



## Flap dampers and gas diverters for power stations, FGD and DeNOx plants

PERFECT DAMPER TECHNOLOGIES FOR INDUSTRIAL PLANTS

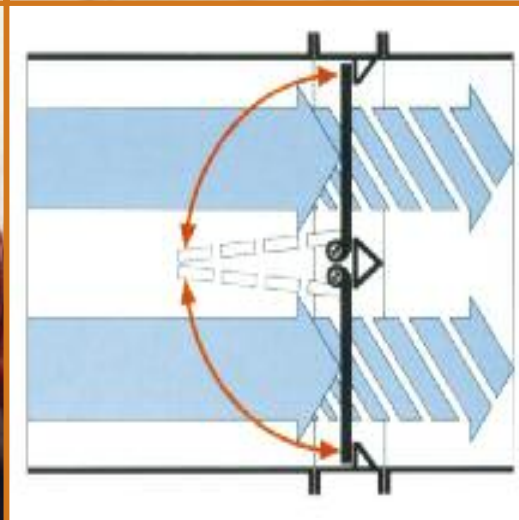
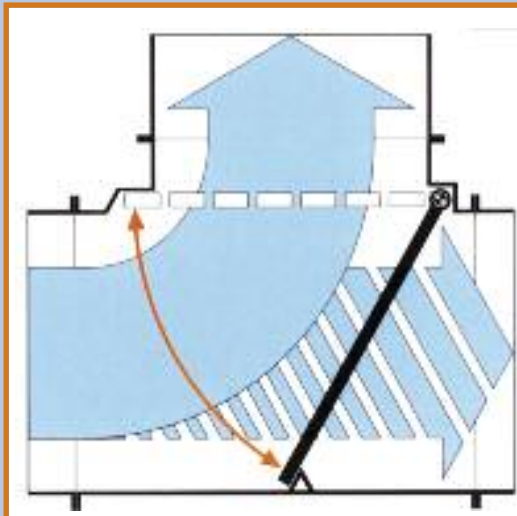




Illustration above: Flap damper DW 7000 mm with duct piece during transportation to the installation site.  
**FGD at the RWE power station, Niederaussem.**

Illustration below: Two gas dampers NS 7480x5300 mm for the **DeNOx plant at the AMER power station in Holland** at the Rauenstein works. Completion with the duct piece takes place on-site.



# Flap dampers and gas diverters for FGD and DeNOx plants



**RAUMAG-JANICH** has developed special flap dampers and gas diverters for rerouting and shutting off flue gas flows during flue gas desulphurisation and denitrification.

As early as 1980 the first flap dampers from JANICH-Systemtechnik were trialed in flue gas desulphurisation and DeNOx plants. In the ensuing years over 500 such valves were delivered.

**Based on this experience, RAUMAG-JANICH** has further developed these solutions which have proven themselves in a multitude of applications worldwide.

**The new MICROFLEX-HIPERFORM sealing system and the lattice supported blades for high gas temperatures form the prerequisite for fault-free operation and reliable leak-tightness even under difficult conditions.**

**Flap dampers** are supplied for circular and rectangular ducts.

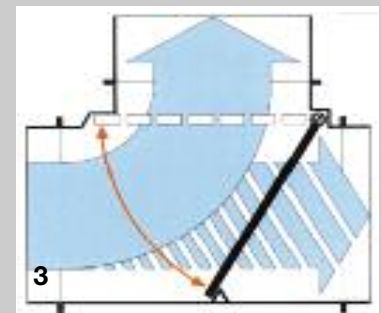
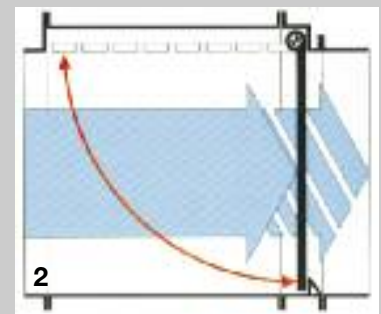
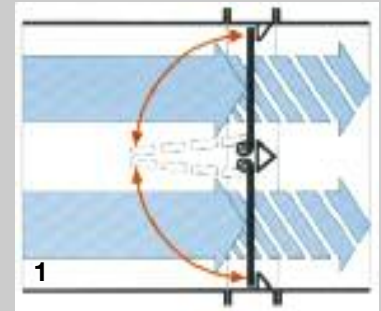
**1 Flap dampers for circular ducts** are two-bladed in their construction for geometric reasons. The damper blades swing towards the centre of the duct.

**2 Flap dampers for rectangular ducts** swing, as a rule, into a recess in the duct wall.

**3 Gas diverters** have three duct connections. The flap blade blocks off one of the ducts at a time.

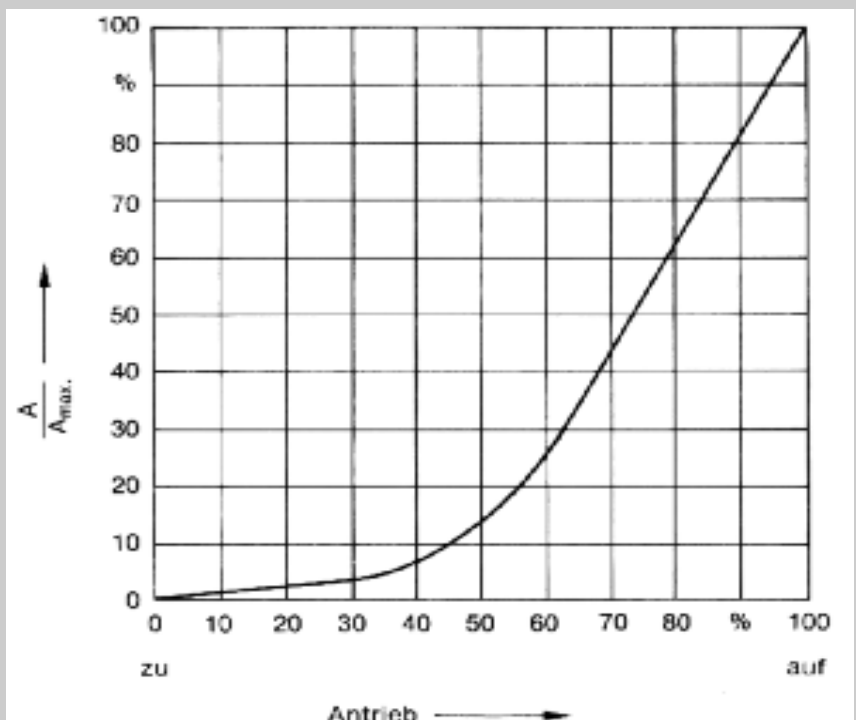
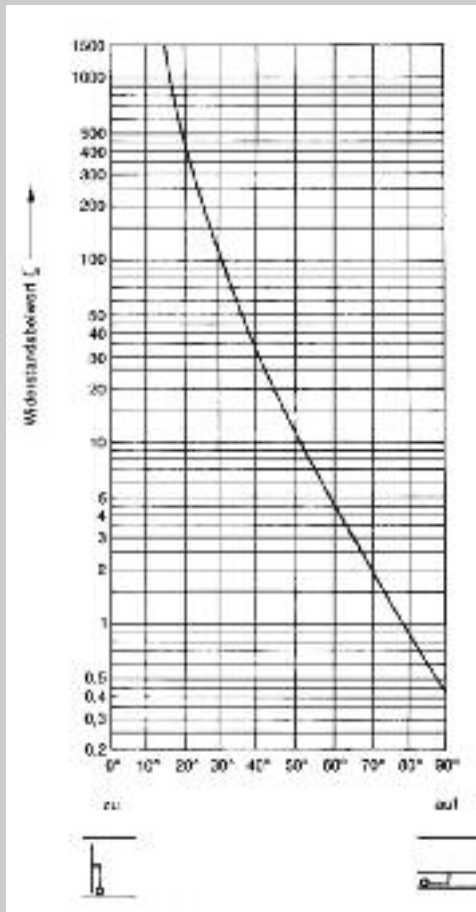
**The drive** is either by means of a peripheral shaft attached to the blade or via a toggle lever in the case of large nominal sizes.

There are special executions in stainless steel available for deployment in flue gas desulphurisation. In this respect, single-sided cladding of the blade and the damper frame is also possible.



## Flap damper resistance coefficients.

Opening diagram of a flap damper with toggle drive.

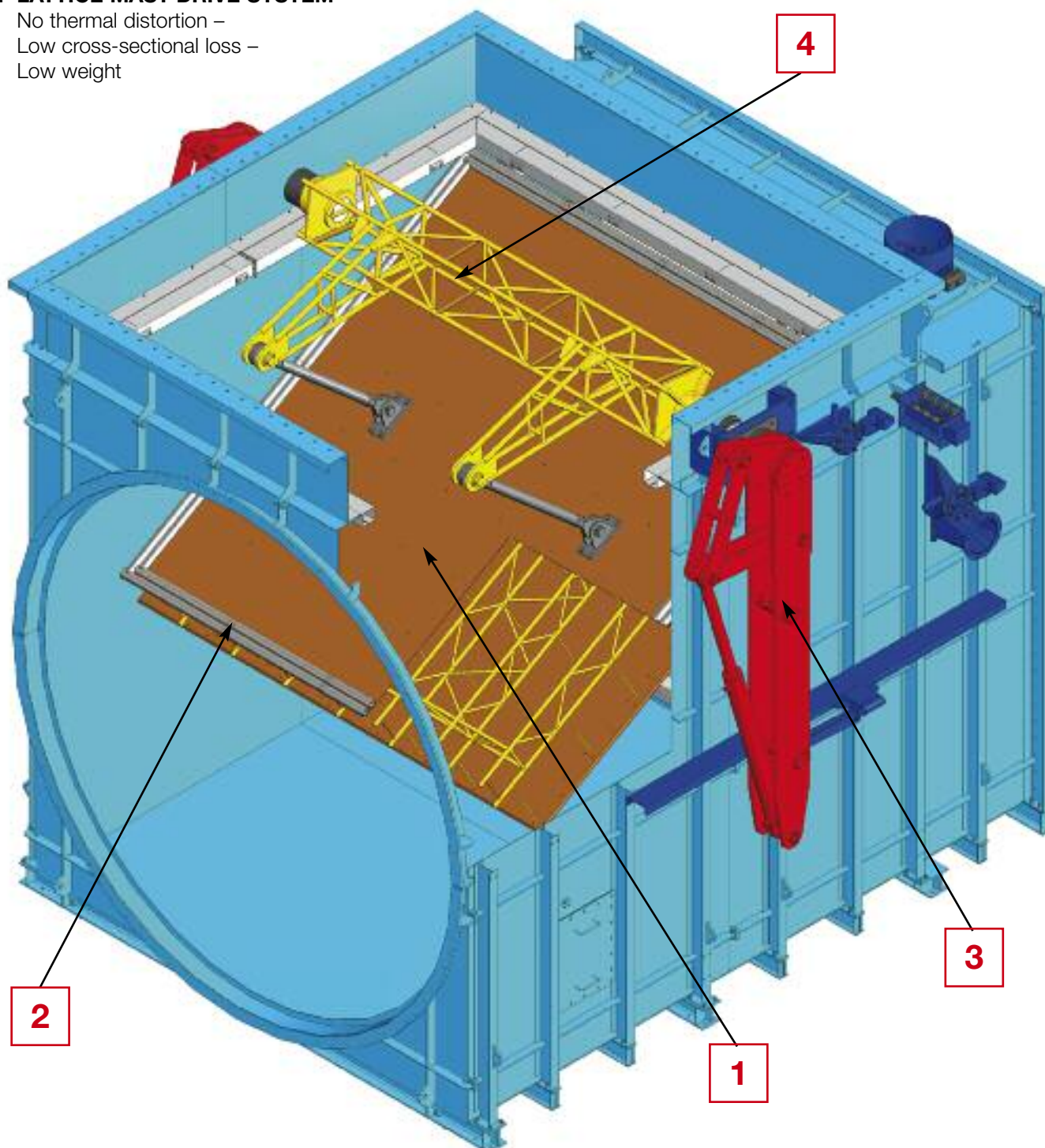


**1 LATTICE SUPPORTED BLADES with gimbal-mounted blade plates –**  
No thermal distortion – low weight

**2 NicroFLEX-HIPERFORM sealing system –**  
High level of elasticity and stability in regulating operation

**3 TWO-LEVER DRIVE –**  
180° rotary movement gives optimum utilisation of the toggle kinematics –  
Lower drive forces, only one cylinder per side –  
No shaft bending stress

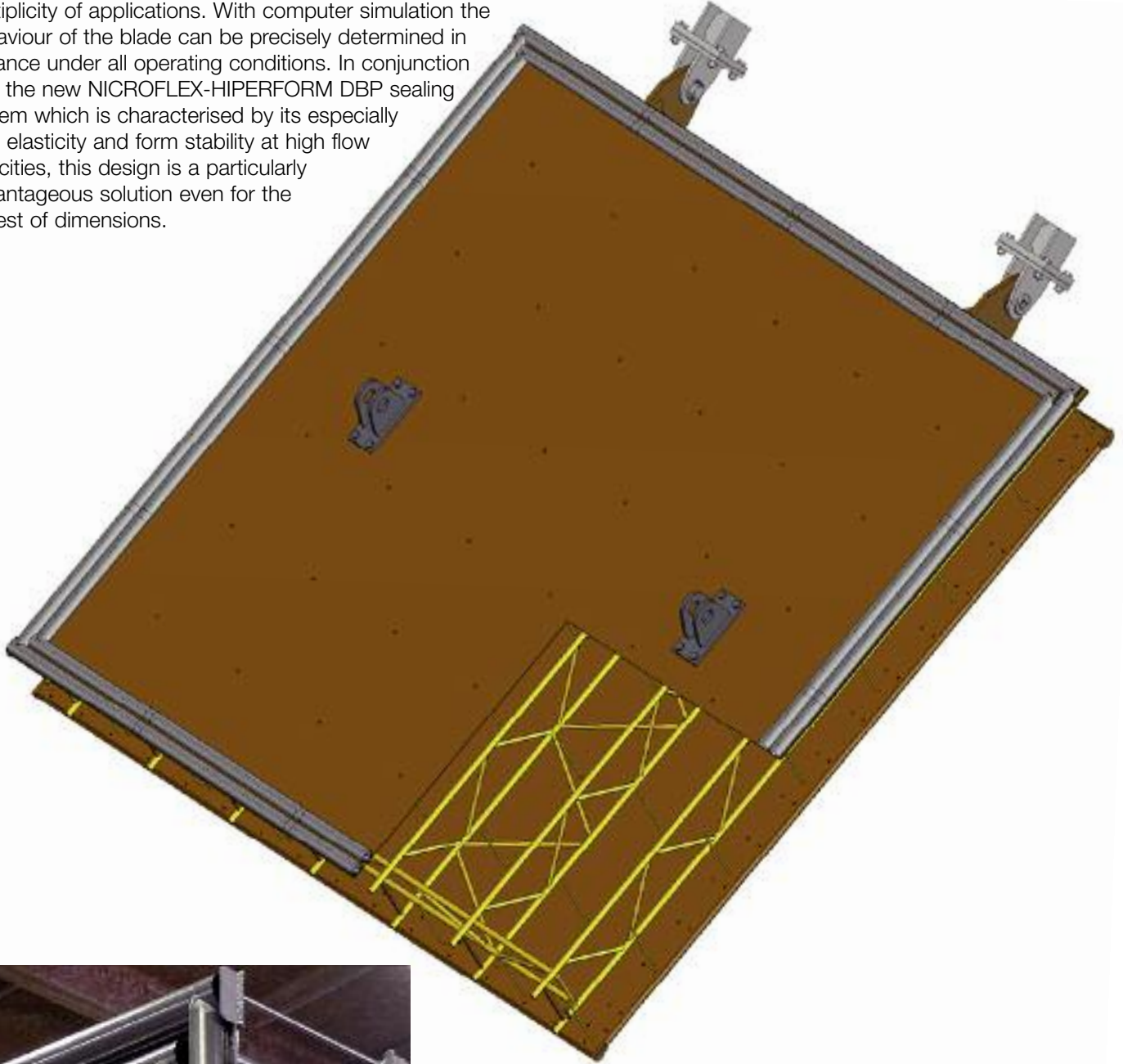
**4 LATTICE MAST DRIVE SYSTEM –**  
No thermal distortion –  
Low cross-sectional loss –  
Low weight



# The patented LATTICE SUPPORT blade

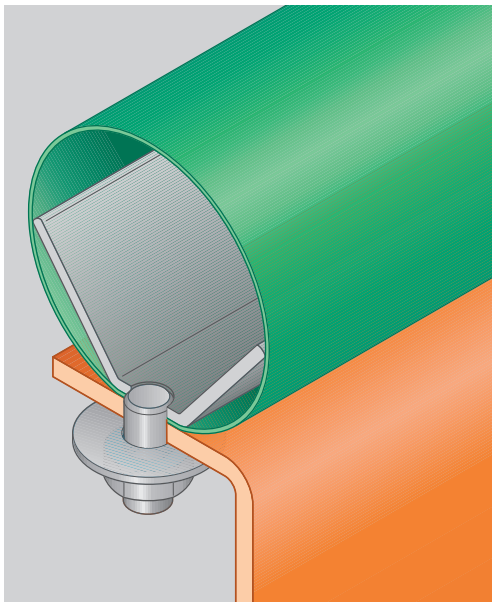


**RAUMAG-JANICH** has developed a new, patented blade construction for deployment in gas diverters and flap dampers. This blade is especially suitable for high temperature areas and has already proven itself to the full in a multiplicity of applications. With computer simulation the behaviour of the blade can be precisely determined in advance under all operating conditions. In conjunction with the new NICROFLEX-HIPERFORM DBP sealing system which is characterised by its especially high elasticity and form stability at high flow velocities, this design is a particularly advantageous solution even for the largest of dimensions.



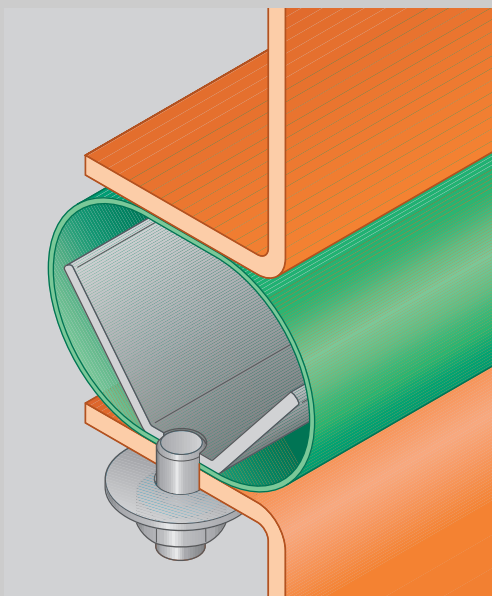
The illustrations show the lattice blade support structure on a gas diverter for DeNOx plants. The blade plates are free-floating gimbal-mounted so that they cannot warp during uneven heating up. The lattice support structure is circulated around on all sides by the hot gases. The temperature of the lattice rods changes evenly in the process even during rapid temperature changes in the hot gas thus preventing a deformation of the blade. The blade can be clad with single or two-sided insulation to minimise heat transfer to the blocked off part of the plant respectively.

# The worldwide patented NICRO-FLEX HIPERFORM sealing system

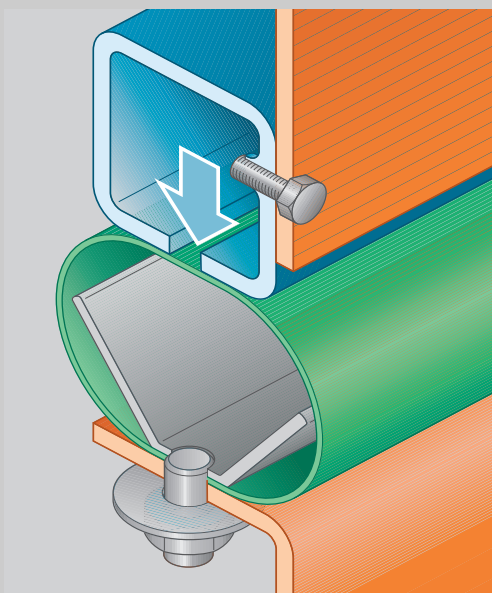


**RAUMAG-JANICH** developed the new NICROFLEX HIPERFORM Type NHI sealing system specifically for shut-off dampers and gas diverters in gas turbine plants and for large-scale flue gas valves. This sealing system originated from the further development of the NICRO-FLEX Type MLO sealing system proven since 1971. The geometric form of the circular metal loop permits high permanent elasticity of over 30mm and even more in the case of larger loop diameters. By this means, even larger unevennesses and thermal expansion of large-format damper blades are well compensated for.

In the unstressed state (when the valve is open), the internal V-shaped clamping strip gives the loop additional lateral support (illustration, top). This prevents it from being destroyed by self-oscillation even at high flow velocities or strong turbulences such as can occur during regulating operation.



In the closed state (illustration, centre), there is a broad contact zone between the seal and counter-flange. This facilitates a particularly high degree of leak-tightness. The lateral free-standing areas of the sealing loop are thus circularly convex and therefore do not yield even at high pressures. The inner V-shaped rail also limits the spring travel and thus prevents any undesirable over-stressing of the seal. By simply fitting one or more spring plates inside the interior of the sealing loop, the spring force can be well matched to requirements. Even in the case of point deformation due to foreign bodies, the seal regains contact with the mating surface within a short distance. The shape alteration on closing causes any caked dust or encrustation to loosen itself.



## Double seal seating and purge air – with one sealing system 100% gas-tight

The illustration below shows the new seal system in contact with a double seal seating which is in the form of a purge air duct with a longitudinal slot. This is facilitated by the wide contact surface which is created in the closed state.

# The TWO-LEVER DRIVE

(Patent applied for)



Illustration below:  
TWO-LEVER DRIVE on a gas diverter  
NS 5600 x 5600 mm



**RAUMAG-JANICH** has developed a new TWO-LEVER DRIVE for gas diverters which enables positioning angles of up to 180°. This yields a series of advantages in operation and safe functioning.

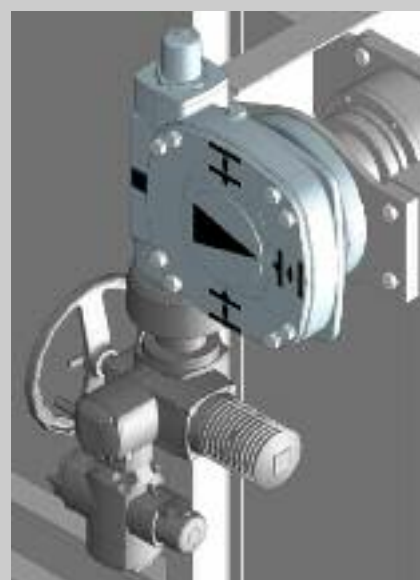
Large nominal size gas diverters are designed with an internal toggle system. The advantage here is that the drive forces are effected in the middle of the blade thereby achieving a uniform blade loading and uniform sealing pressure. On top of that, due to the toggle system, when the blade is in the end position and is being subjected to the highest differential pressure and the seals come to bear, an effective translation of the torque into a high closing force is made possible.

However because, in the case of hydraulic drives with a simple lever or double lever, only relatively small positioning angles can be achieved due to the lever system geometry, the drive shaft is usually pushed in the direction of the blade pivot point. But in this respect, however, with the toggle system in the end position when the blade with its seal is pushed onto the sealing seat and the active differential pressure is at its greatest, the effect of the toggle system is under-utilised. The cylinders have to be sized for higher forces. The necessary torque is greater in the end position. The drive system is altogether more heavily loaded.

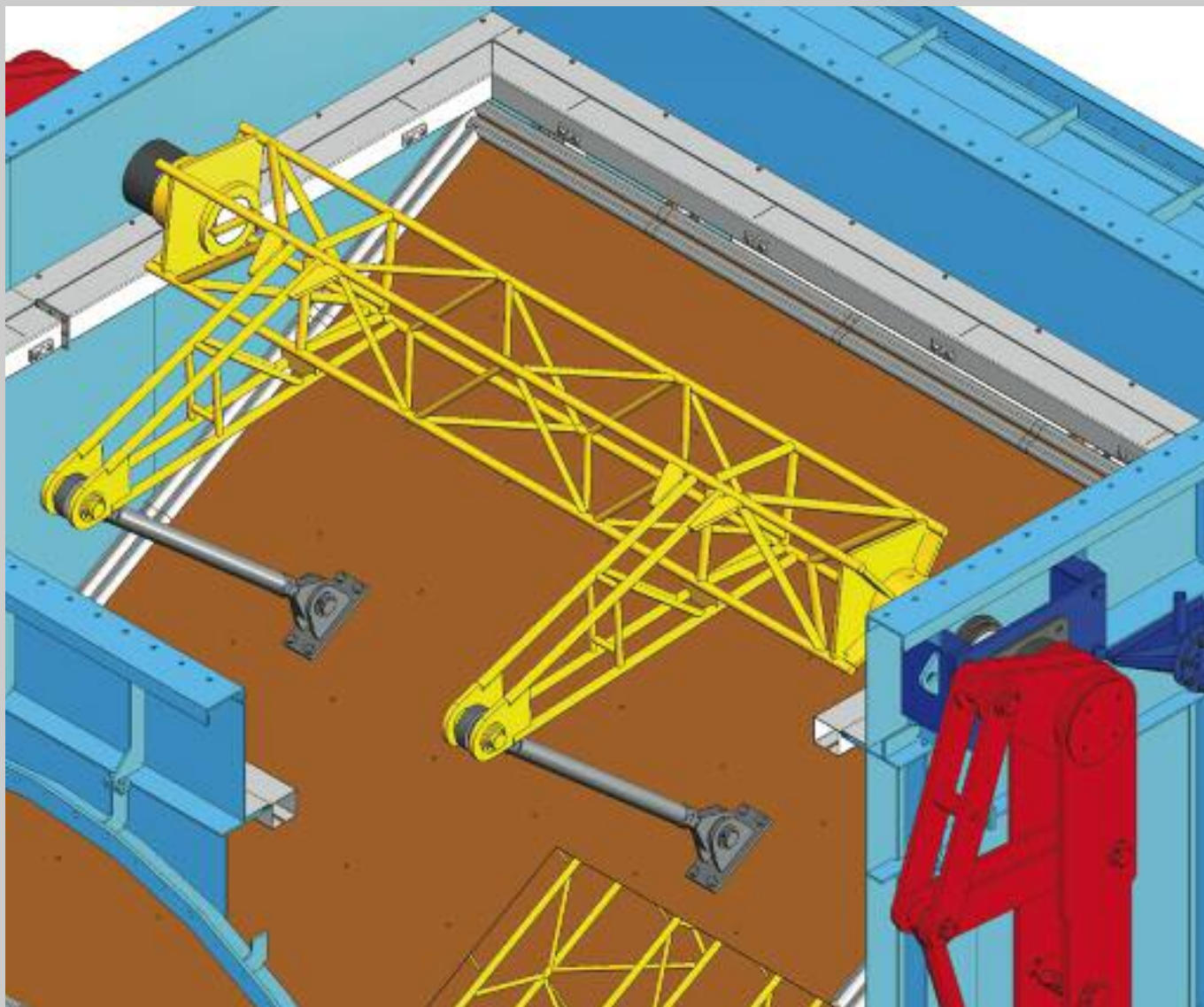
**The new TWO-LEVER DRIVE can achieve an operating angle of 180° thus enabling optimum utilisation of the toggle effect and with it, lower drive forces. Hence only one cylinder per side is necessary.**

## Electromechanical drives

Gas diverters not requiring a regulation or safety function are fitted with electromechanical drives.



The illustration on the right shows a typical drive arrangement.



**RAUMAG-JANICH** developed a new LATTICE MAST DRIVE SYSTEM (GMA)

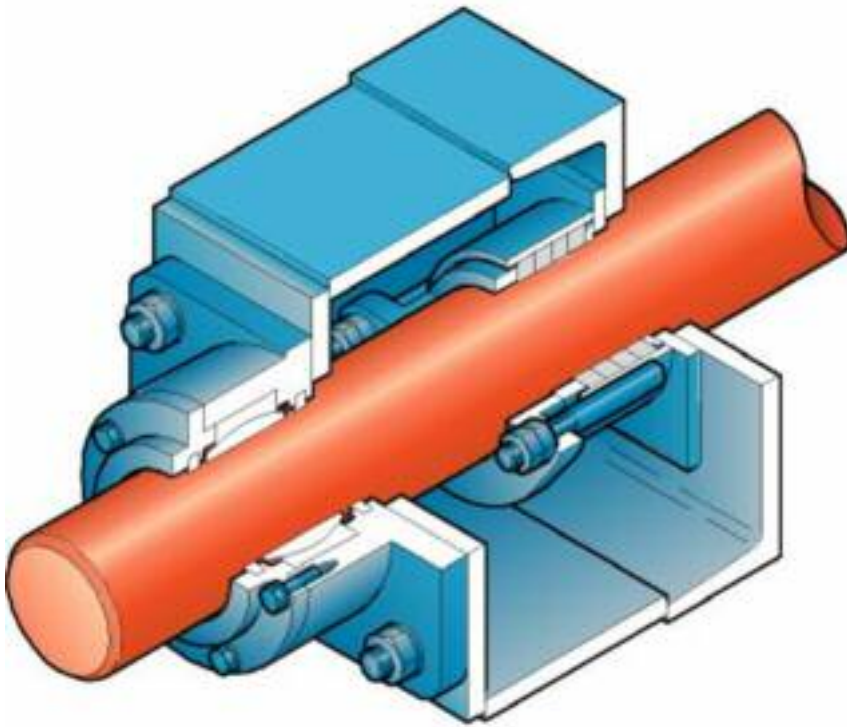
The GMA system replaces the otherwise conventional hollow shaft from thick walled tube which is also partially fabricated from U-shaped shells. This design leads to a considerable cross-sectional loss and causes distortion of the hollow shaft when opening the bypass due to one-sided oncoming flow and nascent welding stresses.

The LATTICE MAST DRIVE SYSTEM avoids these drawbacks. The latticework rods are circulated around on all sides by the hot gases and are thereby heated up evenly, thus preventing any distortion. This design reduces cross-sectional loss and self-weight to a minimum.

The illustration below shows the LATTICE MAST DRIVE SYSTEM in a gas diverter NS 5600 x 5600 mm.



## Drive shaft mountings in external swivel bearings



The main drive shaft is mounted in dust-tight, encapsulated, maintenance-free swivel bearings. Neither the medium nor environmental influences can damage these bearings. The spherical, large bearing surfaces with special coating prevent bearing damage and stiffness even under strong vibrations. The shaft entries on the diverter housing are also sealed off by packing glands and thrust rings.

## The redundant purge air system



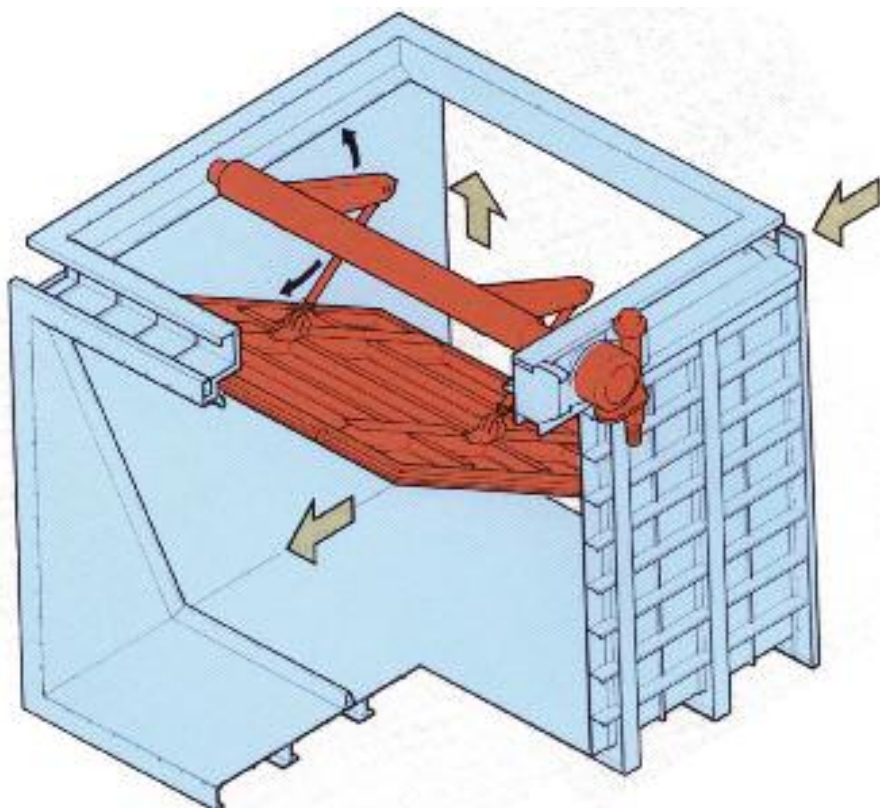
In conjunction with a double seal, a 100% shut-off of the hot gas flow is achieved by the introduction of purge air between the two sealing planes when the damper blade is closed. In the process, the purge air pressure must be greater than the pressure of the gas being shut off.

The shut-off is in accordance with UVV (periodic accident prevention inspection).

In order to prevent gas breaching the seal if the purge air blower fails, a second blower is fitted which switches on in the case of a fault.

The adjacent illustration shows a typical purge air blower arrangement.

## Gas diverters for FDG and DeNOx plants



**RAUMAG-JANICH** can call on over 30 years of experience in the design of gas diverters and flap dampers. Proven and reliable solutions can be supplied for any size of FDG and DeNOx plants. With the new **NICRO-FLEX-HIPERFORM** sealing system (page 6), long-lasting, high level sealing is achieved due to its high elasticity. The **LATTICE SUPPORTED** blade (pages 4 and 5) exhibits no thermal distortion even at high temperatures.

Illustration below:

**Gas diverter NS 5000 x 4000 mm.**  
With hydraulic drive and SIEMENS SP controller.  
Supplied twice through **AUSTRIAN ENERGY** for the FDG at the Turkish **CAYIRHAN** power station.



# Gas diverters for FDG and DeNOx plants



Illustration above:  
Two **gas diverters NS 7480 x 5300 mm** during trial runs at the Rauenstein works. These are connected to a T-shaped housing on-site, enabling switchover and flue gas shut off in two directions. Supplied for the DeNOx plant at the **Dutch AMER power station** on behalf of FISIA-BABCOCK.

Illustration right:  
**Gas diverter NS 4700 x 4700 mm.** Twelve gas diverters of this size have been supplied for the **FDG at the RWE power station, Frimmersdorf.**



## Gas diverters for FDG and DeNOx plants



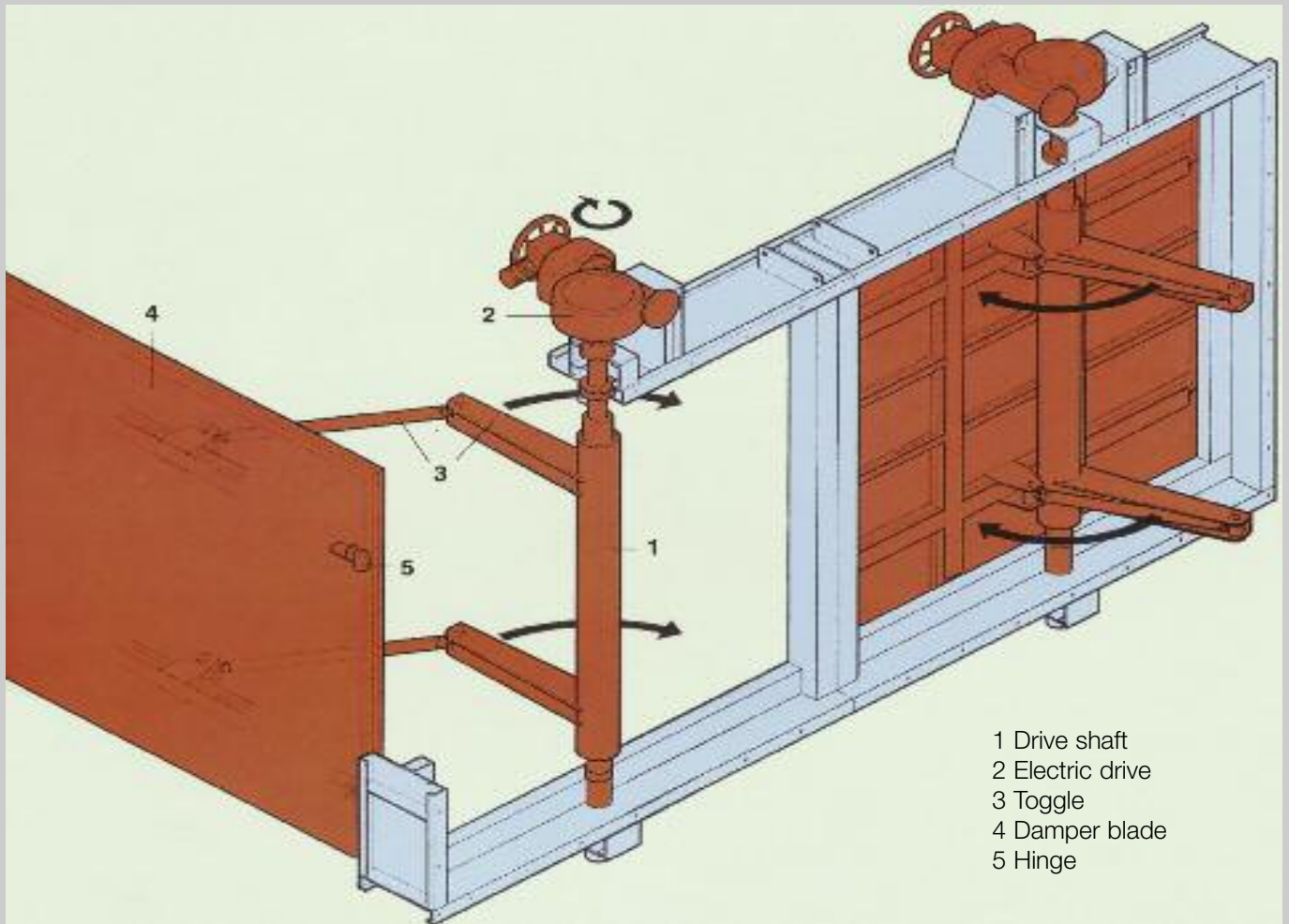
**Gas diverter 2300 x 2300 mm** supplied through **Noell-KRC** for the **FDG at the Amsdorf BRD power station.**

Pneumatic drive via peripheral shaft.  
 With double sealing and purge air, 100% shut-off.

**Gas diverter 4800 x 5300 mm,** supplied for the **FDG at the WESER power station, Veltheim BRD.**  
 Built-in scrubber.  
 Drive via toggle.  
 With double sealing and purge air, 100% leak-tight shut-off.



# Flap dampers for FDG and DeNOx plants



**Flap damper NR 9000 x 4500 mm** with toggle drive, 100% gas-tight connection in accordance with UVV (periodic accident prevention inspection) with purge air. 44 dampers of this execution have been supplied for the flue gas desulphurisation plants at the **RWE power stations in Frimmersdorf and Nieder- aussem.**





Illustration above:  
**Flap damper NS 7480 x 5300 mm.**  
 Supplied for the **De-NOx plant at the AMER power station in Holland.**  
 The lattice supported blade is driven via a toggle system (insert). 100% gas-tight using the NICROFLEX-HIPERFORM sealing system.



Illustration right:  
**Flap damper DN 7000 mm with toggle drive.** Supplied for the **FDG at the RWE power station, Niederaussem.**

# Flap dampers for FDG and DeNOx plants



Illustration left:

**Flap damper NS 2500 x 2500 mm.**

Supplied for the **FDG at the Amsdorf BRD power station**. Drive via peripheral shaft with swing-arms. Gas-tight shut-off by means of double seal and purge air.

Illustration below:

**2-bladed flap damper NS 1800 x 1800 mm.**

Supplied for the **FDG at the Amsdorf BRD power station**. Pneumatic drive. Gas-tight shut-off by means of double seal with purge air.



Illustration left:

**2-bladed flap damper NS 3030 x 3430 mm**, supplied via **ALSTOM** for the **FDG at the Badenwerk BRD power station**.

All components in contact with the flue gas are clad with stainless steel. Gas-tight shut-off by means of double seal and purge air.

The damper blade drive is by means of an external toggle system via a common electric drive.

### Special purpose dampers for

- **Power stations**
- **Gasturbine plants**
- **Offshore-Installations**
- **Flue gas desulphurisation plants**
- **Flue gas denitrification plants**
- **Cement plants**
- **Steel smelters**
- **Waste heat recovery plants**
- **Garbage incinerating plants**
- **Chemical process industries**
- **Other industrial plants**

### Large, tailor designed dampers for Gasturbine plants

- **Diverter** for the isolation, rerouting and modulation of the turbine exhaust gas. With double seals and seal air 100% gastight in terms of UVV regulations.
- **Diverter** for gasturbine-off-shore plants, designed to meet the specific service requirements.
- **Flap dampers**, also for modulating operations, with seal air, 100% gastight in terms of UVV regulations.
- **Louver** and **double louver** dampers for modulating service and shut-off.
- **Stack caps**, also as **emergency dampers**.
- **Blanking plate Guillotines** for combined cycle plants, also with double seals and seal air for 100% gastight shut-off in terms of UVV regulations.
- **Flexible joints** for combined cycle plants.

### Shut-off and modulation dampers

- **Shut-off dampers**, of round or rectangular configuration
- **Shut-off dampers** of high tightness, 99,98% minimum
- **Double-shut off dampers**, with seal air 100% gastight to UVV
- **Tandem dampers**, cost economic alternative to double shut-off damper, with seal air 100% gastight to UVV
- **High efficiency louver dampers**, for modulation or shut-off.
- **Double louver dampers**, with seal air 100% gastight to UVV
- **Tandem louver dampers**, cost economic and space saving alternative to Double louver dampers, with seal air 100% gastight to UVV
- **Lever flap dampers**, also with double sealing and seal air, 100% gastight to UVV
- **Diverter dampers**, with double sealing and seal air, 100% gastight to UVV
- **Emergency dampers**, fast opening or closing, also on loss of energy
- **Stack dampers**, also with emergency features
- **RK10 sandwich dampers**, for fitting between existing flanges
- **Dopex shut-off valves**
- **Toggle disc valves**, DVGW approved, as shut-off or emergency dampers
- **Hot gas valves**, also air or water cooled

### Isolators

- **Guillotine dampers** for FGD plants. 100% gastight to UVV
- **High efficiency guillotine dampers**
- **Guillotine dampers**, with double sealing and seal air 100% gastight to UVV
- **Sickle isolator**, 100% gastight to UVV
- **Goggle valves**, DVGW approved, 100% gastight to UVV
- **High temperature isolators**, with or without internal lagging or refractory lining
- **High temperature isolators**, with air or water cooling

### Service and maintenance

- **Professional maintenance** of flue gas modulation and shut-off-dampers
- **Conversion and modernising** of existing flue gasmodulation and shut-off dampers
- **Upgrading of obsolete sealing systems and operating systems**

### Fabrication for industrial machinery and process industries

- **Cooler** for dusty bulk materials
- **Fabricated**, welded components made of **steel and stainless steel**, also machined if required
- **Boltless wear liners** for cyclones and air separators etc.

**RAUMAG-JANICH – Perfect technique, Quality and Security**

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