

SEC
BREMEN

A **CIG**
COMPANY



PRODUCTS & SERVICES CATALOGUE

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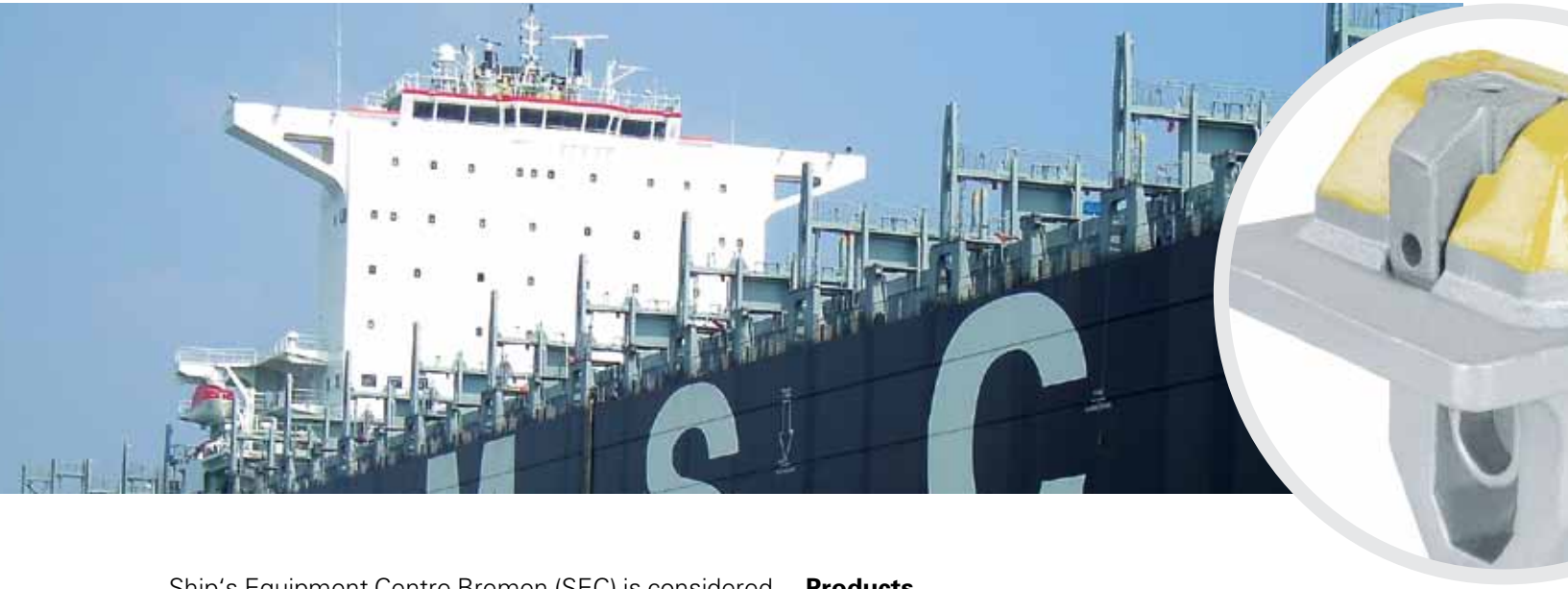
Introduction

0

INTRODUCTION

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- 0.4 Shanghai SEC Machinery & Equipment
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Company profile SEC



Ship's Equipment Centre Bremen (SEC) is considered to be today's worldwide leading manufacturer of container lashing equipment.

The basis of this leading position is the perfect combination of in house design and engineering facilities. This combined with unique know how of manufacturing and services has made Ship's Equipment Centre Bremen as a first class partner for yards and owners.

An enthusiastic team of high skilled experts is operating out of the main office located in Bremen, Germany. A city which provides an infrastructure where the cargo securing technology has quite a history.

As essential support towards an all around service is provided by the international network of agencies and logistics partners. Ship's Equipment Centre Bremen products are being distributed through world wide stocks kept at the main centres of international shipping activities. This network is essential to make sure that only exclusive Ship's Equipment Centre products are being supplied. Whether supplied out of New York, Long Beach, Singapore, Shanghai or Europe, each fitting is an original Ship's Equipment Centre item.

Having the vessels equipped by Ship's Equipment Centre Bremen means a full range of high quality gear according to International Maritime Organization (IMO) and latest classification rules.

Products

The range of products is to be separated into hardware and services. The fittings (hardware) as such being separated into two groups, namely fixed and loose gear.

Fixed fittings:

- Deck and hatch cover foundations
- Lashing points
- In hold installations
- Tank top fittings

Loose fittings:

- Twistlocks, manual and automatic
- Midlocks and stackers
- Lashings
- Supports
- RoRo and timber equipment

This is just to mention a few. The company has over 1500 approved different designs in production.

Company profile SEC / services



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SWIFT-BIC: DEU TDE BR
IBAN No.: DE58 1307 0000 0139 2331 00

Chamber of commerce:
Industrie- und Handelskammer Bremen
Reg. Nr.: HRB 13231

Among a variety of makers and traders in this segment Ship's Equipment Centre Bremen is superior with regard to the engineering facilities which are world wide leading and unique in its kind. Whether it regards the integral calculation of entire lashing bridge designs for 18000 TEU giants by FEM-calculation methods or the design of such constructions using latest 3-dimensional CAD systems, Ship's Equipment Centre Bremen is being known as front runner in this business. Ship's Equipment Centre Bremen has set certain trends in order to fulfil system integration demands which became essential for large container ship projects.

The complex interaction of the main components such as hatch covers, lashing bridges, deck supports and cargo requires an integral approach which was not known this way before. This is the most significant example for Ship's Equipment Centre's technical expertise and its reputation as system integrator for such applications. When receiving an order for the delivery of fixed fittings we will always prepare offset drawings showing the arrangement of foundations, lashing plates etc. for all positions on board. In these drawings the foundations and lashing plates are measured in relation to each other but not in relation to the hull structure.

Company profile SEC / services



SEC | A SEC BREMEN
BREMEN SHANGHAI | COMPANY

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SEC | A SEC BREMEN
KOREA | COMPANY

Ship`s Equipment Centre (Korea) Co., Ltd

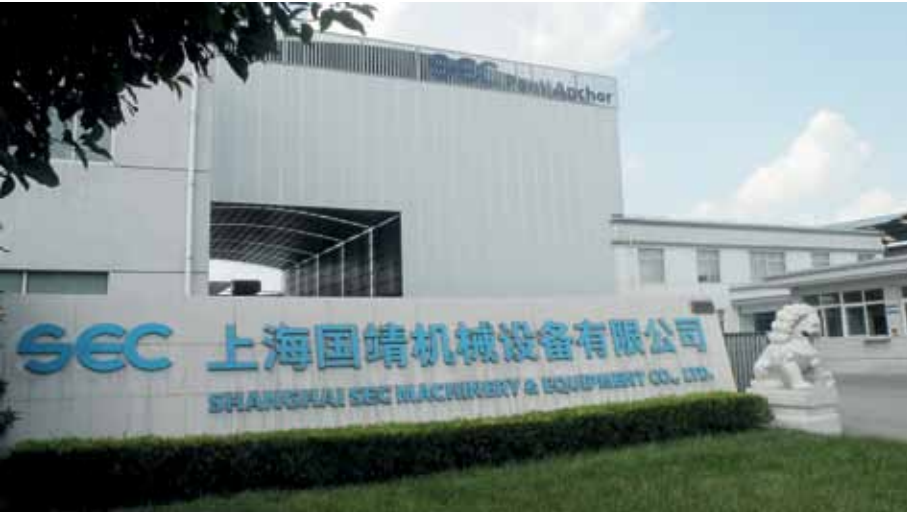
#2304, Centum Leaders Mark Bldg., U-dong,
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Corporate Registration Number: 617-81-95376

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In the two major ship building countries SEC operates their own branch offices with highly qualified staff. Both offices are staying in close contact to our local clients for any kind of business operation. Additional in our Shanghai office we have a team of experienced designers who are in charge of design for lashing bridges, cellguides, container deck stanchions and other container related designs. Instead of agents which are often working for several companies our colleagues in Shanghai and Korea are 100% dedicated to SEC.

For our latest agency network and consignment stock please visit the SEC webpage.

Shanghai SEC Machinery & Equipment Corp., Ltd.



For almost 20 years SEC equipment is produced in our own production company in Jiading district close to Shanghai in order to ensure continuously high quality of our products. Since 2008 the fabrication is certified by LRQA according ISO 9001 Quality Assurance System and OHSAS 18000 (Occupation Health Safety Assessment) as well as ISO 14000 (Environmental Management) have been initiated end of 2014.

For the complex welding procedure of row materials with high tensile strength such as lashing bars Shanghai SEC has important flash butt welding machines from Germany.

Beside of container securing equipment also mooring winches and POOL anchors are produced here.

Our production company is equipped with certified test benches, testing rig for anchor and winches as well as a material laboratory for chemical analyses and all kind of mechanical tests.



About SEC



SEC is considered to be today's leading manufacturer of container lashing equipment. The basis of this leading position is the perfect combination of in house design and engineering facilities.

This combined with unique know-how of manufacturing and services has made SEC a first class partner for yards and owners. SEC can be a partner from the very start of a container vessel construction project. In addition to the delivery of hardware, a wide variety of services can be offered to help the ship owner find a safe and cost efficient solution. Whether approached by shipyards or owners, SEC is able to create concepts and turnkey solutions from the beginning. The SEC way of thinking is to build the ship around the cargo. In order to be really prepared for our client's demands SEC keeps its design team for securing systems equipped with all necessary facilities. This means, for example, development of our own lashing calculation software, Finite Element Method (FEM) calculation workstations and, of course, the latest 3D technology in order to meet the highest standards of today's shipbuilding and shipping. The result of such technical services is the range of products that SEC keeps available through its world wide network of stockist.

Having the vessel equipped by SEC means a full range of high quality gear according to latest IMO and classification rules. All equipment is tested and certified by any kind of institution or classification society involved. Since the SEC office for securing systems is located in Bremen, Germany, SEC is working within an infrastructure where the cargo securing technology has quite a history. The team of SEC Securing Systems in Bremen offers decades of experience,

even though the present method of container lashing itself has been for about 25 years. Being and remaining at the top requires a few rules which make all the difference in comparison to trade houses and distributors of lashing gear. SEC develops the products in house. Accordingly, the full range of fittings is made by SEC itself. Whether SEC supplies out of New York, Singapore, Shanghai or Europe, each fitting is an original SEC-item. All raw materials used for the SEC lashing equipment are purchased from class registered production facilities. If requested, SEC is able to prove the origin of each element of the product range. The latest IMO-regulations recommend attention to proper documentation of the cargo securing equipment. SEC can provide original certificates, test reports and even material analysis reports.

SEC much appreciates the latest approach of the IMO towards greater safety and transparency regarding container securing material. Too many accidents have happened as consequence of improper and substandard equipment. This manual will give an impression of the standards which SEC provides but it is almost impossible to refer to all kinds of fittings which SEC has made or which SEC will create.

Therefore this manual focuses on the basis of all SEC products. SEC would like to draw attention to the fact that all kinds of custom-made solutions are possible.

Container part

1

GENERAL

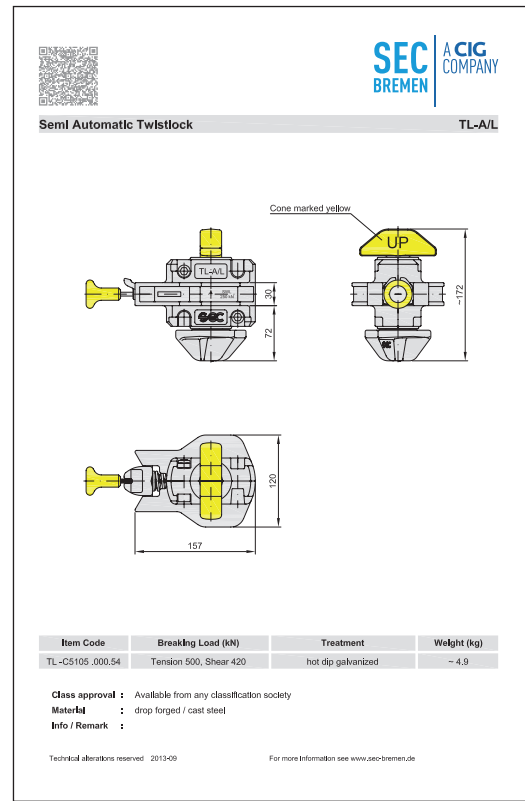
- 1.1 - 1.3 Available documentation
- 1.4 Code of container positions
- 1.5 Container sizes
- 1.6 Container dimensions
- 1.7 Container corner castings
- 1.8 Container offset dimensions
- 1.9 Common container spaces
- 1.10 Static and dynamic components
- 1.11 Permissible forces on containers
- 1.12 Typical damages on containers
- 1.13 Necessary data for quotation

Available documentation

Together with our quotation a detailed specification describing the proposed securing solution will be provided. This also includes sketches showing typical lashing arrangement at midship section with preliminary weight distribution and item drawings for each fitting with all relevant dimensions. Item drawings can be transmitted by telefax or by e-mail (pdf-files).

When receiving an order for the delivery of fixed fittings we will always prepare offset drawings showing the arrangement of foundations, lashing plates etc. for all positions on board. In these drawings the foundations and lashing plates are measured in relation to each other but not in relation to the hull structure.

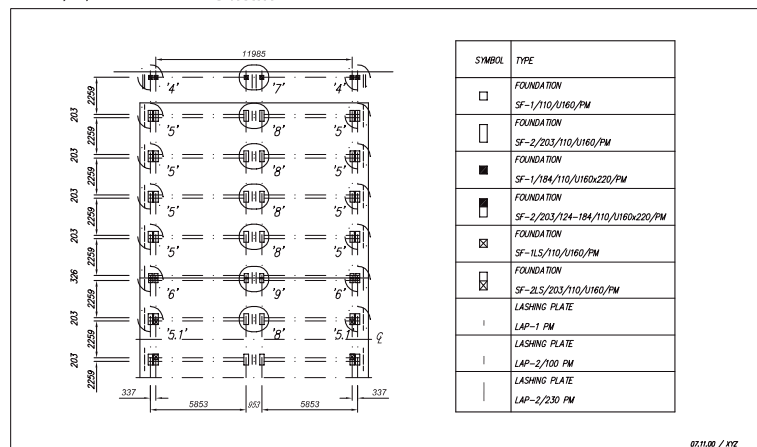
Offset drawings cannot be approved by classification societies. Their only purpose is to help ship designers to find the correct position for each type of fitting when preparing steel drawings for tank top with reinforcements underneath each fitting for example or for hatch cover designers when preparing outfitting drawings for hatch covers. Placing the order for delivery of loose fittings with us always includes that we will take responsibility for preparation of container securing manual and cargo securing manual.



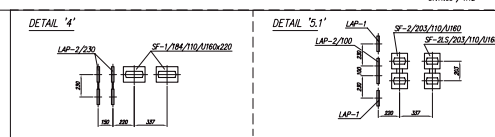
Item drawing

ARRANGEMENTS OF FIXED FITTINGS
 BAY 58, 54, 46-18 - DECK - S 4036.10

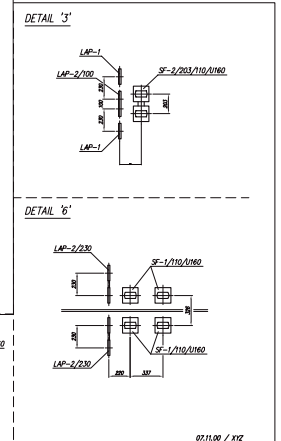
Technical alterations reserved 10



Offset drawing

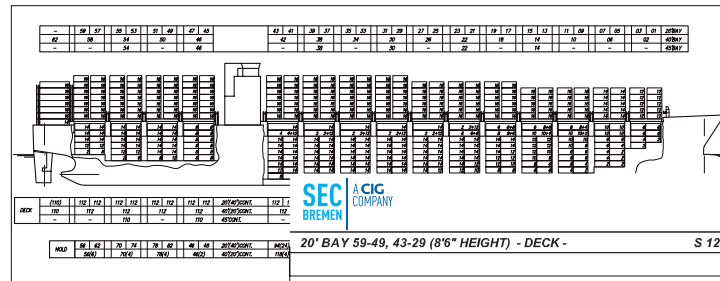


DETAIL '1' - '6' S 1234.10 - 8 -



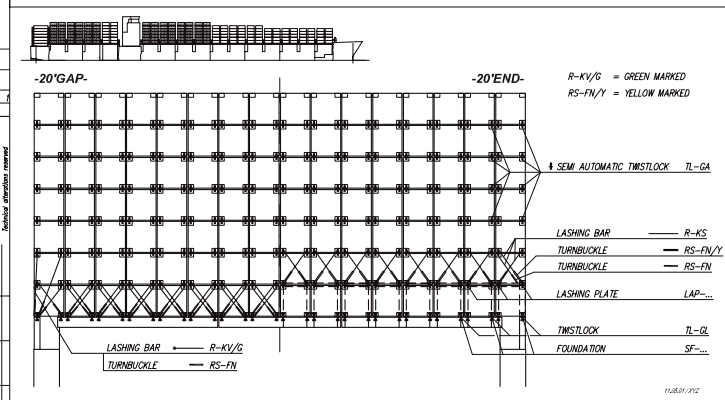
Available documentation

CONTAINER STOWAGE PLAN - DECK AND HOLD - S 1234.00 - f. - Technical alterations reserved 10



LOOSE MATERIAL LIST acc. to a.m. CONTAINER - DECK - STOWAG

ITEM TYPE	SYMBOL	62	59	57	55	53	51	49	47	45	43	41	39	37	35	33	31	29	27	25	23	21	19	17
TWISTLOCK TL-GL		-	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128
SEM AUTOMATIC TWISTLOCK TL-GA		-	768	768	768	768	768	768	768	768	768	768	768	768	768	768	640	640	640	640	640	640	640	640
TURNBUCKLE RS-FN		-	196	196	196	260	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196
LASHING BAR R-KS L = 2400		-	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248
LASHING BAR R-KS L = 4700		-	8	8	8	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
LASHING BAR R-KV/G L = 4400		-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
OPERATING ROD OR-A/10370		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
STORAGE BIN 1075x1075x780		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50
BIN RACK PL-20x8/10		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5



Container Securing Arrangement

The container securing arrangement (CSA) is a booklet showing the application of loose lashing gear and maximum weight distribution for a certain GM case. Approval of CSA is in the responsibility of the corresponding classification society. The cargo securing manual (CSM) according IMO is a booklet which contains all kinds of useful information about securing of cargo on board such as:

- A material list with all fixed and loose securing fittings on board specifying safe working load, proof load, breaking load, material grade, name of maker etc.
- Item drawings for all loose and fixed securing fittings on board
- Handling and maintenance instructions
- A copy of the approved CSA
- Acceleration factors and example calculations for securing of non-standardized cargo
- Example calculations for container lashing
- Approval certificates for all fixed and loose securing fittings on board
- ...

Approval of cargo securing manual is in the responsibility of national authorities depending on flag of the vessel. For the reason that most countries do not have their own approval office for cargo securing manuals instead they will be approved by classification societies.

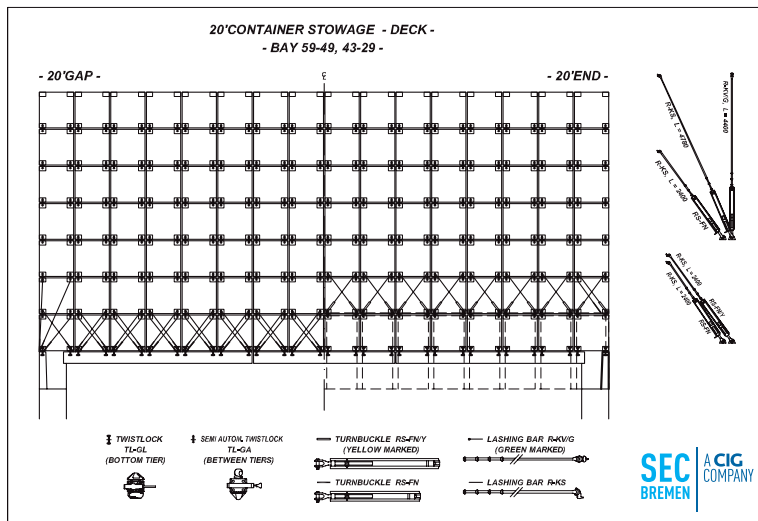
Available documentation



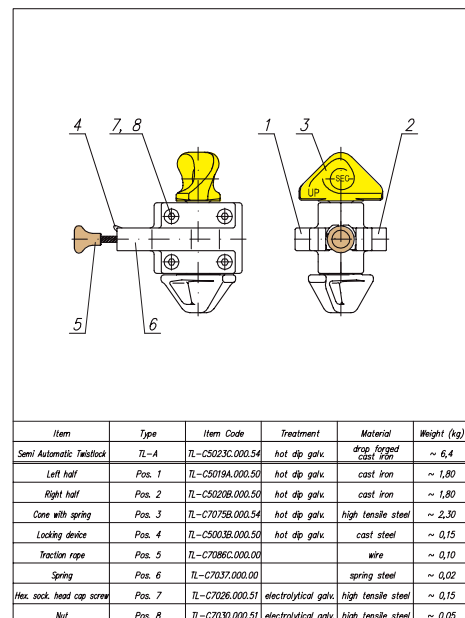
In each harbour the stevedore gang has to be informed how to install the lashings. For this purpose we are offering instruction boards showing the application of lashings and twistlocks. These instruction boards in DIN A 3 size are made of plastic with self-gluing back for easy installation at the longitudinal hatch coaming or other suitable positions.

which is also available on CD ROM on request. Most components of a twistlock, turnbuckle, bridge fitting etc. can be delivered separately. On request we will provide an individual spare parts catalogue for each newbuilding. This spare parts catalogue is listing each securing element with separate article number and drawing of all components. When using this catalogue spare parts can be ordered easily and wrong deliveries will belong to the past.

Even the best securing equipment needs some maintenance from time to time. In order to explain each movement for assembly/disassembly we have prepared a "Maintenance & Repair Video" for our main equipment

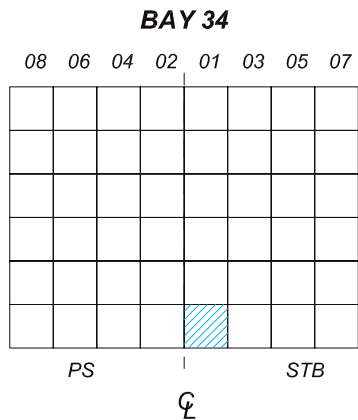
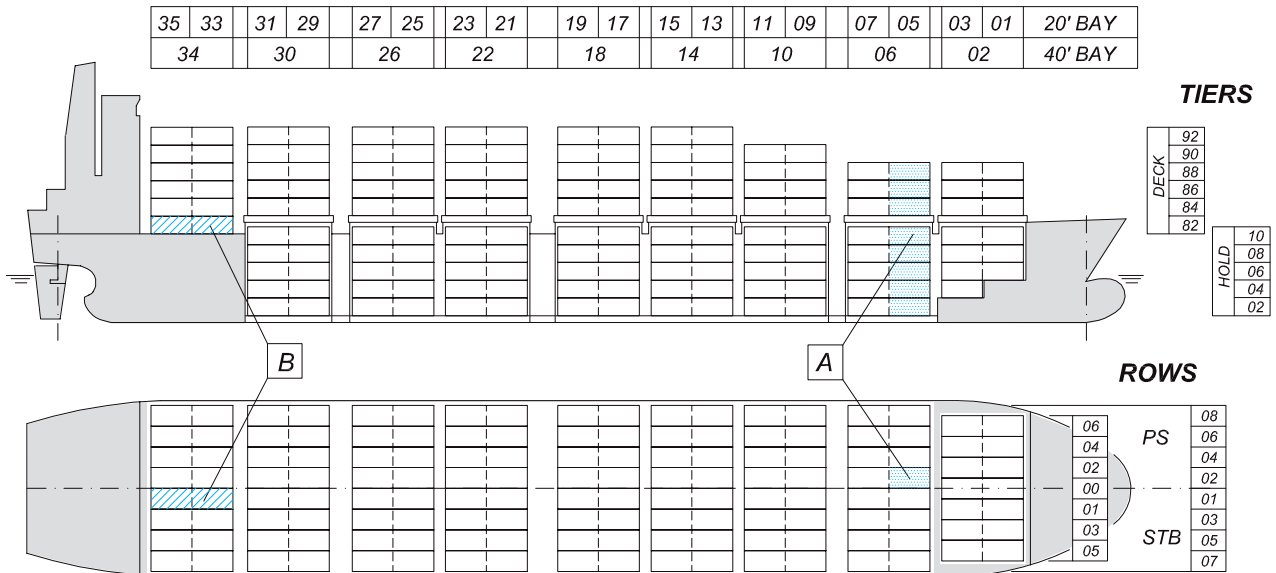


Instruction board

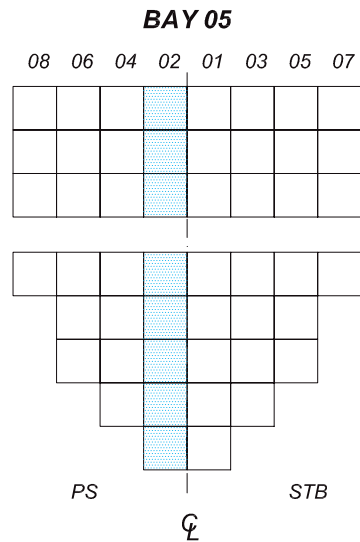
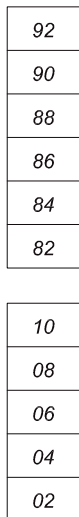


Spare parts catalogue

Code of container positions



TIERS



Definition

- A Position of a stack
- Example 20' stack
- B Position of a container
- Example 40' container

BAY No. ROW No.

05 - 02

BAY No. ROW No. TIER No.

34 - 01 - 82

In accordance with ISO 9711-1 (1990)

Container sizes

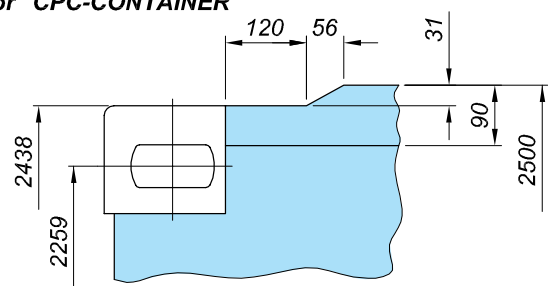
CONTAINER SIZE (ft)	CONTAINER SIZE (mm)			OFFSETS (mm)		WEIGHT max. (t)	REMARKS
	LENGTH	WIDTH	HEIGHT	LENGTH	WIDTH		
10' x 8' x 8'	2991	2438	2438	2787	2259	10.16	ISO 668 (1995)
20' (19'10.5") x 8' x 8'	6058	2438	2438	5853	2259	24.0	ISO 668 (1995)
20' (19'10.5") x 8' x 8'6"			2591				
20' (19'10.5") x 8' x 9'6"			2896				
40' x 8' x 8'	12192	2438	2438	11985	2259	30.48	ISO 668 (1995)
40' x 8' x 8'6"			2591				
40' x 8' x 9'6"			2896				
20' x 2500 x 8'6"	6058	2500	2591	5853	2259	24.0	EURO
20' x 2500 x 9'6"			2896				
40' x 2500 x 8'6"	12192	2500	2591	11985	2259	30.48	EURO
40' x 2500 x 9'6"			2896				
30' (29'11 1/4 ") x 8' x 8"	9125	2438	2438	8918	2259	25.4	ISO 668 (1995)
30' (29'11 1/4 ") x 8' x 8'6"			2591				
30' (29'11 1/4 ") x 8' x 9'6"			2896				
43' x 8' x 8'6"	13107	2438	2591	12900	2259	32.5	Reefer
45' x 8' x 8'6"	13716	2438	2591	13509	2259	30.48	ISO 668 (1995)
45' x 8' x 9'6"			2896				
48' x 8'6" x 9'6.5"	14630	2591	2908	14427	2259	30.48	
48' x 8' x 9'6"		2438	2896				
24.5' (24'2 1/2 ") x 8'6 5/32 " x 8'6"	7430	2595	2591	7225	2259		
24.5' (24'2 1/2 ") x 8'6 5/32 " x 9'6"			2896				
49' x 8'6 5/32 " x 8'6"	14935	2595	2591	14728	2259	30.48	
49' x 8'6 5/32 " x 9'6"			2896				
53' x 8'6" x 9'6.5"	16154	2591	2908	15951	2259	30.48	
35' x 2430 x 2590	10659	2430	2590			30.0	"SEALAND"
24' x 8' x 8'	7316	2438	2438				"MATSON"
24' x 8' x 8'6"			2591				
20' x 2462 x 9'6"	6058	2462	2896	5853	2259	24.0	"BELL LINES" OR "CPC-CONTAINER"
40' x 2462 x 9'6"	12192			11985		30.48	
40' x 2500 x 8'6"	12192	2500	2591	11985	2259	30.48	
40' x 2500 x 9'6"			2896				
45' x 8' x 9'6"	13716	2438	2896	13509	2259	34.0	"GEEST"
45' x 2500 x 9'6"		2500					

Tolerances:

Width:	+0- 5 mm	for all containers
Height:	+0- 5 mm	for all containers
Length:	+0- 10 mm	for 53' -30' containers
	+0- 6 mm	for 24.5' -20' containers

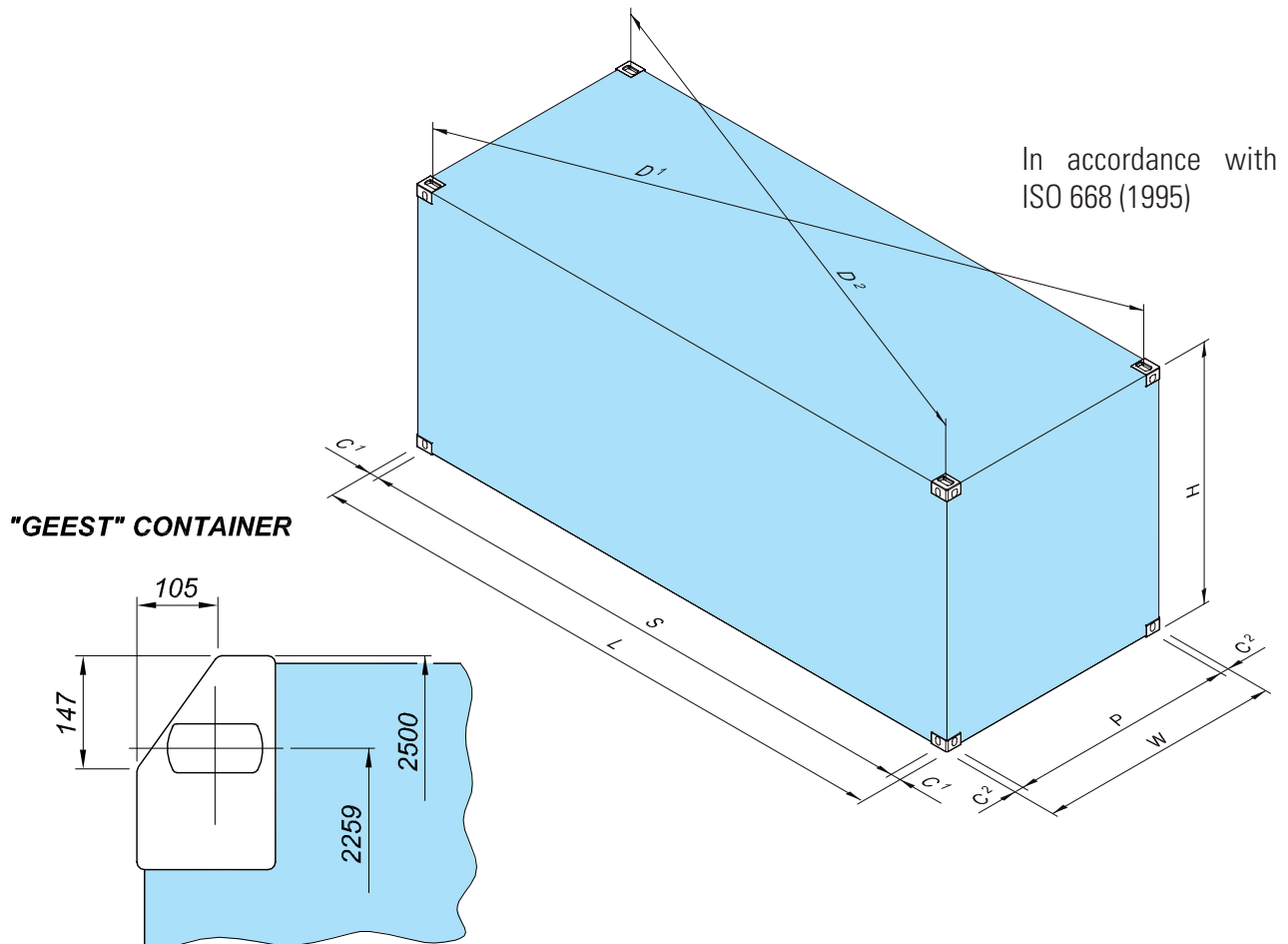
Common for all containers is the transverse measure from centre to centre point of the holes of corner fittings = 2259 mm.

"BELL LINES" or "CPC-CONTAINER"



Container dimensions

Designation		ISO 668 (1995)												
		45'		40'				30'				20'		
		1EE	1EEE	1A	1AA	1AAA	1AX	1B	1BB	1BBB	1BX	1C	1CC	1CX
Height	ft	8'6"	9'6"	8'	8'6"	9'6"	<8'	8'	8'6"	9'6"	<8'	8'	8'6"	<8'
	H mm	2591 ^{0/-5}	2896 ^{0/-5}	2438 ^{0/-5}	2591 ^{0/-5}	2896 ^{0/-5}	<2438	2438 ^{0/-5}	2591 ^{0/-5}	2896 ^{0/-5}	<2438	2438 ^{0/-5}	2591 ^{0/-5}	<2438
Length	L	ft	45'	40'				29'11 1/4"				19'10 1/2"		
		mm	13716 ^{0/-10}	12192 ^{0/-10}				9125 ^{0/-10}				6058 ^{0/-6}		
	S	mm	13509 ^{+4/-6}	11985 ^{+4/-6}				8918 ^{+4/-6}				5853 ^{+3/-5}		
	C ₁	mm	101.5 ^{0/-1,5}											
Width	W	ft	8'											
		mm	2438 ^{0/-5}											
	P	mm	2259 ^{0/-5}											
	C ₂	mm	89 ^{0/-1,5}											
Difference D1-D2		≤ 19mm		≤ 19mm				≤ 16mm				≤ 13mm		
max. grossmass kg		30480		30480				25400				24000		

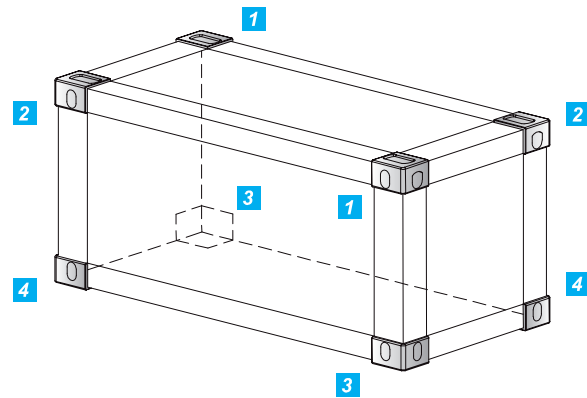
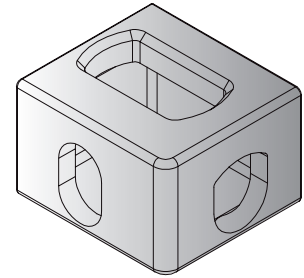
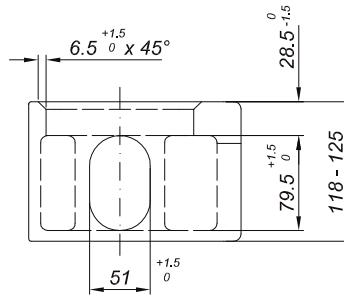
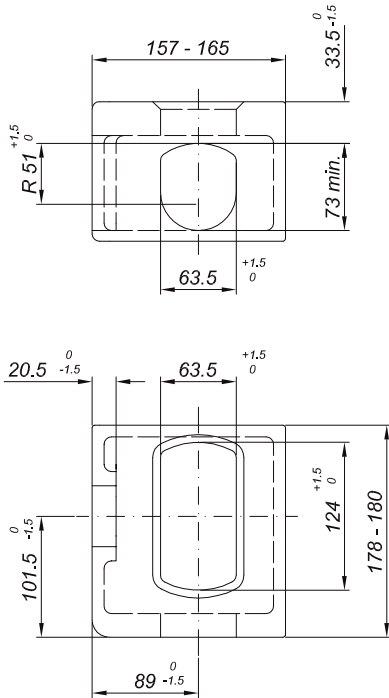


Container corner castings

Top corner fittings

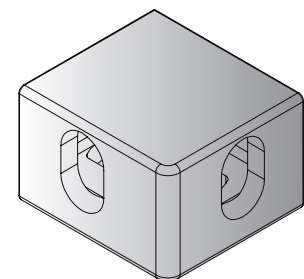
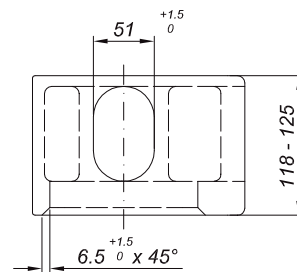
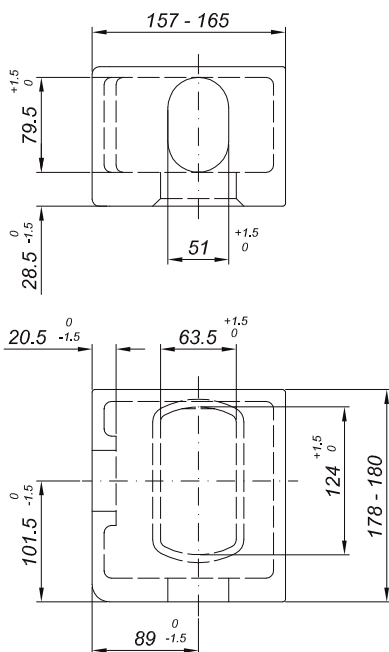
Type 1 - upper left
(Type 2 mirror inverted - upper right)

In accordance with ISO 1161 (1984)



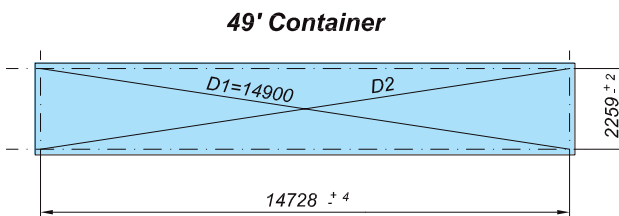
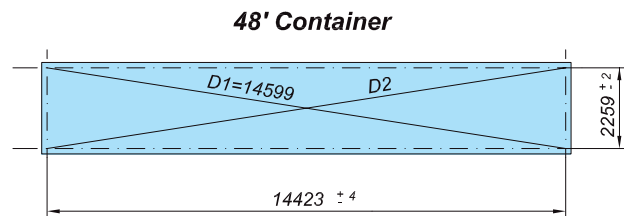
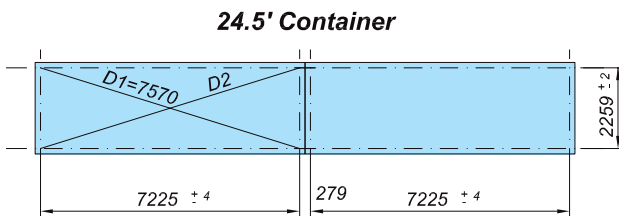
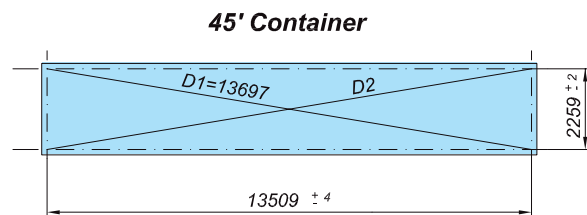
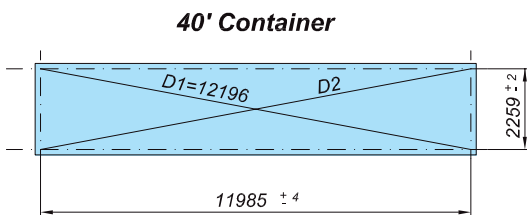
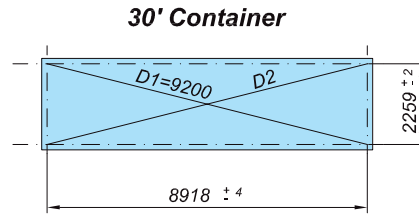
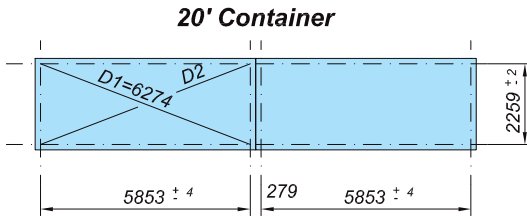
Bottom corner fittings

Type 3 - bottom left
(Type 4 mirror inverted - bottom right)



Container offset dimensions

Installation tolerances of container foundations (recommendation only)



Difference of diagonals

$D1 - D2$

Should not be more than:

- 20' Container - 6mm
- 40' Container - 8mm
- 24.5' Container - 6mm
- 30' Container - 6mm
- 45' Container - 8mm
- 48' Container - 8mm
- 49' Container - 8mm

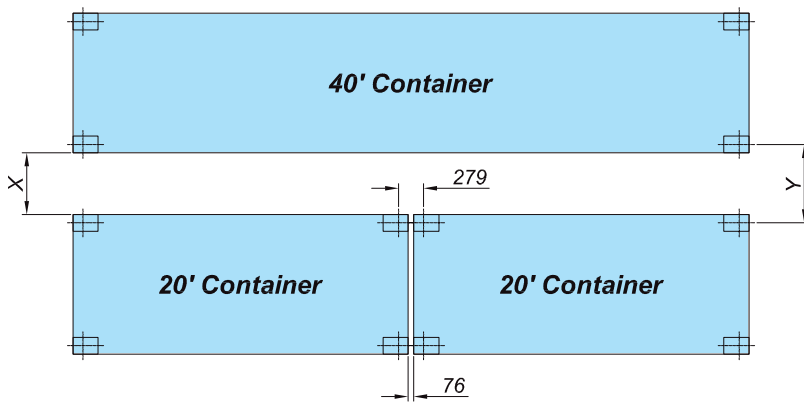
Height tolerances of container foundations

Transverse: 1 point is reference, the others ± 3 mm

Longitudinally: ± 6 mm to reference point

Common container spaces

Width of containers = 2438 according ISO 668 (1995)

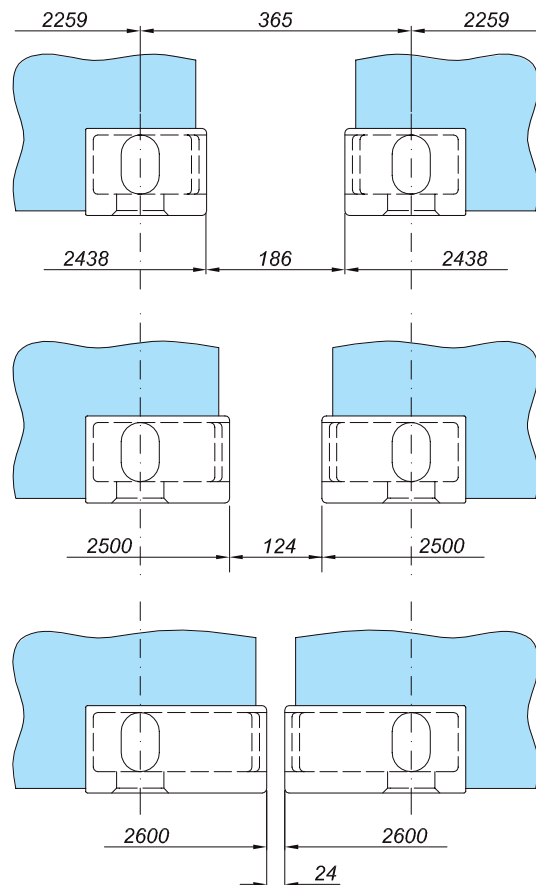
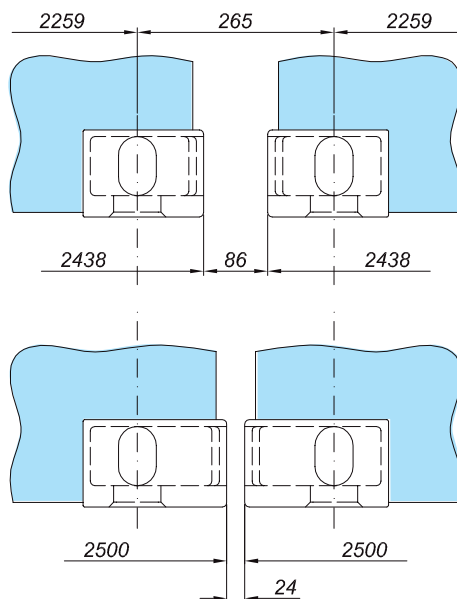


Container spaces X	Container distances Y centre to centre
25	203
38	216
80	258
186 (24 based on EURO)	365

The figures shown are the most common ones, but others are possible as well.

Transversal distances of EURO-containers

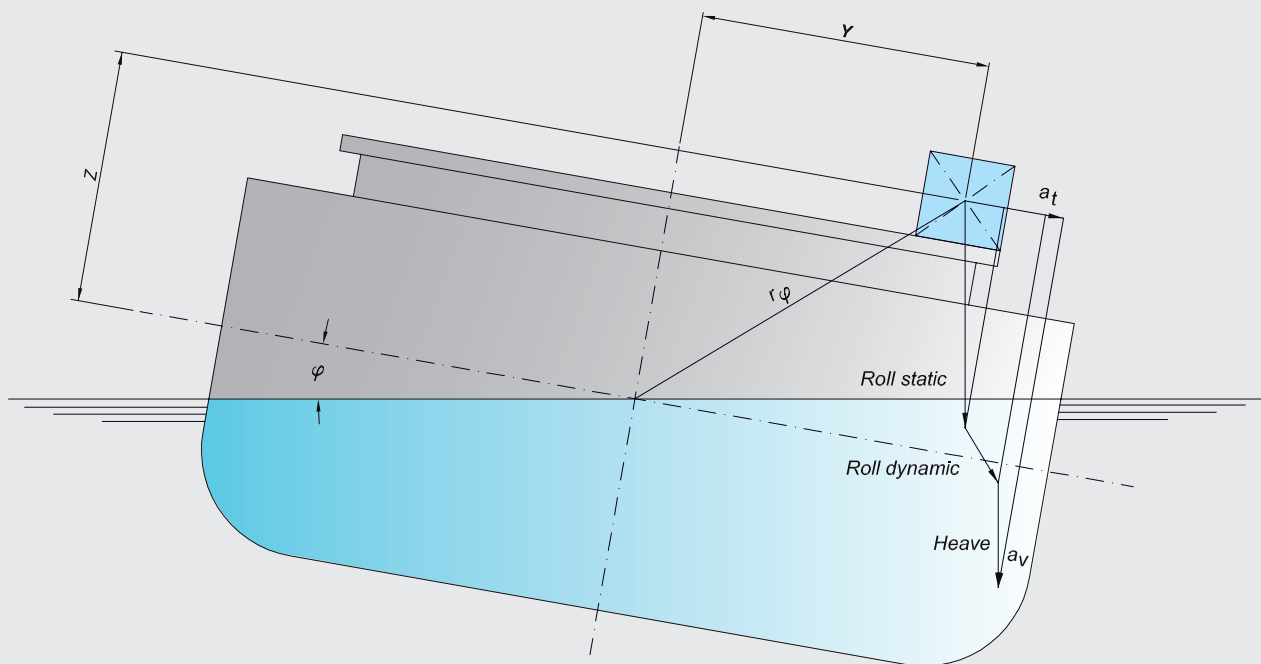
Width of container	Container distances Y centre to centre min.
2500	265
2600	365



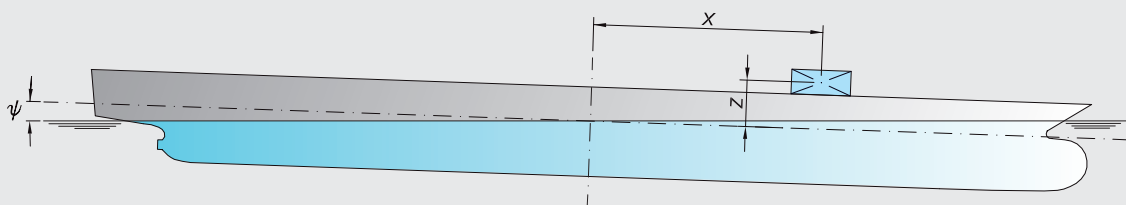
Static and dynamic components



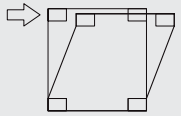
Rolling condition

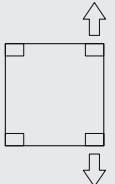
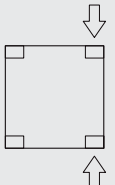


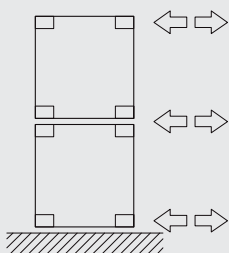
Pitching condition



Permissible forces on containers

RACKING FORCE (kN)			Classification Society / ISO 1496-1 (1990)					
			LR	GL	DnV	ABS	BV	ISO
	door and front wall frame	20'/40'	150	150	150	150	150	150
	side walls, closed box containers	20'/40'	150	150	150	150	150	75
	side walls			125	75	125	100	

FORCES IN VERTICAL DIRECTION (kN)			Classification Society / ISO 1496-1 (1990)					
			LR	GL	DnV	ABS	BV	ISO
	tension	top	250	250	250	250	250	118
		40'						150
	bottom	20'	250	250	250	250	250	112
		40'						141
	corner post compression	20'	848	848	848	848	848	942
		40'						
	compression at bottom corner	20'	954*	-	-	954	-	1048
		40'	983*					

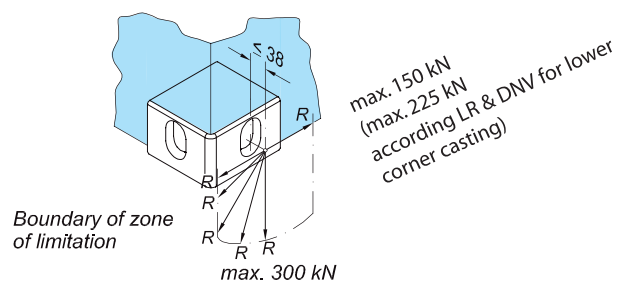
HORIZONTAL SUPPORT FORCE (kN)			Classification Society / ISO 1496-1 (1990)						
			LR	GL	DnV	ABS	BV	ISO	
	top	tension	20'	340	250	200	250	200	150
			40'			250			
		compression	340	250	340	250	200	100	
	intermediate	tension	20'	840	650	400	600	500	300
		40'	500						
	bottom	compression	840	650	840	600	500	250	
		tension	20'	500	400	200	350	300	150
	40'		250						
compression	500	400	500	350	300	150			

* can be ignored when substructure and foundations are approved for increased pressure forces.

Lashing loads at corner casting

Acting parallel to front and side face at top and bottom corner fitting.

In accordance with ISO 1161 (1984)

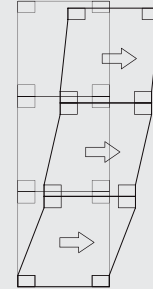


Typical damages on containers

Racking force:

The resultant force in the container – end and door frame, as a result of the static and dynamic forces parallel to the deck. In pitching condition the racking force is acting in the container side frames.

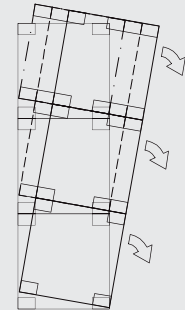
Exceeding racking forces can be reduced by use of diagonal lashing units.



Lifting force:

The resultant vertical lifting force.

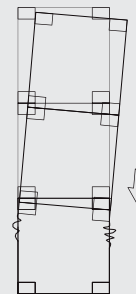
Exceeding lifting forces can be reduced by use of diagonal or vertical lashing units.



Post load:

The resultant pressure force in the container corner post.

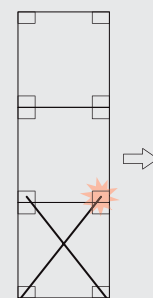
Exceeding corner post compression cannot be reduced by lashing units, contrary diagonal lashings are even increasing vertical loads. Container weights must be reduced.



Lashing force:

The resultant force in the lashing.

Exceeding lashing force can be reduced by using additional lashing units.



Necessary data for quotation

For a precise quotation and calculation of weight distribution we do need certain information from you. Additionally to below listed data please provide a general arrangement (GA) plan or container arrangement plan in suitable size.

- Length between perpendiculars Lpp _____
- Moulded breadth B _____
- Depth D _____
- Service Speed v _____
- Draught d _____
- Height of tank top h1 _____
- Top of H/C above baseline h2 _____
- Class of vessel
- OSHA compliance required..... yes no
- Compliance to new CSS code required..... yes no

Additional data for calculations according LRoS:

- Standard angle of roll (30°) or reduced angle of roll Summer draft: _____ C_p-factor at summer draft: _____
- Standard GM value (2.5% and 7.5% of B) or as specified: _____ Breakwater existing: yes no

Additional data for calculation according GL:

- Standard GM value or other GM value _____ Unrestricted worldwide service (LC) or route specific (RSCS)
- Routes: _____

Additional data for calculation according DNV:

- Standard GM value (5% of B for B<32.2m / 8% of B for B>40.0m) or as specified: _____ but not less than 1.00m
- Bilge keel existing: yes no Block coefficient at design draft to be specified: _____

Additional data for calculation according BV:

- Standard GM value (7 % of B) or as specified: _____
- Standard value for roll axis above baseline (35 % of B) or as specified: _____
- Block coefficient at design draft to be specified: _____

Additional data for calculation according ABS:

- GM value to be evaluated over the expected operation range: _____ Bilge keel existing: yes no

Container data:

- Required stackloads on deck for 20' _____ 40' _____ others: _____
- Required stackloads in hold for 20' _____ 40' _____ others: _____
- Transversal distance between containers on deck 25 38 80 mm or others: _____
- Transversal distance between containers in holds 25 38 80 mm or others: _____
- Longitudinal arrangement of 20' containers with 76 mm ISO-gap
- or with lashing way in between (breadth of lashing way to be specified): _____
- Longitudinal container arrangement per each bay to be done symmetrically or asymmetrically

Container Securing equipment:

Type of foundations and lashing points on deck:

- ISO-foundations (H = 110 mm) in combination with lashing plates or dovetail foundations in combination with D-rings
- or other solution: _____

Type of foundations in hold:

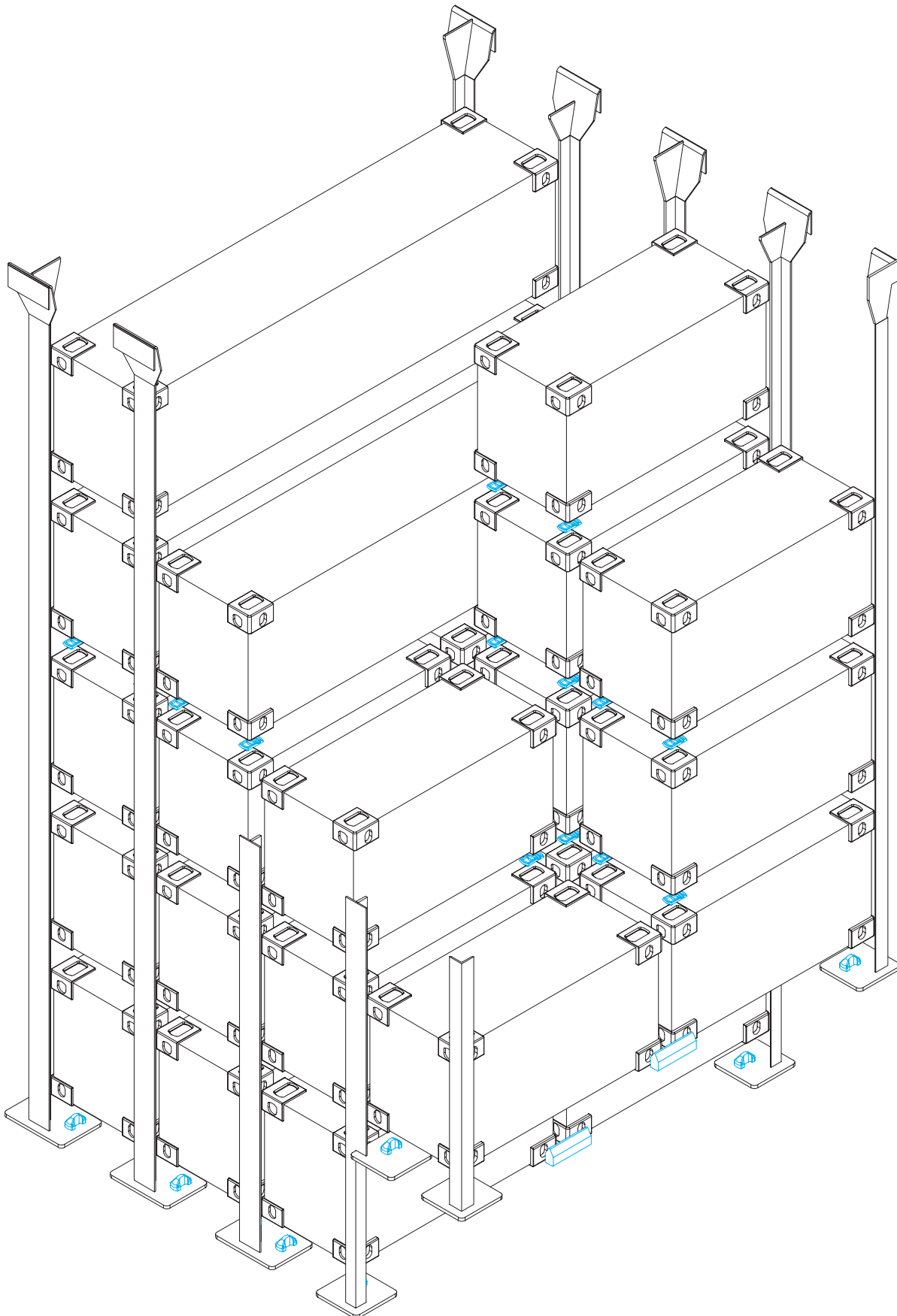
- Cellguides with welding cones at bottom in combination with guide fittings at ISO-gap
- or flush type twistlock pockets or welding plates (t = 30 mm) with ISO-holes

2

STOWAGE SYSTEMS

2.1 - 2.2	OSHA stowage system in holds
2.3 - 2.6	Transversal stowage system in holds
2.7 - 2.8	Arrangement of sliding foundations
2.9 - 2.10	Automatic solution for bottom tier on deck
2.11 - 2.13	Longitudinal arrangement of containers on deck
2.14 - 2.15	External lashing systems

Osha storage system in holds



Osha stowage system in holds



Description

Since OSHA regulations have to be applied not only for container on deck but also for container securing in holds the mixed stowage system or OSHA stowage system became the most common securing system for 20' containers within 40' cellguides.

Under high pressure from shipping companies all major classification societies have revised their regulations for this kind of securing system but nevertheless the stack-weights are strictly limited compared to traditional stow-age systems. The maximum stackweights are depending on the acceleration factors according class rules for the concerned vessel and the number of tiers. Some classification societies are limiting the number of tiers for 20' containers.

Twist stackers are handled in the same way as semi-automatic-twistlocks which means the twist stackers will be inserted on the quay side and then loaded together with the container on board. Twist stackers do not have any locking function because lifting forces

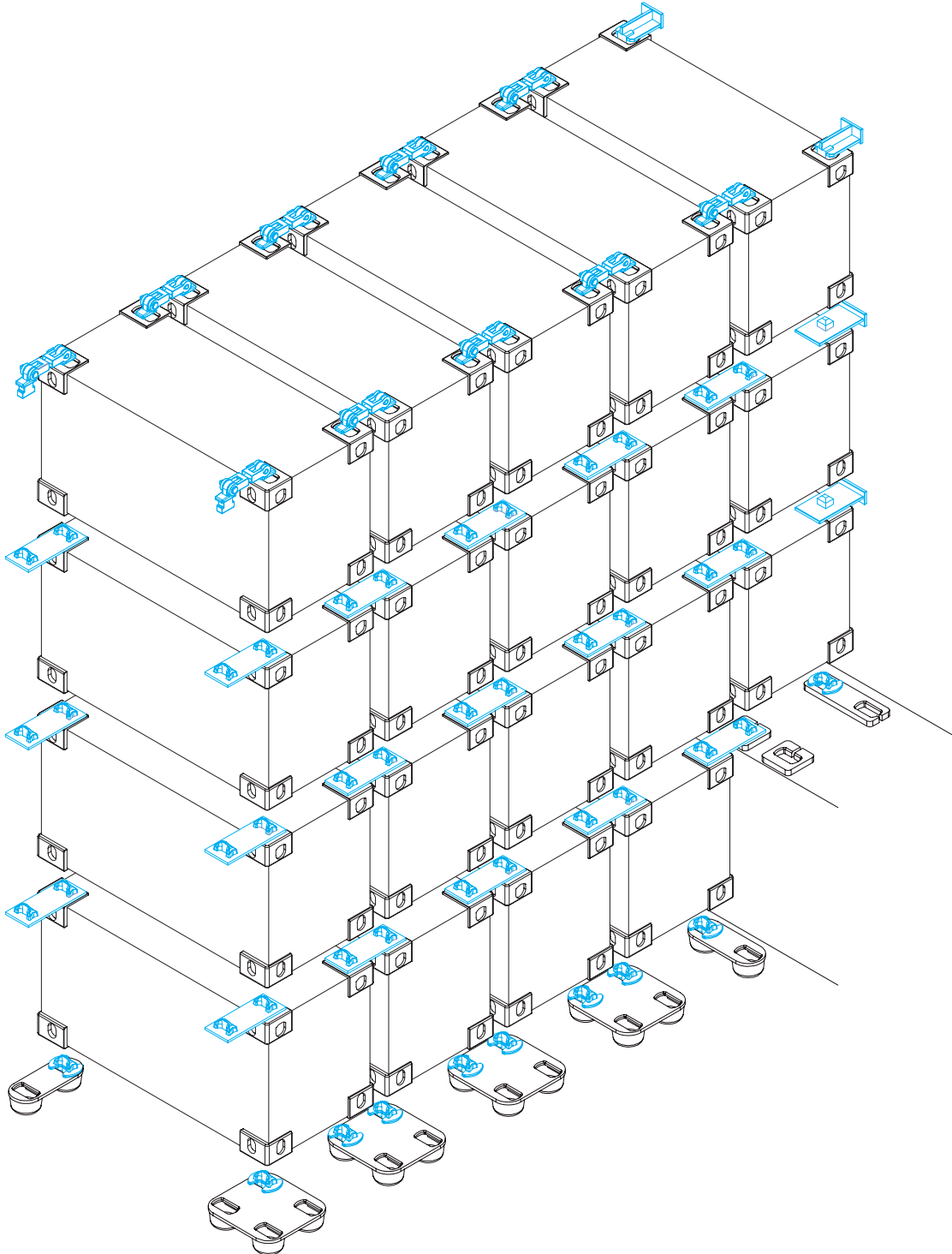


do not occur for this securing solution, their only purpose is to prevent 20' containers against horizontal sliding. When discharging containers the twist stackers will be transported to the quay side hanging underneath the container and finally stored in bins on flat racks.

The mixed stowage system offers highest flexibility because no horizontal connection between 20' containers is necessary, each stack stands separately, therefore 20' containers can be loaded next to a 40' stack and each stack can be loaded/unloaded individually.

When using twist stackers without flange type IS-1T/LF (page 6.2) the container corners are standing directly on top of each other without 13 mm flange of twist stacker in between. With such type of twist stacker the quantity of stacking cones can be reduced by 50 %.

Transversal storage system in holds



Transversal stowage system in holds



Description

Pressure system

This conventional securing system in the past presented the largest group of securing systems in hold and is splitted again in two subdivisions:

Pressure System

Only pressure forces will be transmitted from the container block to the supporting points at the longitudinal bulkhead.

Tension/Compression System

The container block is splitted in two or three separate blocks and both, tension and compression forces will be transmitted into the side structure by use of T/P-Elements.

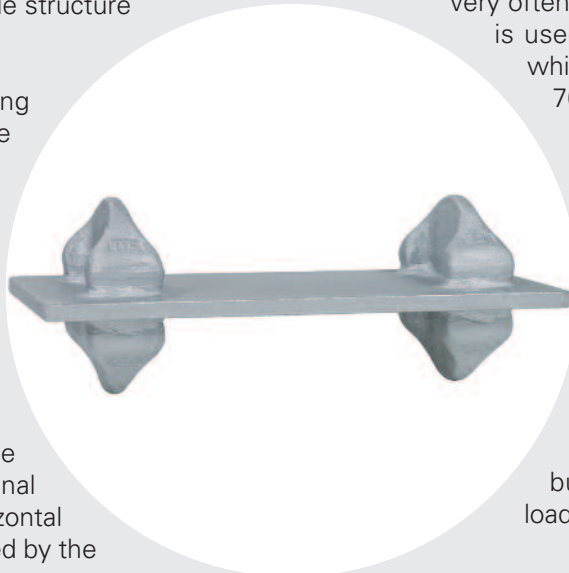
For the transversal securing system all containers have to be connected by use of double stacking cones in transversal direction. The horizontal forces from the containers which occur in rolling condition will be transmitted from one stack into the next one and at the same time adding up. The resulting force at the outermost stack has to be absorbed at the longitudinal bulkheads. The maximum horizontal force which may be transmitted by the

container corner castings is specified in the individual rules of the classification societies (please compare to chapter 1.11).

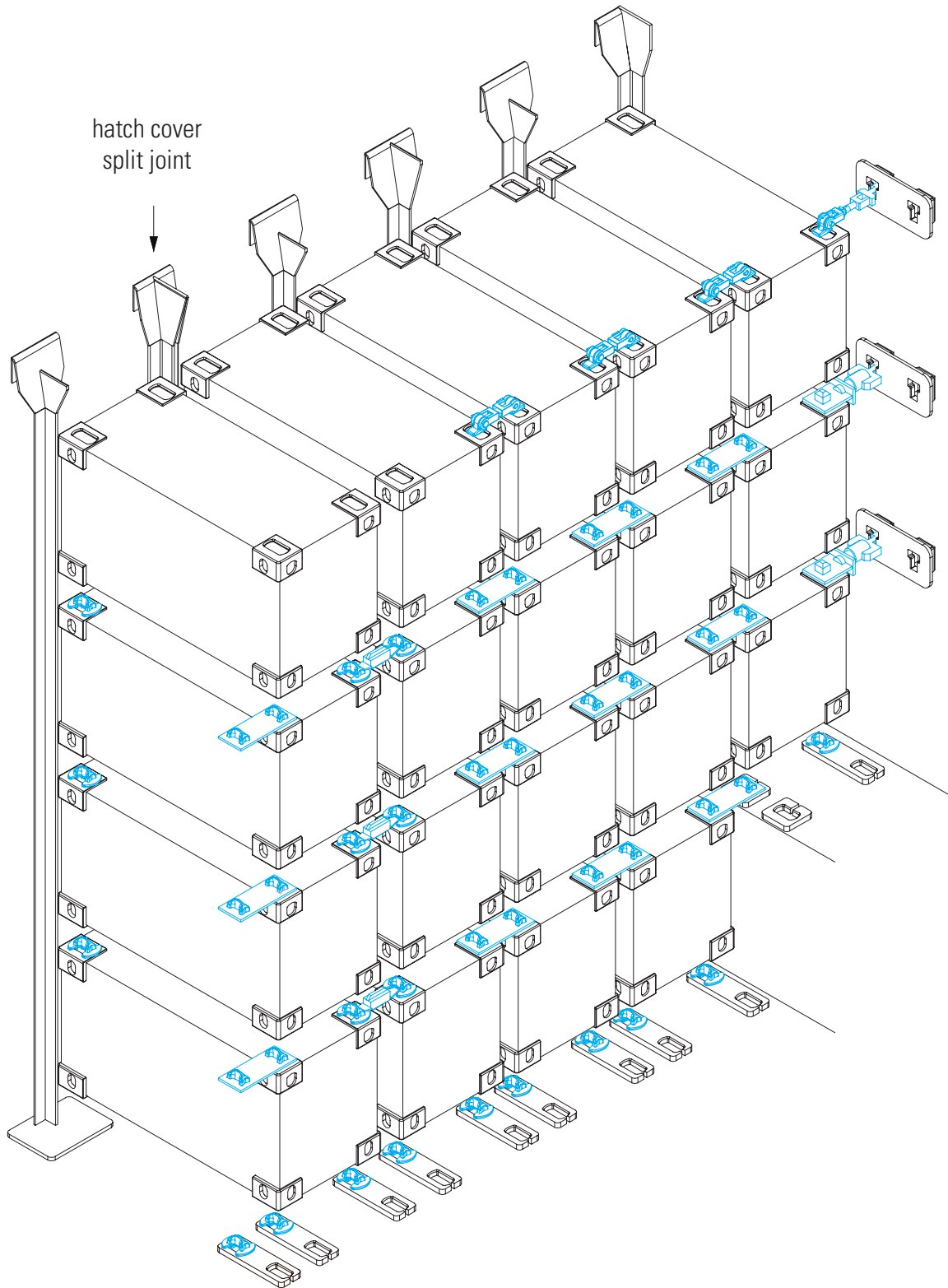
The required number of supporting points is depending on the acting forces in the container block and the allowable support force specified by class. For this reason it can be necessary in some cases not just to use pressure elements between all tiers but also on top by using bridge fittings and especially designed pressure elements.

Very often the transversal securing system is used for securing of 20' containers which are stowed in 40' cellguides at 76 mm ISO gap position but also the transversal securing system is the one and only adequate securing solution for multi purpose container vessels without cellguides in holds.

As an option the pressure elements may be replaced by fixed installed pressure rails which are at the same time protecting the longitudinal bulkhead from damage when loading containers.



Transversal stowage system in holds



Transversal stowage system in holds



Description

Tension/compression system

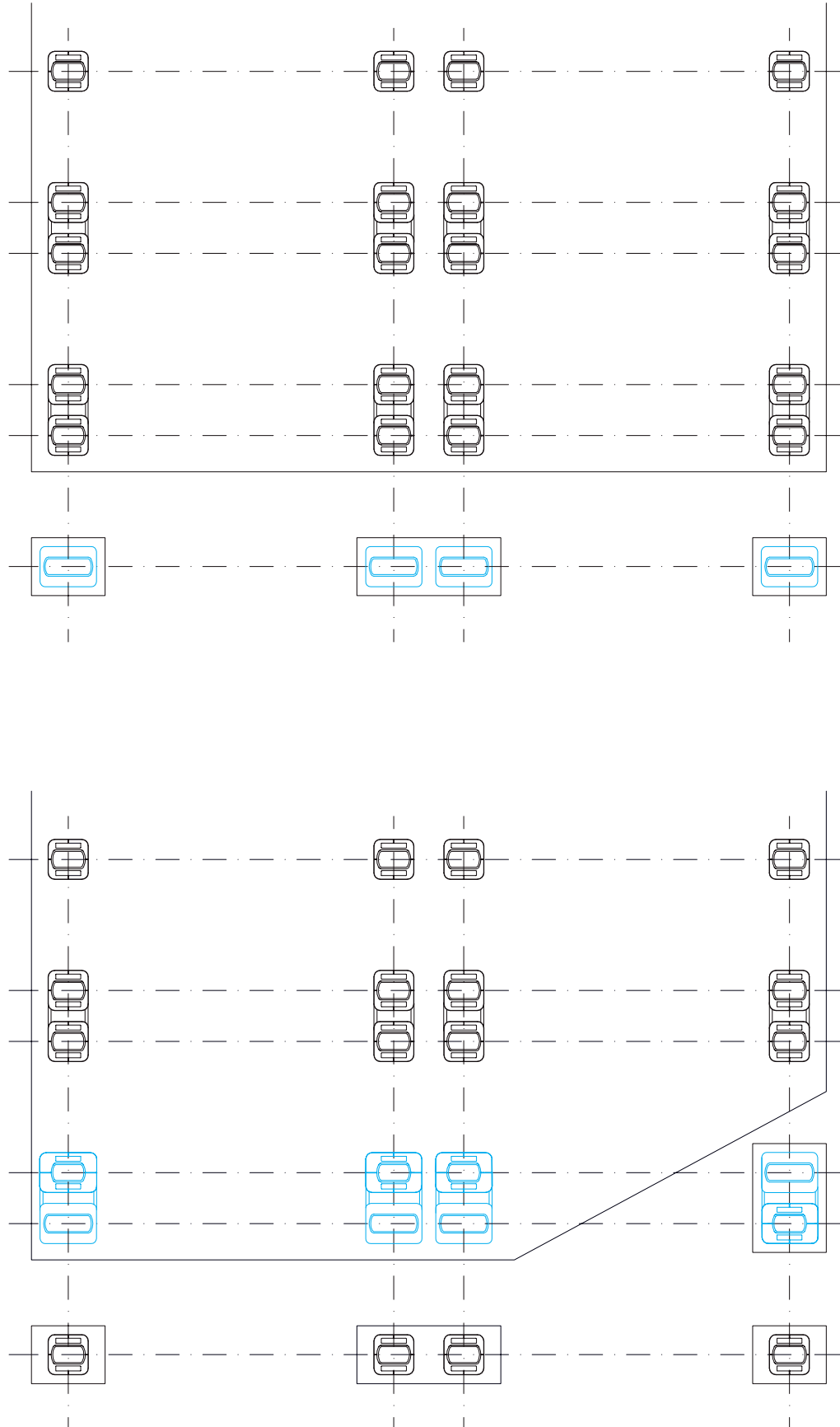
In case that fully loaded containers can not be achieved even if all container levels are supported by pressure elements, it will be necessary to separate the container block. This separation can be realised by using single stacking cones for example in way of ship's longitudinal axis. The two separate container blocks now have to be connected by means of tension/pressure-elements and corresponding counter bearings to the longitudinal bulkhead.

For larger container vessel with three hatch cover panels it could be an advantage to separate the containers in three blocks. For this reason single stacking cones in combination with pressure adapters should be used in line with the hatch cover split joint. The container block in the middle of the hold will act by pressure force alternately to both sides. The advantage of this system is that the container blocks below each panel can be discharged separately.

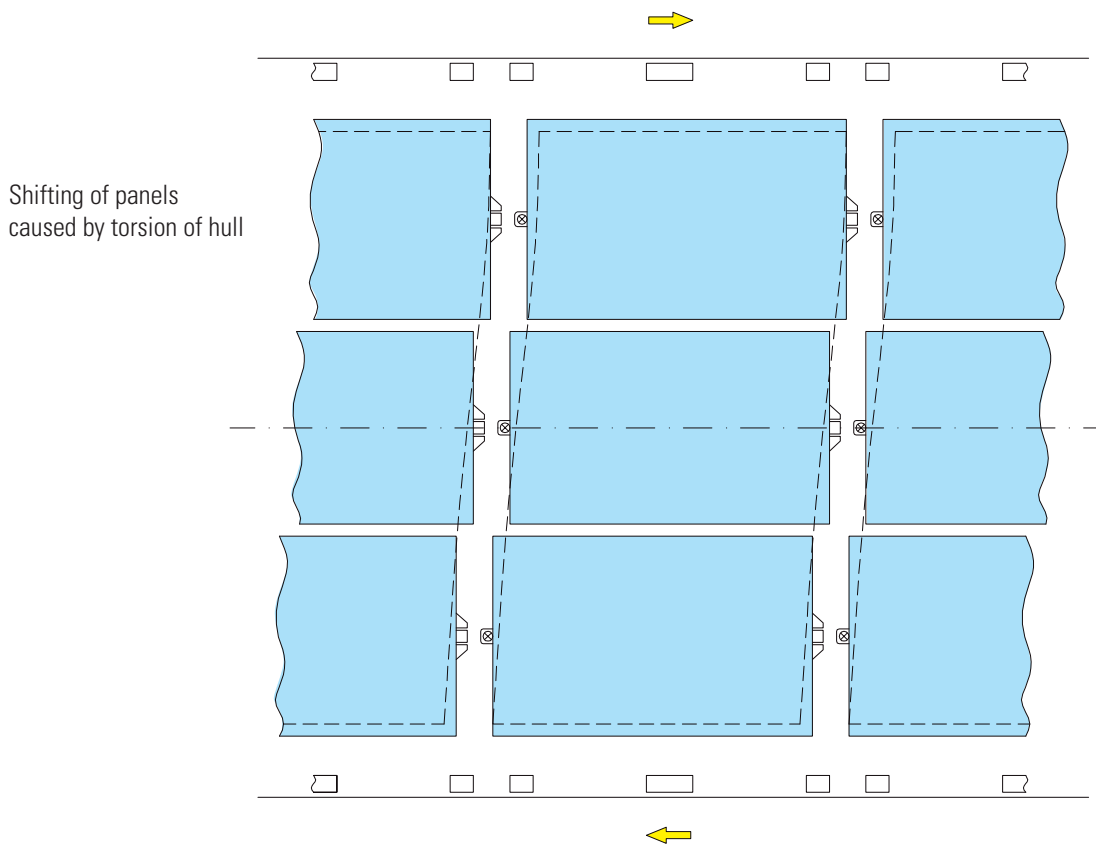
When deciding about the type of counter bearing it is important to know which container heights have to be covered because for each combination of 8'6" and 9'6" container height there must be a possibility to insert the tension/pressure-elements.

Main disadvantage of the transversal stowage system is that loading and unloading of containers can only be made tierwise. It is not possible to have a 40' stack next to a 20' stack because this would interrupt the transmission of horizontal forces.

Arrangement of sliding foundations



Arrangement for sliding foundations



When containers are partly stowed on hatch covers and partly on deck stanchions or on two different panels deformation of hull needs to be compensated by the foundations.

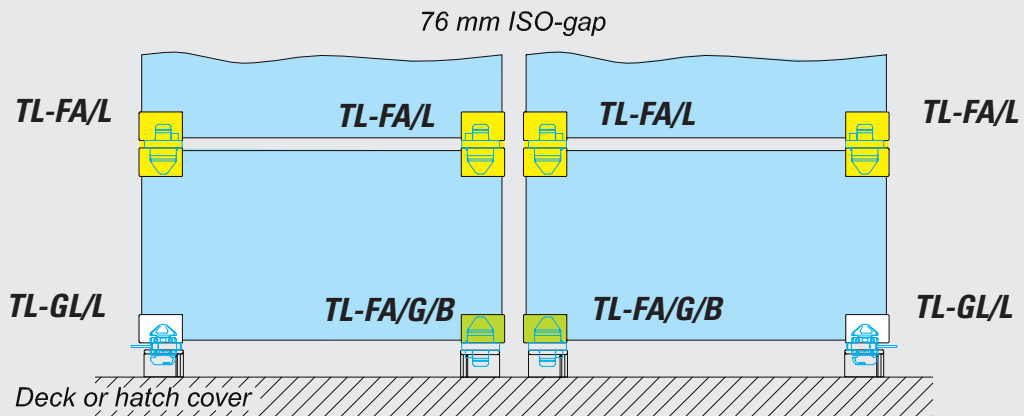
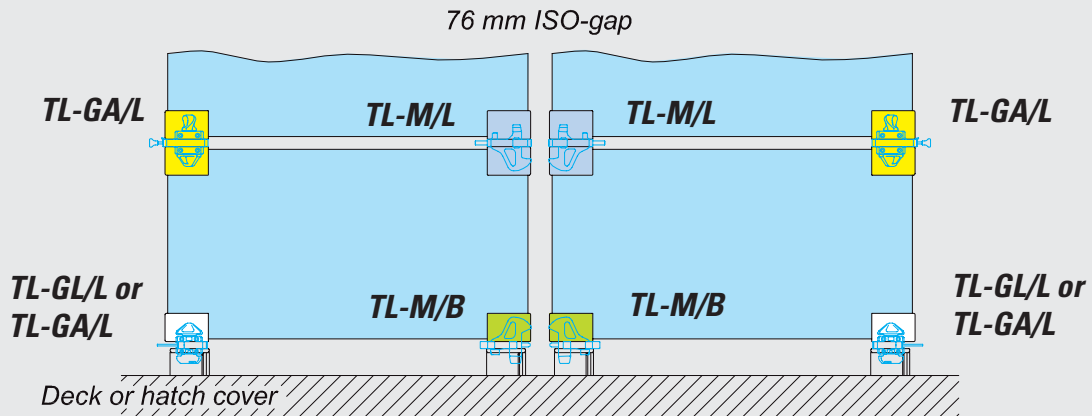
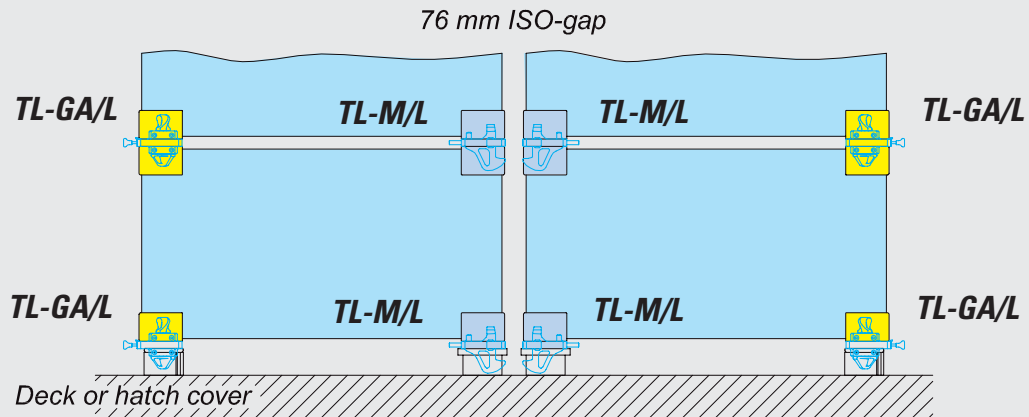
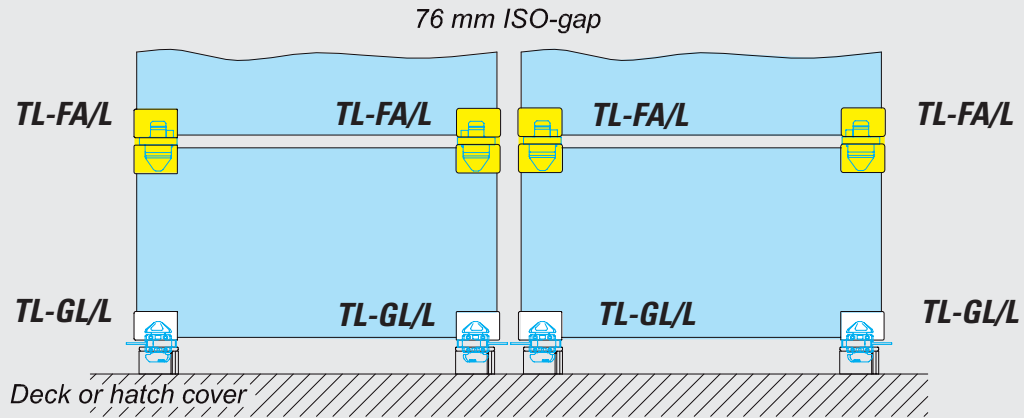
For a typical container vessel torsion of hull causes longitudinal movements at the container foundations. In this case longitudinal sliding foundations can be used to compensate movements of panels but nowadays foundations with elongated ISO-holes are much more common.

Where ever possible the elongated foundations will be arranged on ship side stanchions but when the outline of hatch covers is inclining at forward end the elongated foundations have to be arranged partly on

hatch cover panels in order to avoid an accumulation of three sliding foundations for one container stack.

Ships with folding type hatch covers will need transversal sliding foundations under normal circumstances. The necessary sliding range and direction should be determined by hatch cover designers together with the yard.

Semi-automatic solution for bottom tier on deck



Semi-automatic solution for bottom tier on deck

Locking and unlocking of bottom twistlocks for 20' containers which are stowed with 76 mm ISO-gap is a permanent problem. OSHA regulations specify that a fall risk begins at 8' height but on the other side all containers are stowed close together so there is no space where to fall down. It is our understanding of the OSHA regulations that stevedores are still allowed to climb on top of the first tier on deck for locking/unlocking of bottom twistlocks at 76 mm ISO-gap. Nevertheless we have fully automatic solutions for the bottom tier as well.

For example our standard midlock type TL-M/L can be used in the bottom tier when specially shaped foundations are installed in way of 76 mm ISO-gap. In this case a minimum of different fittings is needed for container securing on deck. The midlock in the bottom tier will be unloaded together with the container.

Alternatively especially shaped bottom midlocks type TL-M/B can be used. This type of midlock remains in the foundation when lifting up the containers and it can be used in combination with standard foundations.

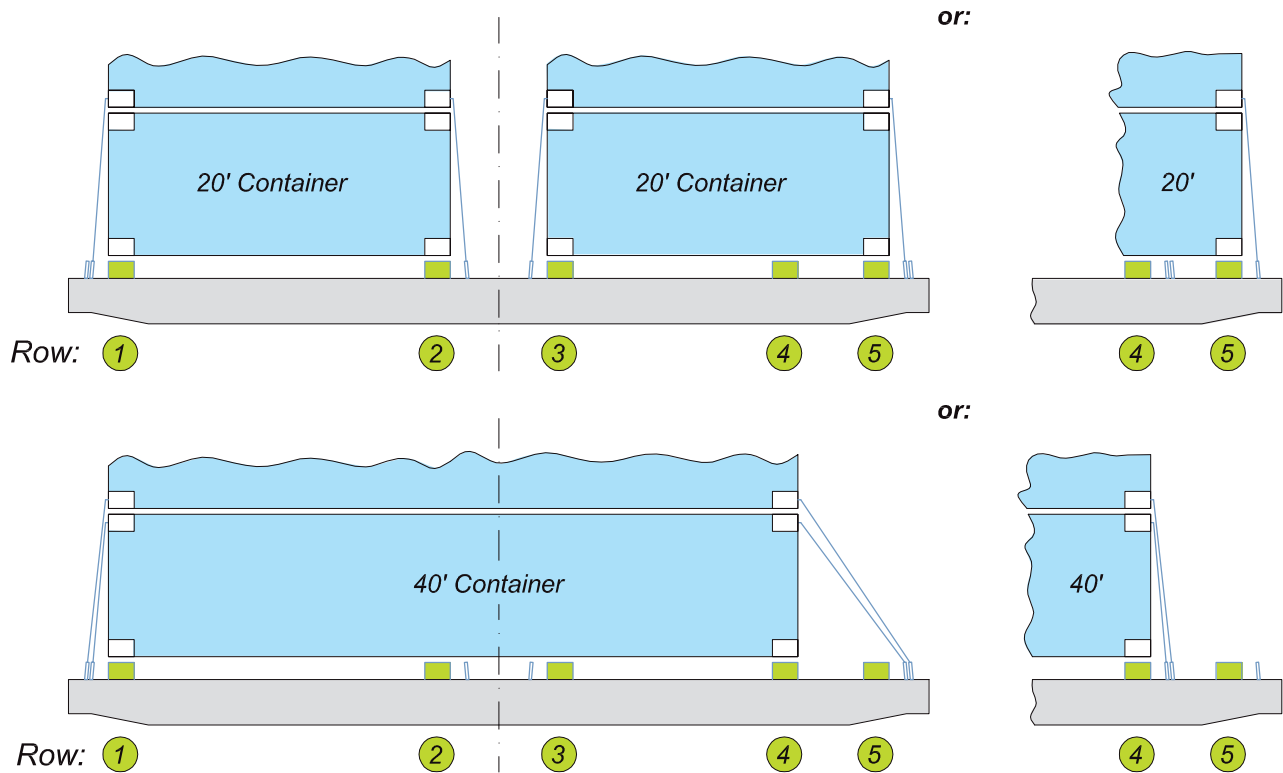
Special care has to be taken when midlocks or bottom midlocks shall be used in combination with longitudinal sliding foundations. In no case foundations with elongated ISO-holes can be used.

Special type fully automatic twistlock TL-FA/G/B can also be used at bottom tier when specially strengthened foundations are installed. For the reason that flexibility of shipside stanchions is unknown we recommend not to use FAT at the bottom of container stacks with overstow (one side on panel and other side on stanchions). TL-FA/G/B at bottom tier remains on board when unloading containers.

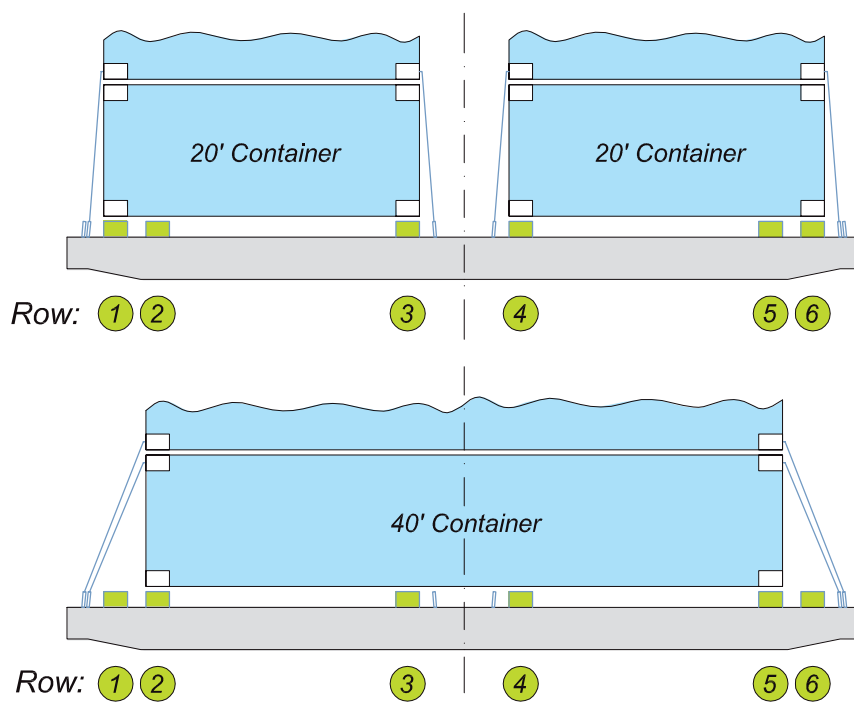
The TL-FA/G/B in the bottom tier works perfect in combination with foundations with elongated ISO-holes, but in no case they can be combined with sliding foundations in transversal direction.

Longitudinal arrangement of containers on deck

Asymmetrical arrangement



Symmetrical arrangement



Longitudinal arrangement of containers on deck



In general there are two solutions for the longitudinal arrangement of containers when 20' containers shall be stowed with lashing gap in between.

Very often it can be seen that containers are arranged asymmetrically with 5 rows of foundations per 40' bay only. Despite of the cost saving effect for a minimum quantity of foundations and reinforcements this solution has several disadvantages.

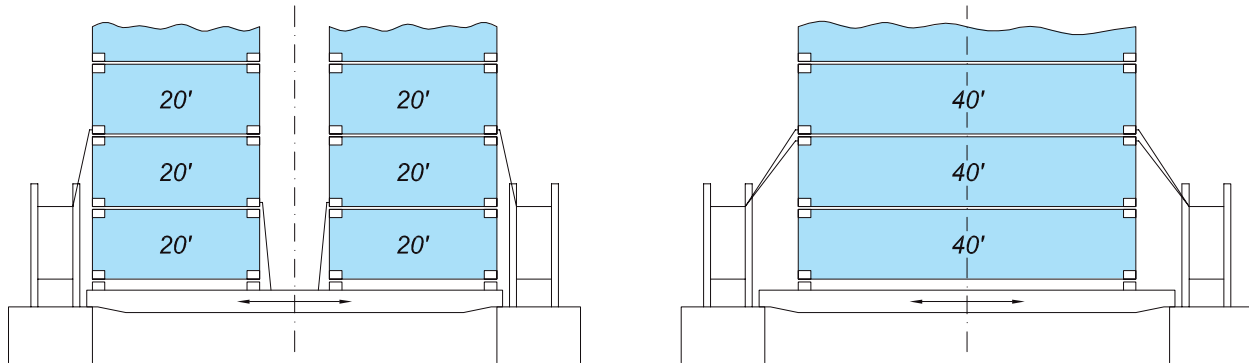
40' lashing at asymmetrical end has to be made 3-dimensional which can have negative effect on the efficiency of lashings. The lashing plates have to be inclined about 10° or even more in direction of containers. The wider the lashing gap between 20' containers is, the more difficult it is to cover all lashing positions with unified length of lashing rods. In some cases it might be necessary to install additional lashing plates at asymmetrical end between 20' and 40' foundations, if so stevedores have to shift turnbuckles each time when loading 20' instead of 40' and opposite.

For this reason we recommend to arrange the containers symmetrically in longitudinal direction resulting in 6 rows of foundation per 40' bay. This solution brings best results concerning the arrangement of lashing plates and unified lashing

length. Even in case of large lashing gap between 20' containers no additional lashing plates have to be arranged and no shifting of turnbuckles by stevedores is required.

According to new CSS code (IMO 1352) a minimum gap of 750 mm has to be provide between containers resp. 600 mm between lashing plates. Thus the minimum gap between containers at typical 20' lashing gap is 860 mm (1063 mm offset distance).

Longitudinal arrangement of containers on deck



In case that the vessel is equipped with lashing bridges the symmetrical arrangement of containers in longitudinal direction is even more important.

Shipowner's requirement for unified length of lashing rods is always extremely difficult to fulfil when the vessel has lashing bridges because a container height difference of at least 2×305 mm has to be considered for high cube container loading. It is very difficult to handle extension rods from lashing bridges therefore they should not be used.

The longitudinal gap between lashing bridges and 20' container end should be minimized as much as possible and 40' containers always to be arranged symmetrically in order to reduce 3D-effect of lashings.

During torsion of hull the container stack will shift together with the hatch cover panels in relation to

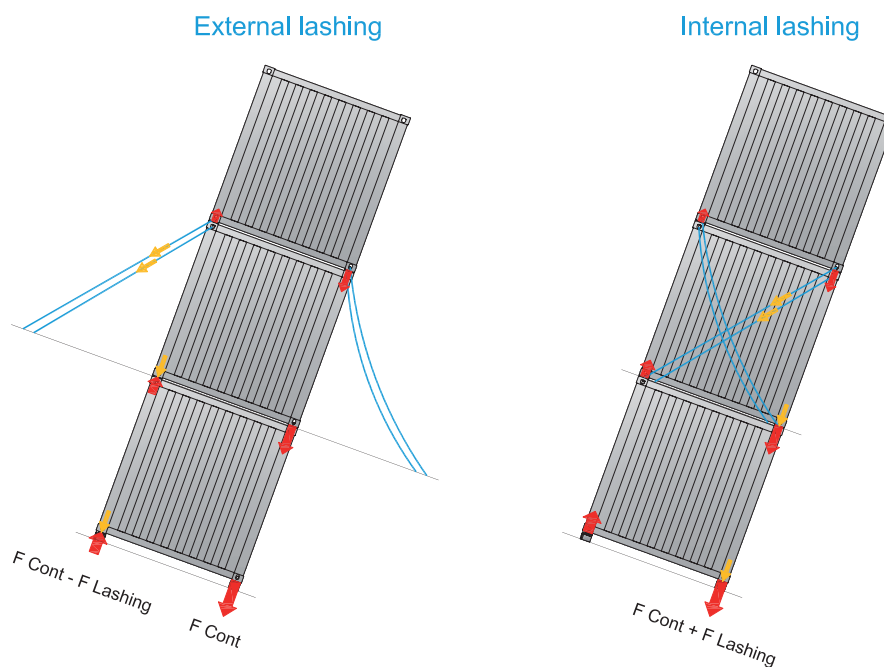
the lashing points on lashing bridge creating additional forces in the lashings. This effect is increasing as more as the lashings are inclined in longitudinal direction.

External Lashing Systems

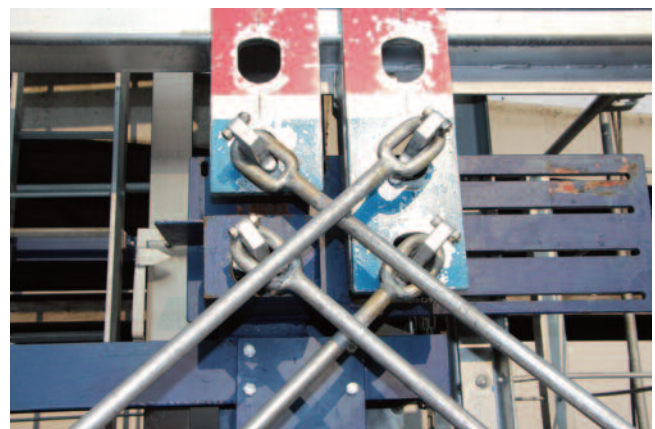
In case of large container vessel with lots of container tiers on deck and high stackloads normally the stackload/weight distribution is limited by the allowed corner post compression acting on the lowermost container.

Traditional internal lashings will produce additional pressure forces at the pressure side of container stack, thus additional lashing units would make situation even worse instead of improving safety.

As an alternative container stacks can be lashed externally. In such case the lashing forces are reducing the tension forces on tension side of container stack without increasing pressure forces on the pressure side of stack.



There is considerable improvement of stackload and weight distribution but on the other hand external lashing systems are very complex and difficult to handle. Interference in way of turnbuckles but also in way of rod heads have to be checked for hundreds of different loading conditions of 8'6" and 9'6" container height. A certain sequence has to be strictly followed when installing the lashing units.

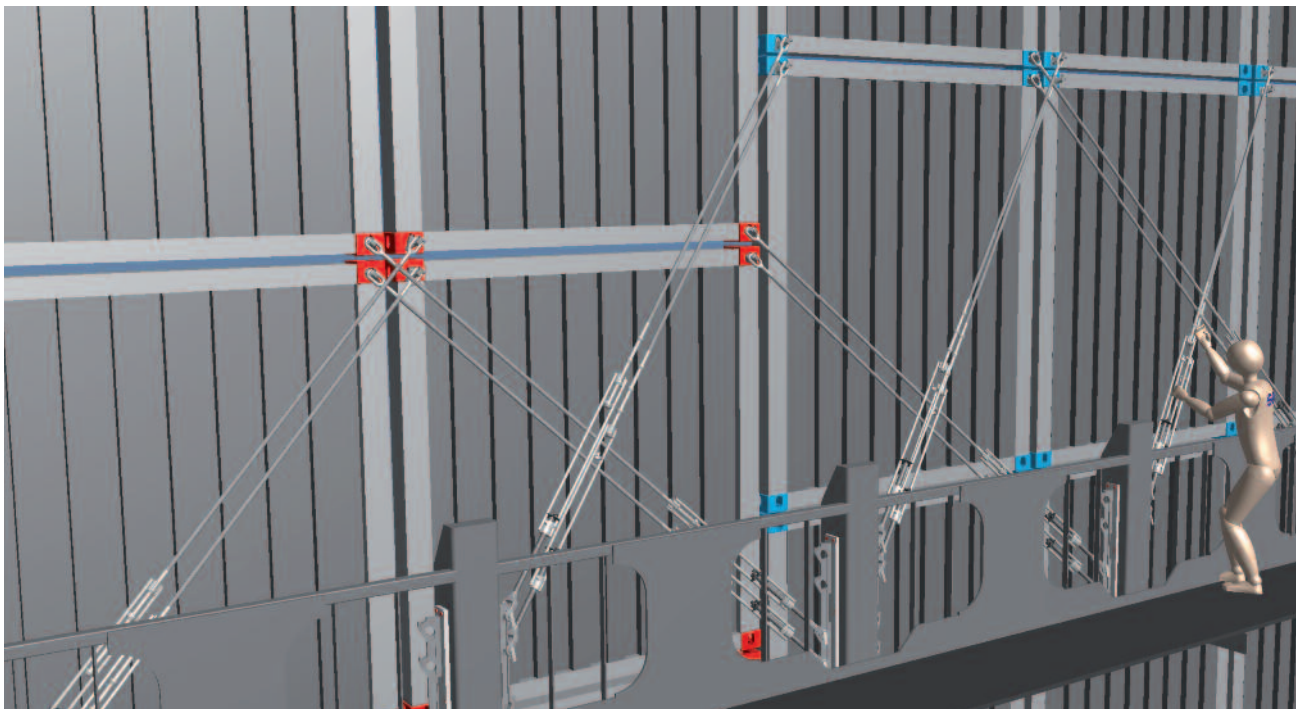


External Lashing System

External lashings should only be applied when 20' containers are arranged with 76mm ISO-gap in between (Russian stowage). When 20' containers are stowed with lashing gap in between 40' containers at neighbor stack cannot be lashed externally.

It is possible to apply some additional lashing plates so that the containers can be lashed internally or externally at choice using same lashing gear. At choice means that containers can be lashed baywise either internally or externally but not stackwise! Arranging the lashing plates for internal or external lashings using same lashing units is high end engineering and requires lots of time for preparation.

In order to improve the situation we recommend to use special type lashing plates offering additional adjusting range which is extremely important for lashing bridges which are 3-tiers high. In case of fixed type lashing plates the lashing angle becomes rather ineffective when lashing high cube containers. But when using adjustable lashing plates and shifting turnbuckles to upper position the lashing angle remains almost same for 8'6" and 9'6" container height resulting in better support to the container stack.



Container part

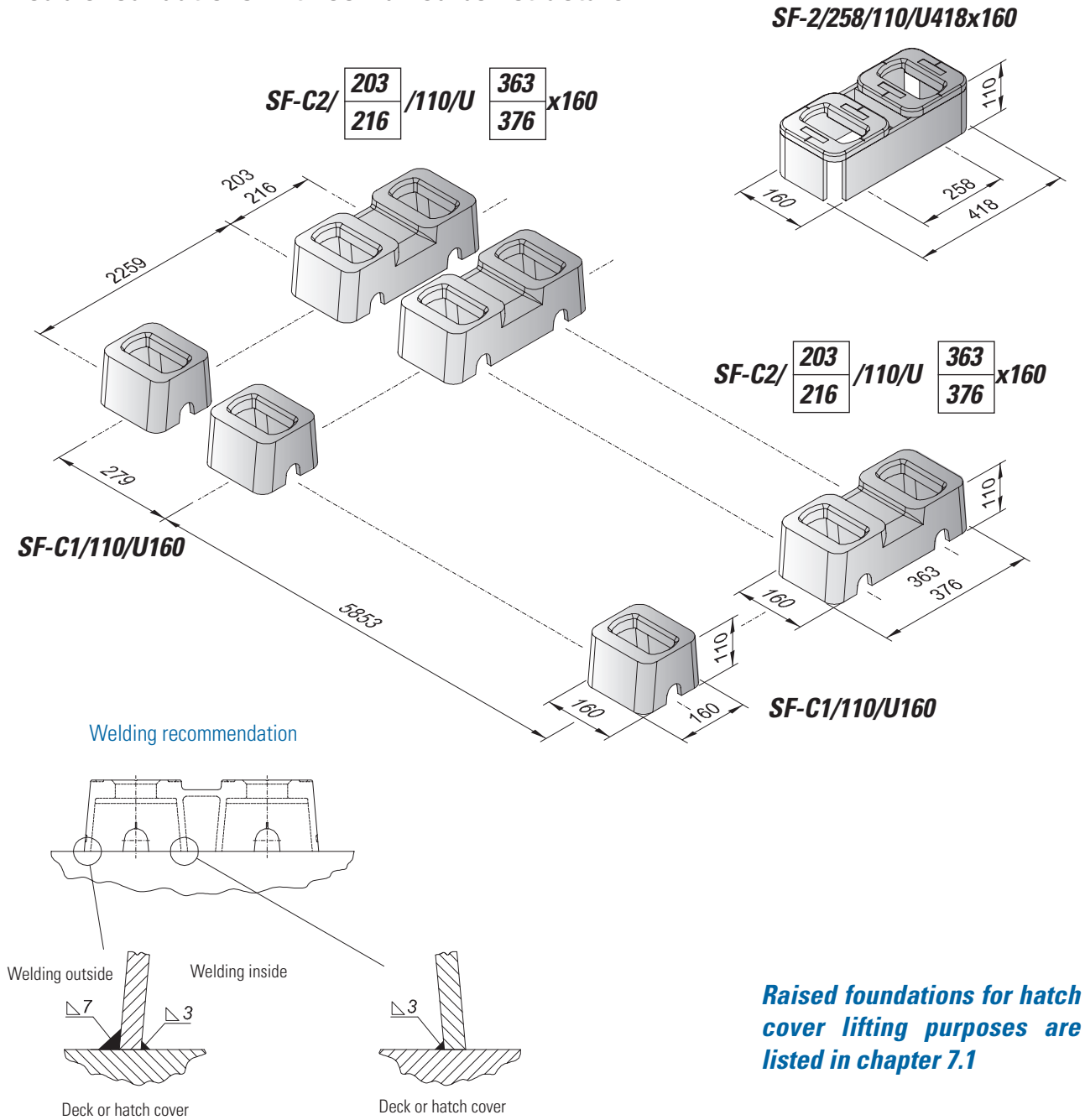
3

FIXED FITTINGS ON DECK

3.1 - 3.2	Raised foundations
3.3 - 3.4	Elongated foundations
3.5 - 3.7	Sliding foundations
3.8	Dovetail foundations
3.9	Lashing plates
3.10	Horn type lashing plates
3.11	D-rings

Raised foundations

Double foundations with combined box structure

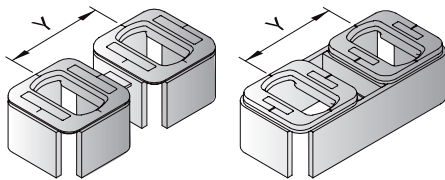
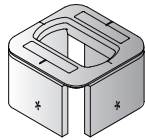
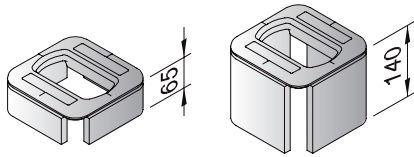


Specification

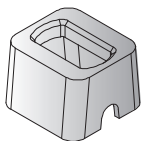
- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Standard height 110 mm
- Centre marks for easy installation
- Standard distances for double foundations 203/216/258 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile cast steel

Raised foundations

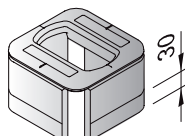
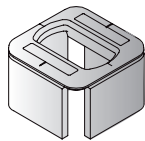
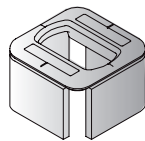
Options and variations for raised foundations



casted type



built type



- Variation of height

Min. height 65 mm.

Attention: These foundations can not be used in combination with semi-automatic twistlocks/midlocks at bottom tier or in combination with lashing plates.

- Max. height 140 mm.
- For example for height adjustment between hatch cover surface and deck stanchions.

- **Additional punchmarks** at side plating for easy installation.

- **Special distances** for double foundations for example for EURO containers or special ship's geometry.

The distance piece has no strength function and only helps to keep correct distance between both parts of foundation.

- **Foundations** are available in built type or casted execution.

Foundations with unusual dimensions always have to be produced in built type execution.

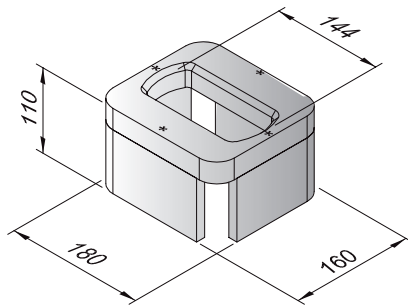
- **Hardened toplates** (min. 235 HB) for built type foundations by additional heat treatment which exceeds class requirements.

- **Special surface treatment** as specified by customer, for example final paint inside excluding welding area.

Elongated foundations

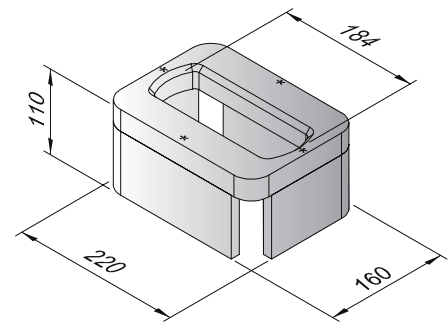
Sliding range ± 10

SF-1/144/110/U160x180



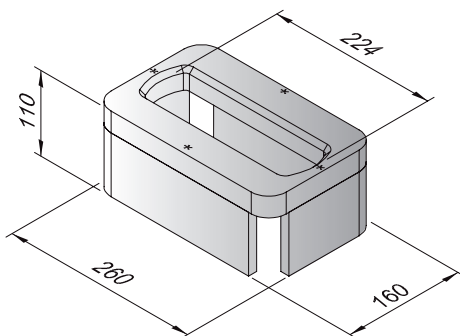
Sliding range ± 30

SF-1/184/110/U160x220

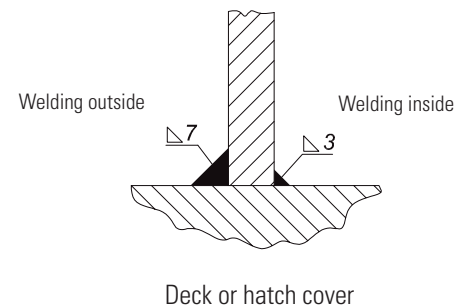


Sliding range ± 50

SF-1/224/110/U160x260



Welding recommendation



Specification

- Min. breaking loads tension 500kN / shear 420 kN
- Approval from any classification society
- Standard height 110 mm
- Topplate with punchmarks for easy installation
- Standard distances for double foundations 203/216/258 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Special sliding range on request
- Other options and variations please compare with raised foundations
- As a standard we offer elongated foundations with hardened topplates (min. 235 HB) in order to reduce wear down

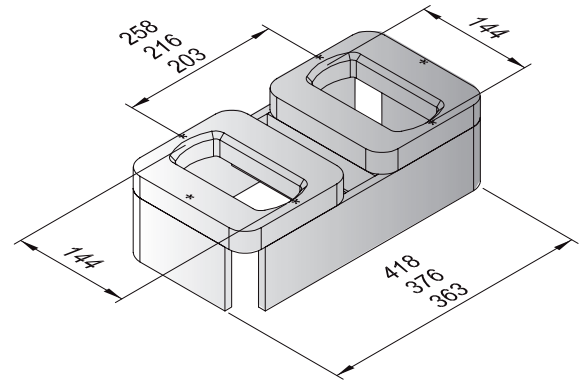
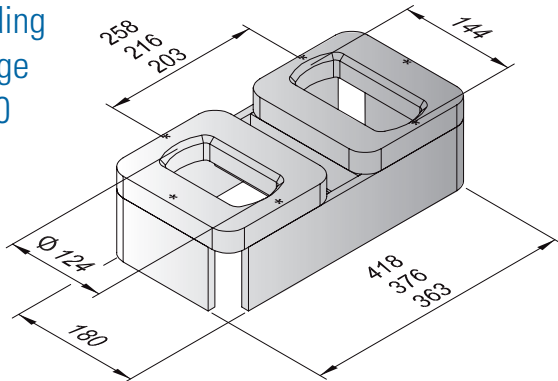
Elongated foundations

Double foundations with combined box structure

<i>SF-2/</i>	203	<i>/124-144/110/U</i>	363	x180
	216		376	
	258		418	

<i>SF-2/</i>	203	<i>/144-144/110/U</i>	363	x180
	216		376	
	258		418	

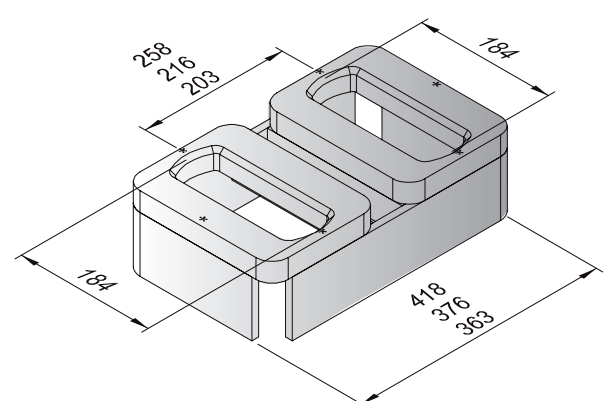
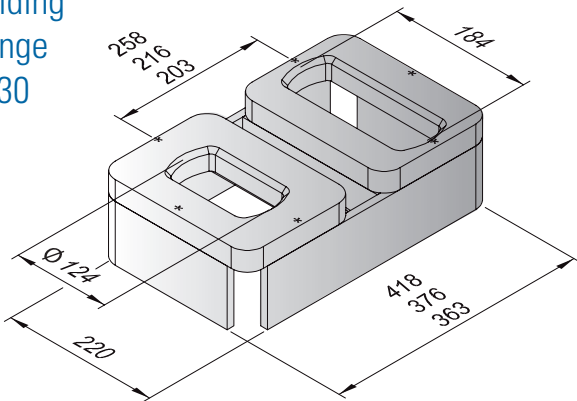
Sliding range
± 10



<i>SF-2/</i>	203	<i>/124-184/110/U</i>	363	x220
	216		376	
	258		418	

<i>SF-2/</i>	203	<i>/184-184/110/U</i>	363	x220
	216		376	
	258		418	

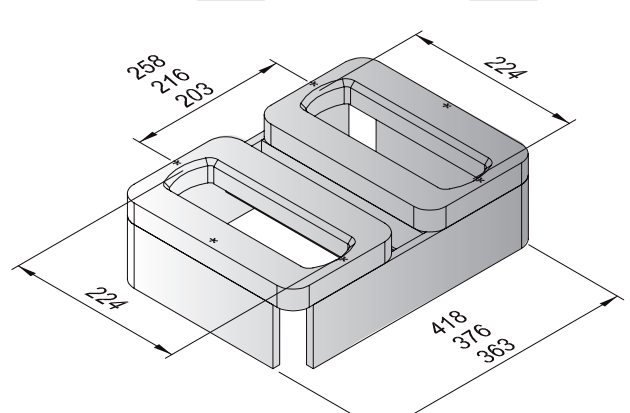
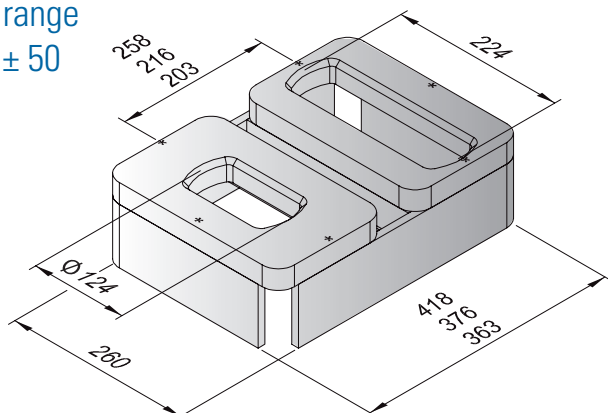
Sliding range
± 30



<i>SF-2/</i>	203	<i>/124-224/110/U</i>	363	x260
	216		376	
	258		418	

<i>SF-2/</i>	203	<i>/224-224/110/U</i>	363	x260
	216		376	
	258		418	

Sliding range
± 50

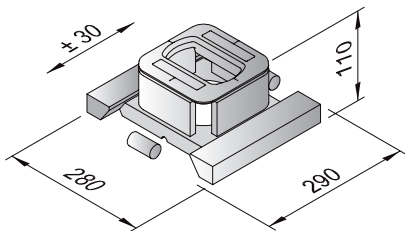


Sliding foundations

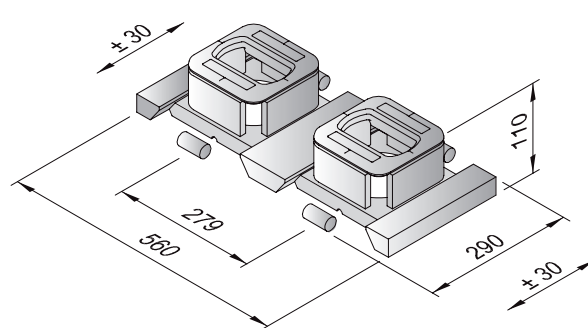
Transversal sliding

Range ± 30

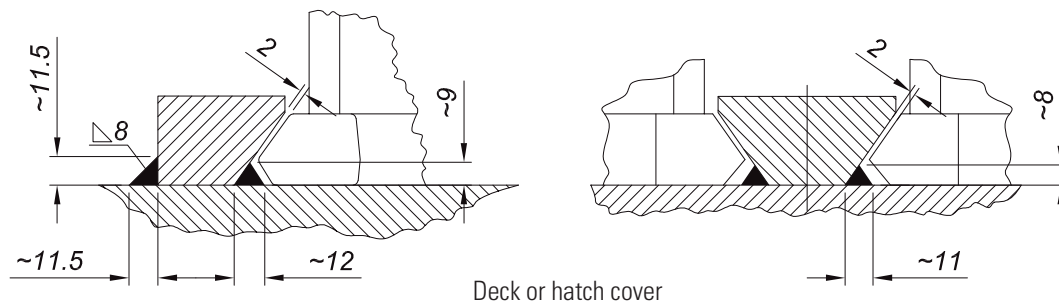
SF-1Q/110



SF-3Q/110



Welding recommendation



Deck or hatch cover

Specification

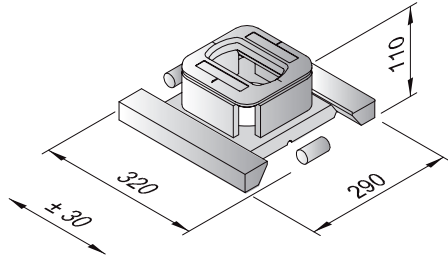
- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Standard height 110 mm
- Topplate with punchmarks for easy installation
- Standard distances for double foundations 203/216/258 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Standard sliding range ± 30 mm

Sliding foundations

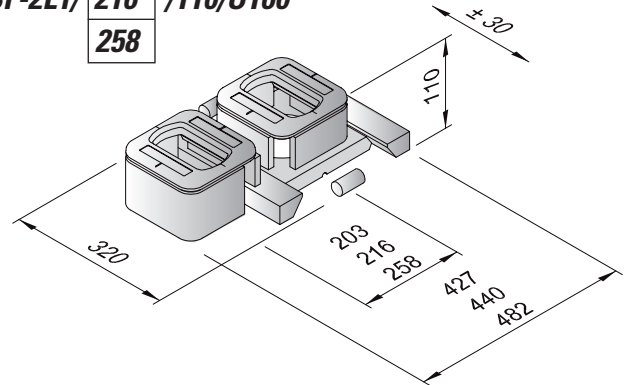
Longitudinal sliding

Range ± 30

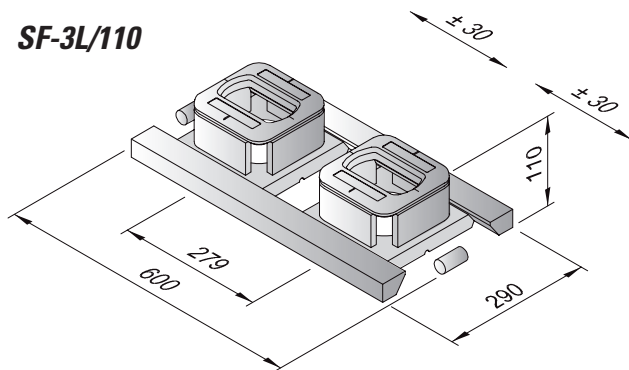
SF-1L/110



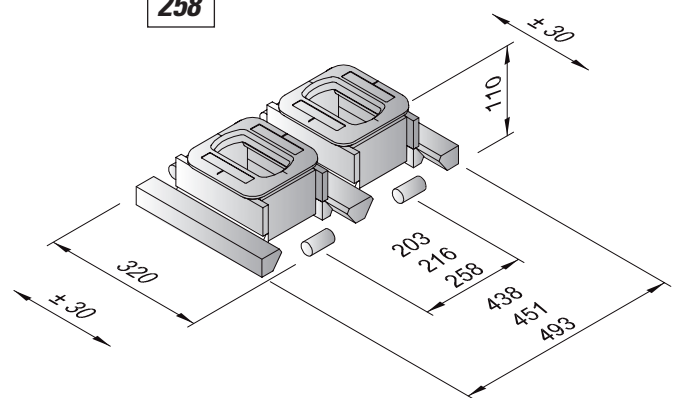
SF-2L/
203
216 /110/U160
258



SF-3L/110



SF-2L/
203
216 /110
258

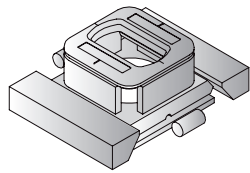


Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Standard height 110 mm
- Topplate with punchmarks for easy installation
- Standard distances for double foundations 203/216/258 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Standard sliding range ± 30 mm

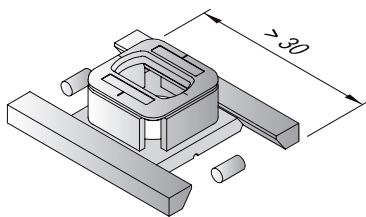
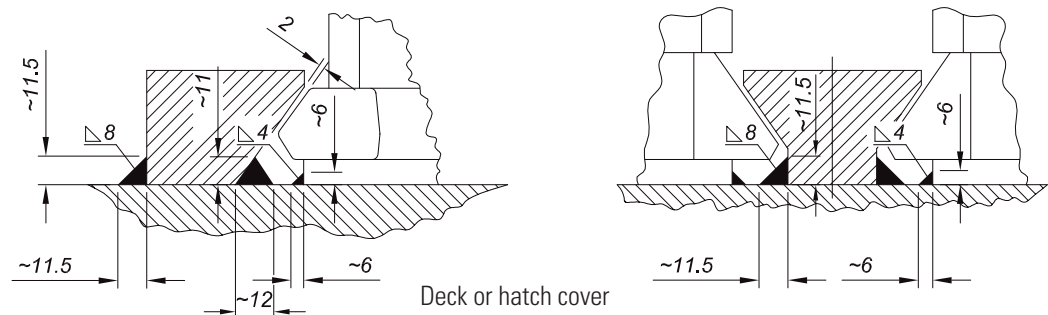
Sliding foundations

Options and variations for sliding foundations

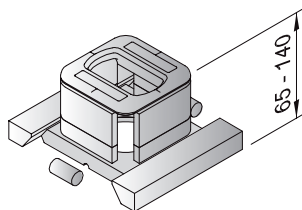


- Sliding foundations with wear plate.

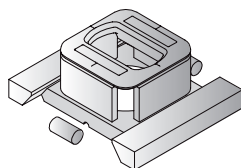
Welding recommendation



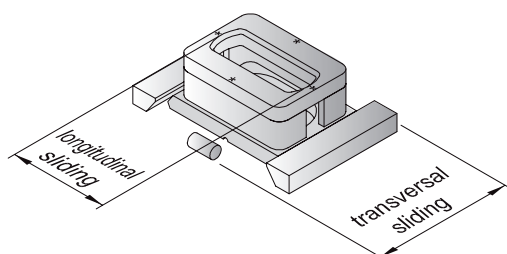
- Sliding foundations with special sliding range.



- Sliding foundations with separate wedge plate for height adjustment on board.

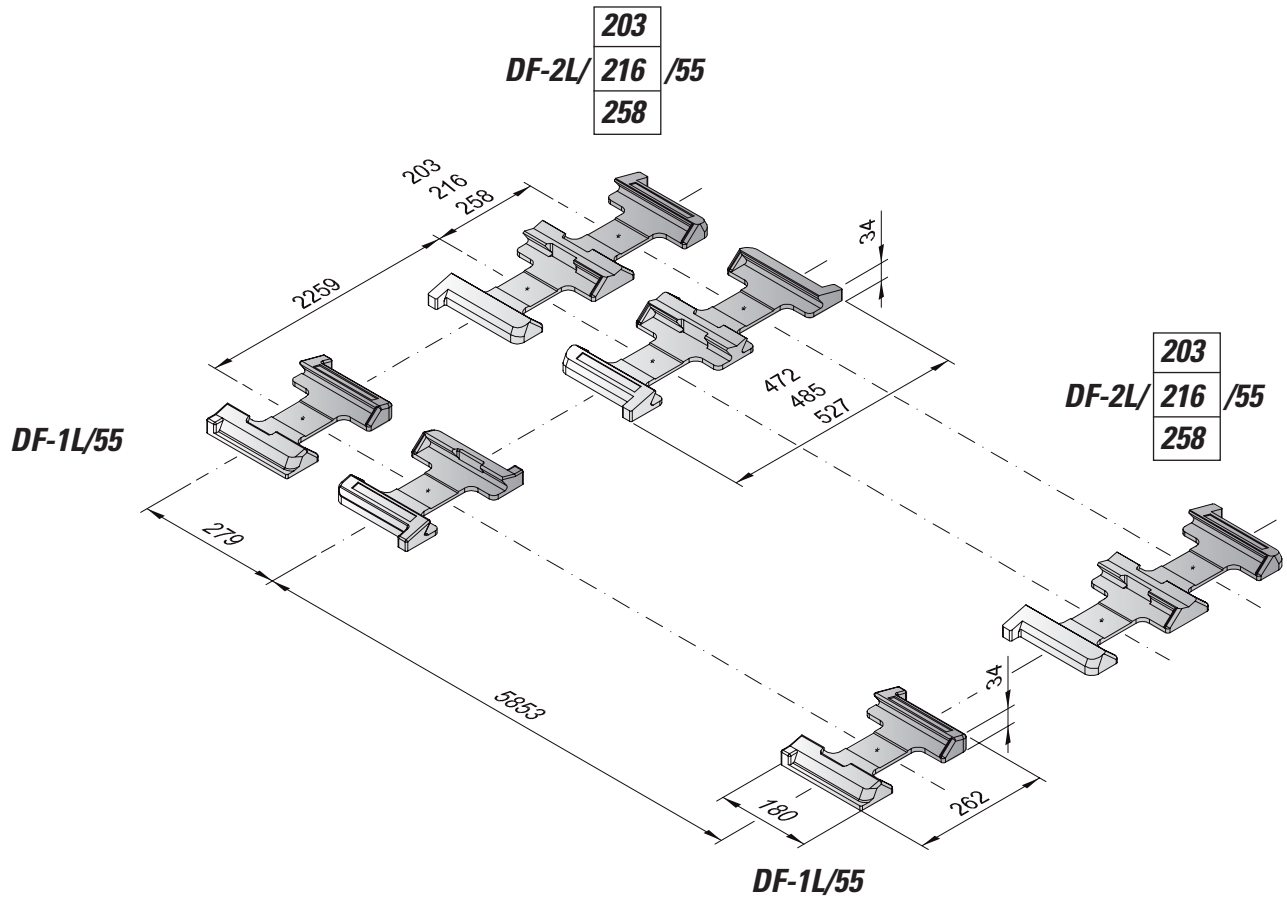


- Loose part of sliding foundation hot dip galvanized.

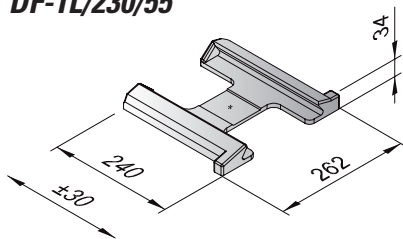


- Transversal sliding foundation combined with elongated ISO-hole for transversal and longitudinal shifting.

Dovetail foundations

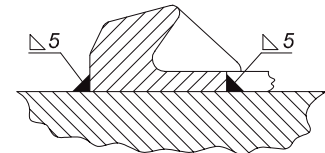


DF-1L/230/55



for sliding purpose

Welding recommendation



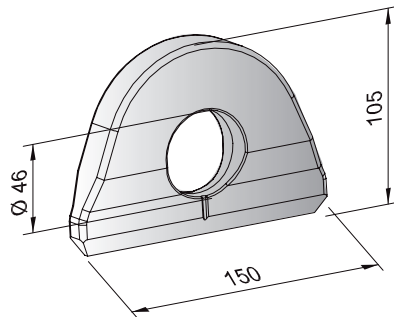
Deck or hatch cover

Specification

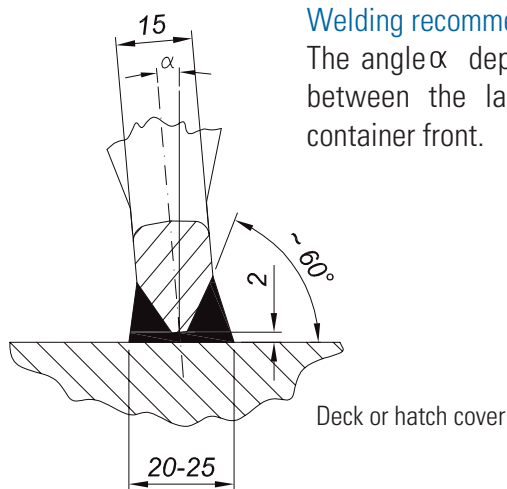
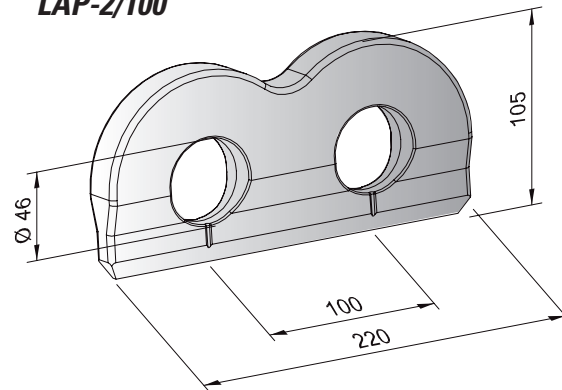
- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Standard distances for double foundations 203/216/258 mm
- Guiding angle 55°
- Thickness of bottom plate 8 mm
- Made of casted steel
- Weldable inorganic zinc or epoxy shop primer
- Centre marking for easy installation

Lashing plates

LAP-1

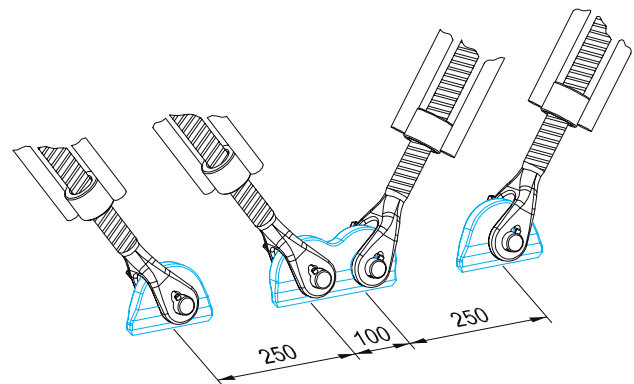


LAP-2/100



Welding recommendation

The angle α depends on the distance between the lashing plate and the container front.

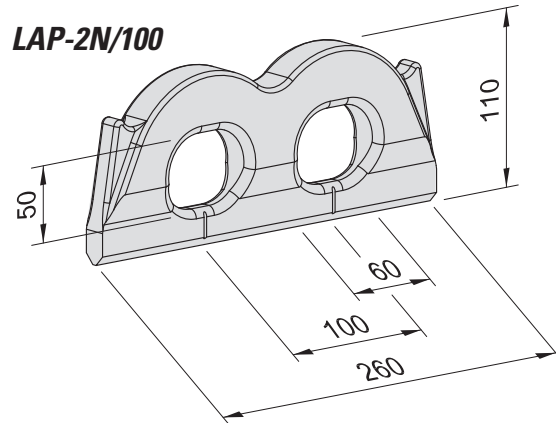
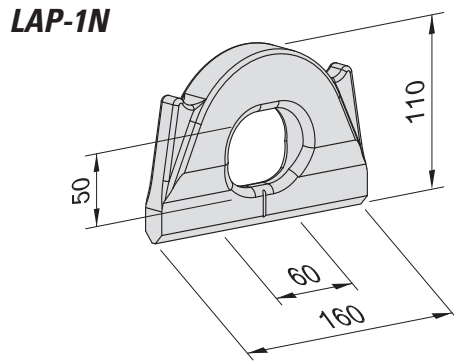


Typical arrangement of lashing plates for double cross lashing systems

Specification

- Min. breaking load 500 kN
- Approval from any classification society
- Welding chamfer
- Drop forged execution
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Smoothed edges all around
- Centre marking for easy installation

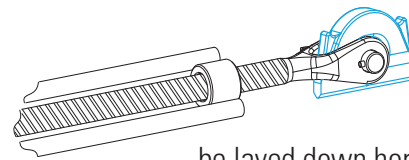
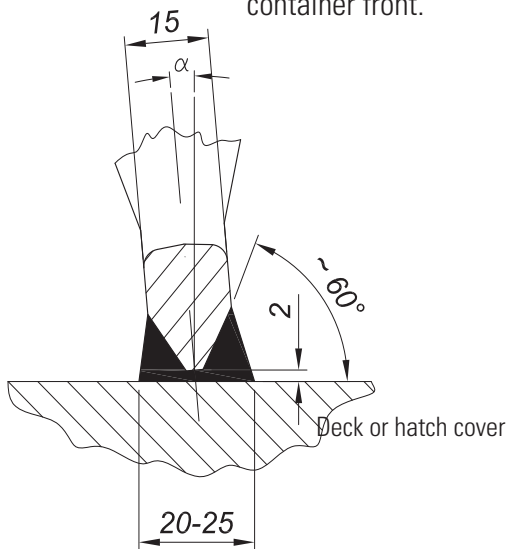
Horn type lashing plates



Welding recommendation

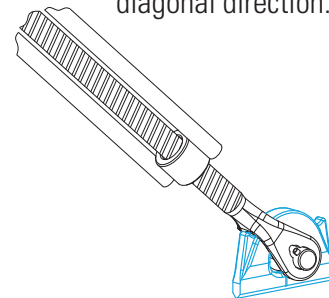
The angle α depends on the distance between the lashing plate and the container front.

Because of special horn design and oval hole the turnbuckle can either:



- be layed down horizontally
or:

- parked upright in
diagonal direction.

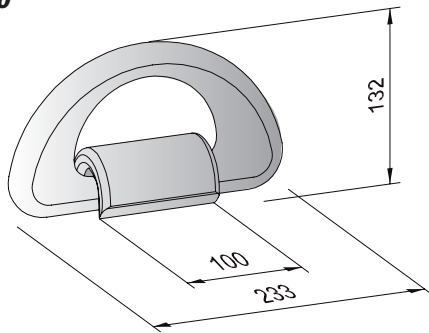


Specification

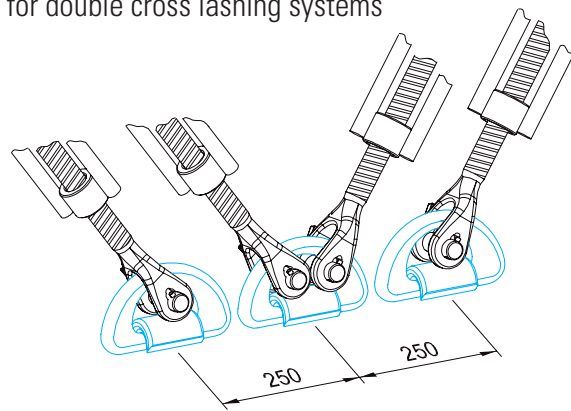
- Min. breaking load 500 kN
- Approval from any classification society
- Welding chamfer
- Drop forged execution
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Smoothed edges all around
- Centre marking for easy installation

D-rings

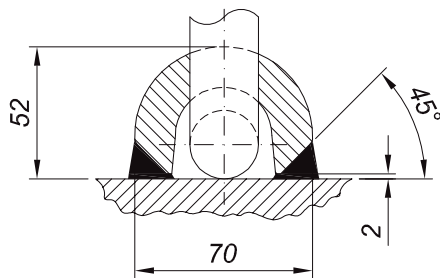
DR-50



Typical arrangement of D-rings for double cross lashing systems



Welding recommendation



Deck or hatch cover

Specification

- Min. breaking load 500 kN
- Approval from any classification society
- Welding chamfer
- Drop forged D-ring and welding bow
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer

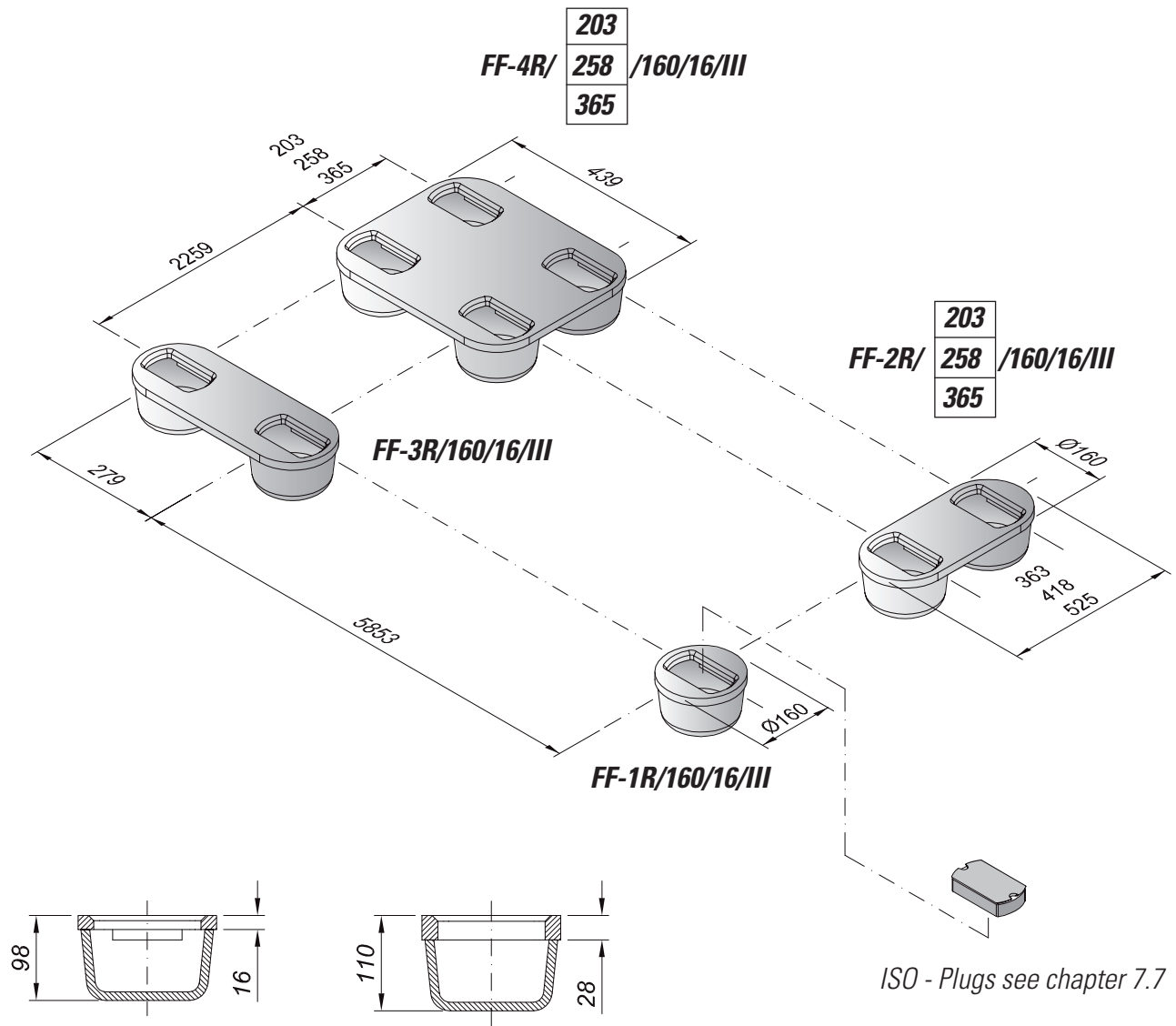
Container part

4

FIXED FITTINGS IN HOLDS

4.1 - 4.4	Flush type twistlock pockets
4.5	Welding plates
4.6	Welding cones
4.7 - 4.8	Guide fittings
4.9 - 4.11	Counter bearings

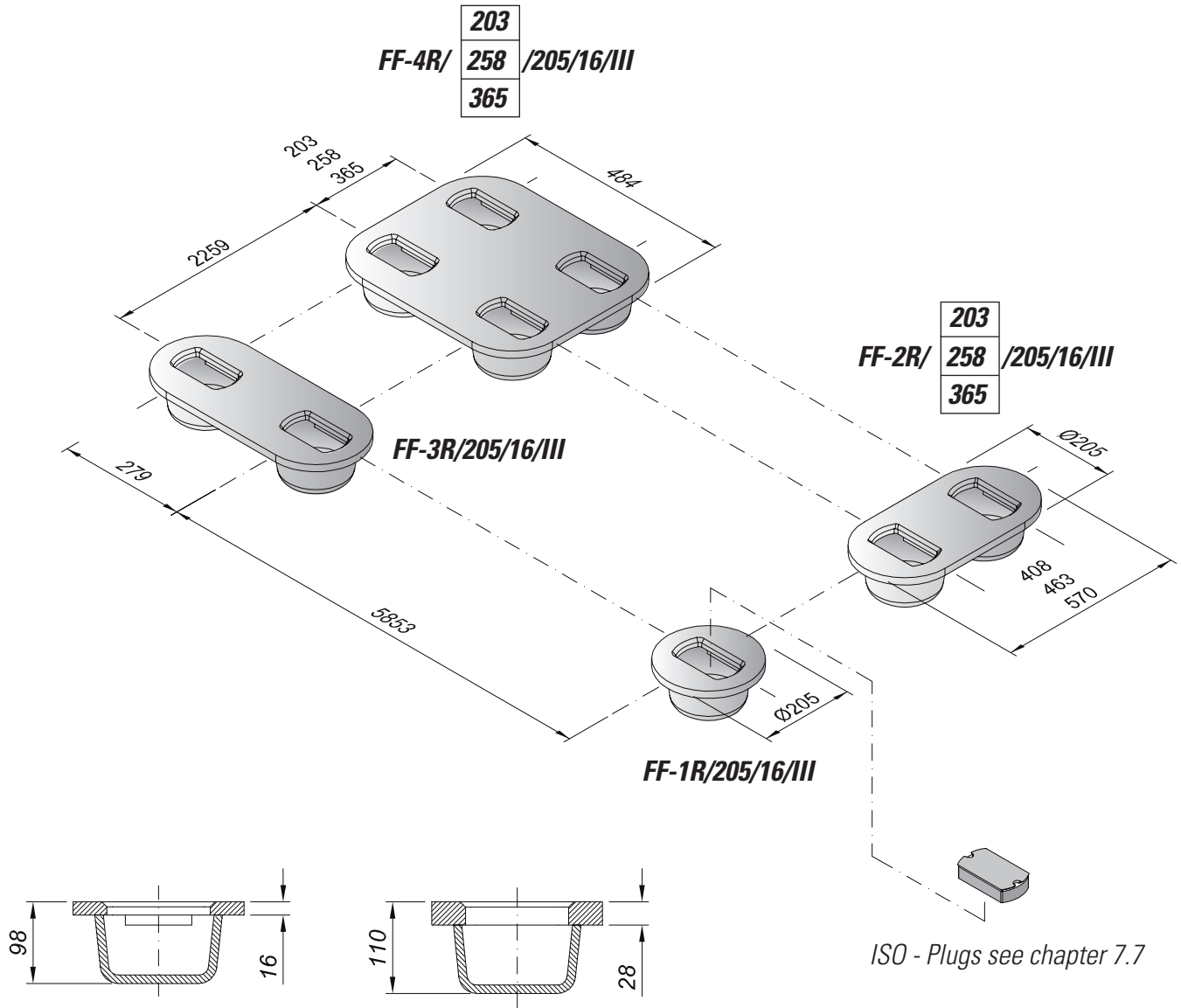
Flush type twistlock pockets



Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society (except Germanischer Lloyd)
- Standard thickness of topplates 16 or 28 mm depending on thickness of tanktop
- Standard diameter of topplates 160 mm (single type)
- All kinds of chamfer preparation
- Tightness tested
- Standard distances 203/365/258 mm (other distances upon request)
- Thickness of pots 10 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel

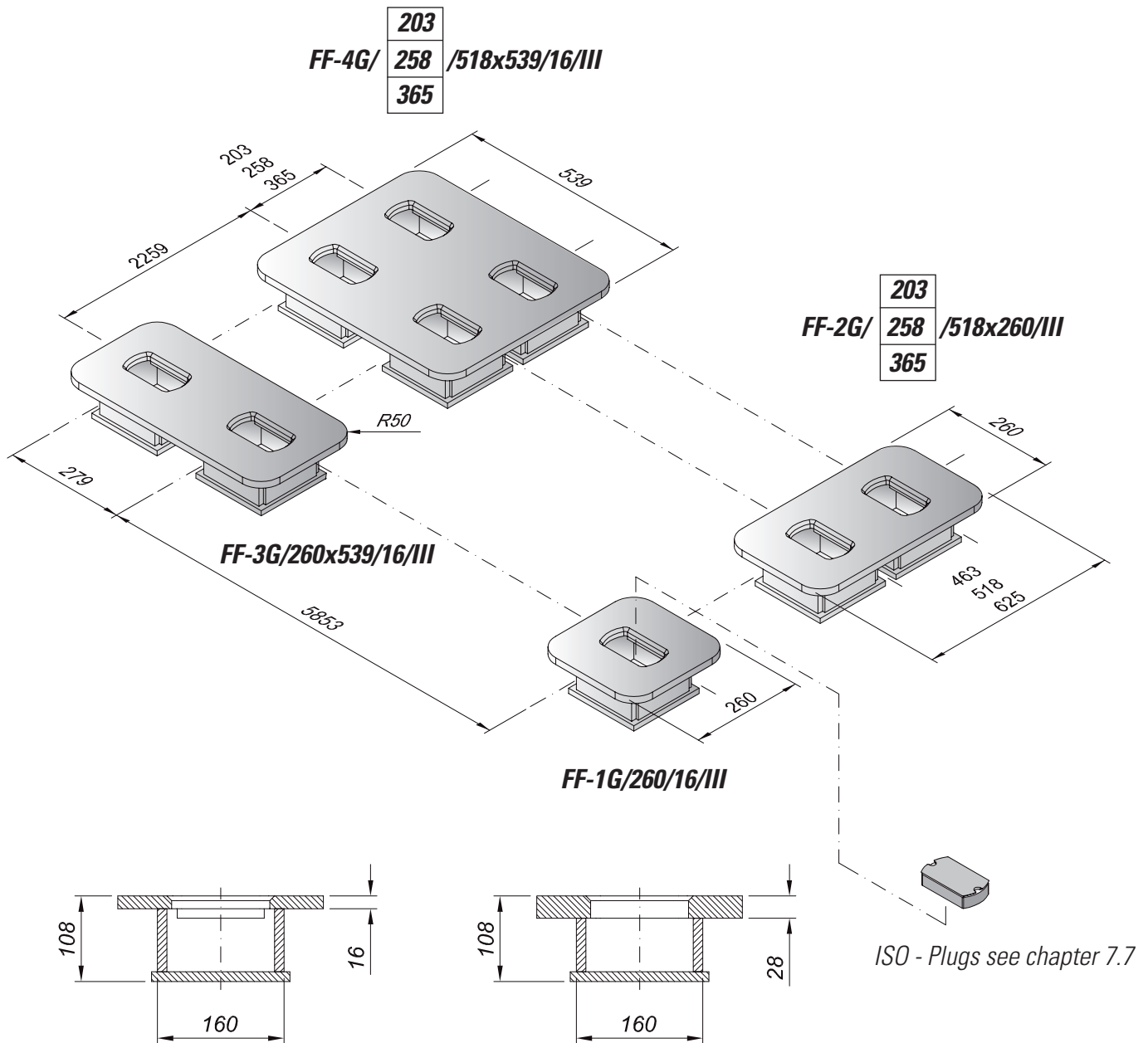
Flush type twistlock pockets



Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Standard thickness of topplates 16 or 28 mm depending on thickness of tanktop
- Standard diameter of topplates 205 mm (single type)
- All kinds of chamfer preparation
- Tightness tested
- Standard distances 203/365/258 mm (other distances upon request)
- Thickness of pots 10 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel

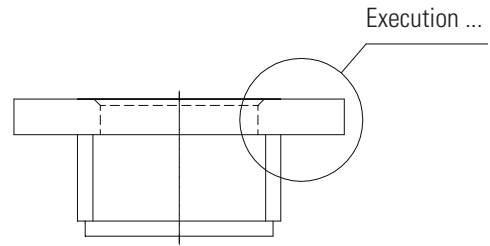
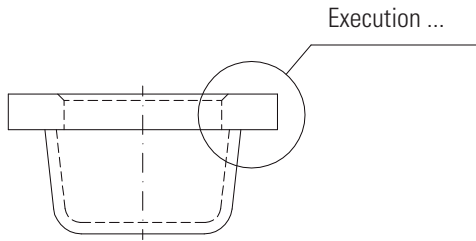
Flush type twistlock pockets



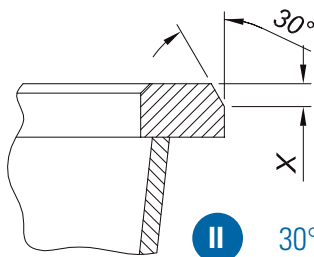
Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Standard thickness of topplates 16 or 28 mm depending on thickness of tanktop
- All kinds of chamfer preparation
- Tightness tested
- Standard distances 203/365/258 mm (other distances upon request)
- Thickness of pots 12 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel

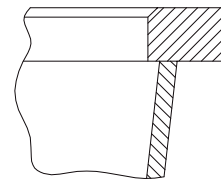
Flush type twistlock pockets



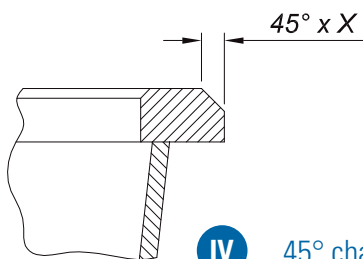
Chamfer type



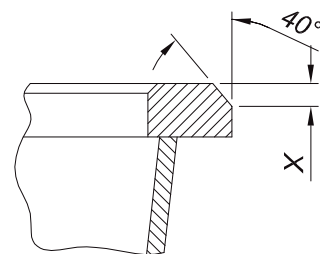
II 30° chamfer from above



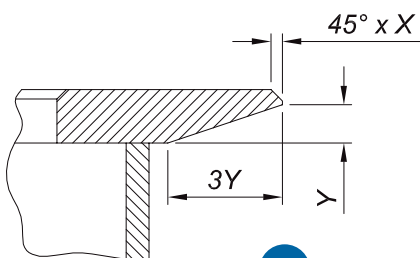
III without chamfer



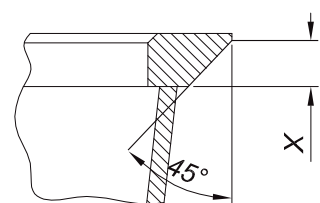
IV 45° chamfer from above



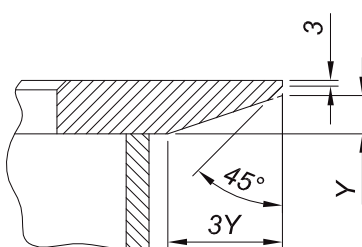
VII 40° chamfer from above



VI 45° chamfer from above and smooth transition of thickness



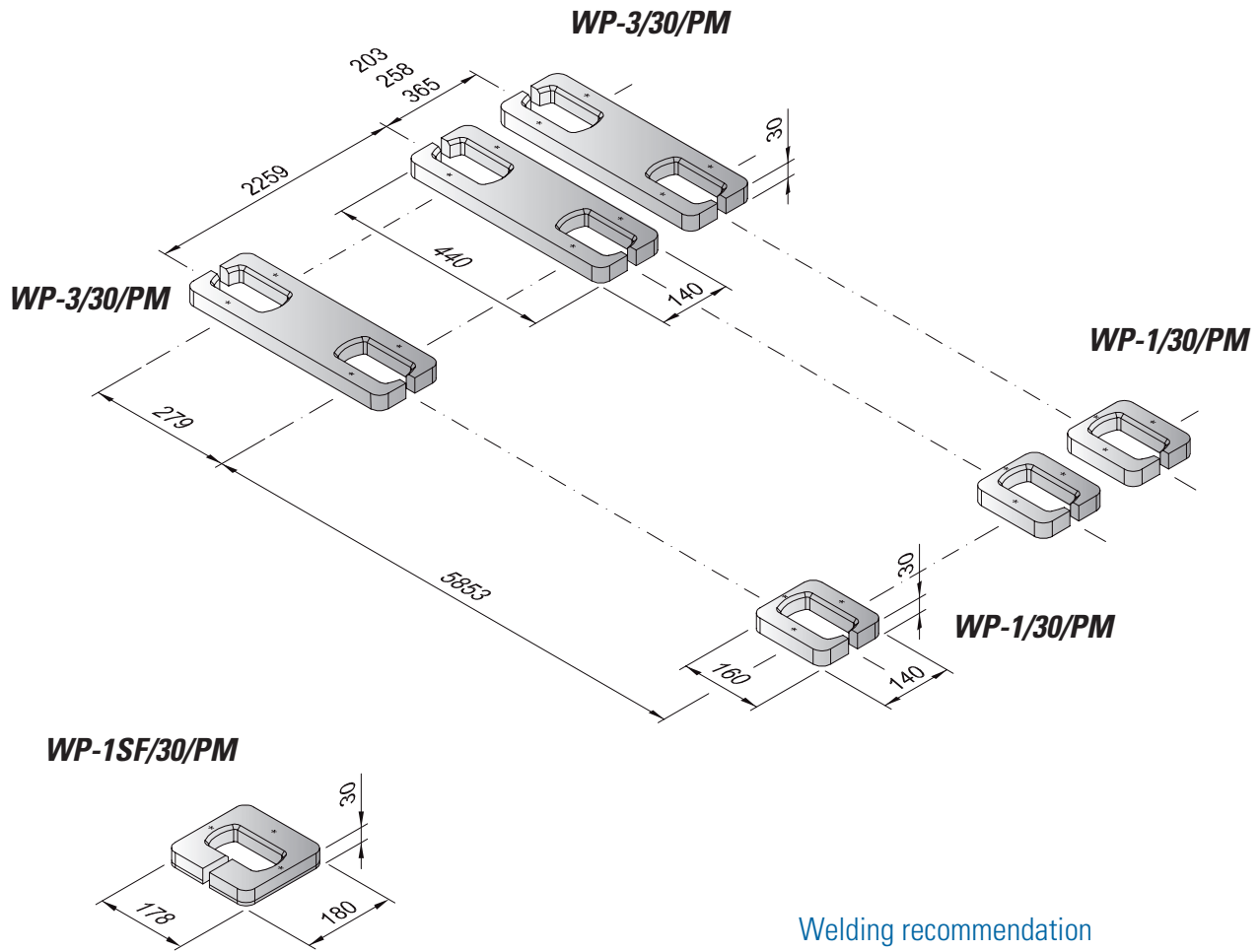
VIII 45° chamfer from below



IX 45° chamfer from below and smooth transition of thickness

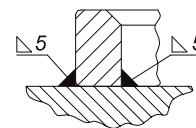
'X' and 'Y' to be specified by yard

Welding plates



For transmission of high lateral forces, preferably on tank steps!

Welding recommendation

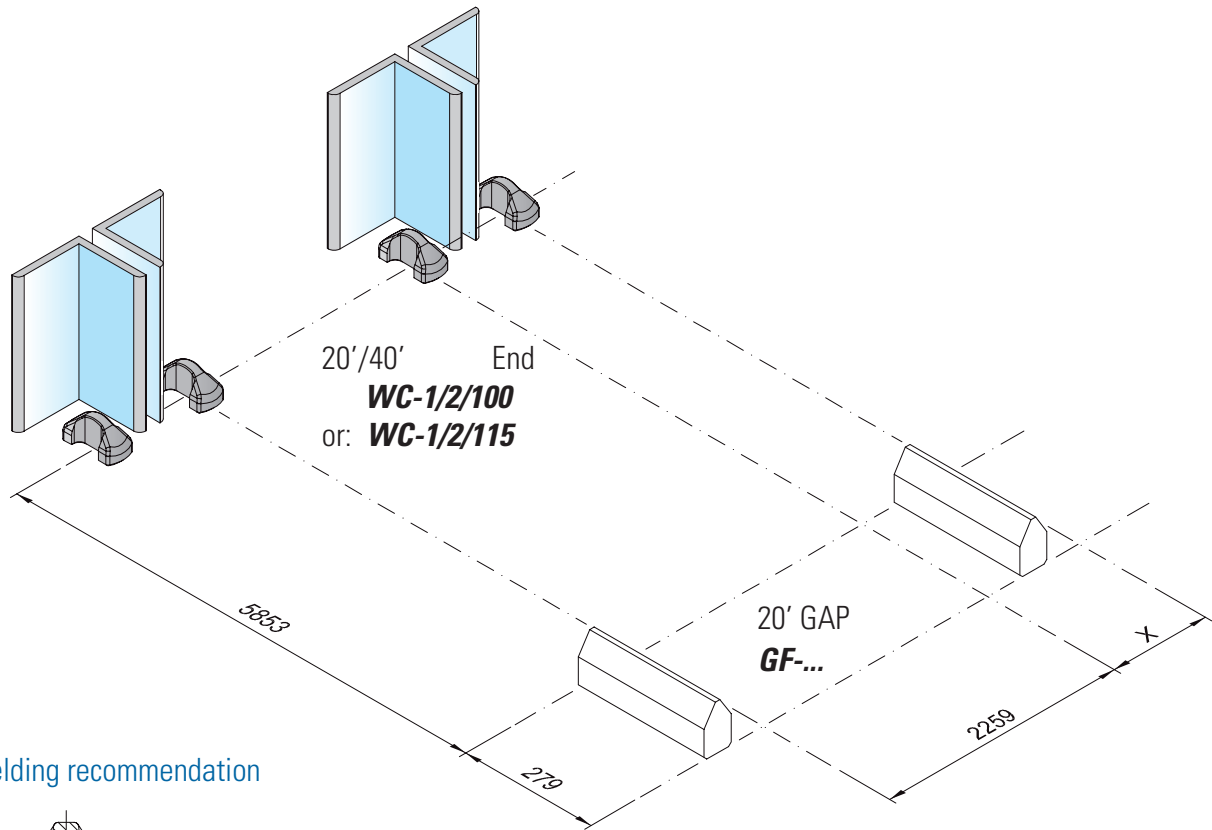


Double bottom or tank step

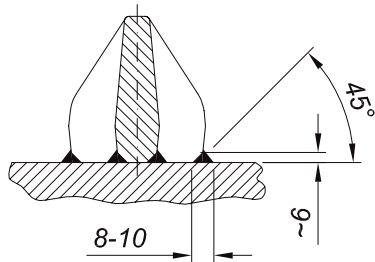
Specification

- Min. breaking load shear 420 kN
- Approval from any classification society
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Punchmarks for easy installation

Welding cones

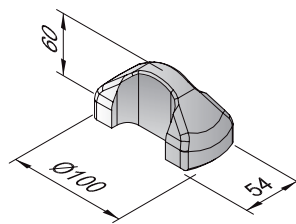


Welding recommendation

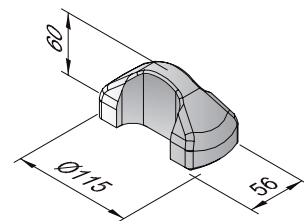


Double bottom or tank step

WC-1/2/100



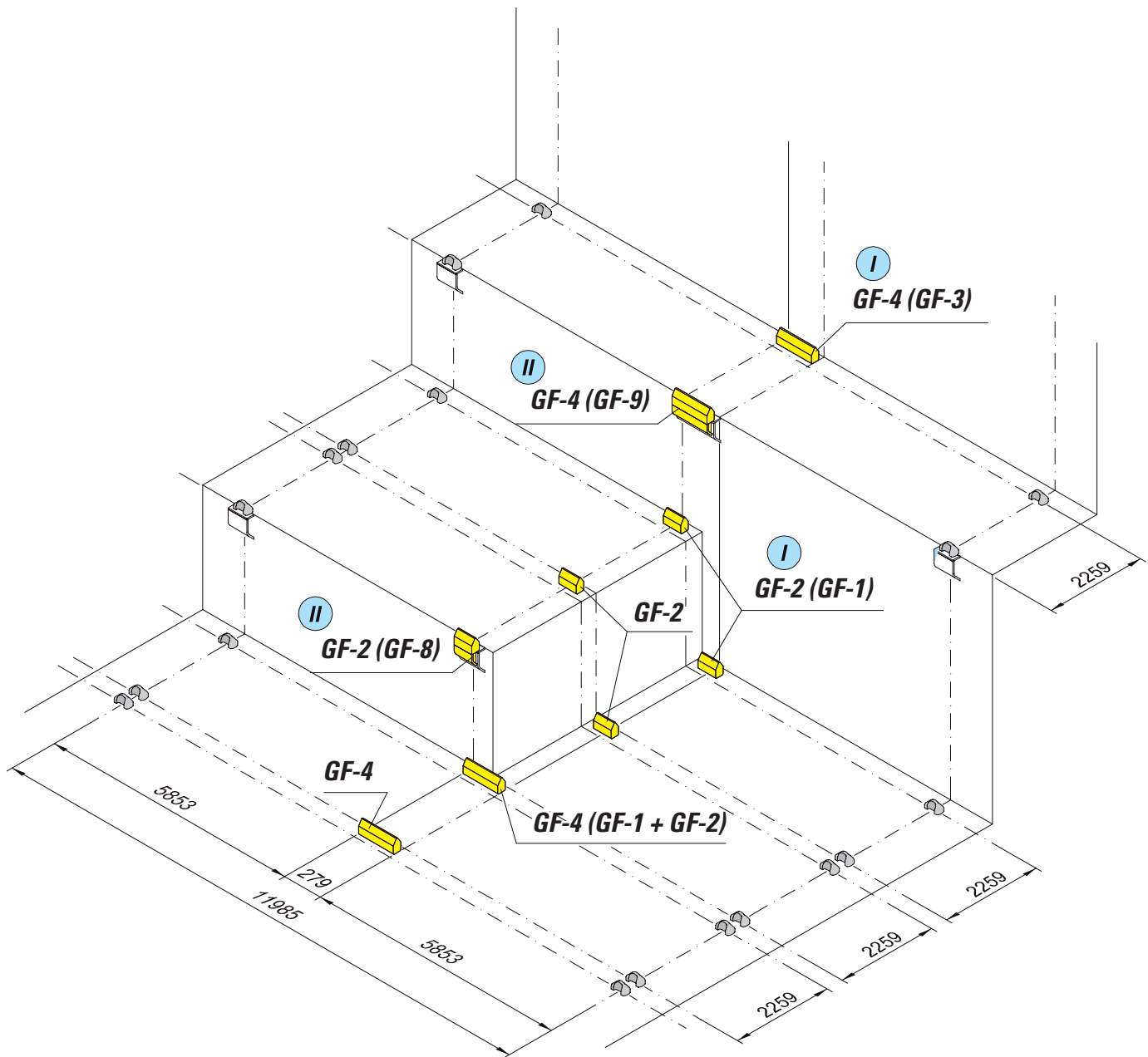
WC-1/2/115



Specification

- Min. breaking load shear 420 kN
- Approval from any classification society
- Drop forged or cast steel execution
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Welding chamfer all around
- Centre marking for easy installation

Guide fittings



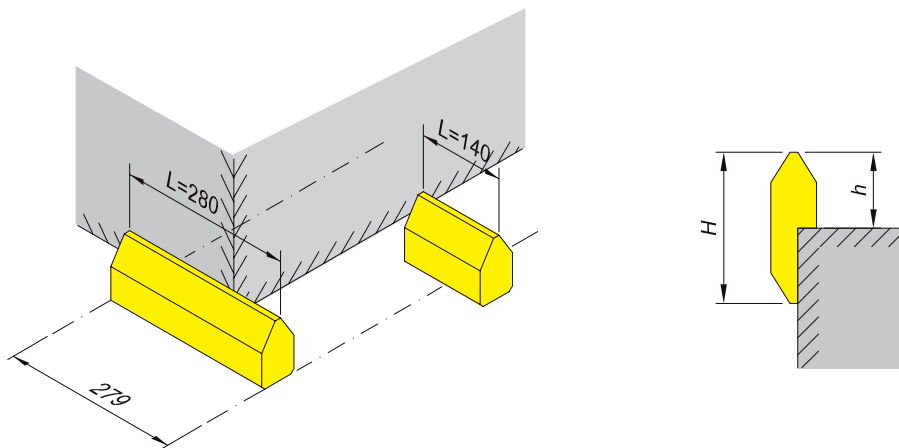
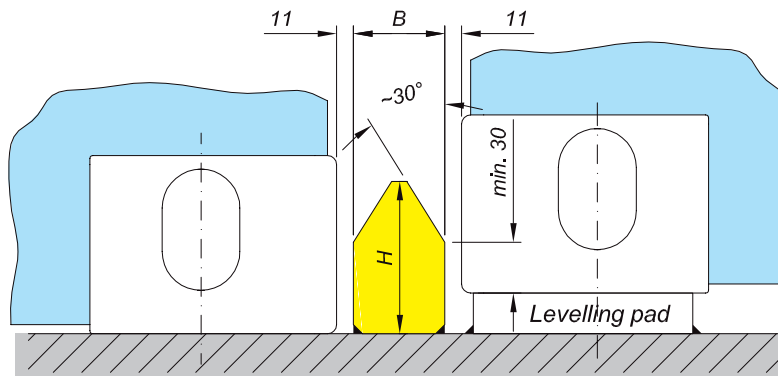
Specification

- Min. breaking load shear 420 kN
- Approval from any classification society
- Made of high tensile steel
- Welding chamfer so that welding does not collide with corner casting
- Designed individually for the specified gap between containers
- Special solutions for tank steps
- Weldable inorganic zinc or epoxy shop primer

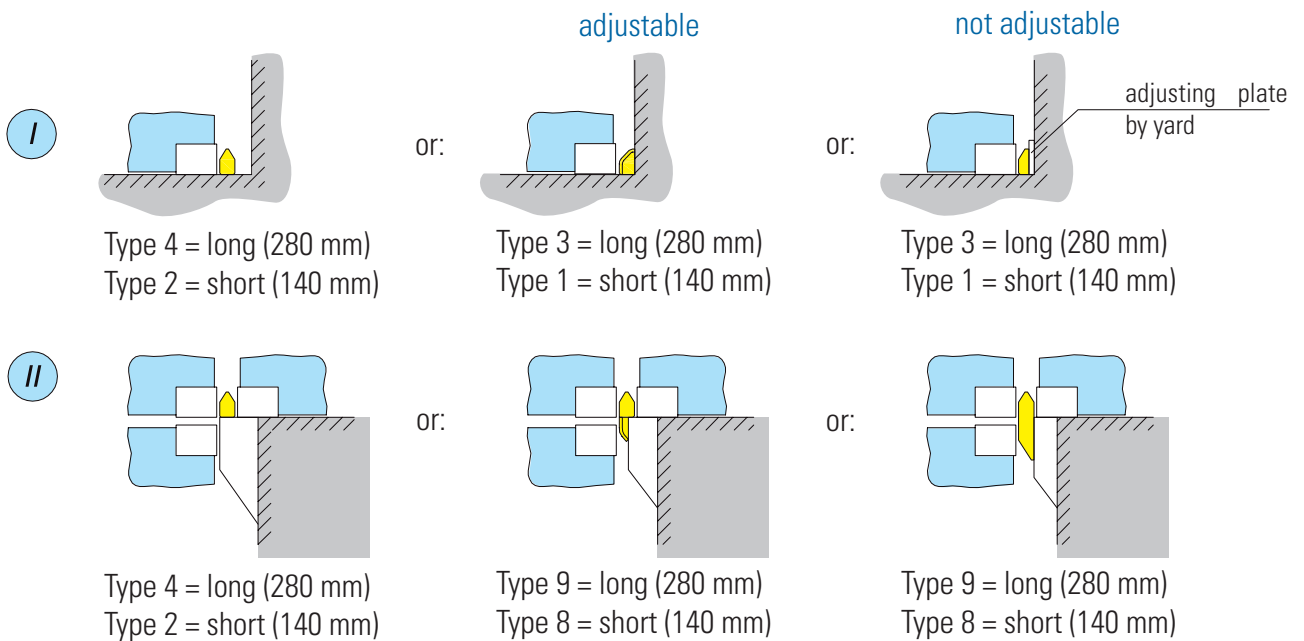
Guide fittings

Types of guide fittings:

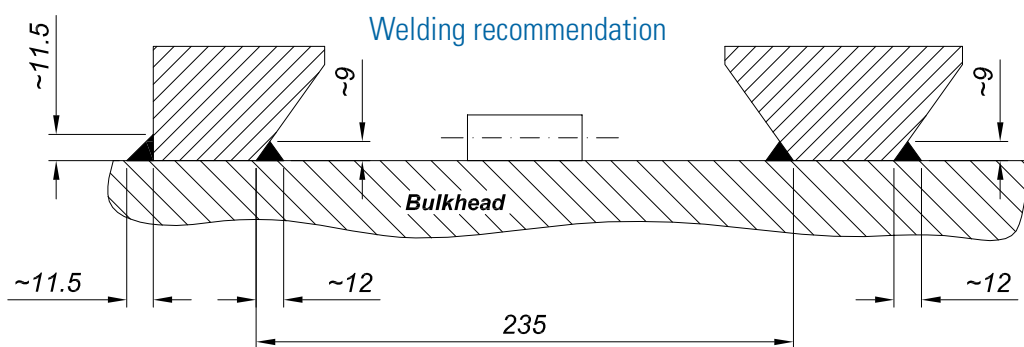
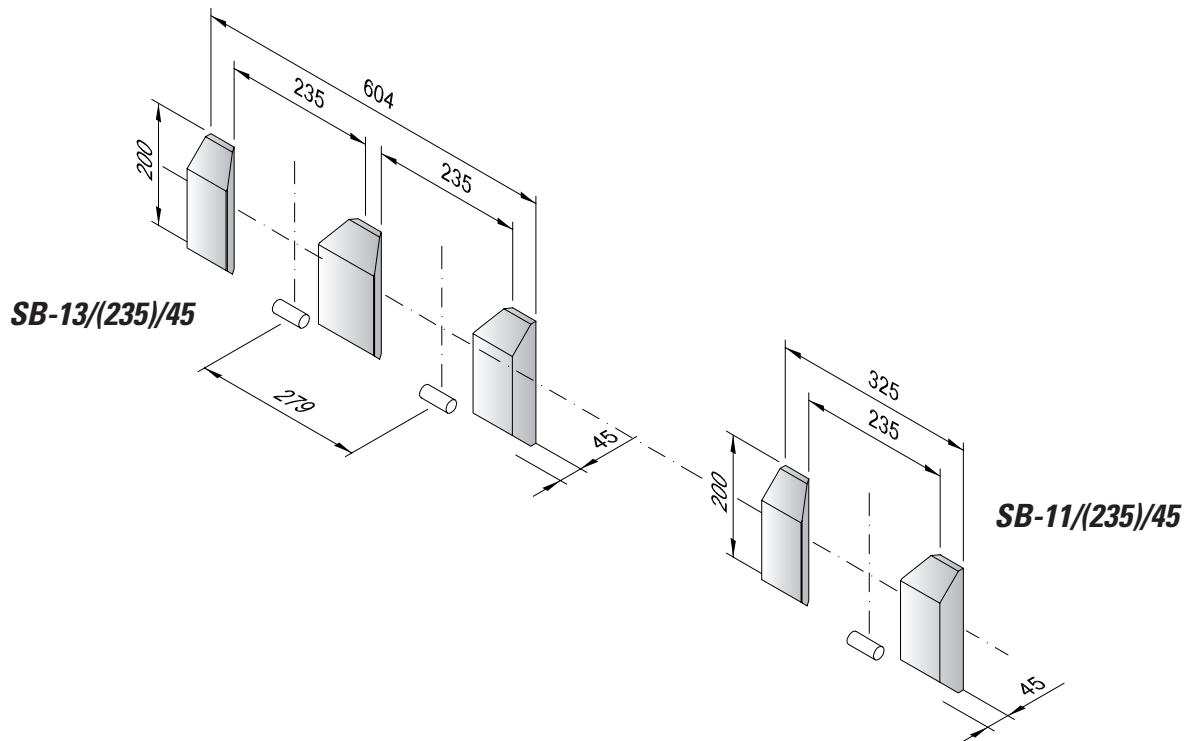
select the TYPE No.:							
GF-	1	2	3	4	8	9	/ L x B x H (h)



Examples for arrangement of guide fittings:



Counter bearings

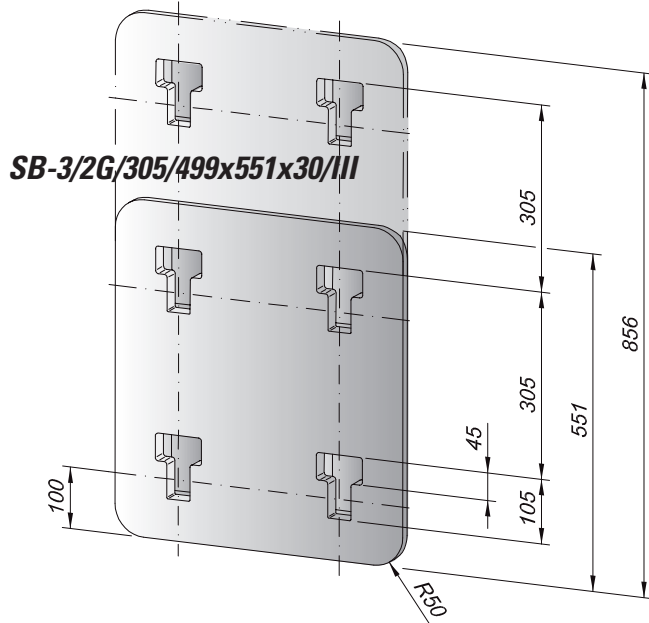


Specification

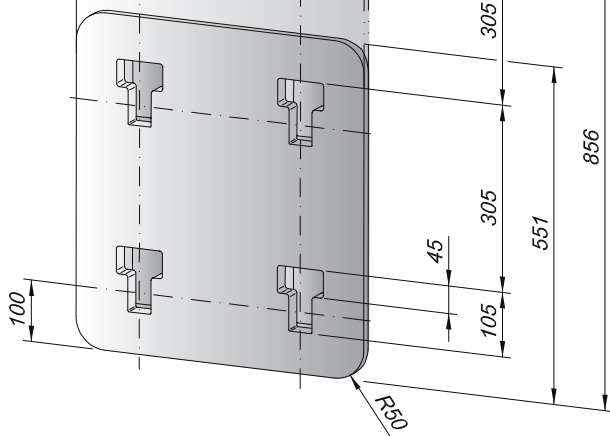
- Min. breaking load tension/compression 850 kN
- Approval from any classification society
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Installation and testing gauge on request
- For high cube container loading several of these counter bearings can be installed on top of each other

Counter bearings

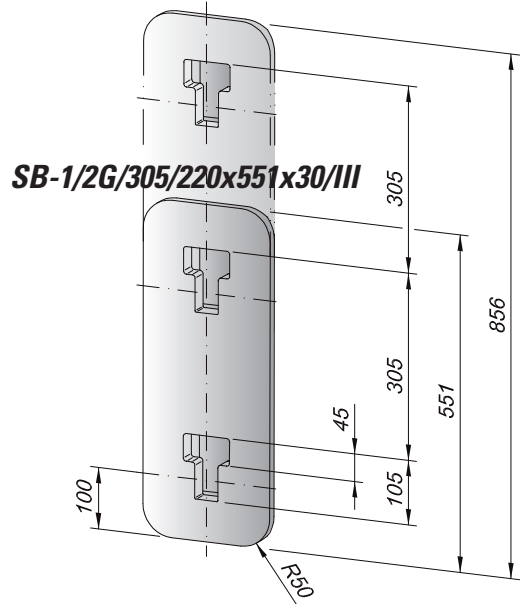
SB-3/3G/305/499x856x30/III



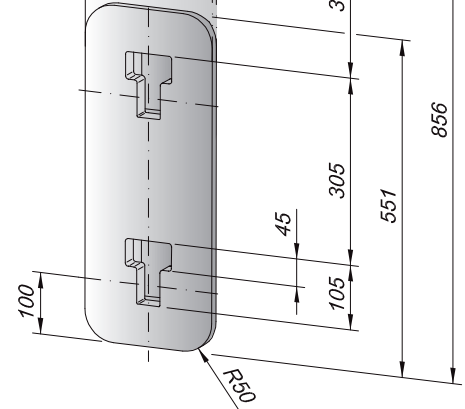
SB-3/2G/305/499x551x30/III



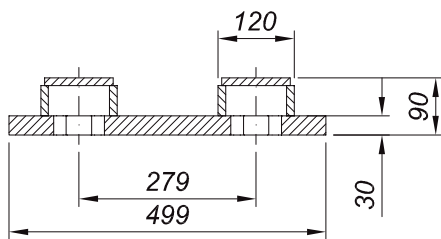
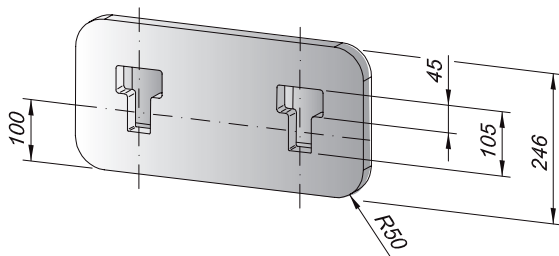
SB-1/3G/305/220x856x30/III



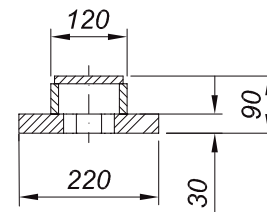
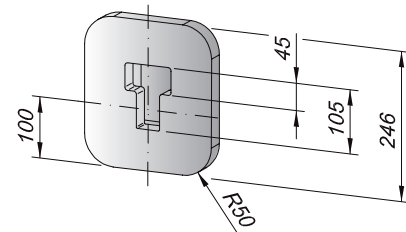
SB-1/2G/305/220x551x30/III



SB-3/G/499x246x30/III



SB-1/G/220x246x30/III

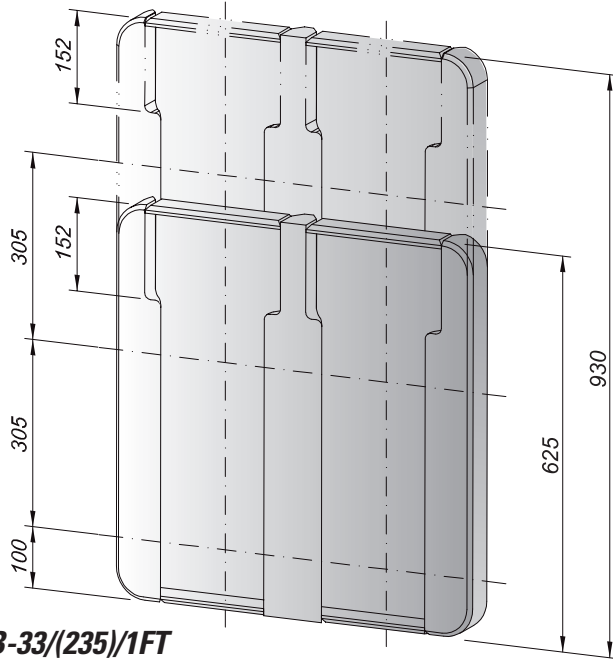


Specification

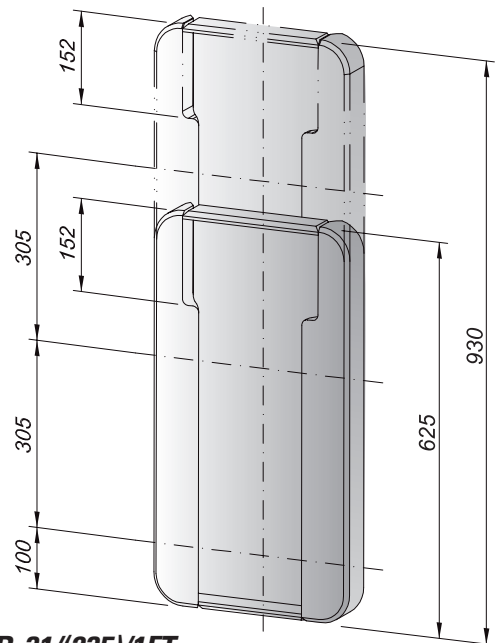
- Min. breaking load tension/compression 850 kN
- Approval from any classification society
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Tightness tested
- All kinds of chamfer preparation on request, please compare to chapter 4.4
- Bevelling of topplate (relation 1 to 3) for smooth integration into bulkhead as requested by most classification societies can be offered on request

Counter bearings

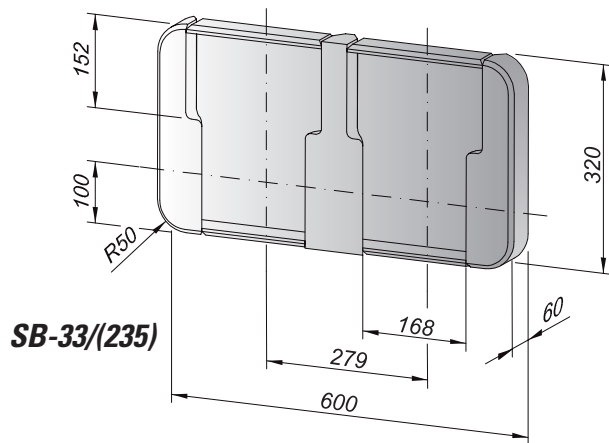
SB-33/(235)/2FT



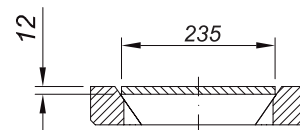
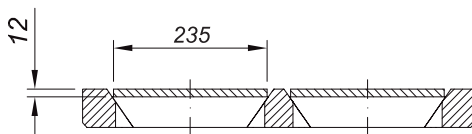
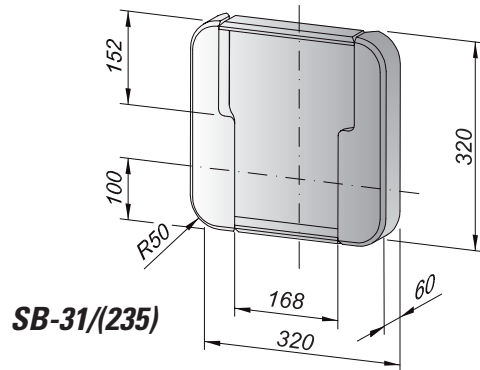
SB-31/(235)/2FT



SB-33/(235)/1FT



SB-31/(235)/1FT



Specification

- Min. breaking load tension/compression 1240 kN
- Approval from any classification society
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Tightness tested
- All kinds of chamfer preparation on request, please compare to chapter 4.4

Container part

5

LOOSE FITTINGS ON DECK

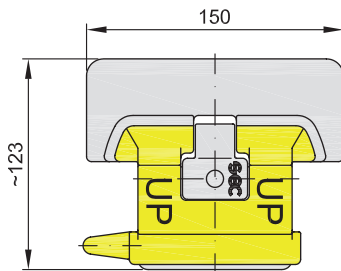
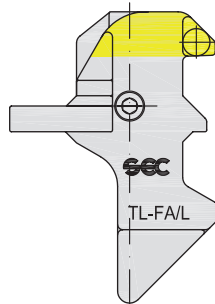
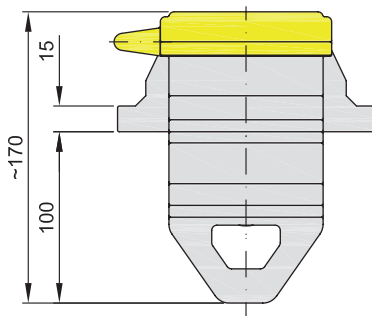
5.1 - 5.3	Fully-automatic twistlocks
5.4 - 5.5	Semi-automatic twistlocks
5.6 – 5.7	Conventional twistlocks
5.8	Midlocks
5.9	Automatic bottom locks
5.10	Dovetail twistlocks for point load
5.11	Dovetail twistlocks for line load
5.12 - 5.13	Turnbuckles (+ spanner)
5.14 - 5.15	Lashing bars (+ extension rods)
5.16 - 5.18	Operating rods
5.19	Bin racks
5.20	Storage bins
5.21	Bridge fittings (+ spanner)

Fully-automatic twistlocks

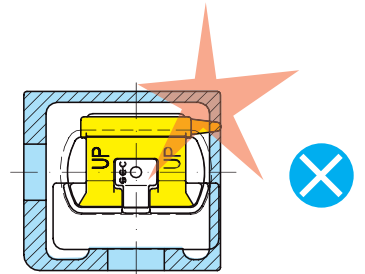
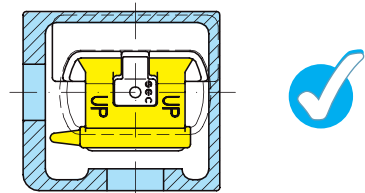
PATENTED



TL-FA/L
~ 5.7 kg



Function of pin



Patented

Wrong insert is not possible because the pin interferes with corner casting.

Specification

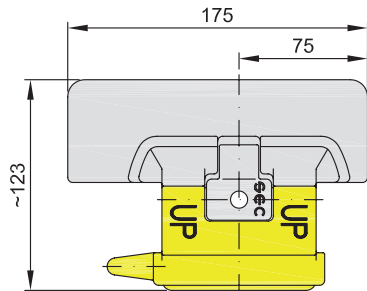
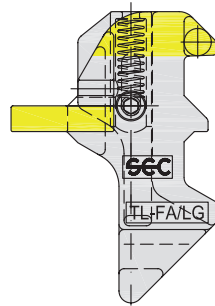
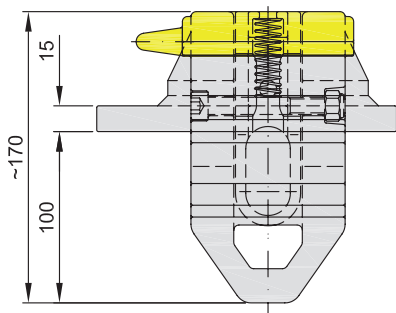
- Min. breaking loads tension 500 kN / shear 420 kN
- Approved by ABS, BV, DNV, GL and LRoS
- Fully automatic locking / unlocking function when loading and unloading
- No need to use operation rods for unlocking
- Safe locking against lifting forces during voyage
- Fully complies to OSHA regulations
- Large resting area according GL rules for highest pressure forces
- No restrictions for the application of different lashing systems
- Vertical clearance same as for semi-automatic twistlocks
- Hot dip galvanised with stainless steel components
- Upper cone marked yellow
- Suitable for lifting with twin spreader
- One piece housing made of high tensile cast steel
- Maintenance is not required
- Minimized thickness of flange but still it can be seen from deck level whether a FAT has been inserted between upper tiers or not

Fully-automatic twistlocks

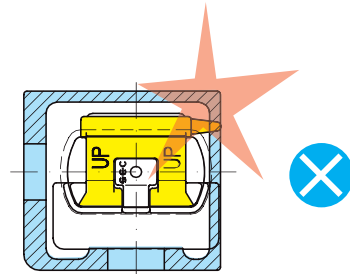
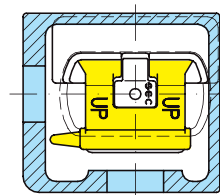
PATENTED



TL-FA/LG
~ 5.9 kg



Function of pin



Patented

Wrong insert is not possible because the pin interferes with corner casting.

Specification

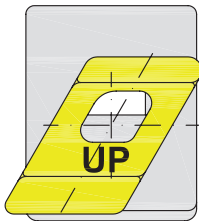
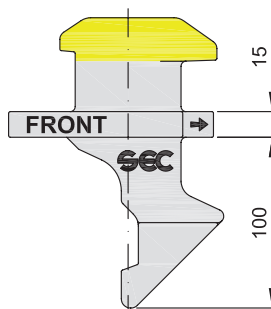
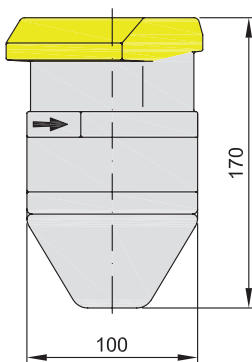
- Min. breaking loads tension 500 kN / shear 420 kN
- Approved by ABS, BV, DNV, GL and LRoS
- Fully automatic locking / unlocking function when loading and unloading
- No need to use operation rods for unlocking
- Safe locking against lifting forces during voyage
- Fully complies to OSHA regulations
- Large resting area according GL rules for highest pressure forces
- No restrictions for the application of different lashing systems
- Vertical clearance same as for semi-automatic twistlocks
- Hot dip galvanised with stainless steel components
- Upper cone marked yellow
- Suitable for lifting with twin spreader
- One piece housing made of high tensile cast steel
- Maintenance is not required
- Compared to TL-FA/L this FAT has an enlarged flange area which is flush with the front of the corner casting and with additional yellow colour marking so that it is easier to see if the FATs have been inserted in all four corners.

Fully-automatic twistlocks

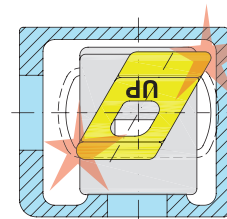
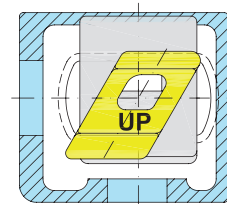
PATENTED



TL-FA/SL
~ 4.9 kg



Safety feature



Patented

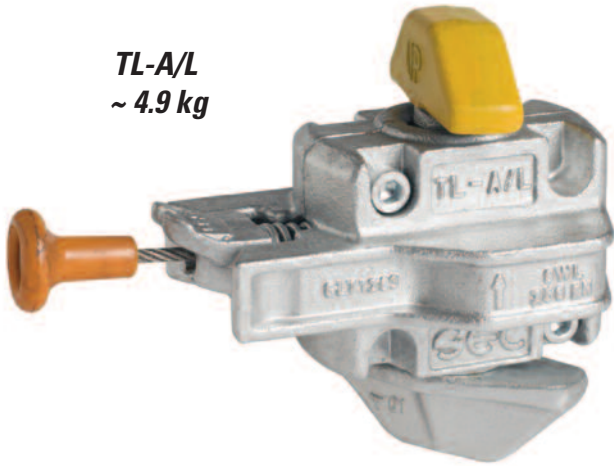
Wrong insert is not possible because the special shape of upper cone interferes with corner casting.

Specification

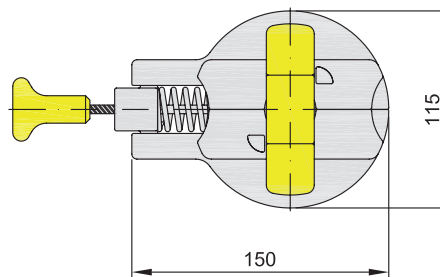
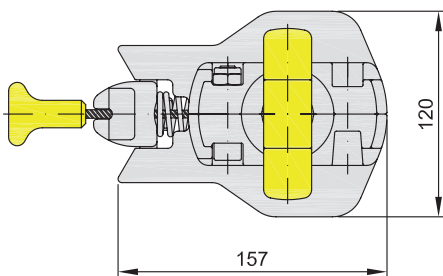
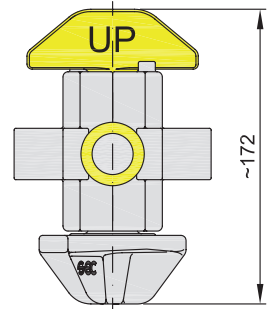
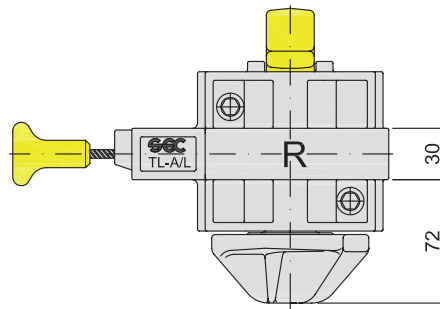
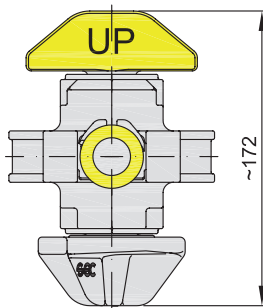
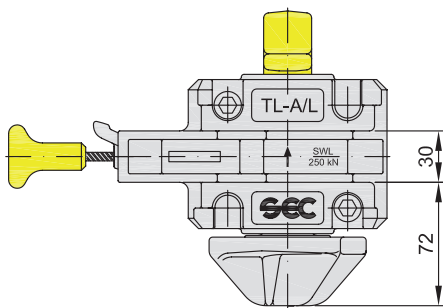
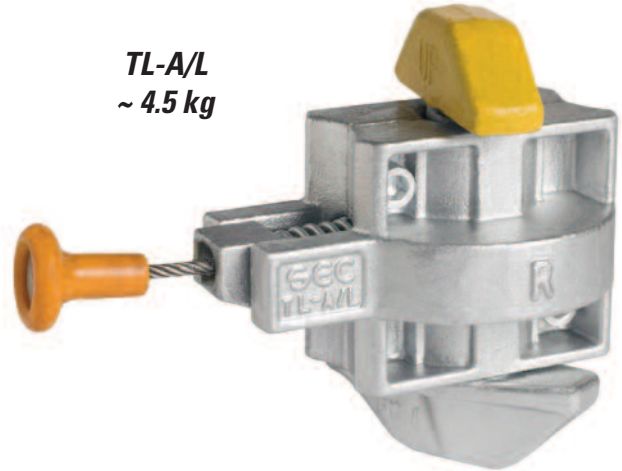
- Min. breaking loads tension 500 kN / shear 420 kN
- Approved by ABS, BV, DNV, GL and LRoS
- Fully automatic locking / unlocking function when loading and unloading
- No need to use operation rods for unlocking
- Safe locking against lifting forces during voyage
- Fully complies to OSHA regulations
- No restrictions for the application of different lashing systems
- Vertical clearance same as for semi-automatic twistlocks
- Hot dip galvanised
- Upper cone marked yellow
- Suitable for lifting with twin spreader
- One piece housing made of high tensile cast steel
- No moveable parts at all
- Maintenance is not required

Semi-automatic twistlocks

TL-A/L
~ 4.9 kg



TL-A/L
~ 4.5 kg

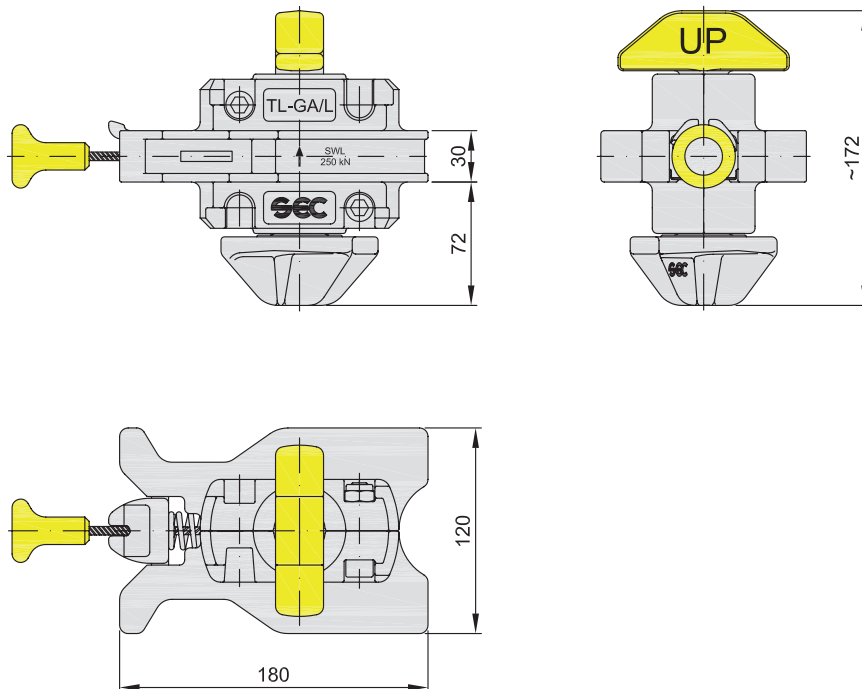
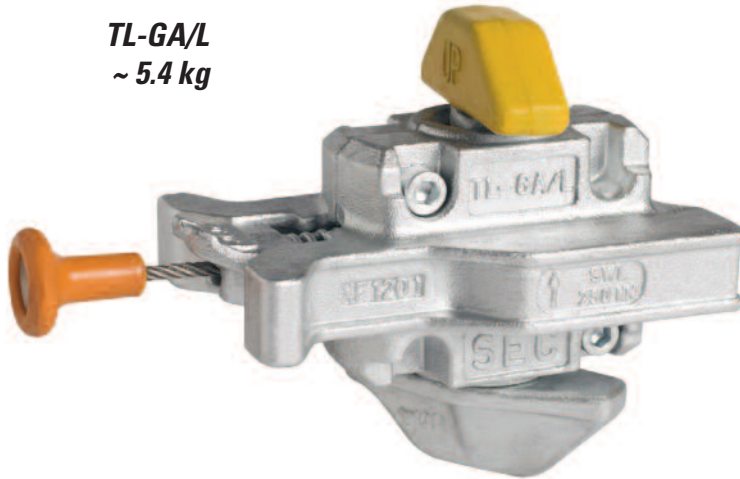


Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- No dual function. SAT with dual function are still available on request.
- Hot dip galvanised with stainless steel components
- Closed housing
- Upper cone marked yellow
- Semi-automatic twistlocks are also available as luxury version with increased diameter of steel wire.
- Cones are always forged for safety reason

Semi-automatic twistlocks

TL-GA/L
~ 5.4 kg

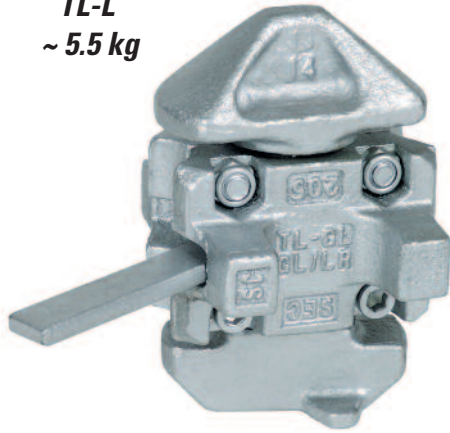


Specification

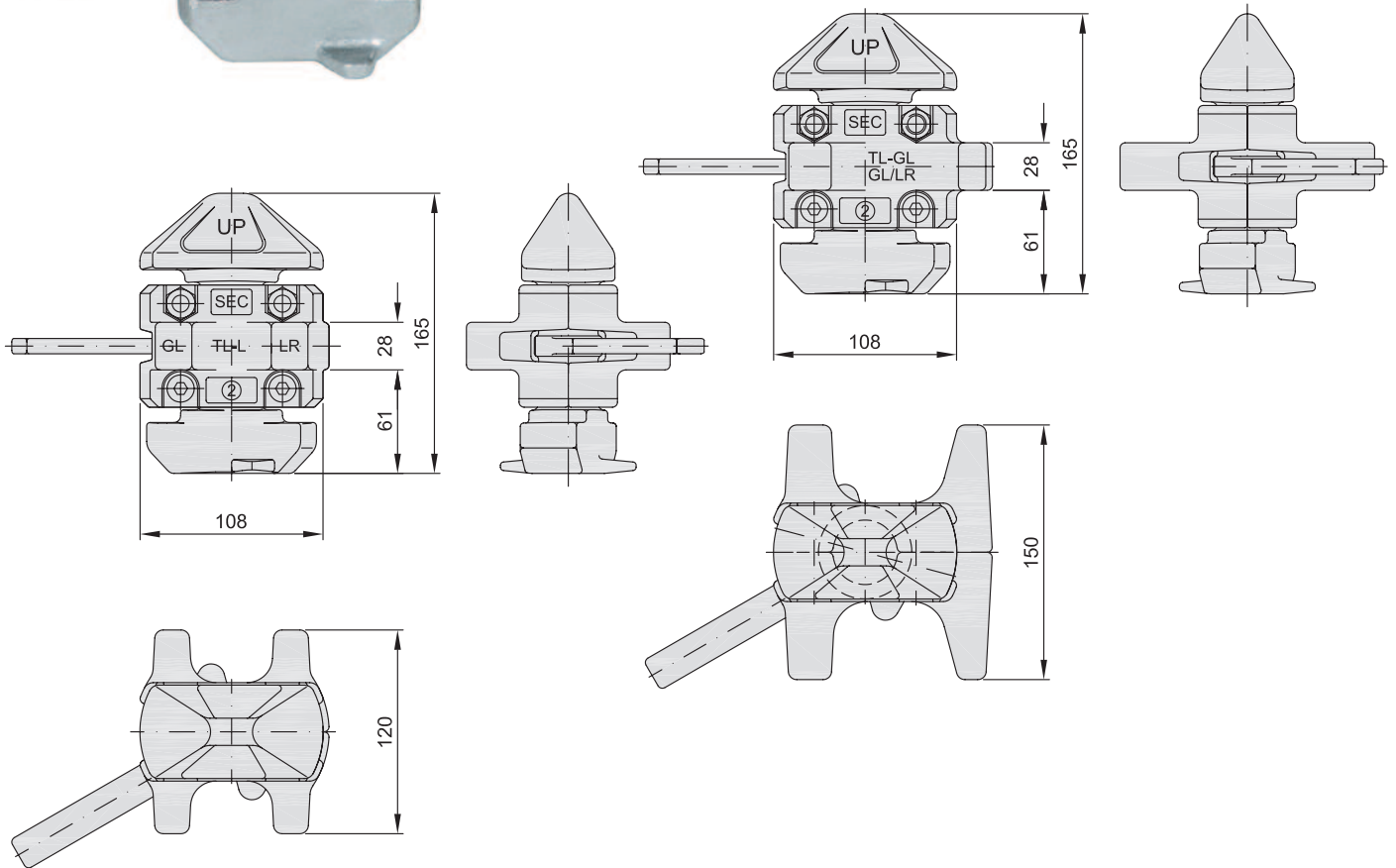
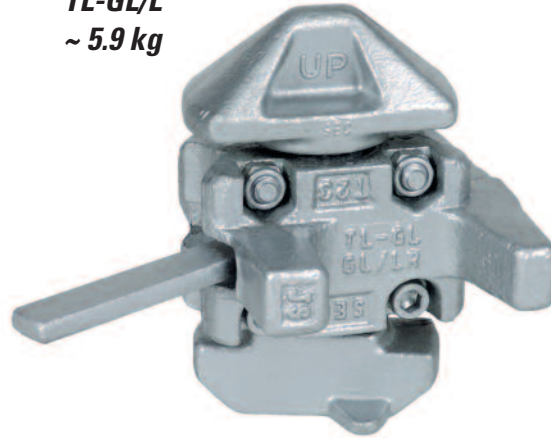
- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- No dual function. SAT with dual function are still available on request.
- Type TL-GA/L with large resting area according class rules for highest pressure forces
- Hot dip galvanised with stainless steel components
- Closed housing
- Upper cone marked yellow
- Semi-automatic twistlocks are also available as luxury version with increased diameter of steel wire.
- Cones are always forged for safety reason

Conventional twistlocks

TL-L
~ 5.5 kg



TL-GL/L
~ 5.9 kg

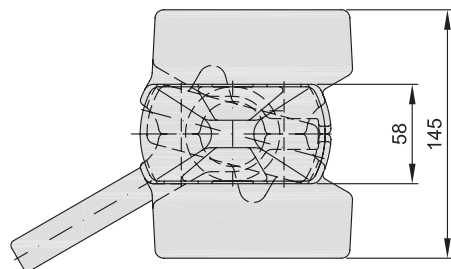
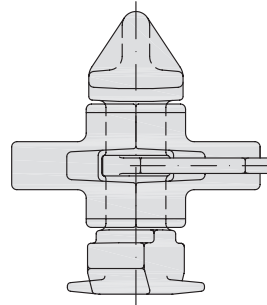
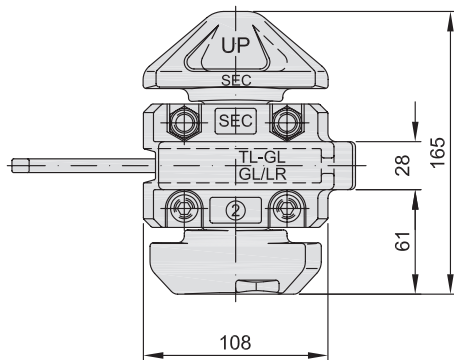


Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Pre-locking function of lower cone
- Left hand locking as standard, right hand locking on request
- Type TL-GL/L with large resting area according GL rules for highest pressure forces
- Hot dip galvanised
- Internal locking mechanism made of stainless steel components

Conventional twistlocks

TL-GL/L
~ 6.6 kg



Specification

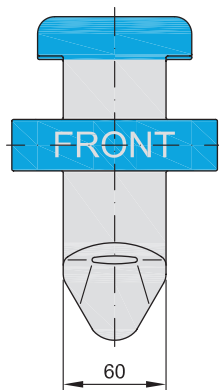
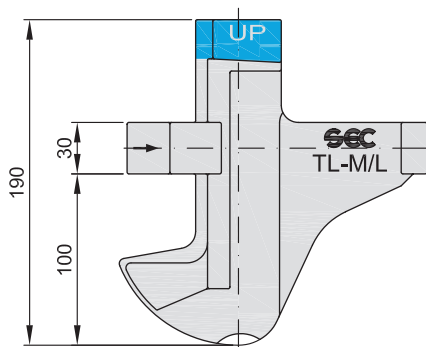
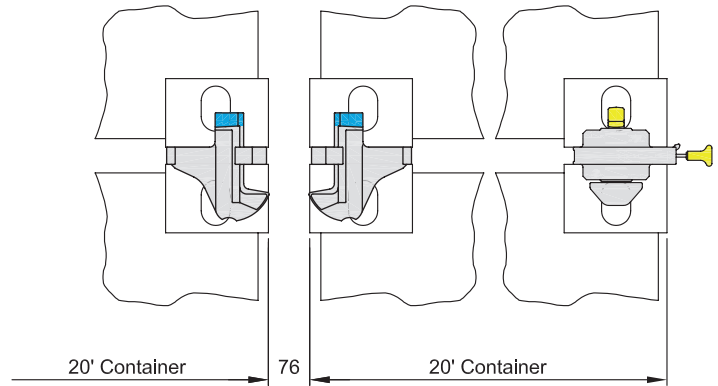
- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Maximum resting area exceeding class requirements by far
- Designed for highest pressure forces and reduction of wear down or slip/stick effect in combination with elongated ISO-sockets
- To be used preferably at bottom tier
- Pre-locking function of lower cone
- Left hand locking as standard, right hand locking on request
- Hot dip galvanised
- Internal locking mechanism made of stainless steel components

Midlocks

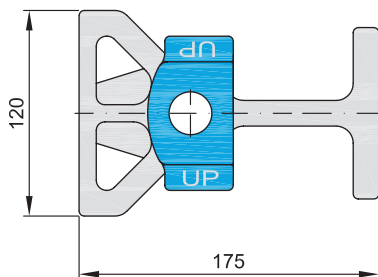
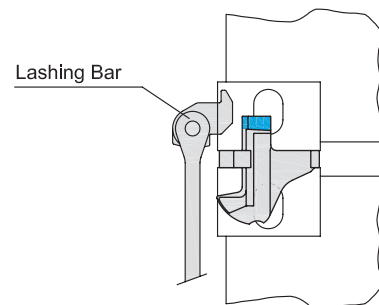
TL-M/L
~ 4.9 kg



Application 1



Application 2



Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Automatic locking/unlocking at ISO-gap position in combination with semi-automatic twistlocks at opposite container end
- Lashing option in the bottom corner of the upper container
- One piece housing without any movable parts
- Hot dip galvanised
- Upper part marked blue
- Can also be used for bottom tier in combination with special shaped foundations

Automatic bottom locks

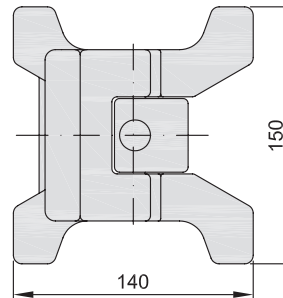
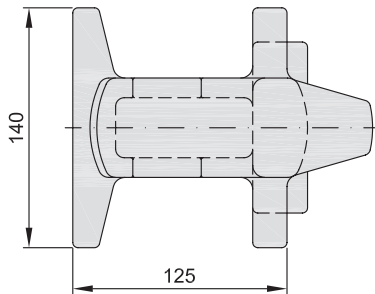
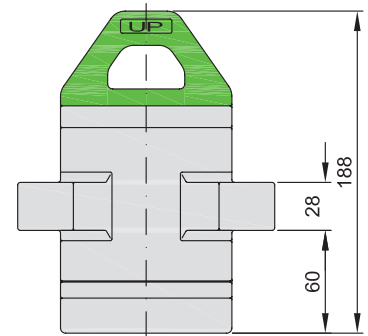
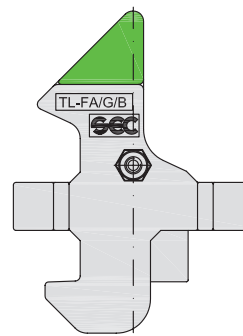
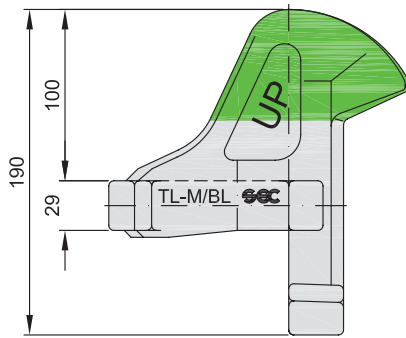
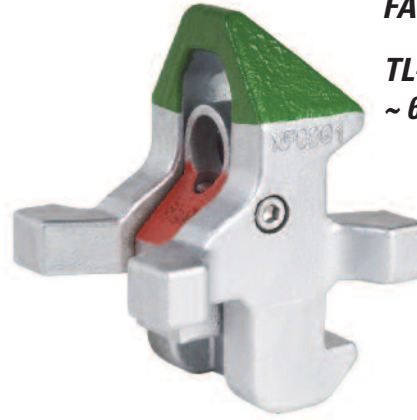
Bottom Midlock

TL-M/BL
~ 5.5 kg

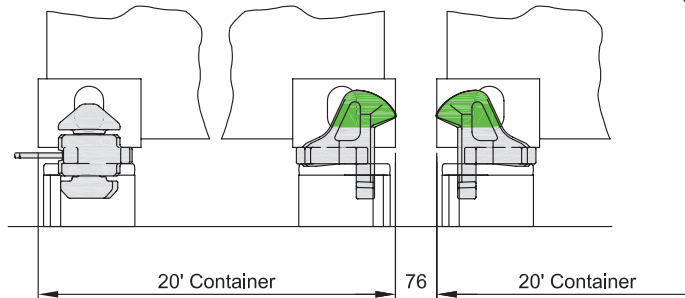


FAT for Bottom Tier

TL-FA/G/B
~ 6.6 kg



Application

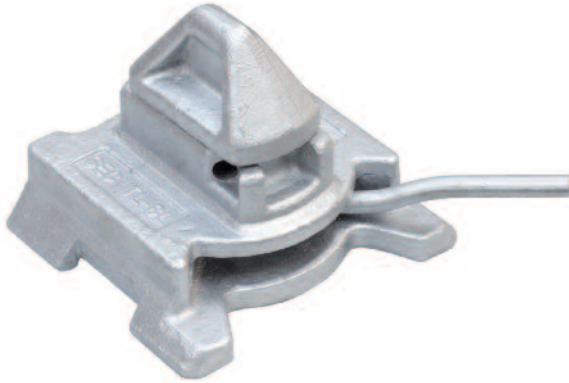


Specification

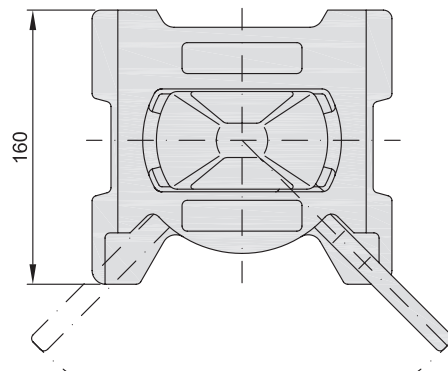
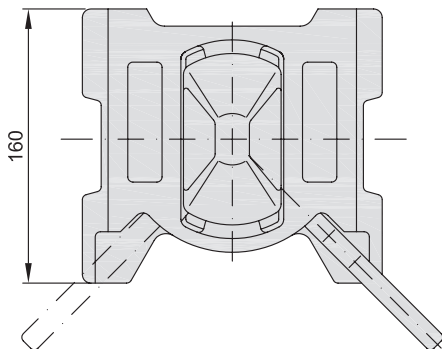
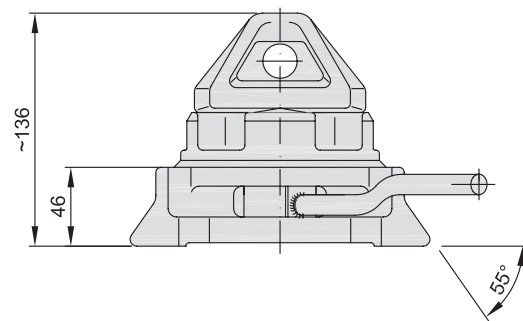
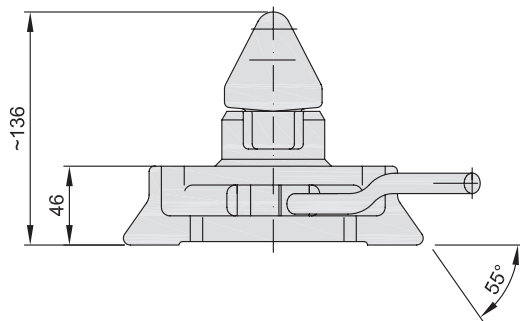
- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- Automatic locking/unlocking at ISO-gap position in combination with conventional twistlocks at opposite container end
- One piece housing without moveable vital parts
- Hot dip galvanised with stainless steel components
- Upper part marked green

Dovetail twistlocks for point load

TL-BL
~ 7.3 kg



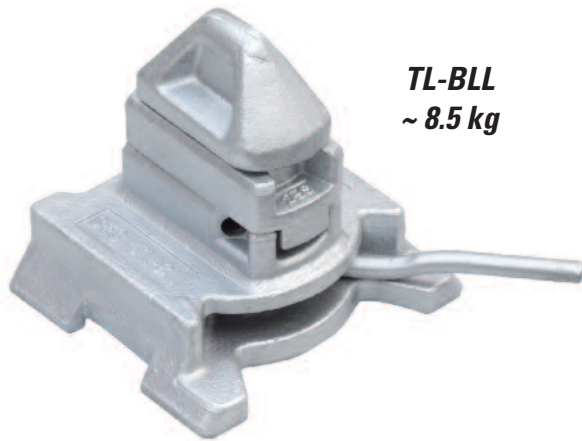
TL-BQ
~ 7.3 kg



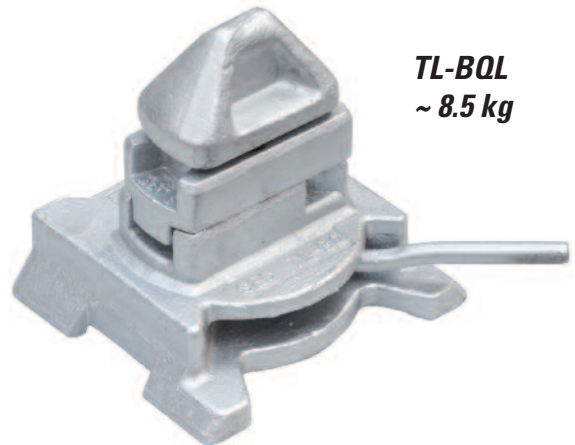
Specification

- Min. breaking loads tension 500 kN / shear 420 kN
- Approval from any classification society
- 55° side angle of housing
- Left hand locking
- Hot dip galvanised
- Internal locking mechanism made of stainless steel components

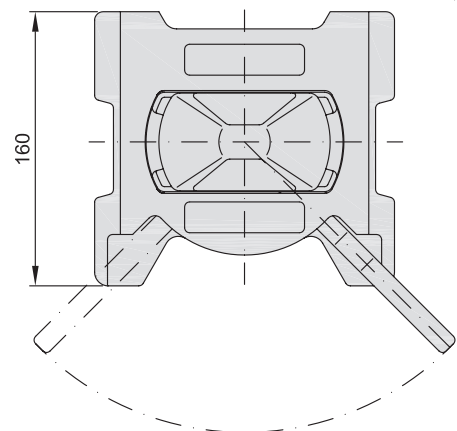
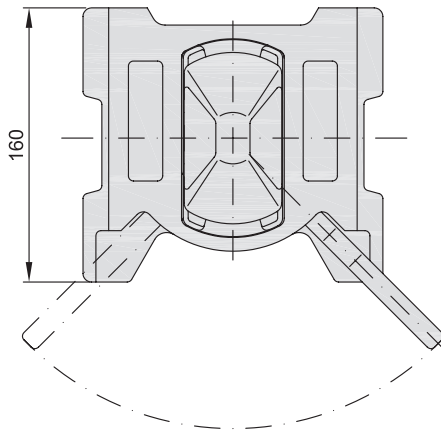
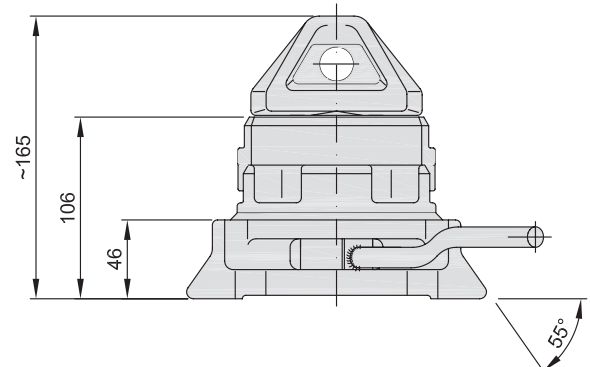
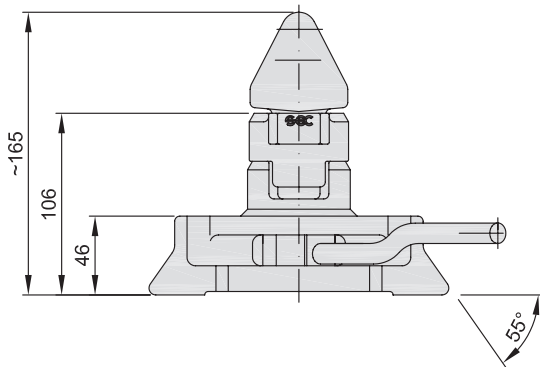
Dovetail twistlocks for line load



TL-BLL
~ 8.5 kg



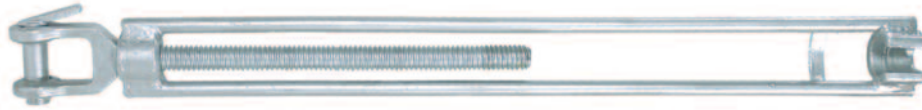
TL-BQL
~ 8.5 kg



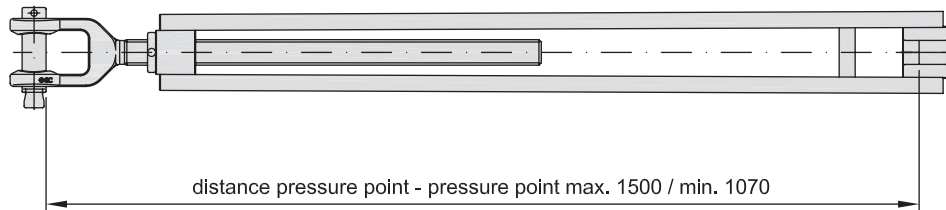
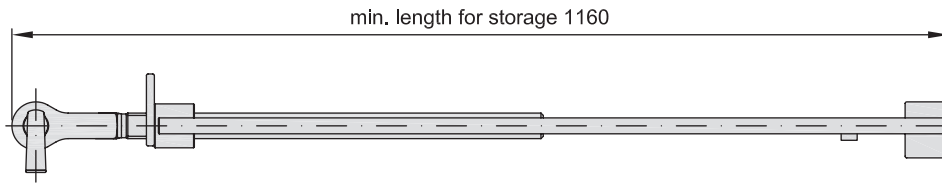
Specification

- Min. breaking load tension 500 kN / shear 420 kN
- Approval from any classification society
- 55° side angle of housing
- Left hand locking
- Hot dip galvanised
- Internal locking mechanism made of stainless steel components
- Depth of recess 82-86 mm in order not to transmit pressure loads

Turnbuckles



RS-FS
~ 11.5 kg

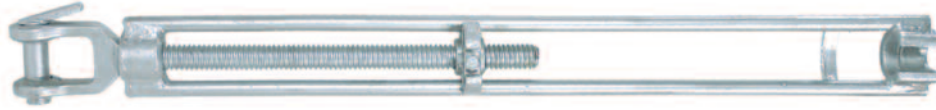


Spanner OT-RS-FS
~ 2.3 kg

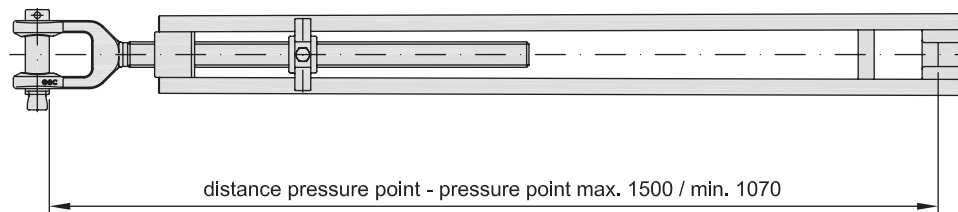
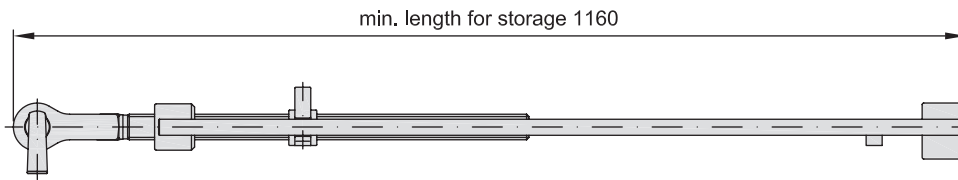
Specification

- Min. breaking load tension 500 kN
- Approval from any classification society
- Hot dip galvanised
- Made of high tensile steel for minimising weight
- Large adjusting range
- Securing nut against self-releasing
- Open design for easy greasing of thread and long life thread lubrication

Turnbuckles



RS-FN
~ 12.4 kg



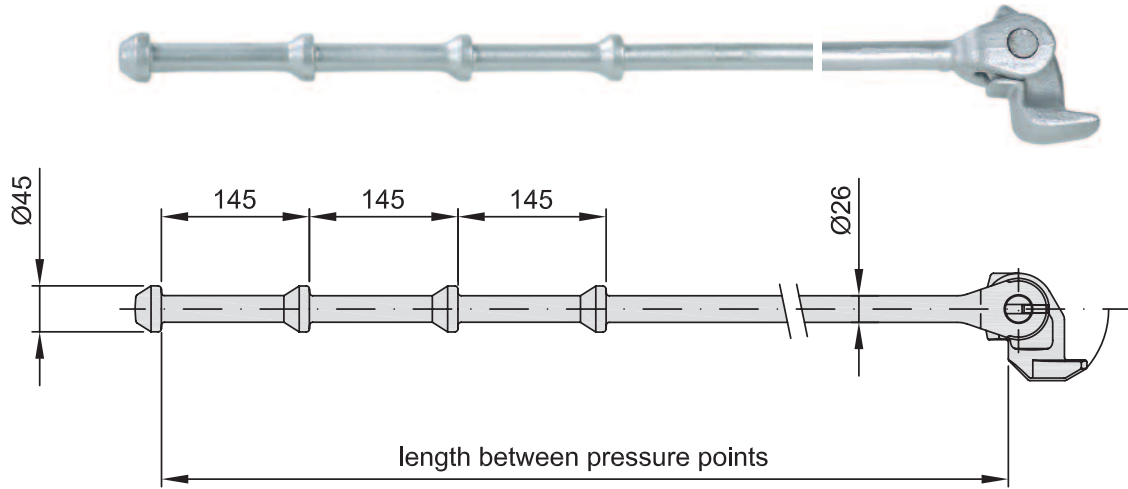
Spanner OT-RS-FN
~ 2.4 kg

Specification

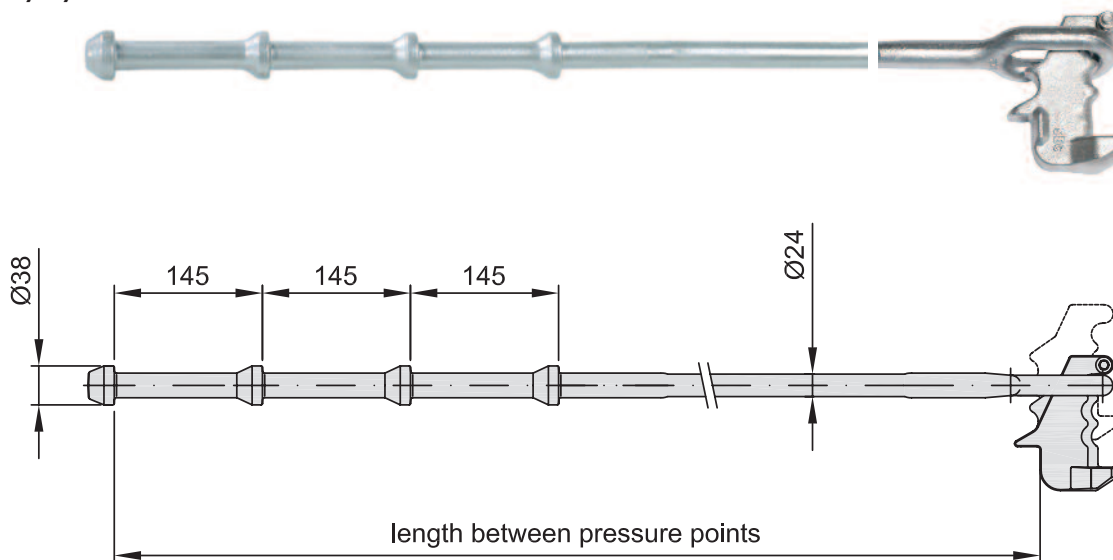
- Min. breaking load tension 500 kN
- Approval from any classification society
- Hot dip galvanised
- Made of high tensile steel for minimising weight
- Large adjusting range
- Patented securing screw against self-releasing at sliding nut
- Open design for easy greasing of thread and long life thread lubrication
- Because of sliding nut principle turnbuckle type RS-FN can be pushed together to minimum storage length directly without any need for rotation. The sliding nut has a securing screw solution for which a patent has been applied for and allows securing against self-releasing at any position of thread by just one short rotation without blocking sliding function

Lashing bars

R-KS/...



R-KX/24/...

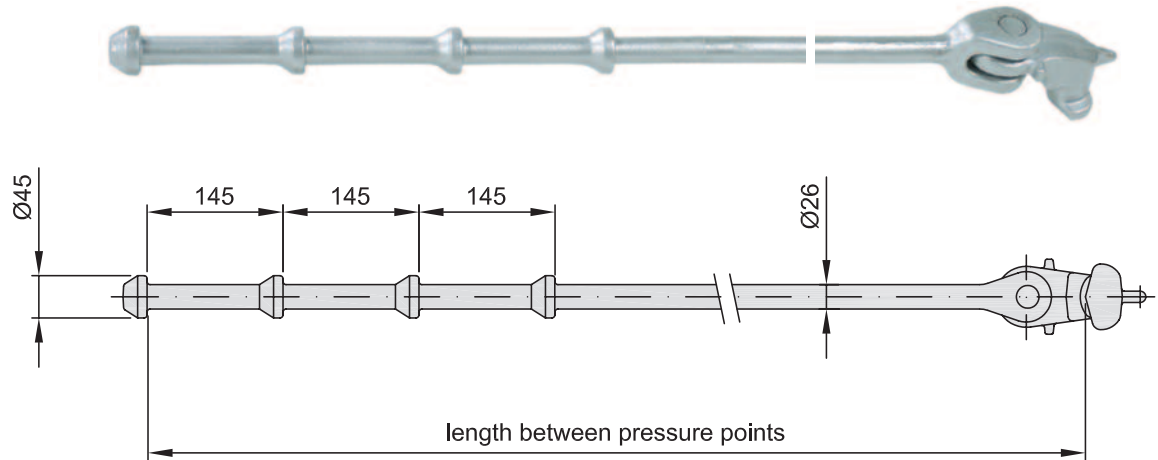


Specification

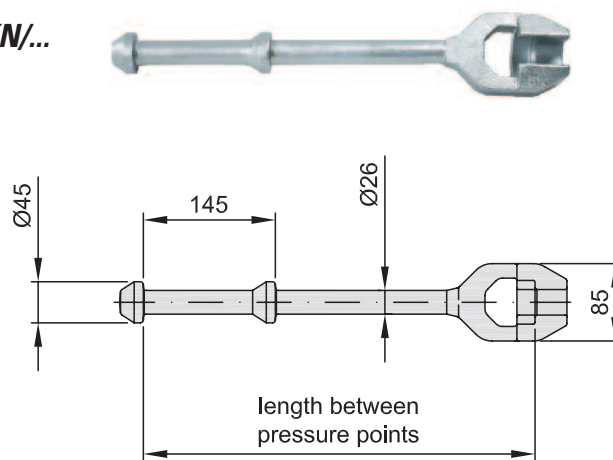
- Min. breaking load tension 500 kN
- Approval from any classification society
- Swivel hook at upper end which is self-securing when the lashing bar is hanging in vertical direction.
- Made of high tensile steel
- Diagonal lashings type R-KS/... and R-KX/24/... with multiple knobs at lower end for fast pre-adjustment of length minimising necessary number of rotations when tightening the turnbuckles
- Under normal conditions the combination of long thread of turnbuckle and multiple knobs at lashing bar guarantees unified lashing length for all container heights. Only in case of unfavourable arrangement of lashing plates it might be necessary to apply additional extension rods at certain stack locations.
- Hot dip galvanised

Lashing bars

R-KV/...



Extension rod R-KN/...

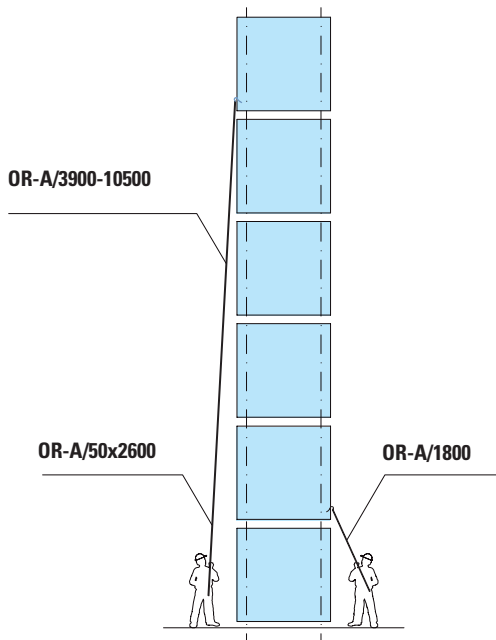
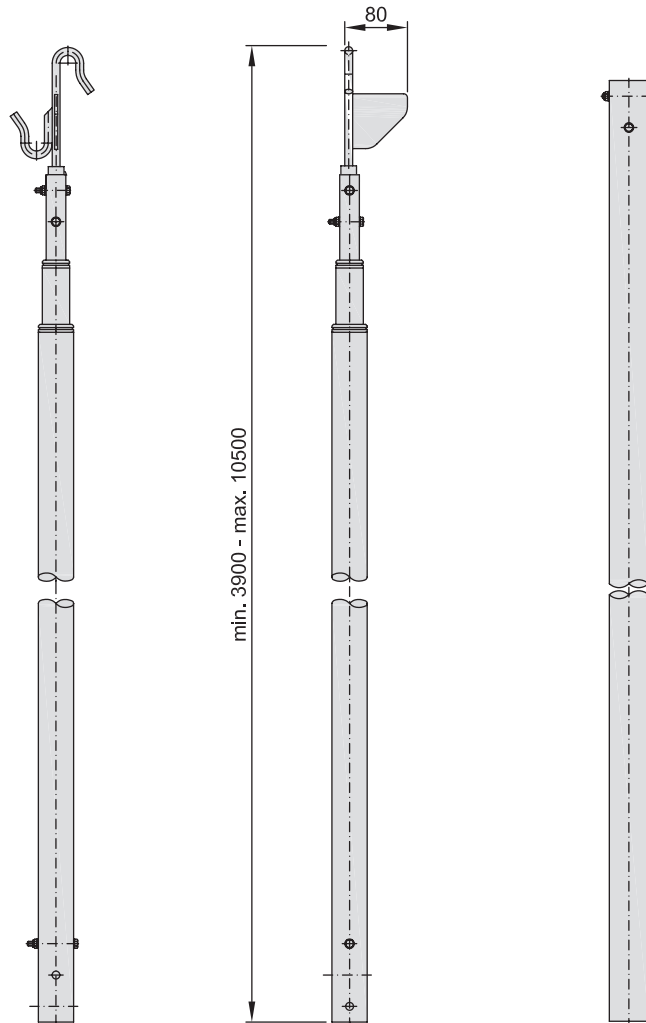


Specification

- Min. breaking load tension 500 kN
- Approval from any classification society
- Swivel hook at upper end which is self-securing when the lashing bar is hanging in vertical direction.
- Made of high tensile steel
- Vertical lashings type R-KV/... with multiple knobs at lower end for fast pre-adjustment of length minimising necessary number of rotations when tightening the turnbuckles

Operating rods

Telescope type for semi-automatic twistlocks



Telescopic operating rod
OR-A/3900-10500
~ 6.6 kg

Extension
OR-A/50x2600
~ 2.1 kg

Specification

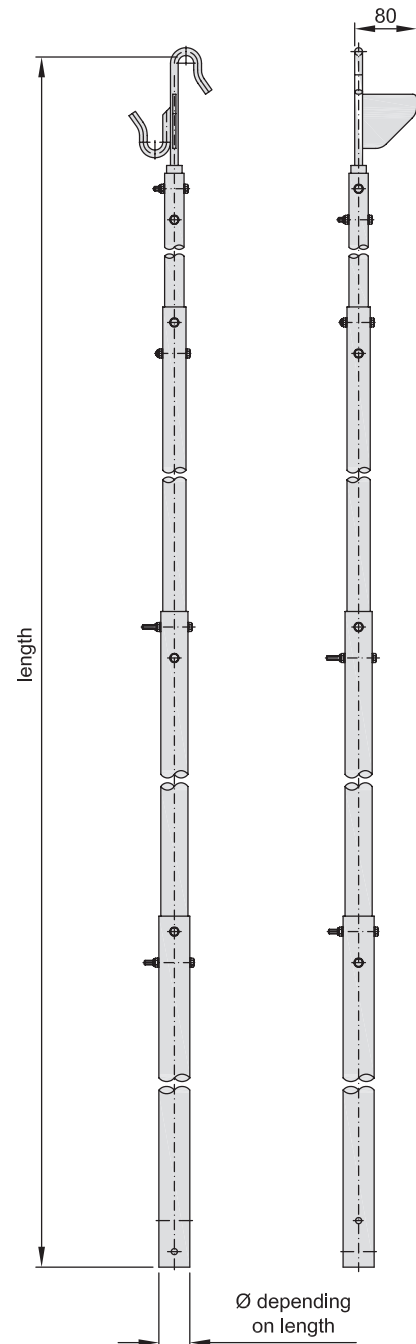
- Light weight design
- Maximum stiffness
- Made of aluminium tubes
- Free adjustment of length without any tools from top of 2nd tier to top of 4th tier
- In order to reach top of 5th tier the telescopic rod can be extended by additional extension bar 2.60 m
- For top of 1st tier operating rod type OR-A/1800 to be used, please compare to next page

Operating rods

OR-A/...



**for semi-automatic
twistlocks**



Type	Length	Tier	Weight
OR-A/1800	1.80 m	1/2	~ 1.1 kg
OR-A/4720	4.72 m	2/3	~ 2.6 kg
OR-A/7640	7.64 m	3/4	~ 4.2 kg
OR-A/10300	10.30 m	4/5	~ 5.9 kg
OR-A/13040	13.04 m	5/6	~ 7.9 kg

Specification

- Light weight design
- Maximum stiffness
- Made of aluminium tubes
- Available in different lengths
- Length adjustment by screw connection

Operating rods

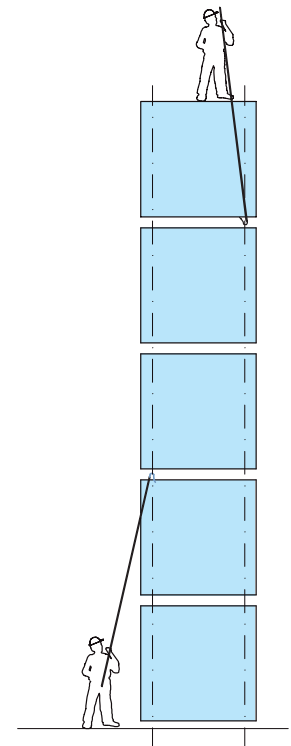
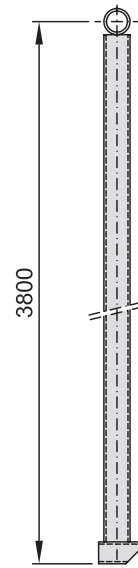
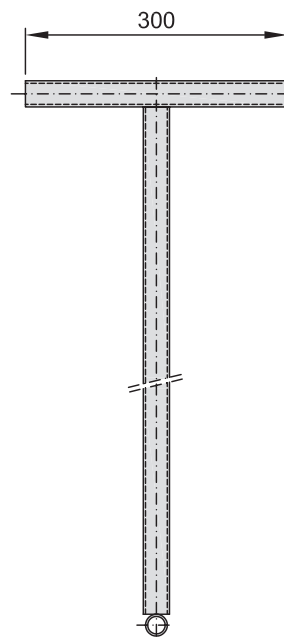
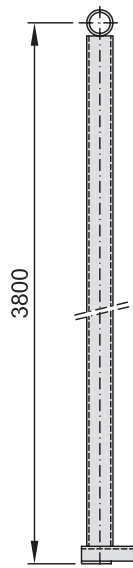
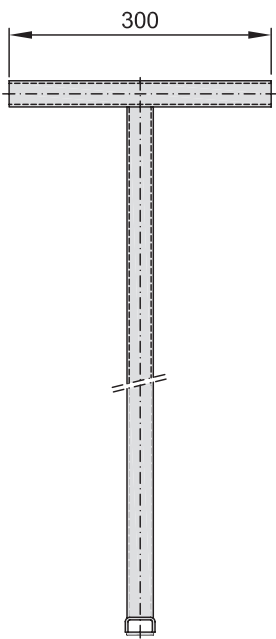
for conventional twistlocks



OR-F/3800
~ 2.0 kg



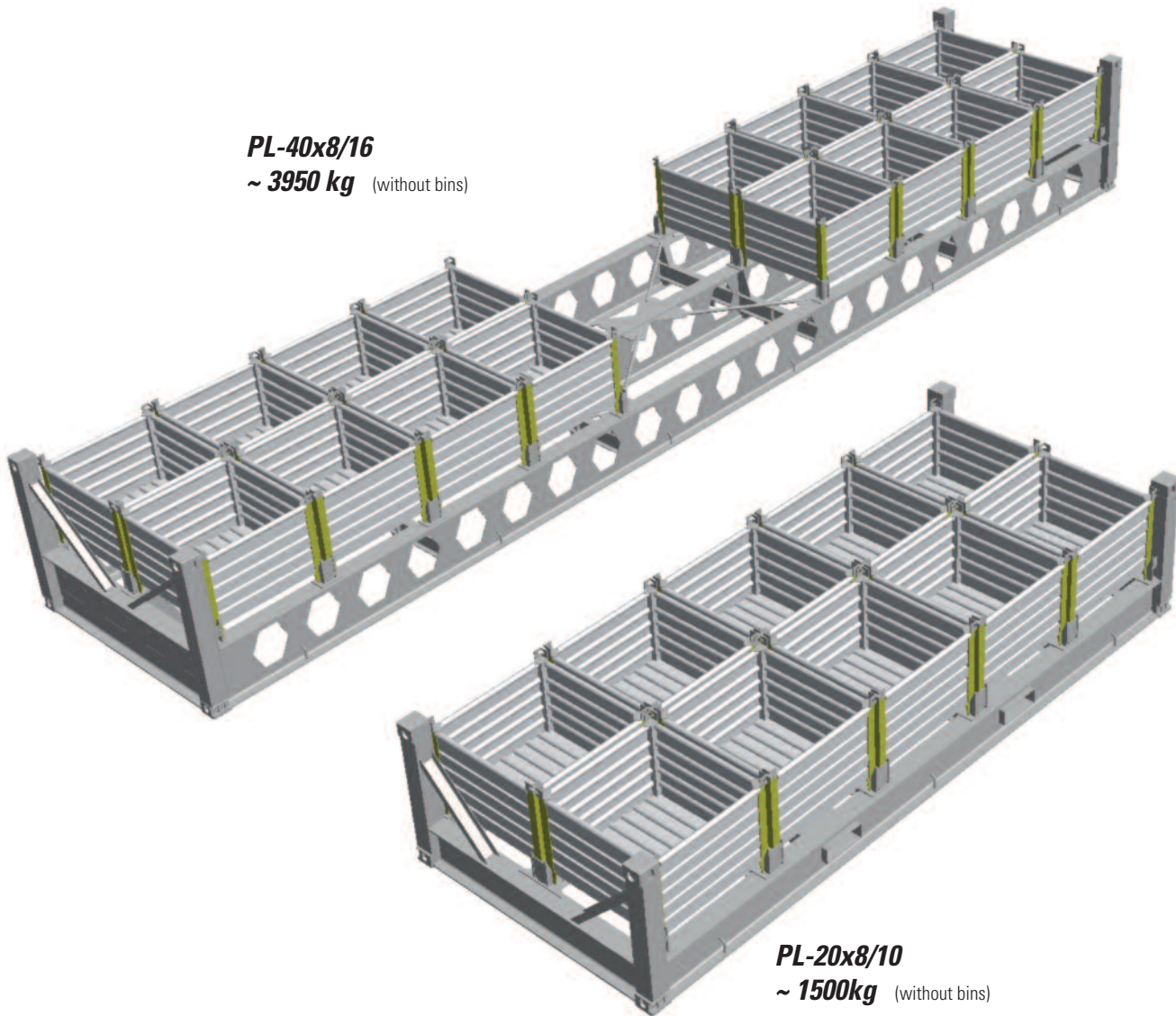
OR-R/3800
~ 2.0 kg



Specification

- Light weight design
- Maximum stiffness
- Made of aluminium tubes
- Special length on request
- To be used for conventional twistlocks depending on shape of hand lever, i. e. type OR-F/3800 for twistlock TL-L and TL-GL/L and OR-R/3800 for all types of SEC dovetail twistlocks

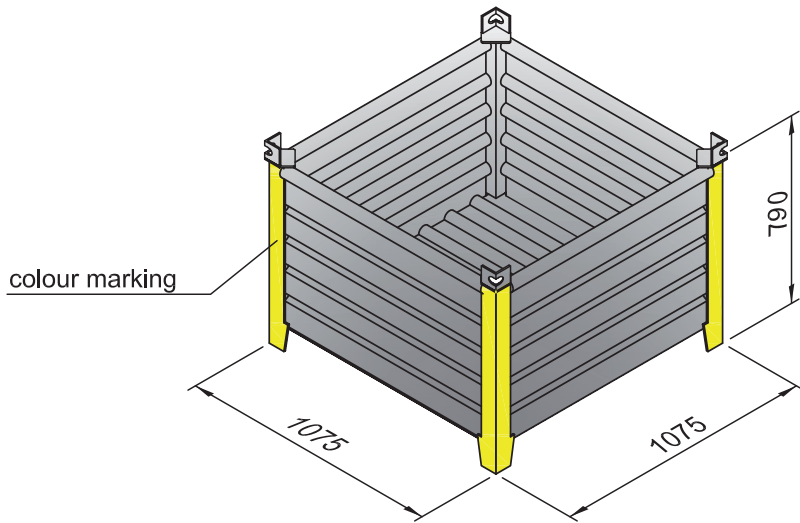
Bin racks



Specification

- Each flat rack will be approved and delivered with CSC-certificate
- Main dimensions and strength in accordance with ISO-norms
- 20' flat rack with pockets for forklift trucks
- Flat racks will be delivered with finish paint but hot dip galvanising is available on request.

Storage bins



Bin 1075x1075x790
~ 95 kg

Stowage capacity for standard bins:

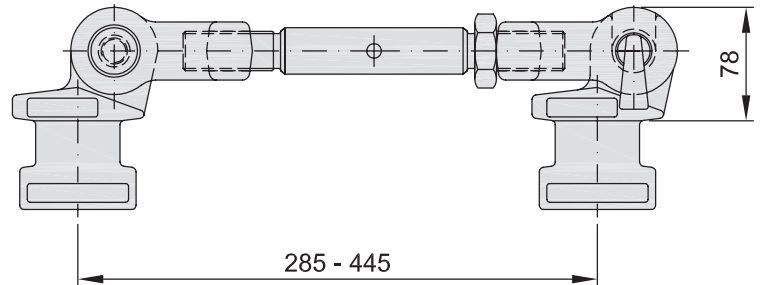
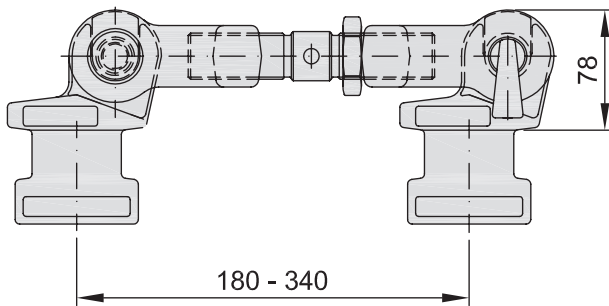
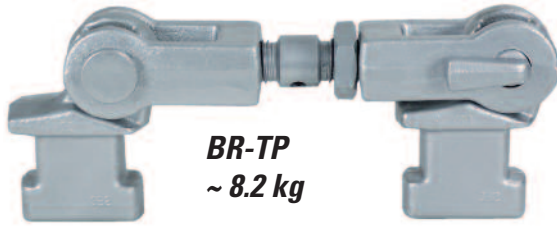
wooden grating

	without	with
● TL-A/L	350 pcs	320 pcs
● TL-GA/L	250 pcs	220 pcs
● TL-FA/L	300 pcs	300 pcs
● TL-FA/SL	300 pcs	270 pcs
● TL-FA/LG	240 pcs	220 pcs
● TL-M/L	300 pcs	270 pcs
IS-1T	420 pcs	420 pcs
IS-1T/L	550 pcs	500 pcs
IS-1T/LG	550 pcs	500 pcs
IS-1T/LF	1100 pcs	1100 pcs

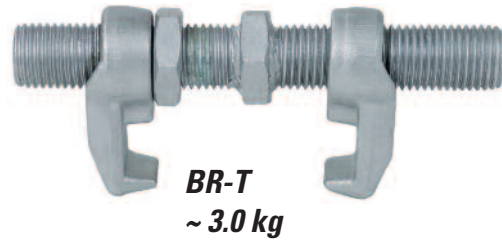
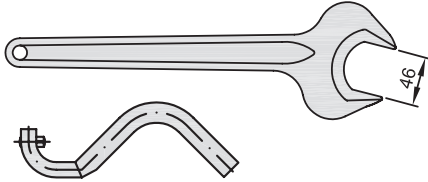
Specification

- Standardised dimensions
- Can be stacked up
- Drainage holes
- Hot dip galvanised
- Colour marking corresponding to the OSHA equipment to be stowed, i. e. yellow marking for fully/semi-automatic twistlocks and blue marking for midlocks
- Wooden grating for bottom is available on request. In this case the stowage capacity per bin is reduced

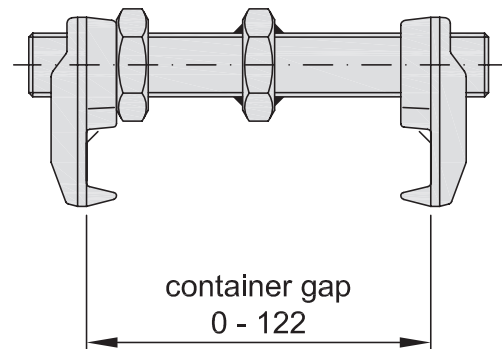
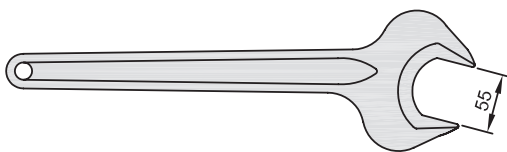
Bridge fittings



Operating tools for BR-TP



Operating tool for BR-T



Specification

- Min. breaking loads tension / compressions 300 kN
- Approval from any classification society
- Spindle with right-and-left screw thread for fast length adjustment
- Hot dip galvanised
- Long life lubrication
- Type BR-T for tension forces up to 100 kN breaking load to be used preferably on deck in order to limit the movement of stacks towards each other

Container part

6

LOOSE FITTINGS IN HOLDS

6.1 - 6.2	Twist stackers
6.3	Stacking cones
6.4	Bottom stacking cones
6.5	Tension/pressure elements
6.6	Pressure elements
6.7	Pressure adapters

Twist stackers



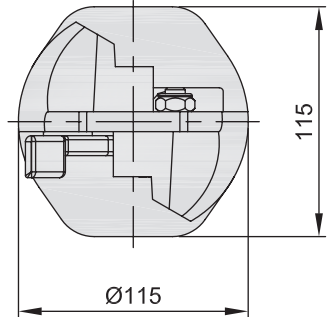
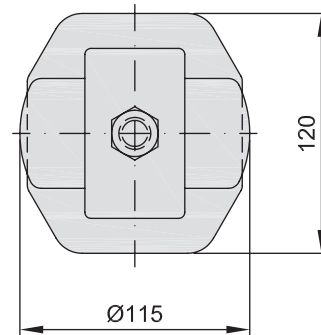
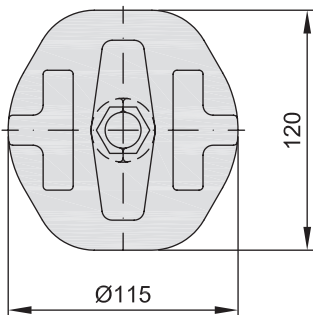
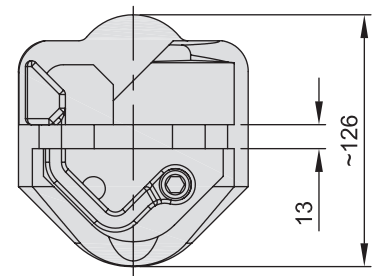
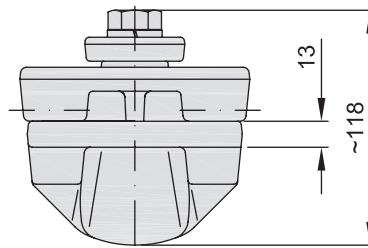
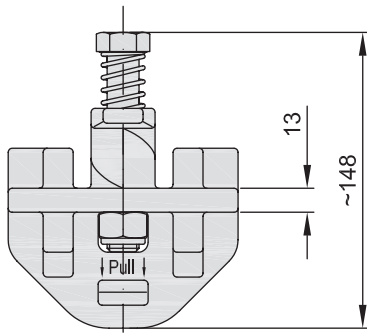
IS-1T/L
~ 2.5 kg



IS-1T
~ 3.6 kg



IS-1T/LG
~ 2.8 kg



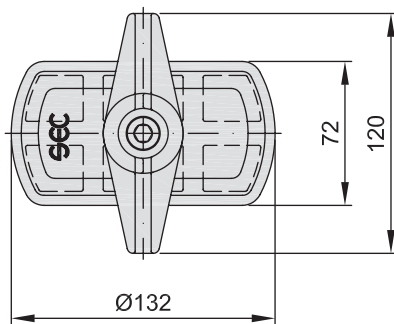
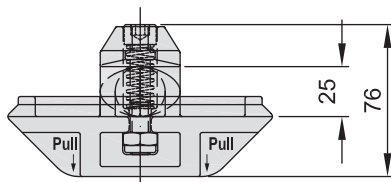
Specification

- Min. breaking load shear 420 kN
- Approval from any classification society
- All types are hot dip galvanised with stainless steel components
- Coning and deconing at the quay side as requested by OSHA
- Easy one-hand operation
- Made of casted steel
- A variety of three different twist stackers with 13 mm resting area is available upon customers preference:
- Type IS-1T/L is our standard version in light weight execution with a spring loaded fallout protection
- Type IS-1T is our heavy duty version with closed housing and internal spring mechanism
- Type IS-1T/LG is a pure after sales product with gravity whip as fallout protection.

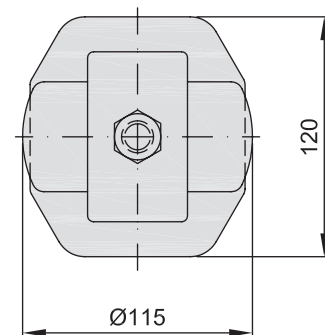
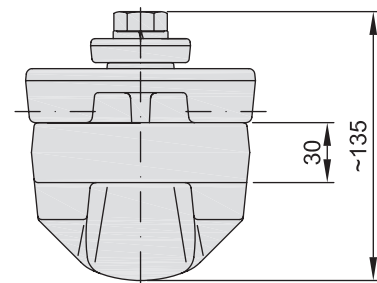
Twist stackers



IS-1T/LF
~ 1.4 kg



IS-1T/30
~ 5.1 kg

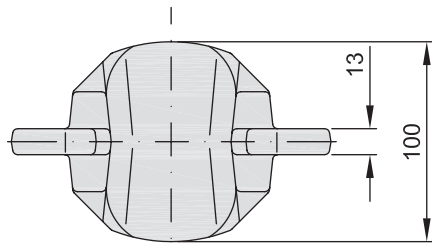


Specification

- Min. breaking load shear 420 kN
- Approval from any classification society
- All types are hot dip galvanized with stainless steel components
- Coning and deconing at the quay side as requested by OSHA
- Easy one-hand operation
- Made of casted steel
- Latest invention twist stacker type IS-1T/LF has no resting area any more and containers can be stowed directly on top of each other without vertical gap. The necessary quantity of twist stackers can be reduced by 50 % compared to standard twist stackers because height alignment at cellguide ends is no longer required.
- Twist stacker IS-1T/30 has a resting area with 30 mm thickness for height adjustment when used in combination with semi-automatic twistlocks for example for containers which are stowed in deck cellguides at one end only.

Stacking cones

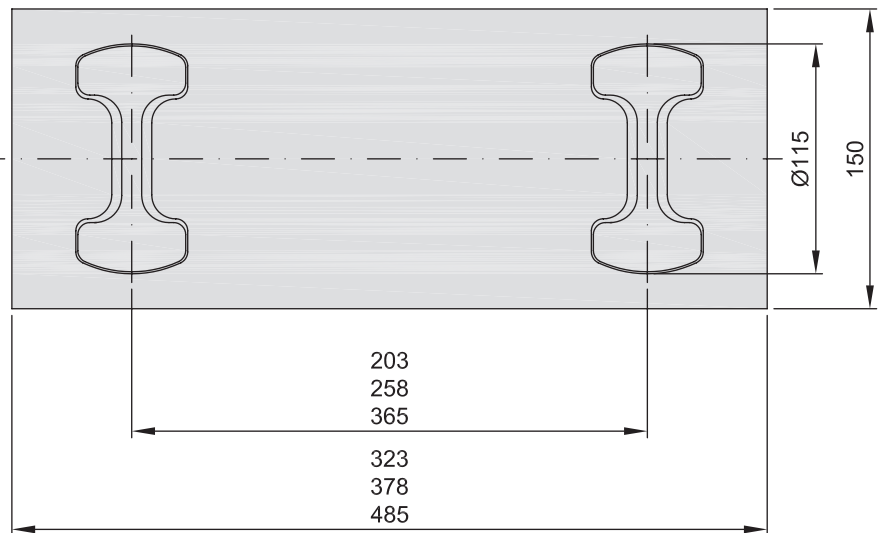
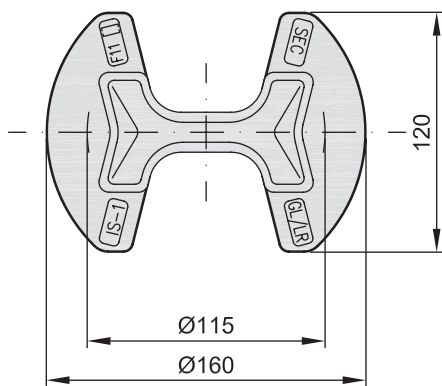
IS-1/115
~ 2.6 kg



IS-2/

203
258
365

/115

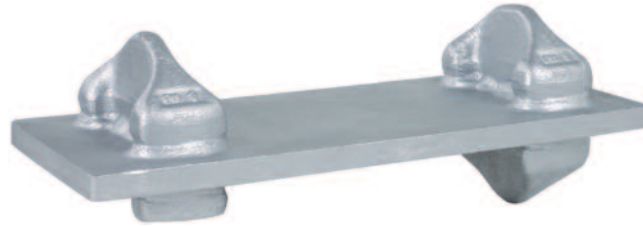
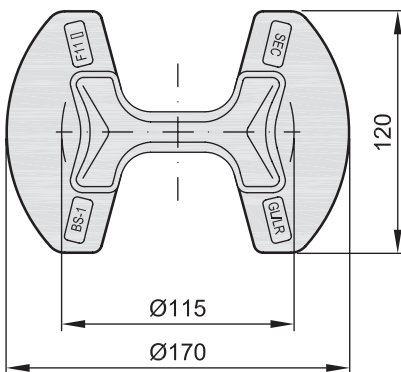
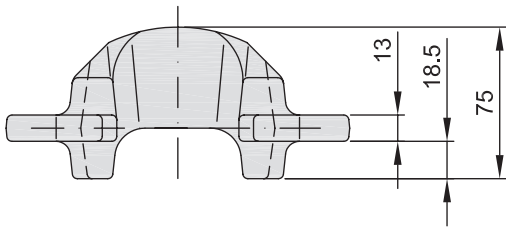


Specification

- Min. breaking load shear 420 kN for single stacking cones
- Min. breaking loads tension / compression up to 1200 kN for double stacking cones
- Approval from any classification society
- The transversal distance between the cones of double stackers will be made to measure the required distance between containers. Distances to be used preferably 203, 258 and 365 mm
- Drop forged cones
- Enlarged length of cones (115 mm) in order to reduce longitudinal misalignment of containers
- Hot dip galvanised

Bottom stacking cones

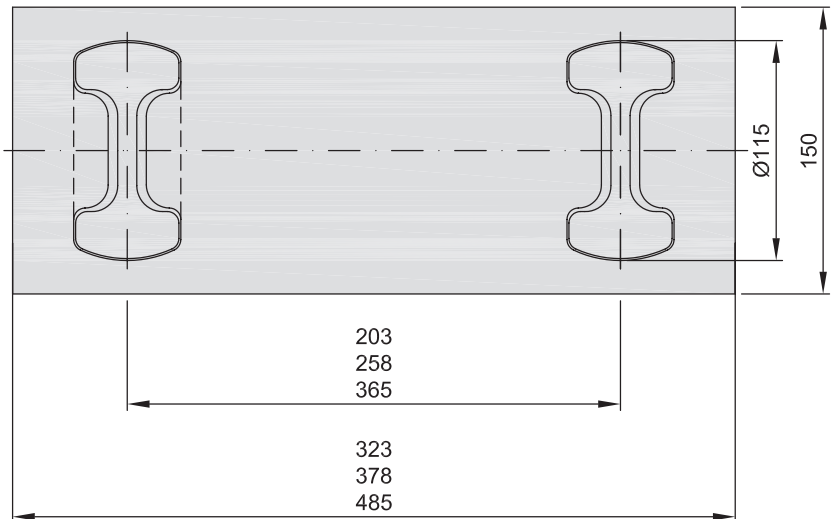
BS-1/115
~ 2.5 kg



CS-2/

203
258
365

/115

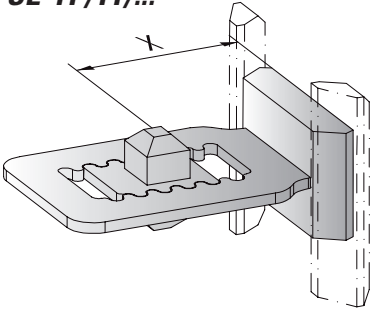


Specification

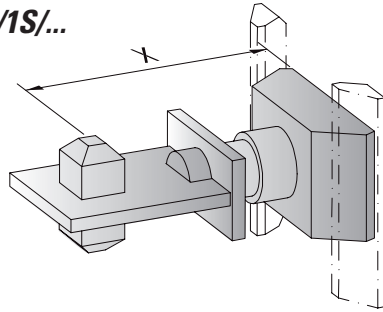
- Min. breaking load shear 420 kN for single stacking cones
- Min. breaking loads tension / compression up to 1200 kN for double stacking cones
- Approval from any classification society
- The transversal distance between the cones of double stackers will be made to measure the required distance between containers. Distances to be used preferably 203, 258 and 365 mm
- To be used in combination with welding plates type WP-1 for example
- Type CS-2/... with one cone flattened to be used for tank step locations
- Drop forged cones
- Enlarged length of cones (115 mm) in order to reduce longitudinal misalignment of containers
- Hot dip galvanised

Tension / pressure elements

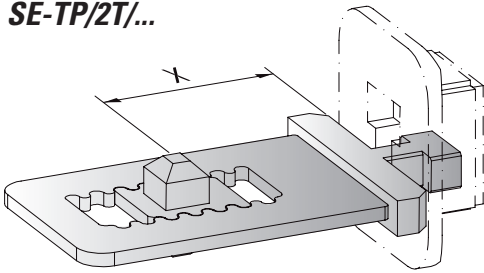
SE-TP/1T/...



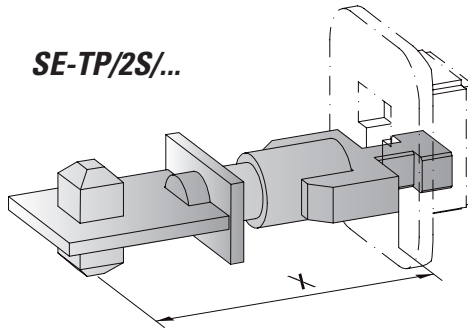
SE-TP/1S/...



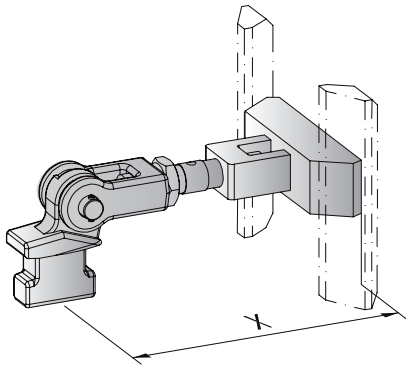
SE-TP/2T/...



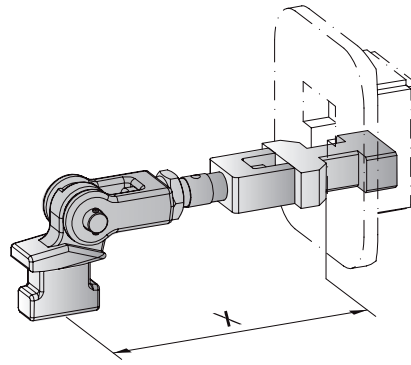
SE-TP/2S/...



SE-TP/1S/.../UP/...

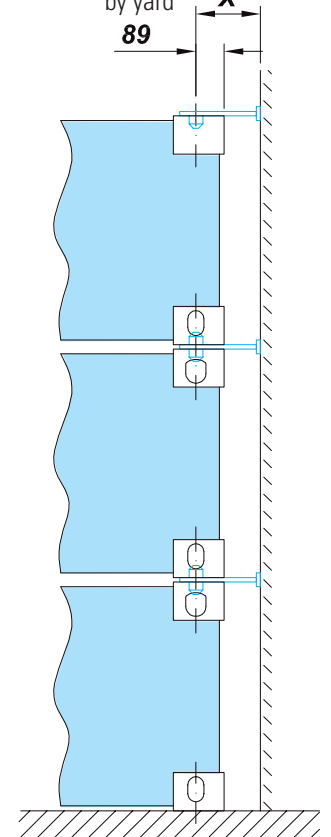


SE-TP/2S/.../UP/...



> Application <

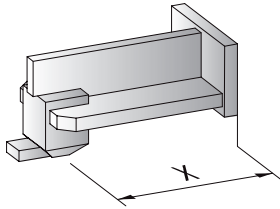
X to be informed
by yard
89



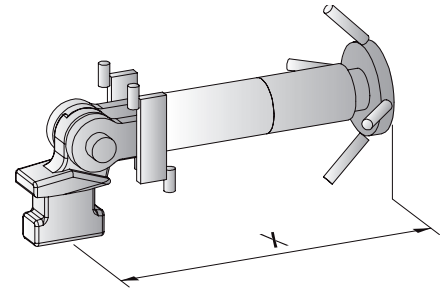
Specification

- Min. breaking loads tension / compression up to 1200 kN
- Approval from any classification society
- Tension/pressure elements without length adjustment are not allowed according to latest rules of Germanischer Lloyd
- Fully galvanised finish
- Length adjustment by thread or saw fish solution
- Custom-made for individual situation on board
- Made of high tensile steel

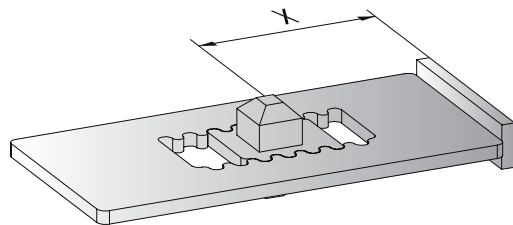
Pressure elements



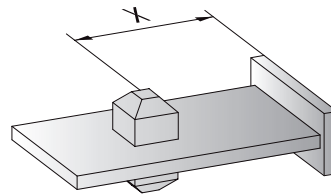
SE-P/F/UP/...



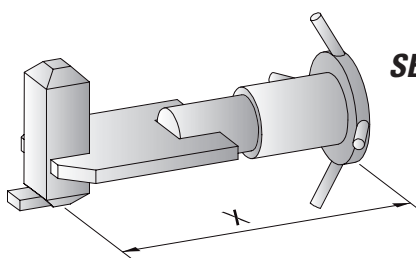
SE-P/S/UP/...



SE-P/T/...



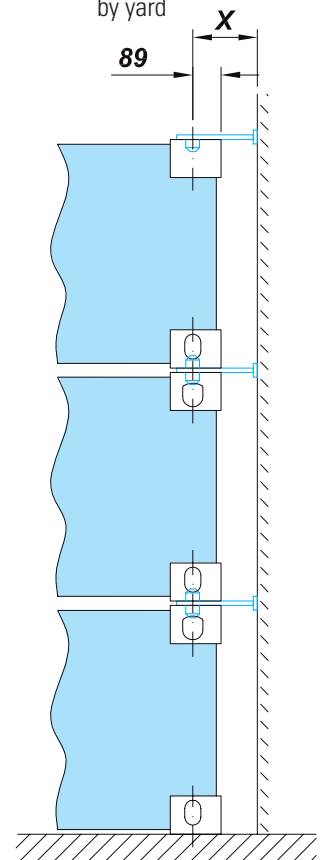
SE-P/F/...



SE-P/S/...

> Application <

X to be informed
by yard



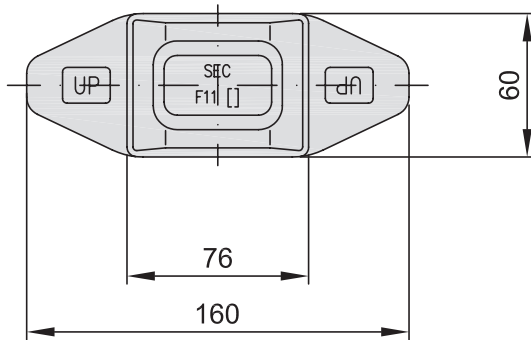
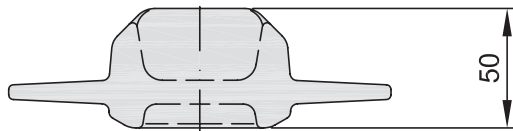
Specification

- Min. breaking load compression up to 1200 kN
- Approval from any classification society
- Pressure elements without length adjustment are no longer allowed according to latest rules of Germanischer Lloyd
- Fully galvanised finish
- Length adjustment by thread or saw fish solution
- Custom-made for individual situation on board
- Made of high tensile steel

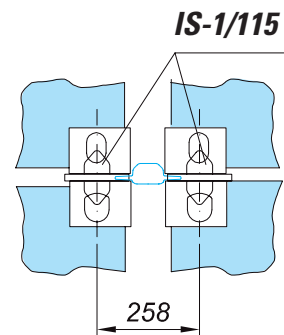
Pressure adapters



DA-IS/258
~ 1.4 kg



> Application <



Specification

- Min. breaking load compression up to 1200 kN
- Approval from any classification society
- To be used in combination with single stacking cones type IS-1/115 preferably in holds underneath longitudinal hatch cover joint for separate unloading of container blocks
- The breadth of pressure adapters will be made to measure the required distance between containers. The preferred distance is 258 mm.
- Hot dip galvanised

Container part

7

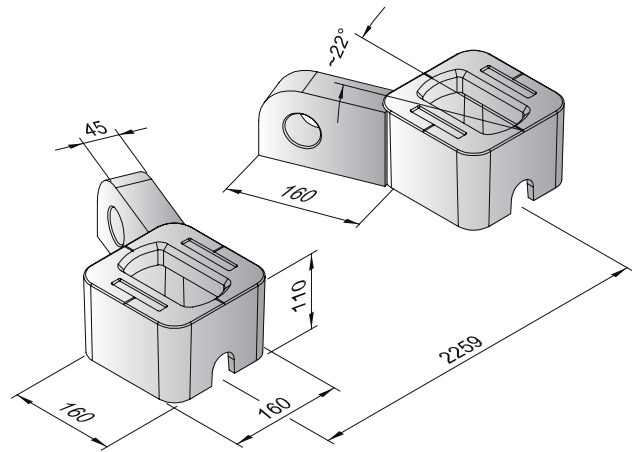
SPECIAL FEATURES

- | | |
|------------|-----------------------------------|
| 7.1 | Lifting foundations |
| 7.2 | Securing points for general cargo |
| 7.3 | Height adapters |
| 7.4 | Adapter pieces |
| 7.5 | Spreader and lifting gear |
| 7.6 | Hatch cover lifting stopper |
| 7.7 | ISO-plugs |
| 7.8 | Removable railing post |
| 7.9 - 7.10 | Removable reefer platforms |

Lifting foundations

Lifting eyes inclined longitudinally

SF-C1LS/EL/110/U160

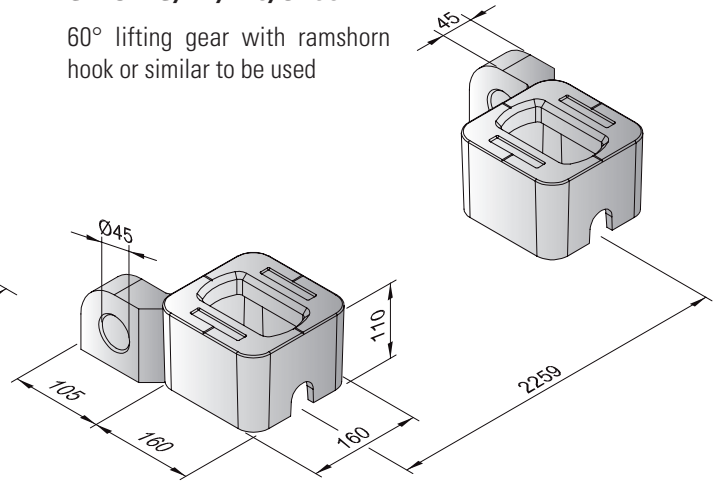


SF-C1LS/ER/110/U160

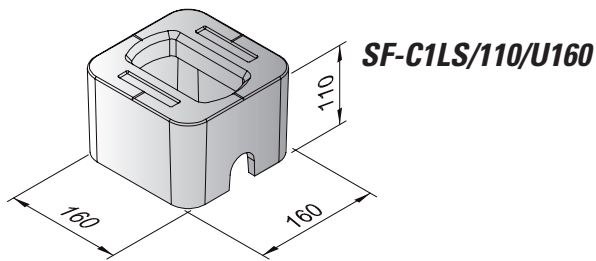
Lifting eyes without inclination

SF-C1LS/ER/110/U160

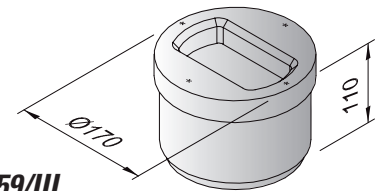
60° lifting gear with ramshorn hook or similar to be used



SF-C1LS/EL/110/U160

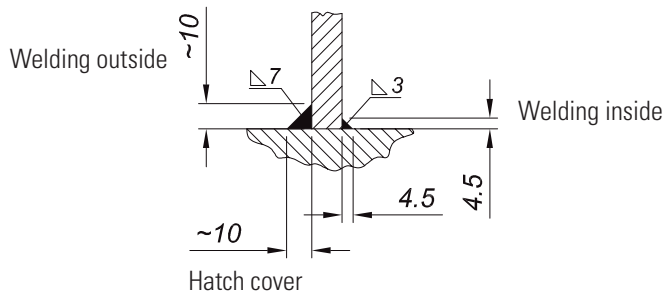


SF-C1LS/110/U160

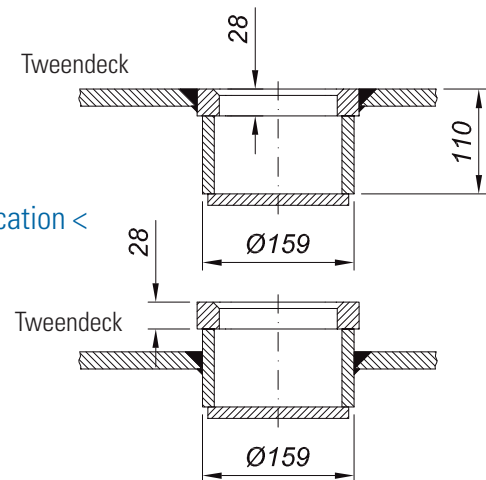


SF-1LS/110/28/R159/III

Welding recommendation



> Application <



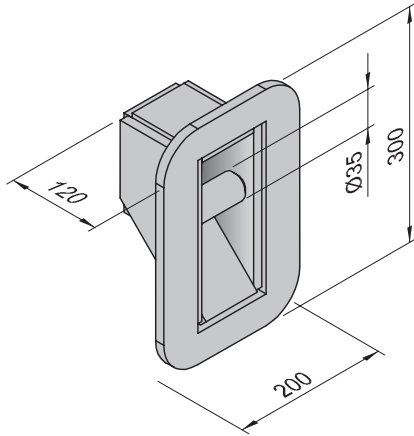
Specification

- Min. breaking loads tension 960 kN for hatch cover lifting weights up to 45 tons
- Approval from any classification society
- Standard height 110 mm to suit spreader cones
- Thickness of top plating 28 mm
- Topplate with punchmarks for easy installation
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel

Securing points for general cargo

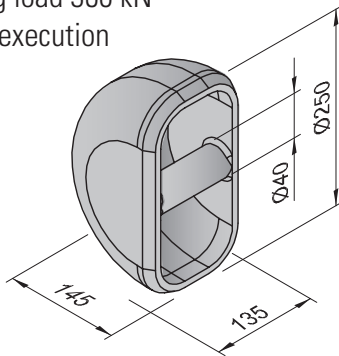
LP-B-1H/BL12/200x300x12/III

Min. breaking load 120 kN



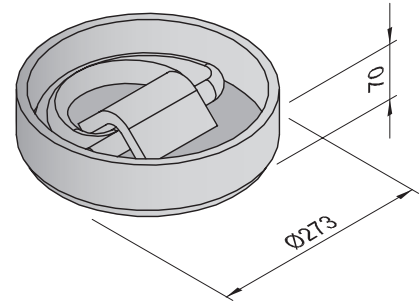
LP-B-C1H/BL36/II

Min. breaking load 360 kN
Casted steel execution



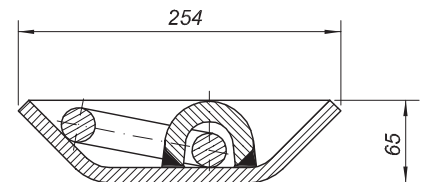
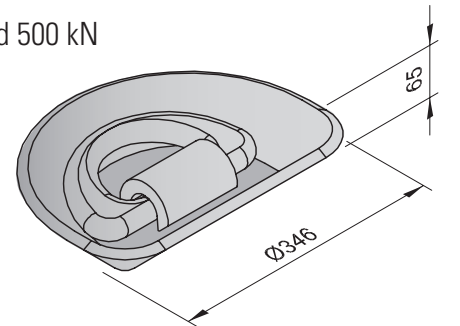
DR-1F

Min. breaking load 500 kN



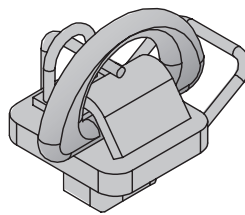
DR-1F/50/IV

Min. breaking load 500 kN

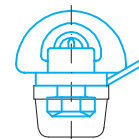


DR-L/45

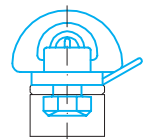
Min. breaking load 450 kN
Hot dip galvanized
~ 12.2 kg



> Application <



FF-...



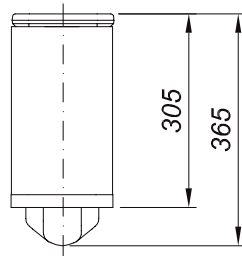
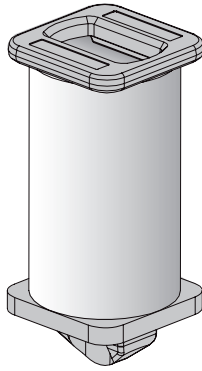
SF-...

Specification

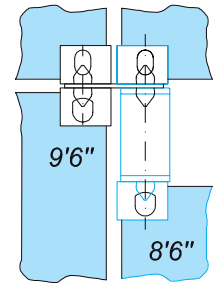
- Approval from any classification society
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Preparation of welding chamfer for fixed securing points on request

High adapters

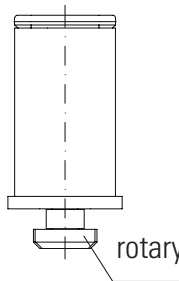
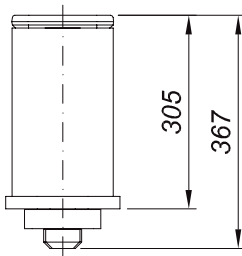
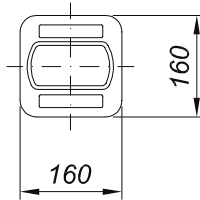
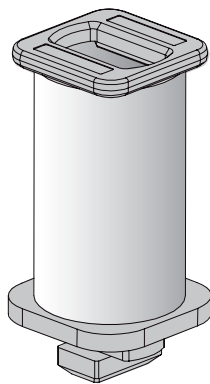
CP-1/TC/305 ~ 19.4 kg



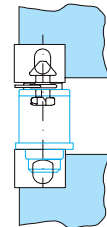
> Application <



CP-1/LT/305 ~ 23.9 kg



> Application <



Compensation pieces or height adapters to be used preferably in holds for levelling of adjacent stacks.

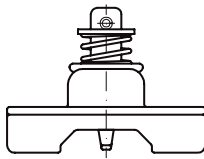
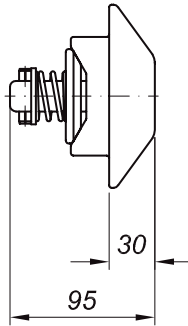
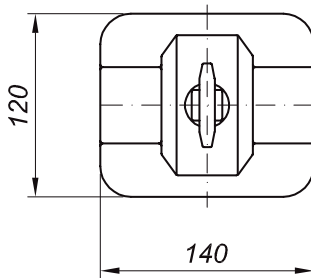
Specification

- When applied in combination with twistlocks compensation piece type CP-1/LT/305 is capable to transmit lifting forces up to 400 kN breaking load
- Approval from any classification society
- Made of high tensile steel
- Standard height is one feet (305 mm) but other heights can be delivered on request

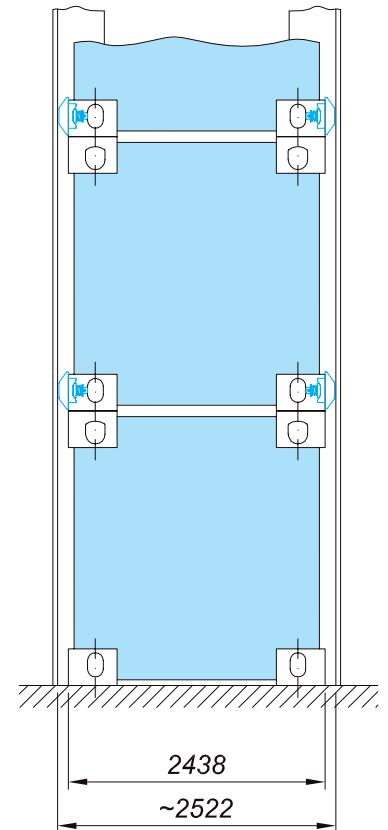
ISO / EURO-adapter pieces



DA-CG/30
~ 3.2 kg



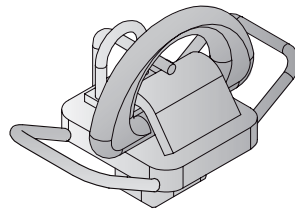
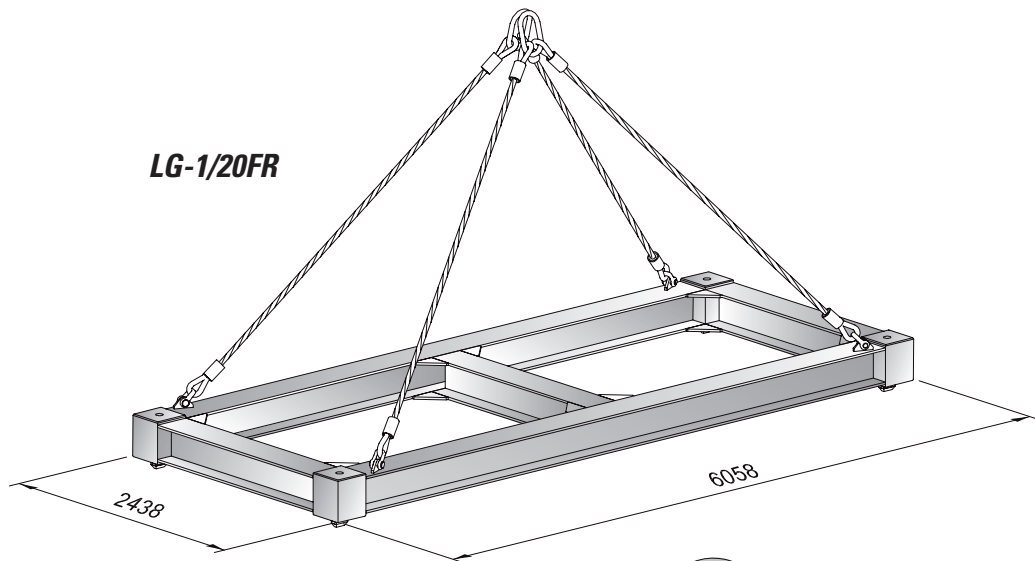
> Application <



Specification

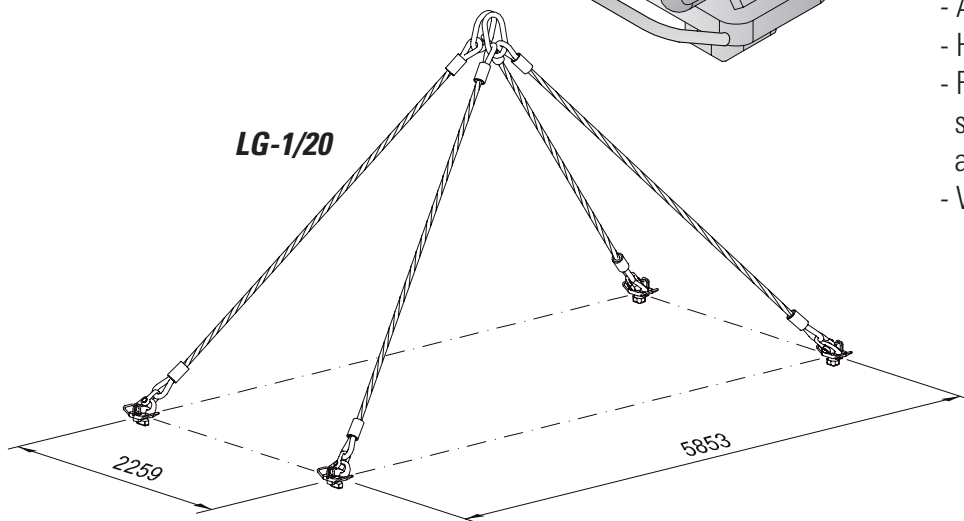
- Adapter pieces for safe loading of ISO-containers within guide angles with increased width suitable for loading of EURO-containers (2500 mm)
- Coning and deconing to be performed on the quayside as requested by OSHA
- Only the lower corners of an ISO-container have to be equipped with adapter pieces. In total four pieces of DA-CG/30 are needed per 40' ISO-container.
- Made of cast steel
- Hot dip galvanised with stainless steel components

Spreader and lifting gear



Removable lifting eye **LGE-50**

- Min. breaking load 500 kN
- Approved for lifting purposes
- Hot dip galvanised
- Fits into all foundations with standardized ISO-hole as well as container corner castings
- Weight ~ 12.7 kg



Description

In addition to container lashing gear SEC supplies 20' and 40' spreaders. Combined designs for twin loading of married 20' containers can be delivered. The SEC spreaders are made-to-measure designs. Options such as working platforms, flippers, etc. can easily be added to basic design. In addition to the standard design with manual operation, SEC provides a semi-automatic version. All spreaders are supplied with class lifting gear certificate as standard. This certificate has to be regularly renewed. Furthermore, any other container related lifting gear is available on request. Please apply for details.

Hatch cover lifting stopper

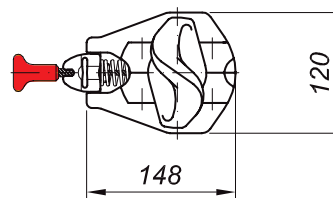
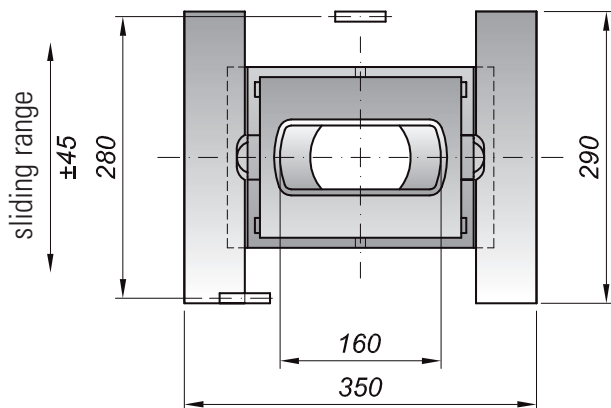
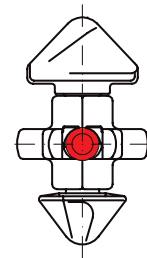
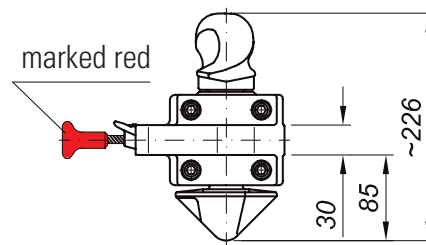
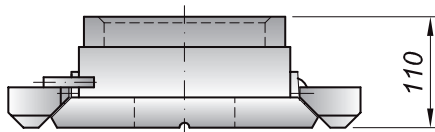
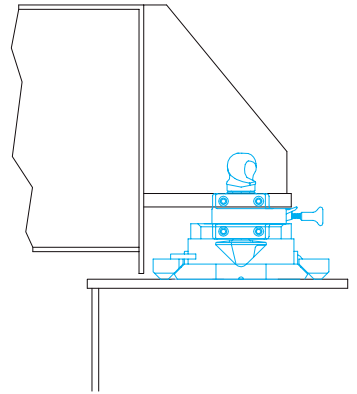


SF-1HSL/160/110/±45



TL-A/HS
~ 7.7 kg

> Application <



PATENTED

Specification

- Min. breaking load tension 800 kN
- Approval from any classification society
- Automatic locking of twistlock when closing panels
- The sliding part of foundation always remains in neutral position due to spring loaded ball pen solution
- Fully forged twistlock in hot dip galvanised execution with stainless steel components
- The foundation can be made to measure according to the individual situation on board as far as necessary sliding range, height, steel grade of conic wedges and surface treatment is concerned

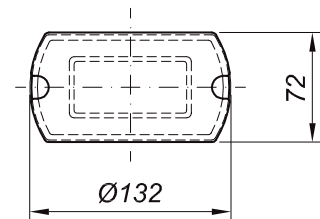
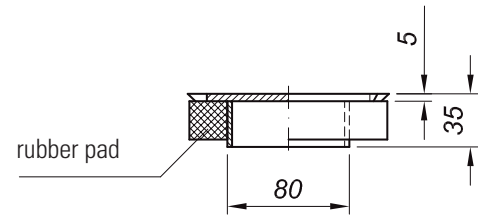
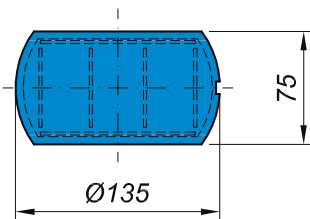
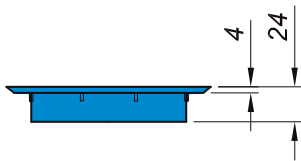
Iso-plugs



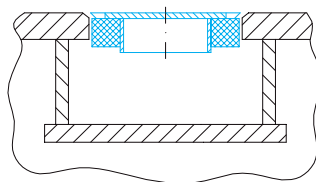
IP-P
~ 0.05 kg



IP-SR
~ 0.45 kg



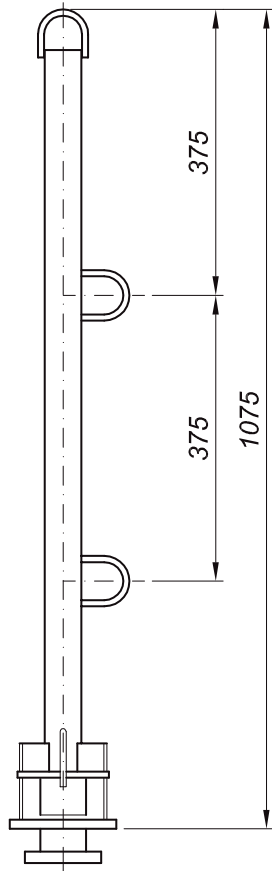
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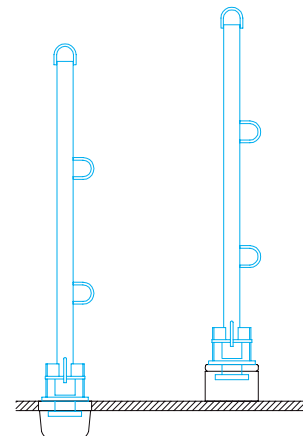
Specification

- As a protection against dirt or when loading grain flush type twistlock pockets can be closed by use of plugs
- Our standard solution is a low cost plastic plug type IP-P
- The luxury version is a metal plug type IP-SR which is hot dip galvanised with rubber sealing
- Also solid rubber version is available

Removable railing post



> Application <



FF-...

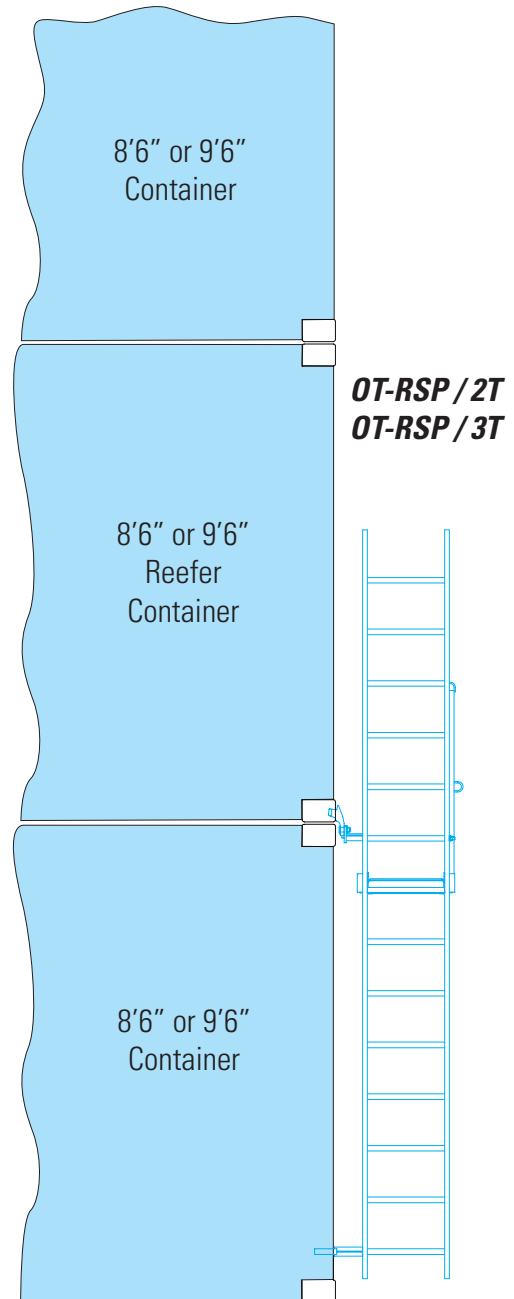
SF-...

For making safe unprotected sides of hatch covers or similar the existing container foundations can be used when fitting SEC movable railing post.

Specification

- Can be used for all foundations with standardised ISO-holes
- Locking function
- Hot dip galvanized
- Light weight design ~ 9.5 kg

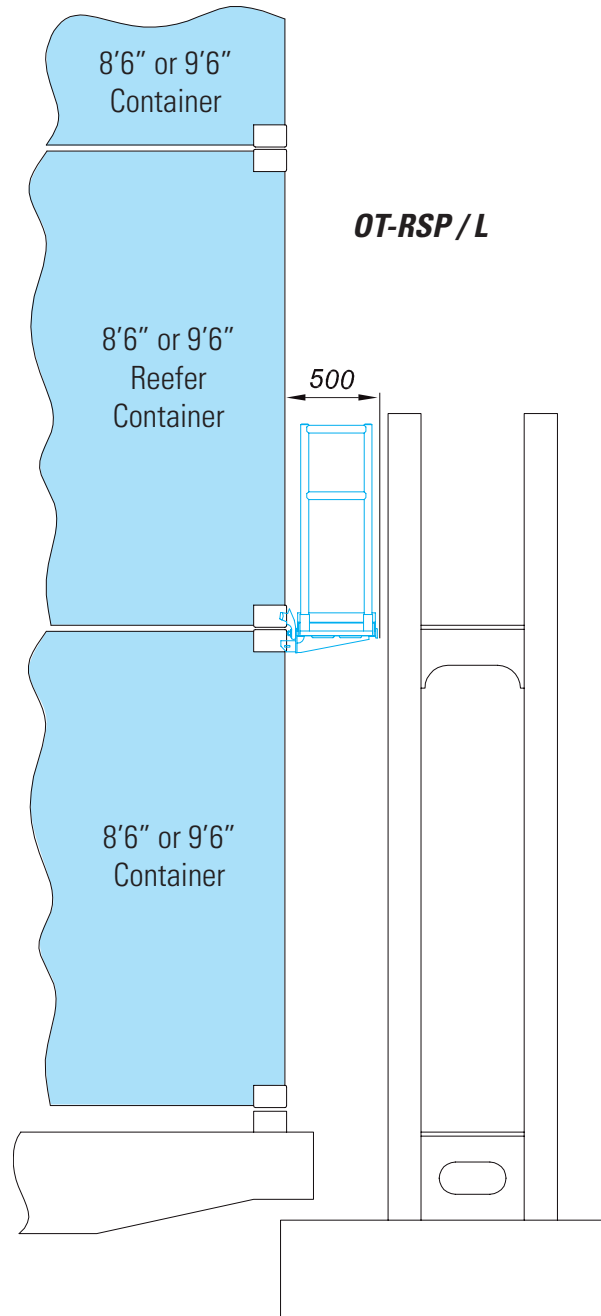
Removable reefer platforms



Specification

- Light weight design
- Large parts such as ladders and platforms made of aluminium. Remaining parts are hot dip galvanised.
- One man operation
- Foldable
- Available for 2nd, 3rd or even 4th tier

Removable reefer platforms



Specification

- Removable reefer platform for various application, for example in combination with lashing bridges.
- Light weight design
- Large parts such as platforms made of aluminium. Remaining parts are hot dip galvanised.
- One man operation
- Foldable hand rail

Design & engineering part

8

DESIGN & ENGINEERING PART

- 8.1 SEC consultancy
- 8.2 SEC design
- 8.3 - 8.4 Lashing bridges
- 8.5 Reefer stages
- 8.6 Lashing stages
- 8.7 Container deck stanchions
- 8.8 Cellguides
- 8.9 Slim cellguides
- 8.10 Deck cellguides
- 8.11 Removable cellguide systems
- 8.12 Cellguide stoppers
- 8.13 Container blind trestles

SEC Consultancy



When planning a newbuilding it is essential to consider the securing and handling of cargo from the very beginning. As earlier taking care of cargo securing/handling as better is the chance to influence ship's layout to improve cargo securing/handling. At later design stage many dimensions can not be changed any more and often tremendous disadvantages have to be accepted for cargo securing/handling. No matter if general cargo, timber, RoRo or especially containers are concerned the project engineers of SEC can work out an optimised solution for the cargo. A large range of subjects has to be considered for cargo securing/handling, such as:

- Optimised lashing system for the requested stackloads on deck under consideration of acceleration from classification society depending on ship size and GM value.
- Maximum stackload for 20' containers which can not be lashed at both ends.
- Maximum number of tiers especially at outermost positions where containers are exposed to wind forces in order to keep the guaranteed TEU capacity.
- Latest requirements from OSHA, AMSA, US Coast Guard, ISO, IMO, national safety authorities etc.
- Optimised arrangement of lashing plates in relation to containers for unrestricted loading of 8'6" and 9'6" containers with unified lashing length.
- Interference of loose lashing gear with hatch cover entry guides, crane pedestals or adjacent stacks.
- Stowage possibilities for special container sizes others than ISO, for example 30', 45', 48', 49' & EURO containers.
- Best securing solution for containers in hold depending on requested stackloads, loading flexibility and OSHA conformity.
- Design parameter, for example necessary spaces for the arrangement of lashing bridges and removable cellguides, levelling of tank steps in hold, strengthening of longitudinal bulkhead and arrangement of counter bearings for transversal stowage systems.
- Arrangement of sliding foundations for compensation of hatch cover movements with necessary sliding range and direction in co-operation with yard and hatch cover designers.
- Transversal spaces between containers considering deflection of hatches or minimum breadth of guide angles.
- Longitudinal arrangement of containers, for example symmetrical or asymmetrical arrangement of 40' containers when two 20' stacks are stowed with lashing gap in between or in combination with other container sizes.
- Advantages/disadvantages of different types of foundations, i. e. raised ISO, dovetail or flush foundations, welding plates or guide fittings.
- Necessary spaces and stowage factors for loose lashing gear.
- Acting forces on bulkheads, container stanchions, lashing bridges etc.
- Necessary spaces and safety requirements according CSS code (IMO 1352).

SEC design

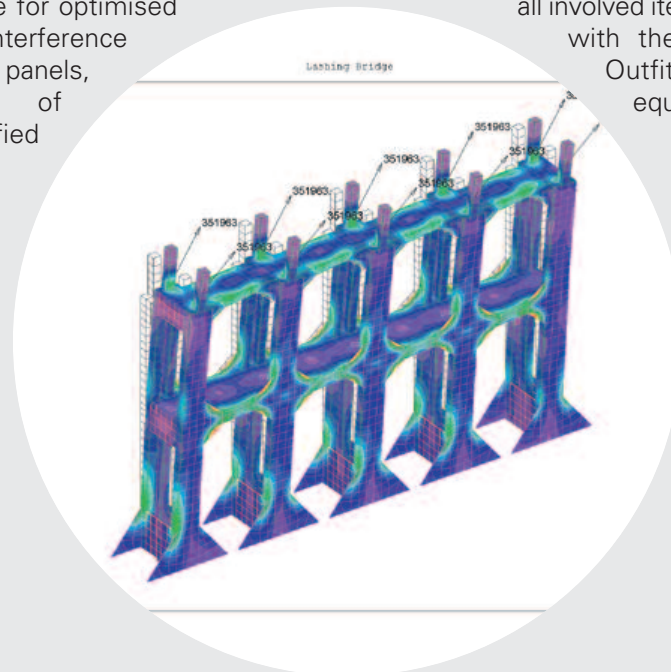
A separate department inside SEC takes care about all kinds of container related design parts for ships as shown on the following pages. Our design office is equipped with the latest CAD programs by AUTODESK namely AutoCAD, Mechanical Desktop and Inventor.

Strength analysis is performed by Finite Element Method (FEM) using ANSYS. Drawing transmission by e-mail is possible in all kinds of common file formats, i. e. dxf and dwg. Large files can be downloadet from SEC exchange server.

Different levels of design can be offered starting with principle layout drawings to detailed manufacturing drawings with complete outfitting. In order to avoid misunderstandings we would like to precise our definition of different design levels:

1.) Layout Level

Principle Layout shows typical situations i. e. at midship section with the principle arrangement of the concerned design part. These drawings to be used as a base for further design levels. An example could be the principle arrangement of lashing plates at lashing bridge for optimised lashing of containers, interference check with hatch cover panels, parking position of turnbuckles and unified lashing length.



2.) Design Level

a) Typical situation only

Principle Design consists of main steel structure with dimensioning based on the result of our FE calculations but without measuring any details. The principle arrangement of necessary reinforcements at the hull will be indicated but dimensioning of such stiffeners to be done by hull designers. An example is the arrangement and dimensioning of typical container stanchions at ship sides.

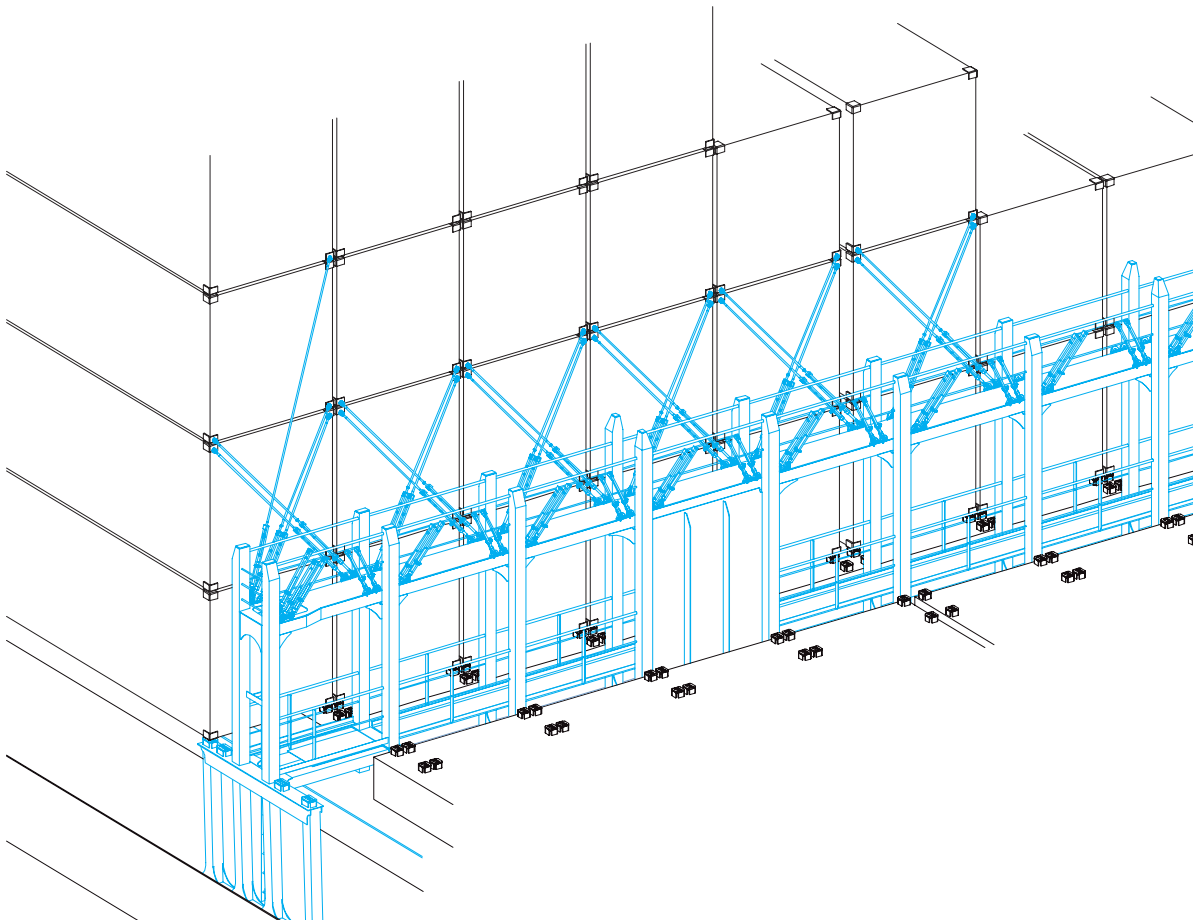
b) Complete design

Same as before but for all situations on board which are different, for example the arrangement and dimensioning of main steel structure for all container stanchions on deck.

3.) Manufacturing Level

We will prepare a complete set of manufacturing drawings with detailed measuring including welding details for each individual item ready for production. Manufacturing drawings normally will include complete outfitting with working platforms, railings, ladders, access lids, gratings, light housings and what ever might be necessary. Material tables listing all involved items will be provided together with the corresponding drawings. Outfitting with electrical equipment can not be offered.

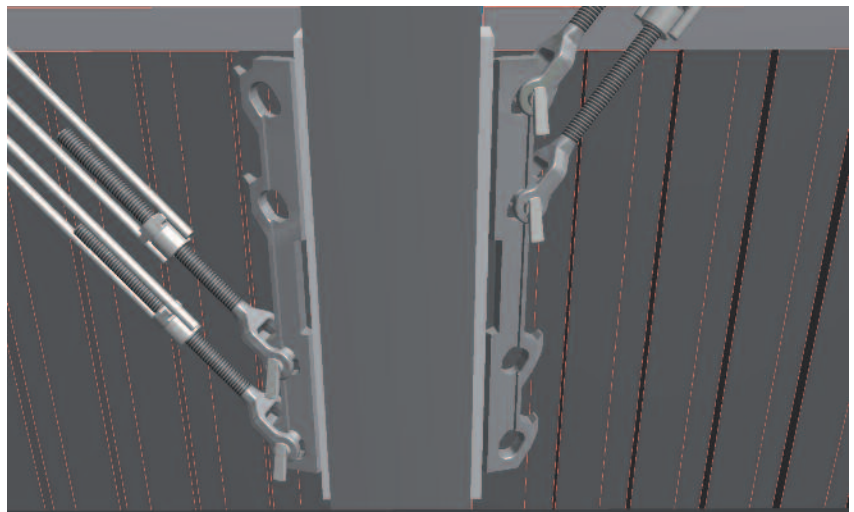
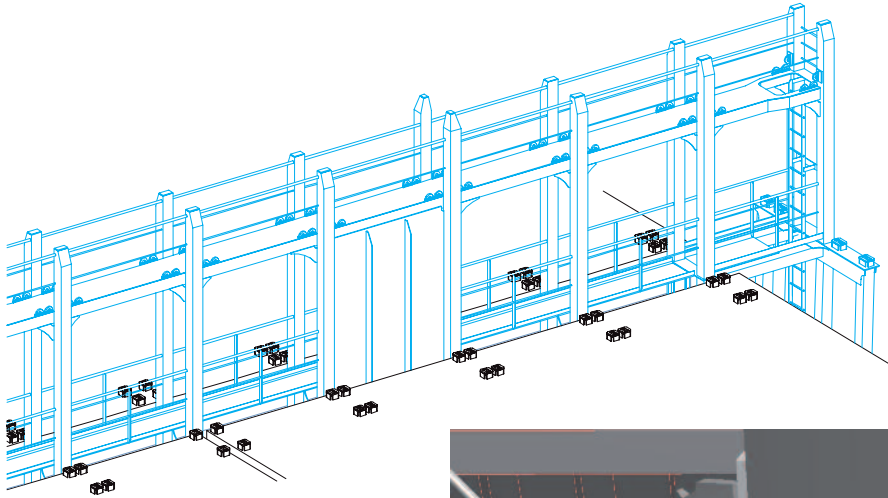
Lashing bridges



Description

When the requested stackload for 40' containers is exceeding the limit of approx. 100 tons lashing from hatch cover level might no longer be sufficient. For this reason lashing bridges are installed between 40' hatches in order to realise more effective support by the lashings. Higher container weights can be realised in the upper tiers while the lashing system can be simplified, i. e. double cross short lashing system (Para-Lash) to be used for 40' containers from lashing bridge level. Heavy and unhandy long lashing bars should not be used except at some outermost stacklocations. The installation of lashing bridges does not have any effect on 20' stackloads because 20' containers still have to be lashed from hatch cover level at midhatch position. The possibility to stow non-standard containers others than 20'/40' ISO containers is restricted. For example 45' containers can be loaded on top of two tiers 40' containers otherwise they would interfere with the lashing bridge structure. Alternatively the length of hatch covers can be increased and additional foundations for 45' containers to be arranged. It has to be kept in mind when elongating the hatches lashing operation of 40' containers will become more difficult due to increased gap between lashing bridge and 40' container end. Depending on the required stackload and number of tiers the height of lashing bridges can be increased so that the uppermost walkway is in line with top of 1st, 2nd or even 3rd tier containers. Stackloads up to 200t can be realised for 3-tier high lashing bridges in combination with external lashings. It should be noted when increasing the height of lashing bridges 3-tier high or more no longer the adjusting range of turnbuckles is sufficient to ensure unrestricted loading of 8'6" and 9'6" containers below lashing level. For this reason SEC has developed a special lashing plate with multiple holes for easy shifting of turnbuckle to higher position for lashing of high cube containers.

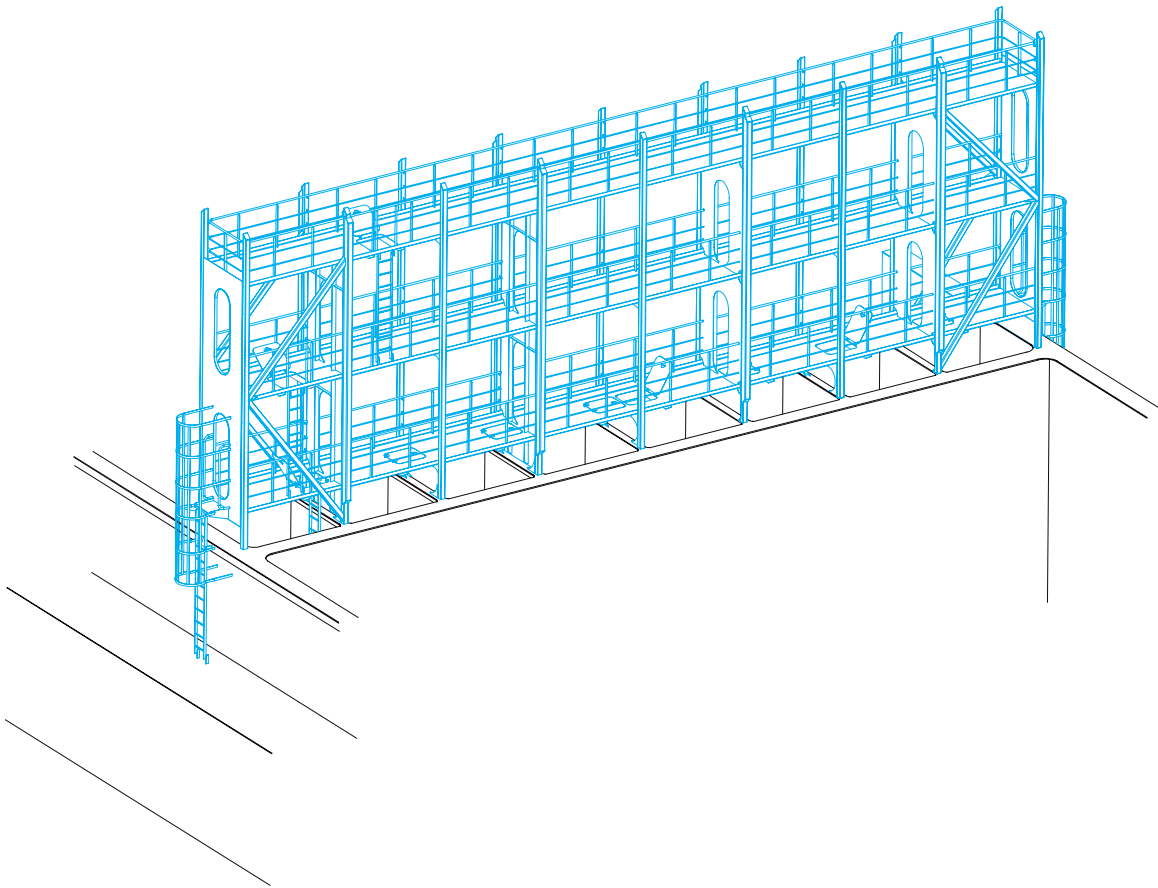
Lashing bridges



Another positive effect of lashing bridges is easy access to reefer containers. Many subjects have to be considered when designing a lashing bridge:

- At first the layout of transversal hold beam has to be checked together with yard and hatch cover designers considering guiding system of hatch cover panels, arrangement of bearing pads and lifting stoppers, sliding range of hatch covers due to ship's torsion, installation tolerances, minimum breadth of walkways, strength of lashing bridge etc.
- The longitudinal gap between lashing bridge and container end to be minimised therefore all containers should be arranged symmetrically on hatch covers.
- Also at this stage the arrangement of reefer sockets and parking positions for loose lashing gear has to be considered.
- Next thing is the optimised arrangement of lashing plates on lashing bridge in order to ensure unified length of lashing rods. Preferably fixed lashing plates are used on lashing bridges instead of slewing eyes because of lower costs and no maintenance work.
- Vibration analyses can be carried out on request.

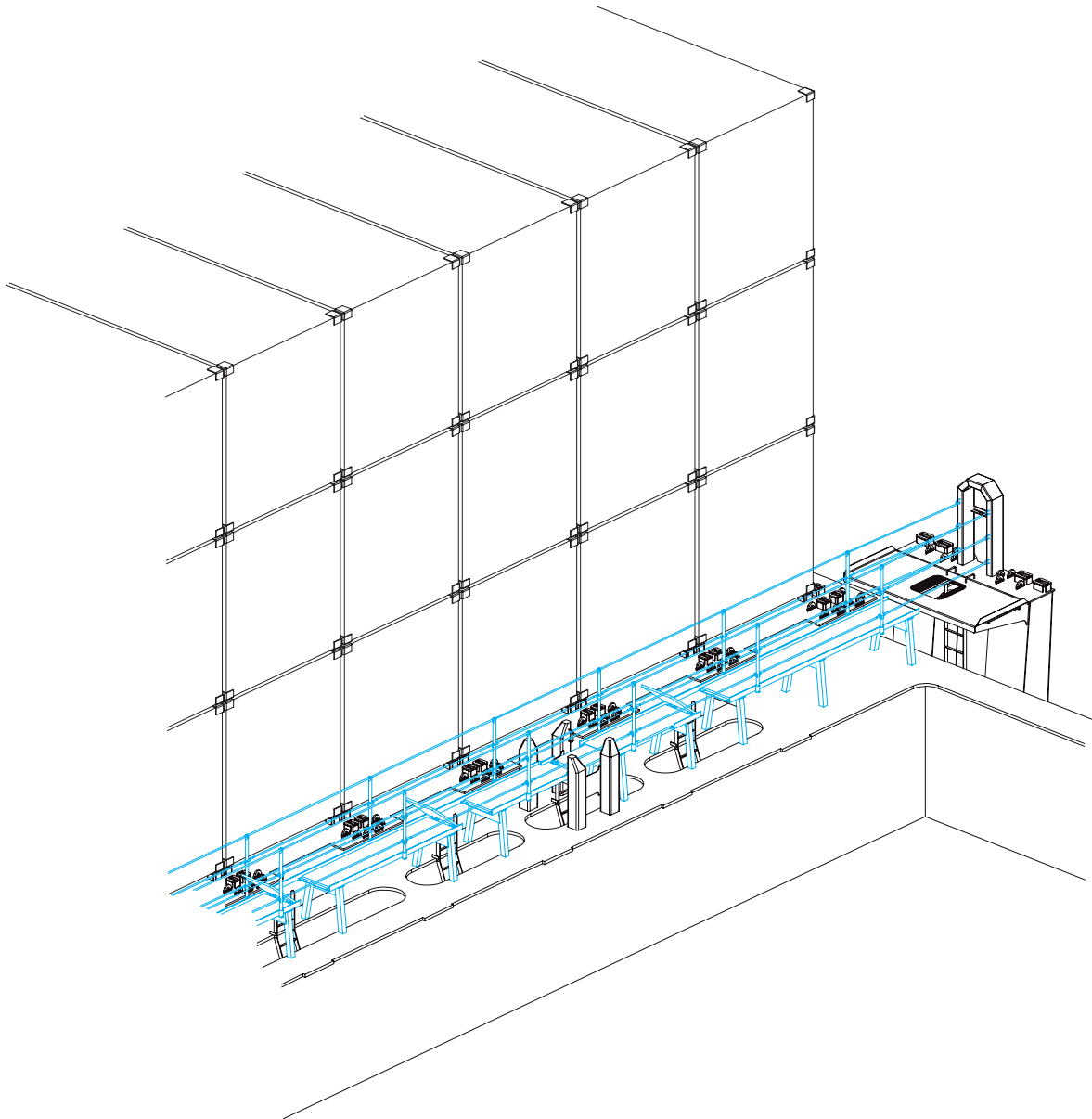
Reefer stages



Description

Fixed installed service stages for reefer containers are a perfect solution for easy surveillance, service and maintenance of reefer containers even at higher tiers. The design is tailor made to accommodate the exact situation on board depending on the requested number of tiers and rows of reefer containers. The light weight steel structure should be strengthened to absorb bumps from containers and hatch cover panels during operation. Guiding system for hatch covers can be integrated on request.

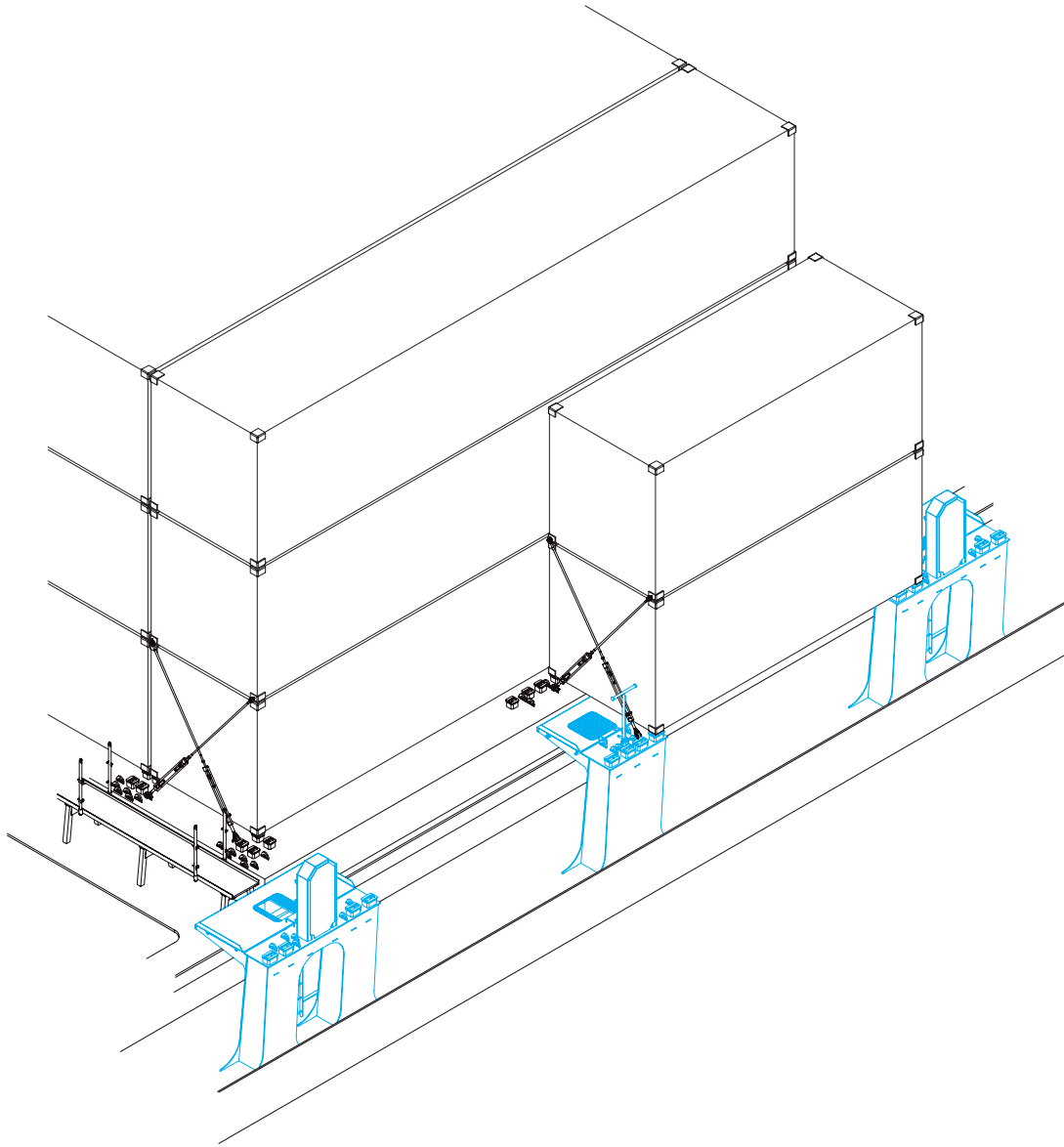
Lashing stages



Description

Using the transversal hatch coaming as working platform for container lashing is very inconvenient for stevedores especially when there are many installations on top such as ventilation housings, hold down devices etc. For this reason it is recommended to install lashing stages at hatch cover level which will make lashing operation much easier. A perfect solution for the lashing stages is when they cross the whole breadth of vessel with direct access to the container stanchions at both sides of the ship. When the holds are open a removable railing system should be integrated to the lashing stages for safety reason.

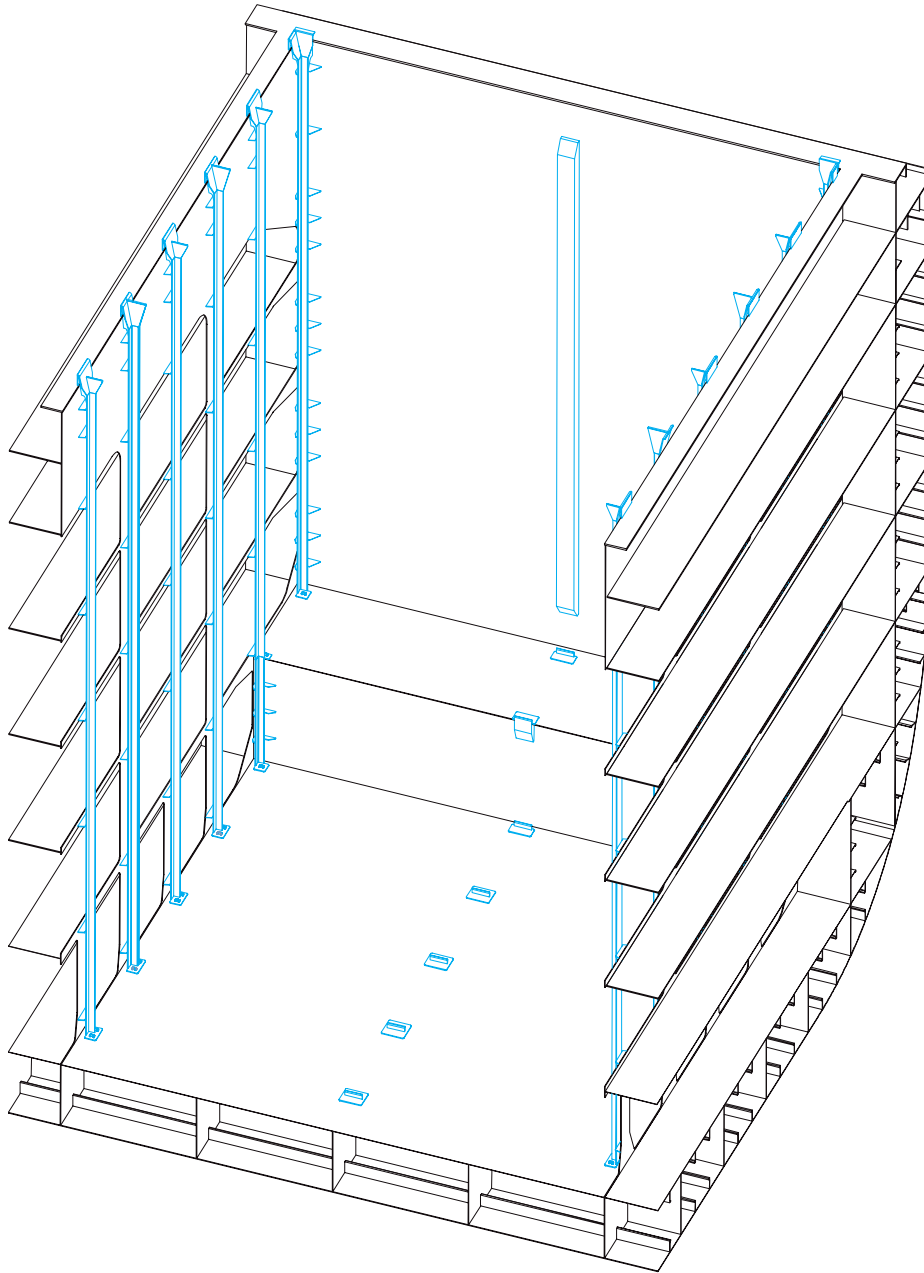
Container deck stanchions



Description

The amount of design hours for container deck stanchions can vary quite a lot from pure strength analysis with FEM and dimensioning of main steel structure to manufacturing drawings with complete outfitting such as working platforms, access lids, ladders and railings subject to demand.

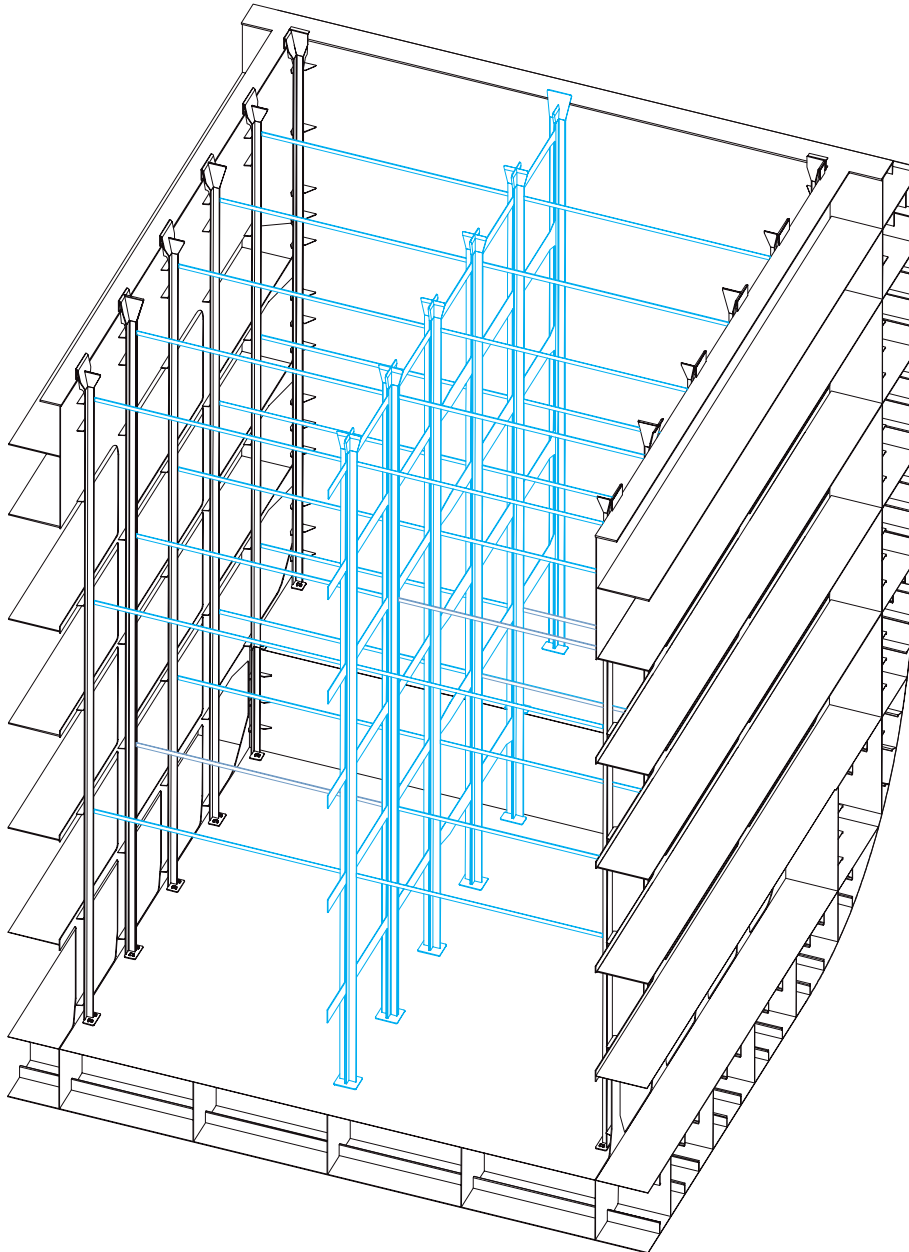
Cellguides



Description

The installation of fixed 40' cellguides is a standard solution for ships which are exclusively designed to carry containers. Vertical guide angles are attached to the transversal bulkheads with entry guides at the upper end in alternating high peak / low peak arrangement to speed up loading time. No loose securing fittings are needed for securing of 40' containers and various securing solutions can be applied when loading two 20' containers in a 40' cell depending on customers preference concerning stackload versus OSHA requirements.

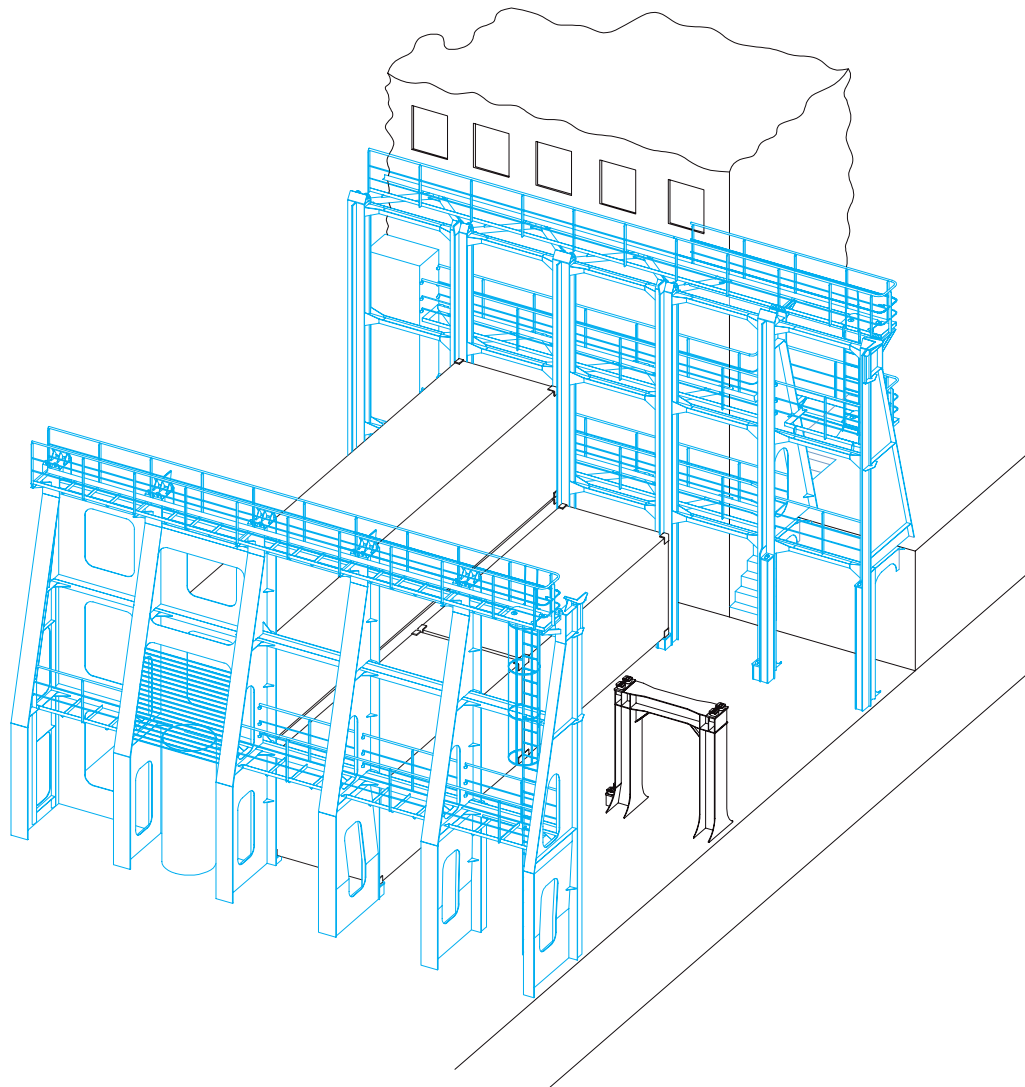
Slim cellguides



Description

Container vessels which frequently have to carry a large amount of heavily loaded 20' containers sometimes are equipped with slim cellguides which are fitted into the 76 mm ISO gap of a 40' cellguide system. Slim cellguides are fixed in longitudinal and transversal direction to transmit forces from container loading into the hull structure. No loose securing fittings are needed at all therefore this system fully complies to OSHA regulations but still allows unrestricted stackloads. No need to mention that exclusively 20' containers can be loaded when slim cellguides are installed. Due to its extreme narrow design slim cellguides are so weak that they normally cannot be made removable.

Deck cellguides

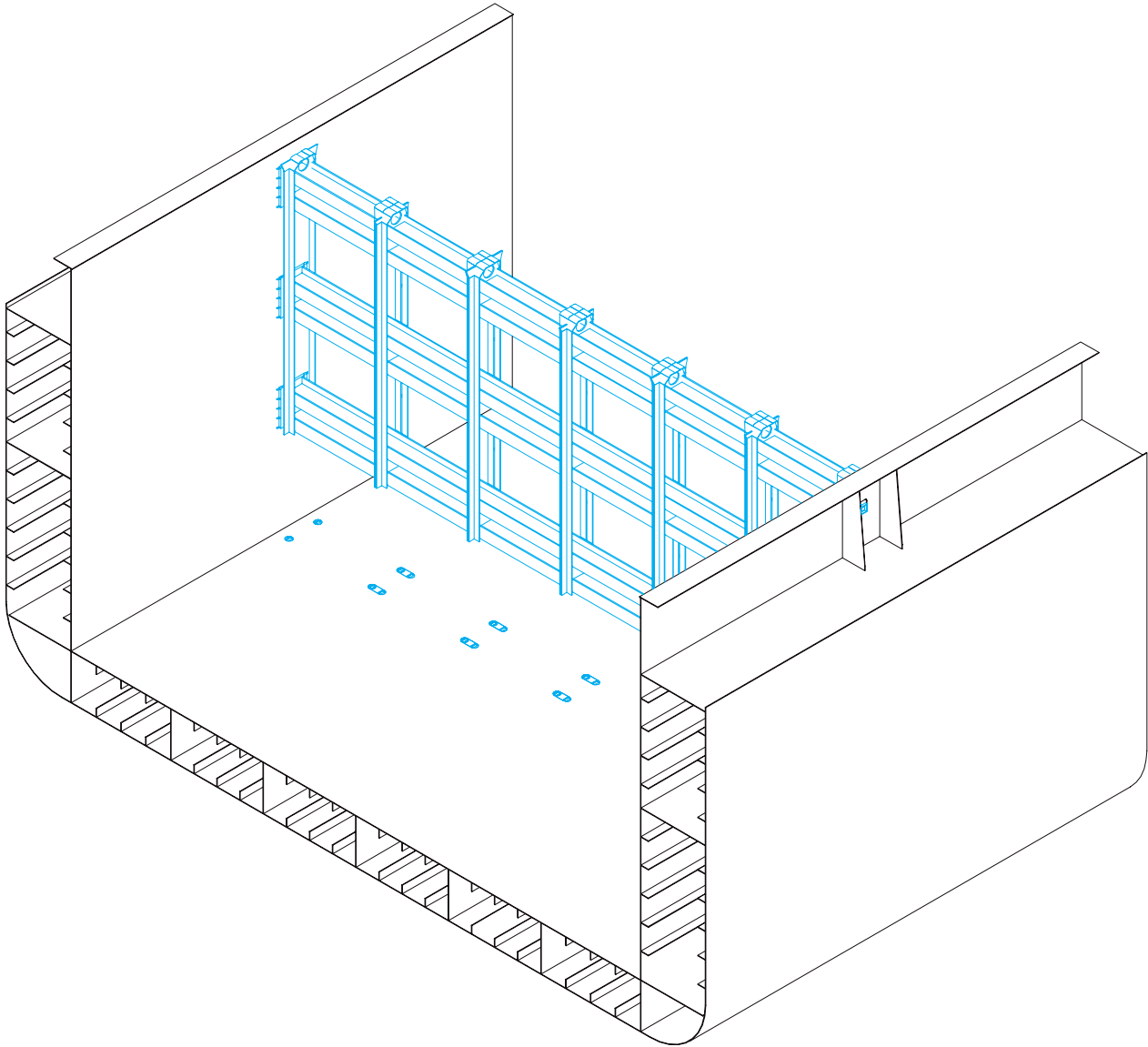


Description

In order to achieve maximum stackweights with a minimum amount of loose fittings the installation of deck cellguides can be an option. When integrating walkways in the deck cellguides easy access to (reefer) containers is another positive effect. A perfect deck cellguide should reach approx. to the lower third of the uppermost container tier and should be exclusively used for one container size, i. e. 40' containers. In this case no loose securing fittings are needed at all and maximum stackloads can be achieved. Container tiers which are exceeding the guide angles have to be secured by vertical lashing bars in order to absorb lifting forces and additional diagonal lashings to be arranged if

heavy containers to be loaded above entry guide level. Loading of high cube containers has to be restricted due to limited adjustable range of turnbuckles. Securing of 20' containers within 40' deck cellguides should be avoided because of many different fittings are needed for fulfilling OSHA regulations.

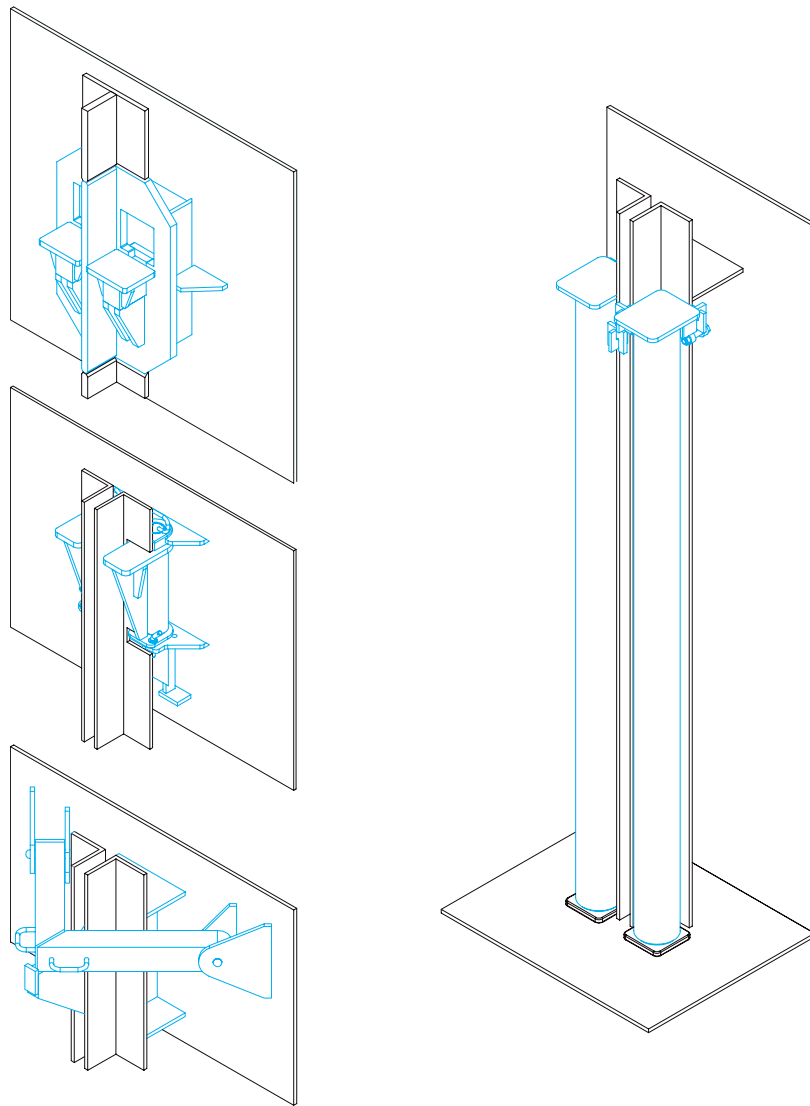
Removable cellguides systems



Description

In case of multi purpose container vessels the loading of other cargoes than containers is disturbed when fixed cellguides are installed. When making the cellguides removable the cargo holds can be used more flexible for other cargoes when parking the cellwall close to the bulkhead. Alternatively the cellguides can be shifted in longitudinal direction to facilitate loading of different container sizes, i. e. 20', 30', 40' or 45'. The cellwall is fully self-sustained with counter bearings at the longitudinal bulkhead. The application of removable cellwalls is limited to a maximum hold breadth of approx. 7 to 8 containers across otherwise the steel weight of the cellwall might exceed the lifting capacity of ship cranes. As an option the removable cellwall can be designed as grain bulkhead.

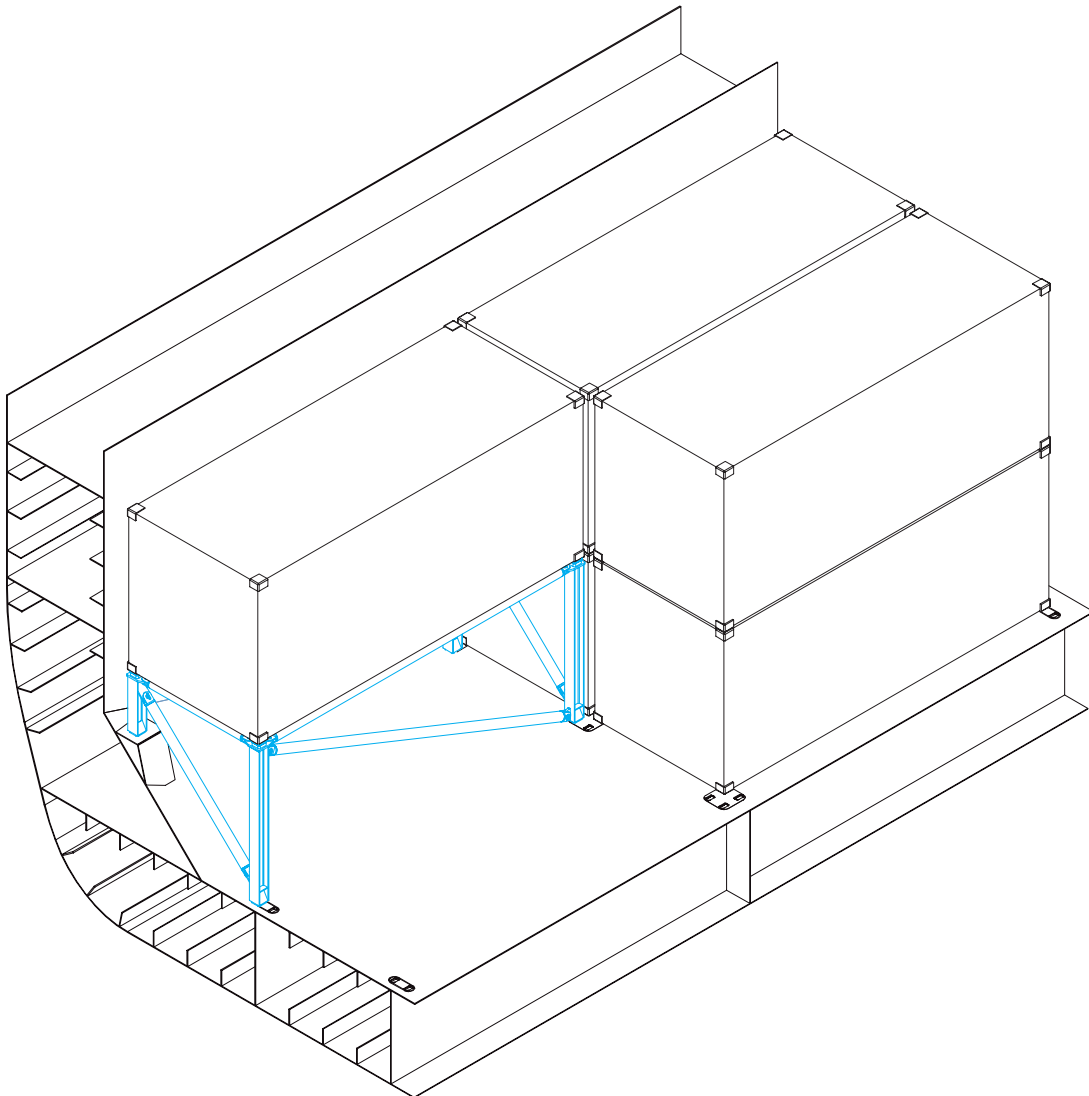
Cellguides stoppers



Description

There are several reasons for integrating vertical stoppers in the cellguides. In the area of inclining hull form with 20' tanksteps the installation of cellguide stoppers do allow loading of 40' containers even when there are no 20' containers available for lowermost position. Vertical stoppers can be integrated at certain level in the cellguides so that non-standardized cargoes can be loaded on tanktop while 40' containers can be stowed above. In case of large container carriers and especially open top container vessels with more than nine tiers on top of each other the stackloads have to be limited because the corner post compression of the lowermost container might be exceeded. Many different solutions for stoppers have been realised depending on customers preference and situation on board. It should be mentioned that stanchion type stoppers are transmitting vertical loads directly into tanktop structure while all other types of stoppers do require large reinforcements to absorb vertical loads.

Container blind trestles



Description

Especially for multi purpose vessel which carry containers only in exceptional cases it might be unfavourable to install tank steps in accordance with ISO container dimension at positions where the hull form is inclining. For such vessels container blind trestles are the best choice for maximum container intake and easy securing solution. The blind trestles can be designed in fixed or removable execution.

Fixed Fittings

9.1 - 9.2 Lashing points for trucks / trailer

9.3 - 9.5 Lashing points for cars

9.6 Combined lashpots

9.7 Lashing chains

9.8 Speed winch

Loose Fittings

9.9 Spanners for chains

9.10 Trailer horses

9.11 Wheel chocks

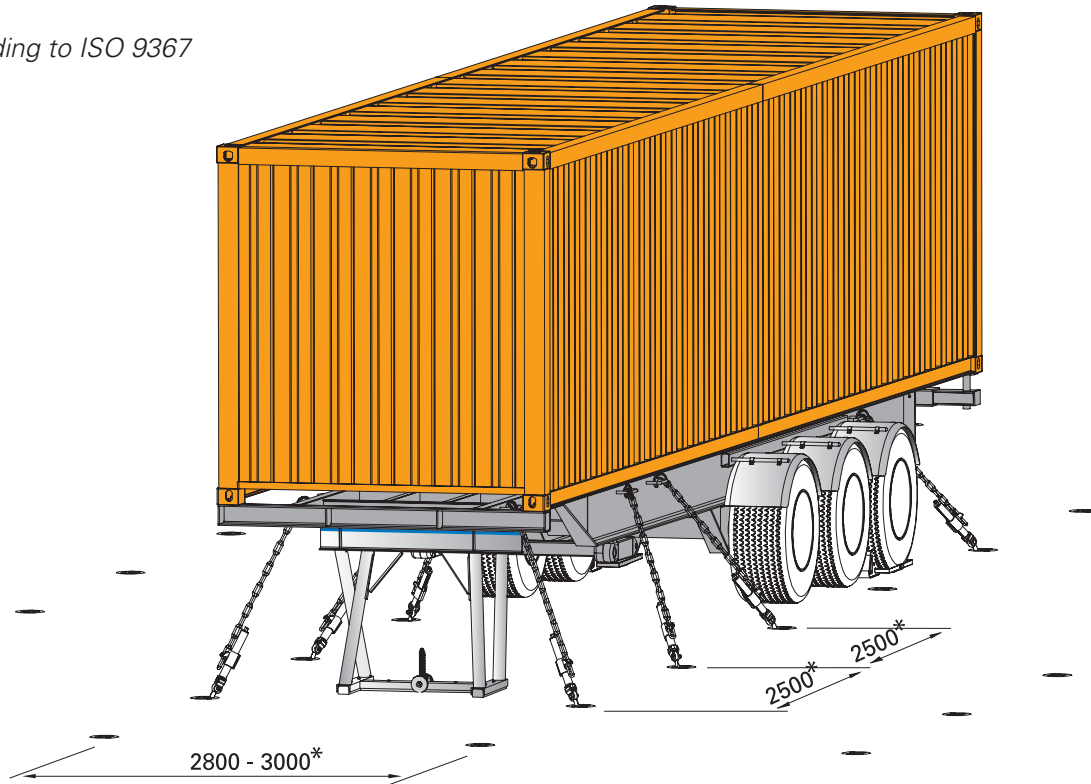
9.12 Web lashings for light vehicles

9.13 - 9.14 Web lashings for medium weight vehicles

9.15 Web lashings for heavy vehicles

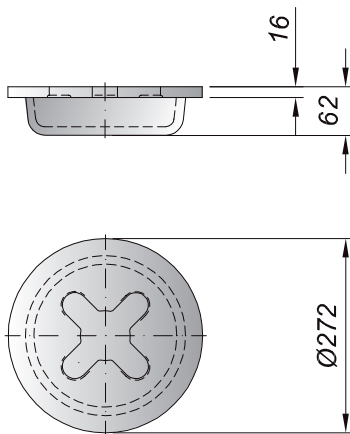
Lashing points for trucks / trailer

* according to ISO 9367



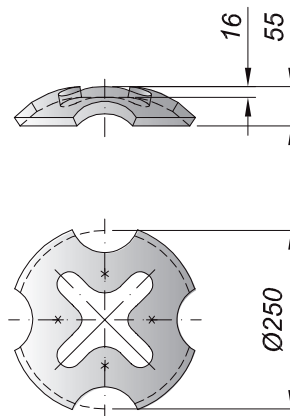
Flush Lashpots

LP-E-F/R4X/272x16/III

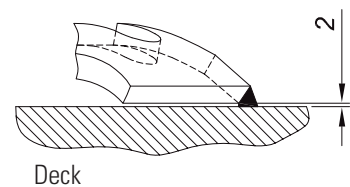


Raised Lashpots

LP-E-R/R4X/268x16/PM



Welding recommendation

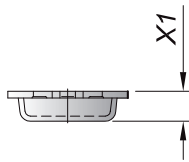


Specification

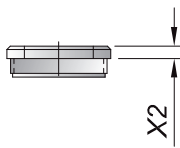
- Min. breaking load tension 200 kN
- Approval from any classification society
- Standard height 55/62 mm
- Thickness of top plating 16 mm
- Top plate with punchmarks for easy installation
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Counter parts are elephant foot or hook

Lashing points for trucks / trailer

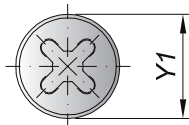
Options and variations for flush lashpots



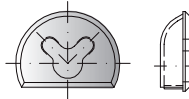
- Variation of height



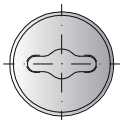
- Variation of thickness of top plate



- Variation of size of top plate



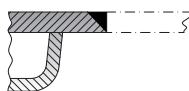
- Half type for narrow positions close to bulkheads



- 2-hole type

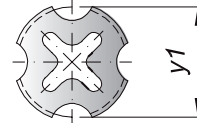


- Special surface treatment as specified by customer, for example final paint inside excluding welding area

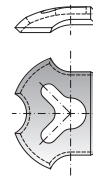


- Variation of chamfer upon request; please compare to chapter 4.4

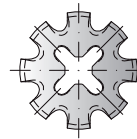
Options and variations for raised lashpots



- Variation of size

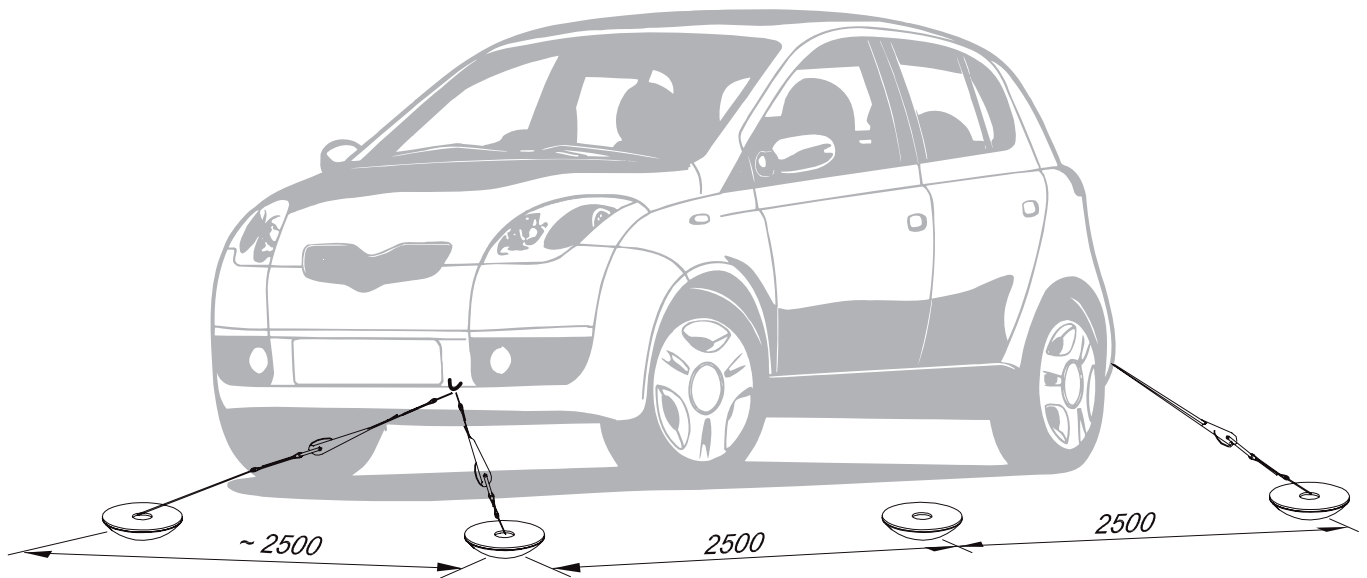


- Half convex type for welding directly against bulkheads or pillars



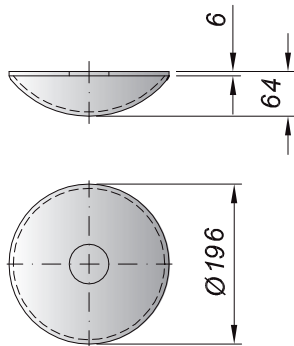
- Aircraft securing type

Lashing points for cars



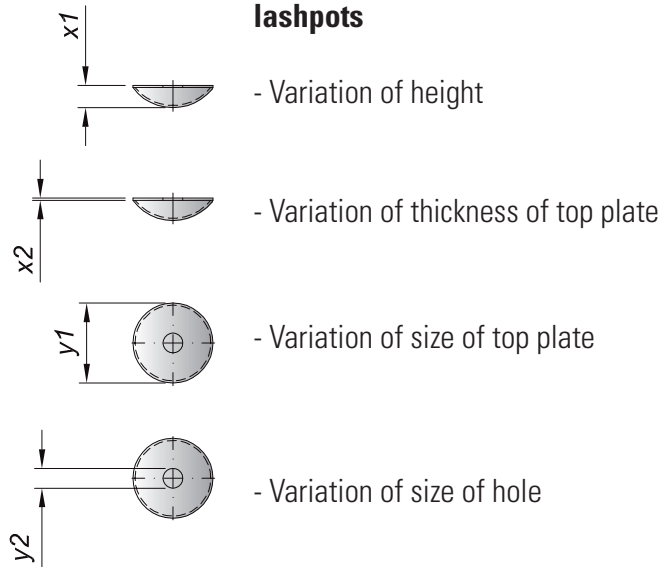
Flush Lashpoints

LP-H-F/PL196x6/CUP196x6/III



- Variation of chamfer upon request;
please compare to chapter 4.4

Options and variations for flush lashpots

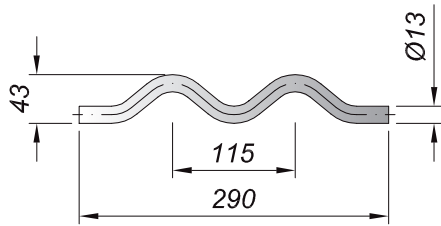


Specification

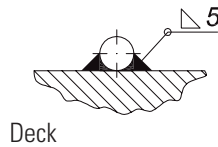
- Min. breaking load tension 60 kN
- Approval from any classification society
- Standard height 64 mm
- Thickness of top plating 6 mm
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Counter part is hook

Lashing points for cars

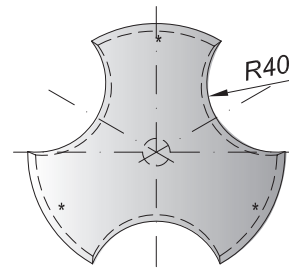
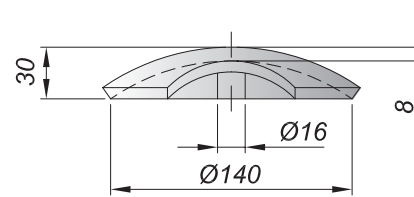
Crinkle Bar
LAF-CB/2



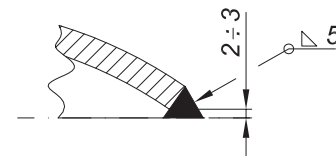
Welding recommendation



Baby Elephant Foot
LP-H-R/150x8/PM



Welding recommendation



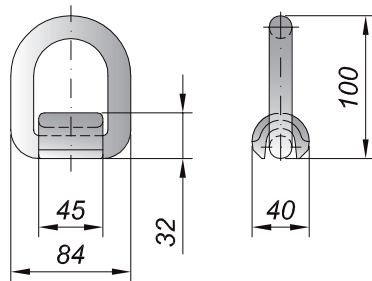
Specification

- Min. breaking load tension 2 x 30 kN for crinkle bar resp. 100 kN for baby elephant foot
- Approval from any classification society
- Weldable inorganic zinc or epoxy shop primer
- Made of high tensile steel
- Counter parts are car lashing units with hook end

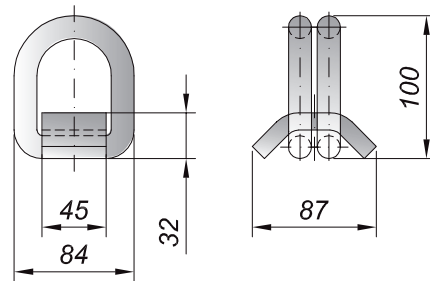
Lashing points for cars

D-Rings

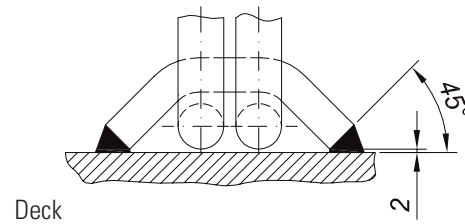
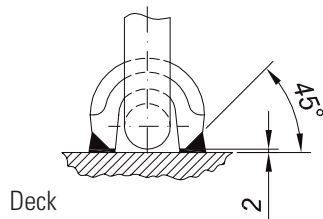
DR-1/15



DR-2/15



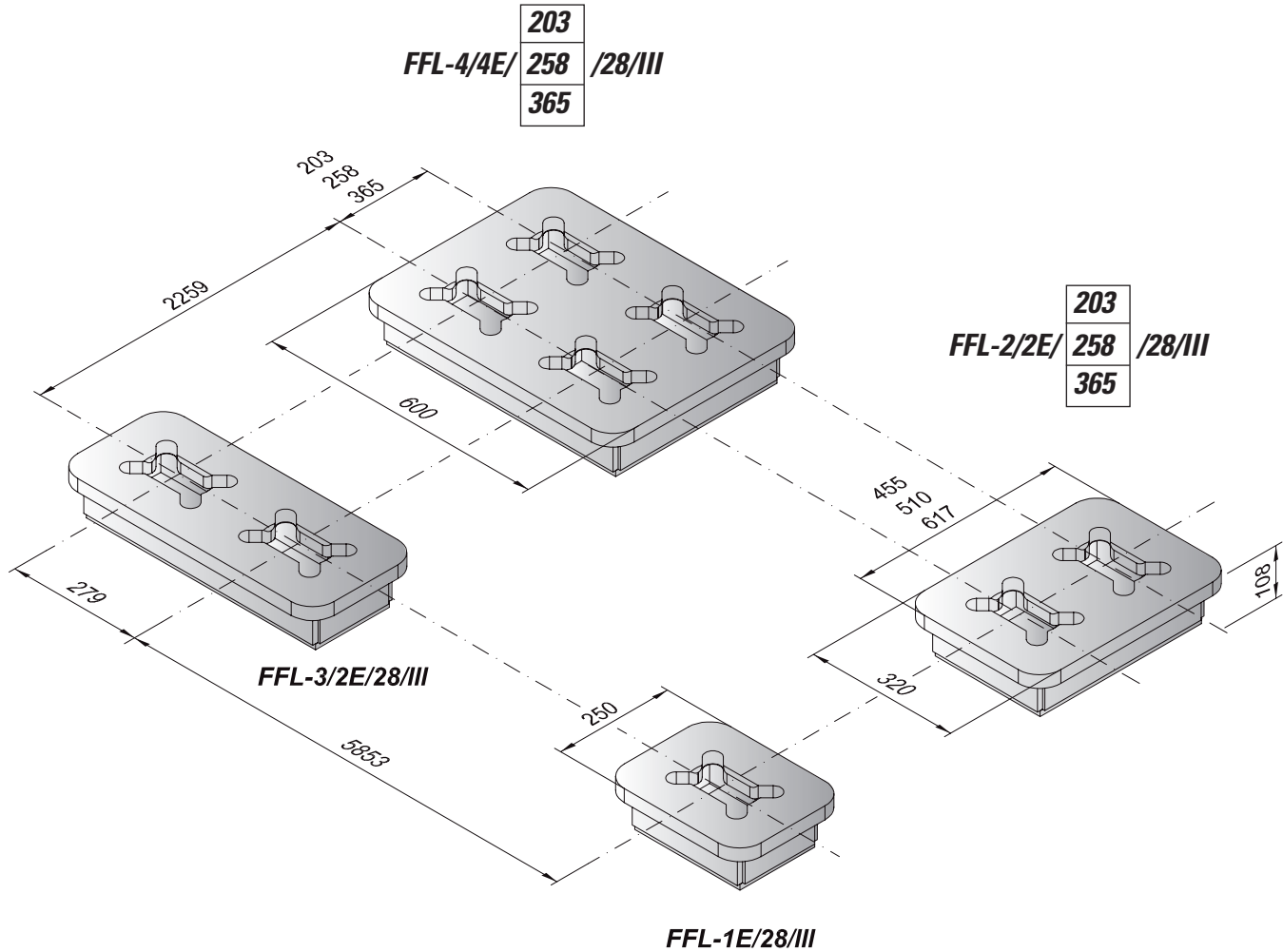
Welding recommendation



Specification

- Min. breaking load tension 150 kN
- Approval from any classification society
- Welding chamfer
- Drop forged D-ring and welding bow
- Made of high tensile steel
- Weldable inorganic zinc or epoxy shop primer
- Counter parts are turnbuckle, hook, shackle or car lashing

Combined lashpots



- Variation of chamfer upon request; please compare to chapter 4.4

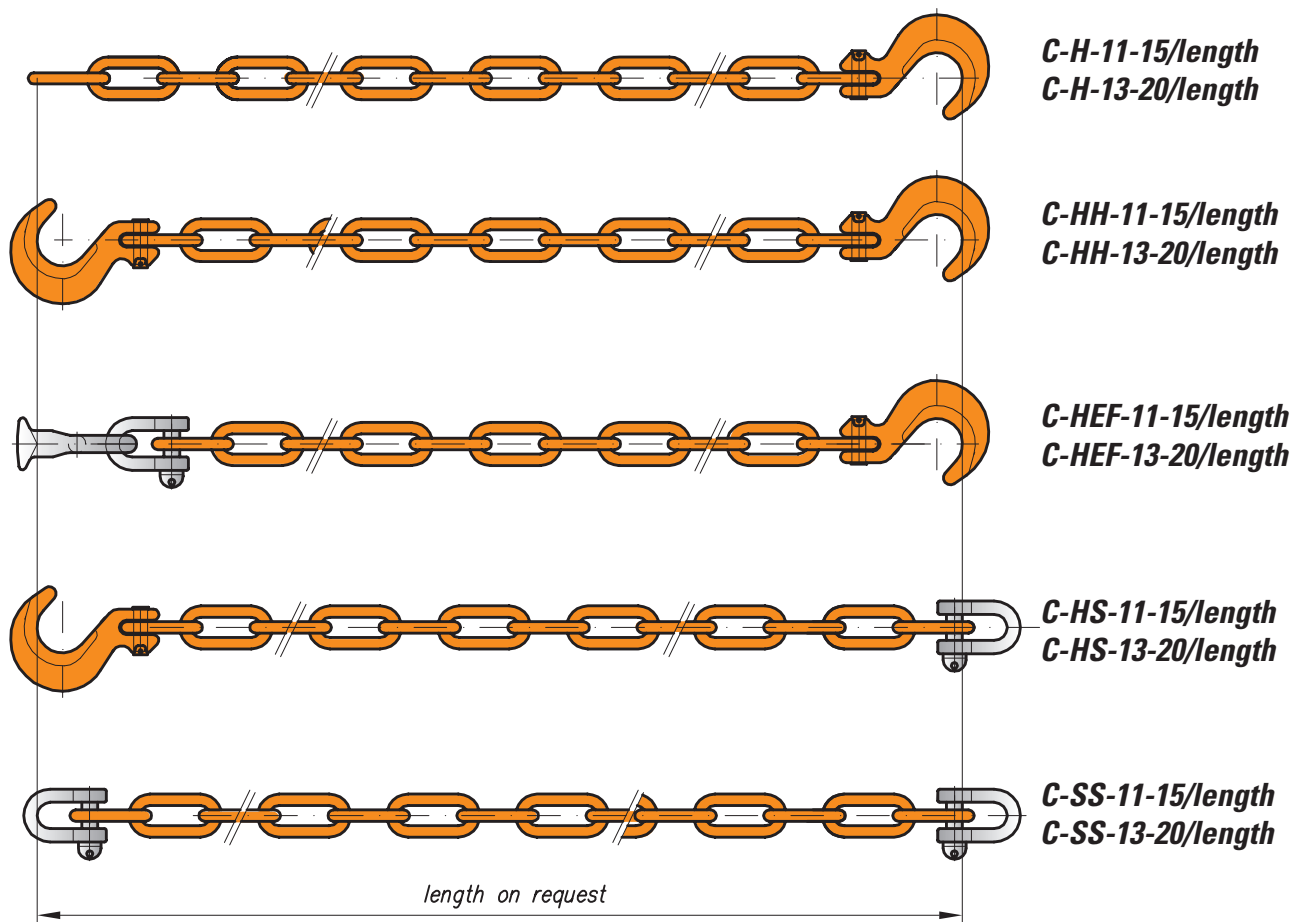
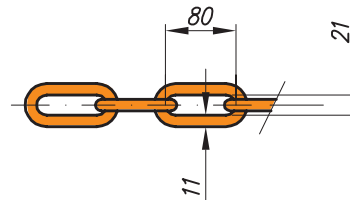
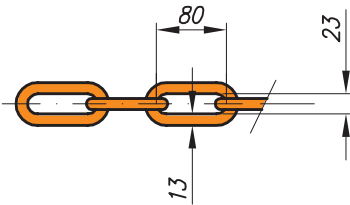
Specification

- Min. breaking load tension 500 kN
- Approval from any classification society
- Thickness of side plating 12 mm
- Topplate with punchmarks for easy installation
- Standard distance for double foundations 203/258/365 mm
- Weldable inorganic zinc or epoxy shop primer
- Counter parts are twistlock or elephant foot

Lashing chains

Chain size 13
Breaking load: 200 kN
Weight: ~2.9 kg/m

Chain size 11
Breaking load: 150 kN
Weight: ~2.2 kg/m

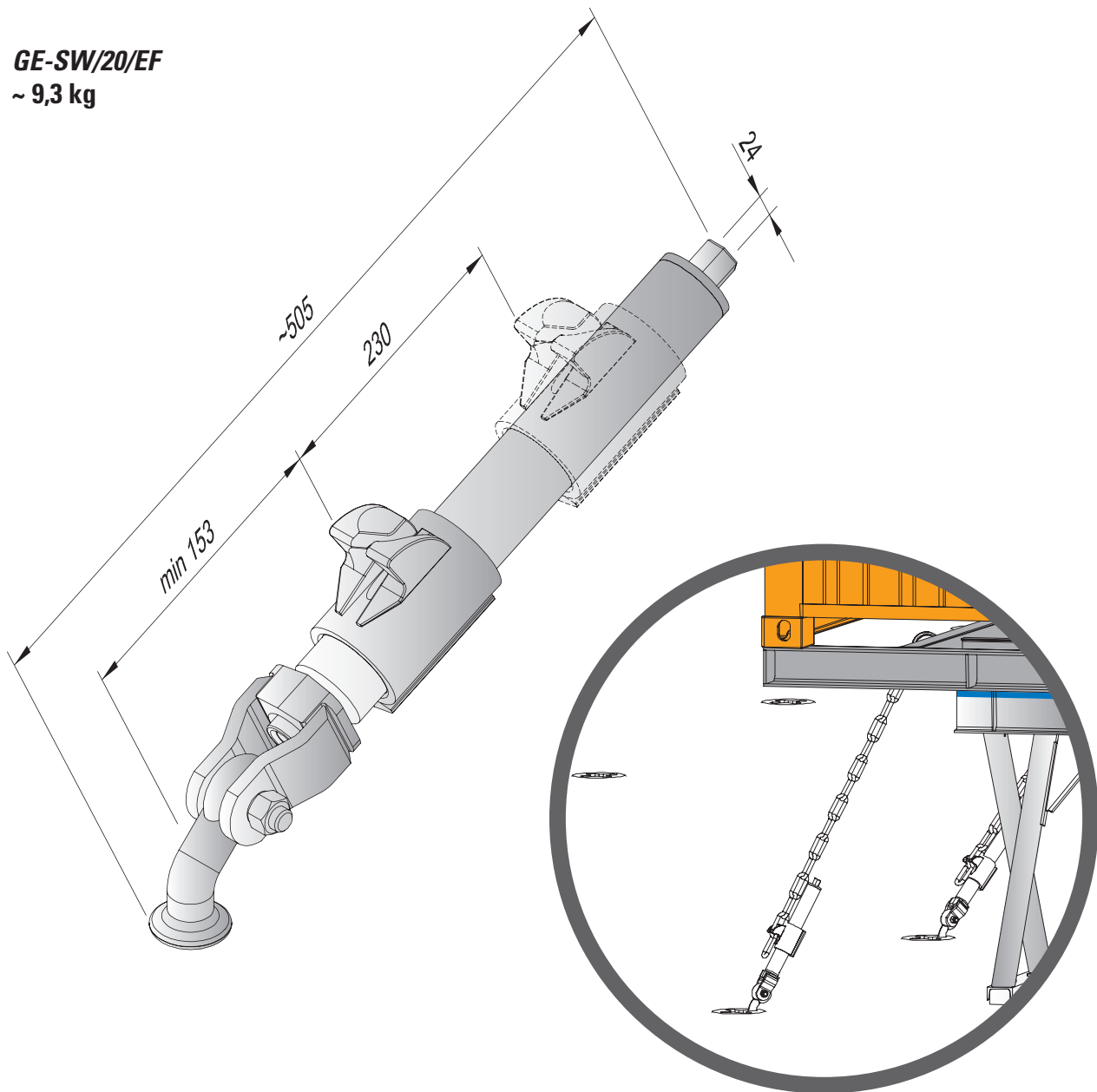


Specification

- Min. breaking load tension 20000 daN resp. 15000 daN
- Length on customer's request
- High tensile steel chain, long link/grade 80
- Spanners and turnbuckles please see next pages
- Painted (orange)

Speed winch

GE-SW/20/EF
~ 9,3 kg



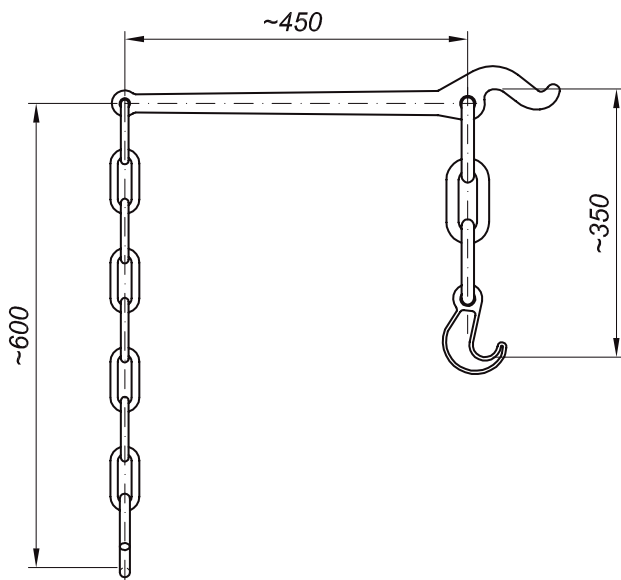
Specification

- Min. breaking load tension 20000 daN
- Suitable for long-link chain
- Can be operated with standard pneumatic or electrical power tools but also with manual ratchets
- Hot dip galvanised
- Long life lubrication
- Approval from any classification society
- Instead of elephant foot a hook can be applied at lower end

Spanners for chains

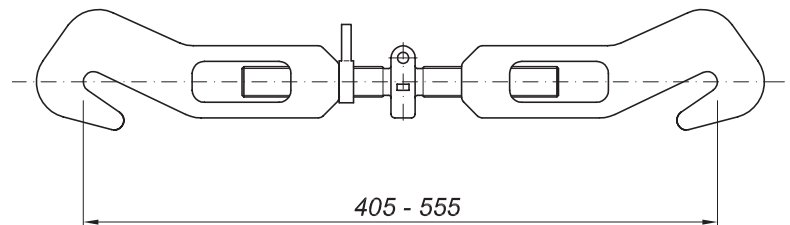
Tension Lever

C-TL-20
~ 5.3 kg



Chain Turnbuckle

RS-C/405-555
~ 3.6 kg

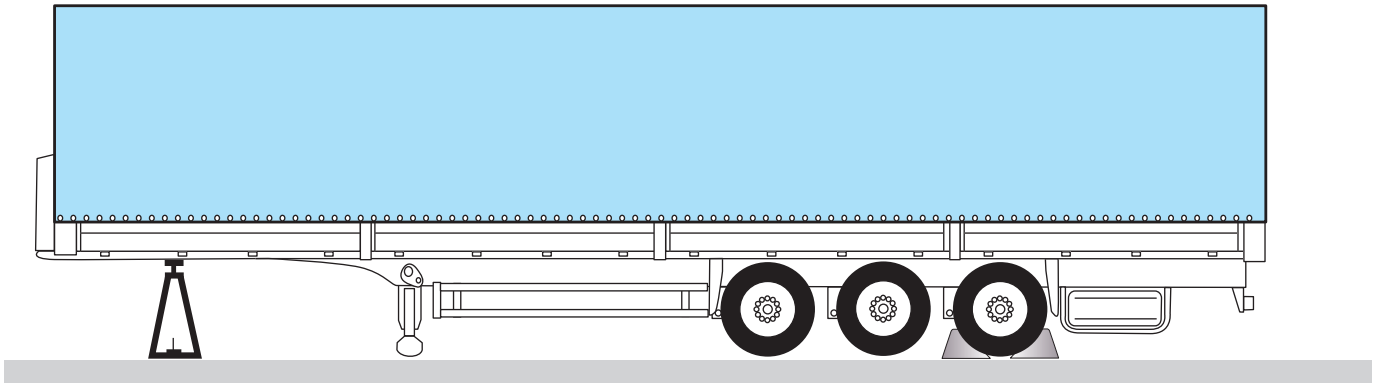


length pressure point / pressure point

Specification

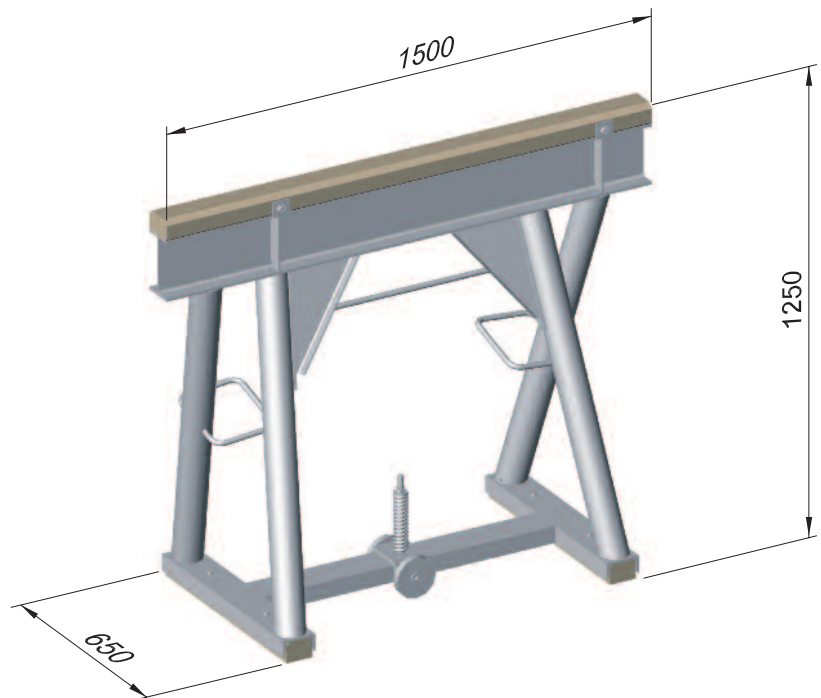
- Min. breaking load tension 20000 daN
- Drop-forged (high tensile steel)
- Counter parts is long-link chain
- Tension lever will be painted (orange)
- Chain turnbuckle will be hot dip galvanised

Trailer horses



GE-TH

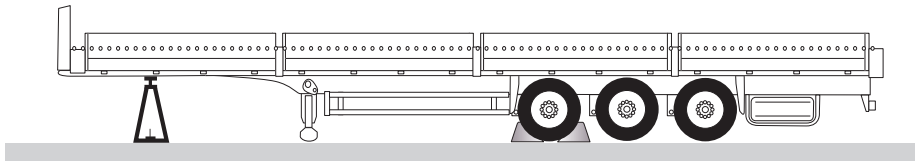
(according to the specifications of leading RoRo carriers)
for securing of multi-axle semi-trailers on PCTC vessels



Specification

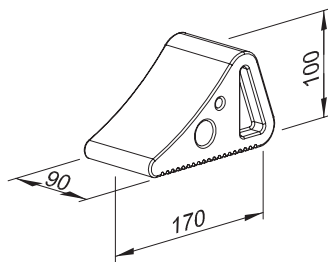
- Min. breaking load 600 kN
- Galvanised steel frame
- Anti-slip shoring
- Weight-controlled rolling gear
- Timber plated crossbeam
- Various load capacities available (25.0 – 60.0 t)
- Weight ~117.0 kg

Wheel chocks



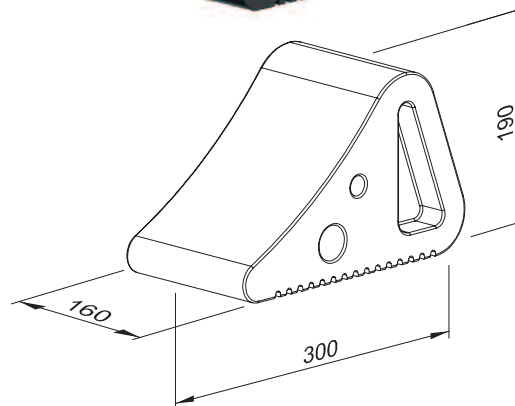
For cars

GE-CC/1
~ 0.7 kg



For trucks/trailer

GE-TC/1
~ 5.2 kg



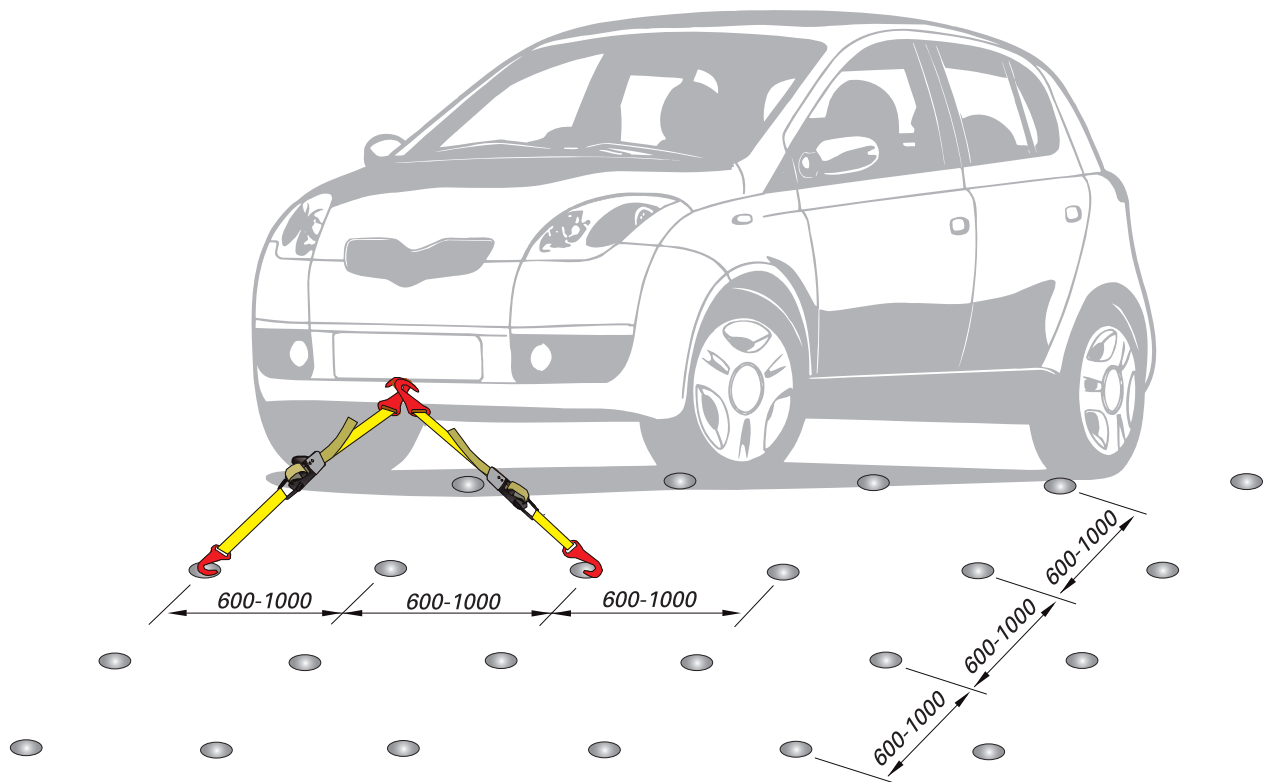
GE-TC/2
~ 11.0 kg



Specification

- Vulcanized long life rubber
- Skid-proof
- Anti-static
- According to DIN 76051 the specifications of leading RoRo carriers for securing of trucks, trailers and construction vehicles on PCTC vessels

Web lashings for light vehicles



Paddle buckle



WL25-1HH1.5/150/1750

for light-weight passenger cars (1500 daN)

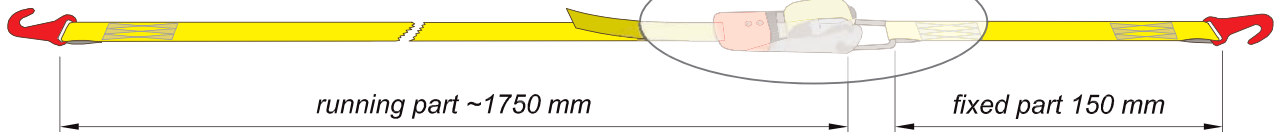
Overcentre buckle



WL25-2HH1.8/150/1750

for passenger cars, sports utility vehicles, vans etc. (1800 daN)

Snap hook



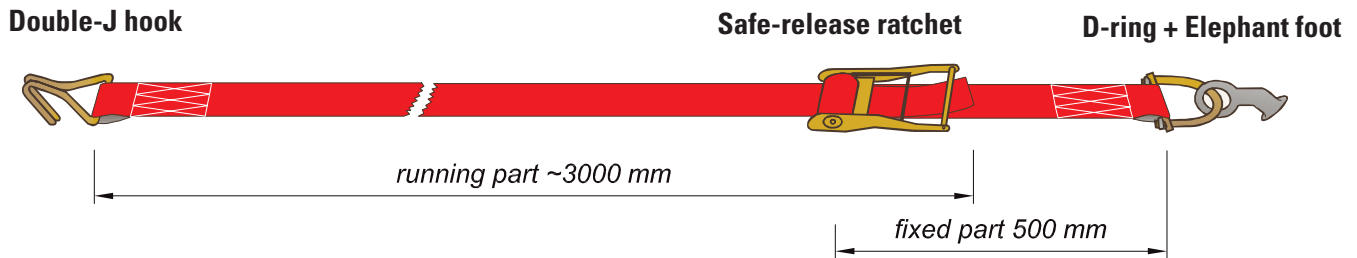
Snap hook

Specification

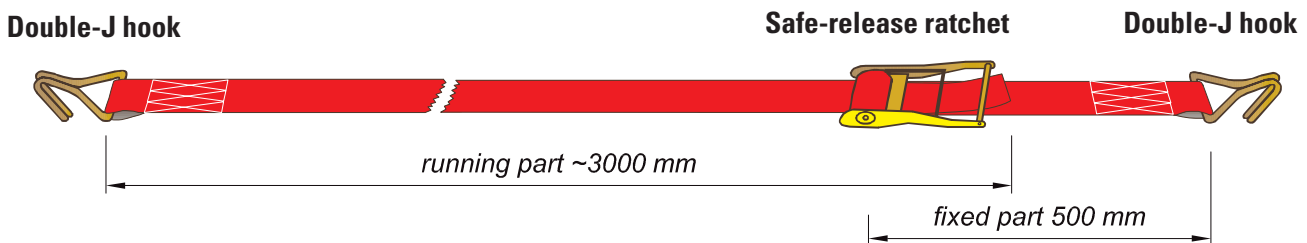
- Min. breaking load tension 1500 daN with overcentre buckle
- Min. breaking load tension 1800 daN with paddle buckle
- High tensile polyester webbing
- Gasoline-, lubricant- and solvent-proof
- Web width = 25 mm
- Steel buckle and hooks; PVC-coated to avoid damages
- According to EN 12195-2

Web lashing for medium weight vehicles

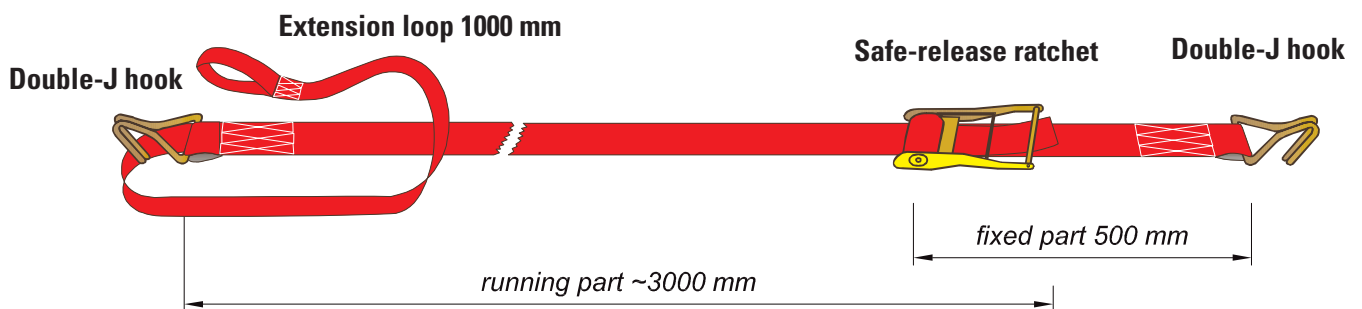
WL50-3HE5.0/500/3000 for securing of medium-weight cargoes on dedicated RoRo vessels



WL50-3HH5.0/500/3000 for securing of medium-weight cargoes on merchant vessels, trucks and railways



WL50-3HH5.0/500/3000+1000 for securing of medium-weight cargoes on merchant vessels, trucks and railways



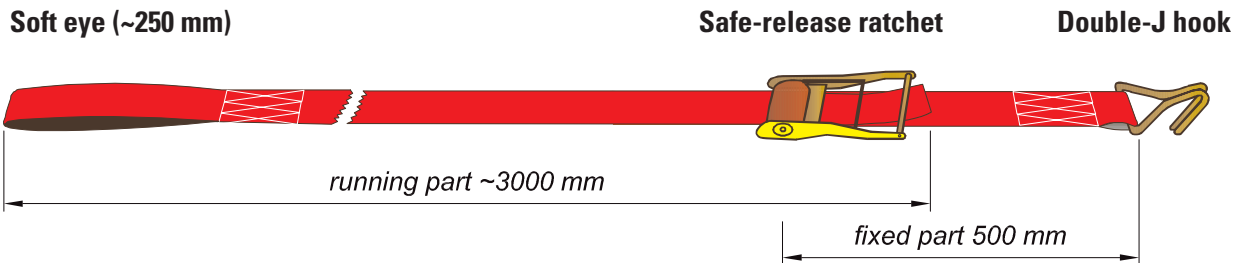
Specification

- Min. breaking load tension 5000 daN
- High tensile polyester webbing
- Gasoline-, lubricant- and solvent-proof
- Safe-release ratchet (yellow chromatic) on fixed end
- Double-J hook (yellow chromatic) on running end
- Web width = 50 mm
- According to EN 12195-2
- Fixed and with double - J Hook or D-Ring + elephant foot

Web lashings for medium weight vehicles

WL50-3HL5.0/500/3000

for medium-weight project shipments on multi-purpose and RoRo vessels



Optional hardware for attachment



Bow shackle
B/L = 10000 - 20000 daN



D-ring
B/L = 12000 - 20000 daN



D-ring
B/L = 12000 - 20000 daN

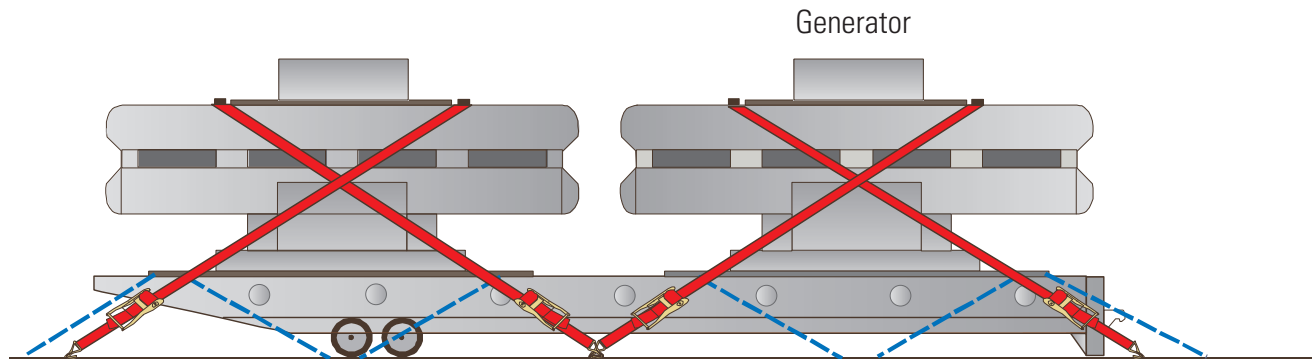


"Elephant foot"
B/L = 6000 - 12000 daN

Specification

- Min. breaking load tension 5000 daN
- High tensile polyester webbing
- Gasoline-, lubricant- and solvent-proof
- Safe-release ratchet and high quality steel hooks (yellow chromatic)
- Extra-large soft eye for variable attachments, e.g. shackles, D-rings, elephant feet etc.
- Web width = 50 mm
- According to EN 12195-2

Web lashings for heavy vehicles

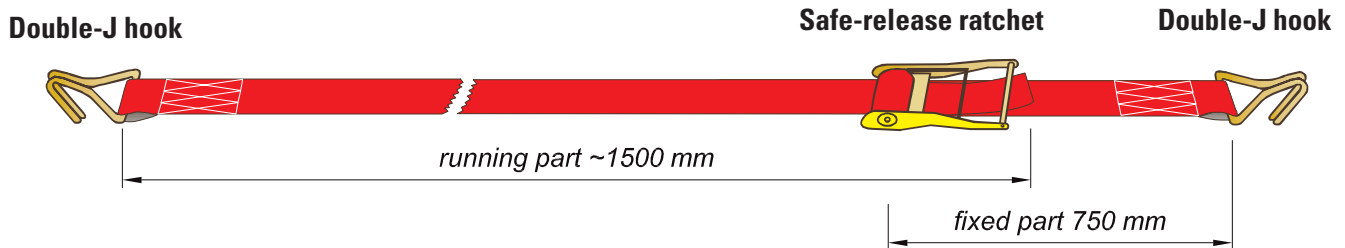


Rolltrailer 40ft., SWL 80 t

WL75-3HH10.0/750/1500

(according to EN 12195-2)

for marine securing of high and heavy cargoes on RoRo vessels, specialized break-bulk carriers etc.



Specification

- Min. breaking load tension 10000 daN
- High tensile polyester webbing
- Gasoline-, lubricant- and solvent-proof
- Safe-release ratchet and high quality steel hooks (yellow chromatic)
- Web width = 75 mm

Timber part

10

TIMBER PART

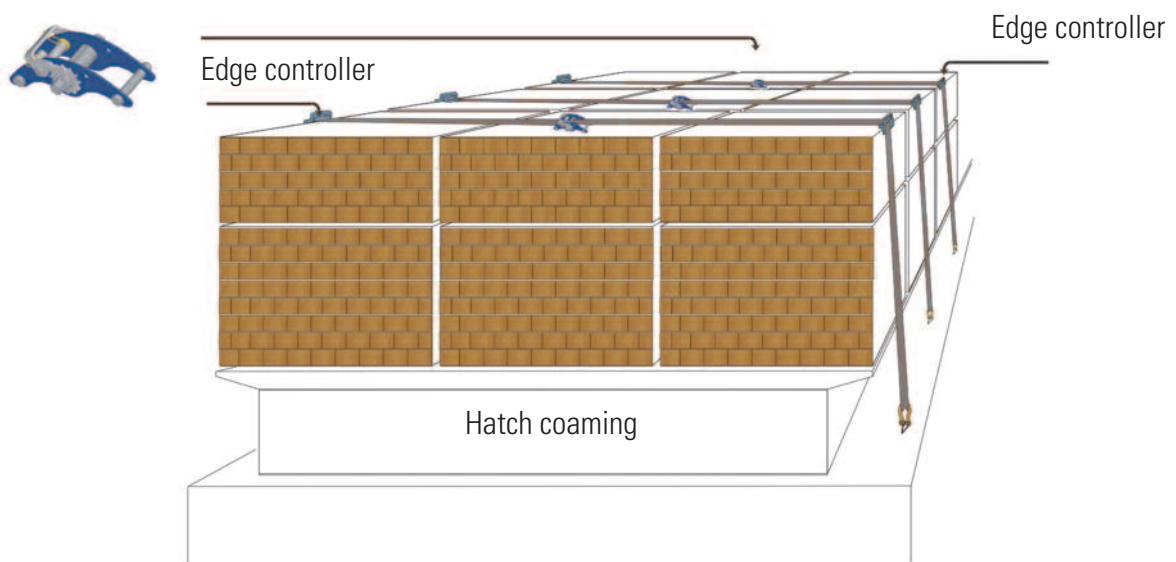
10.1 - 10.2	Master Lashing (Single winch system)
10.3 - 10.4	Master Lashing (Double winch system)
10.5	Set of IMO-levers
10.6	Edge controllers

Master lashings (single winch system)

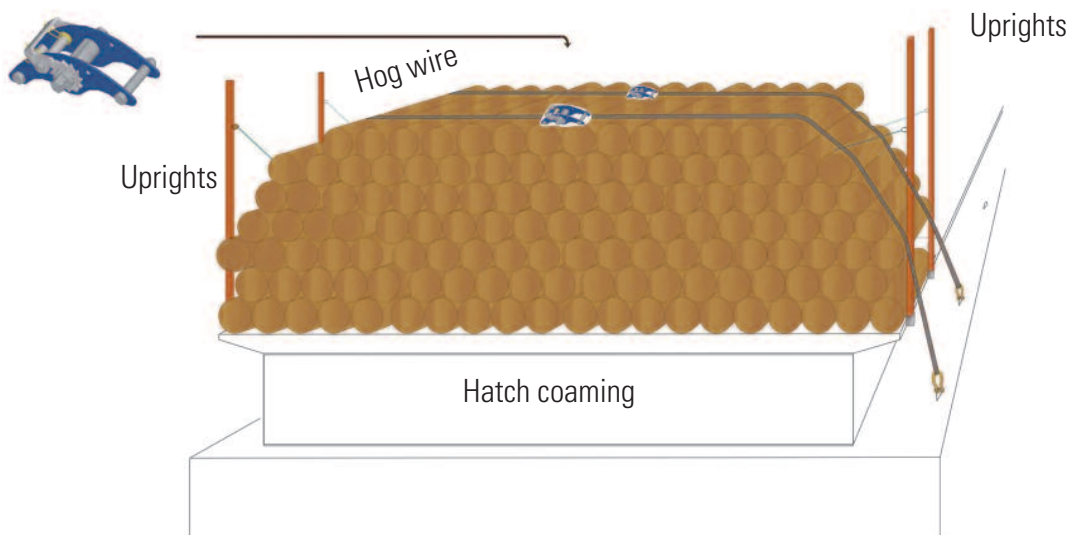
Professional securing system for timber deck cargoes

(in compliance with IMO 275E "Code of Safe Practice for Ships Carrying Timber Deck Cargoes")

Lashing arrangement for unitized/packaged timber



Lashing arrangement for Logs



Master lashing (single winch system)

Master Lashing

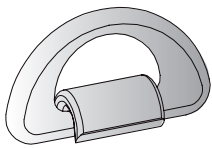
ML-1/100/13.3

Single winch arrangement



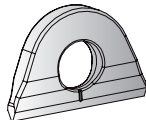
Fixed fittings

DR-50



see chapter 3.13

LAP-1



see chapter 3.9

Components of each system

- 1 x Ratchet Winch
- 1 x Web band 100 % PES, fixed end / 1 reinforced eye / 1 soft eye
- 1 x Web band 100 % PES, loose end / 1 reinforced eye / 1 open end
- 2 x shackles
- 2 x Edge controller (web band protector) – Option

Benefits

- Easy handling and quick installation
- Easy access to tightening devices (ratchet winch) via cargo topside
- Additional personnel protection + safety devices required
- Tailor-made system to match vessel's specifications, tie down provisions and cargo dimensions

Specification

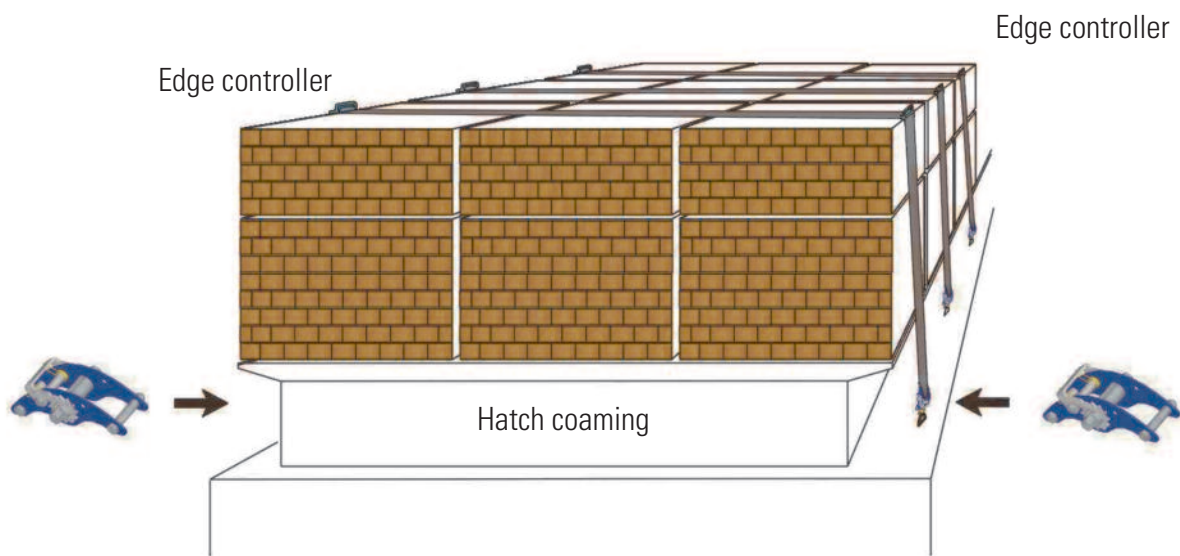
- Min. breaking load tension 13300 daN
- Extremely high tensile band webbing (100 % Polyester)
- Gasoline-, lubricant- and solvent-proof
- High quality steel ratchet winch, galvanization of all parts
- Safe-release feature (stand-off operation)

Master lashing (double winch system)

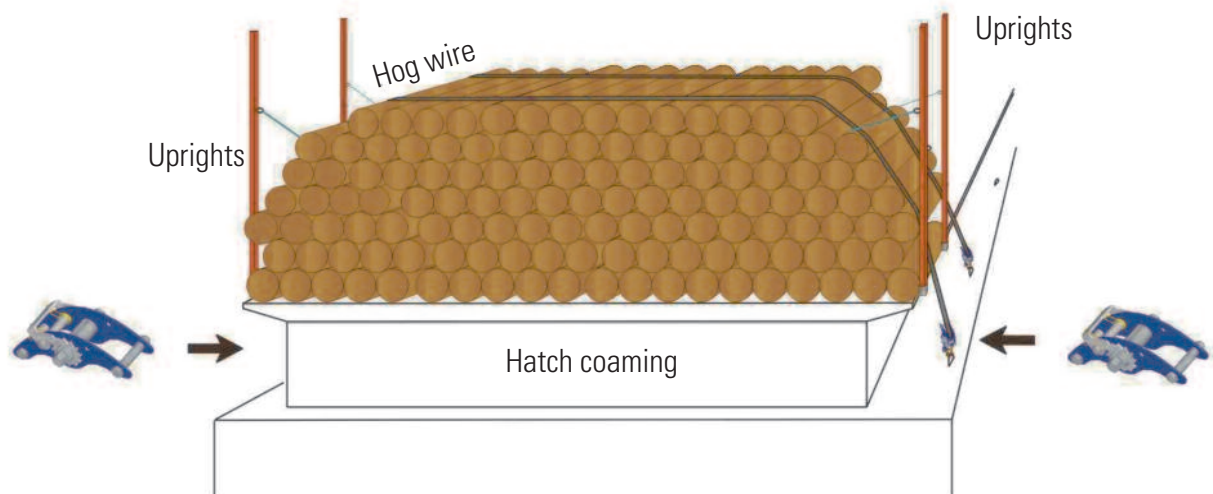
Professional securing system for timber deck cargoes

(in compliance with IMO 275E "Code of Safe Practice for Ships Carrying Timber Deck Cargoes")

Lashing arrangement for unitized/packaged timber



Lashing arrangement for logs



Master lashing (double winch system)

Master Lashing

ML-2/100/13.3

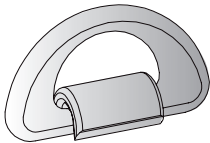
Double winch arrangement

Components of each system

- 2 x Ratchet Winch with 1 steel adapter each
- 1 x Web band 100 % PES, loose end, variable length
- 2 x Edge controller (web band protector) – Option

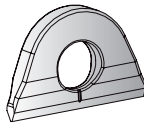
Fixed fittings

DR-50



see chapter 3.13

LAP-1



see chapter 3.9



Benefits

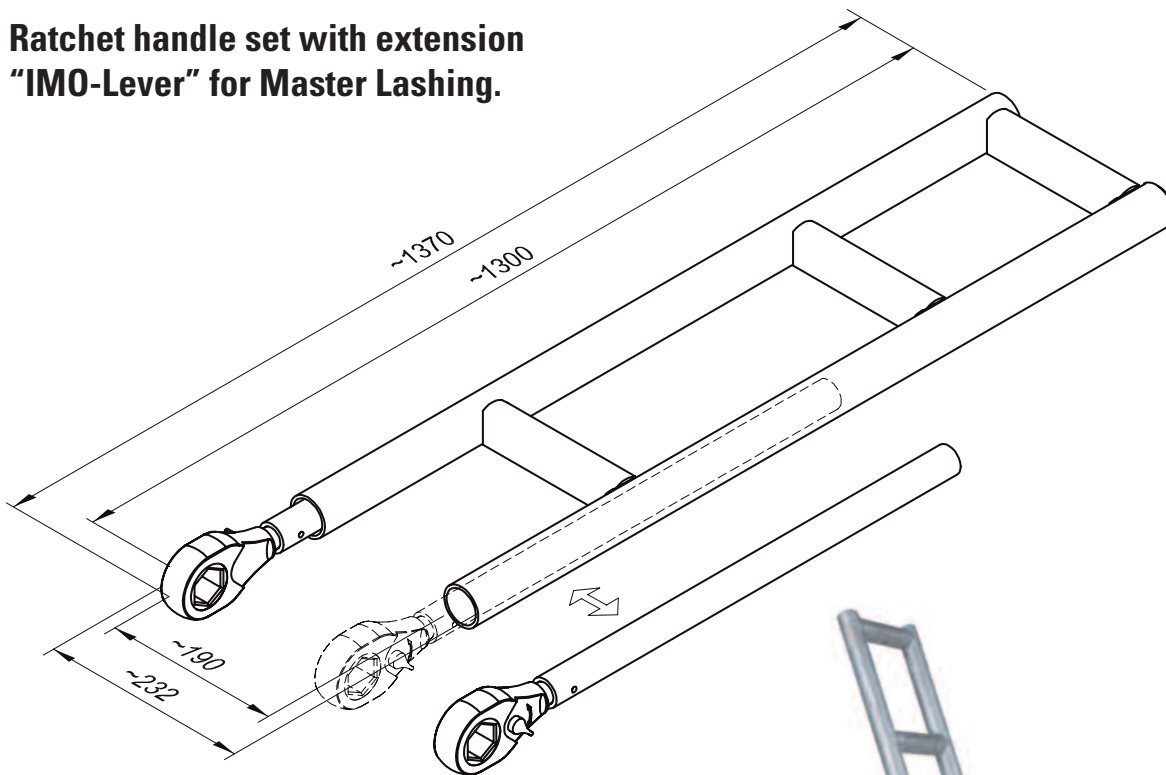
- Safe and economical
- Easy access to tightening devices (ratchet winch)
- No additional personnel protection + safety devices needed
- Maximum performance due to variable belt lengths
- Good flexibility to be adjusted to any lashing point arrangement and / or cargo dimension

Specification

- Min. breaking load tension 13300 daN
- Extremely high tensile band webbing (100 % Polyester)
- Gasoline-, lubricant- and solvent-proof
- High quality steel ratchet winch, galvanization of all parts
- Safe-release feature (stand-off operation)

Set of IMO-levers

**Ratchet handle set with extension
"IMO-Lever" for Master Lashing.**



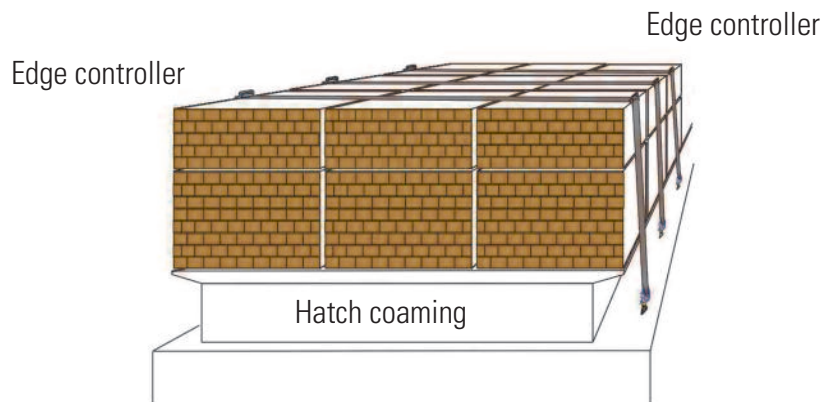
**Ratchet handle with
32 mm box spanner**



Specification

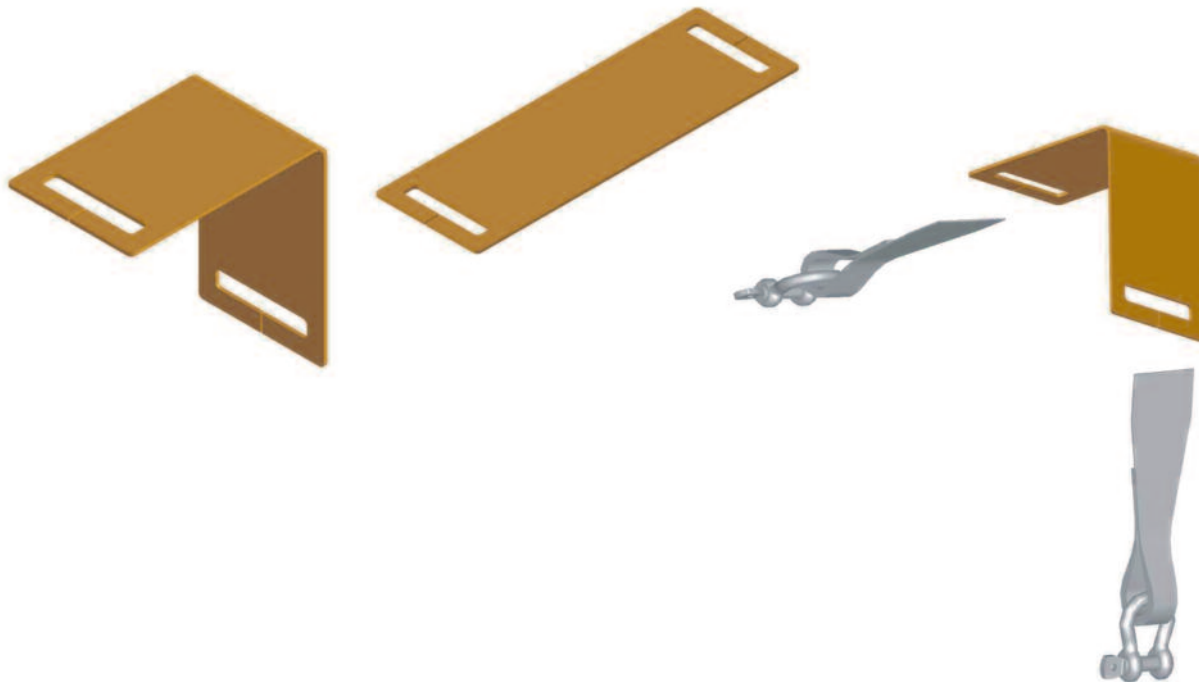
- Light weight design
- IMO-lever hot dip galvanised
- High quality stainless steel ratchet
- One set consist of two ratchets and one extension
- Low budget solution for narrow working space is available on request

Edge controllers



Edge Controller *EC-100/1*

To prevent web lashings from direct chafing
To spread tension forces in order to protect cargoes and / or tarpaulins



Specification

- Light-weight and strong polyurethane (PUR) material
- Resistant against exposure to UV-rays
- Belt guide with slide-in feature