

Practical guide for POF installation tester: Measurement of POF duplex cables before and after installation

Attenuation measurement of POF duplex cables

For this purpose, the following steps are to be carried out:

1. Connection of POF installation tester to a suitable feeder cable

The POF installation tester must first be connected to a feeder cable, that allows to connect the cable to be measured as easy as possible. The feeder cable is provided with 2 FSMA connectors that must be screwed in to the FSMA plug of the POF installation tester.



Attention: The FSMA connectors may be screwed by manual force only! Never use tools like tongs or wrenches!

It is not allowed to introduce other bodies into the FSMA plugs. This may cause damage or destruction of the transmitter and receiver elements inside. In case that no feeder cable is connected please use the dust protection caps.

If the POF cable to be measured is not equipped with a pre-assembled connector, the feeder cable should provide a suitable receptacle for the connector less cable ends. It is important to note that POF cables with 2.2mm and 1.5mm are common and the connection of the feeder cable must be suitable for the respective cable type. It is useful to have a feeder cable for 1.5mm and one for 2.2mm POF cable available.



2. Zero calibration

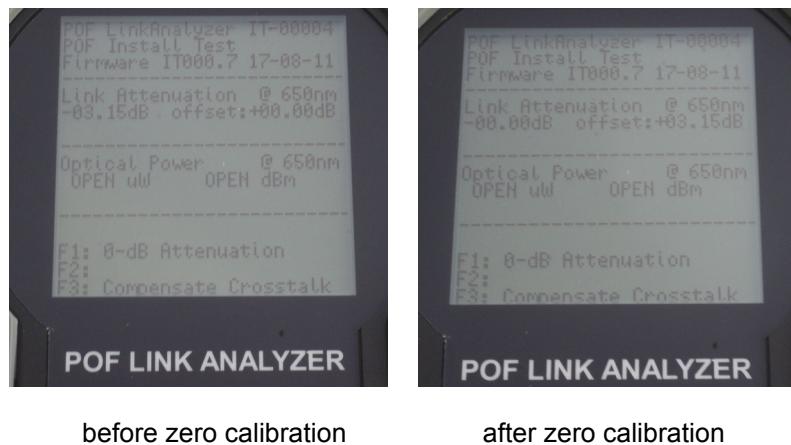
Due to different feeder cables, the connected SMA connectors, the endface quality of the feeder cable and the condition of the feeder cable, uncontrolled influences on the attenuation measurement of the cable to be measured can arise. These influences are excluded before the actual measurement by a zero calibration. For this purpose, the POF endfaces of the feeder cable are mutually connected as precisely as possible.

If the feeder cable has 2.2mm outside jacket diameter, a POF coupling ferrule with an internal diameter of 2.2mm and a length of 20mm is recommended. A set of 10 pieces of these coupling ferrules is included with the POF installation tester. Further ferrules are available as consumables.

If the feeder cable is "short circuited" this way and the POF installation tester switched on by pressing the button „“, the display gives under "Link Attenuation" an attenuation figure that is determined by the feeder cable attenuation. (To switch off the unit please press again the button „“ and subsequently „“.)

For zero calibration press the button F1 and confirm in the display menu "OK" by pressing the button „✓“. The figure given under "Link Attenuation" changes to 0dB. The offset introduced by zero calibration is given on the right. Zero calibration can be canceled by pressing F1 again and confirmation with „✓“.

The photos below show the display before and after zero calibration.



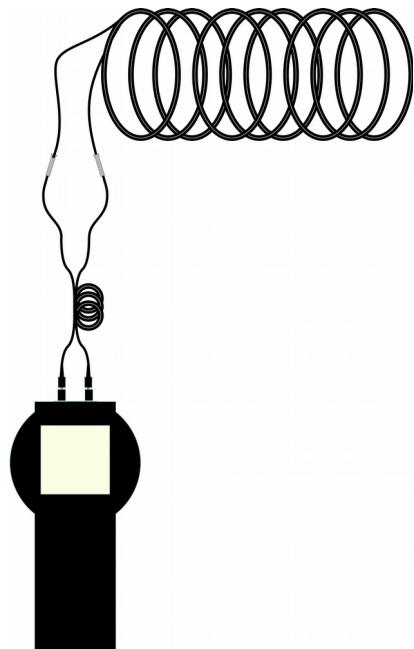
After zero calibration the POF installation tester measures the optical attenuation between den endfaces of the feeder cable.

3. Measurement of cable attenuation

To carry out the attenuation measurement, both endfaces of the cable to be measured are connected to the feeder cable. If no plugs are available, the coupling ferrules are also suitable for this purpose. After zero calibration is done and the installation tester is connected with the cable to be measured, the display gives under "Link Attenuation" the cable attenuation in dB.

It is to be noted that the total attenuation, i.e. the sum of the measured attenuation and offset, shall not be larger than 45dB; otherwise, the dynamic range of the POF installation tester is exceeded.

Typically, the attenuation of the feeder cable is approximately 3 to 4 dB; thus a dynamic range of >40 dB is available for the cable to be measured. Assuming an attenuation of 20dB for a 100m POF cable, the POF installation tester can be used with POF cables at 650nm up to a length of approx. 200m.



4. Zero calibration with feeder cable comprising a duplex POF connector

Feeder cables with duplex POF connectors are useful when cables shall be measured without using coupling ferrules. The two end surfaces of the feeder cable can not be directly "short circuited", because they are fixed in the duplex connector.

The picture on the right shows by way of an example a POF installation tester with a connection cable with OC adapter. The procedure for zero calibration works as follows.

A short, about 30cm long POF "short circuit" cable is used. Its endfaces should be carefully prepared. Every feeder cable with duplex POF connector that is available as accessory comes with a suitable "short circuit" cable. Its attenuation can be measured by the process described above.



Zero calibration is done after introducing the "short circuit" cable to the duplex POF connector of the feeder cable. Subsequently, the "short circuit" cable is substituted by the cable to be measured and the attenuation figure determined.

Strictly speaking this way of cable attenuation measurement determines the difference between the cable attenuation and the "short circuit" cable. Therefore, the "short circuit" cable attenuation must be added to the measured figure in order to determine the exact cable attenuation figure. But, as the "short circuit" cable attenuation in general is very low, it is allowed in many cases to neglect it.

In a similar way the cable attenuation measurement is carried out, if other types of duplex connectors like e.g. SMI, SC or V-pin duplex connectors are present at the feeder cable.

Cables that are comprised with connector systems allowing to separate the fiber ferrules like FSMA or V-pin can be connected via a fiber adapter for zero calibration.

5. Measurement of installed cables

In case that the attenuation of a duplex POF cable installed in a building shall be measured, it is necessary to fix a "short circuit" cable at one cable end. The POF installation tester measures from the other side the attenuation of uplink, downlink and "short circuit" cable in sum. The "short circuit" cable attenuation can be neglected generally. If the 50% attenuation figure measured in this way is in the allowed power budget region for the data transmission system, the installed cable is suitable for the intended application.

If the sum of uplink and downlink attenuation exceeds twice the attenuation for a cable of this length, further investigation is necessary:

- both cable cores may be damaged, or
- one cable core is damaged only.

In practice it is not important, which case applies, because the cable as a whole has to be substituted.

If it makes sense to determine which cable core is damaged this can be done by using the feeder cable with 1x2 low crosstalk splitter for reflexive cable measurements. The instruction to carry out this measurement is enclosed in the kit with the feeder cable cable for reflexive measurements. It is available as accessory.

6. Measurement of external light sources

During the installation of a POF network it may be useful to determine the optical transmit power of transceivers or measure the radiated optical power at a cable endface. In this way it is easy to check, if all transceivers of an optical switch are working with sufficient optical power, or if there is sufficient optical power for the receiver available.

The optical power of external light sources like optical transceivers can be determined with the POF installation tester in the range of +3dBm to -25dBm as follows:

The receiver input of the POF installation tester is connected via a FSMA connector with a simplex POF cable with known attenuation. The other cable endface is connected to the transceiver to be tested. The POF installation tester gives under "Optical Power" the measured external light power (see photo right: -11.59dBm). The optical power is determined with the supposition that the external light has 650nm wavelength.

The optical power figure determined this way has to be corrected by the attenuation of the used POF cable. This results in the transceiver transmit power.



In every POF installation tester package there is enclosed a special FSMA connector for 2.2mm POF cables. It allows to determine the optical power at the endface of an arbitrary 2.2mm POF cable directly. The cable is shifted in the special FSMA connector up to the end of the ferrule and the connector is then attached to the receiver input. The cable endface touches directly the surface of the PIN diode in the POF installation tester.



Attention: In no case the cable may be shifted with too strong mechanical force. No metallic or other bodies (drills, needles,...) instead of the cable may be used. This action could scratch or destroy the internal PIN diode.