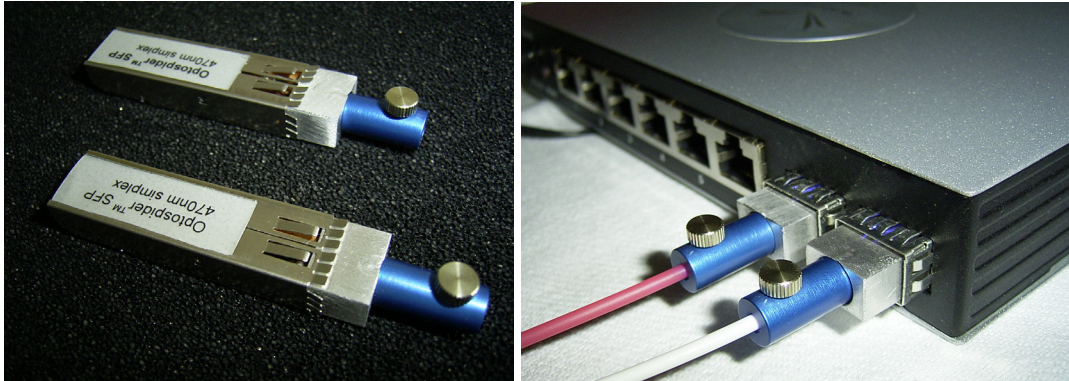


POF SFP transceivers, the missing link in POF inhouse data networks

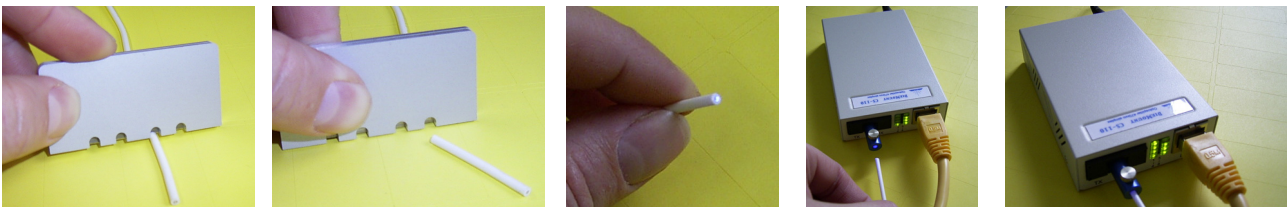
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Broadband data access for private homes is a powerful development in all industrial countries. The data rate is continuously growing and allows now the introduction of new services like IPTV and high quality VoIP. High speed xDSL lines or glass fiber cables transport the data to the house and building entry, respectively. But which technical solution brings the data from the building entry to the individual apartments? And how shall the homeowner realize the network connection of each terminal equipment? There are strong arguments to use a special optical waveguide, the optical polymeric fiber (POF), instead of shared media systems like wireless (WLAN) or power line communication (plc). This article presents DieMount's latest developments in the field of POF transceivers, the POF SFP transceiver. POF SFP transceivers allow to design a building and home network via POF with great flexibility. They are the missing link for the successful mass application of private POF networks.

1. POF, the data cable of the future

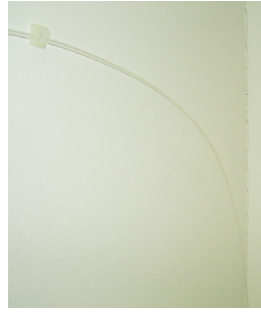
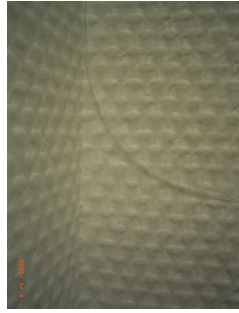
The optical polymeric fiber (POF) is an optical waveguide like the well-known glass fiber. But its waveguide core diameter is not 0.009mm or 0.050mm as typical for glass fiber, but 1mm instead. This allows everybody, even nonexperts and private persons, to do the cable installation and termination with nearly no special tools (see figures below) within a few seconds.



The POF cable termination process in detail: cut, plug to transceiver, ready for operation

The ease of POF termination is unbeatable; neither glass fiber nor electrical CAT5 cable can be terminated as easily as POF.

But POF has even more advantages: the only 1mm (POF without jacket) or 2.2mm (POF with standard jacket) diameter fiber can be installed nearly invisible (see figure below).



Simplex bare fiber POF on wall paper (left figure) and simplex POF cable with transparent jacket (right figure)

Shared media systems like WLAN or plc don't need a cable to connect the network nodes; they use a common medium, i.e. a special frequency domain in the case of WLAN and the building power line installation in the frequency range up to 30MHz for data exchange. As the shared medium overall data rate is limited, every new network participant reduces the data rate available per node. Nearly free access from the outside enforces to use encryption methods. Perturbations from electrical machines or neighbouring networks destabilize the network.

POF data networks don't have problems of this type. As a consequence standard 1mm POF is the preferred 100 Mbit/s Fast Ethernet cabling system over transmission distances of 30m to 70m for inhouse applications.

2. POF media converters and network system equipment

Up to now the system equipment for POF networks was more or less limited to media converter products (see figure below). Startsets of this type allow the installation of a 100Mbit/s Fast Ethernet link for every private customer.



Startsets Optopider™ 650nm simplex for link distances up to 30m and Optopider™ 470nm simplex for link distances up to 70m are available including a 30m and 70m POF cable

With the dissemination of the media converter products more and more customers are asking for POF compatible switch modules and triple play gateway module (customer premises equipment, CPE). A short glance around the available system equipment for glass fiber networks generates the desire for similar POF network equipment among all POF users. But unfortunately the POF industry is still in a rather early stage and misses at present mass volume sales to finance the development of a huge variety of network modules like known from the glass fiber market.

But there is a new development in the glass fiber field that allows the adaption of network modules to POF networks without an extra development effort for the network module: it's the introduction of pluggable 100Mbit/s and Gbits/s SFP transceivers. The figure below shows some commercially available network modules with Fast Ethernet compatible SFP ports in the range from LowCost to HighEnd.

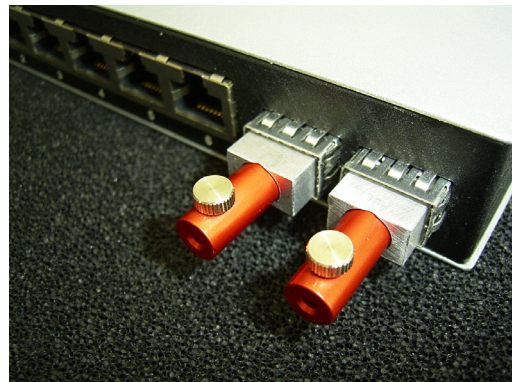
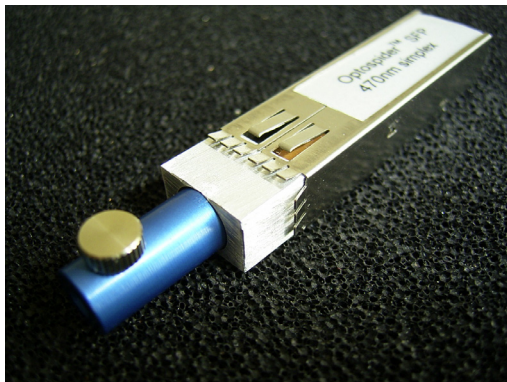


100BASE-FX SFP supported products from Wamin (CS-Fx2), D-Link (DGS-3612G) and Cisco (Catalyst 3750)

It is expected that the number of 100BASE-FX SFP compatible network products will grow rapidly in near future.

3. POF SFP 100BASE-FX modules

In order to combine glass fiber network products with the requirements of POF inhouse installations the German manufacturer DieMount developed POF SFP transceiver modules.



POF SFP prototypes for Fast Ethernet data transmission via a simplex POF cable: Optospider™ 470nm simplex (transmission distance 70m) on the left and Optospider™ 650nm simplex (transmission distance 30m) on the right

POF SFP modules of this type allow to use all SFP 100BASE-FX compatible network products for POF networks. A huge variety of options suddenly opens to POF networkers. The table below lists the POF SFP modules that are now ready for series fabrication and will be brought to the market in the near future:

<i>type of operation</i>	<i>wavelength</i>	<i>connection to POF</i>	<i>transmission distance</i>
simplex	650nm	cable directly	30m
simplex	470nm	cable directly	70m
simplex	470nm	SC	70m
duplex	650nm	cable directly	70m
duplex	470nm	cable directly	120m

4. CPE network modules

Switches are the solution of choice for data networks. Home networks often require a special central node, the triple play optimized gate way CPE (customer premises equipment). As many home networks today use WLAN or plc networks, the manufacturer of CPE modules integrate these network interfaces. An additional POF port is used by a small percentage of customers. The additional POF port must be very lowcost therefore. Those customers who are using the POF port for their network, are not contented with the built in POF transceiver due to its low cost and low performance attributes. The diversification of CPE modules isn't really an alternative, because it costs additional effort for the fabrication, storage and distribution of a variety of CPE products.

Again, the solution of choice is POF SFP: POF SFP allow the CPE manufacturer to save costs for those customers that do not intend to use a POF network. The SFP interface in the CPE itself is a very low cost device (much more low cost than any POF transceiver). Those customers that intend to set up a POF network will buy a POF SFP with the quality they require. The POF SFP thus brings flexibility and system product diversity to the small but rapidly growing market of POF network systems.

5. Outlook to Gbit/s

At the first glance Gbit/s networks via standard 1mm PMMA POF seem to be not feasible due to the high dispersion of standard POF. But latest developments indicate that 1Gbit/s data transmission up to a distance of 30m is possible even on standard 1mm POF, if the transceiver is suitably designed. Low launch NA and dispersion compensation are the corresponding transceiver key elements. The expectation is that in future short distance POF SFP transceivers will come to the market that are able to bridge a distance of up to 30m and are thus well suited for nearly all apartment network applications. POF installations are a future proofed solution that is not limited to the present 100Mbit/s data rate.

6. Conclusion

The development of POF SFP transceivers opens the still small and emerging POF data network industry the variety of network products originally made for glass fiber applications. Many different switch solutions for POF networks are feasible eve today. The number of options grows with every new developed product comprising SFP ports. Even the measurement equipment is affected by this development. The figure below shows a hand-held cable tester with SFP ports. Though made for glass fiber applications is will be usable for POF cables.



SIGNALTEK™ FO –
Multimedia-Kabel-Qualifizierer
comprising SFP transceiver port
from Ideal Industries