

VDM® ALLOY 699 XA

ADVANCED SOLUTION FOR METAL DUSTING IN PETROCHEMICAL APPLICATIONS

Tubacex, a global leader in seamless stainless steel and special alloy tubes for the energy and mobility sectors, has partnered with VDM Metals to incorporate the high-performance VDM® Alloy 699 XA in its product portfolio. This collaboration enables Tubacex to supply advanced tubes specifically engineered to withstand the severe corrosive conditions caused by metal dusting – a critical challenge in petrochemical, refinery, fertilizer, ammonia, and gasification industries.

THE CHALLENGE: METAL DUSTING CORROSION

Metal dusting is a highly aggressive form of high-temperature corrosion that occurs in hydrogen and carbon monoxide-rich environments, typically between 400°C and 700°C. This corrosion leads to the disintegration of metal surfaces into fine carbon and metal dust particles, causing pitting, material loss, and eventual component failure. Such environments are common in synthesis gas (syngas) processing and related heat exchanger applications within oil, gas, and petrochemical plants.

Traditional alloys often face limitations under these conditions, exhibiting restricted ductility or insufficient resistance to prolonged metal dusting, which results in increased maintenance costs and downtime risks for end users.

THE VDM® ALLOY 699 XA ADVANTAGE

VDM® Alloy 699 XA (UNS N06699) is a nickel-chromium-aluminum (NiCrAl) alloy developed to overcome the drawbacks of conventional materials in metal dusting environments. Its unique chemical composition provides:

- **Exceptional metal dusting resistance** by significantly extending the incubation period before corrosion initiates and limiting damage depth.
- **Superior creep resistance**, comparable to that of VDM® Alloy 601, ensuring durability under high temperature and stress.
- **Excellent ductility and manufacturability**, enabling efficient welding and fabrication processes without compromising mechanical integrity.
- **Availability in multiple product forms**, including tubes ideal for heat exchangers used in syngas cooling and synthesis processes such as hydrogen, ammonia, and methanol production.

By incorporating this alloy, Tubacex delivers innovative, high-value-added solutions that improve operational efficiency and lifecycle performance for clients operating in the harshest industrial environments.

STRATEGIC COLLABORATION AND MARKET IMPACT

The partnership between Tubacex and VDM Metals not only combines Tubacex's expertise in advanced tube manufacturing with VDM's materials technology but also focuses on securing international approvals for VDM® Alloy 699 XA. This effort ensures compliance with industry standards, reinforcing the alloy's competitive edge as no other material on the market offers a similar combination of resistance and processability.

Aligned with Tubacex's strategic commitment to innovation and sustainability, this cooperation supports the company's vision to provide cutting-edge products that contribute to cleaner, safer, and more efficient energy and chemical processes.

VDM® ALLOY 699 XA TUBES FOR APPLICATION IN PETROCHEMICAL AND POWER GENERATION INDUSTRIES UNDER METAL DUSTING CONDITIONS

METAL DUSTING CORROSION

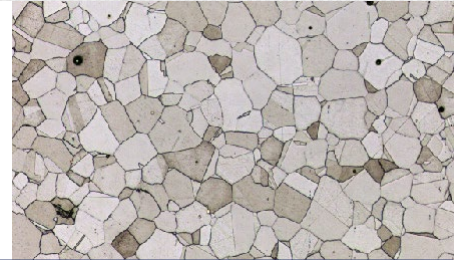
- Potentially carburizing and reducing atmospheres
- Temperature range: usually 450°- 800°C
- Formation of pits or general attack



VDM® ALLOY 699 XA

- Highly metal dusting resistant
- Workability comparable to VDM® Alloy 601
- Creep resistance at least like VDM® Alloy 601
- Good weldability under Argon

Granted DIN Number: 2.4842
Short Name: NiCr 30 Al



CHEMICAL COMPOSITION

	Ni	Cr	Al	Fe	Mn	Si	Ti	Nb	Cu	Zr	C	N	P	S	B
Min.		26.0	1.9								0.005				
Max.	bal	30.0	3.0	2.5	0.50	0.50	0.60	0.50	0.50	0.10	0.10	0.05	0.02	0.01	0.008

MECHANICAL PROPERTIES

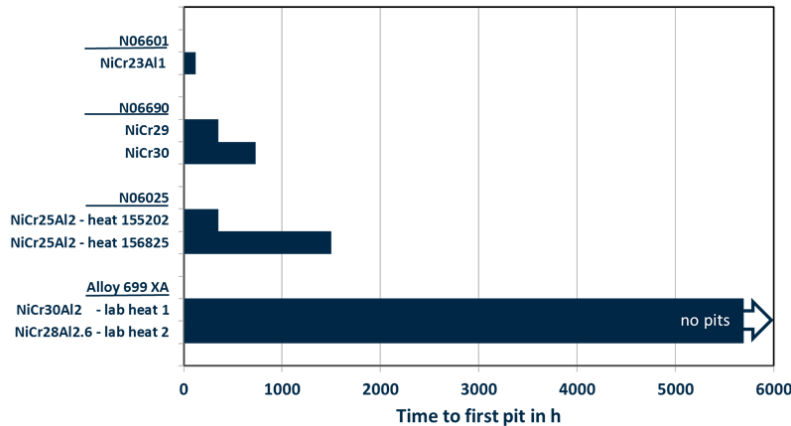
Preliminary values

T in °C	20°C
KV ₂ in J	≥ 70

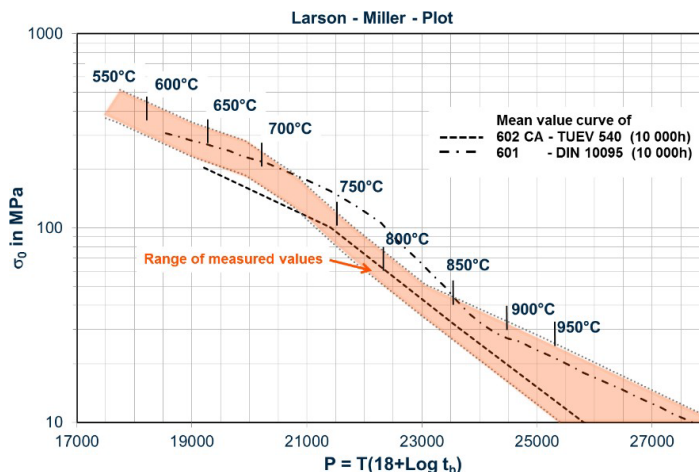
T in °C	20	100	200	300	400	500	600	700
R _{p0.2} in MPa	240	210	180	160	150	143	137	120
R _m in MPa	610							
A in %	40							

METAL DUSTING RESISTANCE

37% CO, 9% H₂O, 7% CO₂, 46% H₂, a_c=163,
p(O₂)= 2.5*10⁻²⁷ bar at
600°C, 20 bar



CREEP RESISTANCE



PRODUCT FORMS



BARS



PLATE



ROD & BAR



WIRE



FILLER METAL

ASME AND TUEV
APPROVALS IN PROGRESS