HYDRA®
Quality by Witzenmann

THE GROUP

With 24 companies in 19 countries
Witzenmann is number 1 in the industry worldwide.

World leader
Witzenmann is a global group specialising in the design and manufacture of flexible metal elements. Guided by our vision of „managing flexibility“, our company has become renowned as a reliable manufacturer and as the innovative development partner of choice within the industry. Today, Witzenmann offers the widest product range worldwide for the most diverse areas of application. This enables us to offer the correct solutions time and time again.

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WITZENMANN
managing flexibility

PIPE HANGERS AND SUPPORTS

The details are provided to the best of our knowledge,
but the contents are not legally binding.

We reserve the right to make changes
in the interests of technical progress.

Updated 10/2015

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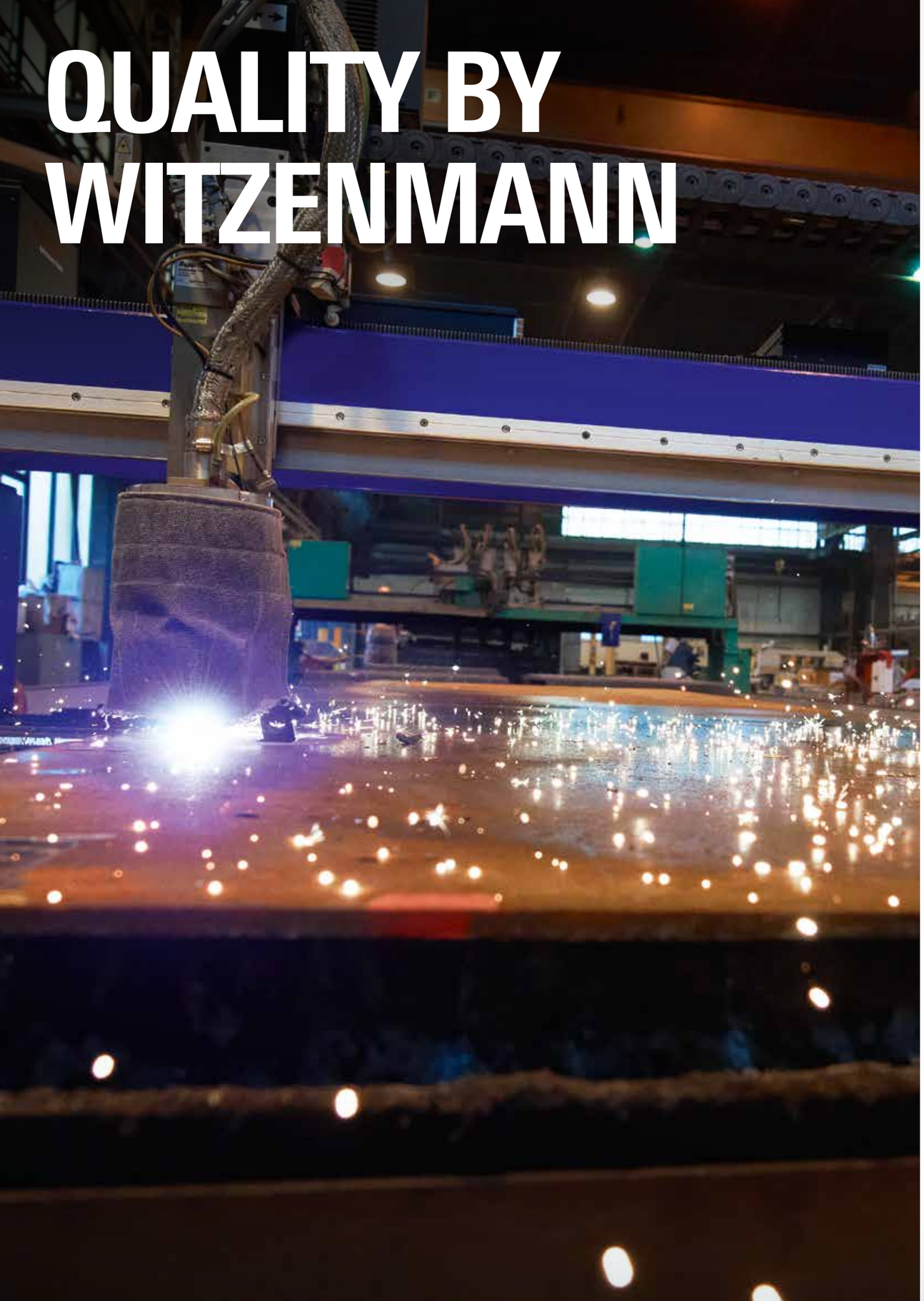


QUALITY BY WITZENMANN

Converting our prominent development expertise perfectly into customised product solutions that fulfil the highest requirements - this is our standard.

Durability and absolute operational reliability are essential for a company aiming to be the quality leader.
It is not only DIN ISO 9001 / TS 16949 certification, but also a wide variety of national and international approvals and certifications such as VDA 6.1, J´ATEX (94/9 CE) or DESP (97/23 CE) that constitute "Hydra - Quality by Witzenmann". Our customers include major companies involved in petrochemicals, industry and plant engineering and construction, power plant operators and suppliers in the energy sector.

Calibration tests

The suitability of the hanger and its accessories for use in power plants has been verified by suitability tests, such as those of the VGB (Association of Major Power Plant Operators) and specified in accordance with DIN 13480. As well as the checking of the QA system, this includes the construction and calculation documents, the verification of suitable materials as well as comprehensive functional, load and lifespan tests. The successful verification took place under the supervision of the VGB through the TÜV Süddeutschland.

Standards

The basic standards on which the design is based are the VGB guidelines R 510 L (1996), "Pipe supports", and KTA 3205.3 (1989), "Mass-produced standard supports". In addition, the following German and foreign regulations are also taken into account:

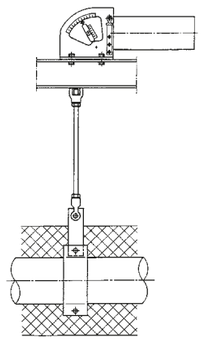
- DIN EN 13480 "Industrial pipelines"
- AD datasheets for pressure vessels (D)
- DIN 18800, Steel structures (D)
- TRD, Technical rules for boilers (D)
- ANSI B 31.1/3 (USA)
- ASME, Boiler and Pressure vessel Code, Sec. III, Subsection NF (USA)
- MSS SP 58
- BS, British Standard (GB).

Conformity in detail will be examined when needed.

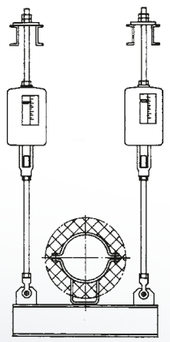
THE HANGER SYSTEM

Load chain with spring hangers and horizontal pipe clamps

Load group with constant hanger attached and horizontal pipe clamp



Double load chain with spring hangers, traverse and horizontal pipe clamps



Our standard range of hangers, supports and accessories is designed, like our entire pipe support range, as a comprehensive, practically oriented, consistent system.

To make planning and selection simple and reliable, we offer a standard range with variants that enable rapid and inexpensive adjustment to the particular case of need.

Load chains
Following selection of hangers and clamps, complete load groups can be designed.

Starting initially from the hanger type, the upper connection to the load-bearing structure is defined. This is followed by the appropriate connection to the pipe clamp, including the threaded part. The distance between these two is bridged with threaded rods, which may be interrupted with rod couplings.

Threaded rods should be ordered with excess lengths so they can be adapted to the real circumstances on the construction site by cutting.

The selection of the required connecting parts has been significantly simplified by our hanger system, which classifies all connecting parts as well as hangers and clamps load groups (LGV).

The fitted measurement "E" indicated for all products simplifies adding up the entire length of the load group.

CONTINUOUS LOAD GROUPS MAKE FOR RELIABLE PLANNING

The load groups of the connecting parts assign together parts of the same nominal load F_N taking into account the same thread diameter. For all spring hangers and constant hangers, the associated load group LGV is indicated and is part of the type designation.

Load group LGV		12	16	20	24	30	36	42	48	56	64	72	80	90
Nominal load F_N in kN		7	12	20	33	50	70	100	132	180	240	300	400	500
Connections	Thread diameter DIN	M 12	M 16	M 20	M 24	M 30	M 36	M 42	M 48	M 56	M 64	M 72	M 80	M 90
	Inch	1/2	5/8	3/4	1	1Ð	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2
	Bolt diameter	12	16	20	24	33	40	45	50	60	70	80	90	100
Spring hangers	Nominal load F_N in kN	7	12	20	33	50	70	100	132	–	200	280	400	500
	VH size	01-05	06	07	08	09	10	11	12	–	13	14	15	16
Constant hanger	Max. permissible required load F_S [1] in kN	6	10	17	29	43	61	87	115	157	209	261	348	435
	possible CH size [2]	01-09	05-11	07-12	08-14	09-15	11-16	11-17	13-18	14-19	16-19	17-20	18-20	19-20

[1] 15% adjustment reserve taken into account

[2] see Table page 32

DEFINITIONS

Model series
Name for a product series in the hanger range, consisting of three letters; it is part of every type designation.

Example: FHD stands for spring hanger with double lug.

Load group (LGV)
Categorizing term for connecting parts, based on the associated thread diameter. The same load group means the same nominal load and the same design safety factor; it is part of the type designation for hangers, supports and connecting parts.

Example: Load group 36 includes all connecting parts with or that fit thread diameter M36; its nominal load is F_N = 70 kN, (see table above).

VH size
Categorizing term for spring hangers and spring supports. The same load size is assigned as number amount to the spring hangers with a specific nominal load F_N regardless of the type series or nominal travel; it forms part of the spring hanger type designation.

Example: FHD 07... stands for the seventh size of spring hangers with double lug, its nominal load is F_N = 20 kN, (see spring hanger table from page 20).

CH size
Categorizing term for constant hangers and constant supports. The same CH size is assigned as a number amount to the constant hangers with a specific CH, the product of nominal load and nominal travel ($F_N \cdot s_N$); it forms part of the constant hanger type designation.

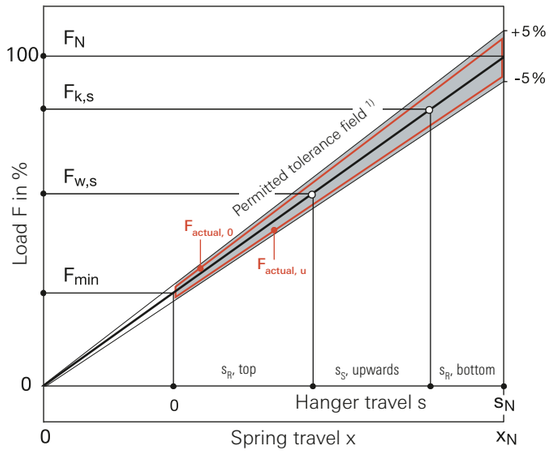
Example: KHD 08... stands for the eighth size of the constant hanger, horizontal, with double lug (see constant hanger tables from page 34).

PLANNING AND DESIGN

Real hanger behaviour
To be able to predict the later real behaviour of the pipes adequately with computer pipe analyses, the planner must be able to predict that the planned hanger will behave as planned within the entire operating time.

The tolerance limits prescribed in the recognised standards (e.g. VGB-R 510 L, KTA 3205.3) therefore permit maximum deviations for spring and constant hangers of only ±5% from the theoretical loads, as made clear in the following diagrams. In addition, load adjustment options and adequate travel reserves are required to be able to adapt the devices during fitting of the actual loads and travels.

Spring hangers and spring supports
Load/Travel characteristic, tolerance limits



1) Permitted tolerances with angled load application: ±6 %

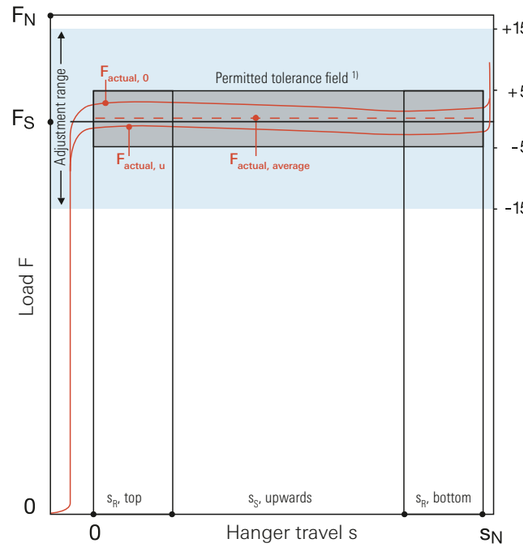
Definition

Start load:	F_{min}
Nominal load:	F_N
Required load, cold (cold load):	$F_{k,s}$
Required load, warm (warm load):	$F_{w,s}$
Spring rate:	$R = \frac{F_N}{x_N} = \frac{F_N - F_{min}}{s_N}$
Spring travel, total:	x_N
Nominal travel:	s_N
Required travel:	s_S
Travel reserve:	s_R

Taking into account load tolerances and friction components
When calculating the pipeline systems the load tolerances and especially the unavoidable friction components must be taken into account. No matter how small they may be; if they are not taken into account as force components that each apply against the movement, they can completely change the operating behaviour of a highly flexible system compared to the calculation. This may result in unintended position changes of the pipelines with the danger of condensation gathering, water hammers, unintended tension increases and other disruptions.

Conditions for the hanger and clamp layout
Alongside the special boundary conditions, such as applicable regulations, prescribed acceptances, required documentation, etc. special criteria are specified depending on the pipe supports position.

Constant hangers and constant supports
Load/Travel characteristic, tolerance limits



1) Permitted tolerances with angled load application: ±6 %

Definition

Nominal load:	F_N
(Maximum load of the constant hanger)	
Required load:	F_s
set average load:	$F_{actual, average}$
Condition for the average setting:	$\frac{\lvert F_s - F_{actual, average} \rvert}{F_s} \leq 0.02$
Nominal travel:	s_N
Required travel:	s_S
Travel reserve:	s_R

DESIGN CRITERIA

Basic decision regarding hanger selection
Before the detailed hanger selection, an initial decision must be made about whether a rigid or moveable hanger is required. Then it must be settled whether a spring hanger is sufficient or a constant hanger is required. (In this respect, when hangers are discussed, supports are included in this.)

The rigid, hanging suspension element is then selected if no vertical movement occurs or is authorised at the suspension point; however, horizontal movement components are permitted to a limited extent.

Spring hangers
These components, which are cheaper than constant hangers, can then be used when the vertical movement to be absorbed is not too large - max. 60 mm - and the suspended pipe system with its component connections can easily bear a different in the loads between installation and operating state (load change); 25% of the heat load would typically be seen as a permitted load change in this respect.

Constant hangers
These components, which are more complex than spring hangers, are required when larger vertical movements must be absorbed - 60 mm and more - or when the load deviations may not exceed ± 5%, in order to avoid unpermitted loads on component connections or critical pipe sections.

Note:
With spring hangers, a decision must be made in advance about whether weight forces must be compensated for in the warm or cold state of the pipeline. In the first case, additional pipe loads are avoided in the warm state, in the other case installation is simpler, as "swimming in" of the pipe can be avoided, i.e. weight compensation is possible with disengaged connections.

Spring hangers and constant hangers
- loads to be borne, taken from pipeline calculation (required load)
- Self-weight of traverses, pipe shoes and hanger housing to be borne, if applicable
- Vertical movements to be absorbed (required travel)
- Direction of the vertical movement from cold to warm (up or down)
- horizontal movement occurring at the same time (defines length or angular load of the suspension element)
- Type of hanger connection to the steel structure (hanging, attached/welded, screwed, clamped)
- Level requirements for hanger/support arrangement (defines connection variants)
- Distance available from centre of pipe to steel structure (defines design of the load chain)
- Set-up type, e.g. inside building or in open air (defines corrosion protection measures)

Pipe clamps
Horizontal or riser clamps are specified by the orientation of the pipeline at the particular suspension point.

The selection of materials is dependent on the clamp temperature to be expected; in the process the temperature drop between the medium temperature and the highest stressed clamp area is to be taken into account, in order to avoid receiving unnecessarily overdimensioned clamps.
(see from page 61)

Through appropriate measurement of the connectable three-bolt and grip clamp as well as the connecting lugs for the two-bolt clamps, we have ensured that at the highest permissible clamp temperature the temperature of the connecting thread part (eye nut or clevis) will not be higher than 80 °C.

It is recommended that the pipe is positioned in shear pins in rigid suspensions, in shear lugs in spring suspensions; this applies independently of any pipe tilt that occurs.

- Operating load at support point
- Diameter of the pipe
- Temperature of the medium (operation, design, etc.)
- Anticipated insulating thickness of the pipeline
- Orientation of the pipeline (horizontal, vertical)
- Spans with riser clamps
- Material requirements for the pipe clamps (e.g. austenite)
- Normally, additional loads are not taken into account in the selection of hangers and clamps, such as those from water pressure testing or pickling of high-pressure steam pipes; they are covered by the permitted overload of the hangers, clamps and connecting parts. All parts of our hanger system bear 2.5 times the nominal load without permanent deformation (taking into account the temperature reduction in pipe clamps).

FLEXPERTE® – DESIGN AND CALCULATION

Ever shorter development cycles call for sound design and relevant calculation results even in the early stages of development. Up-to-date FEM programs can be used to determine most of the important characteristics of parts by calculation as early as in the design phase. Not only the tensions, but also functional characteristics such as static and dynamic rigidity, resonant frequencies and stability limits are used as the basis of service life calculations.

We can furnish our customers at an early stage with CAD models of Witzenmann products for static and dynamic FEM analyses. Thus, our customers can integrate components made by Witzenmann into their calculations with all requisite properties and without additional effort.

FLEXPERTE® – DESIGN SOFTWARE

The design of suitable pipe brackets is a substantive part of planning complex pipeline systems. As the design of the pipelines is naturally subject to various modifications in the course of the project sequence plan, the appropriate support can usually only be made available at the end of planning. However the support must still be fitted at the installation location before the pipelines. This often results in a critical time delay in the planning sequence noted above. The use of the FLEXPERTE design software from Witzenmann helps you efficiently design pipe support under high time pressure and generate the optimal solution on time.

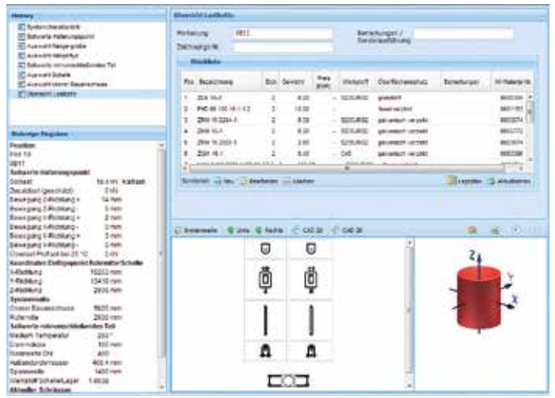
Direct access to the complete range

The FLEXPERTE design software can be downloaded for free from the Witzenmann homepage at **www.witzenmann.de**.

The software offers direct and rapid access to the entire standard pipe support range. It allows complete load groups to be configured at the click of a mouse. Changes in requirements can be carried out directly without requiring significant time or work. Once the design is complete, the calculated configuration data can be transmitted directly in the form of an electronic order list.

Simple operation

The required data can be entered using an intuitive user interface - in most cases these are only a few parameters. The system calculates the optimal solution for the particular pipe support point. The software configures the entire load group, taking individual customer requirements into account. These customer-specific parameters can also be simply and transparently selected in the software options at any time.



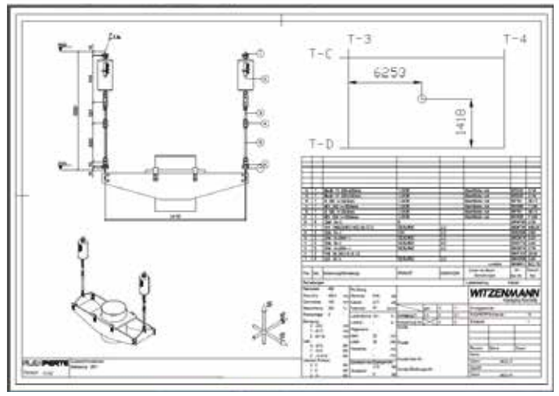
Clearly structured and user-friendly

Screen to terminate the design: tracing and overview of the input steps that have taken place (history), current status of the input (previous entries) as well as parts list and schematic drawing of the selected parts.

Substantive result

In parallel to the calculation of the load chains, these will be shown in scale-appropriate drawings and can be saved in the system so they can be called up at any time. The drawings have all relevant information and can also be supplemented with editable information at any time. FLEXPERTE also automatically creates parts lists with weight and material information and additional documentation when needed. The drawings are output as PDF and DXF files from FLEXPERTE.

FLEXPERTE® – DESIGN SOFTWARE



Technical drawing of the design

Scale-appropriate representation of the load chain including parts list and all relevant and defined parameters.

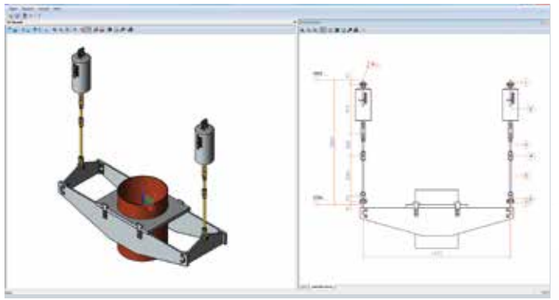
System integration

Interfaces to all current CAD and CAE systems permit comprehensive integration of the data from or into other applications. For example, FLEXPERTE is compatible with the analysis program ROHR2® (Sigma) and Caesar II (Intergraph, in preparation). The data calculated in these systems forms the basis for the pipe support calculation.

3D data at the press of a button

As well as 2D output, there is the option to transfer the finished drawings for implementation to the corresponding programs as 3D graphics. For example this is possible for:

- AutoCAD®
- Inventor
- CATIA
- ProEngineer
- SolidWorks



3D generator

For easy creation of 3D models of the design

The 3D graphics can also be exported into all current native formats. STEP and IGES are the best known of these. This enables importation into all CAD and CAE systems.

Interfaces

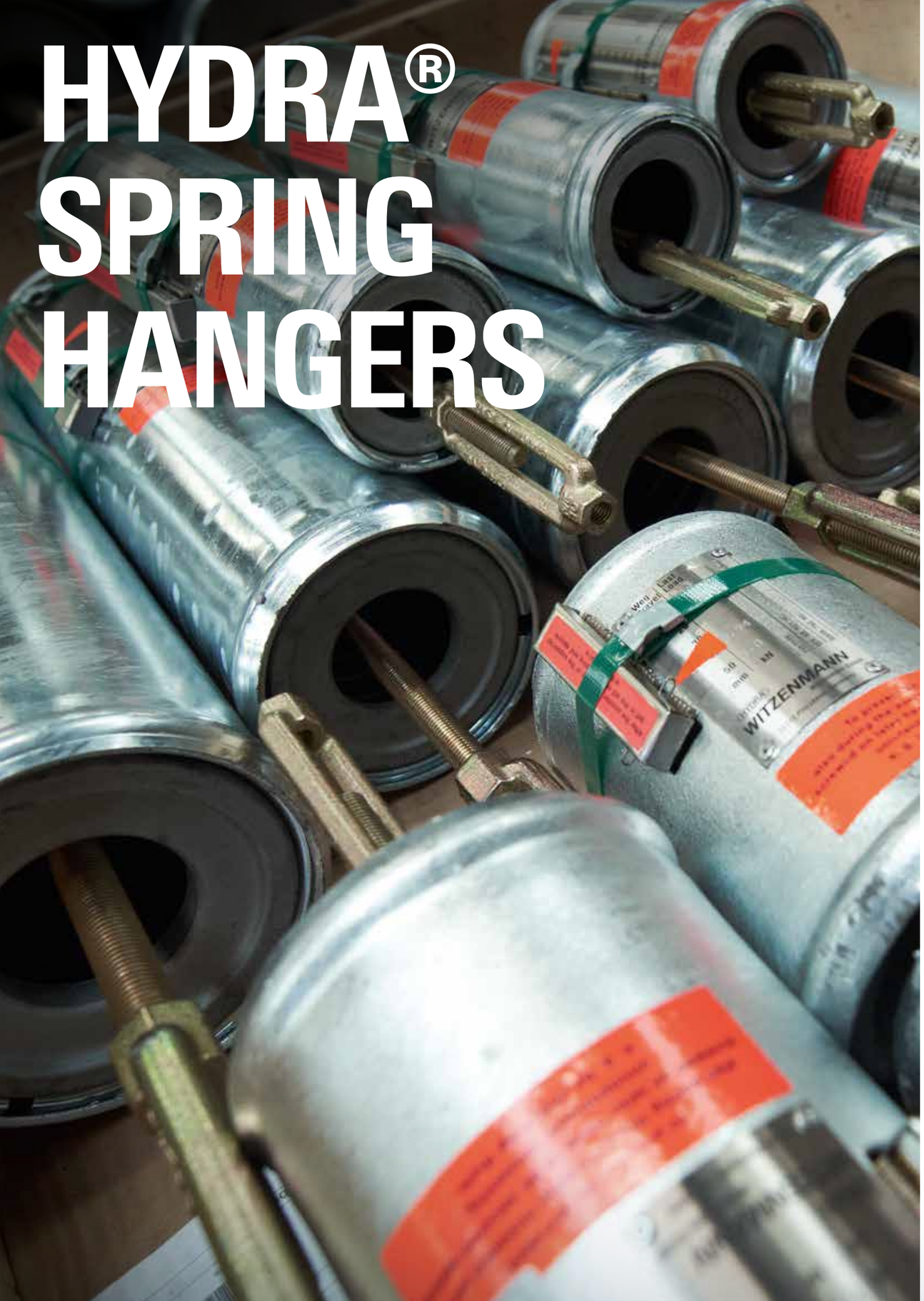
We make interfaces available for additional planning in the 2D and 3D field:

- Smart3D for Plant
- Microstation PDS®
- AVEVA PDMS™

The planning interfaces to 3D programs (here Aveva)

allows integration of Witzenmann products and simplifies the planning and design of complex pipeline systems.

HYDRA® SPRING HANGERS

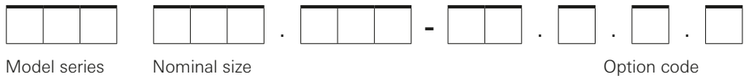


STRUCTURE OF THE TYPE DESIGNATION

The type designation consists of three parts:
1. Series, defined by three letters
2. Nominal size, defined by several number groups
3. Option code, defined by figure codes, separated from the nominal size by hyphens

Type designations without option codes refer to standard versions.

Diagram illustrating the naming principle



Option code

	Travel stop [1]		Surface protection
0	Without travel stop	0	blank
1	With travel stop	1	Electro-galvanized
	Threaded connection[1]	2	Hot-dip galvanized
1	in accordance with DIN ISO (metric)	3	Primed
2	Inch thread	4	Other coating please specify exactly

[1] Only spring hangers and constant hangers

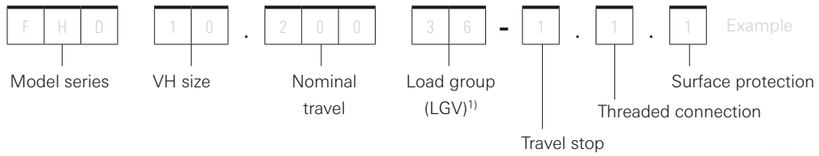
Series

Meaning of characters dependent on position

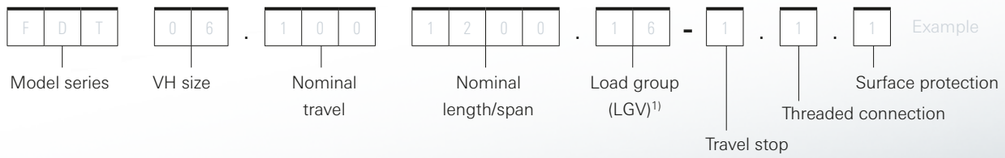
Product group Position 1		Design/Component Position 2		Connection/Other Position 3	
Spring hangers/ Spring supports	F	suspended	H	Double lug	D
				Thread	G
				Continuous tie rod	S
		double	D	With traverse	T
		supporting	S	Support plate, steel	S
				Sliding plate, PTFE	P
				Spherical sway head	G

Type designation of the products

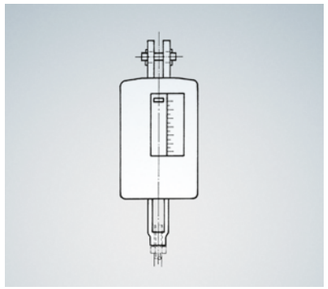
Spring hangers/spring supports



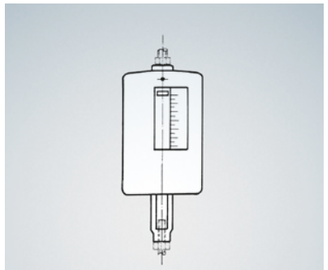
Sway support (FSG) and double hanger with traverse (FDT)



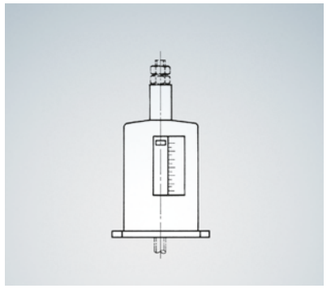
CONNECTION CRITERIA OF THE SERIES



FHD
The **spring hanger with double lug** (including bolts) is suitable for direct connection to a supporting structure above - only via a welding or clamping lug without additional connecting parts. The load can be adjusted with the associated turnbuckle.

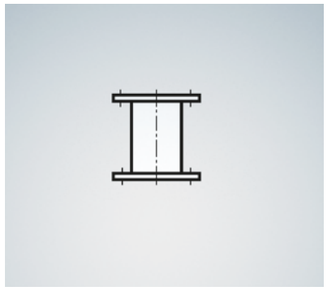


FHG
The **spring hanger with thread connection** is suitable for installation on a desired level by interim placement of a threaded rod of appropriate length upwards to the steel structure; the connection to the load-bearing structure is made via a clevis and a welded or clamping lug or by means of hexagonal nuts via a perforated plate with spherical washer. The load can be adjusted with the associated turnbuckle.

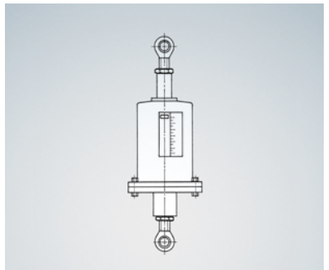


FHS
The **spring hanger for continuous tie rod** is suitable for placement upon the load-bearing structure; it is fastened with screws. The load is introduced via the continuous threaded rod and the screwed-on nuts; the load can be adjusted by turning the nuts.

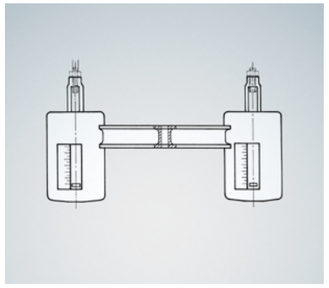
FSS/FSP
The **spring support with support plate** takes the load from above; it is placed upon the steel structure with the base plate and fastened with screws. The load to be borne is placed via the sliding or insulating shoe with an even support surface on the support plate of the spring support. If lateral movements are expected, the support should be chosen with a sliding plate made from PTFE (FSP series).



ZZF
The **intermediate piece** allows height differences to be balanced out.



FSG
The spring **sway support** takes the load as pressing force and passes it on to the load-bearing structure via joint connections. Larger lateral displacements thus become possible on the load-bearing components, with smaller lateral forces at the same time. Their use is only permitted when the components to be carried exhibit sufficient inherent rigidity and are held securely in their position in every operating state.



FDT
The **double hanger with traverse** is appropriate for suspending pipelines that run close beneath the load-bearing steel structure. These can be fitted with a suitable pipe shoe and placed on the traverse. The load can be adjusted with the associated turnbuckles.

VH SIZES AND LOAD GROUPS

Selection
The table below gives the possible loads (Required load F_s) for every VH size dependent on the springer travel, relative to the particular nominal travel SN of 50, 100 and 200 mm. The maximum load corresponds to the nominal load FN of the spring hanger. The required travel of the spring hanger corresponds to the temperature-caused vertical movement of the suspended system components. The load change between installation and operating position, which is unavoidable with spring hangers, subjects the system components to additional load. The difference between warm load and cold load should be ≤ 25 %, in accordance with VGB-R 510L and KTA 3205.3.

Example
Spring hanger with double lug (standard)
Warm load: F_W = 90 kN
Required travel downwards: s_S = 25 mm
Blocked at: cold load F_K

Selection:
With downwards directed required travel, the warm load is at a higher load; it is placed as close to the nominal load as possible.
This gives:
VH size: 11
Nominal travel: s_N = 100 mm
(from recommended working travel > s_S = 25 mm)

FHD 11.100.42

With cold load: 73.2 kN
Travel reserve: 15 mm
Load change: ΔF = 16.8 kN
corresponding to 19% of F_W read from the Load/Travel table or calculated by means of spring rate: $\Delta F = R \cdot s_S$
Installation dimension:
$E = E^* + s_V = 705 + 60$
(E* see measurement tables from page 18)
E = 765 mm

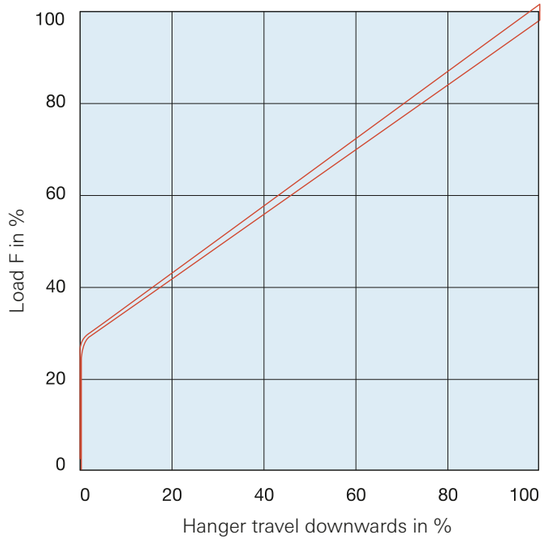
Nominal travel s_N						VH size															
50		100		200		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Hanger travel						Required load F_S, travel-dependent															
recommended work travel																					
mm		mm		mm		kN															
0	5	0	10	0	20	0.16	0.32	0.66	1.30	2.30	3.90	6.60	10.9	16.5	23.0	33.0	43.6	66.0	92.0	132	165
2.5		5		10		0.18	0.35	0.73	1.44	2.54	4.31	7.27	12.0	18.2	25.4	36.4	48.0	72.7	101	145	182
5.0	7.5	10	15	20	30	0.19	0.39	0.79	1.57	2.77	4.71	7.94	13.1	19.9	27.7	39.7	52.4	79.4	111	159	199
7.5		15		30		0.21	0.42	0.86	1.71	3.01	5.12	8.61	14.2	21.5	30.1	43.1	56.9	86.1	120	172	215
10.0		20		40		0.23	0.46	0.93	1.84	3.24	5.52	9.28	15.3	23.2	32.4	46.4	61.3	92.8	130	186	232
12.5		25		50		0.25	0.49	1.00	1.98	3.48	5.93	9.95	16.4	24.9	34.8	49.8	65.7	99.5	139	199	249
15.0	10	30	20	60	40	0.26	0.52	1.06	2.11	3.71	6.33	10.6	17.5	26.6	37.1	53.1	70.1	106	148	212	266
17.5		35		70		0.28	0.56	1.13	2.25	3.95	6.74	11.3	18.6	28.2	39.5	56.5	74.5	113	158	226	282
20.0		40		80		0.30	0.59	1.20	2.38	4.18	7.14	12.0	19.7	29.9	41.8	59.8	79.0	120	167	239	299
22.5		45		90		0.31	0.63	1.26	2.52	4.42	7.55	12.6	20.8	31.6	44.2	63.2	83.4	126	177	253	316
25.0	12.5	50	25	100	50	0.33	0.66	1.33	2.65	4.65	7.95	13.3	22.0	33.3	46.5	66.5	87.8	133	186	266	333
27.5		55		110		0.35	0.69	1.40	2.79	4.89	8.36	14.0	23.1	34.9	48.9	69.9	92.2	140	195	279	349
30.0		60		120		0.36	0.73	1.46	2.92	5.12	8.76	14.6	24.2	36.6	51.2	73.2	96.6	146	205	293	366
32.5		65		130		0.38	0.76	1.53	3.06	5.36	9.17	15.3	25.3	38.3	53.6	76.6	101	153	214	306	383
35.0	15	70	30	140	60	0.40	0.80	1.60	3.19	5.59	9.57	16.0	26.4	40.0	55.9	79.9	105	160	224	320	400
37.5		75		150		0.42	0.83	1.67	3.33	5.83	9.98	16.7	27.5	41.6	58.3	83.3	110	167	233	333	416
40.0		80		160		0.43	0.86	1.73	3.46	6.06	10.4	17.3	28.6	43.3	60.6	86.6	114	173	242	346	433
42.5		85		170		0.45	0.90	1.80	3.60	6.30	10.8	18.0	29.7	45.0	63.0	90.0	119	180	252	360	450
45.0		90		180		0.47	0.93	1.87	3.73	6.53	11.2	18.7	30.8	46.7	65.3	93.3	123	187	261	373	467
47.5		95		190		0.48	0.97	1.93	3.87	6.77	11.6	19.3	31.9	48.3	67.7	96.7	128	193	271	387	483
50.0		100	30	200		0.50	1.00	2.00	4.00	7.00	12.0	20.0	33.0	50.0	70.0	100	132	200	280	400	500
Load group LGV						12	12	12	12	12	16	20	24	30	36	42	48	64	72	80	90

Spring rate R																		
N/mm																		
Nominal travel s_N	50	6.8	13.6	26.8	54	94	162	268	442	670	940	1340	1768	2680	3760	5360	6700
	100	3.4	6.8	13.4	27	47	81	134	221	335	470	670	884	1340	1880	2680	3350
	200	1.7	3.4	6.7	13.5	23.5	40.5	67.0	110.5	167.5	235	335	442	670	940	1340	1675

LOAD LEVELS OF HYDRA® SPRING HANGERS

Operating principle
Spring hangers and spring supports are moveable pipe supports with travel-dependent bearing behaviour. The pressure springs used are fitted with pre-tension so that already approx. 30% of the nominal load FN is available in the upper hanger position. With downwards movement of the spring plate, which corresponds to an additional pressing together of the spring, the load increases according to the spring rate.

Load/Travel diagram (principle)



Main characteristics
Suitable for use in industrial systems inside or in the open air, on ships and offshore platforms (choose appropriate corrosion protection!).

Permissible ambient temperature 80 °C.

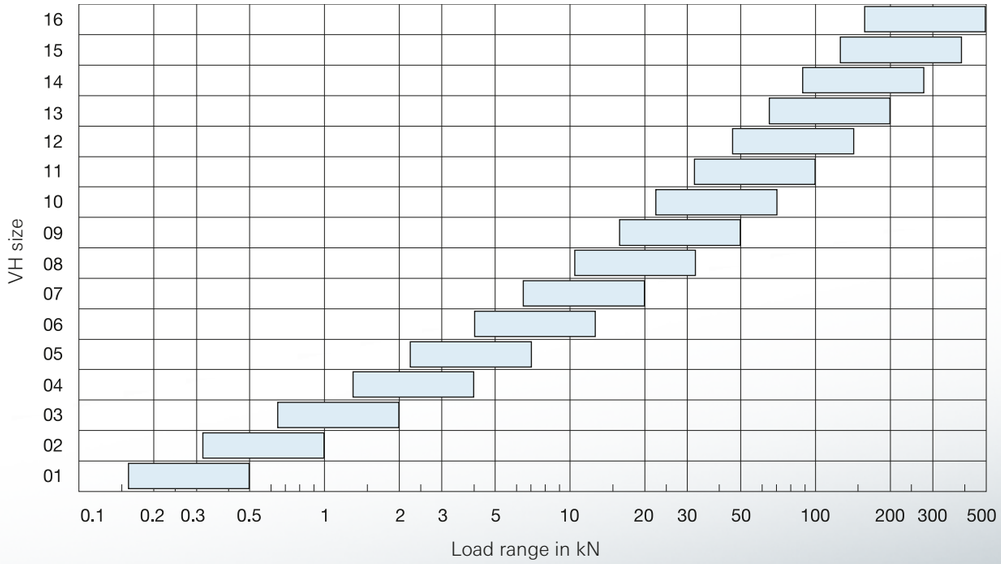
Deviation from the theoretical load/travel characteristic with straight draw generally less than 3% (max. permitted 5%). Permitted angular deviation of tie rods in hangers is 4° in all directions (spring supports excepted). 2.5 times the nominal load FN can be endured in extreme cases without permanent deformation; if already unblocked, the hanger moves to the lower stop. The stop can be suspended so that it remains permanently attached for later re-use on the housing.

Load gradation
With only 16 VH sizes, the load range is covered from 0.16 to 500 kN. Attention has been paid to a practical gradation of the VH sizes while simultaneously ensuring adequate overlap.

Three versions of the VH sizes are available with three nominal travels of 50, 100 and 200 mm. This makes it easy for the selection of suitable hangers for every case of need.

Extra-long springs
Longer springs only on request and after careful checking of the individual case.

Load gradation of the HYDRA spring hangers/spring supports



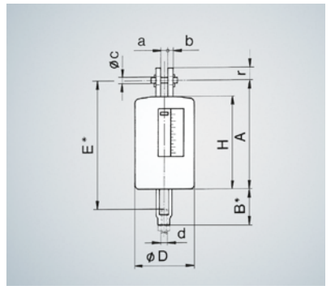
HYDRA® SPRING HANGER FHD

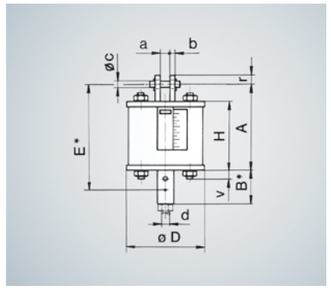
With double lug

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset, spring with additional terrosone coating. Key see page 15

Order example: FHD 11.100.42
(Standard design)





VH size	Nominal travel	Nominal load	Type FHD…	Spring rate	Load group	Installation dimension	Main dimensions				Connecting dimensions						Weight approx.
–	s_N	F_N	–	R	LGV	E*	A	B*	D	H	a	b	c	d	r	v	–
–	mm	kN	–	N/mm	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	050	0.5	01.050.12	6.8	12	220	185	85	110	155	12	5	12	M12	12		3
	100		01.100.12	3.4		300	265			235							4
	200		01.200.12	1.7		470	435			405							6
02	050	1	02.050.12	13.6	12	220	185	85	110	155	12	5	12	M12	12		3
	100		02.100.12	6.8		300	265			235							4
	200		02.200.12	3.4		470	435			405							7
03	050	2	03.050.12	26.8	12	230	195	85	120	165	12	5	12	M12	12		4
	100		03.100.12	13.4		305	270			240							5
	200		03.200.12	6.7		480	445			415							8
04	050	4	04.050.12	54.0	12	230	195	85	120	165	12	5	12	M12	12		4
	100		04.100.12	27.0		305	270			240							6
	200		04.200.12	13.5		480	445			415							9
05	050	7	05.050.12	94.0	12	285	250	85	150	210	16	6	12	M12	20		9
	100		05.100.12	47.0		380	345			305							11
	200		05.200.12	23.5		605	570			530							16
06	050	12	06.050.16	162.0	16	300	250	110	150	210	16	6	16	M16	20		10
	100		06.100.16	81.0		395	345			305							13
	200		06.200.16	40.5		620	570			530							19
07	050	20	07.050.20	268.0	20	350	290	130	180	245	20	8	20	M20	25		18
	100		07.100.20	134.0		450	390			345							23
	200		07.200.20	67.0		695	635			590							34
08	050	33	08.050.24	442.0	24	410	335	165	230	280	24	10	24	M24	30		34
	100		08.100.24	221.0		520	445			390							43
	200		08.200.24	110.5		795	720			665							63
09	050	50	09.050.30	670.0	30	510	435	175	255	350	36	15	33	M30	55		60
	100		09.100.30	335.0		640	565			480							73
	200		09.200.30	167.5		985	910			825							108
10	050	70	10.050.36	940	36	510	435	180	255	350	36	15	40	M36	55		65
	100		10.100.36	470		640	565			480							82
	200		10.200.36	235		985	910			825							123
11	050	100	11.050.42	1340	42	565	485	205	285	405	36	15	45	M42	60		103
	100		11.100.42	670		710	630			550							127
	200		11.200.42	335		1100	1020			940							188
12	050	132	12.050.48	1768	48	490	420	200	490	300	50	20	50	M48	90	33	213
	100		12.100.48	884		600	530			410							248
	200		12.200.48	442		880	810			690							330
13	050	200	13.050.64	2680	64	615	500	270	560	370	50	20	70	M64	100	38	365
	100		13.100.64	1340		750	635			505							412
	200		13.200.64	670		1095	980			850							549
14	050	280	14.050.72	3760	72	645	540	265	620	390	50	25	80	M72	120	43	513
	100		14.100.72	1880		780	675			525							587
	200		14.200.72	940		1125	1020			870							765
15	050	400	15.050.80	5360	80	720	615	270	720	445	60	25	90	M80	135	48	760
	100		15.100.80	2680		865	760			590							869
	200		15.200.80	1340		1255	1150			980							1133
16	050	500	16.050.90	6700	90	970	615	535	720	445	60	25	100	M90	150	48	829
	100		16.100.90	3350		1115	760			590							957
	200		16.200.90	1675		1505	1150			980							1268

**-Dimensions are relative to the non-preset start position at low load; dimensions increase with the pre-tension by the pre-tensioned travel.*

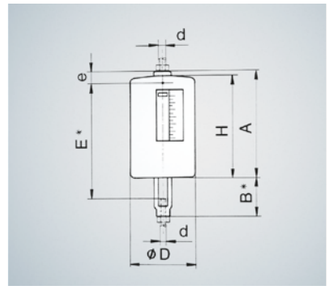
HYDRA® SPRING HANGER FHG

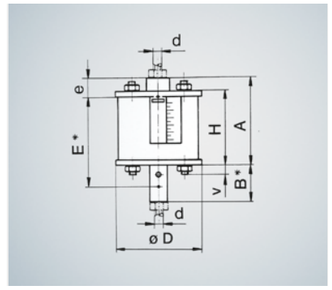
With threaded connection

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset, spring with additional terrosone coating. Key see page 15

Order example: FHG 11.100.42
(Standard design)





VH size	Nominal travel	Nominal load	Type FHG…	Spring rate	Load group	Installation dimension	Main dimensions				Connecting dimensions			Weight approx.
–	s_N	F_N	–	R	LGV	E*	A	B*	D	H	d	e	v	–
–	mm	kN	–	N/mm	–	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	050	0.5	01.050.12	6.8	12	175	165	85	110	155	M12	27		3
	100		01.100.12	3.4		255	245			235				4
	200		01.200.12	1.7		425	415			405				6
02	050	1	02.050.12	13.6	12	175	165	85	110	155	M12	27		3
	100		02.100.12	6.8		255	245			235				4
	200		02.200.12	3.4		425	415			405				6
03	050	2	03.050.12	26.8	12	185	175	85	120	165	M12	27		4
	100		03.100.12	13.4		260	250			240				5
	200		03.200.12	6.7		435	425			415				8
04	050	4	04.050.12	54.0	12	185	175	85	120	165	M12	27		4
	100		04.100.12	27.0		260	250			240				5
	200		04.200.12	13.5		435	425			415				8
05	050	7	05.050.12	94.0	12	230	225	85	150	210	M12	33		8
	100		05.100.12	47.0		325	320			305				10
	200		05.200.12	23.5		550	545			530				16
06	050	12	06.050.16	162.0	16	240	225	110	150	210	M16	35		9
	100		06.100.16	81.0		335	320			305				12
	200		06.200.16	40.5		560	545			530				19
07	050	20	07.050.20	268.0	20	270	255	130	180	245	M20	44		17
	100		07.100.20	134.0		370	355			345				22
	200		07.200.20	67.0		615	600			590				33
08	050	33	08.050.24	442.0	24	320	300	165	230	280	M24	55		33
	100		08.100.24	221.0		430	410			390				41
	200		08.200.24	110.5		705	685			665				62
09	050	50	09.050.30	670.0	30	390	380	175	255	350	M30	67		56
	100		09.100.30	335.0		520	510			480				68
	200		09.200.30	167.5		865	855			825				103
10	050	70	10.050.36	940	36	380	380	180	255	350	M36	70		61
	100		10.100.36	470		510	510			480				77
	200		10.200.36	235		855	855			825				118
11	050	100	11.050.42	1340	42	440	430	205	285	405	M42	72		97
	100		11.100.42	670		585	575			550				122
	200		11.200.42	335		975	965			940				183
12	050	132	12.050.48	1768	48	350	355	200	490	300	M48	75	33	200
	100		12.100.48	884		460	465			410				235
	200		12.200.48	442		740	745			690				317
13	050	200	13.050.64	2680	64	465	440	270	560	370	M64	90	38	341
	100		13.100.64	1340		600	575			505				388
	200		13.200.64	670		945	920			850				526
14	050	280	14.050.72	3760	72	475	460	265	620	390	M72	90	43	469
	100		14.100.72	1880		610	595			525				543
	200		14.200.72	940		955	940			870				721
15	050	400	15.050.80	5360	80	530	520	270	720	445	M80	95	48	704
	100		15.100.80	2680		675	665			590				813
	200		15.200.80	1340		1065	1055			980				1077
16	050	500	16.050.90	6700	90	785	525	535	720	445	M90	95	48	772
	100		16.100.90	3350		930	670			590				900
	200		16.200.90	1675		1320	1060			980				1211

**-Dimensions are relative to the non-preset start position at low load; dimensions increase with the pre-tension by the pre-tensioned travel.*

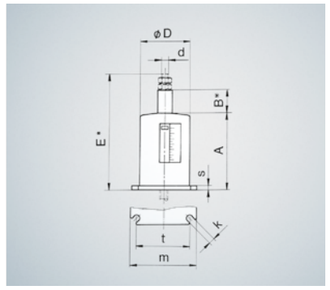
HYDRA® SPRING HANGER FHS

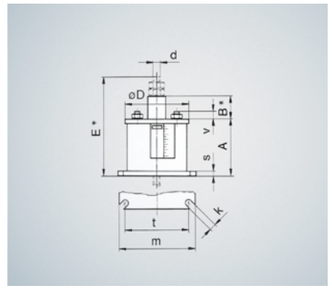
For continuous tie rods

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset, spring with additional terrosone coating. Key see page 15

Order example: FHS 11.100.42
(Standard design)





VH size	Nominal travel	Nominal load	Type FHS…	Spring rate	Load group	Installation dimension	Main dimensions			Connecting dimensions						Weight approx.
–	s_N	F_N	–	R	LGV	E*	A	B*	D	d	k	m	s	t	v	–
–	mm	kN	–	N/mm	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	050	0.5	01.050.12	6.8	12	290	160	75	110	M12	12	130	8	95		3
	100		01.100.12	3.4		425	240	130								5
	200		01.200.12	1.7		700	410	235								7
02	050	1	02.050.12	13.6	12	290	160	75	110	M12	12	130	8	95		4
	100		02.100.12	6.8		425	240	130								5
	200		02.200.12	3.4		700	410	235								7
03	050	2	03.050.12	26.8	12	300	170	75	120	M12	14	150	10	110		5
	100		03.100.12	13.4		430	245	130								6
	200		03.200.12	6.7		710	420	235								9
04	050	4	04.050.12	54.0	12	300	170	75	120	M12	14	150	10	110		5
	100		04.100.12	27.0		430	245	130								7
	200		04.200.12	13.5		710	420	235								10
05	050	7	05.050.12	94.0	12	355	215	80	150	M12	18	190	12	130		11
	100		05.100.12	47.0		500	310	130								13
	200		05.200.12	23.5		830	535	235								19
06	050	12	06.050.16	162.0	16	375	215	80	150	M16	18	190	12	130		11
	100		06.100.16	81.0		520	310	130								15
	200		06.200.16	40.5		850	535	235								22
07	050	20	07.050.20	268.0	20	420	230	80	180	M20	23	220	12	160		19
	100		07.100.20	134.0		570	330	130								24
	200		07.200.20	67.0		920	575	235								36
08	050	33	08.050.24	442.0	24	495	265	90	230	M24	23	270	15	200		37
	100		08.100.24	221.0		660	375	145								46
	200		08.200.24	110.5		1035	650	245								67
09	050	50	09.050.30	670.0	30	570	335	90	255	M30	27	300	15	215		61
	100		09.100.30	335.0		755	465	145								74
	200		09.200.30	167.5		1200	810	245								109
10	050	70	10.050.36	940	36	580	335	90	255	M36	27	300	15	215		64
	100		10.100.36	470		765	465	145								81
	200		10.200.36	235		1210	810	245								121
11	050	100	11.050.42	1340	42	650	390	90	285	M42	27	340	20	250		99
	100		11.100.42	670		850	535	145								124
	200		11.200.42	335		1340	925	245								184
12	050	132	12.050.48	1768	48	535	305	85	490	M48	27	530	25	460	30	203
	100		12.100.48	884		705	415	145								239
	200		12.200.48	442		1090	695	250								322
13	050	200	13.050.64	2680	64	680	375	85	560	M64	27	590	30	520	40	330
	100		13.100.64	1340		875	510	145								378
	200		13.200.64	670		1325	855	250								513
14	050	280	14.050.72	3760	72	700	395	85	620	M72	27	640	35	570	40	451
	100		14.100.72	1880		895	530	145								525
	200		14.200.72	940		1345	875	250								698
15	050	400	15.050.80	5360	80	770	455	85	720	M80	33	760	40	670	50	697
	100		15.100.80	2680		970	600	140								804
	200		15.200.80	1340		1470	990	250								1060
16	050	500	16.050.90	6700	90	790	455	85	720	M90	33	760	40	670	50	740
	100		16.100.90	3350		990	600	140								865
	200		16.200.90	1675		1490	990	250								1165

**-Dimensions are relative to the non-preset start position at low load; dimensions reduce with the pre-tension by the pre-tensioned travel.*

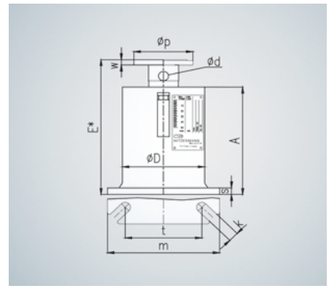
HYDRA® SPRING SUPPORT FSS/FSP

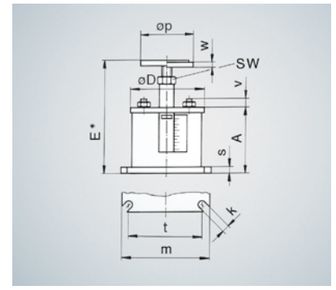
With steel support plate/with PTFE sliding plate
Permitted lateral force: 0.3* F_N for VH size 01-11, 0.1* F_N for VH size 12-16

Standard design
Support preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated

Options
Support not preset, spring with additional terrosone coating. Key see page 15

Order example: FSS 11.100.00
(Standard design)





VH size	Nominal travel	Nominal load	Type FSS… FSP…	Spring rate	Load group	Installation dimension	Main dimensions		Connecting dimensions								Weight approx.
–	s_N	F_N		R	LGV	E*	A	D	k	m	p	s	t	v	w	d/SW	–
–	mm	kN	–	N/mm	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	050	0.5	01.050.00	6.8	not relevant	190	140	100	12	130	70	8	95		8	12	4
	100		01.100.00	3.4		280	220										6
	200		01.200.00	1.7		480	390										8
02	050	1	02.050.00	13.6		190	140	100	12	130	70	8	95		8	12	4
	100		02.100.00	6.8		280	220										6
	200		02.200.00	3.4		480	390										9
03	050	2	03.050.00	26.8		200	150	115	14	150	70	10	110		8	12	6
	100		03.100.00	13.4		285	225										7
	200		03.200.00	6.7		490	400										10
04	050	4	04.050.00	54.0		200	150	115	14	150	70	10	110		8	12	6
	100		04.100.00	27.0		285	225										7
	200		04.200.00	13.5		490	420										11
05	050	7	05.050.00	94.0		245	195	140	18	190	100	12	130		10	17	12
	100		05.100.00	47.0		355	290										14
	200		05.200.00	23.5		610	515										21
06	050	12	06.050.00	162.0		245	195	140	18	190	100	12	130		15	17	12
	100		06.100.00	81.0		355	290										16
	200		06.200.00	40.5		610	515										24
07	050	20	07.050.00	268.0		275	225	170	23	220	100	12	160		15	17	19
	100		07.100.00	134.0		390	325										24
	200		07.200.00	67.7		665	570										36
08	050	33	08.050.00	442.0		320	260	220	23	270	120	15	200		15	22	36
	100		08.100.00	221.0		440	370										45
	200		08.200.00	110.5		745	645										67
09	050	50	09.050.00	670.0		390	330	245	27	300	150	15	215		15	27	59
	100		09.100.00	335.0		535	460										72
	200		09.200.00	167.5		905	805										109
10	050	70	10.050.00	940		390	330	245	27	300	150	15	215		15	27	61
	100		10.100.00	470		535	460										79
	200		10.200.00	235		905	805										122
11	050	100	11.050.00	1340		445	385	275	27	340	150	20	250		15	27	95
	100		11.100.00	670		605	530										120
	200		11.200.00	335		1020	920										182
12	050	132	12.050.00	1768		425	305	490	27	530	150	25	460	30	25	145	222
	100		12.100.00	884		550	415										257
	200		12.200.00	442		860	695										339
13	050	200	13.050.00	2680		495	375	560	27	590	180	30	520	40	25	145	353
	100		13.100.00	1340		645	510										399
	200		13.200.00	670		1020	855										533
14	050	280	14.050.00	3760		515	395	620	27	640	200	35	570	40	25	145	475
	100		14.100.00	1880		665	530										548
	200		14.200.00	940		1040	875										720
15	050	400	15.050.00	5360		590	455	720	33	760	260	40	670	50	40	145	734
	100		15.100.00	2680		750	600										840
	200		15.200.00	1340		1170	990										1095
16	050	500	16.050.00	6700		590	455	720	33	760	260	40	670	50	40	145	777
	100		16.100.00	3350		750	600										902
	200		16.200.00	1675		1170	990										1200

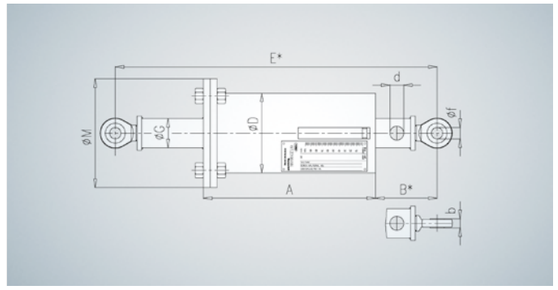
**-Dimension is independent of the preset position; it changes during loading by the corresponding spring travel. Adjustment option: + 30 mm, maximum spring travel from: s_N 50 = -35 mm, s_N 100 = -45 mm, s_N 200 = -75 mm; increases during use of the adjustment option.*

HYDRA® SWAY SUPPORT FSG

Spring support with joint connections
Installation length E can be adjusted subsequently to real installation situation

Standard design
Support preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated

Options
Support not preset, spring with additional terrosone coating. Key see page 15



Order example: FSG 06.100.1000.46
(Standard design)

VH size	Nominal travel	Nominal load	Type FSG…	Spring rate	Nominal length	Installation length E*		Main dimensions					Connecting dimensions			Weight approx.
–	s_N	F_N	–	R	$E_{Nominal}$	min	max	A	B*	D	G	M	b	f	d	–
–	mm	kN	–	N/mm	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	100	0.5	01.100.0800.008	3.4	800	400	1250	228	98	102	34	130	10	12	12	8
02	100	1	02.100.0800.008	6.8	800	400	1250	228	98	102	34	130	10	12	12	8
03	100	2	03.100.0800.008	13.4	800	410	1250	235	98	114	34	150	10	12	12	10
04	100	4	04.100.0800.008	27	800	410	1250	235	98	114	34	150	10	12	12	11
05	100	7	05.100.1000.046	47	1000	490	1550	305	101	140	51	190	16	20	17	23
06	100	12	06.100.1000.046	81	1000	490	1550	305	101	140	51	190	16	20	17	24
07	100	20	07.100.1000.046	134	1000	525	1550	340	101	168	51	220	16	20	17	34
08	100	33	08.100.1200.046	221	1200	595	1750	390	105	219	76	270	16	20	22	66
09	100	50	09.100.1400.100	335	1400	720	1950	480	126	245	89	300	22	30	27	101
10	100	70	10.100.1400.100	470	1400	720	1950	480	126	245	89	300	22	30	27	108
11	100	100	11.100.1400.100	670	1400	795	1950	555	126	273	89	340	22	30	27	157

**-Dimension is independent of the preset position; it changes during loading by the corresponding spring travel. Adjustment option: + 30 mm, maximum spring travel from: -45 mm, increases during use of the adjustment option.*
For on-site connection and joining with clamp - use HYDRA bracket MBS.

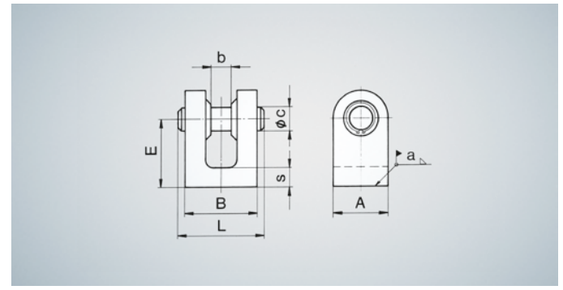
HYDRA® BRACKET MBS

With bolt, for alternating load clamp MSN

Version
The brackets are designed for welding.
They permit a lateral angular deviation of 6°.

Materials
S355J2G 3 (bracket)
stainless steel (bolt)

Surface protection
Bracket primed (standard) or blank
Bolt blank, key see page 15



Order example: MBS 018
(Standard design)

Sway support	Nominal load	Type MBS…	Installation dimension	Main dimensions			Connecting dimensions			Weldseam	Weight approx.
–	F_N	–	–	A	B	L	b	f	d	a	–
–	kN	–	mm	mm	mm	mm	mm	mm	mm	mm	kg
01÷04	8	MBS 008	35	30	37	46	10.5	12	12	3	0.3
	18	MBS 018	40	35	43	52	12.5	15	13	4	0.6
05÷08	46	MBS 046	50	55	55	65	16.5	20	15	5	1.1
09÷11	100	MBS 100	75	90	80	95	22.5	30	23	8	3.8

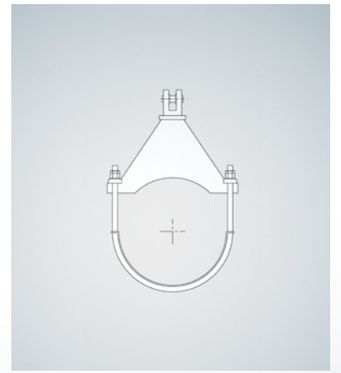
HYDRA® DYNAMIC LOAD CLAMPS MSN

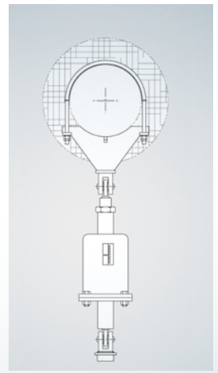
Connection for sway support FSG

Special installation parts, dynamic load clamps and joint brackets are available for connection of the sway supports to the pipe and steel structure.

These components are designed in such a way that the dynamic loads can be supported without problems.

Dynamic load clamp MSN
Sheet metal support ensures optimum transfer of the support force into the pipe. Suitable material combinations allow high pipe temperatures to be accommodated. The joint connection corresponds to the HYDRA bracket MBS, see above. Dimensions from page 97





HYDRA® DOUBLE HANGER

With traverse

Selection
The table below shows the possible loads for the 11 VH sizes of the double hangers, depending on the hanger travel. They are relative to the particular nominal travel s_N of 50, 100 or 200 mm. The maximum load corresponds to the nominal load F_N of the double hanger and will therefore amount to double the load of single hangers.
For calculating the required load Fs, the loads resulting from the weight of the pipe shoe (F_A) and traverse (F_T), and from the active weight of the hangers (F_H) (1kg corresponds to approx. 0.01 kN) must be added to the load of the pipe.
The other selection criteria correspond to those for single hangers FHG see page 21.

Example
Requirement: double hanger with traverse, hot-dip galvanized
Connection thread: metric, span: L = 800 mm
Pipe shoe: LSL 23.0350.150-37.2
Warm load: F_w = 30 kN
Required travel, upwards: s_S = 25 mm
Blocked at: Cold load F_K

Selection:
In the case of upward required travel where the hot load occurs at a lower load, a hanger size should be selected which has a cold load as close as possible to the nominal load.

This gives:
VH size: 07
Nominal travel: s_N = 100 mm
(from recommended working travel > s_S = 25 mm)

FDT 07.100.0800.20

With required load, warm, at the hanger
$F_S = F_w + F_A + F_T + F_H$
$= 30 + 0.2 + 0.2 + 0.2^*$
F_S = 30.6 kN
Stop load: 37.3 kN
Travel reserve: s_R = 10 mm

corresponding 22 % of F_W
For the pipeline this gives:
Cold load: $F_k = 37.3 - 0.9 = 36.4$ kN
** active loads determined from tables, page 26 and page 27*

Nominal travel s_N						VH size										
50		100		200		01	02	03	04	05	06	07	08	09	10	11
Hanger travel recommended work travel						Required load F_S, travel-dependent										
mm		mm		mm		kN										
0	5	0	10	0	20	0.32	0.64	1.32	2.60	4.60	7.80	13.2	21.8	33.0	46.0	66.0
2.5		5		10		0.35	0.71	1.45	2.87	5.07	8.61	14.5	24.0	36.4	50.7	72.7
5.0	8	10	15	20	30	0.39	0.78	1.59	3.14	5.54	9.42	15.9	26.2	39.7	55.4	79.4
7.5		15		30		0.42	0.84	1.72	3.41	6.01	10.2	17.2	28.4	43.1	60.1	86.1
10.0		20		40		0.46	0.91	1.86	3.68	6.48	11.0	18.6	30.6	46.4	64.8	92.8
12.5		25		50		0.49	0.98	1.99	3.95	6.95	11.9	19.9	32.9	49.8	69.5	99.5
15.0	10	30	20	60	40	0.52	1.05	2.12	4.22	7.42	12.7	21.2	35.1	53.1	74.2	106
17.5		35		70		0.56	1.12	2.26	4.49	7.89	13.5	22.6	37.3	56.5	78.9	113
20.0		40		80		0.59	1.18	2.39	4.76	8.36	14.3	23.9	39.5	59.8	83.6	120
22.5		45		90		0.63	1.25	2.53	5.03	8.83	15.1	25.3	41.7	63.2	88.3	126
25.0	13	50	25	100	50	0.66	1.32	2.66	5.30	9.30	15.9	26.6	43.9	66.5	93.0	133
27.5		55		110		0.69	1.39	2.79	5.57	9.77	16.7	27.9	46.1	69.9	97.7	140
30.0		60		120		0.73	1.46	2.93	5.84	10.2	17.5	29.3	48.3	73.2	102	146
32.5		65		130		0.76	1.52	3.06	6.11	10.7	18.3	30.6	50.5	76.6	107	153
35.0	15	70	30	140	60	0.80	1.59	3.20	6.38	11.2	19.1	32.0	52.7	79.9	112	160
37.5		75		150		0.83	1.66	3.33	6.65	11.7	20.0	33.3	55.0	83.3	117	167
40.0		80		160		0.86	1.73	3.46	6.92	12.1	20.8	34.6	57.2	86.6	121	173
42.5		85		170		0.90	1.80	3.60	7.19	12.6	21.6	36.0	59.4	90.0	126	180
45.0		90		180		0.93	1.86	3.73	7.46	13.1	22.4	37.3	61.6	93.3	131	187
47.5		95		190		0.97	1.93	3.87	7.73	13.5	23.2	38.7	63.8	96.7	135	193
50.0	15	100	30	200	60	1.00	2.00	4.00	8.00	14.0	24.0	40.0	66.0	100	140	200
Load group LGV						12	12	12	12	12	16	20	24	30	36	90

Spring rate R N/mm												
Nominal travel s_N	50	13.6	27.2	53.6	108	188	324	536	884	1340	1880	2680
	100	6.8	13.6	26.8	54	94	162	268	442	670	940	1340
	200	3.4	6.8	13.4	27	47	81	134	221	335	470	670

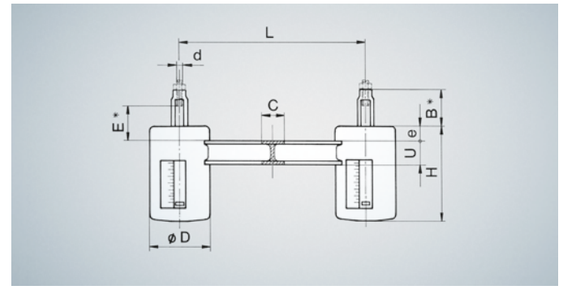
HYDRA® DOUBLE HANGER FDT

With traverse

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

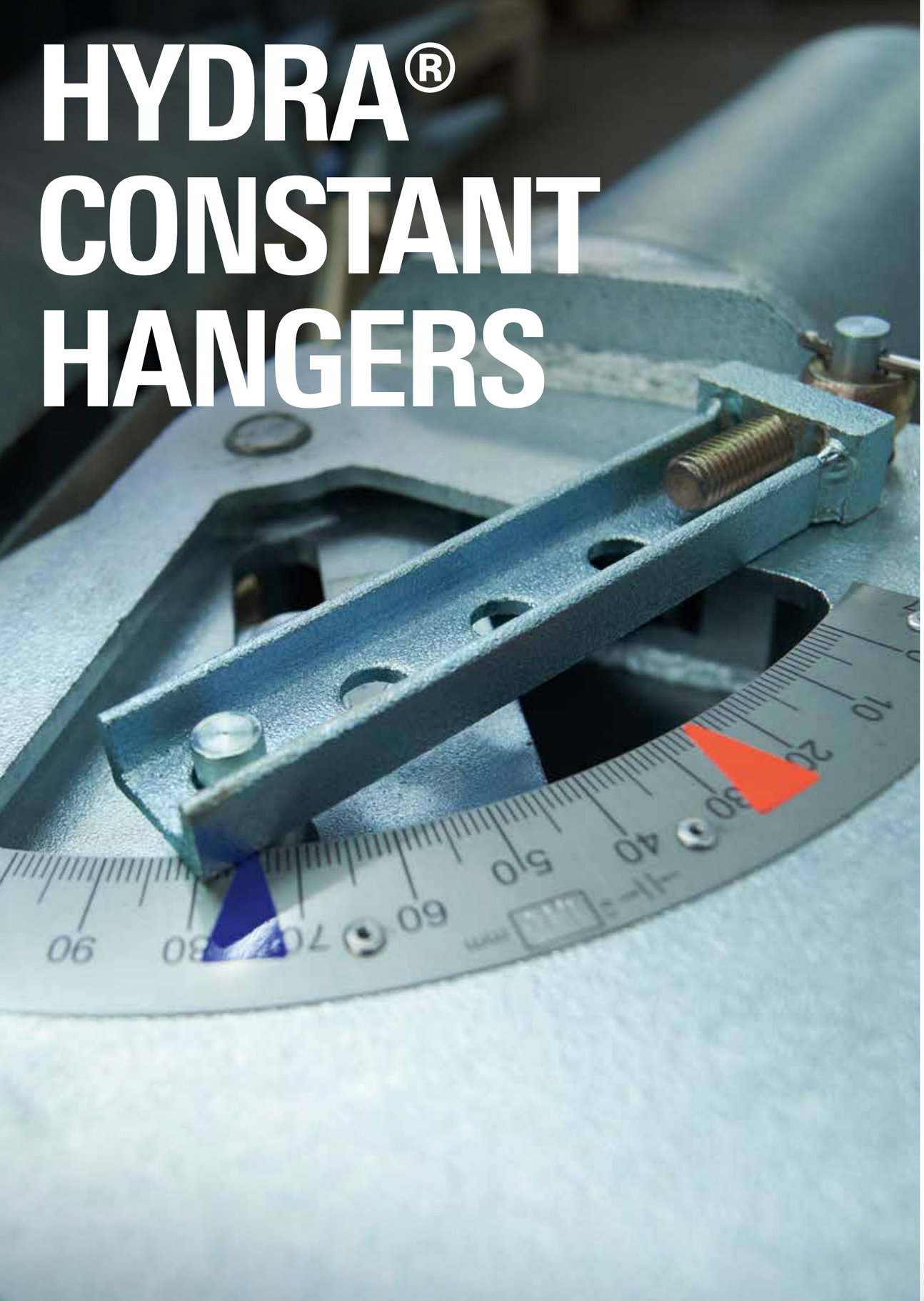
Options
Hanger not preset, spring with additional terrosone coating. Key see page 15

Order example: FDT 07.100.0800.20
(Standard design)



Dimensions and active weights of the hangers														Dimensions and weights of the traverses										
VH size	Nominal travel	Nominal load	Type FDT…	Spring rate	Load group	Installation dimension	Dimensions						Weight[2] approx.	Dimensions in mm	Span L									
–	s_N	F_N	–	R	LGV	E*	B*	D	H	d	e	–	Weight in kg	400	600	800	1000	1200	1400	1600	1800	2000
–	mm	kN	–	N/mm	–	mm	mm	mm	mm	mm	mm	kg												
01	50	1	01.050..[1]..12	13.6	12	55	85	110	155	M12	20	4	C	46	46	46	46	46	46	46	46	46
	100		01.100..[1]..12	6.8					235			6	U	80	80	80	80	80	80	80	80	80
	200		01.200..[1]..12	3.4					405			9	Weight	2	3	4	5	7	8	9	10	11
02	050	2	02.050..[1]..12	27.2	12	55	85	110	155	M12	20	4	C	46	46	46	46	46	46	46	46	55
	100		02.100..[1]..12	13.6					235			6	U	80	80	80	80	80	80	80	80	100
	200		02.200..[1]..12	6.8					405			9	Weight	2	3	4	5	7	8	9	10	15
03	050	4	03.050..[1]..12	53.6	12	55	85	120	165	M12	20	5	C	55	55	55	55	55	55	55	55	55
	100		03.100..[1]..12	26.8					240			7	U	100	100	100	100	100	100	100	100	100
	200		03.200..[1]..12	13.4					415			10	Weight	2	4	6	7	9	10	12	14	15
04	050	8	04.050..[1]..12	108	12	55	85	120	165	M12	20	5	C	100	100	100	100	100	100	100	100	100
	100		04.100..[1]..12	54					240			7	U	100	100	100	100	100	100	100	100	100
	200		04.200..[1]..12	27					415			10	Weight	6	10	14	18	22	27	31	35	39
05	050	14	05.050..[1]..12	188	12	60	85	150	210	M12	25	9	C	10	100	100	100	100	100	100	120	120
	100		05.100..[1]..12	94					305			12	U	100	100	100	100	100	100	100	120	120
	200		05.200..[1]..12	47					530			18	Weight	6	10	14	18	22	26	30	45	50
06	050	24	06.050..[1]..16	324	16	75	110	150	210	M16	25	9	C	100	100	100	100	120	120	120	120	140
	100		06.100..[1]..16	162					305			12	U	120	100	100	100	120	120	120	120	140
	200		06.200..[1]..16	81					530			18	Weight	6	10	14	18	29	34	40	45	63
07	050	40	07.050..[1]..20	536	20	90	130	180	245	M20	30	15	C	120	120	120	140	160	160	160	180	180
	100		07.100..[1]..20	268					345			18	U	120	120	120	140	160	160	160	180	180
	200		07.200..[1]..20	134					590			27	Weight	7	12	17	29	45	53	62	85	95
08	050	66	08.050..[1]..24	884	24	105	165	230	280	M24	30	29	C		160	160	180	180	200	200	220	220
	100		08.100..[1]..24	442					390			36	U		160	160	180	180	200	200	220	220
	200		08.200..[1]..24	221					665			52	Weight		18	26	42	52	74	87	115	130
09	050	100	09.050..[1]..30	1340	30	110	175	255	350	M30	35	42	C		200	220	220	220	240	240	240	260
	100		09.100..[1]..30	670					480			51	U		200	220	220	220	240	240	240	260
	200		09.200..[1]..30	335					825			74	Weight		25	43	58	72	100	117	134	168
10	050	140	10.050..[1]..36	1880	36	110	180	255	350	M36	35	42	C		240	240	260	260	260	280	280	280
	100		10.100..[1]..36	940					480			51	U		240	240	260	260	260	280	280	280
	200		10.200..[1]..36	470					825			74	Weight		35	51	76	94	113	146	166	187
11	050	200	11.050..[1]..42	2680	42	120	205	285	405	M42	40	76	C		300	300	300	300	300	320	320	320
	100		11.100..[1]..42	1340					550			87	U		300	300	300	300	300	320	320	320
	200		11.200..[1]..42	670					940			115	Weight		49	72	96	119	142	180	205	231

[1] Insert span L in mm. [2] Active weight of both hangers; for complete hanger weight see FHG, page 21
**-Dimensions are relative to the non-preset start position at low load; dimensions increase by the pre-tensioned travel.*



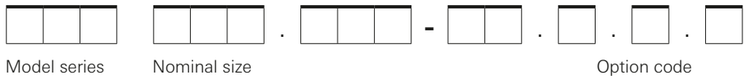
HYDRA® CONSTANT HANGERS

STRUCTURE OF THE TYPE DESIGNATION

The type designation consists of three parts:
1. Series, defined by three letters
2. Nominal size, defined by several number groups
3. Option code, defined by figure codes, separated from the nominal size by hyphens

Type designations without option codes refer to standard versions.

Diagram illustrating the naming principle



Option code

	Travel stop [1]		Surface protection
0	Without travel stop	0	blank
1	With travel stop	1	Electro-galvanized
	Threaded connection[1]	2	Hot-dip galvanized
1	in accordance with DIN ISO (metric)	3	Primed
2	Inch thread	4	Other coating please specify exactly

[1] Only spring hangers and constant hangers

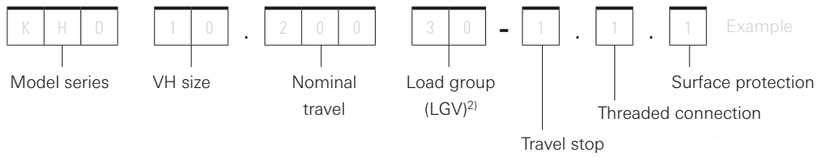
Series

Meaning of characters dependent on position

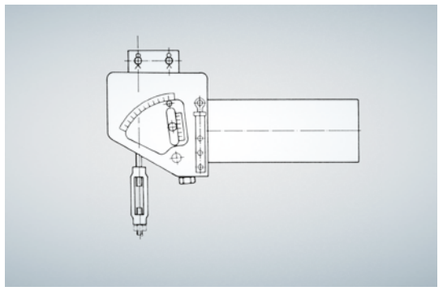
Product group Position 1		Design/Component Position 2		Connection/Other Position 3	
Constant hangers/ Constant supports	K	horizontal vertical	H	Double lug	D
			V	-Base plate (permanent)	S
		supporting	S	Roller bearing	R
				Sliding plate, PTFE	P

Type designation of the products

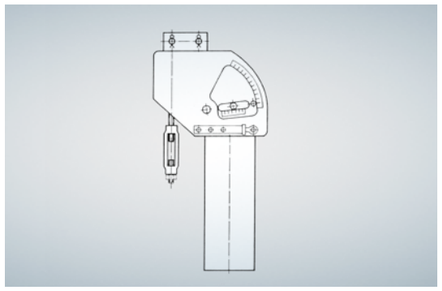
Constant hangers/constant supports



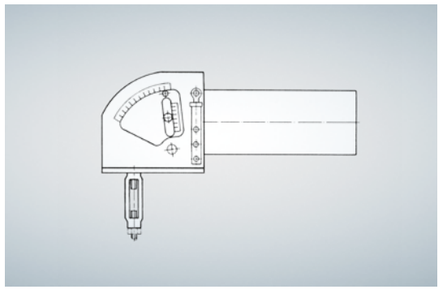
CONNECTION CRITERIA OF THE SERIES



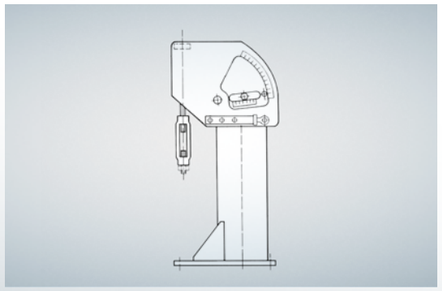
KHD
The **constant hanger, horizontal, with double lug** (including bolt and turnbuckle) is suitable for direct connection to the upper load-bearing structure, the connection being made via welding or clamping lug. In this the main bolt is suitable for taking the load including the hanger weight. The auxiliary bolts fix the hanger position.



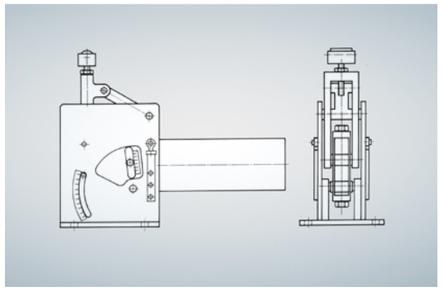
KVD
The **constant hanger, vertical, with double lug** (including bolt and turnbuckle) is suitable for direct connection to the upper load-bearing structure. It is selected when space is restricted.



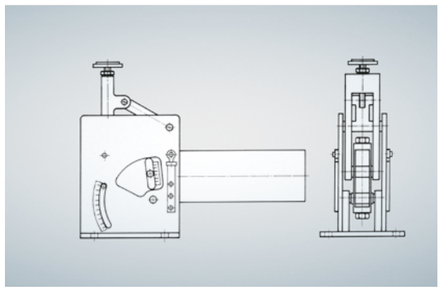
KHS
The **constant hanger, horizontally standing** (including turnbuckle) is suitable for placing on the load-bearing steel structure, if the load connection should be made via the turnbuckle below the steel structure. The hanger is fixed with screws in which the spring head is aligned parallel to the supports.



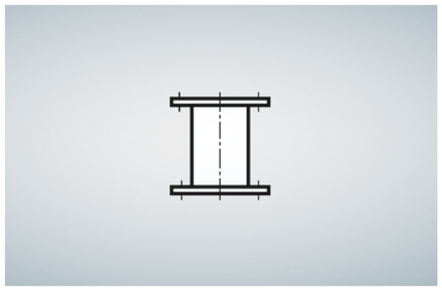
KVS
The **constant hanger, vertically standing** (including turnbuckle) is suitable for placing on the load-bearing steel structure. The load connection is made via the easily accessible turnbuckle arranged above the steel structure. With large hangers, the mechanism housing is placed between the spring pillars, which reduces the structure height.



KSR
The **constant support with support roll** is placed on and screwed on to the load-bearing structure. It carries the load via the roller above. For this purpose the system components are fitted with a flat sliding shoe as a load support.
The roller reduces the lateral force in the roll direction to approx. 3% of the imposed load. That requires precise positioning of the support in the direction of horizontal movement. The load deviation of the support remains uninfluenced.



KSP
The **constant support with support plate** is placed on and screwed on to the load-bearing structure. It carries the load via the PTFE-covered support plate above. For this purpose the system components are fitted with a flat sliding shoe as a load support.
The sliding shoe must have a sliding surface made from stainless steel. This version allows relative movements on all sides with lateral forces of 6 – 10 % of the imposed load. The increased lateral force increases the friction components of the constant support slightly.



ZZK
The **intermediate piece** allows height differences to be balanced out.

LOAD GROUPS OF HYDRA® CONSTANT HANGERS

Selection
The table below gives the maximum required load $F_{s\,max}$ for every CH size, dependent on the nominal travel s_N . This still allows a load adjustment of ± 15 % before the nominal load FN is reached. With required load F_s and required travel s_s, the CH size with the next higher load $F_{s\,max}$ is selected. (In this a larger than required nominal travel s_N can be selected as long as the maximum required load of the hanger is sufficient.)
If a subsequent load adjustment is dispensed with (e.g. with boiler hangers), the nominal load F_N can be selected as the required load F_s. The required load F_s is set in the factory. The possible hanger travel (Nominal travel s_N) should always be chosen to be somewhat larger than the required travel (Re-quired travel s_s). The required travel is normally in the central area of the nominal travel.
The intended travel reserves s_R are then available equally at both end positions of the hanger travel and in each case they should be at least 10% of s_s but not less than 10 mm. This gives a stop position and installation dimension, dependent on the direction of movement from cold to warm for upwards (+) or downwards (–) movement: E = E* – 0.5 (sN ± ss).

Example

Requirement:	
Constant hanger, horizontal with double lug	**KHD 11.180.24**
Required load: F_s = 22 kN	with $F_{s\,max}$ = 26.1 kN
Required travel: s_s = 148 mm, upwards	(set to F_s 22 kN)
	sN = 180 mm
	(travel reserves 2 x 11 %)
Selection:	Connection thread M24
Fs max ≥ 22 kN	Installation dimension E:
$s_N \geq s_s + 2\,s_R = s_s \cdot 1.2$	E = E* + 0,5 (s_N + s_s)
≥ 148 · 1.2 = 177.6 mm	= 740 + 0.5 (180 + 148)
This gives:	= 904 mm (E* ab S. 18)
Nominal travel 180 mm	Please indicate if there
CH size 11	are other stop requests!
Load group LGV 24	

Nominal travel s_N	CH size																				Load group LGV
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	
mm	Maximum required load F_{smax} in kN																				
50	0.47	0.94	1.85	3.72	6.48																
60	0.39	0.78	1.54	3.10	5.40	9.30	15.4	22.8	37.7												
70	0.33	0.67	1.32	2.66	4.63	7.97	13.2	19.6	32.3	44.3	61.0										
80	0.29	0.59	1.16	2.33	4.05	6.98	11.5	17.1	28.2	38.8	58.8										
90	0.26	0.52	1.03	2.07	3.60	6.20	10.3	15.2	25.1	34.5	52.3	73.3	105								
100	0.23	0.47	0.92	1.86	3.24	5.58	9.24	13.7	22.6	31.0	47.0	66.0	94.1	140							
110	0.21	0.43	0.84	1.69	2.95	5.07	8.40	12.5	20.5	28.2	42.8	60.0	85.5	128							
120	0.20	0.39	0.77	1.55	2.70	4.65	7.70	11.4	18.8	25.9	39.2	55.0	78.4	117	154						
130	0.18	0.36	0.71	1.43	2.49	4.29	7.10	10.5	17.4	23.9	36.2	50.8	72.4	108	142						
140	0.17	0.33	0.66	1.33	2.31	3.99	6.60	9.78	16.1	22.2	33.6	47.1	67.2	100	132	200					90
150	0.16	0.31	0.62	1.24	2.16	3.72	6.16	9.13	15.1	20.7	31.4	44.0	62.7	93.5	123	187	261				
160	0.15	0.29	0.58	1.16	2.03	3.49	5.77	8.56	14.1	19.4	29.4	41.2	58.8	87.7	116	175	246				
170	0.14	0.28	0.54	1.09	1.91	3.28	5.43	8.06	13.3	18.3	27.7	38.8	55.3	82.5	109	165	232				
180	0.13	0.26	0.51	1.03	1.80	3.10	5.13	7.61	12.6	17.2	26.1	36.7	52.3	77.9	103	156	219	312			
190	0.12	0.25	0.49	0.98	1.71	2.94	4.86	7.21	11.9	16.3	24.8	34.7	49.5	73.8	97.4	147	207	295	414		
200	0.12	0.23	0.46	0.93	1.62	2.79	4.62	6.85	11.3	15.5	23.5	33.0	47.0	70.1	92.5	140	197	281	394		
225	0.10	0.21	0.41	0.83	1.44	2.48	4.10	6.09	10.0	13.8	20.9	29.3	41.8	62.3	82.2	124	175	249	350		
250	0.09	0.19	0.37	0.74	1.30	2.23	3.69	5.48	9.04	12.4	18.8	26.4	37.6	56.1	74.0	112	157	224	315	435	
275	0.09	0.17	0.34	0.68	1.18	2.03	3.36	4.98	8.21	11.3	17.1	24.0	34.2	51.0	67.3	102	143	204	286	408	
300	0.08	0.16	0.31	0.62	1.08	1.86	3.08	4.57	7.53	10.3	15.7	22.0	31.4	46.8	61.7	93.4	131	187	262	374	
325						1.72	2.84	4.21	6.95	9.55	14.5	20.3	28.9	43.2	56.9	86.2	121	173	242	345	
350						1.59	2.64	3.91	6.45	8.87	13.4	18.9	26.9	40.1	52.9	80.0	112	160	225	321	
375								3.65	6.02	8.28	12.5	17.6	25.1	37.4	49.3	74.7	105	150	210	299	80
400								3.42	5.65	7.76	11.8	16.5	23.5	35.1	46.3	70.0	98.4	140	197	281	
425								3.22	5.32	7.30	11.1	15.5	22.1	33.0	43.5	65.9	92.6	132	185	264	
450								3.04	5.02	6.90	10.5	14.7	20.9	31.2	41.1	62.2	87.5	125	175	249	
475								2.88	4.76	6.53	9.90	13.9	19.8	29.5	39.0	59.0	82.9	118	166	236	72
500								2.74	4.52	6.21	9.41	13.2	18.8	28.1	37.0	56.0	78.7	112	157	224	
Load group LGV									12		16	20		24	30	36	42	48	56	64	

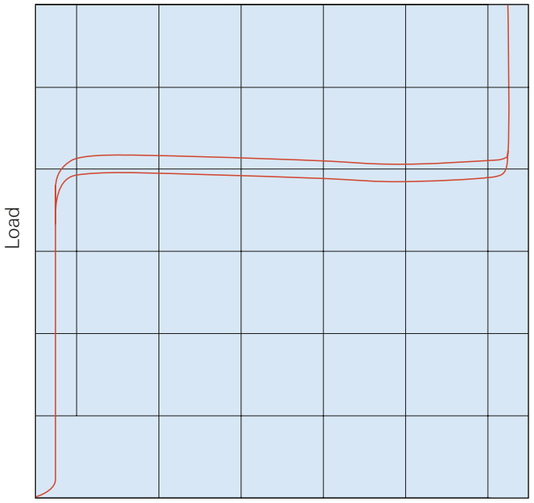
The required loads can be adjusted by up to 40% (to the next lower CH size) in the factory. Every set required load can be adjusted by up to ± 15%.

Nominal travel s_N	12	16	20	24	30	36	42	48	56	64	72	80	90
"Connecting (DIN ISO) thread (inch)"	"M12 1/2"	"M16 5/8"	"M20 3/4"	"M24 1"	"M30 1 1/8"	"M36 1 1/2"	"M42 1 3/4"	"M48 2"	"M56 2 1/4"	"M64 2 1/2"	"M72 2 3/4"	"M80 3"	"M90 3 1/2"
Nominal load in kN	7	12	20	33	50	70	100	132	180	240	300	400	500
Max. required load in kN. approx .	6	10	17	29	43	61	87	115	157	209	261	348	435

LOAD LEVELS OF HYDRA® CONSTANT HANGERS

Operating principle
Constant hangers and constant supports are movable pipe supports with a constant load-bearing behaviour.

Load/Travel diagram (principle)

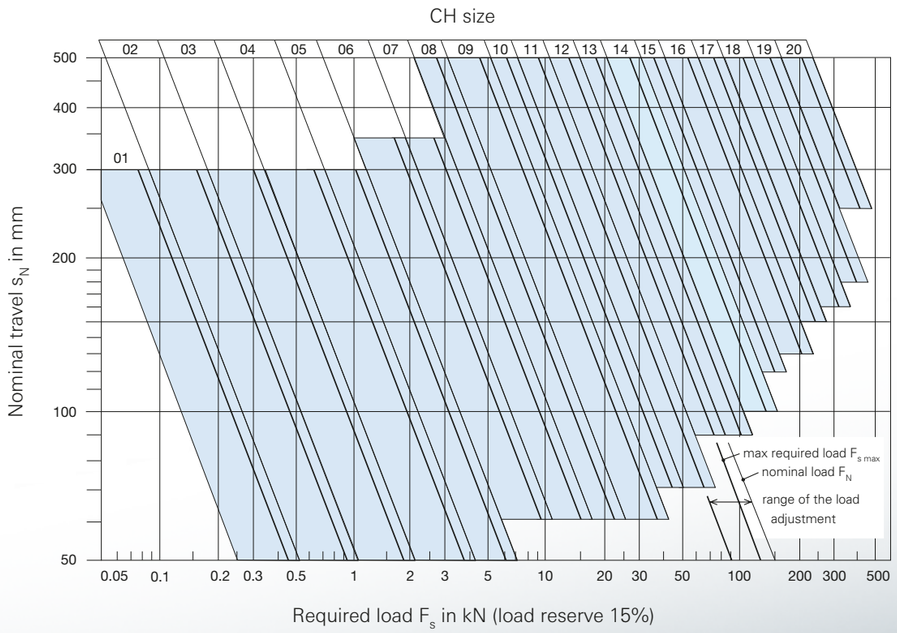


Main characteristics
The suitability, particularly for power plants, has been verified through suitability testing in accordance with KTA 3205.3 and VGB guidelines.

Permissible ambient temperature 80 °C. After fitting in the system, the load can be adjusted by at least ± 15% without the hanger travel being affected. Deviation from constant required load (load deviation) in straight pull maximum 5% (friction component less than 3%).
Permitted angular deviation of tie rods in hangers is 4° in all directions (constant supports excepted).
2.5 times the nominal load F_N can be endured in extreme cases without permanent deformation; if already unblocked, the hanger moves to the lower stop. They have an infinitely adjustable travel stop, that remains permanently attached for later re-use on the housing.
Maintenance-free!

Load gradation
Only 20 VH sizes cover the entire load range from 0.04 to 500 kN: nominal travels between 50 and 500 mm can be selected in specified small gradation intervals. **Larger travels on request!**
Five construction types/series are available for every CH size.

HYDRA Constant hangers/constant supports gradation



HYDRA® CONSTANT HANGERS KHD

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset. Spring additionally terrosone coated. Key see page 29

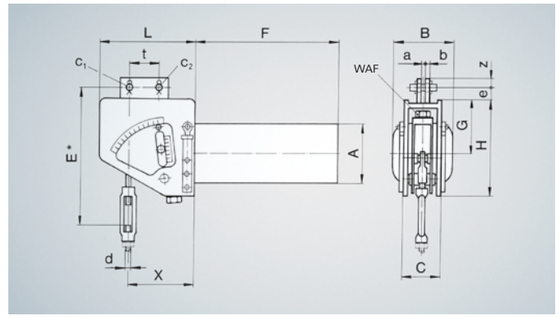
Travel-independent dimensions

CH size	Main dimensions						Weight approx.
–	A x B	C	F	G	H	WAF	–
–	mm	mm	mm	mm	mm	mm	kg
01	Ø 122	82	248	126	210	24	15
02	Ø 122	82	248	126	210	24	15
03	Ø 122	82	248	126	210	24	15
04	Ø 122	82	248	126	210	24	15
05	Ø 150	82	314	126	210	24	20
06	Ø 150	92	314	171	255	30	30
07	Ø 178	92	351	171	255	30	40
08	Ø 229	116	645	217	350	36	85
09	Ø 229	116	645	217	350	36	100
10	Ø 229	136	645	241	400	46	110
11	Ø 256	136	812	241	400	46	160
12	Ø 256	160	812	281	450	55	210
13	Ø 273	160	880	281	450	55	260
14	Ø 508	209	948	367	610	55	510
15	500 x 416	209	948	367	610	55	540
16	623 x 511	224	1207	457	720	75	880
17	623 x 511	224	1207	457	720	75	980
18	1140 x 510	265	1577	633	1000	75	1750
19	1140 x 510	265	1577	633	1000	75	1950
20	1250 x 560	265	1787	633	1000	75	2650

Load group[1)]	Threaded connec-tion	Connecting dimensions						
LGV	d	a	b	c_1	c_2	e	t	z
	mm	mm	mm	mm	mm	mm	mm	mm
12	M12	14	6	12	12	25	70	25
16	M16	14	6	16	12	30	85	20
20	M20	16	6	20	16	36	95	34
24	M24	20	10	24	20	45	120	35
30	M30	25	10	33	24	55	120	45
36	M36	30	15	40	33	70	150	60
42	M42	35	15	45	33	75	160	60
48	M48	42	20	50	40	85	160	70
56	M56	42	20	60	40	100	230	85
64	M64	50	20	70	45	125	240	100
72	M72	50	20	80	45	135	270	110
80	M80	60	25	90	45	145	300	120
90	M90	60	25	100	45	155	300	130

[1)] The load group of the connecting parts LGV - dependent on the load size and nominal travel - can be found in the load/travel - table on page 32.

HYDRA® CONSTANT HANGERS KHD



Order example: KHD 11.180.24
(Standard design)

Travel-dependent dimensions

CH size	01-05		06/07		08/09		10/11		12/13		14/15		16/17		18 -20	
	Installation dimension E*/Load axis position X															
Nominal travel S_N	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
50	441	107														
60	436	116	544	116	745	156										
70	431	125	539	125	740	165	833	190								
80	426	135	534	135	735	175	827	200								
90	421	144	529	144	730	184	822	209	940	209						
100	416	153	524	153	725	193	817	218	935	218	1157	288				
110	411	163	519	163	720	203	812	228	928	228	1152	298				
120	406	172	514	172	715	212	807	237	923	237	1147	307				
130	401	181	509	181	710	221	802	246	918	246	1142	316				
140	396	191	504	191	705	231	797	256	913	256	1137	326	1311	326		
150	391	200	499	200	700	240	792	265	908	265	1132	335	1306	335		
160	386	209	494	209	695	249	787	274	903	274	1127	344	1301	344		
170	381	219	489	219	690	259	782	284	898	284	1121	354	1296	354		
180	376	228	484	228	685	268	778	293	893	293	1116	363	1291	363	1556	418
190	371	237	479	237	680	277	773	302	888	302	1111	372	1286	372	1551	427
200	366	247	474	247	675	287	768	312	883	312	1106	382	1281	382	1546	437
225	354	270	462	270	664	310	756	335	871	335	1094	405	1269	405	1535	460
250	341	293	449	293	651	333	743	358	858	358	1081	428	1256	428	1522	483
275	329	317	437	317	639	357	731	382	846	382	1069	452	1244	452	1509	507
300	316	340	424	340	626	380	717	405	833	405	1056	475	1231	475	1496	530
325			412	363	614	403	705	428	821	428	1044	498	1218	498	1484	553
350			399	387	601	427	692	452	808	452	1031	522	1205	522	1471	577
375					589	450	680	475	796	475	1019	545	1193	545	1459	600
400					576	473	667	498	784	498	1006	568	1180	568	1446	623
425					564	497	655	522	772	522	994	592	1168	592	1434	647
450					551	520	642	545	759	545	981	615	1155	615	1421	670
475					539	543	630	568	747	568	969	638	1143	638	1409	693
500					526	567	617	592	734	592	956	662	1130	662	1396	717
Length of mechanism housing L																
Travel range S_N Length L	50-130 220		60-160 250		60-225 360											
Travel range S_N Length L	140-225 305		170-250 340		250-325 450		70-250 410		90-275 450							
Travel range S_N Length L	250-300 380		275-350 440		350-425 550		275-375 525		300-400 560		100-275 660					
Travel range S_N Length L					450-500 630		400-500 650		425-500 660		300-500 740		140-500 770		180-500 900	

The indicated dimensions (E, X, L) apply to the CH sizes 15, 17, 19 and 20 only in the permitted travel range according to the load/travel table.*
The load axis position X changes very slightly as it passes through the entire nominal path ($\Delta X_{max} = \pm 7$ % of S_N)
E applies to the upper travel limit; it increases with a changed block position according to the travel proportion.*

HYDRA® CONSTANT HANGER KVD

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset. Spring additionally terrosone coated. Key see page 29

Travel-independent dimensions

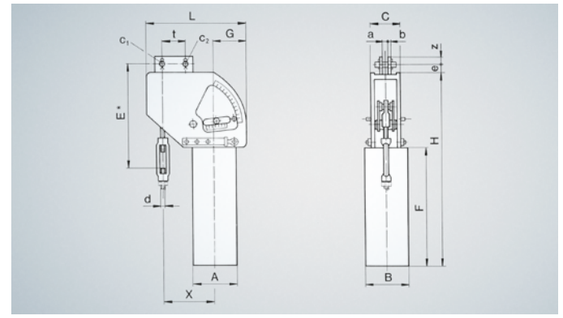
CH size	Main dimensions						Weight approx.
–	A x B	C	F	G	H	WAF	–
–	mm	mm	mm	mm	mm	mm	kg
01	Ø 122	82	248	116	498	24	20
02	Ø 122	82	248	116	498	24	20
03	Ø 122	82	248	116	498	24	20
04	Ø 122	82	248	116	498	24	20
05	Ø 150	82	314	116	564	24	25
06	Ø 150	92	314	141	599	30	30
07	Ø 178	92	351	141	636	30	40
08	Ø 229	116	645	182	1065	36	90
09	Ø 229	116	645	182	1065	36	100
10	Ø 229	136	645	201	1115	46	120
11	Ø 256	136	812	201	1282	46	160
12	Ø 256	160	812	231	1302	55	220
13	Ø 273	160	880	231	1370	55	260
14	Ø 508	209	948	327	1688	55	540
15	r416 x 500	209	948	327	1688	55	570
16	r511 x 623	224	1207	407	2057	75	920
17	r511 x 623	224	1207	407	2057	75	1020

Load group[1)]	Threaded connec-tion	Connecting dimensions						
LGV	d	a	b	c_1	c_2	e	t	z
	mm	mm	mm	mm	mm	mm	mm	mm
12	M12	14	6	12	12	25	70	25
16	M16	14	6	16	12	30	85	20
20	M20	16	6	20	16	36	95	34
24	M24	20	10	24	20	45	120	35
30	M30	25	10	33	24	55	120	45
36	M36	30	15	40	33	70	150	60
42	M42	35	15	45	33	75	160	60
48	M48	42	20	50	40	85	160	70
56	M56	42	20	60	40	100	230	85
64	M64	50	20	70	45	125	240	100
72	M72	50	20	80	45	135	270	110

[1)] The load group of the connecting parts LGV - dependent on the load size and nominal travel - can be found in the load/travel - table on page 32.

HYDRA® CONSTANT HANGER KVD

Order example: KVD 11.180.24
(Standard design)



Travel-dependent dimensions

CH size	01-05		06/07		08/09		10/11		12/13		14/15		16/17	
	Installation dimension E*/Load axis position X													
Nominal travel S_N	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
50	451	101												
60	446	110	579	153	805	192								
70	441	119	574	162	800	201	898	217						
80	436	129	569	172	795	211	892	227						
90	431	138	564	181	790	220	887	236	1005	245				
100	426	147	559	190	785	229	882	245	1000	254	1222	366		
110	421	157	519	157	730	196	877	255	993	264	1217	376		
120	416	166	514	166	725	205	802	221	988	273	1212	385		
130	411	175	509	175	720	214	797	230	983	282	1207	394		
140	406	185	504	185	715	224	792	240	978	292	1202	404	1406	434
150	401	194	499	194	710	233	787	249	883	249	1197	413	1401	443
160	396	203	494	203	705	242	782	258	878	258	1192	422	1396	452
170	391	213	489	213	700	252	777	268	873	268	1186	432	1391	462
180	386	222	484	222	695	261	773	277	868	277	1181	441	1386	471
190	381	231	479	231	690	270	768	286	863	286	1176	450	1381	480
200	376	241	474	241	685	280	763	296	858	296	1171	460	1376	490
225	364	264	462	264	674	303	751	319	846	319	1159	483	1364	513
250	351	287	449	287	661	326	738	342	833	342	1096	396	1351	536
275	339	311	437	311	649	350	726	366	821	366	1084	420	1339	560
300	326	334	424	334	636	373	712	389	808	389	1071	443	1326	583
325			412	357	624	396	700	412	796	412	1059	466	1253	466
350			399	381	611	420	687	436	783	436	1046	490	1240	490
375					599	443	675	459	771	459	1034	513	1228	513
400					586	466	662	482	759	482	1021	536	1215	536
425					574	490	650	506	747	506	1009	560	1203	560
450					561	513	637	529	734	529	996	583	1190	583
475					549	536	625	552	722	552	984	606	1178	606
500					536	560	612	576	709	576	971	630	1165	630

Length of mechanism housing L							
Travel range S_N Length L	50-100 312	60-160 391	60-200 505				
Travel range S_N Length L	110-200 398	170-250 471	225-300 600	70-200 550	90-250 631		
Travel range S_N Length L	225-300 491	275-350 571	325-400 700	225-350 691	275-375 751	100-400 940	
Travel range S_N Length L			425-500 800	375-500 841	375-500 871	400-500 1030	140-500 1137

The indicated dimensions (E, X, L) apply to the CH sizes 15 and 17 only in the permitted travel range according to the load/travel table.*
The load axis position X changes very slightly as it passes through the entire nominal path ($\Delta X_{max.}$ = ±7 % of S_N)
E applies to the upper travel limit; it increases with a changed block position according to the travel proportion.*

HYDRA® CONSTANT HANGER KHS

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset. Spring additionally terrosone coated. Key see page 29

Travel-independent dimensions

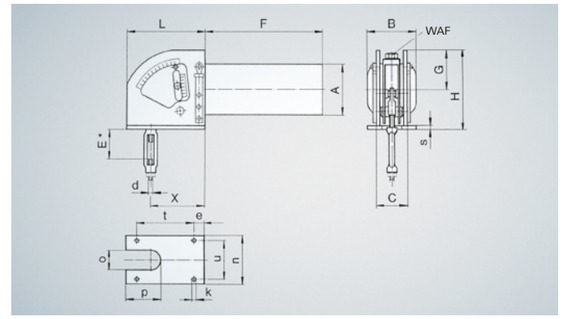
CH size	Main dimensions				Connecting dimensions								Weight approx.
–	A x B	C	F	G	e	k	n	o	p	s	u	WAF	–
–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	Ø 122	82	248	116	25	14	160	65	171	8	130	24	20
02	Ø 122	82	248	116	25	14	160	65	171	8	130	24	20
03	Ø 122	82	248	116	25	14	160	65	171	8	130	24	20
04	Ø 122	82	248	116	25	14	160	65	171	8	130	24	20
05	Ø 150	82	314	116	25	14	160	65	171	8	130	24	25
06	Ø 150	92	314	126	40	18	190	70	180	10	150	30	30
07	Ø 178	92	351	126	40	18	190	70	180	10	150	30	40
08	Ø 229	116	645	182	50	23	220	85	285[1)]	12	170	36	90
09	Ø 229	116	645	182	50	23	220	85	285[1)]	12	170	36	110
10	Ø 229	136	645	191	80	23	260	105	310[2)]	12	200	46	120
11	Ø 256	136	812	191	80	23	260	105	310[2)]	12	200	46	160
12	Ø 256	160	812	221	100	23	300	120	340[3)]	15	240	55	210
13	Ø 273	160	880	221	100	23	300	120	340[3)]	15	240	55	250
14	Ø 508	209	948	312	100	27	380	165	480	20	300	55	520
15	500 x 416	209	948	312	100	27	380	165	480	20	300	55	550
16	623 x 511	224	1207	397	120	27	380	180	495	20	300	75	900
17	623 x 511	224	1207	397	120	27	380	180	495	20	300	75	950
18	1140 x 510	265	1577	463	150	33	480	225	505	25	380	75	1800
19	1140 x 510	265	1577	463	150	33	480	225	505	25	380	75	2000
20	1250 x 560	265	1787	463	150	33	480	225	505	25	380	75	2650

Load group[4)]	Thread connection
LGV	d
	mm
12	M12
16	M16
20	M20
24	M24
30	M30
36	M36
42	M42
48	M48
56	M56
64	M64
72	M72
80	M80
90	M90

[1)] Sizes 08 -09 for travel range 450 - 500 p = 295
[2)] Sizes 10 -11 for travel range 275 - 375 p = 325
for travel range 400 - 500 p = 355
[3)] Sizes 12 -13 for travel range 300 - 400 p = 350
for travel range 425 - 500 p = 390

[4)] The load group of the connecting parts LGV - dependent on the load size and nominal travel - can be found in the load/travel - table on page 32.

HYDRA® CONSTANT HANGER KHS



Order example: KHS 11.180.24
(Standard design)

Travel-dependent dimensions

CH size	01-05		06/07		08/09		10/11		12/13		14/15		16/17		18 -20	
	Installation dimension E*/Load axis position X															
Nominal travel S_N	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
50	136	107														
60	136	116	184	116	201	156										
70	136	125	184	125	201	165	237	190								
80	136	135	184	135	202	175	237	200								
90	136	144	184	144	202	184	237	209	250	209						
100	136	153	184	153	202	193	237	218	250	218	330	288				
110	136	163	184	163	202	203	237	228	250	228	330	298				
120	136	172	184	172	202	212	237	237	250	237	330	307				
130	136	181	184	181	202	221	237	246	250	246	330	316				
140	136	191	184	191	202	231	237	256	250	256	330	326	319	326		
150	136	200	184	200	202	240	237	265	250	265	330	335	319	335		
160	136	209	184	209	202	249	237	274	250	274	330	344	319	344		
170	136	219	184	219	202	259	237	284	250	284	329	354	319	354		
180	136	228	184	228	202	268	237	293	250	293	329	363	319	363	324	418
190	136	237	184	237	202	277	237	302	250	302	329	372	319	372	324	427
200	136	247	184	247	202	287	237	312	250	312	329	382	319	382	324	437
225	136	270	184	270	200	310	237	335	250	335	329	405	319	405	326	460
250	136	293	184	293	200	333	237	358	251	358	329	428	320	428	326	483
275	136	317	184	317	200	357	237	382	251	382	329	452	320	452	327	507
300	136	340	184	340	200	380	235	405	251	405	329	475	320	475	327	530
325			184	363	200	403	235	428	251	428	330	498	319	498	327	553
350			184	387	200	427	235	452	251	452	330	522	319	522	327	577
375					200	450	235	475	251	475	330	545	319	545	327	600
400					200	473	235	498	250	498	330	568	319	568	327	623
425					200	497	235	522	250	522	330	592	319	592	327	647
450					200	520	235	545	250	545	330	615	319	615	327	670
475					200	543	235	568	250	568	330	638	319	638	327	693
500					200	567	235	592	250	592	330	662	319	662	327	717

Length of mechanism housing L

Travel range SN	50 - 130	60 - 160	60 - 225					
Length L	220	240	375					
Height H	268	295	439					
Hole pitch t	170	160	275					
Travel range SN	140 - 225	170 - 250	250 - 325	70 - 250	90 - 275	100 - 275		
Length L	320	340	460	425	455	670		
Height H	322	340	484	483	546	715		
Hole pitch t	270	260	360	265	255	435		
Travel range SN	250 - 300	275 - 350	350 - 425	275 - 375	300 - 400	300 - 400	140 - 350	
Length L	390	440	560	540	570	700	755	
Height H	356	390	536	533	596	805	850	
Hole pitch t	340	360	460	365	360	500	440	
Travel range SN			450 - 500	400 - 500	425 - 500	425 - 500	375 - 500	180 - 500
Length L			640	665	670	750	780	930
Height H			576	603	636	805	910	1158
Hole pitch t			530	460	420	500	510	600

The indicated dimensions (E, X, L) apply to the CH sizes 15, 17, 19 and 20 only in the permitted travel range according to the load/travel table.*
The load axis position X changes very slightly as it passes through the entire nominal path (ΔX_{max} = ±7 % of S_N)
E applies to the upper travel limit; it increases with a changed block position according to the travel proportion.*

HYDRA® CONSTANT HANGER KVS

Standard design
Hanger preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd resin coated.

Options
Hanger not preset. Spring additionally terrosone coated. Key see page 29

Travel-independent dimensions

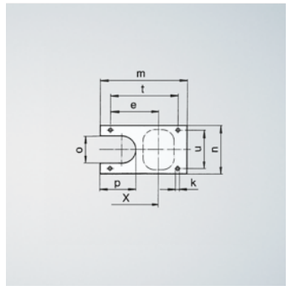
CH size	Main dimensions					Connecting dimensions						Weight approx.
–	A x B	C	F	G	H	k	n	o	s	u	WAF	–
–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	Ø 114	82	266	116	516	14	180	80	8	130	24	20
02	Ø 114	82	266	116	516	14	180	80	8	130	24	20
03	Ø 114	82	266	116	516	14	180	80	8	130	24	20
04	Ø 114	82	266	116	516	14	180	80	8	130	24	20
05	Ø 140	82	266	116	516	14	180	80	8	130	24	25
06	Ø 152	92	418	141	703	18	230	100	10	180	30	40
07	Ø 194	92	420	141	705	18	230	100	10	180	30	50
08	Ø 194	116	642	182	1062	23	300	160	12	230	36	90
09	Ø 219	116	642	182	1062	23	300	160	12	230	36	110
10	Ø 219	136	772	201	1242	23	320	180	12	250	46	130
11	Ø 245	136	772	201	1242	23	320	180	12	250	46	170
12	Ø 273	160	904	231	1394	23	360	200	15	280	55	240
13	Ø 299	160	904	231	1394	23	360	200	15	280	55	290
14	Ø 508	209	973	327	1713	27	580	260	20	480	55	580
15	418 x 502	209	973	327	1713	27	580	260	20	480	55	630
16	517 x 629	224	1228	407	2078	33	700	340	20	600	75	1000
17	517 x 629	224	1228	407	2078	33	700	340	20	600	75	1100
18	756 x 851	305	1660	393	1925	33	950	300	25	850	75	2100
19	760 x 855	305	1660	393	1925	33	950	300	25	850	75	2400
20	835 x 915	305	1850	433	1925	33	950	300	25	850	75	3000

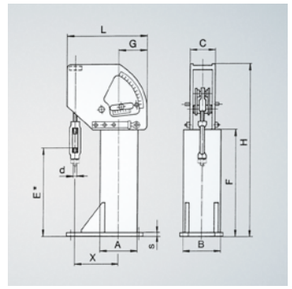
Load group[1)]	Thread connection
LGV	d
	mm
12	M12
16	M16
20	M20
24	M24
30	M30
36	M36
42	M42
48	M48
56	M56
64	M64
72	M72
80	M80
90	M90

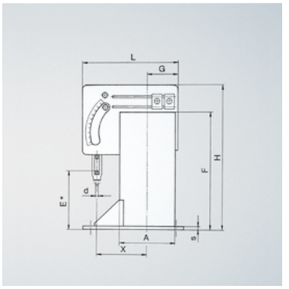
[1)] The load group of the connecting parts LGV - dependent on the load size and nominal travel - can be found in the load/travel - table on page 32.

HYDRA® CONSTANT HANGER KVS

Order example:
KVS 11.180.24
(Standard design)







Travel-dependent dimensions

CH size	01-05		06/07		08/09		10/11		12/13		14/15		16/17		18 -20	
	Installation dimension E*/Load axis position X															
Nominal travel S_N	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
50	61	101														
60	66	110	79	153	317	192										
70	71	119	84	162	322	201	360	217								
80	76	129	89	172	328	211	365	227								
90	81	138	94	181	333	220	370	236	454	245						
100	86	147	99	190	338	229	375	245	459	254	581	366				
110	91	157	139	157	393	196	380	255	464	264	586	376				
120	96	166	144	166	398	205	455	221	469	273	591	385				
130	101	175	149	175	403	214	460	230	474	282	596	394				
140	106	185	154	185	407	224	465	240	479	292	601	404	797	434		
150	111	194	159	194	412	233	470	249	574	249	606	413	802	443		
160	116	203	164	203	417	242	475	258	579	258	611	422	807	452		
170	121	213	169	213	422	252	480	268	584	268	617	432	812	462		
180	126	222	174	222	427	261	485	277	589	277	622	441	817	471	741	385
190	131	231	179	231	432	270	490	286	594	286	627	450	822	480	746	395
200	136	241	184	241	437	280	495	296	599	296	632	460	827	490	751	404
225	149	264	197	264	450	303	508	319	612	319	645	483	840	513	763	427
250	161	287	209	287	462	326	520	342	624	342	707	396	852	536	775	451
275	174	311	222	311	475	350	533	366	637	366	720	420	865	560	788	474
300	186	334	234	334	487	373	545	389	649	389	732	443	877	583	800	497
325			247	357	500	396	558	412	662	412	745	466	950	466	813	521
350			259	381	512	420	570	436	674	436	757	490	962	490	825	544
375					525	443	583	459	687	459	770	513	975	513	838	567
400					537	466	595	482	699	482	782	536	987	536	850	591
425					550	490	608	506	712	506	795	560	1000	560	863	614
450					562	513	620	529	724	529	807	583	1012	583	875	637
475					575	536	633	552	737	552	820	606	1025	606	888	660
500					587	560	645	576	749	576	832	630	1037	630	899	684

Length of mechanism housing L									
Travel range SN	50-100	60-160	60-200						
Housing length L	312	391	505						
Hole to centre e	171	225	290						
Length base m	285	375	455						
Hole pitch t	235	325	385						
Cut-out Base p	138/125	170/150	225/215						
Travel range SN	110-200	170-250	225-300	70 - 200	90-250				
Housing length L	398	471	600	550	631				
Hole to centre e	257	305	385	315	360				
Length base m	370	455	550	490	570				
Hole pitch t	320	405	480	420	490				
Cut-out Base p	190	210	270	240/225	250				
Travel range SN	225-300	275-350	325-400	225-350	275-375	100-400			
Housing length L	491	571	700	691	751	940			
Hole to centre e	350	405	485	455	480	655			
Length base m	465	555	650	630	690	985			
Hole pitch t	415	505	580	560	610	885			
Cut-out Base p	180	220	290	340	350	450/490			
Travel range SN			425-500	375-500	400-500	425-500	140-500	180-500	
Housing length L			800	841	871	1030	1137	1300	
Hole to centre e			585	615	600	655	680	760	
Length base m			750	790	810	985	1050	1300	
Hole pitch t			680	720	730	885	950	1200	
Cut-out Base p			310	370	370	450/490	472	550	

Dim. p: 1st value applies to 1st CH size

The indicated dimensions (E, X, L) apply to the CH sizes 15, 17, 19 and 20 only in the permitted travel range according to the load/travel table.*
The load axis position X changes very slightly as it passes through the entire nominal path ($\Delta X_{max.}$ = ±7 % of S_N)
E applies to the upper travel limit; it increases with a changed block position according to the travel proportion.*

HYDRA® CONSTANT SUPPORTS

Support roller and sliding plate height adjustable: ±20 mm

The constant support is placed on to the load-bearing structure and accepts the load via a roller or a PTFE-covered sliding plate. In both cases the system components are fitted with a flat sliding shoe.
In the support roller version (KSR series), the lateral force in the rolling direction is reduced to less than 3% of the imposed load. The load constancy remains unaffected. This support must be aligned exactly with the horizontal movement of the component supported. The version with sliding plate (KSP series), allows relative movements in all direction at higher lateral force (6 - 10% of the imposed load). This causes somewhat higher friction forces in the constant support. The sliding shoe must have a sliding surface made from stainless steel.

Load/travel table for constant supports
(for constant hanger see page 32)

Nominal travel s_N	CH size																
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
mm	Maximum required load $F_{s\,max}$ in kN																
50	0.47	0.94	1.85	3.72	6.48												
60	0.39	0.78	1.54	3.10	5.40	9.30	15.4	22.8	37.7								
70	0.33	0.67	1.32	2.66	4.63	7.97	13.2	19.6	32.3								
80	0.29	0.59	1.16	2.33	4.05	6.98	11.5	17.1	28.2	38.8	58.8						
90	0.26	0.52	1.03	2.07	3.60	6.20	10.3	15.2	25.1	34.5	52.3	73.3	105				
100	0.23	0.47	0.92	1.86	3.24	5.58	9.24	13.7	22.6	31.0	47.0	66.0	94.1				
110	0.21	0.43	0.84	1.69	2.95	5.07	8.40	12.5	20.5	28.2	42.8	60.0	85.5	128			
120	0.20	0.39	0.77	1.55	2.70	4.65	7.70	11.4	18.8	25.9	39.2	55.0	78.4	117	154		
130	0.18	0.36	0.71	1.43	2.49	4.29	7.10	10.5	17.4	23.9	36.2	50.8	72.4	108	142		
140	0.17	0.33	0.66	1.33	2.31	3.99	6.60	9.78	16.1	22.2	33.6	47.1	67.2	100	132	200	
150						3.72	6.16	9.13	15.1	20.7	31.4	44.0	62.7	93.5	123	187	261
160						3.49	5.77	8.56	14.1	19.4	29.4	41.2	58.8	87.5	116	175	246
170								8.06	13.3	18.3	27.7	38.8	55.3	82.5	109	165	232
180								7.61	12.6	17.2	26.1	36.7	52.3	77.9	103	156	219
190								7.21	11.9	16.3	24.8	34.7	49.5	73.8	97.4	147	207
200								6.85	11.3	15.5	23.5	33.0	47.0	70.1	92.5	140	197
225								6.09	10.0	13.8	20.9	29.3	41.8	62.3	82.2	124	175
250										12.4	18.8	26.4	37.6	56.1	74.0	112	157
275												24.0	34.2	51.0	67.3	102	143
300														46.8	61.7	93.4	131
325														43.2	56.9	86.2	121
350														40.1	52.9	80.0	112
375																74.7	105
400																70.0	98.4

Up to 40% smaller loads (to the next lower CH size) set in the factory. Every set required load can be adjusted in the system by up to ± 15%. The nominal load FN is 15% above the max. required load. It can be used during planning when a subsequent load adjustment can be dispensed with.

Selection
The table above, set up especially for constant supports, shows the maximum required load $F_{s\,max}$ for every CH size – according to the nominal travel s_N. This still allows a load adjustment of +=15% before the nominal load F_N is reached. With required load F_s and required travel s_s, the CH size with the next higher load $F_{s\,max}$ is selected. The required load F_s is set in the factory.
The possible support travel (Nominal travel s_N) should always be chosen to be somewhat larger than the required travel (Required travel s_s). The intended travel reserves s_R will then be available equally at both ends of the travel and in each case they should be at least 10% of s_s but not less than 10 mm; i.e. the required travel is in the central area of the nominal travel. This gives a stop position and installation dimension, dependent on the direction of movement from cold to warm for upwards (+) or downwards (–) movement:
$E = E^* - 0.5\ (s_N \pm s_s)$

Example **KSR 12.190.00**

Requirements:
Constant support
with support roller
Required load: F_s = 32 kN
Required travel: s_s = 155 mm, upwards
Selection:
$F_{s\,max} \geq 32$ kN
$s_N \geq s_s + 2\ s_R = s_s \cdot 1.2$
$= 155 \cdot 1.2 = 186$ mm
This gives:
Nominal travel 190 mm
CH size 12
(The load group is not relevant for constant supports).

with $F_{s\,max}$ = 26.1 kN
(set to F_s 32 kN)
s_N = 190 mm and travel reserves 2 s_R = 2 x 17.5 mm)

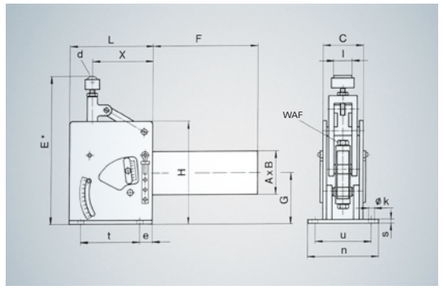
Installation dimension E:
$E = E^* - 0.5\ (s_N + s_s)$
$= 920 - 0.5\ (190 + 155)$
$= 747.5$ mm (E* from p. 18)

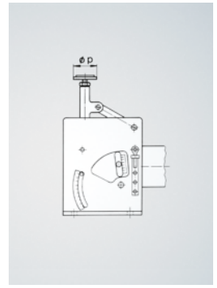
HYDRA® CONSTANT SUPPORTS KSR/KSP

Standard design
Support preset and blocked, housing hot-dip galvanized, connecting parts electro-galvanized, spring alkyd coated.

Options
Support not preset. Spring additionally terrosone coated. Key see page 29

Order example: KSR 12.190.00 (Standard)





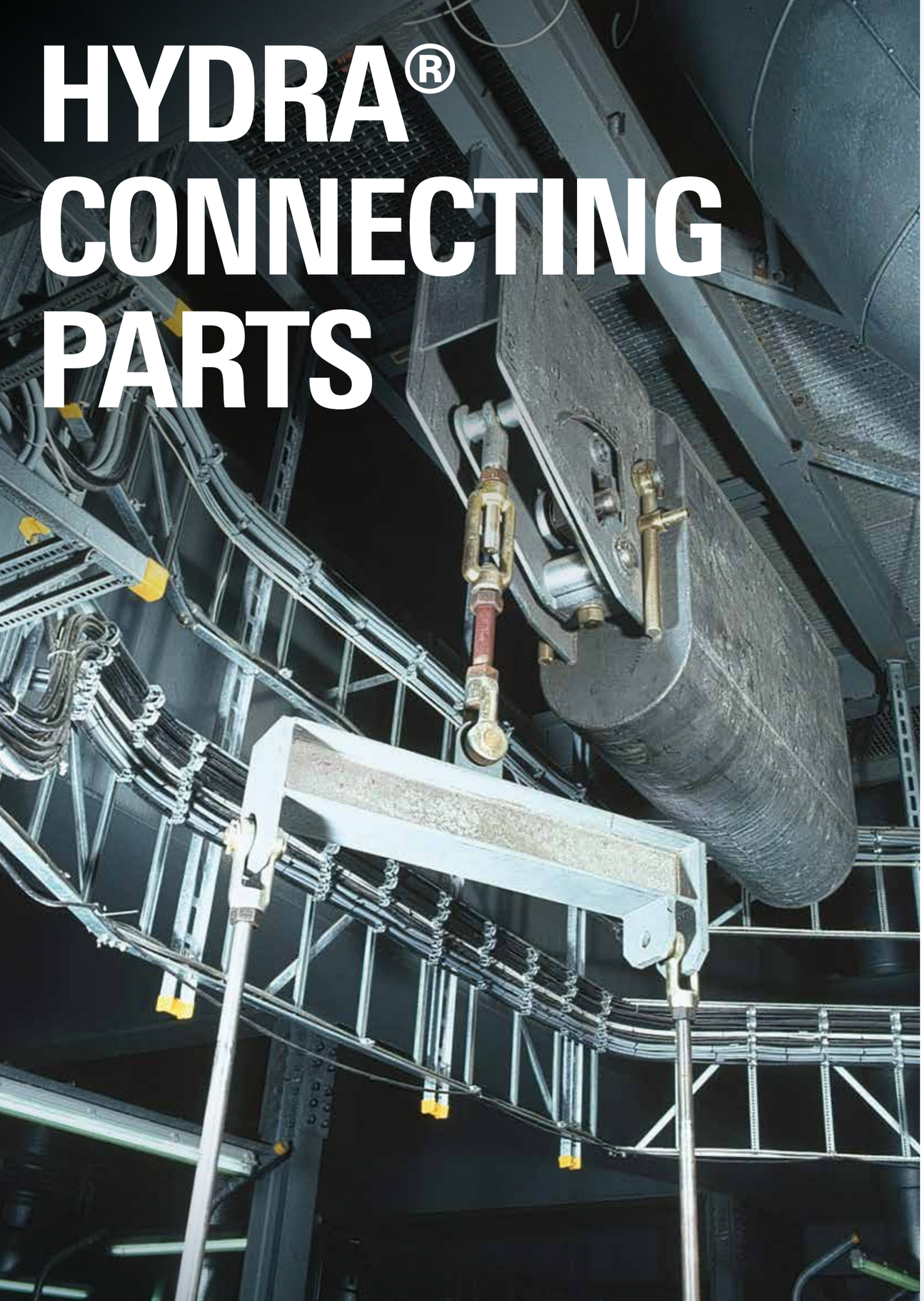
Travel-independent dimensions

CH size	Main dimensions						Connecting dimensions										Weight approx.
–	A x B	C	F	G	H	L	d	e	k	l	n	p	s	t	u	WAF	–
–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
01	0120	145	245	170	315	230	50	40	14	65	210	70	8	150	180	24	25
02	0120	145	245	170	315	230	50	40	14	65	210	70	8	150	180	24	25
03	0120	145	245	170	315	230	50	40	14	65	210	70	8	150	180	24	25
04	0120	145	245	170	315	230	50	40	14	65	210	70	8	150	180	24	25
05	0150	145	310	175	315	230	50	40	14	65	210	70	8	150	180	24	30
06	0150	175	310	195	355	250	60	50	18	90	260	70	10	150	220	30	30
07	0180	175	350	195	355	250	60	50	18	90	260	70	10	150	220	30	50
08	0230	195	580	295	500	360	60	55	23	90	300	100	12	250	250	36	90
09	0230	195	680	295	500	360	60	55	23	90	300	100	12	250	250	36	100
10	0230	240	680	340	580	425	90	62	23	120	360	120	12	300	300	46	140
11	0255	240	810	340	580	425	90	62	23	120	360	120	12	300	300	46	180
12	0255	260	810	350	625	450	90	60	23	120	400	140	15	330	320	55	280
13	0275	260	880	350	625	450	90	60	23	120	400	140	15	330	320	55	300
14	0510	350	870	485	835	630	110	100	27	150	500	180	20	410	440	55	550
15	500/420	350	960	485	835	630	110	100	27	150	500	180	20	410	440	55	660
16	620/510	365	1290	535	960	695	140	120	27	190	520	220	20	440	440	75	1000
17	620/510	365	1290	535	960	695	140	120	27	190	520	220	20	440	440	75	1150

Travel-dependent dimensions

CH size	01-05		06/07		08/09		10/11		12/13		14/15		16/17	
	Installation dimension E*/Load axis position X													
Nominal travel S_N	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X	E*	X
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
50	480	105												
60	485	115	545	115	685	155								
70	490	125	550	125	690	165								
80	495	135	555	135	695	175	825	200						
90	500	145	560	145	700	185	830	210	870	210				
100	505	155	565	155	705	195	835	220	875	220				
110	510	165	570	165	710	205	840	230	880	230	1165	300		
120	515	170	575	170	715	210	845	235	885	235	1170	305		
130	520	180	580	180	720	220	850	245	890	245	1175	315		
140	525	190	585	190	725	230	855	255	895	255	1180	325	1305	325
150			590	200	730	240	860	265	900	265	1185	335	1310	335
160			595	210	735	250	865	275	905	275	1190	345	1315	345
170					740	260	870	285	910	285	1195	355	1320	355
180					745	270	875	295	915	295	1200	365	1325	365
190					750	275	880	300	920	300	1205	370	1330	370
200					755	285	885	310	925	310	1210	380	1335	380
225					770	310	900	335	940	335	1225	405	1350	405
250							910	360	950	360	1235	430	1360	430
275									965	380	1250	450	1375	450
300											1260	475	1385	475
325											1275	500	1400	500
350											1285	520	1410	520
375													1425	545
400													1435	565

The load axis position X changes very slightly as it passes through the entire nominal path (ΔX_{max} = ±7 % of S_N)
E applies to the upper travel limit; it increases with a changed block position according to the travel proportion.*



HYDRA® CONNECTING PARTS

STRUCTURE OF THE TYPE DESIGNATION

The type designation consists of three parts:
1. Series, defined by three letters
2. Nominal size, defined by several number groups
3. Option code, defined by figure codes, separated from the nominal size by hyphens

Type designations without option codes refer to standard versions.

Diagram illustrating the naming principle

			.				-		.

Model series — Nominal size — Option code

Option code

	materials[1)]
37	1.0038/S235JR
16	1.5415/16Mo3
13	1.7335/13CrMo4-5
10	1.7380/10CrMo9-10
91	1.4903/X10CrMoVNb9-1(P91)
41	1.4541/X6CrNiTi18-10
71	1.4571/X6CrNiMoTi17-12-2
80	1.4958/X5NiCrAlTi31-20(Incoloy800H)

	Surface protection
0	blank
1	Electro galvanized
2	Hot-dip galvanized
3	Primed
4	Other coating please specify exactly

1) only connecting lugs, sliding shoes and clamps

Series

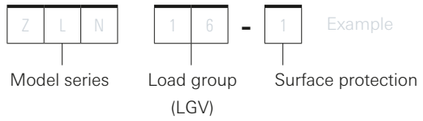
Meaning of characters dependent on position

Product group Position 1		Design/Component Position 2		Connection/Other Position 3	
Connecting parts (accessories)	Z	Welding lug Clamping lug	L K	normal (for spring hangers or rigid load chains) for constant hangers	N K
		Connecting lug	V	Normal reinforced Heavy-duty	N V S
		Perforated plate	P	Spherical washer	K
		Clevis with bolt Turnbuckle Eye nut Rod coupling	G S O H	Metric thread (DIN ISO) Inch thread (inch)	M I
		Threaded rod, Right-hand thread Threaded rod, Left/right-hand thread	R L	Metric thread (DIN ISO) Inch thread (inch)	M I
		Nut (normal)	M	Metric thread (DIN ISO) Inch thread (inch)	M I
		Traverse	T	Normal	N
		Intermediate support piece	Z	Spring support Constant support	F K

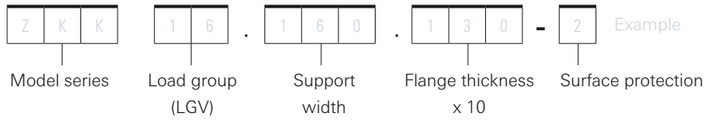
TYPE DESIGNATION OF THE PRODUCTS

Thanks to the assignment of the load groups (LGV) they can easily be combined as load chains, regardless of whether the load chains are rigid or moveable.

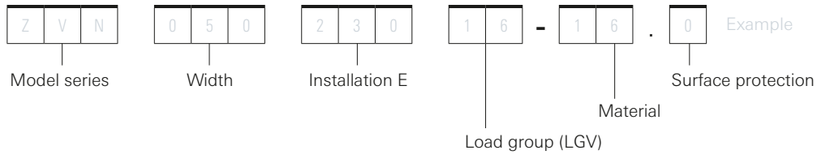
Lugs (other than connecting and clamping lugs)



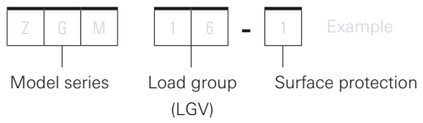
Clamping lugs



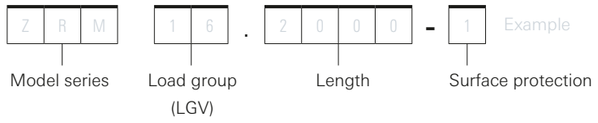
Connecting lugs



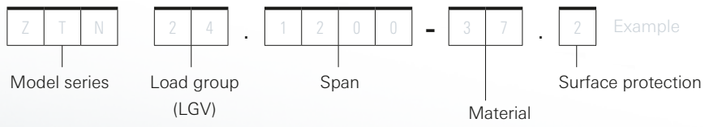
Threaded parts



Threaded rods



Traverses

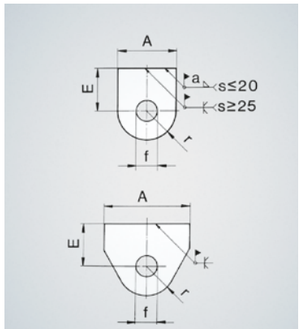


HYDRA® CONNECTING ELEMENTS

HYDRA® WELDING LUG ZLN

normal, for spring hangers and rigid load chain

Order example: ZLN 42-3 (primed)

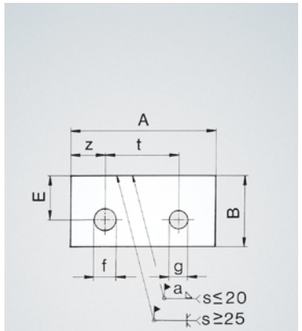


Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	30	40	45	55	70	70	80	120	120	130	150	170	180
Dimensions and Connecting dimensions in mm	A	40	50	60	70	90	110	120	130	280	320	400	450	500
	f	14	18	22	26	35	42	47	52	62	72	82	92	102
	r	20	25	30	35	45	55	60	65	90	100	120	135	160
	s	8	10	12	15	20	25	30	35	35	40	40	50	50
Weldseam	a	4	4	5	6	7	8	-	-	-	-	-	-	-
Weight approx.	kg	0.1	0.2	0.4	0.6	1.3	2.2	3.2	5.5	11	16	22	36	46

HYDRA® WELDING LUG ZLK

for constant hangers

Order example: ZLK 42-3 (primed)

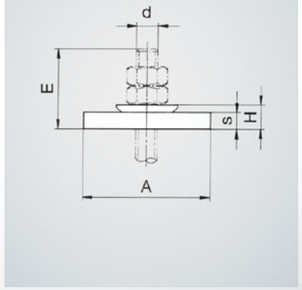


Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	35	40	46	55	65	80	90	100	115	140	150	160	170
Dimensions and Connecting dimensions in mm	A	100	120	140	175	190	235	255	270	355	385	425	470	480
	B	60	60	80	90	110	140	150	170	200	240	260	280	300
	f	14	18	22	26	35	42	47	53	63	73	83	93	103
	g	14	14	18	22	26	35	35	42	42	47	47	47	47
	s	10	10	12	15	20	25	30	35	35	40	40	50	50
	t	70	85	95	120	120	150	160	160	230	240	270	300	300
	z	15	20	25	30	40	45	55	60	75	90	100	110	120
Weldseam	a	4	4	5	6	7	8	-	-	-	-	-	-	-
Weight approx.	kg	0.4	0.5	1.0	1.7	3.0	6.0	8.4	12	18	27	32	48	53

HYDRA® PERFORATED PLATE ZPK

with hardened spherical washer

Order example: ZPK 42-3 (primed)



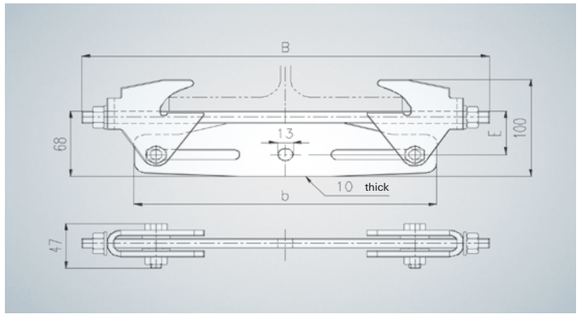
Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	60	85	95	110	110	135	170	185	215	245	270	300	330
Dimensions and Connecting dimensions in mm (inch)	A	80	100	100	100	130	130	150	150	180	180	220	240	280
	H	13	18	19	25	35	41	44	58	62	76	79	91	93
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		($^1/_2$)	($^5/_8$)	($^3/_4$)	(1)	(1 $^1/_8$)	(1 $^1/_2$)	(1 $^3/_4$)	(2)	(2 $^1/_4$)	(2 $^1/_2$)	(2 $^3/_4$)	(3)	(3 $^1/_2$)
	s	10	15	15	20	25	30	30	40	40	50	50	60	60
Weight approx.	kg	0.5	1.2	1.2	1.5	3.3	3.9	5.2	7.0	10	13	19	26	35

Load group LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Nominal load F_N in kN	7	12	20	33	50	70	100	132	180	240	300	400	500

HYDRA® CLAMPING LUG ZKB

LGV 12 infinitely variable, normal, for spring hangers and rigid support assembly

for support width 80 to 300 mm and
flange thickness 7.4 to 21 mm
for supports
IPE 160 – 600
HEA 100 – 450
HEB 100 – 320



Order example: ZKB 12.200-2

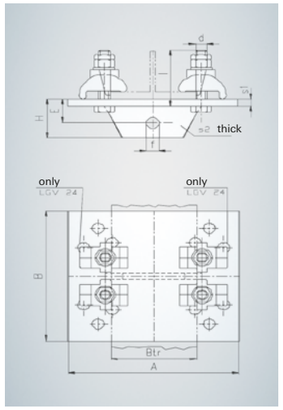
LGV 12, support width 80 mm to 200 mm,
S235JR, hot-dipped galvanized

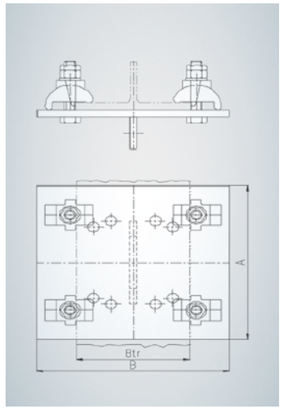
LGV	Type	Support width	E	B	b	H	Weight
		mm	mm	mm	mm	mm	kg
12	ZKB 12.200-2	80-200	45	350	260	100	2.0
12	ZKB 12.300-2	200-300	45	460	370	100	3.0

HYDRA® CLAMPING LUG ZKN 1

Gradation 20 mm

for support width 100 to 200 mm and
flange thickness 8 to 16 mm
Arrangement for
LGV 16 and Btr = 160
LGV 20 and Btr = 180





Order example: ZKN 1.16.160-2

LGV 16, maximum support width 160 mm,
S235JR, hot-dipped galvanized

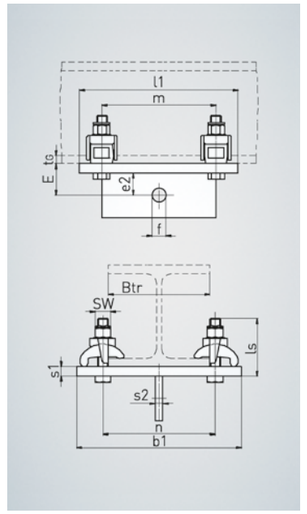
LGV	E	H	Support width Btr[1]		A	B	S1	S2	f	d	l	Weight
			min	max								
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
16	40	65	100	160	255	275	12	10	18	16	90	10
20	50	80	120	180	295	315	15	12	22	20	110	16
24	65	100	140	200	370	370	25	15	26	24	130	36

HYDRA® CONNECTING ELEMENTS

HYDRA® CLAMPING LUG ZKN 2

Infinitely variable, normal, for spring hangers and rigid load chain

for support width 82 to 300 mm and flange thickness 7.4 to 36 mm
for supports
IPE 160 – 600
HEA 100 – 1000
HEB 100 – 1000
HEM 100 – 280

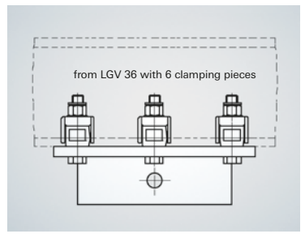


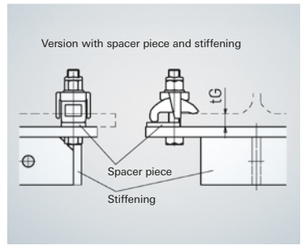
Order example: ZKN 2.16.200.15.2

LGV 16, support width 200 mm,
Flange thickness 15 mm, hot-dip galvanized

Support-dependent dimensions

LGV	Btr	Type	tg	n	b1	s1	E	ls Bolt length	Weight
	mm	ZKN 2...	mm	mm	mm	mm	mm	mm	kg[3]
16	82 - 99	16. ... .[1]	7.4 - 11	[4] + 17	[4] + 100	12	42	80 - 90	7
	161 - 220	16. ... .[1]	10.2 - 25	[4] + 17	[4] + 100	15	45	90 - 100	10
	240 - 300	16. ... .[1]	12 - 36	[4] + 17	[4] + 100	20	50	100 - 120	16
20	100 - 119	20. ... .[1]	8 - 21	[4] + 17	[4] + 100	15	55	90 - 100	10
	181 - 190	20. ... .[1]	14 - 24	[4] + 17	[4] + 100	18	58	100 - 110	13
	200 - 240	20. ... .[1]	10 - 26	[4] + 17	[4] + 100	20	60	90 - 110	16
	260 -300	20. ... .[1]	12.5 - 36	[4] + 17	[4] + 100	16	56	90 - 120	19 [2]
24	100 - 135	24. ... .[1]	8.5 - 21	[4] + 21	[4] + 125	18	63	100 - 110	16
	201 - 240	24. ... .[1]	9.5 - 26	[4] + 21	[4] + 125	25	70	110 - 120	25
	260 - 300	24. ... .[1]	12.5 - 36	[4] + 21	[4] + 125	20	65	110 - 130	30 [2]
30	100 - 110	30. ... .[1]	8 - 20	[4] + 25	[4] + 155	20	90	120 - 130	25
	120 - 190	30. ... .[1]	8 - 24	[4] + 25	[4] + 155	25	95	130 - 140	31
	200 - 300	30. ... .[1]	10 - 36	[4] + 25	[4] + 155	20	90	120 - 150	39 [2]
36	120 - 180	36. ... .[1]	8 - 23	[4] + 25	[4] + 155	25	95	130 - 140	43
	190 - 300	36. ... .[1]	10 - 36	[4] + 25	[4] + 155	25	95	130 - 150	60 [2]
42	190 - 300	42. ... .[1]	10 - 36	[4] + 25	[4] + 155	25	100	130 - 150	63 [2]





[1] Enter support width and flange thickness (x 10)
[2] With additional stiffening
[3] Weight only average values
[4] Sum of existing support width + value indicated in table

Load-group dependent dimensions

LGV	m	l1	s2	e2	f	WAF
	mm	mm	mm	mm	mm	mm
16	150	230	10	30	18	24
20	170	250	12	40	22	24
24	200	300	15	45	26	30
30	215	340	20	70	35	36
36	275	400	25	70	42	36
42	275	400	30	75	47	36

Spacer piece available

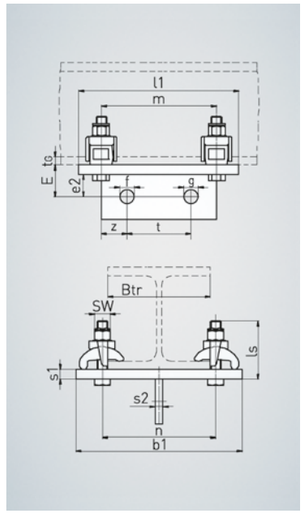
LGV	with t_G greater then
16	16 mm
20	16 mm
24	20 mm
30	24 mm
36	24 mm
42	24 mm

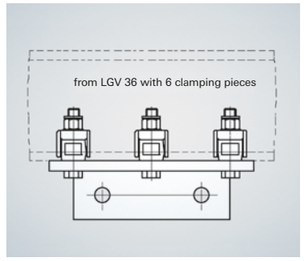
HYDRA® CLAMPING LUG ZKK

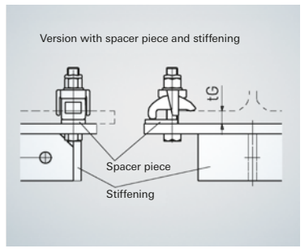
for constant hangers

for support width 82 to 300 mm and flange thickness 7.4 to 36 mm
for supports
IPE 160 – 600
HEA 100 – 1000
HEB 100 – 1000
HEM 100 – 280

Order example: ZKK 12.200.15-2
LGV 12, support width 200 mm, flange thickness 15 mm, hot-dip galvanized







Support-dependent dimensions

LGV	Btr	Type	tg	n	b1	s1	E	ls Bolt length	Weight
	mm	ZKK ...	mm	mm	mm	mm	mm	mm	kg[3]
12	82 - 140	12. ... . [1]	7.4 - 21	[4] + 13	[4] + 80	10	45	70 - 80	4
	150 -210	12. ... . [1]	10.7 - 25	[4] + 13	[4] + 80	12	47	80 - 90	6
	220 - 300	12. ... . [1]	11 - 36	[4] + 13	[4] + 80	15	50	80 - 100	9
16	82 - 120	16. ... . [1]	7.4 - 11	[4] + 17	[4] + 100	12	52	80 - 90	7
	135 - 220	16. ... . [1]	10.2 - 25	[4] + 17	[4] + 100	15	55	90 - 100	10
	240 - 300	16. ... . [1]	12 - 36	[4] + 17	[4] + 100	20	60	100 - 120	16
20	100 - 135	20. ... . [1]	8 - 21	[4] + 17	[4] + 100	15	60	90 - 100	10
	140 - 150	20. ... . [1]	8.5 - 22	[4] + 17	[4] + 100	16	61	90 - 100	11
	160 -190	20. ... . [1]	14 - 24	[4] + 17	[4] + 100	18	63	100 - 110	13
	200 - 240	20. ... . [1]	10 - 26	[4] + 17	[4] + 100	20	65	90 - 110	16
	260 - 300	20. ... . [1]	12.5 - 36	[4] + 17	[4] + 100	16	61	90 - 120	19 [2]
24	100 - 135	24. ... . [1]	8.5 - 21	[4] + 21	[4] + 125	18	73	100 - 110	16
	140 - 170	24. ... . [1]	8.5 - 23	[4] + 21	[4] + 125	20	75	100 - 120	19
	180 - 240	24. ... . [1]	9.5 - 26	[4] + 21	[4] + 125	25	80	110 - 120	25
	260 - 300	24. ... . [1]	12.5 - 36	[4] + 21	[4] + 125	20	75	110 - 130	30 [2]
30	100 -110	30. ... . [1]	8 - 20	[4] + 25	[4] + 155	20	85	120 - 130	25
	120 - 190	30. ... . [1]	8 - 24	[4] + 25	[4] + 155	25	90	130 - 140	31
	200 - 300	30. ... . [1]	10 - 36	[4] + 25	[4] + 155	20	85	120 - 150	39 [2]
36	120 - 180	36. ... . [1]	8 - 23	[4] + 25	[4] + 155	25	105	130 - 140	43
	190 -300	36. ... . [1]	10 - 36	[4] + 25	[4] + 155	25	105	130 - 150	60 [2]
42	190 - 300	42. ... . [1]	10 - 36	[4] + 25	[4] + 155	25	115	130 - 150	63 [2]

[1] Enter support width and flange thickness (x 10)
[2] with additional stiffening
[3] Weight only average values
[4] Sum of existing support width + value indicated in table

Load-group dependent dimensions

LGV	m	l1	s2	e2	f	g	t	z	WAF
	mm	mm	mm	mm	mm	mm	mm	mm	mm
12	135	200	10	35	14	14	70	50	18
16	155	235	10	40	18	14	85	55	24
20	190	270	12	45	22	18	95	65	24
24	240	340	15	55	26	22	120	80	30
30	255	380	20	65	35	26	120	90	36
36	305	430	25	80	42	35	150	100	36
42	335	460	30	90	47	35	160	120	36

Spacer piece available

LGV	with t_G greater then
12	12 mm
16	16 mm
20	16 mm
24	20 mm
30	24 mm
36	24 mm
42	24 mm

HYDRA® CONNECTING ELEMENTS

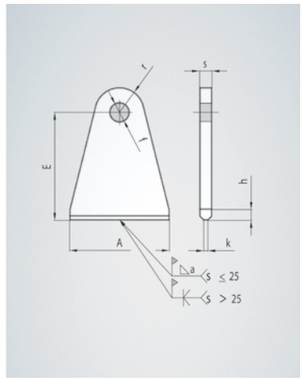
HYDRA® WELDING LUG ZLV

reinforced

Order example: ZLV 42.255-37.3

LGV 42, installation dimension E=255 mm, material S235JR, primed

Load group	LGV		12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension for material	E	S235JR	150	180	225	230	235	245	255	265	275	285	295	305	315
		16Mo3	250	280	325	330	335	345	355	365	375	385	395	405	415
		13CrMo4-5	350	380	425	430	435	445	455	465	475	485	495	505	515
Dimensions and Connection dimensions in mm	A		80	100	120	140	180	220	240	260	315	350	420	490	560
	f		14	18	22	26	35	42	47	52	62	72	82	92	102
	r		20	25	30	35	45	55	60	65	90	100	120	140	160
	s		10	12	15	15	20	25	30	35	40	40	40	50	50
	h		20	25	30	35	40	45	50	55	60	65	70	75	80
	k		-	-	-	-	-	-	10	10	12	12	12	16	16
Weldseam	a		4	4	5	6	7	8	-	-	-	-	-	-	-
Max. insulation thickness	J	S235JR	135	165	205	205	205	205	210	215	215	215	215	215	215
		16Mo3	235	265	305	305	305	305	310	315	315	315	315	315	315
		13CrMo4-5	335	365	405	405	405	405	410	415	415	415	415	415	415
Dimensions approx.	kg	S235JR	0.8	1.5	2.7	3.3	5.8	9.5	13	17	27	31	40	61	74
		16Mo3	1.3	2.2	3.8	4.6	8.1	12.9	17.4	22.7	35	40.1	50.5	75.3	91.8
		13CrMo4-5	1.8	2.9	5.0	5.9	10	16	22	28	43	49	61	91	110



Load group LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Nominal load F_N in kN	7	12	20	33	50	70	100	132	180	240	300	400	500

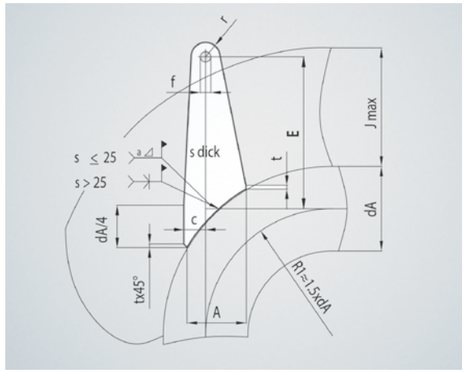
HYDRA® WELDING LUG ZLB

for pipe bend

Order example: ZLB 0150.160.16-37.3

Nominal width 150, LGV 16, installation dimension E=160 mm, material S235JR, primed

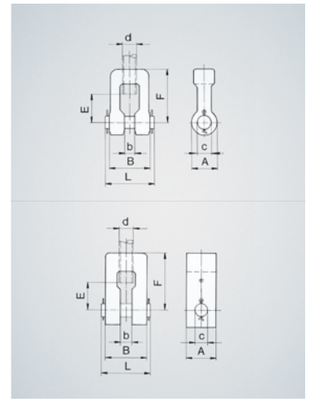
LGV	FN	f	r	s	a
-	kN	mm	mm	mm	-
12	7	14	20	10	4
16	12	18	25	12	4
20	20	22	30	15	5
24	33	26	35	15	6
30	50	35	45	20	7
36	70	42	55	25	8
42	100	47	60	30	-
48	132	52	65	35	-
56	180	62	90	40	-
64	240	72	100	40	-
72	300	82	120	40	-
80	400	92	140	50	-
90	500	102	160	50	-



DN	dA	Type	E			A	c	t	Weight			Jmax			LGV
			37	16	13				37	16	13	37	16	13	max
-	mm	ZLB...	mm	mm	mm	mm	mm	mm	kg	kg	kg	mm	mm	mm	-
50	60.3	0050.xxx.xx-xx.x	160	265	370	55	30	5	0.8	1.2	1.6	125	225	325	12
65	76.1	0065.xxx.xx-xx.x	160	265	370	60	30	5	0.8	1.2	1.6	125	225	325	12
80	88.9	0080.xxx.xx-xx.x	160	270	375	65	30	5	0.8	1.3	1.8	125	225	325	12
100	114.3	0100.xxx.xx-xx.x	205	315	420	85	35	5	1.6	2.3	3.0	160	260	360	16
125	139.7	0125.xxx.xx-xx.x	205	315	425	100	40	5	1.9	2.7	3.5	160	260	360	16
150	168.3	0150.xxx.xx-xx.x	210	320	430	120	50	10	2.9	4.1	5.3	160	260	360	20
200	219.1	0200.xxx.xx-xx.x	210	325	440	160	65	10	4.0	5.6	7.2	160	260	360	24
250	273	0250.xxx.xx-xx.x	255	375	485	195	80	15	8.0	10.7	13.2	190	290	390	30
300	323.9	0300.xxx.xx-xx.x	260	380	495	235	95	15	13.0	17.1	21.0	190	290	390	36
350	355.6	0350.xxx.xx-xx.x	265	385	500	255	105	20	17.4	22.8	27.9	190	290	390	42
400	406.4	0400.xxx.xx-xx.x	300	420	535	295	120	20	26.3	33.4	40.1	215	315	415	48
450	457	0450.xxx.xx-xx.x	290	415	535	325	135	25	28.4	36.3	43.9	215	315	415	48
500	508	0500.xxx.xx-xx.x	300	425	545	360	145	25	41.2	51.9	62.1	215	315	415	56
550	559	0550.xxx.xx-xx.x	305	430	550	400	165	30	46.3	57.7	68.7	225	325	425	56
600	610	0600.xxx.xx-xx.x	315	440	560	435	175	30	53.5	66.0	78.1	225	325	425	64
700	711	0700.xxx.xx-xx.x	305	435	560	510	205	35	62.6	77.2	91.2	230	330	430	64
800	813	0800.xxx.xx-xx.x	305	435	560	580	235	40	77.3	94.1	110	230	330	430	72
850	864	0850.xxx.xx-xx.x	305	435	560	615	250	45	82.5	100	117	235	335	435	72
900	914	0900.xxx.xx-xx.x	310	445	570	655	265	45	118	143	166	235	335	435	80
1000	1016	1000.xxx.xx-xx.x	310	445	570	730	295	50	140	168	194	235	335	435	90

HYDRA® CLEVIS WITH BOLT ZGM/ZGI[1)]

Order example: ZGM 42-1 (electro-galvanized)

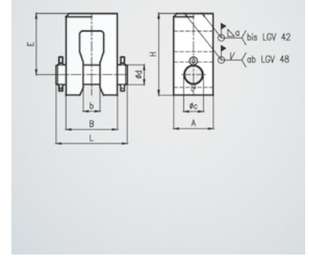


Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	49	52	55	68	80	92	100	100	100	110	130	150	170
Dimensions and Connecting dimensions in mm (inch)	A	24	32	46	53	64	80	90	100	120	140	160	180	200
	B	34	44	57	68	80	93	111	130	120	140	140	160	180
	F	70	80	90	110	130	150	170	180	190	210	240	270	300
	L	55	65	85	100	120	135	160	180	175	205	205	225	245
	b	12	17	20	22	27	32	37	42	45	50	50	60	60
	c	12	16	20	24	33	40	45	50	60	70	80	90	100
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		(1/2)	(5/8)	(3/4)	(1)	(1 1/8)	(1 1/2)	(1 3/4)	(2)	(2 1/4)	(2 1/2)	(2 3/4)	(3)	(3 1/2)
Weight approx.	kg	0.2	0.4	1.0	1.6	2.6	4.5	6.9	10	21	33	43	61	85

1) Version with inch thread ZGI see ( ) values

HYDRA® WELD CLEVIS ZGW

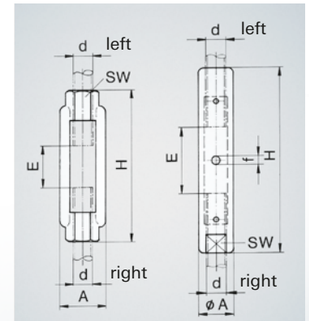
Order example: ZGW 36-3 (primed)



Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	50	60	70	85	100	115	135	155	175	195	215	230	245
Dimensions and Connecting dimensions in mm	A	25	30	40	50	70	80	90	100	120	140	160	180	200
	B	34	44	57	68	80	93	111	120	130	140	160	180	190
	H	63	77	92	111	135	157	182	207	237	267	297	322	347
	b	12	17	20	22	27	32	37	42	45	50	60	70	75
	L	55	65	85	100	120	135	160	180	175	205	225	245	245
	c	12	16	20	24	33	40	45	50	60	70	80	90	100
Weldseam	a	3	4	4	5	6	7	8	-	-	-	-	-	-
Weight approx.	kg	0.3	0.6	1.2	2.2	4.5	6.9	11	15	21	29	43	60	74

HYDRA® TURNBUCKLE ZSM/ZSI[1)]

Order example: ZSM 42-1 (electro-galvanized)

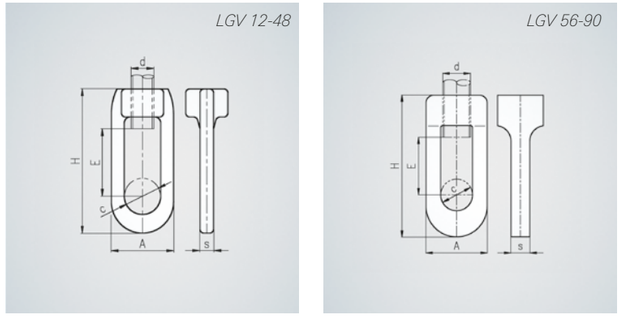


Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E[2)]	38	50	57	74	75	72	82	70	90	116	106	104	105
Dimensions and Connecting dimensions in mm (inch)	A	34	42	52	64	78	92	110	130	90	100	120	130	140
	H	130	170	200	250	270	290	330	330	355	425	425	440	460
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		(1/2)	(5/8)	(3/4)	(1)	(1 1/8)	(1 1/2)	(1 3/4)	(2)	(2 1/4)	(2 1/2)	(2 3/4)	(3)	(3 1/2)
	f	-	-	-	-	-	-	-	-	25	25	30	30	30
	WAF	18	24	30	36	46	55	65	75	80	90	100	110	130
Weight approx.	kg	0.2	0.4	0.7	1.3	2.3	3.6	5.7	7.9	12	16	26	32	39

1) Version with inch thread ZSI see ( ) values

HYDRA® EYE NUT ZOM/ZOI[1)]

Order example: ZOM 42-1 (electro-galvanized)

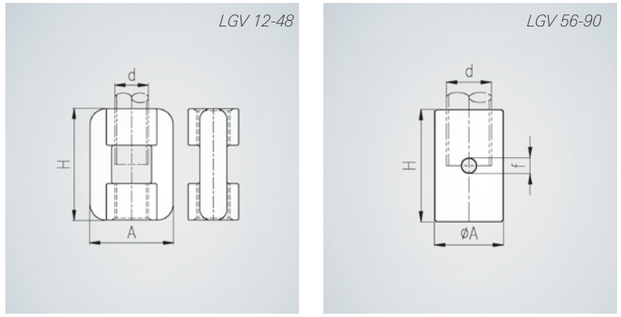


Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	39	47	55	68	75	77	85	100	115	140	150	160	170
Dimensions and Connecting dimensions in mm (inch)	A	33	44	59	72	88	100	110	120	135	150	160	180	200
	H	79	101	125	154	181	202	229	258	280	325	370	400	435
	c_{max}	16	24	28	33	40	45	50	60	60	70	82	92	102
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		($1/2$)	($5/8$)	($3/4$)	(1)	($1\ 1/8$)	($1\ 1/2$)	($1\ 3/4$)	(2)	($2\ 1/4$)	($2\ 1/2$)	($2\ 3/4$)	(3)	($3\ 1/2$)
	s	6	10	10	15	17	20	25	30	40	40	50	60	60
Weight approx.	kg	0.1	0.2	0.4	1.0	1.5	2.3	3.8	6.5	13	17	24	35	46

[1)] Version with inch thread ZOI see ( ) values
[2)] If a smaller bolt diameter c is used E increases correspondingly

HYDRA® ROD COUPLING ZHM/ZHI[1)]

Order example: ZHM 42-1 (electro-galvanized)



Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Dimensions and Connecting dimensions in mm (inch)	A	34	42	52	62	78	92	110	130	90	100	120	130	140
	H	45	60	75	90	105	120	150	180	140	160	180	200	220
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		($1/2$)	($5/8$)	($3/4$)	(1)	($1\ 1/8$)	($1\ 1/2$)	($1\ 3/4$)	(2)	($2\ 1/4$)	($2\ 1/2$)	($2\ 3/4$)	(3)	($3\ 1/2$)
	f	-	-	-	-	-	-	-	-	25	25	25	25	25
Weight approx.	kg	0.1	0.2	0.4	0.8	1.1	1.7	2.7	5.3	4.7	6.5	11.1	14	17

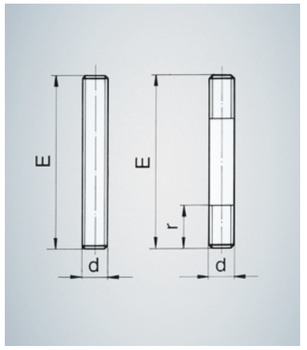
[1)] Version with inch thread ZHI see ( ) values

Load group LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Nominal load F_N in kN	7	12	20	33	50	70	100	132	180	240	300	400	500

HYDRA® THREADED ROD ZRM/ZRI[1)]

Right-hand thread

Order example: ZRM 42-1500-1 E=1500 mm (electro-galvanized)



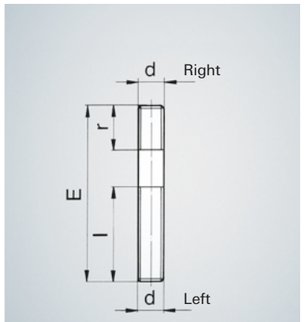
Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	Maximum 2000 (3000)												
Dimensions and connection dimensions in mm (inch)	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		($1/2$)	($5/8$)	($3/4$)	(1)	($1\ 1/8$)	($1\ 1/2$)	($1\ 3/4$)	(2)	($2\ 1/4$)	($2\ 1/2$)	($2\ 3/4$)	(3)	($3\ 1/2$)
	r	-	-	-	-	-	-	-	-	300	300	300	400	400
Weight approx.	kg/m	0.7	1.3	2.1	3.0	4.7	6.9	9.4	12.0	17	22	29	36	46

[1)] Version with inch thread ZRI see ( ) values

HYDRA® THREADED ROD ZLM/ZLI[1)]

Left/right-hand thread

Order example: ZLM 42-1 (electro-galvanized)



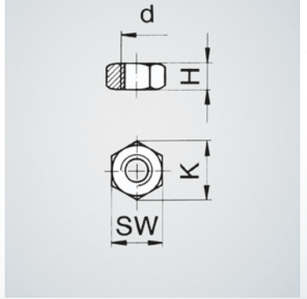
Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Installation dimension	E	150	200	220	260	270	300	380	380	460	520	580	640	700
Dimensions and connecting dimensions in mm (inch)	l	75	100	120	150	160	180	220	220	260	300	340	380	420
	r	55	80	80	90	90	100	140	140	180	200	220	240	260
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		($1/2$)	($5/8$)	($3/4$)	(1)	($1\ 1/8$)	($1\ 1/2$)	($1\ 3/4$)	(2)	($2\ 1/4$)	($2\ 1/2$)	($2\ 3/4$)	(3)	($3\ 1/2$)
Weight approx.	kg	0.1	0.3	0.5	0.8	1.2	2.1	3.6	4.7	7.8	12	17	23	32

[1)] Version with inch thread ZLI see ( ) values

Standard threaded rods:
Material S235JR (to M48), S355J2 (to M56), rolled thread, electro-galvanized

HYDRA® NUT ZMM/ZMI[1)]

Order example: ZMM 42-1 (electro-galvanized)



Load group	LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Dimensions and Connecting dimensions in mm	$H^{2)}$	11	15	18	21	25	31	34	38	45	51	58	64	72
	k	21	27	33	40	51	61	72	83	94	105	118	129	146
	d	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M72	M80	M90
		($1/2$)	($5/8$)	($3/4$)	(1)	($1\ 1/8$)	($1\ 1/2$)	($1\ 3/4$)	(2)	($2\ 1/4$)	($2\ 1/2$)	($2\ 3/4$)	(3)	($3\ 1/2$)
	WAF	18	24	30	36	46	55	65	75	85	95	105	115	130
Weight approx.	kg	0.02	0.04	0.07	0.12	0.23	0.4	0.7	1.0	1.5	2.0	2.7	3.5	5.0

[1)] DIN EN ISO 4032; version with inch thread ZMI see ( ) values
[2)] Maximum wall

Load group LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Nominal load F_N in kN	7	12	20	33	50	70	100	132	180	240	300	400	500

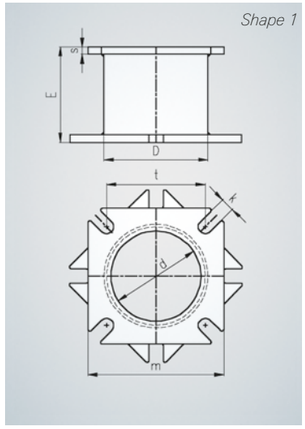
HYDRA® INTERMEDIATE PIECE ZZF

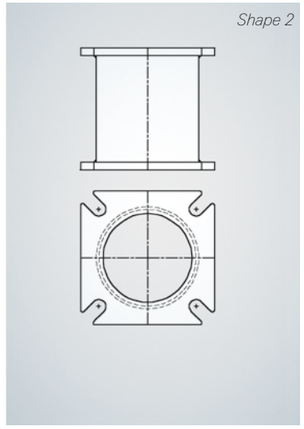
for spring support

Standard version:
materials S235JR, surface hot-dip galvanized
Option: primed surface

Order example: ZZF 06.0200.2-37.2

(Size 05 or 06, length 200 mm,
Shape 2: material S235JR, hot-dip galvanized)
Shape 0 is a plate of thickness E; the cross-section corresponds to the base plate of shape 1 and 2





Size FSP FSS	Type ZZF...	D	d	m	k	t	s	Shape 0 E min	Shape 0 E max	Shape 1 E min	Shape 1 E max	Shape 2 E min	Shape 2 E max	ΔR	Weights [3] at E_{max} Shape 0	Shape 1	Shape 2
-	-	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg/mm	kg	kg	kg
01/02	02. ...[1]. ...[2]	102	96	130	12	95	8	10	10	40	89	90	250	0.007	0.7	1.6	2.7
03/04	04. ...[1]. ...[2]	114	108	150	14	110	10	10	20	50	109	110	350	0.008	1.8	2.5	4.5
05/06	06. ...[1]. ...[2]	140	132	190	18	130	12	10	30	60	129	130	400	0.012	4.6	4.9	8.2
07	07. ...[1]. ...[2]	168	160	220	23	160	12	10	40	70	149	150	500	0.016	7.6	6.6	12
08	08. ...[1]. ...[2]	219	211	270	23	200	15	10	40	70	149	150	650	0.024	10	11	23
09/10	10. ...[1]. ...[2]	245	235	300	27	215	15	10	50	80	179	180	700	0.030	16	14	29
11	11. ...[1]. ...[2]	273	263	340	27	250	20	10	60	90	189	190	800	0.033	26	22	42
12	12. ...[1]. ...[2]	508	508	530	27	460	25	10	70	100	199	200	1000	0.123	57	59	157
13	13. ...[1]. ...[2]	508	508	590	27	520	30	10	80	110	209	210	1000	0.123	107	99	196
14	14. ...[1]. ...[2]	610	610	640	27	570	30	10	80	110	209	210	1200	0.148	94	92	239
15/16	16. ...[1]. ...[2]	610	610	760	33	670	40	10	100	130	239	240	1200	0.148	247	221	363

[1] *Insert length*
[2] *Insert shape*

HYDRA® CONNECTING ELEMENTS

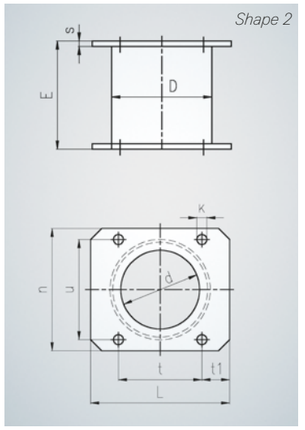
HYDRA® INTERMEDIATE PIECE ZZK

for constant support

Standard version: materials S235JR, surface hot-dip galvanized

Order example: ZZK 07.0200.2-37.2

(Size 06 or 07, length 200 mm,
Shape 2: material S235JR, hot-dip galvanized)
Shape 0 are 2 plates of thickness E with cross-section L x n0;
With shape 1 the dimensions n1 and u1 apply for the base plate



Size KSP KSR	Type ZZK ...	D	d	L	n	n1	n0	k	t	t1	u	u1	s	Shape 0 E min	Shape 0 E max	Shape 1 E min	Shape 1 E max	Shape 2 E min	Shape 2 E max	Weights [3] DR	at E_{max} Shape 0	Shape 1	Shape 2
-	-	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg/mm	kg	kg	kg
01-05	05. ...[1]. ...[2]	168	151	230	210	270	30	14	150	40	180	240	8	10	20	41	89	90	400	0.018	2.1	12	11
06/07	07. ...[1]. ...[2]	219	200	250	260	330	40	18	150	50	220	290	10	10	40	61	109	110	500	0.024	6.2	18	17
08/09	09. ...[1]. ...[2]	273	251	360	300	390	50	23	250	55	250	340	12	10	50	71	139	140	700	0.033	14	36	33
10/11	11. ...[1]. ...[2]	324	301	425	360	450	60	23	300	62	300	390	12	10	50	71	139	140	800	0.044	19	53	49
12/13	13. ...[1]. ...[2]	356	321	450	400	490	80	23	330	60	320	410	15	10	50	71	139	140	1000	0.085	27	110	105
14/15	15. ...[1]. ...[2]	406	366	630	500	600	60	27	410	100	440	540	20	10	50	71	169	170	1200	0.098	28	188	178
16/17	17. ...[1]. ...[2]	508	468	695	520	620	80	27	440	120	440	540	20	10	50	71	169	170	1200	0.123	42	212	201

[1] *Insert length*
[2] *Insert shape*

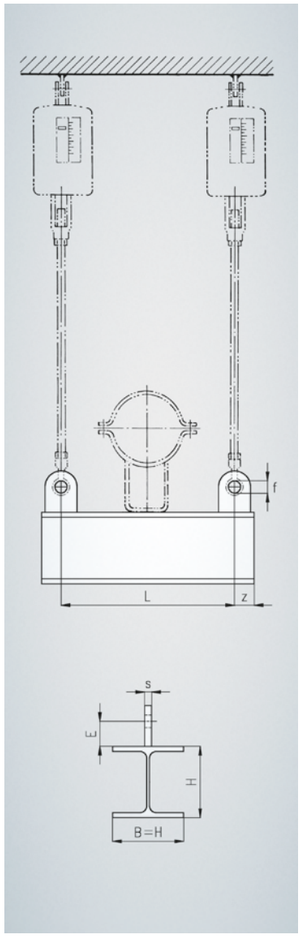
HYDRA® CONNECTING ELEMENTS

HYDRA® TRAVERSE ZTN

Order example: ZTN 24.1200-37.2

(LGV 24, span 1200 mm, S235JR, hot-dip galvanized)

Load group		LGV	12	16	20	24	30	36	42
Nominal load (kN)		F_N [1]	14	24	40	66	100	140	200
Installation dimension		E	30	40	45	55	70	70	80
Connecting dimensions in mm		f	14	18	22	26	35	42	47
		s	8	10	12	15	20	25	30
		z	30	35	40	45	55	65	70
Span L [2] in mm	300	Type	12.0300	16.0300	20.0300	24.0300			
		H	100	100	100	120			
		Weight	7.6	8.0	8.5	12			
	400	Type	12.0400	16.0400	20.0400	24.0400			
		H	100	100	120	120			
		Weight	9.6	10.0	13.5	14			
	500	Type	12.0500	16.0500	20.0500	24.0500	30.0500		
		H	100	100	120	140	180		
		Weight	11.6	12	16.2	21	34		
	600	Type	12.0600	16.0600	20.0600	24.0600	30.0600		
		H	100	100	120	160	200		
		Weight	13.7	14.1	18.9	31	46		
	800	Type	12.0800	16.0800	20.0800	24.0800	30.0800	36.0800	42.0800
		H	100	100	140	160	220	240	300
		Weight	17.8	18.2	30.4	39	68	82	116
	1000	Type	12.1000	16.1000	20.1000	24.10400	30.1000	36.1000	42.1000
		H	100	120	140	180	220	260	300
		Weight	21.8	29	37.1	57	82	109	140
	1200	Type	12.1200	16.1200	20.1200	24.1200	30.1200	36.1200	42.1200
		H	100	120	160	180	220	260	300
		Weight	25.9	34.3	55.2	67	96	128	163
	1400	Type	12.1400	16.1400	20.1400	24.1400	30.1400	36.1400	42.1400
		H	100	120	160	200	240	280	300
		Weight	30	39.6	63.8	93	128	162	187
	1600	Type	12.1600	16.1600	20.1600	24.1600	30.1600	36.1600	42.1600
		H	120	140	160	220	240	280	320[3]
		Weight	44.5	56.7	72.4	122	145	183	227
	1800	Type	12.1800	16.1800	20.1800	24.1800	30.1800	36.1800	42.1800
		H	120	140	180	220	260	300	320[3]
		Weight	49.9	63.4	97.1	136	180	230	253
	2000	Type	12.2000	16.2000	20.2000	24.2000	30.2000	36.2000	42.2000
		H	120	140	180	220	260	300	340[3]
		Weight	55.2	70.2	107.3	151	199	254	293
	2200	Type	12.2200	16.2200	20.2200	24.2200	30.2200	36.2200	42.2200
		H	120	160	180	220	280	300	340[3]
		Weight	60.5	97.1	117.5	165	241	277	320
	2400	Type	12.2400	16.2400	20.2400	24.2400	30.2400	36.2400	42.2400
		H	140	160	200	220	280	300	340[3]
		Weight	83.1	106	153	179	261	300	347



[1] *The nominal load FN is the permitted load of the traverse centre*
[2] *Intermediate lengths can be supplied if needed*
[3] *B = 300 mm*

Load group LGV	12	16	20	24	30	36	42	48	56	64	72	80	90
Nominal load F_N in kN	7	12	20	33	50	70	100	132	180	240	300	400	500

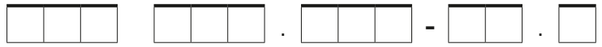
HYDRA® PIPE CLAMPS

STRUCTURE OF THE TYPE DESIGNATION

The type designation consists of three parts:
1. Series, defined by three letters
2. Nominal size, defined by several number groups
3. Option code, defined by figure codes, separated from the nominal size by hyphens

Type designations without option codes refer to standard versions.

Diagram illustrating the naming principle



Option code

Materials	
37	1.0038/S235JR
16	1.5415/16Mo3
13	1.7335/13CrMo4-5
10	1.7380/10CrMo9-10

Surface protection	
0	blank
1	Electro-galvanized
2	Hot-dip galvanized
3	Primed
4	Other coating please specify exactly

Series

Meaning of characters dependent on position

Product group Position 1		Design/Component Position 2		connection/Other Position 3	
Horizontal clamps	H	Two-bolt clamp	Z	Normal	N
		Three-bolt clamp	D	reinforced	V
		Grip clamp	G	Heavy-duty	S
		U-type clamp	B		
Riser clamps	V	Formed clamp	B	Shear block support	K
		Box-type clamp	K	Round cam support	R
		Box-type clamp for support	S		
		Box-type clamp for support with PTFE	P		

REDUCTION FACTORS

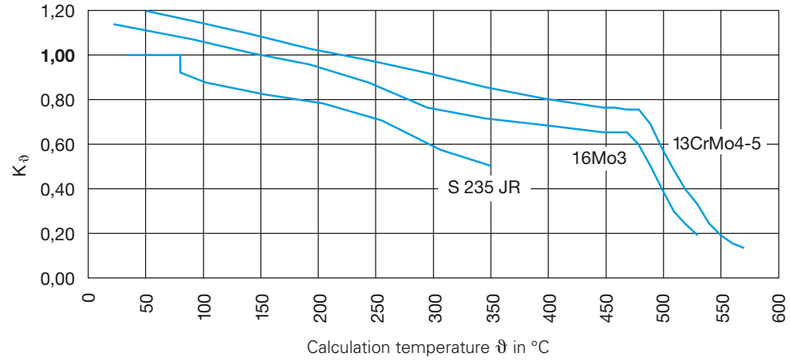
The standardized range of HYDRA® pipe clamps covers the wide range of nominal diameters and loads met with in practice. In addition to common two-bolt and three-bolt clamps in accordance with DIN 3567, new horizontal and riser clamps with enhanced properties and practical advantages have been developed and added to our range.

Nominal load and factors

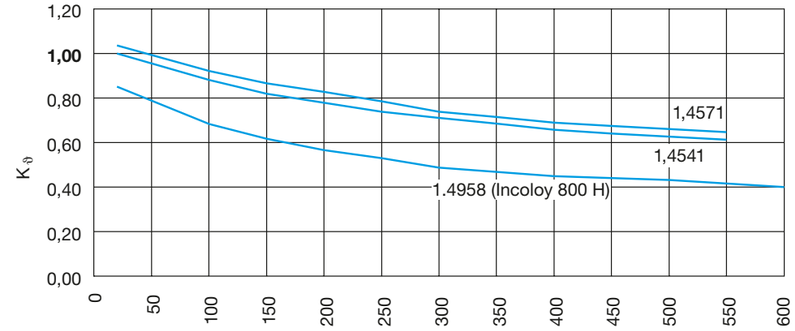
To simplify things, the clamps designed according to nominal loads are chosen via temperature-dependent correction factors for real operating conditions. The correction factors can be found in the adjacent diagrams or the table below, which indicate values determined from standards including for other clamp materials.

To further simplify clamp selection, tables are shown below with the series indicated; the material-dependent and temperature-dependent loads can be read from these directly.

Correction factor K_ϑ for ferritic materials



Correction factor K_ϑ for austenitic materials



Correction factors K_ϑ for clamps made from ferritic and martensitic materials																				
Material		Upper temperature limit as per		Correction factor K_ϑ																Option code
No. acc. DIN EN	Name in accordance with DIN EN	VGB-R510L	DIN EN, WB	Component temperature ϑ in °C																
–	–	in °C		100	200	250	300	350	400	450	480	500	520	540	560	580	600	630	650	–
1.0038	S235JR	300	350	0.88	0.79	0.71	0.58	(0.5)												37
1.5415	16Mo3	500	530			(0.87)	0.76	0.72	0.68	0.65	0.60	0.39	(0.25)							16
1.7335	13CrMo4-5	530	570					0.85	0.80	0.76	0.75	0.58	0.40	(0.25)	(0.17)					13
1.7380	10CrMo9-10	580	600									(0.57)	0.43	0.33	0.24	0.18	(0.14)			10
1.4903	X10CrMoVNb9-1 (P91)	580	650										(0.91)	0.76	0.62	0.49	0.38	0.25	0.19	91
Correction factors K_ϑ for clamps made from austenitic materials																				
–	–	in °C		Component temperature ϑ in °C																–
				50	100	150	200	300	400	500[1]	550[1]	580	590	600	610	630	650			
1.4541	X6CrNiTi18-10	>580	550	0.94	0.88	0.82	0.78	0.71	0.66	0.63	0.62									41
1.4571	X6CrNiTiMo17-12-2	>580	550	1.0	0.92	0.87	0.83	0.74	0.69	0.67	0.66									71
1.4958	X5NiCrAlTi31-20 (800A)	–	900[2]							0.42	0.40	0.40	0.40	0.40	0.40	0.38	0.32			80

1) For component temperature > 400 °C, another screw material must be used. Consequently the temperature information must be provided with the order.

2) Due to lack of screw materials, only upon request at temperatures above 650 °C.

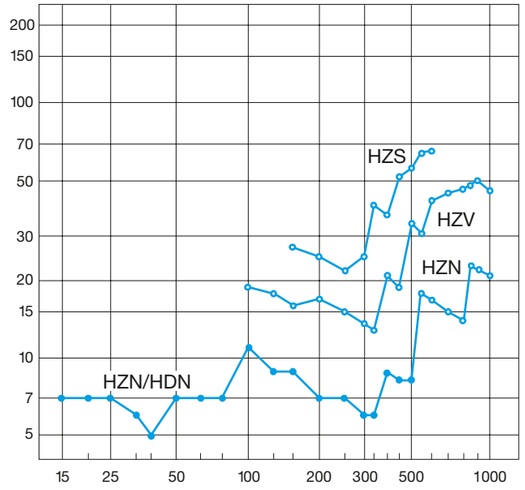
HYDRA® HORIZONTAL CLAMPS

Horizontal clamps are used as supports for horizontal pipes.

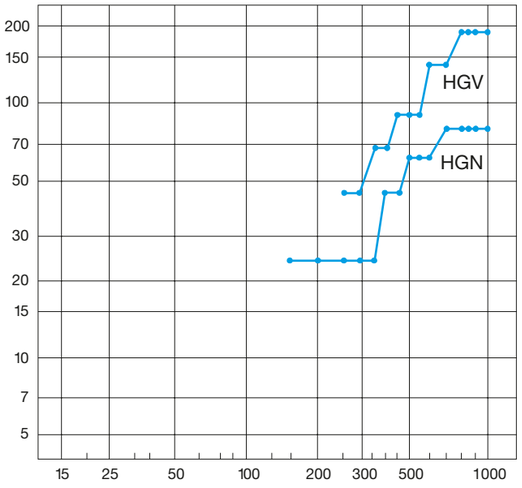
Area of application
Two-bolt and three-bolt flat steel clamps are available for the lower diameter and load range, grip clamps for high nominal loads. S235JR, 16Mo3 and 13CrMo4-5 are provided as standard materials that enable use over the entire medium temperature range up to approx. 560 °C.

Main characteristics
- Many years of positive experience during use in power plants and other industrial systems.
- Overload permitted up to 2.5 times the load-carrying capacity (temperature-reduction taken into account); no permanent deformations.
- Usual insulation thicknesses taken into account in dimensioning the support area The design of grip clamps allows adaptation to greater diameter deviations and oval characteristics of the pipe.
- Connection ensured by the connection parts required in each case.

Flat steel clamps



Grip clamps



Type designations

Two-bolt clamps

H	Z	V		0	3	5	0	-	3	7	.	3	Example
Model series				Nominal diameter					Material			Surface protection	

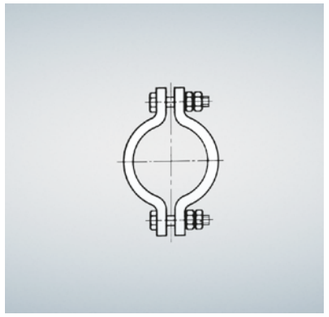
Three-bolt clamps/Grip clamps/U-type clamps

H	G	V		0	5	0	0	.	5	7	0	.	2	4	-	1	3	.	0	Example
Model series				Nominal diameter					Installation E				Load group (LGV)			Material			Surface protection	

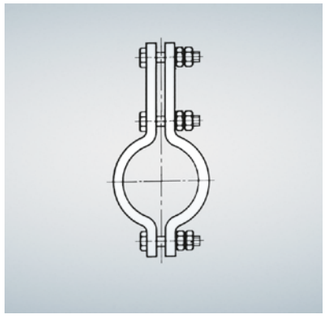
HYDRA® HORIZONTAL CLAMPS

Series

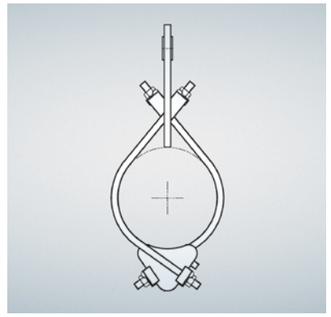
HZN/HZV/HZS
DN 15 – 1200



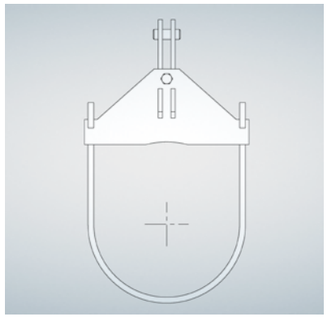
HGN/HGV
DN 150 – 1000



HDN/HDV/HDS
DN 15 – 1200



HBN/HBV/HBS
DN 100 – 900



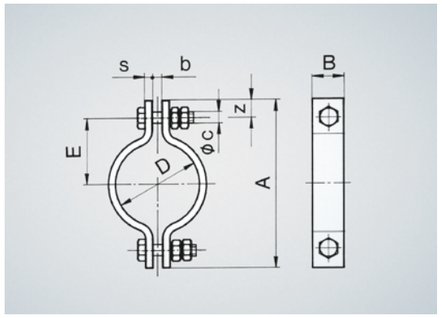
HYDRA® TWO-BOLT CLAMPS HZN

Normal version, up to DN 500 according to DIN 3567

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60

Order example: HZN 0300-37.3
S235JR, primed



Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Installation dimension	Main dimensions		Connection dimensions				Weight approx.
DN	D	F_n	HZN	E	A	B	b	c	s	z	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	kg
15	21.3	7	0015	30	90	30	7	10	5	15	0.3
20	26.9	7	0020	33	96	30	7	10	5	15	0.3
25	33.7	7	0025	36	102	30	7	10	5	15	0.3
32	42.4	6	0032	41	112	30	7	10	5	15	0.4
40	48.3	5	0040	44	118	30	7	10	5	15	0.4
50	60.3	7	0050	54	144	40	9	12	6	18	0.7
65	76.1	7	0065	61	158	40	9	12	6	18	0.8
80	88.9	7	0080	68	172	40	9	12	6	18	0.9
100	114.3	11	0100	89	226	50	11	16	8	24	2.0
125	139.7	9	0125	102	252	50	11	16	8	24	2.2
150	168.3	9	0150	116	280	50	11	16	8	24	2.5
200	219.1	7	0200	142	332	50	11	16	8	24	3.0
250	273	7	0250	174	408	60	14	20	8	30	4.6
300	323.9	6	0300	199	458	60	14	20	8	30	5.2
350	355.6	6	0350	216	492	60	14	20	8	30	5.6
400	406.4	9	0400	249	570	70	18	24	10	36	9.4
450	457	8	0450	274	620	70	18	24	10	36	10
500	508	8	0500	300	672	70	18	24	10	36	11
550	559	18	0550	345	780	90	25	30	15	45	24
600	610	17	0600	370	830	90	25	30	15	45	26
700	711	15	0700	425	940	90	25	30	15	45	29
800	813	14	0800	475	1040	90	25	30	15	45	33
850	864	23	0850	515	1120	100	30	30	20	45	51
900	914	22	0900	540	1170	100	30	30	20	45	53
1000	1016	21	1000	590	1270	100	30	30	20	45	58
1100	1120	19	1100	645	1380	100	30	30	20	45	64
1200	1220	18	1200	695	1480	100	30	30	20	45	69

Loads f_t in kN

Materials (standard)										
S235JR				16Mo3				13CrMo4-5		
Temperature in °C										
100	200	250	300	350	400	450	480	500	515	530
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
5.3	4.7	4.3	3.5	4.3	4.1	3.9	3.6	3.5	2.7	2.0
4.4	4.0	3.6	2.9	3.6	3.4	3.3	3.0	2.9	2.3	1.7
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
9.7	8.7	7.8	6.4	7.9	7.5	7.2	6.6	6.4	5.0	3.6
7.9	7.1	6.4	5.2	6.5	6.1	5.9	5.4	5.2	4.1	3.0
7.9	7.1	6.4	5.2	6.5	6.1	5.9	5.4	5.2	4.1	3.0
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
6.2	5.5	5.0	4.1	5.0	4.8	4.6	4.2	4.1	3.2	2.3
5.3	4.7	4.3	3.5	4.3	4.1	3.9	3.6	3.5	2.7	2.0
5.3	4.7	4.3	3.5	4.3	4.1	3.9	3.6	3.5	2.7	2.0
7.9	7.1	6.4	5.2	6.5	6.1	5.9	5.4	5.2	4.1	3.0
7.0	6.3	5.7	4.6	5.8	5.4	5.2	4.8	4.6	3.6	2.6
7.0	6.3	5.7	4.6	5.8	5.4	5.2	4.8	4.6	3.6	2.6
15.8	14.2	12.8	10.4	13.0	12.2	11.7	10.8	10.4	8.1	5.9
15.0	13.4	12.1	9.9	12.2	11.6	11.1	10.2	9.9	7.7	5.6
13.2	11.9	10.7	8.7	10.8	10.2	9.8	9.0	8.7	6.8	5.0
12.3	11.1	9.9	8.1	10.1	9.5	9.1	8.4	8.1	6.3	4.6
20.2	18.2	16.3	13.3	16.6	15.6	15.0	13.8	13.3	10.4	7.6
19.4	17.4	15.6	12.8	15.8	15.0	14.3	13.2	12.8	9.9	7.3
18.5	16.6	14.9	12.2	15.1	14.3	13.7	12.6	12.2	9.5	6.9
16.7	15.0	13.5	11.0	13.7	12.9	12.4	11.4	11.0	8.6	6.3
15.8	14.2	12.8	10.4	13.0	12.2	11.7	10.8	10.4	8.1	5.9

The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N.

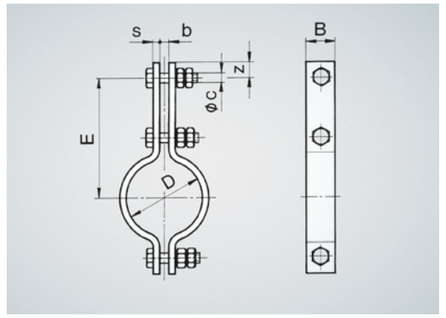
HYDRA® THREE-BOLT CLAMPS HDN

Normal version, according to DIN 3567, installation dimension increased

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60

Order example: HDN 0300.370.12-37.3
S235JR, primed



Nominal sizes, dimensions, weights (Loads f_t as HZN, alongside)

Nominal diameter	Outer pipe diameter	Nominal load	Type	Dimensions				S235JR			16Mo3			13CrMo4-5		
								Installation dimension	Max. insulating thickness	Weight approx.	Installation dimension	Max. insulating thickness	Weight approx.	Installation dimension	Max. insulating thickness	Weight approx.
DN	D	F_n	HDN…	B	b	s	z	E	J		E	J		E	J	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	kg	mm	mm	kg	mm	mm	kg
15	21.3	7	0015. … . …[1)]	30	7	5	15	120	70	0.5	180	120	0.7	230	160	0.8
20	26.9	7	0020. … . …[1)]	30	7	5	15	125	70	0.6	185	120	0.7	235	160	0.8
25	33.7	7	0025. … . …[1)]	30	7	5	15	125	70	0.6	185	120	0.7	235	160	0.8
32	42.4	6	0032. … . …[1)]	30	7	5	15	130	70	0.6	190	120	0.8	240	160	0.9
40	48.3	5	0040. … . …[1)]	30	7	5	15	135	70	0.6	195	120	0.8	245	160	0.9
50	60.3	7	0050. … . …[1)]	40	9	6	18	165	95	1.2	225	145	1.4	285	195	1.7
65	76.1	7	0065. … . …[1)]	40	9	6	18	170	95	1.3	230	145	1.5	290	195	1.7
80	88.9	7	0080. … . …[1)]	40	9	6	18	180	95	1.4	240	145	1.6	300	195	1.8
100	114.3	11	0100. … . …[1)]	50	11	8	24	230	130	3.0	290	180	3.4	350	230	3.7
125	139.7	9	0125. … . …[1)]	50	11	8	24	240	130	3.2	300	180	3.6	360	230	4.0
150	168.3	9	0150. … . …[1)]	50	11	8	24	255	130	3.5	315	180	3.9	375	230	4.3
200	219.1	7	0200. … . …[1)]	50	11	8	24	280	130	4.0	340	180	4.4	400	230	4.8
250	273	7	0250. … . …[1)]	60	14	8	30	345	160	6.1	405	210	6.6	465	260	7.0
300	323.9	6	0300. … . …[1)]	60	14	8	30	370	160	6.7	430	210	7.2	490	260	7.6
350	355.6	6	0350. … . …[1)]	60	14	8	30	385	160	7.1	445	210	7.6	505	260	8.0
400	406.4	9	0400. … . …[1)]	70	18	10	36	440	185	12	500	240	13	560	290	13
450	457	8	0450. … . …[1)]	70	18	10	36	465	185	13	525	240	13	585	290	14
500	508	8	0500. … . …[1)]	70	18	10	36	490	185	14	550	235	14	610	285	15
550	559	18	0550. … . …[1)]	90	25	15	45	525	195	29	585	245	30	645	295	31
600	610	17	0600. … . …[1)]	90	25	15	45	550	195	30	610	245	32	670	295	33
700	711	15	0700. … . …[1)]	90	25	15	45	605	200	34	665	250	35	725	300	37
800	813	14	0800. … . …[1)]	90	25	15	45	655	200	37	715	250	39	775	300	40
850	864	23	0850. … . …[1)]	100	30	20	45	685	205	57	745	255	59	805	305	61
900	914	22	0900. … . …[1)]	100	30	20	45	710	205	59	770	255	61	830	305	63
1000	1016	21	1000. … . …[1)]	100	30	20	45	760	205	64	820	255	66	880	305	68

Connection diameter	DN	15-40	50-80	100-200	250-350	250-350	400-500	400-500	550-1000	550-1000	550-1000
	LGV	12	12/16	12/16	12	16	12	16	12	16/20	24
	c (mm)	10	12	16	16	20	16	24	16	24	30

1) Insert installation dimension and LGV

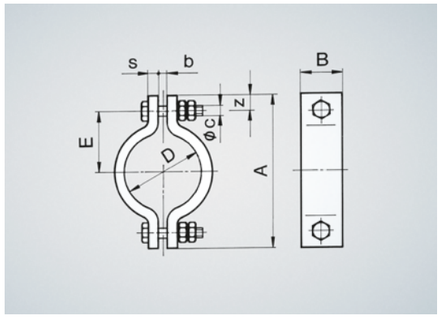
HYDRA® TWO-BOLT CLAMPS HZV

Reinforced version

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60

Order example: HZV 0400-16.0
16Mo3, blank



Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Installation dimension	Main dimensions		Connection dimensions				Weight approx.
DN	D	F_n	HZV	E	A	B	b	c	s	z	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	kg
100	114.3	19	0100	105	280	70	20	24	10	35	4.5
125	139.7	18	0125	115	300	70	20	24	10	35	4.8
150	168.3	16	0150	130	330	70	20	24	10	35	5.3
200	219.1	17	0200	165	400	70	20	24	12	35	7.4
250	273.0	15	0250	190	450	70	20	24	12	35	8.4
300	323.9	14	0300	215	500	70	20	24	12	35	9.5
350	355.6	13	0350	230	530	70	20	24	12	35	10
400	406.4	21	0400	270	610	90	25	24	15	35	18
450	457	19	0450	295	660	90	25	24	15	35	19
500	508	32	0500	335	760	100	25	30	20	45	33
550	559	31	0550	360	810	100	25	30	20	45	35
600	610	45	0600	405	920	110	30	36	25	55	55
700	711	45	0700	455	1020	120	30	36	25	55	67
800	813	47	0800	510	1130	140	30	36	25	55	87
850	864	48	0850	535	1180	150	30	36	25	55	97
900	914	50	0900	560	1230	160	30	36	25	55	109
1000	1016	47	1000	610	1330	160	30	36	25	55	118
1100	1120	43	1100	665	1440	160	30	36	25	55	129
1200	1220	41	1200	715	1540	160	30	36	25	55	139

Loads f_t in kN

Materials (standard)										
S235JR				16Mo3				13CrMo4-5		
Temperature in °C										
100	200	250	300	350	400	450	480	500	515	530
16.7	15.0	13.5	11.0	13.7	12.9	12.4	11.4	11.0	8.6	6.3
15.8	14.2	12.8	10.4	13.0	12.2	11.7	10.8	10.4	8.1	5.9
14.1	12.6	11.4	9.3	11.5	10.9	10.4	9.6	9.3	7.2	5.3
15.0	13.4	12.1	9.9	12.2	11.6	11.1	10.2	9.9	7.7	5.6
13.2	11.9	10.7	8.7	10.8	10.2	9.8	9.0	8.7	6.8	5.0
12.3	11.1	9.9	8.1	10.1	9.5	9.1	8.4	8.1	6.3	4.6
11.4	10.3	9.2	7.5	9.4	8.8	8.5	7.8	7.5	5.9	4.3
18.5	16.6	14.9	12.2	15.1	14.3	13.7	12.6	12.2	9.5	6.9
16.7	15.0	13.5	11.0	13.7	12.9	12.4	11.4	11.0	8.6	6.3
28.2	25.3	22.7	18.6	23.0	21.8	20.8	19.2	18.6	14.4	10.6
27.3	24.5	22.0	18.0	22.3	21.1	20.2	18.6	18.0	14.0	10.2
39.6	35.6	32.0	26.1	32.4	30.6	29.3	27.0	26.1	20.3	14.9
39.6	35.6	32.0	26.1	32.4	30.6	29.3	27.0	26.1	20.3	14.9
41.4	37.1	33.4	27.3	33.8	32.0	30.6	28.2	27.3	21.2	15.5
42.2	37.9	34.1	27.8	34.6	32.6	31.2	28.8	27.8	21.6	15.8
44.0	39.5	35.5	29.0	36.0	34.0	32.5	30.0	29.0	22.5	16.5
41.4	37.1	33.4	27.3	33.8	32.0	30.6	28.2	27.3	21.2	15.5
37.8	34.0	30.5	24.9	31.0	29.2	28.0	25.8	24.9	19.4	14.2
36.1	32.4	29.1	23.8	29.5	27.9	26.7	24.6	23.8	18.5	13.5

The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N.

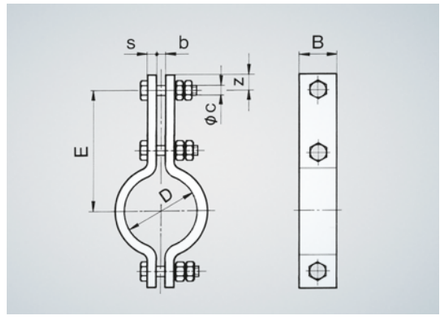
HYDRA® THREE-BOLT CLAMP HDV

Reinforced version

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60

Order example: HDV 0400.490.16-16.0
16Mo3, blank



Nominal sizes, dimensions, weights (Loads f_t as HZV, alongside)

Nominal diameter	Outer pipe diameter	Nominal load	Type	Dimensions				S235JR			16Mo3			13CrMo4-5		
								Installation dimension	Max. insulating thickness	Weight approx.	Installation dimension	Max. insulating thickness	Weight approx.	Installation dimension	Max. insulating thickness	Weight approx.
DN	D	F_n	HDV …	B	b	s	z	E	J		E	J		E	J	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	kg	mm	mm	kg	mm	mm	kg
100	114.3	20	0100. … . …[1)]	70	20	10	35	235	135	6.4	295	185	7	355	235	7.7
125	139.7	18	0125. … . …[1)]	70	20	10	35	245	130	6.7	305	180	7.4	365	230	8.0
150	168.3	16	0150. … . …[1)]	70	20	10	35	260	130	7.2	320	180	7.9	380	230	8.5
200	219.1	17	0200. … . …[1)]	70	20	12	35	325	170	10	385	220	11	445	270	12.0
250	273	15	0250. … . …[1)]	70	20	12	35	350	170	11	410	220	12	470	270	13.0
300	323.9	14	0300. … . …[1)]	70	20	12	35	375	170	12	435	220	13	495	270	14.0
350	355.6	13	0350. … . …[1)]	70	20	12	35	390	170	13	450	220	13	510	270	14.0
400	406.4	21	0400. … . …[1)]	90	25	15	35	430	185	22	490	235	23	550	285	24
450	457	19	0450. … . …[1)]	90	25	15	35	455	185	23	515	235	25	575	285	26
500	508	32	0500. … . …[1)]	100	25	20	45	495	190	39	555	240	41	615	290	43
550	559	31	0550. … . …[1)]	100	25	20	45	520	190	42	580	240	43	640	290	45
600	610	46	0600. … . …[1)]	110	30	25	55	565	205	63	625	255	66	685	305	69
700	711	45	0700. … . …[1)]	120	30	25	55	615	205	76	675	255	79	735	305	82
800	813	47	0800. … . …[1)]	140	30	25	55	670	210	97	730	260	101	790	310	104
850	864	48	0850. … . …[1)]	150	30	25	55	695	205	108	755	255	112	815	305	116
900	914	50	0900. … . …[1)]	160	30	25	55	720	205	120	780	255	124	840	305	128
1000	1016	47	1000. … . …[1)]	160	30	25	55	770	205	130	830	255	134	890	305	138

Connection diameter	DN	100-450	100-450	500-550	500-550	500-550	600-1000	600-1000	600-1000	600-1000
	LGV	12	16/20	12	16/20	24	12	16/20	24	30
	c (mm)	16	24	16	24	30	16	24	30	36

1) Insert installation dimension and LGV

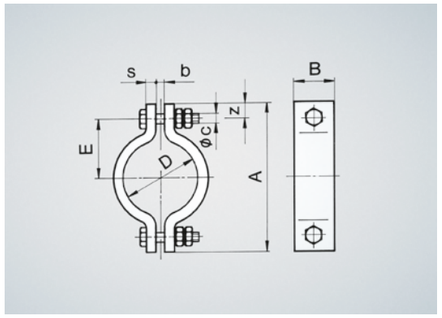
HYDRA® TWO-BOLT CLAMPS HZS

Heavy-duty version

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60

Order example: HZS 0300-13.0
13CrMo4-5, blank



Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Installation dimension	Main dimensions		Connection dimensions				Weight approx.
DN	D	F_n	HZS	E	A	B	b	c	s	z	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	kg
150	168.3	28	0150	140	350	70	25	24	15	35	7.7
200	219.1	26	0200	170	410	70	25	24	15	35	9.1
250	273.0	22	0250	200	470	70	25	24	15	35	11
300	323.9	25	0300	225	520	90	25	24	15	35	15
350	355.6	40	0350	260	610	100	25	30	20	45	26
400	406.4	37	0400	285	660	100	25	30	20	45	28
450	457	56	0450	325	750	110	30	36	25	50	44
500	508	56	0500	355	810	120	30	36	25	50	52
550	559	65	0550	385	890	150	30	42	25	60	72
600	610	66	0600	410	940	160	30	42	25	60	82
700	711	60	0700	460	1040	160	30	42	25	60	92
800	813	53	0800	515	1150	160	30	42	25	60	103

Loads f_t in kN

Materials (standard)										
S235JR			16Mo3					13CrMo4-5		
Temperature in °C										
100	200	250	300	350	400	450	480	500	515	530
24.6	22.1	19.9	16.2	20.2	19.0	18.2	16.8	16.2	12.6	9.2
22.9	20.5	18.5	15.1	18.7	17.7	16.9	15.6	15.1	11.7	8.6
19.4	17.4	15.6	12.8	15.8	15.0	14.3	13.2	12.8	9.9	7.3
22.0	19.8	17.8	14.5	18.0	17.0	16.3	15.0	14.5	11.3	8.3
35.2	31.6	28.4	23.2	28.8	27.2	26.0	24.0	23.2	18.0	13.2
32.6	29.2	26.3	21.5	26.6	25.2	24.1	22.2	21.5	16.7	12.2
49.3	44.2	39.8	32.5	40.3	38.1	36.4	33.6	32.5	25.2	18.5
49.3	44.2	39.8	32.5	40.3	38.1	36.4	33.6	32.5	25.2	18.5
57.2	51.4	46.2	37.7	46.8	44.2	42.3	39.0	37.7	29.3	21.5
58.1	52.1	46.9	38.3	47.5	44.9	42.9	39.6	38.3	29.7	21.8
52.8	47.4	42.6	34.8	43.2	40.8	39.0	36.0	34.8	27.0	19.8
46.6	41.9	37.6	30.7	38.2	36.0	34.5	31.8	30.7	23.9	17.5

The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N.

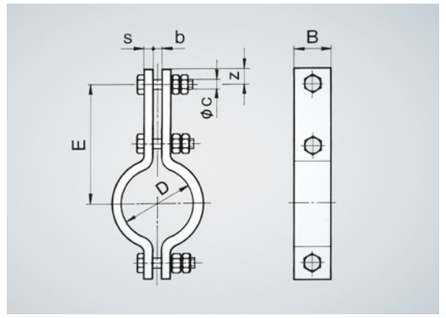
HYDRA® THREE-BOLT CLAMPS HDS

Heavy-duty version

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60

Order example: HDS 0300.505.16-13.0
13CrMo4-5, blank



Nominal sizes, dimensions, weights (Loads f_t as HZS, alongside)

Nominal diameter	Outer pipe diameter	Nominal load	Type	Dimensions				S235JR			16Mo3			13CrMo4-5		
								Installation dimension	Max. insulating thickness	Weight approx.	Installation dimension	Max. insulating thickness	Weight approx.	Installation dimension	Max. insulating thickness	Weight approx.
DN	D	F_n	HDS…	B	b	s	z	E	J		E	J		E	J	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	kg	mm	mm	kg	mm	mm	kg
150	168.3	28	0150. … . …[1)]	70	25	15	35	290	155	11	350	205	12	410	255	14
200	219.1	27	0200. … . …[1)]	70	25	15	35	320	160	12	380	210	14	440	260	15
250	273	22	0250. … . …[1)]	70	25	15	35	350	165	13	410	215	15	470	265	17
300	323.9	25	0300. … . …[1)]	90	25	15	35	385	175	19	445	225	21	505	275	23
350	355.6	40	0350. … . …[1)]	100	25	20	45	420	185	32	480	235	34	540	285	36
400	406.4	37	0400. … . …[1)]	100	25	20	45	445	185	34	505	235	37	565	285	39
450	457	57	0450. … . …[1)]	110	30	25	50	485	200	53	545	250	56	605	300	59
500	508	56	0500. … . …[1)]	120	30	25	50	515	205	61	575	255	64	635	305	68
550	559	65	0550. … . …[1)]	150	30	25	60	545	200	84	605	250	88	665	300	93
600	610	66	0600. … . …[1)]	160	30	25	60	570	200	94	630	250	99	690	300	103
700	711	60	0700. … . …[1)]	160	30	25	60	620	210	106	680	260	110	740	310	115
800	813	53	0800. … . …[1)]	160	30	25	60	675	210	116	735	260	121	795	310	125

Connection diameter	DN	150-300	150-300	350-400	350-400	350-400	350-400	450-800	450-800	450-800	450-800	450-800
	LGV	12	16/20	12	16/20	24	30	12	16/20	24	30	36
	c (mm)	16	24	16	24	30	36	16	24	30	36	42

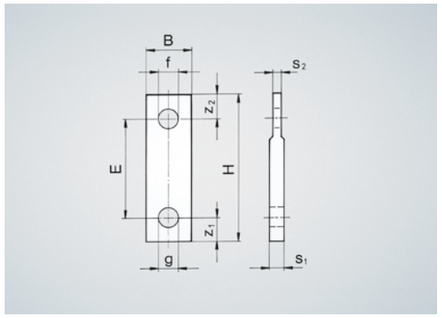
1) Insert installation dimension and LGV

HYDRA® CONNECTING LUG ZVN, ZVV

Normal version for HZN, reinforced version for HZV

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60



Order example: ZVN 050.230.16-16.0
16Mo3, blank

Nominal sizes, dimensions, weights

Nominal diameter	Nominal load	Type	Max. insulation thickness	Installation dimension	Dimensions				Weight approx.
DN	F_n	ZVN	J	E	B	g	s_1	z_1	
–	kN	–	mm	mm	mm	mm	mm	mm	kg
250	7	040. 150..[1]..	160	150	40	23	6	24	0.3
Until	7	040. 210..[1]..	210	210	40	23	6	24	0.4
350	7	040. 270..[1]..	260	270	40	23	6	24	0.6
400	9	050. 170..[1]..	180	170	50	27	8	30	0.7
Until	9	050. 230..[1]..	230	230	50	27	8	30	0.8
500	9	050. 290..[1]..	290	290	50	27	8	30	1.0
550	23	070. 170..[1]..	200	170	70	33	10	40	1.2
Until	23	070. 230..[1]..	250	230	70	33	10	40	1.6
1000	23	070. 290..[1]..	300	290	70	33	10	40	1.9

Loads f_t in kN (reference temperature ϑ_1)

Materials (standard)										
S235JR				16Mo3				13CrMo4-5		
Temperature in °C										
100	200	250	300	350	400	450	480	500	515	530
6.2	5.5	5.0	4.1							
				5.0	4.8	4.6	4.2			
								4.1	3.2	2.3
7.9	7.1	6.4	5.2							
				6.5	6.1	5.9	5.4			
								5.2	4.1	3.0
20.2	18.2	16.3	13.3							
				16.6	15.6	15.0	13.8			
								13.3	10.4	7.6

Load group	Width	Connection dimensions		
LGV	B	f	s_2	z_2
–	kN	mm	mm	mm
12	40	14	6	18
16	40	18	6	18
12	50	14	8	24
16	50	18	8	24
20	50	23	8	24
12	70	14	10	35
16	70	18	10	35
20	70	23	10	35
24	70	27	10	35

Order example: ZVV 070.210.16-16.0
16Mo3, blank

Nominal diameter	Nominal load	Type	Max. insulation thickness	Installation dimension	Dimensions				Weight approx.
DN	F_n	ZVV	J	E	B	g	s_1	z_1	
–	kN	–	mm	mm	mm	mm	mm	mm	kg
100	19	070. 120..[1]..	130	120	70	27	10	35	1.0
Until	19	070. 180..[1]..	180	180	70	27	10	35	1.3
150	19	070. 230..[1]..	220	230	70	27	10	35	1.6
200	21	070. 150..[1]..	180	150	70	27	10	35	1.1
Until	21	070. 210..[1]..	230	210	70	27	10	35	1.5
450	21	070. 270..[1]..	280	270	70	27	10	35	1.8
500	32	090. 150..[1]..	190	150	90	33	15	45	2.4
Until	32	090. 210..[1]..	240	210	90	33	15	45	3.0
550	32	090. 270..[1]..	290	270	90	33	15	45	3.6
600	50	100. 150..[1]..	200	150	100	39	20	50	3.6
Until	50	100. 210..[1]..	250	210	100	39	20	50	4.5
1000	50	100. 270..[1]..	300	270	100	39	20	50	5.5

Materials (standard)										
S235JR				16Mo3				13CrMo4-5		
Temperature in °C										
100	200	250	300	350	400	450	480	500	515	530
16.7	15.0	13.5	11.0							
				13.7	12.9	12.4	11.4			
								11.0	8.6	6.3
18.5	16.6	14.9	12.2							
				15.1	14.3	13.7	12.6			
								12.2	9.5	6.9
28.2	25.3	22.7	18.6							
				23.0	21.8	20.8	19.2			
								18.6	14.4	10.6
44.0	39.5	35.5	29.0							
				36.0	34.0	32.5	30.0			
								29.0	22.5	16.5

Load group	Width	Connection dimensions		
LGV	B	f	s_2	z_2
–	kN	mm	mm	mm
12	70	14	10	40
16	70	18	15	40
20	70	23	15	40
24	70	27	15	40
12	90	14	10	40
16	90	18	15	40
20	90	23	15	40
24	90	27	15	45
30	90	36	15	45
12	100	14	10	40
16	100	18	15	40
20	100	23	15	40
24	100	27	20	40
30	100	36	20	50
36	100	43	20	55

[1] Enter load group LGV

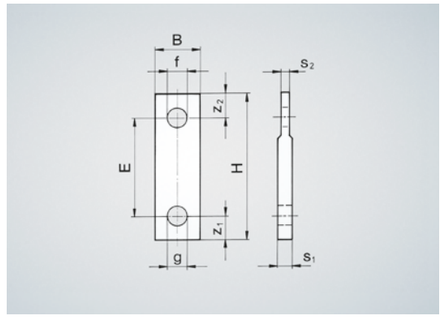
The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N. In all cases the nominal load F_N of the load group LGV may not be exceeded.

HYDRA® CONNECTING LUG ZVS

Heavy duty version for HZS

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when used at
appropriately low temperature) key see page 60



Order example: ZVS 120.270.20-13.0
13CrMo4-5, blank

Nominal sizes, dimensions, weights

Nominal diameter	Nominal load	Type	Max. insulation thickness	Installation dimension	Connection dimensions				Weight approx.
DN	F_n	ZVS	J	E	B	g	s_1	z_1	
–	kN	–	mm	mm	mm	mm	mm	mm	kg
150	28	070. 140..[1]...	160	140	70	27	12	35	1.3
Until	28	070. 200..[1]..	210	200	70	27	12	35	1.7
300	28	070. 260..[1]..	260	260	70	27	12	35	2.1
350	40	090. 140..[1]..	170	140	90	33	15	45	2.2
Until	40	090. 200..[1]..	220	200	90	33	15	45	2.8
400	40	090. 260..[1]..	270	260	90	33	15	45	3.5
450	56	100. 140..[1]..	180	140	100	39	20	55	3.5
Until	56	100. 200..[1]..	230	200	100	39	20	55	4.5
500	56	100. 260..[1]..	280	260	100	39	20	55	5.4
550	66	120. 150..[1]..	200	150	120	45	20	60	4.6
Until	66	120. 210..[1]..	250	210	120	45	20	60	5.7
600	66	120. 270..[1]..	300	270	120	45	20	60	6.8

Loads f_t in kN (reference temperature ϑ_1)

Materials (standard)										
S235JR				16Mo3				13CrMo4-5		
Temperature in °C										
100	200	250	300	350	400	450	480	500	515	530
16.7	15.0	13.5	11.0							
				13.7	12.9	12.4	11.4			
								11.0	8.6	6.3
18.5	16.6	14.9	12.2							
				15.1	14.3	13.7	12.6			
								12.2	9.5	6.9
28.2	25.3	22.7	18.6							
				23.0	21.8	20.8	19.2			
								18.6	14.4	10.6
44.0	39.5	35.5	29.0							
				36.0	34.0	32.5	30.0			
								29.0	22.5	16.5

Load group	Width	Connection dimensions		
LGV	B	f	s_2	z_2
–	kN	mm	mm	mm
12	70	14	10	35
16	70	18	12	35
20	70	23	12	35
24	70	27	12	35
12	90	14	10	40
16	90	18	15	40
20	90	23	15	45
24	90	27	15	45
30	90	36	15	45
12	100	14	10	40
16	100	18	15	40
20	100	23	15	45
24	100	27	20	45
30	100	36	20	50
36	100	43	20	60
42	120	48	20	60
16	120	18	15	40
20	120	23	15	45
24	120	27	20	45
30	120	36	20	50
36	120	43	20	60

[1] Enter load group LGV

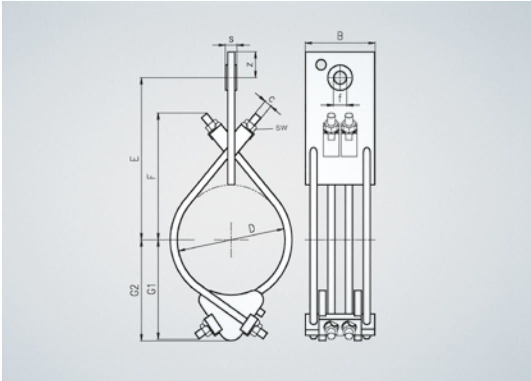
The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N. In all cases the nominal load F_N of the load group LGV may not be exceeded.

HYDRA® GRIP CLAMP HGN

Normal version

Standard design
Materials: S235JR, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed.
Key see page 60



Order example: HGN 0300.370.12-37.1
Standard S235JR, surface

Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Max. insulation thickness	Installation dimension	Dimensions				Nuts torque max. Ma[2]	WAF	Weight approx.
DN	D	F_n	HGN..	J	E	B	F	Max. G_1/G_2	c			
–	mm	kN	–	mm	mm	mm	mm	mm	mm	Nm	–	kg
150	168.3	24	0150. 255..[1]..	120	255	110	204	159	12	10	19	6.2
			0150. 365..[1]..	220	365							7.5
200	219.1	24	0200. 295..[1]..	135	295	110	243	192	12	10	19	6.9
			0200. 405..[1]..	235	405							8.1
250	273.0	24	0250. 330..[1]..	145	330	110	287	225	12	10	19	7.4
			0250. 440..[1]..	245	440							8.7
300	323.9	24	0300. 370..[1]..	160	370	110	326	238	12	10	19	7.6
			0300. 470..[1]..	250	470							8.7
350	356.6	24	0350. 390..[1]..	165	390	110	348	257	12	10	19	7.9
			0350. 490..[1]..	255	490							9.0
400	406.4	45	0400. 450..[1]..	190	450	130	409	303	16	30	24	14
			0400. 540..[1]..	270	540							15
450	457	45	0450. 490..[1]..	205	490	130	448	332	16	30	24	14
			0450. 570..[1]..	275	570							15
500	508	62	0500. 505..[1]..	190	505	170	459	381	20	50	30	24
			0500. 605..[1]..	280	605							26
550	559	62	0550. 550..[1]..	205	550	170	495	410	20	50	30	25
			0550. 635..[1]..	285	635							27
600	610	62	0600. 580..[1]..	210	580	170	530	440	20	50	30	27
			0600. 665..[1]..	290	665							29
700	711	81	0700. 675..[1]..	250	675	210	567	523	24	100	36	44
			0700. 730..[1]..	300	730							46
800	813	81	0800. 695..[1]..	220	695	210	635	580	24	100	36	47
			0800. 780..[1]..	300	780							49
850	864	81	0850. 725..[1]..	225	725	210	667	608	24	100	36	48
			0850. 810..[1]..	300	810							51
900	914	81	0900. 755..[1]..	230	755	210	703	635	24	100	36	50
			0900. 835..[1]..	300	835							52
1000	1016	81	1000. 825..[1]..	245	825	210	767	692	24	100	36	53
			1000. 885..[1]..	300	885							55

Loads f_t in kN

Materials (standard)										
S235JR					13CrMo4-5					
Temperature in °C										
20	100	200	250	300	350	400	450	500	515	530
24	21.1	19.0	17.0	13.9						
					20.4	19.2	18.2	13.9	10.8	7.9
24	21.1	19.0	17.0	13.9						
					20.4	19.2	18.2	13.9	10.8	7.9
24	21.1	19.0	17.0	13.9						
					20.4	19.2	18.2	13.9	10.8	7.9
24	21.1	19.0	17.0	13.9						
					20.4	19.2	18.2	13.9	10.8	7.9
24	21.1	19.0	17.0	13.9						
					20.4	19.2	18.2	13.9	10.8	7.9
45	39.6	35.6	32.0	26.1						
					38.3	36.0	34.2	26.1	20.3	14.9
45	39.6	35.6	32.0	26.1						
					38.3	36.0	34.2	26.1	20.3	14.9
62	54.6	49.0	44.0	36.0						
					52.7	49.6	47.1	36.0	27.9	20.5
62	54.6	49.0	44.0	36.0						
					52.7	49.6	47.1	36.0	27.9	20.5
62	54.6	49.0	44.0	36.0						
					52.7	49.6	47.1	36.0	27.9	20.5
81	71.3	64.0	57.5	47.0						
					68.9	64.8	61.6	47.0	36.5	26.7
81	71.3	64.0	57.5	47.0						
					68.9	64.8	61.6	47.0	36.5	26.7
81	71.3	64.0	57.5	47.0						
					68.9	64.8	61.6	47.0	36.5	26.7
81	71.3	64.0	57.5	47.0						
					68.9	64.8	61.6	47.0	36.5	26.7
81	71.3	64.0	57.5	47.0						
					68.9	64.8	61.6	47.0	36.5	26.7

[1] Enter load group LGV

[2] Torque of the U-type clamp during installation

The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N.

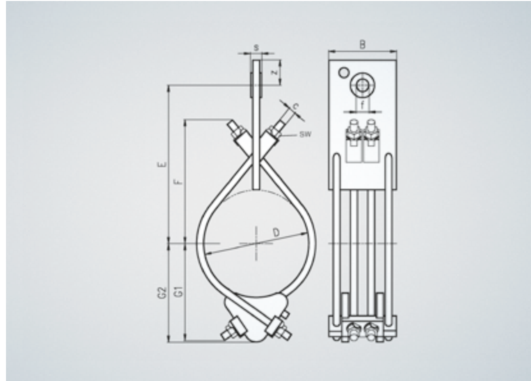
Load group and connection dimensions see page 73

HYDRA® GRIP CLAMP HGV

Reinforced version

Standard design
Material: 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed.
Key see page 60



Order example: HGV 0300.480.20-13.0
13CrMo4-5, blank

Nominal sizes, dimensions, weights / **Loads f_t in kN**

Nominal diameter	Outer pipe diameter	Nominal load	Type	Max. insulation thickness	Installation dimension	Dimensions				Nuts torque max. Ma[2]	WAF	Weight approx.	Materials (standard) 13CrMo4-5, Temperature in °C					
DN	D	F_n	HGV..	J	E	B	F	Max. G_1/G_2	c									
–	mm	kN	–	mm	mm	mm	mm	mm	mm	Nm	–	kg	350	400	450	500	515	530
250	273.0	45	0250. 400..[1]..	210	400	136	309	222	16	30	24	14	38.3	36.0	34.2	26.1	20.3	14.9
			0250. 450..[1]..	275	450							15						
300	323.9	45	0300. 430..[1]..	210	430	136	348	252	16	30	24	14	38.3	36.0	34.2	26.1	20.3	14.9
			0300. 480..[1]..	280	480							15						
350	356.6	67	0350. 450..[1]..	210	450	176	388	281	20	50	30	23	57.0	53.6	50.9	38.9	30.2	22.1
			0350. 500..[1]..	280	500							25						
400	406.4	67	0400. 490..[1]..	225	490	176	427	311	20	50	30	25	57.0	53.6	50.9	38.9	30.2	22.1
			0400. 540..[1]..	295	540							26						
450	457	90	0450. 530..[1]..	230	530	216	437	356	24	100	36	39	76.5	72.0	68.4	52.2	40.5	29.7
			0450. 580..[1]..	305	580							40						
500	508	90	0500. 570..[1]..	245	570	216	472	383	24	100	36	41	76.5	72.0	68.4	52.2	40.5	29.7
			0500. 620..[1]..	315	620							42						
550	559	90	0550. 610..[1]..	260	610	216	512	413	24	100	36	43	76.5	72.0	68.4	52.2	40.5	29.7
			0550. 650..[1]..	320	650							44						
600	610	143	0600.630..[1]..	245	630	256	573	468	30	200	46	68	122	114	109	82.9	64.4	47.2
			0600. 680..[1]..	325	680							70						
700	711	143	0700. 700..[1]..	265	700	256	644	534	30	200	46	78	122	114	109	82.9	64.4	47.2
			0700. 740..[1]..	335	740							79						
800	813	190	0800. 760..[1]..	245	760	294	676	617	36	300	55	115	162	152	144	110	85.5	62.7
			0800. 800..[1]..	340	800							117						
850	864	190	0850. 780..[1]..	240	780	294	709	645	36	300	55	118	162	152	144	110	85.5	62.7
			0850. 820..[1]..	330	820							120						
900	914	190	0900. 820..[1]..	255	820	294	744	672	36	300	55	122	162	152	144	110	85.5	62.7
			0900.860..[1]..	345	860							124						
1000	1016	190	1000. 880..[1]..	265	880	294	809	729	36	300	55	128	162	152	144	110	85.5	62.7
			1000. 920..[1]..	355	920							130						

Connecting dimensions

Load group	Connection dimensions		
LGV	f	s	z
–	mm	mm	mm
12	14	10	40
16	18	12	40
20	22	15	50
24	26	15	50
30	35	25	70
36	42	28	80
42	48	32	90
48	53	36	90
56	65	40	90
64	75	40	100

[1] Enter load group LGV

[2] Torque of the U-type clamp during installation

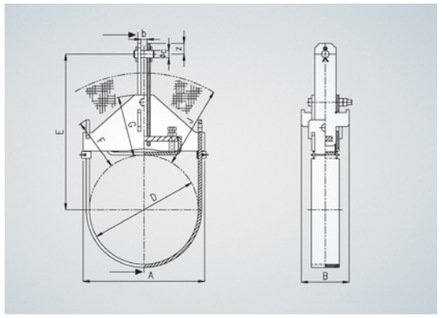
The loads for interim temperatures can be interpolated linearly within a material type.
For lower and higher temperatures than indicated, loads can be determined based on the material from the temperature factors on page 61 from the nominal load F_N.

HYDRA® U-TYPE CLAMP HBN

Normal version

Standard design
Materials: S235JR, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed.
Key see page 60



Order example: HBN 0300.450.30-13.0
13CrMo4-5, blank

Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Max. insulating thickness	Installation dimension	Dimensions					Weight approx.
DN	D	F_n	HBN..	J	E	A	B	F	G	b	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	kg
100	114.3	39	0100. 310..[1]..	185	310	146	120	92	139	16	6.0
			0100. 370..[1]..	235	370						6.4
125	139.7	39	0125. 330..[1]..	185	330	171	120	96	138	16	6.5
			0125. 390..[1]..	235	390						6.9
150	168.3	39	0150. 340..[1]..	185	340	200	120	100	147	16	7.3
			0150.400..[1]..	235	400						7.6
200	219.1	65	0200. 370..[1]..	185	370	262	132	127	147	16	11
			0200. 430..[1]..	235	430						12
250	273.0	76	0250. 410..[1]..	195	410	316	132	145	166	16	13
			0250. 470..[1]..	245	470						14
300	323.9	106	0300. 450..[1]..	200	450	377	154	164	185	20	22
			0300. 510..[1]..	250	510						23
350	355.6	108	0350. 470..[1]..	205	470	410	154	169	195	20	24
			0350. 530..[1]..	255	530						24
400	406.4	158	0400. 520..[1]..	220	520	486	204	181	205	25	43
			0400. 580..[1]..	270	580						45
450	457	162	0450. 550..[1]..	225	550	537	204	191	219	25	48
			0450. 610..[1]..	275	610						49
500	508	195	0500.590..[1]..	230	590	599	234	216	219	30	65
			0500.650..[1]..	280	650						67
550	559	203	0550. 620..[1]..	235	620	650	234	230	233	30	72
			0550. 680..[1]..	285	680						73
600	610	241	0600. 650..[1]..	240	650	727	284	238	243	30	109
			0600. 710..[1]..	290	710						111
700	711	256	0700. 730..[1]..	260	730	829	284	262	266	40	127
			0700. 770..[1]..	300	770						129
800	813	349	0800. 810..[1]..	280	810	957	334	288	301	50	197
			0800.850..[1]..	320	850						199
850	864	349	0850. 850..[1]..	290	850	1009	334	298	310	50	209
			0850. 890..[1]..	330	890						211
900	914	364	0900. 880..[1]..	300	880	1079	384	311	321	50	266
			0900. 930..[1]..	350	930						269

Connecting dimensions

Load group	Connection dimensions	
LGV	c	z
–	mm	mm
12	16	20
16	24	30
20	24	30
24	33	40
30	40	50
36	45	55
42	50	65
48	60	75
56	60	75

[1] Enter load group LGV

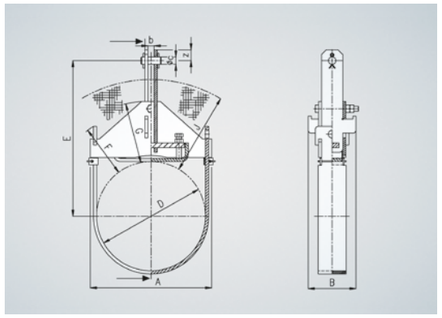
Loads for higher temperatures and materials in accordance with reduction factors on page 61.

HYDRA® U-TYPE CLAMP HBV

Reinforced version

Standard design
Material: S235JR, 13CrMo4-5,
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed.
Key see page 60



Order example: HBV 0300.520.36-13.0
13CrMo4-5, blank

Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Max. insulating thickness	Installation dimension	Dimensions					Weight approx.
DN	D	F_n	HBV..	J	E	A	B	F	G	b	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	kg
150	168.3	95	0150. 360..[1]..	185	360	220	154	138	168	16	14
			0150.420..[1]..	235	420						15
200	219.1	109	0200. 380..[1]..	185	380	272	154	146	167	20	16
			0200. 440..[1]..	235	440						17
250	273.0	171	0250. 430..[1]..	195	430	351	214	175	178	25	35
			0250. 490..[1]..	245	490						36
300	323.9	212	0300. 460..[1]..	200	460	412	239	188	188	30	48
			0300. 520..[1]..	250	520						49
350	355.6	238	0350. 500..[1]..	210	500	460	264	196	207	30	66
			0350. 660..[1]..	360	660						71
400	406.4	270	0400. 560..[1]..	240	560	511	269	213	236	30	78
			0400. 590..[1]..	270	590						79
450	457	274	0450. 590..[1]..	245	590	562	269	226	245	40	86
			0450. 620..[1]..	275	620						87
500	508	315	0500.630..[1]..	250	630	639	304	239	251	40	117
			0500.670..[1]..	280	670						118
550	559	328	0550. 670..[1]..	265	670	690	304	248	265	50	128
			0550. 700..[1]..	285	700						129
600	610	354	0600. 700..[1]..	270	700	752	334	262	265	50	156
			0600. 730..[1]..	290	730						157
700	711	415	0700. 790..[1]..	290	790	889	409	287	286	50	249
			0700. 800..[1]..	300	800						250
800	813	490	0800. 880..[1]..	330	880	992	424	322	323	50	309
			0800. 880..[1]..	330	880						309
850	864	603	0850. 930..[1]..	340	930	1094	504	330	335	60	449
			0850. 930..[1]..	340	930						449
900	914	651	0900. 970..[1]..	350	970	1144	514	348	354	60	493
			0900. 970..[1]..	350	970						493

Connecting dimensions

Load group	Connection dimensions	
LGV	c	z
–	mm	mm
20	24	30
24	33	40
30	40	50
36	45	55
42	50	65
48	60	75
56	60	75
64	70	85
72	80	100

[1] Enter load group LGV

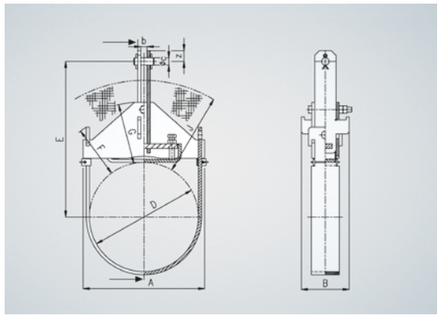
Loads for higher temperatures and materials in accordance with reduction factors on page 61.

HYDRA® U-TYPE CLAMP HBS

Heavy-duty version

Standard design
Materials: S235JR, 13CrMo4-5, 10CrMo9-10
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed.
Key see page 60



Order example: HBS 0300.530.36-10.0
10CrMo9-10, blank

Nominal sizes, dimensions, weights

Nominal diameter	Outer pipe diameter	Nominal load	Type	Max. insulating thickness	Installation dimension	Dimensions					Weight approx.
DN	D	F_n	HBS..	J	E	A	B	F	G	b	
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	kg
200	219.1	163	0200. 460..[1]..	240	460	297	194	148	169	25	27
250	273.0	208	0250. 500..[1]..	250	500	376	244	168	190	30	49
300	323.9	232	0300. 530..[1]..	250	530	427	249	190	198	30	58
350	355.6	292	0350. 560..[1]..	260	560	485	294	199	209	30	84
400	406.4	338	0400. 600..[1]..	270	600	536	299	216	237	30	98
450	457	340	0450. 630..[1]..	280	630	587	299	229	247	40	107
500	508	373	0500. 660..[1]..	280	660	664	334	241	252	40	141
550	559	390	0550. 700..[1]..	290	700	715	334	251	267	50	153
600	610	421	0600. 740..[1]..	290	740	787	384	264	269	50	200
700	711	492	0700. 800..[1]..	300	800	939	469	293	289	50	321
750	762	520	0750. 850..[1]..	310	850	990	469	303	303	50	346
800	813	593	0800. 890..[1]..	330	890	1042	484	328	326	50	398

Connecting dimensions

Load group	Connection dimensions	
LGV	c	z
–	mm	mm
20	24	30
24	33	40
30	40	50
36	45	55
42	50	65
48	60	75
56	60	75
64	70	85
72	80	100

[1] Enter load group LGV

Loads for higher temperatures and materials in accordance with reduction factors on page 61.

HYDRA® RISER CLAMPS

Selection, type designations, series

Area of application

In the lower diameter and load area formed clamps are used, for larger diameters and high loads yoke and box-type clamps. The practically graduated spans are based on common insulation thicknesses and cover, depending on diameter and loads, 300 to 2400 mm. As standard materials, S235JR, 16Mo3 and 13CrMo4-5 are chosen, these enabling use up to approx. 560 °C.

Selection

The clamps are designed in such a way that for the selection only the required load F_S in operating state must be taken into account (such as with spring and constant hangers).

The medium temperature ϑ_M (design temperature of the pipeline) gives the reference temperature ϑ_1 for the selection of riser clamps from the diagram "Component temperatures of pipe clamps" on page 61.

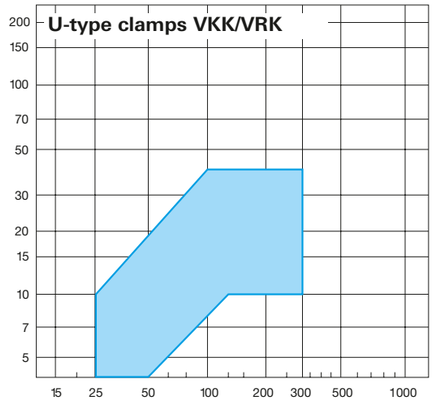
With the reference temperature ϑ_1 as design temperature of the clamps derive both the required clamp material as well as the minimum nominal load of the clamp.

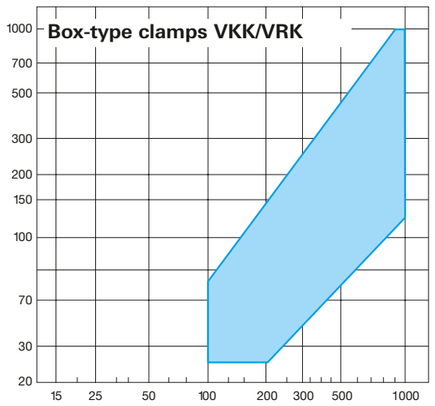
In the material selection for the clamp, however, the upper temperature limit (Table page 61) is taken into account (according to some specifications it may not be exceeded by the medium temperature ϑ_M)!

The minimum load of the clamp can be read from the adjacent load tables or using the correction factors in page 61 in accordance with the equation

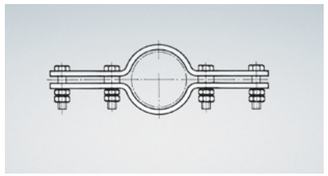
FN ≥ FS / K.

Depending on the required load F_S and possible requirements (LGV) due to connected load chains, the riser clamp must be selected in parallel to the connected area.

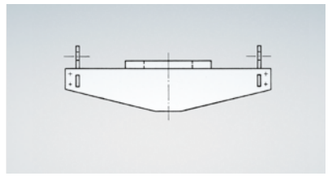




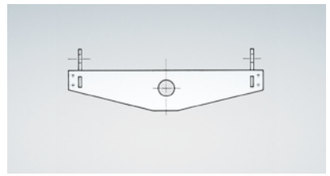
VBK



VKK



VKR



Riser clamps/Joint clamps MSN

V	B	K		0	0	4	0		0	1	6		0	4	0	0		1	2		1	6		0	Example
Model series				Nominal diameter[1]					Nominal load				Span/Installation dimension E					Load group (LGV)[2]			Material			Surface protection	

[1] Indicate external diameter of the pipe, if not standard

[2] for MSN nominal load of bracket

HYDRA® RISER CLAMPS

Requirement

Riser clamp, blank
Nominal diameter: DN 100
Span: L = 800 mm
Required load: F_s = 8 kN
Medium temperature: ϑ_M = 555°C
Insulation thickness: J = 200 mm
LGV 12 (2 x)
Selection:
Reference temperature: ϑ_1 = 500 °C (diagram page 61)
with ϑ_1 = 500°C and
F_s = 8 kN from the following load table
Material: 13CrMo4-5,
Load of the clamp: F_t = 9.3 kN
Nominal load of the clamp: F_N = 16 kN
Formed clamp: VBK 0100.016.0800.12-13.0

Example for box-type clamp

Riser clamp with shear block support, blank
Nominal diameter: DN 500
Span: L = 1400 mm
Required load: L = 50 kN
Medium temperature: ϑ_M = 330 ° C
Insulation thickness: J 160 mm
LGV 24 (2 x)
Selection:
Reference temperature: ϑ_1 = 300 °C (diagram page 61)
with ϑ_1 = 300°C and
F_s = 50 kN from the following load table:
Material: S235JR
Load of the clamp: F_t = 58 kN
Nominal load of the clamp: F_N = 100 kN
Box-type clamp: VKK 0500.100.1400.24-37.0

Loads F_t for clamps made from ferritic/martensitic steels in kN

Nominal load F_N	Material																					
	S235JR				16Mo3				13CrMo4-5			10CrMo9-10				X10CrMoVNb9-1 (P91)						
	Temperature in °C																					
kN	100	200	250	300	350	400	450	480	500	515	530	540	560	580	600	540	560	580	600	630	650
1	0.88	0.79	0.71	0.58	0.72	0.68	0.65	0.60	0.58	0.45	0.33	0.33	0.24	0.18	0.14	0.76	0.82	0.49	0.38	0.25	0.19
4	3.5	3.2	2.8	2.3	2.9	2.7	2.6	2.4	2.3	1.8	1.3	1.3	0.96	0.72	0.56	3.0	2.5	2.0	1.5	1.0	0.76
6.3	5.5	5.0	4.5	3.7	4.5	4.3	4.1	3.8	3.7	2.8	2.1	2.1	1.5	1.1	0.88	4.8	3.9	3.1	2.4	1.6	1.2
10	8.8	7.9	7.1	5.8	7.2	6.8	6.5	6.0	5.8	4.5	3.3	3.3	2.4	1.8	1.4	7.6	6.2	4.9	3.8	2.5	1.9
16	14	13	11	9.3	12	11	10	9.6	9.3	7.2	5.3	5.3	3.8	2.9	2.2	12	9.9	7.8	6.1	4.0	3.0
25	22	20	18	15	18	17	16	15	15	11	8.3	8.3	6.0	4.5	3.5	19	16	12	10	6.3	4.8
40	35	32	28	23	29	27	26	24	23	18	13	13	10	7.2	5.6	30	25	20	15	10	7.6
63	55	50	45	37	45	43	41	38	37	28	21	21	15	11	8.8	48	39	31	24	16	12
100	88	79	71	58	72	68	65	60	58	45	33	33	24	18	14	76	62	49	38	25	19
160	141	126	114	93	115	109	104	96	93	72	53	53	38	29	22	122	99	78	61	40	30
250	220	198	178	145	180	170	163	145	145	113	83	83	60	45	35	190	155	123	95	63	48
400	352	316	284	232	288	272	260	240	232	180	132	132	96	72	56	304	248	196	152	100	76
630	554	498	447	365	454	428	410	378	365	284	208	208	151	113	88	479	391	309	239	158	120
1000	880	790	710	580	720	680	650	600	580	450	330	330	240	180	140	760	620	490	380	250	190

Loads F_t for clamps made from austenitic steels in kN

Nominal load F_N	Material																					
	1.4541/X6CrNiTi18-10								1.4571/X6CrNiTiMo17-12-2								1.4958/X5NiCrAlTi31-20 (800H)					
	Temperature in °C																					
kN	50	100	150	200	300	400	500[1]	550[1]	50	100	150	200	300	400	500[1]	550[1]	580	590	600	610	630	650
1	0.94	0.88	0.82	0.78	0.71	0.66	0.63	0.62	1.0	0.92	0.87	0.83	0.74	0.69	0.67	0.66	0.40	0.40	0.40	0.40	0.38	0.32
4	3.8	3.5	3.3	3.1	2.8	2.6	2.5	2.5	4.0	3.7	3.5	3.3	3.0	2.8	2.7	2.6	1.6	1.6	1.6	1.6	1.5	1.3
6.3	5.9	5.5	5.2	4.9	4.5	4.2	4.0	3.9	6.3	5.8	5.5	5.2	4.7	4.3	4.2	4.2	2.5	2.5	2.5	2.5	2.4	2.0
10	9.4	8.8	8.2	7.8	7.1	6.6	6.3	6.2	10	9.2	8.7	8.3	7.4	6.9	6.7	6.6	4.0	4.0	4.0	4.0	3.8	3.2
16	15	14	13	12	11	11	10	10	16	15	14	13	12	11	11	11	6.4	6.4	6.4	6.4	6.1	6.1
25	24	22	21	20	18	17	16	16	25	23	22	21	19	17	17	17	10	10	10	10	9.5	8.0
40	38	35	33	31	28	26	25	25	40	37	35	33	30	28	27	26	16	16	16	16	15	13
63	59	55	52	49	45	42	40	39	63	58	55	52	47	43	42	42	25	25	25	25	24	20
100	94	88	82	78	71	66	63	62	100	92	87	83	74	69	67	66	40	40	40	40	38	32
160	150	141	131	125	114	106	101	99	160	147	139	133	118	110	107	106	64	64	64	64	61	51
250	235	220	205	195	178	165	158	155	250	230	218	208	185	173	168	165	100	100	100	100	95	80
400	376	352	328	312	284	264	252	248	400	368	348	332	296	276	268	264	160	160	160	160	152	128
630	592	554	517	491	447	416	397	391	630	580	548	523	466	435	422	416	252	252	252	252	239	202
1000	940	880	820	780	710	660	630	620	1000	920	870	830	740	690	670	660	400	400	400	400	380	320

1) For temperatures greater than 400 °C, another screw material must be used. Calculation temperature information is required.

HYDRA® FORMED CLAMP VBK

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5, dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when usage temperature appropriately low) key see page 60

Note
The flat cams (shear connectors) to support the pipe are not included in the delivery.

Order example: VBK 0100.016.0600.12-16.0

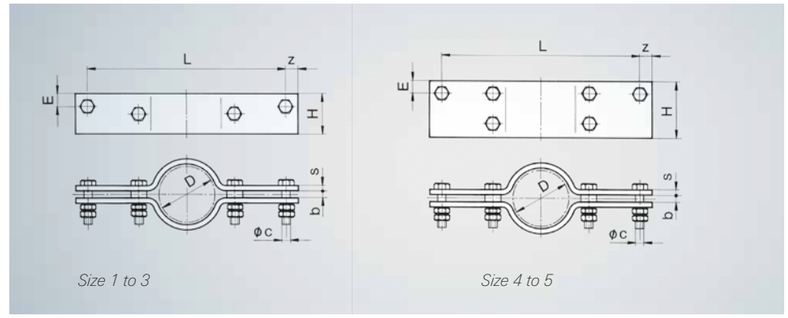
Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type	Size	Dimensions				Span L in mm				
DN	D	F_N	VBK..		H	b	s	z	300	400	500	600	800
–	mm	kN	–		mm	mm	mm	mm	Weight in kg				
25	33.7	4	0025. 004. ... .[1)]	1	70	10	12	20	5	6			
			0025. 004. ... .[1)]	2	90	15	15	30			13	15	
		6.3	0025. 006. ... .[1)]	2	90	15	15	30	9	11	13		
		10	0025. 010. ... .[1)]	2	90	15	15	30	9				
32	42.4	4	0032. 004. ... .[1)]	1	70	10	12	20	5	6			
			0032. 004. ... .[1)]	2	90	15	15	30			13	15	
		6.3	0032. 006. ... .[1)]	2	90	15	15	30	9	11	13		
		10	0032. 010. ... .[1)]	2	90	15	15	30	9				
40	48.3	4	0040. 004. ... .[1)]	1	70	10	12	20	5	6			
			0040. 004. ... .[1)]	2	90	15	15	30			13	15	
		6.3	0040. 006. ... .[1)]	2	90	15	15	30	9	11	13		
			0040. 006. ... .[1)]	3	100	15	20	35				23	
		10	0040. 010. ... .[1)]	2	90	15	15	30	9				
			0040. 010. ... .[1)]	3	100	15	20	35		16	19	23	
		16	0040. 016. ... .[1)]	3	100	15	20	35	13	16			
50	60.3	4	0050. 004. ... .[1)]	1	70	10	12	20	5	7			
			0050. 004. ... .[1)]	2	90	15	15	30			13	16	
		6.3	0050. 006. ... .[1)]	2	90	15	15	30	9	11	13		
			0050. 006. ... .[1)]	3	100	15	20	35				23	
		10	0050. 010. ... .[1)]	2	90	15	15	30	9				
			0050. 010. ... .[1)]	3	100	15	20	35		16	20	23	
		16	0050. 016. ... .[1)]	3	100	15	20	35	13	16			
65	76.1	6.3	0065. 006. ... .[1)]	2	90	15	15	30	9	11	14		
			0065. 006. ... .[1)]	3	100	15	20	35				23	29
		10	0065. 010. ... .[1)]	2	90	15	15	30	9				
			0065. 010. ... .[1)]	3	100	15	20	35		17	20	23	
			0050. 010. ... .[1)]	4	130	20	25	45					49
		16	0065. 016. ... .[1)]	3	100	15	20	35	13	17			
			0065. 016. ... .[1)]	4	130	20	25	45			34	39	
		25	0065. 025. ... .[1)]	4	130	20	25	45		29	34		
80	88.9	6.3	0080. 006. ... .[1)]	2	90	15	15	30	9	12	14		
			0080. 006. ... .[1)]	3	100	15	20	35				23	29
		10	0080. 010. ... .[1)]	2	90	15	15	30	9				
			0080. 010. ... .[1)]	3	100	15	20	35		17	20	23	
			0080. 010. ... .[1)]	4	130	20	25	45					49
		16	0080. 016. ... .[1)]	3	100	15	20	35	14	17			
			0080. 016. ... .[1)]	4	130	20	25	45			34	39	
		25	0080. 025. ... .[1)]	4	130	20	25	45		29	34		

[1)] Enter span L and load group LGV

Size	1	2	3	4		5		
Load group LGV	12	12 - 16	12 - 16	12	16 - 20	12	16	20 - 24
Dimensions E in mm	20	30	35	35	45	35	45	45
c in mm	12	16	16	16	20	16	20	24

HYDRA® FORMED CLAMP VBK



Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type	Size	Dimensions				Span L in mm					
DN	D	F_N	VBK..		H	b	s	z	400	500	600	800	1000	1200
–	mm	kN	–		mm	mm	mm	mm	Weight in kg					
100	114.3	10	0100. 010. ... .[1)]	3	100	15	20	35	17	20	23			
			0100. 010. ... .[1)]	4	130	20	25	45				50		
		16	0100. 016. ... .[1)]	3	100	15	20	35	17	34	40			
			0100. 016. ... .[1)]	5	180	25	25	45				69		
		25	0100. 025. ... .[1)]	4	130	20	25	45	29	34				
			0100. 025. ... .[1)]	5	180	25	25	45			55	69		
		40	0100. 040. ... .[1)]	5	180	25	25	45	41	48				
125	139.7	10	0125. 010. ... .[1)]	3	100	15	20	35	18	21	24			
			0125. 010. ... .[1)]	4	130	20	25	45				50		
		16	0125. 016. ... .[1)]	3	100	15	20	35	18					
			0125. 016. ... .[1)]	4	130	20	25	45		35	40	50		
		25	0125. 025. ... .[1)]	4	130	20	25	45	30	35				
			0125. 025. ... .[1)]	5	180	25	25	45			56	70		
		40	0125. 040. ... .[1)]	5	180	25	25	45	42	49				
150	168.3	10	0150. 010. ... .[1)]	3	100	15	20	35		21	24			
			0150. 010. ... .[1)]	4	130	20	25	45				51	61	
		16	0150. 016. ... .[1)]	4	130	20	25	45		36	41	51		
			0150. 016. ... .[1)]	5	180	25	25	45					85	
		25	0150. 025. ... .[1)]	4	130	20	25	45		36				
			0150. 025. ... .[1)]	5	180	25	25	45			57	71		
		40	0150. 040. ... .[1)]	5	180	25	25	45		50				
200	219.1	10	0200. 010. ... .[1)]	3	100	15	20	35		22	25			
			0200. 010. ... .[1)]	4	130	20	25	45				52	62	
		16	0200. 016. ... .[1)]	3	100	15	20	35		22				
			0200. 016. ... .[1)]	4	130	20	25	45			42	52		
			0200. 016. ... .[1)]	5	180	25	25	45				87		
		25	0200. 025. ... .[1)]	4	130	20	25	45		37	42			
			0200. 025. ... .[1)]	5	180	25	25	45				73		
		40	0200. 040. ... .[1)]	5	180	25	25	45		52	59			
250	273	10	0250. 010. ... .[1)]	4	130	20	25	45			43	54	64	74
		16	0250. 016. ... .[1)]	4	130	20	25	45			43	54		
			0250. 016. ... .[1)]	5	180	25	25	45					89	103
		25	0250. 025. ... .[1)]	4	130	20	25	45			43			
			0250. 025. ... .[1)]	5	180	25	25	45				75		
		40	0250. 040. ... .[1)]	5	180	25	25	45			61			
300	323.9	10	0300. 010. ... .[1)]	4	130	20	25	45			45	55	65	75
			0300. 010. ... .[1)]	4	130	20	25	45						
		16	0300. 016. ... .[1)]	4	130	20	25	45			45	55		
			0300. 016. ... .[1)]	5	180	25	25	45					91	105
		25	0300. 025. ... .[1)]	4	130	20	25	45			45			
			0300. 025. ... .[1)]	5	180	25	25	45				77	91	
		40	0300. 040. ... .[1)]	5	180	25	25	45			62			

[1)] Enter span L and load group LGV

HYDRA® BOX-TYPE CLAMPS VKK

Standard design
Materials: S235JR, 16Mo3, 10CrMo9-10, dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when usage temperature appropriately low) key see page 60

Note
The flat cams (shear connectors) to support the pipe are not included in the delivery.

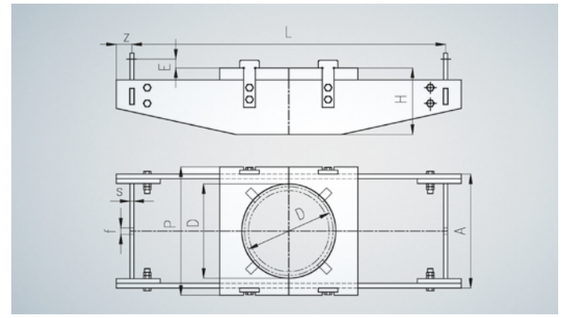
Order example: VKK 0500.100.1400.24-37-0
S235JR, raw

Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type	Installation dimension	Dimensions					Span L in mm							
DN	D	F_N	VKK..	E	A	H	D	P	z	400	500	600	800	1000	1200	1400	1600
–	mm	kN	–	mm	mm	mm	mm	mm	mm	Weight in kg							
100	114.3	25	0100. 025..[1]..	19	154	166	116	173	22	14	16	17	21				
100	114.3	40	0100. 040..[1]..	15	164	200	116	188	24	20	23	25	29				
100	114.3	63	0100. 063..[1]..	35	174	245	116	203	28		33	36	42	48			
125	139.7	25	0125. 025..[1]..	19	179	166	142	198	22		17	19	22	26			
125	139.7	40	0125. 040..[1]..	15	189	200	142	213	24		24	27	31	37			
125	139.7	63	0125. 063..[1]..	35	199	245	142	228	28		36	39	45	51			
150	168.3	25	0150. 025..[1]..	19	208	166	170	227	22		19	21	24	28			
150	168.3	40	0150. 040..[1]..	15	218	200	170	242	24		27	29	33	40			
150	168.3	63	0150. 063..[1]..	35	228	245	170	257	28			42	48	54	63		
150	168.3	100	0150. 100..[1]..	40	243	290	170	279	40			69	79	89	100		
200	219.1	25	0200. 025..[1]..	19	259	166	222	278	22		22	24	27	31			
200	219.1	40	0200. 040..[1]..	15	269	200	222	293	24			34	38	45	52		
200	219.1	63	0200. 063..[1]..	35	279	245	222	308	28			48	54	60	69		
200	219.1	100	0200. 100..[1]..	40	294	290	222	330	40				89	98	110	124	
200	219.1	160	0200. 160..[1]..	50	319	360	222	367	44				143	159	176	195	
250	273	40	0250. 040..[1]..	10	323	205	276	347	24			39	43	50	57		
250	273	63	0250. 063..[1]..	30	333	250	276	362	28			55	61	67	76		
250	273	100	0250. 100..[1]..	40	348	290	276	384	40				101	110	122	136	
250	273	160	0250. 160..[1]..	50	373	360	276	421	44				160	176	192	211	
250	273	250	0250. 250..[1]..	40	398	400	276	458	56				239	261	284	310	
300	323.9	40	0300. 040..[1]..	10	373	205	328	397	24			44	48	55	62		
300	323.9	63	0300. 063..[1]..	30	383	250	328	412	28			63	69	75	84		
300	323.9	100	0300. 100..[1]..	40	398	290	328	434	40				112	122	134	148	
300	323.9	160	0300. 160..[1]..	50	423	360	328	471	44				176	192	209	228	
300	323.9	250	0300. 250..[1]..	40	448	400	328	508	56				260	283	305	331	
350	355.6	40	0350. 040..[1]..	10	405	205	360	429	24			47	52	58	65		
350	355.6	63	0350. 063..[1]..	30	415	250	360	444	28			67	73	80	88		
350	355.6	100	0350. 100..[1]..	35	430	295	360	466	40				117	127	139	153	
350	355.6	160	0350. 160..[1]..	50	455	360	360	503	44					203	220	239	261
350	355.6	250	0350. 250..[1]..	40	480	400	360	540	56					298	320	346	376
400	406.4	63	0400. 063..[1]..	30	466	250	411	495	28				83	89	98	108	
400	406.4	100	0400. 100..[1]..	35	481	295	411	517	40				130	139	152	166	
400	406.4	160	0400. 160..[1]..	40	506	370	411	554	44					221	237	256	279
400	406.4	250	0400. 250..[1]..	30	531	410	411	591	56					322	345	371	401
400	406.4	400	0400. 400..[1]..	40	556	490	411	628	70					465	497	528	559
450	457	63	0450. 063..[1]..	25	517	255	462	546	28				90	96	105	116	
450	457	100	0450. 100..[1]..	30	532	300	462	568	40				141	151	163	177	
450	457	160	0450. 160..[1]..	40	557	370	462	605	44					240	256	275	298
450	457	250	0450. 250..[1]..	30	582	410	462	642	56					342	364	390	421
450	457	400	0450. 400..[1]..	40	607	490	462	679	56					499	530	561	592

[1] Enter span L and load group LGV (see page 83)

HYDRA® BOX-TYPE CLAMPS VKK



Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type	Installation dimension	Dimensions					Span L in mm							
DN	D	F_N	VKK..	E	A	H	D	P	z	1000	1200	1400	1600	1800	2000	2200	2400
–	mm	kN	–	mm	mm	mm	mm	mm	mm	Weight in kg							
500	508	63	0500. 063..[1]..	25	568	255	514	597	28	108	117	128	138				
500	508	100	0500. 100..[1]..	30	583	300	514	619	40	166	177	192	208				
500	508	160	0500. 160..[1]..	40	608	370	514	656	44		275	294	317	341			
500	508	250	0500. 250..[1]..	30	633	410	514	693	56		393	419	450	482			
500	508	400	0500. 400..[1]..	40	658	490	514	730	70		568	599	630	672			
550	559	63	0550. 063..[1]..	25	619	255	565	648	28	119	128	139	150				
550	559	100	0550. 100..[1]..	30	634	300	565	670	40	181	193	207	223				
550	559	160	0550. 160..[1]..	40	659	370	565	707	44		293	312	335	360			
550	559	250	0550. 250..[1]..	30	684	410	565	744	56		421	447	478	510			
550	559	400	0550. 400..[1]..	40	709	490	565	781	70		605	636	667	709			
600	610	100	0600. 100..[1]..	30	685	300	617	721	40	196	208	222	239				
600	610	160	0600. 160..[1]..	40	710	370	617	758	44		317	336	359	384			
600	610	250	0600. 250..[1]..	30	735	410	617	795	56		452	479	510	543			
600	610	400	0600. 400..[1]..	40	760	490	617	832	70			677	709	751	795		
600	610	630	0600. 630..[1]..	50	785	620	617	869	74			984	1031	1078	1126		
700	711	100	0700. 100..[1]..	20	786	320	719	822	40	242	257	273	291				
700	711	160	0700. 160..[1]..	40	811	380	719	859	44			383	407	431	461		
700	711	250	0700. 250..[1]..	30	836	420	719	896	56			542	573	606	640		
700	711	400	0700. 400..[1]..	40	861	490	719	933	70			764	795	838	882		
700	711	630	0700. 630..[1]..	40	886	630	719	970	74				1126	1173	1221	1283	
800	813	100	0800. 100..[1]..	20	888	320	822	924	40	283	298	314	332				
800	813	160	0800. 160..[1]..	40	913	380	822	961	44			437	461	486	516		
800	813	250	0800. 250..[1]..	20	938	430	822	998	56			610	641	674	709		
800	813	400	0800. 400..[1]..	30	963	500	822	1035	70			847	878	920	965	1018	
800	813	630	0800. 630..[1]..	40	988	630	822	1072	74				1249	1296	1343	1406	1480
900	914	160	0900. 160..[1]..	30	1014	390	924	1062	44			492	516	541	571		
900	914	250	0900. 250..[1]..	20	1039	430	924	1099	56			680	712	745	780		
900	914	400	0900. 400..[1]..	30	1064	500	924	1136	70				981	1024	1069	1123	
900	914	630	0900. 630..[1]..	40	1089	630	924	1173	74				1387	1434	1481	1545	1619
900	914	1000	0900. 1000..[1]..	50	1114	780	924	1210	94					1974	2036	2097	2179
1000	1016	160	1000. 160..[1]..	30	1116	390	1027	1164	44			549	573	598	628		
1000	1016	250	1000. 250..[1]..	20	1141	430	1027	1201	56			760	792	825	860		
1000	1016	400	1000. 400..[1]..	30	1166	500	1027	1238	70				1083	1126	1171	1224	1273
1000	1016	630	1000. 630..[1]..	40	1191	630	1027	1275	74					1536	1583	1646	1720
1000	1016	1000	1000. 1000..[1]..	50	1216	780	1027	1312	94						2230	2292	2373

[1] Enter span L and load group LGV

Size	12	16	20	24	30	36	42	48	56	64
Load group LGV F_N in kN	7	12	20	33	50	70	100	132	180	240
Dimensions f in mm	14	18	22	26	35	42	47	52	62	72
s in mm	8-10	10-15	10-20	10-20	15-25	15-30	20-30	20-35	25-35	25-35

Standard design
Materials: S235JR, 16Mo3,
13CrMo4-5, 10CrMo9-10
dependent on the service temperature
Surface: blank

Options
For other materials see page 60
Surface: primed. Hot-dip galvanized.
(Only makes sense when usage temperature appropriately low) key see page 60

Note
The round cams (to fit the hole diameter d) to support the pipe are not included in the delivery.

Order example: VSR 0400.063.1000.00-16.0
16Mo3, blank

1) Enter span L and for VKR load group LGV (see page 85), for VSR/VPR enter load group LGV "00".
2) Applies to maximum span, may be less for smaller spans.

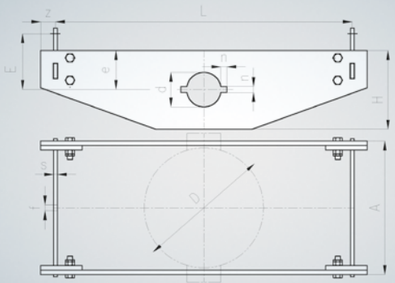
Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type VKR.. VSR.. VPR..	Dimensions							Span L in mm							
						VGR		VSR/VPR										
DN	D	F_N		A	H[2]	E	e	E	e	W	400	500	600	800	1000	1200	1400	1600
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	Weight in kg							
100	114.3	25	0100. 025..[1]..	150	180	120	85	85	5	243	17	19	23	27				
100	114.3	40	0100. 040..[1]..	154	210	140	105	105	5	243	23	26	32	37				
100	114.3	63	0100. 063..[1]..	158	260	175	130	130	0	251		38	48	56	63			
125	139.7	25	0125. 025..[1]..	175	180	120	85	85	5	269		19	24	27	31			
125	139.7	40	0125. 040..[1]..	179	210	140	105	105	5	269		26	33	37	42			
125	139.7	63	0125. 063..[1]..	183	260	175	130	130	0	277		36	47	55	62			
150	168.3	25	0150. 025..[1]..	204	190	120	85	85	5	297		19	25	28	32			
150	168.3	40	0150. 040..[1]..	208	220	140	105	105	5	297		27	34	39	44			
150	168.3	63	0150. 063..[1]..	212	270	175	130	130	0	305			42	57	65	73		
150	168.3	100	0150. 100..[1]..	218	330	205	155	155	-5	309			71	93	106	119		
200	219.1	25	0200. 025..[1]..	255	200	120	85	85	5	348		20	22	29	34			
200	219.1	40	0200. 040..[1]..	259	240	140	105	105	5	348			31	42	47	53		
200	219.1	63	0200. 063..[1]..	263	270	175	130	130	0	356			43	60	68	75		
200	219.1	100	0200. 100..[1]..	269	330	205	155	155	-5	360				98	109	122	135	
200	219.1	160	0200. 160..[1]..	279	380	250	190	190	0	374				174	192	210	228	
250	273	40	0250. 040..[1]..	313	250	140	105	105	5	402			32	43	49	56		
250	273	63	0250. 063..[1]..	317	270	175	130	130	0	410			45	63	71	78		
250	273	100	0250. 100..[1]..	323	330	205	155	155	-5	414				102	113	126	139	
250	273	160	0250. 160..[1]..	333	380	250	190	190	0	428				182	200	218	236	
250	273	250	0250. 250..[1]..	343	400	270	200	200	0	442				262	285	309	332	
300	323.9	40	0300. 040..[1]..	363	260	140	105	105	5	453			33	45	51	59		
300	323.9	63	0300. 063..[1]..	367	285	175	130	130	0	461			46	66	73	83		
300	323.9	100	0300. 100..[1]..	373	330	205	155	155	-5	465				106	117	130	143	
300	323.9	160	0300. 160..[1]..	383	380	250	190	190	0	479				189	207	225	243	
300	323.9	250	0300. 250..[1]..	393	400	270	200	200	0	493				272	296	319	343	
350	355.6	40	0350. 040..[1]..	395	260	140	105	105	5	485			34	46	52	60		
350	355.6	63	0350. 063..[1]..	399	300	185	140	140	10	493				68	76	86	95	
350	355.6	100	0350. 100..[1]..	405	330	205	155	155	-5	497				108	119	132	146	
350	355.6	160	0350. 160..[1]..	415	380	250	190	190	0	511				212	230	248	265	
350	355.6	250	0350. 250..[1]..	425	410	270	200	200	0	525					302	325	349	376
400	406.4	63	0400. 063..[1]..	450	320	185	140	140	10	543				57	79	90	101	
400	406.4	100	0400. 100..[1]..	456	340	205	155	155	-5	547				92	123	136	152	
400	406.4	160	0400. 160..[1]..	466	400	250	190	190	0	561					219	237	261	280
400	406.4	250	0400. 250..[1]..	476	420	275	205	205	5	575					315	339	363	391
400	406.4	400	0400. 400..[1]..	486	480	340	240	240	0	581					458	491	525	559
450	457	63	0450. 063..[1]..	501	320	185	140	140	10	594				58	81	92	104	
450	457	100	0450. 100..[1]..	507	340	205	155	155	-5	598				94	127	140	156	
450	457	160	0450. 160..[1]..	517	400	250	190	190	0	612					226	244	268	287
450	457	250	0450. 250..[1]..	527	420	275	205	205	5	626					324	348	372	401
450	457	400	0450. 400..[1]..	537	480	340	240	240	0	632					469	503	537	571

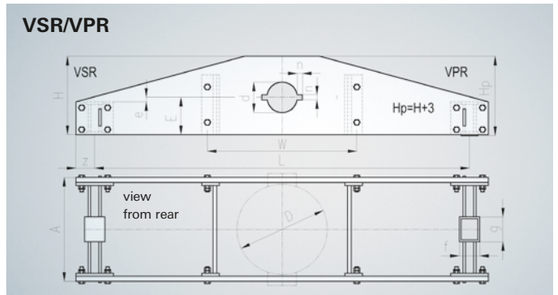
DN	100-125	150	200	250	300-350	400-450	500-550	600	700	800	900	1000
d in mm	51	63	79	92	118	144	173	199	224	250	279	330
n in mm	13	13	16	16	16	16	16	16	16	16	16	16

HYDRA® BOX-TYPE CLAMPS VKR, VSR/VPR

VKR



VSR/VPR



1) Enter span L and for VKR load group LGV (see page 85), for VSR/VPR enter load group LGV "00".
2) Applies to maximum span, may be less for smaller spans.

Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type VKR.. VSR.. VPR..	Dimensions							Span L in mm							
						VGR		VSR/VPR										
DN	D	F_N		A	H[2]	E	e	E	e	W	1000	1200	1400	1600	1800	2000	2200	2400
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	Weight in kg							
500	508	63	0500. 063..[1]..	552	365	205	160	160	30	645	90	100	112	124				
500	508	100	0500. 100..[1]..	558	390	220	170	170	10	649	136	148	167	185				
500	508	160	0500. 160..[1]..	568	430	260	200	200	10	663		257	275	301	324			
500	508	250	0500. 250..[1]..	578	450	275	205	205	5	677		362	386	419	449			
500	508	400	0500. 400..[1]..	588	510	340	240	240	0	683		515	549	583	635			
550	559	63	0550. 063..[1]..	603	365	205	160	160	30	696	92	102	115	127				
550	559	100	0550. 100..[1]..	609	390	220	170	170	10	700	140	152	171	189				
550	559	160	0550. 160..[1]..	619	430	260	200	200	10	714		264	282	308	331			
550	559	250	0550. 250..[1]..	629	450	275	205	205	5	728		371	396	429	459			
550	559	400	0550. 400..[1]..	639	510	340	240	240	0	734		527	561	595	646			
600	610	100	0600. 100..[1]..	660	410	230	180	180	20	751	120	160	177	198				
600	610	160	0600. 160..[1]..	670	440	260	200	200	10	765		270	289	315	342			
600	610	250	0600. 250..[1]..	680	470	275	205	205	5	779		381	405	439	479			
600	610	400	0600. 400..[1]..	690	545	340	240	240	0	785			578	612	665	717		
600	610	630	0600. 630..[1]..	700	630	410	300	300	0	801			890	940	989	1062		
700	711	100	0700. 100..[1]..	761	440	250	200	200	40	852		177	190	208	228			
700	711	160	0700. 160..[1]..	771	480	275	215	215	25	866			312	332	363	393		
700	711	250	0700. 250..[1]..	781	510	290	220	220	20	880			432	466	503	546		
700	711	400	0700. 400..[1]..	791	560	350	250	250	10	886			611	646	700	750		
700	711	630	0700. 630..[1]..	801	670	415	305	305	5	902				983	1033	1107	1185	
800	813	100	0800. 100..[1]..	863	460	260	210	210	50	954		153	202	222	242			
800	813	160	0800. 160..[1]..	873	500	285	225	225	35	968			333	353	385	415		
800	813	250	0800. 250..[1]..	883	520	300	230	230	30	982			459	495	532	571		
800	813	400	0800. 400..[1]..	893	600	365	265	265	25	988			644	680	729	787	840	
800	813	630	0800. 630..[1]..	903	710	415	305	305	5	1004				1027	1078	1153	1231	1313
900	914	160	0900. 160..[1]..	974	520	295	235	235	45	1069			353	378	407	438		
900	914	250	0900. 250..[1]..	984	540	310	240	240	40	1083			487	523	561	601		
900	914	400	0900. 400..[1]..	994	620	375	275	275	35	1089				721	765	824	879	
900	914	630	0900. 630..[1]..	1004	720	430	320	320	20	1105				1078	1129	1206	1286	1360
900	914	1000	0900. 1000..[1]..	1014	840	505	385	385	25	1125					1822	1893	1995	2113
1000	1016	160	1000. 160..[1]..	1076	560	315	255	255	65	1171			301	407	438	470		
1000	1016	250	1000. 250..[1]..	1086	580	330	260	260	60	1185			407	561	601	643		
1000	1016	400	1000. 400..[1]..	1096	680	395	295	295	55	1191				761	807	869	925	992
1000	1016	630	1000. 630..[1]..	1106	750	445	335	335	35	1207					1188	1268	1351	1427
1000	1016	1000	1000. 1000..[1]..	1116	900	510	390	390	30	1227						1987	2093	2203

Load group LGV		12	16	20	24	30	36	42	48	56	64
Nominal load LGV F_N in kN		7	12	20	33	50	70	100	132	180	240
Dimensions f in mm		14	18	22	26	35	42	47	52	62	72
s in mm		8-10	10-15	10-20	10-20	15-25	15-30	20-30	20-35	25-35	25-35

Nominal load LGV F_N in kN		25	40	63	100	160	250	400	630	1000
VKR	z in mm	22	24	28	40	44	56	70	74	94
VGR/VSR and VPR	f in mm	100/110	100/110	100/110	100/140	120/170	130/220	165/240	205/240	315/315
	g in mm	55/110	60/110	80/110	84/140	135/170	145/200	175/240	225/240	265/315
	z in mm	74	74	82	82	100	113	143	175	230

DYNAMIC COMPONENTS

STRUCTURE OF THE TYPE DESIGNATION

The type designation consists of three parts:
1. Series, defined by three letters
2. Nominal size, defined by several number groups
3. Option code, defined by figure codes, separated from the nominal size by hyphens

Type designations without option codes refer to standard versions.

Diagram illustrating the naming principle

			.				-		.	
Model series				Nominal size					Option code	

Type designation of the products

Shock absorbers

S	S	B		9	9	9	9	.	9	9	.	9	9	9	9	.	9		Example
Model series				Nominal load					Stroke			Installation dimension					Type			

Extension for shock absorbers

S	B	V	9	9	9	9	.	9	9	9	.	9		Example
Model series			Nominal load					Length				Type			

Sway struts

S	S	G	9	9	9	9	.	9	9	9	9	.	9		Example
Model series			Nominal load					Length					Type					

Bracket

M	B	W	9	9	9	9	.	9		Example
Model series			Nominal load					Surface protection					

Alternating load clamps

A	A	A	9	9	9	9	.	9	9	9	.	9	9	9	9	.	9	9	.	9		Example
Model series			Nominal diameter					Nominal load				MSL & MSN: Installation dimension VGR: Span					Material			Surface protection						

HYDRAULIC SHOCK ABSORBERS AND SWAY SUPPRESSORS

Hydraulic shock absorbers and sway suppressors are components that form an important part of the safety technology for pipelines and system components and serve to protect them. The hydraulic shock absorbers and sway suppressors are used to prevent damage to devices, pipes, pressure containers, valves, pumps, that is caused by suddenly occurring dynamic loads. This includes dynamic load cases, which, on the one hand can occur during operation such as: water hammers, pipe breaks or pressure surges through drain safety valves; and on the other hand, from external influences such as earthquakes, explosions and wind stress. Furthermore, the hydraulic shock absorbers and sway suppressors can be used as sway dampeners when pipelines and system components are oscillating.

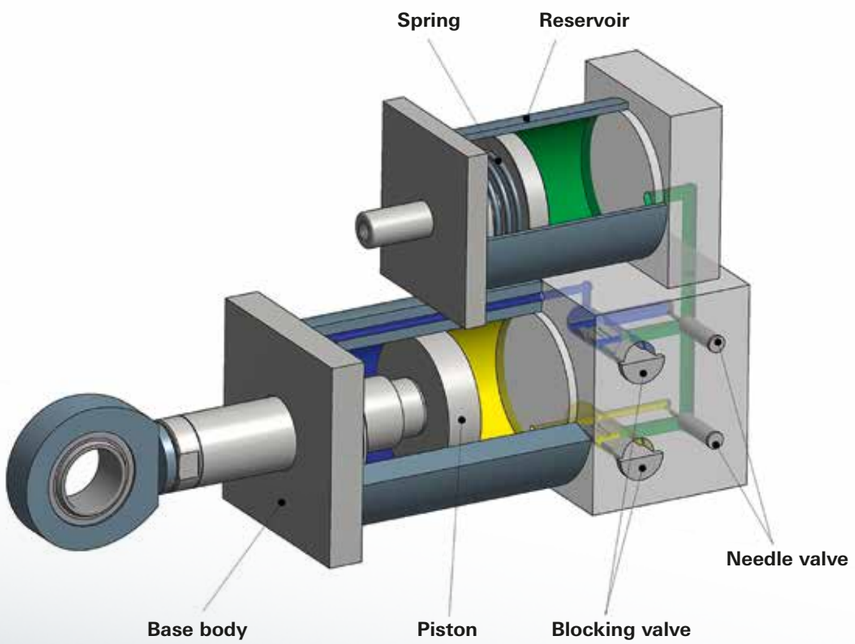
Precondition for use as sway suppressor

- Amplitude > 0.5 mm
- Frequency between 1 Hz – 33 Hz

The use of hydraulic shock and sway suppressors limits the travel amplitudes occuring dynamically to a minimum level. Movements from temperature changes are not limited by hydraulic shock absorbers and sway suppressors.

Function

With a dynamic load that moves the piston faster than the set closing speed (2 mm/s as standard), the no-return valve closes, the unobstructed flowing of the silicone oil is impeded and the sway suppressor now absorbs the forces. If the set force is underrun, for example by reversing the direction of movement, the no-return valve opens again. During an oscillating movement, both no-return valves open and close alternately; that means the sway suppressor takes the same load in the push and pull direction. The overflow valve or needle valve has the task of enabling the piston to yield to the defined nominal load.



HYDRAULIC SHOCK ABSORBERS AND SWAY SUPPRESSORS

Construction and quality characteristics

Shock and sway suppressors can be installed in any position, due to the pre-tensioned hydraulic system. The fluid level of the absorbers/suppressors can be easily and reliably observed from the relative positions of the piston rods. Shock absorbers and sway suppressors have a modular design. Adjustments and changes, for example due to very narrow installation area or replacement of other sway suppressor makes, can be performed easily through modification of the standard components.

The shock absorbers and sway suppressors have two independently working valve pairs, which are accessible from the outside. In this way they can be optimized to the customer's requirements on the test bench (response velocity, by-pass velocity). Even after installation, adjustment is possible if required. Due to independently working closing valves, shock and sway suppressors apply the required force even at high frequencies in the push and pull direction. When the direction of movement changes, the second valve can already react before the first valve has returned to its start position. Due to the use of the most modern, high-grade seal and guide components, a usage time of 40 years can be estimated for a shock absorber for core technical applications. Appropriate simulations were carried out in conjunction with the TÜV.

Depending on the usage conditions of the hydraulic shock absorbers and sway suppressors, a maintenance-free period of between 10 and 25 years can be guaranteed.

The following were taken into account in the design:

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

Version

Hydraulic shock and sway supports are manufactured in the following versions: Standard version
housing parts made from carbon steel with extremely corrosion-resistant zinc-iron coating 15 µm. The piston rods are coated on all sides with 40 µm nickel and the shaft additionally coated with 20 µm hard chromium. Additional material combinations and special coatings are available at the customer's request.

Standard settings and test values in accordance with KTA 3205.3 and VGB-R510L:

Starting resistance	max. 2 % of the nominal load
Friction	max. 2 % of the nominal load
Response velocity	2 – 6 mm/s
By-pass velocity	0.2 – 2.0 mm/s
Piston rod travel Sa	> 0.5 mm (play)
Piston rod travel Sb	< Amount ± 0.02 Nominal travel (force generation peak to peak)
Temperatures	max. operating temperature 80 °C Short-term operating temperature for max. 3 hours 150 °C
Later deflection from bolt axis	max.: ± 70 °
Deflection in bolt axis	min.: ± 5 °

Special setting can be made at customer request

HYDRAULIC SHOCK ABSORBERS AND SWAY SUPPRESSORS

Maintenance of hydraulic shock and sway suppressors

Hydraulic sway suppressors consist of metallic and organic components. According to the different versions, the metallic components are designed for a usage duration of the maximum lifespan of a system (up to 40 years). The hydraulic liquid and seals consist of organic components subject to natural ageing. Furthermore, these components may experience accelerated ageing under extreme usage conditions (continuous oscillation, use at high temperatures, extreme radiation exposure). Depending on the installation location and purpose of use of the hydraulic shock and sway suppressors, the seals and hydraulic liquid should be replaced after 20 years. The maintenance of parts of the system is the responsibility of the system operator, but the following maintenance recommendations apply to the hydraulic shock and sway suppressors:

- Annual visual inspection of the sway suppressors and check of the position of the reservoir piston rod (as long as this is visible, there is enough hydraulic liquid in the sway suppressor).
- After about 10 to 15 years, a functional check of individual sway suppressors on a hydraulic test rig is recommended.
- After a maximum of 20 years the hydraulic liquid and the seals should be replaced.

We are happy to put together a hydraulic shock and sway suppressor maintenance plan for you tailored to the system and purpose of use.

Calculation installation position, operating position

Cp = Installation position
Hp = Operating position
T/T = Overall travel
- Mvt = Feed movement
+ Mvt = retraction movement
z = lost travel piston rod

Movement in one direction

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

$$Hp = Cp +/- Mvt$$

Movement in two directions

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

Extensions SBV

Extensions are used to bridge given installation lengths without having to change the existing steel structure.

Furthermore, the specified installation dimensions can be balanced out in the substitution of third-party manufacturers. The extensions are fastened to the cylinder base of the shock absorbers and sway suppressors via threaded components. In this the thread dimension corresponds to the thread dimension of the particular joint head. The model also offers the option of compensating for existing construction tolerances through adjustment. The extent of the adjustment is based on type and size and lies between
+/– 10 mm for the design S,
+/– 40 mm for design C up to
+/– 100 mm for design W.

As standard, the extensions are manufactured from carbon steels and coated with zinc irons. Depending on the model of the shock absorbers and sway suppressors, the extensions are appropriately adjusted and on customer request can be delivered in all typical commercial steel types and coating systems.

OTHER DYNAMIC COMPONENTS

Sway strut SSG

Sway struts are push-pull elements and are mainly used to reduce dynamic loads. In addition, sway struts can be used as pipeline guides or as flexible fixed points, so-called "axial stops".

Construction and quality characteristics

Sway struts consist of a base element and in each case two threaded inserts with joint head. Installation tolerances can be compensated for via the fine thread of the thread inserts. The type and size of the sway strut are defined based on the nominal load and the required overall installation length. Sway struts permit a lateral deviation in relation to the bolt axis of max.: ± 70°, in bolt axis of at least ± 5°.
The following were taken into account in the design of sway struts:

- VGB guidelines
- KTA 3205.3
- DIN 1050, DIN 4100
- BS 3974, Part 1
- ANSI B31.1
- MSS SP 58
- SVDB guidelines
- ASME Section III Subsection NF

Sway struts are approved by TÜV.

Version: Standard design

In the standard version, sway struts are manufactured from carbon steels and coated with zinc irons.
Spherical bearings are obtained from reputable manufacturers. As standard, maintenance-free spherical bearings are used, maintenance-mandatory ones for core technical applications.

Weld-on bracket MBW

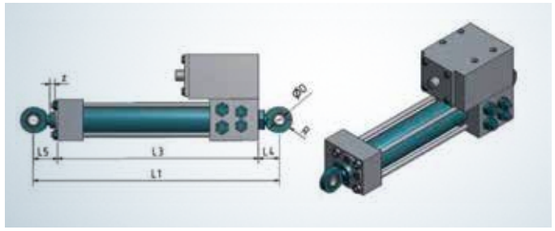
The weld-on bracket is used as a connecting element between hydraulic shock absorbers and sway suppressors and sway struts and the steel structure, to transfer dynamic forces. As a connecting element, the permitted loads are precisely tuned to the particular
main components.

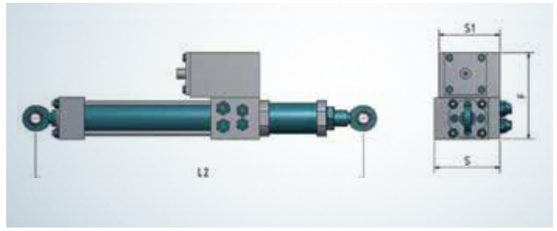
Alternating load clamps

Alternating load clamps are connecting elements between hydraulic sway suppressors or sway struts and the pipelines. The values for the design of the alternating load clamps can be taken from the installation dimensions and load tables of the individual pipe clamp types.

SHOCK ABSORBER SSB

Shock absorber SSB: model B - up to 78 kN



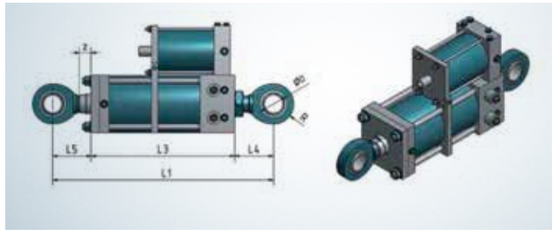


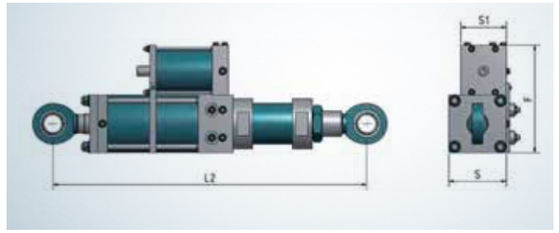
Order example: SSB 0013.05.1000.B

Nominal load 13 kN, stroke 5" (127 mm), length 1000 mm, model B

Type	FN	Stroke	Stroke	L1 min	L1 max	L2 min	L2 max	L3	Ø D	L4	L5	R	F	S	S1	z	Weight	Bracket
–	kN	"	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	–
SSB 0003.05. … .B	3	5	127	364	491	384	1000	287	10	28	49	15	120	87	81	7	10.0	MBW 0008-3
SSB 0005.05. … .B	5	5	127	364	491	384		287									10.0	MBW 0008-3
SSB 0008.05. … .B	8	5	127	364	491	384		287									10.0	MBW 0008-3
SSB 0013.05. … .B	13	5	127	393	520	413	1500	310	15	45	38	22	135	103	96	9	13.5	MBW 0013-3
SSB 0013.10. … .B	13	10	254	520	774	540		437									15.0	MBW 0013-3
SSB 0013.15. … .B	13	15	381	647	1028	667		564									19.2	MBW 0013-3
SSB 0045.05. … .B	45	5	127	442	569	477	2000	334	25	50	58	32	200	115	105	17	26.5	MBW 0045-3
SSB 0045.10. … .B	45	10	254	569	823	604		461									28.6	MBW 0045-3
SSB 0045.15. … .B	45	15	381	696	1077	731		588									30.7	MBW 0045-3
SSB 0045.20. … .B	45	20	508	823	1331	858		715									32.8	MBW 0045-3
SSB 0078.05. … .B	78	5	127	495	622	536	2500	355	35	68	72	41	240	135	130	20	37.1	MBW 0078-3
SSB 0078.10. … .B	78	10	254	622	876	663		482									41.6	MBW 0078-3
SSB 0078.15. … .B	78	15	381	749	1130	790		609									47.7	MBW 0078-3
SSB 0078.20. … .B	78	20	508	876	1384	917		736									52.3	MBW 0078-3

Shock absorber SSB: model A - from 121 kN to 303 kN





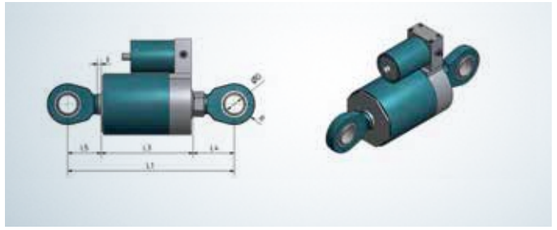
Order example: SSB 0121.05.1000.A

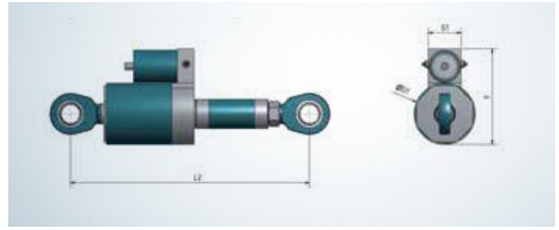
Nominal load 121 kN, stroke 5" (127 mm), length 1000 mm, model A

Type	FN	Stroke	Stroke	L1 min	L1 max	L2 min	L2 max	L3	Ø D	L4	L5	R	F	S	S1	z	Weight	Bracket
–	kN	"	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	–
SSB 0121.05. … .A	121	5	127	545	672	362	3000	362	45	90	93	51	260	145	105	25	59.0	MBW 0130-3
SSB 0121.10. … .A		10	254	672	926	489		489									73.0	MBW 0130-3
SSB 0121.15. … .A		15	381	799	1180	616		616									83.2	MBW 0130-3
SSB 0121.20. … .A		20	508	926	1434	743		743									93.4	MBW 0130-3
SSB 0202.05. … .A	202	5	127	625	752	381		381	60	119	125	68	295	180	105	30	77.0	MBW 0234-3
SSB 0202.10. … .A		10	254	752	1006	508		508									93.0	MBW 0234-3
SSB 0202.15. … .A		15	381	879	1260	635		635					325		134		106.3	MBW 0234-3
SSB 0202.20. … .A		20	508	1006	1514	762		762									119.6	MBW 0234-3
SSB 0303.05. … .A	303	5	127	679	806	420		420	70	137	140	80	355	210	134	30	106.0	MBW 0380-3
SSB 0303.10. … .A		10	254	824	1078	547		547									126.0	MBW 0380-3
SSB 0303.15. … .A		15	381	951	1332	674		674									145.2	MBW 0380-3
SSB 0303.20. … .A		20	508	1078	1586	801		801									164.4	MBW 0380-3

SHOCK ABSORBER SSB / EXTENSION SBV

Shock absorber SSB: model A - from 590 kN



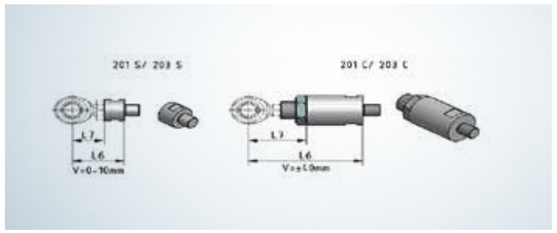


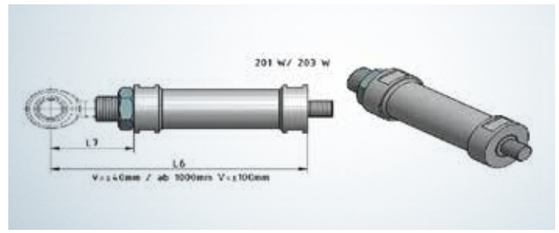
Order example: SSB 0590.05.1000.A

Nominal load 590 kN, stroke 5" (127 mm), length 1000 mm, model A

Type	FN	Stroke	Stroke	L1 min	L1 max	L2 min	L2 max	L3	Ø D	L4	L5	R	F	Ø D1	S1	z	Weight	Bracket
–	kN	"	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	–
SSB 0590.05. … .A	590	5	127	689	816	770	3100	399	80	157	133	90	428	268	145	3	161	MBW 0600-3
SSB 0590.10. … .A		10	254	816	1070	897		526									192	MBW 0600-3
SSB 0835.05. … .A	835	5	127	735	862	825	3400	443	90	157	135	100	488	310	170	5	250	MBW 0900-3
SSB 0835.10. … .A		10	254	862	1116	952		570									288	MBW 0900-3
SSB 1250.05. … .A	1250	5	127	829	956	927	3800	487	110	182	160	123	538	360	170	5	350	MBW 1250-3
SSB 1250.10. … .A		10	254	956	1210	1054		614									408	MBW 1250-3
SSB 1730.05. … .A	1730	5	127	908	1035	1024	4200	536	120	197	175	138	648	420	220	5	515	MBW 1750-3
SSB 1730.10. … .A		10	254	1035	1289	1151		663									587	MBW 1750-3

Extension SBV





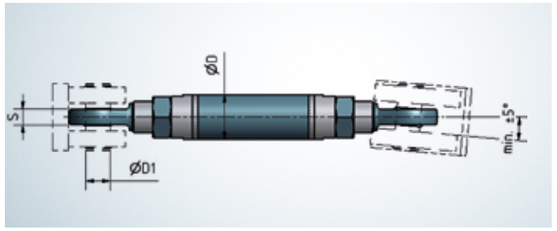
Order example: SBV 0121.200.S

Nominal load 121 kN, length 200 mm, model S

Type	FN	Type S					Type C					Type W				
		L6 min	L6 max	L7	Weight at L6 min	Weight increase [kg] per additional 100 mm	L6 min	L6 max	L7	Weight at L6 min	Weight increase [kg] per additional 100 mm	L6 min	L6 max	L7	Weight at L6 min	Weight increase [kg] per additional 100 mm
–	kN	"	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
SBV 0008…. .	8	57	197	37	0.1	0.4	198	429	83	1.8	1.5	430	1120	83	3.3	0.5
SBV 0013…. .	13	57	197	37	0.1	0.4	198	429	83	1.8	1.5	430	1120	83	3.3	0.5
SBV 0045…. .	45	89	249	54	0.4	1.2	250	441	109	7.8	5	442	1620	109	9.6	1.2
SBV 0078…. .	78	109	269	66	0.8	1.9	270	458	122	7.7	5	459	2090	122	10.2	1.2
SBV 0121…. .	121	150	306	92	2.3	3.9	307	469	145	13.3	7.5	470	2250	145	20.4	2.3
SBV 0202…. .	202	168	258	122.5	4.7	6.2	259	695	174	23.9	12.1	696	2500	174	39.7	3.2
SBV 0303…. .	303	194	368	140	6.2	7.5	369	710	189	23.2	12.1	711	2450	189	40.7	3.2
SBV 0590…. .	590	237	430	157	7.3	8.9	431	930	225	42.4	17.8	931	2575	225	72.6	3.9
SBV 0835…. .	835	247	430	157	9.8	9.8	431	930	225	48	22.3	931	2830	225	87.7	6.9
SBV 1200…. .	1200	280	455	182	14.2	14.2	456	955	250	82.3	29.8	956	3135	250	142.8	10.8
SBV 1730…. .	1730	313	494	197	21.4	17.8	495	970	265	80.8	29.8	971	3495	265	147.4	10.8

SWAY STRUTS SSG

Sway strut SSG: model 1 - up to 600 kN

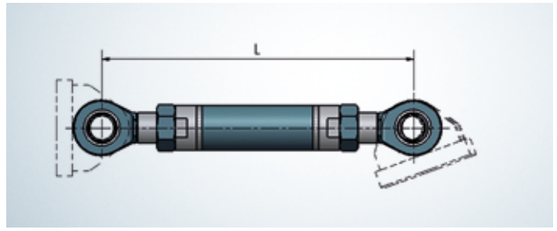


Order example: SSG 0130.500.1

Nominal load 130 kN, length 500 mm, model 1

Type	FN	L min	L max	S	Ø D	Ø D1
–	kN	mm	mm	mm	mm	mm
SSG 0003. ….1	3	114	500	9	20	10
SSG 0005. ….1	5	130	500	10	22	12
SSG 0013. ….1	13	153	500	12	25	15
SSG 0032. ….1	32	188	550	16	36	20
SSG 0045. ….1	45	225	550	20	45	25
SSG 0078. ….1	78	323	600	25	65	35
SSG 0130. ….1	130	389	750	32	76.1	45
SSG 0180. ….1	180	433	750	35	76.1	50
SSG 0234. ….1	234	488	850	44	88.9	60
SSG 0303. ….1	303	549	900	49	101.6	70
SSG 0600. ….1	600	624	1000	55	114.3	80

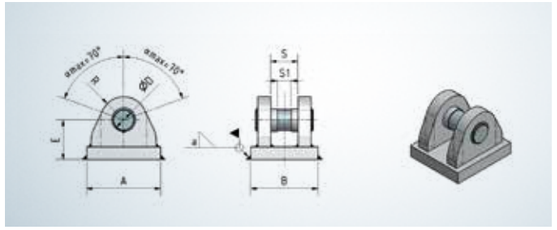
Sway strut SSG: model 2 - up to 4000 kN

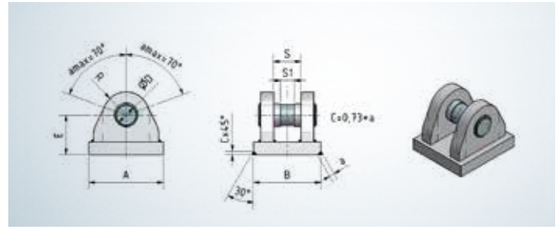


Type	FN	L min	L max	S	Ø D	Ø D1
–	kN	mm	mm	mm	mm	mm
SSG 0003. ….2	3	404	2000	9	60.3	10
SSG 0005. ….2	5	412	2000	10	60.3	12
SSG 0013. ….2	13	418	2500	12	60.3	15
SSG 0032. ….2	32	506	3000	16	76.1	20
SSG 0045. ….2	45	518	3000	20	76.1	25
SSG 0078. ….2	78	564	3000	25	76.1	35
SSG 0130. ….2	130	610	3000	32	101.6	45
SSG 0180. ….2	180	628	3000	35	101.6	50
SSG 0234. ….2	234	680	3000	44	139.7	60
SSG 0303. ….2	303	732	3000	49	139.7	70
SSG 0600. ….2	600	800	3000	55	168.3	80
SSG 0750. ….2	750	852	4000	60	177.8	90
SSG 0900. ….2	900	852	4000	60	177.8	90
SSG 1000. ….2	1000	872	4000	70	177.8	100
SSG 1250. ….2	1250	906	5000	70	219.1	110
SSG 1750. ….2	1750	952	5000	85	219.1	120
SSG 2000. ….2	2000	1080	6000	90	273	140
SSG 2500. ….2	2500	1142	6000	105	273	160
SSG 3000. ….2	3000	1198	8000	105	406.4	180
SSG 4000. ….2	4000	1306	8000	130	406.4	200

BRACKET MBW

Bracket MBW





Order example: MBW 0130-3

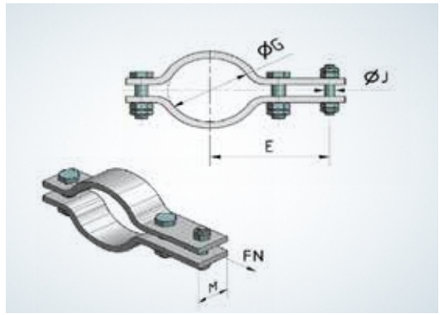
Nominal load 130 kN, surface primed

Type	FN	E	S	S1	A	B	Ø D H7	R	a = 0°	a a = 30°	a = 70°	Weight
–	kN	mm	mm	mm	mm	mm	mm	mm				kg
MBW 0003-3	3	26	13.5	9.5	34	34	10	10	4	4	4	0.3
MBW 0008-3	8	35	15.5	10.5	55	65	10	15	4	4	4	0.5
MBW 0013-3	13	40	18.5	12.5	65	80	15	17.5	4	4	4	1
MBW 0032-3	32	50	30.5	16.5	100	110	20	22.5	4	4	4	2.8
MBW 0045-3	45	60	35.5	20.5	120	120	25	30	4	4	4	3.8
MBW 0078-3	78	70	40.5	25.5	140	140	35	30	4	4	4	6.8
MBW 0130-3	130	85	55.5	32.5	180	180	45	45	4	4	4	13.8
MBW 0180-3	180	105	64.5	35.5	210	210	50	58	4	4	4	22.8
MBW 0234-3	234	120	70.5	44.5	260	240	60	65	4	4	4	36.5
MBW 0380-3	380	140	80.5	49.5	340	280	70	75	4	4	5	64.2
MBW 0600-3	600	155	90.5	55.5	420	300	80	90	4	5	6	85.5
MBW 0750-3	750	170	120	61.7	320	290	90	100	6	8	9	88.3
MBW 0900-3	900	170	120	61.7	350	288	90	105	6	9	10	96.2
MBW 1000-3	1000	200	120	71.7	360	300	100	110	6	10	11	118.6
MBW 1250-3	1250	200	135	71.7	460	315	110	120	6	10	11	151
MBW 1750-3	1750	225	135	86.9	470	330	120	135	8	13	15	200.5
MBW 2000-3	2000	245	165	91.9	540	370	140	165	8	13	15	271.8
MBW 2500-3	2500	265	205	106.9	560	410	160	180	10	14	17	325.8
MBW 3000-3	3000	300	210	107.2	650	500	180	200	10	14	17	482.9
MBW 4000-3	4000	320	230	132.2	850	550	200	230	11	15	17	689.4

THREE-BOLT CLAMP / ALTERNATING LOAD CLAMP MSL

Standard design
Materials: S355J2, 16Mo3, 13CrMo4-5
Surface: blank

Options
For other materials see page 60
Surface: priming, galvanized



Order example: MSL 0300.045.0315 - 52.3
S355J2, primed

Nominal diameter	Pipe outside diameter	Type	Nominal load											
			8 kN				13 kN				32 kN			
			Bolt diameter											
			10 mm				15 mm				20 mm			
DN	D	MSL ..	E	M	Max. ISO	Weight approx.	E	M	Max. ISO	Weight approx.	E	M	Max. ISO	Weight approx.
–	mm	–	mm	mm	mm	kg	mm	mm	kg	mm	mm	mm	mm	kg
15	21.3	0015 ..[1)]	80	30	70	0.6	85	40	75	1.3	-	-	-	-
20	26.9	0020 ..[1)]	85	30	75	0.6	90	40	80	1.4	-	-	-	-
25	33.7	0025 ..[1)]	95	30	85	0.7	100	40	90	1.5	115	60	105	3.6
32	42.4	0032 ..[1)]	100	40	90	0.9	105	40	95	1.5	120	60	110	3.8
40	48.3	0040 ..[1)]	105	40	95	1.0	110	40	100	1.6	125	60	115	3.3
50	60.3	0050 ..[1)]	110	40	100	1.1	120	50	110	2.0	135	60	125	4.9
65	76.1	0065 ..[1)]	120	40	110	1.2	130	50	120	2.6	150	60	140	5.3
80	89.9	0080 ..[1)]	130	40	120	1.6	140	50	130	2.8	160	60	150	5.7
90	102	0090 ..[1)]	135	40	125	1.7	145	50	135	2.9	170	60	160	6.0
100	114.3	0100 ..[1)]	145	40	135	1.8	155	60	145	3.6	180	70	170	7.2
125	139.7	0125 ..[1)]	155	50	145	2.4	165	70	155	4.5	190	70	180	7.8
150	168.3	0150 ..[1)]	175	50	165	2.7	185	80	175	5.7	210	80	200	9.7
200	219.1	0200 ..[1)]	195	60	185	3.8	215	70	205	7.0	240	100	230	13.8
250	273	0250 ..[1)]	225	60	215	5.5	245	80	235	9.3	270	80	260	17.0
300	323.9	0300 ..[1)]	250	60	240	6.3	270	80	260	13.1	295	100	285	23.4
350	355.6	0350 ..[1)]	270	60	260	6.8	290	80	280	14.2	315	100	305	25.1
400	406.4	0400 ..[1)]	310	60	300	7.8	330	80	320	16.0	355	100	345	27.9
450	457	0450 ..[1)]	330	80	320	11.2	350	80	340	17.5	375	100	365	30.2
500	508	0500 ..[1)]	360	80	350	12.6	380	100	370	23.8	405	150	395	49.2
550	559	0550 ..[1)]	400	100	390	17.2	420	100	410	26.3	450	150	440	53.9
600	610	0600 ..[1)]	430	100	420	18.6	450	100	440	28.3	480	150	470	58.1

Nominal diameter	Pipe outside diameter	Type	Nominal load							
			45 kN				78 kN			
			Bolt diameter							
			25 mm				35 mm			
DN	D	MSL ..	E	M	Max. ISO	Weight approx.	E	M	Max. ISO	Weight approx.
–	mm	–	mm	mm	mm	kg	mm	mm	kg	mm
65	76.1	0065 ..[1)]	160	80	145	10.2	180	80	160	9.7
80	89.9	0080 ..[1)]	175	80	160	10.9	190	80	170	10.3
90	102	0090 ..[1)]	185	80	170	11.5	200	80	180	10.8
100	114.3	0100 ..[1)]	200	80	185	12.2	220	80	200	11.7
125	139.7	0125 ..[1)]	210	80	195	13.2	235	100	215	15.8
150	168.3	0150 ..[1)]	230	80	215	14.4	260	120	240	20.8
200	219.1	0200 ..[1)]	260	100	245	20.1	290	150	270	29.7
250	273	0250 ..[1)]	290	100	275	22.8	325	150	305	44.1
300	323.9	0300 ..[1)]	315	120	300	29.9	350	150	330	49.0
350	355.6	0350 ..[1)]	335	150	320	39.5	370	150	350	52.2
400	406.4	0400 ..[1)]	375	150	360	43.8	410	180	390	69.0
450	457	0450 ..[1)]	395	150	380	47.4	435	180	415	74.6
500	508	0500 ..[1)]	425	200	410	68.1	465	200	445	93.4
550	559	0550 ..[1)]	475	200	460	74.8	515	220	495	107.3
600	610	0600 ..[1)]	505	200	490	80.2	540	250	520	129.5

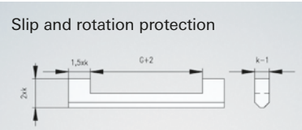
1) Insert nominal load and installation dimension

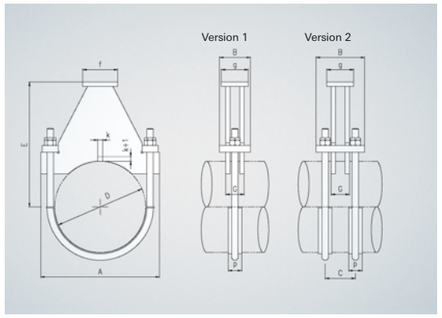
[1)] Insert nominal load bracket MBW. Loads for higher temperatures and materials in accordance with reduction factors on page 61.
The MSN clamp can be used in conjunction with the MBW bracket. This is welded on in the factory.
The anti-slip and rotation lock is supplied loose and needs to be welded on to the pipe at the installation site.

HYDRA® ALTERNATING-LOAD CLAMP MSN

Standard design
Materials: S235JR, 13CrMo4-5, 10CrMo9-10 dependent on the service temperature
Surface: blank

Slip and rotation protection





Options
For other materials see page 60
Surface: primed. Key see page 60

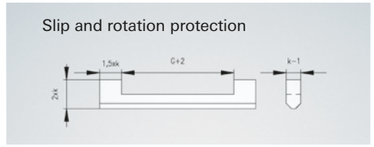
Order example: MSN 0200.029.270.18-37.3
S235JR, primed

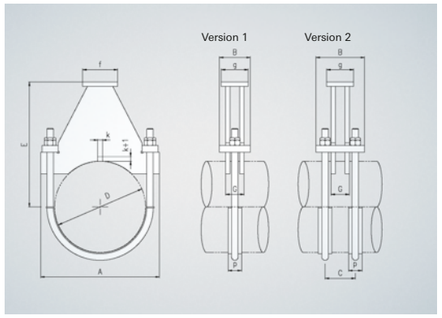
Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type	Max. insulation thickness	Instal-lation dimension	Dimensions								Version	Weight approx.
DN	D	F_n	MSN..	J	E	A	B	C	G	p	k	f	t		
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	–	kg
40	48.3	14	0040. 014,120. ...[1)]	70	120	105	48		35	25	7	50	45	I	0.9
			0040. 014,180. ...[1)]	180											1.1
50	60.3	14	0050. 014,130. ...[1)]	75	130	115	48		35	25	7	50	45	I	1.1
			0050. 014,200. ...[1)]	130	200										1.3
50	60.3	29	0050.029.130. ...[1)]	75	130	115	86	62	45	25	9	60	55	II	1.9
			0050.029.200. ...[1)]	130	200										2.3
65	76.1	14	0065. 014,150. ...[1)]	85	150	135	48		35	25	7	50	45	I	1.3
			0065. 014,210. ...[1)]	140	210										1.6
65	76.1	29	0065. 029,150. ...[1)]	85	150	135	86	62	45	25	9	60	55	II	2.2
			0065.029. 220. ...[1)]	140	220										2.6
80	88.9	14	0080. 014,160. ...[1)]	90	160	145	48		35	25	7	50	45	I	1.4
			0080. 014,230. ...[1)]	145	230										1.8
80	88.9	29	0080. 029,160. ...[1)]	90	160	145	86	62	45	25	9	60	55	II	2.4
			0080. 029,230. ...[1)]	145	230										2.9
100	114.3	29	0100. 029,190. ...[1)]	100	190	170	86	62	45	25	9	60	55	II	2.9
			0100. 029,250. ...[1)]	150	250										3.5
100	114.3	53	0100.053.190. ...[1)]	100	190	185	114	82	60	30	9	80	80	II	5.5
			0100. 053,250. ...[1)]	150	250										6.4
125	139.7	29	0125. 029,210. ...[1)]	110	210	200	86	62	45	25	9	60	55	II	3.4
			0125. 029,270. ...[1)]	160	270										4.1
125	139.7	53	0125.053.210. ...[1)]	110	210	210	114	82	60	30	9	80	80	II	6.3
			0125. 053,270. ...[1)]	160	270										7.4
150	168.3	29	0150. 029,230. ...[1)]	120	230	225	86	62	45	25	9	60	55	II	3.9
			0150. 029,290. ...[1)]	170	290										4.7
150	168.3	53	0150.053.240. ...[1)]	120	240	240	114	82	60	30	9	80	80	II	7.4
			0150.053.300. ...[1)]	170	300										8.6
150	168.3	79	0150. 079,240. ...[1)]	120	240	250	170	130	105	40	16	110	125	II	12
			0150. 079,300. ...[1)]	170	300										14
150	168.3	114	0150.114.240. ...[1)]	120	240	260	192	144	115	40	16	120	135	II	19
			0150.114.300. ...[1)]	170	300										21
200	219.1	29	0200. 029,270. ...[1)]	135	270	280	86	62	45	25	9	60	55	II	5
			0200. 029,330. ...[1)]	185	330										6
200	219.1	53	0200.053.280. ...[1)]	135	280	290	114	82	60	30	9	80	80	II	9.2
			0200.053.340. ...[1)]	185	340										11
200	219.1	79	0200. 079,280. ...[1)]	135	280	300	170	130	105	40	16	110	125	II	15
			0200. 079,340. ...[1)]	185	340										17
200	219.1	114	0200.114.290. ...[1)]	135	290	315	192	144	115	40	16	120	135	II	23
			0200.114.350. ...[1)]	185	350										25
250	273	29	0250. 029,320. ...[1)]	150	320	330	86	62	45	25	9	60	55	II	7
			0250. 029,380. ...[1)]	200	380										8
250	273	53	0250.053.320. ...[1)]	150	320	345	114	82	60	30	9	80	80	II	11
			0250. 053,380. ...[1)]	200	380										13
250	273	79	0250. 079,320. ...[1)]	150	320	355	170	130	105	40	16	110	125	II	18
			0250. 079,380. ...[1)]	200	380										20
250	273	114	0250.114.330. ...[1)]	150	330	370	192	144	115	40	16	120	135	II	27
			0250.114.390. ...[1)]	200	390										30

HYDRA® ALTERNATING-LOAD CLAMP MSN

Standard design
Materials: S235JR,
13CrMo4-5, 10CrMo9-10
dependent on the
service temperature
Surface: blank





Options
For other materials see page 60
Surface: primed. Key see page 60

Order example: MSN 0500.114.480.46-37.3
S235JR, primed

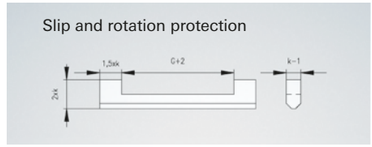
Nominal sizes, dimensions, weights

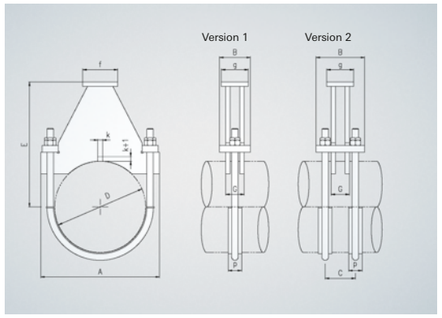
Nominal diameter	Pipe outside diameter	Nominal load	Type	Max. insulation thickness	Instal-lation dimension	Dimensions								Version	Weight approx.
DN	D	F_n	MSN..	J	E	A	B	C	G	p	k	f	t		
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	–	kg
300	323.9	53	0300. 053,350. ...[1)]	155	350	395	114	82	60	30	9	80	80	II	13
			0300. 053,410. ...[1)]	205	410										15
300	323.9	79	0300. 079,350. ...[1)]	155	350	410	170	130	105	40	16	110	125	II	20
			0300. 079,410. ...[1)]	205	410										23
300	323.9	114	0300. 114,360. ...[1)]	155	360	420	192	144	115	40	16	120	135	II	30
			0300. 114,420. ...[1)]	205	420										34
300	323.9	182	0300.182.360. ...[1)]	155	360	440	232	172	135	50	16	145	155	II	40
			0300. 182,420. ...[1)]	205	420										45
350	355.6	53	0350. 053,370. ...[1)]	160	370	430	114	82	60	30	9	80	80	II	15
			0350. 053,430. ...[1)]	210	430										17
350	355.6	79	0350. 079,370. ...[1)]	160	370	440	170	130	105	40	16	110	125	II	21
			0350. 079,430. ...[1)]	210	430										25
350	355.6	114	0350. 114,380. ...[1)]	160	380	450	192	144	115	40	16	120	135	II	32
			0350. 114,440. ...[1)]	210	440										36
350	355.6	182	0350. 182,750. ...[1)]	200	750	470	232	172	135	50	16	145	155	II	43
			0350. 182,810. ...[1)]	250	810										49
400	406.4	79	0400. 079,410. ...[1)]	170	410	490	170	130	105	40	16	110	125	II	25
			0400. 079,470. ...[1)]	220	470										28
400	406.4	114	0400. 114,420. ...[1)]	170	420	505	192	144	115	40	16	120	135	II	36
			0400. 114,480. ...[1)]	220	480										41
400	406.4	182	0400. 182,750. ...[1)]	200	750	520	232	172	135	50	16	145	155	II	49
			0400. 182,810. ...[1)]	250	810										54
400	406.4	265	0400. 265,750. ...[1)]	200	750	540	260	188	145	50	21	155	165	II	68
			0400. 265,810. ...[1)]	250	810										75
450	457	79	0450. 079,440. ...[1)]	175	440	540	170	130	105	40	16	110	125	II	28
			0450. 079,500. ...[1)]	225	500										32
450	457	114	0450. 114,450. ...[1)]	175	450	555	192	144	115	40	16	120	135	II	40
			0450. 114,510. ...[1)]	225	510										45
450	457	182	0450.182.750. ...[1)]	200	750	570	232	172	135	50	16	145	155	II	53
			0450.182.810. ...[1)]	250	810										59
450	457	265	0450.265.750. ...[1)]	200	750	590	260	188	145	50	21	155	165	II	75
			0450. 265,810. ...[1)]	250	810										83
500	506	79	0500.079.470. ...[1)]	180	470	595	170	130	105	40	16	110	125	II	31
			0500.079.530. ...[1)]	230	530										35
500	506	114	0500.114.480. ...[1)]	180	480	605	192	144	115	40	16	120	135	II	45
			0500. 114,540. ...[1)]	230	540										50
500	506	182	0500.182.750. ...[1)]	200	750	625	232	172	135	50	16	145	155	II	58
			0500.182.810. ...[1)]	250	810										64
500	506	265	0500. 265,750. ...[1)]	200	750	640	260	188	145	50	21	155	165	II	81
			0500. 265,810. ...[1)]	250	810										89
500	506	456	0500.456.750. ...[1)]	200	750	680	380	284	230	70	26	300	250	II	148
			0500. 456,810. ...[1)]	250	810										161

[1)] Insert nominal load bracket MBW
The MSN clamp can be used in conjunction with the MBW bracket. This is welded on in the factory.
The anti-slip and rotation lock is supplied loose and needs to be welded on to the pipe at the installation site.

HYDRA® ALTERNATING-LOAD CLAMP MSN

Standard design
Materials: S235JR,
13CrMo4-5, 10CrMo9-10
dependent on the
service temperature
Surface: blank





Options
For other materials see page 60
Surface: primed. Key see page 60

Order example: MSN 0500.114.480.46-37.3
S235JR, primed

Nominal sizes, dimensions, weights

Nominal diameter	Pipe outside diameter	Nominal load	Type	Max. insulation thickness	Instal-lation dimension	Dimensions								Version	Weight approx.
DN	D	F_n	MSN..	J	E	A	B	C	G	p	k	f	t		
–	mm	kN	–	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	–	kg
550	559	79	0550. 079,500. ...[1)]	185	500	654	246	206	180	40	16	180	200	II	42
			0550. 079,560. ...[1)]	235	560										48
550	559	114	0550. 114,510. ...[1)]	185	510	655	278	230	200	40	16	200	220	II	62
			0550. 114,570. ...[1)]	235	570										71
550	559	182	0550. 182,750. ...[1)]	200	750	675	326	266	230	50	16	250	250	II	76
			0550. 182,810. ...[1)]	250	810										85
550	559	265	0550. 265,750. ...[1)]	200	750	695	344	272	230	50	21	250	250	II	103
			0550. 265,810. ...[1)]	250	810										114
550	559	456	0550. 456,750. ...[1)]	200	750	730	380	284	230	70	26	300	250	II	157
			0550. 456,810. ...[1)]	250	810										171
600	610	79	0600. 079,530. ...[1)]	190	530	695	246	206	180	40	16	180	200	II	45
			0600. 079,590. ...[1)]	240	590										52
600	610	114	0600. 114,540. ...[1)]	190	540	710	278	230	200	40	16	200	220	II	67
			0600. 114,600. ...[1)]	240	600										76
600	610	182	0600. 182,750. ...[1)]	200	750	725	326	266	230	50	16	250	250	II	81
			0600. 182,810. ...[1)]	250	810										91
600	610	265	0600. 265,750. ...[1)]	200	750	745	344	272	230	50	21	250	250	II	110
			0600. 265,810. ...[1)]	250	810										122
600	610	456	0600. 456,750. ...[1)]	200	750	785	380	284	230	70	26	300	250	II	168
			0600. 456,810. ...[1)]	250	810										183
700	711	79	0700. 079,590. ...[1)]	200	590	800	246	206	180	40	16	180	200	II	53
			0700. 079,650. ...[1)]	250	650										61
700	711	114	0700. 114,600. ...[1)]	200	600	810	278	230	200	40	16	200	220	II	77
			0700. 114,660. ...[1)]	250	660										87
700	711	182	0700. 182,750. ...[1)]	200	750	830	326	266	230	50	16	250	250	II	92
			0700. 182,810. ...[1)]	250	810										103
700	711	265	0700. 265,750. ...[1)]	200	750	845	344	272	230	50	21	250	250	II	123
			0700. 265,810. ...[1)]	250	810										136
700	711	456	0700.456.750. ...[1)]	200	750	885	380	284	230	70	26	300	250	II	189
			0700.456.810. ...[1)]	250	810										205
800	813	79	0800.079.650. ...[1)]	200	650	900	246	206	180	40	16	180	200	II	61
			0800. 079,710. ...[1)]	250	710										69
800	813	114	0800.114.650. ...[1)]	200	650	915	278	230	200	40	16	200	220	II	86
			0800.114.710. ...[1)]	250	710										97
800	813	182	0800.182.750. ...[1)]	200	750	930	326	266	230	50	16	250	250	II	102
			0800. 182,810. ...[1)]	250	810										114
800	813	265	0800.265.750. ...[1)]	200	750	950	344	272	230	50	21	250	250	II	139
			0800.265.810. ...[1)]	250	810										153
800	813	456	0800. 456,750. ...[1)]	200	750	990	380	284	230	70	26	300	250	II	208
			0800. 456,810. ...[1)]	250	810										226

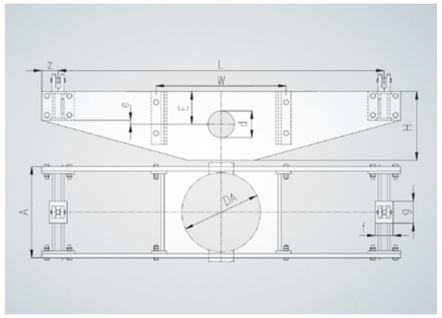
[1)] Insert nominal load bracket MBW
The MSN clamp can be used in conjunction with the MBW bracket. This is welded on in the factory.
The anti-slip and rotation lock is supplied loose and needs to be welded on to the pipe at the installation site.

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Standard design
Materials: S235JR, 16Mo3, 13CrMo4-5, 10CrMo9-10
Surface: blank

Options
For other materials see page 60
Surface: Priming, hot-dip galvanized (only for S235JR)

Order example: VGR 0400.063.1000.018-16.0
16Mo3, blank



Nominal sizes, dimensions, weights

DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
100	114.3	25	0100.025.0400 ....[1]	1	150	180	51	85	5	-	400	15
100	114.3	25	0100.025.0500 ....[1]	1	150	180	51	85	5	-	500	17
100	114.3	25	0100.025.0600 ....[1]	1	150	180	51	85	5	243	600	22
100	114.3	25	0100.025.0800 ....[1]	1	150	180	51	85	5	243	800	25
100	114.3	40	0100.040.0400 ....[1]	2	154	210	51	105	5	-	400	21
100	114.3	40	0100.040.0500 ....[1]	2	154	210	51	105	5	-	500	24
100	114.3	40	0100.040.0600 ....[1]	2	154	210	51	105	5	243	600	30
100	114.3	40	0100.040.0800 ....[1]	2	154	210	51	105	5	243	800	35
100	114.3	63	0100.063.0500 ....[1]	3	158	260	51	130	0	-	500	36
100	114.3	63	0100.063.0600 ....[1]	3	158	260	51	130	0	251	600	47
100	114.3	63	0100.063.0800 ....[1]	3	158	260	51	130	0	251	800	54
100	114.3	63	0100.063.1000 ....[1]	3	158	260	51	130	0	251	1000	61
125	139.7	25	0125.025.0500 ....[1]	1	175	180	51	85	5	-	500	17
125	139.7	25	0125.025.0600 ....[1]	1	175	180	51	85	5	269	600	22
125	139.7	25	0125.025.0800 ....[1]	1	175	180	51	85	5	269	800	26
125	139.7	25	0125.025.1000 ....[1]	1	175	180	51	85	5	269	1000	29
125	139.7	40	0125.040.0500 ....[1]	2	179	210	51	105	5	-	500	24
125	139.7	40	0125.040.0600 ....[1]	2	179	210	51	105	5	269	600	31
125	139.7	40	0125.040.0800 ....[1]	2	179	210	51	105	5	269	800	35
125	139.7	40	0125.040.1000 ....[1]	2	179	210	51	105	5	269	1000	40
125	139.7	63	0125.063.0500 ....[1]	3	183	260	51	130	0	-	500	35
125	139.7	63	0125.063.0600 ....[1]	3	183	260	51	130	0	277	600	46
125	139.7	63	0125.063.0800 ....[1]	3	183	260	51	130	0	277	800	53
125	139.7	63	0125.063.1000 ....[1]	3	183	260	51	130	0	277	1000	61
150	168.3	25	0150.025.0500 ....[1]	1	204	180	63	85	5	-	500	18
150	168.3	25	0150.025.0600 ....[1]	1	204	180	63	85	5	297	600	23
150	168.3	25	0150.025.0800 ....[1]	1	204	180	63	85	5	297	800	26
150	168.3	25	0150.025.1000 ....[1]	1	204	190	63	85	5	297	1000	30
150	168.3	40	0150.040.0500 ....[1]	2	208	220	63	105	5	-	500	25
150	168.3	40	0150.040.0600 ....[1]	2	208	220	63	105	5	297	600	32
150	168.3	40	0150.040.0800 ....[1]	2	208	220	63	105	5	297	800	37
150	168.3	40	0150.040.1000 ....[1]	2	208	220	63	105	5	297	1000	42
150	168.3	63	0150.063.0600 ....[1]	3	212	270	63	130	0	-	600	40
150	168.3	63	0150.063.0800 ....[1]	3	212	270	63	130	0	305	800	56
150	168.3	63	0150.063.1000 ....[1]	3	212	270	63	130	0	305	1000	63
150	168.3	63	0150.063.1200 ....[1]	3	212	270	63	130	0	305	1200	71
150	168.3	100	0150.0100.0600 ....[1]	4	218	310	63	155	-5	-	600	65
150	168.3	100	0150.0100.0800 ....[1]	4	218	310	63	155	-5	309	800	88
150	168.3	100	0150.0100.1000 ....[1]	4	218	320	63	155	-5	309	1000	101
150	168.3	100	0150.0100.1200 ....[1]	4	218	330	63	155	-5	309	1200	114

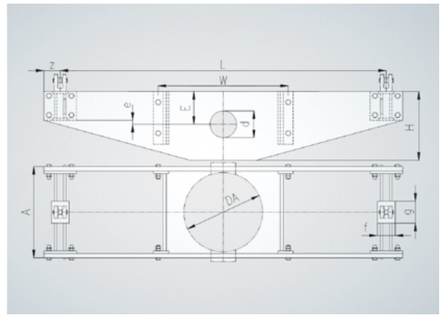
Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
1	100	55	74	6	6	8	80
2	100	60	74	6	6	10	100
3	100	80	82	8	8	12	130
4	100	85	82	10	10	15	160

1) Insert nominal load bracket MBW

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Nominal sizes, dimensions, weights

Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
1	100	55	74	6	6	8	80
2	100	60	74	6	6	10	100
3	100	80	82	8	8	12	130
4	100	85	82	10	10	15	160
5	120	135	100	15	15	20	190
6	130	145	113	20	20	25	200

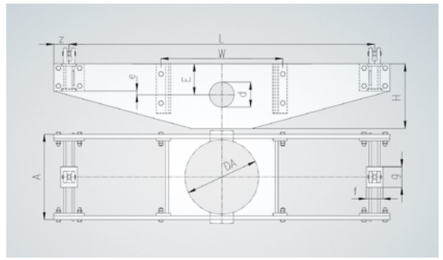


DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
200	219.1	25	0200.025.0500. ...[1]	1	255	180	79	85	5	-	500	18
200	219.1	25	0200.025.0600. ...[1]	1	255	180	79	85	5	-	600	20
200	219.1	25	0200.025.0800. ...[1]	1	255	180	79	85	5	348	800	28
200	219.1	25	0200.025.1000. ...[1]	1	255	200	79	85	5	348	1000	33
200	219.1	40	0200.040.0600. ...[1]	2	259	230	79	105	5	-	600	30
200	219.1	40	0200.040.0800. ...[1]	2	259	230	79	105	5	348	800	40
200	219.1	40	0200.040.1000. ...[1]	2	259	230	79	105	5	348	1000	45
200	219.1	40	0200.040.1200. ...[1]	2	259	240	79	105	5	348	1200	51
200	219.1	63	0200.063.0600. ...[1]	3	263	270	79	130	0	-	600	42
200	219.1	63	0200.063.0800. ...[1]	3	263	270	79	130	0	356	800	59
200	219.1	63	0200.063.1000. ...[1]	3	263	270	79	130	0	356	1000	66
200	219.1	63	0200.063.1200. ...[1]	3	263	270	79	130	0	356	1200	74
200	219.1	100	0200.0100.0800. ...[1]	4	269	310	79	155	-5	360	800	92
200	219.1	100	0200.0100.1000. ...[1]	4	269	310	79	155	-5	360	1000	103
200	219.1	100	0200.0100.1200. ...[1]	4	269	320	79	155	-5	360	1200	116
200	219.1	100	0200.0100.1400. ...[1]	4	269	330	79	155	-5	360	1400	130
200	219.1	160	0200.0160.0800. ...[1]	5	279	380	79	190	0	374	800	166
200	219.1	160	0200.0160.1000. ...[1]	5	279	380	79	190	0	374	1000	184
200	219.1	160	0200.0160.1200. ...[1]	5	279	380	79	190	0	374	1200	202
200	219.1	160	0200.0160.1400. ...[1]	5	279	380	79	190	0	374	1400	220
250	273	40	0250.040.0600. ...[1]	2	313	230	92	105	5	-	600	30
250	273	40	0250.040.0800. ...[1]	2	313	230	92	105	5	402	800	41
250	273	40	0250.040.1000. ...[1]	2	313	230	92	105	5	402	1000	47
250	273	40	0250.040.1200. ...[1]	2	313	250	92	105	5	402	1200	54
250	273	63	0250.063.0600. ...[1]	3	317	270	92	130	0	-	600	43
250	273	63	0250.063.0800. ...[1]	3	317	270	92	130	0	410	800	62
250	273	63	0250.063.1000. ...[1]	3	317	270	92	130	0	410	1000	69
250	273	63	0250.063.1200. ...[1]	3	317	270	92	130	0	410	1200	77
250	273	100	0250.0100.0800. ...[1]	4	323	310	92	155	-5	414	800	97
250	273	100	0250.0100.1000. ...[1]	4	323	310	92	155	-5	414	1000	108
250	273	100	0250.0100.1200. ...[1]	4	323	320	92	155	-5	414	1200	121
250	273	100	0250.0100.1400. ...[1]	4	323	330	92	155	-5	414	1400	134
250	273	160	0250.0160.0800. ...[1]	5	333	380	92	190	0	428	800	174
250	273	160	0250.0160.1000. ...[1]	5	333	380	92	190	0	428	1000	192
250	273	160	0250.0160.1200. ...[1]	5	333	380	92	190	0	428	1200	210
250	273	160	0250.0160.1400. ...[1]	5	333	380	92	190	0	428	1400	228
250	273	250	0250.0250.0800. ...[1]	6	343	400	92	200	0	442	800	245
250	273	250	0250.0250.1000. ...[1]	6	343	400	92	200	0	442	1000	269
250	273	250	0250.0250.1200. ...[1]	6	343	400	92	200	0	442	1200	292
250	273	250	0250.0250.1400. ...[1]	6	343	400	92	200	0	442	1400	316
300	323.9	40	0300.040.0600. ...[1]	2	363	230	118	105	5	-	600	31
300	323.9	40	0300.040.0800. ...[1]	2	363	230	118	105	5	453	800	43
300	323.9	40	0300.040.1000. ...[1]	2	363	240	118	105	5	453	1000	49
300	323.9	40	0300.040.1200. ...[1]	2	363	260	118	105	5	453	1200	57
300	323.9	63	0300.063.0600. ...[1]	3	367	270	118	130	0	-	600	45
300	323.9	63	0300.063.0800. ...[1]	3	367	270	118	130	0	461	800	64
300	323.9	63	0300.063.1000. ...[1]	3	367	270	118	130	0	461	1000	72
300	323.9	63	0300.063.1200. ...[1]	3	367	285	118	133	3	461	1200	82

1) Insert nominal load bracket MBW

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Nominal sizes, dimensions, weights



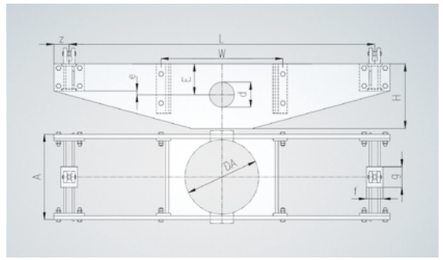
Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
2	100	60	74	6	6	10	100
3	100	80	82	8	8	12	130
4	100	85	82	10	10	15	160
5	120	135	100	15	15	20	190
6	130	145	113	20	20	25	200

DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
300	323.9	100	0300.0100.0800. ...[1]	4	373	310	118	155	-5	465	800	101
300	323.9	100	0300.0100.1000. ...[1]	4	373	310	118	155	-5	465	1000	112
300	323.9	100	0300.0100.1200. ...[1]	4	373	320	118	155	-5	465	1200	125
300	323.9	100	0300.0100.1400. ...[1]	4	373	330	118	155	-5	465	1400	138
300	323.9	160	0300.0160.0800. ...[1]	5	383	380	118	190	0	479	800	182
300	323.9	160	0300.0160.1000. ...[1]	5	383	380	118	190	0	479	1000	199
300	323.9	160	0300.0160.1200. ...[1]	5	383	380	118	190	0	479	1200	217
300	323.9	160	0300.0160.1400. ...[1]	5	383	380	118	190	0	479	1400	235
300	323.9	250	0300.0250.0800. ...[1]	6	393	400	118	200	0	493	800	255
300	323.9	250	0300.0250.1000. ...[1]	6	393	400	118	200	0	493	1000	279
300	323.9	250	0300.0250.1200. ...[1]	6	393	400	118	200	0	493	1200	303
300	323.9	250	0300.0250.1400. ...[1]	6	393	400	118	200	0	493	1400	326
350	355.6	40	0350.040.0600. ...[1]	2	395	230	118	105	5	-	600	32
350	355.6	40	0350.040.0800. ...[1]	2	395	230	118	105	5	485	800	44
350	355.6	40	0350.040.1000. ...[1]	2	395	240	118	105	5	485	1000	50
350	355.6	40	0350.040.1200. ...[1]	2	395	260	118	105	5	485	1200	58
350	355.6	63	0350.063.0800. ...[1]	3	399	280	118	140	10	493	800	67
350	355.6	63	0350.063.1000. ...[1]	3	399	280	118	140	10	493	1000	75
350	355.6	63	0350.063.1200. ...[1]	3	399	290	118	140	10	493	1200	84
350	355.6	63	0350.063.1400. ...[1]	3	399	300	118	140	10	493	1400	94
350	355.6	100	0350.0100.0800. ...[1]	4	405	310	118	155	-5	497	800	103
350	355.6	100	0350.0100.1000. ...[1]	4	405	310	118	155	-5	497	1000	114
350	355.6	100	0350.0100.1200. ...[1]	4	405	320	118	155	-5	497	1200	127
350	355.6	100	0350.0100.1400. ...[1]	4	405	330	118	155	-5	497	1400	141
350	355.6	160	0350.0160.1000. ...[1]	5	415	380	118	190	0	511	1000	204
350	355.6	160	0350.0160.1200. ...[1]	5	415	380	118	190	0	511	1200	222
350	355.6	160	0350.0160.1400. ...[1]	5	415	380	118	190	0	511	1400	240
350	355.6	160	0350.0160.1600. ...[1]	5	415	380	118	190	0	511	1600	258
350	355.6	250	0350.0250.1000. ...[1]	6	425	400	118	200	0	525	1000	285
350	355.6	250	0350.0250.1200. ...[1]	6	425	400	118	200	0	525	1200	309
350	355.6	250	0350.0250.1400. ...[1]	6	425	400	118	200	0	525	1400	332
350	355.6	250	0350.0250.1600. ...[1]	6	425	410	118	200	0	525	1600	360
400	406.4	63	0400.063.0800. ...[1]	3	450	280	144	140	10	-	800	56
400	406.4	63	0400.063.1000. ...[1]	3	450	280	144	140	10	543	1000	77
400	406.4	63	0400.063.1200. ...[1]	3	450	300	144	140	10	543	1200	88
400	406.4	63	0400.063.1400. ...[1]	3	450	320	144	140	10	543	1400	100
400	406.4	100	0400.0100.0800. ...[1]	4	456	310	144	155	-5	-	800	86
400	406.4	100	0400.0100.1000. ...[1]	4	456	310	144	155	-5	547	1000	118
400	406.4	100	0400.0100.1200. ...[1]	4	456	320	144	155	-5	547	1200	131
400	406.4	100	0400.0100.1400. ...[1]	4	456	340	144	155	-5	547	1400	147
400	406.4	160	0400.0160.1000. ...[1]	5	466	380	144	190	0	561	1000	211
400	406.4	160	0400.0160.1200. ...[1]	5	466	380	144	190	0	561	1200	229
400	406.4	160	0400.0160.1400. ...[1]	5	466	400	144	190	0	561	1400	253
400	406.4	160	0400.0160.1600. ...[1]	5	466	400	144	190	0	561	1600	272
400	406.4	250	0400.0250.1000. ...[1]	6	476	410	144	205	5	575	1000	298
400	406.4	250	0400.0250.1200. ...[1]	6	476	410	144	205	5	575	1200	322
400	406.4	250	0400.0250.1400. ...[1]	6	476	410	144	205	5	575	1400	346
400	406.4	250	0400.0250.1600. ...[1]	6	476	420	144	205	5	575	1600	374

1) Insert nominal load bracket MBW

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Nominal sizes, dimensions, weights



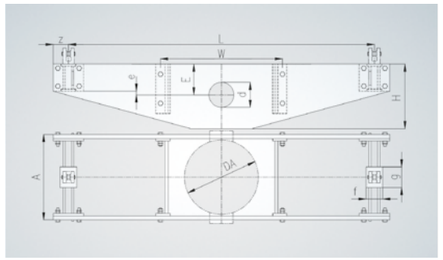
Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
3	100	80	82	8	8	12	130
4	100	85	82	10	10	15	160
5	120	135	100	15	15	20	190
6	130	145	113	20	20	25	200
7	165	175	143	20	20	30	240

DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
400	406.4	400	0400.0400.1000. ...[1]	7	486	480	144	240	0	581	1000	430
400	406.4	400	0400.0400.1200. ...[1]	7	486	480	144	240	0	581	1200	464
400	406.4	400	0400.0400.1400. ...[1]	7	486	480	144	240	0	581	1400	498
400	406.4	400	0400.0400.1600. ...[1]	7	486	480	144	240	0	581	1600	532
450	457	63	0450.063.0800. ...[1]	3	501	280	144	140	10	-	800	57
450	457	63	0450.063.1000. ...[1]	3	501	280	144	140	10	594	1000	80
450	457	63	0450.063.1200. ...[1]	3	501	300	144	140	10	594	1200	91
450	457	63	0450.063.1400. ...[1]	3	501	320	144	140	10	594	1400	102
450	457	100	0450.0100.0800. ...[1]	4	507	310	144	155	-5	-	800	89
450	457	100	0450.0100.1000. ...[1]	4	507	310	144	155	-5	598	1000	122
450	457	100	0450.0100.1200. ...[1]	4	507	320	144	155	-5	598	1200	135
450	457	100	0450.0100.1400. ...[1]	4	507	340	144	155	-5	598	1400	151
450	457	160	0450.0160.1200. ...[1]	5	517	380	144	190	0	612	1200	236
450	457	160	0450.0160.1000. ...[1]	5	517	380	144	190	0	612	1000	218
450	457	160	0450.0160.1400. ...[1]	5	517	400	144	190	0	612	1400	260
450	457	160	0450.0160.1600. ...[1]	5	517	400	144	190	0	612	1600	279
450	457	250	0450.0250.1000. ...[1]	6	527	410	144	205	5	626	1000	308
450	457	250	0450.0250.1200. ...[1]	6	527	410	144	205	5	626	1200	332
450	457	250	0450.0250.1400. ...[1]	6	527	410	144	205	5	626	1400	356
450	457	250	0450.0250.1600. ...[1]	6	527	420	144	205	5	626	1600	384
450	457	400	0450.0400.1000. ...[1]	7	537	480	144	240	0	632	1000	442
450	457	400	0450.0400.1200. ...[1]	7	537	480	144	240	0	632	1200	476
450	457	400	0450.0400.1400. ...[1]	7	537	480	144	240	0	632	1400	510
450	457	400	0450.0400.1600. ...[1]	7	537	480	144	240	0	632	1600	544
500	508	63	0500.063.1000. ...[1]	3	552	320	173	160	30	645	1000	88
500	508	63	0500.063.1200. ...[1]	3	552	330	173	160	30	645	1200	98
500	508	63	0500.063.1400. ...[1]	3	552	350	173	160	30	645	1400	111
500	508	63	0500.063.1600. ...[1]	3	552	365	173	163	33	645	1600	123
500	508	100	0500.0100.1000. ...[1]	4	558	340	173	170	10	649	1000	131
500	508	100	0500.0100.1200. ...[1]	4	558	340	173	170	10	649	1200	143
500	508	100	0500.0100.1400. ...[1]	4	558	370	173	170	10	649	1400	162
500	508	100	0500.0100.1600. ...[1]	4	558	390	173	170	10	649	1600	180
500	508	160	0500.0160.1200. ...[1]	5	568	400	173	200	10	663	1200	249
500	508	160	0500.0160.1400. ...[1]	5	568	400	173	200	10	663	1400	267
500	508	160	0500.0160.1600. ...[1]	5	568	420	173	200	10	663	1600	293
500	508	160	0500.0160.1800. ...[1]	5	568	430	173	200	10	663	1800	316
500	508	250	0500.0250.1200. ...[1]	6	578	420	173	205	5	677	1200	345
500	508	250	0500.0250.1400. ...[1]	6	578	420	173	205	5	677	1400	370
500	508	250	0500.0250.1600. ...[1]	6	578	440	173	205	5	677	1600	403
500	508	250	0500.0250.1800. ...[1]	6	578	450	173	205	5	677	1800	433
500	508	400	0500.0400.1200. ...[1]	7	588	480	173	240	0	683	1200	488
500	508	400	0500.0400.1400. ...[1]	7	588	480	173	240	0	683	1400	522
500	508	400	0500.0400.1600. ...[1]	7	588	480	173	240	0	683	1600	556
500	508	400	0500.0400.1800. ...[1]	7	588	510	173	240	0	683	1800	608
550	559	63	0550.063.1000. ...[1]	3	603	320	173	160	30	696	1000	91
550	559	63	0550.063.1200. ...[1]	3	603	330	173	160	30	696	1200	101
550	559	63	0550.063.1400. ...[1]	3	603	350	173	160	30	696	1400	113
550	559	63	0550.063.1600. ...[1]	3	603	365	173	163	33	696	1600	125

1) Insert nominal load bracket MBW

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Nominal sizes, dimensions, weights



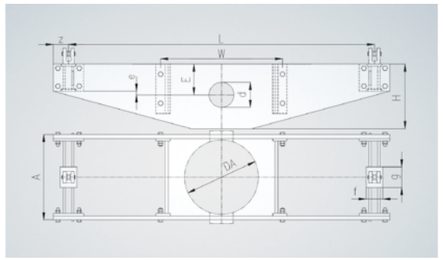
Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
4	100	85	82	10	10	15	160
5	120	135	100	15	15	20	190
6	130	145	113	20	20	25	200
7	165	175	143	20	20	30	240
8	205	225	175	25	25	35	300

DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
550	559	100	0550.0100.1000. ...[1)]	4	609	340	173	170	10	700	1000	135
550	559	100	0550.0100.1200. ...[1)]	4	609	340	173	170	10	700	1200	147
550	559	100	0550.0100.1400. ...[1)]	4	609	370	173	170	10	700	1400	166
550	559	100	0550.0100.1600. ...[1)]	4	609	390	173	170	10	700	1600	183
550	559	160	0550.0160.1200. ...[1)]	5	619	400	173	200	10	714	1200	256
550	559	160	0550.0160.1400. ...[1)]	5	619	400	173	200	10	714	1400	274
550	559	160	0550.0160.1600. ...[1)]	5	619	420	173	200	10	714	1600	300
550	559	160	0550.0160.1800. ...[1)]	5	619	430	173	200	10	714	1800	323
550	559	250	0550.0250.1200. ...[1)]	6	629	420	173	205	5	728	1200	355
550	559	250	0550.0250.1400. ...[1)]	6	629	420	173	205	5	728	1400	379
550	559	250	0550.0250.1600. ...[1)]	6	629	440	173	205	5	728	1600	412
550	559	250	0550.0250.1800. ...[1)]	6	629	450	173	205	5	728	1800	442
550	559	400	0550.0400.1200. ...[1)]	7	639	480	173	240	0	734	1200	500
550	559	400	0550.0400.1400. ...[1)]	7	639	480	173	240	0	734	1400	534
550	559	400	0550.0400.1600. ...[1)]	7	639	480	173	240	0	734	1600	568
550	559	400	0550.0400.1800. ...[1)]	7	639	510	173	240	0	734	1800	619
600	610	100	0600.0100.1000. ...[1)]	4	660	360	199	180	20	-	1000	115
600	610	100	0600.0100.1200. ...[1)]	4	660	360	199	180	20	751	1200	155
600	610	100	0600.0100.1400. ...[1)]	4	660	380	199	180	20	751	1400	172
600	610	100	0600.0100.1600. ...[1)]	4	660	410	199	180	20	751	1600	193
600	610	160	0600.0160.1200. ...[1)]	5	670	400	199	200	10	765	1200	263
600	610	160	0600.0160.1400. ...[1)]	5	670	400	199	200	10	765	1400	281
600	610	160	0600.0160.1600. ...[1)]	5	670	420	199	200	10	765	1600	307
600	610	160	0600.0160.1800. ...[1)]	5	670	440	199	200	10	765	1800	334
600	610	250	0600.0250.1200. ...[1)]	6	680	420	199	205	5	779	1200	364
600	610	250	0600.0250.1400. ...[1)]	6	680	420	199	205	5	779	1400	389
600	610	250	0600.0250.1600. ...[1)]	6	680	440	199	205	5	779	1600	422
600	610	250	0600.0250.1800. ...[1)]	6	680	470	199	205	5	779	1800	462
600	610	400	0600.0400.1400. ...[1)]	7	690	490	199	240	0	785	1400	550
600	610	400	0600.0400.1600. ...[1)]	7	690	490	199	240	0	785	1600	585
600	610	400	0600.0400.1800. ...[1)]	7	690	520	199	240	0	785	1800	638
600	610	400	0600.0400.2000. ...[1)]	7	690	545	199	243	3	785	2000	690
600	610	630	0600.0630.1400. ...[1)]	8	700	600	199	300	0	801	1400	878
600	610	630	0600.0630.1600. ...[1)]	8	700	600	199	300	0	801	1600	927
600	610	630	0600.0630.1800. ...[1)]	8	700	600	199	300	0	801	1800	977
600	610	630	0600.0630.2000. ...[1)]	8	700	630	199	300	0	801	2000	1050
700	711	100	0700.0100.1200. ...[1)]	4	761	400	224	200	40	852	1200	171
700	711	100	0700.0100.1400. ...[1)]	4	761	400	224	200	40	852	1400	184
700	711	100	0700.0100.1600. ...[1)]	4	761	420	224	200	40	852	1600	203
700	711	100	0700.0100.1800. ...[1)]	4	761	440	224	200	40	852	1800	223
700	711	160	0700.0160.1400. ...[1)]	5	771	430	224	215	25	866	1400	305
700	711	160	0700.0160.1600. ...[1)]	5	771	430	224	215	25	866	1600	324
700	711	160	0700.0160.1800. ...[1)]	5	771	460	224	215	25	866	1800	356
700	711	160	0700.0160.2000. ...[1)]	5	771	480	224	215	25	866	2000	385
700	711	250	0700.0250.1400. ...[1)]	6	781	440	224	220	20	880	1400	416
700	711	250	0700.0250.1600. ...[1)]	6	781	460	224	220	20	880	1600	450
700	711	250	0700.0250.1800. ...[1)]	6	781	480	224	220	20	880	1800	486
700	711	250	0700.0250.2000. ...[1)]	6	781	510	224	220	20	880	2000	529

1) Insert nominal load bracket MBW

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Nominal sizes, dimensions, weights



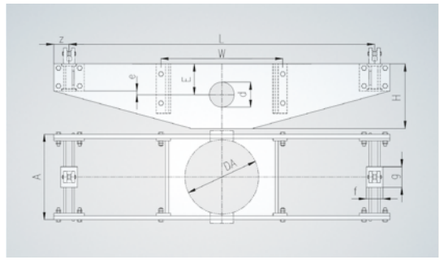
Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
4	100	85	82	10	10	15	160
5	120	135	100	15	15	20	190
6	130	145	113	20	20	25	200
7	165	175	143	20	20	30	240
8	205	225	175	25	25	35	300

DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
700	711	400	0700.0400.1400. ...[1)]	7	791	510	224	250	10	886	1400	584
700	711	400	0700.0400.1600. ...[1)]	7	791	510	224	250	10	886	1600	619
700	711	400	0700.0400.1800. ...[1)]	7	791	540	224	250	10	886	1800	673
700	711	400	0700.0400.2000. ...[1)]	7	791	560	224	250	10	886	2000	723
700	711	630	0700.0630.1600. ...[1)]	8	801	610	224	305	5	902	1600	971
700	711	630	0700.0630.1800. ...[1)]	8	801	610	224	305	5	902	1800	1021
700	711	630	0700.0630.2000. ...[1)]	8	801	640	224	305	5	902	2000	1095
700	711	630	0700.0630.2200. ...[1)]	8	801	670	224	305	5	902	2200	1172
800	813	100	0800.0100.1200. ...[1)]	4	863	420	250	210	50	-	1200	148
800	813	100	0800.0100.1400. ...[1)]	4	863	420	250	210	50	954	1400	197
800	813	100	0800.0100.160. ...[1)]	4	863	440	250	210	50	954	1600	216
800	813	100	0800.0100.1800. ...[1)]	4	863	460	250	210	50	954	1800	237
800	813	160	0800.0160.1400. ...[1)]	5	873	450	250	225	35	968	1400	325
800	813	160	0800.0160.1600. ...[1)]	5	873	450	250	225	35	968	1600	345
800	813	160	0800.0160.1800. ...[1)]	5	873	480	250	225	35	968	1800	378
800	813	160	0800.0160.2000. ...[1)]	5	873	500	250	225	35	968	2000	407
800	813	250	0800.0250.1400. ...[1)]	6	883	460	250	230	30	982	1400	443
800	813	250	0800.0250.1600. ...[1)]	6	883	480	250	230	30	982	1600	478
800	813	250	0800.0250.1800. ...[1)]	6	883	500	250	230	30	982	1800	516
800	813	250	0800.0250.2000. ...[1)]	6	883	520	250	230	30	982	2000	554
800	813	400	0800.0400.1400. ...[1)]	7	893	530	250	265	25	988	1400	617
800	813	400	0800.0400.1600. ...[1)]	7	893	530	250	265	25	988	1600	653
800	813	400	0800.0400.1800. ...[1)]	7	893	550	250	265	25	988	1800	702
800	813	400	0800.0400.2000. ...[1)]	7	893	580	250	265	25	988	2000	760
800	813	400	0800.0400.2200. ...[1)]	7	893	600	250	265	25	988	2200	813
800	813	630	0800.0630.1600. ...[1)]	8	903	620	250	305	5	1004	1600	1014
800	813	630	0800.0630.1800. ...[1)]	8	903	620	250	305	5	1004	1800	1065
800	813	630	0800.0630.2000. ...[1)]	8	903	650	250	305	5	1004	2000	1140
800	813	630	0800.0630.2200. ...[1)]	8	903	680	250	305	5	1004	2200	1218
800	813	630	0800.0630.2400. ...[1)]	8	903	710	250	305	5	1004	2400	1300
900	914	160	0900.0160.1400. ...[1)]	5	974	470	279	235	45	1069	1400	345
900	914	160	0900.0160.1600. ...[1)]	5	974	480	279	235	45	1069	1600	370
900	914	160	0900.0160.1800. ...[1)]	5	974	500	279	235	45	1069	1800	400
900	914	160	0900.0160.2000. ...[1)]	5	974	520	279	235	45	1069	2000	430
900	914	250	0900.0250.1400. ...[1)]	6	984	480	279	240	40	1083	1400	470
900	914	250	0900.0250.1600. ...[1)]	6	984	500	279	240	40	1083	1600	507
900	914	250	0900.0250.1800. ...[1)]	6	984	520	279	240	40	1083	1800	545
900	914	250	0900.0250.2000. ...[1)]	6	984	540	279	240	40	1083	2000	585
900	914	400	0900.0400.1600. ...[1)]	7	994	560	279	275	35	1089	1600	694
900	914	400	0900.0400.1800. ...[1)]	7	994	570	279	275	35	1089	1800	738
900	914	400	0900.0400.2000. ...[1)]	7	994	600	279	275	35	1089	2000	797
900	914	400	0900.0400.2200. ...[1)]	7	994	620	279	275	35	1089	2200	852
900	914	630	0900.0630.1600. ...[1)]	8	1004	640	279	320	20	1105	1600	1065
900	914	630	0900.0630.1800. ...[1)]	8	1004	640	279	320	20	1105	1800	1117
900	914	630	0900.0630.2000. ...[1)]	8	1004	670	279	320	20	1105	2000	1193
900	914	630	0900.0630.2200. ...[1)]	8	1004	700	279	320	20	1105	2200	1273
900	914	630	0900.0630.2400. ...[1)]	8	1004	720	279	320	20	1105	2400	1347

1) Insert nominal load bracket MBW

HYDRA® BOX-TYPE CLAMPS / ALTERNATING LOAD CLAMP VGR

Nominal sizes, dimensions, weights

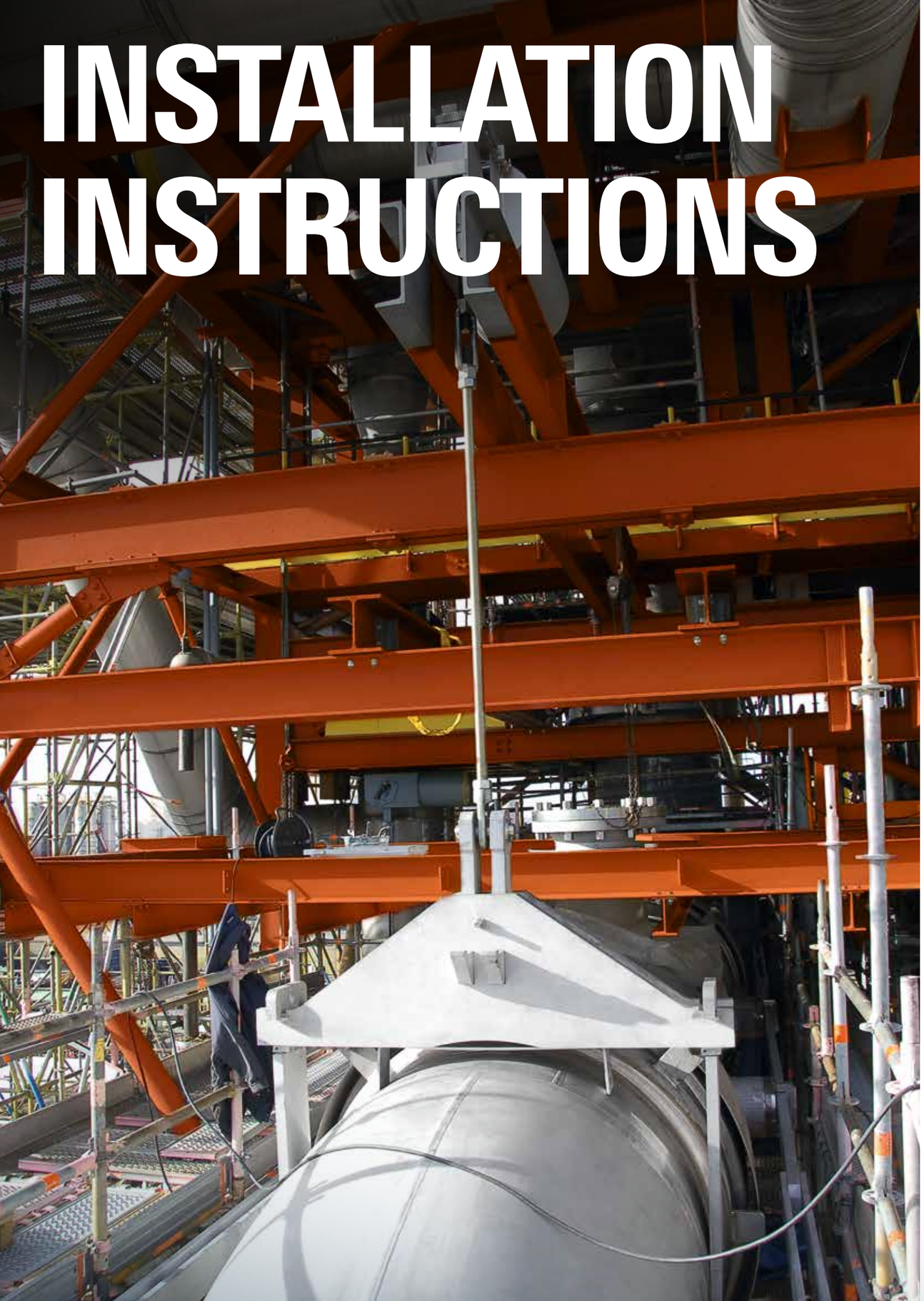


Size	f	g	z	sT	sP	s	ha
–	mm	mm	mm	mm	mm	mm	mm
5	120	135	100	15	15	20	190
6	130	145	113	20	20	25	200
7	165	175	143	20	20	30	240
8	205	225	175	25	25	35	300
9	315	265	230	35	35	40	360

DN	DA	Nominal load FN	Type VGR ..	Size	A	H	d	E	e	W	L	Weight
mm	mm	kN	–		mm	mm	mm	mm	mm	mm	mm	kg
900	914	1000	0900.1000.1800. ...[1)]	9	1014	770	279	385	25	1125	1800	1802
900	914	1000	0900.1000.2000. ...[1)]	9	1014	770	279	385	25	1125	2000	1873
900	914	1000	0900.1000.2200. ...[1)]	9	1014	800	279	385	25	1125	2200	1976
900	914	1000	0900.1000.2400. ...[1)]	9	1014	840	279	385	25	1125	2400	2093
1000	1016	160	1000.0160.1400. ...[1)]	5	1076	510	330	255	65	-	1400	293
1000	1016	160	1000.0160.1600. ...[1)]	5	1076	520	330	255	65	1171	1600	399
1000	1016	160	1000.0160.1800. ...[1)]	5	1076	540	330	255	65	1171	1800	430
1000	1016	160	1000.0160.2000. ...[1)]	5	1076	560	330	255	65	1171	2000	462
1000	1016	250	1000.0250.1400. ...[1)]	6	1086	520	330	260	60	-	1400	391
1000	1016	250	1000.0250.1600. ...[1)]	6	1086	540	330	260	60	1185	1600	545
1000	1016	250	1000.0250.1800. ...[1)]	6	1086	560	330	260	60	1185	1800	585
1000	1016	250	1000.0250.2000. ...[1)]	6	1086	580	330	260	60	1185	2000	627
1000	1016	400	1000.0400.1600. ...[1)]	7	1096	590	330	295	55	1191	1600	734
1000	1016	400	1000.0400.1800. ...[1)]	7	1096	600	330	295	55	1191	1800	780
1000	1016	400	1000.0400.2000. ...[1)]	7	1096	630	330	295	55	1191	2000	841
1000	1016	400	1000.0400.2200. ...[1)]	7	1096	650	330	295	55	1191	2200	898
1000	1016	400	1000.0400.2400. ...[1)]	7	1096	680	330	295	55	1191	2400	965
1000	1016	630	1000.0630.1800. ...[1)]	8	1106	670	330	335	35	1207	1800	1176
1000	1016	630	1000.0630.2000. ...[1)]	8	1106	700	330	335	35	1207	2000	1255
1000	1016	630	1000.0630.2200. ...[1)]	8	1106	730	330	335	35	1207	2200	1338
1000	1016	630	1000.0630.2400. ...[1)]	8	1106	750	330	335	35	1207	2400	1414
1000	1016	1000	1000.1000.2000. ...[1)]	9	1116	800	330	390	30	1227	2000	1968
1000	1016	1000	1000.1000.2200. ...[1)]	9	1116	830	330	390	30	1227	2200	2073
1000	1016	1000	1000.1000.2400. ...[1)]	9	1116	860	330	390	30	1227	2400	2183
1000	1016	1000	1000.1000.2600. ...[1)]	9	1116	900	330	390	30	1227	2600	2308

1) Insert nominal load bracket MBW

INSTALLATION INSTRUCTIONS



INSTALLATION INSTRUCTIONS FOR SPRING HANGERS/SUPPORTS

Hanger FDH FHG FHS FDT

Support FSS FSP FSG

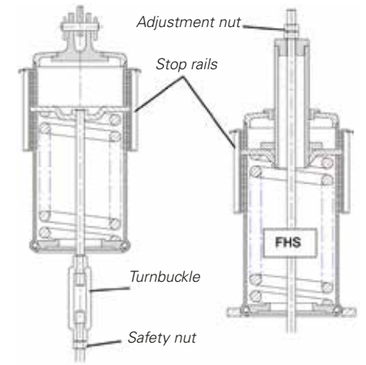
General information
Spring hangers and supports are delivered on pallets. Ensure careful handing during transport on site. The corrosion protection, the connecting threads, manufacturer's plate and scales are especially at risk. Storage should be in closed rooms; if stored in the open air the devices should be protected from moisture and dirt with suitable coverings.

Connections
To fasten the hangers / support to the load bearing structure, the required connections must be prepared; welding plates, clamping lugs for the hanging versions FHD, FHG and FDT; supports (perforated) or support plates for the base-mounted types FHS, FSS and FSP and brackets for the sway supports.

Function
Spring hangers and supports carry forces from the pipe support to the load-bearing structure over a specific travel range. The hangers/supports are set to the required load at the factory (fitting unblocked devices is not recommended).

Installation
Hangers must be connected in a form-closed way with the connections; support bolts must be secured with cotter pins or safety rings, thread connections with lock nuts.

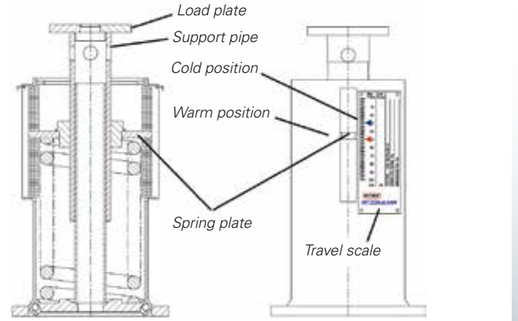
Load connection / load adjustment
Hanger with turnbuckle
The lower tie rod (threaded rod) must first be screwed in to the turnbuckle of the hanger and connected with the load to be carried (note system dimension E of the turnbuckle, lubricate both threads of the turnbuckle well in advance and screw on safety nuts first). The length of the lower tie rod is to be adapted to the real installation dimensions if necessary. The turnbuckle is turned until the intended cold load is reached. (The set cold load can be read on the travel scale on the engraved or blue triangle.) This point is reached when on both sides the travel stops become loose through the existing play and can be easily removed by hand. (Remove transport lock first.) In the case of a larger thread diameters (for example from around M 42) the turnbuckles cannot be adjusted under load; they must be relieved of the load using additional aids (lifting tool, hydraulic lift).



Double hanger with traverse (FDT)
As described above; ensure the load is even on both tie rods.

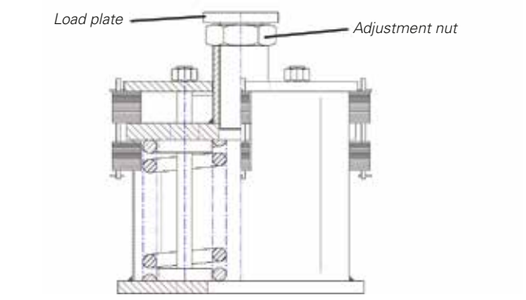
Hanger without turnbuckle (FHS)
Turn the adjustment nut until the intended cold load is reached (previously lubricate thread). Continue as above.

Support size 01-11
Insert the load plate with flange loosely. Turning the support pipe (previously lubricate thread) tensions it (adjustment option + 30 mm). With supports from size 08 the load plate should be relieved of the load using suitable aids (such as lifting tool, hydraulic lift).



INSTALLATION INSTRUCTIONS FOR SPRING HANGERS/SUPPORTS

Support size 12-16 (FSS, FSP)
Inser the load plate with thread part loosely. Turning the adjustment nut (previously lubricate thread) tensions it (adjustment option + 30 mm). With supports from size 08 the load plate should be relieved of the load using suitable aids (such as lifting tool, hydraulic lift).



Sway support size 01-11
(FSG) On the side of the moveable support pipe, the joint head is loosely inserted as with the other supports. Turning the support pipe (previously lubricate thread) tensions it (adjustment option + 30 mm). With sway supports from size 08 load relief should be done as with supports.

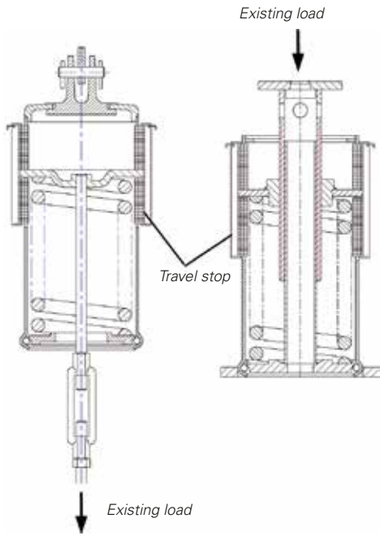
After unblocking
The travel stops are now suspended with their wire hangers below the nib of the load plate in the housing slit for retention and secured with wire (up to size 11). From size 12 these are fastened to welded-on thread bolts. Finally, for hangers, the angular draw of the load chain must be checked. Taking into account the movements to be expected during operation, this should not be more than 4°. All thread connections in the load chain (except the left-hand thread in the turnbuckle) are to be secured with nuts.

Hydraulic pressure testing
For hydraulic testing of pipe systems supported by hangers/supports, the hangers/supports should be blocked in order to avoid unacceptable movement of the pipe. The hangers/supports are dimensioned in such a way that both in the blocked and unblocked state, twice the nominal load of the hanger/support can be borne with a safety factor of 1.25 (in the unblocked state the hanger/support moves to the lower stop).

Operational check
After commissioning of the system the warm positions of the hangers/supports are to be checked (red triangle on the travel scale). If greater deviations are noted, additional corrective measures are required. If the cause is smaller/larger loads than calculated, the set loads of the hangers and supports must be adjusted. This can be done through further adjustment of the turnbuckle or adjusting nut. If the travel reserves are exceeded in the process, the device must be replaced with another.

Maintenance
Spring hangers and supports are absolutely maintenance-free and have no wearing parts.

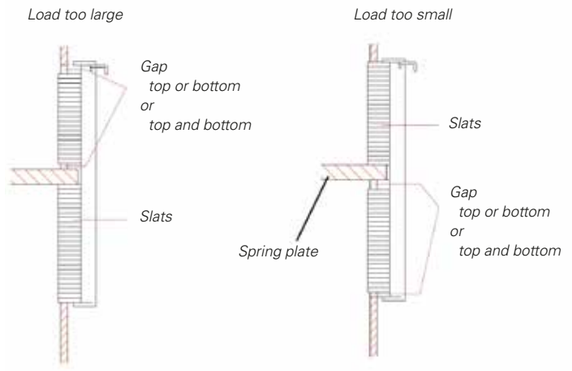
Supplement - Unblocking
Hangers/supports are fitted blocked. All loads based on the set blocking load (medium, insulation, other loads) affect the hanger and the support. After removing the tensioning belt placed around the hanger/support (transport lock), the blocking elements placed in the housing slit
(Size 01-11, 2 pieces;
Size 12-16, 4 pieces)
must be removed by hand.



HYDRA

INSTALLATION INSTRUCTIONS FOR SPRING HANGERS/SUPPORTS

If not, the effective load F_{vorh} deviates from the travel stop of the hanger/support. Changing the installation dimension (with the hanger by turning the turnbuckle; with the support by turning the support pipe or adjustment nut) the effective force on the hanger/support can be corrected and the set travel stop adapted. The position of the slats indicates whether the existing load is too large or too small.



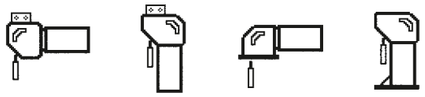
Existing load too large:
- With hangers increase installation dimension
- With supports reduce installation dimension

Existing load too small:
- With hangers reduce installation dimensions
- With supports increase installation dimensions

Important
Correcting the installation dimension changes the existing loads on the adjacent support points.

INSTALLATION INSTRUCTIONS FOR CONSTANT HANGERS/SUPPORTS

Springer **KHD** **KVD** **KHS** **KVS**

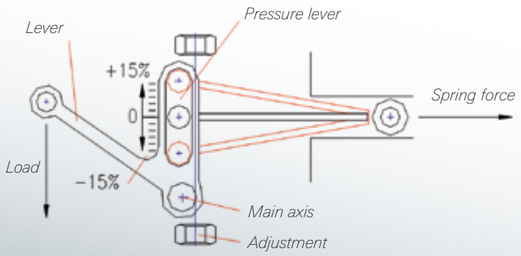


Supports **KSP** **KSR**

General information
Constant hangers and supports are delivered on pallets. Ensure careful handing during transport on site. The corrosion protection, the connecting threads, manufacturer's plate, scales and adjustment mechanism are especially at risk. Storage should be in closed rooms; if stored in the open air the devices should be protected from moisture and dirt with suitable coverings.

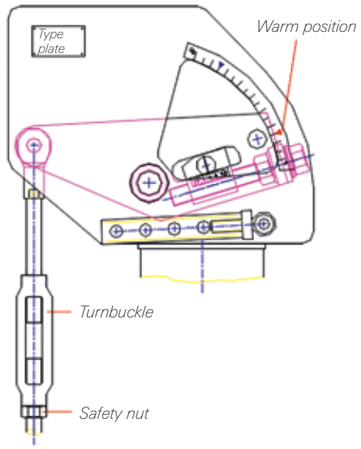
Connections
To fasten the hangers / support to the load-bearing structure, the required connections must be prepared; welding plates, clamping lugs for the hanging versions KHD and KVD; supports (perforated) or support plates for the base-mounted types KHS, KVS and KSP, KSR.

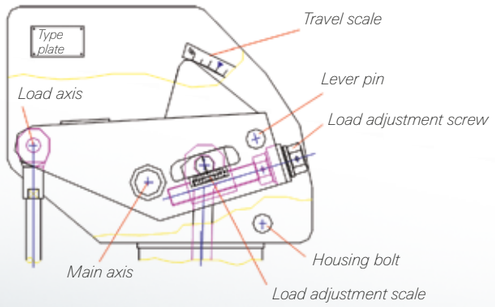
Function
Over a specific travel range, constant hangers and supports carry constant forces (max. deviation +5%) from the pipe support to the load-bearing structure. deviation +5%) from the pipe support to the load-bearing structure. This load constancy is achieved through the leverage principle. The hangers/supports are set to the required load at the factory. When installed, this load can be adjusted by +15 % using the adjustment mechanism. As per standard, the hanger is blocked in such a way that for each end position the same travel reserve sR = (sN - sS) / 2 is available
(sN .. Nominal travel hanger/support; sS .. required travel).
Cold and warm position (engraved or blue or red triangle) are marked on the travel scale (by default with percent gradations).



Installation
Hangers must be connected in a form-closed way with the connections; support bolts must be secured with cotter pins or safety rings, thread connections with lock nuts. Constant hangers/supports should be aligned in the vertical direction of the support.

Load connection / load adjustment
Hanger
The lower tie rod (threaded rod) must first be screwed in to the turnbuckle of the hanger and connected with the load to be carried (note system dimension E of the turnbuckle, lubricate both threads of the turnbuckle well in advance and screw on safety nuts first). The length of the lower tie rod is to be adapted to the real installation dimensions if necessary. The turnbuckle is turned until the hanger bears the required load. This point is reached when the stop becomes loose through the existing play. (Remove transport lock first.) In the case of a larger thread diameters (for example from around M 42) the turnbuckles cannot be adjusted under load; they must be relieved of the load using additional aids (lifting tool, hydraulic lift).





INSTALLATION INSTRUCTIONS FOR CONSTANT HANGERS/SUPPORTS

Tensioning is performed by turning the load plate or the load rollers, whose threaded bolt is screwed in and should be well lubricated (adjustment option +20 mm). With supports from size 09 load relief should be done as with hangers. After removing the safety pins, the stop rails can now be removed from their support bolts on both sides.

It should be noted that a section of line with several constant hangers/supports should always be considered as a whole and that in this neither an displacement or tensioning of the pipeline should occur. If a deblocking cannot be achieved immediately, because the actual load does not match the set required load, an adjustment of the set load can be performed (+15% of the required load) through the load adjustment mechanism.

From hanger/support size 15, the adjustment of the load adjustment mechanism should be done with a torque tool (e.g. PLARAD XVR 65 planetary gear). There should previously be a check to see whether unwanted stops hinder the free movement of the line. The adjustment must be very carefully judged and take into account all hangers/supports of a pipe section. Under no circumstances may the block rails be removed forcefully. After unblocking the stop rails are again placed on the unmoving housing bolts and secured by cotter pins. With vertically aligned models (KVD and KVS) they lie on the termination plate of the spring housing.

The set cold position must match the marking on the travel scale. Deviations must be corrected by adjustment of the turnbuckle (possible to around M36 without load relief).

Finally, for hangers, the angular draw of the load chain must be checked. Taking into account the movements to be expected during operation, this should not be more than 4°. All thread connections in the load chain (except the left-hand thread in the turnbuckle) are to be secured with nuts.

Hydraulic pressure testing
For hydraulic testing of pipe systems supported by hangers/supports, the hangers/supports should be blocked in order to avoid unacceptable movement of the pipe.

The hangers/supports are dimensioned in such a way that both in the blocked and unblocked state, twice the required load of the hanger/support can be borne with a safety factor of 1.25 (in the unblocked state the hanger/support moves to the lower stop).

Operational check
After commissioning of the system the heat positions of the hangers/supports are to be checked (red triangle on the travel scale). If greater deviations are noted, additional corrective measures are required.

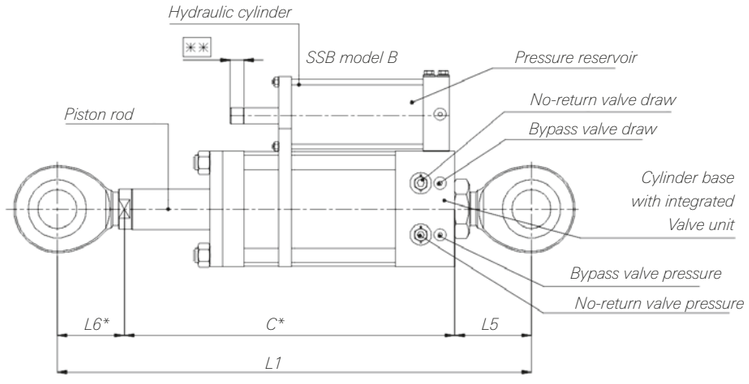
If the cause is smaller/larger loads than calculated, the set loads of the hangers and supports must be adjusted. Constant hangers and supports can be adjusted using the load adjustment mechanism by up to +15% of original set load, without the working travel being restricted by this.

If the actually occurred movement exceeds the required travel (including reserves) or if the operating load deviates by more than 15% from the required load, the device must be replaced for another.

Maintenance
Constant hangers and supports are absolutely maintenance-free and have no wearing parts.

INSTALLATION INSTRUCTIONS FOR HYDRAULIC SHOCK ABSORBERS AND SWAY SUPPRESSORS

Description



** Dimension L6 + C = Installation dimension of the piston rod*
*** Marking oil reserve*

The hydraulic shock absorber and sway suppressor are used to prevent damage caused by earthquakes, slug flows, pipe breakages or the blow-off of safety valves.
The unit consists of a push-pull cylinder, a patented valve in the cylinder base and a pressure reservoir. The pressure reservoir includes a specific liquid reserve for the case of a liquid loss over an extended period. However it mainly works as an expansion tank which the liquid driven by the piston flows in and out of. The liquid volume in the reservoir is always set with force on the piston ring annular surface with the fitted coil spring.
Thanks to this pressure reservoir, the hydraulic shock absorber can be installed in any position.

With a dynamic load that moves the piston faster than the closing speed set by Witzenmann, the no-return valve and the sway suppressor can now absorb the forces. It is the job of the overflow valve or bypass valve to enable the speed of the piston to react. The ability of a sway suppressor to permit a reaction in speed in an emergency is of exceptional significance for the function of a sway suppressor.
To adjust the valves, special test rigs are required that can measure the load and speed.
Do not perform valve adjustment on the construction site. The adjustment may only be carried out by Witzenmann personnel.

Installation
Important: Make certain that the installation location and tools are clean.

Check whether the sway suppressor has been damaged by transport (e.g. see if there is oil leaking, etc.)

Before installation, check the dimension of the installation area, as well as the Pin-to-Pin measurement (sketch above: measurement L1) of the drawing and compared to the ACTUAL length.

The indicated dimension (L6 + C) cannot be checked by the customer.

Due to the expansion of the hydraulic oil at different environmental temperatures, the adjustment of the piston rod should be performed directly at the installation location of the sway suppressor.

Important: the hydraulic shock absorbers and sway suppressors react quickly to small movements. If it is necessary to move the piston rod of the brake before installation, it must be slowly pulled or pressed. If the piston rod is moved by hand, please turn the rod to overcome the friction while it is slowly pulled or pushed. If the brake blocks, please release it and turn and pull from the start again. Do not attempt to move the piston rod with a pulling winch as this will certainly block the suppressor.

INSTALLATION INSTRUCTIONS FOR HYDRAULIC SHOCK ABSORBERS AND SWAY SUPPRESSORS

Screws or a hydraulic device can be used to move the piston rod in and out. Bear in mind that the movement value must always be smaller than 2.5 mm/s at cylinder sizes up to 6 inches (1.25 mm/s at 6 inches size).

For SBV (adjustable extension piece) fit appropriate brake holder and / or clamp(s) to unit. Set piston rod end using the provided piston bolt. Set extension piece in such a way that it reaches the other fastening and secure with lock nut. If it is advantageous, the distance from bolt to bolt can be measured in advance and the extension piece set accordingly.

Check that all normal system movements can be performed without the sway suppressor using the last 10 mm stroke at either end. If the sway suppressor has the required installation length, the installation position can be freely selected.

Unnecessary turning of the screws on the hydraulic cylinder or the reservoir is not permitted. This may impair the function of the sway suppressor.

Maintenance
Depending on the environment in which the brake works, the maintenance conditions may be very different. The effects of dust or dirt, weather influences or strong vibrations might make maintenance necessary at shorter intervals.

Annually:
1. Clean rod and check for damage; a scratched or corroded rod can damage the seals and lead to leaks. Check brakes for leaks. With the exception of the cylinder, smaller leaks in the hydraulic system can often be remedied by tightening the nuts that hold the seals together. However the cylinder tie rod may not be adjusted. If damage or excessive leaks occur, please inform Witzenmann customer service.
2. Check the liquid level in the pressure reservoir of the sway suppressor

There are 2 red grooves on the piston rod of the pressure reservoir. They show the start of the oil reserve area.
If both of these marks disappear into the cylinder head of the reservoir, the sway suppressor has lost so much oil that oil needs to be refilled in the reservoir or, depending on the size of the leak, the sway suppressor may need to be sealed again in the factory.

In principle it is possible to refill the tank at the construction site, but this can only be done by trained Witzenmann staff.

For example: When used in the open air, in environments where there is lots of dust or strong vibrations, take the following measures:
Maintenance as indicated in sections 1 + 2 at least every 6 months.

General information on replacing seals
We recommend completely replacing the seals of the sway suppressors every 10 years, as natural ageing processes may occur in elastomer materials.

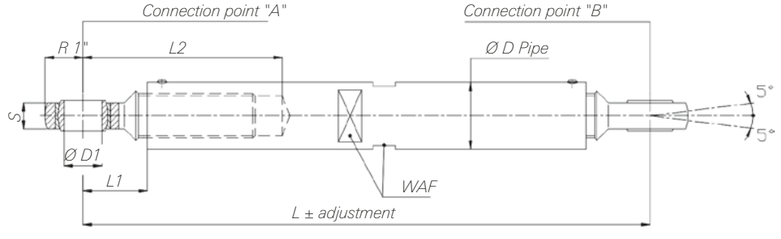
INSTALLATION INSTRUCTIONS FOR SWAY STRUTS

Application
Sway struts are push-pull elements and are mainly used to reduce dynamic loads. In addition, sway struts can be used as pipe guides to avoid complex steel constructions.

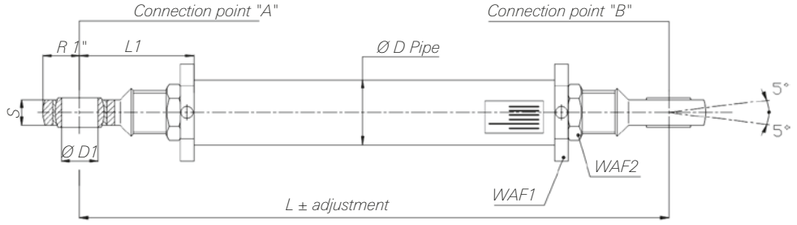
Function
The sway struts consist of a central part with two joint heads. Each sway strut has a threaded part with a right and left thread. The sway struts are set to compensate for construction tolerances via these threaded parts.

Sway strut overview drawings

E1



E2



Mounting instructions
The sway struts must be fitted in a way that ensures the following points are complied with:

- The deflection may not exceed the following values for the axis of the connecting bolt:
  In the bolt axis +/- 5°
  Lateral to the bolt axis +/- 70°
- The min. and max. installation length of the sway strut as per the catalogue details may not be exceeded.
- The threaded rods (E2) and the joint heads (E1) are marked in red because of their prescribed minimum screw depth. The colour marking must not be visible after the the installation length of the sway strut has been set, otherwise the full load cannot be transferred via the thread.
- After setting the sway struts to the final installation length, the lock nuts must be secured with the following torques:
  Size A – Torque max. 21 Nm
  Size B – Torque max. 56 Nm
  Size C – Torque max. 278 Nm
  Size D – Torque max. 392 Nm
  Size E – Torque max. 680 Nm
  Size F – Torque max. 1456 Nm
  Size G – Torque max. 2888 Nm
  Size H – Torque max. 4689 Nm
  Size I – Torque max. 8181 Nm
- With sway strut E2 you must ensure that the joint head with its surface is firmly pressed against the threaded rod shoulder.

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