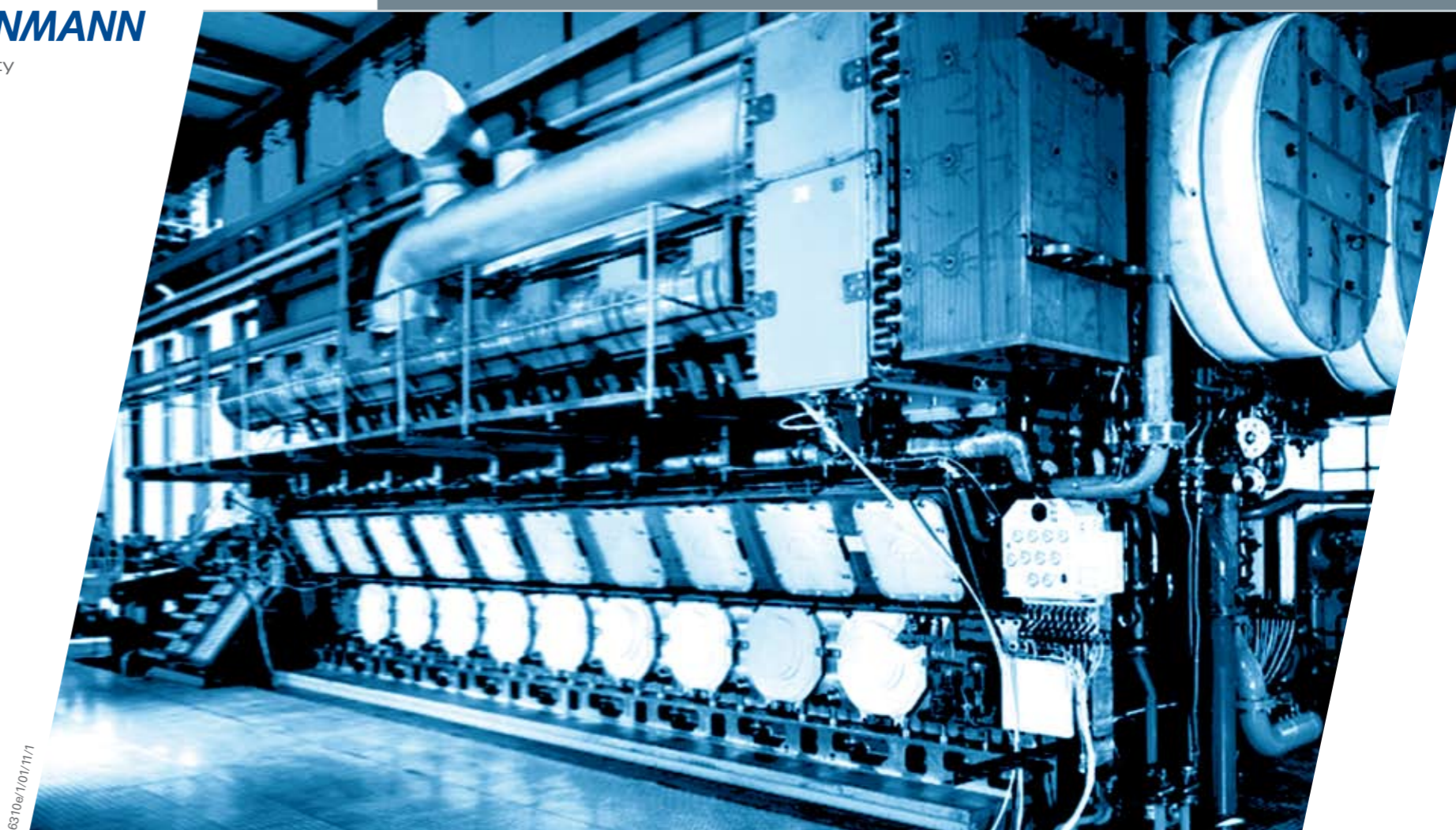


WITZENMANN
managing flexibility

Flexible solutions for diesel and gas engines





The
Witzenmann
group

"Managing flexibility" is the demand and vision of the Witzenmann Group. In 1885, when Heinrich Witzenmann invented the flexible metal hose, he established the flexible metal hose and expansion joints industry. Today the Witzenmann Group is one of the worldwide leading manufacturers of flexible metal elements. 2,800 employees at 24 locations worldwide generate annual sales of more than € 350 million.

ON DUTY FOR YOU WORLDWIDE



Our global network ensures that our customers will get what the name of Witzenmann stands for: Optimal solutions of highest quality. We achieve this in close cooperation with the customer and by means of the most stringent test programs: electrodynamic vibration test rigs, hot-gas and durability testing facilities, corrosion testing facilities and many other things.

In the meantime, all big international manufacturers of commercial vehicles, ship and industrial engines and of the aerospace technology rank among our customers. When economic and reliable system solutions are in demand, Witzenmann is first class worldwide.

Aerospace industry:

Airbus Deutschland GmbH, EADS Astrium GmbH, EADS Space Transportation, Eaton-Aerospace Operations, Eurocopter Deutschland GmbH, Liebherr-Aerospace, Magna Steyr Space Technology, MTU Aero Engines, Snecma Moteurs

Engines:

Caterpillar, Baudoin, GE Jenbacher, MaK, MAN Diesel, MTU, MTU DDC, Hyundai Heavy Industries, Fairbanks Morse Engine, S.E.M.T. Pielstick, STX Enpaco, Wärtsilä

Lorries:

Arvin Meritor, Behr, Cummings, DAF Trucks, DaimlerChrysler, Evobus, IVECO, Leyland, MAN, Neoplan, Nissan Diesel, RENAULT VI, Tenneco, Volvo Truck Corp.

Special vehicles:

AGCO, Bombardier, Case Steyr, John Deere, Liebherr, Linde Material Handling, Volvo Construction Equipment

DEVELOPMENT PARTNER FOR YOUR SUCCESS



One step ahead by tradition. From the invention of the metal hose to the foundation of a new branch of industry to the development of tailor-made system solutions for future markets. In every era, Witzemann coined the trade and industry as technology leader. That is why today we are your development partner when it comes to implementing new technologies into practice – onshore, offshore and in the air.



Just as our customers and their products, we are also present worldwide. Tailor-made solutions of highest quality result from the cooperation between the head office in Germany and those who know the market on site.

To us, flexibility is more than just a product feature. Behind it is the demand to develop optimal and tailor-made solutions for each of our customers. In the business field of commercial vehicles and engines, technical knowledge and engineering competence of our engineers join with experiences made of decades in automotive engineering and industrial applications.

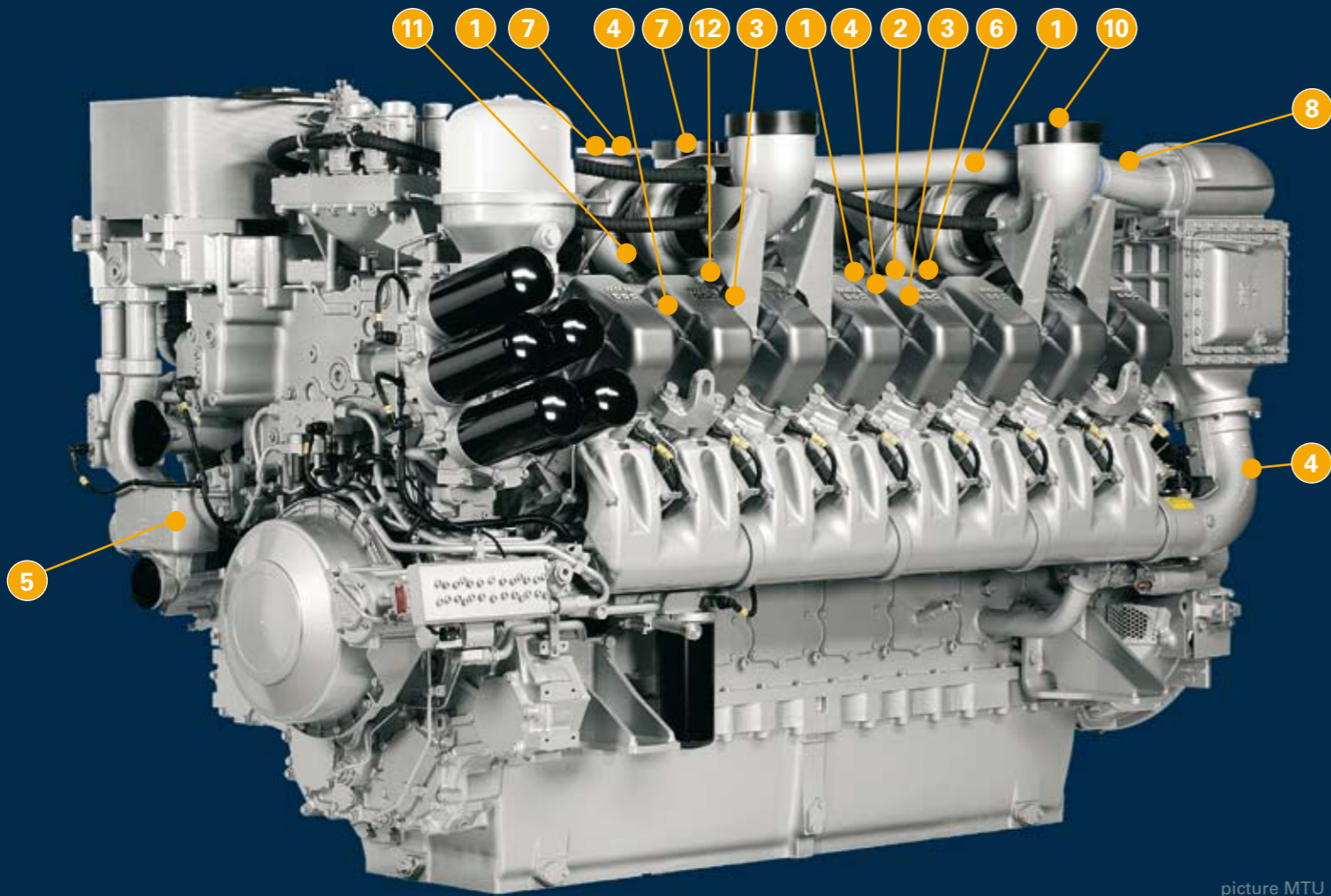
As the technologically leading company in the industry, Witzemann always takes a pioneering task when it comes to implementing new quality standards worldwide. Our international production locations belong to the first ones which were certified according to ISOTS 16949. For maritime applications,

type approvals of all renowned classification companies are available.

Witzemann is also a member of the international trade association EJMA ((Expansion Joint Manufacturers Association). In this function, we continuously work on the permanent further development of internationally binding standards.

But innovative and groundbreaking solutions require even more: visions, creativity and a keen sense for new technologies. These qualities have made us become the technology leader.





picture MTU

Systems and Components

On the basis of our metal hoses, expansion joints and metal bellows, we develop customized system components and piping systems.

Engine

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Fluid and Air Pipe

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Exhaust Systems

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INDIVIDUAL SOLUTIONS IN SERIES

Expansion joint

To compensate thermal expansions, vibrations and installation tolerances in the exhaust gas system, in front of and behind the turbocharger and in the charge air area. Designed as bellows elements in stainless steel or nickel-based alloys.

Exhaust gas and oil return pipe

To reduce pollutant emissions and ensure the oil supply to engines and other components. They compensate thermal expansions, installation tolerances, vibrations and component movements. They function reliably even at extreme temperatures.

Fluid-, air pipe

For the gas-tight and oil-tight intake and charge air supply to engines and other components. They are designed as a flexible pipe with bellows elements or as a metal hose and can be employed even in areas exposed to high temperatures. Designs with bolted flange, sliding seat, individual bracket or customer-specific connecting elements.

Pipe system

A combination of rigid and flexible components for use as a pressure-resistant system in gas and/or liquid circuits. They combine simple installation with a reliable compensation of installation tolerances and component movements while meeting the very highest safety demands.

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Installation

Expansion joints for use in the engine

In the engine expansion joints are used to compensate thermal expansions, vibrations and to equalise any installation tolerances. Resistant to even the highest temperatures. The latest computational and testing methods guarantee an optimal design.

Areas of application

Exhaust gas: manifold, bypass, in front of and behind the turbocharger, charge air

Types

- Axial and universal
- With and without internal sleeve
- Design according to customer's specification
- Connection with flange, V-End or according to customer's specification
- Scope of supply including connecting parts
- Integration of diffuser or reducer practicable

Technical properties

- Compensation of thermal expansions and installation tolerances, decoupling of vibrations
- Technically leak-free due to metal bellows
- Heat and pressure-resistant due to the selection of suitable materials and multi-layer construction
- Resistant to corrosive media or media constituents due to the selection of suitable materials
- Geometric and technical properties and connection technique can be adapted to suit customer-specific installation situation
- Currently available in all standard nominal diameters and lengths
- Compact design

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maximum safety

Pressure pipe casing

Leak-free protective system for fuel injection pipes and single-walled pipes for inflammable fluids.

The flexibility permits adaptation to the prevailing pipe layout even with large diameters. Existing type approvals permit use in maritime applications.

Areas of application

Piping systems for inflammable fluids (fuel, engine or hydraulic oil)

Types

- Design according to customer's specification
- Connection according to customer's specification
- Approvals of the leading classification societies

Technical properties

- Collection possibility for leaks with connection to control facilities
- Multiple security against bursting pressure
- Technically oil- and leak-free
- Heat and pressure-resistant thanks to selection of suitable materials
- Geometric and technical properties and connection technique can be adapted to suit customer-specific installation situation
- Currently available in all standard nominal diameters and lengths



Installation

Installation

Bellows for applications in the engine

In the engine, bellows are used to compensate thermal expansions, vibrations and to equalise any installation tolerances. The elements are already present to the customer's specification. This increases customer values.

Areas of application

Exhaust gas: In front of and behind the turbocharger, charge air

Types

- With and without internal sleeve
- With and without insulation
- Design according to customer's specification, preferably with corrugated section
- Connection with flange, V-End or according to customer's specification
- Scope of supply including connecting parts possible

Technical properties

- Compensation of thermal expansions and installation tolerances, decoupling of vibrations
- Technically leak-free thanks to metal bellows
- Heat and pressure-resistant thanks to selection of suitable materials and multi-layer construction
- Resistant to corrosive media or media constituents thanks to selection of suitable materials
- Geometric and technical properties and connection technique can be adapted to suit customer-specific installation situation
- Currently available in all standard nominal diameters and lengths
- Compact design

Bellows with cast manifold

In the engine, bellows with welded cast manifolds are used to compensate thermal expansions, vibrations and to equalise any installation tolerances at the inlet and outlet of the turbocharger and at the inlet and outlet of the aftercooler. Thanks to a suitable design, the components can be used even where installation space is at a premium.

Areas of application

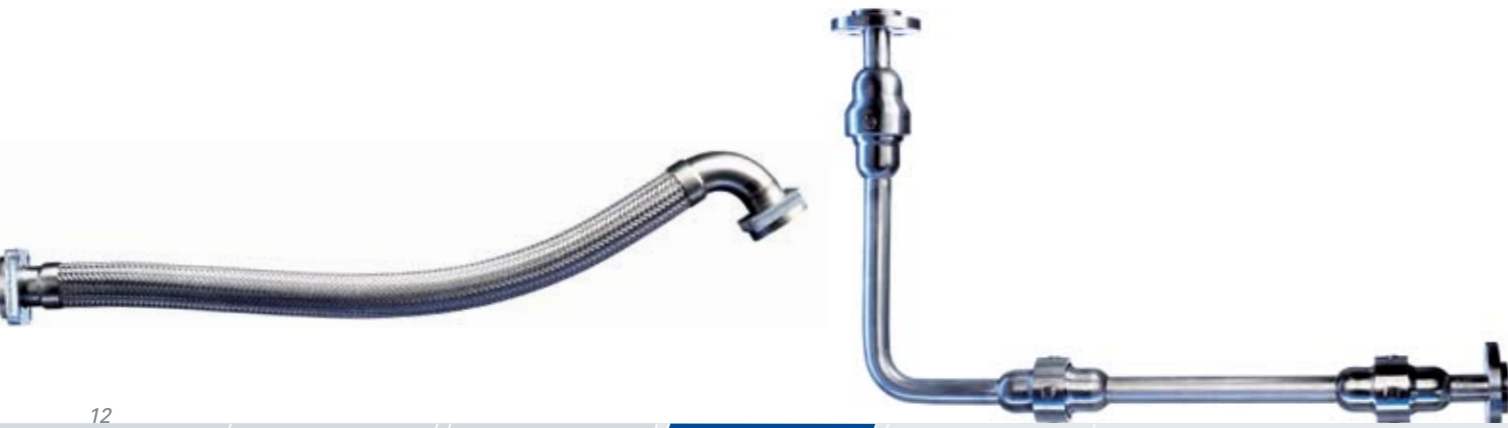
Exhaust gas: In front of and behind the turbocharger, charge air

Types

- With and without internal sleeve
- With and without insulation
- Design with cast manifold according to customer's specification
- Connection with flange, V-End or according to customer's specification
- Scope of supply including connecting elements possible

Technical properties

- Compensation of thermal expansions and installation tolerances, decoupling of vibrations
- Technically leak-free thanks to metal bellows
- Heat and pressure-resistant thanks to selection of suitable materials and multi-layer construction
- Resistant to corrosive media or media constituents thanks to selection of suitable materials
- Geometric and technical properties and connection technique can be adapted to suit customer-specific installation situation
- Compact design



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fit for use

Fuel pipes

Pressure-resistant systems for reliable conducting of inflammable media. They combine simple installation with reliable compensation of installation tolerances and component movements while meeting the very highest safety demands.

Areas of application

Supply pipe systems for fuel (diesel, fuel oil, gas)

Types

- Design according to customer's specification
- Connection according to customer's specification
- Approvals of the leading classification societies

Technical properties

- Compensation of thermal expansions, vibrations and installation tolerances
- Multiple security against bursting pressure
- Technically oil- and leak-free
- Heat and pressure-resistant thanks to selection of suitable materials
- Geometric and technical properties and connection technique can be adapted to suit customer-specific installation situation
- Simple, inexpensive installation and application possibilities
- Currently available in all standard nominal diameters and lengths



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Installation

Oil return pipes

To ensure the supply of oil to engines with turbochargers. They compensate thermal expansions, installation tolerances, vibrations and component movements. This function is retained even at extreme temperatures.

Areas of application

Pipes for oil return on diesel and gas engines.

Types

- Design according to customer's specification, preferably with corrugated section
- 3-dimensional design as a bare pipe elbow or as a bend in the corrugated section
- Connection with flange, screw fitting, V-End or according to customer's specification
- With and without insulation or heat shield

Technical properties

- Compensation of vibrations, thermal expansions and installation tolerances
- Technically oil- and gas-tight thanks to metal bellows or metal hose
- Heat-resistant thanks to selection of suitable materials
- Corrosion-resistant thanks to selection of suitable materials
- Low weight
- Simple, inexpensive installation



perfectly fitting
and leak-free

Suction pipes

For selective intake or secure transport of filtered air to the turbocharger. The air intake pipes are technically leak-free even under extreme conditions. The scope of supply includes the necessary connection technology and the necessary brackets.

Areas of application

Air intake pipe in front of/behind the filter to the turbocharger

Types

- 3-dimensional design as a segmented arc
- Connection with flange, V-End, ribs or according to customer's specification
- With connection technique for cylindrical connections
- With and without necessary brackets

Technical properties

- Pipe layout optimised for installation space thanks to segmented arcs
- Technically leak-free
- Heat and pressure-resistant thanks to selection of suitable materials
- Corrosion-resistant thanks to selection of suitable materials
- Low weight thanks to use of thin-walled pipes



stainless steel
with welded to
cast iron

Charge air pipes

For secure transport of charged air from the turbocharger to the aftercooler or to the engine intake.

The implementation of ever stricter exhaust gas emissions regulations and the optimisation of the power of the engines results in increased charge air pressures and temperatures. These high demands on the charge air pipes are satisfied by our purely all-metal pipes, whether rigid or flexible.

Areas of application

Connection between turbocharger and aftercooler or engine intake port.

Types

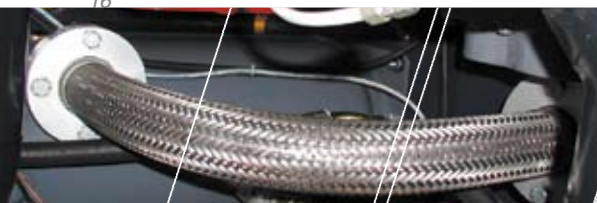
- 3-dimensional design as a bare pipe elbow (from our own production up to DN 150), casting or with bend in the corrugated section (combinations of the different types are possible)
- Connection with flange, V-End, ribs or according to customer's specification

Technical properties

- Compensation of vibrations, thermal expansions and installation tolerances
- Technically gas-tight/oil-tight thanks to metal bellows or rigid pipe sections
- Heat and pressure-resistant thanks to selection of suitable materials
- Ageing-resistant thanks to all-metal pipe
- Corrosion-resistant thanks to selection of suitable materials



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Installation

Hoses for air and fluid systems

Technically gas-tight metal hoses with and without braiding are installed as air or fluid pipes in places with difficult access. Hoses from Witzemann can also be reliably used for pipe systems with very high pressures. Combinations of flexible hose segments and rigid pipe section of stainless steel or cast elements are produced to individual customers' specifications.

Areas of application

Coolant pipes, oil pipe, compressed air pipe

Types

- Design according to customer's specification
- Connection parts according to customer's specification
- Welded to corresponding specification
- Use of one or more flexible elements, depending on requirements
- With and without insulation

Technical properties

- Pipe layout optimised for installation space thanks to segmented arcs
- Technically leak-free
- Heat and pressure-resistant thanks to selection of suitable materials
- Corrosion-resistant thanks to selection of suitable materials
- Low weight thanks to use of thin-walled pipes



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Installation

Pipe systems for the exhaust gas sector

They combine simple installation with the reliable compensation of installation tolerances and component movements. They also decouple the vibrations at the outlet from the turbocharger.

Areas of application

Exhaust gas behind the turbocharger

Types

- With and without internal sleeve
- With and without insulation
- With and without braiding, inside and outside
- Design according to customer's specification preferably with flexible section
- Connection with flange, V-End or according to customer's specification
- Optionally segment and/or bare pipe elbow (from our own production up to DN 150)

Technical properties

- Compensation of thermal expansions and installation tolerances, decoupling of vibrations
- Technically leak-free thanks to metal bellows
- Heat and pressure-resistant thanks to selection of suitable materials and multi-layer construction
- Resistant to corrosive media or media constituents thanks to selection of suitable materials
- Geometric and technical properties and connection technique can be adapted to suit customer-specific installation situation

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Detail

**Exhaust manifold**

System solution for connections between water-cooled casting, including connection technique and connecting parts. Intelligent solutions permit a fatigue-proof design for the whole service life of the engine.

Areas of application

Exhaust manifold between pairs of cylinders

Types

- V-End compensator with internal sleeves clamped at both ends
- V-End as rotary part to hold a gasket and for clamping of the internal sleeves
- Mating piece to customer's specification
- Special V-End clamp with profiles segments of solid material for higher clamping forces for high-temperature applications
- All parts of high-temperature-resistant materials

Technical properties

- Compensation of vibrations, thermal expansions and installation tolerances
- Technically leak-free thanks to metal bellows
- Heat and pressure-resistant (even under extreme conditions) due to selection of suitable materials
- Optimised Internal sleeve dimensions for minimum axial gap at operating temperature

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3-D-assembly

Exhaust collectors

Pipe systems permit simple installation – even with complex geometries. The bellows guarantee a reliable decoupling of expansions and vibrations. Stream line essential parts can be integrated in a space-saving manner.

Areas of application

Exhaust gas combination after several turbochargers and transmission to the customer connection

Types

- Supply of the whole pipe system
- Complete pre-insulated piping for immediate installation on the engine
- Stream line essential parts such as diffusers integrated into the pipe system
- Flexible components integrated into the pipe system
- Connections, incl. connection technique and gasket system form part of our scope of supply

Technical properties

- Compensation of vibrations, thermal expansions and installation tolerances
- Technically leak-free thanks to metal bellows
- Heat-resistant thanks to selection of suitable materials
- Simple, inexpensive installation