

Free Space Optics Systems

OPTICOMM

**Optical Signal Transmission through the 'Free' Atmosphere
Fast Laser Links for LAN, Telephone and Video Connections**

Features

- Protocol independent and transparent signal transfer in full duplex mode
- 2-channel systems for parallel LAN and telephone exchange links
- Multimode and single-mode fibre optic interfaces
- Interfaces for online monitoring and SNMP management
- Immunity to electromagnetic interference (EMI/RFI)
- No radio licences or right-of-way permits required
- Installation distances up to 4000 m
- Highest data security and privacy
- Installation within a few hours



OC eC021

General Description

The Free Space Optics (FSO) systems OPTICOMM developed and manufactured by OPTEL employ modulated laser light for directed transmission of signals through the atmosphere.

In urban and inaccessible environments FSO systems offer an ideal, economical alternative to expensive leased lines for providing highly secure point-to-point broadband transmission links between buildings.

Costs for planning and implementation of a broadband transmission link bridging roads, railway lines or waterways are minimal, as the main expenses are reduced to the installation of power and optical fibre cable in the customer's buildings.

Systems for LANs or telephone exchanges incorporate multi-mode or single-mode fibre optic (F/O) interfaces.

As signal transmission is protocol independent and transparent, without any changes in signal format, coding or speed, the OPTICOMM link is simply configured as a F/O cable extension.

System configurations cover a variety of requirements, differing in data rate, fibre optic interfaces and the number of transmission channels.

| Systems | Channels | Bandwidth | F/O Interface |
|------------------|----------|--------------------------------|---------------------------------------|
| OPTICOMM-LAN | 1 | 0.2 - 45 Mbps | Multimode 820 nm |
| OPTICOMM-FDD | 1 | 0.5 - 155 Mbps | Multimode 1300 nm |
| OPTICOMM-FDD/HS | 1 | 0.5 - 155 Mbps | Single-mode 1300 nm |
| OPTICOMM-DUAL | 2 | 2x 0.2 - 20 Mbps | Multimode 820 nm |
| OPTICOMM-DUAL/HS | 2 | 0.2 - 4 Mbps 0.5 - 155 Mbps | Multimode 820 nm Multimode 1300 nm |

Advantages

Free Space Optics offer substantial advantages in comparison to wired data lines or wireless microwave systems:

- OPTICOMM systems need no radio licences, right-of-way permits or other regulatory approvals.
- OPTICOMM systems offer fibre optic transmission speeds at a fraction of the cost of competing technologies, without recurring annual rental or licensing fees.
- OPTICOMM systems offer almost 100 % link availability in combination with a wireless LAN (WLAN) bridge back up.
- OPTICOMM systems offer 'Plug-and-play' capability and are installed and operating within hours.
- OPTICOMM systems offer highest data security and privacy.
- OPTICOMM systems are not affected by radio antennas.
- OPTICOMM systems offer extremely short planning and installation times.

Systems Description

The Free Space Optics systems OPTICOMM consist of two identical optical transceiver units, mounted and aligned in the mutual unimpeded line-of-sight.

Each OPTICOMM transceiver unit incorporates a semiconductor laser transmitter and a laser receiver for the atmospheric signal transmission, together with all processing and interfacing electronics.

Laser transmitter and laser receiver electronics operate independently, supporting data signal transfer in full duplex mode.

The integrated fibre optic (F/O) interfaces allow simple connections to networking (LAN) routers, bridges, switches etc. or telephone exchanges and offer optimal protection against EMI/RFI, ground faults and transients.

Triggered by signals from the F/O interface input port, the laser transmitter emits light signals which are propagated along the line of sight to the laser receiver of the transceiver unit installed at the opposite site.

The laser receiver at the opposite site picks up the light signals and feeds them after processing and reconditioning to the F/O interface output port.

The compact coaxial design of laser transmitter and laser receiver in the OPTICOMM transceiver units ensures easy, straightforward systems alignment and long-term stable, service-free operation.

Systems Selection

For the selection of a suitable FSO system it is only necessary to determine

- the required transmission speed of the planned link,
- the approximate air-line distance between the buildings.

Transmission Bandwidth

The following OPTICOMM systems are offered, covering requirements from basic telecom to high speed LAN applications.

OPTICOMM-LAN systems are the solution for low-speed LAN protocols. They offer multimode F/O interfaces and a transparent full duplex signal transmission bandwidth of 200 kbps to 45 Mbps, suitable for Ethernet and Token Ring networks. In telecommunications, the systems cover standard G.703 T1/E1 to T3/E3 telephone lines.

OPTICOMM-FDD systems are designed for high-speed LAN protocols. They offer multimode F/O interfaces and a transparent full duplex signal transmission bandwidth of 500 kbps to 155 Mbps, suitable for Fast Ethernet, FDDI and ATM networking protocols.

OPTICOMM-FDD/HS systems have the same bandwidth, incorporate however a single-mode F/O interface for medium and long distance components in PDH and SDH applications.

OPTICOMM-DUAL systems are genuine 2-channel systems, incorporating two independent multimode F/O interfaces. Both channels provide a transparent full duplex signal transmission bandwidth of 200 kbps to 20 Mbps.

FREE SPACE OPTICS SYSTEMS

OPTICOMM

This allows LAN connections employing low-speed LAN protocols, parallel to G.703 T1/E1 telephone exchange links.

OPTICOMM-DUAL/HS systems also offer two independent full duplex channels. However, one high-speed channel has a transparent signal transmission bandwidth of 500 kbps to 155 Mbps, the other channel a bandwidth of 200 kbps to 4 Mbps.

This allows high-speed LAN connections using Fast Ethernet, FDDI or ATM protocols, parallel to G.703 T1/E1 telephone exchange links.

Installation Distance

All OPTICOMM systems are available in four performance classes to suit varying range requirements.

| Model | Min. Distance | Max. Distance |
|------------|---------------|---------------|
| OC-xx 400 | 10 m | 400 m |
| OC-xx 1000 | 50 m | 1000 m |
| OC-xx 2000 | 50 m | 2000 m |
| OC-xx 5000 | 250 m | 4000 m |

Systems of a higher performance class offer higher link availabilities due to higher power margins, if installed at the same distance.

BackUp

Despite laser technology and the high efficiency of the FSO systems OPTICOMM, adverse weather conditions like fog and heavy rain or snow fall can disrupt the atmospheric signal communication for some minutes or even hours.

Whether there is a disruption at all depends on the installation distance and the power margin of the system in use.

However, it always makes sense to minimize interruptions of any kind by supporting a single data line with an alternative method of signal transmission.

Especially qualified to back up high-speed FSO systems are also license-free operating wireless LAN (WLAN) bridges, which offer Ethernet connections with data rates of up to 3 - 5 Mbps in half duplex mode.

Data Security

OPTICOMM systems offer highest data security. The OPTICOMM transceiver units are mounted on roofs of high buildings or are fixed to inaccessible walls.

The data is transmitted as invisible modulated light pulses. The optical transmission channel is very narrow, high in the air, without side lobes and reaches a diameter of only approx. 1 m at a distance of 500 m.

The optical power is very low and cannot be detected by spectrum analysers or RF meters.

FREE SPACE OPTICS SYSTEMS

OPTICOMM

The electromagnetic radiation outside the optical region is extremely low and only detectable within a distance of a few meters.

Furthermore, even the fibre optic interfacing offers above-average security in comparison to copper interfaces.

OPTICOMM Management Features

The supervision of major networking components is of particular importance in extended networks.

It helps to localise malfunctions and to minimise costly network downtimes with resulting delays and production losses.

Management features for OPTICOMM systems are available in scaled, upgradable options.

In the basic version performance data is internally stored for evaluation.

On the highest level a Linux-based SNMP-Agent is integrated in the OPTICOMM transceiver unit allowing central monitoring and administration of the data link. The agent is connected to the network via a F/O interface 100Base-FX

Laser Safety Considerations

The OPTICOMM systems incorporate laser transmitters classified as Class 1M or Class 3B laser products, according to IEC 60825-1, depending on systems configuration.

The direct viewing of a Class 1M laser is harmless as long as no optical instrument (telescope, binoculars) is used.

The light emitted by a Class 3B laser can cause damage to the retina of the eye, if viewed directly from a short distance. Therefore a minimal safe viewing distance must be observed.

This distance depends on the OPTICOMM transceiver model and varies between approx. 6 meters and 20 meters for an uninterrupted exposure time of 100 seconds.

Reliability

The FSO systems OPTICOMM have been in successful operation for more than 20 years.

They are especially designed for operation in harsh outdoor environments of widely varying temperatures, wind, rain, snow, direct sunlight and aggressive aerosols.

The careful selection of materials and component, together with the ruggedly designed electronics in compact hermetic housings perfected over years, ensures long-lasting and trouble-free operation.

Service / Maintenance

The FSO systems OPTICOMM need no special maintenance.

Under normal circumstances, it should suffice to check the alignment and clean the optics once a year.

General Technical Data

| | | | | | |
|--|--------------|----------------------------|--------|--------|----------|
| Optical Transmitter | | Semiconductor Laser | | | |
| Laser Output Power | | max. 8 mW | | | |
| Laser Classification (IEC 60825-1) | | Class 1M / Class 3B | | | |
| Systems | OPTICOMM-XXX | -400 | -1000 | -2000 | -5000 |
| Installation Distance | min. | 10 m | 50 m | 50 m | 250 m |
| | max. | 400 m | 1000 m | 2000 m | 4000 m |
| Transmitting Angle (Far Field) | | 2 mrad | 2 mrad | 2 mrad | 1.5 mrad |
| Supply Voltage | | 230 VAC | | | |
| optional | | 24 VDC / 48 VDC | | | |
| Power Consumption | | max. approx. 6 - 15 VA (W) | | | |
| Protection Rating | | IP 65 | | | |
| Operating Temperature | | -20°C ... +50°C | | | |
| Weight per Transceiver Unit | | 5.5 kg | | | |
| incl. Alignment Base, Weather Protection | | 20 kg | | | |
| Alignment Telescope | | 3 - 9 x 40 mm | | | |

Fibre Optic Interfaces

Fibre optic (F/O) interfaces facilitate the transparent and protocol independent transmission of signals.

F/O also permit cable lengths of up to 2000 m between networking equipment and the OPTICOMM transceiver unit for multimode fibres and even longer cable lengths for single-mode fibres.

The F/O cables are connected directly to the rear panel of the OPTICOMM transceivers and protected against dust and water by cable glands.

F/O Interface OPTICOMM-LAN / OPTICOMM-DUAL

The F/O interface operates at a wavelength of 820 nm and is specified for multimode fibres of 50/125 µm and 62,5/125 µm core/cladding diameter.

The transparent signal transmission bandwidth is 200 kbps to 45 Mbps for the OPTICOMM-LAN systems and twice 200 kbps to 20 Mbps for the OPTICOMM-DUAL systems.

| | |
|--------------------------------------|---------------------|
| Fibre Optic Ports | ST Receptacle |
| Fibre Optic Transmitter | LED |
| Wavelength | 820 nm |
| Output Power coupled into 50/125µm | -14 dBm ... -17 dBm |
| Output Power coupled into 62,5/125µm | -12 dBm ... -15 dBm |
| Fibre Optic Receiver | Photodiode |
| Dynamic Range | -13 dBm ... -25 dBm |
| Bit Error Rate | 10 exp -10 |

F/O Interface OPTICOMM-FDD

The F/O interface operates at a wavelength of 1300 nm and is specified for multimode fibres of 50/125 µm and 62,5/125 µm core/cladding diameter.

The transparent signal transmission bandwidth is 500 kbps to 155 Mbps.

| | |
|--------------------------------------|---------------------|
| Fibre Optic Ports | ST Receptacle |
| Fibre Optic Transmitter | LED |
| Wavelength | 1300 nm |
| Output Power coupled into 50/125µm | -18 dBm ... -21 dBm |
| Output Power coupled into 62,5/125µm | -16 dBm ... -19 dBm |
| Fibre Optic Receiver | Photodiode |
| Dynamic Range | -15 dBm ... -30 dBm |
| Bit Error Rate | 10 exp -12 |

F/O Interface OPTICOMM-FDD/HS

The F/O interface operates at a wavelength of 1300 nm and is specified for single-mode fibres of 9/125 µm core/cladding diameter, to suit components in PDH and SDH applications in telecommunications.

Two configurations are available to accommodate components for medium and long distance applications.

The transparent signal transmission bandwidth is 500 kbps to 155 Mbps.

| | |
|--------------------------------|---------------------|
| Fibre Optic Ports | ST Receptacle |
| Fibre Optic Transmitter | Laser |
| Wavelength | 1300 nm |
| Output Power (medium distance) | -10 dBm \pm 1 dBm |
| Output Power (long distance) | -3 dBm \pm 1 dBm |
| Fibre Optic Receiver | Photodiode |
| Dynamic Range | -1 dBm ... -30 dBm |
| Bit Error Rate | 10 exp -12 |

F/O Interface OPTICOMM-DUAL /HS

This 2-channel system combines the F/O interfaces of the OPTICOMM-FDD and OPTICOMM-LAN systems.

Both F/O interfaces are specified for multimode fibres of 50/125 µm and 62,5/125 µm core/cladding diameter.

One channel has a transparent signal transmission bandwidth of 500 kbps to 155 Mbps and an operating wavelength of 1300 nm, the other channel a bandwidth of 200 kbps to 4 Mbps and a wavelength of 820 nm.

All other specifications are as stated for the OPTICOMM-FDD and LAN systems.

Contact Addresses

OPTEL Gesellschaft für Lasertechnik und Elektronik mbH
Holzoppel 1, D-22869 Schenefeld / Hamburg, Germany

www. Optel.com
 eMail: Info@Optel.com
 Tel.: +49 (040) 830 99 360
 Fax.: +49 (040) 830 99 362

OPTEL-Service

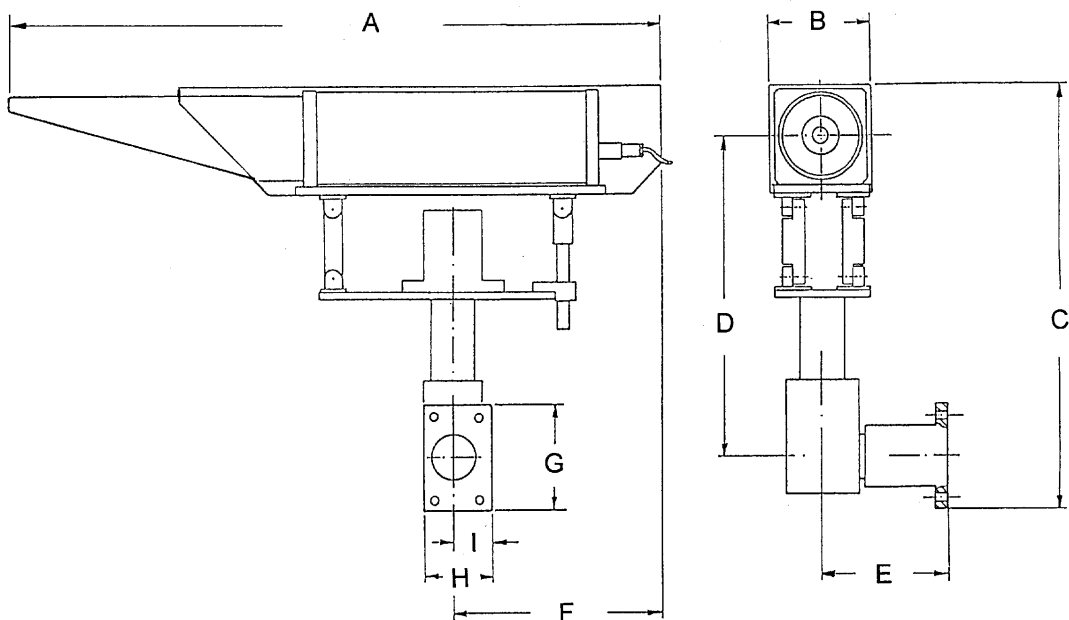
eMail: Service@Optel.com
 Mobil: +49 (0172) 5154 360

Mechanical Outlines

OPTICOMM Transceiver Unit

with **Weather Protection Cover** and **Optic Protection Tube**
 mounted on **Standard Angled Alignment Base**

Mounting Hole Diameter: (4 x) 11 mm Hole Pattern: 80 mm x 80 mm



| Systems | A | B | C | D | E | F | G | H | I |
|-----------------------|------|-----|-----|-----|-------------|-----|-----|-----|----|
| OC-LAN 400 | 890 | 140 | 555 | 405 | min. 160 | 290 | 110 | 110 | 55 |
| OC-FDD 400 | | | | | | | | | |
| OC-LAN 1000 - 5000 | 1010 | 170 | 580 | 420 | | 310 | | | |
| OC-DUAL 400 - 5000 | | | | | | | | | |
| OC-FDD/HS 1000 - 5000 | | | | | | | | | |

All dimensions in mm