CA2 to CA4

Heavy Industrial Shock Absorbers

Deceleration of heavy loads

Self-compensating

Energy capacity 3,600 Nm/cycle to 126,500 Nm/cycle

Stroke 50 mm to 406 mm

CA2EU

CA3EU

CA4EU

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

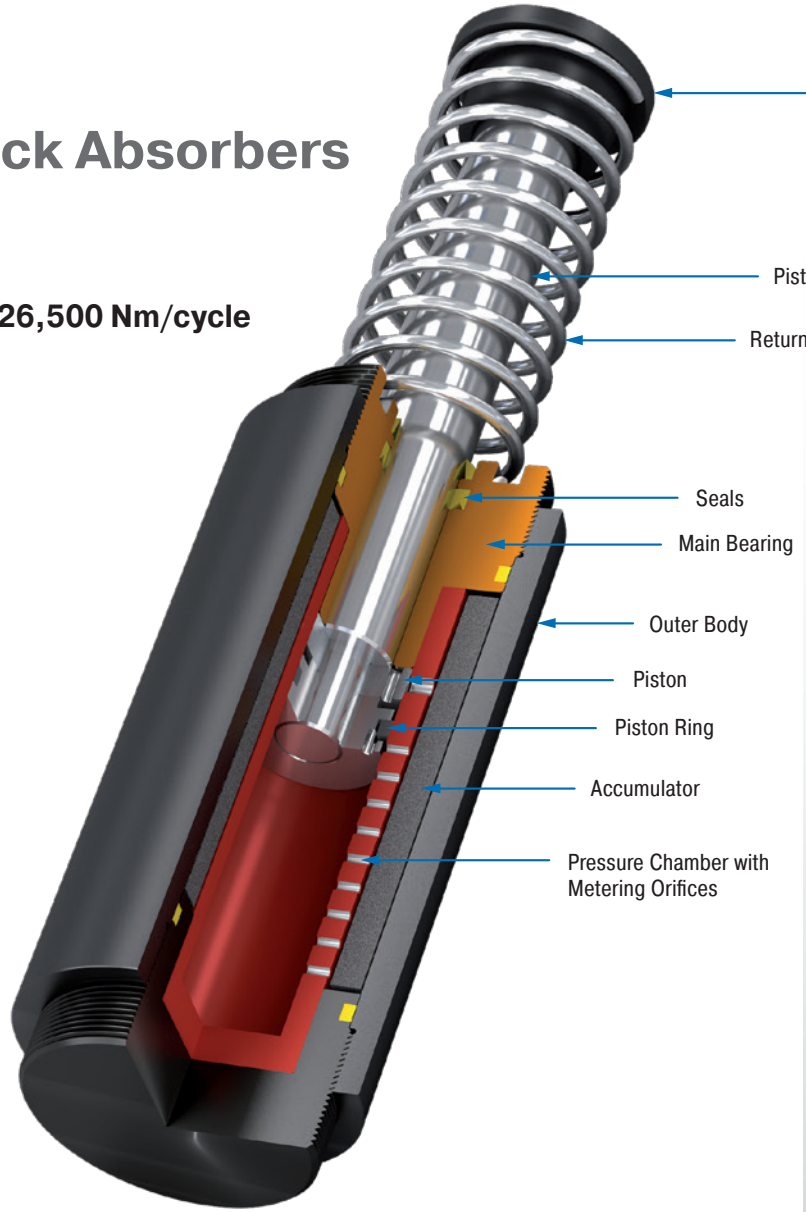


Table of contents **Page**

Heavy Industrial Shock Absorbers CA2 to CA4 (self-compensating)

Manual

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.

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

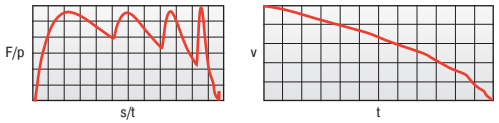
ACE industrial shock absorbers are used wherever moving masses are to be slowed down in a defined end position. The industrial shock absorbers are designed for force capacity in an axial direction. Within the permissible load limits the industrial shock absorber also acts as a stop.

Description and function

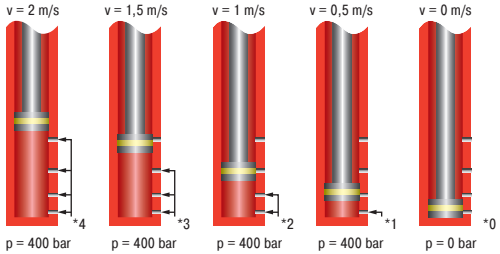
The ACE industrial shock absorbers CA2 to CA4 are maintenance-free, ready-to-install hydraulic components with numerous metering openings.

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 over the entire stroke. A requirement for a constant rate of deceleration is the correct calculation of the industrial shock absorber and therefore the correct selection of the right metering orifice pattern or the right hardness level of the shock absorber. The standard hardnesses are graded from 1 (soft) to 7 (hard)

General Function



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



* 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_3 [Nm/cycle]

W_4 [Nm/h]

Effective weight me

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 CA2 to CA4 industrial shock absorbers are filled with automatic transmission fluid (ATF). The corresponding data sheet is available on request.

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

Heavy Industrial Shock Absorbers CA2 (self-compensating)

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.

Self-compensating

The CA range of shock absorbers is self-compensating. In a selectable range according to a table, the different effects of power, weight, temperature and speed balance out independently.

Commissioning

- After installation, start a test run of the moving mass at reduced operating speed to begin with.

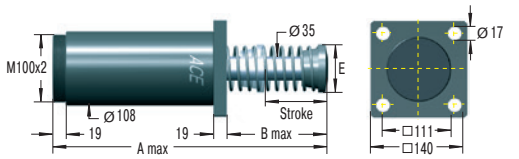
During the test run

- Gradually accelerate the load capacity up to the subsequent operating speed. You can find this in the calculation for your application. In the correct final setting, the piston rod of the shock absorber reaches the end position (positive stop) without a hard stop.

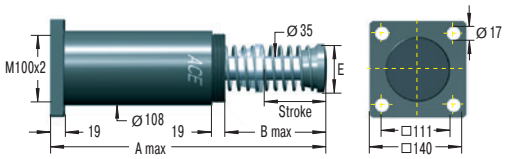
Mounting accessories

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

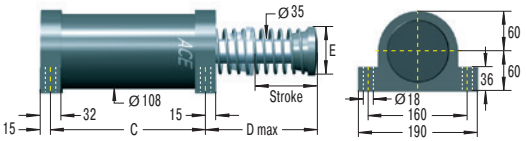
CA2-F Front Flange



CA2-R Rear Flange



CA2-SM Foot Mount



Model type prefix

Standard types

CA: Self-contained with spring, self-compensating

Special types

CAA: not self-contained, without spring. Use only with external air/oil tank.
CNA: Self-contained, without spring
CSA: not self-contained, with spring. Use only with external air/oil tank.

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.

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.**

Dimensions

BASIC TYPES	Stroke mm	A max. mm	B max. mm	C mm	D max. mm	E mm
CA2X2EU	50	313	110	173	125	70
CA2X4EU	102	414	160	224	175	70
CA2X6EU	152	516	211	275	226	70
CA2X8EU	203	643	287	326	302	92
CA2X10EU	254	745	338	377	353	108

Performance data

	Max. Energy Capacity			Effective Weight							
TYPES	[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	Hardness	Return Force min. N	Return Force max. N	Return Time s	Side Load Angle max. °	Weight kg
CA2X2EU-1	3,600	1,100,000	1,350,000	700	2,200	-1	210	285	0.25	3	14.3
CA2X2EU-2	3,600	1,100,000	1,350,000	1,800	5,400	-2	210	285	0.25	3	14.3
CA2X2EU-3	3,600	1,100,000	1,350,000	4,500	13,000	-3	210	285	0.25	3	14.3
CA2X2EU-4	3,600	1,100,000	1,350,000	11,300	34,000	-4	210	285	0.25	3	14.3
CA2X4EU-1	7,200	1,350,000	1,700,000	1,400	4,400	-1	150	285	0.50	3	16.7
CA2X4EU-2	7,200	1,350,000	1,700,000	3,600	11,000	-2	150	285	0.50	3	16.7
CA2X4EU-3	7,200	1,350,000	1,700,000	9,100	27,200	-3	150	285	0.50	3	16.7
CA2X4EU-4	7,200	1,350,000	1,700,000	22,600	68,000	-4	150	285	0.50	3	16.7
CA2X6EU-1	10,800	1,600,000	2,000,000	2,200	6,500	-1	150	400	0.60	3	19.3
CA2X6EU-2	10,800	1,600,000	2,000,000	5,400	16,300	-2	150	400	0.60	3	19.3
CA2X6EU-3	10,800	1,600,000	2,000,000	13,600	40,800	-3	150	400	0.60	3	19.3
CA2X6EU-4	10,800	1,600,000	2,000,000	34,000	102,000	-4	150	400	0.60	3	19.3
CA2X8EU-1	14,500	1,900,000	2,400,000	2,900	8,700	-1	230	650	0.70	3	22.3
CA2X8EU-2	14,500	1,900,000	2,400,000	7,200	21,700	-2	230	650	0.70	3	22.3
CA2X8EU-3	14,500	1,900,000	2,400,000	18,100	54,400	-3	230	650	0.70	3	22.3
CA2X8EU-4	14,500	1,900,000	2,400,000	45,300	136,000	-4	230	650	0.70	3	22.3
CA2X10EU-1	18,000	2,200,000	2,700,000	3,600	11,000	-1	160	460	0.80	3	32.3
CA2X10EU-2	18,000	2,200,000	2,700,000	9,100	27,200	-2	160	460	0.80	3	32.3
CA2X10EU-3	18,000	2,200,000	2,700,000	22,600	68,000	-3	160	460	0.80	3	32.3
CA2X10EU-4	18,000	2,200,000	2,700,000	56,600	170,000	-4	160	460	0.80	3	32.3

[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.

Heavy Industrial Shock Absorbers CA3 (self-compensating)

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.

Self-compensating

The CA range of shock absorbers is self-compensating. In a selectable range according to a table, the different effects of power, weight, temperature and speed balance out independently.

Commissioning

- After installation, start a test run of the moving mass at reduced operating speed to begin with.

During the test run

- Gradually accelerate the load capacity up to the subsequent operating speed. You can find this in the calculation for your application. In the correct final setting, the piston rod of the shock absorber reaches the end position (positive stop) without a hard stop.

Mounting accessories

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

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.

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.

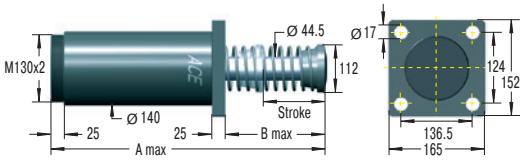
Fluids, gases and dirt particles in the surrounding area can attack or destroy the seal system of the damper and cause it to fail. Protect or encapsulate piston rod and seal system from external materials in the surrounding area.

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

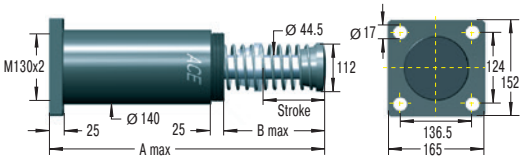
The piston rod can be torn from the damper. Do not load the piston rod with tensile stress.

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.

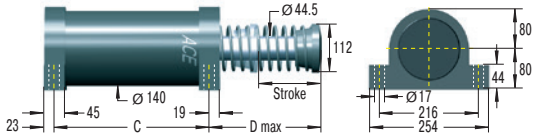
CA3-F Front Flange



CA3-R Rear Flange



CA3-S Foot Mount



Model type prefix

Standard types

CA: Self-contained with spring, self-compensating

Special types

CAA: not self-contained, without spring. Use only with external air/oil tank.
CNA: Self-contained, without spring
CSA: not self-contained, with spring. Use only with external air/oil tank.

Dimensions

BASIC TYPES	Stroke mm	A max. mm	B max. mm	C mm	D max. mm
CA3X5EU	127	490.5	211	254	224
CA3X8EU	203	641	286	330	300
CA3X12EU	305	890	434	432	447

Performance data

	Max. Energy Capacity			Effective Weight							
TYPES	[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	Hardness	Return Force min. N	Return Force max. N	Return Time s	Side Load Angle max. °	Weight kg
CA3X5EU-1	14,125	2,260,000	2,800,000	2,900	8,700	-1	270	710	0.6	3	32.7
CA3X5EU-2	14,125	2,260,000	2,800,000	7,250	21,700	-2	270	710	0.6	3	32.7
CA3X5EU-3	14,125	2,260,000	2,800,000	18,100	54,350	-3	270	710	0.6	3	32.7
CA3X5EU-4	14,125	2,260,000	2,800,000	45,300	135,900	-4	270	710	0.6	3	32.7
CA3X8EU-1	22,600	3,600,000	4,520,000	4,650	13,900	-1	280	740	0.8	3	38.5
CA3X8EU-2	22,600	3,600,000	4,520,000	11,600	34,800	-2	280	740	0.8	3	38.5
CA3X8EU-3	22,600	3,600,000	4,520,000	29,000	87,000	-3	280	740	0.8	3	38.5
CA3X8EU-4	22,600	3,600,000	4,520,000	72,500	217,000	-4	280	740	0.8	3	38.5
CA3X12EU-1	33,900	5,400,000	6,780,000	6,950	20,900	-1	270	730	1.2	3	47.6
CA3X12EU-2	33,900	5,400,000	6,780,000	17,400	52,200	-2	270	730	1.2	3	47.6
CA3X12EU-3	33,900	5,400,000	6,780,000	43,500	130,450	-3	270	730	1.2	3	47.6
CA3X12EU-4	33,900	5,400,000	6,780,000	108,700	326,000	-4	270	730	1.2	3	47.6

[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.

Heavy Industrial Shock Absorbers CA4 (self-compensating)

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.

Self-compensating

The CA range of shock absorbers is self-compensating. In a selectable range according to a table, the different effects of power, weight, temperature and speed balance out independently.

Commissioning

- After installation, start a test run of the moving mass at reduced operating speed to begin with.

During the test run

- Gradually accelerate the load capacity up to the subsequent operating speed. You can find this in the calculation for your application. In the correct final setting, the piston rod of the shock absorber reaches the end position (positive stop) without a hard stop.

Mounting accessories

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

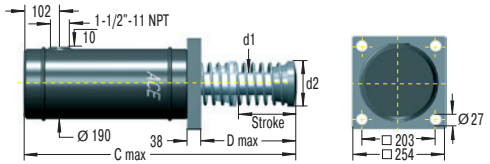
Packaging disposal

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.

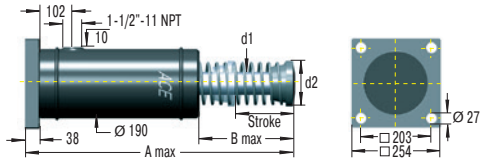
WARNING

- **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.**

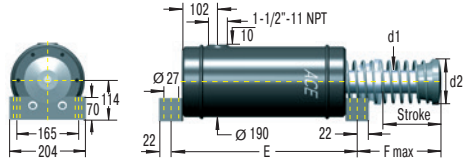
CA4-F Front Flange



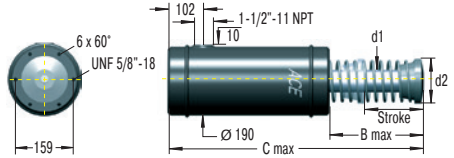
CA4-R Rear Flange



CA4-S Foot Mount



CA4-FRP 6 Tapped Holes



Model type prefix

Standard types

CA: Self-contained with spring, self-compensating

Special types

CAA: not self-contained, without spring. Use only with external air/oil tank.
CNA: Self-contained, without spring
CSA: not self-contained, with spring. Use only with external air/oil tank.

Dimensions

BASIC TYPES	Stroke mm	A max. mm	B max. mm	C max. mm	D max. mm	d1 mm	d2 mm	E mm	F mm
CA4X6EU	152	716	278	678	240	54	114	444	256
CA4X8EU	203	818	329	780	291	54	114	495	307
CA4X16EU	406	1,300	608.5	1,262.6	569	63.5	127	698	585

Performance data

	Max. Energy Capacity				Effective Weight						
TYPES	[1] W_3 Nm/cycle	W_4 Nm/h	W_4 with Oil Tank Nm/h	W_4 with oil recirculation Nm/h	[2] me min. kg	[2] me max. kg	Hardness	Return Force min. N	Return Force max. N	Return Time s	Weight kg
CA4X6EU-3	47,500	3,000,000	5,100,000	6,600,000	3,500	8,600	-3	480	1,000	1.8	60
CA4X6EU-5	47,500	3,000,000	5,100,000	6,600,000	8,600	18,600	-5	480	1,000	1.8	60
CA4X6EU-7	47,500	3,000,000	5,100,000	6,600,000	18,600	42,700	-7	480	1,000	1.8	60
CA4X8EU-3	63,300	3,400,000	5,600,000	7,300,000	5,000	11,400	-3	310	1,000	2.3	68
CA4X8EU-5	63,300	3,400,000	5,600,000	7,300,000	11,400	25,000	-5	310	1,000	2.3	68
CA4X8EU-7	63,300	3,400,000	5,600,000	7,300,000	25,000	57,000	-7	310	1,000	2.3	68
CA4X16EU-3	126,500	5,600,000	9,600,000	12,400,000	10,000	23,000	-3	310	1,000	ask	146
CA4X16EU-5	126,500	5,600,000	9,600,000	12,400,000	23,000	50,000	-5	310	1,000	ask	146
CA4X16EU-7	126,500	5,600,000	9,600,000	12,400,000	50,000	115,000	-7	310	1,000	ask	146

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

Heavy Industrial Shock Absorbers CA2 to CA4 (self-compensating)

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: 3,600 Nm/cycle to 126,500 Nm/cycle

Impact velocity range: 0.3 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.

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: Automatic Transmission Fluid (ATF)

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

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.