

A1½ to A3 Heavy Industrial Shock Absorbers

**Deceleration of heavy loads and
progressive adjustment**

Adjustable

**Energy capacity from 2,350 Nm/cycle
to 44,000 Nm/cycle**

Stroke 50 mm to 305 mm

A1½EU

A2EU

A3EU

The identification numbers listed are the respective standard units of the corresponding shock absorber series. Special types can have deviating identification numbers.

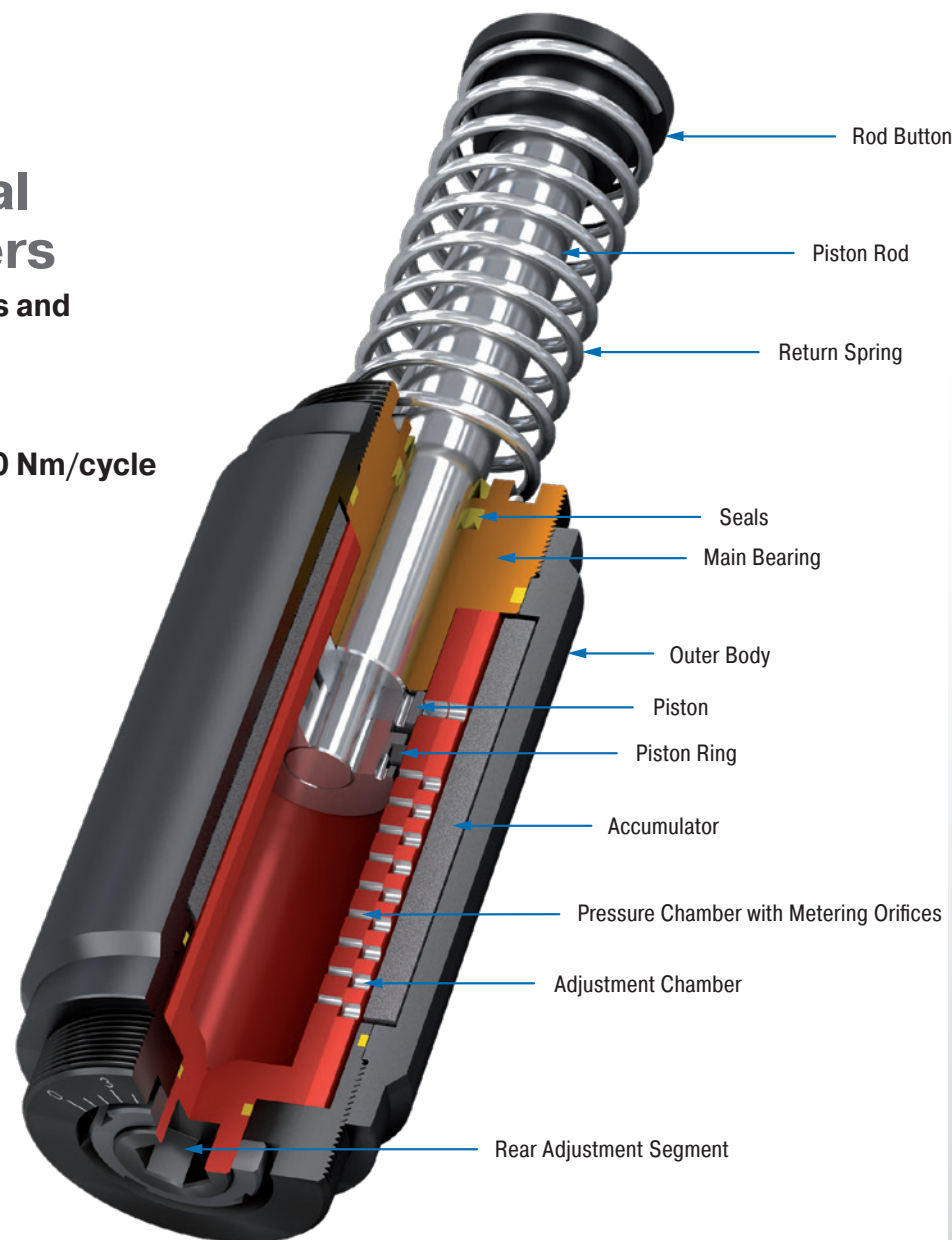


Table of contents	Page
General instructions.....	2
Safety information	2
Intended use.....	2
Description and function.....	2
Calculation and design	2
Delivery and storage	2
Maintenance and care	2
Disassembly and disposal.....	2
Mounting instructions.....	3 - 5
Warranty	6
Expected service life	6
Technical data.....	6

General instructions

This manual is for the disruption-free use of the product types listed on page 1; its compliance is a prerequisite for the fulfilment of any warranty claims.

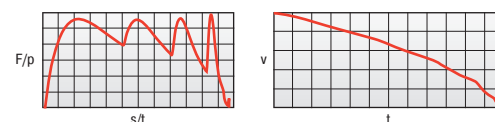
Therefore, make sure to read this manual before use.

Please always maintain the specified limits from the performance table (technical data). Take into account the predominant environmental conditions and restrictions.

Note the regulations of the trade association, TÜV or corresponding national, international and European regulations. Installation and commissioning only according to mounting instructions.

over the entire stroke. A requirement for a constant rate of deceleration is the correct calculation of the industrial shock absorber and the correct adjustment of the damping according to the respective application (see mounting instructions).

General Function



F = Force (N) p = Internal pressure (bar) s = Stroke (m)
t = Deceleration time (s) v = Velocity (m/s)

Safety information

WARNING

- ⚠ If ACE industrial shock absorbers are used where a failure of the product could lead to personal injuries and/or material damage, additional safety elements must be implemented.
- ⚠ Free-moving masses can lead to injuries by crushing during installation of the shock absorber. Secure moving masses against inadvertent starting with suitable safety precautions before installing the shock absorbers.

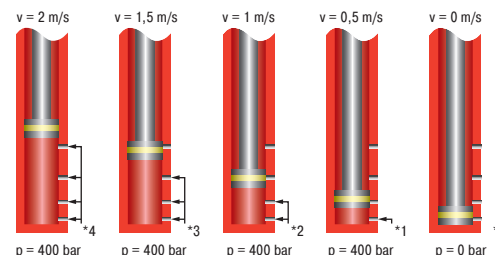
Intended use

ACE industrial shock absorbers are used wherever moving masses are to be slowed down in a defined end position. The industrial shock absorbers are designed for force capacity in an axial direction. Within the permissible load limits the industrial shock absorber also acts as a stop.

Description and function

The ACE industrial shock absorbers A1½ to A3 are maintenance-free, ready-to-install hydraulic components with numerous metering openings.

During the slowing down process the moving mass moves with kinetic energy and, if necessary, an additional drive energy in the axial direction of the piston rod with a defined impact velocity against the rod end button of the shock absorber. Alternatively, numerous shock absorbers can also be used in parallel. During the initiated slowing down process the piston rod is pushed into the shock absorber. The hydraulic oil located before the piston is displaced through all metering orifices at the same time. The number of effective metering openings reduces in proportion to the driven stroke. The retraction speed reduces. The dynamic pressure applied in front of the piston corresponds to the counterforce applied by the shock absorber and remains approximately constant



* The load velocity reduces continuously as you travel through the stroke due to the reduction in the number of metering orifices (*) in action. The internal pressure remains essentially constant and thus the Force vs. stroke curve remains linear.

Calculation and design

In order to ensure an optimum, fault-free and durable function of the industrial shock absorbers they must be correctly dimensioned and designed. The following parameters must be known and used in the calculation:

- Moving mass [kg]
- Impact velocity of the mass into the shock absorber(s) [m/s]
- Additionally acting propelling force, propelling power or propelling torque [N, kW, Nm]
- Number of shock absorbers acting in parallel [n]
- Number of strokes or cycles per hour [1/h]

The correct size of the shock absorbers can be determined with the ACE online calculation programme at www.ace-ace.de. You can also send us the completed online form via e-mail for checking.

Or make use of our free calculation service by phoning: +49 (0)2173 - 9226-20.

WARNING

- ⚠ The dampers must be dimensioned in such a way that the calculated values do not exceed the maximum values of the respective performance table (technical data):
W_j [Nm/cycle]
W_i [Nm/h]
Effective weight m_e
Max. side load angle [°]
- ⚠ For a correct damping design the shock absorber must represent the only braking system. Additional braking systems, such as a pneumatic end position damping length, must not overlap with the end position damping length by the shock absorber and must be disabled.

Delivery and storage

- After delivery please check the shock absorber for any damage.
- The shock absorber can become damaged if it falls. Carefully remove shock absorber from the packaging.
- Shock absorbers can generally be stored in any position.
- Storage in the original packaging is preferred.
- Always store shock absorbers in a dry place in order to avoid oxidation.
- The recommended maximum storage time is three years.

Maintenance and care

Regularly check the shock absorbers for oil loss, return of the piston rod and external damage.

Shock absorbers are machine elements that are subject to continuous wear. Increased service life results in reduced damping effect. If this is no longer sufficient, the shock absorbers must be replaced or exchanged as appropriate.

Disassembly and disposal

Take account of environmental protection (recovery of problematic substances) during disposal of the shock absorber. The A2 to A3 industrial shock absorbers are filled with automatic transmission fluid (ATF). The types of the A1½ range are filled with HLP 46 fluid. The corresponding data sheet is available on request.

Faulty dampers can be sent to our service department for determination of the cause of failure.

Mounting instructions and mounting accessories

Installation instructions

Before installation and use check whether the identification number on the damper or on the packaging matches the respective designation on the delivery note. Industrial shock absorbers are maintenance-free and ready to install.

Operating temperature range: -12 °C to 66 °C

Mounting: As required but always in such a way that the entire damper stroke is used. The dampers must always be mounted in such a way that the forces are introduced centrally over the piston rod. The maximum permissible side load angle (see table) must not be exceeded. If there is a side load angle, it generally leads to a reduction in service life. In the case of maximum permissible values being exceeded a side load adapter must be used.

WARNING

- ⚠ **Positive stop:** Secure 2.5 to 3 mm before end of stroke.
- ⚠ **Temperature effect:** The W4 and me values given in the performance table (see manual or catalogue) are valid for room temperature. Deviating values apply to higher temperatures.
- ⚠ During installation of the dampers, moving masses can lead to injuries due to inadvertent starting. Secure moving masses against inadvertent moving.
- ⚠ The dampers may be unsuitable for use and have an insufficient damping effect. Check the specific suitability of the dampers before installation.
- ⚠ If operated outside of the operating temperature range, the damper can lose its function. Operating temperature range must be maintained. Do not paint dampers due to heat emission.
- ⚠ Fluids, gases and dirt particles in the surrounding area can attack or destroy the seal system of the damper and cause it to fail. Protect or encapsulate piston rod and seal system from external materials in the surrounding area.
- ⚠ Damage to the piston rod surface can destroy the seal system. Do not grease, oil piston rod etc. and protect against dirt particles.
- ⚠ The piston rod can be torn from the damper. Do not load the piston rod with tensile stress.
- ⚠ Damper can tear off upon impact. Always lay out the connection structure in such a way that the maximum occurring forces can be absorbed with sufficient safety. The maximum reacting forces listed in the calculation range may deviate from the actually occurring reacting forces, as these are based on theoretical values.
- ⚠ An adjustment of the dampers to the respective application is essential. Incorrect adjustment of the damping leads to an increased machine load and premature failure of the shock absorbers.

Packaging disposal

Please dispose of the transportation packaging in an environmentally-friendly manner. Recycling packaging materials saves raw materials and reduces waste. The packaging materials do not contain any prohibited materials.

Commissioning and adjustment

After mounting of the damper the device is run several times. In doing so, the adjustment segment is turned until the optimum adjustment is reached.

A hard impact at the start of the stroke means: Adjustment too hard. Turn adjustment segment clockwise to 9.

Hard impact at end of stroke means: Adjustment too soft. Turn adjustment segment anticlockwise to 0.

The rear adjustment screw is blocked with a locking ring. Before adjusting the damper, release the locking ring and, after completing the adjustment process, tighten it again. The shock absorber is set to the value 5 in delivered condition.

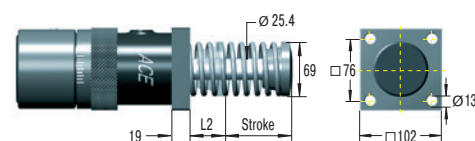
Fastening

The screw connection for fastening the flanges must always be designed by the customer. In the case of foot mounting, an additional support strip is required to support the damper force. This support strip (max. thickness 18 mm) is preferably positioned behind the rear foot flange. The support strip prevents the fixing screws of the damper from being subjected to bending and shearing. The customer must design, manufacture and install the fastening of the support strip (welding, screw fastening, etc.) on site.

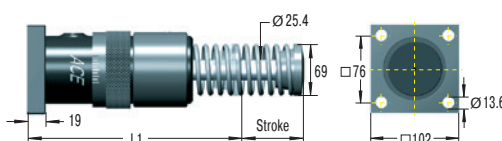
Mounting accessories

If using accessory parts and mounting elements, note the respective separate mounting instructions for accessories.

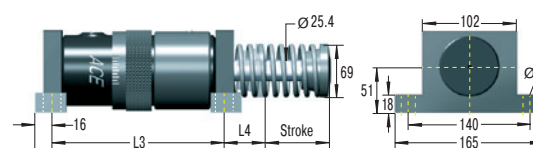
A1½-F Front Flange



A1½-R Rear Flange



A1½-S Foot Mount



A1½-C Clevis Mount



Model type prefix

Standard types

A: Self-contained with spring, adjustable

Special types

AA: not self-contained, without spring. Use only with external air/oil tank.

NA: Self-contained, without spring

SA: not self-contained, with spring. Use only with external air/oil tank.

Dimensions

TYPES	Stroke mm	L min. mm	L max. mm	L1 mm	L2 mm	L3 mm	L4 mm
A1½X2EU	50	277.8	328.6	195.2	54.2	-	-
A1½X3½EU	89	316.6	405.6	233	54.2	170	58.6
A1½X5EU	127	354.8	481.8	271.5	54.2	208	58.6
A1½X6½EU	165	412	577	329	73	246	78

Performance data

TYPES	Max. Energy Capacity			Effective Weight		Return Force min. N	Return Force max. N	Return Time s	Side Load Angle max. °	Weight kg
	¹ W ₃ Nm/cycle	² W ₄ Nm/h	² W ₄ with Oil Tank Nm/h	³ me min. kg	³ me max. kg					
A1½X2EU	2,350	362,000	452,000	195	32,000	160	210	0.10	5	7.6
A1½X3½EU	4,150	633,000	791,000	218	36,000	110	210	0.25	4	8.9
A1½X5EU	5,900	904,000	1,130,000	227	41,000	90	230	0.40	3	9.4
A1½X6½EU	7,700	1,180,000	1,469,000	308	45,000	90	430	0.40	2	12.0

¹ It is permissible to exceed the stated energy in emergency stop situations. In the event of such a case, please contact ACE.

² With oil recirculation on request.

³ The effective weight range limits can be raised or lowered on request.

Mounting instructions and mounting accessories

Installation instructions

Before installation and use check whether the identification number on the damper or on the packaging matches the respective designation on the delivery note. Industrial shock absorbers are maintenance-free and ready to install.

Operating temperature range: -12 °C to 66 °C

Mounting: As required but always in such a way that the entire damper stroke is used. The dampers must always be mounted in such a way that the forces are introduced centrally over the piston rod. The maximum permissible side load angle (see table) must not be exceeded. If there is a side load angle, it generally leads to a reduction in service life. In the case of maximum permissible values being exceeded a side load adapter must be used.

WARNING

Positive stop: Secure 2.5 to 3 mm before end of stroke.

Temperature effect: The W4 and me values given in the performance table (see manual or catalogue) are valid for room temperature. Deviating values apply to higher temperatures.

During installation of the dampers, moving masses can lead to injuries due to inadvertent starting. Secure moving masses against inadvertent moving.

The dampers may be unsuitable for use and have an insufficient damping effect. Check the specific suitability of the dampers before installation.

If operated outside of the operating temperature range, the damper can lose its function. Operating temperature range must be maintained. Do not paint dampers due to heat emission.

Fluids, gases and dirt particles in the surrounding area can attack or destroy the seal system of the damper and cause it to fail. Protect or encapsulate piston rod and seal system from external materials in the surrounding area.

Damage to the piston rod surface can destroy the seal system. Do not grease, oil piston rod etc. and protect against dirt particles.

The piston rod can be torn from the damper. Do not load the piston rod with tensile stress.

Damper can tear off upon impact. Always lay out the connection structure in such a way that the maximum occurring forces can be absorbed with sufficient safety. The maximum reacting forces listed in the calculation range may deviate from the actually occurring reacting forces, as these are based on theoretical values.

An adjustment of the dampers to the respective application is essential. Incorrect adjustment of the damping leads to an increased machine load and premature failure of the shock absorbers.

Packaging disposal

Please dispose of the transportation packaging in an environmentally-friendly manner. Recycling packaging materials saves raw materials and reduces waste. The packaging materials do not contain any prohibited materials.

Commissioning and adjustment

After mounting of the damper the device is run several times. In doing so, the adjustment segment is turned until the optimum adjustment is reached.

A hard impact at the start of the stroke means: Adjustment too hard. Turn adjustment segment clockwise to 9.

Hard impact at end of stroke means: Adjustment too soft. Turn adjustment segment anticlockwise to 0.

The rear adjustment screw is blocked with a locking ring. Before adjusting the damper, release the locking ring and, after completing the adjustment process, tighten it again. The shock absorber is set to the value 5 in delivered condition.

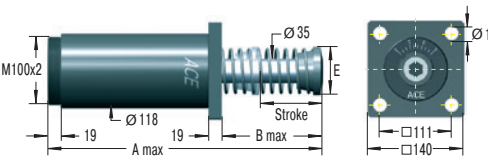
Fastening

The screw connection for fastening the flanges must always be designed by the customer. In the case of foot mounting, an additional support strip is required to support the damper force. This support strip (max. thickness 11 mm) is preferably positioned behind the rear foot flange. The support strip prevents the fixing screws of the damper from being subjected to bending and shearing. The customer must design and install the fastening of the support strip (welding, screw fastening, etc.) on site.

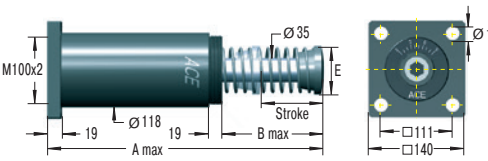
Mounting accessories

If using accessory parts and mounting elements, note the respective separate mounting instructions for accessories.

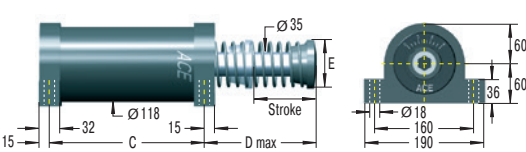
A2-F Front Flange



A2-R Rear Flange



A2-SM Foot Mount



Model type prefix

Standard types

A: Self-contained with spring, adjustable

Special types

AA: not self-contained, without spring. Use only with external air/oil tank.

NA: Self-contained, without spring

SA: not self-contained, with spring. Use only with external air/oil tank.

Dimensions						
TYPES	Stroke mm	A max. mm	B max. mm	C mm	D max. mm	E mm
A2X2EU	50	313	110	173	125	70
A2X4EU	102	414	160	224	175	70
A2X6EU	152	516	211	275	226	70
A2X8EU	203	643	287	326	302	92
A2X10EU	254	745	338	377	353	108

Performance data										
	Max. Energy Capacity			Effective Weight						
	¹ W ₃ Nm/cycle	² W ₄ Nm/h	² W ₄ with Oil Tank Nm/h	³ me min. kg	³ me max. kg	Return Force min. N	Return Force max. N	Return Time s	Side Load Angle max. °	Weight kg
TYPES										
A2X2EU	3,600	1,100,000	1,350,000	250	77,000	210	285	0.25	3	14.3
A2X4EU	9,000	1,350,000	1,700,000	250	82,000	150	285	0.50	3	16.7
A2X6EU	13,500	1,600,000	2,000,000	260	86,000	150	400	0.60	3	19.3
A2X8EU	19,200	1,900,000	2,400,000	260	90,000	230	650	0.70	3	22.3
A2X10EU	23,700	2,200,000	2,700,000	320	113,000	160	460	0.80	3	26.2

¹ It is permissible to exceed the stated energy in emergency stop situations. In the event of such a case, please contact ACE.

² With oil recirculation on request.

³ The effective weight range limits can be raised or lowered on request.

Mounting instructions and mounting accessories

Installation instructions

Before installation and use check whether the identification number on the damper or on the packaging matches the respective designation on the delivery note. Industrial shock absorbers are maintenance-free and ready to install.

Operating temperature range: -12 °C to 66 °C

Mounting: As required but always in such a way that the entire damper stroke is used. The dampers must always be mounted in such a way that the forces are introduced centrally over the piston rod. The maximum permissible side load angle (see table) must not be exceeded. If there is a side load angle, it generally leads to a reduction in service life. In the case of maximum permissible values being exceeded a side load adapter must be used.

WARNING

Positive stop: Secure 2.5 to 3 mm before end of stroke.

Temperature effect: The W4 and me values given in the performance table (see manual or catalogue) are valid for room temperature. Deviating values apply to higher temperatures.

During installation of the dampers, moving masses can lead to injuries due to inadvertent starting. Secure moving masses against inadvertent moving.

The dampers may be unsuitable for use and have an insufficient damping effect. Check the specific suitability of the dampers before installation.

If operated outside of the operating temperature range, the damper can lose its function. Operating temperature range must be maintained. Do not paint dampers due to heat emission.

Fluids, gases and dirt particles in the surrounding area can attack or destroy the seal system of the damper and cause it to fail. Protect or encapsulate piston rod and seal system from external materials in the surrounding area.

Damage to the piston rod surface can destroy the seal system. Do not grease, oil piston rod etc. and protect against dirt particles.

The piston rod can be torn from the damper. Do not load the piston rod with tensile stress.

Damper can tear off upon impact. Always lay out the connection structure in such a way that the maximum occurring forces can be absorbed with sufficient safety. The maximum reacting forces listed in the calculation range may deviate from the actually occurring reacting forces, as these are based on theoretical values.

An adjustment of the dampers to the respective application is essential. Incorrect adjustment of the damping leads to an increased machine load and premature failure of the shock absorbers.

Commissioning and adjustment

After mounting of the damper the device is run several times. In doing so, the adjustment segment is turned until the optimum adjustment is reached.

A hard impact at the start of the stroke means: Adjustment too hard. Turn adjustment segment clockwise to 9.

Hard impact at end of stroke means: Adjustment too soft. Turn adjustment segment anticlockwise to 0.

The rear adjustment screw is blocked with a locking ring. Before adjusting the damper, release the locking ring and, after completing the adjustment process, tighten it again. The shock absorber is set to the value 5 in delivered condition.

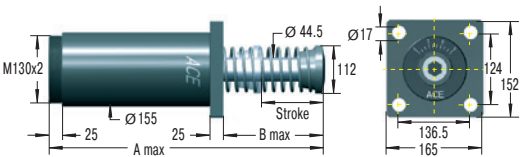
Fastening

The screw connection for fastening the flanges must always be designed by the customer. In the case of foot mounting, an additional support strip is required to support the damper force. This support strip (max. thickness 14 mm) is preferably positioned behind the rear foot flange. The support strip prevents the fixing screws of the damper from being subjected to bending and shearing. The customer must design and install the fastening of the support strip (welding, screw fastening, etc.) on site.

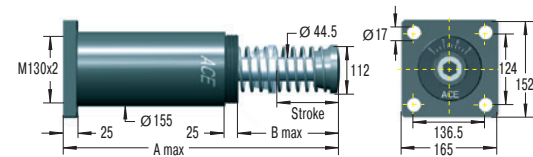
Mounting accessories

If using accessory parts and mounting elements, note the respective separate mounting instructions for accessories.

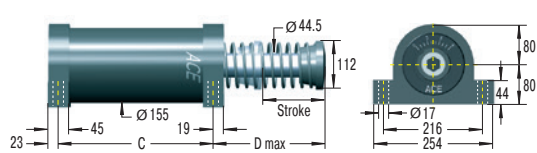
A3-F Front Flange



A3-R Rear Flange



A3-S Foot Mount



Model type prefix

Standard types

A: Self-contained with spring, adjustable

Special types

AA: not self-contained, without spring. Use only with external air/oil tank.
NA: Self-contained, without spring
SA: not self-contained, with spring. Use only with external air/oil tank.

Dimensions										
TYPES	Stroke mm	A max. mm	B max. mm	C mm	D max. mm					
A3X5EU	127	490.5	211	254	224					
A3X8EU	203	641	286	330	300					
A3X12EU	305	890	434	432	447					

Performance data										
TYPES	Max. Energy Capacity			Effective Weight		Return Force min. N	Return Force max. N	Return Time s	Side Load Angle max. °	Weight kg
	¹ W ₃ Nm/cycle	² W ₄ Nm/h	² W ₄ with Oil Tank Nm/h	³ me min. kg	³ me max. kg					
A3X5EU	15,800	2,260,000	2,800,000	480	154,000	270	710	0.6	3	32.7
A3X8EU	28,200	3,600,000	4,520,000	540	181,500	280	740	0.8	3	38.5
A3X12EU	44,000	5,400,000	6,780,000	610	204,000	270	730	1.2	3	48.0

¹ It is permissible to exceed the stated energy in emergency stop situations. In the event of such a case, please contact ACE.
² With oil recirculation on request.
³ The effective weight range limits can be raised or lowered on request.

Manual

Warranty

Fundamentally, all modifications to the product by third parties lead to exclusion from the warranty.

Obvious defects must be reported to the vendor in writing immediately after delivery, no later than one week, but in any case before processing or installation, otherwise the assertion of a warranty claim is excluded. A timely dispatch is sufficient to keep the term.

The vendor is to be given an opportunity to check on site. If the complaint is justified the vendor offers warranty by repair or replacement at its own discretion. If the rectification fails, the buyer may choose to demand reduction of payment or cancellation of the contract. If there is only a minor lack of conformity, particularly with only minor defects, the buyer nevertheless has a right of withdrawal.

If, after failed rectification, the buyer chooses to cancel the contract due to a defect of title or material defect, they are not entitled to additionally claim for damages.

If, after failed fulfilment, the buyer chooses compensation, the goods remain with the buyer, if this is reasonable. The compensation is limited to the difference between the purchase price and the value of the defective item. This does not apply if the vendor maliciously causes the breach of contract.

The quality of the goods is only considered as agreed upon with the product description of the vendor. Public statements, claims or advertising of the manufacturer do not represent an additional contractual specification of quality of the goods.

If the buyer receives defective mounting instructions, the buyer is only obligated to deliver defect-free mounting instructions and only if the defect to the mounting instructions prevents proper mounting.

The warranty period is two years and begins upon completion. Exchange and return of custom products are fundamentally excluded. The factory conditions of the manufacturing factory apply to parts not manufactured and processed by the vendor, which can be viewed by the orderer at the vendor at any time. Construction and installation parts are delivered according to the present standard of engineering.

Service life

In general industrial shock absorbers are machine elements that are subject to wear. Wear parts such as seals, pressure chambers and pistons are excluded from the general warranty. The wear of seals is largely dependent upon the operating conditions and the respective application and its operating parameters.

In general with this model of industrial shock absorber with grooved ring wiper seal system an average service life of three to five million load changes can be expected. Adverse environmental and operating conditions can significantly reduce the expected service life.

Technical data

Energy capacity: 2,350 Nm/cycle to 44,000 Nm/cycle

Impact velocity range: 0.1 m/s to 5 m/s (depending on type and calculation of effective weight). Other speeds on request.

Operating temperature range: -12 °C to +66 °C. Other temperatures on request.

Mounting: in any position

Positive stop: External positive stops 2.5 mm to 3 mm before the end of stroke provided by the customer.

Adjustment: Hard impact at the start of stroke, adjust the ring towards 9. Hard impact at the end of stroke, adjust the ring towards 0.

Material:

Outer body:	steel corrosion-resistant coating
Piston rod:	Hard chrome plated steel
Piston rod seal:	NBR
Rod end button:	steel hardened and corrosion-resistant coating
Return spring:	Zinc plated steel

Damping medium: A1½: HLP 46; A2 and A3: Automatic Transmission Fluid (ATF)

Application field: Portal systems, Machines and plants, Conveyor systems, Crane systems, Loading and lifting equipment, Impact panels, Heavy load appliances, Swivel units, Shelf storage systems

Note: It is permissible to exceed the stated energy in emergency stop situations and continuous use. In the event of such a case, please contact ACE.

Safety instructions: External materials in the surrounding area can attack the sealing components and lead to a shorter service life. Please contact ACE for appropriate solution suggestions. Do not paint the shock absorbers due to heat emission.

On request: Special oils, nickel-plated, increased corrosion protection or other special options are available on request.