INDUSTRIAL APPLICATIONS

Providing Specialised Expansion Joint Technology

DEKOMTE
Expansion Joint Technology

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Introduction

With a worldwide reputation for excellence, DE**KOM**TE manufactures fabric and stainless steel expansion joints for all applications within a thermal power station and offer varying technical standards to suit the technical requirements, maintenance cycles and budgets for each joint.

As well as the power generation sector DE**KOM**TE expansion joints are used in a variety of other industries such as oil and gas, refineries, chemical plants, steel plants, thermal solar plants, nuclear and many others. Some may be standard solutions based on power generation but many of the applications are unique to DE**KOM**TE and designed by our highly trained technical staff to solve difficult technical challenges. DE**KOM**TE has the turnkey capability whatever industry you are from, to provide you with the best technical solutions to your expansion joint problems.

Depending on the operating conditions of the site, a DE**KOM**TE solution can offer lifespans of up to 25 years.

DE**KOM**TE is accredited to RAL GZ 719, the world-class quality standard for fabric expansion joints, ensuring that a detailed and thorough technical approach is maintained in all products offered, and the highest quality is guaranteed in the delivered solutions.

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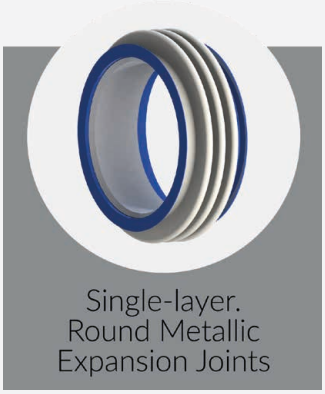
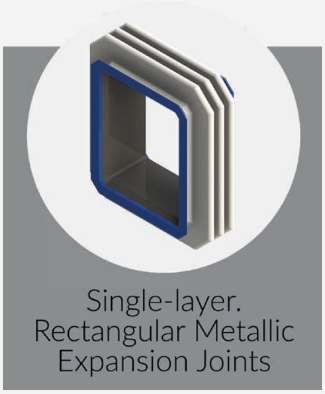
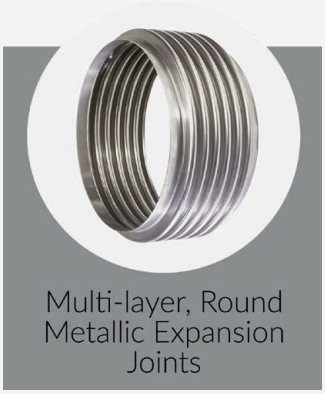
Fabric Expansion Joints



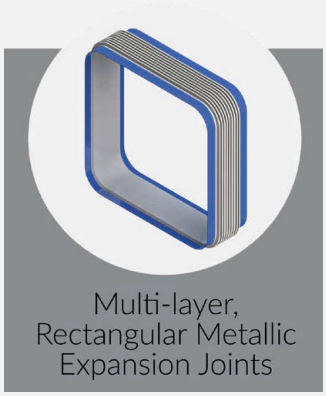
Single-layer. Round Metallic Expansion Joints



Single-layer. Rectangular Metallic Expansion Joints



Multi-layer, Round Metallic Expansion Joints



Multi-layer, Rectangular Metallic Expansion Joints

PTFE Expansion Joints

Rubber Expansion Joints

Flexible Hoses

Scope of Supply - Design for Integration

DE**KOM**TE fabric expansion joints are available in any geometric shape (round, square, oval, multi-sided) and in any size.

The scope of design responsibility is a key aspect of DE**KOM**TE philosophy for an integrated solution to the adjacent duct; this ensures no weakness in the steel frame, liner plate or insulation system.

A metal frame, flow plate, liner system, backing bars, fixings and insulation all form part of the scope that creates a reliable expansion joint. DE**KOM**TE is able to consider the impacts of turbulent flow, pressure variations, vibration to the expansion joint and the surrounding environment.

External features such as heat convectors for a reliable fixing system, can be a key design aspect for the fabric and clamping area to function.

Adjacent jacketed insulation systems can be used to aid the interfaces to external ducting telemetry or insulation.

Personnel guards and external protection equipment can be integrated with the expansion joint to give a package of supply and make the installation as straight forward as possible.

Formed Solutions

DE**KOM**TE manufacture bespoke tailor-made solutions, utilising moulds and forms that create an expansion joint to a desired shape. The purpose of a mould is to allow movements to take place without any creasing or folding of materials.

A smooth and formed joint maintains a constant and even surface temperature which reduces the thermal stress and any fatigue to the materials and important gas membrane.

Formed joints are essential in all high movement requirements, where creasing causes rapid material degradation and failure.

Technical Services, Inspection & Installation

Design Studies and Technical Support

Design comparison, investigation and modelling can be achieved using the extensive database of empirical knowledge at DE**KOM**TE. We offer objective technical support at short notice for critical problems.

Engineering Services

DE**KOM**TE pushes the boundaries of product development with the latest computer and industry best practice tools and procedures.

The discerning use of Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD), together with 2D and 3D design software, allows a correlation of on-site empirical experience and theoretical models. The formulation of specifications, tenders and design critique are also offered as an independent technical service.

Inspection and Maintenance

DE**KOM**TE has experienced site engineers and designers who are able to review all expansion joints in a plant. We produce a technical report for maintenance planning and plant improvement, establishing a baseline of the sites expansion joints and helping to build a plan to reduce total costs. This includes:

- Visual and thermographic inspection
- Create a condition report on all existing joints on the plant:
  - » Evaluation of fixing system and gas tightness
  - » Review of adjacent elements for corrosion, cracking or distortion
  - » Internal review of expansion joint, including the flow plate and lining systems

Turnkey Installation

The use of skilled design engineers, technicians, and service engineers, together with qualified on-site skilled labour means DE**KOM**TE offers a complete turnkey contracting solution for duct problems.

Oil and Gas

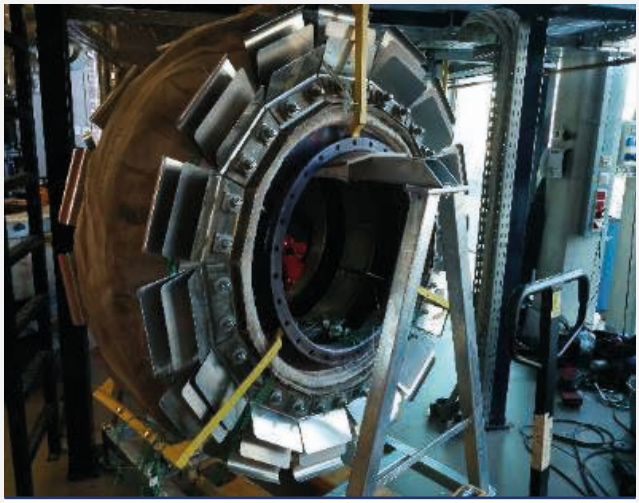
The petroleum industry, also known as the oil and gas industry, includes the global processes of exploration, extraction, refining, transporting (often by oil tankers and pipelines), and sale of petroleum products. The largest volume products of the industry are fuel oil and gasoline (petrol).

The large costs involved in bringing equipment into remote locations, necessitates the highest reliability and durability from the supplied equipment. Maintenance must be kept to a minimum to reduce time and operation costs. The extreme conditions of platforms or remote areas of the world creates a demanding environment for the systems to withstand the chemical, UV and atmospheric attack.

DE**KOM**TE solutions for the prime mover equipment, with great focus on quality and reliability make it an equipment supplier of choice for many of the package, platform, and vessels.

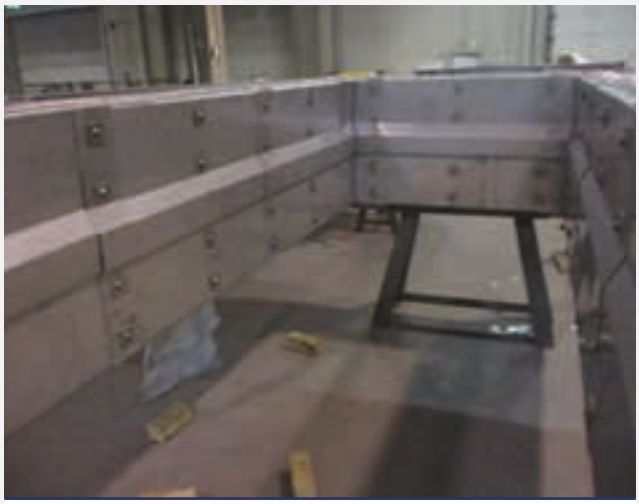
DE**KOM**TE solutions are currently installed on:

- Upstream (exploration) – this involves the search for underwater and underground natural gas fields or crude oil fields and the drilling of exploration wells and drilling into established wells to recover oil and gas.
- Midstream entails the transportation, storage, and processing of oil and gas. Once resources are recovered, it must be transported to a refinery, which is often in a completely different geographic region compared to the oil and gas reserves. Transportation can include anything from tanker ships to pipelines and trucking fleets.
- Downstream refers to the filtering of the raw materials obtained during the upstream phase. This means refining crude oil and purifying natural gas. The marketing and commercial distribution of these products to consumers and end users in several forms including natural gas, diesel oil, petrol, gasoline, lubricants, kerosene, jet fuel, asphalt, heating oil, LPG (Liquefied Petroleum Gas) as well as several other types of petrochemicals.



The DE**KOM**TE 3WA fabric EJ was selected for the exhausts of LM2500+ G4 project with onshore and offshore gas turbine compressor stations. DE**KOM**TE designed, manufactured and installed an integrated, turnkey solution capable of operating under extreme service conditions and high cycling.

DE**KOM**TE designed and manufactured a fabric installation unit for Solar Mars® and Titan® GTs on a Total offshore platform. The construction focuses on fully integrated design; working according to RAL, latest industry, petroleum and ATEX standards to assure quality.



Located 100km northeast off the coast of Scotland in 96m of water, the CNOC International-operated Buzzard asset is the UK's highest-producing field. The 3 PGT25+ gas turbines are at base load duty with 50% in standby. The expansion joint operated reliably from 2005 until the refit and change in 2020.

DE**KOM**TE supplies metallic bellows, fabric expansion joints, rubber, and PTFE solutions that all adhere to the requirements of petroleum applications offshore. Trained personnel are supplied that meet the safety and experience needed when visiting a platform or compressor station.

Refineries / Chemical Plants

An oil refinery or petroleum refinery is an industrial process plant where crude oil is transformed and refined into more useful products such as petroleum naphtha, gasoline, diesel fuel, asphalt base, heating oil, kerosene, liquefied petroleum gas, jet fuel and fuel oils.

Petrochemicals feed stock like ethylene and propylene can also be produced directly by cracking crude oil without the need of using refined products of crude oil such as naphtha.

Chemical process plants require high quality piping and mechanical process equipment, all of which require expansion joint solutions. Design integration for movement and pipe stresses requires a long-life concept approach, coupled with a strong understanding of materials and their durability to the medium and environment of the plant.

Fluid Catalytic Cracking Units (FCCU) are considered the heart of the refinery. The process converts heavy crude oil into several more valuable products including LPG, gasoline, kerosene, jet fuel, diesel oil, propylene and some fuel oils.

The FCC operates at very high pressures and temperatures (760°C / 1400°F), consequently resulting in large thermal movements that must be absorbed by the expansion joint. Adding a catalyst to the refining process exposes the expansion joint to gradual deterioration and possible premature failure if the right design is not installed or if crucial components are missing.

Fabric Expansion Joints

DE**KOM**TE multi-layer fabric expansion joints are best for gaseous media, such as air, exhaust gas and solvent fumes, particularly for operation below the dew point, in acidic environments, or for abrasive exhaust gases.

Metallic Bellows

Metallic bellows have a greater flexibility, high cycling capability and gas tightness; normally constructed with 1 to 6 layers of stainless or other high alloy steels. Construction in various geometry from 25mm to 3600mm cross-section.

PTFE Expansion Joints

PTFE multi convolution bellows ensure minimum porosity and a homogeneous wall-thickness. Capable to operate with a high vacuum and pressure resistance, even during a long period of operation.

Rubber Expansion Joints

Rubber expansion joints are universal expansion joints for axial, lateral and angular movements; available with full developed rubber flanges and revolving steel flanges.

Steel Plants

A steel mill or steelworks is an industrial plant for the manufacture of steel. It may be an integrated steel works carrying out all steps of steelmaking from smelting iron ore to rolled product but may also be a plant where steel semi-finished casting products are made from molten pig iron or from scrap.

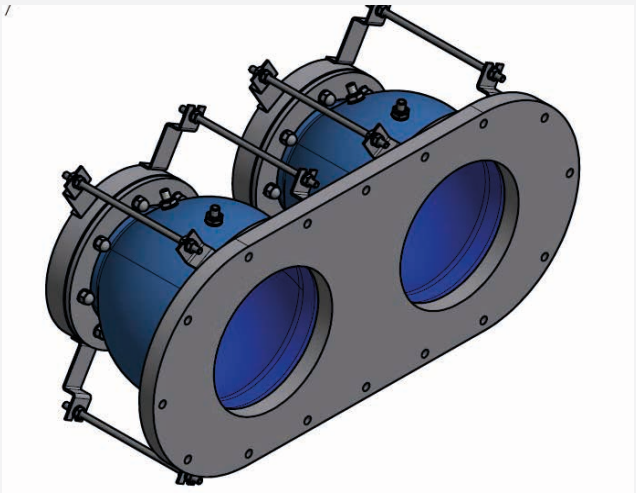
Metal and fabric expansion joints are installed around the furnace and strip mills to ensure no flue gas and heat can leak. Maintaining temperature stability is key to the process and the environmental considerations of this high energy process.

The metal expansion joint is a key element in the piping of these systems, having a design which is especially sensitive to the flexibility, combination of movements and number of life cycles in operation of this equipment. To get a large axial movement, with low rigidities, these metallic compensators have been designed with multi-layer bellows made of high-strength refractory stainless steels, with leakage detection systems. In this case, an inner sleeve has not been required since there was a large lateral movement to be absorbed.

On the side walls of strip steel production plants, fabric expansion joints are often used with very high movement capability, whilst giving full gas tightness and high temperature insulation from the process.

CGL / CAL Steering Roll Expansion Joints

Special moulded silicon coated, multi -layer expansion joints, designed to operate in excess of 500°C, to seal the steering roll to the continuous galvanising line, allowing high lateral movements.



Entry Seal Expansion Joints

Metallic and fabric joints as seals to the furnace and galvanising lines, which ensure air / gas tightness. Integrated nitrogen injection ports in the moulded joints and full movement flexibility for high cycles.

Thermal Solar Plants

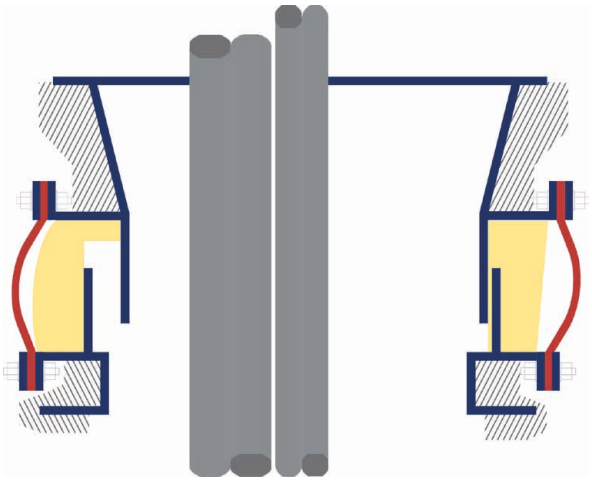
In order to use solar energy independently from sun, engineers have developed a technology to accumulate solar energy. This energy is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.

Fluid salt serves as storage medium. Such a power plant has many thousand tons of a special salt-mixture available that is being pushed via pumps back and forth between two well insulated tanks. On the way from one boiler to the other the molten salt reaches a pipe section that is surrounded by thermo-oil.

During the sun-flooded daily hours the 400°C hot oil releases its heat to the fluid salt. If no sun is available, the heat transfer process is being reversed. The hot salt solution flows back into the adjacent tank. This time the salt releases its heat surplus to the oil.

Expansion joints are being applied everywhere in such power plants where saliferous process pipes lead into the tanks.

In the present case besides the thermal extensions and highly corrosive medium, the problem of subsidence of the immense tank came up. During the initial fill and during the time short after the commissioning of the power plant such an event had to be taken into account and to be compensated for with an expansion joint solution.



The possible subsidence and the expected thermal extension meant the expansion joint had to be designed for an axial movement of more than 160mm. Also, the aggressive medium required the use of high-quality material, special welding technologies and a condensate dissipating flow plate.

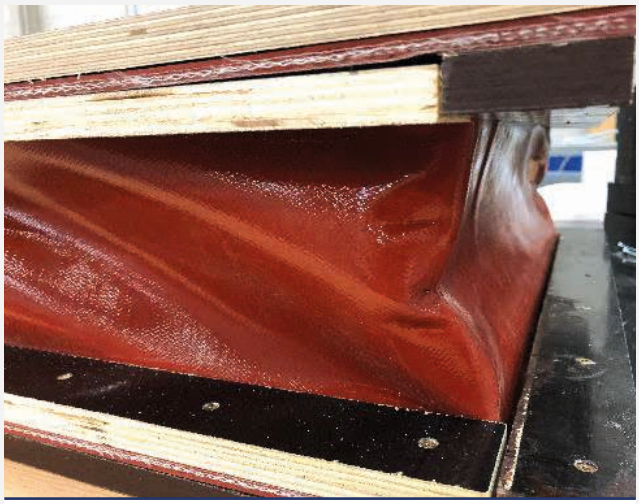
Nuclear Technology

Nuclear power is the use of nuclear reactions to produce electricity. Nuclear power can be obtained from nuclear fission, nuclear decay and nuclear fusion reactions. Presently, the vast majority of electricity from nuclear power is produced by nuclear fission of uranium and plutonium in nuclear power plants.

Expansion joints designed to meet the most stringent safety and quality guidelines are required in all areas and aspects of a nuclear power plant. DE**KOM**TE is certified in accordance 10CFR50 appendix B (equivalent to nuclear ASME standard). The standard covers design, procurement, manufacturing, installation, examination, testing, storage, handling, packaging and shipping of fabric expansion joints; the complete life cycle.

DE**KOM**TE also complies with ASME NQA-1 Ed 2008 part II subpart 2.2. level B, ISO 9001 : 2015 qualification, RAL : quality association for fabric expansion joints and VCA / SCC safety for contractors petrochemical for installation. DE**KOM**TE have experience in supplying the following locations:

- Fabric expansion joints in HVAC ducts NPP
- Fabric expansion joints in fume extract fans NPP
- EPDM expansion joints in hot zone reactor NPP
- Hatch sleeve (TAM) expansion joint NPP



DE**KOM**TE EJs are installed to fulfil seismic displacement according to RG1-29 with movements in all directions. Higher design pressures, humidity and radiation add to the material durability. Testing to achieve an air tightness for a minimum of 3000 cycles requires a complete design solution with full responsibility of the joint performance.

A lengthy design and product validation process was required by DE**KOM**TE to assure a high-quality solution for the TAM hatch sleeve location. A 20-year guarantee of life under high stress, high movements and seismic load. Built to be airtight and withstand flooding, fire and the normal movement and operation.

Fire Resistant Applications

Fire resistance according norm EN1366-4 : 2001. Fireproof expansion joints are installed at wall penetrations in nuclear power plants to absorb thermal movements of pipes, seismic requirements and vibrations.

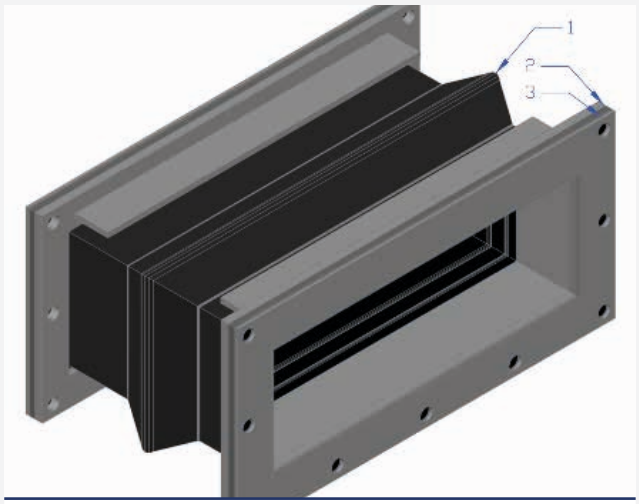
Expansion joints with fire rating are installed in many applications, including power plant exhaust systems, ventilation ducts and high-speed train ducts.

The materials are tested and approved for fire resistance up to 2 hours according following norms:

- NBN 713.020 Belgian norm “Laboratorium voor Aanwending van Brandstoffen en Warmteoverdracht”, University Ghent, Belgium
- DIN 4102 klasse A1 / A2 “Forschungs- und Materialprüfungsanstalt”, University Stuttgart, Germany
- EDF HN 18 S 01, approved by “Centre Technique Industriel de la Construction Métallique”, France
- EN 1366-4:2001 approved by “Warringtonfiregent”
- Efectis Metz France EFR-16-000953 document HROQ 41106 for resistance of material and structural elements against fire according to EN-1366-4

Fireproof EJs in Datacentres

The cooling air system supply in datacentres requires a special DE**KOM**TE clamping system with sealing, and symmetrical composition joints to assure air sealing in the event of fire and systems failure.



Fireproof EJs for High-Speed Trains

A 10-year guarantee of the vibrations, movements and air tightness for the ventilation system of a high speed train required a specially designed, moulded EJ. Fire testing to maintain the airduct integrity was a critical requirement.

RAL - GZ 719

Key tasks of the Quality Association for fabric expansion joints are:

- Reliable use of the products in all application fields
- Continuous amendments of the state of the art for optimum product quality:
  - » By quality and inspection specifications
  - » By technical information optimised regarding cost and benefit

Fabric expansion joints can be used for all types of media in many duct arrangements and countless applications. The user must be sure that by using these elements:

- The application risks are minimised
- Extreme requirements can be fulfilled
- Durability and reliability of the products are provided

Item	Title
TI-001	Determination of tensile strength of supporting layers for fabric expansion joints
TI-002	Flue-gas tight fabric expansion joints
TI-003	Nekal-tight fabric expansion joints
TI-004	Expansion joint questionnaire
TI-005	Tightness test of fabric expansion joints with foam building liquid
TI-006	Documentation of fabric expansion joints
TI-007	Bolted connections for fabric expansion joints
TI-008	Storage, packing and transportation of fabric expansion joints
TI-009	Planning of installation for fabric expansion joints
TI-010	Installation of fabric expansion joints
TI-011	Insulation requirement for fabric expansion joints
TI-012	Maintenance of fabric expansion joints during shut-down period
TI-013	Tolerances for connection flanges and installation dimensions for fabric expansion joints
TI-014	Glossary
TI-015	Safety management of fabric expansion joints
TI-016	Surface temperature of fabric expansion joints
TI-017	Remarks about EC Declaration of Conformity and CE marking of fabric expansion joints
TI-018	Inspection documents according to EN 10204 for fabric expansion joints

With the increased quality demands according to RAL-GZ 719 and the associated technical information, DE**KOM**TE automatically fulfils and exceeds the quality demands of the European Sealing Association (ESA) and the American Fluid Sealing Association (FSA).

Quality Assurance

Quality - ISO 9001:2015

The DE**KOM**TE management team commit themselves to take independent responsibility of the quality of the contractually agreed conditions, standards and other regulations and the associated legal obligations. The DE**KOM**TE management team actively supports the consistent further development of the system in compliance with the imposed requirements.

Safety - ISO 45001

DE**KOM**TE recognises that its activities give rise to a range of hazards, in particular: manual handling, use of machinery, work on site at height and IT. It also recognises that its employees may be exposed to hazards when providing on-site support to their customers.

DE**KOM**TE believes that despite the presence of these hazards, all accidents and incidents of work related ill-health are preventable. It also recognises it has a legal responsibility to ensure the health, safety and welfare of persons affected by its activities.

Environment - ISO 14001:2018

DE**KOM**TE has a responsibility to help protect the environment wherever it has an opportunity to do so and to provide a good environment for its employees to work in.

Fabrication

DE**KOM**TE hold manufacturing and workshop execution class EXC3 accreditation, EN1090 and ISO 3834-2 for base materials. Approved and applied methods include arc welding, part-mechanised Tungsten-inert gas metallic arc welding and part-mechanised active-gas welding. DE**KOM**TE welders are approved and accredited to ISO 9606-1 / ISO 14732.

The personnel for non-destructive testing of welding seams (NDT) is accredited according to ISO 9712.

EJMA - DE**KOM**TE metal expansion joints are in accordance with EJMA (10th Edition) and AD B13.

PED - DE**KOM**TE de Temple Engineering SRL has the certification accredited to AD 2000-Merkblatt HP 0, TRD 201 and EN ISO 3824-2. Therefore DE**KOM**TE is able to manufacture pressure equipment accredited to “Pressure Equipment Directive 2014/68/EU”.

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