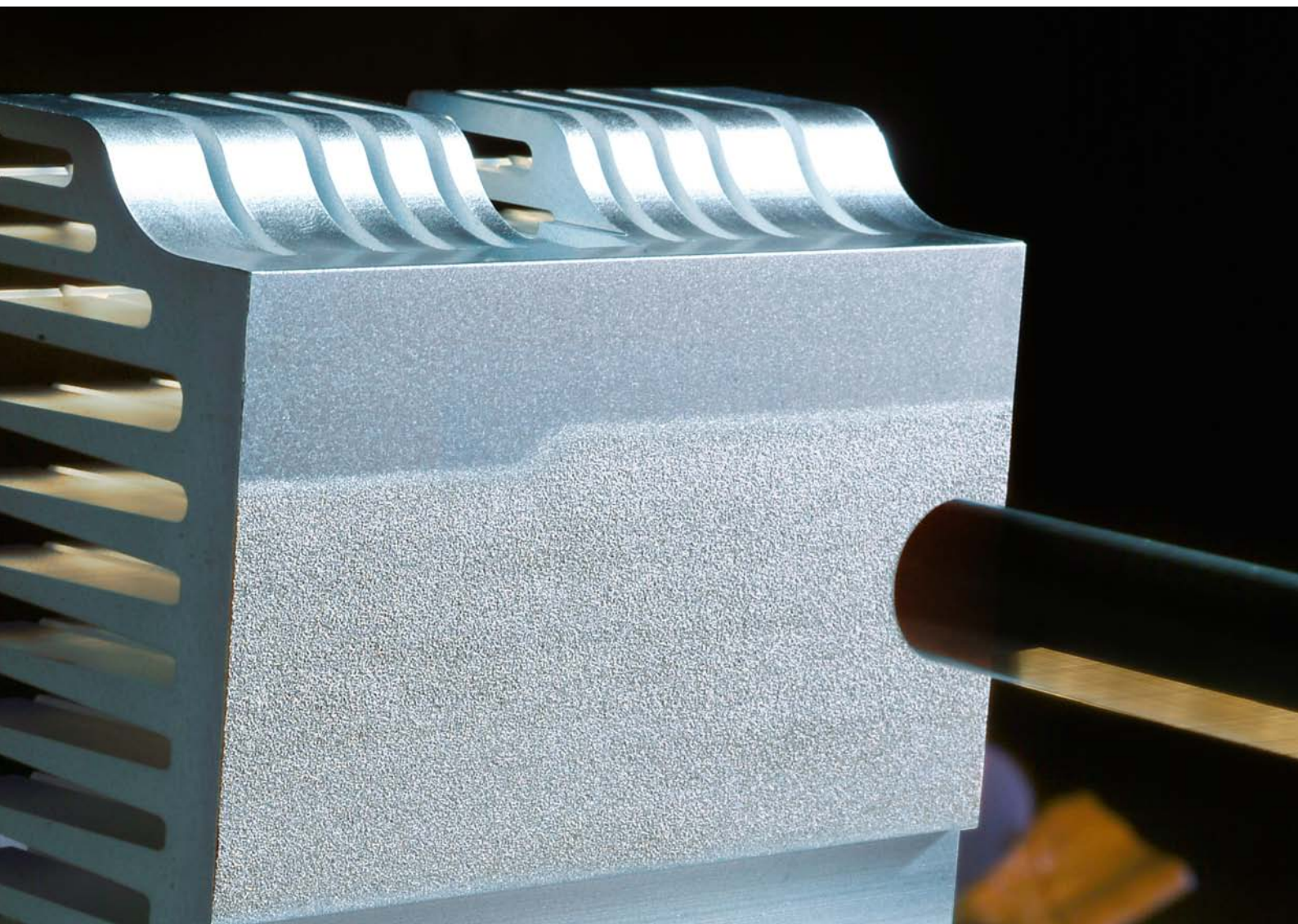
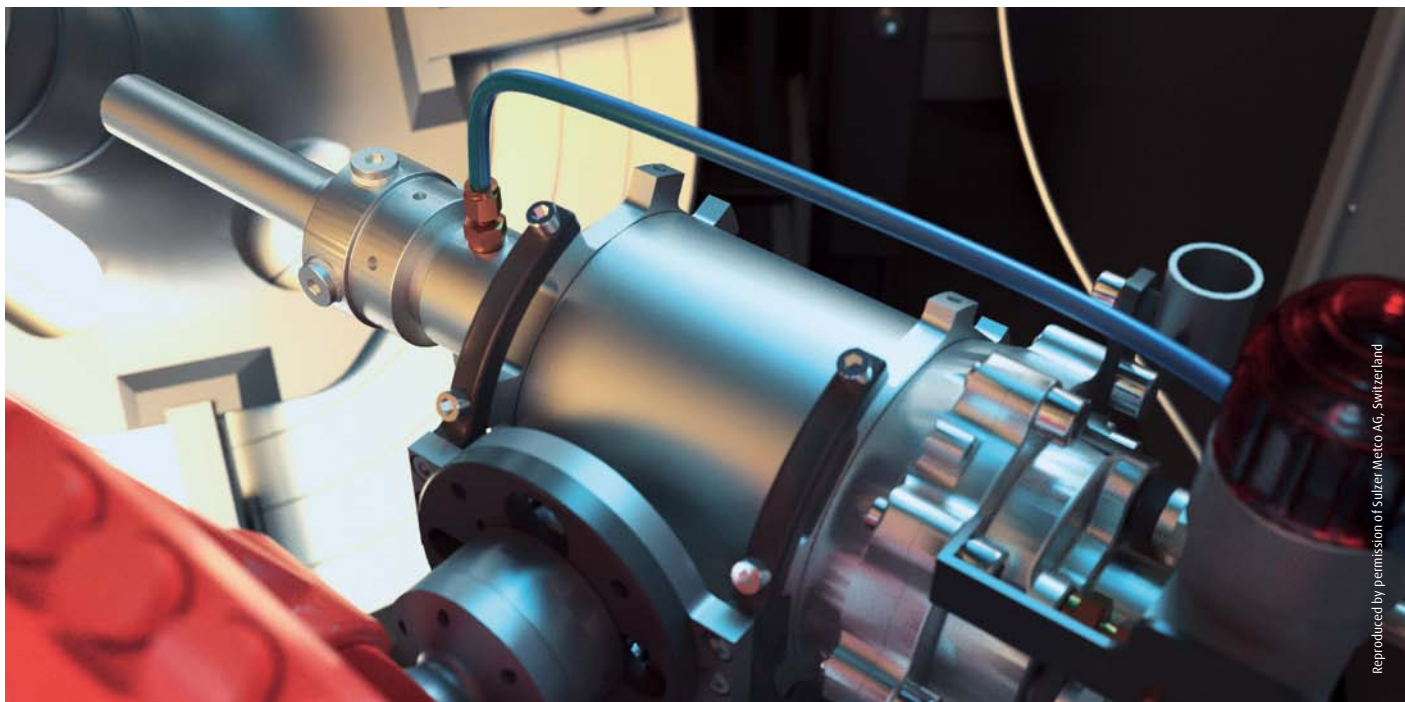


LINSPRAY[®] cold spray solution.
With the power of PRESUS[™]
pressure-boosting technology.





Reproduced by permission of Sulzer Metco AG, Switzerland

Challenge.

In recent years, thermal spraying has grown in popularity, both in the manufacture of new parts and the repair of existing parts. This surface coating technology offers a number of benefits, including improved resistance to wear, corrosion and heat in the final product. The challenge in spraying lies in finding the right coating solution coupled with the ideal gas supply concept.

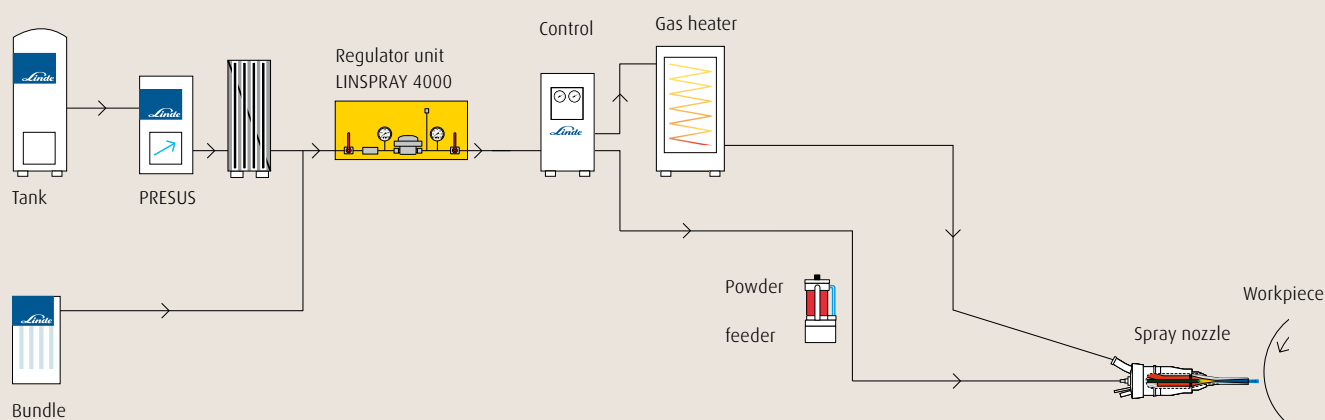
The term thermal spraying covers a number of processes, one of which is cold spraying. The main difference relative to traditional thermal spraying lies in the temperature. Thermal spraying processes heat the powder to above its melting temperature whereas cold spraying processes require a powder temperature of only a few hundred degrees. This is achieved by increasing the particle velocity (kinetic energy).

The compelling productivity and quality benefits of cold spraying are driving demand for this process. Both hardware manufacturers and operators are looking for ways to increase spray gas pressure and particle velocity even further in order to increase process efficiency and open up new applications using different types of materials.

"Our cold spraying research team is always looking for ways to optimise existing processes. We have been working closely with Linde for over a decade, and really appreciate the uncomplicated sharing of know-how and insights to help advance our research work."

Prof. Thomas Klassen, Institute of Materials Technology, Helmut-Schmidt-University of the Federal Armed Forces

Sample setup for PRESUS and LINSPRAY 4000



Solution.

Building on our core competence as a trusted, reliable supplier of industrial gases, we offer a full range of coating solutions and productivity-enhancing supply concepts under our LINSPRAY® programme. Particularly in the area of cold spraying, extensive R&D investments have positioned us as the innovation driver in this high-tech space. Many of our developments are protected by patents or have patents pending. Our application experts thus have the experience and insights to deliver and optimise the cold spraying solution best suited to your application needs. Extending the quality gains offered by our LINSPRAY portfolio, we can take your productivity to the next level with our state-of-the-art pressure-boosting technology. Eliminating the need for additional pressurising devices, our PRESUS™ N10 solution supports pressures of up to 60 bar at consumption rates between 90 and 150 m³/h.

“At Corporate Technology, our mission is to secure the technological and innovative future of Siemens. To achieve that, we look for visionary, reliable partners such as Linde, who can synergise their in-depth process insights with our hands-on expertise to take our cold spraying applications to the next level.”

Dr. Oliver Stier, Senior Key Expert Engineer, Siemens AG Corporate Technology

Technical specifications of PRESUS N10

Medium	Liquid nitrogen or liquid argon
Maximum final pressure	300 bar
Flow rate	5-130 m³/h (N₂)
Liquid nitrogen supply pressure	4-15 bar recommended
Power supply	400 VAC, 50 Hz, 5 x 16 A
Required energy	Depends on final pressure and consumption/average consumption: 25 W/m³
Gas quality	Depends on the liquid supply, 100% oil-free
Dimensions (H x W x D)	1950 x 1200 x 660 mm
Weight	Approx. 660 kg
Noise level	73 dB (A)

PRESUS N10 pressure boosting unit



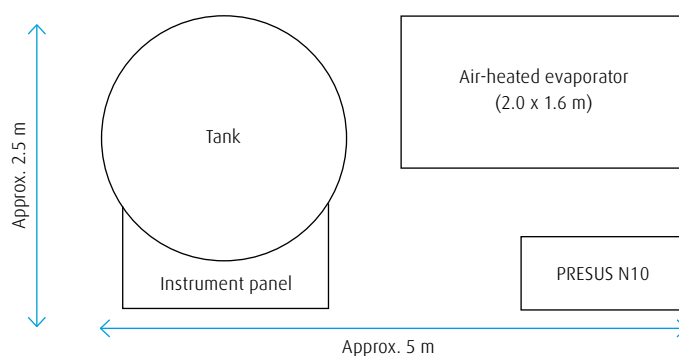
Supply concept.

Nitrogen, helium or mixtures of these gases are used for cold spraying. Generally speaking, the gas is supplied from a dedicated tank as gas bundles only have enough capacity for short laboratory tests. We offer a variety of services to ensure security and quality of supply. These include SECCURA®, our automatic gas supply service for tanks and cylinders, and ACCURA®, our gas management and cylinder tracking service for smaller-volume users. The gas flowing from the tank is fed into a PRESUS N10 pressure booster to increase the pressure to the level required for the LINSPRAY application. It achieves this by pressurising the gas with a hydraulically operated, slow-moving piston before it is evaporated. The LINSPRAY 4000 pressure regulator panel ensures a constant flow, eliminating the risk of fluctuations which could have an adverse impact on the coating quality.

“Linde has been supporting all of our thermal spraying gas needs since 1998. But Linde is much more than just a trusted supplier – we work closely and collaboratively with Linde’s cold spraying experts, for instance, to maximise the quality and innovative capabilities of our services in this cutting-edge area.”

Ingo Dresel, Sven Hartmann, Eberhard Schopp, Owners, obz innovation GmbH

Supply concept



Benefits of cold spraying with LINSPRAY.

- Optimum surface quality
- Extremely high bond strengths
- Exceptionally dense layers
- No porosity
- Oxide-free spray coatings
- No material changes in coated substrates due to thermal influences

Benefits of the PRESUS N10 pressure boosting technology.

- Simple, inexpensive, compact installation – also suited to outdoor areas
- High degree of reliability – proven by numerous customer installations
- No additional pressurising devices required
- Low energy consumption, up to 95% less than state-of-the-art gas compression units
- No degradation of gas purity on gasification
- Absolute oil-free operation compared with gas compressors
- Flow rate at least five times higher than that of state-of-the-art gas compressors
- Easy to operate with automatic PLC control system

Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages, and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardised as well as customised solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimisation, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – ideas become solutions.