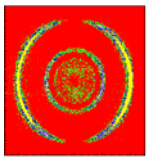
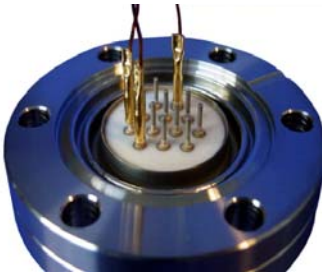
The FT4/12/16TP signal decoupler & flange mountings



RoentDek Handels GmbH

Supersonic Gas Jets
Detection Techniques
Data Acquisition Systems
Multifragment Imaging Systems

The **RoentDek** **FT4TP**, **FT12TP** and **FT16TP** signal decoupler sets are specific product assemblies to link **RoentDek** MCP-based detectors, i.e. **DET**, **DLD** and **HEX** with high-voltage supplying modules (such as **RoentDek** **HV2/4**) and with front-end electronics devices (e.g. **RoentDek** **FEE**) for further processing of detector signals to retrieve time and position coordinates for detected particles. Detailed functional descriptions are given in the respective detector manuals. The product assembly may also include flange-mounting gear for detectors, e.g. **FT12TP100** for mounting a **DLD40** on a DN**100**CF (ICF153) flange. Drawings of mounting gears are provided on the **RoentDek** website.



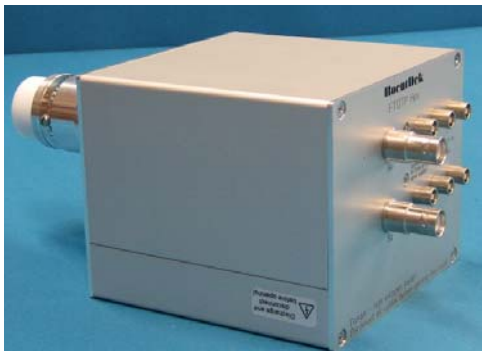
The product assemblies contain in-vacuum cables and connectors from the detector to special signal feedthroughs, for example a 12-pin feedthrough (**FT12**) on a DN40CF flange (see above) for delay-line detectors (e.g. **DLD**), while a **DET** timing detector requires a fourfold set of standard MHV or SHV feedthroughs, usually also grouped on a DNCF40 (ICF70) flange (**FT4**, **FT4shv**). The combination of **FT4** and **FT12(hex)** forms the **FT16** feedthrough assembly for connecting **HEX** detectors.

HFST signal terminator

Special plugs containing signal decoupling electronics circuits are connected to the air-side of these feedthroughs. They have one or several high voltage inputs (usually via SHV sockets) and signal outputs (usually as coaxial “lemo” sockets) and serve to separate (decouple) the weak high frequency signal, induced by particle impact on a detector contact from the high voltage (DC) load needed for MCP operation.

12TP signal decoupler

Single-channel HighFrequencySignalDecoupler (**HFSD**) sets are used for the **DET** timing detectors. Since decent signal quality requires control of signals potentially leaking from other detector parts there is also an AC-terminating version (**HFST**) of this plug. Combinations of two to four of these plugs are delivered as parts of the **FT4TP** product assembly for readout of **DET**.



12TPhex signal decoupler

The multi-channel **12TP** decoupler serves as the link between **DLD** and the **FEE2(x)** or **FEE5(x)** electronics sets and to high voltage supplies (e.g. **HV2/4**). It is usually supplemented by a **BA3** battery box for supplying both anode wire voltages from a single high voltage source. The version **12TPz** requires only two independent high voltage inputs are for completely biasing a **DLD**.

The **12TPhex** version of this plug (typically bundled with **BA3**) provides signal output for a Hexanode only: it has to be completed by a set of **HFSD and HFST**: **FT4TP** plus **FT12TPhex** forms the **FT16TP** product assembly, which is used for readout of **HEX** detectors.

All signal decouplers are passive units and do not require external operating voltages (the SHV inputs serve only for the detector bias). Decoupling plugs and feedthroughs are specified up to 4 kV (**FT4TPshv** up to 5 kV) DC input (or higher*).

Although armed with **SP1** discharge protection chips the internal circuits may be damaged by unsafe detector operation conditions or operational failures. Likewise, electronic units connected to the **FT4/12/16TP** can be damaged in this way.

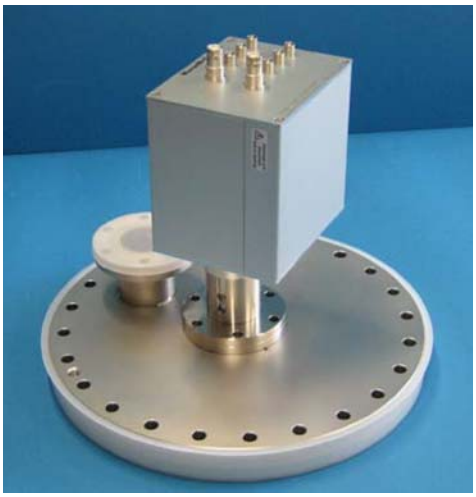
The size of the **HFSD and HSFT** case is 21 x 47 x 65 mm³, prolonged by the MHV/SHV sockets so that the full height of a connected **HFSD/T** over the DN40CF flange face is 115 mm for MHV and 106mm for SHV feedthroughs (+13 mm to the mounting flange face). Extra space must be provided for connecting an SHV cable to the socket. The latter is also to be considered for the **12TP(hex)**.

On demand **RoentDek** can supply customized versions of the **FT12TP** connector plug with almost any kind of internal signal decoupling circuits, serving for very different applications on demand.

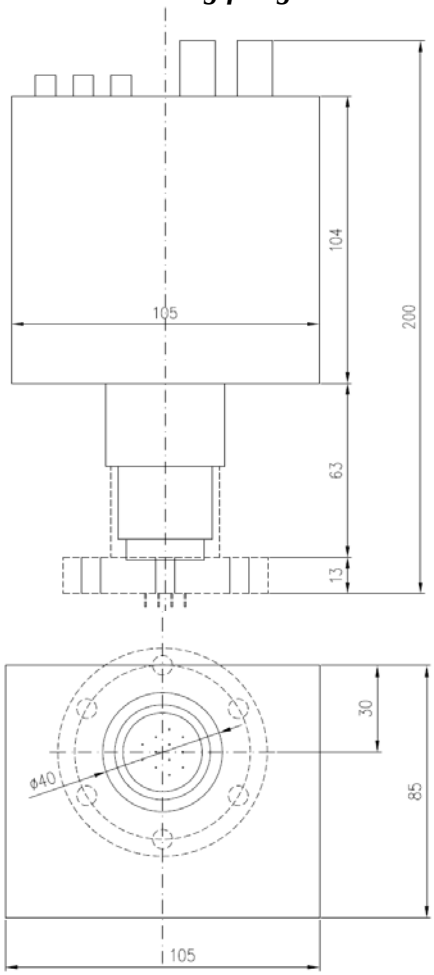
Likewise, **HFSD**-type decoupler may contain custom circuit on demand. This includes **HFSD/T** plugs for higher voltage ratings or with additional embedded circuits, e.g. like the internal **HVT**. This may increase the case size so that space restrictions apply, additional cables may then be needed to connect all leads of an **FT4**.

The simple **PinX12** pin extender for the **FT12** feedthrough can be used for verifying connections in vacuum or as base unit for test circuits.

PinX12 extender for FT12



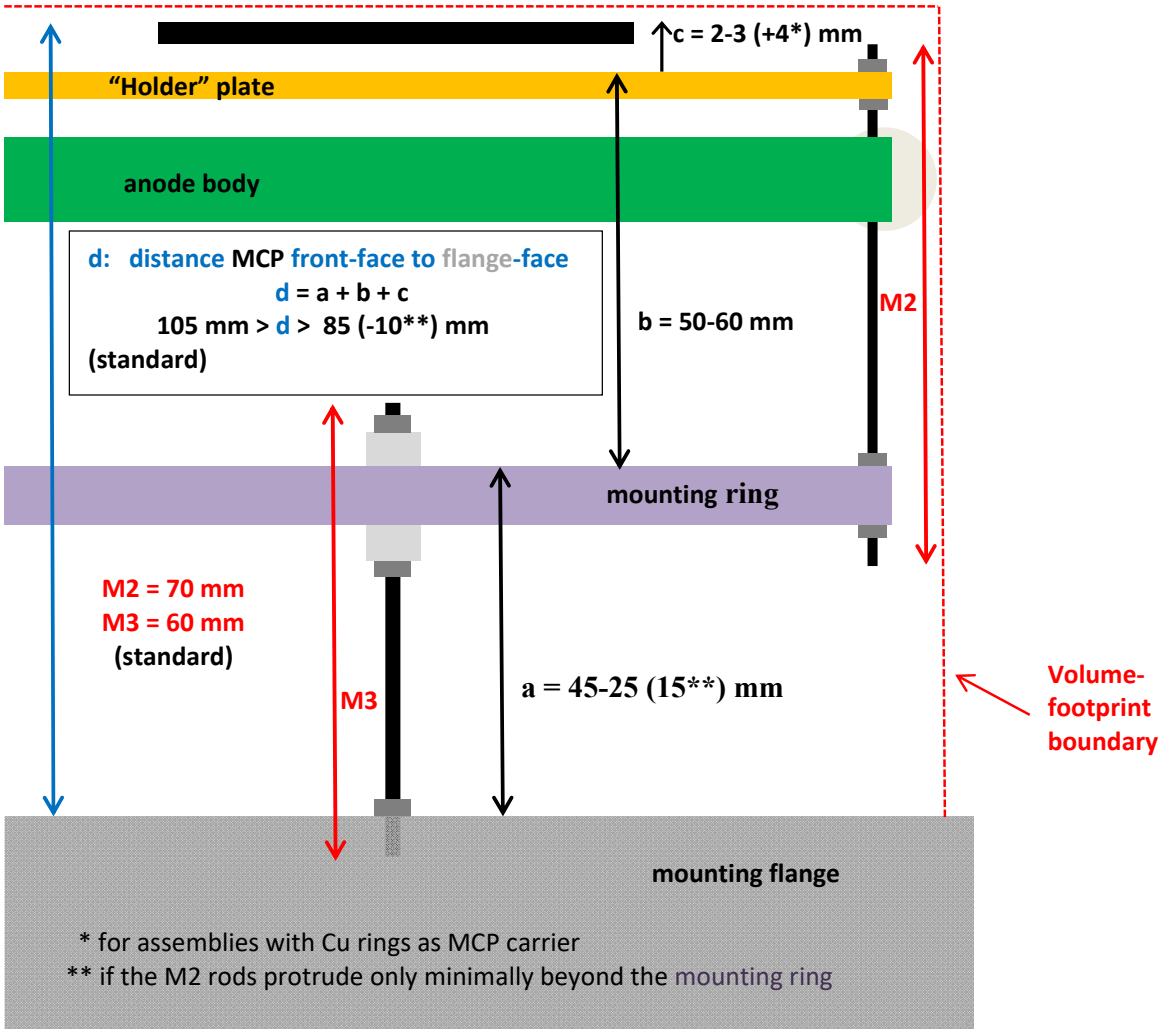
Mounting of FT12TP, here: Hex version on DN200CF-DN40CF² (or CF200-CF35², ICF253-ICF70²) detector mounting flange.



* Special versions of the **12TP(hex)** plugs serve as signal transforming units for **XHV** signal decoupling devices.

Flange mounting schemes:

RoentDek offers a standard flange mounting scheme for **DLD/HEX** and **DET** detectors, see figure below. For **FT4TP/XXX**, **FT12TP/XXX** or **FT16/TPXXX** the red digits define the nominal inner port diameter in mm for Conflat flanges, e.g. 100 mm for **FT12TP/100**, mating to an (ideally rotatable) DN100CF (ICF153, 6"-flange, …) port. The mounting flange contains sufficient DN40CF ports to install the feedthrough flange(s), being part of **FT4/12/16**, as well as tapped holes for mounting rods.



These mounting schemes have in common that an intermediate (mounting) ring is fixed on a (mounting) flange face via M3 rods screwed into tapped holes of the mounting flange face. The M3 rods then pass through holes (lined with insulating ceramic spacers) in the mounting ring and are fixed to it by nuts (a). Long threaded M2 rods (b) emerging from the detector serve to attach it to the mounting ring through holes via nuts. Thus, holder and mounting ring share the same potential, insulated from the M3 mounting rods via the ceramic spacers (specified for up 5 kV potential difference)*. The standard position of MCP front for this mounting scheme is at about 100 mm distance (d) from the flange face. This default distance can typically be fine-tuned within the range of +5 mm and -30 mm.

*except for certain **DET** mounting schemes and for Hexanodes larger than **HEX100**: Mounting ring can be on ground potential since here M3 rods from the anode are insulated from the mounting ring via ceramic or by using PEEK screws.

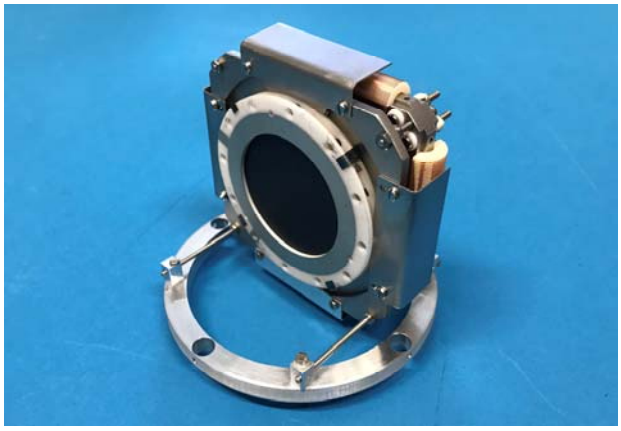
Options beyond the standard flange mounting scheme:

Smaller mounting distance: allowing for a smaller distance (d > 50 mm) between MCP front and flange face in case of **DLD** and **HEX** requires an alternative connection scheme of the anode wire terminals: Instead of the standard push-on pins pointing towards the rear one can use connection lugs that point inwards. However, this connection method can impose stress on the terminals during connecting and disconnecting of cables. Therefore, this scheme is not the most favorable option and requires extra handling care. These assemblies are only delivered with pre-mounted connection cables and **RoentDek** cannot take responsibility for the integrity of the anode if cables are removed/reconnected.

For **DET** detectors small mounting distances d around 50 mm can easily be achieved and are even recommended since shorter distances between feedthrough and anode typically yield smaller signal widths, being of advantage for certain applications. Mounting of the detector to an intermediate ring may alternatively be accomplished by PEEK screws/rods so that this ring may be at ground potential (see also below: *Alternative flange mounting for **DET40** and **DET25***).

Larger mounting distances can be achieved by using longer M3 rods. However, in case of horizontal detector insertion sag from detector weight may become remarkable as rod length is increased, especially for the bigger (heavier) detectors. This can be compensated to some extend by fortifying the M3 rods with a thick tube jacket, being the method of choice for intermediate mounting distances up to 200 mm. **RoentDek** can provide adequate tube jackets tailored for this application. Very large mounting distances > 200 mm, however, require more massive supporting bars, ending with M3 studs. On demand, **RoentDek** can supply such supporting bars which still allow certain fine adjustment, as common for the standard mounting scheme.

Mounting with rectangular detector positioning:
All previously described mounting schemes have in common that the MCP front face is parallel to the mounting flange. Alternatively, **RoentDek** provides special detectors such as the **DLD40SL**, designated for mountings with MCP front facing perpendicular to the mounting bar(s). A similar mounting scheme is also specified for a standard **DLD40**, see figure on the right: The **DLD40** is placed at right angle on its standard mounting ring.



Mounting schemes for high anode/holder potentials > 5 kV (**XHV**) require the use of ceramic distance pieces beyond the metal rods. **RoentDek** can provide such mounting schemes for at least up to 10 kV potential as add-on to any of the above-described options.

Reverse (custom) mounting:
The mounting ring can also be placed in front of the detector, as an alternative to rear-side (flange) mounting schemes. Some smaller detectors can also be fixed to a custom support via M3 threaded holes in the MCP carrier plates, allowing customer specific front-side mounting without using the standard mounting ring. This typically requires the use of M3 PEEK screws available from **RoentDek**.

Alternative flange mounting for **DET40** and **DET25**: