Dr. Schnabel FLUROFLEX®-N

# POLYFLURON® PTFE Bellows ASME/DIN US

## Process Technology

Broad Base. Best Solutions.

SGL GROUP
THE CARBON COMPANY

# Carbon is Future.

**SGL Group – The Carbon Company.**

Carbon has unique properties. It is indispensable in the production of steel, aluminum and solar energy systems. Carbon increases the performance of wind turbines and reduces the weight of airplanes, cars and sports equipment.

Carbon substitutes other materials and contributes to a reduction in $CO_2$ emissions.

SGL Group is one of the leading manufacturers of carbon-based products and has the broadest product and technology portfolio, a global sales network and state-of-the-art production sites in Europe, North America and Asia.

## Process Technology

The Business Unit Process Technology is a premium technology provider for chemical and related industry process systems, equipment and after sales services. Our focus are high-tech materials for demanding chemical applications. With smart and sustainable solutions for an increasing number of industry we give proof of our strong innovation culture.

**Broad Base**

Our range of materials:

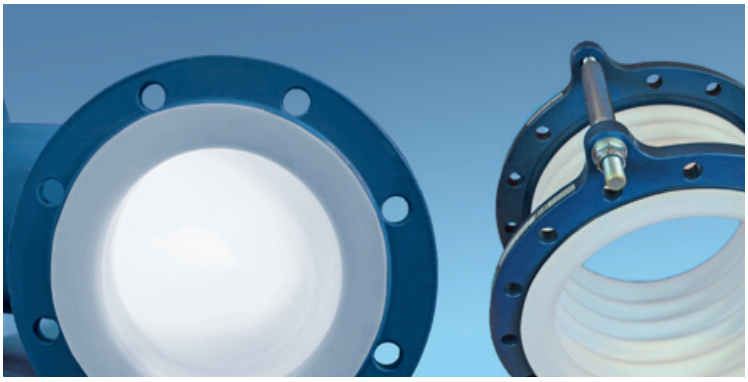
- graphite
- SiC
- PTFE
- reactive metals
- steel

Our range of services:

- process design
- engineering
- project management
- production and assembly
- commissioning
- after sales services.

With 9 manufacturing sites in 8 countries and a continually growing worldwide sales and service network, we are always close to our customers.

**RELIABILITY.**
**EFFICIENCY.**
**SUSTAINABILITY.**



Powered by our **Broad Base** of competencies, products and services, we offer **Best Solutions** to our customers. For the Business Unit Process Technology, those solutions are characterized by reliability, efficiency and sustainability.

### Best Solutions

- Reliability

  In a business that strongly depends on reliability we never compromise on quality and safety. Our products deliver dependable results; our services are fast and competent. The long-standing loyalty of our customers proves that we keep our promises – on-time, on-spec, on-budget.

- Efficiency

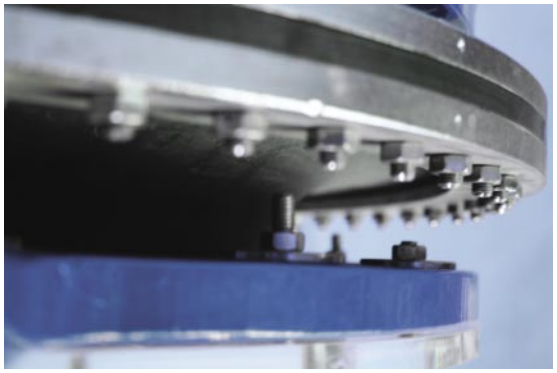
  Tailor made, innovative solutions and an integrated approach on chemistry, materials, technology and design, ensure outstanding efficiency and improved customer value: higher yields, lower operating cost, lower service and maintenance cost, longer service intervals and less downtimes, and the extended product lifetime sum up to significant lower total cost of ownership and to a higher return on investment for our customers.

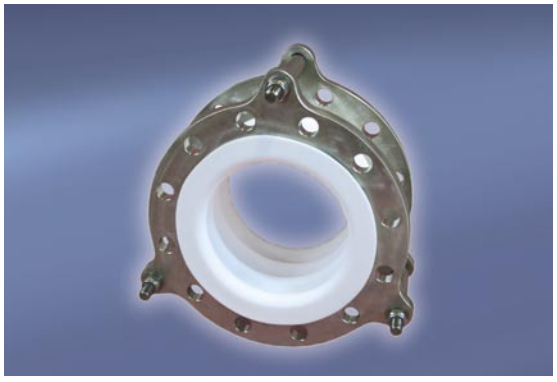
- Sustainability

  In all industries that deal with resource- and energy- consuming processes sustainability is of crucial importance. Based on innovative solutions, more than 60 % of our sales contribute to the saving of resources and energy and to the reduction of greenhouse gases.

### Contents

# Engineering and Manufacturing Expertise





FLUROFLEX®-N Bellows up to DN 150/6" come with chromated flanges

**R&D, Engineering & Manufacturing Performance**

Dr. Schnabel FLUROFLEX® bellows are manufactured from virgin paste-extruded POLYFLURON® PTFE. They are designed for maximum flex-life in a wide range of high temperature/high purity Chemical Process Industry (CPI) applications. General FLUROFLEX® bellows or flexible connectors or expansion joints, are used in piping systems to absorb vibration caused by rotating equipment, to absorb thermal expansion and contraction of piping systems and protect stress-sensitive process equipment (graphite, glass, glass-lined steel, FRP, dual laminate, etc.). PTFE is ideal for use as a bellow material because of its near universal corrosion resistance, low spring rate and near unlimited flexlife. Providing this system flexibility, any bellow is virtually designed to be the most sensitive link in a piping system. Dr. Schnabel has conducted longterm POLYFLURON® PTFE studies to ensure comprehensive understanding of all aspects of the bellow design, manufacture and quality control to maximize performance and safety. We can supply our POLYFLURON® PTFE with static dissipating (antistatic) properties suitable for use with solvents and other liquids where static build up is an issue.

**The steps in the engineering & manufacturing optimization process were:**

1. Optimize bellow geometry and wall thickness to achieve maximum burst pressure and minimize spring rate.
2. Manufacture the bellow according to the principles found in the theoretical calculations, without reducing the bellow performance due to manufacturing limitations.
3. Use best available PTFE liner (POLYFLURON® PTFE) to form the bellow.
4. Define operating parameters such as operating pressures that are important to the customer and take into account, that the lifetime of the bellow is influenced by PTFE creep.
5. Comply with the European Pressure Equipment Directive.

# Engineering and Manufacturing Expertise

### Optimize Bellow Geometry and Wall Thickness

For the optimization of the bellow design it is important to find a careful balance of wall thickness and bellow geometry. A thin wall thickness will lead to a low burst pressure but also good flexibility. A high bellow wall thickness without a change in bellow geometry and a limitation on bellow movement will lead to premature failure due to PTFE crimping (over compression in convolution radius).

Dr. Schnabel conducted a Finite Element Analysis (FEA) to optimize the bellow geometry and wall thickness. This Analysis showed clearly, that the maximum stress on the POLYFLURON® PTFE is in the inside of the convolution (green/yellow zone in Figure 2). Dr. Schnabel FLUROFLEX® bellows are designed to minimize the stress peak in this most sensitive area during operation.

### Manufacturing of Bellows

Dr. Schnabel FLUROFLEX® bellows are made of virgin paste-extruded POLYFLURON® PTFE and are formed without machining. Dr. Schnabel FLUROFLEX® bellows are formed in such a way, that a uniform wall is assured.

### Best Liner

Through more than 50 years of experience, Dr. Schnabel has continuously optimized the POLYFLURON® PTFE processing techniques to manufacture bellows. After sintering, Dr. Schnabel's virgin paste-extruded POLYFLURON® PTFE has uniform strength in both axial and lateral directions. The porosity, crystallinity, density, and tensile strength are constantly measured and controlled to guarantee the best performance. In addition, tests have shown that virgin paste-extruded POLYFLURON® PTFE is far superior to isostatically molded PTFE in terms of permeability reduction. See for example NACE-Paper 400.

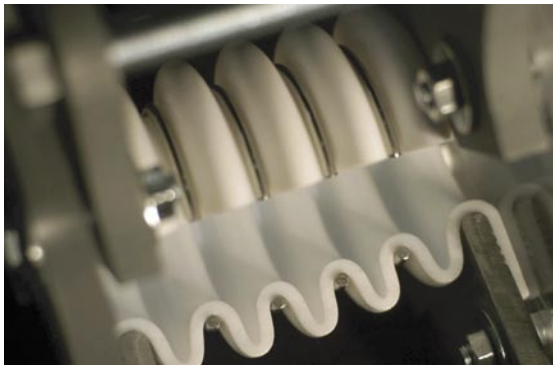


Fig 1 Dr. Schnabel FLUROFLEX® bellow with the assured uniform wall thickness.

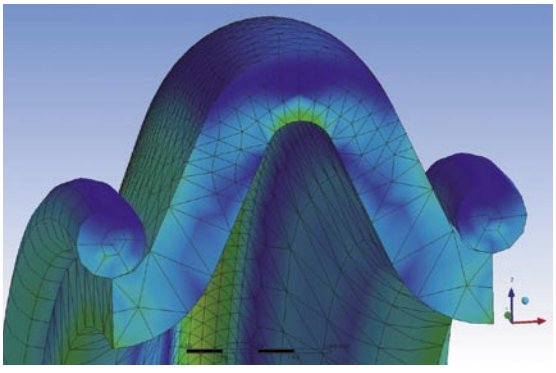
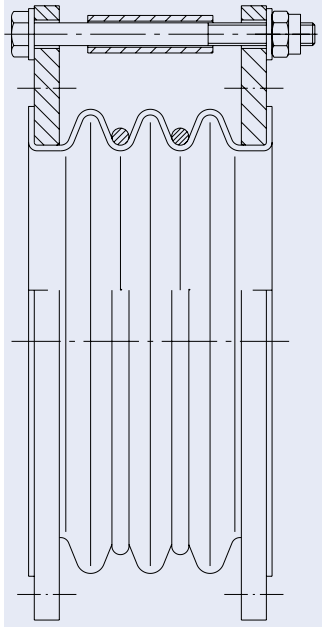


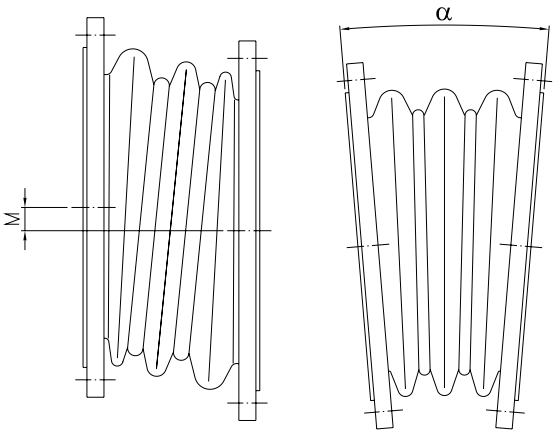
Fig 2 Finite element of a theoretical bellow. The maximum stress is found on the inside of the outside convolution (green/yellow zone). The minimum stress is found on the outside of the convolution (blue zone).

# Family of the FLUROFLEX® PTFE Bellows



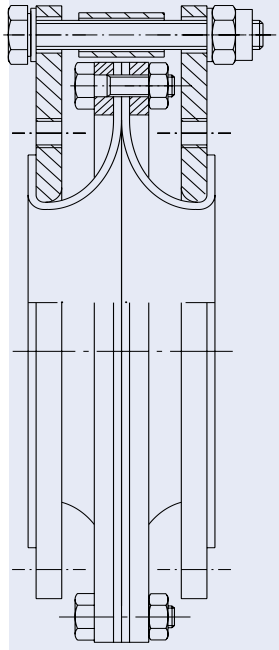
**FLUROFLEX®-N1 to 6**
(1-6 Convolutions)
up to ND 100" (2500)

See page 10 to 13




Lateral Movement Angular Movement

**Features and Options:**
These bellows feature Dr. Schnabel's compression stops that prevent damage to the POLYFLURON® PTFE convolutions from over compression of the bellows in case pipe supports are not sufficient. Dr. Schnabel bellows are vacuum resistant, for details see page 21.



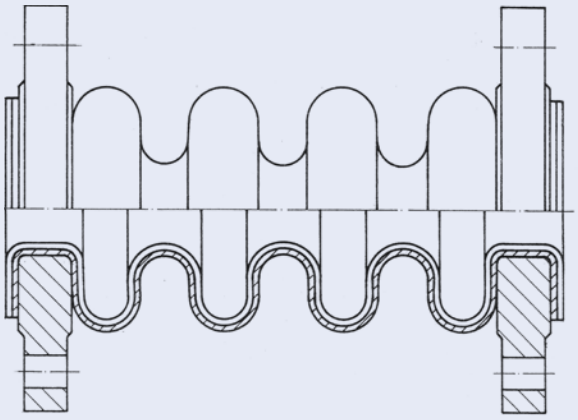
**FLUROFLEX®-0**
**(for Full vacuum)**
ND 8" (200) to ND 56" (1400)
Full vacuum rating to 392°F
Eliminates internal vacuum support rings made from expensive alloy.

See page 14

Non-standard flanges and clearance holes are available. Stainless steel flange material, J-Bolt flanges according to various standards are possible according to customer specifications. Reducing flange arrangements can also be supplied.

**Axial/Lateral/Angular**
Movement Restriction
Dr. Schnabel FLUROFLEX® bellows can be supplied with tie rods engineered to restrict movements according to customer requirements.

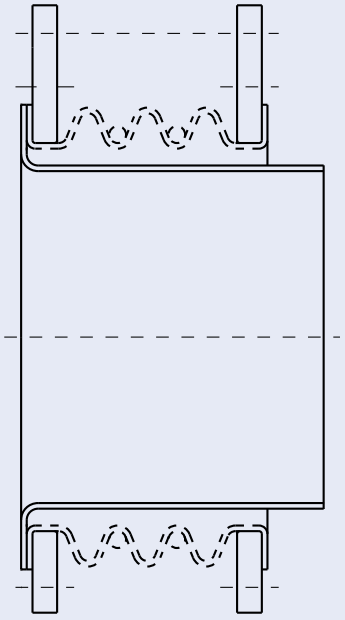
Dr. Schnabel can also provide plain lateral or plain angular (hinged) bellows.



**FLUROFLEX®-16**
**(for PN16)**
also available for PN25 or N10

ND 1,5" (40) to ND 24" (600) Combines the corrosion resistance of POLYFLURON® PTFE and the high pressure rating of a stainless steel bellows. Multiple metal construction (HASTELLOY®, Titanium, etc. are also available) to minimize spring rate.

See page 15, 16



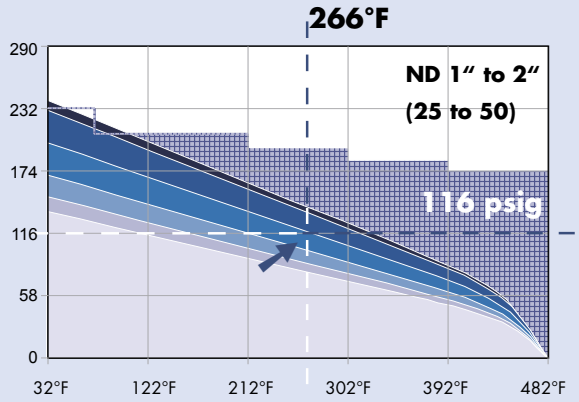
**FXS Smoothbore Sleeve**
Prevents damage to POLYFLURON® PTFE convolutions in abrasive service and prevents build-up of solids in the convolution. POLYFLURON® PTFE is standard, but alloys are also available according to customer-specified requirements.

See page 17,18

# How to use the Temperature-Pressure diagram

Start by selecting the diagram with the nominal size of the bellow required. Continue by selecting the maximum operating pressure on the vertical axis and then the maximum operating temperature on the horizontal axis. The cut area where the two lines meet determines the appropriate type of bellow for your application. Although, bellows above this cut area (with fewer convolutions) can be likewise selected. Bellows below this cut area are not recommended, due to their lower temperature/pressure resistance. **Rule of thumb**: Bellows with fewer convolutions offer higher temperature/pressure ratings, but smaller movements compared to the bellows with more convolutions. The more convolutions the bigger the movements but the lower the temperature/pressure ratings. These temperature pressure diagrams are based on extensive research at a German University, TUEV and Dr. Schnabel. They contain safety margins starting with a minimum of 300% for new bellows at 68°F. In accordance with test regulations, we tested FLUROFLEX®-N bellows for long term operation at 302°F following DIN EN ISO 9080 and DVS 2205-1 sheet 21 with a safety factor of 2. For applications with high operating pressures and high temperatures, we recommend our POLYFLURON® PTFE lined bellows with metal body (FLUROFLEX® -16 / 10/ 25).

**Example:**




**Result:**

For maximum pressure of 116 psig and maximum temperature of 266°F, you can select the FLUROFLEX®-N 3 bellow or a bellow with fewer convolutions.

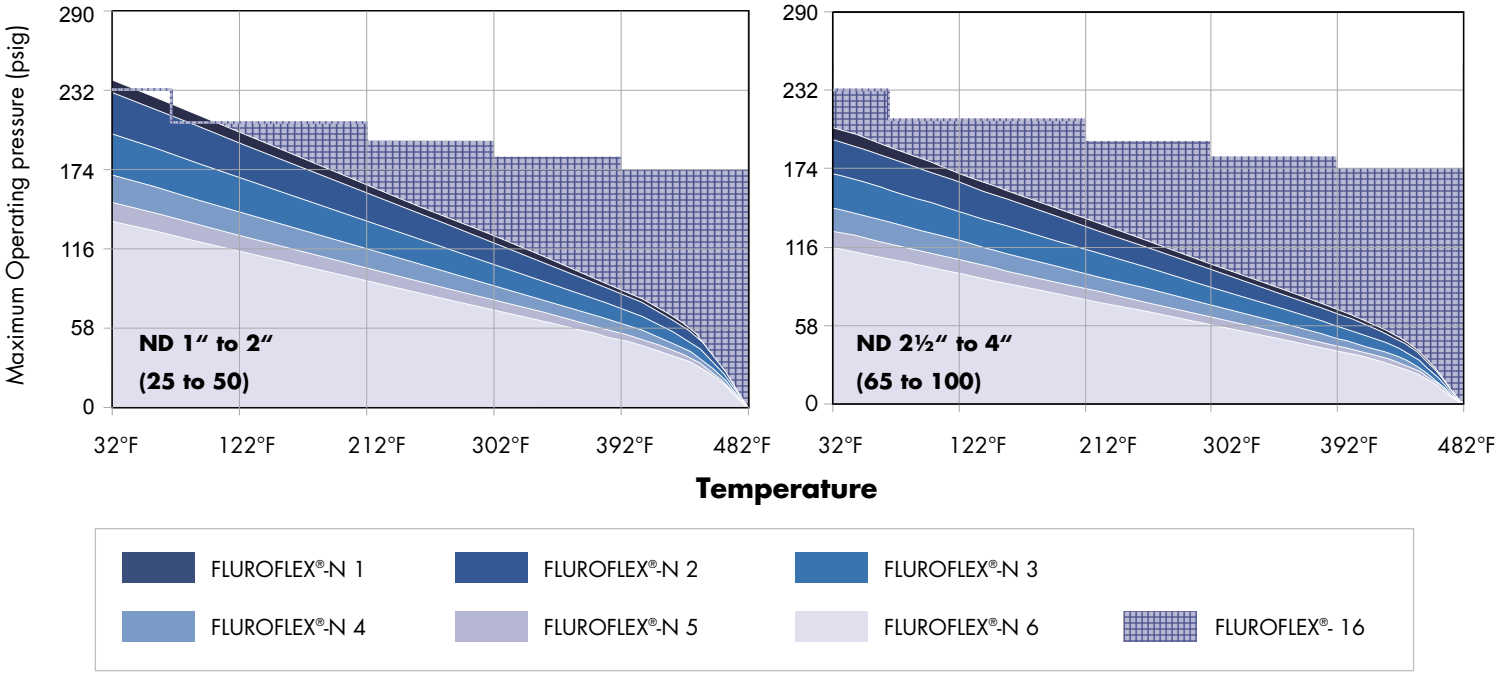
**ND = Nominal diameter**

-The FLUROFLEX®-N 1 and FLUROFLEX®-N 2 Bellows have higher temperature/pressure rating but smaller movements.

-The FLUROFLEX®-N 3 is the standard bellow and the most likely in stock at Dr. Schnabel.

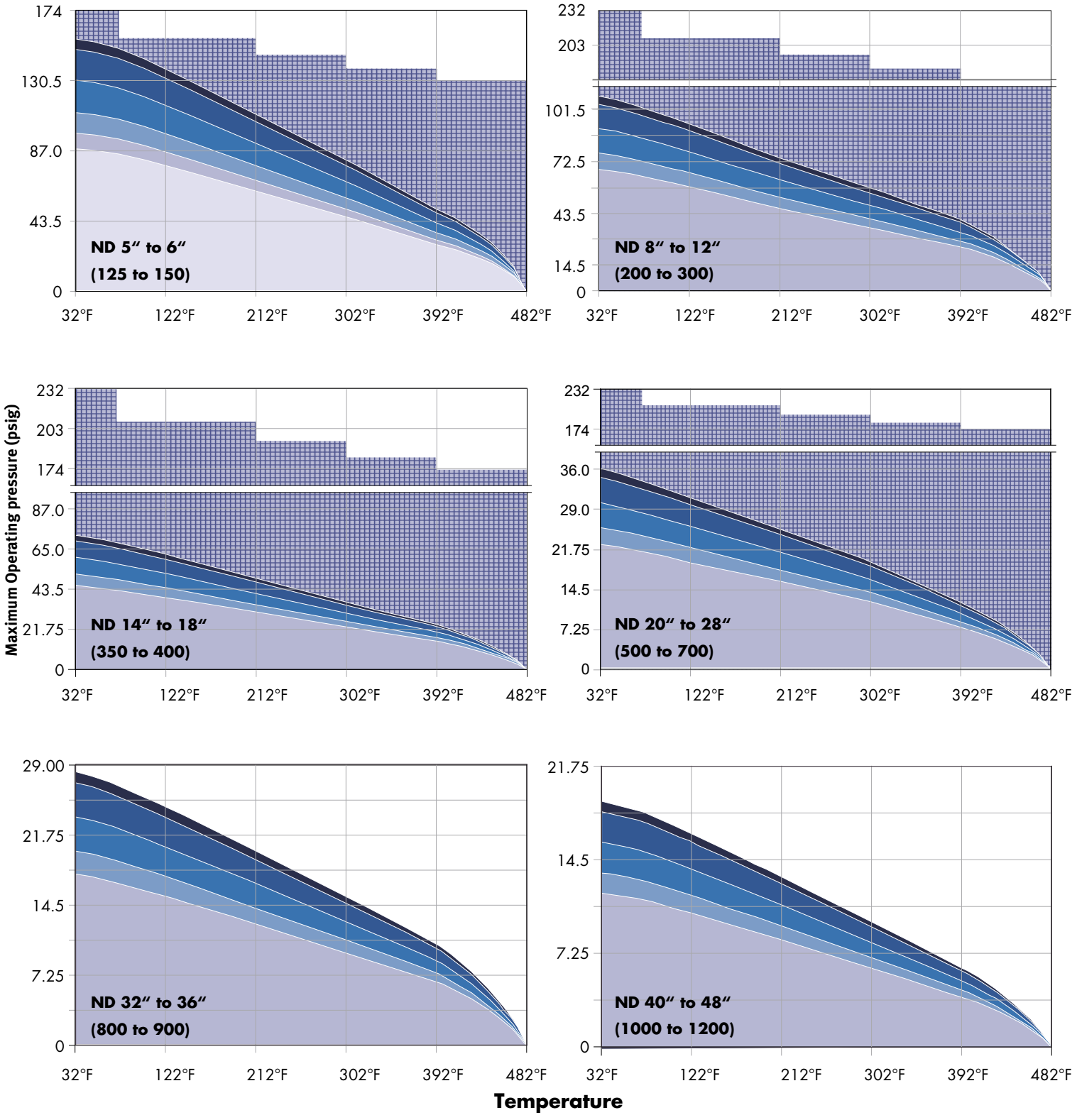
-The FLUROFLEX®-N 4, FLUROFLEX®-N 5 and FLUROFLEX®-N 6 bellows have bigger movements but lower temperature/pressure ratings.

Maximum operating pressure versus temperature



# Maximum operating pressure versus temperature

Please contact us if the specified operating pressure is not sufficient for your application.



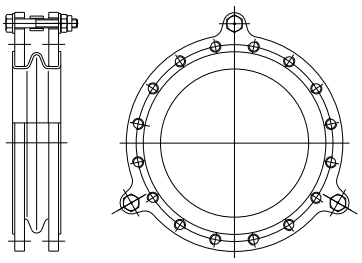
# FLUROFLEX®-N1 to FLUROFLEX®-N2

All FLUROFLEX® bellows are supplied with carbon steel flanges as standard:

ASME flange drillings are according to ASME B 16.5 150 lb, from ND 28" to ND 60" according to MSS SP-44 150 lb. DIN flange drillings are according to DIN 2501 PN 10 (the diameters ND 1300 and ND 1500 are not considered in the DIN standards). All flanges are threaded, except for the FLUROFLEX®-N2 with DIN flanges from ND 80 up to ND 400.

Special flange designs are available on request. (i.e. flanges for glass connections).

The max. movements (axial, lateral, angular) indicated in the table, are values for non combined movements. For values at combined movements please contact us.



| Nominal diameter ND | | FLUROFLEX®-N1 | | | | | | | FLUROFLEX®-N2 | | | | | | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Operating Pressure | | Length | | | Movement 4) | | Operating Pressure | | Length | | | Movement 4) | | | |
| ASME | DIN | Pmax @68°F | Pmax @392°F | neutral 3) | min. | max. | lateral | angu-lar | Pmax @68°F | Pmax @392°F | neutral 3) | min. | max. | lateral | angu-lar | DIN | ASME |
| inch | mm | psig | psig | inches | inches | inches | inches | degrees | psig | psig | inches | inches | inches | inches | degrees | lbs | lbs |
| 1 | 25 | 229 | 90 | 1 9/16 | 1 5/16 | 1 11/16 | 1/16 | 2 | 221 | 84 | 2 1/8 | 1 7/8 | 2 3/8 | 1/8 | 4 | 4.2 | 3.7 |
| 1.25 | 32 | 229 | 90 | 1 9/16 | 1 5/16 | 1 11/16 | 1/16 | 2 | 221 | 84 | 2 3/16 | 1 15/16 | 2 7/16 | 1/8 | 4 | 5.5 | 4.4 |
| 1 1/2 | 40 | 229 | 90 | 1 9/16 | 1 5/16 | 1 11/16 | 1/16 | 2 | 221 | 84 | 2 3/16 | 1 15/16 | 2 7/16 | 1/8 | 4 | 6.6 | 5.1 |
| 2 | 50 | 229 | 90 | 1 7/8 | 1 5/8 | 2 1/16 | 1/16 | 2 | 221 | 84 | 2 11/16 | 2 5/16 | 3 1/16 | 3/16 | 5 | 9.5 | 8.4 |
| 2 1/2 | 65 | 194 | 71 | 2 1/8 | 1 3/4 | 2 3/8 | 1/8 | 3 | 185 | 68 | 3 1/16 | 2 5/8 | 3 9/16 | 3/16 | 5 | 11.2 | 10.6 |
| 3 | 80 | 194 | 71 | 2 3/8 | 1 15/16 | 2 5/8 | 1/8 | 3 | 185 | 68 | 3 7/16 | 2 7/8 | 4 1/16 | 3/16 | 6 | 12.5 | 12.1 |
| 4 | 100 | 194 | 71 | 2 1/2 | 2 1/8 | 2 13/16 | 1/8 | 4 | 185 | 68 | 3 7/16 | 2 7/8 | 4 1/16 | 5/16 | 6 | 16.3 | 15.0 |
| 5 | 125 | 153 | 53 | 2 3/4 | 2 5/16 | 3 1/16 | 3/16 | 4 | 146 | 50 | 3 3/4 | 3 1/8 | 4 5/16 | 5/16 | 5 | 19.8 | 19.8 |
| 6 | 150 | 153 | 53 | 2 15/16 | 2 1/2 | 3 5/16 | 3/16 | 4 | 146 | 50 | 4 1/8 | 3 9/16 | 4 3/4 | 5/16 | 5 | 28.6 | 26.4 |
| 8 | 200 | 103 | 40 | 3 3/8 | 2 13/16 | 3 3/4 | 3/16 | 3 | 103 | 40 | 4 5/16 | 3 3/4 | 4 15/16 | 3/8 | 5 | 37.4 | 37.4 |
| 10 | 250 | 103 | 40 | 3 11/16 | 3 1/8 | 4 1/16 | 3/16 | 3 | 103 | 40 | 5 1/16 | 4 1/4 | 5 13/16 | 3/8 | 4 | 52.8 | 55.0 |
| 12 | 300 | 103 | 40 | 3 15/16 | 3 5/16 | 4 5/16 | 3/16 | 3 | 103 | 40 | 5 1/2 | 4 3/4 | 6 5/16 | 3/8 | 4 | 81.4 | 101.2 |
| 14 | 350 | 69 | 25 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 2 | 69 | 25 | 5 11/16 | 4 15/16 | 6 1/2 | 3/8 | 4 | 96.8 | 112.2 |
| 16 | 400 | 69 | 25 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 2 | 69 | 25 | 5 11/16 | 4 15/16 | 6 1/2 | 1/2 | 3 | 118.8 | 138.6 |
| 18 | 450 | 69 | 25 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 2 | 69 | 25 | 5 11/16 | 4 1/2 | 6 1/2 | 1/2 | 3 | 129.8 | 143.0 |
| 20 | 500 | 34 | 13 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 2 | 34 | 13 | 5 11/16 | 4 1/2 | 6 1/2 | 1/2 | 3 | 147.4 | 167.2 |
| 24 | 600 | 34 | 13 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 2 | 34 | 13 | 5 11/16 | 4 1/2 | 6 1/2 | 1/2 | 2 | 213.4 | 248.6 |
| 28 | 700 | 34 | 13 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 1.5 | 34 | 13 | 5 11/16 | 4 1/2 | 6 1/2 | 1/2 | 2 | 268.4 | 303.6 |
| 32 | 800 | 26 | 7 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 1.5 | 26 | 7 | 6 1/8 | 4 15/16 | 6 7/8 | 1/2 | 2 | 288.2 | 343.2 |
| 36 | 900 | 26 | 7 | 4 1/16 | 3 7/16 | 4 7/16 | 3/16 | 1.5 | 26 | 7 | 6 1/8 | 4 15/16 | 6 7/8 | 1/2 | 2 | 365.2 | 435.6 |
| 40 | 1000 | 18 | 6 | 4 7/16 | 3 13/16 | 4 13/16 | 3/16 | 1.5 | 18 | 6 | 6 1/8 | 5 5/16 | 6 7/8 | 1/2 | 1.5 | 424.6 | 514.8 |
| 48 | 1200 | 18 | 6 | 4 7/16 | 3 13/16 | 4 13/16 | 3/16 | 1.5 | 18 | 6 | 6 1/8 | 5 5/16 | 6 7/8 | 1/2 | 1.5 | 545.6 | 649.0 |
| 52 | 1300 | 18 | 6 | 4 7/16 | 3 13/16 | 4 13/16 | 3/16 | 1 | 18 | 6 | 6 1/8 | 5 5/16 | 6 7/8 | 1/2 | 1 | 653.4 | 653.4 |
| 56 | 1400 | 18 | 6 | 4 7/16 | 3 13/16 | 4 13/16 | 3/16 | 1 | 18 | 6 | 6 1/8 | 5 5/16 | 6 7/8 | 1/2 | 1 | 763.4 | 723.8 |
| 60 | 1500 | 18 | 6 | 4 7/16 | 3 13/16 | 4 13/16 | 3/16 | 1 | 18 | 6 | 6 1/8 | 5 5/16 | 6 7/8 | 1/2 | 1 | 792.0 | 792.0 |
| Operating temperature range: 14°F up to 482°F. | | | | | | | | | | | | | | | | | |

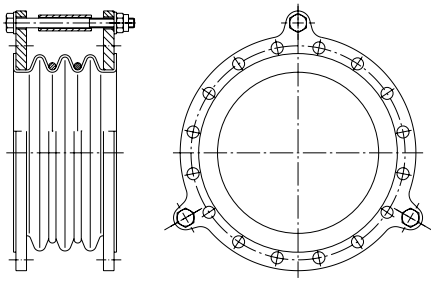
3) neutral length can be adjusted within min & max. length 4) at mentioned neutral length
Technical specifications are subject to change without notice.

# FLUROFLEX®-N3 to FLUROFLEX®-N4

All FLUROFLEX® bellows are supplied with carbon steel flanges as standard:

ASME flange drillings are according to ASME B 16.5 150 lb, from ND 28" to ND 60" according to MSS SP-44 150 lb.
DIN flange drillings are according to DIN 2501 PN 10 (the diameters ND 1300 and ND 1500 are not considered in the DIN standards).
Flanges on FLUROFLEX®-N3 and FLUROFLEX®-N4 up to ND 2 1/2" (65) threaded, from ND 3" (80) onwards are with clearance holes. Special flange designs are available on request. (i.e. flanges for glass connections).

The max. movements (axial, lateral, angular) indicated in the table, are values for non combined movements. For values at combined movements please contact us.



| Nominal diameter ND | | FLUROFLEX®-N3 | | | | | | | FLUROFLEX®-N4 | | | | | | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Operating Pressure | | Length | | | Movement 4) | | Operating Pressure | | Length | | | Movement 4) | | | |
| ASME | DIN | Pmax @68°F | Pmax @392°F | neutral 3) | min. | max. | lateral | angular | Pmax @68°F | Pmax @392°F | neutral 3) | min. | max. | lateral | angular | DIN | ASME |
| inch | mm | psig | psig | inches | inches | inches | inches | degrees | psig | psig | inches | inches | inches | inches | degrees | lbs | lbs |
| 1 | 25 | 191 | 74 | 2 3/4 | 2 3/8 | 3 1/8 | 3/16 | 6 | 162 | 62 | 3 6/16 | 2 13/16 | 3 7/8 | 1/4 | 8 | 4.6 | 4.2 |
| 1.25 | 32 | 191 | 74 | 2 15/16 | 2 9/16 | 3 3/8 | 3/16 | 6 | 162 | 62 | 3 9/16 | 3 1/16 | 4 1/16 | 1/4 | 8 | 6.2 | 4.8 |
| 1 1/2 | 40 | 191 | 74 | 3 1/8 | 2 9/16 | 3 3/4 | 3/16 | 6 | 162 | 62 | 3 7/8 | 3 1/8 | 4 9/16 | 1/4 | 8 | 7.3 | 5.5 |
| 2 | 50 | 191 | 74 | 3 3/8 | 2 3/4 | 3 15/16 | 5/16 | 8 | 162 | 62 | 4 1/8 | 3 3/8 | 4 15/16 | 3/8 | 9 | 10.6 | 9.2 |
| 2 1/2 | 65 | 165 | 59 | 3 15/16 | 3 1/8 | 4 3/4 | 5/16 | 8 | 135 | 51 | 4 13/16 | 3 13/16 | 5 13/16 | 3/8 | 10 | 12.5 | 11.7 |
| 3 | 80 | 165 | 59 | 4 5/16 | 3 9/16 | 5 1/8 | 5/16 | 10 | 135 | 51 | 5 5/16 | 4 5/16 | 6 5/16 | 1/2 | 11 | 13.9 | 13.4 |
| 4 | 100 | 165 | 59 | 4 5/16 | 3 3/8 | 5 5/16 | 1/2 | 10 | 135 | 51 | 5 3/8 | 4 1/8 | 6 11/16 | 9/16 | 13 | 18.0 | 16.7 |
| 5 | 125 | 129 | 44 | 4 3/4 | 3 3/4 | 5 11/16 | 1/2 | 10 | 106 | 37 | 5 11/16 | 4 7/16 | 7 | 9/16 | 13 | 22.0 | 22.0 |
| 6 | 150 | 129 | 44 | 5 1/8 | 4 1/8 | 6 1/8 | 1/2 | 8 | 106 | 37 | 6 1/8 | 4 13/16 | 7 3/8 | 9/16 | 12 | 30.8 | 28.6 |
| 8 | 200 | 88 | 34 | 5 1/2 | 4 1/8 | 6 11/16 | 9/16 | 8 | 76 | 29 | 6 7/8 | 5 1/8 | 8 1/4 | 11/16 | 10 | 41.8 | 41.8 |
| 10 | 250 | 88 | 34 | 6 1/2 | 4 15/16 | 7 11/16 | 9/16 | 6 | 76 | 29 | 7 11/16 | 5 7/8 | 9 1/4 | 11/16 | 10 | 59.4 | 61.6 |
| 12 | 300 | 88 | 34 | 6 7/8 | 5 3/16 | 8 1/16 | 9/16 | 6 | 76 | 29 | 8 7/16 | 6 1/2 | 10 1/16 | 11/16 | 9 | 90.2 | 112.2 |
| 14 | 350 | 59 | 21 | 7 1/2 | 5 3/4 | 8 7/8 | 11/16 | 6 | 51 | 19 | 9 1/4 | 6 7/8 | 10 7/8 | 7/8 | 8 | 107.8 | 125.4 |
| 16 | 400 | 59 | 21 | 7 1/2 | 5 3/4 | 8 7/8 | 11/16 | 6 | 51 | 19 | 9 1/4 | 6 7/8 | 10 7/8 | 7/8 | 8 | 132.0 | 154.0 |
| 18 | 450 | 59 | 21 | 7 1/2 | 5 3/4 | 8 7/8 | 11/16 | 5 | 51 | 19 | 9 1/4 | 6 7/8 | 10 7/8 | 7/8 | 7 | 143.0 | 158.4 |
| 20 | 500 | 29 | 10 | 7 1/2 | 5 3/4 | 8 7/8 | 13/16 | 5 | 25 | 10 | 9 1/4 | 6 7/8 | 10 7/8 | 7/8 | 6 | 162.8 | 184.8 |
| 24 | 600 | 29 | 10 | 7 1/2 | 5 3/4 | 8 7/8 | 13/16 | 4 | 25 | 10 | 9 1/4 | 6 7/8 | 10 7/8 | 7/8 | 6 | 237.6 | 275.0 |
| 28 | 700 | 29 | 10 | 7 1/2 | 5 3/4 | 8 7/8 | 13/16 | 4 | 25 | 10 | 9 1/4 | 6 7/8 | 10 7/8 | 7/8 | 5 | 299.2 | 336.6 |
| 32 | 800 | 22 | 9 | 7 1/2 | 6 1/8 | 8 7/8 | 13/16 | 3 | 18 | 6 | 9 1/4 | 7 1/2 | 10 7/8 | 7/8 | 4 | 321.2 | 380.6 |
| 36 | 900 | 22 | 9 | 7 1/2 | 6 1/8 | 8 7/8 | 13/16 | 3 | 18 | 6 | 9 1/4 | 7 1/2 | 10 7/8 | 7/8 | 4 | 404.8 | 484.0 |
| 40 | 1000 | 15 | 6 | 7 1/2 | 6 1/2 | 8 7/8 | 13/16 | 3 | 12 | 4 | 9 1/4 | 7 15/16 | 10 7/8 | 7/8 | 3 | 470.8 | 572.0 |
| 48 | 1200 | 15 | 6 | 7 1/2 | 6 1/2 | 8 7/8 | 13/16 | 3 | 12 | 4 | 9 1/4 | 7 15/16 | 10 7/8 | 7/8 | 3 | 605.0 | 721.6 |
| 52 | 1300 | 15 | 6 | 7 1/2 | 6 1/2 | 8 7/8 | 13/16 | 2 | 12 | 4 | 9 1/4 | 7 15/16 | 10 7/8 | 7/8 | 2 | 726.0 | 726.0 |
| 56 | 1400 | 15 | 6 | 7 1/2 | 6 1/2 | 8 7/8 | 13/16 | 2 | 12 | 4 | 9 1/4 | 7 15/16 | 10 7/8 | 7/8 | 2 | 847.0 | 803.0 |
| 60 | 1500 | 15 | 6 | 7 1/2 | 6 1/2 | 8 7/8 | 13/16 | 2 | 12 | 4 | 9 1/4 | 7 15/16 | 10 7/8 | 7/8 | 2 | 880.0 | 880.0 |

Operating temperature range: 14°F up to 482°F.

3) neutral length can be adjusted within min & max. length 4) at mentioned neutral length
Technical specifications are subject to change without notice.

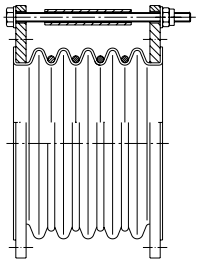
# FLUROFLEX®-N5 to FLUROFLEX®-N6

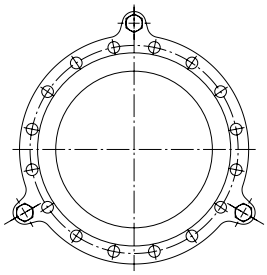
All FLUROFLEX® bellows are supplied with carbon steel flanges as standard:

ASME flange drillings are according to ASME B 16.5 150 lb, from ND 28" to ND 60" according to MSS SP-44 150 lb. DIN flange drillings are according to DIN 2501 PN 10 (the diameters ND 1300 and ND 1500 are not considered in the DIN standards).
Flanges up to ND 2 1/2" (65) threaded, from ND 3" (80) with clearance holes.

Special flange designs are available on request (in example flanges for glass-connections).

The max. movements (axial, lateral, angular) indicated in the table, are values for non combined movements.
For values at combined movements please contact us.





| Nominal diameter ND | | FLUROFLEX®-N5 | | | | | | | FLUROFLEX®-N6 | | | | | | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Operating Pressure | | Length | | | Movement 4) | | Operating Pressure | | Length | | | Movement 4) | | | |
| ASME | DIN | Pmax @68°F | Pmax @392°F | neutral 3) | min. | max. | lateral | angular | Pmax @68°F | Pmax @392°F | neutral 3) | min. | max. | lateral | angular | DIN | ASME |
| inch | mm | psig | psig | inches | inches | inches | inches | degrees | psig | psig | inches | inches | inches | inches | degrees | lbs | lbs |
| 1 | 25 | 141 | 56 | 3 15/16 | 3 3/8 | 4 1/2 | 5/16 | 10 | 129 | 49 | 4 1/2 | 3 3/4 | 5 5/16 | 3/8 | 13 | 5.5 | 5.1 |
| 1.25 | 32 | 141 | 56 | 4 1/8 | 3 9/16 | 4 3/4 | 5/16 | 10 | 129 | 49 | 4 15/16 | 4 1/8 | 5 11/16 | 3/8 | 13 | 6.6 | 5.3 |
| 1 1/2 | 40 | 141 | 56 | 4 1/2 | 3 3/4 | 5 5/16 | 5/16 | 12 | 129 | 49 | 5 3/16 | 4 | 6 3/8 | 3/8 | 15 | 8.8 | 6.6 |
| 2 | 50 | 141 | 56 | 4 15/16 | 1 5/8 | 5 7/8 | 1/2 | 12 | 129 | 49 | 5 11/16 | 4 1/2 | 6 7/8 | 9/16 | 16 | 11.4 | 9.9 |
| 2 1/2 | 65 | 121 | 46 | 5 11/16 | 4 1/2 | 6 7/8 | 1/2 | 14 | 112 | 41 | 6 5/8 | 5 1/16 | 8 3/16 | 9/16 | 16 | 15.0 | 14.1 |
| 3 | 80 | 121 | 46 | 6 5/16 | 4 15/16 | 7 11/16 | 9/16 | 16 | 112 | 41 | 7 5/16 | 5 11/16 | 8 7/8 | 11/16 | 20 | 15.0 | 14.5 |
| 4 | 100 | 121 | 46 | 6 1/2 | 4 15/16 | 8 1/16 | 11/16 | 16 | 112 | 41 | 7 9/16 | 5 9/16 | 9 1/2 | 7/8 | 20 | 21.6 | 20.0 |
| 5 | 125 | 96 | 34 | 6 11/16 | 5 1/8 | 8 1/4 | 11/16 | 14 | 87 | 29 | 7 7/8 | 5 7/8 | 9 13/16 | 7/8 | 18 | 24.2 | 24.2 |
| 6 | 150 | 96 | 34 | 7 1/16 | 5 1/2 | 8 11/16 | 11/16 | 13 | 87 | 29 | 8 1/4 | 6 5/16 | 10 1/4 | 7/8 | 16 | 37.4 | 35.2 |
| 8 | 200 | 66 | 25 | 8 1/4 | 5 13/16 | 9 13/16 | 7/8 | 13 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 46.2 | 46.2 |
| 10 | 250 | 66 | 25 | 9 7/16 | 7 | 11 7/16 | 7/8 | 12 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 70.4 | 74.8 |
| 12 | 300 | 66 | 25 | 9 13/16 | 7 3/8 | 11 13/16 | 7/8 | 10 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 96.8 | 121.0 |
| 14 | 350 | 44 | 16 | 10 7/16 | 8 | 12 3/8 | 1 | 10 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 129.8 | 149.6 |
| 16 | 400 | 44 | 16 | 10 7/16 | 8 | 12 3/8 | 1 | 8 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 143.0 | 167.2 |
| 18 | 450 | 44 | 16 | 11 | 8 1/16 | 13 | 1 | 8 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 171.6 | 189.2 |
| 20 | 500 | 22 | 9 | 11 | 8 1/16 | 13 | 1 | 7 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 176.0 | 200.2 |
| 24 | 600 | 22 | 9 | 11 | 8 1/16 | 13 | 1 | 6 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 286.0 | 330.0 |
| 28 | 700 | 22 | 9 | 11 | 8 1/16 | 13 | 1 | 5 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 323.4 | 363.0 |
| 32 | 800 | 18 | 6 | 11 | 8 7/8 | 13 | 1 | 5 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 385.0 | 457.6 |
| 36 | 900 | 18 | 6 | 11 | 8 7/8 | 13 | 1 | 4 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 437.8 | 523.6 |
| 40 | 1000 | 12 | 3 | 11 | 9 1/4 | 13 | 1 | 4 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 565.4 | 686.4 |
| 48 | 1200 | 12 | 3 | 11 | 9 1/4 | 13 | 1 | 3 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 653.4 | 778.8 |
| 52 | 1300 | 12 | 3 | 11 | 9 1/4 | 13 | 1 | 2 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 871.2 | 871.2 |
| 56 | 1400 | 12 | 3 | 11 | 9 1/4 | 13 | 1 | 2 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 915.2 | 866.8 |
| 60 | 1500 | 12 | 3 | 11 | 9 1/4 | 13 | 1 | 2 | 5) | 5) | 5) | 5) | 5) | 5) | 5) | 1056.0 | 1056.0 |

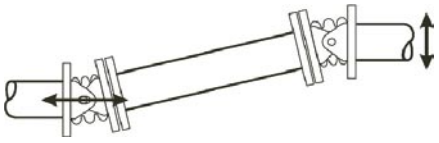
Operating temperature range: 14°F up to 482°F.

3) neutral length can be adjusted within min & max. length 4) at mentioned neutral length 5) please contact us
Technical specifications are subject to change without notice.

# Types of FLUROFLEX® Special Bellows

**Hinged Typed (angular) FLUROFLEX® Bellows**
Hinged bellows allow only angular movement of the bellows about the centre of the bellows. This type of bellow can serve as a directional anchor for the piping system. The hinges are designed to carry the full weight of flooded pipe mounted to the bellows.

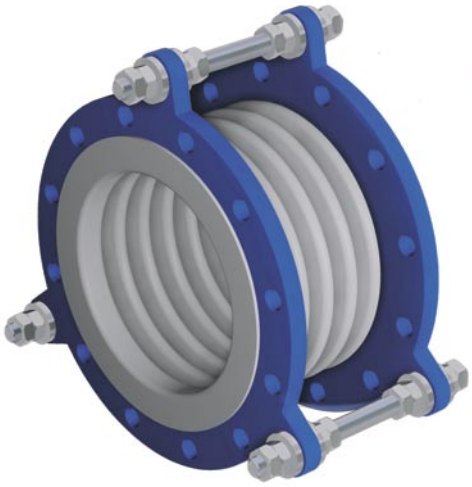
When combined with a bellow having slotted hinges these bellows can be used to handle large lateral misalignments using only two bellows as shown on the right.

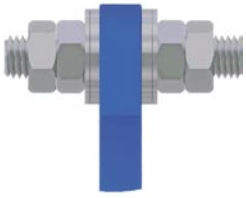


Hinged and slotted FLUROFLEX® bellows allow axial movement of the bellow in addition to angular movement.

**Lateral FLUROFLEX® Bellows**
The flanges of a FLUROFLEX® bellow can be tied using spherical washers and nuts that eliminate or reduce the axial travel of the bellow yet allow for full lateral offset of the bellow. This type of bellows replaces a direction anchor when properly located in the pipeline.

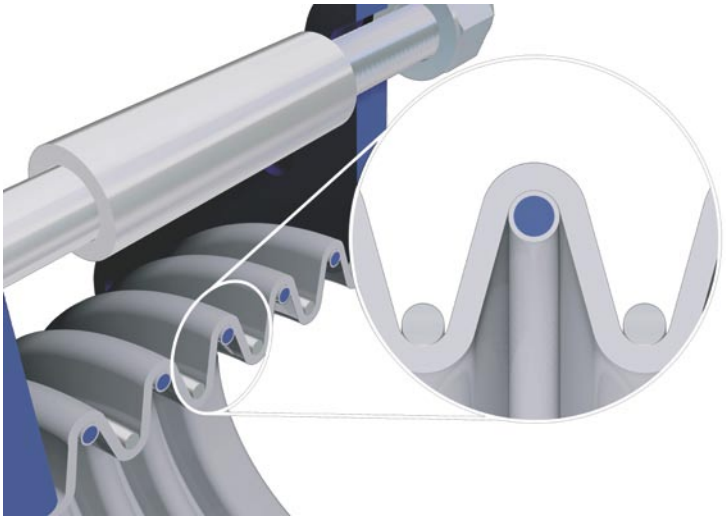
The spherical nuts and washers are supplied in carbon steel as standard.





**FLUROFLEX®-N1 to N6 bellows with internal support rings for higher vacuum resistance**
FLUROFLEX®-N1 to N6 bellows can be supplied with internal vacuum support rings made of virgin paste-extruded POLYFLURON® PTFE lined stainless steel rings. These rings increase the vacuum resistance of the bellows up to full vacuum depending on bellow size. The internal support rings are available also made of virgin paste-extruded POLYFLURON® PTFE lined HASTELLOY®, Tantalum etc.

A special design and manufacturing method of the ends of these rings provide long life-time for this component, as long as the bellows are used within our recommended limits.



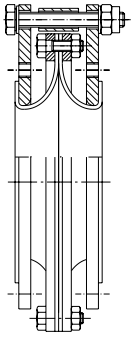
# FLUROFLEX®– 0, Bellows for Full Vacuum

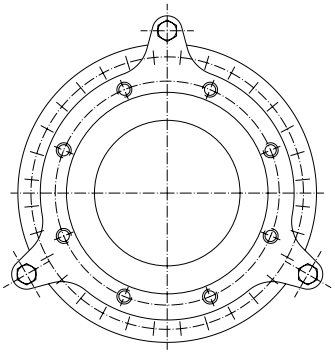
The FLUROFLEX®– 0 bellow for FULL VACUUM is available from ND 8" (200) to ND 56" (1400).

ASME flange drillings are according to ASME B 16.5 150 lb, from ND 28" to ND 40" according to MSS SP-44 150 lb. DIN flange drillings are according to DIN 2501 PN 10.

All flanges are with threaded holes. Special flange designs are available on request (in example flanges for glass-connections).

The max. movements (axial, lateral, angular) indicated in the table, are values for non combined movements. For values at combined movements please contact us.





| Nominal diameter ND | | FLUROFLEX®- 0 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Operating Pressure | | | Length | | | Movement 1) | | Weight | |
| ASME | DIN | Vacuum @392°F | Pmax. @68°F | Pmax. @392°F | neutral | min. | max. | lateral | angular | DIN | ASME |
| inch | mm | FV=full vacuum | psig | psig | inches | inches | inches | inches | degrees | lbs | lbs |
| 8 | 200 | FV | 44.1 | 44.1 | 5 7/8 | 5 5/16 | 6 1/2 | 3/16 | 4 | 64 | 64 |
| 10 | 250 | FV | 44.1 | 44.1 | 5 7/8 | 5 5/16 | 6 1/2 | 1/4 | 4 | 86 | 90 |
| 12 | 300 | FV | 44.1 | 44.1 | 5 7/8 | 5 1/8 | 6 11/16 | 1/4 | 4 | 117 | 141 |
| 14 | 350 | FV | 44.1 | 44.1 | 6 5/16 | 5 1/2 | 7 1/16 | 1/4 | 4 | 141 | 163 |
| 16 | 400 | FV | 44.1 | 29.4 | 6 5/16 | 5 1/2 | 7 1/16 | 5/16 | 3 | 167 | 194 |
| 18 | 450 | FV | 44.1 | 29.4 | 6 5/16 | 5 1/2 | 7 1/16 | 3/8 | 3 | 183 | 198 |
| 20 | 500 | FV | 44.1 | 29.4 | 6 5/16 | 1 5/8 | 7 1/16 | 3/8 | 3 | 211 | 238 |
| 24 | 600 | FV | 44.1 | 14.7 | 6 11/16 | 5 7/8 | 7 1/2 | 3/8 | 3 | 293 | 332 |
| 28 | 700 | FV | 14.7 | 7.4 | 6 11/16 | 5 11/16 | 7 11/16 | 3/8 | 2 | 363 | 405 |
| 32 | 800 | FV | 7.4 | 4.4 | 6 11/16 | 5 11/16 | 7 11/16 | 7/16 | 2 | 471 | 535 |
| 36 | 900 | FV | 1.5 | 1.5 | 6 11/16 | 5 11/16 | 7 11/16 | 1/2 | 2 | 524 | 607 |
| 40 | 1000 | FV | 0.0 | 0.0 | 6 11/16 | 5 11/16 | 7 11/16 | 1/2 | 2 | 609 | 713 |
| Operating temperature range: 14°F up to 482°F. | | | | | | | | | | | |

1) at mentioned neutral length  Technical specifications are subject to change without notice.

**Features and Options:**

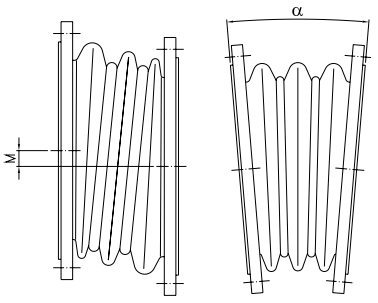
These bellows feature Dr. Schnabel's compression stops that prevent damage to the POLYFLURON® PTFE convolutions from over compression of the bellows.

Stainless steel flange material, J-Bolt flanges according to various standards are possible to customer specification. Reducing flange arrangements can also be supplied.

**Axial/Lateral/Angular Movement**

Dr. Schnabel FLUROFLEX®–0 bellows are mainly designed for axial movements.

Lateral Movement  Angular Movement



# FLUROFLEX®– 16, PTFE lined Metal Bellows for High Pressure

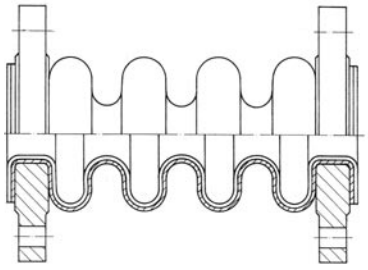
The FLUROFLEX®– 16 is available from ND 1 ½" (40) to ND 24" (600).

Combines corrosion resistance of POLYFLURON® PTFE and the high pressure rating of a metal bellow. Multiple metal layer design minimizes spring rates.

FLUROFLEX®-10/16/25 bellows are supplied standard with carbon steel flanges and stainless steel body.

ASME flange drillings are according to ASME B 16.5 150 lb. DIN flange drillings are according to DIN 2501 PN 10.

Special flange designs are available on request.



| Nominal diameter ND | | Operating Pressure | | Length | | | Movement 3) | | ca. Weight | |
|---|---|---|---|---|---|---|---|---|---|---|
| ASME | DIN | Pmax. @68°F | Pmax. @392°F | neutral | min. | max. | lateral | angular | DIN | ASME |
| inch | mm | psig | psig | inches | inches | inches | inches | degrees | lbs | lbs |
| 1 1/2 | 40 | 235.2 | 188.2 | 5 1/8 | 4 3/4 | 5 1/2 | 1/16 | 3 | 9 | 11 |
| 1 1/2 | 40 | 235.2 | 188.2 | 8 7/8 | 8 1/4 | 9 7/16 | 3/16 | 5 | 10 | 11 |
| 2 | 50 | 235.2 | 188.2 | 4 15/16 | 4 9/16 | 5 1/4 | 1/16 | 3 | 11 | 13 |
| 2 | 50 | 235.2 | 188.2 | 8 7/16 | 7 7/8 | 9 1/16 | 1/8 | 4 | 13 | 15 |
| 2 1/2 | 65 | 235.2 | 188.2 | 5 5/16 | 4 15/16 | 5 11/16 | 1/16 | 2 | 13 | 15 |
| 2 1/2 | 65 | 235.2 | 188.2 | 8 7/8 | 8 1/8 | 9 9/16 | 1/8 | 4 | 15 | 18 |
| 3 | 80 | 235.2 | 188.2 | 5 1/8 | 4 3/4 | 5 1/2 | 1/16 | 2 | 18 | 22 |
| 3 | 80 | 235.2 | 188.2 | 8 11/16 | 7 15/16 | 9 7/16 | 1/8 | 4 | 20 | 24 |
| 4 | 100 | 235.2 | 188.2 | 6 5/16 | 5 7/8 | 6 11/16 | 1/16 | 2 | 20 | 24 |
| 4 | 100 | 235.2 | 188.2 | 10 1/4 | 9 7/16 | 11 1/16 | 1/8 | 4 | 22 | 26 |
| 5 | 125 | 235.2 | 188.2 | 6 7/8 | 6 7/16 | 7 5/16 | 1/16 | 2 | 26 | 31 |
| 5 | 125 | 235.2 | 188.2 | 10 5/8 | 9 3/4 | 11 9/16 | 1/16 | 3 | 31 | 37 |
| 6 | 150 | 235.2 | 188.2 | 6 1/2 | 6 1/16 | 6 15/16 | 1/16 | 1 | 31 | 37 |
| 6 | 150 | 235.2 | 188.2 | 11 13/16 | 10 13/16 | 12 13/16 | 1/8 | 3 | 37 | 44 |
| 8 | 200 | 235.2 | 188.2 | 7 1/16 | 6 5/8 | 7 9/16 | 1/16 | 1 | 44 | 53 |
| 8 | 200 | 235.2 | 188.2 | 12 13/16 | 11 1/2 | 14 1/8 | 1/8 | 3 | 53 | 64 |
| 10 | 250 | 235.2 | 188.2 | 7 7/8 | 7 5/16 | 8 7/16 | 1/16 | 1 | 64 | 77 |
| 10 | 250 | 235.2 | 188.2 | 13 | 11 5/8 | 14 5/16 | 1/16 | 3 | 73 | 88 |
| 12 | 300 | 235.2 | 188.2 | 8 1/4 | 7 5/8 | 8 15/16 | 1/16 | 1 | 84 | 101 |
| 12 | 300 | 235.2 | 188.2 | 13 3/4 | 12 3/16 | 15 3/8 | 1/16 | 3 | 97 | 117 |
| 14 | 350 | 235.2 | 188.2 | 6 7/8 | 6 3/16 | 7 5/8 | 1/16 | 1 | 119 | 143 |
| 14 | 350 | 235.2 | 188.2 | 10 | 8 3/4 | 11 1/4 | 1/16 | 2 | 139 | 152 |
| 14 | 350 | 235.2 | 188.2 | 12 3/8 | 10 11/16 | 14 1/8 | 1/16 | 3 | 145 | 167 |
| 16 | 400 | 235.2 | 188.2 | 11 13/16 | 10 1/8 | 13 1/2 | 1/16 | 2 | 277 | 332 |
| 18 | 450 | 235.2 | 188.2 | 11 | 9 7/16 | 12 5/8 | 1/16 | 2 | 304 | 365 |
| 20 | 500 | 235.2 | 188.2 | 11 13/16 | 10 1/8 | 13 1/2 | 1/16 | 2 | 403 | 484 |
| 24 | 600 | 235.2 | 188.2 | 12 5/8 | 10 11/16 | 14 1/2 | 1/16 | 2 | 537 | 645 |
| Operating temperature range: 14°F up to 392°F. | | | | | | | | | | |

3) higher lateral and angular movements are possible, but then the max. operating pressure must be reduced, please contact us.
Technical specifications are subject to change without notice.

# FLUROFLEX®– 10 and 25, PTFE lined Metal Bellows for High Pressure

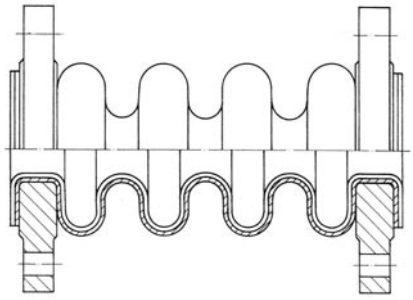
The FLUROFLEX®– 25 or 10 are available from ND 1 ½" (40) to ND 24" (600).

Combines corrosion resistance of POLYFLURON® PTFE and the high pressure rating of a metal bellow. Multiple metal layer design minimizes spring rates.

FLUROFLEX®- 10/16/25 bellows are supplied standard with carbon steel flanges and stainless steel body.

ASME flange drillings are according to ASME B 16.5 150 lb. DIN flange drillings are according to DIN 2501 PN 10.

Special flange designs are available on request.



| Nominal diameter ND | | FLUROFLEX®- 10 | | | | | | | FLUROFLEX®- 25 | | | | | | | Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Operating Pressure | | Length | | | Movement 3) | | Operating Pressure | | Length | | | Movement 3) | | | |
| ASME | DIN | Pmax. @68°F | Pmax. @392°F | neutral | min. | max. | lateral | angular | Pmax. @68°F | Pmax. @392°F | neutral | min. | max. | lateral | angular | DIN | ASME |
| inch | mm | psig | psig | inches | inches | inches | inches | degrees | psig | psig | inches | inches | inches | inches | degrees | lbs | lbs |
| 1 1/2 | 40 | 147 | 118 | 5 11/16 | 5 5/16 | 6 1/8 | 1/16 | 4 | 368 | 294 | 5 11/16 | 5 3/8 | 6 | 1/16 | 3 | 4 | 5 |
| 1 1/2 | 40 | 147 | 118 | 9 13/16 | 9 1/8 | 10 9/16 | 3/16 | 6 | 368 | 294 | 10 1/4 | 9 11/16 | 10 13/16 | 1/8 | 5 | 4 | 5 |
| 2 | 50 | 147 | 118 | 5 1/2 | 5 1/8 | 5 7/8 | 1/16 | 3 | 368 | 294 | 5 7/8 | 5 9/16 | 6 1/4 | 1/16 | 2 | 4 | 7 |
| 2 | 50 | 147 | 118 | 8 11/16 | 8 | 9 5/16 | 1/8 | 5 | 368 | 294 | 9 7/16 | 8 7/8 | 10 1/16 | 1/8 | 5 | 5 | 6 |
| 2 1/2 | 65 | 147 | 118 | 5 7/8 | 5 7/16 | 6 3/8 | 1/16 | 3 | 368 | 294 | 5 11/16 | 5 3/8 | 6 1/16 | 1/16 | 2 | 7 | 9 |
| 2 1/2 | 65 | 147 | 118 | 8 11/16 | 7 15/16 | 9 7/16 | 1/8 | 5 | 368 | 294 | 9 1/16 | 8 7/16 | 9 11/16 | 1/16 | 4 | 8 | 10 |
| 3 | 80 | 147 | 118 | 5 1/8 | 4 3/4 | 5 1/2 | 1/16 | 2 | 368 | 294 | 6 5/16 | 5 7/8 | 6 3/4 | 1/16 | 2 | 11 | 13 |
| 3 | 80 | 147 | 118 | 8 11/16 | 7 7/8 | 9 7/16 | 1/16 | 4 | 368 | 294 | 8 7/8 | 8 1/4 | 9 1/2 | 1/16 | 3 | 20 | 24 |
| 4 | 100 | 147 | 118 | 5 1/2 | 5 1/16 | 6 | 1/16 | 2 | 368 | 294 | 6 1/8 | 5 11/16 | 6 1/2 | 1/16 | 2 | 26 | 33 |
| 4 | 100 | 147 | 118 | 10 1/4 | 9 5/16 | 11 1/8 | 1/16 | 4 | 368 | 294 | 8 11/16 | 8 | 9 5/16 | 1/16 | 3 | 29 | 35 |
| 5 | 125 | 147 | 118 | 6 11/16 | 6 1/4 | 7 1/8 | 1/16 | 2 | 368 | 294 | 8 11/16 | 8 3/16 | 9 1/8 | 1/16 | 2 | 35 | 44 |
| 5 | 125 | 147 | 118 | 9 7/16 | 8 5/8 | 10 1/4 | 1/16 | 3 | 368 | 294 | 11 13/16 | 11 | 12 5/8 | 1/16 | 3 | 40 | 48 |
| 6 | 150 | 147 | 118 | 6 5/16 | 5 7/8 | 6 11/16 | 1/16 | 1 | 368 | 294 | 8 1/16 | 7 5/8 | 8 1/2 | 1/16 | 1 | 31 | 37 |
| 6 | 150 | 147 | 118 | 10 1/4 | 9 5/16 | 11 3/16 | 1/16 | 3 | 368 | 294 | 11 5/8 | 10 13/16 | 12 3/8 | 1/16 | 2 | 37 | 44 |
| 8 | 200 | 147 | 118 | 6 7/8 | 6 7/16 | 7 3/8 | 1/16 | 1 | 368 | 294 | 9 1/16 | 8 9/16 | 9 9/16 | 1/16 | 1 | 44 | 53 |
| 8 | 200 | 147 | 118 | 10 7/16 | 9 7/16 | 11 7/16 | 1/16 | 2 | 368 | 294 | 12 13/16 | 11 13/16 | 13 3/4 | 1/16 | 2 | 53 | 64 |
| 10 | 250 | 147 | 118 | 7 5/16 | 6 3/4 | 7 13/16 | 1/16 | 1 | 368 | 294 | 8 11/16 | 8 3/16 | 9 1/8 | 1/16 | 1 | 64 | 77 |
| 10 | 250 | 147 | 118 | 11 1/4 | 9 15/16 | 12 1/2 | 1/16 | 2 | 368 | 294 | 13 | 11 15/16 | 14 1/16 | 1/16 | 2 | 73 | 88 |
| 12 | 300 | 147 | 118 | 7 11/16 | 7 | 8 3/8 | 1/16 | 1 | 368 | 294 | 9 1/4 | 8 11/16 | 9 13/16 | 1/16 | 1 | 84 | 101 |
| 12 | 300 | 147 | 118 | 10 7/16 | 9 3/16 | 11 11/16 | 1/16 | 2 | 368 | 294 | 13 9/16 | 12 5/16 | 14 7/8 | 1/16 | 2 | 97 | 117 |
| 14 | 350 | 147 | 118 | 6 5/16 | 5 9/16 | 7 | 1/16 | 1 | 368 | 294 | 7 11/16 | 7 1/16 | 8 5/16 | 1/16 | 1 | 119 | 143 |
| 14 | 350 | 147 | 118 | 10 13/16 | 9 5/16 | 12 3/8 | 1/16 | 2 | 368 | 294 | 12 3/8 | 11 | 13 3/4 | 1/16 | 2 | 143 | 152 |

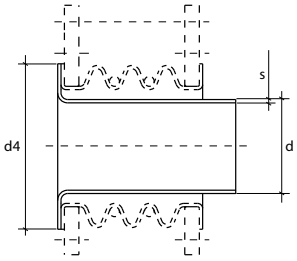
Operating temperature range: 14°F up to 392°F.

3) higher lateral and angular movements are possible, but then the max. operating pressure must be reduced, please contact us.
Technical specifications are subject to change without notice.

# Accessories for the FLUROFLEX®-Bellows

**Smoothbore sleeves**

Dr. Schnabel FXS smoothbore sleeves prevent damage to PTFE convolutions in abrasive service and prevent build-up of solids in the convolution. The smoothbore sleeves are recommended when fluid velocity is high. POLYFLURON® PTFE sleeves are standard, but alloys are also available per customer specification.



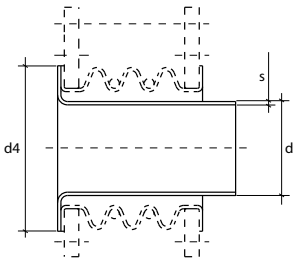

| Smoothbore sleeves for FLUROFLEX®-N1 to N6 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal diameter ND | | d 4 | | d | s | FLUROFLEX®-N1 | | FLUROFLEX®-N2 | | FLUROFLEX®-N3 | | FLUROFLEX®-N4 | | FLUROFLEX®-N5 | | FLUROFLEX®-N6 | |
| ASME | DIN | ASME | DIN | | | Length | Weight | Length | Weight | Length | Weight | Length | Weight | Length | Weight | Length | Weight |
| inch | inch | Ø inches | Ø inches | Ø inches | inches | inches | lbs | inches | lbs | inches | lbs | inches | lbs | inches | lbs | inches | lbs |
| 1 | 25 | 2 | 2 11/16 | 13/16 | 1/8 | 2 1/16 | 0.1 | 2 3/4 | 0.1 | 3 9/16 | 0.1 | 4 3/16 | 0.1 | 4 15/16 | 0.1 | 5 11/16 | 0.2 |
| 1 1/4 | 32 | 2 1/2 | 3 1/16 | 1 1/8 | 1/8 | 2 1/16 | 0.1 | 2 13/16 | 0.1 | 3 3/4 | 0.2 | 4 1/2 | 0.2 | 5 1/8 | 0.2 | 6 1/8 | 0.2 |
| 1 1/2 | 40 | 2 7/8 | 3 7/16 | 1 6/16 | 1/8 | 2 1/16 | 0.2 | 2 13/16 | 0.2 | 4 1/8 | 0.2 | 4 15/16 | 0.3 | 5 11/16 | 0.3 | 6 9/16 | 0.4 |
| 2 | 50 | 3 5/8 | 4 | 1 3/4 | 1/8 | 2 1/2 | 0.2 | 3 7/16 | 0.2 | 4 5/16 | 0.3 | 5 5/16 | 0.3 | 6 5/16 | 0.4 | 7 5/16 | 0.4 |
| 2 1/2 | 65 | 4 1/8 | 4 13/16 | 2 3/16 | 1/8 | 2 3/4 | 0.3 | 3 15/16 | 0.4 | 5 1/8 | 0.4 | 6 3/16 | 0.5 | 7 5/16 | 0.6 | 8 3/8 | 0.7 |
| 3 | 80 | 5 | 5 7/16 | 2 5/8 | 1/8 | 3 1/16 | 0.4 | 4 7/16 | 0.5 | 5 8/16 | 0.6 | 6 3/4 | 0.7 | 8 1/16 | 0.8 | 9 5/8 | 1.0 |
| 4 | 100 | 6 3/16 | 6 1/4 | 3 7/16 | 1/8 | 3 3/16 | 0.6 | 4 7/16 | 0.8 | 5 11/16 | 0.9 | 7 1/16 | 1.1 | 8 7/16 | 1.3 | 9 15/16 | 1.5 |
| 5 | 125 | 7 5/16 | 7 3/8 | 4 5/16 | 3/16 | 3 7/16 | 0.9 | 4 3/4 | 1.2 | 6 1/8 | 1.4 | 7 3/8 | 1.7 | 8 11/16 | 1.9 | 10 4/16 | 2.2 |
| 6 | 150 | 8 1/2 | 8 3/8 | 5 3/8 | 3/16 | 3 11/16 | 1.2 | 5 1/8 | 1.6 | 6 1/2 | 1.9 | 7 3/4 | 2.2 | 9 1/16 | 2.4 | 10 5/8 | 2.9 |
| 8 | 200 | 10 5/8 | 10 9/16 | 6 9/16 | 3/16 | 4 1/2 | 2.0 | 5 11/16 | 2.4 | 7 1/2 | 2.9 | 9 1/16 | 3.3 | 10 5/8 | 4.0 | - | - |
| 10 | 250 | 12 3/4 | 12 5/8 | 8 3/8 | 3/16 | 4 13/16 | 2.9 | 6 5/8 | 3.5 | 8 7/16 | 4.3 | 10 1/16 | 4.8 | 12 3/16 | 5.7 | - | - |
| 12 | 300 | 15 | 14 9/16 | 10 1/2 | 3/16 | 5 1/8 | 3.7 | 7 1/16 | 4.6 | 8 7/8 | 5.6 | 10 13/16 | 6.6 | 12 5/8 | 7.5 | - | - |
| 14 | 350 | 16 1/4 | 16 15/16 | 12 3/8 | 3/16 | 5 1/4 | 5.1 | 7 5/16 | 6.4 | 9 5/8 | 8.0 | 11 11/16 | 9.2 | 13 3/16 | 10.3 | - | - |
| 16 | 400 | 18 1/2 | 19 | 13 11/16 | 3/16 | 5 1/4 | 5.7 | 7 5/16 | 7.3 | 9 5/8 | 8.9 | 11 11/16 | 10.3 | 13 3/16 | 11.4 | - | - |
| 18 | 450 | 21 | 20 15/16 | 15 13/16 | 3/16 | 5 1/4 | 6.4 | 7 5/16 | 7.9 | 9 5/8 | 9.8 | 11 11/16 | 11.4 | 13 3/4 | 13.2 | - | - |
| 20 | 500 | 23 | 23 1/16 | 17 11/16 | 3/16 | 5 1/4 | 7.7 | 7 5/16 | 9.7 | 9 5/8 | 11.9 | 11 11/16 | 13.9 | 13 3/4 | 15.8 | - | - |
| 24 | 600 | 27 1/4 | 26 15/16 | 21 5/8 | 3/16 | 5 5/8 | 9.9 | 7 11/16 | 12.1 | 10 1/16 | 14.9 | 12 1/16 | 17.4 | 14 3/16 | 19.8 | - | - |
| 28 | 700 | 31 1/2 | 31 1/2 | 25 9/16 | 3/16 | 5 5/8 | 12.1 | 7 11/16 | 14.7 | 10 1/16 | 18.1 | 12 1/16 | 20.9 | 14 3/16 | 23.8 | - | - |
| 32 | 800 | 36 | 35 5/8 | 29 1/2 | 3/16 | 5 5/8 | 14.1 | 8 1/16 | 18.0 | 10 1/16 | 21.1 | 12 1/16 | 24.2 | 14 3/16 | 27.5 | - | - |
| 36 | 900 | 40 1/4 | 39 9/16 | 33 7/16 | 3/16 | 5 5/8 | 16.1 | 8 1/16 | 20.2 | 10 1/16 | 23.9 | 12 1/16 | 27.5 | 14 3/16 | 31.2 | - | - |
| 40 | 1000 | 44 1/4 | 43 11/16 | 37 3/8 | 3/16 | 6 | 18.9 | 8 1/16 | 22.9 | 10 1/16 | 26.9 | 12 1/16 | 31.0 | 14 3/16 | 35.2 | - | - |
| 48 | 1200 | 53 1/2 | 52 3/8 | 43 5/16 | 3/16 | 6 | 25.1 | 8 1/16 | 29.7 | 10 1/16 | 34.4 | 12 1/16 | 39.2 | 14 3/16 | 44.0 | - | - |
| 52 | 1300 | 57 1/2 | 1) | 47 1/4 | 3/16 | 6 | 29.0 | 8 1/16 | 34.3 | 10 1/16 | 39.2 | 12 1/16 | 44.4 | 14 3/16 | 49.7 | - | - |
| 56 | 1400 | 62 | 60 7/16 | 51 3/16 | 3/16 | 6 | 29.9 | 8 1/16 | 35.6 | 10 1/16 | 41.1 | 12 1/16 | 46.6 | 14 3/16 | 52.6 | - | - |
| 60 | 1500 | 66 | 1) | 55 2/16 | 3/16 | 6 | 34.8 | 8 1/16 | 40.7 | 10 1/16 | 46.6 | 12 1/16 | 52.8 | 14 3/16 | 59.0 | - | - |

1) according to customer specification. Technical specifications are subject to change without notice.

# Accessories for the FLUROFLEX®-0 Bellows

## SMOOTHBORE SLEEVES

Dr. Schnabel FXS smoothbore sleeves prevent damage to PTFE convolutions in abrasive service and prevent build-up of solids in the convolution. The smoothbore sleeves are recommended when fluid velocity is high. POLYFLURON® PTFE sleeves are standard, but alloys are also available per customer specification.




| SMOOTHBORE SLEEVES for FLUROFLEX®-0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Nominal diameter ND | | d 4 | | d | s | FLUROFLEX® - 0 | |
| ASME | DIN | ASME | DIN | | | Length | Weight |
| inch | mm | Ø inches | Ø inches | Ø inches | inches | inches | lbs |
| 8 | 200 | 10 5/8 | 10 9/16 | 6 9/16 | 3/16 | 7 5/16 | 2.9 |
| 10 | 250 | 12 3/4 | 12 5/8 | 8 3/8 | 3/16 | 7 5/16 | 3.7 |
| 12 | 300 | 15 | 14 9/16 | 10 1/2 | 3/16 | 7 1/2 | 4.8 |
| 14 | 350 | 16 1/4 | 16 15/16 | 12 3/8 | 3/16 | 7 7/8 | 6.8 |
| 16 | 400 | 18 1/2 | 19 | 13 11/16 | 3/16 | 7 7/8 | 7.7 |
| 18 | 450 | 21 | 20 15/16 | 15 13/16 | 3/16 | 7 7/8 | 8.4 |
| 20 | 500 | 23 | 23 1/16 | 17 11/16 | 3/16 | 7 7/8 | 10.1 |
| 24 | 600 | 27 1/4 | 26 15/16 | 21 5/8 | 3/16 | 8 11/16 | 13.4 |
| 28 | 700 | 31 1/2 | 31 1/2 | 25 9/16 | 3/16 | 8 7/8 | 16.5 |
| 32 | 800 | 36 | 35 5/8 | 29 1/2 | 3/16 | 8 7/8 | 19.1 |
| 36 | 900 | 40 1/4 | 39 9/16 | 33 7/16 | 3/16 | 8 7/8 | 21.8 |
| 40 | 1000 | 44 1/4 | 43 11/16 | 37 3/8 | 3/16 | 8 7/8 | 24.4 |

Technical specifications are subject to change without notice.

## Safety Shields

It is highly recommended to use safety shields around flange connections and bellows if corrosive or other dangerous media is handled! Especially when the plant is used under the European Pressure Equipment Directive.

Please ask for our detailed RAMCO® Safety Shield catalogue.

# Flange Dimensions, Effective Area and Spring Rates

| Nominal diameter ND | | FLUROFLEX®- 0 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flange dimensions | | | | | | | | | Effective Area | | Spring rates +/-30% (at room temperature) | |
| | | Raised face Ø | | Bolt circle Ø | | Hole and bolt dimensions | | | | Flange Thick-ness | | | | |
| | | | | | | ASME | | DIN | | | | | | |
| ASME | DIN | ASME | DIN | | | hole | bolt | hole | bolt | | ASME | DIN | ax. compr. | ax. Expans. |
| inch | mm | Ø inch | Ø inch | Ø inch | Ø inch | # x inch | # x bolt | # x mm | # x bolt | inch | inch^2 | inch^2 | lbs/inch | lbs/inch |
| 8 | 200 | 10 5/8 | 10 9/16 | 11 5/8 | 11 3/4 | 8 x 7/8 | 8 x 3/4"UNC | 8 x 22 | 8 x M20 | 5/8 | 83.2 | 82.3 | 213 | 140 |
| 10 | 250 | 12 3/4 | 12 5/8 | 13 3/4 | 14 1/4 | 12 x 1 | 12 x 7/8"UNC | 12 x 22 | 12 x M20 | 13/16 | 124.9 | 120.7 | 255 | 168 |
| 12 | 300 | 15 | 14 9/16 | 15 3/4 | 17 | 12 x 1 | 12 x 7/8"UNC | 12 x 22 | 12 x M20 | 1 | 176.2 | 159.0 | 292 | 193 |
| 14 | 350 | 16 1/4 | 16 15/16 | 18 1/8 | 18 13/16 | 12 x 1 1/8 | 12 x 1"UNC | 16 x 22 | 16 x M20 | 1 | 226.1 | 211.7 | 330 | 218 |
| 16 | 400 | 18 1/2 | 19 | 20 1/4 | 21 1/4 | 16 x 1 1/8 | 16 x 1"UNC | 16 x 26 | 16 x M24 | 1 | 287.5 | 268.9 | 359 | 237 |
| 18 | 450 | 21 | 20 15/16 | 22 1/4 | 22 3/4 | 16 x 1 1/4 | 16 x 11/8"8UN | 20 x 26 | 20 x M24 | 1 | 341.9 | 329.2 | 383 | 253 |
| 20 | 500 | 23 | 23 1/16 | 24 7/16 | 25 | 20 x 1 1/4 | 20 x 11/8"8UN | 20 x 26 | 20 x M24 | 1 | 415.7 | 395.6 | 425 | 281 |
| 24 | 600 | 27 1/4 | 26 15/16 | 28 9/16 | 29 1/2 | 20 x 1 3/8 | 20 x 11/4"8UN | 20 x 30 | 20 x M27 | 1 3/16 | 581.9 | 553.8 | 494 | 326 |
| 28 | 700 | 31 1/2 | 31 1/2 | 33 1/16 | 34 | 28 x 1 3/8 | 28 x 11/4"8UN | 24 x 30 | 24 x M27 | 1 3/16 | 775.9 | 745.2 | 1) | 1) |
| 32 | 800 | 36 | 35 5/8 | 37 3/8 | 38 1/2 | 28 x 1 5/8 | 28 x 11/2"8UN | 24 x 33 | 24 x M30 | 1 3/16 | 1013.4 | 964.3 | 1) | 1) |
| 36 | 900 | 40 1/4 | 39 9/16 | 41 5/16 | 42 3/4 | 32 x 1 5/8 | 32 x 11/2"8UN | 28 x 33 | 28 x M30 | 1 3/16 | 1257.7 | 1193.2 | 1) | 1) |
| 40 | 1000 | 44 1/4 | 43 11/16 | 45 11/16 | 47 1/4 | 36 x 1 5/8 | 36 x 11/2"8UN | 28 x 36 | 28 x M33 | 1 3/16 | 1546.3 | 1466.0 | 1) | 1) |
| 48 | 1200 | 53 1/2 | 52 3/8 | 54 5/16 | 56 | 44 x 1 5/8 | 44 x 11/2"8UN | 32 x 39 | 32 x M36 | 1 3/16 | 2179.5 | 2089.1 | 1) | 1) |

1) please contact us. Technical specifications are subject to change without notice.

| Temperature correction factors (TCF) for spring - rate conversion | |
|---|---|
| **Temperature** | **TCF** |
| 176°F | 0.65 |
| 248°F | 0.5 |
| 302°F | 0.4 |

Example:
spring rate @ 248°F =
spring rate @ room temperature x 0.5

# Flange Dimensions, Effective Area and Spring Rates

| Nominal diameter ND | | FLUROFLEX®-N1 to N6 | | | | | | | | | | FLUROFLEX®-N3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flange dimensions | | | | | | | | | | Spring rates (@ room temperature) +/-30% | | | |
| | | Raised face ø mm | | Bolt circle ø mm | | Hole and bolt dimensions ASME | | DIN | | Flange Thickness | Effective Area | ax. Compr. | ax. Expans. | lateral | angular |
| ASME | DIN | ASME | DIN | ASME | DIN | hole | bolt | hole | bolt | | | | | | Nm/ |
| inch | mm | Ø inch | Ø inch | Ø inch | Ø inch | # x inch | # x bolt | # x mm | # x bolt | inch | inch^2 | lbs/inch | lbs/inch | lbs/inch | ft lbs/degree |
| 1 | 25 | 2 | 2 11/16 | 3 1/8 | 3 3/8 | 4 x 5/8 | 4 x 1/2"UNC | 4 x 14 | 4 x M12 | 3/8 | 1.6 | 19 | 19 | 13 | 1 |
| 1 ¼ | 32 | 2 1/2 | 3 1/16 | 3 1/2 | 3 15/16 | 4 x 5/8 | 4 x 1/2"UNC | 4 x 18 | 4 x M16 | 3/8 | 2.2 | 20 | 20 | 18 | 1 |
| 1 ½ | 40 | 2 7/8 | 3 7/16 | 3 7/8 | 4 5/16 | 4 x 5/8 | 4 x 1/2"UNC | 4 x 18 | 4 x M16 | 3/8 | 3.3 | 21 | 21 | 24 | 2 |
| 2 | 50 | 3 5/8 | 4 | 4 3/4 | 4 15/16 | 4 x 3/4 | 4 x 5/8"UNC | 4 x 18 | 4 x M16 | 1/2 | 4.7 | 32 | 32 | 28 | 2 |
| 2 ½ | 65 | 4 1/8 | 4 13/16 | 5 1/2 | 5 11/16 | 4 x 3/4 | 4 x 5/8"UNC | 4 x 18 | 4 x M16 | 1/2 | 7.6 | 27 | 27 | 34 | 3 |
| 3 | 80 | 5 | 5 7/16 | 6 | 6 5/16 | 8 x 3/4 | 4 x 5/8"UNC | 8 x 18 | 8 x M16 | 1/2 | 10.9 | 27 | 27 | 40 | 3 |
| 4 | 100 | 6 3/16 | 6 1/4 | 7 1/2 | 7 1/16 | 8 x 3/4 | 8 x 5/8"UNC | 8 x 18 | 8 x M16 | 9/16 | 16.4 | 34 | 34 | 45 | 5 |
| 5 | 125 | 7 5/16 | 7 3/8 | 8 1/2 | 8 1/4 | 8 x 7/8 | 8 x 3/4"UNC | 8 x 18 | 8 x M16 | 9/16 | 24.8 | 53 | 53 | 69 | 5 |
| 6 | 150 | 8 1/2 | 8 3/8 | 9 1/2 | 9 7/16 | 8 x 7/8 | 8 x 3/4"UNC | 8 x 22 | 8 x M20 | 11/16 | 34.9 | 64 | 64 | 94 | 6 |
| 8 | 200 | 10 5/8 | 10 9/16 | 11 3/4 | 11 5/8 | 8 x 7/8 | 8 x 3/4"UNC | 8 x 22 | 8 x M20 | 13/16 | 54.7 | 23 | 15 | 70 | 8 |
| 10 | 250 | 12 3/4 | 12 5/8 | 14 1/4 | 13 3/4 | 12 x 1 | 12 x 7/8"UNC | 12 x 22 | 12 x M20 | 7/8 | 82.3 | 30 | 20 | 88 | 11 |
| 12 | 300 | 15 | 14 9/16 | 17 | 15 3/4 | 12 x 1 | 12 x 7/8"UNC | 12 x 22 | 12 x M20 | 1 | 112.1 | 37 | 24 | 105 | 16 |
| 14 | 350 | 16 1/4 | 16 15/16 | 18 3/4 | 18 1/8 | 12 x 1 1/8 | 12 x 1"UNC | 16 x 22 | 16 x M20 | 1 3/16 | 161.4 | 42 | 28 | 123 | 20 |
| 16 | 400 | 18 1/2 | 19 | 21 1/4 | 20 1/4 | 16 x 1 1/8 | 16 x 1"UNC | 16 x 26 | 16 x M24 | 1 3/16 | 208.6 | 48 | 32 | 140 | 24 |
| 18 | 450 | 21 | 20 15/16 | 22 3/4 | 22 1/4 | 16 x 1 1/4 | 16 x 11/8"8UN | 20 x 26 | 20 x M24 | 1 3/16 | 250.9 | 56 | 37 | 158 | 28 |
| 20 | 500 | 23 | 23 1/16 | 25 | 24 7/16 | 20 x 1 1/4 | 20 x 11/8"8UN | 20 x 26 | 20 x M24 | 1 3/16 | 321.6 | 61 | 40 | 175 | 32 |
| 24 | 600 | 27 1/4 | 26 15/16 | 29 1/2 | 28 9/16 | 20 x 1 3/8 | 20 x 11/4"8UN | 20 x 30 | 20 x M27 | 1 3/16 | 459.0 | 74 | 49 | 211 | 44 |
| 28 | 700 | 31 1/2 | 31 1/2 | 34 | 33 1/16 | 28 x 1 3/8 | 28 x 11/4"8UN | 24 x 30 | 24 x M27 | 1 3/16 | 620.6 | 88 | 58 | 246 | 58 |
| 32 | 800 | 36 | 35 5/8 | 38 1/2 | 37 3/8 | 28 x 1 5/8 | 28 x 11/2"8UN | 24 x 33 | 24 x M30 | 1 3/16 | 806.6 | 1) | 1) | 1) | 1) |
| 36 | 900 | 40 1/4 | 39 9/16 | 42 3/4 | 41 5/16 | 32 x 1 5/8 | 32 x 11/2"8UN | 28 x 33 | 28 x M30 | 1 3/16 | 1017.0 | 1) | 1) | 1) | 1) |
| 40 | 1000 | 44 1/4 | 43 11/16 | 47 1/4 | 45 11/16 | 36 x 1 5/8 | 36 x 11/2"8UN | 28 x 36 | 28 x M33 | 1 3/8 | 1251.6 | 1) | 1) | 1) | 1) |
| 48 | 1200 | 53 1/2 | 52 3/8 | 56 | 54 5/16 | 44 x 1 5/8 | 44 x 11/2"8UN | 32 x 39 | 32 x M36 | 1 3/8 | 1794.1 | 1) | 1) | 1) | 1) |
| 52 | 1300 | 57 1/2 | 2) | 60 1/2 | 2) | 44 x 1 7/8 | 44 x13/4"8UN | 2) | 2) | 1 3/8 | 2102.0 | 1) | 1) | 1) | 1) |
| 56 | 1400 | 62 | 60 7/16 | 65 | 62 5/8 | 48 x 1 7/8 | 48 x 13/4"8UN | 36 x 42 | 36 x M39 | 1 3/8 | 2434.0 | 1) | 1) | 1) | 1) |
| 60 | 1500 | 66 | 2) | 69 1/4 | 2) | 52 x 1 7/8 | 52 x13/4"8UN | 2) | 2) | 1 3/8 | 2790.5 | 1) | 1) | 1) | 1) |

1) please contact us.
2) according to customer specification.
Technical specifications are subject to change without notice.

| Convolution correction factors (CCF) for spring - rate conversion | |
|---|---|
| number of convolutions | CCF |
| 1 | 3 |
| 2 | 1.5 |
| 3 | 1 |
| 4 | 0.75 |
| 5 | 0.6 |
| 6 | 0.5 |

Example:
spring rate FLUROFLEX® 5 = spring rate FLUROFLEX® 3x 0.6

| Temperature correction factors (TCF) for spring - rate conversion | |
|---|---|
| Temperature | TCF |
| 176°F | 0.65 |
| 248°F | 0.5 |
| 302°F | 0.4 |

Example:
spring rate @ 248°F =
spring rate @ room temperature x 0.5

# Temperature-Vacuum-Rating

**The vacuum resistance can be increased up to full vacuum with internal support rings shown on page 13**

| Nominal diameter | | VACUUM RESISTANCE of FLUROFLEX®- N1 to N6 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | FLUROFLEX®- N1 | | | FLUROFLEX®- N2 | | | FLUROFLEX®- N3 | | | FLUROFLEX®- N4 | | | FLUROFLEX®- N5 | | | FLUROFLEX®- N6 | | |
| ND | | Operating temperature | | | Operating temperature | | | Operating temperature | | | Operating temperature | | | Operating temperature | | | Operating temperature | | |
| ASME | DIN | 68°F | 212°F | 302°F | 68°F | 212°F | 302°F | 68°F | 212°F | 302°F | 68°F | 212°F | 302°F | 68°F | 212°F | 302°F | 68°F | 212°F | 302°F |
| inch | mm | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi | psi |
| 1 | 25 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV |
| 1 1/4 | 32 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV |
| 1 1/2 | 40 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV |
| 2 | 50 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV |
| 2 1/2 | 65 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV |
| 3 | 80 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | 1.5 |
| 4 | 100 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | 1.5 | FV | 1.5 | 3.0 |
| 5 | 125 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | 1.5 | 2.9 | 1.5 | 3.0 | 4.4 |
| 6 | 150 | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | FV | 1.5 | 1.5 | 2.9 | 4.4 | 3.0 | 4.4 | 5.7 |
| 8 | 200 | FV | FV | FV | FV | FV | FV | FV | FV | 2.9 | FV | 1.5 | 4.4 | 2.9 | 4.4 | 5.8 | 4.4 | 5.7 | 6.4 |
| 10 | 250 | FV | FV | 2.8 | FV | FV | 3.2 | FV | 2.3 | 5.1 | 1.5 | 3.5 | 5.9 | 4.4 | 4.8 | 7.0 | 5.7 | 5.9 | 7.8 |
| 12 | 300 | FV | FV | 4.5 | FV | 2.3 | 4.9 | 2.2 | 4.4 | 6.5 | 3.3 | 5.4 | 7.3 | 4.6 | 6.4 | 8.1 | 5.8 | 7.4 | 8.8 |
| 14 | 350 | 1.6 | 4.1 | 6.5 | 2.2 | 4.6 | 6.8 | 4.2 | 6.2 | 8.1 | 5.2 | 7.1 | 8.7 | 6.2 | 7.8 | 9.4 | 7.3 | 8.7 | 10.0 |
| 16 | 400 | 3.6 | 5.8 | 8.3 | 4.1 | 6.1 | 8.6 | 5.8 | 7.5 | 9.6 | 6.7 | 8.3 | 10.0 | 7.5 | 9.0 | 10.6 | 8.4 | 9.6 | 11.0 |
| 18 | 450 | 5.1 | 7.4 | 9.6 | 5.5 | 7.7 | 9.9 | 7.0 | 8.8 | 10.6 | 7.7 | 9.4 | 11.0 | 8.4 | 10.0 | 11.3 | 9.3 | 10.6 | 11.6 |
| 20 | 500 | 6.5 | 8.6 | 10.4 | 6.8 | 8.7 | 10.7 | 8.1 | 9.7 | 11.3 | 8.7 | 10.2 | 11.6 | 9.4 | 10.7 | 11.9 | 10.0 | 11.2 | 12.3 |
| 24 | 600 | 8.7 | 10.2 | 11.7 | 9.0 | 10.3 | 11.9 | 9.9 | 11.0 | 12.3 | 10.3 | 11.3 | 12.5 | 10.7 | 11.7 | 12.8 | 11.3 | 12.0 | 12.9 |
| 28 | 700 | 10.3 | 11.6 | 12.9 | 10.4 | 11.7 | 12.9 | 11.2 | 12.2 | 13.2 | 11.5 | 12.5 | 13.3 | 11.9 | 12.6 | 13.5 | 12.2 | 12.9 | 13.6 |
| 32 | 800 | 11.6 | 12.6 | 13.6 | 11.9 | 12.8 | 13.6 | 12.3 | 13.1 | 13.8 | 12.5 | 13.2 | 13.8 | 12.8 | 13.3 | 13.9 | 12.9 | 13.5 | 13.9 |
| 36 | 900 | 12.6 | 13.3 | 13.8 | 12.8 | 13.5 | 13.8 | 13.1 | 13.6 | 13.9 | 13.2 | 13.8 | 13.9 | 13.3 | 13.8 | 14.1 | 13.5 | 13.9 | 14.1 |
| 40 | 1000 | 13.3 | 13.8 | 13.9 | 13.5 | 13.8 | 13.9 | 13.6 | 13.9 | 14.1 | 13.8 | 13.9 | 14.1 | 13.8 | 14.1 | 14.1 | 13.9 | 14.1 | 14.1 |
| 48 | 1200 | 13.8 | 13.9 | 14.1 | 13.8 | 13.9 | 14.1 | 13.9 | 14.1 | 14.1 | 13.9 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| 52 | 1300 | 13.9 | 14.1 | 14.1 | 13.9 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| 56 | 1400 | 13.9 | 14.1 | 14.1 | 13.9 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| 60 | 1500 | 13.9 | 14.1 | 14.1 | 13.9 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |

Technical specifications are subject to change without notice.

**The FLUROFLEX®- 0 is fully vacuum resistant (FV) up to 392°F**

| VACUUM RESISTANCE of FLUROFLEX® - 0 | | | | | |
|---|---|---|---|---|---|
| Nominal diameter ND | | Operating temperature | | | |
| DIN | ASME | 68°F | 212°F | 302°F | 392°F |
| 200-1200 | 8 - 48 | FV | FV | FV | FV |

# Materials of construction/How to order

### Materials of construction

| | |
|---|---|
| flanges: | S235 JRG2 up to ND16" (400)<br>S355 J2G3 from ND18" (450) upwards |
| surface protection: | flanges ND8" (200) and bigger are painted with 2-components epoxy paint RAL 5003<br>smaller diameters are zinc galvanized & yellow chromated |
| bellow material: | virginal paste-extruded PTFE, white |
| external support rings: | 1.4571, similar to AISI 316 Ti |
| tie rods: | 8.8 A2P, carbon steel zinc galvanized |
| support flange:<br>( FLUROFLEX®- 0 ) | S235 JRG2, painted with<br>2-components epoxy paint RAL 5003 |

### Options:

| | |
|---|---|
| flanges: | stainless steel, etc. |
| bellow material: | virginal paste-extruded PTFE, anti-static, black |
| external support rings: | HASTELLOY®,POLYFLURON® PTFE-lined metal |
| internal support rings: | stainless steel, HASTELLOY®, etc. always POLYFLURON® PTFE-lined |
| tie rods: | stainless steel, etc. |
| support flange:<br>( FLUROFLEX®- 0 ) | stainless steel |

### How to order:

## Example:

FX - N2 - 300 - D - C - C - W - 110 - SP - ANG - FXS
A - B - C - D - E - F - G - H - I - J

A: number of convolutions
0 = means vacuum bellow
16 = means metal bellow POLYFLURON® PTFE-lined

B: ND (mm or inch) according to flange standard under „C"

C: flange standard
A = ASME 150 lbs
D = DIN PN10
J = JIS

D: C = clearance holes
T = drilled and tapped
S= standard

E: flange material
C = carbon steel
S = stainless steel

F: PTFE
w = white
a = anti-static

G: shipped length within min./max. range in mm or inch

H: internal support rings
– = no rings
SP = vacuum support rings stainless steel/POLYFLURON® PTFE-lined

H: TA = vacuum support rings tantalum/POLYFLURON® PTFE-lined
HA = vacuum support rings HASTELLOY®/POLYFLURON® PTFE-lined

I: bellow type
STD = standard bellow
ANG = hinged bellow for plain angular movement
LAT = plain lateral bellow
AXI = bellow for plain axial movement

J: FXS = with smooth bore sleeve

# Quality Management
## and After Sales Service

**Quality Management**

Continuous quality assurance is an integral part of the SGL Group corporate philosophy.

Our quality management system is certified in accordance with ISO 9001:2008. In order to guarantee consistently high quality to our customers, we work according to a key performance indicator orientated quality management system.

Depending on specifications we are able to meet specific requirements like the Pressure Equipment Directive 97/23/EC Annex III, Module H/H1, AD 2000 Merkblatt N2 as well as ASME "U" Stamp, Section VIII, Part UIG.

**After Sales Services –**
**Anytime and Everywhere**

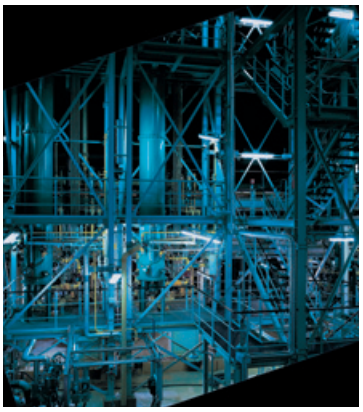
We take care of our products during the entire operational lifetime. We aim to provide the best customer service anytime and everywhere.

- Maintenance – genuine spare parts supply, failure analysis, repair, field service
- Fast emergency support
- Start-up assistance
- Consulting for continuous improvement

Our service specialists as well as our service centers work in a global network to support you best.

# Process Technology

## Our Products



**System Solutions**

- Syntheses
- Distillation and concentration
- Purification
- Dilution
- Absorption
- Desorption
- Thermal destruction and recycling
- Reactors and converters
- Heat storage
- …

**Equipment Solutions**

- Graphite and SiC heat exchangers – shell & tube, block and plate type
- Columns and internals
- Vessels
- Quenchers
- Pumps
- Rupture discs
- PTFE piping and bellows
- PTFE hoses
- …

**After Sales Services**

- Maintenance
- Emergency support
- Start-up assistance
- Consulting
- …

# Regional Sales & Service Center

**Central and East Europe**

**SGL CARBON GmbH**
Werner-von-Siemens-Straße 18
86405 Meitingen/Germany
Phone +49 8271 83-1564
Fax +49 8271 83-2101
manfredbirle.ptint@sglcarbon.de

**South Europe, Middle East, Africa**

**SGL CARBON Technic S.A.S.**
18, Avenue Marcel Cachin
38407 Saint Martin d'Heres/France
Phone +33 4 7625 9600
Fax +33 4 7625 6277
christianriedinger.ptint@fr.sglcarbon.de

**Americas**

**SGL CARBON Technic, LLC**
21945 Drake Road
44149 Strongsville, Ohio/USA
Phone +1 440 572-3600
Fax +1 440 572-9570
michaelcoscia.ptint@sglcarbon.com

**Asia, Oceania**

**SGL CARBON Far East Ltd. Shanghai**
1208, Shanghai Oriental Plaza
31 Wujiang Road/China
Phone +86 21 5211 0333
Fax +86 21 5211 0085
lancesmith.ptint@sglcarbon.com.cn

**India**

**SGL CARBON India Pvt. Ltd.**
Plot No. E-100, MIDC Ranjangaon
Village: Karegaon, Taluka: Shirur
Dist. Pune - 412 220/India
Phone +91 21 386 122-14
mkbanerjee.ptint@sglcarbon.in



04 2012/0 1NÄ Printed in Germany



**Process Technology**

**SGL CARBON GmbH**

Söhnleinstraße 8
65201 Wiesbaden/Germany
www.sgl-processtechnology.com

**www.sglgroup.com**

SGL GROUP
THE CARBON COMPANY