90th ANNIVERSARY / LIMITED EDITION

2013 2014 CATALOGUE

IRIZAR FORGE

CATALOGUE
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WELCOME ABOARD

IRIZAR
FORGE

IRIZAR FORGE headquarters team: noon shift.

XXXX

IRIZAR FORGE

I have the honor of providing our welcome to the limited edition of IRIZAR FORGE new catalogue. This edition is published in a limited way for 2013 and 2014 for two reasons:

First, we are celebrating our 90th Anniversary, a historic milestone for the company and its stakeholders.

The second reason is because the European lifting industry is located at this moment between the current standard, DIN15400 and the already in progress but not yet published European standards EN13135.

Facing the challenges that the new standard is offering, and due to the restless character of IRIZAR FORGE, we have reviewed those challenges and have not limited ourselves to simply analyzing them like observers, but we have accepted and embraced them; these new challenges act like a compass to identify our strong points as well as those that we want to strengthen. And, it also helps us in reformulating our business to the extent necessary.

And, it has already been necessary. A few months ago, with the event of a new historic milestone for the company, the fourth generation assumed in January 2012 of both the government and management of the business, and proceeded with a business reorganization which was the result of a deep Shakespearean reflection (Who we are?, Where do we come from? Where do we go?).

Maria Lasa Irizar
Managing Director
4º Generation Representative

With the next 30 years' succession now ensured and formalized, it is here and now where we publish **the DNA of IRIZAR FORGE:**

MISSION: Provide practical and innovative solutions to the material handling industry in order to facilitate handling operations wherever they are: land, sea, air.

VISION: Be the preferred and valued partner for design, production and inspection of lifting and mooring elements with a high value added service policy focused on Oil & Gas, Marine, Offshore, Nuclear, Ports, Steel, Mining and Hydro Industries by providing highly qualified, maintenance-free products having high safety factors, long life, and competitive service.

STRATEGY: Adapting and preparing ourselves over 2 to 3 years, and before the competition, to the detected market trend: A clearly evolving preference for forged over other non-forged solutions for certain safety related items and for operations above 1000 Tn.

Fatigue analisis developed by dynamic test.

R&D
RESEARCH & DEVELOPMENT

From now on at IRIZAR FORGE we are not limiting ourselves to the classical lifting scenario of vertical motion controlled by a cable against terrestrial gravity. We consider the Heavy Duty Material Handling Industry (MHI) as a wide world without boundaries, allowing horizontal and translational movements, non-terrestrial included.

Moving from the philosophical to the real world, a generally open mind has provided huge curiosity and RESEARCH & DEVELOPMENT (R&D) mindset in specific and particular areas as dissimilar as the metallurgical, the industrial processes, and the markets:

Metallurgical R&D:

» To create and maintain the structural grain flow of steel, we have developed processes that replace other non-forged materials that are currently used in the industry by default, due to lack of resources, lack of interest or a limited application requirement.

We have taken DIN15400 off and we`ve got into the world of metal, iron and its compositions, analyzing the elements with some certain characteristics (forge-ability, strength, elasticity, tough but strong…) that when combined among them can give us the most adequate way of changing the world of Heavy Duties MHI, lead until now by materials processed by casting.

Markets R&D:

We enter into the MOORING, where the marine gains ground over the terrestrial, and therefore we enter the offshore industry, and specifically, submerged sub-sea applications.

With lateral strengths unknown in Crane World, with no terrestrial gravity, and with an ecosystem/environment yet to be fully understood , the subsea, and more specifically the very deep seas (Pre –Salt) are considered a challenge for the 3 pillars of IRIZAR FORGE: ROV design applications, production made by different metallurgical characteristics suited to provide at least 20 years of useful life free of maintenance, and inspection and testing that guarantee the aforementioned in either static or dynamic way.

Production Processes R&D:

There is a constant in the 90-year life of the company and that is the metal transformation activity from the ancestral technique of the FORGE. Re-confirmed as our core-business for at least the next 15 years is this art which gives to IRIZAR's products the future characteristics of the markets such as: RELIABILITY and DURABILITY: We create grain flow orientation due to the pressures exerted on raw material structure, and that grain flow orientation must stay intact until the final product, whereby the IRIZAR product is distinguished from others which lack this reinforcing grain flow orientation.

» A young organization only 90 years old.

IRIZAR FORGE

COMPANY PROFILE

1923

Founded by Francisco Irizar
in Lazkao (Basque Country)

OWNED:
Private Limited Family owned company (4th Generation).

FORMAL NAME & LOCATION:
FORJAS IRIZAR S.L. EU: Basque Country (Northern Spain)

HEADQUARTERS:
Forjas Irizar S.L. Hiribarren 26. 20210 Lazkao, Spain.

MAIN ACTIVITY:
> Design & Calculation.
> Production & Processing.
> Inspection & Testing.
> Distribution & Warehousing.

Of lifting & mooring components for standard & non-standard conditions.

MAIN PRODUCTS:
> Forged HOOK (up to 1500 Tn SWL).
> Rope SHEAVE (up to 4000 diameter).
> Crane forged WHEEL.
> Complete crane BLOCKS.
> Others (eye bolts, shafts, ...).

To 1500 Tn SWL till 2015.

To 4000 Tn SWL, 2015 in advance.

MAIN MARKETS:
> Crane Industry (OEM).
> Offshore Industry.
> Nuclear Industry.
> Oil & Gas Industry.
> Hydro Industry.
> Steel Industry.
> Mega-Construction Industry

To 1500 Tn SWL till 2015.

To 4000 Tn SWL, 2015 in advance.

MAIN PRODUCTION ACTIVITY:
FORGING.

AUXILIARY PRODUCTION ACTIVITIES:
Heat treatment, surface conditioning, machining, coating/painting, assembly.

MAIN INSPECTION & TESTING ACTIVITIES:
> DT & NDT Labs, Pull Test Loads (PTL) to 1500 Tn.
> Static & Dynamic Tests on request based.

FORGING METHODE:
> Close Die forging.
> Open Die forging.
> Free forging.

FORGING CAPABILITIES TILL 2015:

MAX. forging final weight 6000 kg:
> 3500 / 5000 Tn hydraulic press+4 smaller hydraulic presses.
> Suspended and terrestrial handlers to 10000 kg.
> 10 m3 Gas furnaces.
> Bending machines for max diam. 500 mm.

FORGING CAPACILITIES FROM 2015 IN ADVANCE:

MAX. forging final weight: 18000 kg:
> 10000 Tn hydraulic press+2 smaller 2000 Tn hydraulic presses.
> 3500 / 5000 Tn hydraulic oil press+4 smaller hydraulic presses.
> Suspended & terrestrial handlers to 20000 kg.
> 50 m3 Gas furnaces.
> Bending machines for max diam. 500mm.

COMMERCIALIZATION & DISTRIBUTION:
> Worldwide 20+Delegations, and growing.
> Cluster Warehouses: Germany, US, Australia, and growing.

For standard hooks, crane hookblocks day to day stock.

CERTIFICATIONS & **ACCREDITATIONS**

» International Accreditations are the passports to operate in certain industries, where just the best operators are permitted to play in.

IRIZAR FORGE operates in maximum requirement markets supplying safety related critical components and solutions, where security and durability are preferred values.

As global player, IRIZAR Forge operates Worldwide and its products, organization and facilities are permanently certified & accredited by recognized classification societies, a must to be a first line lead player for Nuclear, Oil & Gas, Hydro, Offshore, Steel Industry, Mining and Mega-Construction Industries.

ISO 9001:2008
(LRQA)

ISO 14000:2004
(LRQA)

AMERICAN BUREAU STANDARD

API-8C
(in process)

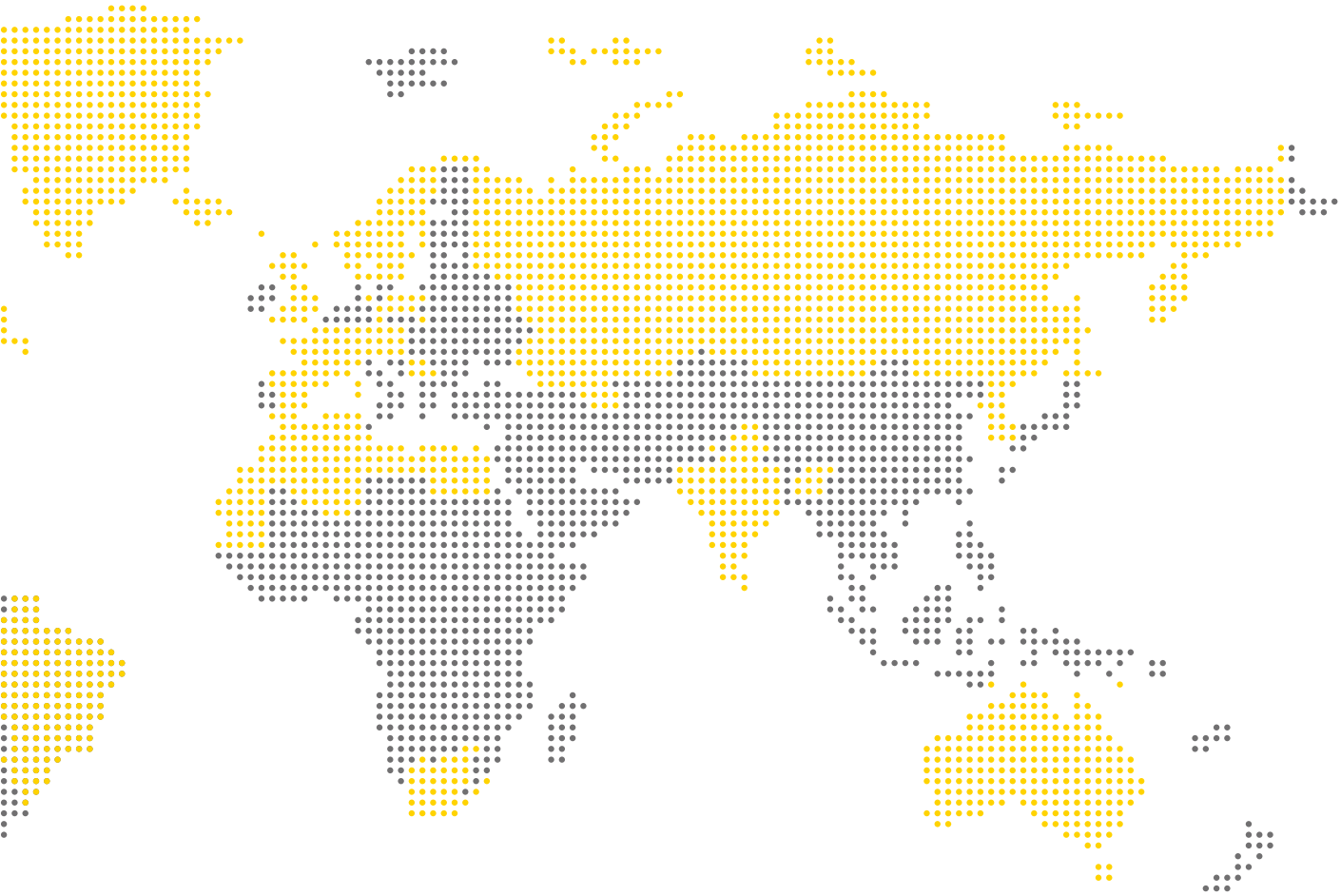
OHSAS 18001
(in process)

TÜV RHEINLAND

GERMANISCHER LLOYD

LLOYDS REGISTER OF SHIPPING

DET NORKE VERITAS



BUREAU VERITAS

ACHILLES

GOST-R

Load testing has acquired great importance in the new standard, mainly for free design and calculation process validation purpose.

GOODBYE DIN15400 WELCOME EN13135

Involved in standardization process since 2009, IRIZAR Forge organization has acquired a wide knowledge on the matter. We will start informing the “new rules of the game” in a networking way to expand them to all players in the Lifting Industry.

It won’t be formally published until 2014 but its effective date 2015 implies that the new EN13135 regulation will coexist with the previous DIN15400 only during the period until the new regulation takes effect then the classic and didactic DIN15400 will be repealed forever.

With its origin in CEN/TS 13001-3.5, the later as result of EN13001-1 & EN13001-2 harmonization, the new EN13135 requires a change in the Lifting Industry’s way of thinking. A new “player” is created between crane manufacturer and crane component producer: DESIGNER.

» The new European standard will be modified substantially in terms of: Calculation, Material Grades, Design/Geometry and Inspections.

Calculation

EN13135 is based on Crane Design standard. As a result the hook must be carefully and specifically selected for each crane, using the same static and dynamic calculations that are applied to the crane.

The interface table “Working Drive Groups” used to link crane versus hook, will not be in force any more. From now on, it will be the result of calculations.

Material Grades

As far as materials are concerned, it will not be mandatory anymore, so while the same grades of steel may be used (Ste420, 34CrMo4, 34CrNiMo6, 30CrNiMo8) it will no longer be limited to them alone. Inside the recommended materials catalog, the nomenclatures P, S, T, V will continue, but with three new points:

- M class will not exist anymore, being the P class properties the minimum ones.
- Hooks in stainless steel will be introduced, with similar values as P class.
- Upper grades over the V are inserted, with mechanic values over 700 MP.

What these three changes do is line up with increasing industry requirements, that demand a material types with higher physical and mechanical limits than the ones specified in DIN15400.

Design/Geometry

With respect to geometry, dimensions and tolerances, and machining… there will exist some non-mandatory to consider where DIN15400 is clearly referenced, but geometries, weights and dimensions will be open to the free market, where each producer will display its technical characteristics. Because of this, the new EN13135 will not be a didactic hook book any more, but it will become, step by step, a standard opened to ingenuity with minimum safety requirements and some established rules.

Tests & Inspections

With respect to tests performed, crane component LOAD TESTING has acquired great importance for the purpose of the design and machining process validation. In addition, more rigors will be required in the sampling of bigger-sized pieces, resulting mandatory in individual inspections 100% based.

BOARD OF DIRECTORS. Formally founded in Jan 2012 and with wide ranging power and authority for the company's government. Members: Marisol Irizar, Benito Lasa, Ane and Maria Lasa Irizar.

IRIZAR FORGE ORGANIZATION

The decision making process is facilitatet by three entities: Management Committee, Engineers and Board of Directors. All skills are balanced to manage the 3 times of the clock of business: short, medium & long term.

The quality of IRIZAR Forge organization is created by every member of the company. The levels of training, expectations, responsibility, sacrifice and commitment, is the result of everyone's contribution.

As we interact with high quality demanding markets, at times during the 20th century, but continuously nowadays, the average requirement level for IRIZAR Forge has increased directly in a proportional and progressive way.

The key positions

Are part of MANAGEMENT COMMITTEE, which in collaboration with Managing Director will guide the present and near future management of the business. 6+1 Members committee composed by Quality Director, Commercial Director, Production Director, Purchase Director, Innovation Director and Financial Director (+ Managing Director).

The technical positions

Are completely formed by fluent English speaking people with mechanical, technical, metallurgical and industrial engineering degrees, with wide experience in the manufacturing industry and a restless vocation for development.

The intermediate positions

Are staffed by self-sufficient, problem-solving and flexible people, with a diversity of training in sales, administrative and organizational processes which provide the organization with an effective, networked operation.

Delegate Skill

Will be formed by local people that will provide service, warmth and local comprehension in a real time. People involved, in one way or another, with the product and /or market, will be the local decisive market interlocutors that will contribute without bothering.

CLOCK OF BUSINESS

All skills are balanced in a way that the 3 times of the clock of business can be managed:

- The short term (operative), with a dynamic team, comfortable in the countdown of the deadline to fulfill the delivery in the agreed terms.
- The medium term (management and strategy), with a thoughtful and strategist human team, comfortable in periods of uncertainty and capable of proposing strategies and making decisions.
- The long term (policies and govermment), with carefully selected people having visionary and intuitive skills, as well depth of experience.

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IRIZAR FORGE
SCOPE OF SUPPLY

IRIZAR
FORGE

DESIGN & CALCULATION

PRODUCTION & PROCESSING

- FORGING
- SURFACE POLISH
- HEAT TREATMENT
- MACHINING
- ASSEMBLY
- PAINTING

INSPECTIONS & TESTING

- CERTIFICATION & QUALIFICATION
- PROOF TEST LOAD

WAREHOUSING & DISTRIBUTION

NOT LIMITED
TO PRODUCTION

IRIZAR FORGE a global partner open to solve the current and future challenges of heavy and very heavy material handling industry, no matter where they are located.

Design and calculation:

Due to the experience gained attending markets with maximum requirements we can offer design service based on new equipment or replacement purpose.

For both business lines, environmental conditions are required as calculation & design procedure are different if items are in standard versus non-standard or extreme conditions.

Production and Processing:

Due the experience gained in IRIZAR's 90 year history, we transform the metal by forging across diverse product lines created for that purpose, from the commodity by closed die forging to the open die forging and free forging, passing through semi- closed die forging for the most popular middle sizes.

Besides forging, auxiliary processes are performed to complete full scope of production: as heat treatment, surface polish, machining, painting, assembly.

Inspection and Testing:

With strict inspection protocols before, during and after production, final tests are the top ones, not only for being the irrefutable final proof, but for classification societies, official entities, customers, end users… who witness by themselves final tests results.

Destructive & non Destructive tests are carried out regularly, where the top tests are static & dynamic load test, overloading under control the item to be certified.

Warehousing & Distribution:

Items produced based on stock for standardization or regular consumption reasons, can be stocked. Stock based items are located where the demand exist, diversifying IRIZAR FORGE products World-wide for a “just in time” local service.

Till Dec 2012, besides central warehouse at headquarters, existing logistic centers are located in Germany, US and Australia, but distribution networking is growing to other clusters as well.

With all four activities a full scope & long term professional relationship is established based on experience exchange, non-stop innovation appliance and trustability.

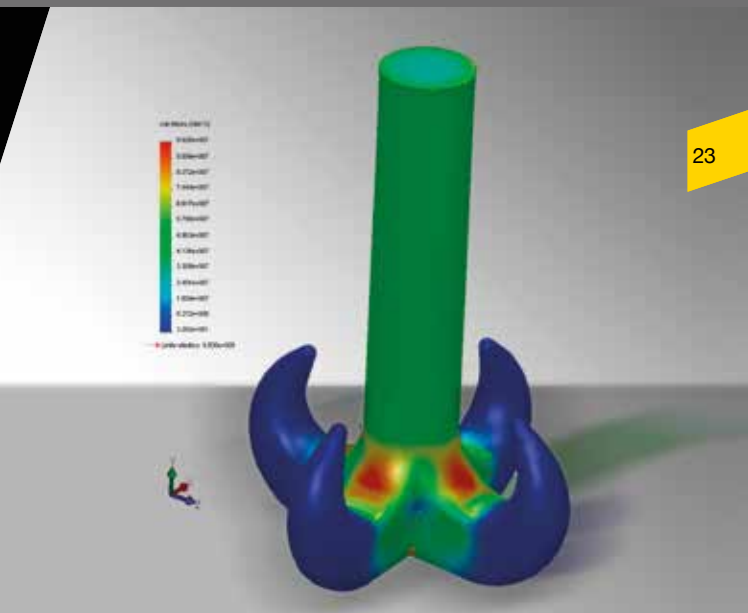
DESIGN & CALCULATION

Stress studies, Finite Elements Analysis, searching of maximum properties and safety factors of the material… are only some of all calculations performed before production, with the only one goal of finding the very best option and the most optimum solution.

Not limited to that, to face simulations to the real world: Design & calculation is a non-stop activity at IRIZAR FORGE and can be lined to

- **New project based business:** design & calculation to be approved by third parties as classification societies, to support customer projects development & execution teams.
- **Replacement after-market business:** not limited to old part identical replacement, IRIZAR service is focused to improve the part providing latest design, material grade and assembly solution in order comply with safety standards, rules & law in force.

» all tests performed such as destructive tests, static proof test loads and/or fatigue proof tests results are used to compare and ratify simulations based on calculations result, and consequently that the choice has been the right one.



PRODUCTION & PROCESSING

The complexity level of its transformation from ingot or pre-forged bar to final forging, is considered medium to high: about 12-15 processes involved with a developing period of 5+ weeks.

Raw material: THE STEEL

IRIZAR FORGE has in its facilities about 2000 ton of required STEEL in different versions and combinations: profiles (ingots, rounds, quarters…) and grades (carbon steel, alloys, austenitic…). In the case of dealing with pre – forged materials always start with a previous forging reduction of 1:3.

80+% of purchase is provided by steel mills with more than 30 years of experience, supplying regular grades for hooks & forgings production Ste52, 34CrMo4, 34CrNiMo6 and 30CrNiMo8; as well as project base grades for specific applications and non- standard conditions and environments, such as AISI-316, superduplex, bronze…

Thanks to raw material stock we can guarantee delivery dates punctuality and a non-stop production schedule.

Then, when raw material is cut ready to start its transformation, processes involved are as follows:

FORGING
HEAT TREATMENT
SURFACE TREATMENT
MACHINING
ASSEMBLY
PAINTING

IRIZAR FORGE's PRODUCTIVE SYSTEM INCLUDES SEMI-OPEN, OPEN DIE AND FREE FORGING process under 1220ºC heat and using hydraulic presses, having as result a great VERSATILITY.

PRODUCTION & PROCESSING

FORGING

TRANSFORMATION AND DEFORMATION OF THE METAL

Semi-open die process is used to be competitive and versatile, due to semi-opened and interchangeable dies, avoiding a loss caused by the machining losses. The orientation of the dies, located aside the shaft, allow us to produce items according to strict standards, with finishes to the shaft (with required dimensions), eye hole…

Open die forging process, is useful as a preparation of preforms with a total flexibility as to shape (weights and dimensions) later to be stamped with proper tools adapted to pieces produced according to the requirements. The open die forging process is the most ancient type of forging and it is so termed because the deformation of the metal is not limited (free–forged) by its shape or mass.

The beneficial effects produced by HOT-FORGE are at least 5 compared to other non-forged materials:

- Reduction of the final forging, in the case of lifting hooks for cranes of 1:5
- Creation of grain flow, due to the molecular alignment and arrangement.
- Grain flow orientation. The mechanical properties of the product improve considerably if the effort is applied in the direction of the formed fiber and worsened if it is applied in perpendicular direction.
- Refining of the grain, in order to guarantee the mechanical values after the thermal treatment.
- Elimination of cavities, porosity, blowholes… Due to the huge pressure the material is subjected to during the forging process, it is compacted and therefore such undesirable characteristics are eliminated (at the same time, said huge pressures and displacements of the material could generate forging folds).

PRODUCTION & PROCESSING

SURFACE TREATMENT

NOT ONLY AN AESTHETIC MATTER

IRIZAR FORGE keeps surface clean free of defects permanently during all production processes:

During Forging, surface is permanently cleaned by water pressure on hot red piece to avoid surface scales flowing into inside during forming process.

Before heat treatment, forging surface is cleaned by grinding one by one in order to eliminate any surface defect, indication, incrustation, marks or scales, that could affect to its mechanical & physical status and results.

Before DT & NDT, forging surface is cleaned by shot-blasting one by one to eliminate scale after heat treatment.

The hook is a critical item for several reasons, but above all because all over its life it is subjected to the effect of FATIGUE, and its effect could cause originate in the area of a small a defect, turning it into a crack in a premature way and therefore, not only radically shortening the hook's life, but risking sudden failure.

This permanent cleaning procedure is not done only for aesthetic reasons, but to control final mechanical properties and item life time submitted to fatigue.

PRODUCTION & PROCESSING

HEAT TREATMENT

PHYSICAL AND MECHANICAL CHARACTERISTICS

After forging & polishing, pieces are submitted, one by one or in a batch, to temperature and medium changes (air, water, oil, polymer…), without changing the state (always solid), applying heating and cooling at controlled temperatures, with the aim of improving its physical and mechanical properties, especially:

- Toughness
- Strength
- Elasticity

The most usual treatments applied to the most commonly recognized materials for hook and accessory production (mentioned above) are:

- Quenchied and tempered (QT)
- Normalized (N)
- Annealed (A)

Consequently IRIZAR FORGE is developing R&D projects related to material grades, properties & heat treatments, applying deep metallurgical expertise that is permitting leadership in our goal markets and industries.

Heat Treatments have acquired great relevance in the industry generally, because as a result of constant innovation, metals with higher strength and abrasion resistance are being specified and required.

Key factors for tests performed on hook and safety related forgings are giving us an idea about the performance that it will have throughout its lifetime.

PRODUCTION & PROCESSING

MACHINING

HOOK ASSEMBLY

Though they are forged pieces, the area typically machined in lifting hooks is the hook shaft, machined with threads, and also the hook's main accessories that will constitute, once assembled, the complete hook assembly or hook suspension: nut and crosshead or traverse.

All items previously forged and heat treated, they are machined at the same time as the hook to guarantee a correct assembly without any deviation.

ROPE SHEAVES & CRANE WHEELS

For round forgings such as sheaves & wheels groove and rolling areas machining are considered critical, and different machining centers are used depending on size & weight:

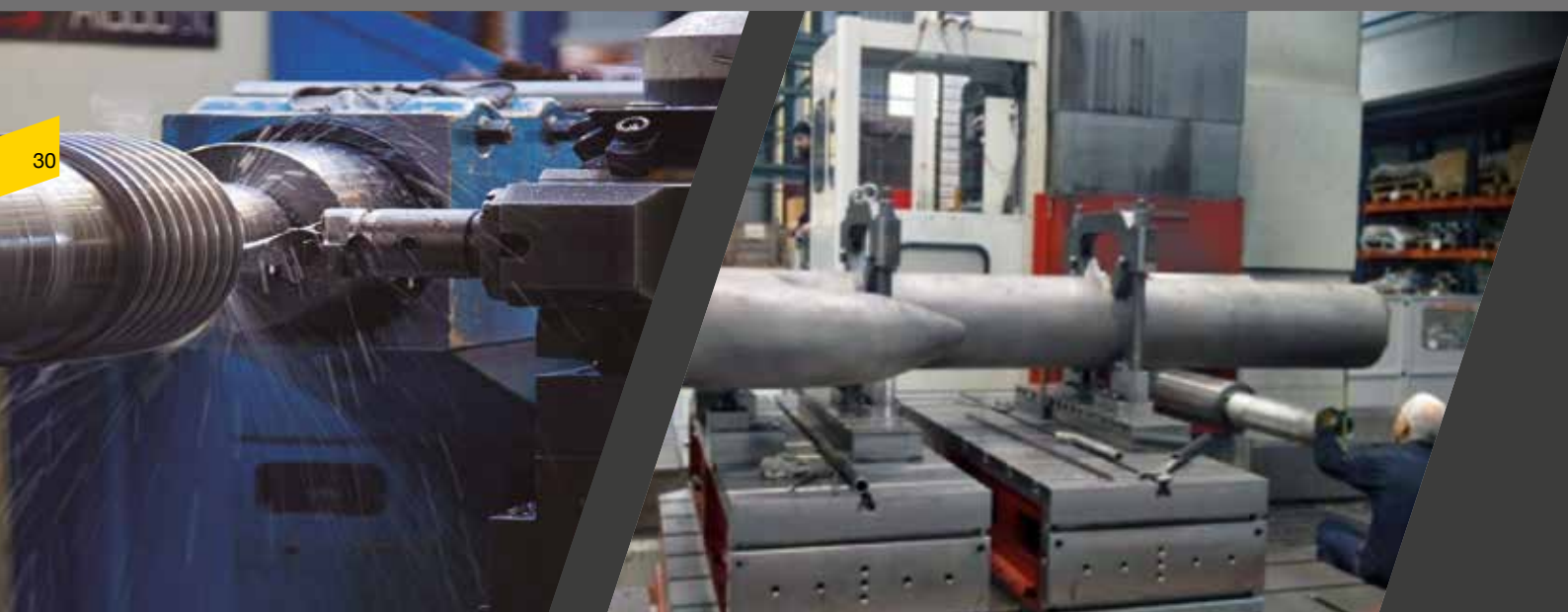
» Depending on its size and shape, items up to 3000 kg (small and medium sizes), the part turns and the equipment is static (lathe). For items over 3000 kg, the part is the static piece and the equipment (machining centre) is the one that moves.

PRODUCTION & PROCESSING

ASSEMBLY

This is the most structural part of IRIZAR FORGE products, composed by elements of welded structures, hardware and seals for final assembly of complete component.

Under our own design or customers, crane hook-blocks, crane wheels and rope sheaves are assembled to be validated afterwards. Validation can be carried out by NDT and pull test loads.



PRODUCTION & PROCESSING

PAINTING

COATINGS & SURFACE PROTECTIONS

The coating requirements are getting stricter because of the extreme conditions that crane components will suffer, such as: extreme temperatures (negatives or positive), corrosion areas in direct contact with salt (seaboard coastal areas with an exceed of salinity or hooks located on the decks of commercial vessels or in their supporting works), direct contact with salt water (e.g., submerged subsea components), direct contact with fresh water (hydroelectric plants), direct contact with chlorinated water (nuclear power station cooling pools), being the most extreme ones from coating specification point of view:

- Sub-sea Pre-SALT: Because of being continuously submerged in ecosystems still unknown for its effects at the metals (6000m depth), the metallic components have to be protected from bacteriologic attack.
- Auxiliary Hydro equipments: For having a precisely amphibious ambiguity, for being submerged or in dry sunlight, the difficulty of enduring both environments, makes the unions, seals and surfaces suffer and shortens their lifetime, and because of this they must be subjected to strict maintenance tests and inspections.

For the extreme cases just mentioned, as a result of its experience IRIZAR FORGE has developed specific instructions and procedures for protection in these applications, for example, to combine the welding beads with zinc- rich silicones and other specific seals.

With always increasing level of requirements, each subassembly is coated before final assembly, for the purpose of protection from hostile surroundings that could degrade the surface of the subassemblies or components.

Due to strict internal inspection protocol IRIZAR FORGE tests and inspects BEFORE, DURING and AFTER the production process.

INSPECTION & TESTING

Invasive tests are executed before machining after heat treatment, removing a sample piece in a very specific way (based on international standards and classification society rules) in order to ensure that sample is sufficiently representative:

- **DESTRUCTIVE TESTS (DT)** to obtain mechanical and physical values required by the applicable standard, classification society rule or customer requirements, in order to get Tensile Strength, Yield Point, Elongation and Reduction of area (with tensile test specimen) and Charpy Impact Test (testing temperature from room temperature to -50ºC, which determines the amount of energy absorbed by a material during fracture).

- **METALLURGICAL TESTS (MT)** to obtain chemical values, can be executed to incoming raw material, after forging, before & after heat treatment under the criteria of internal procedures and instructions, mainly to know grain size, cavities, grain-flow orienting,…

Non-invasive or NON DESTRUCTIVE TESTS (NDT) are made to incoming ingot, pre-forged bar and to final forging, without any independent sample but to the part itself, and they are divided in two major groups:

- SURFACE examinations: The aim of this kind of tests is detecting imperfections, indications or cracks in the surface of the forging, detected by different techniques as: magnetic particles or liquid test.

- INTERNAL or not superficial examinations: The aim of this test by using an ULTRASONIC technique is to detect the internal defects and imperfections, like folds, porosity…

» In both examinations any evidence is registered and analyzed if it's accepted according to international standards or classification society rules acceptance criteria. Most of affected pieces out of acceptance criteria are rejected at IRIZAR FORGE not being allowed to repair or rework (welding is totally prohibited).

Other non-destructive checks are performed, which in and of themselves are not considered tests as DIMENSIONAL CONTROL and VISUAL CONTROL

INSPECTION & TESTING

CERTIFICATION & QUALIFICATIONS

All Inspections, Examinations, Tests and Controls, not only the final ones, but all performed anywhere in process, are performed by an officially qualified on-site team with at least 5 years of experience. Called the Quality Team, is totally independent from production team.

IRIZAR FORGE Laboratories and Capabilities to perform them correctly are also audited and certified by recognized entities.

INSPECTION DOCUMENTS QUALITY CERTIFICATES AND ACREDITATIONS

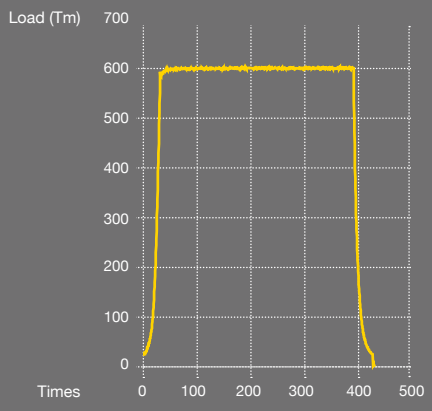
> **Certificate EN10204-3.1:** Document validated by IRIZAR FORGE Quality major Authority, declaring that supplied item is in accordance with the requirements of purchase order/project, including all tests & inspections results.

> **Certificate EN10204-3.2:** Document prepared jointly by IRIZAR FORGE Quality major Authority and third party representing the buyer, where both declare that supplied item is in accordance with purchase order/project requirements, including all tests & inspections results.

Besides EN10204 Certificates, 12 to 24 months Guarantee Certificate & CE Declaration of Conformity Certificates are issued.

» Original Manufacturer Certificate EN10204-3.1 is considered the passport; without it, safety related items cannot be delivered, assembled or used.

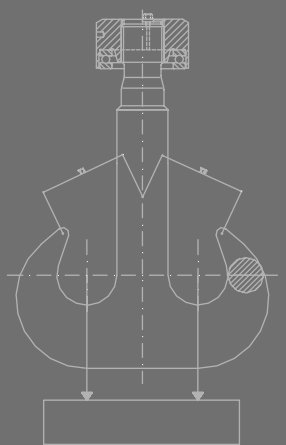
1500 TM LOAD TESTING MACHINE. Machine Num.: 862MHG. Translator Num.: 528M047163.



Test ID: 603
Date: 30/10/2012
Hour: 11:23:29
Load test: 600 Tm
Time test: 360 s
Maximum run over: 38,80 mm
Applied norm: Customer Drawing
Piece tested: OF12/0269.0.1.1

Before test y1 = y2 = 470
After test y1 = y2 = 470

Note: Auxiliary cylinders pretensiled.
Test made al hook's horns.



INSPECTION & TESTING

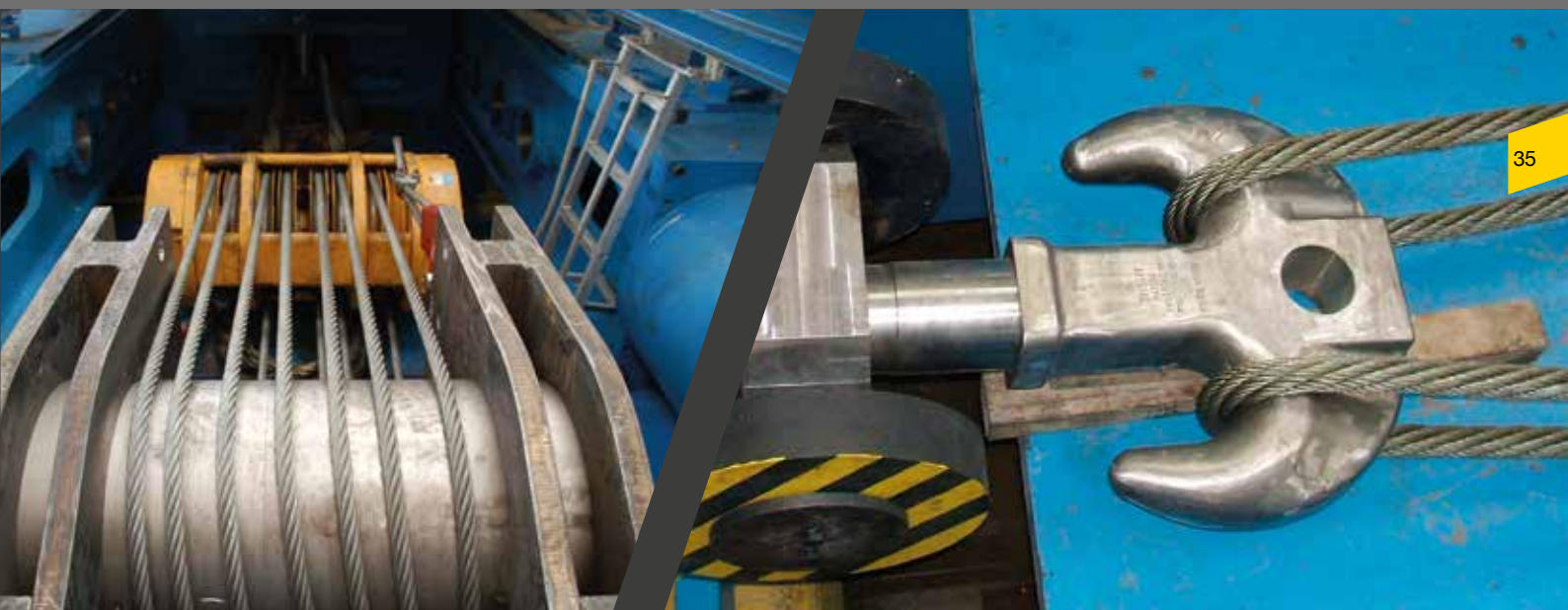
PROOF TEST LOAD

OVER LOAD UNDER CONTROL

The over-stress tests by over-loading is performed either individually to the sub-component, such as to the hook assembly (machined hook), sheaves, cables…; or to the complete block unit, with the aim of validating the created joints and assemblies.

Remember that Proof Test Load is a static test, which with design safety factors of 1:5, and by applying the forces (Tons) and degrees (º) as described by international standards and recognized rules, there is not the expectation of failure. Because of this, we can affirm that it is a non-destructive test having overload under total control.

IRIZAR FORGE proof test loads are performed at 2 on-site laboratories: one is for small items for tests up to 100 Tn and the newest is for heavy duty items up to 1500 Tn. After proof test, the proof loaded item is again inspected by complete NDT examination in order to check any deviations.



Day to Day Stock **Just In Time** **Worldwide**

WAREHOUSING & DISTRIBUTION

As far as distribution and market openings are concerned, IRIZAR FORGE will always count on strategic logistic based central warehouse at headquarters, but atomized in diverse clusters, in order to enable immediate worldwide service.

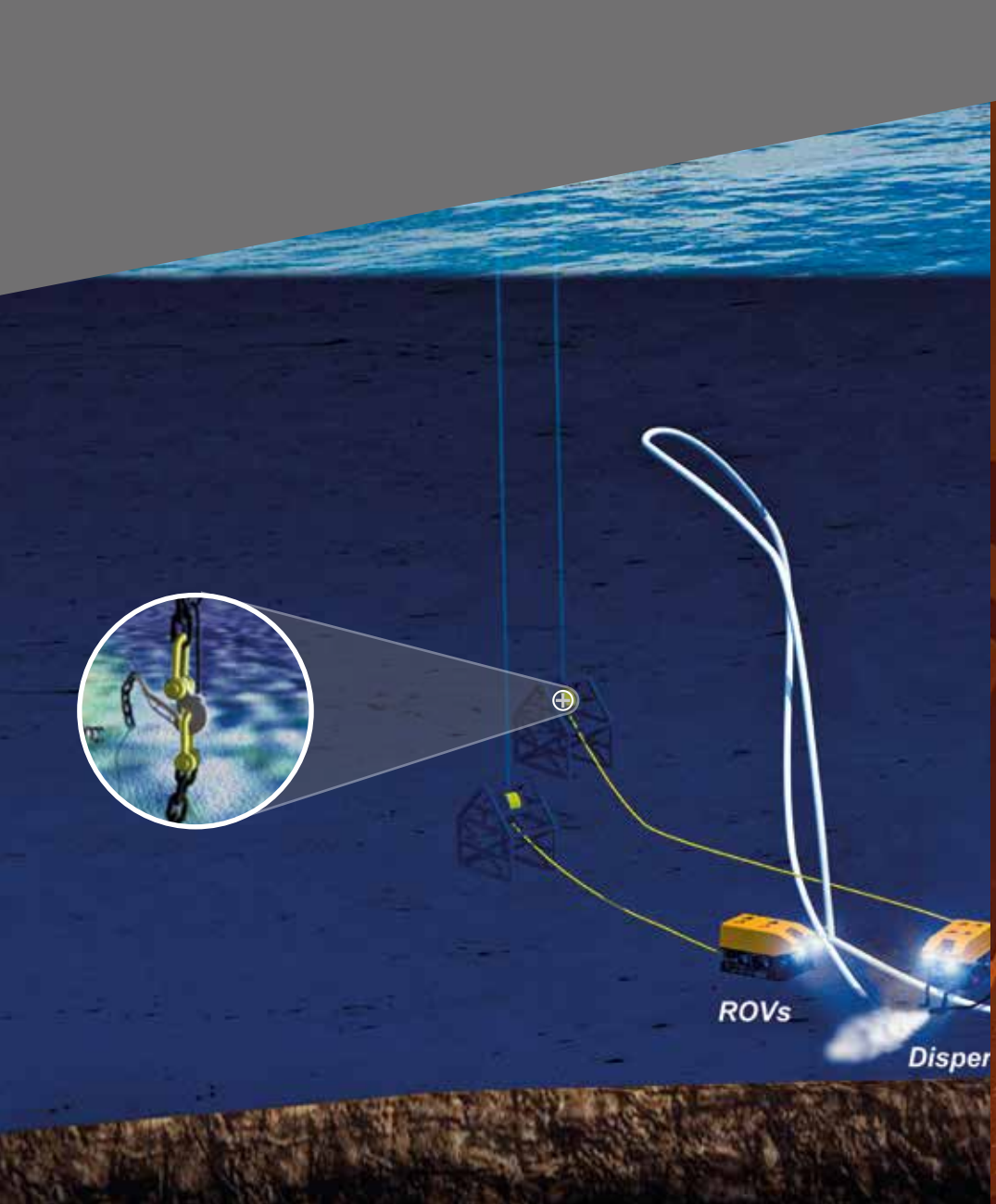
This "Globality" is achieved through **IRIZAR Delegation Community** and network, where by applying a Global sense with a Worldwide network, proximity, warmth and the feeling of local service is offered, which makes of IRIZAR FORGE its national identity sign: Being, despite its small-medium size, a multinational, and thanks to its small-medium size, now becoming a Flexible Multinational open to the world.

Stock base items are located in **Germany, US & Australia** clusters, but new locations are coming up. Items called to stock are based on internationally recognized standards and regular consumption.

» With a global model type business, the characteristic of offering a close and local service is a must, achieving a feeling of closeness with the customer, buyer or decision maker.

3

IRIZAR FORGE
INDUSTRIES



IRIZAR
FORGE

» MHI is global and duties must be handled everywhere. As IRIZAR FORGE added values are safety + durability, we are attending specifically non-standard conditions and extreme environments where abnormal operations are faced.

WELCOME TO THE MATERIAL HANDLING INDUSTRY

FOR NON-STANDARD CONDITIONS

However, over the last 20 years IRIZAR FORGE has been positioned as a preferred & valued partner for medium and heavy duty applications and for the last 10 years were among the top global players for very heavy duty applications above 500 Tn, where very few positions are reserved for expert players only.

IRIZAR FORGE is a MHI global player, designing, producing, inspecting & distributing components for this global industry.

Material Handling Industry is wide, diverse, and global, but for heavy-duty handling **applications can be vertical or horizontal:**

For vertical applications we have the **lifting industry** where the most popular equipment is the CRANE in all of its varieties.

For horizontal applications we have the **Mooring Industry and Dregging Systems** where the most developed environments are marine-subsea, together with mining.

IRIZAR Forge has historically been focused in the crane industry, covering a huge variety of OEMs operating across 4 segments:

Crane Industry Segmentation by Swl

** Approx. hook size based on medium drive group of crane and non-alloy grades.

But the most popular range and consequently the 80% worldwide crane consumption (% based on ice-berg theory 20-80) is in the lighter ranges (segments 1+2), having a huge amount of different types of cranes, specifically designed for certain works:

» For the players focused on “Above 500 Ton” (4th segment) it is a challenge to know where the limit is. Right now this is an open question because there is no limit. But capabilities for production, material grades, and sources are limited (economically, technically, metallurgically, financially). This is the challenge.

OPEN THINKING
MARKETS NOT LIMITED TO CRANE INDUSTRY...

Thinking in a global way as a young, open min organization, IRIZAR FORGE realized that ABOVE 500 Ton segment terrain crane could not be in the future the equipment for very heavy duty applications, for many limitations (weight, length...).

» The Really Heavy duty applications are located off the shore, around the marine environment, as sea freight is providing more opportunities for larger, heavier & higher volume work.

Not only in the area of transportation, but also energy industry is moving from land to shore, and from shore to overseas. Wind Farms and Oil Platform are moving to seaside looking for free of limits. Consequently, construction, transportation and all related auxiliary industries should do it.

Offshore environment is different than Onshore, and materials are handled in a different way, not being limited at all to crane operations, but using chains, and using water itself (subsea). Materials are not just heavy or very heavy but could be very long, very wide, large in volume,... in the form of pipes, structures, chains...facing multiple abnormal handling operations.

AMERICAN BUREAU STANDARD
Standardization for Marine Industry and American Offshore

API-8C
Standardization for American Oil & Gas and Energy Industry
(in process)

LLOYDS REGISTER OF SHIPPING
standardization for Shipyards & installations of marine environment.

DET NORKE VERITAS
standardization for Marine Industry and Norwegian and Scandinavian Offshore.

BUREAU VERITAS
standardization for Heavy Industry and Francophone Nuclear

ACHILLES
accreditation for North Sea's Oil & Gas Industry

GOST-R
Standardization for Russian & CIS Countries' heavy Industry (in process)

GERMANISCHER LLOYD
standardization by DIN for German Industry

TÜV RHEINLAND
standardization by KTA for German Nuclear Industry

ISO 14000:2004
(LRQA)

ISO 9001:2008
(LRQA)

OHSAS 18001
(in process)

Shipyards and dockyards are locations where ships are repaired and built. These can be yachts, military vessels, cargo vessels, cruise liners or ferries etc. Dockyards are sometimes more associated with maintenance and repair activities whereas shipyards are generally associated with the initial construction of a vessel... The terms are routinely used interchangeably, in part because of the evolution of dockyards and shipyards has often caused them to change or merge roles.

Geographically speaking, the Shipbuilding market would be divided between South Korea, China, Japan and Philippines, and they control almost 85% market share. Smaller and more specialist yards are located throughout the world but particularly in Germany, Holland, Norway, Northern Spain and UK.

With regards to lifting appliances, the main type of cranes used include: Quay, Yard, Gantry, Portal, Mobile and Special Purpose Cranes (for example at Military Dockyards), which all require forged hooks to lift heavy duties. Other types of applications, such as Ship 'Unloader', Container Cranes and RoRo (used at Ferry terminals), all have requirements for sheaves.

Regarding the crane lifting applications, Gantry and Shipyard Cranes are the most used in operations where the crane straddles the ship allowing massive objects, like ships' engines, to be lifted and moved over the ship.

SHIPYARDS

ABNORMAL CONDITIONS | CORROSION | COLD & HUMIDITY | SUBMERSIBLE, SALT | ABNORMAL HANDLING OPERATIONS | ADVERSE CLIMATOLOGY

PROJECTS DATA

Year: 2012
Project Ref: Shiploader Pasadena (USA)
Product Ref: Forged Wheels
End User: Kinder Morgan

Year: 2011
Product Ref: Ramshorn hook for 400t OMC Main hoist lower block
End user: Subsea7

PROJECTS DATA

Year: 2013
Project Ref.: Deep Water Pipelay Vessel
Product Ref: Solid sheaves Ø1750 mm diameter for 720 Tn SWL
EPC: Technip

Year: 2012
Project Ref.: JC1582_UPGRADE OF 250T HAMMERHEAD CRANE TO 325T
Product Ref: Hookblock with 6 sheaves for 325 Tn
EPC: Technip

Year: 2010
Projects Ref: Valder Vessel (Angola)
Product Ref: Travelling BlockHook + Quick Connect Hook 1000 Tn for J-Lay Equip
End-User: HMC

Year: 2009
Project Ref: Nord Stream Gas Pipeline Project (NORD STREAM AG)
Product Ref: 330t Recovery Hook

OFFSHORE

Offshore construction is the installation of structures and facilities in a marine environment, usually for the production and transmission of oil, gas, power, electricity and other resources.

Offshore construction includes the design, construction, and/or repair of offshore structures, both commercial and military, which includes Subsea, Offshore Platforms, Floating Oil & Gas Platform and lately renewable energy (Wind Farms).

Construction in the offshore environment is a high difficult and dangerous activity. Construction and pre-commissioning is typically performed, as much as possible, on land or inshore areas. To optimize the costs and risks of installing large offshore platforms, different construction strategies have been developed.

Regarding the types of lifting appliances, the main types of cranes used are Heavy Lift with Jib, Mast, Luffing, Subsea and Heave compensation etc.

Forged components required on this environment are huge, for several purposes such as lifting (forged hooks, hookblocks and sheaves as main critical components) or fixing (with high critical forged components) where IRIZAR FORGE is high recognized as high level quality supplier on this Industry. **Actually, certificates such as API, DNV, LRS or ABS provide its prestige as World Known Supplier for high critical and safety related technical solutions.**

ABNORMAL CONDITIONS | CORROSION | COLD & HUMIDITY | SUBMERSIBLE, SALT | ABNORMAL HANDLING OPERATIONS | ADVERSE CLIMATOLOGY | INACCESSIBILITY

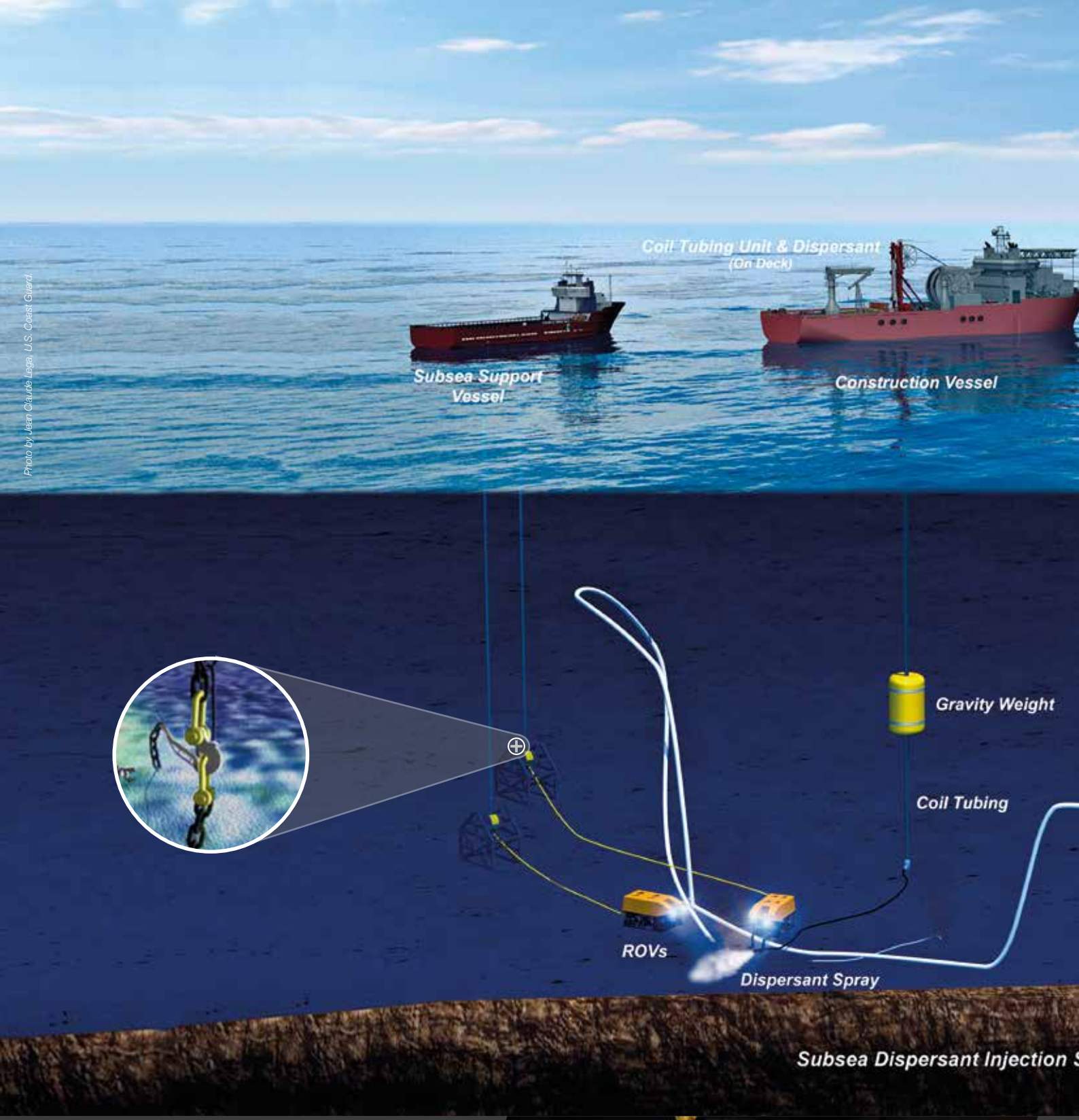


Photo by Jean Claude Lege, U.S. Coast Guard.

PROJECTS DATA

Year: 2002-2020
Project Ref: Thunder Horse BP
Product Ref: Pipe line Equipment Terminal 600 Tn Hook
End-User: FMC Technologies (US)

Year: 2011-2014
Project Ref: Chain Accessory Custom Hook
Product Ref: Pelikan hook for 120 mm diameter chain (KS Hook)
End-User: Petrobras (Brazil)

Year: 2012
Project Ref: Samsung Heavy Industries Vessel FDS2
Product Ref: ROV Hook 825 Tn
End user: Saipem

Year: 2012
Project Ref: Arabiyah & Hasbah
Product Ref: 150 Tn subsea Hook
End User: Saudi Aramco

SUBSEA

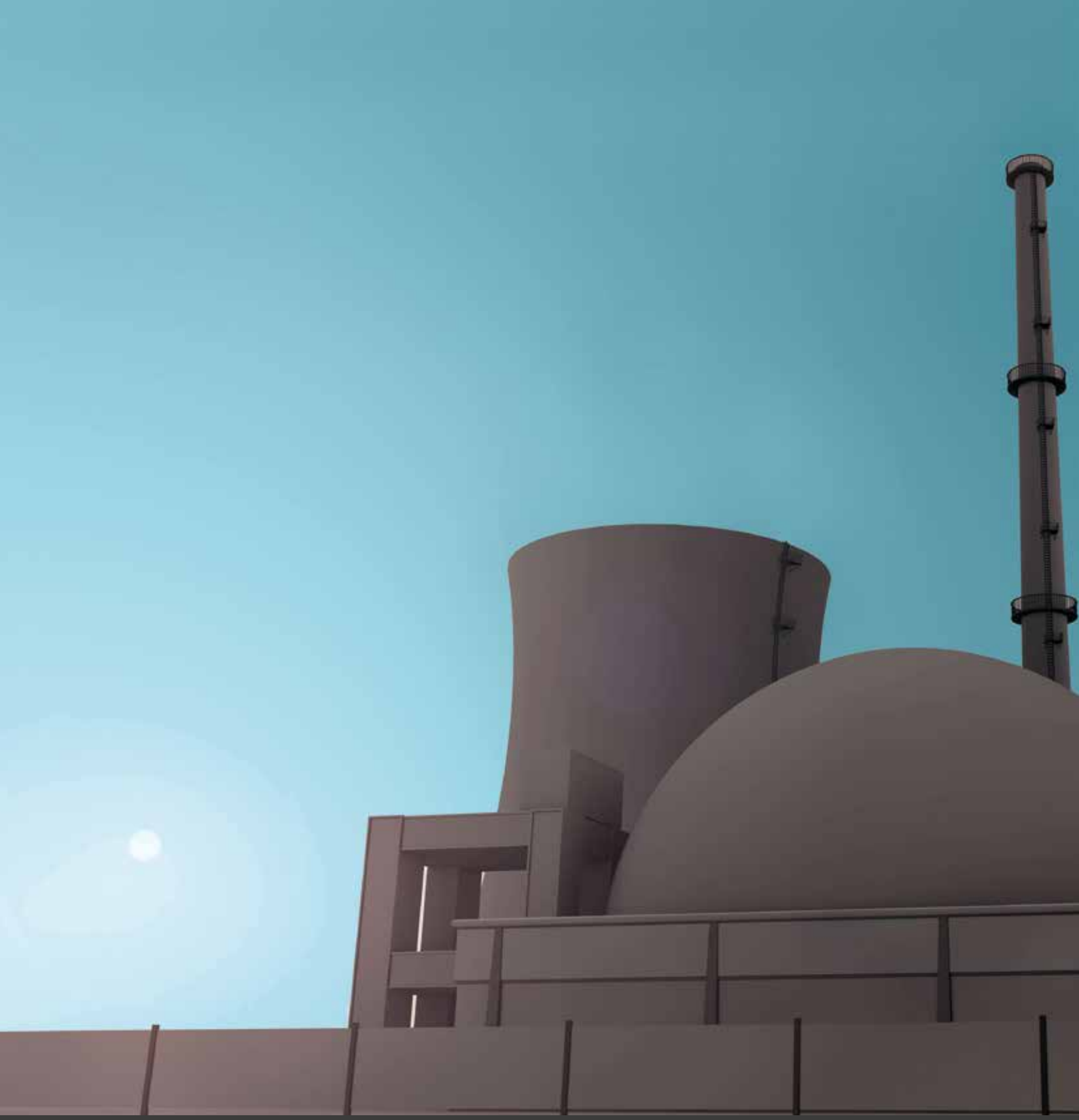
Oil and gas fields are mainly located beneath inland waters in offshore areas around the world, and in the oil and gas industry the term subsea relates to the exploration, drilling and development of oil and gas fields in underwater locations.

The development of subsea oil and gas fields requires specialized equipment. The equipment must be reliable enough to safe guard the environment, and make the exploitation of the subsea hydrocarbons economically feasible. The deployment of such equipment requires specialized and expensive vessels, which need to be equipped with diving equipment for relatively shallow equipment work (i.e. a few hundred feet water depth maximum), and robotic equipment for deeper water operations. Any requirement to repair or intervene with installed subsea equipment is thus normally very expensive. This type of expense can result in economic failure of the subsea development. **Most common solution provided by IRIZAR FORGE are forged mooring components used for Subsea Industry. Mainly, Plet Hooks, Quick Connect Hooks, Chain Hooks, RoV Hooks, Shackles and Chain Link & Swivels.**

In all cases, safety factors are extremely important due to the high specifications required. IRIZAR FORGE standard safety factors its 1 to 5 which shows high performance level for toughest environments on most deep waters. **Thus, current certifications from ABS, and DNV as chain accessories provides required guarantee in order to be chosen as high prestige partner for mooring forged components.**

System

ABNORMAL CONDITIONS | CORROSION | VERY EXTREME CONDITIONS | SUBMERSIBLE, SALT | AXIAL FORCES OPERATIONS | INACCESSIILITY



PROJECTS DATA

Year: 2013
Project Ref: USINA NUCLEAR DE AGRA (Unidade 3)
Product Ref: Lifting hook suspensions num. 200
End-User: ELETRONUCLEAR. Brasil

Year: 2012
Project Ref: VC Summer-Unit 2
Product Ref: AP1000 Containment Polar Crane Hook
End User: SOUTH CAROLINA ELECTRIC & GAS

Year: 2011
Project Ref: NEBRASCA PUBLIC POWER DISTRICT
Product Ref: 115t Cask Handling Crane's Main hook eye & nut
End User: Westinghouse

Year: 2010
Product: Hook block with 8 sheaves for 380 Tn SWL
End User: ELETROBRAS TERMONUCLEAR S/A

Year: 2009
Project Ref: OLKILUOTO 3 NPP
Product Ref: Hoists 320t-75t-5t
End User: Areva

NUCLEAR

Nuclear power is the use of sustained nuclear fission to generate heat and electricity. Nuclear power plants provide about 6% of the world's energy and 13–14% of the world's electricity with the U.S., France, and Japan together accounting for about 50% of nuclear generated electricity.

Recently, the International Atomic Energy Agency reported there were 439 nuclear power reactors in operation in the world, operating in 31 countries. Also, more than 150 naval vessels using nuclear propulsion have been built.

Heavy lifting equipment for the nuclear industry must be able to handle extremely strenuous circumstances without causing harm to employees, public health, and the environment, impairing facility equipment or operations, or losing control of loads.

Type of cranes used are Polar Cranes, Fuel Handling Cranes, Proof Cranes, Missile Shield Cranes and Turbine Maintenance cranes, where first one it´s most popular used in Nuclear Industry.

Regarding lifting components, forged parts are fully required due to high critical environment and safety factor requisition. Main high level requisition, its Safety Factor, where components often are required as Safety.

Thus, current certification mainly based on KTA 1401 as well as KTA 3901/02/03 by TÜV provides required guarantee in order to be chosen as high prestige parteer for nuclear projects.

ABNORMAL CONDITIONS | HEAT | INACCESSIBILITY | POLLUTED AIR, REACTIVE | SUBMERSIBLE, CHLORINE | BIG DANGER, HUMANS AREA

PROJECTS DATA

Year: 2013
Product: Complete Duplex Forged Hooks for 200 Tn
Project: New ladle turnkey
End-User: Rourkela Steel Plant (India)

Year: 2012
Product Ref: Hookblock with 6 sheaves for 115 Tn
End-User: EMAL, Dubai

Year: 2012
Product Ref: Full Set Duplex Hooks
End-User: Odisha Project (SMS & Hot Strip Mill)

STEEL MAKING

A steel mill or steelworks is an industrial plant for the manufacture of steel. The principal raw materials for an integrated mill are iron ore, limestone, and coal (or coke).

Most common cranes which are used in Steel Mills are charging cranes (operate in dusty, extremely hot environments) ladle cranes (the only crane in a steel mill that can perform ladle handling) maintenance cranes, billet handling cranes (have high speed requirements and must be able to handle radiant heat from the product) and magnet cranes with high no limit SWL.

The harsh operating conditions in foundries, with difficult loads, complex handling functions and high or extremely fluctuating ambient temperatures, demand high levels of safety and functional reliability of the systems to be used.

ABNORMAL CONDITIONS | EXTREME HEAT | BIG DANGER, HUMANS AREA | POLLUTED AIR, DUSTY

PROJECTS DATA

Year: 2013
Product Ref: Nr. 200-T Hook Assemblies with auxiliary hook suspensions
End User: ALSTOM India

Year: 2012
Product Ref: Hookblock with 12 sheaves for 450 Tn SWL
Project Ref: VOITH HYDRO LTDA

Year: 2011
Product Ref: Special Submergible Hookblock for fresh Water
Project Ref: JIRAU, Brazil

HYDRO

Hydropower or water power is power derived from the energy of falling water, which may be harnessed for useful purposes. Water's power is manifested in hydrology, by the forces of water on the riverbed and banks of a river. This higher force results in the removal of sediment and other material from the riverbed and banks of the river, locally causing erosion, transport and, with lower flow, sedimentation downstream.

From lifing point of view, components in order to have a precisely amphibious ambiguity, for being submerged or in dry sunlight, the difficulty of enduring both environments, makes the unions, seals and surfaces suffer and shortens their lifetime, and because of this they must be subjected to strict maintenance tests and inspections.

ABNORMAL CONDITIONS | SUN DRYNESS | SUBMERSIBLE | INACCESSIBILITY

PROJECTS DATA

Year: 2012

Product: Hookblock with 2 sheaves for 12.5 Tn SWL

End user: ALCOA (AUSTRALIA)

Year: 2011

Product: Hookblocks with inner & outer sheaves, 16 Tn SWL

End User: RIO TINTO (SouthAfrica)

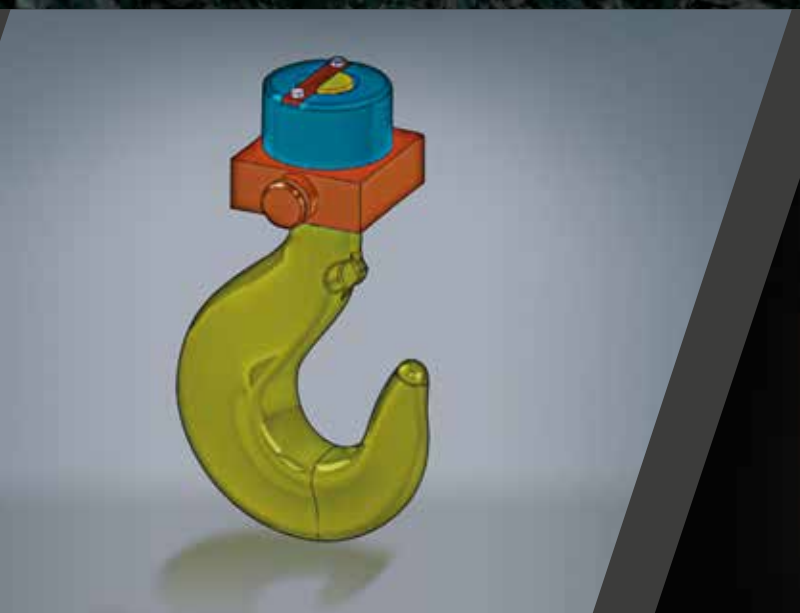
MINING

Mining is the extraction of valuable minerals or other geological materials from the earth, from an orebody, lode, vein, (coal) seam or reef, which forms the mineralized horizon and package of economic interest to the miner.

Geographically speaking, key players countries for Mining Industry are Argentina, Chile, South Africa and Australia. Regarding lifting appliances in the mining industry, the most commonly used are travelling overhead, knuckle boom, slewing and jib cranes, servicing crusher and general maintenance, and refinery smelter operations.

IRIZAR FORGE its also included in this industry where still European components are clearly valuated due to are considered as high critical components classification. On this consideration, Irizar still provides European material certification.

ABNORMAL CONDITIONS | INACCESSIBILITY | POLLUTED AIR, DUSTY



4

IRIZAR FORGE
PRODUCTS

IRIZAR
FORGE


STANDARD
TAILORING
THE STANDARD
CUSTOM
STANDARIZING
CUSTOM

TYPOLOGY OF INDUSTRIALIZATION

The variety and typology of products range depends on requirements, from a technical point of view could be:

Standard

Products fully according to a globally recognized standard with no possibility for any deviation, commonly called a “commodity”. Easily marketable, produced in competitive batches (batches based on cost) and regularly in permanent stock to attend a worldwide urgent global demand.

Tailoring the standard

Products based on standard but with possibility to introduce controlled deviations, with a versatile result and competitive cost. These items can be produced maintained in stock to attend to several customers.

Custom

Custom made products produced according to a specific design, usually for single usage and specific application, and not marketable for the general industry. These items are produced on a project basis and are not normally available in stock.

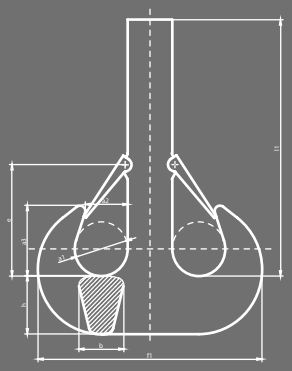
Standarizing custom

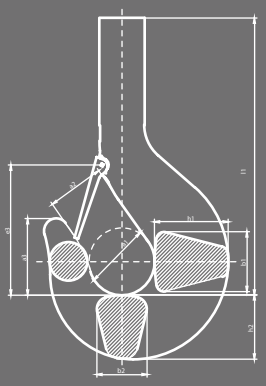
This is the result of continuous activity on a project basis, that due to similar characteristics (such as geometry, appliance, weight,...) designs can be homogenized in a global design to comply with a specific niche demand. As result we can get a concept design to cover a homogenized niche demand very close to custom-made but much more competitive. When a company like IRIZAR is involved in a continuous design process and can detect similar characteristics, a new IRIZAR Standard Product is being developed.

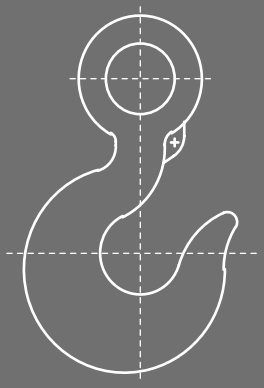
When a company like IRIZAR is involved in a continuous design process and can detect similar characteristics, a new IRIZAR Standard Product is being developed.

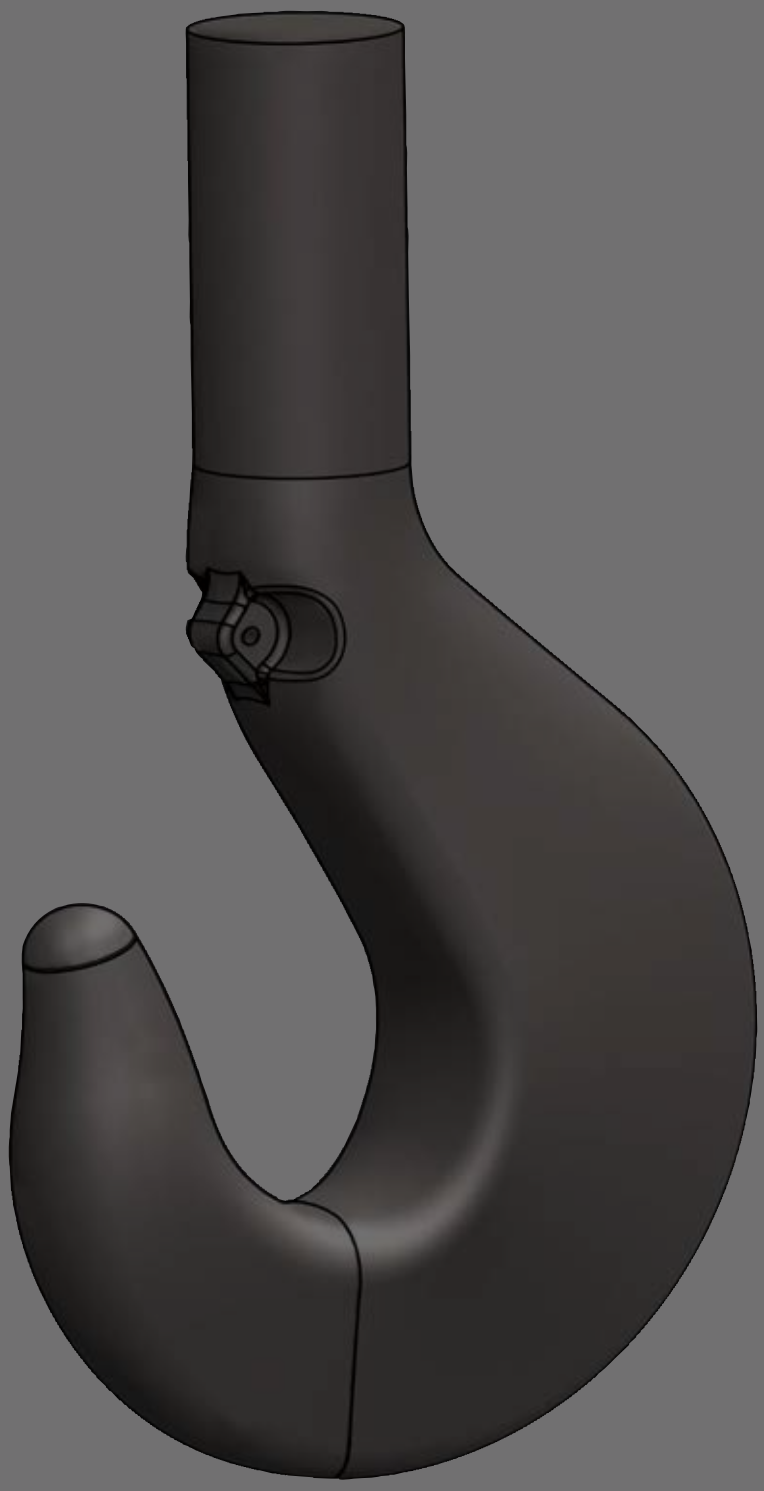
STANDARIZED

Let us know the standard you require for the hook. We can do it according to DIN, BS, JIS, IS, UNI, GOST, NEN, SMS, etc.





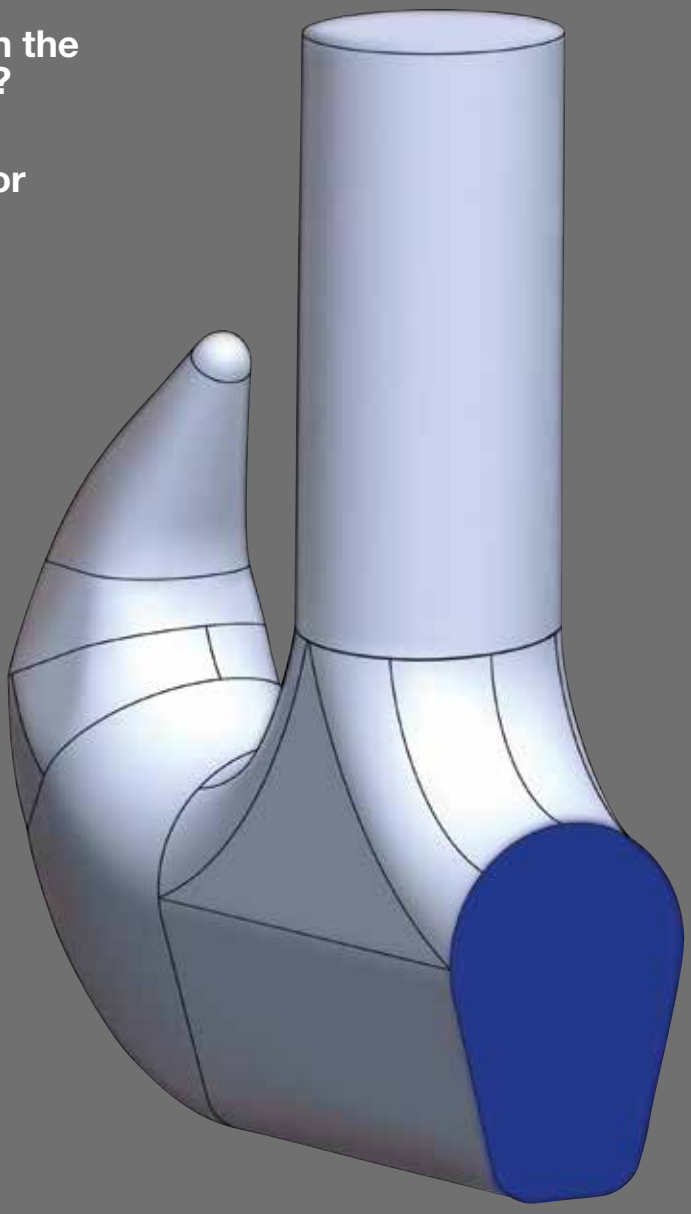




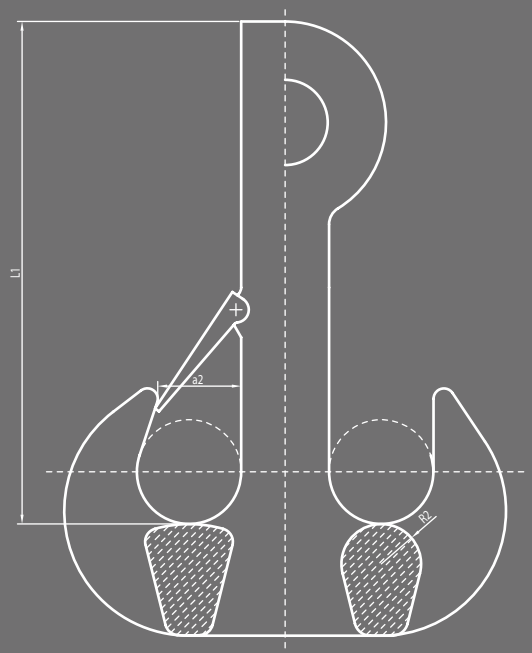
TAILORING
THE STANDARD

Do you need to change a detail in the hook comparing to the standard?

We will check the possibilities, make calculations and confirm for production!

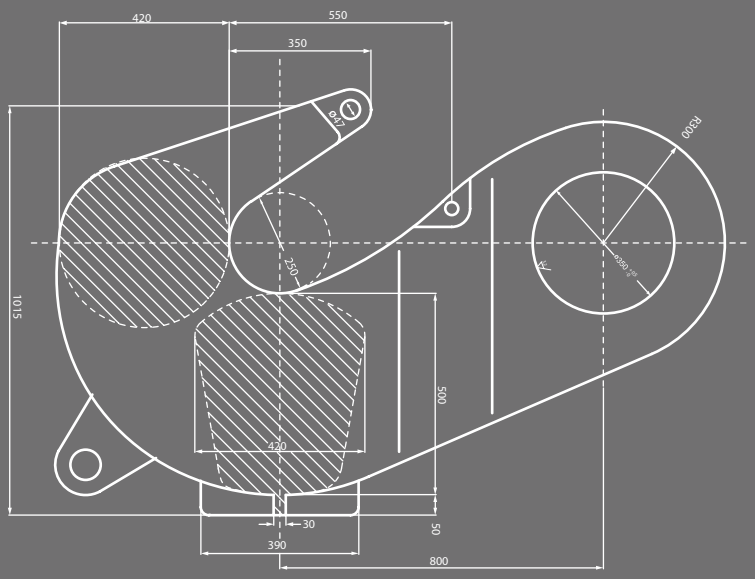


MOST COMMON TECHNICAL DEVIATIONS	
L_1	SHANK LENGTH
N	NOSE RFN/RF
A_2	OPENING THROAD
R_2	MAIN SECTION



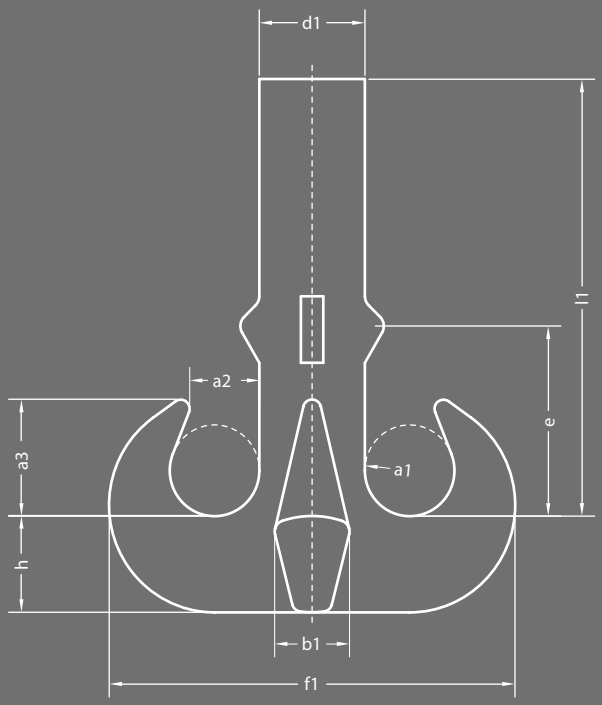
CUSTOM

Need a different hook?
Do not worry; we will help you!



STANDARIZING CUSTOM

When a special product becomes a standard for us...



CRANE FORGED
HOOKS

ROPE
SHEAVES

HOOK
BLOCKS

WHEELS

IRIZAR FORGE PRODUCTS RANGE

IRIZAR FORGE, in its long and vast history has developed a limited but high-performing variety of products, the most popular being the famous forged crane HOOK.

Not limited to crane forged hook, the range IRIZAR FORGE is focused below:

Products based in vertical handling

CRANE INDUSTRY.
For any segment (any SWL):

- Crane forged hook assembly.
- Crane rope sheave.
- Complete crane block assembly.
- Traveling crane wheel.
- Other crane components (ladle hook, fork-link…)

Products based on non-vertical handling

OFFSHORE AND MARINE INDUSTRY.
Mainly for heavy & very heavy segments (above 200 Tn):

- Forged chain eye hook.
- Forged plet hook.
- Forged chain accessories.
- Forged rov hooks.
- Rope sheave free of welding.
- Subsea mooring fishing hook.
- Other mooring accessories (shackles, forged pin shaft, eye bolt).

The main philosophy of our “90 years-young organization” is to develop:

» Products for the Material Handling Industry, focused on heavy-duty and safety-critical applications. These are components where, for critical reasons, welded, cast and other non-forged materials are not permitted are undesirable.

The scope of the RIZAR FORGE Product Development Policy is as follows:

» Components and Accessories for lifting & mooring applications offering safety, high-performance, and long-life products offered in a competitive environment to Original Equipment Manufacturers (OEM), EPC (Engineering Procurement Construction), and FEU (Final End Users), adding value and prestige to the complete supply chain.

CRANE
FORGED HOOKS

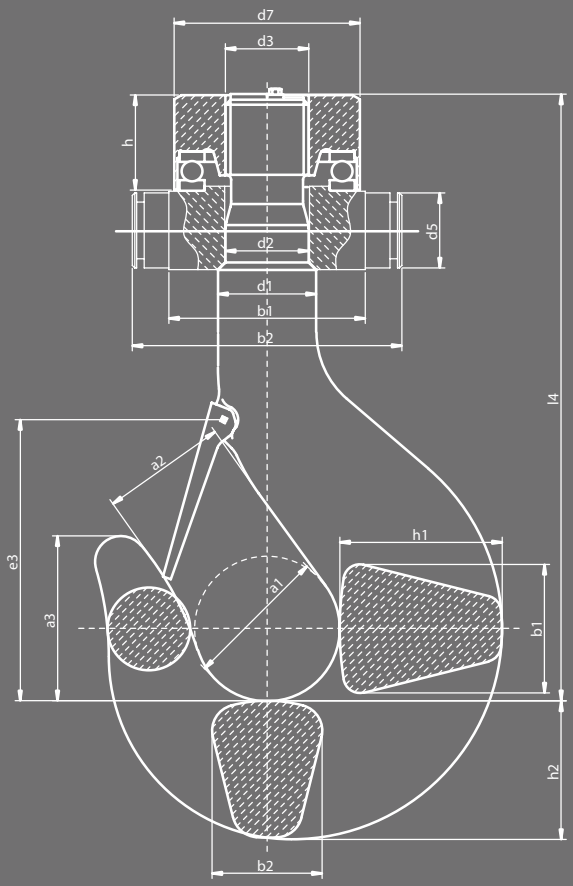
IRIZAR FORGE designs, produces and inspects the largest range of hooks in the World.

IRIZAR FORGE supplies the widest range of hooks in the market. We manufacture single hooks, ramshorn hooks, form b type, eyehooks… even quadruple hooks. We use only the highest quality raw material to forge each hook with a guaranteed grain orientation. All our hooks fulfill our client's particular requirements as well as all relevant international standards.

Ordering options for our hooks are varied:

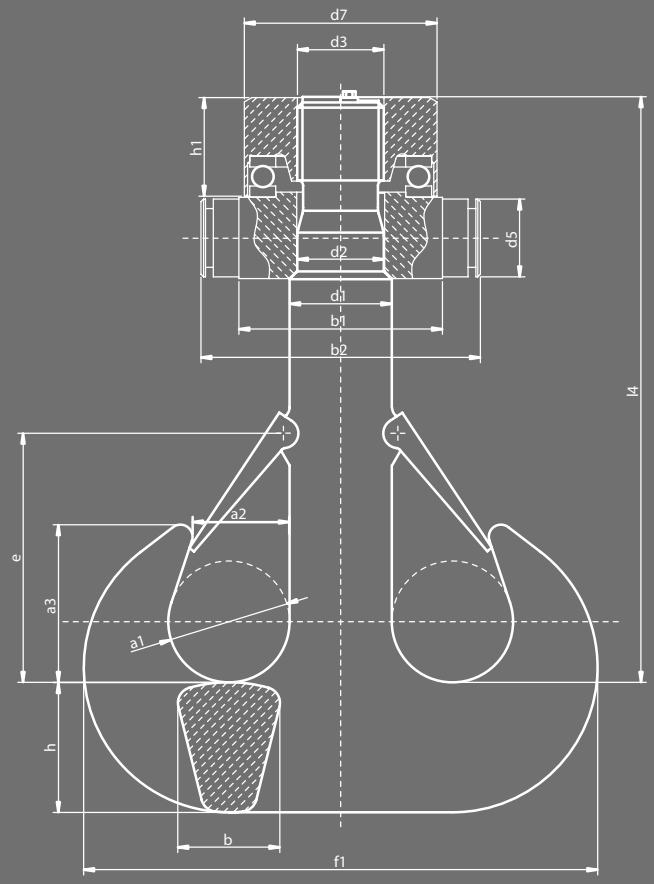
- An stablished design following a specific standard (e.g. DIN 15400).
- The client's own drawing, following its own specifications.
- Just give enough data to allow us to create a personalized hook design.

The type of hook should be chosen following its intended use: from the functionality of the single hook to the flexibility of the quad type, without forgetting the versatility of the ramshorn hook form b.



SINGLE HOOK SUSPENSIONS

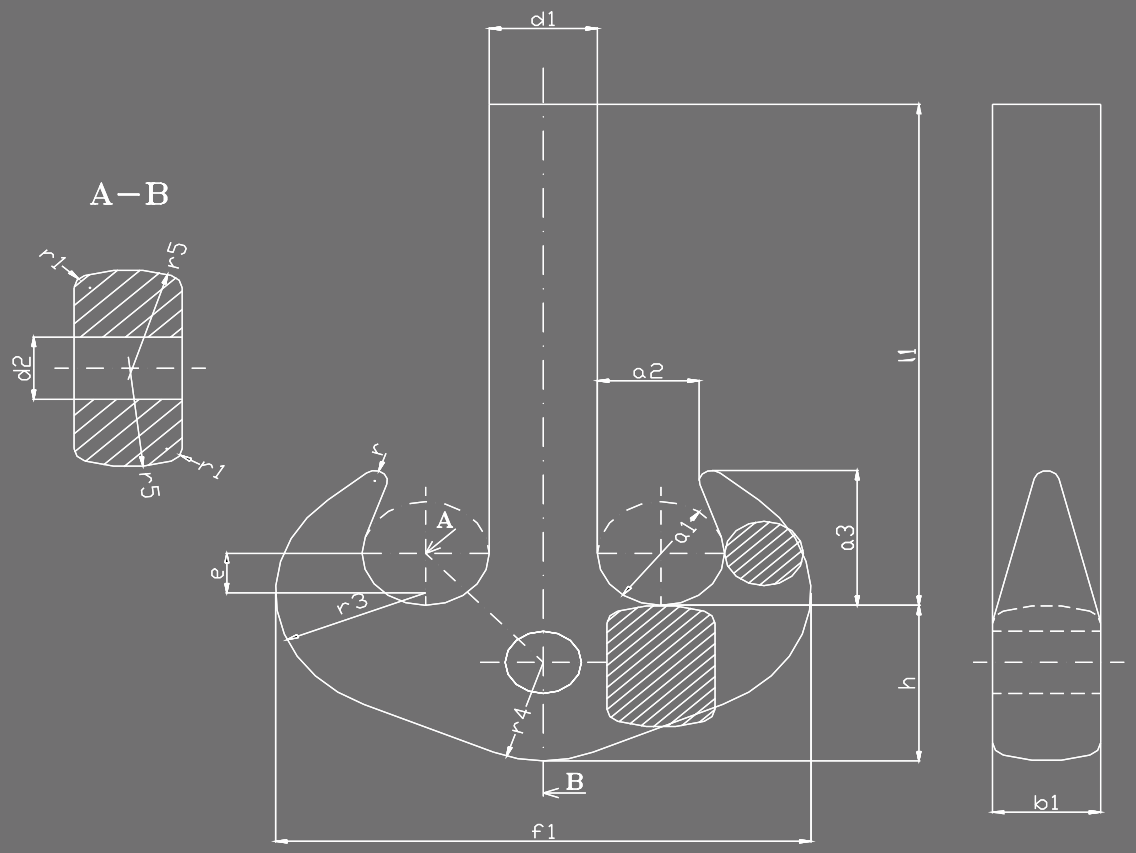
DIN 15401												DIN 15412			DIN 15413		
N.º	a_1	a_2	a_3	b_1	b_2	d_1	e_3	h_1	h_2	d_2	d_3	b_1	b_2	d_5	d_7	h_1	l_4
2.5	63	50	72	53	45	42	132	67	58	36	M36	80	125	30	70	44	250
4	71	56	80	63	53	48	148	80	67	42	M42	90	140	35	80	49	281,5
5	80	63	90	71	60	53	165	90	75	45	M45	100	155	40	95	56	314,5
6	90	71	101	80	67	60	185	100	85	50	Rd50x6	125	185	45	115	60	375
8	100	80	113	90	75	67	210	112	95	56	Rd56x6	140	210	50	125	67	413
10	112	90	127	100	85	75	221	125	106	64	Rd64x8	160	230	55	145	76	446
12	125	100	143	112	95	85	252	140	118	72	Rd72x8	180	265	60	165	87	504,5
16	140	112	160	125	106	95	280	160	132	80	Rd80x10	190	275	70	175	91	576
20	160	125	180	140	118	106	330	180	150	90	Rd90x10	200	295	80	185	102	645
25	180	140	202	160	132	118	360	200	170	100	Rd100x12	220	318	90	205	113	716
32	200	160	225	180	150	132	400	224	190	110	Rd110x12	260	378	100	240	131	788
40	224	180	252	200	170	150	447	250	212	125	Rd125x14	285	415	110	270	144	885
50	250	200	285	224	190	170	485	280	236	140	Rd140x16	335	465	125	320	153	969
63	280	224	320	250	212	190	550	315	265	160	Rd160x18	380	522	140	360	181	1100
80	315	250	358	280	236	212	598	355	300	180	Rd180x20	420	565	160	400	198	1245
100	355	280	402	315	365	236	688	400	335	200	Rd200x22	470	645	180	445	228	1388
125	400	315	450	355	300	265	750	450	375	225	Rd225x24	510	685	200	490	246	1565
160	450	355	505	400	335	300	825	500	425	250	Rd250x28	550	750	220	530	274	1761
200	500	400	565	450	375	335	900	560	475	280	Rd280x32	610	810	240	590	343	2012
250	560	450	635	500	425	375	980	630	530	320	Rd320x36	700	920	260	680	383	2272



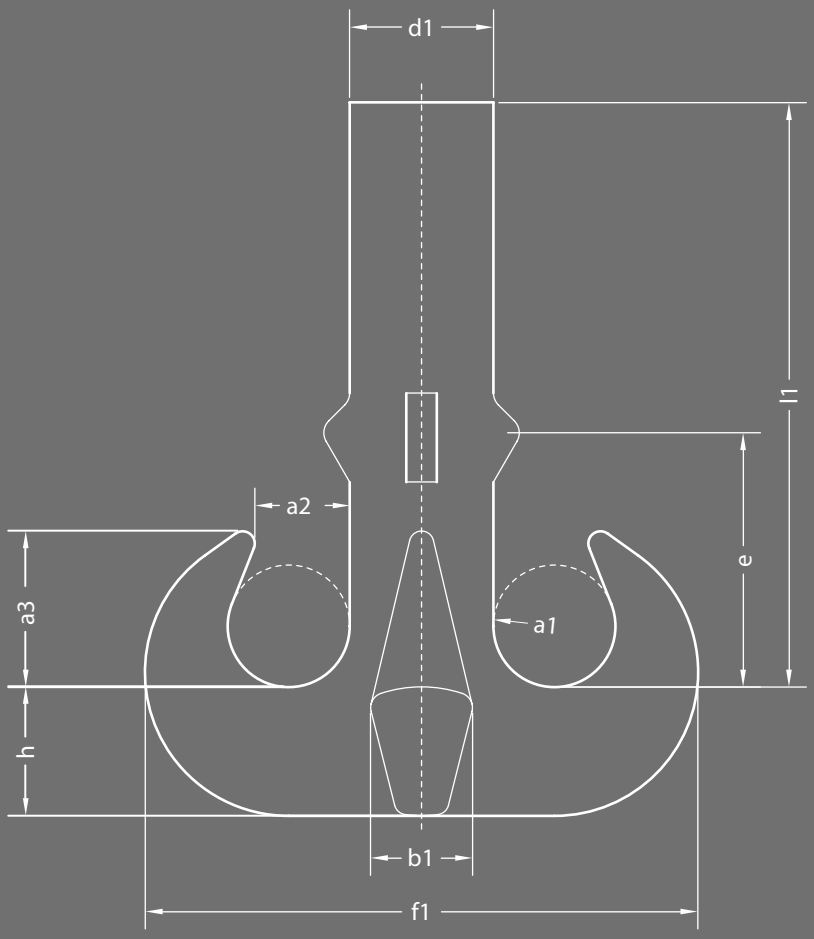
RAMSHORN HOOK SUSPENSIONS

	DIN 15402										DIN 15412			DIN 15413		
N.º	a_1	a_2	a_3	b	d_1	e	f_1	d_2	h	d_3	b_1	b_2	d_5	d_7	h_1	l_4
2.5	50	40	65	40	42	112	208	50	36	M36	80	125	30	70	44	250
4	56	45	73	48	48	124	238	60	42	M42	90	140	35	80	49	281,5
5	63	50	82	53	53	143	266	67	45	M45	100	155	40	95	56	314,5
6	71	56	92	60	60	160	301	75	50	Rd50x6	125	185	45	115	60	375
8	80	63	103	67	67	182	337	85	56	Rd56x6	140	210	50	125	67	413
10	90	71	116	75	75	192	377	95	64	Rd64x8	160	230	55	145	76	446
12	100	80	130	85	85	210	421	106	72	Rd72x8	180	265	60	165	87	504,5
16	112	90	146	95	95	237	471	118	80	Rd80x10	190	275	70	175	91	576
20	125	100	163	106	106	265	531	132	90	Rd90x10	200	295	80	185	102	645
25	140	112	182	118	118	315	598	150	100	Rd100x12	220	318	90	205	113	716
32	160	125	205	132	132	335	672	170	110	Rd110x12	260	378	100	240	131	788
40	180	140	230	150	150	375	754	190	125	Rd125x14	285	415	110	270	144	885
50	200	160	260	170	170	420	842	212	140	Rd140x16	335	465	125	320	153	969
63	224	180	292	190	190	460	944	236	160	Rd160x18	380	522	140	360	181	1100
80	250	200	325	212	212	515	1062	265	180	Rd180x20	420	565	160	400	198	1245
100	280	224	364	236	236	575	1186	300	200	Rd200x22	470	645	180	445	228	1388
125	315	250	408	265	265	645	1330	335	225	Rd225x24	510	685	200	490	246	1565
160	355	280	458	300	300	725	1505	375	250	Rd250x28	550	750	220	530	274	1761
200	400	315	515	335	335	800	1685	425	280	Rd280x32	610	810	240	590	343	2012
250	450	355	580	375	375	875	1885	475	320	Rd320x36	700	920	260	680	383	2272

(*) This dimension can be modified

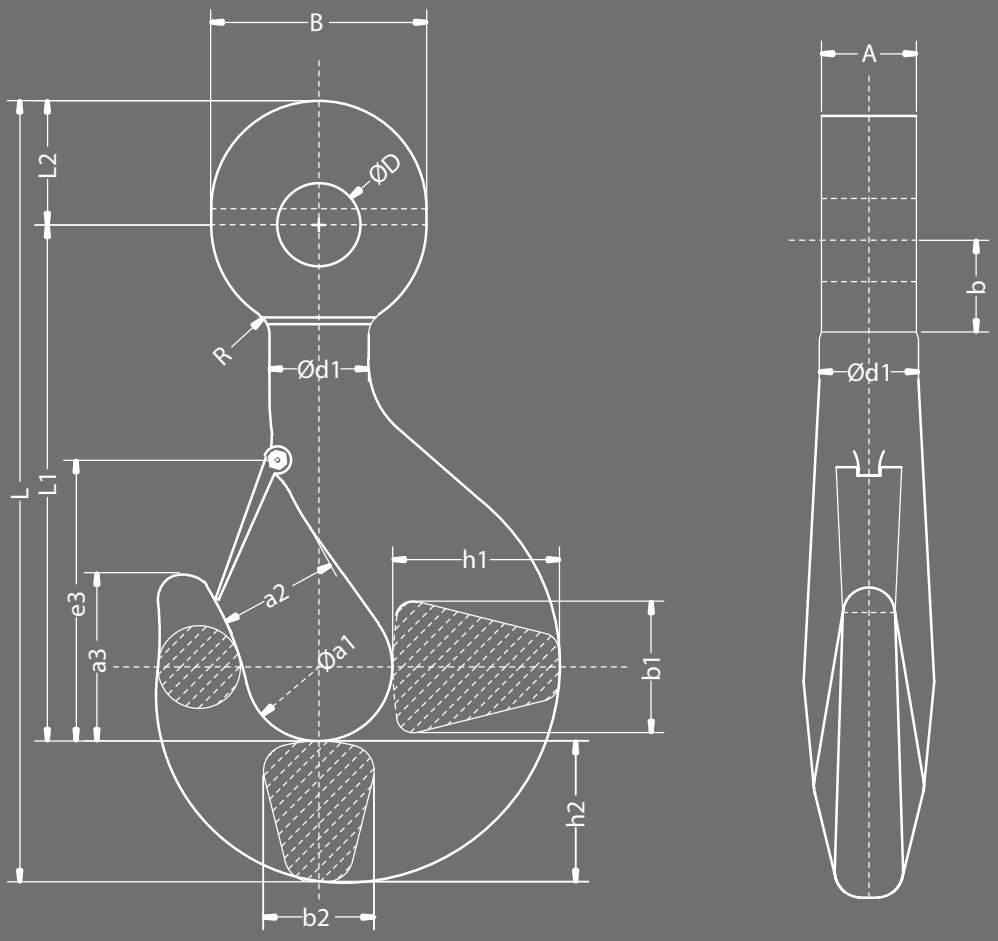


RAMSHORN BOTON PIN HOLE HOOK																
DIN 15402-B																
Hook N.º	a_1	a_2	a_3	b_1	d_1	d2H15	e	f_1	h	l_1	r_1	r_2	r_3	r_4	r_5	Weight (kg)
10	90	71	116	75	75	74	34	377	130	450	11	9	106	85	95	41
12	100	80	130	85	85	78	38	421	150	510	12,5	10	118	95	106	57
16	112	90	146	95	95	86	42	471	170	580	14	11	132	106	118	82
20	125	100	163	106	106	96	45	531	190	650	16	12,5	150	118	132	115
25	140	112	182	118	118	106	50	598	212	715	18	14	170	132	150	160
32	160	125	205	132	132	116	60	672	236	790	20	16	190	150	170	229
40	180	140	230	150	150	131	68	754	265	885	22	18	212	170	190	330
50	200	160	260	170	170	146	76	842	300	965	25	20	236	190	212	458
63	224	180	292	190	190	168	83	944	335	1090	28	22	265	212	236	638
80	250	200	325	212	212	188	90	1062	375	1235	32	25	300	236	265	892
100	280	224	364	236	236	208	105	1186	425	1375	36	28	335	265	300	1248



QUAD-HOOKS. Class "V"										
STANDARIZING CUSTOM										
QUADRUPLE N.º	1Bm=M3	a_1	a_2	a_3	b_1	d_1	e	f	h	l_1*
16	160t	112	90	146	95	132	237	508	118	580
20	200t	125	100	163	106	150	265	575	132	650
25	250t	140	112	182	118	170	315	650	150	715
32	320t	160	125	205	132	190	335	730	170	790
40	400t	180	140	230	150	212	375	816	190	885
50	500t	200	160	260	170	236	420	908	212	965

(*) This dimension can be modified.

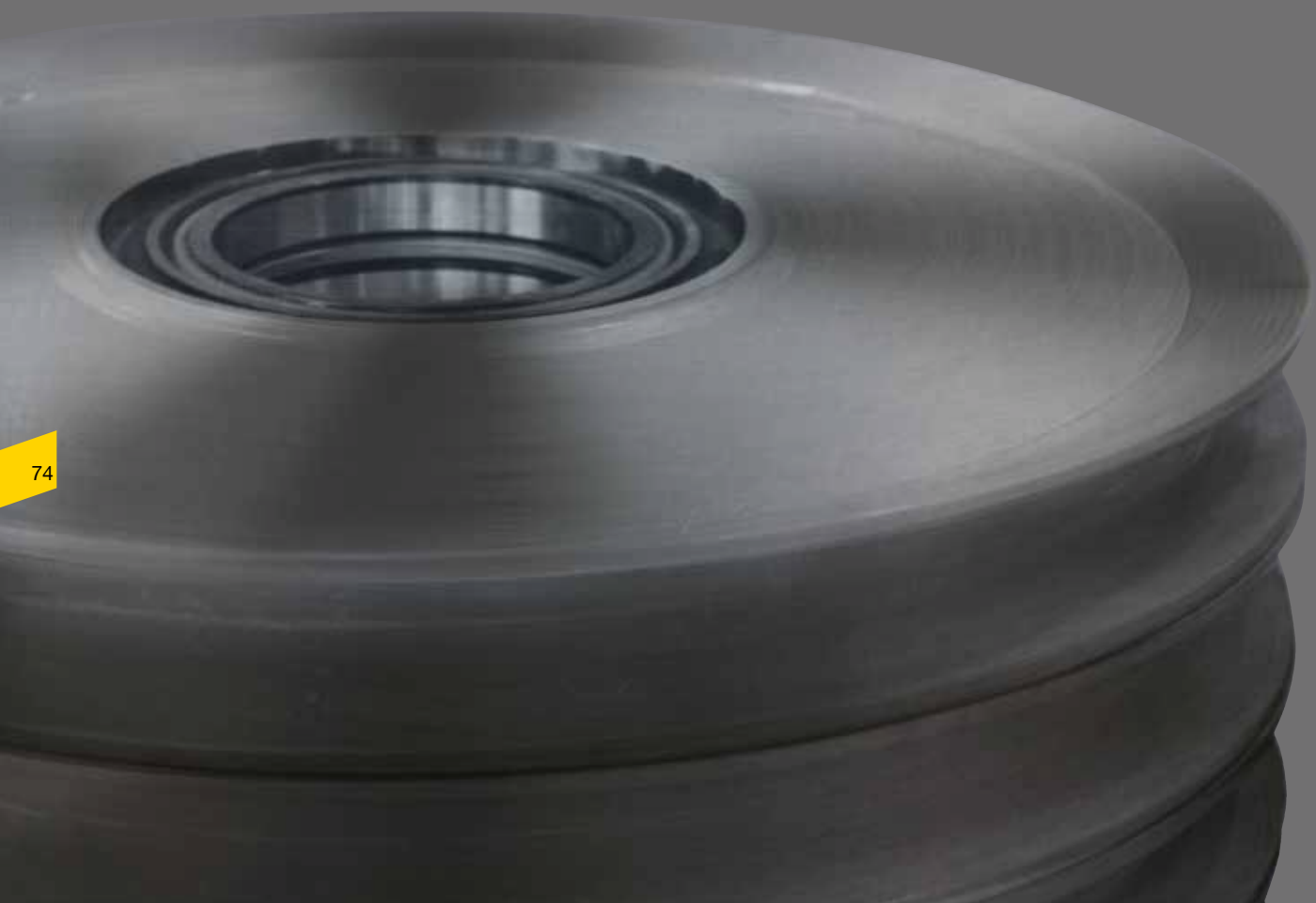


SINGLE EYE HOOKS																		
TAILORING THE STANDARD																		
Code	**Capacity TM**	**a 1**	**a2**	**a3**	**b1**	**b2**	**d1**	**e3**	**h1**	**h2**	**b**	**A +0/-1%**	**B**	**D +0/-0%**	**L1**	**L2**	**L***	**Weight Kg.**
GSOJ8T	30	100	80	113	90	75	67	210	112	95	51	57	115	41.5	419	65	569	17
GSOJ8V	40	100	80	113	90	75	67	210	112	95	59	69	140	51	427	80	602	24
GSOJ12V	55	125	100	143	112	95	85	252	140	118	68	79	155	57.5	484	90	692	55
GSOJ20V	85	160	125	180	140	118	106	330	180	150	80	98	195	70	585	112	847	112
GSOJ25V	120	180	140	202	160	132	118	360	200	170	91	120	235	83	646	135	951	160
GSOJ32V	150	200	160	225	180	150	132	400	224	190	112	127	250	95.5	722	145	1057	220
GSOJ40V	175	224	180	252	200	170	150	447	250	212	126	133	285	108	793	165	1170	310
GSOJ40V	200	224	180	252	200	170	150	447	250	212	147	177	320	121	814	185	1211	310
GSOJ50V	250	250	200	285	224	190	170	485	280	236	168	209	340	127.5	903	195	1334	430
GSOJ63V	300	280	224	320	250	212	190	550	315	265	168	206	405	153	978	235	1478	600
GSOJ80V	400	315	250	358	280	236	212	598	355	300	196	203	460	178	1098	265	1663	860

(*) Minimum measures

ROPE SHEAVES

Originating as a part of an IRIZAR block, the sheave today is a standard-alone product with its own character.



Main dimensions and tech characteristics for sheaves:

PLATE MATERIAL	SHEAVE A TYPE (1 welding plate)	SHEAVE C TYPE (2 welding plates)	SOLID SHEAVE (free of welding)
Outer diameter (mm)	Ø125 - Ø800	Ø500-Ø1500	Ø150 -Ø2500*
Inner diameter (mm)	Ø100 - Ø710	Ø100-Ø1300	Ø100-Ø1800
Welding	YES	YES	NO
Welded unions	2	4	0
Groove angle	45º	45º	customer request

***Above 2500 mm custom based design.**

A TYPE SHEAVE:
1 plate + 1 welding

Due to its 1 + 1 design and cold working manufacturing process.

A type sheave is a very competitive option with high quality. As it is naturally limited to heavy loads is greatest choice for small and medium diameters.

PLATE MATERIAL	S275JR
HUB MATERIAL	STE355
MINIMUM GROOVE HARDNESS	180HB

C TYPE SHEAVE:
2 plates + 2 welding

C type sheave has a 2+2 design with a strategic inclination of its plates. Owing to this, it can withstand heavier loads than A type with a more uniform stress distribution. Therefore, it allows larger diameters with less limitation of the load capacity.

Its only limitation is through being welded and because it is a hollow sheave. For that reason, it is not recommended for subsea jobs/duties and/or corrosive environments.

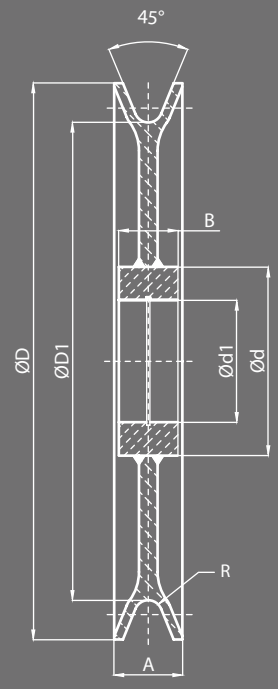
ANGLE AND PLATES MATERIAL	S355J2
HUB MATERIAL	S355
MINIMUM GROOVE HARDNESS	180HB

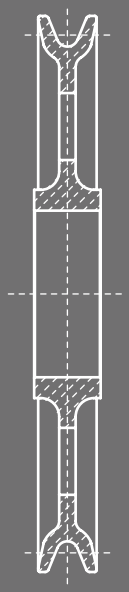
SOLID SHEAVE:
Free of welding

It offers the strongest solution in comparison with the A and C type sheaves because It lacks any welding. It can be machined according to customer's drawings in rolled or forged steel.

Due to the manufacturing processes, they make it the most suitable sheave to work in harsh & hazard environments where welding is not allowed at all.

Two diferent production technologies can be used to achive free of welding criteria based on forging reduction and mechanical values requeriments.





HOOK BLOCKS

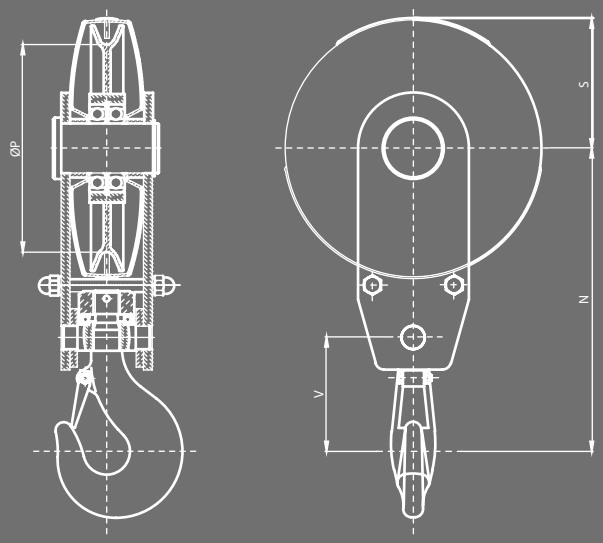
This is the complete Hook Blocks ready to set it up in the crane, for OEMs and crane end users to assemble directly original component with no interme diaries including an original manufacturer certificate with full guarantee.

Standard blocks of established design made for manufacturers of bridge cranes, tower cranes, jib cranes and gantry cranes, among others.

STANDARD CRANE BLOCKS:
Capacities from 630 to 32,000 Kg.

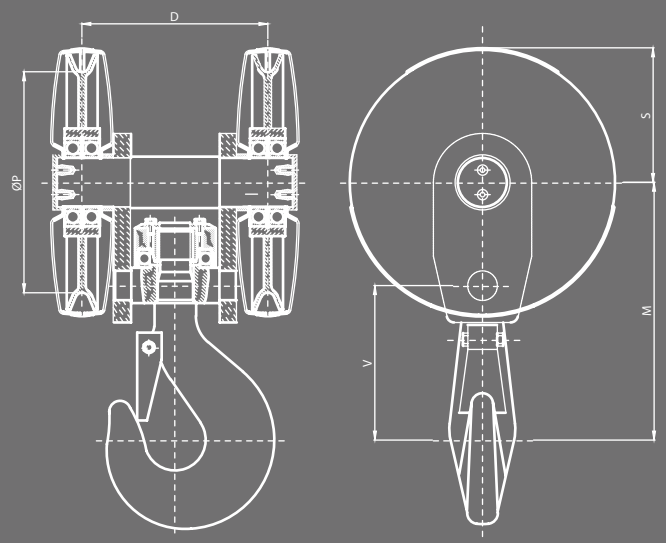
Standard blocks of established design made for manufacturers of bridge cranes, tower cranes, jib cranes and gantry cranes, among others.

Our standard crane blocks are according following tables:



2 SHEAVE HOOK-BLOCK (Code 4/1)

GENERAL DIMENSIONS							DRIVE GROUPS AND CAPACITY IN KG in P class						WEIGTH aprox. (kg)
Nº Of Hook	WIRE ROPE Ø	ØP	D	V	M	S	1 Bm M3	1Am M4	2m M5	3m M6	4m M7	5m M8	
1,6	7	160	162	140	240	105	4.000	3.200	2.500	2.000	1.600	1.250	18
2,5	10	200	194	150	260	131	6.300	5.000	4.000	3.200	2.500	2.000	30
5	15	280	242	195	335	180	12.500	10.000	8.000	6.300	5.000	4.000	66
8	16	355	327	265	435	223	20.000	16.000	12.500	10.000	8.000	6.300	142
12	22	450	379	315	525	274	32.000	25.000	20.000	16.000	12.500	10.000	257



1 SHEAVE HOOK-BLOCK (Code 2/1)

GENERAL DIMENSIONS							DRIVE GROUPS AND CAPACITY IN KG in P class						WEIGTH aprox. (kg)
Nº Of Hook	WIRE ROPE Ø	ØP	D	V	M	S	1 Bm M3	1Am M4	2m M5	3m M6	4m M7	5m M8	
0,8	7	160	—	120	285	105	2.000	1.600	1.250	1.000	800	630	12
1,6	10	200	—	140	345	131	4.000	3.200	2.500	2.000	1.600	1.250	20
2,5	15	280	—	155	435	180	6.300	5.000	4.000	3.200	2.500	2.000	36
5	16	355	—	195	520	223	12.500	10.000	8.000	6.300	5.000	4.000	79
6	22	450	—	240	631	274	16.000	12.500	10.000	8.000	6.300	5.000	126

HOOK BLOCKS

HEAVY DUTY BLOCKS:

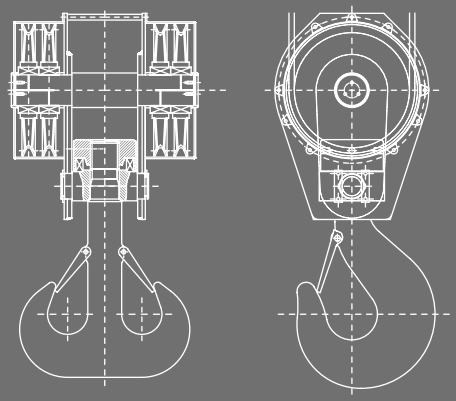
These heavy duty block assemblies are produced following the established design practices of IRIZAR FORGE based on general customer requirements.

Heavy duty assemblies are especially designed to withstand the extreme working conditions of for example, steel mills and smelters, ports, and hydroelectric and nuclear plants.

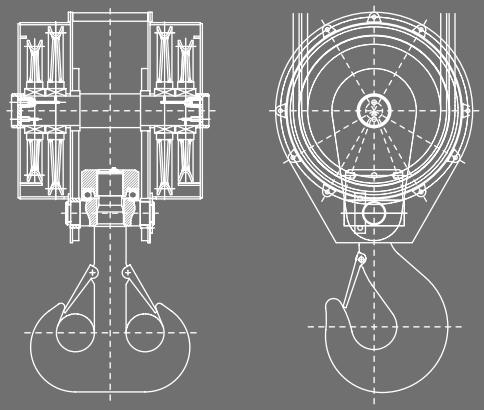
These assemblies could have multiple sheaves and different designs:

HOOK BLOCK DESIGNED WITH OUTSIDE SHEAVES (From 2 to 12 sheaves)

EQUAL MEASURES OF SHEAVES

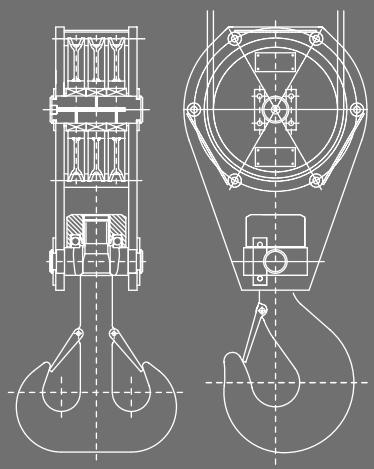


DIFERENT MEASURES OF SHEAVES

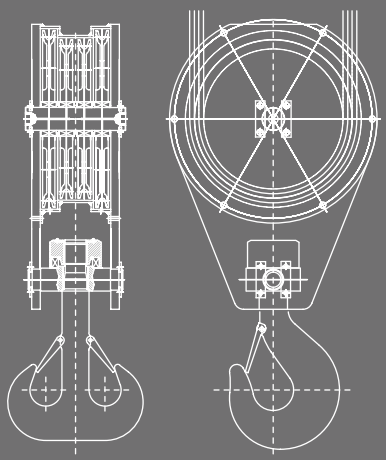


HOOK BLOCK DESIGNED WITH INSIDE SHEAVES (From 1 to 6 inside sheaves)

EQUAL MEASURES OF SHEAVES

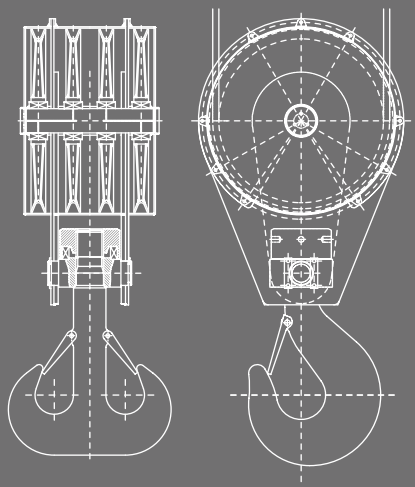


DIFERENT MEASURES OF SHEAVES

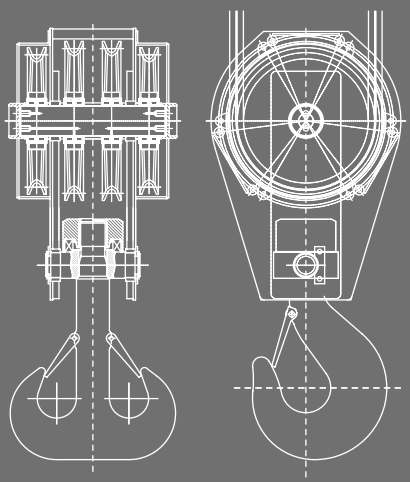


HOOK BLOCK DESIGNED WITH OUTSIDE & INSIDE SHEAVE (From 2 to 12 outside sheaves & from 2 to 6 inside sheaves)

EQUAL MEASURES OF SHEAVES



DIFERENT MEASURES OF SHEAVES



WHEELS

Having wide application in mechanical engineering, forged wheels are suitable for bridge cranes and all types of mechanisms that require guided movement on rails or in lanes, Built under exacting quality standards, these wheels guarantee high reliability in the functional assembly while in use under tough service conditions.

Wheel units consist of a wheel applied with an interference fit onto a shaft mounted on spherical roller bearings housed in separate housings. Each design includes drive and idler wheels. The entire assembly can be supplied painted, fully lubricated, and ready for final assembly.

All items are designed on the basis of the **following DIN standards:**

DIN 15070 cranes: Principles of design for crane drive wheels.

DIN 15072 cranes: Tread profile of crane rail wheels and table of rails for different wheel diameters.

DIN 15093 cranes: Driving wheel units and idler wheel units.

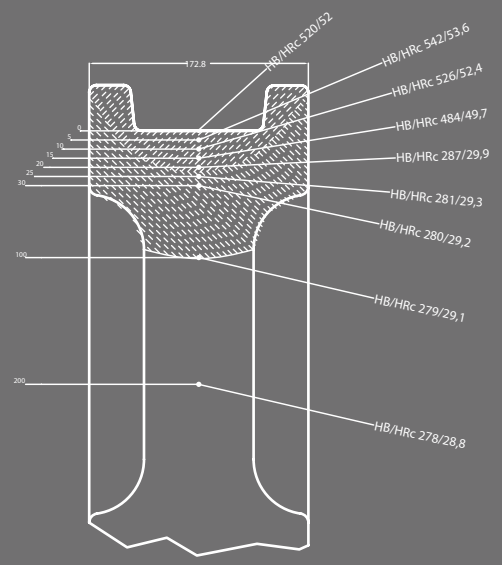
DIN 15071 cranes: Determination of the bearing load of crane rail wheels.

DIN 15090 cranes: Driving wheel units and idler wheel units; assembly

> Also available to **non-standard designs and to user specifications,** to offer flexible solutions geared to the needs, included load calculations for special applications and designs.

Material Grades & Hardness:

The most common steel used is AISI 4140 / AISI 4150 according to EN-10083, or ASTM A504 Grade C with Rt = 900-1200 MPa. Wheels are supplied with certified volumetric heat treatment providing a hardness range from 320 to 420 HB, and when requested by the customer wheels can be supplied with hardness in the range of 58-62 HRC using raceway surface hardening techniques. Wheels are also made from AISI - 1045 / 1055-AISI / AISI-1070 using various surface treatments techniques to result in surfaces with unique mechanical properties and a hardness range of 58 to 62 HRC. Our unique hardening processes provide uniform hardness to depths greater than 10 mm.



DIN 536 / FIXED MEASURES

TYPE	Weights Kgs/Mt	Height (H) mm	Base (P) mm	Head (B) mm	Core (S) mm
A45	22,10	55	125	45	24
A55	31,80	65	150	55	31
A65	43,10	75	175	65	38
a75	56,20	85	200	75	45
A100	74,30	95	200	100	60
A120	100,00	015	220	120	72
A150	150,00	150	220	150	80

Note: These rails are available in grades R90 R70 p.

SPECIAL PROFILE / FIXED MEASURES

TYPE	Weights Kgs/Mt	Weights Lb/YD	Height (H) mm	Base (P) mm	Head (B) mm	Core (S) mm
MRS73	73,63	148,43	157,0	146,0	70,0	32,0
MR77/5A	77,0	155,23	100,0	200,0	100,0	60,0
MRS86	85,50	172,40	102,0	165,0	102,0	80,3
MRS87A	86,80	175,00	152,4	152,4	101,6	34,9
MRS125	125,00	252,00	180,0	180,0	120,0	40,0
MRS221	221,409	446,32	160,0	220,0	220,0	145,0

AMERICAN STANDARD PROFILE / FIXED MEASURES

TYPE	Weights		Height (H)		Base (P)		Head (B1)		Core (S)	
	Kgs/Mt	Lb/Yd	mm	inches	mm	inches	mm	inches	mm	inches
MRS51	51,59	104,00	127,00	5"	127,00	5"	63,50	21/2"	25,40	1"
MRS52	52,09	105,00	131,76	5 3/16"	131,76	5 3/16"	65,09	2 9/16"	23,81	15/16"
MRS67	66,97	135,00	146,05	5 3/4"	131,76	5 3/16"	87,31	3 7/16"	31,75	1 1/4"
MRS85	84,83	171,00	152,40	6"	152,40	6"	109,22	4 5/16"	31,75	
MRS87B	86,80	175,00	152,40	6"	152,40	6"	107,95	4 1/4"	38,10	1 1/2"





As representative of IRIZAR FORGE organization, I would like to show my gratitude to all the people and organizations taking part of this work.

Nothing of this would be possible without the human quality, commitment and spirit of change and adaptation of the people that leads and surrounds IRIZAR FORGE Organization.

With a special fondness to our Board of Directors for its proactivity and determination; to Benito for his intuition, to Marisol for her energy, to Ane for her freshness. Thank you.

Maria Lasa Irizar

More than **20 Worldiwide Delegations**

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