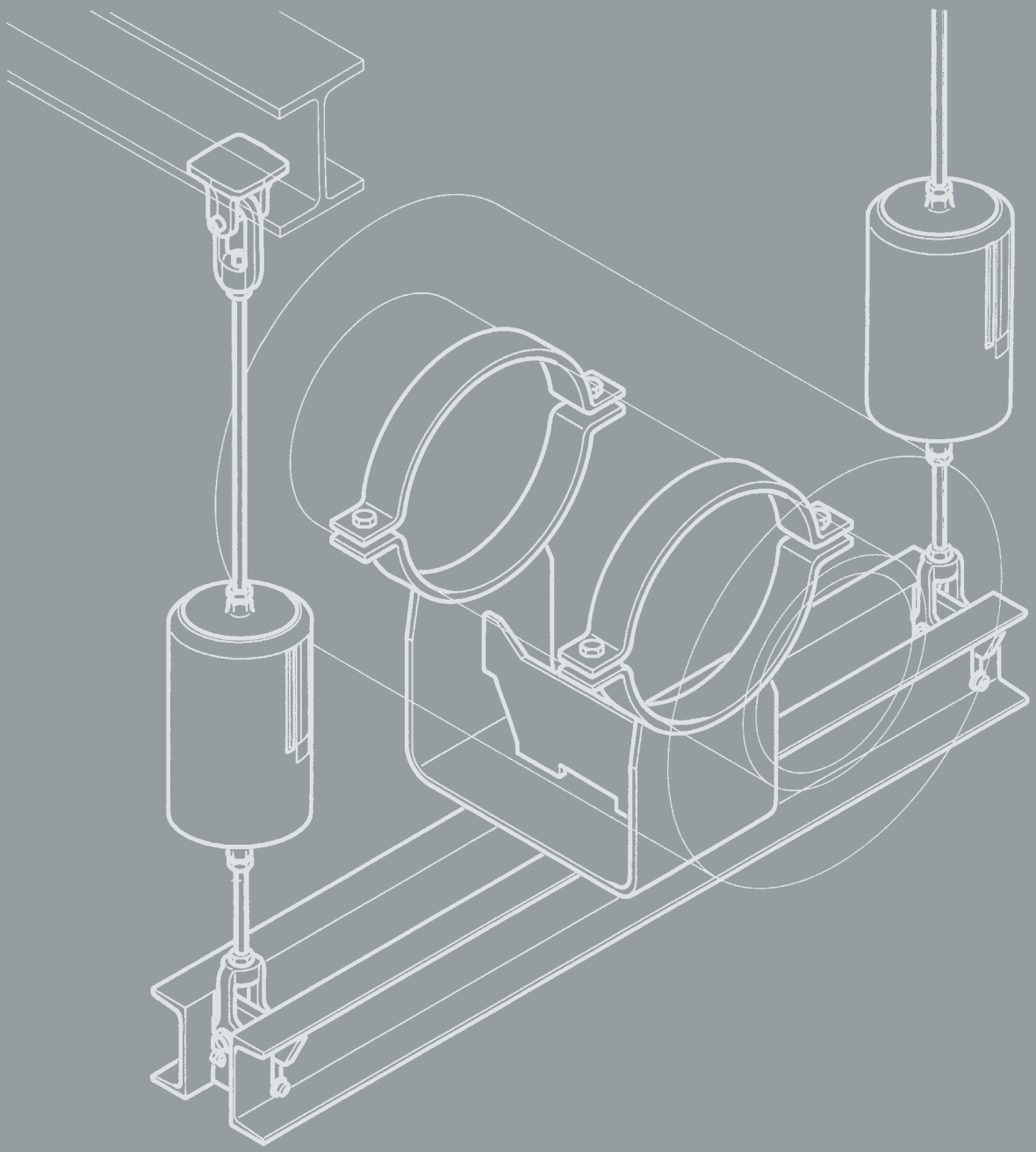
Technical specifications



LISEGA

Technical specifications

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Technical specification

The products outlined in this catalog - Standard Supports 2020 - are fully in line with the latest developments in support technology and satisfy general requirements for plant installation at the highest level. For the general design of LISEGA standard supports, uniform criteria are applied. They are described in the following Technical specifications and are binding for the contents of this catalog. Componentrelated features are outlined in the corresponding sections of the product groups and in the type data sheets

Unless expressly agreed otherwise, the stipulations in the catalog Standard Supports 2020 apply to all our shipments.

1. Standard Supports, definition and requirements

1.1 Requirements

For the support of industrial piping systems the use of standard supports is regarded as well-proven, up-to-date technology.

Only a high level of standardization can satisfy the demand for technically superior and at the same time economical support components. The complex requirements for modern pipe supports are:

- **reliable functioning**
- **maintenance-free operation**
- **quick delivery**
- **low component prices**
- **computerized design systems**
- **easy installation**
- **favorable performance weight ratio**

1.2 Definition

Standard supports must fulfill the following criteria:

- **component shapes are uniform and designed to make the optimum use of material**
- **components are compatible regarding dimensions and load capacity**
- **components are cataloged and clearly designated via an identification system**
- **components are manufactured in series production**
- **components comply with the approved standards and international codes**
- **the functional capacity, suitability and durability of the components is well proven**
- **components are certified and approved for use by independent certification bodies**

The relevant codes for pipe supports in German and European plant construction (power stations), the **DIN EN 13480-T3** and **VGB Guideline R 510 L**, require the preferential use of standard supports and define the criteria as follows:

“Standard Supports are pipe support components in which the design in form and dimensions, as well as the design data regarding loads, are specified, verified and cataloged and where the components are manufactured according to defined, reproducible processes, e.g. series production”.

2. LISEGA Standard Supports

2.1 Scope

At LISEGA, standard supports form the basis of a comprehensive performance package. A complete product program of more than **12,000 standardized components** covers all support situations, operational loads, temperatures and travel ranges normally experienced in piping systems in industrial plant construction:

- **≤ 650°C operating temperature for pipe clamps and clamp bases**
- **≤ 400kN nominal load for all mainly statically loaded components**
- **≤ 1000kN nominal load for rigid struts and standard snubbers**
- **≤ 5000kN design load for large-bore snubbers**
- **≤ 900mm travel range for constant hangers**
- **≤ 400mm travel range for spring hangers**

2.2 Design features

Specially developed components are available for the various support functions. Fundamental design principles were taken into consideration in the design and construction of the components:

- **symmetrical design shapes**
- **compact installation dimensions**
- **special, reliable functional principles**
- **extra-wide adjustment ranges**
- **fully compatible load ranges and connection dimensions**
- **integrated installation aids**

Moreover, LISEGA hangers feature **only one** upper connection point. Due to this, along with compact and symmetrical design shapes, load distribution free of imposed moments on the connections is ensured and easy installation made possible. The operating position of the moving parts (hangers, supports and snubbers) can be read directly off a linear travel indicator.

Load adjustment of the constant hangers and supports can be carried out at all times, even in the installed condition. Hangers and supports can be blocked **in any travel position**.

2.3 Principle of the optimum design

For the design and arrangement of support components, optimum coverage of the specific support function is the decisive factor. So **only one** design is required **for each function**, namely, the optimum one for the purpose. The project engineer is no longer forced to choose from a range of alternative solutions.

This not only facilitates application but also increases safety. In addition it is a prerequisite for the logical implementation of standardized construction according to the modular system.

- **There's only ONE best solution!**

3. The LISEGA Modular System

3.1 User benefits

The cost of pipe supports is a major factor in the total cost of a pipe system. The cost of the supports is the accumulated total arising from the individual costs of:

- **project management (processing)**
- **design and engineering work**
- **use of material (components) and**
- **installation and assembly work**

Moreover, the pipe supports are almost always critical for the commissioning deadlines and can, through delays in delivery, cause incalculable extra costs.

The goal of the LISEGA product strategy is to achieve optimum user benefits for customers at the lowest cost, following the **economic principle**.

The LISEGA modular system provides the corresponding basis. The standardization of components is the decisive prerequisite for:

- **rational series production**
- **favorable performance/weight ratios**
- **consistently high product quality**
- **ready availability from stock**
- **our special LICAD® design software**

The cumulative benefits from this result in reliable project processing at competitive prices with superior component quality. In addition, the user also benefits from cost reductions in labor-intensive sectors such as support engineering (design) and onsite installation. The assembly procedure for the pipe systems can also be streamlined by **first installing the supports, then mounting the piping directly into them.**

The economic principle:

= with the least possible effort, achieving the maximum possible benefit

= Total Cost Minimum/TCM

3.2 Functionality

The standardization of components at LISEGA is specifically directed toward their systematic interaction as support configurations. To this end, load and travel ranges as well as the geometry of the connections are harmonized. The LISEGA standard support program has been developed in this fashion as a fully functional and effective modular system. The individual components therein form modules and guarantee load compatibility. This enables a wide range of combinations to produce tailor-made support configurations as required. The comprehensive selection of components enables adaptation widely to differing support situations and application conditions.

First install the supports, then mounting the pipes!

3.3 Product groups

The standardized components are divided into **7 product groups** according to task and function (see standardized components table p. 0.3 and diagram on p. 0.4).

Product Groups
+ load groups
+ travel ranges
+ connection compatibility

= Modular System

3.4 Load groups

To ensure uniform loading in component combinations the product groups are arranged throughout according to clearly classified static and dynamic load groups (see p. 0.5 and p. 0.6).

Modular System
+ CAD design
+ IT Logistics System

= High-Tech Application

① Metric or UNC according to region of application.

Within a load group (nominal load) all components feature uniform load limits and safety margins. Within a load group the connection dimensions of the components (thread① and bolt diameters) are uniform and compatible with the components in other product groups.

As different components can only be combined with each other within the same load group the stresses **on a load chain are consistent throughout**, whereby the clamps are selected in each case according to the relevant temperature and isolation thickness of the pipe system.

The incorrect combination of parts from different load groups is thus avoided.

3.5 Travel ranges

3.5.1 Constant and spring hanger travel ranges

Moving components such as constant and spring hangers are split into travel ranges corresponding to the usable spring travel of the standard springs used. The relevant travel range in each case is designated in the type description by the 4th digit in the following table.

② For spring hangers and supports (Product Group 2) the springs are pre-stressed to approx. 1/3 of their nominal load. This results in the initial load.

constant hangers	
travel range [mm]	type designation
0 - 75	1 . . 1 . .
0 - 150	1 . . 2 . .
0 - 300	1 . . 3 . .
0 - 450	1 . . 4 . .
0 - 600	1 . . 5 . .
0 - 750	1 . . 6 . .
0 - 900	1 . . 7 . .

spring hangers	
travel range [mm] ②	type designation
0 - 50	2 . . 1 . .
0 - 100	2 . . 2 . .
0 - 200	2 . . 3 . .
0 - 300	2 . . 4 . .
0 - 400	2 . . 5 . .

3.5.2 Snubber travel ranges

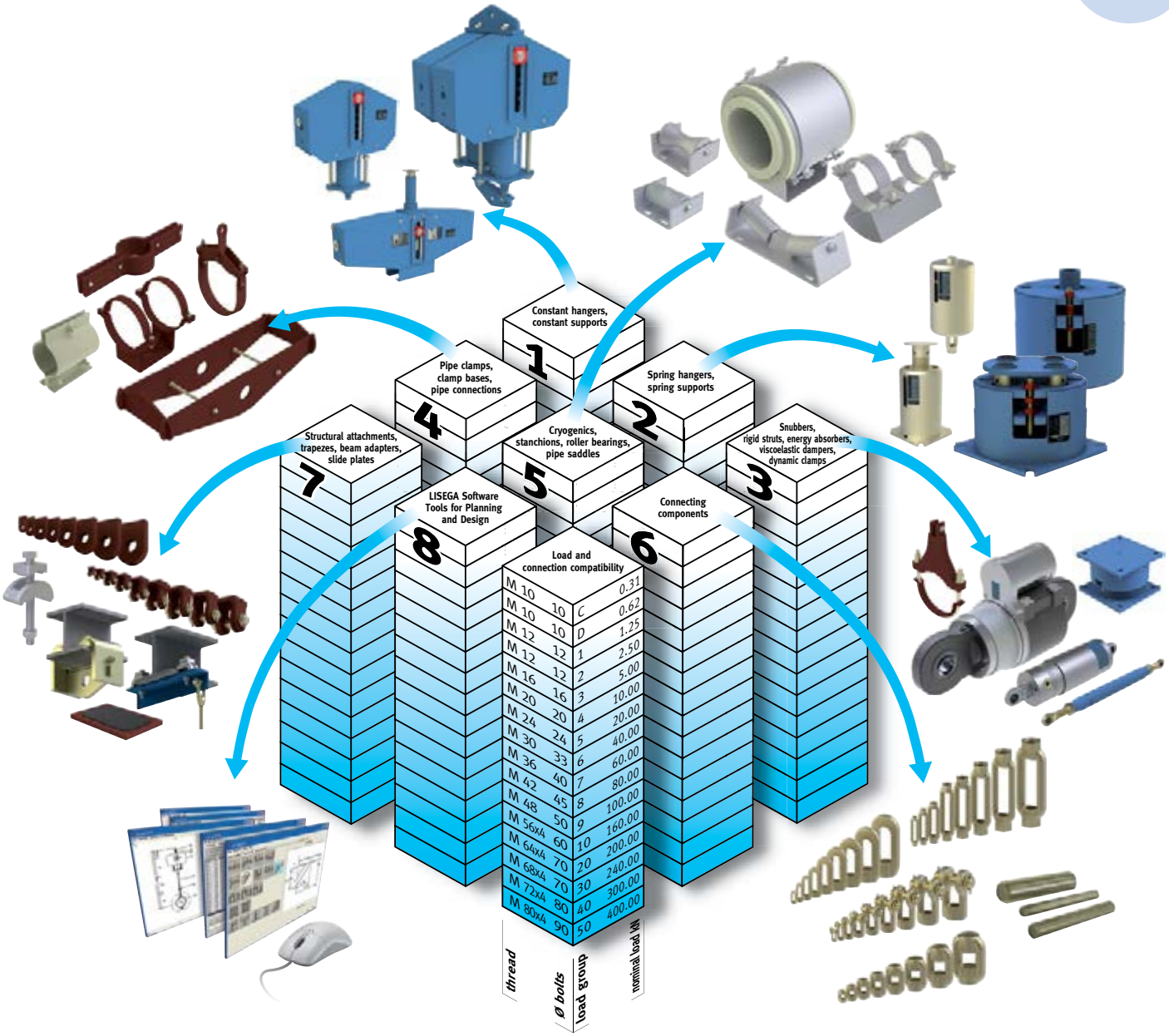
The LISEGA snubbers are grouped into standard stroke ranges denoted by the 4th digit of the type designation as in the following table.

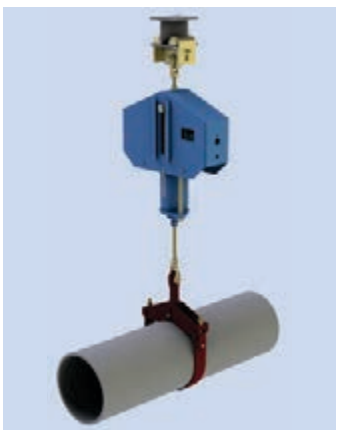
snubbers		
stroke [mm]	type	type designation
150	30	3 . . 2 . .
300	30	3 . . 3 . .
400	30	3 . . 4 . .
500	30	3 . . 5 . .
600	30	3 . . 6 . .
750	30	3 . . 7 . .
100	30/31	3 . . 8 . .
200	30/31	3 . . 9 . .

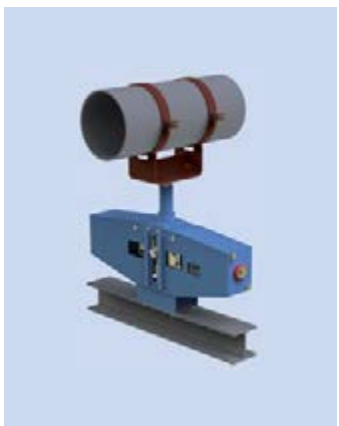
3.6 Product groups

standard components			
product group		type	component
1	Constant hangers & supports	11	Constant hangers
		12-14	Constant hangers, multi-cell
		16	Constant supports, multi-cell
		17	Servo hangers
		18	Constant hangers, low profile
		19	Constant supports, low profile
		19	Angulating const. supp., low profile
		71	Brackets for constant hangers
		79	Constant hanger trapezes
2	Spring hangers	20	Angulating spring supports
		21	Spring hangers
		22	Heavy duty spring hangers
		25	Spring hangers, seated
		26	Heavy duty spr. hang. (seated)
		27	Sway braces
		28	Heavy duty spring supports
		29	Spring supports
		72	Base plates
		79	Spring hanger trapezes
3	Dynamic components	30	Snubbers
		31	Large bore snubbers
		32	Energy absorbers
		33	Installation extensions
		34	Dynamic pipe clamps
		35	Weld-on brackets
		36-38	Dynamic pipe clamps
		39	Rigid struts
		3D	Viscoelastic dampers
		3L	Shear lugs
		3R	Pipe whip restraints
4	Pipe connecting components	40	U-bolts
		41	Weld-on lugs
		42-44	Horizontal clamps
		45,46,48	Riser clamps
		49	Clamp bases, lift-off restraints
		77	Connection plates
5	Pipe bearings and saddle components, cryogenic clamp bases	51	Cylinder roller bearings
		52	Double taper roller bearings
		53	Double cylinder roller bearings
		54	Weld-on pipe saddles
		54	Pipe saddle with pipe clamps
		55	Lift-off restraints
		56	Cryogenic clamp bases
		57	Cryogenic axial stops
		57	Weld-on pipe shoes
		58	Stanchions
6	Threaded connecting elements	60	Eye nuts
		61	Clevises
		62	Turnbuckles
		63	Hexagon nuts
		64	Rod couplings
		65	Tie rods L/R
		66	Tie rods
		67	Threaded rods / stud bolts
7	Structural attachment elements	70	Sliding components
		73	Weld-on clevises
		74	Weld-on plates with sph. washers
		75	Weld-on eye nuts
		76	Beam adapters
		78	Beam clamps
		79	Trapezes

3.7 Modular system for load and connection compatibility







Cold load:
The cold load is the load determined by the pipe system calculations for the support point in shut down condition.

Set load (blocking load):
The set or blocking load is the load at which the spring or constant hanger is set and blocked. The set load is made up of the cold load and the dead weight of the components suspended from the spring or constant hanger. In part, blanket dead weights are already calculated into the cold loads. These must be taken into account when designing the hanger arrangement.

Hot load (operating load):
The hot or operating load is the load acting on the support point during normal operation. For spring hangers it is made up of the set load and the force resulting from spring travel multiplied by spring rate. For constant hangers the hot load corresponds to the set load.

Hydrostatic test load:
The hydrostatic test load is the load acting on the support during pressure testing, in general at 80°C.

Pickling (and clean) load:
The pickling load is the load distributed from the supports points during pickling of the pipe system, in general at 200°C.

4. Permissible loads

4.1 Statically and dynamically loaded components

For permissible loads we distinguish between statically and dynamically loaded components. The components in product groups **1, 2, 4, 5, 6, and 7** are, according to their function, loaded in only one direction (static or quasi static) and are viewed as statically determined components.

4.1.1 Static components

The nominal load is used to denote the load group. For the statically determined components in product groups **1, 2, 6 and 7** the **nominal load** corresponds to the max. **set load** of spring elements such as spring hangers. The **max. operating load** (load case H) is, in the event of use as a rigid support, considerably higher than the nominal load and is adapted to the load capacity of the connection thread. This also includes spring hangers and constant hangers in blocked condition, whereby for **cold loads** in pressure tests (short duration) the emergency loads (load case HZ) can be exploited.

4.1.2 Dynamic components

For dynamically loaded components the nominal load corresponds at the same time to the operating load for load case H (under normal conditions) or load A/B (ASME).

As these components are generally used as safety devices for emergencies, load case HZ or level C (ASME) are taken as the maximum occasionally occurring load condition. In any case, **the requirements set forth by the project engineer responsibly apply.**

4.2 Product group 4

For product group 4 (pipe connections), a corresponding overlapping area in the load groups is taken into account, due to the wide temperature-dependent range of different loads. Data on the permissible loads for pipe-connecting components under consideration of the respective operating temperatures can be taken from the individual selection tables.

The permissible operating loads for long-term operation (load case H (under normal conditions), normal load, level A) are shown here. On higher short-term loading (e.g. hydrostatic tests) no permanent deformation is caused.

The permissible loads in load cases HZ (emergency (occasionally occurring operating conditions), level C) and HS (faulted condition, level D) depend on the codes to be complied with.

	examples	
code	load case HZ (emergency)	load case HS (faulted condition)
ASME section III, NF	H x 1.5	H x 1.6
RCCM	H x 1.33	H x 1.6
MSS SP-58	H x 1.2	no data
DIN EN 13480	H x 1.2	no data
VGB-R 510 L ①	H x 1.15	H x 1.5
KTA 3205.3 ①	H x 1.15	H x 1.5

4.3 Product group 5

The components in product group 5, clamp bases for cold pipe systems, low temperature systems (cryogenic) as well as roller bearings and pipe saddles, are regarded as static after determined but are not considered to be part of the modular system with regard to the load group. As they are more comparable with components in secondary steelwork with respect to loading, they form a separate group. The nominal load here corresponds to the max. operating load according to load case H. For product group 5 see also 4.4.3, p. 0.6.

① For components qualified acc. to KTA 3205 the following applies: HZ = H x 1.5; HS = H x 1.7

dynamically determined components product group 3		
load group	nominal load [kN]	ø connecting bolt
–	–	–
–	–	–
1	3	10
2	4	10
3	8	12
4	18	15
5	46	20
6	100	30
7	200	50
8	350	60
9	550	70
10	1000	100
20	2000	120
30	3000	140
40	4000	160
50	5000	180

statically determined components product groups 1, 2, 6, 7				
load group	nominal load [kN]	ø connecting bolt	spanner width	connecting bolt
C	0.31	M10	16	10
D	0.62	M10	16	10
1	1.25	M12	18	12
2	2.5	M12	18	12
3	5.0	M16	24	16
4	10	M20	30	20
5	20	M24	36	24
6	40	M30	46	33
7	60	M36	55	40
8	80	M42	65	45
9	100	M48	75	50
10	160	M56x4	85	60
20	200	M64x4	95	70
30	240	M68x4	100	70
40	300	M72x4	105	80
50	400	M80x4	115	90

4.4 Load tables

The permissible loads of the components are arranged in the form of a matrix (ordered acc. to load groups and load cases) in the following LISEGA load tables. The definition of the load cases are in line with **DIN EN 13480-T3, VGB-R 510 L, ASME B31.1, MSS SP-58, ASME section III, Div. 1, Subsection NF** and **KTA 3205**. The load table applies uniformly to all components in the LISEGA modular system and to other LISEGA components scheduled for use with standard components **such as special designs**.

4.4.1 Max. permissible load [kN] for statically determined components

load group	nom. load [kN] ①	normal operating conditions ③ H/normal ② 80°C	normal operating conditions ③ upset 150°C	occas. occurring operating conditions ④ HZ/emergency 80°C	occas. occurring operating conditions ④ HZ/emergency 150°C	⑤ faulted condition HS/faulted 80°C	⑤ faulted condition HS/faulted 150°C
C	0.31	0.7	0.8	0.7	1.1	1.0	1.4	1.3
D	0.62	1.7	2.5	2.2	3.3	2.9	4.3	3.8
1	1.25	2.8	4.2	3.7	5.6	5.0	7.2	6.4
2	2.5	4.4	6.7	6.0	9	8.0	13.3	12
3	5.0	8.5	11.3	10.1	15	13.4	22.2	20
4	10.0	14	23.3	20.9	31	27.8	41	37
5	20.0	27	34	30	46	41	61	55
6	40.0	43	56	50	74	66	96	86
7	60.0	63	83	74	108	97	140	126
8	80.0	85	114	102	150	135	195	175
9	100	112	151	135	196	176	255	230
10	160	178	222	199	295	265	381	343
20	200	215	297	266	395	355	512	461
30	240	270	340	305	452	406	585	526
40	300	320	380	340	505	450	650	585
50	400	400	490	440	650	585	840	755

4.4.2 Max. permissible loads [kN] for dynamically determined components, product group 3

load group	normal operating conditions (FN)/upset ⑥ level A/B 80°C	normal operating conditions (FN)/upset ⑥ level A/B 150°C	occas. occurring operating conditions ⑦ level C 80°C	occas. occurring operating conditions ⑦ level C 150°C	faulted condition ⑧ level D 80°C	faulted condition ⑧ level D 150°C
1 ⑨	3	2.9	4.0	3.8	5.2	5.0
2 ⑨	4	3.9	5.3	5.1	6.9	6.7
3	8	7.5	10.6	9.7	13.7	12.6
4	18	16.5	23.9	22.0	31	28.5
5	46	44.0	61	58.5	77	74.5
6	100	94.5	141	127	180	162
7	200	175	267	239	336	301
8	350	339	472	423	655	588
9	550	535	735	715	935	910
10	1000	937	1335	1236	1740	1612
20	2000	1900	2660	2520	3440	3270
30	3000	2850	4000	3800	5160	4900
40	4000	3800	5320	5050	6880	6530
50	5000	4750	6650	6310	8600	8150

4.4.3 Max. permissible loads for roller bearings in product group 5

permissible loads [kN]						
normal operating conditions	4	8	16	35	60	120
occas. occur. operat. cond.	5.5	11	22	47	80	160

4.4.4 Max. permissible loads for snubbers

permissible loads [kN]									
3D .. .. -D	2.5	5	10	20	30	40	60	80	100
3D .. .. -L	5.0	10	15	25	40	50			

① Max. operating load for spring and constant hanger corresponding to max. load on main springs. The load group allocation does not apply to types 18/19.

② Permissible loads acc. to design criteria for US standard "MSS SP-58" (ASME B 31.1 / B 31.3).

③ All loads are included here that can possibly occur during conventional operation of the plant, including startup and shutdown, weight tolerances, and hydrostatic tests.

④ Loads falling outside conventional operation are included here, according to the regulations in each case, also hydrostatic tests. Subsequent inspection of the whole support arrangement is strongly advised.

⑤ Due to the loads specified the yield stress of the components can be reached. At all events replacement is recommended.

⑥ All dynamic stresses possibly resulting from plant operation are included here including pressure shock forces from valve operations or possibly from operating basis earthquakes (O.B.E.).

⑦ All dynamic stresses beyond conventional operation and possibly safety shutdown earthquakes (S.S.E.) are included here. Subsequent inspection of the whole support arrangement is strongly recommended.

⑧ For the dynamic loads specified the yield stress of the components can be reached. At all events replacement is strongly recommended.

⑨ Load groups 1 and 2 are compatible regarding load and connections, whereby load group 1 refers to the smallest snubber and load group 2 to the corresponding rigid struts and weld-on brackets.

5. Type designations

All components can be identified via coded type designations. **6 digits** contain all the information required for description of the standard design.

The type designation system is the prerequisite for the use of modern IT and enables the unrestricted integration of the LISEGA modular system into current CAD programs.

The LISEGA type designations can be decoded by way of the following tables.

The 1st digit describes the product group (PG)
PG 1 = Constant hangers and supports PG 2 = Spring hangers and supports PG 3 = Dynamic components PG 4 = Pipe connecting components PG 5 = Pipe bearings and saddle components, cryogenic clamp bases PG 6 = Threaded connecting elements PG 7 = Structural attachment elements

The digits 2 – 6 designate the further characteristics according to the following tables. The design for increased requirements (5th or 6th digit) is described on p. 0.18.

PG 1 Constant hangers and supports

2nd digit	3rd digit	4th digit	5th digit	6th digit
design	load group	travel range [mm]	field of application	production series
1= CH	C=M10 D=M10 1=M12 2=M12 3=M16 4=M20 5=M24 6=M30 7=M36 8=M42 9=M48	2=150 3=300 4=450 5=600 6=750 7=900	1= standard 5= ‹increased require-ments›	3=2013 5=1985 9=1999 9=2009
2= CH 2 x coupled	8≙LG10 9≙LG20		1,3 = standard 5,7 = ‹increased require-ments›	5=1985
3= CH 3 x coupled	8≙LG30 9≙LG40			
4= CH 4 x coupled	8≙LG40 9≙LG50			
6= heavy con. support	8≙160kN 9≙200kN	2=150mm 3=300mm	2= coupled 2 x	6=with high temp. SE* 7=with PTFE-SE* 9=without SE*
	8≙240kN 9≙300kN		3= coupled 3 x	
	8≙320kN 9≙400kN		4= coupled 4 x	
7= servo hanger	5=M24 6=M30 7=M36 8=M42 9=M48	2=150 3=300	1= standard 5= ‹increased require-ments›	5=1985

*SE= sliding element

PG 1 Constant hangers and supports (continued)

2nd digit	3rd digit	4th digit	5th digit	6th digit
constant hanger	load group [kN]	travel range [mm]	field of application	production series
8= CH short	D=M10 1=M12 2=M12 3=M16 4=M20 5=M24 6=M30 7=M36 8=M42 9=M48	1=75 2=150 3=300	1,2= standard 5,6= ‹increased requirements›	7=2007
9= C-support, Angulating constant support, short			1,2= standard constant support 3,4= standard angulating constant support 5,6= support ‹incr. requirem.› constant support 7,8= ‹increased requirements› angulating constant support	6=with high temp. SE* 7=with PTFE-SE*

PG 2 Spring hangers and supports

2nd digit	3rd digit	4th digit	5th digit	6th digit
spring hanger	load group [kN]	travel range [mm]	field of application	production series
0= angulating spring support 0= extension for type 20 1= suspended 5= seated 7= sway brace 7= extension for type 27 9= spr. support	C=M10 D=M10 1=M12 2=M12 3=M16 4=M20 5=M24 6=M30 7=M36 8=M42 9=M48	1= 50 2=100 3=200 4=300 5=400 9 = Ext. f. type 20 & type 27 & type 29	1= standard 5= ‹increased requirements› 2= telescopable spring support 6= ‹increased requirements›	4=1994 8=1978 6=with high temp. SE* 7=with PTFE-SE* 9=1999 1=1991
2= heavy SH suspended 6= heavy SH seated 8= heavy spring support	1=M56x4 2=M64x4 3=M68x4 4=M72x4 5=M80X4	1= 50 2=100 3=200	1= standard 5= ‹increased requirements› 2= standard 6= ‹increased requirements›	9=1999 6=with high temp. SE* 7=with PTFE-SE*

PG 3 Dynamic components

2nd digit	3rd digit	4th digit	5th digit	6th digit
design	load group [kN]	travel range [mm]	field of application	production series
0= hydr. snubber serial version 2= energy absorber 3= extension	1=3 2=4 3=8 4=18 5=46 6=100 7=200 8=350 9=550 0=1000	2=150 3=300 4=400 5=500 8=100 9=200	1= standard 5= ‹increased requirements› 9= to 600°C	2=2002 3=1993 6=1986 8=1988
1= hydr. snubber large bore	2=2000 3=3000 4=4000 5=5000 9=550 0=1000	8=100 9=200		
5= weld-on brackets	19=3 29=4 39=8 49=18 59=46 69=100	79=200 89=350 99=550 09=1000 20=2000	1= standard 5= ‹increased requirements›	1=1991 3=1993 9=1989 8=1988

PG 3 Dynamic components (continued)

2nd digit	3rd digit	4th digit	5th digit	6th digit
design	pipe diameter load group [kN]		field of application	production series
6= dynamic pipe clamps with U-bolt	Pipe diameter in mm/10 ⋮ T0=1016 T1=1067 T2=1118 T3=1168 T4=1219		standard 1=to 350°C 2=to 500°C 3=to 560°C 4=to 600°C ‹increased requirements› 6=to 350°C 7=to 500°C 8=to 560°C 9=to 600°C	1-3= 1 x U-bolt 4-5= 2 x U-bolt
7= dynamic clamps with strap				1-6= 1 x Strap 7-8= 2 x Strap
9= rigid struts	2=4 3=8 4=18 5=46 6=100 7=200 8=350 9=550 0=1000	Middle installation dimension in mm/100		3-4= standard 8-9= ‹increased requirem.›
L= shear lugs	3rd to 6th digit corresponds to clamp type			

2nd digit	3rd + 4th digit		5th digit	6th digit
design	load [kN]		travel vertical [mm]	travel horizontal [mm]
D= viscous-elastic damper	03=2.5 05=5 10=10 15=15 20=20 25=25	40=40 50=50 60=60 80=80 H1=100	3=30 4=40 5=50	3=30 4=40 5=50
	.. .. ..-D = depend		.. .. ..-L = limit	

PG 4 Pipe clamps, clamp bases and pipe-connecting components

2nd digit	3rd + 4th digit	5th digit	6th digit
design	pipe diameter [mm] / load group	field of application	production series
1= weld-on lug	D9= LGD 29= LG2 39= LG3 49= LG4 59= LG5 69= LG6 79= LG7	1=standard	for straight pipes max. insulation thickness in mm 1=10 2=100
	01=21.3 02=26.9 03=33.7 04=42.4 05=48.3 06=60.3 07=73.0 08=76.1 09=88.9 10=108.0 11=114.3 13=133.0 14=139.7 16=159.0 17=168.3 19=193.7 22=219.1 24=244.5	1=standard	for pipe elbows R≈1.5OD max insul. thickn. in mm 3,4=10 5,6=100
horiz. clamp 2= 1-hole 2= 2-hole 3= 3-hole 4= with U-bolt or strap	26=267.0 27=273.0 32=323.9 36=355.6 37=368.0 41=406.4 42=419.0 46=457.2 51=508.0 56=558.8 61=609.6 66=660.4 71=711.2 76=762.0 81=812.8 86=863.6 91=914.4 97=965.2 T0=1016 T1=1067 T2=1118 T3=1168 T4=1219	standard 1=to 350°C 2=to 500°C 3=to 560°C 4=to 600°C 5=to 650°C ‹increased requirements› 6=to 350°C 7=to 500°C 8=to 560°C 0=special material	depen-ding on Load Group and design
riser clamp 5= flat steel 6= box-sh. for shear lugs 8= box-sh for trunnions			

PG 4 Pipe clamps, clamp bases and pipe-connecting components (continued)

2nd digit	3rd + 4th digit	5th digit	6th digit
design	pipe diameter [mm]	field of application	production series
9= clamp base	01=21.3 02=26.9 03=33.7 04=42.4 05=48.3 06=60.3 07=73.0 08=76.1 09=88.9 10=108.0 11=114.3 13=133.0 14=139.7 16=159.0 17=168.3 19=193.7 22=219.1 24=244.5 26=267.0 27=273.0 32=323.9 36=355.6 37=368.0 41=406.4 42=419.0 46=457.2 51=508.0 56=558.8 61=609.6 66=660.4 71=711.2 76=762.0 81=812.8 86=863.6	standard 1=to 350°C 2=to 500°C 3=to 560°C 4=to 600°C 5=to 650°C ‹increased requirements› 6=to 350°C 7=to 500°C 8=to 560°C	1= low 2= middle 3= low, welded 4= med., welded 5= high, welded
0= U-bolt	91=914.4 97=965.2 T0=1016 T1=1067 T2=1118 T3=1168 T4=1219	1= S235JR 3= 1.4301 ‹incr. requirem.› 6= S235JR 8= 1.4301	8= standard
9= lift-off restraint for clamp base	00= lift-off restraint	0= lift-off restraint	1-5= compon. size

PG 5 Roller bearings, pipe saddles and cryogenic clamp bases

2nd digit	3rd + 4th digit	5th digit	6th digit
design	load group pipe diameter ø	field of application	production series
1= cyl. roller bear. 2= doub.tap.roll.bear. 3= doub. cyl. roll. bear. 5= lift-off restraint for roll. bear.	04= 4kN 08= 8kN 12= 120kN 16= 16kN 35= 35kN 60= 60kN	1= standard 2= movable laterally	9=1989
4= pipe saddle with pipe clamps, weld-on saddles	01= 21.3mm 02= 26.9mm 03= 33.7mm 05= 48.3mm 06= 60.3mm 07= 73.0mm	1= without pipe clamps 2,3= with pipe clamps	
6= cryogenic clamp base 7= cryogenic axial stop	08= 76.1mm 09= 88.9mm 10=108.0mm 11=114.3mm 13=133.0mm 14=139.7mm 16=159.0mm 17=168.3mm 19=193.7mm 22=219.1mm 24=244.5mm 26=267.0mm 27=273.0mm	Length: 3=150mm 5=300mm 7=500mm 8=750mm	Insulation thickness in mm 0=25 1=40 2=50 3=80 4=100 5=130 6=150 7=180 8=200 9=250
6= pipe bearing with cold block	32=323.9mm 36=355.6mm 37=368.0mm 41=406.4mm 42=419.0mm 46=457.2mm 51=508.0mm 56=558.8mm 61=609.6mm 66=660.4mm 71=711.2mm 76=762.0mm 81=812.8mm 91=914.4mm 97=965.2mm	9= pipe bearing with cold block	1= pipe bearing
A= weld-on bearing		1= Standard	1= out of T-section 2= out of U-section
8= pipe supports		1= rigid pipe supports 2= pipe supports, adjustable	1,2=for str. pipes 3,4=for elbows R≈ DA 5,6=for pipe elbows R≈1.5 DA

PG 6 Connecting components

2nd digit	3rd + 4th digit		5th digit	6th digit
design	load group		field of application	production series
0= eye nut 1= clevis 2= turn-buckle 4= rod coupling	D9= M10-0.62kN 29= M12-2.50kN 39= M16-5.00kN 49= M20-10.0kN 59= M24-20.0kN 69= M30-40.0kN 79= M36-60.0kN 89= M42-80.0kN 99= M48-100kN 10= M56x4-160kN 20= M64x4-200kN 30= M68x4-240kN 40= M72x4-300kN 50= M80x4-400kN		1= standard 5= ‹increased requirements›	2=1982 5=1995 8=1978 9=1999
3= hex. nut			2= standard 3= 25CrMo4 5= ‹increased requirements›	3=1993 8=1978 9=1999
5= tie rod L/R 6= tie rod R/R 7= stud bolt, threaded rod	D=M10 2=M12 3=M16 4=M20 5=M24 6=M30 7=M36 8=M42 9=M48	Length: 1=not standard 2= 500mm 3=1000mm 4=1500mm 5=2000mm 6=2500mm 7=3000mm	1= standard 5= ‹increased requirements›	
	10=M56x4 20=M64x4 30=M68x4 40=M72x4 50=M80x4	Length not standardized		

Type designation

1 2 3 4 5 6

- 6 — Production series/travel/variant
- 5 — Field of application/travel
- 4 — Travel range/pipe ø/function
- 3 — Load gr./pipe ø/thread ø
- 2 — Design
- 1 — Product Group (PG)

Examples

1 1 5 3 1 5

- 5 — 1985
- 1 — Standard design
- 3 — Travel range 3/0-300mm
- 5 — Load gr. 5/F_N = 20kN
- 1 — Individual design
- 1 — Constant hanger

4 9 5 1 8 5

- 5 — High design, welded
- 8 — 13CrMo4-5, increased requirements
- 1 — Pipe diameter 508mm
- 5 — Clamp base
- 9 — Pipe connection

3 9 6 2 5 4

- 4 — Standard design
- 5 — Medium length 2500mm
- 2 — Load group 6/F_N = 100kN
- 6 — Rigid strut

PG 7 Structural attachments and trapezes

2nd digit	3rd digit	4th digit	5th digit	6th digit
design	load group [kN]	function	field of application	production series
0= sliding elements	Width 1= 50 2=100 3=150 4=200	Length 1= 50 2=100 3=150 4=200 6=300 7=390 8=490	1= welded 2,3= bolted	1= rectangular, up to 180°C 4= rectangular, up to 350°C
	05=ø 50 13=ø 130 08=ø 85 17=ø 170 10=ø 100 20=ø 200		1= welded 2,3= bolted	2= round, up to 180°C 5= round, up to 350°C
1= support bearing for constant hanger	C...9= Load Group	2=150 3=300 4=450 5=600 6=750 (7=900)	6= standard 8= ‹increased requirements›	1= single support
1= support bearing for heavy constant hanger	8=160kN 9=200kN			2= coupled 2 x
	8=240kN 9=300kN			3= coupled 3 x
	8=320kN 9=400kN			4= coupled 4 x
2= base plate for spring hangers	D...9= Load Group	1, 2, 3, 9= dep. on design	2= standard 7= ‹increased requirements›	8= 1978
3= weld-on clevis 4= weld-on plate 5= weld-on eye plate	D...50= Load Group	0 > Load Group 9	1= standard 5= ‹increased requirements›	2= 1982 3= 1993 9= 1989
6= beam adapters & combi-nations	D...4= size	2= beam adapter & bolts		1= 2001
	C...2= size	1= cantilever		6= vertical connection 7= horizontal connection
	00=lift-off restraints			1...4= size
8= beam clamp	2..7= Load Group	1= standard		1= 1991
9= constant hanger trapezes	3rd to 6th digits correspond to single hangers in each case (see PG1)			
9= spring hanger trapezes	3rd to 5th digits correspond to single hangers in each case (see PG2)			1= welded unit 9= with individual supports
9= rigid trapezes	C...4= Load Group	2,3= depending on design type	3= standard 7= ‹increased requirements›	7= L-profile
	2...9= Load Group			9= U-profile, centric connection
	2...20= Load Group	0 > LG9		4= U-profile
7= connecting plates	3rd to 6th digit correspond to the clamps to be coupled			

4 4 6 1 4 8

- 8 — Strap clamp for heavy loads
- 4 — Material 10CrMo9-10 standard design
- 1 — Pipe diameter 609.6mm
- 6 — Horizontal clamp, U-bolt or strap
- 4 — Pipe connection

Worldwide coverage of recognized standards

6. Standards and codes

In design, in stress and load calculations, as well as in production, the relevant European and other international standards are taken into account.

The material characteristics upon which all design calculations are based are taken from the relevant standards and technical codes.

the following codes apply:		
DIN EN 13480-T3	Metallic industrial pipe systems	Europe
VGB-R 510 L	Standard supports	Germany
KTA 3205.1/2/3	Nuclear regulations	Germany
AD-Merkblätter	Pressure vessels working group	Germany
RCC-M	Specifications for pipe supports	France
MSS SP-58	Pipe supports – material and design	USA
MSS SP-69	Pipe supports – application	USA
ANSI ASME B31.1 / B31.3	Pressure piping systems	USA
ASME section III Div.I - NF	Supports for nuclear components	USA
JSME S NC 1	Technical regulations	Japan
JEAG 4601	Nuclear design regulations	Japan
SPIR-O-2008	Supports for nuclear plants for AES-2006	Russia

7. Materials

Materials are exclusively used that conform to DIN-EN, ASTM or CN steel material requirements.

As a matter of course only materials of guaranteed strength characteristics are used for the support components.

Preferred materials for pipe connections

Standardized selection of carbon steels and heat-resistant materials!

			temperature of medium in °C						
DIN-EN	ASTM	CN-Steel	≤350	≤450	≤500	≤530	≤560	≤600	≤650
S235JR	A 36	Q235B	x						
S235JR	A 516 Gr. 60		x						
S235JR	A 675 Gr. 55		x						
S355J2	A 675 Gr. 70	Q345B/Q345R	x						
S355J2	A 299	Q345B/Q345R	x						
S355J2	A 516 Gr. 70	Q345B/Q345R	x						
P235TR1	A 53 S Gr. A	20G	x						
P235GH	A 53 S Gr. A	20G	x						
P355NH	A 106 Gr. C	20G	x						
16Mo3	A 204	(Q345R)/15CrMoR	x	x	x				
13CrMo4-5	A 387 Gr. 12 Cl.2	15CrMoR	x	x	x	x	x		
10CrMo9-10	A 387 Gr. 22 Cl.2	12Cr1MoVR/12Cr2Mo1R	x	x	x	x	x	x	
X10CrMoVNb9-1+NT/QT	A 387 Gr. 91 Cl.2		x	x	x	x	x	x	x
X5CrNi18-10	A 240 TP 304	06Cr19Ni10	x	x	x	x			
42CrMo4+QT	A 193 B7	42CrMo	x						
	A 193 B8		x	x	x	x	x	x	x
X10CrMoVNb9-1+NT/QT	A 182 F91		x	x	x	x	x	x	x
21CrMoV5-7+QT		25Cr2MoVA	x	x	x	x	x		
25CrMo4+QT	A 194 Gr. 2H	25Cr2MoVA	x	x	x	x	x		

Materials for use at higher temperatures on request

8. Welding

All welding is carried out as gas metal arc welding under protective gas according to DIN EN ISO 4063.

- **MAG/GMAW (= gas metal arc welding), Procedure no. 135**
- **MAG/FCAW (= flux core arc welding), Procedure no. 136**
- **WIG/GTAW (= gas tungsten arc welding), Procedure no. 141**

For these procedures (welding procedure specifications (WPS)) are on hand which are certified on the basis of the EN ISO 15614-1 and / or ASME section IX (WPQR).

The welders are qualified according to EN 287-1 and ASME section IX for the corresponding procedures and material classes, and the service personnel for welding equipment according to EN 1418 and ASME section IX.

LISEGA holds certifications according to:

- **DIN 18800-T7 Kl. E, recertification according to EN1090-1 – EXE 4 conformity certification for support components and EN 1090-2 Technical regulations for the execution of steel construction**
- **ASME section III Div. I Subs. NCA 4000 – NPT and NS stamp**
- **EN ISO 3834-2**
- **TRD 201/AD 2000 Leaflet HPO**
- **Technical Regulations for Steam Boilers/ Manufacture and inspection of pressure vessels by the German TÜV**

The current welding inspection team is qualified according to:

- **EN ISO 14731, welding engineers IWE and EWE (International/European welding engineer) and welding technicians, IWS (International Welding Expert)**
- **Certified welding inspectors acc. to AWS 1.1**
- **ASME section III Div. I Subs. NF-5500**
- **SNT-TC-1A**

Non-destructive testing VT, PT, MT, UT and RT (external) is conducted by test personnel qualified acc. to standards ISO 9712 Level II and SNT-TC-1A Level II. Supervision is carried out by personnel qualified acc. to ISO 9712 Level III and SNT-TC-1A Level III.

The tests are conducted on the basis of regulations:

- **EN ISO 5817 Assessment Group C**
- **EN ISO 17635 (ISO 10836) with relevant stipulations for the various ZfP procedures**
- **RCCM Subs. H 4000 with MC 3000 – MC 7000**
- **ASME section V as required by subsection NF**

9. Surface treatment against corrosion

As a matter of principle, LISEGA products are designed for long-term operation, functioning reliably for the whole life of the plant. To limit maintenance work, particular attention is paid to protection against corrosion. It is important to specify the type of surface treatment for the environmental conditions prevailing. LISEGA offers a range of suitable corrosion protection systems based on the corrosivity categories and protection periods of EN ISO 12944:

- **Standard surface protection (9.1)**
- **Increased surface protection (9.2)**
- **Hot-dip version (9.3)**
- **Surface protection for extreme applications (9.4)**

Whenever technically feasible, LISEGA uses low-solvent, environmentally friendly, "water-borne" paint finishes.

9.1 Standard corrosion protection

As protection against corrosion, the surfaces of LISEGA products are treated with high-quality protection systems. Our standard corrosion protection corresponds to the **Corrosion Category C3, medium protection period (M) acc. to EN ISO 12944** and is well suited to implementation in environments with a moderate industrial atmosphere. Typical fields of application in this regard are the interiors of production workshops with increased levels of humidity and dust or exteriors with an normal atmosphere.

9.1.1 Standard paint finish

Data on specified coat thicknesses correspond to NDFT (Nominal Dry Film Thickness) acc. to DIN EN ISO 12944, measured acc. to DIN EN ISO 2808.

Metallic surfaces of carbon steel exposed to the open air receive by **shotblasting to SA 2 ½** (SP10 acc. to ASTM) and then an undercoating of **zinc-rich primer 60µm** is applied. The total dry film thickness of the coating amounts to **approx. 120µm**, color shade RAL 5012 – light blue.

Components falling into this category are constant hangers and supports, heavy spring hangers and supports, trapezes, extension tubes for snubbers, rigid strut tubes and viscoelastic dampers.

9.1.2 Cathodic dip coating of springs

High quality helical coil springs are an important element in LISEGA constant and spring hangers. Due to their exposed functional significance, all springs are treated with a cathodic immersion process (CIP). The springs are shot-blasted and zinc-phosphated on their extended or peeled surfaces. Finally, a dual-component epoxy resin coating is applied in a galvanic process and baked at approx. 200°C.

9.1.3 Electrogalvanizing

Spring hangers and spring supports, beam clamps and all threaded components and internal functional parts of the constant hangers and supports are galvanized with a coating thickness of **approx. 12-15µm**.

9.1.4 Hot dip galvanizing

Roller bearings, pipe saddles and cold-block clamp bases are treated as standard with hot dip galvanization, coat thickness **60–80µm**.

9.1.5 Primer coating

Due to their special installation situation, mainly within the insulation, the pipe-surrounding components such as pipe clamps and clamp bases, weld-on brackets, weld-on eye nuts, weld-on clevises, weld-on bearings and weld-on pipe supports (stanchions) are treated to higher quality transport protection with a weldable primer coating on a shot-blasted surface, coat thickness **approx. 30µm**.

9.1.6 Snubbers

Snubbers are manufactured completely from corrosion resistant materials and require no special coating.

The separate connection lugs of type 30, are manufactured from carbon-steel, and treated according to 9.1.7.

9.1.7 Snubbers connections

Connecting lugs are galvanized according to 9.1.3 and fitted with corrosion-protected ball bushings. Extension pipes are treated with the standard paint coating acc. to 9.1.1. Weld-on brackets are given a weldable primer coat acc. to 9.1.5 and the connection pins are of stainless steel.

9.1.8 Rigid struts

The rigid strut tubes are given a standard color coating (9.1.1). The ball bushing joints are electro galvanized (9.1.3) and fitted with corrosion-protected ball bushings. Weld-on brackets are treated with a weldable primer coating (9.1.5), while the connecting pins are stainless steel.

9.2 Increased corrosion protection

Increased corrosion protection acc. to **EN ISO 12944, Corrosivity Category C4, medium protection period (M)**, is recommended in aggressive atmospheres, such as in the open in industrial areas and in coastal regions with moderate saline exposure or in the case of internal applications in chemical plants.

Increased corrosion protection is ensured through corresponding additional measures for surface treatment acc. to 9.2.1 to 9.2.5 on the basis of the standard treatment.

9.2.1 Increased corrosion protection for carbon steel surfaces

Painted surfaces corresponding to the standard version (9.1.1), such as constant hangers and supports, support bearings, trapezes, snubber extensions, rigid strut tubes and viscoelastic dampers are topcoated with an additional coat of **60µm** on an already existing coat of **120µm**, so that a specified coat thickness of **180µm** is achieved, color shade RAL 5012 – light blue.

Functional components lying within the constant hanger bodies are also treated acc. to corrosivity category C4, medium protection (M), in line with EN ISO 12944.

9.2.2 Increased corrosion protection for electrogalvanized surfaces

Surfaces galvanized as standard acc. to 9.1.3, such as spring hangers and supports, are given a layer of adhesion primer of **40µm** thickness plus a topcoat of **60µm** to create a total layer thickness of **approx. 115µm**, color shade RAL 5012 – light blue.

Threaded parts from Product Group 6 are not given additional surface coats and can if required be supplied galvanized.

9.2.3 Increased corrosion protection for spherical bearings

The connecting elements of rigid struts and snubbers receive a special coating containing zinc and aluminum lamellas with an additional organic topcoat, layer thickness approx. **20–25µm.**

9.2.4 Increased corrosion protection for LISEGA helical coil springs

On top of the standard CIP coating acc. to 9.1.2 a supplementary paint layer with a specified thickness of **60µm** is applied.

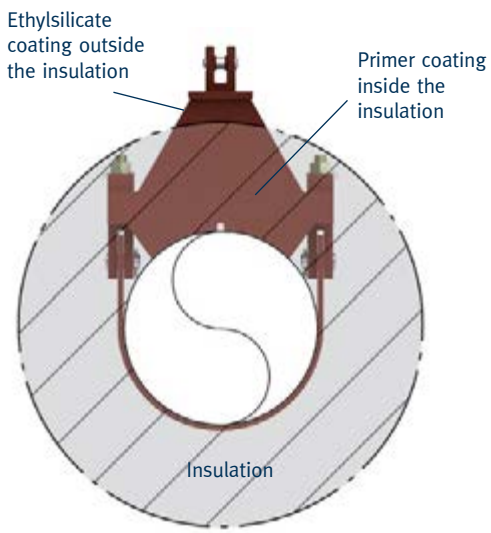
9.2.5 Increased corrosion protection for pipe clamps and clamp bases, product groups 3 and 4

Pipe clamps and clamp bases for an application range up to 350°C can, if required, be supplied electrogalvanized.

application range [type]	coating for increased corrosion protection
up to 350°C [3. .. 1. / 4. .. 1.] [3. .. 6. / 4. .. 6.]	electrogalvanization

Pipe clamps and clamp bases for a range over 350°C are given a coating which corresponds in the stability of its maximum working temperature to the following table.

application range [type]	coating for increased corrosion protection
over 350°C [3. .. 2. / 4. .. 2.] [3. .. 3. / 4. .. 3.] [3. .. 4. / 4. .. 4.] [3. .. 5. / 4. .. 5.] [3. .. 7. / 4. .. 7.] [3. .. 8. / 4. .. 8.]	within the insulation: Primer (as transport protection) Coat thickness approx. 30µm outside the insulation: Ethylsilicate coating Specified coat thickness 80µm



Coating in example of pipe clamps, insulated at T > 350°C

Threaded parts, boltings, straps and plates on the pipe-surrounding components must, for increased corrosion protection and a working temperature over 350°C, be located within the insulation in accordance with the installation instructions.

9.3 Hot dip galvanized version

As an alternative to 9.2, all components in the LISEGA product program can also be supplied as hot dip galvanized version or, where this is not suitable for technical reasons, made from corrosion resistant materials. Components receive a galvanized coating of approx. 60–80µm. Internal functional components, threads, small parts receive a coating thickness of approx. **40µm.**

For components not suited to hot dip galvanization due to the material used or the application area, the version 'Increased corrosion protection C4' corresponding to 9.2 represents a good alternative.

9.3.1 Constant hangers and supports, product group 1

If required, constant hangers and supports can be supplied hot dip galvanized. When ordering it should be stated whether corrosion protection C3 acc. to 9.1 is sufficient or C4 acc. to 9.2 is required. The difference consists in the additional treatment of the inner functional components.

9.3.2 Components in product group 2

Spring hangers and supports are available ex stock in hot dip galvanized versions.

9.3.3 Pipe clamps and clamp bases, product group 3 and 4

See section 9.2.5.

9.3.4 Components in product group 5

Roller bearings, cryogenic clamp bases and pipe saddles are supplied in hot dip galvanized versions as a standard.

9.3.5 Components in product group 6

Connecting rods and other connecting components, tie rods and threaded rods, threaded clevises, threaded eye nuts, turnbuckles and couplings can be supplied ex stock in hot dip galvanized versions.

9.4 Surface protection in extremely aggressive atmosphere

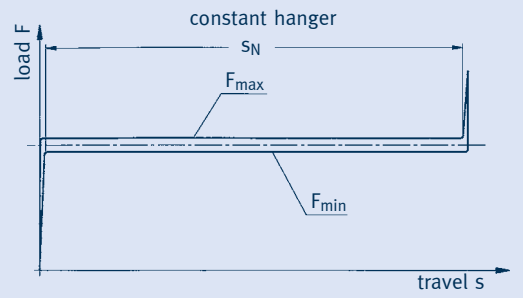
For use in extremely aggressive atmospheres such as e.g. seawater, offshore or aggressive chemical vapors, well-tested corrosion protection systems suitable for all conditions can be supplied.

10. Operational behavior

10.1 Function

10.1.1 Constant hangers / supports

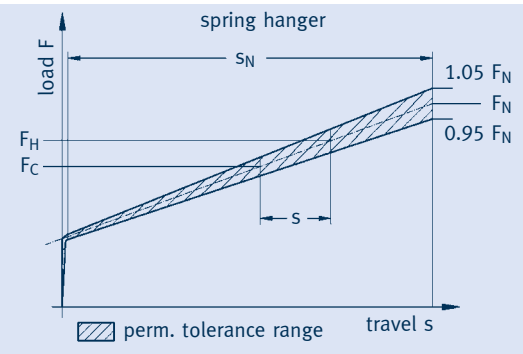
Constant hangers and constant supports of the product group 1 are designed, that in theory, minimum load deviation occurs over the whole operating range. The total deviation arising from springs, bearing friction and production tolerances is restricted to ±5% in series production. Load adjustment is made to an accuracy level of 2%.



F_N = nominal load
F_{min} = minimum load (upward travel)
F_{max} = maximum load (downward travel)
s_N = nominal travel (incl. reserve)

10.1.2 Spring hangers / supports

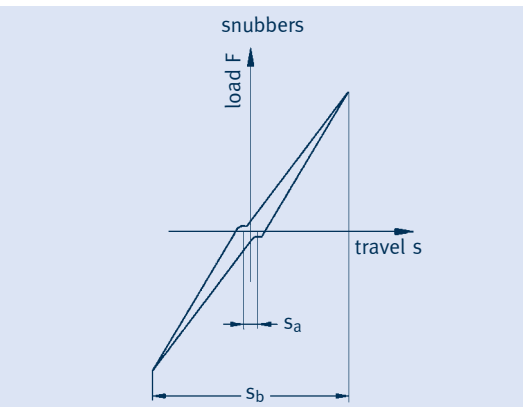
For spring hangers and spring supports in product group 2 the load changes linearly in line with the spring travel. The deviation of the spring hysteresis from theoretical values, which results from spring hysteresis and production tolerances, amounts to less than ±5% within the operational travel.



F_N = nominal load
s_N = nominal travel (incl. reserve)
F_H = hot load a (operating load) for downward operational travel
F_C = cold load a (installation load)
s = operational travel

10.1.3 Snubbers

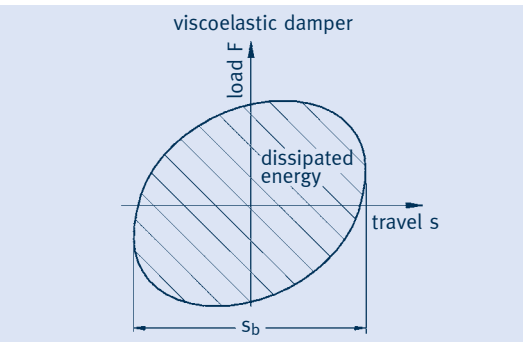
Snubbers are designed, in the event of an impact load between the component to be secured and the building structure, to produce an instantaneous rigid connection. Slow displacement due to thermal expansion must not be resisted. Hence the locking mechanism that blocks the component reacts to velocity. The individual functional data are specified in section 3, p. 3.7.



s_a = piston rod tolerance
s_b = piston rod travel

10.1.4 Viscoelastic dampers

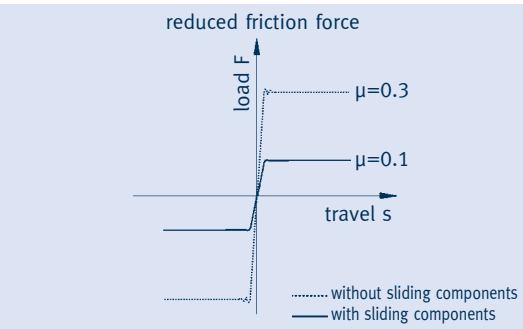
Viscoelastic dampers are employed to reduce operational vibrations from machines or plant components to a harmless level by means of broadband damping. The kinetic energy is thereby transformed into heat via a viscous mass. The damping resistance in all degrees of freedom is decisive for its effectiveness. The individual functional data are specified in section 3, page 3.13.



s_b = operational stroke

10.1.5 Slide plates

Slide plates are used to reduce the lateral forces produced by the change in position of the sliding bearing-points. In the LISEGA slide plates, low-friction materials are used with self-lubricating characteristics that reduce friction forces by up to 2/3 at an operating temperature of max. 350°C. The individual design data are given in section 7, p. 7.10.



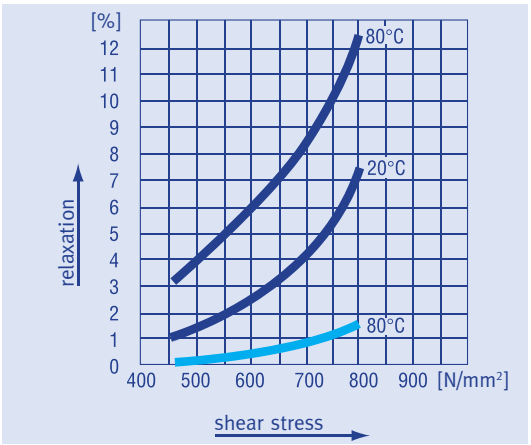
Reduction in reaction forces in the piping system by the use of slide plates.

10.2 Spring relaxation

When under loading and depending on time and temperature, standard helical compression springs lose a considerable amount of their internal stress through relaxation or settling loss. If no special measures are taken to counter this, in constant and spring hangers, it can in the long-term lead to a reduction of more than 10% in the set ultimate load.

In contrast to common practise, LISEGA **exclusively** uses specially treated springs that exhibit practically no relaxation.

In these springs the expected settling loss is anticipated through hot setting. This method is called **prerelaxation**.



Relaxation behavior of helical coil springs

cold set helical coil springs (loosely based on DIN 2089)

LISEGA hot set helical coil springs, qualified by the German TÜV, nuclear plant suitability tests and VGB type tests

11. Connection dimensions

11.1 Installation dimension E

Simple method for checking the installation possibilities with the E dimension!

For the simple determination of the required rod lengths in load chains, the installation **dimension E** is specified for all components apart from tie rods and threaded rods (Product Group 6).

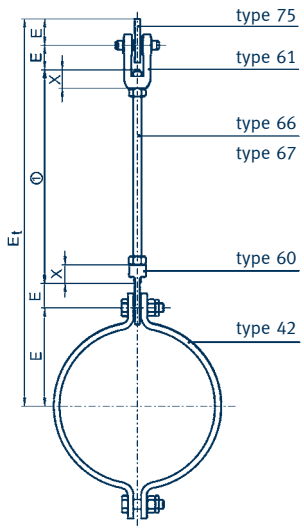
This E dimension denotes the respective installation length of the components minus the thread engagement depths (X dimensions) of the connecting tie rods and threaded rods.

The length of the rods required is given by the total installation height (pipe axis to reference edge of connection surface) minus the sum of the E dimensions of the components to be connected.

To determine the total length of the rods in a load chain all the E dimensions are added together. The sum is compared with the total installation dimension. If a difference results which is greater than the sum of the thread engagement depths (X dimensions), then the chain selected is correct for the total installation height.

For load chains solely with bolted connections the **minimum installation dimension** results from the sum of all E dimensions.

Product-related details are to be found in the selection tables.



X = Thread depth
E_t = Total installation dimension ($E_t=E_{total}$)
① = Length adapted to individual installation conditions

components (extract)	reference basis for installation dimension "E"
product group 1	
constant hangers constant supports servohangers	• upper starting position (0 on travel scale) • on deviation in blocking position to the new blocking position is also to be considered
product group 2	
spring hangers	• upper starting position (0 on travel scale) • on deviation in blocking position the blocking position is also to be considered
spring supports (without type 29 .. 2.)	• upper starting position (0 on travel scale) • independent of blocking position due to adjustment available in the support tube
product group 3	
snubbers	• specification of "E min" and "E max" corresponding to possible travel • for installation instructions the planned installation position incl. travel reserves is to be taken into account
viscoelastic damper	• middle position
product group 4	
pipe clamps	• distance from pipe axis to pin connection
product group 6	
threaded connections	• middle line of pin or lower edge of engagement depth up to upper edge of engagement depth
product group 7	
structural attachments	• middle line of pin up to face of structure

11.2 Regulation of total installation length

11.2.1 Turnbuckle function of connection threads

For length adjustment in installed condition (setting pipe installation position, creating force-fitting) the lower connections on the constant and spring hangers are designed to function as turnbuckles. In this way convenient future adjustment of installation lengths (connecting rods) is ensured. The length adjustment amounts to:

- **300mm for constant hangers type 11**
- **150mm for constant hangers type 18**
- **the adjustment possibilities of a type 62 turnbuckle for spring hangers type 21**
- **min. 140mm for spring hangers type 22**
- **for spring hangers types 25 and 26 the load-bearing rods are led through the weld-on support tube and held by an adjusting nut. Adjustment can be made within the scope of the available thread length of the rods.**

All connecting threads are right-hand.

11.2.2 Constant and spring supports

For types 19, 16, 28, and 29, the installation height is adjustable independently of the respective presetting by using the support tube designed as a spindle. The necessary load is actuated at installation by turn out the support tube.

11.2.3 Turnbuckles type 62, tie rods L/R type 65 (see p. 6.3)

For rigid hangers with short installation lengths a defined reserved length for connection components types 60 and 61 usually enables sufficient length adjustment. For greater installation lengths the use of a turnbuckle L/R type 62 in combination with a tie rod L/R type 65 is recommended for the purpose of simpler adjustability. For easy accessibility this combination should always be placed at the lowest end of the load chain.

11.2.4 Rigid struts type 39

The connections for the rigid struts type 39 are supplied as standard as right/left fine thread for length adjustability in installed condition. Flat faces on the rigid strut body enable easy adjustment with an ordinary wrench.

Further instructions are given in the corresponding installation instructions.

12. Quality Management and IMS

For the effective management and supervision of the organization (Corporate Governance) the **Integrated Management System (IMS)** summarizes in a centralized structure the established methods and regulations in the company for observation of the demands in the main sectors.

The IMS covers the areas:

- **fundamental company principles**
- **quality management**
- **environmental protection**
- **work and health protection**
- **organizational procedures**
- **international export certification**

Through the utilization of synergies and the pooling of resources, lean and effective management is possible. In IMS the data from the various systems are gathered, analyzed and evaluated centrally according to the requirements of modern **CAQ (Computer-aided quality)** solutions. The system takes into account recognized standards and guidelines including the corresponding reporting system. Relevant approvals from authorized bodies can be found in the table on page 0.18.

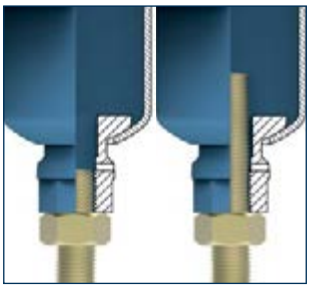
12.1 Quality management

Our quality management (QM) monitors and regulates all activities affecting quality in the company. The independent QM department is the leading system in IMS and has overall supervision of the clearly targeted function of the processes integrated into IMS and the observation of rules and regulations.

One of the most important corporate principles at LISEGA is superior product quality, a vital element which also encompasses the activities and close partnership with our business partners. The organization and behavior of our personnel are correspondingly attuned to this.

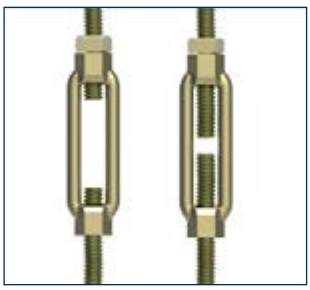
The particular measures ensuring quality undertaken by QM are outlined in the **quality management program (QMP)**, which covers the whole organization. These measures and activities to promote quality are an integral component in the processing cycle and are firmly rooted in the procedures.

Constructive devices available for the subsequent adjustment of installation lengths!



Constant hanger type 11

Spring support type 29



Turnbuckle type 62

Rigid strut type 39

The QMP, as an integral component, forms an entity with the processing cycle!

Following international codes and standards, the QMP is described in detail in the **Quality Management Manual (QMM)**. The QMM takes into account all the recognized European and other international standards, especially **DIN EN ISO 9001** and **ASME section III Div. 1 Subs. NCA 4000** including **Subs. NF** and **KTA 1401, RCCM-H**.

The QMM covers the whole organization of the LISEGA Group and is applied generally both in the conventional sector as well as in areas with **increased requirements**, such as the **nuclear industry**. The scope of the traceability of material, and testing the corresponding documentation can also be adapted exactly to special demands by the activation of further verification levels. All international requirements, including those affecting the nuclear field, can be covered by the QMM. The relevant approvals are available and are regularly renewed.

12.2 Raw material and goods reception

All the materials used are monitored by way of a receiving inspection check by quality management regarding compliance with the technical specifications. The materials used are, according to requirements, certified by material test approvals according to ASME and DIN EN 10204.

12.3 Production supervision

The supervision of production is carried out through constant quality control according to QMM. In particular, for nuclear applications the international quality stipulations according to the codes ASME section III NF / NCA 4000 (USA), RCCM-Section H (FR), KTA (DE), DIN EN 13480-T5 and NNSA (CN) are fulfilled.

12.4 Final inspection

Before shipment, constant hangers and spring hangers, as well as snubbers and dampers are subjected, under the responsibility of Quality Management, to function tests on special test benches. The measurements are recorded and can if required be accessed and documented. All the testing faculties are regularly inspected and checked by qualified personnel according to EN ISO 7500-1.

12.5 Documentation on delivery

If required, the materials used are documented by certification via material tests according to ASME and DIN EN 10204. In addition, the results of the functional test can be confirmed by the issue of an acceptance test certificate, also by an independent test institute if so desired. Computerized verification in line with special requirements and special quality-related documents can be agreed upon between customer, producer and supervisor.

13. Suitability tests, type tests

For the use of serially produced standard supports in industrial piping installations, especially in plants with more stringent requirements, e.g. nuclear power stations, special suitability and type tests are required worldwide. The test programs specified mainly involve the following steps:

- **inspection of the quality management program**
- **inspection of the materials used**
- **inspection of the design documentation**
- **verification of the computer-based tensile stress values**
- **experimental testing on**
  - **function**
  - **overload capacity**
  - **continuous load capacity**

On successful testing, suitability is regarded as proven and general approval can be issued for use in industrial piping installations.

Type and suitability tests have been carried out for the major part of the LISEGA product range by the various German and international, independent institutions. They therefore also comply with the requirements of current European codes.

- **DIN EN 13480–T3 Section 13**
- **RCCM H5300, H5400**
- **KTA 3205.3**
- **VGB-R 510 L**

Certifications can be supplied upon request.

14. Standard version and increased requirements

Our standard supports are absolutely equal in design and function for both the conventional market and where increased requirements are concerned, e.g. in the nuclear field. Hence they do not differ in design or construction. However, due to additional quality assurance requirements and materials with supplementary certification in these sectors, a separate production process may be required.

For areas with increased requirements, all components right up to the finished product must be traceable through batch restamping and the units themselves identifiable according to KTA and ASME codes. In the type designation the increased requirement level is indicated in the 5th digit and for rigid struts in the 6th digit. The relevant component documentation refers to this and to the number of the production order.

In this catalog the standard component, i.e. the one for conventional applications, is identified by the type designations. As the functional data and component dimensions specified are identical to the increased requirements version, in all cases the selection of products can be made using the catalog. However, when planning or ordering, it is important to verify the part number associated with the requirement level (5th or 6th digit).

The order examples on the individual data sheets should be noted. The type code under Sect. 5 (pp. 0.7 and 0.8) can also be used for this.

Separate production processes of components meeting increased requirements for the traceability of certified materials!

the most important LISEGA Group certifications

certification code	certifing body	certification No. ①
ISO 9001	TÜV Nord BSI TÜV Rheinland AFAQ LRQA TÜV Nord	78 100 034445 FS 557331 01 100 038965 1996 / 5030.4 MEA6011026/1 07 100 010963
EN 1090-1:2009/A1:2011	TÜV Nord	0045-CPR-1090-1.00151 TÜVNORD.2013.002
Cl. E; DIN 18800-7:2008-11, DIN 18801	TÜV Nord	DIN 18800-7 / 0513-EW /13/0
AD 2000 Leaflet-HP0	TÜV Nord	07-203-1282-HP-0513/13
DIN EN ISO 3834-2	TÜV Nord	07-202-1282-EN -0513/13
BS OHSAS 18001:2007 „Safety management“	TÜV Nord AFAQ	78 116 034445 2010/38940.1
DIN EN ISO 14001:2009 „Environmental“	TÜV Nord	78 104 034445
SCC	TÜV Nord	78 106 034445
ASME section III Div. I NCA 4000 NS - Certificate for supports	ASME	N 3092 N 3025
ASME section III Div. I NCA 4000 NPT - Stamp for supports	ASME	N 3169 N 2951
KTA 1401	VGB, EnBW Kernkraft, RWE, E.ON, Vattenfall	
NNSA Designing NNSA Manufacturing	China National Nuclear Safety Administration	1405 1406
TN VED / Rostechnazor	Federal Service for Ecological, Technological and Atomic Supervision	PPC 00-043746
GOST R	RST Expert	РОСС DE.АГ80.Н02052 РОСС DE.АГ80.Н02053 РОСС DE.АГ80.Н02054
SPIR-O-2008	ATT=Atomic Techno Test	РОСС RU.0001.01АЭ00.00.10.2849
SSMFS 2008:13	INSPECTA NUCLEAR AB	5477
ASME section III Div. I, Subs. NF Class 1.23, MC, ASME section XI	Tractebel Belgium	2951

① At the time of publication

Piping can only be as good as its supports!

15. Form of shipment

Unless specified otherwise, all products are classified according to component types and shipped in appropriate packaging for transport or for short-term storage. They are clearly marked and, if necessary, protected against corrosion by special measures. If long-term storage is required, different packaging can be agreed on for this purpose.

Specific requirements can, where applicable, be found in the data sheets or installation instructions. Complete pipe supports (load chains of different components) can on request be pre-assembled, bundled, and labeled.

16. Warranty

For all LISEGA components a 2-year warranty is issued from date of commissioning, limited to 3 years after transfer of ownership.

17. Technical modifications

Modifications in the interests of further technical development are expressly reserved.