VDM Metals

Alloys for the

Oil and Gas Industry

Materials for the future.

Tough demands are our business

During the past eight decades, VDM Metals has developed into a world market leader for high-performing metallic materials covering the widest product and service portfolio in the industry. The quality of our products and services is based on our integrated production chain in Germany and the United States and a sales network that spans the globe servicing the most demanding industries backed by a strong R&D and Application Engineering force.

VDM Metals produces high-performance alloys for the use in extreme conditions – high temperatures, icy waters, soaring heights and deep underground. Our materials are made to last, resisting heavy mechanical, thermal and chemical stresses, sometimes all three simultaneously. In many key technologies alloys from VDM Metals are indispensable for the industrial-scale implementation and safe control of mission-critical processes in hot or corrosive environments.

Strategic investments, mergers and acquisitions have made the company one of the world leaders in the production of nickel and cobalt alloys, zirconium and special stainless steels. Our production sites can draw on extensive metallurgical know-how and long standing experience in the production of long and flat products as well as welding filler metals.

Focus on safety and reliability
In oil and gas engineering, safe and reliable operations are always the top priorities. Corrosive media, temperature differences and mechanical loads place enormous demands on all components. General corrosion resistance in a wide range of media, both oxidizing and reducing, resistance to stress-corrosion cracking, pitting and crevice corrosion are just some of the features our materials can offer.

Quality control
Materials made by VDM Metals pass through especially stringent quality control. We perform extensive testing on each single product according to the respective customer specifications which define physical and mechanical properties as well as corrosion behavior, thus contributing to safe and reliable operations.

At a very early stage, we established quality assurance as the overriding principle and developed it into a quality management system with in-process checks and inspections. This is closely linked to our continual improvement processes for optimizing all operating procedures.

We are where you need us to be
A globally operating sales organization, working in close cooperation with strategically situated service centers, ensures optimum customer proximity and a significant footprint in all key regions and markets.

The result of our efforts: efficient processes as well as maximum purity, homogeneity, reproducibility and optimized processing characteristics of our products. Thus, our offering is nothing less than premium materials in any form needed as well as first class services, available anywhere in the world, right on time.

Materials for highly demanding applications

VDM Metals is offering high-performance alloys in the product forms plate, sheet, strip, rod, bar and wire. All products exhibit excellent fabricability into tubes, pipes, fittings, flanges, tooling etc. which are subsequently manufactured into the different pieces of equipment required by the oil and gas industry in upstream and midstream applications.

Crude oil and natural gas are organic mixtures with widely varying compositions, depending on their deposits. The standard components of crude oil include hydrocarbons and sulphur, oxygen and nitrogen compounds. Natural gas consists of methane, ethane, propane and other secondary constituents such as sulphuric acid. Resistance to pitting, crevice and stress corrosion is therefore one of the most important characteristics of materials used in the production of oil and gas. For more than three decades, VDM Metals has been a reliable supplier of high-value nickel alloys to the oil and gas industry.

The worldwide supply of energy will continue to rely on petroleum and natural gas extraction for a long time to come. To ensure the long-term availability of these fossil fuel reserves, extraction rates at existing oil and gas wells are continually being improved through deep drilling and the use of secondary and tertiary extraction methods. The efforts to explore new deposits and their development have been intensified. The search for new deposits is becoming increasingly difficult, with future oil and gas production requiring ever more advanced extraction techniques. However, nickel alloys and special stainless steels produced by VDM Metals will continue to contribute to keeping the world supplied with fuel and energy.

Upstream applications
In the upstream segment these materials are used as pressure tubes in umbilicals, in flowlines, riser pipes, valve systems, wire lines and subsea bandings.

Rods and bars (forged, rolled and drawn), produced for example from VDM® Alloy 718, VDM® Alloy 625 and VDM® Alloy K-500, are used in many different areas, including the manufacturing of hanger and packer systems, completion tools and pump shafts.

Midstream applications
Hot or cold rolled plate or sheet metal and strip in coils produced by VDM Metals are used in the manufacture of long-seam welded pipes, as well as flanges and fittings. Sheet and plate are available in lengths up to 39 ft (12 m), depending on the thickness and width of the plate as well as alloy type. Additionally, we are supplying forged billets used as pre-materials for seamless tubes and pipes in the casing and tubing segment, as well as for sub-sea control units.

Welding consumables
Weld cladding with strip and wire electrodes has a firm place in the oil and gas industry as well as in the construction of chemical apparatus and plants. As only the surfaces are susceptible to corrosion, the weld cladding of corrosion resistant materials onto unalloyed or low-alloy steels helps reduce material costs. Many VDM materials such as VDM® Alloy 625 or VDM® Alloy 825 are suitable for weld cladding (deposition welding), e. g. to protect welded pipes made of a low-alloy base material against corrosion.

In general, welding techniques play a vital role in the research and development work at VDM Metals, given its position as manufacturer of special products for corrosion protection and also as an expert for all types of joint welding. We are offering wires on standardized spools, special spools or in various barrel types as well as strips in coils and rods in quivers. Our welding wires are suitable for automatic and semi-automatic gas shielded processes and submerged arc welding.

Alloys & specifications

Common alloys and standard specifications*

VDM Metals designation	UNS	DIN EN	Typical chemical composition, in %	Specification	Product form				
					Billet	Bar	Plate	Wire	Strip
VDM® Alloy 22	N06022	2.4602	Ni-21Cr-13.5Mo-3Fe-3W		•	•	•	•	•
				ANSI/NACE MR0103			•		•
				ANSI/NACE MR0175/ISO 15156-3	•	•	•		•
				ASTM-B-/ASME-SB-574	•	•			
				ASTM-B-/ASME-SB-575			•		•
				DIN 17744			•	•	•
				DIN 17750			•		•
				DIN 17753				•	
				VdTÜV data sheet 479	•	•	•		•
VDM® Alloy 33	R20033	1.4591	Cr-32Fe-31Ni-1.6Mo-0.7Cu-0.4N		•		•	•	•
				ASTM-B-/ASME-SB-625			•		•
				ASTM-B-/ASME-SB-649	•			•	
				VdTÜV data sheet 516	•		•		•
VDM® Alloy 59	N06059	2.4605	Ni-23Cr-16Mo		•	•	•	•	•
				ANSI/NACE MR0175/ISO 15156-3	•	•	•		•
				ASTM-B-/ASME-SB-574	•	•			
				ASTM-B-/ASME-SB-575			•		•
				DIN 17744	•	•	•	•	•
				DIN 17750			•		•
				DIN 17752	•	•			
				DIN 17753				•	
				VdTÜV data sheet 505	•	•	•		•
VDM® Alloy 400	N04400	2.4360	Ni-32Cu-1.5Fe-1.0Mn		•	•	•	•	•
				ANSI/NACE MR0103			•		•
				ANSI/NACE MR0175/ISO 15156-3	•	•	•		•
				ASTM-B-/ASME-SB-127			•		•
				ASTM-B-/ASME-SB-164	•	•		•	
				DIN 17743	•	•	•	•	•
				DIN 17750			•		•
				DIN 17752	•	•			
				DIN 17753				•	
				QQ-N-281D Amd. 2/Class A/Form 1	•	•			
				QQ-N-281D Amd. 2/Class A/Form 4			•		
				QQ-N-281D Amd. 2/Class A/Form 6			•		
				VdTÜV data sheet 263	•	•	•		
VDM® Alloy 405	N04405	2.4360	Ni-1Fe-32Cu-1Mn		•	•			
				ANSI/NACE MR0175/ISO 15156-3	•	•			
				ASTM-B-/ASME-SB-164	•	•			
				QQ-N-281D Amd. 2/Class A/Form 1	•	•			
VDM® Alloy 625	N06625	2.4856	Ni-21.5Cr-9Mo-3.5Nb		•	•	•	•	•
				ANSI/NACE MR0103			•		•
				ANSI/NACE MR0175/ISO 15156-3	•	•	•		•
				API 5LD			•		•
				ASTM-B-/ASME-SB-443			•		•
				ASTM-B-/ASME-SB-446	•	•			
				DIN 17744	•	•	•	•	•
				DIN 17750			•		•
				DIN 17752	•	•			
				DIN 17753				•	
				VdTÜV data sheet 499	•	•	•		•

• Available product forms.

* Complete list of available alloys on request.

VDM Metals designation	UNS	DIN EN	Typical chemical composition, in %	Specification	Product form				
					Billet	Bar	Plate	Wire	Strip
VDM® Alloy 690	N06690	2.4642	Ni-29Cr-9Fe		•	•	•		
				ASTM-B-/ASME-SB-166	•	•			
				ASTM-B-/ASME-SB-168			•		
				DIN 17742	•	•	•		
				DIN 17750			•		
				DIN 17752	•	•			
VDM® Alloy 718 CTP	N07718	2.4668	Ni-19Cr-17Fe-3Mo-5Nb-1Ti-0.5Al		•	•	•	•	•
				ANSI/NACE MR0175/ISO 15156-3	•	•			
				API 6A CRA**	•	•			
				ASTM-B-670			•		•
				DIN 17744	•	•	•	•	•
				DIN 17750			•		•
				DIN 17753				•	
VDM® Alloy 825	N08825	2.4858	Ni-30Fe-23Cr-3Mo-2Cu-0.9Ti		•	•	•	•	•
				ANSI/NACE MR0103			•		
				ANSI/NACE MR0175/ISO 15156-3	•	•	•		•
				API 5LD			•		•
				ASTM-B-/ASME-SB-424			•		•
				ASTM-B-/ASME-SB-425	•	•			
				DIN 17744	•	•	•	•	•
				DIN 17750			•		•
				DIN 17752	•	•			
				DIN 17753				•	
				VdTÜV data sheet 432	•	•	•		•
VDM® Alloy 925	N09925	2.4852	Ni-20Cr-29Fe-3Mo-2.2Ti-2Cu-0.3Al		•	•			
				ANSI/NACE MR0175/ISO 15156-3	•	•			
				API 6A CRA**	•	•			
VDM® Alloy 926	N08926	1.4529	Fe-25Ni-20Cr-7Mo		•	•	•	•	•
				ANSI/NACE MR0175/ISO 15156-3			•		•
				API 5LD			•		•
				ASTM-B-/ASME-SB-625			•		•
				ASTM-B-/ASME-SB-649	•	•		•	
				DIN EN 10028-7			•	•	•
				DIN EN 10088-2			•	•	•
				DIN EN 10088-3	•	•			
				VdTÜV data sheet 502	•	•	•		•
VDM® Alloy C-276	N10276	2.4819	Ni-16Cr-16Mo-5Fe-4W		•	•	•	•	•
				ANSI/NACE MR0103			•		•
				ANSI/NACE MR0175/ISO 15156-3	•	•	•		•
				API 5LD			•		•
				ASTM-B-/ASME-SB-574	•	•			
				ASTM-B-/ASME-SB-575			•		•
				DIN 17744	•	•	•	•	•
				DIN 17750			•		•
				DIN 17752	•	•			
				DIN 17753				•	
				VdTÜV data sheet 400	•	•	•		•
VDM® Alloy K-500	N05500	2.4375	Ni-30Cu-2.7Al-1Fe-1Mn-0.6Ti		•	•			
				ANSI/NACE MR0175/ISO 15156-3	•	•			
				ASTM-B-865	•	•			
				DIN 17743	•	•			
				DIN 17752	•	•			
				QQ-N-286G	•	•			

• Available product forms. ** Strength level on request.

Alloys & specifications

Welding consumables**

VDM Metals designation	UNS	DIN EN	Typical chemical composition, in %	Specification	Product form		
					Rod	Wire	Strip
VDM® FM 33	R20033	1.4591	Ni-33Cr-32Fe-1.5Mo-0.8Cu-0.4N	AWS A5.9 ER33-31, TÜV	•	•	
VDM® FM 59	N06059	2.4607	Ni-22.5Cr-0.5Fe-15.5Mo	AWS A5.14 ERNiCrMo-13, EQNiCrMo-13, TÜV, ABS, FBTS (Wire)	•	•	•
VDM® FM 60	N04060	2.4377	Ni-1Fe-29Cu-3.2Mn-2.4Ti	AWS A5.14 ERNiCu-7, TÜV, ABS	•	•	
VDM® FM 61	N02061	2.4155	Ni-3.3Ti	AWS A5.14 ERNi-1, TÜV, ABS	•	•	
VDM® FM 67	C71581	2.0837	Ni-0.6Fe-67Cu-0.7Mn	AWS A5.7 ERCuNi, TÜV, ABS	•		
VDM® FM 82	N06082	2.4806	Ni-21Cr-1Fe-3.2Mn-2.5Nb	AWS A5.14 ERNiCr-3, EQNiCr-3, TÜV, ABS (Wire)	•	•	•
VDM® FM 625	N06625	2.4831	Ni-22Cr-0.5Fe-9Mo-3.5Nb	AWS A5.14 ERNiCrMo-3, EQNiCrMo-3, TÜV, ABS, FBTS (Wire)	•	•	•
VDM® FM C-276	N10276	2.4886	Ni-16Cr-6Fe-16Mo-3.5W-0.5Mn-0.2V	AWS A5.14 ERNiCrMo-4, EQNiCrMo-4, TÜV (Wire)	•	•	•

• Available product forms.

** Please find further detailed information in our welding consumables catalog.

Integrated production

VDM Metals has more than 85 years of experience in designing and producing materials of the highest quality standards. The company operates production sites in Germany and the United States, covering the majority of important production steps – from melting to hot forming to cold forming.

Our objectives are to meet our customers' requirements, be able to carry out every step in the production chain in-house, respond flexibly to customer needs and guarantee maximum delivery reliability. Our modern and extremely versatile range of facilities means that VDM is optimally equipped to keep pace with present and future market demands and challenges. According to the philosophy of lean manufacturing, best practices and a robust production process, all our equipment features state-of-the-art process data acquisition for maximum productivity and reproducible product quality.

Melting and casting
VDM's nickel alloys and special stainless steels are melted in an electric arc furnace or an electric induction furnace (i.e. the 30-ton furnace) and then subjected to vacuum treatment. A ladle furnace is available for secondary metallurgical treatment. Casting takes place in a vertical continuous caster or by ingot casting. In addition to the conventional technology electric furnace-vacuum treatment, VDM uses the technology of vacuum induction melting (VIM). The homogeneity and purity of our materials can be enhanced by electroslag (ESR) or vacuum arc remelting (VAR).

The cast and/or remelted slabs and ingots serve VDM Metals as starting material for the production of sheet and plate, strip, bars and rods, welding consumables and wire.

Forgings
VDM's 5,000-ton forging press uses two manipulators and receives its feedstock from dedicated heating and reheating furnaces. Following precisely specified procedures, bars, billets and other semi-finished products are produced.

Rods and bars
For the production of forged bars with a diameter of more than 4.72 in (120 mm) and semi-finished products, state of the art turning lathes, peeling and grinding machines are available.

The production of hot-rolled and forged bars with a diameter of less than 4.72 in (120 mm) is performed with modern peeling and grinding machines. A 60-ton drawing bench is available for the manufacture of cold-drawn precision bars.

Alternatively, the hot rolling of round bar, flat bar, and specialty shapes is performed on either a 14 in (355 mm) or a 10 in (254 mm) hand mill. VDM's finishing plants are equipped with heat treatment furnaces, pickling, shot blasting and cutting units.

Wire and welding consumables
VDM Metals produces wire in fine and ultra-fine gauges down to a diameter of 0.004 in (0.1 mm), heavy gauge and section wire as well as welding wire with its standardized dimensions and individualized packing.

Sheet and plate
Sheet and plate in thicknesses of 12 to 3.93 in (3 to 100 mm) are hot rolled on a 4-high mill, before finishing steps such as annealing, grinding, shot blasting, pickling and cutting take place. VDM operates a Sendzimir reversing mill that can process hot-rolled sheet to individual cold-rolled sheets in widths of up to 98.42 in (2,500 mm).

Strip
Strip is cold rolled on 4-high and Sendzimir mills. Foil can be rolled down to a thickness of 0.001 in (0.025 mm) on a special 20-high mill. Annealing, levelling and cutting equipment is available for finishing operations to meet customer specifications.

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Headquarters

VDM Metals International GmbH
Plettenberger Straße 2
58791 Werdohl
Germany

Phone +49 (0) 2392 55-0
Fax +49 (0) 2392 55-2217

vdm@vdm-metals.com

VDM Metals USA, LLC
306 Columbia Turnpike
Florham Park, NJ 07932
USA

Phone +1 973 437-1664
Fax +1 973 437-1602

vdmusasales@vdm-metals.com

www.vdm-metals.com