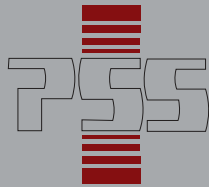


Pipe Support Systems GmbH
International

Dynamically Stressed Pipe Supports



Å wir unterstützen Sie
Å we support you



Pipe Support Systems GmbH
International



... we are

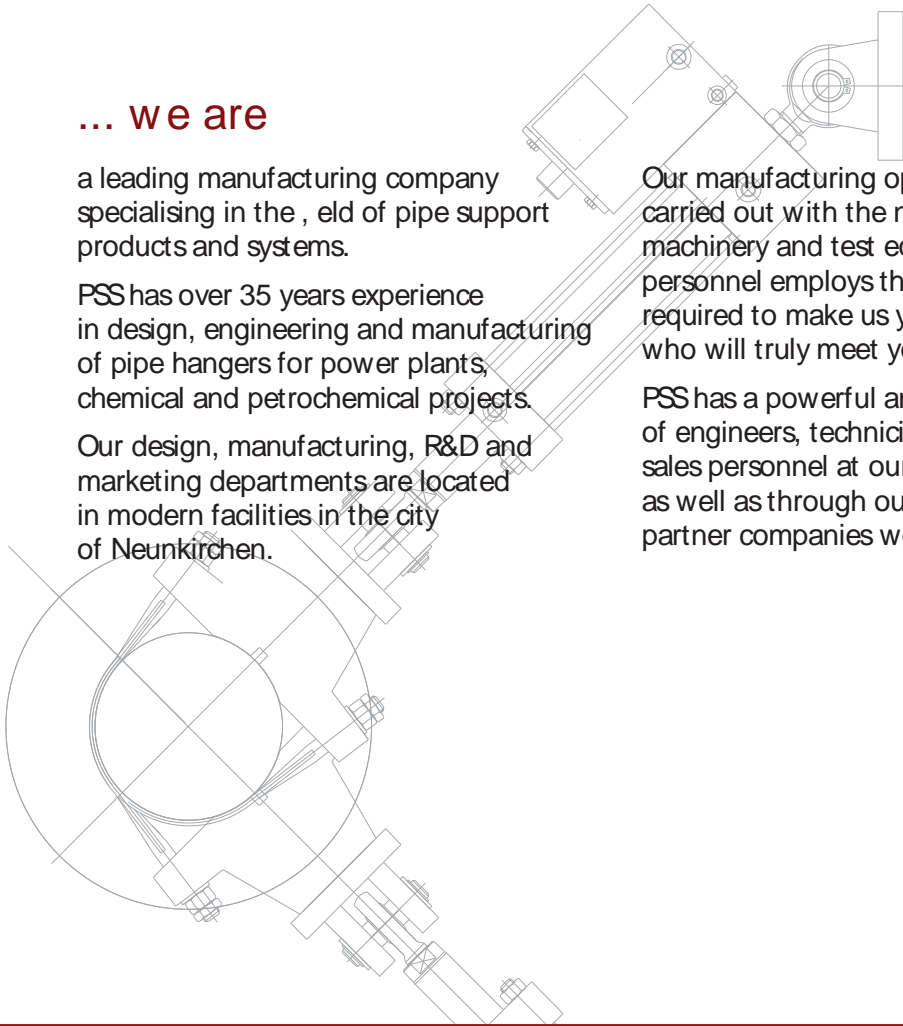
a leading manufacturing company specialising in the field of pipe support products and systems.

PSS has over 35 years experience in design, engineering and manufacturing of pipe hangers for power plants, chemical and petrochemical projects.

Our design, manufacturing, R&D and marketing departments are located in modern facilities in the city of Neunkirchen.

Our manufacturing operations are carried out with the newest production machinery and test equipment and our personnel employs the proven technology required to make us your reliable partner who will truly meet your needs.

PSS has a powerful and experienced team of engineers, technicians, service and sales personnel at our Neunkirchen facility as well as through our representatives and partner companies worldwide.





ENGINEERING

Design and Calculation of all Types
of Pipe Supports
Detail Engineering
PDMS Engineering
Design of Special Pipe Supports
Stress Analysis and Finite Element Analysis

... OUR PRODUCT RANGE

Hydraulic Shock and Sway Suppressors
(snubbers)
Constant Hangers and Supports
Variable Spring Hangers and Supports
Pipe Clamps
Sway Struts
Special Pipe Supports
Accessories for Pipe Hangers

... OUR MAJOR MARKETS

Nuclear and Conventional Power Plants
Refineries
Platforms
Oil, Gas and Chemical Process Plants
and Related Industries

... OUR QUALITY STANDARDS

DIN EN ISO 9001
KTA 1401
SIEMENS QSP 4A

PSS STANDARD SUPPORTS

are designed in accordance with:

DIN EN, VGB and SVDB Specifications
BS3974, Part 1
KTA 3205.3
ANSI B 31.1
MSS SP 58 and MSS SP 69
ASME Section III, Subsection NF

PSS INTERNATIONAL PRODUCTS

are worldwide present in more than 60 countries
in Europe, Asia, North- and South America, Africa
and Oceania.

• wir unterstützen Sie
• we support you



Content Summary

Dynamically Stressed Pipe Supports	5
1. Hydraulic Shock Suppressors and Vibration Dampers	6
General Information on Hydraulic Shock Suppressors and Vibration Dampers (Snubbers) Application, Function	6
Construction and quality characteristics	7
Design Variations	8
Standard settings and test values, Maintenance of hydraulic shock suppressors and vibration dampers	9
Test Diagram for Hydraulic Snubbers	10
Technical data Allowable loads	11
Figures without extension: Figures 200A, 200B, 202A Figures with extension: Figures 201A, 201B, 203A	12
Figures 200A, 201A	13
Figures 200B, 201B	14
Figures 202A, 203A	15
Calculation cold position, hot position	16
2. Extensions	17
Extension pieces for Hydraulic Shock and Sway Suppressors	17
Technical data Extension pieces, Fig. 201S, 201C and 201W	18
3. Sway struts	19
General Information on Sway struts Application, Construction and quality characteristics, Design Variations	19
Technical data Figure 211L Typ E1	20
Figure 211L Typ E2	21
4. Weld-on brackets	22
General Information on Weld-on brackets	22
Technical data Figure EHS 14S	23
5. Dynamic load clamps	24
General Information on Dynamic load clamps	24
Technical data Dynamic three bolt clamp, Fig. 211R	25
Dynamic yoke clamp, EHS17D	28
Dynamic U-Bolt clamp, EHS18S	32
Dynamic Vertical clamp, Fig. 403D	34

Dynamically Stressed Pipe Supports



Dynamically stressed pipe supports from PSS are used to support, restrain and suppress dynamic load events.

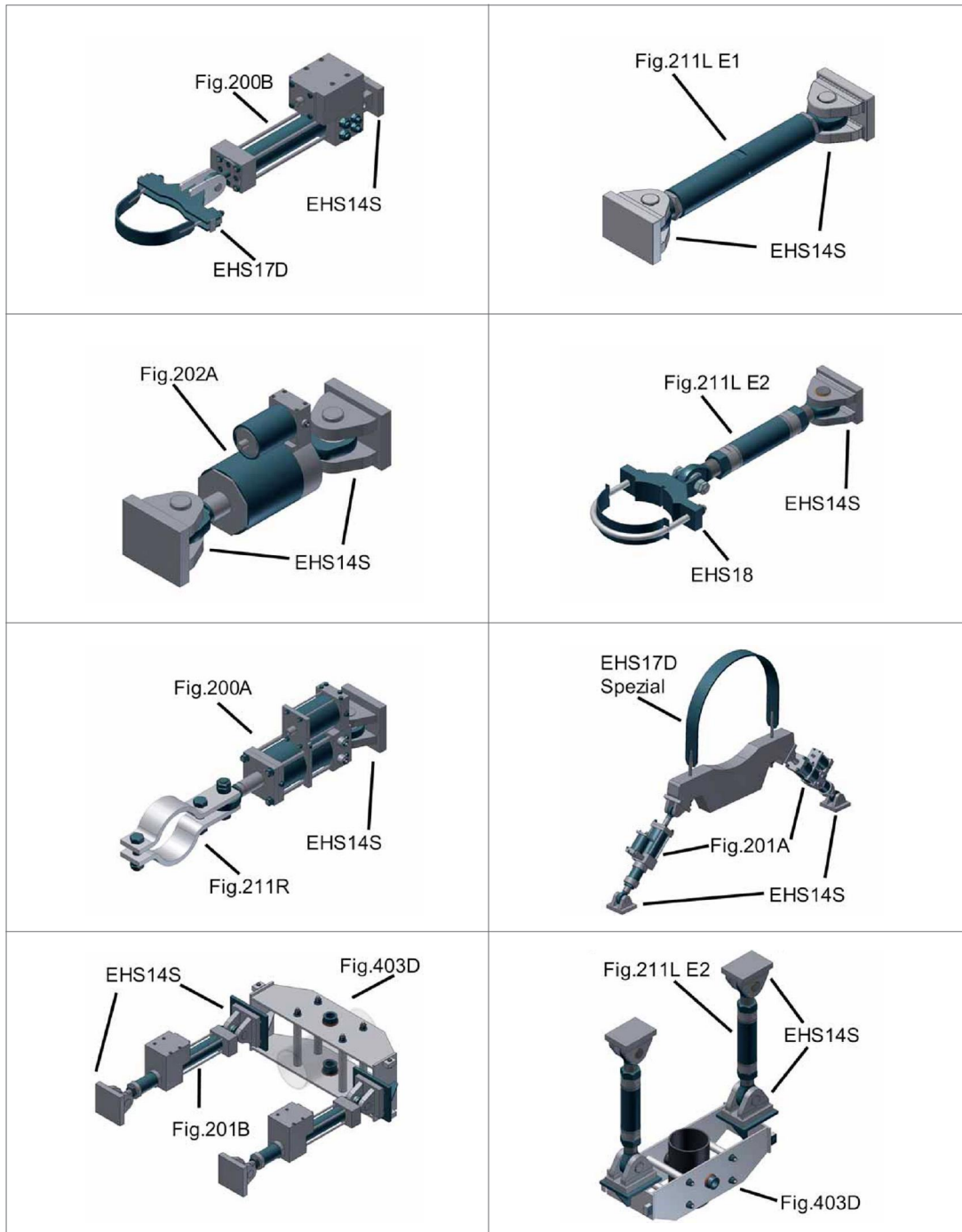
This group consists of the following products:

Hydraulic shock suppressors
and vibration dampers

Sway struts

Weld-on brackets

Dynamic pipe clamps



Hydraulic Shock Suppressors and Vibration Dampers

1. Hydraulic Shock Suppressors and Vibration Dampers

1.1 Application

Hydraulic shock suppressors and vibration dampers are components of great relevance to the technical safety of pipelines and system components, and are employed for the purpose of their protection.

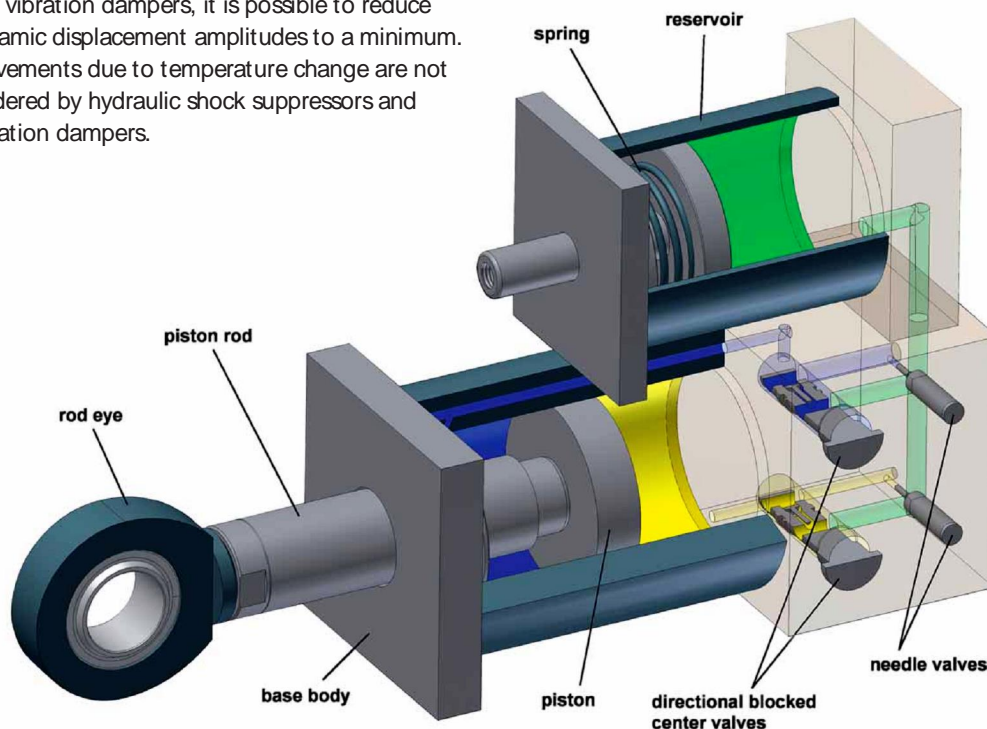
PSS hydraulic shock suppressors and vibration dampers are employed to prevent damage to apparatuses, pipelines, pressure vessels, valves and pumps, which can occur through suddenly acting forces. This includes dynamic load events which can occur during operation, such as water hammer, pipe bursts or pressure surges caused by blowing off safety valves, as well as cases resulting from external events and conditions, such as earthquakes, explosions and wind load. Moreover, PSS hydraulic shock suppressors and vibration dampers can be employed in vibrating pipelines and system components where vibration damping is required.

Conditions: Amplitude is greater than 0.5 mm
Frequency is in the range 1-33Hz

By employing hydraulic shock suppressors and vibration dampers, it is possible to reduce dynamic displacement amplitudes to a minimum. Movements due to temperature change are not hindered by hydraulic shock suppressors and vibration dampers.

1.2 Function

In the event of a dynamic load that causes the piston to move faster than the locking velocity set by PSS (standard velocity 2 mm/s), the check valve closes, the free flow of the silicon oil is impeded, and the shock suppressor absorbs forces. When the pre-set force level is not attained, for instance when the direction of movement is reversed, the check valve opens up again. In the event of a vibrating movement, both check valves open and close alternately, i.e. the shock suppressor absorbs the same load in both tension and compression directions. The bypass (or over) valve allows the piston to yield as far as the defined nominal load.



Hydraulic Shock Suppressors and Vibration Dampers



1.3 Construction and quality characteristics

The PSS hydraulic shock suppressors and vibration dampers have pressurized hydraulic systems thus allowing their installation in any position and orientation. The fluid level of the suppressors can be easily and accurately verified through the position of the piston rods as they relate to each other.

PSS hydraulic shock suppressors and vibration dampers are of a modular construction. Modifications and alterations, which may be required due to tight installation spaces or in order to replace shock suppressors from other manufacturers, can be implemented quickly by modifying the standard components.

at high frequencies in tension and compression directions. When the direction of movement changes, the second valve can already react before the first valve has returned to its initial position.

By employing modern, high-quality sealing and guide components, a service life of 40 years can be expected from a PSS shock suppressors when used in nuclear applications. Relevant simulation testing with shock suppressors, Fig. 200A, have been conducted in association with the TÜV institute. Depending on the conditions in which hydraulic shock suppressors and vibration dampers are employed, a maintenance-free period of between ten and 25 years can be assured.

Use conditions for PSS hydraulic shock absorbers and vibration dampers

	Unit	With hydraulic fluid nuclear	With hydraulic fluid standard
Constant operating temperature	[°C]	-20 to 80	-50 to 80
Short-term temperature*	[°C]	150	150
Radiation dose, max.	[Megarad]	100	20
Ambient pressure, constant op.	[bar]	1	1
Ambient pressure, short-term	[bar]	10	10
Solidification point	[°C]	-40	-67
Flashpoint	[°C]	>550	600
Ignition point	[°C]	>600	>675

* max. 40h per year with max. cycle times of 1 hour

A PSS hydraulic shock suppressor and vibration damper consists of two valve pairs, working independently and which are externally accessible. This allows the dampers to be optimised in accordance with customer requirements on the test bench (e.g. locking velocity, bleed rate). Even following installation, it is still possible to modify the settings should this be required by the conditions at the installation site. By employing independently functioning closing valves, PSS hydraulic shock suppressors and vibration dampers are able to generate the force required for use

The following documents were taken into consideration in the dimensioning of PSS hydraulic shock suppressors and vibration dampers:

VGB Guidelines (Richtlinien)
KTA 3205.3
DIN 1050, DIN 4100
BS 3974, Part 1
ANSI B31.1
MSS SP 58
MSS SP 69
SVDB Guidelines (Richtlinien)
ASME Section III Subsection NF

Hydraulic Shock Suppressors and Vibration Dampers

1.4 Design Variations

PSS hydraulic shock suppressors and vibration dampers are manufactured and available in the following options:

Standard design

Housing components made of carbon steel with an extremely corrosion-resistant zinc-iron coating, 15 μ m.

The piston rods are additionally coated with 40 μ m electroless nickel on all sides and the shaft with 20 μ m hard chrome.

Low-temperature design down to -50°C

Housing components are made of stainless steel 1.4301 and additionally coated with 15 μ m electroplated nickel.

Piston rods made of materials suitable for use at low temperatures are additionally coated with 40 μ m electroless nickel on all sides and the shaft with 20 μ m hard chrome.

Stainless steel design

All housing components, piston rods and joint heads are made of chloride-resistant steels, e.g. 1.4462 or 1.4404, with coating if required.

Offshore design

Piston rods and reservoir made of chloride resistant stainless steels, e.g. 1.4462 or 1.4404, rod eyes supplied in material 1.4541.

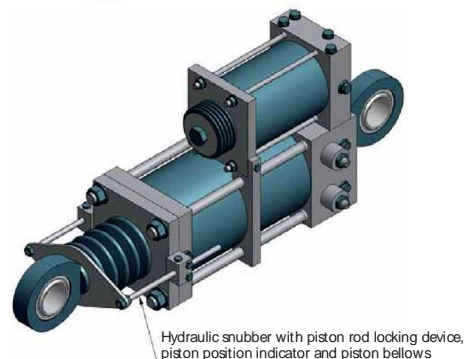
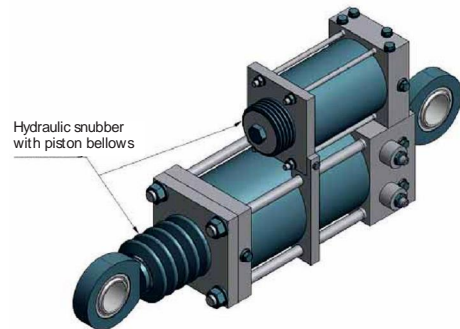
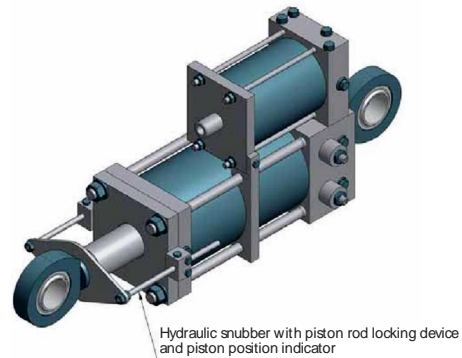
Stainless steel hydraulic snubber



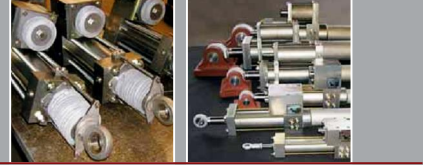
The cylinder body is made of carbon steels, protected by a zinc-iron plating plus a painting system according corrosive category C5-M (PSS-painting system PSS-6)

Other material combinations and special coatings are available if requested by the customer.

Furthermore, PSS offers special accessories, such as bellows for protection against the build up of hard ice deposits on the piston rods or to protect the piston rods when employed in sandstorms or in installation areas with a high level of dirt. To prevent the installation length supplied by the customer from being altered during installation, PSS also offers a piston rod lock as an optional accessory. This can be combined with the piston position indicator (see images).



Hydraulic Shock Suppressors and Vibration Dampers



1.5 Standard settings and test values per KTA 3205.3 and VGB-R510L:

Rolling resistance:	max. 2% of nominal load
Friction:	max. 2% of nominal load
Response speed:	2 . 6 mm/s
Post-reaction speed:	0,2 . 2,0 mm/s
Sliding rod distance Sa:	> 0,5 mm (non-rotating)
Sliding rod distance Sb:	< amount \pm 0.02 nominal displacement (force build-up peak-to-peak)
Temperatures:	max. operating temp. 80°C Short-term operating temp. for max. 3 hours 150°C
De' ection perpendicular to bolt axis:	max.: \pm 70 °
De' ection in bolt axis:	min.: \pm 5 °

special settings on customer demands

1.6 Maintenance of hydraulic shock suppressors and vibration dampers

PSS hydraulic shock suppressors and vibration dampers are composed of metallic and organic components. The metallic components are dimensioned in line with the various application designs to provide a service life that conforms with the maximum service life of a system (up to 40 years). The hydraulic fluid and seals are made of organic components, which are subject to natural ageing. When used in extreme conditions, it is possible that these components age at an accelerated rate (constant vibration, high temperature, extreme radiation). Depending on the location and purpose of the hydraulic shock suppressors and vibration dampers, the seals and hydraulic fluid should be changed after 20 years at the latest.

The operator of the system is responsible for maintaining the system components. However, PSS provides the following maintenance recommendations that apply to hydraulic shock suppressors and vibration dampers:

Annual visual inspection of the shock suppressors and checking of the position of the reservoir piston rod (as long as this is visible, there is sufficient hydraulic fluid in the shock suppressor).

After a period of 10-15 years, a functional test of the individual shock suppressors is recommended, to be performed on a hydraulic test bench.

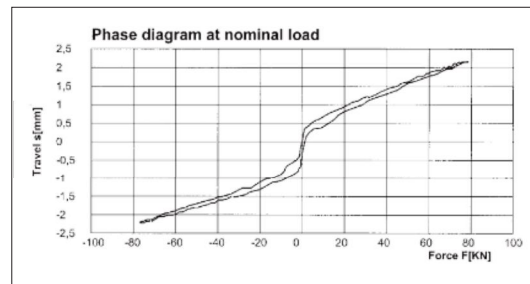
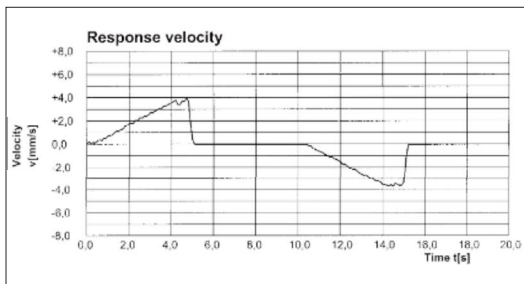
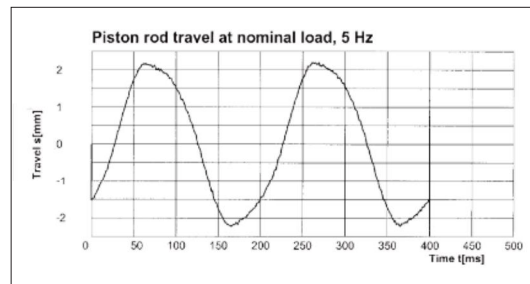
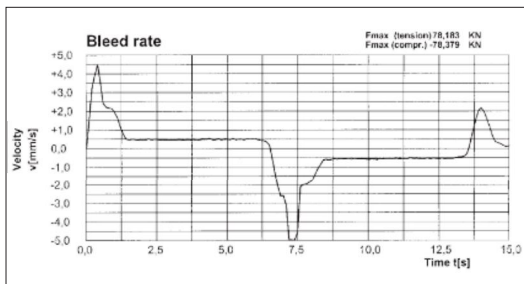
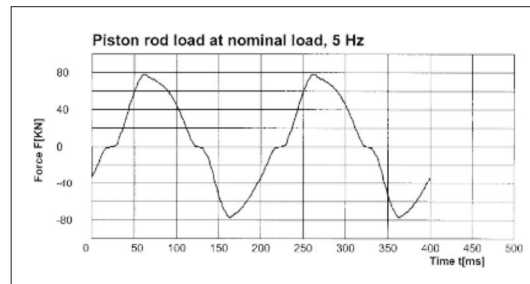
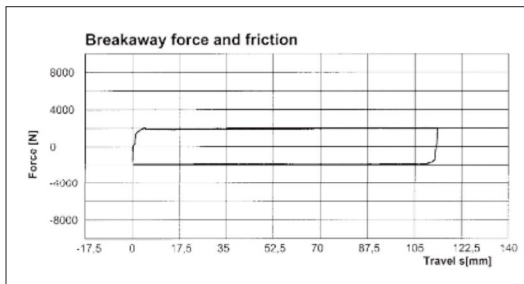
After 20 years at the latest, both the hydraulic fluid and the seals should be changed.

PSS will be happy to supply you with a service plan compiled specifically for the system and the application of the hydraulic shock suppressors and vibration dampers.

Hydraulic Shock Suppressors and Vibration Dampers

Test Diagram for Hydraulic Shubbers

Figure No.: 200A	Size (inch): 6	Nominal travel (inch): 5	Serial Number: R8925N10
Nominal load (Newton): 303000	PSSworks order number: 10209	Customer:	Temperature (°C): 21
			Mark No.: 1075



Test Results

Breakaway force (Newton)		Friction force (Newton)		Bleed rate (mm/s)	
tension	compression	tension	compression	tension	compression
2005	.	1927	. 1886	0,5	. 0,5

Response velocity (mm/s)		Load at 5 Hz (Newton)		Piston reaction travel (mm)	
tension	compression	tension	compression	S _a	S _b
3,9	. 3,9	78272	. 77139	0,5	4,4

Measured stroke	Measured reservoir oil level	Leakage control	Miscellaneous
127,7 mm	63,0 mm	ok	

Hydraulic Shock Suppressors and Vibration Dampers



1.7 Technical Data

Allowable loads:

cylinder-bore size inch	Figure	Figure with extension	$1 \times F_N$ load case H* [kN]	$1,5 \times F_N$ load case HZ* (kN)	$1,7 \times F_N$ load case HS* [kN]
			A/B** Nominal load	C** Emergency	D** Faultet
1/4, 1/2, 1	200A, 200B	201A, 201B	8	12	14
1 1/2	200A, 200B	201A, 201B	13	20	22
2 1/2	200A, 200B	201A, 201B	45	68	77
3 1/4	200A, 200B	201A, 201B	78	117	133
4	200A	201A	121	182	206
5	200A	201A	202	303	343
6	200A	201A	303	455	515
8 1/2	202A	203A	590	885	1003
10	202A	203A	835	1253	1419
12	202A	203A	1200	1800	2040
14	202A	203A	1730	2595	2941
17	202A	203A	2470	3705	4199
20 1/2	202A	203A	3610	5415	6137
24 1/2	202A	203A	5130	7695	8721
29 1/2	202A	203A	7510	11265	12767
35 1/2	202A	203A	10815	16223	18385
43	202A	203A	16155	24233	27463

* KTA Nuclear Safety Commission 3205.3

** ASME Section III, Sub-section NF

Hydraulic Shock Suppressors and Vibration Dampers

Figures without extension Figures 200A, 200B, 202A

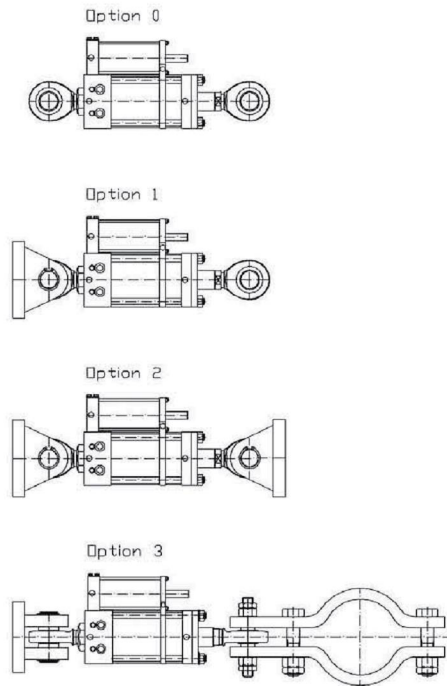


Fig. 200A, 200B, 202A

- Option 0: snubber body with 2 rod eyes
- Option 1: snubber body with 2 rod eyes
1 rear bracket EHS 14S at the steelwork
- Option 2: snubber body with 2 rod eyes
2 rear brackets EHS 14S
- Option 3: snubber body with 2 rod eyes
1 rear bracket EHS 14S at the steelwork
1 special dynamic pipe clamp

Figures with extension Figures 201A, 201B, 203A

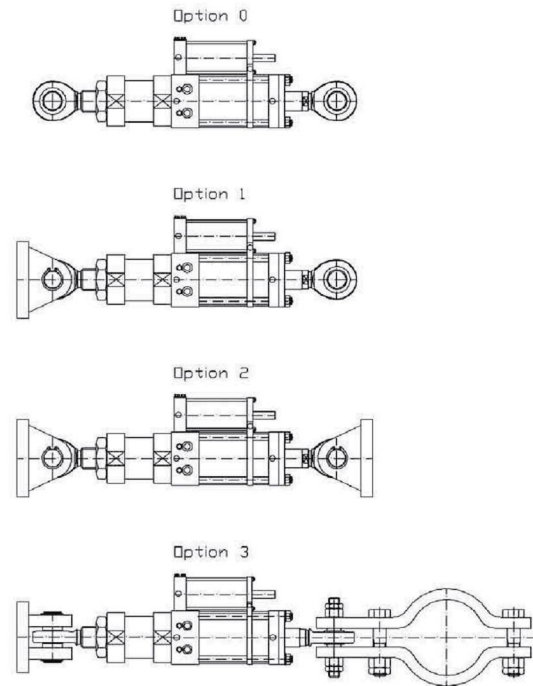


Fig. 201A, 201B, 203A (with extension)

- Option 0: snubber body with 2 rod eyes
1 extension piece (201S, C, W)
- Option 1: snubber body with 2 rod eyes
1 rear bracket EHS 14S at the steelwork
1 extension piece (201S, C, W)
- Option 2: snubber body with 2 rod eyes
2 rear brackets EHS 14S
1 extension piece (201S, C, W)
- Option 3: snubber body with 2 rod eyes
1 rear bracket EHS 14S at the steelwork
1 extension piece (201S, C, W)
1 special dynamic pipe clamp

Hydraulic Shock Suppressors and Vibration Dampers



Fig. 200A

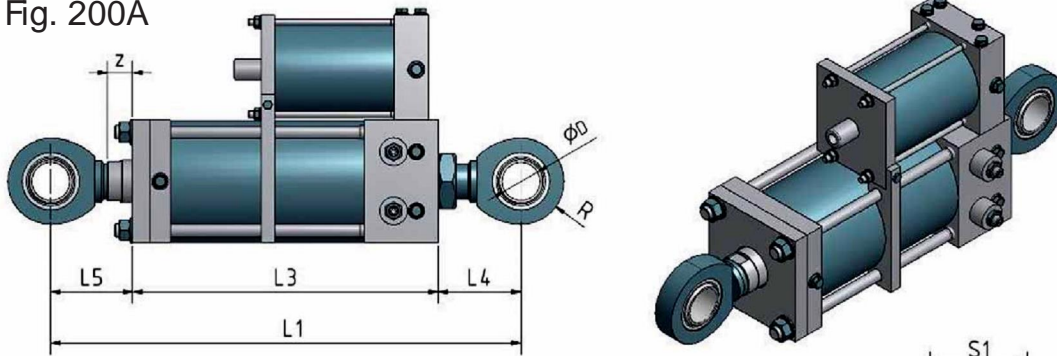


Fig. 201A

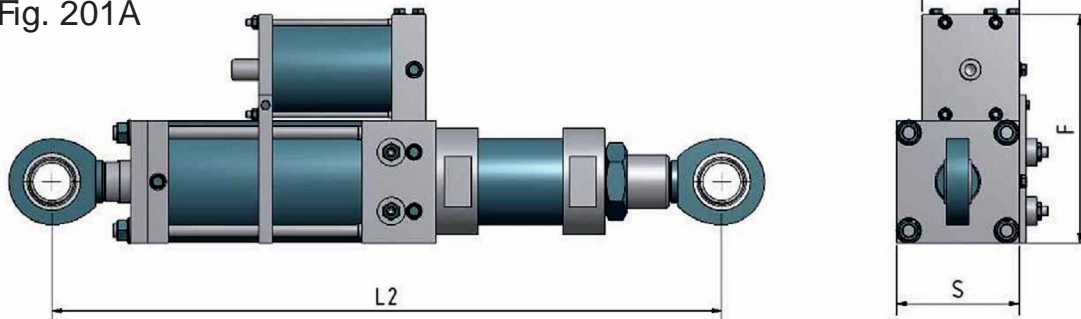


Fig. 200A/ 201A		L1	L1	L2	L2	L3	ØD	L4	L5	R	F	S	Sl	H-S 14 S	z	Weight				
Size	Nominal load	Stroke		min.	max.	min.	max.	mm										Size	mm	kg
	kN	inch	mm																	
1 1/2% ^z	13	5% _{oo}	127	425	552	445	1500	317	15	42	66	22	155	90	55	B	10	14,2		
		10% _{oo}	254	552	806	572		444					155		55			15,7		
		15% _{oo}	381	679	1060	699		571					165		65			18,4		
2 1/2% ^z	45	5% _{oo}	127	440	567	475	2000	330	25	52	58	34	175	100	65	D	17	27,1		
		10% _{oo}	254	567	821	602		457					195		90			36,0		
		15% _{oo}	381	694	1075	729		584					195		90			41,4		
		20% _{oo}	508	821	1329	856		711					195		90			46,9		
3 1/4% ^z	78	5% _{oo}	127	487	614	529	2500	355	30	62	70	37	245	130	105	E	25	45,0		
		10% _{oo}	254	614	868	656		482					245		105			58,0		
		15% _{oo}	381	741	1122	783		609					245		105			65,8		
		20% _{oo}	508	868	1376	910		736					245		105			73,7		
4% _{oo}	121	5% _{oo}	127	545	672	603	3000	362	45	90	93	51	260	145	105	F	25	59,0		
		10% _{oo}	254	672	926	730		489					260		105			73,0		
		15% _{oo}	381	799	1180	857		616					260		105			83,2		
		20% _{oo}	508	926	1434	984		743					260		105			93,4		
5% _{oo}	202	5% _{oo}	127	625	752	695	3000	381	60	119	125	68	295	180	105	G	30	77,0		
		10% _{oo}	254	752	1006	822		508					295		105			93,0		
		15% _{oo}	381	879	1260	949		635					325		134			106,3		
		20% _{oo}	508	1006	1514	1076		762					325		134			119,6		
6% _{oo}	303	5% _{oo}	127	697	824	779	3000	420	70	137	140	80	355	210	134	H	30	106,0		
		10% _{oo}	254	824	1078	906		547					355		134			126,0		
		15% _{oo}	381	951	1332	1033		674					355		134			145,2		
		20% _{oo}	508	1078	1586	1160		801					355		134			164,4		

Special strokes on request

* delivery on request, PSS standard is Figure 200B / 201B

Hydraulic Shock Suppressors and Vibration Dampers

Fig. 200B

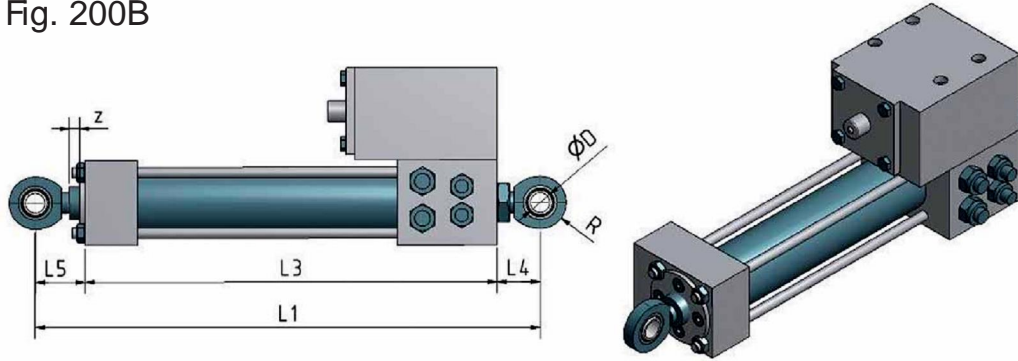


Fig. 201B

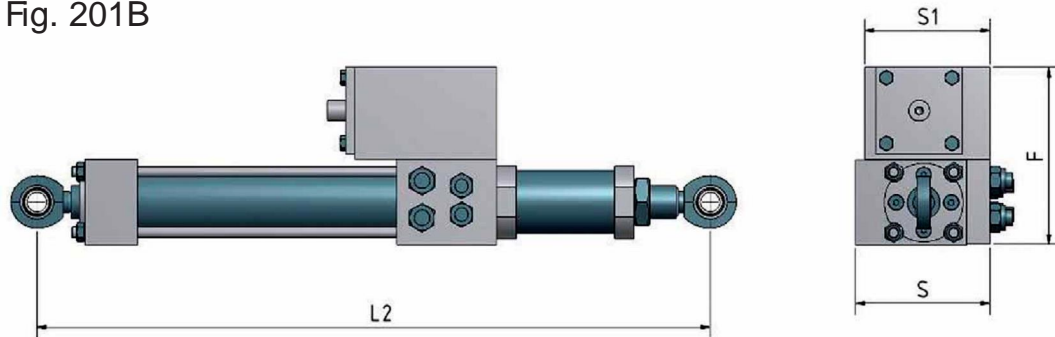


Fig. 200B/201B			L1	L1	L2	L2	L3	ØD	L4	L5	R	F	S	S1	EHS 14 S	z	Weight		
Size	Nominal load	Stroke	min.	max.	min.	max.													
	kN	inch	mm	mm														Size	mm	kg
1/4%	3	5%	127,0	364	491	384	1000	287	10	28	49	15	120	87	81	A	7	10,0	
1/2%	5	5%	127,0	364	491	384	1000	287	10	28	49	15	120	87	81	A	7	10,0	
1%	8	5%	127,0	364	491	384	1000	287	10	28	49	15	120	87	81	A	7	10,0	
1 1/2%	13	5%	127,0	393	520	413	1500	310	15	45	38	22	135	103	96	B	9	13,5	
		10%	254,0	520	774	540		437										15,0	
		15%	381,0	647	1028	667		564										19,2	
2 1/2%	45	5%	127,0	442	569	477	2000	334	25	50	58	32	200	115	105	D	17	26,5	
		10%	254,0	569	823	604		461										28,6	
		15%	381,0	696	1077	731		588										30,7	
		20%	508,0	823	1331	858		715										32,8	
3 1/4%	78	5%	127,0	495	622	536	2500	355	35*	68	72	41	240	135	130	E	20	37,1	
		10%	254,0	622	876	663		482										41,6	
		15%	381,0	749	1130	790		609										47,7	
		20%	508,0	876	1384	917		736										52,3	

Special strokes from 1% to 50% on request
 * validity 2011, ØD = 30 mm on request

Hydraulic Shock Suppressors and Vibration Dampers



Fig. 202A

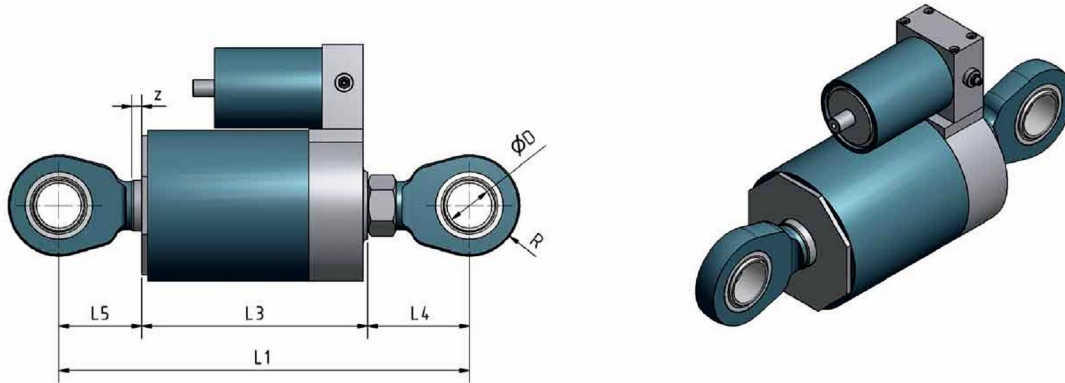


Fig. 203A

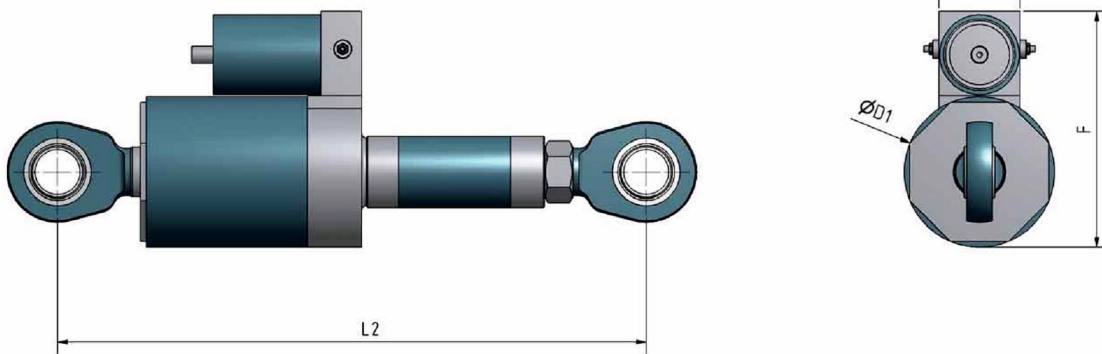


Fig. 202A/ 203A		L1	L1	L2	L2	L3	L4	L5	ØD	S1	R	F	ØD1	H-S 14 S	z	Weight	
Size	Nominal load	Stroke	min.	max.	min.	max.	mm						Size	mm	kg		
	kN	mm															
8,5"	590	127	689	816	770	3100	399	157	133	80	145	90	428	268	I	3	161
		254	816	1070	897	3100	526										192
10"	835	127	735	862	825	3400	443	157	135	90	170	100	488	310	K	5	250
		254	862	1116	952	3400	570										288
12"	1250	127	829	956	927	3800	487	182	160	110	170	123	538	360	M	5	350
		254	956	1210	1054	3800	614										408
14"	1730	127	908	1035	1024	4200	536	197	175	120	220	138	648	420	N	5	515
		254	1035	1289	1151	4200	663										587

Special bore diameters from 17% to 43% and special strokes on request

Hydraulic Shock Suppressors and Vibration Dampers

Calculation cold position, hot position

Cp = cold position
 Hp = hot position
 T/T = total travel

. Mvt = retraction
 +Mvt = extension
 z = dead length of the piston rod

Single Movement:

$$Cp = \frac{T/T \cdot (+/- Mvt)}{2} + z$$

$$Hp = Cp +/- Mvt$$

Double Movement:

$$Cp = \frac{T/T \cdot (+ Mvt) \cdot (- Mvt)}{2} + z$$



Extensions



2. Extensions

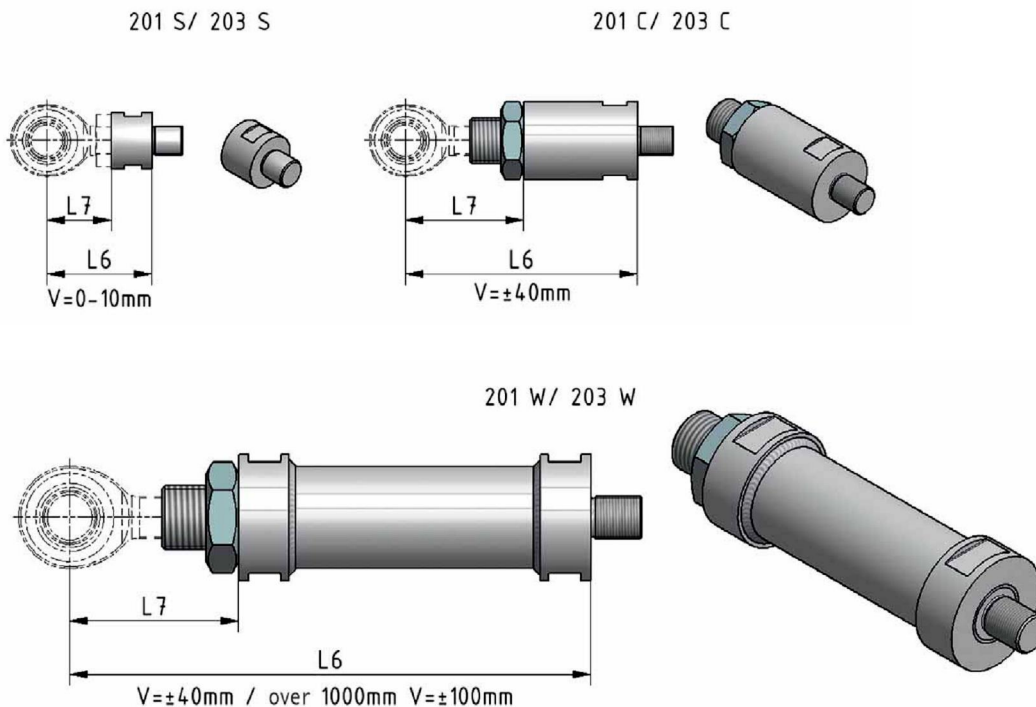
PSS extensions of the types 201S, 201C and 201W are used for bridging existing installation lengths without needing to introduce modifications to the existing steel construction.

Specified installation dimensions can also be compensated when replacing snubbers by other makers. The extensions are attached to the snubber cylinder blocks by threaded parts. The PSS extension design also offers the ability to compensate existing construction tolerances by means of adjustment.

The amount of adjustment depends on the type and size; it is in the range of ± 10 mm for the type 201S, ± 40 mm for the type 201C and ± 100 mm for the type 201W.

Standard extensions are manufactured from carbon steel and are zinc-iron plated. Depending on the type of PSS hydraulic snubber selected, extensions can be modified to the appropriate requirements and are manufactured to the customer's specification in all generally used steel types and coating systems.

2.1 Extension pieces for Hydraulic Shock and Sway Suppressors



V = adjustability

Extensions

Extension pieces, Fig. 201S, 201C and 201W

type of extension	1/4‰, 1/2‰, 3/4‰, 1/2‰				2. 1/2‰				3. 1/4‰						
	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm
stub 201 S	40/57*	197	24/37*	0,1	0,4	89	249	54	0,4	1,2	109	269	66	0,8	1,9
compact 201 C	198	429	83	1,8	1,5	250	441	109	7,8	5	270	458	122	7,7	5
welded 201 W	198/430*	1120	73/83*	3,3	0,5	442	1620	109	9,6	1,2	459	2090	122	10,2	1,2

type of extension	4‰				5‰				6‰						
	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm
stub 201 S	150	306	92	2,3	3,9	168	358	122,5	4,7	6,2	194	368	140	6,2	7,5
compact 201 C	307	469	145	13,3	7,5	359	695	174	23,9	12,1	369	710	189	23,2	12,1
welded 201 W	470	2550	145	20,4	2,3	696	2500	174	39,7	3,2	711	2450	189	40,7	3,2

type of extension	8.1/2‰				10‰				12‰				14‰			
	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	L6 min [mm]	L6 max [mm]	L7 [mm]	Weight at L6 min [Kg]	increase in weight [kg] per additional 100 mm	
stub 201 S	237	430	157	7,3	8,9	157	430	280	14,2	13,9	313	494	197	21,4	17,8	
compact 201 C	431	930	225	42,4	17,8	431	930	456	82,3	29,8	495	970	265	80,8	29,8	
welded 201 W	931	2575	225	72,6	3,9	877	2830	956	142,8	10,8	971	3495	265	147,4	10,8	

Special lengths on request

* , 1st value for Hydraulic Shock and Sway Suppressor size 1/4‰, 1/2‰ and 1‰, second value for size 1 1/2‰

Sway struts



3. Sway struts

3.1 Application

Sway struts are employed primarily as tension-compression elements for bearing dynamic loads. Sway struts can also be used as pipeline guides or axial stops.

3.2 Construction and quality characteristics

A sway strut is composed of a base body and two threaded inserts with swivel heads (, g. E1 with only two swivel heads). The , ner of the two threads is used for balancing out installation tolerance. The type and dimension of the sway strut is determined by the nominal load and the total required installation length. PSS sway struts allow a maximum de' ection perpendicular to the bolt axis of $\pm 70^\circ$ and in the bolt axis of $\pm 5^\circ$.

The following documents were taken into consideration in the dimensioning of PSS sway struts:

VGB Guidelines (Richtlinien)

KTA 3205.3

DIN 1050, DIN 4100

BS3974, Part 1

ANSI B31.1

MSS SP 58

MSS SP 69

SVDB Guidelines (Richtlinien)

ASME Section III Subsection NF

3.3 Design Variations

Standard design

Regular PSS sway struts are made from carbon steels and have a zinc-iron coating as standard. Pivot bearings are obtained from reputable manufacturers. Maintenance-free pivot bearings are used as standard, while mandatory-maintenance models are employed in nuclear applications.

Special designs

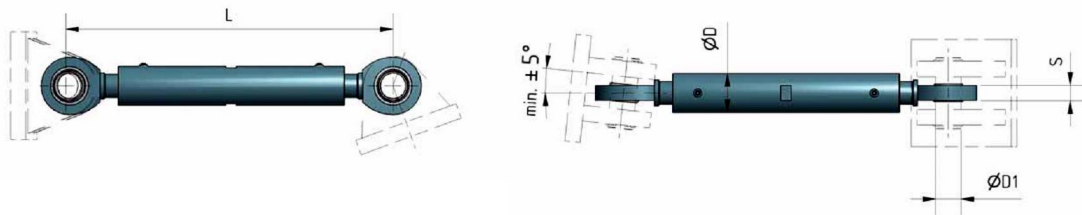
As with hydraulic shock suppressors and vibration dampers, PSS also manufactures sway struts which are suitable for use at low temperatures, made of rust-free and chloride-resistant steels for offshore use, or other special designs to customer specification.



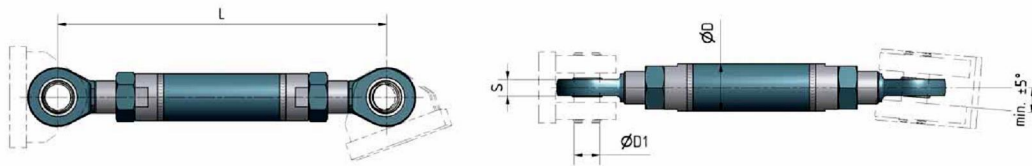
Sway struts

3.4 Technical Data

Sway Strut, Fig. 211 L, Type E1, Size A0 - I



Sway Strut, Fig. 211 L, Type E2, Size A0 - R



Lmin = minimum length by total adjustability
 Lmax = maximum length by total adjustability

Sway Strut Fig. 211L Typ E1

Size	Nominal load	Adjustability	Lmin	Lmax	S	ØD1	ØD	Weight	
	kN	mm	mm	mm	mm	mm	mm	Fixed parts kg	Pipe kg/m
A0	3	+/. 10	114	500	9	10	Ø20	0,14	2,47
A	5	+/. 10	130	500	10	12	Ø22	0,22	2,98
B	13	+/. 15	153	500	12	15	Ø25	0,4	3,85
C	32	+/. 20	188	550	16	20	Ø36	0,7	7,99
D	45	+/. 25	225	550	20	25	Ø45	1,24	12,5
E	78	+/. 30	323	600	25	35*	Ø65	3,18	26,0
F	130	+/. 50	389	750	32	45	Ø76,1 x 20	5,82	27,7
F1**	180	+/. 50	433	750	35	50	Ø76,1 x 20	7,6	27,7
G	234	+/. 55	488	850	44	60	Ø88,9 x 22,2	12,96	36,5
H	303	+/. 65	549	900	49	70	Ø101,6 x 25	17,82	47,5
I	600	+/. 70	624	1000	55	80	Ø114,3 x 25	25,98	55,3

* validity 2011, ØD1 = 30 mm on request

** non standard product, delivery on request

Size J- R on request

Sway struts



Sway Strut, Fig. 211 L, Type E2, Size A0 - R

Size	Nominal load	Adjustability	Lmin	Lmax	S	ØD1	ØD	Weight	
	kN							mm	mm
A0	3	+/. 90	404	750	9	10	60,3 x 3,6	2,3	5,07
		+/. 200	751	2000				3,08	
A	5	+/. 90	412	750	10	12	60,3 x 3,6	2,32	5,07
		+/. 200	751	2000				3,21	
B	13	+/. 90	418	750	12	15	60,3 x 3,6	2,52	5,07
		+/. 200	751	2500				3,36	
C	32	+/. 90	506	940	16	20	76,1 x 7,1	8,64	12,1
		+/. 200	941	3000				12,35	
D	45	+/. 90	518	940	20	25	76,1 x 7,1	9,14	12,1
		+/. 200	941	3000				12,98	
E	78	+/. 90	564	980	25	35*	76,1 x 7,1	10,33	12,1
		+/. 200	981	3000				13,46	
F	130	+/. 90	610	1050	32	45	101,6 x 10	20,69	22,6
		+/. 200	1051	3000				27,21	
F1**	180	+/. 90	628	1050	35	50	101,6 x 10	21,64	22,6
		+/. 200	1051	3000				27,59	
G	234	+/. 90	680	1100	44	60	139,7 x 10	46,38	32
		+/. 200	1101	3000				53,88	
H	303	+/. 90	732	1160	49	70	139,7 x 10	52,58	32
		+/. 200	1161	3000				59,98	
I	600	+/. 90	800	1260	55	80	168,3 x 10	80,73	39
		+/. 200	1261	3000				90,03	
J	750	+/. 90	852	1500	60	90	177,8 x 17,5	95,2	69,1
		+/. 200	1501	4000				111,6	
K	900	+/. 90	852	1500	60	90	177,8 x 17,5	99,4	69,1
		+/. 200	1501	4000				118,6	
L	1000	+/. 90	872	1500	70	100	177,8 x 17,5	109,8	69,1
		+/. 200	1501	4000				129	
M	1250	+/. 90	906	1500	70	110	219,1 x 22,2	166,5	108
		+/. 200	1501	5000				193,3	
N	1750	+/. 90	952	1600	85	120	219,1 x 22,2	195,2	108
		+/. 200	1601	5000				225,6	
O	2000	+/. 90	1080	1600	90	140	273 x 25	325	154
		+/. 200	1601	6000				368,8	
P	2500	+/. 90	1142	1700	105	160	273 x 25	420,2	154
		+/. 200	1701	6000				474,6	
Q	3000	+/. 90	1198	1800	105	180	406,4 x 25	535,8	237
		+/. 200	1801	8000				601,4	
R	4000	+/. 90	1306	1900	130	200	406,4 x 25	645,2	237
		+/. 200	1901	8000				732,2	

* validity 2011, ØD1 = 30 mm on request

** non standard product, delivery on request

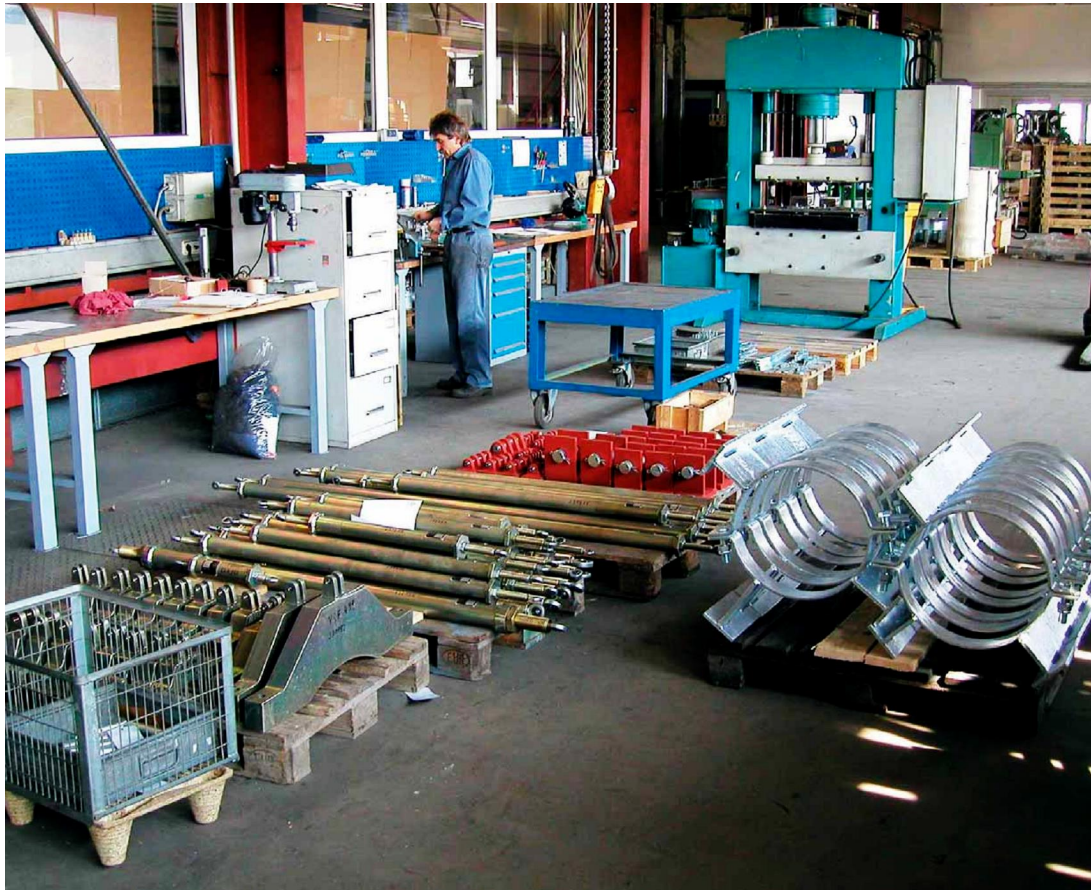
Weld-on brackets

4. Weld-on brackets

The bracket EHS14S serves as the connecting element between the hydraulic shock suppressor or sway strut and the steel construction, for the transmission of dynamic forces. Since it is a connecting element, the allowable loads are matched exactly to the corresponding main components. Brackets are produced in the following versions:

The brackets can be supplied as special designs with bolted on baseplates. The load bolt can also be supplied as a special option with split pins or nuts.

	Basic body	Locating bolt	Retaining device
Standard version	S355J2G3	1.4057	Shaft retaining ring made of SS A2
Low temperatures to . 48 °C	P355NL1	1.7225	Shaft retaining ring made of SS A4
Low temperatures to . 170 °C	1.4301	1.4301	Shaft retaining ring made of SS A4
Offshore	1.4404	1.4462	Shaft retaining ring made of SS A4

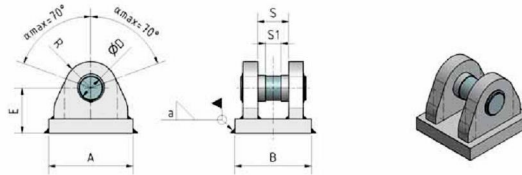


Weld-on brackets

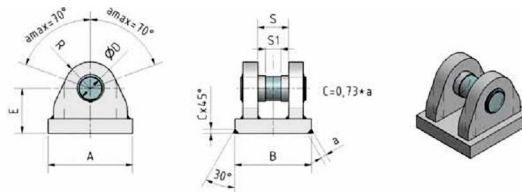


Weld-on brackets, EHS 14S, Size A0 - R

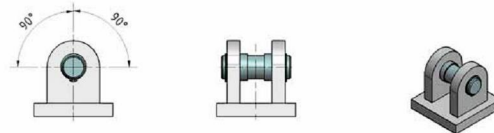
standard rear bracket EHS 14S Size A0 . M



standard rear bracket EHS 14S Size N . R



special rear bracket EHS 14SB (on request)



EHS 14S	Size	Nominal load kN	HSB Size	Fig. 211L Size	E	S	S1	A	B	ØD H7	R	a			Weight kg
												S355J2G3			
												a=0°	a=30°	a=70°	
					mm										
	A0	3		A0	26	13,5	9,5	34	34	10	10	4	4	4	0,3
	A***	8	1/4% 2% 4%	A	35	15,5	10,5	55	65	10/12	15	4	4	4	0,5
	B	13	1 1/2%	B	40	18,5	12,5	65	80	15	17,5	4	4	4	1
	C	32		C	50	30,5	16,5	100	110	20	22,5	4	4	4	2,8
	D	45	2 1/2%	D	60	35,5	20,5	120	120	25	30	4	4	4	3,8
	E	78	3 1/4%	E	70	40,5	25,5	140	140	35*	30	4	4	4	6,8
	F	130	4%	F	85	55,5	32,5	180	180	45	45	4	4	4	13,8
	F1**	180		F1	105	64,5	35,5	210	210	50	58	4	4	4	22,8
	G	234	5%	G	120	70,5	44,5	260	240	60	65	4	4	4	36,5
	H	380	6%	H	140	80,5	49,5	340	280	70	75	4	4	5	64,2
	I	600	8 1/2%	I	155	90,5	55,5	420	300	80	90	4	5	6	85,5
	J	750		J	170	120	61,7	320	290	90	100	6	8	9	88,3
	K	900	10%	K	170	120	61,7	350	288	90	105	6	9	10	96,2
	L	1000		L	200	120	71,7	360	300	100	110	6	10	11	118,6
	M	1250	12%	M	200	135	71,7	460	315	110	120	6	10	11	151
	N	1750	14%	N	225	135	86,9	470	330	120	135	8	13	15	200,5
	O	2000		O	245	165	91,9	540	370	140	165	8	13	15	271,8
	P	2500		P	265	205	106,9	560	410	160	180	10	14	17	325,8
	Q	3000		Q	300	210	107,2	650	500	180	200	10	14	17	482,9
	R	4000		R	320	230	132,2	850	550	200	230	11	15	17	689,4

* validity 2011, ØD= 30 mm on request

** non standard product

*** ØD H7 10 mm for HSB 1/4%/2%/4%

Dynamic load clamps

5. Dynamic load clamps

Dynamic load clamps are connecting elements between hydraulic shock suppressors or sway struts and the pipelines. PSS offers four types of dynamic load clamps:

Fig. 211R shows the conventional three-bolt pipe clamp for dynamic loads, designed for small to medium nominal pipe widths and lower design loads. The axial displacement of the pipe clamp on the pipeline in the axial direction is prevented through the use of shear lugs. Lateral displacement is prevented through the appropriate tightening torque of the screw, fitting as the specified load requires.

Fig. EHS17D shows the universal clamp for dynamic loads. Designed as a strap clamp, the standard design covers nominal pipe diameters ranging from 6" to 48" and insulation thicknesses up to 300 mm. The available loads depending on the material, insulation thickness and temperature can simply be read off from the load table. A single shear lug welded onto the pipe serves as an anti-torsion device. The shear lug which is made of similar material to the pipe, must be supplied by the pipe fabricator and welded on according to the corresponding welding instructions.

The dynamic clamp Fig. EHS18S was designed for extremely high loads and high pipe wall thicknesses and covers the range above which it is no longer practical to manufacture the EHS17D clamp.

For double suspension fittings, PSS offers the riser clamp shown in Fig. 403D designed as a box clamp.

The values for the design of the dynamic load clamps can be taken from the installation size and stress tables of the individual pipe clamp types.

The shear lug sizes for the pipe clamps EHS17D and EHS18S can be dimensioned according to the values of the installation size tables.

Requested ordering data for Dynamic Load Clamps:

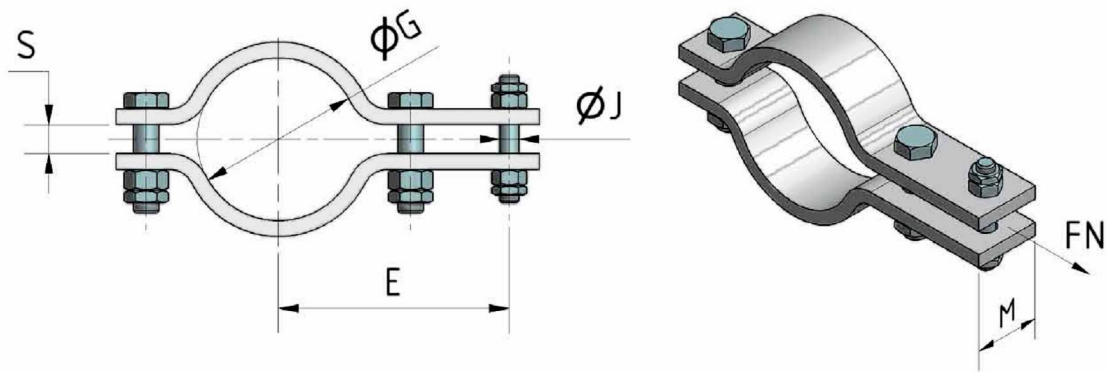
- kind of Connection (Fig-No. of Shubber or Sway Strut)
- Nominal Load
- Pipe Diameter
- Design Temperature
- Insulation Thickness



Dynamic load clamps



5.1 Dynamic three bolt clamp, Fig. 211R, Pipe size NW15 to NW600



Installation dimensions and weight data sheet, Fig. 211R, Size A0 - C

Pipe Size		ØG	Sway Strut Size, Fig. 211L											
			A0, A				B				C			
			Hydraulic Stubber Size, Fig. 200AB/201A/B											
			1/4% ^o 1/2% ^o 1% ^o				1 1/2% ^o				-			
inch	mm	mm	E	M	max Insul.	Weight	E	M	max Insul.	Weight	E	M	max Insul.	Weight
1/2	15	22	80	30	70	0,6	85	40	75	1,3	-	-	-	-
3/4	20	27	85	30	75	0,6	90	40	80	1,4	-	-	-	-
1	25	34	95	30	85	0,7	100	40	90	1,5	115	60	105	3,6
1 1/4	32	43	100	40	90	0,9	105	40	95	1,5	120	60	110	3,8
1 1/2	40	49	105	40	95	1,0	110	40	100	1,6	125	60	115	3,3
2	50	61	110	40	100	1,1	120	50	110	2,0	135	60	125	4,9
2 1/2	65	77	120	40	110	1,2	130	50	120	2,6	150	60	140	5,3
3	80	90	130	40	120	1,6	140	50	130	2,8	160	60	150	5,7
3 1/2	90	102	135	40	125	1,7	145	50	135	2,9	170	60	160	6,0
4	100	115	145	40	135	1,8	155	60	145	3,6	180	70	170	7,2
5	125	141	155	50	145	2,4	165	70	155	4,5	190	70	180	7,8
6	150	169	175	50	165	2,7	185	80	175	5,7	210	80	200	9,7
8	200	220	195	60	185	3,8	215	70	205	7,0	240	100	230	13,8
10	250	274	225	60	215	5,5	245	80	235	9,3	270	80	260	17,0
12	300	325	250	60	240	6,3	270	80	260	13,1	295	100	285	23,4
14	350	360	270	60	260	6,8	290	80	280	14,2	315	100	305	25,1
16	400	411	310	60	300	7,8	330	80	320	16,0	355	100	345	27,9
18	450	463	330	80	320	11,2	350	80	340	17,5	375	100	365	30,2
20	500	514	360	80	350	12,6	380	100	370	23,8	405	150	395	49,2
22	550	565	400	100	390	17,2	420	100	410	26,3	450	150	440	53,9
24	600	617	430	100	420	18,6	450	100	440	28,3	480	150	470	58,1

larger pipe size and special dimensions on request

Dynamic load clamps

Installation dimensions and weight data sheet, Fig. 211R, Size D - E

Pipe Size		ØG	Sway Strut Size, Fig. 211L							
			D				E			
			Hydraulic Snubber Size, Fig. 200A/B, 201A/B							
			2 1/2‰				3 1/4‰			
Inch	mm	mm	E	M	max Isol.	Gew.	E	M	max Isol.	Gew.
				mm		kg	mm		kg	
1/2	15	22	.	.	.	.	.	.	.	.
3/4	20	27	.	.	.	.	.	.	.	.
1	25	34	.	.	.	.	.	.	.	.
1 1/4	32	43	.	.	.	.	.	.	.	.
1 1/2	40	49	.	.	.	.	.	.	.	.
2	50	61	.	.	.	.	.	.	.	.
2 1/2	65	77	160	80	145	10,2	180	80	160	9,7
3	80	90	175	80	160	10,9	190	80	170	10,3
3 1/2	90	102	185	80	170	11,5	200	80	180	10,8
4	100	115	200	80	185	12,2	220	80	200	11,7
5	125	141	210	80	195	13,2	235	100	215	15,8
6	150	169	230	80	215	14,4	260	120	240	20,8
8	200	220	260	100	245	20,1	290	150	270	29,7
10	250	274	290	100	275	22,8	325	150	305	44,1
12	300	325	315	120	300	29,9	350	150	330	49,0
14	350	360	335	150	320	39,5	370	150	350	52,2
16	400	411	375	150	360	43,8	410	180	390	69,0
18	450	463	395	150	380	47,4	435	180	415	74,6
20	500	514	425	200	410	68,1	465	200	445	93,4
22	550	565	475	200	460	74,8	515	220	495	107,3
24	600	617	505	200	490	80,2	540	250	520	129,5

Connecting dimensions for Snubbers and Sway Struts

Fig. 211R	Fig. Size		Pipe Size [mm]		Nominal load		ØJ	S
	211L	200A/B/201A/B	211L	200A/B/201A/B	211L	200A/B/201A/B		
					kN	kN	mm	mm
A0	.		15 . 600	.	3	.	10	15
A	1/4‰/2‰		15 . 600	15 . 600	5	8	10 / 12*	15
B	1 1/2‰		15 . 600	90 . 600	13	13	15	18
C	.		25 . 600	.	32	32	20	30
D	2 1/2‰		65 . 600	90 . 600	45	45	25	35
E	3 1/4‰		65 . 600	90 . 600	78	78	35	40

special clamps on request

* for Hydraulic Shock and Sway Suppressor ØJ= 10 mm, for Sway Strut ØJ= 12 mm

Dynamic load clamps



Load data sheet for Dynamic three bolt clamp, Figure 211R

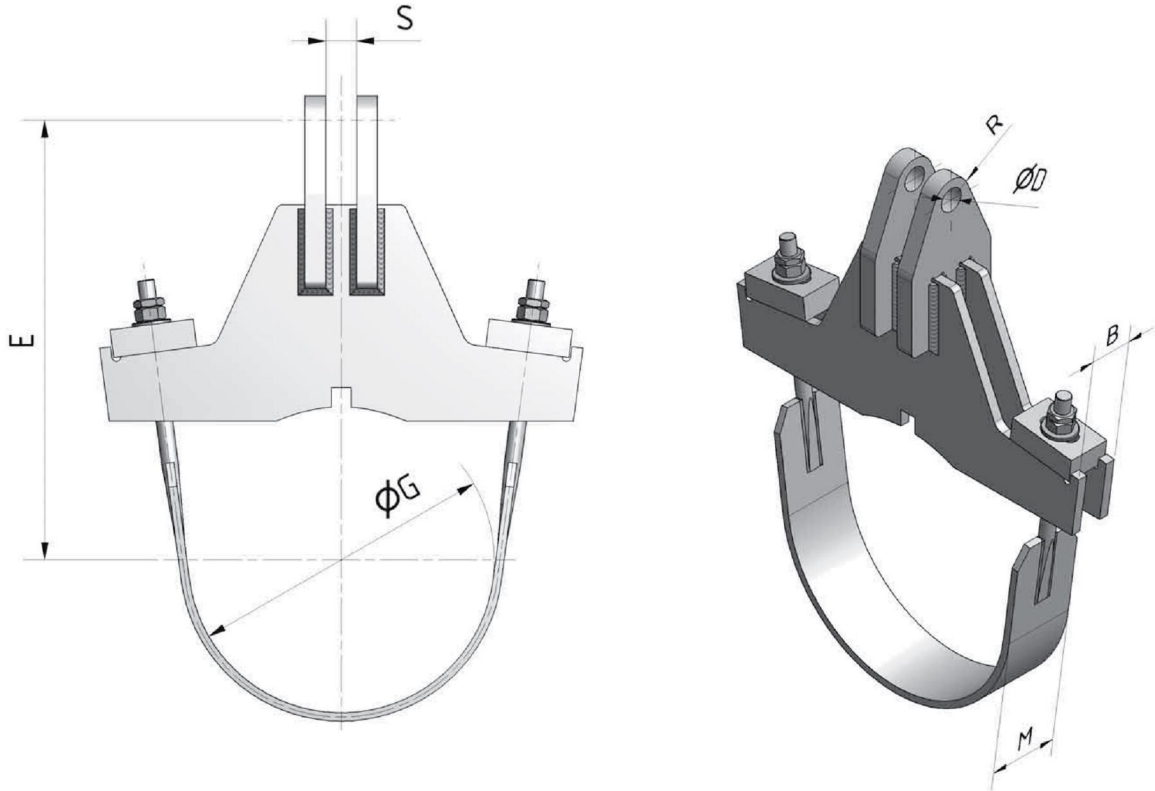
Size	Size	FN	FN	Pipe Size	Allowable loads							
Temp. °C	Temp. °C	Fig. 211	Fig. 200A/B		80°C	150°C	300°C	400°C	500°C	80°C	300°C	550°C
Material	Material		201A/B		S355J2G3 (1.0570)			16Mo3 (1.5415)		X6CrNiTi18 10(1.4541)		
Fig. 211	Fig. 200/201	KN	KN	mm	KN							
A0	.	3,0	.	15 . 600	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
A	1 4/16%	5,0	8,0	15 . 600	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0
B	1 1/2%	13,0	13,0	15 . 600	13,0	13,0	13,0	13,0	13,0	13,0	13,0	13,0
C	.	32,0	.	25 . 600	32,0	32,0	32,0	32,0	32,0	32,0	32,0	32,0
D	2 1/2%	45,0	45,0	65 . 600	45,0	45,0	45,0	45,0	45,0	45,0	45,0	45,0
E	3 1/4%	78,0	78,0	65 . 600	78,0	78,0	78,0	78,0	78,0	78,0	78,0	78,0

Size	Size	FN	FN	Pipe Size	Allowable loads								
Temp. °C	Temp. °C	Fig. 211	Fig. 200A/B		400°C	500°C	540°C	540°C	560°C	580°C	560°C	600°C	650°C
Material	Material		201A/B		13CrMo4-5 (1.7335)			10CrMo9-10 (1.7380)		X10CrMoVNb9-1 (1.4903)			
Fig. 211	Fig. 200/201	KN	KN	mm	KN								
A0	.	3,0	.	15 . 600	3,0	3,0	3,0	3,0	2,6	1,8	3,0	3,0	2,6
A	1 4/16%	5,0	8,0	15 . 600	5,0	5,0	3,2	3,5	2,6	1,8	5,0	5,0	2,6
B	1 1/2%	13,0	13,0	15 . 600	13,0	13,0	8,6	9,3	6,9	4,8	13,0	13,0	6,8
C	.	32,0	.	15 . 600	32,0	32,0	19,6	21,9	16,2	11,4	32,0	32,0	15,9
D	2 1/2%	45,0	45,0	15 . 600	45,0	45,0	28,0	31,3	23,1	16,2	45,0	45,0	22,7
E	3 1/4%	78,0	78,0	15 . 600	78,0	78,0	46,6	52,0	38,5	27,0	78,0	78,0	37,8

Higher loads or special materials on request

Dynamic load clamps

5.2 Dynamic yoke clamp EHS17D



Installation dimensions for Snubbers and Sway Struts

Snubber	Sway Strut	Load [kN]		ØD [mm]		S [mm]		R [mm]
Fig. 200/201	Fig. 211	Fig. 200/201	Fig. 211	Fig. 200/201	Fig. 211	Fig. 200/201	Fig. 211	
.	A0	.	3	10	10	.	16,2	10
1/4‰/2‰/3‰	A	8	5	10	12	16,2	15,5	15
1 1/2‰	B	13	13	15	15	18,5	18,5	17,5
.	C	.	32	.	20	.	30,5	22,5
2 1/2‰	D	45	45	25	25	35,5	35,5	30
3 1/4‰	E	78	78	35	35	40,5	40,5	30
4‰	F	121	130	45	45	55,5	55,5	45
.	F1	.	180	.	50	.	64,5	58
5‰	G	202	234	60	60	70,5	70,5	65
6‰	.	303	.	70	.	80,5	.	75

EHS 17D over 303 kN on request

Dynamic load clamps



Installation dimensions and weight data sheet, Fig. EHS 17D

Version	ØDA	Pipe size		ØG	M	Insulation								
						up to 100 mm			up to 200 mm			up to 300 mm		
						E	B	Weight	E	B	Weight	E	B	Weight
[mm]	[mm]	[inch]	[mm]	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[kg]	[mm]	[mm]	[kg]	
L	168,3	150	6	170	50	240	32	6,2	330	32	7,0	.	.	.
S							40	7,2		40	8,2			
L	219,1	200	8	222	60	275	36	7,9	365	36	8,9	.	.	.
S							44	9,2		44	10,3			
L	273,0	250	10	276	70	340	40	10,3	430	40	12,8	530	40	14,6
S					60		52	18,3		48	20,4		48	23,2
L	323,9	300	12	328	70	370	44	14,0	455	40	14,5	555	40	17,3
S					60		62	25,9		56	26,7		56	30,4
L	355,6	350	14	360	70	390	48	19,3	475	40	18,3	575	40	21,6
S					60		72	31,3		56	28,6		56	33,6
L	406,4	400	16	411	80	415	54	27,3	500	48	27,2	600	48	34,8
S							82	46,7		62	41,4		62	49,8
L	457,2	450	18	462	80	445	58	31,4	525	52	34,1	625	52	39,6
S							82	51,3		62	47,3		62	53,5
L	508,0	500	20	513	100	470	68	44,2	550	52	36,4	650	52	44,4
S							92	68,5		62	50,2		62	60,0
L	558,8	550	22	565	100	500	68	46,5	580	58	44,1	680	58	51,0
S							92	67,8		72	58,3		72	67,5
L	609,6	600	24	616	100	540	72	54,4	600	62	52,4	700	62	64,9
S							98	85,9		78	77,9		78	94,8
L	660,4	650	26	670	130	570	72	61,8	630	62	58,4	730	62	69,7
S							98	86,7		78	76,1		78	91,3
L	711,2	700	28	719	130	590	72	62,7	650	62	68,3	750	62	76,4
S							98	98,1		78	99,0		78	109,9
L	762,0	750	30	770	130	665	72	78,4	700	62	69,5	800	62	76,8
S							98	107,9		88	100,7		88	112,9
L	812,8	800	32	821	130	690	88	99,8	725	78	90,9	830	78	100,7
S							114	131,5		94	111,2		94	123,4
L	863,6	850	34	873	130	720	88	104,9	750	78	95,2	850	78	105,0
S							114	139,2		94	116,7		94	129,0
L	914,4	900	36	924	130	780	88	116,9	800	78	104,4	880	78	114,3
S							114	154,8		104	143,5		104	158,3
L	1016,0	1000	40	1027	150	840	94	137,2	870	84	124,3	940	84	134,1
S							130	200,7		110	172,6		110	187,3
L	1220,0	1200	48	1233	150	960	94	161,0	970	94	162,8	1040	94	175,0
S							130	237,0		120	219,6		120	235,7

L = light version

S = heavy version

smaller and larger pipe size or special dimension on request

Dynamic load clamps

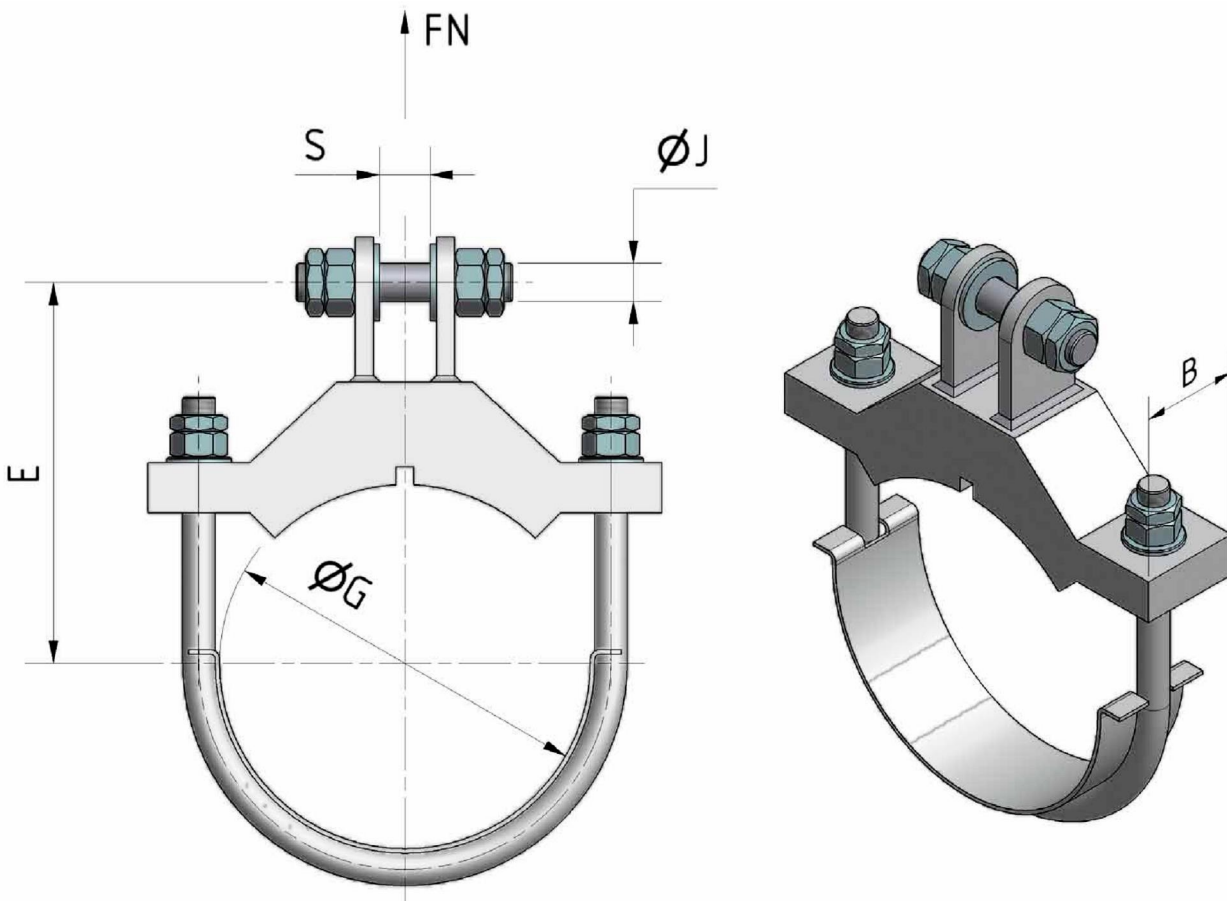
Load data sheet for EHS 17D - Insulation thickness 0 to 100 mm

Version	Temp. °C	ØDA mm	Pipe Size		Allowable loads kN															
			mm	Inch	80°C	150°C	300°C	400°C	500°C	500°C	540°C	80°C	300°C	550°C	540°C	560°C	580°C	560°C	600°C	650°C
Insulation					Insulation thickness 0 to 100 mm															
Material					S355J2C3 (1.0570)	16Mn3 (1.5415)	13CrMo4-5 (1.7335)	X6CrNiTi18 10 (1.4541)	100Mn9-10 (1.7380)	X100MoVNb9-1 (1.4903)										
L	188,3	150	6	35	33	26	21	19	25	23	16	18	18	16	17	13	9	37	32	13
S				65	58	46	37	34	44	40	28	34	34	29	31	23	16	67	57	23
L	219,1	200	8	35	33	26	21	19	25	23	16	18	18	16	17	13	9	37	32	13
S				65	58	46	37	34	44	40	28	34	34	29	31	23	16	67	57	23
L	273,0	250	10	65	58	46	37	34	44	40	28	34	34	29	31	23	16	67	57	23
S				101	91	71	58	54	69	63	43	53	53	45	48	36	25	104	89	35
L	323,9	300	12	65	58	46	37	34	44	40	28	34	34	29	31	23	16	67	57	23
S				146	126	99	81	74	96	88	54	77	76	62	60	45	31	145	124	44
L	355,6	350	14	65	58	46	37	34	44	40	28	34	34	29	31	23	16	67	57	23
S				146	131	103	84	77	100	91	62	77	76	64	70	52	36	150	129	51
L	406,4	400	16	65	58	46	37	34	44	40	28	34	34	29	31	23	16	67	57	23
S				146	131	103	84	77	100	91	62	77	76	64	70	52	36	150	129	51
L	457,2	450	18	101	91	71	58	54	69	63	39	53	53	45	44	32	23	104	89	32
S				146	131	103	84	77	100	91	62	77	76	64	70	52	36	150	129	51
L	508,0	500	20	101	91	71	58	54	69	63	43	53	53	45	48	36	25	104	89	35
S				146	131	103	84	77	100	91	62	77	76	64	70	52	36	150	129	51
L	558,8	550	22	101	91	71	58	54	69	63	43	53	53	45	48	36	25	104	89	35
S				146	131	103	84	77	100	91	62	77	76	64	70	52	36	150	129	51
L	609,6	600	24	146	124	98	80	73	95	86	53	77	73	61	59	44	31	143	123	43
S				232	187	147	119	110	143	130	80	122	109	92	89	66	46	214	184	65
L	660,4	650	26	146	115	91	74	68	88	80	49	77	67	57	55	41	29	132	113	40
S				232	173	136	111	102	132	120	74	122	101	85	83	61	43	198	170	60
L	711,2	700	28	146	107	84	69	63	82	74	46	77	63	53	51	38	27	123	106	37
S				231	161	127	103	95	123	112	69	121	94	79	77	57	40	185	158	56
L	762,0	750	30	146	129	101	82	76	98	89	55	77	75	59	61	45	32	147	127	45
S				232	204	152	123	114	147	134	83	122	112	95	92	68	48	221	190	67
L	812,83	800	32	216	151	119	97	89	115	105	65	114	88	70	72	53	37	173	149	52
S				303	211	166	135	125	162	147	90	159	123	104	101	75	52	242	208	73
L	863,6	850	34	217	151	119	97	89	116	105	65	114	88	74	72	53	37	173	149	52
S				303	212	167	135	125	162	147	91	160	123	104	101	75	52	243	208	73
L	914,4	900	36	232	199	156	127	117	152	138	85	122	116	98	95	70	49	228	196	69
S				338	278	219	178	164	213	193	119	178	162	137	133	98	69	319	274	97
L	1016,0	1000	40	270	188	148	121	111	144	131	81	142	110	93	90	67	47	216	185	65
S				432	301	237	193	178	230	209	129	227	176	148	144	107	75	346	297	105
L	1220,0	1200	48	272	190	150	122	112	145	132	81	143	111	93	91	67	47	218	187	66
S				436	304	239	195	179	232	211	130	229	177	150	145	107	75	349	299	106

L = light Version S = heavy Version Higher loads and additional clamp materials on request

Dynamic load clamps

5.3 Dynamic U-Bolt clamp, EHS 18S, Pipe size NW 125 to NW 1200



Connecting dimensions for Snubbers and Sway Struts

EHS18S	Figure		Nominal load FN [kN]				ØJ	S
	200A/B	211L	S235JR2		13CrMo4.5			
	201A/B		80°C	300°C	300°C	500°C	[mm]	
Size 1	3 1/4‰	E	78	44,8	81,8	66,5	35	22,5
Size 2	4‰	F	130	74,8	136,3	110,9	45	32,5
Size 3	5‰	G	234	134,6	245,4	199,7	60	44,5
Size 4	6‰	H	303	174,4	317,7	258,6	70	49,5

Dynamic load clamps

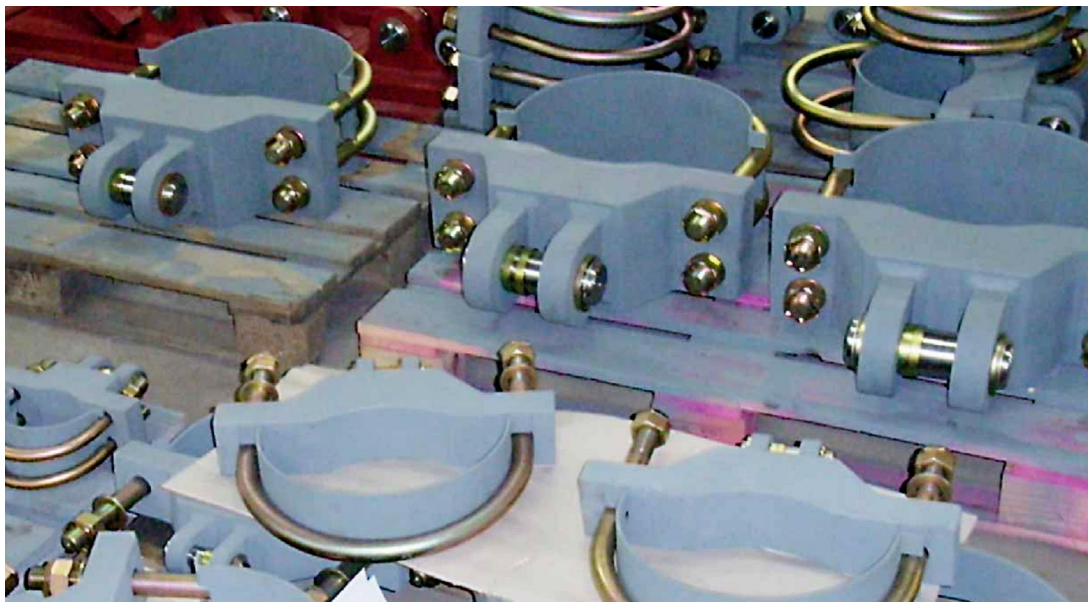


Installation dimensions and weight data sheet, EHS18

Pipe Size		Pipe ØDA	ØG [mm]	B [mm]	EHS18S											
inch	mm				Size 1			Size 2			Size 3			Size 4		
					E	Insul*	Weight	E	Insul*	Weight	E	Insul*	Weight	E	Insul*	Weight
5	125	139,7	141	60	180	160	17	.	.	.	.	.	.	.	.	.
6	150	168,3	170	60	205	185	19	235	210	34	.	.	.	.	.	.
8	200	219,1	222	60	225	205	22	255	230	42	.	.	.	.	.	.
10	250	273,0	276	90	265	245	26	300	275	45	325	290	64	.	.	.
12	300	323,9	328	90	295	275	32	330	305	61	355	320	93	360	320	107
14	350	355,6	360	130	325	305	34	365	340	65	390	355	98	395	355	112
16	400	406,4	411	130	365	345	38	400	375	72	425	390	122	430	390	133
18	450	457,2	462	130	405	385	41	450	425	81	475	440	132	480	440	146
20	500	508,0	513	130	445	425	51	500	475	115	525	490	205	530	490	219
22	550	558,8	565	150	485	465	53	550	525	121	575	540	213	580	540	227
24	600	609,6	616	150	525	505	55	600	575	125	625	590	219	630	590	233
28	700	711,2	714	150	600	580	61	685	660	135	710	675	233	715	675	247
30	750	762,0	770	a.A	650	630	63	700	675	130	750	715	240	760	720	255
32	800	812,8	815	a.A	655	635	67	740	715	145	765	730	252	770	730	266
34	850	863,6	873	a.A	680	660	70	760	735	150	795	760	257	810	770	271
36	900	914,4	918	a.A	700	680	74	785	760	155	810	775	262	815	775	276
40	1000	1016,0	1019	a.A	880	860	93	950	925	165	980	945	275	1010	970	285
48	1200	1220,0	1233	a.A	980	960	112	1050	1025	175	1080	1045	286	1110	1070	315

* maximum insulation

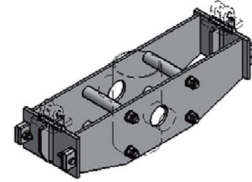
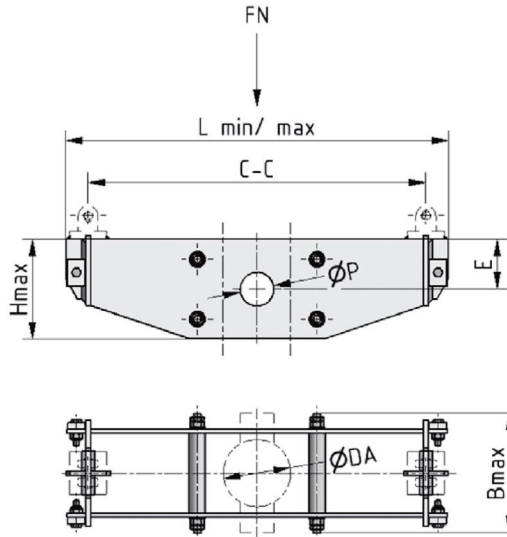
special clamp or special clamp materials on request



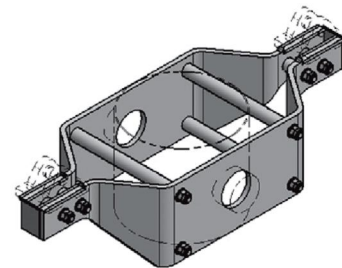
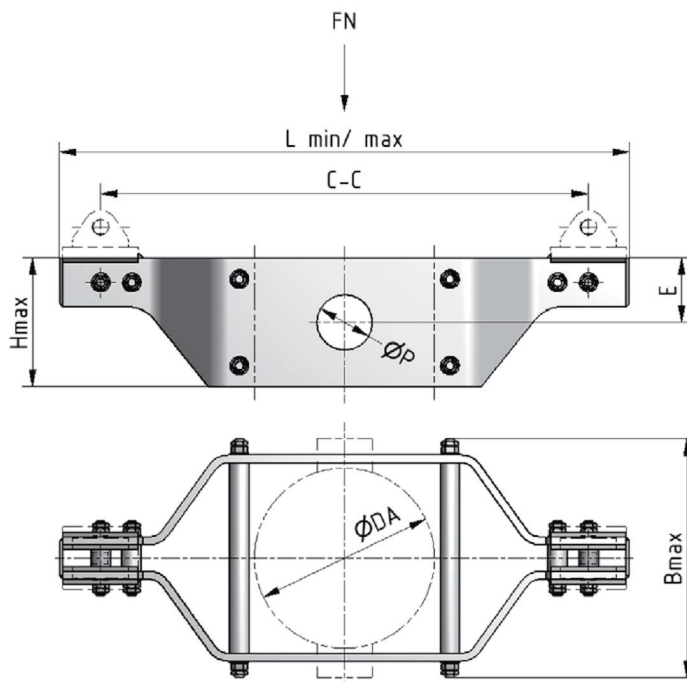
Dynamic load clamps

5.4 Dynamic Vertical clamp, Fig. 403D

Design for Pipe size NW 50 to NW 250



Design for Pipe size NW 300 to NW 1000



Dynamic load clamps



Connecting dimensions data sheet, Fig. 403D

Pipe size		Pipe ØDA	GC			ØP	Bmax	Hmax	E1
inch	mm		min	middle	max				
mm									
2	50	60,3	300	500	700	36	140	120	60
2,5	65	76,1	300	500	700	36	155	130	65
3	80	88,9	300	550	800	36	170	140	70
3,5	90	101,6	350	600	850	51	180	150	75
4	100	114,3	350	650	950	51	230	210	105
5	125	139,7	400	700	1000	51	260	220	110
6	150	168,3	450	775	1100	63	315	250	125
8	200	219,1	500	950	1400	79	400	310	155
10	250	273	550	975	1400	92	485	370	185
12	300	323,9	950	1150	1350	118	460	340	170
14	350	355,6	1000	1175	1350	118	505	370	185
16	400	406,4	1050	1200	1350	144	560	370	185
18	450	457,2	1200	1500	1800	144	645	460	230
20	500	508	1350	1575	1800	173	720	450	225
22	550	558,8	1450	1625	1800	173	770	490	245
24	600	609,6	1500	1750	2000	199	840	510	255
26	650	660,4	1600	1800	2000	224	890	530	265
28	700	711,2	1900	2200	2500	224	970	550	275
30	750	762	1900	2200	2500	250	1020	590	295
32	800	812,8	2200	2350	2500	250	1075	580	290
34	850	863,6	2300	2450	2600	250	1145	600	300
36	900	914,4	2400	2550	2700	279	1195	630	315
38	950	965	2600	2800	3000	279	1320	640	320
40	1000	1016	2600	2800	3000	279	1370	640	320

Weight data sheet, Fig. 403D

Pipe size		Pipe ØDA	Weight						Lmin	Lmax	
inch	mm		GCmin		GCmiddle		GCmax				
kg											
mm											
2	50	60,3	5,2		7,4		10		370	770	
2,5	65	76,1	5,5		7,9		10,7		370	770	
3	80	88,9	6,9		10,5		14,5		370	870	
3,5	90	101,6	7,7		11,8		16,1		420	920	
4	100	114,3	light	8,7	light	14,2	light	19,7	47,8	450	1050
5	125	139,7		12,4		heavy		21	heavy	29,9	53,2	500	1100
6	150	168,3	15,3	heavy	23,8	heavy	33,5	heavy	82,4	570	1220
8	200	219,1	24,7	heavy	41,6	heavy	60,3	heavy	172,2	640	1540
10	250	273	32,2	heavy	51,7	heavy	72,8	heavy	252	730	1580
12	300	323,9	92,5		98,5		106,5		1130	1530	
14	350	355,6	114		119		126		1180	1530	
16	400	406,4	143,5		149,5		157,5		1230	1530	
18	450	457,2	208,5		315,5		245,5		1380	1980	
20	500	508	302		317		334		1530	1980	
22	550	558,8	345,5		357,5		372,5		1630	1980	
24	600	609,6	425		449		475		1680	2180	
26	650	660,4	463,5		482,5		503,5		1780	2180	
28	700	711,2	636		678		721		2080	2680	
30	750	762	711,5		742,5		775,5		2320	2920	
32	800	812,8	877		899		923		2620	2920	
34	850	863,6	1012		1035		1058		2720	3020	
36	900	914,4	1086		1110		1135		2820	3120	
38	950	965	1351		1391		1433		3020	3420	
40	1000	1016	1386		1425		1465		3020	3420	

Dynamic load clamps

Load data sheet Dynamic Vertical clamp Figure 403D, Pipe size NW 50 to NW 150

ØDA	Pipe size		CC	Allowable loads FN in kN																	
	mm	inch		80°C	150°C	300°C	400°C	500°C	540°C	80°C	300°C	550°C	540°C	580°C	560°C	580°C	560°C	600°C	650°C		
60,3	50	2	Min	67	47	37	32	30	38	35	20	35	27	23	22	17	12	54	46	16	
			Middle	40	28	22	19	18	23	21	12	12	16	14	13	10	7	32	28	10	
			Max	700	29	16	14	13	16	15	9	9	15	12	10	10	7	5	23	20	7
76,1	65	2 1/2	Min	80	56	44	38	35	45	41	24	42	33	28	27	20	14	64	55	19	
			Middle	500	48	34	26	23	21	27	25	14	25	20	17	16	12	8	38	33	12
			Max	700	34	24	19	16	15	19	18	10	18	14	12	11	8	6	27	24	8
88,9	80	3	Min	113	79	62	54	50	63	58	34	59	46	39	38	28	20	90	78	27	
			Middle	62	43	34	29	27	35	32	18	32	25	21	21	15	11	49	42	15	
			Max	800	42	30	23	20	19	24	22	13	22	17	15	14	10	7	34	29	10
101,6	90	3 1/2	Min	105	73	58	50	46	59	54	31	55	43	36	35	26	18	84	72	25	
			Middle	600	61	43	34	29	27	34	31	18	32	25	21	20	15	11	49	42	15
			Max	850	43	30	24	21	19	24	22	13	23	18	15	14	11	7	35	30	10
114,3	100	4	Min	122	85	67	58	54	68	62	36	64	49	42	40	30	21	97	83	29	
			Middle	65	46	36	31	29	37	34	20	34	27	22	22	16	11	52	45	16	
			Max	950	45	31	25	21	20	25	23	13	24	18	15	15	11	8	36	31	11
139,7	125	5	Min	163	129	102	88	82	104	95	55	86	75	64	62	46	32	148	127	45	
			Middle	100	70	55	47	44	56	51	30	36	28	23	23	17	12	55	47	17	
			Max	350	245	241	188	188	185	131	129	70	124	96	81	79	58	41	189	162	57
168,3	150	6	Min	236	165	130	112	104	133	121	70	124	96	81	79	58	41	189	162	57	
			Middle	950	162	113	89	77	71	91	83	48	85	66	55	54	40	28	129	111	39
			Max	400	162	113	89	77	71	91	83	48	85	66	55	54	40	28	130	111	39
183,3	150	6	Min	93	65	51	44	41	52	48	28	49	38	32	31	23	16	74	64	22	
			Middle	65	45	36	31	29	36	33	19	34	26	22	22	16	11	52	45	16	
			Max	1000	245	232	188	187	185	126	129	72	127	98	83	81	60	42	194	166	59
183,3	150	6	Min	242	169	133	115	107	136	124	72	127	98	83	81	60	42	194	166	59	
			Middle	1000	169	118	93	81	75	96	87	51	89	69	58	56	42	29	136	116	41
			Max	450	156	109	86	74	69	88	80	47	82	63	53	52	38	27	125	107	38
183,3	150	6	Min	90	63	50	43	40	51	46	27	48	37	31	30	22	16	72	62	22	
			Middle	775	64	44	35	30	28	36	33	19	34	26	22	21	16	51	44	15	
			Max	1100	302	280	221	191	177	226	206	120	159	159	138	134	99	70	322	276	97
183,3	150	6	Min	234	163	128	111	103	131	120	70	123	95	80	78	58	40	187	160	57	
			Middle	1100	165	115	90	78	72	93	84	49	87	67	56	55	41	28	132	113	40
			Max	450	395	362	302	283	298	298	191	208	208	208	158	111	64	298	256	90	
183,3	150	6	Min	372	260	204	177	164	209	191	111	196	152	128	124	92	64	298	256	90	
			Middle	1100	262	183	144	125	116	148	135	78	138	107	90	87	65	45	210	180	64
			Max	1100	262	183	144	125	116	148	135	78	138	107	90	87	65	45	210	180	64

Dynamic load clamps



Load data sheet for Dynamic Vertical clamp Figure 403D, Pipe size NW 200 to NW 250

ØDA	Pipe size		CC	Allowable loads FN in kN																
	mm	inch		80°C	150°C	300°C	400°C	500°C	540°C	80°C	300°C	550°C	540°C	540°C	540°C	540°C	540°C	540°C		
219,1	200	8	S355LDC3 (1.0570)	Min	145	114	99	92	117	107	62	109	85	71	69	51	36	166	143	50
				Middle	76	60	52	48	62	56	33	58	45	38	36	27	19	88	75	27
				Max	52	41	35	33	42	38	22	39	30	25	25	18	13	59	51	18
					344	271	234	217	277	253	147	194	169	164	122	85	339	339	119	
					181	142	123	114	146	133	77	137	106	89	86	64	45	208	178	63
		176	123	97	84	99	90	53	93	72	60	59	43	30	141	121	43			
		490	422	365	338	369	369	229	258	258	258	189	133	583	527	186				
		404	282	192	178	227	207	121	213	164	139	135	100	70	323	278	98			
		274	191	130	121	154	141	82	144	112	94	91	68	47	219	188	66			
		613	608	469	469	462	462	331	323	323	323	369	273	192	728	728	268			
	583	407	320	277	328	299	174	307	237	200	194	144	101	466	401	141				
	396	276	217	188	222	203	118	208	161	136	132	98	68	317	272	96				
	242	169	133	115	136	124	72	128	99	83	81	60	42	194	166	59				
	137	95	75	65	77	70	41	72	56	47	46	34	24	109	94	33				
	95	66	52	45	54	49	28	50	39	33	32	23	16	76	65	23				
	429	411	324	280	323	302	176	226	226	202	196	145	102	471	405	143				
	332	232	182	158	187	171	99	175	135	114	111	82	58	266	228	81				
	232	161	127	110	130	119	69	122	94	79	77	57	40	185	159	56				
	572	572	494	428	431	431	269	301	301	301	300	222	156	680	619	218				
	508	354	279	241	286	261	152	267	207	174	169	125	88	406	349	123				
	354	247	194	168	199	181	106	186	144	121	118	87	61	283	243	86				
	715	715	702	547	539	539	382	376	376	376	426	315	221	880	850	310				
	715	503	396	343	405	370	215	376	293	247	240	178	125	577	495	175				
	502	350	276	239	282	258	150	264	204	172	167	124	87	402	345	122				
	786	786	786	602	593	583	473	414	414	414	527	390	274	934	934	384				
	786	623	490	425	502	458	267	414	363	307	298	220	155	580	614	216				
	622	434	341	296	350	319	186	327	253	213	207	153	108	498	427	151				

Higher loads or special materials on request

Dynamic load clamps

Load data sheet for Dynamic Vertical clamp Figure 403D, Pipe size NW 300 to NW 750

Version		ØDA	Pipe size		C-C max	Allowable loads kN																	
Temp. °C	mm	mm	inch	mm	mm	80°C	150°C	300°C	400°C	500°C	400°C	500°C	540°C	80°C	300°C	550°C	540°C	560°C	580°C	560°C	600°C	640°C	
Material						SS55LP3 (1.0570)	16Mo3 (1.5415)	13CrMo4-5 (1.7335)	X6CrNiTi18 10(1.4541)	10CrMo9-10 (1.7380)	X10CrMoVNb9-1 (1.4903)												
L	323,9	300	12	300	1350	76	54	42	37	34	44	40	23	40	31	26	26	19	13	62	53	21	
M						101		76		57													
S						134		101		83													
L	355,6	350	14	350	1350	64	54	42	37	34	44	40	23	34	31	26	26	19	13	62	53	21	
M						96		72		62													
S						123		92															
L	406,4	400	16	400	1350	64	50	40	34	32	41	37	21	34	29	25	24	18	12	58	50	20	
M						105		79		72													
S						200		151		126													
L	457,2	450	18	450	1800	87	82	64	55	51	65	60	35	45	40	40	39	29	20	94	80	32	
M						167		126		95													
S						229		172		156													
L	508,0	500	20	500	1800	75	75	60	52	48	56	56	33	39	37	37	37	27	19	88	75	30	
M						161		123		106													
S						296		223		176													
L	558,8	550	22	550	1800	74	74	60	57	57	66	60	40	39	39	45	45	33	23	89	89	37	
M						191		146		126													
S						336		257		214													
L	609,6	600	24	600	2000	60	60	46	46	46	46	46	38	31	31	42	42	31	22	71	71	35	
M						209		157		149													
S						377		284		253													
L	660,4	650	26	650	2000	100	100	88	76	70	75	75	48	52	52	53	53	39	27	119	110	44	
M						226		173		157													
S						398		304		265													
L	711,2	700	28	700	2500	93	85	68	71	68	70	70	46	49	49	52	52	38	27	110	106	43	
M						281		215		165													
S						463		354		278													
L	762,0	750	30	750	2500	101	101	77	77	77	76	76	57	53	53	64	64	47	33	120	120	53	
M						302		231		191													
S						491		376		315													

all loads at C-C max

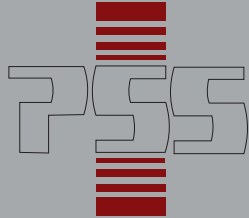
Dynamic load clamps



Load data sheet for Dynamic Vertical clamp Figure 403D, Pipe size NW 800 to NW 1200

Version		ØDA	Pipe size		C-C max	Allowable loads kN																		
Temp. °C	Material	mm	mm	inch	mm	80°C	150°C	300°C	400°C	500°C	500°C	400°C	500°C	540°C	80°C	300°C	550°C	540°C	560°C	580°C	560°C	600°C	640°C	
						SS55.LD33 (1.0570)			16Mo3 (1.5415)	130Mo4-5 (1.7335)	X60CrTi18 10(1.4541)	100Mo9-10 (1.7380)	X100MoVNb9-1 (1.4903)											
L						127	127	126	97	96	71	67	80	59	41	151	66							
M	812,8	800	32	2500	343	262	262	258	207	180	180	230	171	120	407	192								
S					541	414	408	408	352	285	285	393	291	204	643	327								
L					126	97	96	96	69	67	67	76	57	40	151	64								
M	863,5	850	34	2600	343	262	258	258	220	180	180	246	182	127	407	204								
S					541	414	408	408	368	285	285	411	304	213	643	341								
L					127	97	96	96	77	67	67	86	64	45	151	72								
M	914,4	900	36	2700	368	282	275	277	229	193	193	256	189	133	407	212								
S					575	440	433	433	380	302	302	424	314	220	683	352								
L					300	230	220	220	160	155	155	180	135	97	355	155								
M	965,0	950	38	3000	470	360	360	360	270	245	245	300	225	160	560	255								
S					650	500	490	490	400	345	345	450	335	235	780	375								
L					340	260	255	255	225	175	175	250	185	130	400	210								
M	1016,0	1000	40	3000	495	380	375	375	315	260	260	350	260	180	590	290								
S					655	500	495	495	405	345	345	450	335	235	780	375								

all loads at C-C max
Higher loads or special materials on request



Pipe Support Systems GmbH International



PSS Pipe Support Systems GmbH International
Geßbachstr. 2, D-66538 Neunkirchen

Postanschrift:

Postfach 1142, D-66511 Neunkirchen

Tel. 0049 (0)6821-4011-0

Fax 0049 (0)6821-4011-37

www.pipesupp.de

info@pipesupp.de

... wir unterstützen Sie
... we support you