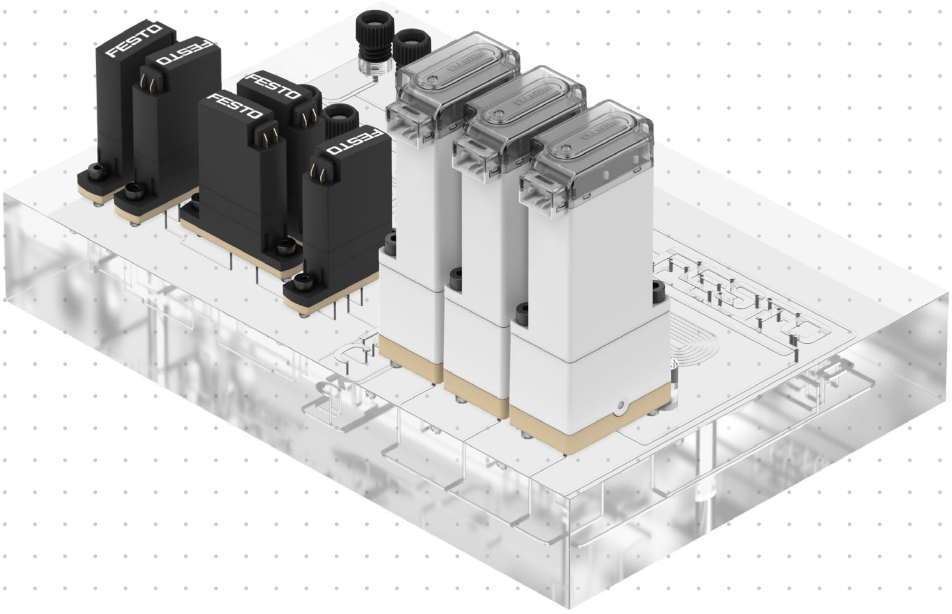
# Diffusion Bonded Manifolds




## Highlights

- Customized design
- High Functional Integration
- Small footprint with high number of channels possible
- No dead volumes: Seamless design
- Contamination-Free Bonding
- Decreased risk of leakage: Less connections
- Easy and fast installation in devices: Plug & work
- Less part numbers for customers to handle

**Diffusion Bonded Manifolds are compact customized components operating as central fluid distribution hub in applications where precise fluid control is required.**
**These manifolds represent cutting-edge fluidic solution combining precision, customization, and contamination-free manufacturing by an adhesive-free bonding process.**
**Perfect fit for small tabletop devices for laboratory analysis and medical technology.**

**The diffusion bonding technology, adopted by Festo from Carville, enhances process reliability and efficiency across the medical, bio-pharmaceutical, and general industrial sectors.**
Manifolds are key products for the connection of components and the distribution of liquids and gases in fluidic systems. Compared to conventional tubed or machined systems, they offer the possibility of significantly increasing integration density and process reliability. The highly specialized HADB technology (High Accuracy Diffusion Bonding) enables precise production of manifolds made of PMMA (acrylic) or PEI (Ultem).

Thanks to the high geometric precision, it also allows using these manifolds in microfluidic applications.

**Microfluidic solutions with channel plates and valves from one supplier**
Diffusion bonded technology leads to competitive advantages, particularly in medical technology, diagnostics and the life sciences. By combining it, for example, with our media-separated valves VYKA, VYKB and VYKC series, Festo is able to offer you functional solutions from a single source.

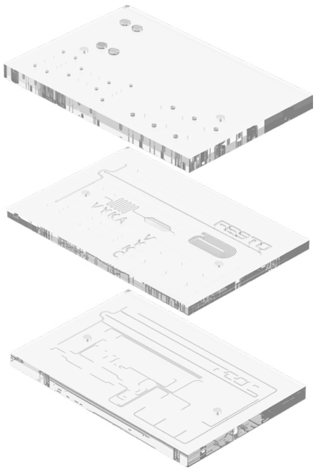
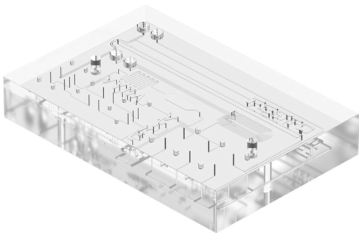
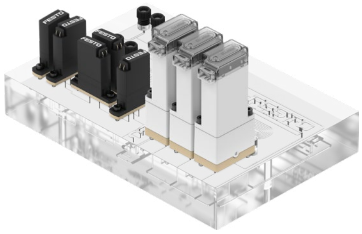
We look forward to working with you to develop precise, reliable and efficient solutions for your applications.

**Additional informations online:**
**Diffusion Bonded Manifolds**
> www.festo.com/bonded-manifold

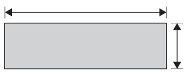
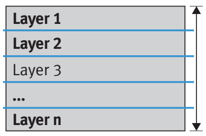
**Contact**
> medlab@festo.com

## Festo offering: From customized manifold to functional sub-system

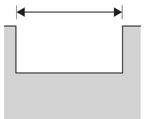
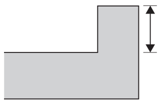
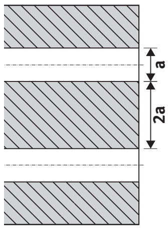
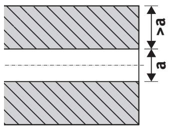
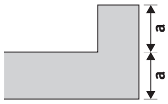
Festo can support in customer specific projects with a wide range of services – from pure manifold production to sub systems which contains manifold design, assembly and testing based on customer requirements.

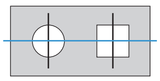
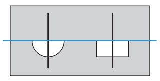
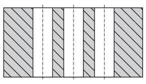
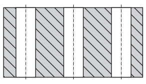
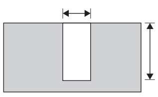
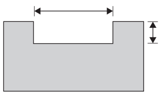
| Layered design approach | Diffusion Bonded Manifold with joint layers by pressure and temperature | Functional sub system as valve assembly |
|---|---|---|
|  |  |  |

## Dimensioning guide for Diffusion Bonded Manifolds

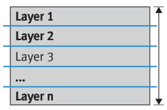
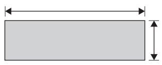
| Material | | Max. total footprint | Max. total thickness |
|---|---|---|---|
| | |  |  |
| **PMMA** (Polymethylmethacrylat) | [mm] | 400 x 700 | 300 |
| **PEI** (Polyetherimid) | [mm] | 400 x 400 | |

## Track Design

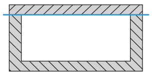
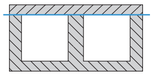
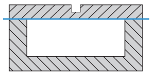
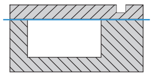
| Item | Recommendation | Sketch |
|---|---|---|
| Minimum track width | 0.30 mm recommended<br>0.15 mm possible |  |
| Minimum track depth | 0.3 mm recommended<br>Smaller possible |  |
| Minimum distance between tracks | Double track width |  |
| Minimum distance between track and edge | Track width (more preferred if possible) |  |
| Minimum distance between track and bottom of layer | Track depth |  |

| Non-preferred (but possible) | | Preferred | |
|---|---|---|---|
| Symmetrical tracks |  | Single layer tracks |  |
| Tightly grouped tracks |  | Widely spaced tracks |  |
| Tracks deeper than they are wide |  | Tracks wider than they are deep |  |

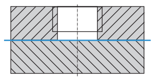
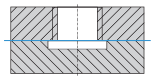
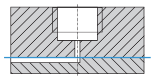
## Layer Design

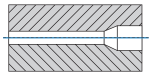
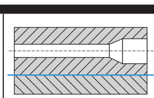
| Item | Recommendation | Sketch |
|---|---|---|
| Minimum layer thickness | PMMA – 1mm<br>PEI – 3mm |  |
| Maximum total thickness | 300 mm<br>Typical manifold designs have between two and six layers, but more are possible. |  |
| Layer thickness | Can vary between layers | |
| Maximum total footprint | PMMA – 400 x 700 mm²<br>PEI – 400 x 400 mm² |  |

## Chamber Design

| Non-preferred (but possible) | | Preferred | |
|---|---|---|---|
| Large unsupported chambers |  | Supports inside chambers |  |
| Tracks in one layer going over large chambers in another layer |  | Tracks in one layer offset from large chambers in another layer |  |

## Thread Design

| Recommendation | Sketch |
|---|---|
| Threads stop 1–2 threads before bonding layer |  |
| Recess is cut out if threads must bottom out |  |
| Thread bottom does not interfere with bonding layer |  |

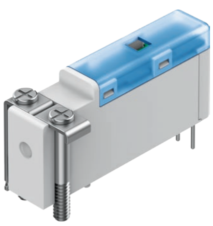
| Non-preferred (but possible) | | Preferred | |
|---|---|---|---|
| Tapped hole machined at layer joint |  | Tapped hole machined away from layer joint |  |

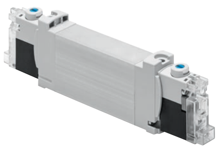
| Threaded Inserts |
|---|
| are commonly used to create a robust thread for mounting. It is recommended that if these are used, they are designed to be far from the bonding layer and that appropriate clearance is designed between the inserts and the edge of the manifold to avoid excessive warping or deformation of the manifold edges. |

Bonding layers are indicated with a blue line

## Some suitable products

We offer you the right Festo products integrated into your functional solutions – everything from a single source.

| | | |
|---|---|---|
|  | VYKA | **Media separated solenoid valve**<br>• Maximum power density and precision in the smallest of spaces (1.2 mm nominal width, with a width of only 7 mm)<br>• High repeat accuracy and precision in dosing processes, even for the smallest volumes<br>• Very good rinsability and minimised media consumption thanks to optimised fluid chamber and small internal volume<br>**> www.festo.com/catalogue/ vyka** |
|  | VYKB | **Media separated solenoid valve**<br>• Compact width of 10 mm and 12 mm for large nominal widths (1.6 mm and 2.0 mm)<br>• For dosing, aspirating and for continuous flow applications<br>• Very easy to clean thanks to media separation<br>**> www.festo.com/catalogue/ vykb** |
|  | VYKC | **Media separated solenoid valve**<br>• Flexible nominal widths (1.2 mm/1.6 mm/2.0 mm) with the same size (16 mm)<br>• High-quality materials, therefore also suitable for aggressive media<br>• Minimised heating effect thanks to intelligent holding current reduction<br>**> www.festo.com/catalogue/ vykc** |
|  | VOVK | **Solenoid valve**<br>• Very narrow: 5.9 mm grid dimension<br>• Extremely small and lightweight<br>• Very low power consumption<br>**> www.festo.com/catalogue/ vovk** |

| | | |
|---|---|---|
|  | MHA1 | **Solenoid valve**<br>• Directly actuated poppet valve<br>• Miniature valve: grid dimension 10 mm<br>• Switching times down to 4 ms<br>**> www.festo.com/catalogue/ mha1** |
|  | VEAB | **Proportional-pressure regulator**<br>• Control vacuum and/or overpressure with a single valve<br>• Highly dynamic pressure control for low flow rates<br>• Maximum performance and optionally available with IO-Link® interface<br>**> www.festo.com/catalogue/ veab** |
|  | | ...and many other valves from the Festo product range.<br>Get in touch with us – together we will find the best solution:<br>**> medlab@festo.com** |

| | | |
|---|---|---|
|  | **NLFA** | **Fitting**<br>• For mounting in laboratory devices<br>• Very easy to flush thanks to connection without dead space<br>• For liquid and gaseous media<br>• Also for aggressive liquid media<br>> **www.festo.com/catalogue/nlfa** |
|  | **NPQO** | **Push-in fitting, resistant to media**<br>• Oxygen compatibility (in accordance with ISO 15001 and ASTM G93)<br>• Biocompatibility (according to ISO 18562)<br>• FDA-listed materials<br>> **www.festo.com/catalogue/npqo** |
|  | **PUN-H** | **Plastic tubing**<br>• Polyurethane<br>• High resistance to microbes and hydrolysis<br>• Suitable for use with energy chains<br>> **www.festo.com/catalogue/pun-h** |

| | | |
|---|---|---|
|  | **PFAN** | **Plastic tubing**<br>• Perfluoroalkoxy alkane<br>• Pneumatic tubing with resistance to high temperatures and chemicals<br>• High resistance to chemicals, microbes, UV radiation, hydrolysis and stress cracks<br>> **www.festo.com/catalogue/pfan** |
|  | | ...and many other accessories from the Festo product range. Get in touch with us – together we will find the best solution:<br>> **medlab@festo.com** |

## Application Examples – Perfect fit for small tabletop devices

- **Lab Automation & BioPharma:**
  Ideal for microfluidic systems requiring precise fluid control and contamination-free environments.

- **Medical Technology:**
  Enables compact, integrated fluidic modules for diagnostic devices and point-of-care (PoC) systems.

- **General Industrial Applications:**
  Suitable wherever complex fluid routing in a confined space is needed, including valve assemblies and manifold systems