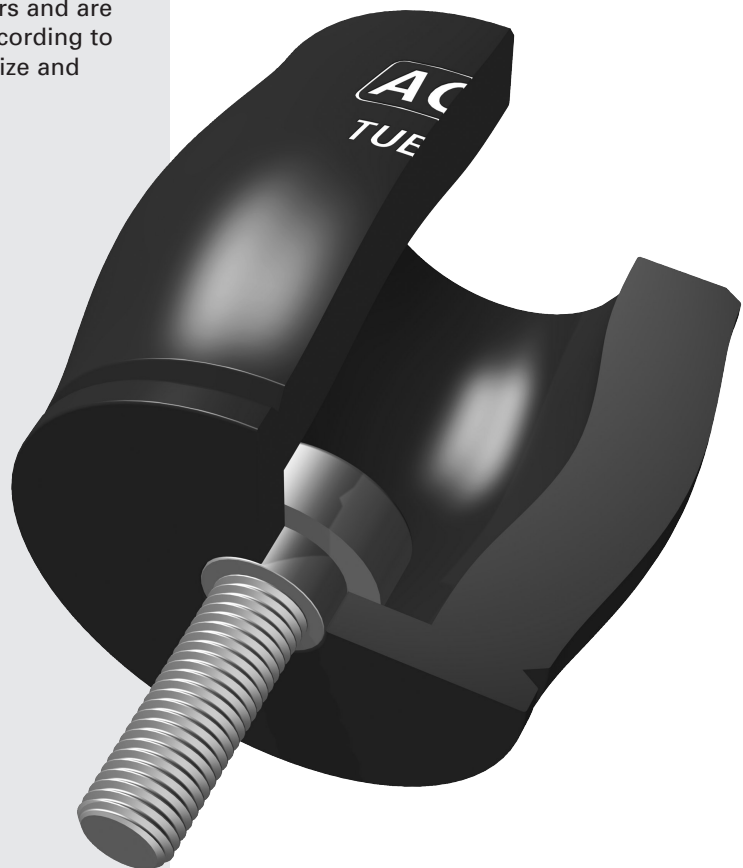


To achieve long lasting and trouble-free service life for our products please observe the following instructions. The operating instructions refer to all profile dampers and are subdivided according to construction size and properties.



Prior to mounting, check whether the damper can be used for your specific application. The following conditions must be fulfilled:

Correct dimensioning of the damper

The energy absorption per stroke under the permanent load W3 must not be exceeded. Exceptions with individual impacts: In this case the W3-ratings can be exceeded by up to 40%.

Please, remember that the moved load does not decelerate to an exact datum position and that the impact energy is not 100% absorbed. For this reason, a limited range of use for the following drive types must be observed:

- belt drive
- threaded spindle drive
- drive with gear

The calculation and selection of the correct profile damper for your application should be referred to ACE for approval and assignment of unique identification number.

Attention: The maximum energy absorption per stroke W3 indicated in the catalogue applies to room temperature environments. With increasing ambient temperature the energy absorption per stroke is reduced correspondingly.

Important: Usage outside the allowable ratings can lead to a premature breakdown and/or destruction of the damper.

Failure to comply might result in an unsatisfactory damping action or in a premature malfunction of the damper. Please, refer to the performance tables in our current catalogue for the allowed values of the individual dampers. You can also find them on the Internet under the address www.ace-ace.de.

Allowable temperature range

The allowable **temperature range** is between **-40°C and 90°C**. Extended periods outside this temperature range can result in damage to the sealing system.

Environment/Material

ACE profile dampers are resistant to microbes, sea water and chemicals. They also have good UV and ozone resistance. The material does not absorb water or swell and is highly resistant to abrasion.

Mounting the damper

To mount the damper, we recommend using original ACE screws.

The resulting reaction forces depend on the individual applications and can be seen in the calculation offer. The mounting construction must be accurately positioned so that the reaction force can be adequately transmitted.

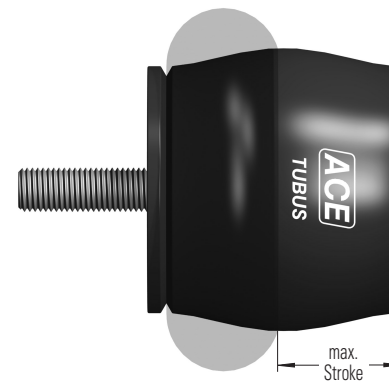
Any axial deviation between profile damper and impacting load must be prevented.

What needs to be checked after a full load impact?

After an Emergency operation cycle please ensure that the Profile dampers are inspected for external damage. In the event of damage please replace them.

Maintenance

Profile dampers are made in one piece and thus require no special maintenance. Profile dampers that are not used regularly (e.g. that are intended for emergency stop systems) should be checked within the normal time frame for safety checks, but **at least once a year**. In this case the surface must be checked for cracks and deformation and the fixing elements for correct seat. Profile dampers that are **used regularly** should be checked **every three months**.



Mounting screw torque:

M3:	2 Nm
M4:	4 Nm
M5:	6 Nm
M6:	10 Nm
M8:	25 Nm
M12:	85 Nm
M16:	210 Nm

Prior to mounting, check whether the damper can be used for your specific application. The following conditions must be fulfilled:

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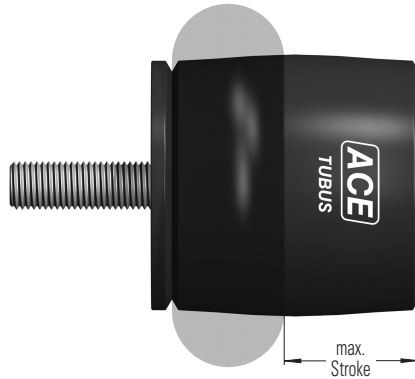
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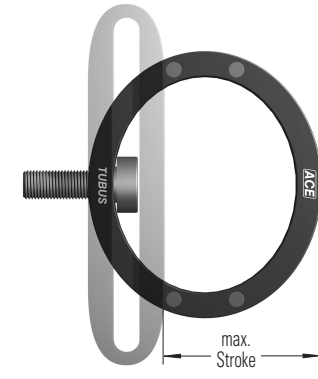
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Mounting screw torque:

M5:	6 Nm
M6:	10 Nm
M8:	25 Nm

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Mounting screw torque:
M8: 25 Nm
M16: 210 Nm

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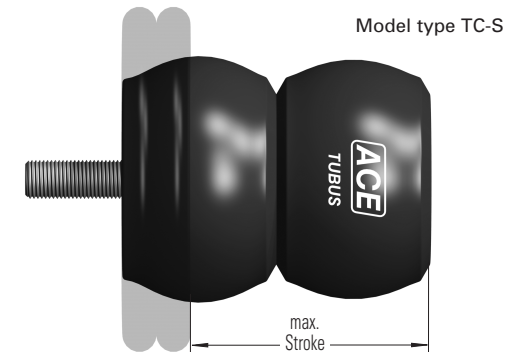
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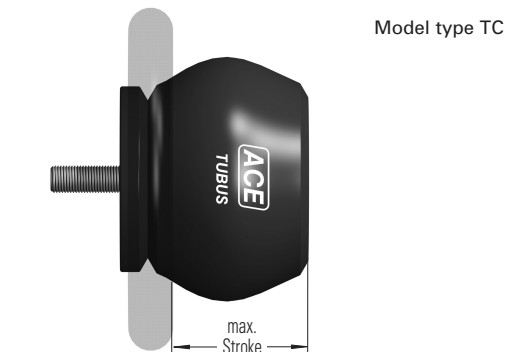
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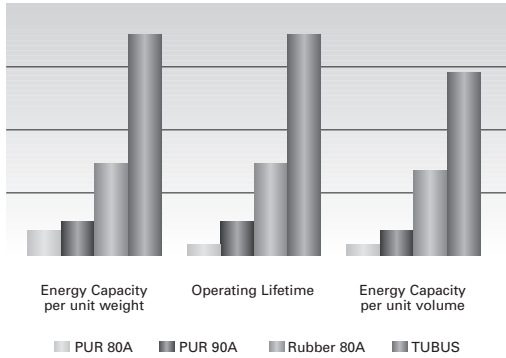
Model type TC-S



Model type TC

Mounting screw torque:
M12: 85 Nm
M16: 210 Nm

Physical Properties of TUBUS Profile Dampers



ACE TUBUS profile dampers are high performance damping elements made from Co-Polyester Elastomer. They have a high energy absorbing capacity compared with other materials.

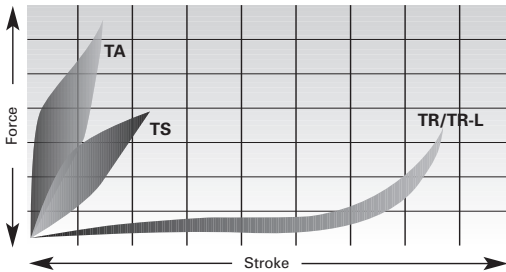
The TUBUS series comprises five main types with over 75 individual models. Generally these products are available from stock.

The damping characteristics are achieved as a result of the material and worldwide patented construction design. This enables us to change the characteristics of the elastomer material so that individual and distinct damping curves are possible.

TUBUS dampers offer a outstanding performance when compared to other dampers such as rubber, polyurethane or steel springs.

A further advantage compared to other damping elements is the **operating life**. Up to **twenty times longer than with urethane dampers, up to ten times longer than with rubber dampers and up to five times longer than with steel springs.**

Comparison of Damping Characteristics



The profile dampers are reversible and absorb energies while exhibiting the following damping characteristics.

TA: Degressive characteristic with max. energy absorption with min. stroke.

Energy absorption: 40% to 66%

TS: Almost linear characteristic with low reaction force over a short operating stroke.

Energy absorption: 26% to 56%

TR/TR-L: Progressive characteristic with gradually increasing reaction force over a long stroke.

Energy absorption **TR:** 17% to 35%

Energy absorption **TR-L:** 14% to 26%

Characteristics of dynamic energy absorption for impact velocity over 0.5 m/s. For impact velocities under 0.5 m/s, please request a static characteristic curve.

The very **long service life** of up to 1 Mio. cycles, the **compact size** and **low unit weight** differentiate the TUBUS-profile dampers from all other types of elastomer damping elements.

They are the preferred solution for end stop dampers in robotic systems, high bay warehouse systems, fitness devices and all similar automated plant and machinery.

For the crane industry we manufacture special **high capacity crane buffers** that have an ideal deceleration characteristic with high return force and energy absor-

bing capacities from 450 to 12700 Nm. This means you can have a TUBUS-crane buffer capable of providing up to 900 kN of braking force in a package weighing only 3 kg and absorbing up to 50% of the energy.

Special dampers

Besides the standard product range of the TUBUS-series there are also a large number of special products available upon request for customer-specific applications.

1. General

All sales and delivery contracts of the seller are based on the following conditions, which are considered accepted and to be valid by placing the order and accepting the delivery. Deviating conditions of the purchaser are only valid upon explicit written acceptance by the seller. The purchasers' purchasing terms do not apply for the seller. For materials, DIN standards or commercial terms and accepted guidelines of industrial trade associations apply.

The seller reserves property rights and copyrights for samples, cost estimates, drawings and similar information of material or immaterial nature, this also includes in electronic form. They must not be made accessible to third parties. The seller obligates itself to only make information and documentation marked by the purchaser as confidential accessible to third parties with its consent.

2. Contract Conclusion

Offers are subject to confirmation. Acceptance of an offer can only be facilitated by written confirmation by the seller. Agreements that deviate from these conditions must be in written form. Change of the agreement for the written form may also only be in writing.

3. Prices

Prices generally apply ex works, excluding the costs for packing, transport and transport risk. If fixed prices were not arranged explicitly, the list prices that were valid on the day of delivery apply. Calculation and payment will be in \square plus statutory value added tax.

4. Delivery

Delivery dates and delivery periods that were arranged with or without obligation are to be specified in writing. Delivery periods become effective on the day of business and technical clarification of the order. Compliance with delivery periods requires timely receipt of all documents to be delivered by party ordering, timely clarification by party ordering and compliance with the arranged terms of payment.

If a delivery date without obligation or a delivery period without obligation is exceeded by three weeks, the purchaser can request delivery from the seller. Effective with receipt of this request, the seller is considered in delay.

If the purchaser is entitled to delay compensation, in cases of slight the seller's negligence, it is limited to a maximum of 5% of the arranged purchase price. If in addition, the seller desires to withdraw from the contract and/or to request compensation instead of delivery, it must provide the seller with a reasonable delivery deadline after expiration of the three-week-period. If the purchaser is entitled to compensation instead of delivery, in the case of slight negligence the entitlement is limited to a maximum of 25% of the arranged purchase price.

If a delivery date with obligation or delivery period with obligation is exceeded, the seller is already in delay with exceeding the delivery date of delivery period. In this case, the aforementioned liability restrictions apply accordingly.

Force majeure or operational interruptions occurring with the seller or its suppliers that temporarily hinder the seller without its fault to deliver the object of purchase at the arranged date or within the arranged period change the dates and periods mentioned in this provision by the time period of the performance interruptions caused by these conditions. The purchaser can withdraw from the contract of sale if corresponding interruptions result in a performance delay of more than two months. Other withdrawal rights remain unchanged.

5. Place of Fulfilment

Place of fulfilment for all obligations that are a direct or indirect result of this contractual relationship, including the payment obligation, is the seller's place of business.

6. Payments

The payment conditions are specified in the confirmation of order or the invoice. Offsetting against counterclaims of any type is excluded, unless the claims have been confirmed by a court of law or are undisputed. Payments must not be withheld against possible counterclaims. In the case of non-compliance with payment terms, the seller is in arrears without notification. Bills of exchange will only be accepted upon prior agreement.

Payments via cheque or bill of exchange are only considered fulfilled after encashment and credit by the seller's financial institute. Discount charges are borne by the party ordering. In case the payment target is exceeded, the seller is entitled to request default interest in the amount of 8% above the base rate. In the event of suspension of payments, the party ordering filing a request to initiate insolvency proceedings, all the seller's invoices are due and at the same time, all discounts become invalid.

7. Retention of Title

The seller reserves the right of ownership of the delivery items including all accessory claims until receipt of all payments from the delivery contract. If the party ordering sends goods to third parties, already with conclusion of the delivery contract, the ordering party assigns its claims against the third party from the sales contract until complete fulfillment of its payment obligations from the delivery contract to the seller (extended retention of title). As long as delivery items are subject to the seller's retention of title, they must only be pledged or transferred as security by the party ordering with the seller's written consent. In the event of seizure or confiscation of delivery items, the party ordering must notify the seller via registered letter. Assertion of the retention of title by the seller shall not be deemed as contract withdrawal. The party ordering is not entitled to assign claims from the delivery contract to third parties without written consent by the seller. If, as a result of the above described extended retention of title, excess security by the seller of more than 20% above the claim to be secured occurs, the ordering party is entitled to request reassignment of the exceeding claim.

8. Warranty, Notice of Defects

Obvious defects must be notified in writing to the seller immediately upon delivery, no later than within one week, but in any case, prior to processing or installation, otherwise assertion of a warranty claim is excluded. Timely sending is considered sufficient for adherence to the time limit.

The seller must be granted the opportunity for an on-site check-over. In case of a justified notice of defects, the seller shall provide at its own choice warranty through correction or compensation delivery.

If the re-fulfilment fails, the purchaser can request at its own choice a reduction of payment (decrease) or rescission of the contract (withdrawal). However, in the event of only a slight lack of conformity with the contract, in particular only slight deficiencies, the purchaser is not entitled to a right of withdrawal.

If the purchaser chooses, due to a legal or material deficiency after failed re-fulfilment to withdraw from the contract, it is not entitled to any additional claim for compensation due to the deficiency.

If the purchaser chooses compensation after failed re-fulfilment, the goods remain with the purchaser if this is reasonable. Compensation is limited to the difference between the purchase price and the value of the deficient item. This does not apply if the seller caused the contract breach maliciously.

Generally, only the seller's product description is agreed to for the condition of the goods. Public statements, advertising or sales promotions by the manufacturer do not represent an additional contractual condition statement of the goods.

If the purchaser receives deficient installation instructions the seller is only obligated to delivery of correct installation instructions and this only then if the deficiency in the installation instructions hinders proper installation.

The warranty period is two years and commences with completion. Exchange and return of custom-made products are always excluded. For parts that were not produced or processed by the seller, manufacturer's conditions apply which can be viewed by the purchaser at any time at the seller's. Construction and built-in parts are delivered according to the respective state-of-the-art.

9. Liability

If, based on legal provisions according to these conditions, the seller is liable to compensate for a damage that was caused slightly negligently, the seller is limitedly liable

The liability only applies for violation of important contractual liabilities and is limited to typical, direct damages that were predictable at contract conclusion. This restriction does not apply in the event of injuries to life, body and health and also possible seller's liability due to malicious non-disclosure of a deficiency or due to granting warranty or exercise risk and according to the product liability law remain unchanged.

As far as the damage is covered by an insurance policy that was concluded for the respective damage case (excluding capital-sum insurance), the seller is liable for the relating disadvantages to the purchaser, e.g. higher insurance amount or interest disadvantages, until damage settlement through the insurance company.

Liability resulting from delivery delay is regulated conclusively under clause 4.

10. Applicable Law, Place of Jurisdiction

For all legal relationships between supplier and orderer, solely the law of the Federal Republic of Germany applies. Place of jurisdiction is the court that is responsible at supplier's place of business. However, the supplier is entitled to file a claim at the orderer's place of business.