Lifting & Mooring

PRODUCT GUIDE

IRIZAR FORGE

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LIFTING & MOORING

IRIZAR FORGE

0. WELCOME TO IRIZAR FORGE

1. CRANE HOOKS

2. CRANE BLOCKS

3. SUBSEA FORGED HOOKS

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WELCOME TO IRIZAR FORGE

The organization where **forging comes true.**

Located in the most industrial powerhouse valley in the Basque Country, IRIZAR FORGE is a **young organization only +90 years old** with a non stop investment policy in World Class facilities and human team.

4 generations accumulated experience and the young energy is the right combination to lead the **Heavy Duty Material Handling Industry.**

With activity both in the **Onshore and Offshore, where the most critical LIFTING & MOORING operations** are held:

* **Onshore target industries**: Industrial, Hydro, Steel & Aluminium**,** Paper... for outdoor & indoor cranes.
* **Shore target industries**: Port & Harbour, Shippyards, Nuclear.
* **Offshore target industries**: Oil & Gas, Renewables for top site & Subsea appliance.

Focused in **heavy duty** appliance **critical** components at **abnormal & extreme conditions** where long lifetime and high safety factors are required:

* **Hooks, rope sheaves and complete crane blocks** up **to 5.000t SWL** for lifting& mooring.
* Additionally other crane components as forged **Wheels.**
* Additionally other mooring line accesories as **Shackles, Y-H-Links, Swivels, Sockets.**

NOT LIMITED TO PRODUCTION: Engineering, Manufacturing & Inspection of crane components as well as lifting & mooring accessories is our core business.

* **DESIGN, CALCULATION & SIMULATION** of critical safety related items is the first step to start advising customers interested in **latest innovative designs or just replacing an old non forged accessory to a new forged** one complying with all relative international rules & standards.

* **PRODUCTION**: After related design approvals production begins heating selected steel.

FORGING: is the main process to achieve safety factors and reduction ratios guaranteeing the many benefits of forging against other processes. Forging facilities are divided into two shops: one for parts up to 5000kg (11.000 lbs) weight and the second for parts up to 20.000kg weight (44.000 lbs).

HEAT TREATMENT: after tensions created in the steel structure, all parts are treated to achieve its final mechanical properties and distress material having as result strong and long lifetime products.

SURFACE FREE OF DEFECTS: non just an aesthetic matter, but small unvisible indications could became a crack in the future failuring the part provocating an accident.

MACHINING & ASSEMBLY: the machining & assembly of all components comes true in our world class facilities focused in **large components processing.**

* **INSPECTION, TESTING & CERTS**: To guarantee a free of defects supply, **DT & NDT** inspections are held **before, during & after production** processes complying with international rules, standards and customer specs & requirements.
The key proof is the **overload test, having in-site several benches up to 6000t.**
The company is certified by the most popular classification societies as **LRS, DNV-GL, ABS, BV, TUV, for major approvals, type and design approvals.**

COME & DISCOVER: IN FORGE WE TRUST: your forge boutique for lifting & mooring critical components.

BRIEFING:

1. WHAT? LIFTING & MOORING SOLUTIONS

* KEY FOCUS: SAFETY RELATED CRANE COMPONENTS and SUBSEA MOORING LINE FORGED ACCESSORIES.

* TOP PRODUCTS:

FORGED HOOKS, WELD FREE SHEAVES, CRANE BLOCKS and WIDE BODY SHACKLES for LIFTING APPLIANCE.

ROV HOOKS and ROV SHACKLES for MOORING APPLIANCE.

2. WHERE? ONSHORE & OFFSHORE

* KEY FOCUS: HARSH ENVIRONMENTS.

ONSHORE (OUT & INDOOR): NUCLEAR, HYDRO, PORTS, SHIPYARDS, CIVIL CONSTRUCTION, INDUSTRIAL PROCESSING.

OFFSHORE (TOPSITE AND SUBSEA): OIL&GAS and RENEWABLES.

3. HOW? FORGED

* KEY TECHNOLOGY: FORGING and WELD FREE SOLUTIONS.

* SCOPE: DESIGN, PRODUCTION, TESTING & CERTIFICATION.

4. WHY? SAFER, LIGHTER, LONGER LIFETIME

* IRIZAR TOP KEY FACTORS:

SAFER.

LIGHTER.

LONGER LIFETIME.

CAPABILITIES:

IRIZAR FORGE

FORGING is the main process and the preferred & valued technology to produce key products described in this PRODUCT GUIDE.

Forging process is achieved in two shops:

SHOP 1: forgings up to 5.000kg single weight

Presses up to 3.000t force for close die and open die forging.

Furnaces 8m3 for heating process before forging and normalizing process after forging.

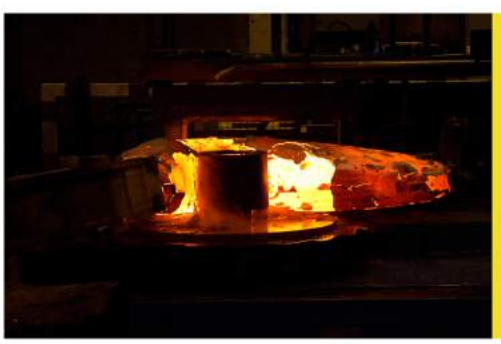
Bending machines up to 300mm.

SHOP 2: forgings up to 20.000kg single weight

Presses up to 10.000t force for close die and open die forging.

Furnaces 20m3 for heating process before forging and normalizing process after forging.

Bending machines up to 500mm.



Auxiliary processes divided in additional 5 workshops:

FLAME CUTTING technology by O2 for 500mm thickness.

SHOT BLASTING & GRINDING MACHINES to achieve smooth surfaces to guarantee free of defects forgings.

MACHINING: milling & lathes for rought & final machining.

ASSEMBLY AND PAINTING for turnkey projects and finished products as complete blocks.

IRIZAR TEST

This unit of the organization is focused on the Complete Quality Management Assurance of the Product & Organization:

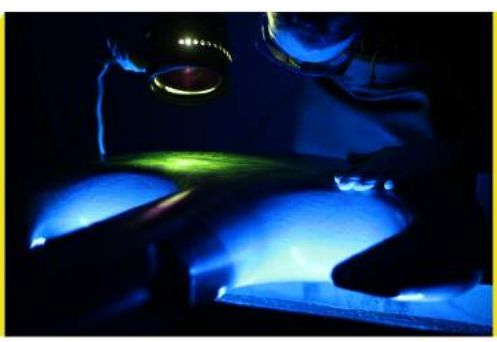
PRODUCT QUALITY ASSURANCE

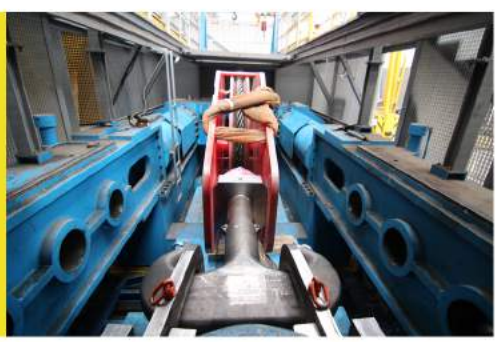
All kind of Tests & Inspections are held in order to comply with most Worldwide International Rules & Standards: DT, NDT & PTL tests are held for a full product guarantee.

PTL, Proof Test Load is the key test, where a physical over load is applied to the product following International rules & standards: three benchs are calibrated to operate this key test, being the largest one 6000t bench.

As a consequence product particular type approvals and Company certificates are kept to operate in the internal business being the most populars LRS, ABS, DNV-GL and BV.

From Company Qualitification point of view, the Company is certified additionally by TÜV for Quality (ISO9001), Environmental (ISO14001) & HSE (ISO45001) point of view.





CRANE HOOKS

1.0 INTRO

HOOK is one of the most critical safety related item of any crane, and its relative cost compared to crane complete cost, makes this component to be the **priority item from safety** point of view.

Different industrial technologies and steel grades are used worldwide but the safest and more efficient is the **FORGING technology**. This is why 100% of IRIZAR hooks are forged.

During the edition of this catalogue all European old national conflicting standards are withdrawn to be substituted by **EN13001-3-5:2016 NEW STANDARD,** as the only one harmonized crane shank hook standard in force, together with antecessor ISO17440.

Crane hooks can achieve different mechanical properties depending on the crane purpose and concept design. These **properties are divided in 5 CLASSES** depending on the achievable Yield Point and Tensile Strength as follows:

CLASS	YT (Min. Yield Stress) f_y N/mm2	US (Min. Ultimate Strength) f_u N/mm2	FS (Fatigue Strength) ▲σc N/mm2
P	315	490	195
S	390	540	210
T	490	700	250
V	620	800	275
W	770	970	310

These minimum values will be used as design values by the crane manufacturer, being chemical compositions and material grades under manufacturer responsibility to comply with these minimum values.

There are different crane hooks design concepts depending on:

- **Hook shape**: can be symmetrical or asymmetrical but always must work aligned. In case of any misaligned, technical solutions are available on request.
- **Hook section**: can be concave, convex, round or similar depending on the rigging accessories, in order to accommodate the hook seat to the below the hook item.
- **Hook body**: can be single, double/Ramshorn, triton, quadruple. Regularly depends on the loads and volumes of the load and lifting operations.
- **Hook articulation**: can be shank hook, eye hook, fork hook… Regularly shank hooks are fitted with screw nut and crosshead.

All hooks must be LOAD TESTED at the end of the process to validate the design and guarantee the general integrity. This test must be done to the sole hook as a component and/or together with the crane during the final test loading. Generally speaking, the hook tested as a component is at higher force than the one applied to the crane because the required normative safety factors.

For an unequivocal hook selection based on EN13001-3-5:2016, crane designer must fill the input form (Annex 1) and return fully filled to our Technical Department to assist in the right hook selection. The reason of this is because old Crane Drive Groups classification (Annex 2 DIN 15400 Drive Groups) considered operating times (not lifts) and new EN 13001 is based on number of work cycles, being more efficient on dynamic calculations and fatigue failures.

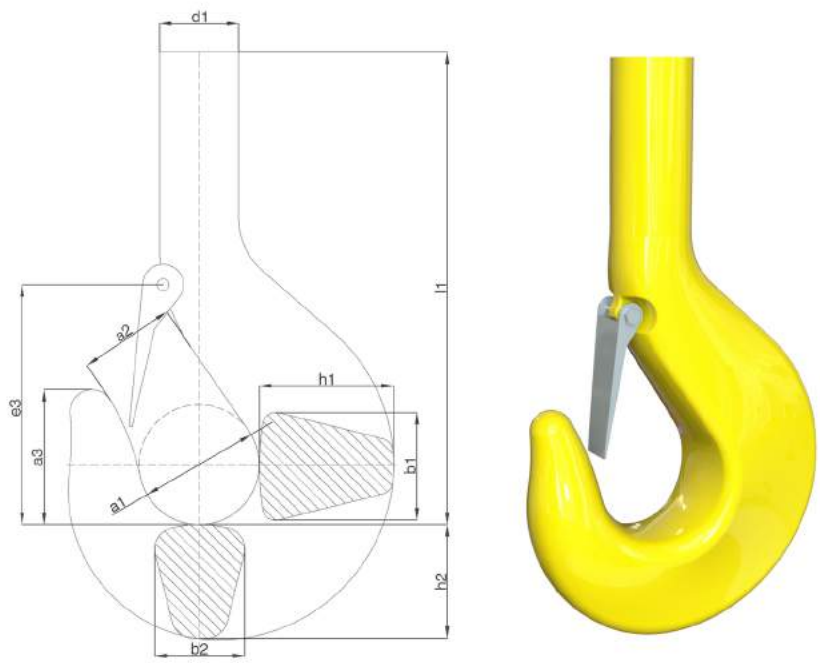
Enjoy CRANE HOOK RANGE in the following pages.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.1 SINGLE FORGED HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS

1.1.1.1 Single forged hooks based on DIN15401 design

1.1.1.1.1 Unmachined



- WLL: from 5t to 2.000t.
- Hook FORGED and HEAT TREATED. Machining recommended to perform by manufacturer.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended after machining.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SINGLE FORGED HOOKS BASED ON DIN15401 DESIGN I UNMACHINED

	OVERALL DIMENSIONS (mm)										Weight
No	a1	a2	a3	b1	b2	d1	e3	h1	h2	l1	Kg
2,5	63	50	72	53	45	42	132	67	58	253	6,3
4	71	56	80	63	53	48	148	80	67	285	8,8
5	80	63	90	71	60	53	165	90	75	318	12,3
6	90	71	101	80	67	60	185	100	85	380	17,1
8	100	80	113	90	75	67	210	112	95	418	24
10	112	90	127	100	85	75	221	125	106	460	40
12	125	100	143	112	95	85	252	140	118	525	55
16	140	112	160	125	106	95	280	160	132	595	77
20	160	125	180	140	118	106	330	180	150	665	112
25	180	140	202	160	132	118	360	200	170	735	160
32	200	160	225	180	150	132	400	224	190	810	220
40	224	180	252	200	170	150	447	250	212	905	310
50	250	200	285	224	190	170	485	280	236	990	430
63	280	224	320	250	212	190	550	315	265	1120	600
80	315	250	358	280	236	212	598	355	300	1270	860
100	355	280	402	315	265	236	688	400	335	1415	1220
125	400	315	450	355	300	265	750	450	375	1590	1740
160	450	355	505	400	335	300	825	500	425	1790	2480
200	500	400	565	450	375	335	900	560	475	2048	3420
250	560	450	635	500	425	375	980	630	530	2305	4800
320	630	500	715	560	475	425	1080	710	580	2605	6770
400	710	560	755	630	530	475	1195	800	630	2950	9405

Tolerances: -0/+7% forging tolerance.

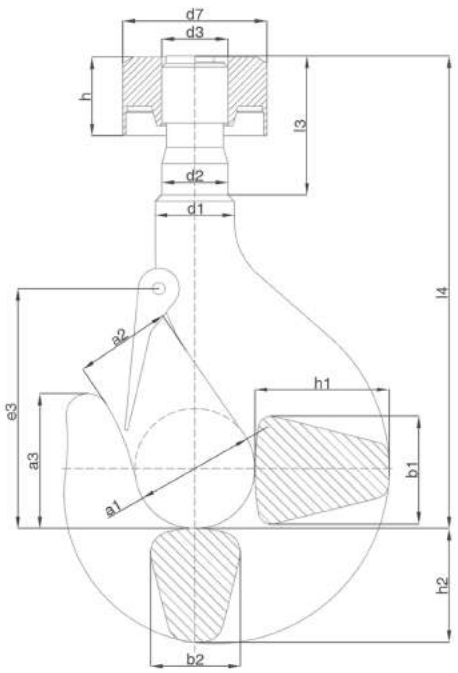
Modifications: Shank length (L). Further dimensions upon request.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.1 SINGLE FORGED HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS

1.1.1.1 Single forged hooks based on DIN15401 design

1.1.1.1.2 Machined fitted with nut



- WLL: from 5t to 2.000t.
- Hook and Nut FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SINGLE FORGED HOOKS BASED ON DIN15401 DESIGN I MACHINED FITTED WITH NUT

OVERALL DIMENSIONS (mm)														DIN 15413 Nut		Weight
No	a1	a2	a3	b1	b2	d1	e3	h1	h2	d2 h11	d3	l3	l4	d7	h	kg
2,5	63	50	72	53	45	42	132	67	58	36	M36	83	250	70	44	7,4
4	71	56	80	63	53	48	148	80	67	42	M42	93	281,5	80	49	10,3
5	80	63	90	71	60	53	165	90	75	45	M45	103	314,5	95	56	14,4
6	90	71	101	80	67	60	185	100	85	50	Rd50x6	112	375	115	60	20,7
8	100	80	113	90	75	67	210	112	95	56	Rd56x6	122	413	125	67	28,8
10	112	90	127	100	85	75	221	125	106	64	Rd64x8	135	446	145	76	40,9
12	125	100	143	112	95	85	252	140	118	72	Rd72x8	157	504,5	165	87	65,4
16	140	112	160	125	106	95	280	160	132	80	Rd80x10	170	576	175	91	90
20	160	125	180	140	118	106	330	180	150	90	Rd90x10	187	645	185	102	130
25	180	140	202	160	132	118	360	200	170	100	Rd100x12	207	716	205	113	184
32	200	160	225	180	150	132	400	224	190	110	Rd110x12	232	788	240	131	254
40	224	180	252	200	170	150	447	250	212	125	Rd125x14	257	885	270	144	361
50	250	200	285	224	190	170	485	280	236	140	Rd140x16	280	969	320	153	502
63	280	224	320	250	212	190	550	315	265	160	Rd160x18	322	1100	360	181	700
80	315	250	358	280	236	212	598	355	300	180	Rd180x20	357	1245	400	198	1007
100	355	280	402	315	365	236	688	400	335	200	Rd200x22	402	1388	445	228	1417
125	400	315	450	355	300	265	750	450	375	225	Rd225x24	465	1565	490	246	2026
160	450	355	505	400	335	300	825	500	425	250	Rd250x28	510	1761	530	274	2846
200	500	400	565	450	375	335	900	560	475	280	Rd280x32	613	2012	590	343	3862
250	560	450	635	500	425	375	980	630	530	320	Rd320x36	690	2272	680	383	5411
320	630	500	715	560	475	425	1080	710	580	370	Rd360x36	780	2565	760	433	7620
400	710	560	755	630	530	475	1195	800	630	415	Rd400x36	875	2878	865	482	10441

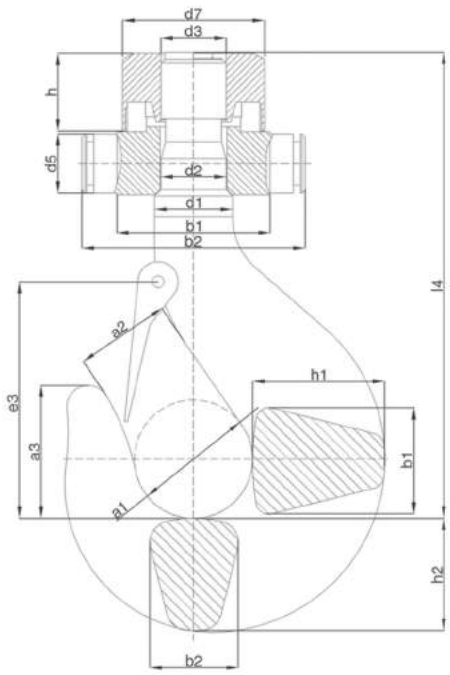
Tolerances: -0/+7% forging tolerance. Machined tolerances as per DIN15403 design.
Modifications: Shank length (L). Further dimensions upon request.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.1 SINGLE FORGED HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS

1.1.1.1 Single forged hooks based on DIN15401 design

1.1.1.1.3 Machined fitted with nut, crosshead and bearing



- WLL: from 5t to 2.000t.
- Hook, Nut and Crosshead FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SINGLE FORGED HOOKS BASED ON DIN15401 DESIGN I MACHINED FITTED WITH NUT, CROSSHEAD and BEARING

OVERALL DIMENSIONS (mm)													DIN 15412 Crosshead			DIN 15413 Nut		Weight
No	a1	a2	a3	b1	b2	d1	e3	h1	h2	d2 h11	d3	l4	b1	b2	d5 h9	d7	h	kg
2,5	63	50	72	53	45	42	132	67	58	36	M36	250	80	125	30	70	44	9,2
4	71	56	80	63	53	48	148	80	67	42	M42	281,5	90	140	35	80	49	13
5	80	63	90	71	60	53	165	90	75	45	M45	314,5	100	155	40	95	56	18,6
6	90	71	101	80	67	60	185	100	85	50	Rd50x6	375	125	185	45	115	60	27,4
8	100	80	113	90	75	67	210	112	95	56	Rd56x6	413	140	210	50	125	67	38
10	112	90	127	100	85	75	221	125	106	64	Rd64x8	446	160	230	55	145	76	54,6
12	125	100	143	112	95	85	252	140	118	72	Rd72x8	504,5	180	265	60	165	87	85,5
16	140	112	160	125	106	95	280	160	132	80	Rd80x10	576	190	275	70	175	91	114,5
20	160	125	180	140	118	106	330	180	150	90	Rd90x10	645	200	295	80	185	102	158,5
25	180	140	202	160	132	118	360	200	170	100	Rd100x12	716	220	318	90	205	113	222,6
32	200	160	225	180	150	132	400	224	190	110	Rd110x12	788	260	378	100	240	131	315
40	224	180	252	200	170	150	447	250	212	125	Rd125x14	885	285	415	110	270	144	443
50	250	200	285	224	190	170	485	280	236	140	Rd140x16	969	335	465	125	320	153	630
63	280	224	320	250	212	190	550	315	265	160	Rd160x18	1100	380	522	140	360	181	885
80	315	250	358	280	236	212	598	355	300	180	Rd180x20	1245	420	565	160	400	198	1254
100	355	280	402	315	365	236	688	400	335	200	Rd200x22	1388	470	645	180	445	228	1768
125	400	315	450	355	300	265	750	450	375	225	Rd225x24	1565	510	685	200	490	246	2491
160	450	355	505	400	335	300	825	500	425	250	Rd250x28	1761	550	750	220	530	274	3483
200	500	400	565	450	375	335	900	560	475	280	Rd280x32	2012	610	810	240	590	343	4791
250	560	450	635	500	425	375	980	630	530	320	Rd320x36	2272	700	920	260	680	383	6793
320	630	500	715	560	475	425	1080	710	580	370	Rd360x36	2565	790	1030	280	760	433	9443
400	710	560	755	630	530	475	1195	800	630	415	Rd400x36	2878	895	1145	300	865	482	13220

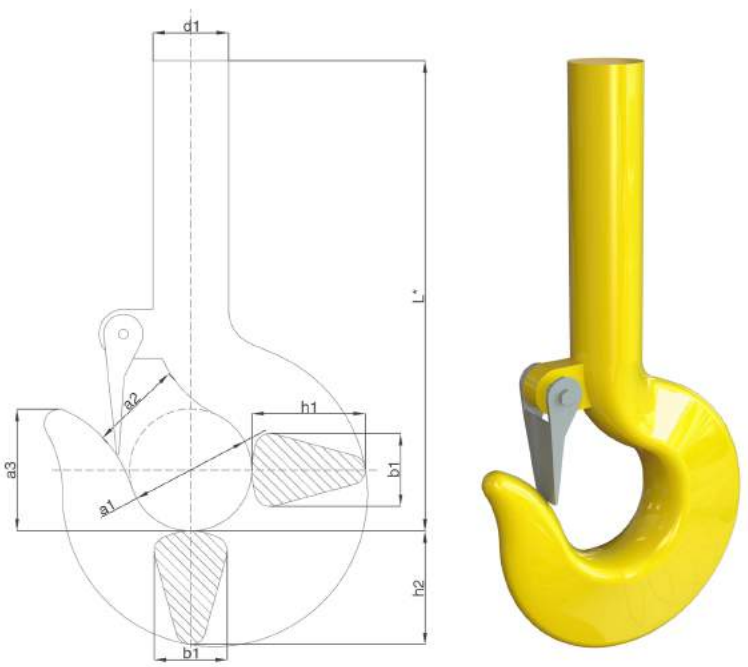
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403.
Modifications: Shank length (L). Further dimensions upon request.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.1 SINGLE FORGED HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS

1.1.1.2 Single forged hooks based on BS2903:1980 design

1.1.1.2.1 Unmachined



- WLL: from 5t to 250t.
- Hook FORGED and HEAT TREATED. Machining recommended to perform by manufacturer.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended after machining.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SINGLE FORGED HOOKS BASED ON BS2903:1980 DESIGN | UNMACHINED

OVERALL DIMENSIONS (mm)									Weight
No	a1	a2	a3	b1	d1	h1	h2	L*	kg
B5	65	49	65	39	38	60	60	253	5
B6,3	73	55	73	44	44	68	68	285	6,5
B8	83	62	84	50	50	77	77	318	10
B10	92	69	92	55	55	86	86	380	14
B12,5	103	77	104	62	60	96	96	418	19
B16	117	88	117	70	65	109	109	452	27
B20	131	98	132	79	75	122	122	510	38
B25	146	110	146	88	85	136	136	582	53
B32	159	119	160	95	90	148	148	653	69
B40	173	130	173	104	105	161	161	724	91
B50	191	143	191	115	115	178	178	796	121
B63	205	154	205	123	125	191	191	796	154

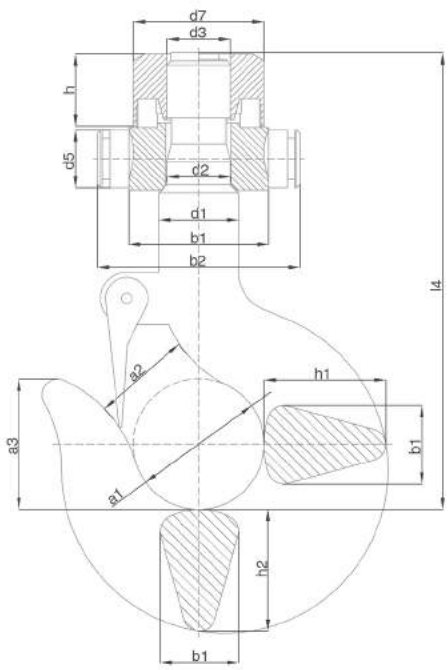
Tolerances: -0/+7% forging tolerance.
Modifications: Shank length (L). Further dimensions upon request.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.1 SINGLE FORGED HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS

1.1.1.2 Single forged hooks based on BS2903:1980 design

1.1.1.2.2 Machined fitted with nut, crosshead and bearing



- WLL: from 5t to 250t.
- Hook, Nut and Crosshead FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SINGLE FORGED HOOKS BASED ON DIN15401 DESIGN I MACHINED FITTED WITH NUT, CROSSHEAD and BEARING

OVERALL DIMENSIONS (mm)											DIN 15412 Crosshead			DIN 15413 Nut		Weight
No	a1	a2	a3	b1	d1	h1	h2	d2 h11	d3	l4	b1	b2	d5 h9	d7	h	kg
B5	65	49	65	39	38	60	60	30	M30	221	65	100	25	60	38	6
B6,3	73	55	73	44	44	68	68	36	M36	250	80	125	30	70	44	8,5
B8	83	62	84	50	50	77	77	42	M42	281,5	90	140	35	80	49	12,5
B10	92	69	92	55	55	86	86	45	M45	314,5	100	155	40	95	56	17,5
B12,5	103	77	104	62	60	96	96	50	Rd50x6	375	125	185	45	115	60	25
B16	117	88	117	70	65	109	109	50	Rd50x6	375	125	185	45	115	60	33
B20	131	98	132	79	75	122	122	64	Rd64x8	446	160	230	55	145	76	50
B25	146	110	146	88	85	136	136	72	Rd72x8	504,5	180	265	60	165	87	71
B32	159	119	160	95	90	148	148	72	Rd72x8	504,5	180	265	60	165	87	87
B40	173	130	173	104	105	161	161	80	Rd80x10	576	190	275	70	175	91	113
B50	191	143	191	115	115	178	178	90	Rd90x10	645	200	295	80	185	102	147
B63	205	154	205	123	125	191	191	100	Rd100x12	716	220	318	90	205	113	189

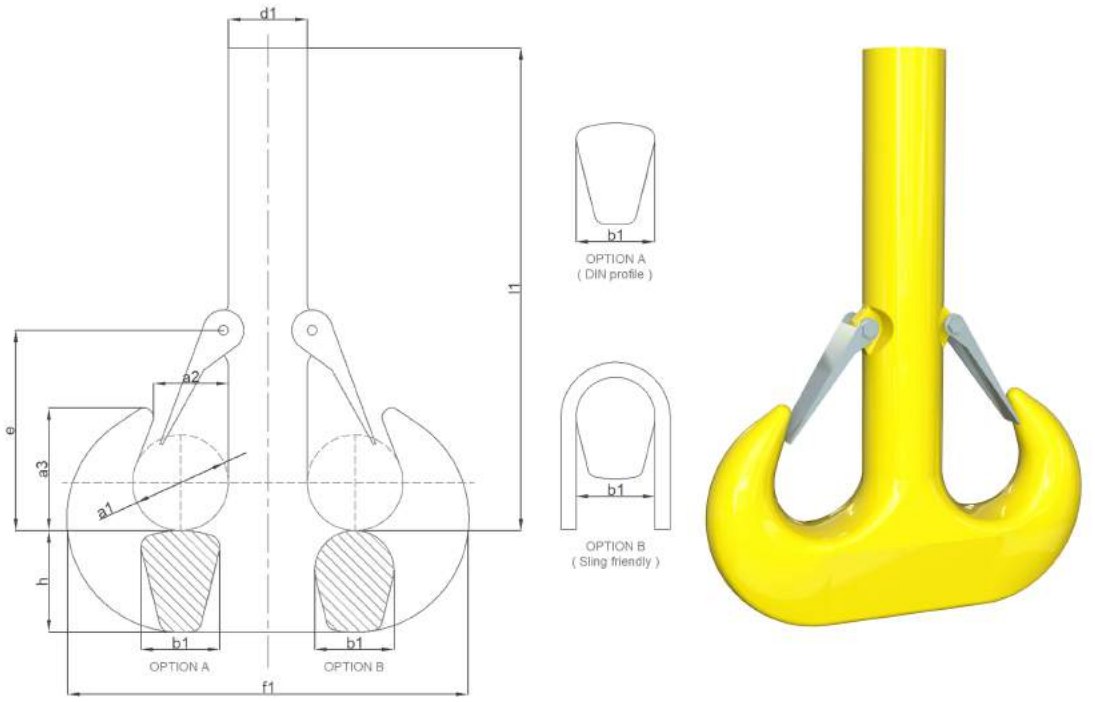
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403 design.
Modifications: Shank length (L). Further dimensions upon request.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.1 Ramshorn forged hooks based on DIN15402 design

1.1.2.1.1 Unmachined



- WLL: from 5t to 2.000t.
- Hook FORGED and HEAT TREATED. Machining recommended to perform by manufacturer.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended after machining.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON DIN15402 DESIGN | UNMACHINED

OVERALL DIMENSIONS (mm)										Weight
No	a1	a2	a3	b1	d1	e	f1	h	l1	kg
2,5	50	40	65	40	42	112	208	50	250	6,9
4	56	45	73	48	48	124	238	60	280	9,7
5	63	50	82	53	53	143	266	67	312	13,4
6	71	56	92	60	60	160	301	75	375	16,8
8	80	63	103	67	67	182	337	85	415	25,3
10	90	71	116	75	75	192	377	95	450	36,3
12	100	80	130	85	85	210	421	106	510	50,5
16	112	90	146	95	95	237	471	118	580	71,1
20	125	100	163	106	106	265	531	132	650	99,5
25	140	112	182	118	118	315	598	150	715	138
32	160	125	205	132	132	335	672	170	790	197
40	180	140	230	150	150	375	754	190	885	286
50	200	160	260	170	170	420	842	212	965	394
63	224	180	292	190	190	460	944	236	1090	547
80	250	200	325	212	212	515	1062	265	1235	759
100	280	224	364	236	236	575	1186	300	1375	1060
125	315	250	408	265	265	645	1330	335	1550	1491
160	355	280	458	300	300	725	1505	375	1745	2115
200	400	315	515	335	335	800	1685	425	1998	3015
250	450	355	580	375	375	875	1885	475	2250	4268
320	500	400	650	425	425	950	2125	530	2550	6018
400	560	450	730	475	475	1045	2375	600	2895	8576

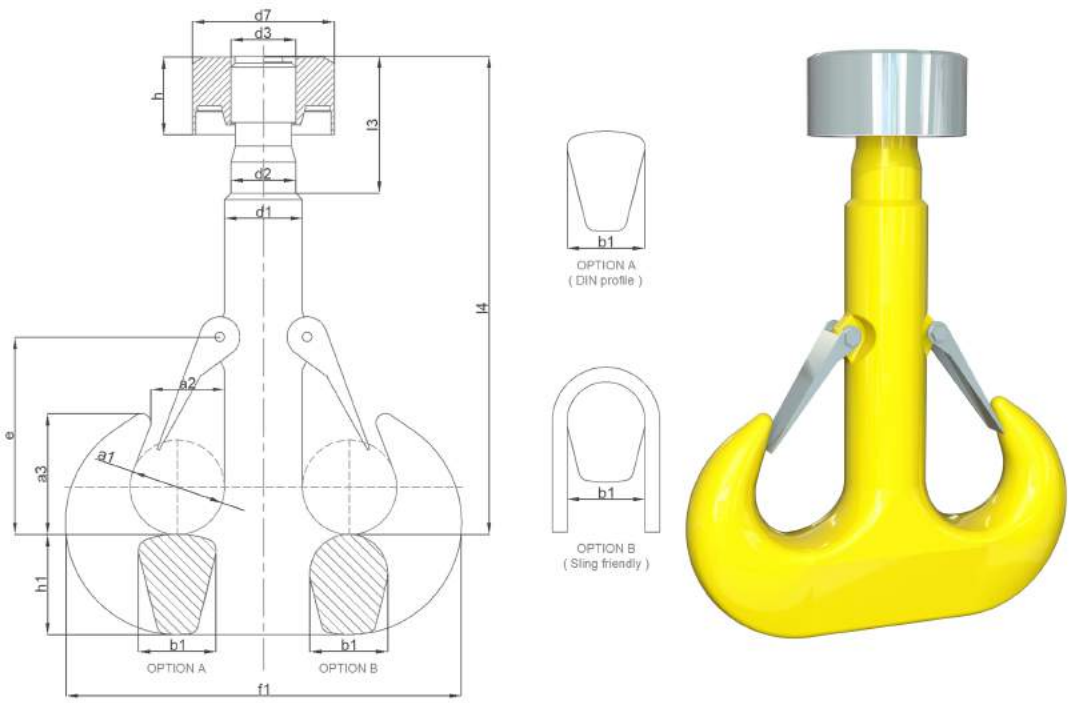
Tolerances: -0/+7% forging tolerance.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: RSN up to No 10 and greater sizes RFN. For the largest hooks, other sections b1xH can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.1 Ramshorn forged hooks based on DIN15402 design

1.1.2.1.2 Machined fitted with nut



- WLL: from 5t to 2.000t.
- Hook and Nut FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON DIN15402 | MACHINED FITTED WITH NUT

OVERALL DIMENSIONS (mm)													DIN 15413 Nut		Weight
No	a1	a2	a3	b1	d1	e	f1	h1	d2 h11	d3	l3	l4	d7	h	kg
2,5	50	40	65	40	42	112	208	50	36	M36	83	243,5	70	44	7,5
4	56	45	73	48	48	124	238	60	42	M42	93	274	80	49	10,6
5	63	50	82	53	53	143	266	67	45	M45	103	306	95	56	14,6
6	71	56	92	60	60	160	301	75	50	Rd50x6	112	365,5	115	60	20,4
8	80	63	103	67	67	182	337	85	56	Rd56x6	122	403	125	67	30,3
10	90	71	116	75	75	192	377	95	64	Rd64x8	135	435	145	76	43,3
12	100	80	130	85	85	210	421	106	72	Rd72x8	157	492	165	87	61
16	112	90	146	95	95	237	471	118	80	Rd80x10	170	562	175	91	84
20	125	100	163	106	106	265	531	132	90	Rd90x10	187	628	185	102	117
25	140	112	182	118	118	315	598	150	100	Rd100x12	207	696	205	113	161
32	160	125	205	132	132	335	672	170	110	Rd110x12	232	768	240	131	230
40	180	140	230	150	150	375	754	190	125	Rd125x14	257	863	270	144	336
50	200	160	260	170	170	420	842	212	140	Rd140x16	280	944	320	153	464
63	224	180	292	190	190	460	944	236	160	Rd160x18	322	1072	360	181	644
80	250	200	325	212	212	515	1062	265	180	Rd180x20	357	1212	400	198	901
100	280	224	364	236	236	575	1186	300	200	Rd200x22	402	1351	445	228	1249
125	315	250	408	265	265	645	1330	335	225	Rd225x24	465	1522	490	246	1765
160	355	280	458	300	300	725	1505	375	250	Rd250x28	510	1714	530	274	2463
200	400	315	515	335	335	800	1685	425	280	Rd280x32	613	1962	590	343	3437
250	450	355	580	375	375	875	1885	475	320	Rd320x36	690	2217	680	383	4852
320	500	400	650	425	425	950	2125	530	370	Rd360x36	780	2505	760	433	6745
400	560	450	730	475	475	1045	2375	600	415	Rd400x36	875	2820	865	482	9513

Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403
Modifications: Shank length (L). Further dimensions upon request.
Hook section: RSN up to No 10 and greater sizes RFN. For the largest hooks, other sections b1xH can be design.

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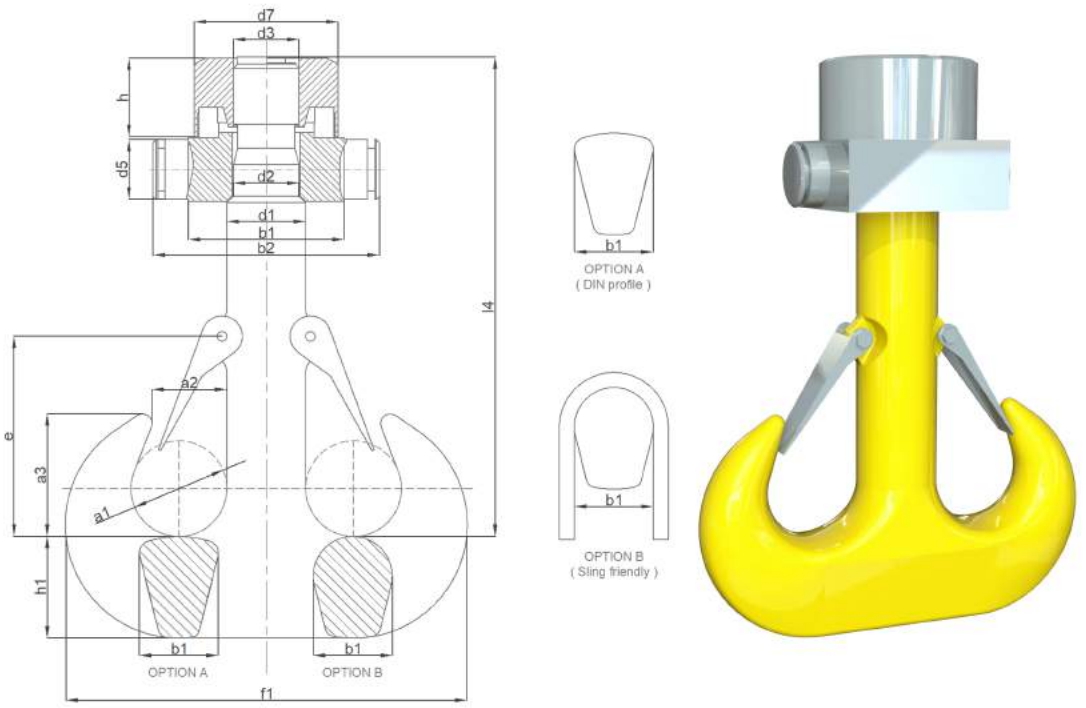
1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.1 Ramshorn forged hooks based on DIN15402 design

1.1.2.1.3 Machined fitted with nut, crosshead and bearing



- WLL: from 5t to 2.000t.
- Hook, Nut and Crosshead FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON BS3017:1980 I MACHINED FITTED WITH NUT, CROSSHEAD and BEARING

OVERALL DIMENSIONS (mm)											DIN 15412 Crosshead			DIN 15413 Nut		Weight
No	a1	a2	a3	b1	d1	e	f1	h1	d2 h11	d3	l4	b1	b2	d5 h9	d7	h	kg
2,5	50	40	65	40	42	112	208	50	36	M36	243,5	80	125	30	70	44	9,5
4	56	45	73	48	48	124	238	60	42	M42	274	90	140	35	80	49	13,5
5	63	50	82	53	53	143	266	67	45	M45	306	100	155	40	95	56	20,6
6	71	56	92	60	60	160	301	75	50	Rd50x6	365,5	125	185	45	115	60	27
8	80	63	103	67	67	182	337	85	56	Rd56x6	403	140	210	50	125	67	39,5
10	90	71	116	75	75	192	377	95	64	Rd64x8	435	160	230	55	145	76	57
12	100	80	130	85	85	210	421	106	72	Rd72x8	492	180	265	60	165	87	81
16	112	90	146	95	95	237	471	118	80	Rd80x10	562	190	275	70	175	91	108
20	125	100	163	106	106	265	531	132	90	Rd90x10	628	200	295	80	185	102	145,5
25	140	112	182	118	118	315	598	150	100	Rd100x12	696	220	318	90	205	113	199,5
32	160	125	205	132	132	335	672	170	110	Rd110x12	768	260	378	100	240	131	291
40	180	140	230	150	150	375	754	190	125	Rd125x14	863	285	415	110	270	144	418
50	200	160	260	170	170	420	842	212	140	Rd140x16	944	335	465	125	320	153	592
63	224	180	292	190	190	460	944	236	160	Rd160x18	1072	380	522	140	360	181	830
80	250	200	325	212	212	515	1062	265	180	Rd180x20	1212	420	565	160	400	198	1148
100	280	224	364	236	236	575	1186	300	200	Rd200x22	1351	470	645	180	445	228	1600
125	315	250	408	265	265	645	1330	335	225	Rd225x24	1522	510	685	200	490	246	2230
160	355	280	458	300	300	725	1505	375	250	Rd250x28	1714	550	750	220	530	274	3100
200	400	315	515	335	335	800	1685	425	280	Rd280x32	1962	610	810	240	590	343	4366
250	450	355	580	375	375	875	1885	475	320	Rd320x36	2217	700	920	260	680	383	6234
320	500	400	650	425	425	950	2125	530	370	Rd360x36	2505	790	1030	280	760	433	8791
400	560	450	730	475	475	1045	2375	600	415	Rd400x36	2820	895	1145	300	865	482	12220

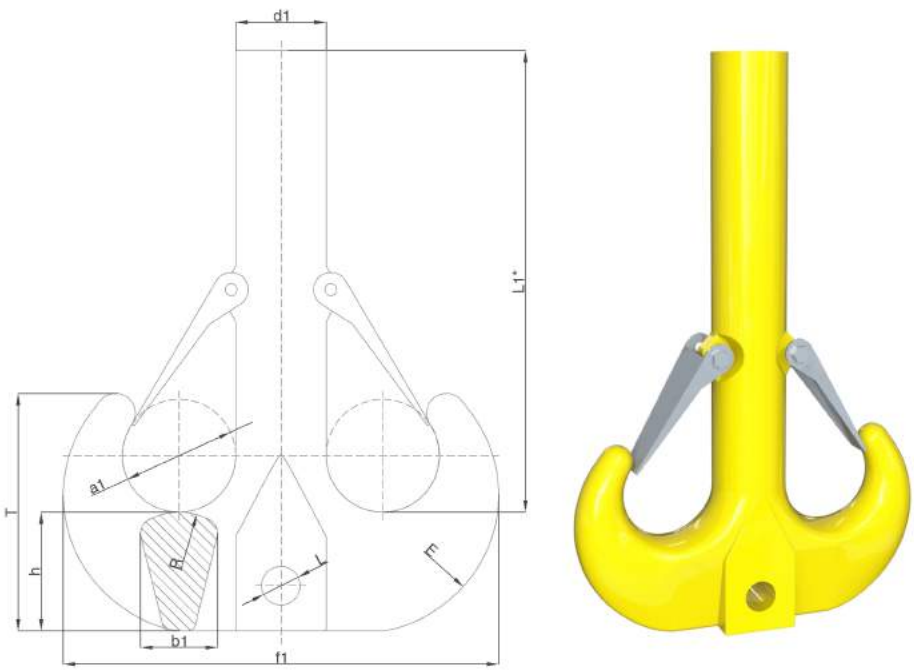
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403
Modifications: Shank length (L). Further dimensions upon request.
Hook section: RSN up to Num.10 and greater sizes RFN. For the largest hooks, other sections b1xH can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.2 Ramshorn forged hooks based on BS3017:1980 design

1.1.2.2.1 Unmachined



- WLL: from 5t to 1.000t (bottom hole excluded).
- Hook FORGED and HEAT TREATED. Machining recommended to perform by manufacturer.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended after machining.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON BS3017:1980 | UNMACHINED

	OVERALL DIMENSIONS (mm)										Weight
No	a1	E	d1	h	L	b1	L1*	R	T	f1	kg
B10	95	114	76	100	33	65	510	2	200	366	40
B15	108	129	83	108	40	70	580	2	219	412	50
B20	120	143	102	117	46	76	650	63	238	458	63
B25	133	157	114	132	46	86	715	71	267	510	79
B30	145	173	121	144	56	94	715	78	291	556	97
B35	153	184	127	156	56	101	790	84	313	584	118
B40	162	194	133	162	59	105	790	87	329	616	143
B45	170	203	140	175	59	114	885	94	351	654	175
B50	178	210	146	181	65	118	885	98	365	684	214
B60	191	229	152	200	65	130	965	108	400	732	262
B70	202	241	159	210	75	136	965	113	425	792	315
B80	211	260	165	225	75	147	1090	122	452	812	375
B100	229	289	178	251	84	163	1090	135	498	882	452
B120	242	311	191	273	90	177	1235	147	540	946	545
B140	255	327	203	289	97	188	1235	156	575	1004	655
B160	267	346	216	308	106	200	1235	166	610	1054	780
B180	279	365	229	327	113	213	1375	177	641	1118	935
B200	287	384	241	346	116	225	1375	187	679	1268	1109
B250	317	432	279	405	136	263	1550	219	762	1308	1335
B300	343	457	305	422	141	274	1745	228	804	1396	1610
B350	356	483	318	451	152	293	1745	244	845	1474	1915
B400	381	518	343	479	161	311	1998	259	899	1570	2300

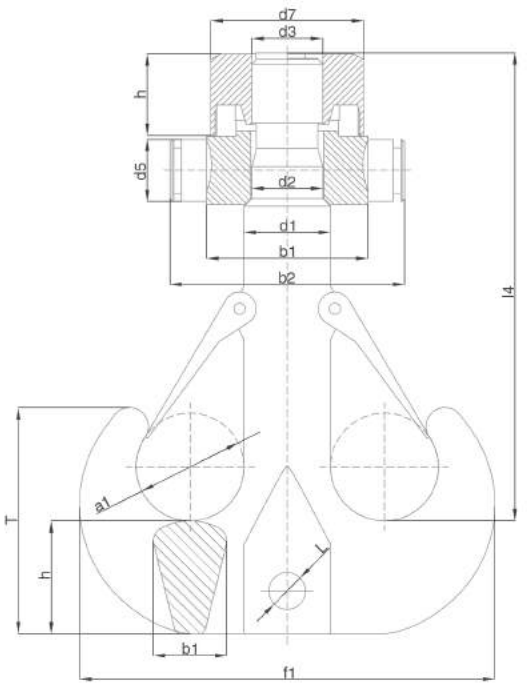
Tolerances: -0/+7% forging tolerance.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.2 Ramshorn forged hooks based on BS3017:1980 design

1.1.2.2.2 Machined fitted with nut, crosshead and bearing



- WLL: from 5t to 1.000t (bottom hole excluded).
- Hook and Nut and Crosshead FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON BS3017:1980 I MACHINED FITTED WITH NUT, CROSSHEAD and BEARING

	OVERALL DIMENSIONS (mm)										DIN 15412 Crosshead			DIN 15413 Nut		Weight
No	a1	d1	h	L	b1	T	f1	d2 h11	d3	l4	b1	b2	d5 h9	d7	h	kg
B10	95	76	100	33	65	200	366	64	Rd64x8	435	160	230	55	145	76	46
B15	108	83	108	40	70	219	412	64	Rd64x8	435	160	230	55	145	76	58
B20	120	102	117	46	76	238	458	80	Rd80x10	562	190	275	70	175	91	73
B25	133	114	132	46	86	267	510	90	Rd90x10	628	200	295	80	185	102	91
B30	145	121	144	56	94	291	556	100	Rd100x12	696	220	318	90	205	113	112
B35	153	127	156	56	101	313	584	100	Rd100x12	696	220	318	90	205	113	135
B40	162	133	162	59	105	329	616	110	Rd110x12	768	260	378	100	240	131	165
B45	170	140	175	59	114	351	654	110	Rd110x12	768	260	378	100	240	131	203
B50	178	146	181	65	118	365	684	110	Rd110x12	768	260	378	100	240	131	246
B60	191	152	200	65	130	400	732	125	Rd125x14	863	285	415	110	270	144	301
B70	202	159	210	75	136	425	792	125	Rd125x14	863	285	415	110	270	144	362
B80	211	165	225	75	147	452	812	125	Rd125x14	863	285	415	110	270	144	435
B100	229	178	251	84	163	498	882	140	Rd140x16	944	335	465	125	320	153	524
B120	242	191	273	90	177	540	946	160	Rd160x18	1072	380	522	140	360	181	626
B140	255	203	289	97	188	575	1004	160	Rd160x18	1072	380	522	140	360	181	753
B160	267	216	308	106	200	610	1054	180	Rd180x20	1212	420	565	160	400	198	897
B180	279	229	327	113	213	641	1118	180	Rd180x20	1212	420	565	160	400	198	1085
B200	287	241	346	116	225	679	1268	200	Rd200x22	1351	470	645	180	445	228	1275
B250	317	279	405	136	263	762	1308	225	Rd225x24	1522	510	685	200	490	246	1550
B300	343	305	422	141	274	804	1396	250	Rd250x28	1714	550	750	220	530	274	1850
B350	356	318	451	152	293	845	1474	250	Rd250x28	1714	550	750	220	530	274	2221
B400	381	343	479	161	311	899	1570	280	Rd280x32	1962	610	810	240	590	343	2668

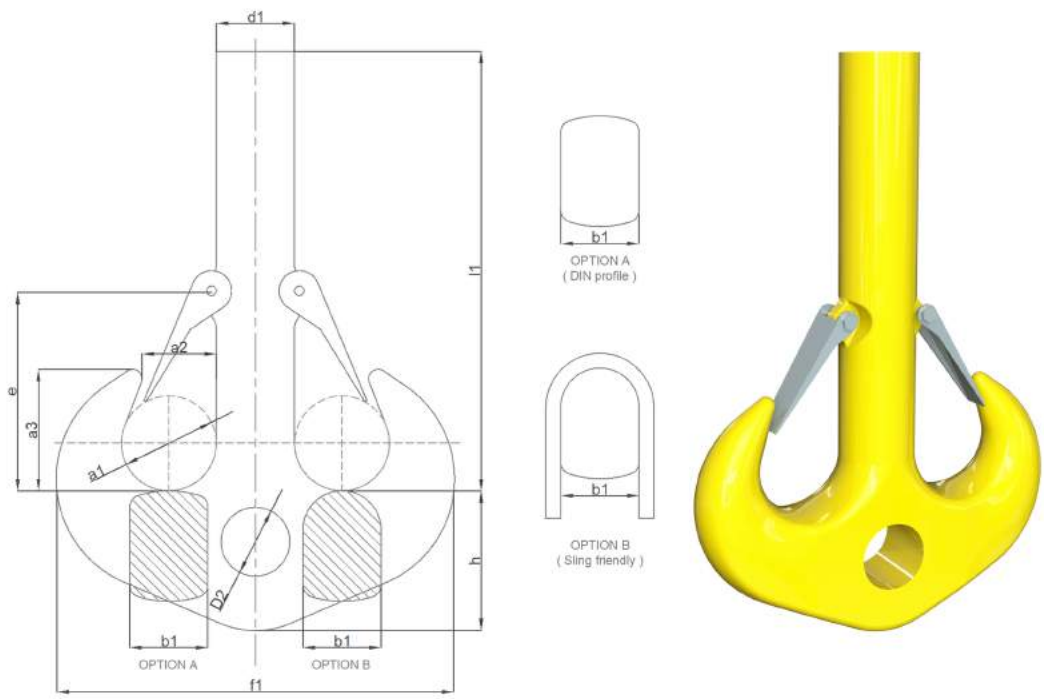
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.3 Ramshorn forged hooks based on DIN15402-B design

1.1.2.3.1 Unmachined



- WLL: from 10t to 2.000t (bottom hole included).
- Hook FORGED and HEAT TREATED. Machining recommended to perform by manufacturer.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended after machining.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON DIN15402-B DESIGN | UNMACHINED

	OVERALL DIMENSIONS (mm)										Weight
No	a1	a2	a3	b1	d1	D2 H15	e	f1	h	l1	kg
10	90	71	116	75	75	74	192	377	130	450	41
12	100	80	130	85	85	78	210	421	150	510	57
16	112	90	146	95	95	86	237	471	170	580	82
20	125	100	163	106	106	96	265	531	190	650	115
25	140	112	182	118	118	106	315	598	212	715	160
32	160	125	205	132	132	116	335	672	236	790	229
40	180	140	230	150	150	131	375	754	265	885	330
50	200	160	260	170	170	146	420	842	300	965	458
63	224	180	292	190	190	168	460	944	335	1090	638
80	250	200	325	212	212	188	515	1062	375	1235	892
100	280	224	364	236	236	208	575	1186	425	1375	1248
125	315	250	408	265	265	235	645	1330	475	1550	1757
160	355	280	458	300	300	260	725	1505	530	1745	2500
200	400	315	515	335	335	282	800	1685	600	1960	3560
250	450	355	580	375	375	312	875	1885	670	2210	5033
320	500	400	650	425	425	340	950	2125	750	2515	7095
400	560	450	730	475	475	378	1045	2375	840	2830	10010

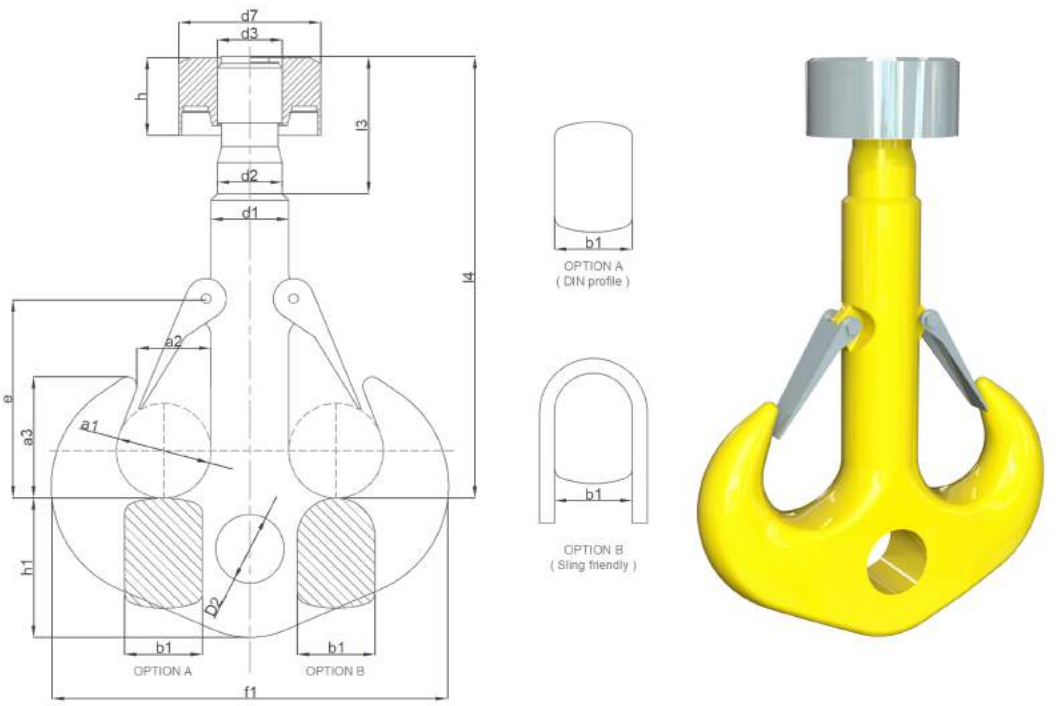
Tolerances: -0/+7% forging tolerance.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.3 Ramshorn forged hooks based on DIN15402-B design

1.1.2.3.2 Machined fitted with nut



- WLL: from 10t to 2.000t (bottom hole included).
- Hook and Nut FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON DIN15402-B DESIGN | MACHINED FITTED WITH NUT

OVERALL DIMENSIONS (mm)														DIN 15413 Nut		Weight
No	a1	a2	a3	b1	d1	e	f1	D2 H15	h1	d2 h11	d3	l3	l4	d7	h	kg
10	90	71	116	75	75	192	377	74	130	64	Rd64x8	135	435	145	76	47
12	100	80	130	85	85	210	421	78	150	72	Rd72x8	157	492	165	87	65,5
16	112	90	146	95	95	237	471	86	170	80	Rd80x10	170	562	175	91	92
20	125	100	163	106	106	265	531	96	190	90	Rd90x10	187	628	185	102	128
25	140	112	182	118	118	315	598	106	212	100	Rd100x12	207	696	205	113	177
32	160	125	205	132	132	335	672	116	236	110	Rd110x12	232	768	240	131	254
40	180	140	230	150	150	375	754	131	265	125	Rd125x14	257	863	270	144	368
50	200	160	260	170	170	420	842	146	300	140	Rd140x16	280	944	320	153	513
63	224	180	292	190	190	460	944	168	335	160	Rd160x18	322	1072	360	181	718
80	250	200	325	212	212	515	1062	188	375	180	Rd180x20	357	1212	400	198	1002
100	280	224	364	236	236	575	1186	208	425	200	Rd200x22	402	1351	445	228	1398
125	315	250	408	265	265	645	1330	235	475	225	Rd225x24	465	1522	490	246	1967
160	355	280	458	300	300	725	1505	260	530	250	Rd250x28	510	1714	530	274	2770
200	400	315	515	335	335	800	1685	282	600	280	Rd280x32	613	1962	590	343	3930
250	450	355	580	375	375	875	1885	312	670	320	Rd320x36	690	2217	680	383	5655
320	500	400	650	425	425	950	2125	340	750	370	Rd360x36	780	2505	760	433	7602
400	560	450	730	475	475	1045	2375	378	840	415	Rd400x36	875	2820	865	482	10705

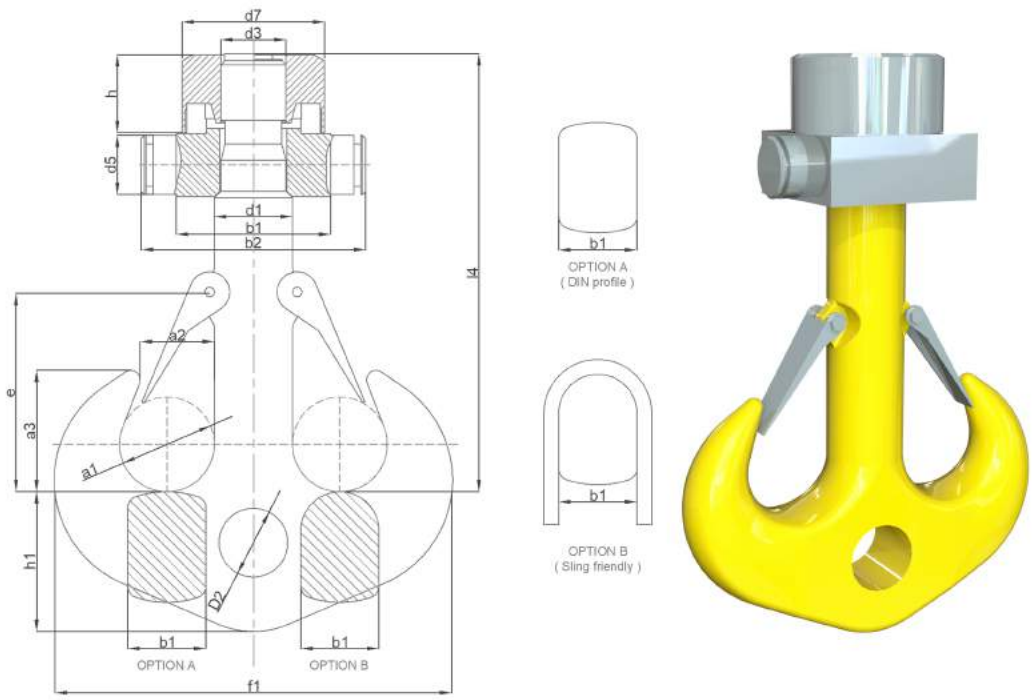
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.2 RAMSHORN FORGED HOOKS BASED ON RECOGNIZED EUROPEAN STANDARDS

1.1.2.3 Ramshorn forged hooks based on DIN15402-B design

1.1.2.3.3 Machined fitted with nut, crosshead and bearing



- WLL: from 10t to 2.000t (bottom hole included).
- Hook, Nut and crosshead FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, S, T, V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

RAMSHORN FORGED HOOKS BASED ON DIN15402-B DESIGN | MACHINED FITTED WITH NUT, CROSSHEAD and BEARING

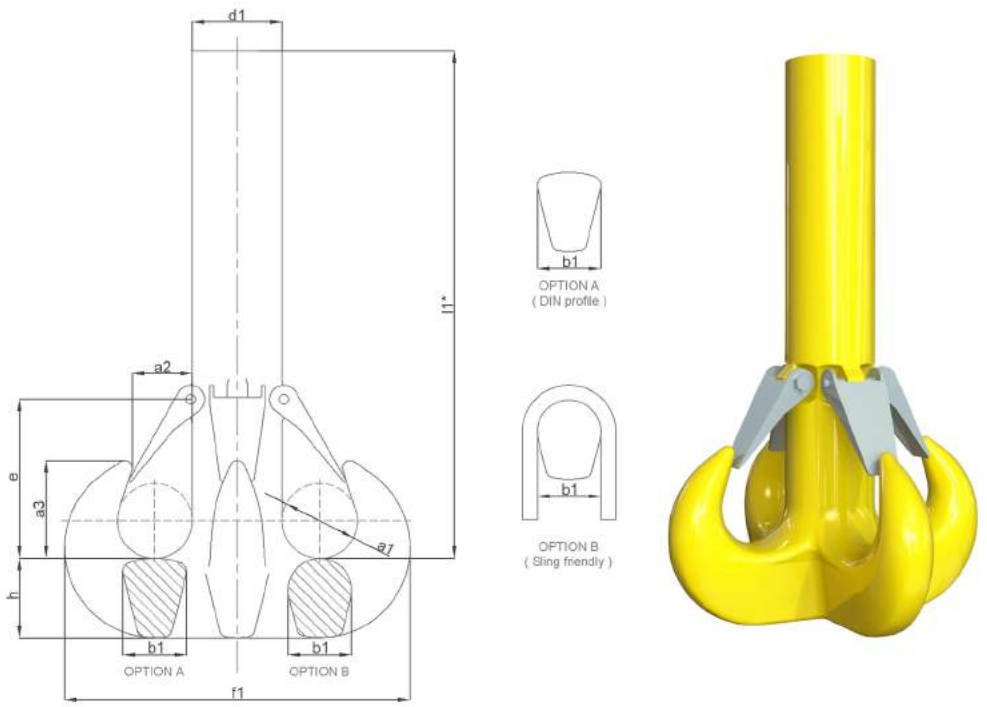
OVERALL DIMENSIONS (mm)												DIN 15412 Crosshead			DIN 15413 Nut		Weight
No	a1	a2	a3	b1	d1	e	f1	D2 H15	h1	d3	l4	b1	b2	d5 h9	d7	h	kg
10	90	71	116	75	75	192	377	74	130	Rd64x8	435	160	230	55	145	76	61,7
12	100	80	130	85	85	210	421	78	150	Rd72x8	492	180	265	60	165	87	87,5
16	112	90	146	95	95	237	471	86	170	Rd80x10	562	190	275	70	175	91	118,9
20	125	100	163	106	106	265	531	96	190	Rd90x10	628	200	295	80	185	102	161
25	140	112	182	118	118	315	598	106	212	Rd100x12	696	220	318	90	205	113	221,5
32	160	125	205	132	132	335	672	116	236	Rd110x12	768	260	378	100	240	131	323
40	180	140	230	150	150	375	754	131	265	Rd125x14	863	285	415	110	270	144	462
50	200	160	260	170	170	420	842	146	300	Rd140x16	944	335	465	125	320	153	656
63	224	180	292	190	190	460	944	168	335	Rd160x18	1072	380	522	140	360	181	921
80	250	200	325	212	212	515	1062	188	375	Rd180x20	1212	420	565	160	400	198	1281
100	280	224	364	236	236	575	1186	208	425	Rd200x22	1351	470	645	180	445	228	1788
125	315	250	408	265	265	645	1330	235	475	Rd225x24	1522	510	685	200	490	246	2496
160	355	280	458	300	300	725	1505	260	530	Rd250x28	1714	550	750	220	530	274	3485
200	400	315	515	335	335	800	1685	282	600	Rd280x32	1962	610	810	240	590	343	4911
250	450	355	580	375	375	875	1885	312	670	Rd320x36	2217	700	920	260	680	383	7037
320	500	400	650	425	425	950	2125	340	750	Rd360x36	2505	790	1030	280	760	433	9302
400	560	450	730	475	475	1045	2375	378	840	Rd400x36	2820	895	1145	300	865	482	13133

Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.3 QUAD FORGED HOOKS BASED ON DIN15402-C DESIGN

1.1.3.1 Unmachined



- WLL: from 160t to 4.000t with equal load on 4 prongs/horns.
- Hook FORGED and HEAT TREATED. Machining recommended to perform by manufacturer.
- Material: super alloys.
- Mechanical properties: V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended after machining.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

QUAD FORGED HOOKS BASED ON DIN15402-C I UNMACHINED

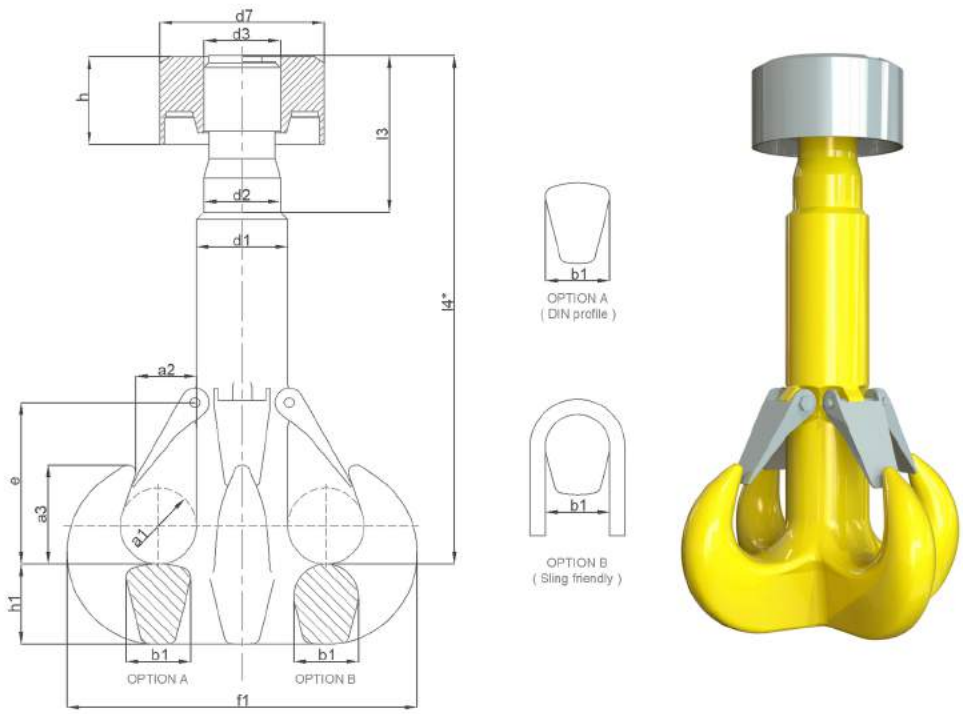
	OVERALL DIMENSIONS (mm)										Weight
No	WLL	a1	a2	a3	b1	d1	e	f1	h	l1*	kg
16	160t	112	90	146	95	132	237	508	118	790	154
20	200t	125	100	163	106	150	265	575	132	885	221
25	250t	140	112	182	118	170	315	650	150	965	312
32	320t	160	125	205	132	190	335	730	170	1090	440
40	400t	180	140	230	150	212	375	816	190	1235	624
50	500t	200	160	260	170	236	420	908	212	1375	868
63	640t	224	180	292	190	265	460	1019	236	1550	1231
80	800t	250	200	325	212	300	515	1150	265	1745	1751
100	1000t	280	224	364	236	335	575	1285	300	1998	2477
125	1260t	315	250	408	265	375	645	1440	335	2250	3490
160	1600t	355	280	458	300	425	725	1630	375	2550	5122
200	2000t	400	315	515	335	475	800	1825	425	2895	7158
250	2600t	450	355	580	375	550	875	2100	475	3270	10060
320	3200t	500	400	650	425	625	950	2390	530	3695	14140
400	4000t	560	450	730	475	725	1045	2775	600	4180	20450

WLL based on V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.3 QUAD FORGED HOOKS BASED ON DIN15402-C DESIGN

1.1.3.2 Machined fitted with nut



- WLL: from 160t to 4.000t with equal load on 4 prongs/horns.
- Hook and Nut FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: super alloys.
- Mechanical properties: V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

QUAD FORGED HOOKS BASED ON DIN15402-C I MACHINED FITTED WITH NUT

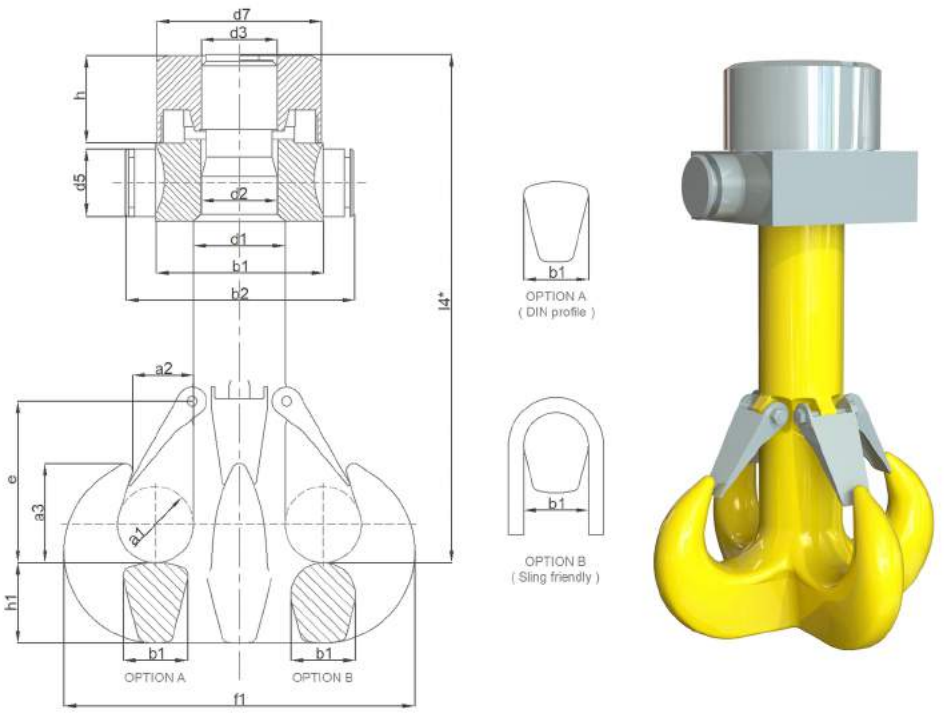
OVERALL DIMENSIONS (mm)														DIN 15413 Nut		Weight
No	WLL	a1	a2	a3	b1	d1	e	f1	h1	d2 h11	d3	l3	l4*	d7	h	kg
16	160t	112	90	146	95	132	237	508	118	110	Rd110x12	232	768	240	131	168
20	200t	125	100	163	106	150	265	575	132	125	Rd125x14	257	863	270	144	241
25	250t	140	112	182	118	170	315	650	150	140	Rd140x16	280	944	320	153	342
32	320t	160	125	205	132	190	335	730	170	160	Rd160x18	322	1072	360	181	490
40	400t	180	140	230	150	212	375	816	190	180	Rd180x20	357	1212	400	198	743
50	500t	200	160	260	170	236	420	908	212	200	Rd200x22	402	1351	445	228	958
63	640t	224	180	292	190	265	460	1019	236	225	Rd225x24	465	1522	490	246	1348
80	800t	250	200	325	212	300	515	1150	265	250	Rd250x28	510	1714	530	274	1879
100	1000t	280	224	364	236	335	575	1285	300	280	Rd280x32	613	1962	590	343	2648
125	1260t	315	250	408	265	375	645	1440	335	320	Rd320x36	690	2217	680	383	3725
160	1600t	355	280	458	300	425	725	1630	375	370	Rd360x36	780	2505	760	433	5228
200	2000t	400	315	515	335	475	800	1825	425	415	Rd400x36	875	2820	865	482	7420
250	2600t	450	355	580	375	550	875	2100	475	480	Rd480x36	985	3175	975	540	10465
320	3200t	500	400	650	425	625	950	2390	530	550	Rd550x36	1110	3570	1090	600	14790
400	4000t	560	450	730	475	725	1045	2775	600	640	Rd640x36	1250	4020	1220	670	21240

WLL based on V material grade.
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.3 QUAD FORGED HOOKS BASED ON DIN15402-C DESIGN

1.1.3.2 Machined fitted with nut, crosshead and bearing



- WLL: from 160t to 4.000t with equal load on 4 prongs/horns.
- Hook, nut and crosshead FORGED, HEAT TREATED and thread fully MACHINED as per DIN15403 design.
- Material: super alloys.
- Mechanical properties: V, W.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

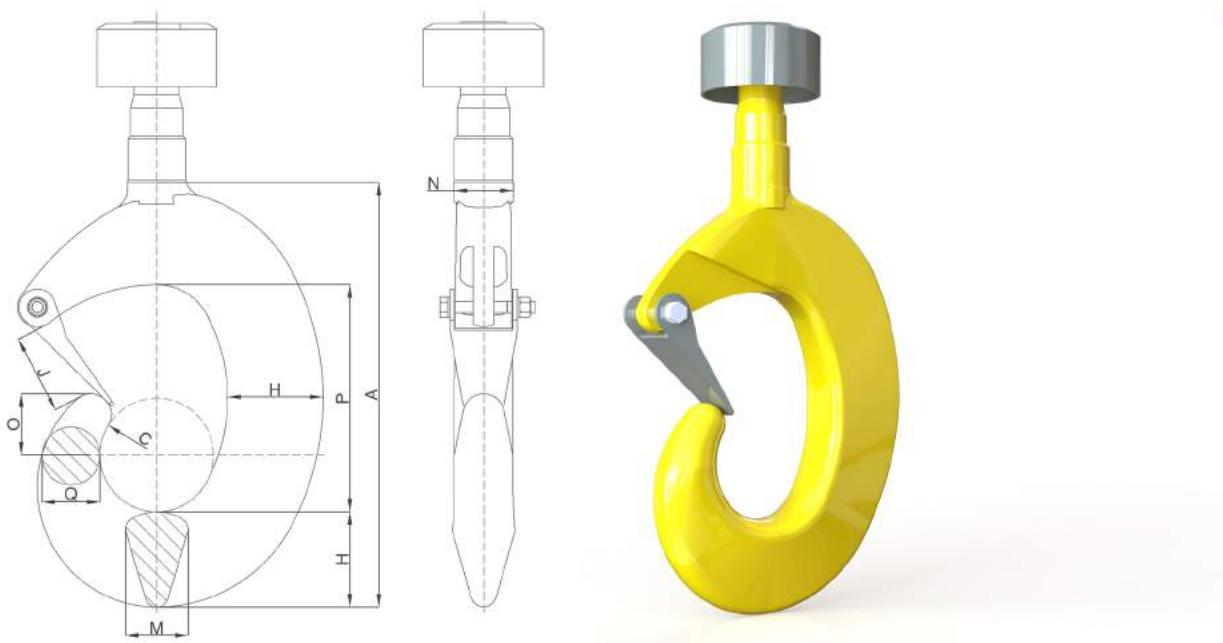
QUAD FORGED HOOKS BASED ON DIN15402-C I MACHINED FITTED WITH NUT, CROSSHEAD and BEARING

OVERALL DIMENSIONS (mm)													DIN 15412 Crosshead			DIN 15413 Nut		Weight
No	WLL	a1	a2	a3	b1	d1	e	f1	h1	d2 h11	d3	l4*	b1	b2	d5 h9	d7	h	kg
16	160t	112	90	146	95	132	237	508	118	110	Rd110x12	768	260	378	100	240	131	231
20	200t	125	100	163	106	150	265	575	132	125	Rd125x14	863	285	415	110	270	144	325
25	250t	140	112	182	118	170	315	650	150	140	Rd140x16	944	335	465	125	320	153	472
32	320t	160	125	205	132	190	335	730	170	160	Rd160x18	1072	380	522	140	360	181	679
40	400t	180	140	230	150	212	375	816	190	180	Rd180x20	1212	420	565	160	400	198	1106
50	500t	200	160	260	170	236	420	908	212	200	Rd200x22	1351	470	645	180	445	228	1321
63	640t	224	180	292	190	265	460	1019	236	225	Rd225x24	1522	510	685	200	490	246	1838
80	800t	250	200	325	212	300	515	1150	265	250	Rd250x28	1714	550	750	220	530	274	2523
100	1000t	280	224	364	236	335	575	1285	300	280	Rd280x32	1962	610	810	240	590	343	3598
125	1260t	315	250	408	265	375	645	1440	335	320	Rd320x36	2217	700	920	260	680	383	5115
160	1600t	355	280	458	300	425	725	1630	375	370	Rd360x36	2505	790	1030	280	760	433	7220
200	2000t	400	315	515	335	475	800	1825	425	415	Rd400x36	2820	895	1145	300	865	482	10195
250	2600t	450	355	580	375	550	875	2100	475	480	Rd480x36	3175	1005	1265	320	975	540	14475
320	3200t	500	400	650	425	625	950	2390	530	550	Rd550x36	3570	1110	1390	345	1090	600	20410
400	4000t	560	450	730	475	725	1045	2775	600	640	Rd640x36	4020	1225	1520	370	1220	670	29100

WLL based on V material grade.
Tolerances: -0/+7% forging tolerance. Machining tolerances as per DIN15403.
Modifications: Shank length (L). Further dimensions upon request.
Hook section: b1xH: other sections can be design.

1.1 SHANK HOOKS BASED ON EN13001-3-5:2016

1.1.4 SINGLE FORGED CARGO HOOKS BASED ON BS2903:1980 DESIGN.



- WLL: from 10t to 50t. Larger ones upon request.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SINGLE FORGED CARGO HOOKS BASED ON BS2903:1980 DESIGN

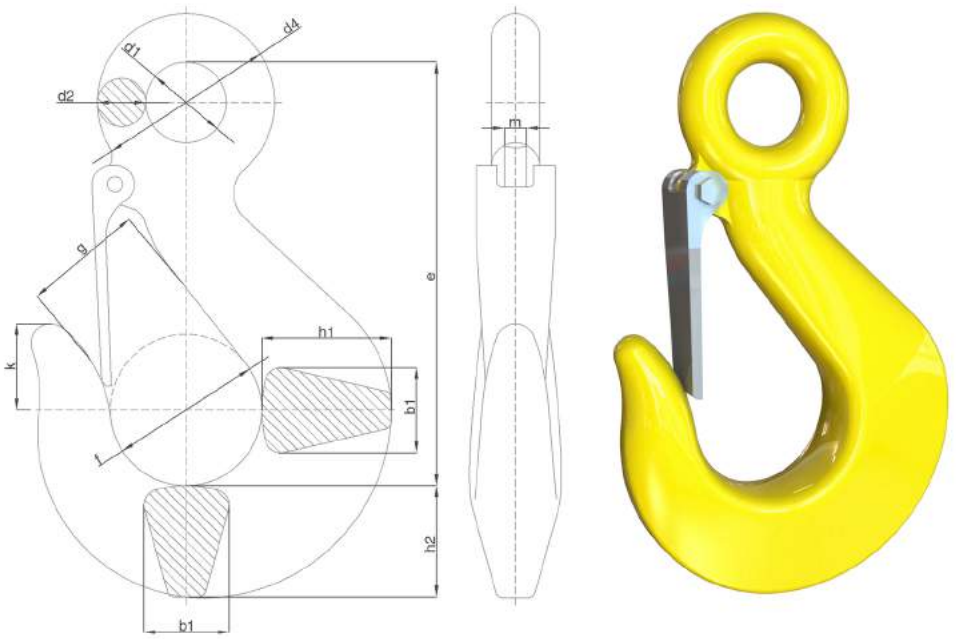
		OVERALL DIMENSIONS (mm)									Weight
No	WLL (t)	C	A	P	H	J	M	O	Q	N	kg
5	10	70	258	140	59	50	38	38	35	41	5,5
6,3	13	78	287	156	66	55	43	42	39	46	8
8	16	88	324	176	74	62	48	48	44	51	11
10	20	98	361	196	82	70	54	53	49	56	15
12,5	25	110	405	220	92	78	60	59	55	61	22
16	32	124	456	248	104	88	68	67	62	66	32
20	40	139	512	278	117	99	76	75	70	76	45
25	50	156	574	312	131	111	86	84	78	81	63

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: Upon request.

1.2 EYE HOOKS

1.2.1 EYE FORGED SINGLE HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS & IRIZAR DESIGNS

1.2.1.1 Eye forged single CHAIN hook based on DIN7540 design



- WLL: from 3t to 400t (for super alloy materials).
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

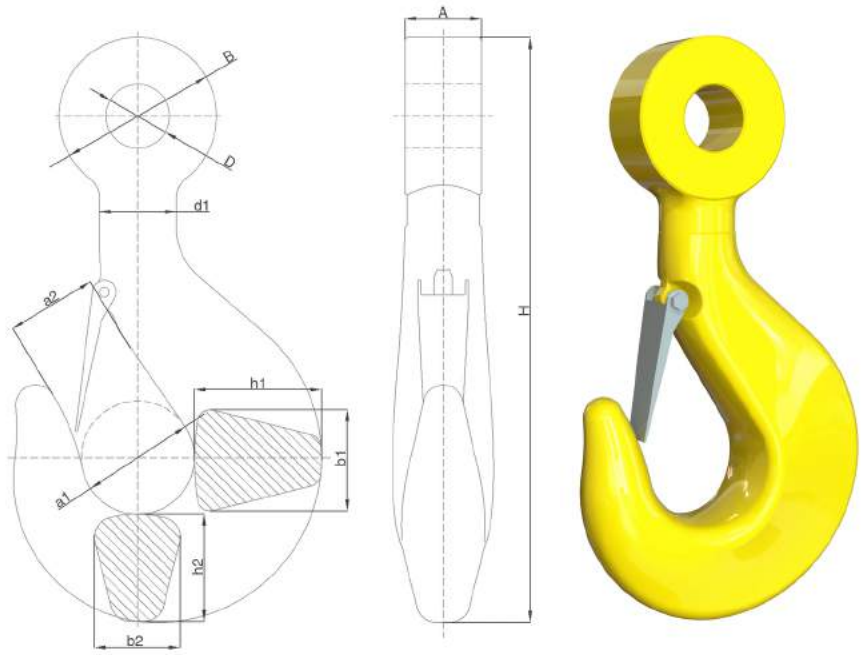
EYE FORGED SINGLE CHAIN HOOK BASED ON DIN7540 DESIGN													
	OVERALL DIMENSIONS (mm)												Weight
No	WLL (t)	b1	d1	d2	e	f	g	h1	h2	k	m	d4	kg
25	5	28	26	16	138	50	39	42,5	36,5	28,5	11	58	1,4
27	8	35	32	20	174	62	49	53,5	46	36	12	72	2,6
28	10	40	36	22,5	190	70	54	60	52	36	14	81	3,9
29	12,5	44,5	40	25	219	79	62	67,5	58	45	16	90	5,7
30	16	49,5	46	28	246	88	69	75	65	50	17	102	8
31	20	56	52	31,5	277	99	78	84,5	73	57	18	115	11,5
32	25	63	60	35,5	313	112	88	96	82,5	64	18	131	16
33	32	70	66	40	349	125	98	106	92	72	19	146	22
34	40	78	72	44,5	388	140	109	118	103	80	20	161	31,5
35	50	89	84	50,5	442	158	124	135	116	90	23	185	46
36	63	99	90	56	494	176	138	151	130	101	25	202	63
37	80	110	102	63	610	198	155	168	145	113	30	228	80
38	100	125	116	74	650	225	175	195	172	133	38	264	125
39	150	160	130	86	765	250	200	225	199	160	38	302	250
40	200	180	150	102	850	275	225	260	237	195	45	354	365
41	250	200	170	120	928	310	255	290	269	210	45	410	515
42	300	220	190	140	1052	350	290	330	309,5	240	45	470	730
43	400	240	210	170	1195	400	320	380	345	270	45	550	1055

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: Modifications upon request.

1.2 EYE HOOKS

1.2.1 EYE FORGED SINGLE HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS & IRIZAR DESIGNS

1.2.1.2 Eye forged single FIX hook based on IRIZAR DESIGN



- WLL: from 80t to 2.000t. Larger ones upon request.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

EYE FORGED SINGLE FIX HOOK BASED ON IRIZAR DESIGN

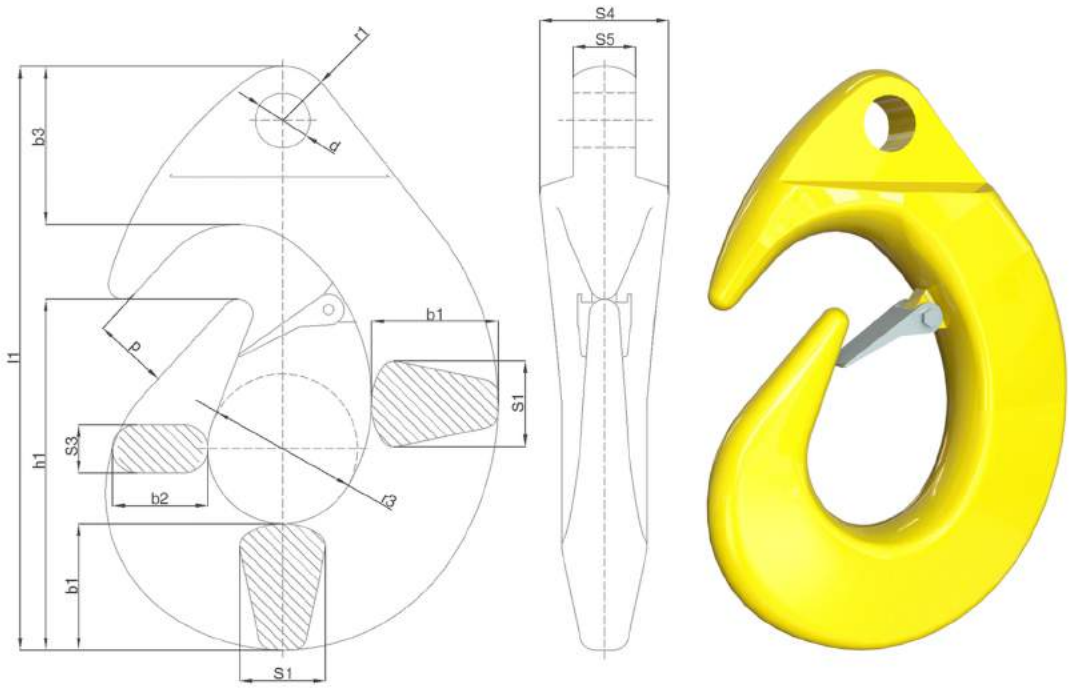
			OVERALL DIMENSIONS (mm)											Weight
No	WLL (t)	MBL (t)	a1	a2	b1	b2	h1	h2	d1	A	D	B	H	kg
16	80	320	140	112	125	106	160	132	95	110	87	180	746	96
20	100	400	160	125	140	118	180	150	106	118	100	210	812	137
25	120	480	180	140	160	132	200	170	118	134	100	210	927	190
32	150	600	200	160	180	150	224	190	132	140	114	240	1052	272
40	200	800	224	180	200	170	250	212	150	150	137	290	1201	397
50	250	1000	250	200	224	190	280	236	170	170	147	310	1314	531
63	300	1200	280	224	250	212	315	265	190	190	158	330	1448	730
80	400	1600	315	250	280	236	355	300	212	205	184	380	1685	1033
100	500	2000	355	280	315	265	400	335	236	230	194	400	1871	1430
125	600	2400	400	315	355	300	450	375	265	255	215	450	2075	1998
160	800	3200	450	355	400	335	500	425	300	280	240	500	2294	2786
200	1000	4000	500	400	450	375	560	475	335	320	280	580	2450	3868
250	1250	5000	560	450	500	425	630	530	375	355	315	650	2810	5442
320	1550	6200	630	500	560	475	710	580	425	355	335	680	3060	7231
400	1800	7200	710	560	630	530	800	630	475	410	395	750	3430	9995

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: H, D and A. Others upon request.

1.2 EYE HOOKS

1.2.1 EYE FORGED SINGLE HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS & IRIZAR DESIGNS

1.2.1.3 Eye forged single CARGO hook based on DIN82017 design



- WLL: from 10t to 100t. Larger ones upon request.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

EYE FORGED SINGLE CARGO HOOK BASED ON DIN82017 DESIGN

	OVERALL DIMENSIONS (mm)														Weight
No	WLL (t)	b1	b2	b3	d	h1	l1	p	r1	r3	S1	S3	S4	S5 A	S5 B	kg
1	2	42	33	50	17,5	117	192	25	18	25	28	16	40	19	16	3
2	4	54	42	69	24	150	251	32	25	32	36	20	58	27	22	7
3	6	68	53	82	30	188	310	40	30	40	46	26	72	35	28	11
5	10	84	66	103	39	234	387	50	38	50	56	32	92	44	35	20
6	12	94	73	114	42	262	432	56	43	56	64	36	102	50	40	27
8	16	106	83	129	48	295	487	63	48	63	72	40	115	56	45	38
10	20	118	92	150	52	328	548	70	55	70	80	45	125	61	50	59
12	24	135	105	172	56	375	627	80	60	80	91	51	138	68	55	78
16	32	152	114	190	66	422	702	90	65	90	103	58	155	75	60	118
20	40	170	133	202	74	470	772	100	70	100	115	64	172	84	65	166
25	50	190	153	220	78	522	852	110	75	110	128	72	192	94	70	250
32	65	203	167	246	86	562	928	120	85	120	137	77	204	102	80	390
40	80	225	189	272	96	618	1020	130	95	130	152	85	225	117	90	610

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: H, D and A. Others upon request.

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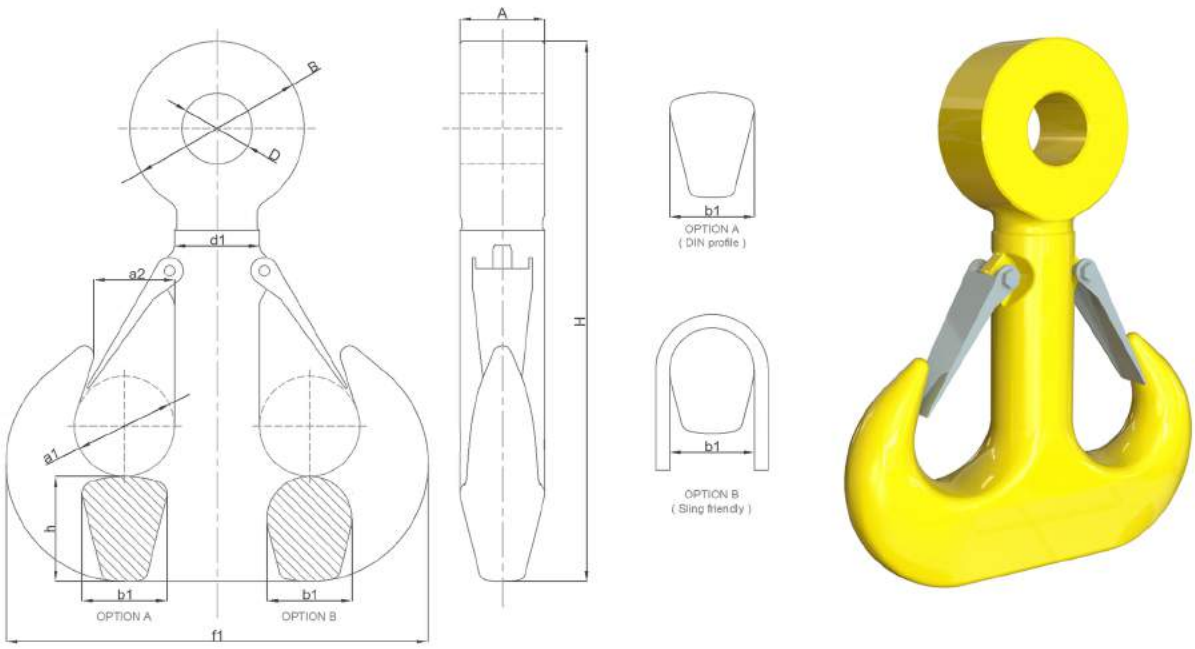
1.2 EYE HOOKS

1.2.2 EYE FORGED RAMSHORN HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS & IRIZAR DESIGNS

1.2.2.1 Eye forged Ramshorn FIX hook based on IRIZAR design



- WLL: from 80t to 2.000t. Larger ones upon request.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

EYE FORGED RAMSHORN FIX HOOK BASED ON IRIZAR DESIGN

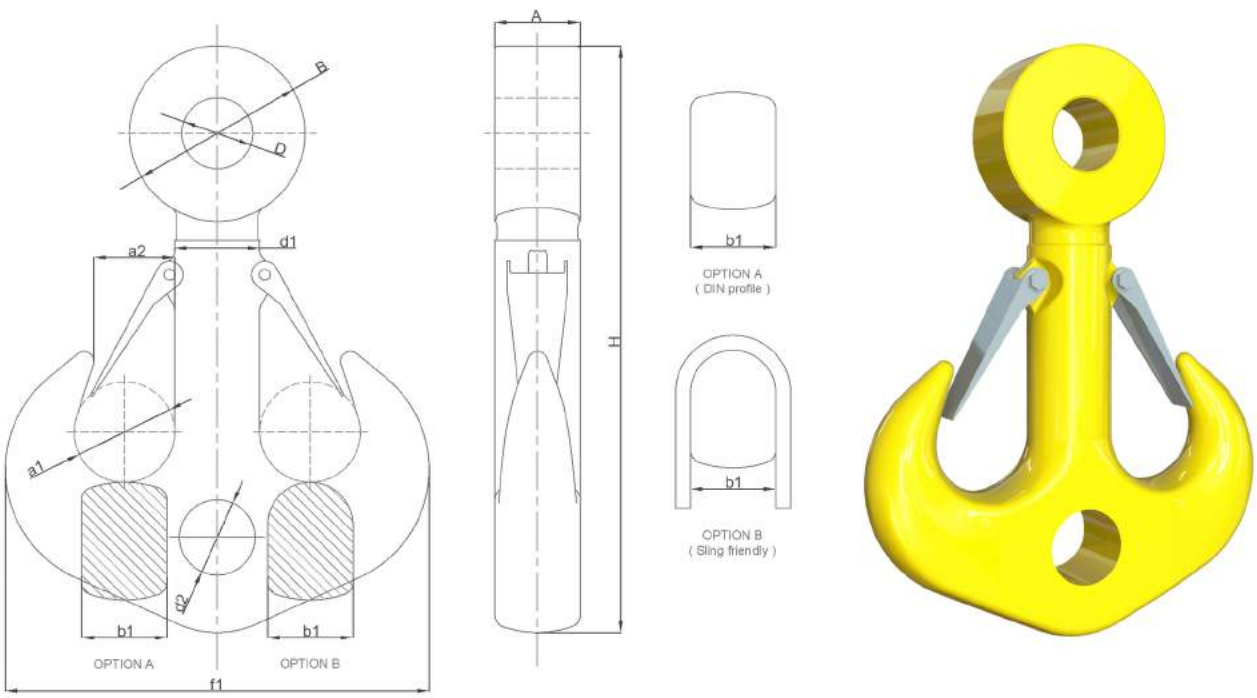
			OVERALL DIMENSIONS (mm)										Weight
No	WLL (t)	MBL (t)	a1	a2	b1	h	d1	f1	A	D	B	H	kg
16	80	320	112	90	95	118	95	471	110	87	180	625	77
20	100	400	125	100	106	132	106	531	118	100	210	713	113
25	120	480	140	112	118	150	118	598	134	100	210	799	153
32	150	600	160	125	132	170	132	672	140	114	240	872	213
40	200	800	180	140	150	190	150	754	150	137	290	1004	307
50	250	1000	200	160	170	212	170	842	170	147	310	1112	420
63	300	1200	224	180	190	236	190	944	190	158	330	1210	577
80	400	1600	250	200	212	265	212	1062	205	184	380	1408	831
100	500	2000	280	224	236	300	236	1186	230	194	400	1536	1096
125	600	2400	315	250	265	335	265	1330	255	215	450	1708	1576
160	800	3200	355	280	300	375	300	1505	280	240	500	1879	2187
200	1000	4000	400	315	335	425	335	1685	320	280	580	2125	3063
250	1250	5000	450	355	375	475	375	1885	355	315	650	2240	4072
320	1550	6200	500	400	425	530	425	2125	355	335	680	2390	5532
400	1800	7200	560	450	475	600	475	2375	410	395	750	2545	7526

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: H, D and A. Others upon request.

1.2 EYE HOOKS

1.2.2 EYE FORGED RAMSHORN HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS & IRIZAR DESIGNS

1.2.2.2 Eye forged Ramshorn B hook based on IRIZAR design



- WLL: from 80t to 2.000t (bottom hole included). Larger ones upon request.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

EYE FORGED RAMSHORN B HOOK BASED ON IRIZAR DESIGN

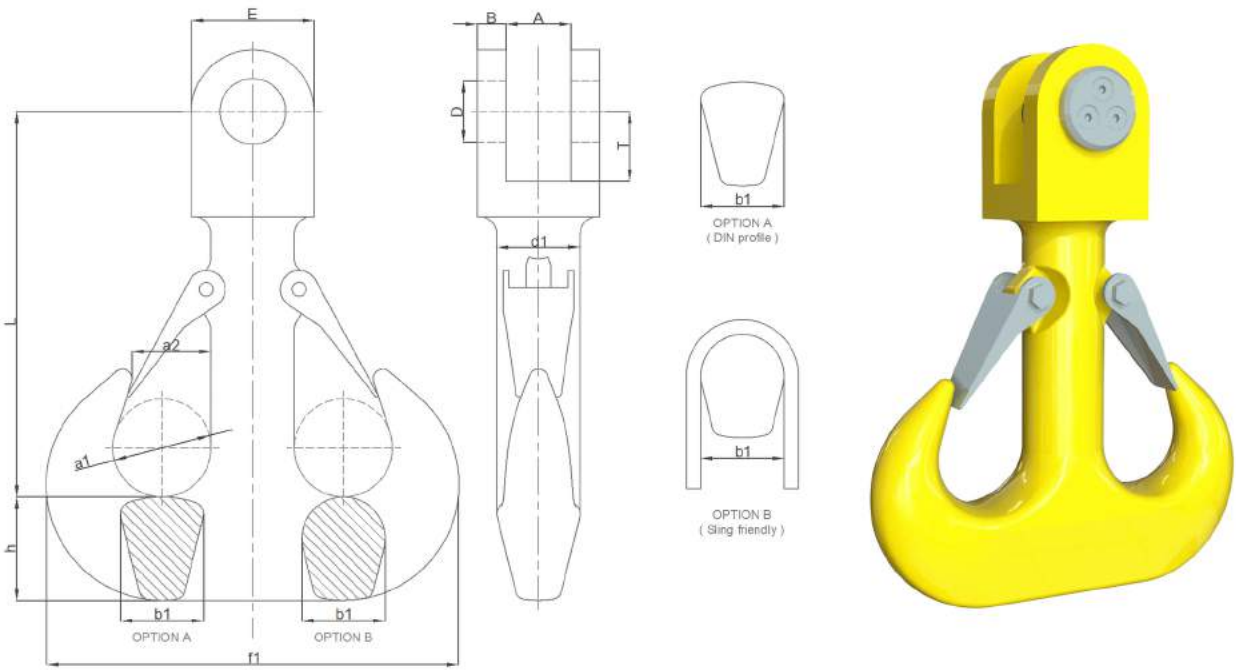
			OVERALL DIMENSIONS (mm)										Weight
No	WLL (t)	MBL (t)	a1	a2	b1	d1	d2H15	f1	A	D	B	H	kg
16	80	320	112	90	95	95	86	471	110	87	180	678	84
20	100	400	125	100	106	106	96	531	118	100	210	771	125
25	120	480	140	112	118	118	106	598	134	100	210	862	169
32	150	600	160	125	132	132	116	672	140	114	240	938	236
40	200	800	180	140	150	150	131	754	150	137	290	1080	353
50	250	1000	200	160	170	170	146	842	170	147	310	1201	468
63	300	1200	224	180	190	190	168	944	190	158	330	1308	633
80	400	1600	250	200	212	212	188	1062	205	184	380	1518	898
100	500	2000	280	224	236	236	208	1186	230	194	400	1660	1240
125	600	2400	315	250	265	265	235	1330	255	215	450	1848	1730
160	800	3200	355	280	300	300	260	1505	280	240	500	2034	2442
200	1000	4000	400	315	335	335	282	1685	320	280	580	2300	3490
250	1250	5000	450	355	375	375	312	1885	355	315	650	2553	4855
320	1550	6200	500	400	425	425	330	2125	355	335	680	2755	6950
400	1800	7200	560	450	475	475	370	2375	410	395	750	2980	9834

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: H, D and A. Others upon request.

1.2 EYE HOOKS

1.2.2 EYE FORGED RAMSHORN HOOKS BASED ON RECOGNIZED EUROPEAN DESIGNS & IRIZAR DESIGNS

1.2.2.3 Eye forged Ramshorn FORK hook based on DIN82019 design



- WLL: from 80t to 2.000t. Larger ones upon request.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, V.
- Safety Factor: min. 4:1 with the highest material grade.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

EYE FORGED RAMSHORN FORK HOOK BASED ON DIN82019 DESIGN

			OVERALL DIMENSIONS (mm)											Weight
No	WLL (t)	MBL	a1	a2	h	d1	f1	A	B	D	L	E	T	kg
16	80	320	112	90	118	95	471	120	70	80	490	155	120	109
20	100	400	125	100	132	106	531	135	80	85	550	170	125	159
25	120	480	140	112	150	118	598	150	89	95	624	200	142	227
32	150	600	160	125	170	132	672	170	102	110	720	230	165	343
40	200	800	180	140	190	150	754	180	120	125	815	260	185	496
50	250	1000	200	160	212	170	842	205	125	140	900	260	210	615
63	300	1200	224	180	236	190	944	205	130	150	1005	305	225	846
80	400	1600	250	200	265	212	1062	230	165	175	1130	350	260	1309
100	500	2000	280	224	300	236	1186	255	180	185	1260	370	275	1717
125	600	2400	315	250	335	265	1330	285	195	205	1390	405	300	2325
160	800	3200	355	280	375	300	1505	310	210	215	1525	435	320	3081
200	1000	4000	400	315	425	335	1685	350	230	240	1660	480	360	4248
250	1250	5000	450	355	475	375	1885	370	278	270	1815	590	405	6715
320	1550	6200	500	400	530	425	2125	370	280	290	1980	610	435	8088
400	1800	7200	560	450	600	475	2375	430	300	330	2375	660	495	11200

WLL: for V material grade.
Tolerances: -0/+7% forging tolerance.
Modifications: r5, b2 and b4. Others upon request.

1.3 CUSTOM HOOKS

FORGED HEAVY DUTY HOOKS

IRIZAR FORGE team can accommodate any forged hook to the specific lifting operation the market is ready to operate **up to 4.000t**, from safety, design, material strength and certification point of view.

- WLL: up to 4.000t.
- Hook FORGED and HEAT TREATED, fully machined and fitted & assembled.
- Material: carbon, alloys and super alloys. Stainless steels available upon request.
- Mechanical properties: P, T, V.
- Safety Factor: min. 4:1 with the highest material grade.
- General Tolerances: -0/+7% forged parts and Machining tolerances as per DIN15403.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

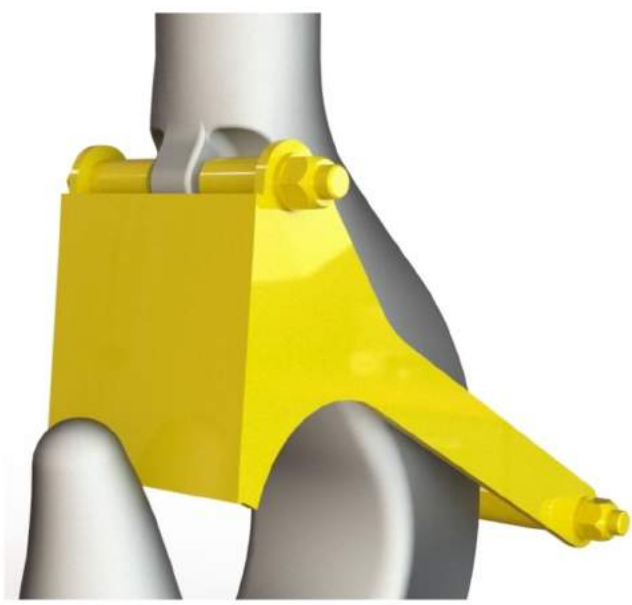
1.4 VARIETY OF SAFETY LATCHES FOR CRANE HOOKS

1.4.1 STANDARD LATCH

- Material: carbon & stainless steels.
- Suitable for: Single & Ramshorn hooks.
- Test: FAT upon request.

1.4.2 GRAVITY LATCH

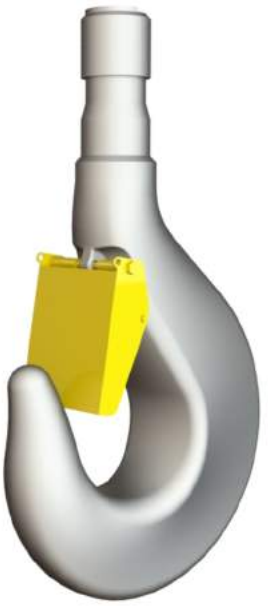
- Material: carbon & stainless steels.
- Suitable for: Single hooks only.
- Test: FAT upon request.

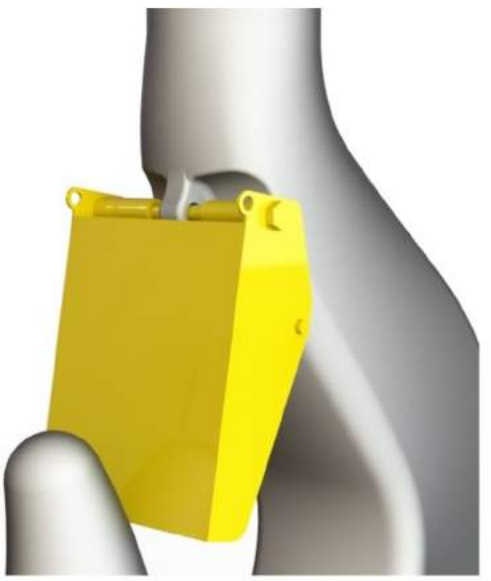


1.4 VARIETY OF SAFETY LATCHES FOR CRANE HOOKS

1.4.3 LOCKING LATCH

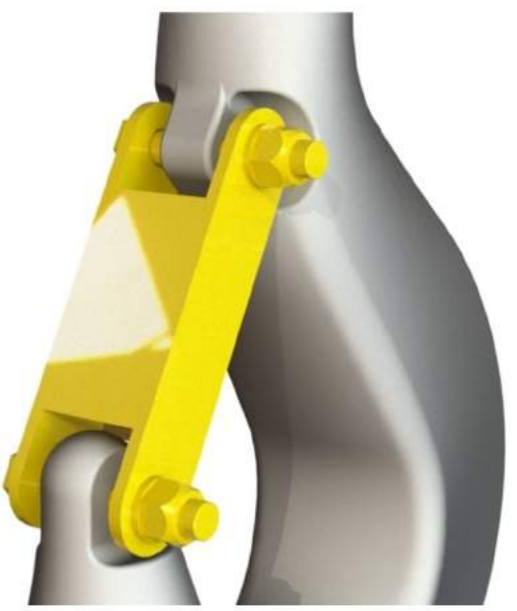
- Material: carbon & stainless steels.
- Suitable for: Single & Ramshorn hooks.
- Test: FAT upon request.





1.4.4 FIX LATCH

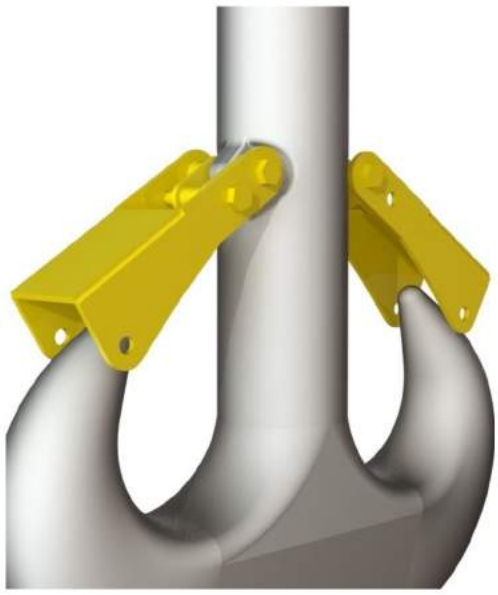
- Material: carbon & stainless steels.
- Suitable for: Single & Ramshorn hooks.
- Test: FAT upon request.



1.4 VARIETY OF SAFETY LATCHES FOR CRANE HOOKS

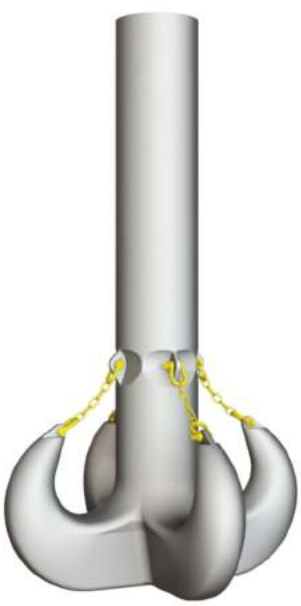
1.4.5 SUBSEA LATCH

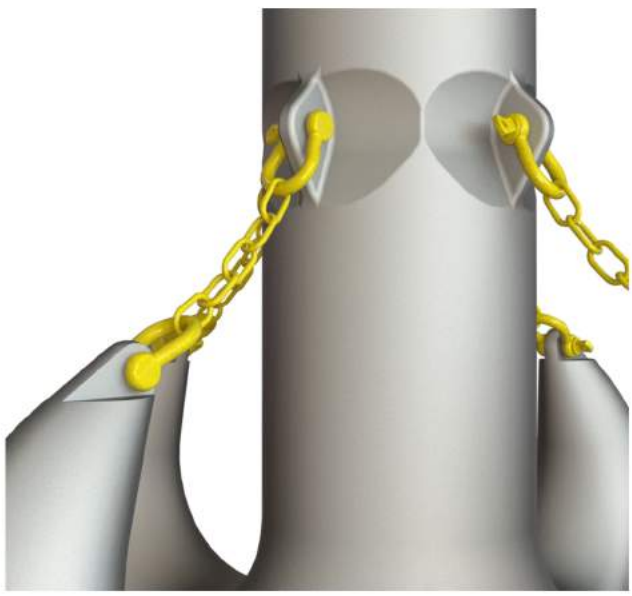
- Material: carbon & stainless steels.
- Suitable for: Single & Ramshorn hooks.
- Test: FAT upon request.



1.4.6 CHAIN LATCH

- Material: carbon & stainless steels.
- Suitable for: Quad & Ramshorn hooks.
- Test: FAT upon request.





CRANE BLOCKS

2.0 INTRO

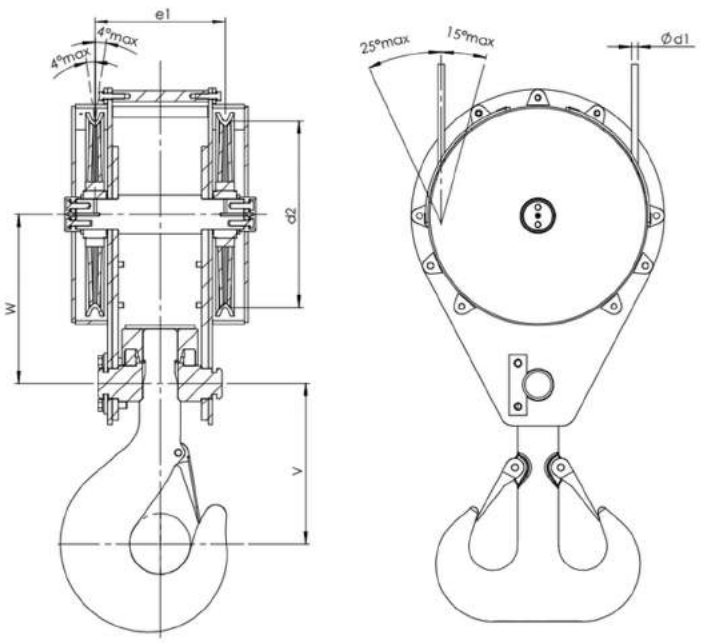
Crane block or hook block is considered the complete component of the hoist and it's linked to the crane by the rope pulleys/ sheaves though the rope.

Its design depends on the crane purpose and concept design whereas rope pulleys or sheaves and hook assembly design will be the key factor to achieve customer requirements and expectations. Using the previous pages for the right hook selection, sheaves must keep a proportional relation and must be symetric to the gravity center of the Crane Block.

Last decades sheaves diameter has been decreased thanks to wire ropes advanced technology using more flexible wire ropes, reducing rope diameter and increasing strengthness thanks to very advanced materials, having decreased the historical factor (rope diameter (d1) x factor=sheave diameter (D). Please see Chapter 7, ROPE ACCESSORIES/SHEAVES.

The number of sheaves in the Hook Block will depend on the total WLL of the Hook Block and individual sheave WLL: falls is called to the twisted rope, whereas 1 sheave has always 2 falls, 2 sheaves have 4 falls...

The fall must have a certain angle for safety reasons: regularly the maximum angle is regulated by International Standards, being the most popular ones as shown below:



Modern Hook Block designs they need to respond to latest customer demands as:

* Easy to disassemble to exchange hook type and replace inner components and accessories as bearings and sheaves.
* Easy to grease it during maintenance, in order to keep all turning parts lubricated.

Proof Test Load (PTL) is being performed at IRIZAR benches in order to cover a full guarantee to the crane operator.

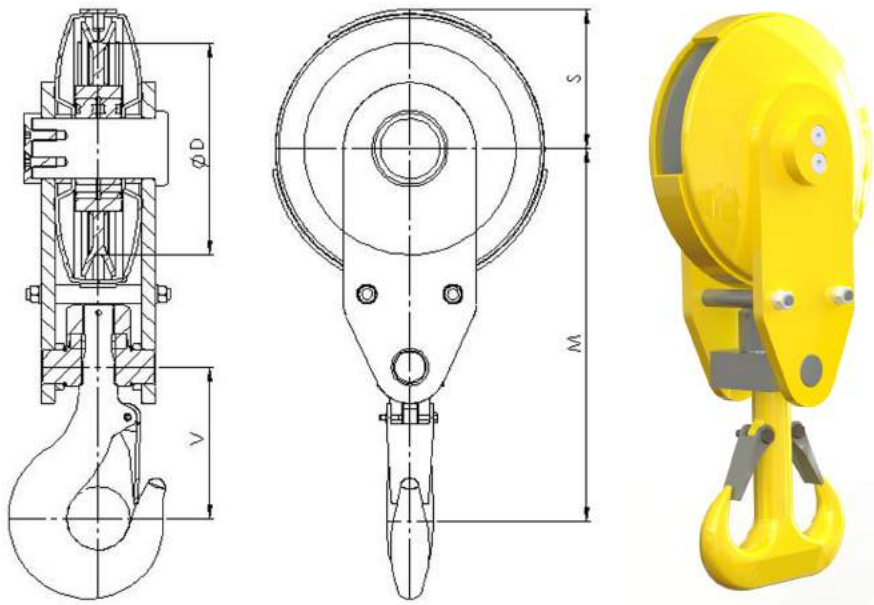
Complete Maintenance Manual is being delivered to the customer full of recommendations and good practices from the original manufacturer for a safe and long lifetime component.

Enjoy CRANE BLOCK RANGE in the following pages.

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.1 LIGHT DUTY BLOCKS

2.1.1.1 One Sheave Block



- WLL: from 2t to 32t.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 8 acc to DIN15400. Material grades: carbon (P) or alloy (T).
- Sheave: 1 (2 falls). Cold Laminated or Technical Plastic. Max size 450mm (inner diameter).
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

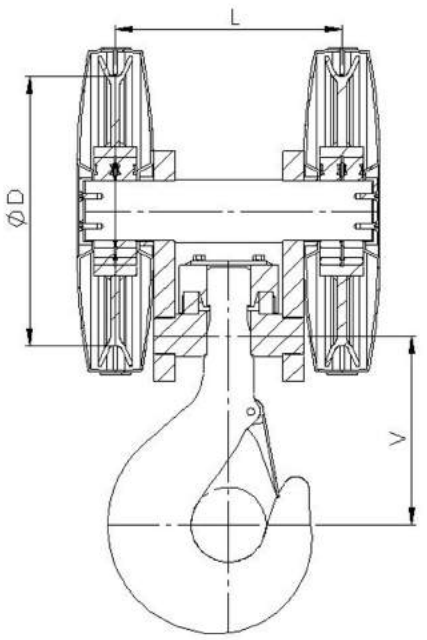
LIGHT DUTY BLOCKS | ONE SHEAVE BLOCK

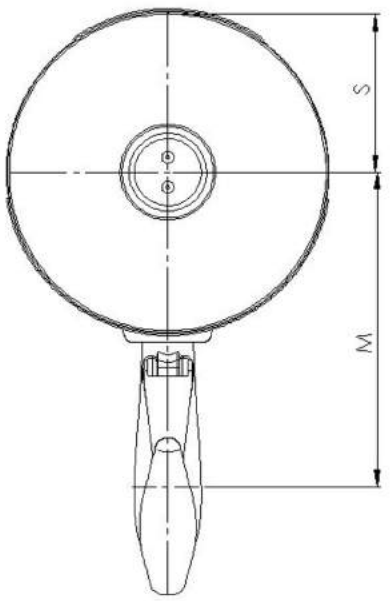
	OVERALL DIMENSIONS (mm)					WLL (t) 1Bm/M3		Weight
Hook No	Ø Wire rope	ØD Sheave	V	M	S	P	T	kg
0,8	7 - 8	160	120	285	105	2	-	12
1,6	9 -10	200	140	345	131	4	6,3	20
2,5	15 -16	280	155	435	180	6,3	10	36
4	16 -18	355	175	500	223	10	16	73
5	16 -18	355	195	520	223	12,5	20	79
6	22 - 24	450	240	630	274	16	25	126
8	22 - 24	450	265	670	274	20	32	137

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.1 LIGHT DUTY BLOCKS

2.1.1.2 Two Sheaves Block





- WLL: from 4t to 64t.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 16 acc to DIN15400. Material grades: carbon (P) or alloy (T).
- Sheave: 2 (4 falls). Cold Laminated or Technical Plastic. Max size 450mm (inner diameter).
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

LIGHT DUTY BLOCKS | TWO SHEAVES BLOCK									
OVERALL DIMENSIONS (mm)							WLL(t) 1Bm/M3		Weight
Hook No	Ø Wire rope	ØD Sheave	L	V	M	S	P	T	kg
1,6	7	160	162	140	240	105	4	6,3	18
2,5	10	200	194	155	265	131	6,3	10	30
4	15	280	222	175	320	180	10	16	60
5	15	280	242	195	335	180	12,5	20	66
6	16	355	302	240	415	223	16	25	131
8	16	355	327	265	435	223	20	32	142
10	22	450	349	280	490	274	25	40	226
12	22	450	379	315	525	274	32	50	257
16	22	450	389	370	590	274	40	63	286

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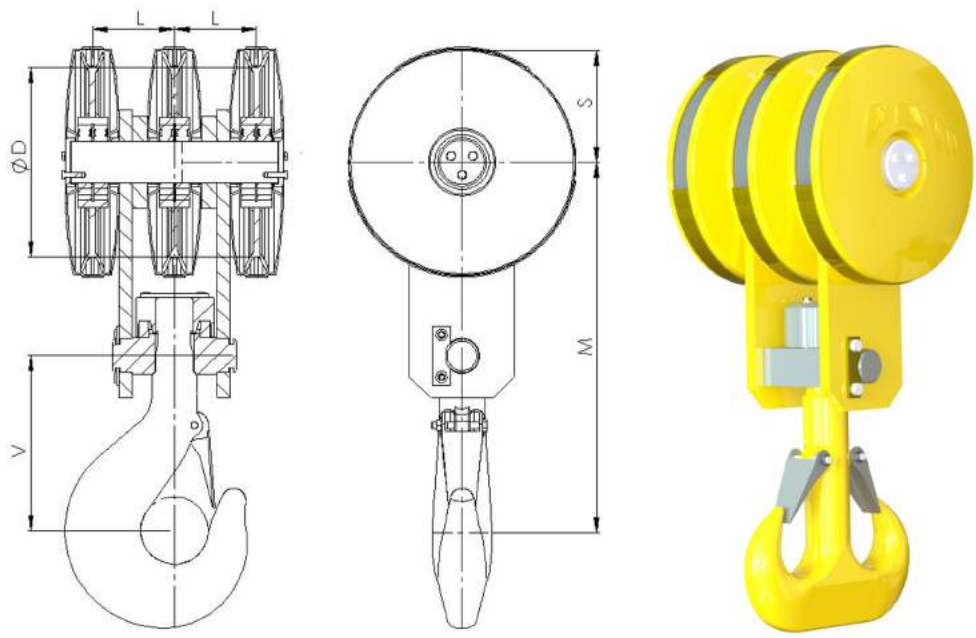
2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.1 LIGHT DUTY BLOCKS

2.1.1.3 Three Sheaves Block



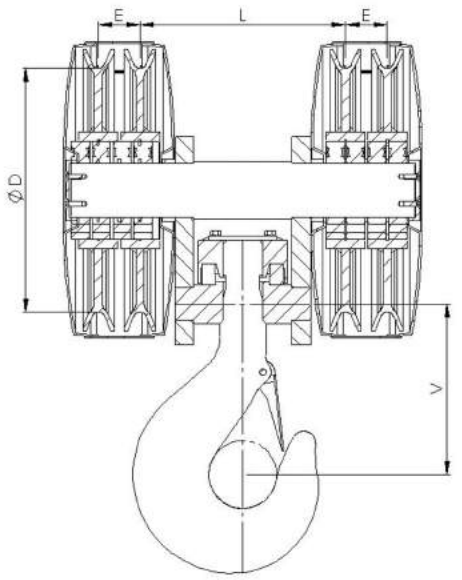
- WLL: from 20t to 80t.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 20 acc to DIN15400. Material grades: carbon (P) or alloy (T).
- Sheave: 3 (6 falls). Cold Laminated or Technical Plastic. Max size 450mm (inner diameter).
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

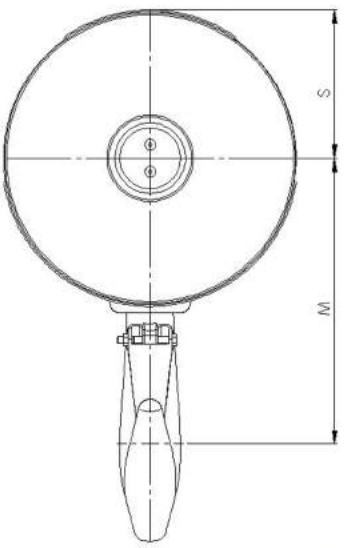
LIGHT DUTY BLOCKS | THREE SHEAVES BLOCK									
OVERALL DIMENSIONS (mm)							WLL(t) 1Bm/M3		Weight
Hook No	Ø Wire rope	ØD Sheave	L	V	M	S	P	T	kg
8	16	355	159	265	650	223	20	32	170
20	22	450	194,5	415	875	274	50	80	436

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.1 LIGHT DUTY BLOCKS

2.1.1.4 Four Sheaves Block





- WLL: from 6t to 100t.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 25 acc to DIN15400. Material grades: carbon (P) or alloy (T).
- Sheave: 4 (8 falls). Cold Laminated or Technical Plastic. Max size 450mm (inner diameter).
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

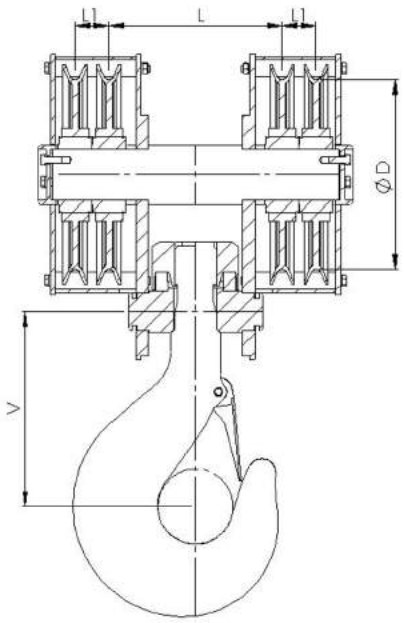
LIGHT DUTY BLOCKS | FOUR SHEAVES BLOCK

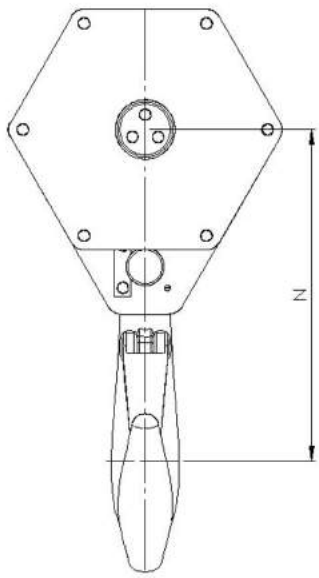
OVERALL DIMENSIONS (mm)								WLL(t) 1Bm/M3		Weight
Hook No	Ø Wire rope	ØD Sheave	L	V	M	S	E	P	T	kg
2,5	10	200	194	155	265	131	45	6,3	10	45
5	15	280	242	195	335	180	50	12,5	20	95
8	16	355	327	265	435	223	65	20	32	197
12	22	450	379	315	525	274	75	32	50	336
25	22	450	410	460	770	274	75	63	100	410

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.2 MEDIUM DUTY BLOCKS

2.1.2.1 Four Sheaves Block





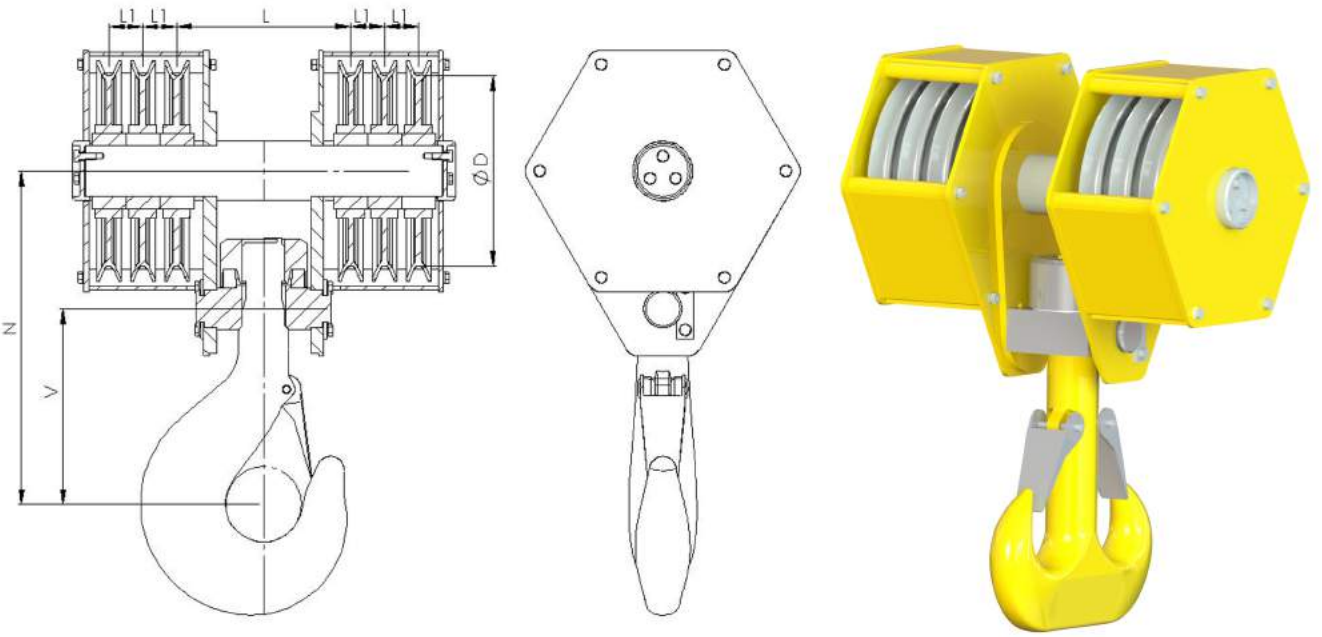
- WLL: from 12t to 200t. Further sizes upon request.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 63 acc to DIN15400. Material grades: carbon (P) or alloy (T). Further hook sizes and higher alloys upon request.
- Sheave: 4 (8 falls). Cold Laminated, Welded or Solid. Further sheaves upon request.
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

MEDIUM DUTY BLOCKS | FOUR SHEAVES BLOCK								
OVERALL DIMENSIONS (mm)							WLL(t) 1Bm/M3	Weight
Hook No	Ø Wire rope	D	L	L1	V	N	P	kg
5	12	290	200	53	195	395	12,5	180
6	12	290	220	53	240	460	16	200
8	16	400	240	53	265	565	20	240
10	20	400	270	60	280	580	25	270
16	20	400	320	65	370	680	40	420
20	20	440	350	80	415	740	50	563
25	22	450	410	80	460	785	63	570
32	24	640	450	90	500	1005	80	870
40	28	710	490	100	565	1130	100	1150
50	30	810	560	105	620	1240	125	1540
63	34	910	620	115	700	1380	160	2600

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.2 MEDIUM DUTY BLOCKS

2.1.2.2 Six Sheaves Block



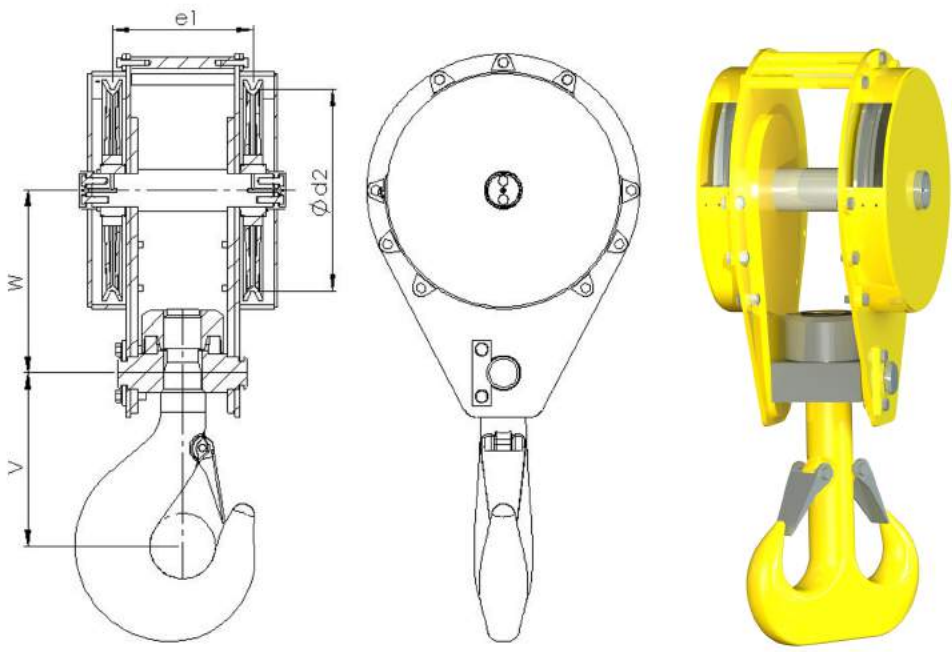
- WLL: from 50t to 300t. Further sizes upon request.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead.
  Max size: 63 acc to DIN15400. Material grades: carbon (P) or alloy (T). Further hook sizes and higher alloy steels upon request.
- Sheave: 6 (12 falls). Cold Laminated, Welded or Solid. Further sheaves upon request.
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

MEDIUM DUTY BLOCKS | SIX SHEAVES BLOCK								
OVERALL DIMENSIONS (mm)							WLL(t) 1Bm/M3	Weight
Hook No	Ø Wire rope	D	L	L1	V	N	P	kg
20	20	390	360	76	415	725	50	800
25	22	450	410	80	460	785	63	864
32	22	570	460	100	500	975	80	1000
40	24	650	500	105	565	1090	100	1320
50	26	720	570	115	620	1190	125	1680
63	28	820	640	145	700	1330	160	2940

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.3 HEAVY DUTY BLOCKS

2.1.3.1 Two Sheaves Block



- WLL: from 16t to 100t. Further sizes upon request.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 40 acc to DIN15400. Material grades: carbon (P) or alloy (T). Further hook sizes and higher alloy steels upon request.
- Sheave: 2 (4 falls). Cold Laminated, Welded or Solid. Further sheaves upon request.
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

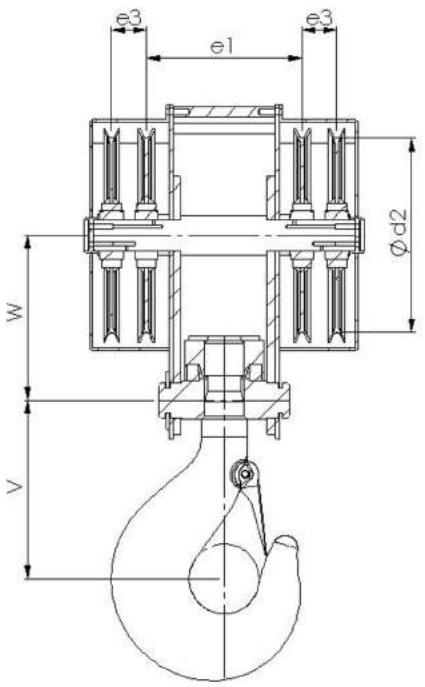
HEAVY DUTY BLOCKS | TWO SHEAVES BLOCK

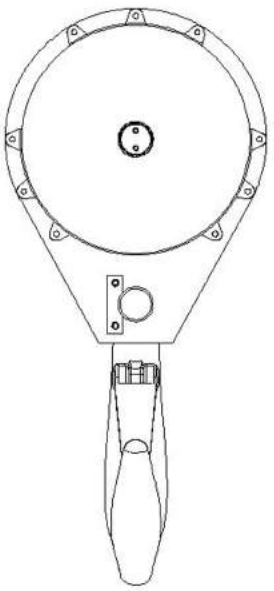
OVERALL DIMENSIONS (mm)						WLL (t) 1Bm/M3	Weight
Hook No	Ø Wire rope	d_2	e_1	V	W	P	kg
6	14	355	230	240	270	16	145
8	16	400	255	265	310	20	190
10	18	450	280	280	340	25	235
12	20	500	320	315	370	32	370
16	22	560	330	370	420	40	400
20	26	630	365	415	460	50	560
25	28	710	385	460	510	63	690
32	32	800	460	500	560	80	1000
40	36	900	495	565	640	100	1355

2.1 OVERHEAD/GANTRY CRANE BLOCKS

2.1.3 HEAVY DUTY BLOCKS

2.1.3.2 Four Sheaves Block





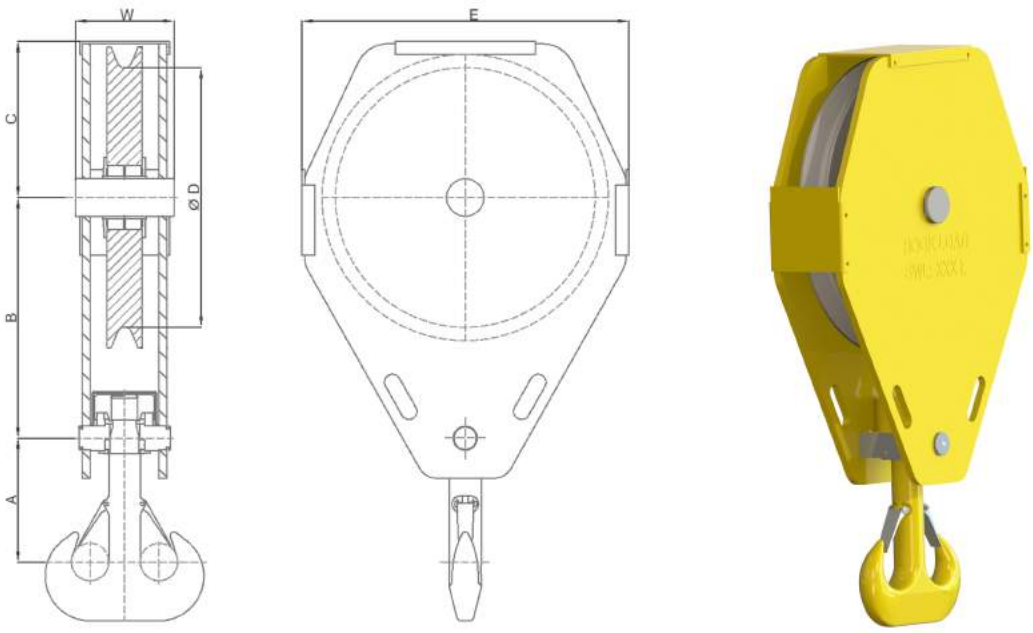
- WLL: from 60t to 500t. Further sizes upon request.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead.
  Max size: 125 acc to DIN15400. Material grades: carbon (P) or alloy (T). Further hook sizes and higher alloy steels upon request.
- Sheave: 4 (8 falls). Cold Laminated, Welded or Solid. Further sheaves upon request.
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

HEAVY DUTY BLOCKS | FOUR SHEAVES BLOCK

OVERALL DIMENSIONS (mm)							WLL(t) 1Bm/M3	Weight
Hook No	Ø Wire rope	d2	e1	e3	V	W	P	kg
25	20	560	400	100	460	420	63	685
32	22	630	465	105	500	470	80	955
40	26	710	520	130	565	520	100	1335
50	28	800	585	145	620	585	125	1770
63	32	900	655	155	700	645	160	2930
80	36	1000	705	165	800	710	200	3070
100	40	1120	775	170	885	790	250	4070
125	44	1250	845	195	1000	860	320	5200

2.2 OFFSHORE CRANE BLOCKS

2.2.1 SINGLE SHEAVE OFFSHORE BLOCK



- WLL: from 80t to 500t.
- Hook: Single or Ramshorn. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Max size: 125 acc to DIN15400. Material grades: alloy (T/V). Further hook sizes upon request.
- Sheave: 1 (2 falls). Solid sheave.
- Bearing: axial for hook assembly + roller/spherical-roller for sheaves. Bronze bushing fully recommended.
- Coating Protection: fully painted inside & outside for offshore environment.
- Sealings: for offshore topsite and subsea lifting.
- Certificate: EN10204-2.1. Load Test & FAT upon request.

OFFSHORE CRANE BLOCKS | SINGLE SHEAVE BLOCK									
OVERALL DIMENSIONS (mm)								WLL(t) 1Bm/M3	Weight
Hook No	Ø Wire rope	ØD	W	A	B	C	E	T	kg
20	42	800	382	445,5	900	520	1090	80	1500
32	56	1080	485	532	1150	670	1410	125	3346
50	70	1350	575	654,5	1350	830	1720	200	5707
80	74	1410	665	838	1500	870	1830	320	7992
100	76	1450	738	926	1500	890	1840	400	9307
125	86	1650	783	1036,5	1650	1020	2110	500	12557

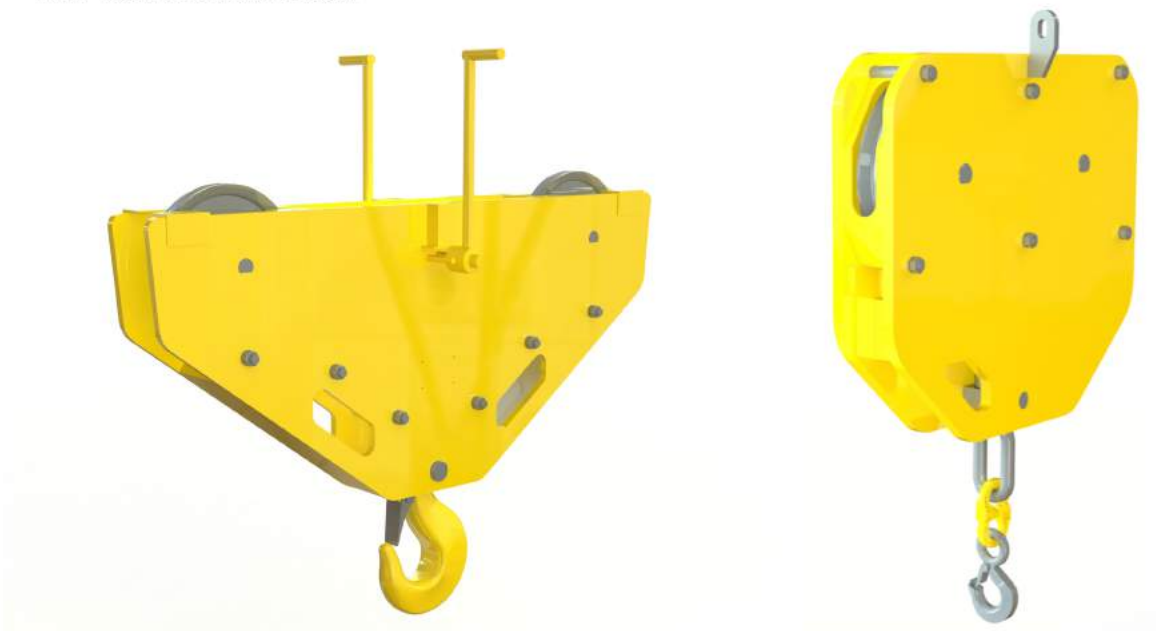
2.2 OFFSHORE CRANE BLOCKS

2.2.2 MULTIPLE SHEAVES OFFSHORE BLOCK

- WLL: from 80t to 2.000t.
- Hook: Ramshorn or Quad based on DIN15400 or others. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Material grades: alloy (T/V). See chapter 1 (Crane Hooks).
- Sheave: Multiple sheaves. Solid sheaves.
- Bearing: axial for hook assembly + roller/spherical-roller for sheaves. Bronze bushing fully recommended.
- Coating Protection: fully painted inside & outside for offshore environment.
- Sealings: for offshore topsite and subsea lifting.
- Certificate: EN10204-3.1. For 3.2 cert with ABS, DNV, ... upon request.

2.3 OTHER TYPE OF CRANE BLOCKS

2.3.1 TOWER CRANE BLOCK



- Hook: Single or Ramshorn based on DIN15400 or others. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Material grades: carbon (P) or alloy (T/V). See chapter 1 (Crane Hooks).
- Sheave: 1 or 2 sheaves (2 or 4 falls). Cold Laminated or Technical Plastic.
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-3.1. For 3.2 cert with ABS, DNV, ... upon request.

2.3 OTHER TYPE OF CRANE BLOCKS

2.3.2 MOBILE CRANE BLOCKS

- WLL: from 8t to 100t. Further sizes upon request.
- Hook: Single or Ramshorn based on DIN15400 or others. FORGED and HEAT TREATED fully MACHINED with nut & crosshead. Material grades: carbon (P) or alloy (T/V). See chapter 1 (Crane Hooks).
- Sheave: 1 or multiple sheaves. Cold Laminated, Welded, Solid or technical plastic.
- Bearing: axial for hook assembly + roller/ball for sheaves.
- Coating Protection: fully painted inside & outside.
- Certificate: EN10204-3.1. For 3.2 cert with ABS, DNV, ... upon request.

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SUBSEA FORGED HOOKS

3.0 INTRO

SUBSEA is considered OFFSHORE environment and it´s divided into shallow water and deep water (PRESALT, SALT and POSTSALT for latins).

SUBSEA Deep Water application is considered one of the most critical OFFSHORE application because of the poor accessibility of the products, harsh environment and high costs to get the products back to top site. Consequently maintenance jobs are difficult to manage and long life times are required.

Under these conditions, FORGED material is the preferred & valued technology to guarantee long life times with low maintenance costs. For high safety factor during long life time, super alloy steels are the preferred steel grades to guarantee a safe functional long life products. Surface protection & coatings have also a key role to keep designed life times.

Besides forging material IRIZAR subsea hooks are fully BENDED with 100% grain orientation, following the good practices of international crane hook rules and standards.

Related to hooks, because its geometry, can comply with different purposes, being the main ones:

Related to **SUBSEA LIFTING**, the crane is regularly located top site, even if recently semi-submergible and submergible cranes are being designed and installed. This kind of Offshore cranes regularly do subsea operations: most of them they do in shallow water, but others do deep water for e.g maniffols recovery, seabed pipeline maintenance or repair… being possible to do operations up to 4.000m subsea.

Related to **LONG TERM MOORING LINE,** main technology to fix floating structures into the seabed, forged hook is a great product to link two chains, chain with rope, rope with sling… or any technology used for floating structures mooring lines. Recently other technologies beside steel chain are being used and recommended by installation companies based on two criterias:

* Weight of mooring line in deep water.
* Cost of commissioning & installation.

IRIZAR FORGE is approved by DNV & ABS to produce, test & certify Offshore Mooring Accessories in material R4 according to "DNV-OS-E302 Offshore Mooring Chain" and "ABS Guide for Offshore Mooring Chain" (see annex 3 and 4).

Mooring Line is being a combination technology in recent projects, combining steel with fiber products: steel chain, steel wire ropes, synthetic ropes and textile slings. Combination of all 4 technologies is reducing commissioning costs and reducing weight. Hooks and other links are in between different technologies to ensure a permanent steel-fiber, steel-steel or fiber-fiber join or linkage.

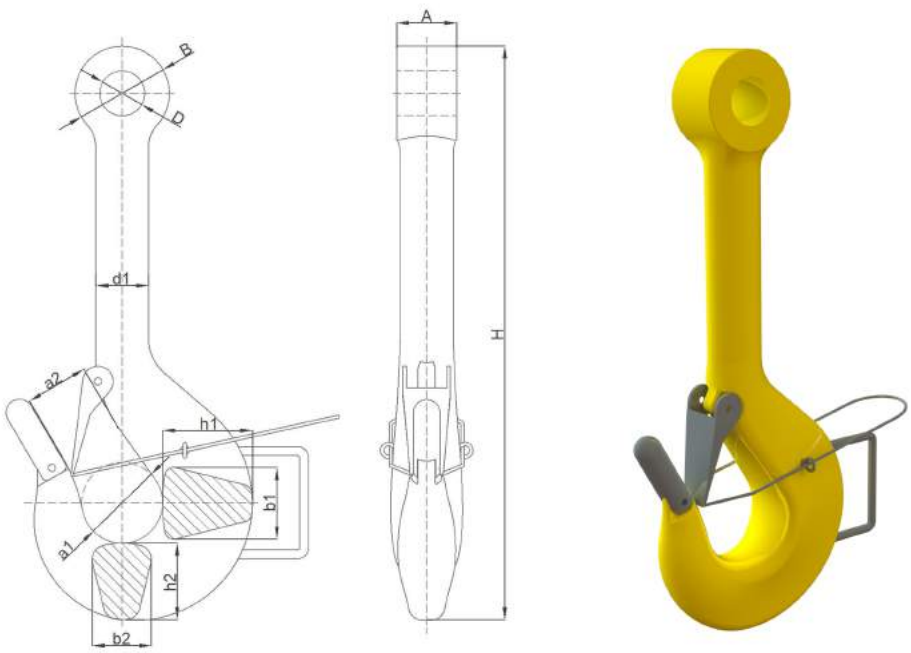
Seabed is full of **PIPELINES** and related equipment: pipelines are flexible to avoid crack when ocean currents effect hits against pipes and related equipment. PLET hook (pipe line end termination), is used to return the pipe to the original position and correct its position permanently.

Seabed is also full of rubbish as consequence of decades extraction activity: hooks together with ROV systems are used to **COLLECT & RECOVER** materials and clean seabed for environmental reasons.

Enjoy SUBSEA FORGED HOOK RANGE in the following pages.

3.1 FORGED ROV EYE HOOKS

3.1.1 LONG SHANK ROV EYE HOOK



- WLL: from 10t to 600t.
- Hook FORGED and HEAT TREATED. Fully bended with 100% grain orienting.
- Material: carbon, alloys and super alloys. Most regular: super alloy steel (R4).
- Surface Protection & Coatings: upon request
- Safety Factor: min. 4:1.
- Load Test: requested / recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

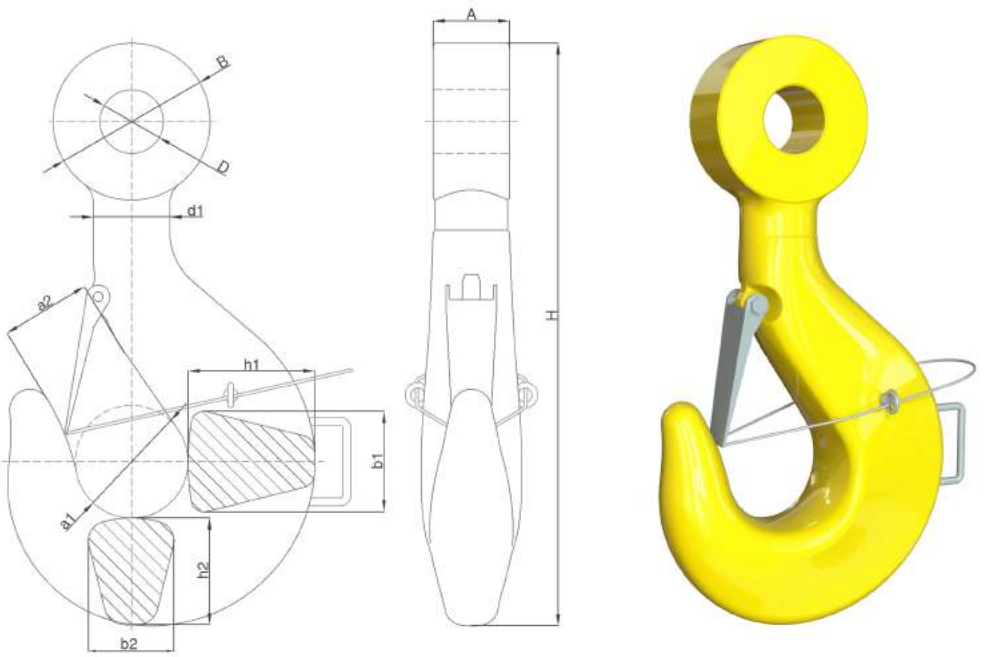
FORGED ROV EYE HOOKS | LONG SHANK ROV EYE HOOK

			OVERALL DIMENSIONS (mm)											Weight
No	WLL (t)	MBL (t)	a1	a2	b1	b2	h1	h2	d1	A	D	B	H	kg
2,5	12	46	63	50	53	45	67	58	42	47	40	100	600	15
5	22	88	80	63	71	60	90	75	53	68	53	120	682	25
6	32	126	90	71	80	67	100	85	60	75	60	130	790	40
12	55	220	125	100	112	95	140	118	85	97	74	155	919	84
16	80	320	140	112	125	106	160	132	95	110	87	180	1046	112
20	100	400	160	125	140	118	180	150	106	118	100	210	1112	157
25	120	480	180	140	160	132	200	170	118	134	100	210	1277	220
32	150	600	200	160	180	150	224	190	132	140	114	240	1402	310
40	200	800	224	180	200	170	250	212	150	150	137	290	1551	450
50	250	1000	250	200	224	190	280	236	170	170	147	310	1664	630
63	300	1200	280	224	250	212	315	265	190	190	158	330	1848	840
80	400	1600	315	250	280	236	355	300	212	205	184	380	2085	1195
100	500	2000	355	280	315	265	400	335	236	230	194	400	2271	1635
125	600	2400	400	315	355	300	450	375	265	255	215	450	2475	2280

WLL Working load limit using R4 material.
Tolerances: -0/+7% forging tolerance.
EYE dimensions (A, B, D) and other dimensions can be modified.

3.1 FORGED ROV EYE HOOKS

3.1.2 STANDARD SHANK ROV EYE HOOK



- WLL: from 80t to 1.000t.
- Hook FORGED and HEAT TREATED. Fully bended with 100% grain orienting.
- Material: carbon, alloys and super alloys. Most regular: super alloy steel (R4).
- Surface Protection & Coatings: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested / recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

FORGED ROV EYE HOOKS | STANDARD SHANK ROV EYE HOOK

			OVERALL DIMENSIONS (mm)											Weight
No	WLL (t)	MBL (t)	a1	a2	b1	b2	h1	h2	d1	A	D	B	H	kg
16	80	320	140	112	125	106	160	132	95	110	87	180	746	96
20	100	400	160	125	140	118	180	150	106	118	100	210	812	137
25	120	480	180	140	160	132	200	170	118	134	100	210	927	190
32	150	600	200	160	180	150	224	190	132	140	114	240	1052	272
40	200	800	224	180	200	170	250	212	150	150	137	290	1201	397
50	250	1000	250	200	224	190	280	236	170	170	147	310	1314	531
63	300	1200	280	224	250	212	315	265	190	190	158	330	1448	730
80	400	1600	315	250	280	236	355	300	212	205	184	380	1685	1033
100	500	2000	355	280	315	265	400	335	236	230	194	400	1871	1430
125	600	2400	400	315	355	300	450	375	265	255	215	450	2075	1998
160	800	3200	450	355	400	335	500	425	300	280	240	500	2294	2786
200	1000	4000	500	400	450	375	560	475	335	320	280	580	2450	3868
250	1250	5000	560	450	500	425	630	530	375	355	315	650	2810	5442
320	1550	6200	630	500	560	475	710	580	425	355	335	680	3060	7231
400	1800	7200	710	560	630	530	800	630	475	410	395	750	3430	9995

WLL Working load limit using R4 material.
Tolerances: -0/+7% forging tolerance.
EYE dimensions (A, B, D) and other dimensions can be modified.

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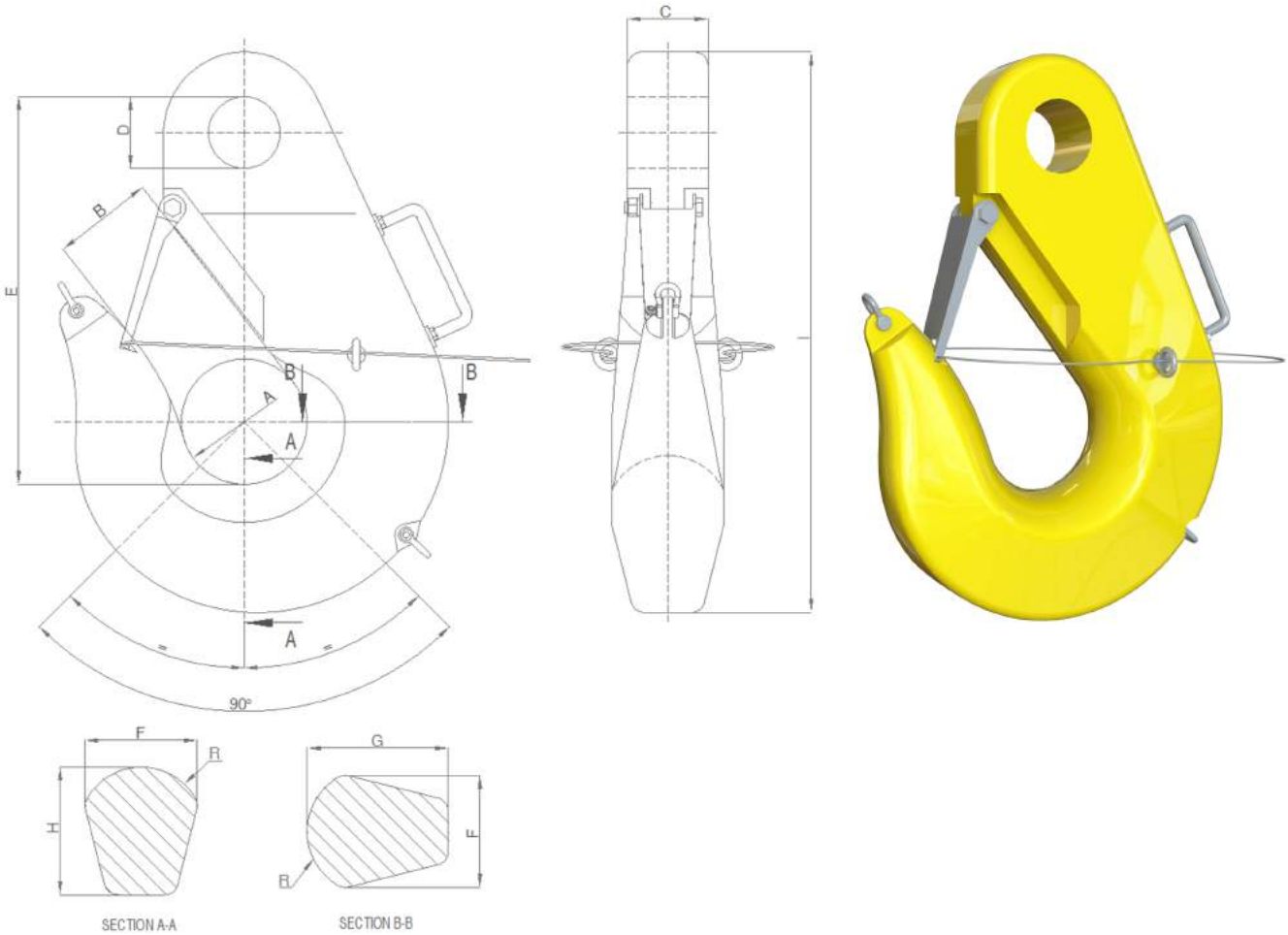
3.2 FORGED ROV HOOKS

3.2.1 STANDARD ROV HOOK



- WLL: from 50t to 1.000t.
- Hook FORGED and HEAT TREATED. Fully bended with 100% grain orienting.
- Material: carbon, alloys and super alloys. Most regular: super alloy steel (R4).
- Surface Protection & Coatings: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested / recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

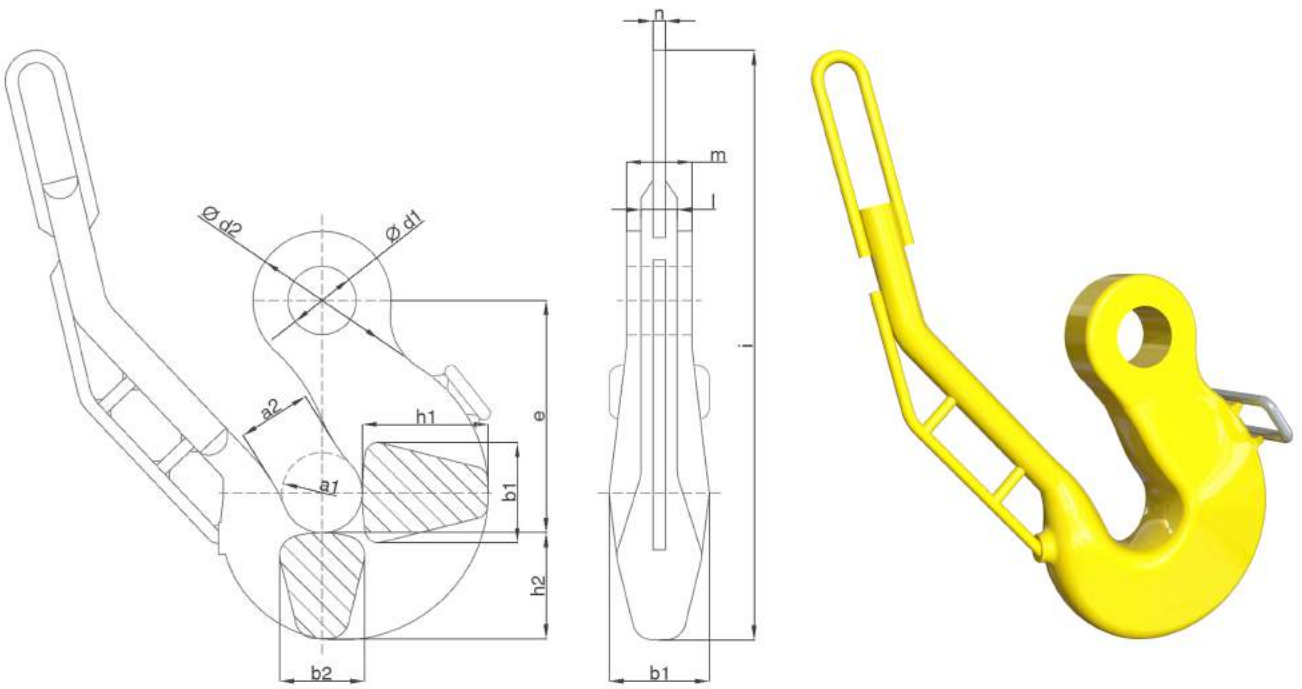
FORGED ROV HOOKS I STANDARD ROV HOOK

	OVERALL DIMENSIONS (mm)												Weight
No	WLL (t)	MBL (t)	A	B	C	D	E	F	R	G	H	I	kg
10	50	200	112	90	80	75	390	100	55	125	115	555	65
12	63	250	125	100	100	80	425	112	60	140	125	605	88
16	80	320	140	112	100	87	465	125	60	160	145	670	112
20	100	400	160	125	130	100	530	140	80	180	165	760	160
25	120	480	180	140	130	100	560	160	80	200	185	815	220
32	150	600	200	160	140	114	590	180	90	224	205	865	305
40	200	800	224	180	150	137	680	200	110	250	225	985	455
50	250	1000	250	200	170	147	750	224	125	280	250	1090	605
63	300	1200	280	224	190	158	865	250	140	315	285	1250	845
80	400	1600	315	250	205	184	910	280	170	355	320	1335	1180
100	500	2000	355	280	230	194	985	315	180	400	360	1455	1510
125	600	2400	400	315	255	215	1035	355	190	450	400	1555	2050
160	800	3200	450	355	280	240	1180	400	220	500	455	1775	3090
200	1000	4000	500	400	320	280	1340	450	240	560	510	2010	4380

WLL Working load limit using R4 material.
Tolerances: -0/+7% forging tolerance.
EYE dimensions (C, D) can be modified

3.2 FORGED ROV HOOKS

3.2.2 KS-ROV HOOK



- WLL: from 200t to 345t.
- Hook FORGED and HEAT TREATED (nose welded). Body fully bended with 100% grain orienting.
- Material: carbon, alloys and super alloys. Most regular: super alloy steel (R4).
- Surface Protection & Coatings: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested / recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

FORGED ROV HOOKS | KS-ROV HOOKS														
	OVERALL DIMENSIONS (mm)													Weight
No	a1	a2	b1	b2	d1	d2	e	h1	h2	i	l	m	n	kg
KS40	200	165	200	170	135	334	578	250	225	1440	90	130	32	395
KS50	200	180	245	200	170	345	580	315	256	1470	90	163	32	610

WLL Working load limit using R4 material.
Tolerances: -0/+7% forging tolerance.
EYE dimensions (d1,d2, m) can be modified.

3.2 FORGED ROV HOOKS

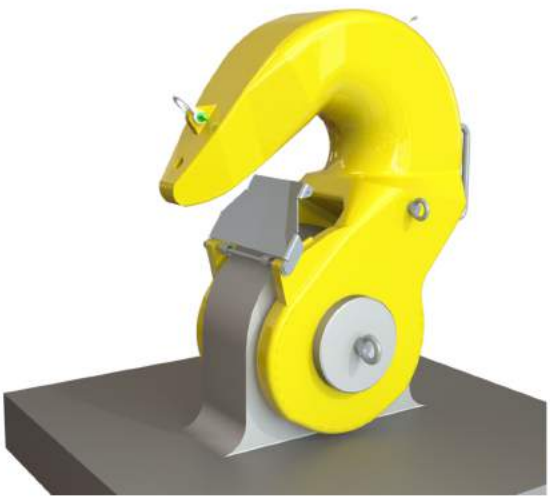
3.2.3 CUSTOM ROV HOOK

IRIZAR FORGE team can accommodate any forged ROV hook to the specific subsea lifting or mooring operation the market is ready to operate **up to 2.000t**, from safety, design, material strength and certification point of view.

- WLL: from 20t to 2.000t.
- Hook FORGED and HEAT TREATED (nose welded).
- Material: carbon, alloys and super alloys. Most regular: super alloy steel (R4).
- Surface Protection & Coatings: upon request
- Safety Factor: min. 4:1.
- Load Test: requested / recommended. ILO-3, FAT or Breaking Test available upon request.
- General Tolerances: -0/+7% for forged parts.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

3.2.3.1 LOAD TRANSFER hook.

3.2.3.2 CLEVIS ROV hook.

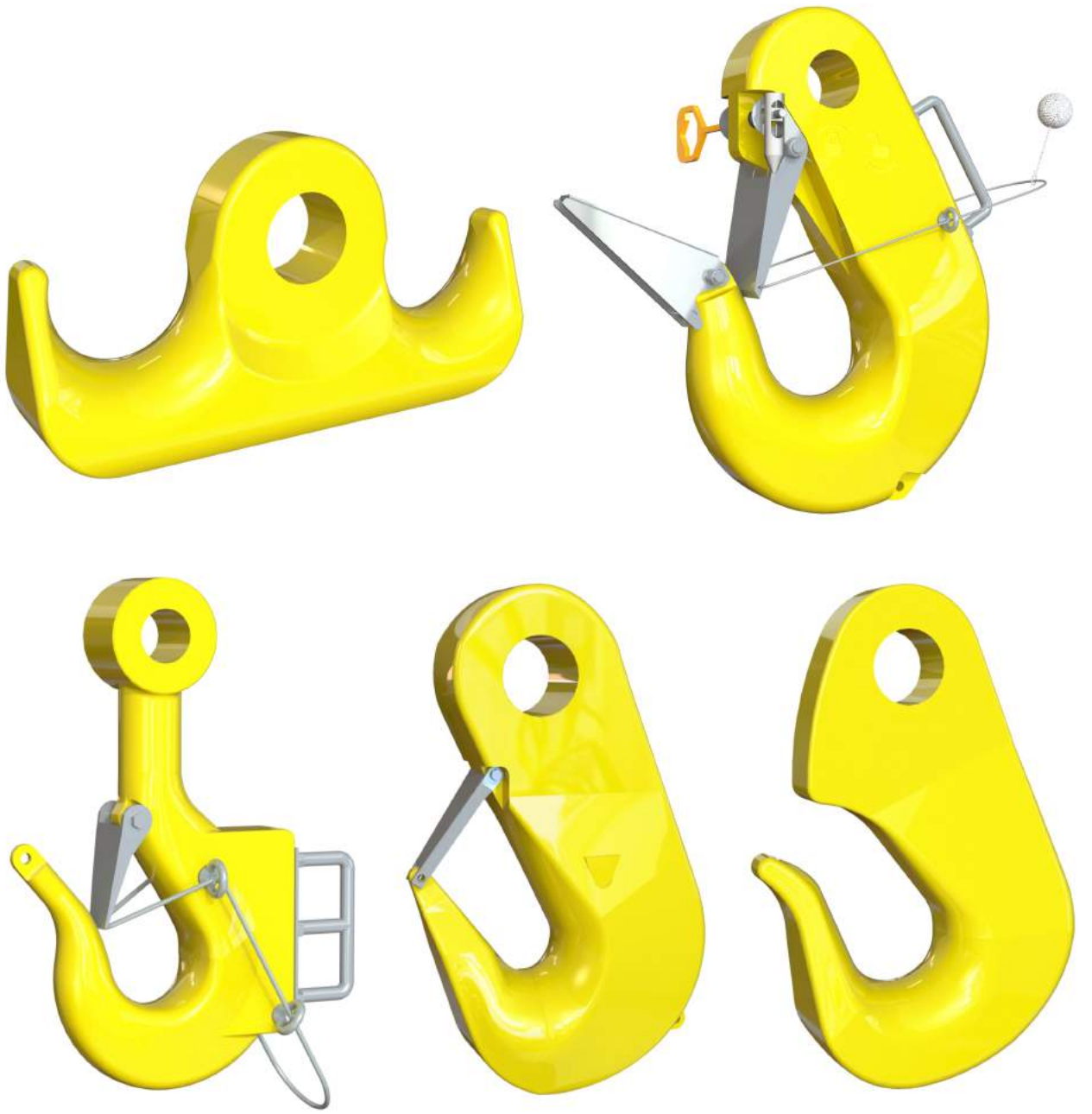


3.2 FORGED ROV HOOKS

3.2.3 CUSTOM ROV HOOK

IRIZAR FORGE team can accommodate any forged ROV hook to the specific subsea lifting or mooring operation the market is ready to operate **up to 2.000t**, from safety, design, material strength and certification point of view.

3.2.3.3 Other CUSTOM ROV hooks designs

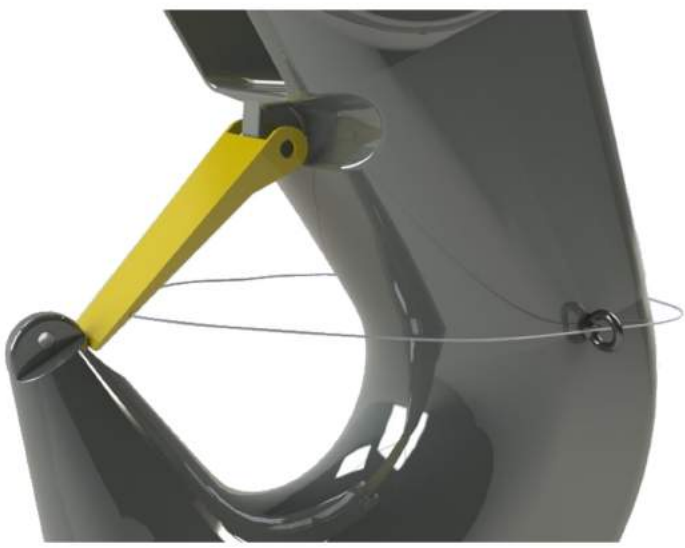


- WLL: from 20t to 2.000t.
- Hook FORGED and HEAT TREATED.
- Material: carbon, alloys and super alloys. Most regular: super alloy steel (R4).
- Surface Protection & Coatings: upon request
- Safety Factor: min. 4:1.
- Load Test: requested / recommended. ILO-3, FAT or Breaking Test available upon request.
- General Tolerances: -0/+7% for forged parts.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

3.3 ROV FRIENDLY ACCESSORIES

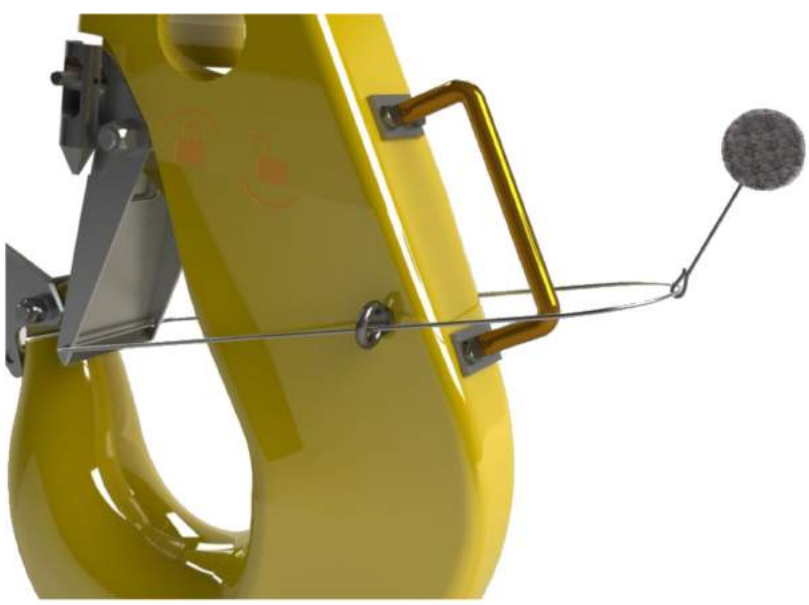
3.3.1 SAFETY LATCH

- Material: stainless steel.
- Useful for: ROV operations opening and closing.
- Additional accessories: monkey fits, rope, eye bolts
- Test: FAT upon request.



3.3.2 MONKEY FIST

- Material: textile.
- Suitable for: ROV operations handling.
- Additional accessories: rope
- Test: FAT upon request.



3.3 ROV FRIENDLY ACCESSORIES

3.3.3 FISHING DEVICE

- Material: stainless steel.
- Useful for: fishing and hooking other connectors.
- Additional accessories: rope, eye bolts.
- Test: FAT upon request.

3.3.4 HANDLES

- Material: stainless steel.
- Suitable for: ROV operations and hook handling.
- Test: FAT upon request.

3.3.5 PADEYES

- Material: non welded, belonging to forging.
- Useful for: hook handling operations.
- Additional accessories: shackle, lifting points…
- Test: FAT upon request.

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LIFTING & MOORING

IRIZAR FORGE

FORGED SHACKLES

4.0 INTRO

Shackle is considered critical accessory from safety point of view because is one of the major hardware link between the crane and the load, and regularly works fix together with chain or non steel fittings as textile slings and similar terminals.

Related to **LIFTING application**, its considered a fix/static temporary rigging accessory and does not belong to the crane itself. Straight design shackles are regularly used for 1 pull and bow design shackles for various pulls. For heavy duty lifting operations widebody is the referred and valued product, that guarantees a safe radius of the related sling into operation, that guarantees a longer life time of the related sling.

Related to **MOORING application**, forged shackle is a great product to link two chains, chain with rope, rope with sling, connected to triplates and masterlinks… or any technology used for floating structures long term mooring lines. Recently other technologies beside steel chain are being used and recommended by installation companies based on two criterias:

* Weight of mooring line in deep water.
* Cost of commissioning & installation.

IRIZAR FORGE is approved by DNV and ABS to produce, test & certify Offshore Mooring Accessories in material R4 according to "DNV-OS-E302 Offshore Mooring Chain" and "ABS Guide for Offshore Mooring Chain" (see annex 3 and 4).

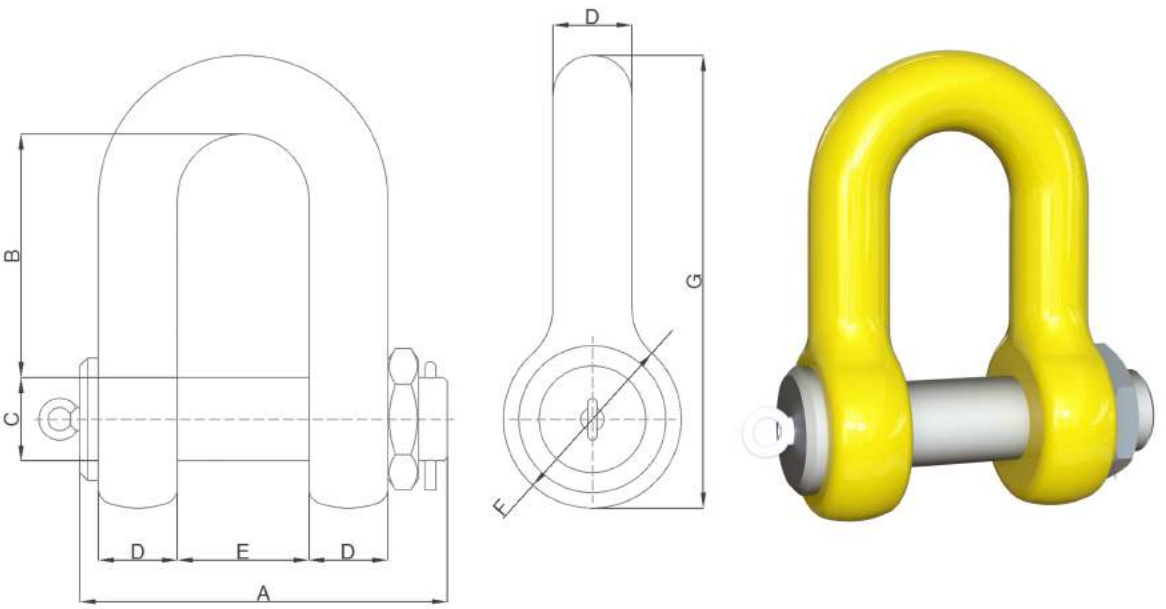
Mooring Line is being a combination technology in recent projects, combining steel with fiber products: steel chain, steel wire ropes, synthetic ropes and textile slings. Combination of all 4 technologies is reducing commissioning costs and reducing weight. Shackles and other links are in between different technologies to ensure a permanent steel-fiber, steel-steel or fiber-fiber join or linkage.

Under this specific conditions, FORGED material is the preferred technology to guarantee safety and long life time. For high safety factors during long life times, super alloy steels are the valued ones to guarantee functionality, safe operating and low maintenance costs during its long life time.

As for forged hooks, all shackles are produced for operating temperatures from -40ºC to +200ºC, considered normal, abnormal and extreme conditions.

Enjoy FORGED SHACKLE RANGE in the following pages.

4.1 DEE FORGED SHACKLES

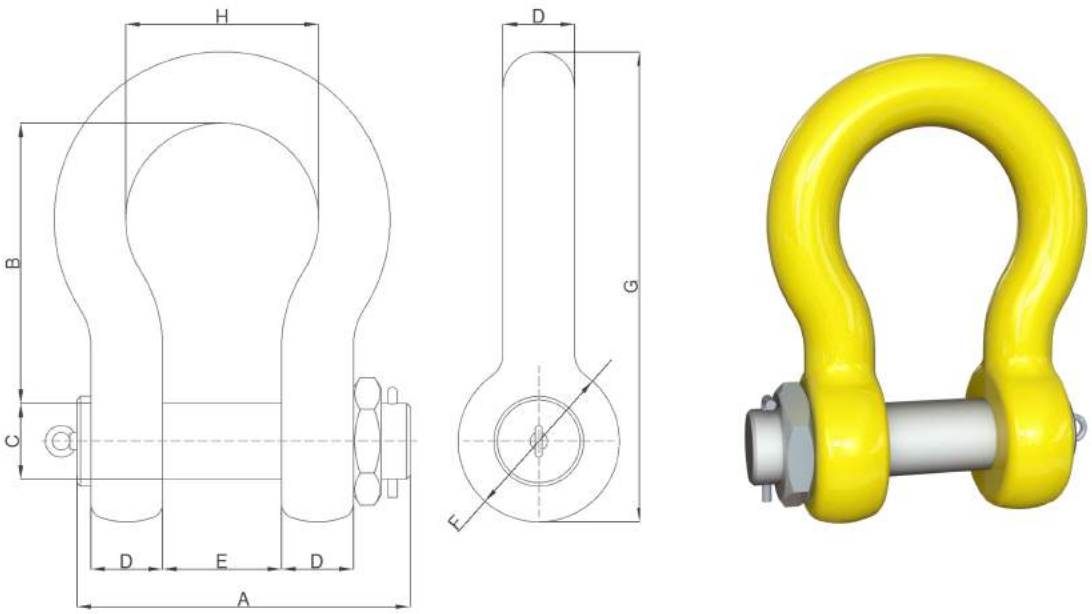


- WLL: from 120t to 550t.
- Shackle FORGED, HEAT TREATED and MACHINED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4)
- Coating Protection: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

DEE FORGED SHACKLES								
	OVERALL DIMENSIONS (mm)							Weight
WLL (t)	A	B	C	D	E	F	G	kg
120	420	270	95	89	150	200	504	100
150	475	315	108	102	170	230	586	143
175	450	360	110	100	150	220	625	135
200	520	500	125	120	180	260	813	239
250	565	460	140	130	195	280	795	268
300	595	500	150	140	205	300	855	332
350	630	520	160	150	220	320	910	403
400	665	580	170	160	235	340	965	484
450	700	600	180	170	250	360	1025	576
500	735	620	190	180	265	380	1080	678
550	795	665	215	190	285	405	1165	840

WLL: for R4 material grades.
Tolerance: Inner Length +/- 7,5%, other forged parts +/-5% and machined parts +/-1%.

4.2 BOW FORGED SHACKLES

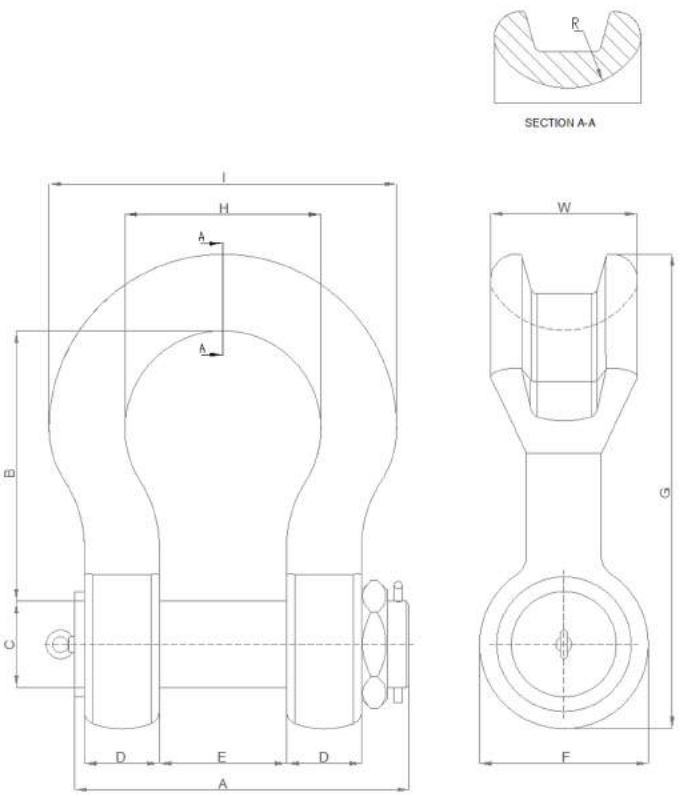


- WLL: from 120t to 2.000t.
- Shackle FORGED, HEAT TREATED and MACHINED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4).
- Coating Protection: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

BOW FORGED SHACKLES									
	OVERALL DIMENSIONS (mm)								Weight
WLL (t)	A	B	C	D	E	F	G	H	kg
120	420	380	95	89	150	200	617	238	110
150	475	400	108	102	170	230	671	275	160
200	520	500	125	120	180	260	813	290	235
250	560	540	140	125	205	260	865	305	285
300	570	600	150	130	205	305	958	305	340
400	665	680	175	165	230	350	1108	325	560
500	720	700	185	180	255	370	1158	350	685
600	815	700	205	195	285	405	1200	375	880
700	860	700	217	205	310	435	1231	400	980
800	870	700	217	210	310	435	1236	400	1100
900	910	700	230	220	330	465	1268	420	1280
1000	950	750	240	230	350	480	1290	420	1460
1250	1105	780	270	278	370	590	1490	450	2320
1500	1105	800	290	280	370	610	1530	450	2450
1750	1230	950	330	300	430	660	1745	540	3280
2000	1300	1050	360	320	460	680	1890	560	3920

WLL: for R4 material grades.
Tolerance: Inner Length +/- 7,5%, other forged parts +/-5% and machined parts +/-1%.

4.3 WIDE BODY FORGED SHACKLES



- WLL: from 120t to 4.000t.
- Shackle FORGED, HEAT TREATED and MACHINED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4)
- Coating Protection: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

WIDE BODY FORGED SHACKLES												
	OVERALL DIMENSIONS (mm)											Weight
WLL (t)	A	B	C	D	E	F	G	H	I	W	R	kg
125	395	370	80	85	140	165	583	220	390	150	80	83
150	420	400	95	90	150	200	638	250	429	170	90	114
200	470	480	105	105	160	225	755	275	484	205	110	181
250	520	550	120	120	180	240	850	300	540	230	125	253
300	580	600	134	140	195	280	947	350	628	265	140	365
400	655	620	160	160	230	330	1035	370	689	320	170	567
500	710	680	180	170	265	350	1125	440	779	340	180	715
600	795	720	200	180	290	405	1213	490	847	370	190	952
700	880	780	215	210	320	465	1330	540	957	400	210	1341
800	925	800	230	220	320	465	1358	555	990	420	220	1390
900	1010	850	250	235	370	480	1450	585	1060	440	235	2082
1000	1050	850	270	235	400	530	1490	615	1091	460	240	2115
1250	1210	960	300	275	455	570	1695	645	1205	560	285	2878
1550	1240	980	320	275	485	610	1745	680	1240	580	290	3135
1750	1325	1120	360	310	500	660	1960	700	1346	600	300	4520
2000	1365	1140	385	320	520	680	2012	720	1368	620	310	4600
2500	1380	1140	400	330	520	740	2065	730	1383	635	320	5180
3000	1410	1140	420	340	530	760	2080	740	1413	650	330	5555
3500	1480	1140	440	350	540	790	2130	750	1480	670	340	6520
4000	1510	1140	460	360	550	810	2140	760	1510	690	350	6995

WLL: for R4 material grades.
Tolerance: Inner Length +/- 7,5%, other forged parts +/-5% and machined parts +/-1%.

4.4 CUSTOM MADE SHACKLES

IRIZAR FORGE team can accommodate any forged shackle to the specific lifting, rigging or mooring operation the market is ready to operate **up to 4.000t**, from safety, design, material strength and certification point of view.

- WLL: from 120t to 4.000t.
- Shackle FORGED, HEAT TREATED and MACHINED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4).
- Coating Protection: upon request.
- Safety Factor: min. 4:1.
- Tolerance: Inner Length +/- 7,5%, other forged parts +/-5% and machined parts +/-1%.
- Load Test: requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

SWIVELS

5.0 INTRO

Swivels are used in Lifting, Mooring & Anchoring applications, and consequently are considered critical lifting component from safety point of view because is the main turning hardware between the crane and the load.

The main difference between Swivel Hook and Block Hook (chapter 2) are pulleys: swivel hook does not need sheaves and the main reason is because there are certain lifting operations where straight lifting is necessary with enough weight and protection to turn.

The key component of the Swivel Hook is the COVER: this part is protecting inner machined parts, bearing and thread to guarantee a full turning and proper rotation of the load, and at the same time is giving the necessary weight to avoid rope outlet and crane incidents. Weight and rotating are the main functions of swivel.

Regularly this kind of products are used in Offshore environments, where swivels could have two main purposes:

For **SUBSEA LIFTING**, the crane is regularly located top site, even if recently semi-submergible and submergible cranes are being designed and installed. This kind of Offshore cranes regularly do subsea operations even if there are dry cranes too: most of them they do in shallow water, but others do deep water for e.g maniffols recovery, seabed pipeline maintenance or repair… being possible to do operations up to 4.000m subsea. For this application regularly Swivel Hooks are used.

For **LONG TERM MOORING LINE,** main technology to fix floating structures into the seabed, forged swivels are a great product to link two chains, chain with rope, rope with sling… or any technology used for floating structures mooring lines. Recently other technologies beside steel chain are being used and recommended by installation companies based on two criterias:

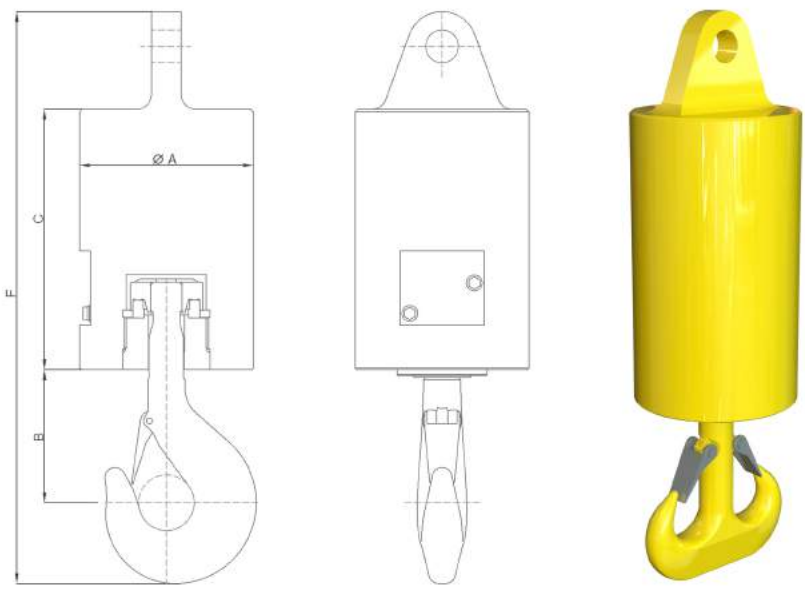
* Weight of mooring line in deep water.
* Cost of commissioning & installation.

Mooring Line is being a combination technology in recent projects, combining steel with fiber products: steel chain, steel wire ropes, synthetic ropes and textile slings. Combination of all 4 technologies is reducing commissioning costs and reducing weight. Hooks and other links are in between different technologies to ensure a permanent steel-fiber, steel-steel or fiber-fiber join or linkage. For this application regularly Eye-Eye and Eye-Clevis Swivels are used.

In both cases, with hook or without hook, swivels are working submergible and to avoid salty water getting into the inner parts, cover part and sealings are used to guarantee a long life time. Additionally when operation is held in deep water, outer & inner pressure difference is a big issue and sealings are a key factor to avoid any problem and guarantee the bearing is rotating correctly.

Enjoy SWIVELS RANGE in the following pages.

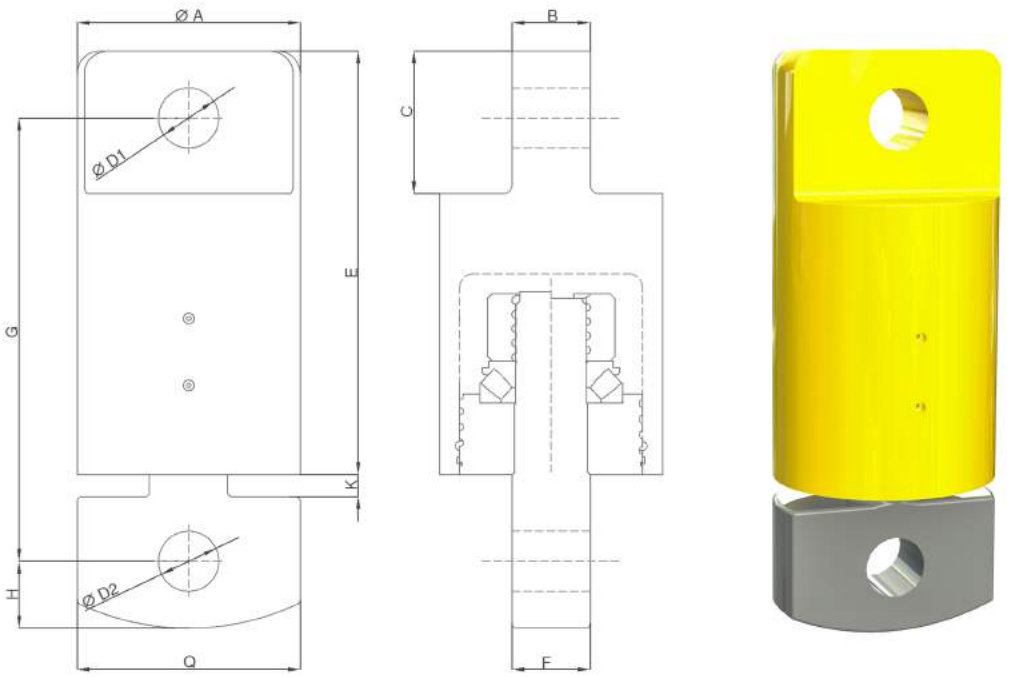
5.1 SWIVEL HOOKS



- WLL/SWL: from 50t to 1.500t.
- Hook FORGED, HEAT TREATED and MACHINED, as per DIN15400 design or others upon request.
- Cover: free of weld
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel.
- Coating Protection: fully painted.
- Safety Factor: 4:1.
- Sealings: for onshore lifting, offshore topsite and subsea lifting & mooring.
- Load Test: requested and recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SWIVEL HOOKS						
	OVERALL DIMENSIONS (mm)					Weight
WLL (t)	Hook No	A	B	C	F	kg
70	25	500	429	600	1624	1000
125	40	600	523	575	1827	1500
150	50	600	570,5	650	1783	1300
200	63	800	648	780	2289	3500
250	80	1000	738	1200	2515	8000
300	100	1000	814	1750	3342	12000
400	125	1000	908,5	1725	3931	12000

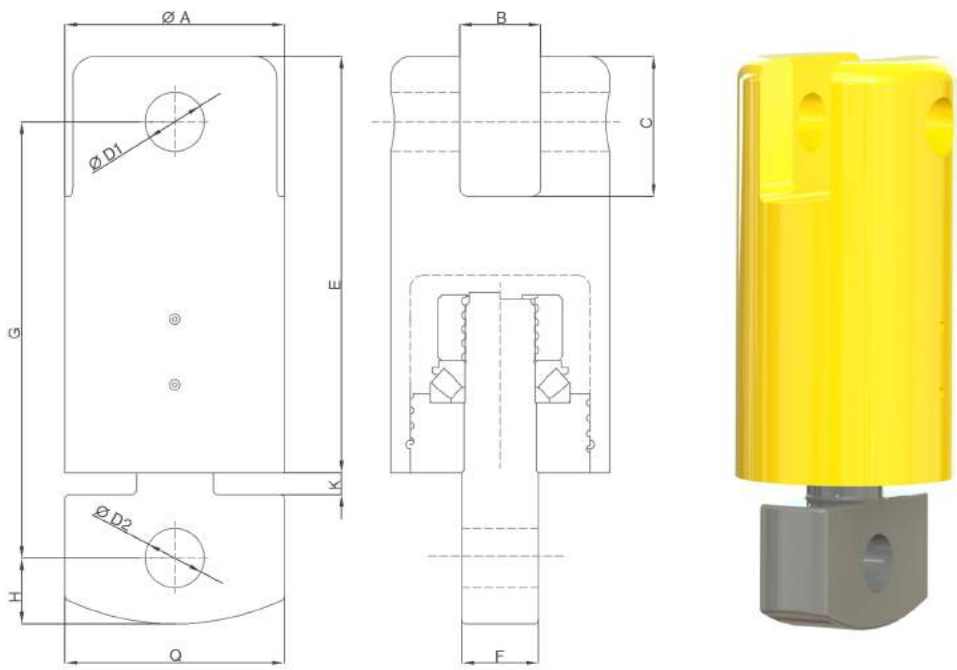
5.2 EYE-EYE SWIVEL



- WLL/SWL: from 50t to 1.500t.
- Hook FORGED, HEAT TREATED and MACHINED, as per DIN15400 design or others upon request.
- Cover: free of weld.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel.
- Coating Protection: fully painted.
- Safety Factor: 4:1.
- Sealings: for onshore lifting, offshore topsite and subsea lifting & mooring.
- Load Test & MBL: requested and recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SWIVEL EYE-EYE												
	OVERALL DIMENSIONS (mm)											Weight
WLL (t)	A	B	C	D1	D2	E	F	G	H	K	Q	kg
200	500	175	320	135	135	950	175	995	150	50	500	1114
300	600	200	365	155	155	1100	200	1150	180	50	600	1841
400	650	216	410	180	180	1150	226	1200	205	50	650	2150

5.3 EYE-CLEVIS SWIVEL



- WLL/SWL: from 50t to 1.500t.
- Hook FORGED, HEAT TREATED and MACHINED, as per DIN15400 design or others upon request.
- Cover: free of weld.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel.
- Coating Protection: fully painted.
- Safety Factor: 4:1.
- Sealings: for onshore lifting, offshore topsite and subsea lifting & mooring.
- Load Test & MBL: requested and recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

SWIVEL EYE-CLEVIS												
	OVERALL DIMENSIONS (mm)											Weight
WLL(t)	A	B	C	D1	D2	E	F	G	H	K	Q	kg
200	11	185	320	135	135	950	175	995	150	50	500	1122
300	600	210	365	155	155	1100	200	1150	180	50	600	1910
400	650	226	410	180	180	1150	226	1200	205	50	650	2285

CONNECTORS

6.0 INTRO

Connectors or Links are used both for Lifting as well as Mooring Applications and it is considered critical accessory from safety point of view because is one of the major hardware link between the crane and the load, and regularly works fix together with chain or non steel fittings as textile slings and similar terminals.

For **Lifting application**, connectors are considered as rigging accessories, consequently the links are not belonging to the crane itself, but as a separate and temporary crane accessory.

For **Subsea Mooring**, links & connectors are considered part of the long term mooring line for floating platforms. Regularly floating platforms are located in deep water seas.
SUBSEA Deep Water application is considered one of the most critical OFFSHORE application because of the poor accessibility of the products, harsh environment and high costs to get the products back to top site. Consequently maintenance jobs are difficult to manage and long life times are required.

Under these conditions, FORGED material is the preferred & valued technology to guarantee long life times with low maintenance costs. For high safety factor during long life time, super alloy steels are the preferred steel grades to guarantee a safe functional long life products. Surface protection & coatings have also a key role to keep designed life times.

Related to connectors, because its geometry, can comply with different purposes, being the main ones:

Related to **LIFTING**, the main connector is MASTER LINK besides shackles (see chapter 4 SHACKLES) and its considered crane accessories not belonging to the crane itself. Crane can be an onshore or offshore crane: the latest can be dry operation or subsea operations: most of them they do in shallow water, but others do deep water for e.g maniffols recovery, seabed pipeline maintenance or repair… being possible to do operations up to 4.000m subsea.

Related to **LONG TERM MOORING LINE**, the most popular connector designs are H-Link & Y-Links as preferred product to link two chains, chain with rope, rope with sling… or any technology used for floating structures mooring lines. Recently other technologies beside steel chain are being used and recommended by installation companies based on two criterias:

* Weight of mooring line in deep water.
* Cost of commissioning & installation.

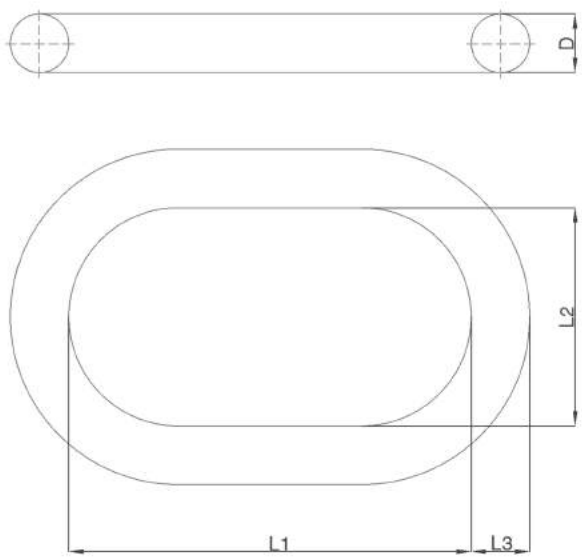
IRIZAR FORGE is approved by DNV and ABS to produce, test & certify Offshore Mooring Accessories in material R4 according to "DNV-OS-E302 Offshore Mooring Chain" and "ABS Guide for Offshore Mooring Chain" (see annex 3 and 4).

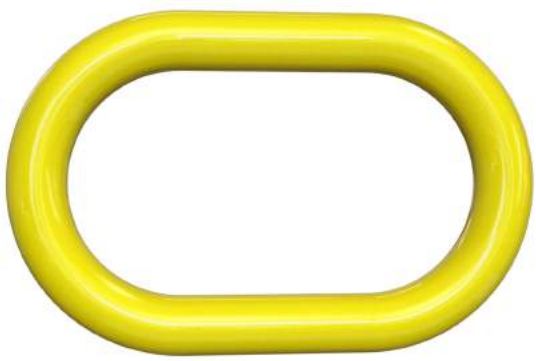
Mooring Line is being a combination technology in recent projects, combining steel with fiber products: steel chain, steel wire ropes, synthetic ropes and textile slings. Combination of all 4 technologies is reducing commissioning costs and reducing weight. Links & connectors are in between different technologies to ensure a permanent steel-fiber, steel-steel or fiber-fiber join or linkage.



Enjoy CONNECTORS RANGE in the following pages.

6.1 MASTER LINK



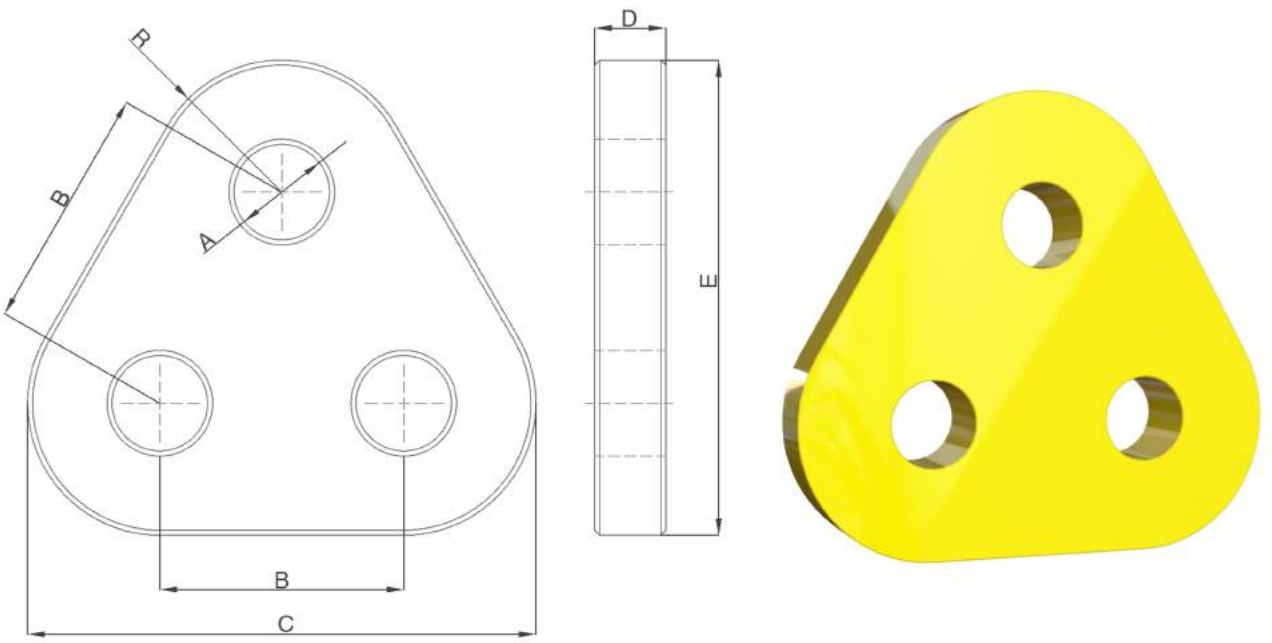


- WLL: from 155t to 1.500t.
- Master links FORGED and HEAT TREATED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4).
- Coating Protection: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

CONNECTORS I STANDARD MASTER LINK						
OVERALL DIMENSIONS (mm)						Weight
WLL (t)	MBL (t)	D	L1	L2	L3	kg
157	628	100	500	300	100	103
250	1000	115	600	400	115	165
300	1200	115	600	300	115	160
400-1	2000	115	490	250	115	135
400-2	2000	115	700	250	115	169
400-3	1600	155	800	400	205	525
500	2000	175	800	400	220	648
600	2400	195	800	400	230	763
700	2800	200	850	400	235	835
800	3200	210	850	400	245	922
900	3600	230	900	400	270	1182
1000	4000	240	900	400	280	1292
1250	5000	260	1000	400	310	1695
1500	6000	270	1000	400	320	1832

Tolerance: forged surface tolerance +/-5% .

6.2 TRIPLATE



- WLL: from 120t to 700t.
- Triplates FORGED, HEAT TREATED and MACHINED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4)
- Coating Protection: upon request.
- Safety Factor: min. 4:1.
- Load Test: requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

CONNECTORS I STANDARD TRIPLATE							
	OVERALL DIMENSIONS (mm)						Weight
WLL (t)	A	B	C	D	E	R	kg
120	105	280	620	100	582	170	188
150	115	320	690	110	647	185	256
175	115	320	710	110	667	195	274
200	140	390	820	120	768	215	390
250	150	390	870	140	818	240	518
300	160	420	920	150	864	250	617
400	185	490	1090	200	1024	300	1170
500	200	550	1270	200	1196	360	1619
600	220	600	1400	200	1320	400	1972
700	230	600	1400	250	1320	400	2452

Tolerance: machined surface tolerance +/-1%. +/-5% for D tolerance.

6.3 CUSTOM CONNECTORS

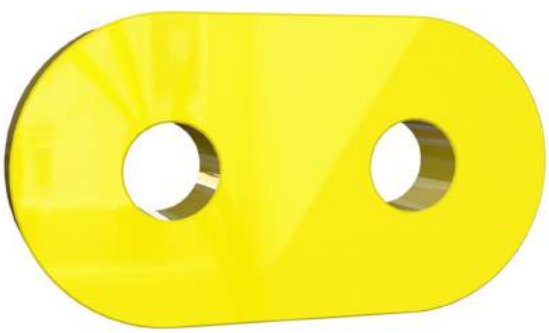
IRIZAR FORGE team can accommodate any forged connector to the specific lifting, rigging or mooring operation the market is ready to operate **up to 1.500t**, from safety, design, material strength and certification point of view.

- WLL: from 155t to 1.500t.
- Y Link, H Link, Twin Plate and Double Pin Connector FORGED and HEAT TREATED.
- Material: carbon steel, alloy and super alloy. Most regular super alloy steel (R4).
- Coating Protection: upon request.
- General Tolerances: +/-5% forged parts and machined parts +/-1%.
- Safety Factor: min. 4:1.
- Load test requested and recommended. ILO-3, FAT or Breaking Test available upon request.
- Certificate: EN10204-3.1. For 3.2, Mooring Accessory Cert with ABS and DNV upon request (see annex 3 and 4).

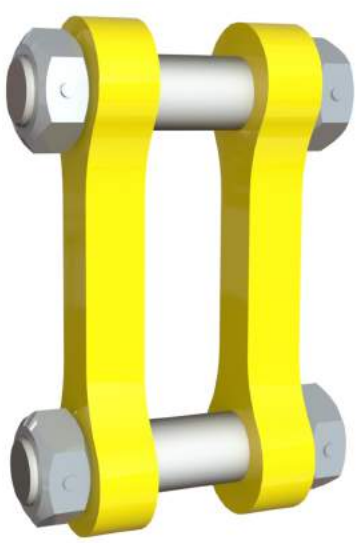
6.3.1 Y LINKS

6.3.2 H LINKS

6.3.3 TWIN PLATE



6.3.4 DOUBLE PIN CONNECTOR



ROPE ACCESSORIES

7.0 INTRO

In this guide Rope Accessories are divided into Sheaves and Sockets.

Sheave or Pulley has always been connected to the rope industry because sheave is the vehicle for the rope to move: sheave is the road and bearing is the motor/vehicle to make the movement faster or slower.

Sheaves can be used in a crane (to guide ropes) and out of a crane equipment wherever the rope is.

Last decades ropes have suffered a big development based in metallurgical R&D: rope diameter has been decreased thanks to wire ropes advanced technology using more flexible wire ropes, reducing rope diameter and increasing strengthness thanks to very advanced materials, having decreased the historical factor "rope diameter (d1) x factor = sheave diameter (D)".

The number of sheaves in the hook block for instance will depend on the total WLL of the hookblock and individual sheave WLL: falls is called to the twisted rope, whereas 1 sheave has always 2 falls, 2 sheaves have 4 falls...

Sheaves or pulleys can be manufactured in several materials (carbon steel, alloy steel, technical plastic) based on the purpose of it. Steel made sheaves can be forged, laminated plate and casting. Forged/casted ones are considered weldfree and plate ones regularly have welding points.

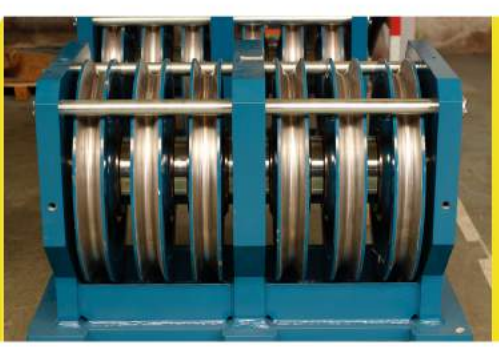
Diferents hardness in the groove can be achieved dependig on the material and the induction treatment.

Bearing is naturally linked to the sheave to get movement and rope can turn: depending on the sheave, load and design main purpose, bearings can be roller bearing, ball bearing, bronze bushing, etc, depending on customer requirements.

Proof Test Load (PTL) is being performed at IRIZAR benches in order cover a full guarantee to the crane operator.

Related to sockets it is considered rope terminal hardware (wirerope end fitting). Depending on the customer requirements, forged socket, close or open type, can be designed and manufactured to comply with the specific lifting, rigging, anchoring, fastening or mooring operations. Regularly forged sockets are required for mooring operations for permanent mooring systems and long term mooring lines.

Sockets can be manufactured in different materials (carbon, alloy and super alloy steel) and designed for the specific rope diameter and capacity required by the application with a minimum safety factor of 4:1. With the correct assembly into the wire rope, socket can meet the breaking strength of the wire rope.



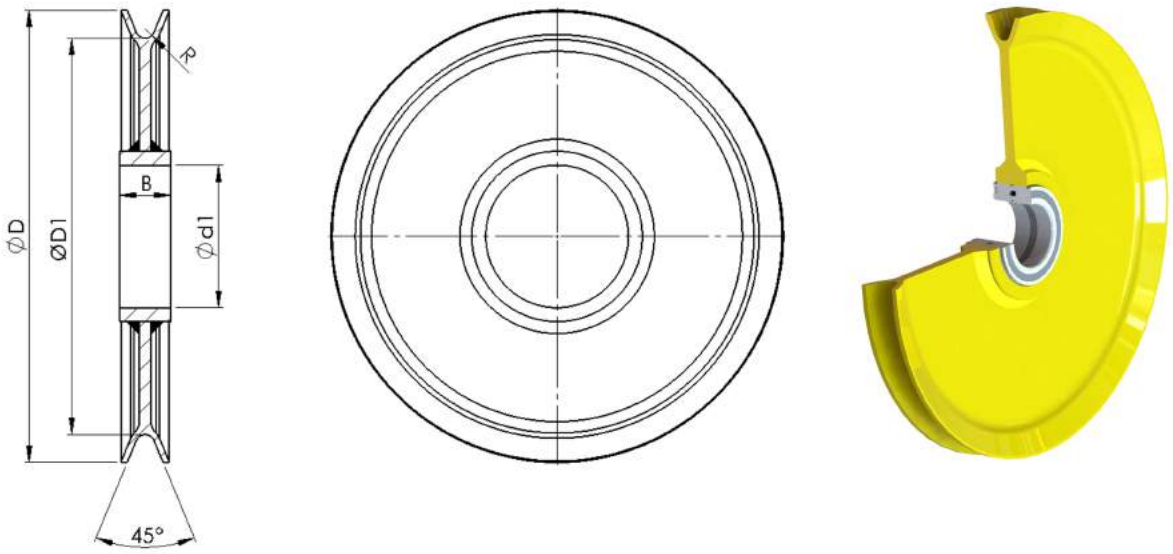
Enjoy ROPE ACCESSORIES RANGE in the following pages.

7.1 SHEAVES

7.1.1 METALLIC SHEAVES

7.1.1.1 Welded sheaves

7.1.1.1.1 One plate sheave

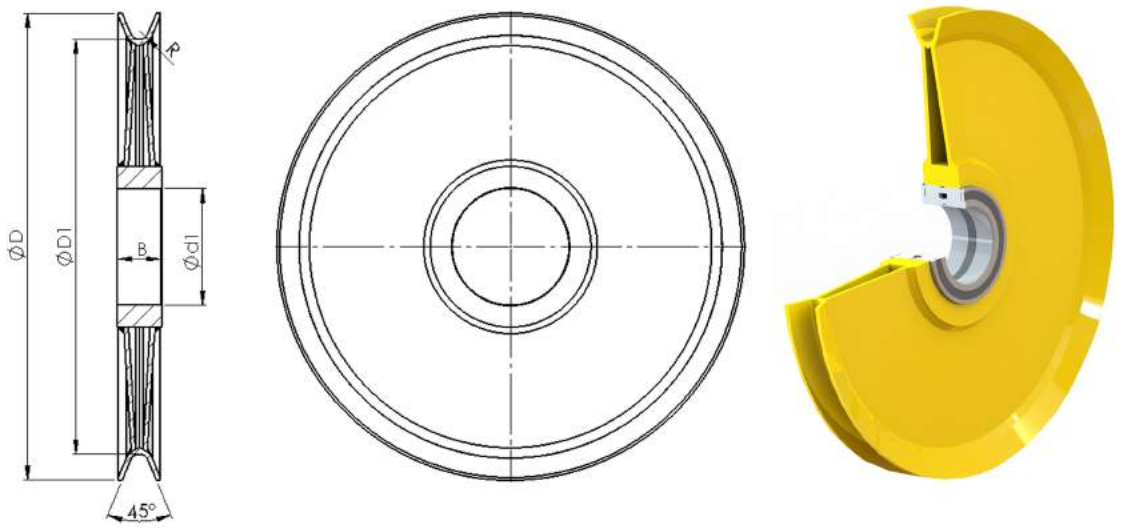


- Material (steel): cold laminated 1 plate + 1 welding
  - Plates: S275JR
  - Hub: S355
- "D" diameter from Ø160mm to Ø800mm.
- Hardness (groove): min 200HB. Further by induction treatment upon request.
- Coating Protection: fully painted.
- Rope diam: acc to customer requirement.
- Assembly: with bearing upon request. FAT upon request.
- Certificate: EN10204-3.1. For 3.2, and Load Test upon request.

METALLIC WELDED SHEAVES I ONE PLATE SHEAVE

OVERALL DIMENSIONS (mm)									Weight
No	D1	D	d1	B	R	Rope	Bearing Ref.	Shaft Ø	kg
Ø 160	160	192	75	35	4,5	8	6009-2RS	45	3,5
Ø 200	200	240	85	41	5,5	10	6209-2RS	45	5
Ø 280	280	335	110	48	8,5	16	6212-2RS	60	12
Ø 355	355	415	150	60	9,5	18	6217-2RS	85	17,5
Ø 450-1	450	520	180	72	12,5	24	6220-2RS	100	34
Ø 450-2	450	520	150	54	12,5	24	SL04 5020PP	100	31,5
Ø 550	550	630	180	65	13,5	25	SL04 5024PP	120	43
Ø 650	650	735	225	81	15	28	SL04 5030PP	150	67

7.1.1.1.2 Two plates sheave



- Material (steel): cold laminated 2 plates + 2 welding
  - Rim: S355J2
  - Plates: S355J2+N
  - Hub: E355
- "D" diameter from Ø160mm to Ø2000mm.
- Hardness (groove): min 200HB. Further by induction treatment upon request.
- Coating Protection: fully painted.
- Rope diam: acc to customer requirement.
- Assembly: with bearing upon request. FAT upon request.
- Certificate: EN10204-3.1. For 3.2, and Load Test upon request.

METALLIC WELDED SHEAVES I TWO PLATES SHEAVE

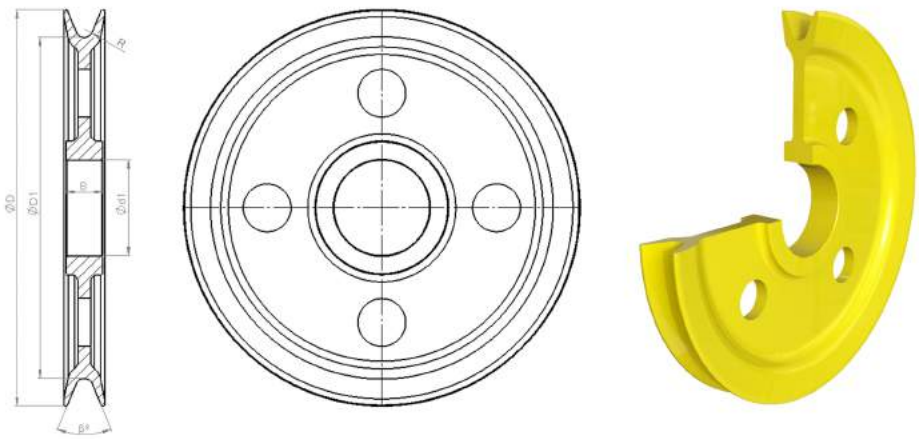
	OVERALL DIMENSIONS (mm)								Weight
No	D1	D	d1	B	R	Rope	Bearing Ref.	Shaft Ø	kg
Ø 500	500	560	140	54	11	20	SL04 5018PP	90	37,5
Ø 560	560	630	150	54	12	22	SL04 5020PP	100	45
Ø 630	630	710	170	65	14	26	SL04 5022PP	110	55,5
Ø 710	710	800	180	65	15	28	SL04 5024PP	120	70
Ø 800	800	900	200	77	17,5	32	SL04 5026PP	130	92
Ø 900	900	1010	210	77	19,5	36	SL04 5028PP	140	132

7.1 SHEAVES

7.1.1 METALLIC SHEAVES

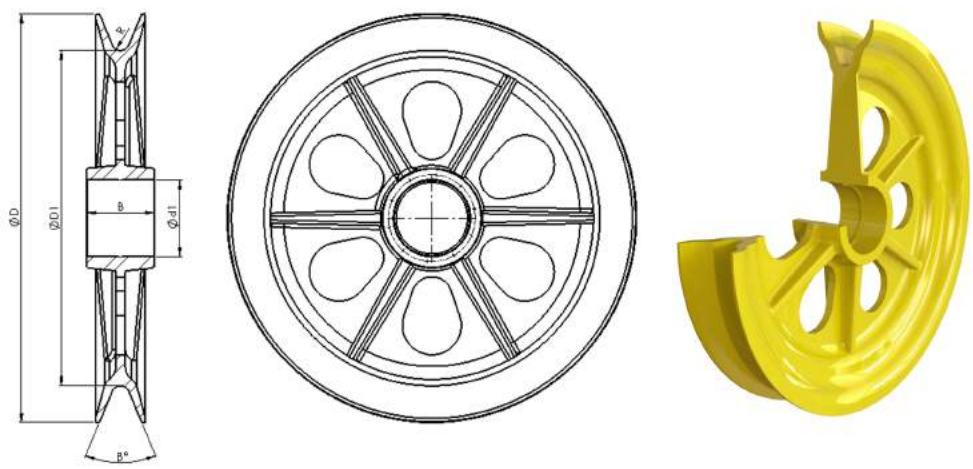
7.1.1.2 Free of weld sheaves

7.1.1.2.1 Solid sheaves



- Material: hot forged / laminated.
  - Carbon steel.
  - Alloy steel.
- "D" diameter up to Ø2000mm.
- Hardness: groove hardness depends on steel grade & treatments. Induction treatment upon request.
- Coating Protection: fully painted.
- Rope diam: acc to customer requirement.
- Assembly: with bearing upon request. FAT upon request.
- Certificate: EN10204-3.1. For 3.2, and Load Test upon request.

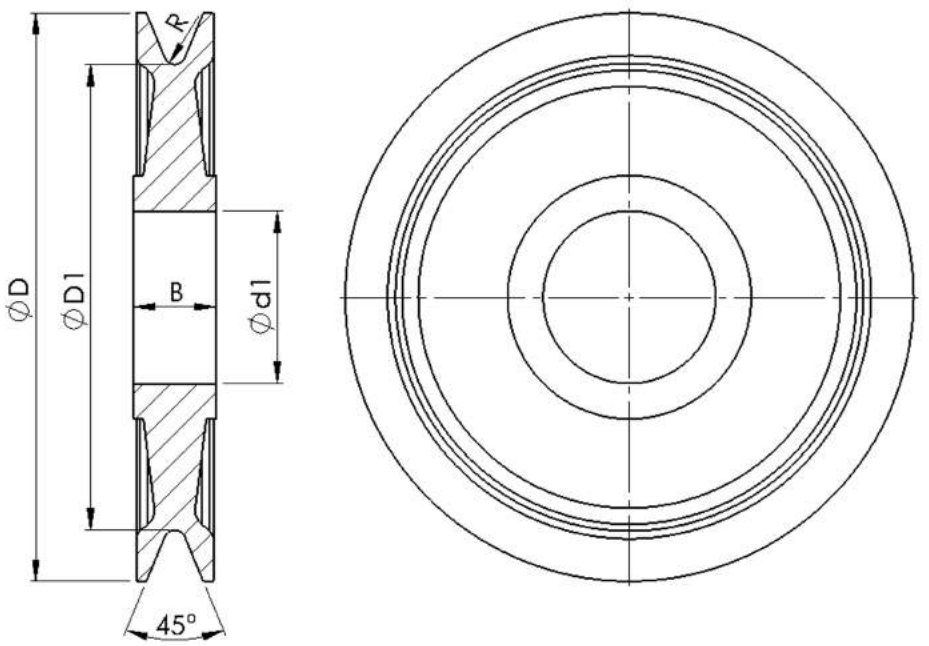
7.1.1.2.2 Cast sheaves



- Material (steel): casting.
  - Carbon and alloy steels.
- "D" diameter up to Ø6000mm.
- Hardness: groove hardness depends on steel grade & treatments. Induction treatment upon request.
- Coating Protection: fully painted.
- Rope diam: acc to customer requirement.
- Assembly: with bearing upon request. FAT upon request.
- Certificate: EN10204-3.1. For 3.2, and Load Test upon request.

7.1 SHEAVES

7.1.2 NON METALLIC SHEAVES



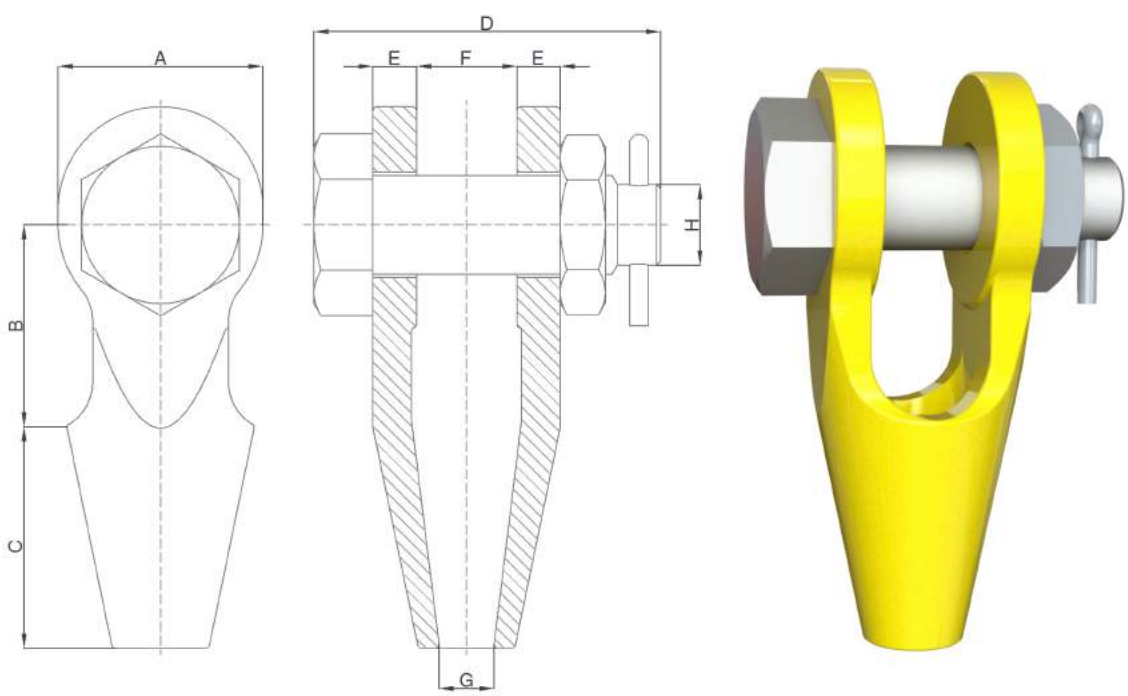
- Material: technical plastic.
  - Lamigamid.
  - Poli-mid 1100.
- "D" diameter from Ø140 to Ø1000mm.
- Rope diam: acc to customer requirement.
- Assembly: with bearing upon request. FAT upon request.
- Load Test upon request.

7.2 FORGED SOCKETS

IRIZAR FORGE team can accommodate any forged socket to the specific lifting, rigging or mooring operation the market is ready to operate up to 320t, from safety, design, material strength and certification point of view.

- WLL: 320t.
- Swivel FORGED, HEAT TREATED and FULLY MACHINED.
- Material: carbon, alloys and super alloys. Most regular: super alloy steel.
- Rope diameter: acc to customer requirement.
- Safety Factor: min. 5:1.
- Surface Protection & Coatings: upon request.
- Sealings: upon request for subsea and offshore apps.
- Load Test: requested / recommended.
- Certificate: EN10204-3.1. For 3.2, ILO-3, FAT or Breaking Test available upon request.

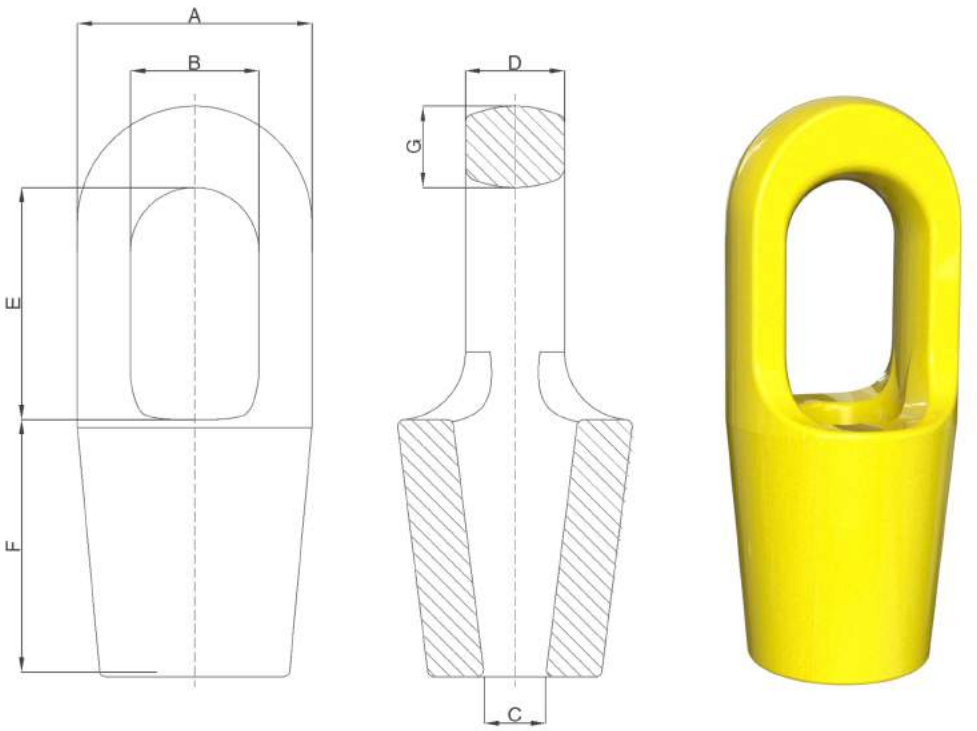
7.2.1 OPEN FORGED SOCKETS



FORGED SOCKETS I OPEN FORGED SOCKETS

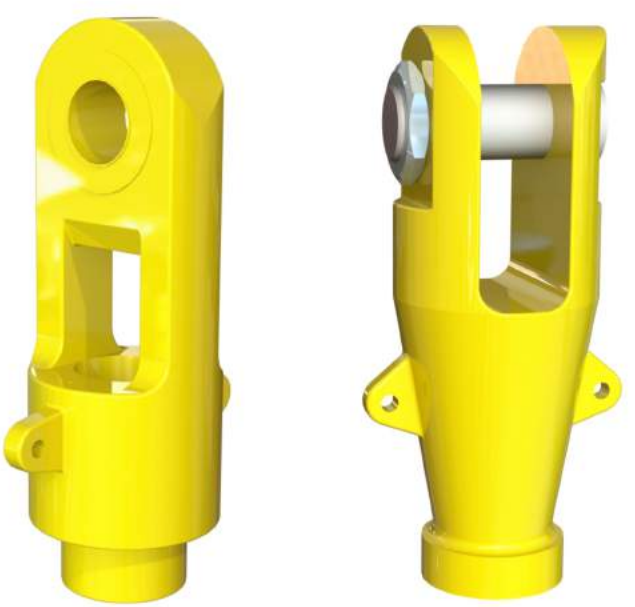
Art. No	Wire diam inch	WLL (t)	MBL (t)	OVERALL DIMENSIONS (mm) A	B	C	D	E	F	G	H	Weight kg
IFSSS-140	3¼ - 3⅜	140	700	286	298	330	412	79	159	92	140	224
IFSSS-150	3½ - 3⅝	150	750	310	318	356	432	83	171	99	152	280
IFSSS-190	3¾ - 4	190	950	352	343	381	464	89	191	108	178	378
IFSSS-240	4½	240	1200	430	480	460	510	101	208	125	190	564
IFSSS-280	5	280	1400	550	500	500	560	120	210	138	250	922
IFSSS-400	5½ - 6	400	2000	590	500	580	620	140	230	160	275	1295
IFSSS-500	6½	500	2500	640	600	675	710	175	310	175	290	1950

7.2.2 CLOSE FORGED SOCKETS



FORGED SOCKETS | CLOSE FORGED SOCKETS											
	OVERALL DIMENSIONS (mm)										Weight
Art. No	Wire diam inch	WLL (t)	MBL (t)	A	B	C	D	E	F	G	kg
IFCSS-140	3¼ - 3⅜	140	700	311	184	92	146	311	330	102	143
IFCSS-150	3½ - 3⅝	150	750	330	197	99	159	330	356	102	166
IFCSS-190	3¾ - 4	190	950	362	216	108	178	356	381	108	217
IFCSS-240	4½	240	1200	405	235	125	190	425	460	120	338
IFCSS-280	5	290	1400	515	270	138	210	475	500	140	579
IFCSS-400	5½ - 6	400	2000	510	300	160	250	550	580	150	654
IFCSS-500	6½	500	2500	600	325	175	300	600	675	175	1063

7.2.3 CUSTOM MADE SOCKETS



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Annex 1

CRANE GENERAL INFORMATION (EN13001-1, EN13001-2)

CRANE PROPERTIES

Crane Type	
Dispositive Hoisting Type	
Hoisting Device Type & Starting Method	
Maximum Constant Hoisting Speed (vh,max) [m/s]	
Constant Hoisting Creep Speed (vh,CS) [m/s]	
Maximum Traslation Acceleration[m/s2]	
Maximum Distribution Acceleration [m/s2]	
Maximum Vertical (Drag) Acceleration[m/s2]	
Drag Device Acceleration Force	
Articulation Type	
Tilting Resistance Factor for Balanced Rope Reeving(Ct)	
Maximum Deliberated Hook Suspension Inclination (β) [º]	

TEMPERATURE FACTORS

Operation Temperature [ºC]	

APPLICATION FACTORS

Risk Factor (n r)	

MASS FACTORS

Mass of the rated hook load (mRC)[kg]	
Total Hook Load with Release device (m H)[kg]	
Maximum Hoisting Load [kg]	

WIND FACTORS

Wind Range in Service	
European Wind Location	
Out of Service (OS) Wind Interval [R] [years]	
Maximum Load Heigth to the Surrounding Ground OS cond.(m)	
Load Percentage for Out of Service Condition (ηW)	

FATIGUE DESIGN FACTORS

Fatigue Operation Temperature [ºC]	
Mass of the Hook Load in a Lifting Cycle (mi) [kg]	
Class Q Parameter	
Class U Parameter	
Average Number of accelerations per Cycle	
Total Number of Lifting Cycles	

ADDITIONAL LOAD OPTIONS

LOAD RELEASE FACTORS

Apply Fast Load Release?	
Load Release Speed	
Release Load Percentage [%]	
Load Release Device Mass [kg]	

TRANSLATION FACTORS

Irregular Traslation surface?	
Factor ϕ4 (EN13001-2)	

SNOW & ICE FACTORS

Apply Snow and Ice Loads?	
Load Horizontal Area Projection (mm)	
Snow or Ice Build-up Thickness (mm)	

EARTHQUAKE FACTORS

Apply Earthquake Loads?	
Máximum Vertical Acceleration due to Earthquake [m/s2]	

Annex 2

DIN 15400 Drive Groups

This table specifies the drive group as a function of hook strength class and the lifting capacity as a function of hook number.

Strength class	Drive group [1]										Strength class
M	Hooks used in a drive group lower				$1B_m$	$1A_m$	2_m	3_m	4_m	5_m	M
P	than $1B_m$ are not included			$1B_m$	$1A_m$	2_m	3_m	4_m	5_m	-	P
S	here.		$1B_m$	$1A_m$	2_m	3_m	4_m	5_m	-	-	S
T		$1B_m$	$1A_m$	2_m	3_m	4_m	-	-	-	-	T
V	$1B_m$	$1A_m$	2_m	3_m	4_m	-	-	-	-	-	V
Hook Number	Lifting capacity, in kg										Hook number
006	320	250	200	160	125	100	-	-	-	-	006
010	500	400	320	250	200	160	125	100	-	-	010
012	630	500	400	320	250	200	160	125	100	-	012
020	1000	800	630	500	400	320	250	200	160	125	020
025	1250	1000	800	630	500	400	320	250	200	160	025
04	2000	1600	1250	1000	800	630	500	400	320	250	04
05	2500	2000	1600	1250	1000	800	630	500	400	320	05
08	4000	3200	2500	2000	1600	1250	1000	800	630	500	08
1	5000	4000	3200	2500	2000	1600	1250	1000	800	630	1
1.6	8000	6300	5000	4000	3200	2500	2000	1600	1250	1000	1.6
2.5	12500	10000	8000	6300	5000	4000	3200	2500	2000	1600	2.5
4	20000	16000	12500	10000	8000	6300	5000	4000	3200	2500	4
5	25000	20000	16000	12500	10000	8000	6300	5000	4000	3200	5
6	32000	25000	20000	16000	12500	10000	8000	6300	5000	4000	6
8	40000	32000	25000	20000	16000	12500	10000	8000	6300	5000	8
10	50000	40000	32000	25000	20000	16000	12500	10000	8000	6300	10
12	63000	50000	40000	32000	25000	20000	16000	12500	10000	8000	12
16	80000	63000	50000	40000	32000	25000	20000	16000	12500	10000	16
20	100000	80000	63000	50000	40000	32000	25000	20000	16000	12500	20
25	125000	100000	80000	63000	50000	40000	32000	25000	20000	16000	25
32	160000	125000	100000	80000	63000	50000	40000	32000	25000	20000	32
40	200000	160000	125000	100000	80000	63000	50000	40000	32000	25000	40
50	250000	200000	160000	125000	100000	80000	63000	50000	40000	32000	50
63	320000	250000	200000	160000	125000	100000	80000	63000	50000	40000	63
80	400000	320000	250000	200000	160000	125000	100000	80000	63000	50000	80
100	500000	400000	320000	250000	200000	160000	125000	100000	80000	63000	100
125	*630000*	500000	400000	320000	250000	200000	160000	125000	100000	80000	125
160	*800000*	*630000*	500000	400000	320000	250000	200000	160000	125000	100000	160
200	*1000000*	*800000*	*630000*	500000	400000	320000	250000	200000	160000	125000	200
250	*1250000*	*1000000*	*800000*	*630000*	500000	400000	320000	250000	200000	160000	250

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LIFTING & MOORING
IRIZAR FORGE

Annex 3

DNV·GL

APPROVAL OF MANUFACTURER CERTIFICATE

Certificate No:
AMMM000004R

This is to certify:

That

FORJAS IRIZAR, S.L.
Lazkao, Gipuzkoa, Spain

is an approved manufacturer of
Chain Cables

in accordance with
DNV-OS-E302 Offshore Mooring Chain

and the following particulars:

Product	**Forged chain cable accessories**
Grades	**NV R3,** **NV R3S,** **NV R4**
Delivery condition	**Annealed, quenched and tempered**
Max. thickness	**See page 2**

This Certificate is valid until **2019-12-31**.

Issued at **Høvik** on **2015-09-18**

DNV GL local station: **Bilbao**

Approval Engineer: **Gorka Lozano**

for **DNV GL**
Digitally Signed By: Gran, Terje
Location: DNV GL Høvik, Norway
Signing Date: 20.09.2015, on behalf of

Hanne Anita Hjerpetjønn
Head of Section

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LIFTING & MOORING
IRIZAR FORGE

Annex 3

Job Id: **263.11-004880-1**
Certificate No: **AMMM000004R**

Particulars of the approval

Particular of approvals for Offshore mooring chain cable accessories			
Grade [2]	**Delivery conditions** [1]	**Max. diameter or thickness (mm)**	**Material manufacturer** [3]
NV R3 **NV R3S** **NV R4**	AQT	265	GERDAU ACEROS ESPECIALES EUROPA, S.L. Reinosa Plant

Remarks:
[1] AQT: Annealed, Quenched and Tempered.
[2] For approved material specification see table S1
[3] The approval is limited to the listed raw material manufacturer

Table S1 - Specification for chemical composition - Offshore mooring chain cable accessories													
Grade, thickness (mm)			C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Al	Ti	N
NV R3 **NV R3S** **NV R4**	265 [2]	Min	.29	-	.60	-	-	1.50	1.65	.25	-	.015	.010	-
		Max	.33	.30	.70	.015	.008	1.65	1.70	.28	.40	.030	.020	.012

Remarks:
[1] The content of Sn, Sb, As and B may be required. In such cases, the maximum content shall be 0.030 % for Sn, 0.030 % for Sb, 0.030% for As and 0.0008% for B.
[2] GERDAU ACEROS ESPECIALES EUROPA, S.L. Reinosa Plant

Miscellaneous:
1) Approval of procedures detailed in the approval letter: OENNO716/GLC/P261.1H-J-5355

Annex 4

Electronically published by ABS London.
Reference T1605602, dated 28-FEB-2017.

ABS

FORJAS IRIZAR S.L. (926420),
HIRIBARREN NO 26,
20210 LAZKAO,
GUIPUZCOA,
SPAIN

Reference: NE/NV T1605602
Project Number: 2167707
Certificate no: QA-3184750

ATTN: Mr. Iñigo Ugarte

Offshore Mooring Chain Manufacturer Facility and Process Approval
ABS Approval of FORJAS IRIZAR S.L., Spain to produce Offshore Mooring Accessories

We have the ABS plant survey report BB3123138 dated 06 May 2016 for your facility along with your submittals together with enclosures relative to the subject. With regard thereto we advise that FORJAS IRIZAR S.L., Spain is considered approved to produce Offshore Mooring Accessories with rolled and forged bars manufactured by Gerdau Aceros Especiales Europa, S.L., Spain & Asco Industries, Fos Sur Mer, France to the requirements of *ABS Guide for Offshore Mooring Chain (2009, updated 2014)* and *ABS Materials & Welding Rules Part 2 (2016)* as outlined herein, provided the Rules are adhered to in all respects and all production, testing and inspection are to the satisfaction of the attending ABS Surveyor.

Repair by welding of forged or rolled Offshore Mooring Accessories is not permitted.

The manufacturer and QA approval is valid for five years subject to quarterly audits and will expire on 05 May 2021. Please note it is the responsibility of the facility to inform ABS of any changes to the manufacturing parameters, to request quarterly audits and renewal of approval prior to the five year expiry date. Our invoice to cover the costs of the technical review is subject to a separate correspondence.

An electronic copy of the drawings, appropriately stamped, is available through the ABS Eagle Construct Engineering Manager (O2E) Web portal. If you need to contact ABS regarding this review please email Nina Edmonds at nedmonds@eagle.org and Nikolaos Vrellos at nvrellos@eagle.org.

Very truly yours

Stefano Penco
Vice President of Engineering
ABS Europe Ltd.

Nikolaos Vrellos
Principal Engineer
London Offshore Engineering Department

CC: ABS Bilbao Port
CC: ABS Houston Materials Dept

Electronically published by ABS London.
Reference T1605602, dated 28-FEB-2017.

Offshore Mooring Chain Manufacturer Facility and Process Approval
ABS Approval of FORJAS IRIZAR S.L., Spain to produce Offshore Mooring Accessories

Product	Grade	Maximum Thickness	Heat Treatment Facility	Delivery Condition	Additional Information	Forged or Rolled Bar Diameter	Steel Bar Manufacturer	Marking
Accessory - Hooks	ABS - R4	265 mm	RAZYA, S.A. (436129) SAN MIGUEL DE ACHA, 7, POLIGONO INDUSTRIAL ALI - GOBEO, VITORIA, SPAIN	Quench & Tempered (QT)	Hooks can be connected to R3, R3S, R4, and R4S chain links. Attention is to be paid to the difference in hardness between adjoining grades.	315 mm	Gerdau Aceros, Especiales Europa, S.L., Spain	AB/R4
Accessory - Shackles	ABS - R4	160 mm	RAZYA, S.A. (436129) SAN MIGUEL DE ACHA, 7, POLIGONO INDUSTRIAL ALI - GOBEO, VITORIA, SPAIN	Quench & Tempered (QT)	Shackles can be connected to R3, R3S, R4, and R4S chain links. Attention is to be paid to the difference in hardness between adjoining grades.	220 mm	Asco Industries, Fos Sur Mer, France	AB/R4
Accessory – H-Link	ABS - R4	225 mm	RAZYA, S.A. (436129) SAN MIGUEL DE ACHA, 7, POLIGONO INDUSTRIAL ALI - GOBEO, VITORIA, SPAIN	Quench & Tempered (QT)	H-Links can be connected to R3, R3S, R4, and R4S chain links. Attention is to be paid to the difference in hardness between adjoining grades.	315 mm	Gerdau Aceros, Especiales Europa, S.L., Spain	AB/R4

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VOCABULARY & ABBREVIATIONS

t: metric ton (1000kg)
kg: kilogram
No: number
mm: millimeters
WLL: Working Load Limit
SWL: Safety Working Load
COC: Certificate of Conformity
COO: Certificate of Origin
DAC: Design Approval Certificate
CSIC: Classification Society Inspection Certificate
EN: European Standard
EN13001: New European Standard for Cranes
EN13001-3-5:2016: New European Standard for forged crane Hooks
EN10204: Metallic products - Types of inspection documents (Material Certificate recognized in Europe)
3.1: EN10204-3.1 Original Manufacturer Material Certificate, with tests results (no 3rd Party)
2.1: EN10204-2.1 Original Manufacturer Assembly Certificate
3.2: EN10204-3.2 Third Party Material Certificate, with tests results (witnessed by 3rd Party)
ILO-3: Load Test Certificate recognized by International Labour Office
PTL: Proof Test Load
FAT: Factory Acceptance Test
MBL: Minimum Breaking Load
FEA: Finite Element Analysis
YS: Yield Strength
US: Ultimate Strength
FS: Fatigue Strength
PL: Proof Load by cold forming
DT: Destructive Test
NDT: Non Destructive Test
UT: Ultrasonic Test
MT: Magnetic Test
+QT: Quenched & Tempered (a kind of heat treatment)
+N: Normalizing (a kind of heat treatment)
R4: alloy steel linked to chain materials
SF: Safety Factor (MBL/WLL)
DIN: Deutsches Institut für Normung
DIN15400: old recognized European standard for crane shank hooks
P: very low mechanical properties material (regularly carbon steel)
S: low mechanical properties material (regularly low alloy steel)
T: medium mechanical properties material (regularly medium alloy steel)
V: high mechanical properties material (regularly high alloy steel)
W: very high mechanical properties material (regularly super alloy steel)

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