GEISLINGER DAMPER

LONG SERVICE LIFE

TORSIONAL VIBRATION CENTER

GEISLINGER®

POWERTRAIN SOLUTIONS. BUILT TO LAST.

GEISLINGER DAMPER

The Geislinger Damper is capable of adjusting the natural frequency of a system and of reducing torsional vibrations. Thus, it reliably protects the crankshafts, camshafts, intermediate and propeller shafts in all kinds of reciprocating systems. By eliminating the critical frequency, the Geislinger Damper also helps to avoid a barred speed range.

As modern engines tend to create more than one critical frequency, Geislinger has developed dual damper solutions as well as combinations of a Geislinger Damper and a Geislinger Vdamp®. This design flexibility guarantees the best solution for every type of engine.

DESCRIPTION

The damper is usually mounted to the free-end of the crankshaft or camshaft and consists of a primary and a secondary section. Between these, groups of steel leaf spring packs are arranged.
These spring packs together with intermediate pieces and the secondary section form chambers which are filled with pressurized engine oil.

The damper's elasticity is determined by the shape and number of springs. In this way, the torsional system is detuned, and the most critical resonance is eliminated.

If the exterior section vibrates in relation to the inner one, the leaf springs bend and the pressurized engine oil is pumped from one chamber into another. This reduces the relative motion of the two parts and thus dampens the residual torsional vibrations.

APPLICATIONS

- 2- and 4-stroke diesel and gas engines
- Reciprocating compressors

TECHNICAL DATA

- Dimensionless damping factor: 0.2 – 0.5
- Ambient temperature: -10°C to 120°C

ADVANTAGES

- Low life-cycle cost
- Tailored to your system
- Precise calculation and defined properties
- No aging
- Long periods between overhauls
- Condition-based maintenance with Geislinger Monitoring
- PTO/PTI coupling can be integrated
- Geislinger Worldwide After Sales Service

Fatigue-resistant springs

The smallest possible damper for each engine

Tailor-made solutions

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.

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Description

Introduction

The patented Geislinger Damper is a tuned torsional vibration damper with steel springs and hydrodynamic oil damping and offers the following advantages:

- High damping factor
- Long lifetime
- Low weight, small size
- No ageing of components; no changing of damping or stiffness
- Low wear and maintenance costs
- Unaffected by high temperatures, dirt and oil
- Geislinger Quality
- Geislinger Monitoring

This catalog is a guideline for a damper selection. It should give the essential information to learn about how a Geislinger Damper works and how it can be selected for any preliminary analysis work.
We would however recommend approaching Geislinger directly to get our direct support and to fully benefit from Geislinger's unmatched damper expertise.

▪ Application

4 stroke engines:
Due to continuing progress in engine design, attention must be paid to the problems of torsional vibrations. Thus, it proves necessary to reduce the torsional vibrations by detuning and damping them. These tasks can be solved by a Geislinger Damper. The combination of the high elasticity of its leaf springs together with hydrodynamic damping ensures shifting the major critical speeds out of the engine's operating speed range. In addition, minor torsional vibrations are effectively reduced to obtain a continuous operation within the speed range. Installation of this damper results in lower vibratory torque of the crankshaft.

The Geislinger Damper is also well proven in other applications such as camshafts, intermediate shafts, gearboxes, etc.

Through tests on prototypes as well as installed dampers data referring to damping and elasticity have been gathered and used for torsional models. This guarantees correct calculation; not only of the critical speeds but also of the amplitudes and loads in all parts of the driveline. Damping and elasticity can be adapted within large limits to meet the needs of every installation.

2 stroke engines:
In propulsion systems with two-stroke-crosshead engines the propeller is in most cases directly driven by the low speed engine. A simple intermediate shaft is used instead of a flexible coupling and a main gear. Engine and propeller run at the same speed. The system engine–shaft–propeller is torsionally excited by the cyclic forces of the diesel engine. Continuous increase of engine power results in higher exciting torques and, therefore, in increased torsional vibrations of the system. A Geislinger Damper at the free end of the crankshaft can protect the crank-, intermediate- and propeller shaft and allows for a compact design of the propulsion installation. Normally, an engine operation restricted by a barred speed range can be avoided if a Geislinger Damper is used.

A Geislinger Damper is a tuned torsional vibration damper. Technical data regarding important parameters such as inertia, torsional stiffness, and damping can be varied independently over a wide range. The selection of a Geislinger Damper is based on a torsional vibration calculation. Torsional stress limits of the shaft line according to the classification society are considered.

For a new Geislinger Damper the predicted vibrations have to be confirmed by a torsiograph measurement. The Geislinger Monitoring System can be used to perform this measurement on the first pilot damper to verify the correct damper parameter. In addition to that the Geislinger Monitoring System can also be used for permanent monitoring of a Geislinger Damper.

Design

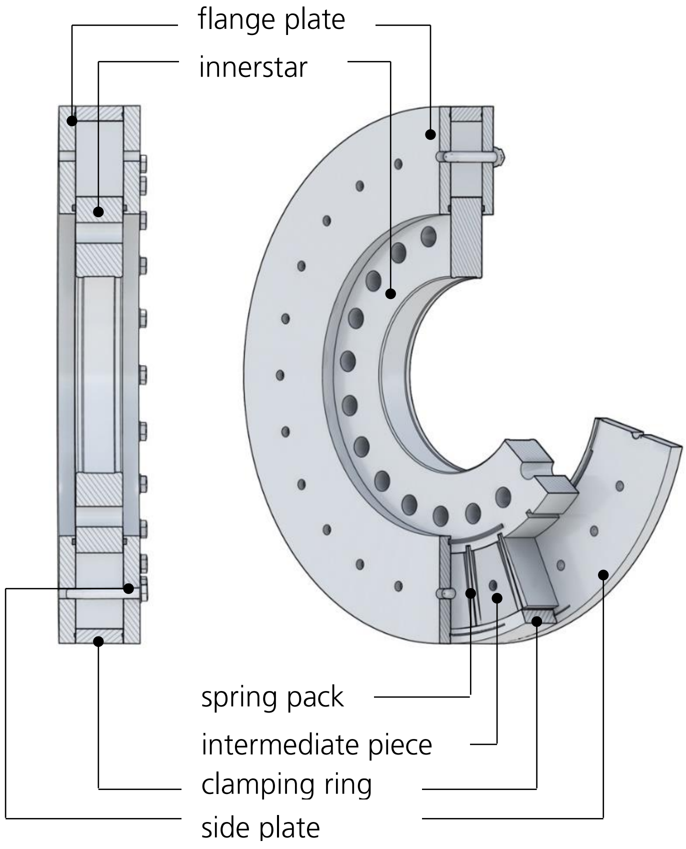
The Geislinger Damper is a tuned torsional vibration damper with steel springs and hydrodynamic oil damping. The major components of a Geislinger Damper are shown in Fig. 1.

Stiffness

The steel spring packs represent the principal part of a Geislinger Damper. These steel spring packs can be produced to any desired degree of stiffness without progression steps, independent of the required damping.

The innerstar is bolted onto the free end of the crankshaft and follows its torsional vibrations. Due to its special design the inertia of the damper inner part is small and therefore more space is available for the large inertia of the effective outer part which greatly affects the performance and the required space of the damper.

Fig.1

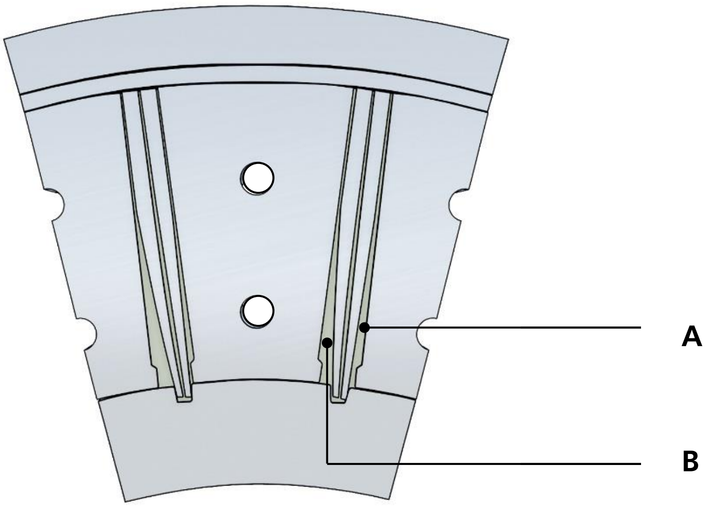


Damping

The Geislinger Damper has a very high damping factor.

The radially arranged steel springs are clamped at their outer ends and are engaged in the grooves of the innerstar. Chambers A and B, which are filled with engine oil, are created between the spring packs, intermediate pieces, and the innerstar.

Fig. 2



A/B = oil chambers

Through the oscillation of the outer part in relation to the innerstar the springs are bended. This movement forces the oil to flow from chamber A to chamber B through designed damping gaps. Depending on the size of this damping gap the flow is more or less restricted, thus creating different rates of torsional hydrodynamic damping.

The Geislinger Damper design is based on the hydrodynamic principal of damping. As a result, the damping factor stays constant over the product’s lifetime because the damper is not affected by wear.

In case of dampers for two-stroke engines fine-tuning of the damping factor can be adjusted in the field.

Assembly

The damper has to be mounted to the free end of the crankshaft.

For two-stroke engines, counterweights as additional inertia can be incorporated into the damper.

For four-stroke engines various design options are possible:

- Torque transmittal through damper inner part to auxiliaries
- Combination of engine turning wheel with the vibration damper
- Mounting of dampers both inside or outside the engine crank case

Oil Supply

The damper has to be supplied with pressurized oil from the crankshaft or the free end through a central bore.

Thermal Load

The capacity of the damper to take high thermal loads is extremely high since most importantly steel is used as material. Furthermore, oil is continuously flowing through the damper and subsequently providing cooling. Adding of cooling fins and a further increase in oil flow can promote extra thermal capacity.

Quality & Survey

All dampers will be produced and verified according to quality assurance requirements outlined in ISO 9001-2000 and ISO 14001.

On request, dampers can be provided with certificates of all major classification authorities (e.g. ABS, DNV, Germanischer Lloyd, etc.)

For the survey by a classification society Geislinger requests the following data:

- Name of classification society
- Type of installation
- Shipyard
- Yard hull number

Designation Code

Example one: D 220 / 3 / 1 / V / M

D: Damper
220: Outer diameter of biggest single damper part in cm
(For examples in this catalog it's the outer diameter of clamping ring in cm)
3: Version number of a specified type
1: Subversion
V: Adjustable damping ring incorporated in damper design
M: Damper with machined gear for GMS signal pick up

Example two: D 220 / AB

D: Damper
220: Outer diameter of biggest single damper part in cm
(For examples in this catalog it's the outer diameter of clamping ring in cm)
AB: Project designation – substituted by a number when a firm order is placed

Selection

Selection Procedure

The sizes given in the technical data only describe the possible range of Geislinger Dampers. In contrary to other damper designs, inertia, stiffness, and damping factor of a Geislinger Damper can be optimised to specific requirements.

We ask you to fill out the enclosed questionnaire and send it to us, so we can evaluate the optimal damper size for your application.

An important dimension – as it determines the damper size – is the outer diameter of the crankshaft flange. To develop a low cost damper this dimension should be as small as possible.

When a Geislinger Damper for a particular engine is produced the first time, the calculations have to be confirmed by torsional vibration measurements. The damper's characteristics can be estimated very accurately, so that the resonances will occur at the predicted speeds. Only the damping factor might require some adjustment.

Dampers for two-stroke engines are equipped with adjustable damping rings, which allow the damping adjustment on site during testing. Once completed, no further adjustments or tests are necessary as dampers can be delivered with reproducible accuracy.

Selection Criterion: Moment of Inertia

First select a damper with the damper's outer part inertia in realistic proportion to the engine's total inertia:

- For 2-stroke engines: 5 to 25%.
- For 4-stroke engines: 10 to 50%.

Selection Criterion: Stiffness

With the Geislinger Damper, assuming infinite damper stiffness ($C_D = \infty$), one calculates the first natural frequency of the engine. From the resonance speeds one can already judge which harmonic orders are of importance within the engine speed range. It is on those orders one has to concentrate when tuning the damper.

Knowing which one is the most important order, assuming infinite damper stiffness ($C_D = \infty$, black curve) a forced torsional vibration calculation is carried out for this order. As a result the angular amplitudes at the crankshaft free end are known. Their values are plotted as a diagram (Dia. 1)

The next step is to select a suitable damper stiffness. It is known, that with most installations the damper's natural frequency should be less than the engine's natural frequency (ω). This formula will give a good first approximation for C_D.

$$C_D < \omega^2 \cdot I_s$$

I_s	moment of inertia of damper outer part	kgm^2
C_D	torsional stiffness of damper	Nm/rad
ω	phase velocity of the engine	rad/s

With C_D fixed as mentioned above a new forced torsional vibration calculation is carried out. As expected, an additional mass and stiffness $C_D \neq \infty$ result in an additional natural frequency and split the original single resonance into two separate resonances (Dia. 2)

If the crankshaft free end amplitudes (red curve) are plotted one can find two characteristic points: the fixed points FP1 and FP2. Characteristic for them is, that they are common for both vibratory systems ($C_D = \infty$ and $C_D \neq \infty$). The same results as for $C_D = \infty$ and $\kappa = 0$ will be achieved for $C_D \neq \infty$ and $\kappa = \infty$. The conclusion is that, whatever rate of damping is defined the curve of any damped vibrations have to pass through these two fixed points. Dampened vibrations pass below the two fixed points if additional system damping is considered. Taking this into account, one can already judge an optimum tuning, without having calculated a damped vibration yet.

One is trying to arrange the fixed points at equal amplitudes (Dia. 4) In Dia. 2 it can be seen that a correct tuning has not yet been achieved. The calculation is repeated with lower damper stiffness. The results are shown in Dia. 3. Now the stiffness is obviously too small, as the position of the fixed points has reversed. Another calculation with stiffness in between gives the optimum. Both fixed points are at the same level (Dia. 4)

At this stage of calculations one can already judge, whether the selected damper size is appropriate or not. Whatever damping factor is selected, the damped curves pass through the fixed points. If the torsional level of the fixed points is too high the damper size is too small. The calculations have to be repeated using a larger damper with a higher mass moment of inertia. The effect is shown in Dia. 5. There is now a greater distance between the resonances and the fixed points are at a lower level.

Selection Criterion: Damping

The damping factor can be determined in various ways.

$$\kappa = \frac{T_d}{T_{el}}$$

Ratio of amplitudes

The ratio of amplitudes of the damping torque T_d to the amplitude of the elastic torque T_{el}

κ	undimensioned damping factor	
T_d	damping torque	Nm
T_{el}	elastic torque	Nm

Linear viscous damping

Observe the differential equation

$$I_1 \cdot \varphi_1'' + k(\varphi_1' - \varphi_2') + C_D(\varphi_1 - \varphi_2) = T_i \cdot \sin \omega t$$

$$\kappa = \frac{k \cdot \omega}{C_D}$$

The relationship between the undimensioned damping factor κ and the linear viscous damping k is as follows:

I_1	moment of inertia	kgm²
$\varphi, \varphi', \varphi''$	vibratory angle, -velocity, -acceleration	
k	linear viscous damping	Nms/rad
C_D	stiffness	Nm/rad
T_i	exciting torque	Nm
κ	undimensioned damping factor	
ω	phase velocity of vibration	rad/s

The damping factor of a Geislinger Damper can be tuned optimally to the application's requirements. In case of an alternator set with a single speed the damper acts as a detuner with little damping. If it is a ship's main propulsion system, a flat curve over the speed range is desired. This is shown in the following example.

Tests confirmed that for a tuned Geislinger Damper the linear viscous damping k is constant within large limits. As the damper's stiffness C_D can also be considered constant,

$$\omega = \frac{i \cdot n \cdot \pi}{30}$$

the undimensioned damping factor κ becomes a function of the vibratory frequency:

ω	exciting phase velocity	rad/s
i	harmonic order	
n	engine speed	min^{-1}

It is recommended to take this dependence on the frequency of the undimensioned damping factor into account in torsional vibration calculations.

By means of the undimensioned damping factor κ a quick check of the damping magnitude, independent of the damper size, can be made. Similar to the procedure of determining the correct stiffness, one has first to choose a damping factor and then carry out the torsional vibration calculation. It is recommended to begin with $\kappa = 0.5$ for nominal speed. With C_D as calculated above and $\kappa = 0.5$ a new forced torsional vibration calculation is performed. Dia. 6 shows the curve of the damped vibration (bold red curve). As the resonance peaks are very high, the damping factor is selected too low. Dia. 7 shows the result of a repeated calculation with higher damping (e.g. $\kappa = 1.5$). The damping factor is now obviously too high, as the original resonance appears too strong. An optimum will be achieved with a damping in between the first two chosen values, as shown in Dia. 8. The curve of the damped vibration is very flat over a wide speed range and without any distinct resonances.

Has the damper now been matched for the most important order, it is recommended to check the match of the 2 or 3 next important orders as well and, if necessary, to adjust the tuning without making any significant changes to the most important order.

When tuning is completed and the damper data are fixed, one has to ensure that the stresses in the crankshaft are within permissible limits and that the permissible load of the damper is not exceeded.

The damper should be checked for the following:

- elastic torque
- damping torque
- thermal load

Selection Criterion: Elastic Torque

Is the tuning of the damper fixed, one can calculate the elastic torque T_{el} of the damper as vector sum of all harmonic orders.

A guideline for the permissible elastic torques is stated on pages 17-21 depending on each damper size.

Selection Criterion: Damping Torque

As a further result of the calculations the vector sum of the damping torque T_d of the damper is known as well. Because of its design, the damper can transmit only a certain damping torque without the occurrence of cavitation. Cavitation depends on the oil feed pressure and leads to loss of damping, therefore it has to be avoided. The damping torque per 1 bar oil pressure $T_{d,p}$ is stated in the technical data *(absolute value).*

Selection Criterion: Required Oil Feed Pressure

Is T_d the damping torque to be transmitted, then the necessary absolute oil feed pressure is

$$p = \frac{T_d}{T_{d,p}}$$

Selection Criterion: Permissible Thermal Load

By means of the formula:

$$P_{KW} = 5.2 \cdot 10^{-5} \cdot \frac{\kappa}{1+\kappa^2} \cdot \frac{T^2 \cdot i \cdot n}{C_D}$$

One can calculate the thermal load in the damper due to a single harmonic order and add the values for all orders algebraically. This total thermal load must also not exceed the limits as listed in the technical data.

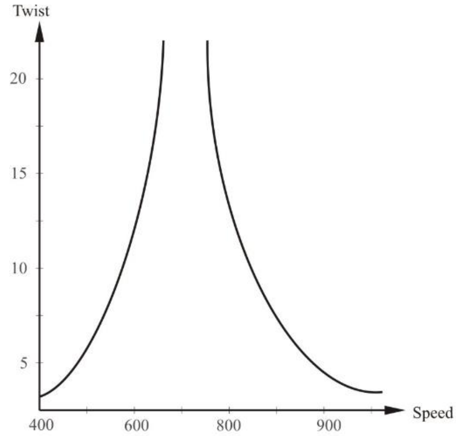
p	absolute oil feed pressure	bar
i	harmonic order	
n	engine speed	min^{-1}
T	total vibratory torque in damper	Nm
T_{el}	elastic torque in damper	Nm
T_d	damping torque in damper	Nm
$T_{d,p}$	damping torque per 1 bar oil pressure	Nm/bar
C_D	damper torsional stiffness	Nm/rad
κ	undimensioned damping factor	
k	dimensioned damping factor	Nms/rad
P_{KW}	thermal load	kW

Technical data for each Geislinger Damper will be tuned individually according to the requirements of each propulsion plant.

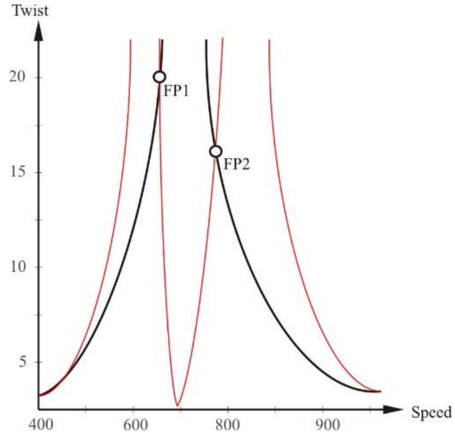
The following graphs, tables and installation examples can only be a guideline for your damper selection.

Ideally you should fill out and send us our damper questionnaire. We would then be glad to select the optimal Geislinger Damper for your application.

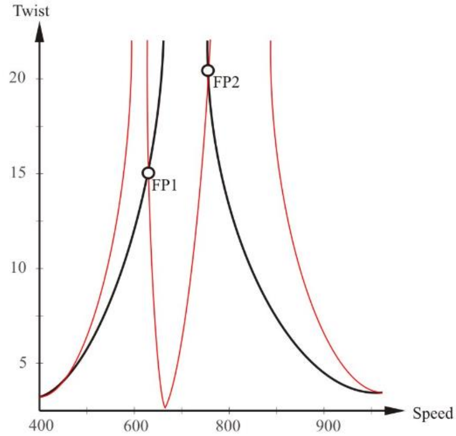
Dia. 1



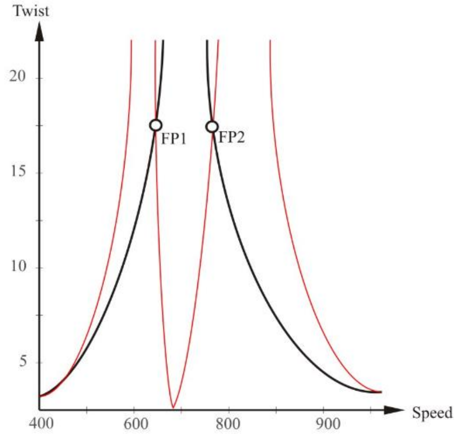
Dia. 2



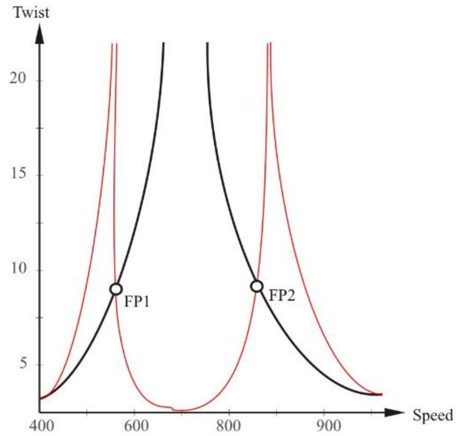
Dia. 3



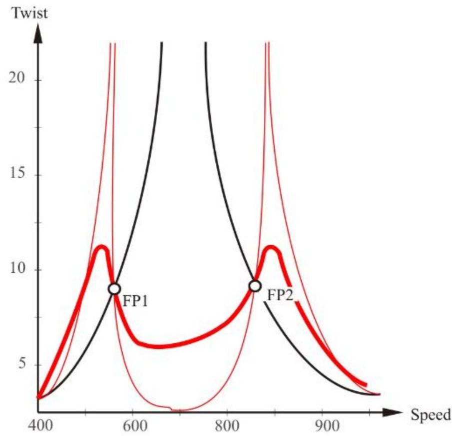
Dia. 4



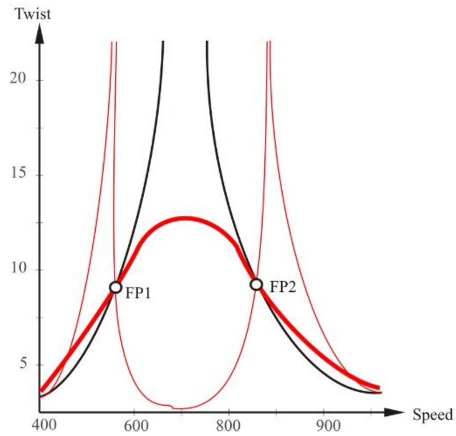
Dia. 5



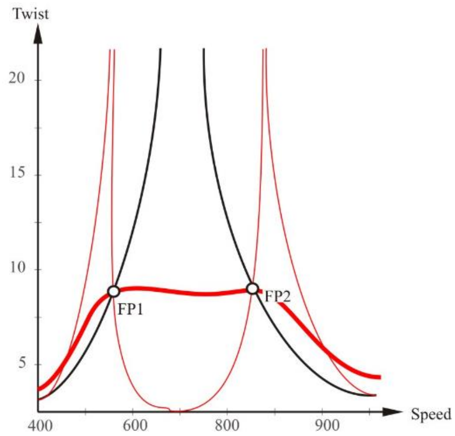
Dia. 6



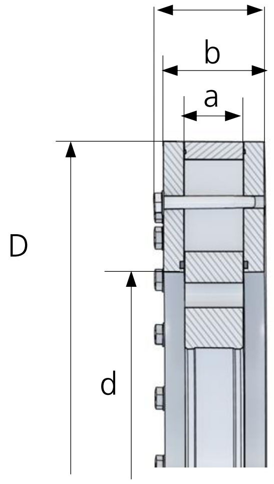
Dia. 7

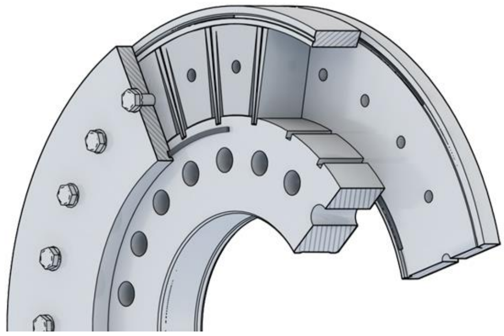


Dia. 8



Technical Data





Size		Dimensions					Inertia		Weight		Thermal load	Damping torque
							primary part	secondary part	primary part	secondary part		
		D	d	a	b	c	I_p	I_s	m_p	m_s	P_{KW}	$T_{d,p}$
		mm					kgm^2		kg		kW	kNm/bar
25	/A	250	110	25	45	52	0.01	0.1	1.9	12	1.0	0.096
25	/B	250	110	50	75	82	0.01	0.2	3.9	20	1.2	0.191
30	/A	300	130	25	45	52	0.01	0.3	2.5	18	1.3	0.143
30	/B	300	130	50	75	82	0.02	0.4	5.0	30	1.6	0.285
36	/A	360	160	25	45	52	0.02	0.5	3.6	26	1.9	0.208
36	/B	360	160	50	75	82	0.05	0.9	7.2	42	2.1	0.415
36	/C	360	160	75	105	112	0.07	1.2	10.7	58	2.4	0.623
41	/A	410	180	25	45	52	0.03	0.9	4.3	34	2.4	0.273
41	/B	410	180	50	75	82	0.07	1.5	8.5	56	2.6	0.547
41	/C	410	180	75	105	112	0.10	2.1	12.8	77	2.9	0.820
45	/A	450	200	25	45	52	0.05	1.3	5.0	41	2.8	0.322
45	/B	450	200	50	75	82	0.10	2.1	10.0	67	3.1	0.644
45	/C	450	200	75	105	112	0.14	3.0	15.1	93	3.4	0.966
48	/A	480	210	25	45	52	0.06	1.7	5.9	46	3.1	0.368
48	/B	480	210	50	75	82	0.13	2.8	11.7	76	3.5	0.736
48	/C	480	210	75	105	112	0.19	3.9	17.6	106	3.8	1.105

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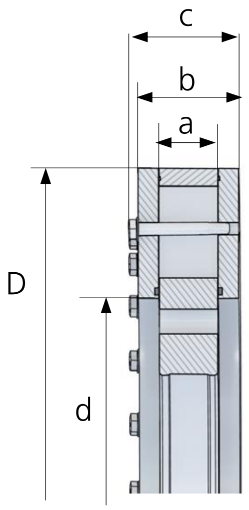

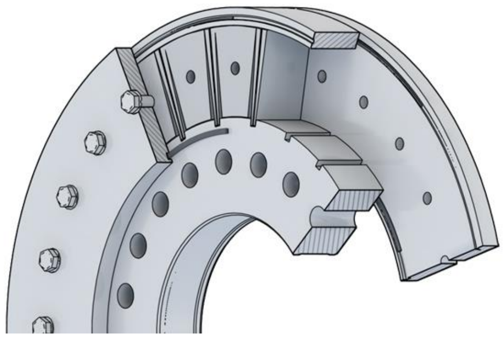

Size		Dimensions					Inertia		Weight		Thermal load	Damping torque
							primary part	secondary part	primary part	secondary part		
		D	d	a	b	c	I_p	I_s	m_p	m_s	P_{KW}	$T_{d,p}$
		mm					kgm²		kg		kW	kNm/bar
56	/B	560	250	50	80	88	0.23	5.5	15.7	110	4.6	0.998
56	/C	560	250	75	110	118	0.35	7.5	23.6	151	5.0	1.500
56	/D	560	250	100	140	148	0.46	9.5	31.4	191	5.4	1.990
63	/B	630	280	50	80	88	0.37	8.8	19.7	141	5.7	1.260
63	/C	630	280	75	110	118	0.55	12.1	29.5	192	6.2	1.880
63	/D	630	280	100	140	148	0.73	15.3	39.4	243	6.6	2.520
72	/B	720	320	50	85	95	0.62	16.0	25.7	196	7.4	1.640
72	/C	720	320	75	115	125	0.94	21.6	38.6	263	7.9	2.460
72	/D	720	320	100	145	155	1.25	27.2	51.5	330	8.4	3.270
80	/B	800	355	50	85	95	0.96	24.4	31.9	242	8.9	2.030
80	/C	800	355	75	115	125	1.43	32.9	47.9	325	9.5	3.050
80	/D	800	355	100	145	155	1.91	41.4	63.9	407	10.0	4.060
90	/B	900	400	50	90	101	1.52	41.3	40.2	326	11.0	2.350
90	/C	900	400	75	120	131	2.28	54.7	60.3	430	12.0	3.520
90	/D	900	400	100	150	161	3.04	67.9	80.4	532	12.0	4.700
93	/C	930	410	75	120	131	2.63	62.4	65.2	459	13.0	3.740
93	/D	930	410	100	150	161	3.51	77.5	86.9	570	13.0	4.990
93	/E	930	410	125	180	191	4.38	92.6	109.0	680	14.0	6.240
100	/D	1000	440	100	150	162	4.69	104	101.0	659	15.0	5.900
100	/E	1000	440	125	180	192	5.86	124	126.0	787	16.0	7.370
100	/F	1000	440	150	210	222	7.03	144	151.0	1913	16.0	8.840

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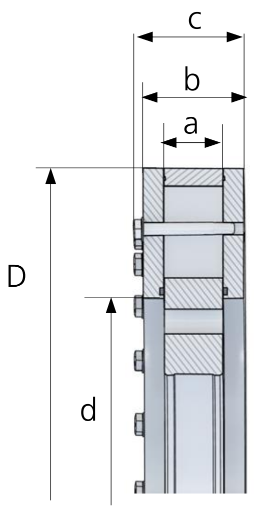
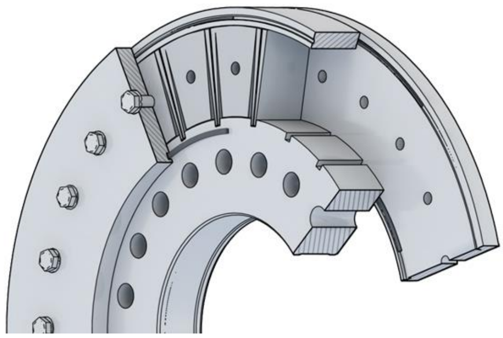
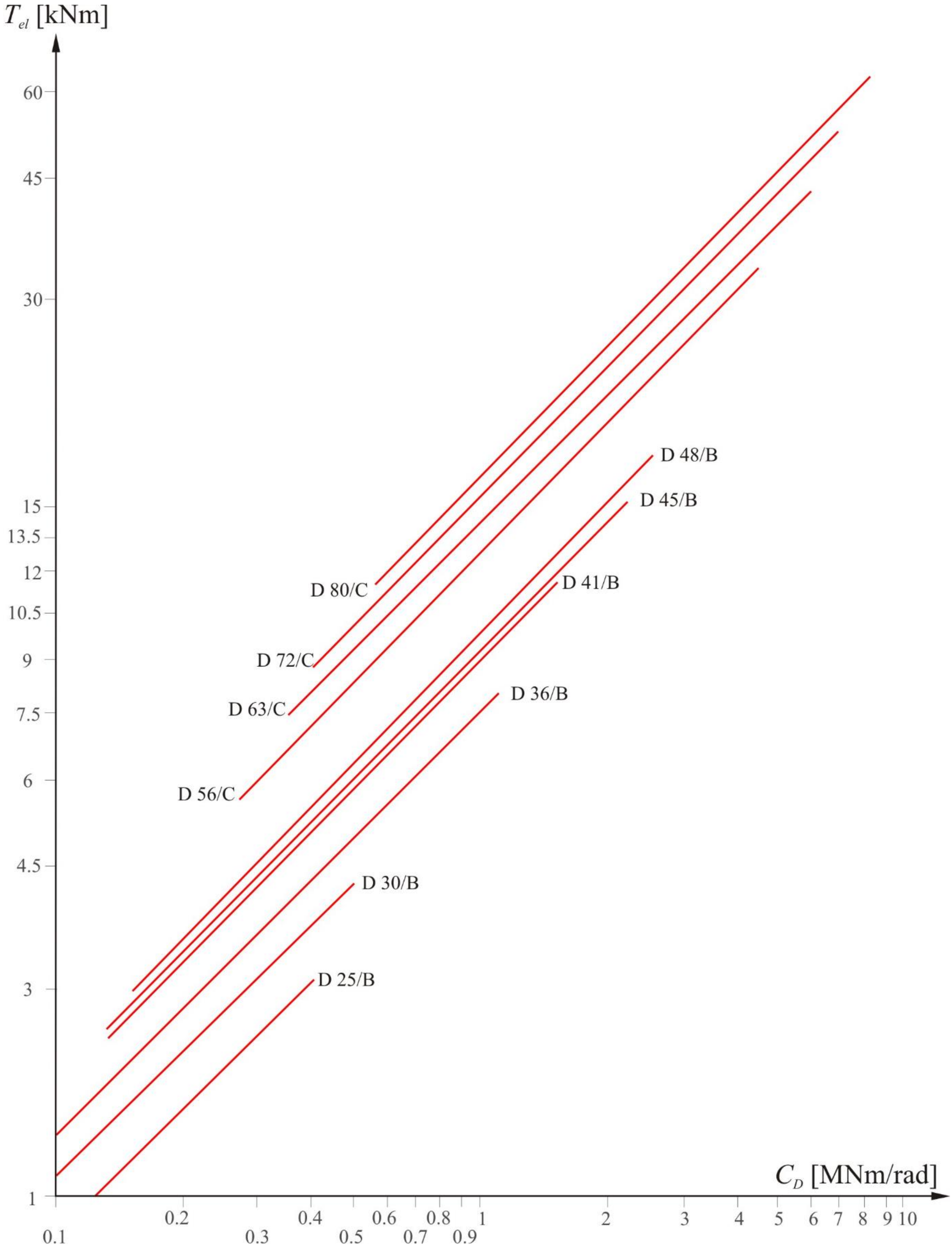


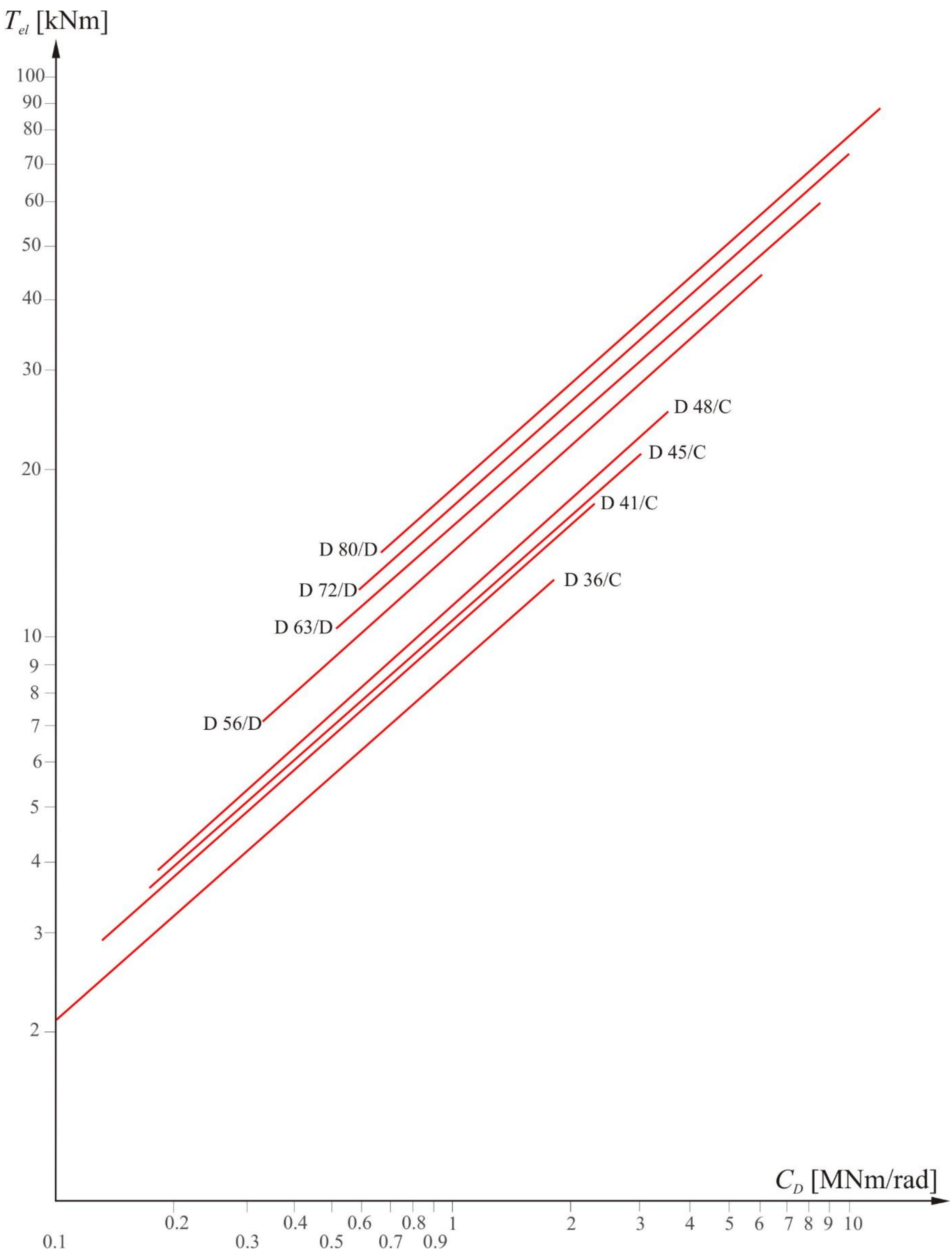


Size		Dimensions					Inertia		Weight		Thermal load	Damping torque
							primary part	secondary part	primary part	secondary part		
		D	d	a	b	c	I_p	I_s	m_p	m_s	P_{KW}	$T_{d,p}$
		mm					kgm²		kg		kW	kNm/bar
110	/D	1100	480	100	150	162	6.98	152	124.0	796	18.0	7.270
110	/E	1100	480	125	180	192	8.72	181	155.0	950	18.0	9.090
110	/F	1100	480	150	210	222	10.50	211	185.0	1100	19.0	10.900
125	/D	1250	540	100	155	169	11.80	263	162.0	1080	22.0	9.120
125	/E	1250	540	125	185	199	14.70	313	202.0	1280	23.0	11.400
125	/F	1250	540	150	215	229	17.70	363	243.0	1480	24.0	13.700
125	/G	1250	540	175	245	259	20.60	412	283.0	1680	25.0	15.900
140	/D	1400	610	100	160	175	18.30	428	201.0	1390	28.0	11.800
140	/E	1400	610	125	190	205	22.90	506	251.0	1650	29.0	14.800
140	/F	1400	610	150	220	235	27.50	585	301.0	1900	30.0	17.700
140	/G	1400	610	175	250	265	32.10	663	351.0	2150	31.0	20.700
160	/E	1600	700	125	190	208	39.00	867	326.0	2150	36.0	18.600
160	/F	1600	700	150	220	238	46.70	1000	391.0	2490	38.0	22.300
160	/G	1600	700	175	250	268	54.50	1140	456.0	2820	39.0	26.000
160	/H	1600	700	200	280	298	62.30	1270	522.0	3150	40.0	29.700
180	/E	1800	780	125	195	215	62.90	1430	417.0	2820	45.0	23.600
180	/F	1800	780	150	225	245	75.50	1650	501.0	3240	47.0	28.600
180	/G	1800	780	175	255	275	88.00	1860	584.0	3660	48.0	33.300
180	/H	1800	780	200	285	305	101.00	2080	668.0	4090	49.0	38.000

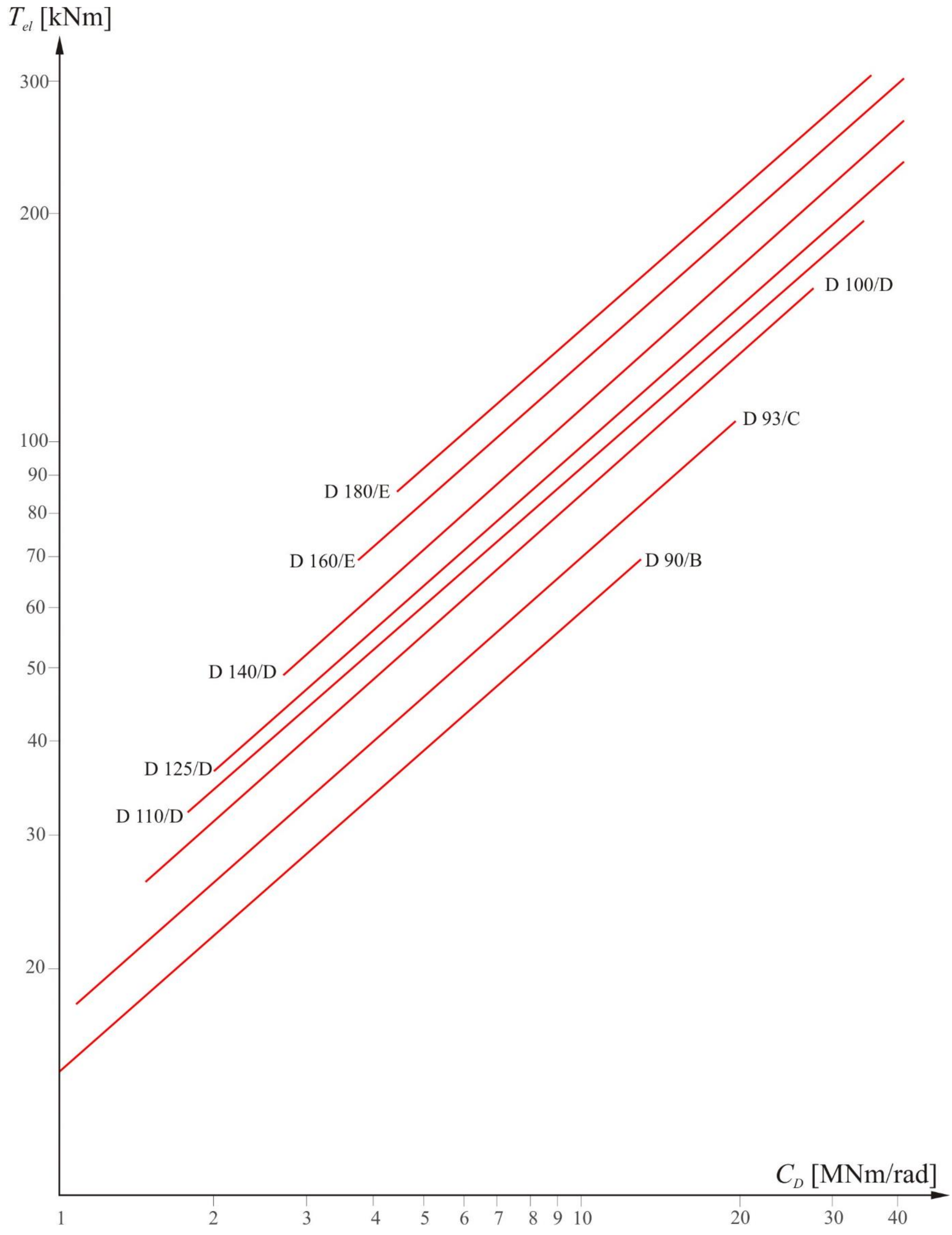
All technical data are without warranty. Modifications of dimensions and design are reserved.

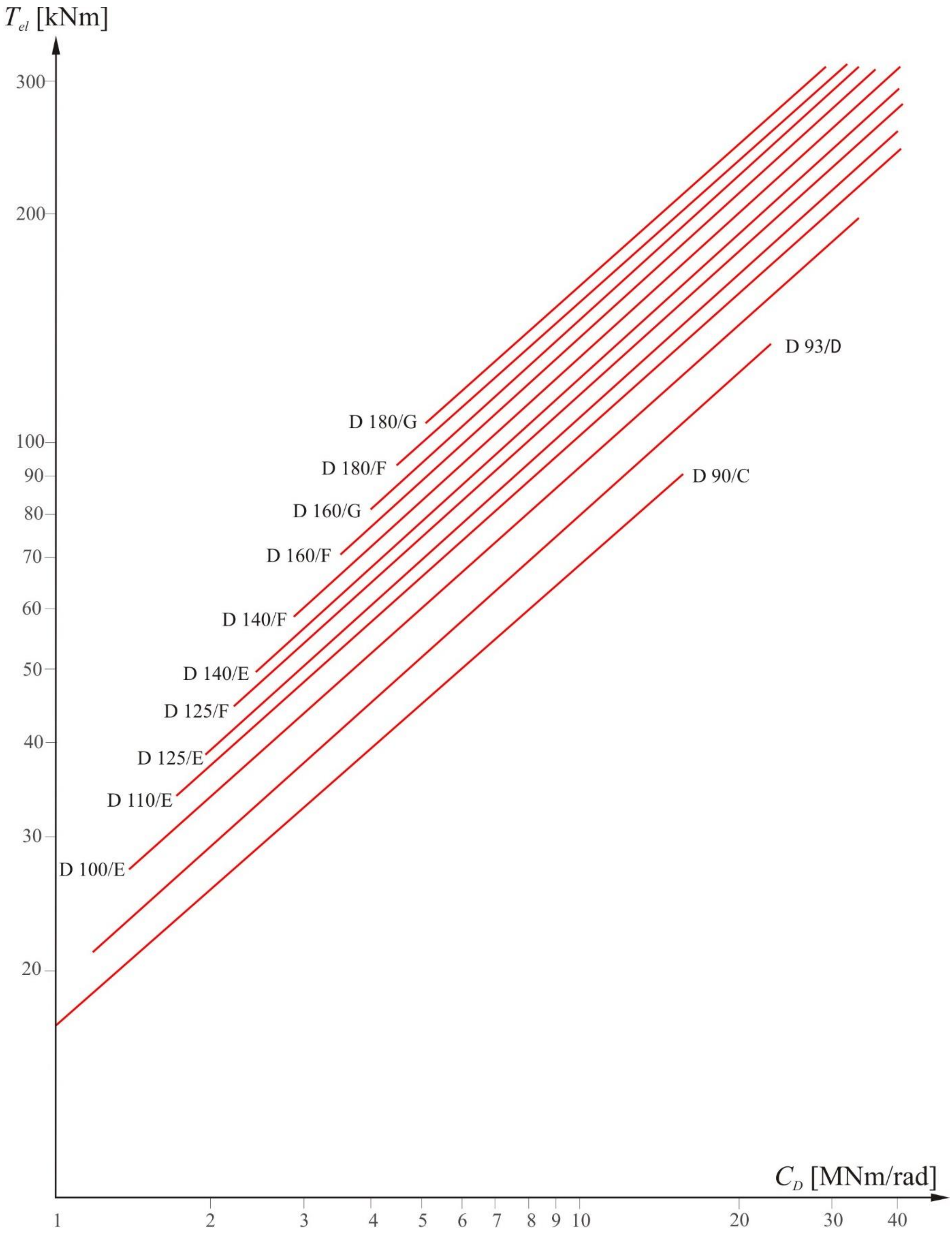
Permissible Elastic Torque





GEISLINGER®
POWERTRAIN SOLUTIONS. BUILT TO LAST.


T_{el} [kNm]
300
200
100
90
80
70
60
50
40
30
20
D 180/E
D 160/E
D 140/D
D 125/D
D 110/D
D 100/D
D 93/C
D 90/B
C_D [MNm/rad]
1
2
3
4
5
6
7
8
9
10
20
30
40



GEISLINGER®
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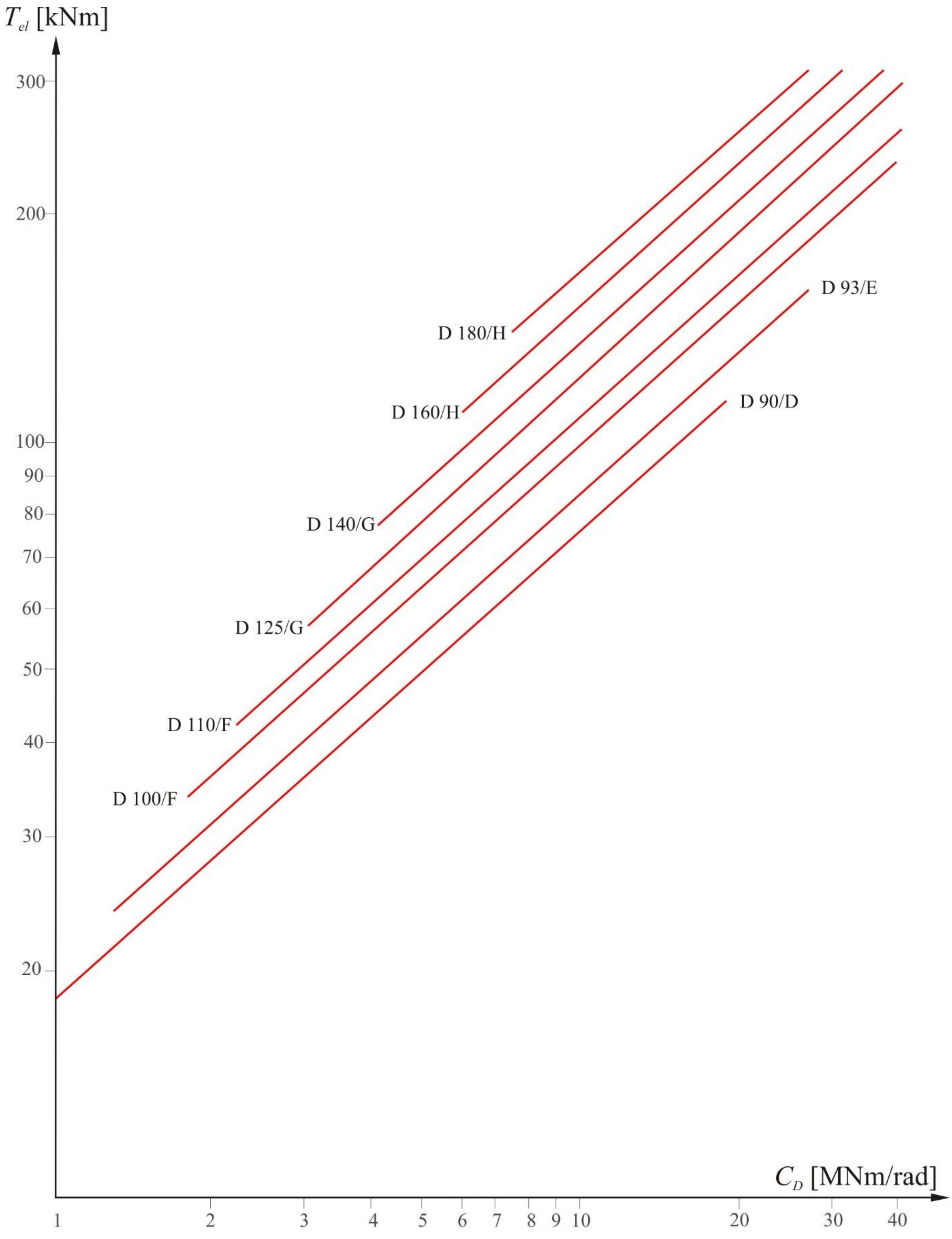
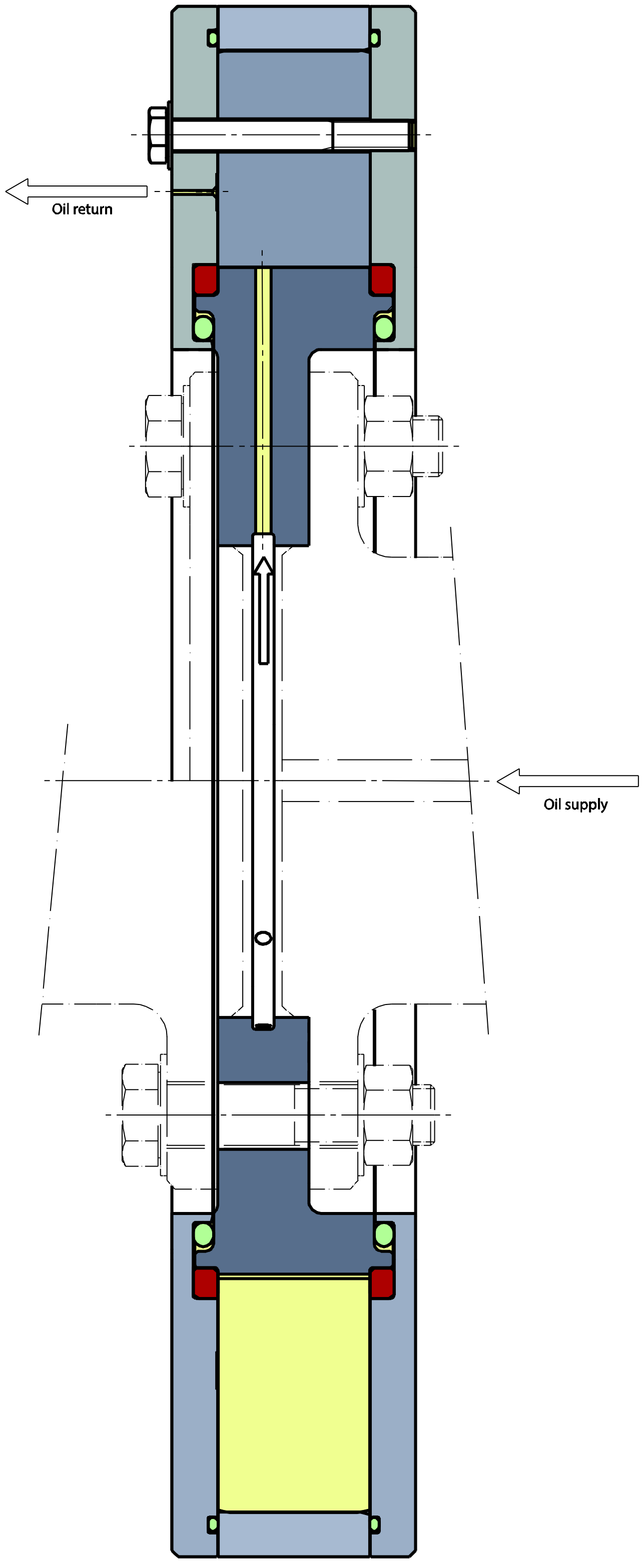


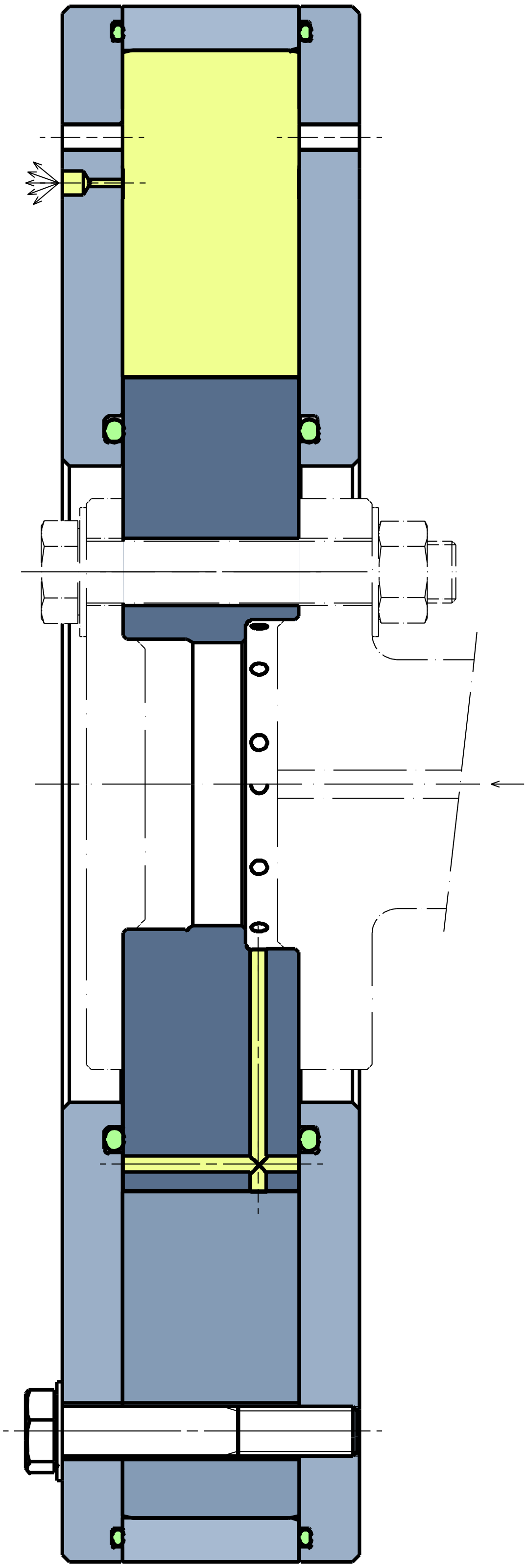
T_{el} [kNm]
300
200
100
90
80
70
60
50
40
30
20
D 180/H
D 160/H
D 140/G
D 125/G
D 110/F
D 100/F
D 93/E
D 90/D
C_D [MNm/rad]
1
2
3
4
5
6
7
8
9
10
20
30
40

Examples

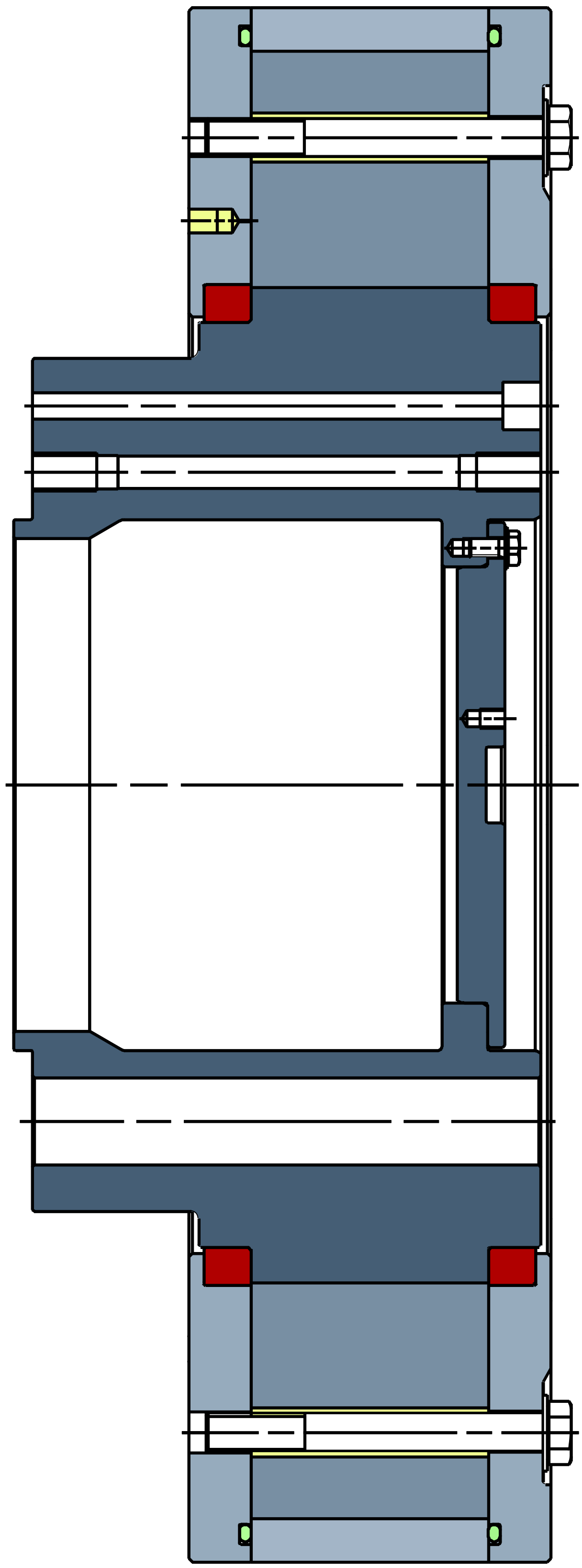
■ Geislinger Damper - standard design with bearing



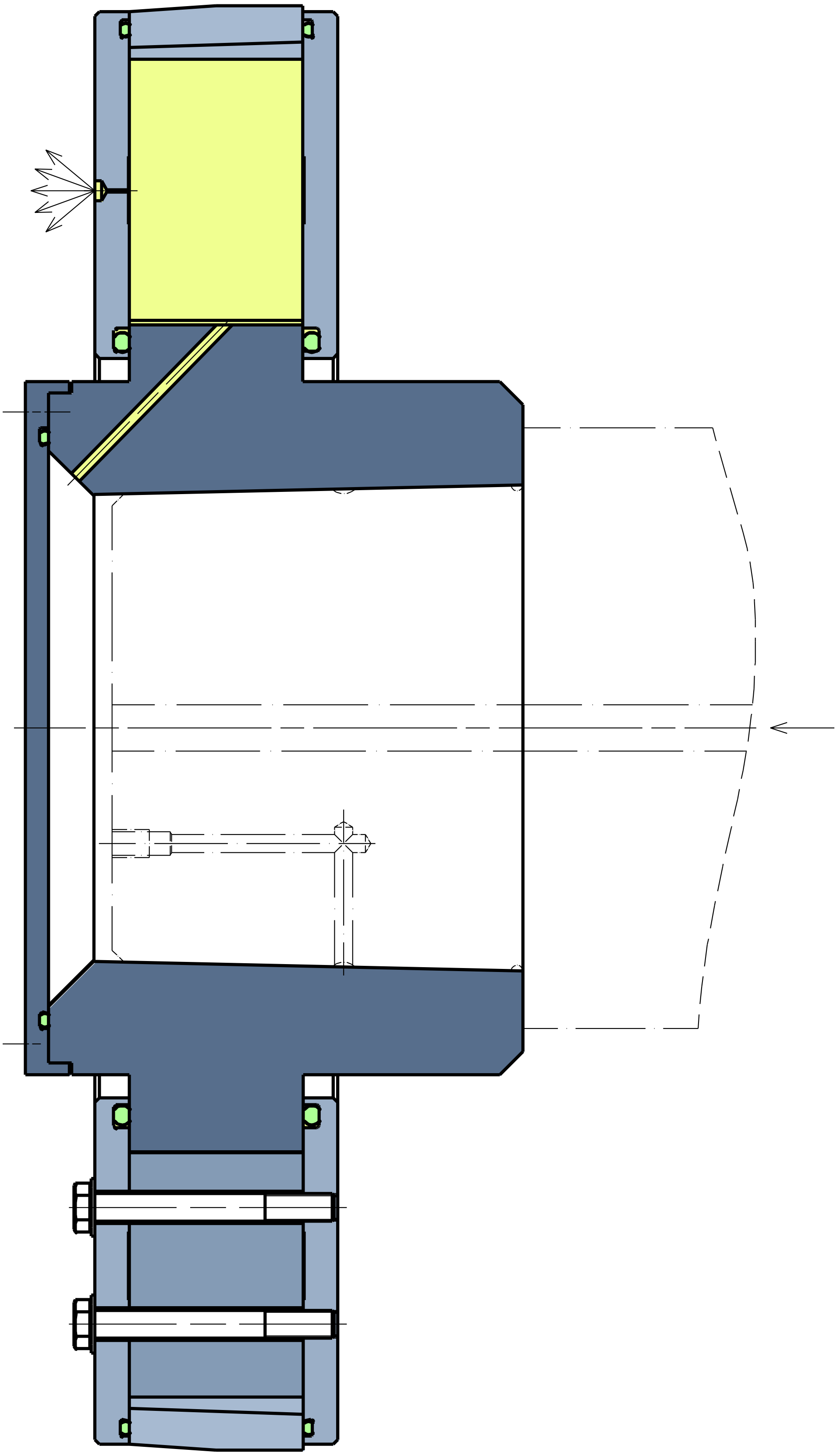
Geislinger Damper - standard design without bearing



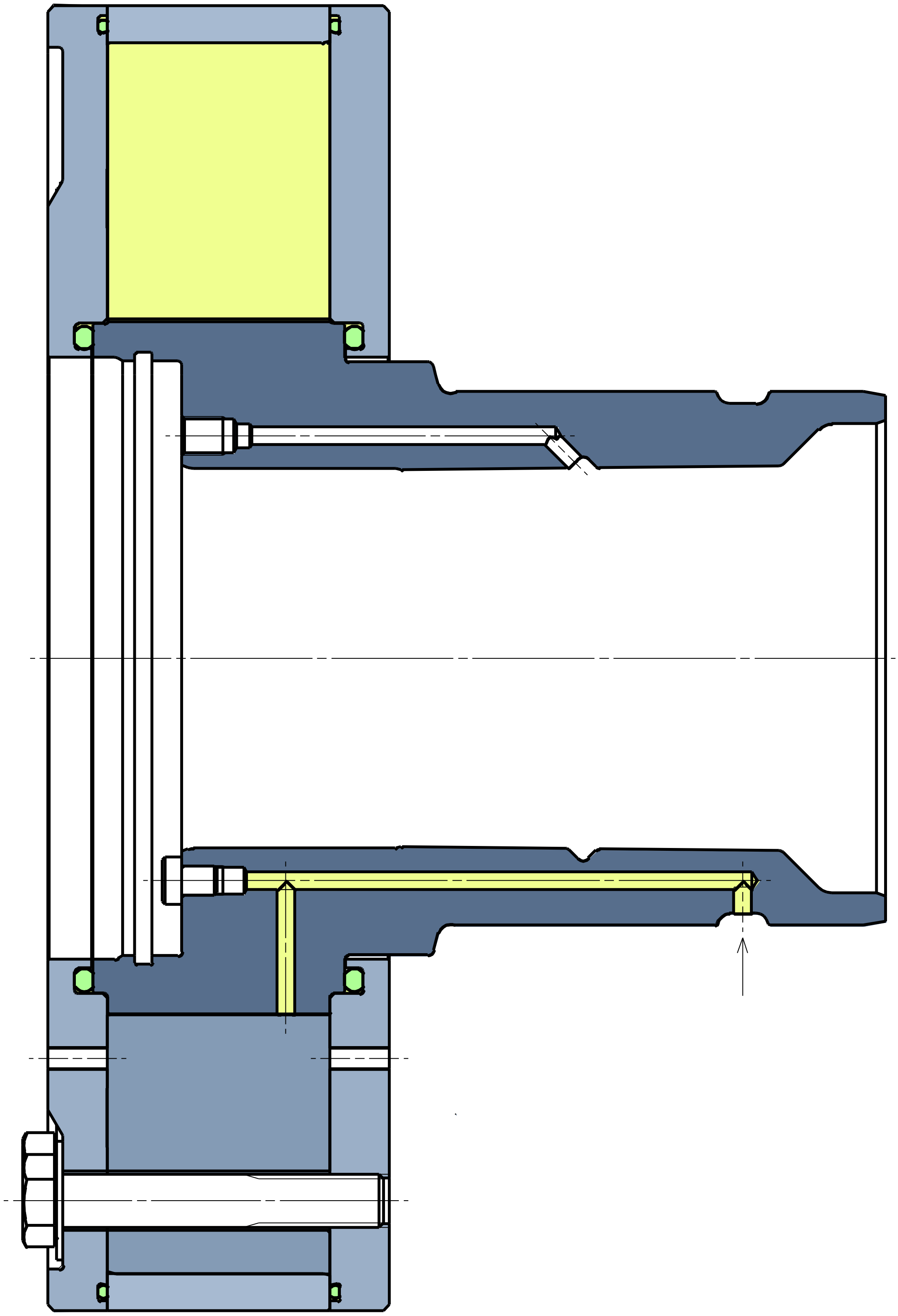
■ Geislinger Damper – standard design without dynamic o-rings



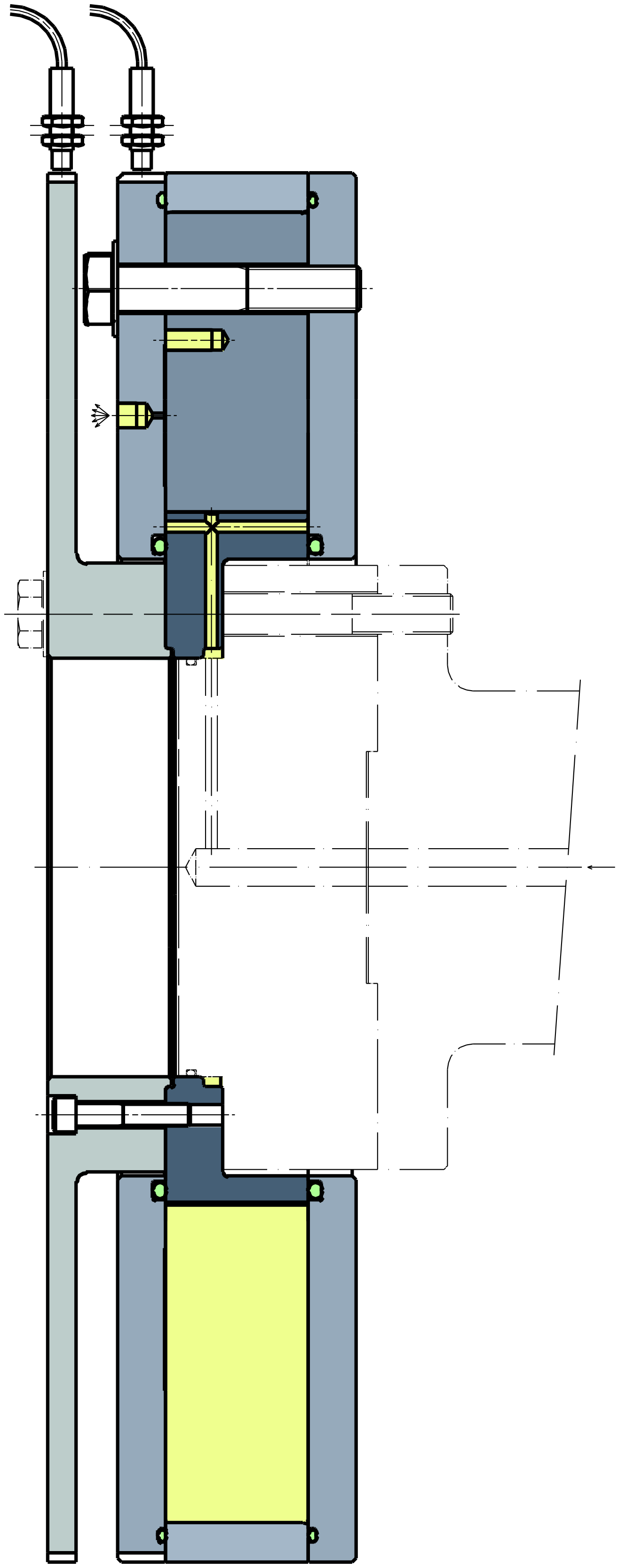
Geislinger Damper for 4-stroke engine with tapered hub



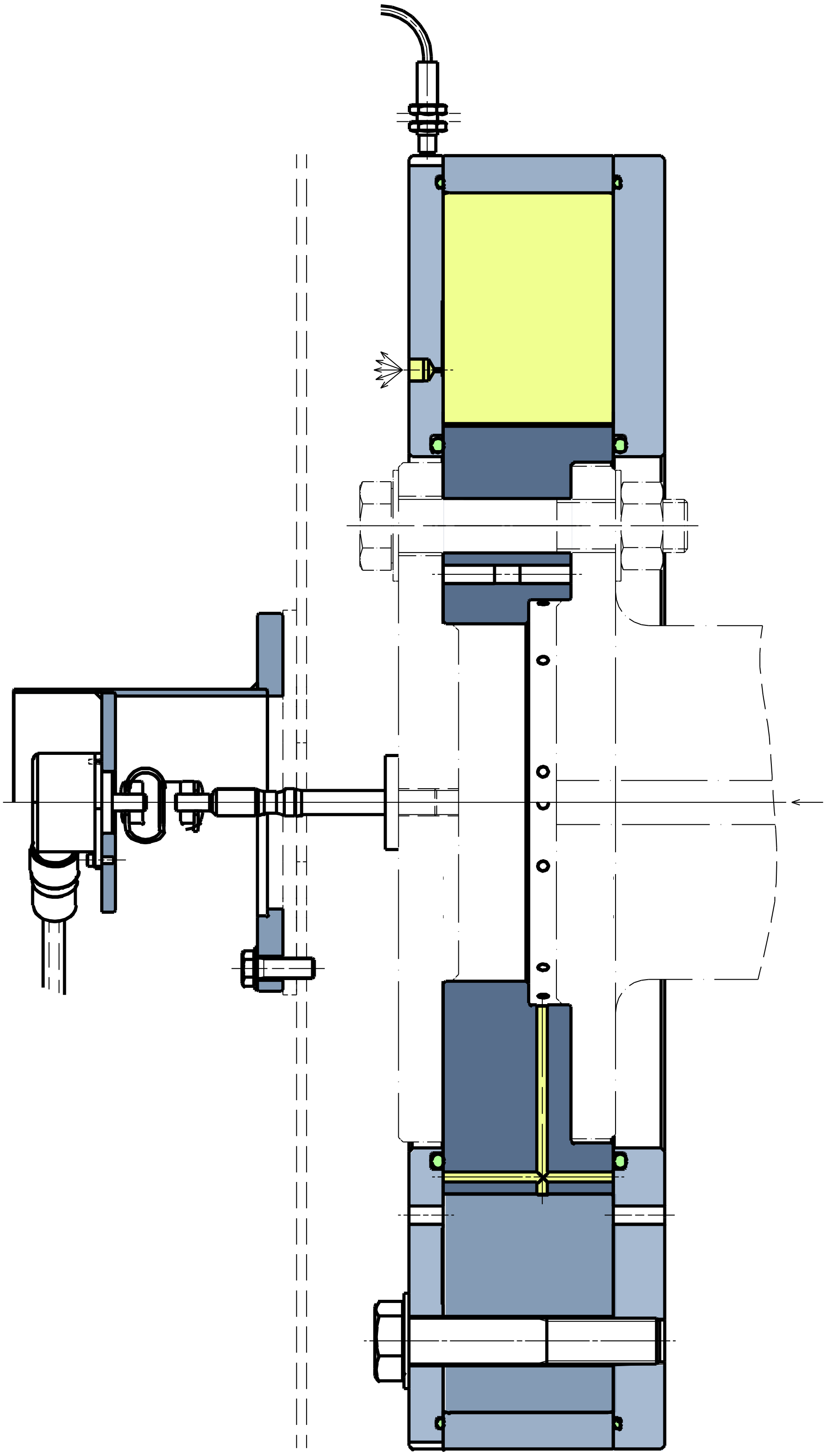
Geislinger Damper with tapered hub



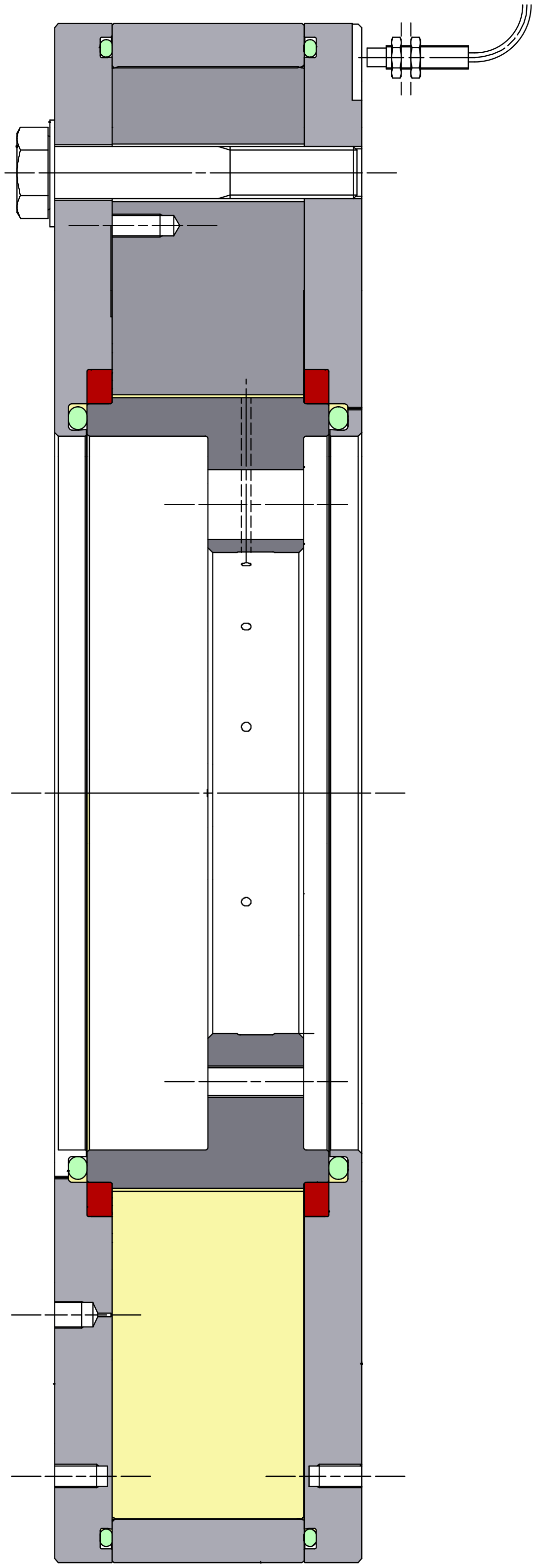
Geislinger Damper with sensor pick up



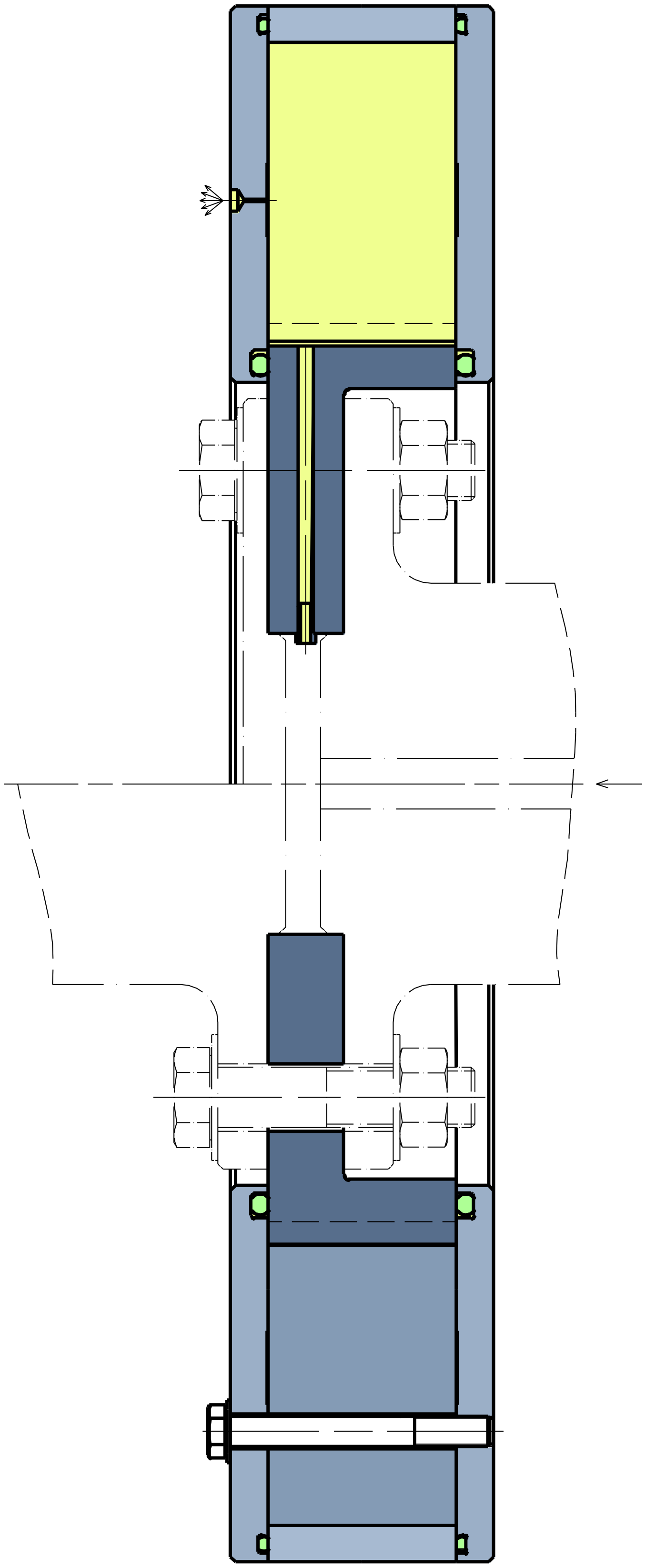
Geislinger Damper with sensor/angle encoder measurement pick-up



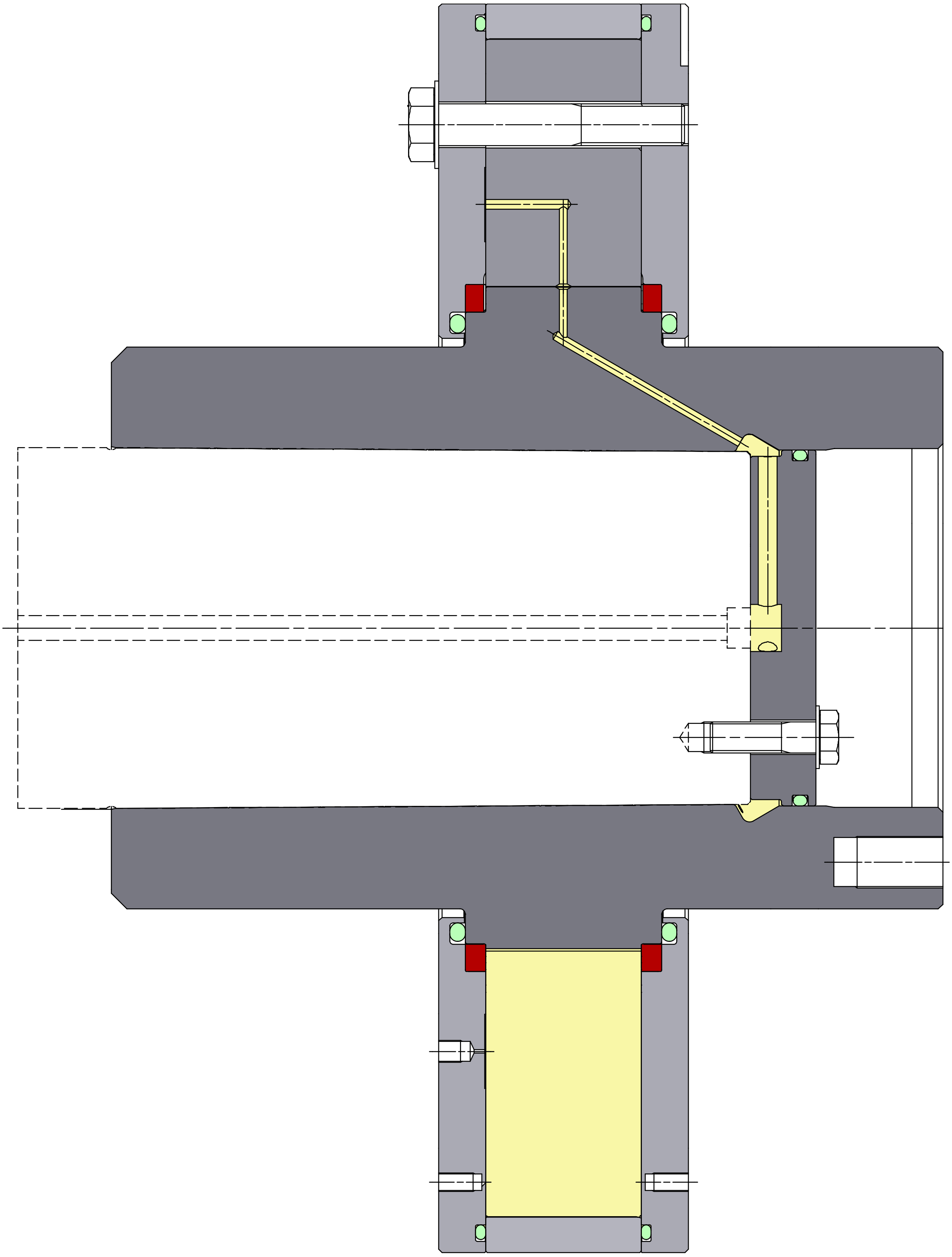
Geislinger Damper with sensor pick up axially



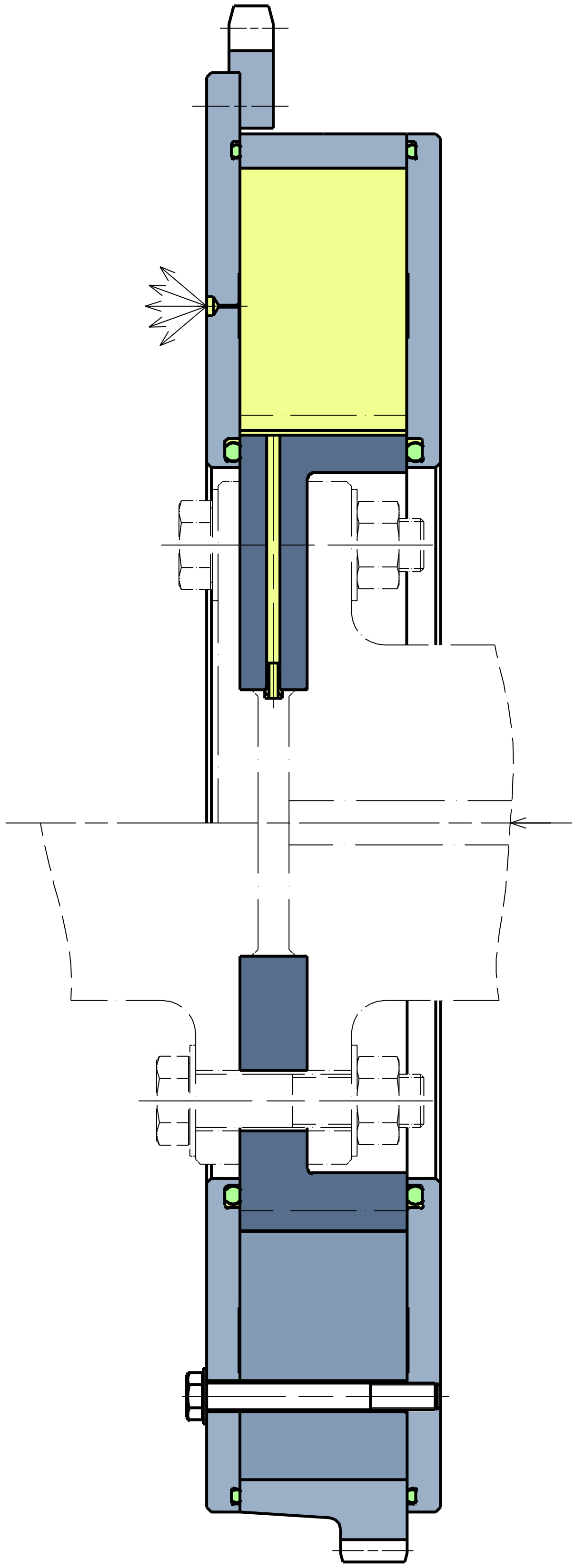
Geislinger Damper with PTO connection



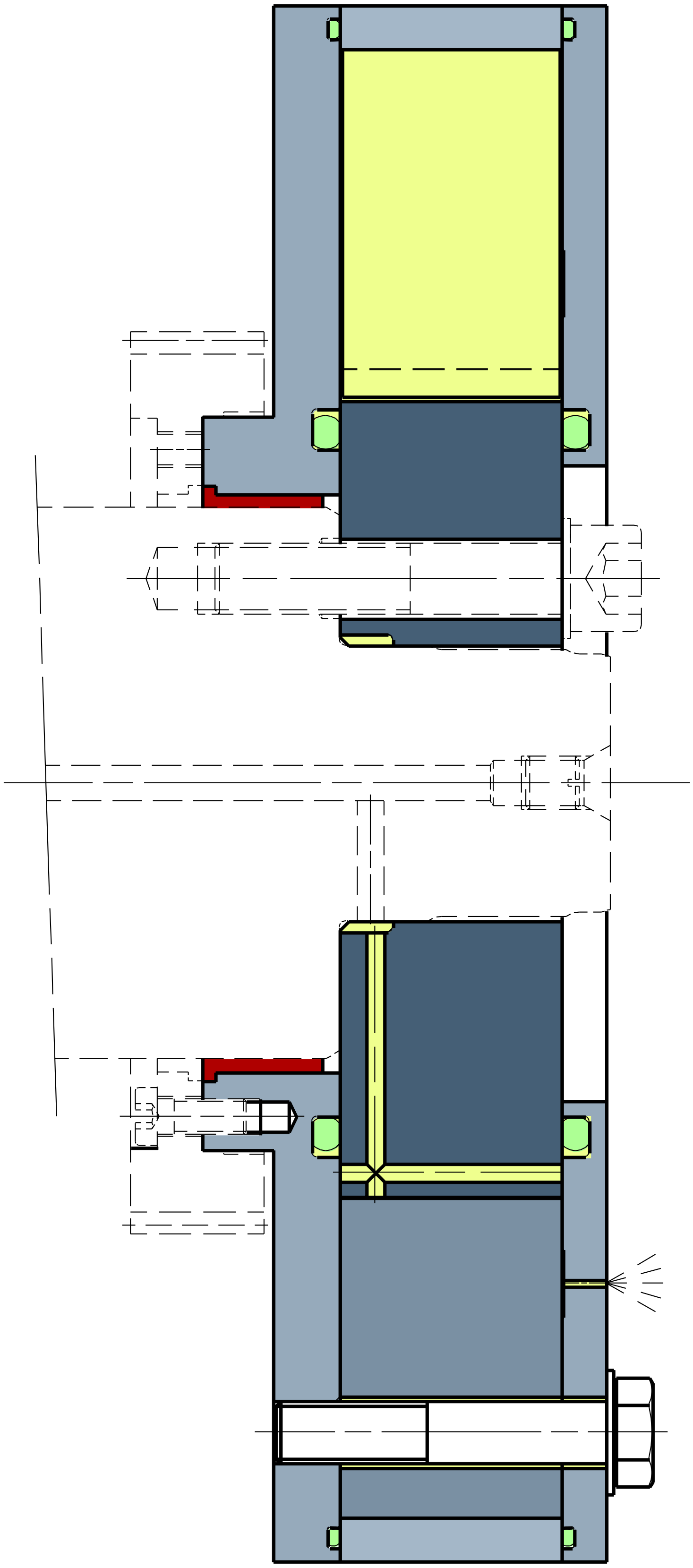
Geislinger Damper with taper hub and PTO interface



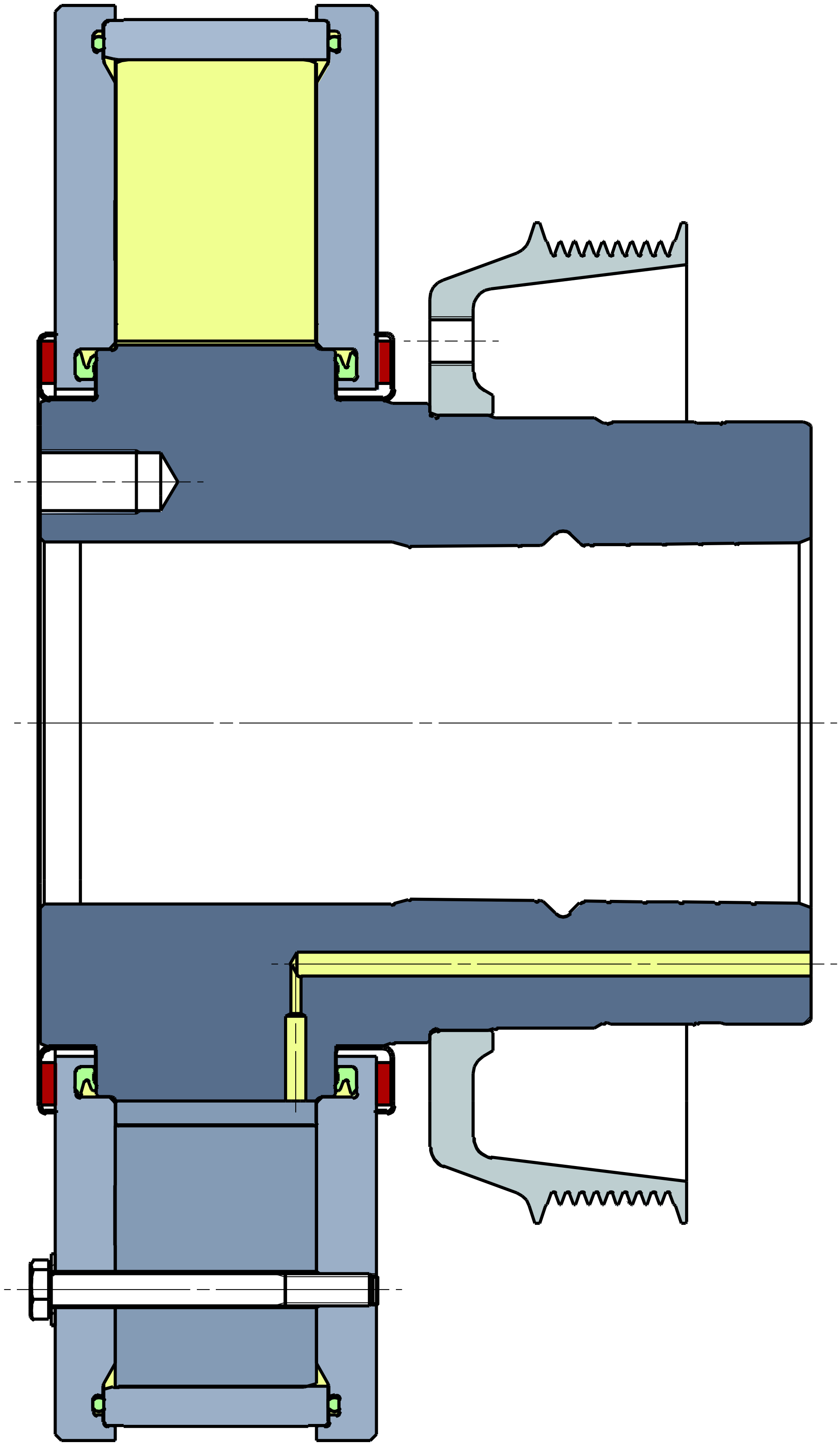
Geislinger Damper for 4-stroke engine with auxiliary gear drive



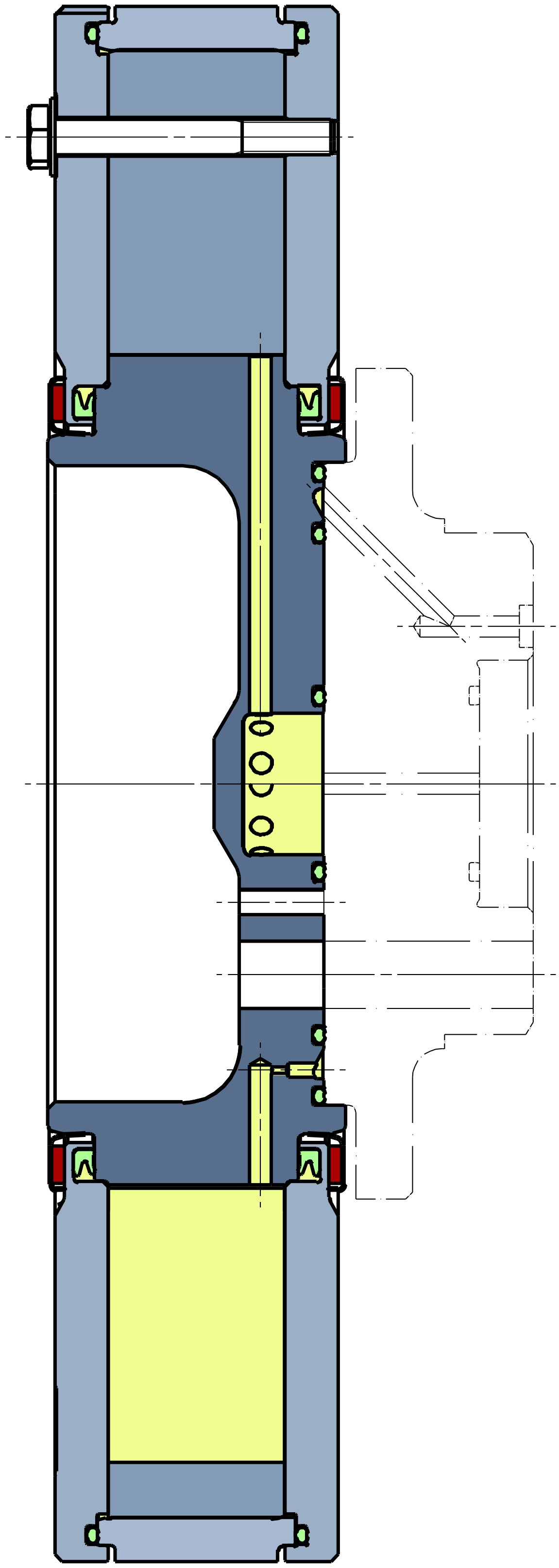
Geislinger Damper for 4-stroke engine with integrated drive gear



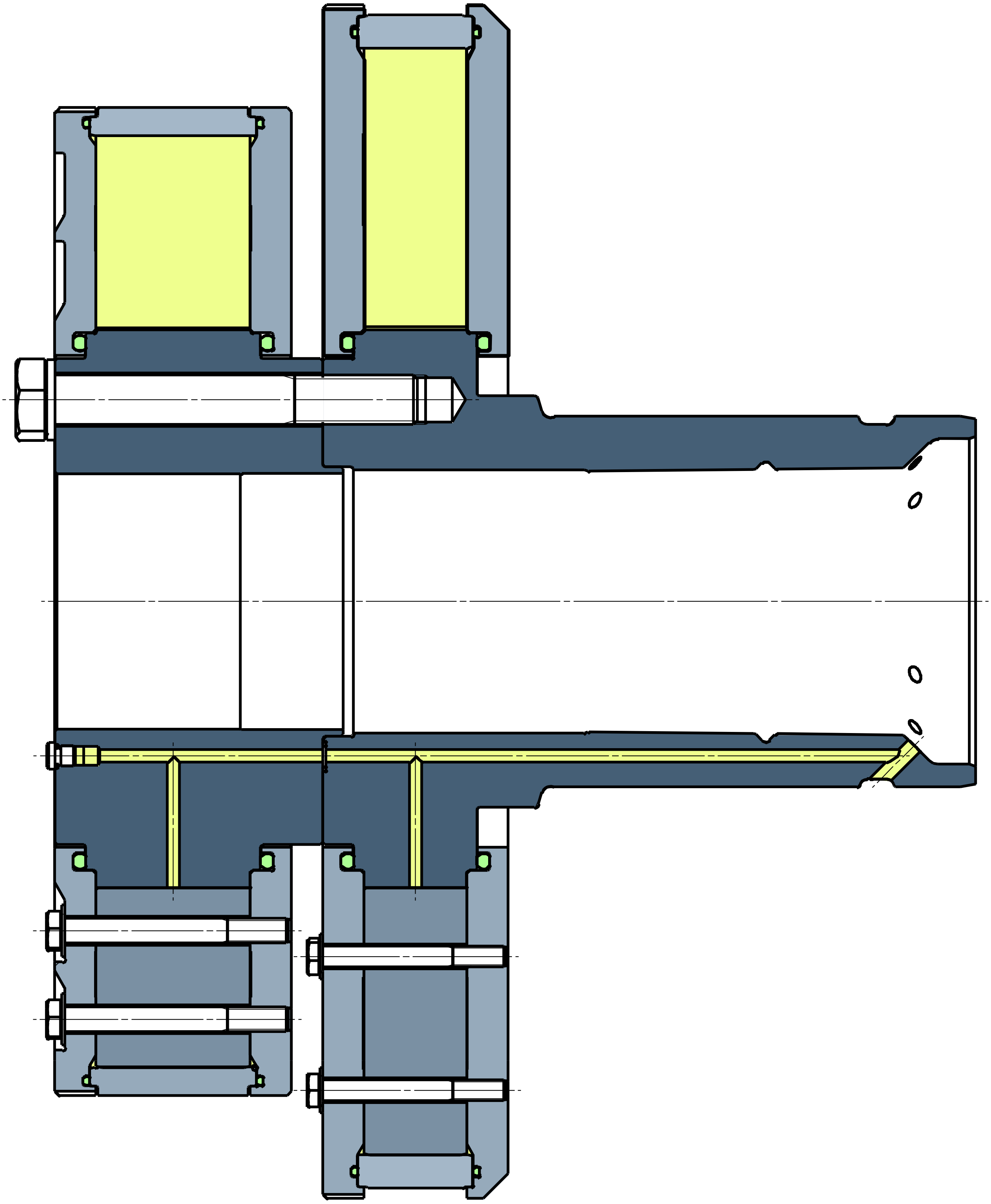
Geislinger Damper with tapered hub



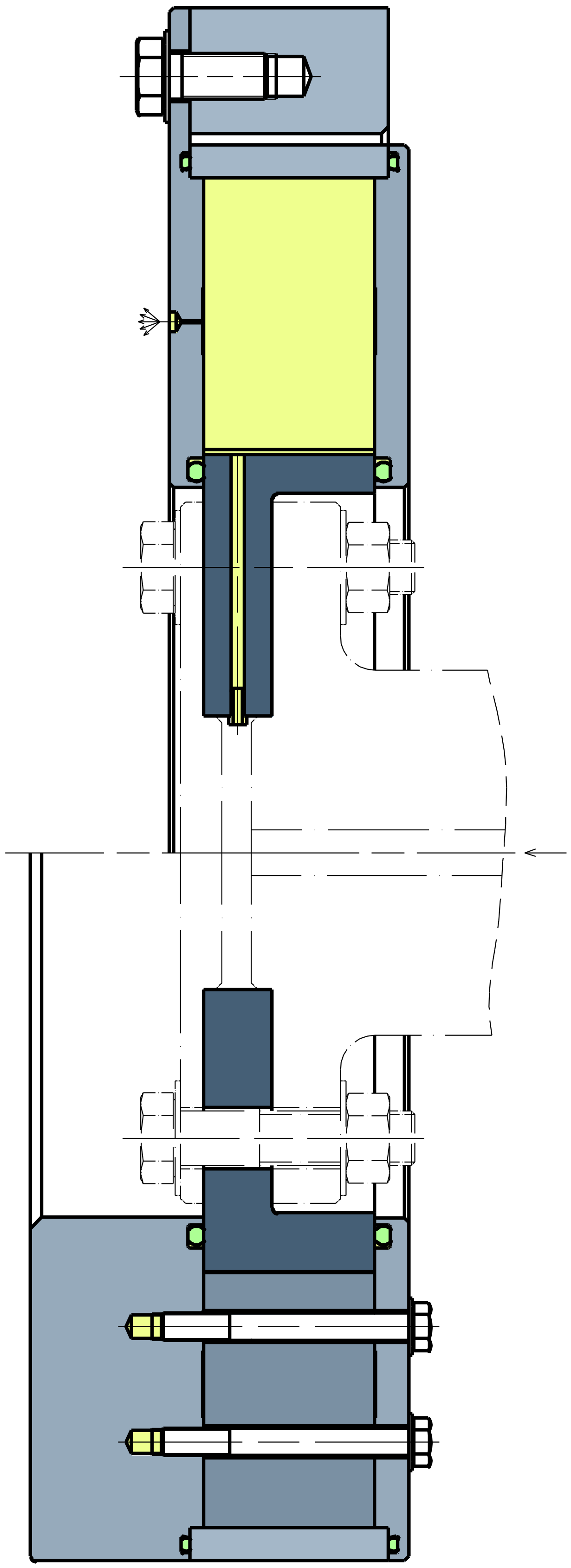
Geislinger Damper located outside of crankcase with special sealing



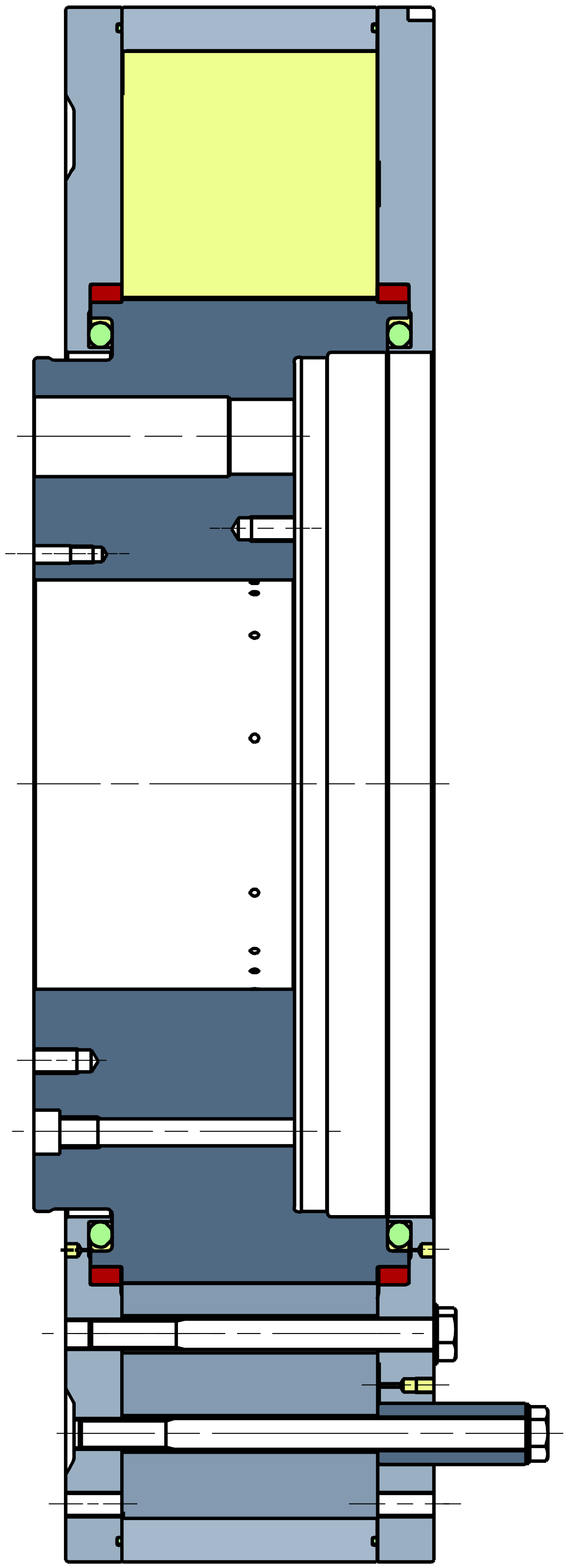
Geislinger Dual Damper configuration



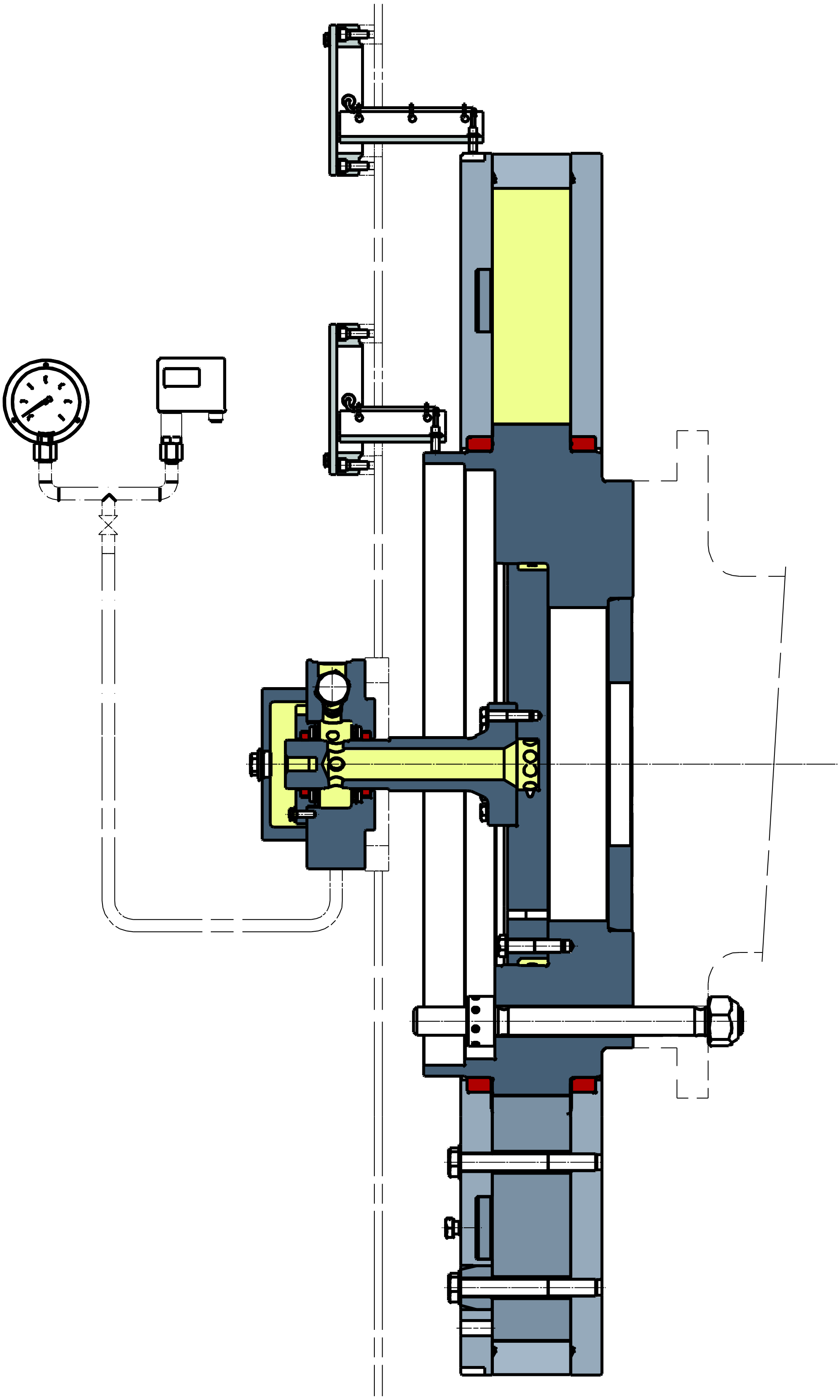
Geislinger Damper with additional mass



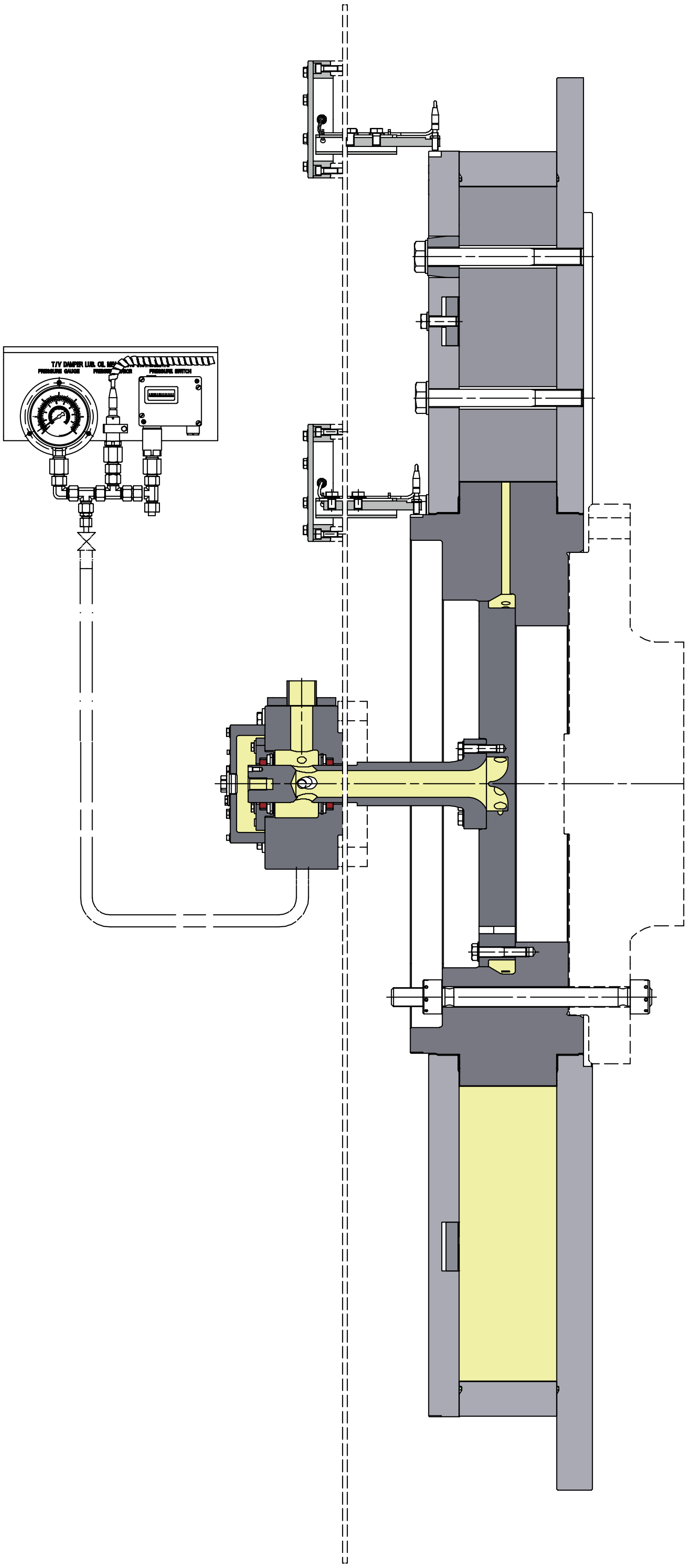
Geislinger Damper with laterally removable side plate



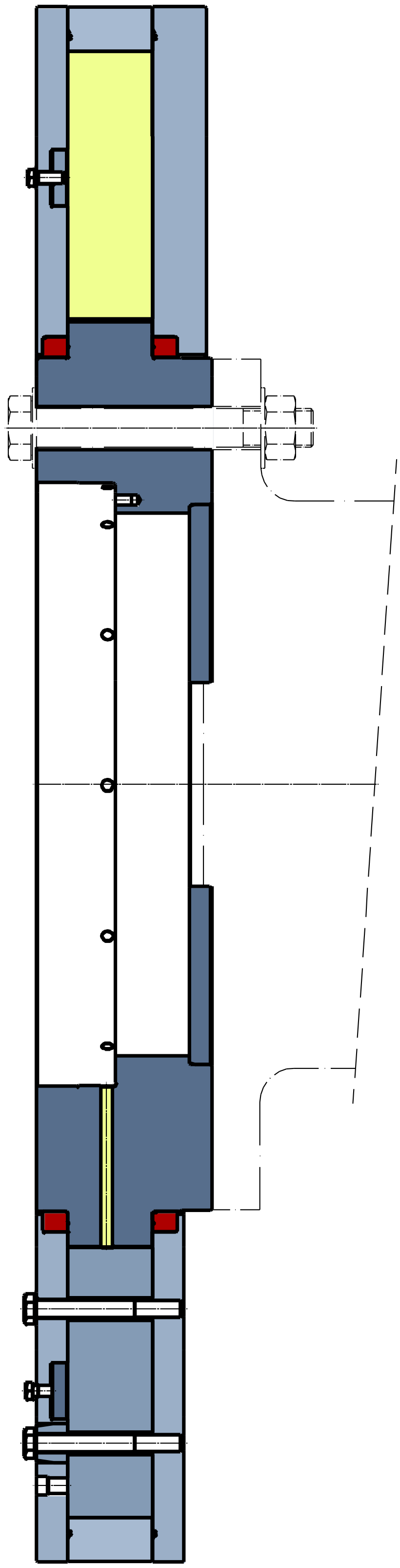
Geislinger Damper 2 stroke / external oil supply and sensors



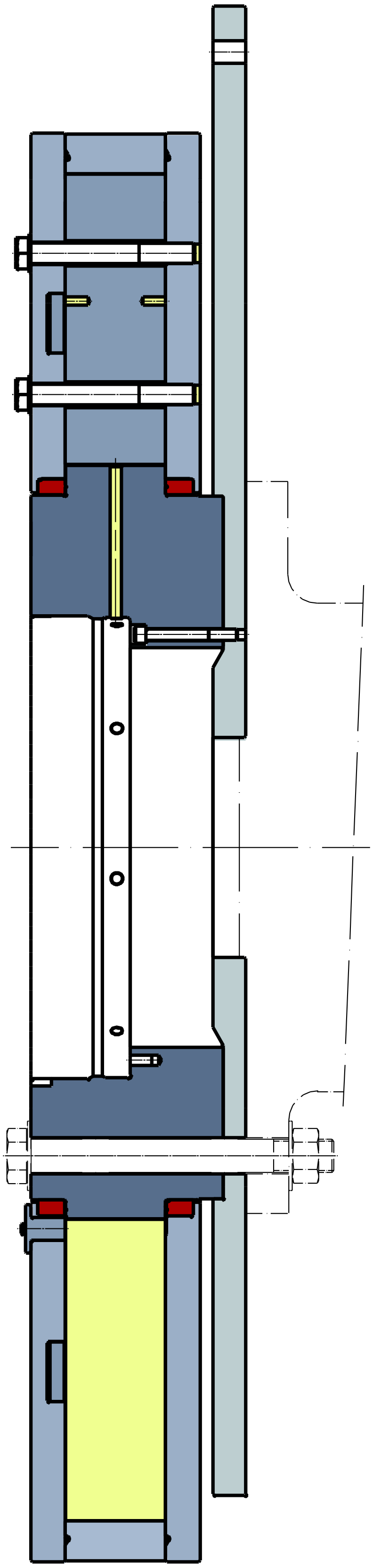
Geislinger Damper 2 stroke external oil supply, sensors and hydraulic kit



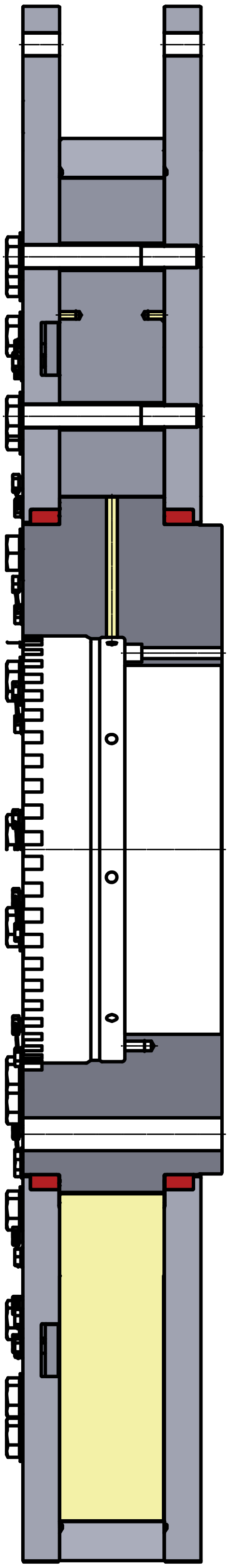
Geislinger Damper 2 stroke with integrated counter weight



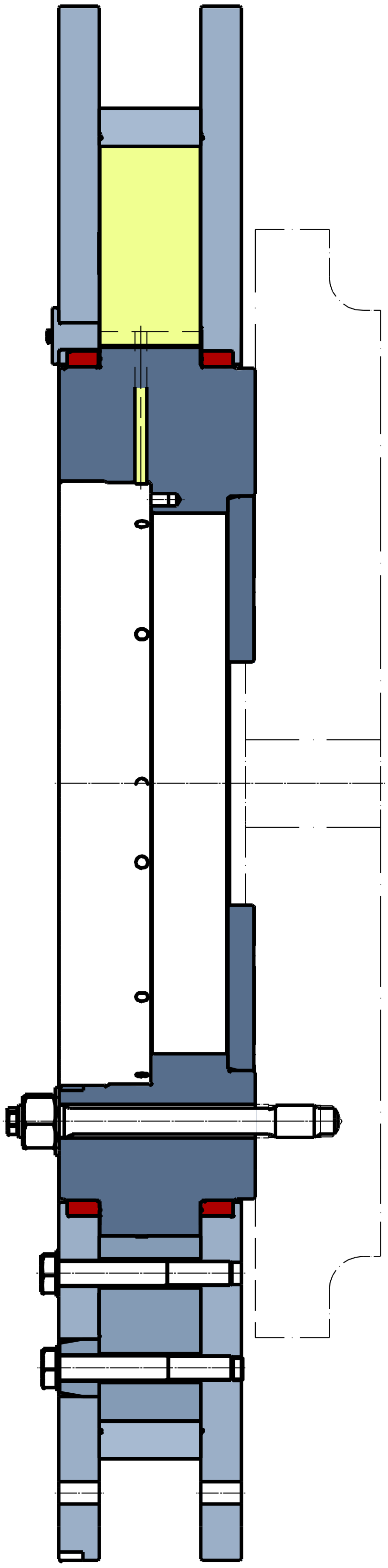
Geislinger Damper 2 stroke with excentric counter weight



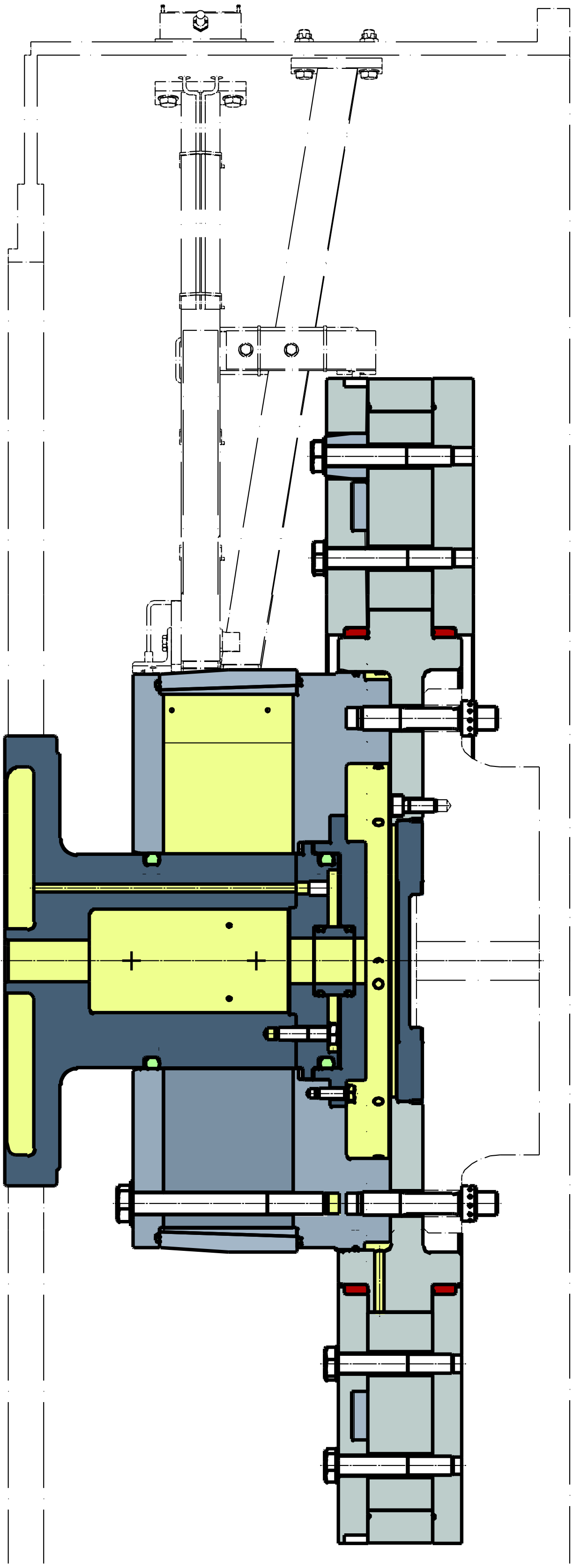
Geislinger Damper 2 stroke with excentric counter weight integrated



Geislinger Damper 2 stroke with additional mass integrated



Geislinger Damper / Coupling combination for free end PTO



Geislinger Coupling

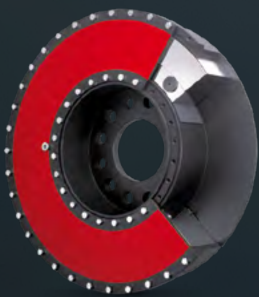
Geislinger Silenco®

Geislinger Carbotorq®

Geislinger Damper

Geislinger Monitoring

Geislinger Flexlink



Geislinger Vdamp®

Geislinger Gesilco®

Geislinger Gesilco® Shaft

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