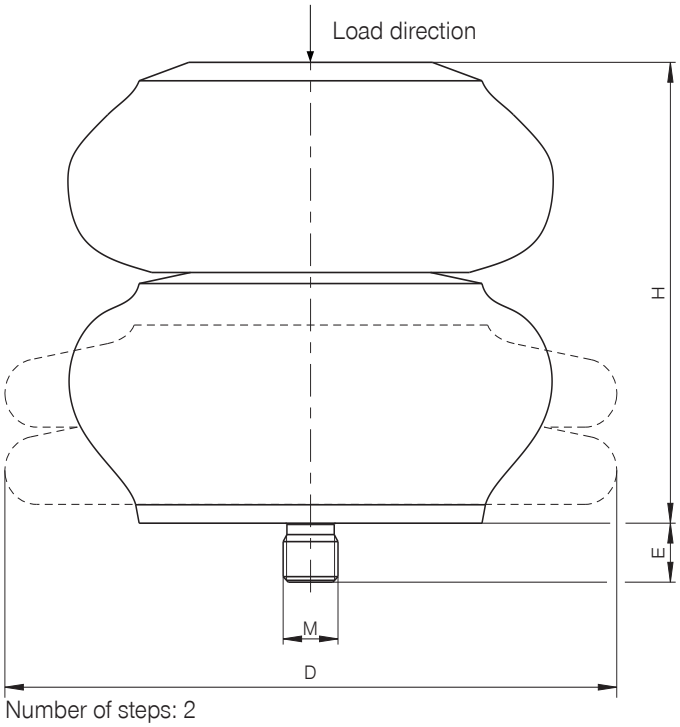
▶ **Installation instructions**

Order No.	Thread M	Wrench size [mm]	Max. tightening torque [Nm]	Weight [g]
TPC-M12-A	M12	10	60	29
TPC-M16-A	M16	14	180	94
TPC-M20-A	M20	17	300	190

The profile dampers must completely contact the underside.
The screws are included in the scope of delivery of the respective BasicStop structural damper. These can also be ordered individually.



Number of steps: 1



Number of steps: 2

▶ TECHNICAL DATA

▶ Axial Advanced

	Order No.	Energy absorption max. Continuous operation per stroke [J]	Energy absorption max. Continuous operation per hour [J/h]	Energy absorption max. Emergency stop operation per stroke [J]	Stroke max. [mm]	Height H Stroke=0 [mm]	Diameter D Stroke=0 [mm]	Diameter D Stroke=max. [mm]	Number of steps	Screw-in depth max. E [mm]	Thread M	Weight (incl. screw) [g]
MEDIUM / HARD	**TPC-AA79X64M**	450	13,500	630	62	79	64	89	2	12	M12	177
	TPC-AA96X74M	980	29,400	1372	75	96	74	114	2	12	M12	241
	TPC-AA57X88M	1210	36,300	1695	40	57	88	133	1	12	M12	285
	TPC-AA68X88H	1640	49,200	2295	49	68	88	124	1	12	M12	286
	TPC-AA84X100M	1785	53,550	2500	59	84	100	149	1	12	M12	515
	TPC-AA53X108H	1900	57,000	2660	30	53	108	133	1	12	M12	394
	TPC-AA94X85M	1940	58,200	2715	74	94	85	127	2	12	M12	325
	TPC-AA98X102H	1970	59,100	2760	63	98	102	140	1	16	M16	645
	TPC-AA129X116M	3710	111,300	5195	97	129	116	187	1	16	M16	1062
	TPC-AA106X136H	4250	127,500	5950	65	106	136	178	1	16	M16	1195
	TPC-AA114X137M	6350	190,500	8890	89	114	137	216	1	16	M16	1129
	TPC-AA224X152M	7260	217,800	10165 *	176	224	152	241	2	20	M20	2370
	TPC-AA186X140M	7310	219,300	10230 *	144	186	140	214	2	16	M16	1596
	TPC-AA118X146H	8330	249,900	11660 *	67	118	146	191	2	16	M16	1535
	TPC-AA241X149M	8860	265,800	12400 *	178	241	149	224	2	20	M20	2589
	TPC-AA166X168M	10100	303,000	14140 *	124	166	168	260	1	16	M16	2297
	TPC-AA252X177M	12725	381,750	17810 *	198	252	177	279	2	20	M20	3161

* Limit angle of impact in emergency stop operation to 2°

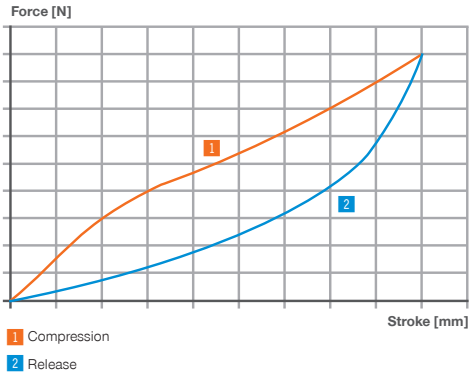
PROFILE DAMPERS BASICSTOP
SERIES RADIAL STANDARD

▶ PRODUCT SPECIFICATIONS



▶ **Design**	Radial
▶ **Shore hardness, hard**	55D
▶ **Shore hardness, medium**	40D
▶ **Damping proportion Hard**	up to 60 %
▶ **Damping proportion Medium**	up to 50 %
▶ **Impact speed**	0 ... 10 [m/s]
▶ **Permitted temperature range**	-50 ... +90 [°C]
▶ **Angle of Impact max.**	30 [°]
▶ **PWIS-free**	Yes
▶ **RoHS compliant**	Yes
▶ **REACH compliant**	Yes

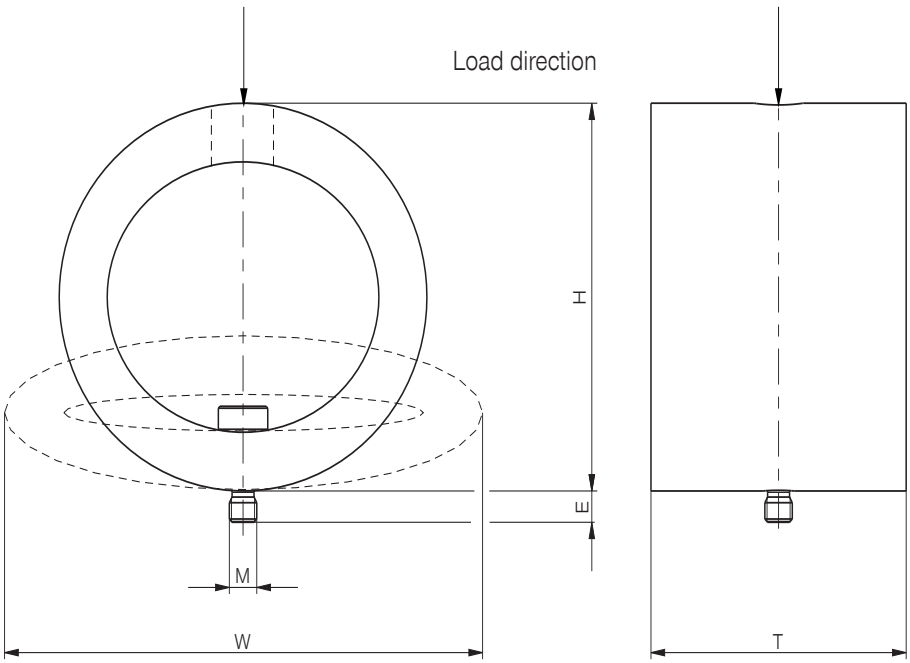
▶ TECHNICAL DATA



▶ **Installation instructions**

Order No.	Thread M	Wrench size [mm]	Max. tightening torque [Nm]	Weight [g]
TPC-M5-R	M5	3	4.5	3
TPC-M6-R	M6	5	7	6
TPC-M8-R	M8	6	17	16

The profile dampers must completely contact the underside.
The screws are included in the scope of delivery of the respective BasicStop structural damper. These can also be ordered individually.

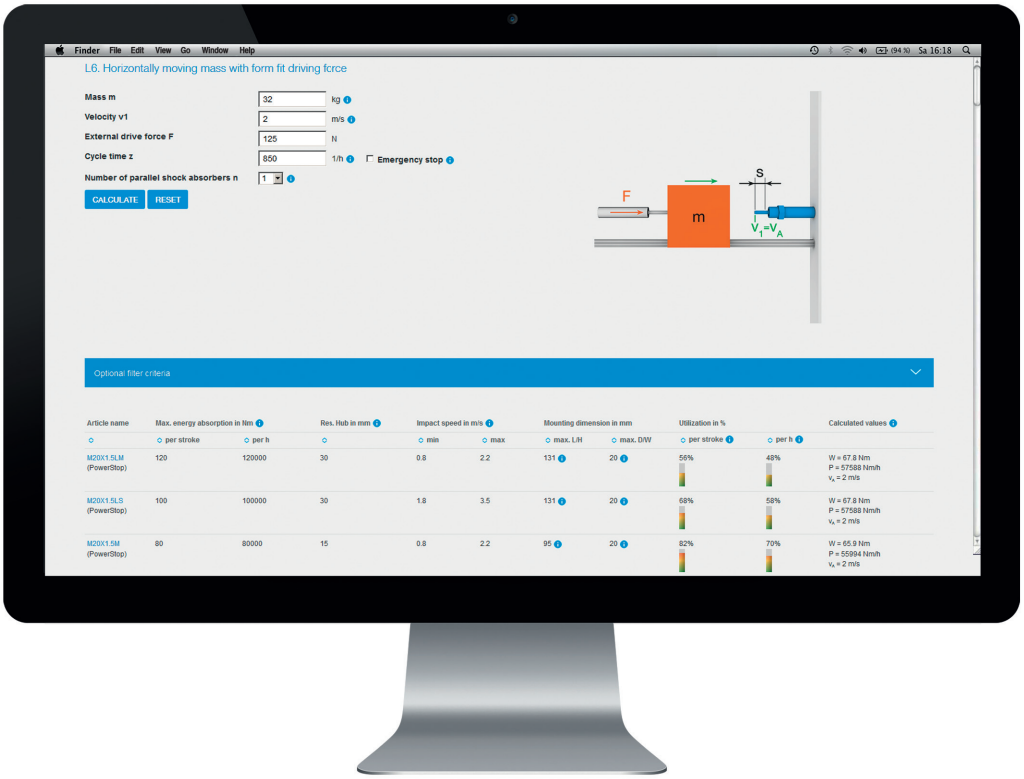


▶ TECHNICAL DATA

▶ Radial Standard

	Order No.	Energy absorption max. Continuous operation per stroke [J]	Energy absorption max. Continuous operation per hour [J/h]	Energy absorption max. Emergency stop operation per stroke [J]	Stroke max. [mm]	Height H Stroke=0 [mm]	Width W Stroke=0 [mm]	Width W Stroke=max [mm]	Depth T [mm]	Screw-in depth max. E [mm]	Thread M	Weight (incl. screw) [g]
HARD	TPC-RS23X13H	2.7	81	5.7	15	23	30	38	13	5	M5	4
	TPC-RS30X19H	6	180	18	19	30	39	50	19	5	M5	11
	TPC-RS36X20H	8.7	261	24	23	36	45	58	20	5	M5	16
	TPC-RS42X34H	11.7	351	20	32	42	52	68	34	5	M5	25
	TPC-RS53X43H	25	750	46	41	53	64	87	43	5	M5	51
	TPC-RS56X46H	66.5	1,995	98	37	56	68	88	46	6	M6	80
	TPC-RS64X46H	81.5	2,445	106	42	64	79	102	46	6	M6	105
	TPC-RS69X51H	124	3,720	206	46	69	86	109	51	6	M6	146
	TPC-RS69X67H	158	4,740	261	46	69	86	111	67	8	M8	190
	TPC-RS77X82H	228	6,840	342	50	77	95	124	82	8	M8	266
	TPC-RS84X81H	290	8,700	427	56	84	102	133	81	8	M8	319
MEDIUM	Order No.											
	TPC-RS25X13M	1.2	36	1.8	17	25	28	38	13	5	M5	6
	TPC-RS32X19M	2.3	69	5.4	21	32	37	50	19	5	M5	13
	TPC-RS37X20M	3.5	105	8.1	25	37	42	58	20	5	M5	17
	TPC-RS44X35M	5.8	174	8.3	34	44	50	68	35	5	M5	26
	TPC-RS55X43M	12	360	17	43	55	63	87	43	5	M5	51
	TPC-RS59X46M	23	690	33	40	59	66	88	46	6	M6	77
	TPC-RS67X46M	34.5	1,035	43	46	67	76	102	46	6	M6	104
	TPC-RS73X51M	45	1,350	74	50	73	83	109	51	6	M6	142
	TPC-RS73X67M	68	2,040	92	50	73	85	111	67	8	M8	206
	TPC-RS83X83M	92	2,760	122	57	83	93	124	83	8	M8	297
	TPC-RS88X81M	115	3,450	146	60	88	100	133	81	8	M8	335

INDUSTRIAL DAMPING TECHNOLOGY
GENERAL



▶ BASES FOR CALCULATION

▶ Overview of formula symbols

Formula symbols	Explanation	Unit
F	External drive force	N
g	Gravitational acceleration g=9.81m/s2	m/s^2
h	Height	m
J	Moment of inertia	$kg \cdot m^2$
L	Distance of center of mass from the instant center	m
m	Moved mass to be damped	kg
M	External drive torque	Nm
n	Number of parallel shock absorbers	-
P_{ges}	Total energy per hour	Nm/h
P	Energy per hour per damper	Nm/h
R	Shock absorber distance to the instant center	m
s	Shock absorber stroke	m
v_o	Initial velocity of the mass in the center of mass	m/s
v_1	Velocity of the mass in the center of mass at the mark	m/s
v_A	Impact velocity of the mass on the shock absorber	m/s
W_1	Kinetic energy at impact	Nm
W_2	Additional kinetic energy during stroke	Nm
W_{ges}	Total energy per stroke	Nm
W	Energy per stroke per damper	Nm
z	Number of strokes per hour	1/h
α	Angle of impact	°
β	Pitch angle	°
μ	Coefficient of friction	-
ω_0	Initial velocity of the mass in the center of mass	1/s
ω_1	Angular velocity of the mass in the center of mass at the mark	1/s
ω_A	Impact angular velocity of the mass on the shock absorber	1/s

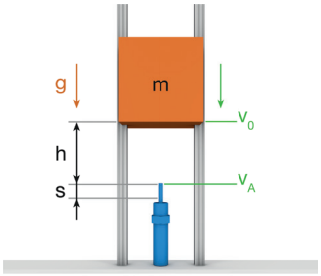
▶ General formulas

Energy	Formula	
Kinetic energy at impact	Translational movement:	$W_1 = \frac{1}{2} \cdot m \cdot {v_A}^2$
	Rotational movement:	$W_1 = \frac{1}{2} \cdot J \cdot {\omega_A}^2 = \frac{1}{2} \cdot m \cdot \left(v_A \cdot \frac{L}{R}\right)^2$
Energy per stroke	Total:	$W_{ges} = W_1 + W_2$
	Per damper:	$W = W_{ges} : n = (W_1 + W_2) : n$
Energy per hour	Total:	$P_{ges} = W_{ges} \cdot z$
	Per damper:	$P = P_{ges} : n = (W_{ges} \cdot z) : n = W \cdot z$
Angle of impact	Translational movement:	α according to information
	Rotational movement:	$\alpha = arc\ sin\ \frac{s}{R}$

▶ Calculation of W1, W2 and VA according to the example load cases listed below, where they are sub-classified into translational and rotational movements.

► LOAD CASES: TRANSLATIONAL

L1. Free-falling mass

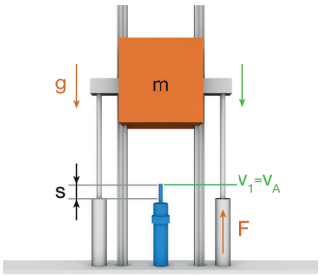


$$W_1 = \frac{1}{2} \cdot m \cdot {v_0}^2 + m \cdot g \cdot h$$

$$W_2 = m \cdot g \cdot s$$

$$v_A = \sqrt{{v_0}^2 + 2 \cdot g \cdot h}$$

L2. Downward moving mass with opposing drive force



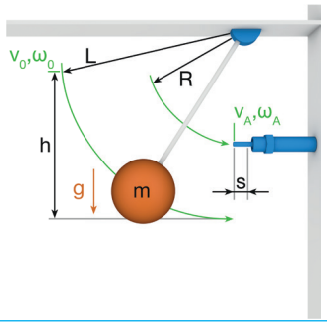
$$W_1 = \frac{1}{2} \cdot m \cdot {v_1}^2$$

$$W_2 = m \cdot g \cdot s - F \cdot s$$

$$v_A = v_1$$

▶ LOAD CASES: ROTATIONAL

R1. Freely oscillating mass
a) at horizontal impact

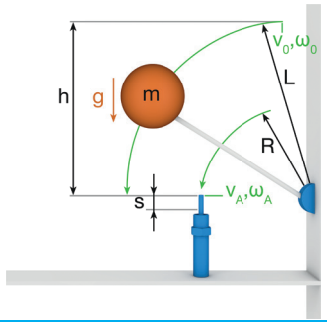


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_0^2 + m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_0^2 + m \cdot g \cdot h$$

$$W_2 = 0$$

$$v_A = \sqrt{(\omega_0 \cdot L)^2 + 2 \cdot g \cdot h} \cdot \frac{R}{L} = \sqrt{v_0^2 + 2 \cdot g \cdot h} \cdot \frac{R}{L}$$

R1. Freely oscillating mass
b) at vertical impact

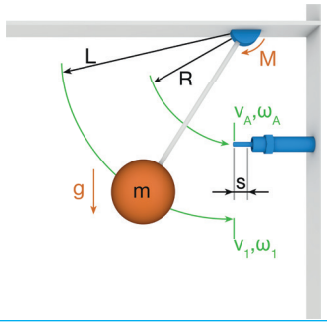


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_0^2 + m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_0^2 + m \cdot g \cdot h$$

$$W_2 = m \cdot g \cdot s$$

$$v_A = \sqrt{(\omega_0 \cdot L)^2 + 2 \cdot g \cdot h} \cdot \frac{R}{L} = \sqrt{v_0^2 + 2 \cdot g \cdot h} \cdot \frac{R}{L}$$

R2. Downward pivoting mass with opposing drive torque
a) at horizontal impact

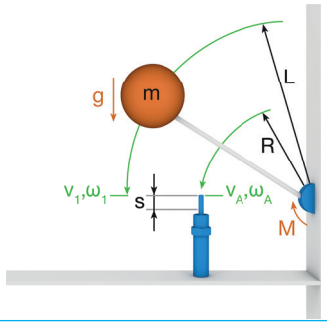


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1^2 = \frac{1}{2} \cdot m \cdot v_1^2$$

$$W_2 = -\frac{M}{R} \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

R2. Downward pivoting mass with opposing drive torque
b) at vertical impact



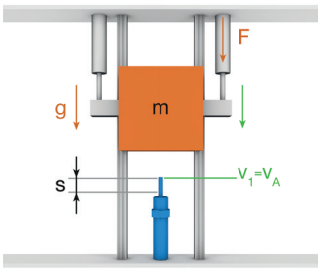
$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1^2 = \frac{1}{2} \cdot m \cdot v_1^2$$

$$W_2 = m \cdot g \cdot s - \frac{M}{R} \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

► LOAD CASES: TRANSLATIONAL

L3. Downward moving mass with drive force

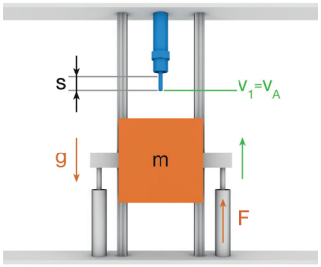


$$W_1 = \frac{1}{2} \cdot m \cdot {v_1}^2$$

$$W_2 = F \cdot s + m \cdot g \cdot s$$

$$v_A = v_1$$

L4. Upward moving mass with drive force



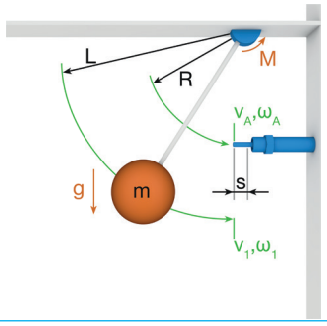
$$W_1 = \frac{1}{2} \cdot m \cdot {v_1}^2$$

$$W_2 = F \cdot s - m \cdot g \cdot s$$

$$v_A = v_1$$

▶ LOAD CASES: ROTATIONAL

R3. Downward pivoting mass with drive torque
a) at horizontal impact

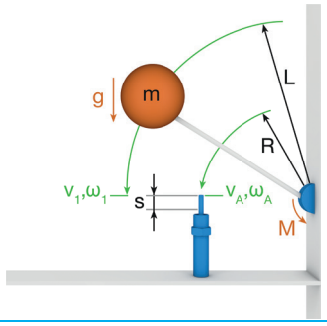


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = \frac{M}{R} \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

R3. Downward pivoting mass with drive torque
b) at vertical impact

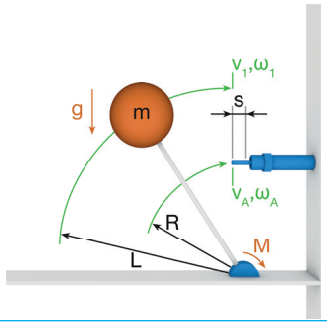


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = \frac{M}{R} \cdot s + m \cdot g \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

R4. Upward pivoting mass with drive torque
a) at horizontal impact

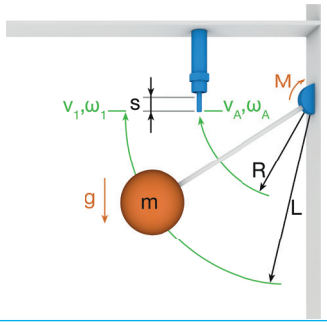


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = \frac{M}{R} \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

R4. Upward pivoting mass with drive torque
b) at vertical impact



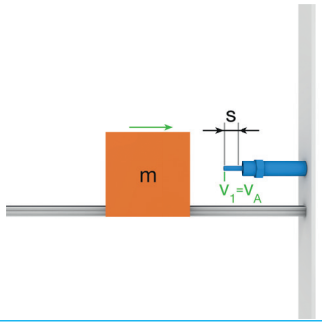
$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = \frac{M}{R} \cdot s - m \cdot g \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

► LOAD CASES: TRANSLATIONAL

L5. Horizontally moving mass without drive force

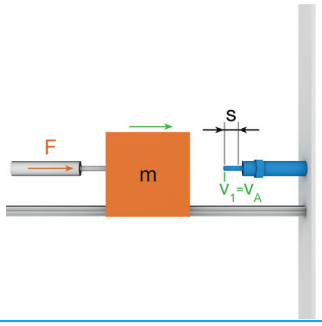


$$W_1 = \frac{1}{2} \cdot m \cdot {v_1}^2$$

$$W_2 = 0$$

$$v_A = v_1$$

L6. Horizontally moving mass with form-fit drive force

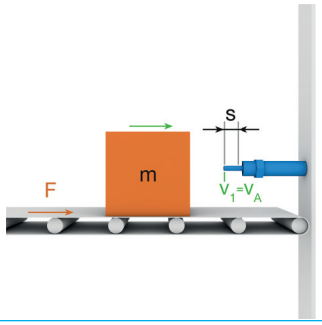


$$W_1 = \frac{1}{2} \cdot m \cdot {v_1}^2$$

$$W_2 = F \cdot s$$

$$v_A = v_1$$

L7. Horizontally moving mass with frictional drive force

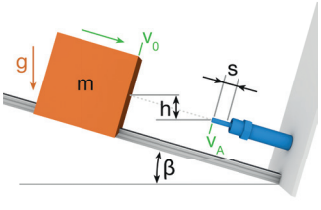


$$W_1 = \frac{1}{2} \cdot m \cdot {v_1}^2$$

$$W_2 = \mu \cdot m \cdot g \cdot s$$

$$v_A = v_1$$

L8. Falling mass on an inclined plane



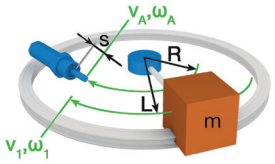
$$W_1 = \frac{1}{2} \cdot m \cdot {v_0}^2 + m \cdot g \cdot h$$

$$W_2 = sin\beta \cdot m \cdot g \cdot s$$

$$v_A = \sqrt{{v_0}^2 + 2 \cdot g \cdot h}$$

▶ LOAD CASES: ROTATIONAL

R5. Horizontally pivoting mass without drive torque

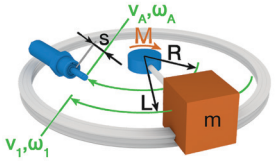


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = 0$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

R6. Horizontally pivoting mass with form-fit drive torque

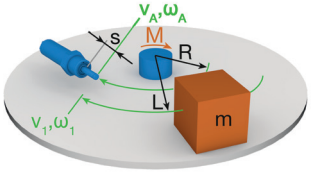


$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = \frac{M}{R} \cdot s$$

$$v_A = \omega_1 \cdot R = v_1 \cdot \frac{R}{L}$$

R7. Horizontally pivoting mass with frictional drive torque



$$W_1 = \frac{1}{2} \cdot J \cdot \omega_1{}^2 = \frac{1}{2} \cdot m \cdot v_1{}^2$$

$$W_2 = \mu \cdot m \cdot g \cdot s \cdot \frac{L}{R}$$

$$v_A = \omega_0 \cdot R = v_0 \cdot \frac{R}{L}$$

Note on rotational movement

▶ To simplify the calculations, it is assumed that the rotationally moving mass at the impact on the damper leaves the path tangentially and the damper acts on this tangential path. Thus the rotational movement energy is completely converted in translational movement energy. For small angles, this simplification provides a sufficient approach.
In addition, if the mass moment of inertia is unknown, for the calculation it can be assumed that all the mass acts from the center of mass, what leads to the method of calculation by using the translational parameters. The method of calculation for the rotational load cases with translational parameters can only work, if the axis of rotation doesn't coincide with the center of mass, what means that the mass doesn't rotate about itself, otherwise the calculation with rotational parameters is inevitable.

GENERAL
CHECKLIST

Customer number | Telephone number

Company | Fax number

Contact | E-mail

☐ Mr. ☐ Mrs.

Sales data | **Article**

Editor | Target price

Desired delivery date | Others

Quantity | Pot. quantity (p.a.) | Date

Desired damping

☐ Hydraulic (100% damping) ▶ Industrial shock absorber (PowerStop)

☐ Viscoelastic (up to 75% damping) ▶ Profile dampers (BasicStop)

Installation conditions

Application

Replacement competitor ☐ Yes | Manufacturer | Thread | Article

Max. installation space | Length / height | mm | Thread / Ø | mm

Environment | Temperature min. | °C | Temperature max. | °C | Pressure | bar

☐ Shavings ☐ Dust ☐ Oil / Grease ☐ Cooling lubricant | Others

Operating conditions | Load case* | Number parallel | Number in row

Operation mode ☐ Duration ▶ | Cycle time | Strokes/h | Number of cycles | Strokes

☐ Emergency stop ▶ | Number of cycles | Strokes

Movement ☐ Translational ▶ | Drive force | N | Angle of impact | °

☐ Rotational ▶ | Drive torque | Nm

Swivel radius shock absorber | mm | Swivel radius mass | mm

Impact velocity ☐ Translational ▶ | min. | m/s | max. | m/s

☐ Rotational ▶ | min. | 1/s | max. | 1/s

Mass / Mass moment of inertia ☐ Translational ▶ | min. | kg | max. | kg

☐ Rotational ▶ | min. | kg m² | max. | kg m²

Other (depending on load case) | Height | mm | Coefficient of friction | Pitch angle | °

☐ Adjustability | Approvals (such as RoHS, LABS, EG, CE, explosion protection, cleanroom)

Industrial shock absorber configuration

Protection ☐ without (in a clean environment) ☐ Wiper (against liquid, oil, ...) ☐ Felt (against dust, chips, ...) ☐ Bellow (sealed)

Impact head ☐ no head ☐ Steel head ☐ Plastic head

Accessories ☐ Locknut ☐ Side load adapter ☐ Stop sleeve ☐ Sensor stop sleeve

☐ Clamping flange screwed in parallel ☐ Clamping flange orthogonal screwed ☐ Pressure chamber seal

Special

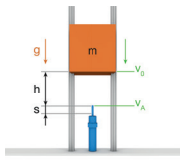
Other (oil, characteristic, stroke, size, thread,...)

*see catalogue or www.zimmer-group.de/en/pdti

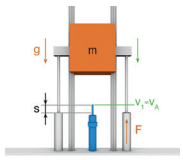
LOAD CASES

Translational

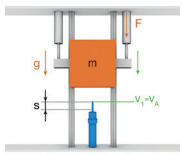
L1. Free-falling mass



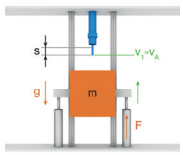
L2. Downward moving mass with opposing drive force



L3. Downward moving mass with drive force

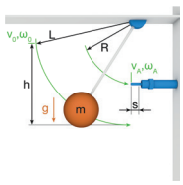


L4. Upward moving mass with drive force

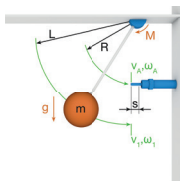


Rotational

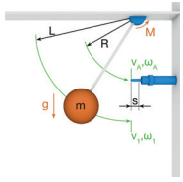
R1. Freely oscillating mass
a) at horizontal impact



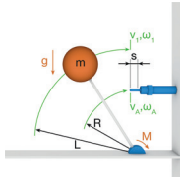
R2. Downward pivoting mass with opposing drive torque
a) at horizontal impact



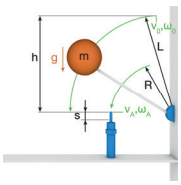
R3. Downward pivoting mass with drive torque
a) at horizontal impact



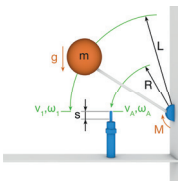
R4. Upward pivoting mass with drive torque
a) at horizontal impact



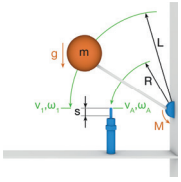
R1. Freely oscillating mass
b) at vertical impact



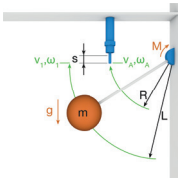
R2. Downward pivoting mass with opposing drive torque
b) at vertical impact



R3. Downward pivoting mass with drive torque
b) at vertical impact

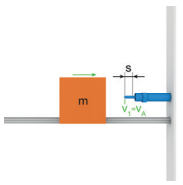


R4. Upward pivoting mass with drive torque
b) at vertical impact

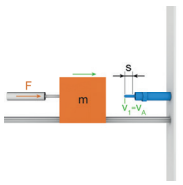


Translational

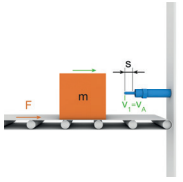
L5. Horizontally moving mass without drive force



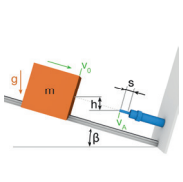
L6. Horizontally moving mass with form-fit drive force



L7. Horizontally moving mass with frictional drive force

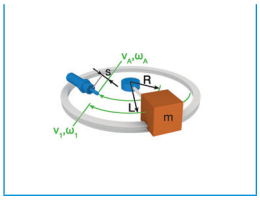


L8. Falling mass on an inclined plane

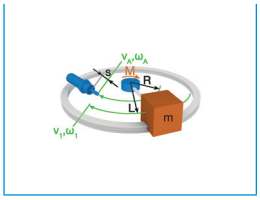


Rotational

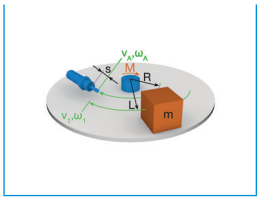
R5. Horizontally pivoting mass without drive torque



R6. Horizontally pivoting mass with form-fit drive torque

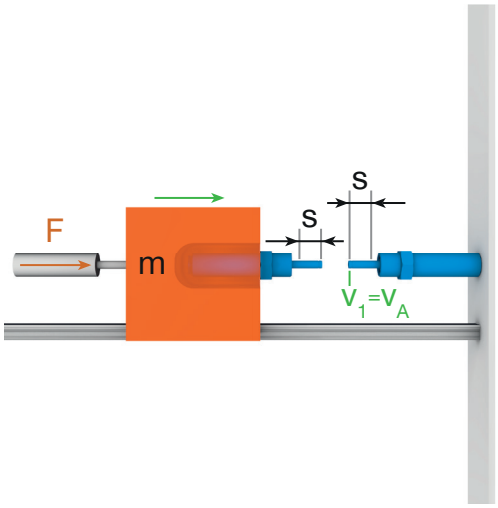


R7. Horizontally pivoting mass with frictional drive torque



GENERAL
TIPS AND TRICKS

▶ TIP 1: Series use of shock absorbers



With n shock absorbers in series, n-fold energy absorption capacity through n-fold stroke with the same force.

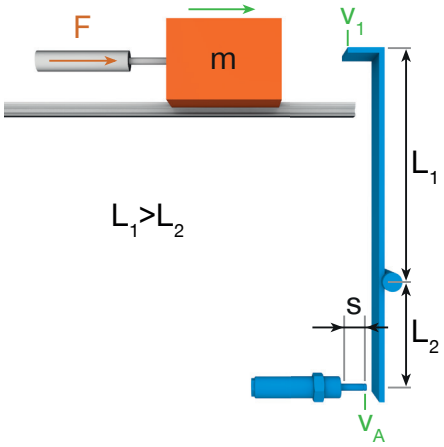
- ▶ Caution: Calculation of the energy per stroke and per hour with n-fold stroke!
- ▶ Example of 2 shock absorbers:
  Total stroke = 2 x shock absorber stroke
  Total shock absorber force = shock absorber force
  Total energy absorption capacity = 2 x shock absorber energy absorption capacity

Equal distribution of the total energy to n shock absorbers

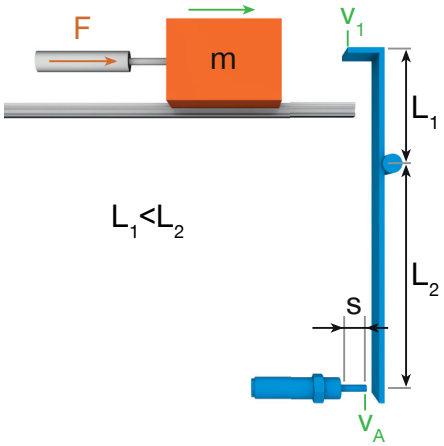
- ▶ Possibility in comparison to use of only one shock absorber:
  Use of the same shock absorber type with reduced utilization or use of a smaller shock absorber type.
- ▶ Example of 2 shock absorbers:
  Shock absorber energy absorption = Total energy absorption/2

▶ TIP 3: Lever translation

a) Translation i < 1



b) Translation i > 1



Translation: $i = \frac{L_2}{L_1}$

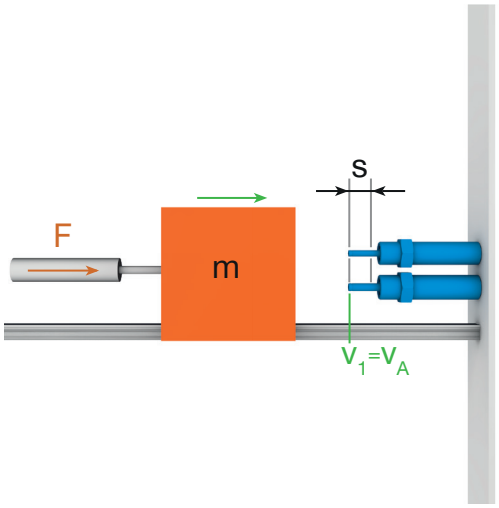
Indices:

- ▶ Parameters at the top end of the lever with mass: Index 1
- ▶ Parameters at the bottom end of the lever with shock absorbers: Index A

Modulation of the parameters according to the following principles

	L1 > L2 (i<1)	L1 < L2 (i>1)	Formula
Translation of impact velocity to shock absorbers	Reduction of impact velocity	Increase of impact velocity	$v_A = v_1 \cdot i$
Translation of shock absorbers stroke to mass	Increase of the stroke of the mass	Reduction of the stroke of the mass	$s_1 = \frac{s_A}{i}$
Translation of shock absorbers force to mass	Reduction of force to mass	Increase of force to mass	$F_1 = F_A \cdot i$
Kinetic energy/energy absorption	Identical	Identical	W

▶ TIP 2: Parallel connection of shock absorbers



With n shock absorbers in parallel, n-fold energy absorption capacity through n-fold force with the same stroke.

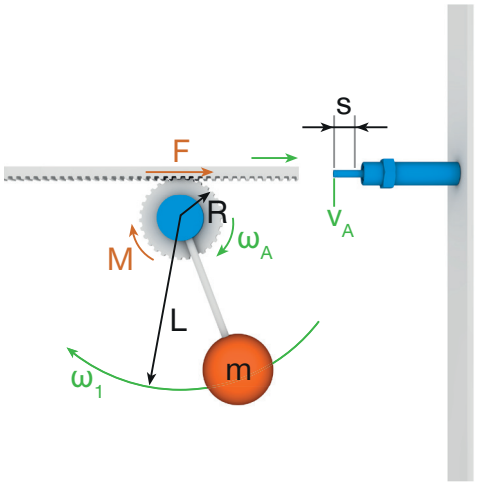
- Calculation of the energy per stroke and per hour remains the same due to identical stroke!
- Example of 2 shock absorbers:
  Total stroke = Shock absorber stroke
  Total shock absorber force = 2 x shock absorber force
  Total energy absorption capacity = 2 x shock absorber energy absorption capacity

Equal distribution of the total energy to n shock absorbers

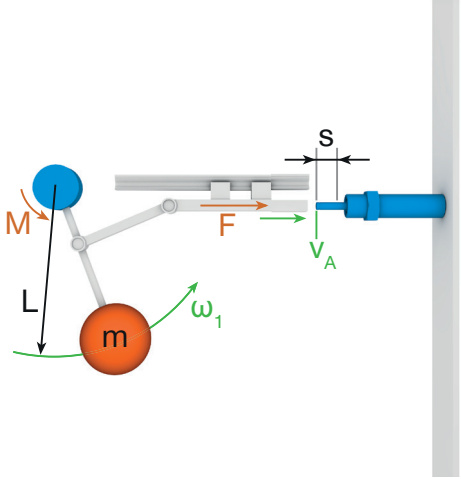
- Possibility in comparison to use of only one shock absorber:
  Use of the same shock absorber type with reduced utilization or use of a smaller shock absorber type.
- Example of 2 shock absorbers:
  Shock absorber energy absorption = Total energy absorption/2

▶ TIP 4: Transformation of rotational into translational movement

a) With gear-rack layout

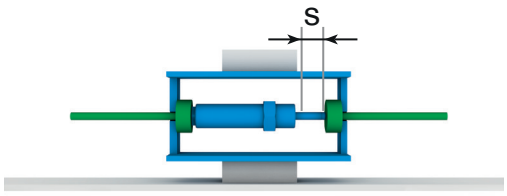


b) With lever mechanism



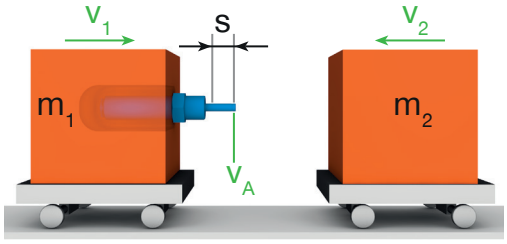
- Translation of a rotational movement into a translational movement with the help of a gear-rack layout (a) or a lever mechanism (b).
- The gear-rack layout is applied, for example, in swivel units from the Zimmer Handling Technology division.

▶ TIP 5: Two-side damping with translational movement



- Damping in both directions through one shock absorber.
- This device transforms a single-effect into a dual-effect shock absorber.

▶ TIP 7: Ideally non-elastic impact with two masses moving toward one another



- Velocity of the entire object (both masses together) following impact:

$$v'_{12} = \frac{m_1 \cdot v_1 - m_2 \cdot v_2}{m_1 + m_2}$$

with positive sign: movement to the right
with negative sign: movement to the left

- Calculation of energy per stroke to be damped by the damper upon impact:

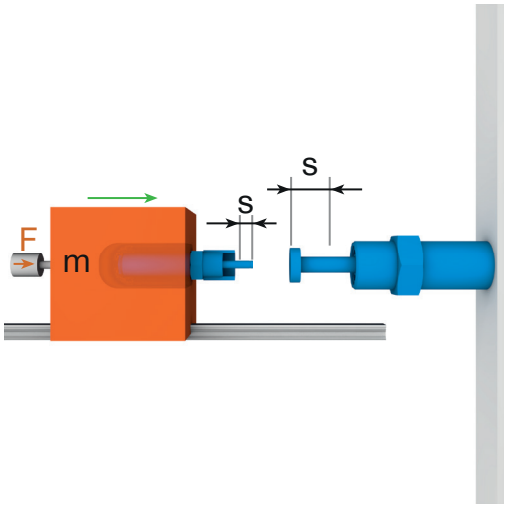
$$W = \frac{1}{2} \cdot \frac{m_1 \cdot m_2}{m_1 + m_2} \cdot (v_1 + v_2)^2$$

with effect of drive forces, addition of W2 = F · s

- Calculation of impact velocity through calculation of relative velocity:

$$v_A = v_1 + v_2$$

▶ TIP 9: Cascade connection

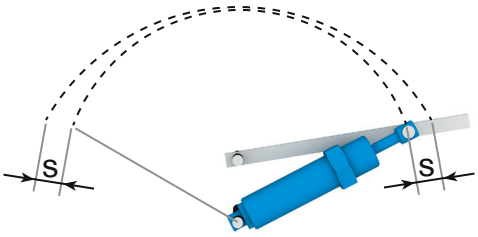


Cascade connection of a small shock absorber that impinges upon a larger shock absorber:

- Continuous operation with low energy absorption:
  The smaller shock absorber damps the energy and retracts until its stop sleeve rests on the head of the larger shock absorber, as a result of which this retracts to an insignificant extent due to its high energy absorption capacity.
- Emergency stop operation with greater energy absorption:
  The smaller shock absorber retracts quickly and transfers the load through its stop sleeve to the head of the larger shock absorber, which retracts as a result and damps the high energy.

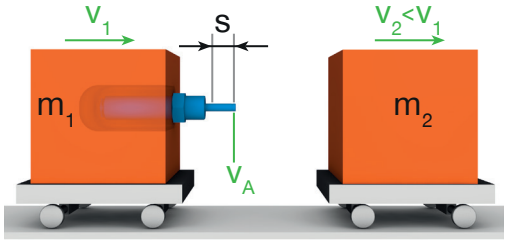
As a result of this layout, optimal damping is guaranteed for both operating modes, although no defined end position can be ensured for continuous operation.

▶ TIP 6: Two-side damping with rotational movement



- Damping in both end positions of the rotation movement by a shock absorber.
- Due to this layout for damping both end positions, only one shock absorber is necessary.

▶ TIP 8: Ideally non-elastic impact with two masses moving in the same direction



- Velocity of the entire object (both masses together) following impact:

$$v'_{12} = \frac{m_1 \cdot v_1 + m_2 \cdot v_2}{m_1 + m_2}$$

- Calculation of energy per stroke to be damped by the damper upon impact:

$$W = \frac{1}{2} \cdot \frac{m_1 \cdot m_2}{m_1 + m_2} \cdot (v_1 - v_2)^2$$

with effect of drive forces, addition of W2 = F · s

- Calculation of impact velocity through calculation of relative velocity:

$$v_A = v_1 - v_2$$

- This means that a second mass, which either stands still or moves more slowly, is accelerated gently by a more quickly moving mass without resulting in a sudden increase in velocity and without the second mass recoiling or springing away.

USAGE NOTE
GENERAL

The contents of this catalog are not legally binding and are intended solely for informational purposes. Any final agreement will be in the form of a written order confirmation from Zimmer GmbH, which occurs only subject to the respective current General Terms and Conditions of Sale and Delivery of Zimmer GmbH. These can be found online at **www.zimmer-group.com.**
All of the products listed in this catalog are designed for their intended use, e.g. machines for automation. The recognized technical regulations for safety and professional work must be followed for use and installation.
Furthermore, the respective laws, guidelines from TÜV, guidelines from the respective trade association and VDE stipulations shall apply.

The technical data listed in this catalog must be observed by the user. The conditions of use may not fall below or exceed the specified data. If information is missing, it cannot be assumed that there are no upper or lower limits or no limitations for specific use cases. Consultation is required in these cases.

Disposal is not included in the price, which would have to be taken into account accordingly in the event of return to or disposal by Zimmer GmbH.

TECHNICAL DATA AND FIGURES

The technical data and figures have been compiled with great care and to the best of our knowledge. We cannot guarantee that the information is up to date, correct or complete.

The specifications and information—such as figures, drawings, descriptions, dimensions, weights, materials, technical and other performance data and the described products and services—contained in general product descriptions, Zimmer GmbH catalogs, brochures and price lists in any form are subject to change and may be modified or updated at any time without prior notification. They are binding only to the extent expressly specified in a contract or order confirmation. Slight deviations from such descriptive product information shall be considered approved and shall not affect fulfillment of agreements insofar as they are reasonable for the customer.

LIABILITY

Products from Zimmer Group are subject to the German Product Liability Act. This catalog does not contain any guarantees, assurances of quality or procurement agreements for the products it depicts, neither expressly nor implied, including for the availability of products. Advertising statements relating to quality features, properties or applications for the products are not legally binding.

To the extent permitted by law, Zimmer GmbH is exempt from any liability for direct or indirect damage, subsequent damage and requests of any kind or on any legal basis resulting from the use of information contained in this catalogue.

TRADEMARK, COPYRIGHT AND REPRODUCTION

The depiction of commercial property rights in this catalog—such as brands, logos, registered trademarks or patents—does not include the granting of licenses or use rights. Their use is not permitted without the expressed written agreement of Zimmer GmbH. All contents of this catalog are the intellectual property of Zimmer GmbH. For the purposes of copyright, any unlawful use of intellectual property, including excerpts, is prohibited. Reprinting, copying or translating (including in the form of excerpts) are permitted only with the prior written consent of Zimmer GmbH.

STANDARDS

Zimmer Group has a quality management system certified in accordance with ISO 9001:2008. Zimmer Group has an environmental management system certified in accordance with ISO 14001:2004.

INDIVIDUAL „INDUSTRIAL DAMPING TECHNOLOGY“ – DIRECTIVES, LAWS AND STANDARDS

Harmonized EU directives

The products of the Zimmer Group comply with the standardized and harmonized directives and standards of the European Union, which apply to products for the EU single market.

CE-relevant harmonized EU directives:

The industrial shock absorbers from the Zimmer Group meet the requirements of the respective harmonized EU directives, as long as they are relevant to them. However, the following guidelines do not define a scope of validity for industrial shock absorbers:

- In accordance with the Machinery Directive, industrial shock absorbers are components for installing in machines, which means neither a EC Declaration of Conformity nor a EC Type Examination are required. In addition, no Manufacturer‘s Declaration is needed either.
- As per the Pressure Equipment Directive, industrial shock absorbers are components with a low potential for danger, which is why they are omitted from this scope of validity.
- Other harmonized directives contained in the German Equipment and Product Safety Act do not apply for general mechanical engineering application as components. For example, the directives for elevators, ropeways and medical products as well as the ATEX explosion protection directive require a corresponding application of shock absorbers in this area. However, this does not correspond to general use. Instead, they represent special applications that are subject to a separate directive review.
- Consequently, no general mandatory CE markings exist for the industrial shock absorbers from the Zimmer Group for general use in mechanical engineering, which is why they are not inspected in the relevant certification processes and, therefore, are not provided with the CE marking.

Other harmonized EU directives:

Waste Electrical and Electronic Equipment Directive (WEEE) and the Restriction of Hazardous Substances directive (RoHS) are also not relevant since hydraulic shock absorbers are not electrical or electronic devices. However, the products can be oriented to the respective ordinances.