DIPL. ING. BERNHARD RICHTER, GROSSBOTTWAR, GERMANY

RING
PRÜFLABOR
RICHTER

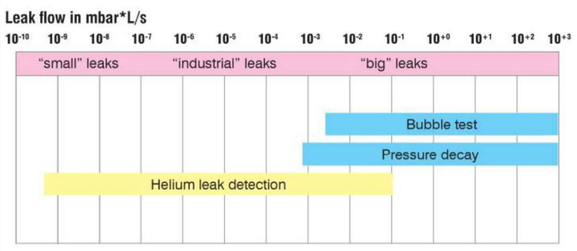
STATE OF THE ART FOR O-RINGS: STANDARDIZATION – TESTING – MATERIALS

STAND DER TECHNIK BEI O-RINGEN: NORMUNG – PRÜFTECHNIK – WERKSTOFFE

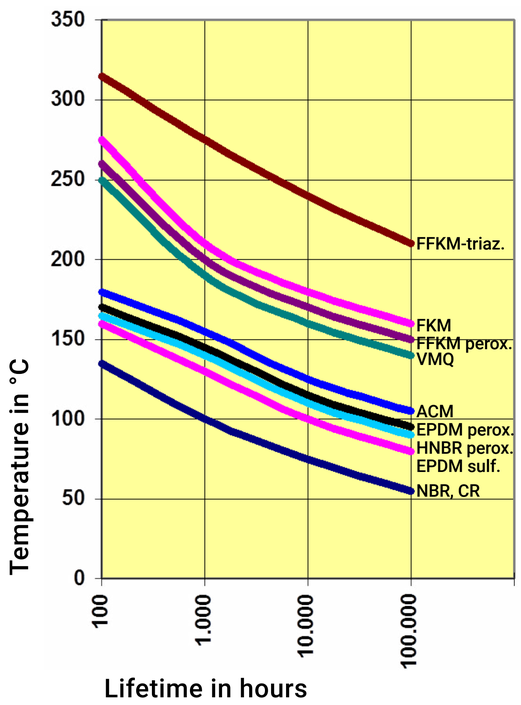
WHAT IS A GOOD SEALING FUNCTION

Sufficiently tight

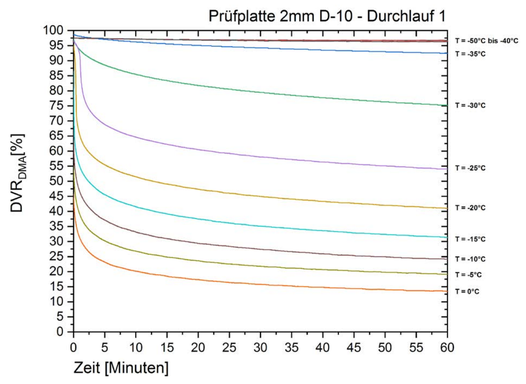
Watertight <0,01 mbar*l/s
Gastight <0,0001 mbar*l/s

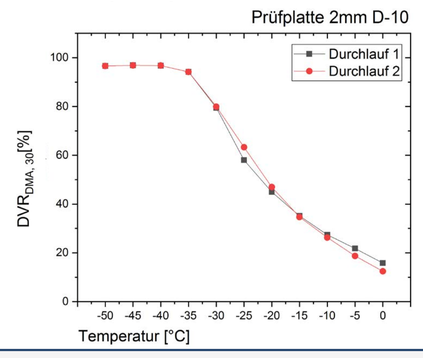


Sufficiently heat resistant

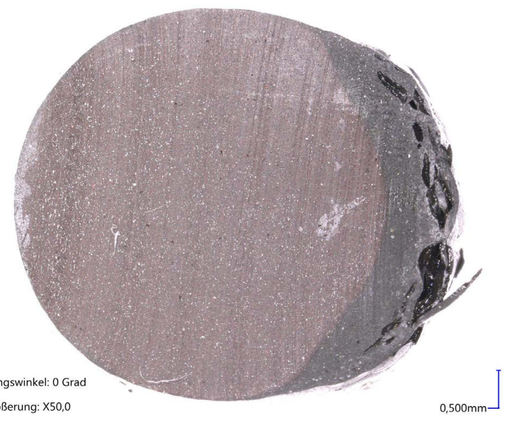


Sufficiently resistant to low temperatures





Sufficiently media resistant



- No chemical attack
- Only limited swelling
- Only limited shrinkage

REQUIREMENTS FOR A GOOD SEALING FUNCTION

GLAND DESIGN

- Enough deformation even at worst case tolerances
- Good surfaces
- No sharp edged surfaces
- No too big gaps

O-RING PROPERTIES

- Keeping the dimensional tolerances
- Good recipe and controlled vulcanization process
- No critical surface defects

ASSEMBLING

- No dirt on sealing surfaces
- No intermixing of compounds
- No contact with sharp edges

Material quality = recipe quality x production quality

Influencing factors:	polymer plasticizer concentration crosslinking system	mould temp. curing time post curing

	Qualification testing	**Serial parts testing**
Material testings	test slab or finished part hardness + specific weight tensile strenght/ elonga-tion at break compression set ageing/ immersion testings TGA/IR-anlysis	finished parts only hardness + specific weight compression set only in special cases: ageing/ immersion testings TGA/IR-anlysis

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STATE OF THE ART

STANDARDIZATION

ISO 3601-1

ISO 3601-3

ISO 3601-5

TESTING

Automated visual inspection and measuring

Analytical test methods for compound-identification

Safer results by accreditation

MATERIALS

FFKM and FKM with improved cold-flexibility and steam resistance

Enlarged range of cross-section tolerances (ISO 3601-1) and limits for surface imperfections (ISO 3601-3) up to 14,0 mm

Non-Fill

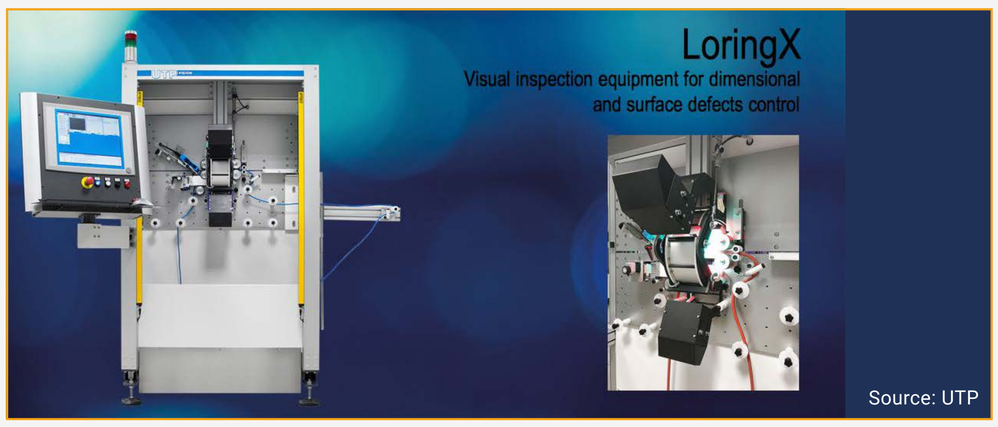
Backrind

Requirements for recipes and for o-ring-properties of NBR, HNBR, EPDM, FKM, VMQ and ACM-materials

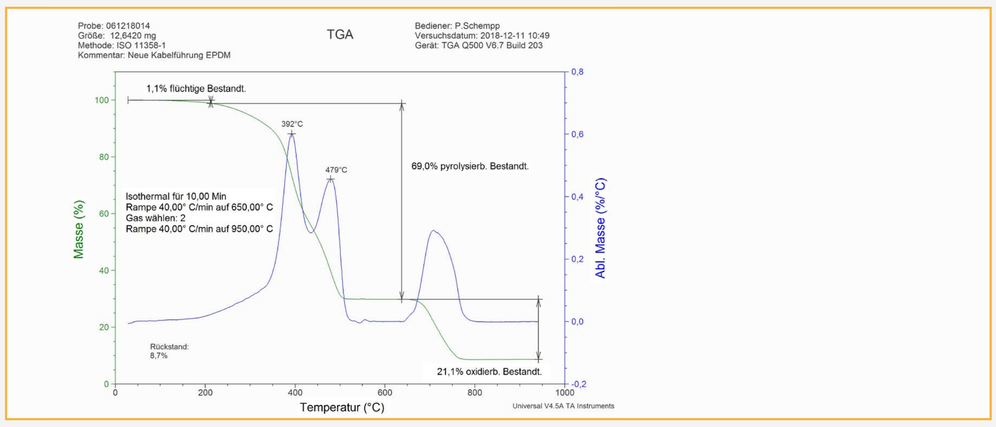
Compression Set Requirements for O-Rings

t=24h	NBR S 70	HNBR 75	FKM 70/75/80	EPDM P 70/80
Test-Temp. [°C]	100	150	200	150
Compression set [%] (min. 2 mm d2)	35	40	25	30
Compression set [%] (< 2 mm d2)	40	45	30	35

Automated visual inspection machines available for o-rings from 0,8 mm inside-diameter to > 1000 mm and from 0,26 mm cross-section to 30 mm including dimensional testing



TGA-analysis indicates the main ingredients of a recipe in regard to weight contents while FTIR-analysis identifies the chemical structure of the polymer and the other ingredients.



ISO/IEC 17025 defines general requirements for the competence of testing and calibration laboratories, accreditation assures conformity

DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

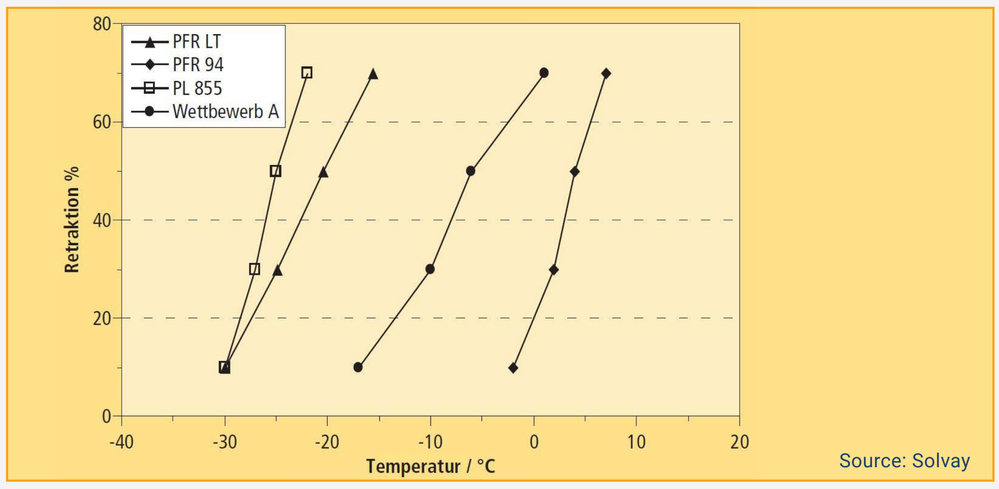
Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

O-Ring Prüflabor Richter GmbH
Kleinbottwarer Straße 1, 71723 Großbottwar

Special FKM-grades for low temperature <-40°C as well FFKM types for improved low temperature (<-30°C) allow a better cold flexibility together with best aging and chemical resistance



Source: Solvay