Rev. 03 / 29-09-2021

ML/MF

CMO VALVES

BIDIRECTIONAL ROUND DAMPER BUTTERFLY VALVE

DESCRIPTION

- Round damper butterfly valve, with bidirectional design.
- Designed for pneumatic transport of air or gases at different temperatures.
- Option of manufacturing "WAFER" type or with bored flanges.
- Watertight integrity between 97% and 99%.
- Option of using an air sealing system to increase watertight integrity up to 100%.
- Various seal and gasket materials available.
- Opening in accordance with **CMO valves** standard. Other openings upon request.

GENERAL APLICATIONS

These butterfly damper valves are suitable to work with a wide range of air and gases. They are particularly suitable for controlling the flow of gas in pipelines.
Used mainly in:

- Cogeneration plants
- Electrical power stations
- Energy sector
- Thermal power stations
- Chemical plants

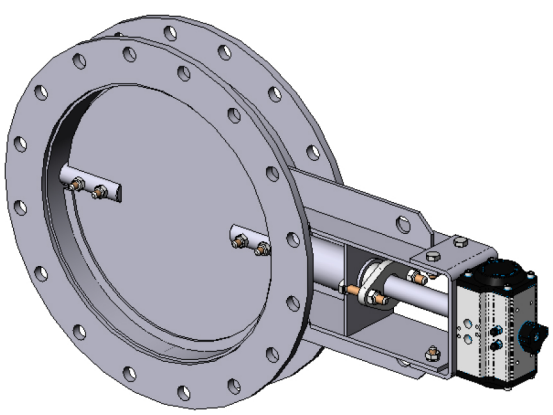

Fig. 1

SIZES

From DN 80 up to DN 3000 (larger sizes on request). Check with **CMO valves** for the general dimensions of a specific damper butterfly.

WORKING (ΔP)

- The most significant difference between the **ML** and **MF** series is the differential working pressure (P). For lower pressures, choose the **ML** series (Light Butterfly); for higher pressures, choose the **MF** series.

- Maximum standard work pressure is 0.5 kg/cm2; greater pressures upon request.

JOINT FLANGES

There are two options to secure these valves to the conduit:
• Flange connection: The valve is manufactured with "WAFER" type design.
• Bolting the flanges: The valve is manufactured with bored flanges.

- In both variants, the flange connections and openings are in line with **CMO valves** standard, although these can be tailored to customer requirements upon request.

WATERTIGHT INTEGRITY

These standard watertight integrity rate for these **CMO** valves is between 97% and 99%. 100% watertight integrity can also be obtained using dual swing check systems sealed by air injection (upon request).

APPLICATION OF EUROPEAN DIRECTIVES

See document of European Directives applicable to **CMO Valves.**

** For further information on categories and zones please contact the* **CMO VALVES**. *Technical-Commercial Dept.*

QUALITY DOSSIER

All valves are tested at **CMO valves** and material and testing certificates can be supplied on request.

The watertight integrity of the seat area is measured with gauges

ADVANTAGES

These **ML** or **MF** valves are mechanically welded.
The main elements which make up these damper butterflies are the body, which contains a swing check which turns on two duly aligned shafts. The rotation shaft is located on the central planes of the swing check and the body (fig. 2), meaning the direction of flow is irrelevant, since the valve is bidirectional.

The watertight integrity of these valves ranges between 97% and 99%. If the body is designed without sealing rims, watertight integrity will be 97%. However, better watertight integrity is achieved if half-moons are welded for sealing. There is also the option of mounting a seal system on the half-moons, in order to achieve up to 99% watertight integrity.

Whenever 100% watertight integrity is required, the design of the valve can be duly adapted, resulting in a slight variation from the standard. A dual swing check is manufactured and an air injection system using a fan is coupled to the body.

The **ML** or **MF** valve body consists basically of a collar of the same interior diameter as the conduit where it is installed, with a flange on each side. If the valve is "WAFER" type, assembly in the conduit is by way of flanges ("sandwich" type) (fig. 3). In the case of bolted flanges, the valve is mounted in the conduit by bolting down the flanges (fig. 4).

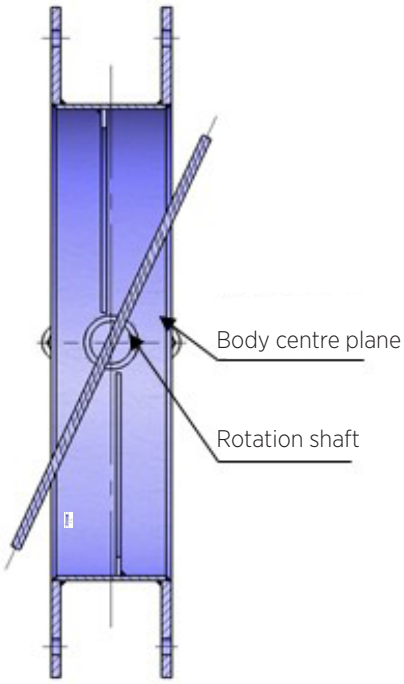

Fig. 2

Both the opening and the boring of the flanges are defined in accordance with **CMO valves** standards; however, they can also be manufactured in accordance with customer requirements. These damper butterflies are designed for the rotation shaft to remain in horizontal position, although they can be designed for assembly in other positions upon request.

Since these valves are designed to control the passage of air or gases, these flows are occasionally at very high temperatures. Specific materials are used for high temperatures (e.g. AISI 316, AISI 310, etc.) in order to ensure the valve responds correctly under these conditions.

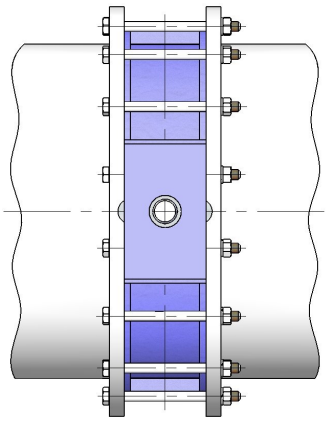

Fig. 3

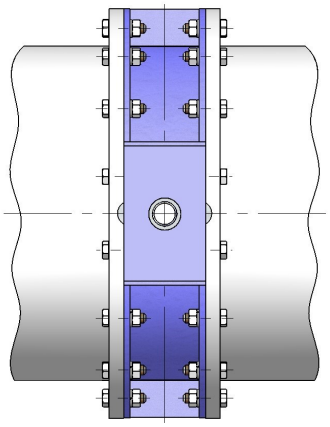

Fig. 4

There are manual and automatic actuators to operate these valves. In either case, the drive system is positioned far away from the valve when the valve is to work at very high temperatures. Exterior insulation, heat dissipaters or interior insulation based on refractory materials can also be used.

Material	Max. Temperature	Material	Max. Temperature
S275JR	250 °C	AISI 304	650 °C
H-II	400 °C	AISI 316	800 °C
16 Mo3	500 °C	AISI 310	1000 °C
Note: *Other materiales upon request*			

Table. 1

The standard components that make up this type of valve are shown below:

STANDARD COMPONENTS LIST							
POS.	**COMPONENT**	**POS.**	**COMPONENT**	**POS.**	**COMPONENT**	**POS.**	**COMPONENT**
1	Body	5	Spacer	9	Support with bearing	13	Bolt
2	Swing check	6	Gasket	10	Seal (optional)	14	Nut
3	Driving shaft	7	Press bushing	11	Actuator	15	Washer
4	Driven shaft	8	Press flange	12	Pin		

Table. 2

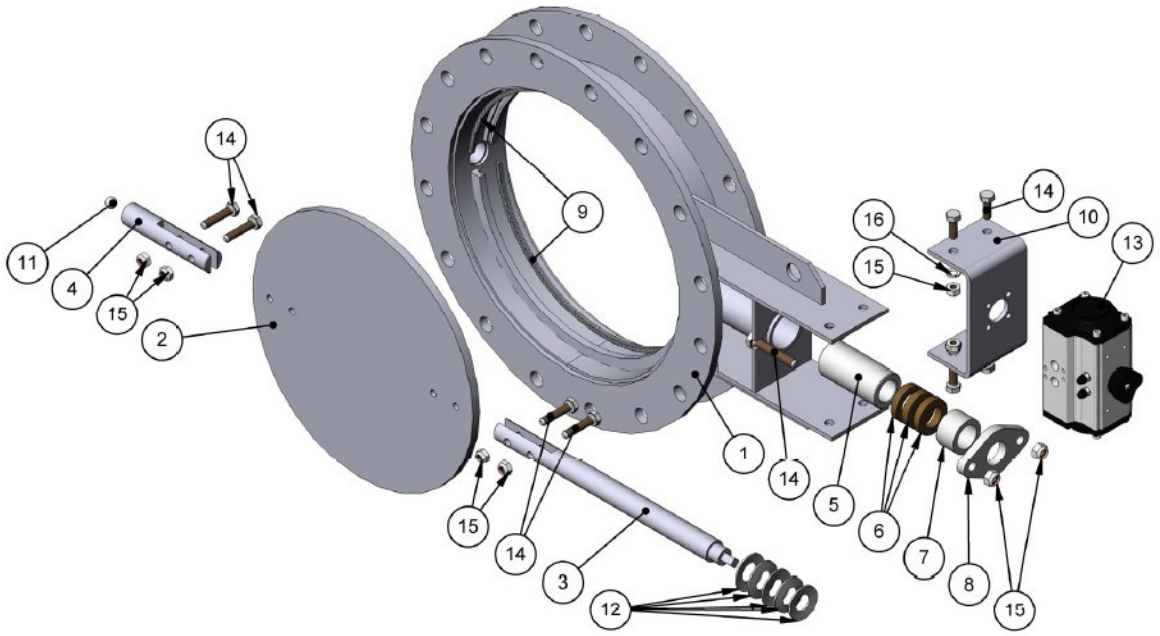

Fig. 5

DESIGN CHARACTERISTICS

BODY

The body of this type of damper butterflies is usually mechanically welded. Its geometry consists basically of a collar of the same interior diameter as the conduit in which it is installed, with a flange on each side. In the case of "WAFER" type valves, these flanges will not include boreholes (fig. 6). When a valve with bored flanges is required (fig. 7), the flanges will be bored in accordance with **CMO valves** standard, as with the opening dimensions of the body throughout the ML and MF series. However, both the opening and the flange standard can be tailored in accordance with customer requirements upon request.

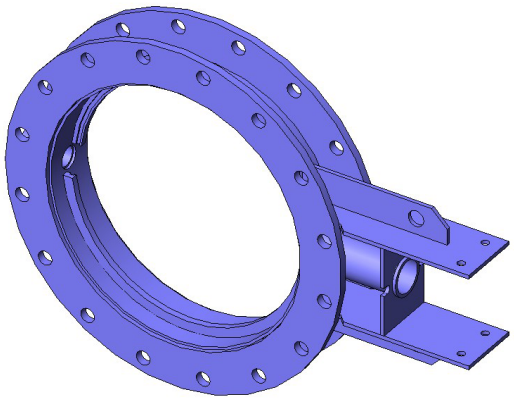

Fig. 6

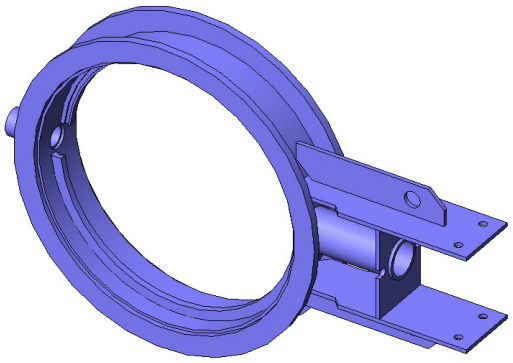

Fig. 7

There are orifices on both sides of the collar in which sections of pipe are welded on the outside (fig. 8). These are perfectly aligned and coincide with the rotation shaft. The shafts are introduced in these pipes to support and operate the swing check. A packing system is used in both pipes in order to ensure the watertight integrity of these areas and prevent leakages of gas from inside the body. This system comprises multiple gasket lines which, when oppressed by way of a flange and press bushing, achieves the watertight integrity between the body and the shafts. The choice of gasket material depends mainly on the work temperature.

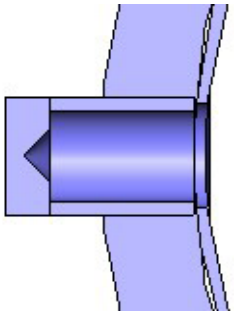

Fig. 8

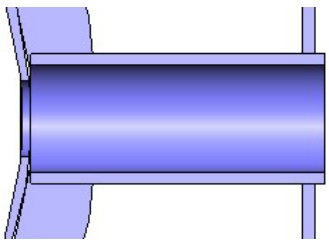

Fig. 9

The watertight integrity offered by this type of valves is at least 97%. If greater watertight integrity is required, half-moons are welded inside the body, which the swing check closes on to improve sealing. There is the possibility of mounting a seal system on these half-moons, increasing watertight integrity up to 99,5%

100% watertight integrity can only be achieved by fitting a dual swing check with dual sealing on the body. Air will be injected using a fan, achieving 100% watertight integrity by air sealing.

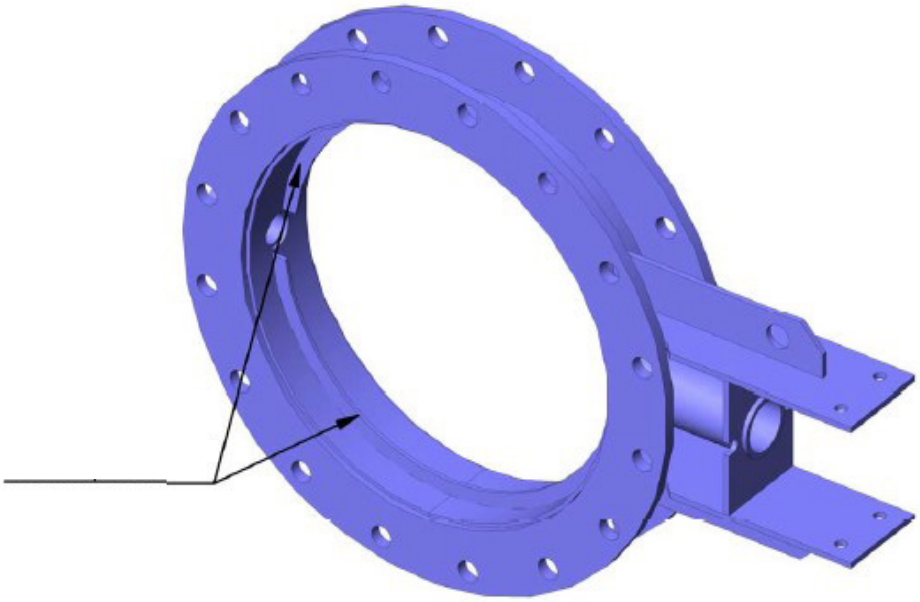

Fig. 10

The construction materials used are highly varied, and are chosen in accordance with the valve requirements, the work temperature, pressure, dimensions, etc. Some of the most commonly used materials are: S275JR carbon steel, stainless steel AISI 304, AISI 316, etc. However, other special materials such as steel HII, 16Mo3, AISI 310, etc., can also be used.
As standard, carbon steel damper butterflies are coated with an anti-corrosive protection of 80 microns of EPOXY, colour RAL 5015. Nevertheless, other types of anti-corrosion protections are available.

SWING CHECK

The swing check in these damper butterflies comprises a circular disc with bushing on each end (fig. 11) where the shafts are introduced. The swing check turns on these shafts and is operated by the driving shaft, joined using pins. The swing check is designed in accordance with the dimension of the conduit and the work pressure required. When the situation so requires, the disc can be fitted with ribs and reinforcements to guarantee the necessary robustness (fig. 12).

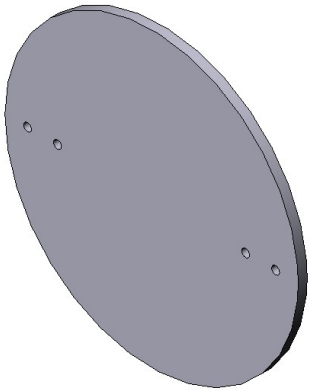

Fig. 11

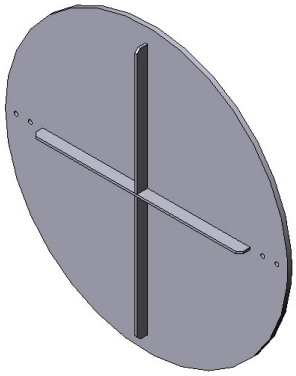

Fig. 12

As mentioned above, the design varies from the standard whenever a valve with 100% watertight integrity is required, most notably through the inclusion of a dual swing check, as shown in fig. 11.

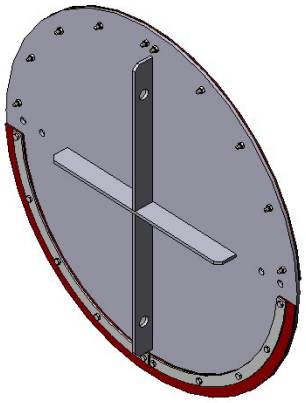

Fig. 13

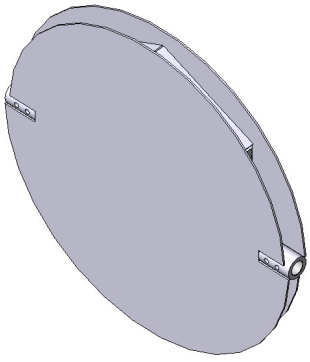

Fig. 14

The swing checks are generally made of the same material as the body, although other materials or combinations can be produced upon request. The materials are chosen in accordance with the requirements of each valve, the working temperature, pressure, dimension, etc. Some of the most commonly used materials are: S275JR carbon steel, stainless steel AISI 304, AISI 316, etc. However, other special materials such as steel HII, 16Mo3, AISI 310, etc., can also be used.

As standard, carbon steel or iron valves are painted with an anti-corrosive protection of 80 microns of EPOXY colour RAL 5015. Nevertheless, other types of anti-corrosion protections are available.

SEAT

Different types of seats are available according to the working application

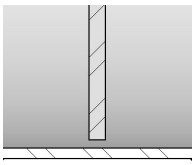

Fig. 15

- Seat 1: In this type of seal there is no contact between the body and the swing check (fig. 12). The estimated leak is 3% of the pipe flow. There is a specific margin between the interior diameter of the body and the exterior diameter of the swing check, in order to ensure the valve can open and close without any problems. We therefore calculate that this type of seal achieves watertight integrity of 97%.

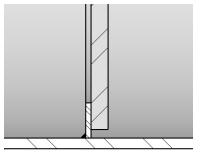

Fig. 16

- Seat 2: Metal/metal seal. This type of seal includes rims in the shape of a half-moon welded inside the body. The swing check closes against these rims, making a metal/metal seal (fig. 13). The estimated leak is 2% of the pipe flow. The thickness of these rims means they can be handled easily to adjust the swing check. We therefore calculate that this type of seal achieves watertight integrity of 98%.

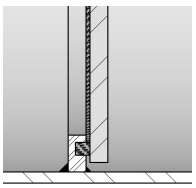

Fig. 17

- Seat 3: Metal/joint seal. This type of seal includes rims in the shape of a half-moon welded inside the body. These rims have a machined recess where the seal fits. The swing check closes against this seal (fig. 14). The estimated leak is 1% of the pipe flow. There are several materials available for the watertight joint, chosen mainly in line with the working temperature of the valve. We calculate that this type of seal achieves watertight integrity of 99%.

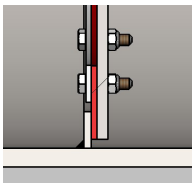

Fig. 18

- Seat 4: Air-sealed. This type of seal is particularly special. The valve is designed with a dual seal, between which air is injected to completely separate the gases on both sides of the swing check (fig. 15). This type of valve requires a dual swing check, which closes against the dual half-moon rim system fitted inside the body. In order to inject air in the seal, a fan system with a check valve is attached (fig. 16), meaning the conduit gases cannot leave through the fan pipe when the damper butterfly is open. We therefore calculate that this type of seal achieves watertight integrity of 100%.

There is a range of materials for the seal when choosing the seal type described in point “Seat 3” (metal/joint seal).

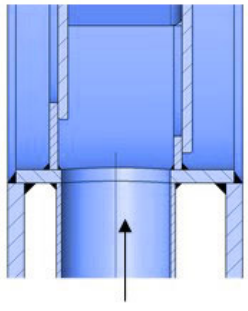

Fig. 19

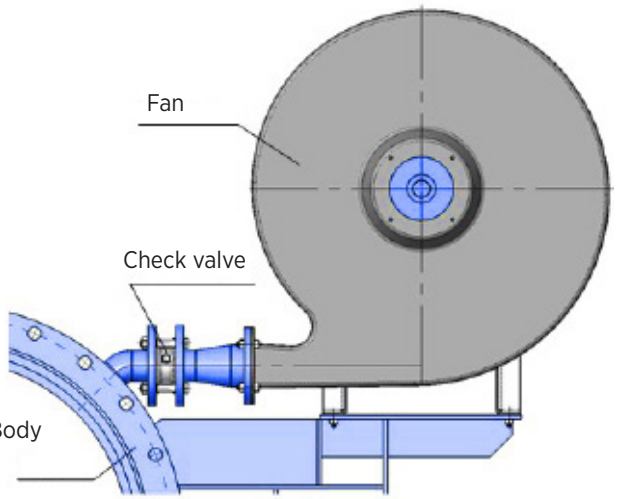

Fig. 20

In the next table a summary of the usually used materials for the seals previously described and their temperature limitations are shown.

SEAT/SEALS		
MATERIAL	**MÁX Tª (ºC)**	**APLICATIONS**
Metal/Metal	>250	High temperature/Low watertight integrity
EPDM (E)	90 *	Water, acids and non-mineral oils.
Nitrile (N)	90 *	Hydrocarbons, oils and greases
Viton (V)	200	Hydrocarbons and solvents
Silicone (S)	200	Food products
PTFE (T)	250	Resistant to corrosion
Natural Rubber	90	Abrasive products
Graphite	650 °C	High temperatures
Ceramic fibre	1400 °C	Extreme temperatures
* ⇨ EPDM and Nitrile: possible up to max temp: 120ºC to order.		
Note: *More details and other materials available to order*		

Table. 3

Watertight seal materials

EPDM
Recommended for temperatures below 90ºC*, providing the damper butterfly with watertight integrity of 99% of the pipe flow.

NITRILE
Used with gases containing fats or oils at temperatures no higher than 90ºC*. Provides the damper butterfly with watertight integrity of 99% of the pipe flow.

NATURAL RUBBER
This can be used in multiple applications at temperatures below 90ºC, with abrasive products, and provides the damper butterfly with 99% watertight integrity.

Depending on the work temperature and the watertight integrity to be achieved, bronze, graphite, Hecker seals, etc., can also be used.

VITON
Suitable for corrosive applications and temperatures of up to 190ºC continuously and peaks of 210ºC. Provides the damper butterfly with watertight integrity of 99% of the pipe flow.

SILICONE
Used mainly in the food industry and for pharmaceutical products with temperatures no higher than 200ºC. Provides the damper butterfly with watertight integrity of 99% of the pipe flow.

PTFE
Suitable for corrosive applications and pH between 2 and 12. Does not provide the damper butterfly with 99% watertight integrity. Estimated leakage: 1.5% of the pipe flow.

GRAPHITE
It can be used in multiple applications up to temperatures of 650°C. It has a wide range of applications because graphite is resistant to steam, water, oils, solvents, alkalis and most acids. It can provide the butterfly damper with a tightness of 99.5% of the pipe flow.

CERAMIC FIBRE
It is a gasket composed of fibers of ceramic material. It is mainly used with air or gases at high temperatures and low pressures. It can provide the butterfly damper with a tightness of 99.5% of the pipe flow.

Depending on the working temperature and the tightness to be achieved, bronze gaskets, hecker, etc. can also be used.

***Note**: : In some applications other types of elastomer are used, such as: hypalon, butyl, etc. Please contact **CMO valves** for any such requirements.

GASKET

CMO's standard gasket comprises several lines of SYNT.+PTFE gasket which provide watertight integrity between the shafts and the body, preventing any type of leakage into the atmosphere (fig. 17). It is located in an easily accessible place and can be replaced without dismantling the valve in the line. Below we indicate various types of gasket available according to the valve's application:

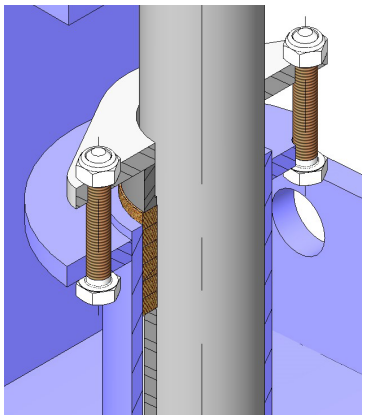

Fig. 21

GREASED COTTON (Recommended for hydraulic services)
This gasket is composed of braided cotton fibres soaked in grease both inside and out. It is for general use in hydraulic applications in both pumps and valves.

DRY COTTON
This gasket is composed of cotton fibres. It is for general use in applications with solids.

COTTON + PTFE
This gasket is composed of braided cotton fibres soaked in PTFE both inside and out. It is for general use in hydraulic applications in both pumps and valves.

SYNTHETIC + PTFE
This gasket is composed of braided synthetic fibres soaked in PTFE both inside and out. It is for general use in hydraulic applications in both pumps and valves and in all types of fluids, especially corrosive ones, including concentrated and oxidising oils. It is also used in gas with solid particles in suspension.

GRAPHITE
This gasket is composed of high-purity graphite fibres. A diagonal braiding system is used and it is impregnated with graphite and lubricant which helps to reduce porosity and improve operation. It has a wide range of applications as graphite is resistant to steam, water, oils, solvents, alkali and most acids.

CERAMIC FIBRE
This gasket is composed of ceramic material fibres. It is used mainly with air or gases at high temperatures and low pressures.

A summary of common packing materials and their limitations is shown in the table below.

GASKET			
Material	**P(bar)**	**Máx. Temp. (°C)**	**pH**
Greased cotton	10	100 °C	6-8
Dry cotton (AS)	0,5	100 °C	6-8
Cotton + PTFE	30	120 °C	6-8
Synthetic + PTFE	100	-200 °C+270 °C	0-14
Graphite	40	650 °C	0-14
Ceramic Fibre	0,3	1400 °C	0-14

Table. 4

SHAFTS

The shafts of **CMO**'s ML and MF damper butterflies are solid and manufactured in stainless steel (AISI 304, AISI 316, AISI 310, etc.). These characteristics make it highly resistant and provide excellent properties against corrosion.

Pins (fig. 22) are used to join the swing check and the shafts, which cross the swing check bushing from side to side, including the part of the shafts located inside.

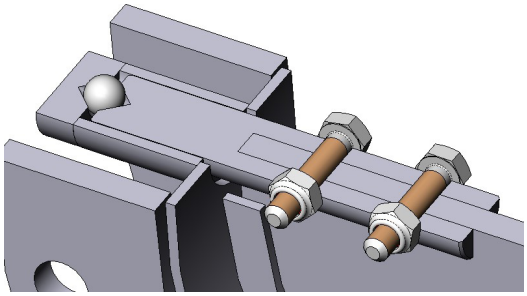

Fig. 22

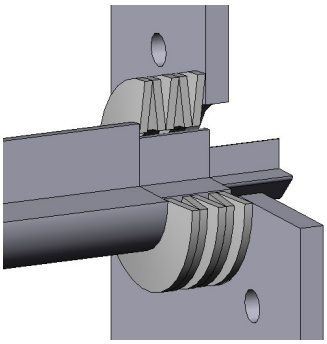

Fig. 23

The other end of the driving shaft can, in order to duly transmit the torque generated by the actuator, use either the square head system (fig. 24) or the slot system (fig. 25).

Commercial support pieces fitted with self-lubricating bearings are used to ensure the shafts can turn without any problems. These support pieces are bolted in the body and each shaft has its own support.

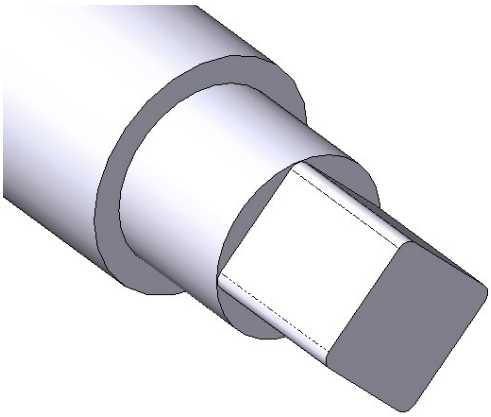

Fig. 24

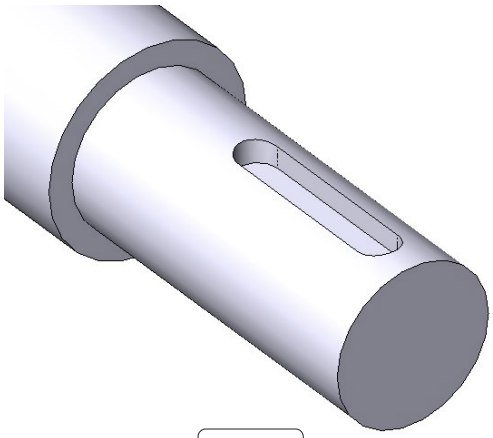

Fig. 25

PACKING GLAND

As explained above, a packing system is used to achieve the watertight integrity of the shaft. This comprises multiple gasket lines which are oppressed by way of a flange and press bushing. The combination of press flange plus packing bushing (fig. 22) allows a uniform pressure and force to be applied throughout the gasket, thus guaranteeing there are no leakages between the body and the shafts.

As a general rule, both the press flange and the press bushing are made of stainless steel AISI 316. However, other materials can be used to order.

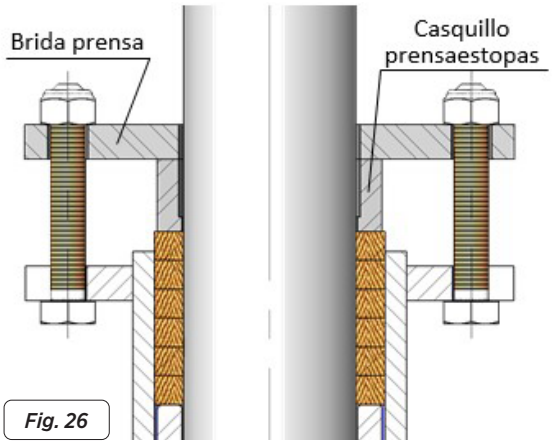

Fig. 26

BRIDGE

The bridge of these butterfly dampers refers to a folded rectangular metal plate with various holes (Fig. 27). Its main function is to support the drive, so on the one hand it must be adapted to suit the required drive. On the other hand, it must also act as a support for the previously mentioned disc washers, and thus in a sense serves as a stop for the moving system of clapper and shafts.

Normally the bridge is made of the same material as the body, but upon request, it can be manufactured with other materials or combinations. To mention some of the most frequently used materials: carbon steel S275JR, stainless steel AISI304, AISI316, etc. But there are also other more special materials to choose from, such as P265GH steel, 16Mo3, AISI310, etc.

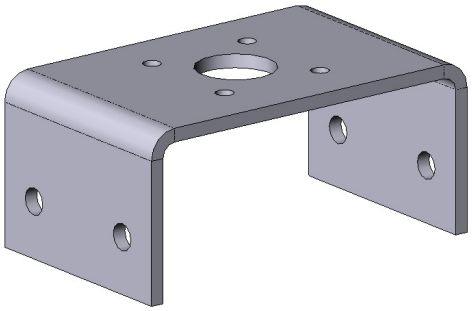

Fig. 27

ACTUATORS

The damper butterfly actuator system is located in one of the body support pieces. The actuator is attached to the body and transmits the torque generated to the swing check through the actuating shaft. Our damper butterflies are supplied with several types of actuator, bringing the advantage that, thanks to the **CMO valves** design, they can be interchanged. This design allows customers to change the actuators themselves and no extra assembly accessories are required. The total dimensions of the damper butterfly may vary in accordance with the type of actuator chosen.

ACTUATORS	
Manual:	**Automatic:**
Reducer (fig. 28)	Electric actuator (fig. 31)
Lever (fig. 29)	Linear pneumatic cylinder (fig. 32) *
Square-head (fig. 30)	¼ Turn pneumatic cylinder (fig. 32) *
...	Single acting pneumatic cylinder (fig.33) *

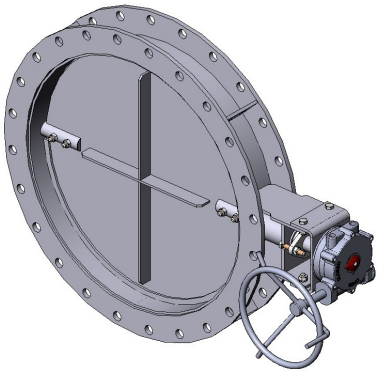

Fig. 28

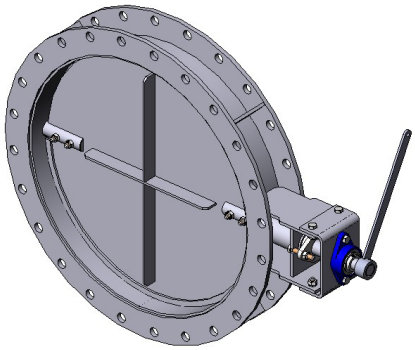

Fig. 29

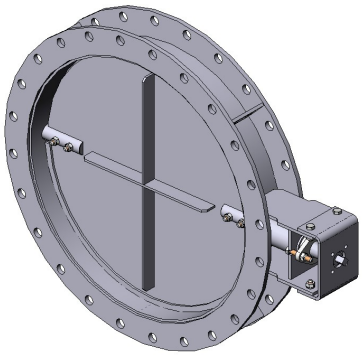

Fig. 30

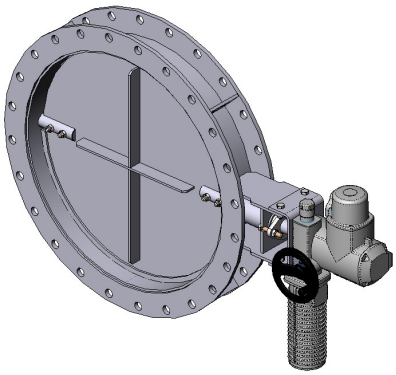

Fig. 31

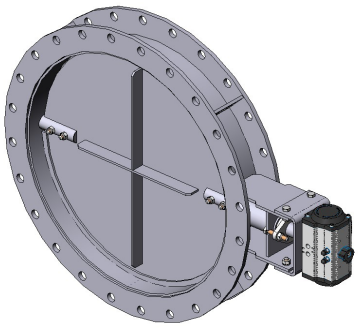

Fig. 32

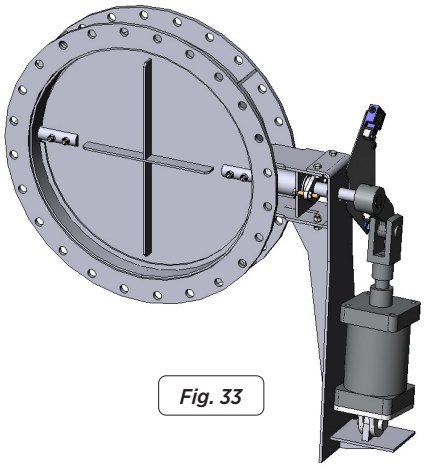

Fig. 33

* ⇨ Speed regulators must be included when the damper butterflies are fitted with a pneumatic drive. In these cases the minimum time of each operation (opening or closing) is 6 seconds.

ACCESSORIES AND OPTIONS

Different accessories are available to adapt the damper butterflies to specific working conditions such as:

MIRROR-POLISHED SWING CHECK
The mirror-polished swing check is especially recommended in the food industry and, as standard, in applications in which solids can stick to the swing check. It is an alternative to ensure the solids slide off and do not stick to the swing check.

PTFE COATED SWING CHECK
As with the mirror-polished swing check, this improves the damper butterfly's resistance to products that can stick to the swing check.

STELLITED SWING CHECK
This consists of providing stellite in the swing check sealing area to protect it from abrasion.

SCRAPER IN THE GASKET
Its function is to stop the passage of harmful particles and prevent damage to the gasket.

AIR INJECTION IN THE GASKET
By injecting air in the gasket, an air chamber is created which improves the watertight integrity.

CASED BODY
Recommended in applications in which the fluid can harden and solidify inside the valve's body. An external casing keeps the body temperature constant, preventing the fluid from solidifying.

FLUSHING HOLES IN BODY
Several holes are drilled in the body to flush air, steam or other fluids out with the aim of cleaning the valve seat before sealing.

MECHANICAL LIMIT SWITCHES, INDUCTIVE SWITCHES AND POSITIONERS
Installation of limit switches (fig. 31) or detectors to indicate specific valve position, and positioners to indicate continuous position.

ELECTROVALVES
For air distribution to pneumatic actuators.

CONNECTION BOXES, CABLING AND PNEUMATIC PIPING
Units supplied fully assembled with all the necessary accessories.

MECHANICAL STROKE LIMITERS (MECHANICAL STOPS)
These are used to mechanically adjust the movement, limiting the turning required of the damper butterfly swing check.

MECHANICAL LOCKING SYSTEM
Allows the valve to be mechanically locked in a set position for long periods.

EMERGENCY MANUAL ACTUATOR (HANDWHEEL/GEARS)
Allows manual operation of the damper butterfly in the event of power or air failure (fig. 30).

INTERCHANGEABLE ACTUATORS
All actuators are easily interchangeable.

EPOXY COATING
All stainless steel bodies and components of **CMO**'s damper butterflies are coated with a layer of EPOXY, which makes them resistant to corrosion and gives an excellent surface finish. **CMO**'s standard colour is blue RAL-5015.

OPTIONS FOR HIGH TEMPERATURES

If a damper butterfly is required to work at high working temperatures, there are different options available in line with the temperature and the space for the valve.

1- Elongated supports (fig. 34):

When the damper butterfly has to work at high temperatures, there is the option of elongating the body supports. This moves the bearings and the actuator away from the source of heat, protecting them from possible damage due to the high temperatures of the conduit.

Whenever the valve is fitted with a manual actuator, this allows the operator to use it without any risk of burns.

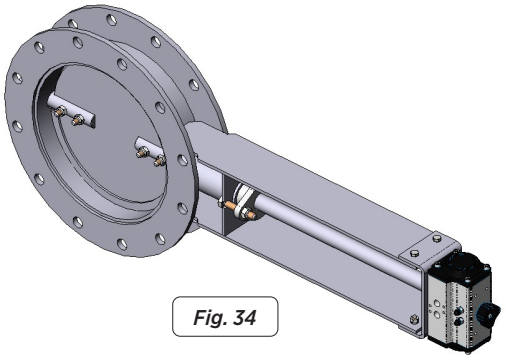

Fig. 34

2- Insulation (fig. 35):

Whenever the damper butterfly has to work as high temperatures and it is necessary to avoid unnecessary loss of heat through the valve, e.g. to maintain optimum performance of the facility, there is the option of protecting the valve body with exterior insulation. Sufficient free space is left around the body in order to fit the insulation whenever the customer deems appropriate. The packing, bearings and drive systems therefore remain easily accessible and maintenance work can be carried out without having to remove the insulation.

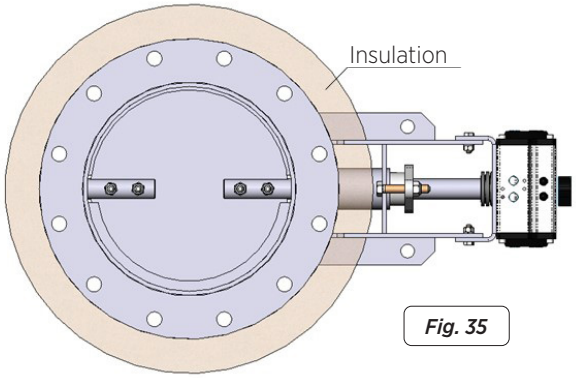

Fig. 35

3- Heat dissipaters (fig. 36):

Heat dissipaters are installed in facilities in which the valve works at high temperatures and there is not enough space to extend the body support pieces (or the length required is greater than normal). They are installed principally in the shafts, since they are solid and have great thermal conductivity.

The aim is to dissipate the heat and bring the temperature of the shafts down in the areas where the bearings and the actuator are assembled. This allows them to work at a lower temperature, causing less wear and tear and extending their working life.

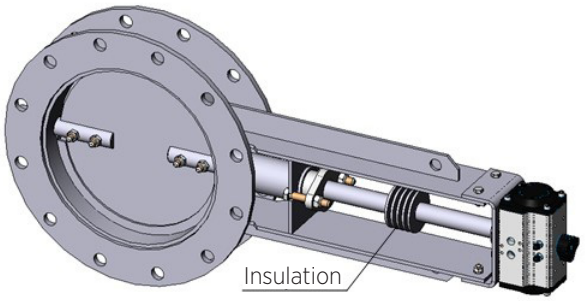

Fig. 36

4- Interior insulation (fig. 37):

This type of damper butterfly is occasionally installed in conduits where the working temperature is very high. It may be the case that the temperature is too hot for the option of fitting insulation or that the valve is to be installed as close as possible to the source of heat. In these cases the inside of the body can be insulated with refractory material.

In valves which use this system, the diameter of the collar in the body is usually significantly larger than the nominal diameter of the conduit. The reason for this characteristic is that the refractory insulator is attached to the interior surface of the collar in the body. In consequence, higher temperatures will require higher quantities of refractory material. For this reason, the difference between the nominal diameter of the conduit and the diameter of the body must be larger.

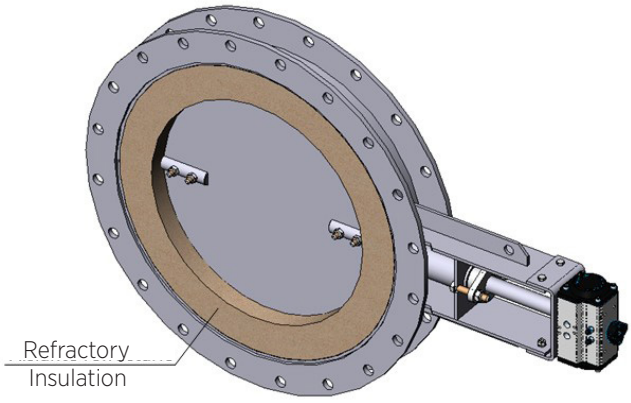

Fig. 37

GENERAL DAMPER BUTTERFLY DIMENSIONS

As indicated previously, the openings and general dimensions of **ML** and **MF** damper butterflies are defined in accordance with **CMO valves** standard. A table is included with these measurements (Table 3). However, since these valves depend on multiple variables, such as work pressure, temperature, nominal diameter of the conduit, etc., we recommend checking with **CMO valves** for the dimensions of a specific damper butterfly.

DN	A	ØB	C	ØD	ØE
80	100	180	4	140	14
100	100	200	4	160	14
125	100	225	8	185	14
150	100	250	8	210	14
200	100	300	8	260	14
250	100	350	12	310	14
300	100	400	12	360	14
350	100	450	12	410	14
400	100	500	16	460	14
450	100	550	16	510	14
500	100	600	20	560	14
550	140	670	20	620	18
600	140	720	20	670	18
650	140	770	20	720	18
700	140	820	24	770	18
750	140	870	24	820	18
800	140	920	24	870	18
850	140	970	24	920	18
900	140	1020	24	970	18
950	140	1070	24	1020	18
1000	180	1140	28	1080	18
1050	180	1190	28	1130	18
1100	180	1240	28	1180	18
1200	180	1340	32	1280	18
1300	200	1450	32	1380	18
1400	200	1550	36	1480	18
1500	200	1650	36	1580	18
1600	300	1800	40	1710	23
1700	300	1900	40	1810	23
1800	300	2000	44	1910	23
1900	300	2100	44	2010	23
2000	400	2220	48	2120	23
2100	400	2320	48	2220	23
2200	400	2420	52	2320	23
2300	400	2520	52	2420	23
2400	400	2620	56	2520	23
2500	400	2720	56	2620	23
2600	400	2820	60	2720	23
2700	400	2920	60	2820	23
2800	400	3020	64	2920	23
2900	400	3120	64	3020	23
3000	400	3220	68	3120	23

Table 5

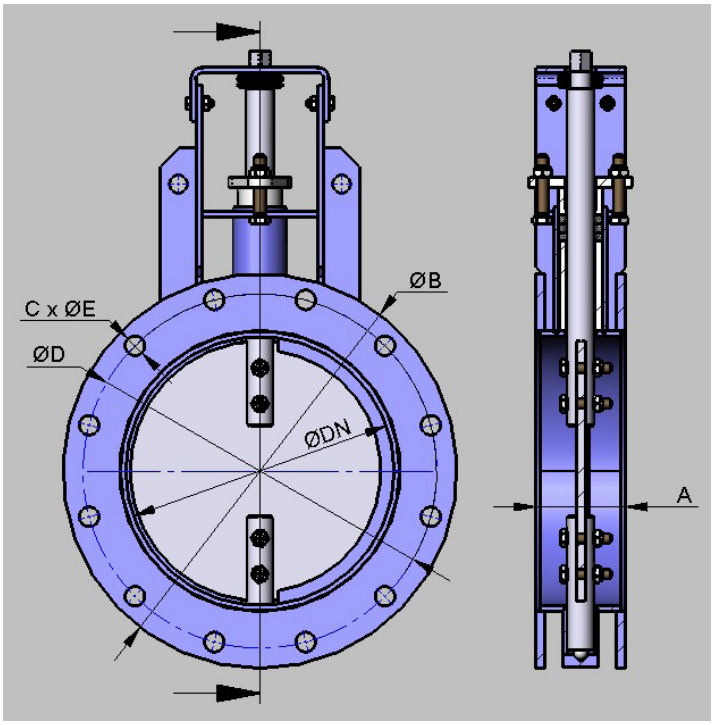

Fig. 38

PRESSURE LOSSES OF DAMPER BUTTERFLIES

It has already been explained during this manual that the operating conditions in which damper butterflies work often vary. Consequently, there are small nuances between equipment designed for different projects, but basically the design and concept of the valve remain the same. Taking into account these details and with **CMO** Valves' decades of experience in this type of valves, approximate values of head losses have been calculated (Table 6) for the most common dimensions and at different degrees of opening.

VALUES "Cv"	DN (mm)	SWING CHECK POSITION								
		90°	80°	70°	60°	50°	40°	30°	20°	10°
	80	473	363	272	160	89	56	34	16	1,9
	100	832	681	489	275	174	120	68	27	3,1
	125	1387	1187	777	448	289	173	99	39	5,8
	150	1859	1548	1012	593	367	234	128	57	6,7
	200	3323	2858	1861	1011	686	436	253	108	13
	250	5331	4628	2899	1696	1064	617	337	138	20
	300	8218	6827	4458	2598	1694	1101	609	237	32
	350	10609	8858	6031	3431	2112	1303	762	300	35
	400	14124	11674	7924	4459	2758	1789	1001	421	40
	450	17341	14533	10223	5992	3546	2124	1340	527	66
	500	22678	18321	12901	7364	4710	2828	1607	634	73
	550	27889	22918	15372	9046	5621	3526	2062	791	124
	600	33119	27536	17821	10742	6519	4218	2506	962	189
	650	39441	32828	21111	12563	7802	5016	2969	1131	241
	700	45780	38115	24369	14314	9093	5820	3427	1301	314
	750	52720	44589	28177	17103	11171	6556	3867	1591	352
	800	59659	51105	32006	19862	13252	7281	4304	1887	379
	850	67892	58655	36559	22159	14733	8202	4851	2098	443
	900	76113	66209	41136	24462	16223	9119	5386	2309	497
	950	89764	76298	47198	28202	18487	10967	6173	2563	588
	1000	103432	86422	53260	31925	20721	12821	6934	2817	668
	1050	111609	91060	56991	34107	21964	14036	7574	3146	697
	1100	119784	95681	60748	36265	23182	15231	8204	3459	732
	1200	133971	106190	71453	42997	27091	18314	10224	3902	848
	1300	150862	122665	82176	48303	29985	19099	11043	4759	967
	1400	173295	142409	90461	54783	32209	20340	12098	5897	1039

Table 6

***Note**: For more information about pressure losses of other dimensions, consult **CMO valves**.

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CMO VALVES

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CMO HEADQUARTERS
MAIN OFFICES & FACTORY

Amategi Aldea, 142
20400 Tolosa
Guipuzcoa (Spain)

Tel.: (+34) 943 67 33 99
Fax: (+34) 943 67 24 40

cmo@cmovalves.com
www.cmovalves.com

CMO MADRID

C/ Rumania, 5 - D5 (P.E. Inbisa)
28802 Alcalá de Henares
Madrid (Spain)

Tel.: (+34) 91 877 11 80
Fax: (+34) 91 879 79 94

cmomadrid@cmovalves.com
www.cmovalves.com