



ScanaVIP® Series

VIPTOOL® VIPBEAR® VIPGOT® VIPOIL®



Scana Energy

Steel solutions made in Sweden

Steel solutions made in Sweden is a result of in-house developed know-how and world class research and developments.

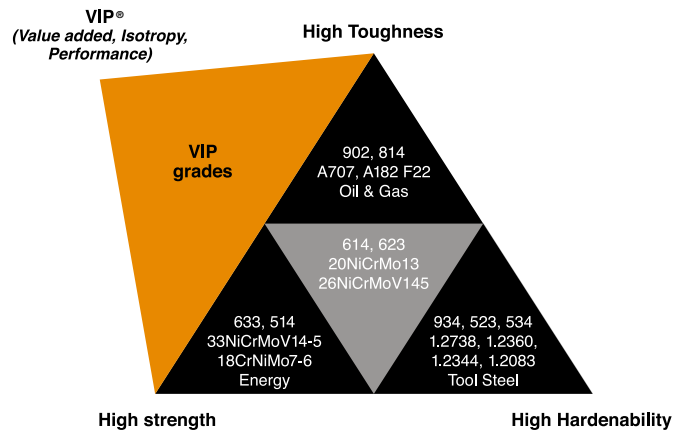
Scana have a tradition of steelmaking, forging and product-process R&D that goes back over 350 years; we are one of the world's leading suppliers of long (Max 24m), slender, rotation symmetrical forged steel products for the customers in Marine, Power Generation, Oil & gas, Machine, Defence and Steel markets.

At our plant, situated in Björneborg, Sweden; our products go through 485 meters of production line that covers the entire steel manufacturing process. From steelmaking to open die forging, heat treatment and machining. Our manufacturing processes are constantly analyzed and continuously improved according to our internationally recognized quality assurance procedures and standards.

We provide solutions covering product development and manufacturing according to customer's requirements. Our VIP® steels are some examples of products developed to match the customer's constant need to reduce the total cost of ownership by improving product performance and reducing the product price in comparison with comparable available products in the market.

▶ What is VIP®?

VIP® is the registered trademark for our products that are VIP® treated for our VIP® customers. VIP® stand for Value added, Isotropy, Performance that are three main characteristics of our VIP® steels. A majority of our products could be delivered in VIP® condition. These products could have very high toughness, extra high hardenability and very high strength or a combination of all. VIP® grades are developed based on our in-house know-how and are applied and tested in real applications such as bearing industry, hot-cold work tool steel and oil & gas products since 2005.



VALUE ADDED For many applications VIP® steels are economic replacements for ESR steels. VIP® steels could be delivered as clean as ESR steels and depending on the reduction ratio of the final forged product they could have segregation pattern equal to ESR steels.

By applying our VIP® grades that have a combination of super cleanliness and modified inclusions that are engineered in favor of final application of products, it is possible to increase the fatigue life of the products under cyclic loading. This will reduce the total cost of ownership resulting in added value to our customers.

ISOTROPY Our VIP® grades have well distributed small spherical inclusions that would react similarly against external loads independent of the direction of the loading (longitudinal or transverse); that makes VIP® steels an isotropic steel.

PERFORMANCE Synergized super cleanliness and modified inclusion morphology, volume fraction and dispersion make it possible to increase the dynamic load carrying capacity of the products and could improve mechanical properties such as fatigue, ductility, toughness, anisotropy and formability of steels. This will allow the customers to apply VIP® grades in high demanding applications and those products that are classified as high performance products.





How do we make it?

VIP® grades are developed based on our in-house know-how. VIP® steels are applied and tested in real applications such as bearing industry, hot/cold work tool steel and oil-gas products since 2005. These grades are results of numerous technical and quality considerations such as:

- Restrictively chosen and controlled types of raw material
- Optimized alloying and vacuum degassing process
- Optimized top slag, molten steel and non-metallic inclusions equilibria
- Engineered choice of thermodynamic and kinetic conditions during the entire production process
- Combined Al, Ca and Si treatment of molten steel
- Restrictive shielding of molten steel from melting to final stages of casting and solidification
- Restrictive choice of ingot type and geometry
- Improved & controlled solidification pattern to minimize segregation & maximize homogeneity
- Restrictive choice of ingot yield
- Tough internal specification, quality assurance and internal micro- meso- macro cleanliness acceptance criteria

How do VIP® steels perform?

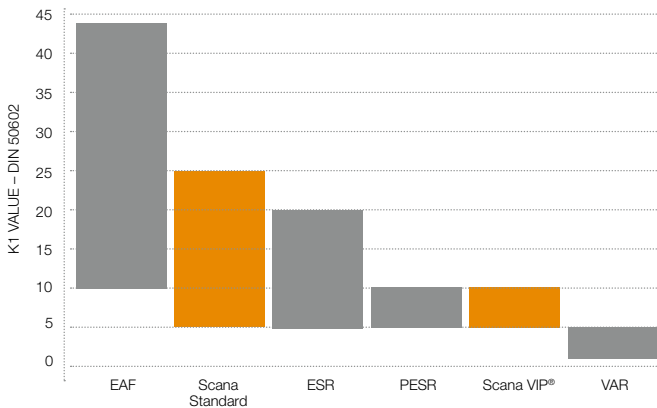
Superior steel quality is a consequence of super cleanliness (low amount of non-metallic inclusions and other indigenous-exogenous defects per unit volume), high material homogeneity (very low segregation) and isotropic properties (uniformity in all orientations.). VIP® steels have an optimized combination of all of these requirements.

Cleanliness results

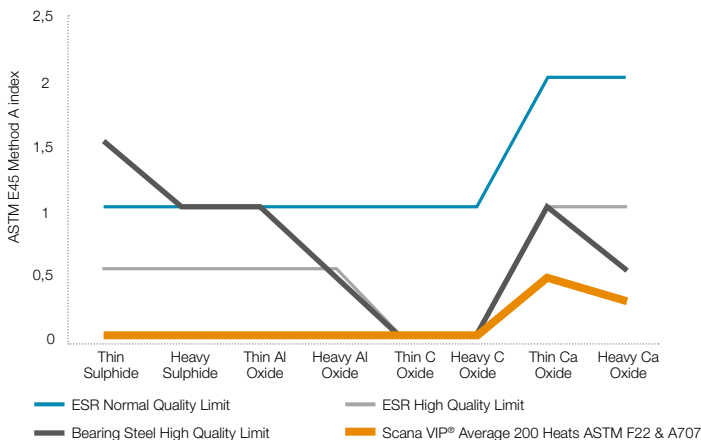
We believe cleanliness should be evaluated by considering the entire volume of the delivered material and by searching for macro defects with equivalent circle diameter above 500µm; that is why 100% volume of all of the products that leave our plant are tested according to a proper ultrasonic evaluation, and based on customers specifications any defects above the agreed limit that are usually according to EN 10308 classes 3 or 4 are reported and discussed with the customer.

Considering micro defects, non-metallic inclusions could be harmful based on their size, type, morphology and distribution; that is why we analyze our steels according to various internationally known standards such as ISO, ASTM and DIN specifications.

Examples of DIN 50602 K1 cleanliness values for steels manufactured via different routes.



Example of ASTM E45 non-metallic inclusions worst field index for steels manufactured via different routes.



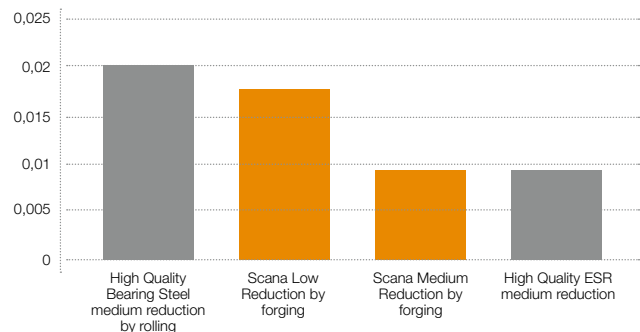
Isotropy

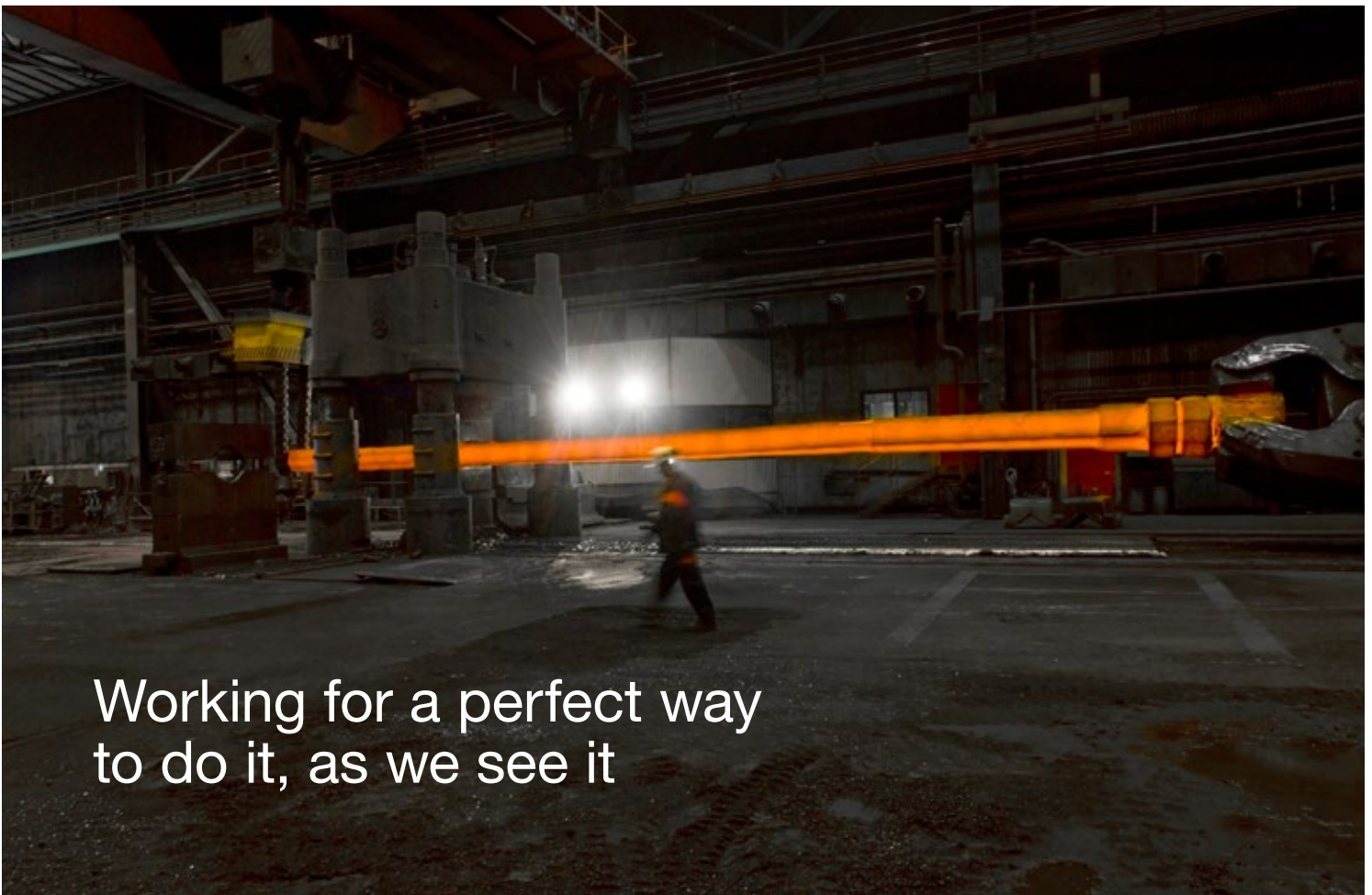
Isotropy means uniformity in all orientations; i.e. having very close mechanical-metallurgical properties in different orientations and independent of the direction of forming namely longitudinal, transverse, and tangential.

VIP® steels are manufactured according to a procedure combining Al, Ca and Si treatment of molten steel during the steelmaking process. Consequently at the same time that almost no inclusions could be found in the material, those that are remaining have a tendency to form very small, spherical morphologies that are well distributed in the material volume and could be easily broken and deformed during subsequent forging process; that basically means a combination of super cleanliness and engineered defects with optimized choice of ingot that leads to very low segregation and very high homogeneity synergized with an optimized forging process could result in isotropic VIP® steels.

The isotropic properties could be traced and analyzed by applying different test methods; Charpy impact test of the samples taken from subsurface, mid radian and center of the products with different orientations namely longitudinal, transverse and tangential combined with analyzing deviation of elemental segregation in the entire material thickness could be applied as reliable data for analysing material homogeneity.

Examples of standard deviation of carbon profile (weight percent carbon deviations) from surface to core of products for steels manufactured via different routes. Surface to core with 6 mm drill.





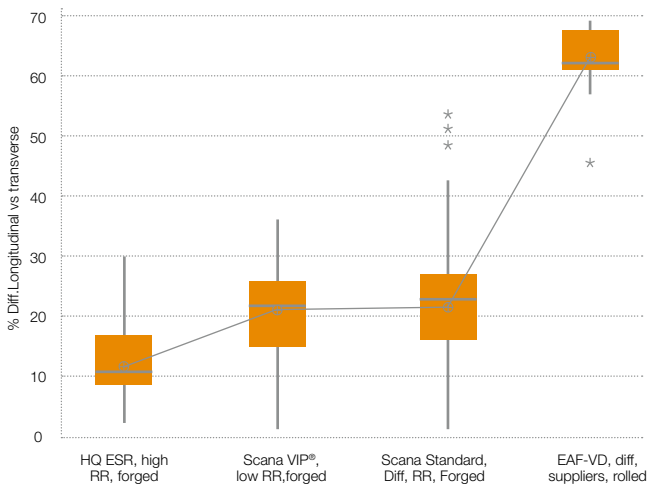
Working for a perfect way to do it, as we see it

Fatigue properties

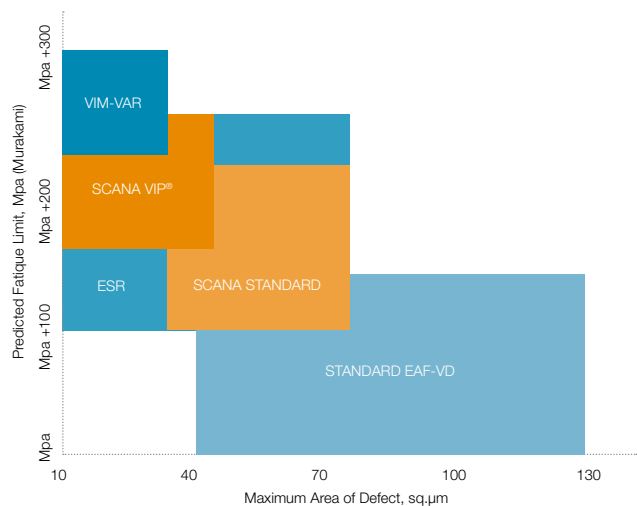
Super cleanliness considering macro, meso and micro defects combined with a very high structural integrity result in high performance products that can be designed for applications that demand high cyclic loading capacity or basically higher fatigue limits.

The superior fatigue properties can allow product designers and manufacturers to apply smaller or lighter steel products under the same loading condition; actual examples could be found in automakers, bearing industry and transportation application.

Examples of percent differences of Charpy impact values at different directions (HQ: High Quality, RR: Reduction Ratio, diff: different) for steels manufactured via different routes.



Example calculation presenting effect of defect size on fatigue performance of steels manufactured via different routes.



What can we do for you?

► Why VIP®?

Buying VIP® means getting a superior material for very high performance products, does not necessarily mean higher purchasing price.

Our costumers business cases for buying our VIP® steels are various, some examples are:

PRICE: Customers who want an economic replacement for ESR. (Lower price is their business case.)

QUALITY: Customers who are trying to present themselves as high end or high performance manufacturers. (Higher performance and better quality is their business case.)

SIZE/WEIGHT REDUCTION: Customers who are interested in size/weight reduction of their currently larger/heavier products under the same loading condition/application for various purposes. (Lower fuel consumption, less waste material and flexible design possibilities are some of their business cases.)

► Who needs VIP®?

More or less every company that deals with steels that are applied in conditions demanding high cyclic loading, superior fatigue properties, isotropic performance, super cleanliness, high material integrity, and high homogeneity is a potential user of VIP® steels.

Specifically we have three main groups of costumers applying VIP® steels in their products:

- Manufacturers of products that are under cyclic loading or fatigue ex. bearing manufacturers, machine manufacturers, ship manufacturers or other transport products.
- Customers that are traditionally applying electro slag remelted steels (ESR) by considering segregation; ex. cold & hot work die manufacturers, roller or bearing manufacturers, cold & hot mill roll manufacturers.
- Customers that perform extra manufacturing processes on the delivered steel parts such as bending, drawing, or photo polishing.

► Our offer

VIP® execution could be applied on a wide range of our products manufactured from various steel grades. Our most popular VIP® products are divided into four classes:

VIPTOOL® These grades are mainly applied in tool/mold steel applications. Many customers have successfully replaced their ESR grades with our VIPTOOL® steels. Grades have very high cleanliness combined with homogenous properties in different directions and have superior photo-polishing properties.

VIPBEAR® These steels could be forged rings, bars, semi-finished or fine machined products that are mainly applied in bearing related industries. These grades covers a wide range of through hardening, induction hardening, and case hardening steels.

VIPGOT® Scana deliver 45 different ingot types in VIP® quality with a weight ranging from 4 to 75 tons. These ingots could be used for further processing by different forming processes. Some examples are ingots used in manufacturing of roller bearing parts such as rings, rolling elements or even gears.

VIPOIL® These grades are very well known steels that are mainly applied in Oil, Gas och Subsea applications. The range of final products is very wide and covers bars, rings, and other semi-finished steels to finished products such as joints, connectors or subsea Christmas trees.

Our offer for tool and mold steel applications

Steel Grade	Standard	C	Si	Mn	S	CR	Ni	Mo	V	Other	Application
VIPTOOL® 944B	1.2360 mod	0,42	0,45	0,35	max 0,003	6,2	max 0,25	1,25			Hot & Cold working tool steel
VIPTOOL® 934E	1.2343	0,36	0,75	0,40	max 0,003	5,0	max 0,25	1,15	0,35	-	Hot working tool steel
VIPTOOL® 934B	1.2344	0,38	0,75	0,40	max 0,003	5,0	max 0,25	1,35	1,0	-	Hot working tool steel
VIPTOOL® 739A	1.2083	0,34	0,80	0,70	max 0,003	13	0,40	0,20	0,15	-	Stainless tool steel
VIPTOOL® 523D	NA	0,25	0,25	1,55	max 0,003	1,4	2,0	0,65	0,08	Cu	High Toughness tool steel
VIPTOOL® 934C	1.2367 mod	0,36	0,25	0,35	max 0,002	5,0	max 0,25	2,3	0,55	-	Hot work tool steel
VIPTOOL® 534D	1.2738	0,42	0,25	1,55	max 0,003	2,0	1,15	0,2	0,08	-	Plastic tool steel
VIPTOOL® 523C	1.2738 HH mod	0,25	0,25	1,55	max 0,003	1,35	1,15	0,55	0,08	-	Plastic polishing tool steel
VIPTOOL® 444C	1.2311	0,43	0,25	1,50	max 0,005	1,9	-	0,2	-	-	Plastic tool steel

Steel Grade – application examples

VIPTOOL® 944B covers a wide range of applications, such as tool steels for cold- and hot working. Most important application is as die steel for die-forging on presses e.g. for crankshafts and other wear sensitive dies. Press hardening tools of automotive crash parts. Hot shear blades, cold forming rolls and punches.

VIPTOOL® 934E hot working tool steel used as extrusion dies, components for die casting molds, drop forging dies and dies for forging machines, mandrels and containers for (light) metal extrusion, molds for car wheel casting, molds for plastic injection when processing of plastics with glass fiber content, high polished and wear resistant plastic molds.

VIPTOOL® 934B for highly stressed hot working tools as extrusion dies, components for die casting molds, drop forging dies and dies for forging machines, hot shear tools, mandrels and containers for (light) metal extrusion, molds for plastic injection when processing of plastics with higher glass fiber content, high polished and extra wear resistant plastic molds.

VIPTOOL® 739A for plastic injection molds applied in corrosive conditions (not for PVC), molds for plastic injection when processing of corrosive plastics, rust resistant molds, transparent plastics, high electronics, steam cooled molds, etc.

VIPTOOL® 523D applied for crack sensitive cavities for plastic injection molds with special requirements on wear resistance, grindability and polishability. Mold steel for graining and high polishing, for decorative car parts, chromium plated plastic parts, car lights, electronics, tv-frames, white ware, compression molding, processing of strengthen plastics, molds for weld-less injection molding etc.

VIPTOOL® 934C used for high performance die-casting inserts, wear effected extrusion tools and forging dies with high temperature load.

VIPTOOL® 534D suitable for cavities for plastic injection molds, even for very large sizes, large cores, mold frames, car bumper molds, car fender molds, large housings etc.

VIPTOOL® 523C molds for plastic injection molding, dies for plastic extrusion, general constructional parts – like machine components requiring improved fatigue strength and reliability.

VIPTOOL® 444C covers a wide range of application. Most important application is as large and medium-sized molds for plastic processing, mold frames for injection molding and die casting industries, components for general mechanical engineering.

► Our offer for gear and bearing applications

		EXAMPLE OF NOMINAL CHEMICAL COMPOSITION							
Steel grade	Standards	C	Si	Mn	S	Cr	Ni	Mo	Other
VIPBEAR® 112A	1.0565	0,17	0,2	1	MAX 0,015	-	-	-	N
VIPBEAR® 494A	1.3539	0,9	0,25	1	MAX 0,003	1,9	-	0,6	
VIPBEAR® 494B	1.3539	1	0,5	0,9	MAX 0,008	1,9	-	0,6	
VIPBEAR® 494E	1.3536	1	0,35	0,8	MAX 0,008	1,8	-	0,35	
VIPBEAR® 442B	1.7225	0,45	0,3	0,9	MAX 0,025	1,2		0,25	
VIPBEAR® 514E	1.6587	0,15	0,4	0,6	MAX 0,005	1,8	1,6	0,3	N
VIPBEAR® 533C	1.6582	0,35	0,3	0,7	MAX 0,015	1,7	1,4	0,2	
VIPBEAR® 613C	1.3533	0,15	0,3	0,6	MAX 0,015	1,5	3,5	0,2	

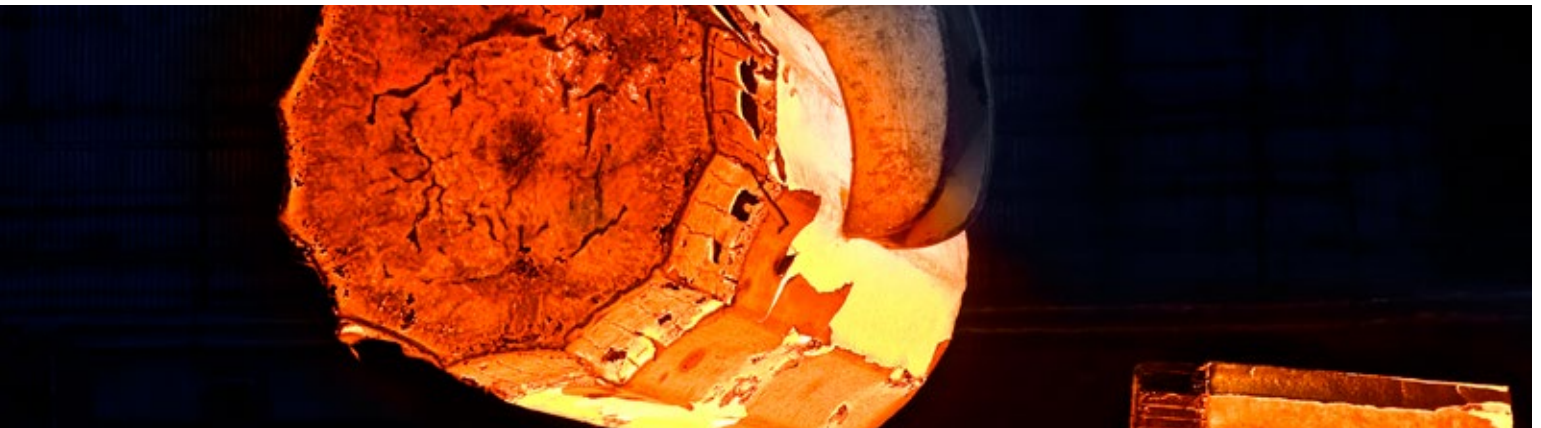
Steel grade	Standards	Application
VIPBEAR® 112A	WSTE355+CE	Nitrogen micro alloyed
VIPBEAR® 494A	100CrMnMoSi8	Ball & roller bearing steel
VIPBEAR® 494B	100CrMnMoSi8	Ball & roller bearing steel
VIPBEAR® 494E	100CrMo7-3	Ball & roller bearing steel
VIPBEAR® 442B	42CrMo4	Crankshaft, rotor shafts, machine applications, medium high strength properties
VIPBEAR® 514E	18CrNiMo7-6	Gear shaft steel. Nitrogen micro alloyed
VIPBEAR® 533C	34CrNiMo6	Construction steel, machine application, with high strength properties
VIPBEAR® 613C	17NiCrMo14	Ball & roller bearing steel, case hardening steel



► Our offer for Oil, Gas and Subsea applications



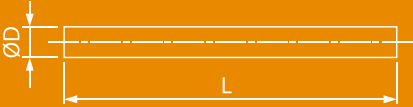


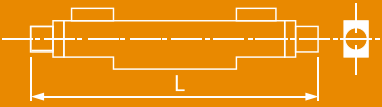



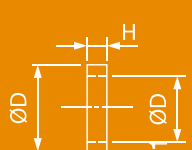
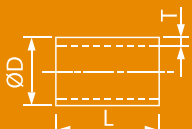
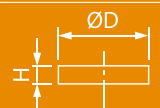
STEEL GRADES	STANDARDS	NOMINAL CHEMICAL COMPOSITION							
		C	Si	Mn	S	Cr	Ni	Mo	Other
VIPOIL® 432J	AISI 4130	0,3	0,3	0,6	max 0,015	1	0,2	0,2	V, Nb, N
VIPOIL® 532A	AISI 8630	0,3	0,3	0,9	max 0,01	1	0,9	0,4	N
VIPOIL® 533D	32CrNiMo6	0,3	0,3	0,8	max 0,010	1,5	1,6	0,3	
VIPOIL® 633I	M11919	0,3	0,2	0,7	max 0,01	1,3	3,2	0,6	V, N
VIPOIL® 814E	A182F22	0,15	0,2	0,5	max 0,01	2,4	0,3	1	N
VIPOIL® 902B	A707 MOD. 3W	0,02	0,2	1,4	max 0,004	0,7	2,2	0,5	Nb, Al, Ca
VIPOIL® 118D	TTSTE355 Z3 MOD	0,1	0,3	1,4	max 0,008	0,2	0,2	max 0,05	N



► Our wide range of ingot

Steel grades	Example of standard steel ingots	Application
VIPGOT®	20Mn5, 28Mn6, CK35, CK45, 40Mn4, 15Mo3, 16CrMo44, 25CrMo4, 24CrMo5, 42CrMo4, 50CrMo4+Ni+V, 30CrMoV9, 100CrMo7-3, 100CrMnMo8, 18CrNiMo7-6, 20NiCrMo13, 33NiCrMoV145, 30CrNiMo8	Ball & roller steels, general structural steels, steels for quench & tempering, through hardening, case hardening, induction hardening steels, tool steels, hot work & cold work, plastic mold, heat resistance, stainless steels

► Dimensions and weights

VARIETY	SHAPE	PREMACHINED	AS FORGED
ROUNDS		D = 275-1 300 mm L max = 24 000 mm W max = 40 000 kg	W max = 54 000 kg Tool steel: W max = 34 000 kg
SQUARE, OCTAGONAL AND RECTANGULAR BARS		T max = 1 300 mm L max = 12 000 mm W max = 30 000 kg	W max = 54 000 kg Tool steel: W max = 34 000 kg
PLATES		F max = 2 000 mm T = 200-1 200 mm L max = 12 000 mm W max = 30 000 kg	W max = 54 000 kg Tool steel: W max = 34 000 kg
CRANK SHAFT FORGING			L max = 12 000 mm W max = 52 000 kg
SHAFTS AND ROLLS		D max = 1 300 mm L max = 20 000 mm W max = 40 000 kg	
FLANGE SHAFTS (1, 2 OR MORE FLANGES)		D max = 1 800 mm L max = 24 000 mm W max = 40 000 kg (Hollow boring to full length)	
TURBINE AND ROTOR SHAFTS		D max = 1 100 mm L max = 12 000 mm W max = 30 000 kg	
RINGS		D max = 3 000 mm H max = 1 400 mm D1 max = 2 000 mm W max = 25 000 kg	
HOLLOW FORGINGS		D max = 1 500 mm T min = 70 mm L max = 6 000 mm W max = 25 000 kg	
DISCS		D max = 2 400 mm H min = 200 mm W max = 20 000 kg	



Scana Energy AB
Kristinehamnsvägen 2
SE-680 71 Björneborg, Sweden
Phone +46 550 251 00
www.scanaenergy.se

From molten steel to finished
assembled product.

It's the steel solution.