LATTY® graf REFLEX

the ultimate high performance gasket

Temperature: –200 to +600 °C Pressure: until 500 bar

- **For all bolted joints**
- **Limiter metal-to-metal contact protects expanded graphite seal from thermal shocks**
- **Warranted to seal and remains tight under extreme and variable conditions**
- **Suitable for any application**
- **Proven in the most demanding nuclear and industrial applications**

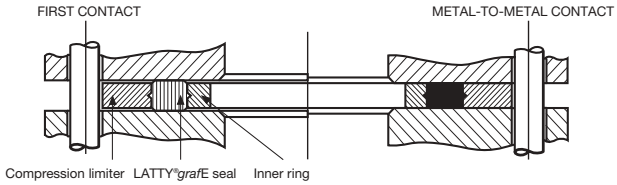
LATTY® international

CONCEPT

The standard LATTY®*graf* REFLEX gasket consists of:

- a sealing component of tightly wound expanded graphite;
- an outer stainless steel retaining ring, precision machined to prevent extrusion and limit compression;
- an inner stainless steel retaining ring.

The main feature of this gasket lies in metal-to-metal contact. During operation, the compression limiter ring protects the LATTY®*graf* E seal by absorbing all mechanical stresses from the pipework, thermal shocks, etc.



The use of LATTY®*graf* E expanded graphite as the working seal means that seal relaxation problems are minimised and that specific pressure on the seal can be calculated and maintained for metal-to-metal contact, essential features for leaktight operation under any conditions, hot or cold.

Exceptional seal resilience is obtained by taking advantage of the elastic recovery of tightly wound expanded graphite.

This recovery represents approximately 10% of the thickness of the compression limiter.

CHOICE OF MATERIALS

- For the inner and outer rings, the standard material used is Z 2 CND 17 – 12/AISI 316 L stainless steel because of its wide range of adaptability. However, at the request of a customer or to meet the needs of a particular application, any machineable material can be used that has the characteristics matching the operating conditions of the joints to be sealed (elastic limit at cold, at temperature, aggressivity of fluid, etc.).
- Thanks to its outstanding properties, expanded graphite, with its high purity and nuclear-quality level with or without protection against corrosion, was first used for long term valve stem sealing. LATTY® International then developed for the Electricité de France a sealing system based on the use of LATTY®*graf* E, an expanded graphite with a very high purity level.

Expanded graphite has proven its sealing efficiency in the 45 PWR stations of E.D.F. It was therefore logical to apply this material. LATTY®*graf* E is approved by E.D.F. and well known for its stability, inertness (except in the presence of high temperature powerfull oxydants), resilience, to flange sealing.

Applied to flanges, it is an active, homogeneous and stable seal with excellent elastic recovery that naturally helps to match flange deformations or defects.

DESIGN

It is essential first to understand the elements and demands of the applications, to assess the stresses that can be imposed on the bolted joints due to temperature and pressure changes in the system.

Fluid: Type, temperature, pressure, also changes of state.

Working conditions: Particularly good with frequent thermal transients.

Flange: Type, dimensions (DN – PN), location of recesses, shape, sizes and machining tolerances. Quality of the bearing surfaces. Hardness of the flange bearing, type of material used.

Closure. Number of bolts, type, material and treatment if any. Method and means of closure.

The availability of all the informations above enables a confident calculation to be made of:

- the load required for metal-to-metal contact,
- the load required for warranted leaktight operation,
- the characteristics of the limiters of the LATTY®*graf* REFLEX gasket: thickness, surface, material (if non-standard).

Standard material: LATTY®*graf* E, Z 2 CND 17 – 12 (316 L).

The definition of all these parameters and the service of Quality Assurance provide the basis for very close repeatability of the LATTY®*graf* REFLEX gasket design characteristics for mass production.

The use of LATTY®*graf* EMB, nuclear quality expanded graphite with inhibitor, is recommended when risks for electrolitycal corrosion exist.

CHARACTERISTICS OF LATTY®*graf* REFLEX

The tests were carried out under controlled conditions between flat steel faces

This curves were plotted by the E.D.F./D.E.R.
Les Renardières (M.T.C. Department).

Mechanical characteristics
Type PEO/ESL

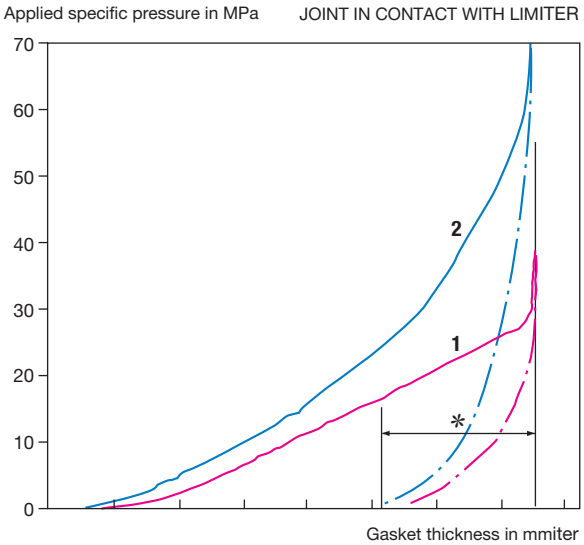
Pressure/recovery curves for LATTY®*graf* REFLEX

Specific pressure with maintained metal-to-metal contact:

Curve 1: for a metal-to-metal contact pressure of 30 MPa

Curve 2: for a metal-to-metal contact pressure of 60 MPa

*Elastic recovery about 10% of the limiter thickness.



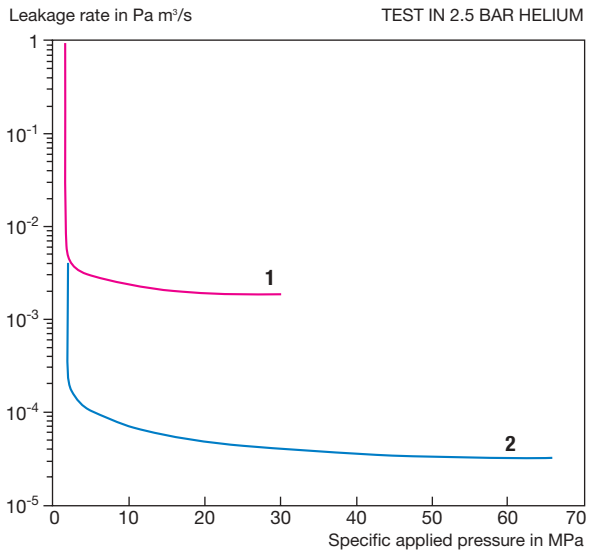
Leakage rate at 2.5 bar helium/specific applied pressure
Type PEO/ESL

Leakage rate at 2.5 bar helium/specific applied pressure to LATTY®*graf* REFLEX gasket during elastic recovery.

Specific pressure with maintained metal-to-metal contact:

Curve 1: 30 MPa

Curve 2: 60 MPa

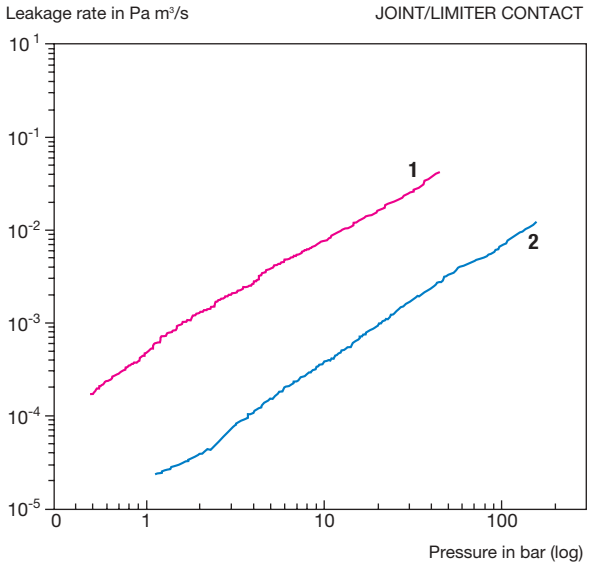


Leakage rate/helium pressure for joints with maintained metal-to-metal contact

Specific pressure with maintained metal-to-metal contact:

Curve 1: 30 MPa

Curve 2: 60 MPa



LATTY®*graf* REFLEX UNAFFECTED BY THERMAL SHOCKS

One of the most interesting characteristics of the LATTY®*graf* REFLEX gasket range is its ability to withstand thermal shock conditions.

The sealing zone of the REFLEX gasket is not affected by the stresses imposed by changes in system temperature and pressure, however rapidly these may occur. These transient thermal and pressure stresses are absorbed by the metal limiter ring in contact with the flange faces while the stability and resilience of the expanded graphite ensure that the seal remains intact.

ADVANTAGES OF THE LATTY®*graf* REFLEX GASKET

■ Raises the efficiency of all bolted joints whether subjected to thermal stresses. Ensures leaktight operation even when thermal transients occur.

■ Reduces the demands on the bolts, allowing for a margin to handle extra stresses due to temperature changes.

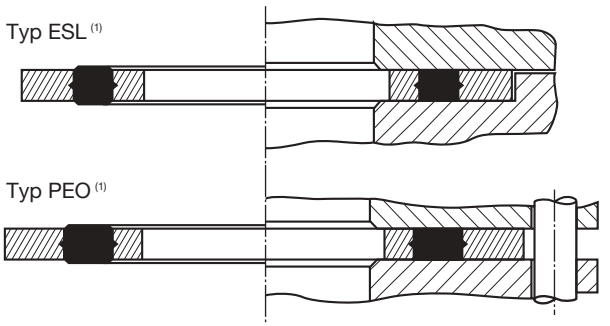
■ Excellent repeatability warrants leaktight operation of each gasket of the same design in the same bolted assembly due to the minimum variation in the required closure load.

■ Limiter and anti-extrusion rings can be made from any machineable material having characteristics compatible with the working conditions.

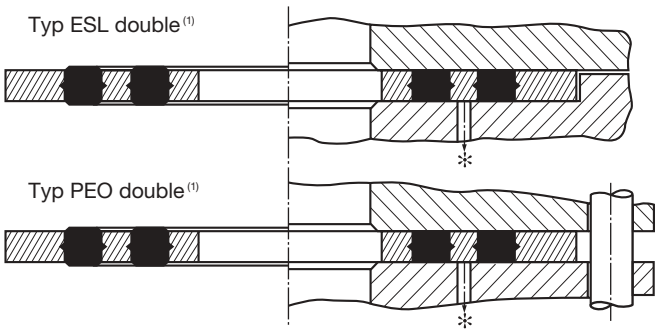
Several thousands of these gaskets are already in service in valve bonnets, valve flanges, pump flanges, manhole joints, etc. to full user satisfaction.

LATTY®*graf* REFLEX DESIGN RANGE

Standard design for flat face, raised face or male and female flanges.

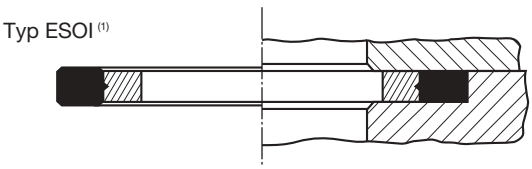


Double barrier gasket for special applications.



Ensures metal-to-metal contact of joint faces in single or double recess flanges.

Can also be used to seal valve bonnets.



(1) DBGM (German Utility Patent)

* Location for leak detector

LATTY® *graf* REFLEX

SOME EXAMPLES IN PRACTICE

Application	Detail
MARINE/NUCLEAR Pump flange to line P. 140 to 180 bar, T. 280°C Fluid: demineralised water **ESL type**	This gasket withstands severe thermal stress conditions Size: dia. 165 x 210 x 4.4 mm Larger sizes up to 300 mm
NUCLEAR Inlet and outlet valves in primary and secondary circuit DAYA BAY and LINGAO nuclear plants in China P. up to 187 bar, T. up to 320°C All fluids including demineralised water and boron water **PEO type**	Reduction of tightening forces Sealing efficiency is maintained after thermal shock conditions cycles Easily fitted on damaged flanges without requiring machining operations
NUCLEAR Pressuriser inlet valves P. 175 bar, T. from 60 to 300°C Fluid: water/steam **ESL/PEO type**	Severe thermal stress conditions when the valve opens LATTY® *graf* REFLEX double face maintains sealing efficiency and reduces tightening forces
NUCLEAR Steam generator joints various applications P. 80 bar, T. 280°C – P. 175 bar, T. 320°C P. 228 bar, T. 300°C – P. 250 bar, T. 110°C **ESL/PEO type**	Characterization and sealing tests carried out by the EDF/DER and the CETIM laboratory Size: DN 15 to DN 600, DN 1/2" to 20"
NUCLEAR Excess let-down heat exchanger in primary circuits T cold side 60°C, T hot side up to 310°C P. 175 bar **ESL type**	Reduction of tightening forces up to 25% Tightening stability after thermal shock conditions Excellent sealing efficiency
INDUSTRIAL Valve, fire-test rigs Fluid: heat transfer oil P. 3 to 5 bar, T. 380°C **PEO type**	Excellent results Complete equipment for loops used for test purposes Size: DN 40 to 100 – PN 16
OEM Valve bodies P. 40 to 60 bar, T. 200°C Fluid: water/steam **ESOI type**	Reduction and regularity of tightening forces Excellent sealing efficiency Size: DN 15 to 100
NUCLEAR and INDUSTRIAL Test rigs for fire-safety valves T. 400 to 600°C **PEO type**	Complete equipment for loops used for test purposes Size: DN 40 to 70 – PN 16
THERMAL Conventional EDF thermal power plants Diaphragms, fluid: overheated water P. 187 bar (service) 280 bar (test), T. 205°C **ESL type**	Installation in drinking water circuit In operation since 1989 Excellent resistance to thermal shock conditions Size: DN 150
NUCLEAR/MANUFACTURER KSB pump flanges in evaporator recirculation circuits Fluid: condensate, T. 155°C Power plant: China Ling Ao Phase II **PEO type**	Original equipment installation instead of metal plastic gaskets coated with silver Excellent references of REFLEX-type gaskets in the nuclear sector Size: DN 3/4" to 250 – PN 150

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