GEISLINGER
CARBOTORQ®

MINIMAL WEIGHT

TORSIONAL VIBRATION CENTER

GEISLINGER®
POWERTRAIN SOLUTIONS. BUILT TO LAST.

GEISLINGER CARBOTORQ®

The Geislinger Carbotorq® coupling is a revolutionary solution for elastomer couplings. Its innovative, maintenance-free design provides torsional elasticity and misalignment capacity in an integral design.

With its low weight and minimized reaction force, the Geislinger Carbotorq® significantly reduces the bearing loads, and thus, increases system service life. Available with torques up to 10 kNm, the requirements of leisure craft boats, crew vessels, work boats und tug boats are well met. The integral design provides constant misalignment values under all circumstances.

DESCRIPTION

The Geislinger Carbotorq® uses silicone elastomer and, unlike other couplings, uniquely combines the misalignment function and the torsional elasticity. This is achieved by connecting the elastomer to a pair of corrugated composite membranes.

In applications where weight is a concern, a combination of a Geislinger Carbotorq®, a Geislinger Shaft, and a Geislinger Gesilco® Coupling is the best solution. This combination provides a very lightweight drive train with extremely high misalignment capabilities. The composite materials also provide high internal damping for high-frequency vibrations and, thus, excellent acoustic insulation.

APPLICATIONS

- Marine propulsion

TECHNICAL DATA

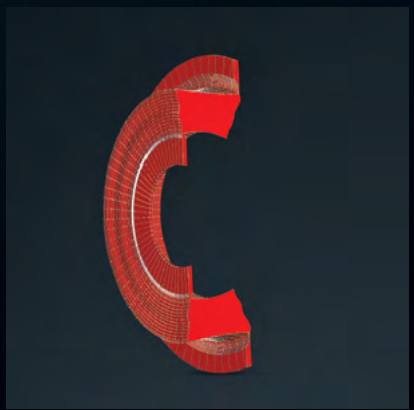
- Torque range: up to 10 kNm
- Ambient temperature: -45°C to 100°C

ADVANTAGES

- Minimal weight
- Maintenance-free
- Low reaction force
- High temperature silicone elastomer
- Radial installation
- Blind assembly design available
- Enhanced acoustic insulation

Coupling combination

Application of high-performance materials



FEM calculation

Preamble

This catalog replaces all old catalog versions.

The content of this catalog is indicative and - based on new developments - Geislinger reserves the right to change the content without prior notice.

Should you have questions, remarks or inquiries please contact us per e-mail (info@geislinger.com) or telephone (+43 662 66999-0).

The latest version of all Geislinger catalogs can be found on our website Geislinger.com.

Index

Description

Carbotorq Application

The Geislinger Carbotorq coupling is a torsionally flexible coupling, which combines advanced composite material and silicone elastomer. It is an extremely light weight coupling that compensates axial, angular and radial misalignments with the following advantages:

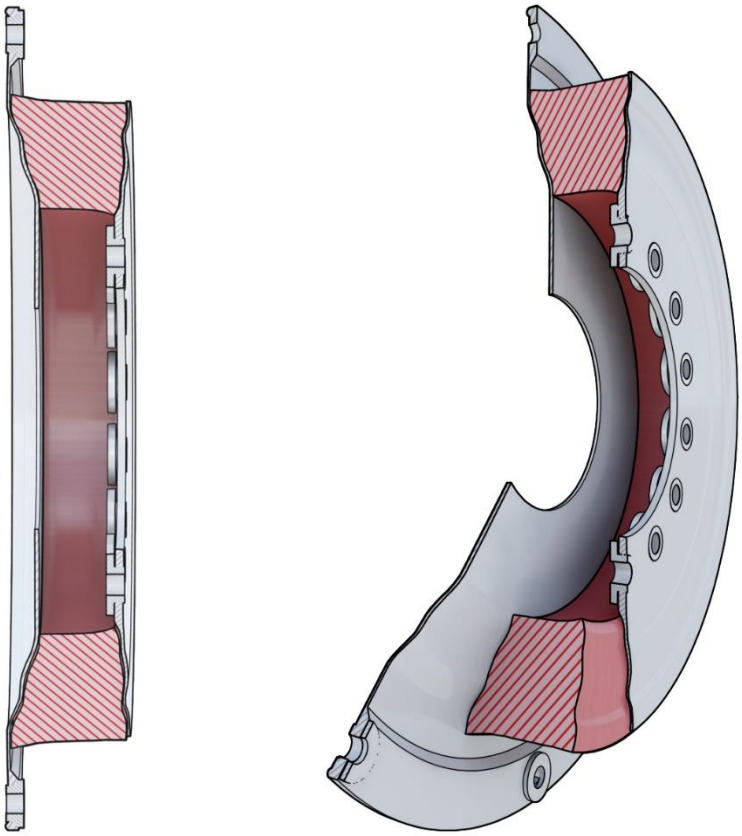
- High torsional elasticity
- Minimum weight and compact design
- Maintenance free
- Noise insulating
- Non-conductive
- Non-magnetic
- Uneffected by heat and oil
- Misalignment capacity in all directions

The coupling tunes the torsional vibration behaviour of the drive line, whereas the torsional stiffness of the heat resistant silicone elastomer element can be adjusted to the torsional vibration demands.

Design

The patented Carbotorq consists of an elastic silicone element and two advanced composite membranes, which are joined by vulcanisation. The membranes are manufactured as a single piece with advanced composite structure.

Fig. 1



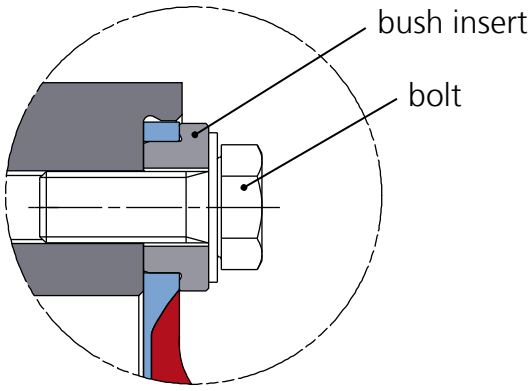
Materials

Membranes of Carbotorq couplings are made of advanced composites. Carbon fibers with formulated epoxy resins are used. These materials, commonly used in aerospace structural applications, are processed by a special manufacturing method. This method provides highly consistent material properties from part to part. The elastomer element is available in heat-resistant silicone with the admissible ambient temperature range from -45°C up to 80°C. With respect to a long lifetime, consideration should be given to sufficiently large ventilation cross sections. This is very important for operation in bell-housings.

Installation

The Carbotorq coupling can be connected to all kinds of shafts, flanges and flywheels. With the plug-in connection it is also possible to install the Carbotorq coupling at hardly accessible places (e.g. not removable housings).

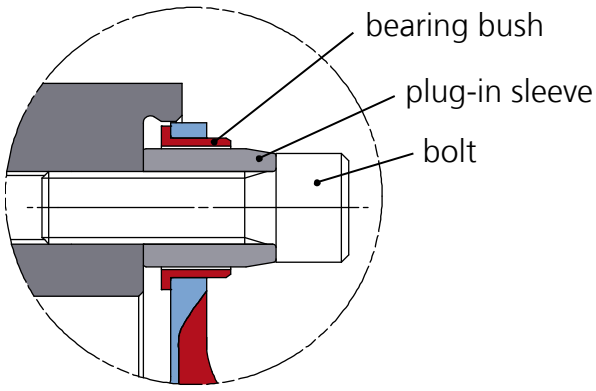
Fig. 2



Standard connection

The Carbotorq coupling is connected directly to the flywheel through bush inserts and bolts.

Fig. 3



Plug-in connection

Plug-in sleeves and bolts are mounted onto the flywheel. The Carbotorq coupling with bearing bushes is mounted onto the output side.

Permissible Misalignments

The Carbotorq coupling is able to compensate axial, angular and radial misalignments without adding further misalignment couplings.

Approval

Carbotorq couplings have been developed in accordance with DIN/ISO 9001 standards.

Designation

Designation Code

Example one: CT 47/7/250U

CT	Carbotorq
47	nominal outside diameter of the coupling in cm
7	width of the coupling in cm
250	stiffness series and the approximate twist in mrad at nominal torque
U	reversible

Example two: CT 58/13/150UB

CT	Carbotorq
58	nominal outside diameter of the coupling in cm
13	width of the coupling in cm
150	stiffness series and the approximate twist in mrad at nominal torque
U	reversible
B	blind assembly (plug-in connection)

Selection

The technical data for the coupling series mentioned above are shown in the "technical data" section.

Nominal Torque T_{KN}

The mean torque T is calculated from the engine power P and the and engine speed n

$$T = 9.55 \cdot \frac{P}{n}$$

T	mean torque	kNm
P	engine power	kW
n	engine speed	min-1

The coupling size should be selected so that the coupling's nominal torque T_{KN} is greater or equal to the mean torque T specified by the prime mover / application.

$$T_{KN} \geq T$$

The values of the nominal torque T_{KN} are based on an ambient temperature of 30°C.

The coupling is able to transmit the nominal torque T_{KN} in both directions.

Maximum Torque $T_{K\,max}$

The maximum torque $T_{K\,max}$ is the highest permissible peak torque. It is allowed for a limited number of load cycles.

Permissible Vibratory Torque T_{KW}

In addition to the static nominal torque T_{KN} the coupling can transmit a vibratory torque. The vibratory torque limit is 30% of the nominal torque.

Speed n_{max}

The maximum permissible speed for each type is given in the 'technical data' section.

Permissible Misalignment Values

Axial Misalignment ΔW_a

An axial misalignment ΔW_a is the deviation from the theoretical nominal length of the coupling. This deviation in length is caused by axial displacements of the adjoining shafts. Reasons for axial displacements include: errors in assembly distances, shaft movements, variations in foundations (i.e. resiliently mounted engines), or thermal expansion.

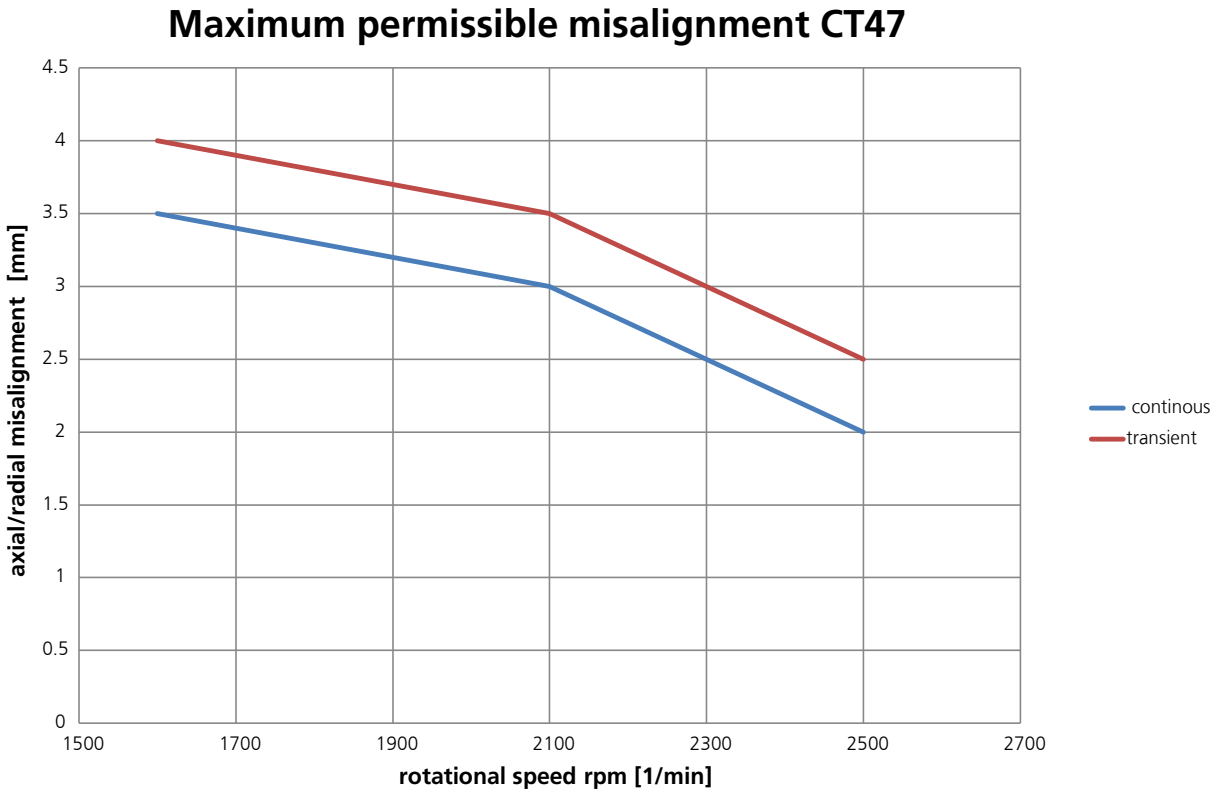
ΔK_a is the maximum permissible axial misalignment capacity of the coupling and must not be exceeded during operation. The axial displacement produces a reaction force F_a. The axial reaction force F_a given in the list of technical data refers to the maximum permissible axial misalignment.

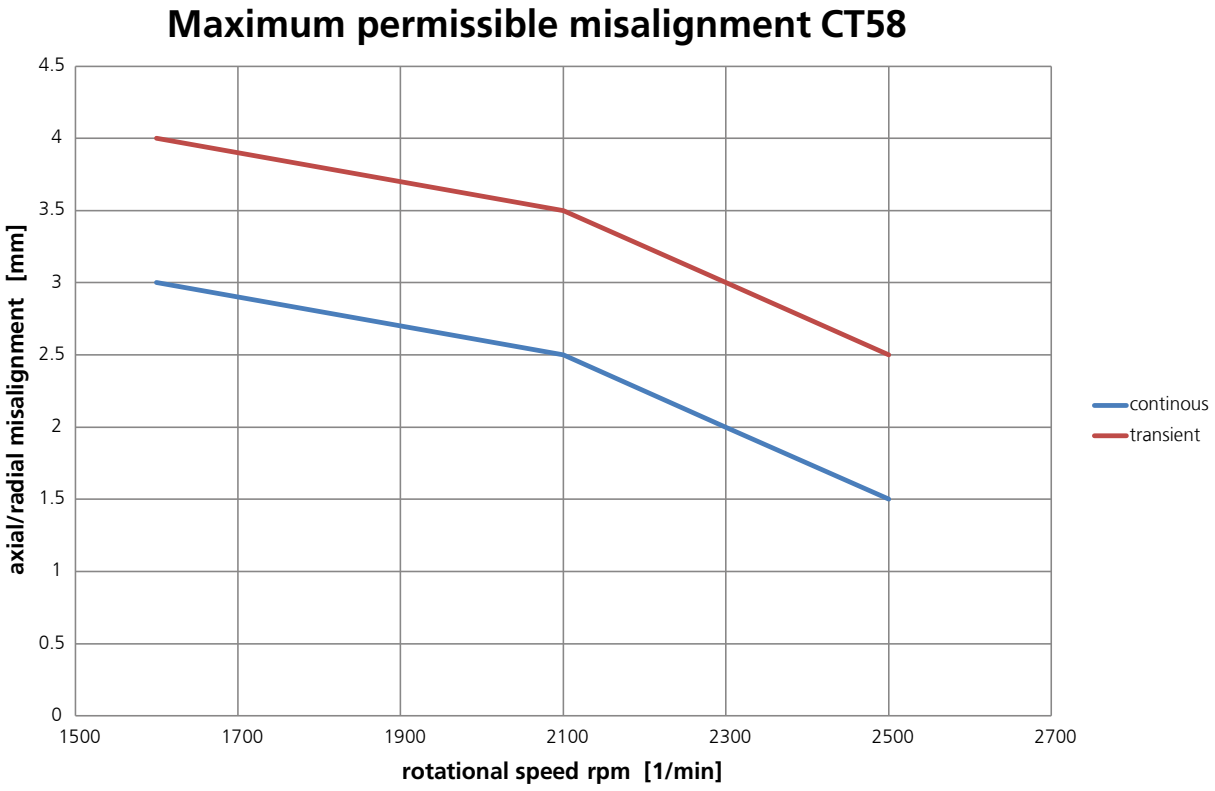
Radial Misalignment ΔW_r

Radial misalignment ΔW_r is the movement between driving and driven shaft in a perpendicular direction (radial) to the axis of rotation. Causes for radial misalignment are: assembly errors, shaft displacements, thermal expansions or elastically mounted driving or driven shafts.

ΔK_r is the maximum permissible radial deflection capacity of the coupling and must not be exceeded by static and dynamic misalignments during operation.

Speed dependent Misalignment Values ΔK_a, ΔK_r





Permissible Thermal Load P_{KW}

The permissible thermal load is defined as the power loss that results in a maximum core temperature of 150°C being reached in the silicone rubber under thermal steady state conditions. The value refers to an ambient temperature of 40°C and is permissible over a period of 60 minutes.

To obtain the thermal load P_{KW} the following formula applies:

$$P_{KW} = \frac{\pi}{60} 10^{-3} \cdot \sum \frac{\kappa \cdot T_v^{\,2} \cdot i \cdot n}{(1+\kappa^2) \cdot C}$$

P_{KW}	thermal load	kW
T_v	total vibratory torque due to harmonic order i transmitted by coupling	Nm
i	harmonic order	
n	speed of coupling	min^{-1}
κ	undimensioned damping factor	
C	stiffness	Nm/rad

Spring Rates

Dynamic Torsional Stiffness C_{Tdyn}

The values refer to the dynamic torsional stiffness at a frequency of 10 Hz and an ambient temperature of 30°C and a test amplitude of $0.2 * T_{KN}$

Due to material variation, torsional stiffness tolerances of +/- 15% have to be considered.

Radial Stiffness C_r

Due to material variation, radial stiffness tolerances of +/- 15% have to be considered.

Relative Damping

Due to material variation, damping tolerances of +/- 15% have to be considered.

Conversion table for different damping values

	k	κ	ψ	M
$k =$	--	$\frac{\kappa \cdot C}{\omega}$	$\frac{\psi \cdot C}{2 \cdot \pi \cdot \omega}$	$\frac{C}{\omega} \cdot \sqrt{\frac{1}{M^2 - 1}}$
$\kappa =$	$\frac{k \cdot \omega}{C}$	-	$\frac{\psi}{2 \cdot \pi}$	$\sqrt{\frac{1}{M^2 - 1}}$
$\psi =$	$\frac{2 \cdot \pi \cdot \omega \cdot k}{C}$	$2 \cdot \pi \cdot \kappa$	-	$\frac{2 \cdot \pi}{\sqrt{M^2 - 1}}$
$M =$	$\frac{\sqrt{C^2 + k^2 \cdot \omega^2}}{k \cdot \omega}$	$\frac{\sqrt{1 + \kappa^2}}{\kappa}$	$\frac{\sqrt{4 \cdot \pi^2 + \psi^2}}{\psi}$	-

k	linear viscous damping	Nms/rad	C	torsional stiffness	Nm/rad
κ	undimensioned damping factor		ω	phase velocity of vibration	rad/s
ψ	ratio of damping energy		M	magnifier	

Geislinger uses the undimensioned damping factor κ.

Ventilation

It is important to ensure that the flange and flywheel housing have many large ventilation holes, in order to provide adequate airflow. By this, the lifetime of the coupling will be increased.

Flange Connections

The couplings listed below show the most commonly used flange types. However, Geislinger is always prepared to manufacture other connections if it is economically and technically feasible. Please contact Geislinger if other assembly dimensions or configurations are required.

Technical Data

Coupling Series 150

Size	Nominal Torque	Maximum Torque	Permissible Vibratory Torque	Perm. Thermal load	Permissible Rotational Speed	Axial Misalignment	Radial Misalignment	Axial Reaction Force	Radial Stiffness	Dynamic Torsional Stiffness				Relative Damping
										0.25 T_{KN}	0.5 T_{KN}	0.75 T_{KN}	1.0 T_{KN}	
	T_{KN} kNm	$T_{K\max}$ kNm	T_{KW} kNm	P_{KW} kW	$n_{K\max}$ 1/min	ΔK_a mm	ΔK_r mm	F_a kN	C_r kN/mm	C_{Tdyn} kNm/rad				Ψ
CT 47/7/150U	5.00	7.50	1.5	0.25	2500	2.00	2.00	4.50	1.44	33	42	57	91	1.1
CT 47/7/150U	5.00	7.50	1.5	0.25	2300	2.50	2.50	5.60	1.44	33	42	57	91	1.1
CT 47/7/150U	5.00	7.50	1.5	0.25	2100	3.00	3.00	6.80	1.44	33	42	57	91	1.1
CT 47/7/150U	5.00	7.50	1.5	0.25	1600	3.50	3.50	7.90	1.44	33	42	57	91	1.1
CT 58/13/150U	10.0	14.0	3.0	0.25	2450	1.50	1.50	2.80	1.40	103	108	119	147	1.1
CT 58/13/150U	10.0	14.0	3.0	0.25	2300	2.00	2.00	3.70	1.40	103	108	119	147	1.1
CT 58/13/150U	10.0	14.0	3.0	0.25	2100	2.50	2.50	4.60	1.40	103	108	119	147	1.1
CT 58/13/150U	10.0	14.0	3.0	0.25	1600	3.00	3.00	5.60	1.40	103	108	119	147	1.1

All technical data are without warranty. Dimensions and design modifications reserved.

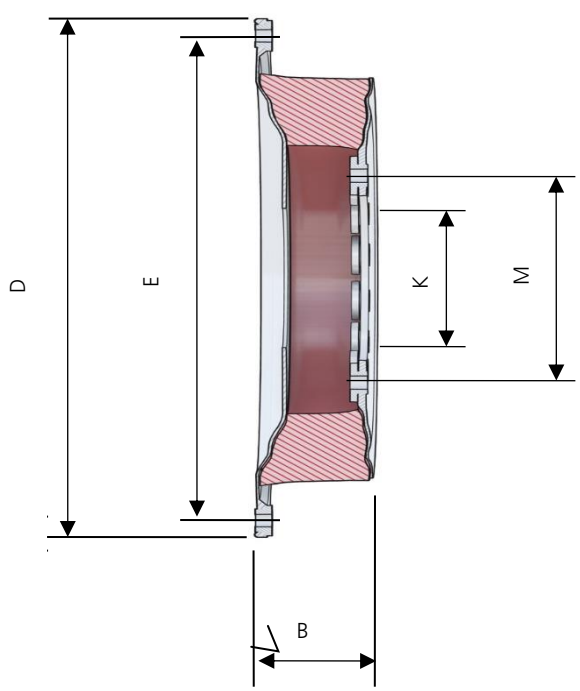
Coupling Series 250

Size	Nominal Torque	Maximum Torque	Permissible Vibratory Torque	Perm. Thermal load	Permissible Rotational Speed	Axial Misalignment	Radial Misalignment	Axial Reaction Force	Radial Stiffness	Dynamic Torsional Stiffness				Relative Damping
										0.25 T_{KN}	0.5 T_{KN}	0.75 T_{KN}	1.0 T_{KN}	
	T_{KN} kNm	$T_{K\max}$ kNm	T_{KW} kNm	P_{KW} kW	$n_{K\max}$ 1/min	ΔK_a mm	ΔK_r mm	F_a kN	C_r kN/mm	C_{Tdyn} kNm/rad				Ψ
CT 47/7/250U	5.00	7.50	1.5	0.3	2500	2.00	2.00	3.80	0.93	20	22	34	48	1.1
CT 47/7/250U	5.00	7.50	1.5	0.3	2300	2.50	2.50	4.75	0.93	20	22	34	48	1.1
CT 47/7/250U	5.00	7.50	1.5	0.3	2100	3.00	3.00	5.70	0.93	20	22	34	48	1.1
CT 47/7/250U	5.00	7.50	1.5	0.3	1600	3.50	3.50	6.60	0.93	20	22	34	48	1.1
CT 58/13/250U	9.0	13.0	2.7	0.3	2450	1.50	1.50	2.30	0.96	60	64	72	89	1.1
CT 58/13/250U	9.0	13.0	2.7	0.3	2300	2.00	2.00	3.00	0.96	60	64	72	89	1.1
CT 58/13/250U	9.0	13.0	2.7	0.3	2100	2.50	2.50	4.50	0.96	60	64	72	89	1.1
CT 58/13/250U	9.0	13.0	2.7	0.3	1600	3.00	3.00	5.40	0.96	60	64	72	89	1.1

All technical data are without warranty. Dimensions and design modifications reserved.

Dimensions

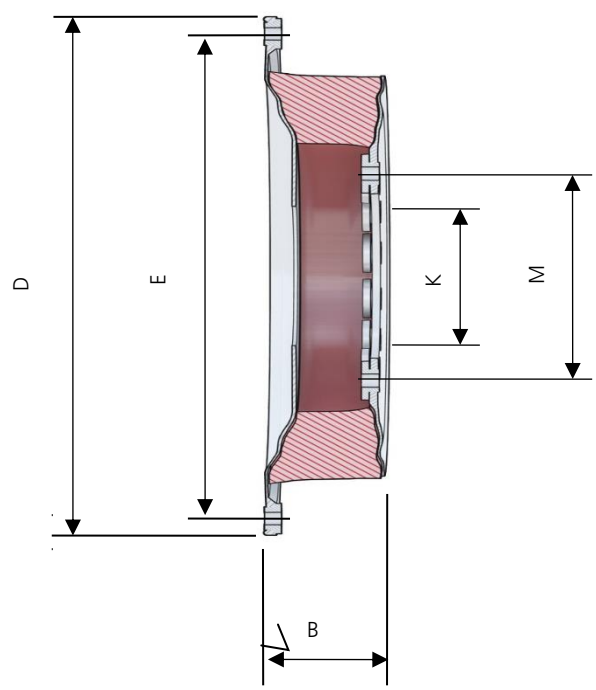
Couplings Series 150



Size	Flywheel SAE J620	Dimension					Inertia		Weight	
		D	E	B	M	K	inner	outer	inner	outer
		mm					kgm²		kg	
CT 47/7/150U	14	466.72	438.15	75	190	150	0.068	0.093	3.4	3.1
CT 47/7/150UB	14	466.72	438.15	75	190	150	0.068	0.082	3.4	2.9
CT58/13/150U	18	583.00	542.92	133	213	170	0.486	0.467	12.9	10.6
CT58/13/150UB	18	583.00	542.92	133	213	170	0.492	0.439	13.0	10.1

All technical data are without warranty. Modifications of dimensions and design reserved.

Couplings Series 250



Size	Flywheel SAE J620	Dimension					Inertia		Weight	
		D	E	B	M	K	inner	outer	inner	outer
		mm					kgm²		kg	
CT 47/7/250U	14	466.72	438.15	75	190	150	0.068	0.093	3.4	3.1
CT 47/7/250UB	14	466.72	438.15	75	190	150	0.068	0.082	3.4	2.9
CT58/13/250U	18	583.00	542.92	133	213	170	0.486	0.467	12.9	10.6
CT58/13/250UB	18	583.00	542.92	133	213	170	0.492	0.439	13.0	10.1

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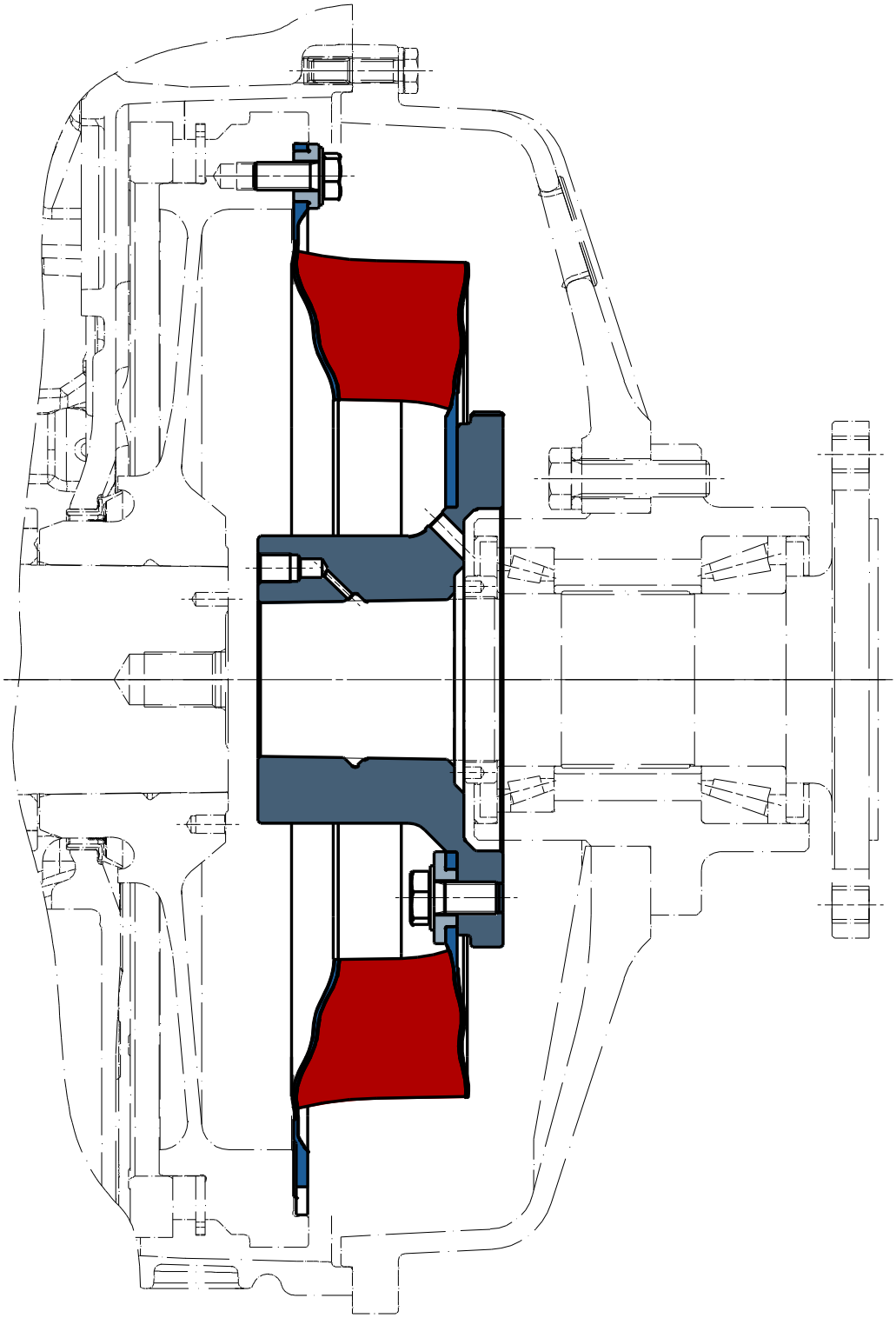
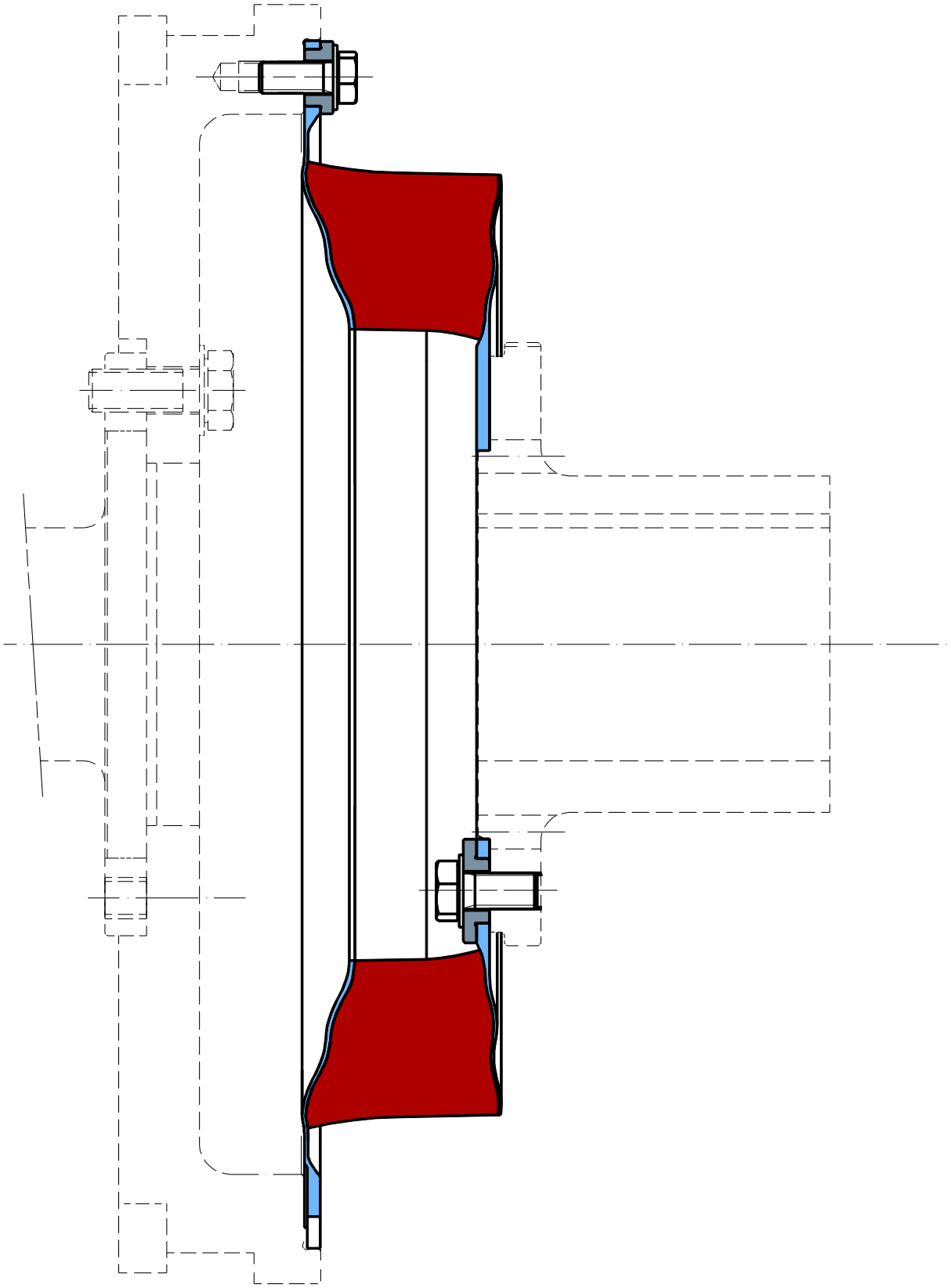
Examples

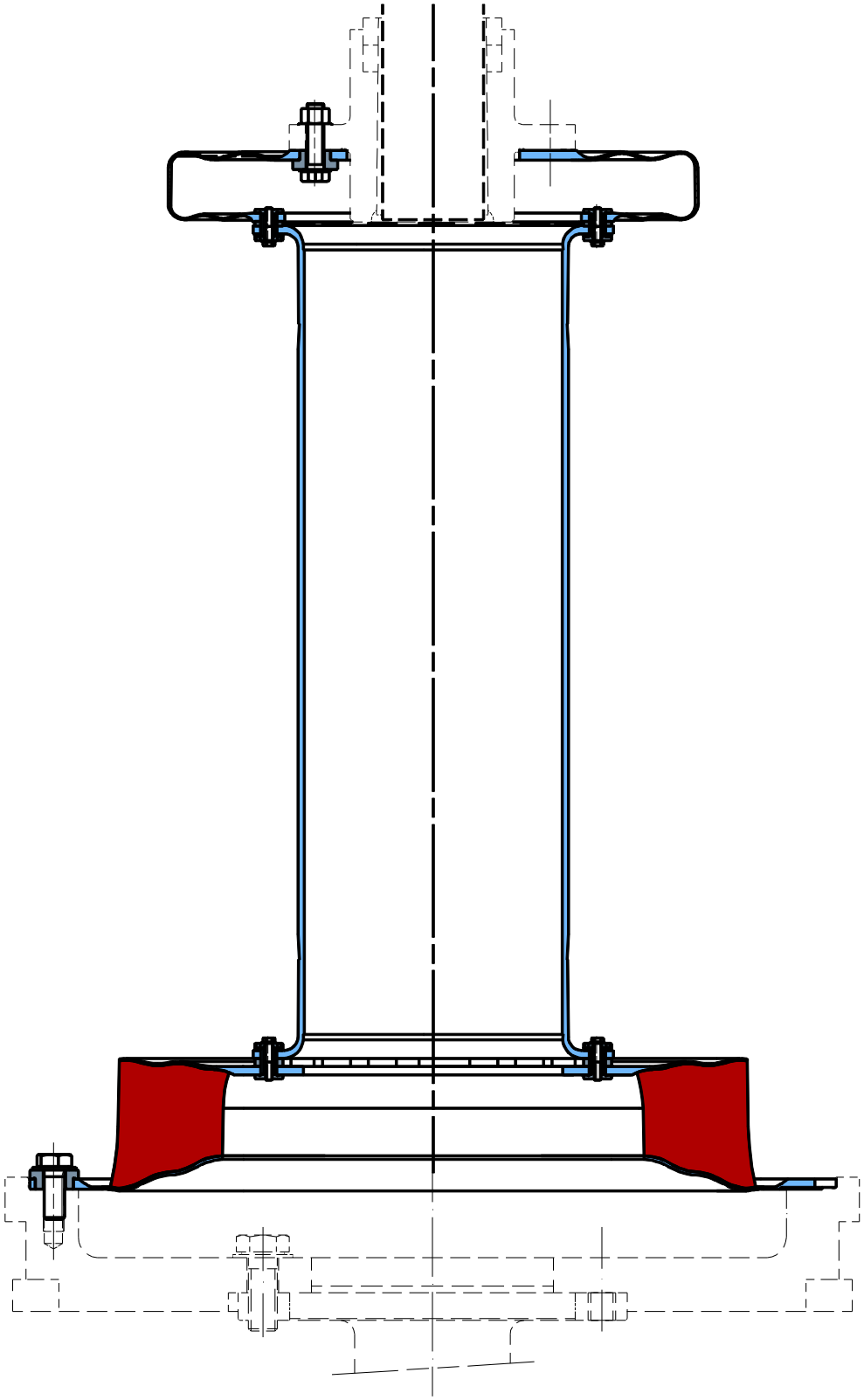
Geislinger Carbotorq - bell housing application



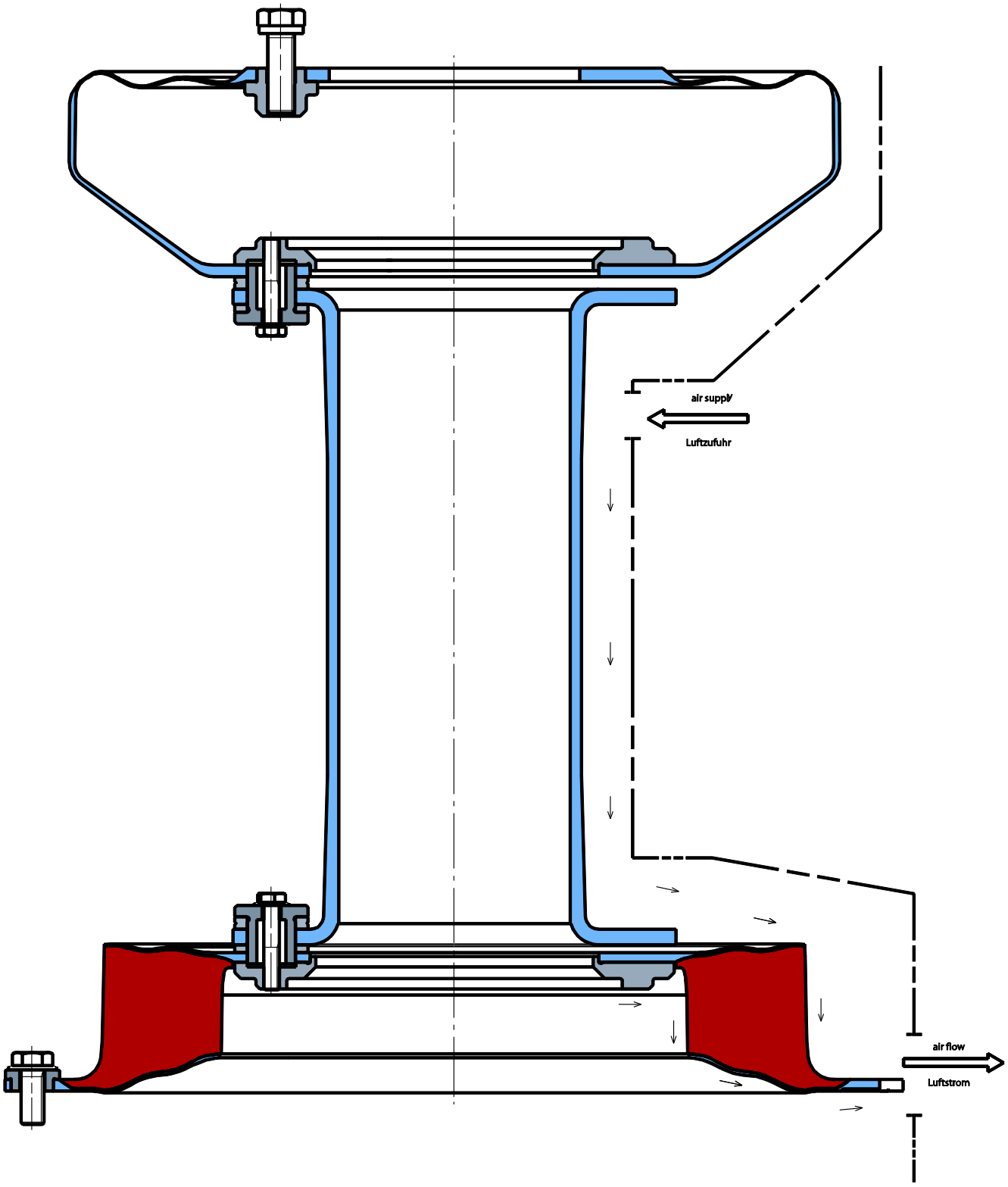
Geislinger Carbotorq - free standing application



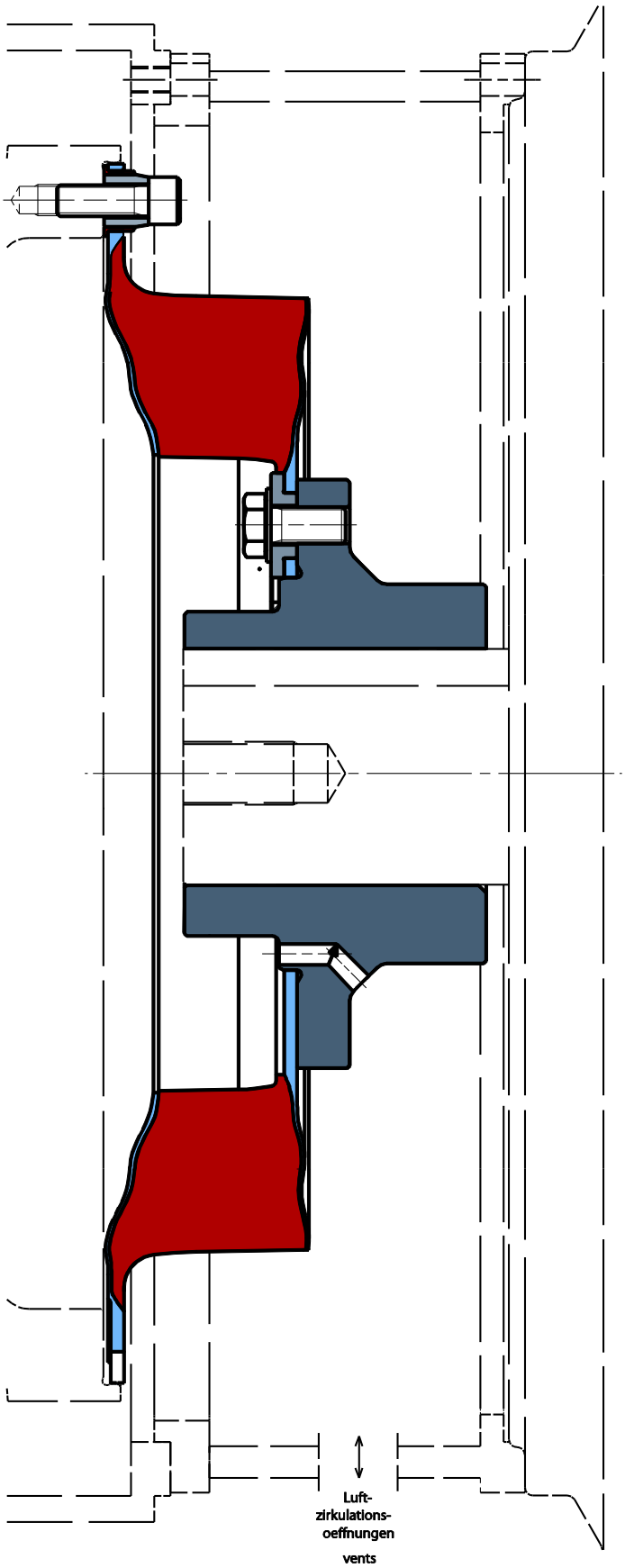
Geislinger Carbotorq with Gesilco CS coupling



Carbotorq with Gesilco Shaft and MB coupling



Geislinger Carbotorq - for blind assembly



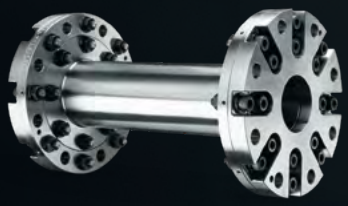
Geislinger Coupling

Geislinger Silenco®

Geislinger Carbotorq®

Geislinger Damper

Geislinger Monitoring



Geislinger Flexlink

Geislinger Vdamp®

Geislinger Gesilco®

Geislinger Gesilco® Shaft

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