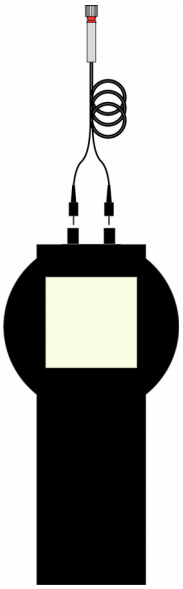
Practical guide for POF installation tester:

Measurement of POF simplex cables before and after installation

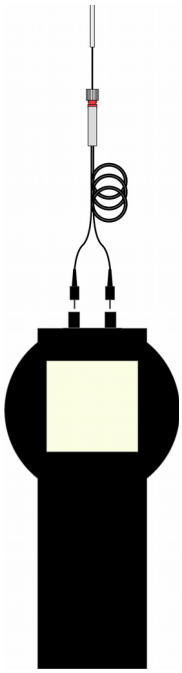
Attenuation measurement of POF simplex cables



The measurement is carried out by the following steps:

1. **Connection of POF installation tester with a feeder cable with integrated POF splitter**

First, the POF installation tester has to be connected with a feeder cable that comprises an integrated low crosstalk splitter at the cable end facing away from the unit. This cable is available as accessory for the POF installation tester in combination with a reflector POF fiber pigtail. This feeder cable is attached via 2 FSMA connectors to the POF installation tester.



2. **Zero calibration**

Next, the zero calibration is carried out to compensate the feeder cable and reflector cable influence to the subsequent attenuation measurement. To this end the reflector cable is introduced to the ferrule at the feeder cable's splitter end and fixed. The reflector cable endface should be carefully prepared to reduce crosstalk as far as possible.
Under “Link Attenuation” in the POF installation tester display an attenuation figure is shown that is mainly (*) determined by the attenuation of the foreward and backward running optical signal in the reflector cable and the optical reflection factor of the mirror in the reflector cable.

Zero calibration is done by pressing the button F1 and confirmation in the new opened display menu “OK” with the button „✔“. The attenuation figure under “Link Attenuation” changes to 0dB.

If after zero calibration a POF simplex cable is introduced between the splitter ferrule and the reflector cable, the unit shows the attenuation of the foreward and backward running signal in the simplex cable. This is twice the attenuation of the cable to be measured.

To (*): The measurement process according to the method described here causes a measurement error, that is determined by crosstalk attenuation. In section 4. “Error estimation” below the error is determined.

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3. Attenuation measurement of POF simplex cable

In order to do a reflexive attenuation measurement the POF simplex cable that is to be measured is introduced between the ferrule at the splitter and the reflector cable. Under “Link Attenuation” the double attenuation of the cable to be measured is given.

4. Error estimation

The crosstalk caused error in the splitter cannot be compensated by zero calibration, because it is influencing the receive signal not by a factor but by a summand. The crosstalk signal must be compensated correcly by subtraction from the received signal.
But in case that the error due to not correct handling the crosstalk induced error is sufficiently small, it may be neglected. What does it mean “sufficiently small”?

An error estimation follows from 2 simple measurements:

- Crosstalk for its own can be measured, if a very long POF simplex cable with carefully prepared endfaces is introduced to the ferrule at the splitter. The cable should be made of equal jacket material as the cable to be measured. At 650nm wavelength 100m cable length are sufficiently long; the reflected signal is more than 55dB weaker than the signal transmitted into the cable. Measured in this way a crosstalk signal signal CT typically between -40dB and -45dB is measured.

- The signal at maximum reflection MR is measured by introducing the reflector cable to the ferrule at the splitter. Typically it is between -12dBm and -15dBm.

If das cable to be measured is introduced between reflector cable and ferrule at the splitter, the optical power figure shown by the POF installation tester can vary between MR to CT.
If the figure for (MR-CT) is typically between 25dB and 30dB, an error of ≤10% is derived, if the signal running twice through the cable experiences an attenuation of 15dB at maximum.

I.e., up to a simplex cable length of 37m the crosstalk generated error by not correct crosstalk compensation is below 10%.

(It was assumed that at 650nm wavelength the POF cable has an attenuation of 200dB/km.)

5. Correct crosstalk compensation

There are cases that do not allow to accept the error by not correct crosstalk compensation, e.g. because the cable to be measured is significantly longer than 37m, because a reflexive sensor head for the determination of physical or chemical figures shall be read very precisely or because the measurement is done at 520nm wavelength with a much lower POF attenuation compared with 650nm.

In this situation the additive crosstalk error compensation and the subsequent zero calibration can be carried out in 2 steps. The actual POF installation tester software version allows this via the button F3.

In the first step crosstalk is determined by connecting a long POF cable of equal type like the cable to be measured. By pressing the button F3 and confirmation with button „✔“ the crosstalk figure is subtracted with each further measurement. The display shows the warning “CrosstalkCom.On” to remind the user that there is a internal crosstalk compensation active in the POF installation tester.

In the second step zero calibration is done as described in section 2.. Finally attenuation measurement can be done.

In section 4. it was estimated that crosstalk compensation is in general not necessary for simple measurements of short cables.

The crosstalk compensation includes the risk, that a wrong measured crosstalk and its compensation by software may lead to incorrect fiber attenuation, up to negative POF cable attenuation. As a consequence, crosstalk compensation by software requires a careful determination of crosstalk in the first step.

Wrong measured crosstalk may occur, if the cable for crosstalk determination

- has badly prepared fiber endfaces,
- there is not perfect axial symmetry between waveguide core and outer jacket diameter,
- is not made of equal jacket material like the cable to be measured,
- is a separated duplex POF cable with unsymmetry due to a remaining burr that is not carefully removed, or
- is not sufficiently long.