

# MINI-LINK™

— E —

## Installation Manual

# MINI-LINK E

## Installation Manual

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# 1 Introduction

## 1.1 MINI-LINK E

MINI-LINK E is a microwave radio link for digital transmission. It consists of an indoor access module and an outdoor radio unit with antenna module.

MINI-LINK E can be configured to meet any network requirements for capacity and range. It provides radio transmission links from 2 up to 17x2 (34+2) Mbit/s, operating within the 7 to 38 GHz frequency bands.

MINI-LINK E can be configured for unprotected terminals (1+0), protected terminals (1+1) or for ring protection.

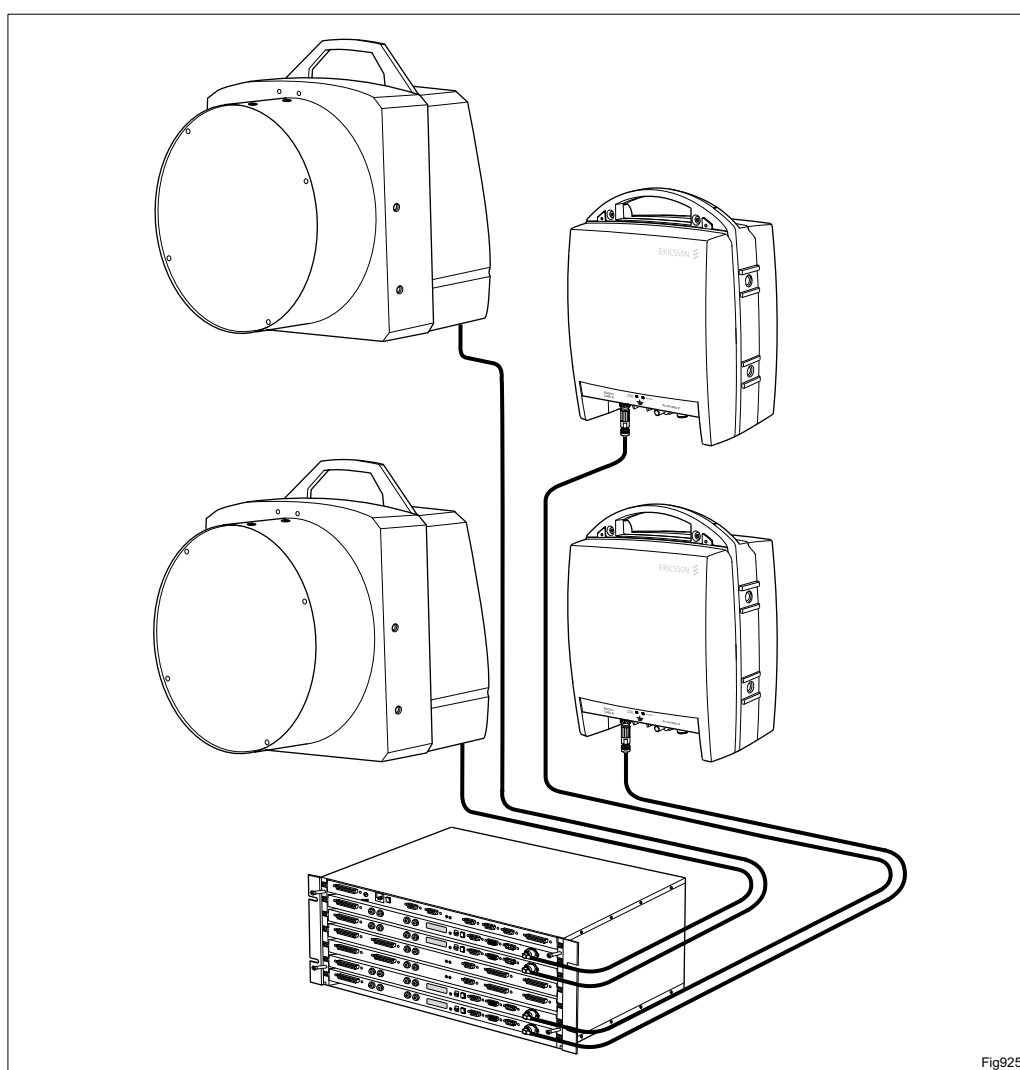


Figure 1-1. MINI-LINK E terminals in an access module magazine.

Up to four MINI-LINK E terminals can be integrated into one common access module magazine. Different configurations, traffic capacities and frequency bands can be combined. Software controlled traffic routing between terminals minimizes cabling.

## 1.2 How to use this Manual

This manual describes how to install MINI-LINK E radio units, antennas, indoor units and accessories.

The manual includes the following chapters:

### **1. Introduction**

*Chapter 1* gives a brief description of MINI-LINK E and this manual. It also gives information about other documents for the MINI-LINK E products.

### **2. Safety**

*Chapter 2* describes safety regulations and requirements as well as safety information used throughout the manual.

### **3. Technical Description**

*Chapter 3* describes the function and design of the main parts of MINI-LINK E.

### **4. Indoor Installation**

*Chapter 4* contains job instructions for installation of the access module and of indoor accessories ①.

### **5. Outdoor Installation, RAU1**

*Chapter 5* contains job instructions for installation of the RAU1 radio unit ②, the antenna module and associated accessories.

### **6. Outdoor Installation, RAU2**

*Chapter 6* contains job instructions for installation of the RAU2 radio unit ③, the antenna module and associated accessories.

### **7. Radio Cable Installation**

*Chapter 7* contains job instructions for the cabling procedure ④, between the radio unit and the access module.

### **8. Software Setup and Antenna Alignment**

*Chapter 8* contains job instructions for the software setup using the display and the switch on the MMU. Software installation with PC is described in a separate manual (see section 1.3). This chapter also contains information on how to align the antenna.

### **9. Local Supervision and Functional Test**

*Chapter 9* contains a description of the Local Supervision interface and job instructions for functional testing when the installation is completed.

### **10. Technical Data**

*Chapter 10* includes the technical data required for the installation of MINI-LINK E.

### **11. Index**

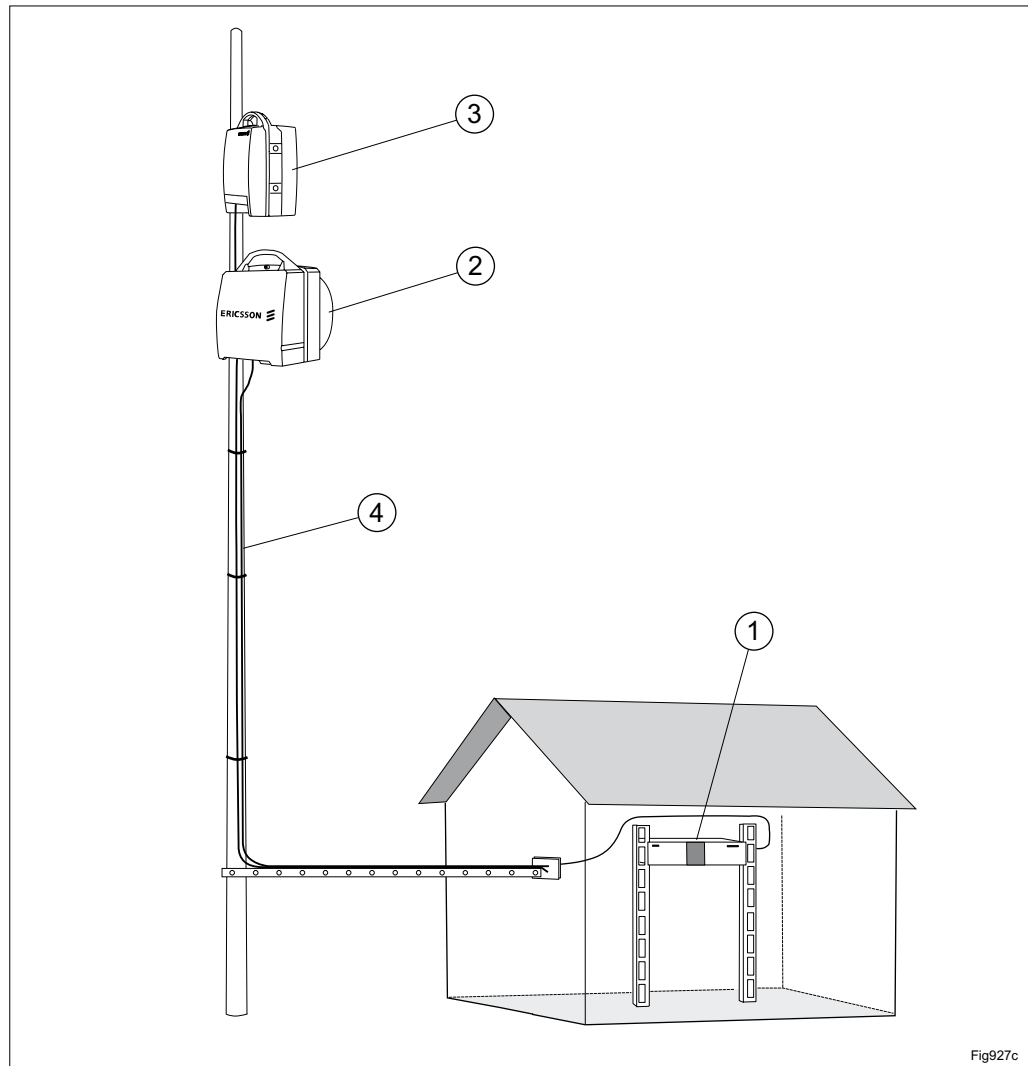


Figure 1-2: MINI-LINK E equipment.

- ① Indoor unit
- ② Outdoor unit, RAU1
- ③ Outdoor unit, RAU2
- ④ Radio cable

## 1.3 Reference Documents for MINI-LINK E

EN/LZT 110 2011	<b>MINI-LINK E and E Micro, Product Catalogue</b> The catalogue is intended to be an aid when compiling an order or simply to give an overview of the radio-link products in the MINI-LINK E-program.
EN/LZT 110 2012	<b>MINI-LINK E and E Micro, Technical Description</b> The description gives a detailed technical and functional description of the main products in the MINI-LINK E program.
EN/LZT 110 5048	<b>MINI-LINK Network Management, Technical Description</b> The document describes the network management system for MINI-LINK equipment.
EN/LZT 110 2013	<b>MINI-LINK E, Planning and Engineering Manual</b> The manual describes how to realize a MINI-LINK network. The purpose is to support both the networks planning phase and the realization phase.
EN/LZT 110 5057	<b>MSM Operation Manual</b> The manual describes how to use the MSM software, including setup, traffic routing, alarm status, control and performance handling of the network, alarm log presentation, trouble shooting and testing of the terminal.
EN/LZT 110 5044	<b>MINI-LINK Netman, Installation and Configuration Manual</b> The manual describes how to install, configure and maintain MINI-LINK Netman software for MINI-LINK networks.
EN/LZT 110 5043	<b>MINI-LINK Netman, Operation Manual</b> The manual describes how to operate the MINI-LINK Netman Client program for the MINI-LINK networks.
EN/LZT 110 5088	<b>MXU Installation Instruction</b> This instruction describes how to install the MINI-LINK cross-connect unit (MXU).
EN/LZT 110 5089	<b>MXU Setup Instruction</b> This instruction describes how to set up the MINI-LINK cross-connect unit (MXU).
EN/LZT 123 4867	<b>MXU Reference Manual</b> Reference manual for MXU
EN/LZT 110 2083 R1A	<b>Installation Instruction for TMR 9202</b> This instruction describes a recommend installation procedure for MINI-LINK E equipment in the transmission cabinet, TMR 9202.
EN/LZT 110 2084 R1A	<b>Installation Instruction for RBS 2101 and RBS 2102</b> This instruction describes a recommend installation procedure for MINI-LINK E equipment in the transmission cabinet, RBS 2101 and RBS 2102.

## 1.4 Terminology

The terms used in this manual are listed below.

<b>Access Module</b>	Indoor part, it consists of an AMM equipped with indoor units (MMU, SMU and SAU) for several terminals (up to four radios).
<b>AGC</b>	Automatic Gain Control
<b>Alignment port</b>	Testport which indicates received signal level. Used for antenna alignment.
<b>AMM</b>	Access Module Magazine.
<b>CSS</b>	Control and Supervision System, which supports building of networks for operation and maintenance.
<b>EAC</b>	External Alarm Channel.
<b>ESD</b>	Electro Static Discharge.
<b>DDU</b>	DC Distribution Unit.
<b>Hop</b>	A radio link connection with a pair of communicating terminals.
<b>LED</b>	Light Emitting Diode.
<b>MMU</b>	Modem Unit.
<b>MSM</b>	MINI-LINK Service Manager. MSM is a computer software package used for service of MINI-LINK network terminals, including installation and fault finding.
<b>MUX</b>	Multiplexer.
<b>MXU</b>	Cross-connect unit.
<b>NCC</b>	Node Communication Channel.
<b>Netman</b>	MINI-LINK Netman is the element manager for a MINI-LINK network.
<b>RAC</b>	Remote Alarm Channel.
<b>RAU</b>	Radio Unit.
<b>RAU1</b>	Version 1 of the radio unit.
<b>RAU2</b>	Version 2 of the radio unit.
<b>SAU</b>	Service Access Unit.
<b>SMU</b>	Switch Multiplexer Unit.
<b>Site</b>	A place with one or several MINI-LINK terminals.
<b>Terminal</b>	One side of a radio-link connection or an SAU with a unique identity in the network.



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## 2 Safety Instructions

### 2.1 Introduction

This chapter describes the system used for presenting safety information.

**Note:** Reduce the risk of accidents by studying all the instructions carefully before you start working. If questions arise regarding the safety instructions, contact your supervisor or your local Ericsson representative.

This manual and specific instructions supplied by Ericsson must be followed in any work performed on Ericsson products or systems. Sufficient knowledge of English or of any of the other languages in which the manuals or instructions are available is necessary.

Ericsson does not take any responsibility for injuries on persons and/or damage to the equipment which are caused by work performed on Ericsson products and/or systems in conflict with the safety regulations set out in this manual.

### 2.2 Safety Standards

The equipment meets the requirements for class I according to EN 60950 (IEC 950) and EN 60215 (IEC 215). The degree of protection provided by the enclosure is IP 20 for indoor equipment and IP 54 for outdoor equipment according to EN 60529 (IEC 529).

### 2.3 Safety Requirements

The safety requirements below must be considered to avoid injuries on persons and/or damage to the equipment.

#### 2.3.1 Service Personnel

Installation and service must be carried out by authorized personnel having appropriate technical training and experience necessary to be aware of hazards during installation and service and of measures to minimize any danger to themselves or any other person.

#### 2.3.2 Access to Equipment

Access to equipment in use shall be restricted to service personnel.

#### 2.3.3 Safety Regulations

Use local safety regulations where these are mandatory. The safety instructions in this manual shall be used as a supplement to the local regulations. In case of conflict between the safety instructions in this manual and the local safety regulations, the local safety regulations shall prevail if these are mandatory. If the local regulations are not mandatory, then the safety instructions in this manual shall prevail.

### **2.3.4 Installation Hardware**

Do not use any installation components (screws, nuts etc) other than what is enclosed with the equipment or recommended by the MINI-LINK manufacturer.

### **2.3.5 Installation Procedures and Tools**

The installation procedures in this manual must be followed. Make sure that:


- The instructions in the manual are followed
- The recommended tools are used
- Adequate safety devices are used.
- You are aware of the risk of falling objects.


As a guide to identify potentially hazardous installation steps, safety symbols according to section 2.4 are used throughout the manual.

## 2.4 Safety Symbols and Definitions

This section shows the system used for presenting safety information.

The following three levels, shown in urgency order, are used.

<b>DANGER</b> 	<b>Danger means that an accident may occur if the safety precautions are neglected. This type of accident is likely to be fatal.</b>
--	--

<b>WARNING</b> 	<b>Warning means that an accident may occur if the safety precautions are neglected. This type of accident may be fatal or can cause serious injury.</b>
---	--

<b>CAUTION</b> 	<b>Caution means that an accident may occur if the safety precautions are neglected. This type of accident may cause minor injury and/or damage to the equipment.</b>
---	---

## 2.5 Notes

**Note:** Notes are used to call the reader's attention to key points that might otherwise be overlooked.

## 2.6 Other Cautions

### 2.6.1 ESD



The ESD symbol indicates when external ESD protection must be used to avoid possible damage to the equipment.

## 2.6.2 Microwave Radiation

<b>CAUTION</b> <b>!</b>	<b>Microwave radiation can endanger your health. Ensure the transmitters are switched OFF before working close to the antennas.</b>
----------------------------	---

- No dangerous levels of microwave radiation exist outside the antenna feeder. However, the body shall not be exposed to the radiation in front of the antenna ( $<0.5$  m from the feeder) for a long time ( $>6$  minutes), see ENV 50166-2.
- The transmitter must be switched off before removing the equipment in order to avoid microwave radiation.

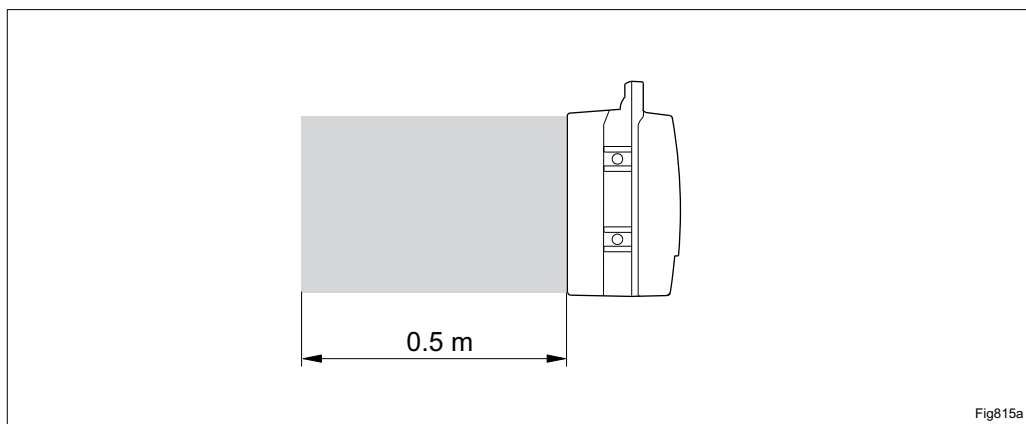


Figure 2-1. Restricted area.

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# 3 Technical Description

## 3.1 Introduction

The MINI-LINK E terminal consists of two main parts:

- An outdoor part, which is fully independent of traffic capacity and supplied for various frequency bands. The outdoor part consists of an antenna module, a radio unit (RAU) and associated installation hardware. The antenna and the radio are either integrated or installed separately. For protected systems (1+1), two radio units and one or two antennas are used. The outdoor part is interconnected to the indoor part with a single coaxial cable.
- An indoor part, the access module, which is fully independent of frequency band and supplied in different versions for various traffic capacities and system configurations. The indoor part consists of a Modem Unit (MMU) and an optional Switch Multiplexer Unit (SMU). For protected systems, two modem units and one switch multiplexer unit are used. An optional Service Access Unit (SAU) can be shared between terminals. For ring protection the optional MINI-LINK Cross-connect Unit (MXU) can be used. All indoor units are housed in one common access module magazine (AMM). Different access module magazines are available for different terminal configurations as well as for network nodes comprising several terminals

The integrated control and supervision system continuously monitors the transmission quality and alarm status.

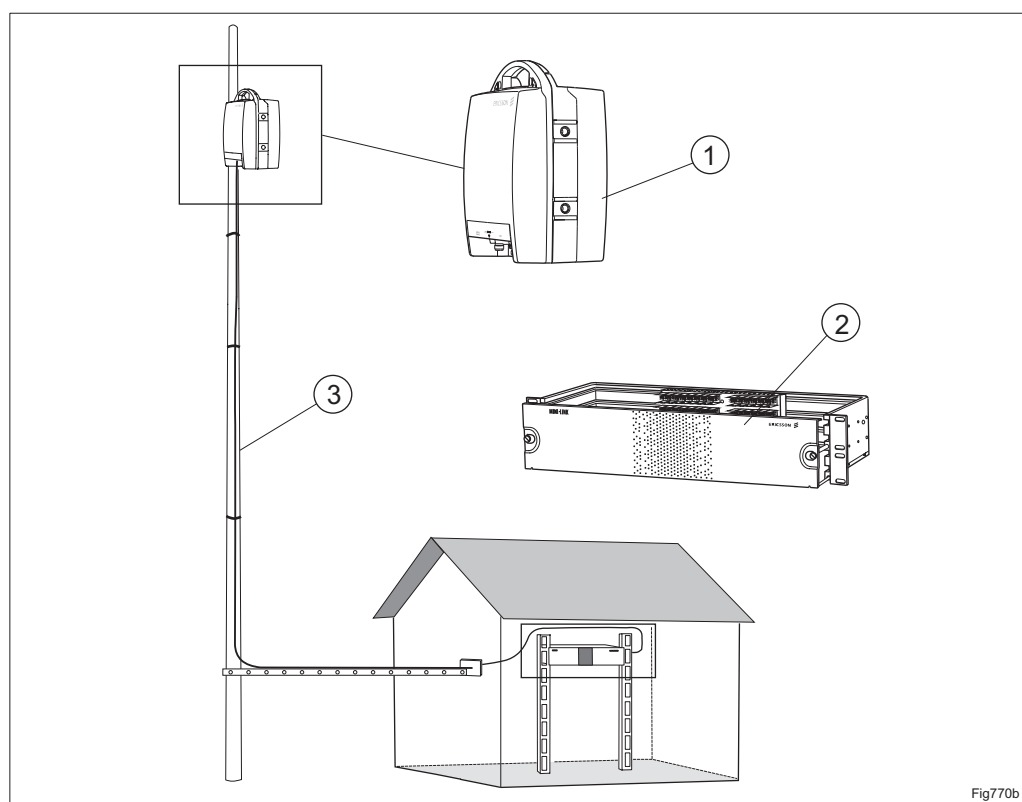


Figure 3-1. MINI-LINK E.

- ① Outdoor unit
- ② Indoor unit
- ③ Radio cable.



## 3.2 Outdoor Part

The outdoor parts, required for a 1+0 terminal, are a radio unit and an antenna module. A 1+1 terminal requires two radio units and two antennas. Instead of using two antennas, one antenna and a power splitter can be used.

### 3.2.1 Radio Unit

There are two versions of the radio unit: RAU1 and RAU2. RAU1 and RAU2 have the same functionality, but different mechanical design and microwave technology. RAU2 has a higher integration of microwave circuits.

The MINI-LINK E RAU1 and RAU2 are microwave radios with RF transceivers, which transmit and receive RF signals. Traffic signals from the indoor units are processed and converted to transmitter frequency and sent over the hop.

All connections to and from the radio are made on the back of the radio. There are connections for antenna alignment, radio cable and earthing.

There are two LEDs on the back of the radio showing alarm and power on/off.

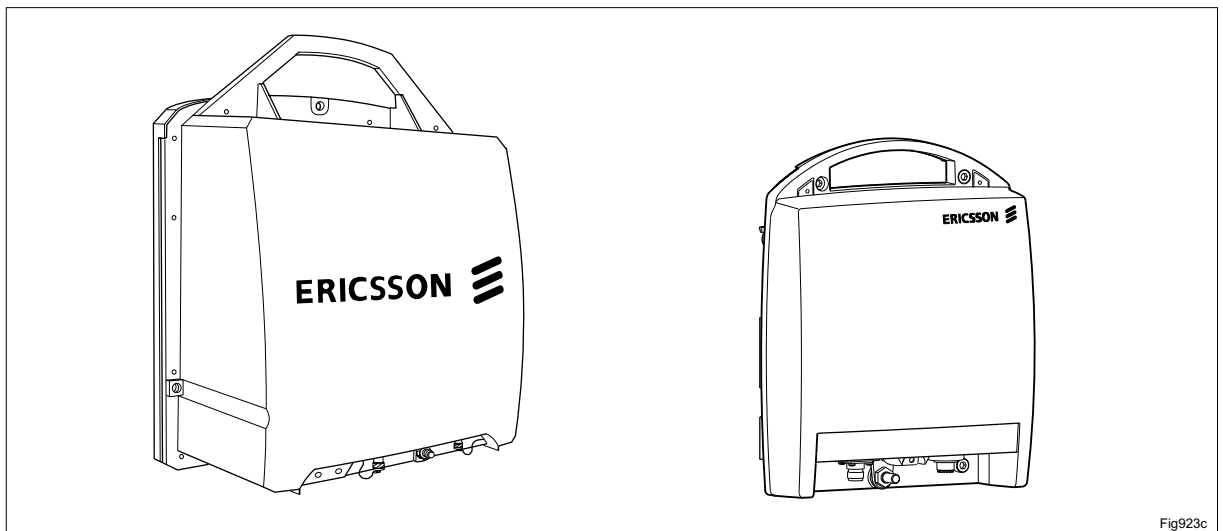


Figure 3-2. MINI-LINK E RAU1 and RAU2.

The radio unit can be connected directly to the antenna without using a flexible waveguide.

The radio unit can also be installed separately and connected via a flexible waveguide to any antenna with standard waveguide interface 154 IEC-UBR. The optional kit for separate installation contains all equipment required.

The radio unit can be disconnected and replaced without affecting the antenna alignment. The radio unit has two guiding hooks and catches to enable handling with one hand during mounting and dismounting.

### 3.2.2 Antenna Module

The antenna module comes in three standard models:

- 0.3 m for RAU1 and RAU2.
- 0.6 m for RAU1 and RAU2.
- 0.2 m Compact for RAU2.

**Note:** An adapter plate must be used when fitting RAU2 to the 0.3 m or 0.6 m antenna.

For separate installation, all antennas can be used with both RAU1 and RAU2 connected via flexible waveguides.

The MINI-LINK product portfolio also contains larger antennas, 1.2 m up to 3.0 m, but they are not described in this manual.

It is possible to change polarization between vertical (linear) or horizontal.

The antenna module is fitted on an antenna support and does not have to be removed during maintenance after alignment.

The elevation can be adjusted  $\pm 13^\circ$  for the 0.2 m compact antenna and  $\pm 15^\circ$  for the 0.3 m and 0.6 m antennas. The azimuth can be adjusted  $\pm 90^\circ$  for the 0.2 m compact antenna and  $\pm 40^\circ$  for the 0.3 m and 0.6 m antennas.

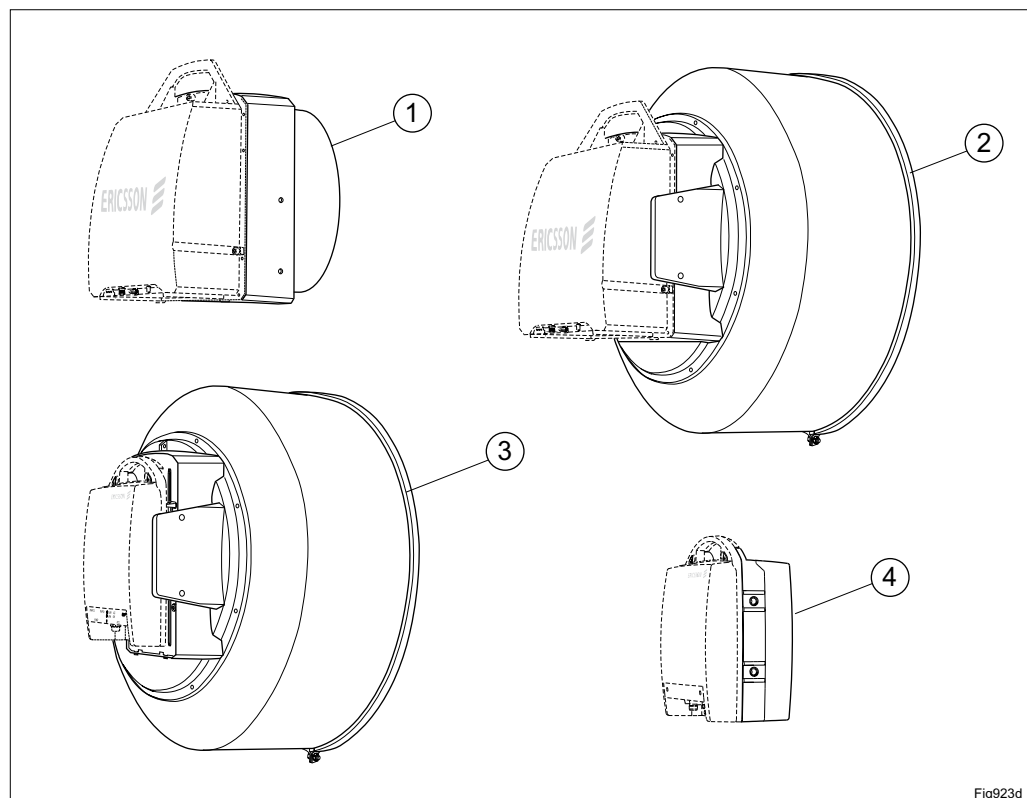


Figure 3-3. RAU1 and RAU2 with different antenna modules.

- ① RAU1 with 0.3 m antenna module.
- ② RAU1 with 0.6 m antenna module.
- ③ RAU2 with 0.6 m antenna module and adapter plate.
- ④ RAU2 with 0.2 m compact antenna module.

## 3.3 Indoor Part

### 3.3.1 Access Module Magazine (AMM)

The magazine is designed for mounting in a 19" rack or cabinet with horizontal units. It is available in three heights: 1U, 2U and 4U high with space for 1, 3, 4 and 7 units respectively, in accordance with the list below:

- AMM 1U can house 1 MMU
- AMM 2U-1 can house 2 MMUs + 1 SAU
- AMM 2U-2 can house 2 MMUs + 1 SMU
- AMM 2U-3 can house 2 MMUs + 1 SMU + 1 SAU
- AMM 4U can house 4 MMUs + 2 SMUs + 1 SAU

As an option, the MXU can be fitted. It fits into any empty slot in the AMM 2U-3 and AMM 4U magazines. See the MXU Installation Instruction, EN/LZT 110 5088, for more information.

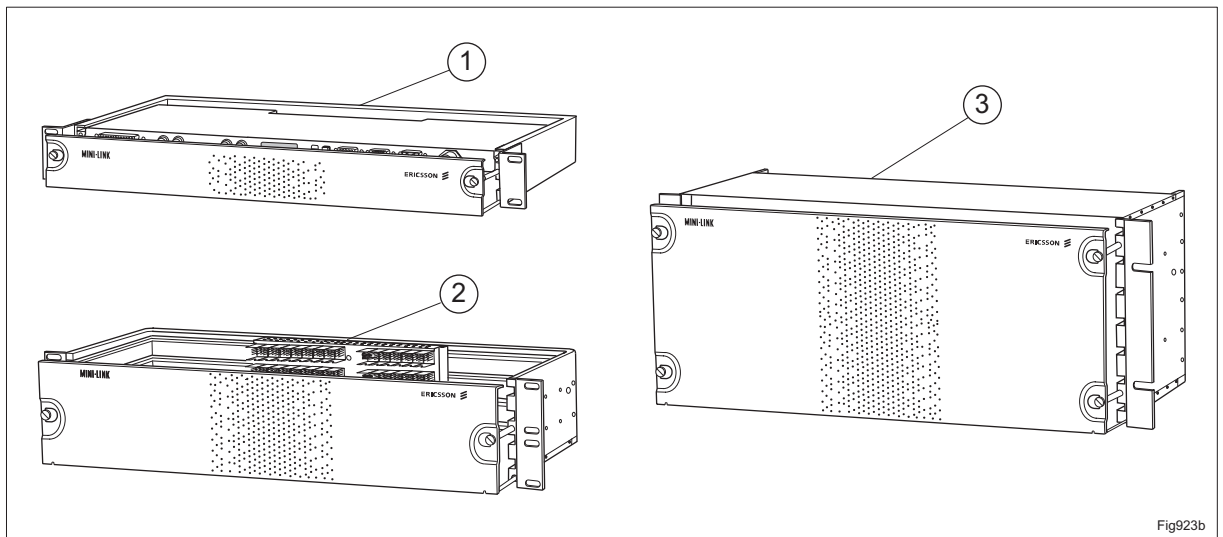


Figure 3-4. Access module magazines.

- ① AMM 1U is used for a single terminal site in 1+0 configuration.
- ② AMM 2U is used for single or dual terminal sites.
- ③ AMM 4U is used for more complex multi-terminal sites.

The AMMs can also be installed horizontally or vertically on a wall using bracket accessories.

In cabinets with forced air cooling, the units are cooled by the air flowing between them. It is also possible to mount cooling flanges to the magazine to improve the cooling or mount a fan unit in the rack.

All units are plugged into the magazine from the front. All indicators, controls and external connector interfaces are located on the front of the units. Cables are routed to the left and right hand side of the front. The magazine has a front panel to protect the cables, connectors and controls. Indicators are visible through the front panel.

### 3.3.2 Plug-in Units

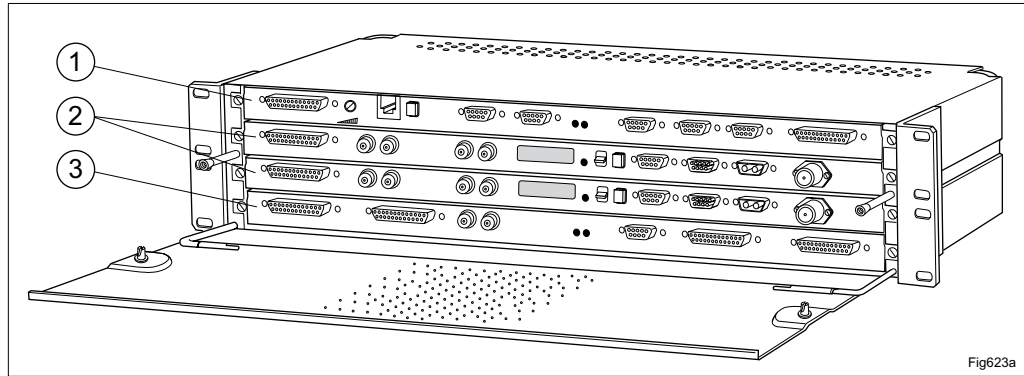


Figure 3-5. Plug-in units in a 2U-3 magazine.

There are three types of plug-in units:

- ① Service Access Unit (SAU)
- ② Modem Unit (MMU)
- ③ Switch Multiplexer Unit (SMU)

#### Modem Unit (MMU)

The MMU is the indoor interface to the radio unit and contains modulator/demodulator. One MMU per radio unit is required. The MMU is available in four versions:

- MMU 2x2 for 2x2 Mbit/s
- MMU 4x2/8 for 4x2 or 8 Mbit/s (includes a 2/8 MUX)
- MMU 2x8 for 2x8 Mbit/s (or 8x2 Mbit/s (with SMU))
- MMU 34+2 for 34+2 Mbit/s (or 17x2 Mbit/s (with SMU))

#### Switch/MUX Unit (SMU)

The SMU is used for 1+1 protection switching and/or multiplexing/demultiplexing of 2 Mbit/s channels. SMU comes in three versions:

- SMU Sw - For 1+1 terminal.  
Traffic capacity: 2x2, 4x2/8, 8x2 or 34+2 Mbit/s
- SMU 8x2 - For 1+0 or 1+1 terminals.  
Traffic capacity: 8x2 Mbit/s.
- SMU 16x2 - For two 1+0 terminals.  
Traffic capacity: One 1+0 terminal with 17x2 Mbit/s and one 1+0 terminal with 2x2, 4x2/8, 8x2 or 34+2 Mbit/s  
- For two 1+0 terminals: Traffic capacity: 8x2 Mbit/s  
- For one 1+1 terminal:  
Traffic capacity: 17x2, 4x8+2 Mbit/s.

#### Service Access Unit (SAU)

The SAU provides additional features, such as service channel, user inputs/outputs and External Alarm Channel (EAC) ports. There are three versions:

- Basic with two external alarm channel ports, 8 input interfaces and 4 input/output interfaces.
- Exp 1 with the Basic functionality, 2 digital service channels per radio terminal and Remote Alarm Channel (RAC).
- Exp 2 with the Basic functionality, 1 analogue service channel, 1 digital service channel per radio terminal and Remote Alarm Channel (RAC).

## 3.4 Operation & Maintenance

A microprocessor monitors all functional alarms and transmits them on a data bus extended throughout the network. The service engineer can access the alarm bus at any location using a PC, giving an overview of the terminal status. Using the same bus, near-end and far-end loops can be set in order to facilitate fault tracing and make an installation test. This integrated maintenance system is further supplemented by a service channel with digital and/or analog interface.

The local supervision interface (display and switches) on the MMU can be used to set frequency, transmitter on/off, output power etc during installation.

The local supervision interface can also give a first fault indication. See chapter 8 for description.

Two PC- software programs are available for the installation and supervision of MINI-LINK E:

- MINI-LINK Netman, for centralized supervision of MINI-LINK E and C networks.
- MINI-LINK Service Manager (MSM), for service of MINI-LINK E and C network terminals, including installation and fault finding.

See separate manuals (section 1.3) for further information.

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# 4 Indoor Installation

## 4.1 Introduction

This chapter describes a recommended installation procedure for the indoor equipment, that is, the access module. The first sections, 4.2 to 4.4, contain general information such as installation tools and product codes. Read the general information to make sure you have the correct tools and equipment. The last sections, 4.5 to 4.11, contain job instructions.

The figure below gives an overview of the installation procedure.

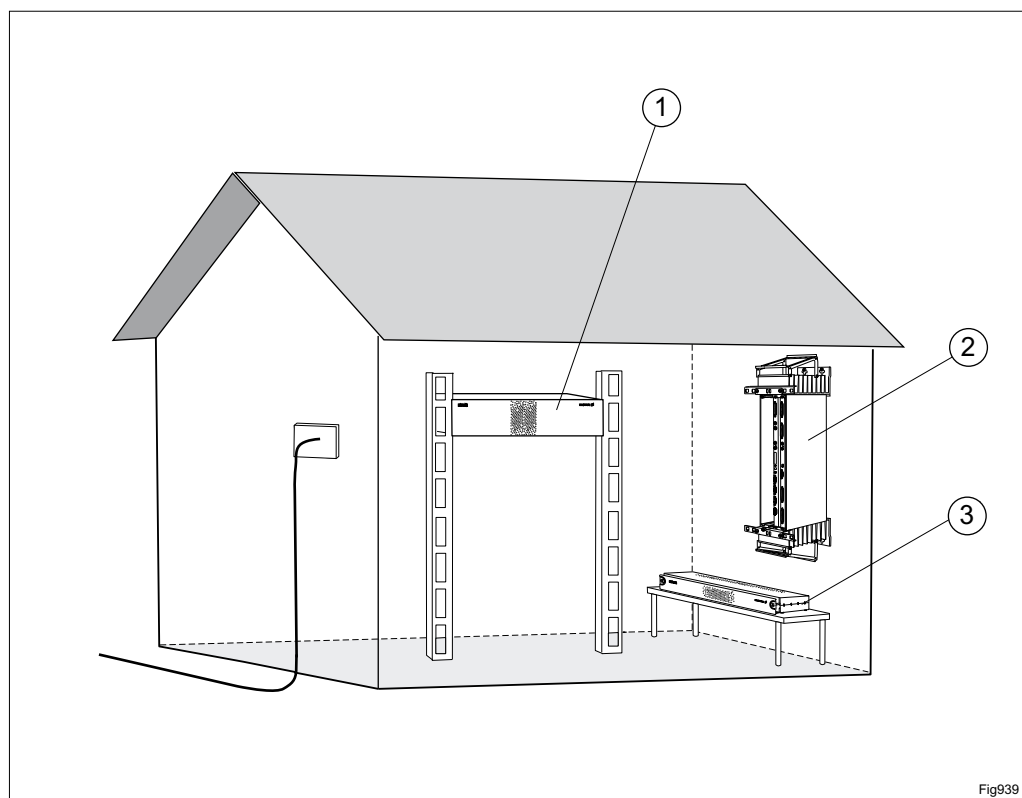


Figure 4-1. Indoor installation.

### Installation procedure

- Step 1** Install the magazine:  
in a rack/cabinet ① (see section 4.5)  
on a wall ② (see section 4.6)  
on a desk ③ (see section 4.7).
- Step 2** Insert the plug-in units (see section 4.8)
- Step 3** Prepare and connect the cables for the access module (see section 4.9)
- Step 4** Fill in the label. (see section 4.10)
- Step 5** Connect a PC or a modem (optional) (see section 4.11)



## 4.2 Installation Equipment

The following tools are required for installation of the indoor unit:

- **D-sub connector pressfit tool** LSD 319 83
- **D-sub connector extraction tool** LSY 120 10
- **DC connector crimping tool** LSD 319 80
- **Crimping tool for pair cable braid** LSD 319 84/1
- **Pin extraction tool for DC wires** LSY 141 12
- **13 mm ring and open jaw wrench**
- **Torx screwdriver** TX 10 (M3)
- **Torx screwdriver** TX 25 (M5)
- **Torx screwdriver** TX 30 (M6)
- **Slot screwdriver 2 mm**
- **Cross slot tool type H** (Philips) no 1
- **Cross slot tool type H** (Philips) no 2

Only for 2, 8 and 34 Mbit/s unbalanced interfaces:

- **SMZ connector crimping toolkit.** LTT 237 17/1  
  **or crimping tool** LSD 319 82
- **SMZ connector dynamometric wrench**

## 4.3 Product Codes for Indoor Equipment

### 4.3.1 Product Code for Access Module Magazine

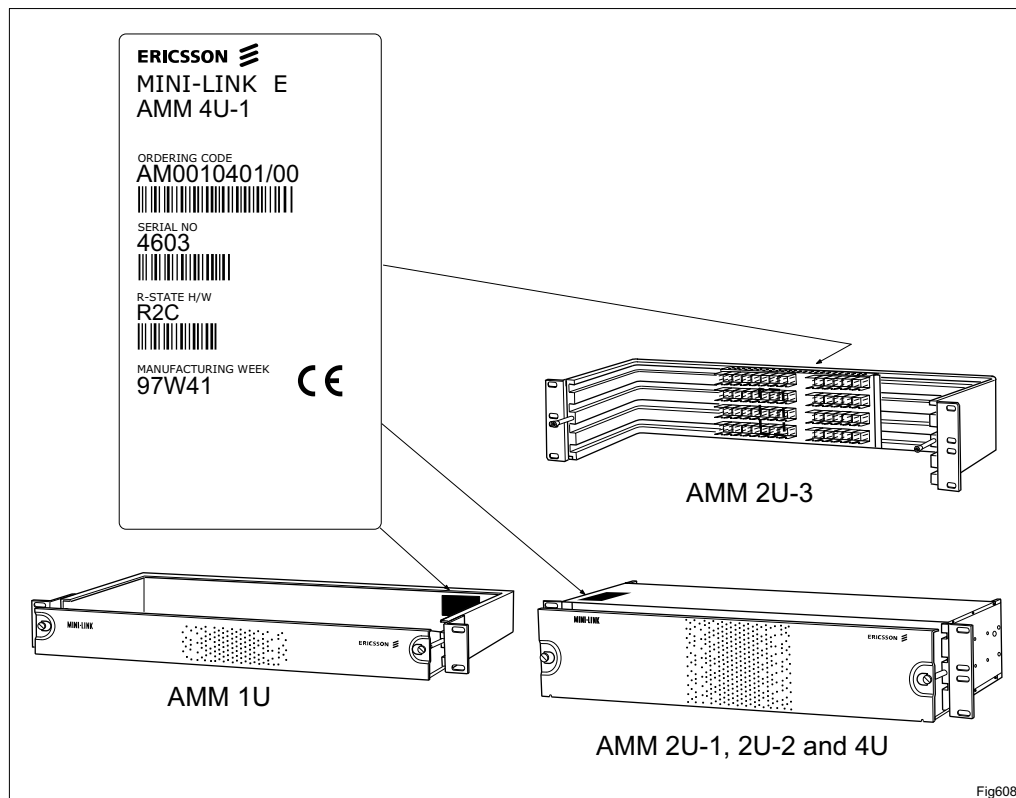


Figure 4-2. The label position for the AMM.

The table below contains a description of the product code for the AMM. The product code can be read on a label on the outside of the unit or on the cardboard box.

AMM		
Product Code	Type	For
AM0010100/00	AMM 1U	MMU
AM0010201/00	AMM 2U-1	SAU + 2 MMUs
AM0010202/00	AMM 2U-2	SMU + 2 MMUs
AM0010203/00	AMM 2U-3	SAU + 2 MMUs + SMU
AM0010401/00	AMM 4U	SAU + 4 MMUs + 2 SMUs

Figure 4-3. The product code for the AMM.

The AMM delivery includes a rack screw kit, an earthing cable and this installation manual. For ordering of a spare magazine replace the /00 by /01 in the product codes above. The indoor unit spare parts are delivered without accessories, such as connectors and this manual.

### 4.3.2 Product Code for Plug-in Units

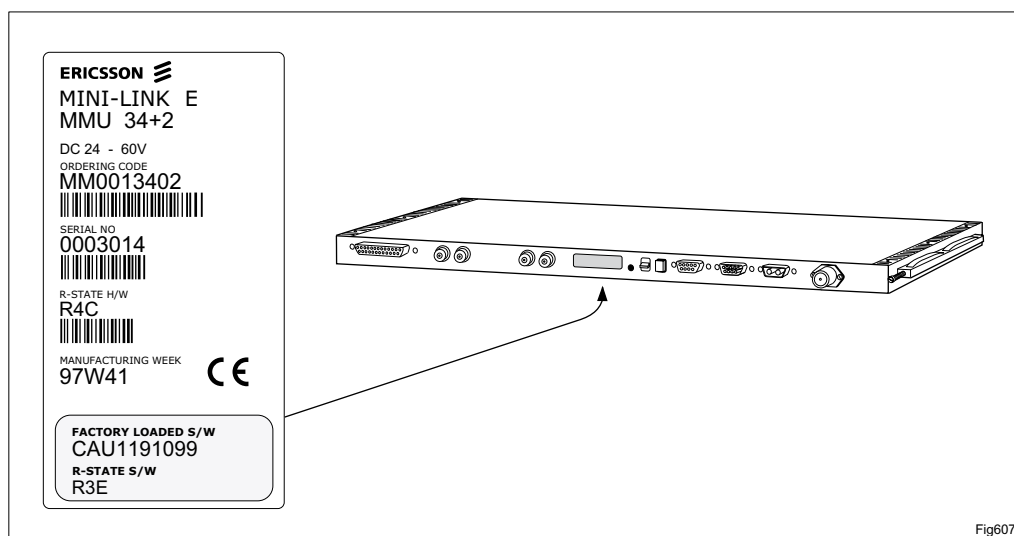


Figure 4-4. The label position for the plug-in units.

The tables below contain descriptions of the product codes for the MMU, SMU and SAU. The product code, which can be read on a label on the outside of the units or on the cardboard box, can be used to identify the units.

MMU		SAU	
Product Code	Type	Product Code	Type
MM0012202/00	MMU 2x2	SA0010012/00	SAU Basic
MM0014202/00	MMU 4x2/8	SA0110012/00	SAU Exp 1
MM0012812/00	MMU 2x8	SA0210012/00	SAU Exp 2
MM0013402/00	MMU 34+2		

SMU	
Product Code	Type
SM0010402/00	SMU Sw
SM0010802/00	SMU 8x2
SM0011602/00	SMU 16x2

Figure 4-5. Describing the product codes for the plug-in units.

To order a spare unit replace the /00 by /01 in the product codes above. The indoor unit spare parts are delivered without accessories, such as connectors and station radio cable (MMU).

## 4.4 Cooling Prerequisites

This section describes the cooling equipment required for the different installation alternatives.

**CAUTION** Insufficient cooling may shorten the operational life of the equipment.

!

If the indoor location has forced cooling through the magazine with an air flow of at least 10 m<sup>3</sup>/h (3.3 g/s or 170 l/min) no other cooling arrangement is required.

Check the temperature on the MMU display after installation. The cooling is sufficient if the temperature is less than 40°C (max 45°C) in normal ambient conditions.

### 4.4.1 Rack Installation

The rack should have free space around it.

Access module type	Cooling arrangement
AMM 1U *	No cooling equipment: 1U (44 mm) free space over and under a maximum of three access modules.
AMM 2U-1 & 2U-2 *	Cooling Flanges: 1U free space over and under a maximum of one fully equipped access module. Fan unit: 1U free space over and under a maximum of four fully equipped access modules.
AMM 2U-3 *	<b>Fan unit required:</b> 1U free space over and under a maximum of three fully equipped access modules.
AMM 4U *	<b>Fan unit required:</b> 1U free space over and under a maximum of two fully equipped access modules.

\* See Note1 and Note2 on page 4-8 for more information.

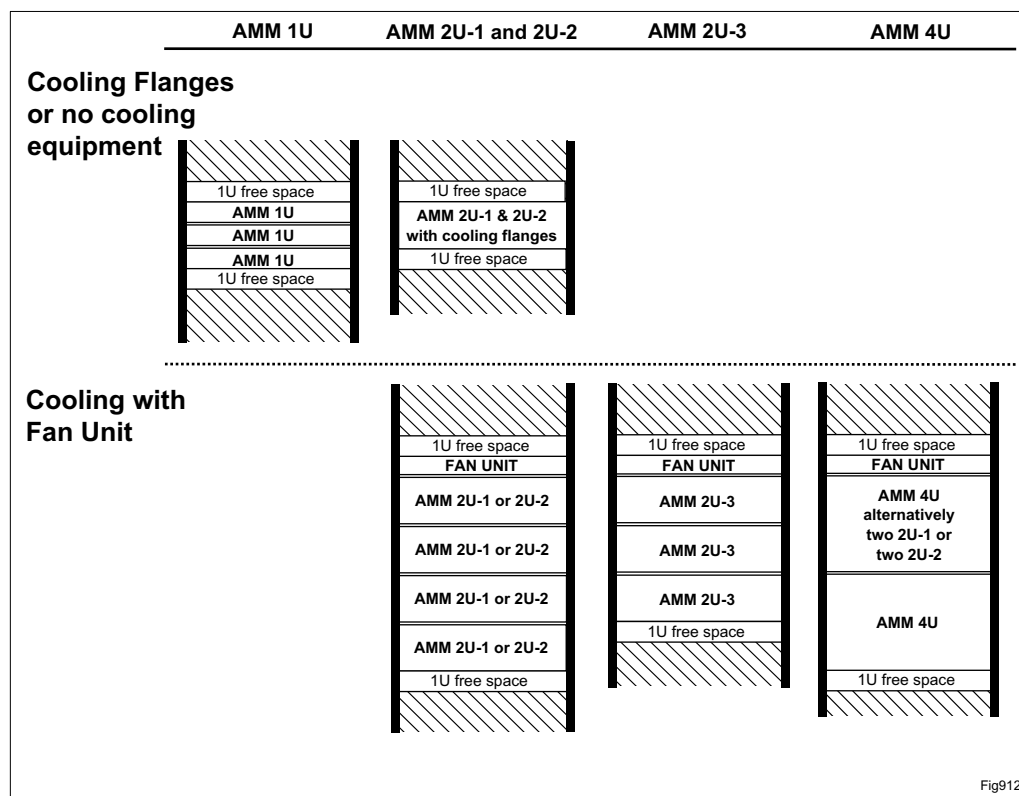


Figure 4-6. Cooling arrangements for rack installation.

## 4.4.2 Cabinet Installation

Access module type	Cooling arrangement
AMM 1U *	No cooling equipment: 1U (44 mm) free space over and under a maximum of three access modules.
AMM 2U-1 & 2U-2 *	Fan unit required: 1U free space over and under a maximum of four fully equipped access modules.
AMM 2U-3 *	<b>Fan unit required:</b> 1U free space over and under a maximum of three fully equipped access modules.
AMM 4U *	<b>Fan unit required:</b> 1U free space over and under a maximum of two fully equipped access modules.

\* See Note1 and Note2 below for more information.

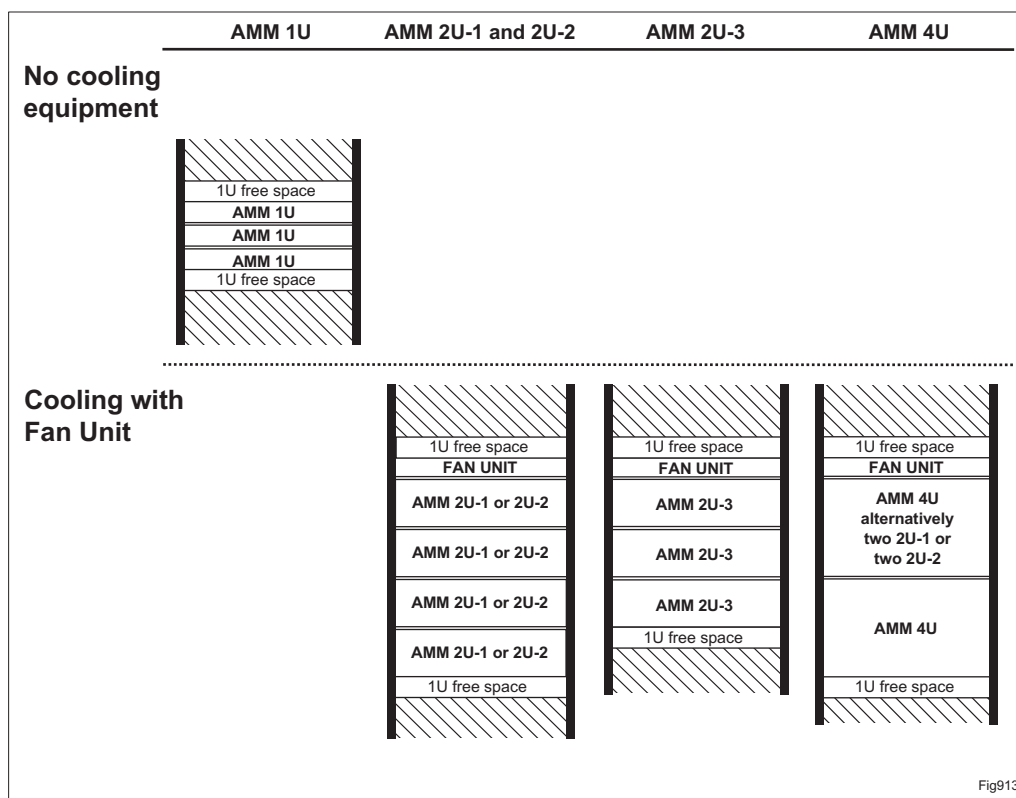


Figure 4-7. Cooling arrangements for cabinet installation.

**Note1:** Dummy fronts (accessory) can be used to cover the empty 1U positions.

**Note2:** AMM 4U, AMM 2U-1 and AMM 2U-2 require the rear installation alternative for installation of the fan unit. AMM 2U-3 requires it's own cooling using the front installation alternative. See section 4.5.7. for more information.

### 4.4.3 Wall Installation

Access module type	Cooling arrangement
AMM 1U	1U free space at the top and bottom of a maximum of three access modules, with one cassette each. AMM 1U can be mounted vertically or horizontally.
AMM 2U-1 & 2U-2	1U free space at the top and bottom of the access module. AMM 2U-1 and 2U-2 can be mounted vertically or horizontally.
AMM 2U-3	1U free space at the top and bottom of the access module. AMM 2U-3 should be mounted vertically.
AMM 4U	1U free space at the top and bottom of the access module. AMM 4U should be mounted vertically.

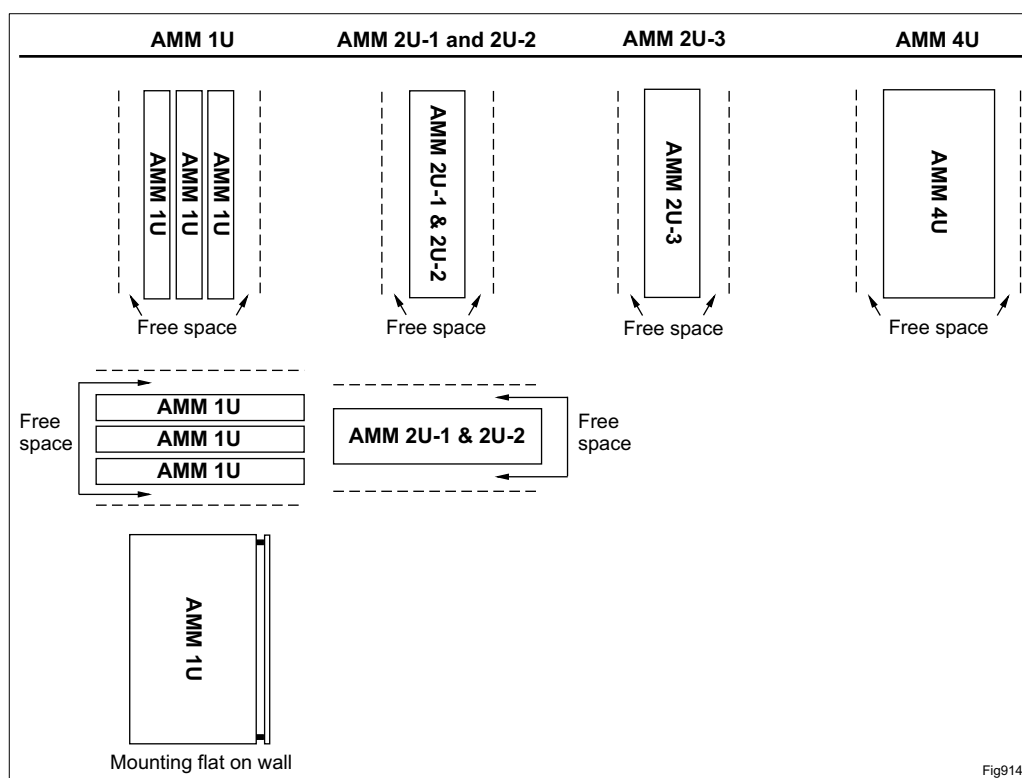


Figure 4-8. Cooling arrangements for wall mounting.

## 4.5 Installing the Magazine in a Rack or Cabinet

The magazines are equipped with brackets for rack and cabinet installation on delivery. See section 4.4 "Cooling Prerequisites" for more information on how to select the correct cooling arrangement. The figure below gives an overview of the jobs included when installing the magazine.

### 4.5.1 Overview of Rack and Cabinet Installation

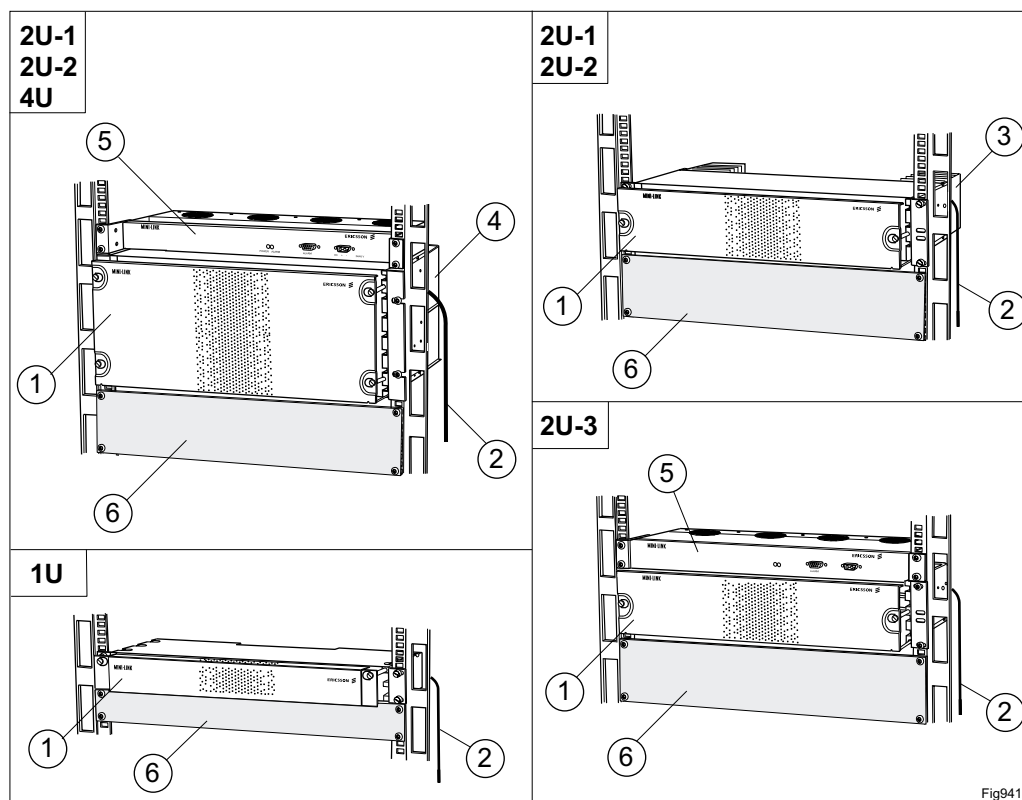


Figure 4-9. Overview of the procedure for rack and cabinet installation.

- Step 1.1** Open and remove the front panel ①  
(see section 4.5.2).
- Step 1.2** Connect the earthing cable ② to the magazine  
(see section 4.5.3).
- Step 1.3** Fit the cooling flanges ③ (option for AMM 2U-1 and 2U-2)  
(see section 4.5.4).
- Step 1.4** Fit the air plates ④ (option for AMM 2U-1, 2U-2 and 4U)  
(see section 4.5.5).
- Step 1.5** Install the magazine  
(see section 4.5.6).
- Step 1.6** Install the fan unit ⑤ (option for AMM 2U-1, 2U-2, 2U-3 and 4U)  
(see section 4.5.7).
- Step 1.7** Fit the dummy front kit ⑥ (option for all AMMs)  
(see section 4.5.8)

**Continue to section 4.8**

## 4.5.2 Opening and Removing the Front Panel

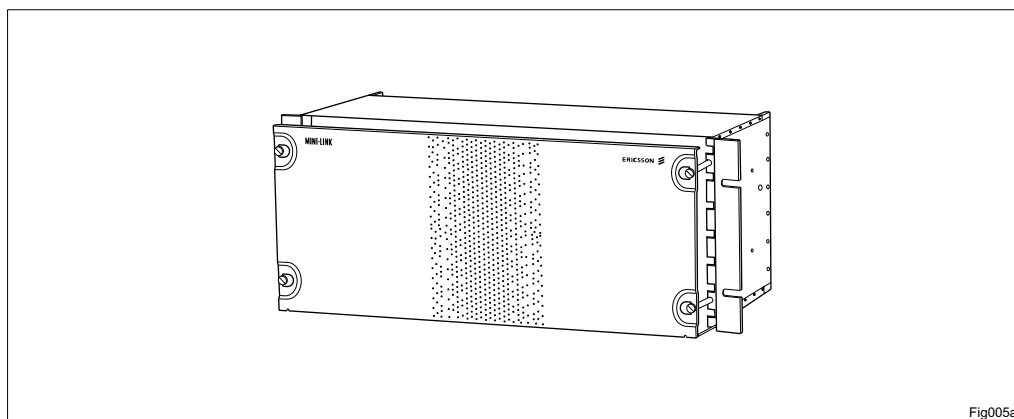


Fig005a

Figure 4-10. The access module magazine.

1. Turn the four screws 90° anti-clockwise.

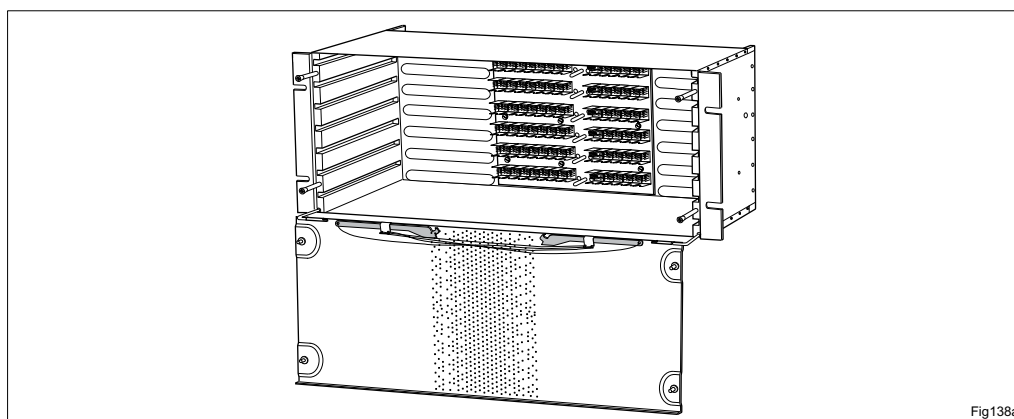


Fig138a

Figure 4-11. Opening the front panel.

2. Open the front panel completely, as shown in the figure above.

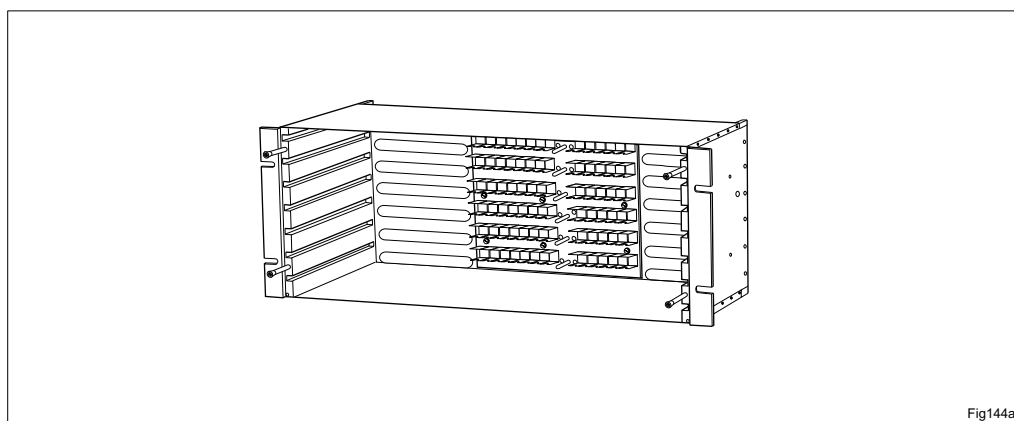


Fig144a

Figure 4-12. The magazine with the front panel removed.

3. Pull out the front panel, with hinges, from the magazine and remove it completely.



### 4.5.3 Earthing the Magazine

The following pages describe the procedure to earth the magazine.

<b>WARNING</b>	<b>The access module magazine must be earthed.</b>
	

The earthing cable kit, SXX 111 514/2, is included as standard in the AMM delivery.

#### 4.5.3.1 Earthing the 1U Access Module Magazine for Rack/Cabinet Installation

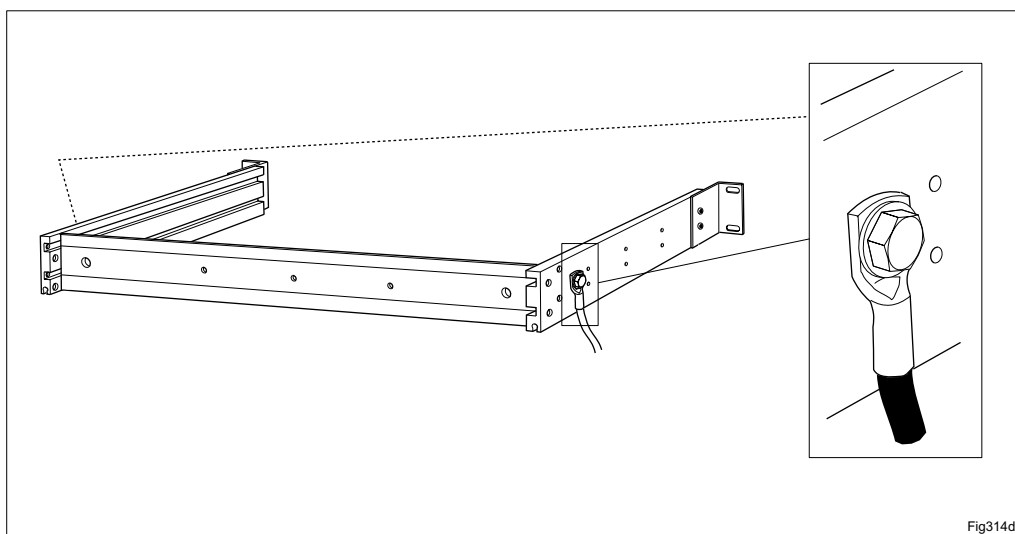


Figure 4-13. Earthing the access module magazine 1U.

1. Connect the cable to the magazine, as shown in the figure above. Use the 13 mm ring and open jaw wrench for tightening. As an alternative, the earthing cable can be connected to the magazine on the opposite side.

### 4.5.3.2 Earthing the 2U-1, 2U-2 and 4U Access Module Magazine for Rack/Cabinet Installation

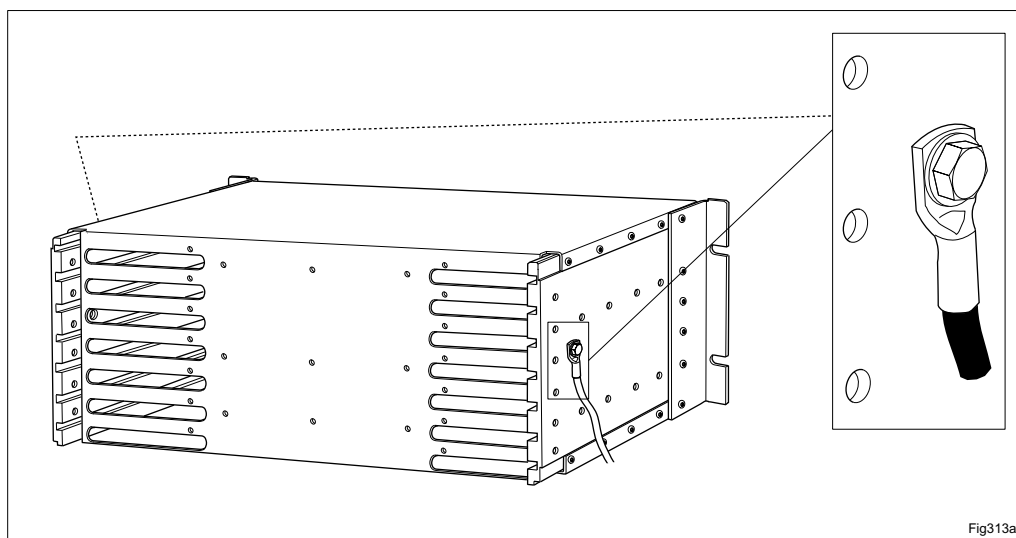


Figure 4-14. Earthing the access module magazines 2U-1, 2U-2 and 4U.

1. Connect the cable to the magazine, as shown in the figure above. Use the 13 mm ring and open jaw wrench for tightening. As an alternative, the earthing cable can be connected to the magazine on the opposite side.

### 4.5.3.3 Earthing the 2U-3 Access Module Magazine for Rack/Cabinet Installation

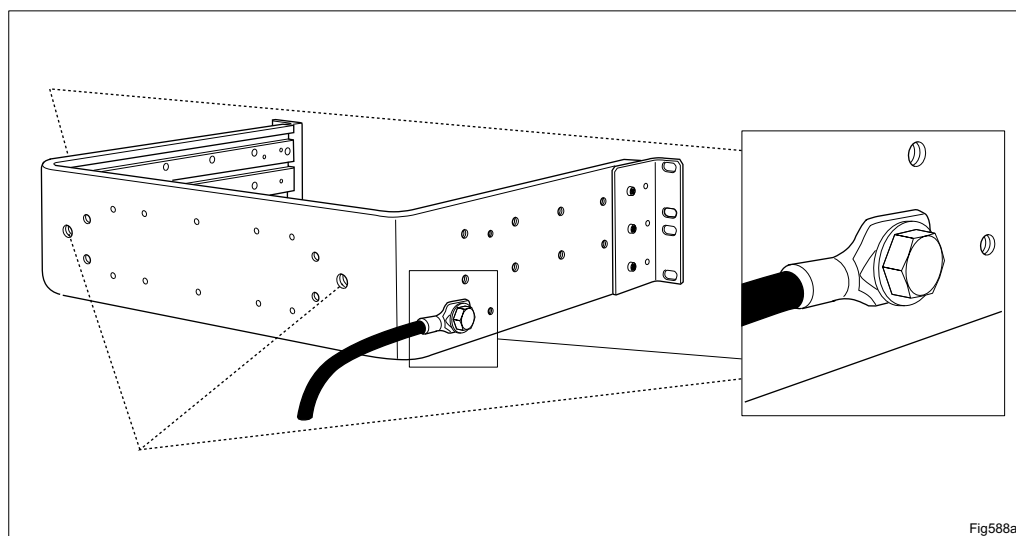


Figure 4-15. Earthing the access module magazine 2U-3.

1. Connect the cable to the magazine, as shown in the figure above. Use the 13 mm ring and open jaw wrench for tightening. As an alternative, the earthing cable can be connected to the magazine on the opposite side and at the back of the AMM.

#### 4.5.4 Fitting the Cooling Flanges (optional)

The cooling flanges SXX 111 529/1 (for a 2U-1 and 2U-2 magazine) are optional and must be fitted to the magazine before the magazine is installed in the rack.

The depth of the access module magazine increases with 80 mm when the cooling flanges have been fitted.

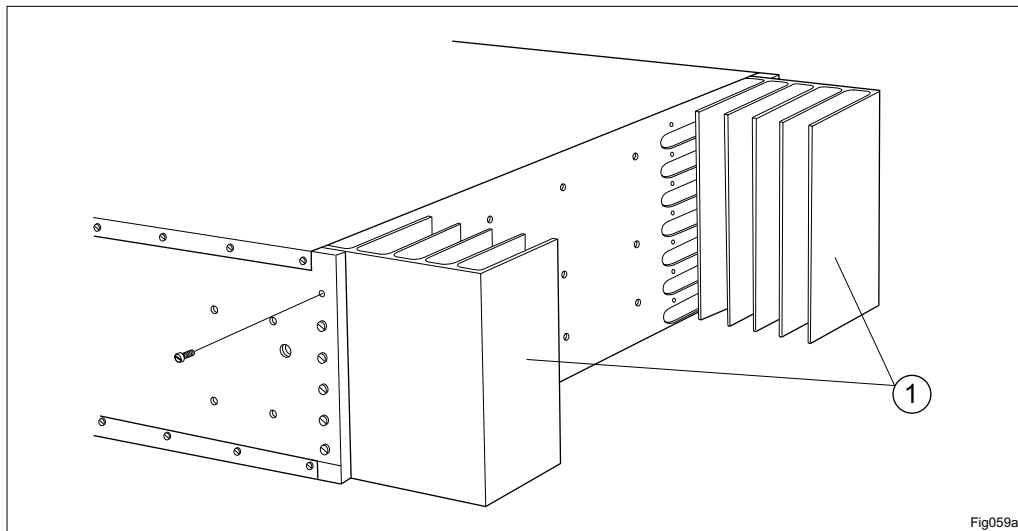


Figure 4-16. Fitting the cooling flanges on a 2U-1 magazine.

##### Fitting:

1. Fit the cooling flanges, ①, to the magazine using the Torx screwdriver TX 25 (M5). See the figure above.

### 4.5.5 Fitting the Air Plates (optional)

**Note:** Items 1-4 apply only if a fan unit is required. For effective cooling, air plates are mounted behind the fan unit on the 2U-1, 2U-2 and 4U magazines.

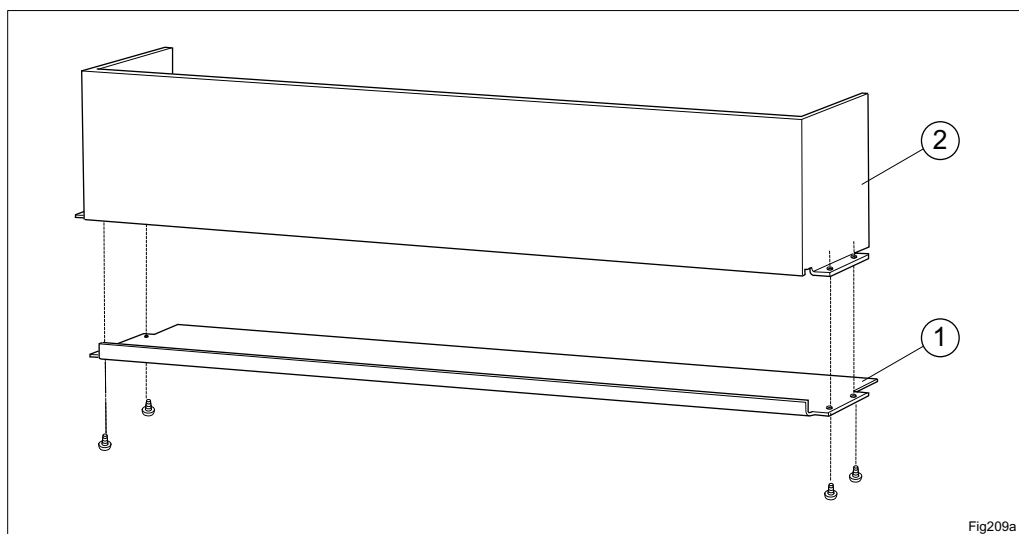


Figure 4-17. Fitting the bottom plate to one of the air plates.

#### Fitting:

1. Fit the bottom plate, ①, to one of the air plates, ②. Use the Torx screwdriver TX 10 (M3).

**Note:** If the fan unit should provide cooling for more than one magazine the bottom plate must be fitted to the bottom magazine. The fan unit can provide cooling for two fully equipped 4U magazines or four fully equipped 2U-1 or 2U-2 magazines.

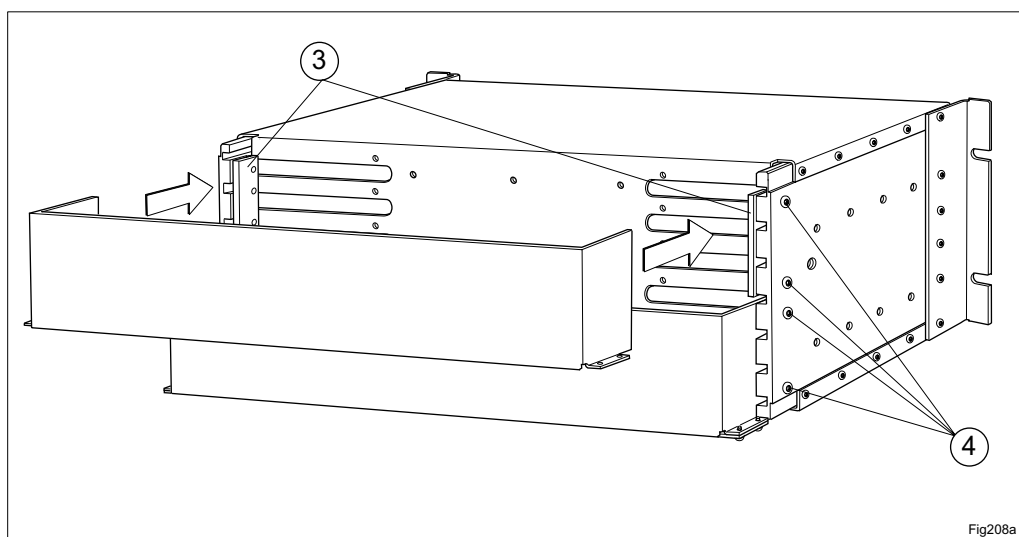


Figure 4-18. Fitting the air plates to the access module magazine.

2. Fit the four air plate holders, ③, to the back of the magazine. Use the Torx screwdriver TX 25 (M5).
3. Insert the air plates between the magazine and the air plate holders.
4. Fasten the air plates by tightening the screws for the air plate holders, ④.

## 4.5.6 Installing the Magazine in a 19" Rack or a Cabinet

### Installation:

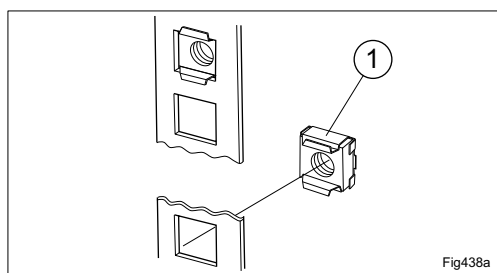


Figure 4-19. Fitting the captive nuts.

1. Fit the four captive nuts, ①, to the rack.
2. Remove the front panel and fit the empty magazine in the rack.

**Note:** Make sure that the magazine is positioned correctly into the rack. The holes for the front panel hinges, ②, shall be at the bottom of the magazine.

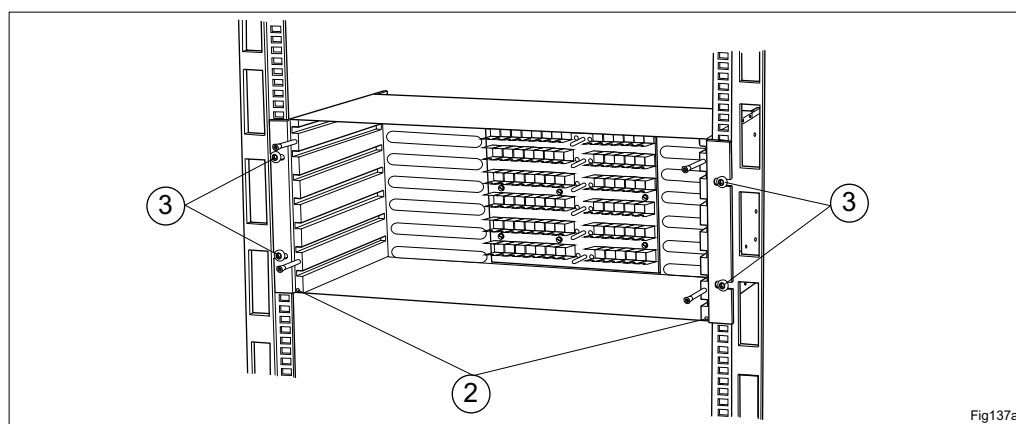


Figure 4-20. Installing the access module magazine in a 19" rack.

3. Tighten the four screws, ③, using the Torx screwdriver TX 30 (M6), as shown in the figure above.

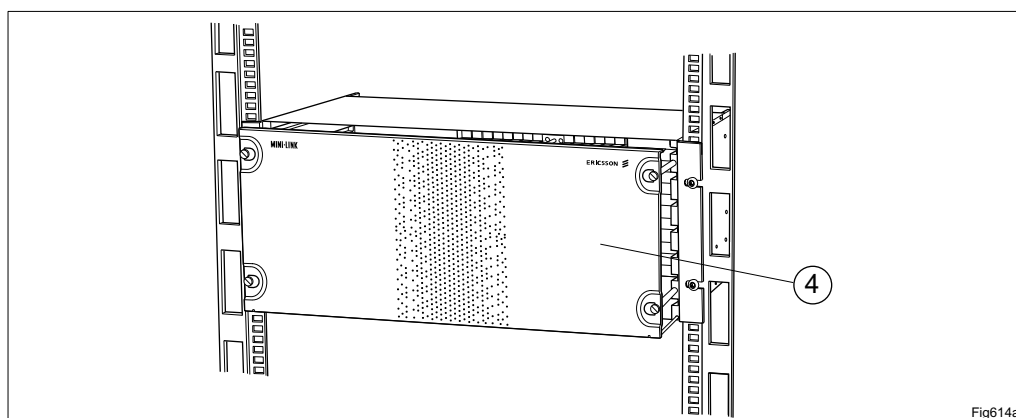


Figure 4-21. Mounting the front panel.

4. Fit the front panel, ④.
5. Connect the earthing cable from the magazine to station earth.

### 4.5.7 Installing the Fan Unit (optional)

The fan unit (fan kit SXX 111 509/1 for AMM 2U and 4U, and SXX 111 619/1 for AMM 2U-3) should always be positioned directly above the access module magazine. The fan unit can provide cooling for two fully equipped 4U magazines or three fully equipped 2U-3 magazines or four fully equipped 2U-1 or 2U-2 magazines. For effective cooling, air plates are fitted behind the fan unit, see section 4.5.5.

#### WARNING



The fan unit must be earthed. Use the earthing cable kit (SXX 111 514/2), which is as standard included in delivery.

The fan unit is delivered with mounting brackets. Each bracket has two pair of holes, one for front installation and one for rear installation of the fan unit.

#### 2U-1, 2U-2 and 4U Magazine

The rear installation alternative should always be used if there is space enough behind the access module magazine. Otherwise use the front installation alternative.

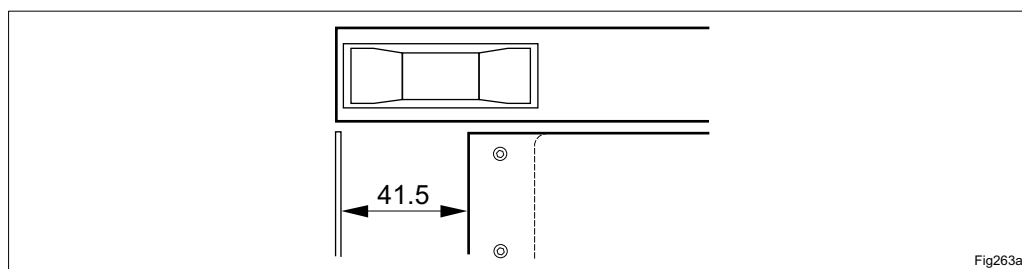


Figure 4-22. Rear installation of the brackets.

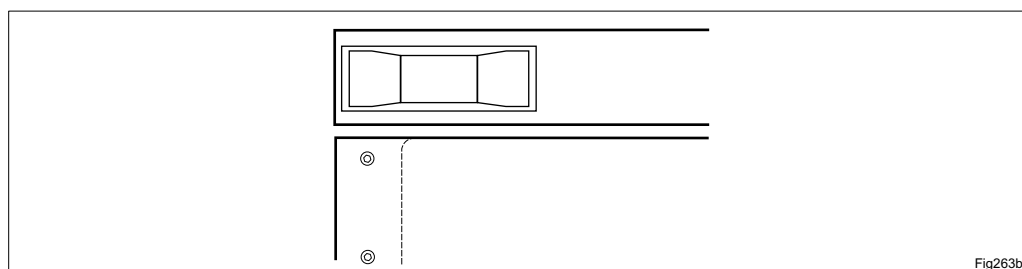


Figure 4-23. Front installation of the brackets.

#### 2U-3 Magazine

The 2U-3 magazine must always use the front installation alternative. The fan unit is delivered for rear installation from factory.

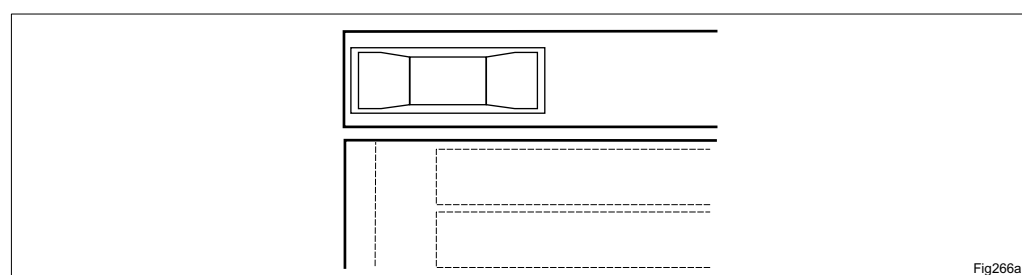


Figure 4-24. Front installation of the fan unit.

## Installation:

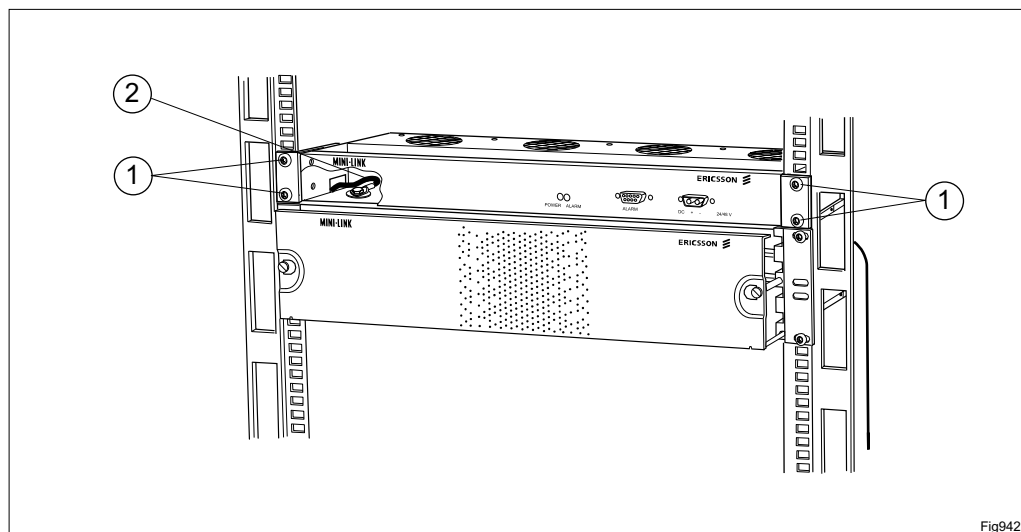


Figure 4-25. Installing the fan unit in a 19" rack with an AMM 2U-3.

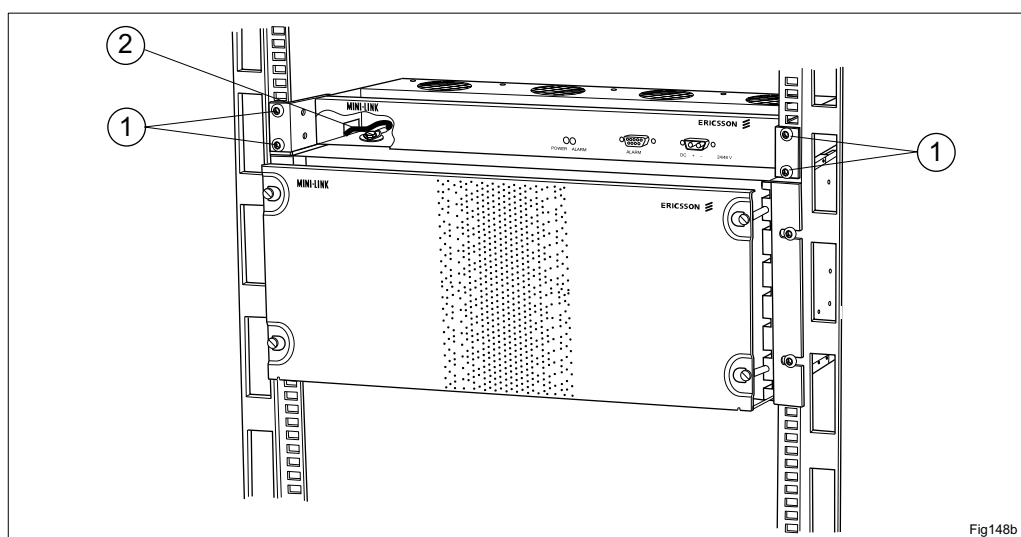


Figure 4-26. Installing the fan unit in a 19" rack with an AMM 1U, 2U-1, 2U-2 or 4U.

1. Fit the four captive nuts to the rack.
2. Fit the fan unit in the rack and tighten the four screws, ①, using the Torx screwdriver TX 30 (M6).
3. Insert the earthing cable, ②, into the fan unit. The earthing cable can be inserted in four different ways, using two separate holes on the front and one on each side of the fan unit.
4. Connect the other end of the earthing cable to the station earth.
5. Connect the earthing cable inside the fan unit. Use the 13 mm ring and open jaw spanner for tightening.

**Note:** See section 4.9.11 for connection of the fan alarm cable to the MMU.

### 4.5.8 Fitting the Dummy Front Kit (optional)

If there is an empty position in the rack a dummy front can be fitted. The dummy front kit comes in two versions:

- Height: 1U (article number: SXX 111 548/1)
- Height: 2U (article number: SXX 111 548/2)

Fit the dummy front kit as described below:

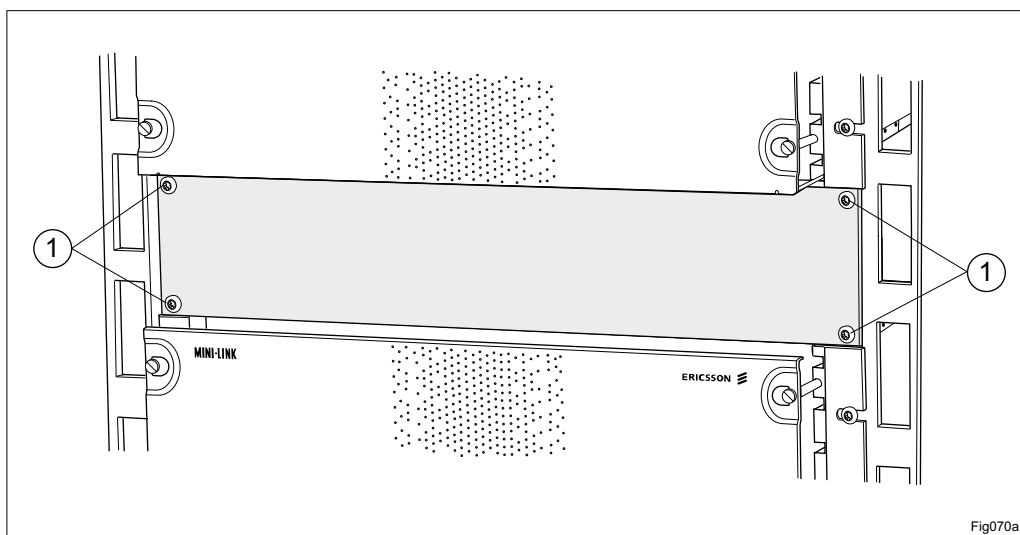


Figure 4-27. Mounting the dummy front kit in a rack.

#### Fitting:

1. Fit the four captive nuts in the rack.
2. Fit the dummy front plate in the rack and tighten the four screws, ①, using the Torx screwdriver TX 30 (M6), as shown in the figure above.



## 4.6 Installing the Magazine on a Wall

The magazines can be installed vertically and horizontally with the exception of the 4U magazine, which only can be installed vertically. The figure below gives an overview of the jobs included when installing the magazine on a wall.

The mounting kits come in four versions:

- Wall set for 1U magazine (SXX 111 537/3)
- Wall set for 2U-1 and 2U-2 magazines (SXX 111 537/1)
- Wall set for 2U-3 magazine (SXX 111 537/4)
- Wall set for 4U magazine (SXX 111 537/2)

### 4.6.1 Overview of Wall Installation

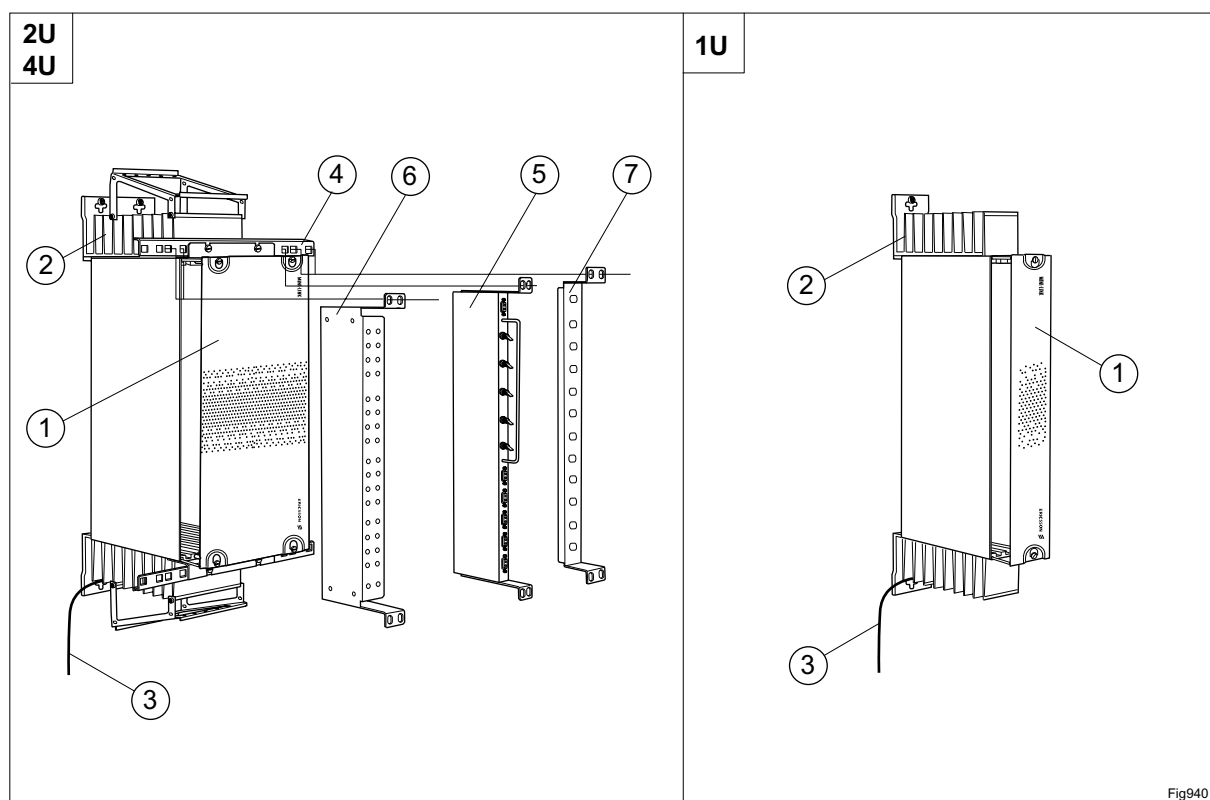


Figure 4-28. Overview of the procedure when installing on a wall.

- Step 1.1** Open and remove the front panel ①, (see section 4.6.2).
- Step 1.2** Assemble the magazine, (see section 4.6.3).
- Step 1.3** Fit the cooling flanges ② (see section 4.6.4).
- Step 1.4** Connect the earthing cable ③ to the magazine, (see section 4.6.5).
- Step 1.5** Install the magazine, (see section 4.6.6).
- Step 1.4** Fit the bars ④ for installation of DDU etc (optional), (see section 4.6.7).
- Step 1.5** Fit the DDU ⑤, coaxial cable panel ⑥ and the radio cable panel ⑦ (optional), (see section 4.6.8).
- Step 1.6** Connect the earthing cables for the DDU and the magazine (optional) (see section 4.6.9).

**Continue to section 4.8**

## 4.6.2 Opening and Removing the Front Panel

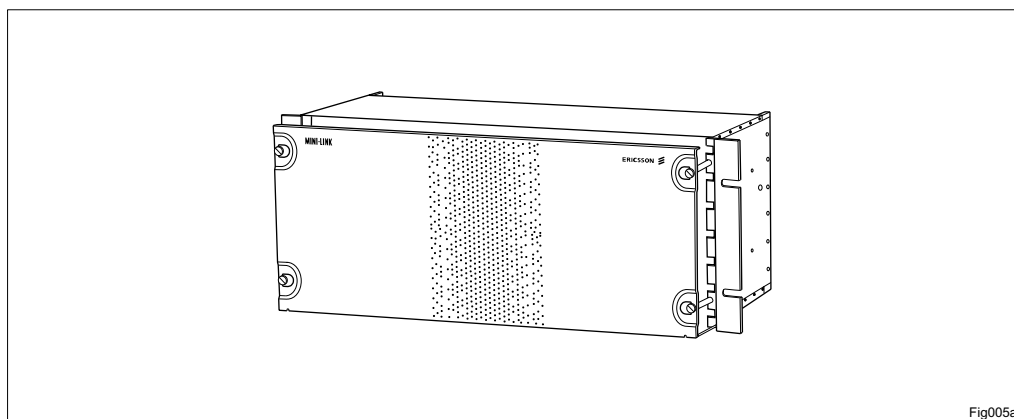


Fig005a

Figure 4-29. The access module magazine.

1. Turn the four screws 90° anti-clockwise.

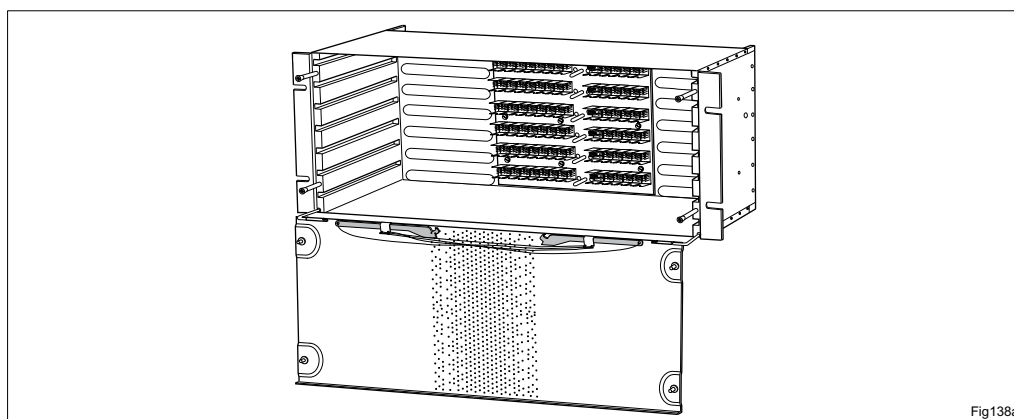


Fig138a

Figure 4-30. Opening the front panel.

2. Open the front panel completely, as shown in the figure above.

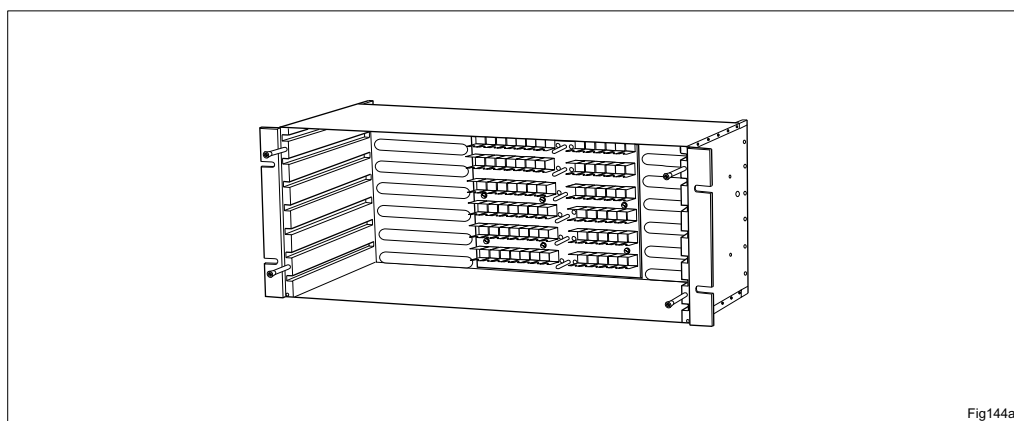


Fig144a

Figure 4-31. The magazine with the front panel removed.

3. Pull out the front panel, with hinges, from the magazine and remove it completely.

### 4.6.3 Assembling the 1U and 2U-3 Magazine

#### 4.6.3.1 Assembling the 1U Magazine

Before the 1U magazine is installed on a wall or put on a desk it has to be assembled.

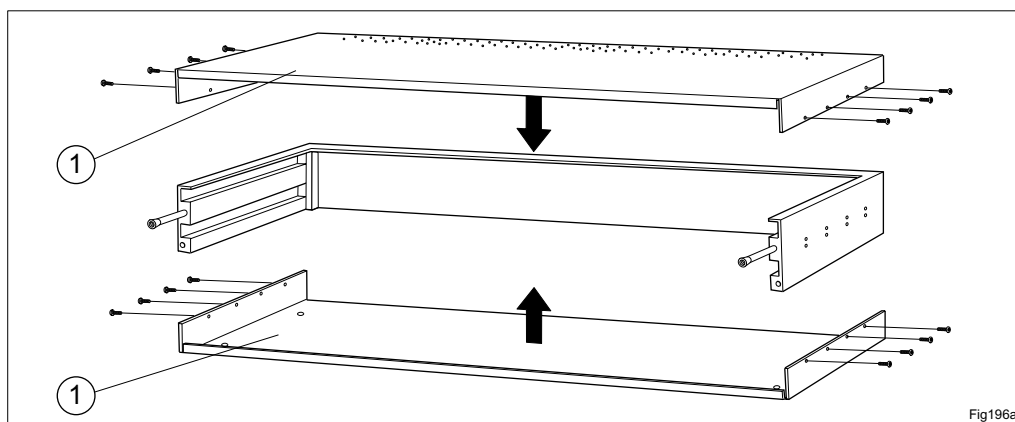


Figure 4-32. Assembling the magazine.

#### Assembly:

1. Remove the brackets from the magazine using Torx screwdriver TX 10 (M3).
2. Fit the plates ① to the magazine (eight screws per plate), as shown in the figure above.

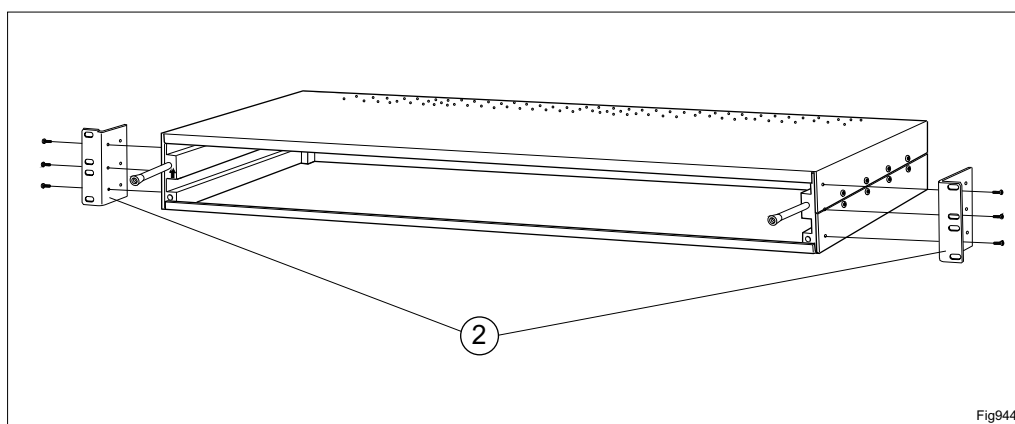


Figure 4-33. Fitting the brackets.

3. Optional: Fit the brackets ② as shown in the figure above if you want to fit bars to the magazine (see section 4.6.7).

### 4.6.3.2 Assembling the 2U-3 Magazine

Before the 2U-3 magazine is installed on a wall it has to be assembled.

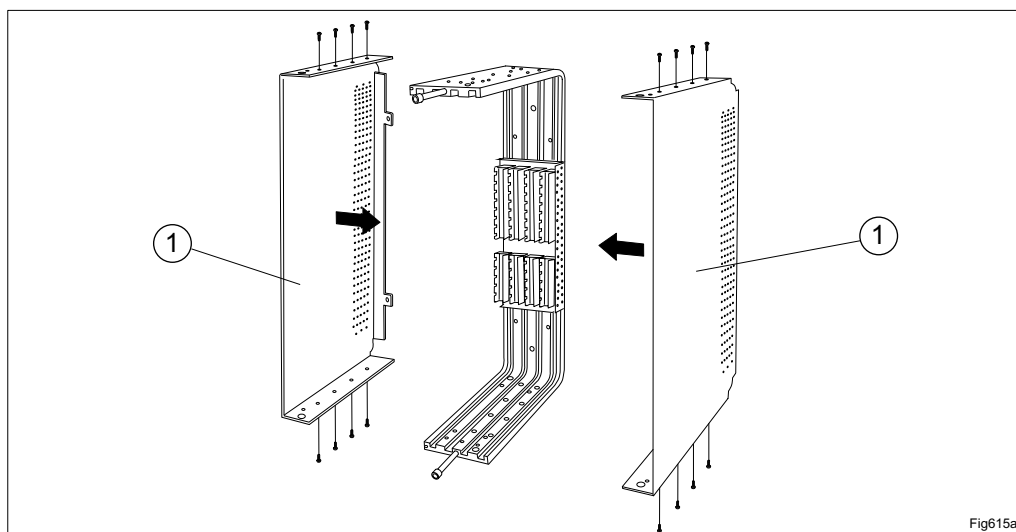


Figure 4-34. Fitting the plates

#### Assembling:

1. Remove the brackets from the magazine using Torx screwdriver TX 10 (M3).
2. Fit the plates ① to the magazine as shown in the figure above.

**Note:** Do not fit the top and bottom screws on the plate to the left. The plate is fixed when the cooling flanges are fitted, see section 4.6.4 for more information.

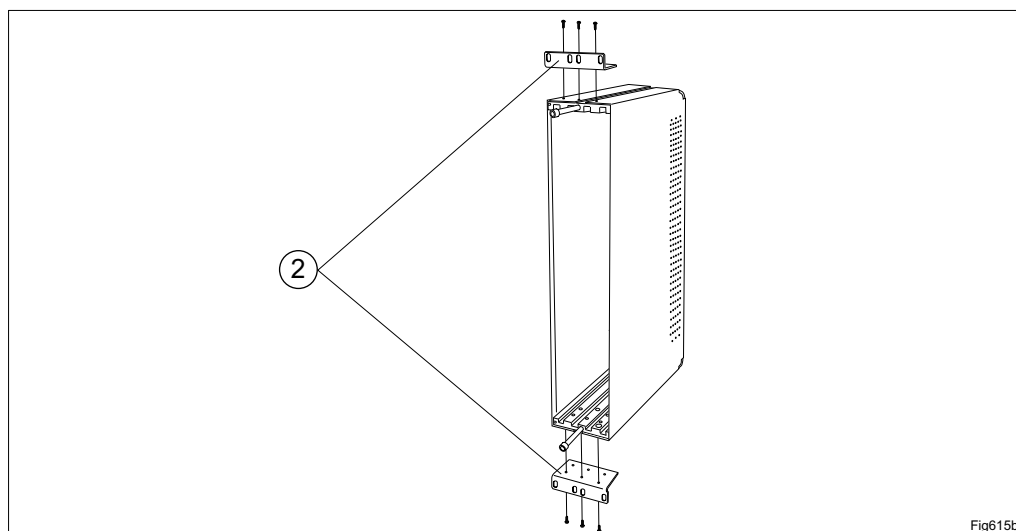


Figure 4-35. Fitting the brackets

3. Fit the brackets, ②, as shown in the figure above if you want to fit bars to the magazine (see section 4.6.7).

### 4.6.4 Fitting the Cooling Flanges

Leave the brackets on the magazine. They are needed if you want to fasten the bars (included in the wall set) to the magazine (see next page). To these bars a DC Distribution Unit (DDU) or a panel for coax cables (see section 4.6.7) can be fastened.

**Note:** See alternative installation, without cooling flanges, for the 1U magazine in section 4.6.6.2.

**Assembly:**

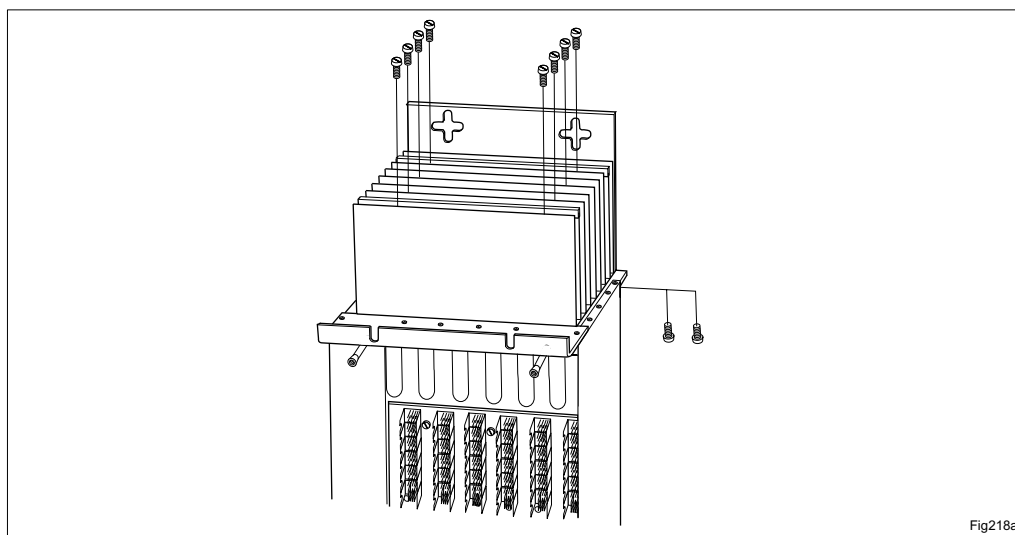


Figure 4-36. Fitting the cooling flanges to a 4U magazine.

1. Fit the cooling flanges on both sides of the magazine using the Torx screwdriver TX 25 (M5). Use all included screws for each cooling flange.

## 4.6.5 Earthing the Magazine

The following pages describe the procedure to earth the magazine.

### WARNING



The access module magazine must be earthed.

The earthing cable kit, SXX 111 514/2, is included as standard in the AMM delivery.

### 4.6.5.1 Earthing the 1U Access Module Magazine for Wall Installation

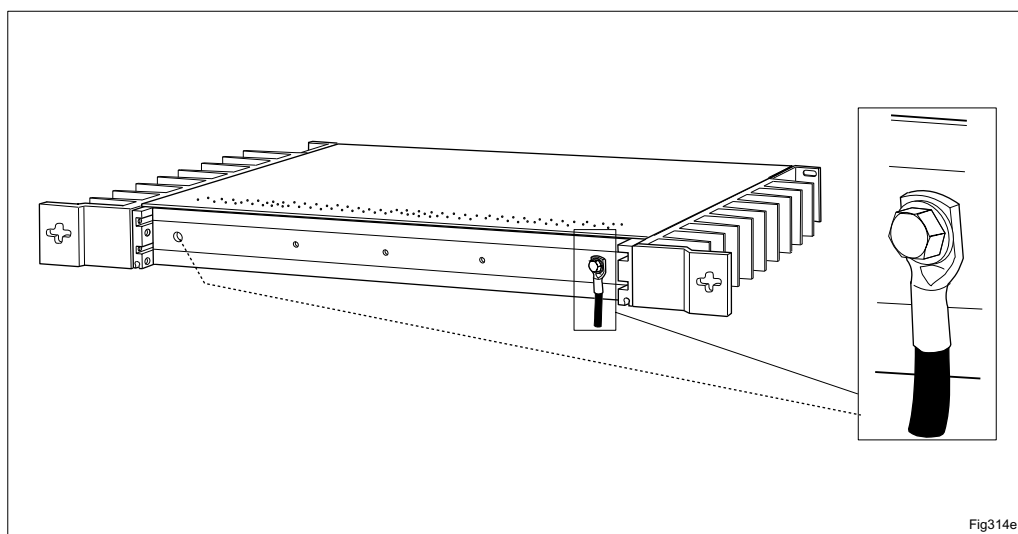


Figure 4-37. Earthing the access module magazine 1U.

1. Connect the cable to the magazine, as shown in the figure above. Use the 13 mm ring and open jaw wrench for tightening. As an alternative, the earthing cable can be connected to the magazine on the opposite side.

#### 4.6.5.2 Earthing the 2U-1, 2U-2 and 4U Access Module Magazine for Wall Installation

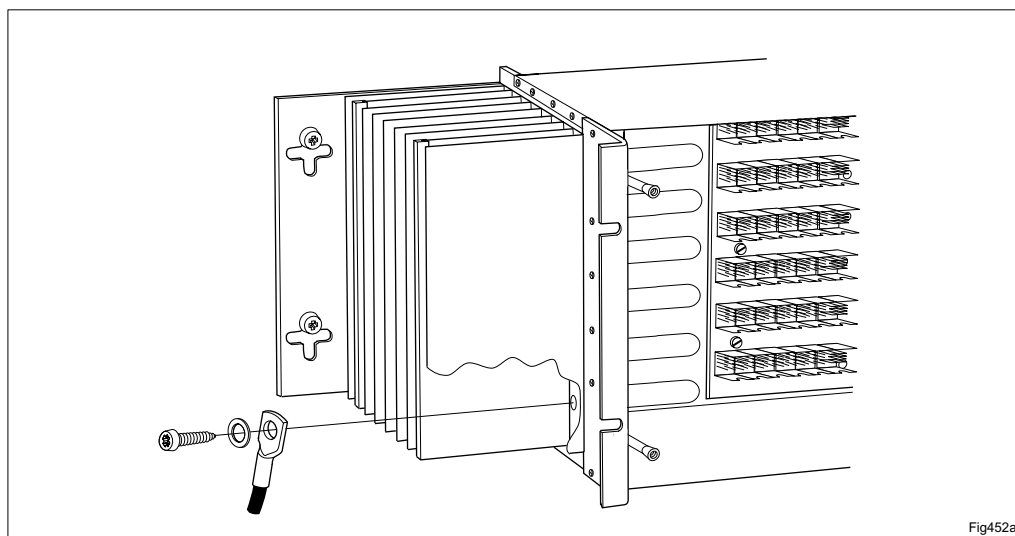


Figure 4-38. Earthing the access module magazines 2U-1, 2U-2 and 4U.

1. Remove one screw from the cooling flanges. Connect the earthing cable using a screw and a washer included in the wall set. As an alternative, the earthing cable can be connected to the magazine on the opposite side.

#### 4.6.5.3 Earthing the 2U-3 Access Module Magazine for Wall Installation

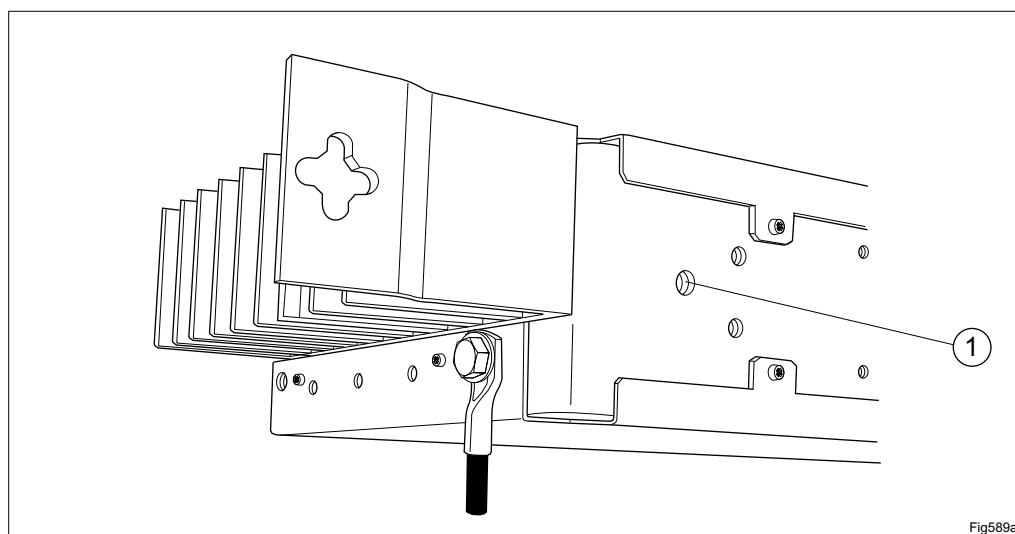


Figure 4-39. Earthing the access module magazine 2U-3.

1. Remove one screw from the cooling flanges. Connect the earthing cable using a screw and a washer included in the wall set. As an alternative, the earthing cable can be connected to the magazine on the opposite side and at the back of the AMM ①.

## 4.6.6 Installing the Magazine on a Wall

### 4.6.6.1 Installing the 1U, 2U and 4U Magazines

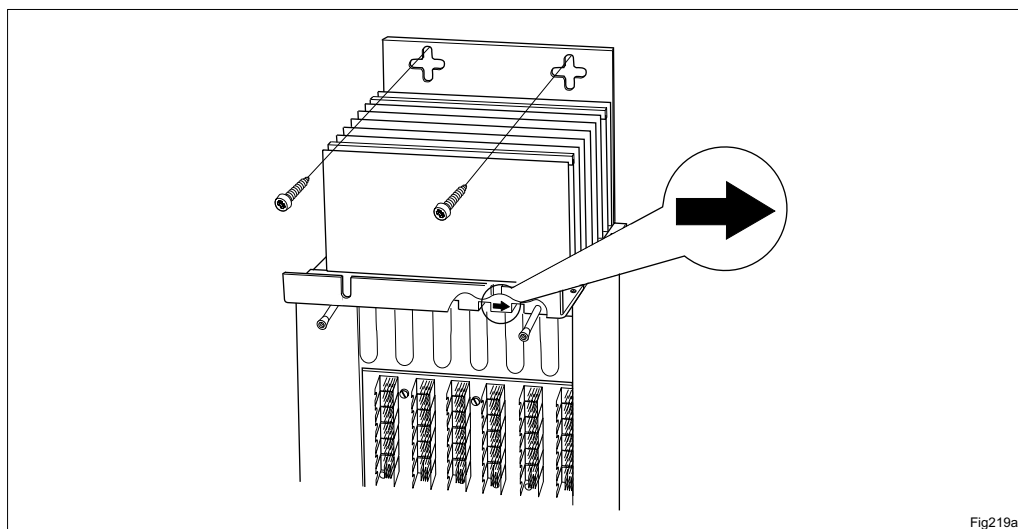


Figure 4-40. Fitting the cooling flanges to a 4U magazine.

1. Mount the magazine on a wall. The arrow on the magazine must point upwards when the magazine is mounted horizontally and to the right when the magazine is mounted vertically, as shown in figure above.

**Note:** The 4U magazine must be installed vertically. The 1U and 2U magazines can be installed vertically or horizontally. The magazine must have 1U (44 mm) free space around it.

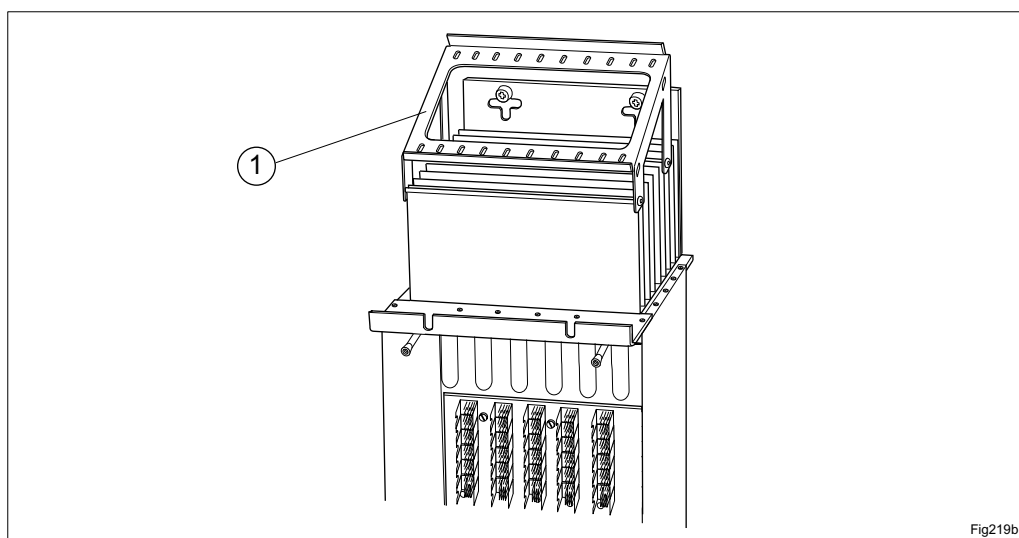


Figure 4-41. Installing the magazine on a wall and fitting the cable holders.

2. Fit the cable holders, ①, to the cooling flanges.
3. Connect the earthing cable from the magazine to earth.



#### 4.6.6.2 Installing the 1U Magazine (optional)

This instruction shows an alternative of how to install the 1U magazine on a wall. The magazine should preferably be installed on a wall as described in section 4.6.6.1.

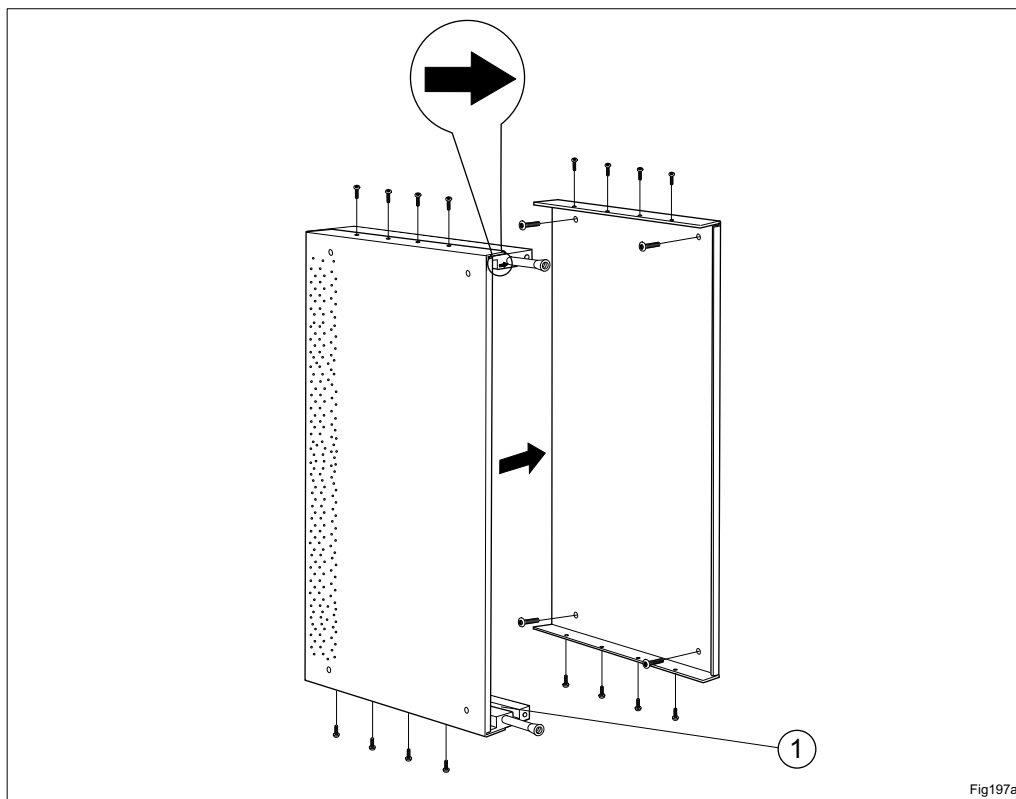


Figure 4-42. Installing the magazine on a wall.

##### Installation:

1. Remove the brackets from the magazine.
2. Fit one plate to the magazine using the eight screws.
3. Fit the other plate to the wall.
4. Fit the magazine to the wall plate.
5. Insert the MMU into the MMU slot, ①.
6. Fit the front panel to the magazine.

### 4.6.7 Fitting the bars for installation of DDU or Coax Cable Panel (optional)

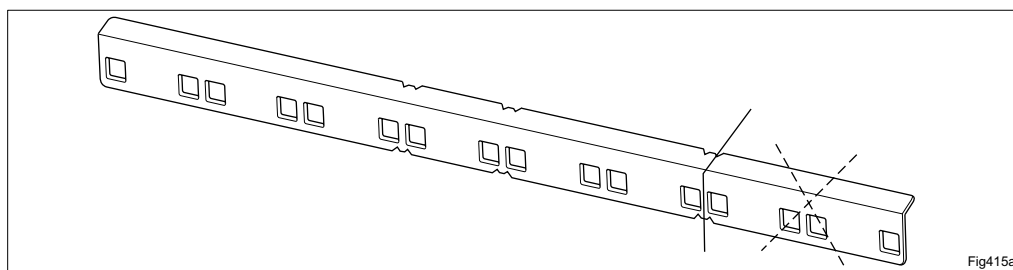


Figure 4-43. The markings on the bar, showing where the bar can be sawn off.

**Note:** The bars can be sawn off to a suitable length.

See the markings on the bar in the figure above.

Use the right marking in a pair when sawing off the right part of the bar (and the left, when sawing off the left part)

Fit the bars as described below:

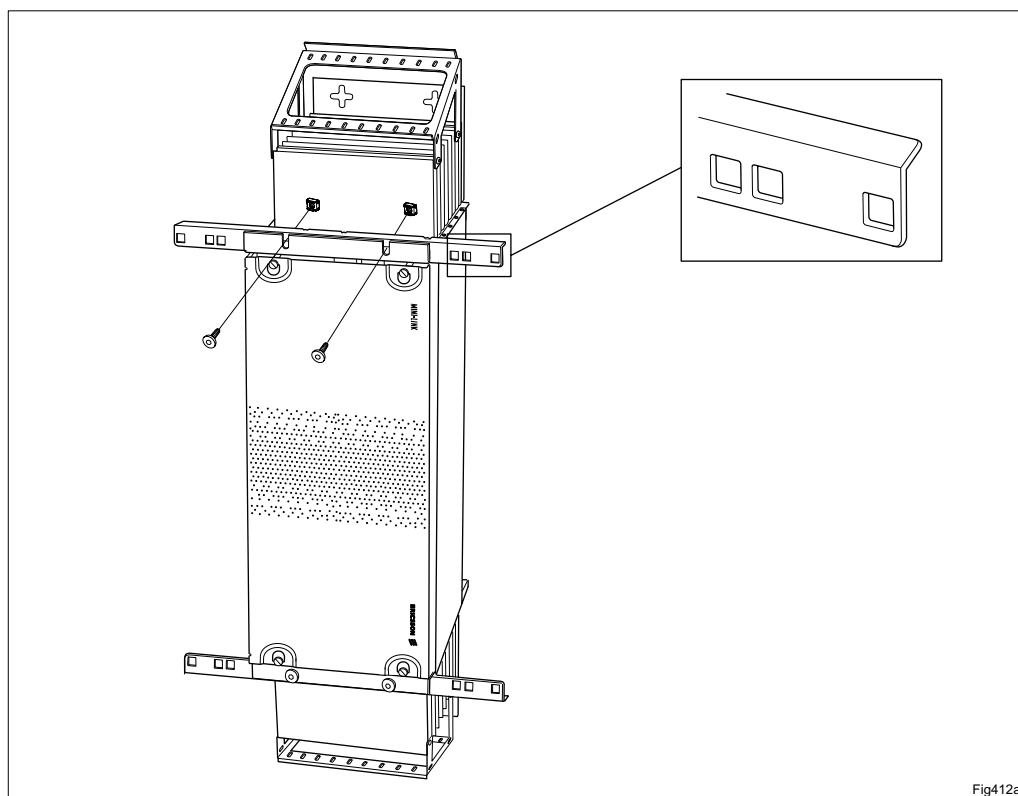


Figure 4-44. Fitting the bars (optional).

#### Fitting:

1. Fit the bars to the brackets on both sides of the magazine, as shown in the figure. Use two screws and captive nuts (included in the wall set) for each bar.

### 4.6.8 Fitting the DDU, Coax Cable Panel and Radio Cable Panel (optional)

The DDU (DC Distribution Unit, BMG 907 003 negative earth and BMG 907 013 positive earth) is used for distribution of primary DC power to MINI-LINK equipment, see separate instruction for further information.

#### 4.6.8.1 Fitting the DDU, Coax Cable Panel and Radio Cable Panel with a 2U Magazine

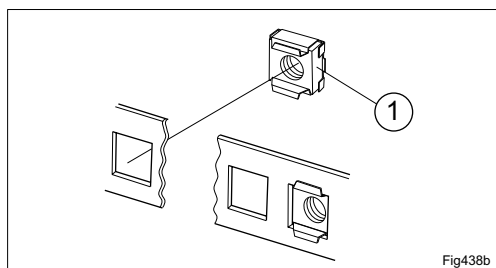


Figure 4-45. Fitting the captive nuts.

2. Fit the captive nuts, ①, to the bar.

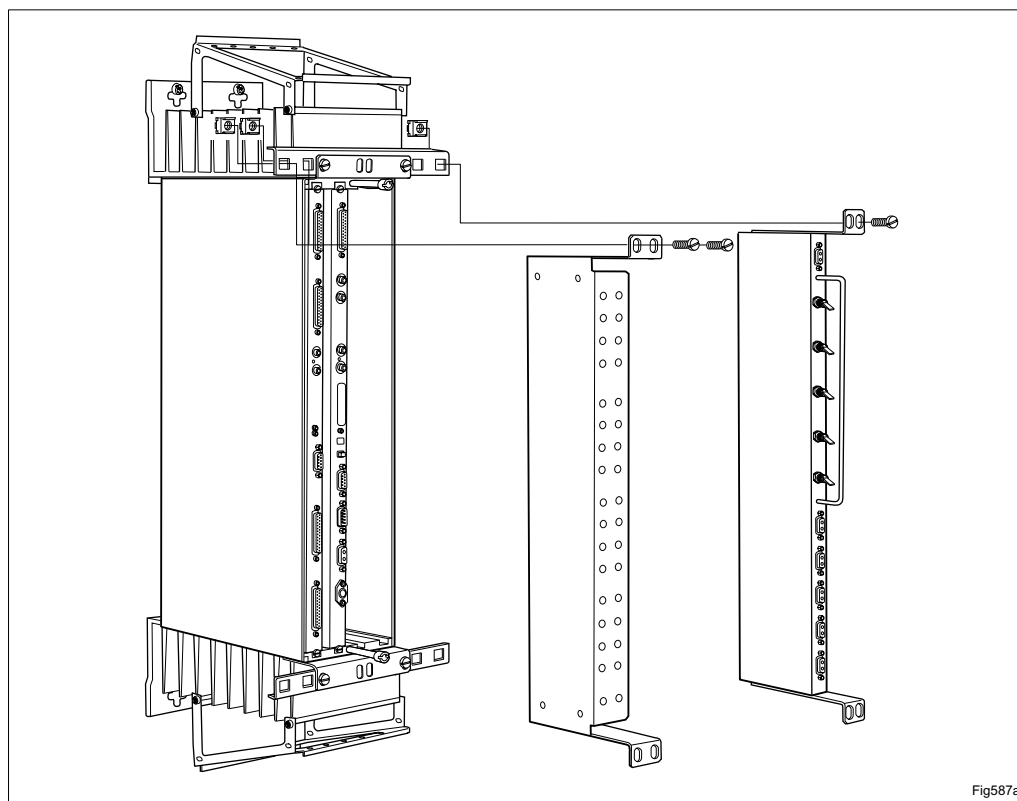


Figure 4-46. Fitting the panels using captive nuts.

3. Fit the panels to both brackets as shown in the figure above, using the screws. Use a wall bracket to fasten the radio cables, see section 7.10.2 for more information.

#### 4.6.8.2 Fitting the DDU, Coax Cable Panel and Radio Cable Panel with a 4U Magazine

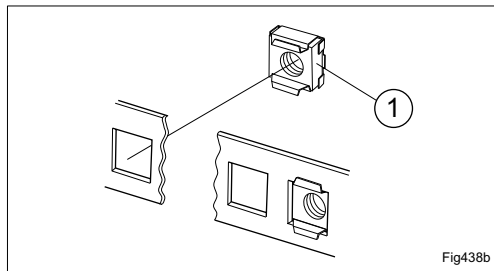


Figure 4-47. Fitting the captive nuts.

1. Fit the captive nuts, ①, to the bar.

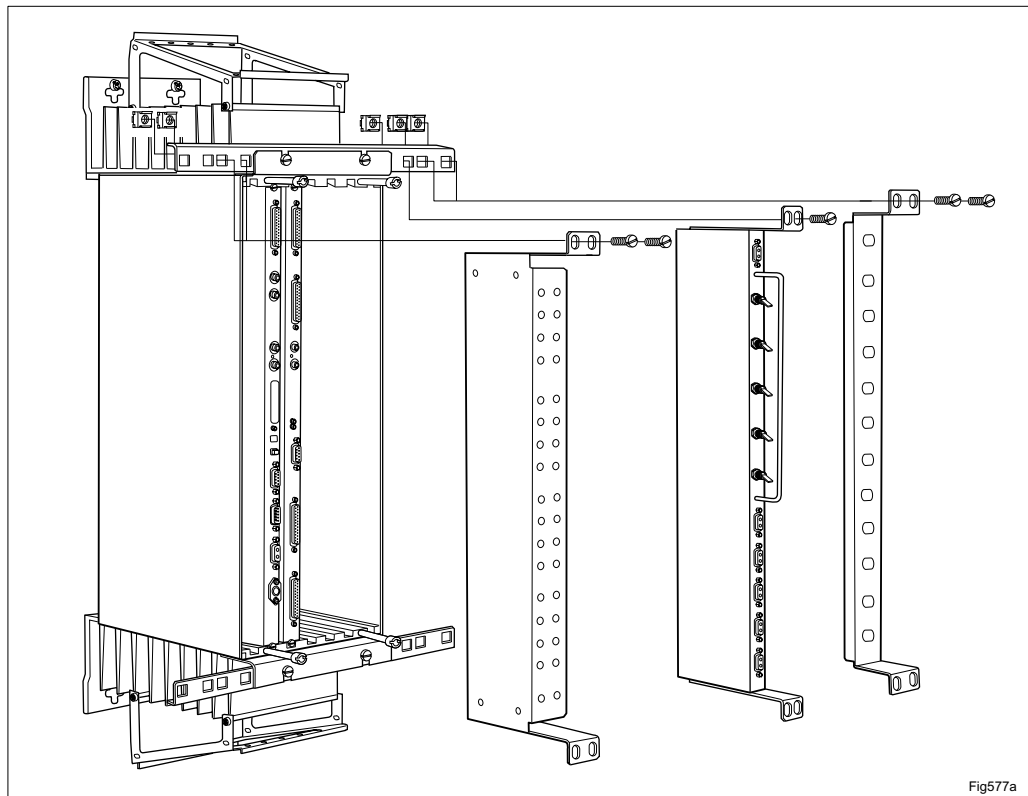


Figure 4-48. Fitting the panels using captive nuts.

2. Fit the panels to both brackets as shown in the figure above, using the screws. Use a wall bracket to fasten the radio cables, see section 7.10.2 for more information.

## 4.6.9 Earthing Cabling of Wall-installed Magazines

### 4.6.9.1 Earthing Cabling of Wall-installed 2U-1, 2U-2 and 4U Magazines

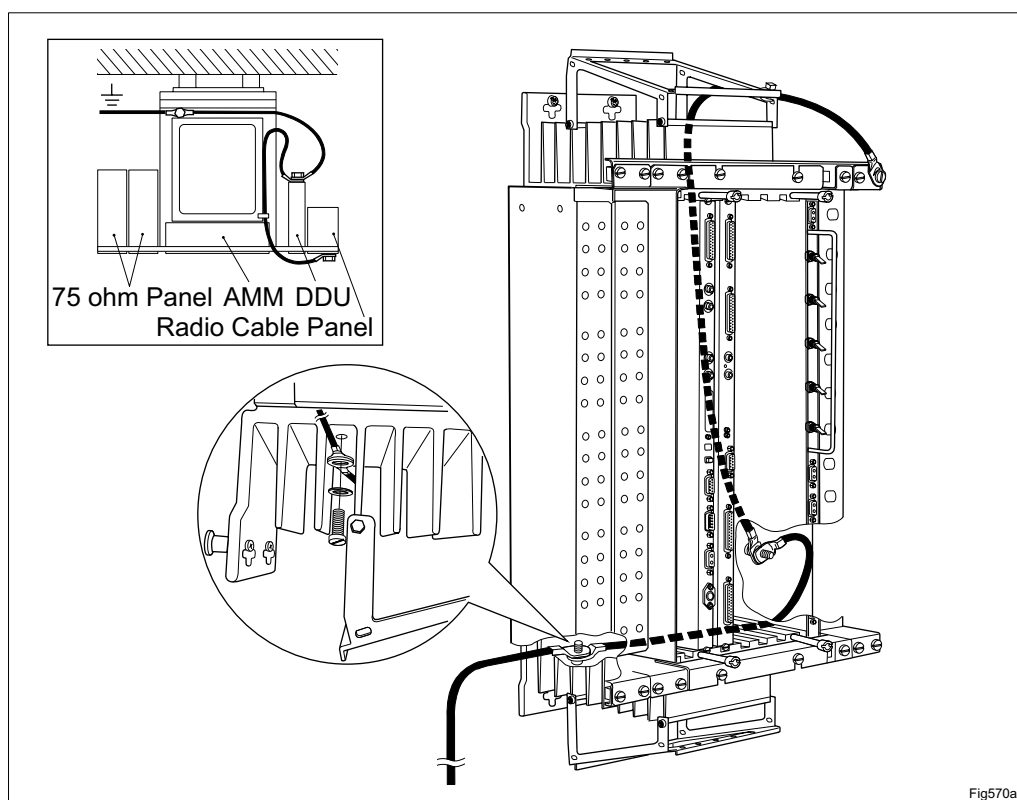


Figure 4-49. Earthing cabling for wall installation of 2U-1, 2U-2 and 4U Magazines.

1. Position and connect the cables to the units as shown in the figure and strap the first cable to the upper cable holder.
2. Remove one screw from the cooling flanges. Connect the earthing cable using a screw and washer included in the wall set.

**Note:** The earthing cables are connected in series to reduce the cabling.

### 4.6.9.2 Earthing Cabling of a Wall-installed 2U-3 Magazine

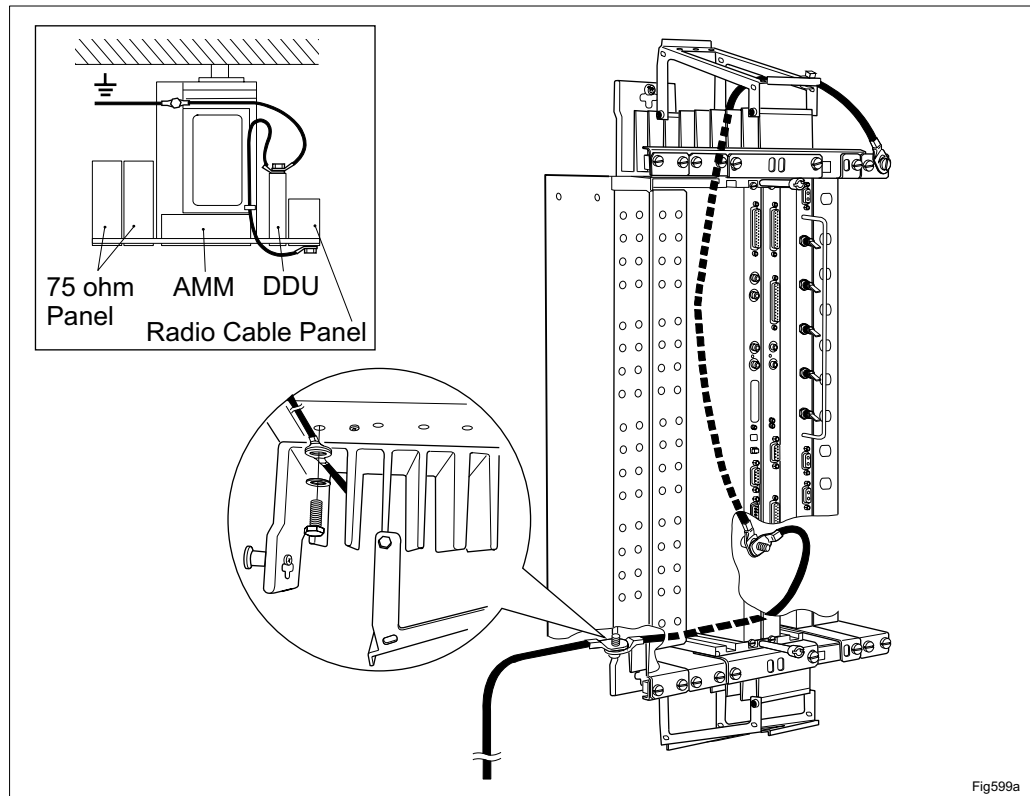


Figure 4-50. Earthing cabling for wall installation of a 2U-3 Magazine.

1. Position and connect the cables to the units as shown in the figure and strap the first cable to the upper cable holder.
2. Remove one screw from the cooling flanges. Connect the earthing cable using a screw and washer included in the wall set.

**Note:** The earthing cables are connected in series to reduce the cabling.

## 4.7 Installing the Magazine on a Desk

The figure below gives an overview of the jobs included when installing the magazine. Use desk set for the 1U magazine (SXX 111 537/3)

### 4.7.1 Overview of Desk Installation

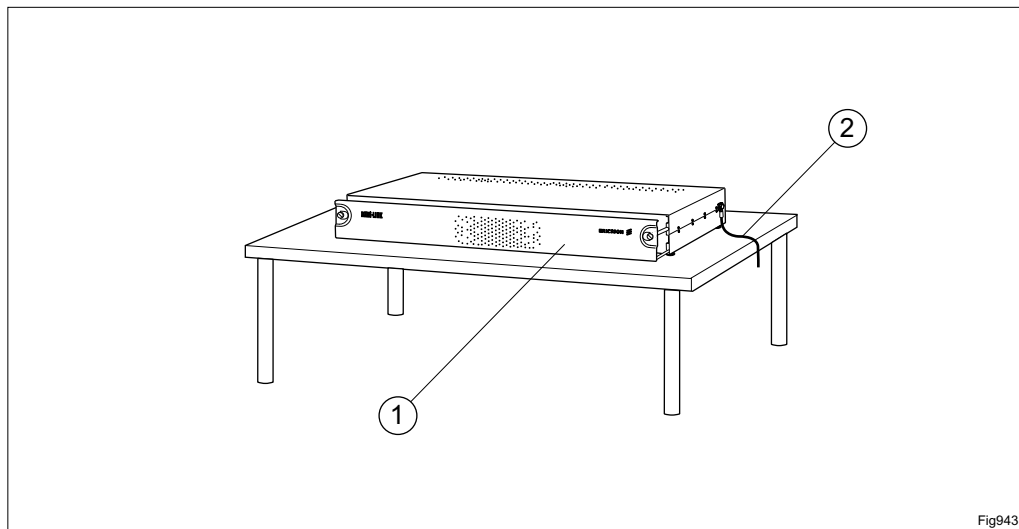


Figure 4-51. Earthing the access module magazines 2U-1, 2U-2 and 4U.

**Step 1.1** Open and remove the front panel ①, (see section 4.7.2)

**Step 1.2** Assemble the magazine, (see section 4.7.3)

**Step 1.3** Connect the earthing cable ② to the magazine (see section 4.7.4).

**Step 1.4** Install the magazine (see section 4.7.5).

**Continue to section 4.8**

### 4.7.2 Opening and Removing the Front Panel

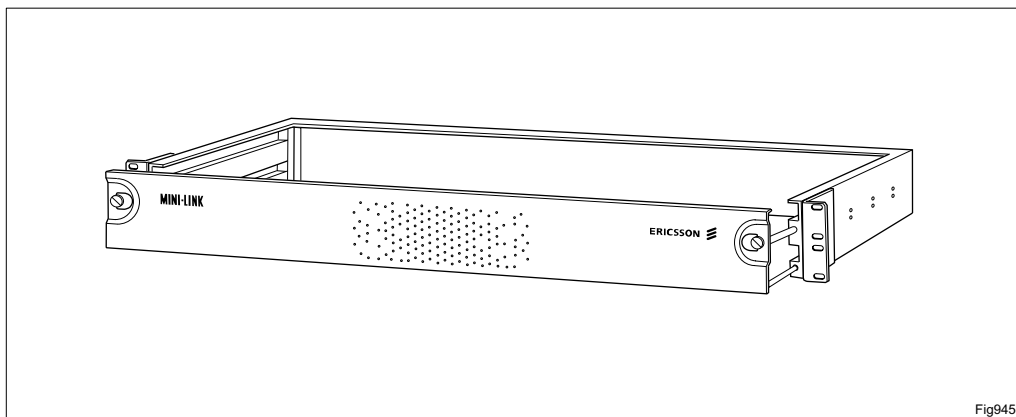


Figure 4-52. The access module magazine.

1. Turn the two screws 90° anti-clockwise.

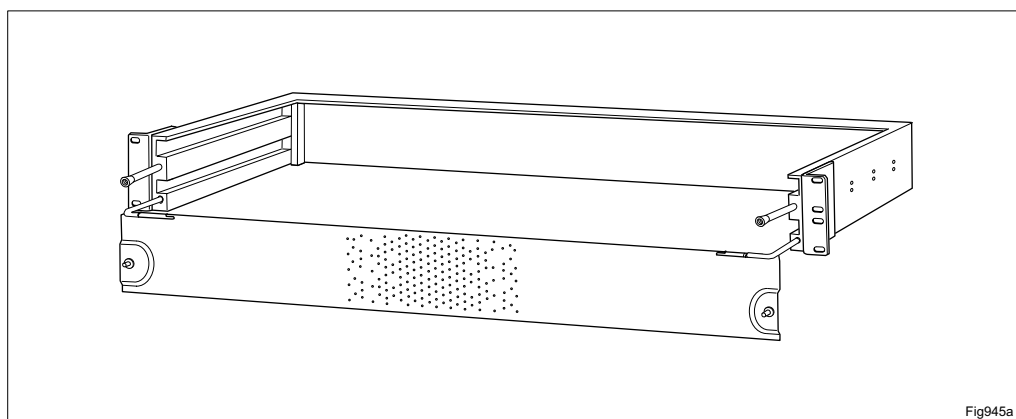


Figure 4-53. Opening the front panel.

2. Open the front panel completely, as shown in the figure above.

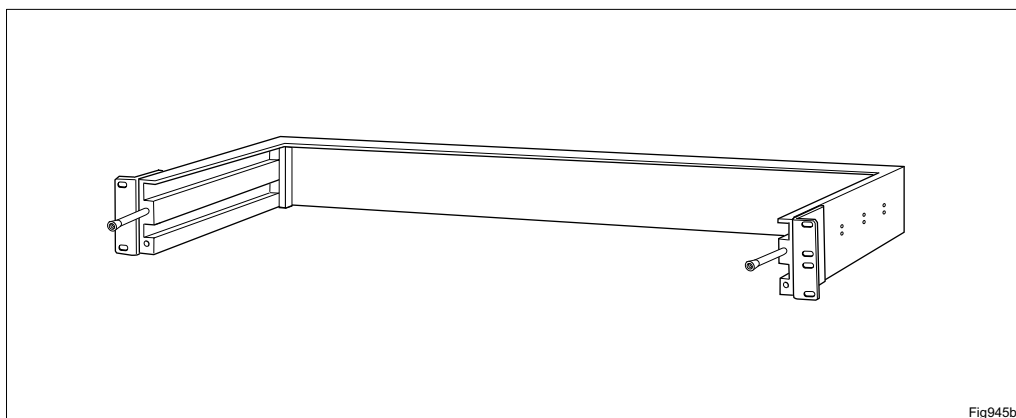


Figure 4-54. The magazine with the front panel removed.

3. Pull out the front panel, with hinges, from the magazine and remove it completely.



### 4.7.3 Assembling the 1U Magazine

Before the 1U magazine is installed on a wall or put on a desk it has to be assembled.

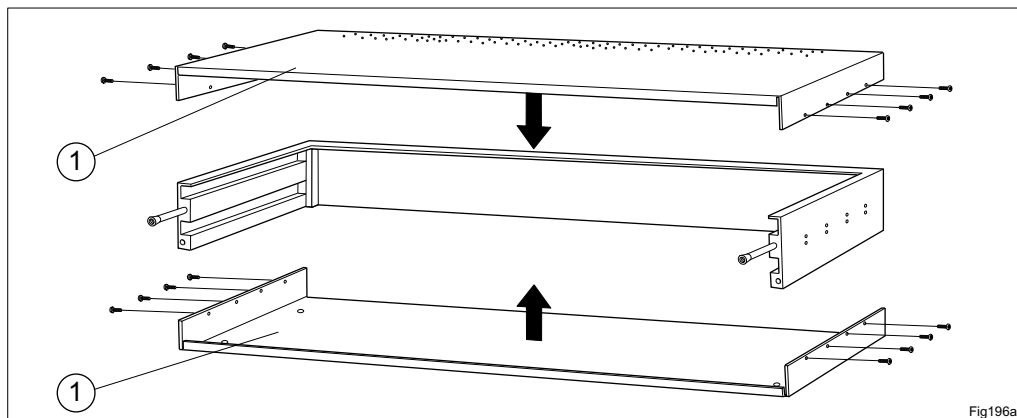


Figure 4-55. Assembling the magazine.

**Assembly:**

1. Remove the brackets from the magazine using Torx screwdriver TX 10 (M3).
2. Fit the top and bottom plate ① to the magazine (eight screws per plate), as shown in the figure above.

## 4.7.4 Earthing the Magazine

The following pages describe the procedure to earth the magazine.

### WARNING



The access module magazine must be earthed.

The earthing cable kit, SXX 111 514/2, is included as standard in the AMM delivery.

### 4.7.4.1 Earthing the 1U Access Module Magazine for Desk Installation

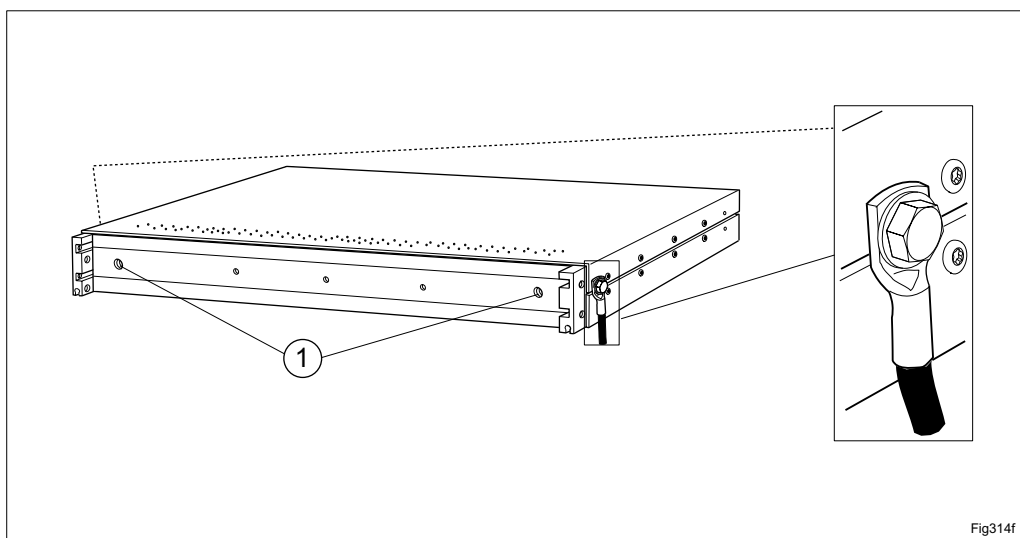


Figure 4-56. Earthing the access module magazine 1U.

1. Connect the cable to the magazine, as shown in the figure above. Use the 13 mm ring and open jaw wrench for tightening. As alternative, the earthing cable can be connected to different positions on the magazine.

### 4.7.5 Installing the 1U Magazine on a Desk

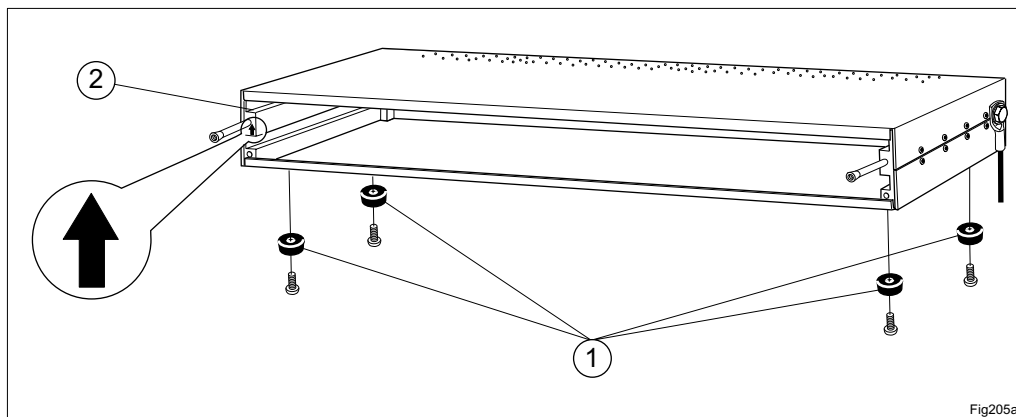


Figure 4-57. Installing the magazine on a desk

**Installing:**

1. Fit the four supports ① to the bottom plate using the four screws.
2. Place the magazine on a desk and insert the MMU into the MMU slot ②, of the magazine. The arrow on the magazine as well as the MMU must point upwards.
3. Fit the front panel to the magazine.

## 4.8 Inserting/removing the Plug-in Units

Read the instructions below before inserting the plug-in units:

- We recommend you to position the units for optimal traffic routing from the beginning considering future upgrades, for example 1+0 to 1+1, increasing traffic or additional terminals. The plug-in unit with the highest traffic rate should be placed in the position with the highest position number in the AMM, see example below. More information is found in the Planning & Engineering Manual, EN/LZT 110 2013.

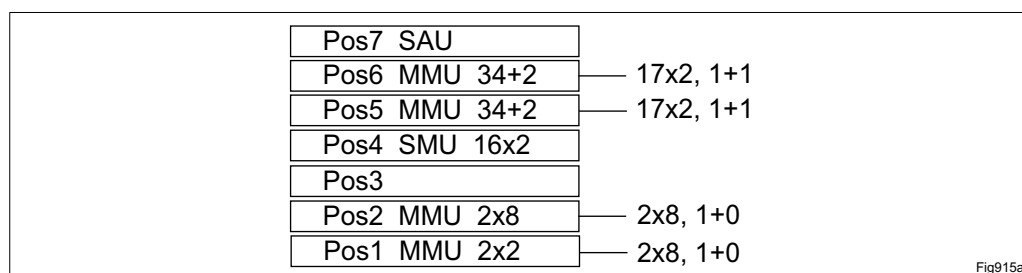


Figure 4-58. The positions of the plug-in units in the AMM.

- If the magazine is not fully equipped, make sure that the plug-in units are positioned in accordance with the position number in the AMM unit, starting with the highest position number. For example, if there are only two MMUs they should be positioned in Pos6 MMU and Pos5 MMU, **not** Pos2 MMU and Pos1 MMU.

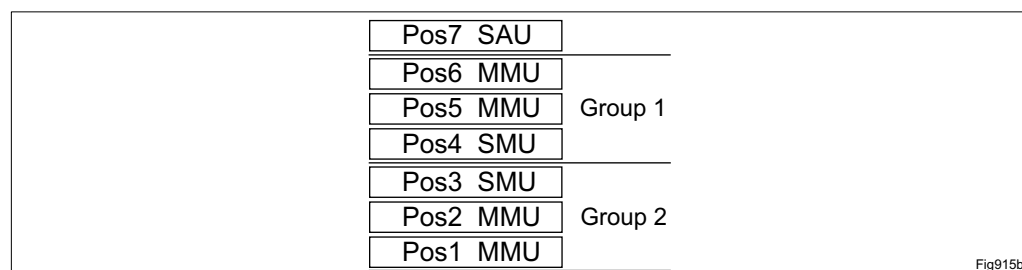


Figure 4-59. The grouping of the plug-in units in the AMM.

- Check the product code labels on the units. Make sure all units in the AMM are specified for the same power supply voltage.

### 4.8.1 Inserting the Plug-in Units

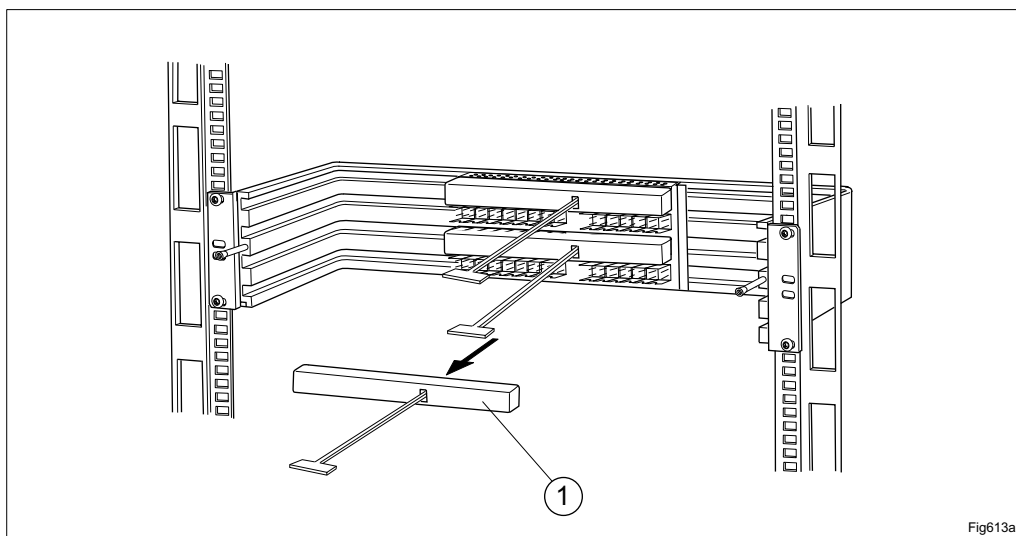


Figure 4-60. Removing the protective caps.

1. For AMM 2U-3: Remove the protective caps, ①, from the positions to be used as shown in the figure above. Remove the front panel during insertion if the lowest position in the magazine is used.

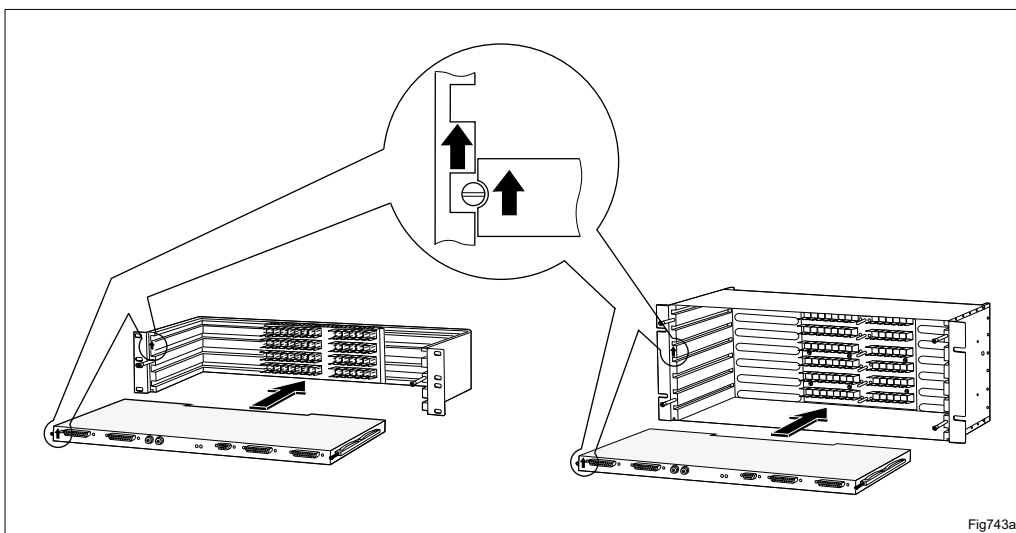


Figure 4-61. Orientation of the plug-in unit and the magazine.

2. Insert the plug-in unit in the magazine, in accordance with the label on the inside of the front panel. The arrow on the magazine as well as on the plug-in unit must point upwards, see figure above.

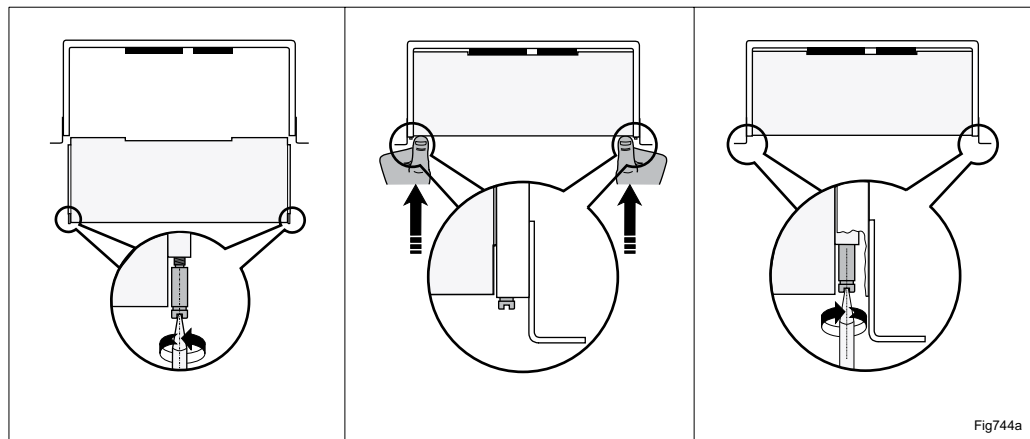


Figure 4-62. Fitting the plug-in unit.

3. Loosen the two screws (2 mm screwdriver), one on each side of the plug-in unit. The slot on the screws must be aligned with the front of the plug-in unit, see figure above.

4. Press in the plug-in unit according to the figure.

**Note:** Make sure the plug-in unit is pressed in straight and until it connects to the back of the AMM.

5. Secure the plug-in unit using the two screws (2 mm screwdriver), one on each side of the plug-in unit.

**Note:** Tighten the screw fully. Make sure the head of the screw is not outside the front of the plug-in unit.

## 4.8.2 Removing the Plug-in Units

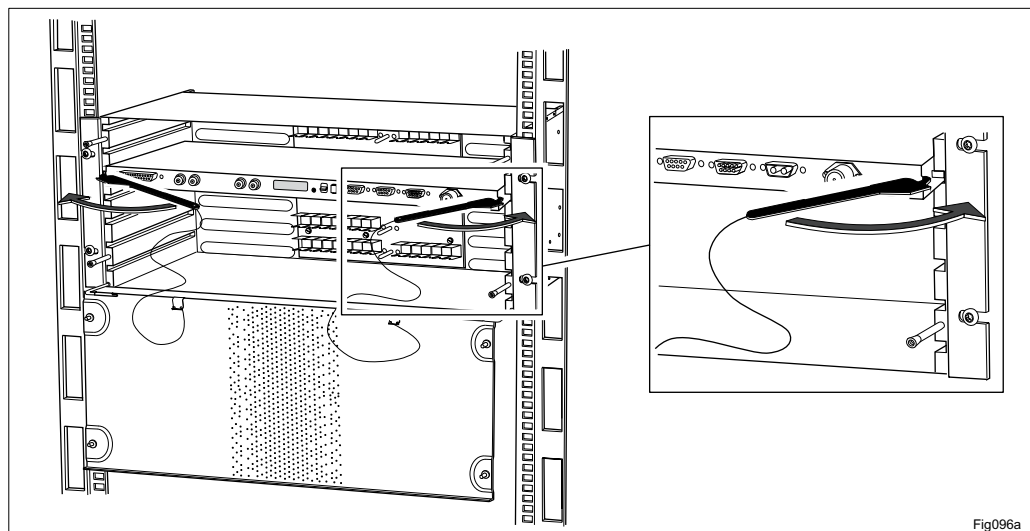


Figure 4-63. Removing a plug-in unit.

1. For AMM 2U-3: Remove the front panel if the lowest position in the magazine is used.
2. Undo the two screws using slot screwdriver 2 mm, one on each side of the plug-in unit.
3. Remove the plug-in unit using the tools attached to the inside of the front cover (see the figure above).

## **4.9 Assembling and Connecting the Cables for the Access Module**

### **4.9.1 Introduction**

The following pages describe the connections to the units in the access module magazine. Ensure that the installation data information from the planning phase is available. This information defines the units required for your installation and for the connections.

Chapter 4.9.12 contains a connector and pin connection overview intended for more experienced technicians.

## 4.9.2 Overview of Cables Connected to the Plug-in Units

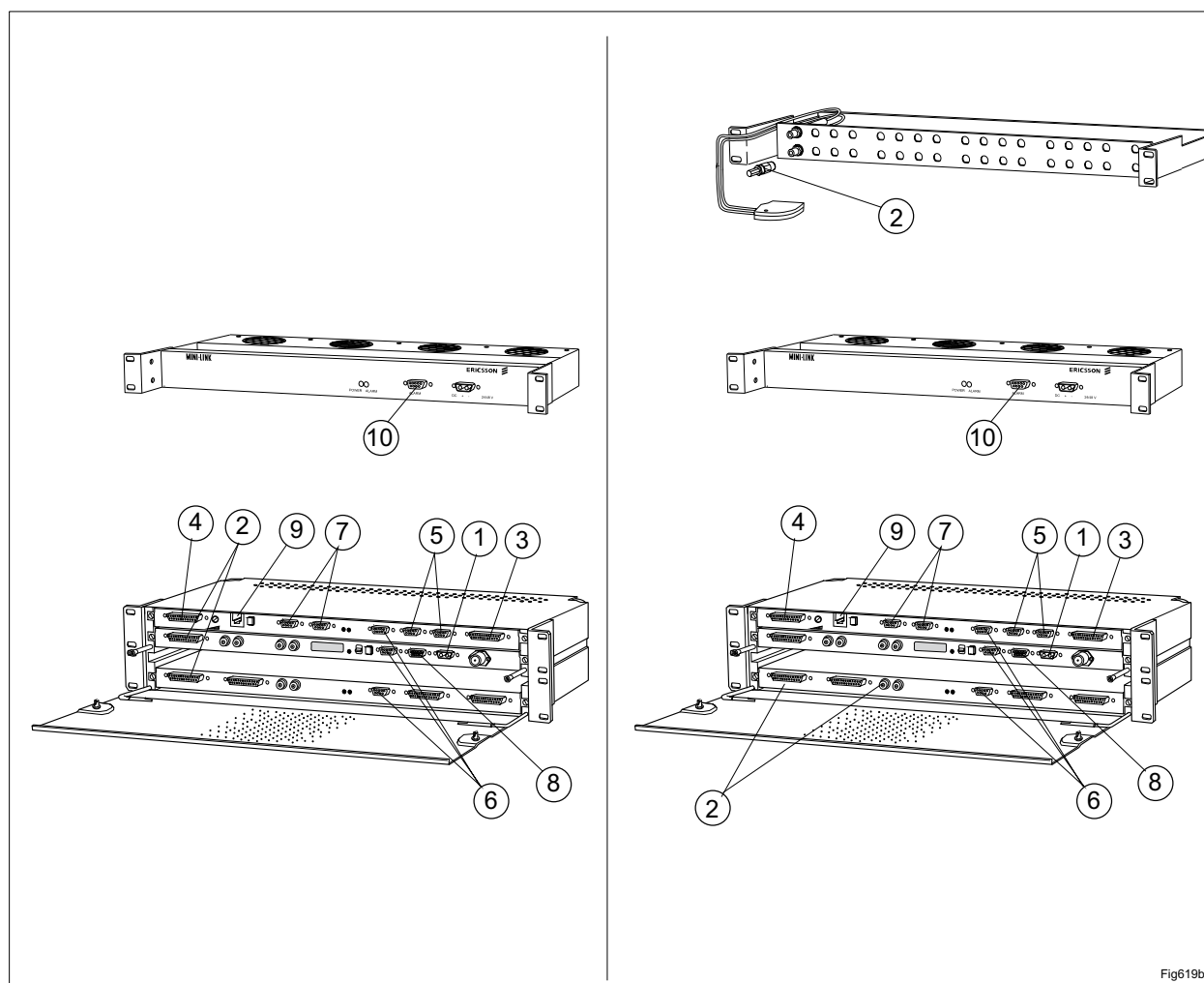


Figure 4-64. Overview of cables connected to the plug-in units.

### Balanced Traffic

- ① DC Cable (see section 4.9.4).
- ② Balanced traffic (see section 4.9.5).
- ③ User In/Out (see section 4.9.5).
- ④ Digital service channel (see section 4.9.5).
- ⑤ EAC cable (see section 4.9.7).
- ⑥ O&M cable (see section 4.9.8).
- ⑦ RAC cable (see section 4.9.8).
- ⑧ NCC cable (see section 4.9.9).
- ⑨ Service telephone (see section 4.9.10).
- ⑩ Fan alarm cable (see section 4.9.11).

### Unbalanced Traffic

- ① DC Cable (see section 4.9.4).
- ② Unbalanced traffic (see section 4.9.6)
- ③ User In/Out (see section 4.9.5).
- ④ Digital service channel (see section 4.9.5).
- ⑤ EAC cable (see section 4.9.7).
- ⑥ O&M cable (see section 4.9.8).
- ⑦ RAC cable (see section 4.9.8).
- ⑧ NCC cable (see section 4.9.9).
- ⑨ Service telephone (see section 4.9.10).
- ⑩ Fan alarm cable (see section 4.9.11).



### 4.9.3 Connectors and Cables

The table below shows the connectors to be used for connection to the access module and cable recommendation. All connectors required are included in the delivery of the units.

Interface	Connector kit	Cable
Traffic (balanced) Digital Service Channels User IN/OUT	SXK 111 517/1	Twisted pair cable TFL 481 53 (8 pairs) or TFL 481 52 (2 pairs)
EAC and BR/EAC RAC	SXK 111 519/1	TFL 481 54 (4 pairs)
NCC	Fan alarm cable, RPM 517 500/2 or NCC cable assembly, RPM 517 500/1	
Traffic (unbalanced), 8 and 34 Mbit/s. (Connected to SMZ connector on MMU/SMU).	SXK 111 520/1 (2 connectors/kit)	Coaxial cable TZC 750 24
Traffic (unbalanced), (connected to 25-pole D-sub connector for 2 and 8 Mbit/s traffic).	See section 4.9.6.	
Testport, TP	SXK 111 520/1 (2 connectors/kit) or a pre- assembled cable, RPM 517 6908/01	
DC	SXK 111 516/1	TFL 424 02
Radio	Station radio cable, RPM 517 6906/01	
O & M	Cable, RPM 517 54/2, included in delivery the installation tool kit.	
Fan alarm	Fan alarm cable, RPM 517 500/2	

Figure 4-65. Connector and cable overview.

#### 4.9.3.1 Traffic cable length

##### Balanced Traffic

Balanced 120  $\Omega$  traffic cable TFL 481 53 or TFL 481 52. Max cable length according to ITU-T Rec G.703 is 175 m for 2 Mbit/s traffic.

##### Unbalanced Traffic

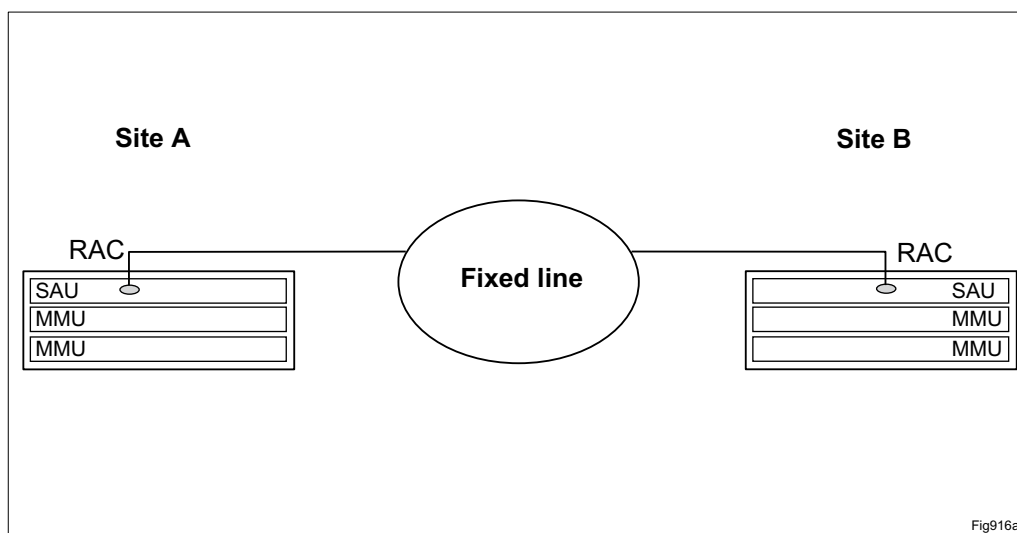
75  $\Omega$  coaxial cable TZC 750 24. Below you find the cable attenuation and max cable length according to ITU-T Rec G.703 for the different traffic rates:

- 23 dB/km for 2 Mbit/s.  
Max cable length is 260 m.
- 45 dB/km for 8 Mbit/s.  
Max cable length is 130 m.
- 92 dB/km for 34 Mbit/s.  
Max cable length is 130 m.

### 4.9.3.2 RAC (Remote Alarm Channel) Cabling

The MINI-LINK clusters can be connected to each other via RAC through a fixed line, RS232 (via modem) or ITU-T Rec. G.703, 64 kbit/s. There are two RAC ports on SAU Exp 1 and SAU Exp 2, which are equivalent.

The RAC should be used when the equipment is not situated on the same site and cannot be reached by air.



SAU RAC connector 9-pin male D-sub			Modem DTE Connector 25 pin male D-sub	
Signal	Pin	Direction	Signal	Pin
RAC 1 RD 104	2		TXD	2
RAC 1 TD 103	3		RXD	3
0 V	5		GND	7

For connection of 64 kbit/s signal, see tables in section 4.9.12.

Figure 4-66. The use and connection of RAC.

The modem shall be connected to the SAU RAC-connector in accordance with the table above.

The RAC ports can also be used to split the net on a site, if there are more terminals than admitted for EAC connection (see section 4.9.3.3).

### 4.9.3.3 EAC and BR/EAC Cabling

Operation and maintenance data to other access modules on the same site or to other MINI-LINK equipment on the site is distributed via the external alarm channel (EAC) in the SAU.

EAC 1 and EAC 2 (BR/EAC1 and BR/EAC2 on SAU Exp 2) are in parallel and either can be used.

**Note:** The maximum cable length at one site is 1200 m.  
Maximum 32 terminals can be connected per site. Maximum 6 of the 32 terminals can be MINI-LINK C Micro units or ICM-C units.

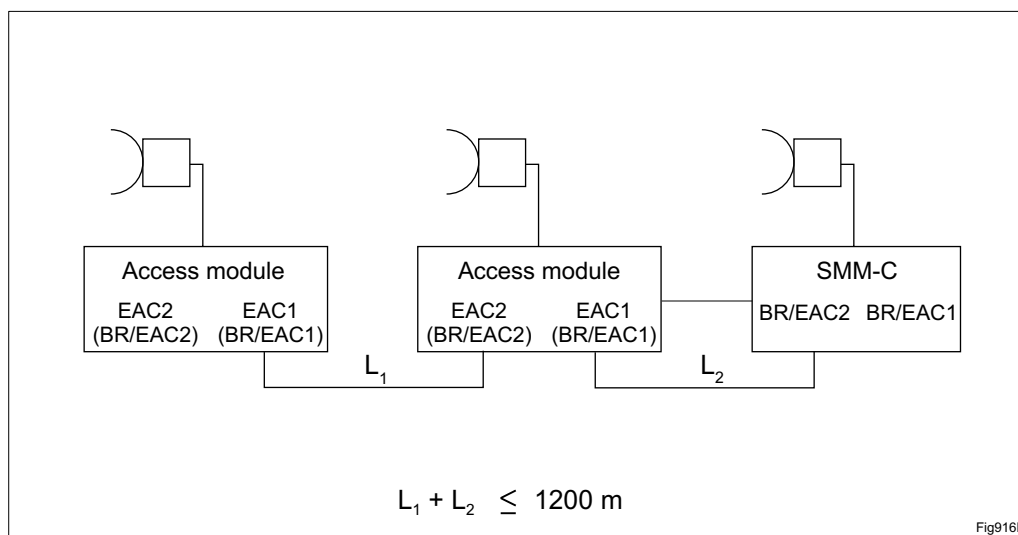


Figure 4-67. EAC cabling

#### 4.9.3.4 NCC cabling

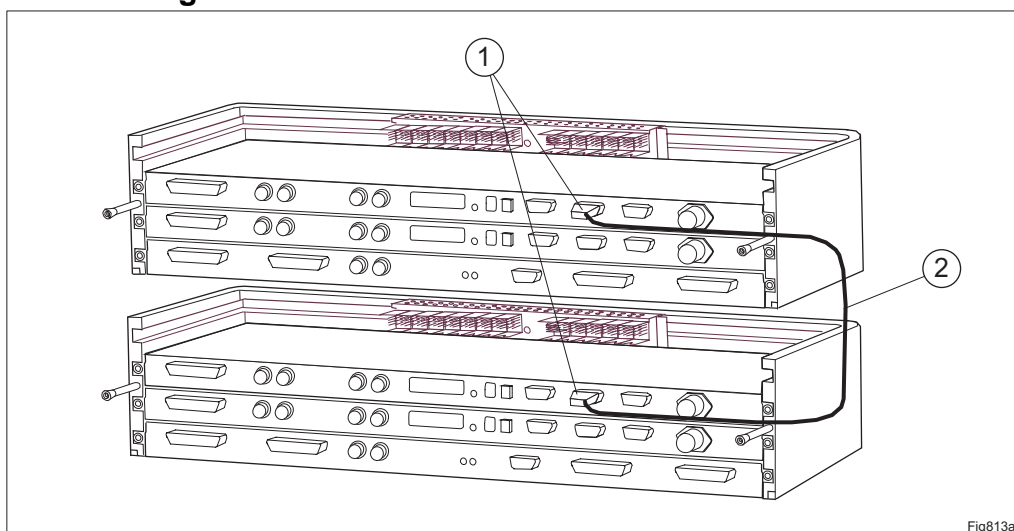


Figure 4-68. Connecting two AMMs with an NCC cable assembly.

NCC is an O&M communication bus which allows interconnection between two AMMs for distribution of operation and maintenance data. The interconnection is made via the NCC ports ①. A 2 m long NCC cable assembly ② is available as accessory. Section 4.9.9 describes how to prepare an NCC cable.

**Note:** A Maximum of two AMMs can be interconnected. Maximum cable length between the two AMMs is 15 m. If the cable length is more than 15 m or if more than two AMMs are to be interconnected, use SAUs. All units in the AMMs must have SW-version  $\geq$  R5C. Hardware revision R1A of AMM 2U-1 does not support expanded NCC.

#### 4.9.3.5 Analog Service Channel Cabling

The analog service channel is used for communication with installation or maintenance personnel in a MINI-LINK network. All MINI-LINK E access modules must be equipped with SAU Exp 2.

For use of the analog service channel, the maximum number of:

- hops in series is 10.
- terminals at a site is 20.
- telephones used at the same time is 5.

#### 4.9.3.6 DC Cabling

Each unit directly connected to the DC supplier must be fused. This can be done by using a DC distribution unit (DDU) or as described on page 4-56.

The DDU is used for distribution of primary DC Power (24-60 V, nominal) to MINI-LINK equipment. The unit can supply five pieces of MINI-LINK equipment, for example four MMUs and one fan unit.

### 4.9.4 Trimming, Assembling and Connecting the DC Cable

Applies to cable TFL 424 02 and 2-pin connector SXX 111 516/1.

The figures below show the parts included in the connector and the cable. Items ② to ⑤ are delivered inside the connector casing.

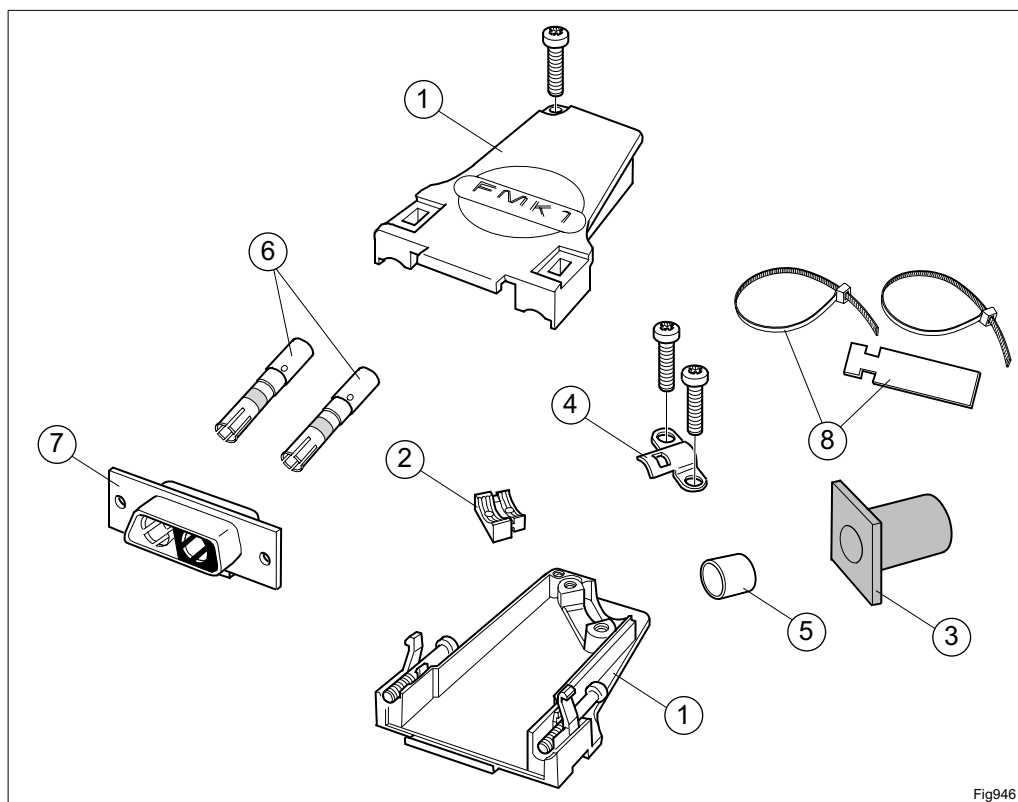


Figure 4-69. The DC connector.

- |                    |                  |
|--------------------|------------------|
| ① Connector casing | ⑤ Tube           |
| ② Insert           | ⑥ Contact sleeve |
| ③ Rubber bushing   | ⑦ Contact socket |
| ④ Clamp            | ⑧ Label          |

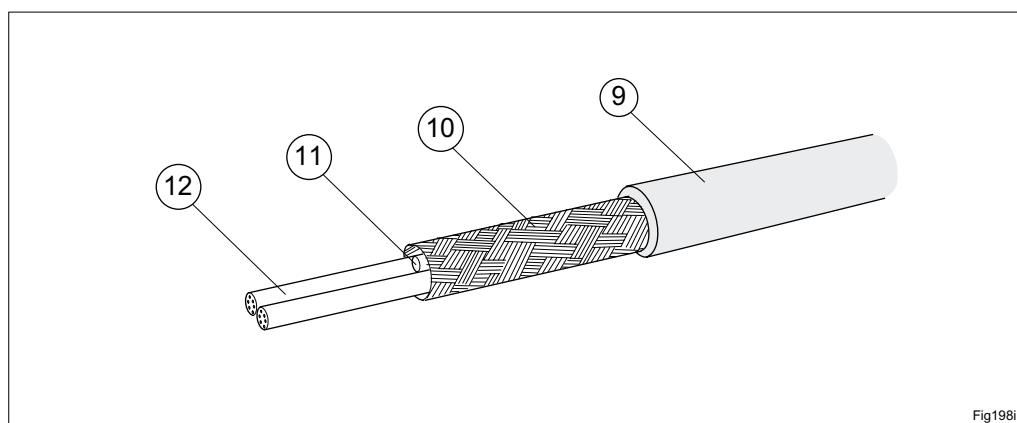
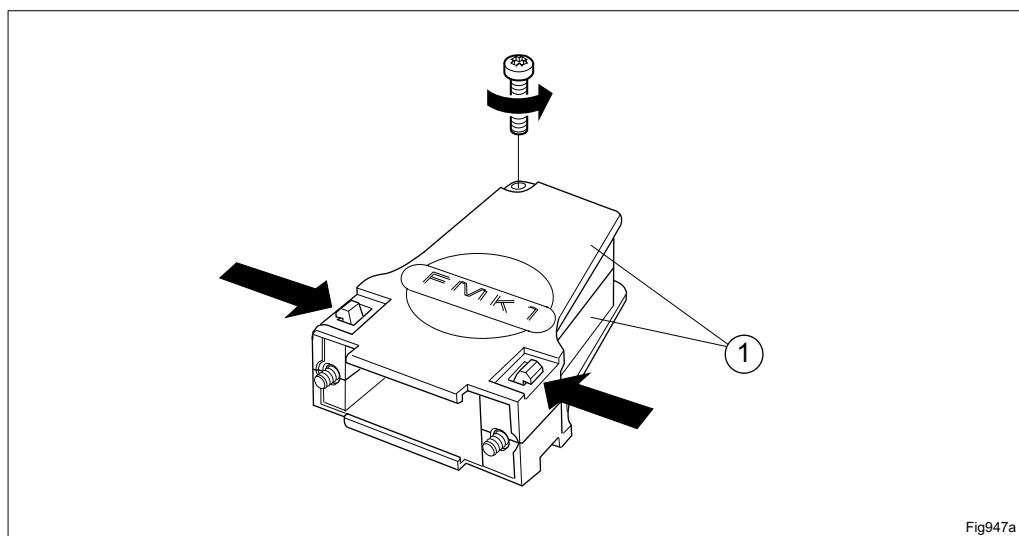
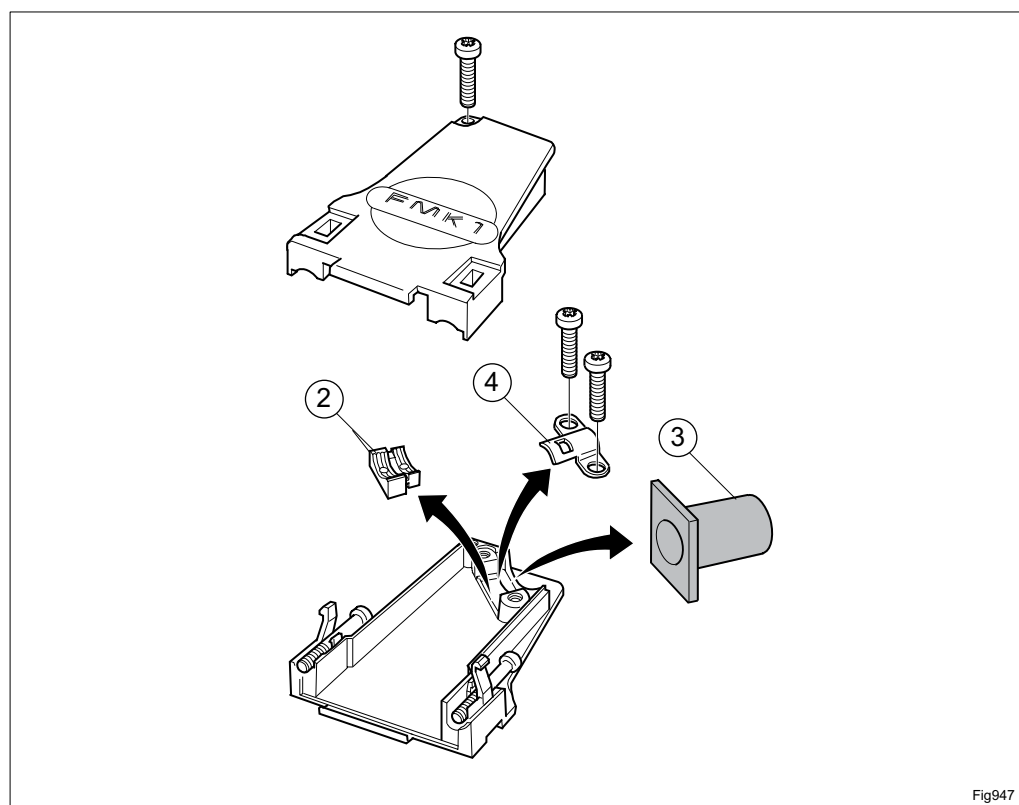


Figure 4-70. The DC cable.

- |          |          |
|----------|----------|
| ⑨ Jacket | ⑪ Filler |
| ⑩ Screen | ⑫ Wire   |

**Opening the connector casing:***Figure 4-71. Opening the connector casing.*

1. Open the connector casing ① by removing the screw, pushing the two plastic springs together and lifting the casing halves apart.

*Figure 4-72. Removing parts*

2. Remove the insert ②, rubber bushing ③ and clamp ④ from the connector casing.

### Trimming:

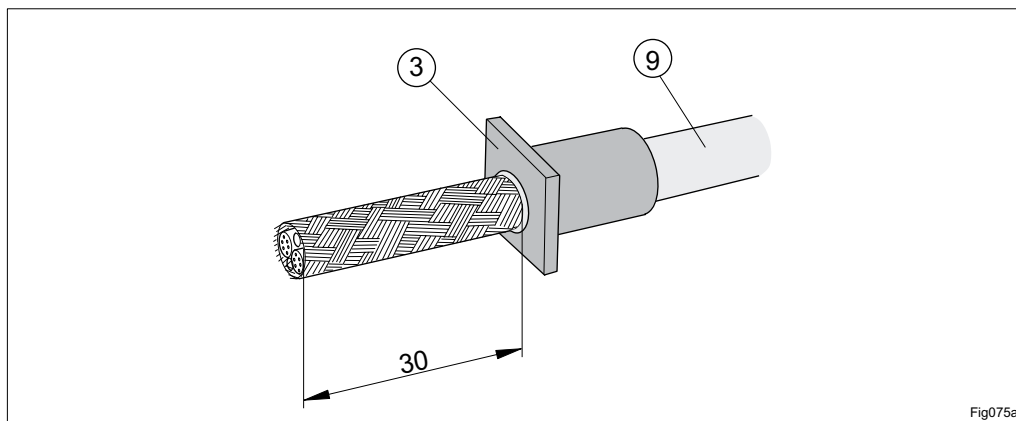


Figure 4-73. Stripping the cable and applying the rubber bushing.

3. Slide the rubber bushing ③ over the cable.
4. Strip the jacket ⑨ approximately 30 mm.

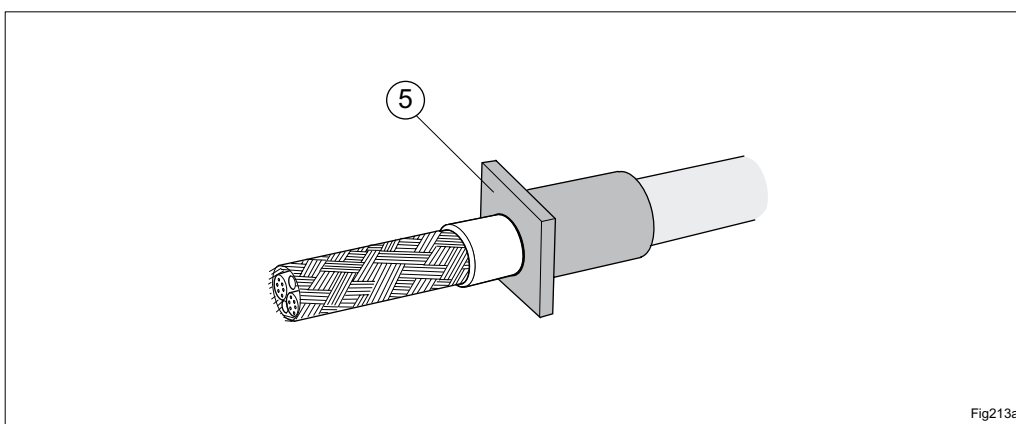


Figure 4-74. Sliding the tube against the jacket.

5. Slide the tube ⑤ over the screen and against the jacket.

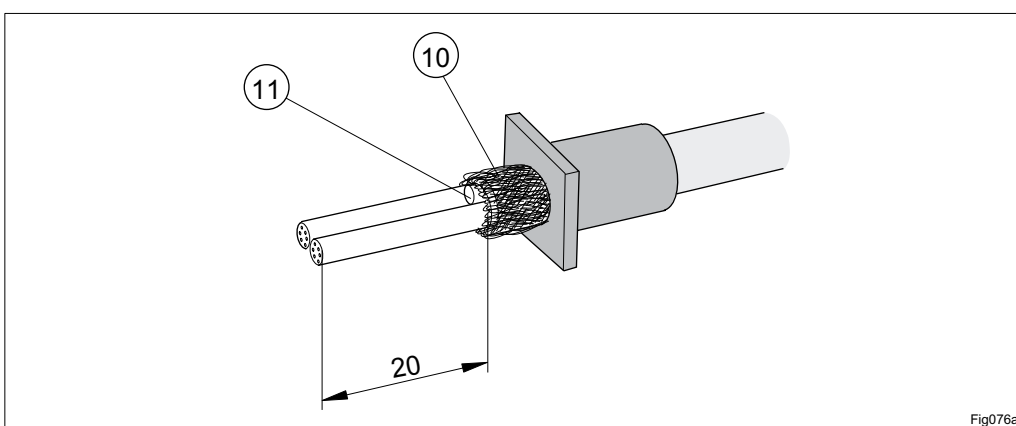


Figure 4-75. Cutting the screen and fillers.

6. Fold the screen ⑩ over the tube and trim the screen.
7. Cut both fillers ⑪ and leave 20 mm of the wires.

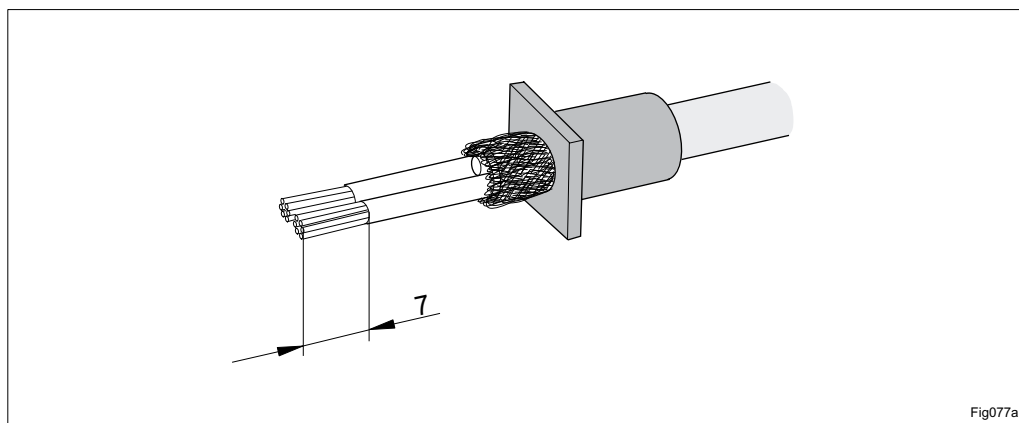


Figure 4-76. Stripping the wires.

- 8.** Strip the wires 7 mm.

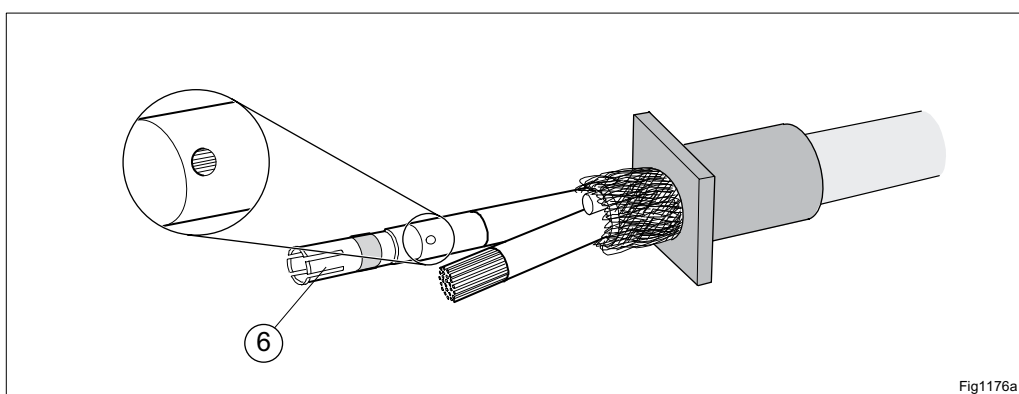


Figure 4-77. Assembling and crimping the contact sleeve.

- 9.** Slide the contact sleeve ⑥ over the wire. Make sure the wire is visible in the inspection hole.

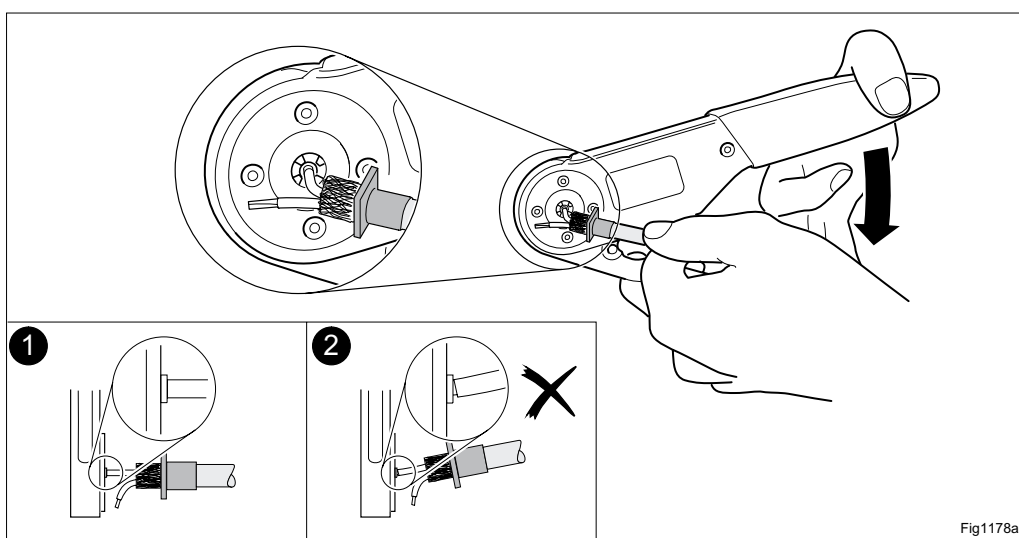


Figure 4-78. Using the crimping tool LSD 319 80.

- 10.** Crimp the contact sleeve by using the crimping tool (LSD 319 80, number 3) and make sure the contact sleeve is inside the crimping tool during crimping. Also make sure the contact and wire are inserted at right angles to the tool ①. Example ② is incorrect.



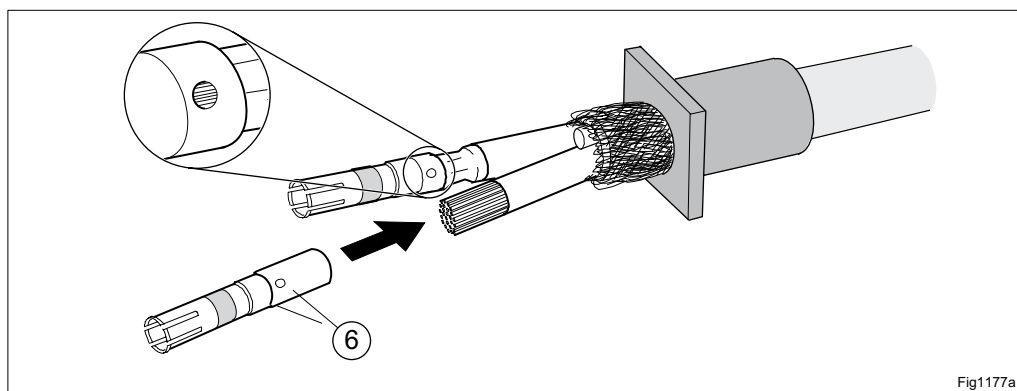
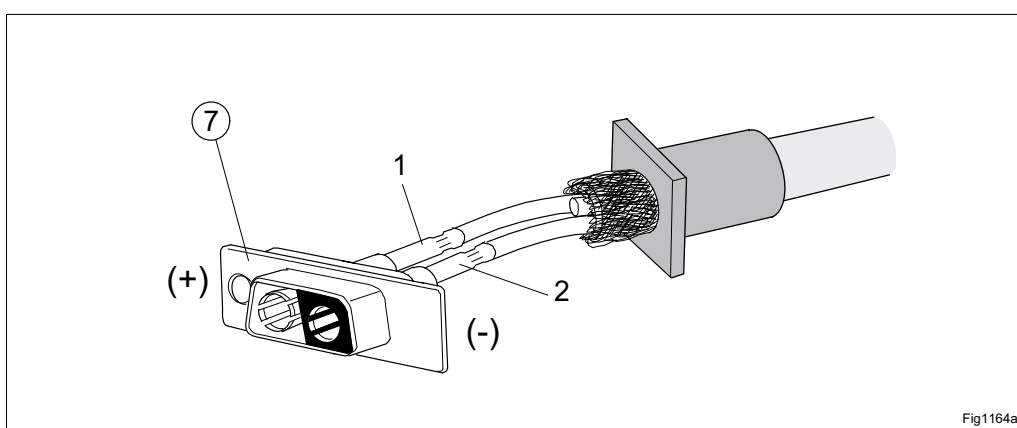


Figure 4-79. Checking the inspection hole and sliding on the second sleeve.

11. Make sure the wires are visible in the inspection hole after crimping.  
Repeat the operation for the second contact sleeve.



External connector	Pin No	Signal	TFL 424 02
DC	1	DC +	Red
	2	DC -	Black

**Note:** The MMU must be installed in the AMM before the power is switched on.

Figure 4-80. Inserting the contact sleeves into the contact socket.

12. Insert the contact sleeves into the contact socket ⑦ according to the table above.

**Note:** Write down colour and polarity (for the connection in the other end.)

**Extracting the contact sleeves:**

Items 13 and 14 only apply if a contact sleeve is inserted improperly.

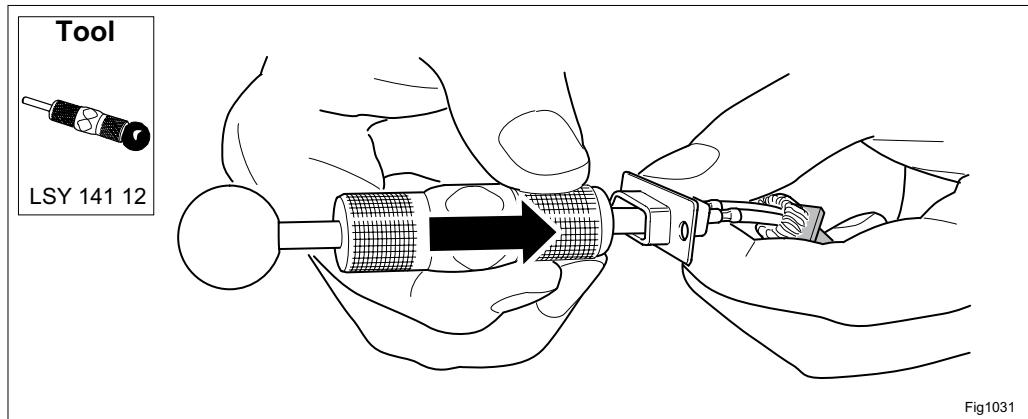


Figure 4-81. Applying the pin extraction tool on the contact socket.

- 13.** Pull back the handle on the pin extraction tool, LSY 141 12, and apply it on the contact socket.

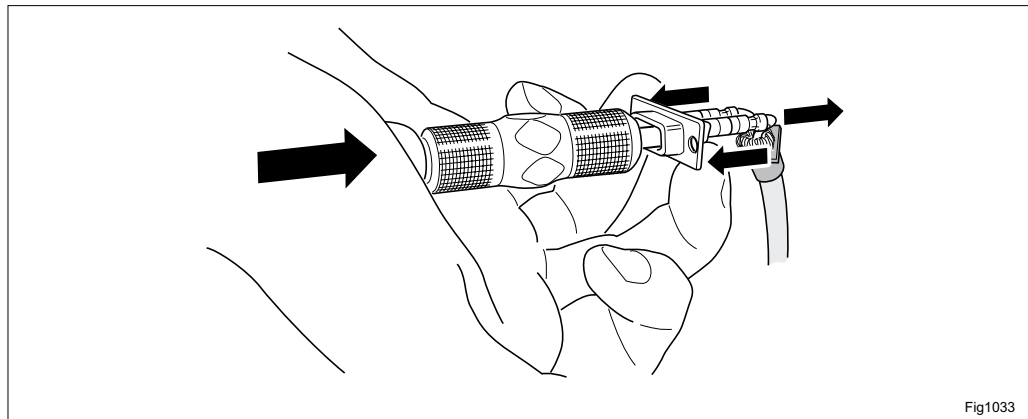


Figure 4-82. Extracting the contact sleeve from the contact socket.

- 14.** Extract the contact sleeve by pressing the contact socket and the tool handle together.

## Assembling:

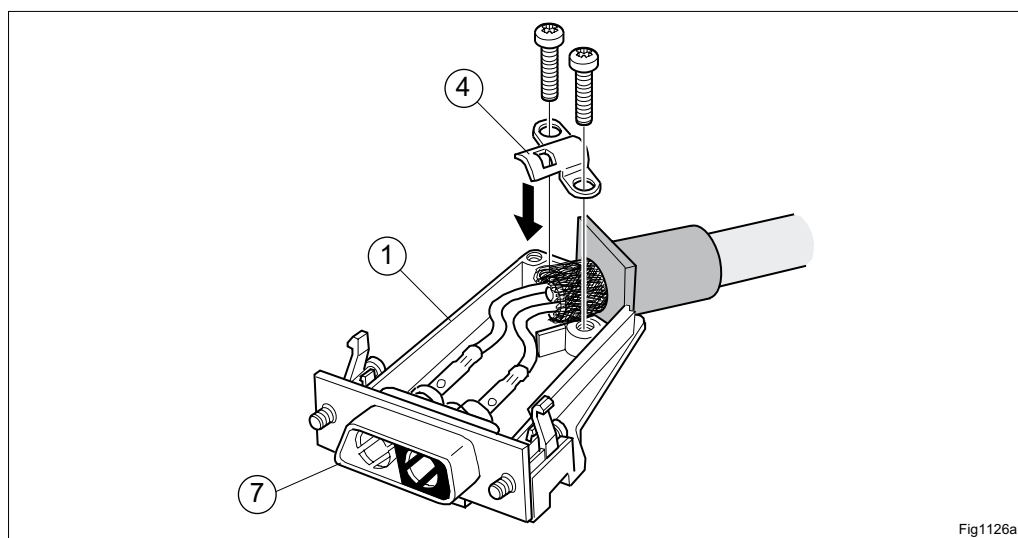


Figure 4-83. Assembling the connector.

15. Lay down the cable and adjust the contact socket ⑦ in the connector casing ①.

**Note:** Ensure the rubber bushing enters the slot in the connector casing properly.

**Note:** Ensure the contact socket ⑦ is positioned as shown in the figure above. Otherwise the cable outlet will point in the wrong direction when the connector is connected to the access module.

16. Fasten the wires and screen with the clamp ④ included, using cross-slot tool type H (Philips) no 1.

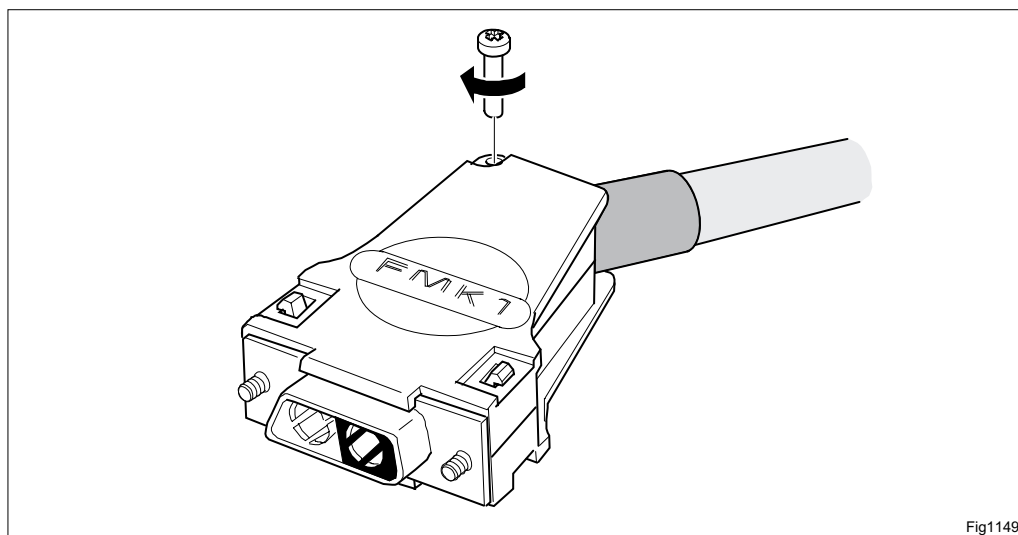


Figure 4-84. Assembled DC connector.

17. Fasten the top of the connector casing with the screw using cross slot tool type H (Philips) no 2.

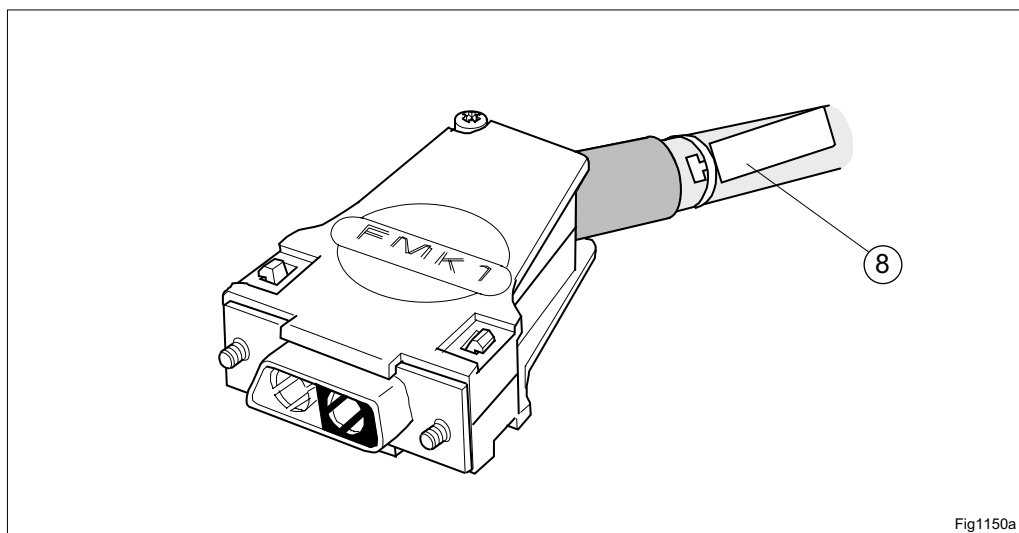


Figure 4-85. Fastening the tag.

18. Fasten a tag ⑧ to the cable using a strap.
19. Mark the assembled connector by writing on the yellow part of the tape and attaching it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

#### Connecting:

**CAUTION**  
!

Make sure the power supply is within the voltage range.  
See section 10.5 for a specification.

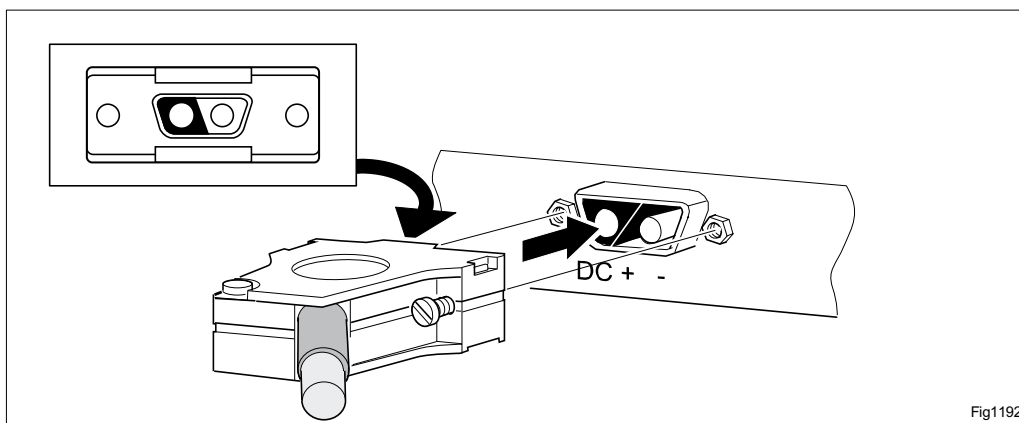


Figure 4-86. Connecting the DC cable.

20. Connect the cable to the DC port on the MMU.

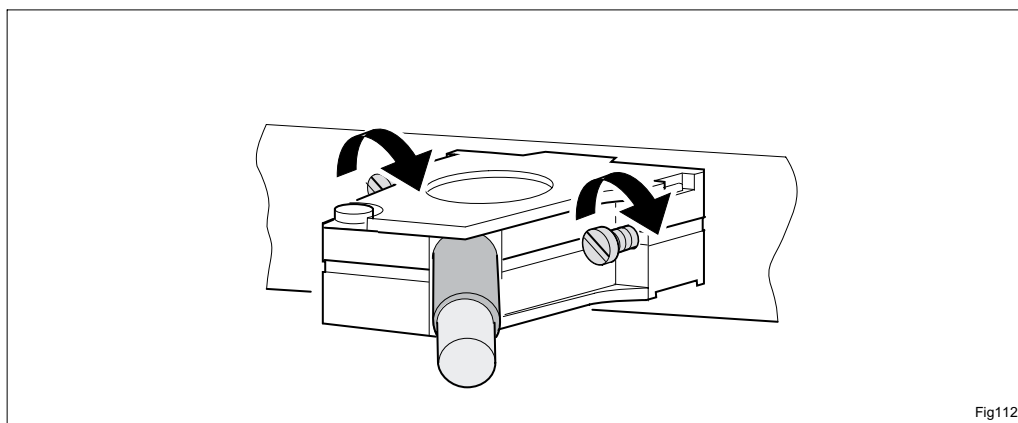


Figure 4-87. Fastening the connector.

**21.** Fasten the connector using the two screws.

**Note:** The MMU must be installed in the AMM before the power is switched on.

Each MMU and the fan unit must have its own fuse. We recommend you to use a DDU (see separate instruction EN/LZT 110 2049). For other cases follow the instruction below:

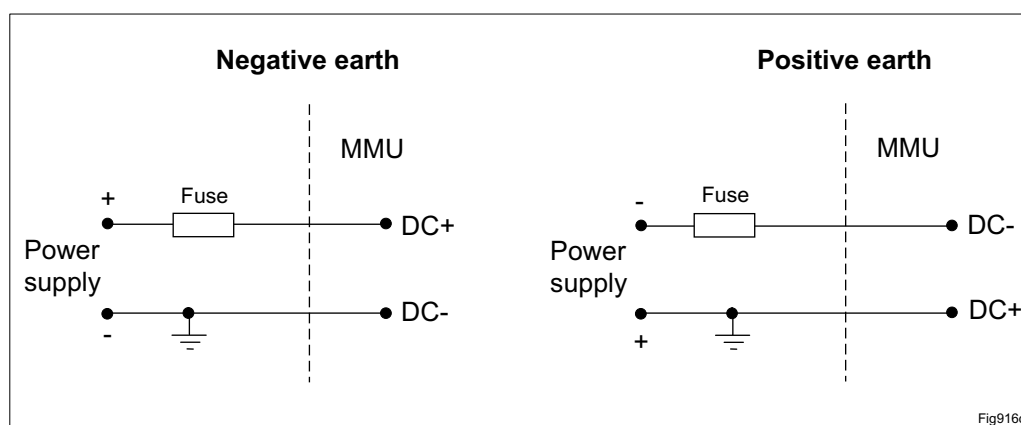


Figure 4-88. How to fuse the power supply for the access module.

**22.** Fuse the power supply as shown in the figure above.

Recommended fuses:

- 5A, min. 100V of type F with ceramic body and high breaking capacity according to UL/CSA 248-14.
- 4A, min 100V of type F with ceramic body and high breaking capacity according to IEC 127.

### 4.9.5 Trimming, Assembling and Connecting the Cables for Balanced Traffic, Digital Service Channel and User In/Out

The connector used is a 25-pin connector (SXX 111 517/1) and it applies to connector for traffic (balanced), digital service channel, User In/Out and cable TFL 481 53 or TFL 481 52.

One 8 pair cable plus one 2 pair cable or up to five 2 pair cables can be connected. The figures show the 2 pairs cable but the instruction also applies to the 8 pair cable. Make sure to use the proper pair of tubes.

**Note:** Included in the connector kit are tubes to suit both the 8 pair and the 2 pair alternatives (five small tubes, five medium and one big), therefore there will always be tubes left over when the cabling is done.

The figures below show the parts included in the connector and cable. Item ② is delivered inside the connector casing.

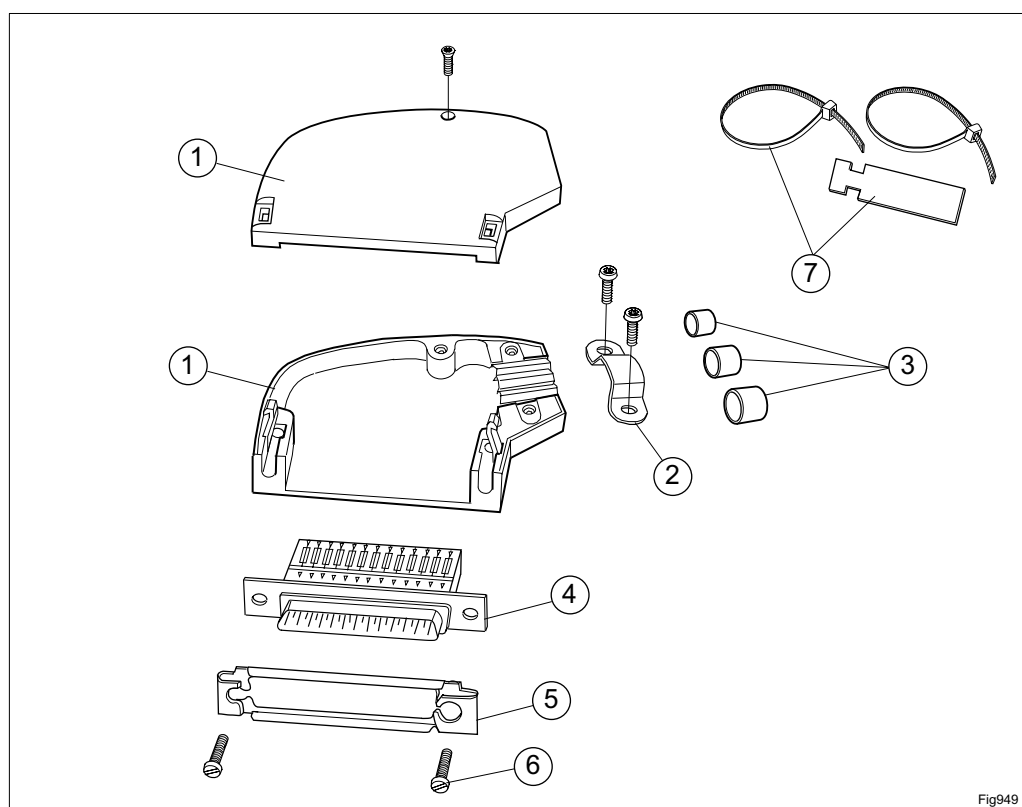


Figure 4-89. The connector.

- |                                |                 |
|--------------------------------|-----------------|
| ① Connector casing             | ⑤ Locking plate |
| ② Clamp                        | ⑥ Screw         |
| ③ Tubes (small, medium, large) | ⑦ Label         |
| ④ Contact socket               |                 |

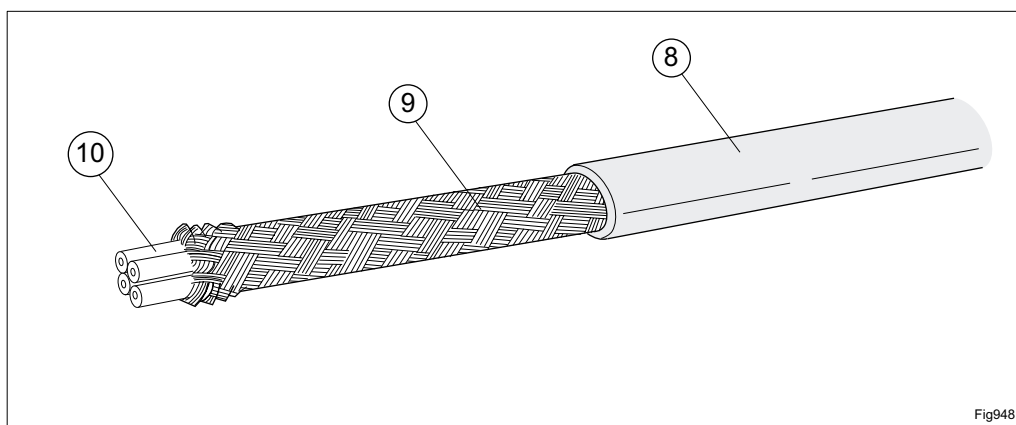


Figure 4-90. The cable.

- ⑧ Jacket
- ⑨ Screen
- ⑩ Wire

### Trimming:

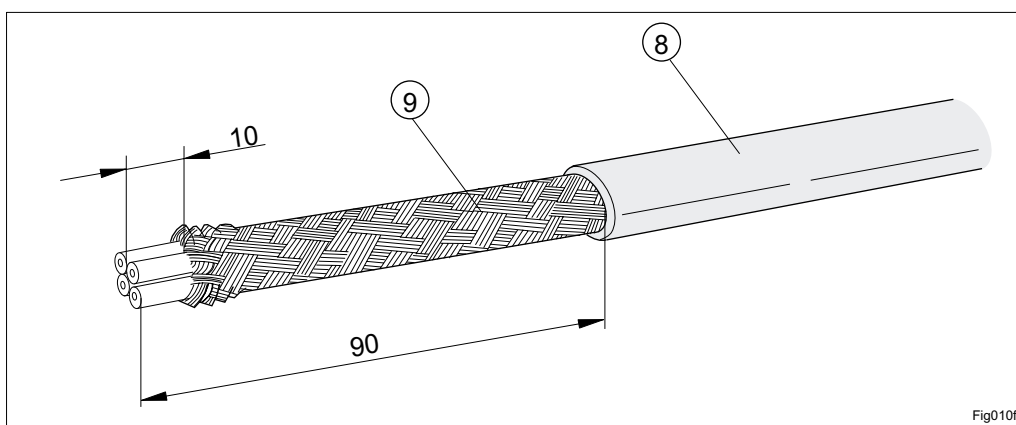


Figure 4-91. Stripping the cable.

1. Strip the jacket ⑧ approximately 90 mm.
2. Push the screen ⑨ back and cut the wires 10 mm.

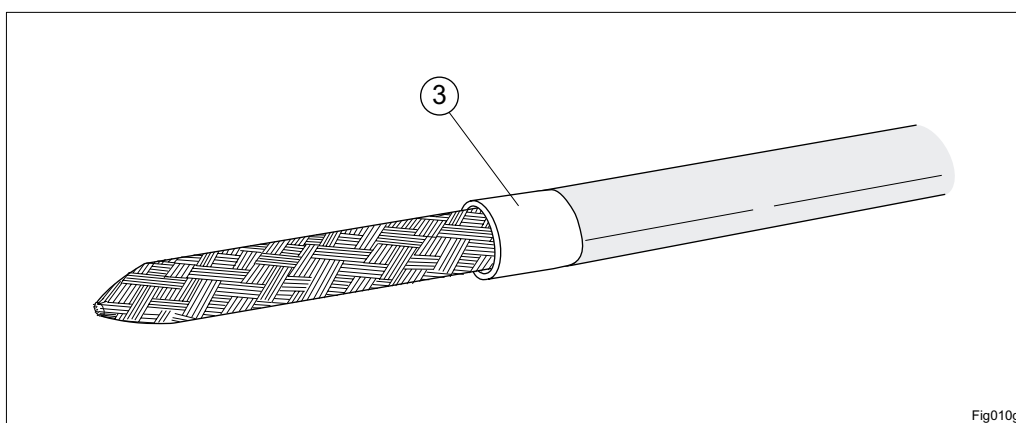


Figure 4-92. Applying the tube.

3. Pull the screen down towards the cable end (it makes it easier to slide on the tube) and slide the small tube ③ (medium for 8 pairs) onto the cable.

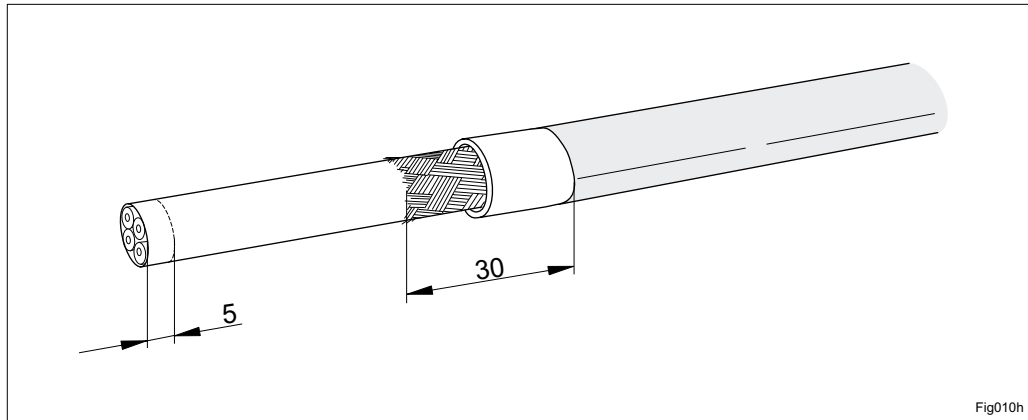


Figure 4-93. Cutting the wires and screen.

4. Cut the screen 60 mm (leave 30 mm).
5. Cut the wires 5 mm.

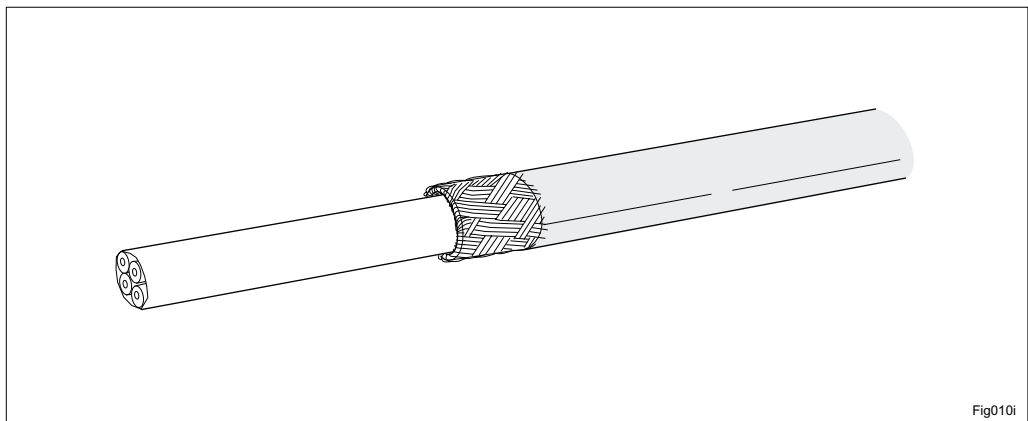


Figure 4-94. Folding the screen over the tube.

6. Fold the screen back over the tube and trim the screen.

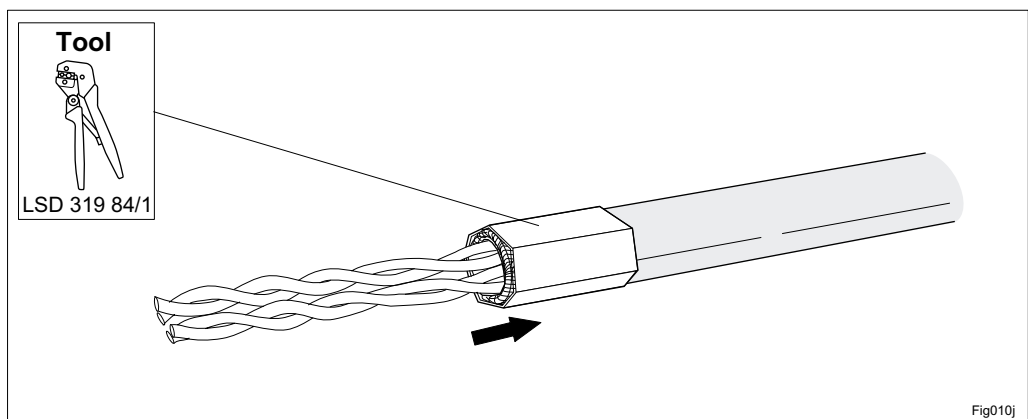


Figure 4-95. Crimping the tube.

7. Slide the medium tube (big for 8 pairs) over the small tube and crimp it, using crimping tool (LSD 319 84/1).
8. Cut the aluminium sheet.

**Note:** Keep the wires twisted in pairs.



### Assembling:

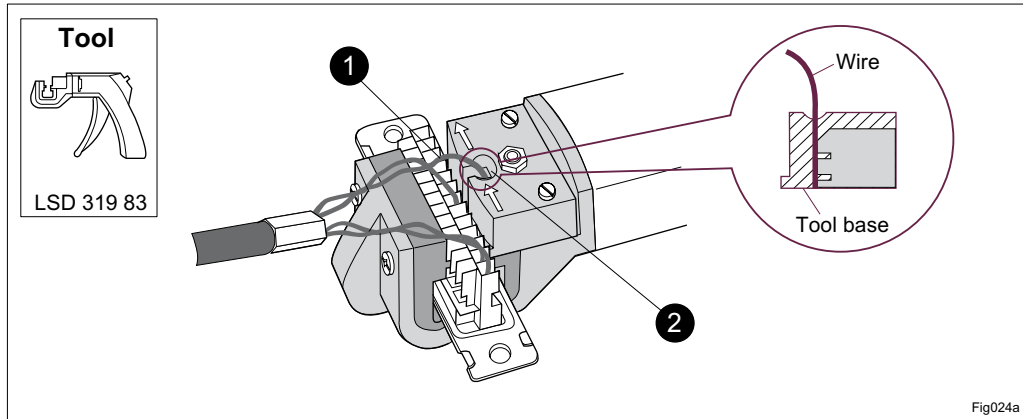


Figure 4-96. Crimping a wire

9. Insert the contact socket from the left (arrow direction in the figure above) into the feeder channel of the press-fit tool (LSD 319 83) until the desired connector pin faces the wire slot ②.
10. Insert an unstripped wire ① into the wire slot until the wire bottoms on the tool base.
11. Center the wire in the wire slot. Squeeze the handle until the inserter bottoms.
12. Release the handle. The inserter will retract and the connector will advance to the next connector pin. Connect all the wires to the contact socket in the same way. Remove the connector from the right side of the feeder channel.

**Note:** Ensure the wires are connected in pairs and inserted into the cavities as described in the tables below.

Tables for connecting the traffic are found in section 4.9.12.1 - 4.9.12.7, depending on which MMU/SMU that is used.

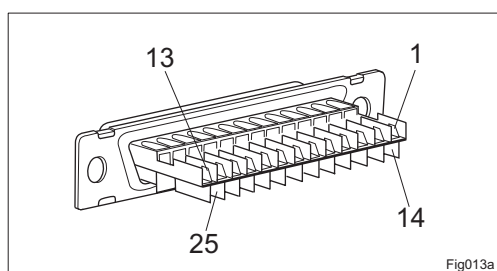


Fig013a

External connector	Pin No	Signal for DIG SC 1-4	Signal for DIG SC 5-8	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
DIG SC 1-4 and 5-8	13	DIG SERV 1 OUT A	DIG SERV 5 OUT A	WHITE	WHITE
	12	DIG SERV 1 OUT B	DIG SERV 5 OUT B	BLUE	BLUE
	11				
	10	DIG SERV 1 IN A	DIG SERV 5 IN A	WHITE	WHITE
	9	DIG SERV 1 IN B	DIG SERV 5 IN B	ORANGE	ORANGE
	8				
	7				
	6	DIG SERV 2 OUT A	DIG SERV 6 OUT A	WHITE	WHITE
	5	DIG SERV 2 OUT B	DIG SERV 6 OUT B	GREEN*	BLUE
	4				
	3	DIG SERV 2 IN A	DIG SERV 6 IN A	WHITE	WHITE
	2	DIG SERV 2 IN B	DIG SERV 6 IN B	BROWN*	ORANGE
	1				
	14	DIG SERV 3 OUT A	DIG SERV 7 OUT A	RED	WHITE
	15	DIG SERV 3 OUT B	DIG SERV 7 OUT B	BLUE	BLUE
	16				
	17	DIG SERV 3 IN A	DIG SERV 7 IN A	RED	WHITE
	18	DIG SERV 3 IN B	DIG SERV 7 IN B	ORANGE	ORANGE
	19				
	20	DIG SERV 4 OUT A	DIG SERV 8 OUT A	RED	WHITE
	21	DIG SERV 4 OUT B	DIG SERV 8 OUT B	GREEN*	BLUE
	22				
	23	DIG SERV 4 IN A	DIG SERV 8 IN A	RED	WHITE
	24	DIG SERV 4 IN B	DIG SERV 8 IN B	BROWN*	ORANGE
	25				

External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
User I/O	13			
	12	USER IN 6 B	WHITE	
	11	USER IN 6 A	BLUE	
	10	USER IN 5 B	WHITE	
	9	USER IN 5 A	ORANGE	
	8	USER IN 4 B	WHITE	
	7	USER IN 4 A	GREEN*	
	6	USER IN 3 B	WHITE	
	5	USER IN 3 A	BROWN*	
	4	USER IN 2 B	RED	
	3	USER IN 2 A	BLUE	
	2	USER IN 1 B	RED	
	1	USER IN 1 A	ORANGE	
	14	USER IN 7 A	RED	
	15	USER IN 7 B	GREEN*	
	16	USER IN 8 A	RED	
	17	USER IN 8 B	BROWN*	
	18	USER IN/OUT 9 A		WHITE
	19	USER IN/OUT 9 B		BLUE
	20	USER IN/OUT 10 A		WHITE
	21	USER IN/OUT 10 B		ORANGE
	22	USER IN/OUT 11 A		WHITE
	23	USER IN/OUT 11 B		BLUE
	24	USER IN/OUT 12 A		WHITE
	25	USER IN/OUT 12 B		ORANGE

\* The wires have switched places compared with the instruction in installation manual <R6A.

Figure 4-97. Connecting the wires to the traffic connector.

**Note:** The connection of the digital service channels to the MMUs are set in the service channel setup via the MSM software. See section 10.9 and 10.10 for recommendation of use for user inputs/outputs.

### Removing a wire:

Items 13 and 14 only apply if a wire is connected improperly.

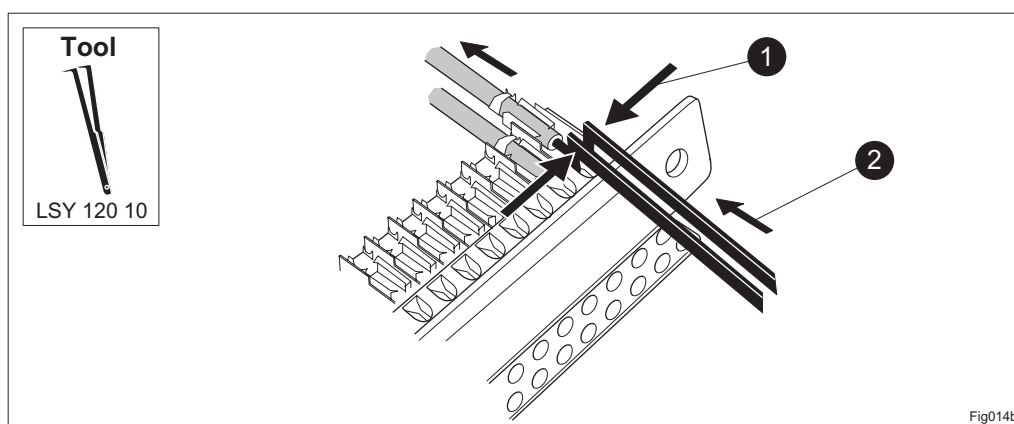


Fig014b

Figure 4-98. Removing a contact pin.

**13.** Remove the contact pin by using the extraction tool (LSY 120 10) on the contact pin. Press the extraction tool together ❶ and push it upwards ❷.

**14.** Insert the contact pin in the correct position.

### Opening the connector casing:

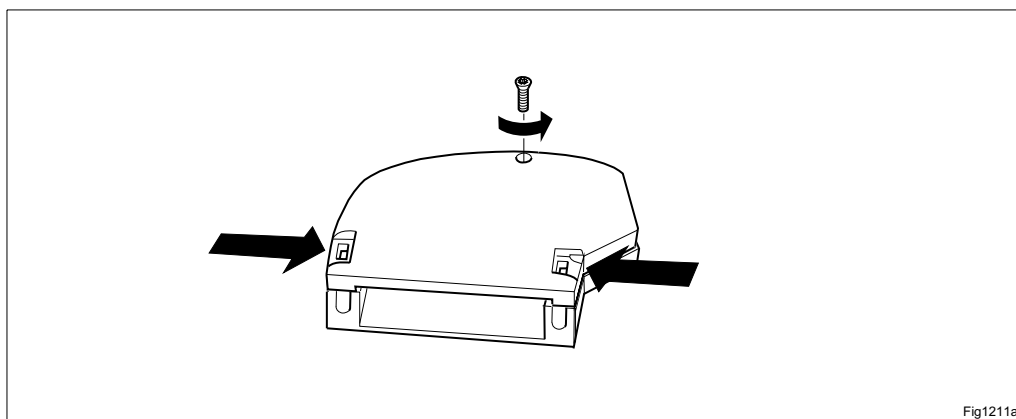


Figure 4-99. Opening the connector casing

15. Open the connector casing by removing the screw, pushing the two plastic springs together and lifting the casing halves apart.

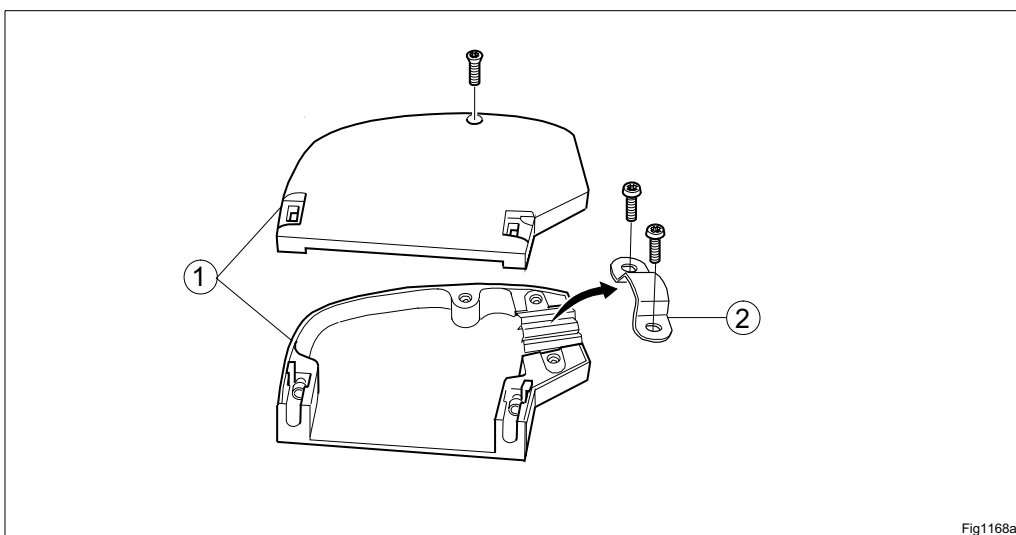


Figure 4-100. Removing the clamp.

16. Remove the clamp ② from the connector casing.

### Assembling:

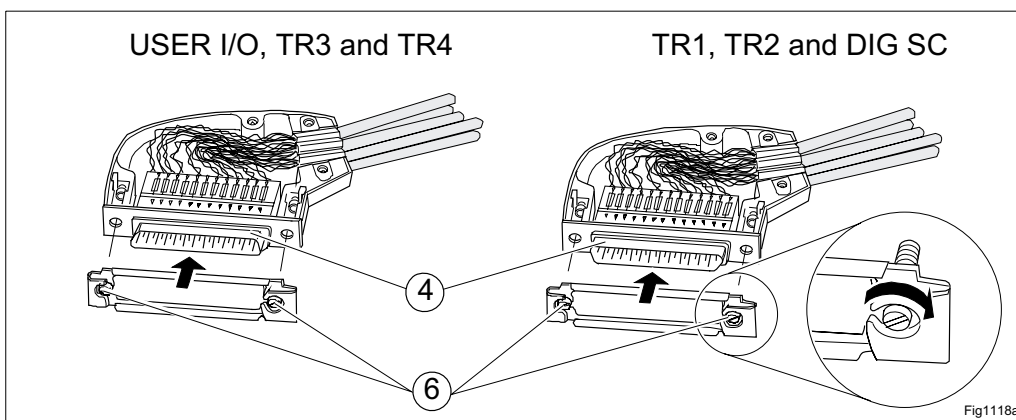


Figure 4-101. Fastening the contact socket in the connector casing.

17. Fasten the contact socket ④ in the connector casing with the sliding lock screws ⑥ as shown in the figure above.

**Note:** Ensure that the contact socket is positioned as shown in the figure. Otherwise the cable outlet will point in the wrong direction when the connector is connected to the access module.

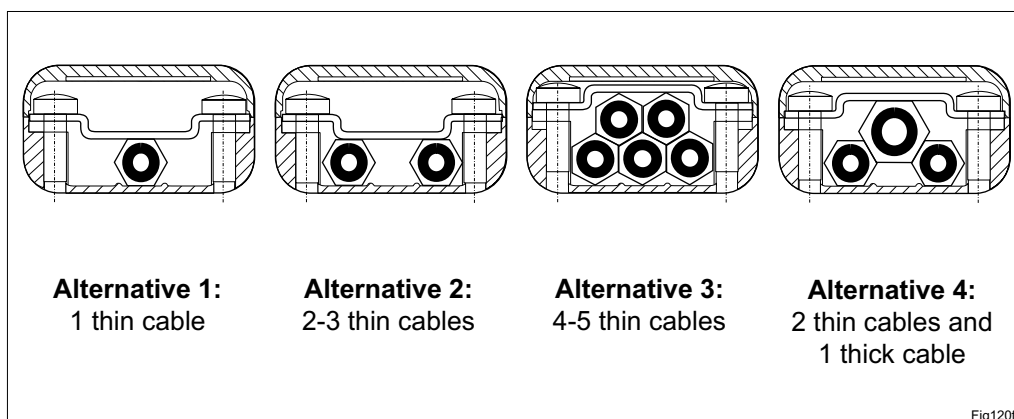


Figure 4-102. Positioning the cables in the connector casing.

**18.** Position the cables in the connector casing as shown in the alternatives above, depending on the diameter of the cables.

**Note:** Use the tubes to fill out the empty spaces. The tubes must be positioned at the inlet of the rear shell half.

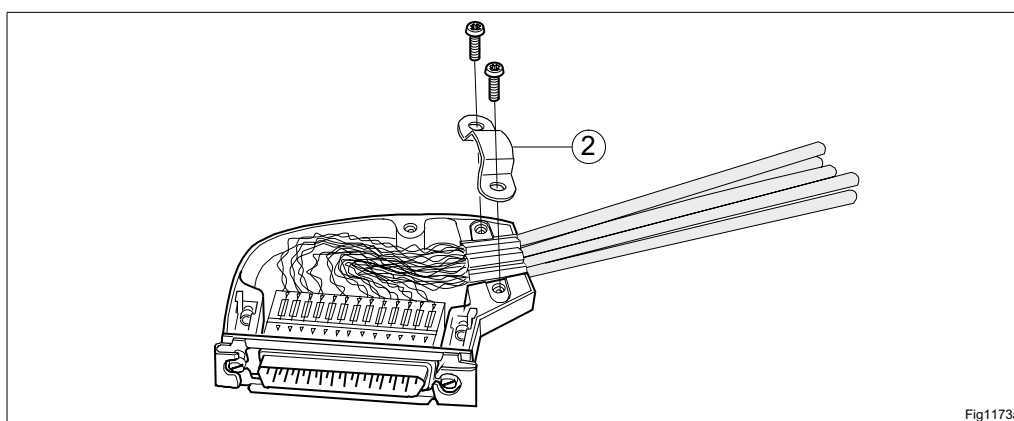


Figure 4-103. Fastening the clamp.

**19.** Fasten the cables and tubes using the clamp ②.

**20.** Arrange the wires in the connector casing.

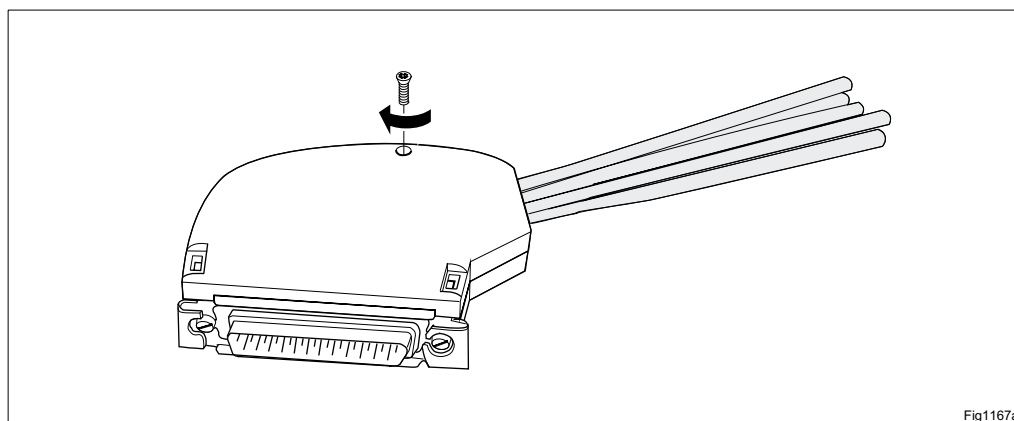


Figure 4-104. Assembling the connector.

**21.** Fasten the top of the connector with the screw.

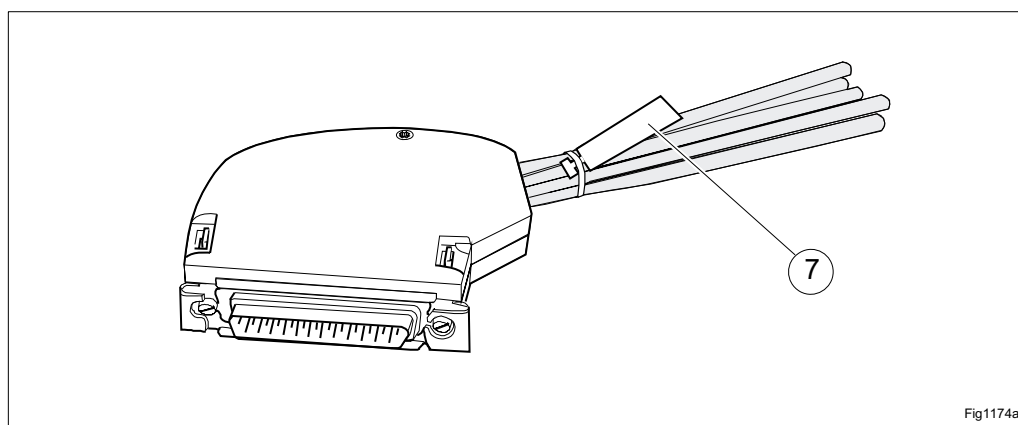


Figure 4-105. Fastening a tag.

**22.** Fasten a tag ⑦ to the cables using a strap.

**23.** Mark the assembled connector by writing on the yellow part of the tape and attach it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

### Connecting:

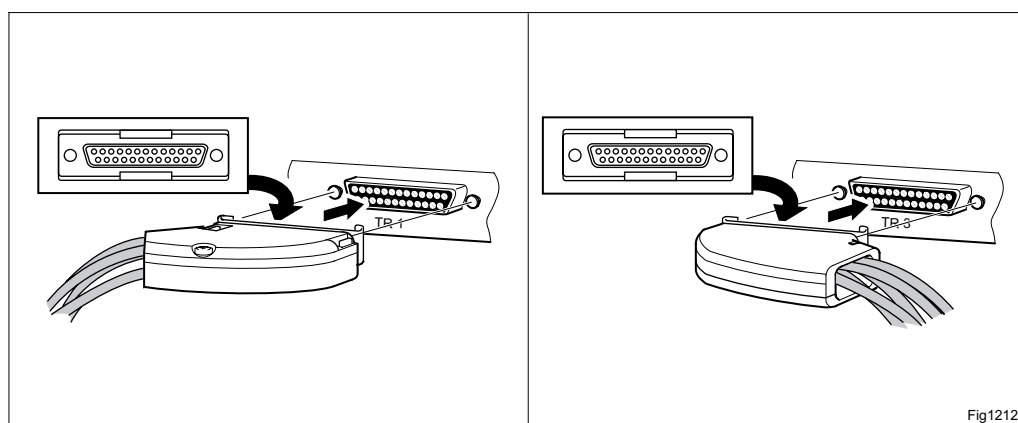


Figure 4-106. Connecting the cable to an MMU or SMU.

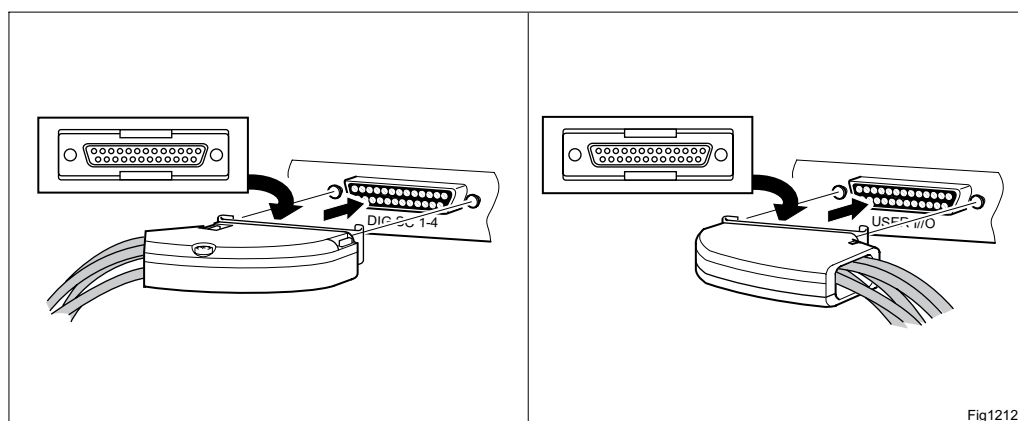


Figure 4-107. Connecting the cable to an SAU.

**24.** Connect the cable to the MMU, SMU or SAU according to the figures above. See section 4.9.12 for more information.

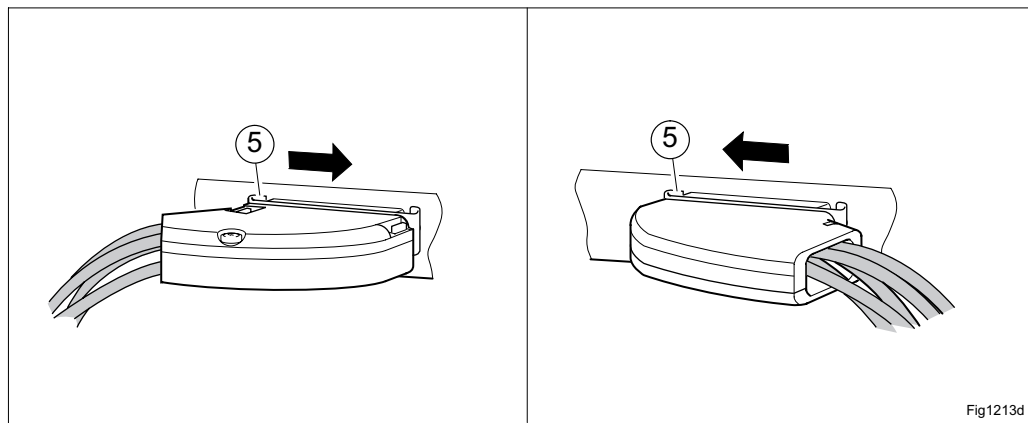


Figure 4-108. Fastening the Traffic, User I/O and Dig SC cable.

- 25.** Fasten the connector by pushing the locking plate ⑤.

### Connection Overview for Balanced Traffic

The tables below present an overview of where to connect the traffic, when traffic routing is not used. The traffic can be routed to other MMUs or SMUs in the same access module by using MINI-LINK Netman or MSM.

#### 1+0 Terminal without SMU

Traffic capacity (Mbit/s)	Connection to MMU
2x2	TR1A-TR1B
4x2	TR1A-TR1D
8	Unbalanced traffic. See section 4.9.6.
2x8	Unbalanced traffic. See section 4.9.6.
34+2	2 Mbit/s: TR1A
	34 Mbit/s: Unbalanced traffic. See section 4.9.6.

#### 1+0 Terminal with SMU

Traffic capacity (Mbit/s)	Connection to MMU	Connection to SMU	SMU type
8x2 (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or 2 MMU)		TR1A-TR1D	SMU 8x2 or SMU 16x2 <sup>1</sup>
		TR2A-TR2D	
8x2 (AMM 2U: Pos 2 MMU) (AMM 4U: Pos 5 MMU or 1 MMU)		TR3A-TR3D	SMU 16x2 only <sup>1</sup>
		TR4A-TR4D	
17x2	TR1A	TR1A-TR1D TR2A-TR2D TR3A-TR3D TR4A-TR4D	SMU 16x2 only <sup>1</sup>

#### 1+1 Terminal

Traffic capacity (Mbit/s)	Connection to MMU	Connection to SMU	SMU type
2x2		TR1A-TR1B	SMU Sw
4x2		TR1A-TR1D	SMU Sw (SMU 8x2 or SMU 16x2)
8x2		TR1A-TR1D TR2A-TR2D	SMU 8x2 (SMU 16x2)
17x2	TR1A (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or 2 MMU)	TR1A-TR1D TR2A-TR2D TR3A-TR3D TR4A-TR4D	SMU 16x2
8		Unbalanced traffic. See section 4.9.6.	SMU Sw
2x8			
34+2	TR1A (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or 2 MMU)	Unbalanced traffic. See section 4.9.6.	SMU Sw

Figure 4-109. Connection overview for balanced traffic.

<sup>1</sup> Two 8x2 terminals can share one SMU 16x2

## 4.9.6 Trimming, Assembling and Connecting the Cables for Unbalanced Traffic

### 4.9.6.1 Panel with 2 m Assembled Coaxial Cables in a Rack

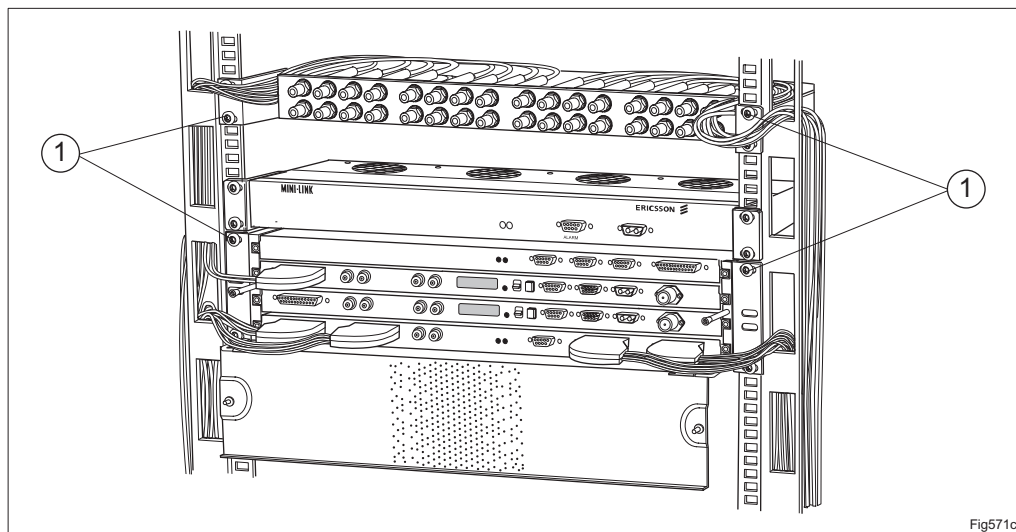


Figure 4-110. Installation of panel in a rack with 2 m assembled coaxial cables. (The figure shows a panel with SMZ connectors.)

1. Fit the four captive nuts.
2. Fit the panel in the rack or to the bars and tighten the four screws ①.
3. Lay and connect the coaxial cables from the panel to the plug-in units in the magazine, as shown in the figure above. The tables show where to connect the cables.

**Note:** Minimum static bending radius is 35 mm.

### Connection Overview for Unbalanced Traffic

The tables below present an overview of where to connect the traffic connectors, when traffic routing is not used.

**Note:** The traffic can be routed to other MMUs or SMUs in the same access module by using MSM. As an alternative, 8 Mbit/s can be connected to TR1A, TR2A, TR3A and TR4A on the SMU 8x2 or SMU 16x2 by using coaxial cables.

#### 1+0 Terminal without SMU

Traffic capacity (Mbit/s)	Connection to MMU
2x2	TR1A-TR1B
4x2	TR1A-TR1D
8	TR2A
2x8	TR2A-TR2B
34+2	2 Mbit/s: TR1A (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or pos 2 MMU)
	34 Mbit/s: TR2A



**1+0 Terminal with SMU**

Traffic capacity (Mbit/s)	Connection to MMU	Connection to SMU	SMU type
8x2 (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or pos 2 MMU)		TR1A-TR1D	SMU 8x2 or SMU 16x21
		TR2A-TR2D	
8x2 (AMM 2U: Pos 2 MMU) (AMM 4U: Pos 5 MMU or pos 1 MMU)		TR3A-TR3D	SMU 16x2 only1
		TR4A-TR4D	
17x2	TR1A	TR1A-TR1D	SMU 16x2 only1
		TR2A-TR2D	
		TR3A-TR3D	
		TR4A-TR4D	

**1+1 Terminal**

Traffic capacity (Mbit/s)	Connection to MMU	Connection to SMU	SMU type
2x2		TR1A-TR1B	SMU Sw
4x2		TR1A-TR1D	SMU Sw (SMU 8x2 or SMU 16x2)
8x2		TR1A-TR1D TR2A-TR2D	SMU 8x2 (SMU 16x2)
17x2	TR1A (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or pos 2 MMU)	TR1A-TR1D TR2A-TR2D TR3A-TR3D TR4A-TR4D	SMU 16x2
8		TR2A	SMU Sw
2x8		TR2A-TR2B	
34+2	2 Mbit/s: TR1A (AMM 2U: Pos 3 MMU) (AMM 4U: Pos 6 MMU or pos 2 MMU)	34 Mbit/s: TR3A	SMU Sw

Figure 4-111. Connection overview for unbalanced traffic.

4. Trim and assemble the cables for the user's equipment. Section 4.9.6.4 is an instruction on trimming and assembling the SMZ-connector and section 4.9.6.5 an instruction on trimming and assembling the BNC-connector.

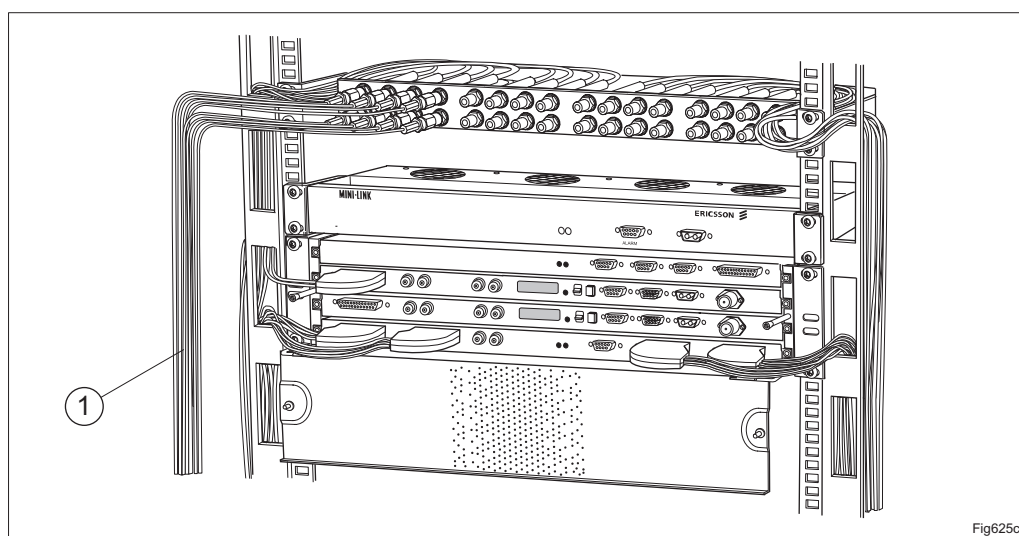


Figure 4-112. Connecting the user's traffic.

5. Connect the cables for the user's equipment, ①.

<sup>1</sup> Two 8x2 terminals can share one SMU 16x2

#### 4.9.6.2 Panel with 2 m Assembled Coaxial Cables in a Wall Installation

For wall mounting, the panel can be fitted between the two bars fastened to the access module (see description in section 4.6.7).

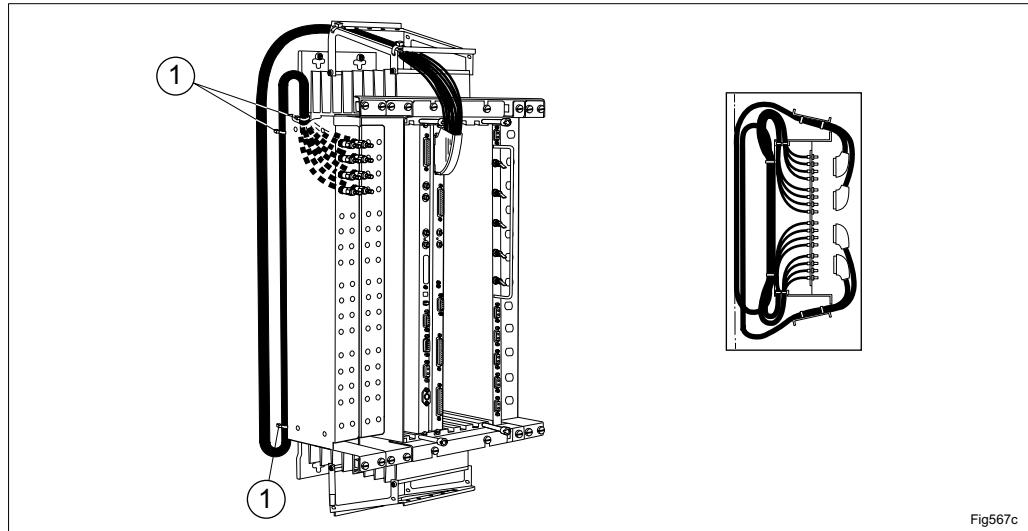


Figure 4-113. Installation of a panel in a wall installation with 2 m assembled coaxial cables. The figure shows a panel with SMZ connectors.

1. Lay and connect the coaxial cables from the panel to the plug-in units in the magazine as shown in the figure above. The tables in section 4.9.6.1 show where to connect the cables.

**Note:** Minimum static bending radius is 35 mm.

2. Strap the cables to the cable holder ①. The cables should also be strapped at the back of the panel.
3. Trim and assemble the cable for the user's equipment. Section 4.9.6.4 is an instruction on trimming and assembling a cable with a SMZ-connector and section 4.9.6.5 an instruction on trimming and assembling a cable with a BNC-connector.

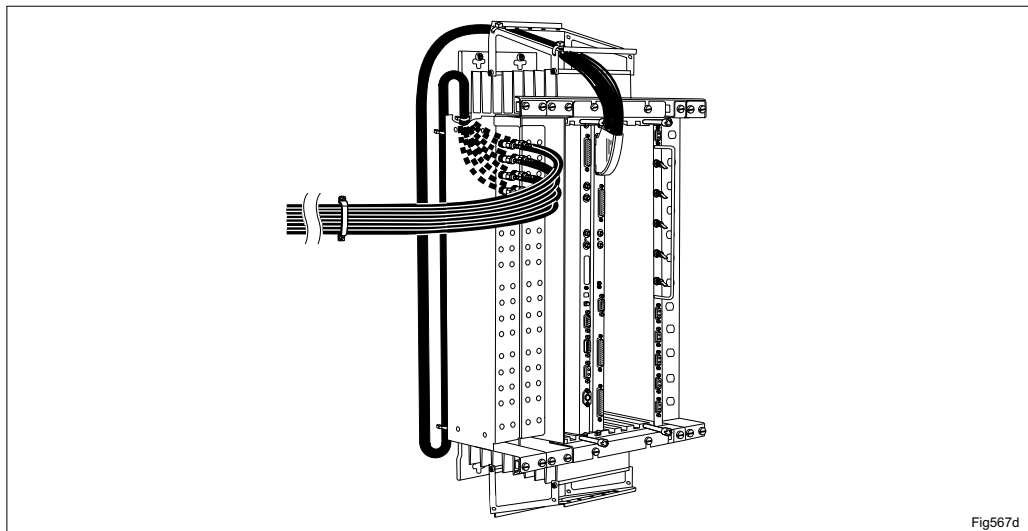


Figure 4-114. Connecting the user's traffic.

4. Connect the cable at the front of the panel.

### 4.9.6.3 2m or 8m Coaxial Cable with User's End Unassembled

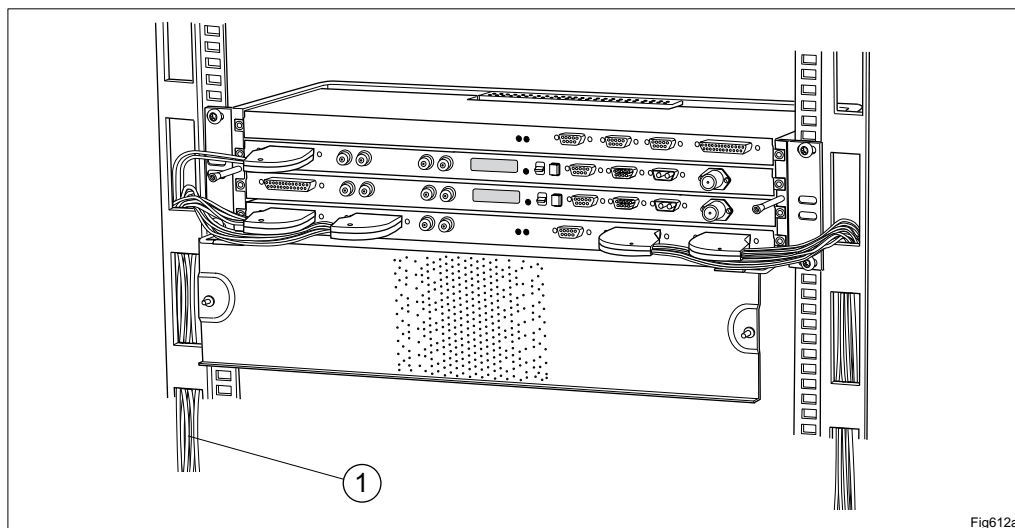


Figure 4-115. Connecting the traffic cables with user's end unassembled.

1. Connect the traffic connector to the plug-in units in the magazine, see figure above. See the tables in section 4.9.6.1, which show where to connect the cables.

2. Lay the cable ① to the user's equipment.

**Note:** Minimum static bending radius is 35 mm.

3. Trim and assemble the cable for the user's equipment. Section 4.9.6.4 is an instruction on trimming and assembling the SMZ-connector and section 4.9.6.5 an instruction on trimming and assembling the BNC-connector.

#### 4.9.6.4 Trimming and Assembling the Cables for Unbalanced Traffic (SMZ Connector)

Applies to cable TZC 750 24 and connector kit SXX 111 520/1.

##### Trimming and Assembling:

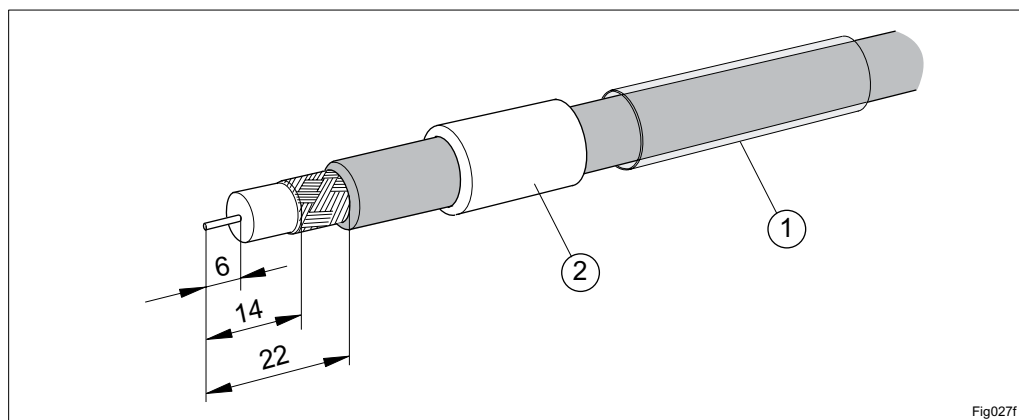


Figure 4-116. Stripping a cable.

1. Strip the wires as shown in the figure above. Be careful not to nick the screen or centre conductor.
2. Slide the shrink sleeve ① and the tube ② over the cable.

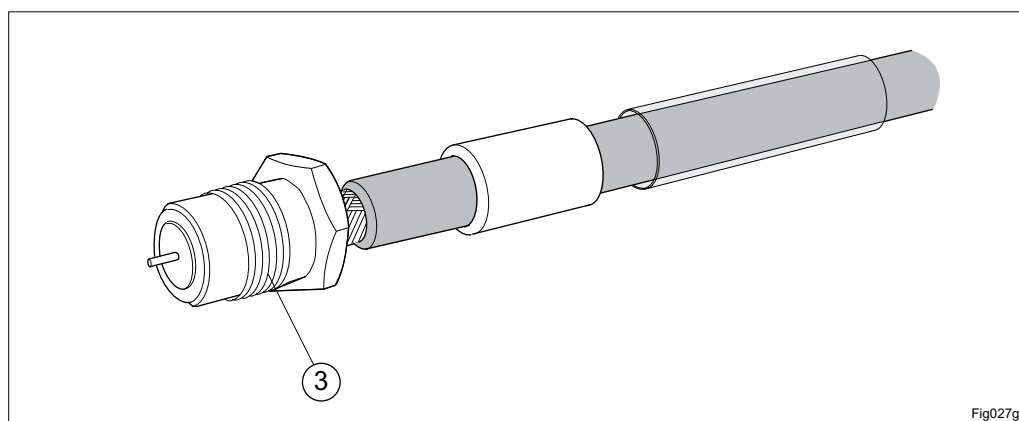


Figure 4-117. Inserting the trimmed cable into the rear end of the rear part connector.

3. Slide the rear part connector ③ over the cable so that the rear body comes between the screen and the dielectric. Gently twisting and rocking the connector body will help.

**Note:** Ensure that no part of the screen is trapped under the rear part connector.

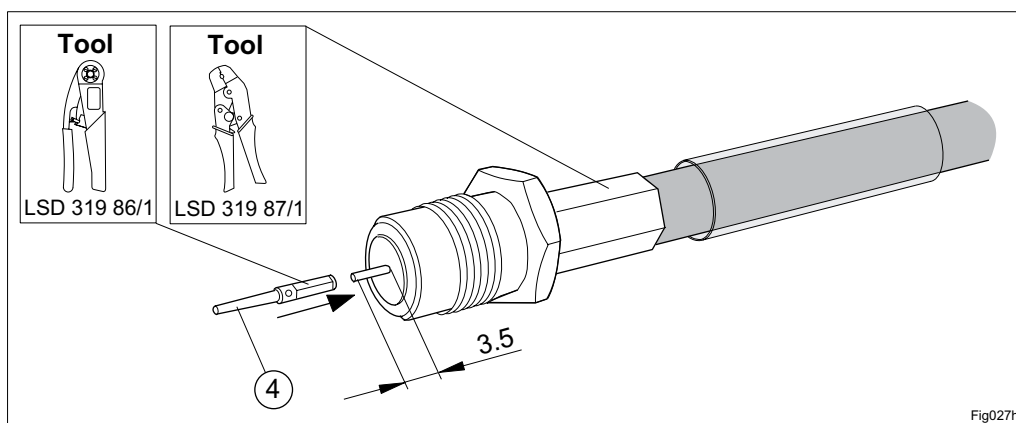


Figure 4-118. Assembling the contact.

4. Slide the tube forward over the screen until it butts up against the back nut of the rear part connector, and crimp it using tool LSD 319 87/1 or LSD 319 82.

**Note:** Slide the tube tightly against the back of the nut. The screen must not be visible.

5. Trim the centre conductor until 3.5 mm protrudes from the face of the rear insulator.
6. Assemble the contact pin ④ onto the centre conductor and crimp using tool LSD 319 86/1 or LSD 319 82.

**Note:** Ensure that the centre conductor is visible in the inspection hole when it is positioned for crimping.

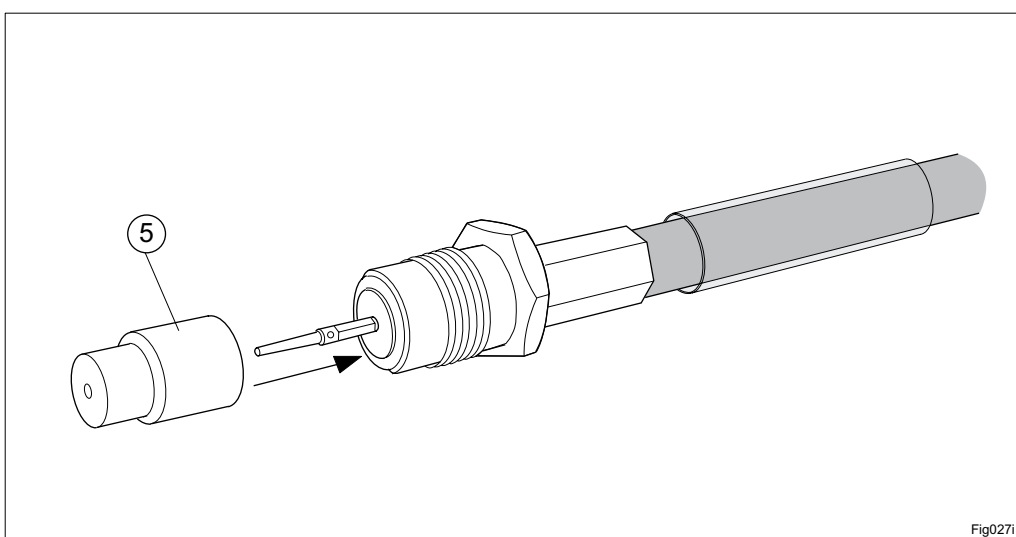


Figure 4-119. Assembling the front insulator.

7. Assemble the front insulator ⑤ over the contact pin.

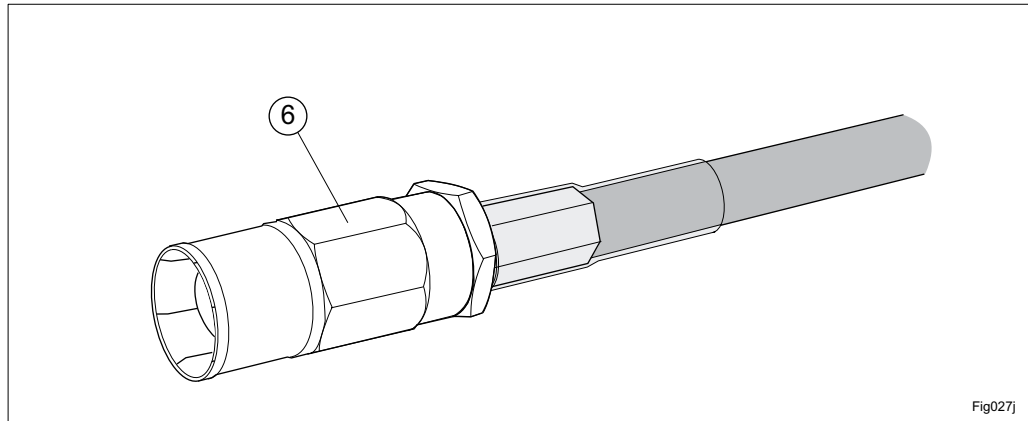


Figure 4-120. Assembled SMZ connector.

8. Slip the front body ⑥ over the rear body and tighten it with a torque of 1 Nm.
9. Slide the shrink sleeve over the crimped tube and heat it until it shrinks.
10. Fasten a tag to the cable using a strap.
11. Mark the assembled connector by writing on the yellow part of the tape and attach it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

**Connecting:**

12. Connect the cable to the MMU, SMU or SMZ panel according to the tables in section 4.9.6.1.

#### 4.9.6.5 Trimming, Assembling and Connecting the Cables for Unbalanced Traffic (BNC Connector)

Applies to cable TZC 750 24 and connector kit SXX 111 520/2.

##### Trimming and Assembling:

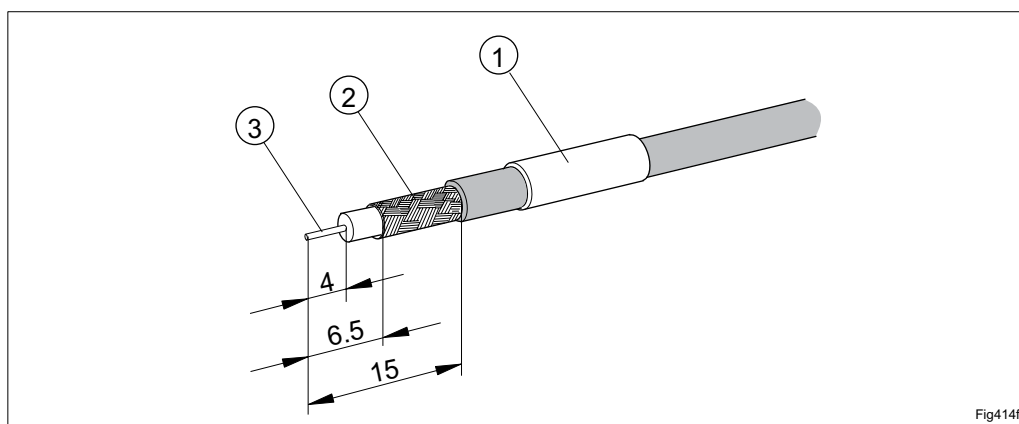


Figure 4-121. Stripping the cable.

1. Slide the tube ① over the cable.
2. Strip the cable as shown in the figure above. Be careful not to nick the screen ② or centre conductor ③.

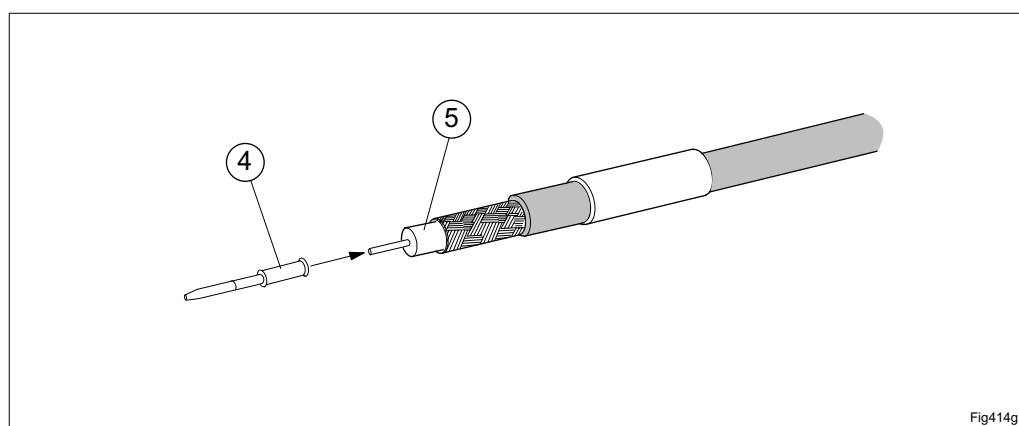


Figure 4-122. Assembling the contact pin.

3. Slide the contact pin ④ over the centre conductor until it bottoms against the dielectric ⑤.

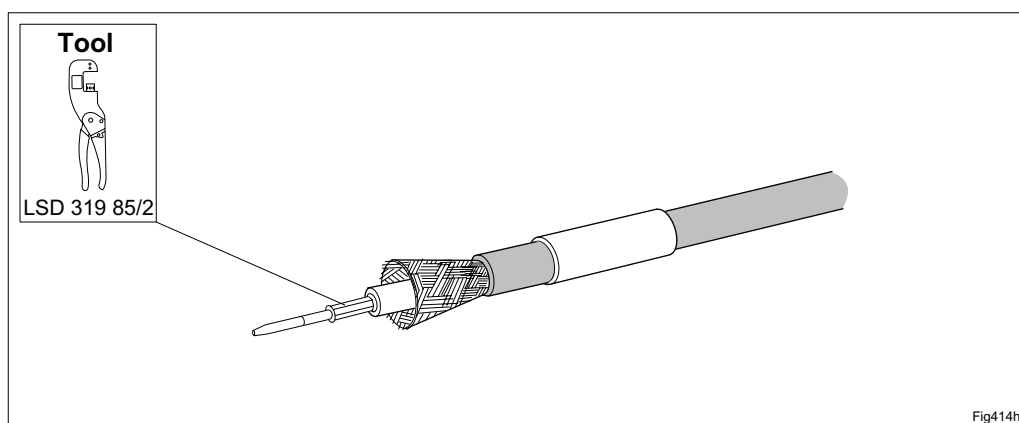


Figure 4-123. Folding out the screen.

4. Crimp the contact pin using tool LSD 319 85/2.

There are two pairs of crimp dies for the tool; one for each contact brand.

- For Radiall, use crimp dies with hexagon cavities 1.45 and 4.45
- For Suhner, use crimp dies with square cavity 0.67 and hexagon cavity 4.95

5. Fold out the screen as shown in the figure above.

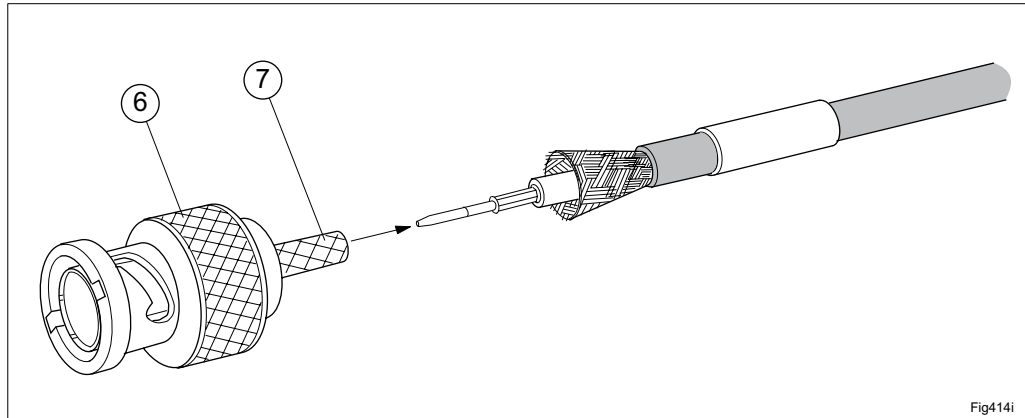


Figure 4-124. Assembling the connector.

6. Slide the connector ⑥ over the cable so that the rear body ⑦ comes between the screen and the dielectric.

**Note:** Ensure that no part of the screen is trapped under the rear body.

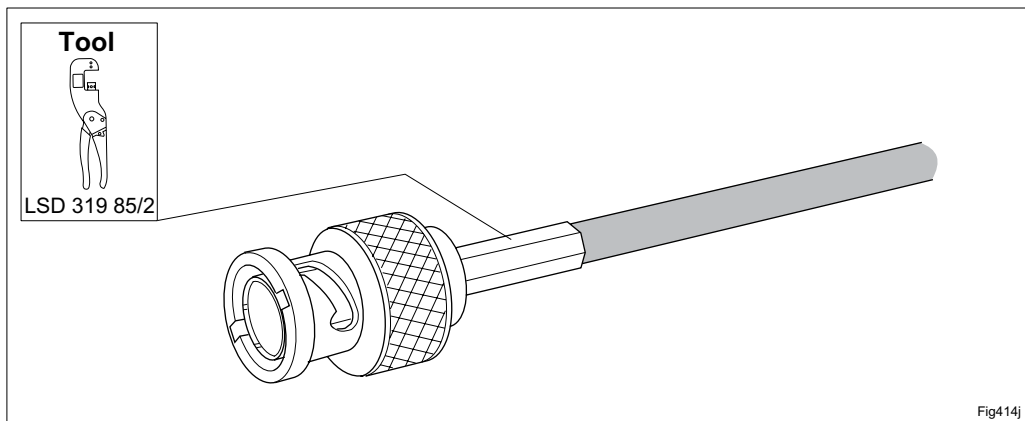


Figure 4-125. Assembled BNC connector.

7. Slide the tube forward over the screen and the rear body until it butts up against the back of the connector, and crimp it using tool LSD 319 85/2 (see step 4).
8. Fasten a tag to the cable using a strap.
9. Mark the assembled connector by writing on the yellow part of the tape and attach it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

### Connecting:

10. Connect the cable to the BNC panel.



### 4.9.7 Trimming, Assembling and Connecting the Cables for EAC and BR/EAC

Applies to cable TFL 481 54 and 9-pin D-sub connector SXX 111 519/1.

The figures below show the parts included in the connector and the cable.  
Items ② to ⑤ are delivered inside the connector casing.

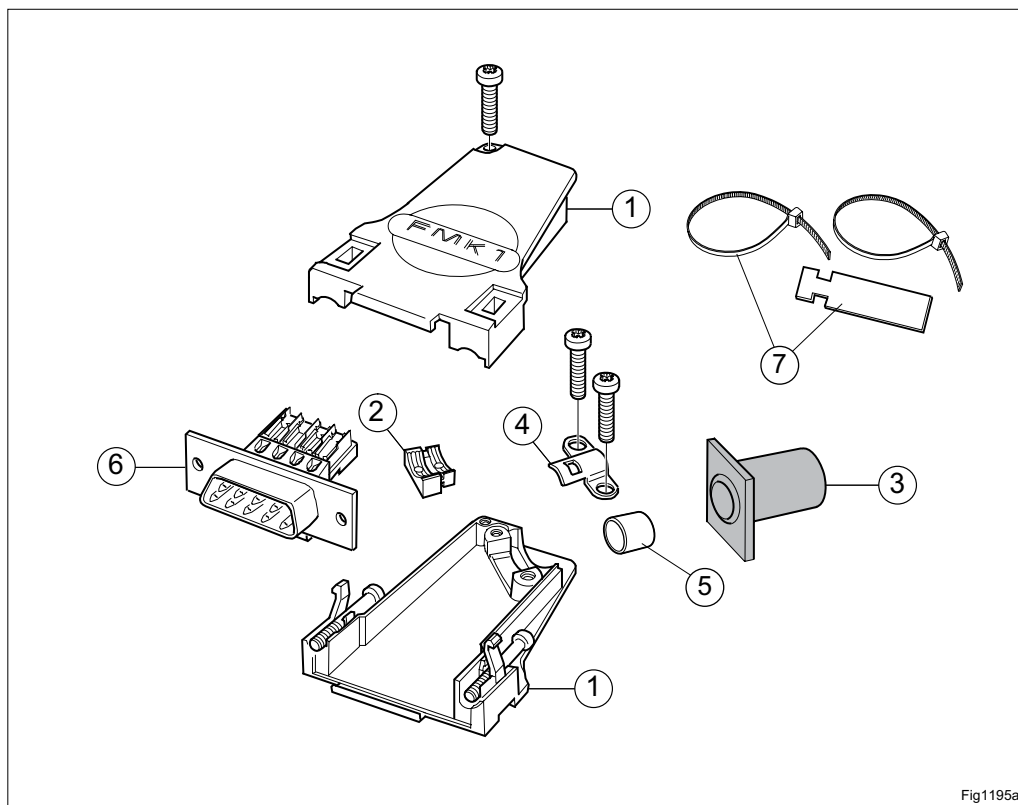


Figure 4-126. The EAC connector

- |                    |                  |
|--------------------|------------------|
| ① Connector casing | ⑤ Tube           |
| ② Insert           | ⑥ Contact socket |
| ③ Rubber bushing   | ⑦ Label          |
| ④ Clamp            |                  |

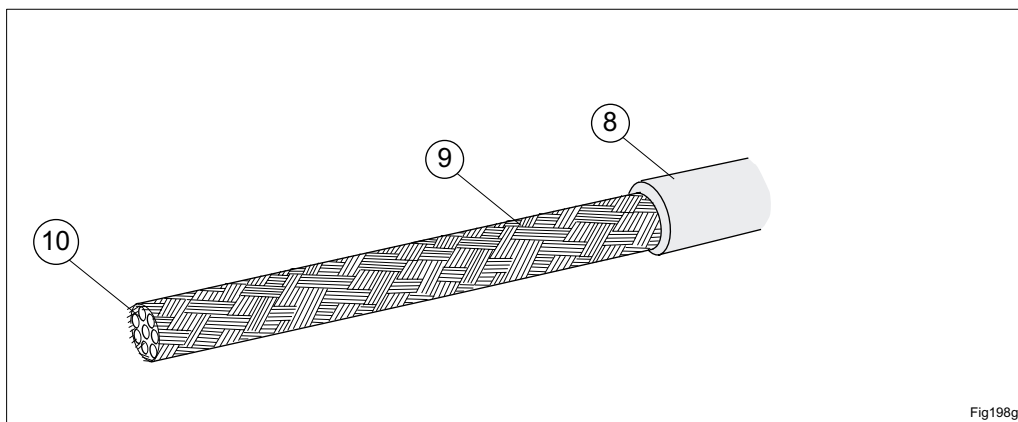


Figure 4-127. The EAC cable

- |          |
|----------|
| ⑧ Jacket |
| ⑨ Screen |
| ⑩ Wire   |

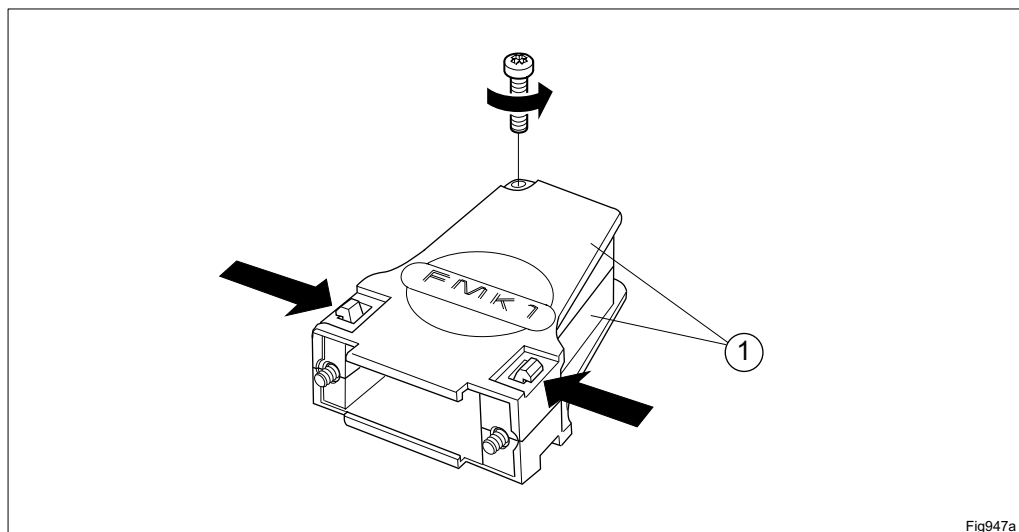
**Opening the connector casing:**

Figure 4-128. Opening the connector casing.

1. Open the connector casing ① by removing the screw, pushing the two plastic springs together and lifting the casing halves apart.

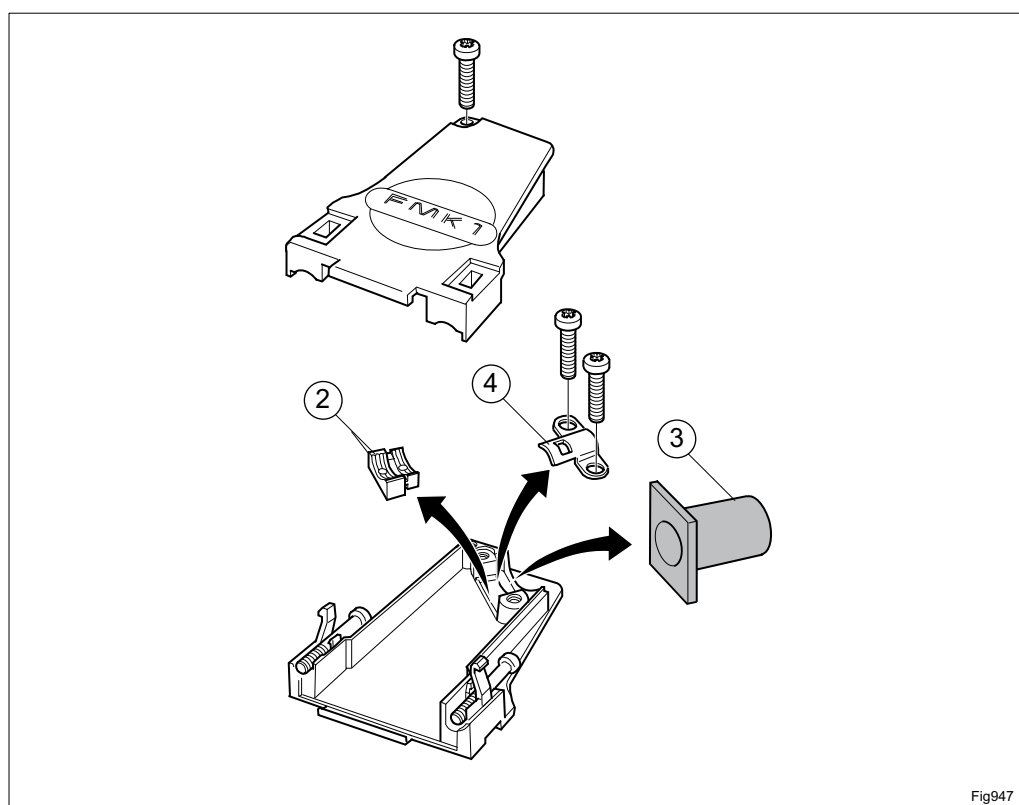


Figure 4-129. Removing the parts.

2. Remove the insert ②, rubber bushing ③ and clamp ④ from the connector casing.

### Trimming:

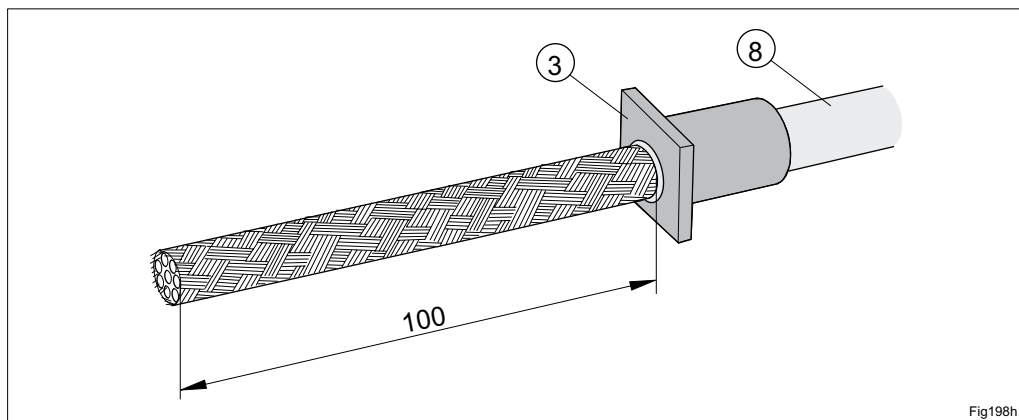


Figure 4-130. Stripping the cable and applying the rubber bushing.

3. Slide the rubber bushing ③ over the cable.
4. Strip the jacket ⑧ approximately 100 mm.

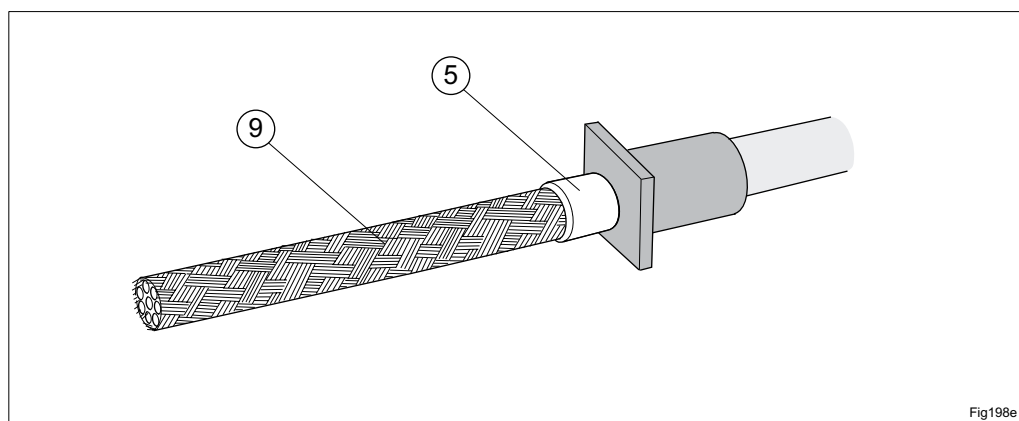


Figure 4-131. Sliding the tube against the jacket.

5. Slide the tube ⑤ over the screen ⑨ and against the jacket.

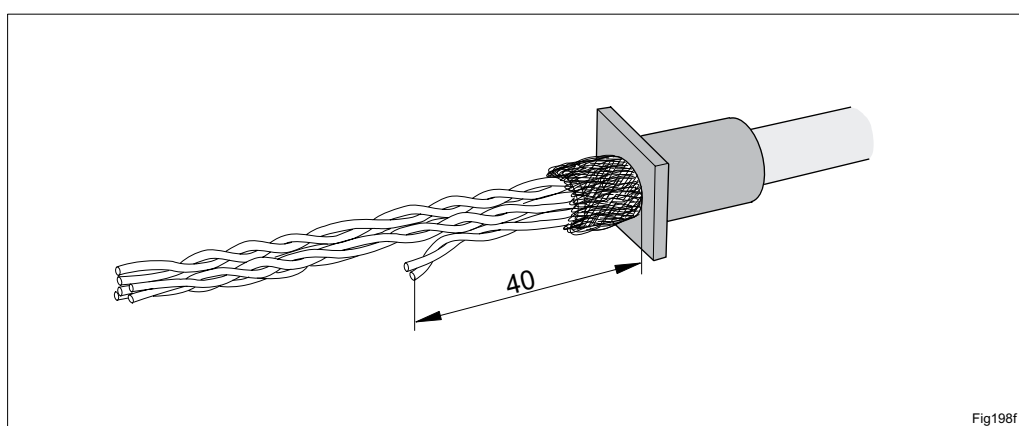


Figure 4-132. Folding the screen over the tube.

6. Fold the screen over the tube and trim the screen.
7. Remove the aluminium and plastic sheet.
8. Cut off 60 mm of each pair (leave 40 mm).

**Note:** Keep the wires twisted in pairs.

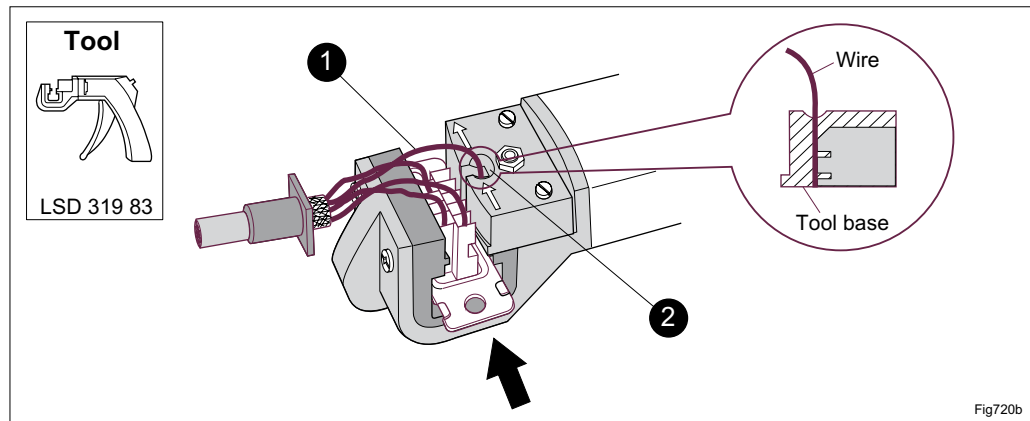


Figure 4-133. Crimping a wire.

9. Insert the contact socket from the left (arrow direction in the figure above) into the feeder channel of the press-fit tool (LSD 319 83) until the desired connector pin faces the wire slot ②.
10. Insert an unstripped wire ① into the wire slot until the wire bottoms on the tool base.
11. Center the wire in the wire slot. Squeeze the handle until the inserter bottoms.
12. Release the handle. The inserter will retract and the connector will advance to the next connector pin. Connect all wires to the contact socket in the same way. Remove the connector from the right side of the feeder channel.

**Note:** Ensure the wires are connected in pairs and inserted into the cavities as described in the tables below (se next page).

External connector	Pin No	Signal	Pin No to other equipment
<b>EAC 1 and 2</b>	5		
	4		
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8		
	9		

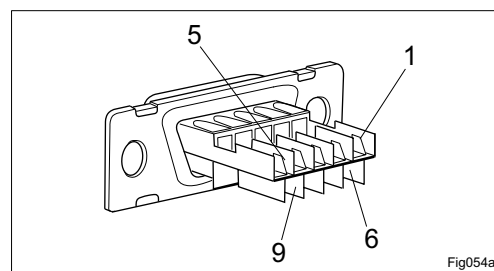


Fig054a

**Note:** Use the same pair of wires for EAC CLOCK A and B  
Use the same pair of wires for EAC DATA A and B

External connector	Pin No	Signal	Pin No to other equipment
<b>BR/ EAC 1</b>	5	SERV 1 BR IN A	5
	4	SERV 1 BR OUT A	4
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8	SERV 1 BR OUT B	8
	9	SERV 1 BR IN B	9

External connector	Pin No	Signal	Pin No to other equipment
<b>BR/ EAC 2</b>	5	SERV 2 BR OUT A	5
	4	SERV 2 BR IN A	4
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8	SERV 2 BR IN B	8
	9	SERV 2 BR OUT B	9

**Note:** Use the same pair of wires for EAC DATA A and B  
Use the same pair of wires for EAC CLOCK A and B  
Use the same pair of wires for SERV BR IN A and B  
Use the same pair of wires for SERV BR OUT A and B

Figure 4-134. Connecting the wires to the EAC and BR/EAC connectors.

### Removing a wire:

Items 13 and 14 only apply if a wire is connected improperly.

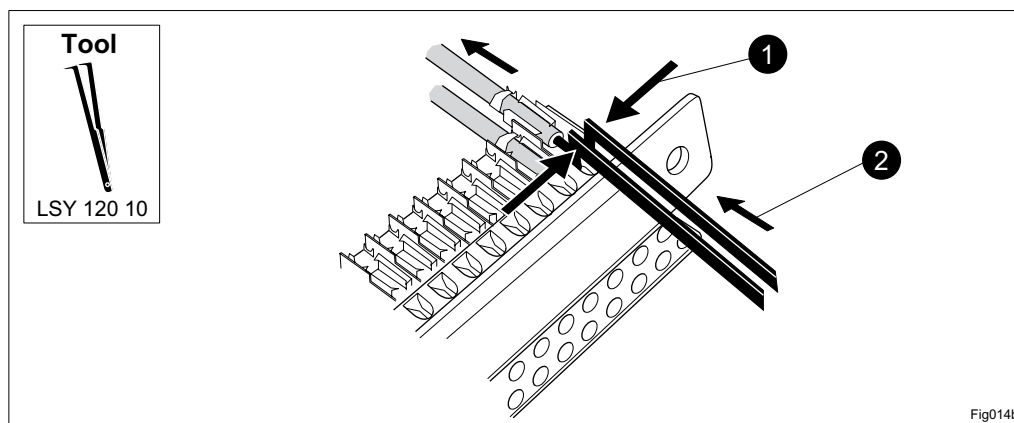


Fig014b

Figure 4-135. Removing a contact pin.

13. Remove the contact pin by using the extraction tool (LSY 120 10) on the contact pin. Press the extraction tool together ❶ and push it upwards ❷.
14. Insert the contact pin in the correct position.

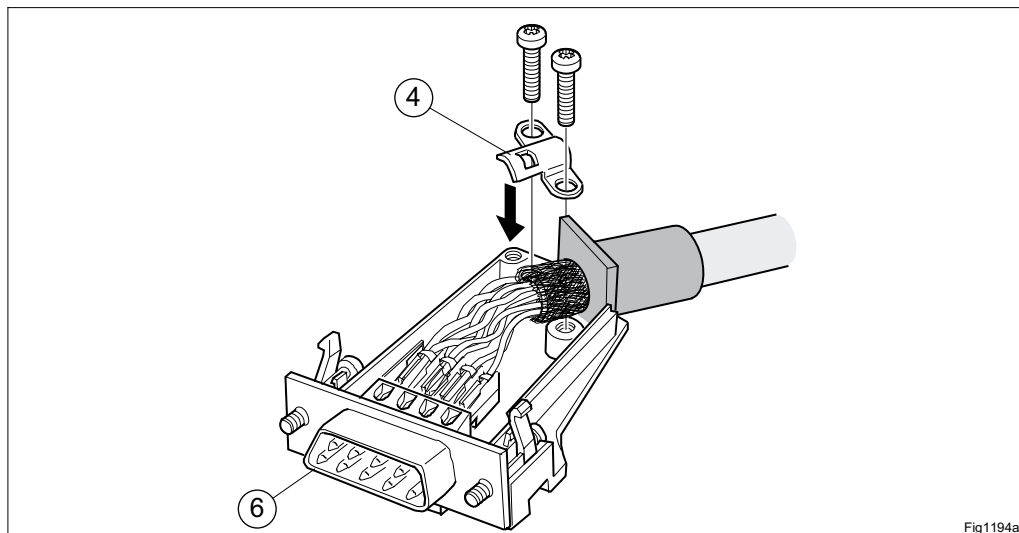
**Assembling:**

Figure 4-136. Fastening the cable.

15. Lay down the cable in the connector casing and fasten the wires and screen with the clamp ④ included using cross-slot tool type H (Philips) no 1.

**Note:** Ensure that the rubber bushing enters the slot in the connector casing properly.

**Note:** Ensure that the contact socket ⑥ is positioned as shown in the figure above. Otherwise the cable outlet will point in the wrong direction when the connector is connected to the access module.

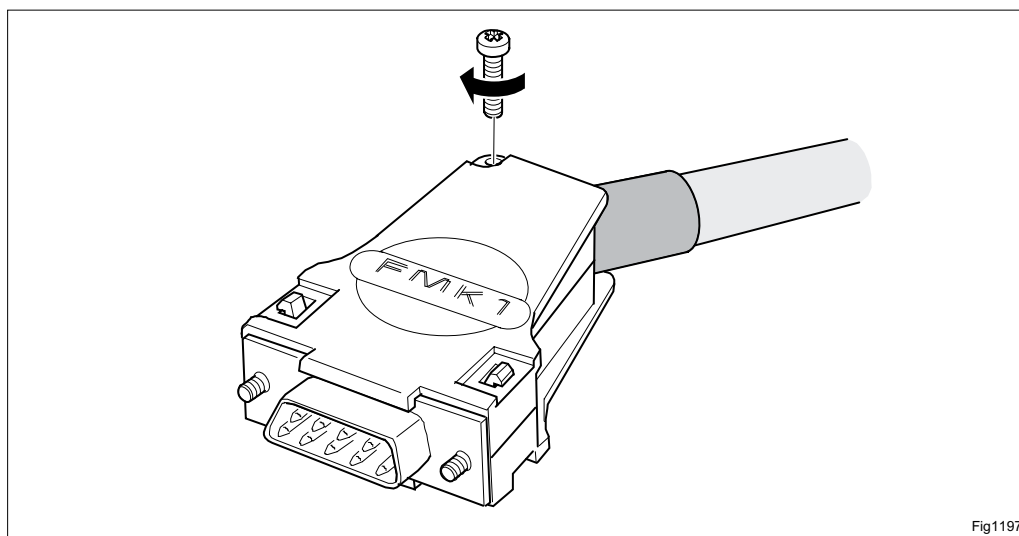


Figure 4-137. Assembling the connector.

16. Fasten the top of the connector casing with the screw using cross-slot tool type H (Philips) no 2.

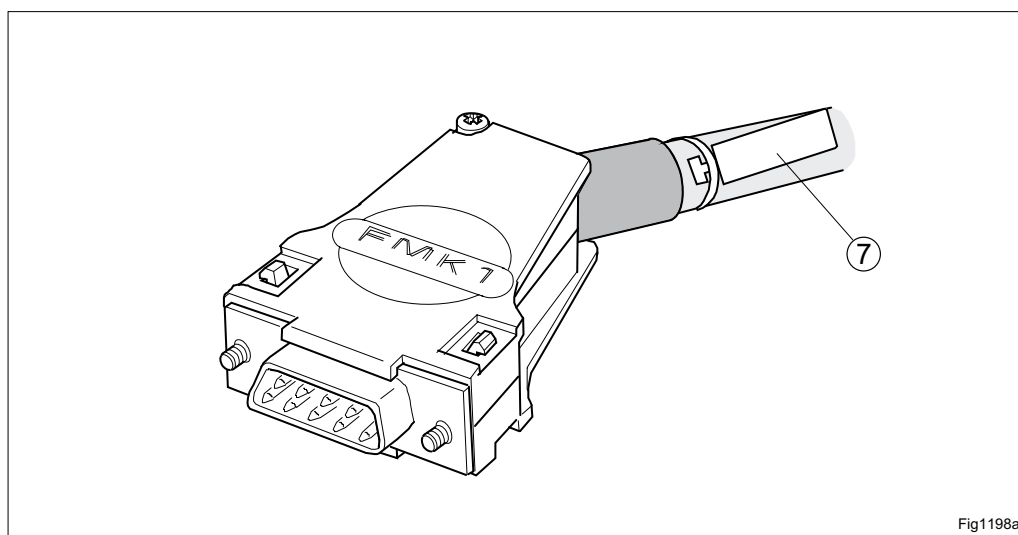


Figure 4-138. Fastening the tag.

17. Fasten a tag ⑦ to the cable using a strap.
18. Mark the assembled connector by writing on the yellow part of the tape and attaching it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

### Connecting:

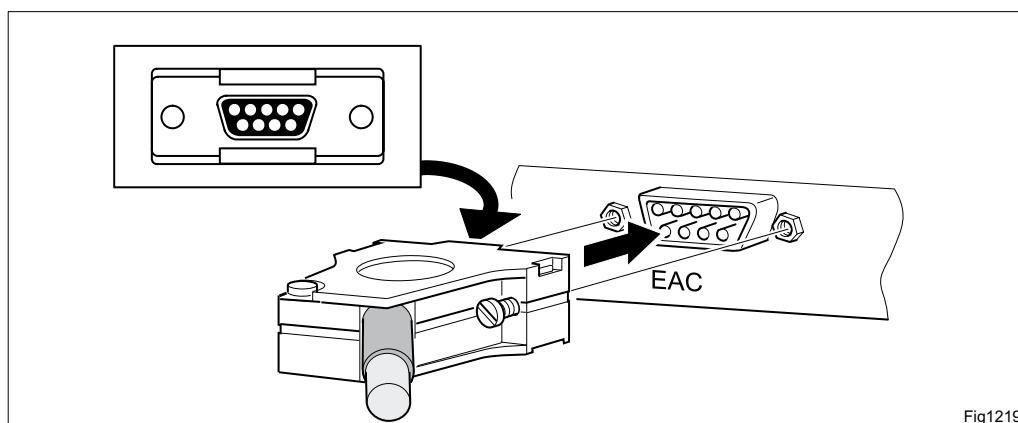


Figure 4-139. Connecting the cable.

19. Connect the cable to the SAU according to the figure above. See section 4.9.12 for more information.

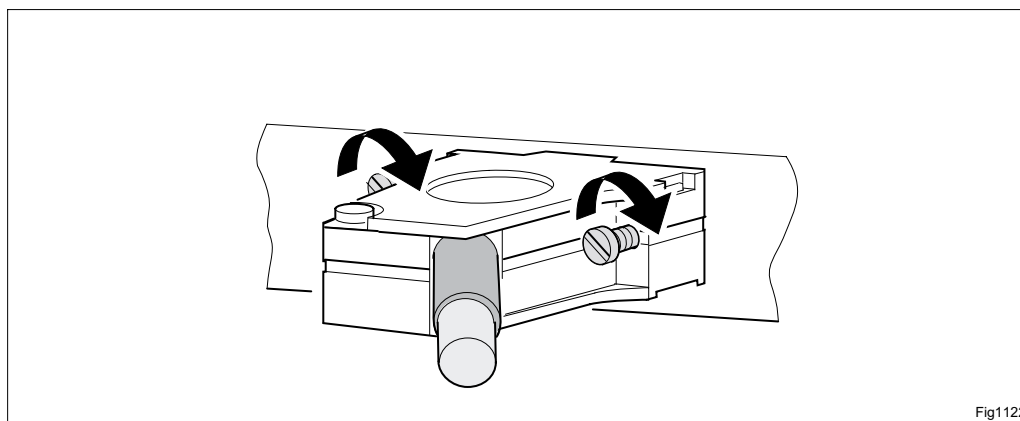


Fig1122

Figure 4-140. Fastening the connector.

20. Fasten the connector using the two screws.

#### 4.9.7.1

### EAC Cabling with the SAU

The figure below shows how to connect the EAC on a site with both MINI-LINK E and C equipment.

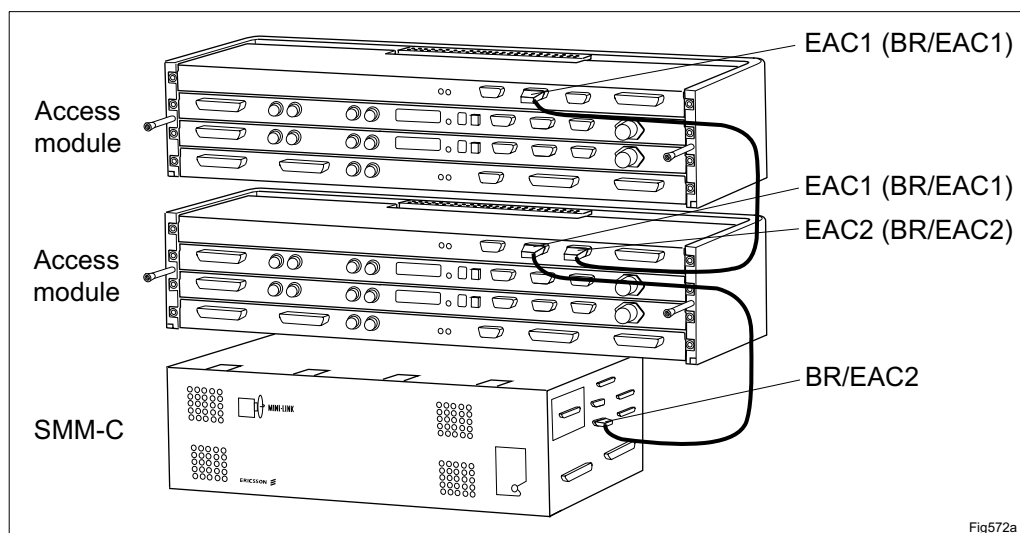


Fig572a

Figure 4-141. EAC cabling on a site with MINI-LINK E and C equipment. (The figure shows two SAU Basic units.)

#### Connecting:

1. Connect the two MINI-LINK E magazines via the EAC ports on the front of the SAUs. The ports on SAU Exp 2 are called BR/EAC.

**Note:** EAC 1 and EAC 2 (BR/EAC 1 and BR/EAC 2 on SAU Exp 2) are connected in parallel and either one can be used.

2. Connect to the BR/EAC port on the MINI-LINK C equipment.



### 4.9.8 Trimming, Assembling and Connecting the Cables for RAC and O&M

Applies to cable TFL 481 54 and 9-pin D-sub connector SXX 111 519/1. The O&M connector is pre-assembled and is not described in this chapter other than in the section handling connection.

The figures below show the parts included in the connector and the cable. Items ② to ⑤ are delivered inside the connector casing.

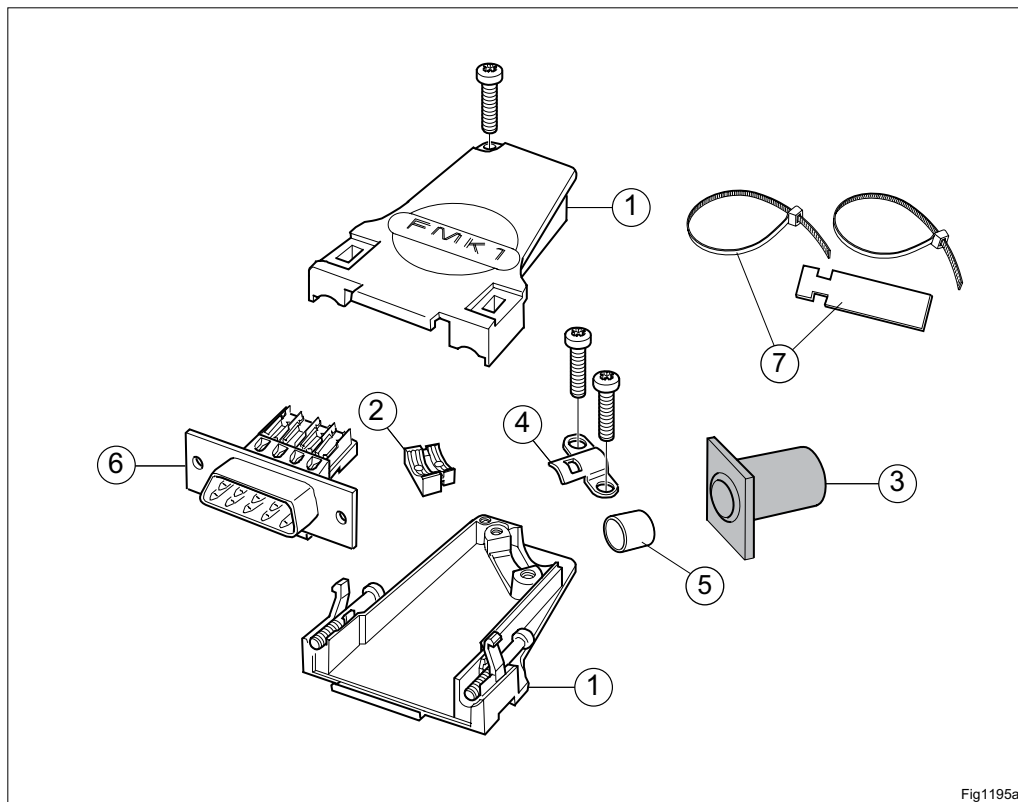


Fig1195a

Figure 4-142. The EAC connector

- |                    |                  |
|--------------------|------------------|
| ① Connector casing | ⑤ Tube           |
| ② Insert           | ⑥ Contact socket |
| ③ Rubber bushing   | ⑦ Label          |
| ④ Clamp            |                  |

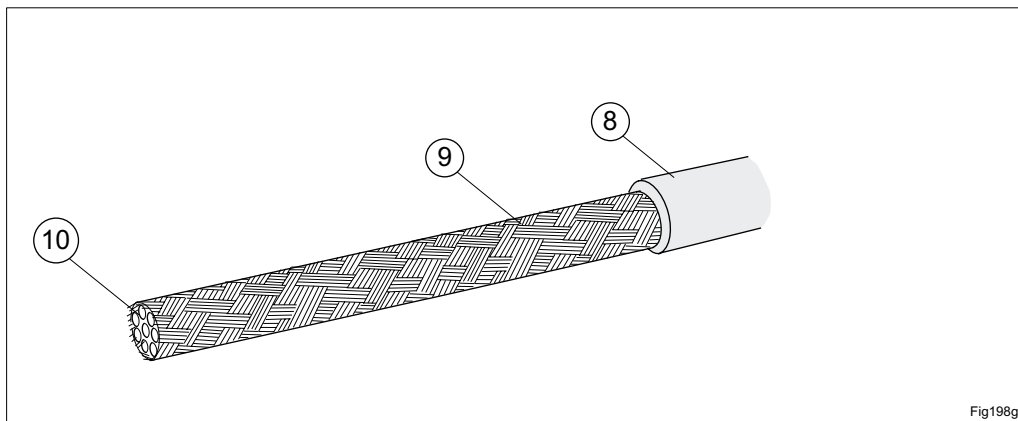


Fig198g

Figure 4-143. The EAC cable

- |          |        |
|----------|--------|
| ⑧ Jacket | ⑩ Wire |
| ⑨ Screen |        |

### Opening the connector casing:

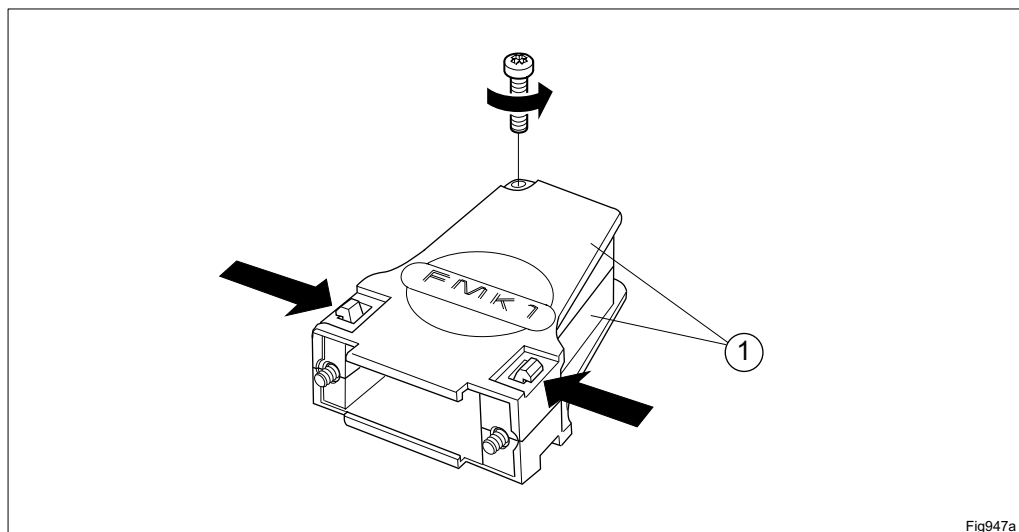


Fig947a

Figure 4-144. Opening the connector casing.

1. Open the connector casing ① by removing the screw, pushing the two plastic springs together and lifting the casing halves apart.

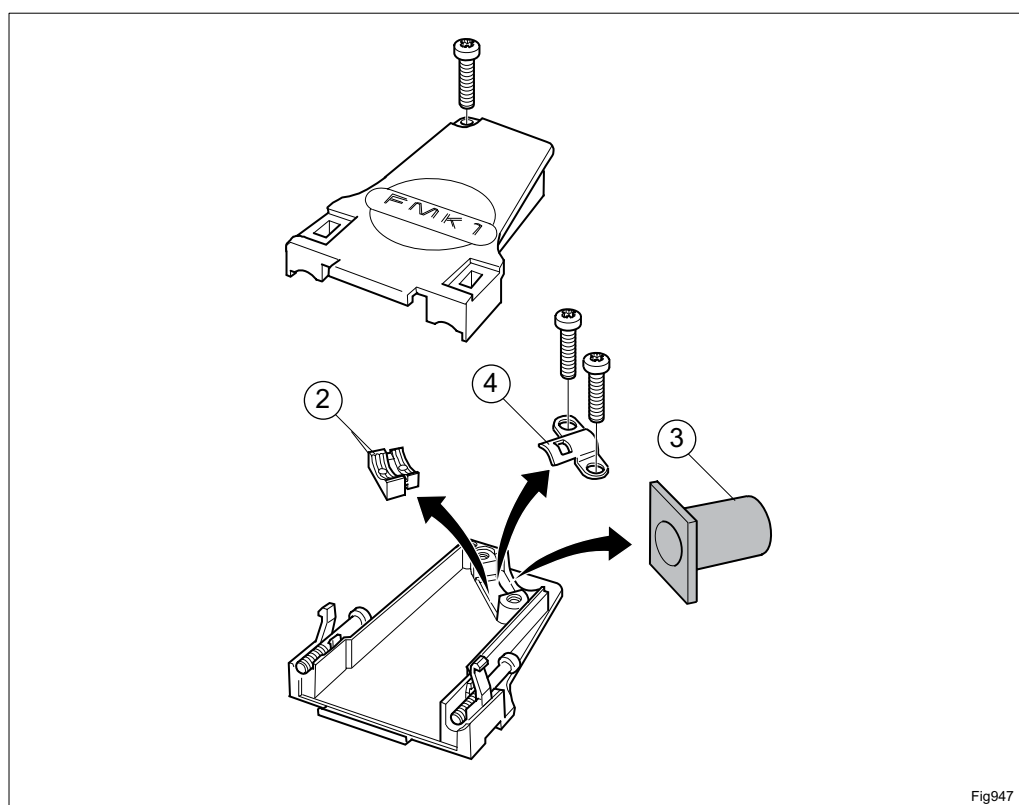


Fig947

Figure 4-145. Removing the parts.

2. Remove the insert ②, rubber bushing ③ and clamp ④ from the connector casing.

### Trimming:

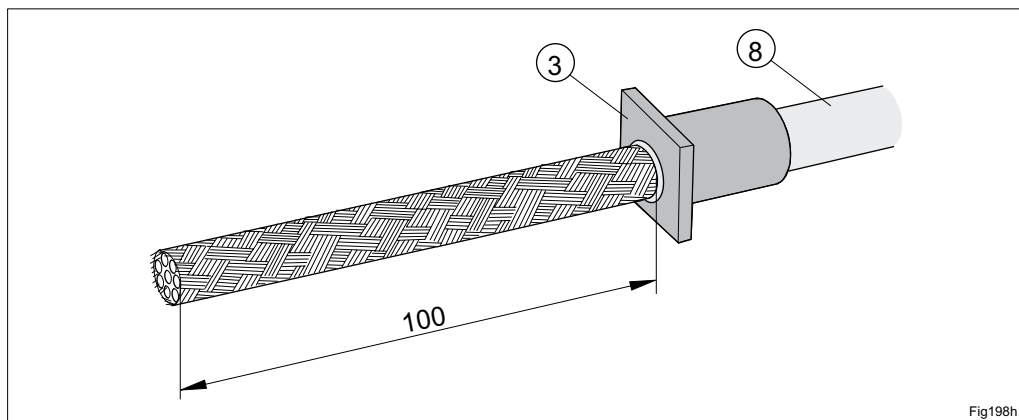


Figure 4-146. Stripping the cable and applying the rubber bushing.

3. Slide the rubber bushing ③ over the cable.
4. Strip the jacket ⑧ approximately 100 mm.

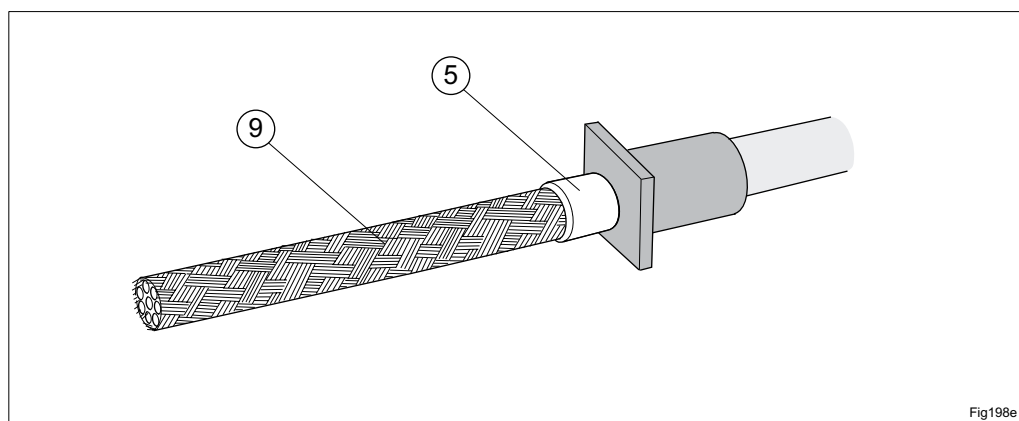


Figure 4-147. Sliding the tube against the jacket.

5. Slide the tube ⑤ over the screen ⑨ and against the jacket.

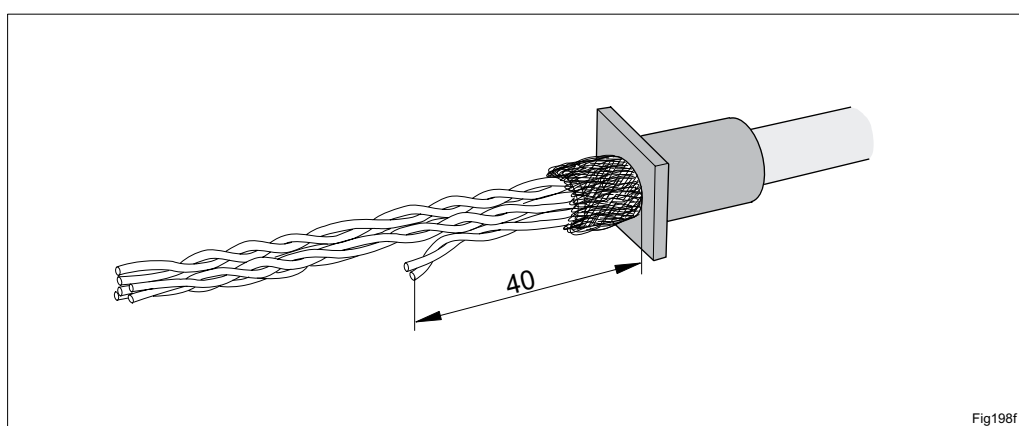


Figure 4-148. Folding the screen over the tube.

6. Fold the screen over the tube and trim the screen.
7. Remove the aluminium and plastic sheet.
8. Cut off 60 mm of each pair (leave 40 mm).

**Note:** Keep the wires twisted in pairs.

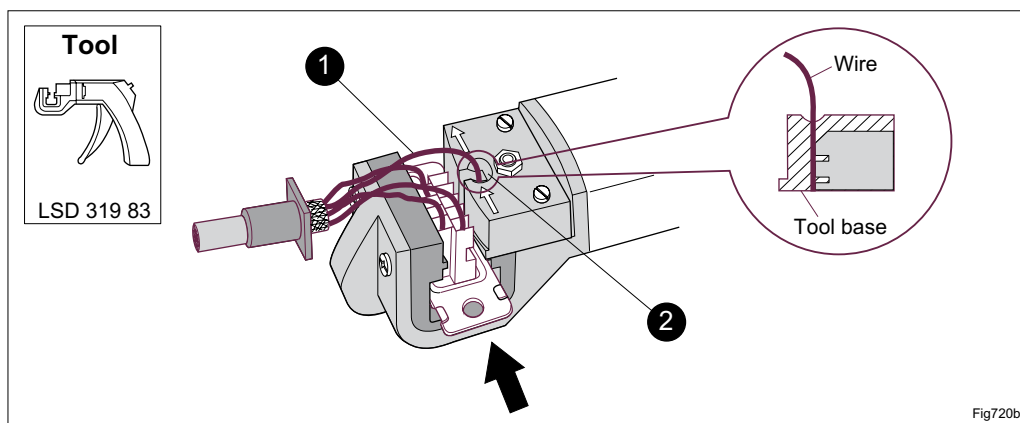
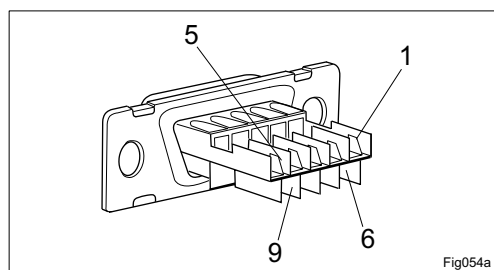


Figure 4-149. Crimping a wire.

9. Insert the contact socket from the left (arrow direction in the figure above) into the feeder channel of the press-fit tool (LSD 319 83) until the desired connector pin faces the wire slot ②.
10. Insert an unstripped wire ① into the wire slot until the wire bottoms on the tool base.
11. Center the wire in the wire slot. Squeeze the handle until the inserter bottoms.
12. Release the handle. The inserter will retract and the connector will advance to the next connector pin. Connect all wires to the contact socket in the same way. Remove the connector from the right side of the feeder channel.

**Note:** Ensure the wires are connected in pairs and inserted into the cavities as described in the tables below.



External connector	Pin No	Signal	Pin No to RS232*	Connect to G.703
<b>RAC 1</b>	5	0 V	7	
	4			
	3	RAC 1 TD 103	3	
	2	RAC 1 RD 104	2	
	1			
	6	DIG RAC 1 IN A		X
	7	DIG RAC 1 IN B		X
	8	DIG RAC 1 OUT A		X
	9	DIG RAC 1 OUT B		X

External connector	Pin No	Signal	Pin No to RS232*	Connect to G.703
<b>RAC 2</b>	5	0 V	7	
	4			
	3	RAC 2 TD 103	3	
	2	RAC 2 RD 104	2	
	1			
	6	DIG RAC 2 IN A		X
	7	DIG RAC 2 IN B		X
	8	DIG RAC 2 OUT A		X
	9	DIG RAC 2 OUT B		X

\* Applies to 25-pin connector.

Figure 4-150. Connecting the wires to the RAC connectors.

**Removing a wire:**

Items 13 and 14 only apply if a wire is connected improperly.

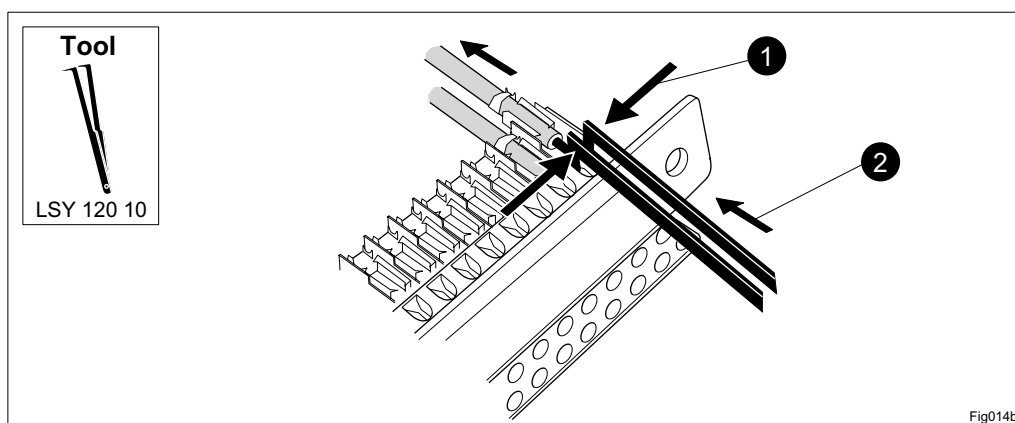


Figure 4-151. Removing a contact pin.

**13.** Remove the contact pin by using the extraction tool (LSY 120 10) on the contact pin. Press the extraction tool together ① and push it upwards ②.

**14.** Insert the contact pin in the correct position.

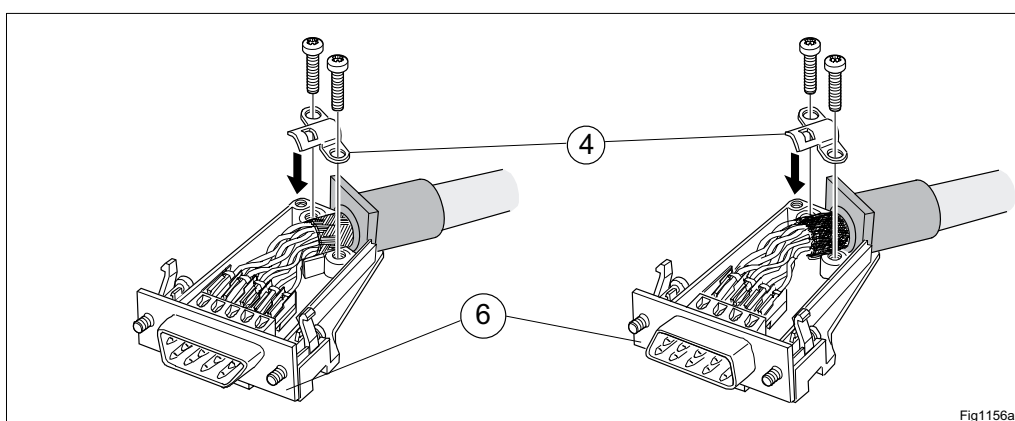
**Assembling:**

Figure 4-152. Fastening the cable.

**15.** Lay down the cable in the connector casing and fasten the wires and screen with the clamp ④ included using cross-slot tool type H (Philips) no 1. The left figure applies to connectors RAC1 and RAC2, the right to O&M.

**Note:** Ensure that the rubber bushing enters the slot in the connector casing properly.

**Note:** Ensure that the contact socket ⑥ is positioned as shown in the figure above. Otherwise the cable outlet will point in the wrong direction when the connector is connected to the access module.

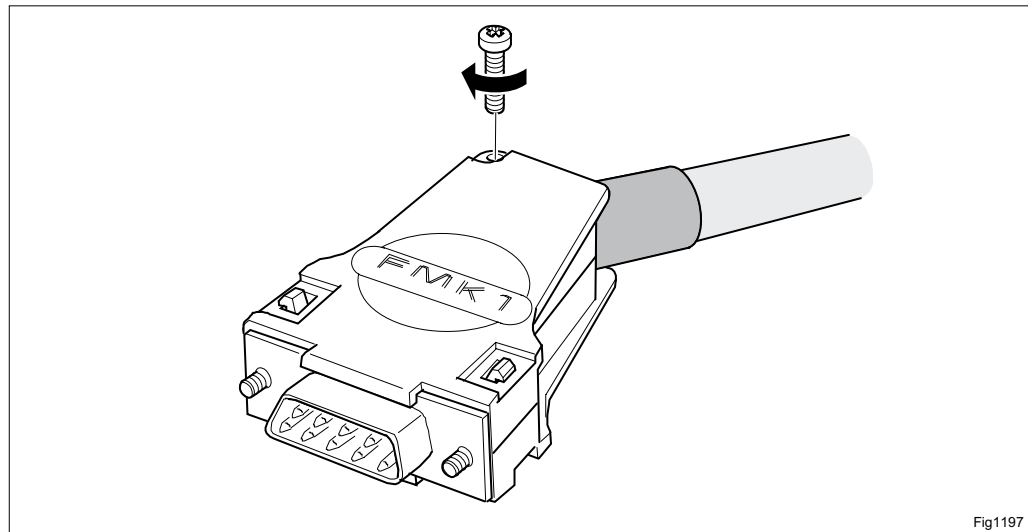


Figure 4-153. Assembling the connector.

16. Fasten the top of the connector casing with the screw using cross-slot tool type H (Philips) no 2.

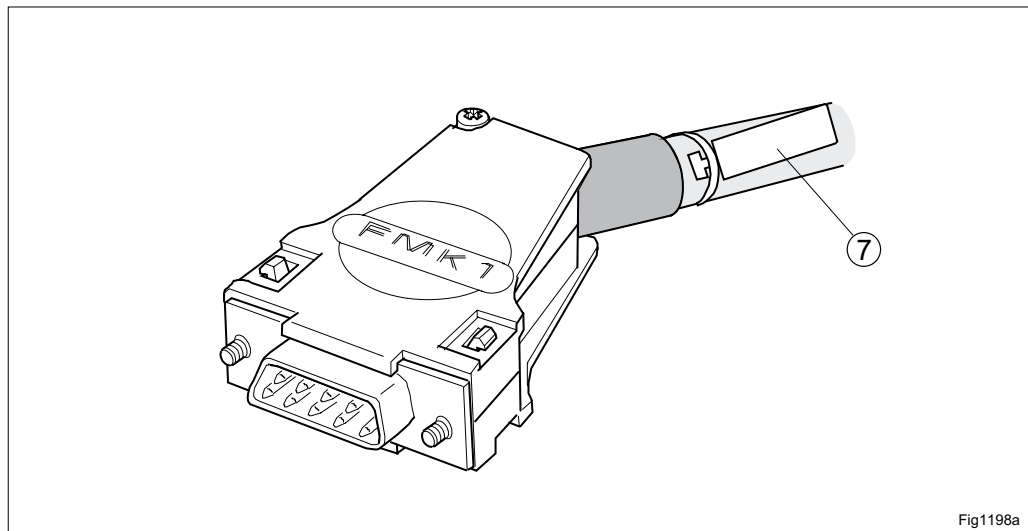


Figure 4-154. Fastening the tag.

17. Fasten a tag ⑦ to the cable using a strap.
18. Mark the assembled connector by writing on the yellow part of the tape and attaching it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

### Connecting:

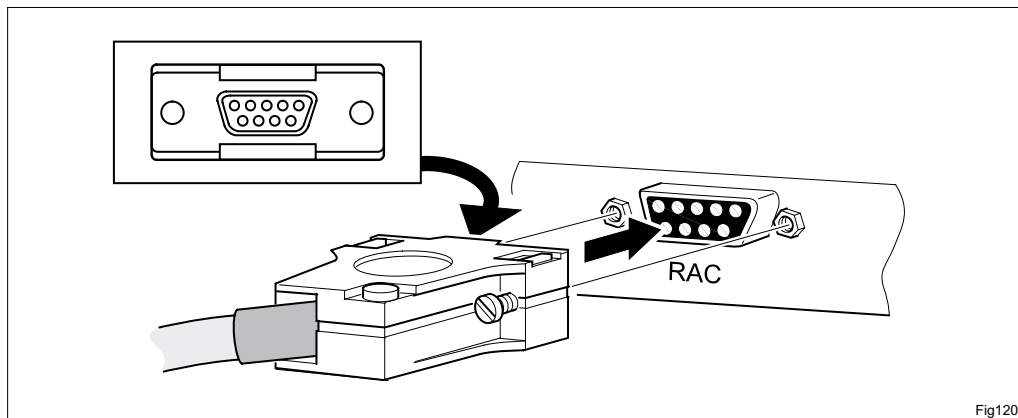


Figure 4-155. Connecting the RAC cable.

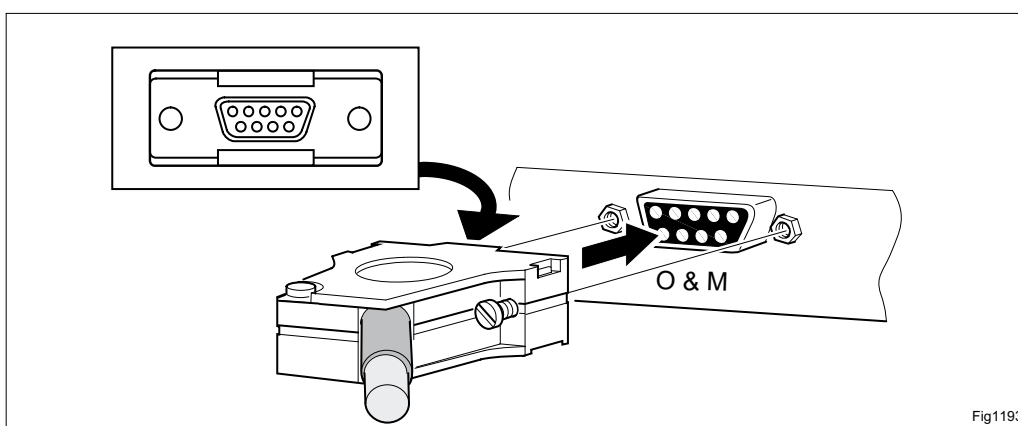


Figure 4-156. Connecting the O&M cable.

- 19.** Connect the cable to the SAU according to the figure above. See section 4.9.12 for more information.

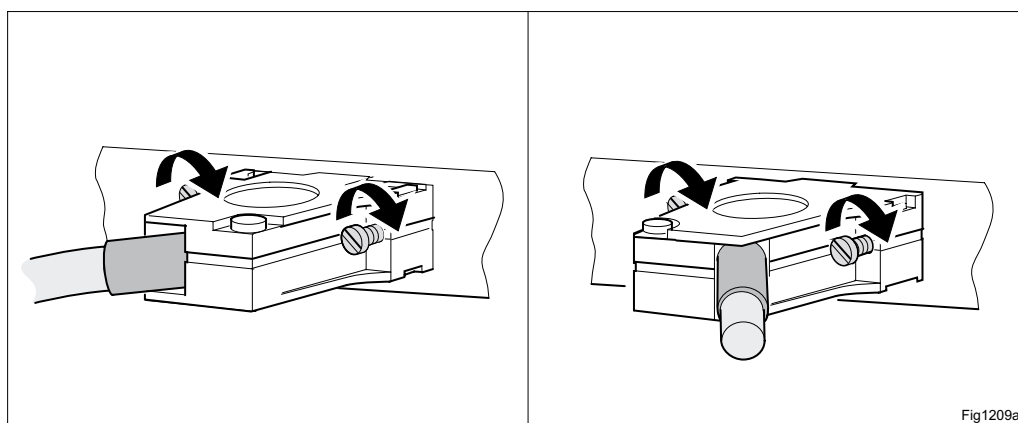


Figure 4-157. Fastening the RAC and O&M connector.

- 20.** Fasten the connector using the two screws.

### 4.9.9 Trimming, Assembling and Connecting the NCC Cable

Applies to cable TFL 481 54 and D-sub 9-pin connector SXX 111 518/1. Cable TFL 481 52 can also be used.

**Note:** A maximum of two AMMs can be interconnected and maximum cable length is 15 m.

The figures below show the parts included in the connector and cable. Items ② to ⑤ are delivered inside the connector casing.

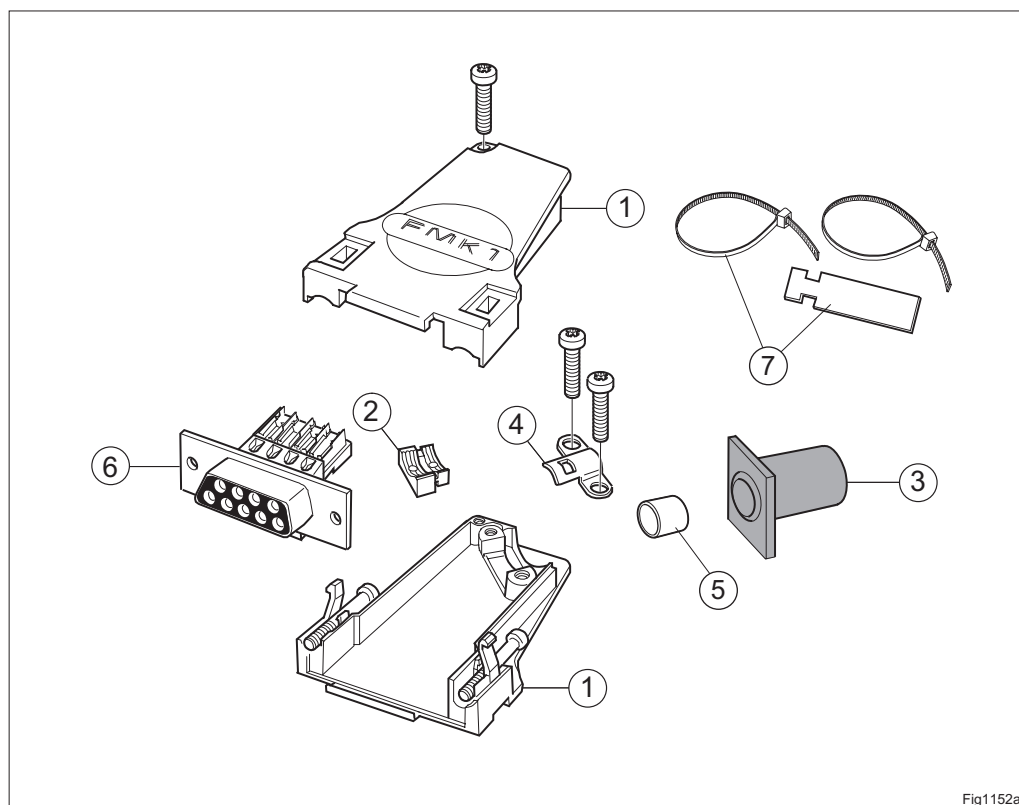


Figure 4-158. The NCC connector.

- |                    |                  |
|--------------------|------------------|
| ① Connector casing | ⑤ Tube           |
| ② Insert           | ⑥ Contact socket |
| ③ Rubber bushing   | ⑦ Label          |
| ④ Clamp            |                  |

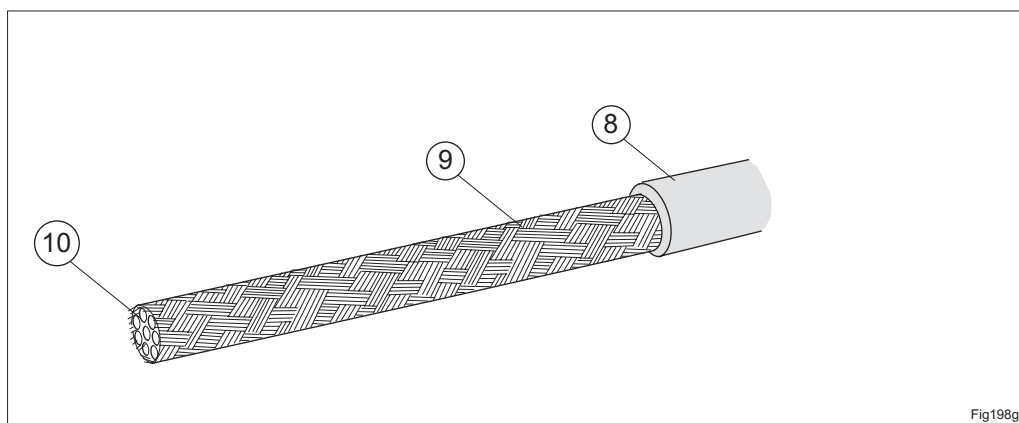


Figure 4-159. The NCC cable.

- |          |        |
|----------|--------|
| ⑧ Jacket | ⑩ Wire |
| ⑨ Screen |        |



### Opening the connector casing:

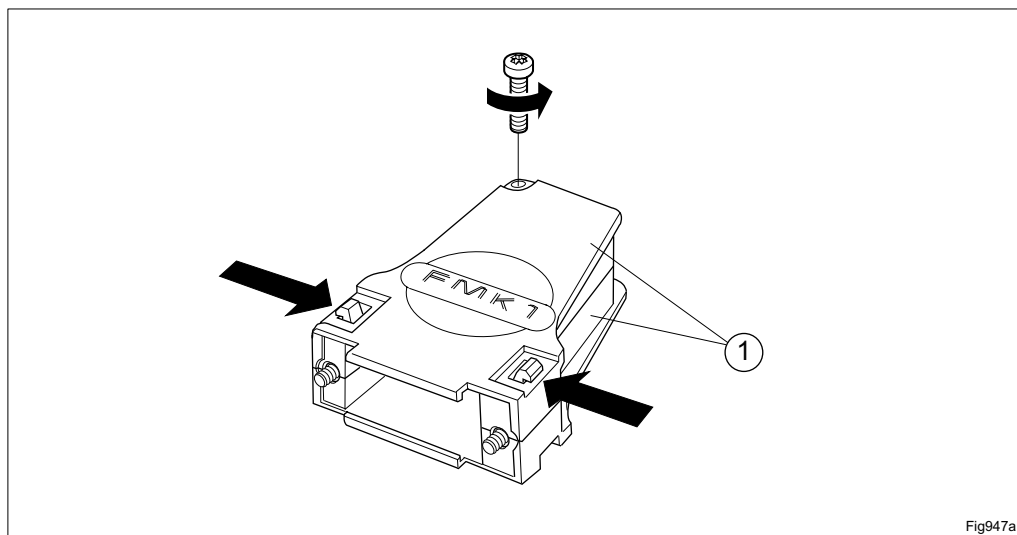


Figure 4-160. Opening the connector casing.

1. Open the connector casing ① by removing the screw, pushing the two plastic springs together and lifting the casing halves apart.

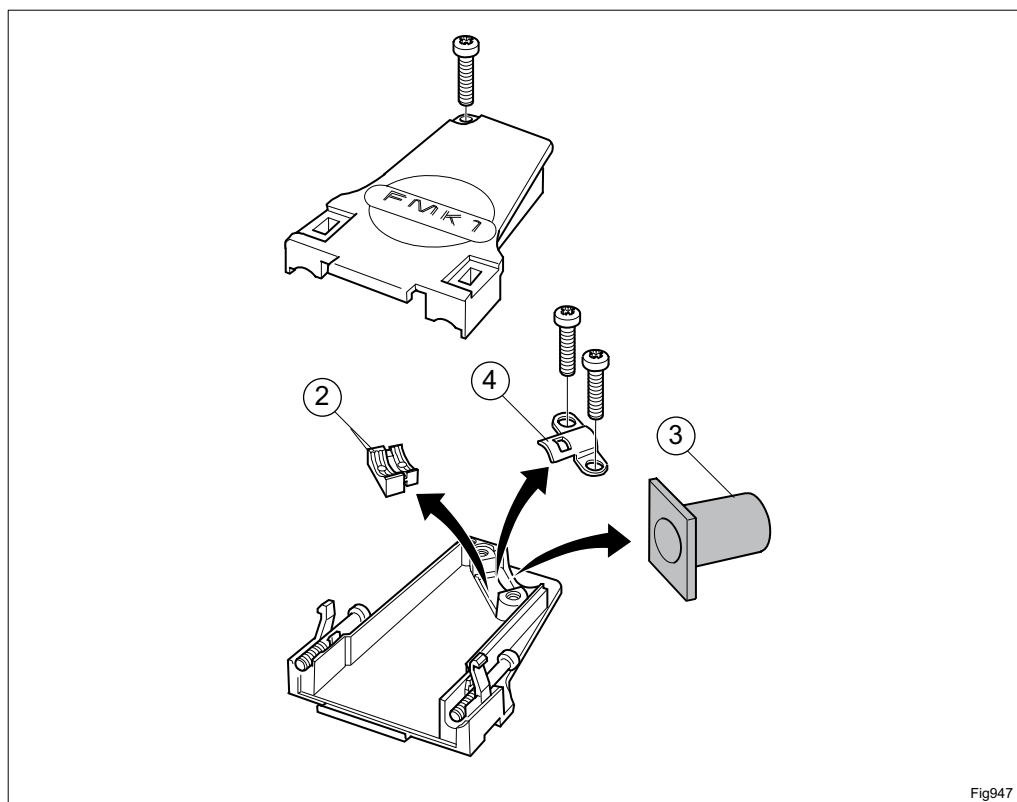


Figure 4-161. Removing the parts.

2. Remove the insert ②, rubber bushing ③ and clamp ④ from the connector casing.

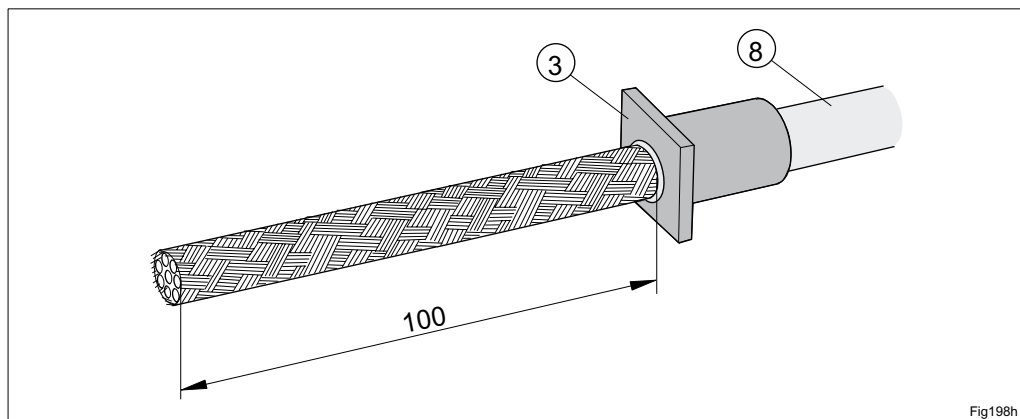
**Trimming:**

Figure 4-162. Stripping the cable and applying the rubber bushing.

3. Slide the rubber bushing ③ over the cable.
4. Strip the jacket ⑧ approximately 100 mm.

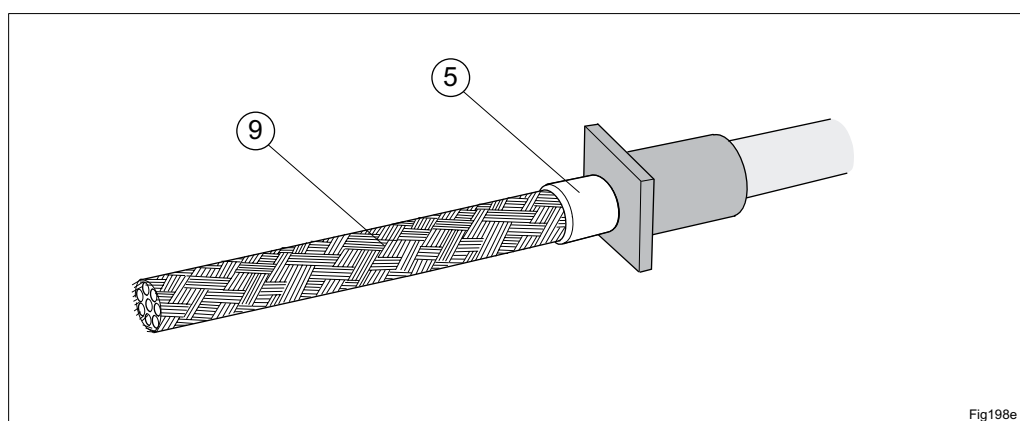


Figure 4-163. Sliding the tube against the jacket.

5. Slide the tube ⑤ over the screen ⑨ and against the jacket.

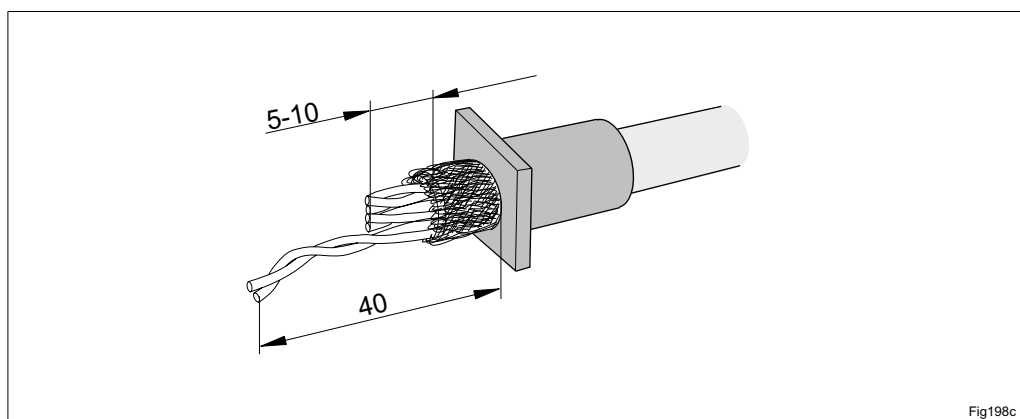


Figure 4-164. Folding the screen over the tube.

6. Fold the screen over the tube and trim the screen.
7. Remove the aluminium and plastic sheet.
8. Cut off 60 mm of the blue and white pair (leave 40 mm) and approximately 90 mm of the other wires since they are not used.

**Note:** Keep the wires twisted in pairs.

9. Save the orange cut-off wire to use as a jumper.

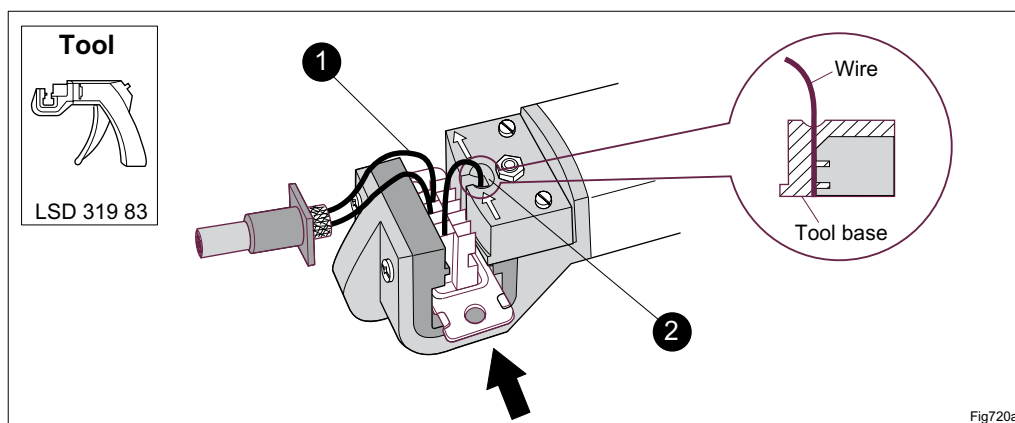


Figure 4-165. Crimping a wire.

10. Insert the contact socket from the left (arrow direction in the figure above) into the feeder channel of the press-fit tool (LSD 319 83) until the desired connector pin faces the wire slot ②.
11. Insert an unstripped wire ① into the wire slot until the wire bottoms on the tool base.
12. Center the wire in the wire slot. Squeeze the handle until the inserter bottoms.
13. Release the handle. The inserter will retract and the connector will advance to the next connector pin. Connect all wires to the contact socket in the same way. Remove the connector from the right side of the feeder channel.

**Note:** Ensure the wires are connected in a pair and inserted into the cavities as described in the table below. Cut all the unused wires.

External connector	Pin No	Signal	TFL 481 54
NCC	5	Jumper connected to pin no 6	Orange
	4		
	3		
	2		
	1		
	6	Jumper connected to pin no 5	Orange
	7		
	8	NCC DATA A	Blue
	9	NCC DATA B	White

Note: Use the same pair of wires for NCC DATA A and B

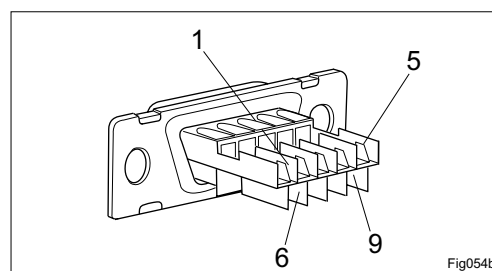


Figure 4-166. Connecting the wires to the NCC connector.

### Removing a wire:

Items 14 and 15 only apply if a wire is connected improperly.

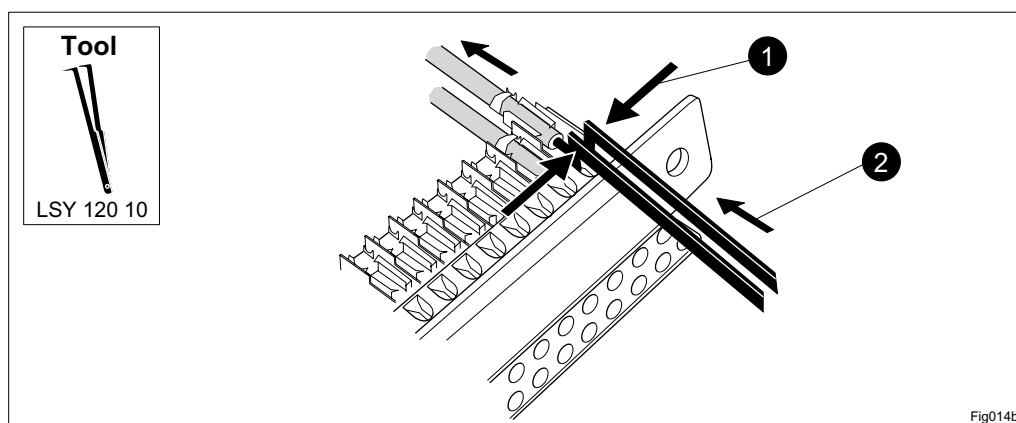


Figure 4-167. Removing a contact pin.

14. Remove the contact pin by using the extraction tool (LSY 120 10) on the contact pin. Press the extraction tool together ① and push it upwards ②.
15. Insert the contact pin in the correct position.

### Assembling:

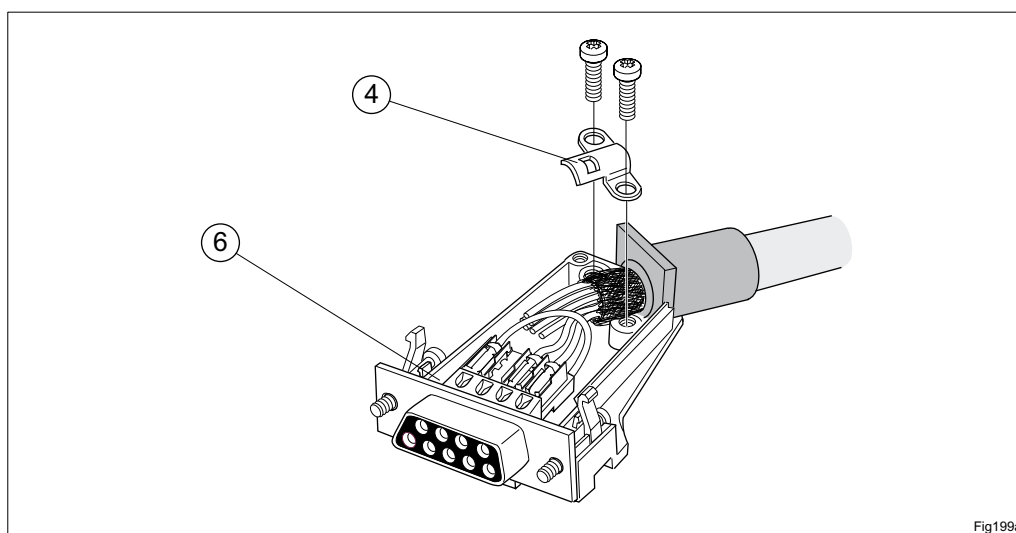


Figure 4-168. Fastening the cable.

16. Lay down the cable in the connector casing and fasten the wires and screen with the clamp ④ included using cross-slot tool type H (Philips) no 1.

**Note:** Ensure that the rubber bushing enters the slot in the connector casing properly.

**Note:** Ensure that the contact socket ⑥ is positioned as shown in the figure above. Otherwise the cable outlet will point in the wrong direction when the connector is connected to the access module.

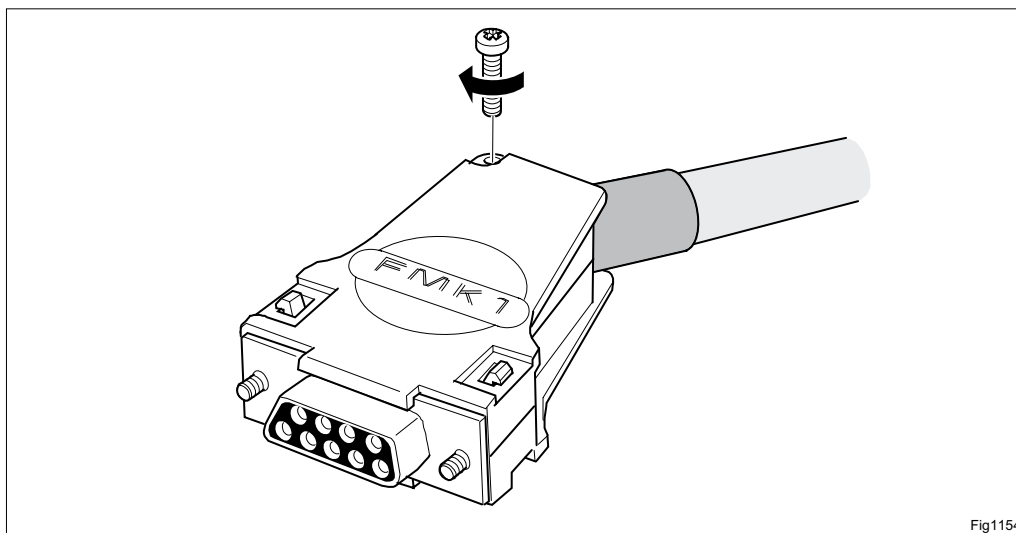


Figure 4-169. Assembling the connector.

17. Fasten the top of the connector casing with the screw using cross-slot tool type H (Philips) no 2.

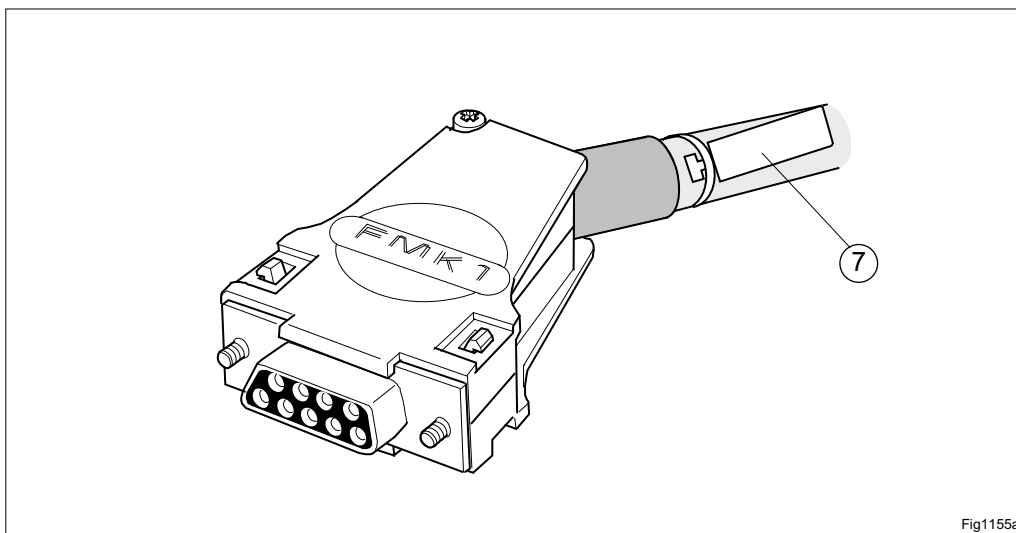


Figure 4-170. Fastening the tag.

18. Fasten a tag ⑦ to the cable using a strap.
19. Mark the assembled connector by writing on the yellow part of the tape and attaching it to the tag (wrapping the transparent part around the tag).

**Note:** There are two tags, one for each end of the cable.

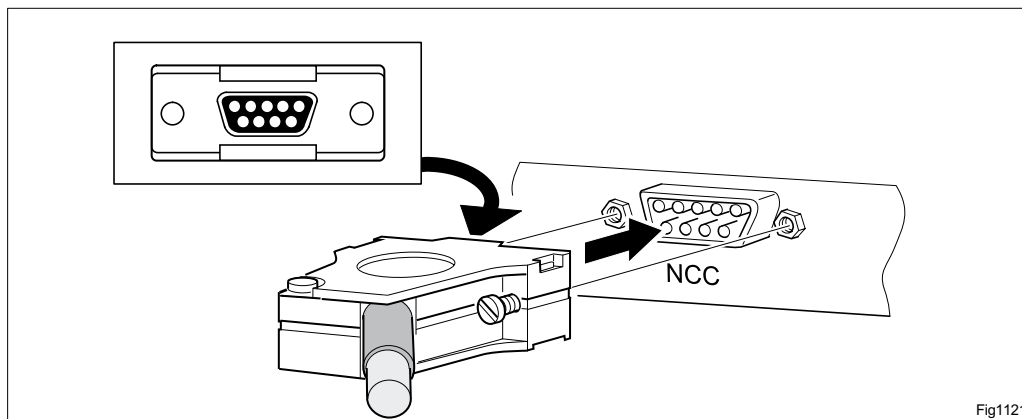
**Connecting:**

Figure 4-171. Connecting the cable

- 20.** Connect the cable to the MMUs according to the figure above. See section 4.9.12 for more information.

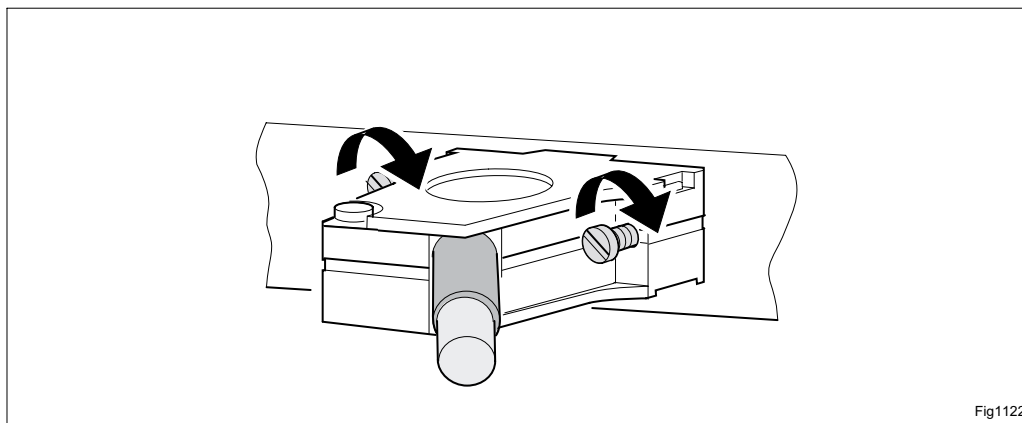


Figure 4-172. Fastening the connector.

- 21.** Fasten the connector using the two screws.

### 4.9.10 Installing and Connecting the Service Telephone

The telephone can be installed on a rack or on a wall:

#### Installing the telephone on a rack

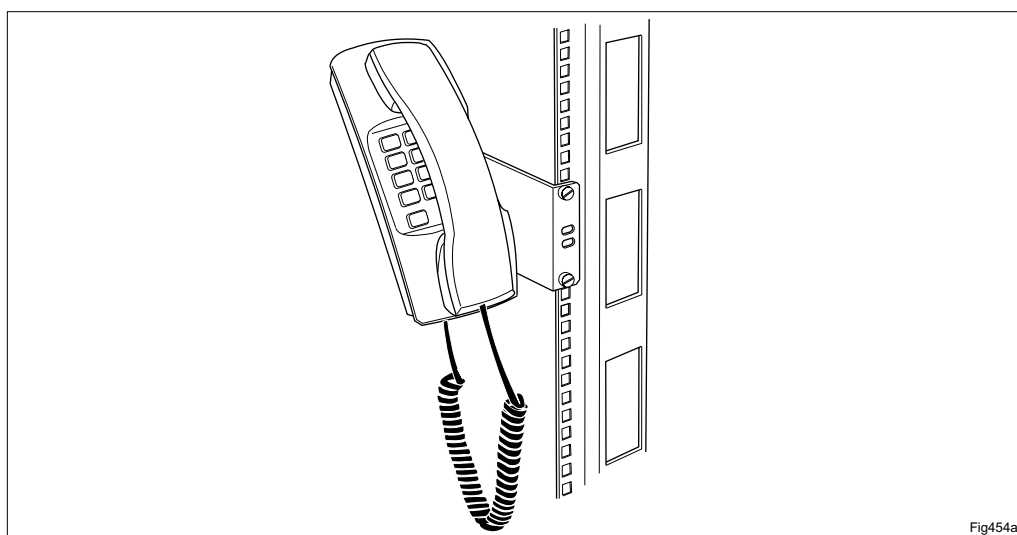
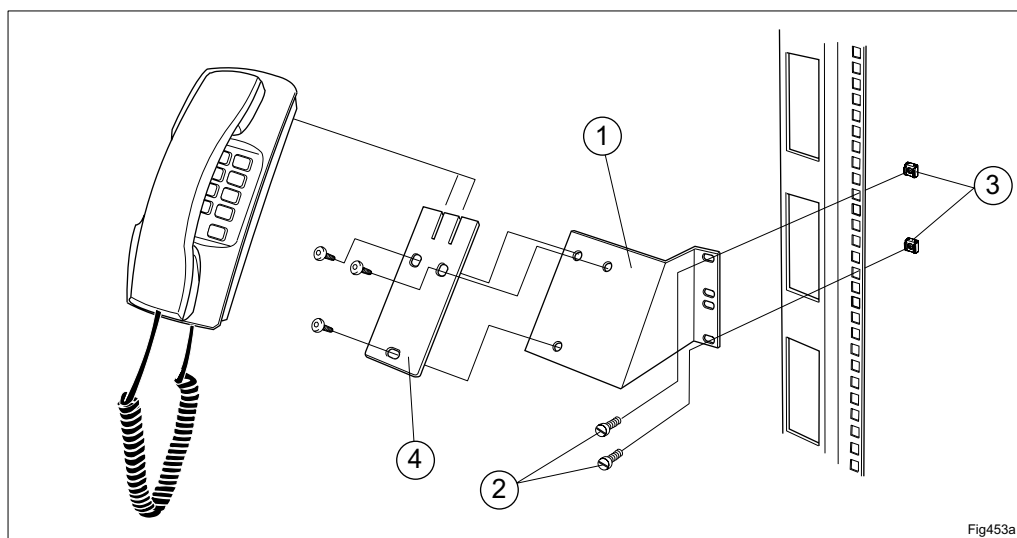


Figure 4-173. The service telephone installed on the rack.

1. Use the bracket ① screws ② and captive nuts ③ included in the SAU Exp 2 delivery, and the wall plate ④ included in the telephone delivery, see figure above.

### Installing the telephone on a wall

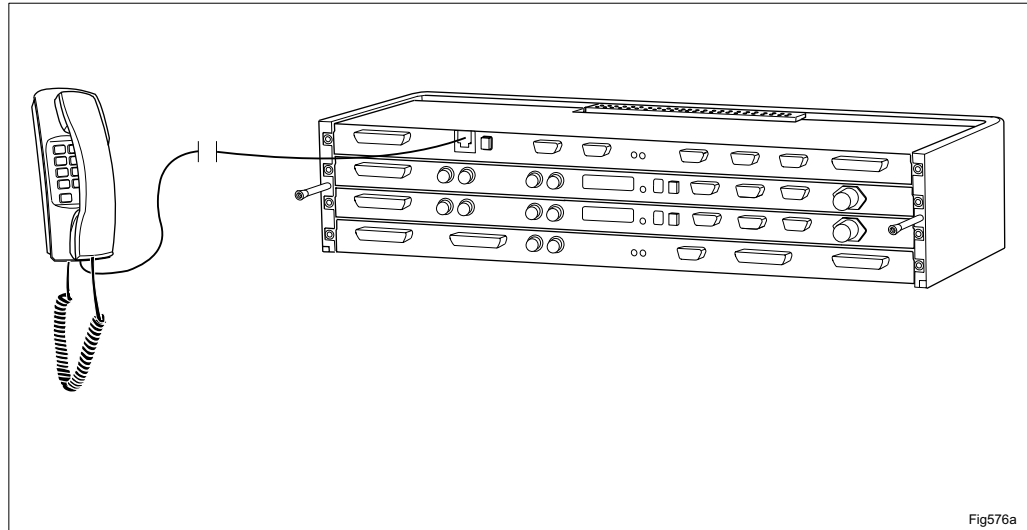


Figure 4-174. The service telephone installed on the wall and connected to the PHONE connector on the SAU Exp 2 (no other cabling is shown).

1. Install the telephone on the wall by the side of the access module or on the side of a cabinet, using the wall plate included in the telephone delivery.

### Connecting the Service Telephone

1. Connect the service telephone to the PHONE connector on the SAU Exp 2.
2. Connect the other end of the telephone cable and the receiver cable to the telephone.



### 4.9.11 Fan Alarm Cabling

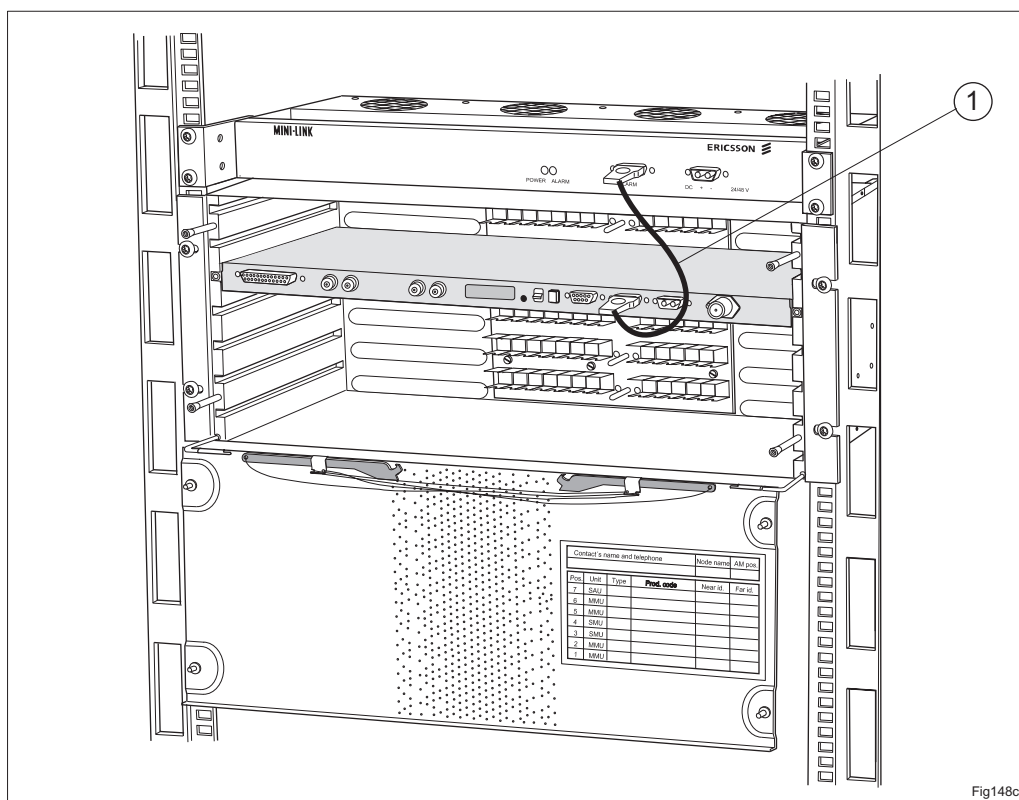


Fig148c

Figure 4-175. Connecting the fan alarm cable.

#### Connecting:

- Connect the fan alarm cable ① (RPM 517 500/2) to the alarm port on the fan unit and the NCC port on the upper MMU.

## 4.9.12 Connector and Pin Connection Overview

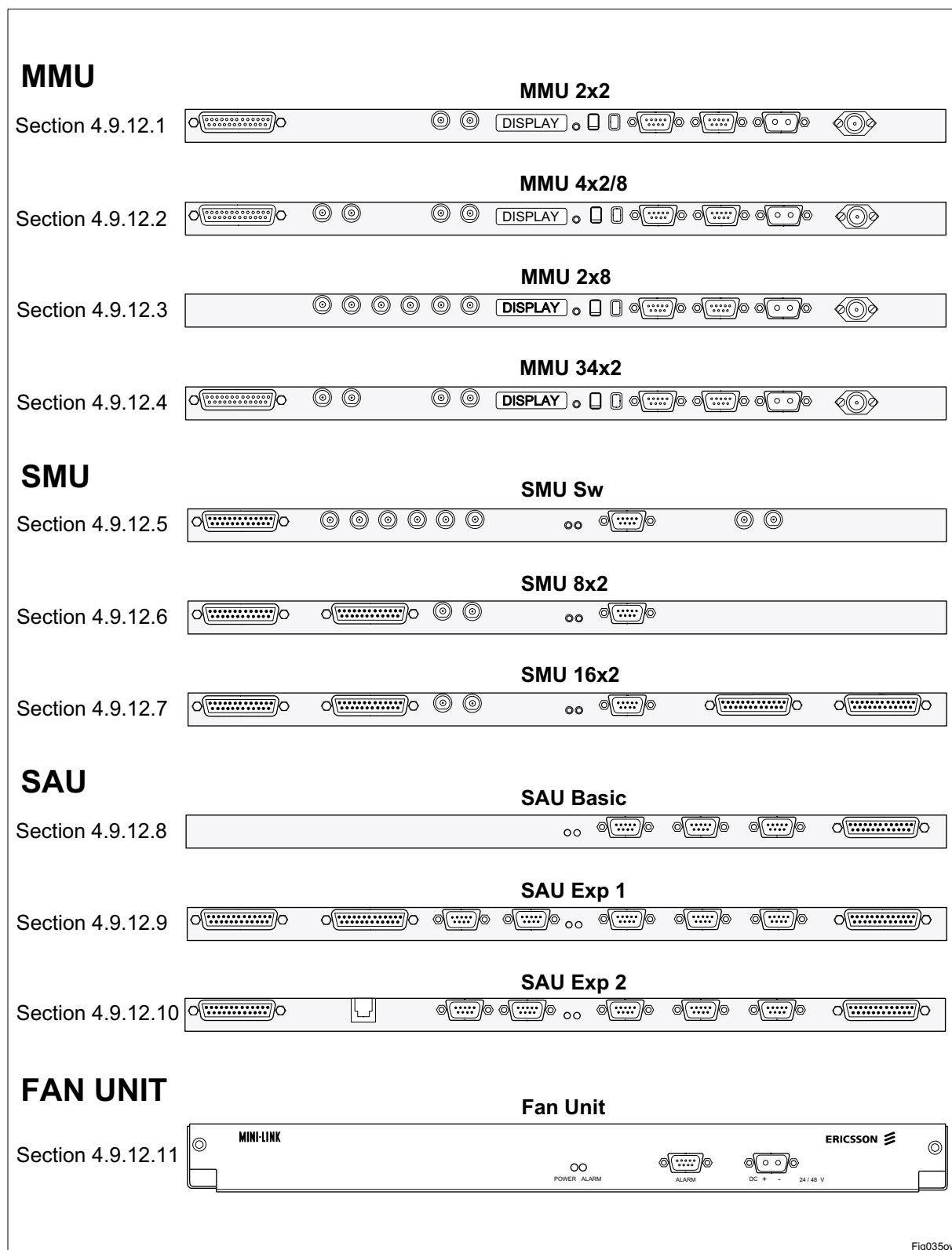
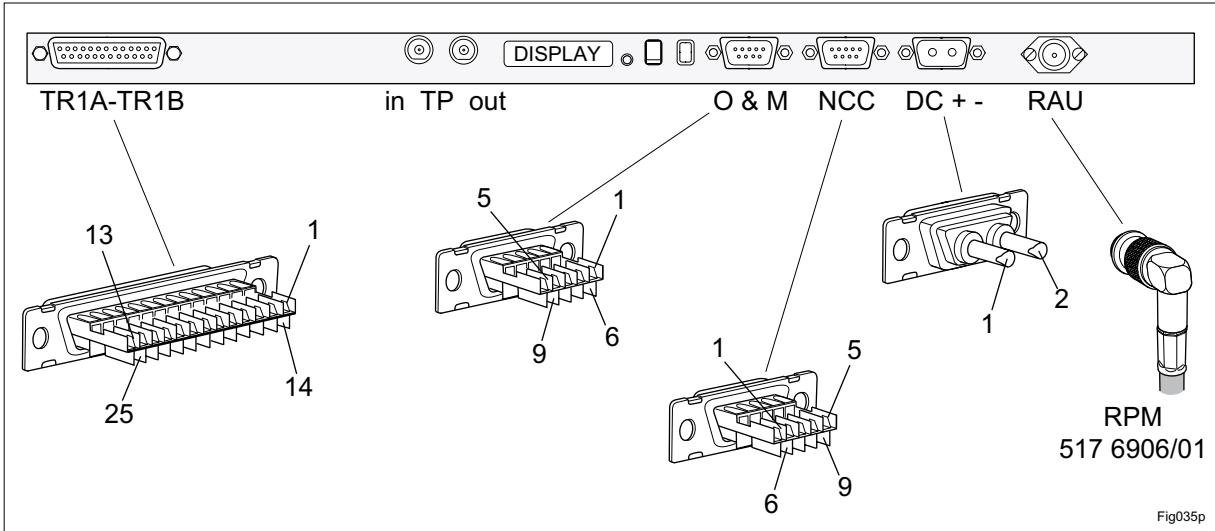


Figure 4-176. Connector and pin connection overview.

4.9.12.1 MMU 2x2 Mbit/s



External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
TR1A-TR1B 2 Mbit/s	13	TRAFFIC1 A OUT A	WHITE	WHITE
	12	TRAFFIC1 A OUT B	BLUE	BLUE
	11			
	10	TRAFFIC1 A IN A	WHITE	WHITE
	9	TRAFFIC1 A IN B	ORANGE	ORANGE
	8			
	7			
	6	TRAFFIC1 B OUT A	WHITE	WHITE
	5	TRAFFIC1 B OUT B	GREEN*	BLUE
	4			
	3	TRAFFIC1 B IN A	WHITE	WHITE
	2	TRAFFIC1 B IN B	BROWN*	ORANGE
	1			
	14			
	15			
	16			
	17			
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25			

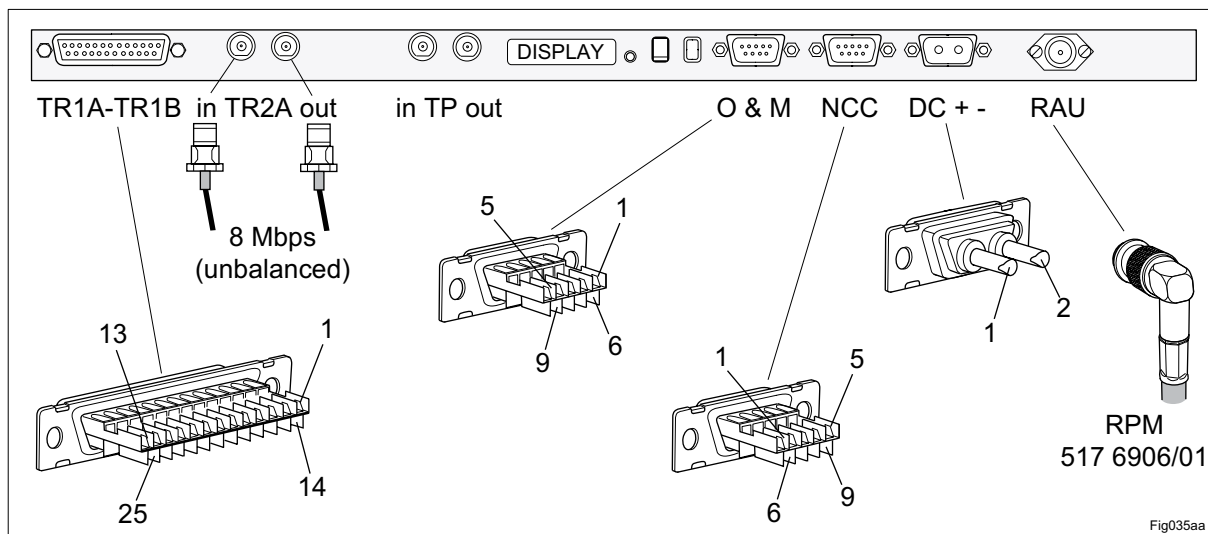
\* The wires have switched places compared with the instruction in InstallationManual < R6A.

External connector	Pin No	Signal	TFL 424 02
DC	1	DC +	Red
	2	DC -	Black

**Note:** The MMU must be installed in the AMM before the power is switched on.

Figure 4-177. MMU 2x2 Mbit/s.

## 4.9.12.2 MMU 4x2/8 Mbit/s



External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>TR1A-TR1D 2 Mbit/s</b>	13	TRAFFIC1 A OUT A	WHITE	WHITE
	12	TRAFFIC1 A OUT B	BLUE	BLUE
	11			
	10	TRAFFIC1 A IN A	WHITE	WHITE
	9	TRAFFIC1 A IN B	ORANGE	ORANGE
	8			
	7			
	6	TRAFFIC1 B OUT A	WHITE	WHITE
	5	TRAFFIC1 B OUT B	GREEN*	BLUE
	4			
	3	TRAFFIC1 B IN A	WHITE	WHITE
	2	TRAFFIC1 B IN B	BROWN*	ORANGE
	1			
	14	TRAFFIC1 C OUT A	RED	WHITE
	15	TRAFFIC1 C OUT B	BLUE	BLUE
	16			
	17	TRAFFIC1 C IN A	RED	WHITE
	18	TRAFFIC1 C IN B	ORANGE	ORANGE
	19			
	20	TRAFFIC1 D OUT A	RED	WHITE
	21	TRAFFIC1 D OUT B	GREEN*	BLUE
	22			
	23	TRAFFIC1 D IN A	RED	WHITE
	24	TRAFFIC1 D IN B	BROWN*	ORANGE
	25			

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

External connector	Pin No	Signal	TFL 424 02
<b>DC</b>	1	DC +	Red
	2	DC -	Black

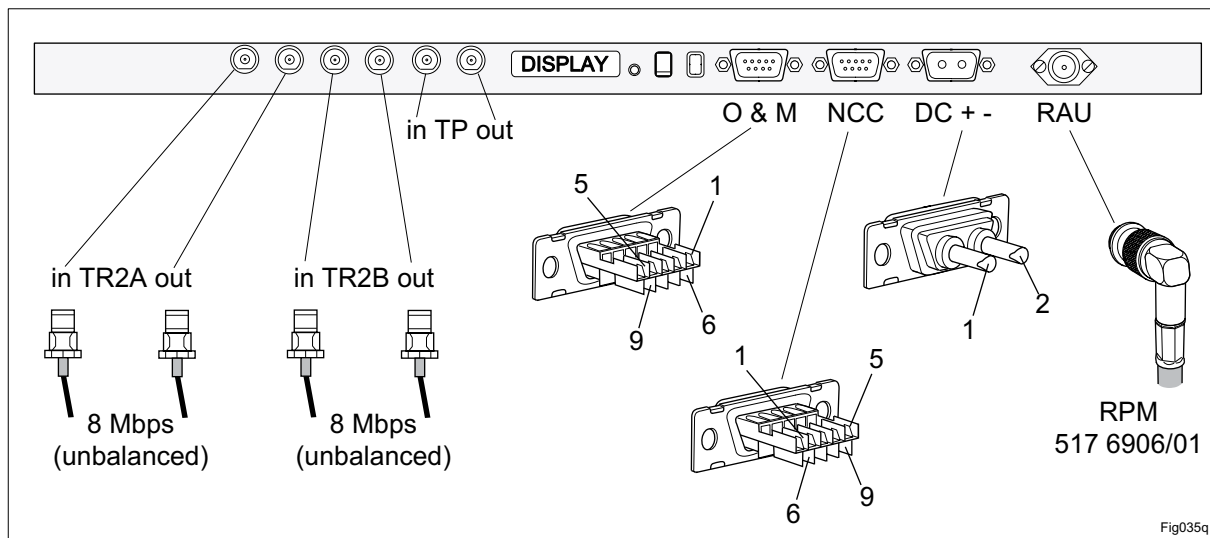
**Note:** The MMU must be installed in the AMM before the power is switched on.

Figure 4-178. MMU 4x2/8 Mbit/s.

External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

External connector	Pin No	Signal
<b>NCC</b>	5	Jumper to pin 6
	4	
	3	
	2	
	1	FAN ALARM
	6	Jumper to pin 5
	7	FAN ALARM RETURN
	8	NCC DATA A
	9	NCC DATA B

## 4.9.12.3 MMU 2x8 Mbit/s



External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

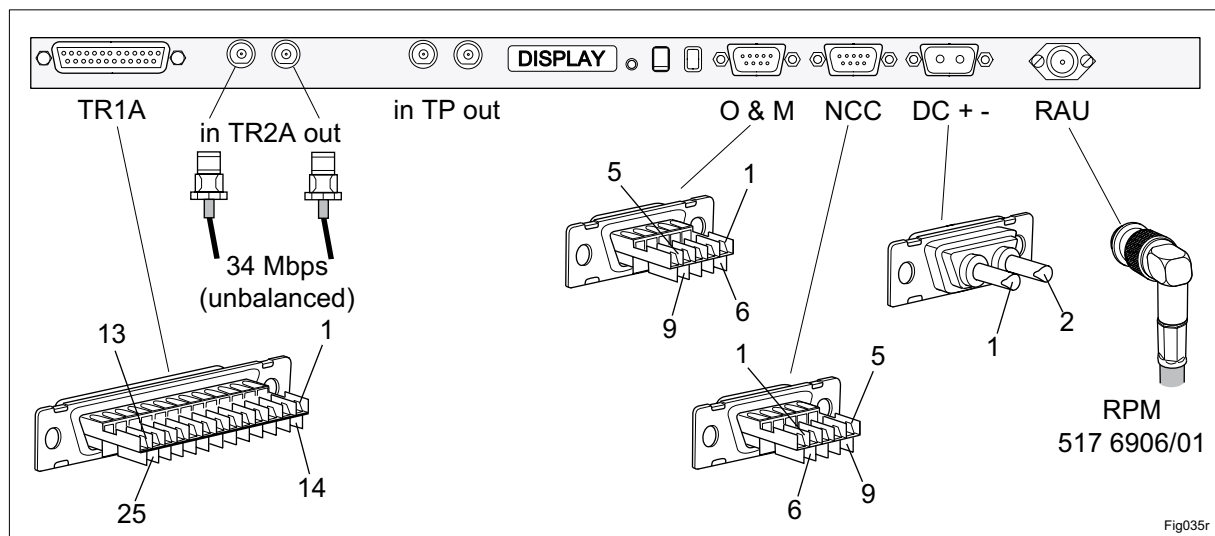
External connector	Pin No	Signal
<b>NCC</b>	5	Jumper to pin 6
	4	
	3	
	2	
	1	FAN ALARM
	6	Jumper to pin 5
	7	FAN ALARM RETURN
	8	NCC DATA A
	9	NCC DATA B

External connector	Pin No	Signal	TFL 424 02
<b>DC</b>	1	DC +	Red
	2	DC -	Black

**Note:** The MMU must be installed in the AMM before the power is switched on.

Figure 4-179. MMU 2x8 Mbit/s.

## 4.9.12.4 MMU 34+2 Mbit/s



External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>TR1A</b> 2 Mbit/s	13	TRAFFIC1 A OUT A	WHITE	WHITE
	12	TRAFFIC1 A OUT B	BLUE	BLUE
	11			
	10	TRAFFIC1 A IN A	WHITE	WHITE
	9	TRAFFIC1 A IN B	ORANGE	ORANGE
	8			
	7			
	6			
	5			
	4			
	3			
	2			
	1			
	14			
	15			
	16			
	17			
	18			
	19			
	20			
	21			
	22			
	23			
	24			
	25			

External connector	Pin No	Signal	TFL 424 02
<b>DC</b>	1	DC +	Red
	2	DC -	Black

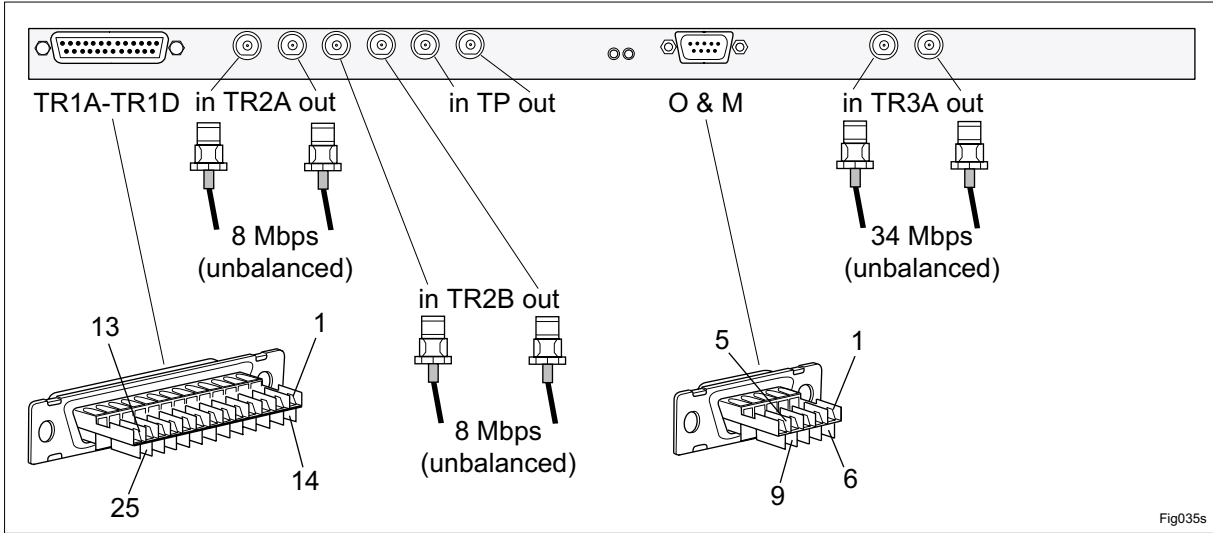
External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

External connector	Pin No	Signal
<b>NCC</b>	5	Jumper to pin 6
	4	
	3	
	2	
	1	FAN ALARM
	6	Jumper to pin 5
	7	FAN ALARM RETURN
	8	NCC DATA A
	9	NCC DATA B

**Note:** The MMU must be installed in the AMM before the power is switched on.

Figure 4-180. MMU 34+2 Mbit/s.

4.9.12.5 SMU Sw



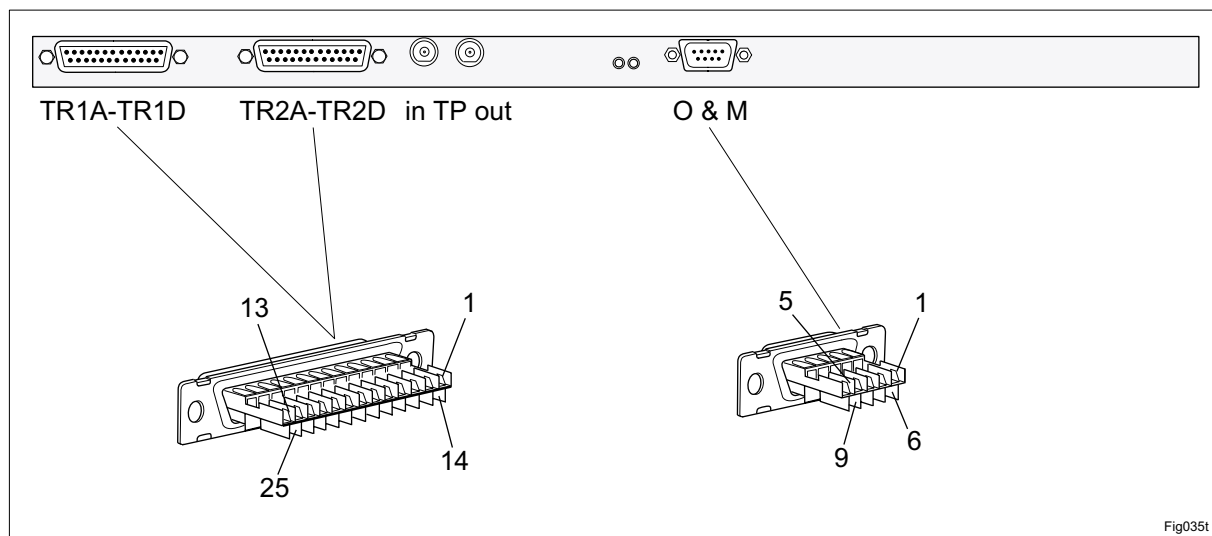
External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
TR1A-TR1D 2 Mbit/s	13	TRAFFIC1 A OUT A	WHITE	WHITE
	12	TRAFFIC1 A OUT B	BLUE	BLUE
	11			
	10	TRAFFIC1 A IN A	WHITE	WHITE
	9	TRAFFIC1 A IN B	ORANGE	ORANGE
	8			
	7			
	6	TRAFFIC1 B OUT A	WHITE	WHITE
	5	TRAFFIC1 B OUT B	GREEN*	BLUE
	4			
	3	TRAFFIC1 B IN A	WHITE	WHITE
	2	TRAFFIC1 B IN B	BROWN*	ORANGE
	1			
	14	TRAFFIC1 C OUT A	RED	WHITE
	15	TRAFFIC1 C OUT B	BLUE	BLUE
	16			
	17	TRAFFIC1 C IN A	RED	WHITE
	18	TRAFFIC1 C IN B	ORANGE	ORANGE
	19			
	20	TRAFFIC1 D OUT A	RED	WHITE
	21	TRAFFIC1 D OUT B	GREEN*	BLUE
	22			
	23	TRAFFIC1 D IN A	RED	WHITE
	24	TRAFFIC1 D IN B	BROWN*	ORANGE
	25			

External connector	Pin No	Signal
O&M	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

Figure 4-181. SMU Sw.

## 4.9.12.6 SMU 8x2 Mbit/s



External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>TR1A-TR1D And TR2A-TR2D</b> four 2 Mbit/s or one 8 Mbit/s (selected in traffic setup)	13	TRAFFIC1 A OUT A	WHITE	WHITE
	12	TRAFFIC1 A OUT B	BLUE	BLUE
	11			
	10	TRAFFIC1 A IN A	WHITE	WHITE
	9	TRAFFIC1 A IN B	ORANGE	ORANGE
	8			
	7			
	6	TRAFFIC1 B OUT A	WHITE	WHITE
	5	TRAFFIC1 B OUT B	GREEN*	BLUE
	4			
	3	TRAFFIC1 B IN A	WHITE	WHITE
	2	TRAFFIC1 B IN B	BROWN*	ORANGE
	1			
	14	TRAFFIC1 C OUT A	RED	WHITE
	15	TRAFFIC1 C OUT B	BLUE	BLUE
	16			
	17	TRAFFIC1 C IN A	RED	WHITE
	18	TRAFFIC1 C IN B	ORANGE	ORANGE
	19			
	20	TRAFFIC1 D OUT A	RED	WHITE
	21	TRAFFIC1 D OUT B	GREEN*	BLUE
	22			
	23	TRAFFIC1 D IN A	RED	WHITE
	24	TRAFFIC1 D IN B	BROWN*	ORANGE
	25			

External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

Figure 4-182. SMU 8x2 Mbit/s.



## 4.9.12.7 SMU 16x2 Mbit/s

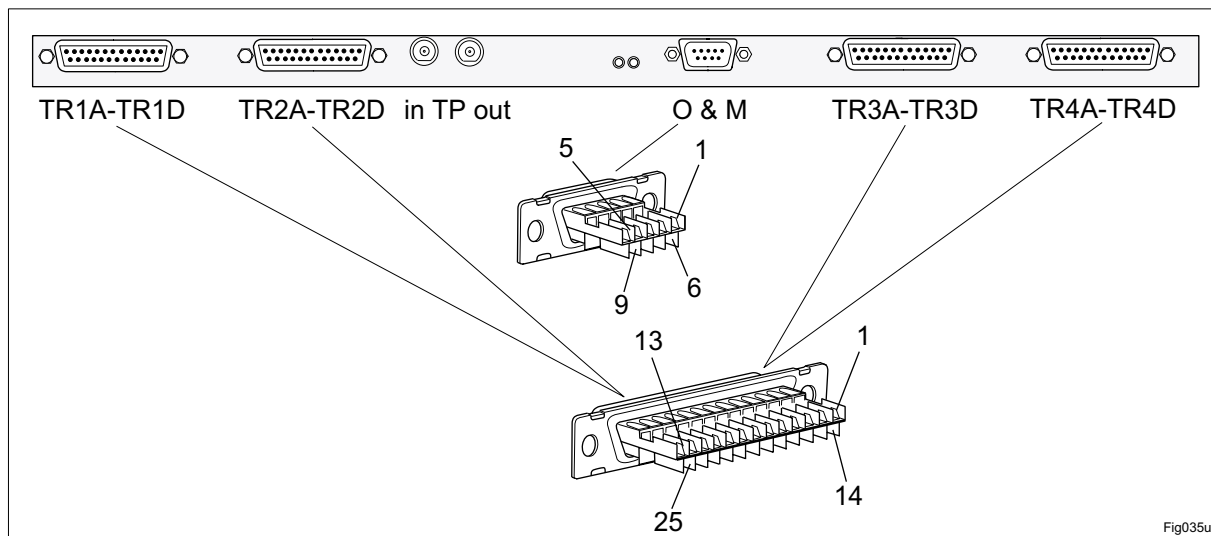


Fig035u

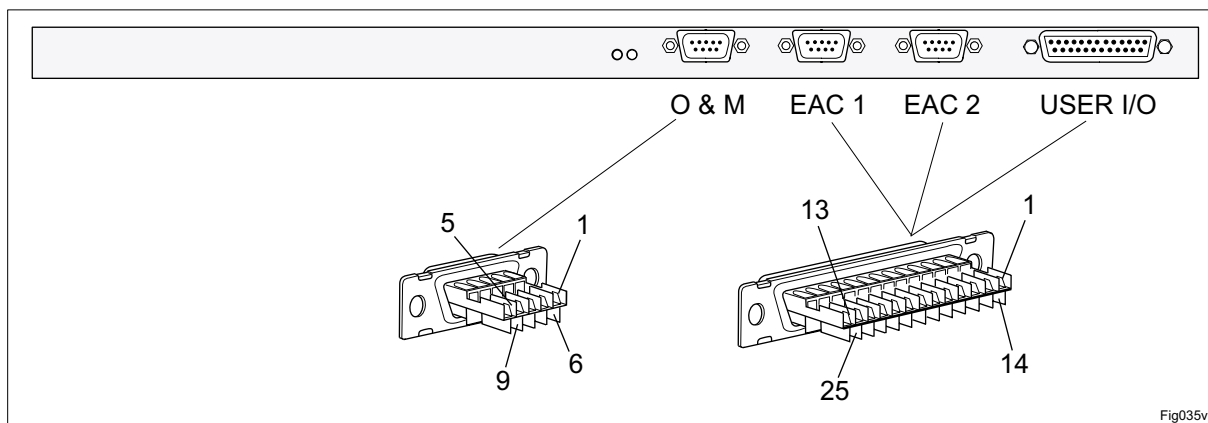
External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>TR1A-TR1D to TR4A-TR4D</b> four 2 Mbit/s or one 8 Mbit/s (selected in traffic setup)	13	TRAFFIC1 A OUT A	WHITE	WHITE
	12	TRAFFIC1 A OUT B	BLUE	BLUE
	11			
	10	TRAFFIC1 A IN A	WHITE	WHITE
	9	TRAFFIC1 A IN B	ORANGE	ORANGE
	8			
	7			
	6	TRAFFIC1 B OUT A	WHITE	WHITE
	5	TRAFFIC1 B OUT B	GREEN*	BLUE
	4			
	3	TRAFFIC1 B IN A	WHITE	WHITE
	2	TRAFFIC1 B IN B	BROWN*	ORANGE
	1			
	14	TRAFFIC1 C OUT A	RED	WHITE
	15	TRAFFIC1 C OUT B	BLUE	BLUE
	16			
	17	TRAFFIC1 C IN A	RED	WHITE
	18	TRAFFIC1 C IN B	ORANGE	ORANGE
	19			
	20	TRAFFIC1 D OUT A	RED	WHITE
	21	TRAFFIC1 D OUT B	GREEN*	BLUE
	22			
	23	TRAFFIC1 D IN A	RED	WHITE
	24	TRAFFIC1 D IN B	BROWN*	ORANGE
	25			

External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

Figure 4-183. SMU 16x2 Mbit/s.

## 4.9.12.8 SAU Basic



External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

External connector	Pin No	Signal	Pin No to other equipment
<b>EAC 1 and 2</b>	5		
	4		
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8		
	9		

**Note:** Use the same pair of wires for EAC CLOCK A and B.  
Use the same pair of wires for EAC DATA A and B.

External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>User I/O</b>	13			
	12	USER IN 6 B	WHITE	
	11	USER IN 6 A	BLUE	
	10	USER IN 5 B	WHITE	
	9	USER IN 5 A	ORANGE	
	8	USER IN 4 B	WHITE	
	7	USER IN 4 A	GREEN*	
	6	USER IN 3 B	WHITE	
	5	USER IN 3 A	BROWN*	
	4	USER IN 2 B	RED	
	3	USER IN 2 A	BLUE	
	2	USER IN 1 B	RED	
	1	USER IN 1 A	ORANGE	
	14	USER IN 7 A	RED	
	15	USER IN 7 B	GREEN*	
	16	USER IN 8 A	RED	
	17	USER IN 8 B	BROWN*	
	18	USER IN/OUT 9 A		WHITE
	19	USER IN/OUT 9 B		BLUE
	20	USER IN/OUT 10 A		WHITE
	21	USER IN/OUT 10 B		ORANGE
	22	USER IN/OUT 11 A		WHITE
	23	USER IN/OUT 11 B		BLUE
	24	USER IN/OUT 12 A		WHITE
	25	USER IN/OUT 12 B		ORANGE

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

**Note:** See section 10.9 and 10.10 for recommendation of use for the user inputs/outputs.

Figure 4-184. SAU Basic.

## 4.9.12.9 SAU Exp 1

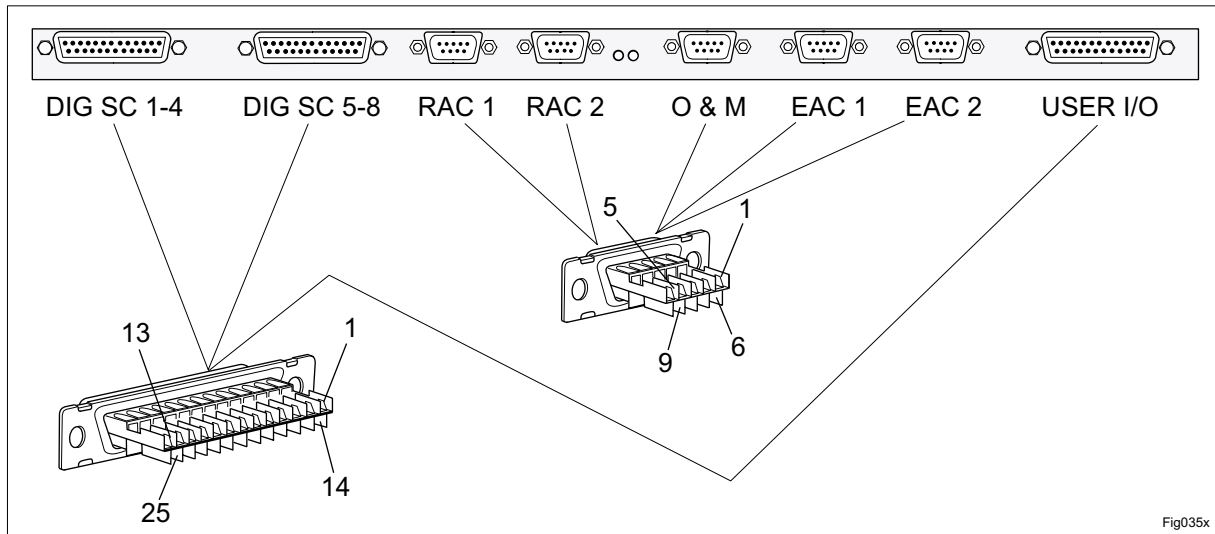


Fig035x

External connector	Pin No	Signal for DIG SC 1-4	Signal for DIG SC 5-8	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>DIG SC 1-4 and 5-8</b>	13	DIG SERV 1 OUT A	DIG SERV 5 OUT A	WHITE	WHITE
	12	DIG SERV 1 OUT B	DIG SERV 5 OUT B	BLUE	BLUE
	11				
	10	DIG SERV 1 IN A	DIG SERV 5 IN A	WHITE	WHITE
	9	DIG SERV 1 IN B	DIG SERV 5 IN B	ORANGE	ORANGE
	8				
	7				
	6	DIG SERV 2 OUT A	DIG SERV 6 OUT A	WHITE	WHITE
	5	DIG SERV 2 OUT B	DIG SERV 6 OUT B	GREEN*	BLUE
	4				
	3	DIG SERV 2 IN A	DIG SERV 6 IN A	WHITE	WHITE
	2	DIG SERV 2 IN B	DIG SERV 6 IN B	BROWN*	ORANGE
	1				
	14	DIG SERV 3 OUT A	DIG SERV 7 OUT A	RED	WHITE
	15	DIG SERV 3 OUT B	DIG SERV 7 OUT B	BLUE	BLUE
	16				
	17	DIG SERV 3 IN A	DIG SERV 7 IN A	RED	WHITE
	18	DIG SERV 3 IN B	DIG SERV 7 IN B	ORANGE	ORANGE
	19				
	20	DIG SERV 4 OUT A	DIG SERV 8 OUT A	RED	WHITE
	21	DIG SERV 4 OUT B	DIG SERV 8 OUT B	GREEN*	BLUE
	22				
	23	DIG SERV 4 IN A	DIG SERV 8 IN A	RED	WHITE
	24	DIG SERV 4 IN B	DIG SERV 8 IN B	BROWN*	ORANGE
	25				

External connector	Pin No	Signal for DIG SC 1-4	Pin No to RS232 <sup>1</sup>	Connect to G.703
<b>RAC 1</b>	5	0 V	7	
	4			
	3	RAC 1 TD 103	3	
	2	RAC 1 RD 104	2	
	1			
	6	DIG RAC 1 IN A		X
	7	DIG RAC 1 IN B		X
	8	DIG RAC 1 OUT A		X
	9	DIG RAC 1 OUT B		X

\* Applies to a 25-pin connector.

External connector	Pin No	Signal for DIG SC 1-4	Pin No to RS232 <sup>1</sup>	Connect to G.703
<b>RAC 2</b>	5	0 V	7	
	4			
	3	RAC 2 TD 103	3	
	2	RAC 2 RD 104	2	
	1			
	6	DIG RAC 2 IN A		X
	7	DIG RAC 2 IN B		X
	8	DIG RAC 2 OUT A		X
	9	DIG RAC 2 OUT B		X

\* Applies to a 25-pin connector.

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

External connector	Pin No	Signal
<b>O&amp;M</b>	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

External connector	Pin No	Signal	Pin No to other equipment
<b>EAC 1 and 2</b>	5		
	4		
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8		
	9		

Note: Use the same pair of wires for EAC CLOCK A and B.  
Use the same pair of wires for EAC DATA A and B.

External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
<b>User I/O</b>	13			
	12	USER IN 6 B	WHITE	
	11	USER IN 6 A	BLUE	
	10	USER IN 5 B	WHITE	
	9	USER IN 5 A	ORANGE	
	8	USER IN 4 B	WHITE	
	7	USER IN 4 A	GREEN*	
	6	USER IN 3 B	WHITE	
	5	USER IN 3 A	BROWN*	
	4	USER IN 2 B	RED	
	3	USER IN 2 A	BLUE	
	2	USER IN 1 B	RED	
	1	USER IN 1 A	ORANGE	
	14	USER IN 7 A	RED	
	15	USER IN 7 B	GREEN*	
	16	USER IN 8 A	RED	
	17	USER IN 8 B	BROWN*	
	18	USER IN/OUT 9 A		WHITE
	19	USER IN/OUT 9 B		BLUE
	20	USER IN/OUT 10 A		WHITE
	21	USER IN/OUT 10 B		ORANGE
	22	USER IN/OUT 11 A		WHITE
	23	USER IN/OUT 11 B		BLUE
	24	USER IN/OUT 12 A		WHITE
	25	USER IN/OUT 12 B		ORANGE

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

Note: See section 10.9 and 10.10 for recommendation of use for the user inputs/outputs.

## 4.9.12.10 SAU Exp 2

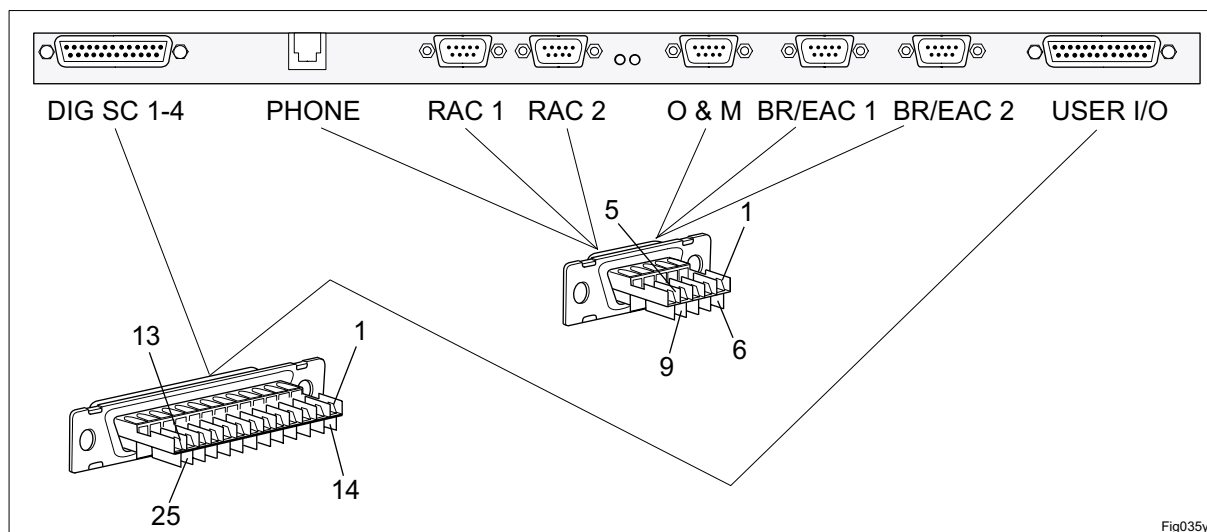


Fig035y

External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
DIG SC 1-4	13	DIG SERV 1 OUT A	WHITE	WHITE
	12	DIG SERV 1 OUT B	BLUE	BLUE
	11			
	10	DIG SERV 1 IN A	WHITE	WHITE
	9	DIG SERV 1 IN B	ORANGE	ORANGE
	8			
	7			
	6	DIG SERV 2 OUT A	WHITE	WHITE
	5	DIG SERV 2 OUT B	GREEN*	BLUE
	4			
	3	DIG SERV 2 IN A	WHITE	WHITE
	2	DIG SERV 2 IN B	BROWN*	ORANGE
	1			
	14	DIG SERV 3 OUT A	RED	WHITE
	15	DIG SERV 3 OUT B	BLUE	BLUE
	16			
	17	DIG SERV 3 IN A	RED	WHITE
	18	DIG SERV 3 IN B	ORANGE	ORANGE
	19			
	20	DIG SERV 4 OUT A	RED	WHITE
	21	DIG SERV 4 OUT B	GREEN*	BLUE
	22			
	23	DIG SERV 4 IN A	RED	WHITE
	24	DIG SERV 4 IN B	BROWN*	ORANGE
	25			

\* The wires have switched places compared with the instruction in Installation Manual < R6A.

External connector	Pin No	Signal
PHONE	1	
	2	
	3	RING
	4	TIP
	5	
	6	

External connector	Pin No	Signal	Pin No to RS232	Connect to G.703
RAC 1	5	0 V	7	
	4			
	3	RAC 1 TD 103	3	
	2	RAC 1 RD 104	2	
	1			
	6	DIG RAC 1 IN A		X
	7	DIG RAC 1 IN B		X
	8	DIG RAC 1 OUT A		X
	9	DIG RAC 1 OUT B		X
RAC 2	5	0 V	7	
	4			
	3	RAC 2 TD 103	3	
	2	RAC 2 RD 104	2	
	1			
	6	DIG RAC 2 IN A		X
	7	DIG RAC 2 IN B		X
	8	DIG RAC 2 OUT A		X
	9	DIG RAC 2 OUT B		X

\* Applies to a 25-pin connector.

External connector	Pin No	Signal
O&M	5	0 V
	4	O&M DCD 109
	3	O&M TD 103
	2	O&M RD 104
	1	
	6	O&M CDSTL 108/1
	7	
	8	
	9	

External connector	Pin No	Signal	Pin No to other equipment
BR/ EAC 1	5	SERV 1 BR IN A	5
	4	SERV 1 BR OUT A	4
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8	SERV 1 BR OUT B	8
	9	SERV 1 BR IN B	9

External connector	Pin No	Signal	Pin No to other equipment
BR/ EAC 2	5	SERV 2 BR OUT A	5
	4	SERV 2 BR IN A	4
	3		
	2	EAC CLOCK A	2
	1	EAC DATA A	1
	6	EAC DATA B	6
	7	EAC CLOCK B	7
	8	SERV 2 BR IN B	8
	9	SERV 2 BR OUT B	9

**Note:** Use the same pair of wires for EAC DATA A and B.  
Use the same pair of wires for EAC CLOCK A and B.  
Use the same pair of wires for SERV BR IN A and B.  
Use the same pair of wires for SERV BR OUT A and B.

External connector	Pin No	Signal	TFL 481 53 (8 pair)	TFL 481 52 (2 pair)
User I/O	13			
	12	USER IN 6 B	WHITE	
	11	USER IN 6 A	BLUE	
	10	USER IN 5 B	WHITE	
	9	USER IN 5 A	ORANGE	
	8	USER IN 4 B	WHITE	
	7	USER IN 4 A	GREEN*	
	6	USER IN 3 B	WHITE	
	5	USER IN 3 A	BROWN*	
	4	USER IN 2 B	RED	
	3	USER IN 2 A	BLUE	
	2	USER IN 1 B	RED	
	1	USER IN 1 A	ORANGE	
	14	USER IN 7 A	RED	
	15	USER IN 7 B	GREEN*	
	16	USER IN 8 A	RED	
	17	USER IN 8 B	BROWN*	
	18	USER IN/OUT 9 A		WHITE
	19	USER IN/OUT 9 B		BLUE
	20	USER IN/OUT 10 A		WHITE
	21	USER IN/OUT 10 B		ORANGE
	22	USER IN/OUT 11 A		WHITE
	23	USER IN/OUT 11 B		BLUE
	24	USER IN/OUT 12 A		WHITE
	25	USER IN/OUT 12 B		ORANGE

\* The wires have switched places compared with the instruction in Installation Manual < R6A.  
See section 10.9 and 10.10 for recommendation of use for the user I/O.

Figure 4-186. SAU Exp 2.

## 4.9.12.11 Fan Unit

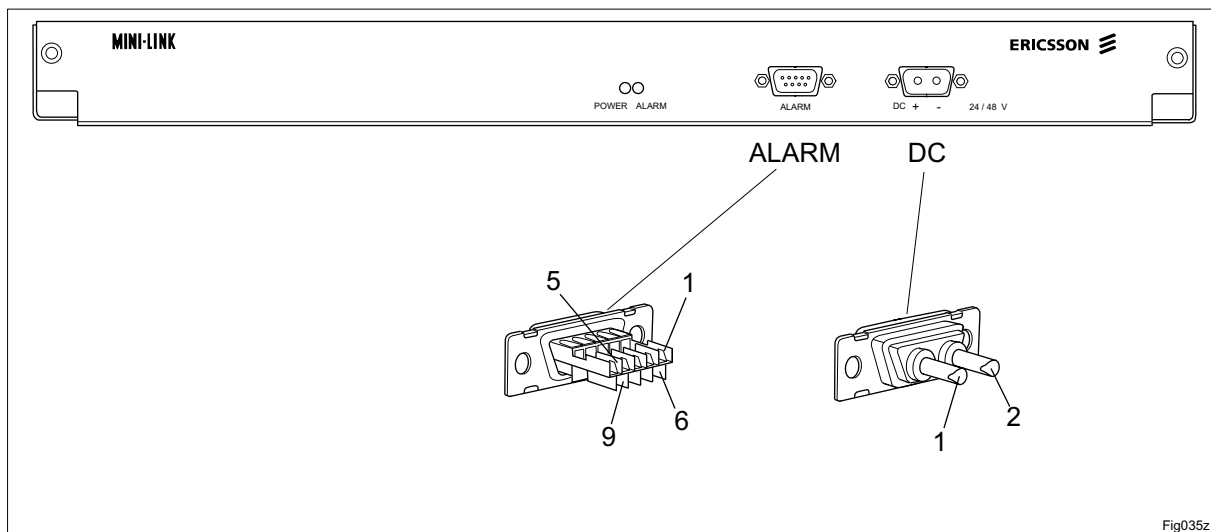


Fig035z

External connector	Pin No	Signal
ALARM	5	
	4	
	3	
	2	
	1	FAN ALARM
	6	IND
	7	FAN ALARM RETURN
	8	
	9	

External connector	Pin No	Signal	TFL 424 02
DC	1	DC +	Red
	2	DC -	Black

**Note:** Connect the alarm port to the NCC port on one MMU in the AMM using the fan alarm cable included in the delivery. The MMU must be loaded with software revision  $\geq R2A$  and the fan unit BKV 175 50/1 must have revision  $\geq R2A$ . If not, do not connect the alarm cable. Contact your ERICSSON representative for upgrading. The fan unit contains four fans. The alarm indicates if two or more fans do not work or if the DC supply is lost. The fan alarm does not work for MMU 4x2/8, 48 V with hardware revision state  $< R3D$  or for MMU 4x2/8, 24 V with hardware revision state  $< R3F$ . Connect the cable to another MMU or contact your ERICSSON representative for upgrading.

Figure 4-187. Fan Unit.

## 4.10 Marking and Labelling

Make sure that all the cables to the access module have been marked and labelled to avoid that any connector is plugged into a faulty position.

Fill in the label on the inside of the front panel in accordance with the example for AMM 4U in the figure below.


 <i>Mr Andersson</i>		<b>Site Name</b>		<b>AM pos</b>	
<i>123-45 67 89</i>		<i>Gbg 1</i>		<i>3</i>	
Pos	Unit	Type	Product code	Near ID.	Far ID.
7	SAU	Exp 2	SA0210011/00	A030	B030
6	MMU	2x2	MM0012201/00	A010	B001
5	MMU	34+2	MM0012201/00	A011	B011
4	SMU	16x2	SM0011701/00		
3	SMU				
2	MMU				
1	MMU				

Figure 4-188. The label on the inside of a front panel on a 4U magazine.

### Description



The name and telephone number to a contact person in case a problem occurs.

### Site Name

The name of the place where the MINI-LINK access module is situated.

### AM pos

The position of the access module in the rack or cabinet.

### Pos

The position of the unit in the access module magazine.

### Unit

The kind of plug-in unit which is inserted in respective position.

### Type

The type of MMU, SMU or SAU which is inserted in the magazine. There are four types of MMU (2x2, 4x2/8, 2x8, 34+2), three types of SMU (Sw, 8x2, 16x2) and three types of SAU (Basic, Exp 1, Exp 2).

### Product Code

The product code for respective plug-in unit.

### Near ID

The identity of the selected terminal.

### Far ID

The identity of the terminal with which the near end terminal communicates.

## 4.11 Connecting PC and Modem

The table below shows how to connect a PC or a modem to the O&M-connection. For further information, consult the modem, PC and the MINI-LINK MSM Operation Manual.

MINI-LINK		PC		Modem	
Connection to O&M		Connection of 9-pin RS232 (or V.24) connector		Connection of 25-pin RS232 (or V.24) connector	
Pin	Name	Pin	Name	Pin	Name
5	0 V	5	SG, Signal Ground	7	SG, Signal Ground
4	O&M DCD 109 <sup>1</sup>	4		8	DCD, Data Carrier Detect
3	O&M TD 103	3	TD, Transmit Data	3	RD, Receive Data
2	O&M RD 104	2	RD, Receive Data	2	TD, Transmit Data
1		1			
6	O&M CDSTL 108/1 <sup>2</sup>	6		20	Connect Data Set to Line
7		7			
8		8			
9		9			

Figure 4-189. Connecting PC or modem.

<sup>1</sup> The signal is provided for dial-up modems with automatic calling facilities.

The signal goes low for 0.6 seconds when an alarm occurs in the network.

<sup>2</sup> The signal is activated when connection is established between the modems. It is used for control of the O&M CDSTL 108/1.

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# 5 Outdoor Installation, RAU1

## 5.1 Introduction

This chapter describes a recommended installation procedure for the RAU1 radio unit and an antenna.

The figure below gives an overview of the installation procedure.

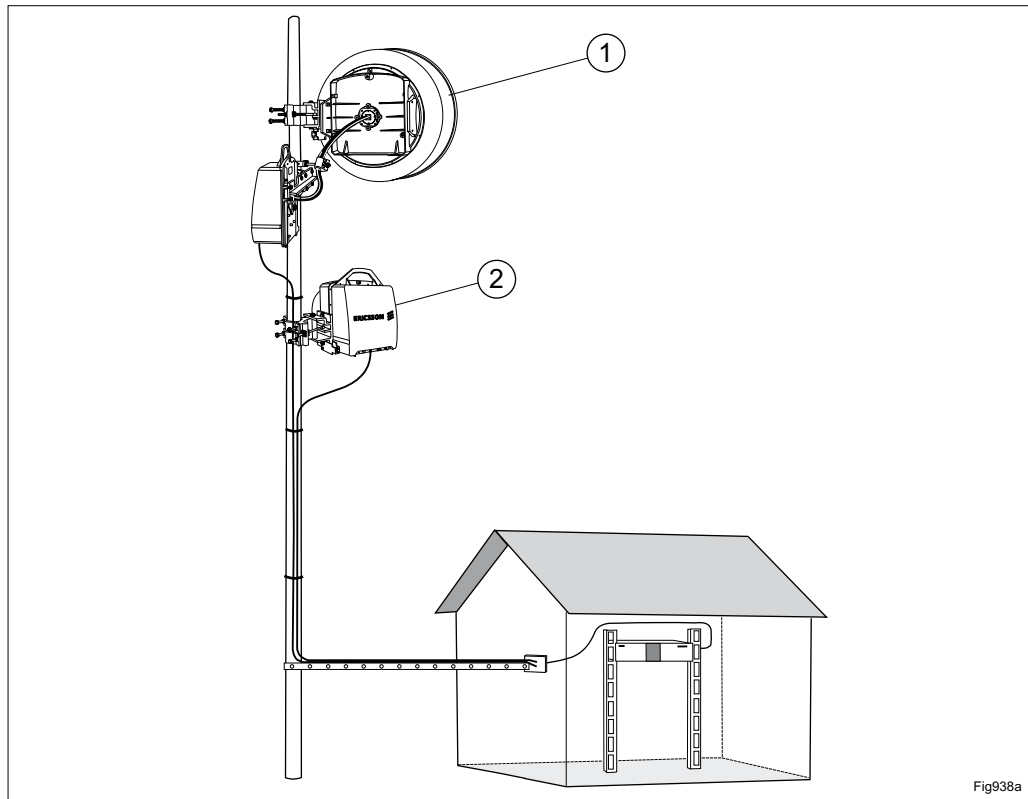


Figure 5-1. Outdoor installation.

### Installation procedure

- Step 1** Set the frequency and the output power for the MINI-LINK radio (done indoors). (See section 5.4)
- Step 2** Integrated installation ② - install the radio unit and the antenna module. (See section 5.5)
- Separate installation ① - install the radio unit and the antenna module. (See section 5.6)

## 5.2 Installation Equipment

The following tools and instruments are required for installation of the outdoor unit:

- Stripping pliers.
- 16 mm ring and open jaw wrench for fitting the antenna support.
- 2.5 mm Allen key for fitting of fixed attenuator and flexible waveguide to antenna unit.
- 6 mm Allen key for integrated installation of the radio unit and the antenna.
- Torx screwdriver TX 20 (M4) for dismounting of radio unit (option) and change of polarization.
- Lubricating substance for outdoor screws and nuts, for example Stucarit 309 (blue).<sup>1</sup>
- Sealing substance for more severe conditions, for example OKS 2020. To be applied around flexible waveguide interfaces (note: must be applied outside after connection).<sup>2</sup>

The variable attenuation, for MINI-LINK 7-E, 8-E, 15-E, 18-E, 23-E and 26-E HP, is set by using a PC with MINI-LINK Netman or MSM.

The following additional instruments are required for MINI-LINK 26-E standard for adjustment of variable attenuator (optional):

- Power meter           for example HP 435B or 438A
- Sensor               for example HP 8485A (-30 to +20 dBm)
- Adapter             APC 3.5 mm (female) to standard PBR/UBR waveguide

The following additional instruments are required for MINI-LINK 38-E for adjustment of variable attenuator (optional):

- Power meter           for example HP 435B or 438A
- Sensor               for example HP R8486A (-30 to +20 dBm) or HP R 8486D (-70 to -20 dBm).

---

<sup>1</sup> Manufacturer: E. Eppler & Co, Seidenstrasse 55, D-7000 Stuttgart, Deutschland.

<sup>2</sup> Manufacturer: Omnikote GmbH, Triebstrasse 9, D-8000 München, Deutschland.

### 5.3 Product Code for Radio Unit - RAU1

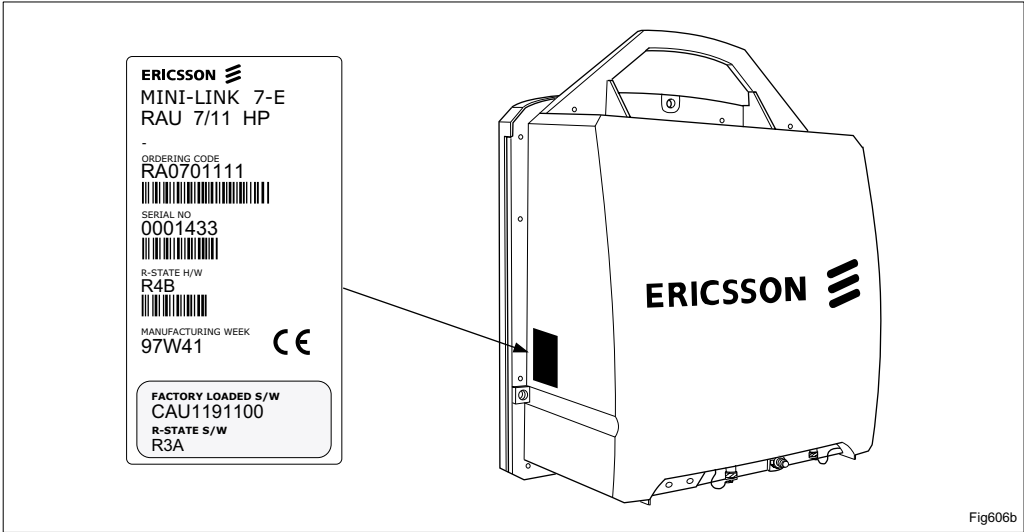


Figure 5-2. The ordering code label positioning for RAU1.

The table below contains a description of the product code for the RAU1 radio unit. The product code, which can be read on the label on the outside of the unit, can be used to identify the radio unit configuration.

Product code for MINI-LINK E RAU1		
R A s t 0 1 x C D / e f		
Letter	Code	Description
s t	07	RAU 7-E
	08	RAU 8-E
	15	RAU 15-E
	18	RAU 18-E
	23	RAU 23-E
	26	RAU 26-E
	38	RAU 38-E
x	0	Standard power
	1	High power
C D	xx	The sub-band number. See section 10.12 for detailed information
e f	00	With standard accessories, which include: - Connector kit for radio cable, diameter 10 mm (2 N-type connectors) - 2.0 m earthing cable - Mounting bracket for radio cable
	01	When the radio unit is delivered as a spare part, without accessories.

Figure 5-3. Description of the product code for RAU1.

## 5.4 Initial Settings

The initial settings should be made indoors prior to radio unit installation.



**Use external ESD protection to avoid damaging the equipment.**

### 5.4.1 Removing and Fitting the Radio Unit Frame

The frame should only be removed if the attenuators are to be mounted. Use Torx screwdriver TX 20 (M4).

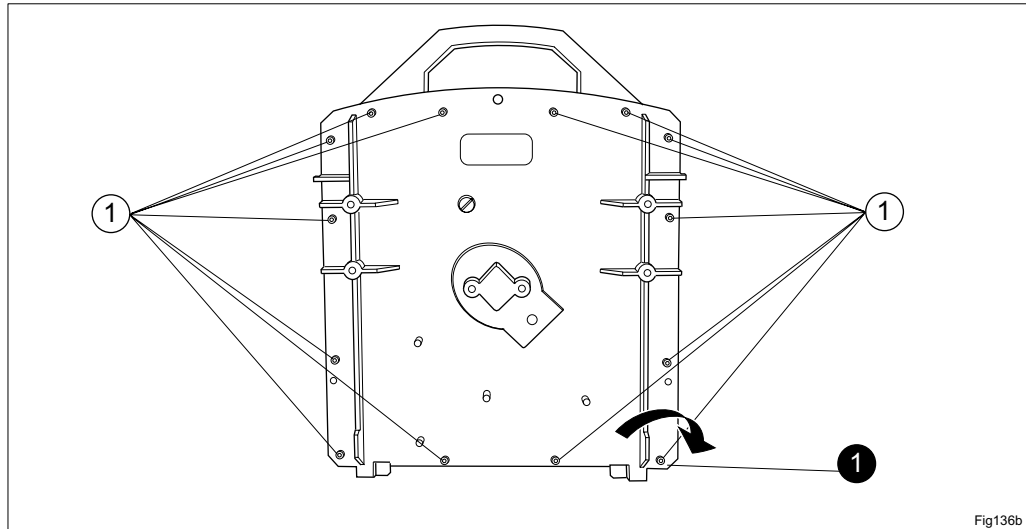


Fig136b

Figure 5-4. The screws for removing and fitting the radio unit frame.

#### Removing the Frame from the Radio Unit

- Undo the 14 screws, ①, and remove the frame.

#### Fitting the Frame to the Radio Unit

- Place the frame on the radio unit and tighten the screws.  
The torque is **150 Ncm ①**.

### 5.4.2 RF Output Attenuation

It is possible to adjust the output power with the built-in variable attenuator. If this reduction is not enough, fixed attenuators are available as accessories.

The RF output power is set using the local supervision interface on the MMU, see section 5.4.5. The RF output power can also be set using a PC with MSM (see separate manual).

For MINI-LINK 26-E (standard) and 38-E the RF output power must be adjusted manually (see section 5.4.6).

See section 10.12 for output power range and tolerances.

MINI-LINK radio	Article code for attenuator	Recommended attenuator	Wanted output power (dBm)
<b>7-E</b>	None		+1 to +21
	329 945/11110	11.0±0.5 dB	-7 to +7
	329 945/11200	20.0±0.6 dB	-16 to -2
<b>7-E HP</b>	None		+8 to +28
	329 945/11110	11.0±0.5 dB	0 to +14
	329 945/11200	20.0±0.6 dB	-9 to +5
<b>8-E</b>	None		0 to +20
	329 945/11110	11.0±0.5 dB	-8 to +6
	329 945/11200	20.0±0.6 dB	-17 to -3
<b>8-E HP</b>	None		+6 to +26
	329 945/11110	11.0±0.5 dB	-2 to +12
	329 945/11200	20.0±0.6 dB	-11 to +3
<b>15-E</b>	None		+3 to +18
	SXK 111 0279/1	12.1±0.9 dB	-7 to +4
	SXK 111 0279/2	22.5±1.7 dB	-17 to -7
<b>15-E HP</b>	None		+10 to +25
	SXK 111 0279/1	12.1±0.9 dB	0 to +11
	SXK 111 0279/2	22.5±1.7 dB	-10 to 0
<b>18-E</b>	None		+2 to +17 <sup>1</sup>
	UMF 101 204/1	7.5±2.0 dB	-2 to +5 <sup>1</sup>
	UMF 101 204/2	15.0±2.0 dB	-9 to -2 <sup>1</sup>
	UMF 101 204/3	22.5±2.0 dB	-16 to -9 <sup>1</sup>
<b>18-E HP</b>	None		+9 to +24 <sup>1</sup>
	UMF 101 204/1	7.5±2.0 dB	+5 to +12 <sup>1</sup>
	UMF 101 204/2	15.0±2.0 dB	-2 to +5 <sup>1</sup>
	UMF 101 204/3	22.5±2.0 dB	-9 to -2 <sup>1</sup>
<b>23-E</b>	None		+5 to +20
	SXK 111 0273/1	12.1±0.9 dB	-5 to +6
	SXK 111 0273/2	22.5±1.7 dB	-15 to -5
	SXK 111 0273/3	31.5±2.3 dB	-23 to -15
	SXK 111 0273/4	39.0±3.0 dB	-30 to -23
<b>26-E</b>	None		-5 to +10
	SXK 111 0274/1	12.1±0.9 dB	-15 to -5
	SXK 111 0274/2	22.5±1.7 dB	-25 to -15
	SXK 111 0274/3	31.5±2.3 dB	-33 to -25
	SXK 111 0274/4	39.0±3.0 dB	-40 to -33
<b>26-E HP</b>	None		+3 to +18
	SXK 111 0274/1	12.1±0.9 dB	-7 to +4
	SXK 111 0274/2	22.5±1.7 dB	-17 to -7
	SXK 111 0274/3	31.5±2.3 dB	-25 to -17
	SXK 111 0274/4	39.0±3.0 dB	-32 to -25
<b>38-E</b>	None		-8.5 to +16.5
	UMF 101 13/20	20.0±2.0 dB	-22.5 to -8,5
	UMF 101 13/35	35.0±3.5 dB	-33.5 to -22.5

Figure 5-5. Description of attenuators.

<sup>1</sup> Subtract 1 dB for sub-bands 21-28

### 5.4.3 Installing the Attenuator

The fixed attenuator is inserted as follows:

1. Remove the vertical frame of the radio unit.
2. *Only MINI-LINK 7-E and 8-E!* Unplug the cable from the filter on the Tx side.  
*Only MINI-LINK 15-E, 18-E, 23-E, 26-E and 38-E!* Remove the lid at the branching unit using the Torx screwdriver TX 10 (M3).
3. Insert the attenuator as shown in the following figures.

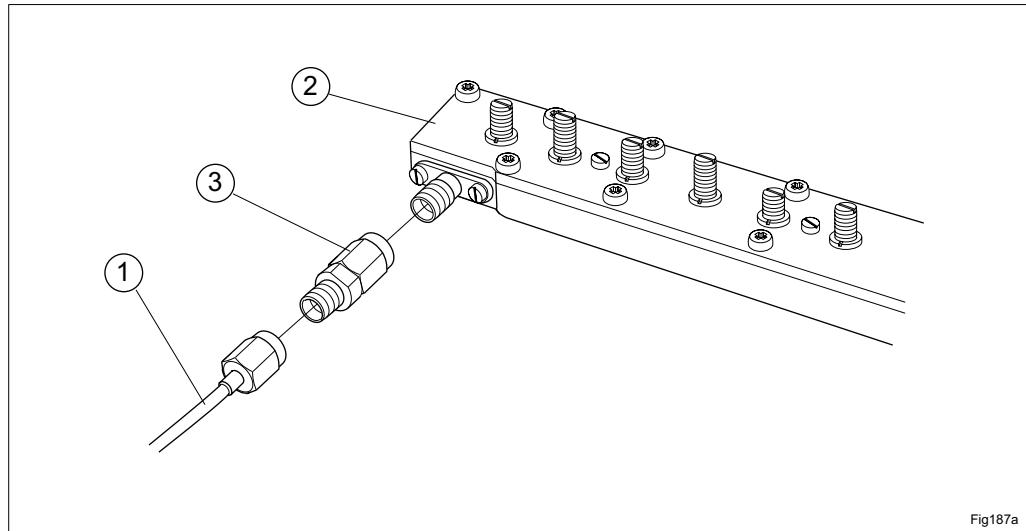


Figure 5-6. Inserting the attenuator in MINI-LINK 7-E and 8-E.

- ① Cable
- ② Filter
- ③ Attenuator

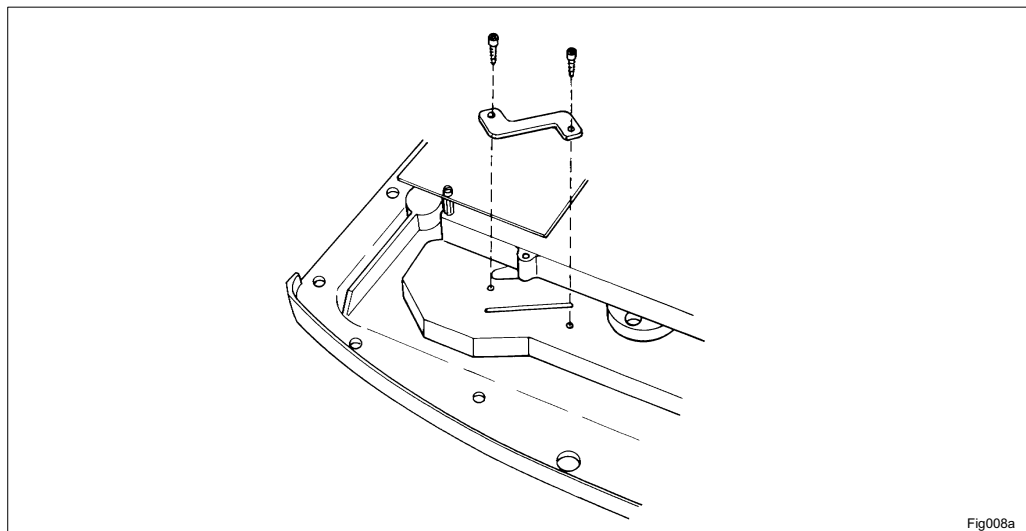


Figure 5-7. Inserting the attenuator in MINI-LINK 15-E. The attenuator for MINI-LINK 18-E looks similar.

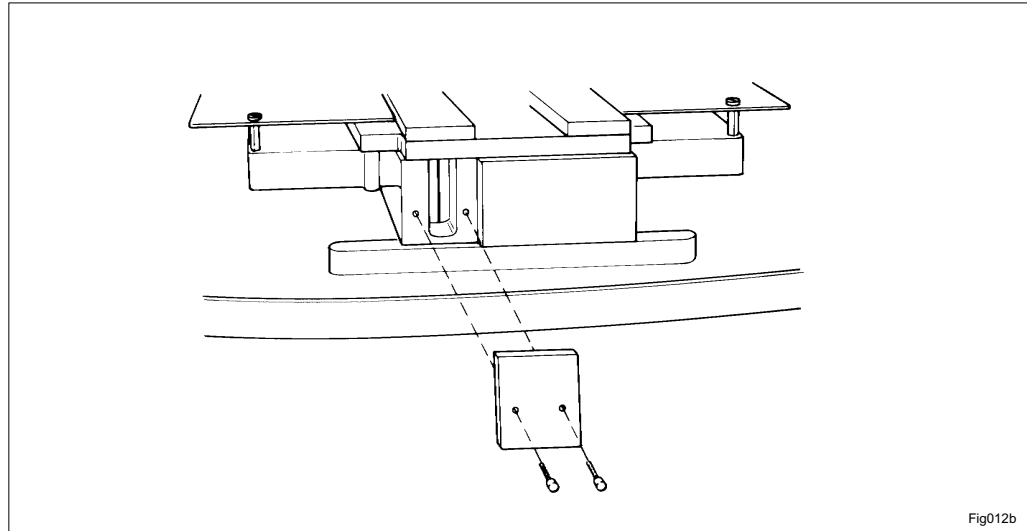


Figure 5-8. Inserting the attenuator in MINI-LINK 23-E and 26-E.

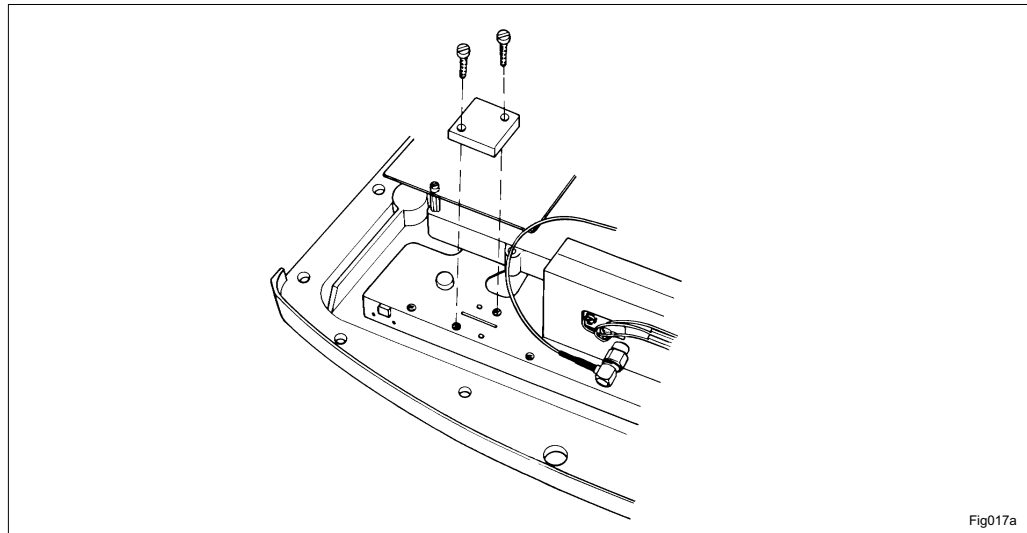


Figure 5-9. Inserting the attenuator in MINI-LINK 38-E.



### 5.4.4 Changing the Frequency Sub-band for MINI-LINK 7-E and 8-E

The same microwave sub-unit is used for half of the frequency band, for example sub-band 11, 12, 13 and 14. The sub-band can be changed within this half frequency band by replacing the filter. Each filter can be fitted in two ways and be used for either of the two sub-bands used for the hop. The index number for each sub-band is printed on the filter. Check the index number before fitting the filter.

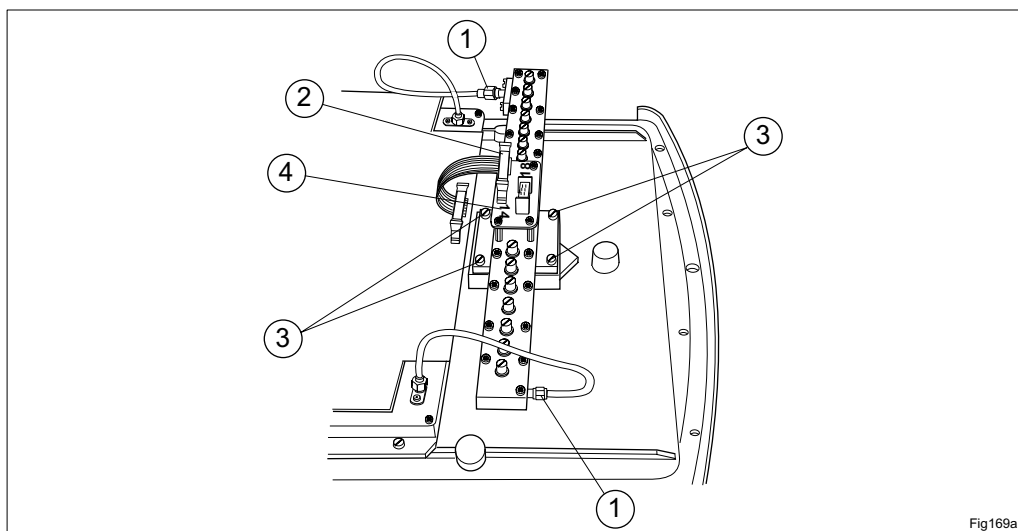


Figure 5-10. Installing the filter.

1. Remove the vertical frame of the radio unit.
2. Disconnect the two cables, ①, from the filter.
3. Disconnect the ribbon cable, ②, from the filter.
4. Undo the four screws, ③, and remove the filter.
5. Install the filter with the correct sub-band number, ④, facing the microwave sub-unit.

**Note:** Each filter can be fitted in two ways. Check the index number before fitting the filter.

6. Fasten the filter using the four screws, ③.
7. Connect the ribbon cable, ②, to the filter.
8. Connect the two cables, ①, to the filter.
9. Fit the vertical frame to the radio unit.

### 5.4.5 Setting the Frequency and the Output Power by using the Local Supervision Interface on the MMU

The frequency and the output power is set using a PC and the MINI-LINK Netman or MSM software, see section 1.3 for separate manuals. The frequency and the output power can be set without a PC using the Local Supervision Interface on the MMU. This procedure is described in the following section. For more detailed information about the local supervision interface see section 9.2.

The frequency and the output power should have been defined during network planning.

Follow these steps to set the frequency and the output power using the local supervision interface on the MMU:

**Step 1.1** Connect the station radio cable, section 5.4.5.1.

**Step 1.2** Switch power on, section 5.4.5.2.

**Step 1.3** Set frequency, section 5.4.5.3.

**Step 1.4** Set output power, section 5.4.5.4.

**Step 1.5** Switch power off, section 5.4.5.5.

**Step 1.6** Disconnect the station radio cable, section 5.4.5.6.

The following details on the MMU front are significant for setup:

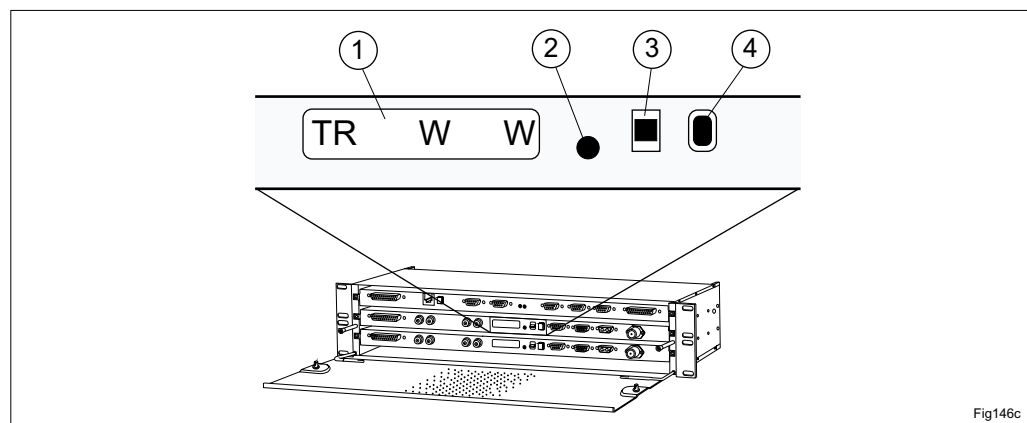


Figure 5-11. The MMU front panel.

- ① Display.
- ② Green LED.
- ③ Toggle switch.
- ④ Push button

Detailed instructions for each step are given below.

**CAUTION**  
**!**

The plug-in units in the access module generate heat and may be hot. Voltage over 60 V is hazardous and warning labels must be attached. See section 10.5 for a specification of power supply.

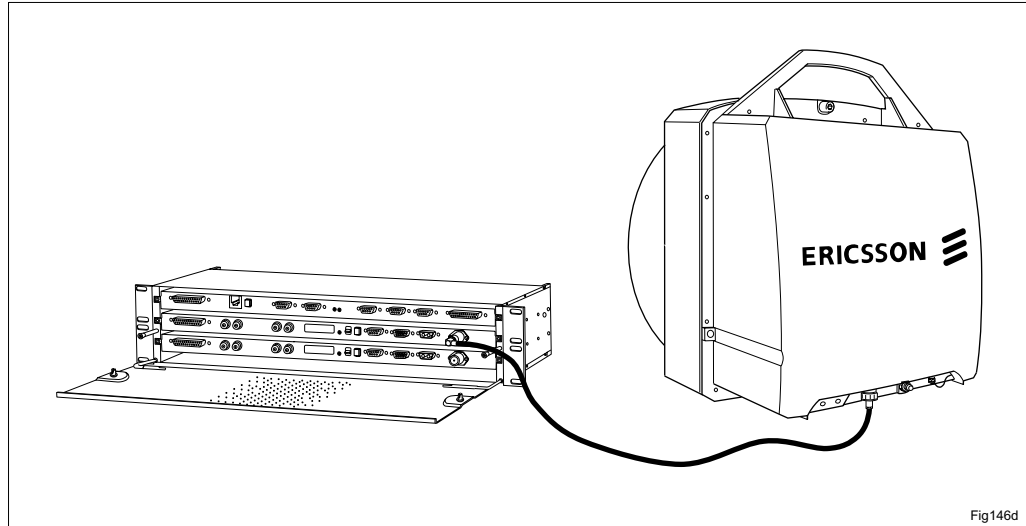
**5.4.5.1 Connect the Station Radio Cable**

Figure 5-12. The station radio cable connection to the MMU.

1. Open the magazine front cover.
2. Connect the station radio cable RPM 517 6906/01 (included in the MMU delivery) between the radio unit and the MMU.

**5.4.5.2 Switch Power on**

**Note:** Ensure the MMU is supplied with the correct nominal voltage (24, 48/60 or 24-60 V nominal DC according to the label).

1. Switch on the power supply to the MMU.
2. Push any button on the MMU to activate the display. The display returns to sleeping mode if it is not used.

### 5.4.5.3 Set Frequency

1. Press the toggle switch downwards (twice) until “Tx Freq” is displayed.

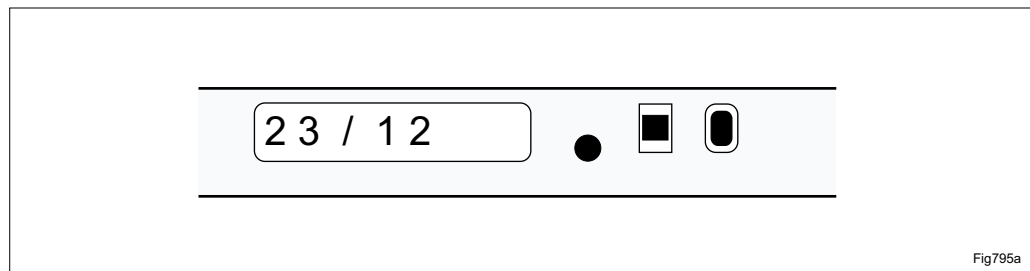


Fig795a

Figure 5-13. Example of the frequency and the sub-band.

2. Press the push button once. The frequency band and sub-band of your MINI-LINK E are displayed, as shown in the figure above.
3. Ensure your MMU displays the sub-band specified during network planning. If not, something is wrong with the connected radio unit.
4. Press the push button again.

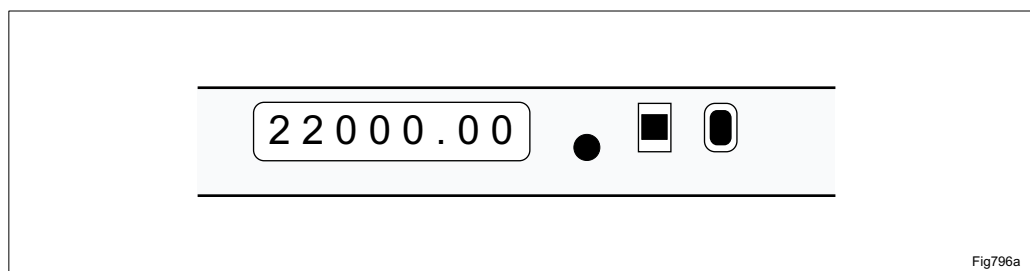


Fig796a

Figure 5-14. Example of the frequency.

5. Select the transmitting frequency for your radio. Increase the frequency by pressing the toggle switch upwards and decrease the frequency by pressing the toggle switch downwards
6. Press the push button when the relevant transmitting frequency is displayed.
7. To save the setting press the push button again when “Execute?” is displayed. Press the toggle switch to go back to the main menu without saving.

*The operational transmitting frequency is now set.*

#### 5.4.5.4 Set Output Power

(See section 5.4.6 for MINI-LINK 26-E standard and 38-E.)

**Note:** Attenuation of fixed attenuators is not included in the value shown on the display (see section “5.4.2 RF Output Attenuation” for further information of fixed attenuators).

1. Press the toggle switch downwards (twice) until “Tx Power” is displayed.
2. Press the push button.

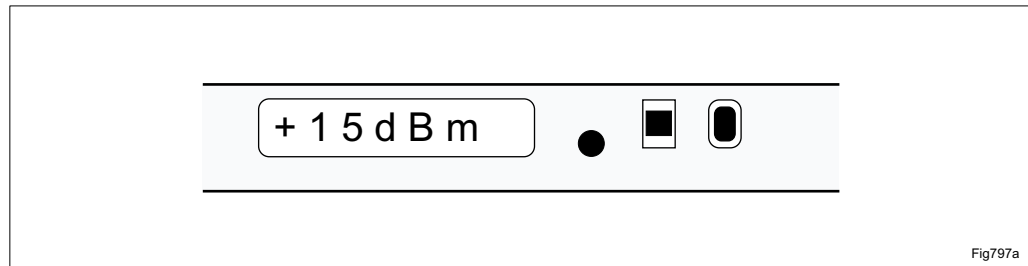


Figure 5-15. Example of the output power.

3. Select the output power using the toggle switch.
4. Press the push button when the relevant output power is displayed.
5. To save the setting press the push button again when “Execute?” is displayed. Press the toggle switch to go back to the main menu without saving.

*The operational output power is now set.*

#### 5.4.5.5 Switch Power off

- Switch off the power supply to the MMU.

#### 5.4.5.6 Disconnect the Station Radio Cable

- Disconnect the station radio cable from the radio unit.

### 5.4.6 Manual Adjustment of the Output Power for MINI-LINK 26-E (standard) and 38-E

**Note:** For MINI-LINK 7-E, 8-E, 15-E, 18-E, 23-E and 26-E (high power) the output power is set using the local supervision interface or a PC with MSM. See section 5.4.5 and separate manual for further information.

#### CAUTION



Switch off the power supply before opening the RF and waveguide port on the microwave assembly.

See section “5.2 Installation Equipment” for recommended instruments.

1. Remove the waveguide protection.
2. Connect the power meter to the antenna port, ①, on the radio unit.
3. Connect the test cable between the radio and a separate MMU.
4. Connect the power supply to the MMU.

**Note:** Ensure that the power supply matches the specification.

5. Remove the attenuator cover from the variable attenuator ②, using a screwdriver.

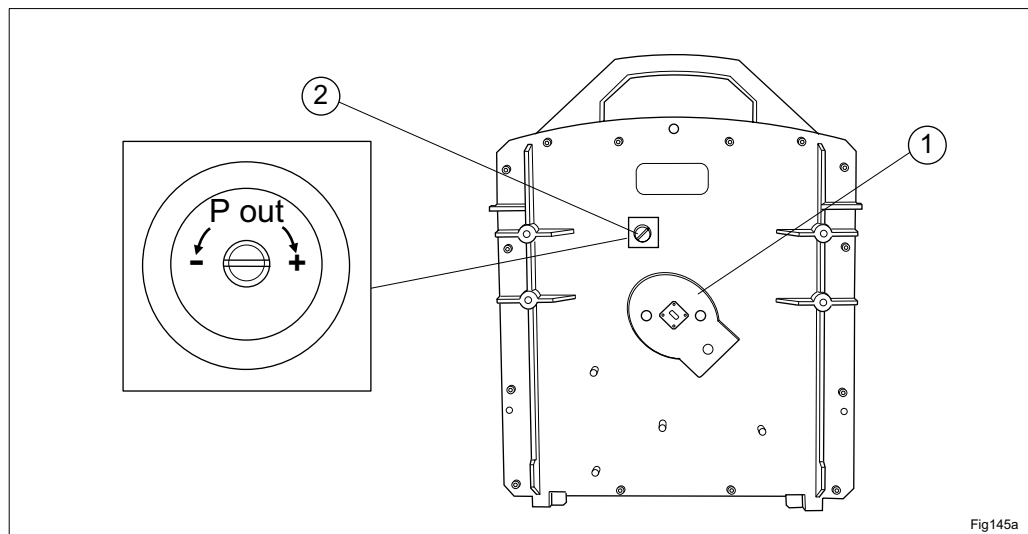


Figure 5-16. The screw for trimming the variable attenuator.

6. Insert the screwdriver through the hole and adjust to the desired output power.
7. Disconnect the power supply.
8. Fasten the attenuator cover over the variable attenuator ②.
9. Fit the waveguide protection.

## 5.5 Integrated Installation of the Radio Unit and the Antenna

This section describes the procedure when using the standard mounting kit SXX 111 0278/1 for installing the radio unit, RAU1, and the antenna. For installation of other antennas than 0.3 m and 0.6 m, and other supports than SXX 111 0278/1, a separate instruction is enclosed in the delivery.

**DANGER**

All tightening instructions must be carefully followed to prevent the equipment from falling down.

The figure below gives an overview of the installation procedure. Only the installation procedure for the 0.3 m antenna is shown, since the installation procedure for the 0.6 m antenna is the same as for the 0.3 m antenna.

**Note:** Directly after installing the radio unit, lay and connect the radio cable and switch the power on to avoid moisture in the radio unit.

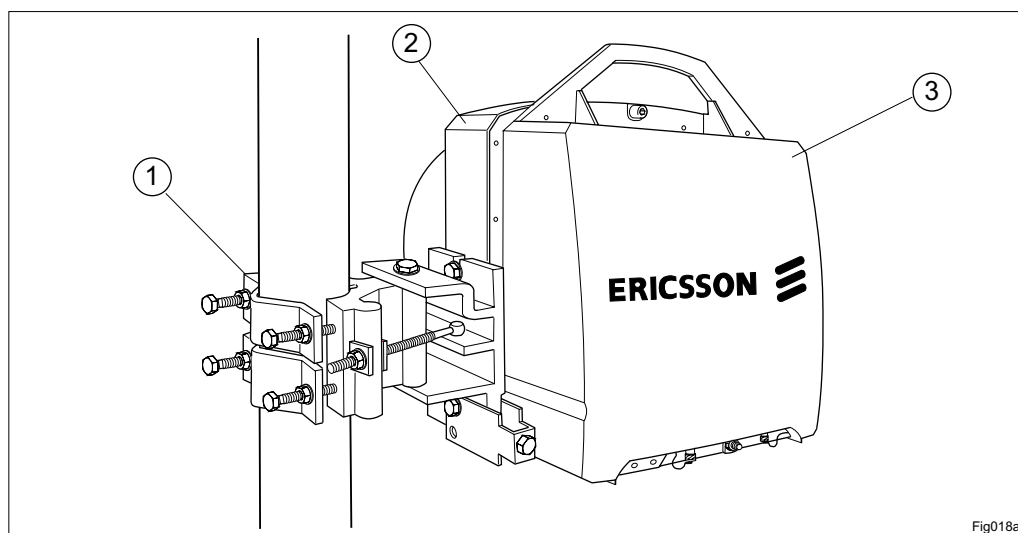


Figure 5-17. Integrated installation of the radio unit and the antenna.

**Step 2.1** Fit the antenna feeder (see section 5.5.1).

**Step 2.2** Fit the antenna support ① (see section 5.5.2).

**Step 2.3** Fit the antenna ② to the antenna support (see section 5.5.3).

**Step 2.4** Install the radio unit ③ (see section 5.5.4).

### 5.5.1 Fitting the Antenna Feeder (Integrated Installation)

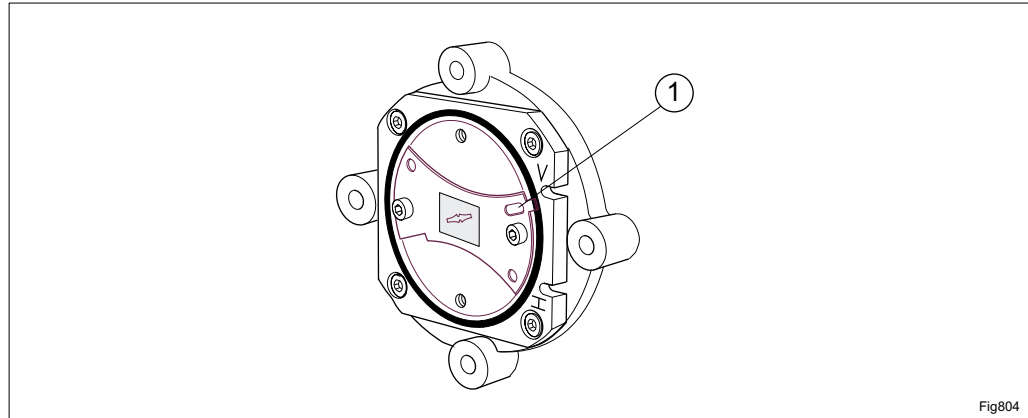


Figure 5-18. The antenna prepared for vertical polarization.

The antenna is prepared for **vertical polarization** on delivery. The pointer, ①, on the polarization plate is pointing towards the V.

To prepare the antenna for horizontal polarization, follow the instructions below:

#### Horizontal polarization

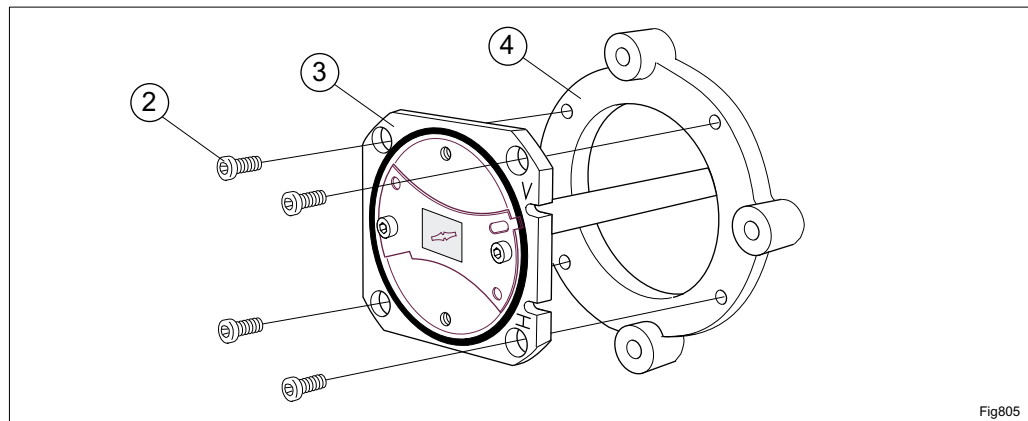


Figure 5-19. Removing the feeder.

1. Undo the four screws ② holding the feeder ③ to the reflector ④ using the Torx screwdriver TX 20 (M4).

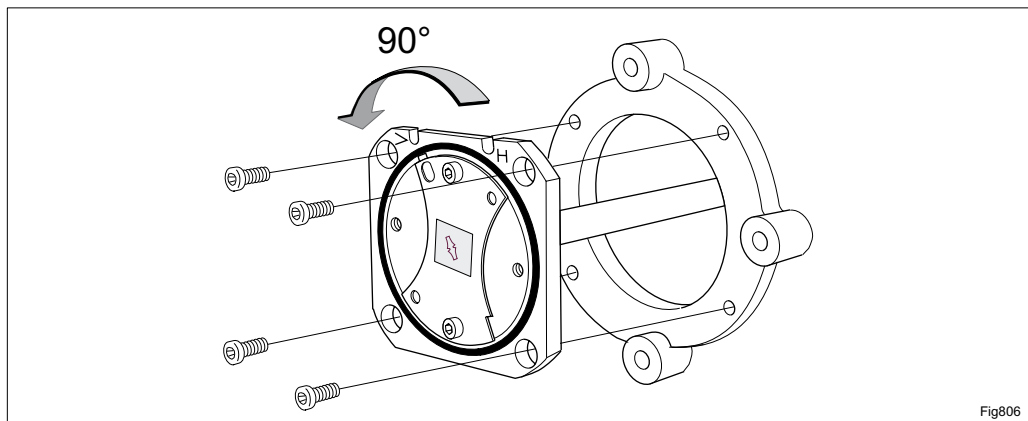


Figure 5-20. Rotating the feeder.

2. Rotate the feeder 90° anti-clockwise and fasten the screws.



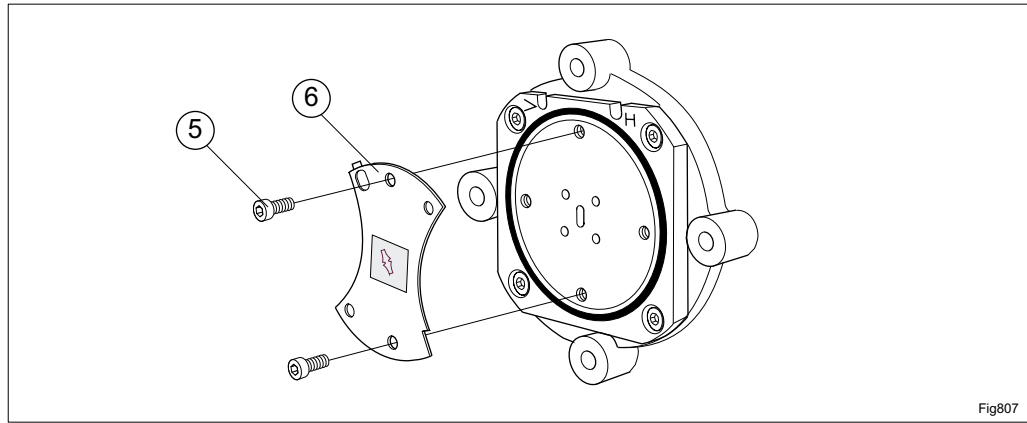


Figure 5-21. Removing the polarization plate.

3. Undo the two screws ⑤ holding the polarization plate ⑥ to the feeder using the Torx screwdriver TX 20 (M4).

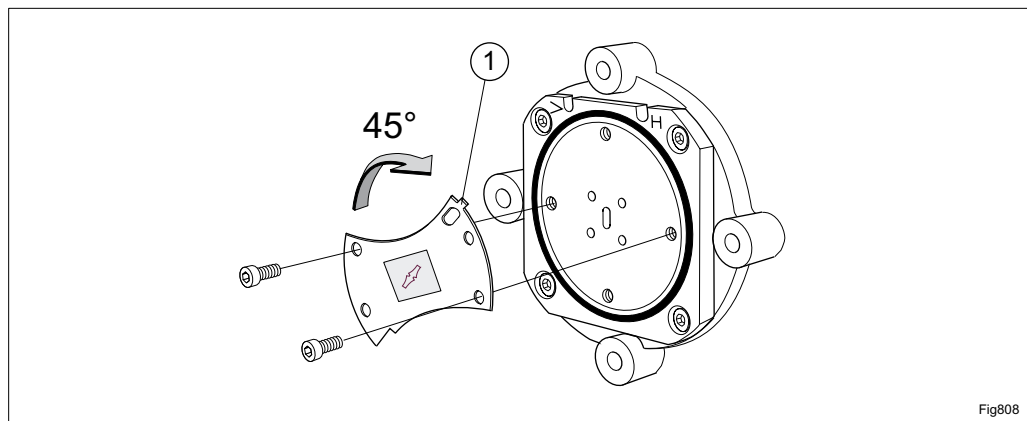


Figure 5-22. Rotating the polarization plate.

4. Rotate the polarization plate 45° clockwise and fasten the screws. The pointer ① on the polarization plate is now pointing towards the H.

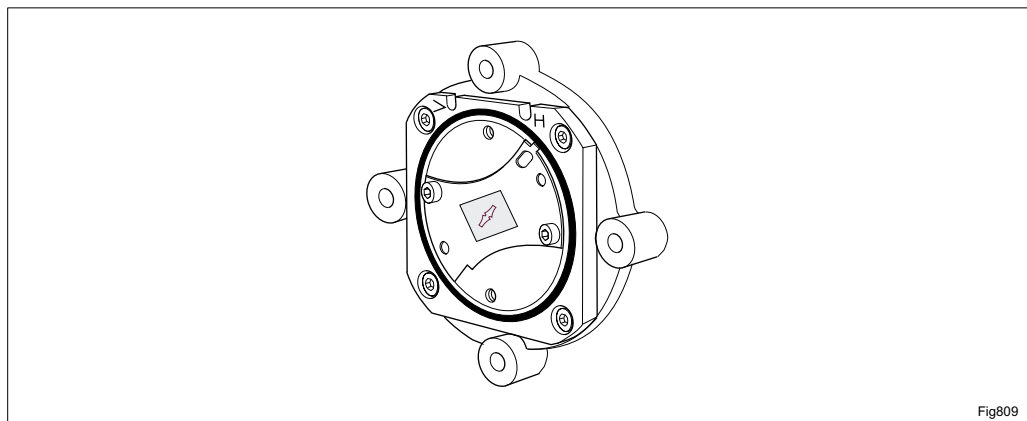


Figure 5-23. The antenna prepared for horizontal polarization.

### 5.5.2 Fitting the Antenna Support (Integrated Installation)

The antenna support fits poles with a diameter of 50 - 120 mm and L-profiles between 40x40x5 mm and 80x80x8 mm.

Read the instruction enclosed with the antenna, EN/LZT 110 4105, before installing and using the antenna support.

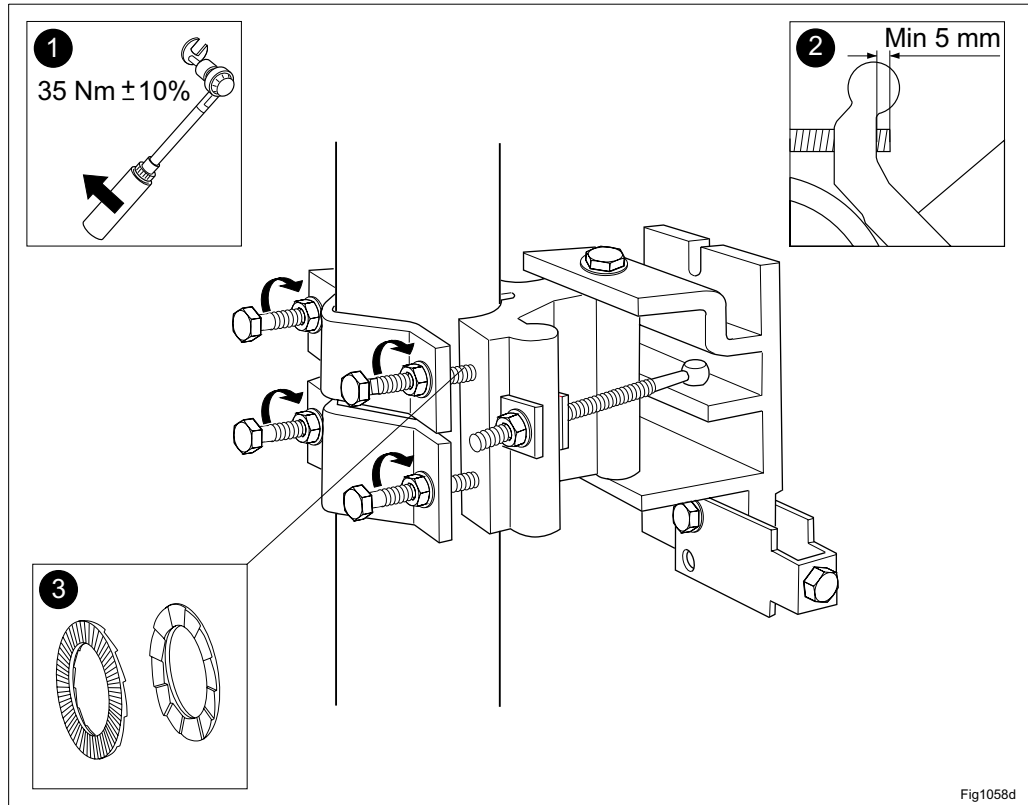


Figure 5-24. Fitting the antenna support, SXK 111 0278/1.

1. Lubricate the screws (for lubricating substance, see section 5.2).
2. Fit the antenna support to the pole and tighten the four screws by using the 16 mm ring and open jaw wrench. The torque is **35 Nm ± 10%** ❶. Position the antenna support so that the antenna points along the radio link path.

**Note:** Make sure the screws protrude at least 5 mm ❷ and that the washers are positioned as shown in the figure above ❸. The washers have different faces. Coarse saw tooth patterns should face and match each other.

### 5.5.3 Fitting the Antenna to the Antenna Support (Integrated Installation)

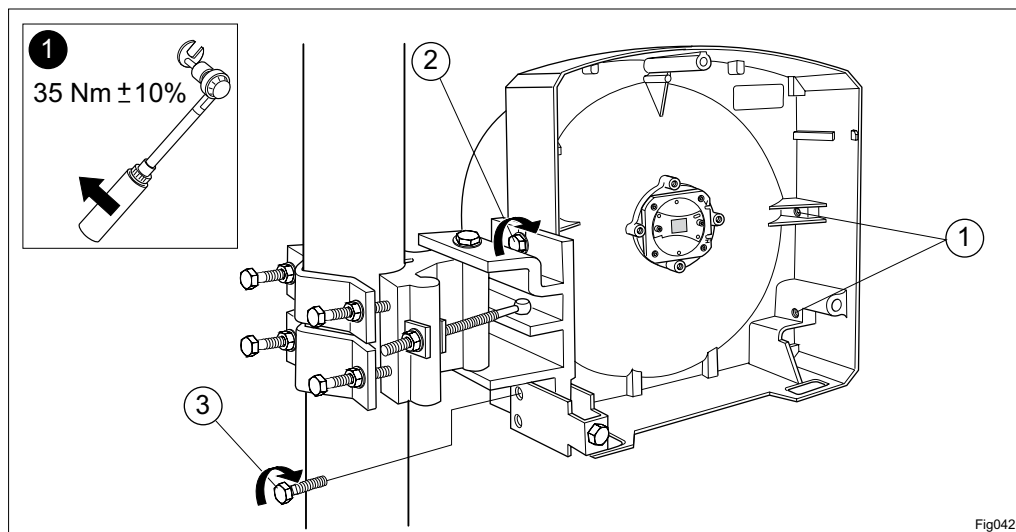


Figure 5-25. Installing the 0.3 m antenna.

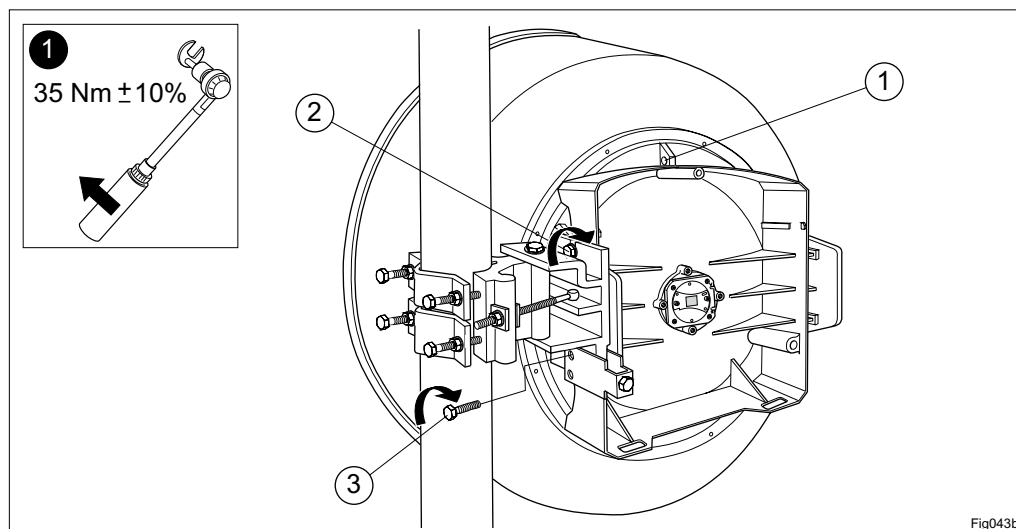


Figure 5-26. Installing the 0.6 m antenna.

The antenna is fitted to the antenna support with two screws.

1. Fasten the screw and washer ② in the upper hole on the side of the antenna.
2. Hoist the antenna unit to the installation site using the hoisting hole ①.
3. Position the screw ② on the antenna in the slot on the antenna support and tighten it. The torque is **35 Nm ± 10%** ①.
4. Fasten the screw and washer ③ in the lower hole on the side of the antenna through the antenna support and tighten. The torque is **35 Nm ± 10%** ①.

### 5.5.4 Installing the Radio Unit (Integrated Installation)

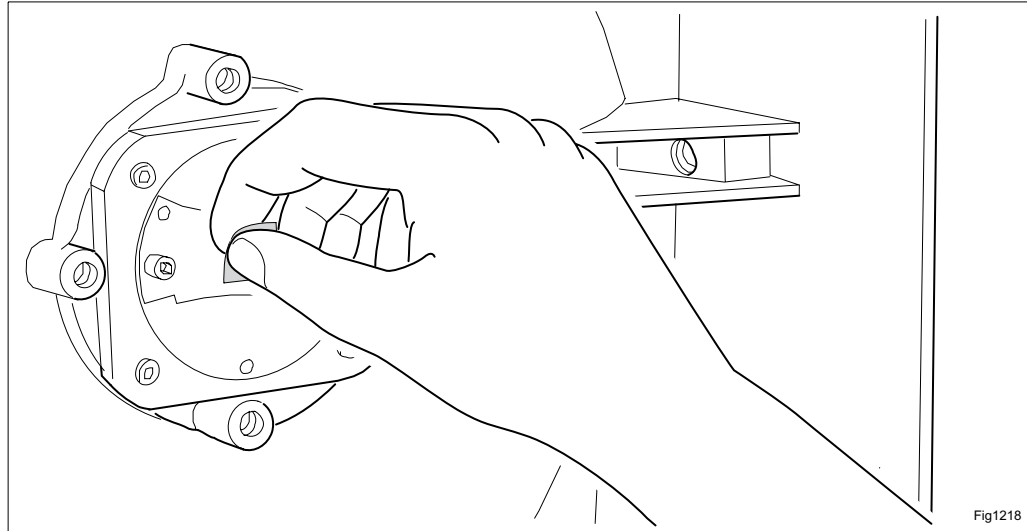


Figure 5-27. Removing the waveguide protection tape from the antenna.

1. Remove the waveguide protection tape from the antenna and the waveguide protection from the radio unit.

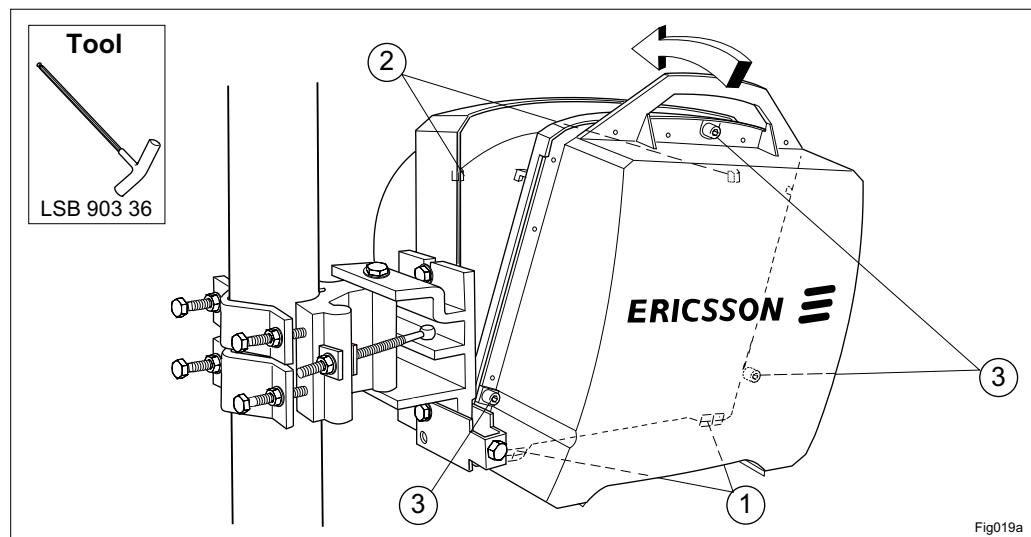


Figure 5-28. Installing the radio unit to the 0.3 m antenna.

2. Hoist the radio unit using the lifting handle.
3. Position the radio unit in the corresponding holes, ①, at the bottom of the antenna unit and lift it over the catches, ②, inside the antenna.
4. Fasten the radio unit using the three screws, ③.

## 5.6 Separate Installation of the Radio Unit and the Antenna

This section describes the procedure when using the standard mounting kit SXX 111 0278/1 for installing the radio unit, RAU1, and the antenna. For installation of other antennas than 0.3 m and 0.6 m, and other supports than SXX 111 0278/1, a separate instruction is enclosed in the delivery.

### DANGER



All tightening instructions must be carefully followed to prevent the equipment from falling down.

The figure below gives an overview of the installation procedure. Only the installation procedure for the 0.3 m antenna is shown, since the installation procedure for the 0.6 m antenna is the same as for the 0.3 m antenna.

**Note:** Directly after installing the radio unit, lay and connect the radio cable and switch the power on to avoid moisture in the radio unit.

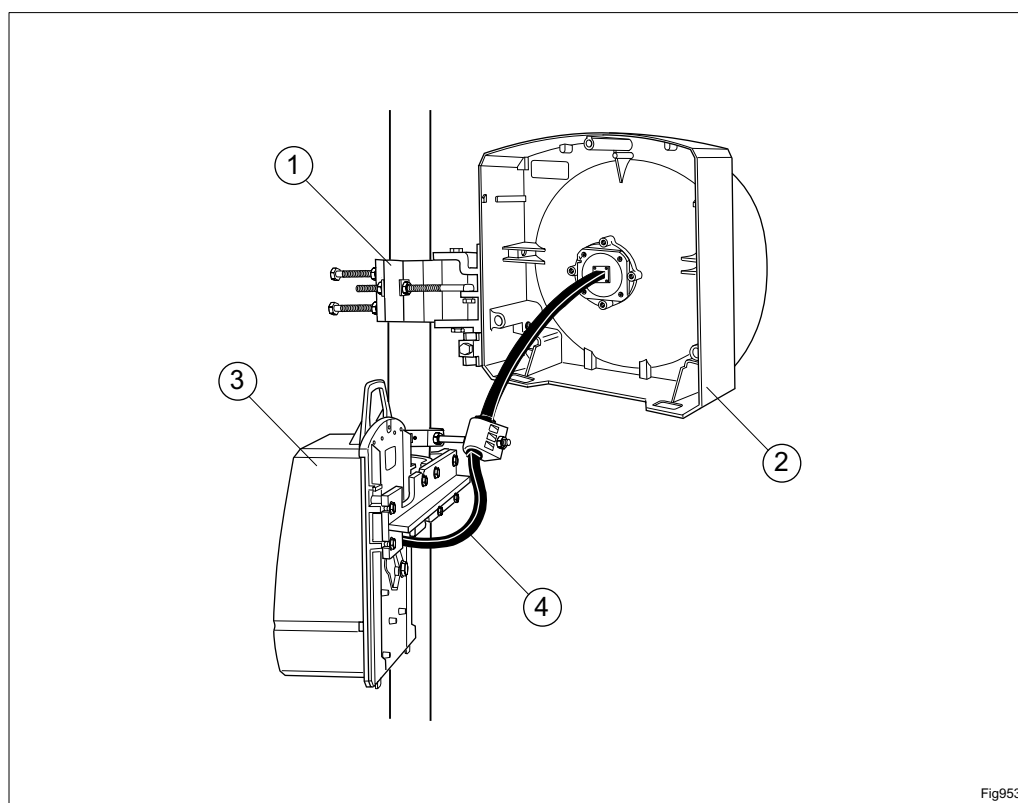


Fig953

Figure 5-29. Separate installation of the radio unit and the antenna.

- Step 2.1** Fit the antenna feeder, section 5.6.1.
- Step 2.2** Fit the antenna support ①, section 5.6.2.
- Step 2.3** Fit the antenna ② to the antenna support, section 5.6.3.
- Step 2.4** Fit the waveguide lock, section 5.6.4.
- Step 2.5** Install the radio unit ③, section 5.6.5.
- Step 2.6** Fit the flexible waveguide ④, section 5.6.6.

Normally, the radio unit is fitted directly to the antenna. In special cases such as for larger antennas, separate installation is required.

Product code for separate mounting kit	Radio unit	Waveguide interface at flexible waveguide
SXK 111 501/X	7 and 8 GHz	154 IEC-PBR 84
SXK 111 0401/X	15 GHz	154 IEC-PBR 140
SXK 111 0402/X	18 and 23 GHz	154 IEC-PBR 220
SXK 111 0403/1	26 GHz	154 IEC-PBR 260
SXK 111 0404/1	38 GHz	154 IEC-PBR 320

X=1 for waveguide 0.65 m long  
X=2 for waveguide 0.90 m long

Figure 5-30. The product code for the separate mounting kit.

The kit for separate installation contains the following parts:

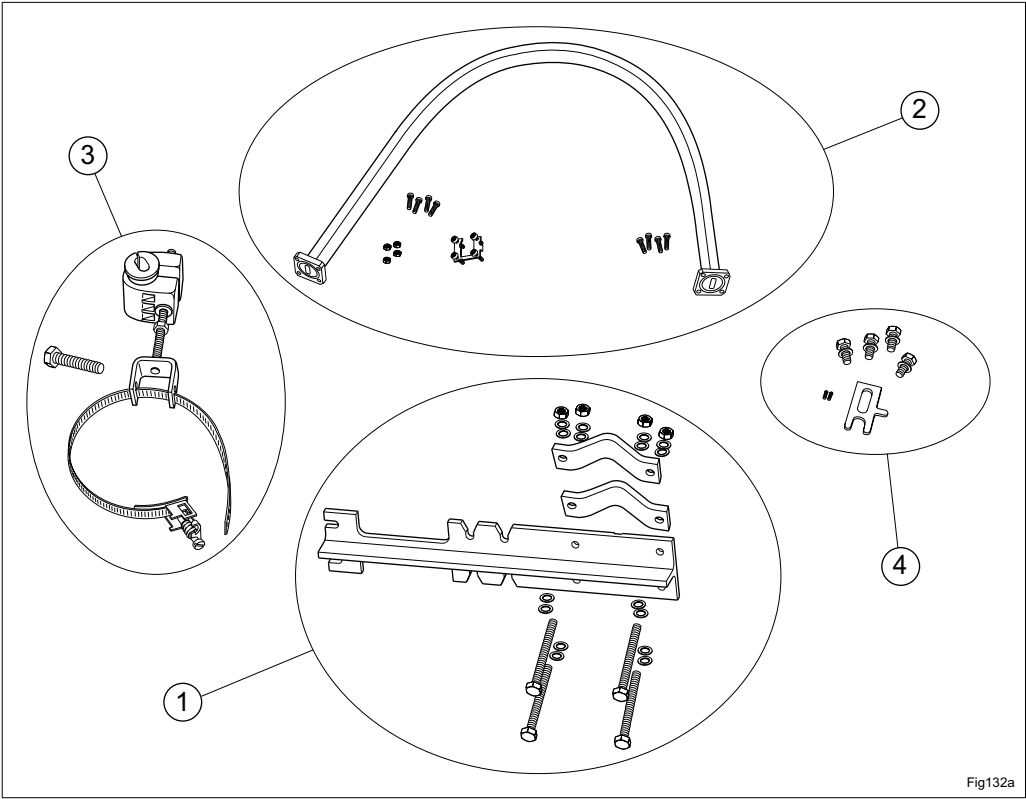


Figure 5-31. The details in the separate mounting kit.

- ① Radio mounting kit with washers, screws and nuts for mounting of radio unit to poles with diameter 50-120 mm.
- ② Flexible waveguide with washer, screws and nuts.
- ③ Supporting arm (clamp kit) for the flexible waveguide, with adjustment screw and hose clamp. (Not for MINI-LINK 7-E or 8-E).
- ④ Waveguide lock and one screw for installation of flexible waveguide to radio unit. Three screws for installing the radio unit to the mounting support and two guide pins.

### 5.6.1 Fitting the Antenna Feeder (Separate Installation)

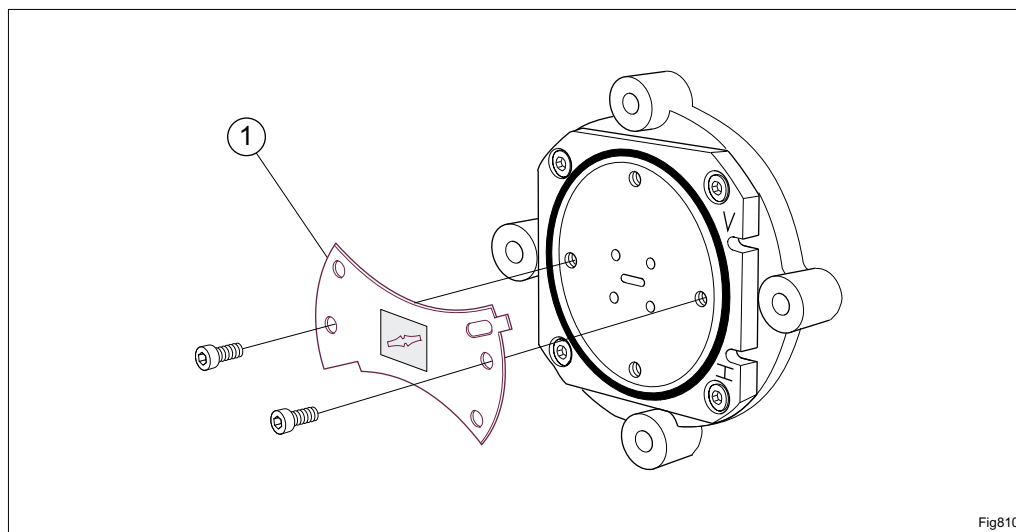


Figure 5-32. Removing the polarization plate.

1. Undo the two screws at the back of the feeder using the Torx screwdriver TX 20 (M4) and remove the polarization plate, ①. It is not used for this application.

The antenna is now prepared for **vertical polarization**. To prepare the antenna for horizontal polarization follow the instructions below.

**Note:** Move the protection tape to the antenna feeder to protect it until the flexible waveguide is installed.

#### Horizontal Polarization

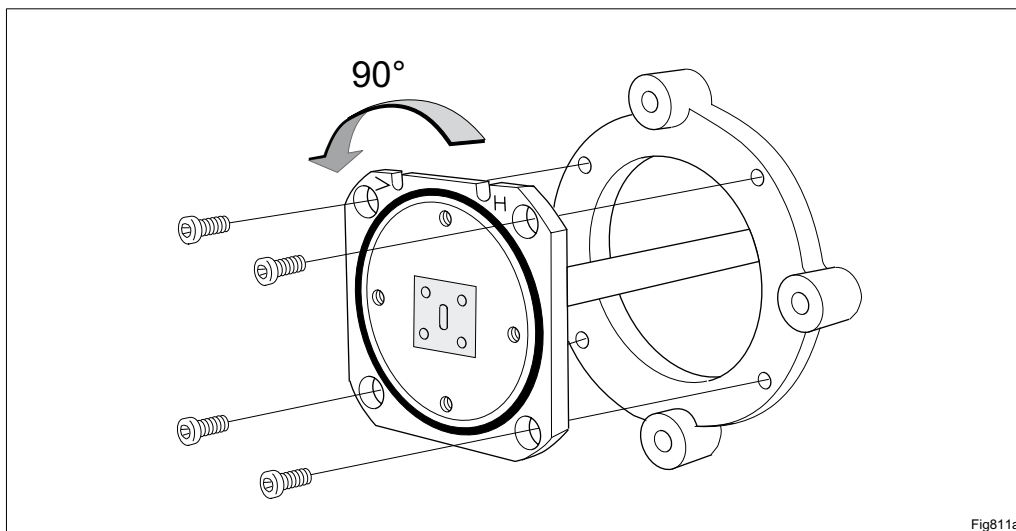


Figure 5-33. Preparing the antenna for horizontal polarization.

1. Undo the 4 screws in the corners of the feeder and rotate the feeder 90° anti-clockwise. Now the two slots in the antenna feeder will be directed upwards.
2. Fasten the feeder using the 4 screws.

### 5.6.2 Fitting the Antenna Support (Separate Installation)

The antenna support fits poles with a diameter of 50 - 120 mm and L-profiles between 40x40x5 mm and 80x80x8 mm.

Read the instruction enclosed with the antenna support, EN/LZT 110 4105, before installing and using the antenna support.

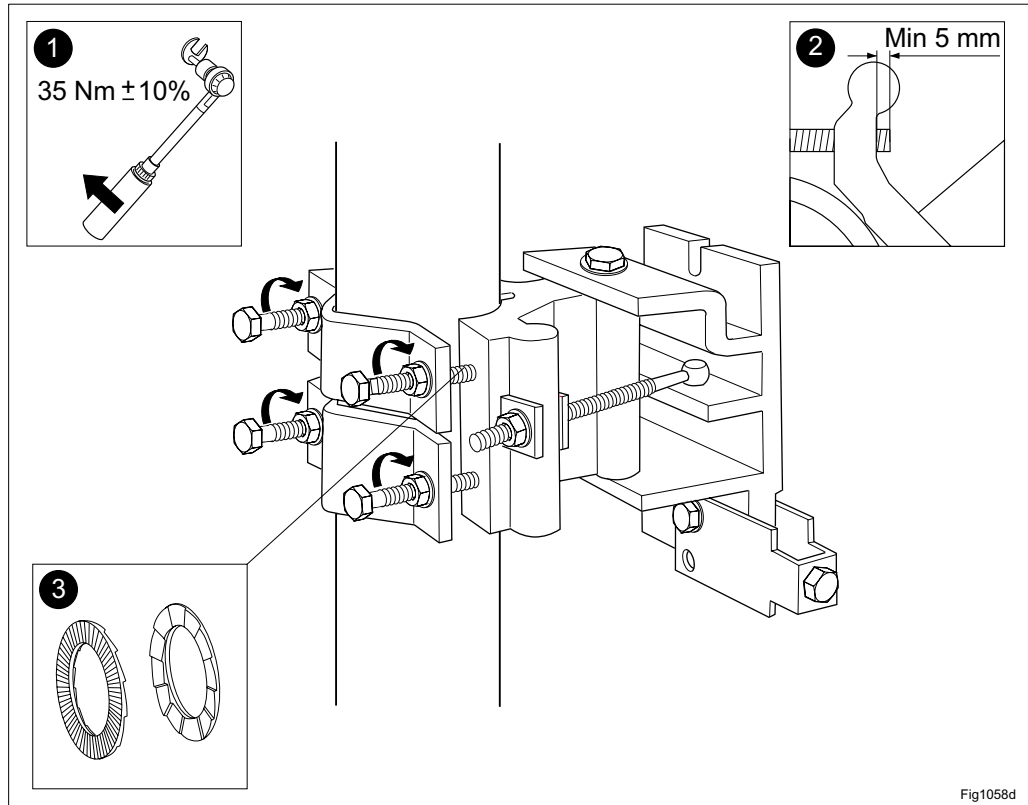


Fig1058d

Figure 5-34. Fitting the antenna support, SXX 111 0278/1.

1. Lubricate the screws (for lubricating substance, see section 5.2).
2. Fit the antenna support to the pole and tighten the four screws by using the 16 mm ring and open jaw wrench. The torque is  $35 \text{ Nm} \pm 10\%$  ❶. Position the antenna support so that the antenna points along the radio link path.

**Note:** Make sure the screws protrude at least 5 mm ❷ and that the washers are positioned as shown in the figure above ❸. The washers have different faces. Coarse saw tooth patterns should face and match each other.



### 5.6.3 Fitting the Antenna to the Antenna Support (Separate Installation)

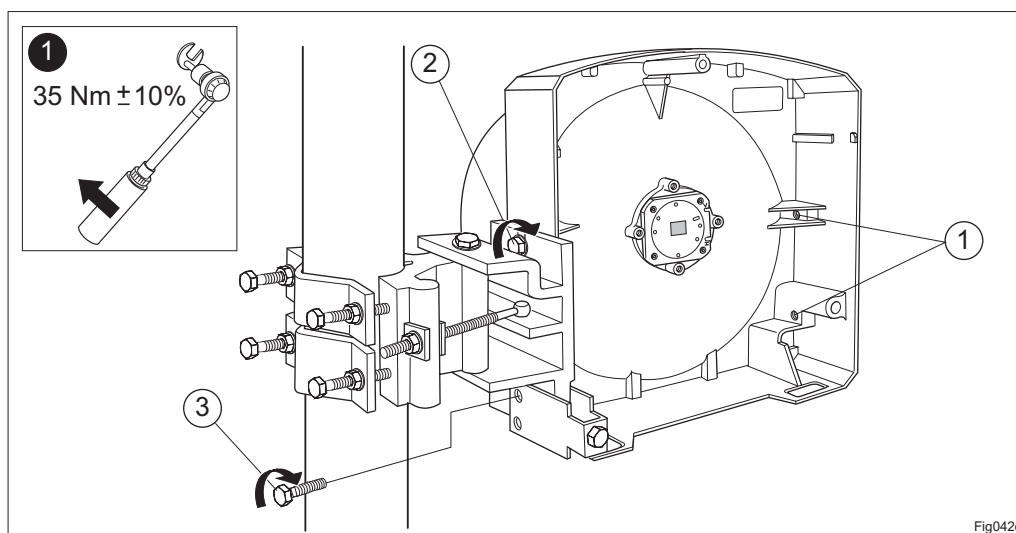


Figure 5-35. Installing the 0.3 m antenna.

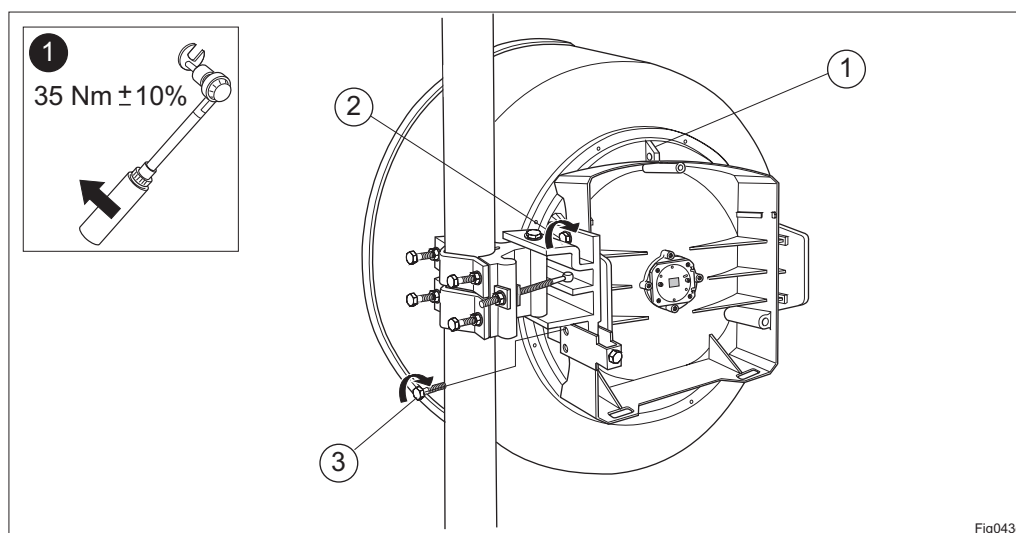
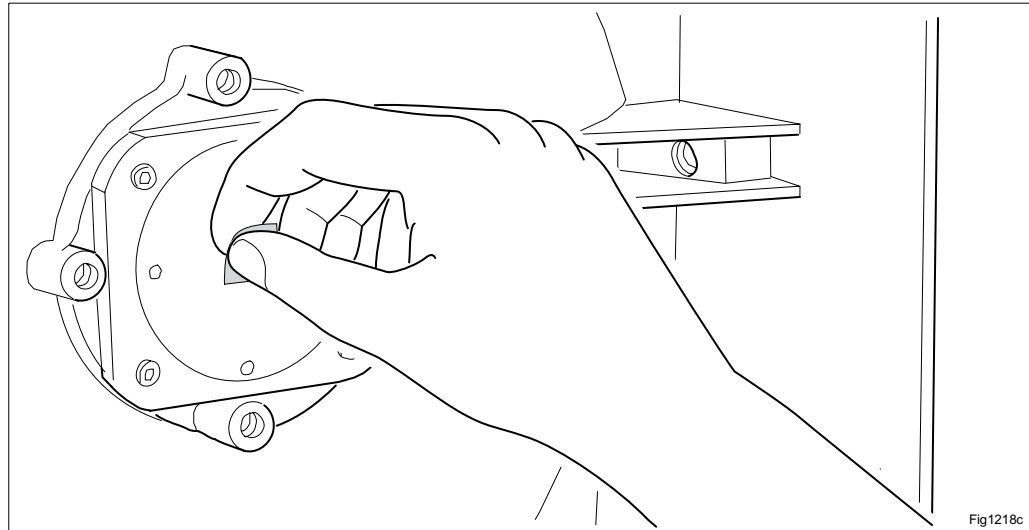


Figure 5-36. Installing the 0.6 m antenna.

The antenna is fitted to the antenna support with two screws.

1. Fasten the screw and washer ② in the upper hole on the side of the antenna.
2. Hoist the antenna unit to the installation site using the hoisting hole ①.
3. Position the screw on the antenna in the slot ② on the antenna support and tighten it. The torque is **35 Nm ± 10%** ❶.
4. Fasten the screw and washer ③ in the lower hole on the side of the antenna through the antenna support and tighten. The torque is **35 Nm ± 10%** ❶.



*Figure 5-37. Removing the waveguide protection tape from the antenna*

- 5.** Remove the waveguide protection tape from the antenna before installing a flexible waveguide or a power splitter.

### 5.6.4 Fitting the Waveguide Lock (Separate Installation)

The waveguide lock must be fitted before the radio unit is hoisted to the mast.

1. Remove the waveguide protection.

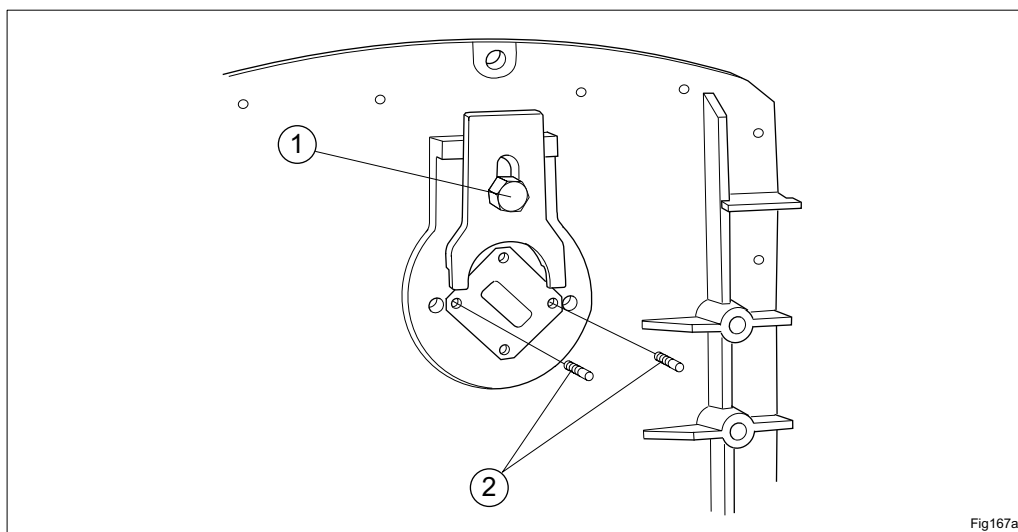


Figure 5-38. Fitting the waveguide lock for MINI-LINK 7-E and 8-E.

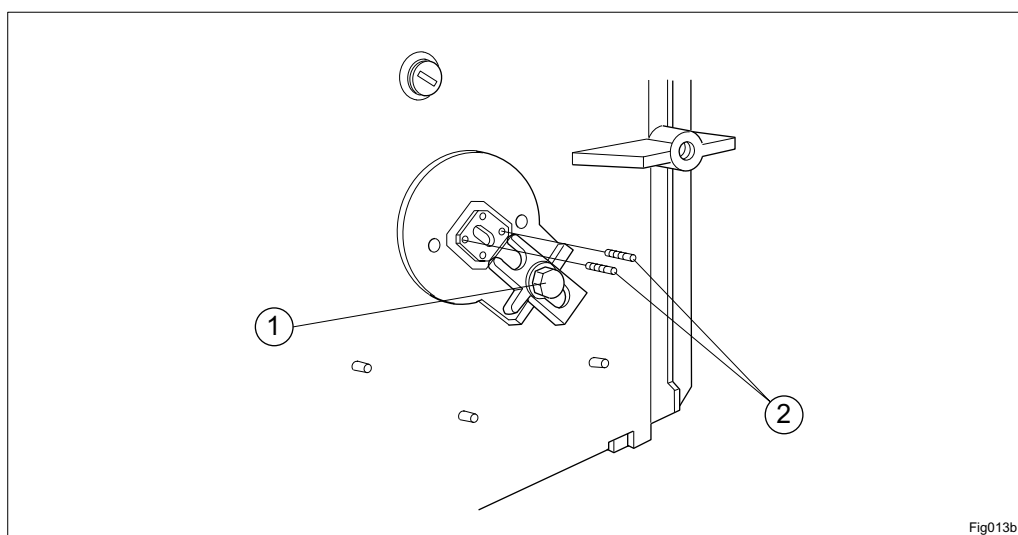


Figure 5-39. Fitting the waveguide lock for MINI-LINK 15-E, 18-E, 23-E, 26-E and 38-E.

2. Lubricate the screw ① and guide pins ② (for lubricating substance, see section 5.2).
3. Fit the waveguide lock to the back of the radio unit and fix the screw ① by hand.
4. Fasten the two guide pins ② in two diagonal holes on the radio unit.

**Note:** Ensure that 2-3 mm of the pins protrude when they are fastened.

### 5.6.5 Installing the Radio Unit (Separate Installation)

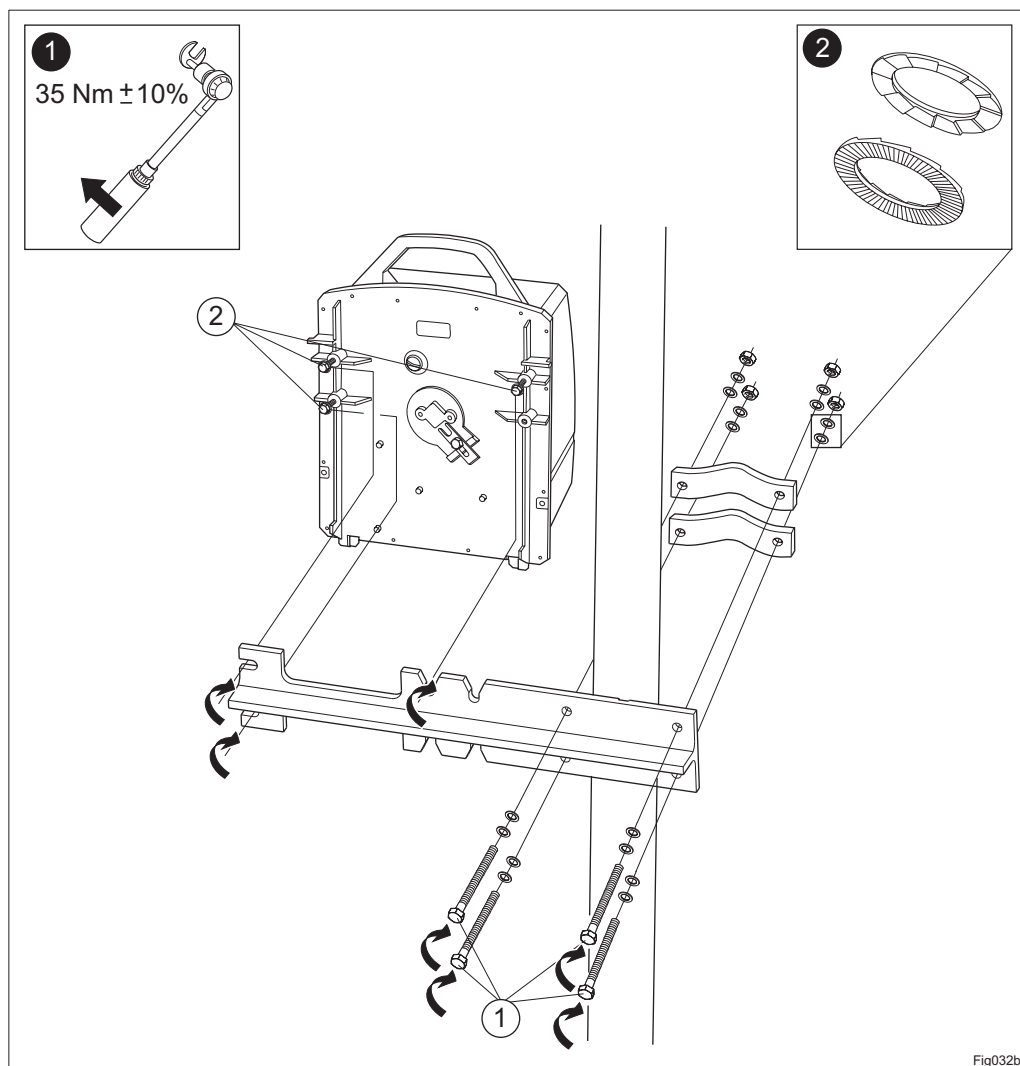


Figure 5-40. Fitting the radio unit to a separate support.

1. Lubricate the screws (for lubricating substance, see section 5.2).
2. Attach the support to the pole and tighten the screws ①. The torque is  **$35 \text{ Nm} \pm 10\%$**  ①. Ensure the washers are positioned as shown in the figure ②.
3. Attach two of the screws at the far end of the radio unit, and the third at the near end.
4. Hook the radio onto the support.
5. Tighten the screws ②. The torque is  **$35 \text{ Nm} \pm 10\%$**  ①.

### 5.6.6 Installing the Flexible Waveguide

**CAUTION**  
**!**

The flexible waveguide is very fragile and must be handled with care.

- Transport the waveguide in its original packaging until it is installed. Leave the protective end caps on until the waveguide flanges are fitted to the radio unit and the antenna.
- Be cautious about sharp cutting edges that can damage the waveguide.
- Make sure the waveguide never supports any weight.
- Do not leave one end of the waveguide hanging free without supporting it close to its final fixing point.
- Do not stretch the waveguide to make it fit if it is too short. Move the equipment closer to each other or use a different waveguide.

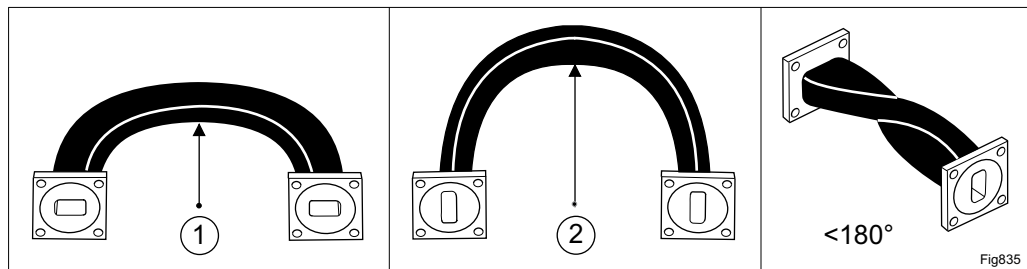


Figure 5-41. The H-bend, E-bend and maximum twisting angle.

- Do not twist the waveguide more than 180° or bend it harder than the minimum bending radius (H-bend, ①, and E-bend, ②) printed on the flexible waveguide.

### Fitting the Optional Power Splitter and Flexible Waveguide to the Antenna Unit

The power splitter is used for 1+1 systems with a single polarized antenna. The power splitter is fitted directly to the 0.3 m and 0.6 m single polarized antennas. The power splitter is available in two versions per frequency band:

- Asymmetrical, mainly for 1+1 hot standby systems.
- Symmetrical, mainly for 1+1 working standby systems.

Product code	Type	Attenuation
UPA 101 013/1	7 GHz	1.6/7 (asymmetrical)
UPA 101 013/2		3.5/3.5 (symmetrical)
UPA 101 016/1	8 GHz	1.6/7 (asymmetrical)
UPA 101 016/2		3.5/3.5 (symmetrical)
UPA 101 005/1	15 GHz	1.6/7 (asymmetrical)
UPA 101 005/2		3.5/3.5 (symmetrical)
UPA 101 015/1	18 GHz	1.6/7 (asymmetrical)
UPA 101 015/2		3.5/3.5 (symmetrical)
UPA 101 010/1	23 GHz	1.6/7 (asymmetrical)
UPA 101 010/2		3.5/3.5 (symmetrical)
UPA 101 008/1	26 GHz	1.6/7 (asymmetrical)
UPA 101 008/2		3.5/3.5 (symmetrical)
UPA 101 009/1	38 GHz	1.7/7 (asymmetrical)
UPA 101 009/2		3.7/3.7 (symmetrical)

Figure 5-42. The product code for the power splitter.

Two kits for separate installation are required (including flexible waveguides). The power splitter is installed as described below:

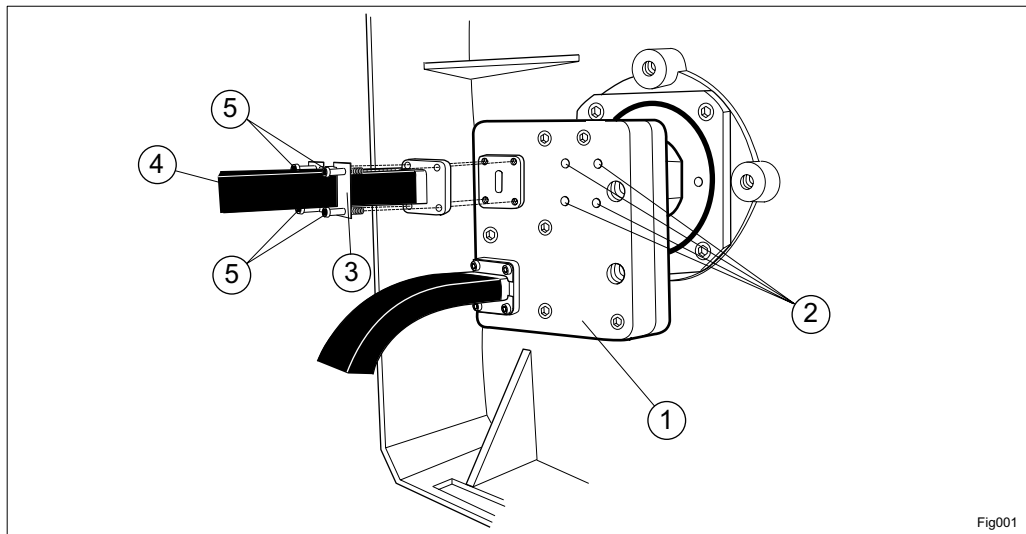


Figure 5-43. Fitting the power splitter.

1. Remove the three waveguide protections from the power splitter, ①.
2. Check that the O-ring is properly located in the flange groove at the interface between the power splitter and the feeder.
3. Fasten the power splitter to the antenna module with the four screws, ②, using the 2.5 mm Allen key (M3) or Torx screwdriver TX 20 (M4), see table in section 10.3.4.
4. Position the washer, ③, on the flexible waveguide.
5. Check that the O-ring is properly located in the waveguide flange groove.
6. Fasten the flexible waveguides, ④, on the power splitter with the four screws, ⑤, using the 2.5 mm Allen key (M3) or Torx screwdriver TX 20 (M4), see table in section 10.3.4.

### Fitting the Optional Power Splitter on a Separate Support

In special cases, such as for large antennas, separate installation of the power splitter is required.

The following accessories are required to install the power splitter on a separate support:

- Mounting kit SXX 111 0340 for fitting on poles with diameter 50-114 mm.
- Two kits for separate installation (including flexible waveguides).
- One flexible waveguide kit.
- One waveguide clamp kit.

The power splitter is installed as described below:

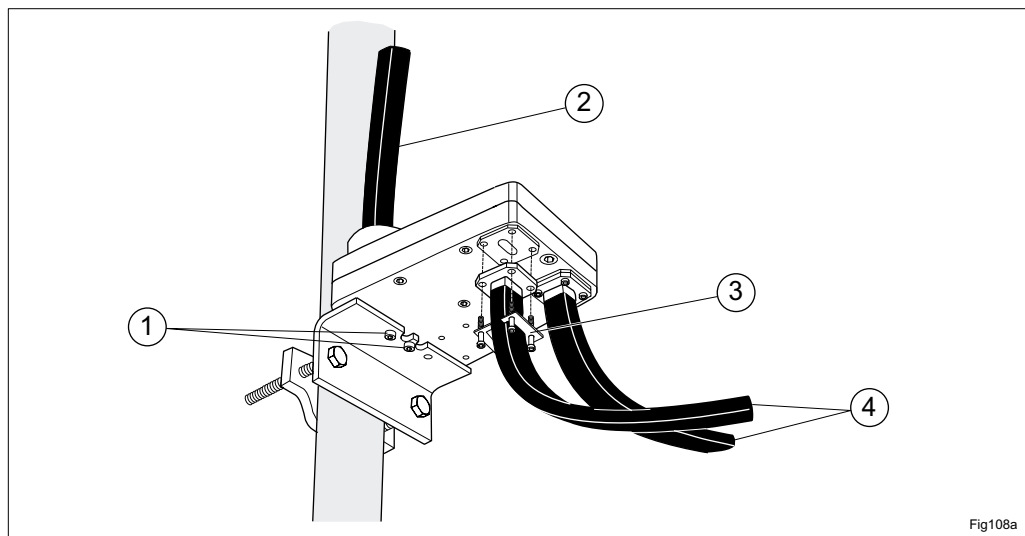


Figure 5-44. Fitting the power splitter, using a separate support.

1. Fit the support to the mast. Tighten the nuts using the 16 mm ring and open jaw wrench.
2. Fit the power splitter to the support, using the two screws ①.
3. Remove the three waveguide protections from the power splitter.
4. Fasten the flexible waveguide ② to the power splitter using the 2.5 mm Allen key (M3) or Torx screwdriver TX 20 (M4), see table in section 10.3.4. Check that the O-ring is properly located in the flange groove at the interface between the power splitter and the flexible waveguide.
5. Fasten the other end of the flexible waveguide to the antenna.
6. Position the washer ③ on the flexible waveguide.
7. Fasten the flexible waveguides ④ from radio unit 1 and 2 on the power splitter with the four screws using the 2.5 mm Allen key (M3) or Torx screwdriver TX 20 (M4), see table in section 10.3.4. Check that the O-rings are properly located in the waveguide flange grooves.



### Fitting the Flexible Waveguide to the Antenna Unit

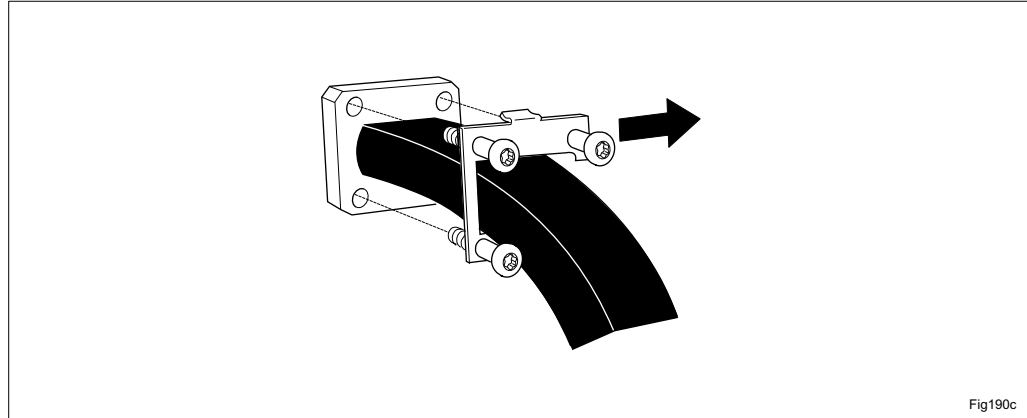


Figure 5-45. Fitting the washer on the flexible waveguide.

1. Position the washer on the flexible waveguide.
2. Make sure the O-ring is properly located in the waveguide flange groove.
3. Remove the waveguide protection tape from the antenna.

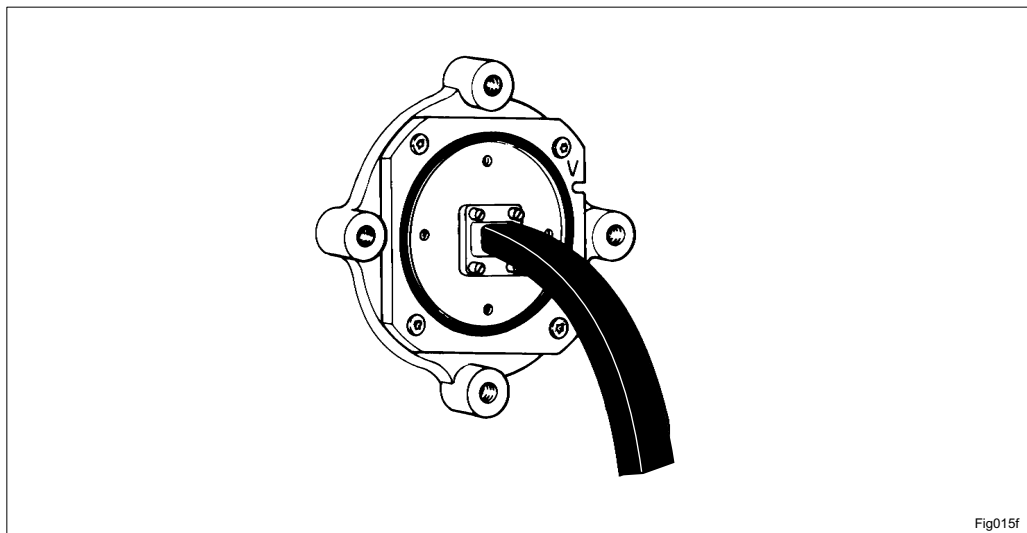


Figure 5-46. Fastening the flexible waveguide on the antenna.

4. Fasten the flexible waveguide on the antenna unit with the four screws using the 2.5 mm Allen key (M3) or Torx screwdriver TX 20 (M4), see table in section 10.3.4.

### Fitting the Flexible Waveguide to the Radio Unit

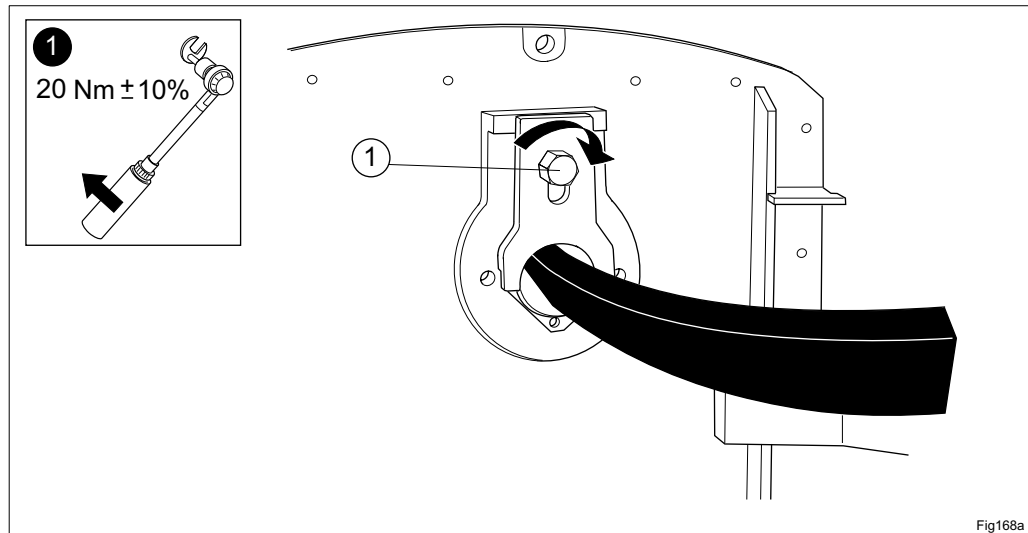


Figure 5-47. Fitting the flexible waveguide to MINI-LINK 7-E and 8-E.

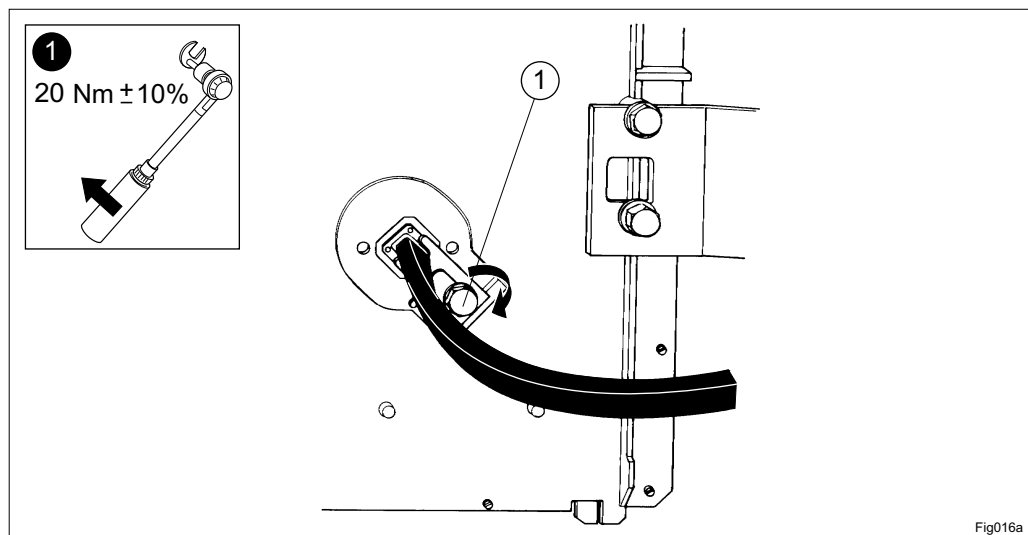


Figure 5-48. Fitting the flexible waveguide to MINI-LINK 15-E, 18-E, 23-E, 26-E and 38-E.

1. Make sure the O-ring is properly located in the waveguide flange groove.
2. Fit the flexible waveguide on the radio unit under the waveguide lock.
3. Fix the waveguide by tightening the waveguide lock screw, ①. The torque is **20 Nm  $\pm$  10%** ①. Use the 16 mm ring and open jaw wrench.

### Fitting the Flexible Waveguide Support Arm

**Note:** This instruction does not apply for MINI-LINK 7-E or 8-E.

The support arm must be used to ensure that the flexible waveguide is not damaged.

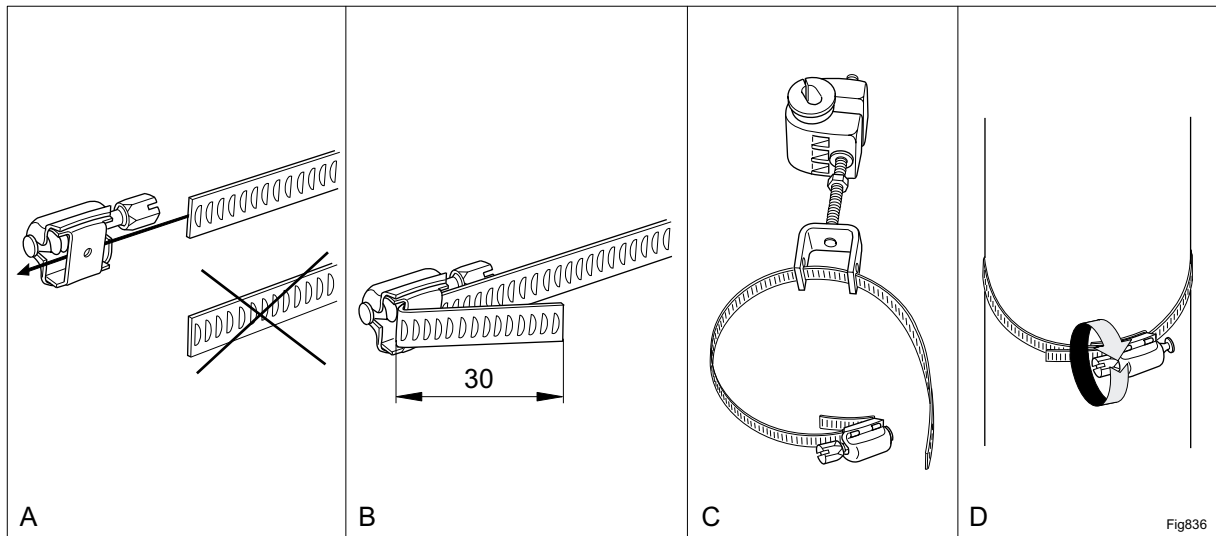


Figure 5-49. Fitting the hose clamp.

1. Fasten the hose clamp around the pole as shown in the figure above.  
Use the screw to tighten the hose clamp.

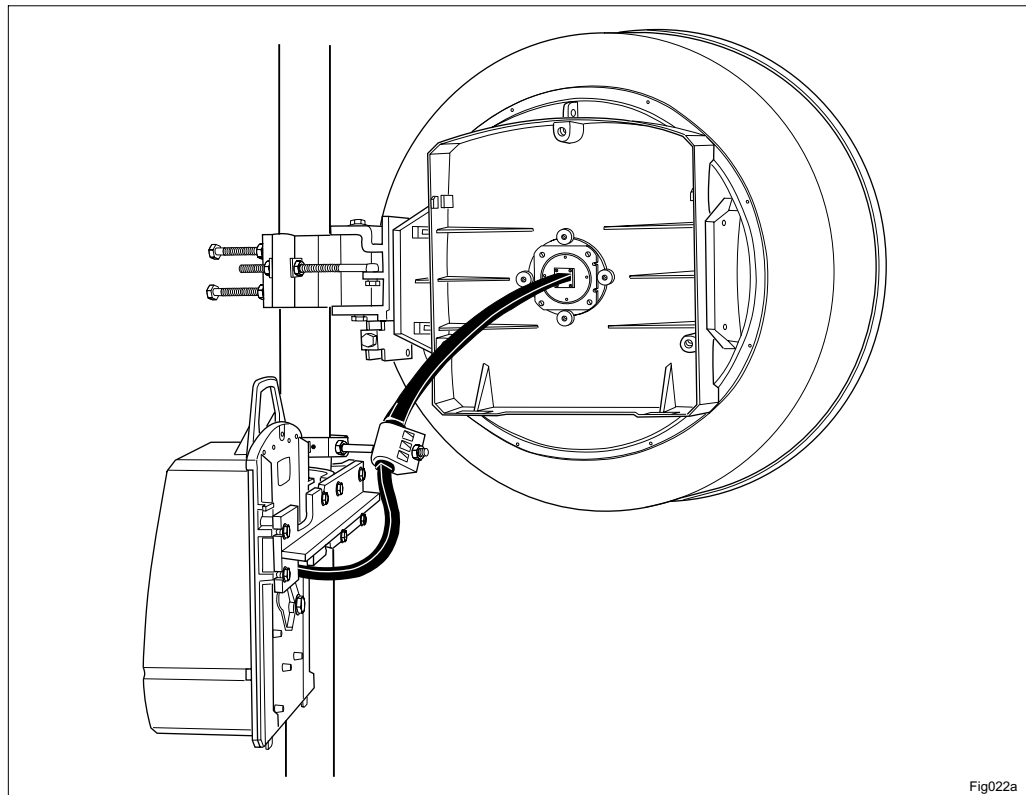


Figure 5-50. The support arm fitted to a flexible waveguide in a separate installation of the radio unit and the antenna.

2. Fasten the flexible waveguide in the clamp in accordance with the figure. For MINI-LINK 38-E use the rubber bushing with the small hole. For MINI-LINK 23-E and 26-E use the rubber bushing with the big hole. MINI-LINK 15-E does not require any rubber bushing.

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# 6 Outdoor Installation, RAU2

## 6.1 Introduction

This chapter describes a recommended installation procedure for the RAU2 radio unit, and the antenna.

The figure below gives an overview of the installation procedure.

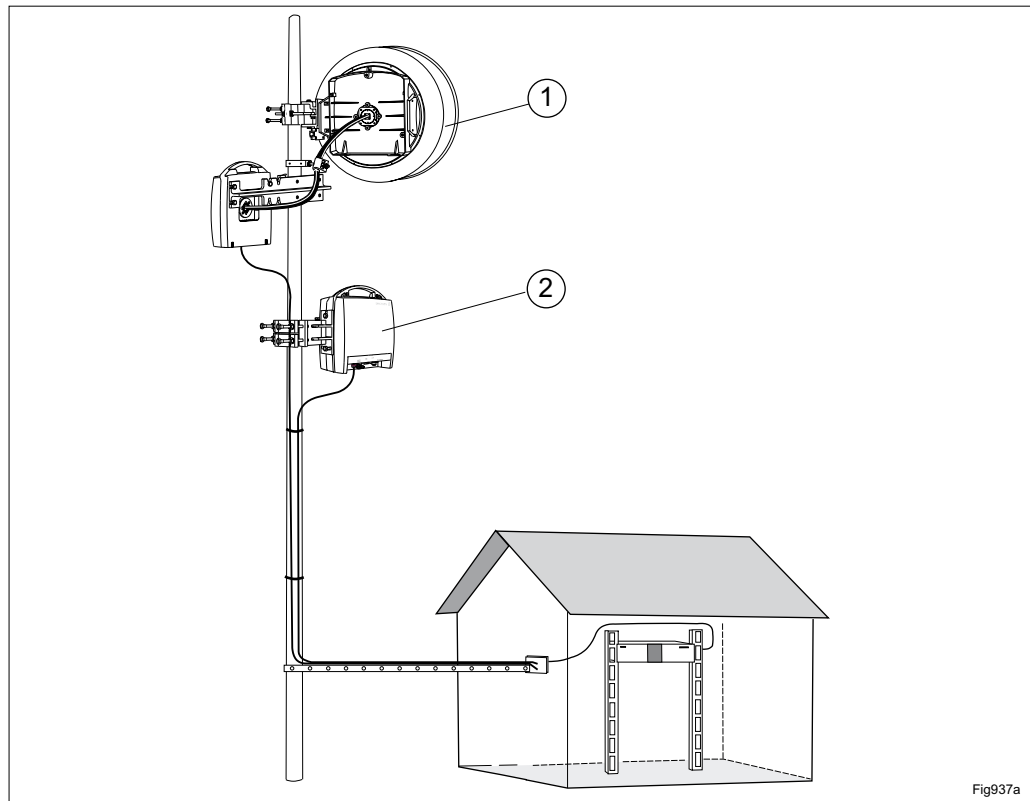


Figure 6-1. Outdoor installation.

### Installation procedure

- Step 1** Set the frequency and the output power for the MINI-LINK radio (done indoors). (See section 6.4)
- Step 2** Integrated installation ② - install the radio unit and the antenna module. (See section 6.5)
- Separate installation ① - install the radio unit and the antenna module. (See section 6.6)

## 6.2 Installation Equipment

The following tools and instruments are required for installation of the radio unit and the antenna:

- 6 mm Allen key for integrated installation of the radio module and the antenna module.
- 16 mm ring and open jaw wrench for fitting the antenna support.
- Torx screwdriver TX 10 (M3) for fitting a flexible waveguide to an antenna unit.
- Torx screwdriver TX 20 (M4) for change of polarization.
- Lubricating substance for outdoor screws and nuts, for example Stucarit 309 (blue).<sup>1</sup>
- Sealing substance for more severe conditions, for example OKS 2020. To be applied around flexible waveguide interfaces (note: must be applied outside after connection).<sup>2</sup>

The variable attenuation is set using a PC with MINI-LINK Netman or MSM.

---

<sup>1</sup> Manufacturer: E. Eppler & Co, Seidenstrasse 55, D-7000 Stuttgart, Deutschland.

<sup>2</sup> Manufacturer: Omnikote GmbH, Triebstrasse 9, D-8000 München, Deutschland.

## 6.3 Product Code for Radio Unit – RAU2

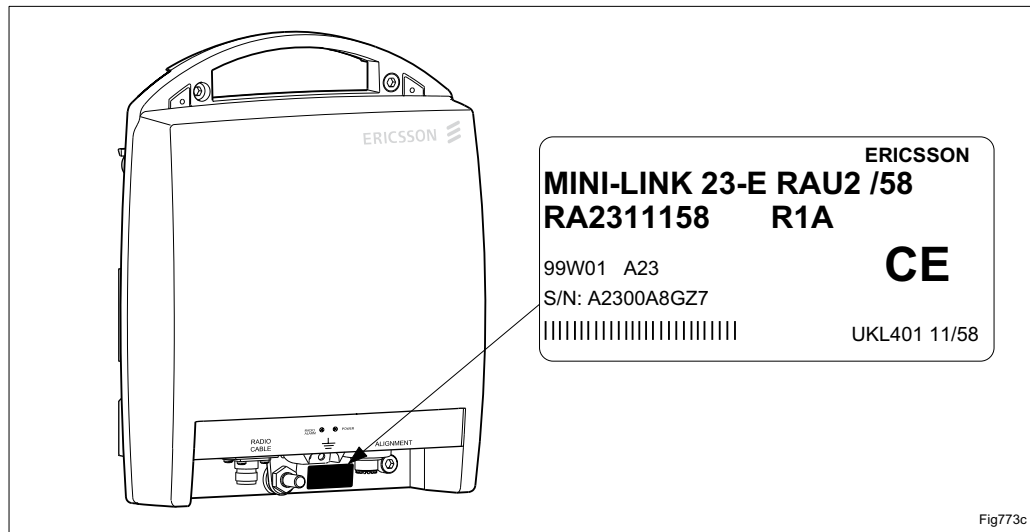


Figure 6-2. The product code label positioning.

The table below contains a description of the product code for the RAU2 radio unit. The product code, which can be read on the label on the outside of the unit, can be used to identify the radio unit configuration.

Product code for MINI-LINK E RAU2		
R A st 1 1 x C D / e f		
Letter	Code	Description
st	23	RAU 23-E
x	0	Standard power
	1	High power
C D	xx	The sub-band number. See section 10.12 for detailed information.
e f	00	With standard accessories, which includes: - Connector kit for radio cable, diameter 10 mm (2 N-type connectors) - 2.0 m earthing cable - Mounting bracket for radio cable
	01	When the radio unit is delivered as a spare part, without accessories.

Figure 6-3. Description of the product code for RAU2.



## 6.4 Initial Settings

The initial settings should be made indoors prior to radio unit installation.



**Use external ESD protection to avoid damaging the equipment.**

### 6.4.1 RF Output Adjustment

The output power can be reduced with the built-in variable attenuator.

MINI-LINK radio	Wanted output power (dBm)		
<b>23-E</b>	-7	to	+20
<b>23-E HP</b>	-7	to	+23

*Figure 6-4. The range of the RF output power.*

The RF output power is set by using a PC with MINI-LINK Netman or MSM software, see separate manuals (section 1.3). It is also possible to set the output power by using the local supervision interface on the MMU, see section 6.4.2.

See section 10.12 for tolerances on the nominal output power.

## 6.4.2 Setting the Frequency and the Output Power using the Local Supervision Interface on the MMU

The frequency and the output power is set by using a PC with MINI-LINK Netman or MSM software, see separate manuals (section 1.3). The frequency and the output power can be set without a PC using the Local Supervision Interface (LSI) on the MMU. This procedure is described in the following section. For more detailed information about the local supervision interface see section 9.2.

The frequency and the output power should have been defined during network planning.

Follow these steps to set the frequency and the output power by using the local supervision interface on the MMU:

- Step 1.1** Connect the station radio cable, section 6.4.2.1.
- Step 1.2** Switch power on, section 6.4.2.2.
- Step 1.3** Set frequency, section 6.4.2.3.
- Step 1.4** Set output power, section 6.4.2.4.
- Step 1.5** Switch power off, section 6.4.2.5.
- Step 1.6** Disconnect the station radio cable, section 6.4.2.6.

The following details on the MMU front are significant for setup:

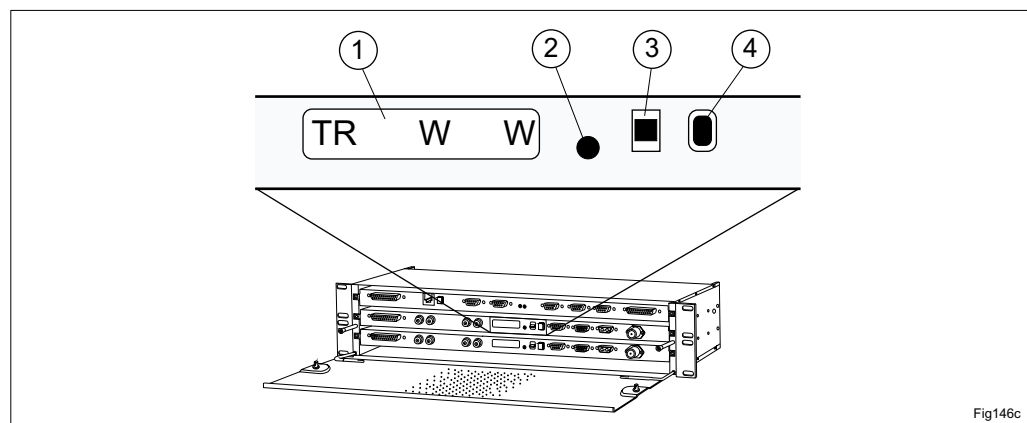


Figure 6-5. The MMU front panel.

- ① Display.
- ② Green LED.
- ③ Toggle switch.
- ④ Push button

Detailed instructions for each step are given below.

**CAUTION**  
**!**

The plug-in units in the access module generate heat and may be hot. Voltage over 60 V is hazardous and warning labels must be attached. See section 10.5 for a specification of power supply.

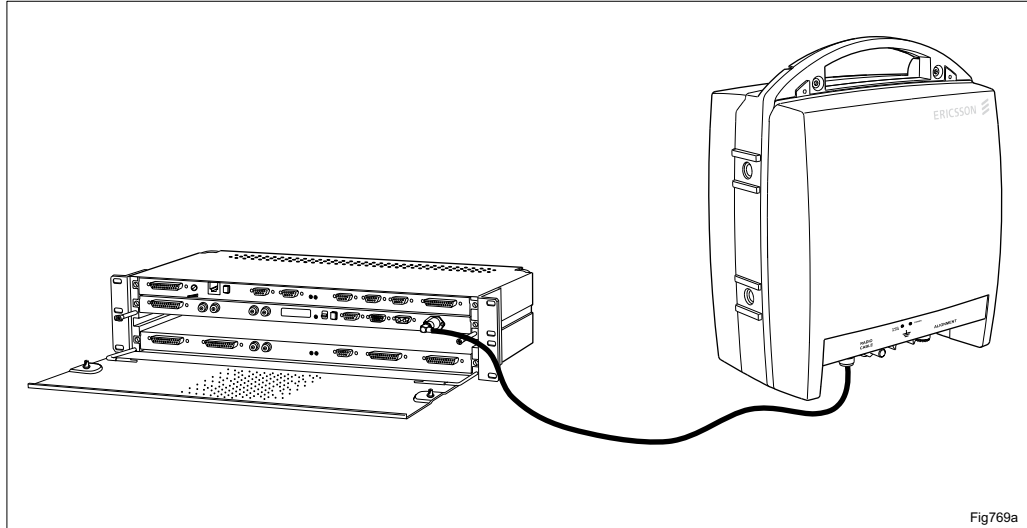
**6.4.2.1 Connect the Station Radio Cable**

Figure 6-6. The station radio cable connection and the MMU front panel.

1. Open the magazine front cover.
2. Connect the station radio cable RPM 517 6906/01 (included in the MMU delivery) between the radio unit and the MMU.

**6.4.2.2 Switch Power On**

**Note:** Ensure the MMU is supplied with the correct nominal voltage (24, 48/60 or 24-60 V nominal DC according to label).

1. Switch on the power supply to the MMU.
2. Push any button on the MMU to activate the display. The display returns to sleeping mode if it is not used.

### 6.4.2.3 Set Frequency

1. Press the toggle switch downwards (twice) until “Tx Freq” is displayed.

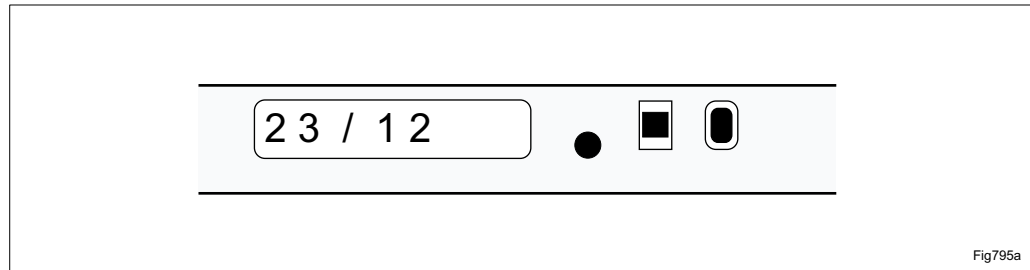


Fig795a

Figure 6-7. Example of the frequency- and the sub-band.

2. Press the push button once. The frequency band and sub-band of your MINI-LINK E are displayed, as shown in the figure above.
3. Ensure your MMU displays the sub-band specified during planning of the network. If not, something is wrong with the connected radio unit.
4. Press the push button again.

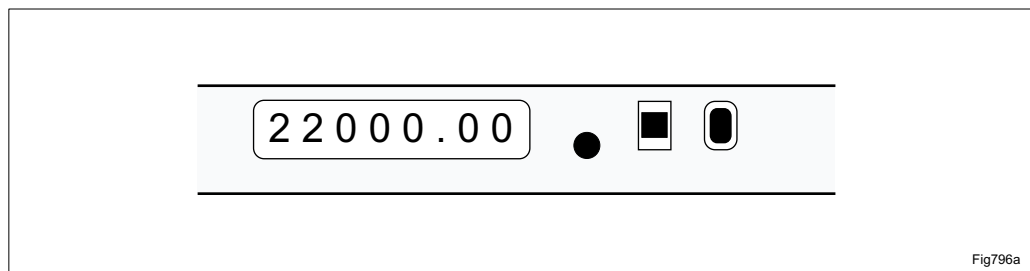


Fig796a

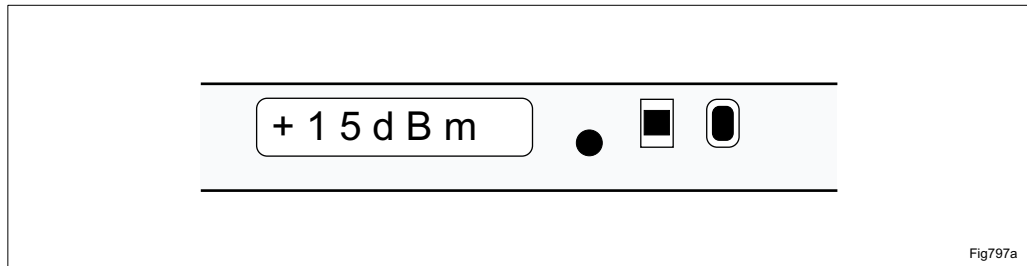
Figure 6-8. Example of the frequency.

5. Select the transmitting frequency for your radio. Increase the frequency by pressing the toggle switch upwards and decrease the frequency by pressing the toggle switch downwards
6. Press the push button when the relevant transmitting frequency is displayed.
7. To save the setting press the push button again when “Execute?” is displayed. Press the toggle switch to go back to the main menu without saving.

*The operational transmitting frequency is now set.*

#### 6.4.2.4 Set Output Power

1. Press the toggle switch downwards (twice) until “Tx Power” is displayed.
2. Press the push button.



*Figure 6-9. Example of the output power.*

3. Select the output power using the toggle switch.
4. Press the push button when the relevant output power is displayed.
5. To save the setting press the push button again when “Execute?” is displayed. Press the toggle switch to go back to the main menu without saving.

*The operational output power is now set.*

#### 6.4.2.5 Switch Power Off

- Switch off the power supply to the MMU.

#### 6.4.2.6 Disconnect the Station Radio Cable

- Disconnect the station radio cable from the radio unit.

## 6.5 Integrated Installation of the Radio Unit and the Antenna

This section describes the procedure when using the standard mounting kit for installing the radio unit, RAU2, and an antenna. (SXX 111 0278/1 is used for the 0.3 m and 0.6 m antennas and SXX 111 582/1 is used for the 0.2 m compact antenna.) For installation of other antennas than 0.2 m compact, 0.3 m and 0.6 m, and other supports than SXX 111 0278/1 or SXX 111 582/1, a separate instruction is enclosed in the delivery.

### DANGER



All tightening instructions must be carefully followed to prevent the equipment from falling down.

The figure below gives an overview of the installation procedure. Only the installation procedures for the 0.2 m compact and the 0.3 m antenna are shown, since the installation procedure for the 0.6 m antenna is the same as for the 0.3 m antenna.

**Note:** Directly after installing the radio unit, lay and connect the radio cable and switch the power on to avoid moisture in the radio unit.

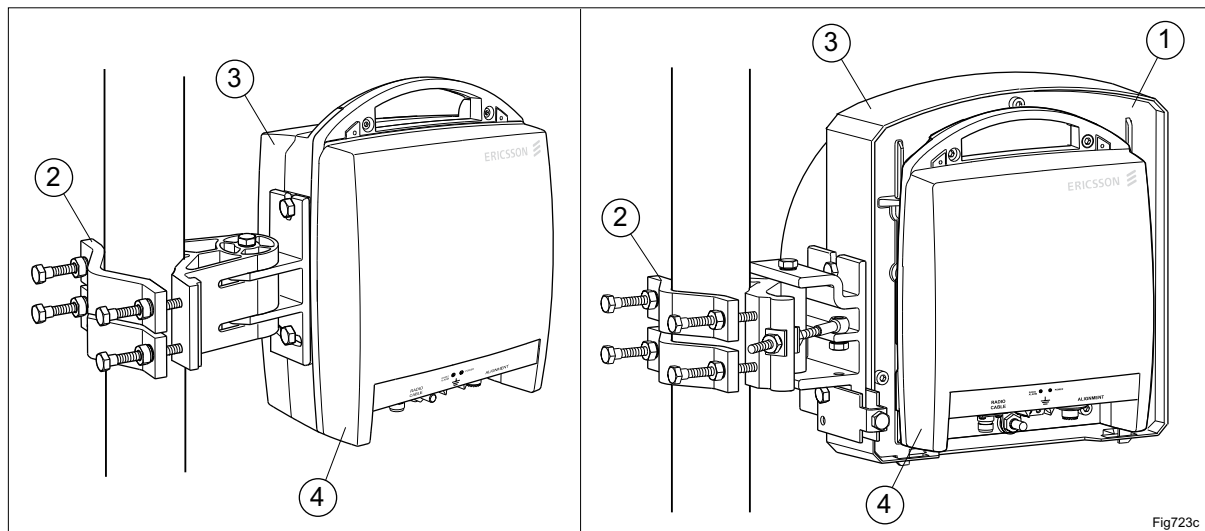


Figure 6-10. Integrated installation for 0.2 m compact antenna and 0.3 m antenna.

- Step 2.1** Fit the antenna feeder (see section 6.5.1).
- Step 2.2** Fit the adapter plate ① (optional) (see section 6.5.2).
- Step 2.3** Fit the antenna support ② (see section 6.5.3).
- Step 2.4** Fit the antenna ③ to the antenna support (see section 6.5.4).
- Step 2.5** Install the radio unit ④ (see section 6.5.5).

### 6.5.1 Fitting the Antenna Feeder (Integrated Installation)

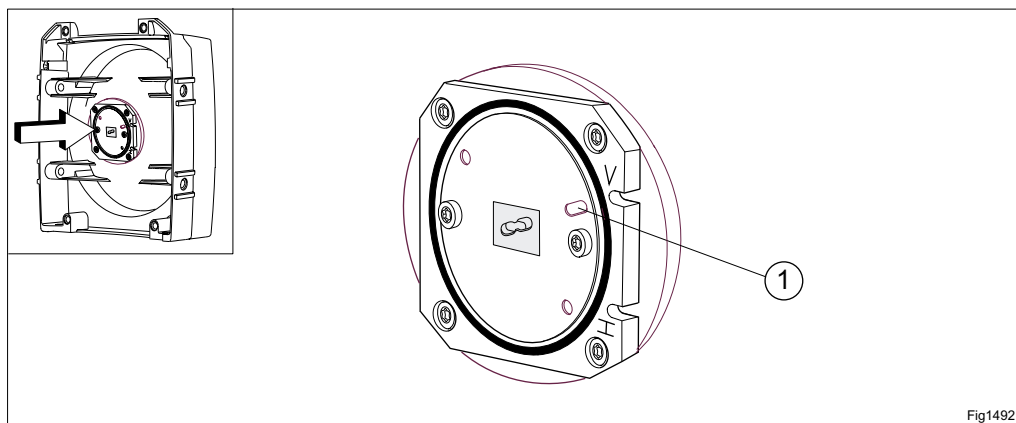


Fig1492

Figure 6-11. The antenna prepared for vertical polarization.

The antenna is prepared for **vertical polarization** on delivery. The hole, ①, on the polarization plate is pointing towards the V.

To prepare the antenna for horizontal polarization, follow the instructions below.

#### Horizontal polarization

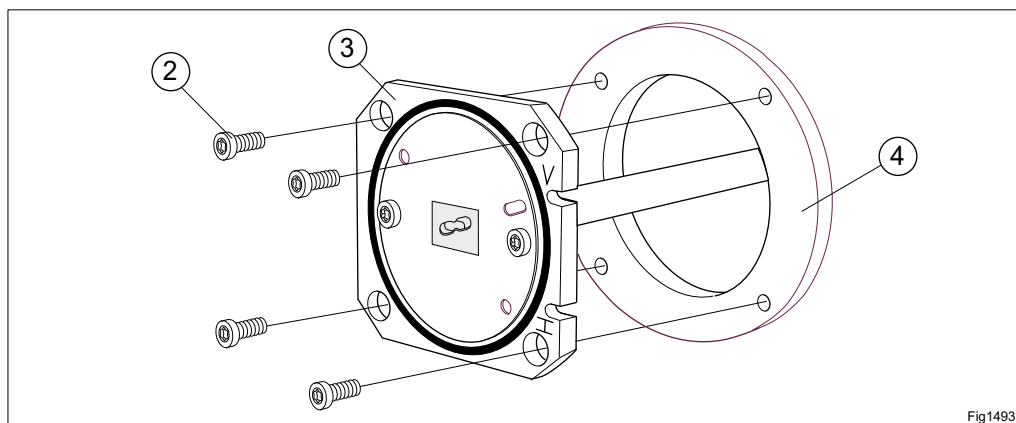


Fig1493

Figure 6-12. Removing the feeder.

1. Undo the four screws ② holding the feeder ③ to the reflector ④ using the Torx screwdriver TX 20 (M4).

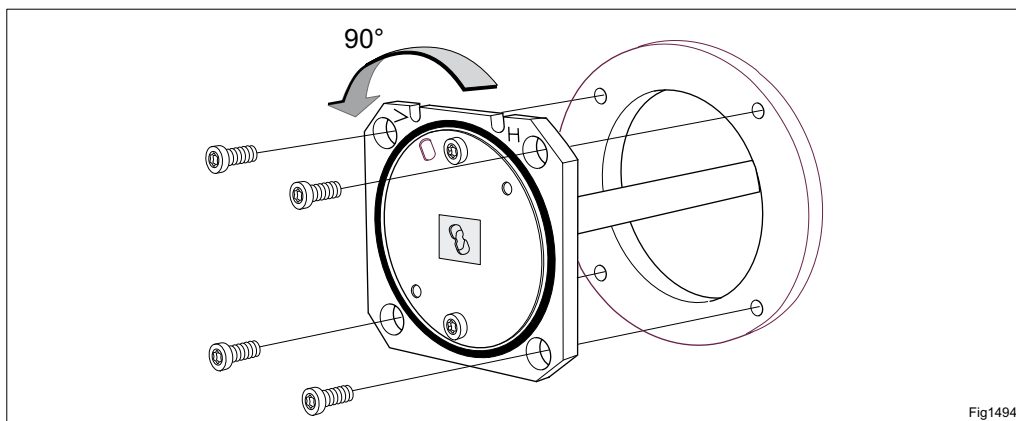


Fig1494

Figure 6-13. Rotating the feeder.

2. Rotate the feeder 90° anti-clockwise and fasten the screws.

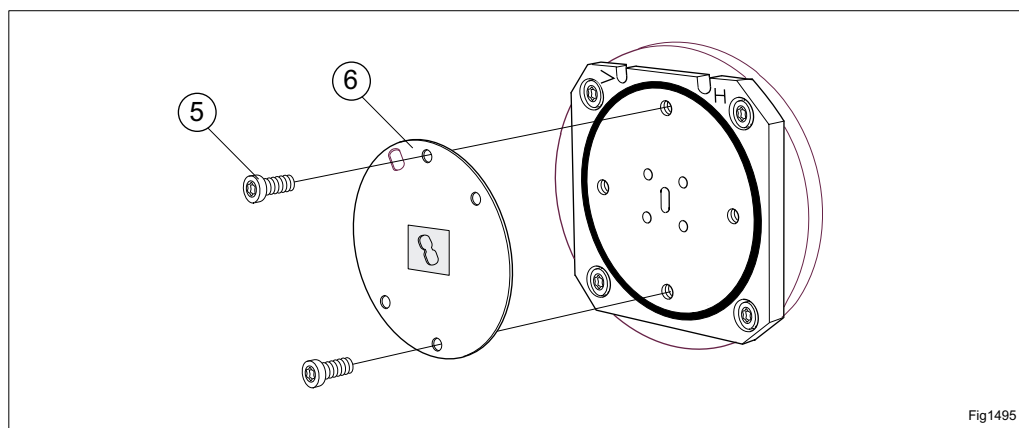


Figure 6-14. Removing the polarization plate.

3. Undo the two screws ⑤ holding the polarization plate ⑥ to the feeder using the Torx screwdriver TX 20 (M4).

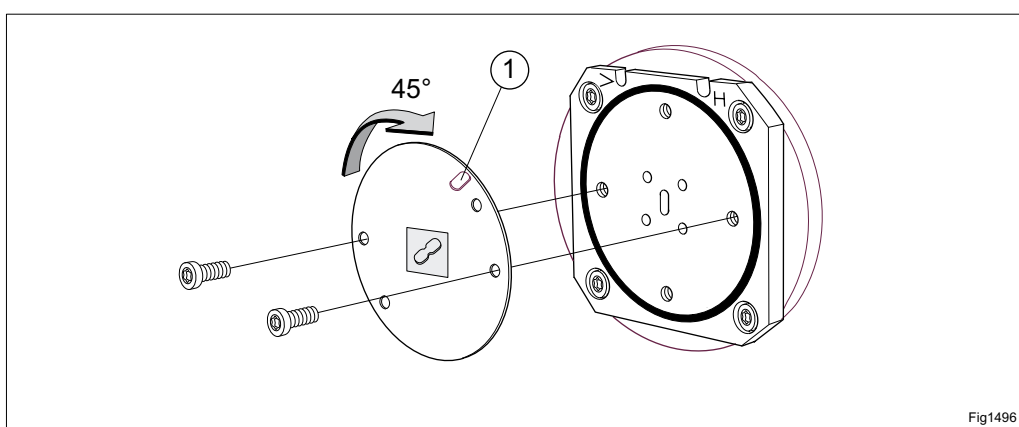


Figure 6-15. Rotating the polarization plate.

4. Rotate the polarization plate 45° clockwise and fasten the screws. The hole ① on the polarization plate is now pointing towards the H.

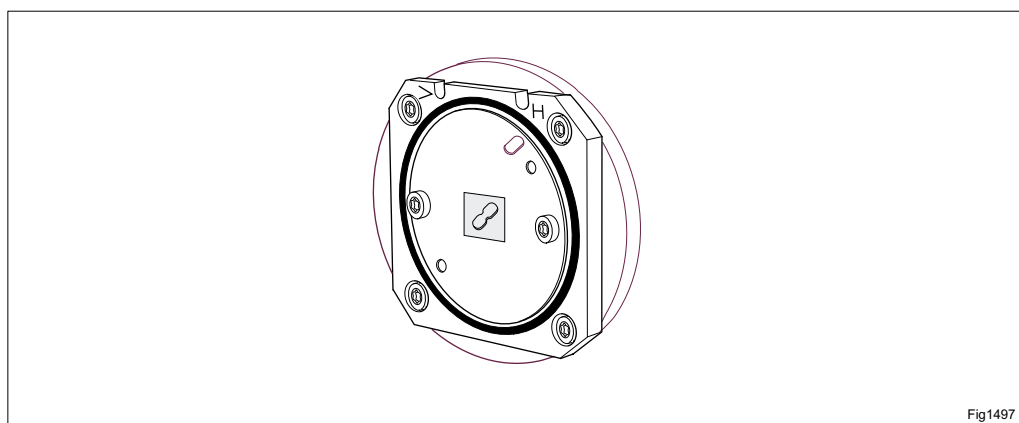


Figure 6-16. The antenna prepared for horizontal polarization.



### 6.5.2 Fitting the Adapter Plate (Optional)

If a 0.3 m or 0.6 m antenna is used, an adapter plate has to be fitted to the antenna before the radio can be installed.

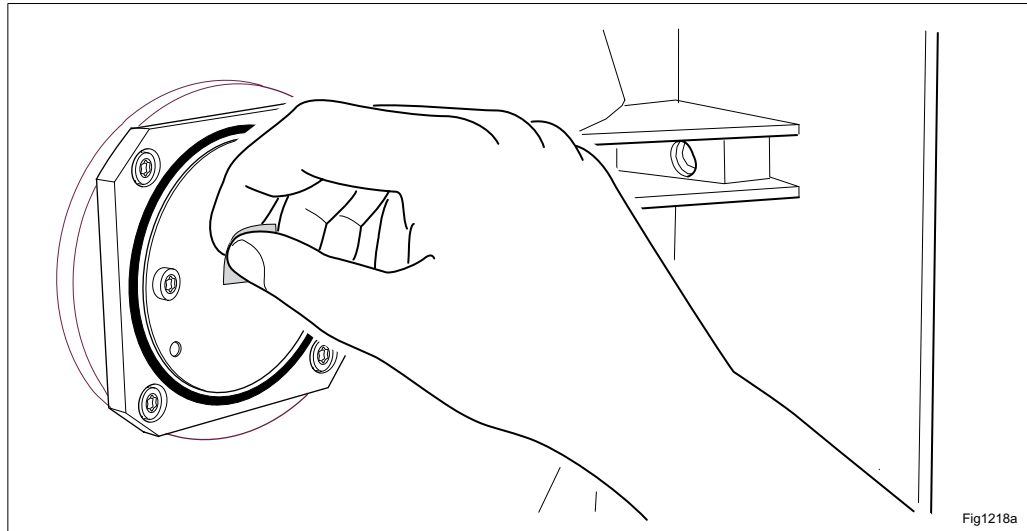


Figure 6-17. Removing the waveguide protection tape from the antenna.

1. Remove the waveguide protection tape from the antenna.

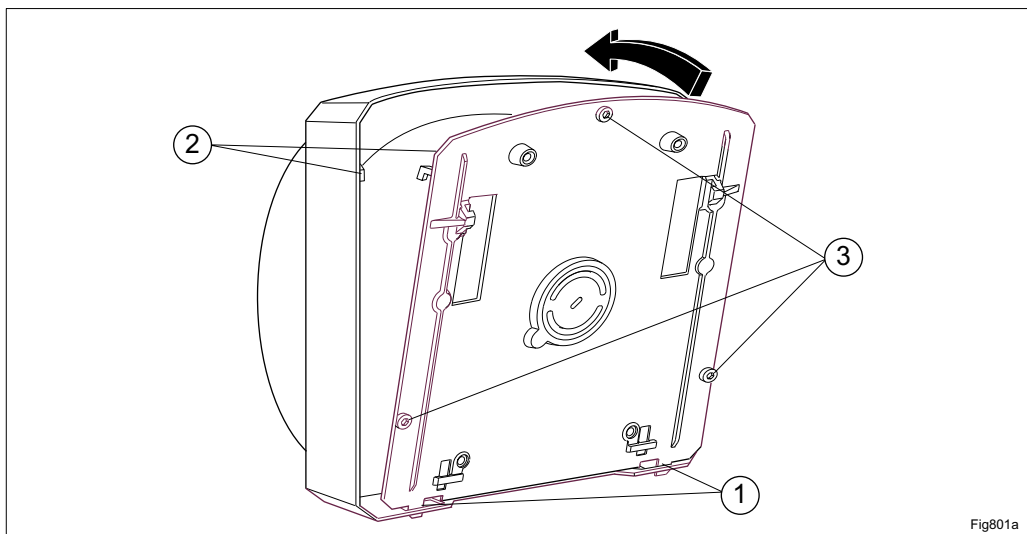


Figure 6-18. Fitting the adapter plate.

2. Position the adapter plate in the corresponding holes, ①, at the bottom of the antenna module and lift the adapter plate over the catches, ②, inside the antenna.
3. Fasten the adapter plate using the three screws, ③.

### 6.5.3 Fitting the Radio Unit to the Antenna (Integrated Installation)

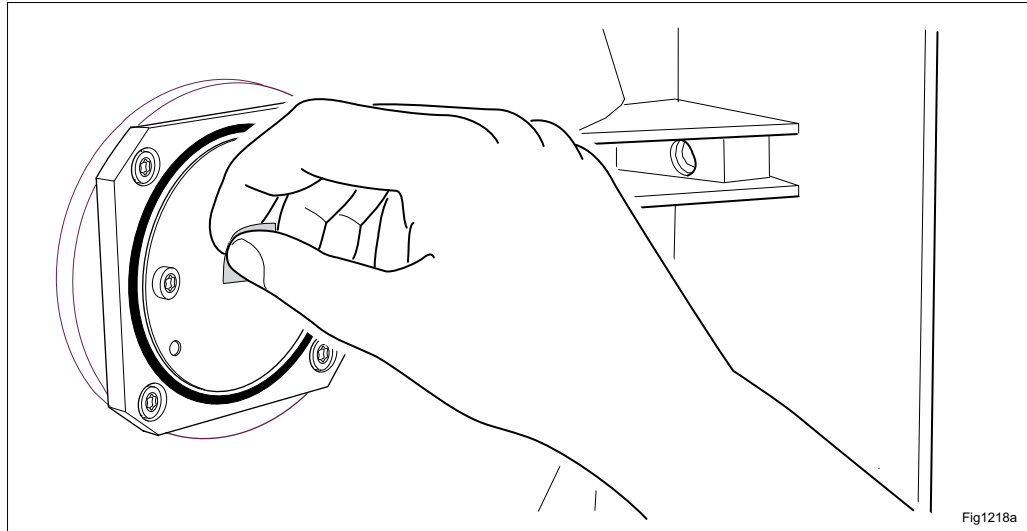


Figure 6-19. Removing the waveguide protection tape from the antenna..

1. Remove the waveguide protection tape from the antenna.

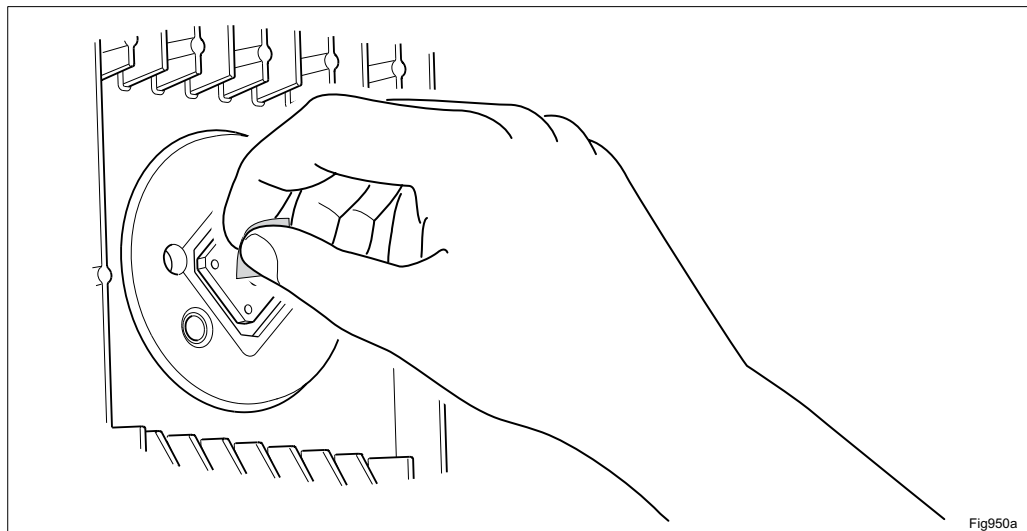


Figure 6-20. Removing the waveguide protection tape from the radio unit.

2. Remove the waveguide protection tape from the radio unit.

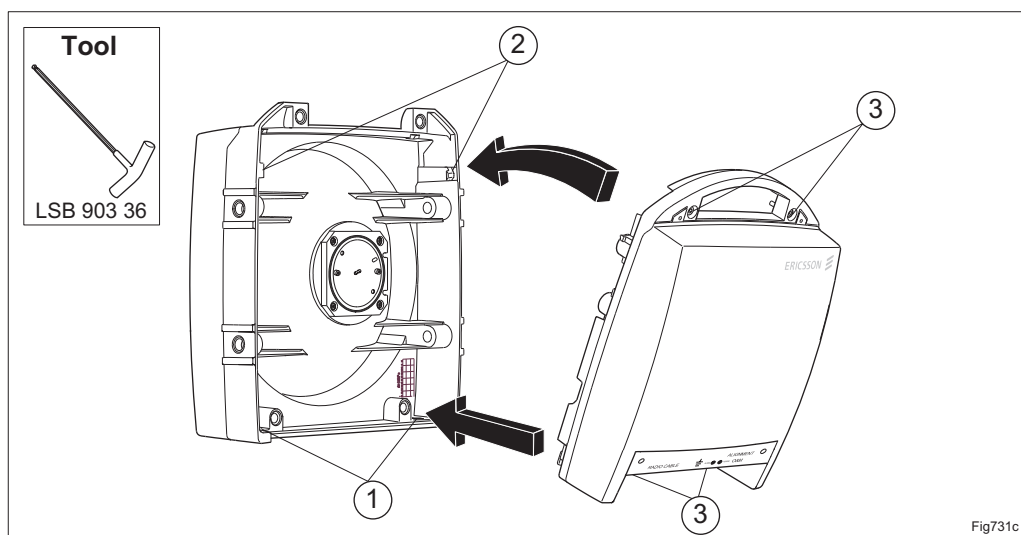
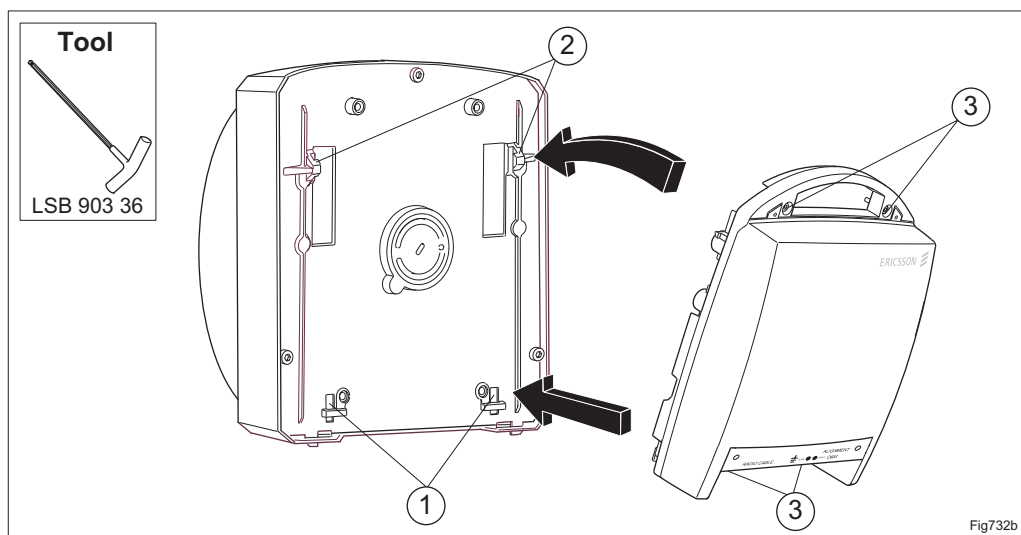


Figure 6-21. Installing the radio unit to the 0.2 m compact antenna.



*Figure 6-22. Installing the radio unit to the 0.3 m antenna.*

3. Position the radio unit in the corresponding holes, ①, at the bottom of the antenna unit and lift it over the catches, ②, inside the antenna.
4. Fasten the radio unit with the four screws, ③.

### 6.5.4 Fitting the Antenna Support (Integrated Installation)

There are two versions of the antenna support. SXX 111 0278/1 is used for 0.3 m and 0.6 m antennas and SXX 111 582/1 is used for the 0.2 m compact antenna. Both supports fits poles with a diameter of 50 to 120 mm and L-profiles between 40x40x5 mm and 80x80x8 mm.

Read the instruction enclosed with the antenna before installing and using the antenna support. Instruction EN/LZT 110 4105 is for SXX 111 0278/1 and EN/LZT 110 5060 is for SXX 111 582/1.

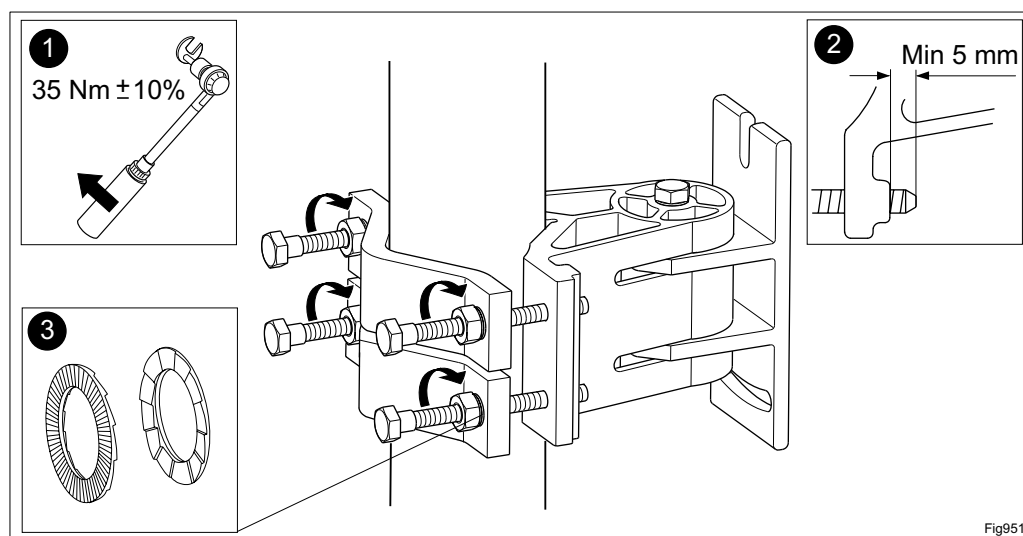


Figure 6-23. Fitting the antenna support SXX 111 582/1

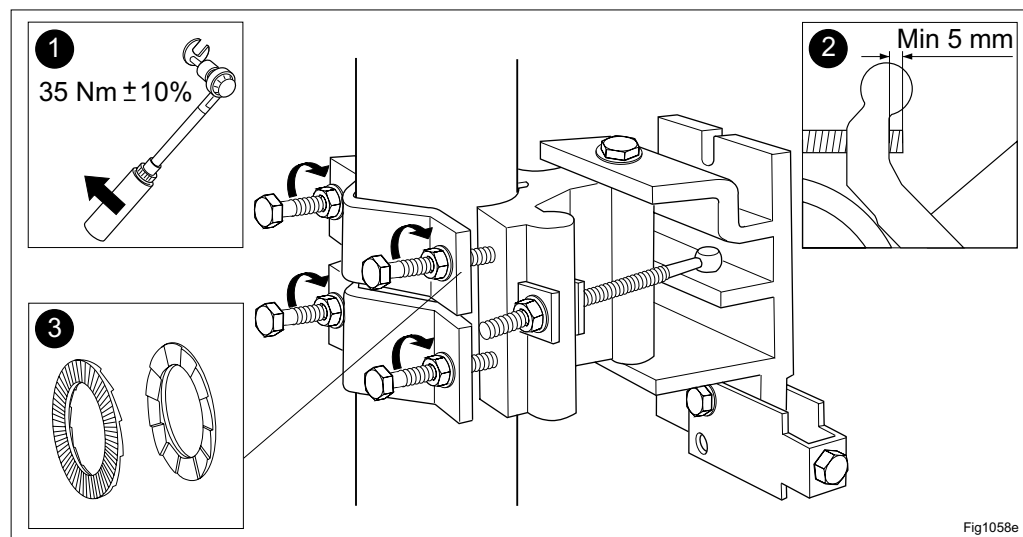


Figure 6-24. Fitting the antenna support SXX 0278/1.

1. Lubricate the screws (for lubricating substance, see section 6.2).
2. Fit the antenna support to the pole and tighten the four screws by using the 16 mm ring and open jaw wrench. The torque is **35 Nm ± 10%** ❶. Position the antenna support so that the antenna points along the radio link path.

**Note:** Make sure the screws protrude at least 5 mm ❷ and that the washers are positioned as shown in the figure above ❸. The washers have different faces. Coarse saw tooth patterns should face and match each other.

### 6.5.5 Fitting the Antenna and Radio to the Antenna Support (Integrated Installation)

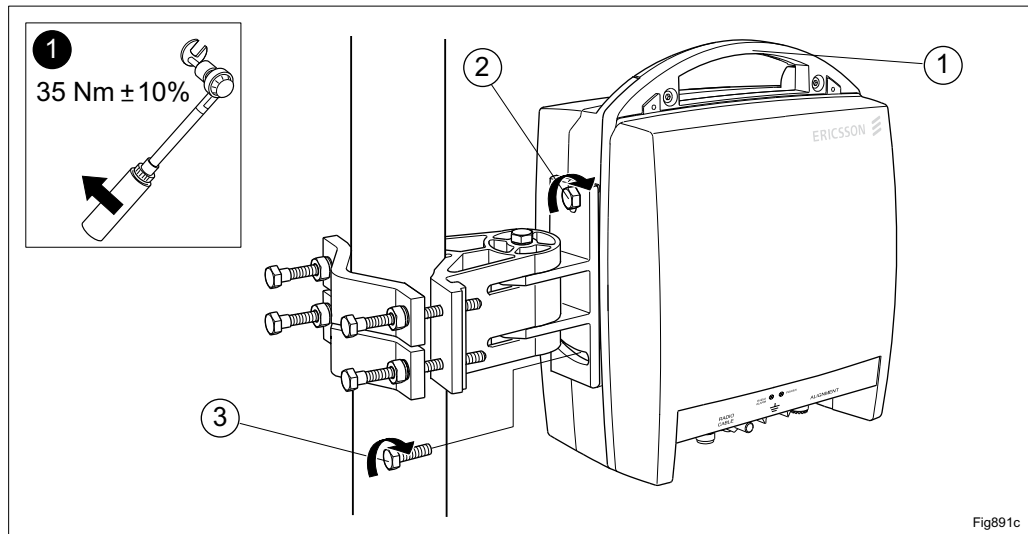


Figure 6-25. Installing the 0.2 m compact antenna.

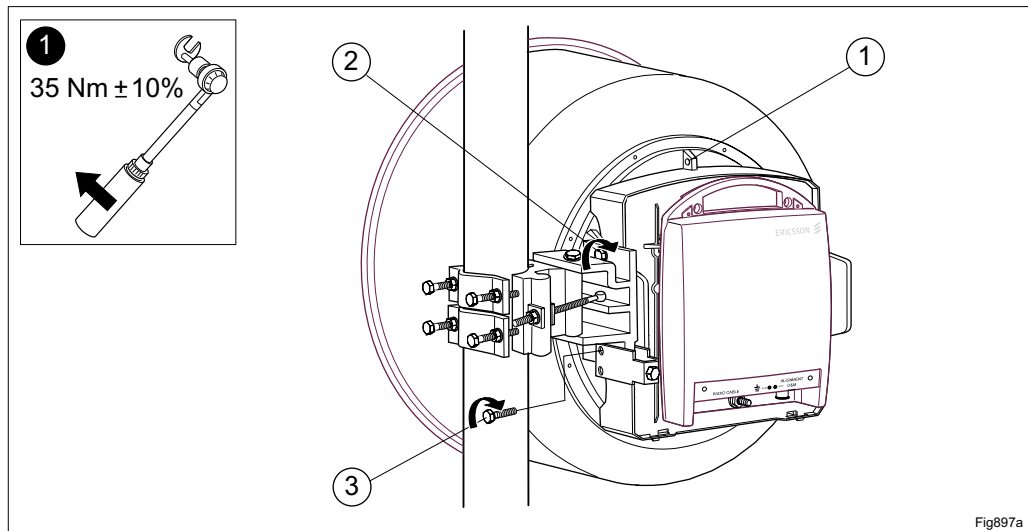


Figure 6-26. Installing the 0.6 m antenna.

The antenna is fitted to the antenna support with two screws.

1. Fasten the screw and washer ② in the upper hole on the side of the antenna.
2. Hoist the antenna and radio unit to the installation site using the handle ① for the 0.2 m compact and 0.3 m antennas, and the hoisting hole ① for the 0.6 m antenna.
3. Position the screw ② on the antenna in the slot on the antenna support and tighten it. The torque is **35 Nm ± 10%** ①.
4. Fasten the screw ③ and washer in the lower hole on the side of the antenna through the antenna support and tighten. The torque is **35 Nm ± 10%** ①.

## 6.6 Separate Installation of the Radio Unit and the Antenna

This section describes the procedure when using the standard mounting kit for installing the radio unit, RAU2, and an antenna. (SXX 111 0278/1 is used for the 0.3 m and 0.6 m antennas and SXX 111 582/1 is used for the 0.2 m compact antenna.) For installation of other antennas than 0.2 m compact, 0.3 m and 0.6 m, and other supports than SXX 111 0278/1 or SXX 111 582/1, a separate instruction is enclosed in the delivery.

### DANGER



All tightening instructions must be carefully followed to prevent the equipment from falling down.

The figure below gives an overview of the installation procedure. Only the installation procedures for the 0.2 m compact and the 0.3 m antenna are shown, since the installation procedure for the 0.6 m antenna is the same as for the 0.3 m antenna.

**Note:** Directly after installing the radio unit, lay and connect the radio cable and switch the power on to avoid moisture in the radio unit.

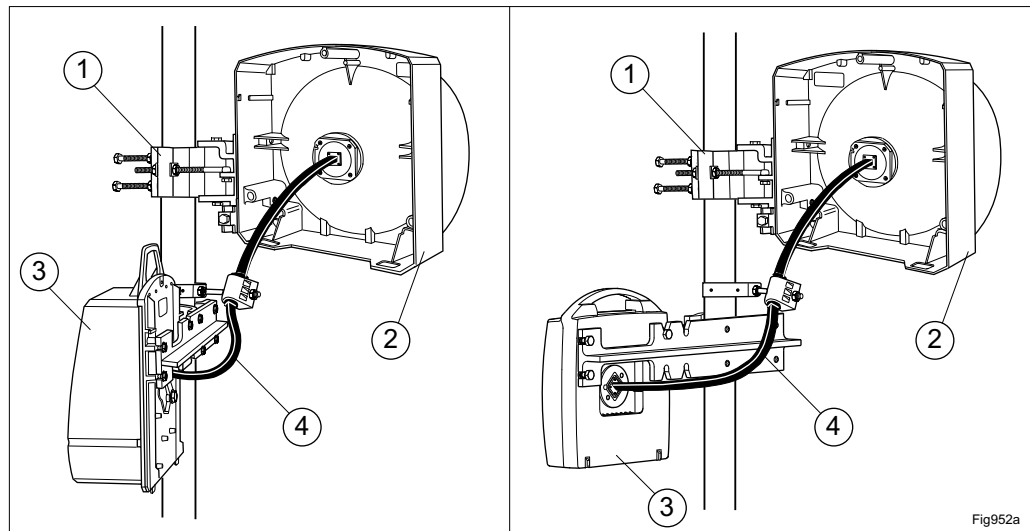


Figure 6-27. Separate installation of the radio unit and the antenna.

- Step 2.1** Fit the antenna feeder (see section 6.6.1).
- Step 2.2** Fit the antenna support ① (see section 6.6.2).
- Step 2.3** Fit the antenna ② to the antenna support (see section 6.6.3).
- Step 2.4** Fit the waveguide lock (see section 6.6.4).
- Step 2.5** Install the radio unit ③ (see section 6.6.5).
- Step 2.6** Fit the flexible waveguide ④ (see section 6.6.6).

Normally, the radio unit is fitted directly to the antenna. In special cases such as for larger antennas, separate installation is required.

Product code for separate mounting kit	Radio unit	Waveguide interface at flexible waveguide
SXK 111 609/X	23 GHz	154 IEC-PBR 220

X=1 for waveguide 0.65 m long

X=2 for waveguide 0.90 m long

Figure 6-28. The product code for the separate mounting kit.

The separate installation kit contains the following parts:

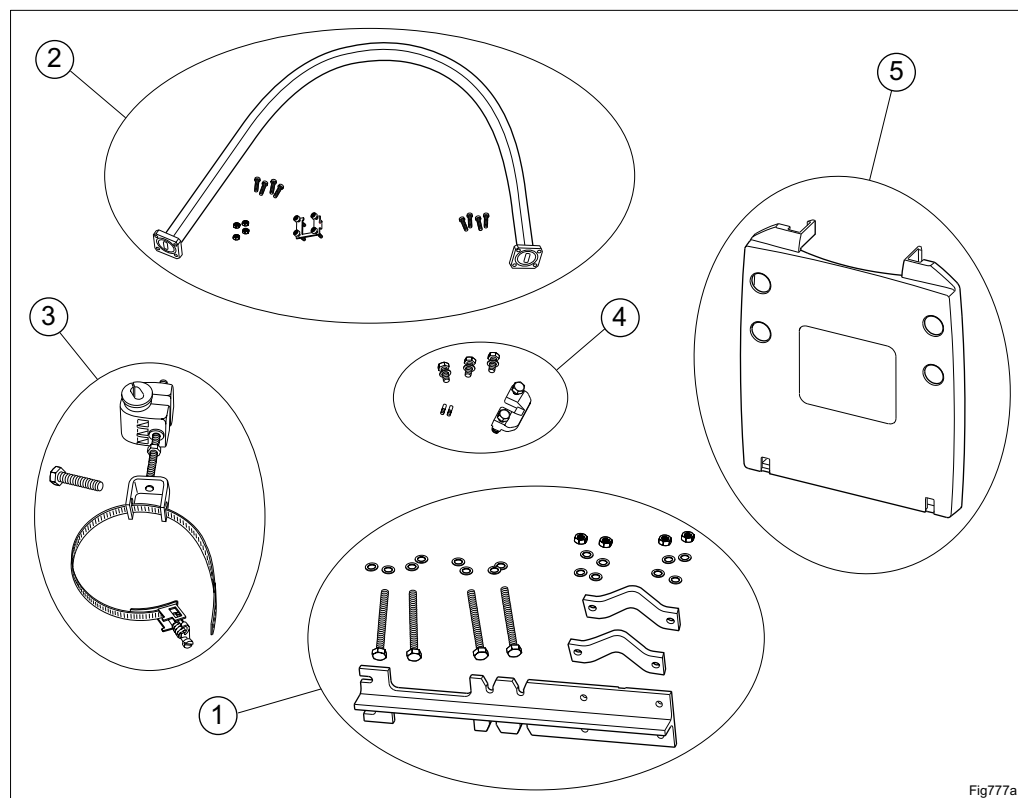


Figure 6-29. The details in the separate mounting kit.

- ① Mounting support with washers, screws and nuts for mounting of radio unit to poles with diameter 50-120 mm.
- ② Flexible waveguide with washer, screws and nuts.
- ③ Supporting arm (clamp kit) for the flexible waveguide, with adjustment screw and hose clamp.
- ④ Waveguide lock and two screws for installation of flexible waveguide to radio unit. Three screws for installing the radio unit to mounting support and two guide pins.
- ⑤ Sun protection plate

### 6.6.1 Fitting the Antenna Feeder (Separate Installation)

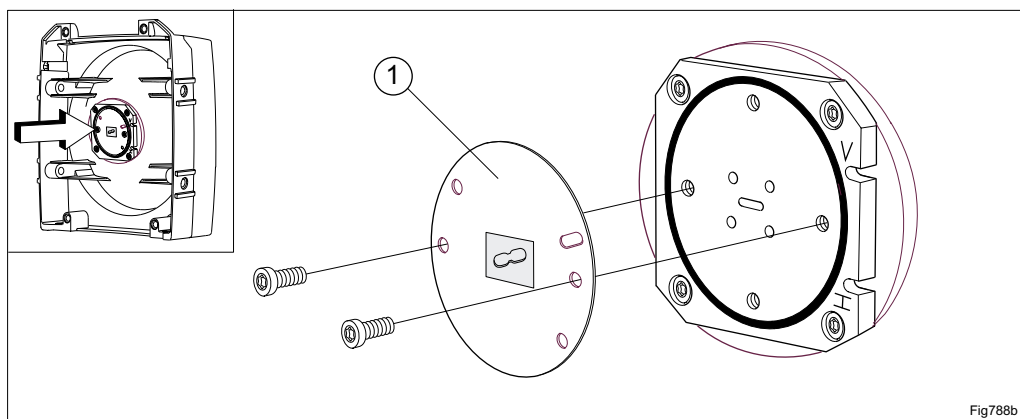


Figure 6-30. Removing the polarization plate.

1. Undo the two screws at the back of the feeder using the Torx screwdriver TX 20 (M4) and remove the polarization plate, ①. It is not used for this application.

The antenna is now prepared for **vertical polarization**. To prepare the antenna for horizontal polarization follow the instructions below.

**Note:** Move the protection tape to the antenna feeder to protect it until the flexible waveguide is installed.

#### Horizontal Polarization

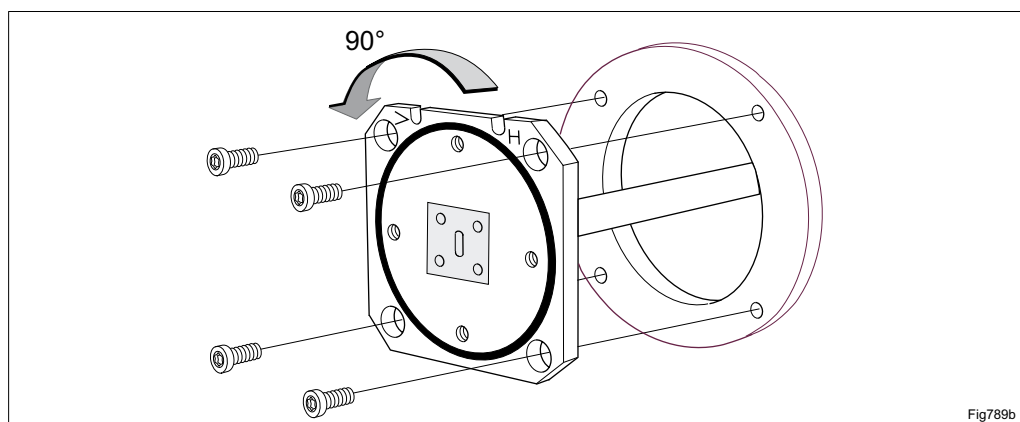


Figure 6-31. Preparing the antenna for horizontal polarization.

1. Undo the 4 screws in the corners of the feeder and rotate the feeder 90° anti-clockwise. Now the two slots in the antenna feeder will be directed upwards.
2. Fasten the feeder using the 4 screws.



### 6.6.2 Fitting the Antenna Support (Separate Installation)

There are two versions of the antenna support. SXX 111 0278/1 is used for 0.3 m and 0.6 m antennas and SXX 111 582/1 is used for the 0.2 m compact antenna. Both supports fits poles with a diameter of 50 to 120 mm and L-profiles between 40x40x5 mm and 80x80x8 mm.

Read the instruction enclosed with the antenna before installing and using the antenna support. Instruction EN/LZT 110 4105 is for SXX 111 0278/1 and EN/LZT 110 5060 is for SXX 111 582/1.

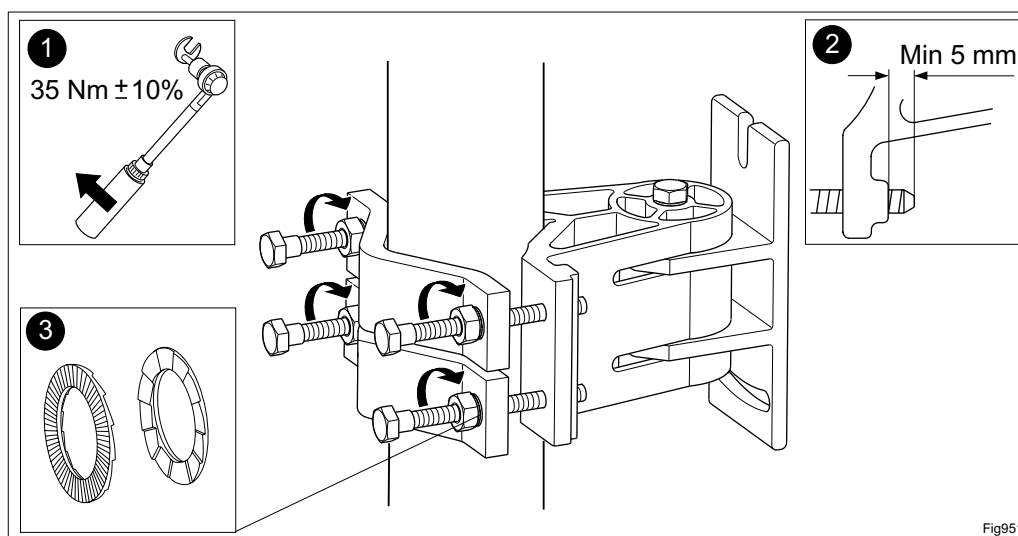


Figure 6-32. Fitting the antenna support SXX 111 582/1.

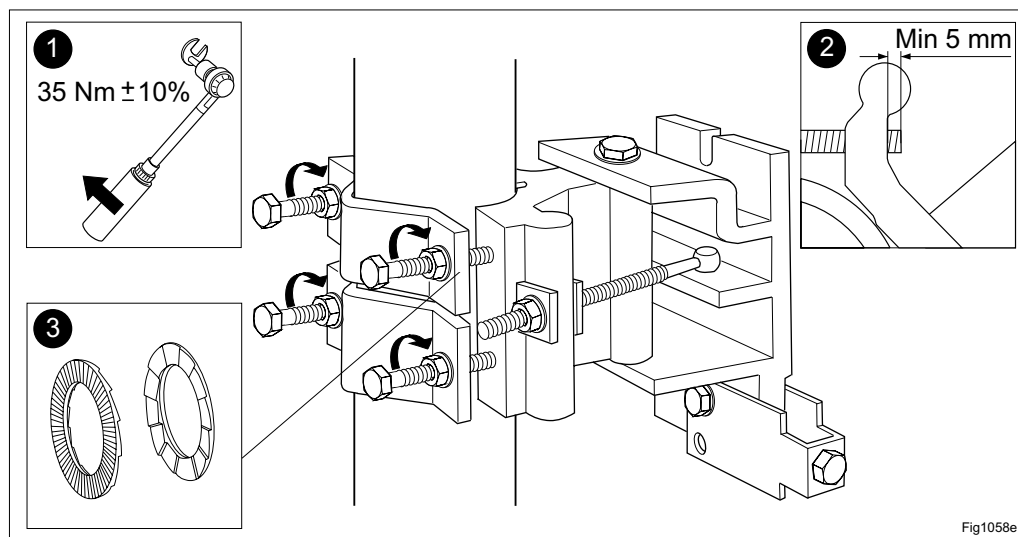


Figure 6-33. Fitting the antenna support SXX 111 0278/1.

1. Lubricate the screws (for lubricating substance, see section 6.2).
2. Fit the antenna support to the pole and tighten the four screws by using the 16 mm ring and open jaw wrench. The torque is **35 Nm ± 10%** ①. Position the antenna support so that the antenna points along the radio link path.

**Note:** Make sure the screws protrude at least 5 mm ② and that the washers are positioned as shown in the figure above ③. The washers have different faces. Coarse saw tooth patterns should face and match each other.

### 6.6.3 Fitting the Antenna (Separate Installation)

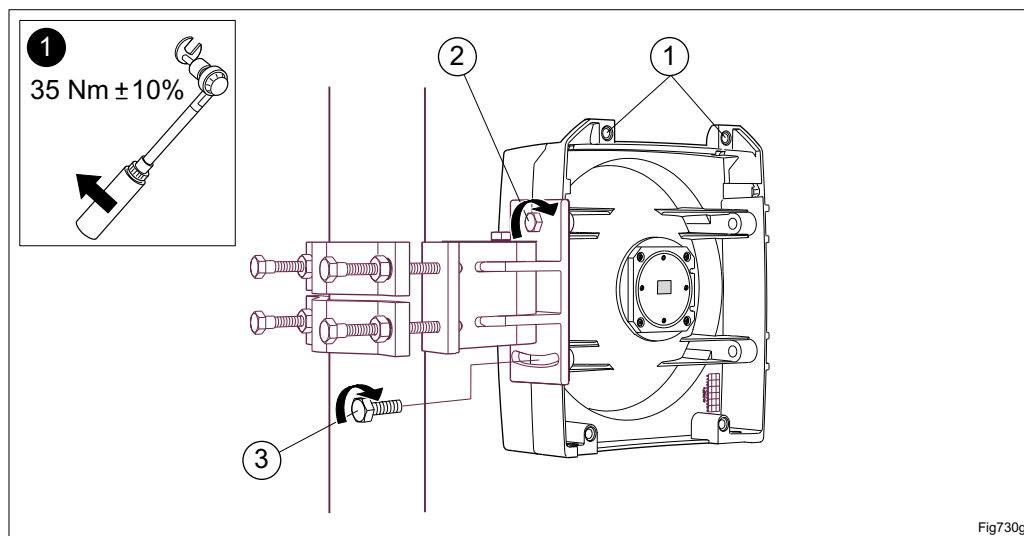


Figure 6-34. Installing the 0.2 m compact antenna.

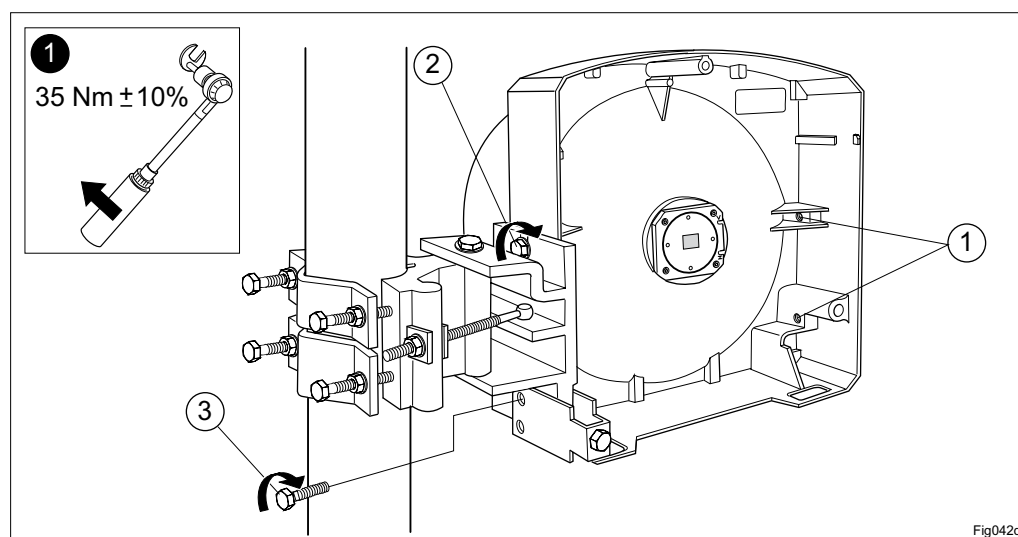
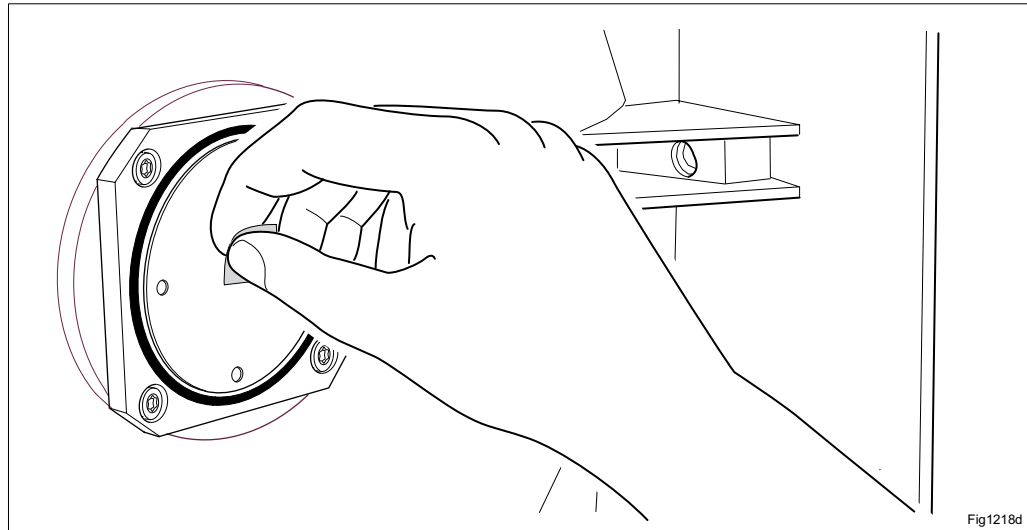


Figure 6-35. Installing the 0.3 m antenna.

The antenna is fitted to the antenna support by two screws.

1. Fasten the screw and washer ② in the upper hole on the side of the antenna.
2. Hoist the antenna and radio unit to the installation site using the hoisting holes ①.
3. Position the screw ② on the antenna in the slot on the antenna support and tighten it. The torque is **35 Nm ± 10%** ①.
4. Fasten the screw ③ and washer in the lower hole on the side of the antenna through the antenna support and tighten. The torque is **35 Nm ± 10%** ①.



*Figure 6-36. Removing the waveguide protection tape from the antenna.*

- 5.** Remove the waveguide protection tape from the antenna before installing a flexible waveguide or a power splitter.

### 6.6.4 Fitting the Waveguide Lock (Separate Installation)

The waveguide lock must be fitted before the radio unit is hoisted to the mast.

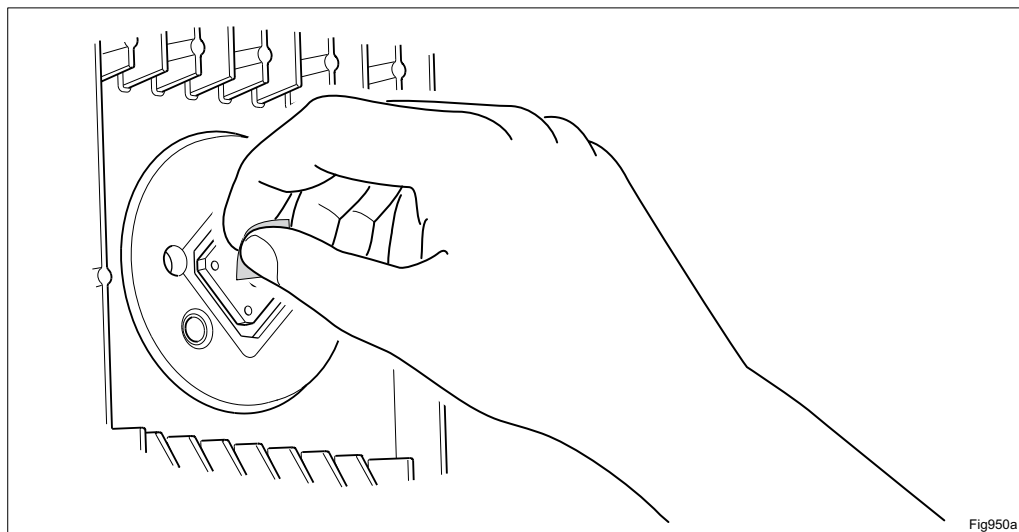


Figure 6-37. Removing the waveguide protection tape from the radio unit.

1. Remove the waveguide protection.
2. Lubricate the screws and guide pins (for lubricating substance, see section 6.2).

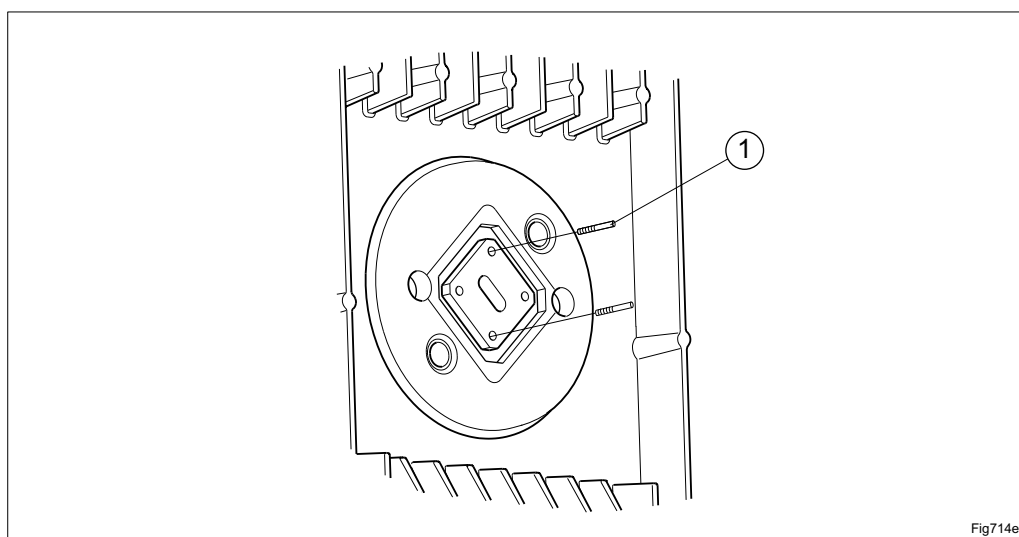
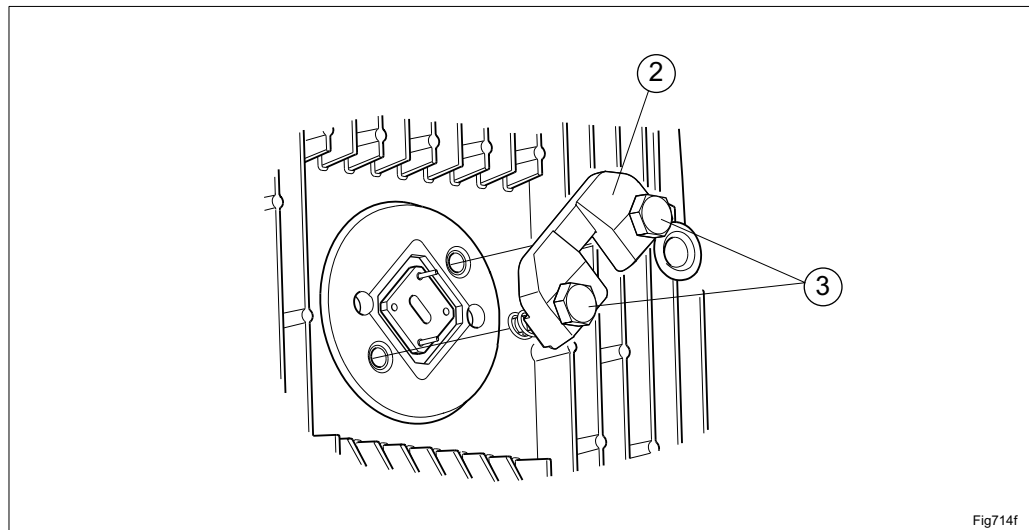


Figure 6-38. Fastening the guide pins.

3. Fasten the two guide pins ① in the small holes on the radio unit.



*Figure 6-39. Fitting the waveguide lock.*

4. Fit the waveguide lock ②, to the back of the radio unit and tighten the screws ③, by hand.

### 6.6.5 Installing the Radio Unit (Separate installation)

1. Lubricate the screws (for lubricating substance, see section 6.2).

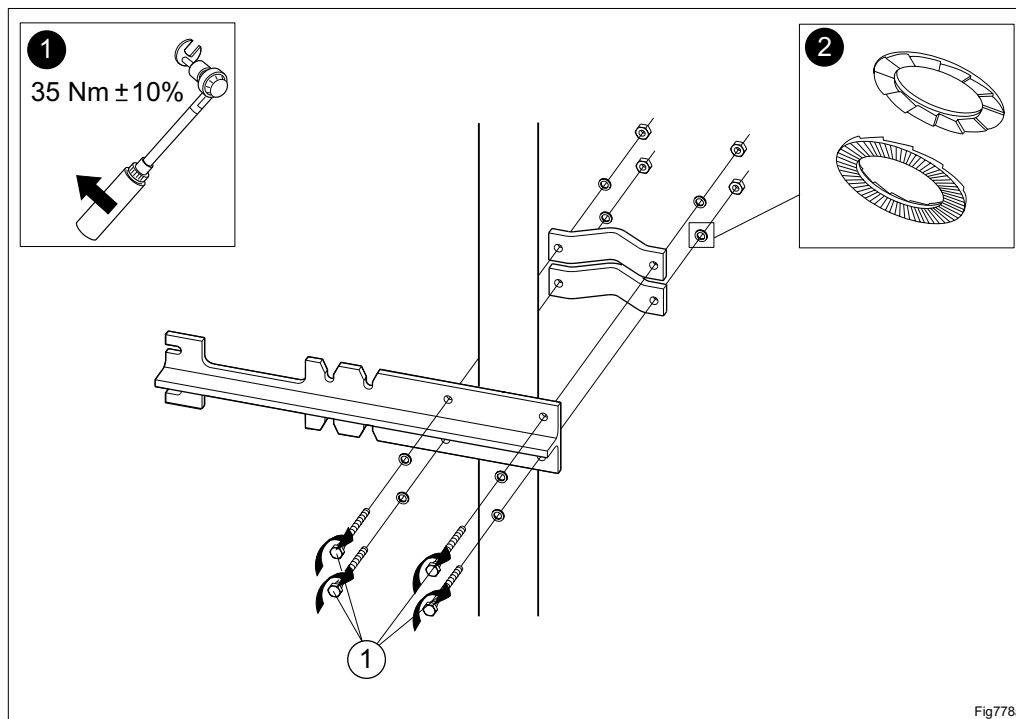


Figure 6-40. Fitting the radio mounting kit.

2. Attach the support to the pole and tighten the screws, ①. The torque is  $35 \text{ Nm} \pm 10\%$  ①. Ensure the washers are positioned as shown in the figure ②.

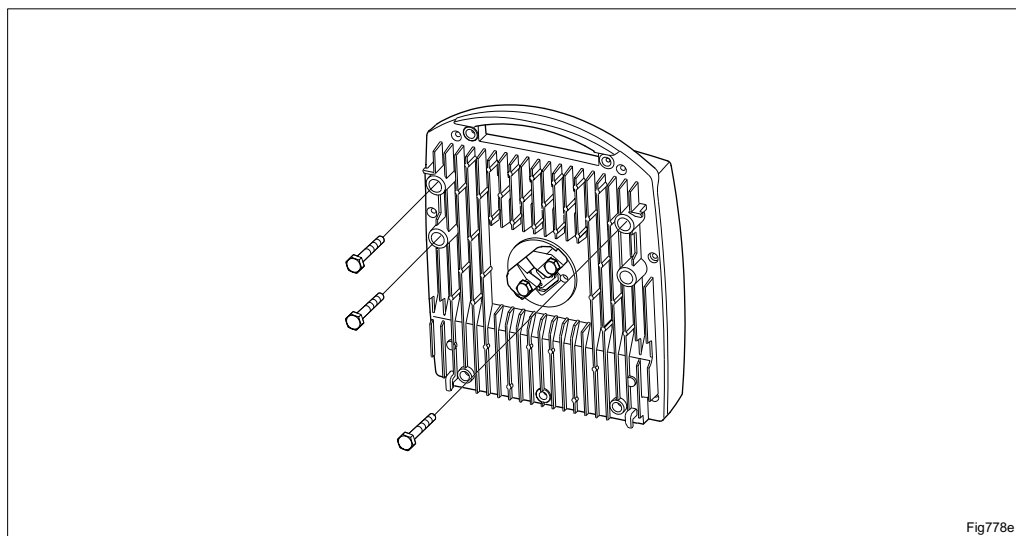


Figure 6-41. Attaching the screws

3. Attach two of the screws at the far end of the radio unit, and the third at the near end.

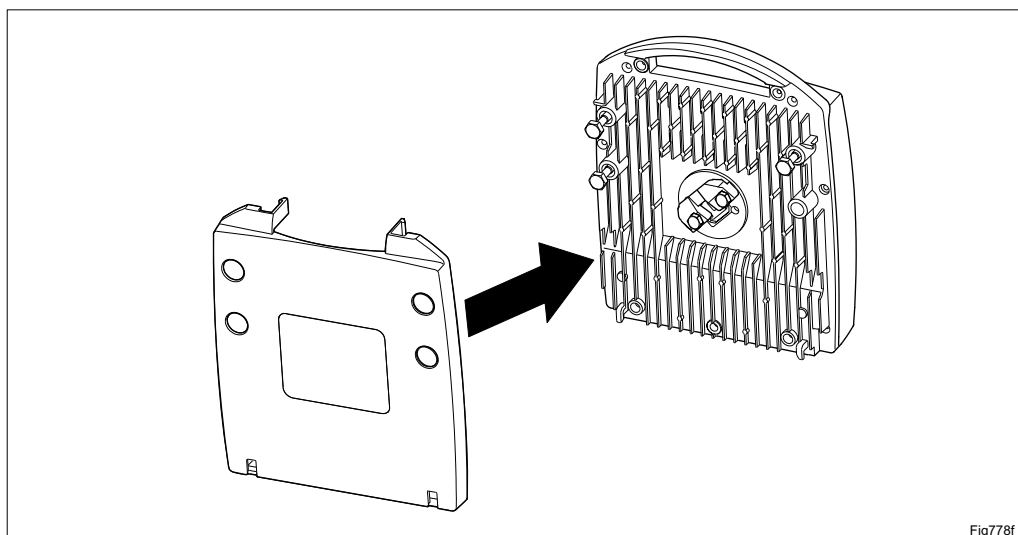


Figure 6-42. Snapping on the sun protection plate.

4. Snap on the sun protection plate.
5. Hook on the radio to the support.

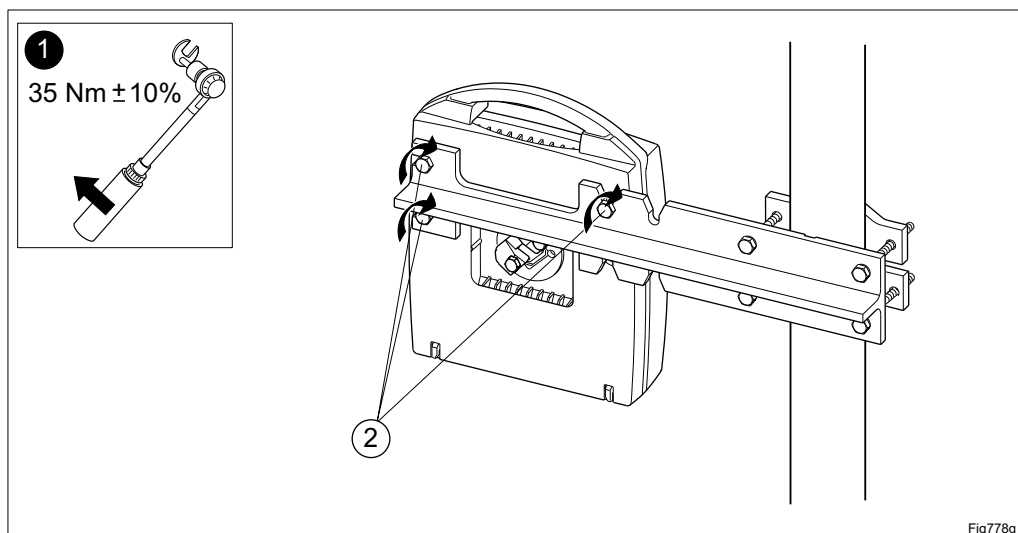


Figure 6-43. Installing the radio unit.

6. Tighten the screws, ②. The torque is **35 Nm ± 10%** ①. Use the 16 mm ring and open jaw spanner.

### 6.6.6 Installing the Flexible Waveguide

**CAUTION**  
**!**

The flexible waveguide is very fragile and must be handled with care.

- Transport the waveguide in its original packaging until it is installed. Leave the protective end caps on until the waveguide flanges are fitted to the radio unit and the antenna.
- Be cautious about sharp cutting edges that can damage the waveguide.
- Make sure the waveguide never supports any weight.
- Do not leave one end of the waveguide hanging loose without supporting it close to its final fixing point.
- Do not stretch the waveguide to make it fit if it is too short. Move the equipment closer to each other or use a different waveguide.

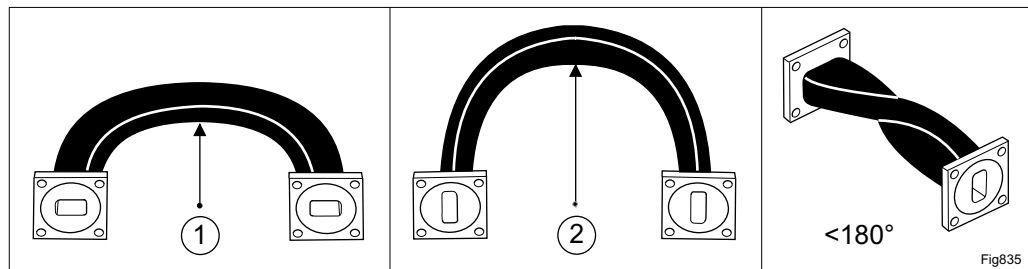


Figure 6-44. The H-bend, E-bend and maximum twisting angle.

- Do not twist the waveguide more than 180° or bend it harder than the minimum bending radius (H-bend, ①, and E-bend, ②) printed on the flexible waveguide.



### Fitting the Optional Power Splitter and Flexible Waveguide to the Antenna Unit

The power splitter is used for 1+1 systems with a single polarized antenna. The power splitter is fitted directly to the 0.2 m compact, 0.3 m and 0.6 m single polarized antennas. The power splitter is available in two versions per frequency band:

- Asymmetrical, mainly for 1+1 hot standby systems.
- Symmetrical, mainly for 1+1 working standby systems.

Product code	Type	Attenuation
UPA 101 010/1	23 GHz	1.6/7 (asymmetrical)
UPA 101 010/2		3.5/3.5 (symmetrical)

Figure 6-45. The product code for the power splitter.

Two kits for separate installation are required (including flexible waveguides). The power splitter is installed as described below:

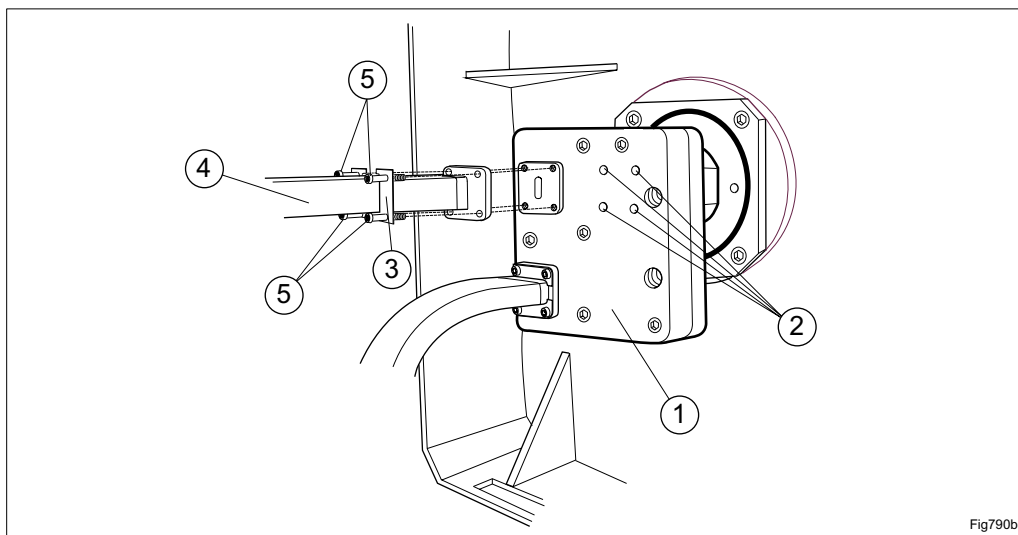


Figure 6-46. Fitting the power splitter.

1. Remove the three waveguide protections from the power splitter ①.
2. Check that the O-ring is properly located in the flange groove at the interface between the power splitter and the feeder.
3. Fasten the power splitter to the antenna module with the four screws ② using the Torx screwdriver TX 10 (M3). Position the washer ③ on the flexible waveguide.
4. Check that the O-ring is properly located in the waveguide flange groove.
5. Fasten the flexible waveguides ④ on the power splitter with the four screws ⑤ using the Torx screwdriver TX 10 (M3).

### Fitting the Optional Power Splitter on a Separate Support

In special cases, such as for large antennas, separate installation of the power splitter is required.

The following accessories are required to install the power splitter on a separate support:

- Mounting kit SXX 111 0340 for fitting on poles with diameter 50-114 mm.
- Two kits for separate installation (including flexible waveguides).
- One flexible waveguide kit.
- One waveguide clamp kit.

The power splitter is installed as described below:

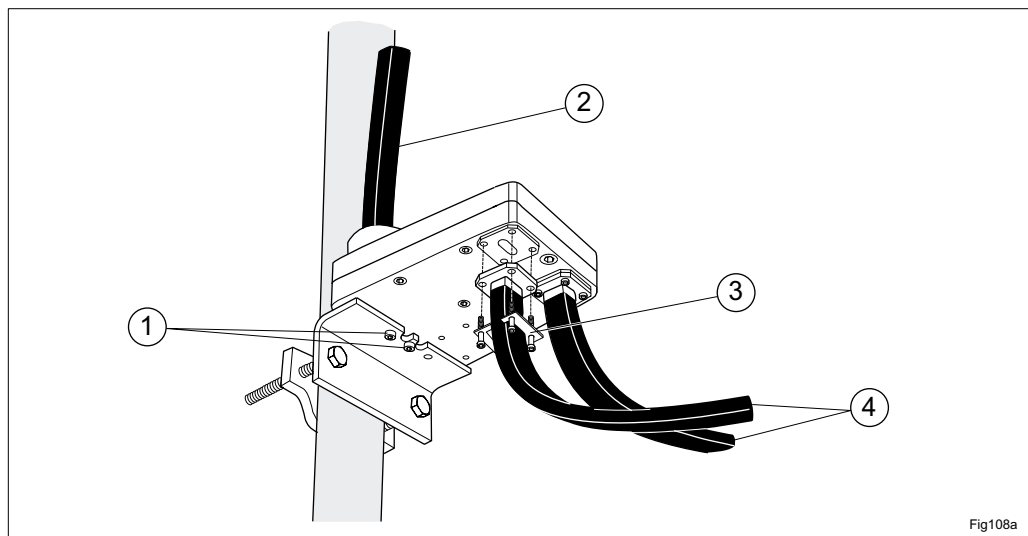


Figure 6-47. Fitting the power splitter, using a separate support.

1. Fit the support to the mast. Tighten the nuts using the 16 mm ring and open jaw wrench.
2. Fit the power splitter to the support, using the two screws ①.
3. Remove the three waveguide protections from the power splitter.
4. Fasten the flexible waveguide ② to the power splitter. Check that the O-ring is properly located in the flange groove at the interface between the power splitter and the flexible waveguide.
5. Fasten the other end of the flexible waveguide to the antenna.
6. Position the washer ③ on the flexible waveguide.
7. Fasten the flexible waveguides ④ from radio unit 1 and 2 on the power splitter with the four screws using the Torx screwdriver TX 10 (M3). Check that the O-rings are properly located in the waveguide flange grooves.

## Fitting the Flexible Waveguide to the Antenna Unit

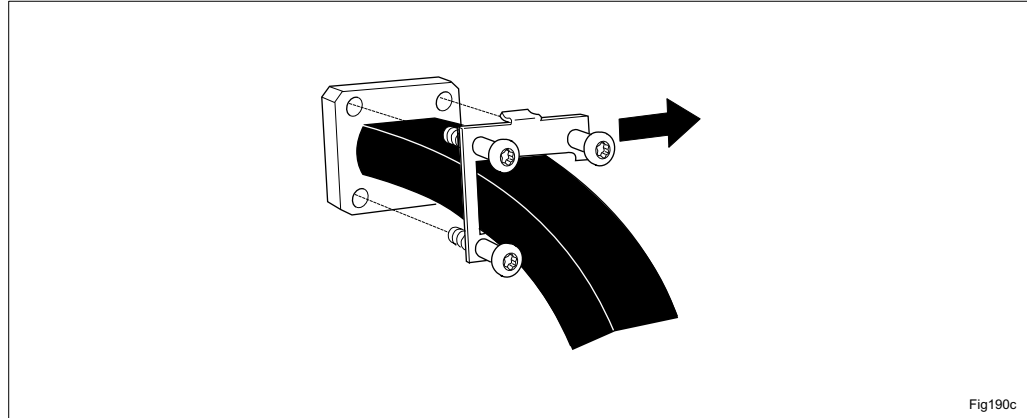


Figure 6-48. Fitting the washer on the flexible waveguide.

1. Position the washer on the flexible waveguide.
2. Make sure the O-ring is properly located in the waveguide flange groove.
3. Remove the waveguide protection tape from the antenna.

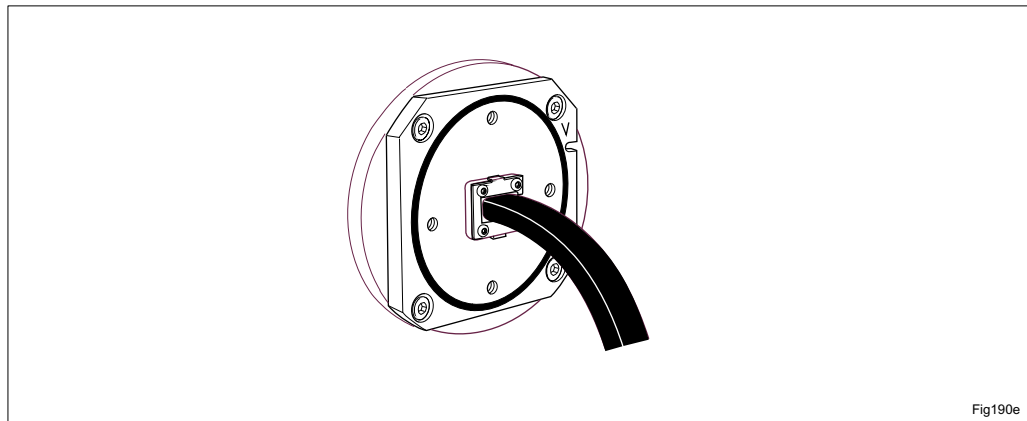


Figure 6-49. Fastening the flexible waveguide on the antenna.

4. Fasten the flexible waveguide on the antenna unit with the four screws using the Torx screwdriver, TX 10 (M3).

### Fitting the Flexible Waveguide to the Radio Unit

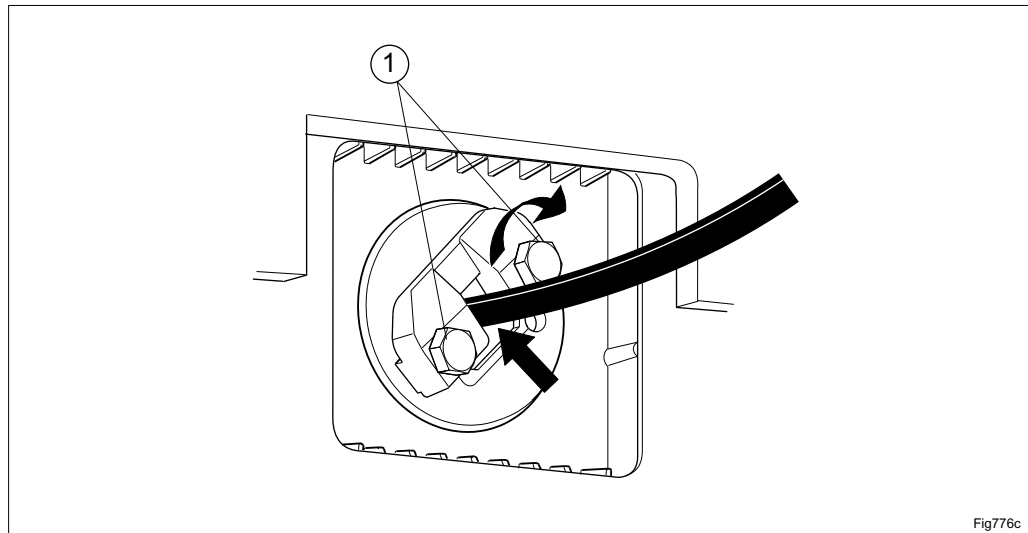


Figure 6-50. Fitting the flexible waveguide to the radio unit.

1. Make sure the O-ring is properly located in the waveguide flange groove.
2. Fit the flexible waveguide on the radio unit under the waveguide lock.
3. Fix the waveguide with the waveguide lock screws ①, tighten gently. Use the 16 mm ring and open jaw wrench.

### Fitting the Flexible Waveguide Support Arm

The support arm must be used to ensure that the flexible waveguide is not damaged.

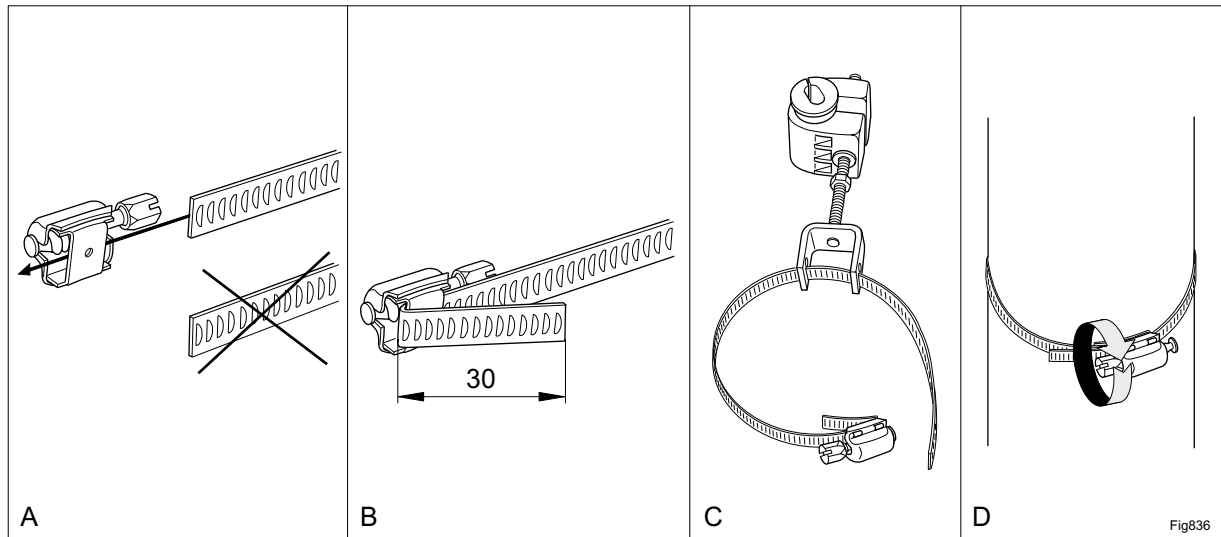


Figure 6-51. Fitting the hose clamp.

1. Fasten the hose clamp around the pole, as shown in the figure above.  
Use the screw to tighten the hose clamp. (Frame D)

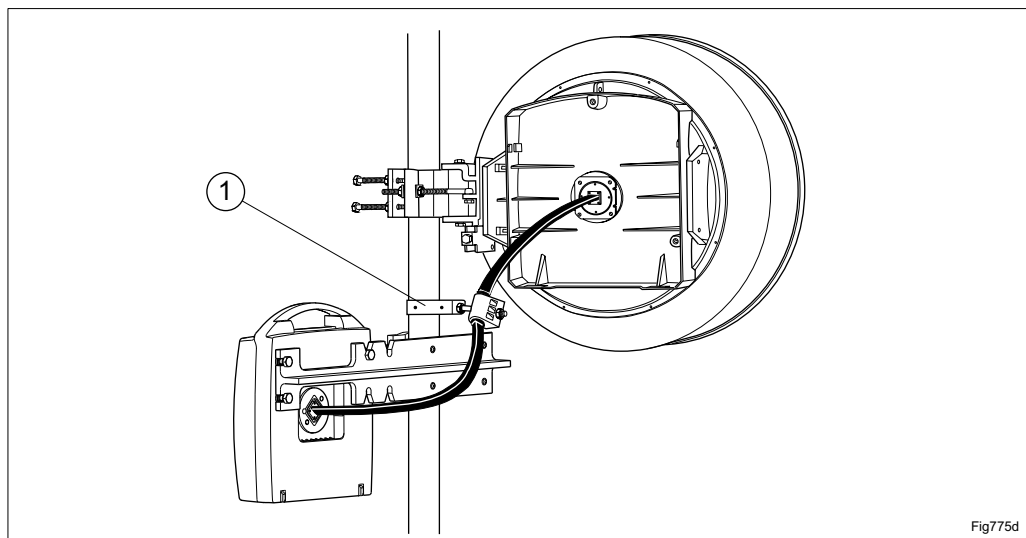


Figure 6-52. The support arm fitted to a flexible waveguide in separate installation of radio unit and antenna.

2. Fasten the flexible waveguide in the clamp, ①. Use the rubber bushing with the big hole for MINI-LINK 23-E

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# 7 Radio Cable Installation

## 7.1 Introduction

This chapter describes the recommended installation procedure for the radio cable between the radio and the access module. The first sections, 7.1 to 7.3, contain general information such as installation equipment and product codes. Read the general information to make sure you have the correct tools and equipment. The last sections contain job instructions.

The figure below gives an overview of the installation procedure.

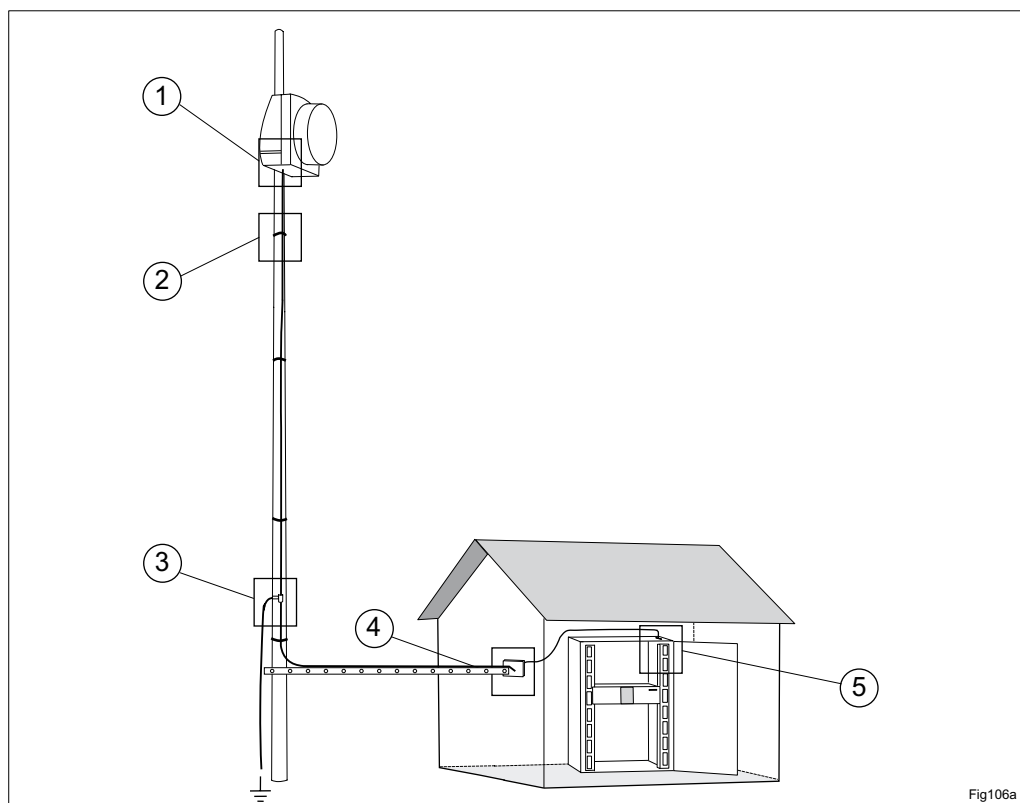


Figure 7-1. The radio cable installation.

- Step 1** Prepare the radio cable (See section 7.4)
- Step 2** Connect the cables to the radio unit ① (See section 7.6)
- Step 3** Fasten radio cable with clamp kit ② (See section 7.7)
- Step 4** Earth the radio cable ③ (See section 7.8)
- Step 5** Fit the wall gland, ④ (See section 7.9)
- Step 6** Connect the radio cable to the indoor unit ⑤ (See section 7.10)



### 7.1.1 Radio Cable Data and Installation Accessories

Product code	Outer Diameter	Maximum length	Connector kit	Wall gland	Earthing kit
TZC 500 32	10 mm	200 m	SXK 111 511/1 <sup>1)</sup>	NDM 125 14/1 / NTM 101 208/1	NGT 211 04/7
TZC 501 26	16 mm <sup>2)</sup>	400 m	SXK 111 511/2	NDM 125 14/1 / NTM 101 208/1	NGT 211 04/2
TZC 501 22	28 mm <sup>3)</sup>	700 m	SXK 111 511/3	NTM 101 208/1	NGT 211 03/2

Product code	Outer Diameter	Minimum bending radius	Clamp kit	Straps
TZC 500 32	10 mm	100 mm	6/NTM 201 230/X <sup>4)</sup>	SET 125 06/1
TZC 501 26	16 mm	125 mm	NTM 201 215/X <sup>4)</sup>	SET 125 06/1
TZC 501 22	28 mm	250 mm	6/NTM 201 230/1	

Figure 7-2. Information about the radio cable and the installation accessories.

### 7.1.2 Cable length in 1+1 configurations

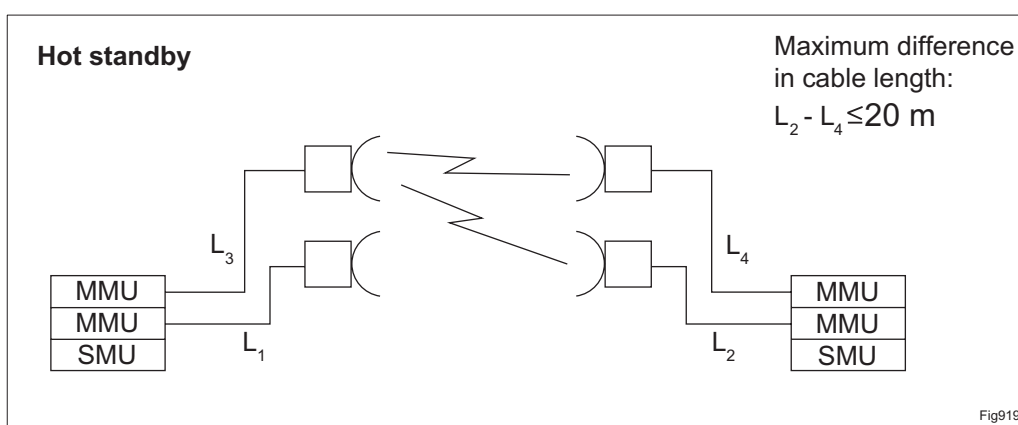


Figure 7-3. Maximum cable length for hot standby in 1+1 configurations.

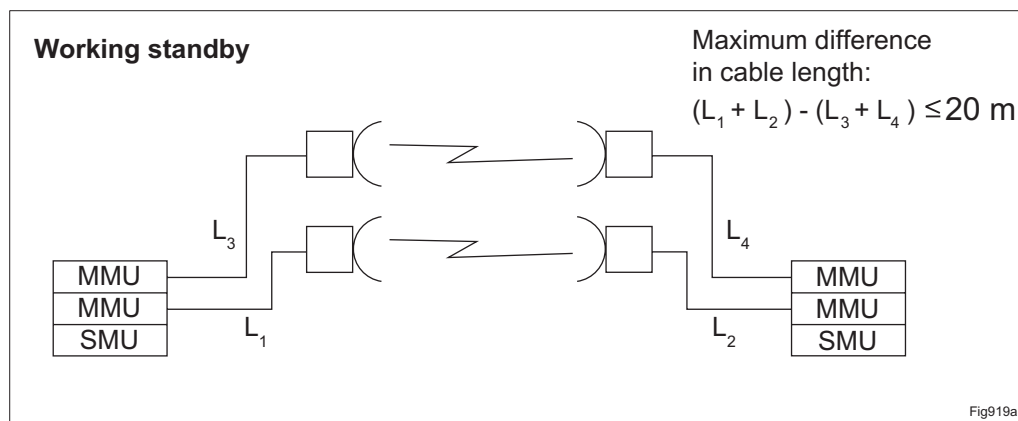


Figure 7-4. Maximum cable length for working standby in 1+1 configurations.

<sup>1)</sup> Included in delivery of RAU

<sup>2)</sup> Sometimes called 1/2 "

<sup>3)</sup> Sometimes called 7/8 "

<sup>4)</sup> X can be either 2 or 4. X=2 means 2 clip kits, and X=4 means 4 clip kits.

## 7.2 Earthing Recommendations

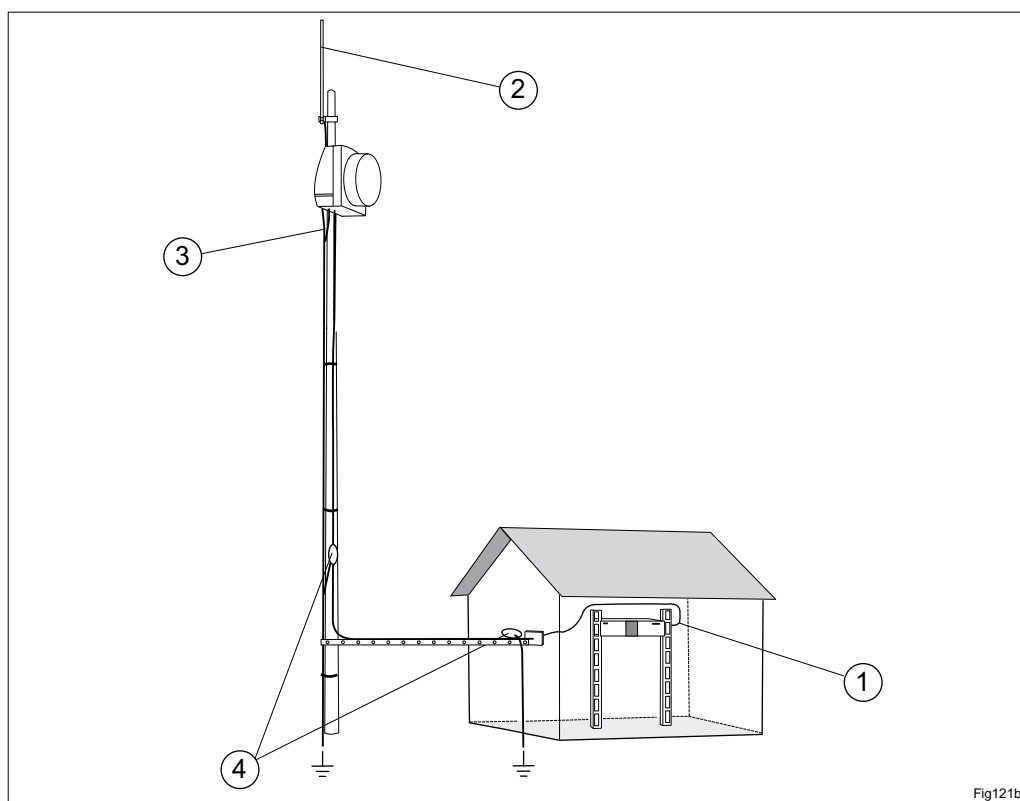


Figure 7-5. Earthing recommendations on a site.

We recommend a combination of several pieces of earthing equipment for the MINI-LINK E sites, unless there are other national standards which need to be considered. The combination consists of:

- ① Indoor earthing
- ② Lightning rod (SXX 111 515/1)
- ③ Radio earthing cable (SXX 111 514/3)
- ④ Cable earthing kits (NGT 211 04/7 for 10 mm , NGT 211 04/2 for 16 mm and NGT 211 03/2 for 28 mm),

This earthing combination will withstand even severe conditions. Normally the outdoor earthing equipment is connected to a separate earthing cable. The radio cable is recommended to be earthed in its lower part, for example before entering a building, and for long cables every 50 metres. It is also recommended to earth the cable before sharp bends.

If the earthing has been properly done, the system has good protection against over voltage.

## 7.3 Installation Equipment

The following tools and equipment are required for the cabling between the radio and the access module:

- Cable jacket cutter, LTX 102 17
- Socket head cap screwdriver for tightening of wall gland (M4)
- Connector kit for radio cable, SXX 111 511/1 (included in delivery)
- Earthing kit, NGT 211 04/7
- Wall gland, NDM 125 14/1
- Radio cable clamp kit, 6/NTM 201 230/42
- Cable clamp pliers, LSD 349 20
- Two 13 mm ring and open jaw wrench
- 14 mm ring and open jaw wrench
- 16 mm ring and open jaw wrench

## 7.4 Preparation of the Radio Cable

The connector kit is included in the RAU delivery.

See section 7.1.1 for more information on radio cable data and installation accessories.

This instruction applies to radio cable TZC 500 32 (outer diameter 10 mm, maximum length, 200 m) and connector kit SXX 111 511/1 version  $\geq$  R4C for connection between the radio unit and the modem unit (MMU).

Make sure the radio cable is handled with care at preparation in order not to deform or tear it.

### 7.4.1 Installation equipment

- Cable jacket cutter, LTX 102 17
- Knife
- Cutting pliers
- Chamfering tool, LDK 901 02/1 or a fine file
- One 16 mm and one 14 mm open jaw wrench

### 7.4.2 Installation/preparation

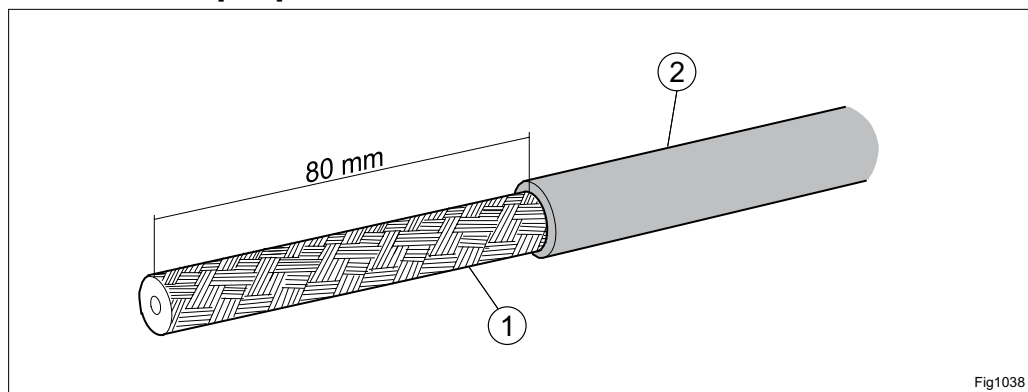


Figure 7-6. Stripping the jacket.

1. Straighten the cable end.
2. Strip the jacket ② approximately 80 mm using a cable jacket cutter (LTX 102 17) or knife.

**Note:** Be careful in order not to damage the shield ①.

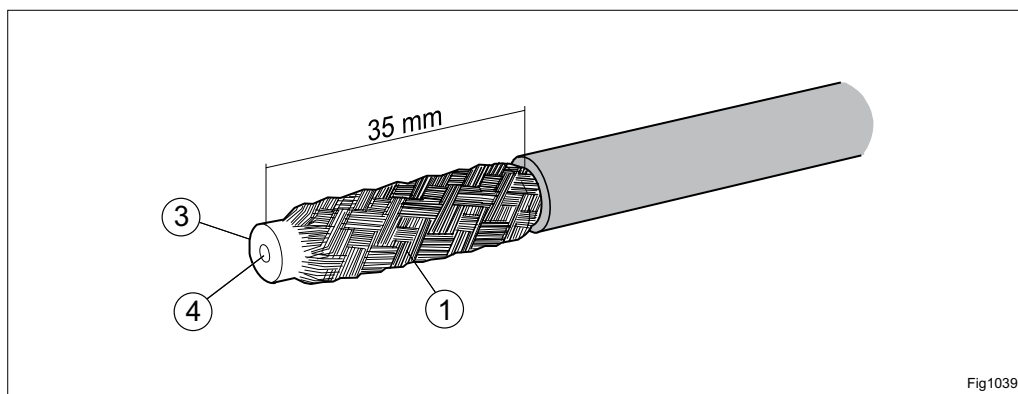


Figure 7-7. Cutting the dielectric and the centre conductor.

3. Push back the shield ①.
4. Cut the dielectric ③ and centre conductor ④ approximately 35 mm from the jacket end using a pair of cutting pliers.

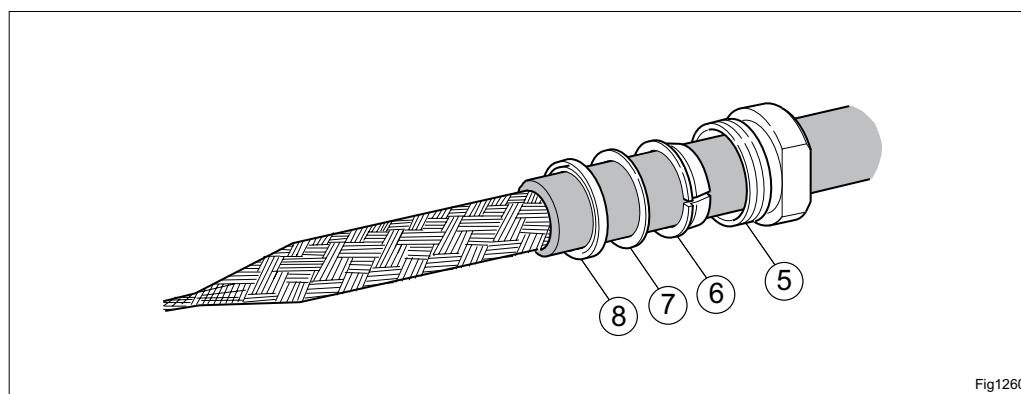


Figure 7-8. Pulling the shield and sliding on the screw nut, the conical case, the washer and the gasket.

5. Pull the shield forward and shape it to a pointed end, keeping it stretched.
6. Slide the rear nut ⑤, the conical case ⑥, the washer ⑦, and the gasket ⑧ onto the cable jacket.

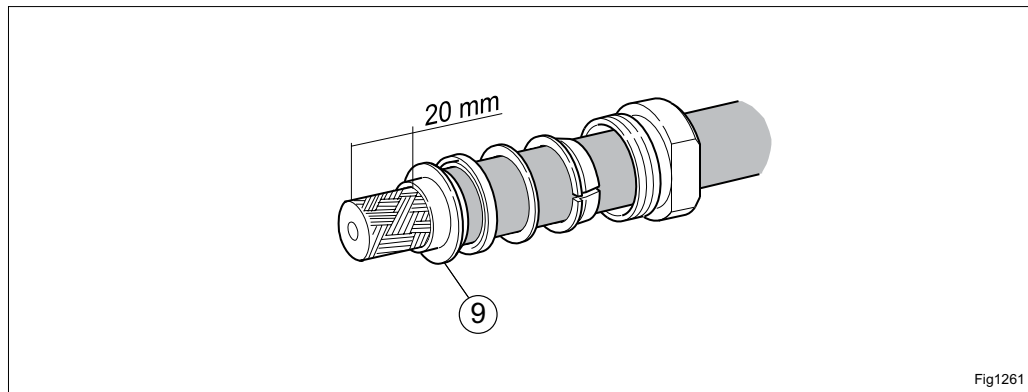


Figure 7-9. Sliding on the braid clamp and cutting the shield, dielectric and centre conductor.

7. Slide the braid clamp ⑨ onto the cable until it reaches the jacket edge.
8. Cut the dielectric with aluminium foil, the centre conductor and the shield 20 mm from the braid clamp.

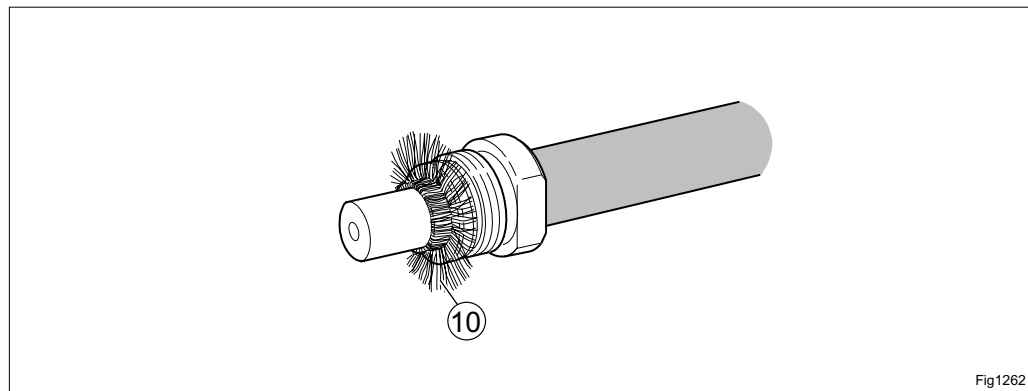


Figure 7-10. Folding the shield and pressing the parts together.

9. Fold the shield ⑩ back over the braid clamp, and press the parts (the rear nut, the conical case, the washer, and the gasket) together.

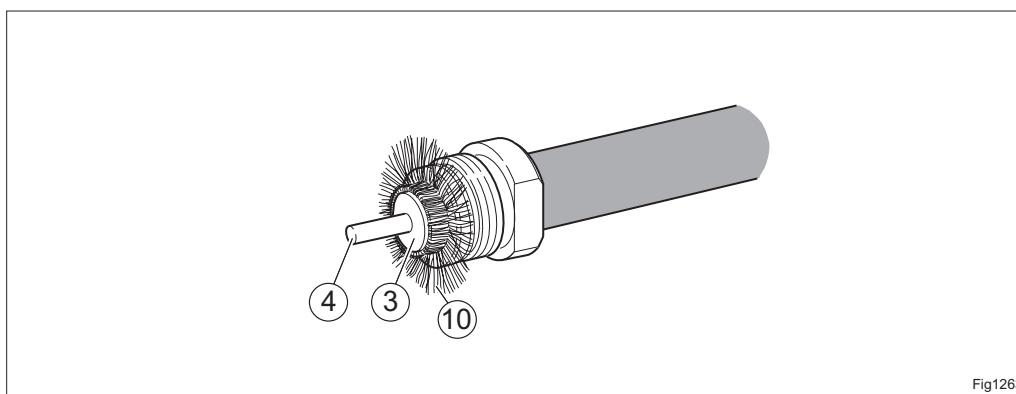


Figure 7-11. Cutting the dielectric.

10. Cut the dielectric and the aluminium foil ③ close to the folded shield ⑩, using a knife.

**Note:** Be careful not to nick the centre conductor.

11. Remove the dielectric and any remaining glue from the centre conductor ④ with a knife.

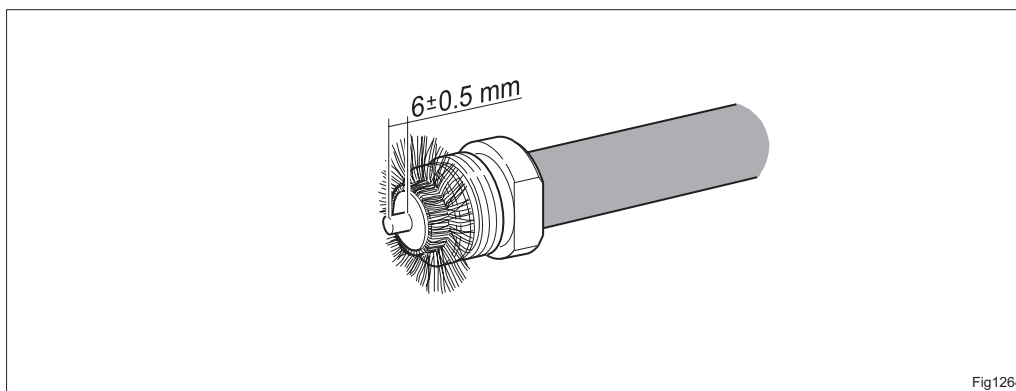


Figure 7-12. Preparing the centre conductor.

12. Cut the centre conductor and leave  $6\pm0.5$  mm. Smooth the edge of the centre conductor (remove burrs) using a chamfering tool or a fine file. This will make it easier to slide on the connector body.

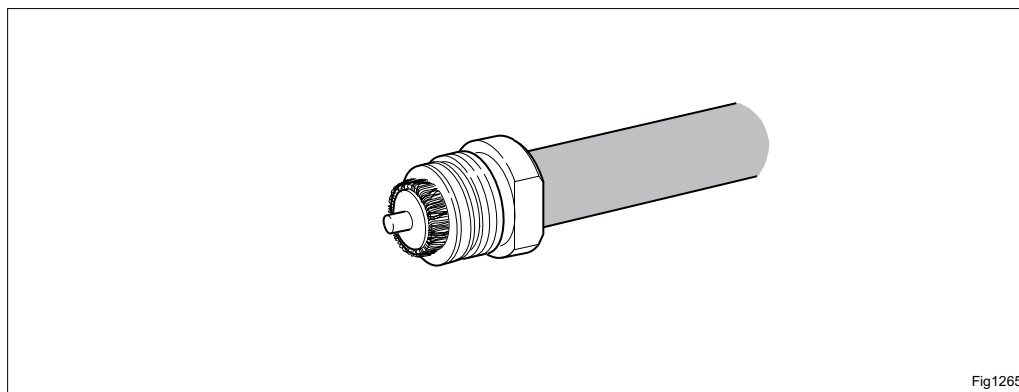


Figure 7-13. Trimming the shield.

13. Trim the shield towards the flank on the braid clamp, using a pair of cutting pliers.

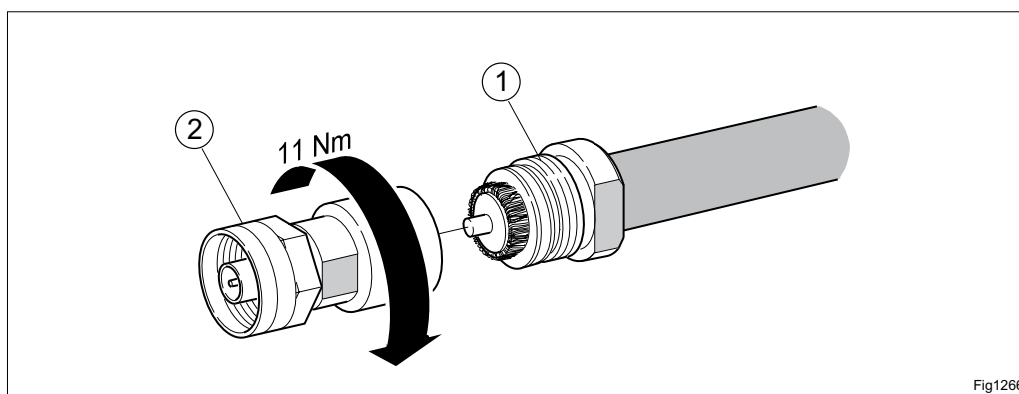


Figure 7-14. Assembling the contact body and the front body.

14. Make sure that there are no remaining parts from the shield or the aluminium sheet that can cause a short circuit between the shield and the centre conductor.
15. Slip the front body ② onto the contact body ① and tighten the connector assembly using 16 mm and 14 mm open jaw wrenches. The torque is **11 Nm ± 10%**.

**Note:** Do not rotate the cable in the connector body.



### 7.4.2.1 Instructions for the Radio Unit End

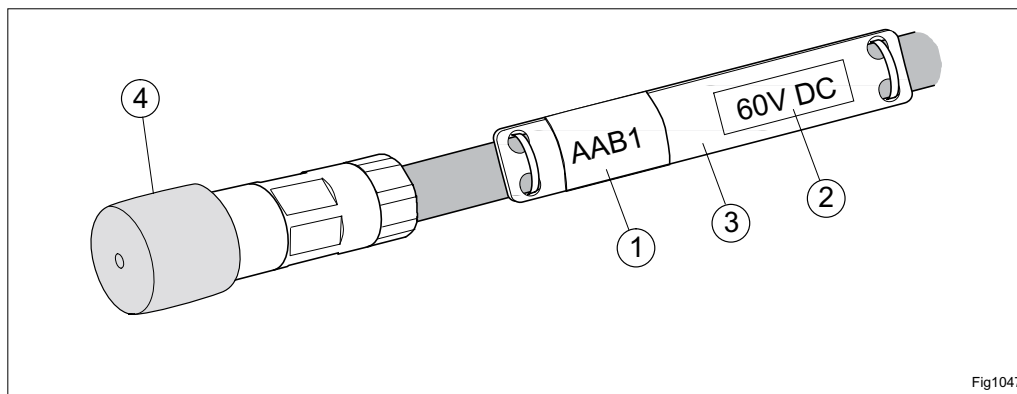


Figure 7-15. Assembling of radio cable cover and attaching of the label.

1. Write the identity on the write-on-tape ①.
2. Attach the DC-label ② and the write-on-tape ① to the label holder ③ and fix the holder to the cable.
3. Protect the cable end using the radio cable cover ④, unless the radio cable is immediately connected to the radio unit.

**Note:** When the cable is connected to the radio unit, wrap the self fusing butyl sealing compound and the PVC tape around the connector in order to protect it from moisture and corrosion.

### 7.4.2.2 Testing the Radio Cable

Make sure there is no short circuit in the radio cable before connecting it into operation. Measure it by using an ohmmeter.

## 7.5 Describing the Connections and LEDs

This section describes the radio unit connections. All connections to/from the antenna and radio unit, are made at the back of the radio unit.

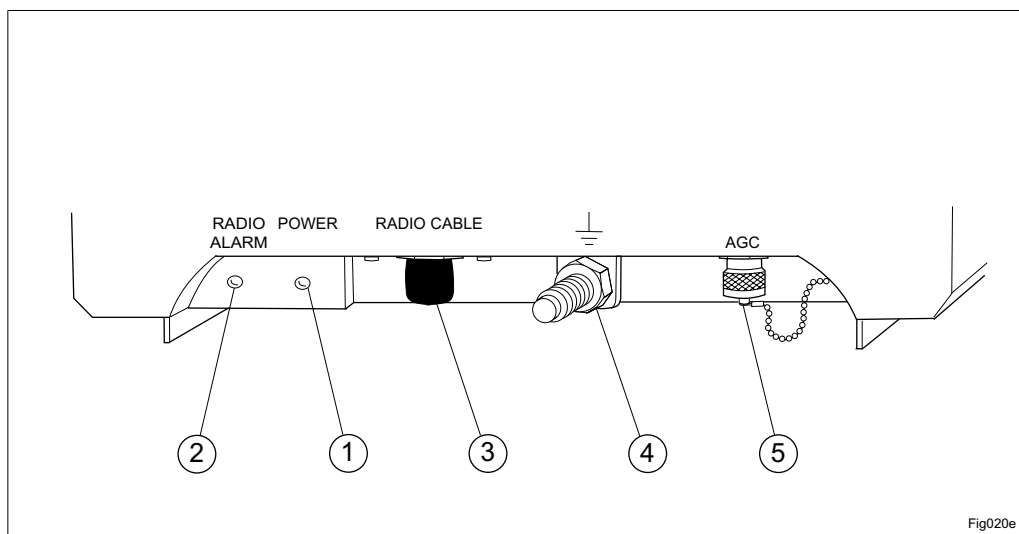


Figure 7-16. Connections on RAU1.

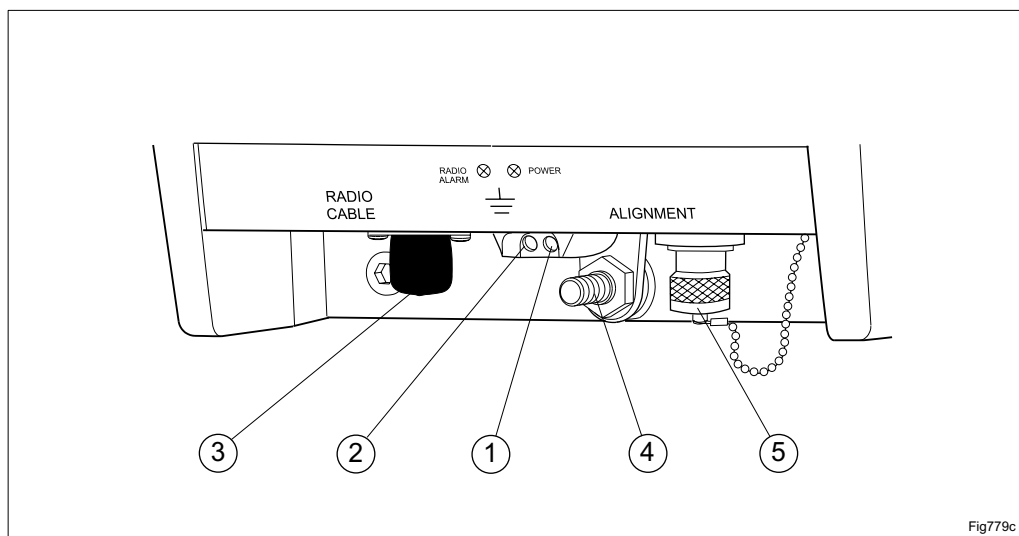


Figure 7-17. Connections on RAU2.

- |                             |  |
|-----------------------------|--|
| ① <b>Green LED (steady)</b> | Power on.  |
| ② <b>Red LED (steady)</b>   | Indicates a faulty radio unit.   |
| ③ <b>RADIO CABLE</b>        | RADIO CABLE is used for connection of the radio cable to the MMU in the access module. |
| ④ <b>EARTH</b>              | EARTH is used for connection of the earthing cable.                                    |
| ⑤ <b>AGC/ALIGNMENT</b>      | Alignment port is used for antenna alignment.  |

## 7.6 Connecting the Cables to the Radio Unit

The cable connection procedure is the same for all radio units.

<b>DANGER</b> 	<b>Earthing of the radio is a safety requirement.</b>  <b>The other end of the earthing cable must be connected to mast earth, see section 7.2 “Earthing Recommendations”.</b>
--	--

1. Remove the protective cover from the connector marked RADIO CABLE and connect the radio cable

**Note:** Use the jumper cable to connect the radio unit and the radio cable, when using a radio cable with diameter 1/2".

2. Slide the butyl sealing compound behind the radio cable connector.  
(The butyl sealing compound makes the connection weatherproof.)

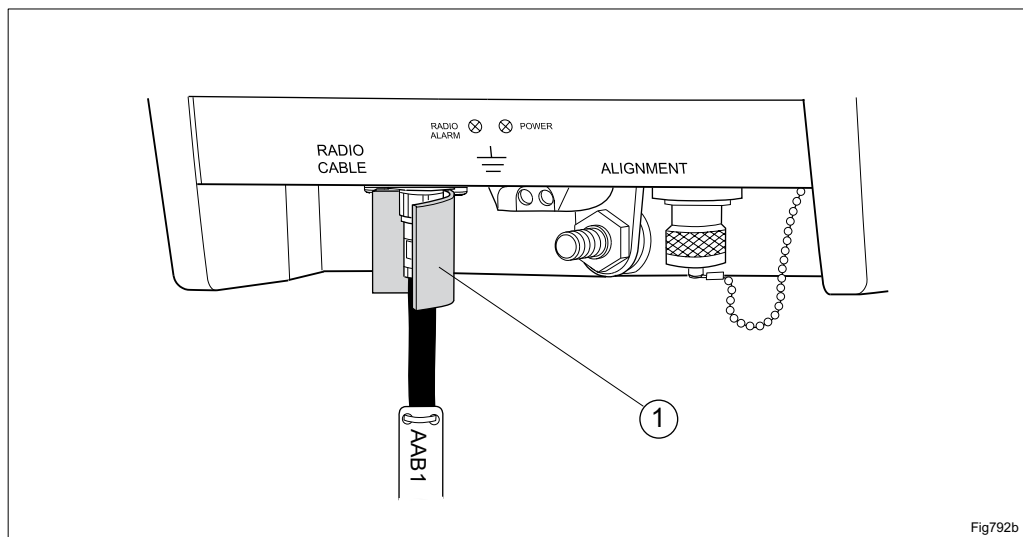


Figure 7-18. Connecting the radio cable to RAU2, RAU1 is similar.

3. Wrap the butyl sealing compound, ①, around the radio cable connector.

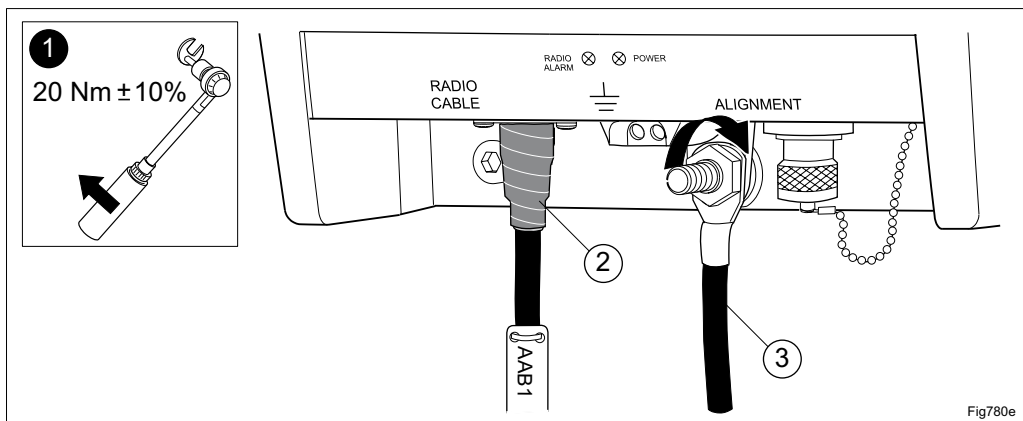


Figure 7-19. Connecting the cables to RAU2, RAU1 is similar.

4. Wrap the included PVC tape ② all around the butyl sealing compound.
5. Connect the earthing cable ③ (SXX 111 514/3) to the radio unit by using the 16 mm ring and open jaw wrench. The torque is **20 Nm ± 10%** ①. Connect the other end to mast earth

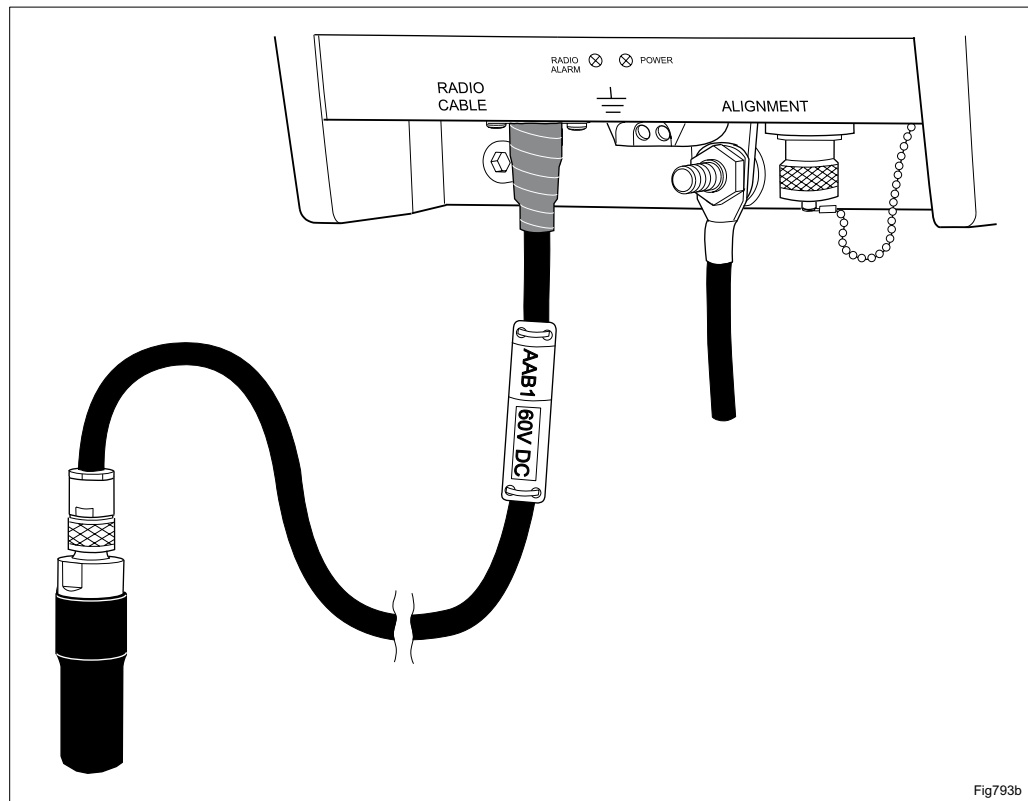


Figure 7-20. The 1/2" diameter radio cable connected to RAU2.

## 7.7 Fasten the Radio Cable with the Clamp kit

This instruction applies to the  $\varnothing 10$  mm radio cable and the  $\varnothing 16$  mm radio cable. See separate instructions when using other cables (clamp kit according to table in 7.1.1).

For one or two  $\varnothing 10$  mm radio cables use clamp kit 6/NTM 201 230/42 (for poles with diameter  $\leq 180$  mm), straps (SET 125 06/1) and pliers, LSD 349 20/1, to fasten the cable to the mast.

The recommended distance between the clamps are max 1.0 m vertical and 0.8 m horizontal. Minimum bending radius for the radio cable is 100 mm.

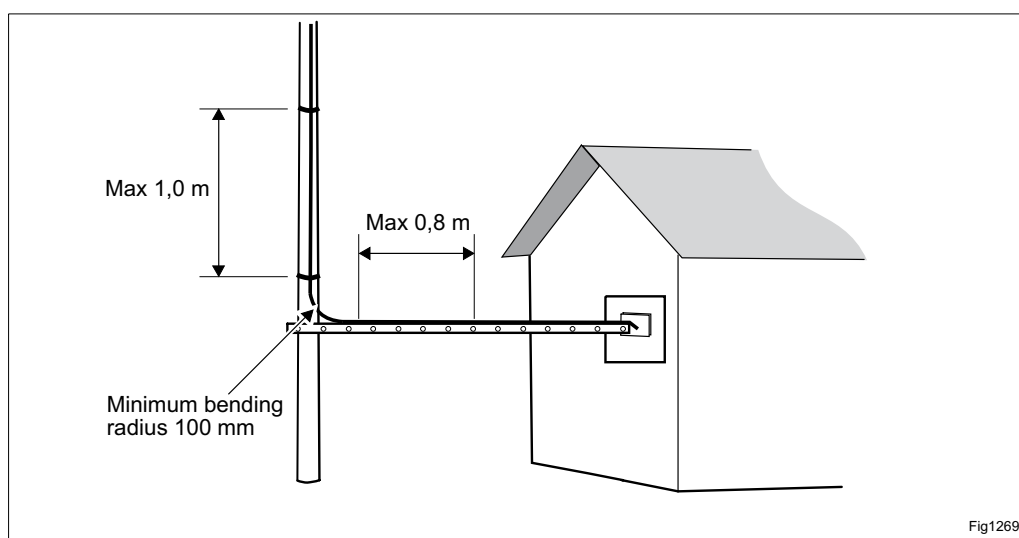


Figure 7-21. Recommended distance between clamps and minimum bending radius for the  $\varnothing 10$  mm radio cable.

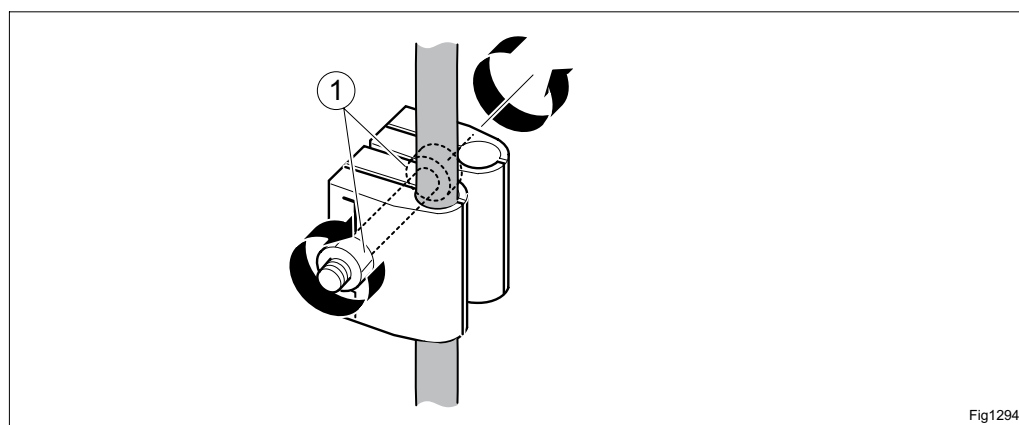


Figure 7-22. Positioning the clamp kit on the radio cable.

1. Insert the radio cable into one clamp and close with the nuts ① using two 13 mm ring and open jaw wrenches.

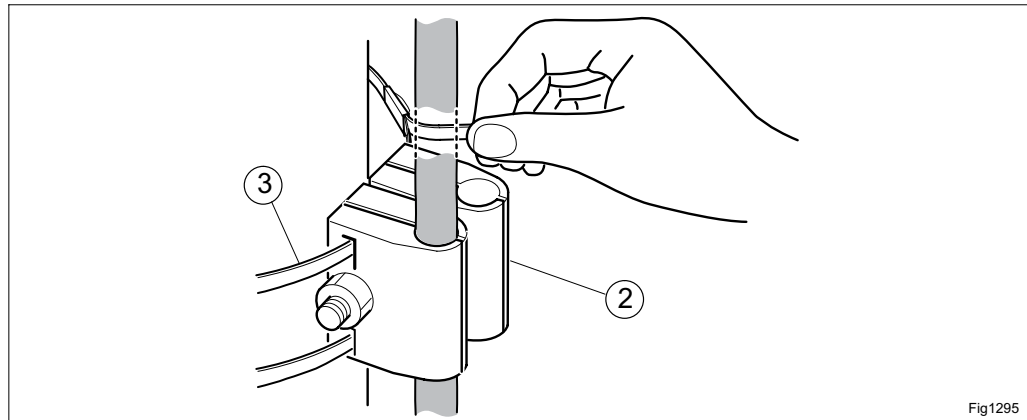


Figure 7-23. Inserting the radio cable into the clamp.

2. Insert the straps ③ through the clamp kit ②.
3. Loop the straps around the mast.
4. Insert the tip of the straps through the head of each strap and tighten by hand.

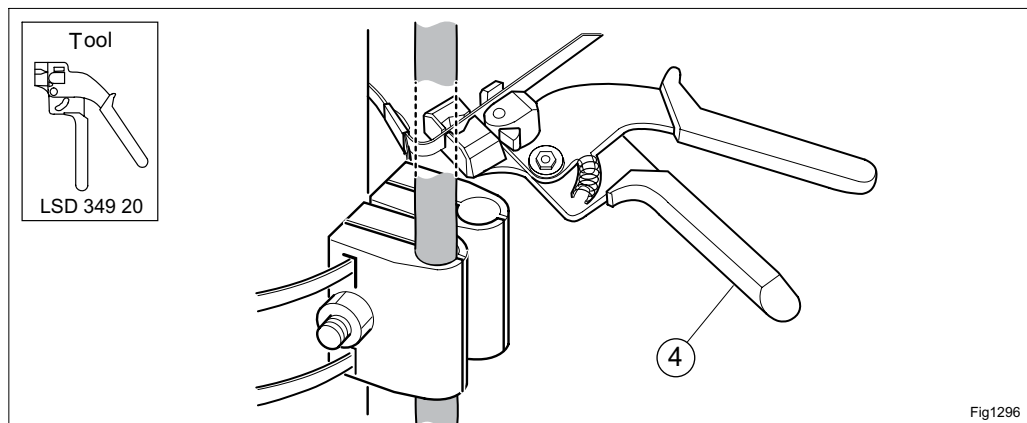




Figure 7-24. Tightening the straps.

5. Position the pliers ④ on the strap, as shown in the figure above.
6. Squeeze the handles to tighten the clamps to the mast.
7. When the clamps are tightened to the mast, rotate the pliers 1/4 - 1/2 turn to cut the excessive tail off.

## 7.8 Earthing the Radio Cable

<b>DANGER</b> 	<b>The lower part of the radio cable must be earthed, for example before entering a building and for long cables every 50 m.</b>
<b>CAUTION</b> 	<b>Install the earthing kit only where the cable runs straight.</b>

This instruction applies to Ø10 mm and Ø16 mm radio cable outdoors. For outdoor earthing of Ø10 mm radio cable use earthing kit NGT 211 04/7 and for Ø16 mm radio cable use NGT 211 04/2. See separate instructions when using Ø28 mm radio cable (earthing kit NGT 211 03/2).

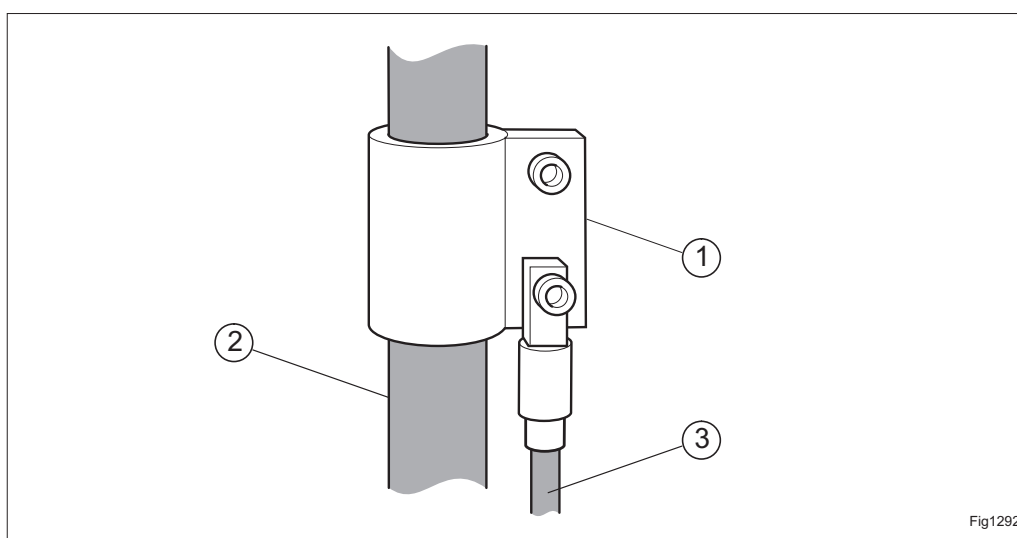


Figure 7-25 An assembled earthing kit NGT 211 04/7 (for Ø10 mm radio cable).

- ① Earthing kit body
- ② Radio cable
- ③ Earthing cable

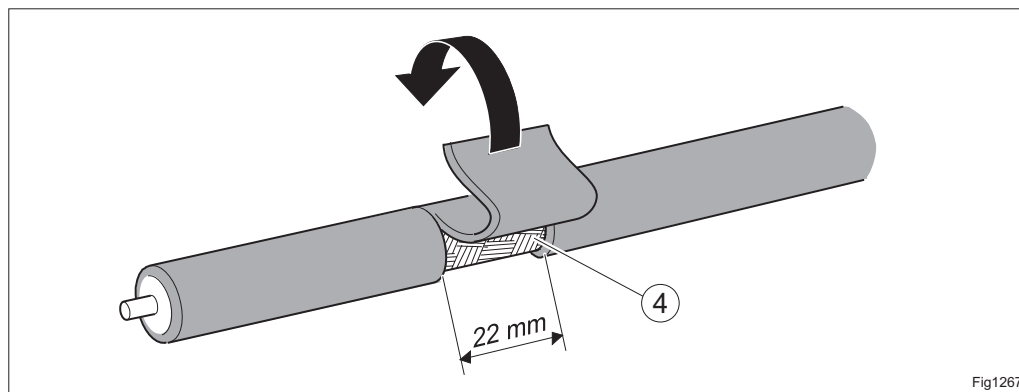
**Earthing procedure:**

Figure 7-26. Stripping 22 mm of the radio cable.

1. Strip 22 mm of the radio cable at desired earthing point. Use appropriate tool, for example cable jacket cutter LTX 102 17 or another tool for stripping cables.

**Note:** Be careful not to damage the screen ④.

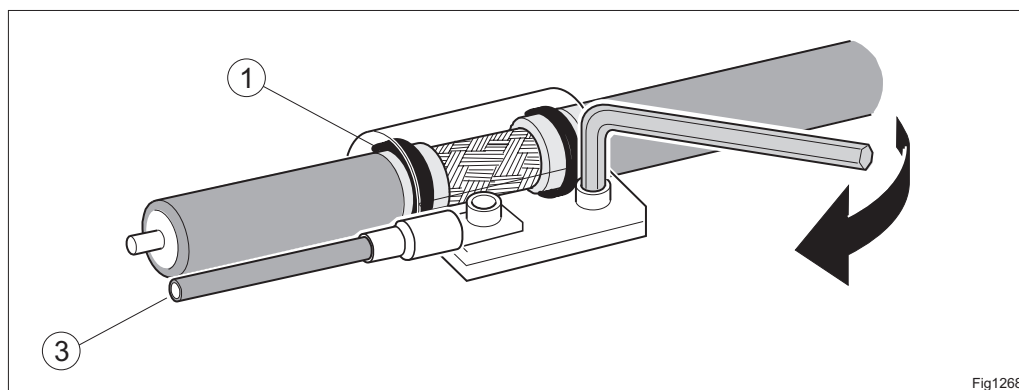


Figure 7-27. Aligning and tightening the body to the radio cable.

2. Remove the covering paper from butyl sealing. Wrap the earthing kit body round the stripped part.
3. Make sure the butyl sealings ① inside the earthing kit body are positioned on the outer jacket.
4. Connect the earthing cable and tighten the two M6 screws firmly with the Allen key.
5. Connect the other end of the earthing cable ③ to earth.

**Note:** Make sure that the earthing cable ③ runs as straight as possible before connecting it to earth.



## 7.9 Wall Gland for One Cable

This instruction applies to Ø10 mm radio cable and is similar for Ø16 mm radio cable. See separate instructions when using other cables.

The wall gland (NDM 125 14/1) fitting should be performed from the outside of the building.

1. Make a hole (Ø44 mm) through the wall.

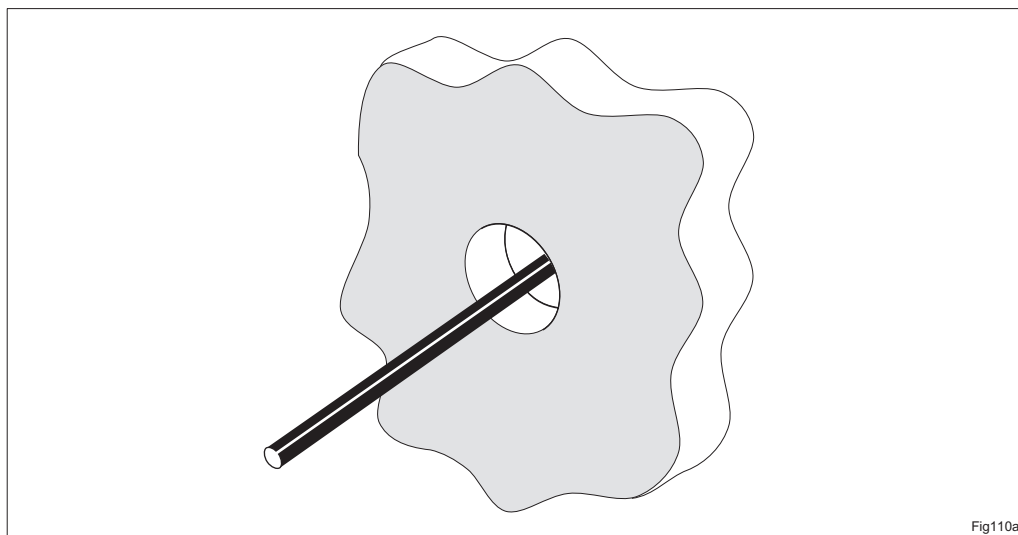


Figure 7-28. Inserting the radio cable through the hole in the wall.

2. Insert the radio cable through the hole.

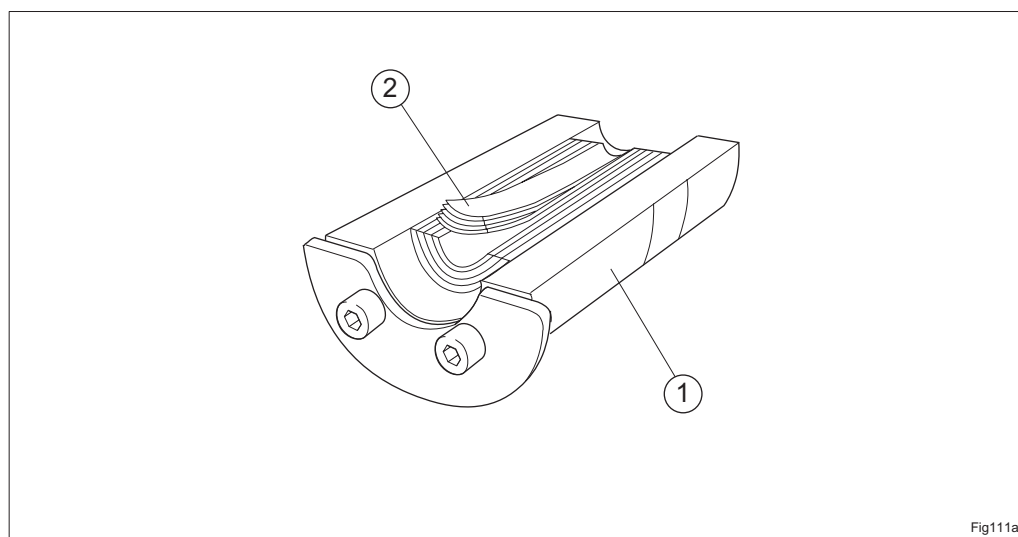


Figure 7-29. Removing the layers.

3. Split the wall gland ① into two halves and remove 5 layers ② (three black and two blue) from each half to make room for the Ø10 mm radio cable.
4. Lubricate both the inside and the outside of the wall gland (using the lubrication included in delivery).

**Note:** Ensure that there is enough radio cable to reach the station radio cable before mounting the wall gland.

5. Insert the bottom half of the wall gland into the bottom of the hole and put the radio cable in it.

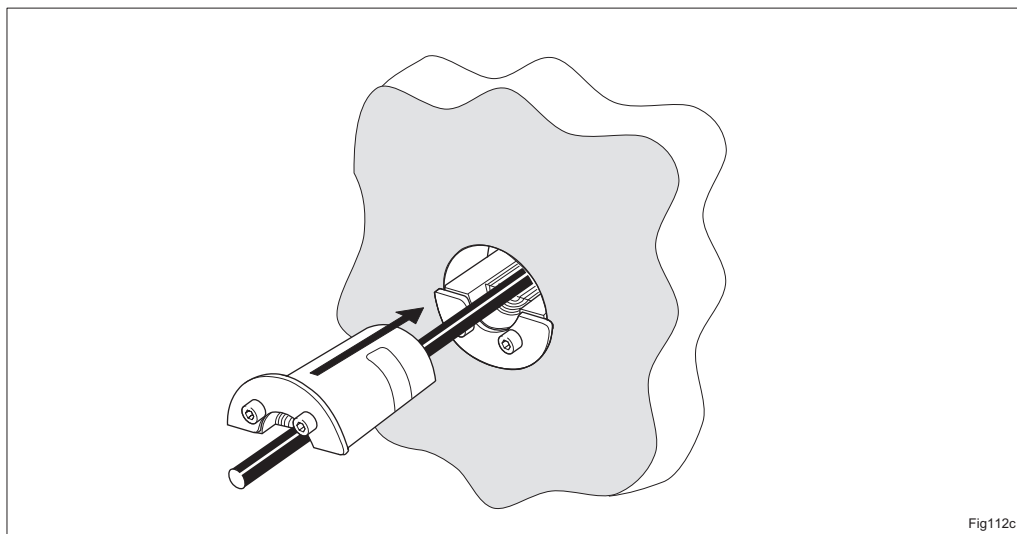


Figure 7-30. Inserting the upper half of the wall gland.

6. Put the upper part of the wall gland on top of the radio cable and insert it into the wall.
7. Tighten the four screws using the socket head cap screwdriver (M4).

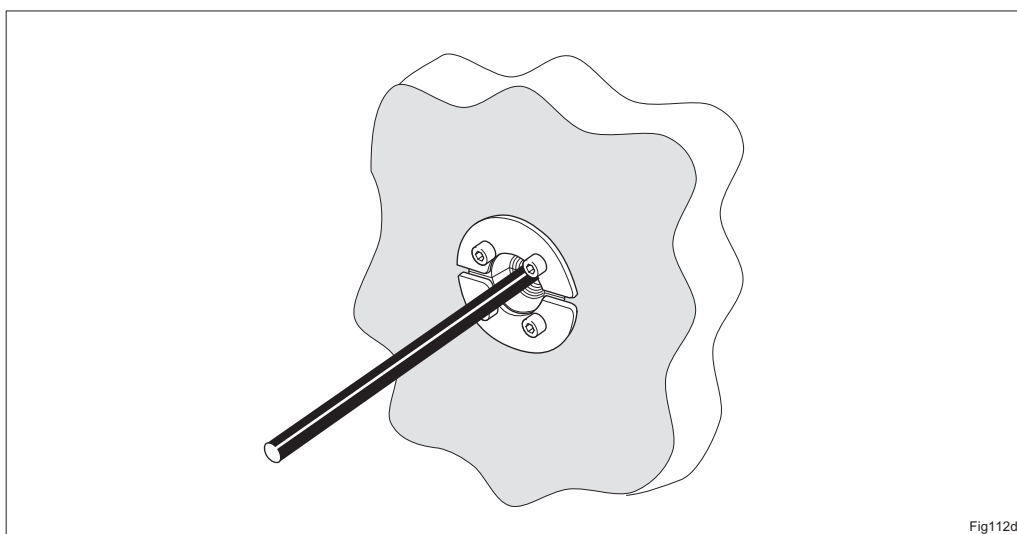


Figure 7-31. Assembled and installed wall gland.

## 7.10 Wall Gland for Several Cables

This instruction applies to the  $\varnothing 10$  mm,  $\varnothing 16$  mm and  $\varnothing 28$  mm radio cable.

The wall gland (NTM 101 208/1) installation should be performed from the outside of the building. Screws or bolts to fix the frame on the wall are not included in delivery.

1. Make a hole for the wall gland through the wall.

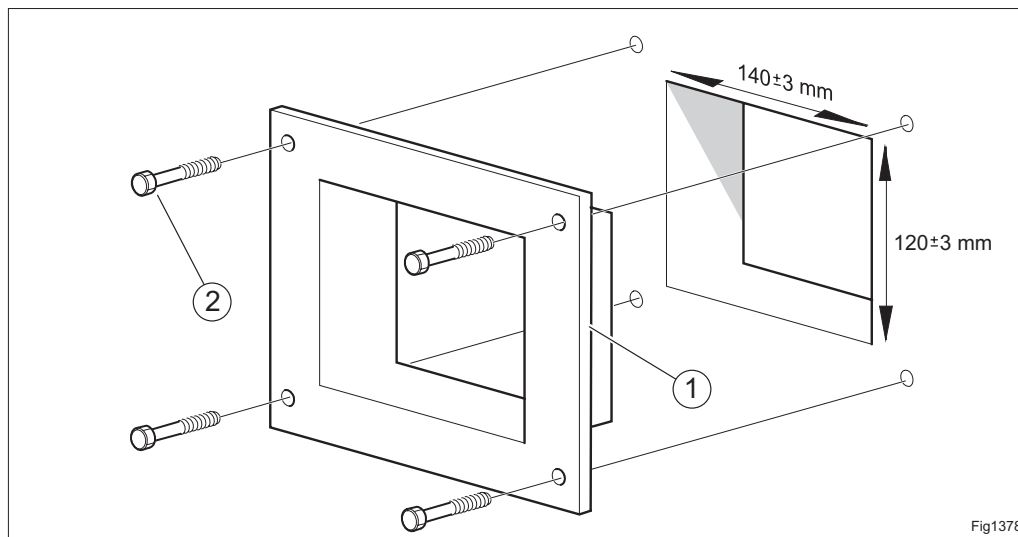


Figure 7-32. Fitting and fastening the frame.

2. Fit the frame ① into the hole from the outside of the wall with the flange pointing inwards.
3. Fix the frame with screws or bolts ② through the four outer holes in the frame.

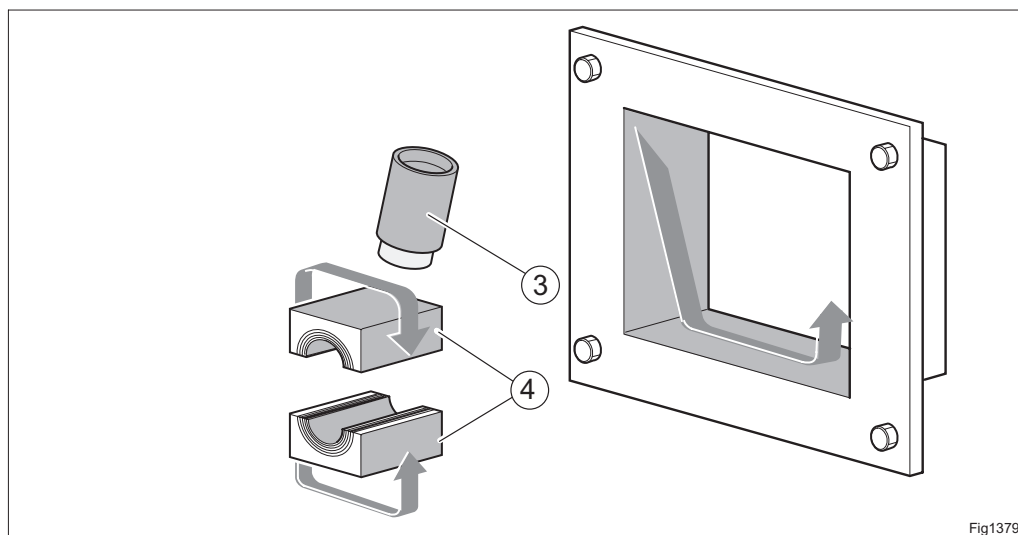


Figure 7-33. Lubricating the frame and modules.

4. Clean the inside of the frame using a brush.
5. Apply lubricant on the inside of the frame. Likewise, lubricate the outside of all modules (using the lubrication ③ included in delivery). The modules ④ should also be lubricated on the inside.

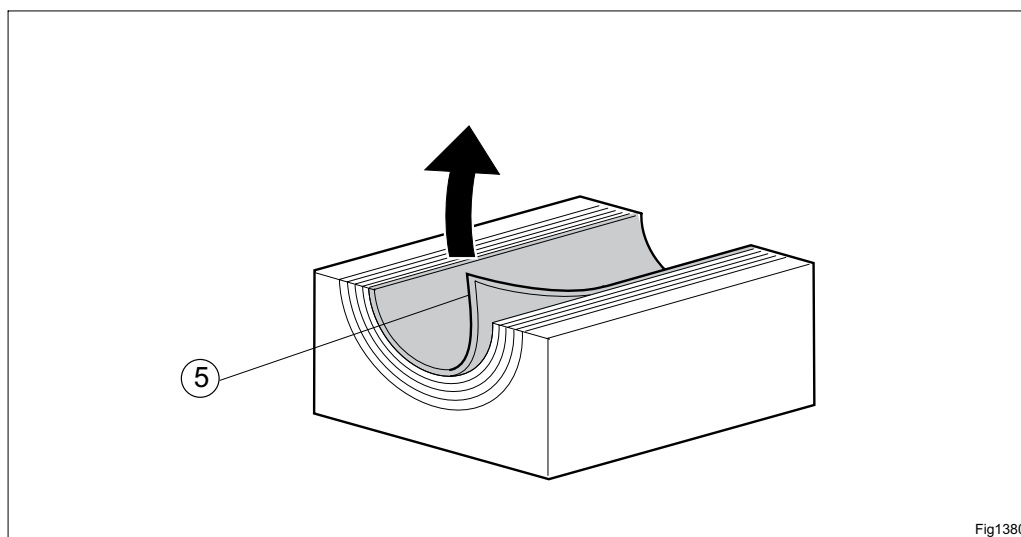


Figure 7-34. Adjusting the inner diameter of the module .

6. Adjust the inner diameter of the modules by removing the rubber layers ⑤ until the cable fits (each layer is 0.6 mm thick). Lubricate the module on the inside when the inner diameter is set.

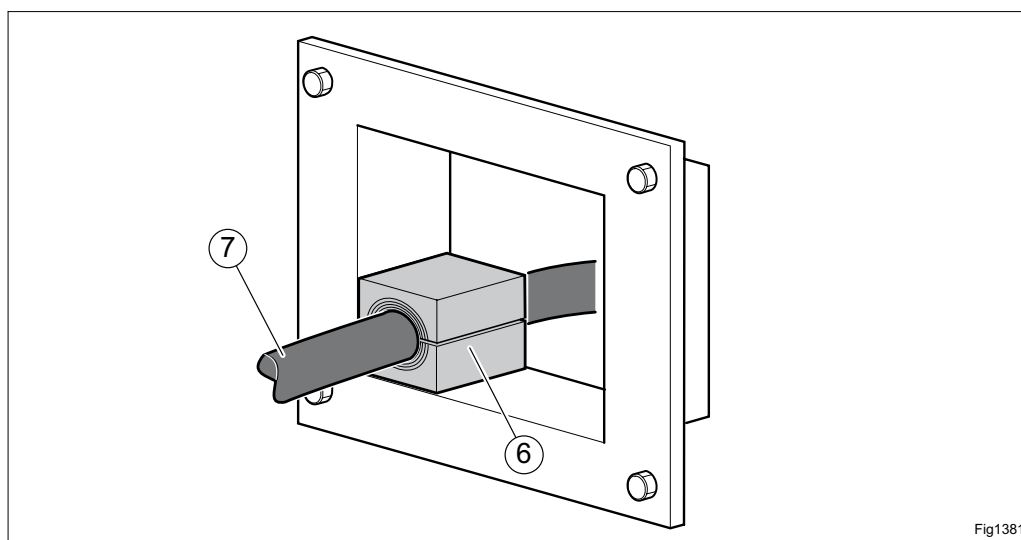


Figure 7-35. Placing the modules in the frame.

7. Place the first line of modules ⑥ at the bottom of the frame. Start with the largest modules. Place the cable ⑦ inside the module.

**Note:** Ensure there is enough radio cable to reach the station radio cable before installing the wall gland.

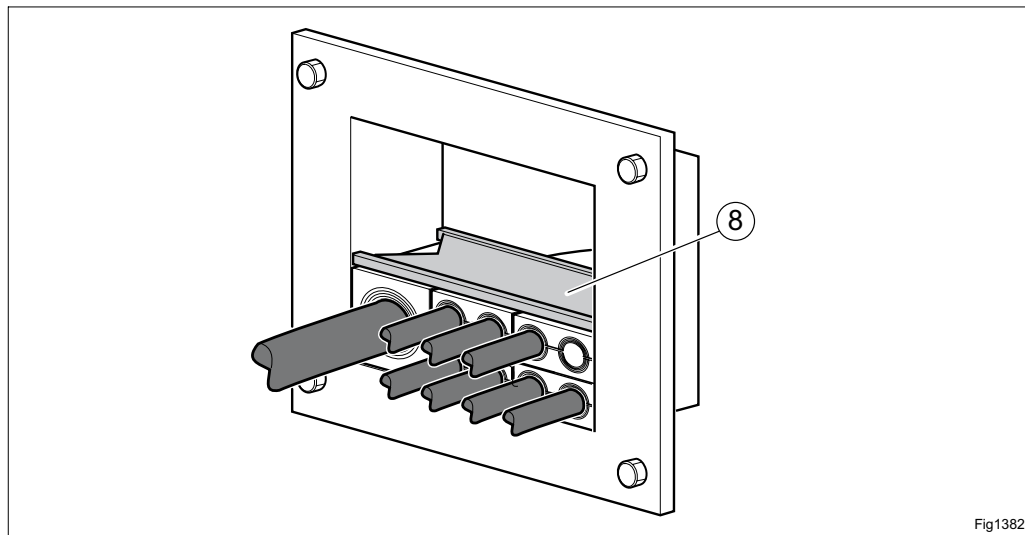


Figure 7-36. Placing a stay plate at the top of every line of modules.

8. Fill the frame with modules. Top every full layer of modules with a stay plate ⑧.

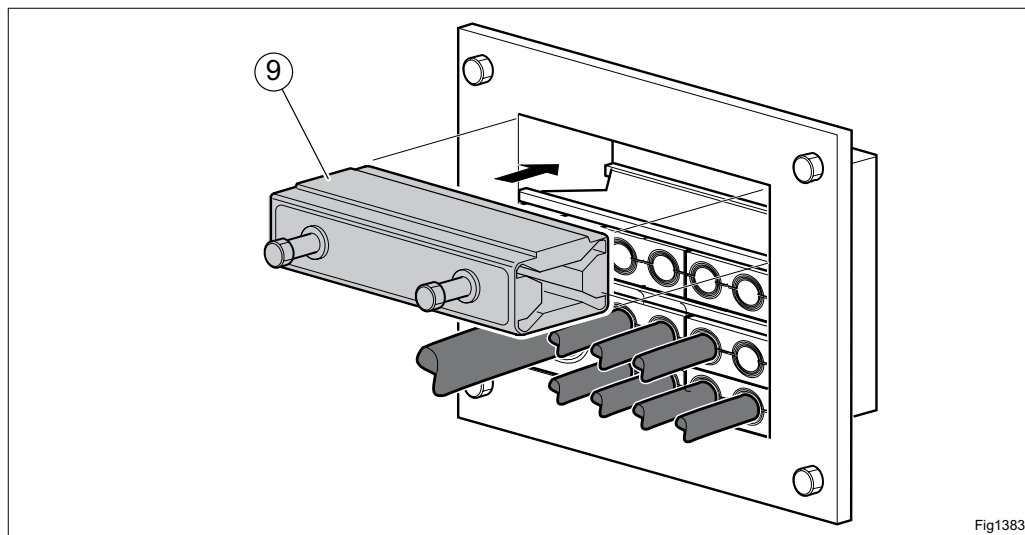


Figure 7-37. Inserting the wedge at the top of the frame.

9. After the installation of the modules is finished, fit the wedge ⑨ (compression unit) at the top of the frame. Loosen the two bolts on the wedge slightly to facilitate the fitting of the wedge.

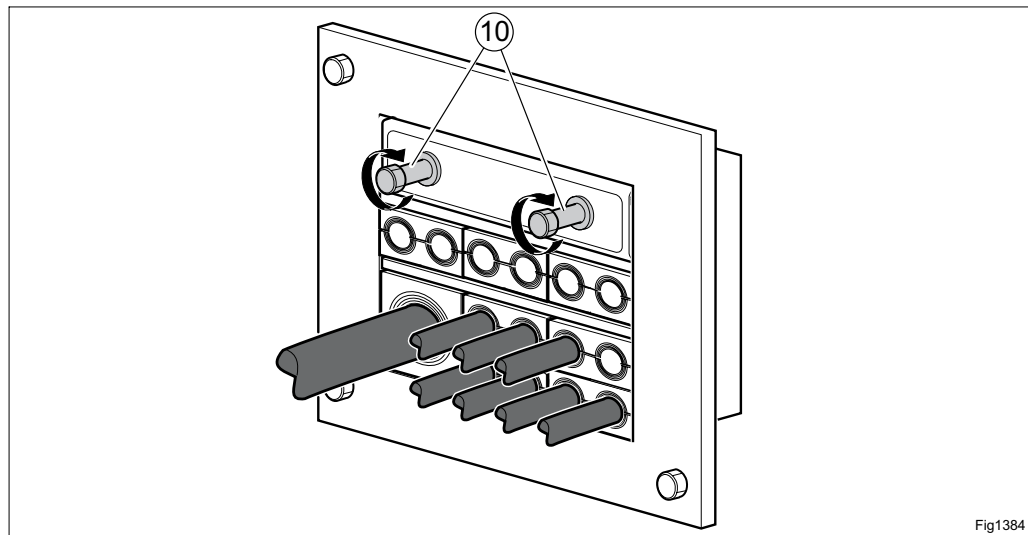


Figure 7-38. Tighten the wedge.

10. Tighten the two bolts, ⑩ on the wedge with a wrench, The maximum torque is **20 Nm**.

## 7.11 Connecting the Radio Cable

This instruction applies to Ø10 mm radio cables. See separate instructions when using other cables. For indoor earthing of Ø16 mm radio cables use earthing kit NGT 211 04/2 and for Ø28 mm radio cables use earthing kit NGT 211 03/2.

The station radio cable (RPM 517 6906/01) is included in the delivery and is used for connection between the radio cable and the MMU.

This section describes the fitting of the radio cable when the access module magazine is installed on a wall or to a 19" cabinet. The radio cable is fastened with the bracket, SXX 111 524/1 (included in the delivery). When connecting several radio cables to access modules in a rack, a cabinet or on a wall the optional radio cable panel, SXX 111 564/1, can be used.

### 7.11.1 Fitting of the Radio Cable to a 19" Cabinet or Rack

The radio cable is fitted to the cabinet or rack by using the bracket included in the radio delivery. If radio cables for several radios are installed, the optional radio cable panel can be used, see section 7.10.3.

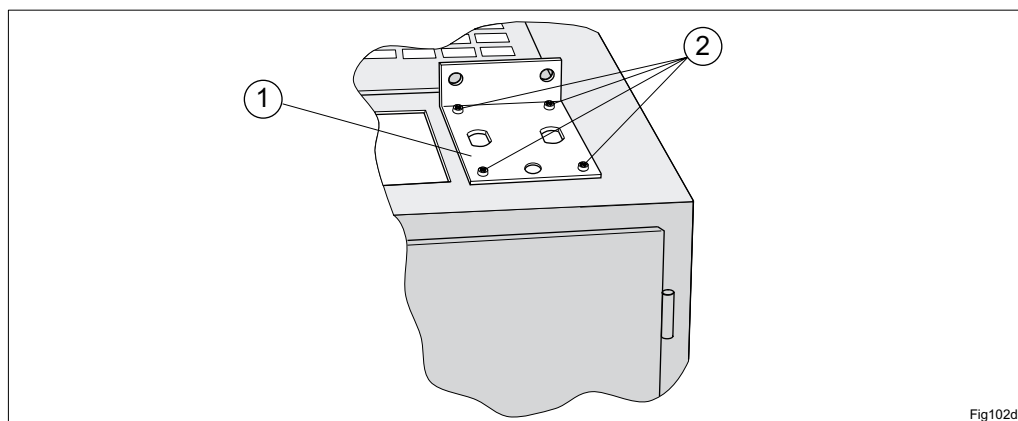


Fig102d

Figure 7-39. Fastening the bracket to the cabinet top.

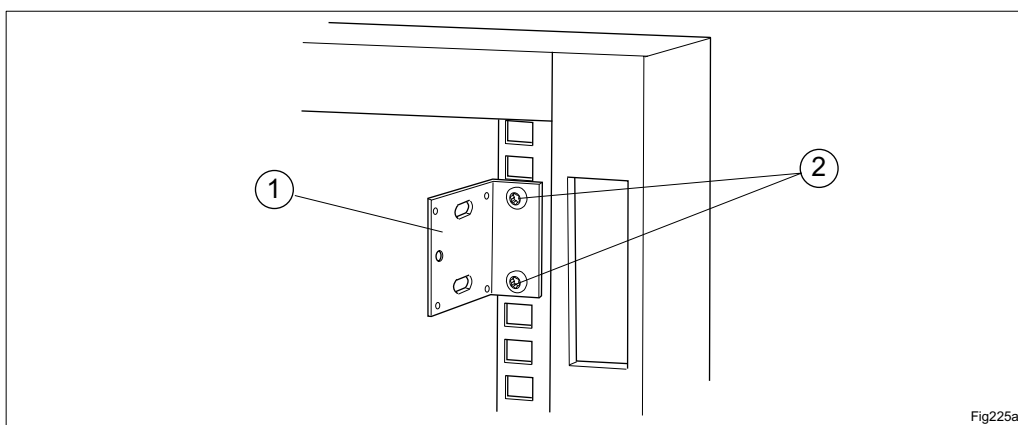


Fig225a

Figure 7-40. Fastening the bracket to the rack.

1. Fasten the bracket ① to the cabinet top by using four screws ② or to the rack using two screws.

If the cabinet is earthed, the radio cable installation is earthed by fastening the plate to the cabinet, using the four screws. Ensure that there is no paint where the plate is fastened to the cabinet.

If the cabinet is not earthed, use the earthing cable SXX 111 514/2 and fit it to one of the holes in the bracket.

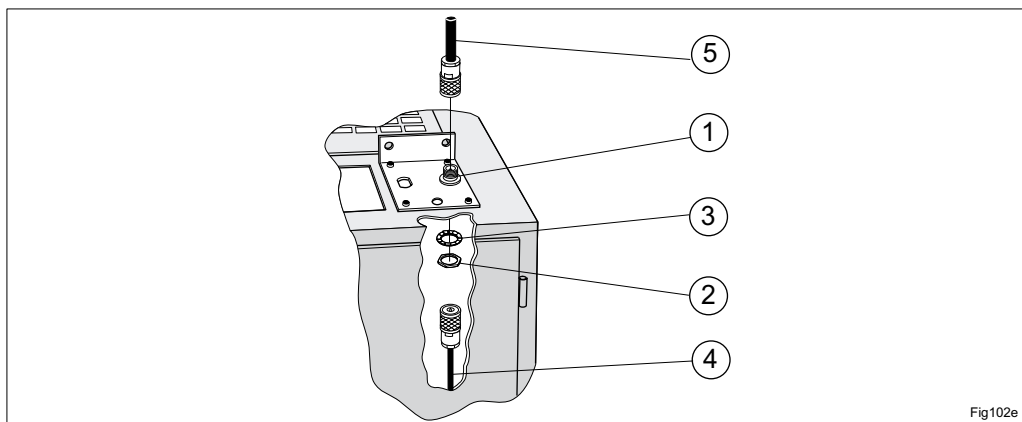


Figure 7-41. Fastening the station radio cable and radio cable to the adapter (cabinet).

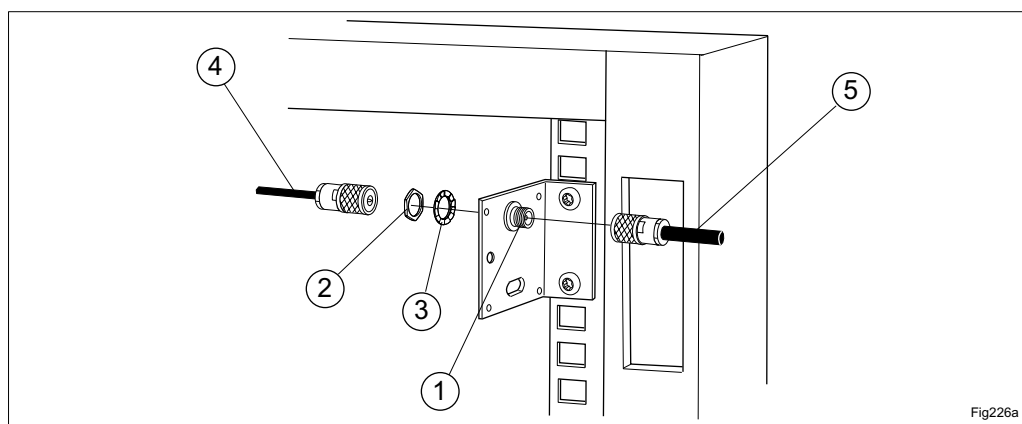
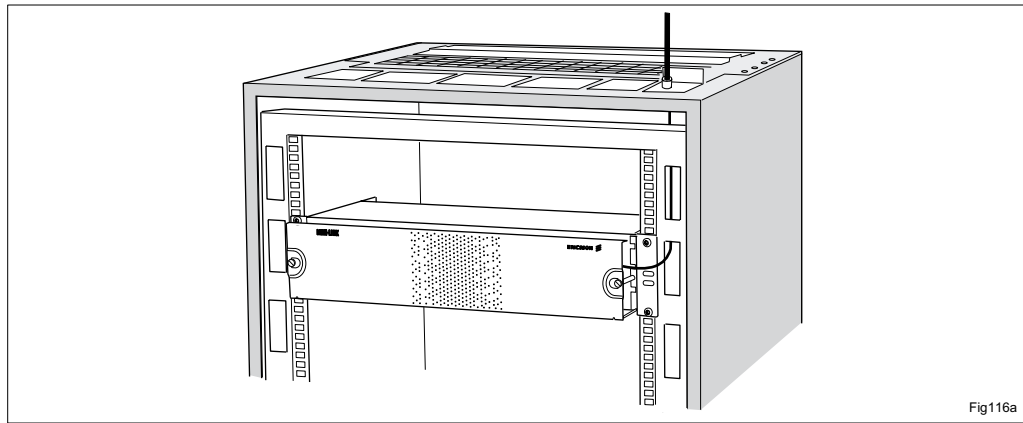


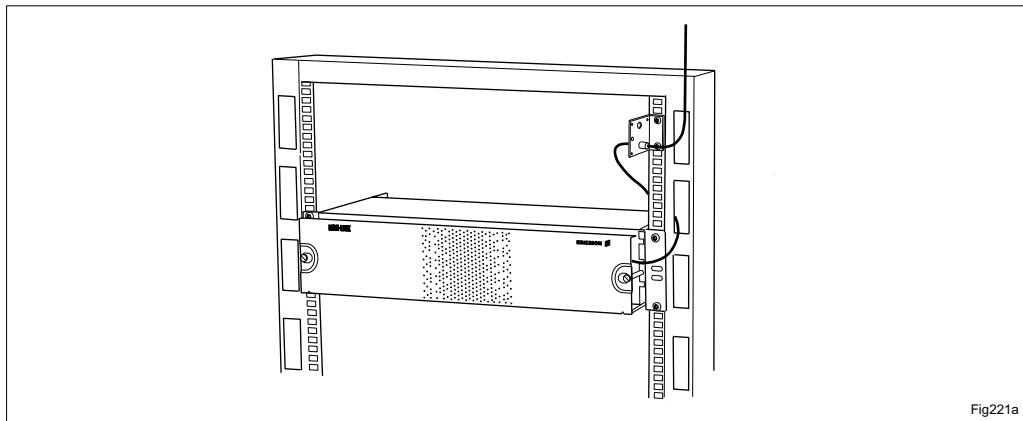
Figure 7-42. Fastening the station radio cable and radio cable to the adapter (rack).

2. Fasten the adapter ① to the bracket with the nut ② and the washer ③ using a 16 mm ring wrench.
3. Connect the station radio ④ cable and the radio cable ⑤ to the adapter.
4. Use cable straps (SXX 111 574/1) to fasten the cables. The recommended distance between two straps is 0.8 m.





*Figure 7-43. A complete installation of the radio cable to the station radio cable in a cabinet.*



*Figure 7-44. A complete installation of the radio cable to the station radio cable in a rack.*

### 7.11.2 Wall Mounting the Radio Cable

The radio cable is fitted to the wall using the bracket included in the delivery. If radio cables for several radios are installed, the optional radio cable panel can be used, see section 7.10.3.

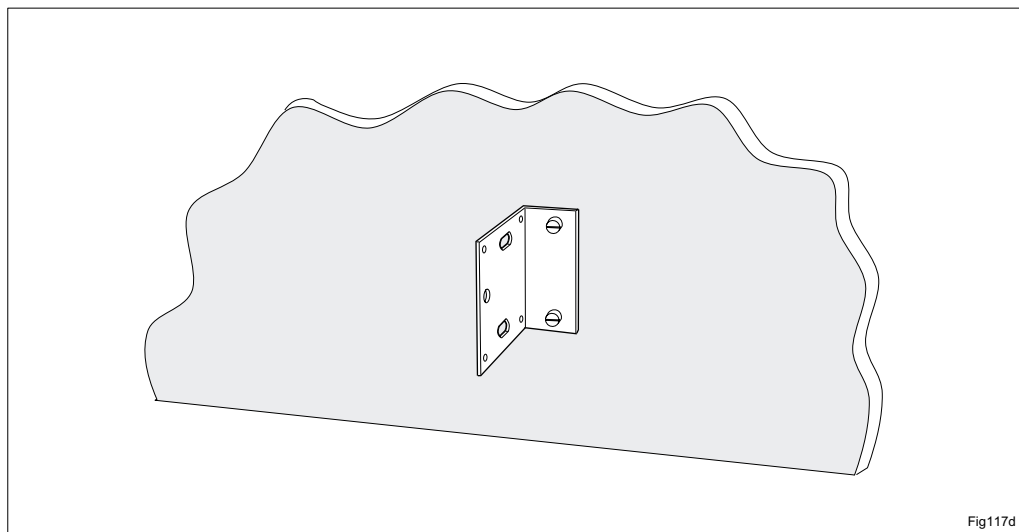


Figure 7-45. Fastening the bracket to the wall.

1. Fasten the bracket to the wall, using the two screws.

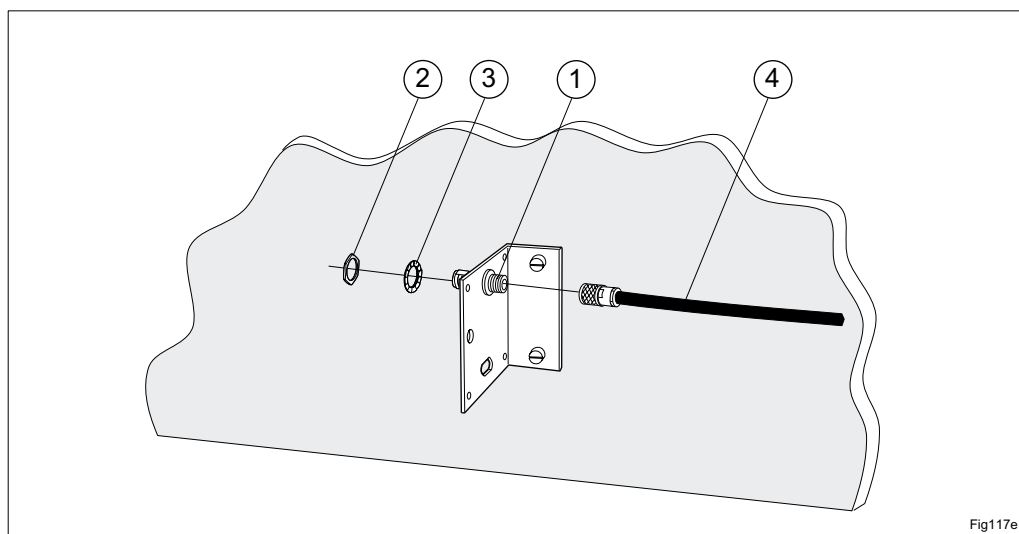


Figure 7-46. Fastening the radio cable to the bracket.

2. Fasten the adapter ① to the bracket, using the nut ② and washer ③.
3. Fasten the radio cable ④ to the adapter.

### 7.11.3 Optional Radio Cable Panel

When connecting several radio cables to access modules in a rack, a cabinet or on a wall, the optional radio cable panel ① (SXX 111 564/1) can be used. Below instructions are given on how to fit the panel and position the cables for a rack/cabinet installation and a wall installation.

#### Rack/Cabinet Installation

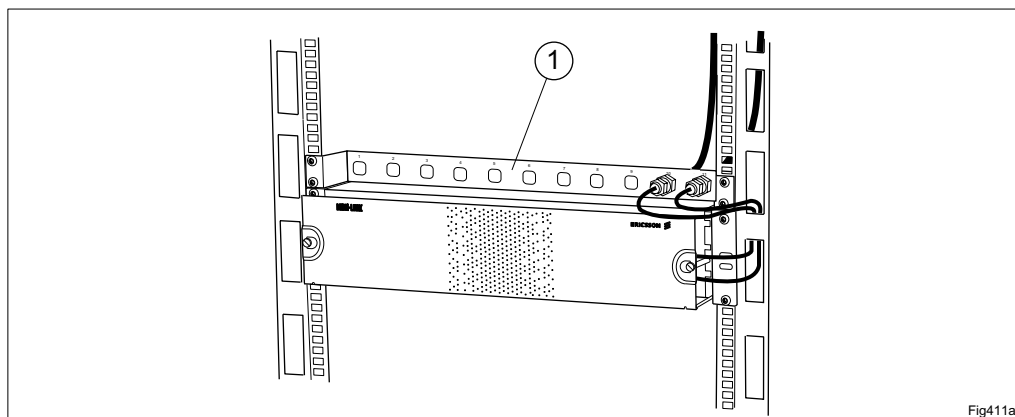


Figure 7-47. Using the radio cable panel, ①, in a rack installation.

1. Fit the panel to the rack using four screws and captive nuts.
2. Connect the cables and adapters to the panel in the same way as for the brackets.
3. Use cable straps (SXX 111 574/1) to fasten the cables. The recommended distance between two straps is 0.8 m.

#### Wall Installation

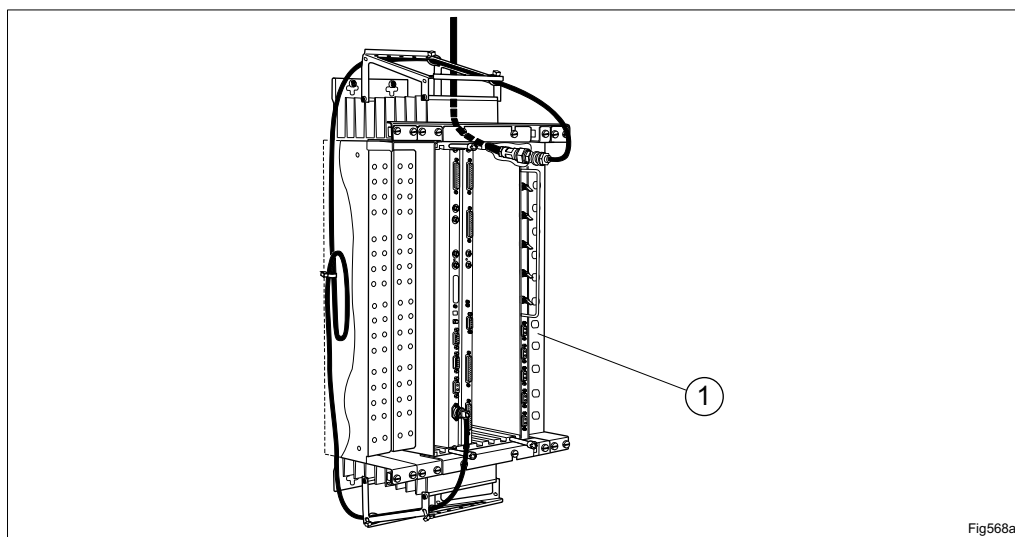


Figure 7-48. Using the radio cable panel, ①, in a wall installation.

1. Fit the panel to the rack using four screws and captive nuts.
2. Lay the station radio cables to the plug-in units as shown in the figure above and strap them to the upper and lower cable holder.
3. Connect the station radio cables to the radio cables via the radio cable panel with adapters.

### 7.11.4 Laying and Connecting the Radio Cable to a Magazine

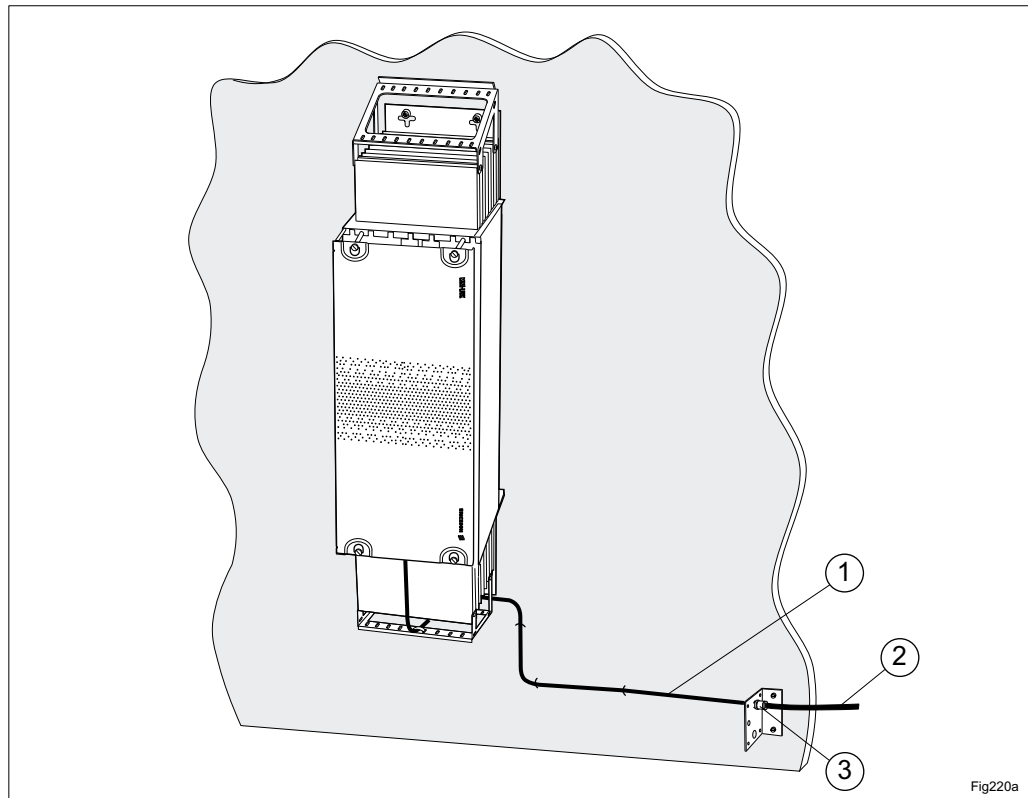


Figure 7-49. Laying the station radio cable.

1. Lay the station radio cable ① to the wall, all the way up to the access module magazine.
2. Connect the station radio cable to the radio cable ② via the adapter ③.
3. Use cable straps (SXXK 111 574/1) to fasten the cable. The recommended distance between two straps is 0.8 m.



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# 8 Software Setup and Antenna Alignment

## 8.1 Introduction

This chapter describes the procedure for antenna alignment and software setup. The software setup is done by using a PC with MSM software. See separate manual (section 1.3) for further information. Some software setup can be done by using the Local Supervision Interface. See section 5.4.5 and 9.2. for more information.

The list below gives an overview of the jobs included in the installation.


- Step 1** Turn the power on (*see section 8.3*)
- Step 2** Repeat the steps in chapter 4 to 7 for the remote site.
- Step 3** Align the antennas (*see section 8.4*)
- Step 4** Set the software in the access module (*see section 8.5*)

## 8.2 Installation Equipment

The following tools and instruments are required for software setup and antenna alignment:

- Voltmeter
- 16 mm torque wrench
- PC with MSM software
- Alignment test cable, RPM 214 100/1

## 8.3 Turning on the Power

<b>WARNING</b> 	See section 10.5 for a specification of power supply.
---	---

Ensure that all units in the magazine are supplied with the correct nominal voltage, according to their label (that is 24, 48/60 V, or 24-60 V, nominal DC).

**Note:** Each MMU must have its own fuse.

1. Make sure there is no short circuit in the radio cable before switching on the power.
2. Turn on the power supply for each MMU.



## 8.4 Alignment Procedure

### 8.4.1 Introduction

MINI-LINK E should be installed on both the far-end and near-end sites. Frequency and output power must be set before the alignment starts.

If a PC is available, perform a RF loop test (only MINI-LINK 7-E, 8-E, 15-E, 18-E and 23-E for RAU1, all models for RAU2) on each MINI-LINK before starting the alignment procedure.

Arrange for communication between the sites if possible, to coordinate alignment actions.

### 8.4.2 Alignment Procedure

1. Align both antennas towards each other coarsely, but as accurately as possible.
2. Turn the transmitter on.

**Note:** The transmitter is turned off at delivery in order not to transmit RF power before the operation frequency is set and has to be turned on manually at installation, see chapter 9.2.2 for more information.

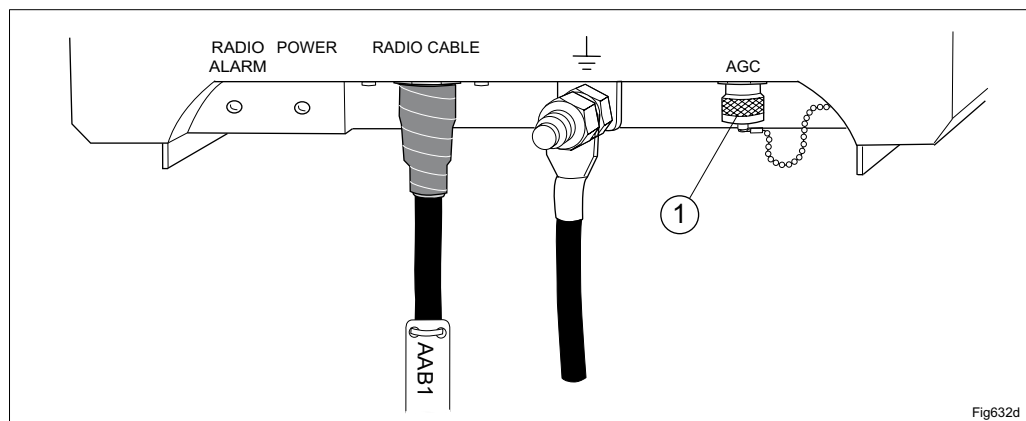


Fig632d

Figure 8-1. The position of the Alignment port (AGC) on RAU1.

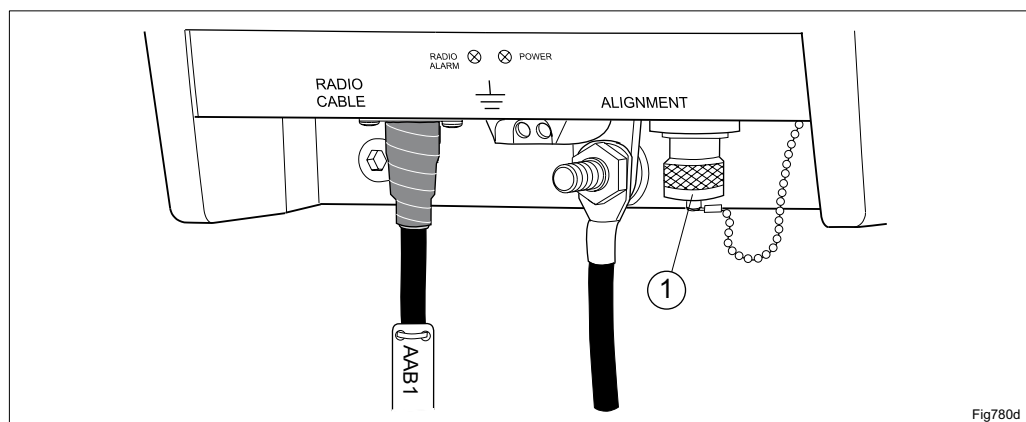


Fig780d

Figure 8-2. The position of the Alignment port on RAU2.

3. Connect the voltmeter to the alignment port ① on the connection interface of the radio unit. Use the AGC test cable, RPM 214 100/1.

The following alignment steps are slightly different for different antenna supports.

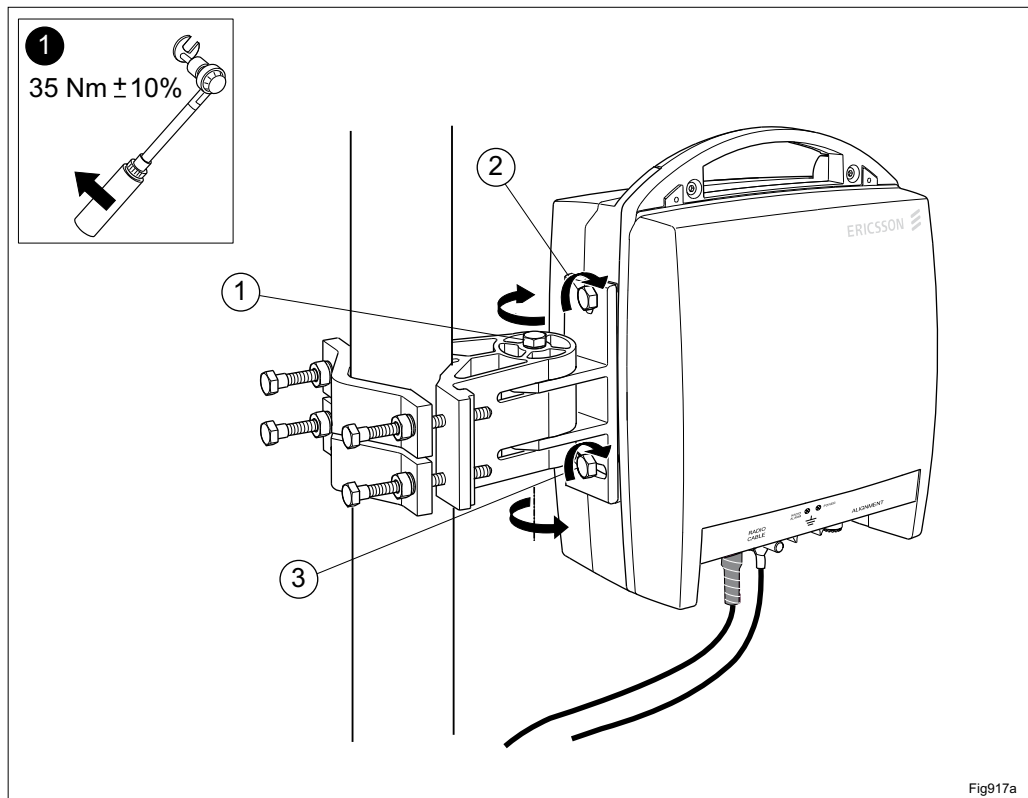


Figure 8-3. Adjustment and locking screws on the antenna support for the 0,2 m compact antenna.

4. Loosen the vertical axis screw ① and adjust the antenna horizontally for maximum AGC value. Tighten the screw when maximum value is found. The torque is **35 Nm ± 10%** ①.
5. Loosen the horizontal axis screws ② and ③ and adjust the antenna in the vertical plane for maximum AGC value. Tighten the screws when maximum value is found. The torque is **35 Nm ± 10%** ①.
6. Repeat instructions 4 and 5 until maximum AGC level is achieved.
7. Measure the AGC level and record the value.
8. Transform the voltage level into RF input level in dBm. A curve for transformation is found in section 10.11.
9. Compare the RF level given in the curve with that calculated for the system during path calculation (done when planning the network). See section 10.11 for information about tolerances.

# **DANGER**



**Make sure all screws are tightened when the alignment procedure is finished.**

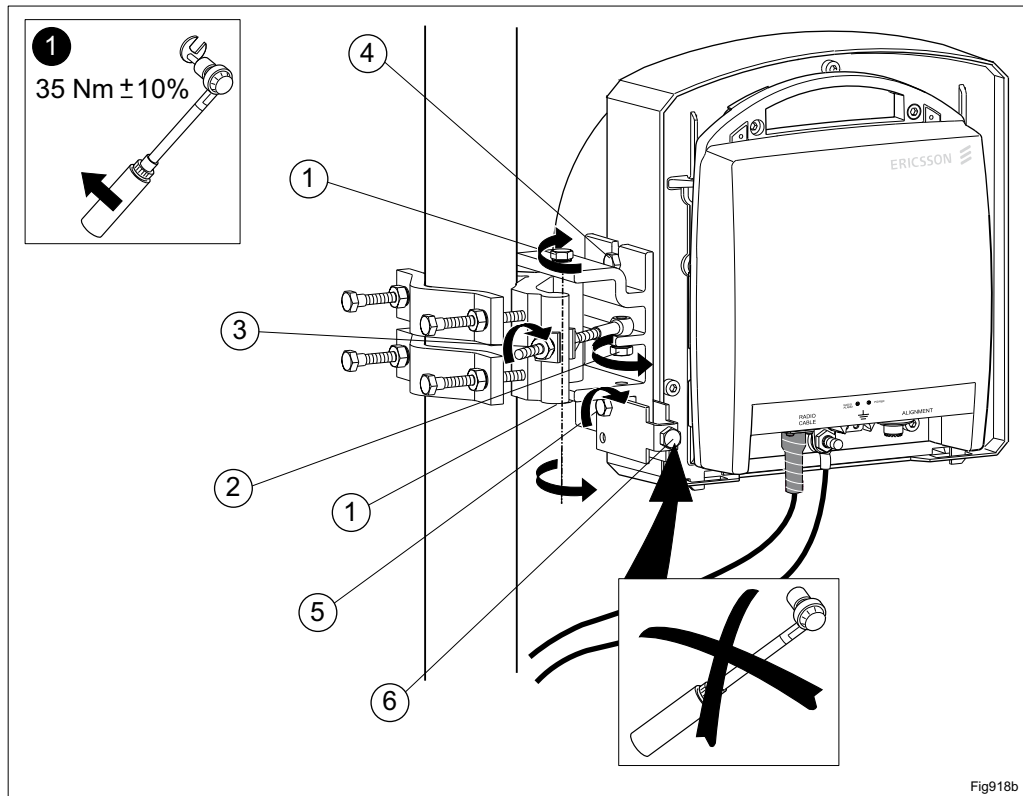


Figure 8-4. Adjustment and locking screws on the antenna support for the 0.3 m and 0.6 m antennas.

4. Loosen the vertical axis locking screws ① and ② and adjust the antenna horizontally for maximum AGC value using the azimuth adjustment screw ③. Tighten the screws when maximum value is found. The torque is **35 Nm ± 10% ①**.
5. Loosen the horizontal axis locking screws ④ and ⑤ and adjust the antenna in the vertical plane for maximum AGC value, using the elevation adjustment screw ⑥. Tighten the locking screws when maximum value is found. The torque is **35 Nm ± 10% ①**.
6. Repeat instructions 4 and 5 until maximum AGC level is achieved.
7. Measure the AGC level and record the value.
8. Transform the voltage level into RF input level in dBm. A curve for transformation is found in section 10.11.
9. Compare the RF level given in the curve with that calculated for the system during path calculation (done when planning the network). See section 10.11 for information about tolerances.

# **DANGER**



**Make sure all screws, except the elevation adjustment screw ⑥, are tightened when the alignment procedure is finished.**

## 8.5 Setup

Settings of frequency and output power by using the local supervision interface on the MMU, is described in section 5.4.5 for RAU1 and in section 6.4.2 for RAU2.

The other software setup is made by using a PC with MINI-LINK Netman or MSM. See separate manual (delivered with the PC software) for further information.



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# 9 Local Supervision and Functional Test

## 9.1 Introduction

This chapter describes the local supervision interfaces and how to perform a functional test.

The list below gives an overview of the test procedure.

### **Test procedure**

**Step 1** Perform a functional test. (See section 9.3)

**Step 2** Start the system. (See section 9.4)



## 9.2 Local Supervision Interfaces

**CAUTION**  
**!**

The plug-in units in the access module generate heat and may be hot.

### 9.2.1 Local Supervision

The local supervision interfaces consist of:

- LEDs on the outdoor radio unit for fault detection
- LEDs on the indoor units for fault detection
- display and switches on the MMU front for setting of software as well as fault detection.

The LEDs on the radio unit indicate the current status of the unit.

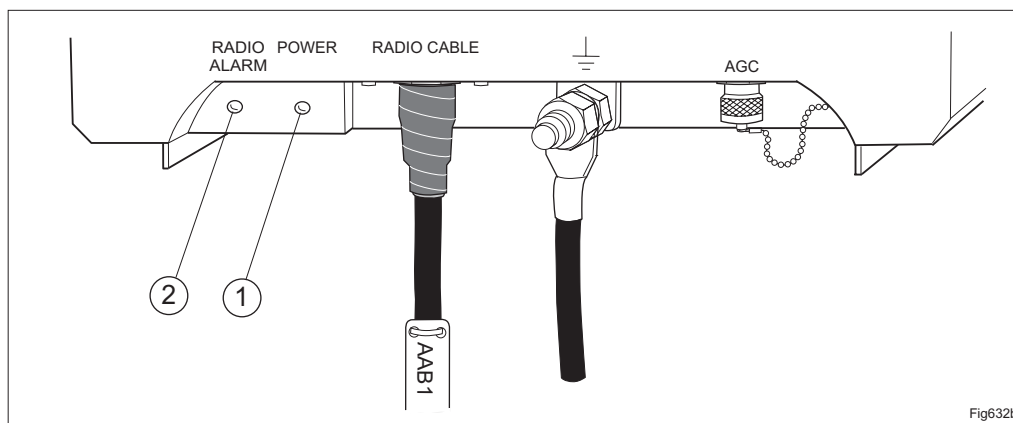


Fig632b

Figure 9-1. The LEDs on RAU1.

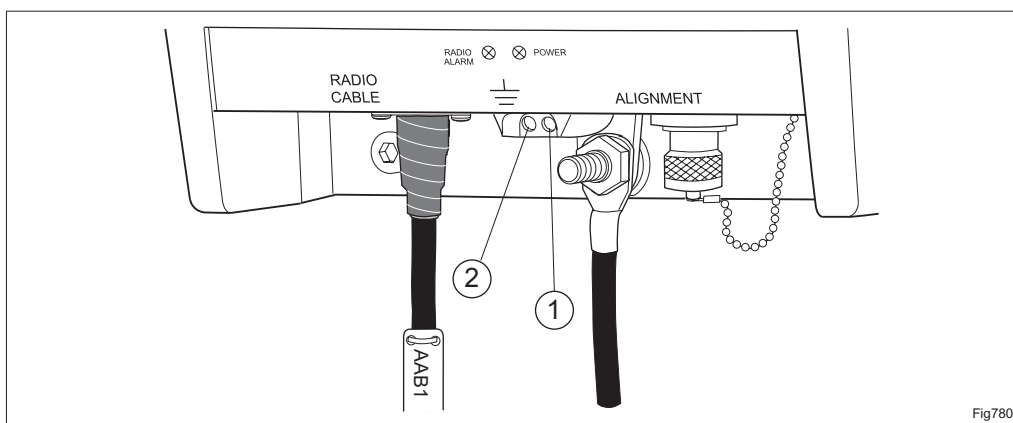
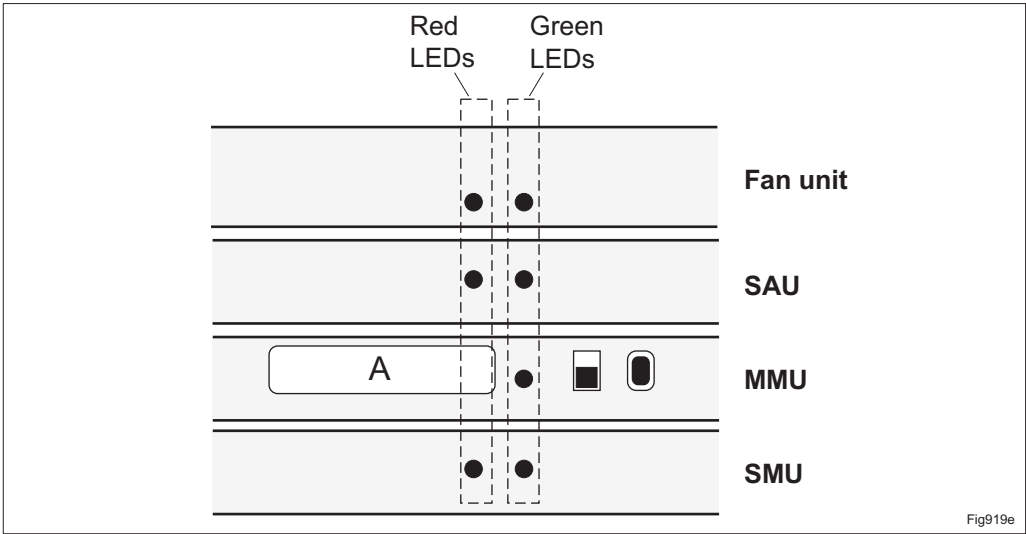


Fig780b

Figure 9-2. The LEDs on RAU2.

- ① **Green LED (steady)**      Power on.
- ② **Red LED (steady)**      Indicates a faulty radio unit.

The LEDs on the MMU, SMU, SAU and fan unit indicate the current status of each unit. The tables below describe the different combinations. The MMU has no red LED. Instead the characters on the display indicate status for near-end or far-end terminal.



	Red	Green, steady	Green, flashing
Fan unit	Faulty fan unit. The alarm has a 1 second delay and occurs if two or more of the fans do not work.	Power on	-
SAU	Faulty SAU	Power on	NCC, EAC or RAC alarm
MMU	-	Power on	NCC alarm
SMU	Faulty SMU	Power on	NCC alarm

Figure 9-3. Description of the LEDs on the Fan unit, SAU, MMU and SMU.

## MMU Display

The display (8 characters) is in sleeping mode when it is not activated. Only near-end alarms are indicated in sleeping mode (position 5). The toggle switch or the push button on the MMU must be pressed once to activate the display. The display returns to sleeping mode after 5 minutes, unless it is activated again.

When the toggle switch or the push button is pressed the alarm status is displayed.

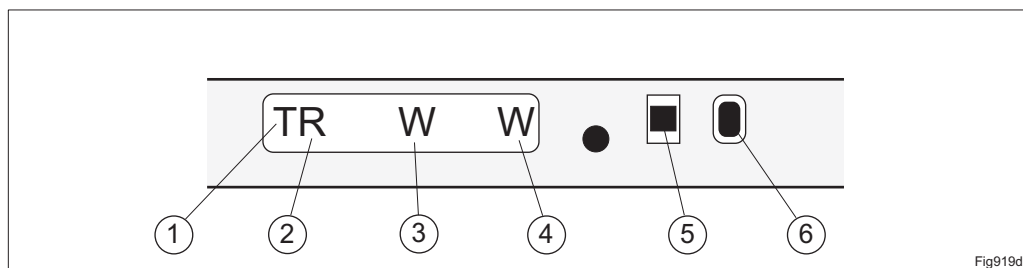


Figure 9-4. Description of the alarms on the MMU when the local supervision interface is activated.

- ① **T** Transmitter on.  
- Transmitter off.
- ② **R** Receiver selected.  
- Receiver standby (1+1 only).
- ③ **A** Traffic disturbing failure detected in the near-end terminal.  
Or  
**B** Failure in the near-end terminal. The failure is not disturbing traffic.  
Or  
**W** Abnormal condition (loops etc) in the near-end terminal.  
Or  
- Normal condition.
- ④ **A** Traffic disturbing failure detected in the far-end terminal.  
Or  
**B** Failure in the far-end terminal. The failure is not disturbing the traffic.  
Or  
**W** Abnormal condition (loops etc) in the far-end terminal.  
Or  
- Normal condition.
- ⑤ Toggle switch
- ⑥ Push button

Push the toggle switch to see the alarm status for the terminal or to set up the terminal.

**Changing Value**

**Note:** Applies only for TX Freq, TX On/Off, TX Power, TX Select, RX Select and Loops.

A new value is selected with the toggle switch. The new value must then be executed by pressing the push button (“Execute?” is displayed). The new value is entered by pressing the push button twice.

The “Execute?” menu is left without entering a new value by pressing the toggle switch.

**Alarm Indication**

An activated alarm is indicated by an asterisk (\*) at the rightmost position in the display.

## 9.2.2 Main Level

The figure below gives an overview of the parameters at the main level.

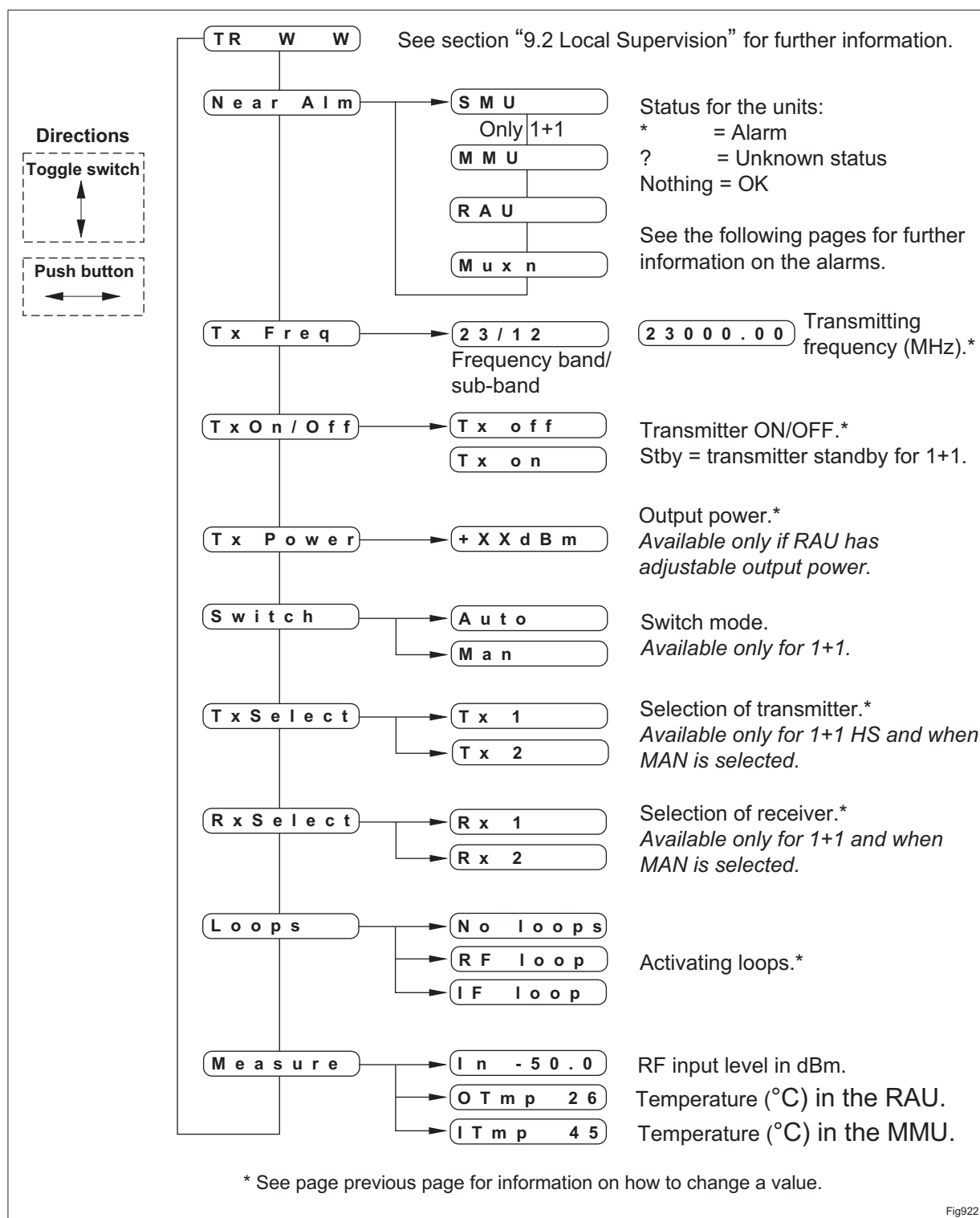


Figure 9-5. Overview of the main level parameters.

### 9.2.3 Connection Information

The tables below show the physical connection to the ports for the signals presented on the MMU display and PC.

MMU 2x2		MMU 4x2/8		MMU 2x8		MMU 34+2	
Port on the plug-in unit	Signal as presented in MSM	Port on the plug- in unit	Signal as presented in MSM	Port on the plug- in unit	Signal as presented in MSM	Port on the plug- in unit	Signal as presented in MSM
TR1A	BB1	TR1A	E1:1			TR1A	BB2
TR1B	BB2	TR1B	E1:2				
		TR1C	E1:3				
		TR1D	E1:4				
		TR2A	BB1	TR2A	BB1		
				TR2B	BB2		

SMU 8x2		SMU 16x2 (used for one terminal)		SMU 16x2 (used for two 1+0 terminals 2x8 Mbit/s)	
Port on the plug-in unit	Signal as presented in MSM	Port on the plug- in unit	Signal as presented in MSM	Port on the plug-in unit	Signal as presented in MSM
TR1A	E1:1	TR1A	E1:1	TR1A	E1:1 (MMU1)
TR1B	E1:2	TR1B	E1:2	TR1B	E1:2 (MMU1)
TR1C	E1:3	TR1C	E1:3	TR1C	E1:3 (MMU1)
TR1D	E1:4	TR1D	E1:4	TR1D	E1:4 (MMU1)
TR2A	E1:5	TR2A	E1:5	TR2A	E1:5 (MMU1)
TR2B	E1:6	TR2B	E1:6	TR2B	E1:6 (MMU1)
TR2C	E1:7	TR2C	E1:7	TR2C	E1:7 (MMU1)
TR2D	E1:8	TR2D	E1:8	TR2D	E1:8 (MMU1)
		TR3A	E1:9	TR3A	E1:1 (MMU2)
		TR3B	E1:10	TR3B	E1:2 (MMU2)
		TR3C	E1:11	TR3C	E1:3 (MMU2)
		TR3D	E1:12	TR3D	E1:4 (MMU2)
		TR4A	E1:13	TR4A	E1:5 (MMU2)
		TR4B	E1:14	TR4B	E1:6 (MMU2)
		TR4C	E1:15	TR4C	E1:7 (MMU2)
			TR4D	E1:16	TR4D

Figure 9-6. Connection information.

### 9.2.4 SMU Alarms (1+1 terminal only)

- Press the push button once to see alarm details for the SMU and twice to leave.

The alarms in the table below are listed in the same order as they are shown on the display. Press the toggle switch to step up and down in the alarm list.

Alarm	Description
Switch	Switch Logic. Fault within the protection switch logic (1+1 configurations only).
Tx SwO	Tx Switch Over. Transmitter has been replaced due to transmitter alarm (1+1 Hot configurations only).
RTx SwO	Rem Tx Switch Over. Transmitter has been replaced on request from the remote terminal (1+1 Hot configurations only). <sup>1)</sup>
Config	Configuration failure.
Proc HW	Processor Hardware. A hardware fault is detected within the CSS of the unit.
Proc SW	Processor Software. A software fault is detected within the CSS of the unit. <sup>1)</sup>
EEPROM	Programming of the non-volatile memory in the unit is interrupted.

*Figure 9-7. Description of SMU alarms.*

---

<sup>1)</sup> Not used.

## 9.2.5 MMU Alarms

- Press the push button once to see alarm details for the MMU and twice to leave.

The alarms in the table below are listed in the same order as they are shown on the display. Press the toggle switch to step up and down in the alarm list.

Alarm	Description
In BB1	Input traffic failure on traffic channel 1 in the transmitting direction.
TXFIFO1	Input traffic failure on traffic channel 1 in the transmitting direction.
In BB2	Input traffic failure on traffic channel 2 in the transmitting direction.
TXFIFO2	Input traffic failure on traffic channel 2 in the transmitting direction.
Mod Ind	Mod Index. The modulation index of the MMU, controlled by the far end MMU, is out of the allowed range.
Ra Frm	Radio Frame. The receiver failed to recognise the frame of the received composite bit stream due to signal faulty.
Ra ID	Radio ID. The received traffic comes from a radio with an ID not matching the Far End ID as set in the Hop setup. This alarm can only be active if the ID Check is activated in Hop setup.
BER	The BER (Bit Error Rate) for the received signal has exceeded the BER alarm threshold. The BER alarm threshold is set in the Hop setup.
Phase	Hitless Phase. Failure when synchronizing the received traffic in the two MMUs (1+1 configurations only).
Ck BB1	Dmod Clock BB1. The internal data rate of the MMU does not correspond to the received data rate. This will cause bit slip in the composite bit stream.
Ck BB2	Dmod Clock BB2. The internal data rate of the MMU does not correspond to the received data rate. This will cause bit slip in the composite bit stream.
AIS BB1	AIS Received BB1. AIS is detected on the received traffic signal. (This alarm does not affect the severity of the terminal.)
AIS BB2	AIS Received BB2. AIS is detected on the received traffic signal. (This alarm does not affect the severity of the terminal.)
Config	Configuration failure.
Proc HW	Processor Hardware. A hardware fault is detected within the CSS of the unit.
Proc SW	Processor Software. A software fault is detected within the CSS of the unit. <sup>1)</sup>
EEPROM	Programming of the non-volatile memory in the unit is interrupted.
HCC	Communication is lost on the HCC between the MMU and the far end MMU.
RCC	Communication is lost on the RCC between the MMU and the RAU.
Fan unit	Two or more of the fans in the fan unit have stopped working or the DC supply to the fan is lost.

Figure 9-8. Description of MMU alarms.

<sup>1)</sup> Not used.



### 9.2.6 RAU Alarms

- Press the push button once to see alarm details for the RAU and twice to leave.

The alarms in the table below are listed in the same order as they are shown on the display. Press the toggle switch to step up and down in the alarm list.

Alarm	Description
Tx IFin	Tx IF Input. Failure on the received IF signal from the MMU to the RAU.
Tx Freq	Tx Frequency. The transmitter frequency loop is unlocked. The fault turns off the transmitter.
RF Out	RF Output Level. A major degradation of transmitter RF output level. Note: This alarm is only active if the transmitter is on.
RF In	RF Input Level. The received RF input signal has dropped below the threshold for the receiver.
AGC	AGC Threshold. The RF input level has dropped below the AGC threshold value. The AGC threshold is set in Hop setup and is mainly used in 1+1 configurations for Rx switching at fading.
Rx Freq	Rx Frequency. The receiver frequency loop is unlocked.
Rx AFC	Rx AFC. The frequency of the received signal is outside the range of the Automatic Frequency Control in the RAU receiver.
Config	Configuration failure. <sup>1)</sup>
Proc HW	Processor Hardware. A hardware fault is detected within the CSS of the unit.
Proc SW	Processor Software. A software fault is detected within the CSS of the unit. <sup>1)</sup>
EEPROM	Programming of the non-volatile memory in the unit is interrupted.

Figure 9-9. Description of RAU alarms.

<sup>1)</sup> Not used.

### 9.2.7 MUX Alarms

- Press the push button once to see alarm details for each MUX and twice to leave.

The alarms in the table below are listed in the same order as they are shown on the display. Press the toggle switch to step up and down in the alarm list.

For alarm names with EX:Y,

- X indicates the traffic rate: 1=2 Mbit/s, 2=8 Mbit/s and 3=34 Mbit/s, and
- Y indicates the traffic signal number.

Example:

A 4x2 Mbit/s terminal contains the traffic signals E1:1, E1:2, E1:3 and E1:4.

Alarm	Description
In X:Y	Input EX:Y. Input traffic failure in the transmitting direction.
In X:Y	Input EX:Y. Input traffic failure in the transmitting direction.
In X:Y	Input EX:Y. Input traffic failure in the transmitting direction.
In X:Y	Input EX:Y. Input traffic failure in the transmitting direction.
SLF X:Y	System Line Fault EX:Y. Traffic signal failure to the MUX in the receiving direction.
Frm X:Y	Frame EX:Y. Receive direction MUX frame lock error.
AIS X:Y	AIS Received EX:Y. AIS is detected on the received traffic signal. (This alarm does not affect the severity of the terminal).

Figure 9-10. Description of MUX alarms.

### 9.2.8 Error Message

The following error message may be shown on the display.

Error Message	Description
TOMnPERF	Type of message not performed. The command is not performed due to a failure in the equipment.

Figure 9-11. Description of error message.

## **9.3 MINI-LINK E Functional Test**

The aim of the functional test is to verify that the installation has been carried out properly.

### **9.3.1 Preparations**

The access modules and the radio units must be installed on both sides of the hop and the antenna modules must be aligned for maximum received level before making the tests.

### **9.3.2 Test Equipment**

- PC with MSM software
- BER-meter for applicable traffic capacity
- Digital voltmeter
- Optional power meter, see section 5.2 for examples.

### **9.3.3 Test Record**

Find the document “MINI-LINK E Test Record” in this chapter. Use one record per terminal.

### **9.3.4 Installation Data**

Make sure the "Installation Data" forms, filled in during the planning phase, are available.

- Complete the “Installation Data” document and record type, serial number, hardware revision, software revision and any additional information for the equipment installed.

For further information about how to use the “Installation Data” document, see the Planning and Engineering Manual, EN/LZT 110 2013.

### 9.3.5 Tests

Perform the following tests on the near-end and far-end terminals and record the results in the MINI-LINK E Test Record:

#### Step 1 Setup Parameters

**Purpose:** To verify that the correct parameters are used.

- Check, by using a PC with MSM software, that all setup parameters are set according to the “Installation Data” form.

#### Step 2 DC Supply

**Purpose:** To verify that the correct DC power is fed to the MMU.

- Measure the primary DC voltage in the DC cable, which connects to the MMU, using a digital voltmeter. Record the value in the test record.

#### Step 3 Transmitter Output Power

**Purpose:** To verify that the output power corresponds to the value provided from the design department.

- If the output power has not been changed during the installation, record the value from the factory test record. (No measurement is required).
- If the output power has been changed via MSM, record that value. (No measurement is required.)
- If the output power has been changed by insertion of fixed attenuator or by manual adjustment of the variable attenuator, measure the output power with an RF power meter and record the value in the test record.
- Compare the value with the value provided by the design department. Contact the design department if they are not similar.

#### Step 4 RF Input Level

**Purpose:** To verify that the input level corresponds to the value provided from the design department.

**Note:** In a 1+1 system the receive level in each radio should be measured twice. Once with input signal from far-end radio 1 and once with input signal from far-end radio 2.

- Read the received RF input level, on the local display on the MMU front or by using a PC with MSM software. Record the level. The design department provides the levels for both radios in a 1+1 system. Compare the received results with these values and record them in the test record.
- Compare the RF input level with the level calculated during path planning. Consult the design department if the difference is more than 3 dB during unfaded conditions. See the Planning and Engineering Manual, EN/LZT 110 2013, for more information on unfaded conditions.

### **Step 5 Interference Test**

**Purpose:** To verify that there are no interfering signals, which can degrade the performance.

- Access the far-end terminal through the MSM program and switch the remote transmitter off.

**Note:** In a 1+1 system both transmitters must be switched off.

- Read the received RF input level. If the level is  $>-90$  dBm, consult the design department. After the test has been performed, activate the transmitters again and restore the communication over the hop.

### **Step 6 Near Alarm Check**

**Purpose:** To verify that the indoor and outdoor units are running properly.

- Check in MSM or on the local display on the MMU that no near-end alarms are activated.

### **Step 7 Traffic Cables and Connection Test**

**Purpose:** To verify that the traffic in each unit is running properly and that all traffic cable connections are OK.

- Check that each tributary (2 Mbit/s, 8 Mbit/s or 34 Mbit/s) signal can be looped back from the remote site at the traffic cable connection. If traffic is routed, internally in the AMM, this check must be carried out from the remote site with traffic looped back.
- Make a short test on each tributary with the BER-meter to confirm that traffic is running through the system.
- Activate the Input Traffic Alarm in the traffic setup, while testing the tributary. While you are checking a tributary, verify that the Input Traffic Alarm disappears for that tributary.
- Shake each tested traffic cable gently, to confirm proper connection.

### **Step 8 Switch Test 1+1 Configuration**

**Purpose:** To verify the functionality of the redundant MMU, radios and SMU switch.

- To perform this test, make sure the radio 1 transmitter and receiver are active and that switch mode is set to auto. Connect a BER-meter to one of the tributaries and run the traffic.
- Disconnect the power to MMU 1 and verify, on the MSM terminal window, that the system switches to the radio 2 transmitter and receiver. Check on the BER-meter that traffic is recovered after switching from radio 1 to radio 2.
- Repeat the switch test for radio 2 (Ra2) and MMU 2.
- **Hitless switch test:** Connect a BER-meter to one of the tributaries and run the traffic. Access via MSM the terminal that the test will be carried out on. Set the AGC Alarm Threshold for the receiving RAU to a level above the received level. As a result, switching to the other radio takes place. Bit errors should not occur on the BER-meter.

### 9.3.6 Hop Test

#### Step 9 Performance Test

**Purpose:** To verify that the hop performance quality after a period of time in normal operation has not degraded.

- Reset performance data for both sides of the hop by using a PC with MSM software. The reset function is found in the Terminal Management Window (View menu). Read the performance for both terminals, for instance after 24 hours.
- If there is no degradation of performance, the test is OK. Attach the test results to the MINI-LINK E Test Record after the test is completed.
- If performance has been degraded, measure for another 24 hours. If the performance is further degraded, check the path and the installation.

### 9.3.7 Optional Tests

#### Step 10 EAC, RAC and NCC Check

**Purpose:** To verify the MINI-LINK network supervision connection

- Connect a PC with MSM to the O&M port on the SAU and scan the network by selecting **scan local** in the network menu. Check that all terminals in the EAC, RAC and Expanded NCC lists are presented in the MSM network window.

#### Step 11 Service Channel (SAU)

**Purpose:** To verify the service channel setup.

- Make sure the service channel is properly installed and set up, see chapter 3 in the MINI-LINK Operation Manual, EN/LZT 110 5057.
- When using SAU Exp 2: Make a test call.

#### Step 12 User In (SAU)

**Purpose:** To verify external User In connections.

- Activate the user IN ports to be used and check the reading in MSM.

#### Step 13 User Out (SAU)

**Purpose:** To verify external User Out connections.

- Disconnect the DC supply to one or several MMUs through the AMM and check that A and B-alarms are active.

#### Step 14 Fan Alarm Test

**Purpose:** To verify the Fan alarm connection.

- Disconnect the DC supply cable for the fan unit. Use a PC with MSM software to check that the fan alarm goes active.

## 9.4 Start the System

Use MSM to carry out the following resets on both sites:

- Restore the terminal in the Terminal Management Window (Misc menu).
- Reset the Alarm History and Performance in the Terminal Management Window (View menu).
- Reset the Switch-over alarms, if active for a 1+1 terminal.

## 9.5 MINI-LINK Failure Report

For fast handling of repairs, please complete and enclose the Failure Report together with the other requested documents (see the shipping instructions below). The Failure Report is found in this chapter. The Failure Report should be as detailed as possible for us to make an efficient and quick analysis. If no fault is found, the cost for a full system test will be charged.

## 9.6 Shipping instructions

Follow the instruction below when sending MINI-LINK equipment to the MINI-LINK Repair Centre.

1. Pack the goods thoroughly and mark it with our address, written below.
2. Enclose delivery note and a copy of the proforma invoice. The information must include:
  - Product codes
  - Serial numbers
  - Number of parts included in the shipment
  - Goods address
  - Invoice address
  - Customs value
  - Customer reference: name or reference number for the shipment.
3. Enclose a failure report giving information about the failure. Use the failure report in this manual.
4. Inform the Repair Centre and our shipping department, by fax, about goods being sent. Please enclose a copy of the proforma invoice.

**Goods address:**

MINI-LINK Repair Centre  
Sandlidsgatan 3  
SE-504 62 Borås  
Sweden  
Fax number: +46 33 179947  
E-mail: emwbsrep@emw.ericsson.se

**Shipping Department:**

Fax number: +46 31 7471665



# MINI-LINK E Functional Test Record

Hop ID:	
Site ID	Far-end site ID:
Site name:	Far-end site name:
Terminal ID:	Far-end terminal ID:

Test no:	Parameter	OK
1	Setup Parameters	<input type="checkbox"/>

Test no:	Parameter	Unit	Ra 1	Ra 2 ( 1+1 config. only)	E Micro
2	DC supply	V			
3	Transmitter output power	dBm			
4	RF input level (far-end 1/ far-end 2)	dBm	/	/	
5	Interference test	dBm			

Test no:	Functional Test	Pass	/ Fail	Pass	/ Fail
6	Near alarm check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Traffic cable and connection test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Switch test (for 1+1 configuration only)	<input type="checkbox"/>	<input type="checkbox"/>		

Test no:	Hop Test	Pass	/ Fail	Pass	/ Fail
9	Performance test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Test no:	Optional Test	Pass	/ Fail	Pass	/ Fail
10	EAC, RAC and NCC check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Service channel (SAU)	<input type="checkbox"/>	<input type="checkbox"/>		
12	User In (SAU)	<input type="checkbox"/>	<input type="checkbox"/>		
13	User Out (SAU)	<input type="checkbox"/>	<input type="checkbox"/>		
14	Fan alarm test	<input type="checkbox"/>	<input type="checkbox"/>	Pass	/ Fail
15	Optional power supply test			<input type="checkbox"/>	<input type="checkbox"/>
16	Battery backup test			<input type="checkbox"/>	<input type="checkbox"/>

<b>Comments:</b>

	Signature	Print name	Title	Date
Performed by:				
Approved by:				

# MINI-LINK Failure Report

Date of report: \_\_\_\_\_

Date of failure: \_\_\_\_\_

## After repair return to:

Goods address	Invoice address

## Failure report

Unit name	Ordering code	Serial No	H/W Revision state
Configuration (1+0, 1+1 etc).			S/W Revision state

MECHANICAL DAMAGE

☐

DC FAILURE

☐

TRAFFIC FAILURE

☐

RF OUTPUT FAILURE

☐

RF INPUT FAILURE

☐

INTERMITTENT FAILURE

☐

NOT WORKING AT INSTALLATION

☐

UNKNOWN

☐

Detailed fault description:

Alarms noticed:

## Location of faulty unit

Site name	
Name of opposite site	
Transmit frequency (MHz) / Channel	Traffic type (Mbit/s)
Start of operation, date	Latest previous failure on same unit, date

Name: \_\_\_\_\_

Telephone No: \_\_\_\_\_

E-mail: \_\_\_\_\_

## ERICSSON MICROWAVE SYSTEMS AB

## Mail

P.O Box 22150  
SE-500 02 BORÅS  
SWEDEN

## Goods address

MINI-LINK Repair Centre  
Sandlidsgatan 3  
SE-504 62 BORÅS  
SWEDEN

## Telephone

+46 33 179600

## Telefax

+ 46 33 179947

## E-mail

emwbsrep@emw.ericsson.se



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<b>10.9</b>	<b>User Outputs</b>	<b>10-13</b>
<b>10.10</b>	<b>User Inputs</b>	<b>10-14</b>
<b>10.11</b>	<b>AGC Curve</b>	<b>10-15</b>
<b>10.12</b>	<b>Technical Performance</b>	<b>10-16</b>
10.12.1	MINI-LINK 7-E	10-16
10.12.2	MINI-LINK 8-E	10-18
10.12.3	MINI-LINK 15-E	10-20
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10.12.6	MINI-LINK 26-E	10-25
10.12.7	MINI-LINK 38-E	10-26



# 10 Technical Data

## 10.1 Introduction

This chapter is a summary of technical data for MINI-LINK E.

## 10.2 Environmental Requirements

### Outdoors units

Temperature limits including solar radiation (full functionality): -50°C to +60°C

Relative humidity: 8-100%

### Indoors units

Temperature limits including solar radiation (full functionality): -20°C to +60°C

Relative humidity: 5-95%

## 10.3 Mechanical Data for Outdoor Equipment

### 10.3.1 RAU1

#### Radio unit

Dim.(HxWxD): 411x326x144 mm

Weight: 7 kg

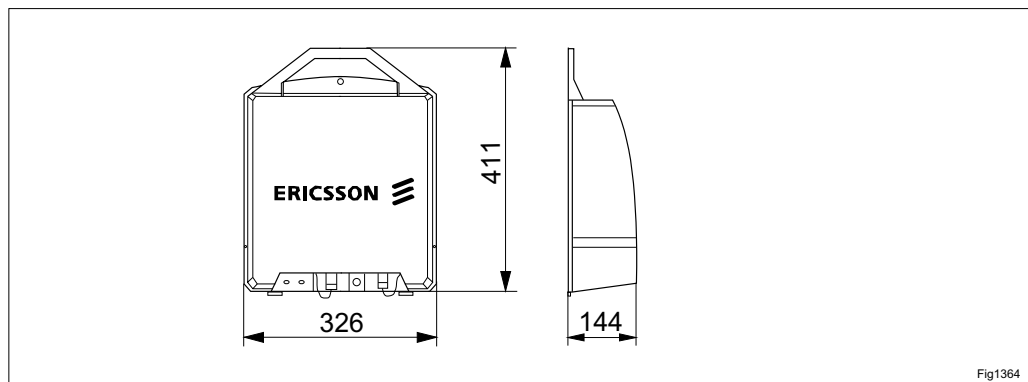


Figure 10-1. Dimensions of the RAU1 Radio unit.

**Integrated installation with 0.3 m antenna**

Dimensions (HxWxD): 411x334x296 mm

Weight: 11 kg

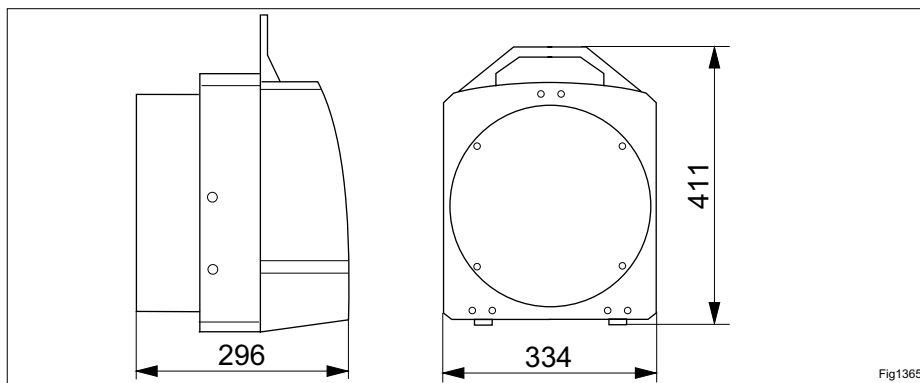


Figure 10-2. Dimensions of the RAU1 with 0.3 m antenna for integrated installation

**Integrated installation with 0.6 m antenna**

Dimensions (HxWxD); HP: 634x634x471 mm

634x634x452 mm (for 7 and 8 GHz)

Weight: 16 kg

Standard: 660x660x471 mm

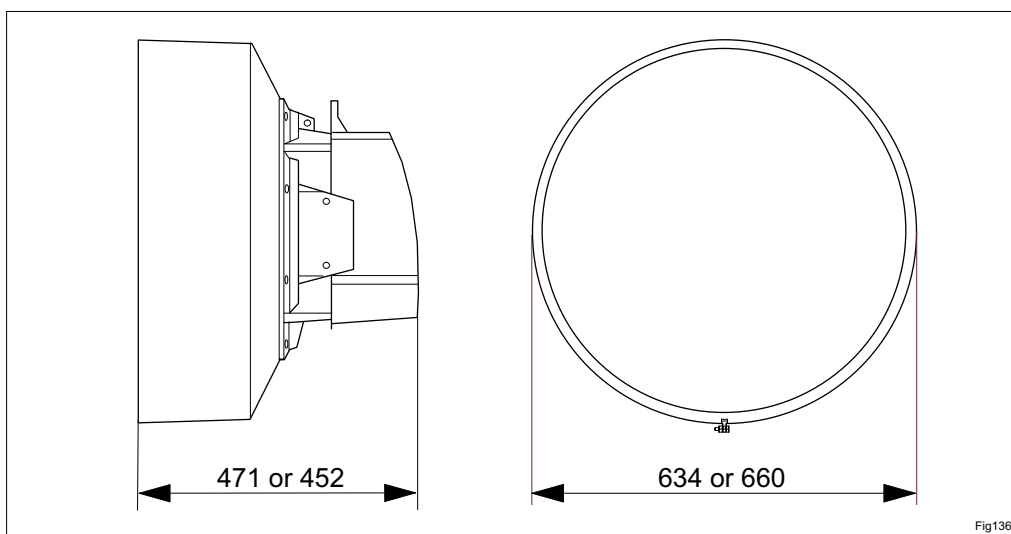


Figure 10-3. Dimensions of the RAU1 with 0.6 m antenna for integrated installation

**Note:** The weight of the antenna mounting kit for 0.3 m and 0.6 m antennas is 4.3 kg.

### 10.3.2 RAU2

#### Radio unit

Dim.(HxWxD): 321x260x97 mm

Weight: 4.5 kg

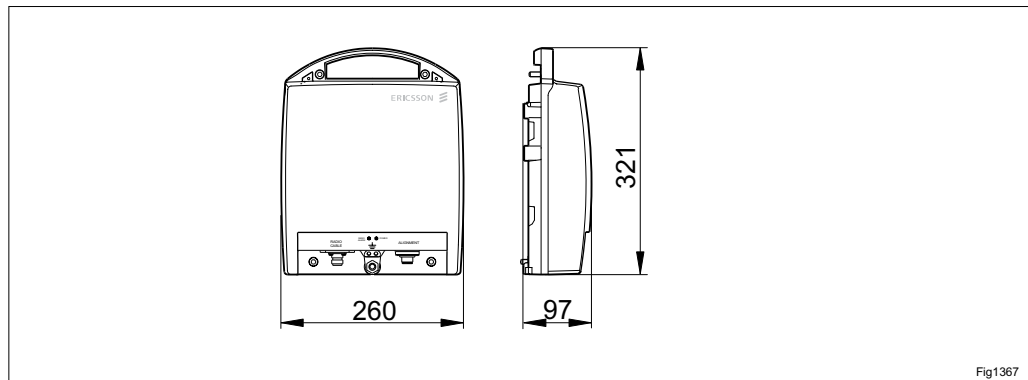


Figure 10-4. Dimensions of the RAU2 Radio unit.

#### Integrated installation with 0.2 m compact antenna

Dimensions (HxWxD): 321x266x171 mm

Weight: 7 kg

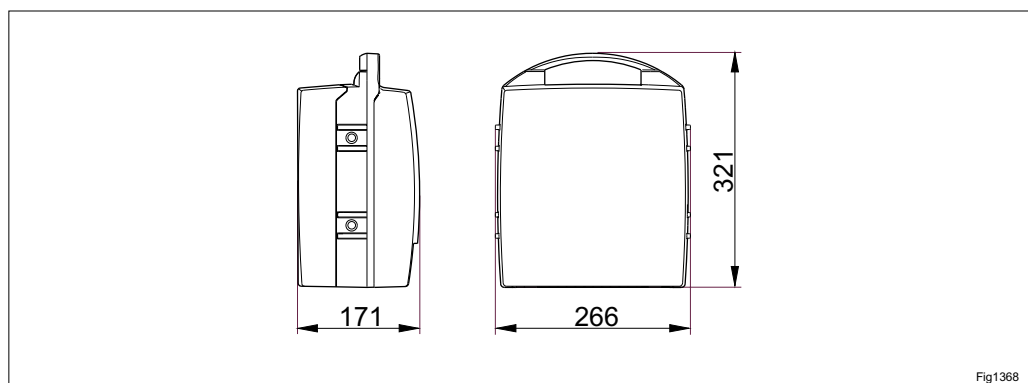


Figure 10-5. Dimensions of the RAU2 with 0.2 m compact antenna for integrated installation.



### Integrated installation with 0.3 m antenna

Dimensions (HxWxD): 361x336x268 mm

Weight: 8 kg

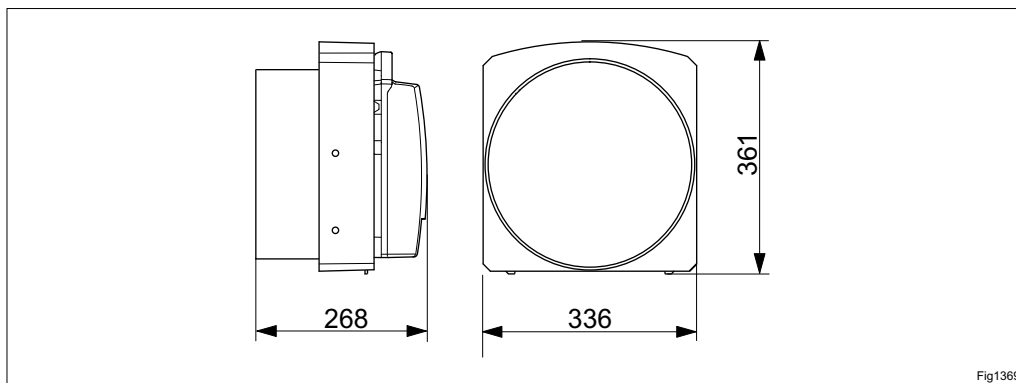


Fig1369

Figure 10-6. Dimensions of the RAU2 with 0,3 m antenna for integrated installation.

### Integrated installation with 0.6 m antenna

Dimensions (HxWxD): 634x634x436 mm

Weight: 13 kg

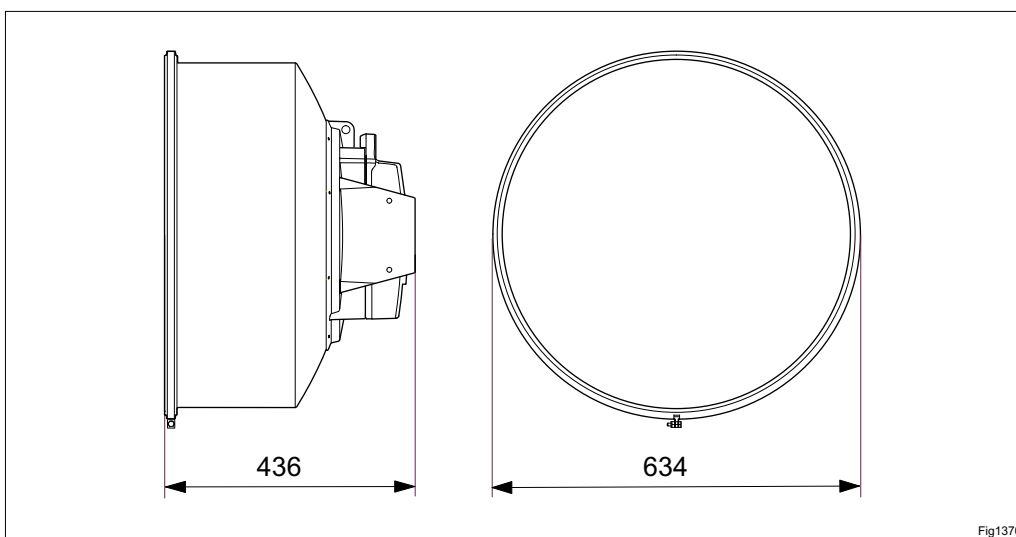


Fig1370

Figure 10-7. Dimensions of the RAU2 with 0.6 m antenna for integrated installation.

**Note:** The weight of the antenna mounting kit for 0.3 m and 0.6 m antennas is 4.3 kg. The weight of the antenna mounting kit for the 0.2 m compact antenna is 2.9 kg.

### 10.3.3 Antennas

Antennas	Dimensions HxWxD [mm]	Weight [kg]
0.2 m compact*	296x266x98	2.5
0.3 m	357x334x183	4
0.6 m HP	634x634x425 634x634x394 (for 7 and 8 GHz)	9

The weight of the antenna mounting kit for 0.3 m and 0.6 m antennas is 4.3 kg. The weight of the antenna mounting kit for the 0.2 m compact antenna is 2.9 kg.

\* Only applies to RAU2.

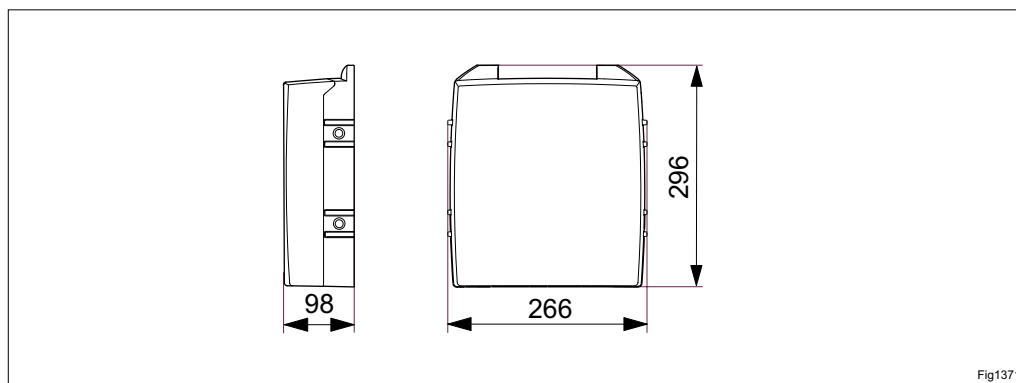


Figure 10-8. Dimensions of the 0.2 m compact antenna.

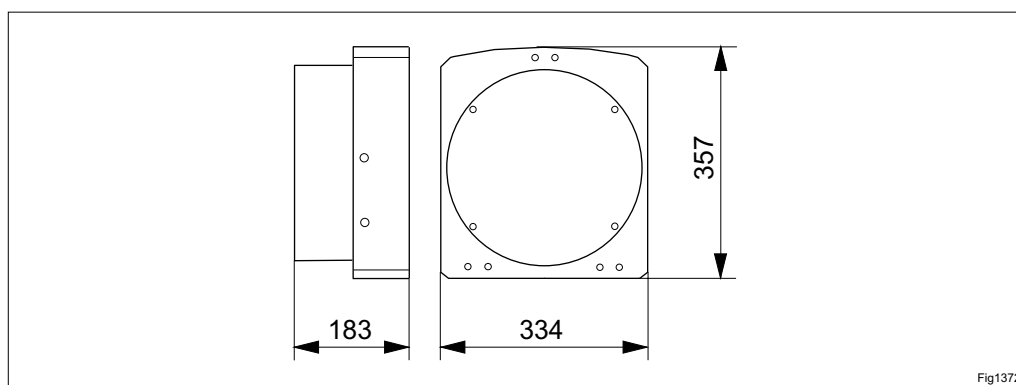


Figure 10-9. Dimensions of the 0.3 m antenna.

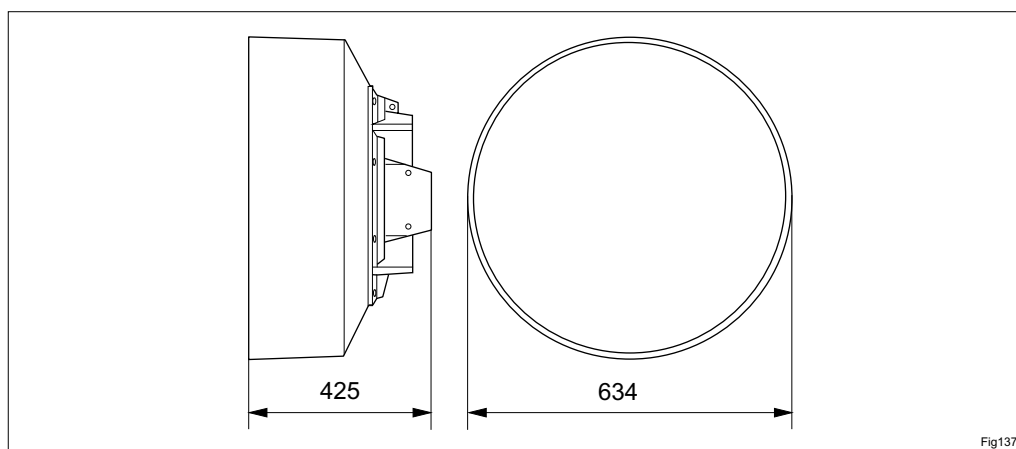
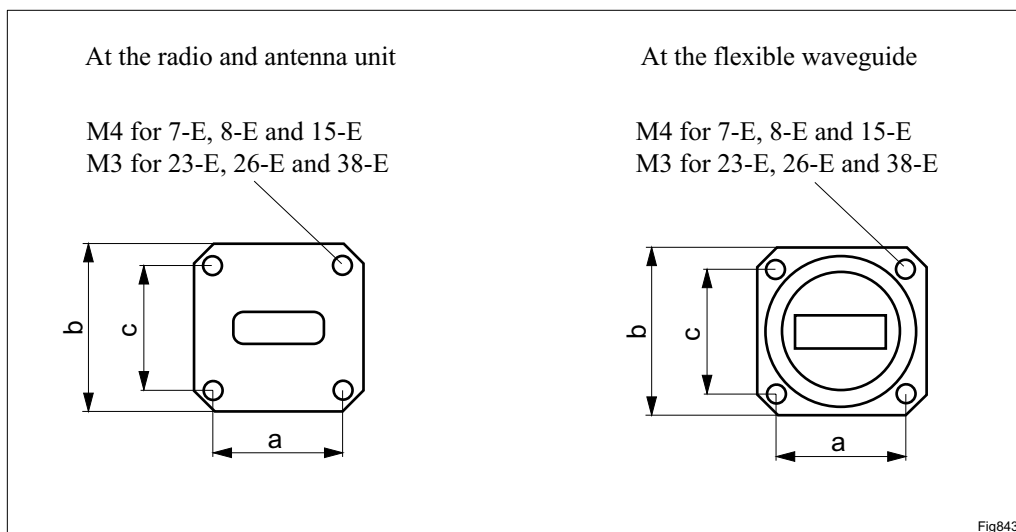


Figure 10-10. Dimensions of the 0.6 m antenna HP antenna, 15-38 GHz (For 7 and 8 GHz, depth equals 394 mm).

### 10.3.4 Waveguide Interface



MINI-LINK radio	Dimensions (mm)			Waveguide interface	
	a	b	c	At the radio unit	At the flexible waveguide
MINI-LINK 7-E and 8-E	34.4	47.6	37.4	154 IEC-UBR 84	154 IEC-PBR 84
MINI-LINK 15-E	25.25	33.3	24.28	154 IEC-UBR 140	154 IEC-PBR 140
MINI-LINK 18-E and 23-E <sup>1</sup>	16.26	22.4	17.02	154 IEC-UBR 220	154 IEC-PBR 220
MINI-LINK 26-E	15.0	22.9	15.8	154 IEC-UBR 260	154 IEC-PBR 260
MINI-LINK 38-E	12.7	19.1	13.46	154 IEC-UBR 320	154 IEC-PBR 320

Figure 10-11. The waveguide interface.

<sup>1</sup> For RAU 1 and RAU 2

## 10.4 Mechanical Data for Indoor Equipment

### 10.4.1 Access Module Magazine

#### AMM 1U

Dimensions and weights:	<b>19" rack</b>	43x483x280 mm (3.7 kg)
(HxWxD)	<b>Wall Mounting</b>	715x61x292 mm (4.5 kg)
	<b>Desk</b>	71x447x280 mm (3.7 kg)

Dimensions and weights are given with desk/wall set included.

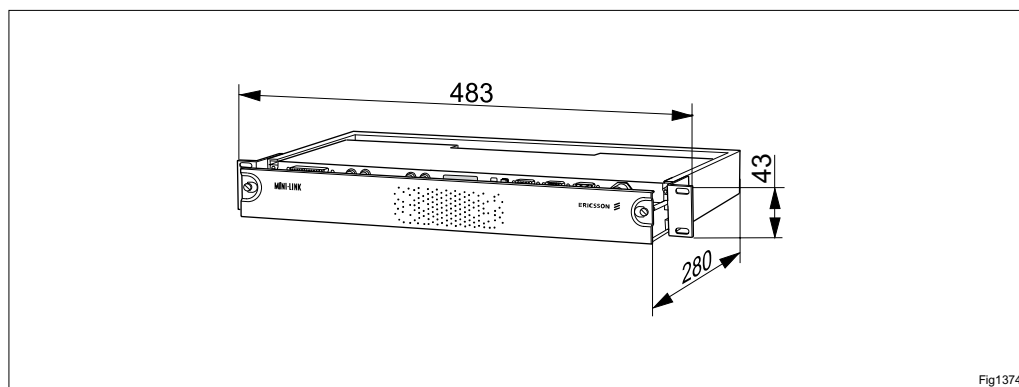


Figure 10-12. Dimensions of the AMM 1U.

#### AMM 2U

Dimensions and weights:	<b>19" rack</b>	88x483x280 mm (9.4 kg)
(HxWxD)	<b>Wall Mounting</b>	715x94x292 mm (11.1 kg)

Dimensions and weights are given with desk/wall set included.

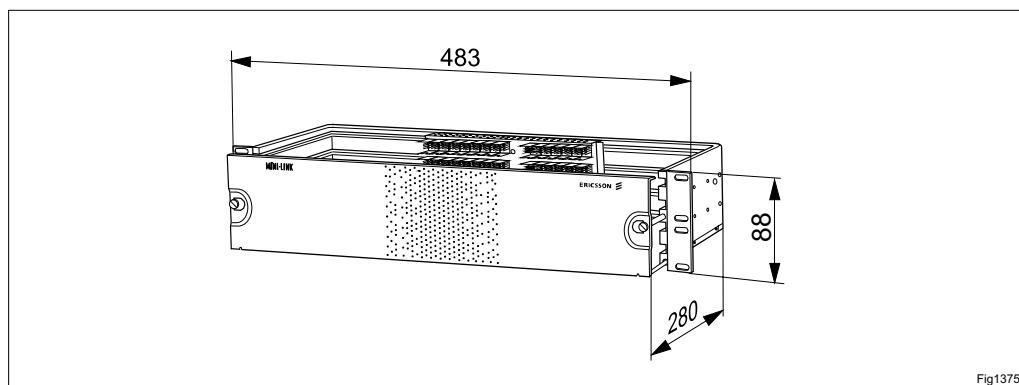


Figure 10-13. Dimensions of the AMM 2U.

**AMM 4U**

Dimensions and weights: **19" rack** 176x483x280 mm (16.3 kg)  
 (HxWxD) **Wall Mounting** 715x176x292 mm (19.5 kg)

Dimensions and weights are given with desk/wall set included.

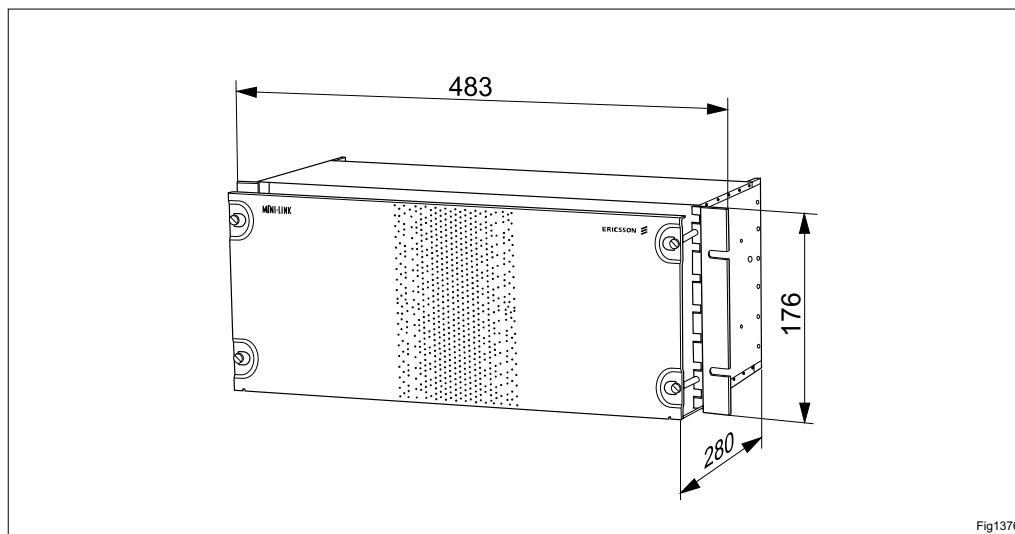


Figure 10-14. Dimensions of the AMM 4U.

**10.4.2 Fan Unit**

Dimensions(HxWxD) : 483x284x44 mm

Dimensions are given with wall set included.

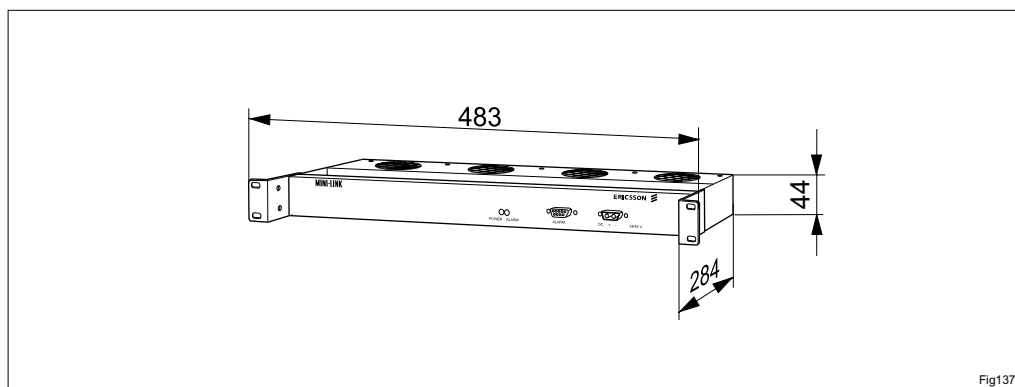


Figure 10-15. Dimensions of the Fan Unit.

## 10.5 Power Supply

Input voltage: 24-60 V, nominal (20.4-72.0 V including tolerance)

See marking on the MMU for information .

**Note:** The mains power supply shall fulfill the requirements of EN 609 50 (IEC 950).

### 10.5.1 RAU1

#### Maximum power consumption for terminal with RAU1

Unit	2x2 Mbit/s	4x2 Mbit/s	8x2 Mbit/s	17x2 Mbit/s
Unprotected terminal (1+0)	42 W	44 W	49 W	54 W
Protected terminal (1+1)	88 W	92 W	94 W	101 W

- With SAU add 10 W
- With Fan unit add 10 W

#### Maximum Indoor power consumption for terminal with RAU1

Unit	2x2 Mbit/s	4x2 Mbit/s	8x2 Mbit/s	17x2 Mbit/s
Unprotected terminal (1+0)	12 W	14 W	19 W	24 W
Protected terminal (1+1)	28 W	32 W	34 W	41 W

- With SAU add 10 W
- With fan unit add 10 W

## 10.5.2 RAU2

### Maximum power consumption for terminal with RAU2

Unit	2x2 Mbit/s	4x2 Mbit/s	8x2 Mbit/s	17x2 Mbit/s
Unprotected terminal (1+0)	32 W	34 W	39 W	44 W
Protected terminal (1+1)	68 W	72 W	74 W	81 W

- With SAU add 10 W
- With Fan unit add 10 W

### Maximum Indoor power consumption for terminal with RAU2

Unit	2x2 Mbit/s	4x2 Mbit/s	8x2 Mbit/s	17x2 Mbit/s
Unprotected terminal (1+0)	12 W	14 W	19 W	24 W
Protected terminal (1+1)	28 W	32 W	34 W	41 W

- With SAU add 10 W
- With Fan unit add 10 W

## 10.6 Traffic Interfaces

Complies to SELV in accordance with EN 60950.

According to ITU-T G.703.

8 and 34 Mbit/s:	<b>Unbalanced 75 <math>\Omega</math></b>
2 Mbit/s:	<b>Balanced 120 <math>\Omega</math></b>
	<b>Unbalanced 75 <math>\Omega</math> (option)</b>
Connector type:	<b>25 pole D-sub (balanced)</b> <b>SMZ (unbalanced)</b>

## 10.7 O & M

Type:	<b>RS232C V.24 / V.28</b>
Format:	<b>8 bit, 1 stop, no parity</b>
Bit rate:	<b>1200 bit/s</b>
Connector type:	<b>9 pole D-sub</b>

## 10.8 RAC (Remote Alarm Channel)

Type 1:	<b>RS232C V.24 / V.28,</b> <b>9600 bit/s, 8 bit,</b> <b>1 stop, no parity.</b>
Type 2:	<b>Balanced, according to</b> <b>ITU-T Rec G.703,</b> <b>64 kbit/s, co-directional.</b>
Connector type:	<b>9 pole D-sub</b>

## 10.9 User Outputs

Applicable to User 9-12. User 9-12 can be individually set as inputs or outputs using a PC with MSM or Netman. They are set as inputs by default.

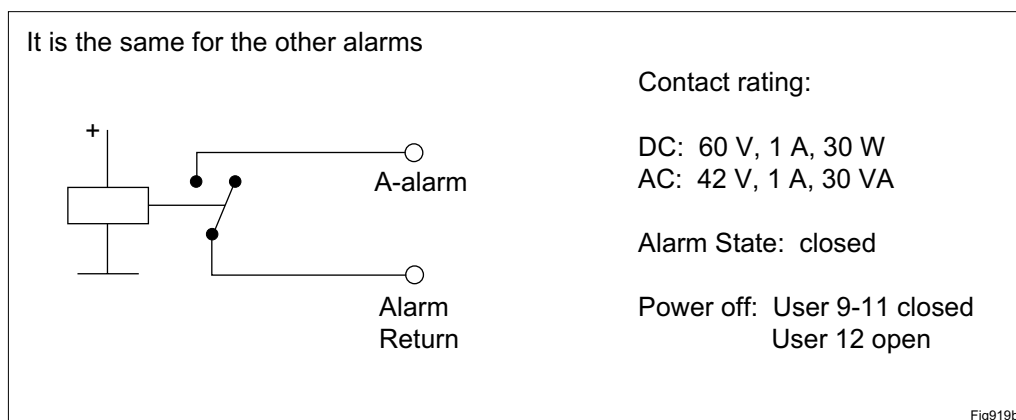


Figure 10-16. Diagram

The user output 9-11 can be set for remote control A-alarm in AM, B-alarm in AM, A- or B-alarm in AM and P-mark in AM. The user output 12 can be set for remote control. A recommendation of how to use User 9-12 is included in the description:

User 9:	<b>A-alarm</b> =	For indication of traffic disturbing failures in the access module.
User 10:	<b>B-alarm</b> =	For indication of faults not disturbing traffic in the access module.
User 11:	<b>P-mark</b> =	For indication of active P-mark. <sup>2</sup>
User 12:	<b>Remote</b> =	For control of user's functions.
Connector type:	<b>25 pole D-sub, unearthed contacts.</b>	

<sup>2</sup> With P-mark activated, all alarm signals are generated and can be read in the normal way, but the alarm notification messages are inhibited.



## 10.10 User Inputs

Applicable to User In 1-8. User 9-12 can be individually set as inputs or outputs using MSM, but they are set as inputs by default.

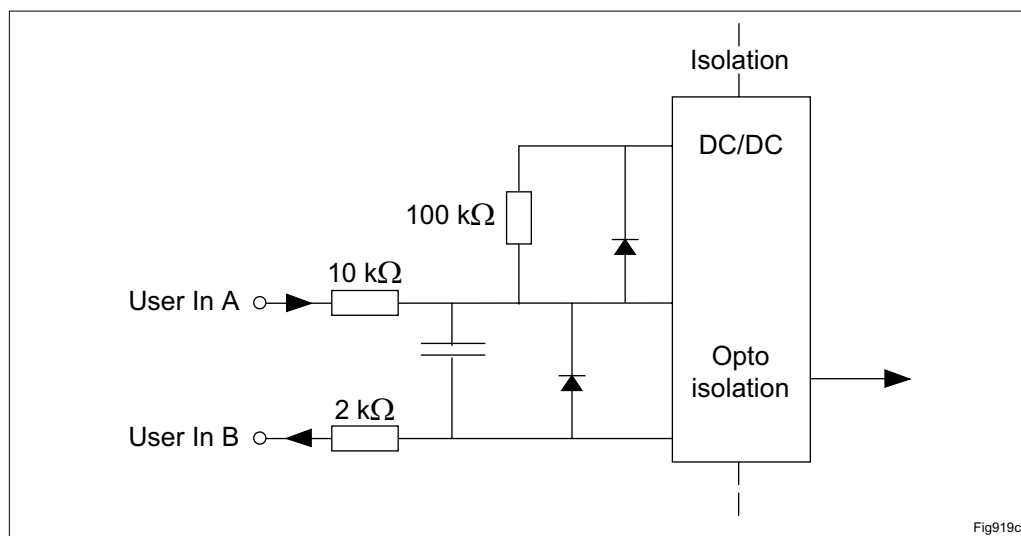


Figure 10-17. Diagram

Type:	<b>5 V CMOS</b>
Max voltage:	<b>15 V</b>
Logical zero:	<b>&lt; 1.0 V (or &lt; 1.0 kΩ to earth)</b>
Logical one:	<b>&gt; 3.5 V (or &gt; 100 kΩ to earth)</b>
Resistance to SAU earth:	<b>800 kΩ</b>
Max DC voltage to SAU earth:	<b>60 V</b>

The alarm condition and alarm severity are selectable via MSM.

Connector type:	<b>25 pole D-sub.</b>
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## 10.11 AGC Curve

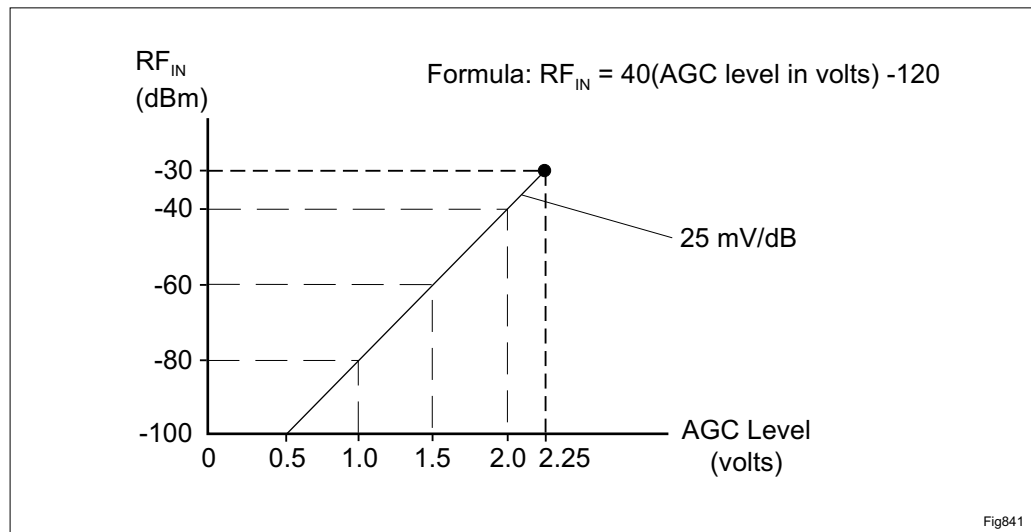


Figure 10-18. RF input level as a function of the AGC level.

**Tolerance measured with either Netman or MSM, or displayed on the MMU:**

-30 dBm to -60 dBm	<b>±2 dB</b>
-60 dBm to -80 dBm	<b>±3 dB</b>

**Tolerance measured with voltmeter:**

-30 dBm to -60 dBm	<b>±2.5 dB</b>
-60 dBm to -80 dBm	<b>±3 dB</b>

## 10.12 Technical Performance

### 10.12.1 MINI-LINK 7-E

Typical values unless otherwise stated.

Output power

Standard: **1-21 dBm (tolerance  $\pm 2$  dB)**

High power: **8-28 dBm (tolerance  $\pm 2$  dB)**

Receiver input levels: **-30 to -90 dBm (+15 dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-91	-87
<b>4x2/8</b>	-88	-84
<b>2x8/8x2</b>	-85	-81
<b>34+2/17x2</b>	-82	-78

### Frequency Plan

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 7-E. The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>11</b>	154	7429.75 / 7482.25	7431.50 / 7480.50	7435.00 / 7477.00	7442.00 / 7470.00
<b>15</b>	154	7583.75 / 7636.25	7585.50 / 7634.50	7589.00 / 7631.00	7596.00 / 7624.00
<b>12</b>	154	7457.75 / 7510.25	7459.50 / 7508.50	7463.00 / 7505.00	7470.00 / 7498.00
<b>16</b>	154	7611.75 / 7664.25	7613.50 / 7662.50	7617.00 / 7659.00	7624.00 / 7652.00
<b>13</b>	154	7485.75 / 7538.25	7487.50 / 7536.50	7491.00 / 7533.00	7498.00 / 7526.00
<b>17</b>	154	7639.75 / 7692.25	7641.50 / 7690.50	7645.00 / 7687.00	7652.00 / 7680.00
<b>14</b>	154	7513.75 / 7566.25	7515.50 / 7564.50	7519.00 / 7561.00	7526.00 / 7554.00
<b>18</b>	154	7667.75 / 7720.25	7669.50 / 7718.50	7673.00 / 7715.00	7680.00 / 7708.00
<b>31</b>	161	7126.25 / 7182.25	7128.00 / 7180.50	7131.50 / 7177.00	7138.50 / 7170.00
<b>35</b>	161	7287.25 / 7343.25	7289.00 / 7341.50	7292.50 / 7338.00	7299.50 / 7331.00
<b>32</b>	161	7154.25 / 7210.25	7156.00 / 7208.50	7159.50 / 7205.00	7166.50 / 7198.00
<b>36</b>	161	7315.25 / 7371.25	7317.00 / 7369.50	7320.50 / 7366.00	7327.50 / 7359.00
<b>33</b>	161	7182.25 / 7238.25	7184.00 / 7236.50	7187.50 / 7233.00	7194.50 / 7226.00
<b>37</b>	161	7343.25 / 7399.25	7345.00 / 7397.50	7348.50 / 7394.00	7355.50 / 7387.00
<b>34</b>	161	7210.25 / 7266.25	7212.00 / 7264.50	7215.50 / 7261.00	7222.50 / 7254.00
<b>38</b>	161	7371.25 / 7427.25	7373.00 / 7425.50	7376.50 / 7422.00	7383.50 / 7415.00
<b>41</b>	161	7426.25 / 7482.25	7428.00 / 7480.50	7431.50 / 7477.00	7438.50 / 7470.00
<b>45</b>	161	7587.25 / 7643.25	7589.00 / 7641.50	7592.50 / 7638.00	7599.50 / 7631.00
<b>42</b>	161	7454.25 / 7510.25	7456.00 / 7508.50	7459.50 / 7505.00	7466.50 / 7498.00
<b>46</b>	161	7615.25 / 7671.25	7617.00 / 7669.50	7620.50 / 7666.00	7627.50 / 7659.00
<b>43</b>	161	7482.25 / 7538.25	7484.00 / 7536.50	7487.50 / 7533.00	7494.50 / 7526.00
<b>47</b>	161	7643.25 / 7699.25	7645.00 / 7697.50	7648.50 / 7694.00	7655.50 / 7687.00
<b>44</b>	161	7510.25 / 7566.25	7512.00 / 7564.50	7515.50 / 7561.00	7522.50 / 7554.00
<b>48</b>	161	7671.25 / 7727.25	7673.00 / 7725.50	7676.50 / 7722.00	7683.50 / 7715.00

continued;

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>51</b>	168	7108.75 / 7161.25	7110.50 / 7159.50	7114.00 / 7156.00	7121.00 / 7149.00
<b>55</b>	168	7276.75 / 7329.25	7278.50 / 7327.50	7282.00 / 7324.00	7289.00 / 7317.00
<b>52</b>	168	7136.75 / 7189.25	7138.50 / 7187.50	7142.00 / 7184.00	7149.00 / 7177.00
<b>56</b>	168	7304.75 / 7357.25	7306.50 / 7355.50	7310.00 / 7352.00	7317.00 / 7345.00
<b>53</b>	168	7164.75 / 7217.25	7166.50 / 7215.50	7170.00 / 7212.00	7177.00 / 7205.00
<b>57</b>	168	7332.75 / 7385.25	7334.50 / 7383.50	7338.00 / 7380.00	7345.00 / 7373.00
<b>54</b>	168	7192.75 / 7245.25	7194.50 / 7243.50	7198.00 / 7240.00	7205.00 / 7233.00
<b>58</b>	168	7360.75 / 7413.25	7362.50 / 7411.50	7366.00 / 7408.00	7373.00 / 7401.00
<b>61</b>	168	7415.75 / 7468.25	7417.50 / 7466.50	7421.00 / 7463.00	7428.00 / 7456.00
<b>65</b>	168	7583.75 / 7636.25	7585.50 / 7634.50	7589.00 / 7631.00	7596.00 / 7624.00
<b>62</b>	168	7443.75 / 7496.25	7445.50 / 7494.50	7449.00 / 7491.00	7456.00 / 7484.00
<b>66</b>	168	7611.75 / 7664.25	7613.50 / 7662.50	7617.00 / 7659.00	7624.00 / 7652.00
<b>63</b>	168	7471.75 / 7524.25	7473.50 / 7522.50	7477.00 / 7519.00	7484.00 / 7512.00
<b>67</b>	168	7639.75 / 7692.25	7641.50 / 7690.50	7645.00 / 7687.00	7652.00 / 7680.00
<b>64</b>	168	7499.75 / 7552.25	7501.50 / 7550.50	7505.00 / 7547.00	7512.00 / 7540.00
<b>68</b>	168	7667.75 / 7720.25	7669.50 / 7718.50	7673.00 / 7715.00	7680.00 / 7708.00
<b>71</b>	154	7129.75 / 7182.25	7131.50 / 7180.50	7135.00 / 7177.00	7142.00 / 7170.00
<b>75</b>	154	7283.75 / 7336.25	7285.50 / 7334.50	7289.00 / 7331.00	7296.00 / 7324.00
<b>72</b>	154	7157.75 / 7210.25	7159.50 / 7208.50	7163.00 / 7205.00	7170.00 / 7198.00
<b>76</b>	154	7311.75 / 7364.25	7313.50 / 7362.50	7317.00 / 7359.00	7324.00 / 7352.00
<b>73</b>	154	7185.75 / 7238.25	7187.50 / 7236.50	7191.00 / 7233.00	7198.00 / 7226.00
<b>77</b>	154	7339.75 / 7392.25	7341.50 / 7390.50	7345.00 / 7387.00	7352.00 / 7380.00
<b>74</b>	154	7213.75 / 7266.25	7215.50 / 7264.50	7219.00 / 7261.00	7226.00 / 7254.00
<b>78</b>	154	7367.75 / 7420.25	7369.50 / 7418.50	7373.00 / 7415.00	7380.00 / 7408.00
<b>81</b>	161	7251.25 / 7307.25	7253.00 / 7305.50	7256.50 / 7302.00	7263.50 / 7295.00
<b>85</b>	161	7412.25 / 7468.25	7414.00 / 7466.50	7417.50 / 7463.00	7424.50 / 7456.00
<b>82</b>	161	7279.25 / 7335.25	7281.00 / 7333.50	7284.50 / 7330.00	7291.50 / 7323.00
<b>86</b>	161	7440.25 / 7496.25	7442.00 / 7494.50	7445.50 / 7491.00	7452.50 / 7484.00
<b>83</b>	161	7307.25 / 7363.25	7309.00 / 7361.50	7312.50 / 7358.00	7319.50 / 7351.00
<b>87</b>	161	7468.25 / 7524.25	7470.00 / 7522.50	7473.50 / 7519.00	7480.50 / 7512.00
<b>84</b>	161	7335.25 / 7391.25	7337.00 / 7389.50	7340.50 / 7386.00	7347.50 / 7379.00
<b>88</b>	161	7496.25 / 7552.25	7498.00 / 7550.50	7501.50 / 7547.00	7508.50 / 7540.00
<b>91</b>	168	7444.75 / 7497.25	7446.50 / 7495.50	7450.00 / 7492.00	7457.00 / 7485.00
<b>95</b>	168	7612.75 / 7665.25	7614.50 / 7663.50	7618.00 / 7660.00	7625.00 / 7653.00
<b>92</b>	168	7472.75 / 7525.25	7474.50 / 7523.50	7478.00 / 7520.00	7485.00 / 7513.00
<b>96</b>	168	7640.75 / 7693.25	7642.50 / 7691.50	7646.00 / 7688.00	7653.00 / 7681.00
<b>93</b>	168	7500.75 / 7553.25	7502.50 / 7551.50	7506.00 / 7548.00	7513.00 / 7541.00
<b>97</b>	168	7668.75 / 7721.25	7670.50 / 7719.50	7674.00 / 7716.00	7681.00 / 7709.00
<b>94</b>	168	7528.75 / 7581.25	7530.50 / 7579.50	7534.00 / 7576.00	7541.00 / 7569.00
<b>98</b>	168	7696.75 / 7749.25	7698.50 / 7747.50	7702.00 / 7744.00	7709.00 / 7737.00

**10.12.2 MINI-LINK 8-E**

Typical values unless otherwise stated.

Output power

Standard: **0-20 dBm (tolerance  $\pm 2$  dB)**

High power: **6-26 dBm (tolerance  $\pm 2$  dB)**

Receiver input levels: **-30 to -90 dBm (+15 dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-91	-87
<b>4x2/8</b>	-88	-84
<b>2x8/8x2</b>	-85	-81
<b>34+2/17x2</b>	-82	-78

## Frequency Plan

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 8-E. The frequency is set in steps of 0.25 MHz, except for sub-bands 11-18 which can be set in steps of 0.025 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz)			
		0.025 MHz step for sub-band 11-18, 0.25 MHz step for sub-band 21-47			
“CD”	(MHz)	2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>11</b>	311.32	7719.900 / 7805.150	7721.750 / 7803.300	7725.475 / 7799.600	7732.875 / 7792.175
<b>15</b>	311.32	8031.225 / 8116.475	8033.075 / 8114.625	8036.800 / 8110.925	8044.200 / 8103.500
<b>12</b>	311.32	7779.200 / 7864.450	7781.050 / 7862.600	7784.775 / 7858.900	7792.175 / 7851.475
<b>16</b>	311.32	8090.525 / 8175.775	8092.375 / 8173.925	8096.100 / 8170.225	8103.500 / 8162.800
<b>13</b>	311.32	7823.675 / 7908.925	7825.525 / 7907.075	7829.250 / 7903.375	7836.650 / 7895.950
<b>17</b>	311.32	8135.000 / 8220.250	8136.850 / 8218.400	8140.575 / 8214.700	8147.975 / 8207.275
<b>14</b>	311.32	7882.975 / 7968.225	7884.825 / 7966.375	7888.550 / 7962.675	7895.950 / 7955.250
<b>18</b>	311.32	8194.300 / 8279.550	8196.150 / 8277.700	8199.875 / 8274.000	8207.275 / 8266.575
<b>21</b>	126	8284.25 / 8322.75	8286.00 / 8321.00	8289.50 / 8317.50	8296.50 / 8310.50
<b>25</b>	126	8410.25 / 8448.75	8412.00 / 8447.00	8415.50 / 8443.50	8422.50 / 8436.50
<b>23</b>	126	8326.25 / 8364.75	8328.00 / 8363.00	8331.50 / 8359.50	8338.50 / 8352.50
<b>27</b>	126	8452.25 / 8490.75	8454.00 / 8489.00	8457.50 / 8485.50	8464.50 / 8478.50
<b>31</b>	119	8287.75 / 8326.25	8289.50 / 8324.50	8293.00 / 8321.00	8300.00 / 8314.00
<b>35</b>	119	8406.75 / 8445.25	8408.50 / 8443.50	8412.00 / 8440.00	8419.00 / 8433.00
<b>33</b>	119	8329.75 / 8368.25	8331.50 / 8366.50	8335.00 / 8363.00	8342.00 / 8356.00
<b>37</b>	119	8448.75 / 8487.25	8450.50 / 8485.50	8454.00 / 8482.00	8461.00 / 8475.00
<b>41</b>	119	8280.75 / 8319.25	8282.50 / 8317.50	8286.00 / 8314.00	8293.00 / 8307.00
<b>45</b>	119	8399.75 / 8438.25	8401.50 / 8436.50	8405.00 / 8433.00	8412.00 / 8426.00
<b>42</b>	119	8308.75 / 8347.25	8310.50 / 8345.50	8314.00 / 8342.00	8321.00 / 8335.00
<b>46</b>	119	8427.75 / 8466.25	8429.50 / 8464.50	8433.00 / 8461.00	8440.00 / 8454.00
<b>43</b>	119	8336.75 / 8375.25	8338.50 / 8373.50	8342.00 / 8370.00	8349.00 / 8363.00
<b>47</b>	119	8455.75 / 8494.25	8457.50 / 8492.50	8461.00 / 8489.00	8468.00 / 8482.00
<b>51</b>	126	8280.75 / 8319.25	8282.50 / 8317.50	8286.00 / 8314.00	8293.00 / 8307.00
<b>55</b>	126	8406.75 / 8445.25	8408.50 / 8443.50	8412.00 / 8440.00	8419.00 / 8433.00
<b>52</b>	126	8308.75 / 8347.25	8310.50 / 8345.50	8314.00 / 8342.00	8321.00 / 8335.00
<b>56</b>	126	8434.75 / 8473.25	8436.50 / 8471.50	8440.00 / 8468.00	8447.00 / 8461.00
<b>53</b>	126	8329.75 / 8368.25	8331.50 / 8366.50	8335.00 / 8363.00	8342.00 / 8356.00
<b>57</b>	126	8455.75 / 8494.25	8457.50 / 8492.50	8461.00 / 8489.00	8468.00 / 8482.00

\* Due to the frequency synthesizer implementation for sub-band 15 to 18 the nominal frequency cannot be set to the exact frequency according to the ITU recommendation. Instead the frequency should be set to the closest possible frequency, see example below.

**Note:** The MMU can only display two decimals. Example: The frequency 8059.025 is displayed as 8059.02.

Frequency		Deviation		Display in MSM	Display on MMU
Frequency according. To ITU-R Rec 386-4, annex 1	Nominal frequency	MHz	ppm		
8059.020	8059.025	0.005	0.6	8059.025	8059.02

### 10.12.3 MINI-LINK 15-E

Typical values unless otherwise stated.

Output power

Standard: **3 to 18 dBm (tolerance  $\pm 2$  dB)**

High power: **10 to 25 dBm (tolerance  $\pm 2$  dB)**

Receiver input levels: **-30 to -90 dBm (+15 dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-91	-87
<b>4x2/8</b>	-88	-84
<b>2x8/8x2</b>	-85	-81
<b>34+2/17x2</b>	-82	-78

#### Frequency Plan

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 15-E. The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>11</b>	735	14506.25 / 14606.00	14506.25 / 14606.00	14506.25 / 14606.00	14513.25 / 14599.00
<b>18</b>	735	15241.25 / 15341.00	15241.25 / 15341.00	15241.25 / 15341.00	15248.25 / 15334.00
<b>12</b>	315	14611.25 / 14725.00	14611.25 / 14725.00	14611.25 / 14725.00	14618.25 / 14718.00
<b>15</b>	315	14926.25 / 15040.00	14926.25 / 15040.00	14926.25 / 15040.00	14933.25 / 15033.00
<b>13</b>	315	14716.25 / 14816.00	14716.25 / 14816.00	14716.25 / 14816.00	14723.25 / 14809.00
<b>16</b>	315	15031.25 / 15131.00	15031.25 / 15131.00	15031.25 / 15131.00	15038.25 / 15124.00
<b>14</b>	315	14821.25 / 14921.00	14821.25 / 14921.00	14821.25 / 14921.00	14828.25 / 14914.00
<b>17</b>	315	15136.25 / 15236.00	15136.25 / 15236.00	15136.25 / 15236.00	15143.25 / 15229.00
<b>21</b>	420	14502.75 / 14613.00	14502.75 / 14613.00	14502.75 / 14613.00	14509.75 / 14606.00
<b>25</b>	420	14922.75 / 15033.00	14922.75 / 15033.00	14922.75 / 15033.00	14929.75 / 15026.00
<b>22</b>	420	14614.75 / 14725.00	14614.75 / 14725.00	14614.75 / 14725.00	14621.75 / 14718.00
<b>26</b>	420	15034.75 / 15145.00	15034.75 / 15145.00	15034.75 / 15145.00	15041.75 / 15138.00
<b>23</b>	420	14726.75 / 14830.00	14726.75 / 14830.00	14726.75 / 14830.00	14733.75 / 14823.00
<b>27</b>	420	15146.75 / 15250.00	15146.75 / 15250.00	15146.75 / 15250.00	15153.75 / 15243.00
<b>24</b>	420	14824.75 / 14921.00	14824.75 / 14921.00	14824.75 / 14921.00	14831.75 / 14914.00
<b>28</b>	420	15244.75 / 15341.00	15244.75 / 15341.00	15244.75 / 15341.00	15251.75 / 15334.00
<b>41</b>	644	14502.75 / 14595.50	14502.75 / 14595.50	14502.75 / 14595.50	14509.75 / 14588.50
<b>47</b>	644	15146.75 / 15239.50	15146.75 / 15239.50	15146.75 / 15239.50	15153.75 / 15232.50
<b>42</b>	644	14600.75 / 14693.50	14600.75 / 14693.50	14600.75 / 14693.50	14607.75 / 14686.50
<b>48</b>	644	15244.75 / 15337.50	15244.75 / 15337.50	15244.75 / 15337.50	15251.75 / 15330.50

continued;

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>61</b>	728	14502.75 / 14613.00	14502.75 / 14613.00	14502.75 / 14613.00	14509.75 / 14606.00
<b>68</b>	728	15230.75 / 15341.00	15230.75 / 15341.00	15230.75 / 15341.00	15237.75 / 15334.00
<b>62</b>	308	14621.75 / 14728.50	14621.75 / 14728.50	14621.75 / 14728.50	14628.75 / 14721.50
<b>65</b>	308	14929.75 / 15036.50	14929.75 / 15036.50	14929.75 / 15036.50	14936.75 / 15029.50
<b>63</b>	308	14705.75 / 14812.50	14705.75 / 14812.50	14705.75 / 14812.50	14712.75 / 14805.50
<b>66</b>	308	15013.75 / 15120.50	15013.75 / 15120.50	15013.75 / 15120.50	15020.75 / 15113.50
<b>64</b>	308	14817.75 / 14924.50	14817.75 / 14924.50	14817.75 / 14924.50	14824.75 / 14917.50
<b>67</b>	308	15125.75 / 15232.50	15125.75 / 15232.50	15125.75 / 15232.50	15132.75 / 15225.50
<b>71</b>	714	14513.25 / 14613.00	14513.25 / 14613.00	14513.25 / 14613.00	14520.25 / 14606.00
<b>78</b>	714	15227.25 / 15327.00	15227.25 / 15327.00	15227.25 / 15327.00	15234.25 / 15320.00
<b>80</b>	490	14404.75 / 14515.00	14404.75 / 14515.00	14404.75 / 14515.00	14411.75 / 14508.00
<b>85</b>	490	14894.75 / 15005.00	14894.75 / 15005.00	14894.75 / 15005.00	14901.75 / 14998.00
<b>81</b>	490	14488.75 / 14599.00	14488.75 / 14599.00	14488.75 / 14599.00	14495.75 / 14592.00
<b>86</b>	490	14978.75 / 15089.00	14978.75 / 15089.00	14978.75 / 15089.00	14985.75 / 15082.00
<b>82</b>	490	14572.75 / 14683.00	14572.75 / 14683.00	14572.75 / 14683.00	14579.75 / 14676.00
<b>87</b>	490	15062.75 / 15173.00	15062.75 / 15173.00	15062.75 / 15173.00	15069.75 / 15166.00
<b>83</b>	490	14656.75 / 14767.00	14656.75 / 14767.00	14656.75 / 14767.00	14663.75 / 14760.00
<b>88</b>	490	15146.75 / 15257.00	15146.75 / 15257.00	15146.75 / 15257.00	15153.75 / 15250.00
<b>84</b>	490	14740.75 / 14851.00	14740.75 / 14851.00	14740.75 / 14851.00	14747.75 / 14844.00
<b>89</b>	490	15230.75 / 15341.00	15230.75 / 15341.00	15230.75 / 15341.00	15237.75 / 15334.00
<b>92</b>	322	14634.00 / 14732.00	14634.00 / 14732.00	14634.00 / 14732.00	14641.00 / 14725.00
<b>95</b>	322	14956.00 / 15054.00	14956.00 / 15054.00	14956.00 / 15054.00	14963.00 / 15047.00
<b>93</b>	322	14718.00 / 14816.00	14718.00 / 14816.00	14718.00 / 14816.00	14725.00 / 14809.00
<b>96</b>	322	15040.00 / 15138.00	15040.00 / 15138.00	15040.00 / 15138.00	15047.00 / 15131.00
<b>94</b>	322	14802.00 / 14900.00	14802.00 / 14900.00	14802.00 / 14900.00	14809.00 / 14893.00
<b>97</b>	322	15124.00 / 15222.00	15124.00 / 15222.00	15124.00 / 15222.00	15131.00 / 15215.00



### 10.12.4 MINI-LINK 18-E

Typical values unless otherwise stated.

Output power

Standard:	<b>2 to 17 dBm for sub-bands 11-18, 31-32 and 35-36 (tolerance <math>\pm 2</math> dB)</b>
High power:	<b>1 to 16 dBm for sub-bands 21-28 (tolerance <math>\pm 2</math> dB)</b>
	<b>9 to 24 dBm for sub-bands 11-18, 31-32 and 35-36</b>
	<b>8 to 23 dBm for sub-bands 21-28</b>

Receiver input levels: **-30 to -90 dBm (+15 dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value <sup>3</sup>	
	BER 10 <sup>-3</sup>	BER 10 <sup>-6</sup>
<b>2x2</b>	-90	-86
<b>4x2/8</b>	-87	-83
<b>2x8/8x2</b>	-84	-80
<b>34+2/17x2</b>	-81	-77

#### Frequency Plan

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 18-E. The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>11</b>	1010	17708.25 / 18007.75	17710.00 / 18006.00	17713.50 / 18002.50	17720.50 / 17995.50
<b>15</b>	1010	18718.25 / 19017.75	18720.00 / 19016.00	18723.50 / 19012.50	18730.50 / 19005.50
<b>12</b>	1010	17935.25 / 18234.75	17937.00 / 18233.00	17940.50 / 18229.50	17947.50 / 18222.50
<b>16</b>	1010	18945.25 / 19244.75	18947.00 / 19243.00	18950.50 / 19239.50	18957.50 / 19232.50
<b>13</b>	1010	18155.25 / 18454.75	18157.00 / 18453.00	18160.50 / 18449.50	18167.50 / 18442.50
<b>17</b>	1010	19165.25 / 19464.75	19167.00 / 19463.00	19170.50 / 19459.50	19177.50 / 19452.50
<b>14</b>	1010	18375.25 / 18674.75	18377.00 / 18673.00	18380.50 / 18669.50	18387.50 / 18662.50
<b>18</b>	1010	19385.25 / 19684.75	19387.00 / 19683.00	19390.50 / 19679.50	19397.50 / 19672.50
<b>21</b>	340	18581.75 / 18668.25	18583.50 / 18666.50	18587.00 / 18663.00	18594.00 / 18656.00
<b>25</b>	340	18921.75 / 19008.25	18923.50 / 19006.50	18927.00 / 19003.00	18934.00 / 18996.00
<b>22</b>	340	18656.75 / 18743.25	18658.50 / 18741.50	18662.00 / 18738.00	18669.00 / 18731.00
<b>26</b>	340	18996.75 / 19083.25	18998.50 / 19081.50	19002.00 / 19078.00	19009.00 / 19071.00
<b>23</b>	340	18731.75 / 18828.25	18733.50 / 18826.50	18737.00 / 18823.00	18744.00 / 18816.00
<b>27</b>	340	19071.75 / 19168.25	19073.50 / 19166.50	19077.00 / 19163.00	19084.00 / 19156.00
<b>24</b>	340	18821.75 / 18918.25	18823.50 / 18916.50	18827.00 / 18913.00	18834.00 / 18906.00
<b>28</b>	340	19161.75 / 19258.25	19163.50 / 19256.50	19167.00 / 19253.00	19174.00 / 19246.00
<b>31</b>	1560	17701.75 / 18001.25	17703.50 / 17999.50	17707.00 / 17996.00	17714.00 / 17989.00
<b>35</b>	1560	19261.75 / 19561.25	19263.50 / 19559.50	19267.00 / 19556.00	19274.00 / 19549.00
<b>32</b>	1560	17838.75 / 18138.25	17840.50 / 18136.50	17844.00 / 18133.00	17851.00 / 18126.00
<b>36</b>	1560	19398.75 / 19698.25	19400.50 / 19696.50	19404.00 / 19693.00	19411.00 / 19686.00

<sup>3</sup> Add 1 dB for sub-bands 21-28

## 10.12.5 MINI-LINK 23-E

### 10.12.5.1 RAU1

Typical values unless otherwise stated.

Output power

Standard: **5 to 20 dBm (tolerance  $\pm 3$  dB)**

Receiver input levels: **-30 to -90 dBm (+15 dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-90	-86
<b>4x2/8</b>	-87	-83
<b>2x8/8x2</b>	-84	-80
<b>34+2/17x2</b>	-81	-77

### Frequency Plan

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 23-E (RAU1). The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>12</b>	1050	21952.00 / 22496.25	21953.75 / 22494.50	21957.25 / 22491.00	21964.25 / 22484.00
<b>14</b>	1050	23002.00 / 23546.25	23003.75 / 23544.50	23007.25 / 23541.00	23014.25 / 23534.00
<b>21</b>	1232	21225.75 / 21784.00	21227.50 / 21782.25	21231.00 / 21778.75	21238.00 / 21771.75
<b>23</b>	1232	22457.75 / 23016.00	22459.50 / 23014.25	22463.00 / 23010.75	22470.00 / 23003.75
<b>22</b>	1232	21785.75 / 22344.00	21787.50 / 22342.25	21791.00 / 22338.75	21798.00 / 22331.75
<b>24</b>	1232	23017.75 / 23576.00	23019.50 / 23574.25	23023.00 / 23570.75	23030.00 / 23563.75
<b>31</b>	1274	21652.75 / 22022.00	21654.50 / 22020.25	21658.00 / 22016.75	21665.00 / 22009.75
<b>33</b>	1274	22926.75 / 23296.00	22928.50 / 23294.25	22932.00 / 23290.75	22939.00 / 23283.75
<b>32</b>	1274	21952.00 / 22321.25	21953.75 / 22319.50	21957.25 / 22316.00	21964.25 / 22309.00
<b>34</b>	1274	23226.00 / 23595.25	23227.75 / 23593.50	23231.25 / 23590.00	23238.25 / 23583.00
<b>46</b>	1200	21798.00 / 22373.75	21799.75 / 22372.00	21803.25 / 22368.50	21810.25 / 22361.50
<b>48</b>	1200	22998.00 / 23573.75	22999.75 / 23572.00	23003.25 / 23568.50	23010.25 / 23561.50
<b>56</b>	1008	22004.50 / 22512.00	22006.25 / 22510.25	22009.75 / 22506.75	22016.75 / 22499.75
<b>58</b>	1008	23012.50 / 23520.00	23014.25 / 23518.25	23017.75 / 23514.75	23024.75 / 23507.75
<b>57</b>	1008	22081.50 / 22589.00	22083.25 / 22587.25	22086.75 / 22583.75	22093.75 / 22576.75
<b>59</b>	1008	23089.50 / 23597.00	23091.25 / 23595.25	23094.75 / 23591.75	23101.75 / 23584.75

**10.12.5.2 RAU2**

Typical values unless otherwise stated.

Output power

Standard: **-7 to 20 dBm (tolerance  $\pm 2$  dB)**

High Power: **-7 to 23 dBm (tolerance  $\pm 2$  dB)**

Receiver input levels: **-30 to -90 dBm (+15 dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-90	-86
<b>4x2/8</b>	-87	-83
<b>2x8/8x2</b>	-84	-80
<b>34+2/17x2</b>	-81	-77

**Frequency Plan**

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 23-E (RAU2). The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>12</b>	1050	21952.00 / 22496.25	21953.75 / 22494.50	21957.25 / 22491.00	21964.25 / 22484.00
<b>14</b>	1050	23002.00 / 23546.25	23003.75 / 23544.50	23007.25 / 23541.00	23014.25 / 23534.00
<b>21</b>	1232	21225.75 / 21784.00	21227.50 / 21782.25	21231.00 / 21778.75	21238.00 / 21771.75
<b>23</b>	1232	22457.75 / 23016.00	22459.50 / 23014.25	22463.00 / 23010.75	22470.00 / 23003.75
<b>22</b>	1232	21785.75 / 22361.50	21787.50 / 22359.75	21791.00 / 22356.25	21798.00 / 22349.25
<b>24</b>	1232	23017.75 / 23593.50	23019.50 / 23591.75	23023.00 / 23588.25	23030.00 / 23581.25
<b>45</b>	1200	21220.00 / 21795.75	21221.75 / 21794.00	21225.25 / 21790.50	21232.25 / 21783.50
<b>47</b>	1200	22420.00 / 22995.75	22421.75 / 22994.00	22425.25 / 22990.50	22432.25 / 22983.50
<b>46</b>	1200	21798.00 / 22373.75	21799.75 / 22372.00	21803.25 / 22368.50	21810.25 / 22361.50
<b>48</b>	1200	22998.00 / 23573.75	22999.75 / 23572.00	23003.25 / 23568.50	23010.25 / 23561.50
<b>56</b>	1008	22004.50 / 22512.00	22006.25 / 22510.25	22009.75 / 22506.75	22016.75 / 22499.75
<b>58</b>	1008	23012.50 / 23520.00	23014.25 / 23518.25	23017.75 / 23514.75	23024.75 / 23507.75
<b>57</b>	1008	22081.50 / 22589.00	22083.25 / 22587.25	22086.75 / 22583.75	22093.75 / 22576.75
<b>59</b>	1008	23089.50 / 23597.00	23091.25 / 23595.25	23094.75 / 23591.75	23101.75 / 23584.75

## 10.12.6 MINI-LINK 26-E

Typical values unless otherwise stated.

Output power

Standard: **10 dBm (tolerance  $\pm 2.5$  dB,  
mechanically adjustable down to  $-5$  dBm)**

High power: **3 to 18 dBm (tolerance  $\pm 2.5$  dB)**

Receiver input levels:  **$-30$  to  $-90$  dBm ( $+15$  dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-89	-85
<b>4x2/8</b>	-86	-82
<b>2x8/8x2</b>	-83	-79
<b>34+2/17x2</b>	-80	-76

### Frequency Plan

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 26-E. The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex (MHz)	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>21</b>	1008	24550.75 / 24997.00	24552.50 / 24995.25	24556.00 / 24991.75	24563.00 / 24984.75
<b>26</b>	1008	25558.75 / 26005.00	25560.50 / 26003.25	25564.00 / 25999.75	25571.00 / 25992.75
<b>24</b>	1008	24997.00 / 25443.25	24998.75 / 25441.50	25002.25 / 25438.00	25009.25 / 25431.00
<b>29</b>	1008	26005.00 / 26451.25	26006.75 / 26449.50	26010.25 / 26446.00	26017.25 / 26439.00
<b>90</b>	1008	24885.00 / 25331.25	24886.75 / 25329.50	24890.25 / 25326.00	24897.25 / 25319.00
<b>95</b>	1008	25893.00 / 26339.25	25894.75 / 26337.50	25898.25 / 26334.00	25905.25 / 26327.00

**10.12.7 MINI-LINK 38-E**

Typical values unless otherwise stated.

Output power

Standard: **16.5 dBm (tolerance  $\pm 3$  dB,  
mechanically adjustable down to  $-8.5$  dBm)**

Receiver input levels:  **$-30$  to  $-90$  dBm ( $+15$  dBm without damage)**

Traffic capacity (Mbit/s)	Receiver sensitivity (dBm) typical value	
	BER $10^{-3}$	BER $10^{-6}$
<b>2x2</b>	-85	-81
<b>4x2/8</b>	-82	-78
<b>2x8/8x2</b>	-79	-75
<b>34+2/17x2</b>	-76	-72

**Frequency Plan**

The table below shows the lowest/highest possible operating centre frequency for MINI-LINK 38-E. The frequency is set in steps of 0.25 MHz.

Sub-band	Duplex	Lowest/Highest Tx centre frequency (MHz) 0.25 MHz step			
		2x2 Mbit/s	8 Mbit/s	2x8 Mbit/s	34+2 Mbit/s
<b>“CD”</b>	(MHz)				
<b>11</b>	1260	37059.75 / 37338.00	37061.50 / 37336.25	37065.00 / 37332.75	37072.00 / 37325.75
<b>15</b>	1260	38319.75 / 38598.00	38321.50 / 38596.25	38325.00 / 38592.75	38332.00 / 38585.75
<b>12</b>	1260	37339.75 / 37618.00	37341.50 / 37616.25	37345.00 / 37612.75	37352.00 / 37605.75
	1260	38599.75 / 38878.00	38601.50 / 38876.25	38605.00 / 38872.75	38612.00 / 38865.75
<b>13</b>	1260	37619.75 / 37898.00	37621.50 / 37896.25	37625.00 / 37892.75	37632.00 / 37885.75
	1260	38879.75 / 39158.00	38881.50 / 39156.25	38885.00 / 39152.75	38892.00 / 39145.75
<b>14</b>	1260	37899.75 / 38178.00	37901.50 / 38176.25	37905.00 / 38172.75	37912.00 / 38165.75
	1260	39159.75 / 39438.00	39161.50 / 39436.25	39165.00 / 39432.75	39172.00 / 39425.75

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