



A Govt. of India Enterprise
Ministry of Defence



Alloying Excellence *for* Viksit Bharat

मिश्र धातु निगम लिमिटेड
MISHRA DHATU NIGAM LIMITED
HYDERABAD



Certified by
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ABOUT MIDHANI

Mishra Dhatu Nigam Limited (MIDHANI) is one of the few integrated and modern metallurgical plants in the world manufacturing a wide range of superalloys, titanium and titanium alloys and special steels in various mill forms using state-of-the-art production facilities.

MIDHANI, incorporated under the companies act as a Public Sector Undertaking (PSU) in November 20, 1973, was conceived to help India achieve self-reliance in the manufacture of a wide spectrum of critical and complex alloys.

MIDHANI is one of the few metallurgical plants of its kind in the world specialized in manufacturing wide range of special purpose products mainly catering to aerospace, defence, space, energy and other industries. Its products are mainly used in high end engineering applications that require precision and high efficiency to withstand stress, temperature, and corrosive atmosphere. With constant developments made over the years in various operational areas, and by utilizing in-house research and development capabilities, MIDHANI has indigenized various critical technologies, alloys, and products. This reduced dependence on imports of various critical materials. MIDHANI has been handling challenging developmental tasks, taking a lead position in indigenization of critical technologies and products to render support to several programmes of national importance.

The manufacturing facilities of MIDHANI include some of the most sophisticated equipment such as Vacuum Induction, Vacuum Arc, Electro-Slag and Electronic Beam Melting Furnaces, Computer-Controlled Forge Presses, state of art Wide Plate Mill, Ring Rolling Mill, Hot Rolling Mills, Precision Cold Strip, Sheet and Foil Rolling mills, Bar & Wire Drawing Equipment and Investment Casting facilities. It has a fully-equipped centralized laboratory which helps in maintaining high quality standards demanded of special grade alloys.

MIDHANI is a ISO 9001: 2015 & AS9100D:2016 certified company & largest superalloy and the only manufacturer of Titanium alloys in India.

MIDHANI has state-of-the-art testing facilities covering chemical, mechanical, metallography, magnetic and non-destructive testing to fit the engineering needs of its strategic materials. It has highly skilled and experienced manpower to handle the above test facilities. Chemical, mechanical, metallography and NDT test labs of MIDHANI have NABL accreditation to ISO/IEC 17025.

SUPER ALLOYS

Super alloys are a group of alloys comprising of nickel, cobalt and iron along with other refractory metals to maintain higher strength even at high temperatures and enhance their corrosion resistance. Super alloys are mainly used in aerospace, gas turbine engines, nuclear Reactors, petrochemical, rocket engines, tools and dies for hot-working of metals in automotive and chemical industries.

Main characteristics of super alloys over conventional alloys are

- Good strength at high temperatures and across thick sections
- Ductile at cryogenic temperatures
- Excellent oxidation resistance at all temperatures
- Good corrosion and erosion resistance

Super alloys market is categorised by base material (Nickel-Based, Iron-Based, and cobalt Base) and application (aerospace, industrial gas turbine, automotive, oil & gas, Industrial, and others).

Wrought Alloys

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
1.	Superni 600	Inconel 600 W.Nr. 2.4816 UNS N06600	Long Products ASTM B166/ B564 AMS 5665/5687 BS 3075NA14/ 3076NA14, DIN 17752/ 17753/17754/17742 ISO 9723/9724/9725 Flat Products ASTM B168/B906 AMS 5540, BS 3072NA14/ 3073NA14 DIN 17750/ 17742 EN 10095, ISO 6208	74Ni-15.5Cr-8Fe	Bar, Rod, Forging, Sheet, Plate & Strip
2.	Superni 601	Inconel 601 UNS N06601 W.Nr. 2.4851	Long Products ASTM B166 DIN 17752/17754 ISO 9723/9725, EN 10095 Flat Products ASTM B168 EN 10095, ISO 6208	60Ni-23Cr-Fe-1.5Al	Bar, Rod, Forging, Sheet, Plate & Strip
3.	Superni 690	Inconel 690 UNS N06690 W.Nr. 2.4642	Long Products ASTM B166/B564 ISO 9723 Flat Products ASTM B163/B167 ISO 6207	Ni-9Fe-29Cr	Bar, Rod, Forging, Sheet, Plate & Strip

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
4.	Superni 625	Inconel 625 UNS N06625 W. Nr.2.4856	Long Products ASTM B446/B564 AMS 5666/9725 BS 3076NA21 EN 10095, DIN 17752/ 17754/17744 ISO 8723 Flat Products ASTM B443, AMS 5599 ISO 6208, BS 3072NA21 EN 10095 DIN 17750/ 17744	62Ni-21.5Cr-9Mo- 3.65Nb	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
5.	Superni 617	Inconel 617 UNS N06617 W.Nr. 2.4663a	Long Products ASTM B166/B564 AMS 5887, ISO 9724 DIN 17752/17754/17744 Flat Products ASTM B168, AMS 5888 ISO 6208 DIN 17750/17744	Ni-22Cr-12.5Co- 9Mo-1Al-0.09C-	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
6.	Superni 718	Inconel 718 UNS N07718 W.Nr. 2.4668	Long Products ASTM B637, AMS 5662/ 5663/5664/5832/5914 ISO 9723/9724/9725 DIN 17752/17753/17754/ 17744, API6ACRA MAT638103 GTM-SU-718/NR-FS GTM-SU-718/R-FS Flat Products ASTM B670/B906 AMS 5596/5597/5950 ISO 6208, DIN 17750 GTM-SU-718/M-CS	52.5Ni-19Cr-3Mo- 5.1Nb-0.9Ti-0.5Al- 18Fe	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
7.	Superni 76	Hastelloy X UNS N06002 W.Nr. 2.4665	Long Products AMS 5754, BS HR6 ASTM B572 DIN 17752/17754/17744 ISO 9723/9725 Flat Products AMS 5536, BS HR204 ASTM B435 DIN 17750/ 17744 ISO 6208	47.5Ni-22Cr-1.5Co- 9Mo-0.6W-18.5Fe	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
8.	Superni 901	W. Nr. 2.4662 UNS N09901 Nimonic 901	Long Products BS HR55 AMS 5660/5661 ISO 9723/9725 MAT638804 GE B50A305-S12	42.5Ni-12.5Cr- 6Mo-2.7Ti-0.015B- 34Fe	Bar, Rod & Forgings
9.	Superni 909	UNS N19909 Incoloy 909 CT X-909	Long Products AMS 5893/5884	42Fe-37.5Ni-14Co- 4.8Nb-1.6Ti	Bar, Rod & Forgings

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
10.	Superni 925	Incoloy 925 UNS N09925 W.Nr. 2.4816	Long Products ES-MA-67-2 API6ACRA, ASTM B805	45Ni-Fe-2Cr-3Mo- 2Cu-0.25Al-2Ti	Bar, Rod & Forging
11.	Superni 263A	UNS N07263 W.Nr. 2.4650 Nimonic 263 Haynes C263 Hastelloy C263	Long Products AMS 5886 DIN 17752/17754/17744 BSHR10, GE B50A774A Flat Products AMS 5872, DIN 17750/17744 BSHR206	50Ni-20Cr- 20Co5.8Mo-2.2Ti- 0.45Al	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
12.	Superni 41	Rene 41, Udimet R41 Pyromet 41 UNS N07041 W.Nr. 2.4973	Long Products AMS 5712/5713 Flat Products AMS 5545	53Ni-19Cr-11Co- 9.8Mo-3.2Ti-1.6Al- 0.006B	Bar, Rod, Forging & Plate
13.	Superni C276	W. Nr. 2.4819 UNS N10276 Inconel C276	Flat Products ASTM B575/B906 ISO 6208 DIN 17750/ 17744	Ni-16Mo-15.5Cr- 5Fe-4W	Plate, sheets & Strip
14.	Superni C22	W. Nr. 2.4602 UNS N06022 Inconel 22	Long Products ASTM B462/B564/B574 ISO 9723/9724 DIN 17752/17754 Flat Products ASTM B575 ISO 6208, DIN 17750	Ni-21Cr-14Mo-4Fe- 3W	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
15.	Superni 75	Nimonic 75 UNS N06075 W. Nr. 2.4951 NC20T AE435	Long Products BS HR5/ 504 DIN 17752/ 17742 TLV85112101, ISO 9723-9725 Flat Products BS HR203 DIN 17750/ 17742 ISO 6208	Ni-20Cr-0.3Ti-0.1C	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
16.	Superni 80A	UNS N07080 W.Nr. 2.4952 Nimonic 80A	Long Products BS HR1/ 3076/ 601 DIN 17742 AFNOR NC 20TA ASTM B637 DPTLV-70000287 TLV952004 ALSTOM NB00146 GE NB00146 MAT632202/ 632204	Ni-20Cr-Ti-Al	Bar, Rod, Rings & Forging
17.	Superni 90	NCK20TA Nimonic 90 W. Nr. 2.4632 UNS N07090	Long Products BSHR2/501/502 AMS 5829, AIR9165 MAT637351 Flat Products BS HR202 TLV85252100	Ni-17Co-19Cr- 2.5Ti-1.5Al.	Bar, Rod, Rings, Forging, Sheet & Plates

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
18.	Superni 105	W. Nr. 2.4634	Long Products BS HR3 AFNOR NCKD 20ATv	Ni-15Cr-20Co- 5Mo-1.2Ti-4.7Al- 0.005B	Bar, Rod, Rings & Forging
19.	Superni 115	Nimonic 115	WIS 150	Ni-15Cr-15Co- 4Mo-4Ti-5Al- 0.16C-0.015B	Plates
20.	Superfer 800/800H/ 800HT	Incoloy 800/800H/ 800HT UNS N08800/ N08810/ N08811	Long Products ASTM B408/B564 AMS 5766, ISO 9723/9725 BS 3076NA15 Flat Products ASTM A240/A480/ B409/B906, AMS 5871 BS 3072NA15, ISO 6208	Fe-32Ni-21Cr- 0.35Al-0.35Ti	Bar, Rod, Rings & Forging
21.	Superfer 286	Alloy A286 UNS S66286 W.Nr. 1.4980	Long Products AMS 5731/5732/5734/ 5737/5895, ASTM A638 Flat Products ASTM A453	25.5Ni-15Cr- 1.2Mo-2.1Ti- 0.006B-0.3V	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
22.	Superfer 52	36HXTI08M	GOST14-117-85	Fe-36Ni-13Cr-8Mo- 1.1Al-3Ti-0.5Si-1Mn	Plates
23.	Superfer 696M	SF696M, AP33BD AE696M 10X11H23T3MP-BD	TY14-1-312-72 TY14-1-3957-85	Fe-22Ni-11Cr-3Ti- 1.5Mo	Bar, Rod, Forging, Sheet, Plate & Strip
24.	Superfer 825	Incoloy 825 UNS N08825 W.Nr. 2.4858	Long Products ASTM B425/B564 DIN 17752/17753/ 17754/17744 ISO 9723/24/25,BS 3076NA16 Flat Products ASTM B424/B906 DIN 17750/17744 BS 3072NA16, BS 3073NA16	Fe-42Ni-21.5Cr- 3Mo-2.2Cu-0.9Ti	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
25.	Superco 605	UNS R30605 W.Nr. 2.4964 L605	Long Products AMS 5759, GEB50A460 Flat Products AMS 5537	52Co-20Cr-10Ni- 15W	Bar, Rod, Rings, Forging, Sheet, Plate & Strip
26.	Superco 783	UNS R30783 Inconel 783 W. Nr. 2.4856	Long Products AMS 5940	34Co-3Cr-28Ni- 3Nb-5.5Al-0.008B- 25.5Fe	Bars & Rods
27.	Ni-Cu 400	UNS N04400 W.Nr. 2.4360 Monel 400	Long Products AMS 4675, DIN17752/ 17754/17743 ASTM B164/ B564 BS3076NA13 Flat Products ASTM B127, AMS 4544 DIN 17750/17743 BS3072NA13 Long Products	67Ni-30Cu	Bar, Rod, Forging, Sheet, Plate & Strip

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
28.	Ni-Cu 500	UNS N05500 W.Nr. 2.4375 Monel K500	AMS 4676, DIN 17752/ 17754/17743, ASTM B865 BS3076NA18 ISO 9723/ 9725	66.5Ni-3Al-0.62Ti- 28Cu	Bar & rods
29.	AE 435	AE435 XH78T NC20T	TY14-1-1671-76 TY14-1-3957-85 TY14-1-1747-76 TY14-1-975-74	Ni-20Cr-0.3Ti	Bar, Rod, Forging, Sheet, Plate & Strip
30.	AE 437A	AE437A	TY-14-1-75-71 TY14-1-402-72	Ni-20Cr-2.5Ti- 0.8Al-0.04C	Bar, Rod, Forging, Sheet, Plate & Strip
31.	AE 437B	AE437B	TY-14-1-75-71 TY14-1-402-72	Ni-20Cr-2.5Ti- 0.8Al-0.04C-0.01B	Bar, Rod, Forging, Sheet, Plate & Strip
32.	AE 602	AE 602	TY14-1-1747-76 TY14-1-146-71	Ni-20Cr-2Mo-1Nb- 0.5Ti-0.5Al-0.06C	Bar, Rod, Forging, Sheet, Plate & Strip
33.	AE 868	AE868 XH60BT	TY14-1-286-98 TY14-1-1747-76 TY14-1-997-74 TY14-1-2287-77*	Ni-15W-25Cr-0.5Ti	Bar, Rod, Forging, Sheet, Plate & Strip

Wrought Alloys

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
1.	Superni 708	EP708-BD XH62BMYOT-BD	TY 14-1-1018-98 OCT 1.92049-78	Ni-18Cr-5Mo- 6W-2Al-1Ti	Forged Bars Hot Rolled Bars Forged Rings Rolled Rings
2.	Superni 698	AE698-BD XH73MBTYO-BD	TY 14-1-285-72 TY 14-1-1973-77 TY 14-1-5329-96	Ni-14Cr-3Mo-2Nb- 1.5Al-2.5Ti-0.05C	Forged Bars Hot Rolled Bars Forged Rings Rolled Rings
3.	Superni 648	EP648-VI XH50BMTYOB-VI	TY 14-1-3046-97	Ni-32Cr-2.3Mo- 4.3W-0.5Al-0.5Ti- 0.5Nb	Hot Rolled Bars Rings
4.	Superni 701	Waspaloy	AMS 5707	Ni-18Cr-12Co-4Mo- 3Ti-1.2Al	Forged Bars

Cast Super Alloys

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
1.	BZL12Y-VI	VZL12Y-VI ВЖЛ12У-ВИ	OCT1-90126-85 TY1-92-177-91	Ni-9Cr-14Co-3Mo- 1.5W-0.9V-0.8Nb- 4.5Ti-5.5Al-0.15C	Remelt stock
2.	Supercast C242	C242	WIS 123	Ni-21Cr-10Co-10Mo- 0.3Mn-0.3Si-0.3C	Remelt stock
3.	Supercast C1023	C1023	WIS 113	Ni-15Cr-10Co-8Mo- 3.6Ti-4Al-0.16C-0.006B	Remelt stock
4.	Supercast CW12MW	CW12MW AMS 5388	AMS 5388	Ni-16Cr-17Mo-5Fe- 4W-0.4V	Remelt stock
5.	Supercast 263A	Nimocast 263 Haynes C 263, C263	WIS 103	Ni-19Cr-20Cr-6Mo- 2Ti-0.5Al-0.0C	Remelt stock
6.	Supercast 247A	CM 247LC	GTM-SU-247LC-MH	Ni-8Cr-9.5W-5.5Al- 0.8Ti-3.2Ta-9.2Co- 1.5Hf-0.5Mo-0.01Zr- 0.015B-0.075C	Remelt stock
7.	ZS6Y-VI	ZC6Y-VI ЖС6У- ВИ	OCT1-90126-85 TY1-92-177-91	Ni-9Cr-10W-10Co- 2Mo-2.5Ti-5.5Al-0.15C	Remelt stock
8.	Supercast 713C	Alloy 713C	AMS 5391	Ni-13Cr-5Mo-2.5Nb- 2Mo-6Al-1Ti-0.15C	Remelt stock

Cast Alloys

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Product Form
1.	Supercast Zc32	ZC32-VI	TY 1-92-177-91	Ni-5Cr-9Co-8W- 0.9Mo-3.6Re-3.7Ta- 5.7Al-1.4Nb	Remelt stock
2.	Supercast 76	Hastelloy X	WIS-101	Ni-22Cr-18.5Fe-9Mo- 1.5Co-0.6W	Remelt stock
3.	Supercast 738LC	IN 738LC	WIS-122	Ni-16Cr-3.2Al-8Co- 1.5Mo-0.6Nb-1.5Ta- 3.2Ti-2.4W	Remelt stock
4.	Supercast 31	Turbaloy 31	WIS-143	54Co-25r-10Ni-7.5W	Remelt stock
5.	Supercast PE10	NC20Nb Nimocast PE10	WIS-154	Ni-21Cr-6Mo-4Fe	Remelt stock

SPECIAL STEELS

Steels are incredibly popular due to high strength, durable and cheaper making them ideal for a wide range of applications. Mechanical properties of steels can vary greatly depending on its composition and processing. MIDHANI possesses comprehensive capabilities to manufacture a wide range of special steels, including precipitation hardening, maraging, austenitic, martensitic, ferritic, and low alloy steels, tailored for strategic applications. With advanced melting technologies like Vacuum Induction Melting (VIM), Electro Slag Remelting (ESR), and Vacuum Arc Remelting (VAR), MIDHANI ensures high-purity, homogeneous steel production. Integrated forging, ring rolling, and heat treatment facilities allow precise control over microstructure and mechanical properties. Backed by NABL-approved testing, MIDHANI consistently delivers steels that meet stringent defence, aerospace, nuclear, and industrial standards, positioning itself as a national hub for metallurgical excellence. MIDHANI is manufacturing special steels for various applications such as aeronautical, defence, armour, nuclear, Naval and power applications.

Low Alloy Steels – Strength, Toughness, and Versatility

Low alloy steels are engineered steels that contain small amounts of alloying elements such as chromium, nickel, molybdenum, vanadium, or manganese (typically less than 10%) to enhance their mechanical properties like strength, hardenability, and toughness while maintaining good weldability. Low alloy steels attain its full strength by hardening and tempering.

At MIDHANI, these steels are produced using air melting (Electric Arc Furnace (EAF), EAF-LRF-VD) or Vacuum Induction Melting (VIM) followed by Electro Slag Remelting (ESR) or Vacuum Arc Remelting (VAR) to ensure superior cleanliness and control of microstructure. The ingots are then forged using precision hydraulic presses, heat treated in programmable furnaces, and subjected to stringent mechanical and non-destructive testing to meet critical standards. MIDHANI's low alloy steels are used in aerospace structural parts, defence vehicle components, pressure vessels, heavy engineering equipment, and tooling applications where a balance of strength, ductility, and impact resistance is essential. List of low alloy steels produced in MIDHANI are mentioned in Table 1.

Table 1 - List of Low Alloy Steel Grades Developed In MIDHANI

S. No	Midhani Grade	Trade Names/International Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	30KHGSA (30XGCA)	30KHGSA 30XГСА	Ty 14-1-950-74, GOST 4543-71 Ty 14-1-2765-79	Fe-0.30C- Cr1- Si 1- Mn1	Hot Rolled Bars
2.	30XGCN2A/ (30KHGSN2A)	30XGCN2A	Tu 14-1-1885-85 GOST 4543-71	Fe-0.33C- Si 1- Mn1-Ni-1.5-Cr-1	Forged and Hot Rolled Bars
3.	MDN LA1 (12X2H4MAW)	12X2H4MAW 12Kh2N4Ash	Ty14-1-2765-79	Fe-C.12-Cr-1.5-Ni- 3.5-Si.30-Mn-0.5	Forged Bars Hot rolled bars
4.	MDN 127A	DMS 127	DMS 127	Fe-C.3-Si.6-Mn.6- Cr1.3-Mo0.5-V.25	HR Plates & CR Strips
5.	MDN 132A	BS 3S 132 S132	BS S132	Fe-C.40-Cr3.2-Mo1- V.2-Si.3-Mn.5	Forged bars
6.	MDN 9201A	ZFNL 9201	ZFNL 9201	Fe-C.15-Ni1.5-Mn.5	Forged bars
7.	E16NCD13	E16NCD13	AIR 9160C (16NCD13) BS S157, AMS 6548	Fe-C.15-Si.3-Mn.5- Ni3.3-Cr1-Mo.25	Forged Bars

S. No	Midhani Grade	Trade Names/International Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
8.	MDN LA2 (16XCH)	La2 16XCH	4M TY 5615-56 DIS/QL/77/020	Fe-C.15-Cr1-Ni.7- Si.7-Mn.5	Cold drawn wired
9.	MDN 99A	S99 EN 26	BS970: PART 3: 1991 826M40, BS 5S 99	Fe-C.4-Si.3-Mn.6- Ni2.5-Cr0.7-Mo.5	Forged, Hot Rolled Bars and Flats
10.	MDN 6758 A	4130, EN 19 25CD4S, 30XMA Chromoly	MIL S 6758 AMS S 6758	Fe-C.3-Si.25-Mn.5- Cr1-Mo.2	Forged, Hot Rolled Bars and Flats
11.	MDN M50 A (Bearing steel)	M50	AMS 6491	Fe-C.8-Mn.3-Cr4.1- Mo4.2-V1	Hot rolled bars
12.	MDN M50 NiA (Bearing steel)	M50 NiL	AMS 6278	Fe-C: 0.13-Mn.25- Ni3.3-Cr4.1-Mo4.3-V1.2	Forged and HR bars
13.	MDN 52100 A (Bearing steel)	52100, 100Cr6 1.3505, EN 31 SUJ2 535A99, S136	AMS 6444 BS S 136	Fe-C1-Si.3-Mn.4- Cr1.5	Forged and HR bars
14.	MDN 4340 A (Bearing steel)	4340, EN 24, 817M40, 34CRNiMO6 35NCD6, S95/S119 WS 1.6582, 40XH2MA	AMS 6414	Fe-C.4-Si.25-Mn.6- Cr.8-Mo.25	Forged and HR bars
15.	15CDV6	15CDV6	AIR9160C (15CDV6)	Fe-C.15-Mn1-Cr1.3- Mo.9-V.25	Forged and Hot rolled bars sheets
16.	E30NCD16	30NCD16	AIR9160/C 41 (30NCD16)	Fe-C.3-Si.3-Mn.5- Cr1.3-Ni4-Mo .5	Forged and Hot rolled bars
17.	MDN E4340 (MDN 4340A)	4340, EN 24, MIL S 5000, 817M40 34CRNiMO6, 35NCD6 S95/S119, WS 1.6582 40XH2MA	AMS 6414	Fe-C.4-Si.3-Mn.8- Ni1.8-Cr.8-Mo.25	Forged and Hot rolled bars
18.	E35NCD16	35NCD16	AIR9160/C 47 (35NCD16)	Fe-C.35-Si.3-Mn.5- Cr1.8-Ni4-Mo.5	Forged and Hot rolled bars
19.	MDN 97	S97	BS 2S 97	Fe-C.3-Si.3-Mn.5- Ni2.5-Mo.5-Al.04	Forged and HR bars
20.	MDN 156	S 156	BS S 156	Fe-C.16-Si.3-Mn.4- Ni4.2-Cr1.3-Mo.25	Forged and HR bars
21.	16X3HBFMB-W	16X3HBFMB BKS-5 DI 39	Ty 14-1-3242-81	Fe-C.16-Si-.7-Mn.5- Ni1.3-Cr2.8-Mo.5- W1.3-V.4-Nb.15	Forged and HR bars
22.	722M24	722M24	BS 970 part 1983	Fe-C.25-Cr3.2-Mo.5- V.2-Si.3-Mn.5	Hot rolled plates
23.	MDN172	38XH3MØA	TY 108.1029-81	Fe-C.4-Mn.3-Si.3- Cr1.3-Ni3.2-Mo.4-V.15	Forged bars rings
24.	25CD4S	SAE4130	AIR 9160, EN 1.7218	Fe-C.28-Si.2-Mn.6- Cr1-Mo.25	Rings
25.	MDN 8CD12	8CD12	AIR 9117	Fe-Mn1.3-Cr3.2- Mo1.1	Weld consumables

Precipitation Hardening (PH) Steels – Strength Through Smart Metallurgy

Precipitation Hardening (PH) steels are a class of corrosion-resistant, high-strength steels that achieve exceptional mechanical properties through a two-step heat treatment process: solution treatment followed by aging. These steels typically contain elements like chromium, nickel, copper, aluminium, titanium and niobium, which form fine precipitates that strengthen the matrix without compromising ductility.

At MIDHANI, PH steels are produced using Vacuum Induction Melting (VIM) or air melting (EAF,EAF/LRF/VD) followed by ESR or VAR remelting to ensure superior cleanliness, microstructural control, and consistency. After forging and primary shaping, these steels undergo a precisely controlled solution annealing process to dissolve alloying elements into a supersaturated solid solution. This is followed by aging at moderate temperatures, allowing fine precipitates to form uniformly and dramatically increase strength and hardness.

MIDHANI's PH steels offer an excellent combination of high strength, good toughness, and superior corrosion resistance, making them ideal for use in aerospace components, nuclear hardware, naval fasteners, turbine parts, and high-performance structural assemblies. The entire process is backed by stringent quality control and NABL-accredited heat treatment facilities, ensuring conformance to aerospace and defense-grade specifications. List of PH steels produced in MIDHANI are mentioned in Table 2.

Table 2 - List of PH Steels Developed In MIDHANI

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	MDN 11-10 PH	03X11H10M2T, EP678 VNS-17, BHC-17	Ty 14-1-4608-89, Ty 14-1-4608-89 Ty 14-1-2519-78, Ty 14-1-2151-77, Ty 14-1-3482-82	Fe-11Cr-9Ni-2Mo	Forged Rings Forged bars, Plates Sheets, Wires
2.	MDN 11-10T PH	03X11H10M2T1 EP679	Ty 14-1-5132-92 Ty 14-1-12151-77	Fe-11Cr-9Ni-2Mo- 1.3Ti	Hot rolled plates Cold rolled sheets
3.	MDN 11-10V PH	03X11H8M2ø EP 52	TY 14-1-2573-78 TY 14-1-4391-88	Fe-11Cr-8Ni-2.5Mo- .2V	Bars, sheets & Plates
4.	MDN 17-4 PH (MDN 174)	UNS S17400 ASTM A 564 (630),1.4542	AMS 5622 AMS 5643	Fe-16Cr-4Ni-4Cu- .4Nb	Forged and HR bars
5.	MDN 17-4 PH (MDN 174)	UNS S17400 ASTM A 693 (630),1.4542	AMS 5604	Fe-16Cr-4Ni-4Cu- .4Nb	Hot rolled Plates and cold rolled sheets
6.	MDN 15-5 PH A	ASTM A693(XM 12), UNS S15500, 1.4540/1.4545, DIN X4CrNiCuNb 164	AMS 5862	Fe-15Cr-5Ni-.4Nb- 4Cu	Hot rolled Plates and cold rolled sheets
7.	MDN 15-5PH	XM 12, UNS S15500 15-5 PH	AMS 5659	Fe-15Cr-5Ni-.4Nb- 4Cu	Forged and HR bars
8.	MDN 13-8 Mo PH	UNS S13800 XM-13	AMS 5629	Fe-13Cr-8Ni-2.2Mo- 1.2Ti	Forged and Hot rolled bars
9.	MDN 465	UNS S46500	AMS 5936	Fe-12Cr-11Ni-1.1Mo- 1.6Ti	Forged and Hot rolled bars
10.	MDN 17-7 PH A	UNS S17700 ASTM A693(631)	AMS 5528	Fe-17Cr-7Ni-1.3Al	Cold rolled sheets
11.	MDN 59 (STA 59)	S144 FV 520 145PH/XM12	BS S144	Fe-14Cr-5.5Ni-1.8Cu- .3Nb-1.8Mo	Forged, hot rolled bars, slabs
12.	STA 60	S532 STA 60	BS S532	Fe-15.5Cr-5.5Ni- 1.8Cu-1.8Mo-.12Ti- 1.2Mn	Cold rolled sheets

Austenitic Stainless Steels – Corrosion Resistance with Cryogenic Toughness

Austenitic stainless steels are non-magnetic, highly ductile, and corrosion-resistant steels containing high levels of chromium (typically >18%) and nickel, often with additions of manganese, molybdenum, or nitrogen for enhanced performance. Known for their exceptional formability, weldability, and toughness even at cryogenic temperatures, these steels are widely used in chemical processing, nuclear reactors, aerospace, and marine environments. At MIDHANI, austenitic stainless steels are produced through Primary Melting followed by Electro Slag Remelting (ESR) or Vacuum Arc Remelting (VAR) to ensure ultra-clean steels with superior microstructural integrity. Forged components are

subjected to solution annealing, a critical heat treatment that dissolves carbides and homogenizes the structure, restoring corrosion resistance and improving mechanical performance. MIDHANI offers austenitic steels in forged bars, billets, plates, and custom-shaped products, engineered to meet stringent ASTM, ASME, AMS, and defense specifications. Their outstanding resistance to oxidation, pitting, and stress corrosion cracking makes them indispensable for heat exchangers, pressure vessels, cryogenic storage, and precision-engineered assemblies operating in aggressive environments. List of austenitic stainless steels produced in MIDHANI are mentioned in Table 3.

Table 3 - List of Austenitic Stainless Steels Developed In MIDHANI

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	MDN301	07X16H6	TY 14-1-1660-76	Fe-17Cr-6.5Ni	Hot rolled bars, plates
2.	MDN 202	UNS S20200	ASTM A 276	Fe-6.5Mn-20Cr-6Ni-.2N	Bars
3.	MDN 304 A	UNS 304 X5CrNi18-10 (1.4301) Z7CN18-09, 08KH18N10	AMS 5639	Fe-18Cr-8Ni	Forged, hot rolled bars
4.	MDN 304L	UNS 304L, 1.4307	ASTM A 276	Fe-18Cr-8Ni	Forged, hot rolled bars
5.	MDN 321 A	AISI 321, Z10CNT18-11 WS 1.4541, S129	BS S129, AMS 5645 Z10CNT18	Fe-18Cr-10Ni-0.6Ti- 1.5Mn	Forged, hot rolled bars
6.	MDN 321A	AISI 321, S526 Z10CNT18-11 WS 1.4541, X10CrNiTi18-9	BS S 526, Z10CNT18-11 WS 1.4541 X10CrNiTi18-	Fe-18Cr-10Ni-.5Si- 1.5Mn-0.6Ti	Cold rolled sheets
7.	MDN 321 A	AISI 321, S129 Z10CNT18-11, 10CNT18-10 Z6CNT18-11, WS 1.4541 X10CrNiTi18-9	DTD 189A GOST 5548 GOST 18143 Z10CNT18	Fe-18Cr-10Ni-.5Si- 1.5Mn-0.6Ti	Cold drawn/Annealed Wires
8.	MDN 316L	UNS S31603, 316L ASTM A 276, 1.4404	AMS 5653	Fe-12Ni-17Cr- 2.5Mo-1.7Mn	Forged, Hot rolled bars
9.	MDN 347A	AISI 347, S130 Z26CrNb18-11, 6CNNb18-11 WS 1.4550, XCrNiNb18-9	BS S 130 MSRR 6522	Fe-18Cr-8Ni-1.5Mn- 1Nb	Forged, Hot rolled bars
10.	12X18H10T	12X18H10T 12KH18N10T	Tu 14-1-377-72 GOST 5582-75, GOST 4986-70 GOST 18143-72, TOCT 18907	Fe-18Cr-10Ni-0.6Ti	Forged, Hot rolled bars, wires plates, Rings, sheets, strip coils
11.	MDN 218	Nitronic 60	ASTM A276	Fe-17Cr-8Ni-8Mn- 0.15N-4Si	Bars
12.	15X18H12 C4TiO	UNS S31500	TY 14-1-3217-81	Fe-18Cr-12Ni- 0.8Mn-4Si-0.5Ti- 0.25Al-C0.15	Bars
13.	MDN U3	X110Mn14	ASTM A128	Fe-17Mn-3Al-0.4C- 0.5Si	Plates, Sheets

Martensitic Stainless Steels - Wear Resistance and High Strength for Demanding Conditions

Martensitic stainless steels are high-strength, heat-treatable alloys characterized by their ability to form a martensitic microstructure upon quenching, followed by tempering for improved toughness. These steels typically contain 11–18% chromium, with carbon, molybdenum, and nickel as additional alloying elements. They offer a unique combination of moderate corrosion resistance, excellent wear resistance, and high mechanical strength. They achieve their strength by Hardening and Tempering heat treatment

At MIDHANI, martensitic stainless steels are produced using advanced primary melting (Air,

Vacuum) followed by ESR or VAR remelting, ensuring superior cleanliness, uniform chemistry, and control over inclusion content. After forging, components undergo a well-controlled heat treatment cycle consisting of austenitizing, quenching (in oil or air), and tempering. This sequence enhances hardness, strength, and dimensional stability, while tailored tempering temperatures can optimize toughness or creep resistance depending on the application. List of Martensitic stainless steels produced in MIDHANI are mentioned in Table 4.

Table 4 - List of Martensitic Stainless Steels Developed In MIDHANI

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	MDN 9Cr-1Mo	UNS K90901/F91	ASTM A182	Fe-9Cr-1Mo-0.2V-0.05N-0.1C-0.4Si	Bars, sheets
2.	MDNAE 961W	AE 961W	Ty14-1-1089-74	Fe-11Cr-1.6Ni-1.8W-0.4Mo-0.25V-C0.12	Forged, Hot rolled bars
3.	MDN431A	AISI 431, S80, Z15CN17-03 LN 668 WL 1.4044.5/6 WS 1.4057, X22CrNi17 X16CrNi16	BS 6S80 AMS 5628	Fe-16Cr-2.5Ni-0.15C	Forged, Hot rolled bars, Hot rolled flats
4.	14X17H2	AISI 431 UNS S 43100	DIN 1.4057	Fe-17Cr-2Ni-0.15C	Rings, bars
5.	MDN 403	AISI 403	ASTM A 276	Fe-13Cr-0.13C	Strips
6.	MDN 410	UNS S41000 SAE 51410 12X13	AMS 5612, AMS 5613 TY 14-1-377-72, ASTM A 240, AMS 5504, DIN 1.4006, ASTM A 276	Fe-12Cr-0.13C	Forged, Hot rolled bars, Hot rolled flats Rings
7.	MDN 420	UNS S42000 SAE 51420, 20X13	AMS 5621 ASTM A 276	Fe-13Cr-0.2C	Bars, sheets
8.	Z30C13	AISI 420/30X13	AIR 9160	Fe-13Cr-0.3C	Bars
9.	MDN 440C	S44004, 440C X105CrMo17	AMS 5618	Fe-17Cr-1.0C-0.5Mo	Forged, Hot rolled bars
10.	MDN 427	BG 42 UNS S42700	AMS 5749	Fe-14Cr-1.2V-1.1C-4Mo-0.5Mn	Forged, Hot rolled bars
11.	09X16H4B	Russian grade	TY 14-1-463-72	Fe-15Cr-4Ni-0.1C	Bars, rods
12.	MDN 15-5W	06X15H6MBPHБIII	TY 14-1-2229-77 ASTM A564, ASTM A693	Fe-14Cr-5Ni-1.0Mo-0.2V-0.12Nb-0.6C-0.8W	Rings, Forged bars, slabs
13.	MDN 122A	Z12CNDV12, 1.4939 S151, UNS S64152 AMS 5719	AMS 5719	Fe-12Cr-1.8Mo-0.30V-2Ni-0.2Nb-0.12C-0.7Mn	Forged and HR bars
14.	MDN S152	S152, 1.47911, Z10CKD10 X8CrCoNiMo10-06	WIS 136 BS S152	Fe-11Cr-1Mo-0.3V-0.3Nb-0.5Ni-0.1C	Forged and HR bars
15.	15X16K5H2MB-W/AE866W	15X16K5H2MB-W/AE866W	Ty 14-1-2756-79	Fe-16Cr-5Co-1.5Mo-2Ni-0.3V-0.15C-1W-0.3Nb	Forged and HR bars
16.	AE 962W	AE 962W	Ty 14-1-1642-76	Fe-12Cr-1.6Ni-1.8W-0.3V-0.4Mo-0.15C	Cold rolled sheets

Ferritic Stainless Steels - Stability, Corrosion Resistance, and Cost-Effectiveness

Ferritic stainless steels are corrosion-resistant alloys primarily composed of chromium (11–18%) with low carbon content and no or minimal nickel. They exhibit a ferritic (BCC) crystal structure at all temperatures and are inherently magnetic. These steels are known for their excellent resistance to stress corrosion cracking, good oxidation resistance, and thermal conductivity, making them ideal for both structural and thermal applications.

At MIDHANI, ferritic stainless steels are manufactured using Vacuum Induction Melting (VIM, VIR, AIM) followed by Electro Slag Remelting (ESR) or Vacuum Arc Remelting (VAR) to achieve high cleanliness and consistent mechanical properties. Post-forging, the steels undergo

annealing heat treatment, typically in the range of 750–800°C, to restore ductility, relieve internal stresses, and refine grain structure. Unlike martensitic grades, ferritic steels are not hardened by quenching and retain their ferritic microstructure throughout processing.

MIDHANI's ferritic stainless steels are used in automotive exhaust systems, heat exchangers, furnace components, structural supports, and electrical enclosures, especially where moderate corrosion resistance and thermal stability are required at an economical cost. Their scaling resistance at elevated temperatures also makes them suitable for high-temperature service environments. List of ferritic stainless steels produced in MIDHANI are mentioned in Table 5.

Table 5 - List of Ferritic Stainless Steels Developed In MIDHANI

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	MDN 446	AISI 446	ASTM A 276, DIN 1.4762	Fe-25Cr	Bars
2.	MDN 430	AISI 430	ASTM A 276, DIN 1.4016	Fe-17Cr	Bars

Maraging Steels - Ultra-High Strength with Excellent Toughness

Maraging steels are a class of ultra-high-strength, low-carbon steels that derive their strength from precipitation of intermetallic compounds during aging, rather than from carbon. Typically alloyed with nickel (15-25%), along with cobalt, molybdenum, titanium, and aluminum, maraging steels offer an exceptional combination of high yield strength (up to 2,000 MPa), good fracture toughness, dimensional stability, and excellent weldability-making them ideal for aerospace, missile, tooling, and nuclear applications.

At MIDHANI, maraging steels are manufactured using Vacuum Induction Melting (VIM) followed by Electro Slag Remelting (ESR) or Vacuum Arc Remelting (VAR) to ensure high purity and a fine, uniform microstructure. After forging and primary

shaping, the steels undergo a two-stage heat treatment: solution annealing at approximately 820–850°C, followed by aging at 480-510°C. This process results in precipitation of Ni₃Mo, Ni₃Ti, or other intermetallic compounds, dramatically increasing strength without compromising ductility.

MIDHANI's maraging steels are extensively used in rocket motor casings, aircraft landing gear, deep-drawing dies, jigs and fixtures, pressure vessels, and nuclear components, where predictable performance under extreme stress and fatigue is mandatory. The materials are supported by extensive mechanical testing, metallography, and ultrasonic inspection, ensuring compliance with military, aerospace, and nuclear-grade specifications. List of maraging steels produced in MIDHANI are mentioned in Table 6.

Table 6 - List of Maraging Steels Developed In MIDHANI

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	MDN 250A	Maraging C250 UNS K92890	MIL S46850D AMS 6512	Fe-18Ni-8Co-5Mo- 0.4Ti-0.10Al	Forged, hot rolled bars Forged, hot rolled Flats, Extruded tubes Ring Forgings, Sheets and strips
2.	MDN 300A	Maraging C 300 UNS K93160	MIL-S-46850D AMS6521	Fe-18Ni-9Co-5Mo- 0.6Ti-0.1Al	Hot rolled strips
3.	MDN2100	03N17K10V10MT/E P836	TU 14-1-4862-90	Fe-Ni17-10Co- 1.2Mo-0.8Ti-10W	Rods

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
4.	MDN 350	Maraging C350	MIL-S-46850D AMS 6515	Fe-18.5Ni-12Co- 4.9Mo-1.4Ti-0.1Al	Forged, hot rolled bars, extruded tubes
5.	MDN T250	Alloy T250 UNS K92150	MIL-S-47319 AMS 6519	Fe-19Ni-3Mo-1.4Ti- 0.1Al	Cast ingots, forged bars
6.	MDN 400	Maraging C400	DIN X2NiCoMo13-15-10	Fe-13Ni-15Co-10Mo- 1Ti	Forged bars

Soft Magnetic Materials

Soft magnetic materials are known for their characteristic ability to magnetize and demagnetize easily. Fe-Co alloys are high performance softmagnetic alloy due to its outstanding magnetic properties, including exceptionally high saturation magnetization and permeability. It finds applications in electrical motors, generators, transformers, and various aerospace and defense components. Poor

ductility and low workability poses challenges for the manufacturing of this alloy. Addition of small amount of Vanadium improves ductility. Midhani has vast experience in manufacturing softmagnetic materials such as Fe-Co-V alloys, low carbon soft iron etc. These grades are melted using vacuum melting techniques to achieve high degree of cleanliness.

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	Softcomag 49A	Permendur 2V/UNS R30005	ASTM A 801	Fe-49Co-2V	Bars, rods, Strips
2.	Soft iron	Magnetic iron/	ASTM A848	99% Fe	Bars, Rods, Strips

Controlled Expansion Alloys

Alloys that exhibit low rate of thermal expansion in a specified temperature range fall under the category of low expansion alloys and alloys that exhibit rate of thermal expansion similar to that of some materials such as glass/ceramics are called matching expansion alloys. They are primarily Fe-Ni alloys

and finds applications in areas where thermal stability is of utmost importance. Midhani has vast experience in manufacturing of various grades of controlled expansion alloys. They are primarily manufactured using vacuum melting techniques to maintain high degree of cleanliness.

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	FerCoNi	Kovar/UNS K94610	ASTM F15	Fe-29Ni-17Co	Bars, Rods
2.	Ferni 36	Invar 36/ UNS K93603	ASTM F1684	Fe-36Ni	Bars, Rods, Rings
3.	Ferni 31-5	Superinvar 32-5/ UNS K93500	ASTM F1684	Fe-32Ni-5Co	Bars, Flats
4.	FerNi39	Invar 39/T-39	ASTM B753	Fe-39Ni	Rings

High Permeability Alloys

They are primarily Ni-Fe alloys having high permeability characteristics and low hysteresis loss. Midhani has capability to manufacture and supply

various grades of high permeability alloys. These grades are vacuum melted to achieve high degree of cleanliness.

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	SoftMag 48B	Permalloy 48B/UNS, K94840	ASTM A 753, Alloy 2	Fe-48Ni	Bars/Rods
2.	SoftMag 78	UNS N14080	ASTM A 753	Fe-78Ni	Bars/Rods

Titanium Alloys

Titanium by virtue of its excellent corrosion resistance and high-strength to weight ratio finds application in the aerospace, chemical, petrochemical, marine, paper pulp, textile, food, dairy industries and bio-medical implants.

Titanium and its alloys are classified in to a) Commercially Pure Titanium b) Alpha & near alpha alloys c) Alpha-Beta alloys & d) Beta alloys based

on alloy's room temperature phase(s). MIDHANI manufactures all four types of alloys.

The processing of titanium alloys involves compaction of raw materials such as titanium sponge, master alloys. It is followed by plasma welding of compacts to form electrode, vacuum annealing, double/triple melting in vacuum arc furnace, forging/rolling, heat treatment & machining.

COMMERCIALLY PURE TITANIUM GRADES

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
01.	Titan 12	Grade 1 UNS No R50250 BT1-00	BS TA1, ASTM B265 ASTM B348, AMS 4940	Ti-0.2Fe-0.1C- 0.03N-0.180	Forged bar, Hot rolled bar Hot rolled plate, Cold rolled sheet, Cold rolled strip
02.	Titan 15	Grade 2, UNS No R50400, BT1-0	BS TA2, ASTM B265 ASTM B348, AMS 4902	Ti-0.3Fe-0.1C- 0.05N-0.250	Forged bar, Hot rolled bar Cold rolled sheet

ALPHA & NEAR ALPHA TITANIUM ALLOYS

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
01.	Titan 21ELI	Grade 6 BT5-1 UNS R54520 VT5-1	AMS 4924 OCT1-90266-78 OCT1-90173-75	Ti-5Al-2.5Sn	Forged bar Forged block Hot rolled bar Hot rolled plate
02.	Titan 22A	TA8DV Ti811 UNS R54810	AMS4972 AMS4973	Ti-8Al-1Mo-1V	Hot rolled bar
03.	Titan 11	PT1M	GOST 21945-76 GOST 22897-86	Ti-0.5Al	Pipes
04.	Titan 24	PT7M	TY 08.90-95	Ti-2.5Al-2Zr	Forged bar Tube
05.	Titan 26A	IMI 685	WIS-82 Equivalent to LA 202	Ti-6Al-5Zr-0.5Mo- 0.3Si-0.150	forged bar feedstock
06.	Titan 29A	IMI834	TTS RCMA(M)/141, Dated 03/01/2011 TTS RCMA(M)/142, Dated 17/01/2011	Ti-6Al-4Sn-3.5Zr- 0.7Nb-0.5Mo- 0.3Si-0.06C	Forged Bar feedstock hot rolled bar
07.	Titan 23A	OT4-1 GTM Ti OT4-1	OCT1-90218-76 GOST-22178-76 GTM-Ti-OT4-1/M-HS-1 OCT1-90173-75 OCT1-90266-72 OCT1-90107-75 GTM-Ti-OT4-1/M-HB	Ti-2Al-1Mn	Hot rolled bar Cold rolled sheet Forged bar

ALPHA-BETA TITANIUM ALLOYS

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
08.	Titan 31A	Ti-6Al-4V (Grade 1) Ti-6Al-4V (Grade 2) Grade 5 GTM Ti64 LT 31 GTM Ti64 IMI 318 BT 6/VT 6 UNS R56400	AMS 4928, AMS4911 AMS 6931 BS2TA 11 BS2 TA12 GTM-Ti-64/FS-2 (REV 2) OCT1-90173-75 OCT1-90006-86 DIN 65040 GTM-Ti-64/FS-1 (REV 2) OCT1-90107-73 GTM-Ti-64/M-HB-1 (REV 2)	Ti-6Al-4V-0.16O	Forged bar Forged flat Hot rolled bar Hot rolled flat Hot rolled plate Cold rolled sheet
09.	Titan 31ELI	Grade 23 UNS R56407	AMS 4907 AMS 4930 AMS 4931	Ti-6Al-4V-0.10	Forged bar Forged slab Hot rolled plate Ring
10.	Titan 32	Half Alloy Grade 9 R56620 PT3B	ASTM B265 AMS 4943 AMS 4944 AMS 4945 TY 1.5-357-95 OCT B5P-9325-2025	Ti-3Al-2.5V	Forged bar Ring Hot rolled plate Cold rolled sheet
11.	Titan BT3-1	BT3-1 VT 3-1	OCT1-90266-78 OCT1-90173-75 OCT1-90006-77 OCT1-90201-75 GTM-BT3-1/MILLFORMS- BARS	Ti-6Al-2.5Mo- 0.5Fe-0.2Si-1Cr	Hot rolled bar Forged disc
12.	Titan 35A	BT9 VT 9 GTM900	OCT1-90173-75 OCT1-90006-77	Ti-6Al-3Mo-1.5Zr- 0.25Si	Hot rolled Bar Hot rolled flat
13.	Titan 33A	BT20	GOST 23755-79	Ti-6Al-2Zr-1.5V- 1.5Mo	Forged slab HR plate
14.	Titan BT14	BT14	GOST 26492-85	Ti-5Al-3Mo-1.5V	Forged bar Forged block Hot rolled plate Cold rolled sheet

BETA TITANIUM ALLOYS

S. No	Grade	Trade Names/ Equivalent Grades	Applicable Specification	Typical Chemistry (Wt.%)	Form
1.	Titan 44	Grade 21 Timetal 21S Beta 21S UNS R58210	AMS 4897	Ti-15Mo-3Nb- 3Al-0.3Fe-0.2Si	Cold rolled sheet
2.	Titan 1023	Ti-10V-2Fe-3Al Ti1023 UNS R56410 Timetal 10-2-3	AMS 4983 AMS 4984 AMS 4986	Ti-10V-2Fe-3Al	Forged bar & Hot rolled bar

MELTING FACILITIES



Vaccum Induction Melting Furnace (VIM)



Air Induction Melting



Electric Arc Furnace (EAF)



Electron Beam Melting Furnace (EBM)



Vacuum Arc Re-melting (VAR)



Electron Slag Remelting (ESR)

FORGING FACILITIES

- Two column pull down 1500T press with two rail bound manipulators of 6T capacity.
- Four column push down 6000T/7000T Press with two rail bound manipulators. 20/25T capacity with isothermal attachment.
- 330/220T Radial axial ring rolling mill.
- 1250T Extrusion press.



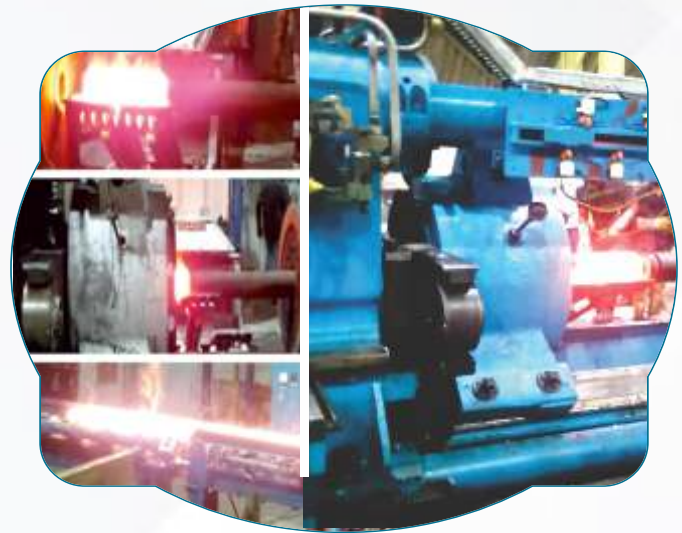
6000 T Forge Press



1500 T Forge Press



330/220T Radial Axial Ring Rolling Mill

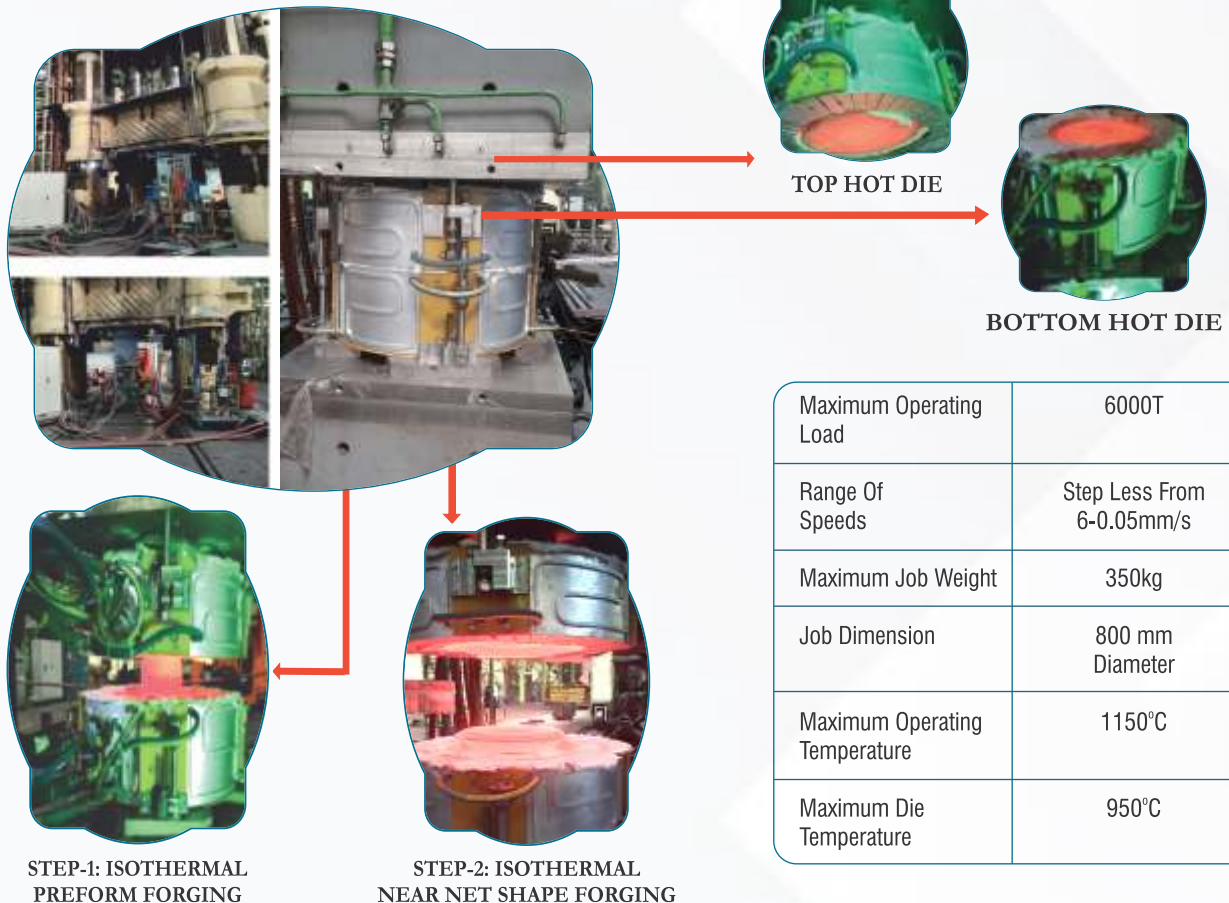


1250T Extrusion Press

FORGING CAPABILITIES

Form	Steel Alloys	Ti Alloys	Super Alloys
Forged bars	Min 100mm to Max 1200mm dia x 1m to 4m length	100mm to 600mm dia x 1m to 4m length	100mm to 350mm dia x 1m to 3m length
Disc	Dia 200 to 2000mm x Height 50mm to 600mm	Dia 200mm to 2000mm x 50mm to 300mm height	Dia 200mm to 2000mm x 70mm to 300mm length
Slabs	50mm to 500mm thick x 100mm to 1800mm width x 1000 to 4000mm length	70mm to 250mm thick x 150mm to 1800mm width x 1000 to 4000mm length	70mm to 250mm thick x 150mm to 1500mm width x 1000 to 3000mm length
Rings (saddle forging)	350mm to 1000mm OD x 60mm (min) Wall thickness x 80mm to 500mm Height	350mm to 1000mm OD x 60mm (min) Wall thickness x 80mm to 500mm Height	350mm to 1000mm OD x 60mm (min) Wall thickness x 80mm to 500mm Height
Rings (ring rolling)	1000 to 3500mm OD x 60mm (min) Wall thickness x 100mm to 600mm Height	1000 to 3500mm OD x 60mm (min) Wall thickness x 100mm to 600mm Height	1000 to 3500mm OD x 60mm (min) Wall thickness x 100mm to 600mm Height
Tubes	OD 300 to OD 1500 X 60mm (min) Wall Thickness x 2000-3000mm	OD 300 to OD 1000 X 70mm (Min) wall Thickness x 1000-2500mm	OD 300 to OD 1000 X 70mm (Min) wall Thickness x 1000-2500mm
Extruded Rods/Tubes	Rod : 40-70 mm Tube OD : 50-70mm Wall Thickness : 8-10mm		Rod : 40-70 mm Tube OD : 50-70mm Wall Thickness : 8-10mm

ISOTHERMAL FORGING FACILITIES



ROLLING FACILITIES

HOT ROLLING FACILITIES AND PRODUCT RANGE



Rolling Mill



Plasma Cutting Machine

Mill Facility	Input Size(mm)	Product Range(mm)	Capacity
Bar Mill	100Sq/100Dia	Rounds and RCS-30-75	Max Weight-85kg
Wire Rod Mill	45Sq/50Dia	Rounds 12-28 , 9-12 coils	Max Weight-20kg
Sheet Mill	90mm (max)	5 (T) x 1100 (W) Max	Max weight-100kg
Strip Mill	65X350mm (max)	6 (T) X 250-350 (W)	Max weight-100kg

RE HEATING/ANNEALING FACILITIES



Roller Hearth Furnace

Furnace Facility	Temperature Range	Size Range(mm)	Capacity
Roller Hearth Furnace	850-1200°C	0.5-15 (T) x 1100(W) x 3000(L)	Max Weight-150kg
Batch Roller Hearth Furnace	800-1050°C	6-10 (T) x 2300 (W) x 10000(L)	Max Weight-2000kg
Fixed Hearth Furnaces	800-1250°C	100Sq/100Dia/ 90x400 slabs	Max weight-1500kg

AUXILIARY FACILITIES

Facility	Size range that can be handled (mm)
Roller Leveller-BR50	0.5 TO 2(T) X1100(W)X3000(L)
Roller Leveller-BR100	2 TO 7(T) X1100(W)X3000(L)
Himalaya Hot/Cold Leveller	5-12(T)x500-2000(W)x 650-6000(L)
Stretcher Leveller	Max -7 (T)X 1100(W)X 3000(L)
Water Jet Cutting Machine	Max- 60mm(T)x1800(W)x2000(L)
Abrasive Cutting	Max-100Sq/100Dia

COLD ROLLING FACILITIES

Product & Size Range:

Sheet Form: 0.50mm To 7.0mm Thick X 500-1100mm Width X 500-3000mm Length

Stripform (cut To Length):

0.50mm To 5.0mm Thick X 80-250mm Width X 500-3000mm Length

Coil Form: 0.10mm To 4.0 To Mm Thick X 80-250mm Width (4.0mm To .50mm), 10-250mm Width (0.50mm To 0.10mm)x Coil



4HI MILL



6HI MILL



12 HI MILL

COLD ROLLING MILL FACILITIES

Mill	Product Range
6 Hi-Sheet Mill	Thickness 0.50mm To 7.0 Mm Width: 500mm To 1100mm Length: 500mm To 3000mm
4 Hi-Strip Mill	Thickness 2.0mm To 4.0mm Width: 80mm To 250mm Cut To Length: 500mm To 3000mm Coil Form: 1000 Od/max 500kg Wt.
12 Hi-Strip Mill	Thickness 2.0mm To 0.10mm (100 Microns) Width: 80mm To 230mm Cut To Length: 500mm To 3000mm Upto 0.50 Mm Coil Form: 1000 Od/max 500kg Wt. (0.50mm And Below)

ANNEALING FACILITIES

Furnace	Capacity
Bell Annealing	Max.temperature: 1000 °c, Atmosphere: Hydrogen/argon Furnace Capacity: 1-1.5ton. Coil Thickness: 6.0mm To 1.70mm
Continous Annealing	Max.temperature: 1125°c, Atmosphere: Hydrogen Coil Thickness: 1.70mm To 0.15 Mm
Vacuum Annealing	Max.temperature: 1250 °c, Atmosphere: Argon Dimensions/capacity: 700widths X 1200 Length X 800 Heights/1000kg Max.



Bell annealing Furnace



Continuous Annealing Line

PICKLING FACILITIES

PICKLING OPERATIONS

Intermediate Products: Slabs, plates, billets.

Finished Products: Rods, wires, sheets, and strips.

Facility Name	Category / Capabilities
Pickling Tanks	<ul style="list-style-type: none">• H₂SO₄ Tanks: Acid-resistant bricks with sulfur cement mortar• HCl Tanks: Brick-lined or PVC tanks• HNO₃ Tanks: Stainless steel• HNO₃ + HF Tanks: Carbon brick lined with carbon-filled mortar
Salt Bath Furnace (SBF):	<ul style="list-style-type: none">• Maintained at approx. 470°C• Enables efficient oxide removal• Used for:<ul style="list-style-type: none">• Superalloys (e.g., Superfer 800, Superco 605)• Titanium alloys (RT12, RT15)• Stainless steels (e.g., MDN304, 316, 321, 904L)• Special steels (MDN174, STA59, STA60)
Wide Plate Mill (WPM) Pickling facility	<ul style="list-style-type: none">• Specialized Facility for handling large plates• Capacity to pickle plates up to 13 meters in length and 4 meters in height• One of the largest pickling facilities in Asia for aerospace and defense-grade alloys• Enables surface cleaning of wide and long forged or hot rolled plates with precision• Integrated with downstream inspections and further processing operations

Process & Controls

- Materials are placed in specially designed cradles and dipped in acid baths.
- Use of spacers for uniform acid contact.
- High-pressure water rinsing follows pickling.
- Parameters like temperature and acid concentration are tightly controlled to ensure consistent quality.



Wide Plate Pickling Tank



Pickled plates

BAR & WIRE DRAWING FACILITIES

➤ B&WD SHOP PRODUCTS AND FACILITY



760 MM Single head Bull Block machines for cold wire drawing operation



6-BLOCKER STRAIGHT LINE MACHINE: Machine is used for Cold drawing with multiple reductions in single pass



Straightening, cutting and embossing machine for manufacturing of TIG/GTAW wires.



Bright annealing furnace/continuous annealing furnace. maximum annealing temperature: 1150°C
Annealing will be done in protective atmosphere with pure Hydrogen gas.



Layer Winding Machine: This machine is used for layer winding of fine GMAW wires.



Wet drawing machines to draw high strength wire

WIDE PLATE MILL

Capabilities:

- Walking Hearth Furnace
- High Pressure Descaler
- 4Hi Reversing Mill
- Hot Crop Dividing Shear
- Hot/Cold Plate Leveler
- Roller Hearth Furnace
- Roller Pressure Quenching
- Tempering
- Shot Blasting
- Pickling
- Plasma cutting



PRODUCT MIX: The following product mix shall be offered for maximum width of plate for given thickness range from MIDHANI as per table given below:

WPM - FEASIBLE PRODUCT MIX

The below table indicates maximum width that can be offered for given thickness range in respective alloy group; values indicated in the table units are in 'mm'

Thickness range	Low Alloy Steel	Stainless Steel	Special Steels	Titanium Alloys	Super Alloys
6 to <8	2500	2500	2000	1500	1250
8 to <10	2500	2500	2500	2000	1500
10 to <16	3000	3000	2500	2000	1500
16 to <25	3000	3000	3000	2500	1500
25 to 50 & above	3000	3000	3000	2500	2000

* MIDHANI can offer 4mm thickness plates for a width upto 1000mm as well for special applications.

Tolerances shall be as per international standard or mutually agreed. Minimum thickness tolerance shall be offered (upto thickness 20mm) is +/-0.3mm and more than 20mm, thickness tolerance will be more than +/-0.5mm. However, further controlled dimensional tolerances shall be offered based on requirement.



INVESTMENT CASTING FACILITIES



Vacuum Precision Investment casting furnace
(VPIC, 60Kg)

- Midhani is equipped with biggest vacuum arc skull melting furnace of India. Procast simulation software is also available.
- **Furnace Capacity:-** 300 Kg of liquid metal (Titanium)
- **Casting capacity:-** 180 Kg of Titanium component
- **Vacuum level:-** 5 micron
- **Special feature:-** Turntable facilities to give centrifugal effect while pouring the liquid metal. It helps to fill the shell / mould faster to avoid defects in casting. It also helps in manufacturing of critical components.



Vacuum Precision Investment casting furnace
(VPIC, 60Kg)

- **Furnace capacity:-** 60 Kg (Super alloy liquid).
- **Casting capacity:-** From few grams to 250 kg super alloy.
- **Vacuum level:-** 10 micron.
- **Special feature:-** Online shell / mould heating facility for uniform heating and inclusion free casting.

Products

Vacuum Investment castings	Titanium alloy investment castings: Valves, hub wheel, casting Super alloy castings (Equiaxed): Impellers, Valves, Hub, Blades Vacuum Grade Steel castings: Impellers, Valves Casting for Isothermal Forging Die
Master Ingot for super alloys	Cast sticks / bars, Diameter 50 – 200 mm

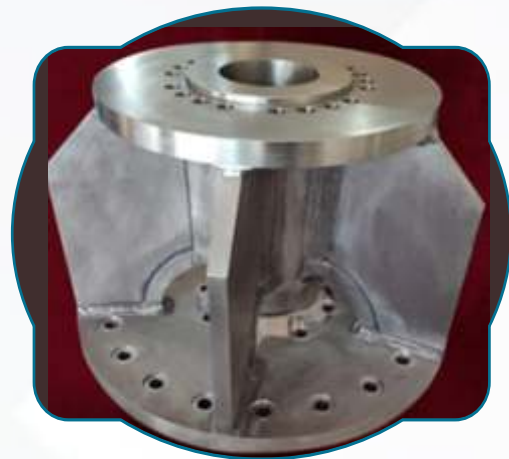
Manufacturing Capabilities

Type of castings	Size (mm)	Weight
Super Alloys & Special Steel	Up to 300 mm diameter	Up to 25 Kg (Single Piece)
Titanium Alloy	Up to 800 mm diameter	Up to 180 Kg (Single Piece)
Casting for Isothermal Forging Die (In VIM 600 Kg)	Up to 800 mm diameter	Up to 700 Kg (Single Piece)
Master Ingots of Super Alloys (In VIM 2.5 T)	Bar Diameter 50 – 200 mm	Batch size up to 1500 Kg

Material Grade

Material Family	Grades
Titanium alloys	Ti6Al-4V, BT5-1, Half Alloys, RT 15etc
Super alloys	SNi706, SNi750MW, SNi100, IN718, IN713C, C-276, SNi80A, ZS6Y, Stellite-6, BZL6Y, SC247 and other DS Super Alloys
Special steels	Vacuum Grade Special Steel
Low Alloy steels	15CDV6, EN8, EN24
High Entropy alloys	Iron base & Vanadium base

Largest Titanium Casting - ADAPTOR



Indegeneous development, Finish weight is 180 kg

AEROSPACE FASTENERS MACHINERY

WARM PROGRESSIVE HEADER MACHINE

- Range : 100 – 200PPM & Wire Dia 3mm – 12mm.
- 5 Dies & Punches with Length cutting provision.
- Two Induction Heaters-customized to use either/neither/both depending on the operational requirement.
- Temperature Monitoring & Load detection.



WARM THREAD ROLLING MACHINE

- Product Size: M4-M10
Shank length 130 mm (Max.)
Thread length 100 mm (Max.)
- Induction Heater
- Temperature Monitoring & Load detection



HEAD TURNING AND DRILLING MACHINE



Facility Overview

Our state-of-the-art manufacturing facility boasts cutting-edge machinery, including fully automated warm/hot head forging, thread rolling, and fillet rolling machines. These advanced technologies ensure precision, efficiency, and consistency in every fastener produced, meeting the exacting standards of the aerospace industry.

WARM PROGRESSIVE HEADER MACHINE



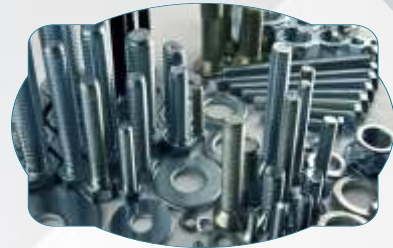
- COLD FORGING**
- HOT FORGING, THREAD ROLLING**
- DRILLING, CNC MACHINING**
- VERTICAL MILLING MACHINES**
- CNC CENTERLESS GRINDING**
- COLD WORKING - FILLET**
- HEAT TREATMENT**
- NADCAP Certified,**
- SURFACE TREATMENT**
- NADCAP Certified**
- NON- DESTRUCTIVE TESTING**
- NADCAP Certified**
- QUALITY TESTING**

WARM THREAD ROLLING MACHINE



SPECIAL STEEL FASTENERS:

Leveraging our expertise in metallurgy, we produce special steel fasteners engineered to withstand extreme conditions encountered in aerospace operations.



TITANIUM FASTENERS:

With a focus on lightweight yet robust solutions, our titanium fasteners offer exceptional strength-to-weight ratios, ideal for aerospace applications where weight reduction is critical.

Pure Titanium, Ti 6Al-4V and Ti 6Al-4V ELI, Ti-Pd, and TiCode 12 are the most common titanium alloys used in industry.

Titanium alloys is a blend of properties of steel and aluminum and are used in such varied applications as satellites, airplanes, cryogenic storage vessels, seawater pumps, pulp and paper production, yachts, jewelry, eyeglass frames, golf clubs, high current superconductors, off-shore drilling equipment, dental implants, and hip and knee replacements.

- Pure Titanium (Grades 1-4)
- Ti 6Al-4V (Grade 5) & Ti 6Al-4V ELI (Grade 23)
- Ti – Pd (Grade 7)
- Ti Grade 12



MIDHANI is the world class supplier of specialty alloy fasteners, precision components, fittings and mill products made out of the highest quality specialty metals. We provide products made to industry standards or to exact customer specifications.

Products are available in the following Specialty Alloys:

Titanium and Titanium Alloys (CP-Ti, Ti 6Al-4V, Ti 6Al-4V ELI, Ti-Pd Gr 7, Ti Gr 12)

Our fastener range includes all hexagon and socket type fasteners, stud and washers.

Size Range: M3 (1/8") to M36 (1 1/2") diameters machined from stock bar.

All our Titanium fasteners come complete with full test certification.



SUPERALLOY FASTENERS:

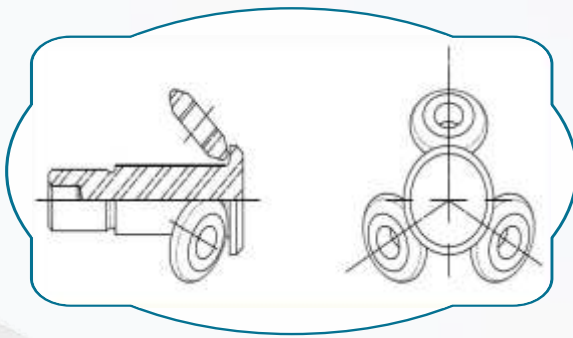
Our proficiency in working with superalloys enables us to deliver fasteners capable of withstanding high temperatures, corrosive environments, and other challenging conditions inherent in aerospace engineering.



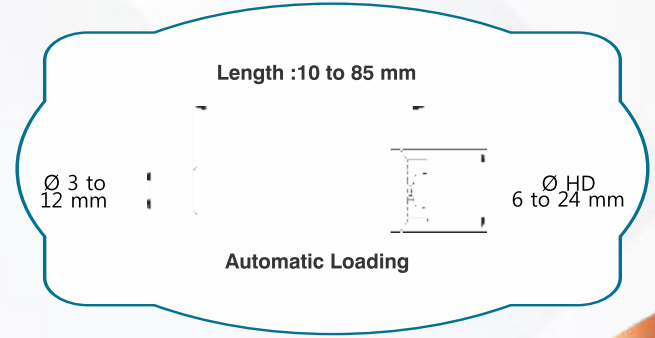
FILLET ROLLING MACHINE



TWIN SLIDE LATHE MACHINE



HEAD TURNING AND DRILLING MACHINE



SPRING PLANT

Major Facilities

- ◆ Spring Coiling Machine
- ◆ Scragging Machine
- ◆ End tapering machine
- ◆ Walking Beam Furnaces
- ◆ End heating furnace
- ◆ Tempering furnace
- ◆ Quenching Facility
- ◆ End Grinding Machine



Spring manufacturing facility for production of various springs required by Indian Railways and OFB.

Railways: Diameters ranging from 18mm to 70mm. for wagons ranges from 18mm to 24 mm diameter, for Coaches up to 56mm and for Locomotives up to 70mm. They are manufactured by hot coiling process, wherein the rods are heated in a furnace, coiled on a mandrel, quenched and tempered, ends ground, and tested to withstand loads....

PRODUCTS MADE UNDER ATMA NIRBHAR BHARAT



High pressure valve casing for AUSC made of Nickel based super alloy (SN 617CC) through open die forging

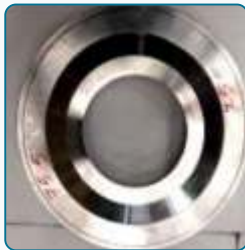


Zircaloy tubes OD 570 X ID 395 X L 3500 mm

➤ HIGH PRESSURE COMPRESSOR DISCS MADE OF TITANIUM 26A



Stage 1



Stage 2



Stage 3

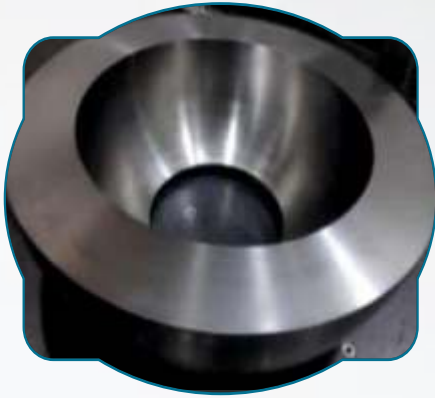


Stage 4



Stage 5

TITAN31 ELI LARGE SIZE FORGINGS FOR SAMUDRAYAAN



Dummy pressure hull forging



RING- 2240ODX ID2040 X 400HT



Top hatch forging

TITAN31 (Ti64) CONICAL FORGING



Near net shaped forging



Machined components

EXTRUSION CONTAINER



195 Dia container made of Iron based super alloy SF 286 & adaptor

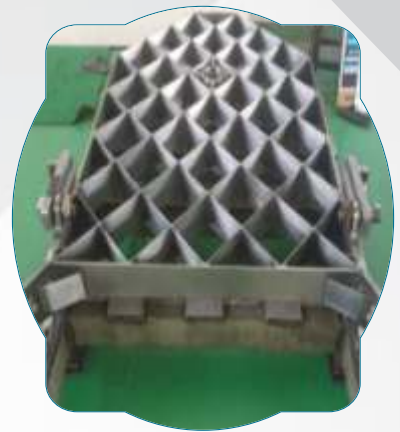


Adaptor (made of Titanium Grade 9) is a critical component for assembly and requires load bearing capacity for different shock and load conditions

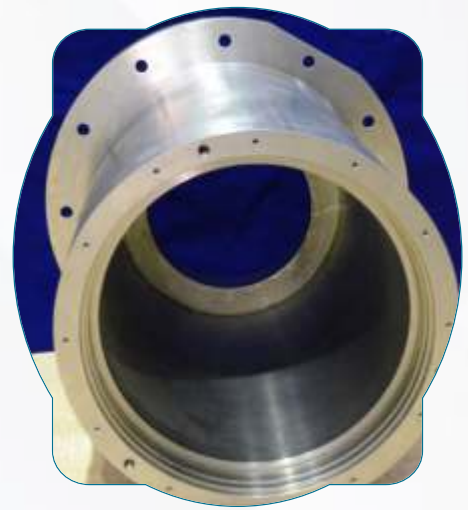
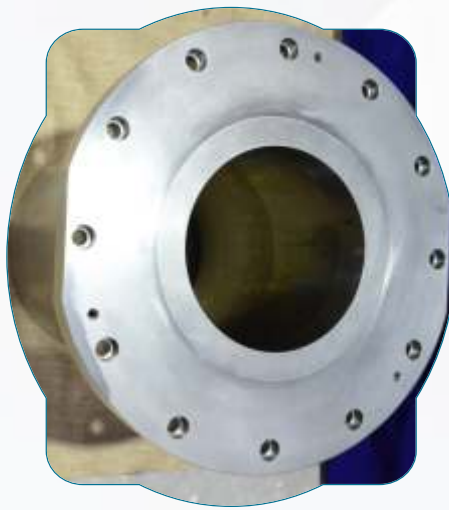
CABLE CHANGING BOX
CP Titanium Grade 2



Titan 31 ELI - Forged Slab



HOUSING
CP Titanium Grade 2



Training shaft



Special ring nut

ARMOURING SOLUTIONS



Bullet Proof Helmet



Bhabha Kavach-India's Lightest BR Jackets



Bullet Proof (BP) Morcha



Bullet Proof Vest



Light Weight Body Armour (LWBA) with DWD and QR



Bullet Proof Helmet



Bullet Proof Light Motor Vehicle (BPLMV) "Shaurya" with run flat tyre system to support operations of Defence Forces, State Police Organizations and CAPFs

R&D CAPABILITIES

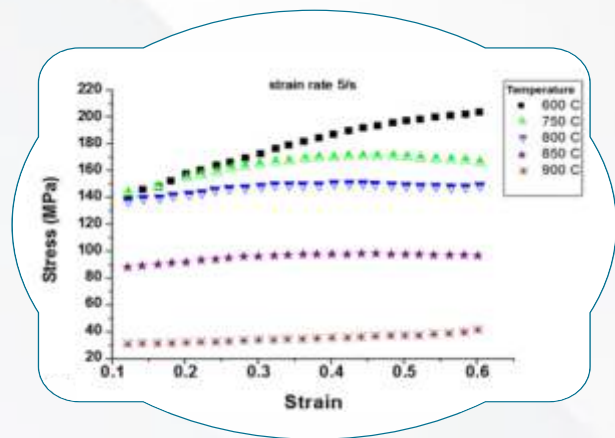
Gleeble Simulation – Precision testing for metallurgical excellence

MIDHANI utilizes the advanced Gleeble Thermo-mechanical simulation system to replicate and analyze complex industrial processes such as hot deformation, welding, heat treatment, and phase transformation under controlled laboratory conditions. This state-of-the-art equipment allows simulation of real-world thermal and mechanical cycles experienced by steels during forging, rolling, or welding—helping to optimize process

parameters, predict material behavior, and fine-tune alloy development. The Gleeble is instrumental in studying dynamic recrystallization, grain growth, stress-strain response, and transformation kinetics, ensuring that MIDHANI's special steels meet stringent performance requirements. By integrating Gleeble-based insights into alloy design and processing, MIDHANI enhances product reliability, structural integrity, and process efficiency, reinforcing its position as a leader in metallurgical innovation.



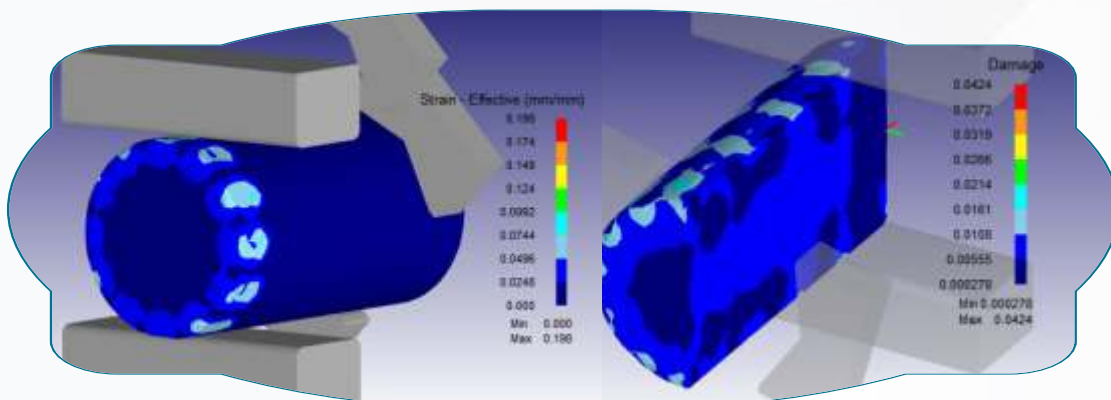
Gleeble test facility



Flow stress data at different temperatures generated.

The data generated by **Gleeble Thermo-mechanical simulation system** will be used in **FEM simulation software** for precise simulation results. MIDHANI has **DEFORM simulation tool** for FEM simulations of metal forming processes.

DEFORM Simulation – Intelligent Forging and Process Optimization



Simulation of forging of heavy section of a superalloy

At MIDHANI, DEFORM (Design Environment for Forming) software is a key tool for thermo-mechanical process simulation, used to optimize forging, rolling, extrusion, and heat treatment operations. This advanced Finite Element Analysis (FEA) based platform allows engineers to model metal flow, strain distribution, temperature gradients, grain size evolution, and defect prediction during deformation processes. By simulating real-world conditions, DEFORM helps in tool

design, die life estimation, load prediction, and the elimination of trial-and-error in production. Its use is crucial for reducing material wastage, energy consumption, and production costs, while ensuring microstructural uniformity and dimensional accuracy. With DEFORM integrated into MIDHANI's R&D workflow, the manufacturing of critical aerospace, defense, and nuclear-grade steels and alloys is guided by science-backed precision and innovation.



Scanning Electron Microscope (SEM) – Unveiling Microstructural Precision

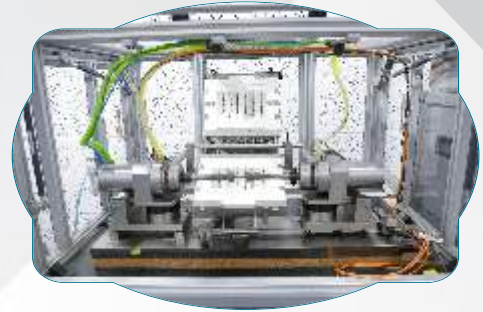
At MIDHANI, Scanning Electron Microscopy (SEM) plays a vital role in the microstructural characterization and quality assurance of special steels and superalloys. SEM provides high-resolution imaging at magnifications far beyond optical microscopes, enabling detailed analysis of grain structure, phase distribution, precipitates, fracture surfaces, and inclusions. Coupled with Energy Dispersive X-ray Spectroscopy (EDS), it also allows precise elemental mapping and

compositional analysis at micro- and nano-scales. This advanced capability is essential for evaluating the effects of heat treatment, welding, and deformation, and for conducting failure analysis. By using SEM in alloy development and process optimization, MIDHANI ensures that its materials meet the highest standards of metallurgical integrity and performance, especially in mission-critical aerospace, defense, and nuclear applications.

QUALITY CONTROL

Mechanical Testing

Tensile Test
Fracture Toughness Test
Hardness Test
Impact Test
Low Cycle Fatigue Test
Stress/ Creep Rupture Test
Rotating Bend Fatigue Test



Chemical Testing

Optical Emission Spectrometer
Carbon & Sulphur Analyzer
Oxygen/Nitrogen/Hydrogen Analyzer
X-Ray Fluorescent Spectrometer
Inductive Coupled Plasma - Atomic Emission Spectrometer
Atomic Absorption Spectrometer



Metallography Testing

Inverted Metallurgical Microscope
Ferritoscope
Macro Etching
X-Ray Diffractometer



Non-Destructive Testing

Ultrasonic Test
Immersion Ultrasonic Test
Dye Penetrant Test
Magnetic Particle Inspection
Fluorescent Penetrant Test
Radiography



MECHANICAL TESTING AND STANDARDS FOLLOWED

Test	Capacity	Test Standards
Tensile test	5kN, 100kN, 200kN, 250kN, 300kN & Temp range -70°C to 1200°C	ASTM E8/E8M, ASTM E21
Fracture Toughness test	Room Temperature (Max. capacity: 100kN)	ASTM E399
Hardness test	Brinell, Vickers, Rockwell, Leeb's Hardness	ASTM E10, E92, E18 & A956
Impact Test	Charpy : 300 Joules, 216ftlbs Temp Range: -196° Izod : 164°C to RT	ASTM E23
Low Cycle Fatigue Test	Temp range: RT to 1200°C Max Frequency : 2Hz	ASTM E 606
Stress/Creep Rupture Test	Max Operating Temp: 980°C, Max. Load: 30kN	ASTM E139/ E292
Rotating Bend Fatigue Test	Max. Capacity : 100Nm	BS 3518

CHEMICAL TESTING AND STANDARDS FOLLOWED

Optical Emission Spectrometry	Analysis of Fe, Ni, Co & Ti Alloys	ASTM E2209, E415, E2994, E3047
Carbon & Sulphur Analysis	C- 2ppm to 6% and S-2ppm to 3%	ASTM E1019
Oxygen-Nitrogen-Hydrogen Analysis	O – 5ppm to 6%, N- 5ppm to 6% & H- 0.5ppm to 1%	ASTM E1019, E1409 & E1447
ICP-Atomic Emission Spectrometry	All trace elements-0.5ppm(Min.)	ASTM E2594 & E2371
Atomic Absorption Spectrometry-GF & Flame	Se, Pb- 10ppb (Min.)	ASTM E1834 & E1835
Corrosion Test	IGC Practice	ASTM A262



METALLOGRAPHIC TESTING AND STANDARDS FOLLOWED

Test	Capacity	Test Standards
Non Metallic Inclusion Rating	Mag: 100X A,B,C,D inclusions upto Severity 3	ASTM E 45, GOST 1778 & DIN50602
Grain Size	Mag: 100X	ASTM E 112, ASTM E 1181, ASTM E 930& GOST 5639
Delta Ferrite	Upto 100%	ASTM A 800
Decarburisation layer measurement	upto 2mm	ASTM E 1077
Micro analysis	Mag: 100X,200X,500X,1000X	AMS 2380, GOST 26492, ASM Handbook Vol.9, ETTC2&ETTC4
Macro etching	Mag 1X	ASTM A 604, ASTM E 381, GOST 10243, AMS 2380 & GOST 26492
Volumetric Delta ferrite	Percentage (%): 0 to 20	GOST 26364
IGC Practice A	Step, Dual and Ditch	ASTM A 262
Retained Austenite Measurement	Percentage: up to 100	ASTM E 975

NON DESTRUCTIVE TESTING AND STANDARDS FOLLOWED

Test	Capacity	Test Standards
Immersion UT For bars	10 mm dia to 60 mm diameter- 4 meters Length 160 mm diameter – 2 meters Length (0.8mm FBH sensitivity)	AMS 2630, 2631, 2154
Immersion UT For Discs & Plates	Disc – 150mm diamer to 1500 mm diameter Plates – 3 Meters x 3 meters (0.4 mm Sensitivity)	AMS 2630, 2631, 2154
Conventional UT	Bars, rings, Slabs, all other products – (0.8 mm FBH Sensitivity, E notch sensitivity)	
MPI	300 Mm diameter – 6 Meters Length Bars (AC , HWDC, 10000A FWDC Currents)	ASTM 1444
FPI	2 Meters (L) X 2 meters (Width)- 10 Microns Sensitivity	ASTM 1417
RT X-ray 320 kV	Titanium – 80 mm thick Jobs can be covered with 0.08mm Least IQI wire -ASTM set A	ASTM E192, ASTM E 446 ASTM E 1320

QUALITY EXCELLENCE



दिनांक / Date: 27-10-2025



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