QBox

24 channel fully shielded Fischer to BNC breakout box specialized for low-noise and low-temperature experiments

QDevil
The Devil is in the detail

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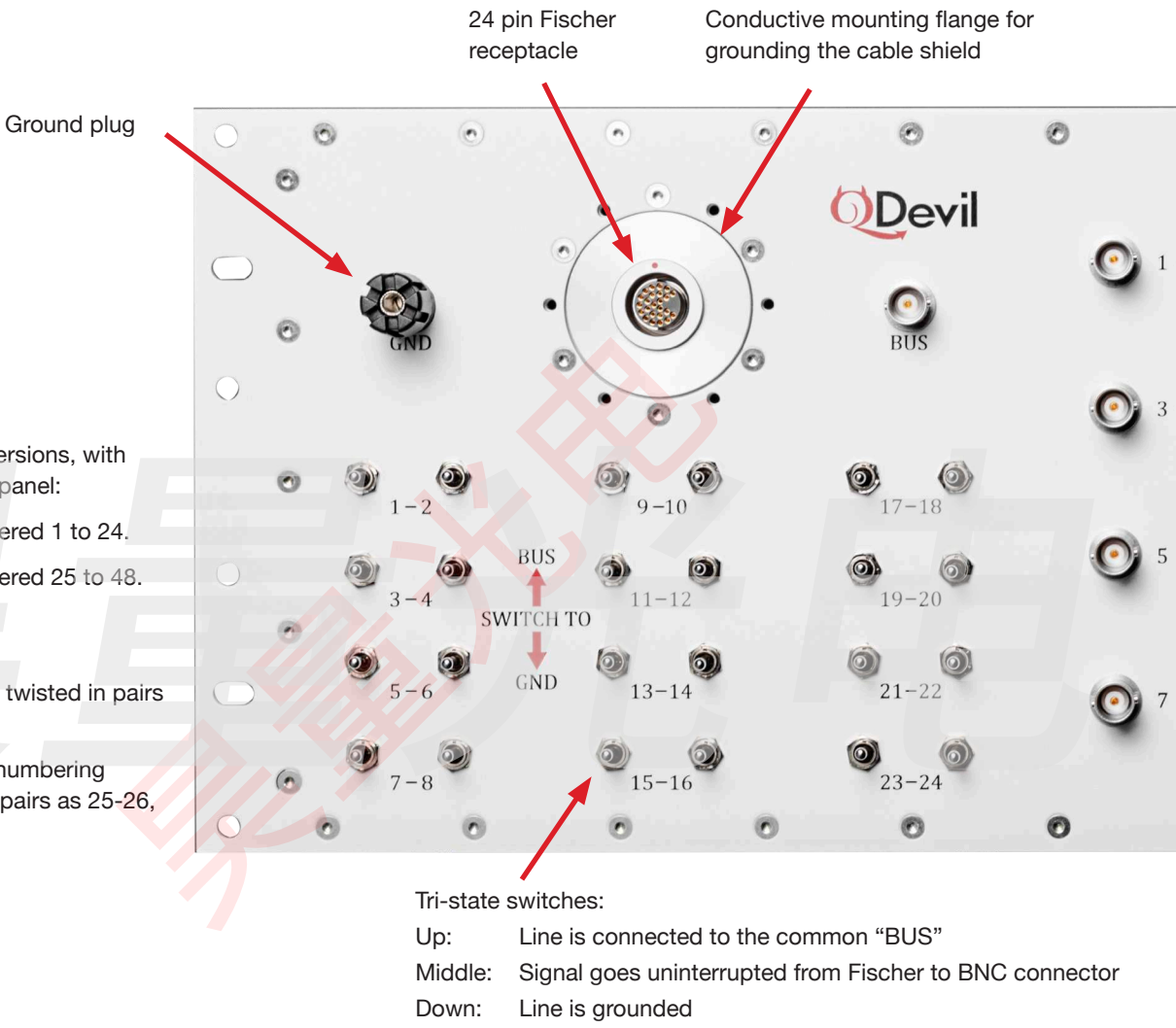
QBox

The QBox is a fully shielded breakout box specialized for electronics labs and low-temperature experiments. The QBox extends the Faraday cage of the cryostat going from a 24 pin Fischer connector to a convenient 24 channel BNC connector panel. All wiring inside the QBox is done in twisted pairs for best noise immunity. Switches enable connecting each channel directly to ground or a common bus, which greatly simplifies the measurement of ESD sensitive multi-terminal devices.



Numbering

The QBox comes in two versions, with different print on the front panel:

Q201: Channels are numbered 1 to 24.

Q202: Channels are numbered 25 to 48.

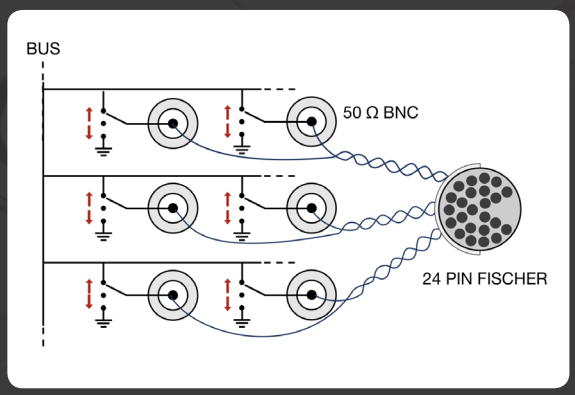
Twisted pairs

Inside the QBox, wires are twisted in pairs as 1-2, 3-4, … , 23-24.

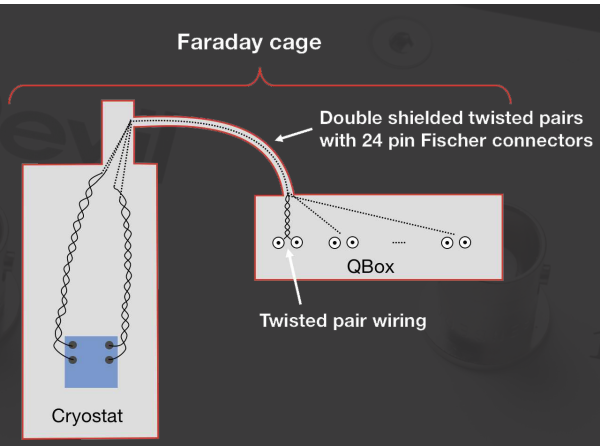
For the version with BNC numbering 25-48 wires are twisted in pairs as 25-26, 27-28, … , 47-48.

Tri-state switches:

Up:	Line is connected to the common “BUS”
Middle:	Signal goes uninterrupted from Fischer to BNC connector
Down:	Line is grounded



All BNC connectors are connected pair wise, using twisted leads, to the 24 pin Fischer receptacle. Each channel can be grounded or connected to common bus (BUS).



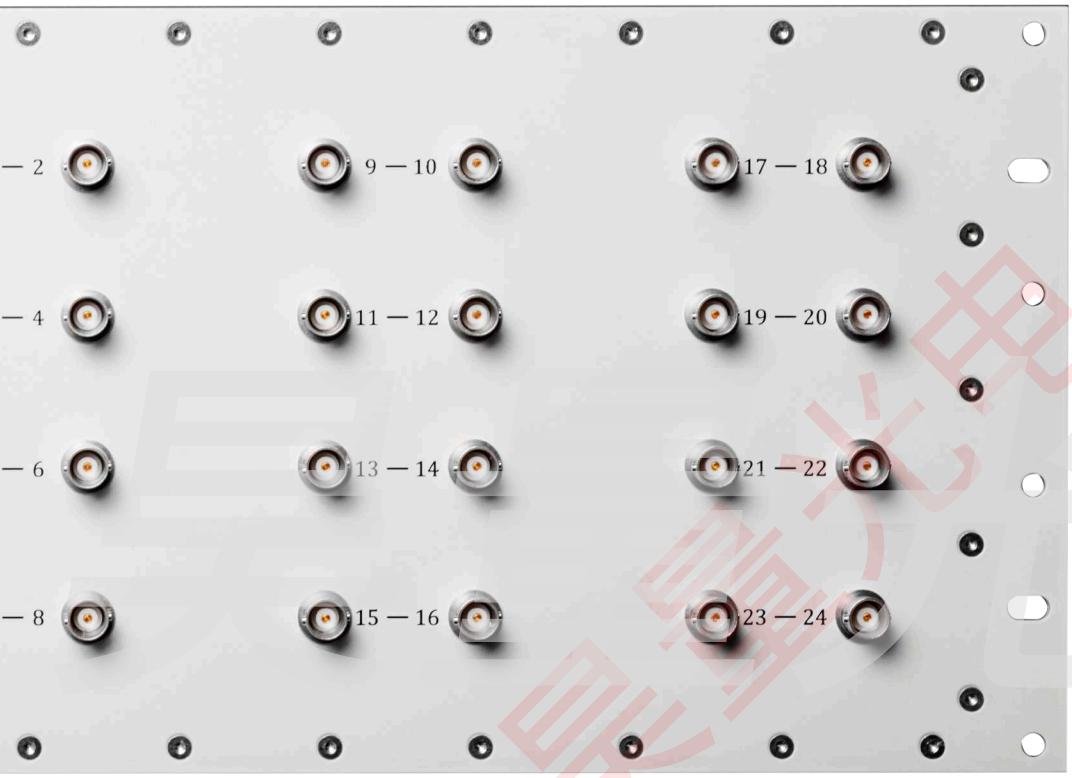
Appropriate for low-noise electrical measurements, the QBox and the Fischer cable extend the Faraday cage of the cryostat to the BNC panel.

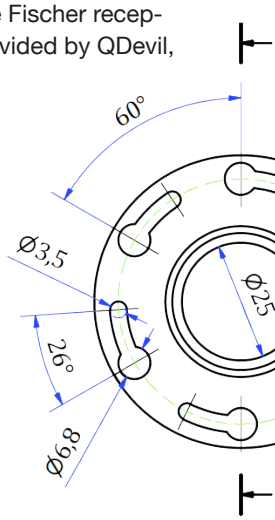
Grounding and shielding

To ensure efficient continuation of the Faraday cage of the cryostat, the shielding braid of the Fischer connector cable is coupled to a metal collar, which is fastened with screws to the mating conductive flange on the QBox.

Experience has shown that the ground impedance provided by the cryostat's Fischer receptacle alone can deteriorate over the course of several years. Therefore, for best results, QDevil recommends adding a grounding flange to the Fischer receptacle of your cryostat and adding a grounding collar at the cryostat-end of the cable. This is normally not provided by QDevil, but drawings can be provided on request.

As an alternative a grounding lug can be mounted at the end of the cable and connected to the cryostat.





Dimensions

The QBox fits in a standard 19" rack (occupying a height of 4U). To prevent ground loops, we recommend the use of electrically isolating mounting hardware.

Width: 483 mm
Height: 177.8 mm
Depth: 451 mm

Double shielded low noise cable

The QBox is used with a flexible, low-noise cable assembly with 24-channel Fischer connectors (plugs) in each end. Inside the cable, the wires are configured as twisted pairs which are individually shielded.

The cable comes with an additional braided metal shield which helps reducing noise pickup further. The metal braid is covered by a protective plastic braid, so that accidental ground connection is avoided. Attaching one end to the QBox, and the other end to the cryostat provides additional shielding and improved ground connection.

The Fischer connectors have protective caps, keeping the connector pins clean when not in use.

The end of the cable with the QBox grounding collar surrounding the 24 pin Fischer connector is shown here.

Item no.	Description
Q201	QBox 24 channel breakout box, numbered 1-24
Q202	QBox 24 channel breakout box, numbered 25-48
Q205	Cable assembly 24 ch. male Fischer to male Fischer, double-shielded twisted pairs, 3 meters

About QDevil

QDevil was founded in 2016 with the mission of developing and producing auxiliary electronic components specialized for quantum electronics research. Product development is done in close collaboration with universities, in particular with the University of Copenhagen.

QDevil's first product is the 24 channel QFilter for reducing electron temperature below 100 mK. It is built on a design developed and patented by Ferdinand Kuemmeth and Charles Marcus while working at Harvard University. The QFilter has been improved since the initial introduction, with high-quality metal connectors and better shielding.

The product portfolio has quickly increased with a 24-channel breakout box, the QBox, two sample holder boards, several specialty cables, and the QDAC, a 24- or 48-channel gate controller DA converter.

QDevil is continuously improving its products and reserves the right to change specifications without notice