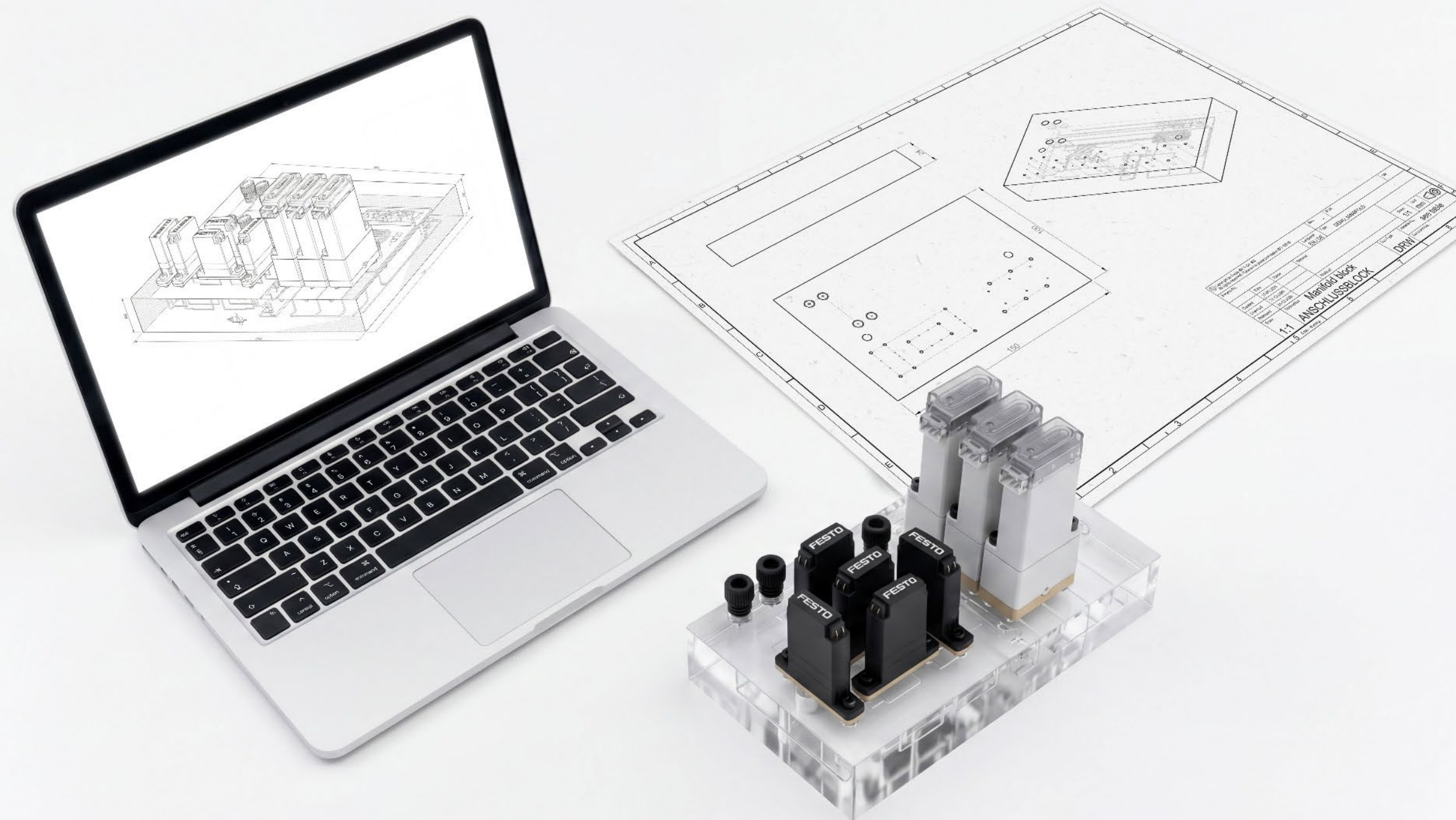


# Review Your Fluidic Manifold Design



## Check Whether Your Manifold Concept Is Ready

A fluidic manifold can simplify the layout of a compact life science device, but the design details determine if the concept is ready for assessment. Use this guide **to review your design for manufacturing diffusion bonded manifolds** before you share your application data with Festo.

It facilitates technical preparation and helps you check:

- Whether track geometry and routing are suitable for the required flow path
- How layer structure affects the feasibility, space, and manufacturability of the design
- Where chambers, threads, inserts, and interfaces need to be looked at more closely
- Which material and cost drivers could influence the design
- What information can make the project discussion more focused

# Where Diffusion Bonded Manifolds Fit

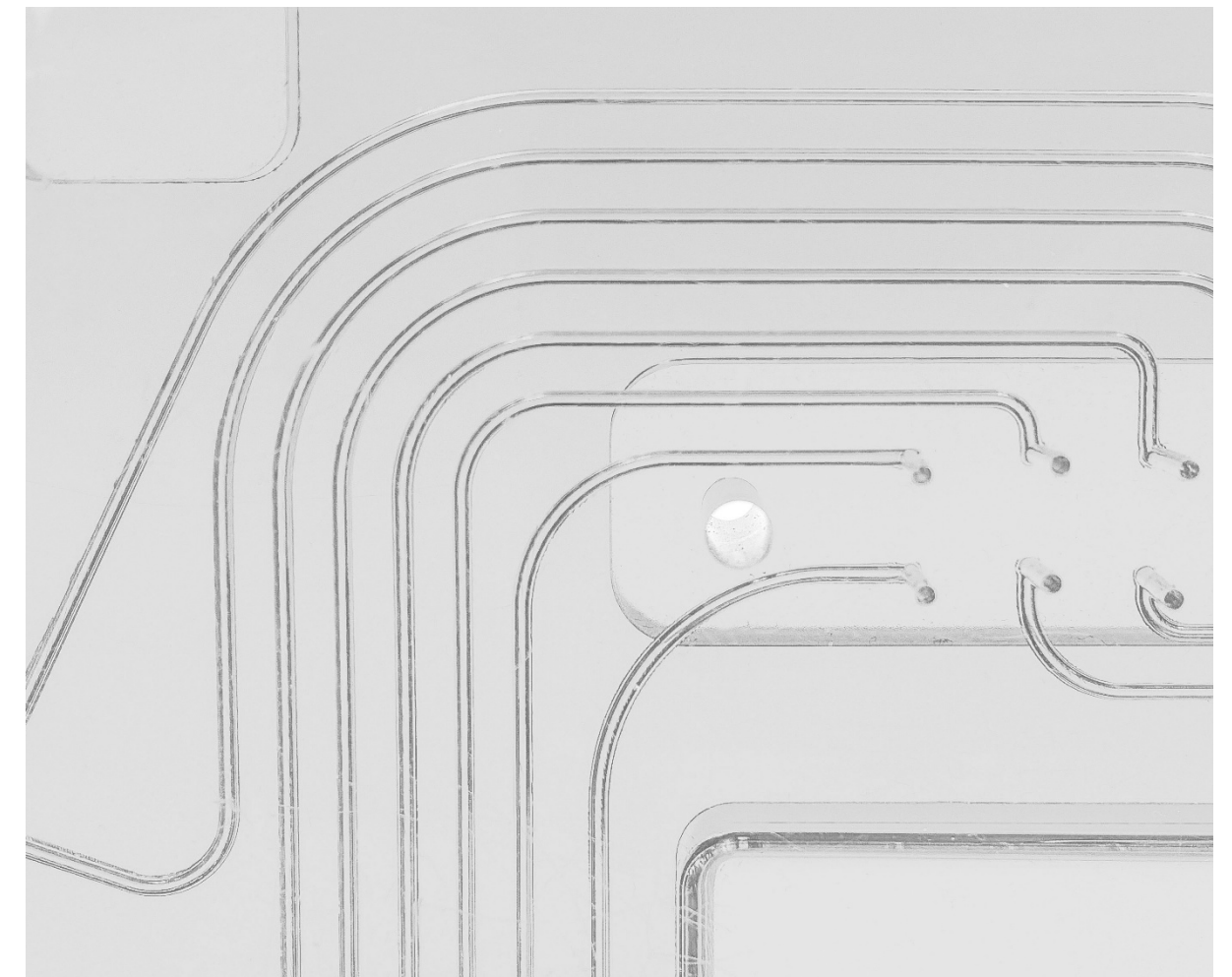
## A quick check before the design review

You are most likely reading this because external tubing, fittings, or a simple machined block no longer give your device the routing clarity, footprint, or integration level it needs.

A diffusion bonded manifold takes a different approach. Precision-machined polymer layers are joined into one compact fluidic component, so multiple internal paths can sit inside the manifold body without the need for adhesive in the bonded area.

That can be useful when a compact life science device needs a specific channel layout, fewer external connections, less dead-volume, or more integrated valves and other fluid control components.

This guide starts off where the architecture comparison has ended. It helps you review if your diffusion bonded manifold concept is at a stage where tracks, layers, chambers, and interfaces can be considered, and what the best material is..



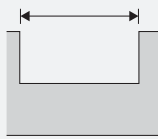
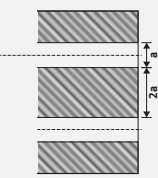
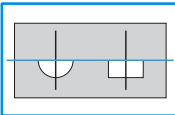
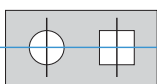
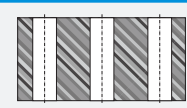
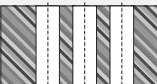
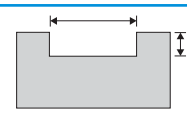
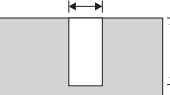
# Check 1: Track Geometry

## Start with width, depth, and spacing

The track design determines how much **routing complexity** a diffusion bonded manifold can carry inside the available footprint. Before doing a detailed review, check whether each track has the right width and depth, and has enough space, edge clearance, and material around it.

Tight routing, symmetrical paths across layers, or tracks that are deeper than they are wide may be possible. They can, however, also increase review effort and manufacturing complexity. More spacing and tracks that are wider than they are deep usually give the concept a clearer starting point.

Use this page as an early check. Festo can then review the final geometry, bonding feasibility, and fluidic performance with your application requirements in mind.

| Design checkpoint                                                                                                                                                                           | Recommended starting point                                                                                                                  | What to check before review                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  Minimum track width                                                                                     | <ul style="list-style-type: none"><li>0.30 mm recommended</li><li>0.15 mm possible</li></ul>                                                | Are your narrowest tracks within or close to the recommendations?                  |
|  Minimum track depth                                                                                     | <ul style="list-style-type: none"><li>0.3 mm recommended</li><li>Smaller possible</li></ul>                                                 | Does the required depth of your track fit the target?                              |
|  Distance between tracks                                                                                 | <ul style="list-style-type: none"><li>Double the track width</li></ul>                                                                      | Do neighboring tracks have enough material between them for a stable layout?       |
|  Distance between track and edge                                                                         | <ul style="list-style-type: none"><li>At least track width</li><li>More clearance preferred</li></ul>                                       | Are tracks kept far enough from outer edges and interfaces?                        |
|  Distance between track and layer bottom                                                               | <ul style="list-style-type: none"><li>At least track depth</li></ul>                                                                        | Is enough material left below the track to support the bonded layer structure?     |
|   Routing pattern | <ul style="list-style-type: none"><li>Single-layer tracks preferred</li><li>Symmetrical multi-layer tracks possible</li></ul>               | Can tracks stay in one layer instead of mirroring across layers?                   |
|   Track grouping  | <ul style="list-style-type: none"><li>Wider spacing preferred</li><li>Tightly grouped tracks possible</li></ul>                             | Can tightly grouped tracks be separated without increasing the footprint too much? |
|   Track profile   | <ul style="list-style-type: none"><li>Tracks wider than they are deep preferred</li><li>Tracks deeper than they are wide possible</li></ul> | Can deep, narrow tracks be avoided in the layout as they reduce design stability?  |

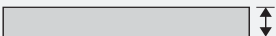
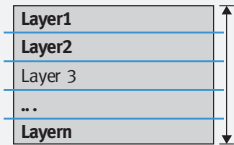
# Check 2: Layer Structure

## Review thickness, footprint, and layer count

A layered design defines how **the fluid paths are distributed** through the manifold. It affects routing freedom, component integration, total height, material use, and the space available for channels, chambers, threads, and inserts.

A diffusion bonded manifold is built using polymer layers that are fused into one compact component. Typical designs use two to six layers, although more layers are possible when this is needed for the application. The layer concept should stay as simple as the routing allows.

Use this check to review whether your chosen material, total footprint, total thickness, and number of layers create a practical starting point. Festo can then assess how the layer stack supports the required flow path, integration needs, and manufacturing approach.

| Design checkpoint                                                                     |                           | Recommended starting point                                                                                     | What to check before review                                                            |
|---------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|    | Minimum layer thickness   | <ul style="list-style-type: none"><li>PMMA: 1 mm</li><li>PEI: 3 mm</li></ul>                                   | Does each layer meet the minimum thickness for the selected material?                  |
|    | Maximum total thickness   | <ul style="list-style-type: none"><li>Up to 300 mm</li></ul>                                                   | Is the full stack of layers below the recommendation?                                  |
|    | Typical layer count       | <ul style="list-style-type: none"><li>Two to six layers</li><li>More possible</li></ul>                        | Can the routing stay within a simple layer stack?                                      |
|    | Layer thickness variation | <ul style="list-style-type: none"><li>Layer thickness can vary between layers</li></ul>                        | Do specific layers need more thickness for channels, chambers, inserts, or interfaces? |
|  | Maximum total footprint   | <ul style="list-style-type: none"><li>PMMA: 400 x 700 mm²</li><li>PEI: 400 x 400 mm²</li></ul>                 | Is the manifold footprint below the given dimensions?                                  |
|                                                                                       | Routing distribution      | <ul style="list-style-type: none"><li>Keep routing as clear as possible across layers</li></ul>                | Are tracks placed so they reduce crossovers, interfaces, and unnecessary complexity?   |
|                                                                                       | Integration space         | <ul style="list-style-type: none"><li>Allow space for valves, fittings, sensors, and mounting points</li></ul> | Does the layer concept leave enough room for functional integration?                   |

# Check 3: Chamber Design

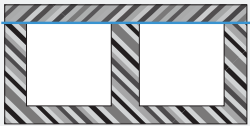
## Look for support, overlap, and layer conflicts

Chambers can help **create volume, mixing space, measurement areas, or connection zones** inside a diffusion bonded manifold. Their shape and position matter because large unsupported areas can affect the stability of the layer stack.

The first check is simple: Avoid large open chambers without support where possible. Internal supports can help divide the chamber area and create a more stable design.

Also review how tracks run above or below the chamber areas. A track in one layer that crosses over a large chamber in another layer can create unnecessary design instability. Where possible, offset tracks from large chambers and keep the layer structure easier to oversee.

Use this check to flag any chamber areas that may need support, relocation, or routing adjustment before the technical review.

| Design checkpoint    | Recommended starting point                                                          |                                            | Non-preferred but still possible                                                    |                                                                   | What to check before review                                                                               |
|----------------------|-------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Large chambers       |  | Add supports inside chambers               |  | Large unsupported chamber areas                                   | Can the chamber be divided or supported without affecting the fluidic function?                           |
| Chamber span         |                                                                                     | Smaller supported areas                    |                                                                                     | Wide open chamber geometry                                        | Does the chamber size create an avoidable unsupported area in the layer stack?                            |
| Tracks over chambers |  | Offset tracks from large chamber areas     |  | Tracks in one layer crossing over large chambers in another layer | Can tracks be moved away from large chambers to reduce layer conflicts?                                   |
| Review readiness     |                                                                                     | Define the chamber purpose and constraints |                                                                                     | Chamber function not clearly defined                              | Is the chamber used for volume, mixing, sensing, buffering, or as a visual interface or connection space? |

# Check 4: Threads and Inserts

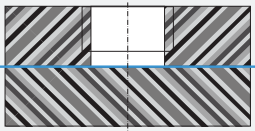
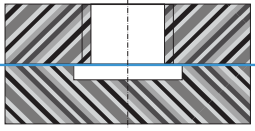
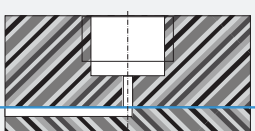
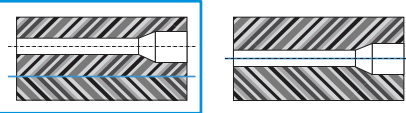
## Keep threaded features away from sensitive layer areas

Threads and threaded inserts are often used to support **mounting, sealing, fittings, or for component integration**. In a diffusion bonded manifold, their position matters because threaded features should not interfere with the bonding layer or weaken nearby edges.

As a first rule, threaded holes should stop before the bonding layer. If a thread must bottom out, the design may need a recess, so the thread bottom does not disturb the bonded interface.

Tapped holes positioned directly at a layer joint are possible, but they usually make the design more unstable. A cleaner way is to place tapped holes away from the layer joint and allow enough clearance between the inserts and the bonding layers and manifold edges.

Use this check to highlight any interfaces that may need relocation, recesses, or additional clearance before the project discussion.

| Design checkpoint                                                                   |                         | Recommended starting point                                                                                                       | What to check before review                                                             |
|-------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  | Thread end position     | Stop threads 1–2 threads before the bonding layer                                                                                | Do threads end before they reach the bonded interface?                                  |
|  | Bottoming threads       | Add a recess if the thread must bottom out                                                                                       | Does the recess prevent the thread bottom from interfering with the bonding layer?      |
|  | Bonding layer clearance | Keep the thread bottom clear of the bonding layer                                                                                | Is enough material left between the thread bottom and the layer joint?                  |
|  | Tapped hole position    | Place tapped holes away from layer joints where possible. Tapped hole machined at layer joint not preferred, but still possible. | Are tapped holes positioned in a stable material area rather than directly at a joint?  |
|                                                                                     | Threaded inserts        | Use inserts for robust mounting when needed                                                                                      | Are inserts required for mounting strength, repeated assembly, or attaching components? |
|                                                                                     | Insert clearance        | Keep inserts away from bonding layers and manifold edges                                                                         | Is there enough clearance to reduce warping, deformation, or edge sensitivity?          |
|                                                                                     | Interface grouping      | Avoid placing threads, inserts, and fluidic tracks close together                                                                | Do mechanical interfaces interfere with channels, chambers, or sealing areas?           |

## Check 5: Material Choice

The choice of materials impacts not just the performance. It also affects **footprint, layer structure, machining effort, post-bonding work, and the manufacturing approach.**

Each material has an influence on the possible footprint, layer thickness, design route, and application fit. **PMMA** is great for transparent, compact designs where visual clarity, fine structures, or a larger format are important. **PEI** is the better option when the application needs a more robust material profile or higher resistance.

Costs should also be considered early, but only to provide a rough guide. The main points to focus on are layer count, machining effort, footprint, and any post-bond machining.

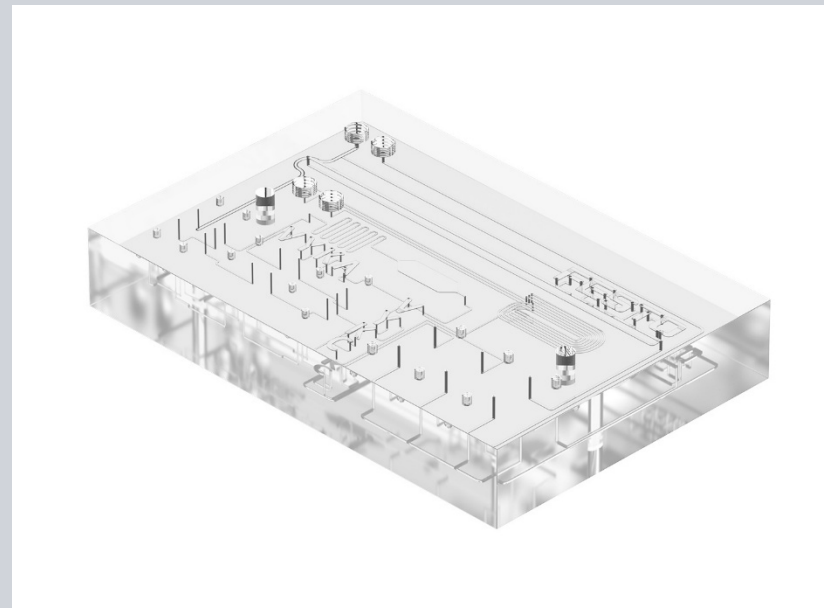
Use this check to clarify which material is most suitable for the application before reviewing detailed geometry and manufacturing scope.

### **PMMA: A practical choice for transparent, compact designs**

PMMA suits applications that need optical clarity, fine structures, and efficient use of space. It allows thinner layers than PEI and a larger maximum footprint. That can help with compact layouts and visual inspection.

Check PMMA when you need:

- Transparent features
- Compact layer structures
- Larger manifold formats

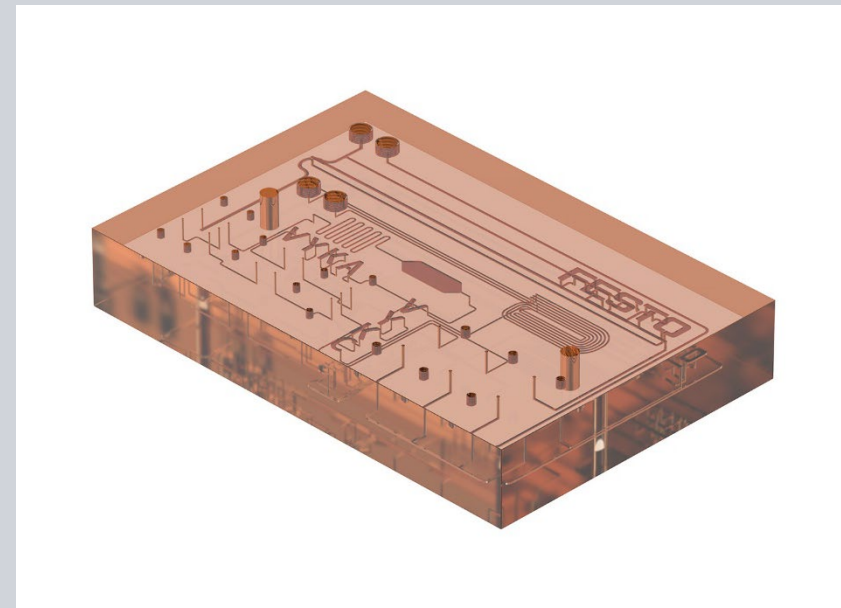


### **PEI: A better option for more demanding requirements**

PEI is a good option for applications that need a material profile that can meet higher demands, such as higher strength or thermal resistance. Compared with PMMA, PEI typically starts with thicker layers and a smaller maximum footprint. That can affect layer concept, space, and cost.

Check PEI when you need:

- A more robust basis
- Higher resistance
- Stable performance in tougher conditions



# Prepare Your Project Assessment

A focused project discussion starts with clear input. Use this final check to gather the main details for your diffusion bonded manifold concept before you contact Festo.

You do not need to have a final design. A clear application description, routing sketch, space requirement, and interface overview are sufficient to start the assessment.

## Your checklist

Before you request a project assessment, collect the information that will help Festo understand the application and design direction.

Prepare these details where available:

- Device type and application purpose
- Media, flow rates, and pressure ranges
- Routing challenge or integration goal
- Preferred material choice, such as PMMA or PEI
- Footprint, height, and installation limits
- Track, chamber, thread, or insert requirements
- Components to integrate, such as valves, fittings, or sensors
- Cleanability, validation, or environmental requirements
- Sketches, CAD data, or fluidic diagrams
- Project timeline or next milestone

Even partial input will be useful. The clearer the starting point, the easier it will be to steer the technical review in the right direction.

### Ready to review your concept with Festo?

This guide helped you check the main design areas that often determine the feasibility of the concept: Track geometry, layer structure, chamber design, thread and insert placement, material selection, and cost drivers.

Use these notes to highlight open questions before you share your concept with Festo and discuss feasibility, integration options, design priorities, and next project steps.

### → Request a project assessment

Start with your concept, sketch, CAD data, or fluidic diagram. Receive a clearer view of feasibility, design priorities, and the next technical steps.