

Application Description:

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Slide Gate Valves in High-Temperature Molten Metal Processing

- Reliable shutoff under vacuum and high-temperature conditions

Application Context

At temperatures of approximately 1,370°C (2,498°F) to 1,530°C (2,786°F) [melting temperatures of stainless steels] and under vacuum conditions in metallurgical processes and molten metal applications.

The slide gate valves used in these applications are integrated into various stages of the manufacturing process, including optical monitoring, temperature control, sampling, and the addition of alloying elements.

Process Engineering Challenges

- High temperatures and intense radiant heat
- Contamination and blockage of the sliding knife
- Short service life due to leakage caused by contamination and heat
- High maintenance requirements in the event of insufficient sealing performance or failure
- Increasing mechanical loads on moving components due to wear
- High plant availability requirements
- Low leakage rates for process safety

Kammerer Solutions

1. Cooled Flange Slide Gate Valve

Installed at a greater distance from the molten metal, resulting in lower exposure to radiant heat.

- **Type:** Slide gate valve [typically DN 100 (4 inch) to DN 200 (8 inch); standard sizes up to DN 400 (16 inch), larger sizes available upon request]
- **Material:** Stainless steel; furnace-side cooled flange with internal liquid cooling
- **Function:** Monitoring of the molten metal using sight glasses and sensors; protection of the instrumentation by the slide gate valve
- **Protection:** Protection against radiant heat, molten metal, slag, and fumes at temperatures of up to 1,500°C (2,732 °F); sealing with elastomers
- **Benefits:** Protection of optical measurement instruments, reliable gas sealing, and high operational safety under vacuum conditions

2. Cooled Slide Gate Valve

Installed directly above the molten metal.

- **Type:** Slide gate valve [typically DN 150 (6 inch) and DN 200 (8 inch); standard sizes up to DN 300 (12 inch), larger sizes available upon request]
- **Function:** Opening for inserting a measurement lance for temperature measurement, as well as for sampling and charging
- **Special feature:** Cooling of the sliding knife and seal carrier (flange) enables the use of low-leakage elastomer seals

- **Benefits:** Installation directly above the molten metal; suitable for integration into existing systems; robust against contamination; significantly extended service life without blockage; depending on the application, service lives of up to 12 months can be achieved; high operational safety under vacuum conditions

Applications of Kammerer Slide Gate Valves

1. Kammerer Slide Gate Valve combined with Viewing Windows
Continuous observation of the molten metal is possible by regularly cleaning the sight glasses without interrupting the vacuum. After the cleaning process, the slide gate valves are opened so that monitoring of the molten metal can continue.
2. Sampling
For temperature measurement, a lance is automatically inserted through the slide gate valve into the vacuum chamber. After the measurement, the lance is fully retracted automatically. Samples can also be taken directly from the molten metal. The valve is robust against slag and metal splashes.
3. Charging
The slide gate valve is opened to allow additional alloying elements to be added and is then securely closed again. The smooth internal surfaces prevent material from adhering and reduce the risk of jamming.

Results

- Long-lasting, process-reliable sealing performance even under extreme thermal and mechanical loads (depending on the application, service lives of up to 12 months can be achieved)
- Significantly reduced maintenance requirements through optimized sealing technology
- Improved process reliability through stable gate valve operation under vacuum conditions
- Proven successful use in industrial production facilities

Note:

Please note that this application example represents a specific individual case. Information regarding extended service life and reduced maintenance costs is based on the specific operating conditions of the respective system. The benefits may vary significantly depending on the medium, temperature, flow conditions, and system configuration.