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Effbe[®]

The signature of quality!

Presentation



In 1949 Mr Fritz Brumme, an engineer at Opel, founded the EFFBE Company in Frankfurt in Germany. A year later he designed, developed and manufactured the first diaphragm in synthetic rubber which enabled quintupling of the lifetime of fuel pumps.

Thanks to the development and adjustment of new materials, Effbe has extended since then its expertise in activity fields such demanding as automotive, gas, water industry, pneumatic systems, aeronautic...

Impeccable quality, unequalled products lifetime, advanced Research & Development department and presence in more than 40 countries: for high performance diaphragms, Effbe is the partner par excellence.

Effbe[®]

The signature of quality!

Reciflex[®] solutions

Manufactured of coated fabric, the RECIFLEX[®] solutions have proven their reliability and their precision on millions of vehicles and in many industrial applications.

The main assets of the RECIFLEX[®] diaphragms are:

- a sensitive operating due to lack of friction even in difficult conditions.
- a great reliability thanks to the use of coated fabric especially conceived.
- an economical conception for an operating without any maintenance.
- an optimal lifetime.

• Construction

The RECIFLEX[®] diaphragms are made of a fabric coated on both sides with elastomer. These shaped diaphragms are formed under pressure and temperature. The form of the RECIFLEX[®] diaphragms allows a better stroke in comparison with flat diaphragms.

• Material

Due to the different application conditions and to the static, dynamic, chemical and thermal influences, EFFBE proposes a large range of materials and material combination.

Application fields



- Automotive industry
- Transports
- Gas industry
- Hydraulic and pneumatic systems
- Medical technologies
- Electronic
- Electricity
- Water industry...



Flat diaphragms



• Characteristics:

- pressure loadable on both sides
- same effective area on both sides
- limited stroke as defined hereunder:
 $H_{max} \leq 0.06 \times DG$ (regulatory function)
 $H_{max} \leq 0.1 \times DG$ (pump function)
- low hysteresis
- no stick-slip effect
- $DLM = DLG + 0.02 DG$

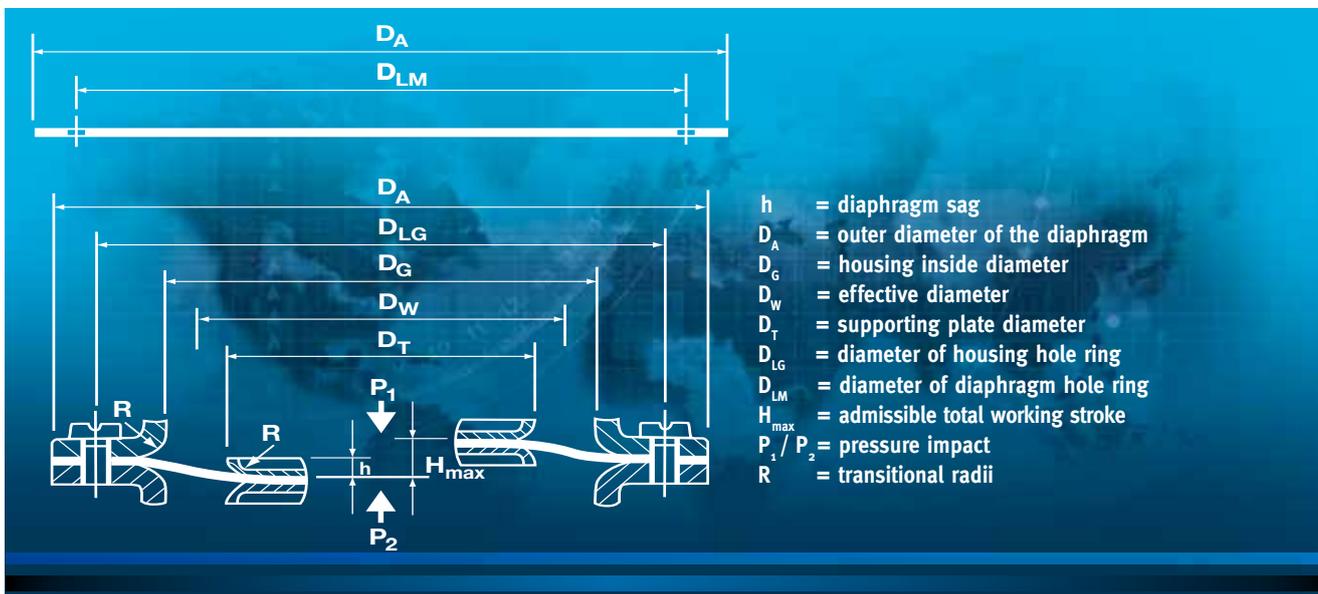
• Design:

- of coated fabric
- fabric reinforced
- rubber sole

• Functions:

- pump
- regulation
- control and measurement

• Construction and dimensions:



Convolute diaphragms



• Characteristics:

- pressure loadable in loop direction
- small effective surface change
- average stroke
- $H_{max} \leq 0.19 \times DW$
- low hysteresis
- no stick-slip effect
- design part for sealing function
- very long working lifetime

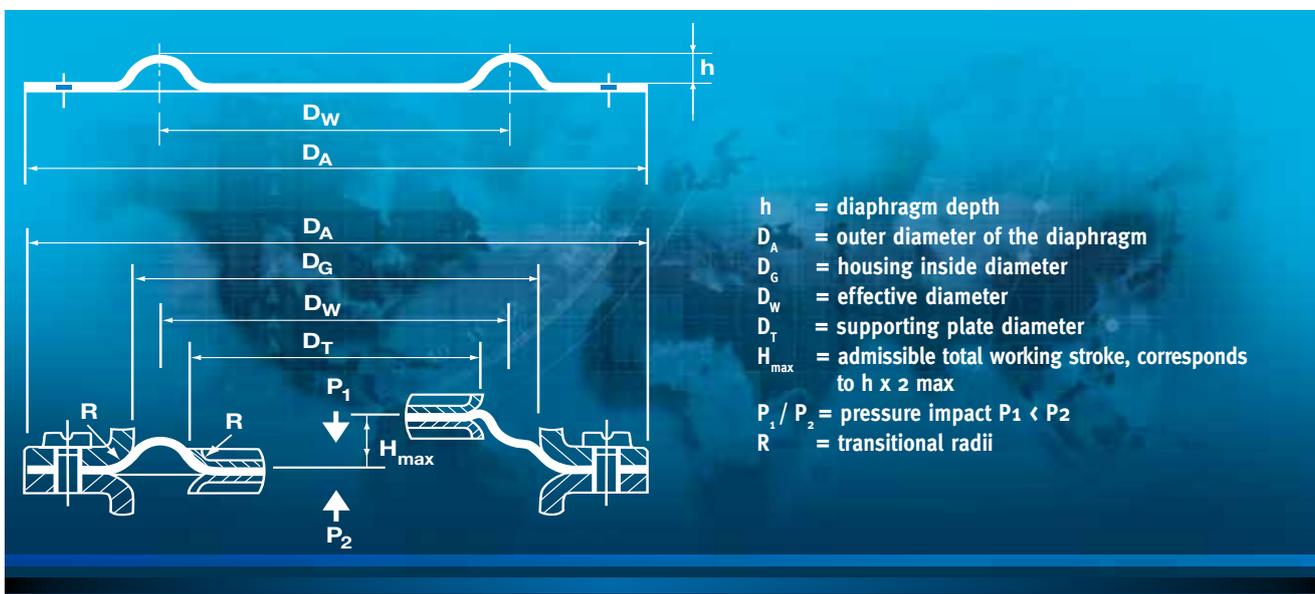
• Design:

- of coated fabric RECIFLEX®
- fabric reinforced
- rubber sole

• Functions:

- regulation
- dosing
- control and measurement
- valve

• Construction and dimensions:





Dish shaped diaphragms



• Characteristics:

- pressure loadable on both sides
- same effective area on both sides
- average stroke
- $H_{max} \leq 0.24 \times DW$
- low hysteresis
- no stick-slip effect
- design part for sealing function
- long working lifetime

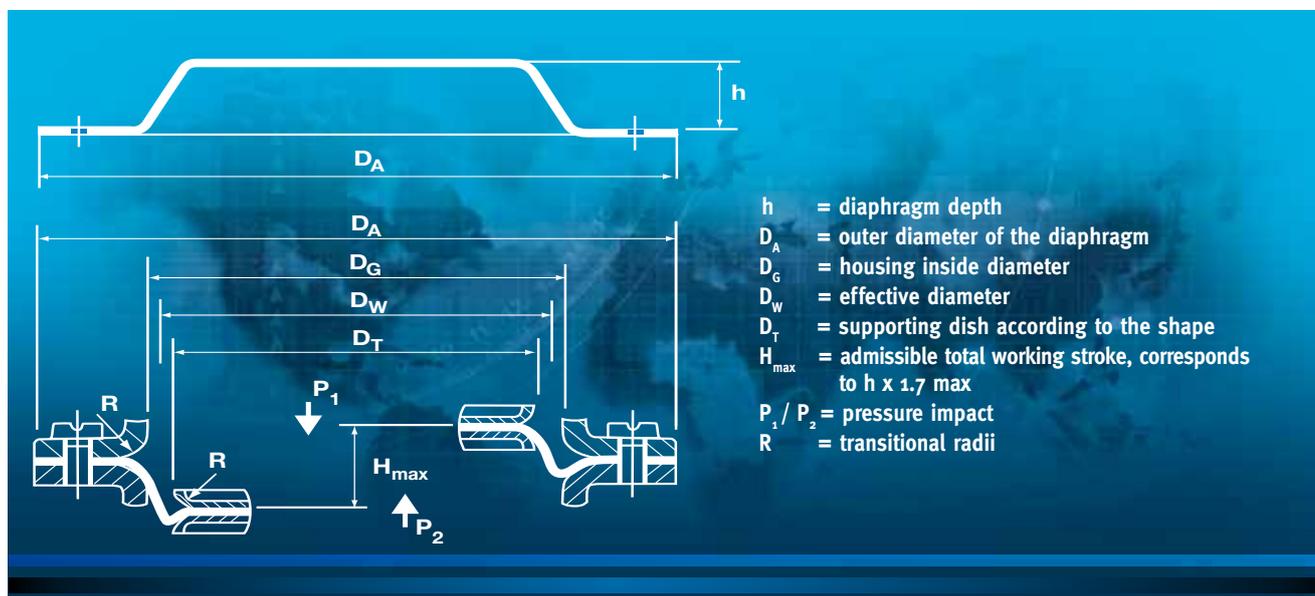
• Design:

- of coated fabric RECIFLEX®
- fabric reinforced
- rubber sole
- with barrier foil (PTFE, PI)

• Functions:

- regulation
- actuator
- dosing
- control and measurement
- valve

• Construction and dimensions:



Rolling diaphragms



• Characteristics:

- pressure loadable only on molding
- few changes in effective area
- $H_{max} \leq 0.67 \times DW$ (RECIFLEX®)
- $H_{max} \leq 1.14 \times DW$ (with fabric reinforcement)
- $H_{max} \leq 1.14 \times DW$ (without fabric reinforcement)
- very large stroke
- possible low hysteresis
- for devices of reduced size
- no stick-slip effect
- design part for sealing function
- long working lifetime

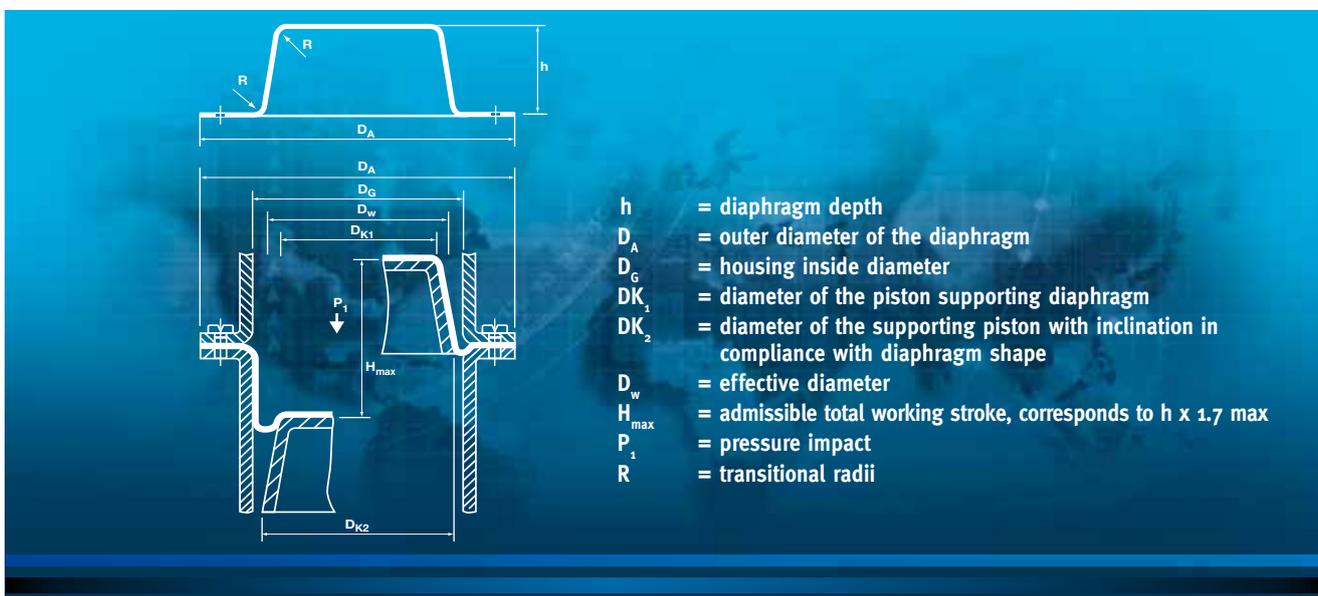
• Design:

- of coated fabric RECIFLEX®
- fabric reinforced
- rubber sole

• Functions:

- regulation
- actuator
- control and measurement

• Construction and dimensions:





Diaphragms with insert



Effbe, specialist of the design and manufacturing of elastomeric parts with insert

The carrying out of elastomeric parts with insert must be of high precision, that is why Effbe uses and develops the most suitable materials in order to get a perfect contact between the elastomer and the insert.

Our diaphragms with insert are mainly designed for fluid control applications.

• Design:

- of coated fabric
- fabric reinforced
- rubber sole

• Functions:

- pump
- valve

• Insert types:

- paper gasket
- metallic
- plastic
- PTFE...

Technical parts in elastomer



Thanks to the know-how, to an advanced knowledge of the materials and to the experience in the design of technical parts, Effbe proposes you a custom-made solution.

Characteristics of the elastomers

All synthetic rubbers are used • own recipe development and mixture manufacture • for use in temperatures ranging from -60°C to + 280°C • resistant to nearly all liquids and gases in use • in accordance with DVGW, KTW/WRC, BGA/FDA requirements.

| Rubber type | Abbreviated code (1) | EFFBE code | Thermal application range Ø °C | Mechanical characteristics | Weather / ozone resistance | Flame resistance | Gas permeability resistance | Resistance to chemicals | | | | | | | | | | | | |
|---|----------------------|------------|--------------------------------|----------------------------|----------------------------|------------------|-----------------------------|-------------------------|----------|-----------|-------|-----------------------|----------|-------|-----------------------|-----------|-----------------------------|--------------------------------|-----------|-----|
| | | | | | | | | Hydrocarbon compounds | | | Fuels | Mineral oils / grease | Alcohols | Water | Acids (non oxidising) | Alkalines | Brake fluids (glycol-based) | Hydraulic fluids | | |
| | | | | | | | | Aliphatic | Aromatic | Halogenic | | | | | | | | H/H-L/H-LP (mineral oil-based) | HFA / HFB | HFC |
| Butyl rubber | IR | B | -45 to + 120 | 0 | 0 | - | + | - | - | - | - | - | + | + | 0/+ | + | + | - | - | + |
| Chloroprene rubber | CR | C | -45 to + 100 | + | 0 | + | 0 | 0 | - | - | - | 0 | + | + | - | 0 | 0 | 0 | 0 | 0 |
| Butadiene-/isoprene-/styrene butadiene rubber | BR/IR SBR | D | -60/-40 to +100 | + | - | - | - | - | - | - | - | - | + | + | - | 0 | + | - | - | + |
| Ethylene-/Propylene copolymer/ Terpolymer | EPDM | E | -50 to + 140 | 0 | + | - | - | - | - | - | - | - | + | + | 0/+ | + | + | - | - | + |
| Fuoro rubber | FKM | F | -30 to + 220 | 0 | + | + | + | + | + | 0/+ | + | + | + | + | + | -/0 | - | + | + | 0 |
| Chlorosulphonated polyethylene | CSM | H | -20 to + 120 | 0 | + | + | 0 | 0 | - | - | - | 0/+ | 0/+ | 0 | 0/+ | + | 0 | - | - | 0 |
| Nitrile rubber | NBR | N | -40 to + 100 | + | - | - | 0 | 0/+ | 0 | - | 0/+ | + | 0/+ | 0 | - | 0 | - | + | + | + |
| Hydrogenated nitrile rubber | HNBR | NH | -40 to + 150 | + | + | - | 0 | + | 0 | - | 0/+ | + | 0/+ | 0 | - | 0 | 0 | + | + | + |
| Epichlorhydrine ethylene oxide copolymer | ECO | P | -40 to + 130 | 0 | + | + | 0 | + | 0 | - | 0 | + | 0 | 0 | - | 0 | - | + | (-) | - |
| Silicone rubber | VMQ | S | -60 to +280 | 0 | + | - | - | - | - | - | - | 0 | + | + | - | - | + | 0 | (+) | (+) |
| Fluosilicone rubber | FVMQ | S | -60 to + 220 | 0 | + | - | - | + | 0/+ | 0 | 0/+ | + | + | + | - | - | 0 | + | (+) | (+) |
| Urethane rubber (polyester basis) | AU | U | -30 to + 90 | + | + | - | + | + | - | - | -/0 | + | - | -/0 | - | - | - | + | - | - |
| Urethane rubber (polyester basis) | EU | U | -45 to + 90 | + | 0 | - | + | 0/+ | - | - | -/0 | 0/+ | - | 0 | - | - | - | 0 | - | - |
| Acrylate rubber | ACM | Y | -25 to + 160 | 0 | + | - | 0 | + | 0 | - | - | + | - | - | - | - | - | + | - | - |
| Ethylene acrylate rubber | AEM | Y | -40 to + 160 | 0 | + | - | 0 | 0 | 0 | - | - | 0 | - | 0 | (-) | (-) | (-) | 0 | (-) | (-) |

Evaluation key: + good, 0 moderate, partially suitable, not recommendable, (+) no information, probably suitable, (-) no information, probably unsuitable.

(1) According to DIN - ISO1629 • (2) Non-binding guide value for use in air



Characteristics of the coated fabrics

Fabric coated on both sides with elastomer • for diaphragms with pressure impact
high dynamic resistance • low hysteresis

| EFFBE Coated Fabrics | | Thickness | Colour | Range of temp (referring to air) | Media |
|----------------------|---------|-----------|--------------|----------------------------------|---|
| 603 C - | AG 600 | 1.10 | grey | - 30/+ 100°C | Acids, alcohol, base, oleiferous air |
| | AG 600 | 1.50 | grey | - 30/+ 100°C | |
| | AG 810 | 2.00 | grey | - 30/+ 100°C | |
| | AG 1000 | 2.50 | grey | - 30/+ 100°C | |
| 738 E - | AG 550 | 0.55 | black | - 40/+ 120°C | Acids, alcohol, ammonia, base, braking fluid, ketone, Glycol, sea water, water, water steam |
| | AG 550 | 0.80 | black | - 40/+ 120°C | |
| | AGN 410 | 0.80 | black | - 40/+ 140°C | |
| | AGN 410 | 1.50 | black | - 40/+ 140°C | |
| 7031 F - | AGN 410 | 0.80 | black | - 25/+ 200°C | Acids, alcohol, base, oleiferous air, base, butane, exhaust gas, fuels acc. FAM-I and FAM-II, gas oil, kerosene, natural gas, oils as ASTM-I, -II and -III, oxygen, pentane, propane, sour gasoline |
| 8051 F - | AGN 410 | 1.50 | black | - 25/+ 200°C | |
| 553 N - | AG 550 | 2.00 | black | - 35/+ 100°C | Alcohol, butane, hydrolic fluids, mineral oil, natural gas, parfin, pentane, propane |
| 555 N - | Ag 125 | 0.18 | black | - 35/+ 100°C | |
| | Ag 125 | 0.28 | black | - 35/+ 100°C | |
| | Ag 125 | 0.40 | black | - 35/+ 100°C | |
| | Ag 125 | 0.70 | black | - 35/+ 100°C | |
| Ag 125 | 1.00 | black | - 35/+ 100°C | | |
| 7010 N - | Ag 300 | 0.40 | black | - 30/+ 100°C | Alcohol, Alcohol added fuels, fluels, sour gasoline |
| | Ag 550 | 0.70 | black | - 30/+ 100°C | |
| 743 N - | Ag 600 | 1.00 | black | - 35/+ 100°C | Butane, engine oil, fuels, gas oil, hydrocarbons, natural gas, oil as ASTM-I, -II and III, pentane, propane |
| | Ag 600 | 1.50 | black | - 35/+ 100°C | |
| 745 N - | Tg 70 | 0.15 | red | - 30/+ 100°C | Butane, engine oil, fuels, gas oil, hydrocarbons, natural gas, oil as ASTM-I, -II and III, pentane, propane |
| | Ag 500 | 1.00 | red | - 30/+ 100°C | |
| | Ag 600 | 2.00 | red | - 30/+ 100°C | |
| | Yg 220 | 0.60 | red | - 30/+ 100°C | |
| | Yg 220 | 1.10 | red | - 30/+ 100°C | |
| Yg 290 | 0.38 | red | - 30/+ 100°C | | |
| 7452 N - | Ag 190 | 0.28 | red | - 25/+ 100°C | Alcohol added fuels, fuels, sour gasoline |
| 7461 N - | Ag 125 | 0.18 | red-brick | - 35/+ 100°C | Alcohol, butane, hydrolic fluids, mineral oil, natural gas, parafin, propane, |
| | Ag 125 | 0.28 | red-brick | - 35/+ 100°C | |
| 745 N/711 N | Ag 550 | 0.68 | red-green | - 30/+ 100°C | Red side: engine fuels, natural gas, oils, green side: engine oils, oleiferous hot air |
| 7511 P - | Ag 125 | 0.28 | black | - 40/+ 120°C | Air, butane, fuels, natural gas, oils, oxygene, pentane, propane |
| | Ag 300 | 0.55 | black | - 40/+ 120°C | |
| | Ag 600 | 1.50 | black | - 40/+ 120°C | |
| 60721 S - | AgN 210 | 0.40 | maroon | - 60/+ 200°C | Air, butane, fuels, natural gas, oils, oxygene, pentane |

Denomination of the Effbe coated fabrics

They indicate the basic data and the combination of respective materials. The following diagram represents the example of a coated fabric

- **Coated fabric EFFBE 603 C- Ag 600-1.10 mm**

60 = hardness shore A
 3 = formula index
 C = elastomer base
 Ag = fabric base material
 600 = bursting strength N/cm
 1,10 = total thickness

The following designations are used by EFFBE for their fabric base materials and for their base elastomers:

- **Fabric Base Materials**

Ag = Polyamide
 AgN = Polyarylamide
 Cg = Carbon
 Gg = Glass
 Tg = Polyester
 Yg = Cellulose

- **Base elastomers**

| | |
|-----------------------------------|------|
| B = Butyle | IIR |
| C = Chloroprene | CR |
| D = Isoprene | IR |
| E = Ethylene-Propylene-Terpolymer | EPDM |
| F = Fluoro | FKM |
| N = Nitrile | NBR |
| P = Epichlorhydrine | ECO |
| S = Fluosilicone | FVMQ |
| S = Silicone | VMQ |

The opposite table allows the selection of suitable EFFBE coated fabric in accordance with given application criteria.

“Antiweaking” coated fabrics

For application where the diaphragm has a fluidway function, EFFBE proposes a range of “antiweaking” coated fabrics.

