

R&S® FE170ST / R&S® FE170SR External Frontends Manual



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Version 03

ROHDE & SCHWARZ
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This document describes the following FE170-type external frontends:

- R&S®FE170ST (1347.9190K02)
- R&S®FE170SR (1347.9090K02)

Available external devices:

- R&S®FE170-Z01 BP-Filter 110 - 136 GHz (1347.9532.02)
- R&S®FE170-Z02 BP-Filter 126 - 153 GHz (1347.9549.02)
- R&S®FE170-Z03 BP-Filter 143 - 170 GHz (1347.9555.02)

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Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®FE170ST is indicated as R&S FE170ST and R&S®FE170SR is indicated as R&S FE170SR.

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1 Safety information (multilingual)

This option or accessory is designed for a specific Rohde & Schwarz product. Multilingual safety information is delivered with the product. Follow the provided installation instructions.

Esta opción o este accesorio están diseñados para un producto Rohde & Schwarz concreto. El producto va acompañado de información de seguridad en varios idiomas. Siga las instrucciones de instalación puestas a disposición.

Diese Option oder dieses Zubehör ist für ein bestimmtes Rohde & Schwarz Produkt vorgesehen. Mit dem Produkt werden mehrsprachige Sicherheitsinformationen geliefert. Befolgen Sie die mitgelieferten Installationsanweisungen.

Cette option ou cet accessoire est conçu pour un produit Rohde & Schwarz spécifique. Des informations de sécurité multilingues sont fournies avec le produit. Suivez les instructions d'installation fournies.

Questa funzione opzionale o accessoria è progettata per un prodotto Rohde & Schwarz specifico. Con il prodotto sono fornite informazioni sulla sicurezza in formato multilingue. Seguire le istruzioni di installazione allegate.

Esta(e) opção ou acessório foi concebida(o) para um produto específico da Rohde & Schwarz. Serão fornecidas informações de segurança multilingues com o produto. Siga as instruções de instalação fornecidas.

Αυτή η προαιρετική επιλογή ή εξάρτημα έχει σχεδιαστεί για συγκεκριμένο προϊόν Rohde & Schwarz. Μαζί με το προϊόν παρέχονται πληροφορίες ασφαλείας σε πολλές γλώσσες. Ακολουθήστε τις παρεχόμενες οδηγίες εγκατάστασης.

Din l-għażla jew aċċessorju huma mfassla għal prodott Rohde & Schwarz speċifiku. L-informazzjoni multilingwi dwar is-sikurezza hija pprovduta mal-prodott. Segwi l-istruzzjonijiet ipprovduti għall-installazzjoni.

Deze optie of dit accessoire is ontwikkeld voor een specifiek product van Rohde & Schwarz. Het product wordt geleverd met veiligheidsinformatie in meerdere talen. Volg de meegeleverde installatie-instructies.

Denne mulighed eller tilbehørsdel er designet til et specifikt Rohde & Schwarz produkt. En flersproget sikkerhedsanvisning leveres sammen med produktet. Følg de medfølgende installationsanvisninger.

Detta tillval eller tillbehör är avsett för en särskild produkt från Rohde & Schwarz. Säkerhetsinformation på flera språk medföljer produkten. Följ de medföljande installationsanvisningarna.

Tämä vaihtoehto tai lisävaruste on suunniteltu tietyille Rohde & Schwarz -yrityksen tuotteelle. Tuotteen mukana on toimitettu monikieliset turvallisuusohjeet. Noudata annettuja asennusohjeita.

Dette alternativet eller ekstrautstyret er utformet for et spesifikt Rohde & Schwarz produkt. Flerspråklig sikkerhetsinformasjon leveres med produktet. Overhold installasjonsveiledningen som følger med.

See valik või lisaseade on mõeldud konkreetsele Rohde & Schwarz tootele. Tootege on kaasas mitmekeelne ohutusteave. Järgige kaasasolevaid paigaldusjuhiseid.

Štī opcija vai piederums ir izstrādāts īpaši Rohde & Schwarz produktam. Produktam pievienota drošības informācija vairākās valodās. Ievērojiet sniegtos uzstādīšanas norādījumus.

Ši parinktis ar priedas skirti konkrečiam Rohde & Schwarz gaminiui. Su gaminiu pateikiama saugos informacijos keliomis kalbomis. Laikykitės pateikiamų montavimo nurodymų.

Þessi auka- eða fylgibúnaður er hannaður fyrir tiltekna Rohde & Schwarz vöru. Öryggisupplýsingar á mörgum tungumálum fylgja með vörunni. Fylgið meðfylgjandi uppsetningarleiðbeiningum.

Tá an rogha nó an oiriúint seo ceaptha le haghaidh táirge Rohde & Schwarz sonrach. Cuirtear eolas sábháilteachta ilteangach ar fáil leis an táirge. Lean na treoracha suiteála a thugtar.

Эта опция или принадлежность предназначена для конкретного продукта Rohde & Schwarz. В комплект поставки продукта входят инструкции по технике безопасности на нескольких языках. Соблюдайте прилагаемые инструкции по установке.

Ця опція або приладдя призначені для конкретного виробу Rohde & Schwarz. Інструкції з техніки безпеки кількома мовами постачаються разом із виробом. Дотримуйтеся наданих інструкцій зі встановлення.

Ta opcja lub akcesorium jest przeznaczona do określonego produktu Rohde & Schwarz. Dostarczany produkt zawiera informacje w wielu językach dotyczące bezpieczeństwa. Należy postępować zgodnie z dostarczonymi instrukcjami instalacji.

Tato varianta nebo příslušenství je určeno pro konkrétní produkt Rohde & Schwarz. S produktem jsou dodávány vícejazyčné bezpečnostní informace. Řiďte se příloženými pokyny k instalaci.

Táto verzia alebo príslušenstvo je navrhnutá pre špecifický výrobok Rohde & Schwarz. S výrobkom sa dodávajú viacjazyčné bezpečnostné pokyny. Riadte sa dodanými pokynmi na inštaláciu.

Ta možnost ali dodatek je zasnovan za določen izdelek podjetja Rohde & Schwarz. Izdelku so priložena varnostna navodila v več jezikih. Upoštevajte priložena navodila za namestitev.

Ezt a beállítást vagy tartozékot egy adott Rohde & Schwarz termékhez tervezték. A termékhez többnyelvű biztonsági információkat mellékelünk. Kövesse a mellékelt szerelési utasításokat.

Тази опция или аксесоар са проектирани за специфичен продукт на Rohde & Schwarz. Многоезикова информация за безопасност се доставя с продукта. Следвайте предоставените инструкции за монтаж.

Ova opcija ili oprema namijenjena je za određeni proizvod tvrtke Rohde & Schwarz. Uz proizvod su dostavljene sigurnosne napomene na više jezika. Pratite isporučene upute za ugradnju.

Ova opcija ili pribor je dizajniran za određeni Rohde & Schwarz proizvod. Proizvodu su priložene sigurnosne informacije na više jezika. Slijedite priložena uputstva za instalaciju.

Ova opcija ili dodatni pribor je projektovan za određeni Rohde & Schwarz proizvod. Bezbednosne informacije na više jezika se isporučuju uz proizvod. Sledite dostavljena uputstva za instalaciju.

Această opțiune sau acest accesoriu a fost conceput pentru un produs specific Rohde & Schwarz. Informațiile multilingve privind siguranța sunt livrate împreună cu produsul. Urmați instrucțiunile de instalare furnizate.

Ky opsion ose aksesori është krijuar për një produkt specifik Rohde & Schwarz. Bashkë me produktin jepen edhe informacionet e sigurisë në shumë gjuhë. Ndiqni udhëzimet e dhëna të instalimit.

Оваа опција или додаток се наменети за одреден производ на Rohde & Schwarz. Со производот се испорачани повеќејазични безбедносни упатства. Следете ги дадените упатства за инсталација.

Bu opsiyon veya aksesuar, belirli bir Rohde & Schwarz ürünü için tasarlanmıştır. Çok dilli güvenlik uyarıları ürünle birlikte teslim edilir. Size sağlanan kurulum talimatlarına uyun.

Şu opsiya ýa-da esbap Rohde & Schwarz anyk önüm üçin niýetlenilen. Dürli dil-däki howpsuzlyk barada maglumat önüm bilen bile üpjün edilyär. Üpjün edilen gurnama ugrukdymalaryny ýerine ýetiriň.

इस विकल्प या एक्सेसरी को एक विशेष Rohde & Schwarz उत्पाद के लिए डिज़ाइन किया गया है. उत्पाद के साथ बहुभाषी सुरक्षा जानकारी दी जाती है. प्रदान किए गए इंस्टालेशन अनुदेशों का पालन करें.

本选项或附件专门设计用于特定的 Rohde & Schwarz 产品。产品随附多种语言版本的安全资讯。谨遵文件中的安装说明。

本オプションアクセサリは、特定の Rohde & Schwarz 製品向けに設計されています。多言語で記載された安全情報が製品に付属します。付属のインストール手順に従ってください。

이 옵션 또는 액세서리는 특정 Rohde & Schwarz 제품용으로 설계되었습니다. 제품과 함께 다국어로 작성된 안전 정보가 제공됩니다. 함께 제공된 설치 지침을 따르십시오.

本選配或配件專門設計用於特定的 Rohde & Schwarz 產品。產品隨附多種語言版本的安全資訊。遵守文件中的安裝說明。

Tùy chọn hoặc phụ kiện này dành riêng cho một sản phẩm Rohde & Schwarz cụ thể. Thông tin an toàn đa ngôn ngữ được cung cấp kèm theo sản phẩm. Thực hiện theo hướng dẫn lắp đặt kèm theo.

ตัวเลือกหรืออุปกรณ์เสริมนี้ออกแบบมาสำหรับผลิตภัณฑ์ Rohde & Schwarz โดยเฉพาะ โดยจะมีการจัดส่งข้อมูลด้านความปลอดภัยหลายภาษามาให้พร้อมกับผลิตภัณฑ์ ปฏิบัติตามคำแนะนำในการติดตั้งที่ให้ไว้

Pilihan atau aksesori ini direka bentuk untuk produk Rohde & Schwarz yang tertentu. Maklumat keselamatan berbilang bahasa disertakan bersama produk. Ikut arahan pemasangan yang diberikan.

Opsi atau aksesori ini dirancang untuk produk Rohde & Schwarz tertentu. Informasi keamanan dalam beberapa bahasa juga disertakan bersama produk. Ikuti petunjuk pemasangan yang disediakan.

Esta opción o este accesorio están diseñados para un producto Rohde & Schwarz en concreto. El producto va acompañado de información de seguridad en varios idiomas. Siga las instrucciones de instalación proporcionadas con el producto.

Esta opção ou acessório foi desenvolvido para um produto Rohde & Schwarz específico. Informações de segurança em vários idiomas acompanham o produto. Siga as instruções de instalação disponibilizadas.

אפשרות זו או האביזר מיועדים למוצר ספציפי של Rohde & Schwarz. מידע רב-לשוני בנושא בטיחות מצורף למוצר. יש לפעול בהתאם להנחיות ההתקנה המצורפות.

تم تصميم هذا الخيار أو الملحق لمنتج معين من منتجات Rohde & Schwarz. يتم تزويد معلومات السلامة متعددة اللغات مع المنتج. اتبع تعليمات التركيب الموضحة.

این قابلیت یا وسیله جانبی منحصراً برای محصول به خصوص Rohde & Schwarz طراحی شده است. اطلاعات ایمنی چندزبانه همراه این دستگاه ارائه شده است. دستور العمل‌های نصب ارائه شده را دنبال کنید.

اس اختیار یا حصے کو مخصوص Rohde & Schwarz پروڈکٹ کے لئے تیار کیا گیا ہے۔ پروڈکٹ کے ساتھ کثیر السانی زبانوں میں تحفظ کی معلومات فراہم کی جاتی ہیں۔ فراہم کردہ تنصیب کی ہدایات پر عمل کریں۔

2 About the FE170ST/SR

Intended use

The FE170-type external frontend (FE) is intended as an accessory for various control instruments, e.g. a Rohde & Schwarz vector signal generator. Observe the operating conditions and performance limits stated in the data sheet.

Target audience

This document targets at all users, including technicians, operators, administrators and maintenance personnel. The required skills and experience of the users depend on the test setup and application in which the accessory is used.

Safety information in the documentation

Safety information warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

The documentation helps you use the FE170ST/SR safely and efficiently. Keep the documentation nearby and offer it to other users.

2.1 Key features R&S FE170ST

- Frequency up-conversion for D-band signals (110 GHz to 170 GHz)
- 10 GHz supported RF bandwidth
- RF connector with output peak envelope power (PEP) of -40 dBm to -15 dBm
- Internal or external local oscillator (LO) with excellent phase noise performance
- LAN plug-and-play solution, fully integrated and controlled by a vector signal generator
- Fully calibrated solution, with correction data of IF cables and frontend considered by vector signal generator
- Small size, easy usage and operation
- Short cabling distances to the device under test (DUT)

For a detailed specification, refer to the data sheet.

2.2 Key features R&S FE170SR

- Frequency down-conversion for D-band signals (110 GHz to 170 GHz)
- Up to 8.3 GHz analysis bandwidth with R&S FSW signal analyzer
- Up to 10 GHz analysis bandwidth with R&S RTP oscilloscope
- RF connector with input peak envelope power (PEP) of -100 dBm to +15 dBm
- Internal or external local oscillator (LO) with excellent phase noise performance
- Additional external devices allow for reduced LO feedthrough and image rejection
- LAN plug-and-play solution, fully integrated and controlled by a Rohde & Schwarz signal analyzer
- Fully calibrated solution, with correction data of IF cables and frontend considered by signal analyzer
- Small size, easy usage and operation
- Short cabling distances to the device under test (DUT)

For a detailed specification, refer to the data sheet.

2.3 Documentation overview

The following documents are relevant when operating the FE170ST/SR.

2.3.1 Safety instructions of the product

Delivered with the product this accessory is designed for.

2.3.2 This manual

Describes the steps from delivery to installation. Further information is provided in the user manual of the control instrument.

www.rohde-schwarz.com/manual/fe170st

www.rohde-schwarz.com/manual/fe170sr

2.3.3 Related documentation

Frontend control documentation

To find out how to use the FE170ST/SR in setups with this control instrument, see

- Frontend control user manual of the control instrument
- User manual of the control instrument

To control the R&S FE170ST, see the frontend control user manual of the Rohde & Schwarz vector signal generator.

To control the R&S FE170SR, see the user manual of the Rohde & Schwarz signal analyzer or the Rohde & Schwarz oscilloscope.

Accessory life-cycle information

Use the control instrument user manual to look up life-cycle information topics:

- Meaning of signal words used in warning messages
- Maintenance tasks
- Transport
- Storage
- Disposal

Exemplary control instrument user manuals:

- Vector signal generator: www.rohde-schwarz.com/manual/SMW200A
- Signal analyzer: www.rohde-schwarz.com/manual/FSW

2.3.4 Data sheet and brochure

The data sheet contains the technical specifications of the FE170ST/SR. It also lists the options and their order numbers.

The brochure provides an overview of the instrument and deals with the specific characteristics.

www.rohde-schwarz.com/brochure-datasheet/fe170st

www.rohde-schwarz.com/brochure-datasheet/fe170sr

2.4 Korea certification class A



이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

3 Unpacking and checking

1. Unpack the FE170ST/SR carefully.
2. Retain the original packing material. Use it when transporting or shipping the FE170ST/SR later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the equipment for damage.

If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

4 Setting up the FE170ST/SR

The FE170-type external frontend is used exclusively in test setups with a control instrument, e.g. the R&S SMW200A.

To place the FE170ST/SR on a bench top

You can place the FE170-type external frontend horizontally or vertically on a bench top.

1. Place the FE170-type external frontend on a stable, flat and level surface.
2. If you want to stack the FE170-type external frontend together with other products:
 - a) Follow the instructions given for the other products.
 - b) Place the FE170-type external frontend on top or in front of the control instrument.

For information on stacking, see the user manual of the control instrument.

3. **NOTICE!** Overheating can damage the product.

Prevent overheating as follows:

- Keep a minimum distance of 10 cm between the fan openings of the FE170-type external frontend and any object in the vicinity.
- Do not place the FE170-type external frontend next to heat-generating equipment such as radiators or other products.

To mount the FE170ST/SR

You can mount the FE170-type external frontend with the height adjustment R&S ZZA-FE01, e.g. outside of an RF shield box or on a wafer prober.

1. Choose a stable, flat and level surface. Ensure that the surface can support the weight of the FE170-type external frontend. For information on the weight, see the data sheet.

2. **NOTICE!** Overheating can damage the product.

Prevent overheating as follows:

- Keep a minimum distance of 10 cm between the fan openings of the FE170-type external frontend and any object in the vicinity.
- Do not place the FE170-type external frontend next to heat-generating equipment such as radiators or other instruments.

3. Unscrew the shock protection from the FE170-type external frontend.
 - a) To mount the FE170-type external frontend vertically, unscrew the four shock protections on the bottom.
 - b) To mount the FE170-type external frontend horizontally, unscrew the four shock protections on the left side or right side.
4. Screw the R&S ZZA-FE01 to the FE170-type external frontend as replacement for the shock protection. Use the same screws.
5. Depending on your test setup, mount the FE170-type external frontend as follows:
 - a) Screw the FE170-type external frontend with the mounted R&S ZZA-FE01 to the surface of, e.g. the RF shield box.
 - b) Screw high adjustment screws into the holes of the R&S ZZA-FE01.

If you mount the FE170-type external frontend with R&S ZZA-FE01 to use the external frontend in your test setup, it looks like this:

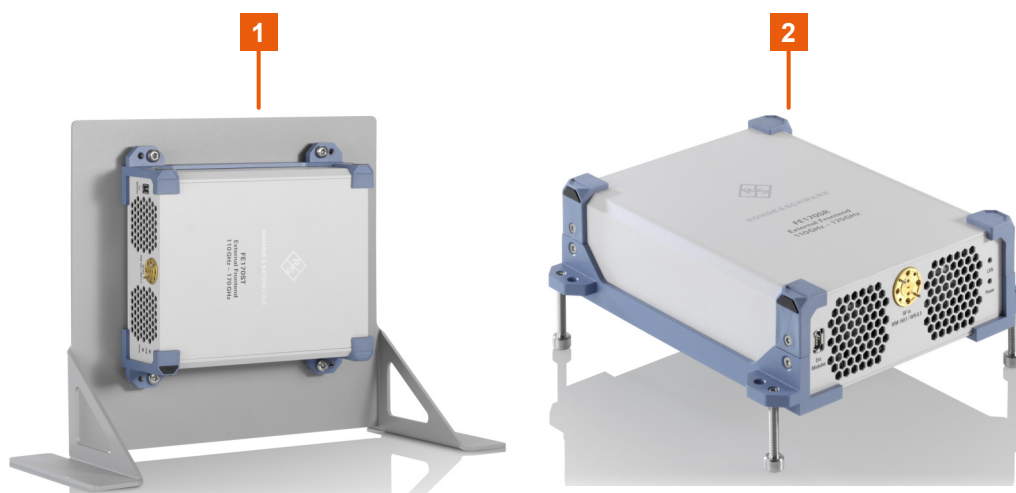


Figure 4-1: FE170-type external frontend with R&S ZZA-FE01

1 = mounted on a demonstrator

2 = with high adjustment screws on a flat surface

For more information, see data sheet and assembly instructions.

5 Connecting the FE170ST/SR

When connecting the FE170-type external frontend in your test setup, use the cables provided with the delivery.

5.1 Considerations for test setup

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Besides the cables delivered with the FE170-type external frontend, use high-quality shielded cables for the following connector types:
 - SMA and 2.92 mm: RF cables that match this connector type.
How to: [Chapter 5.5, "Connecting to SMA and 2.92 mm connectors"](#), on page 21.
 - LAN: at least CAT6+ cables.
How to: [Chapter 5.3, "Connecting to LAN"](#), on page 19
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

Signal input and output levels

Information on signal levels is provided in the data sheet. Keep the signal levels within the specified ranges to avoid damage to the FE170-type external frontend and connected devices.

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT.

- ▶ **NOTICE!** Electrostatic discharge can damage the electronic components of the product and the device under test (DUT).

Ground yourself to prevent electrostatic discharge damage:

- a) Use a wrist strap and cord to connect yourself to ground.

- b) Use a conductive floor mat and heel strap combination.

5.2 Connecting to power

Only use the external power supply and the AC power cable delivered with the FE170-type external frontend.

For safety information, see the instructions delivered with the external power supply. Required ratings of the DC input level and maximum current are listed next to the socket and in the data sheet.

1. Connect the DC power cable to the socket of the power supply connector on the rear panel.
For R&S FE170ST, see [Figure 6-3](#).
For R&S FE170SR, see [Figure 6-4](#).

2. Connect the appliance coupler of the AC power cable to the external power supply.

3. Insert the AC power plug into a power outlet with ground contact.

If connected to power, the FE170-type external frontend switches on automatically. On the front panel of the FE170-type external frontend, the "Power" LED switches from gray to green, see [Table 5-1](#).

Alternatively, you can power the FE170-type external frontend via power over Ethernet (PoE++) injector, for example to allow longer distances for power connection. Power and data are transferred over the same Ethernet cable. For more information, see the documentation of your PoE injector.

To troubleshoot hardware problems

Both a red "Power" LED and red "LAN" LED indicate hardware problems that result in a malfunction of the FE170-type external frontend. If hardware problems occur, the FE170-type external frontend switches to a safe state. The LAN connection is aborted.

If the "Power" LED or the "LAN" LED or both are red, proceed as follows:

1. Switch off the FE170-type external frontend.
You do not need to disconnect the cabling.

2. Switch on the FE170-type external frontend.

How to: [Chapter 5.7, "Switching on or off"](#), on page 26

If hardware problems persist, contact Rohde & Schwarz customer support.

Status LEDs

Status LEDs indicate the power and LAN state.

Table 5-1: Overview power states

LED	Power state
● gray	Power Off
● green	Power On
● red	Error

Table 5-2: Overview LAN connection states

LED	LAN connection state
● no light / gray	Not active
● green	Connected to LAN
● orange	Connected to control instrument
● red	Error

5.3 Connecting to LAN

To connect to LAN

- ▶ Connect the LAN socket on the rear panel via an RJ-45 cable to the LAN.
If connected, the "LAN" LED is green, see [Table 5-2](#).

IP address assignment

The IP address is assigned automatically by one of the following methods:

- By default, the FE170-type external frontend is configured to use DHCP (dynamic host configuration protocol) and no static IP address is configured. If switched on and connected to the LAN, the FE170-type external frontend dis-

Connecting to the waveguide connector

plays the IP address information on the electronic label with "IP Addr.". See [Chapter 6.3, "Electronic label"](#), on page 34.

- If the network does not support DHCP or the attempt does not succeed, the external frontend tries to obtain the IP address via Zeroconf (APIPA) protocol. IP addresses assigned via Zeroconf start with the number blocks 169.254.*.*.
Note: An IP address that is assigned via the Zeroconf protocol although the network requires an IP address assigned via the DHCP server can cause network connection failures.

You can also assign the IP address of the FE170-type external frontend manually on the control instrument.

See ["Frontend control documentation"](#) on page 12.

To reset the IP address

If for example, a manually assigned IP address of the FE170-type external frontend is located in another subnet than the IP address of the control instrument, you can reset the IP address of the FE170-type external frontend.

Prerequisites: The frontend is switched on and connected to LAN.

- ▶ Press the "IP Preset" button on the rear panel of the FE170-type external frontend using a pointed tool for about 1 second.

After resetting, the FE170-type external frontend reboots.

5.4 Connecting to the waveguide connector

The "RF Out" (R&S FE170ST) or "RF In" (R&S FE170SR) connector is a WR-6.5 waveguide connector.

The precision waveguide flange of the WR-6.5 waveguide connector provides two pins and two holes for aligning the DUT.

1. Remove the protective cap from the waveguide connector on the front panel.
2. Inspect the waveguide flange connector visually to check that it is clean, undamaged and mechanically compatible.

Thus, you prevent insertion loss and mismatch, and even premature wear of the connectors.

Connecting to SMA and 2.92 mm connectors

- Carefully align the pins to the holes of the WR-6.5 waveguide connectors on the DUT to the holes of the connector on the FE170-type external frontend until they match.

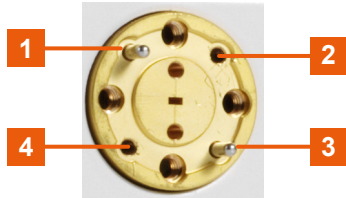



Figure 5-1: WR-6.5 waveguide connector

1, 3 = Alignment pin
2, 4 = Hole for pin of the DUT

- Carefully put the WR-6.5 waveguide connectors of the DUT and the FE170-type external frontend together.
- NOTICE!** Excessive tightening can damage the connectors.
Screw the WR-6.5 waveguide connectors together:
 - Align the screw of the WR-6.5 waveguide connector to the screw thread of the opposite connector.
 - Use a calibrated torque wrench to torque the screw to 0.58 Nm, e.g. R&S ZCTW (order no. 1175.2014.02).

5.5 Connecting to SMA and 2.92 mm connectors

The "IF out" (R&S FE170SR) connector, the "Ref In" connector and the "LO In"/"LO Out" connectors are SMA female connectors. The "IF In" (R&S FE170ST) connector is a 2.92 mm connector.

 For information on how to handle and maintain the screwable connectors, to minimize measurement deviations and ensure its longevity, see application note [1MA99](#).

- Inspect the connector visually to check that it is clean, undamaged and mechanically compatible.
Thus, you prevent insertion loss and mismatch, and even premature wear of the connectors.

Connecting to a control instrument

2. **NOTICE!** Excessive reverse power at the RF connector can damage the instrument.
Make sure that the signal power is within the limits as given in the data sheet.
3. **NOTICE!** DC voltage at the RF connector can damage the instrument. Never apply DC voltage to the RF input connectors.
Make sure that the values are within the DC limits given in the data sheet.
If necessary, insert a DC blocker.
4. **NOTICE!** Excessive tightening can damage the connectors.
To connect the cable with the connector on the rear panel, proceed as follows:
 - a) Carefully align the connector of the cable along a common axis.
 - b) Mate the connectors along the common axis until the male pin of the inner connector engages with the female socket of the outer connector.
 - c) Turn the nut of the outer connector until the connectors are firmly coupled.
 - d) Use a calibrated torque wrench to torque the nut to the limit as in the table below. Hold the opposite connector part stationary with a spanner.

Table 5-3: Connector type, name, size, torque limit and nut opening

Connector		Torque limit		Nut opening	
Type	Name	lb-Inch	Nm	Inch	mm
SMA	IF Out (R&S FE170SR) Ref In LO In LO Out	5	0.56	5/16	8
2.92 mm	IF In (R&S FE170ST)	8	0.9	5/16	8

Tighten the connectors enough so that the measurement results are accurate.

5.6 Connecting to a control instrument

Operating the FE170-type external frontend requires a control connection (LAN) with the control instrument.

The FE170-type external frontend is off but connected to power.

1. Connect the FE170-type external frontend via LAN to the control instrument.

How to: [Chapter 5.3, "Connecting to LAN"](#), on page 19

2. Connect the SMA and 2.92 mm connectors.

How to: [Chapter 5.5, "Connecting to SMA and 2.92 mm connectors"](#), on page 21.

5.6.1 Test setup with R&S FE170ST

Test setup with an external frontend connected to a vector signal generator as control instrument and an antenna, which is mounted inside an RF shield box.

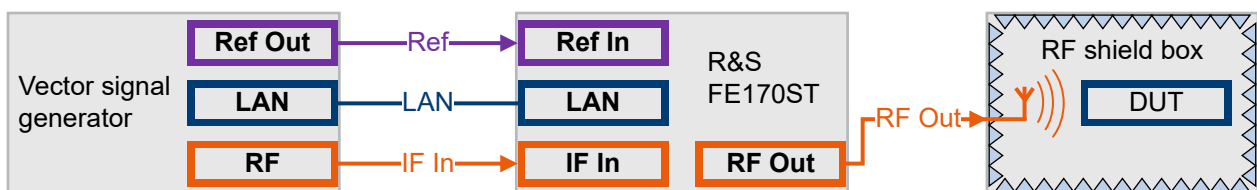


Figure 5-2: Test setup R&S FE170ST with vector signal generator

5.6.2 Test setup with R&S FE170SR

Test setup with an external frontend connected to a signal analyzer as control instrument and an antenna, which is mounted inside an RF shield box.

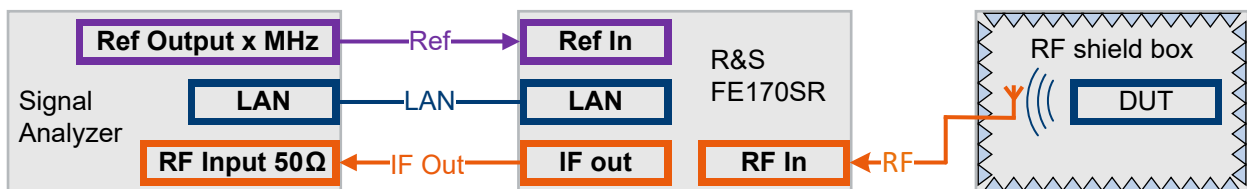


Figure 5-3: Test setup R&S FE170SR with signal analyzer

5.6.3 Adding external devices to a test setup

The IX type B connector allows you to connect up to two additional external devices, e.g. a filter or an amplifier, to the FE170-type external frontend in a test setup. Using an IX cable, correction data and device information for the external device is transferred to the FE170-type external frontend and to the connected control instrument. The data and information is used for the internal level correction of the control instrument.

Recommended frequency ranges for external filters

The supported frequency ranges of the available external filters overlap. For best results regarding image suppression and LO feedthrough, for example, use the filter according to the frequency range listed in [Table 5-4](#).

Table 5-4: Recommended frequency ranges for external filters

Frequency Range	Bandpass Filter
$110 \text{ GHz} \leq f_{\text{in/out}} \leq 131 \text{ GHz}$	R&S FE170-Z01
$131 \text{ GHz} < f_{\text{in/out}} \leq 148 \text{ GHz}$	R&S FE170-Z02
$148 \text{ GHz} < f_{\text{in/out}} \leq 170 \text{ GHz}$	R&S FE170-Z03

5.6.3.1 To connect external devices to the R&S FE170ST

Test setup

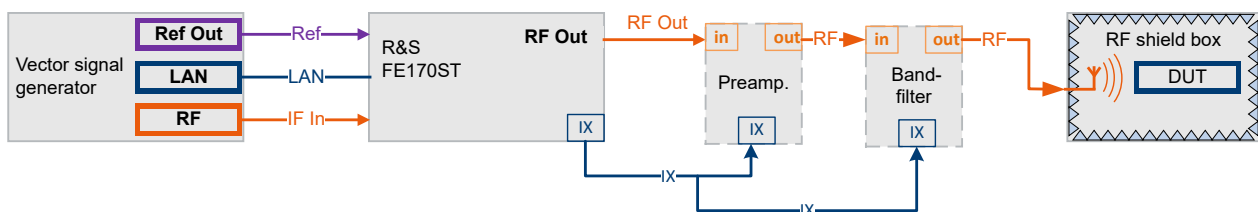


Figure 5-4: R&S FE170ST with additional external devices (vector signal generator as control instrument)

1. Connect the RF output of the R&S FE170ST to the RF input of the external device.
2. Connect the IX connector of R&S FE170ST with the cable provided with the device to the IX type B connector on the external device.
To connect two external devices, connect the provided IX Y-cable to both external devices.
See [Chapter 6.1.1, "IX type B connector"](#), on page 29.
Note: You can add only one external device of the same type to the test setup.
3. Connect the RF output of the external device to the DUT.

See ["Frontend control documentation"](#) on page 12.

5.6.3.2 To connect external devices to the R&S FE170SR

Test setup

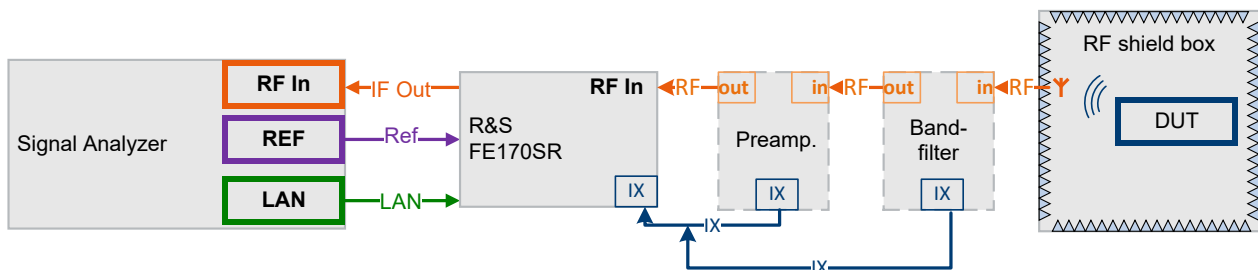


Figure 5-5: R&S FE170SR with additional external devices (signal analyzer as control instrument)

1. Connect the RF output of the DUT to the RF input of the external device.
2. Connect the RF output connector of the external device to the "RF In" connector of the R&S FE170SR, as described in [Chapter 5.4, "Connecting to the waveguide connector"](#), on page 20.
3. Connect the IX cable provided with the device to the IX type B connector on the external device.
To connect two external devices, connect the provided IX Y-cable to both external devices.
Note: You can add only one external device of the same type to the test setup.
4. Connect the other end of the IX cable to the IX type B connector on the front panel of the R&S FE170SR.
See [Chapter 6.1.1, "IX type B connector"](#), on page 29.

See "[Frontend control documentation](#)" on page 12.

5.6.4 Test setup with multiple frontends

In a test setup with more than one FE170-type external frontend, you can build a phase coherent test setup when using the same LO signal for all connected frontends. In this setup, couple the LO output and LO input of the external frontends as shown in the examples.

Test setup with LO signal from R&S FE170ST

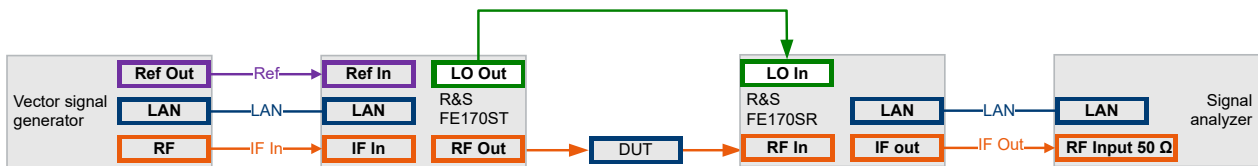


Figure 5-6: Phase coherent test setup with LO signal from R&S FE170ST

Test setup with LO signal from R&S FE170SR

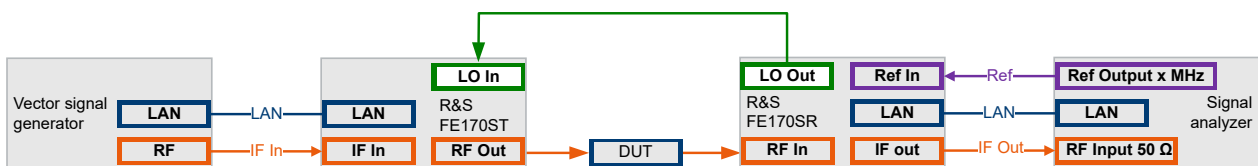


Figure 5-7: Phase coherent test setup with LO signal from R&S FE170SR


For information on configuration, see ["Frontend control documentation"](#) on page 12.

5.7 Switching on or off

Once connected to power, the FE170-type external frontend switches on automatically (see [Chapter 5.2, "Connecting to power"](#), on page 18). If the FE170-type external frontend is switched off but connected to power, you can switch on the FE170-type external frontend manually.

To switch on the FE170-type external frontend manually

The FE170-type external frontend is switched off, but connected to power. The "Power" LED is gray. See [Table 5-1](#).

- ▶ On the rear panel of the FE170-type external frontend, press the "Power" key .

See [Chapter 6.2.10, "Power key"](#), on page 34.

The "Power" LED changes to green. The FE170-type external frontend boots.

To switch off the FE170-type external frontend

The FE170-type external frontend is switched on.

- ▶ **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.

Press the "Power" key  for one to two seconds.

The "Power" LED changes to gray.

To disconnect from power

The FE170-type external frontend is switched off.

- ▶ Disconnect the DC power cable from the socket of the power supply connector.

6 FE170ST/SR tour

This chapter provides an overview of the control elements and connectors of the FE170-type external frontend.

The meanings of the labels on the FE170-type external frontend are described in [Chapter 6.3, "Electronic label"](#), on page 34.

6.1 Front panel tour

This section gives an overview of the front panel elements of the FE170-type external frontend.

R&S FE170ST front panel

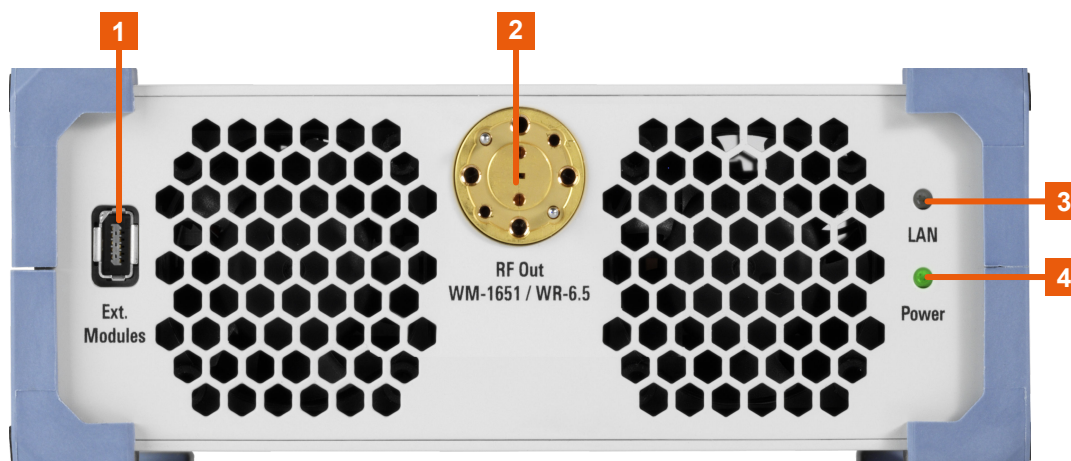


Figure 6-1: R&S FE170ST front panel

- 1 = IX type B connector
- 2 = RF Out / RF In connector
- 3 = LAN status LED
- 4 = Power status LED

R&S FE170SR front panel

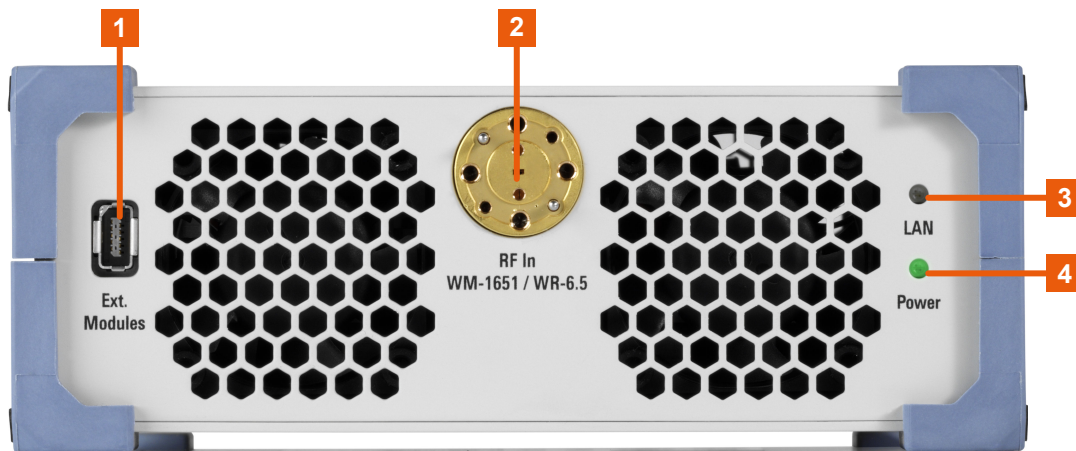


Figure 6-2: R&S FE170SR front panel

- 1 = IX type B connector
- 2 = RF Out / RF In connector
- 3 = LAN status LED
- 4 = Power status LED

6.1.1 IX type B connector

The IX type B connector allows you to connect external devices to the FE170-type external frontend. Using the provided IX cable, correction data and device information for the external device is transferred to the FE170-type external frontend and to the connected control instrument. Thus, the control instrument cannot only detect the external devices, but also consider their correction data for the RF signal.

To connect two external devices to the FE170-type external frontend, use the provided IX Y-cable to combine the two IX inputs from the devices. Connect them to the IX type B connector on the FE170-type external frontend.

The IX type B connector can provide power of +11.5 V or -5.0 V. For details, also on supported external devices, see the data sheet.

See "[Frontend control documentation](#)" on page 12.

6.1.2 RF Out / RF In connector

The "RF Out" (R&S FE170ST) or "RF In" (R&S FE170SR) connector is a WR-6.5 waveguide connector for RF signal output or RF signal input in a frequency range of 110 GHz to 170 GHz.

How to: [Chapter 5.4, "Connecting to the waveguide connector"](#), on page 20.



Always replace the protective caps on the waveguide connectors for transport and storage.

Cleaning the waveguide connector

► **NOTICE!** Liquids or compressed air can imperceptibly damage the waveguide connector.

Considerations for cleaning the waveguide connector:

- Do not use any cleaning agents or compressed air for cleaning. Liquids and in particular compressed air damage the printed circuits inside the waveguide.
- Use a dry, lint-free cloth to clean the test port flange surface.

6.1.3 LAN status LED

The "LAN" LED indicates the LAN connection state, see [Table 5-2](#).

6.1.4 Power status LED

The "Power" LED indicates the power state, see [Table 5-1](#).

6.2 Rear panel tour

This section provides an overview of the rear panel elements of the FE170-type external frontend.

Rear panel (R&S FE170ST)

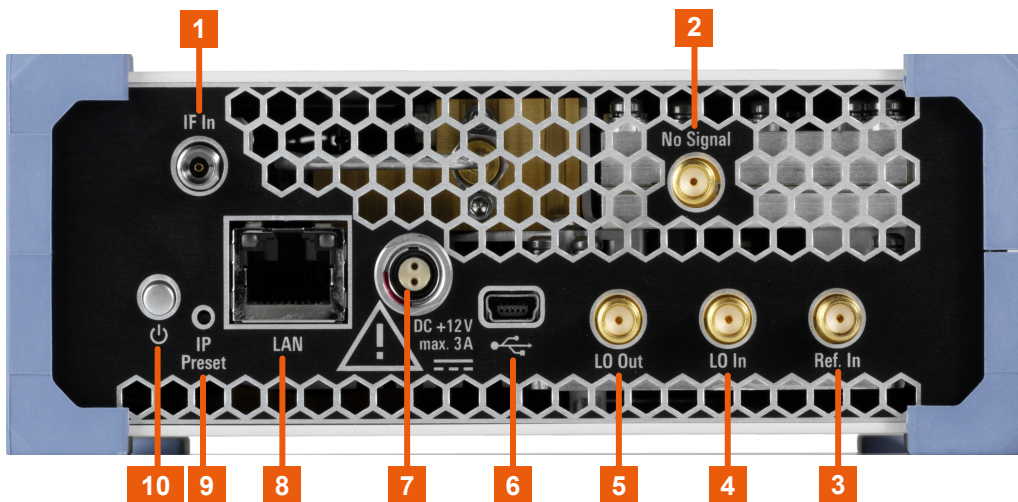


Figure 6-3: R&S FE170ST rear panel

- 1 = IF In connector (R&S FE170ST)
- 2 = No Signal connector (R&S FE170ST)
- 3 = Ref In connector
- 4, 5 = LO In/LO Out connector
- 6 = USB In connector
- 7 = Power supply connector
- 8 = LAN connector
- 9 = IP Preset button
- 10 = Power key

Rear panel (R&S FE170SR)

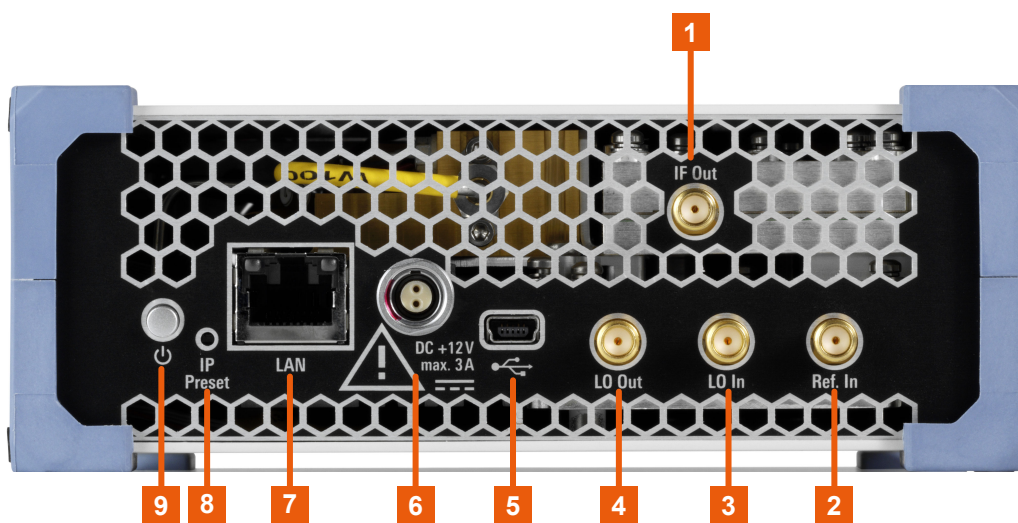


Figure 6-4: R&S FE170SR rear panel

- 1 = IF Out connector (R&S FE170SR)
- 2 = Ref In connector
- 3, 4 = LO In/LO Out connector
- 5 = USB In connector
- 6 = Power supply connector
- 7 = LAN connector
- 8 = IP Preset button
- 9 = Power key

6.2.1 IF In connector (R&S FE170ST)

Female 2.92 mm connector for input of the intermediate frequency (IF) signal from the control instrument.

How to: [Chapter 5.5, "Connecting to SMA and 2.92 mm connectors"](#), on page 21.

6.2.2 No Signal connector (R&S FE170ST)

SMA female connector, reserved for future use.

6.2.3 IF Out connector (R&S FE170SR)

SMA female connector for output of the intermediate frequency (IF) signal to the control instrument.

How to: [Chapter 5.5, "Connecting to SMA and 2.92 mm connectors"](#), on page 21.

6.2.4 Ref In connector

SMA female connector for providing a reference signal for the synthesizer inside the FE170-type external frontend.

How to: [Chapter 5.5, "Connecting to SMA and 2.92 mm connectors"](#), on page 21

6.2.5 LO In/LO Out connector

SMA female connectors for local oscillator (LO) input and output in phase coherent test setups with more than one FE170-type external frontend.

- "LO In": Input of LO signal

- "LO Out": Output of LO signal

How to: [Chapter 5.5, "Connecting to SMA and 2.92 mm connectors"](#), on page 21.

6.2.6 USB In connector

Type-B USB 2.0 input connector for service purposes.

6.2.7 Power supply connector

Main power supply connector for connection of the external DC power supply.

How to: [Chapter 5.2, "Connecting to power"](#), on page 18

6.2.8 LAN connector

RJ-45 connector to connect the FE170-type external frontend to a LAN. Connection is required to control the FE170-type external frontend by a control instrument.

How to: [Chapter 5.3, "Connecting to LAN"](#), on page 19

6.2.9 IP Preset button

The "IP Preset" button resets the IP settings of the FE170-type external frontend to factory settings. The button is only accessible via a pointed tool to avoid accidental resets.

See ["To reset the IP address"](#) on page 20.

To resolve firmware update problems

Prerequisite: The frontend is switched off.

1. Press the "IP Preset" button on the rear panel of the FE170-type external frontend using a pointed tool.
2. While pressing the "IP Preset" button, switch on the FE170-type external frontend using the "Power" key on the front panel.

3. Release both the button and the key.

The previous firmware version is restored.

6.2.10 Power key

Power key to switch on and switch off the FE170-type external frontend.

How to: [Chapter 5.7, "Switching on or off"](#), on page 26

6.3 Electronic label

The electronic label is located on the right side panel of the frontend casing. If connected to a LAN, it displays specific network parameters, see [Table 6-1](#).

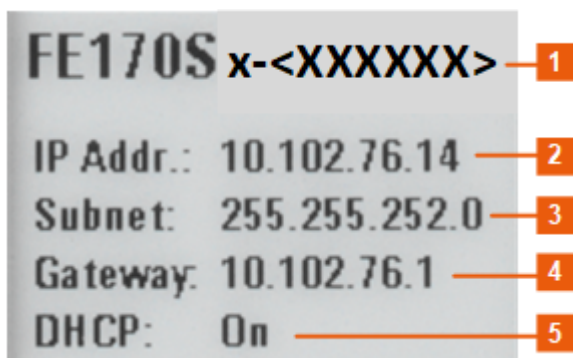


Table 6-1: Electronic label elements

Label	Label element	Description
1	FE170S<x>-<xxxxxx>	<Frontend name>-<Serial number> Displays the hostname that contains the frontend name (FE170S<x>) and the 6-digit serial number (<xxxxxx>) of the frontend. Each frontend has an individual hostname. You can use this hostname to search for your frontend in a LAN instead of the IP address.
2	IP Addr.	Displays the IP address of the frontend in the network.
3	Subnet	Displays the bit group of the subnet in the host identifier.

Label	Label element	Description
4	Gateway	Displays the gateway address. This address identifies the router that is used to forward traffic to destinations beyond the local network. The router belongs to the same network as the frontend.
5	DHCP	Displays the state of the DHCP (dynamic host configuration protocol). <ul style="list-style-type: none">• On: Configuration via DHCP is used.• Off: A static IP address is configured.

7 Contacting customer support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:



Figure 7-1: QR code to the Rohde & Schwarz support page