TÜV CERT

EN ISO 9001:2000
Certifikát č. 041004025/E01

ZDAS





INGOTS • FORGINGS • CASTINGS • PATTERNS

ZDAS
METALLURGY

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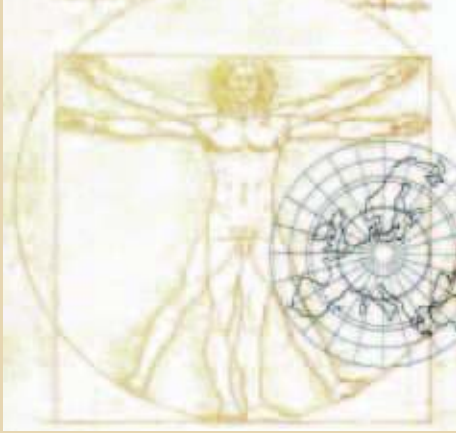

Ingots
Forgings
Castings
Patterns

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Dear Customers and Business Partners,

Manufacturing metallurgical components and semi-products belongs to the principal lines of ZDAS, a.s.
It mainly encompasses production and deliveries of high-quality castings, forgings, ingots, foundry patterns and a number of supporting services. During these activities, high attention is paid to a consistent working of inquiries, orders and comprehensive technical documentation which is subsequently taken as the basis for the production preparation and for the production and inspection process.
The continual improvement of quality and the high-level production is supported by the established quality system to CSN EN ISO 9001. The achieved level is annually verified through certification defence carried out by an independent company RW TÜV.
The main target of ZDAS Metallurgy's technical, commercial and production staff is to be a reliable partner to all of those who buy our products and services. We are approaching prosperity through our customers' satisfaction.

Some Dates from the Past

1951 traditional bell was cast, thus commencing the metallurgical production at a new company ZDAS
1989 the two-millionth ton of steel was poured
1993 production system at Metallurgy was certified to ISO 8001 by RW TÜV
1997 a 43 ton casting was made as the heaviest one in the existing ZDAS' history
1999 the VD/VOD/VIC (secondary metallurgy) technology was put into operation
2002 a new strategic partner, the Slovak company Zeleziarne Podbrezova, came in ZDAS and became its majority owner


CERTIFICATE

STEEL PLANT

Annual capacity of the Steel Plant is 60 thousand tons of steel. The steel made is either poured into ingot moulds (ingots) or into moulds (castings). A wide range of steels is produced, from structural, low- and medium-alloy steels including tool steels, to high-alloy (Cr, Ni, Mn), austenitic and special steels intended for aerospace and power engineering.

MANUFACTURING FACILITIES

Steel making takes place in three electric arc furnaces (EAF), one ladle furnace (LF) and a deep-deoxidation & vacuum degassing facility also offering the possibility of vacuum decarburization of high-alloy chrome liquid alloys (VD/VOD).

Capacity of production units

No. 2 EAF	16 to 22 tons	LF	14 to 22 tons
No. 3 EAF	4 to 8 tons	VD	14 to 22 tons
No. 4 EAF	12 to 19 tons	VOD	14 to 19 tons

MANUFACTURING PROCESS

- the EAF, LF & VD/VOD integrated workstation offers high variability of the molten-metal-making process, molten metal processing and pouring
- manufacturing process is chosen according to customer requirements, mainly with regard to the range of chemical composition, ultrasonic testing, micro- and macro-cleanliness, gas content etc.
- comprises both primary and secondary metallurgy steps
- enables to achieve, on a standard basis, high qualitative parameters, flexibility and respond to customer wish within a reasonable time

GUARANTEED ARE

- gas content (H_2, N_2, O_2), micro-cleanliness to DIN 50602
- ultrasonic testing to SEP 1921
- austenitic grain size

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INGOT SHOP

MANUFACTURING PROGRAM

The range of ingots produced in the Ingot Shop comprises about 40 types of ingots with weight ranging from 500 kg to 12 tons. The ingots are intended for open die forging (octagonal polygonal ingots of 8K series) and rolling (pentadecagonal polygonal, round and slab-type ingots). Production of new types of ingots can also be agreed according to customer's requirement.

MANUFACTURING PROCESS

Ingots are bottom poured into ingot moulds on plate lined with high-clayey refractory casting material. When pouring ingots, the steel surface is protected with casting powder. Ingot top is treated using isolating or exothermic mixtures/powders. During steel casting, argon protection of the flowing metal is used. Based on customer's requirement/our recommendation, ingots can be delivered as annealed (soft annealed, stress relief annealed).

DELIVERY CONDITION

- non-split ingots with their tops
- certificate of chemical composition
- absence of radioactivity certificate
- annealing certificate – on request
- also ingots in hot condition can be delivered to customers

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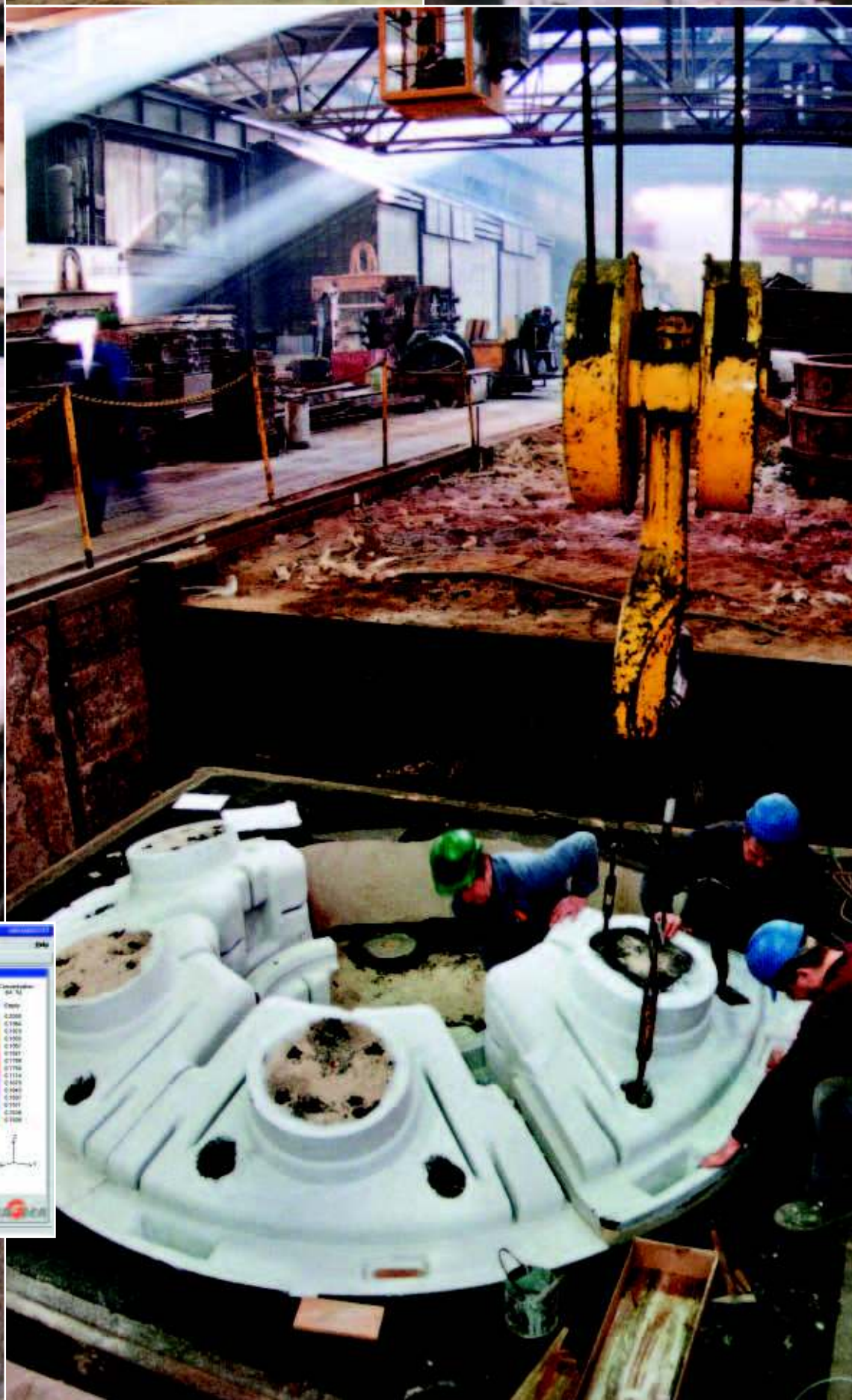

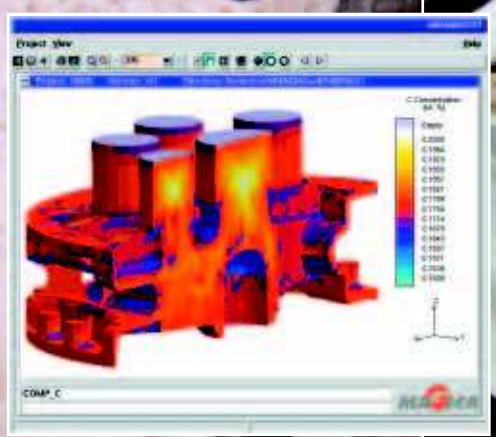
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PRODUCTION OF CASTINGS

MANUFACTURING PROGRAM

Production of castings was commenced on August 27th, 1951; the manufacturing program is currently aimed at MAGMA-aided castings being demanding for their shapes and materials; weight of these castings is ranging from 200 kg to 40000 kg of rough casting weight, the maximum dimensions being 8500 x 4800 x 3000 mm.

MATERIALS PRODUCED

- Carbon steels
- Low- and medium-alloy steels
- High-alloy steels
- Nodular cast iron
- According to customer requirement, if the condition of molten metal (heat) accumulation is satisfied

SAND MIXTURES USED

- Organic-resin-bonded chromite mixture
- Water-glass-bonded slate-clay mixture
- Water-glass-bonded silica mixture
- Bonding bentonite mixture

HEAT TREATMENT

is carried out in modernized natural-gas-fired furnaces with automatic temperature control, temperature difference throughout the furnace space does not exceed ±5 deg. C. The castings can be delivered in normalized condition, water, oil, air quenched and tempered.

FETTLING AND SURFACE FINISH,

being included in the manufacturing process, is performed through ordinary cleaning operations such as hydro blasting and steel shot blasting, compressed-air grit blasting. Rough grinding is carried out at the robotized workstation ANDROMAT and using portable grinding machines.

DELIVERY CONDITION OF CASTINGS

- fettled rough castings
- machine-fettled rough castings
- rough machined castings having machining allowance of agreed size

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OPEN DIE FORGINGS

MANUFACTURING PROGRAM

The Forge Shop has been manufacturing open die forgings since 1966 in a comprehensive range of shapes, with weights ranging from 20 kg to 9000 kg.

STEELS USED, MADE SOLELY AT ŽĎAS STEEL PLANT

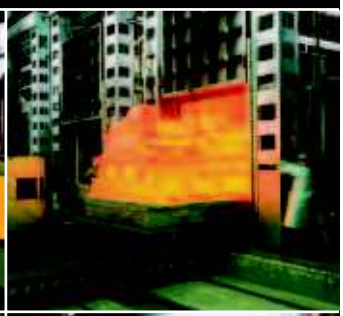
- Structural standard-grade steels intended for various application
- Structural carbon steels for quenching and tempering, case-hardening etc.
- Structural alloy-steels of various types – Mn, Si, Cr, Ni, Mo, V, Al, W
- Alloy, high Cr, Ni, Mn content steels
- Tool carbon and alloy steels for forming tools
- Steels for special application

MANUFACTURING FACILITIES

- 3 open die forging presses of in-house design, CKV 630, CKV 1250 and CKV 1800, with rail-bound manipulators, heating furnaces (car-hearth + chamber type)
- heat treatment furnaces (car-hearth + soaking type)
- quenching tanks (water + oil)
- material-dividing saws, up to a diameter of 1000 mm
- sampling saws

DELIVERY CONDITION, ACCORDING TO CUSTOMER'S REQUIREMENT

- forged and heat treated
- rough machined
- finish machined



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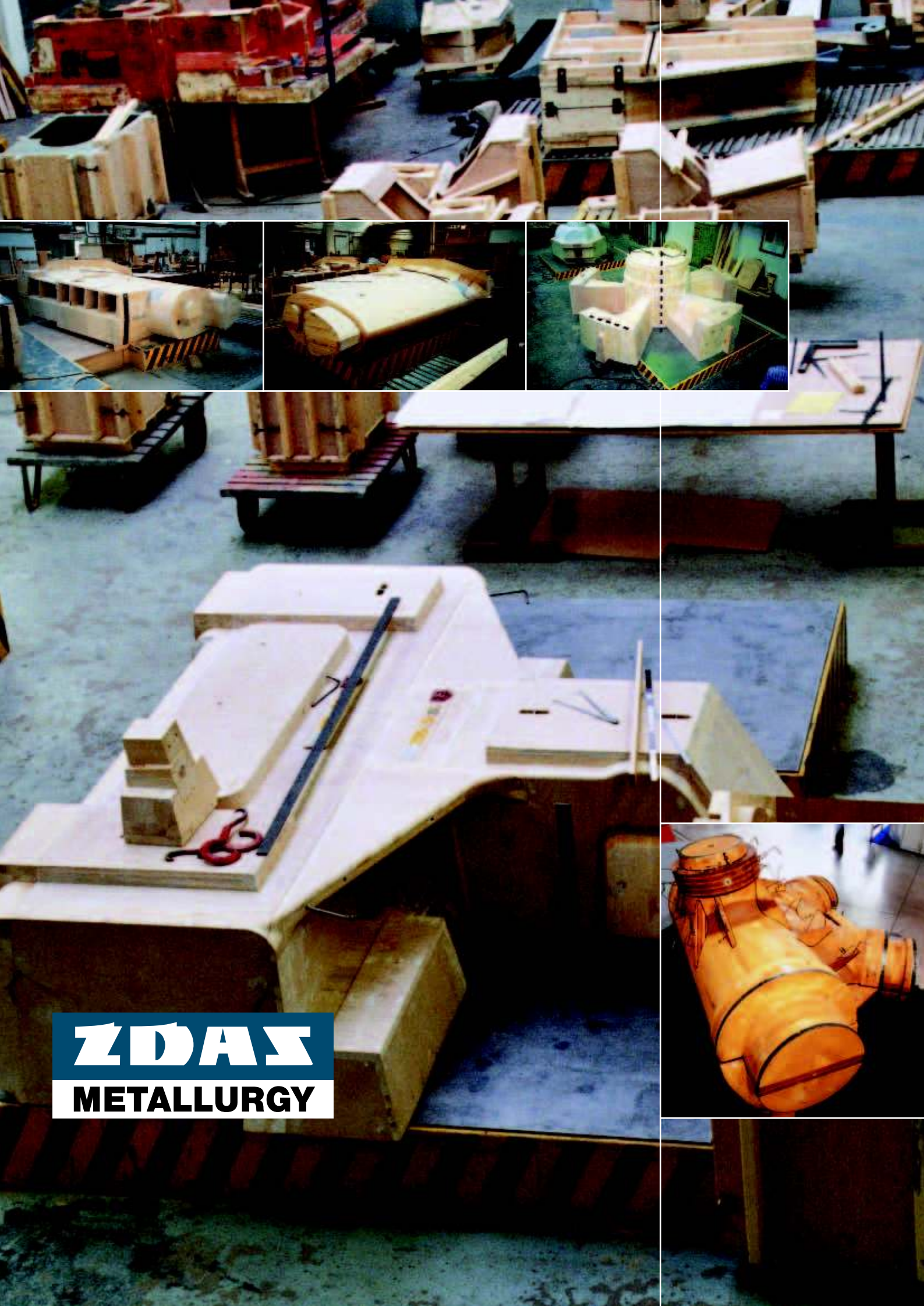
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PATTERN SHOP

MANUFACTURING PROGRAM

The Pattern Shop produces pattern equipment both for hand and machine moulding, piece and series production as well. Workmanship classes depend on customer's requirement, the material being polystyrene, wood, plastics, metal and combinations of the named materials.

MANUFACTURING FACILITIES

Complete technological equipment is available, providing high quality of all the manufacturing operations, from material preparation including its drying through finishing of the pattern equipment by painting. Available is a well-equipped workstation intended for receipt of production documentation and 3D patterns in majority of engineering standards, e.g. Iges, VDA, STAP, ProE, Autocad, CATIA and CAD/CAM system workstation intended for documentation processing and CNC-machine cutting.

MANUFACTURING CAPACITY

Maximum size of non-split pattern equipment is 10000 x 5000 x 4000 mm. Rotary patterns up to a diameter of 5250 mm, milled patterns up to a radius of 15500 mm and 40 deg., working on CNC machine having the work-table size 6000 x 2000 mm

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ROUGH MACHINING

MANUFACTURING PROGRAM

Rough machining of castings and forgings using conventional as well as numerically-controlled machine tools is performed at the Rough Machining Shop. Rough machining (i.e. with an allowance/stock left) of castings and forgings is carried out to facilitate finish machining and to ensure adequate surface finish for conduction of NDT testing. In some cases, it is important also for the preparation of castings and forgings for subsequent heat treatment. Included within the Rough Machining Shop activities is also finishing of products before their shipment to customer.

MANUFACTURING FACILITIES

- Centre lathes with swing diameter 495 mm to 1200 mm and turning length 2000 mm to 8000 mm intended for up to 28 ton piece weight
- Vertical turret lathes with table diameter 1250 mm to 5000 mm, with the possibility of machining pieces being up to 10000 mm in diameter and with work table load capacity up to 40 tons
- Horizontal boring and milling machines with up to 3150 mm vertical travel and 3150 mm to 7000 mm traverse. (Maximum dimensions to be machined: 3150 x 6000 x 5600 mm, 32 t for the conventional machines and 3150 x 3200 x 3200 mm, 20 t for the CNC machines.)
- Planer-type milling machines with clamping area 800 x 3500 mm up to 2000 x 6000 mm and clamping table loading capacity 5 to 20 tons.

The Rough Machining Shop has 46 machine-tools altogether (of which 10 are NC controlled) that enable rough machining of forgings and castings up to a weight of 32000 kg.

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LABORATORIES





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The Labs carry out full determination of mechanical, chemical and metallographic properties of the steel made and also of metallic materials and input raw materials in general. The Labs are incorporated in a system being accredited to ISO 9001:2000 and they, on a regular basis, take part in interlaboratory tests in order to provide high quality of the results.

MECHANICAL LAB

- tensile testing (up to +600 °C)
- compression test
- bending test
- notched-bar impact test (from –196 °C up to +120 °C)
- technological tests
- hardness testing

Tensile testing machines – ZWICK Z 400E, THZ 723, ZD 400
Impact testers – PSW 300, WPM 300
Hardness testers – Vickers HPO 250, Rockwell HP 250, Brinell KPE 3000 + HPO 3000
Cooling device – AMSLER TV 742

CHEMICAL LAB

- analyses of low-, medium- and high-alloy steel
- analyses of non-ferrous metals (Cu-, Al-alloys)
- analyses of nickel alloys
- contents of gases in steel (H_2, N_2, O_2)
- metering of specific activity
- analyses of input raw materials and slags

Spectrometers – ARL 4460 and ARL 3460
Gammaspectrometer – EXPLORANIUM GR 320
Thermoevolution analysers – LECO TC 136, RH 404 and CS 225
Spectrometer with induction-bonded plasm – (ICP) GBC Integra XL
Atomic absorptive spectrometer – (AAS) GBC Avanta Ultra Z

METALLOGRAPHIC LAB

- steel micro-cleanliness
- steel microstructure
- steel macrostructure
- grain size
- depth of chemical-heat-treated layers
- intercrystalline corrosion resistance
- heat treatment

Microscopes – NEOPHOT 32 and OLYMPUS GX51F
Image analysis – LECO IA32
Digital documentation – OLYMPUS DP 10
Micro hardness tester – LECO M-400-H1

All the above testing is performed in accordance with relevant standards (ČSN, DIN, ASTM,...) and technical-and-delivery conditions laid down by customer.

QUALITY INSPECTION

NON-DESTRUCTIVE TESTING

The Metallurgy Plant has ultrasonic, magnetic and liquid-penetrant testing facilities to ČSN, DIN, EN and ASTM standards available.

The testing personnel is qualified in compliance with the EN 473 and SNT-TC-1A standards.

In 2002, a device made by CGM company of Italy was installed; it is intended for surface magnetization by rectified current, with the output up to 3 x 18000 A.

To carry out ultrasonic testing, analogue and digital instruments of the company Krautkrämmer are used; internal defects are detected using normal, double crystal, angle and special probes according to customer requirements.

DIMENSIONAL CHECK

Following to metal cutting operation, all products are subject to dimensional check.

FINAL INSPECTION AND ISSUE OF CERTIFICATES

Final inspection documentation and certificate of conformity are issued in accordance with EN 10 204 and customer's technical requirements.

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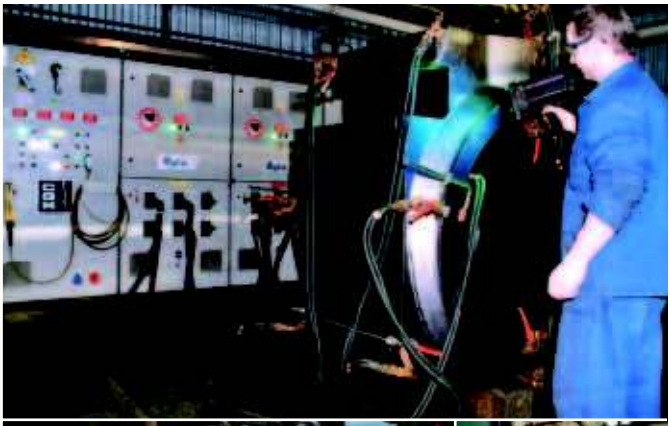
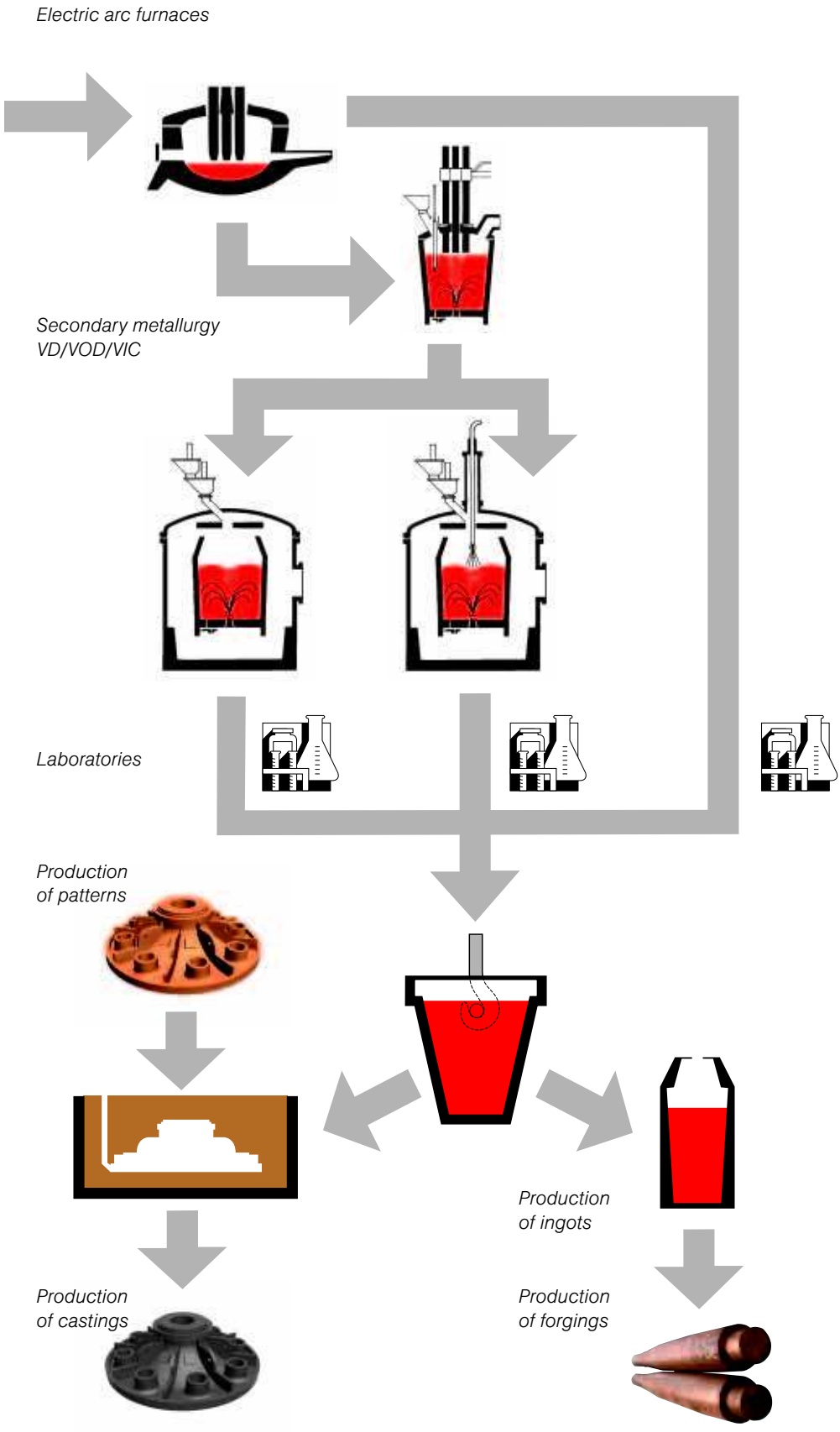


Technological Processes



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REFERENCE EXAMPLES OF CASTINGS

Structural parts

Machines and equipment

Power engineering

Nuclear research

Shipbuilding industry

Press Tool Carrier 6 500 kg

Casing Body 3 300 kg

Flow Meter Body 2 800 kg

Bridge Connection Piece 10 700 kg

Cardan Joint 2 200 kg

Ship Stabilizer Body 4 700 kg

Chock 15 200 kg

Gear Wheel 15 200 kg

Upper Cross Beam 13 700 kg

Crusher Body 5 400 kg

Generator Shield 6 700 kg

Annealing Strainer 1 200 kg

Necked Face 15 500 kg

Bearing Hooks 3 500 kg

Jet-valve Housing 450 kg

Slag Ladle 17 300 kg

Bracket 5 800 kg

Bracket 3 200 kg

Offshore Oil Platform Fairlead Sheave
16 500 kg

Accelerator Connection Pieces
6 300 kg

Rudder Bearing 5 800 kg

Inside Turbine Casing
1 800 kg

Pump Cover 1 400 kg

Quick-closing Device Body
2 800 kg

Upper Shackle 7 500 kg

Frame 32 400 kg

Flow Meter Body 9 900 kg

Half Gear Rim 12 300 kg

Movable Crosshead 7 400 kg

Offshore Oil Platform Coupling
17 500 kg

Turbine Bearing 950 kg

Valve Chamber 1 800 kg

Crusher Arm 5 200 kg

Blade Support 3 200 kg

Forming Machine Frame
20 000 kg

Turbine Wheel Blade
9 700 kg

Pendulum 6 900 kg

Steam Turbine Top & Bottom
28 000 kg & 30 300 kg

Propeller Hub 4 300 kg

Gas Turbine Shell 8 400 kg

Steam Turbine Bottom & Top
10 800 kg

Gas Turbine Shell
3 800 kg

REFERENCE EXAMPLES OF FORGINGS

Tapered Sockets 700 kg

Pin Forging 1 700 kg

Shaft Bushing 1 400 kg

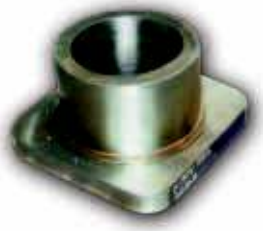
Rudder Shaft 1 100 kg

Rings 400 kg

Rudder Bush 2 800 kg

Valve Body 2 900 kg

Ship Engine Connecting Rod 1 200 kg



Clamping Bush 700 kg

Shaft 2 500 kg

Rudder Shafts 3 200 kg

Rings 1 100 kg

Ship Engine Cylinder Cover 1 900 kg

Compressor Shafts 3 700 kg
Generator Shafts 4 100 kg

Crosshead 1 000 kg

Pipe Coupling 2 200 kg

Pin Forging 400 kg

Ship Stabilizer Pieces 2 200 kg

Propeller Shaft 800 kg

Printing Press Rolls 2 400 kg

Hollow Bushing 3 450 kg

Rough Forgings of Aircraft Landing Gear 600 kg

Main Shaft of Wind-power Plant 1 500 kg

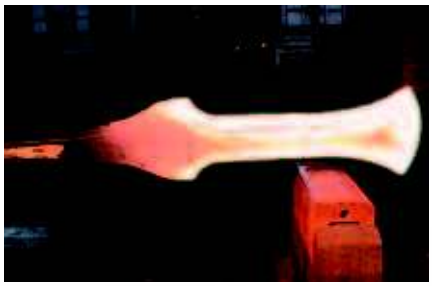
Spherical Valve Pieces 1 000 kg

ZDAS METALLURGY

The historical tradition of iron-and-steel metallurgy in the Highlands includes production of bells. Therefore, a cast-steel bell weighing 530 kg was made on the occasion of the 50th anniversary of production commencement at ZDAS' Metallurgical Plant.

In the summer 2002, the tongue of the biggest Czech bell situated in St. Vitus's cathedral in Prague burst. A new tongue was made at ZDAS' forging shop according to a 300-year old example; this new tongue was donated to the Prague Castle Administration by ZDAS' management.

Towards the end of 2003, the biggest casting in the company's history was made at ZDAS Metallurgy Plant's foundry. The weight of the machined nodular cast iron frame intended for an Italian customer was 43 500 kg.



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Principal References:

- highly qualified and steady production and technical personnel
- modern production and development platform
- international certification according to ISO 9001:2000 standards
- high-quality international references in all production branches
- continuous attention given to ecological and region's issues

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