RAUMAG JANICH

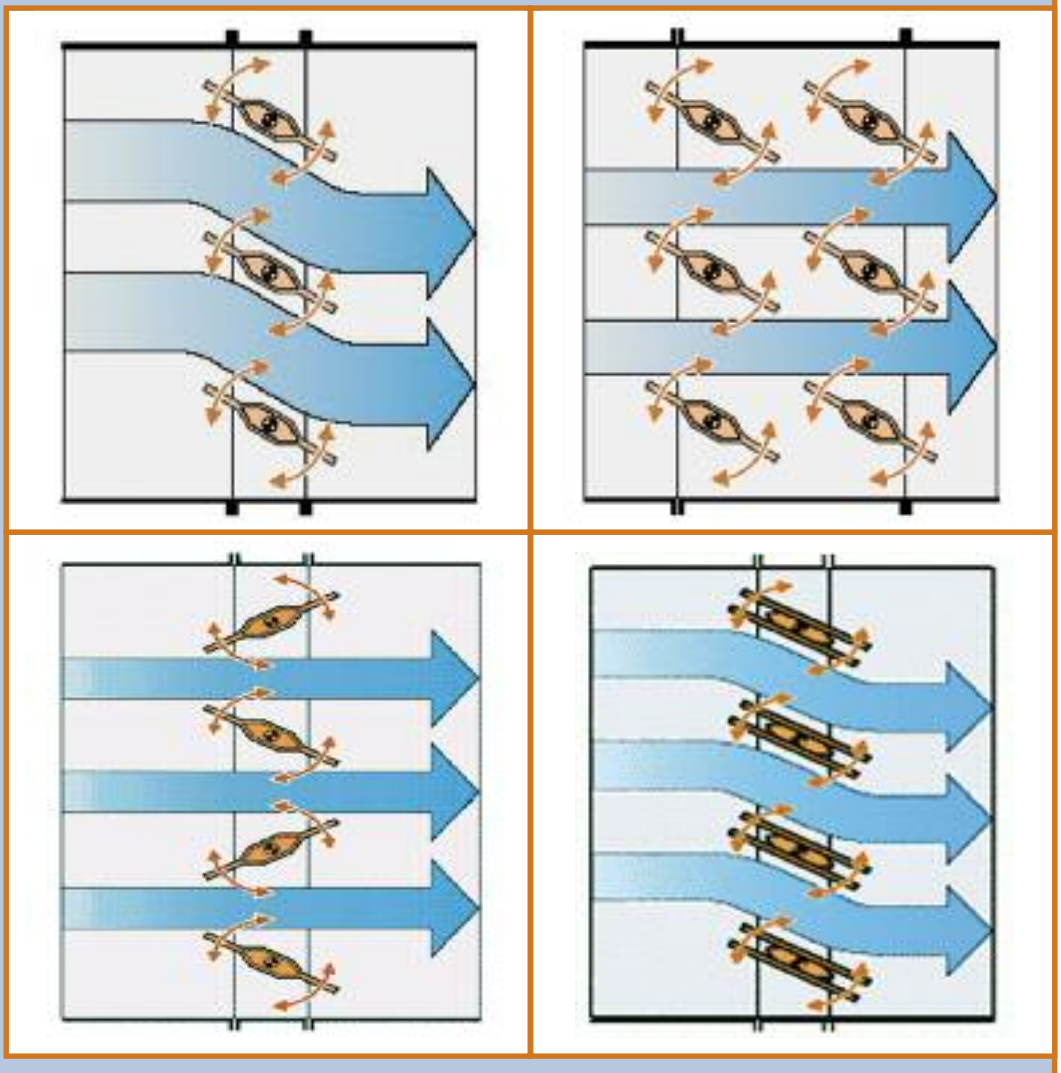
A LEADER IN DAMPER TECHNOLOGIES

TOP 100 Top-Innovator

Louvre dampers
Double louvre dampers
Tandem louvre dampers

for power stations, FDG and DeNOx plants

PERFECT DAMPER TECHNOLOGIES FOR INDUSTRIAL PLANTS



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Technology lead through patented innovations

RAUMAG-JANICH can call on over 40 years of experience in the field of industrial valve construction. Special consideration has been given to driving the development of louvre dampers and tandem dampers in collaboration with our customers. At the beginning of the 80's, the first ever so-called free-floating shell blade was developed which also excelled itself at high gas temperatures due to its low warp characteristic. Blade lengths of 5000 mm and correspondingly large widths could thus be achieved. This enabled, in the case of large nominal sizes, considerable simplification of the construction and substantial improvement in reliability.

The illustration above shows a **shut-off damper for the DeNOx reactor at the STEAG power station Herne 4.** With a nominal size of 16,000 x 17,000mm, it is to date the world's largest shut-off damper.

In 1995, RAUMAG-JANICH developed the LATTICE SUPPORTED blade with which the problem of warping was entirely solved. The blade now consisted of two parts with different functions. The supporting function and the transmission of the positioning forces are performed by the LATTICE SUPPORT with stub shafts on each side. The blade plate (the actual blade itself) performs the regulation and shut-off functions. In so doing, the blade plate is free-floating and gimbal-mounted on the LATTICE SUPPORT so that even at high temperatures and long blade lengths no warping occurs. Blade lengths of 17,000 mm have already been executed for operating temperatures upwards of 700°C. Cross-sectional loss has been reduced to 7%.

The illustration below shows the **shut-off damper for DeNOx reactor at the Theiss 2000 power station in Austria** with a nominal size of 10,000 x 9,000 mm. The damper has been executed using the new LATTICE SUPPORTED BLADES.

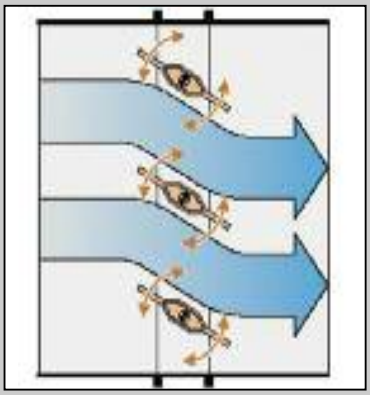
Louvre dampers, double louvre dampers and tandem louvre dampers
are deployed for shutting off and regulating flue gas flows. These are designed in circular or rectangular form according to the installed situation. A defined number of damper blades determined by the duct cross-section and damper function are arranged in a robust flanged frame. With shut-off dampers, the number of blades should in principle be kept to a minimum to keep the sealing length as short as possible. In the case of regulating dampers and special installation situations the number of blades is determined in line with requirements.

The schematic illustrations on the right show the most conventional damper executions:
Louvre dampers, co-rotating
All blades rotate in the same direction. Deployed as a regulating or shut-off damper.
Double louvre dampers
Deployed as shut-off dampers with purge air for 100% closure, also used as safety or regulation dampers.
Louvre dampers, contra-rotating
Use as regulating dampers with very good control characteristics. Also deployed to homogenise flow and as shut-off valves.

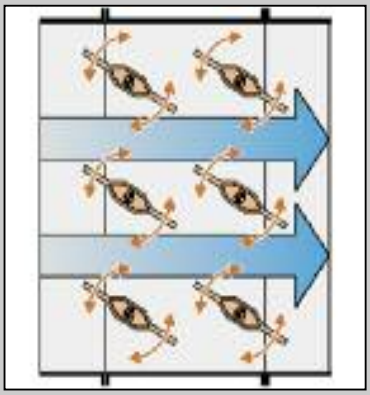
For utilisation in flue gas desulphurisation plants or in other chemically aggressive media, the dampers can be produced in stainless steel or with chemical resistant coatings.
There are also proven deigns available for use with unscrubbed flue gas in DeNOx plants. The damper blade drive can take the form of electric, pneumatic or hydraulic actuators. In the case of special drives, all dampers can be designed as fast-opening or fast-closing safety dampers.

Tandem louvre dampers
As with the double louvre damper, tandem dampers are deployed for 100% shut-off. Only one blade plane is necessary, however, thus halving the number of bearings, packing glands, shafts and rods required.
Tandem dampers can also be contra-rotating to achieve optimum regulation characteristics.
Louvre dampers in conjunction with the new NICROFLEX HIPERFORM sealing system achieve a high degree of permanent leak-tightness even with the largest dimensions of blade. The surface area equivalent sealing is 99.98%.
Double louvre dampers and tandem dampers with purge air enable a 100% shut-off in accordance with UVV (periodic accident prevention inspection).

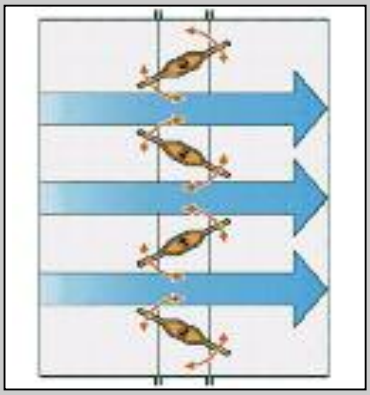
Louvre dampers



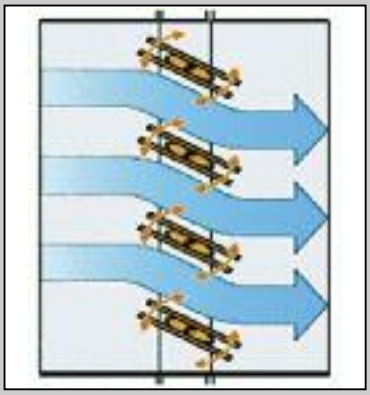
Double louvre dampers



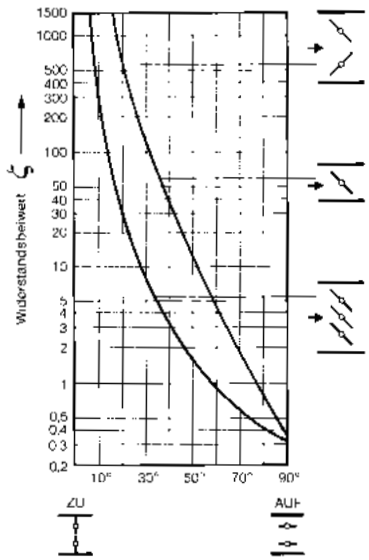
Louvre dampers, contra-rotating



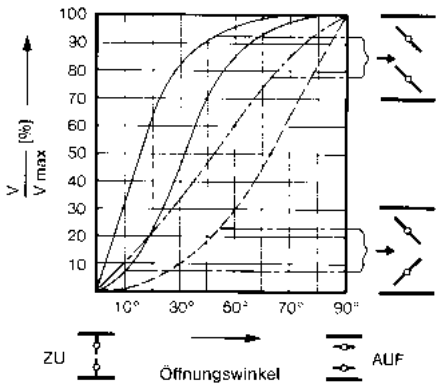
Tandem louvre dampers



Resistance coefficient for louvre dampers



Flow curve for louvre dampers without allowance for pipeline resistances



Technical data: T = 350°C
DeltaP = 30mbar
W =18m/s

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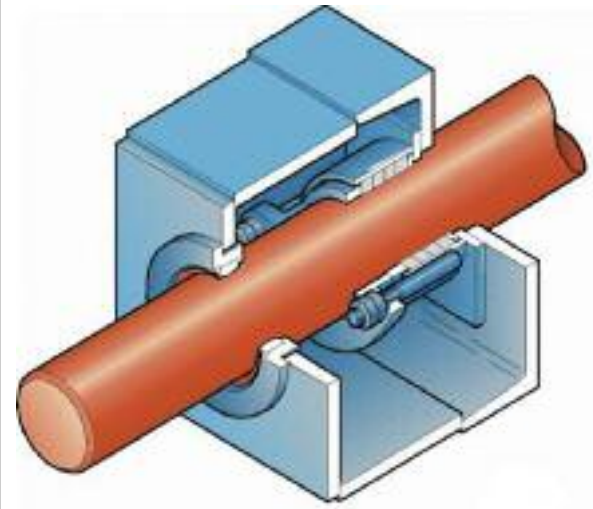
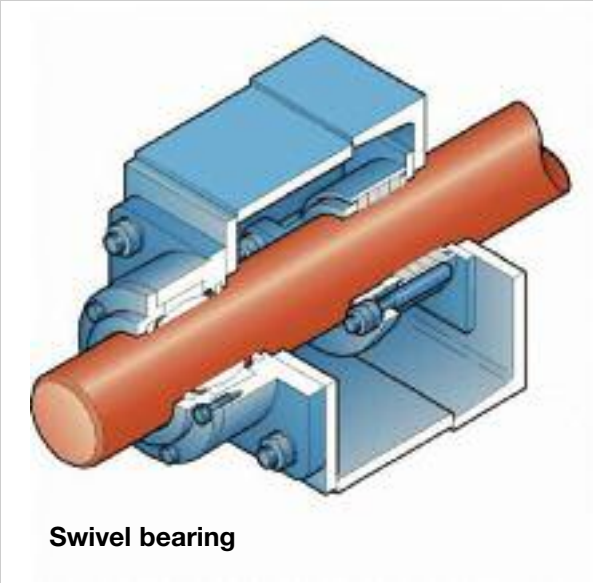
Damper shaft bearings and sealing



Ring bearing, outer



Swivel bearing

Damper shaft bearings
Long years of experience in the most diverse areas of deployment have led in particular to the following designs being utilised depending on application.

Ring bearing, outer
and maintenance-free, suitable for high temperatures and unscrubbed flue gas.

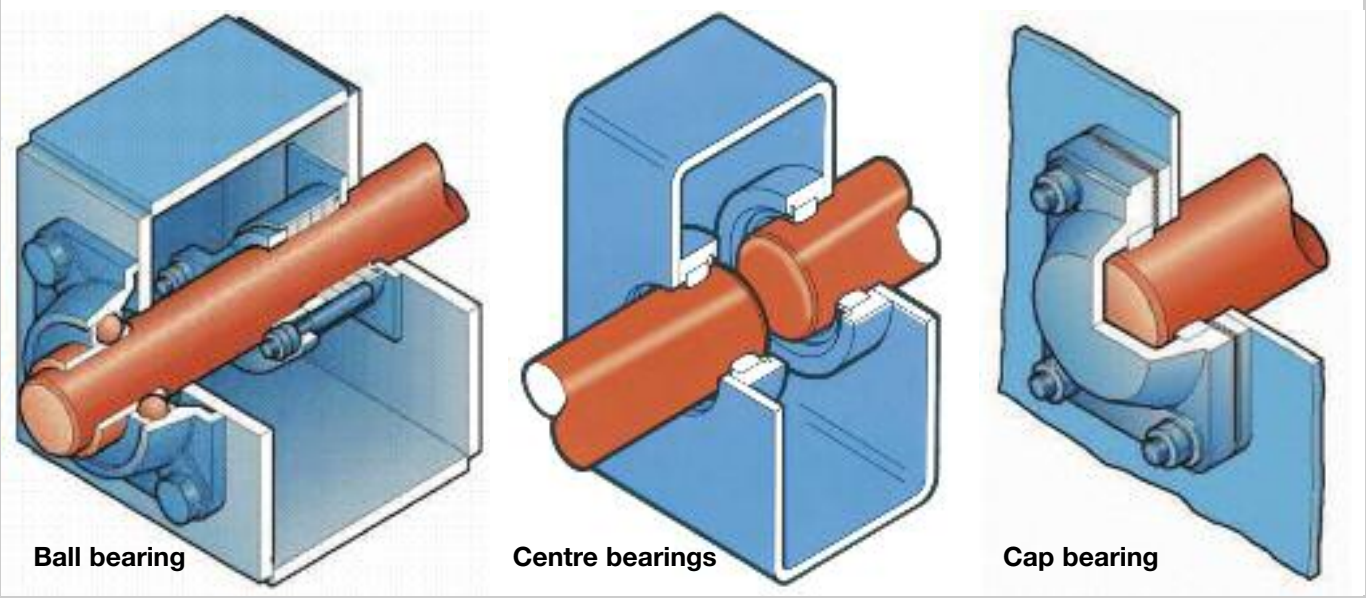
Swivel bearing
in special, dust-tight encapsulated housings, virtually maintenance-free. Neither the medium nor environmental influences can damage these bearings. Even strong vibration cannot lead to bearing damage.

Ball bearing
outer, economical solution. Where the damper shafts are subject to vibration and longer idle periods, the bearing surfaces can be destroyed.

Centre bearings
for the damper shafts within the duct. These bearings are unsusceptible to dust, are maintenance-free and can be utilised at high temperatures.

Cap bearing
for the damper shafts opposite the drive side. All other bearings can be utilised optionally for this.

Shaft entry seals
The damper shafts are sealed off at the housing entries by means of packing glands. The packing glands can also be executed with spring-loaded adjustment.



Ball bearing

Centre bearings

Cap bearing

Drives for louvre dampers

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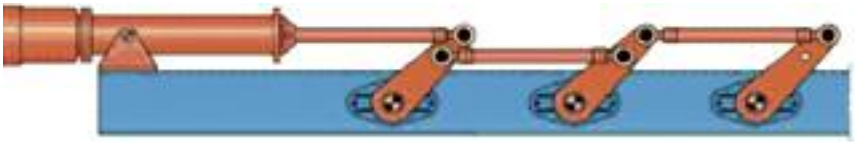
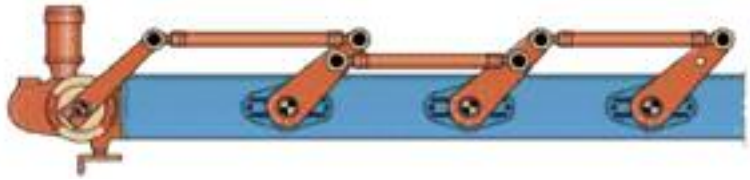
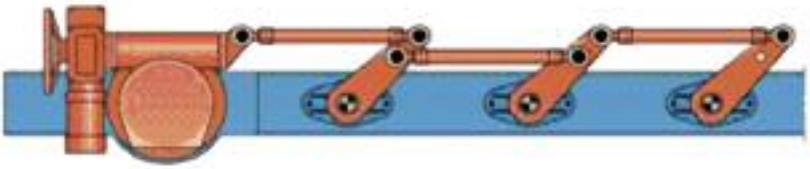


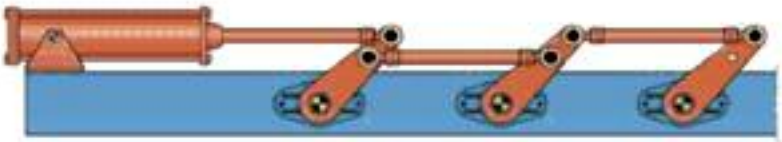
Electric drive, open, close and regulation drive



Electric drive



Electric shaft-mounted drive, open, close and regulation drive,

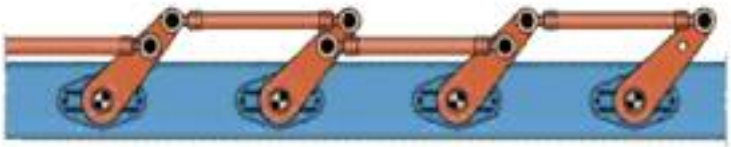


hydraulic and pneumatic drives also as rotary drives and for regulation.

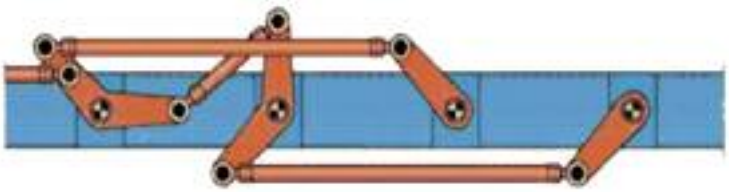
Drives and arrangement
Apart from manual drives, any desired form of drive can be supplied.
All drives equipped with limit switches, torque switches, potentiometers and/or swing angle measurement transducers as required.

Safety drives
All shut-off and regulation dampers are fitted with fast closing or fast-opening drives if required.
The drive can be designed so that the damper opens or closes in the case of power loss or when a specific operating parameter is reached.
In such cases the opening and closing is effected by springs, drop-weights or pneumatic pressure accumulator.

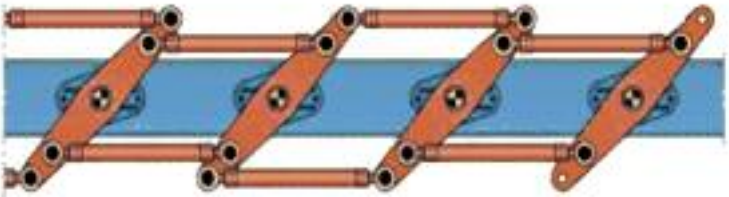
Rod arrangement for louvre dampers



Rods for co-rotating movement



Rods for contra-rotating movement



Duplex rods for co-rotating movement

Rod arrangement
The rod arrangement effects a specific direction of blade rotation and therefore a specific regulation characteristic. However, due to flow engineering considerations, different rod arrangements are executed.
The connection to the damper levers is by means of maintenance-free ball joints to enable free movement to be maintained even during temperature fluctuations. The rods can also be equipped with expansion compensation for strong temperature differentials between the housing and rods (page 11).

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The standard sealing system

RAUMAG-JANICH has developed proven sealing systems for the most diverse applications. Figs. 1 – 6 show standard seals which are applied according to the leak-tightness required and deployment conditions.

Sweeping blade (Fig. 1)
for regulating dampers with no or with low demand on leak-tightness.

Straight abutting blade (Fig. 2).
for abrasive media, low leak-tightness

Inclined abutting blade (Fig. 3)
for strongly dust-laden media, low leak-tightness.

Adjustable butting strip (Fig. 4)
for strongly abrasive media and media with a caking tendency, for increased leak-tightness.

NICROFLEX Type MLS (Fig. 5)
(metal leaf seal)
Leaf seal from stainless spring steel lamellae for high-level leak-tightness.
Not suitable for high flow velocities or regulating operation. The blades can be destroyed by self-oscillation.

NICROFLEX Type MLO (Fig. 6)
(metal loop seal)
This proven special seal has been deployed in power stations and cement works in flue gas flows since 1971. The sealing elements consist of elastic stainless steel loops.
Even after longer periods of stress these resume their original form. Caking and encrustations loosened themselves due to the shape alteration when closing. A high level of leak-tightness is achieved.

Fig. 1

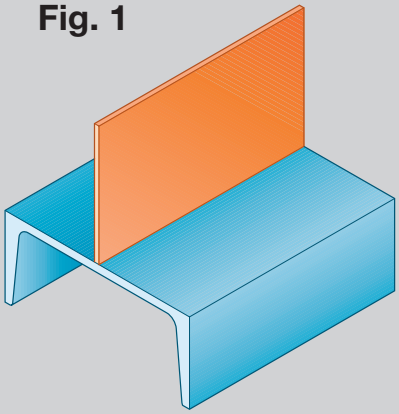


Fig. 2

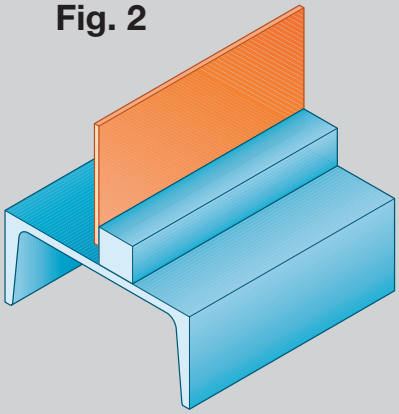


Fig. 3

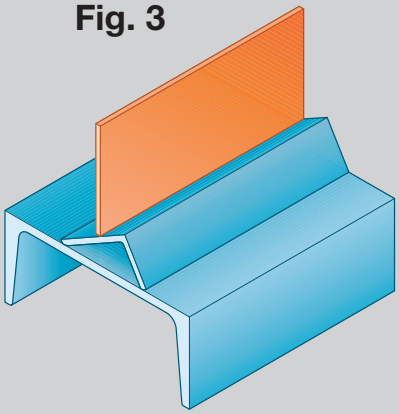


Fig. 4

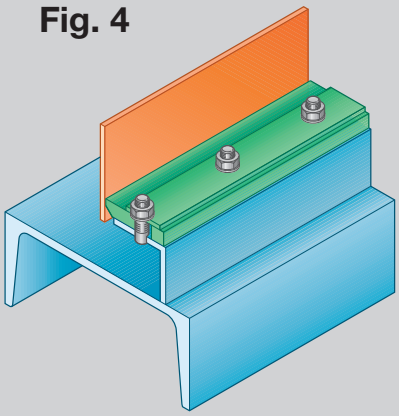


Fig. 5

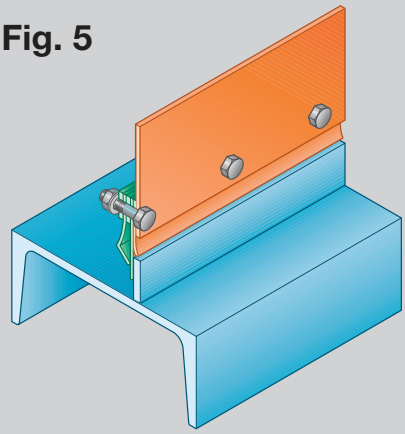
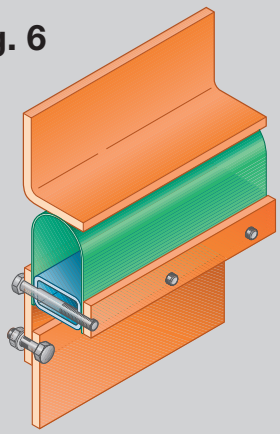


Fig. 6



The worldwide patented NICRO-FLEX HIPERFORM sealing system

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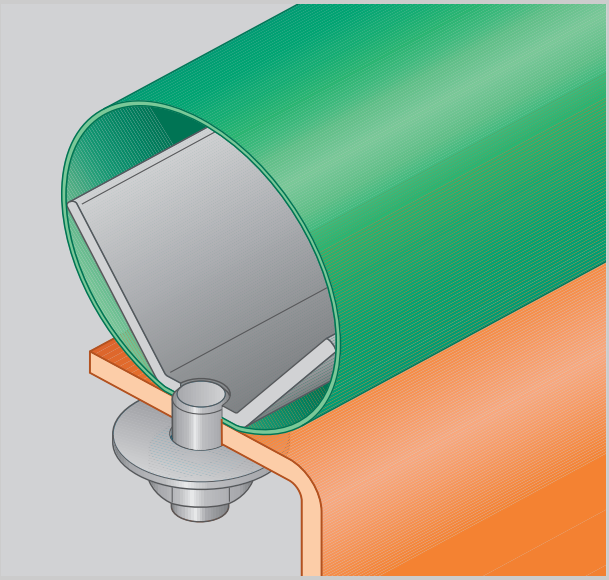
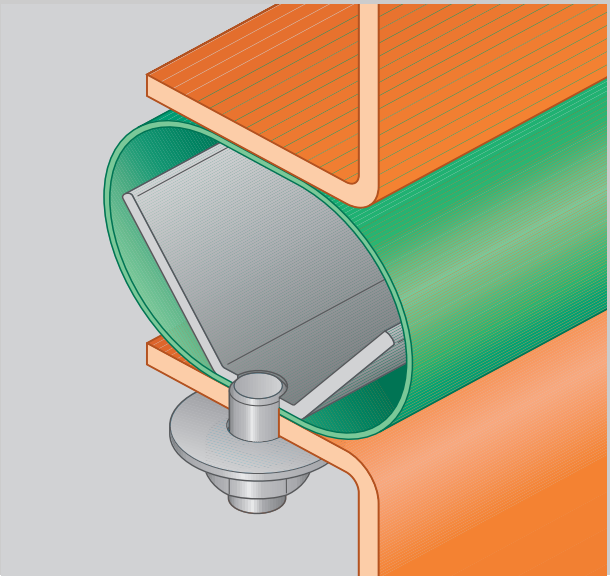
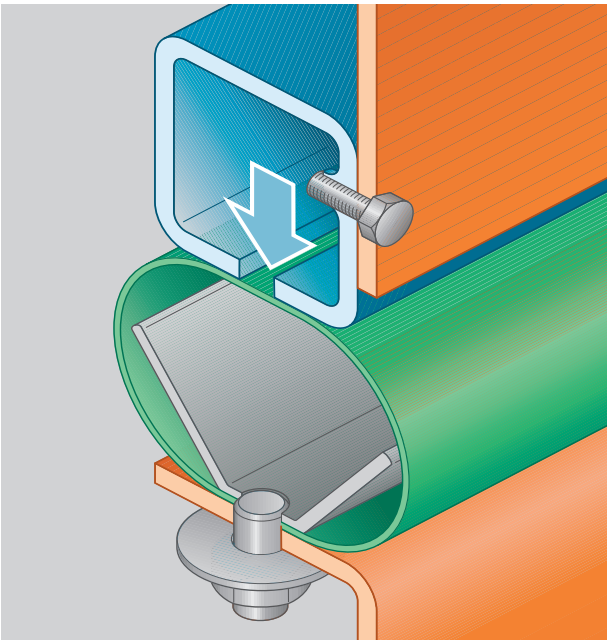


RAUMAG-JANICH developed their new NICROFLEX HIPERFORM Type NHI sealing system specifically for shut-off dampers and gas diverters in gas turbine plants and for large-scale flue gas valves.
This sealing system originated from the further development of the NICROFLEX Type MLO sealing system, proven since 1971 (Fig. 6 on the previous page).
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 (opposite, top). This prevents it from being destroyed by self-oscillation even at high flow velocities or strong turbulence.



In the closed state (opposite, 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 overstressing 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 on the left 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.

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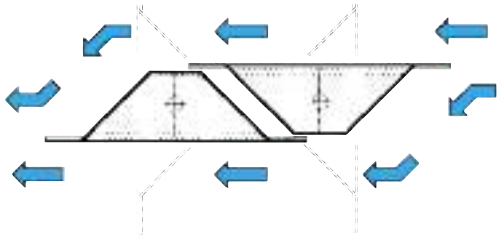
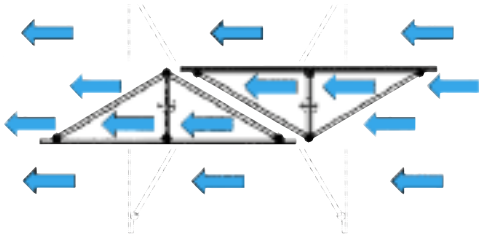
No thermal distortion plus energy savings due to the lattice supported blade DBP

The illustrations below show an example of a double louvre damper comparing the flow characteristics of shell blades and lattice supported blades. In the open position, the shell blades form a displacement body and take up close to 1/3 of the duct cross-section.
By contrast, the flow passes through the lattice supported blades causing only a slight cross-sectional loss of approx. 7%.
Particularly in the case of dampers which are permanently open during plant operation, this facilitates enormous energy savings due to the lower pressure loss.

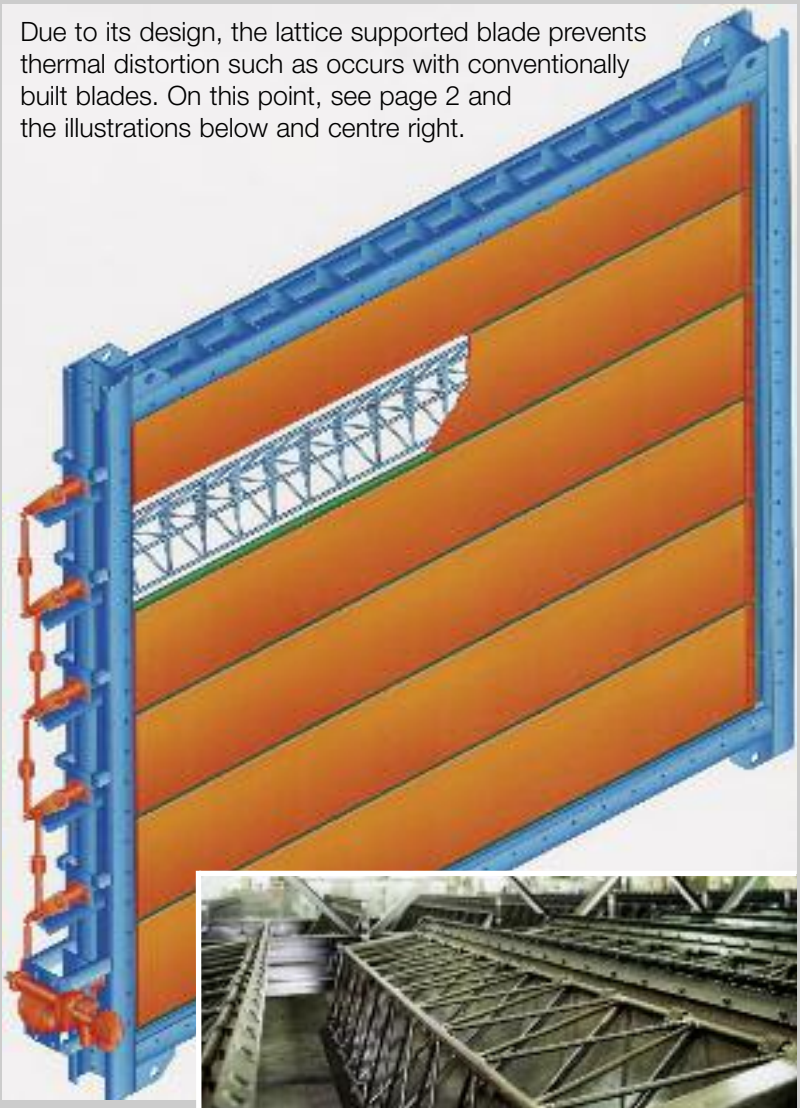
Shell blades



Lattice supported blades



Due to its design, the lattice supported blade prevents thermal distortion such as occurs with conventionally built blades. On this point, see page 2 and the illustrations below and centre right.



Low transportation costs due to container orientated modular construction (Patent applied for)

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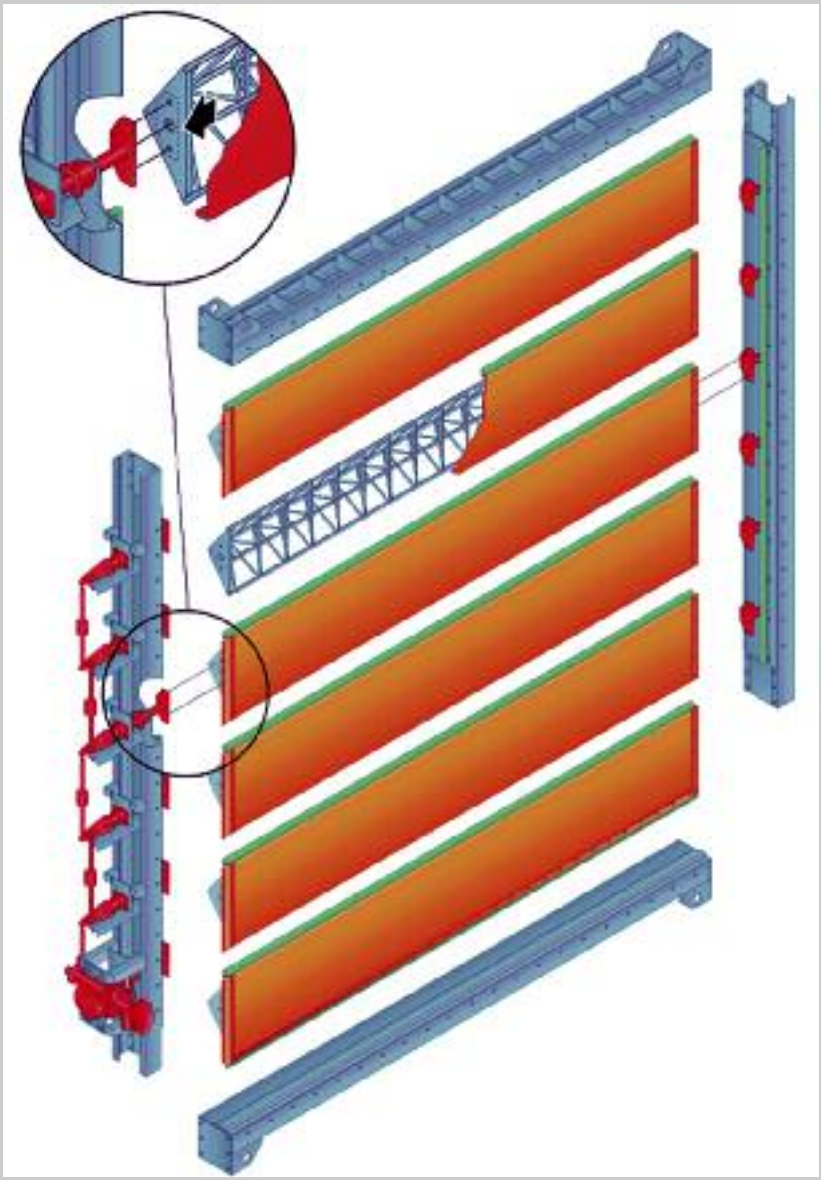
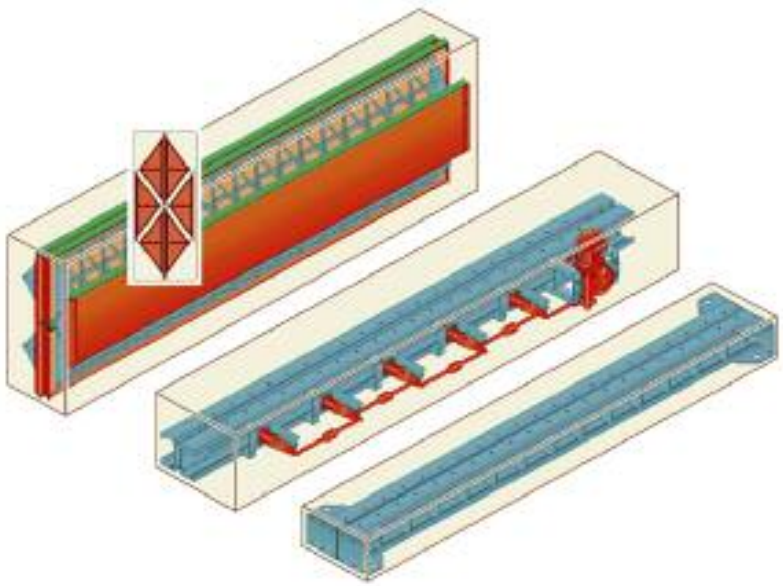
Louvre dampers and tandem dampers in large-scale nominal sizes involve high transport costs. With cross-country HGV transport, this is down to the extra wide load. With maritime transport, the uneconomical ratio of weight to required loading surface leads to high costs.
On top of that, the costs of special crating for transport by sea are very high.

RAUMAG-JANICH has, for these reasons, developed a modular construction for louvre dampers and tandem dampers which facilitates simple dismantling and reassembly of the individual modules after the trial runs in the factory. The individual modules can thus be fitted in with each other to save space for transportation.
To this end, the damper consists of four frame elements and the damper blades. The connections between the blades and the shafts are easily detachable “plug in” connections. The shafts remain connected to their respective frame elements so that only the plug connections have to be made during reassembly on site.
The drive side frame element carries the drive shafts, the levers, the connecting rods and the drive, by which means, even after dismantling, the functionality and settings of the limit switches remain intact.
The corner connections of the damper frame are first bolted together on site then welded gas-tight with a short sealing seam.



The **lattice support design** of the damper blade, in conjunction with the highly elastic new sealing system **NICROFLEX-HIPERFORM DBP,** permits large-scale blade spans. For this reason, the louvre dampers and tandem louvre dampers can be executed without centre bearings in the duct. They are therefore less fault-prone and simpler in their construction than conventional designs. The individual modules, damper blades and frame elements, can be fitted together into units for container transport as shown in the illustration on the right. The sub-assemblies are secured with simple transport fastenings. This leads to a considerable reduction of packaging and transport costs.



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Louvre dampers

Illustration top left:
Louvre damper NS 8220 x 5300 mm supplied for the **FGD at the Jänschwalde power station.**

Illustration top, right:
Louvre damper DN 5600 mm with NICROFLEX sealing system.
Rating: t = 400 °C, p diff. 90 mbar
Material: 15 Mo 3.
Supplied for the DeNOx plant in the **STEAG power station Herne.**

Illustration above:
Two louvre dampers NS 6200 x 6200 mm undergoing leak-tightness testing at the Rauenstein works. Supplied for the **flue gas desulphurising plant at the Boxberg power station.** The dampers are operated by a hydraulic drive with an emergency operation feature.

Illustration left:
Louvre damper NS 6400 x 6400 mm.
Material: inconel 625
The opening time is adjustable between 0.5 and 10 secs.
Each blade is driven separately and opens without external power. Supplied for the bypass in the **FGD at the Badenwerk power station.**

Louvre dampers

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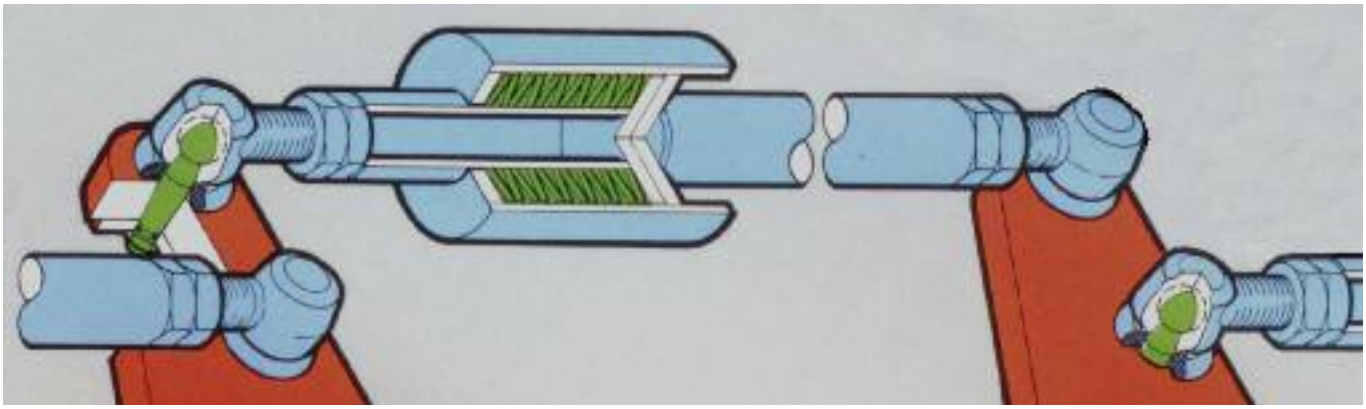
Illustration above:
Louvre damper NS 9000 x 10000 mm, supplied for the **DeNOx plant at the THEISS 2000 power station** in Austria. It serves to close off the reactor. Due to the high flue gas temperature and the large nominal size, the damper blades have been executed in the lattice support design.
A considerable advantage also arises from the low flow resistance (approx. 7%) in normal operation with the valve open.

Illustration below:
In the case of louvre dampers, the individual force transferring levers are connected with adjustable ball-jointed rods. This facilitates the precise setting and guiding of the damper blades.
For high flue gas temperatures, these rods are fitted with expansion compensation (spring pots) as otherwise the damper blades would move in an uncontrolled manner in the end position due to the difference in thermal expansion between the damper housing and the cold rods.
This can lead to an untight closure



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Double louvre dampers

Illustration left:
Double louvre damper NS 4400 x 4000 mm with chemically resistant coating.
Supplied for the **FGD VEW power station, Gersteinwerk.**

Double louvre damper NS 6780 x 5390 with NICROFLEX-HIPERFORM DBP sealing system and purge air, 100% leak-tight closure in accordance with UVV (periodic accident prevention inspection).
Supplied for the **RWE STEAG power station** Voerde within the scope of a plant renovation and modernisation project.

Tandem louvre dampers DBP

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A LEADER IN DAMPER TECHNOLOGIES

RAUMAG-JANICH on behalf of **ABB-Umwelttechni**k in Butzbach, supplied all shut-off and regulating valves for the new **FGD and DeNOx plant at the Theiss 2000 power station** in Austria. This also included the tandem louvre dampers NS 4700 x 4700 mm as illustrated on the left for 100% leak-tight shut-off in accordance with UVV (periodic accident prevention inspection). The dampers are fitted with the metal-elastic sealing NICROFLEX Type MLO and MLS sealing system. In the open position, the flue gas flows through the damper blades in such a way that the cross-sectional loss and consequently the pressure loss is low.

RAUMAG-JANICH supplied, on behalf of **LURGI-SMS** Denmark, all the necessary shut-off and regulation dampers for the **FDG at the Dolna Odra power station.** This supply included one tandem louvre damper NS 6000 x 8000 mm, one tandem louvre damper NS 8000 x 5000 mm and eight tandem louvre dampers NS 3070 x 2790 mm as illustrated on the left. While the tandem louvre damper 8000 x 5000 mm was manufactured entirely from 1.4562 material, the eight tandem louvre dampers 3070 x 2790 mm were of a single-sided execution in 2.4605 material.

RAUMAG-JANICH supplied four tandem louvre dampers NS 9,000 x 5,000 mm for the **FDG at the Jiangyou power station** in China. The illustration below shows two of the dampers during factory assembly at the Rauenstein works.

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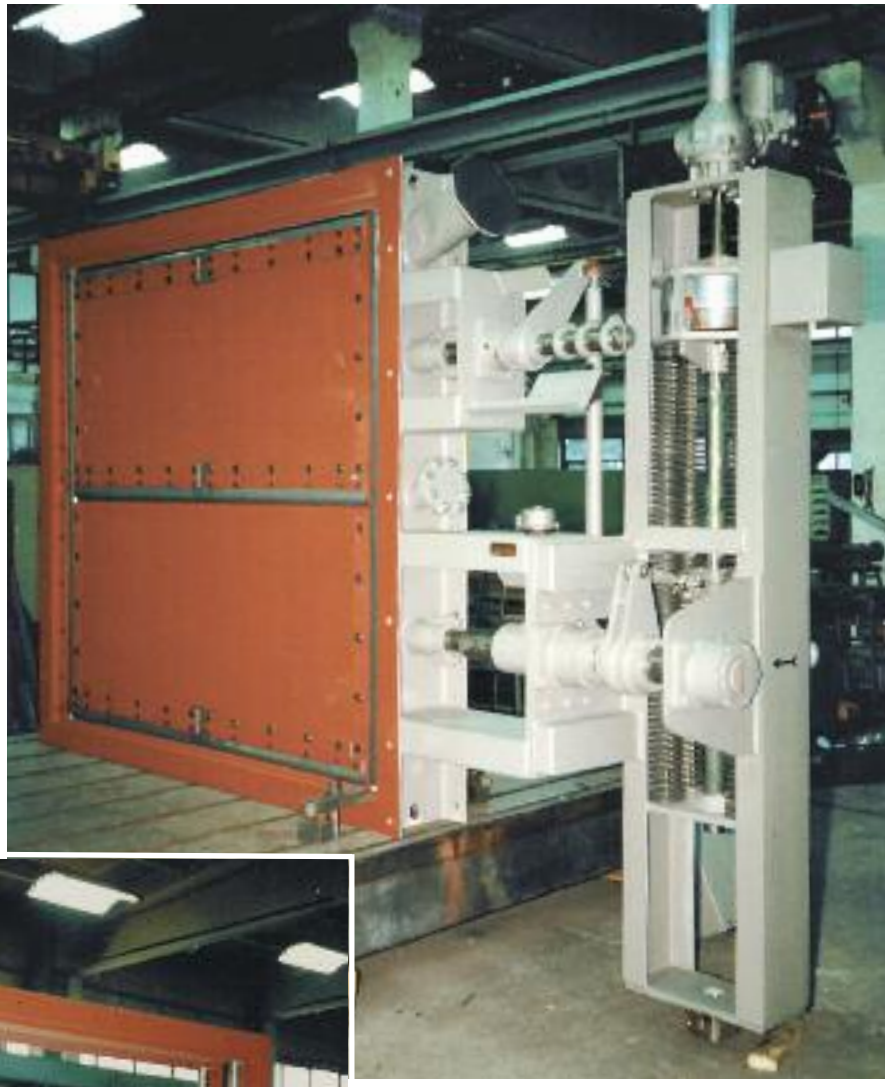
Tandem louvre dampers DBP

Tandem louvre damper
Nominal size 1980 x 1980 mm for a flue gas desulphurisation plant.
Actuation is by means of **a safety drive.**
The electric drive closes the damper thereby tensioning the springs in the drive “tree”. A solenoid connects the springs with the electric drive spindle. In the case of a power failure or safety incident, the solenoid becomes dead and the springs draw the damper blades into the opened position. In this position, the flue gas flows through the blades thus causing only marginal cross-sectional loss. The NICROFLEX-MLO sealing system in conjunction with purge air enables a **100% shut-off in accordance with UVV** (periodic accident prevention inspection).



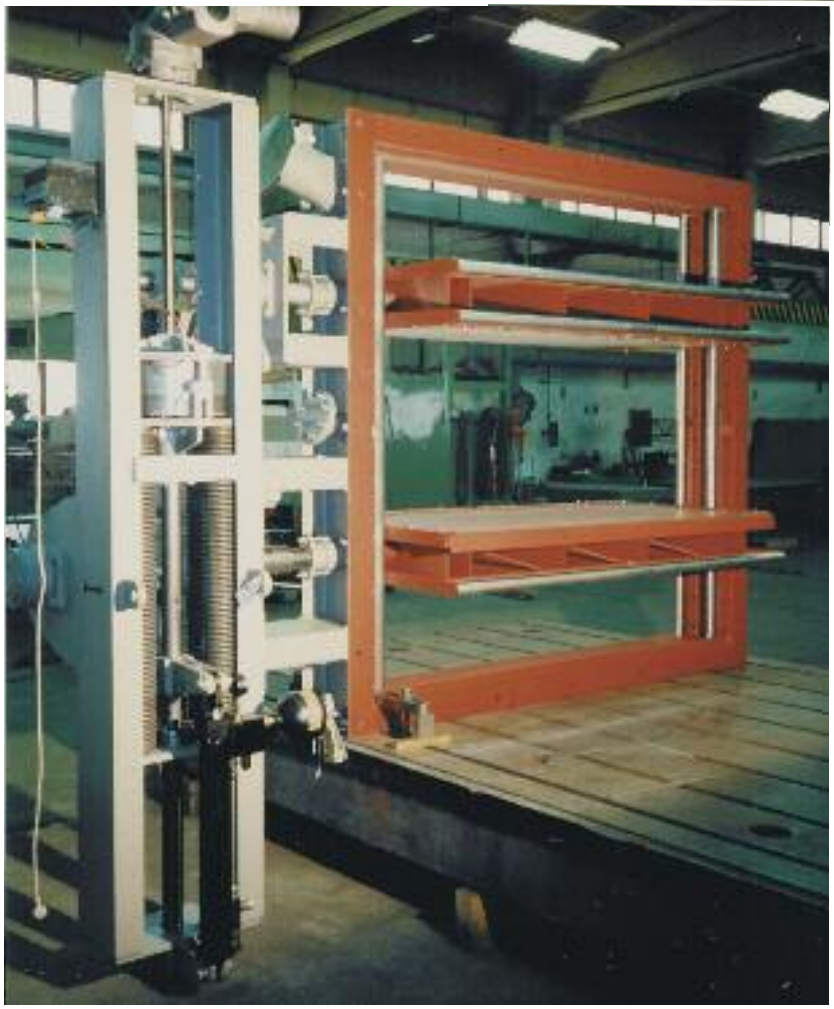


Illustration above:
The electric drive has closed the damper blades and the springs are tensioned in preparation for a safety incident.

Illustration below:
The blades are in the opened position. The springs are released. The solenoid has already engaged the spindle so that the damper can be closed by means of the electric drive.

Tandem louvre dampers DBP

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RAUMAG-JANICH supplied, for the FDG at the Ninghai power station in China, 8 tandem louvre dampers NS 11,600 x 5,200 mm. The dampers are moved by pneumatic drives and have a safety function. The above illustration shows two dampers during test runs at the Rauenstein works.

RAUMAG-JANICH supplied a total of 57 such large-format tandem louvre dampers up to June 2009 for the FDG plants in power stations in the People's Republic of China.

RAUMAG-JANICH supplied the new tandem louvre dampers NS 4500 x 4500 mm within the scope of relining and renovation of the flue gas desulphurisation plant at the **Buschhaus power station.** RAUMAG-JANICH's newly developed construction with the gas through-flow lattice supported blades DBP was deployed in conjunction with the new sealing system **NICROFLEX-HIPERFORM DBP.**

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A LEADER IN DAMPER TECHNOLOGIES

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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