

James Walker®

Fluid sealing guide for the Defence & Aerospace industries



- *Cost effective, high-integrity sealing*
- *Standard and custom-designed products*
- *Researched, developed, tested and proven*
- *Backed by surety of global supply*

High Performance Sealing Technology



James Walker in action

James Walker is a dynamic global manufacturer and distributor that supplies a vast range of specialised products and services to virtually every industrial sector.

We have more than 50 production, engineering, distribution, technical support and customer support facilities worldwide — backed by extensive IT networks, e-commerce systems and logistics operations — to serve customers in over 100 countries.

Our world-leading areas of expertise encompass high performance fluid sealing and bolting technology, together with plant engineering services. These activities are mainly led by materials technology and design expertise, and range from research, development and manufacture, to product application and equipment refurbishment.

Together with associated knowledge-based services, they help keep global industry running safely and efficiently, year-in and year-out.

Defence & aerospace pedigree

We are committed to working closely with governments in support of fluid seal design to enhance their defence capabilities. This service naturally extends to equipment manufacturers and maintenance contractors operating on a global basis.

The long-term partnerships we have fostered with customers, since our company was founded in 1882, have proved to be among the most valuable key strengths that we offer.

Our business started with the development and supply of fluid sealing products to improve the safety and efficiency of the 'new' high pressure, high temperature steam engines used by naval and commercial fleets. Since then, our long-established pedigree in high performance sealing technology has led us to supply many generations of products used in:

- **Naval forces** — surface ships, submarines, support craft...
- **Air forces** — fixed wing combat aircraft, helicopters, logistics and support aircraft, training aircraft...
- **Ground forces** — fighting vehicles, personnel carriers, field guns, rocket launchers...
- **Civil aerospace** — engines, fuel systems, airframes, doors...

Much of our high level work for the defence and aerospace sectors is confidential. We are accustomed to operating under these conditions and fully respect the security issues involved.



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Front cover photographs

Astute Class submarine, Challenger battle tank, Eurofighter Typhoon, 146 Lufthansa Regional – © 2005 BAE Systems. All rights reserved.

Quality – the prime consideration

Quality culture

Quality design, quality manufacture and quality service are paramount throughout James Walker's worldwide operations. No effort is spared to achieve the highest standards.

We start with the best raw materials and use advanced manufacturing techniques with strict quality control, culminating in an exacting inspection of finished products. This culture of quality is reinforced by our top-level technical support, logistics network and a multitude of customised services for the defence and aerospace sectors.

Standards

Our quality standards are third party registered to BS EN ISO 9001:2000. We are also regularly assessed and quality approved by a wide range of industry bodies and individual customers, including multinational corporations, utilities and government organisations.

With regard to the defence and aerospace sectors, we hold:

- AS-EN 9100 accreditation
- AS-EN 9104 accreditation.

Together with the ability to store and package products to Ministry of Defence and aerospace standards.

In addition, we are accredited suppliers to many original equipment manufacturers and contractors, including:

- Airbus
- BAE Systems
- Ministry of Defence (UK)
- Martin-Baker
- Rolls-Royce
- Raytheon.



Elastomer production at James Walker's Cockermouth plant



Critical inspection of elastomeric mouldings with state-of-the-art optical measuring system



Vacuum moulding at James Walker's Cockermouth plant

Leading with technology

Expert advice from James Walker Technology Centre

Our success is founded on the technical expertise and support we give to customers with expert advice, specialised materials and product designs.

James Walker's applications and field engineers solve sealing problems around the world. They will advise and custom-design the optimum sealing solution for your plant and equipment. But, as well as working with customers at original design stage, they are just as willing to go into the field to solve expensive on-site problems.

This level of advice on high technology fluid sealing is freely available to original equipment designers, end users, maintenance specialists and plant refurbishment contractors.



Production development & testing

We have extensive product test facilities. These are used during the development of new products and also to ensure that optimum performance is maintained when the item is in production. For sealing applications we use:

Rotary seal testing

- Five dynamic test rigs — covering 50mm, 160mm, 190mm and 330mm diameter.
- Pressures to 4bar.
- Speeds to 40m/s.
- Liquid/liquid interface (eg, for marine stern gland or stabiliser).
- Mineral and synthetic oils, water.
- Steel or ceramic shafts.
- Direct torque measurement.

Materials testing, development & research

Our team of polymer technologists is dedicated to the continuous improvement of the materials we use — and the development of new ones. Unlike the majority of sealing product manufacturers, we design, develop and mix all of our elastomer compounds.

In addition to the standard test equipment in our Materials Laboratory that we use to monitor the quality of our compounds, we also have state-of-the-art specialised tools to characterise them and diagnostic tools for performance investigations.

Techniques include:

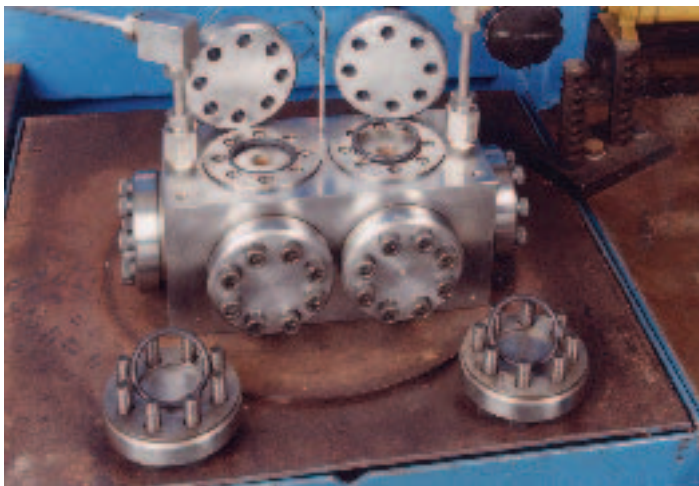
- Fourier transform infrared (FTIR) analysis.
- Thermogravimetric analysis (TGA).
- Compression stress relaxometry.
- Precision tensometry, with temperature control from -100°C to +300°C.



Leading with technology

Hydraulic seal testing

- Four dynamic test rigs — three for rods, one for pistons.
- Rod sizes — 50mm and 100mm diameter.
- Bore sizes — 63mm and 160mm diameter.
- Pressures to 420bar.
- Speeds to 0.5m/s.
- High water based fluids (HWBF).
- Direct friction measurement.



Static seal testing

For testing and characterisation of gaskets, jointings and special static seals we have

- A variety of test rigs.
- Pressurised with oil to 1550bar.
- Pressurised with inert gas to 400bar.



Hydrocarbon test facility

Unique for a seal manufacturer, we have extensive test facilities with the required safety features to test with flammable gases (methane or hydrocarbon gas mixture) at:

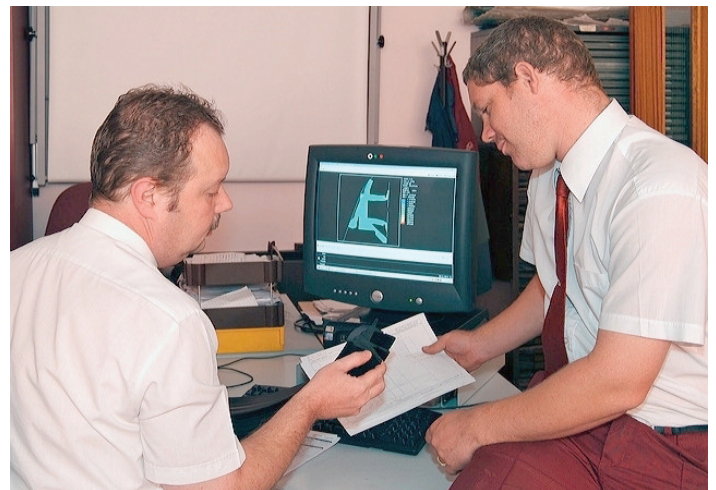
- Pressures to 400bar.
- Temperatures to 200°C.

This is extensively used for the development and validation of our world-leading range of explosive-decompression (ED) resistant elastomers, and high performance valve packings for control of fugitive VOC emissions. It accommodates all relevant international and customer-specific validation testing regimes.

Finite element analysis (FEA)

Using non-linear finite element analysis software, our design specialists can mathematically model the behaviour of elastomeric products under operational conditions.

This tool is invaluable for the evaluation of design concepts and predicting performance before the manufacture of prototypes. It is also helpful in understanding modes of failure and the reasons for poor performance.



Gaskets & jointings

Gasket products & materials for all configurations of bolted flange joints

Semi-metallic & metallic gaskets

(Please ask for product brochure, part number ML-155396)

- Metaflex® spiral wound and Metakamm® Kammprofile-type gaskets for pipelines, pressure vessels, heat exchangers, etc.
- Available to nuclear industry specifications, and TA-Luft VOC emission control certification.
- Recommended for steam duties to 650°C or 350bar, and with oxidising media to 500°C.
- Versions for cryogenic duties or temperatures to 1000°C.
- Resist thermal cycling, pressure fluctuations and vibration.
- Also many designs of solid and metal-jacketed gaskets.

Metal ring joints

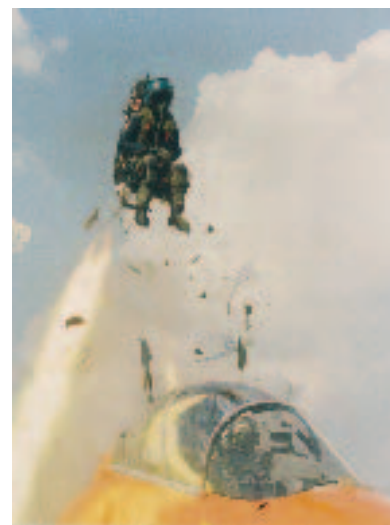
(Please ask for product brochure, part number ML-155396)

- World-leading Moorside® machined products.
- Approved to API and ASME standards — fit ASME, BS and DIN flanges.
- Exacting performance under extreme conditions, including pressures exceeding 700bar.
- Supplied in all relevant materials, profiles and sizes.

Cut gaskets & sheet jointings

(Please ask for product brochure, part number ML-155396)

- Precision gaskets cut from **any** sheet material using waterjet and abrasive waterjet CAD/CAM machines.
- Full range of non-asbestos fibre jointings — covering ratings to ASME Class 300 flanges to at least 260°C, plus potable water services.
- PTFE Fluolion® Integra and GORE™ grades for hygiene and outstanding chemical resistance.
- Supagraf® expanded graphite — excellent chemical resistance with applications from cryogenic to 400°C in oxidising conditions.
- Supagraf® Ultra High Purity for nuclear applications.
- Nebar® cork-elastomer grades — for switchgear, transformers, fuel oils, petrol and lubricants.
- Specification grade elastomers — NR, NBR, CR, IIR, EPDM, VMQ, PVMQ, MQ, PMQ, FMQ, FKM. Also Kalrez® perfluoroelastomer FFKM from DuPont Performance Elastomers.



Courtesy of Martin-Baker Aircraft Co Ltd

Flange insulation sets

(Please ask for product brochure, part number ML-155396)

- Sets of electrically insulating flange gasket and bolt sleeves, plus washers, to prevent corrosion through bolts.
- Used in cathodic protection systems, and to eliminate galvanic corrosion on pipelines carrying water, oil or gas.

Metaflex® and Metakamm® gaskets



Precision gasket cutting by waterjet



Supagraf® expanded graphite



Nebar® cork-elastomer



Engineering plastics & metals

In-house expertise in PTFE, engineering plastics & advanced machining of metals plus other materials

PTFE-based materials

(Please ask for product brochure, part number ML-155396)

- Components supplied in Fluolion® virgin PTFE.
- Also in filled Fluolion® grades of PTFE, to improve specific physical properties — including rigidity, wear resistance, creep resistance, thermal conductivity and load-bearing capacity.
- Coating, encapsulation, impregnation and bonding with PTFE.
- Fluolion® Thread Tape — unsintered PTFE tape for sealing screw threads on oxygen systems, air lines, etc.

Engineering plastics

- Complete range of materials, including nylon, acetal and PEEK™.
- Injection moulding of virtually all engineering thermoplastics.
- CNC machining of engineering plastics.
- Hot casting of polyurethane.
- Components manufactured from 2mm to 3000mm diameter.
- Production runs from single items to millions.
- Potable water and food quality materials supplied.

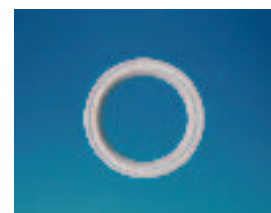
Custom machining of metals

- Precision profile cutting of **any** sheet material by CAD/CAM abrasive waterjet or laser cutters, all working directly from customers' CAD files.
- Abrasive waterjet cutting capacity includes stainless steels from 100mm thickness down to thin foil, without heat distortion, as well as titanium sheet.
- Laser cutting capacity covers mild steel to 20mm thickness, stainless steel to 10mm and aluminium to 5mm.
- Advanced thin wall machining capability up to 2.3m diameter at tight tolerances with absolute concentricity, plus radial and tangential drilling, for alloy steels and nickel alloys.
- CNC machining of metals and manufacture of new or obsolescent components.
- Plant re-engineering and assembly.



AgustaWestland Apache AH MK1 – © AgustaWestland, all rights reserved

PTFE component



Injection moulded engineering thermoplastics



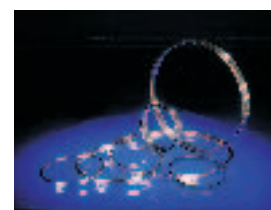
Abrasive waterjet cutting



Laser cutting



Thin wall machining expertise



Elastomer engineering

World-class materials & products from a world leader in elastomer technology

High performance elastomers

(Please ask for product brochure, part number ML-010959)

- Over 300 grades formulated and compounded in-house.
- Elastomers custom-developed to meet optimum requirements.
- Compounds to resist extremes of temperature and pressure, abrasion and chemical attack.
- State-of-the-art facilities for precision compounding.
- Rigorous testing and control with full traceability.

Elastomer manufacturing

(Please ask for product brochure, part number ML-010959)

- Compression moulding to 2.2m diameter in a single operation.
- Moulding under vacuum to 2m diameter.
- Special mould-joining technique for producing moulded elastomeric components to unlimited diameter.
- High precision injection moulding — from complex miniature components to 500mm diameter.
- Transfer moulding.
- Plastic or metal inserts securely moulded in.
- Extrusion of simple or complex profiles, by continuous or batch production.
- Bonding to metals or plastics, plus production of special composites.

Custom design & manufacture

(Please ask for product brochure, part number ML-010959)

- Design and development of precision elastomeric components.
- Prototyping, testing and full-scale manufacture.
- In-house tool design and CAD/CAM machining.



BAE Astute Class submarine – © BAE Systems. All rights reserved

High precision custom mouldings



Compression moulding of giant seals



Precision moulding under vacuum



Extrusion process



Chemical treatment of metal surfaces for top quality rubber-to-metal bonding



Elastomeric sealing products

High-performance fluid sealing technology at its very best

Rotary seals for all applications

(Please ask for product brochure, part number ML-016655)

- Walkersele® radial lip seals in 10,000 type/size combinations.
- Walkersele® OSJ — patented On-Site Joining technique that minimises downtime by allowing seals to be installed without stripping down the housing.
- Walkersele® Ultraglide — for up to six times longer life in hot and abrasive environments.
- Cartridge assemblies — HydroSele® and custom designed models to solve specific problems.
- Commercial V-rings and metal-cased lip seals.

'O' rings

(Please ask for product brochure, part number ML-011653)

- Precision moulded in over 100 elastomer grades.
- Approved to numerous standards, including DEF STAN 02-337, DGS, DTA, and replacement BSF and AMS.
- All sizes to industry standards and international standards.
- Vast stocks for immediate delivery, with non-stocked rings on short lead times.
- Commercial grade rings and kits for less critical duties.

Bonded seals

- Metal washer with shaped elastomer ring bonded inside.
- All standards and sizes, also non-standard designs.
- Bonded inserts of general and high performance elastomers.
- Washers of alloy steels, and non-ferrous metals and alloys.

Hydraulic sealing products

(Please ask for product brochure, part number ML-017376)

- Well-proven seals for all hydraulic applications.
- From small actuators to giant jacks and forging presses.
- Designed for optimum performance and long trouble-free life.
- For duties with mineral-based or fire-resistant fluids.
- Low friction with reduced leakage.
- Plus wipers, scrapers, bearing strips...



Eurofighter Typhoon – © BAE Systems. All rights reserved

Walkersele® radial lip seals



Walkersele® OSJ-2



Custom-designed cartridge seal



'O' rings



Hydraulic seal range



Gland packings & mechanical seals

Rotary, reciprocating & static sealing expertise

Gland packings

(Please ask for product brochure, part number CPN000014195)

- 50 packing grades ranging from state-of-the-art materials to traditional natural yarns.
- For the most modern pumps and valves, as well as stern glands, rudder posts and hatch lids.
- Reduce stockholding levels, as length form packings often have multi-service use on many pumps and valves at a site.
- Also supply a full range of seal installation lubricants and anti-seize compounds.

Packings for rotary & reciprocating pumps

(Please ask for product brochure, part number CPN000014195)

- Choice of PTFE, graphite, synthetic fibre or natural yarn.
- Rotary to 25m/s or 25bar, reciprocating to 250bar or 1.5m/s.
- Temperature ranges from cryogenic to 650°C.
- Grades for chemically aggressive and abrasive media, and pumps in poor mechanical condition.

Valve stem packings

(Please ask for product brochure, part number CPN000014195)

- Reduce VOC emissions in hydrocarbon and chemical systems.
- Grades for abrasive slurries and chemically aggressive media.
- Approved grades for potable water, and liquid/gaseous oxygen.

Tank lid packings & static sealing

(Please ask for product brochure, part number CPN000014195)

- Tank lid and hatch seals for marine duties and tank containers.
- Tankatite® packing for hatches covering bulk liquid cargoes in all IMO classes.
- Halo manlid seals and other products for tank containers.
- Very high temperature packing for furnace doors at 1000°C.

Mechanical seals & cartridge seals

(Please ask for product brochure, part number CPN000087011)

- Types and sizes for all applications, including slurry pumps.
- Specials custom-designed and manufactured.
- Trouble-shooting and problem solving service.
- All makes refurbished to good-as-new condition.



Devonport Royal Dockyard – Photo by DMIL

Fluolion® Emulsion 2XA — cost effective multi-service on land and sea



Supagraf® Control can reduce VOC emissions from valves to 50ppm



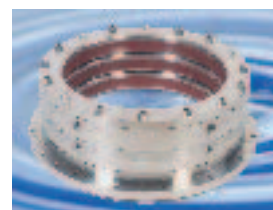
Tankatite® 440 for all types of vessel



Halo manlid seals for tank containers



Cartridge seals



Expansion joints & bellows

Flexible products to absorb movement in ducts & pipework

Expansion joints

(Please ask for product brochure, part number CPN000043584)

- Comflex® gas turbine exhaust expansion joint — accepts high temperatures, large movements, pulsations and vibration.
- Comflex® gas turbine inlet expansion joint — for long life, with excellent sound attenuation and particulate free inner surface.
- Comflex® multi-layer fabric wrap — an emergency measure for failed expansion joints that often becomes a permanent solution.
- Comflex® elastomeric expansion joints — hardwearing products in a range of materials to suit different applications.
- Comflex® PTFE expansion joints — single layer joints with a chemical barrier of laminated PTFE films on the inner surface.

Flexible bellows

(Please ask for product brochure, part number CPN000043584)

- Comflex® HT/XA bellows — twill-woven stainless steel and glass yarn, proofed with high temperature resistant compound.
- Comflex® fabric reinforced bellows — used as heavy duty protectors on hydraulic rams and other dynamic systems.
- Comflex® metallic bellows in many alloys — contain system pressure in pipes and absorb thermal movement and vibration.
- Comflex® rubber bellows — absorb displacement and motion between flanges of up to 2500NB; stock sizes to 400NB.
- Comflex® PTFE lined rubber bellows for chemical environments.

Bulkhead penetration seals

- Comflex® penetration seals — supplied in kit form for fitting to an existing pipe penetrating a boiler casing wall or bulkhead.
- Special designs to accommodate banks of pipes.
- Available in fabric, or metallic materials for demanding duties.



Type 45 destroyer — © BAE Systems. All rights reserved

Comflex® GT exhaust expansion joint



Comflex® GT inlet expansion joint



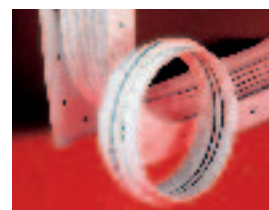
Comflex® multilayer fabric wrap



Comflex® metallic bellows



Comflex® HT/XA expansion joints



Vibration attenuation

Scientifically designed materials to attenuate noise, vibration & shock loads

Pipe grips

(Please ask for product brochure — see page 15)

- Tico® Pipe Grips — safe, reliable and easy to install.
- Approved for marine, offshore and land-based applications.
- U-bolts fully encased in fire retardant elastomer cover.
- Designed for use with stainless steel and Cu/Ni pipes.
- Prevent wear, accept vibration and thermal movement.
- Isolate pipes to prevent electrolytic corrosion.

Clip strip

(Please ask for product brochure — see page 15)

- Tico® Clip Strip — for effective and economical pipe isolation.
- Approved for marine, offshore and land-based applications.
- Cork-elastomer strip with raised shoulders for positive location.
- Reduces and absorbs shock, noise and vibration.
- Prevents electrolytic action between dissimilar metals.
- Three grades accommodate temperatures up to 300°C.

Mounting pads & buffers

(Please ask for product brochure — see page 15)

- Tico® S machinery mounts — rapid bolt-free installation with all types of machinery base, also attenuate noise and vibration.
- Tico® Adjustamount — swift precision levelling or gradient generation for plant and machinery.
- Tico® LF mounting pads — easy-to-install bonded sandwich pads for isolating plant or structures at low frequencies.
- Tico® CF pads — critical frequency isolation of plant from structures at down to 8Hz under load.
- Tico® Hi-duty pads and buffers — three grades that cushion massive impact and shock loads to prolong machinery life.

Flooring & decking

(Please ask for product brochure — see page 15)

- Treadmaster® Original anti-slip decking — excellent slip resistance with durability and comfort in wet and dry conditions.
- Treadmaster® ER — for engine rooms and other below deck areas where machinery and mineral oils are used.



Tico® Pipe Grips



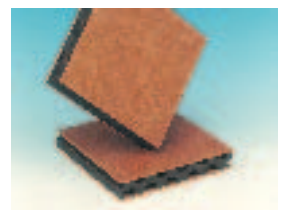
Tico® VHT Clip Strip for duties to 300°C



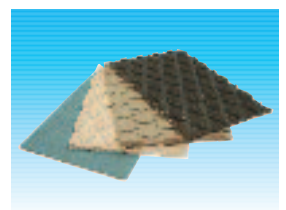
Tico® Adjustamount



Tico® LF mounting pads



Treadmaster® anti-slip decking



Bolted joint integrity

Maintaining the integrity & reliability of bolted joints & process equipment

RotaBolt® tension control systems

(Please ask for product brochure — see page 15)

- Award winning fasteners with tactile, visual and remote tension-measuring systems.
- Increase ratings on OEM equipment and reduce production and assembly costs.
- Reduce in-service maintenance costs and component consumption.
- Speed up bolt installation times, with assured safety and reliability, and no vibration loosening.
- Compatible with all common tightening methods.

Joint integrity programme

(Please ask for product brochure, part number CPN000086033)

- Combines the expertise of James Walker and partner companies.
- Controls and monitors the key reliability parameters of installed bolt tension and joint compression.
- Delivers long-term engineered solutions to maximise up-time, reduce leaks and minimise product loss.
- Services include on-site leak detection and repair (LDAR), data management and reporting, and plant refurbishment.
- Covers pressure vessels, heat exchangers, pipework, bolted joints, and valves.



Challenger Battle Tank – © BAE Systems. All rights reserved

RotaBolt® Vision



RotaBolt® 2 — with upper and lower limits



LDAR monitoring



On-site maintenance



Valve refurbishment



Support services for defence & aerospace industries

Plant consultancy services, design, manufacture, assembly, maintenance & refurbishment

Hydraulic systems

(Please ask for a leaflet — see page 15)

- Problem-solving consultancy service covering all types of hydraulic system.
- Failure-mode analysis and creation of long term solutions.
- Design and manufacture of new systems.
- Assembly, testing, installation, and on-site maintenance by teams holding Safety Passports.

Plant refurbishment

(Please ask for a leaflet — see page 15)

- Skilled refurbishment work carried out by experienced craftsmen, either on-site or in our dedicated machine shops.
- Valves of all types and sizes.
- Hydraulic cylinders and systems for all duties.
- Mechanical seals of every make and type.
- Rotary and reciprocating pumps.
- Plant tested and certified before re-installation.

General on-site works

- Plant maintenance by experienced teams holding Safety Passports.
- Scheduled and emergency work undertaken.
- Gland and flange sealing improvements carried out on all types of plant.
- Installation of expansion joints and bellows.
- Boiler and steam system overhauls.



146 Lufthansa Regional – © BAE Systems. All rights reserved

Design and manufacture of strand jacks



Hydraulic cylinder refurbishment



Valve refurbishment service



Flange sealing improvements



Expansion joint installation



General information

These guides give detailed technical information on the products and services covered in this publication. Please ask for your copies, or visit our website www.jameswalker.biz where many of them can be downloaded in pdf form.



Gaskets & Jointings
(Part number: ML-155396)



High performance elastomers
(Part number: ML-010959)



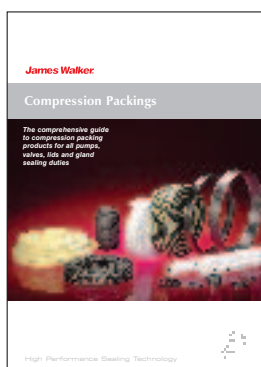
'O' rings
(Part number: ML-011653)



Hydraulic seals
(Part number: ML-017376)



Walkersele® rotary lip seals
(Part number: ML-016655)



Compression packings
(Part number: CPN00014195)



Cartridge seals
(Part number: CPN000087011)



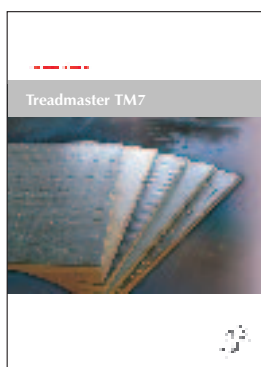
Expansion joints & bellows
(Part number: CPN000043584)



Pipework support products



Mounting pads & buffers



Flooring & decking



RotaBolt® tension control



Joint integrity programme
(Part number: CPN000086033)



Hydraulic systems



Plant refurbishment

Trademark acknowledgements

James Walker acknowledges the following trademarks as mentioned in this publication. All other names bearing the ® symbol are registered trademarks of James Walker.

GORE™ WL Gore & Associates
 Kalrez® DuPont Performance Elastomers
 PEEK™ Victrex

James Walker®

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Health warning: If PTFE or fluoroelastomer (eg, FKM, FFKM, FEPM) products are heated to elevated temperatures, fumes will be produced which may give unpleasant effects, if inhaled. Whilst some fumes are emitted below 250°C from fluoroelastomers or below 300°C from PTFE, the effect at these temperatures is negligible. Care should be taken to avoid contaminating tobacco with particles of PTFE or fluoroelastomer, or with PTFE dispersion, which may remain on hands or clothing. Material Safety Data Sheets (MSDS) are available on request.

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