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TACTICAL OPTICAL NETWORK

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Active Components for Military Communication

Ethernet Switches
Media Converters
Communication and Information Modules

LMC Ethernet Media Converter

Converter	1G BASE-T	1G BASE-X	100M BASE-T	100M BASE-X	PoE Ports	managed	Operating temp.	Storage temp.	Notes	page
LMC-01.BF	-	-	1	1	-	-	-30 to 50°C	-50 to 70°C		3
LMC-01.GF	1	1	-	-	-	X	-30 to 50°C	-50 to 70°C		3
LMC-02.GF	2	2	-	-	-	X	-30 to 50°C	-50 to 70°C		3

LMSW Ethernet Managed Switches

Switch	1G BASE-T	1G BASE-X	100M BASE-T	100M BASE-X	Cisco IOS®	Func. Layer	PoE Ports	Operating temp.	Storage temp.	24-48 VDC / 90-264 VAC dual input	Notes	page
LMSW-42M	4	2	-	-	-	L2	4	-40 to 70°C	-40 to 85°C	X		4
LMSW-62M	6	2	-	-	-	L2	6	-40 to 70°C	-40 to 85°C	X		4
LMSW-82M	8	2	-	-	-	L2	8	-40 to 70°C	-40 to 85°C	X		4
LMSW-62H	-	2	6	-	X	L3	4	-40 to 80°C	-40 to 85°C	X		5
LMSW-71H	1	1	6	-	X	L3	6	-40 to 80°C	-40 to 85°C	X		5
LMSW-82H	-	2	8	-	X	L3	8	-40 to 80° C	-40 to 85°C	X		5
LMSW-10	-	-	8	2	X	L2	4	-30 to 50°C	-50 to 70°C		2x FXS ports, Battery backup	6

LMSB Communication and Information Module

	1000 BASE-T	1000 BASE-X	FXS VoIP ports	CCME/SIP sesions	Server 2xCPU Xeon E5-2600v2, up to 512GB RAM	NAS server	Power supplying	Operating temp.	Storage temp.	page
LMSB-14.2	6	4	24	50/150	-	-	Redundant 230V/24V	-30 to 50°C	-40to 65°C	7
LMSB-14.3	6	3	4 to 8	35/100	2	-	Redundant 230V/24V	-30 to 50°C	-40to 65°C	8
LMSB-14.4	6	3	4 to 8	35/100	2	-	Provide LMSB-14.2	-30 to 50°C	-40to 65°C	8
LMSB-15	6	3	4 to 8	35/100	2	1	Redundant 230V/24V	-30 to 50°C	-40to 65°C	9

LMCR FO Repeater

	100M BASE-X	Operating temp.	Operating Storage	Notes	page
LMCR-SP24-80	2	-30 to 50°C	-50 to 70°C	Battery backup photovoltaic cells	10

LMC-series

Fast/Gigabit Ethernet
Media Converter
Ruggedized type

The LMC series introduces the media converter housed in a robust metal box, which provides Expanded Beam connectors for fiber optic cable and copper twisted pairs ports for harsh environmental conditions. The LMC rugged design extends the use of Ethernet in military, aerospace, broadcasting, petrochemical and harsh industrial applications. It meets demands for mobility, easy installation and the mechanical resistance required for tactical deployment in the field. LMC converters provide you the freedom to extend your 10/100/1000 Mbps cabling distance by allowing connectivity up to 2 km over MM fiber, up to 50 kilometers used with SM fiber. LED indicators show the power status of the converter, LAN port and fiber activity. The basic configuration includes the media converter in ruggedized box. The optical and electrical ports converters are terminated at separate connectors: HMA type for FO, rugged RJ-45 for copper LAN interface. The power supply is ensured via 3-pins rugged connector.

LMC configuration

LMC-01.BF Fast Ethernet Media Converter
LMC-01.GF Gigabit Ethernet Media Converter
LMC-02.GF 2x Gigabit Ethernet Media Converter

Key Features

- LMC-01.BF: 10/100Base-TX to 100Base-FX Converter
- LMC-01.GF/LMC-02.GF: 10/100/1000BASE-T to 100/1000BASE-X converter
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or Manual mode in TP port
- Support flow control Enable or Disable
- Support Jumbo Frame 9K Packet
- Ingress/Egress Bandwidth control
- Support 802.3ah-OAM/IP in-band management
- Firmware upgrade via Web
- Support Link Fault Pass Through (LFP) Function
- Support Auto Laser Shutdown (ALS) Function
- Web management on stand-alone.
- Support 16 Tag VLAN Group
- RMON counters

Standard Accessories

- Documentation and user manual
- Data cable, LAN-RJ-45 (IP67)/RJ-45, 8 m length 5 m
- Power supply cable 24 VDC 3 m, 3 wires

Product Specifications

LMC-01.BF	IEEE 802.3 10Base-T, 802.3u 100Base-TX IEEE 802.3u 100Base-FX
LMC-01.GF/ LMC-02.GF	IEEE 802.3 10Base-T, 802.3u 100Base-TX, 802.3ab 1000BASE-T IEEE 802.3u 100Base-FX, 802.3z 1000BASE-X,
Protocol	CSMA/CD
Interface	Ruggedized RJ-45 port using copper twisted pair cable[1]: data transmission Ruggedized power supply port: power supply HMA connector: 62.5/125 µm or 50/125 µm MM fiber optic cable 9/125 µm SM fiber optic cable
Wavelength	MM: 1310 nm, SM: 1310 nm, 1550 nm
Maximum Segment Length	UTP cable (10Base-T, 100Base-TX): 100 m MM fiber optic cable, full duplex: 2 km SM fiber optic cable, full duplex: 10, 30, 50 km
Environmental Temperature Humidity	According to MIL-STD 810E Operating -30°C to +50°C, Storage -50°C to + 70°C 10% to 95%
Mechanical	According to MIL-STD 810E
EMC	According to MIL-STD 461E and MIL-STD 464E
Power Supply[2] LMC-01.BF	DC type: external 10 – 36 V DC; DC12 type: 12 DC; power consumption: <4 W PoE PD (Power over Ethernet powered device: IEEE 802.3af)
Power Supply[2] LMC-01.GF	external 10 – 36 V DC; power consumption: <4 W PoE PD (Power over Ethernet powered device: IEEE 802.3af)
Dimension	LMC-01.BF: 146 x 106 x 75 mm (box) 180 x 130 x 120 (including connectors) LMC-01.GF: 146 x 106 x 75 mm (box) 180 x 130 x 120 (including connectors)

Note:
1) Copper wires cable, to ensure data connection and power supply - available on request
2) AC/DC power supply adaptor – can be delivered on request, please contact: SALES@OPTOKON.CZ

Ordering code

LMC-01.BF **LMC-01-GF** **LMC-02.GF**	**- XX**	**- HMA**	**- XX**	**- XX /(FR[3])**
01.BF -100M converter **01.GF** -1G converter **02.GF** -2x 1G converter	**Fiber Type** **M5**: MM 50/125 µm **M6**: MM 62.5/125 µm **S3**: SM 1310 nm **S5**[4]: SM 1550 nm	**Connector Type**[2]	**Distance Connectivity**[1] **02**: MM **10**: 10 km **30**: 30 km **50**: 50 km	**Power Supply** **DC**: 10–36 V **DC12**: 12 V **PD**: PoE powered Device

Note:
1) MM fiber – the distance depends on fiber type, up to 2 km. SM fiber – longer distance available on request
2) HMA-J standard, other on request
3) ...-xx/FR, on request: modification-milling of front panel, to fit into mounting hole at vehicle installation panel (front panel without description of siganlization LEDs)
4) 1550 nm – DFB laser, 50 km distance connectivity

LMSW-42M
LMSW-62M
LMSW-82M
LMSW-83M

Ruggedized PoE Gigabit Ethernet Managed Switches

A ruggedized field switch, which has been developed according to the requirements for optical networks in harsh environmental conditions. It is designed for operation in military tactical networks, for installation in heavy industry enterprise, oil refineries and mining plants, and can be used in rescues actions during natural disasters. The switch combines all the advantages associated with: excellent optical network performance and rugged construction.

The switch supports a variety of management functions, including STP/RSTP/MSTP and ITU-T G.8032 Ring<50 ms recovery time, advanced PoE management functions such as PoE device auto-checking and auto reset, layer 2 Ethernet IGMP, VLAN, QoS, Security, IPv6, bandwidth control, port mirroring, cable diagnostic and Green Ethernet.

The switch is classified as power source equipment (PSE) and can be used to power IEEE 802.3af/at standard devices (PD), eliminating the need for additional power cable wiring. It can fit all standard 24/48 VDC and 230 VAC power systems simultanously (redundant power supply). The switch operates in a wide operating temperature range -40 +70 °C.

Switch configuration

LMSW-42M	4x RJ-45 LAN PoE ports and 2x FO ports.
LMSW-62M	6x RJ-45 LAN PoE ports and 2x FO ports.
LMSW-82M	8x RJ-45 LAN PoE ports and 2x FO ports.
LMSW-83M	8x RJ-45 LAN PoE ports and 3x FO ports.

Key features

- Robust compact design resistant to harsh environmental conditions and rough handling
- 2x 100/1000Base-X: HMA FO connectors
- 4, 6 or 8x 10/100/1000Base-T: RJ-45 interface with support of IEEE802.3af/at PoE output (30 W per Port)
- Built-in power booster designed for up to 55 VDC for PoE/PoE+ output
- Redundant dual input power 20-57 VDC/90-264 VAC

Specifications

IEEE Standard	STP (Spanning Tree Protocol) RSTP (Rapid Spanning Tree Protocol) MSTP (Multiple Spanning Tree Protocol) EPR (Ethernet Protection Ring) Virtual LANs (VLAN) Port based Network Access Control, Authentication Link aggregation for parallel links with LACP(Link Aggregation Control Protocol) Flow control for Full Duplex PoE+ (Power over Ethernet ehancements) Stacked VLANs, Q-in-Q LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization Link Layer Discovery Protocol (LLDP) EEE (Energy Efficient Ethernet)
VLAN ID	4096
Data Processing	Store and Forward
Flow Control	IEEE 802.3x for full duplex mode. Back pressure for half duplex mode
Jumbo Frame	9.6KB
Console	RS-232 (RJ-45)
Protocol	CSMA/CD
Protection	Reverse polarity protection Overload current protection CPU Watch Dog
Power Supply	Redundant Dual DC 20-57VDC/80-264 VAC
Interface	RJ-45 port: ruggedized, watertight connectors FO - HMA-J[1]: 50/125 µm or 62.5/125 µm MM optical cable, 9/125 µm SM optical cable
Wavelength	MM: 1300 nm, SM: 1310 nm, 1550 nm
Distance	UTP cable: 100 m MM optical cable, full duplex: up to 2 km, SM optical cable, full duplex: 10, 30, 50 km
Environmental temperature	Fulfils MIL-STD 810E Operating: -40 °C to +70 °C Storage: -40 °C to + 85 °C
Mechanical	Fulfils MIL-STD 810E, IP 63 protection
Power supply: DC AC	20-57 V DC 90-264 V AC
Dimensions (without connectors)	LMSW-42M 200 x 200 x 60 mm (W x D x H) LMSW-62M 248 x 240 x 65 mm (W x D x H) LMSW-82M 322 x 240 x 65 mm (W x D x H) LMSW-83M 322 x 240 x 65 mm (W x D x H)

Ordering code

LMSW-42M **LMSW-62M** **LMSW-82M**[4] **LMSW-83M**	**XX**	-	**XX**	-	**(AC/DC[3])**
	Fiber Optic **M5** MM 50/125 µm **M6** MM 62.5/125 µm **S3** SM 1310 nm **S5** SM 1550 nm		**Distance (FO)** XX[1] Multimode 10: 10 km 30: 30 km 50[2]: 50 km		**Power suply** **AC**: 90-264 V AC **DC**: 20-57 V DC

Standard accessories

- Documentation and user manual
- Power supply cable 230 VAC 2.5 m
- Power supply cable 24 VDC 2.5 m

Note:
1) MM fiber - the distance depends on fiber type, up to 2 km.
SM fiber - longer distance on request
2) 1550 nm - DFB laser, 50 km distance connectivity
3) standard power supply: AC/DC, please define - if required different
4) 8x LAN PoE ports at front panel, 2x Fiber Optic HMA connectors at rear panel

LMSW-62H
LMSW-71H
LMSW-82H

Ruggedized L3 Switch
PoE Ethernet Managed Switch

A ruggedized field L3 switch, which has been developed according to the requirements for optical networks in harsh environmental conditions. It is designed for operation in military tactical networks, for installation in heavy industry enterprise, oil refineries and mining plants, and can be used in rescues actions during natural disasters. The switch combines all the advantages associated with: excellent optical network performance and rugged construction. Software, provides highly secure data, voice, and video communications to stationary and mobile network nodes.

Security: Dot1x, port security, and Dynamic Host Configuration Protocol (DHCP) allow dynamic port-base authentication; Secure Shell Version 2 (SSHv2); Simple Network Management Protocol Version 3 (SNMPv3) provides encrypted administrator traffic during Telnet and SNMP sessions; TACACS+ and RADIUS authentication facilitate centralized control and restrict unauthorized users

Resiliency: Flex links for fast recovery, Ethernet Protocol (REP) for fast convergence

Manageability: Auto SmartPort, Web Device Manager, Telnet, HTTPS access, and SNMP

Key Features

- Robust compact design, resistant to harsh environmental conditions and rough handling
- 1 or 2x 100/1000Base-X FO HMA-J uplink ports
- 6 or 8x 10/100Base-T Ethernet ports
- LAN 1-6 or 1-8 10/100Base-T with PoE
- PoE Standard IEEE 802.3af, 15.4 Wats per port
- Redundant dual power supply
- 24-48 V DC / 90-264 V AC operating (110/230 VAC nominal)
- RS-232 console
- Operating Temperature: -40 to +80 °C
- Storage Temperature: -40 to +85 °C

Product Specifications

Standard	IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX, 802.3z 1000Base-X
Layer 2 switching	IEEE 802.1, 802.3 standard (see Table 6), VTPv2, NTP, UDLD, CDP, LLDP, Unicast MAC filter, Flex Link, EPVTPv3, EtherChannel, Voice VLAN
Security:	SCP, SSH, SNMPv3, TACACS+, RADIUS Server/Client, MAC Address Notification, BPDU Guard, SPAN session, Port-Security, DHCP Snooping, Dynamic Arp Inspection, IP Source Guard, 802.1x, Guest VLAN. MAC Authentication Bypass, 802.1x Multi-Domain Authentication, Storm Control, Trust Boundary
Layer 3 routing	IPv4 Static Routing
Interface	Metallic - mechanical resistant, watertight connectors Optical - HMA-J 50/125 µm or 62.5/125 µm MM optical cable, 9/125 µm SM optical cable
Wavelength	MM: 1300 nm, SM: 1310 nm, 1550 nm
Distance	UTP cable: 100 m MM optical cable, full duplex: up to 2 km SM optical cable, full duplex: 10, 30, 50 km
Environmental temperature humidity	Fulfils MIL-STD 810E operating -40 °C to +80 °C storage –40 °C to +85 °C 10% to 95%
Mechanical	Fulfils MIL-STD 810E, IP 63 protection
Power supply: Redundant DC/AC	24-48 V DC 90-264 V AC external rugged adapter 250W
Dimensions (without connectors)	LMSW-62H 248 x 240 x 65 mm (W x D x H) LMSW-71H, 82H 322 x 240 x 65 mm (W x D x H)

Configuration

Type	1G Fiber optic interface uplink	1G metalic uplink	100M Interface
LMSW-62H	2x 100/1000Base-X FO HMA-J port	-	6x 10/100Base-T PoE ports
LMSW-71H	1x 100/1000Base-X FO HMA-J port	1x 100/1000Base-T	6x 10/100Base-T PoE ports
LMSW-82H	2x 100/1000Base-X FO HMA-J port	-	8x 10/100Base-T PoE ports

Ordering code

LMSW-62H **LMSW-71H** **LMSW-82H**	**- XX**	**-**	**XX**	**(AC/DC[3])**
	Fiber Optic **M5** MM 50/125 µm **M6** MM 62.5/125 µm **S3** SM 1310 nm **S5** SM 1550 nm		**Distance (FO)** **XX**[1]: Multimode **10**: 10 km **30**: 30 km **50**[2]: 50 km	**Power supply** **AC**: 80-264 V AC **DC**: 20-57 V DC

Note:
1) MM fiber – distance depends on fiber type, up to 2 km
SM fiber – longer distance on request
2) 1550 nm – DFB laser, 50 km distance connectivity
3) standard power supply: AC/DC, please define – if required different

LMSW-10

Ruggedized PoE Field Switch
8x 10/100Base-T
2x 100/100Base-X
2x FXS ports

Interconnection networks based in fiber optic components, are designed to connect the nodes of tactical networks using fiber optic cables. The Expanded Beam technology used preserves all advantages of signal transmissions through optical lines in harsh environmental field conditions.

For example, tactical fiber optic cables with Expanded Beam connectors enable to arrange connections between headquarters and subaltern points in field conditions in a very short time. The flexible 2 – 6 fiber 6 mm outer diameter optical cables have high crush and strain relief resistance and a rugged field repairable connector design. The wide range of cable drums has been developed to facilitate storage and handling with cable coils. The drums are designed to store up to 500 m tactical cable and the low weight of the cable coils allows easy network reconfiguration in field conditions.

The optical interface of the active networking device should be based on the same Expanded Beam technology, preferably on the same standards used for installation of the passive infrastructure of the tactical fiber optic network.

The LMSW-10 ruggedized field switch has been developed according to the above mentioned requirements. The switch combines all the advantages associated with excellent optical network performance and rugged construction designed for operation in harsh environmental conditions. The LMSW-10-282 includes a 10 port switch (2 fiber optic, 8 UTP LAN ports) and a VoIP gateway with 2 FXS ports. The LAN1-4 ports offer PoE (Power over Ethernet) capability.

Product Specifications

Standard data VoIP	IEEE 802.3 10Base-T, 802.3u 100Base-TX and 100Base-FX, H323 (SIP[1], Call Manager[1])
Protocol	CSMA/CD
Interface	Metallic - mechanical resistant, watertight connectors Optical - HMA 62.5/125 µm or 50/125 µm MM optical cable, 9/125 µm SM optical cable
PoE	PSE – power sourcing equipment, LAN port 1-4, Pre-standard PoE[2]
Wavelength	MM: 1300 nm, SM: 1310 nm, 1550 nm
Distance	UTP cable (10Base-T, 100Base-TX): 100 m MM optical cable, full duplex: 2 km, SM optical cable, full duplex: 10, 30, 50, 80 or 120 km
Environmental temperature humidity	Fulfils MIL-STD 810E operating -30°C to +50°C, storage -50°C to + 70°C, 10% to 95%
Mechanical	Fulfils MIL-STD 810E, IP 63 protection
Power supply	12 to 32 VDC
Dimensions	576 x 305 x 335 mm (W x D x H), 795 x 518 x 393 mm including transporting box

Note: 1) on request
2) PoE - IEEE 802.3af standard available on request

Key Features

- Robust compact design. Resistant to harsh environmental conditions and rough handling
- 2 fiber optic ports, 8 UTP ports, 2 FXS ports
- PoE – Power over Ethernet (LAN 1-4 ports)
- Pre-standard PoE(IP phones 7960G series)
- IEEE 802.3/802.3u auto-negotiation function
- QoS function for each port
- LED signalization
- VLAN support for each port
- Support for STP (Spanning Tree Protocol)
- Autocross function for UTP ports
- Power supply from 12 – 32 VDC
- Backup battery - 4 hour operation
- AC/DC adaptor included
- Complies with STANAG 4643 standards
- Hard carrying case for transportation

Ordering code

LMSW-10		**- XXX**		**- XX**	**- XX**	**- XX**
Ports Configuration[1]				**Fiber Optic**	**Distance (FO)**	**Power supply**[2]
Type	**FO**	**UTP**	**FXS**	**M**: Multimode	**02**: 2 km (MM)	**DC**: external
282	2	8	2	**S3**: SM 1310 nm	**10**: 10 km	
				S5: SM 1550 nm	**30**: 30 km	
					50: 50 km	

Note 1) other – available on request
2) AC, DC without battery backup – available on request

LMSW 10 ruggedized switch has been developed as a part of solution: Integrated System (ISSŘ) for Armed Forces of the Czech Republic

Czech Army Technical specifications:
TP-LMSW10-OPT01-08

LMSB-14.2

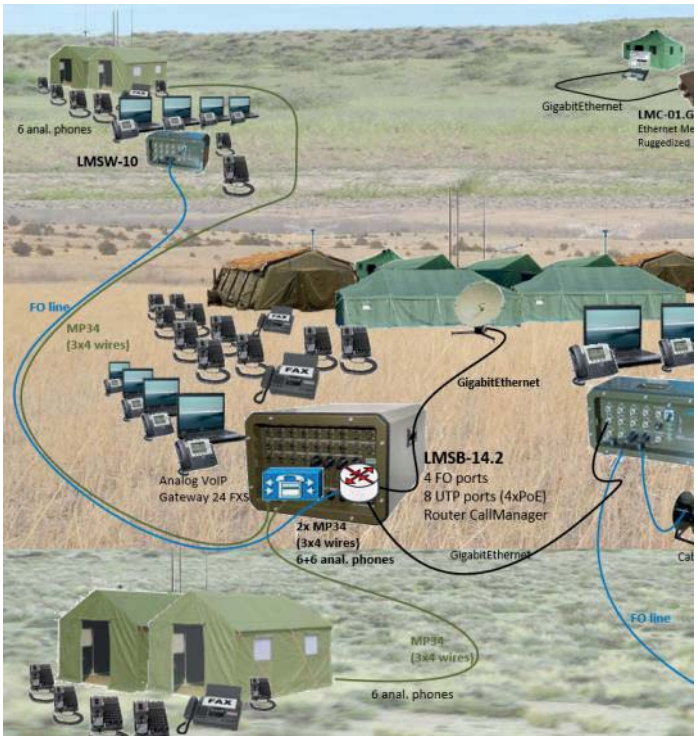
Communication and Information Module

The LMSB-14.2 forms part of the of LMSB-14, the original Communication and Information Module which enables to connect 50 phone and X[1] PC subscribers and to connect any type of communication equipment or systems (Radio, E&M, FXS, FXO, xDSL, T1/E1, E3, SAT, TETRA, GSM, PSTN) from different suppliers. The LMSB-14.2 comprises a set of data networking devices in a compact block and is easily transportable.

Note 1) X depends on the number of LMSW-xx switches used to expand subscriber capacity

Key Features

- Flexible integration of IP communication
- System mobility and modularity
- Local or network operation with Call Manager Express
- Ruggedized and weather proof design
- Easy and fast installation
- Fiber/copper cable, RRL and satellite connection
- Proven Expanded Beam HMA connector technology
- Interoperation with radio systems



Product Specifications

Routing	● Integration with voice, video, security, wireless, mobility, and data services ● High Performance up to 75 Mbps ● WAN routed ports 10/100/1000 Gigabit Ethernet, 2x 1000Base-FX, 1x 10/100/1000Base-T, 1x G.HDSL ● Modular interfaces, support to increasing bandwidth requirements, time-division multiplexing (TDM) ● Interconnections ● Two high-speed USB 2.0 ports and two external Compact Flash slots
VoIP Call Manager	● VoIP gateway fully compliant with SIP standard, H.323 and Cisco Communications Manager Express and Survivable Remote Site Telephony ● Digital voice support SIP/ H.323 sessions: 150 ● Video conferencing
24x FXS subscribers VoIP analog gateway ports	● 12x RJ-45 ports, 12 lines in two MP34 (3x4 pairs) or MP54 (5x4 pairs) connectors ● SIP protocol for analog phones, fax machines and legacy PBX systems. SIP sessions: 200 ● Supported voice/Fax codecs include G.711, G.723.1, G.726A/B, iLBC, T.38 Fax ● Identity management using authentication, authorization, and accounting (AAA) and public key infrastructure ● Embedded hardware - accelerated VPN encryption ● 4 SIP Server profiles per system and independent SIP account per port
Procol support	IPv4, IPv6, Static Routes, OSPF, IGRP, EIGRP, BGP, IS-IS, Multicast Internet Group Management Protocol (IGMPv3) Protocol Independent Multicast sparse mode (PIM SM), PIM Source Specific Multicast (SSM), Distance Vector Multicast Routing Protocol (DVMRP), IPSec, Generic Routing Encapsulation (GRE), Bi-Directional Forwarding Detection (BVD), IPv4-to-IPv6 Multicast, MPLS, L2TPv3, 802.1ag, 802.3ah, L2 and L3 VPN
Management	Embedded Traffic Management Web Services Management Agent , Embedded Event Manager, SNMP, Remote Monitoring (RMON), syslog, NetFlow, and TR-069
Managed PoE L3 Switch	● Total 10 System Ports Gigabit Ethernet + Two mini-GBIC expansion slot ● 8x any of the RJ-45 ports support 802.3af PoE and 802.3at PoE, Maximum power of 15.4 W ● Switching can be fully managed using the Web GUI or CLI ● Switching Capacity 20 Gigabits per Second ● Support for up to 4096 VLANs simultaneously, Voice VLAN, Multicast TV VLAN ● IP telephony support: embedded QoS intelligence to prioritize delay-sensitive services ● Static routing/Layer 3 switching between VLANs ● IPv4 DHCP Server, IPv6 support
UPS Capacity	5 – 10 min
Strong security	Embedded security, Extensive access control lists (ACLs), Guest virtual LANs (VLANs), Bridge Protocol Data Unit (BPDU), Secure Core Technology (SCT)
surge protection	Nominal discharge current (8/20 µs) In 20 kA Maximum discharge current (8/20 µs) Imax 40 kA
Power supply	Input 24 to 28 VDC / 160 – 294 VAC (any is main or backup - redundant) Power Consumption up to 227 W max (577 W with air conditioner) Output for LMSB-14.4 up to 505 W max (732 W with air conditioner)
Environmental temperature and humidity	Fulfils MIL-STD 810E, IP 63 protection Operating -30°C to +50°C, Storage -40°C to + 65°C Humidity 10% to 95%
Dimensions	583 x 845 x 400 mm (W x D x H)

LMSB-14.3 Red LAN (Secret)
LMSB-14.4 Black LAN

Information Module

The LMSB-14.x CIM X COMM ALL is a Communication and Information Module that connects X[1] PC subscribers x the number of LMSW-xx switches used to expand subscriber capacity and any type of communication equipment or systems (Radio, E&M, FXS, FXO, xDSL, T1/E1, E3, SAT, TETRA, GSM, PSTN) from different suppliers.

The LMSB-14.x is an easily transportable modular, mobile, compact block. The CIM block is connected to a higher system via optical and metallic cables, radio relay systems and satellite devices.

The LMSB-14.x module also connects a cryptographic device for transmission of classified information. The kit is designed for classification up to SECRET level. The technical solution means the module can be used in mobile communication nodes.

The module has a built-in inverter with UPS function and can be powered from 24 VDC and 230 VAC networks. The inverter has enough power to supply a minimum of 4 laptops and charge vehicle batteries.

Note 1) X depends on the number of LMSW-xx switches used to expand subscriber capacity

Key Features

- Flexible integration of IP communication
- System mobility and modularity
- Local or network operation with Call Manager Express to 35
- sessions.
- Ruggedized and weather-proof design
- Easy and fast installation
- Fiber/copper cable, RRL and satellite connection
- Proven Expanded Beam HMA connector technology
- Interoperation with radio systems

Product Specifications

Routing	● Integration with voice, video, security, wireless, mobilty, and data services ● High Performance up to 75 Mbps ● WAN routed ports 10/100/1000 Gigabit Ethernet, 2x 1000Base-FX, 1x 10/100/1000Base-T, 1x G.HDSL ● Modular interfaces, support to increasing bandwidth requirements, time-division multiplexing (TDM) ● Two high-speed USB 2.0 ports and two external Compact Flash slots
VoIP Call Manager	● VoIP gateway fully compliant with SIP standard, H.323 and Cisco Communications Manager Express and Survivable Remote Site Telephony ● Digital voice support SIP/H.323 sessions: 150 ● Video conferencing
24x FXS subscribers VoiP analog gateway ports	● 12x RJ-45 ports, 12 lines in two MP34 (3x4 pairs) or MP54 (5x4 pairs) connectors ● SIP protocol for analog phones, fax machines and legacy PBX systems. SIP sessions: 200 ● Supported voice/Fax codecs include G.711, G.723.1, G.726A/B, iLBC, T.38 Fax ● Identity management using authentication, authorization, and accounting (AAA) and public key infrastructure ● Embedded hardware-accelerated VPN encryption ● 4 SIP Server profiles per system and independent SIP account per port
Main Server BackUp Server	Motherboard: ● 2x CPU Xeon E5-2600v2 family,16 DIMM up to 512GB DDR3, 3 (x16) PCI-E 3.0 and 3 (x8) PCI-E 3.0 slots; 2x Gigabit Ethernet LAN; 8 SATA2 and 2 SATA3 ports; 11x USB 2.0 ports (4 rear, 6 via header, 1 Type A); IPMI 2.0 and KVM with dedicated LAN. ; VMware® Ready certification Server Chassis: ● Eight hot-swappable 2.5" SAS/SATA hard drive bays.; 1x Slim DVD-RW; 7x Low-profile, Half-length I/O Slots; Power Switch & 6 LED Indicators. 600W High-efficiency Platinum Certified Power Supply
NAS server	Intel® Atom™ D2550 (1.86GHz Dual Core); až 16 TB HDD, 4x hot-swap disk; supports RAID 0, 1, 5, 6, 10 and JBOD; 2xUSB3; HDMI output; RJ-45x2GiB.
Managed PoE L3 Switch	● Total 10 System Ports Gigabit Ethernet + Two mini-GBIC expansion slot ● 8x any of the RJ-45 ports support 802.3af PoE and 802.3at PoE, Maximum power of 15.4 W ● Switching can be fully managed using the Web GUI or CLI ● Switching Capacity 20 Gigabits per Second ● Support for up to 4096 VLANs simultaneously, Voice VLAN, Multicast TV VLAN ● IP telephony support: embedded QoS intelligence to prioritize delay-sensitive services ● Static routing/Layer 3 switching between VLANs ● IPv4 DHCP Server, IPv6 support
UPS Capacity	5 – 10 min
Strong security	Embedded security, Extensive access control lists (ACLs), Guest virtual LANs (VLANs), Bridge Protocol Data Unit (BPDU), Secure Core Technology (SCT)
surge protection	Nominal discharge current (8/20 µs) In 20 kA Maximum discharge current (8/20 µs) Imax 40 kA
Power supply	Input 24 to 28 VDC/160 - 294 VAC (any can be used for main or backup - redundant) Power Consumption up to 227 W max (577 W with air conditioner) Output for LMSB-14.4 up to 505 W max (732 W with air conditioner)
Temperature and Humidity	Fulfils MIL-STD 810E, IP 63 protection Operating -30°C to +50°C, Storage -50°C to + 65°C Humidity 10% to 95%
Dimensions	583 x 845 x 400 mm (W x D x H)

LMSB-15

Information Module

The LMSB-15 CIM X COMM ALL is a Communication and Information Module that connects X[1] PC subscribers x the number of LMSW-xx switches used to expand subscriber capacity and any type of communication equipment or systems (Radio, E&M, FXS, FXO, xDSL, T1/E1, E3, SAT, TETRA, GSM, PSTN) from different suppliers.

The LMSB-15 is an easily transportable modular, mobile, compact block. The CIM block is connected to a higher system via optical and metallic cables, radio relay systems and satellite devices.

The LMSB-15 module also connects a cryptographic device for transmission of classified information. The kit is designed for classification up to SECRET level. The technical solution means the module can be used in mobile communication nodes.

The module has a built-in inverter with UPS function and can be powered from 24 VDC and 230 VAC networks. The inverter has enough power to supply a minimum of 4 laptops and charge vehicle batteries.

Note 1) X depends on the number of LMSW-xx switches used to expand subscriber capacity

Key Features

- Flexible integration of IP communication
- System mobility and modularity
- Local or network operation with Call Manager Express to 35 sessions.
- Ruggedized and weather-proof design
- Easy and fast installation
- Fiber/copper cable, RRL and satellite connection
- Proven Expanded Beam HMA connector technology
- Interoperation with radio systems

Product Specifications

Routing	● Integration with voice, video, security, wireless, mobility, and data services ● High Performance up to 75 Mbps ● WAN routed ports 10/100/1000 Gigabit Ethernet, 2x 1000Base-FX, 1x 10/100/1000Base-T, 1x G.HDSL ● Modular interfaces, support to increasing bandwidth requirements, time-division multiplexing (TDM) ● Two high-speed USB 2.0 ports and two external Compact Flash slots
VoIP Call Manager	● VoIP gateway that is fully compliant with SIP standard, H.323 and Cisco Communications Manager Express and Survivable Remote Site Telephony ● Digital voice support SIP/H.323 sessions: 150 ● Video conferencing
24x FXS subscribers VoIP analog gateway ports	● 12x RJ-45 ports, 12 lines in two MP34 (3x4 pairs) or MP54 (5x4 pairs) connectors ● SIP protocol for analog phones, fax machines and legacy PBX systems. SIP sessions: 200 ● Supported voice/Fax codecs include G.711, G.723.1, G.726A/B, iLBC, T.38 Fax ● Identity management using authentication, authorization, and accounting (AAA) and public key infrastructure ● Embedded hardware-accelerated VPN encryption ● 4 SIP Server profiles per system and independent SIP account per port.
Main Server BackUp Server	Motherboard: ● 2x CPU Xeon E5-2600v2 family,16 DIMM up to 512GB DDR3, 3 (x16) PCI-E 3.0 and 3 (x8) PCI-E 3.0 slots; 2x Gigabit Ethernet LAN; 8 SATA2 and 2 SATA3 ports; 11x USB 2.0 ports (4 rear, 6 via header, 1 Type A); IPMI 2.0 and KVM with dedicated LAN; VMware® Ready certification Server Chassis: ● REight hot-swappable 2.5” SAS/SATA hard drive bays; 1x Slim DVD-RW; 7x Low-profile, Half-length I/O Slots; Power Switch & 6 LED Indicators. 600W High-efficiency Platinum Certified Power Supply
NAS server	Intel® Atom™ D2550 (1.86GHz Dual Core); až 16 TB HDD, 4x hot-swap disk; supports RAID 0, 1, 5, 6, 10 and JBOD; 2xUSB3; HDMI output; RJ-45x2GiB
Managed PoE L3 Switch	● Total 10 System Ports Gigabit Ethernet + Two mini-GBIC expansion slot ● 8x any of the RJ-45 ports support 802.3af PoE and 802.3at PoE, Maximum power of 15.4 W ● Switching can be fully managed using the Web GUI or CLI ● Switching Capacity 20 Gigabits per Second ● Support for up to 4096 VLANs simultaneously, Voice VLAN, Multicast TV VLAN ● IP telephony support: embedded QoS intelligence to prioritize delay-sensitive services ● Static routing/Layer 3 switching between VLANs ● IPv4 DHCP Server, IPv6 support
UPS Capacity	5 – 10 min
Strong security	Embedded security, Extensive access control lists (ACLs), Guest virtual LANs (VLANs), Bridge Protocol Data Unit (BPDU), Secure Core Technology (SCT)
surge protection	Nominal discharge current (8/20 µs) In 20 kA; Maximum discharge current (8/20 µs) Imax 40 kA
Power supply	Input 24 to 28 VDC/160-294 VAC (any can be used as main or backup - redundant) Power Consumption up to 227 W max (577 W with air conditioner) Output for LMSB-14.4 up to 505 W max (732 W with air conditioner)
Temperature and Humidity	Fulfils MIL-STD 810E, IP 63 protection Operating -30°C to +50°C, Storage -40°C to + 65°C Humidity 10% to 95%
Dimensions	583 x 845 x 400 mm (W x D x H)

LMCR-SP24-80

Ruggedized FO Repeater with
Solar Power Supply

The LMCR-SP24-80 repeaters ensure 3R - Retransmission, Reshaping and Reclocking of optical signals over distances of up to 80km on one optical line segment. The LMCR-SP24-80 are based on the LMC, the double media converters box and a supply of solar energy. The solar power supply using photovoltaic cells ensures an uninterrupted power supply when no standard source of power is available. It fully complies with requirements for mobility, easy installation and the mechanical resistance necessary for tactical deployment in the field. The electrical interface of both devices are connected to each other. The optical signal from one media converter is transformed to electrical, connected to the electrical port of the second media converter and transformed to the optical signal again.
Practical use – the transmission of a high speed data signal over a long haul optical line. The high power reserve of the optical transceivers enables transmission of the data signal over distances of up to 80 km. In cases where the optical line is longer and passes through uninhabited areas, such as deserts, plains or tundra, it is necessary to amplify and regenerate the optical signal. The power for the device for amplification and regeneration of the optical signal can be ensured without the need of any other external power energy source.

Ordering code

LMCR -SP24 -80
FO repeator with solar power supply, distance 80 km

Product Specifications

Standards	802.3u 1000Base-FX
Protocol	CSMA/CD
Interface	HMA connectors: 9/125 µm SM fiber optic cable
Wavelength	SM: 1550 nm
Maximum Segment Length	SM fiber optic cable, full duplex: 80 km
Enviromental Temperature Humidity	According to MIL-STD 810E Operating -30°C to +50°C, Storage -50°C to + 70°C , 10% to 95%
Mechanical	According to MIL-STD 810E
EMC	According to MIL-STD 461E and MIL-STD 464E
Power Supply	24 VDC, 80 W
Protection	IP67
Dimensions	576 x 305 x 230 mm (W x D x H)

Key Features

- Connectivity over long haul fiber optical line
- Ruggedized design for field installations
- Operates 24 hours/365 days
- IP67 protection
- Photovoltaic cells for solar energy usage
- Battery backup for uninterrupted power supply

Passive Components

Cable & Connectors

Cable Drums

Cable & Connectors	Application	page
HMA -J Series	Harsh environmental Expanded Beam	11
HMA -S Series	Harsh environmental Expanded Beam	12
HMA -M Series	Harsh environmental Expanded Beam	12
HMA -JF Series	Harsh environmental ferrule connector	13
LD optical cable	low cost, field usable, quick repairs to tactical cables	14
MCS -04	Mini cable splice, quick repairs to tactical cables	16

Cable Drums	Description	Cable length	page
BBD -200	Heavy duty drum with direct crank	200	15
BBD -500NR	Heavy duty drum with direct crank	500	15
BBD -1000	Heavy duty drum with direct crank	1000	15
TBD -200	BBD drum is installed on mobile chassis	200	15
TBD -500NR	BBD drum is installed on mobile chassis	500	15
SBD -200	Trolley drum with one piece foot	200	15
MBD -200/500	Small, lightweight and durable design	200/500	15
RBD -200/500	Mobile drum, with strap belts for shoulder wear	200/500	15
CBD -80V3	Compact Cable Drum	up to 80 m	16

HMA-J Series

Harsh Environmental Expanded Beam

HMA-J plug connector

The OPTOKON HMA-J connector series, a medium size Expanded Beam connector is designed for connecting tactical network nodes using fiber optical cables. The expanded beam technology preserves all the benefits of signal transmission through optical lines in field harsh environmental conditions. In addition to military optical networks the HMA-J is suited for a vast array of applications, such as heavy industry connections, petrochemical applications and temporary optical lines used for broadcasting.
The innovative design ensures it can be deployed in the toughest environments, where high performance and total reliability are critical. Benefiting from expanded beam technology, the precision optical alignment system provides immunity from water, mud, dust oil and other contaminants. The HMA-J Hermaphroditic coupling eliminates the need for adaptors and male and female mating halves. Hermaphroditic housings allow for rapid deployment, creating low loss Singlemode and Multimode daisy chained links in a variety of planforms ranging from simplex fiber to four fibers. The OPTOKON HMA-J is ideally suited for environmental extremities where low maintenance and quick repairability are required.

Key Features

- Ruggedised field design
- Hermaphroditic interconnection
- Easy cleaning – removeable sleeves
- 4 Fiber channels
- Single mode and/or Multimode

Application

- Military communications
- Telecomms
- Surveillance
- Broadcasting

Benefits

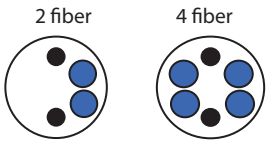
- No adaptors required
- Excellent transmission parameters
- SFF ferrule termination procedure

Specifications

Optical Loss	50/125 @ 850/1300 nm 0.7 dB typ. 9/125 @ 1310/1550 nm 1.0 dB typ.
Return Loss	9/125 @ 1310/1550 nm >32 dB
Durability	3000 matings minimum
Operating temperature	-55 to +85°C
Storage temperature	-55 to +85°C
Water immersion	2 m depth duration 24 Hours
Vibration Sinusoidal	10-500 Hz, 3 directions, 0.75 mm amplitude @ 10 G acceleration
Free fall resistance	500 falls from 1.2 m height
Bump resistance	4000 bumps @ 40 G acceleration
Tensile Strength	Tensile of 1500 N, cable dependent
Crush resistance	6.7 kN
Cable Variations	Compatible with tactical cable: Plug: 5.0-5.5 mm, Bulkhead: 2.8-5.5 mm o/d Other cable sizes available on request

All tests compliant with EN 186000-1 specifications

Optical insert arrangement:



Ordering code

HMA - XX - XXX - X(SM, M5, M6)- Y(D,P)

M	Mini
J	Junior (4)
S	Senior (6)
-	Expanded Beam
F	Ferrule
P	POF

-	plug
BN	bulkhead jam nut
BNB	bulkhead jam nut with boot
BF	bulkhead flange
BFB	bulkhead flange with boot

X	fiber number
YD	contact number, size 20
YP	contact number, size 16

HMA-J bulkhead

HMA-S Series
HMA-M Series

Harsh Environmental
Expanded Beam Connector

The OPTOKON HMA-S connector series (large size Expanded Beam connector) and the HMA-M connector series, a (a mini- sized Expanded Beam connector) are designed for connection of the nodes of tactical network nodes using fiber optical cables. The used Expanded Beam technology preserves all the benefits of signals transmission through suitable optical lines in field harsh environmental conditions. In addition to military optical networks the HMA-S/M connectors are suitable for a vast array of applications, such as heavy industry connections, petrochemical applications and temporary optical lines used for broadcasting.
The innovative designs ensure it can be deployed in the toughest environments where high performance and total reliability are critical. Benefiting from expanded beam technology, the precision optical alignment system provides immunity from water, mud, dust oil and other contaminants. The HMA Hermaphroditic coupling eliminates the need for adaptors and male and female mating halves. Hermaphroditic housings enable rapid deployment, creating low loss Singlemode and Multimode daisy chained links in a variety of planforms ranging from simplex fiber to four fibers. The OPTOKON HMA is ideally suited for environmental extremities where low maintenance and quick repairability are required.

Benefits

- Best optical performance available
- No adaptors required
- Combined fiber and electrical channels
- Inexpensive, low downtime field repair
- Easy clean, no special tools

Key Features

- Advanced expanded beam technology
- Hermaphroditic interconnection
- 1 to 8 HMA-S (1 to 4 HMA-M) SM or MM fiber channels
- Rugged field repairable connector design
- Keyed boot for 'Blind Mating'
- HMA-S Hybrid electrical & fiber channel options available
- HMA-S is fully compatible with other HMA connectors and with Pro Beam Senior connector

Specifications

Insertion Loss HMA-S	50/125 @ 850/1300 nm: 1 to 4 channels: 1.0 dB typ. 6 & 8 channels: 1.5 dB typ. 9/125 @ 1310/1550 nm: 1 to 4 channels: 1.5 dB typ. 6 & 8 channels: 2.0 dB typ.
Optical Loss HMA-M	50/125 @ 850/1300 nm 0.7 dB typ. 9/125 @ 1310/1550 nm 1.0 dB typ.
Return Loss	9/125 @ 1310/1550 nm > 32 dB
Electrical power Contacts (HMA-S only)	Size 20 & size 16 MIL-C-39029. Contact resistance <4 mΩ. Operating voltage 1000 VAC. Operating current 5A (short term 15 A)
Operating temperature	HMA-S -40 to +70 °C, HMA-M -55 to +85 °C
Storage temperature	-55 to +85 °C
Water immersion	up to 2 m
Vibration Sinusoidal	10-500 Hz, 0.75 amplitude @ 10 g acceleration
Free fall resistance	500 falls onto concrete from 1.2 m
Bump resistance	4000 bumps @ 40 g acceleration
Tensile Strength	Tensile of 1500 N, cable dependent
Crush resistance	6.7 kN

Application

- Military communications
- Broadcasting
- Industrial
- Petrochemical


HMA-M plug


HMA-S plug

Ordering code

HMA - XX - XXX - X(SM, M5, M6)- Y(D,P)

M	Mini
J	Junior (4)
S	Senior (6)
-	Expanded Beam
F	Ferrule
P	POF

X	fiber number
YD	contact number, size 20
YP	contact number, size 16

-	plug
BN	bulkhead jam nut
BNB	bulkhead jam nut with boot
BF	bulkhead flange
BFB	bulkhead flange with boot

Optical insert arrangement:


2CH OPTICAL
HMA-S & HMA-M


4CH OPTICAL
HMA-S & HMA-M


6CH OPTICAL
HMA-S only


8CH OPTICAL
HMA-S only

Hybrid insert arrangement HMA-S only


2CH OPTICAL
2 POWER (#16)


2CH OPTICAL
2 SIGNAL (#20)


2CH OPTICAL
2 POWER (#16)
2 SIGNAL (#20)


4CH OPTICAL
2 POWER (#16)

HMA-JF Series

Harsh Environmental Ferrule Connector

The HMA-JF uses a 1.25 mm ferrule design, already industry proven in Single mode and Multimode applications. The HMA-JF ideally suits long distance military applications where the excellent transmission parameters are desired. The unique design of the HMA-JF enables users to ensure high SFF performance. Small Form Factor optical connectors in field conditions. The coupling sleeves are removable by using a special tool, which enables easy cleaning and ferrule end face inspection. Rapid deployment and 'daisy chaining' is achieved using hermaphroditic designs, eliminating the need for adaptors or male and female mating halves. Hermaphroditic interconnection; facilitates expansion of cable distances by inserting of standard cable harnesses. The HMA-JF is IP68 rated and fully sealed.

Key Features

- Ruggedised field design
- Hermaphroditic interconnection
- Easy cleaning – removeable sleeves
- 4 Fiber channels
- Single mode and/or Multimode

Application

- Military communications
- Telecomms
- Surveillance
- Broadcasting

Benefits

- No adaptors required
- Excellent transmission parameters
- SFF ferrule termination procedure

Specifications

Optical Loss	50/125 @ 850/1300 nm 0.3 dB typ
	9/125 @ 1310/1550 nm 0.5 dB typ
Return Loss	9/125 @ 1310/1550 nm > 45 dB (typical 48 dB)
Operating temperature	-40 to +70°C
Storage temperature	-55 to +85°C
Water immersion	up to 2 m depth, IP 68
Vibration Sinusoidal	10-500 Hz, 0.75 amplitude @ 10 g acceleration
Shock resistance	100 g, 6 ms
Mating durability	1000 cycles
Tensile Strength	Tensile of 500 N, cable dependent
Corrosion Resistance	500 Hours Salt Spray
Cable Variations	Compatible with tactical cable: ≤ 5.5 mm outer diameter
	Other cable sizes available on request

Ordering code

Available types:
HMA-JF-4XX 4 fibers plug
HMA-JF-BN-4XX 4 fibers bulkhead, jam nut

HMA - XX - XXX - X(SM, M5, M6) - Y(D,P)

M	Mini
J	Junior (4)
S	Senior (6)
-	Expanded Beam
F	Ferrule
P	POF

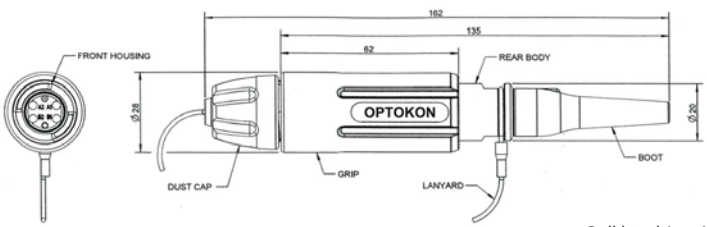
X	fiber number
YD	contact number, size 20
YP	contact number, size 16

-	**plug** [2]
BN	bulkhead [3] jam nut
BNB	bulkhead jam nut with boot
BF	bulkhead flange
BFB	bulkhead flange with boot

Note: 2) HMA-JF plug, designed for cable termination
3) HMA-JF-Bxx bulkhead, designed for installation on panel

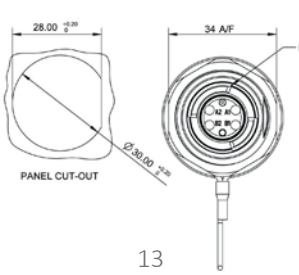
Plug Connector: HMA-JF (SM,MM)
Suitable cable: MIL-TAC D, 4 channel Ø 5.5 mm
Duplex2 channel 2.8x5.5 mm, 4 channel 2x 2.8x5.5 mm

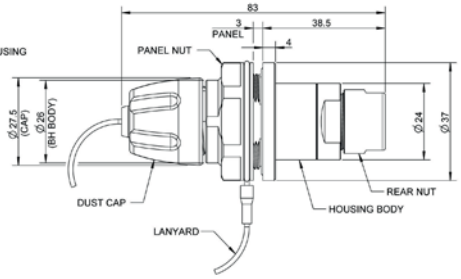
Technical drawings



HMA-JF-BN bulkhead

Bulkhead Jam-Nut: HMA-JF-BN (SM,MM)
Suitable cable: MIL-TAC D, 4 channel Ø 5.5 mm
Duplex2 channel 2.8x5.5 mm, 4 channel 2x 2.8x5.5 mm



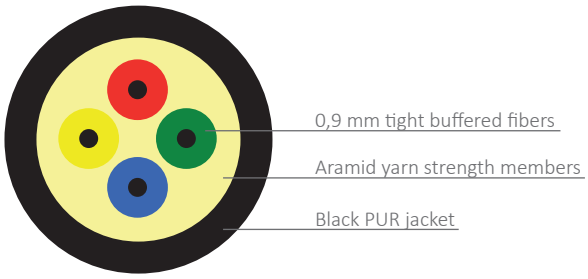


Optical cables

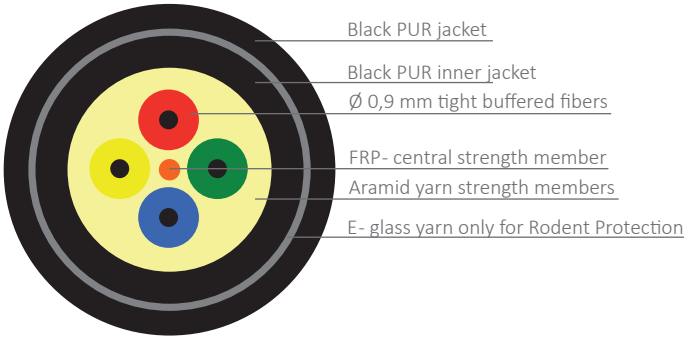
for mobile and tactical use

LD single jacket cable
LDD dual jacket cable

This specification covers optical cables with 2 – 12 fibers. This cable type has a number of tight buffered optical fibers, surrounded by a heavy layer of aramid yarns. The jacket is from polyurethane. The cable is suitable for indoor and outdoor use. The cable has low abrasion and good cut resistance.



LD cable single jacket



LDD cable double jacket

Construction

Optical Fibers

The cable can be supplied with SMF 9/125 µm or 50/125 µm and 62.5/125 µm multimode fibers. For fiber properties, see the appropriate Fiber Specification. The fibers are individually color-coded for easy identification.

Cable Core

The cable core consists a number of 900 µm tight buffered fibers, surrounded by a heavy layer of aramid yarns.

Sheath

The cable sheath consists of a black polyurethane sheath. The polyurethane sheath has extremely good tear resistance and very good low-temperature flexibility. It has excellent resistance to microorganisms and against hydrolysis.

Fiber (uncolored)

SM 9/125, MM 50/125; MM 62.5/125

Buffer - tight:	strip in one shot 0.5 - 10 cm
Material:	PU-LSZH
Color:	1st to 12th: red, green, blue, yellow, white, grey, brown, violet, turquoise, black, orange, pink,

*Other buffer colors available on request.

Strength member:	Water blocking Aramid yarn
RIP-cord:	1× under outer jacket
Outer jacket:	PU-LSZH - Polyurethane Low Smoke Zero Halogen UV stable, black

Ordering code

Cable type	- XX - YY	- XX - (YY)
LD	**Fiber**	**Cable jacket**
LD(D)	**XX** - Number 2-12	**XX** - Jacket
	YY - Type	**PUR** Polyurethane
	S2D	
	S7A[1] 9/125 µm, G.657A	**(YY)** - Color
	S7B2 9/125 µm, G.657B2	**BK** Black
	OM1 62.5/125, optimized 1 Gbps	
	OM2 50/125, optimized 1 Gbps	
	OM3 50/125, optimized 10 Gbps	

Note: 1) S7A - G.657A1 standard, other on request

Mechanical and Environmental properties

Parameter	Reference to IEC 794-1	LD Single Jacket	LDD Double Jacket
Max. tensile strength	*E1A	1800 N	2500 N
Crush resistance	*E3	440 N/cm	800 N/cm
Impact resistance	*E4	200 impacts	50 impacts, 2.0 Nm, R = 12.5 mm
Minimal bending radius	*E11A	10× Outer diameter	10× Outer diameter
Temperature range	*F1	-45˚C to +85˚C	-55˚C to +85˚C
Cable informative nominal weight(calc.)		27 kg/km	105 kg/km
Cable diameter		5.9 mm	9.4 mm

* IEC 60794-1-2, TIA/EIA-455-41 and TIA/EIA-455-25 military request

Application

- Army and air force tactical networks
- Oil research, heavy industry
- Broadcasting
- Connection to moving objects

Cable Drums

KČM: 0062416401587

OPTOKON provides high quality deployable cable drums. Users can select the appropriate design and style for their particular application. The drums are ideally suited to Military, Industrial, Broadcast and pro Audio applications. All drums are supplied with a third flange to enable full access to each end of the cable assembly. The drums are delivered in standard black color RAL 9005 mat. Other - green khaki RAL 6014 mat color is available upon request.

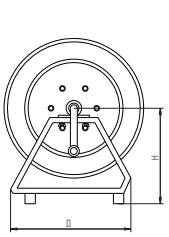
BBD-200, BBD-500NR, BBD-1000

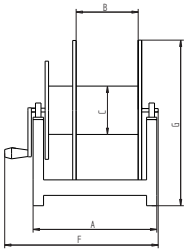
KČM:(BBD -200) 0119309072963
(BBD -500) 0119309072987

Heavy duty drum with direct crank rewind permanently attached to the axle. Designed for installation on military vehicle or TBD-500 type trolley suitable for mobile applications.
The same dimensions apply for the 200m and 500m models; the only difference is the cable length. The BBD-200 drum contains 200m of cable. The BBD-500NR drum is supplied with 500m of 6mm diameter cable. The BBD-1001 drum is supplied with 1km of cable.

Reel Dimensions BBD-200, BBD-500, BBD-1000[1]							
A[1]	B[1]	C	D	E	F[1]	G	H
360	210	140	335	405	470	480	280

Note: 1) BBD-1000 is wider, each dimension targeting to width is 210 mm larger.





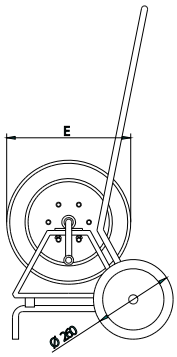
BBD-500NR

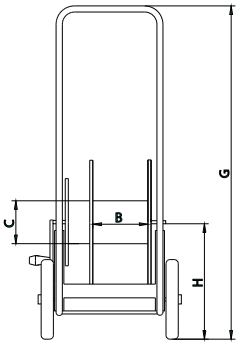
TBD-200, TBD-500NR

KČM : 0119309072925, 0119309072932

Trolley drum with one-piece foot, rubber tyres and removable steel handle-bars for long term shipping and storage. The large wheel diameter enables easy field operations. The BBD drum is installed on a mobile chassis.

Reel Dimensions TBD-200, TBD-500NR							
A	B	C	D	E	F	G	H
460	210	140	450	405	490	1090	380

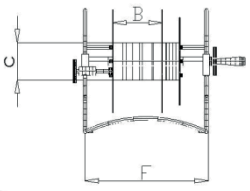




TBD-500NR

RBD-200

RBD-500

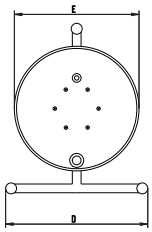


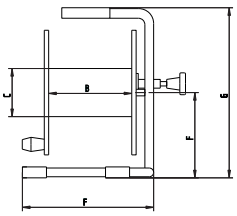
SBD-200

KČM : 0119309072918

Trolley drum with one-piece foot, rubber tyres and removable steel handlebars for long term shipping and storage. The large wheel diameter enables easy field operations. The BBD drum is installed on a mobile chassis.

Reel Dimensions SBD-200						
B	C	D	E	F	G	H
200	110	325	305	300	390	30

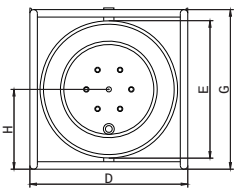


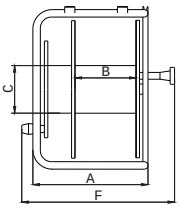


MBD-200, MBD-500

KČM (MBD -200): 0119309072949

Small, lightweight and durable design for quick and easy use, ideal for applications where 200 m lengths of cable are deployed over large areas. For a typical cable diameter of 5.5 mm, the SBD drum will take 250 m of cable.





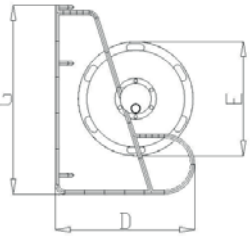
Reel Dimensions MBD-200							
A	B	C	D	E	F	G	H
290	200	110	375	305	385	370	185
Reel Dimensions MBD-500							
340	210	140	465	405	450	470	235

RBD-200, RBD-500

KČM (RBD -200): 0119309072970

Mobile drum, with strap belts for shoulder wear. Suitable for use in the field. The weight with HMA connectors 200 m cable is 15 kg. The drum is available in two versions, for 200 m and 500 m of 5.5 mm tactical cable. For a typical cable diameter of 5.5 mm, the RBD drum will accept 200 m, the RBD-500 up to 500 m of cable.

Reel Dimensions RBD-200							
A	B	C	D	E	F	G	H
-	200	110	310	305	360	570	-
Reel Dimensions RBD-500							
-	325	110	320	305	430	570	-



CBD-80V3

Compact Cable Drum

OPTOKON offers the CBD-80V3 compact portable cable drum. The drum is ideal for use in military, industrial, broadcast and audio applications.
The drum is designed for winding up to 80 m of military tactical cable with an outer diameter of 6 mm. The standard application includes 4 fiber tactical military cable terminated with a HMA-J connector on one side.
The internal end of the cable is terminated with 4 x SC/APC connectors connected with adapters. Two duplex SC adapters are installed in a protected box on the drum body and can be accessed after opening the cover. Once closed, there is IP 54 environmental protection for storage and handling of the drum in outdoor conditions.

Specifications

Dimensions:	drum Ø 275 mm, 370 x 280 x 210 mm (HxWxD)
Weight	without cable: 1 kg
Cable length:	up to 80 m
Protection:	IP 54
Tensile strength:	80 N (fixing cable to the drum)

Key Features

- Small, lightweight and durable design
- Quick and easy use
- HMA-J to 4x SC/APC four fibers cable
- 2 x duplex SC adapters fixed to the drum body
- Up to 80 m of cable, diameter 6 mm

Ordering Code

CBD-80V3-HMA-J-(4xXXX) / CCC FFF - XX - LL

Connector type

	Up to 4 fibers
HMA-J	Plug
XXX	
NSC	SC/APC
ULC	LC/UPC
other	Please define

CCC – Cable type

LD4	Tactical cable 4 fibers
LD2	Tactical cable 2 fibers

FF – Fiber type

OM1	MM 62.5/125 µm
OM2	MM 50/125 µm
OM3	MM 50/125 µm
S2D	SM 9/125 µm (G.652D)
S7A[1]	SM 9/125 µm (G.657x)

Cable length

LL	Length (m)

Cable type

JC	Cable cross

Note: 1) S7A - G.657A1 standard, other on request

Detail view– open cover at drum
SC adapters

MCS-04

Mini cable splice

The OPTOKON MCS-04 provides low cost, field usable, quick repairs to tactical cables in the toughest of environments. Utilising the proven mechanical splice in both Single mode and multimode applications, there is no need for power, heat or complicated termination procedures. Based on standard mechanical splice technology, the MCS-04 provides low loss fiber jointing in just a few minutes.
Cable retention and tie off is achieved through the aramid yarn and IP67, which is guaranteed in the same way as military connectors. With small dimensions the Mini Cable Splice connect military tactical cables up to 4 fibers.
The MCS-04 is supplied as the OMK-SR-MCS kit. Purchased with all the tooling and consumables necessary to carry out the operation, the kit comes complete with splice unit, ready for use in a rugged field usable carry case. The splice unit, spares and consumables are then replaced and replenished at a low cost, whenever necessary.

Application

- Military Communications
- Internal support structures
- Broadcasting

Available types

- MCS-04 4 fiber optical cables
- MCS-02 2 fiber optical cables

Specifications

- Harsh environmental use
- Proven mechanical splice technology
- 1 to 4 fiber Multimode or Single mode
- Fully field repairable

OMK-SR-OTS.2

Diagnostic Set

KČM: 0062375453050

The diagnostic set includes measuring instruments and tools for diagnosing faults on fiber optic cables with connectors STRATOS and CTOS connectors, and direct HMA technical successor connectors.
The OPTOKON Diagnostic Set includes two instruments - Light source and Power meter. Both instruments are housed in a hard carry case that meets the requirement of fiber optic networks installation and maintenance teams, who require rugged and lightweight fiber optic test equipment that combines high performance with ease of use and reliable operation.
The Diagnostic Set provides traceable measurements on dual wavelength and data storage to any PC. It includes the hybrid master HMA-FC patchcord for testing of military tactical networks and is comprised of these measurement instruments:

LS-800	light source
PM-800	power meter

NSN: 6650-16-006-2316

LS-800 Light source

- Small size, light weight
- Modulation CW, 270 Hz, 1 kHz, 2 kHz
- AWD function (Auto Wavelength Detection)
- Changeable output connectors
- Battery status indicator
- User manual
- Up to 7 light source combinations
- Build-in Li-Pol rechargeable battery charging via USB port

PM-800 Power meter

- Small size, light weight
- Up to 6 working wavelengths
- Detection of modulation 270 Hz, 1 kHz, 2 kHz
- AWD (Auto Wavelength Detection) function
- Absolute and Relative optical power measurement
- Two level high capacity memory
- SmartProtocol PC software
- Memory download and reporting solution
- USB
- Build-in Li-Pol rechargeable battery, battery charging via USB port
- Auto Off function and battery status indicator
- Easy to use with menu navigation
- Universal 2.5 mm testing adaptor

Case Peli 1450

Material:
Case: Copolymer Polypropylene Structural Resin
Latches: ABS
O' Ring: Neoprene sponge
Pins: Stainless Steel
Purge Valve: ABS with Gore-Tex membrane
Foam: Polyester
Standard:
MIL STANDARD MIL-C-4150J
IP67 in accordance with EN60529/91 & IEC60529/68
Air Transportation Association Spec. 300

Applications

- measurement of insertion loss
- measurement of absolute and relative values
- measurement of two wavelength
- measurement of optical networks during construction and operation

Equipment included in OMK-SR-OTS.2

Hard carry case	Peli 1450, IP67
Protocol	CSMA/CD
Measuring instruments:	Light source: LS-800V-P2-FC-LED850-30 Power meter: PM-800V
Reference patch cords:	PC-28OM2-J-002 HMA-J-4xPC-LD4OM2-J-002 CTOS-4xPC-LD4OM2-002 HMA-J/LD4 OM2-J-002
Measuring adapter	A-FC/PC-02-240-12
USB cable	Storing data to PC
Polyethylene bottle with siphon	Includes isopropyl alcohol
Cleaning wipes	Cleaning connectors
External power supply	Charging internal battery
User manuals	Light source, Power meter
Quick start manual	Check of the route, Measuring the output of the LMC converter

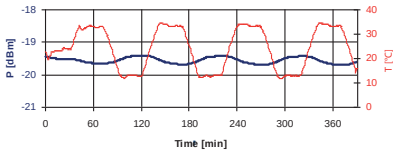
OFT-920

Ruggedized Optical Test Set

The OFT-920 ruggedized optical test set is designed for testing optical networks terminated with connectors operating in harsh environments. It combines both light source and optical power meter in one common box. The test set is designed to meet the tactical military, and broadcast industry demand. The ruggedized aluminium case makes the unit ideal for field operation. The memory capacity allows storage and uploading of up to 2000 measurements including memory position or fiber number, wavelength, absolute value or relative value and insertion loss. The tester supports memory download and test report generating. The rechargeable battery ensures long term working with minimum operation costs.

Key Features

- Expanded Beam and ferrule technology harsh environmental connectors, ruggedized aluminium case
- Multimode (MM) or Single mode (SM) applications
- Simultaneous testing of all 2/4 fibers
- Easy to use with menu navigation
- Build-in Li-Pol rechargeable battery charging via USB port
- Displayed units: dBm, dB
- High dynamic range
- Up to 4 light sources combinations
- Internal memory



temperature drift of output level

Application: Optical network measurements Fiber continuity testing

Ordering Code

light source code	Description[1]	application
LD650	650 nm visible laser	visual checking
LD850	850 nm LD (VCSEL)	
LED850	850 nm LED	
LED30	1300 nm LED	MM fiber testing
LD850-LED30	850 nm LD + 1300 nm LED	
LD31	1310 nm LD	
LD55	1550 nm LD	SM fiber testing
LD62	1625 nm LD	
LD31-55	1310 + 1550 nm LD	

Note: 1) other wavelengths and port combinations on demand

Czech Army part number:	NATO stock number:
OFT 920 -MM-HMA2-LD850 -LED30	NSN: 6650 -16-006-2311
OFT 920 -MM-HMA4-LD850 -LED30	NSN: 6650 -16-006-2316

Light Source

Output power		Note:
LD 850 nm, LED 850, 1300 nm	-26 dBm (62.5/125 µm fiber)	
LD 1310, 1490, 1550, 1625 nm	-16 dBm	typ. value

Stability (1 hour, delta/2):		tested after 20 min warm up temperature 23 ± 1°
LD 850 nm, LED 850, 1300 nm	± 0.03 dB	
LD 1310, 1490, 1550, 1625 nm	± 0.05 dB	

Power Meter

Photodetector	1 mm InGaAs	
Working wavelengths	MM: 850, 1300 nm SM: 1310, 1490, 1550, 1625 nm	can be customized
Uncertainty	± 12%	1310, 1550 nm @ -20 dBm
Resolution	0.1	
Dynamic range	-55 dBm to +10 dBm -53 dBm to +17 dBm	1300, 1310, 1490, 1550, 1625 nm, 850 nm

General specifications

Dimensions	145 x 145 x 56 mm	without connectors
Weight	400 g	with battery
Temperature operating storage Humidity (non condensing)	-10 to +50°C -40 to +70°C 0 to 95%	
IP rating	IP 54	
Battery working time	> 20 hrs	between battery charging

Standard accessories: Power charging adaptor, Soft carrying case, USB Cable, Cleaning swabs

Options: Reference patchcord

OFT-920 **XX** **XXXX** **XXX**

M5 (MM)	MM 50/125 mm
M6	MM 62.5/125 mm
SM	Singlemode

Source wavelength as below

Connector type[2]

HMA2	HMA[1] Expanded Beam connector (non-contact optics), 2 fibers
HMA4	HMA[1] Expanded Beam connector (non-contact optics), 4 fibers

Note: 1) HMA -J compatible

2) Other connector types available on request

OFTE-930

Ruggedized Hybrid Cable Tester

The OFTE-930 ruggedized hybrid cable tester is designed for testing optical fiber loss and checking the continuity of copper pairs in hybrid cables while operating under harsh environmental conditions. The test set is designed to meet tactical military, broadcast and industry demand. The ruggedized aluminium case makes the unit ideal for field operation. The memory capacity enables to store and upload of up to 2000 measurements including memory position or fiber number, wavelength, absolute value or relative value and insertion loss. The tester supports memory download and test report generating. The rechargeable battery ensures long term work with minimum operation costs.

Key Features

- Expanded Beam and ferrule technology harsh environmental connectors
- Hybrid cables – fiber optic testing and copper pairs checking
- Ruggedized aluminium case
- Multimode (MM) or Single mode (SM) applications
- Simultaneous testing of 2 fibers
- Internal memory
- Displayed units: dBm, dB
- High dynamic range
- Up to 4 light sources combinations
- Build-in Li-Pol rechargeable battery charging via USB port
- Easy to use with menu navigation

Ordering Code

OFTE-930 - XX - XXXXX - XXX

M5 (MM)	MM 50/125 mm
M6	MM 62.5/125 mm
SM	Singlemode

Source wavelength as below

Connector type[2]

3K93C	SMPTE compatible HDTV connection system 3K.93C series
other	on request

light source code	Description[1]	application
LD650	650 nm visible laser	fiber visual checking
LD850	850 nm LD (VCSEL)	
LED850	850 nm LED	
LED30	1300 nm LED	MM fiber testing
LD850-LED30	850 nm LD + 1300 nm LED	
LD31	1310 nm LD	
LD55	1550 nm LD	SM fiber testing
LD62	1625 nm LD	
LD31-55	1310 + 1550 nm LD	

Note: 1) other wavelengths and port combinations on demand

Optical Light Source

Output power		Note:
LD 850 nm, LED 850, 1300 nm	-26 dBm (62.5/125 µm fiber)	
LD 1310, 1490, 1550, 1625 nm	-16 dBm	typ. value

Stability (1 hour, delta/2):		tested after 20 min warm up temperature 23 ± 1°
LD 850 nm, LED 850, 1300 nm	± 0.03 dB	
LD 1310, 1490, 1550, 1625 nm	± 0.05 dB	

Optical Power Meter

Photodetector	1 mm InGaAs	
Working wavelengths	MM: 850, 1300 nm SM: 1310, 1490, 1550, 1625 nm	can be customized
Uncertainty	± 12%	1310, 1550 nm @ -20 dBm
Resolution	0.1	
Dynamic range	-55 dBm to +10 dBm -53 dBm to +17 dBm	1300, 1310, 1490, 1550, 1625 nm, 850 nm

Electrical wires checking

Electrical wires continuity
Short circuit
Isolation
Electrical contacts –pin interconnection

Standard accesories

- Power charging adaptor
- Soft carrying case
- USB Cable
- Cleaning swabs

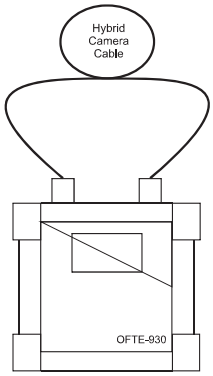
Options:

- Reference patchcord

General specifications

Dimensions	145 x 145 x 56 mm	without connectors
Weight	400 g	with battery
Temperature operating storage Humidity (non condensing)	-10 to +50°C -40 to +70°C 0 to 95%	
IP rating	IP 54	
Battery working time	> 20 hrs	between battery charging

Accessories



Fiber optic testing Copper wires continuity checking

MOTV-700

Ruggedized Mini OTDR

The OFTE-930 ruggedized hybrid cable tester is designed for testing optical fiber loss and checking the continuity of copper pairs in hybrid cables while operating under harsh environmental conditions. The test set is designed to meet tactical military, broadcast and industry demand. The ruggedized aluminium case makes the unit ideal for field operation. The memory capacity enables to store and upload of up to 2000 measurements including memory position or fiber number, wavelength, absolute value or relative value and insertion loss. The tester supports memory download and test report generating. The rechargeable battery ensures long term work with minimum operation costs.

Key Features

- Measures optical power
- Stabilized light source
- 650nm visible light source
- PC control option
- Memory for up to 200 traces (file in Bellcore format)
- Upgrading of internal software via USB

Typical configuration:

MOTV-700D-31-55-62	three wavelengths, high dynamic range
MOTV-700-31-55	standard low cost model

OTDR	
Light source	Laser
Wavelength, nm	850, 1300, 1310, 1490, 1550, 1625, 1650
Wavelength tolerance	± 20 nm
Dynamic range, dB at 10 ms pulse	20 or 32
Pulse duration, ns	10, 80, 240, 500, 1000, 3000, 10000
Distance measurement accuracy	±1 m ±3 × Measurement distance × 10–5 ± Marker resolution (excluding IOR uncertainty
Attenuation measurement linearity	0.05 dB/dB
Attenuation DZ @ RL 40 dB	to 5 m
Event DZ @ RL 40 dB:	to 1.5 m
Return Loss Measurement Accuracy:	±2 dB
No. of sampling points:	64 000 (min. 32 000)
Number of reflectogramm points	2048
Evaluation of measured optical trace	Auto/manual
Powering + connection to PC	Mini-USB connector
PC SW	
Auto/manual evaluation of measured optical trace	
Real control of OTDR	
TXT export	

General specifications

Size (W x H x D) mm	80 x 170 x 42
Weight, kg	0.6
Operating temperature,°C (humidity,%)	-10 to +40, (95)
Power source	NiMH- battery
Working time, hrs	10

Key Features

- FC/PC adaptor
- Battery charger
- Soft carrying case
- Manual
- CD with software
- USB Cable
- Protective dust cup

Key Features

- Master patch cord
- Launch cable
- Set of optical
- adapters

Ordering Code

MOTV-700(D)[1]	-	XX-XX-XX

XX-wavelength

85	850 nm
30	1300 nm
31	1310 nm
49	1490 nm
55	1550 nm
62	1625 nm
65	1650 nm

1) MOTV-700 OTDR 20 dB dynamic range
MOTV-700D OTDR 32 dB dynamic range

Overview:	Wavelength (nm)				
Product number	850	1300	1310	1550	1625
MOTV-700D-85	x				
MOTV-700D-31			x		
MOTV-700D-55				x	
MOTV-700D-85-30	x	x			
MOTV-700D-31-55			x	x	
MOTV-700D-31-55-62			x	x	x

Termination, Repair & Maintenance tool kits

OMK-SR-UNI

OMK-SR-UNI Termination & Repair Tool Kit is designed for military connectors. The tool kit is supplied in aluminum case suitable for military tactical applications.
The tool Kit includes all necessary instruments and accessories for termination of harsh environment fiber optic connectors. All instruments are placed in special pre-formed plastic foam that secures the tools during transit and simplifies inventory checks.
The tool Kit is designed for harsh environmental conditions use: water resistant, temperature range -40°C to +80°C, resistant to UV and magnetic emission.

OMK-SR-SPL

KČM : 0062368600199

This fast repair tool kit contains a MCS-04 mini cable splice and all the tools required for field repair of broken tactical cables. All instruments are placed in special pre-formed plastic foam that secures the tools during transit and simplifies inventory checks. The surface of the case is washable.

Specifications

Standard:
MIL STANDARD MIL -C -4150J
IP67 in accordance with EN60529/91 & IEC60529/68
Air Transportation Association Spec. 300

OMK-SR-CLN

KČM : 0062416401587

The Maintenance Clean Kit OMK-SR-CLN is intended for cleaning and inspecting of military optical connectors. It contains all of the necessary tools for cleaning fiber optic components. The Kit tools are housed in the water/airtight, unbreakable NATO codified case. They are further protected with pre-moulded cut to fit each item. Case is made from extremely resistant Copolymer Polypropylene and equipped with automatic pressure release valve. Due to the copolymer polypropylene and extra-thick wall is not get scratched or damaged easily.

Specifications

Microscope 100x
Adapter LC/MU for Microscope 100x
Cotton swabs (pack 5 pcs)
Cleaning cartridge -CLETOP
Cleaning wipes (pack)
Dust cleaner
Visible pen VSP-03-125
Visible pen VSP-03-250

OMK-SR-FSK

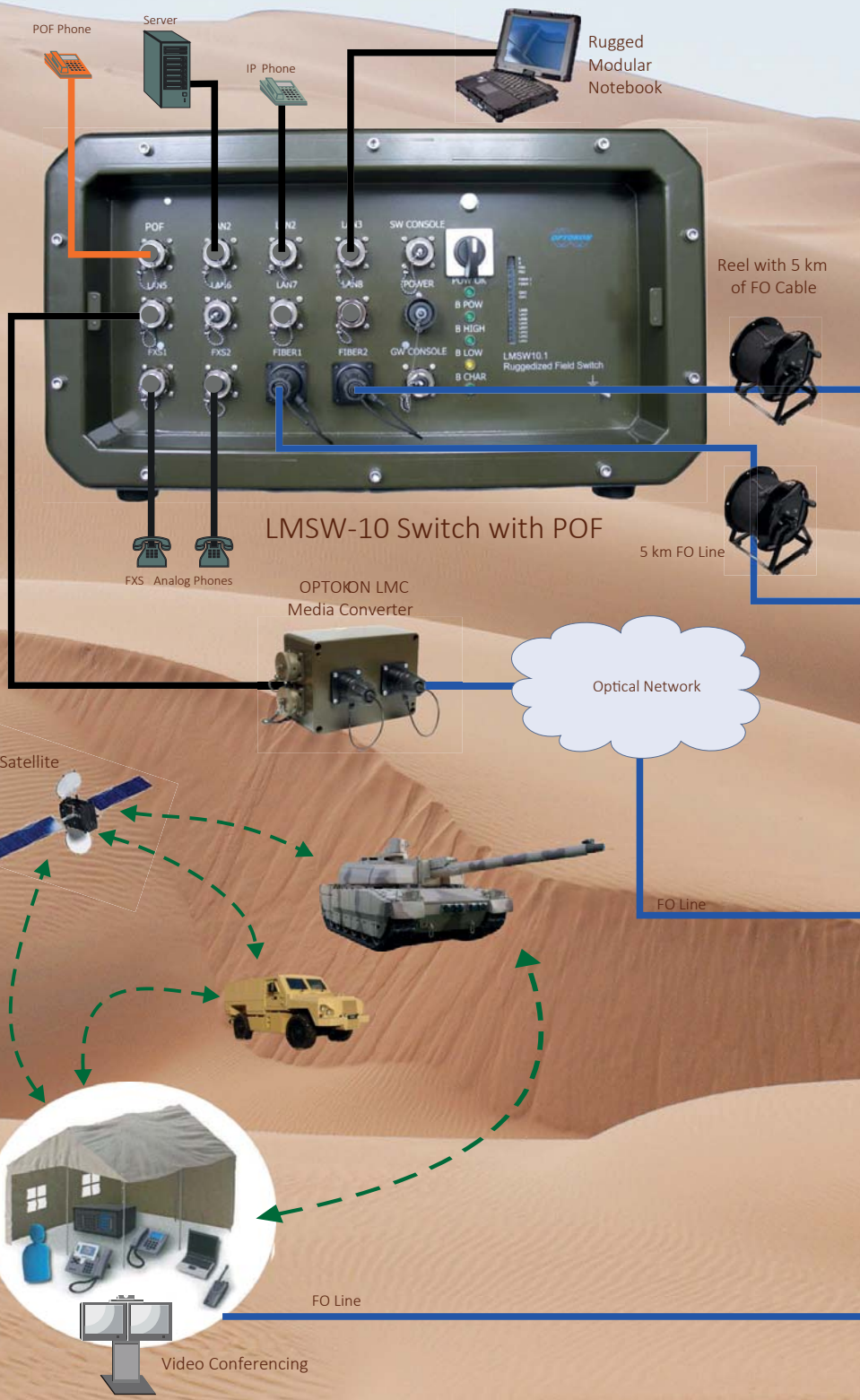
The OPTOKON Splice Kit OMK-SR-FSK is intended for the quick repair of damaged or broken mobile tactical optical cables. The kit contains a portable mobile fusion splicer and all necessary splicing tools.
The kit tools are housed in a water/airtight, unbreakable NATO codified case. All tools are further protected with pre-moulds cut to fit each item. The case is made from extremely resistant Copolymer Polypropylene and fitted with an automatic pressure release valve.

HW ARCHITECTURE FOR C2/C4 ISR

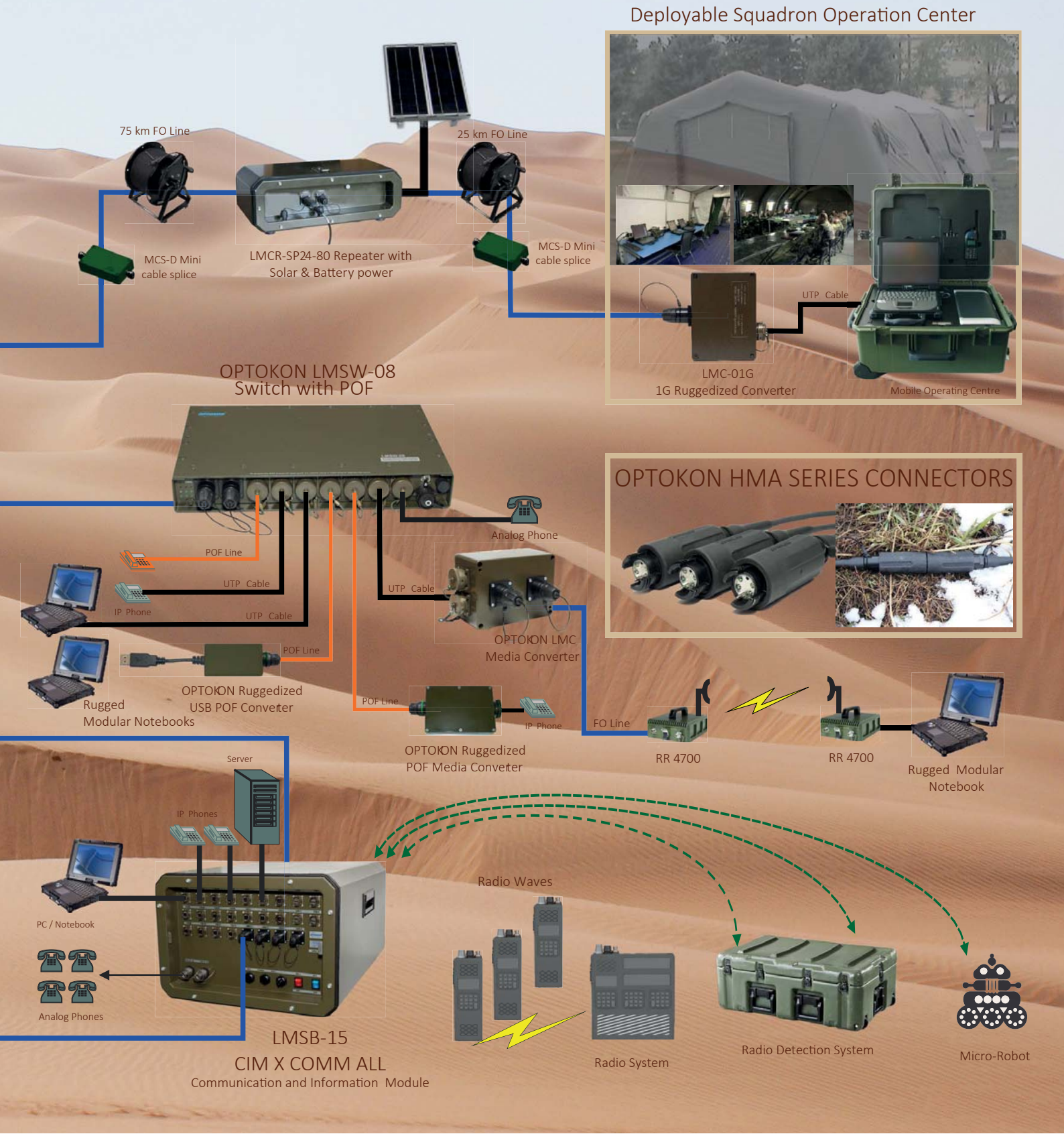
SYSTEM OF SYSTEMS

LMSW-10 & LMSW-08 ruggedized switches have been developed as a part of the Integrated System for Armed Forces of NATO

Czech Army Technical specifications: TP-LMSW10-OPT01-08



COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE



OPTOKON

OPTOKON, a.s. is a leading global producer and supplier of premium active and passive fiber optic components and specializes in fully tested integrated data network, FTTx and tactical military solutions. Our components and solutions can be found in applications in businesses, communities and armed forces throughout the world.
OPTOKON is an ISO 9001 approved company, was founded in 1991 with headquarters located in Jihlava, the Czech Republic. The operational management structure of the OPTOKON is based on a matrix organization consisting of six manufacturing divisions utilizing state-of-the art technology and strong technical expertise to create the OPTOKON product portfolio; which is coupled with regionally managed OPTOKON facilities comprised of company branches and distribution outlets, thus ensuring an active global distribution network to meet customer demand.


- Fiber Optic Technology leadership
- 25 years experience on the global fiber optic market
- NATO supplier code: 1583G
- More than 17 years experience of supplying the militaries of over 24 countries
- National Security Authority certified
- ISO and AQAP certified
- Accredited Calibration Laboratory No. : 2315

OPTOKON PORTFOLIO, SERVICES & DIVISIONS

- FIBER OPTIC DIVISION
  - Connectors, Cable Assemblies
  - Cable Management Systems
  - Splitters, WDM, CWDM and DWDM
  - Data Network Equipment
  - Test Equipment
  - Harsh Environment Optical Network
  - Service and Calibration Center
- SERVICE DIVISION



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