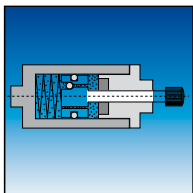


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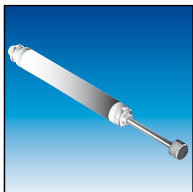
## Damping Engineering

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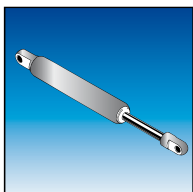
**Types  
Functioning of the Dampers**

**Page 03.003.00**



**Final Dampers  
Single and Bi-Directional**

**Page 03.009.00**



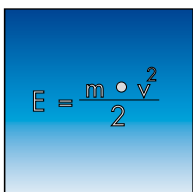
**Oil Dampers with Fixings  
on Both Ends**

**Page 03.027.00**



**Radial Dampers**

**Page 03.035.00**



**Calculation Examples,  
Selection Criteria**

**Page 03.065.00**

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**Notes**

**State 02/2018**

## DICTATOR Damping Solutions

### Types of Dampers and Functioning

DICTATOR damping solutions offer four different lines of dampers:

#### 1) EDH and ZDH final dampers

Final dampers are used to slow down a movement before reaching the final position, e.g. with sliding doors in the positions OPEN and CLOSED. The relatively long stroke dimensions assure a sufficient safety zone. Final dampers are adjustable, to fit exactly the requirements of each door.

#### 2) Oil dampers with fixings on both ends

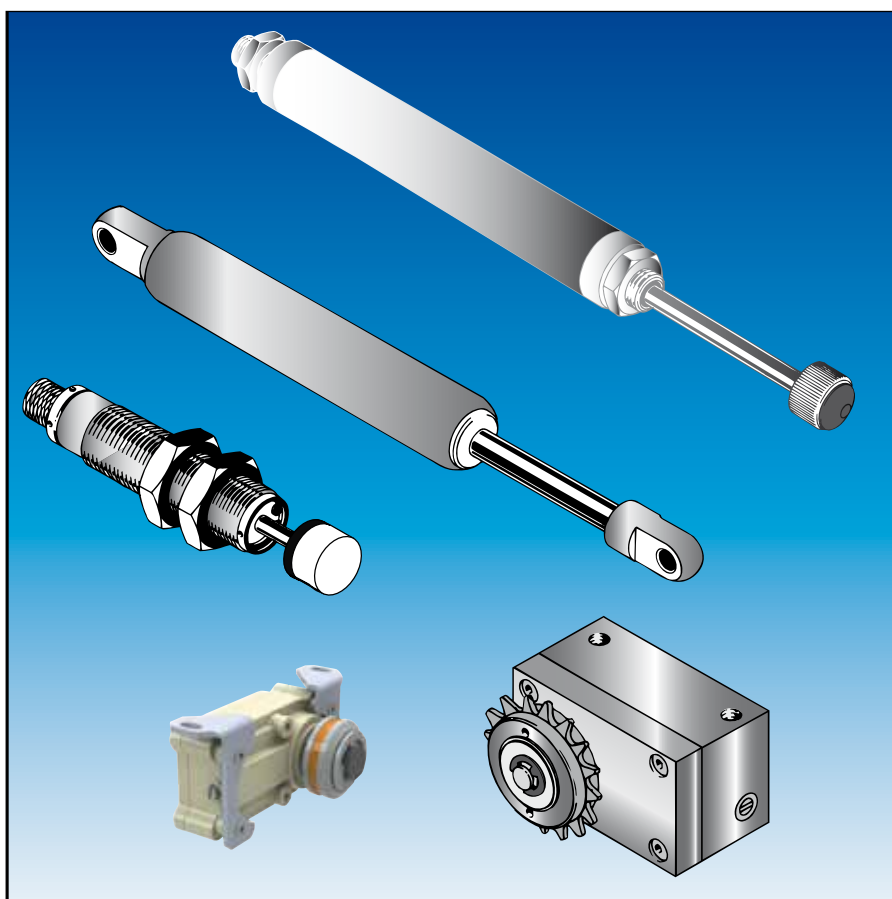
Oil dampers with fixings on both ends are connected firmly to the object that has to be damped (e.g. a flap). This way they control the movement from the very first moment. They are fabricated in two different lines: adjustable and preset.

#### 3) High-performance final dampers

These dampers slow down high loads on a very short distance. They are mainly used in machine construction.

#### 4) Radial dampers

Radial dampers use the rotation principle for damping. This way they provide constant damping even for high loads over large travel distances (e.g. sliding doors).



### Summary

Types of dampers	linear and radial
Damping	hydraulic
Damping fluid	hydraulic, biological, silicone oil
Product range	standard product line and customised production (also single units)

## Functional Principle

### Basic Information

Masses are moved almost everywhere in daily life and working units: doors and gates, flaps, transported goods or machinery parts. These involve high kinetic energy and high impact speed. If these forces are not controlled and slowed down, products and machinery can be damaged and people can get injured.

DICTATOR dampers are based on the principle of transforming kinetic energy into thermal energy. The movement is transmitted to the damping cylinder - depending on the type of damper either via the piston rod or the wheel of the radial damper. Inside the cylinder the piston or the gear pump displaces the hydraulic fluid and pushes it through one or several of the throttling ports. With most DICTATOR dampers the diameter of the throttling port can be adjusted individually to achieve an optimum damping result for different requirements.

In the following the functioning principles of the different types of dampers are shown, along with information for which application area each type is designed.

### Fields of Application

Final dampers are needed to slow down the rotative or linear movement of all kinds of objects. DICTATOR final dampers are used

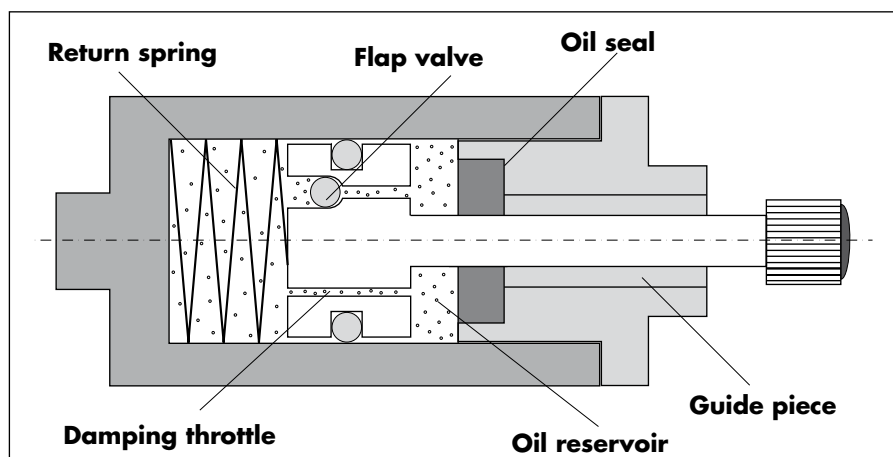
- if the distance is too large to control the movement during the whole travel.
- if the object should move unrestrictedly during most of the distance (e.g. as fast as possible).
- due to space restrictions.

The relatively long strokes offer safety distances allowing for protection against pinching and squeezing.

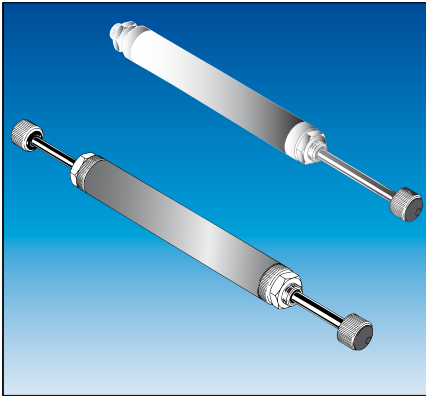
Detailed examples you will find in our overview folder.

### Functional Principle of Final Dampers

#### Basic functional principle



Hydraulic dampers are an indispensable alternative to springs (spiral springs, rubber buffers) as these return the taken energy at once by springing back. They lessen the impact but neither can regulate nor slow down the kinetic energy. Hydraulic dampers in contrast bring moving objects in a controlled way to a standstill. The movement of the impacting mass is transferred by the piston rod to the damper. The entering piston is damped continually by pushing the oil in the cylinder through one or several throttling ports. The displaced oil is collected in a reservoir. From there it flows back by the flap valve as soon as the piston rod returns to its starting position.



### Functional Principle - cont.

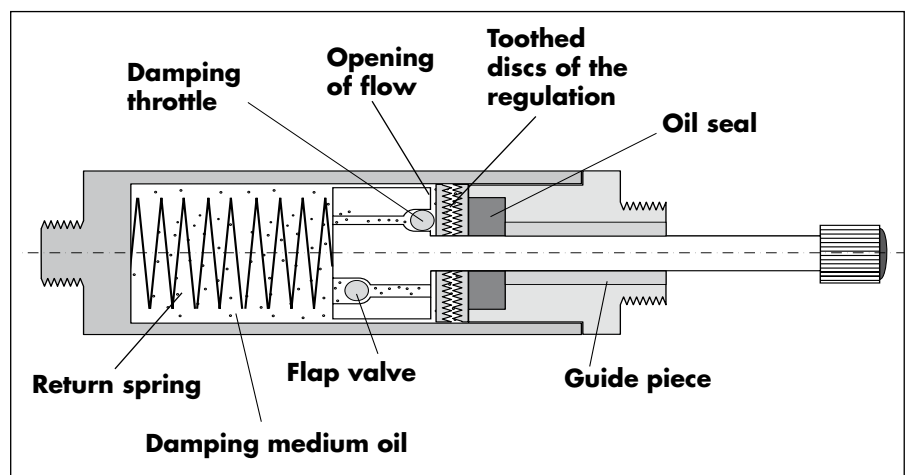
The diameter of the throttling port in the piston is adjustable with the final dampers.

There exist **two different kinds of adjusting**:

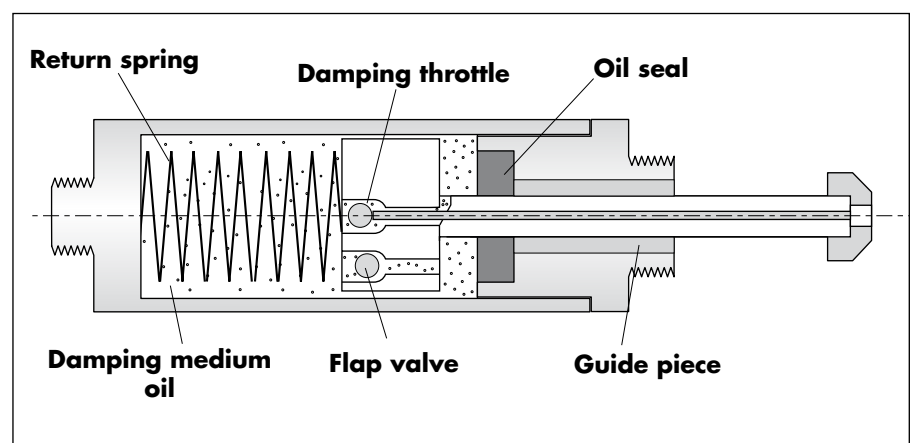
- stepped adjustment
- screw adjustment

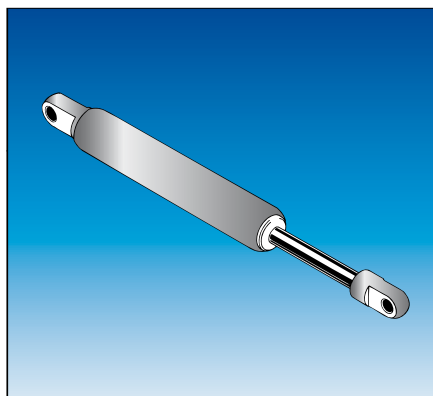
The stepped adjustment is more common. It has got its name by two toothed discs, which allow to adjust the opening of the throttling port only when being intertwined. The farther to the front the two discs are positioned the bigger is the flow opening for the oil, i.e. the less the damping.

To adjust the opening of the throttling port the piston rod has to be pulled out completely.



The screw adjustment allows a very precise adjustment and works as follows: The throttling port in the piston is adjusted by a setting screw in the front of the piston rod. The adjusting bar changes the position of the ball in the throttling port: the farther it is pushed to the back the more oil can flow through, i.e. the less is the damping. However this type of regulation is only possible with the damper types EDH 28 and ZDH 28, because the buckling resistance of the piston rod with the internal bore is diminished in comparison to one of solid material.





## Functional Principle of Oil Dampers with Fixings on Both Ends

**DICTATOR** oil dampers with fixings on both ends are chosen,

- when you need a damping as constant as possible during the whole travel.
- if otherwise the risk of accident would be too high (e.g. with roof hatches).

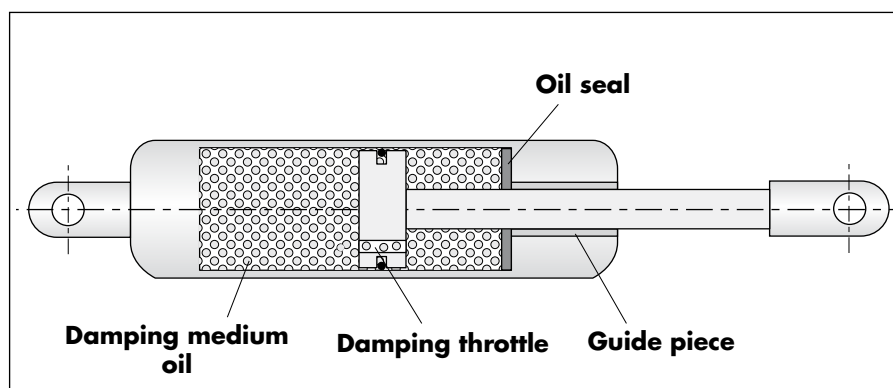
Oil dampers are installed in the same way as gas springs. But contrary to gas springs, which for example should assist in opening, they are intended to damp a movement (e.g. to prevent a hatch opening too fast downward).

Detailed examples you will find in our overview folder.

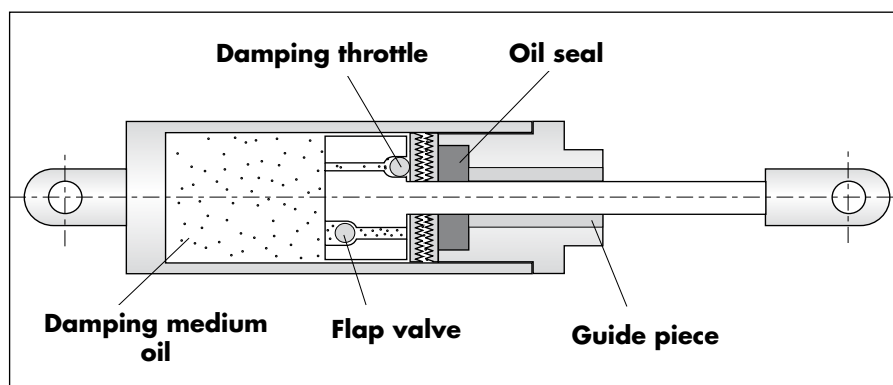
## Functional Principle of Oil Dampers with Fixings on Both Ends

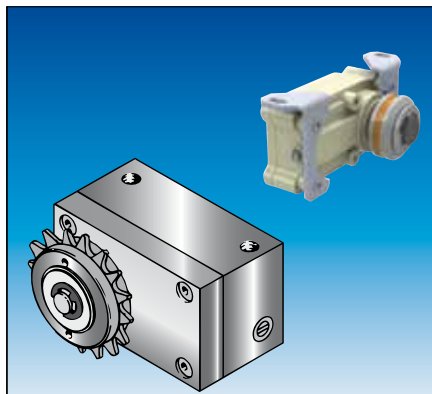
Apart from some exceptions oil dampers with fixings on both ends are always **custom made** as they are connected firmly with the object to be damped. They are available with and without adjustment of the damping. The factory preadjusted oil dampers (ÖD) are mainly used in unchanging applications (e.g. damping of a flap in a serial-production machine) or when all data to calculate the necessary damping force are known. The non-adjustable oil dampers are more economic than the ones with regulation (ÖDR).

To determine the required damping with the preadjusted oil dampers with fixings on both ends we need among other data the mass to slow down and its speed, as they determine the diameter of the throttling port in the piston. Our technical service will gladly assist you in calculating and choosing the appropriate oil damper. We just need the information asked for in the questionnaire on page 03.068.00 et seq. at the end of this chapter.



The **adjustable oil dampers with fixings on both ends (ÖDR)** use the stepped adjustment of the final dampers. The damping is adjusted by pulling and turning the piston rod.





### Functional Principle Radial Dampers

**DICTATOR radial dampers** are designed to continuously control the speed of high masses on long distances. The movement is controlled during the whole travel. Often they are used on sliding doors.

To transfer the force to be controlled to the radial damper there exist different possibilities: by tensioned chain or rope, by revolving chain, rope or toothed belt, by rack or directly by a friction wheel on the radial damper.

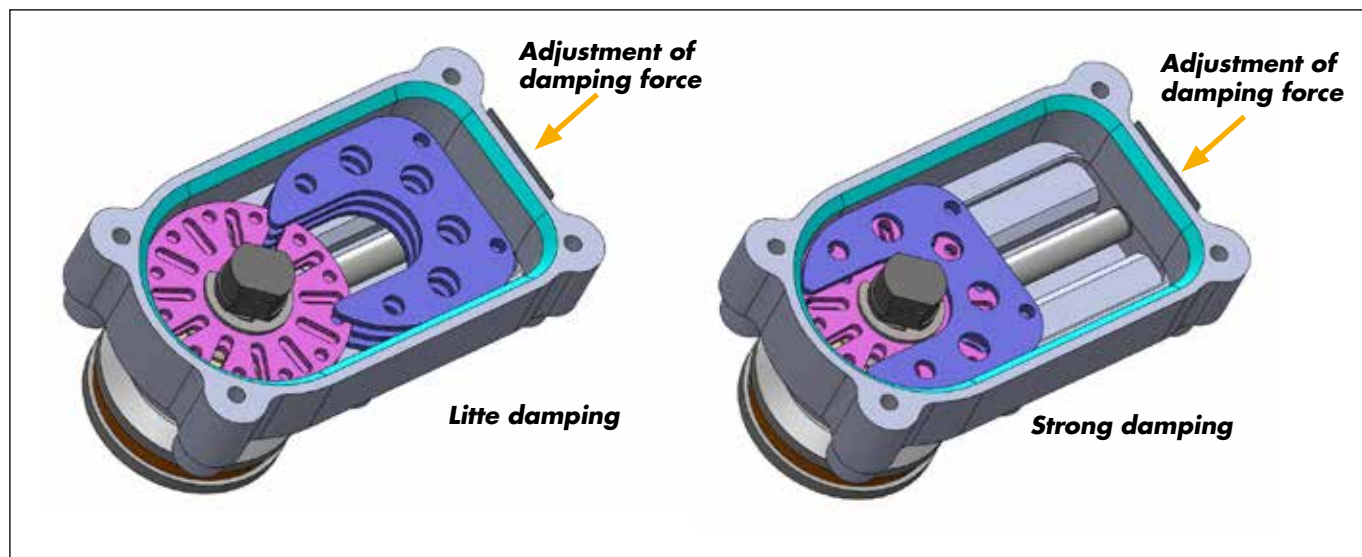
The radial dampers are furnished in two different base types: in a plastic casing or in an aluminium casing (for very heavy loads and for use on fire protection doors).

Detailed examples you will find in our overview folder.

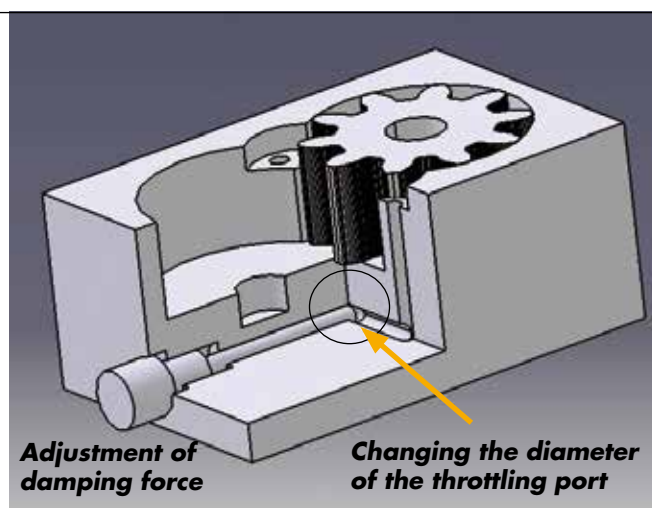
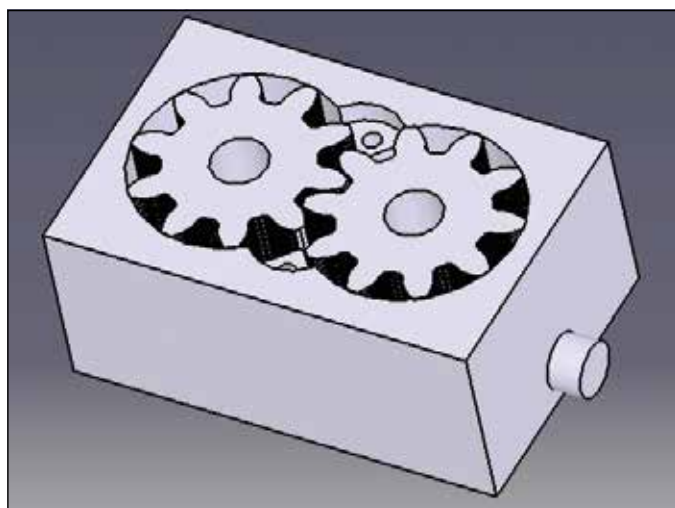
### Functional Principle Radial Dampers

The damping force of the radial dampers can be adjusted continuously.

The damping force of the **lamellar radial dampers LD** is determined by how far the movable lamellae gear into the lamellae fixed on the axle of the damper. The farther they gear into, the stronger the damping.



In case of the radial dampers **type RD 240/241** the damping is adjusted by an adjusting screw on the side of the aluminium casing.







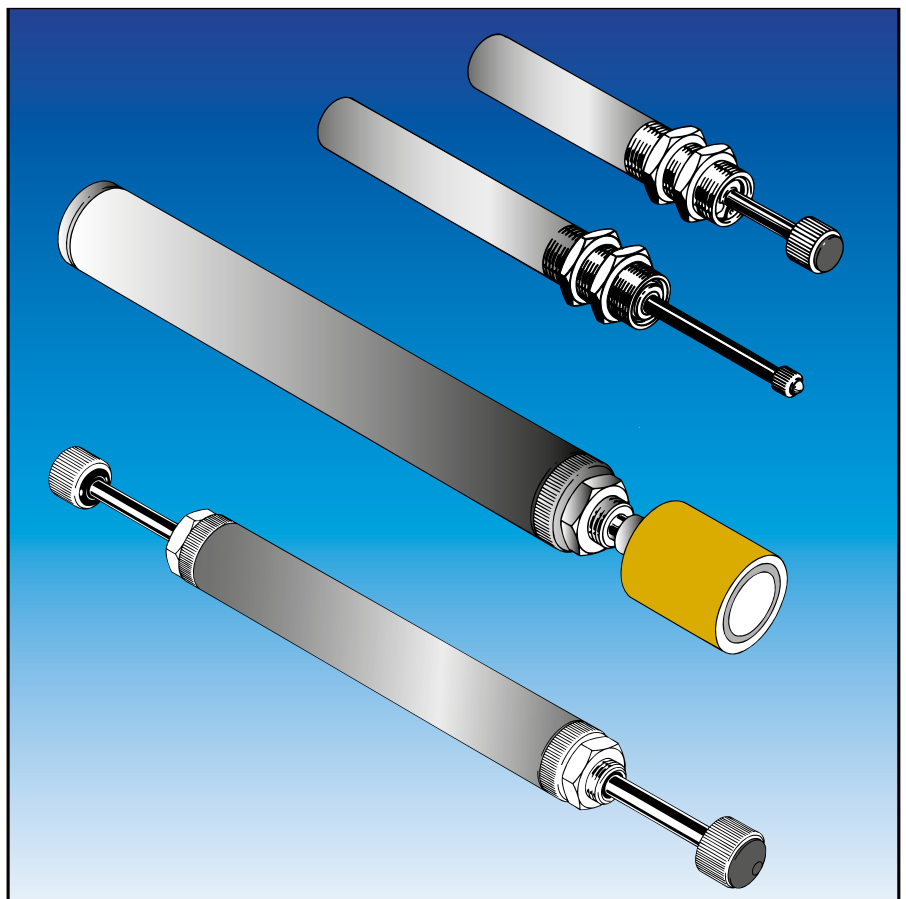
## DICTATOR Final Dampers

DICTATOR final dampers are needed to slow down all kinds of rotative or linear movement. Their relatively long strokes offer sufficient safety distances. The final dampers are available in both single (EDH) and bi-directional (ZDH) configurations.

A large variety of dimensions is on stock. In addition we furnish customised dampers, same as with the oil dampers with fixings on both ends and the gas springs (see extra chapter) - even single pieces.

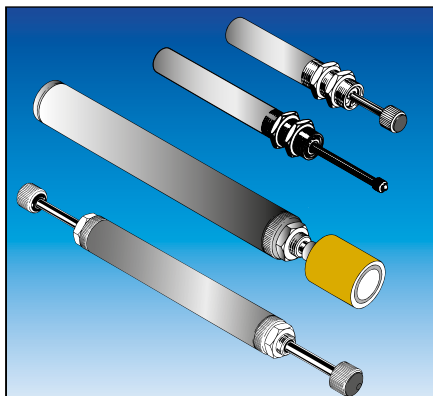
The DICTATOR production programme is very comprehensive and thus offers solutions for a broad spectrum of applications. The most important characteristics of the DICTATOR final dampers are:

- many different diameters
- stroke depends on application
- different buffers or piston rod end fittings
- different possibilities of resetting
- fixing possibilities
- all final dampers are adjustable
- with and without overload safety valve
- partly with authorisation for fire protection applications



### Technical Data

Diameter piston rod	4, 6, 8.5, 10, 12, 25 mm (as standard)
Diameter cylinder	14, 20, 28, 35, 69 mm (as standard)
Material piston rod	hard chromed, AISI 304, AISI 316
Material cylinder	steel tube zinc or nickel plated, painted, AISI 304, -316, aluminium
Stroke lengths	20 mm to 1000 mm
Damping fluids	hydraulic oil, biological oil (on demand also with FDA authorisation)
Damping forces	up to 12.000 N



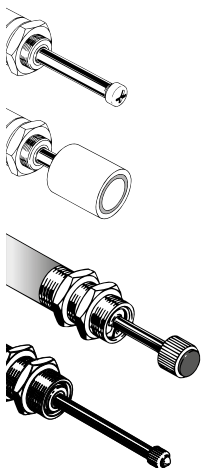
## Final Damper Variations

Almost all dampers of the DICTATOR standard program can be produced as modified types. Generally just the relation between the diameter of piston rod and cylinder has to be observed.

Apart from other dimensions a large range of other features is variable: material, finish, damping characteristics, end fittings, type of fixing, special damping fluids etc.

On the following pages you will find the standard dampers of the different diameter series. Here all the above mentioned variables may be adapted to your requirements. Just ask our technical department.

## End Fittings



Most final dampers are equipped with a **rubber buffer (PF)** on the piston rod.

Wherever there is any danger that the integrated return spring of the damper might push back e.g. the door (as it is moving very smoothly), the damper is delivered with a **magnet (M)** on the piston rod. When the damped object is removed from the damper, the magnet adheres to it until the piston rod is completely extended. Besides the standard magnet there are other dimensions/forces available as well as the **neodym magnet**. This special magnet represents a very economic alternative. However it can not be used when there are high surrounding temperatures (max. temperature 80 °C compared to 120 °C of the standard magnets). Furthermore the neodym magnet has a higher back reflection and therefore should not be used anywhere where this might cause problems.

A further possibility is the **ball head (K)**. It is mainly used when the impact of the mass is not exactly in-line.

The dampers can also be produced with **customized threads on cylinder and piston rod** (there an inside thread is also possible). This allows for the use of other buffers or fixing parts.

## Fixing

The cylinders of the **final dampers** are normally provided with a thread at the front and partly also at the rear of the cylinder. Furthermore they can be furnished with a thread on the cylinder itself, either end-to-end or just part of it.

For the dampers of the series EDH 28 and ZDH 28 we provide standard fixing accessories (see page 03.026.00).

## Resetting of the Piston Rod

With final dampers it must be assured that the piston rod always returns to its extended position in order to be ready to work again on the next impact of the load. This normally is achieved with a **built-in return spring (RF)**. During the entering of the piston rod into the cylinder this spring is compressed and automatically pushes out the piston rod as soon as the damped object is withdrawn.

The second standard option with single final dampers (EDH) is a **permanent magnet** on the piston rod (see above). As counterpart to the permanent magnet there is needed on the door either an even iron area or an extra counter plate (part no. 040025) has to be installed.

Further possibilities are (on request):

- an outside return spring (reduces the total length of the damper)
- nitrogen (when the damping has to be as linear as possible)

For the bi-directional dampers **ZDH** we offer the following resetting alternatives:

- built-in return springs for both piston rods (**ZDH a**)
- return spring for one piston rod (side A), the other piston rod (side B) is pushed out by the entering piston rod of side A (**ZDH aeg**)
- without return spring: the piston rods are pushed outside by one another (**ZDH bg**)

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## **Final Damper Variations, cont.**

### **Adjustment of the Damping Force**

The damping force of final dampers can be **adjusted** continuously. Depending on the application or the requirements this is either done with a screw in the front of the piston rod (**screw adjustment = NR**) or by pulling and turning the piston rod (**stepped adjustment = ZR**).

A self-acting adjustment of the stepped adjustment is not possible, as this adjustment only works when you pull the piston rod sufficiently to engage two toothed discs on the piston. Only then you can adjust the damping force by turning the piston rod.

The screw adjustment allows an absolutely precise adjustment. A misadjustment by mistake is almost impossible. It is however only available for dampers of the ø 28 mm series. Dampers for high loads (for reasons of stability) can only be produced with the stepped adjustment.

### **Types of Damping**

Depending on the requirements of the application hydraulic dampers offer different damping characteristics. The three types are:

- Constant (**k**): uniform damping during the whole travel
- Progressive (**p**): gentle start and then progressive damping
- **ABS**: In case of a too high impact the overload safety valve in the piston opens and thus prevents blocking. Otherwise this impact could cause the piston rod to bend.

### **Safety Instructions**

The damper has to be installed in a way that the impact hits the piston rod exactly in-line. This prevents lateral forces which could damage/destroy the damper.

To avoid loss of oil or complete failure, the surface of the piston rod should be protected against damages and heavy soiling (e.g. colour).

As a failure could provoke dangerous situations, you should fix the damper securely and look for oil leakage. Due to the oil and/or gas pressure, dampers are not to be opened or damaged (risk of injuries).

### **Calculation Instructions**

Starting on page 03.071.00 you will find instructions how to choose the appropriate damper and formula to calculate the needed damping force. The correction factor needed for this purpose you will find on the following pages.

But DICTATOR would be glad to do this work for you. Just fill in the questionnaires on pages 03.066.00 and 03.067.00 and send it to us.

## Overview Production Range of Final Dampers

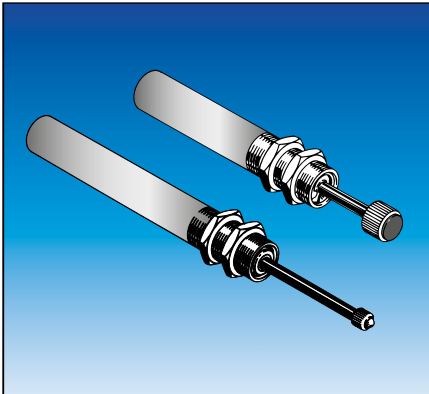
### Final Dampers

	Series					
ø piston rod [mm]	4	6	8,5	10	12	25
ø cylinder [mm]	14	20	28	28	35	69
Stroke max. [mm]	50	75	120	200	500	1000
Damping force max. [N] <i>(depending on the stroke: the shorter the stroke, the stronger the damping force)</i>	1750	3100	5200	5200	17500	22000
Type of adjustment	ZR	ZR	NR, ZR	ZR	ZR	ZR
Type of damper - single (EDH) - bidirectional (ZDH)	x	x	x x	x x	x o	x
End fitting piston rod - damper EDH - damper ZDH	PF, K, M	PF, K, M	PF, M PF	PF, M PF	PF, M	point
Resetting of the piston rod - damper EDH - damper ZDH <i>(customised dampers on request)</i>	RF, M	RF, M	RF, M a, aeg	RF, M a, aeg bg	RF, M a, aeg bg	RF bg
Damping	k, ABS	k, ABS	k, p ABS	k, p ABS	k, p ABS	k, p
Material piston rod - hard chromed - AISI 304 - AISI 316	x o o	x o o	x x o	x x o	x o o	x o o
Material cylinder - steel nickel-plated - steel zinc-plated - steel powder-coated - AISI 304 - AISI 316	x o o o o	x o o o o	o x o x o	o x o x o	o x o o o	x o o o o
Temperature range 0° to +60 °C to +80 °C to -30 °C	x o o	x o o	x o o	x o o	x o o	x o o
Damping medium - hydraulic oil - biological oil - silicone oil	x o o	x o o	x o o	x o o	x o o	x o o

#### Key:

ZR	stepped adjustment
NR	needle adjustment
PF	rubber buffer
K	ball head
M	permanent magnet
RF	return spring
a	extending automatically
aeg	side A extending automatically
bg	side B pushed out by side A
	sides A and B push out one another
k	constant/uniform damping
p	progressive damping
ABS	overload safety valve
x	standard
o	on request

For explications please see the previous pages.



### Final Dampers Series EDH 14

**For impact loads up to 100 kg**

The series EDH 14 comprises the smallest standard final dampers. The diameter of the piston rod of 4 mm allows them to be used with accordingly short strokes for loads up to 100 kg.

The damping force can continuously be adjusted by turning the piston rod.

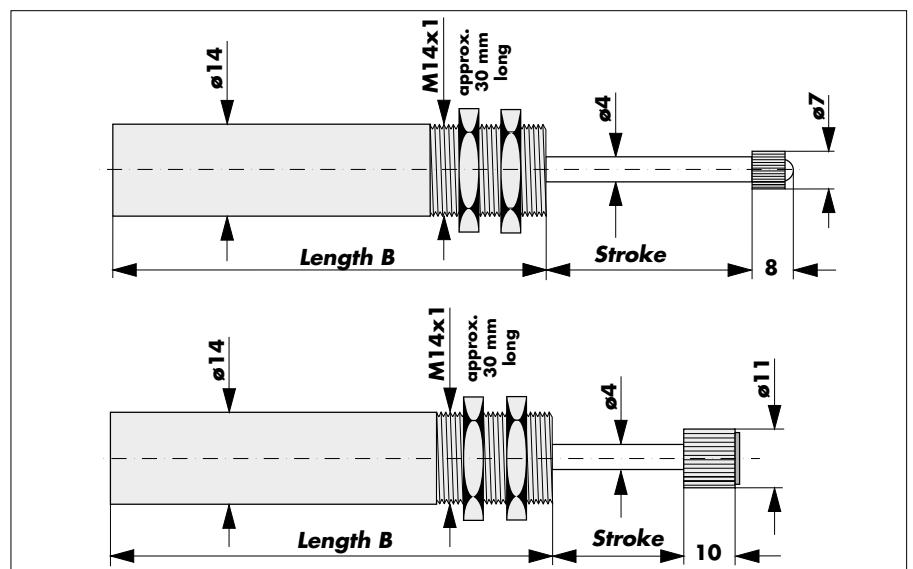
The dampers EDH 14 are available with and without overload safety valve (ABS).

Dampers of the series EDH 14 and EDH 20 are for example used in handling systems, small robots, turnstiles and for slowing down rotative movements.

### Technical Data

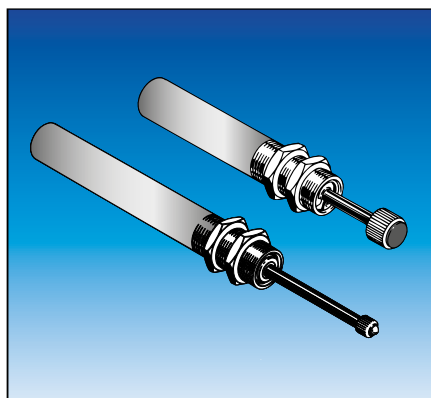
Finish	nickel-plated, piston rod hard chromed
Adjustment	pulling and turning of the piston rod
Types of damping	constant, ABS
End fittings for the piston rod	buffer, ball head (for rotary motion)
Fixing	thread on cylinder with two nuts
Impact speed	0.1 to 0.9 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.0$
Returning force (internal spring)	30 N
Energy per stroke	max. 16 Nm
Ø piston rod / Ø cylinder	4 mm / 14 mm
Length of stroke	max. 50 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

### Dimensions



### Order Information Standard Types

Part no. with ABS ball head	Part no. without ABS ball head	Part no. with ABS buffer	Part no. without ABS buffer	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Length B [mm]
201923	201823	201920	201820	20	100	1750	87
201924	201824	201921	201821	35	75	900	102
201925	201825	201922	201822	50	50	700	117



## Final Dampers Series EDH 20

### For impact loads up to 250 kg

The construction of the series EDH 20 mostly corresponds to the series EDH 14. Due to the larger diameter of 6 mm of the piston rod it can slow down impact loads up to 250 kg. Please keep in mind that the longer the stroke the less is the maximum admissible impact load (see table below).

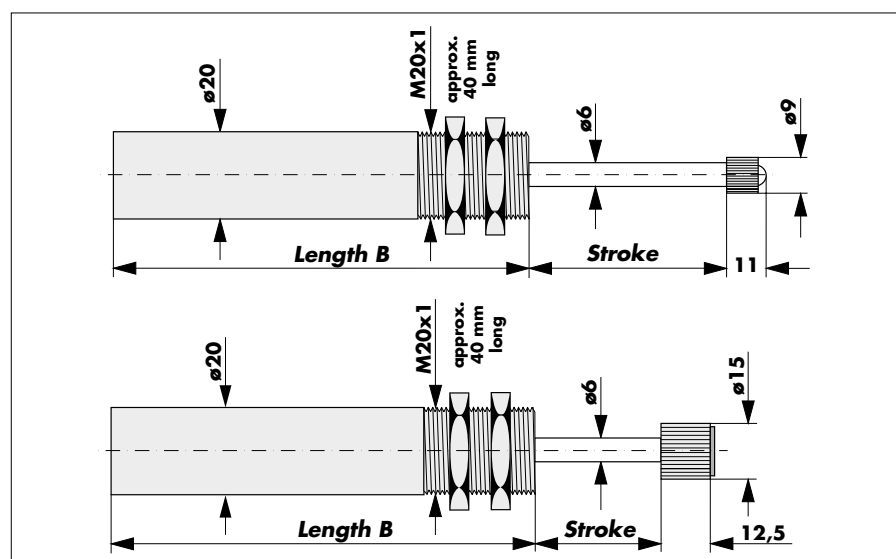
The damping force can continuously be adjusted by turning the piston rod.

The final dampers EDH 20 are available with and without overload safety valve (ABS). If the impact is too heavy, this valve in the piston opens and prevents blocking. Otherwise the piston rod might bend.

## Technical Data

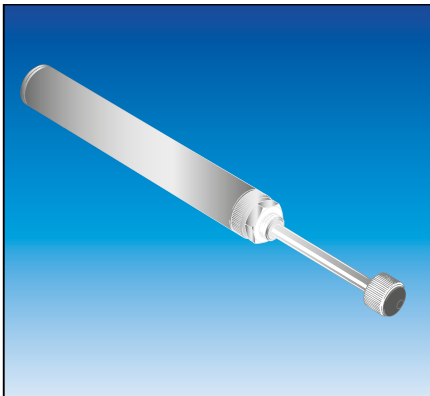
Finish	nickel-plated, piston rod hard chromed
Adjustment	Pulling and turning of the piston rod
Types of damping	constant, ABS
End fittings for the piston rod	buffer, ball head (for rotary motion)
Fixing	thread on cylinder with two nuts
Impact speed	0.1 to 0.9 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.0$
Returning force (internal spring)	30 N
Energy per stroke	max. 54 Nm
Ø piston rod / Ø cylinder	6 mm / 20 mm
Length of stroke	max. 75 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

## Dimensions



## Order Information Standard Types

Part no. with ABS ball head	Part no. without ABS ball head	Part no. with ABS buffer	Part no. without ABS buffer	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	LengthB [mm]
201915	201815	201911	201811	25	250	3100	107
201916	201816	201912	201812	50	125	2150	132
201917	201817	201913	201813	75	75	1440	157



### Final Dampers Series EDH 28

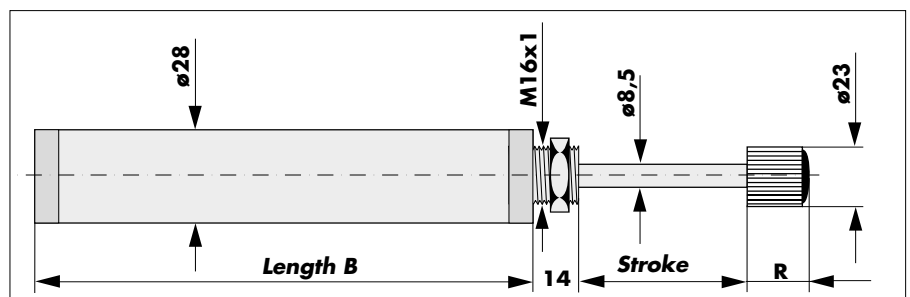
**For impact loads up to 3000 kg - Return spring, one fixing thread**

The series EDH 28 is the one of the final dampers offering the greatest variety: many different stroke lengths, with and without return spring, also in AISI 304 and AISI 316, different possibilities of adjusting. For this series we also offer standard fixing accessories. The adjusting is done either by stepped adjustment ZR (pulling and turning of the piston rod) or by screw adjustment NR (adjustment screw in the front of the piston rod). This series with one fixing thread is intended for stroke lengths up to 120 mm.

### Technical Data

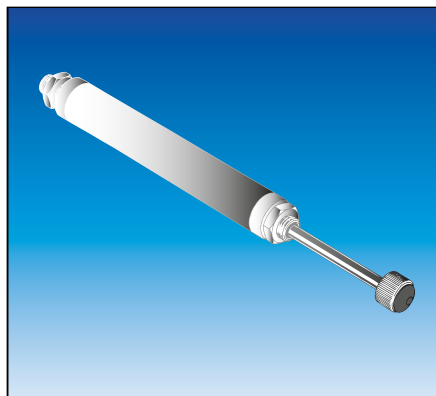
Finish	zinc-plated, piston rod hard chromed
Adjustment	screw or stepped adjustment
Types of damping	constant, ABS, progressive
End fitting for the piston rod	buffer
Fixing	one thread at the front of the cylinder
Impact speed	0.08 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	30 N (from 120 mm stroke: 40 N)
Energy per stroke	max. 154 Nm
Ø piston rod / Ø cylinder	8.5 mm / 28 mm
Length of stroke	max. 120 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

### Dimensions



### Order Information Standard Types

Part no.	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Energy/stroke max. [Nm]	Length B [mm]	Buffer size R [mm]	Damping type	Adjustment
200000	50	3000	5200	154	130	14	k	NR
200400	50	3000	5200	149	157	25	ABS	ZR
200002	50	3000	5200	154	130	25	k	ZR
200100	70	3000	4400	154	159	14	k	NR
200410	70	3000	4400	149	192	25	ABS	ZR
200102	70	3000	4400	154	159	25	k	ZR
200209	75	3000	3100	154	185	25	k	ZR
200200	100	3000	3100	154	193	14	k	NR
200420	100	3000	3100	149	225	25	ABS	ZR
200202	100	3000	3100	154	193	25	k	ZR
200206	100	3000	3100	154	257	25	k	ZR
200300	120	3000	2600	154	212	14	k	NR
200302	120	3000	2600	154	213	25	k	ZR



## Final Dampers Series EDH 28

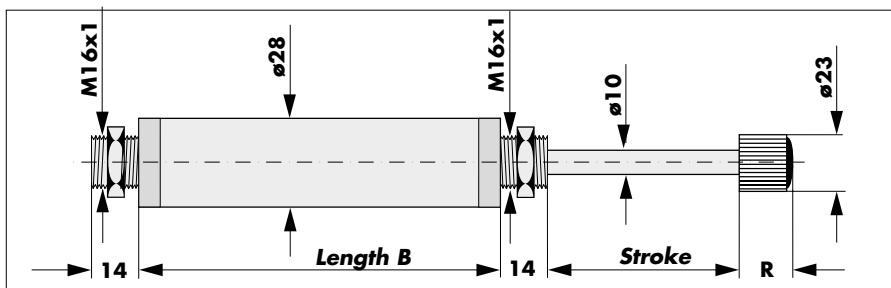
For impact loads up to 3000 kg - Return spring, two fixing threads

For applications where you need a damper EDH 28 with a longer stroke (120 mm to 200 mm) we furnish the version with two fixing threads and a Ø 10 mm piston rod.

### Technical Data

Finish	zinc-plated, piston rod hard chromed
Adjustment	screw or stepped adjustment
Types of damping	constant, ABS, progressive
End fittings for the piston rod	buffer P28-ZR, P28-NR, P28-BS
Fixing	thread at both ends of the cylinder
Impact speed	0.08 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	30 N (from 120 mm stroke: 40 N)
Energy per stroke	max. 154 Nm
Ø piston rod / Ø cylinder	10 mm / 28 mm
Length of stroke	max. 200 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

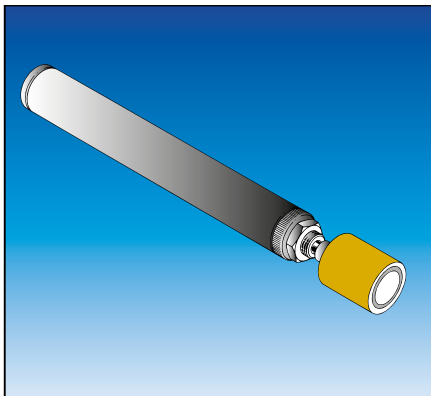
### Dimensions



### Order Information Standard Types

Part no.	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Energy/stroke max. [Nm]	Length B [mm]	Buffer size R [mm]	Damping type	Adjustment
200207	90	3000	3100	154	220	25	k	ZR
200203	100	3000	3100	154	200	25	k	ZR
200303	120	3000	3100	154	220	25	k	ZR
203115-28	200	3000	2400	149	314	25	ABS	ZR





## Final Dampers Series EDH M 28

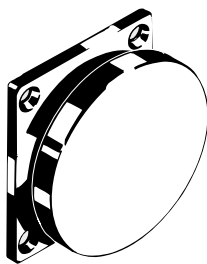
**For impact loads up to 3000 kg - Resetting by magnet**

The dampers of the series EDH M 28 are especially used with sliding doors moving very smoothly. When opening the door the magnet adheres as long to the counter plate until the piston rod has been extracted completely. These dampers don't have an internal return spring.

As counterpiece for the permanent magnet on the piston rod you either need an even iron area or a separate counter plate (part no. 040025).

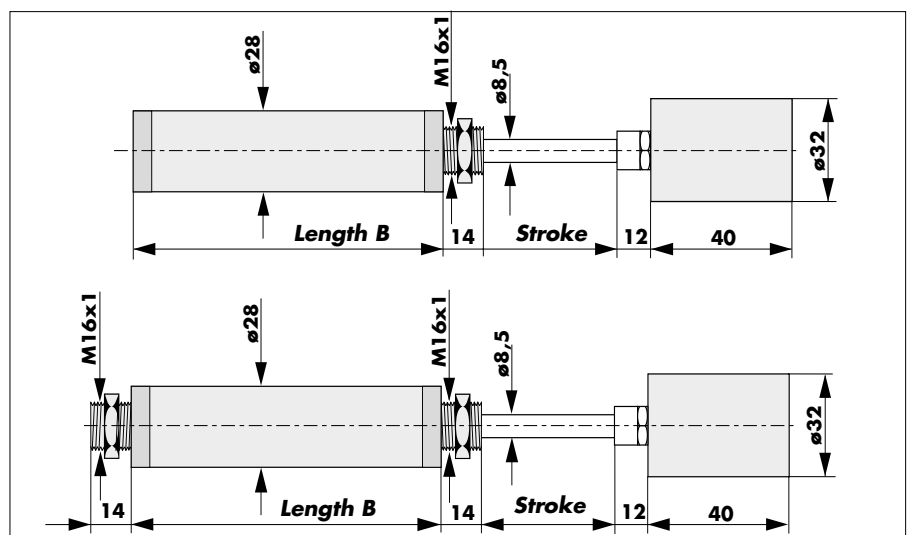
## Technical Data

**Counter plate**  
part no. 040025



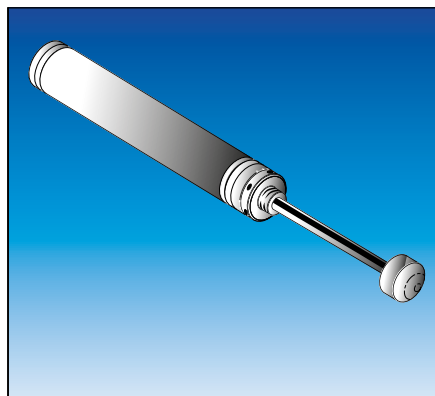
Finish	zinc-plated, piston rod hard chromed
Adjustment	stepped adjustment
Types of damping	constant, ABS, progressive
End fittings for the piston rod	permanent magnet (standard or Neodyn)
Fixing	thread at one or two ends of the cylinder
Impact speed	0.08 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force	0 N
Energy per stroke	max. 154 Nm
Ø piston rod / Ø cylinder	8.5 or 10 mm / 28 mm
Length of stroke	max. 200 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

## Dimensions



## Order Information Standard Types

Part no.	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Length B [mm]	Damping type	Fixing thread
203150	50	3000	5200	154	130	k	1
200101	70	3000	4400	154	163	k	1
203015	120	3000	2600	149	220	k	2
200600-28	200	3000	2400	149	329	k	2



## Final Dampers Series EDH 28 in Stainless Steel

**For impact loads up to 1000 kg - Return spring, one fixing thread**

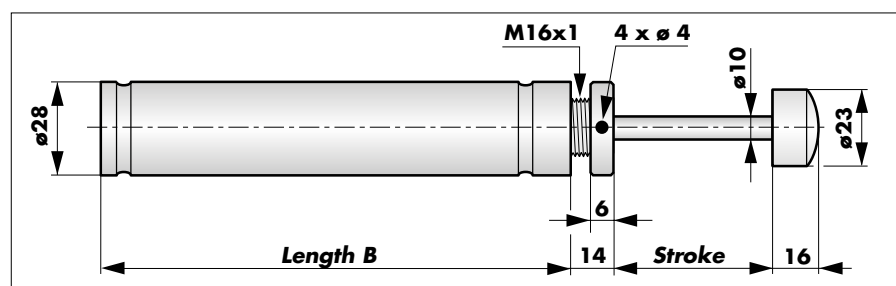
Final dampers of the series EDH 28 also can be produced in stainless steel. They are designed e.g. for applications in the food processing industry (AISI 304) or in tunnels (AISI 316).

A special application area for stainless steel dampers (AISI 304) is the medical sector. If necessary, all parts including the inner components can be produced out of unmagnetic material.

## Technical Data

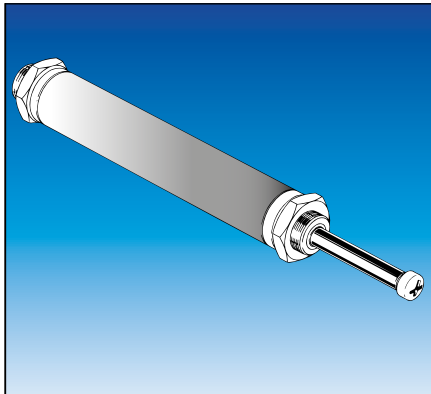
Finish	AISI 304 (standard ) or AISI 316
Adjustment	stepped adjustment
Types of damping	constant, ABS, progressive
End fitting for the piston rod	buffer from Delrin
Fixing	one thread at the front of the cylinder
Impact speed	0.1 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	30 N (from 120 mm stroke: 40 N)
Energy per stroke	max. 149 Nm
Ø piston rod / Ø cylinder	10 mm / 28 mm
Length of stroke	max. 200 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

## Dimensions



## Order Information Standard Types

Part no.	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Length B [mm]	Damping type	Material
200520	50	1000	5200	149	130	k	AISI304
200525	100	1000	3100	149	193	k	AISI304
200530	200	1000	2400	149	314	k	AISI304



### Final Dampers Series EDH 35

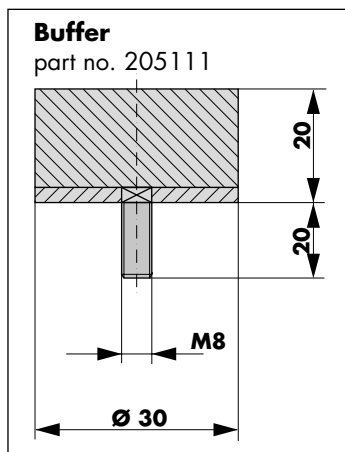
**For impact loads up to 6000 kg - Return spring, two fixing threads**

The DICTATOR final dampers of the series EDH 35 are intended for heavy impact loads. The maximum damping force depends on the stroke length: the shorter the stroke the higher the damping force.

The standard version is supplied with inside thread in the piston rod. As accessories a buffer, part no. 205111, is available.

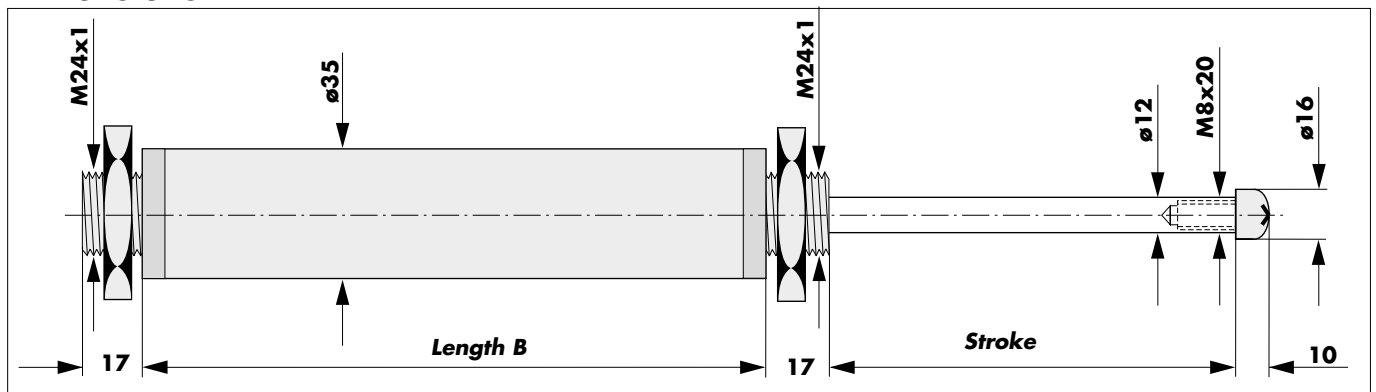
The field of application comprises heavy sliding gates, shifting racks in storage rooms, machine slides.

### Technical Data



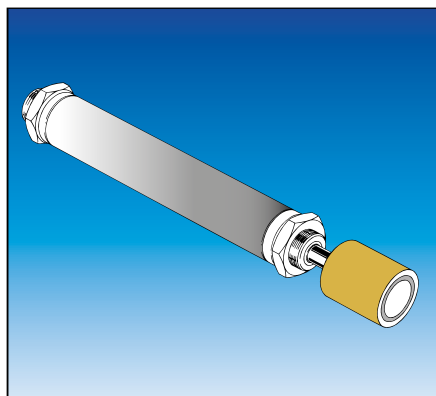
Finish	zinc-plated, piston rod hard chromed
Adjustment	stepped adjustment
Types of damping	constant, progressive
End fitting for the piston rod	inside thread M8x20 with screw
Fixing	threads at both ends of the cylinder
Impact speed	0.08 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	45 N - 60 N
Energy per stroke	max. 438 Nm
Ø piston rod / Ø cylinder	12 mm / 35 mm
Length of stroke	max. 500 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

### Dimensions



### Order Information Standard Types

Part no.	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Length B [mm]	Damping type	Returning force max. [N]
200309	50	6000	17500	438	184	k	45
200310	70	6000	12500	438	204	k	45
200311	100	6000	8800	438	230	k	48
200312	150	6000	5800	438	288	k	50
200500	200	6000	4400	438	330	k	50
200320	500	6000	1800	438	739	k	60



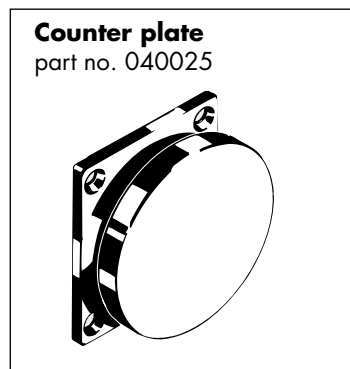
## Final Dampers Series EDH M 35

**For impact loads up to 6000 kg - Resetting by magnet**

The technical data of the DICTATOR final dampers series EDH M 35 correspond to those of the series EDH 35. The only difference is the missing internal return spring. When the door is opened the magnet pulls the piston rod back to its extended position.

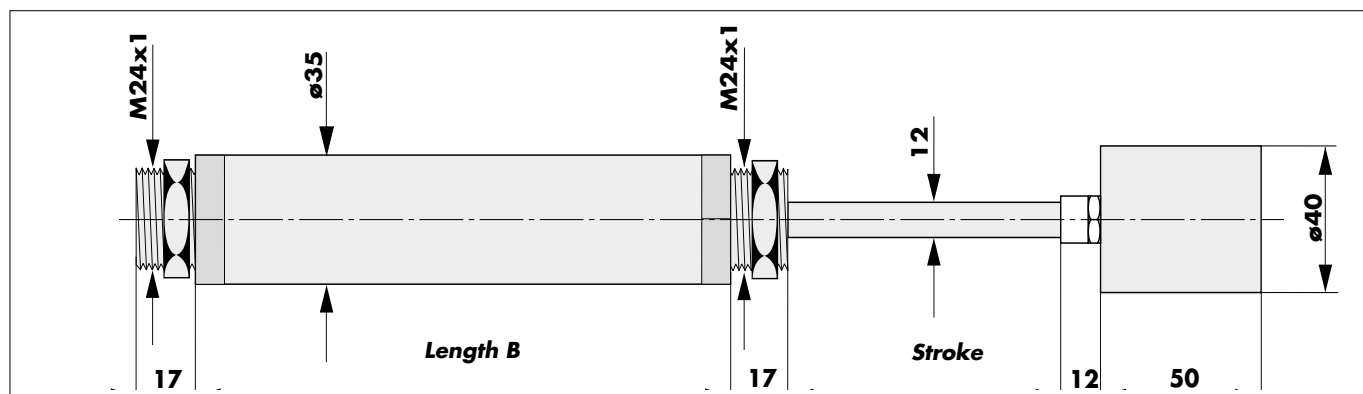
As counterpiece for the permanent magnet on the piston rod you either need an even iron area or a separate counter plate (part no. 040025).

## Technical Data



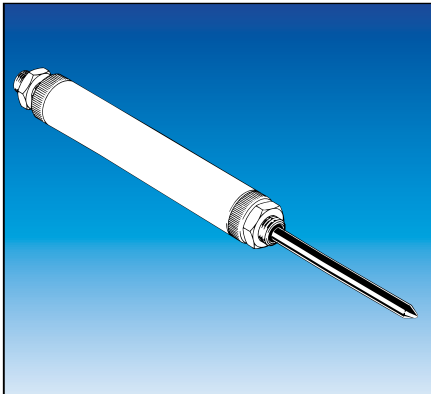
Finish	zinc-plated, piston rod hard chromed
Adjustment	stepped adjustment
Types of damping	constant, progressive
End fitting for the piston rod	permanent magnet
Fixing	threads at both ends of the cylinder
Impact speed	0.08 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force	0 N
Energy per stroke	max. 438 Nm
Ø piston rod / Ø cylinder	12 mm / 35 mm
Length of stroke	max. 500 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

## Dimensions



## Order Information Standard Types

Part no.	Stroke [mm]	Impact load	Damping force max. [kg]	Energy per stroke max. [N]	Length B [mm] max. [Nm]	Damping type	Returning force max. [N]
200313	100	6000	8800	438	224	k	0
200600	200	6000	4400	438	330	k	0



### Final Dampers Series EDH 69

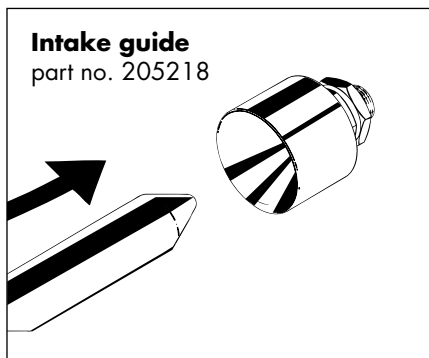
**For impact loads up to 15000 kg - Return spring, two fixing threads**

The series EDH 69 represents the largest and strongest DICTATOR final dampers. The maximum damping force depends on the stroke length: the shorter the stroke the higher the damping force.

The field of application comprises e.g. heavy sliding gates, shifting racks in storage rooms, machine slides.

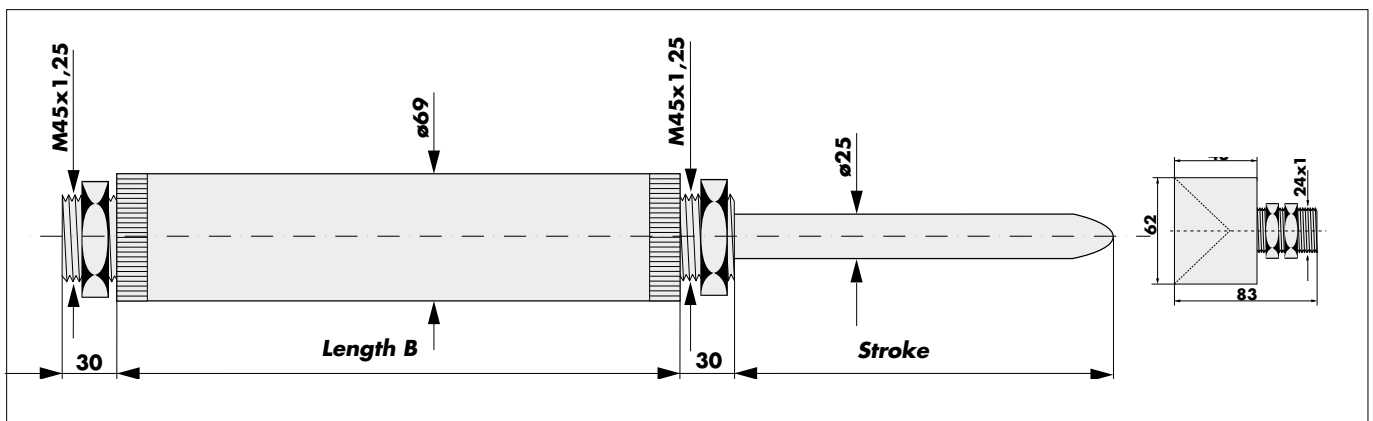
As counter piece for the piston rod we furnish an intake guide.

### Technical Data



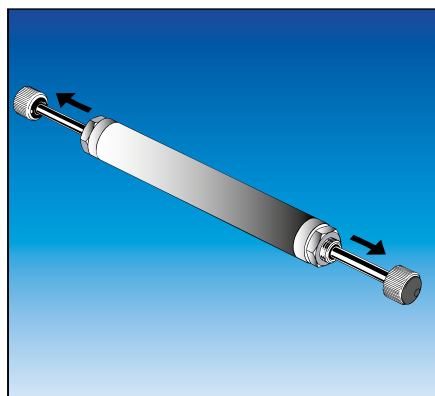
Finish	zinc-plated, piston rod hard chromed
Adjustment	stepped adjustment
Types of damping	constant, progressive
End of piston rod	tip (standard) or thread
Fixing	threads at both ends of the cylinder
Impact speed	0.1 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	80 N
Energy per stroke	max. 4000 Nm
Ø piston rod / Ø cylinder	25 mm / 69 mm
Length of stroke	max. 1000 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

### Dimensions



### Order Information Standard Types

Part no.	Stroke [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Length B [mm]	Damping type	Returning force max. [N]
200780	100	15000	12000	4000	297	k	80
200800	200	15000	12000	4000	397	k	80
200820	300	15000	10000	4000	520	k	80
200840	400	15000	8000	4000	620	k	80
200940	1000	15000	6000	4000	1420	k	80



## Bi-Directional Final Dampers Series ZDH a 28

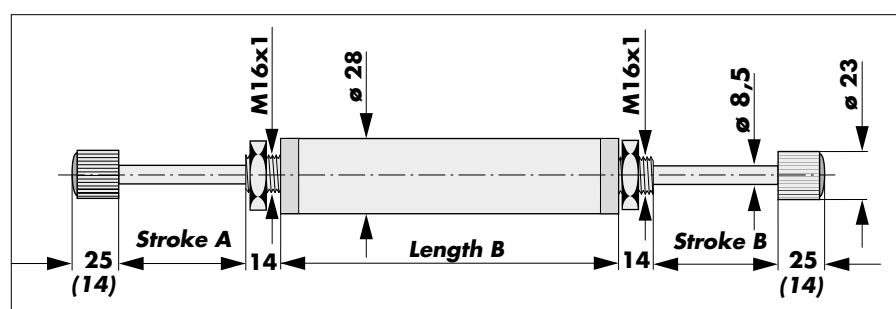
**For impact loads up to 1000 kg - Both sides with return spring**

The final dampers of the series ZDH a 28 are characterised by their two piston rods extending independently from one another by an internal return spring. The damper ZDH a 28 is directly fixed to the moving object, thus damping with only one damper both final positions.

### Technical Data

Finish	zinc-plated, piston rod hard chromed
Adjustment	screw or stepped adjustment
Types of damping	constant, ABS, progressive
End fittings for the piston rod	buffer (dimensions buffer NR in parentheses)
Fixing	threads at both ends of the cylinder
Impact speed	0.1 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	min. 30 N, max. 60 N
Energy per stroke	max. 165 Nm
Ø piston rod / Ø cylinder	8.5 mm / 28 mm
Length of stroke	max. 200 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

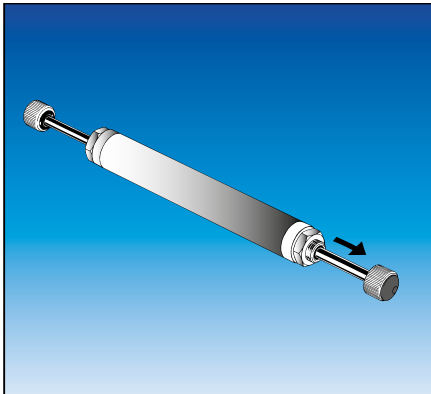
### Dimensions



### Order Information Standard Types

Part no.	Stroke A [mm]	Stroke B [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Returning force max. [N]	Length B [mm]	Damping type	Adjustment
210000	50	50	560	4300	120	45	137	k	NR
210001	50	50	1000	5000	135	45	165	p	NR
212000	70	70	500	3500	130	50	164	k	NR
210410	70	70	700	3200	150	35	232	ABS	ZR
210400	65	65	700	3200	125	30	260	ABS	ZR
210420*	60	80	700	4200	125	30	260	ABS	ZR
216000	100	100	500	2400	130	50	221	k	NR
214000	120	120	500	1700	130	60	235	k	NR
218000	100	100	1000	2800	165	50	260	p	NR
213000	120	120	1000	1900	165	60	232	p	NR

\* Length of thread at stroke A: 44 mm



### Bi-Directional Final Dampers Series ZDH aeg 28

**For impact loads up to 1000 kg - Return spring for one side only**

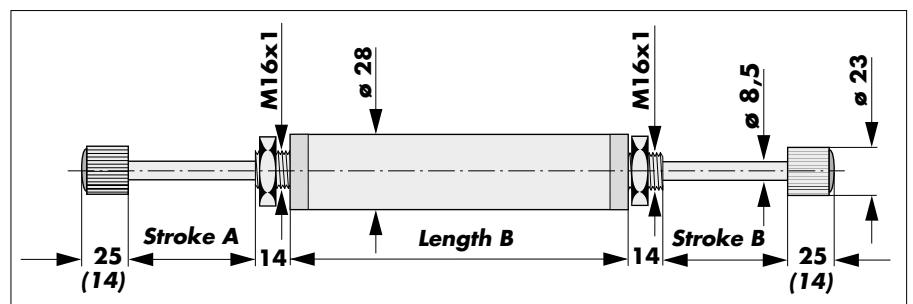
The final dampers of the series ZDH aeg 28 only have on one side (stroke A) a return spring that automatically returns the piston rod. The piston rod on the other side (stroke B) is pushed out by the entering piston rod A. Dampers of this type are often used on sliding doors.

The automatically returning piston rod (stroke A) should point into the opening direction of the door to damp the opening of the door even then when the door, e.g. because of a new opening command, hadn't completely been closed before. The opposite piston rod damps the closing of the door. As on this side there is no return spring, the door won't be reopened.

### Technical Data

Finish	zinc-plated, piston rod hard chromed
Adjustment	screw or stepped adjustment
Types of damping	constant, ABS, progressive
End fittings for the piston rod	buffer (dimensions buffer NR in parentheses)
Fixing	threads at both ends of the cylinder
Impact speed	0.1 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (stroke A)	min. 30 N, max. 50 N
Energy per stroke	max. 160 Nm
Ø piston rod / Ø cylinder	8.5 mm / 28 mm
Length of stroke	max. 200 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

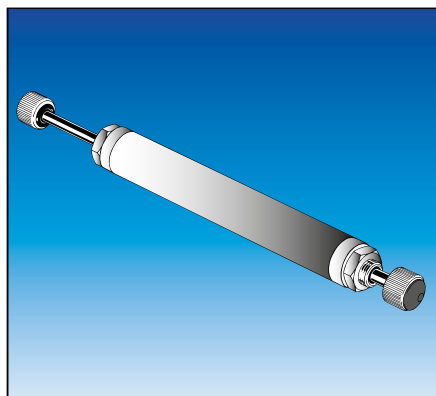
### Dimensions



### Order Information Standard Types

Part no.	Stroke A [mm]	Stroke B [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Returning force max. [N]	Length B [mm]	Damping type	Adjustment
203190	50	50	1000	5000	135	0/45	220	p	ZR
211000*	70	50	560	4300	120	20/0	137	k	NR
203191	70	70	1000	4000	160	0/50	260	p	ZR
212300	80	80	800	4200	140	0/50	291	p	NR
217000	100	100	500	2400	130	0/50	328	k	NR

\* **Attention:** The side A piston rod of damper 211000 extends automatically only 20 mm. The missing 50 mm will be pushed out only when side B piston rod enters.



## Bi-Directional Final Dampers Series ZDH bg 28

**For impact loads up to 560 kg - No return spring**

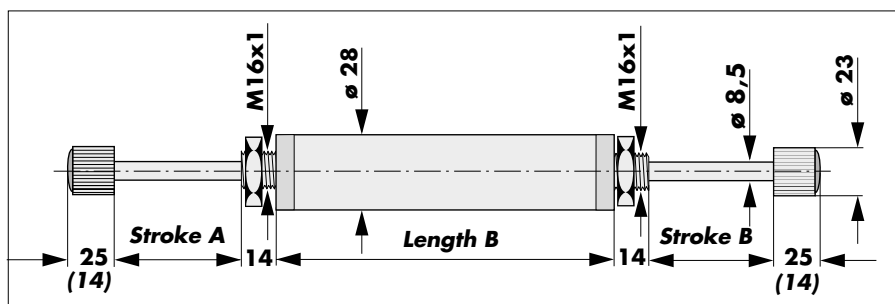
The final dampers ZDH bg 28 have no return spring. Each piston rod is pushed out by the opposite piston rod when it enters. The damper ZDH bg 28 is mounted directly on the moving object, thus damping it in both final positions.

These dampers are mostly used on smoothly moving doors, slides or free pendulums, because there are no return forces to move the object from its final position.

### Technical Data

Finish	zinc-plated, piston rod hard chromed
Adjustment	screw or stepped adjustment
Types of damping	constant, ABS, progressive
End fittings for the piston rod	buffer (dimensions buffer for NR in parentheses)
Fixing	threads at both ends of the cylinder
Impact speed	0.1 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (no spring)	0
Energy per stroke	max. 130 Nm
Ø piston rod / Ø cylinder	8.5 mm / 28 mm
Length of stroke	max. 120 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

### Dimensions



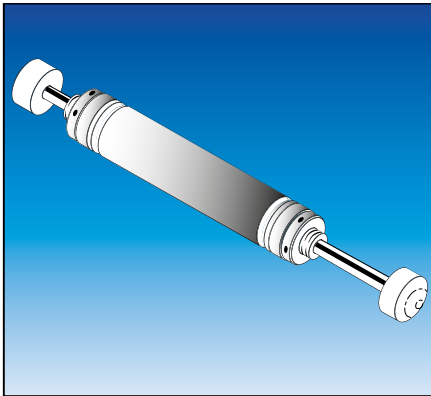
### Order Information Standard Types

Part no.	Stroke A [mm]	Stroke B [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Returning force max. [N]	Length B [mm]	Damping type	Adjustment
210110	50	50	560	4300	120	0	137	k	NR
203195*	55	55	560	5000	120	0	132	k	ZR
203162**	120	120	500	1700	130	0	208	k	ZR

\* cylinder ø 35 mm, buffer ø 23 mm, piston rod ø 12 mm, thread on one side M24x1, length 17 mm

\*\* with relief groove





### Bi-Directional Final Dampers ZDH a 28 in AISI 304/316 For impact loads up to 500 kg - Both sides with return spring

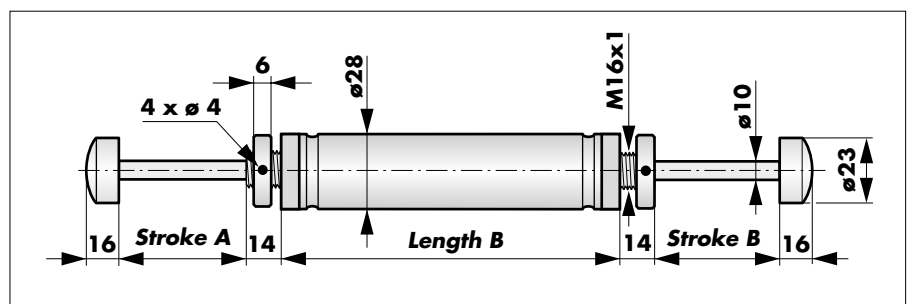
The final dampers of the series ZDH a 28 can also be produced in stainless steel. They are designed for the use in the food processing industry (AISI 304) and in tunnels (AISI 316).

A special application area for stainless steel dampers is the medical sector. If necessary, all parts including the inner components can be produced out of unmagnetic material.

### Technical Data

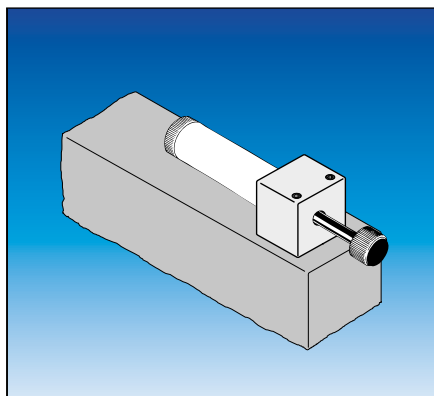
Finish	AISI 304 (standard) or AISI 316
Adjustment	stepped adjustment
Types of damping	constant, ABS, progressive
End fitting for the piston rod	buffer from Delrin
Fixing	threads at both ends of the cylinder
Impact speed	0.1 to 2.0 m/s
Correction factor (see p. 03.072.00)	$f_k = 2.5$
Returning force (internal spring)	30 N (from 120 mm stroke: 40 N)
Energy per stroke	max. 160 Nm
Ø piston rod / Ø cylinder	10 mm / 28 mm
Length of stroke	max. 200 mm
Strokes per minute	maximum 10
Operating temperature	0° to 60 °C (on request: -30 °C, +80 °C)

### Dimensions



### Order Information Standard Types

Part no.	Stroke A [mm]	Stroke B [mm]	Impact load max. [kg]	Damping force max. [N]	Energy per stroke max. [Nm]	Returning force max. [N]	Length B [mm]	Damping type	Adjustment
210525	100	100	500	2400	130	50	221	k	ZR



## Fixing Accessories for Final Dampers

### Series EDH 28 and ZDH 28

For the final dampers of the series EDH 28 and ZDH 28 we also supply fixing accessories. The fixing bracket is especially intended to be used when the dampers are mounted on sliding doors with tubular travelling gear. With the aid of the counter plate it can directly be fixed to the guide rail.

The XL fixing bracket is especially intended for guide rails larger than e.g. Helm 400. With this bracket the threaded holes are in the clamp plate.

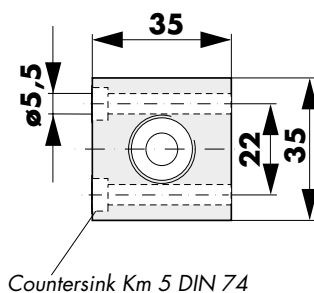
## Technical Data

Fixing block	aluminium
Fixing bracket	steel zinc-plated

## Dimensions

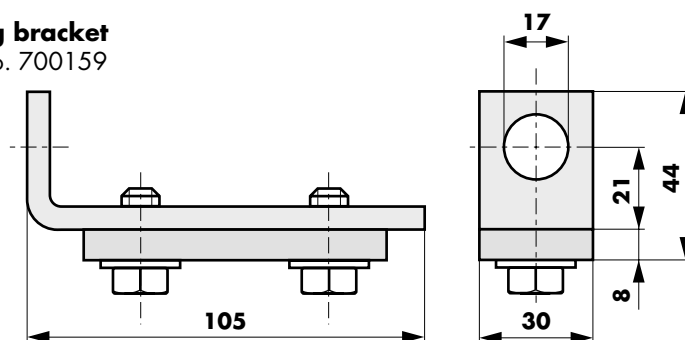
### Fixing block

part no. 205199



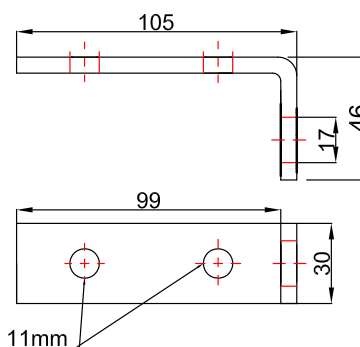
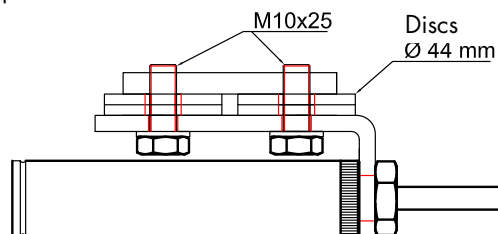
### Fixing bracket

part no. 700159

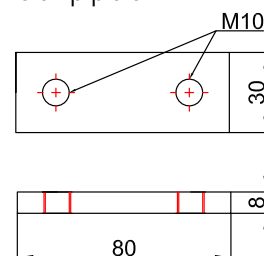


### Fixing bracket XL

part no. 700159XL



### Clamp plate



## Order Information

Fixing block	part no. 205199
Fixing bracket	part no. 700159
Fixing bracket with clamp plate with threaded holes	part no. 700159XL

## Oil Dampers with Fixings on Both Ends

Oil dampers with fixings on both ends are used when moving objects may not exceed a certain speed e.g. flaps, lids, lever arms. They are fixed at both ends and slow down the movement over the whole distance. The oil dampers control **pull** or **push forces** as well as pull **and** push forces.

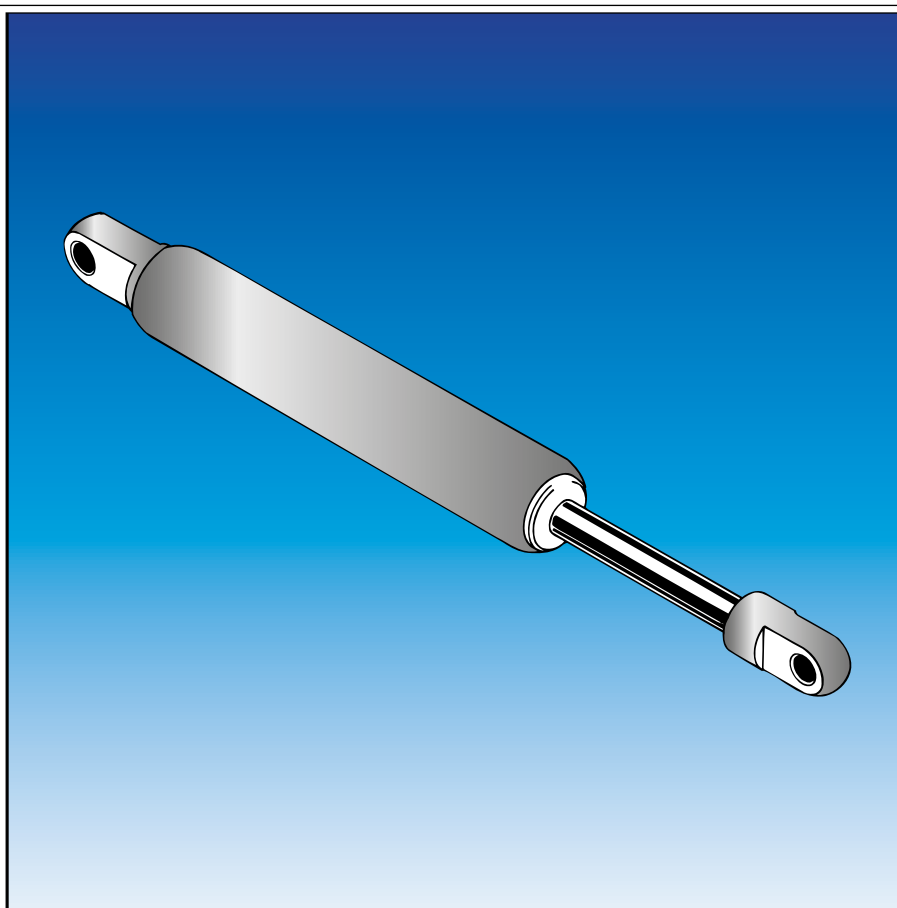
Oil dampers with fixings on both ends are available in **2 designs**:

- as preset oil damper **ÖD**
- as adjustable oil damper **ÖDR**

With the preset oil dampers (**ÖD**) as economically priced alternative the required extending and retracting speed of the piston rod is preset during fabrication according to your requirements. The exact speed is subject to certain tolerances. It depends on the type of installation and on the tolerances of the boring in the piston.

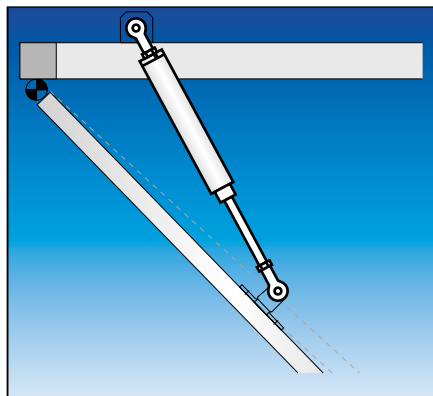
The **adjustable** oil dampers (**ÖDR**) are the ideal solution when the forces cannot exactly be determined, as the damping force can be adjusted on site.

The fabrication of the oil dampers is generally to order. Therefore it is no problem to realize special, customized designs.



### Technical Data

Diameter piston rod	<b>ÖD:</b> 6, 8, 10, 14 mm / <b>ÖDR:</b> 6, 10, 14, 25 mm
Diameter cylinder	<b>ÖD:</b> 19, 23, 28, 40 mm / <b>ÖDR:</b> 20, 28, 35, 69 mm
Strokes / Damping forces	20 mm - 1000 mm / up to 7500 N max.
Operating temperature	0 °C - 60 °C; on demand also other temperatures
Finish piston rod	hard chromed, AISI 304, AISI 316
Finish cylinder	zinc-plated or painted in RAL colours, AISI 304, AISI 316
Damping fluid	hydraulic, biological oil
Maximum stroke frequency 6 strokes per minute	



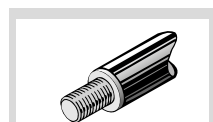
## Preset Oil Dampers with Fixings on Both Ends, ÖD

Preset oil dampers are always produced to order. Stroke and therewith the length of the cylinder, end fittings, damping force and speed depend on the application it is designed for.

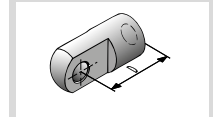
The speed realised when the oil damper has been fitted may vary from the adjusted speed. It depends on several parameters of the installation, for example the acting forces and the installation situation. The speed furthermore depends on the damping force. Therefore not all combinations of speed and damping force are possible. Please observe the tolerances given below.

## End Fittings

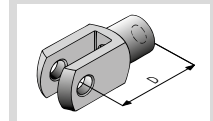
### On piston rod



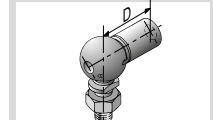
Threaded end **GZ**



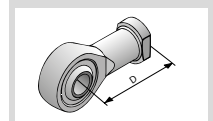
Eyelet **A**



Fork **G**

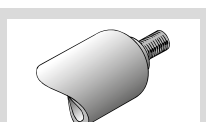


Ball and socket joint **WG**

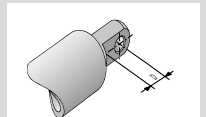


Rose bearing **GK**

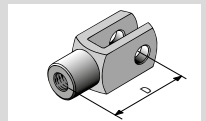
### On cylinder



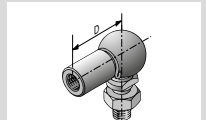
Threaded end **GZ**



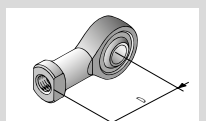
Eyelet **A**



Fork **G**



Ball and socket joint **WG**



Rose bearing **GK**

Exactly dimensioned drawings of the above end fittings with indication of measure D can be found on page 03.030.00.

### Material

Default version: Piston rod hard chromed,  
cylinder zinc-plated  
Special execution: 8-23 and 10-28 completely from AISI 304 and AISI 316

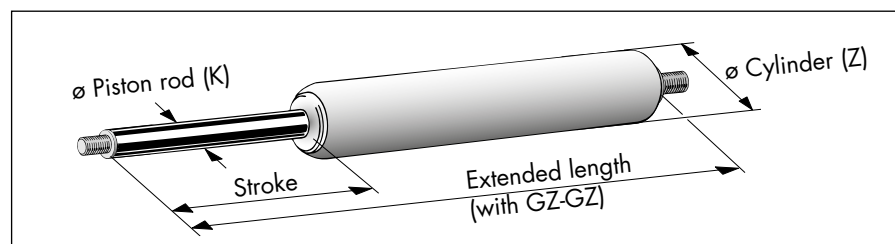
### Types of damping

- 1 = damping on extending stroke (pull forces)
- 2 = damping on compressing stroke (push forces)
- 3 = damping on both extending and compressing stroke (push and pull forces)

## Determining your preset oil damper

With help of the following table you can easily find the correct oil damper if you already know the necessary stroke, force and end fittings. If you require other end fittings than the threaded end, simply add the measurement D of the chosen end fitting to the total length of the oil damper.

If not all data are available or if you need technical advice, please contact our advisory service.

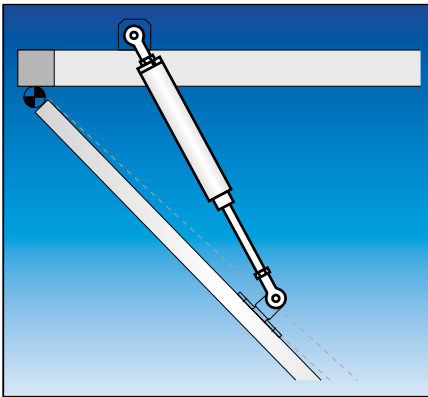


Required data	Diameters				Your ÖD
ø K / ø Z [mm]	6-19	8-23	10-28	14-40	<input type="text"/>
Max. stroke [mm]	250	400	500	500	<input type="text"/>
Type of damping	You can choose between: type of damping <b>1, 2, 3</b>				<input type="text"/>
Damping fluid	oil	oil	oil	oil	<input type="text"/>
Compressed length (Le)	extended length - stroke				<input type="text"/>
Extended length (La) min.	2 x stroke + measure F + measure(s) D of end fittings				<input type="text"/>
Measure F	38	45	45	70	<input type="text"/>
Piston rod end fittings	GZ, A*, G, WG, GK (observe measure D!)				<input type="text"/>
Cylinder end fittings	GZ, A*, G, WG, GK (observe measure D!)				<input type="text"/>
Options	<b>6</b> = protective tube (La + 5 mm), <b>8</b> = plant oil				<input type="text"/>
Required speed	meter per second <sup>1)</sup> ≥ 0.02 m/s				<input type="text"/>
Max. damping force [N]	400	700	1200	2500	<input type="text"/>

<sup>1)</sup> **Speed tolerances** (due to production):

Oil dampers 6-19 +/- 25 %, Oil dampers 8-23 +/- 20 %  
Oil dampers 10-28 +/- 15 %, Oil dampers 14-40 +/- 15 %

If you need a more precise or a lower speed, please contact our technical department.



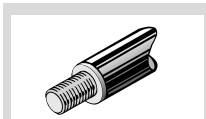
### Adjustable Oil Dampers with Fixings on Both Ends, ÖDR

Adjustable oil dampers with fixings on both ends have - compared to the preadjusted oil dampers - a much more complicated design. However they are the ideal solution when the existing forces cannot be determined precisely. Damping force and speed are adjusted on site, once the damper has been installed.

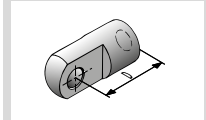
The standard adjustable oil dampers are produced in 4 different ranges of diameters. Which diameter should be chosen depends amongst others on the required stroke and the damping force.

### End Fittings

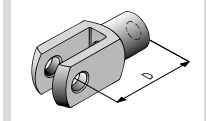
#### On piston rod



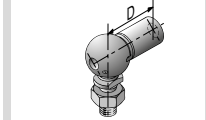
Threaded end **GZ**



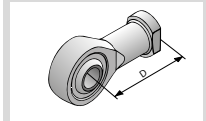
Eyelet **A**



Fork **G**

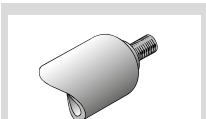


Ball and socket joint **WG**

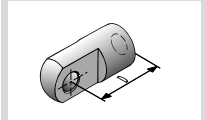


Rose bearing **GK**

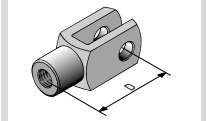
#### On cylinder



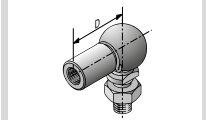
Threaded end **GZ**



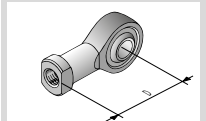
Eyelet **A**



Fork **G**



Ball and socket joint **WG**



Rose bearing **GK**

Exactly dimensioned drawings of the above end fittings with indication of measure D can be found on page 03.030.00.

#### Material

Standard: piston rod hard chromed  
cylinder zinc-plated  
Special types: 10-28 + 14-35 completely  
from AISI 304 and AISI 316

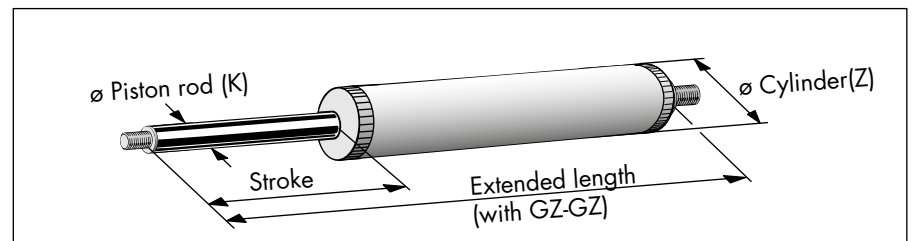
#### Types of damping

- 1 = damping on extending stroke (pull forces)
- 2 = damping on compressing stroke (push forces)
- 3 = damping on both extending and compressing stroke (push and pull forces)

### Determining your adjustable oil damper

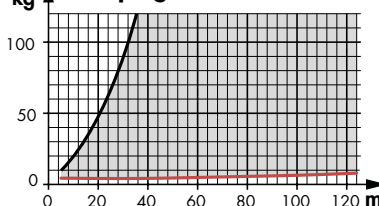
With help of the following table you can easily find the correct oil damper if you already know the necessary stroke, force and end fittings. If you require other end fittings than the threaded end, simply add the measurement D of the chosen end fitting to the total length of the oil damper.

If not all data are available or if you need technical advice, please contact our advisory service.

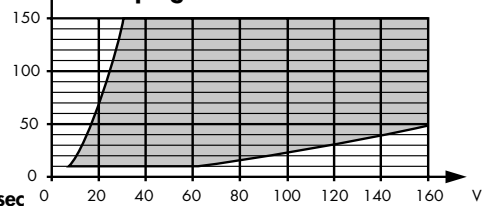


Required data	Diameters				Your ÖDR
Ø K / Ø Z [mm]	6-20	10-28	14-35	25-69	<input type="text"/>
Max. stroke [mm]	75	500	1000	1000	<input type="text"/>
Type of damping	You can choose between: type of damping <b>1, 2, 3</b>				<input type="text"/>
Damping fluid	oil	oil	oil	oil	<input type="text" value="oil"/>
Compressed length (Le)	extended length - stroke				<input type="text"/>
Extended length (La)	min. 2 x stroke + measure F + measure(s) D of end fittings				<input type="text"/>
Measure F	82	80	100	220	<input type="text"/>
Piston rod end fittings	GZ, A, G, WG(!), GK (observe measure D!)				<input type="text"/>
Cylinder end fittings	GZ, A, G, WG(!), GK (observe measure D!)				<input type="text"/>
Options	<b>6</b> = protective tube (La + 20 mm!), <b>8</b> = plant oil				<input type="text"/>
Max. damping force [N]	220	1200	1700	7500	<input type="text"/>

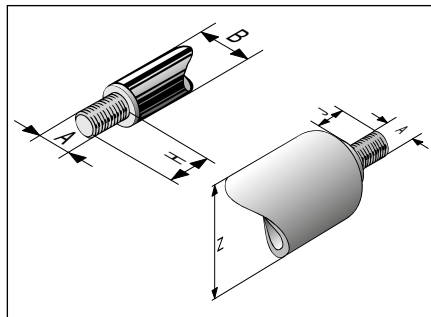
kg Damping force ÖDR 10-28



kg Damping force ÖDR 14-35



## End Fittings

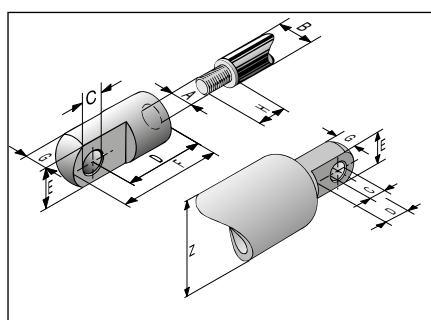


### Threaded end on the piston rod (GZ)

	6-19 6-20	8-23	10-28	14-35	14-40	25-69
A	M5	M8	M8	M10	M10	M20x1,5
H	6,5	10	10	12	12	30
B	Ø6	Ø8	Ø10	Ø14	Ø14	Ø25

### Threaded end on the cylinder (GZ)

	6-19	6-20	8-23	10-28	14-35	14-40	25-69
A	M5	M5	M8	M8	M10	M10	M20x1,5
J	8	8	12	12	12	12	30
Z	Ø19	Ø20	Ø23	Ø28	Ø35	Ø40	Ø69

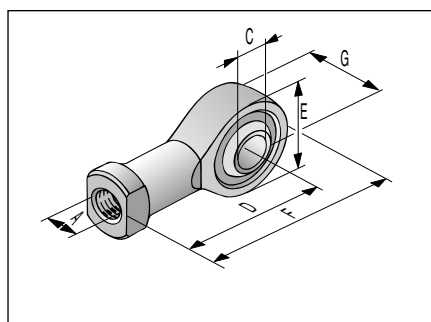


### Eyelet with inside thread (a) - to be screwed onto

	6-19	6-20	8-23	10-28	14-35	14-40	25-69
A	M5	M5	M8	M8	M10	M10	M20x1,5
C	Ø6	Ø6	Ø8	Ø8	Ø8	Ø8	Ø20
D	16	16	22	22	30	30	80
E	10	10	14	14	18	18	40
F	21	21	32	32	40	40	105
G	6,5	6,5	10	10	10	10	20

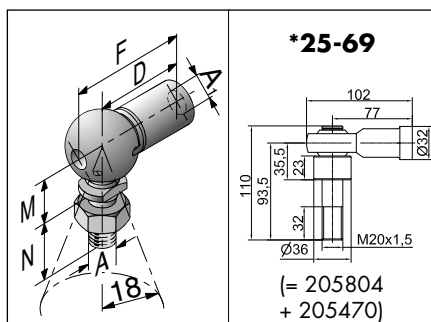
### Eyelet on cylinder end (A) - pressed into cylinder\*

	6-19	8-23	10-28ÖD	
C	Ø6	Ø8	Ø8	* This eyelet is only available for the adjacent series. For all other series, please use the eyelet with inside thread both on the piston rod and the cylinder.
D	11	13	16	
E	10	14	18	
G	6	10	10	



### Rose bearing (GK) (for piston rod and cylinder)

	6-19/6-20	8-23	10-28	14-35/14-40	25-69
Part no.	205800	205801	205801	205802	205804
A	M5	M8	M8	M10	M20x1,5
C	5	8	8	10	20
D	27	36	36	43	77
E	18	24	24	28	50
F	36	48	48	57	102
G	8	8	8	14	25

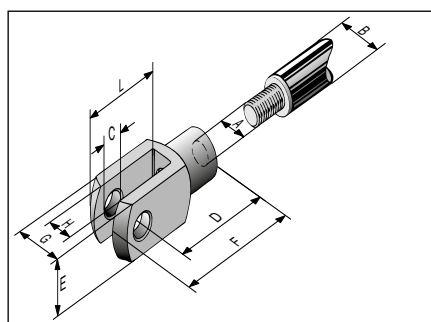


### Ball and socket joint (WG) DIN 71802 (for piston rod and cylinder)

	6-19	6-20	8-23	10-28	14-35	14-40	25-69*
A <sub>1</sub> /A	M5	M5	M8	M8	M10	M10	M20x1,5
D	22	22	30	30	35	35	77
F	28	28	39	39	46	46	102
M	9	9	13	13	16	16	see drawing
N	10	10	16	19	19	19	see drawing

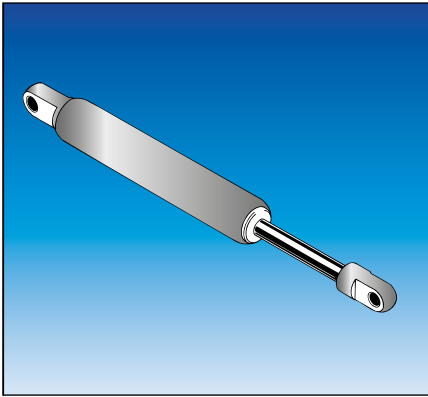
**ATTENTION:** With ball and socket joints from AISI 304 or AISI 316 the maximum admissible damping forces are reduced as follows:

6-19 and 6-20: 300 N / 8-23 and 10-28: 800 N / 14-35 and 14-40: 1200 N



### Fork (G) DIN 71752 (for piston rod and cylinder)

	6-19	6-20	8-23	10-28	14-35	14-40	25-69
A	M5	M5	M8	M8	M10	M10	M20x1,5
B	Ø6	Ø6	Ø8	Ø10	Ø14	Ø14	Ø25
C	Ø5	Ø5	Ø8	Ø8	Ø10	Ø10	Ø20
D	20	20	32	32	40	40	80
E	10	10	16	16	20	20	40
F	26	26	41	41	52	52	105
G	10	10	16	16	20	20	40
H	5	5	8	8	10	10	20
L	16	16	25	25	32	32	65



## Installation, Fixing Brackets

Gladly we will help you in choosing the most appropriate oil damper for your application. The following information would be very helpful:  
Description of the problem, dimensioned drawing and weight

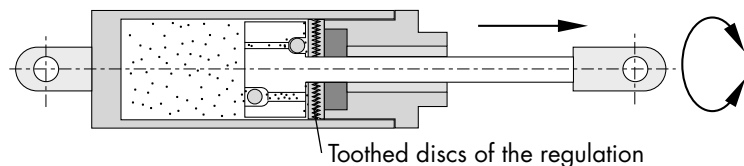
## Adjusting the Damping of the ÖDR

The adjusting of the damping force works the same way as with the final dampers with stepped adjustment (see page 03.005.00).

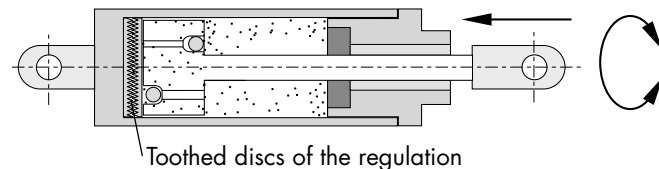
Standard stepped adjustment: The piston rod is pulled out completely (Attention: For this purpose you should never use nippers as this would damage the surface of the piston rod and following the seal). Then you increase or decrease the damping force by turning the piston rod.

Some oil dampers are produced with the adjustment when the piston rod is completely pushed in. Please observe the label on the cylinder!

### Adjusting with the completely pulled out piston rod



### Adjusting with the completely pushed in piston rod



## Installation Instruction

Oil dampers start damping only after a few millimeters of travel.

Oil dampers should not be used as a final stopping device. It is recommended to provide a separate mechanical final stop.

## Fixing Accessories

For the mounting of the oil dampers various fixing brackets are available. The type of bracket to be chosen depends on the end fittings of the oil damper and the type of mounting (lateral or frontal). A large variety can be found in the chapter gas springs of this catalogue.





## Adjustable Oil Dampers with Fixings, ÖDR 14-35 for Hinged Gates with Ascending Hinges

Hinged doors and gates with ascending hinges which are opened by hand close as soon as they are free. Depending on the size of the door/gate, high loads can build up when the gate is closing. This represents a high injury risk for persons and it might damage the complete door installation.

The increased demands of the EN 13241 regarding safety will be met when an adjustable oil damper with fixings on both ends is mounted on these gates.

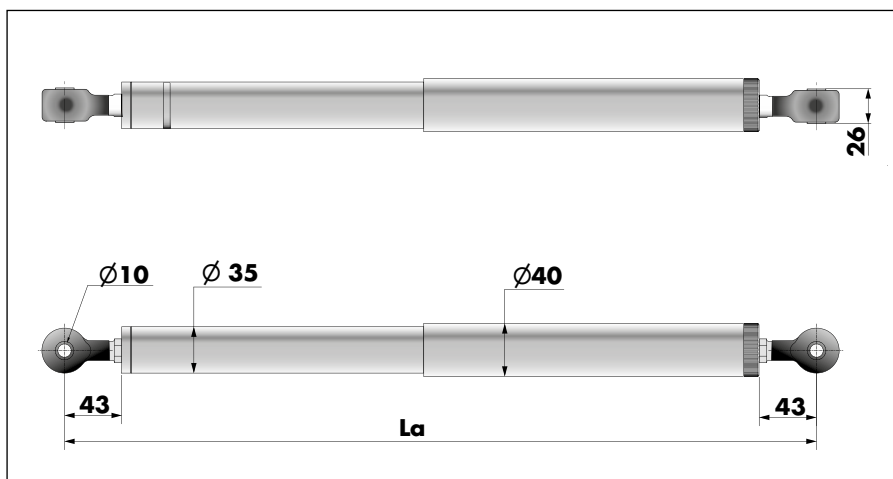
### Versions

For the use on hinged gates with ascending hinges DICTATOR supplies adjustable oil dampers with three different stroke lengths. Due to the outside application they always have a protective tube to protect the piston rod against dirt and damage.

As one end of the oil dampers is fixed on the gate and the other one on the wall or the jamb, they provide a cushioned movement during the complete closing.

Information about fixing accessories can be found two pages ahead.

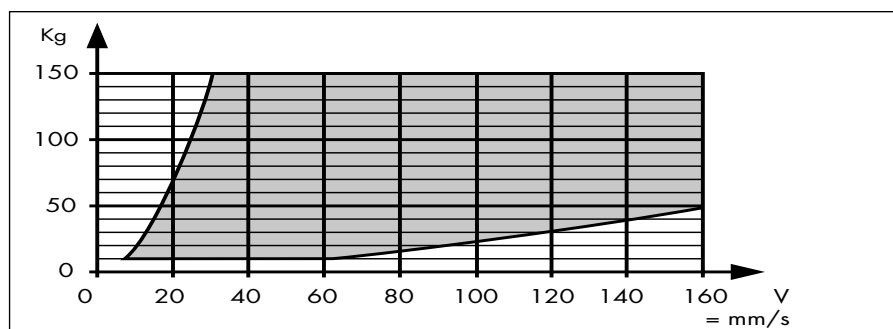
### Dimensions



Stroke (mm)	$L_a^*$ GK-GK (mm)
200	700
300	900
400	1100

\*  $L_a$  = extended length (with end fittings)

### Diagram Load - Speed







## Adjustable Oil Dampers with Fixings, ÖDR 14-35 for Hinged Gates with Ascending Hinges - cont.

Gladly we will help you in choosing the most appropriate oil damper for your application. For this we need the following data:

- dimensions and weight of the gate
- opening angle
- gradient
- fixing possibilities

The rose bearings (GK) are sealed against entering water.

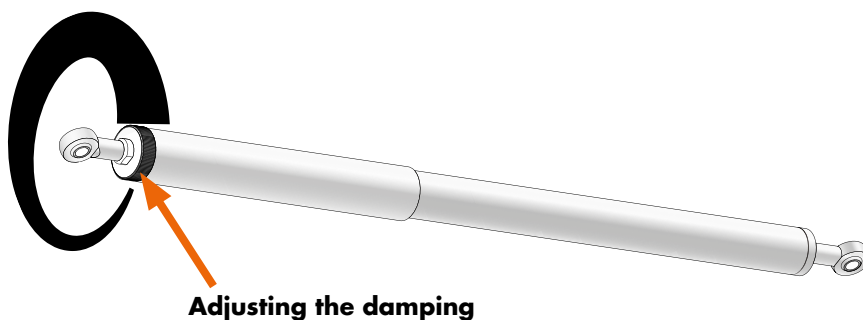
### Technical Data

Maximum tensile load	1 500 N = approx. 150 kg
Minimum speed	35 mm/s
Material piston rod	hard chromed
Material/finishing cylinder	zinc-plated steel, in addition covered with shrink wrap, colours either black, grey or white
Material/finishing protective tube	aluminium, in addition covered with shrink wrap, colours either black, grey or white

### Adjusting the Damping

The damping force of the adjustable oil dampers ÖDR for hinged gates with ascending hinges can be regulated **when they are mounted**. For this purpose the dampers have a knurled shifting ring which allows an exact adaption of the damping to the respective gate.

Due to the outside installation, larger temperature changes influence the damping behaviour. But the damping force can easily be adapted.



### Order Information

Model	Part number		
	black	grey	white
ÖDR 14-35-200-1/ÖI-500-700-GK-GK-6 with protective tube and external regulation	392530S	392530G	392530W
ÖDR 14-35-300-1/ÖI-600-900-GK-GK-6 with protective tube and external regulation	392540S	392540G	392540W
ÖDR 14-35-400-1/ÖI-700-1100-GK-GK-6 with protective tube and external regulation	392550S	392550G	392550W

On demand, these dampers are also available completely in AISI 304.

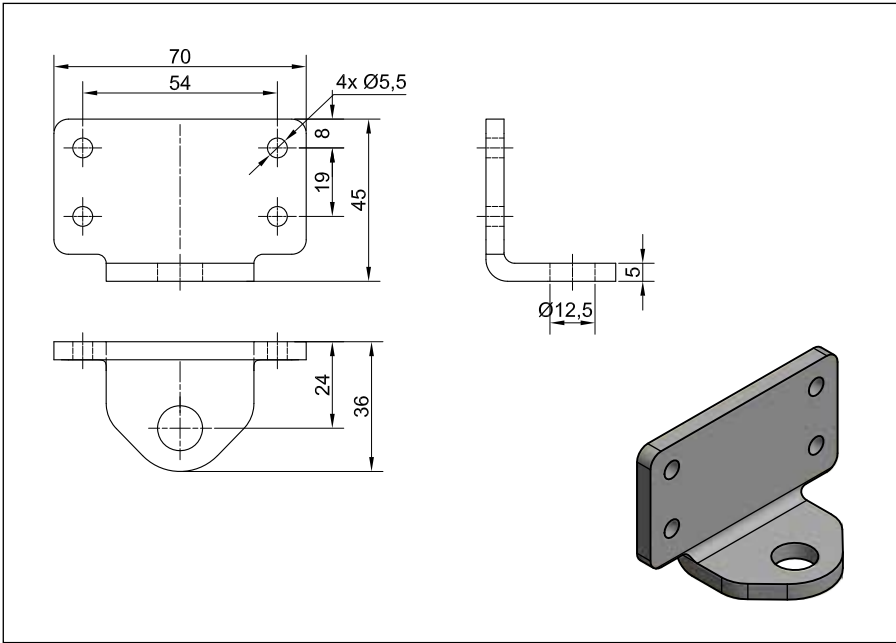


**Adjustable Oil Dampers with Fixings, ÖDR 14-35  
for Hinged Gates with Ascending Hinges - Fixing**

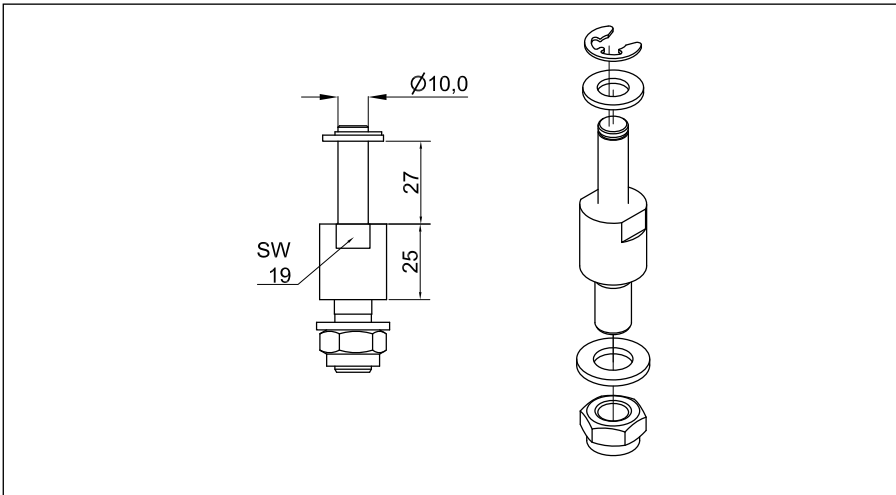
Due to the many different gate and hinge situations, for the ÖDR 14-35 no standard fixing brackets are available. Often, however, the fixing bracket shown below can be used. Our technical staff members will be happy to help you.

For fixing the oil damper ÖDR in the fixing bracket or in brackets on site, a pin with the corresponding accessories is available.

**Dimensions  
Fixing Bracket**



**Dimensions  
Fixing Pin**



**Order Information  
Accessories**

Fixing pin ÖDR 25 mm, Ø 10 mm, zinc-plated, with accessories	part no. 205510
Fixing bracket TB 70x45x36, zinc-plated	part no. 205489

## Radial Dampers

### Fully Adjustable, for Constant Damping

DICTATOR provides **two** different **types** of radial dampers for the control and the damping of rotating and linear movements over long distances:

- Lamellar radial dampers LD
- Radial dampers RD 240/241

They are ideal for avoiding high mass forces. They control and reduce speed during the whole travel of moving objects, e.g. sliding doors and gates, of sledges or carriages in machine construction. All types can be adjusted continuously. DICTATOR radial dampers damp in both directions, but usually they come with a free wheel in one direction.

The patented lamellar radial dampers LD are characterized by their small basic dimensions combined with high performance and the possibility to individually adapt them to requirements of the customers.

Information about the radial dampers approved for their use on fire protection sliding doors and gates can be found in our Fire Door Operators catalogue.



### Overview

Radial dampers LD 50	max. pivot moment 2 Nm
Radial dampers LD 100	max. pivot moment 5 Nm
Radial dampers LD	special models with differing damping according to customer's requirements
Radial dampers RD 240/241	max. pivot moment 8 Nm double radial damper: max. 12.2 Nm
Damping by	rope, chain (tensioned or revolving), toothed belt, rack and friction wheel (only RD 240/241), customised



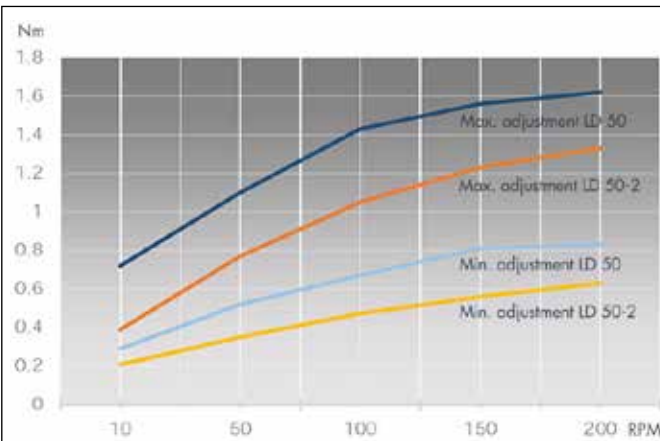
## Technical Data Lamellar Radial Dampers LD

The two following diagrams inform about the damping force of the LD 50 and LD 100 series of the lamellar radial dampers. Both series differ in their height. The base dimensions are identical.

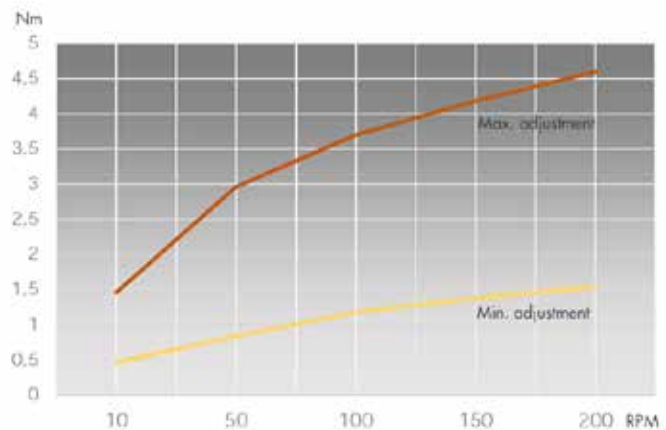
The patented lamellar construction allows by varying the height to realize also customised damping forces. This is also possible with small quantities as the damping characteristics don't depend on the material of the body. When there are special requirements regarding the damping forces or the material, the casing can also be made of aluminium or stainless steel for instance.

## Damping Diagrams LD 50 / LD 100

The lamellar radial damper LD offers a very large adjusting range. In the diagram of the radial damper LD 50 are indicated two damping ranges. They are determined by the used oil. Therefore, on demand, also other damping ranges are possible.



Radial dampers LD 50 / LD 50-2



Radial dampers LD 100

## Notes about the diagrams

The values shown in the diagram were determined in a standardized test environment.

Two factors here are:

- Installation of the lamellar radial damper vertically, adjustment screw points downwards
- Ambient temperature 22 - 25 °C

When the damper is used in actuality, the damping behavior can additionally be influenced by various external factors, so that the damping behavior in actual use may deviate from that shown in the diagram.

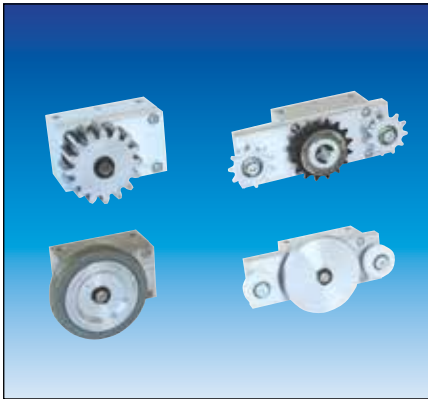
The lamellar dampers are not intended for continuous operation because they may overheat, which has a negative effect on its durability. The temperature of the damper, which is influenced by ambient temperature, actuation frequency, speed and the settings of the control (damping power), should preferably not exceed 50°C on the outside of the housing.

## Technical Data

Operating temperature -15° up to +40 °C

Material casing LD      Aquamid (glass fibre reinforced, flame resistant; standard)  
other materials as aluminium or stainless steel on demand

Versions LD              rope pulley, chain wheel, toothed wheel, others on demand



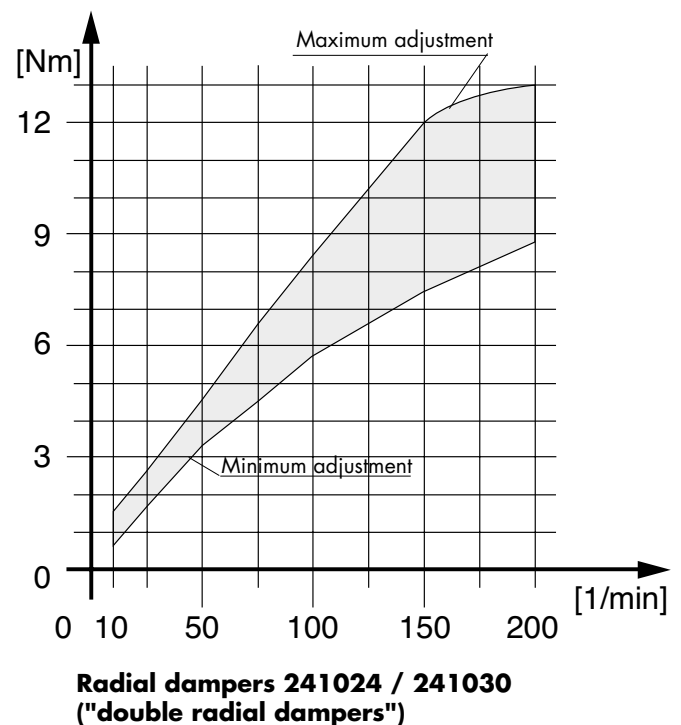
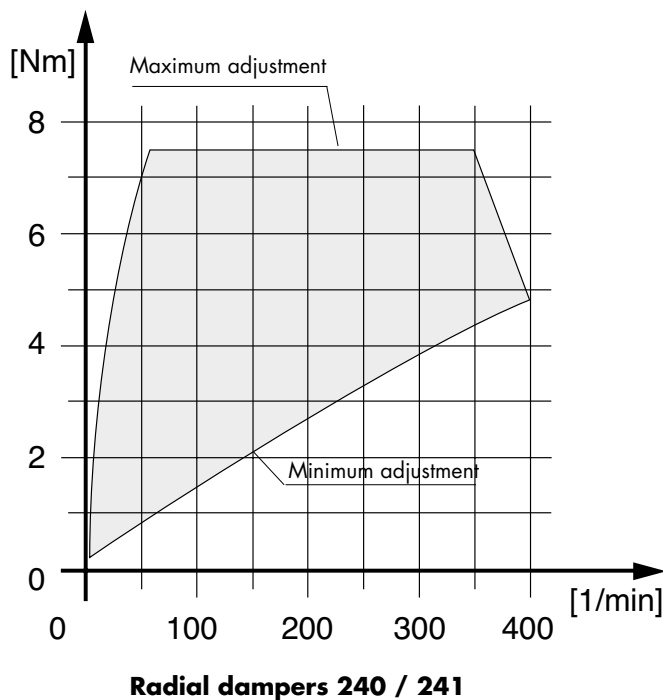
### Technical Data Radial Dampers Series RD 240/241

The damping forces of the RD 240/241 series can be seen in the two following diagrams. Most of the RD 240/241 models have been tested for their use on fire sliding doors. The body of this series is made of aluminium. Therefore they allow a slightly higher duty cycle than the lamellar radial dampers LD.

Detailed information about the different standard models can be found beginning on page 03.057.00. On demand, other models are available.

### Damping Diagrams RD 240 / 241

The radial dampers of the RD 240/241 series are available in two strengths. The double radial damper is higher, the dimensions of the base, however, correspond to those of the RD 240/241.



### Technical Data

Operating temperature	-15° up to +70 °C
Duty cycle*	standard approx. 50 %
Material casing	aluminium
Versions	chain wheel, rope pulley, friction wheel, toothed wheel

\*Duty cycle: the duty cycle of a door that is being damped during closing and is always moving, i.e. opening and closing permanently, is 50 %, as the radial damper works only during closing.



## Radial Dampers LD

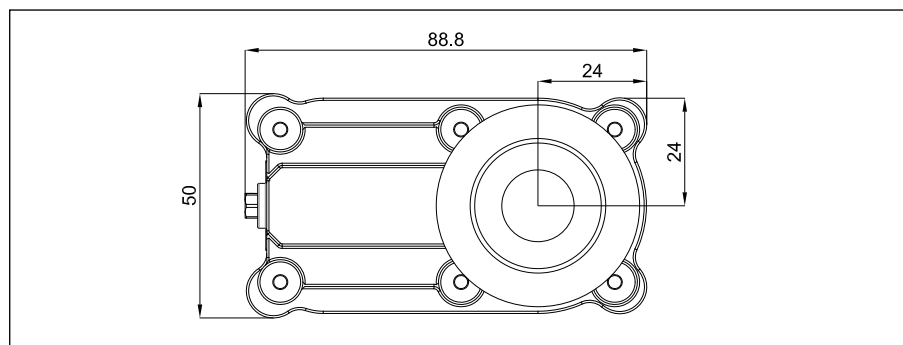
**Patented new development with extremely broad damping range**

DICTATOR has broken new ground with the LD radial damper. It is an in-house newly developed, patented technology. Its flexible, extremely adaptable construction offers the possibility to easily realize beside the standard models customized solutions - in small quantities and even single units. It is possible to adapt the damping characteristics and also to manufacture bodies of other material, e.g. aluminium or stainless steel.

## Damping Characteristics

More crucial advantages of the new series:

- Very large damping range.
- Very precise and sensitive adjusting of the damping.
- Stable damping characteristics, also at very high numbers of revolutions.
- All radial dampers of the new generation have the same dimensions of the body base. They only differ in their height. Due to the small width (50 mm) it is easy to mount them, if necessary often even in the rail.



## Variation Possibilities

The LD radial dampers can be furnished with the most different driving wheels to **transmit the damping**: from rope pulleys with different diameters and for different rope diameters to toothed wheels, toothed belt disks, chain wheels, friction wheels etc. It is also possible to supply the radial damper just with the axle for your own driving wheel. On the following pages only the standard models are described. In case of differing requirements, we gladly will elaborate an individual solution.

Also the **damping characteristics** of the radial dampers can be adapted to the customer's requirements:

- **Increasing the damping** by a higher body - in a customized casing - on demand.
- **Modifying the damping force** by using different damping media with differing viscosity (for an example please see the damping diagram LD 50 on page 03.036.00). In the description of the lamellar radial damper this is indicated by adding a "-2", "-3", "-4" (e.g. LD 50-2 S-45).
- **Damping in both directions** (By default the driving wheel features a freewheel and therefore hydraulically damps only in one direction.)

The **standard casing** of the LD radial damper is made of **plastics**. This casing has passed a **fire test according to DIN 53438-2** and thus meets the special directives for the **use in rail vehicles**.



It is however possible to make it for **special requirements** also in **other material** as e.g. aluminium or stainless steel (see picture on the left).



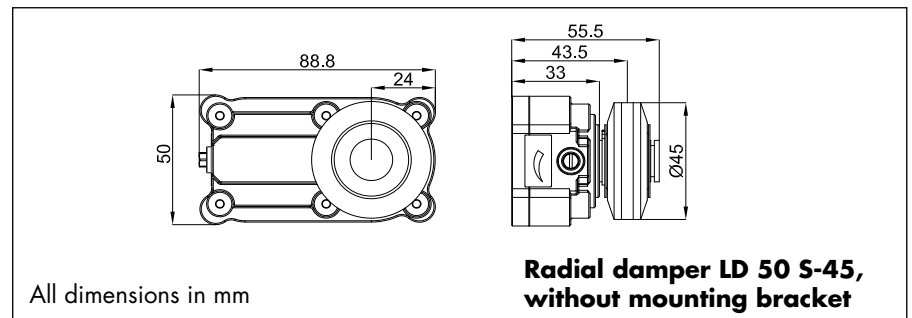


## Radial Damper LD 50 S-45 with Rope Pulley Ø 45 With or without mounting bracket kit

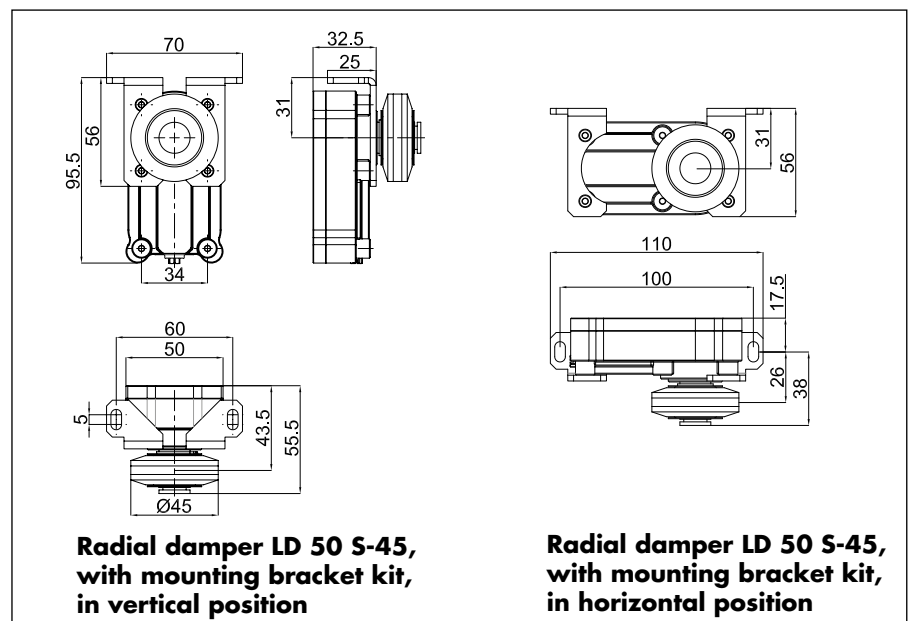
The LD 50 S-45 radial damper has been designed for damping by **revolving rope**. The rope pulley has a diameter of 45 mm.

In total the LD radial damper has 6 mounting holes with a diameter of 2.9 mm for individual fitting. The mounting bracket kit allows to easily fix the LD 50 radial damper in an either horizontal or vertical position. Other fitting accessories are available on demand.

### Dimensions LD 50 S-45 Basic Unit



### Dimensions LD 50 S-45 with Mounting Bracket Kit



### Components Included

Radial damper LD 50 S-45 with rope pulley Ø 45 in aluminium with Vulkollan insert, with freewheel, casing in plastics, with or without mounting bracket kit

### Optional Accessories

Rope Ø 2 mm in steel or stainless steel, idler pulley Ø 45, door actuator (see page 03.052.00)

### Order Information

LD 50 S-45, without mounting bracket	part no. 244041
LD 50 S-45, with mounting bracket kit, zinc-plated	part no. 244040
LD 50 S-45, with mounting bracket kit, AISI 304	part no. 244042
LD 50-2 S-45, without mounting bracket	part no. 244049
LD 50-2 S-45, with mounting bracket kit, zinc-plated	part no. 244047
LD 50-2 S-45, with mounting bracket kit, AISI 304	part no. 244048



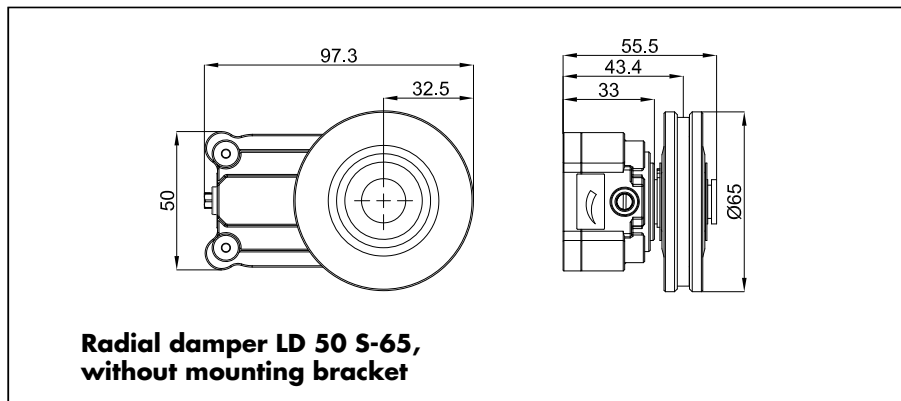
## Radial Damper LD 50 S-65 with Rope Pulley Ø 65 With or without mounting bracket kit

The LD 50 S-65 radial damper has been designed for damping with **revolving rope**. The rope pulley has a diameter of 65 mm.

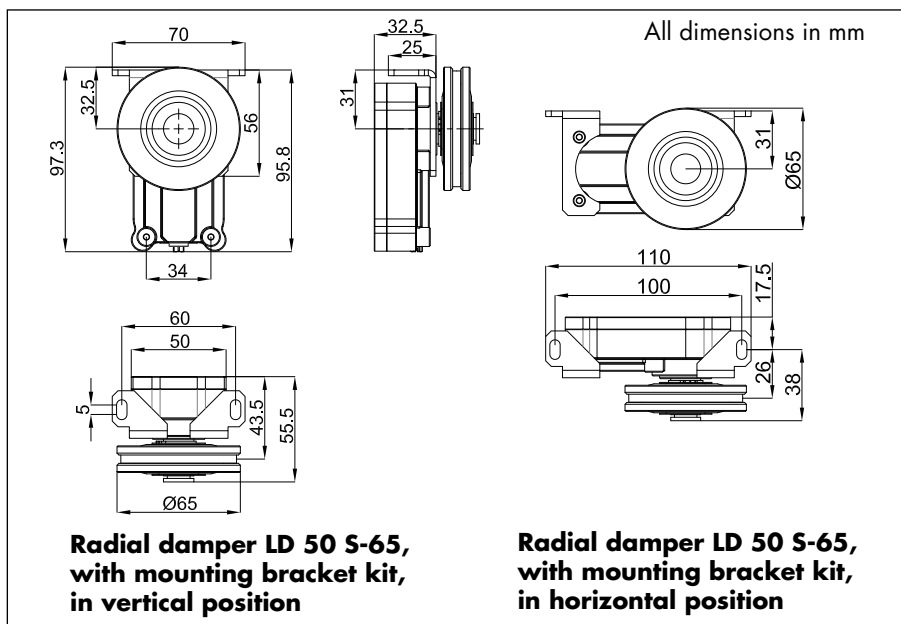
The LD 50 S-65 radial damper is intended in particular for lightweight doors (room doors). Due to the larger diameter of the rope pulley, the damping can be adjusted in an optimum way to this application.

To achieve an optimum damping, the rope should enlase the rope pulley for about 150°.

### Dimensions LD 50 S-65 Basic Unit



### Dimensions LD 50 S-65 with Mounting Bracket Kit



### Components Included

Radial damper LD 50 S-65 with rope pulley Ø 65 in aluminium with Vulkollan insert, with freewheel, casing in plastics, with or without mounting bracket kit

### Optional Accessories

Rope Ø 2 mm in steel or stainless steel, idler pulley Ø 63, door actuator (see page 03.052.00)

### Order Information

LD 50-2 S-65, without mounting bracket	part no. 244063
LD 50-2 S-65, with mounting bracket kit, zinc-plated	part no. 244061
LD 50-2 S-65, with mounting bracket kit, AISI 304	part no. 244062





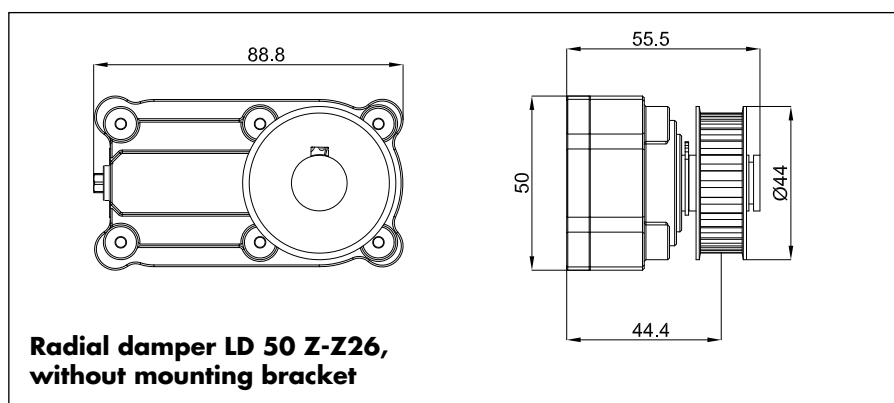
### Radial Damper LD 50 Z-Z26 with Toothed Belt Disk With or without mounting bracket kit

The LD 50 Z-Z26 radial damper uses a **revolving toothed belt**. The driving wheel of the LD 50 Z-Z26 is configured for a toothed belt 5M, 10 mm wide. Driving wheels for other toothed belt types are available on demand.

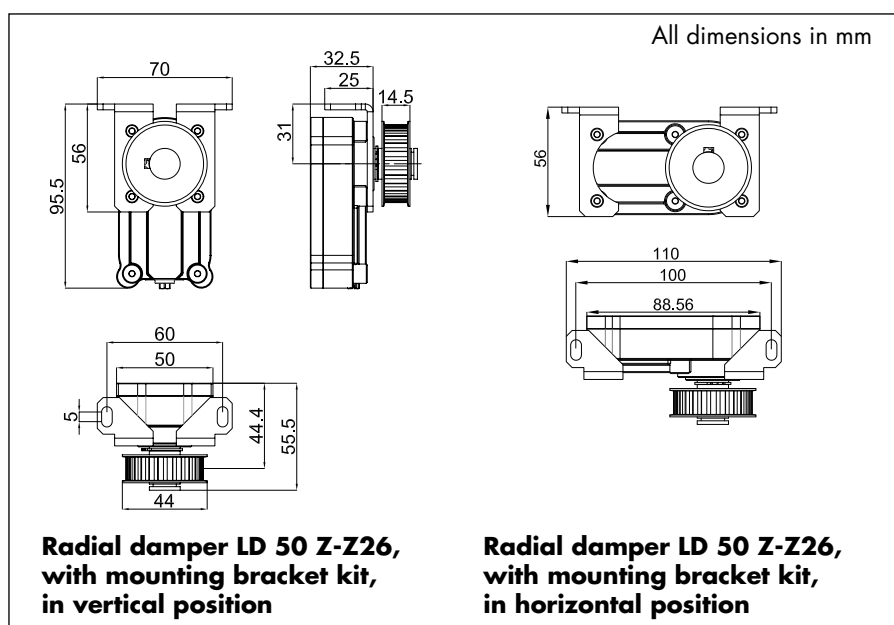
The toothed belt is the ideal medium for power transmission as it creates an absolutely positive connection between the toothed belt and the driving wheel of the radial damper. Therefore, in comparison with a steel rope, less pretension is required, friction is reduced and it is easier to move the door.

The toothed belt disk is made from steel.

### Dimensions LD 50 Z-Z26 Basic Unit



### Dimensions LD 50 Z-Z26 with Mounting Bracket Kit



### Components Included

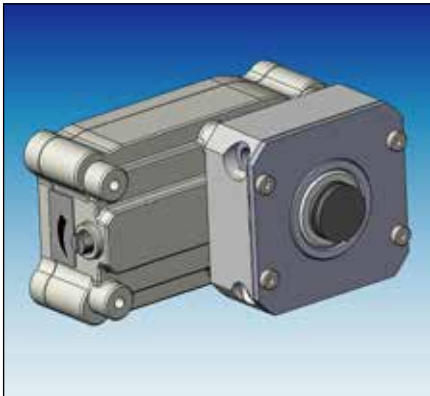
Radial damper LD 50 Z-Z26 with toothed belt disk in steel for toothed belt HDT 5, 10 mm wide, with freewheel, casing in plastics, with or without mounting bracket kit

### Optional Accessories

Toothed belt HDT 5, 10 mm wide; idler pulley, door actuator (see page 03.054.00)

### Order Information

LD 50 Z-Z26, without mounting bracket	part no. 244071
LD 50 Z-Z26, with mounting bracket kit, zinc-plated	part no. 244070
Toothed belt HDT 5, 10 mm wide, per meter	part no. 710502



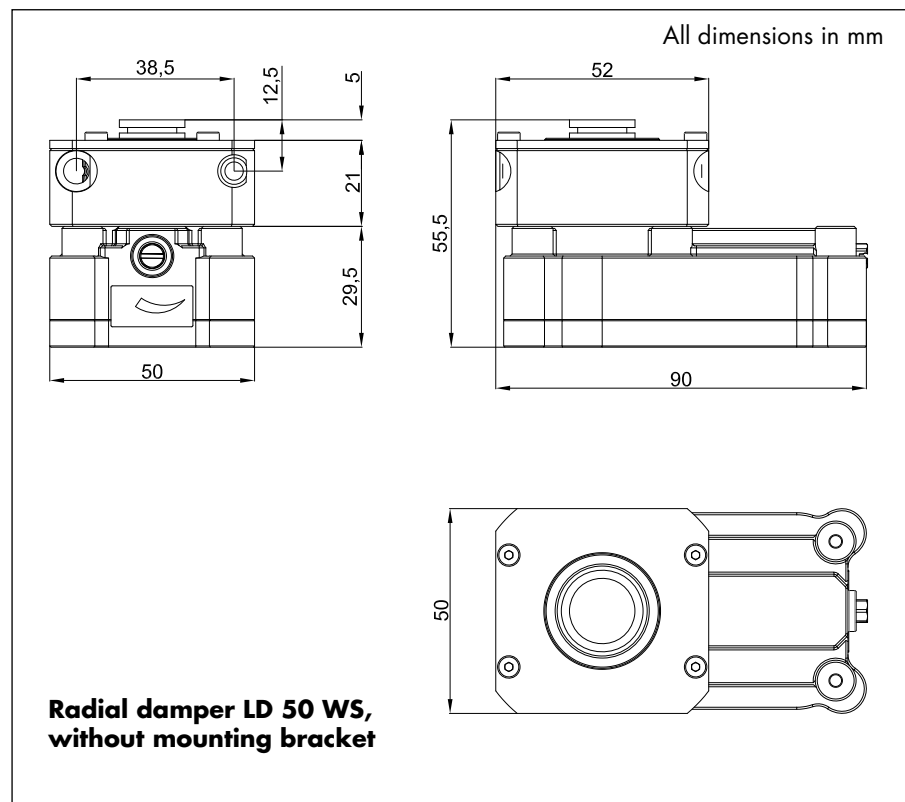
## Radial Damper LD 50 WS

For tensioned wire rope

The LD 50 WS hydraulically damps via a **tensioned wire rope** which runs through the cap on the radial damper. The rope is fixed on both sides of the door (e.g. to the door frame). This type of radial damper is mounted on the door leaf.

To fix and tension the wire rope a tensioner and a clamp piece are available, both either with or without mounting bracket.

## Dimensions LD 50 WS



## Components Included

Radial damper LD 50 WS with cap in steel for tensioned WS6 wire rope, with freewheel, casing in plastics, without mounting bracket

## Optional Accessories

Mounting bracket for LD 50 WS, WS6 wire rope, wire rope tensioner and clamp piece for tensioning the wire rope, with or without bracket.

## Order Information

LD 50 WS, without mounting bracket	part no. 244080
Wire rope WS6, per meter	part no. 244147
Wire rope tensioner, without bracket	part no. 701042
Wire rope tensioner, with bracket	part no. 701043
Clamp piece, without bracket	part no. 701047
Clamp piece, with bracket	part no. 701048
Mounting bracket	part no. 701040



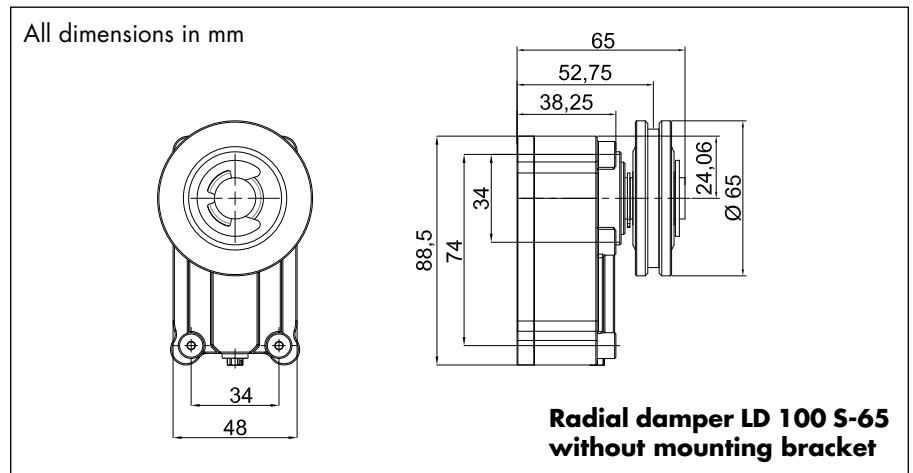
## Radial Damper LD 100 S-65 with Rope Pulley Ø 65 For horizontal or vertical mounting

The radial damper LD 100 S-65 with rope pulley Ø 65 uses a **revolving rope** of Ø 3 mm to transmit the damping. The LD 100 S-65 is available with or without mounting bracket kit.

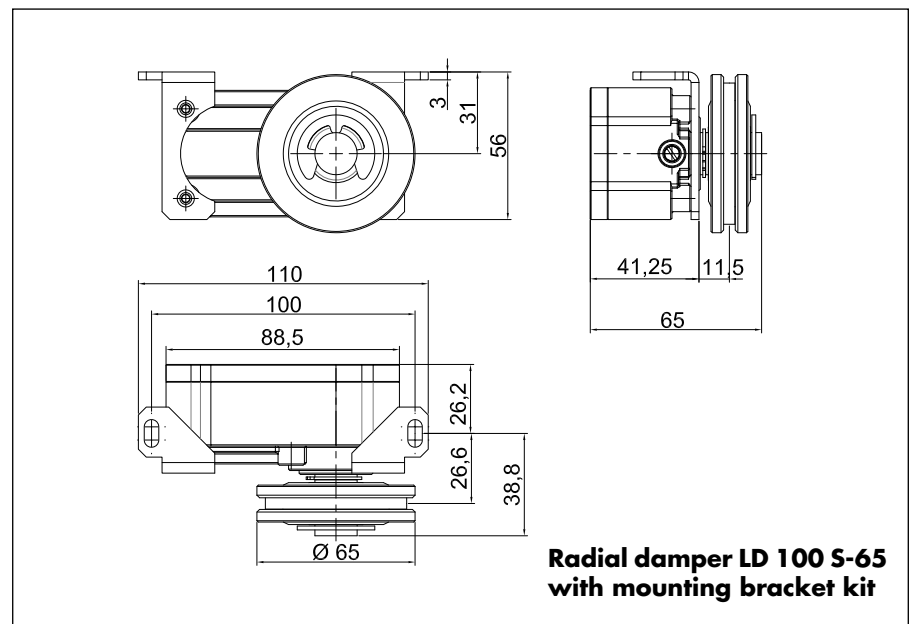
The standard rope pulley features a freewheel, i.e. it hydraulically damps only in one direction.

To achieve an optimum damping, please make sure when mounting the damper that the rope enlaces the rope pulley for about 150°.

### Dimensions LD 100 S-65 Basic Unit



### Dimensions LD 100 S-65 with Mounting Bracket Kit



### Components Included

Radial damper LD 100 S-65 with rope pulley Ø 65 in aluminium with Vulkollan insert, with freewheel, casing in plastics, with or without zinc-plated mounting bracket kit

### Optional Accessories

Steel rope Ø 3 mm, idler pulley Ø 63 mm, rope tensioner with door actuator (see pages 03.052.00 and 03.053.00)

### Order Information

LD 100 S-65, without mounting bracket	part no. 244141
LD 100 S-65, with mounting bracket kit, zinc-plated	part no. 244101

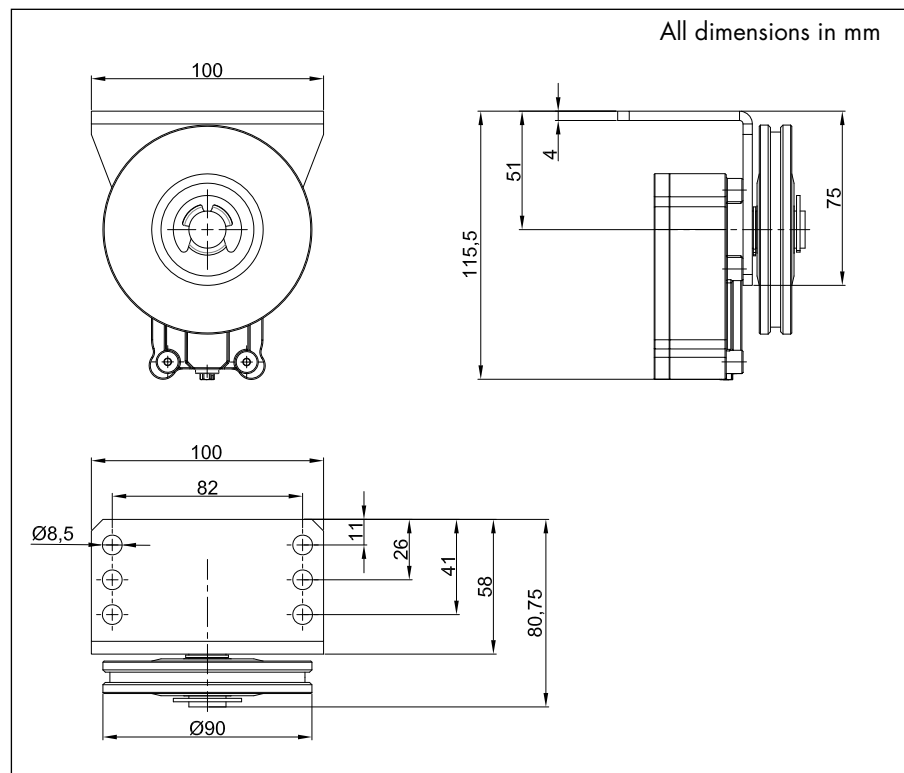


## Radial Damper LD 100 S-90 with Rope Pulley Ø 90 With zinc-plated mounting bracket with 6 holes

The radial damper LD 100 S-90 with rope pulley Ø 90 uses a **revolving rope** of Ø 3 mm to transmit the damping. When the rope runs over longer distances, it is preferable to use this model as due to the larger diameter of the rope pulley, the rope is longer in contact with the pulley and therefore offers a more secure rope guiding. To achieve an optimum damping, the rope should enlase of the rope pulley for about 150°.

The rope pulley of the standard model features a freewheel, i.e. it hydraulically damps only in one direction.

## Dimensions



Normally the LD 100 S-90 is supplied with a zinc-plated mounting bracket. It has 6 holes to allow adapting the mounting position to the local situation. If you need another fitting type, please contact us.

## Components

Radial damper LD 100 S-90 with rope pulley Ø 90 in aluminium with Vulkollan insert, with freewheel, casing in plastics, zinc-plated mounting bracket with 6 fixing holes

## Optional Accessories

Steel rope Ø 3 mm, idler pulley Ø 90 mm, rope tensioner with door actuator (for order information see below, for drawings see page 03.053.00)

## Order Information

LD 100 S-90, without mounting bracket	part no. 244142
LD 100 S-90, with mounting bracket kit, zinc-plated	part no. 244102
Idler pulley Ø 90 for rope	part no. 700530
25 m of steel rope Ø 3 mm	part no. 700155
Rope tensioner with door actuator	part no. 700478



### Radial Damper LD 100 Z-Z26 with Toothed Belt Disk With or without fixing accessories

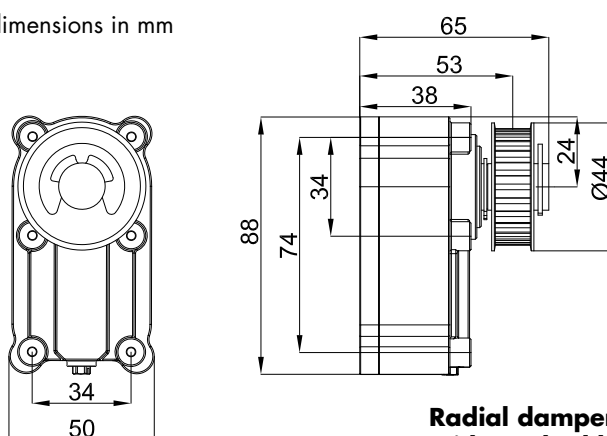
The LD 100 Z-Z26 radial damper using a **revolving toothed belt** ensures an absolutely reliable speed control also for larger masses, due to the positive connection between toothed belt and the driving wheel of the radial damper. Therefore, in comparison with a steel rope, less pretension is required, friction is reduced and it is easier to move the door.

The damping wheel is intended for a toothed belt 5M, 10 mm wide. Driving wheels for other toothed belt types are available on demand.

The toothed belt disk is made from steel.

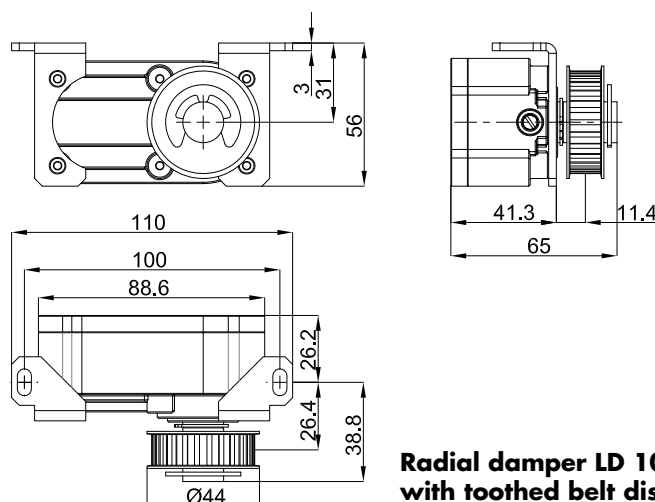
### Dimensions LD 100 Z-Z26 Basic Unit

All dimensions in mm



**Radial damper LD 100 Z-Z26  
with toothed belt disk Z26,  
without mounting bracket kit**

### Dimensions LD 100 Z-Z26 with Mounting Bracket Kit



**Radial damper LD 100 Z-Z26  
with toothed belt disk Z26,  
with mounting bracket kit**

### Components

Radial damper LD 100 Z-Z26 with toothed belt disk Z26 in steel for toothed belt HDT 5, 10 mm wide, with freewheel, casing in plastics, with or without zinc-plated mounting bracket kit

### Optional Accessories

Toothed belt HDT 5, 10 mm wide; idler pulley, door actuator (see page 03.054.00)

### Order Information

LD 100 Z-Z26, without mounting bracket	part no. 244104
LD 100 Z-Z26, with mounting bracket kit, zinc-plated	part no. 244105
Toothed belt HDT 5, 10 mm wide, per meter	part no. 710502

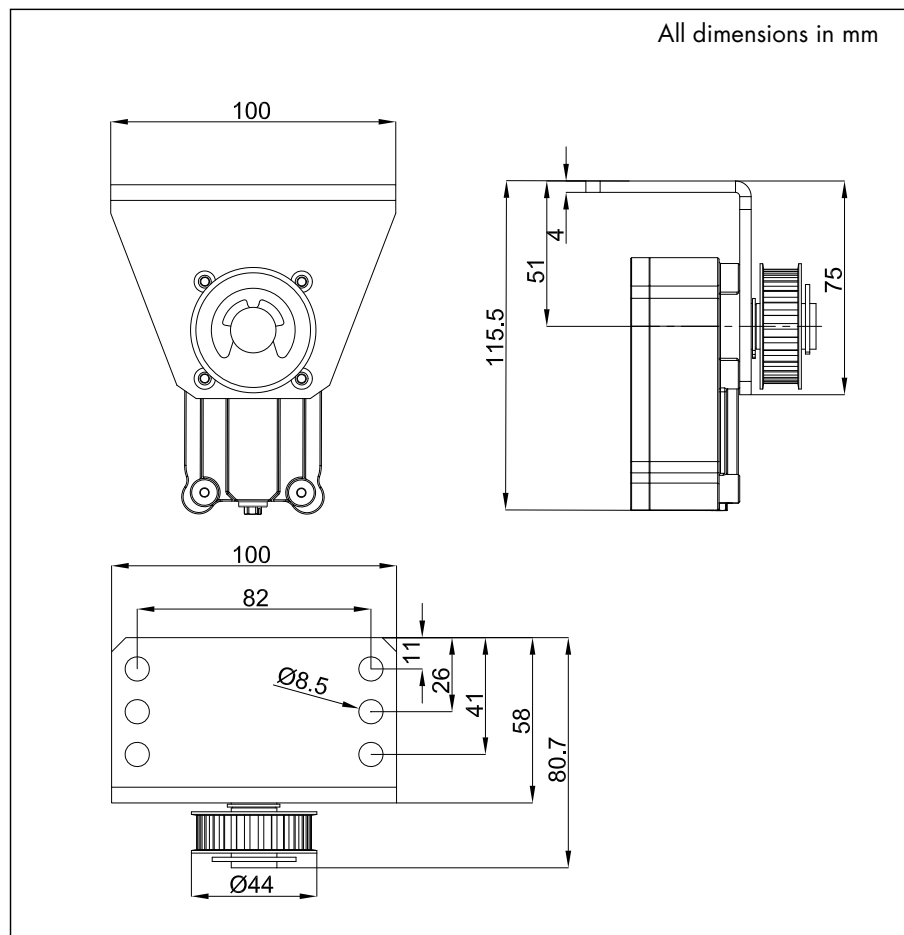


### Radial Damper LD 100 Z-Z26 with Toothed Belt Disk With zinc-plated mounting bracket with 6 holes

The LD 100 Z-Z26 radial damper with mounting bracket uses a **revolving toothed belt** to control the speed. Due to the very **stable mounting bracket** it is ideal for applications where higher forces occur. The 6 holes of the bracket allow to optimally adapt the mounting position.

The driving wheel is intended for a toothed belt 5M, 10 mm wide. Driving wheels for other toothed belts are available on demand.

### Dimensions



### Components Included

Radial damper LD 100 Z-Z26 with toothed belt disk Z26 in steel for toothed belt HDT 5, 10 mm wide, with freewheel, casing in plastics, zinc-plated mounting bracket with 6 fixing holes

### Optional Accessories

Toothed belt HDT 5, 10 mm wide; idler pulley, door actuator with belt tensioner (for order information and drawings see page 03.054.00)

### Order Information

LD 100 Z-Z26, with mounting bracket, zinc-plated	part no. 244106
Toothed belt HDT 5, 10 mm wide, per meter	part no. 710502

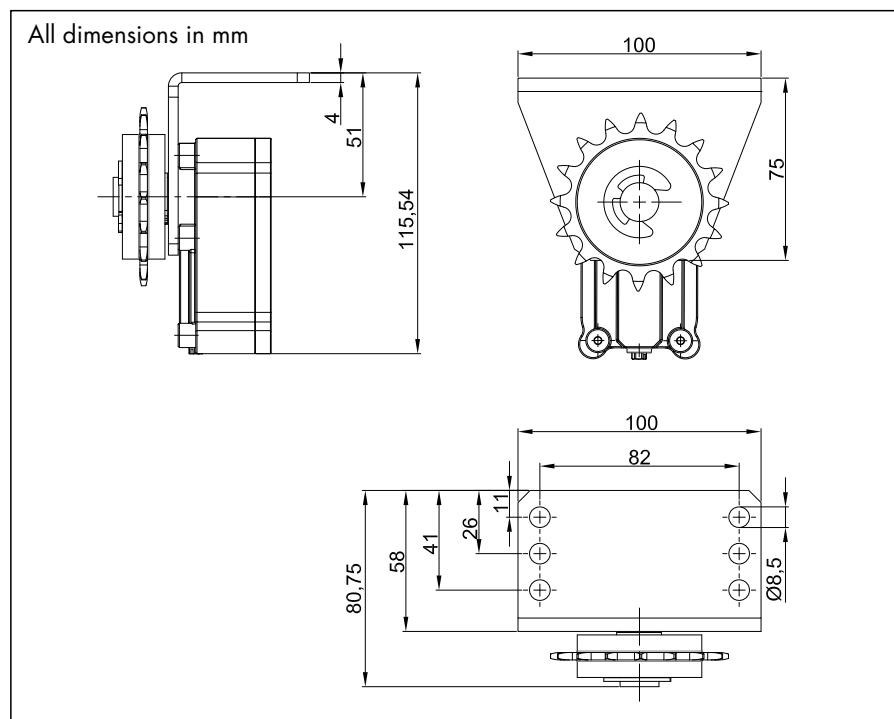


### Radial Damper LD 100 K-Z16, Chain Wheel Z16 1/2x1/8" With zinc-plated mounting bracket with 6 holes

The radial damper LD 100 K-Z16 with chain wheel uses a **revolving chain** 1/2x1/8" to transmit the damping. This provides an absolutely positive connection to the device to be damped (door). To achieve an optimum damping, it is important that as many chain links as possible engage with the chain wheel.

On demand the LD 100 K radial damper is also available with other chain wheels. The standard chain wheel features a freewheel, i.e. it hydraulically damps only in one direction.

### Dimensions



Normally the LD 100 K-Z16 with chain wheel is supplied with a zinc-plated mounting bracket. It has 6 holes to allow adapting the mounting position to the local situation.

### Components Included

Radial damper LD 100 K-Z16 with chain wheel Z16, 1/2 x 1/8", with freewheel, casing in plastics, zinc-plated mounting bracket with 6 fixing holes

### Optional Accessories

Chain 1/2 x 1/8", idler pulley, door actuator with chain tensioner (for order information and drawings see page 03.054.00)

### Order Information

LD 100 K-Z16, with mounting bracket, zinc-plated	part no. 244103
Chain 1/2 x 1/8", piece of 5 m length	part no. 220006
Chain lock	part no. 220007



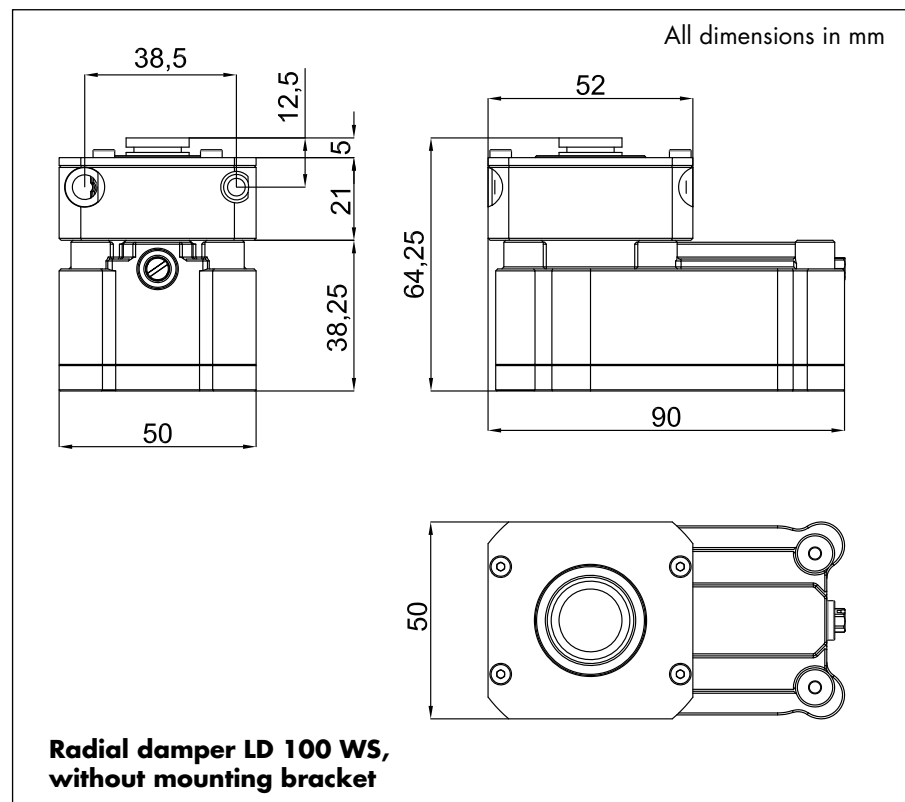
## Radial Damper LD 100 WS

For tensioned wire rope

The LD 100 WS hydraulically damps via a **tensioned wire rope** which runs through the cap on the radial damper. The rope is fixed on both sides of the door (e.g. to the door frame). This type of radial damper is mounted on the door leaf.

For fixing and tensioning the wire rope are available a tensioner and a clamp piece, both either with or without mounting bracket.

## Dimensions LD 100 WS



## Components Included

Radial damper LD 100 WS with cap in steel for tensioned WS6 wire rope, with free-wheel, casing in plastics, without mounting bracket

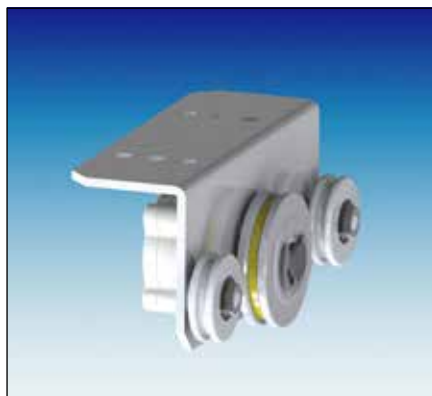
## Optional Accessories

Mounting bracket for LD 100 WS, WS6 wire rope, wire rope tensioner and clamp piece for tensioning the wire rope, with or without bracket.

## Order Information

LD 100 WS, without mounting bracket	part no. 244150
Wire rope WS6, per meter	part no. 244147
Wire rope tensioner without bracket	part no. 701042
Wire rope tensioner with bracket	part no. 701043
Clamp piece without bracket	part no. 701047
Clamp piece with bracket	part no. 701048
Mounting bracket	part no. 701040



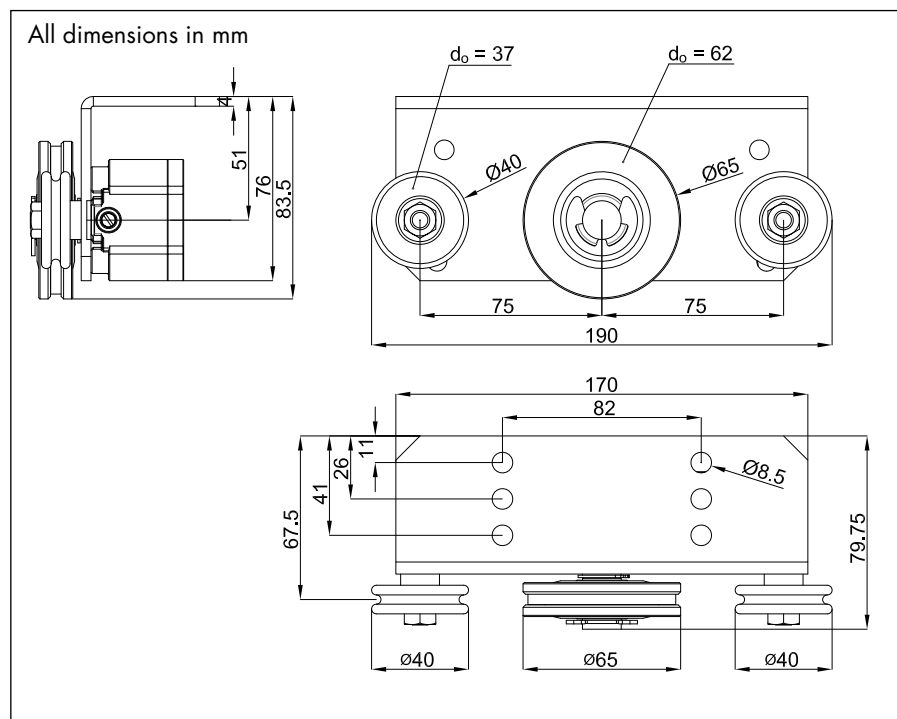


### Radial Damper LD 100L S-65 with Rope Pulley Ø 65, two small guiding pulleys Ø 40 and wide mounting bracket

The radial damper LD 100L S-65 with rope pulley Ø 65 and two additional guiding pulleys Ø 40 hydraulically damps by means of a **tensioned rope** Ø 3 mm. The rope is guided via the two guiding pulleys around the central rope pulley of the lamellar radial damper. This ensures an optimum damping.

The standard rope pulley features a freewheel. The way of guiding the rope around the pulleys determines the direction of damping. It is of course possible to take off the driving rope pulley, turn it around and fix it again on the axle (see page 03.056.00).

### Dimensions



The lamellar radial damper LD 100L S-65 with rope pulley Ø 65 and two guiding pulleys is always supplied with mounting bracket. The bracket has 6 holes to allow adapting the mounting position to the local situation.

### Components Included

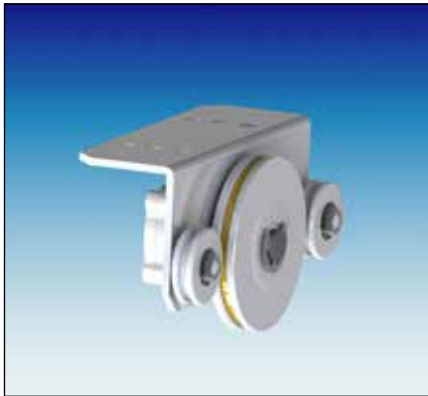
Radial damper LD 100L S-65 with rope pulley Ø 65 in aluminium with Vulkollan insert, with freewheel, 2 small guiding pulleys Ø 40 in plastics, casing in plastics, zinc-plated mounting bracket with 6 fixing holes

### Optional Accessories

Steel rope Ø 3 mm, rope tensioner (for order information see below)

### Order Information

Radial damper LD 100L S-65, 2 guiding pulleys Ø 40, mounting bracket, zinc-plated	part no. 244121
25 m of steel rope Ø 3 mm	part no. 700155
Rope tensioner (complete kit)	part no. 220005S

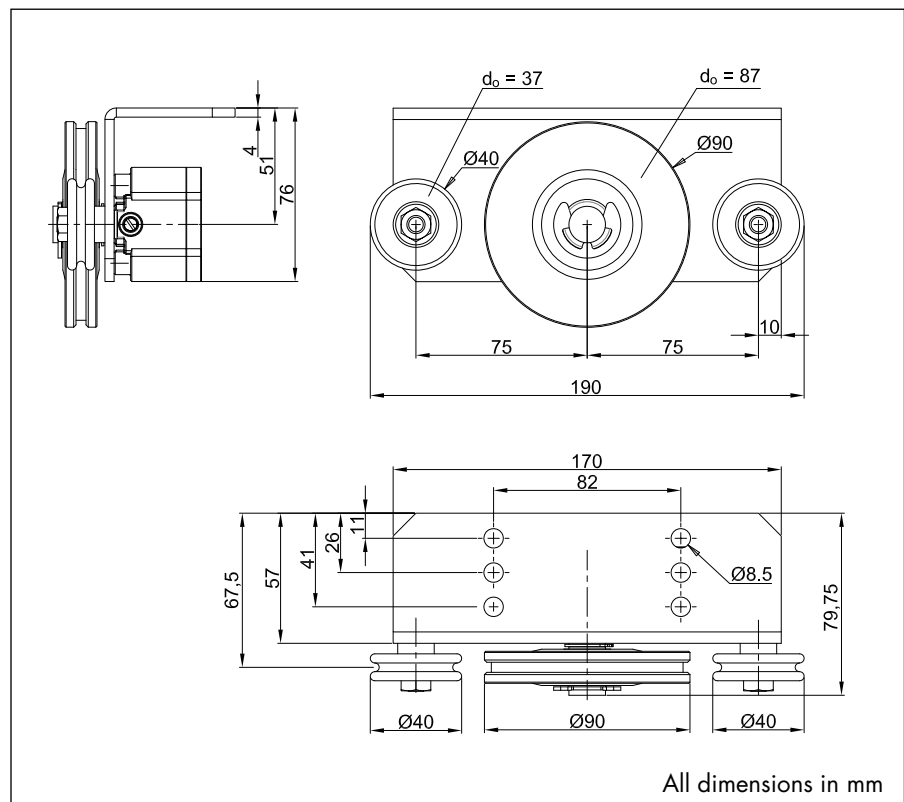


### Radial Damper LD 100L S-90 with Rope Pulley Ø 90, two small guiding pulleys Ø 40 and wide mounting bracket

The radial damper LD 100L S-90 with rope pulley Ø 90 and two additional guiding pulleys Ø 40 hydraulically damps by means of a **tensioned rope** Ø 3 mm. When there are higher loads, you should use this model as the rope is longer in contact with the rope pulley due to its larger diameter.

The standard center rope pulley of the model features a freewheel. The way of guiding the rope around the pulleys determines the direction of damping. It is of course possible to take off the rope pulley, turn it around and fix it again on the axle (see page 03.056.00).

### Dimensions



The lamellar radial damper LD 100L S-90 with rope pulley Ø 90 and two guiding pulleys is always supplied with mounting bracket. The bracket has 6 holes to allow adapting the mounting position to the local situation.

### Components Included

Radial damper LD 100L S-90 with rope pulley Ø 90 in aluminium with Vulkollan insert, with freewheel, 2 small guiding pulleys Ø 40 in plastics, casing in plastics, zinc-plated mounting bracket with 6 fixing holes

### Optional Accessories

Steel rope Ø 3 mm, rope tensioner (for order information see below)

### Order Information

LD 100L S-90, 2 guiding pulleys Ø 40, mounting bracket, zinc-plated part no. 244144

25 m of steel rope Ø 3 mm part no. 700155

Rope tensioner (complete kit) part no. 2200055

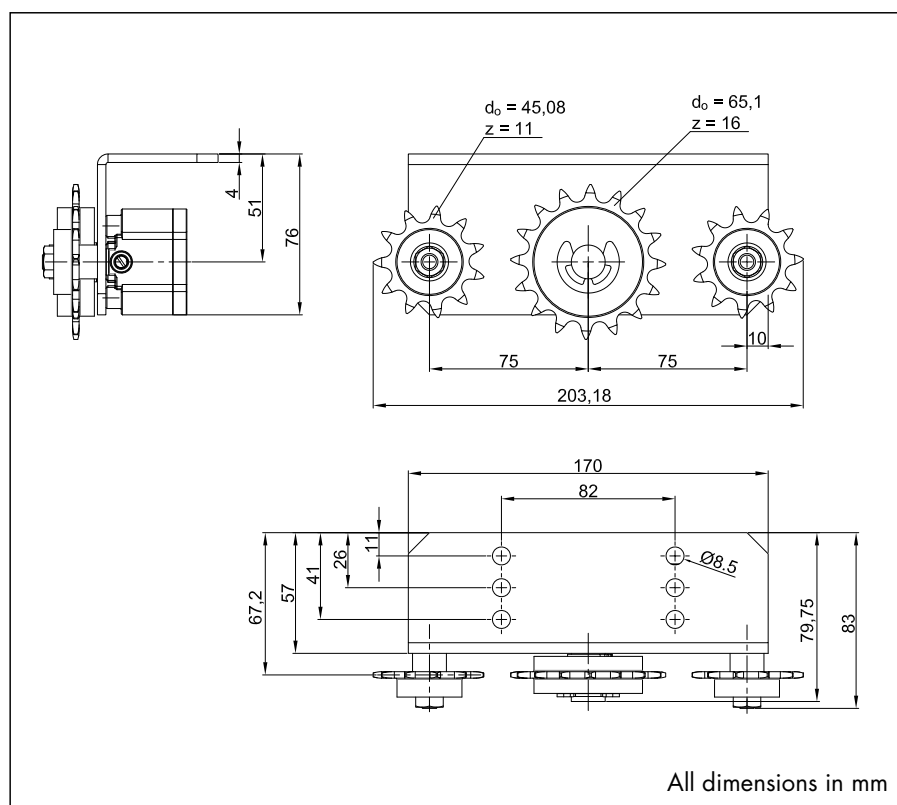


### Radial Damper LD 100L K-Z16 with Chain Wheel Z16, two small chain wheels and wide mounting bracket

The radial damper LD 100L K-Z16 with chain wheel Z16 and two additional guiding wheels Z11 damps by means of a **tensioned chain**. This model should always be used in case of high loads as it assures an absolutely positive connection between radial damper and the device (e.g. door) to be controlled.

By default the chain wheel Z16 features a freewheel and therefore hydraulically damps only in one direction. The way of guiding the chain around the wheels determines the direction of damping. It is of course possible to take off the chain wheel, turn it around and fix it again on the axle (see page 03.056.00).

### Dimensions



The lamellar radial damper LD 100L K-Z16 with chain wheel Z16 and two guiding chain wheels is always supplied with mounting bracket. The bracket has 6 holes to allow adapting the mounting position to the local situation.

### Components Included

Radial damper LD 100L K-Z16 with chain wheel Z16, with freewheel, 2 small chain wheels Z11, casing in plastics, zinc-plated mounting bracket

### Optional Accessories

Chain 1/2 x 1/8", chain tensioner (for order information see below))

### Order Information

LD 100L K-Z16, 2 chain wheels Z11, mounting bracket, zinc-plated	part no. 244145
Chain 1/2 x 1/8", piece of 5 m length	part no. 220006
Chain lock	part no. 220007
Chain tensioner (complete kit)	part no. 220005



## Accessories for Radial Dampers LD 50 S

### Mounting accessories for revolving rope (up to rope pulley Ø 65 mm)

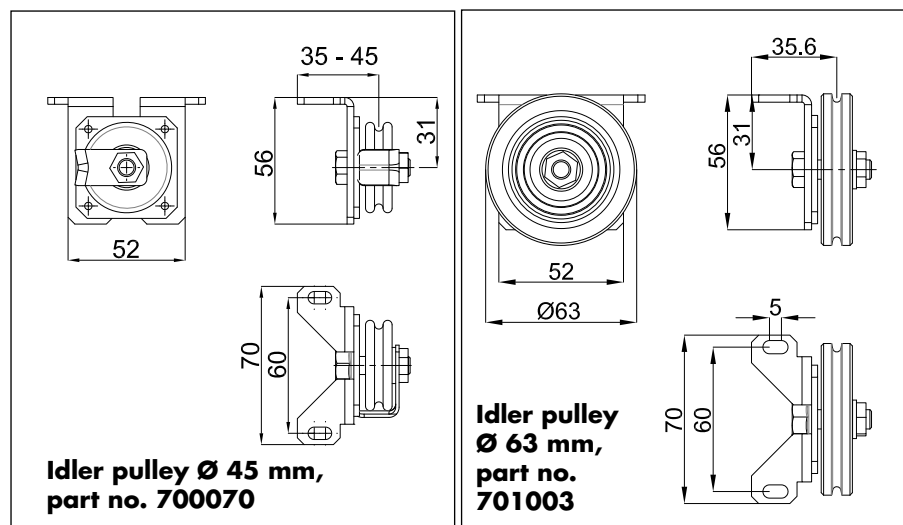
For the radial damper LD S with revolving rope the appropriate accessories for transmitting the damping force are available.

Due to the different forces effective in the applications they are used for, the radial dampers LD 50 and LD 100 require different accessories. For the LD 50 radial dampers is used a steel rope of Ø 2 mm, for the LD 100 ones one of Ø 3 mm.

More accessories can be found on the pages of the respective models.

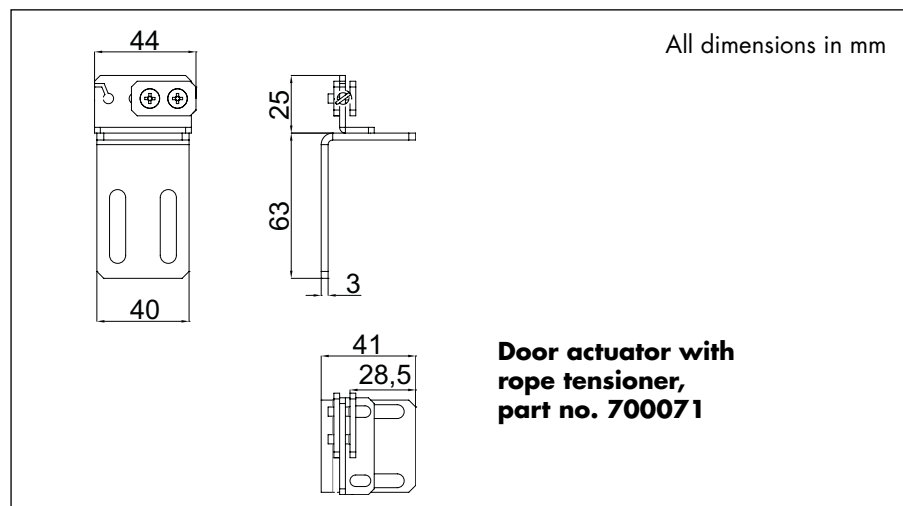
## Dimensions

### Idler Pulleys Ø 45/63 mm



## Dimensions

### Door Actuator with Rope Tensioner for Rope Ø 2 mm



## Order Information

Door actuator for revolving rope Ø 2 mm, zinc-plated	part no. 700071
Door actuator for revolving rope Ø 2 mm, AISI 304	part no. 700073
Idler pulley Ø 45, mounting bracket kit for LD 50 S-45, zinc-plated	part no. 700070
Idler pulley Ø 45, mounting bracket kit for LD 50 S-45, AISI 304	part no. 700077
Idler pulley Ø 63, mount. bracket kit for LD 50/100 S-65, zinc-plated	part no. 701003
Idler pulley Ø 63, mount. bracket kit for LD 50/100 S-65, AISI 304	part no. 701004
8 m of steel rope Ø 2 mm with compensation spring for LD 50 S	part no. 700075
8 m of stainless steel rope Ø 2 mm with compens. spring for LD 50 S	part no. 700076



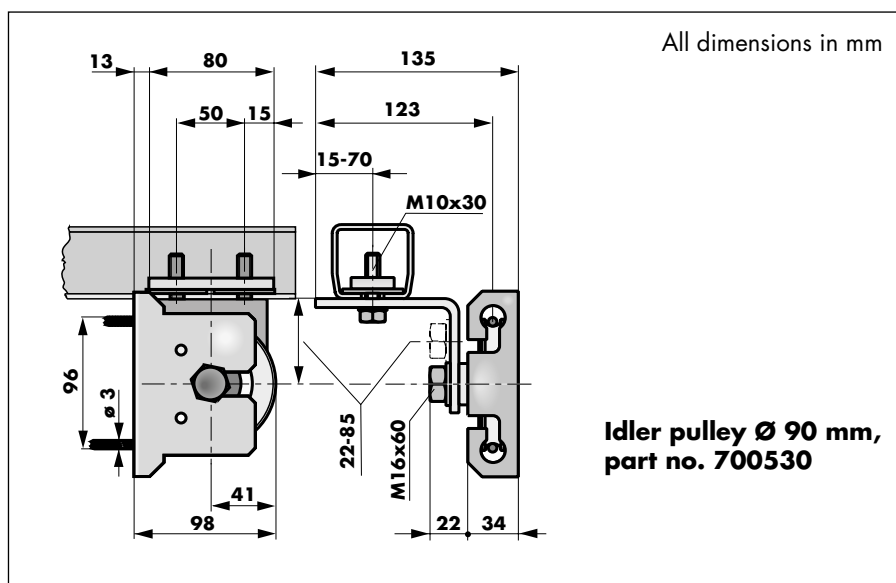
## Accessories for Radial Dampers LD 100 S

### Mounting accessories for revolving rope (rope pulley Ø 90 mm)

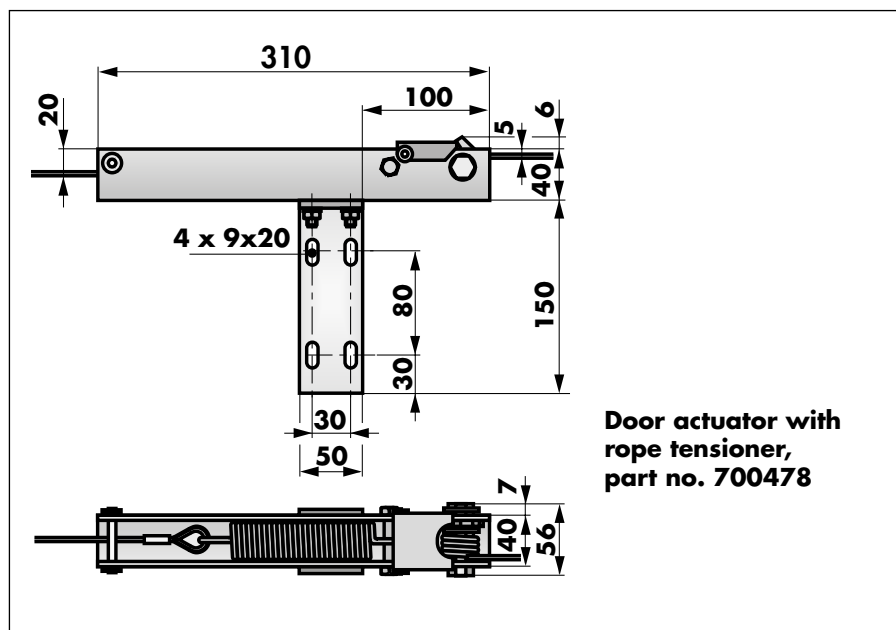
For the LD 100 S radial dampers, models LD 100 S-65 and LD 100 S-90, you always should use the Ø 3 mm steel rope. The rope is tensioned by means of the rope tensioner, part no. 700478.

The dimensions of the idler pulley for the model LD 100 S-65 can be found on the preceding page.

### Dimensions Idler Pulley Ø 90 mm



### Dimensions Door Actuator with Rope Tensioner for Rope Ø 3 mm



## Order Information

Door actuator for revolving rope for LD 100 S-65 and S-90	part no. 700478
Idler pulley Ø 90 for revolving rope for LD 100 S-90	part no. 700530
25 m of steel rope Ø 3 mm for LD 100 S	part no. 700155



## Accessories for LD 50 Z/K and LD 100 Z/K

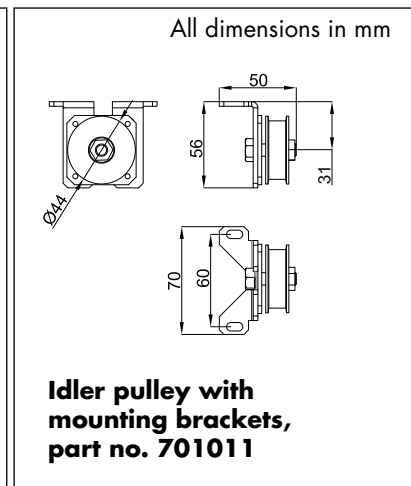
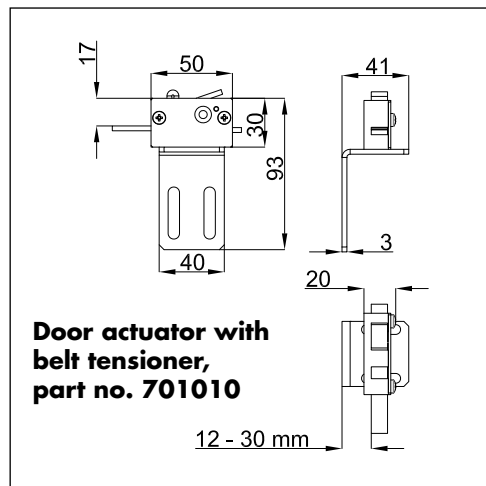
### Mounting accessories for revolving toothed belt, chain

For the radial dampers LD transmitting the damping force by toothed belt or chain, the appropriate accessories are available.

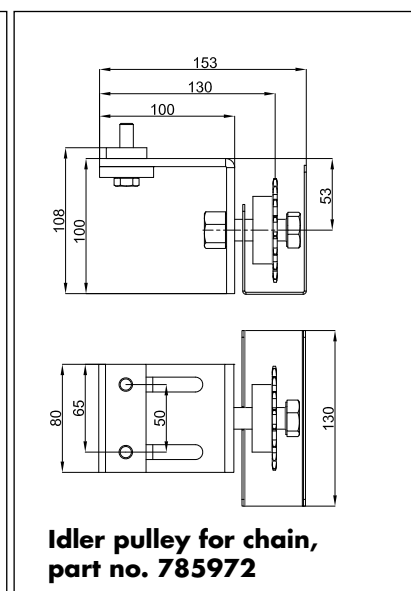
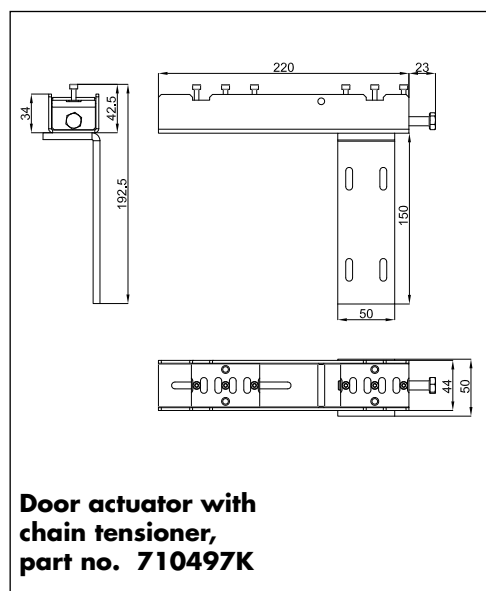
The idler pulley is intended for the radial damper LD with toothed belt disk Z26.

The chain 1/2 x 1/8" is packaged in pieces of 5 m. To connect the chain pieces, chain locks can be ordered.

## Dimensions Accessories for Revolving Toothed Belt

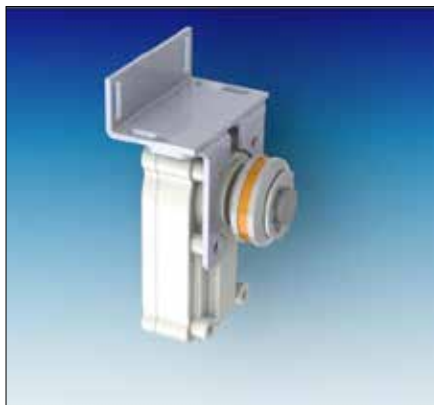


## Dimensions Accessories for Revolving Chain



## Order Information

Door actuator for revolving toothed belt	part no. 701010
Idler pulley with mounting brackets for toothed belt	part no. 701011
Toothed belt HDT 5, 10 mm wide, per meter	part no. 710502
Idler pulley for chain	part no. 785972
Door actuator for revolving chain	part no. 710497K
Chain 1/2 x 1/8", piece of 5 m length	part no. 220006
Chain lock	part no. 220007

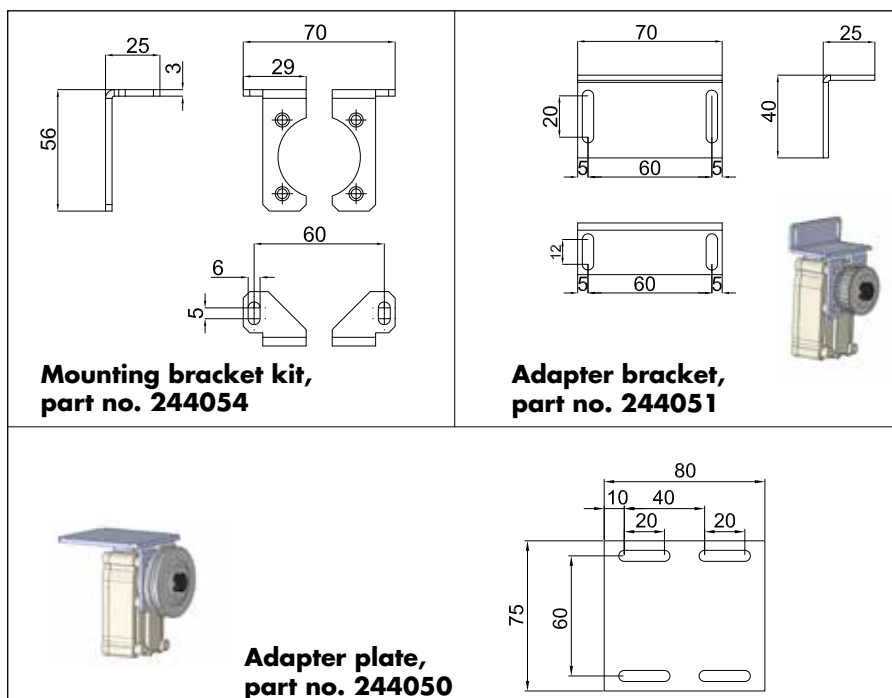


### Mounting Brackets for radial dampers LD 50 and LD 100

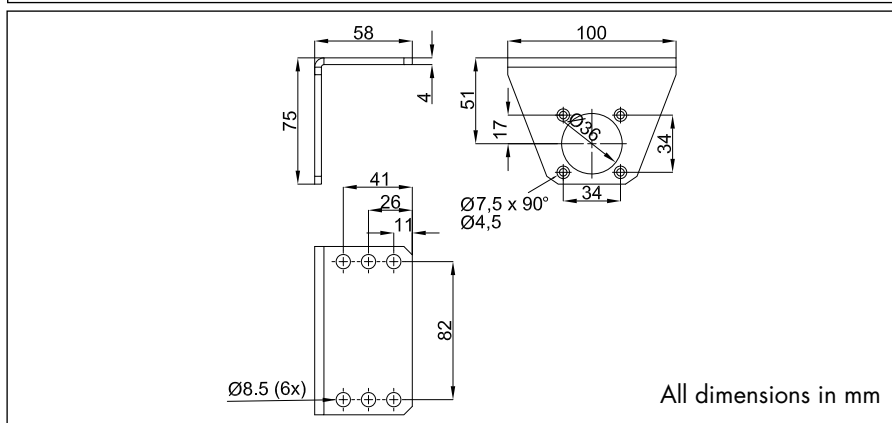
The mounting bracket kit for fitting the LD radial dampers can be complemented with an additionally available adapter bracket and an adapter plate.

Also the mounting bracket with 6 fixing holes can be ordered separately. Other accessories can be found on the pages of the respective models.

### Dimensions Mounting Bracket Kit for LD 50 and LD 100 and Adapter Bracket and Adapter Plate



### Dimensions Mounting Bracket with 6 Fixing Holes



### Order Information

Mounting bracket kit for LD 50/LD 100, zinc-plated	part no. 244054
Mounting bracket kit for LD 50/LD 100, AISI 304	part no. 244055
Adapter bracket 70 x 25 x 40, zinc-plated	part no. 244051
Adapter bracket 70 x 25 x 40, AISI 304	part no. 244053
Adapter plate 75 x 80, zinc-plated	part no. 244050
Adapter plate 75 x 80, AISI 304	part no. 244052
Mounting bracket with 6 fixing holes	part no. 244057



## Mounting and Operating Instructions

### For radial dampers LD 50 and LD 100

The DICTATOR LD radial dampers control the speed of movements over unlimited distances.

The damping force and therewith the speed can continuously be adjusted and exactly adapted to the requirements.

The mounting depends on the model. Below you will find the most important instructions for the different types.

## Damping Adjustment

The lateral adjusting screw allows to continuously adjust the damping force to the requirements.

The more you tighten the adjusting screw (turn it clockwise) the higher becomes the damping force. Turning it anticlockwise will reduce the damping force.

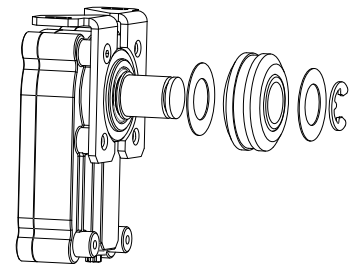
### Adjusting screw



When mounting the radial damper, make sure the adjusting screw is always easy to reach.

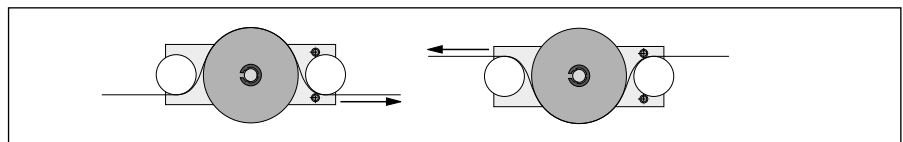
## Mounting of the Driving Wheel

All models with only one damping wheel (rope pulley, chain wheel, toothed belt disk) are delivered with the wheel not being mounted. By default the rope pulley, the chain wheel as well as the toothed belt disk have a freewheel, i.e. they damp only in one direction. (On demand the driving wheel can also be furnished without freewheel for damping in both directions.) Depending on the mounting, the desired damping direction and the guiding of the rope/chain/toothed belt you put the driving wheel on the axle and secure it.



## Determining the Damping Direction of the Models with 2 Guiding Pulleys

The damping direction of the models with two guiding pulleys is determined by the way the rope or chain is guided around the pulleys/wheels, see the following illustration.



But you also can change the damping direction by taking off the driving pulley, turning it around and fixing it again on the axle.

## Type of Driving Wheel

Beside the standard models shown on the previous pages, on demand also other driving wheels are possible, e.g. friction wheels, toothed wheels Z16 module 4 or Z30 module 1.5. Just ask us.







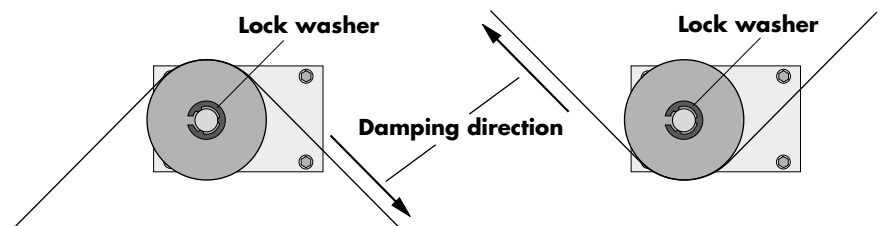
## Installation and Operating Instructions

### Radial Damper RD 240/241 with Gear Wheel

**For continuous damping with a revolving chain**

DICTATOR radial dampers provide continuous damping over unlimited distances. Although designed for sliding doors, they are also used on a variety of other applications e.g. roller conveyors, chain hoists etc.

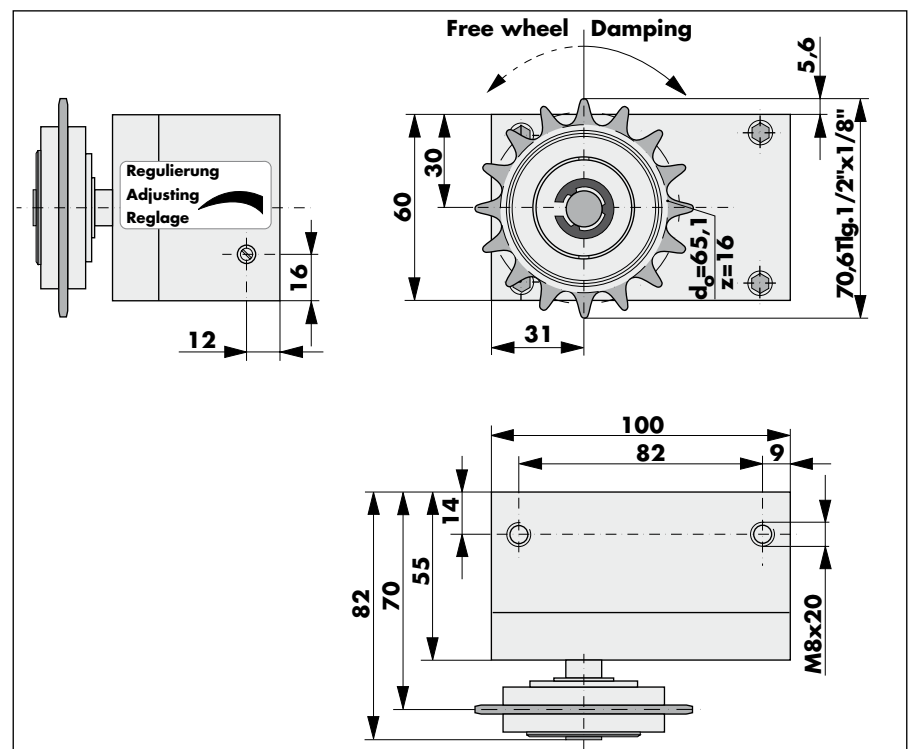
RD 240000 and RD 240017 radial dampers damp by means of a revolving chain which runs around the chain wheel (at least one quarter of the wheel should be in constant contact with the chain).



The diagram below shows the direction in which the chain wheel usually rotates. The direction of damping depends on the direction the chain is run around the wheel (see diagram above). If necessary, you can change the damping direction by removing the lock washer, taking off the wheel and replacing it on the axle the other way round. Make sure you replace the lock washer again.

The closing speed can continuously be varied by the adjustment screw.

## Dimensions



## Order Information

RD 240000 radial damper, normal damping	part no. 240000
RD 240017 radial damper, slight damping	part no. 240017
Idler pulley for chain	part no. 785972
Chain tensioner	part no. 710497
Chain per running meter	part no. 220006
Chain joint	part no. 220007





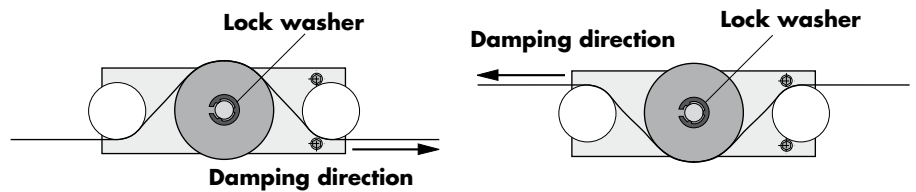
### Installation and Operating Instructions

#### RD 240001 Radial Damper

##### For continuous damping with tensioned chain

DICTATOR radial dampers provide continuous damping over unlimited distances. They are used on sliding doors, fire protection doors, roller conveyors, rope or chain hoists etc.

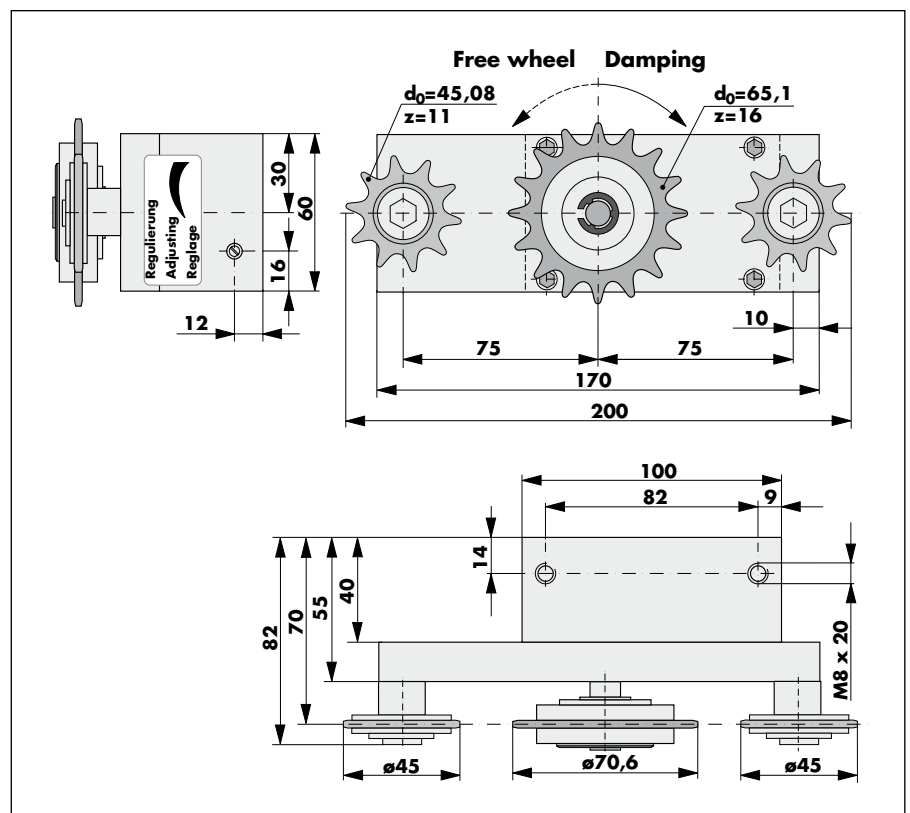
The RD 240001 damps by means of a tensioned chain which runs around three toothed wheels.



The diagram below shows the direction in which the toothed wheel usually rotates. The direction of damping depends on the direction the chain is run around the wheel (see diagram above). If necessary, you can change the damping direction by removing the lock washer, taking off the centre wheel and then placing it back on the axle the other way round. Make sure you put the lock washer back on again.

The closing speed can continuously be varied by the adjustment screw.

### Dimensions



### Order Information

Radial damper for tensioned chain	part no. 240001
Chain (per running meter)	part no. 220006
Chain tensioner (complete set)	part no. 220005
Chain lock	part no. 220007



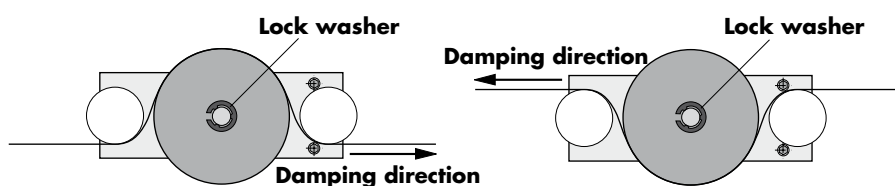
## Installation and Operating Instructions

### RD 240003 and RD 240012 Radial Dampers

#### For continuous damping with tensioned rope

DICTATOR radial dampers provide continuous damping over unlimited distances. They are used on sliding doors, fire protection doors, roller conveyors, rope or chain hoists etc.

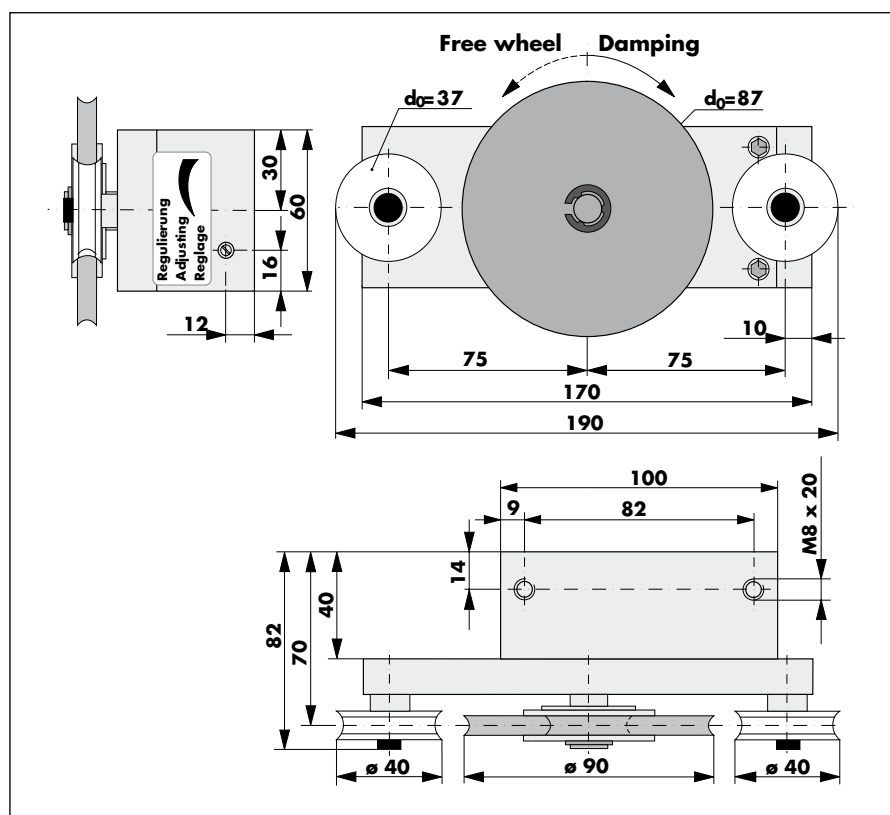
RD 240003 and RD 240012 radial dampers damp by means of a tensioned rope running around three pulleys.



The diagram below shows the direction in which the damping pulley usually rotates. The direction of damping depends on the direction the rope is run around the wheel (see diagram above). If necessary, you can change the damping direction by removing the lock washer, taking off the centre pulley and then placing it back on the axle the other way round. Make sure you put the lock washer on again.

The closing speed can continuously be varied by the adjustment screw.

## Dimensions



## Order Information

Radial damper for tensioned rope, normal damping	part no. 240003
Radial damper for tensioned rope, slight damping	part no. 240012
Steel rope (length 25 m)	part no. 700155
Rope tensioner (complete set)	part no. 220005



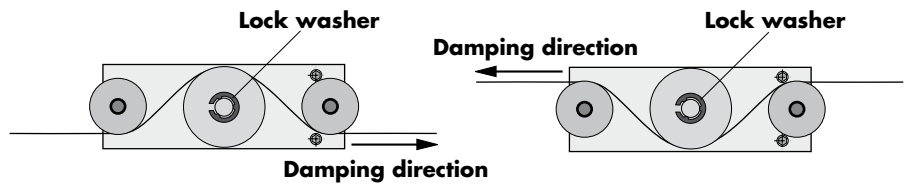
# Installation and Operating Instructions

## RD 240004 Radial Damper

### For continuous damping with tensioned rope

DICTATOR radial dampers provide continuous damping over unlimited distances. They are used on sliding doors, fire protection doors, roller conveyors, rope or chain hoists etc.

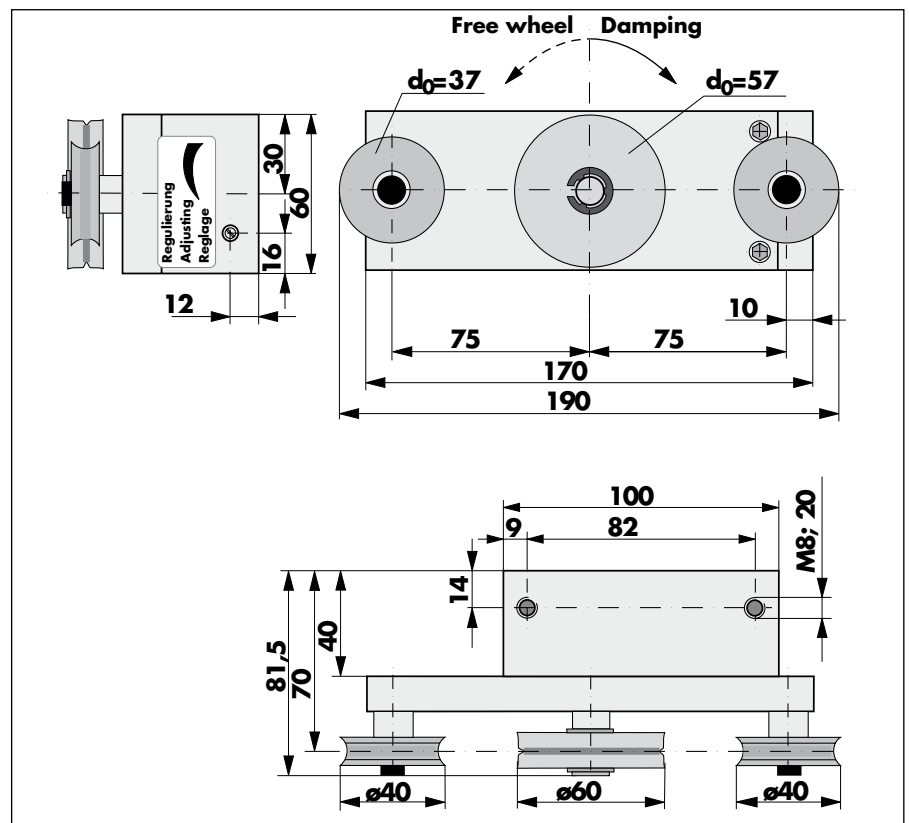
The radial damper RD 240004 damps by means of a tensioned rope running around three pulleys.



The diagram below shows the direction in which the pulley usually rotates. The direction of damping depends on the direction the rope is run around the wheel (see diagram above). If necessary, you can change the damping direction by removing the lock washer, taking off the centre pulley and then placing it back on the axle the other way round. Make sure you put the lock washer on again.

The closing speed can continuously be varied by the adjustment screw.

## Dimensions



## Order Information

Radial damper for tensioned rope (pulley ø 60 mm)	part no. 240004
Steel rope (length 25 m)	part no. 700155
Rope tensioner (complete set)	part no. 220005



### For continuous damping with a rubber wheel

The RD 240022 radial damper stays in damping contact with the moving object by a rubber wheel.

Fix the RD 240022 radial damper in a position where the rubber wheel presses against a straight and even area of the object it has to slow down.

You can change the damping direction by removing the lock washer from the axle and taking off the rubber wheel. Now it is put back on the axle the other way round and secured again. Take care not to damage the inner shaft seals which protect the free wheel.

The closing speed can continuously be varied by the adjustment screw.

Technical drawing of a roller with a diameter of  $\varnothing 100$  mm. The drawing includes three views: a side view, a front view, and a top view. The side view shows a roller with a diameter of  $\varnothing 100$  mm and a height of 25 mm. The front view shows a rectangular base with a width of 100 mm and a height of 83 mm. The base has a central hole with a diameter of 16 mm and two side holes with a diameter of 12 mm. The distance between the side holes is 60 mm. The top view shows a circular roller with a diameter of 100 mm and a central hole with a diameter of 16 mm. The roller is mounted on a base with a width of 100 mm and a height of 83 mm. The base has a central hole with a diameter of 16 mm and two side holes with a diameter of 12 mm. The distance between the side holes is 60 mm. The roller is labeled "Free wheel" and "Damping" with a double-headed arrow indicating the direction of movement.

## Radial damper with rubber wheel

part no. 240022



## RD 241013 and RD 241029 Radial Dampers

For continuous damping of inclined gates with running rack

The DICTATOR radial dampers with gearwheel, model 4 (16 teeth) and model 6 (12 teeth) have especially been designed for sliding gates being usually opened and closed by a door drive unit with the help of a rack. For safety reasons a RD 241013 or 241029 radial damper should be fitted on all ascending gates to control the closing speed over the complete distance in the event of power failure.

As these radial dampers are mainly used at the outside they are rust resistant.

## Installation and Operating Instructions

The radial damper is fixed to the door post or near the drive unit. The geared wheel must be in mesh with the rack transmitting the power from the drive unit.

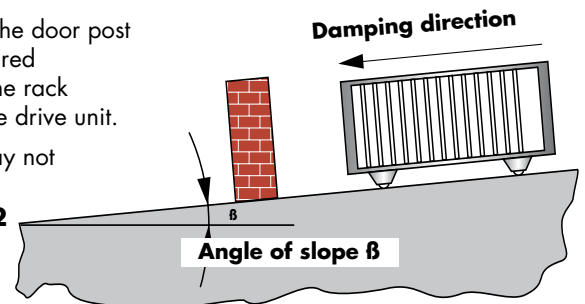
The load on the damper  $M$  may not exceed 7 Nm:

$$M \text{ [Nm]} = G \times \sin \beta \times 0.032$$

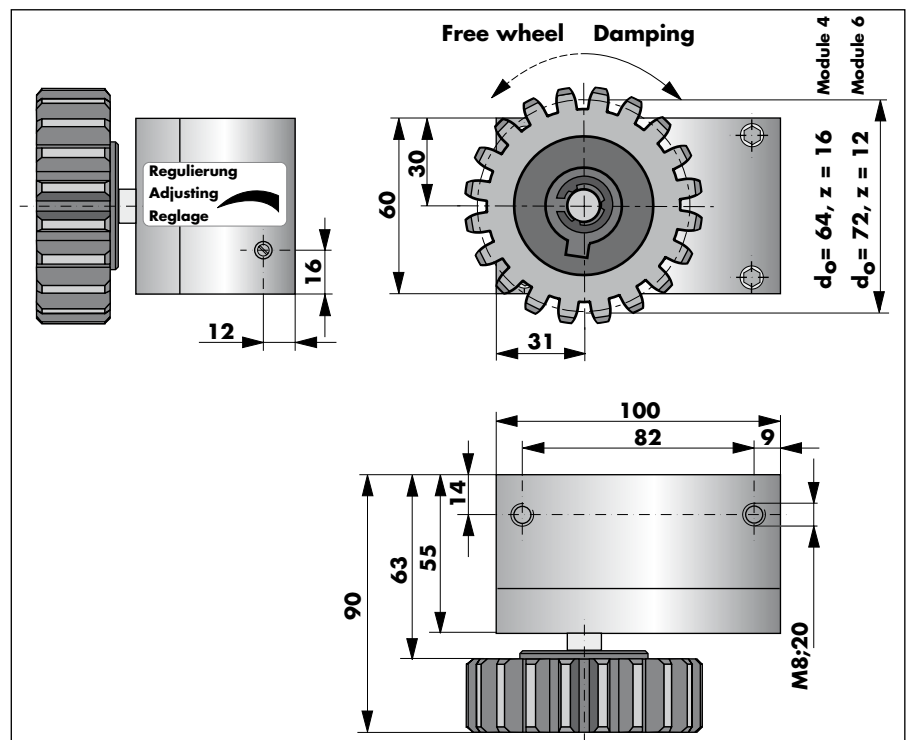
{  $G$  = weight of the gate in N  
 $\beta$  = ascent in degrees }

The diagram below shows the direction in which the toothed wheel usually rotates. You can change the damping direction by removing the lock washer from the axle and taking off the toothed wheel. Now it is put back on the axle the other way round and secured again. Take care not to damage the inner shaft seals which protect the free wheel.

The closing speed can continuously be varied by the adjustment screw.



## Dimensions



## Order Information

Radial damper with toothed wheel module 4 (Ø 64, 16 teeth)	part no. 241013
Radial damper with toothed wheel module 6 (Ø 72, 12 teeth)	part no. 241029



## Double Radial Dampers RD 241024 and RD 241030

### To slow down high forces

The DICTATOR double radial dampers offer higher damping forces than the normal radial dampers (the damping moment is 12.2 Nm). The total dimensions change but slightly: only the height increases by 19 mm.

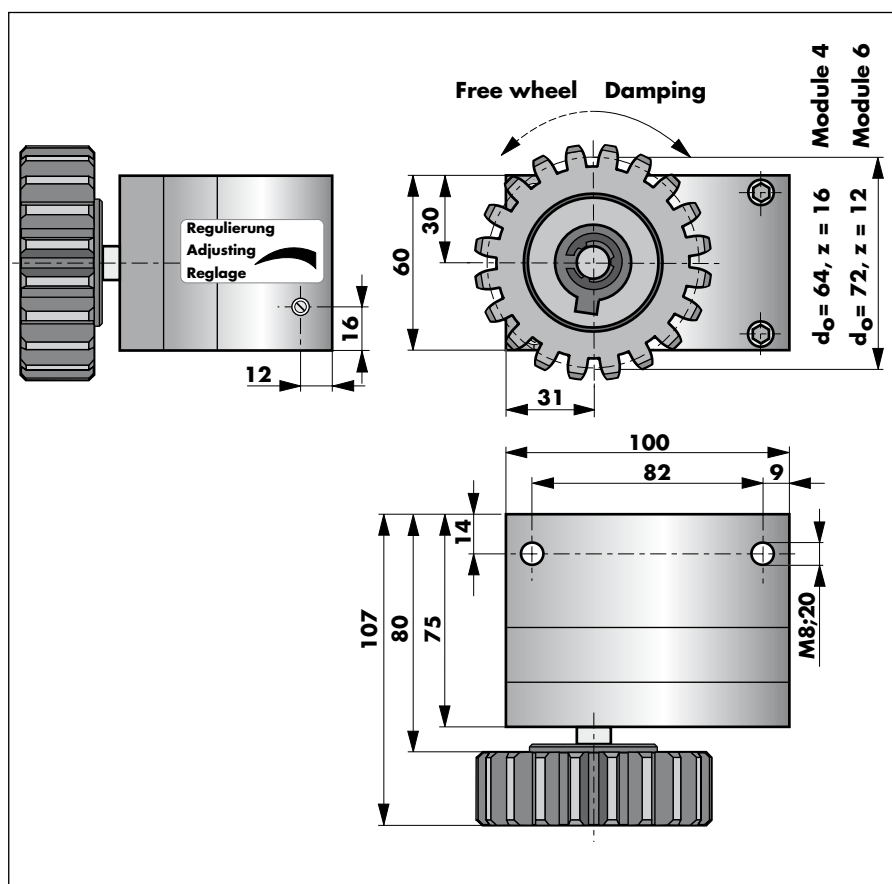
On demand the double radial damper is also available with a pulley for steel rope or with a normal toothed wheel.

## Installation and Operating Instructions

The diagram below shows the direction in which the gearwheel usually rotates. You can change the damping direction by removing the lock washer, taking off the wheel and then placing it back on the axle the other way round. Make sure you put the lock washer back on again.

The closing speed can continuously be varied by the adjustment screw.

## Dimensions



## Order Information

Double radial damper with gearwheel module 4 ( $\varnothing 64$ , 16 teeth) part no. 241024

Double radial damper with gearwheel module 6 ( $\varnothing 72$ , 12 teeth) part no. 241030

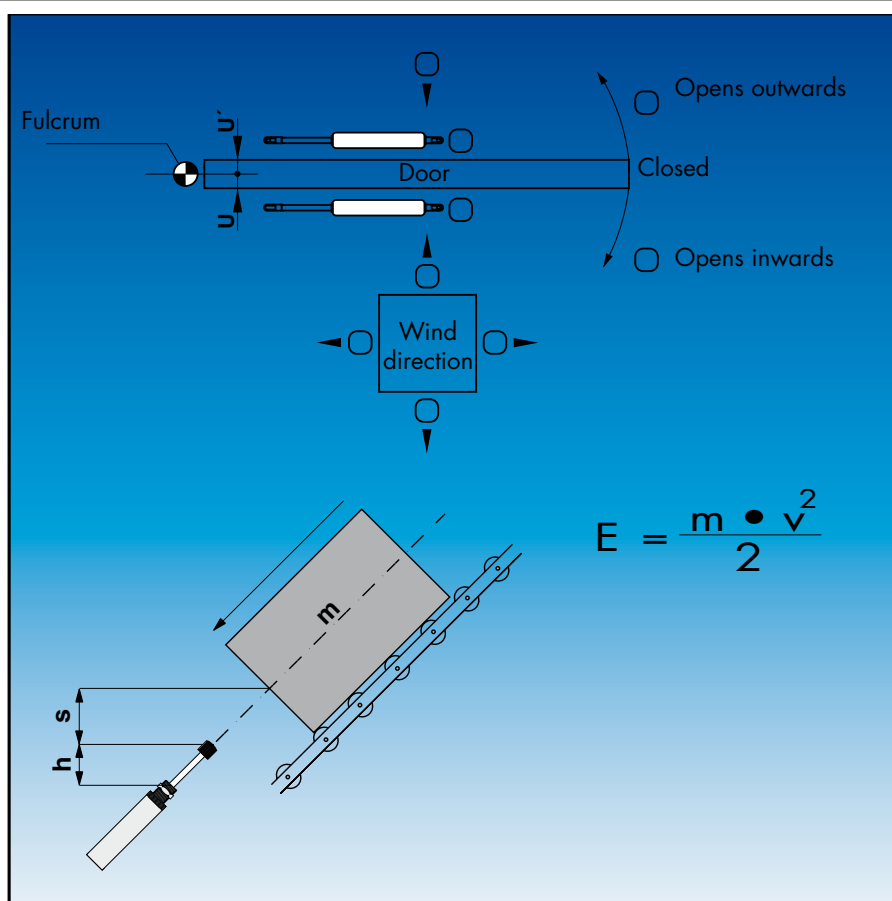


## Advice for Calculation and Selection of the Appropriate Damper

DICTATOR assists you in selecting the appropriate damper for your application. You merely have to complete one of the following questionnaires. DICTATOR then will calculate and offer you the damper from our large range going best with your requirements.

On the next two pages you will find questionnaires for final dampers. They are followed by those for oil dampers with fixings on both ends. To facilitate your work there are several ones for different fields of application. You only have to fill in the one representing your use.

In case of questions or problems do not hesitate to contact our Technical Service.



### Outline of Questionnaires

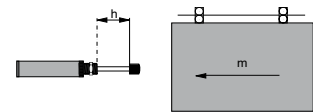
Final dampers		page 03.066.00
Oil dampers with fixings on both ends	on vertical flaps	page 03.068.00
Oil dampers with fixings on both ends	on horizontal flaps	page 03.069.00
Oil dampers with fixings on both ends	on hinged doors	page 03.070.00
Formula and calculation examples for final dampers		page 03.071.00.

## Questionnaire for Final Dampers

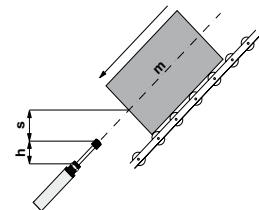
The questionnaire for final dampers consists of two pages. On the first page please mark which kind of impact you need to cushion. On the second page please fill in - as complete as possible - all information regarding mass and speed. Please send us these two pages. We gladly calculate the necessary damper.

In case you want to calculate the damper yourself, you will find the corresponding formula beginning with page 03.071.00.

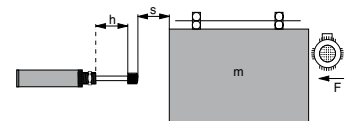
☐ **Horizontal impact**



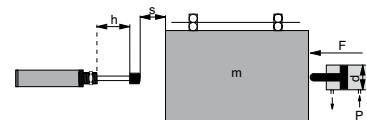
☐ **Inclined impact**



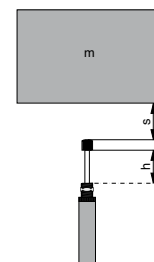
☐ **Electric operator**



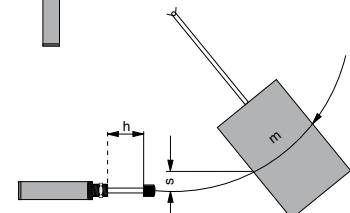
☐ **Pneumatic operator**



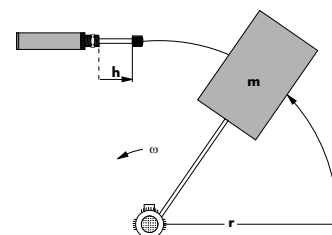
☐ **Vertical impact**



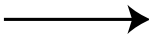

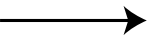

☐ **Falling pendulum**



☐ **Rotary operator**



## Questionnaire for Final Dampers - cont.

<b>Impact mass</b>	..... <b>kg</b>
<hr/>	
<b>Impact speed</b>	<p><b>Direction of movement</b></p> <p><input type="checkbox"/> linear:  ..... <b>m / s</b></p> <hr/> <p><input type="checkbox"/> rotating:  ..... <b>degree/s</b></p> <p>Angular velocity: ..... <b>rad / s</b></p> <hr/>
<b>Driving power</b>	<p><input type="checkbox"/> linear:  ..... <b>N</b></p> <hr/> <p><input type="checkbox"/> rotating:  ..... <b>Nm</b></p> <hr/>
Driving power unknown	<p><b>Kind of operator</b></p> <p><input type="checkbox"/> Pneumatic: Diameter of piston: ..... <b>mm</b> Pressure: ..... <b>bar</b></p> <p><input type="checkbox"/> Hydraulic system: Diameter of piston: ..... <b>mm</b> Pressure: ..... <b>bar</b></p> <p><input type="checkbox"/> Electric motor: Capacity: ..... <b>KW</b> Gearing: .....</p> <hr/>
<b>Movement direction of the mass</b>	<p><input type="checkbox"/> <b>horizontally:</b></p> <p><input type="checkbox"/> <b>vertically:</b> up: <input type="checkbox"/> down: <input type="checkbox"/> Drop height: ..... <b>mm</b></p> <p><input type="checkbox"/> <b>incline:</b> Angle: ..... Distance of acceleration: ..... <b>mm</b></p> <p><input type="checkbox"/> <b>rotating:</b> Distance between fulcrum and barycentre: .....<b>mm</b> Distance between fulcrum and damper:... <b>mm</b></p> <hr/>
<b>Number of operations</b>	<p><input type="checkbox"/> <b>continuously:</b> per minute: ..... per hour: .....</p> <hr/>

You don't have to fill in all questions, just what you know. Of course it would be most helpful to know the kind, mass and speed of the impact.  
The developing of a damper includes a test under realistic conditions. Our experienced technicians gladly will advise you. Please contact us: +49-821-2467355

### Questionnaire for Oil Dampers with Fixings on Both Ends - Vertical

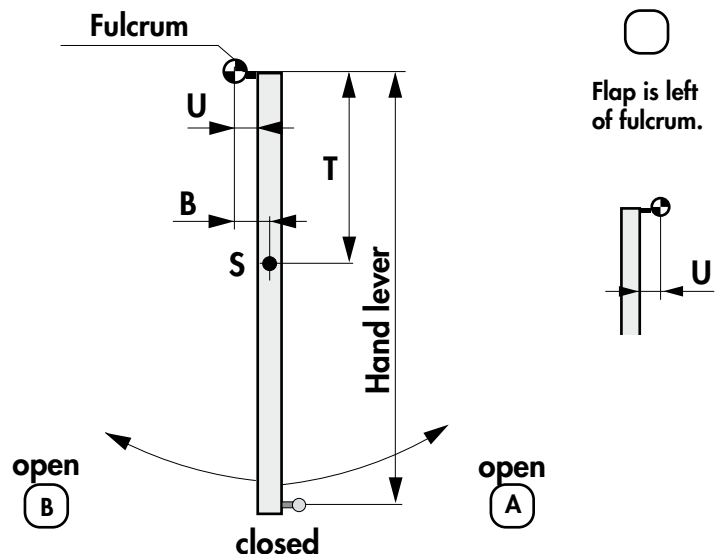
<b>Address</b> Name : Street : Town, postcode : Tel. : Fax : Person in charge : Date :	<b>Data of the flap</b> Weight [ Kg ] : Barycentre [ mm ] T : Barycentre [ mm ] B : Hand lever [ mm ] A : Opening angle [ degree] q : Distance lower edge U : Number of dampers : On which side shall the damper be positioned? Please draw in.
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Please tick your application and indicate your dimensions.  
The flap is shown in the closed position.

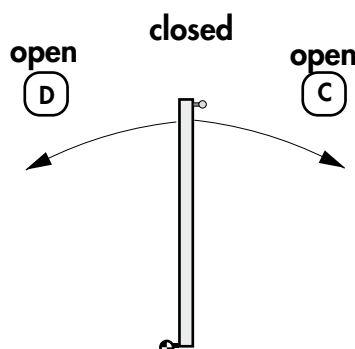
Fulcrum at the top

- ☐ A Flap is vertical, opening to the exterior
- ☐ B Flap is vertical, opening to the interior



Fulcrum below

- ☐ C Flap is vertical, opening to the exterior
- ☐ D Flap is vertical, opening to the interior



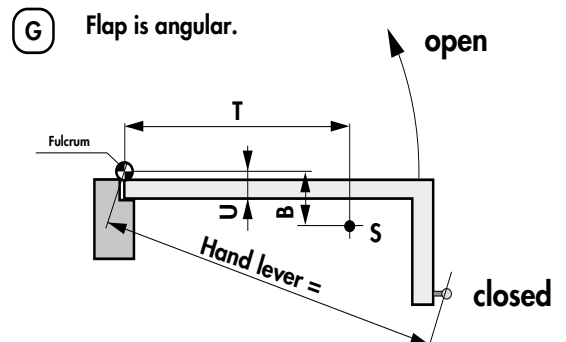
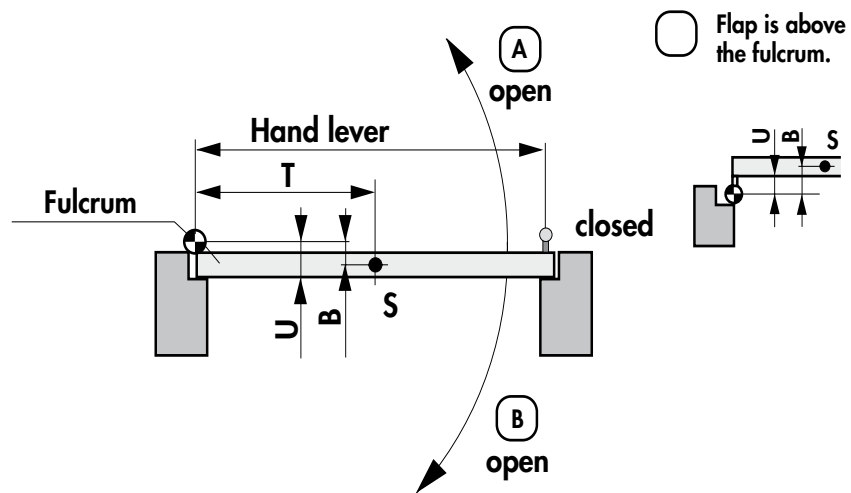
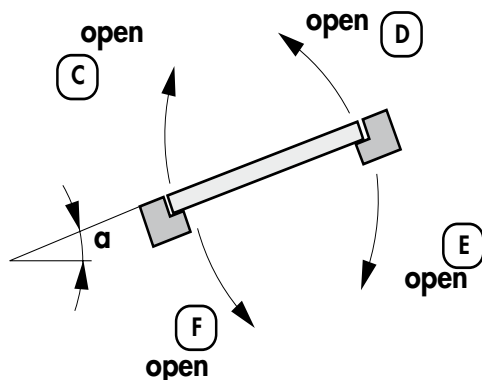
## Questionnaire for Oil Dampers with Fixings on Both Ends - Horizontal

<b>Address</b> Name : Street : Town, postcode : Tel : Fax : Person in charge : Date :	<b>Data of the flap</b> Weight [ Kg ] : Barycentre [ mm ] T : Barycentre [ mm ] B : Hand lever [ mm ] A : Roof slope [ degree ] : Opening angle [ degree ] q : Distance lower edge U : Number of dampers : On which side shall the damper be positioned? Please draw in.
--	---



Please tick your application and indicate your dimensions.  
The flap is shown in the closed position.

- ☐ A Flap is horizontal, opening angle to the top.
- ☐ B Flap is horizontal, opening angle to the bottom.
- ☐ C Flap is inclined, hinges are on top.
- ☐ D Flap is inclined, hinges are below.
- ☐ E Flap is inclined, hinges are below.
- ☐ F Flap is inclined, hinges are on top.



### Questionnaire for Oil Dampers with Fixings on Both Ends - Hinged Doors

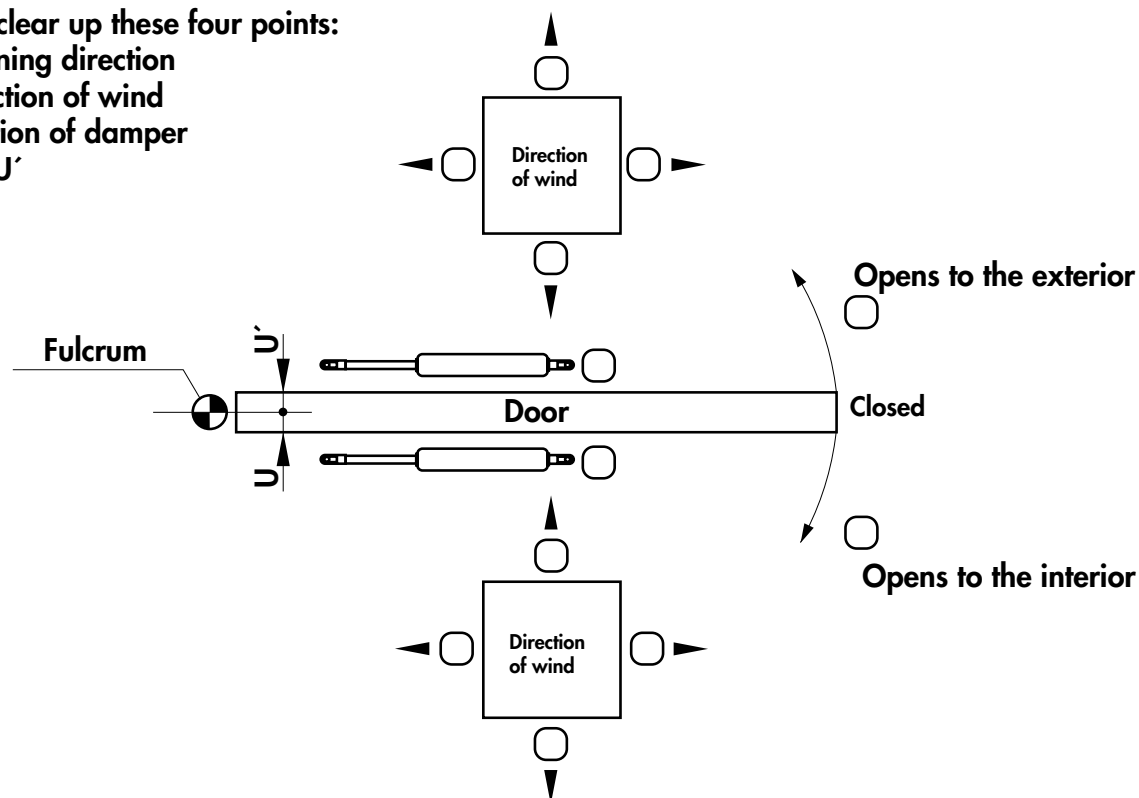
<b>Address</b>  <b>Name</b> : <b>Street</b> : <b>Town, postal code</b> : <b>Tel.</b> : <b>Fax</b> : <b>Person in charge</b> : <b>Date</b> :	<b>Data of the door</b>  <b>Weight</b> [ kg ] : <b>Width</b> [ mm ] : <b>Height</b> [ mm ] : <b>Opening angle [ degree]</b> : <b>Distance lower edge U / U'</b> : <b>Wind load</b> [ N/qm ] :
---	--



Please tick your application.  
Door shown in closed position.

Please clear up these four points:

1. Opening direction
2. Direction of wind
3. Position of damper
4. U / U'



Door is ☐ vertical ☐ inclined to the interior ☐ inclined to the exterior

angle of inclination :  
angle of inclination :

## Calculation and Determining of a Final Damper

### Calculation Examples / Formula

Please follow the instructions given below to calculate yourself the required final damper.

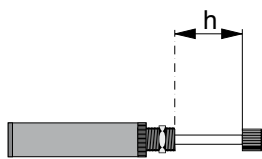
If the situation allows it, you should choose a stroke as long as possible, as this keeps the actual impact (damping force) lower.

To obtain the necessary damping force you first have to calculate the energy the damper has to absorb with every stroke. Therefore you need - depending on the application - the following data:

- impact mass **m** (e.g. weight of door) in kg
- mass moment of inertia **J** [ $\text{kg} \cdot \text{m}^2$ ] =  $m \cdot r^2$
- impact speed **v** in meters per second
- angular velocity  $\omega$  [ $\text{r/s}$ ] =  $\text{Upm} \cdot 0.1047$
- damping distance (stroke) **h**
- correction factor **f<sub>k</sub>** (see Technical Data of the damper)
- distance of acceleration **s** (e.g. height of fall)
- driving force **F** [N]
- turning moment **M** [Nm]

Which of these data you need depends on the purpose the damper is intended for.

#### Load moved horizontally without operator



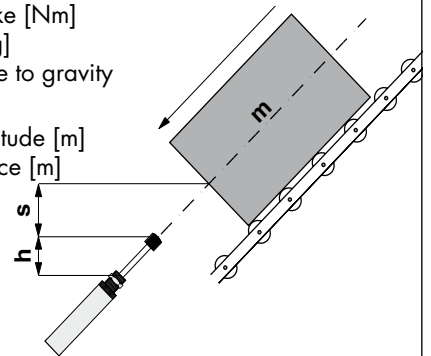
$$E = \frac{m \cdot v^2}{2}$$

E = energy per stroke [Nm]  
m = impact mass [kg]  
v = impact speed [m/s]  
h = damping distance [m]

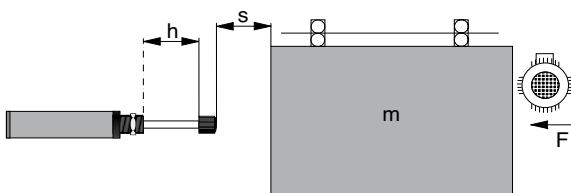
#### Load on an incline

$$E = (m \cdot g \cdot h) + (m \cdot g \cdot s)$$

E = energy per stroke [Nm]  
m = impact mass [kg]  
g = acceleration due to gravity  
[ $\text{m/s}^2$ ] = 9.81  
s = acceleration altitude [m]  
h = damping distance [m]



#### Load moved horizontally (electric operator)

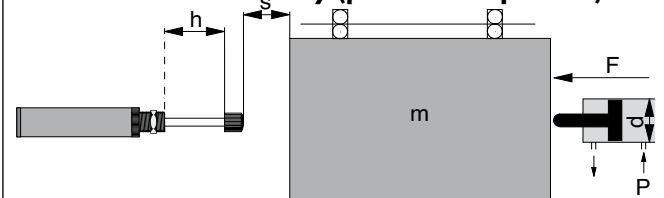


$$E = \frac{m \cdot v^2}{2} + F \cdot h$$

$$v = \sqrt{2 \frac{F \cdot s}{m}}$$

E = energy per stroke [Nm]  
m = impact mass [kg]  
v = impact speed [m/s]  
s = acceleration distance [m]  
F = driving force [N]  
h = damping distance [m]

#### Load moved horizontally (pneumatic operator)



$$E = \frac{m \cdot v^2}{2} + F \cdot h$$

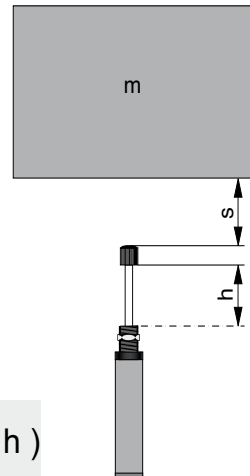
$$v = \sqrt{2 \frac{F \cdot s}{m}}$$

$$F = 0,07854 \cdot d^2 \cdot P$$

E = energy per stroke [Nm]  
m = impact mass [kg]  
v = impact speed [m/s]  
F = driving force [N]  
h = damping distance [m]  
d = piston diameter of the pneumatic cylinder [mm]  
P = pressure [bar]  
s = acceleration distance [m]

### Free fall

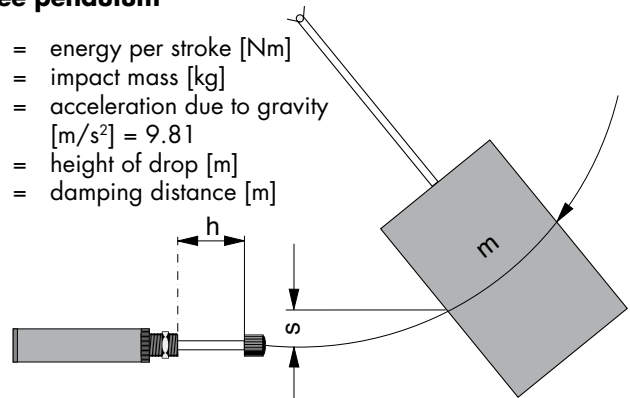
E = energy per stroke [Nm]  
m = impact mass [kg]  
g = acceleration due to gravity  
[m/s<sup>2</sup>] = 9.81  
s = height of drop [m]  
h = damping distance [m]



$$E = (m \cdot g \cdot s) + (m \cdot g \cdot h)$$

### Free pendulum

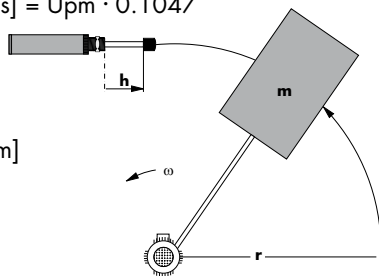
E = energy per stroke [Nm]  
m = impact mass [kg]  
g = acceleration due to gravity  
[m/s<sup>2</sup>] = 9.81  
s = height of drop [m]  
h = damping distance [m]



$$E = m \cdot g \cdot s$$

### Turning load (electric operator)

E = energy per stroke [Nm]  
J = mass moment of inertia [kg · m<sup>2</sup>] = m · r<sup>2</sup>  
ω = angular velocity [r/s] = Upm · 0.1047  
F = driving force [N]  
h = damping stroke [m]  
m = impact mass [kg]  
r = radius [m]  
M = turning moment [Nm]



$$E = \frac{J \cdot \omega^2}{2} + F \cdot h$$

$$= \frac{m \cdot r^2 \cdot (Upm \cdot 0.1047)^2}{2} + \frac{M \cdot h}{r}$$

### Calculation of the damping force

**Damping force**  
[N] =  $\frac{\text{energy per stroke [Nm]} \times \text{correction factor} \times 1000}{\text{stroke [mm]}}$

Correction factor: it is indicated in the technical data of the respective damper type.

Now look in the table of the chosen damper type for the damper corresponding to the calculated damping force. The calculated damping force is valid only for the stroke used in the calculation.

In case you don't find in the chosen table a damper on which you could put the weight (damping force) calculated, there are three possibilities:

1. The chosen type of damper does not suit your application. Choose another type of damper and recalculate the damping force.
2. Your application is a special one needing a special damper. Please fill in the questionnaire on pages 03.066.00 and 03.067.00.

We will calculate an appropriate damper.

3. There are no exact data at hand and you have to estimate the energy per stroke. In this case please also contact the DICTATOR Technical Service.

### Calculation Example

"You are looking for a damper to cushion a pneumatically moved slider, e.g. with an EDH 20."

Impact mass (weight of slider and drive piston) m = 300 [kg]

Acceleration distance (not dampened) s = 0.15 [m]

Ø of piston of pneumatic cylinder

d = 30 [mm]

Pressure P = 3.5 [bar]

Thus calculating:

$$\text{Driving power } F \text{ [N]} = 0.07854 \times 30^2 \times 3.5 = 247.4 \text{ N}$$

$$\text{Impact speed } v \text{ [m/s]} = \sqrt{2 \times \frac{247.4 \times 0.15}{300}} = 0.5 \text{ m/s}$$

First calculation with a stroke of 25 mm, damper type EDH 20.

Resulting in:

$$\text{Energy per stroke [Nm]} = \frac{300 \times 0.5^2}{2} + 247.4 \times 0.025 = 43.7 \text{ Nm}$$

As the correction factor for the type EDH 20 is 2,0:

$$\text{Damping force [N]} = \frac{43.7 \times 2.0 \times 1000}{25} = 3496 \text{ N}$$

This result exceeds the maximum value in the table. But if you chose a longer stroke of e.g. 50 mm, the new calculation results in 2000 N. This value would be okay.