



**POWER GENERATION** 

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# Since 1956 the reliable partner of power generation equipment manufacturers





We share know-how within the FOMAS Group, optimizing processes and materials, minimizing cost, and maximizing product quality.

Our added value is to provide turnkey solutions, from forging and ring rolling to the finished ma-

Starting from a thorough analysis of the customer's design, then engineering the production of contour forgings close to net shape up to the finished or preassembled part.

All the required machining processes such as milling, lathe-machining, drilling, sawing, cladding and others can be carried within our manu-



# **Steam and Gas**

FORGINGS		
STEAM	GAS	
• Generators	$\cdot$ All alloys and super alloys	
HP/IP/LP Rotor	components	
(monoblock and welded	Forward compressor shafts	
design) shafts	$\cdot$ Compressor wheel stages	
• Flywheel	After compressor shafts	
	Distance pieces	
	• Torque disk/tubes	
	• Mid shafts	
	• Turbine wheel stages	
	• Spacers	
	• After turbine shafts	
	· Couplings	

RINGS	
STEAM	GAS
STEAM TURBINE	GAS TURBINE
• Diaphragms	• 1 <sup>st</sup> and 2 <sup>nd</sup> stage casings
• Guide Van Strips	• Heat Shields
	SHROUD RINGS
	• Inner / Outer Shield
	• Discharge Support Rings
	• Inner
	and outer transition ducts
	• Half Rings

# Aeroderivative

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ORGINGS		
LM9000 Shaft	11/2	









### RINGS

- Statoric Cases
- Rotor bushing
- Laby seals
- $\cdot$  Bearing spring finger
- · Coupling flange
- Balance drum



# References

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**POWER GENERATION ROTATING COMPONENTS** GENERAL ELECTRIC Reference List

#### EUROPEAN DESIGN

SGT5-4000F (former V94.3A), SGT5-8000H (former V94.2), SGT6-2000E (former V84.2), SGT6-4000F (former V84.3A)

Main Components	Materials
Compr. Disks	26NiCrMoV14.5 (Super Clean)
Shafts	26NiCrMoV14.5
Torque Disks	26NiCrMoV11.5
Turbine Disks	X12CrMoWVNbN1011 (COST E)
Nuts / Rings	

#### FIRST SGT5-7000F

Main Components	Materials	
Shafts	26NiCrMoV14.5 (SC)	
Compr. Disks	26NiCrMoV11.5	
Torque Disks		
Turbine Disks		
Nuts		

#### **US DESIGN**

**SGT6-6000G** (former W501G), **SGT6-5000F** (former W501F), **SGT6-3000E** (former W501D5/D4)

Main Components	Materials
Shafts	30NiCrMoV15
Compr. Disks	30NiCrMoV12
Torque Disks	30NiCrMoV12Mod
Turbine Disks	26CrMoNiVNb8
Nuts	



\* HP's / IP's LP's Rotors max. gashed shipping weight of 80 t \*\* up to shipping weight of 90 t

## GAS TURBINES / ALL FRAMES 9 H - 7 H - 9 E - 9FA - 9FB - 9 B - 7FA - 7 E - 7FB - 6 B - 6 C - 6FA -5/2 E - 5M - 5C - 5D - GT11N2 - GT13E2 - GT24 - GT26

Main Components	Main Material
Shafts	30NiCrMoV12
Compr. Disks	30NiCrMoV15
Turbine Disks	30CrMoV4.11
Spacers	12Cr Type M152



#### GENERATOR **ROTORS** \*\*

Main Materials

30NiCrMoV15

#### STEAM **TURBINES \***

Main Materials

30CrMoV4.11mod 30NiCrMoV15

# References

**POWER GENERATION ROTATING COMPONENTS** Nuclear Rotors Reference List

POPANS .

POLYBLOCK LP'S / IP'S / HP'S ROTORS, CONVENTIONAL ND 30/33/37/41, POLYBLOCK NUCLEAR HP / LP'S

Materials	Weights
22NiCrMoV12.7	from 15 to 105 shipped tons
22Cr2Ni3MoV	
20Cr2NiMo	
20CrNiMo8	









## **SIEMENS (ENERGY)** / W101, W191, W301

Main Comp Shafts Compr. Disks Torque Disks Turbine Disks

### **POWER GENERATION STATORIC COMPONENTS**

### **GENERAL E**

Main Compo Heat Shield 1st & 2st Turbi 1st & 2st Diap 1st & 2st Shou

Centrifugal co





### POWER GENERATION ROTATING COMPONENTS Mechanical Drive Gas Turbines

#### GENERAL ELECTRIC / PGT10, PGT25, LM2500

Main Components	Main Materials
Compr. Disks	30NiCrMoV12
Turbine Disks	30NiCrMoV15
Shafts	30CrMoV4.11
Spacers	12Cr Type M152
	A 286
	INCONEL 718

### **GENERAL ELECTRIC** / GT8C2

onents	Materials
	Alstom grades
	CrMoV
	NiCrMoV

onents	Materials
	30NiCrMoV15
5	30NiCrMoV12
	30NiCrMoV12Mod
S	26CrMoNiVNb8
	DISCALOY (Ni base alloy)

LECTRIC	
onents	Materials
	Nimonic263
ine case	ASTM-A470-CL8
ohragm	
urds	Ni alloy
	Austenitc Steel
ompressor components	



## Geothermal

FORGINGS

Bushing rings

 $\cdot$  Triple phase stainless steel shafts

### RINGS

• Crown Bands

Labyrinths

# Hydroelectric

#### FORGINGS

- Single and double flanged hydro shafts
- $\cdot$  Pelton runners up to 100 ton
- $\cdot$  Generators shafts
- Bushing Rings
- Hydro casings
- Stay rings
- Upper and lower deck head covers
- Bottom Rings

### LARDERELLO PROJECT, ITALY

FOMAS is a standard and preferred supplier of rotors for this geothermal power plant, in operation since 1913. The plant has now a total capacity of 810 MW.





#### RINGS

- Diaphragms
- Labyrinth Rings
- Francis and Pelton wheels
- Sealing rings





# Metal powders for power generation

### Boost your innovative projects with our customised metal powders

MIMETE, part of FOMAS Group, produces gas atomised metal powders in Iron, Nickel and Cobalt base alloys thanks to a tailor made VIGA plant.

Our powders are available for additive (PBF, DED, and Binder Jetting) and HIP (Hot Isostatic Pressing) applications.

#### PRODUCT QUALITY

- Spherical powders
- Optimal flowability
- Particle size distribution tailored according to customers' request

#### TECHNOLOGY

- Vacuum Inert Gas Atomiser (VIGA) ensuring the highest purity and sphericity of the powder;
- SIEVING and BLENDING machines working under inert atmosphere
- Fully equipped in-house Laboratory (ISO/IEC 17025:2017 certified)

MIMETE Grade	AI	с	Co	Cr	Fe	Мо	Nb	Ni	ті	w	Nb+Ta	Reference Standard
VENUS 718	0,50	≤ 0,08	≤ 1,00	19,00	19,00	3,05		bal	0,90		5,15	ASTM F3055
VENUS 625	≤ 0,40	≤ 0,10	≤ 1,00	21,50	≤ 5,00	9,00	3,65	bal	≤ 0,40			ASTM F3056
VENUS X		0,10	1,50	21,80	18,50	9,00		bal		0,60		ASTM B435

## Wind

FORGINGS

• Main turbine shafts



#### RINGS

#### MULTIPLE WIND TURBINE ROLLED RING APPLICATIONS

- MAIN GEARBOX
- Planetary gears
- Hollow shafts
- Ring gears

#### TOWER ASSEMBLY

Structural flanges

BEARINGS

- Yaw slewing bearings
- Pitch slewing bearings

#### COUPLING

Flanges

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### POWER GENERATION PRODUCT RANGE

- VENUS (Nickel base powders)
- Standard grades (available in stock): VENUS 718, VENUS 625, VENUS X
- Customised grades: powders designed according to customer requirements

### WHY MIMETE

- Alloy design, development and production in deep partnership with customers.
- Technical support on new applications and critical topics.
- Advanced laboratory testing on powders.
- Certified ISO 9001, EN 9100, EN 9120, ISO 45001 & ISO 14001.

Our offer ensures the supply of powders with **the highest quality standards**, guaranteed by our fully equipped in-house laboratory.



### Nuclear

FOMAS has successfully provided "High Integrity Open Die Forgings" to Nuclear Power Plants for the past 50 years. In the early 70's FOMAS delivered the first main inlet and outlet nozzles steel type ASME SA 508 Class 2 forgings to Breda Termomeccanica (first ever ASME N-Stamp in Europe) for the 850 MW BWR Caorso Power Station.

Among our recognitions, FOMAS remains the oldest and most experienced European supplier with uninterrupted ASME Material Organization qualification, backing up to the late 1970's.





Today we supply forgings in accordance with:

SME	ISO EN
ССМ	BS
ÜV	GOST
TA	JAW
	NNSA-HAF604

#### FORGINGS

- 1<sup>ST</sup> TO 4<sup>TH</sup> GENERATION PRIMARY/SECONDARY CIRCUIT FORGINGS
- EQUIPMENT FOR NUCLEAR WASTE MANAGEMENT
- NUCLEAR HOT FUSION ITER PROJECT

#### TYPICAL COMPONENTS

- Steam Generator
- Primary Heads
- Main Tubesheets
- Feedwater Nozzles
- Valve body & auxilliary components
- Inlet Outlet Super Heater Nozzles
- Manway nozzles
- Sever Accident Safety Valve nozzles Safe End
- Primary nozzle Dam Rings
- Core Support Components
- Primary Feedwater Pump Components
- $\cdot$  Spray nozzle Transition Rings
- $\cdot$  Boron Control System Motor Cases
- $\cdot$  Low Pressure Steam Rotors
- Cask

### CASK BODY

#### PLATE

- LF2 LF3 SA 508 grade 1A
- F49 F347H
- 15 tons
  2,3 m
- SHELL
- LF2 LF3 F347H
- 29 tons
- 2,4 m





# Case study

#### FOMAS UPP AND EPP FORGINGS

#### ITER Tokamak plant

FOMAS has successfully qualified and produced crucial components for the vacuum vessel of the ITER Tokamak plant, providing the forging to machine out those components in a **monolithic solution**.

Mechanical properties and microstructural requirements, in compliance with ITER specifications, have pushed the forged solutions to a high performance range and integrity, performances where FOMAS is a the principal reference on the market, thanks to its modern plants and remarkable know-how.

The dimension of the parts, connected to crucial requirements in terms of homogeneity and cleanliness, drove the choice on FOMAS ESR high weight ingots. FOMAS has developed dozens of different re-melted steel grades with very good experience in several austenitic alloys over 10 years of activity.



ITER starting material was processed in order to obtain high levels of structural homogeneity right from the beginning. The forging process at the 12,500 tons press refined the structure, so that mechanical properties and grain size could comply with the challenging requirements of the ITER specifications. A first component of each kind, 100% UT inspected, was completely cut up to verify properties all across the volume.

The results outlined a performance comparable with the small plates originally intended for welding. Mastering on forging cycle and heat treatment parameters allowed FOMAS to grant outstanding microstructural homogeneity, all across the component. Mechanical and metallurgical properties were fully compliant with the specification requirements. Very low dispersion in numeric values, both per isotropy and performance, was measured all across the forged block.

Once more, FOMAS ESR and its forging expertise have demonstrated the actual possibility of projecting performance, expected and well known on small components, to huge scale-up, leveraging on grain size control, cleanliness, soundness of bulk material as well as precise design and control of both Forging and Heat treatment.

# MATERIALS - Special steels, nickel and titanium alloys

	Steel	Material Number	Uns-Designation	Din-identification	Alloy	Application	
<u>-</u>		~1,4302	S30400	X5CrNi18-10	F304		
		~1.4306	\$30403	X2CrNi19-11	F304 L		
			\$30454	X5CrNi18-10	F304 LN		
	8	.1 / 0 / 1	571000	VIECTNIZE 21	F710		
s	ŝ	1,4041	531000	XISCINI23-21	F310	Nuclear, Oil&Gas	
	itio	~1,4401	551600	ASCHNIM017-12-2	FSIG		
	te	~1,4404	531603	X2CrNiMol7-12-2	F316 L		
	ST .	~1,4406	S31653	X2CrNiMoN17-11-2	F316 LN		
		~1,4541	S32100	X6CrNiTi18-10	F321		
		~1,4550	S34700	X6CrNiNb18-10	F347		
	a designed	~1,4961	S34709	X8CrNiNb18-10	F347 H		
	U U	~1,4454	S21904	X2CrMnNiN20-9-7	F XM-11 / Nitronic 40		
	els	no	S20910	X3CrMnNiN22-5-12	F XM-19 / Nitronic 50	Aerospace, Nuclear,Oli&Gas	
	Sup Ste	~1,4547	S31254	X1CrNiMoCuN20-18-7	F44		
	e .	~1.4565	S34565	X2CrNiMnMoNbN25-18-5-4	F49	Oil&Gas	
		~14413	\$41500	X3CrNil3-4	F6NM		
	ţ;	~14006	\$41000	X12Cr13	F6 a	Oil&Gas,Process Equipment	
	sele	~1/923	-	X22CrMoV/12-1		Oil&Gas Process Equipment Power Concertion	
	Ste	1,4525		X4CrNil6 4	Virgo 79	Oil& Cas Process Equipment	
	Σ	-	-	X4CINII0-4	Virgo 38	Cille Cas Process Equipment	
-	0	1,4959	-		Jethete M 152	Oll&Gas, Process Equipment, Power Generation	
	e is	-	-	XI4CrMoVNbN	Cost F	Power Generation, Gas Steam Turbine compo-	
	Sto - St	-		X12CrMoWVNbN	Cost E	nents	
	rter	-		X13CrMoCoVNbNB	FB2		
	Sist	X10CrMoVNb9-1	K90901	X10CrMoVNb9-1	F91	Power Generation Steam Valves Dressure Vossal	
	ě		K92460	-	F92	r ower Generation, Stearn valves, Pressure Vessel	
	sss it. sing	~14545			15-5 DH		
	inle len eelt	1,-13-13			15-5 FT	Aerospace, high-strength corrosion	
	Sta Pre larc St	~1,4542	S17400	X5CrNiCuNb16-4-4	17-4 PH	resistant components	
	×	1///02	671007		<b>FC1</b>	Oils Cas ECDO platforms	
plex & srduplex ainless teels	~1,4462	531803	X2CINIMON22-5-3	F5I	Oli&Gas,FSPO platforms		
	~1,4410	\$32750	X2CrNIMON25-7-4	F53			
	Sta	~1,4501	\$32760	X2CrNiMoCuWN25-7-4	F55	Oil&Gas, Pumps, Valves	
	ดี	~1,4507	S32550	X2CrNiMo25-7-4	F61		
	1 C 1		N08120	NiFeCr	HR120	Power Concration shrouds diaphrams	
		2,4683	R30188	CoCr22NiW	Haynes 188 / Udimet 188	heat shields, turbine stage	
		2,4733	N06230	NiCr22W14Mo	Haynes 230		
	u	2,4831/2,4856	N06625	NiCr22Mo9Nb	Inconel 625	Dressure Containers Oils Cas	
	ð	2,4642	N06690	NiCr29Fe	Inconel 690	Pressure Containers, Oli&Gas	
	al	2,4668	N06718	NiCr19Fe19Nb5Mo3	Inconel 718	Power Generation, Turbine components, Avia-	
	å	2,4665		NiCr22Fe18Mo	Hastelloy X / Inconel HX	tion, Oil&Gas, Nuclear	
	Ś	2.465	N07236	NiCo20Cr20MoTi	Nimonic 263	Power Generation shrouds diaphrams heat	
	-				GTD333	shields, turbine stage	
	1200	14876	N08810	X10NiCrAlTi32-21	Incoloy 800H	Nuclear Oil&Gas	
		1,4944	no	no	A-286	Power Generation Oil&Gas	
		1,1311	110	110	SA 105		
	1.1				0,1100		
					SA 266		
					SA 266		
					SA 266 A 266 CL2		
	-				SA 266 A 266 CL2 SA 350 LF2		
					SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2		
	-				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR		
					SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR 20 Mn 5		
					SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5		
					SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5		
					SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55		
					SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52		
	s				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60		
	teels				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F65		
	ys Steels				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F65 A 694 F70		
	lloys Steels				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W		
	w Alloys Steels				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5	Oil&Gas. General Industry	
	Low Alloys Steels				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3	Oil&Gas, General Industry	
	n & Low Alloys Steels				SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF6	Oil&Gas, General Industry	
	bon & Low Alloys Steels	1,5421	K12822	20MnMo3-5	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F60 A 694 F65 SA 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF6 SA 336 F1	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362	K12822 K41545	20MnMo3-5 X11CrMo5	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F60 A 694 F65 SA 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF6 SA 336 F1 SA 336 F5	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362	K12822 K41545 K11572	20MnMo3-5 X11CrMo5 no	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 SA 336 F1 SA 336 F1	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7337	K12822 K41545 K11572 K11564	20MnMo3-5 X11CrMo5 no 16CrMo4-4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F65 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 SA 336 F1 SA 336 F1 SA 336 F12	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,737 no	K12822 K41545 K11572 K11564 K31545	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF6 SA 336 F1 SA 336 F1 SA 336 F12 SA 336 F12 SA 336 F21	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7337 no 1,738	K12822 K41545 K11572 K11564 K31545 K21590	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F60 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 A 350 LF3 SA 336 F1 SA 336 F1 SA 336 F1 SA 336 F12 SA 336 F21 A 182 F22	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7377 no 1,738 no	K12822 K41545 K11572 K11564 K31545 K21590 K31835	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF6 SA 336 F1 SA 336 F1 SA 336 F1 SA 336 F12 SA 336 F12 SA 336 F12 SA 336 F21 A 182 F22 A 182 F22	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7362 ~1,738 no 1,738 no ~1,7214	K12822 K41545 K11572 K11564 K31545 K21590 K31835 no	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10 30CrMo4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF6 SA 350 LF6 SA 336 F1 SA 336 F2 A 182 F22 A 182 F22 A 182 F22V A 181 4130	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7337 no 1,738 no -1,7214 1,7225	K12822 K41545 K11572 K11564 K31545 K21590 K31835 no no no	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10 30CrMo4 42CrMo4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F60 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 A 350 LF6 SA 336 F1 SA 336 F2 A 182 F22 A 182 F22 A 182 F22 A 181 4130 AISI 4140	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,737 no 1,738 no ~1,728 no ~1,7214 1,7225	K12822 K41545 K11572 K11564 K31545 K21590 K31835 no no no	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10 30CrMo4 42CrMo4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1/CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 A 350 LF6 SA 336 F1 SA 336 F1 SA 336 F1 SA 336 F1 SA 336 F2 SA 330 F2 SA 336	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7337 no 1,738 no ~1,7214 1,7225	K12822 K41545 K11572 K11564 K31545 K21590 K31835 no no no	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10 30CrMo4 42CrMo4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 A 350 LF3 SA 336 F1 SA 346	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,7337 no 1,738 no ~1,7214 1,7225	K12822 K41545 K11572 K11564 K31545 K21590 K31835 no no no	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10 30CrMo4 42CrMo4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F65 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 A 350 LF3 SA 336 F1 SA 336 F1 SA 336 F1 SA 336 F1 SA 336 F2 SA 336 F1 SA 336 F2 SA 336	Oil&Gas, General Industry	
	Carbon & Low Alloys Steels	1,5421 ~1,7362 ~1,737 no 1,738 no -1,7214 1,7225	K12822 K41545 K11572 K11572 K11564 K31545 K21590 K31835 no no no	20MnMo3-5 X11CrMo5 no 16CrMo4-4 no 10CrMo9-10 12CrMoV9-10 30CrMo4 42CrMo4	SA 266 A 266 CL2 SA 350 LF2 SA 508 Grade 3 CL1 /CL2 A48 CP-APR 20 Mn 5 16 MnD 5 18 MnD 5 20 MnMoNi 55 A 694 F52 A 694 F52 A 694 F60 A 694 F65 A 694 F70 A 707 Grade 3W 15NiCuMoNb5 SA 350 LF3 A 350 LF3 A 350 LF6 SA 336 F1 SA 336	Oil&Gas, General Industry	



mastering science metals

### The Group

FOMAS Group is an established global partner for Power Generation applications, with dedicated engineering and production of open die forgings, seamless rolled rings and metal powders with the highest levels of quality and delivery service. Our purpose is to enable sustainable energy, reliable power and limitless motion by moving the needle in mastering the science of metals with a responsible approach.

The Group's Mission is to play to win with innovation, responsiveness and a passionate commitment to long-term partnerships.

Our vision for the future is to be a multicultural, people-centric organization leading our core businesses by leveraging cutting-edge competencies in the science of metals and embracing the digital transformation.

Everything we do is underpinned by our core values of: proactivity, integrity, meritocracy, accountability, reliability, transparency & trust.

The Group has over 1,400 employees all around the world. Working with us signifies entering a team which is focused on continuous evolution, a company that measures its success in the achievement of excellence at each and every step of function and process.

The attention dedicated by our Group to safeguard the health and safety of its employees and to improve the environmental performance of its activities represents a key reference in continual improvement of business reliability. We believe this essential to ensure a long term health of our business.

FOMAS Group promotes safety and environmental protection in every aspect of its production cycle. This mindset is the foundation on which the company builds the continuous improvement of environmental, safety and health conditions in its sites worldwide.

An integrated group HSE management system, is the mean through which this goal is pursued.

In a continuous effort to reduce its impacts, FOMAS Group sustainability process adopts also energy management best practices. An example is the adoption of certified energy management systems and best practice sharing between the sites.





average

![](_page_9_Picture_17.jpeg)

![](_page_9_Picture_18.jpeg)

![](_page_10_Picture_0.jpeg)

## Forgings

#### Actual as forged weight and dimension limits

- max. diameter: 5,500 mm
- max. length: 18,000 mm
- max. ingot: 125 ton ESR
- (equivalent to 170 tons conventional ingot)
- max. shipped weight: 100 ton

• Differential heat treatment • Fully control on drasticity • Cooling zone control

• Very uniform properties

• Time evolution of drasticity control • Full rotor stability due to rotation

Plc controlled » fully reproducible process

• Full control on position/distance of nozzles

Six state of the art automatic UT stand both • n° 2 - 3,500 ton vertical and horizontal, produced on FOMAS design and qualified by the major turbine manufacturers.

Titanium and Aluminium heat treatment production line equipped with electric drop furnace.

### Presses

The forgings are processed in smaller or larger presses depending on the contours and size.

- Our presses for open die forgings
- (all with integrated manipulators):
- 12,500 ton
- 6,000 ton

• 2,000 ton

### Horizontal spray-quench

### **Electro Slag Remelting**

plant

- Three ESR stands
- New 125 ton ESR ingot equivalent to a conventional ingot of 170 ton.
- Pressurised ESR for top quality remelting of special steel & stainless steel under full inert gas atmosphere.

# Rings

- max. ring diameter: 7,000 mm
- max ring height: 1,250 mm
- max ring weight: 20 ton\*
- max ingot weight: 40 ton

### **Rolling Mills**

19 lines (axial/radial)

unloading operations.

![](_page_10_Picture_32.jpeg)

\*up to 5,500 diameter mm

![](_page_10_Picture_34.jpeg)

(no variance)

18

State of the art in-house heat treatment plants, with an automated mobile conveyor for loading/

This means quick, consistent and optimized transfer time from furnace to tank.

Our production sites across the globe roll approximately 105,000 tons of rings per year.

![](_page_10_Picture_40.jpeg)

![](_page_11_Picture_0.jpeg)

# Certifications

All the Group Companies' management systems are certified by DNV in accordance with:

- ISO 9001 Quality
- ISO 14001 Environment
- ISO 45001 Occupational Health and Safety
- ISO 50001 Energy

Moreover each company is certified by the most prestigious bodies in specific sectors.

FOMAS Group's central research and development department aims to respond to customer needs. Our approach is to focus on safety, cost reduction, minimize end waste. Moreover we strive to sustain profitability providing the highest level of quality and safety throughout the entire manufacturing cycle and at the same time ensuring the least possible impact on the environment.

![](_page_11_Picture_9.jpeg)

![](_page_11_Picture_10.jpeg)

![](_page_11_Picture_11.jpeg)

![](_page_12_Picture_1.jpeg)

FOMAS ITALY ASFO ITALY **BAY-FORGE INDIA** MIMETE ITALY FOMAS USA LA FOULERIE FRANCE HOT ROLL ITALY FOMAS DALIAN CHINA

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![](_page_12_Picture_5.jpeg)

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