



# COMPEL INDUSTRIES

PRODUCTION - TRADE - SOLUTION - COMPANY

## TACTICAL OPTICAL NETWORK

SHAPING THE FUTURE OF FIELD  
OPTICAL TACTICAL COMMUNICATIONS



The complete solution

# HW ARCHITECTURE FOR C2/C4 ISR SYSTEM OF SYSTEMS



Rugged Modular Notebook

UTP



### LMSW-E33

Ruggedized 1/10 Gigabit Ethernet Layer 2 Managed PoE Switch Based on CISCO



### LMIPT-41

#### High-class Rugged IP Phone

Proven Cisco technology  
Five programmable line keys  
Encrypted voice communications  
Widescreen VGA backlit color display



OPTOKON LMC Media Converter

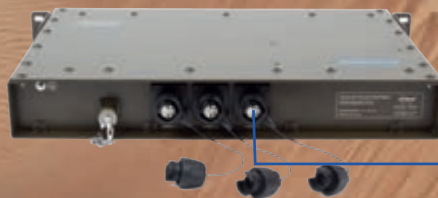
Optical Network

75 km FO Line



### LMSW-83M

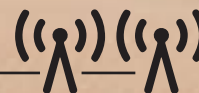
Ruggedized Gigabit Ethernet Layer 2 Managed PoE Switch  
3x 100/1000Base-X FO HMA  
8x 10/100/1000Base-T, RJ-45 with PoE+



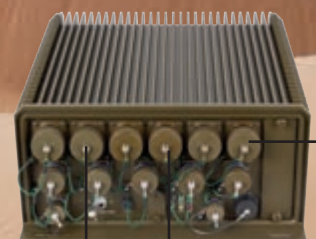
Optical Network



NETWORK



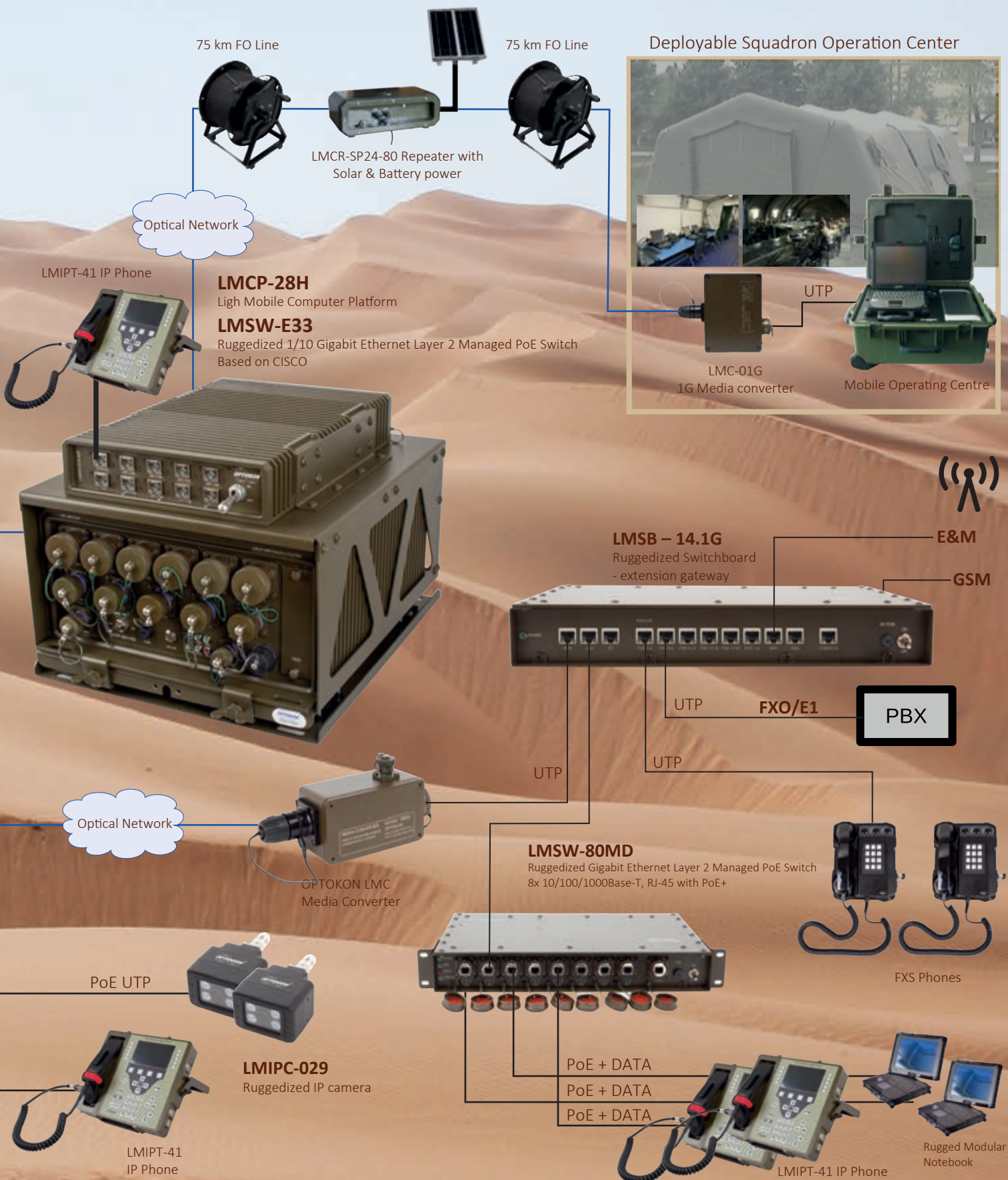
Rugged Modular Notebook



### LMCP- 28H/41H

Light Mobile Computing Platform

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



# Components for Military Communication

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# LMC-01.GC

# LMC-02.GC

# LMC-01.BC

Gigabit/Fast Ethernet  
Mini Media Converter  
Ruggedized type



LMC-01.GC



LMC-02.GC

The LMC Mini series introduces the mini media converter housed in a robust metal box. It 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 the demands for mobility, easy installation and the mechanical resistance necessary for tactical deployment in the field. The LMC converters give the freedom to extend 10/100/1000 Mbps cabling distance by allowing connectivity up to 2 km over MM fiber, up to 50 kilometers if using SM fiber. LED indicators show the power status of the converter, LAN port and fiber activity.

The basic LMC-01/02.GC configuration includes the media converter in a ruggedized box. The optical and electrical ports converters are terminated at separate connectors: HMA type for FO, rugged RJ-45 for copper LAN interface. Power supply is ensured via a 3-pins rugged connector.

## LMC configuration

- LMC-01.BC Fast Ethernet Media Converter
- LMC-01.GC Gigabit Ethernet Media Converter
- LMC-02.GC 2x Gigabit Ethernet Media Converter

## Key Features

- Rugged design for use in harsh environments
- Small compact box
- 10/100/1000BASE-TX to 1000BASE-X converter
- HMA Expanded Beam FO interface
- Auto-Cross over for MDI/MDIX in TP port
- Auto-Negotiation or Manual mode in TP port
- Store and forward mode1
- Support Jumbo Frame 9K Packet (LMC-01.GC, LMC-02.GC)
- Support Link Fault Pass Through (LFP) Function (LMC-01.-GC, LMC-02.GC)

## Product Specifications

Standard	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	Rugged RJ-45 port using copper twisted pair cable2: data transmission Rugged 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	Operating: -30°C to +50°C, Storage -50°C to +70°C
Humidity	10% to 95%
Mechanical	According to MIL-STD 810G and ČOS 999902
EMC	According to MIL-STD 461E, MIL-STD 461F, EN 55022, EN 61000-6-3
Power Supply	External 10 – 36 V DC; power consumption: <4 W
Dimension	LMC-01.BC 115 x 65 x 55 mm LMC-01.GC: 115 x 65 x 55 mm LMC-02.GC: 115 x 90 x 55 mm
Weight	LMC-01.BC 0.6 kg LMC-01.GC 0.6 kg LMC-01.GC 0.8 kg



LMC-01.BC

## Ordering code

LMC-XX.GC	- XX	- HMA	- XX	- XX - (BK <sup>4</sup> )/M
LMC-01.GC 1G converter LMC-02.GC 2x 1G converter LMC-01.BC	Fiber Type: M5: MM 50/125 μm M6: MM 62.5/125 μm S3: SM 1310 nm S5 <sup>3</sup> : SM 1550 nm	Connector Type <sup>2</sup>	Distance Connectivity <sup>1</sup> XX: MM 10: 10 km 30: 30 km 50: 50 km	Power Supply DC: 10 – 36 V

Note:

- 1) MM fiber – distance depends on fiber type, up to 2 km.  
SM fiber – longer distance on request
- 2) HMA-J standard, other available on request
- 3) 1550 nm – DFB laser, 50 km distance connectivity
- 4) Standard green khaki RAL 6014 mat color, please use -BK in P/N code if black color RAL 9005 mat required, application: industry, broadcasting, ...

# LMC-01.GF

# LMC-02.GF

# LMC-01.BF

Gigabit/Fast Ethernet  
Media Converter  
Ruggedized type



LMC-02.GF

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 the freedom to extend 10/100/1000 Mbps cabling distance by allowing connectivity up to 2 km over MM fiber and up to 50 kilometers 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 a 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 a 3-pin rugged connector.

## LMC configuration

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

## 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 <sup>1</sup> 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	According to MIL-STD 810E Operating -30°C to +50°C, Storage -50°C to +70°C
Humidity	10% to 95%
Mechanical	According to MIL-STD 810E
EMC	According to MIL-STD 461E and MIL-STD 464E
Power Supply <sup>2</sup> LMC-01.BF	DC type: external 10 – 36 V DC; DC12 type: 12 V DC: power consumption: < 4 W PoE PD (Power over Ethernet powered device: IEEE 802.3af)
Power Supply <sup>2</sup> 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.COM



LMC-01.BF

## Ordering code

LMC-02.GF LMC-01.GF LMC-01.BF	- XX	- HMA	- XX	- XX / (FR <sup>3</sup> )
01.BF -100M converter 01.GF -1G converter 02.GF -2x 1G converter	<b>Fiber Type</b> M5: MM 50/125 μm M6: MM 62.5/125 μm S3: SM 1310 nm S5 <sup>4</sup> : SM 1550 nm	<b>Connector Type<sup>2</sup></b>	<b>Distance Connectivity<sup>1</sup></b> XX: MM 10: 10 km 30: 30 km 50: 50 km	<b>Power Supply</b> 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 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 signalisation LEDs)
- 4) 1550 nm - DFB laser, 50 km distance connectivity

# LMSW-83M

**Ruggedized PoE Gigabit Ethernet  
Ruggedized Gigabit Ethernet  
Layer 2 Managed PoE Switch  
3x 100/1000Base-X FO HMA  
8x 10/100/1000Base-T, RJ-45 with PoE+**

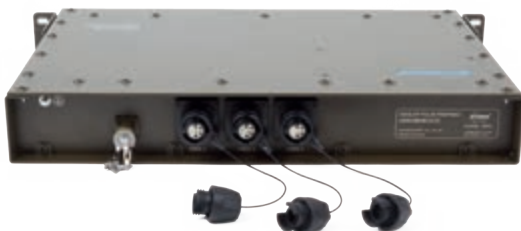


LMSW-83M

The LMSW-83M is Layer 2 military grade managed switch with 3x Fiber optic HMA-J ports (Gigabit or Fast Ethernet) and 8x 10/100/1000Base-X RJ-45 ports with PoE+ functionality that provides stable and reliable Ethernet transmission. The LMSW-M series models can provide excellent data optical network performance and feature a rugged design. 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 able to fit all the common 12/24 V DC and 230 V AC power systems simultaneously (redundant power supply). The switch operates in a wide operating temperature range -40 to +70°C. The switch can operate as a stand alone device or in addition, the 19" brackets allow switch installation into a 19" rack.

## Key features

- Robust compact design resistant to harsh environmental conditions and rough handling
- Front panel : 8x 10/100/1000Base-T
- RJ-45 interface with support of IEEE802.3af/at PoE output (30 W per Port, up to 180 W)
- Rear panel: 3x 100/1000Base-X FO port with HMA-J connectors
- Built-in power booster design up to 55 V DC for PoE/PoE+ output
- Redundant dual input AC/DC power supply available



## Specifications

IEEE 802.3 10Base-T, 10 Mbps Ethernet	
IEEE 802.3u	100Base-TX, 100Base-FX, Fast Ethernet
IEEE 802.3ab	1000Base-T Gbps Ethernet over twisted pair
IEEE 802.1d	STP (Spanning Tree Protocol)
IEEE 802.1w	RSTP (Rapid Spanning Tree Protocol )
IEEE 802.1s	MSTP (Multiple Spanning Tree Protocol )
ITU-T G.8032/	EPR (Ethernet Protection Ring ) Y.1344
IEEE 802.1Q	Virtual LANs (VLAN)
IEEE 802.1X	Port based Network Access Control, Authentication
IEEE 802.3ad	Link aggregation for parallel links with LACP (Link Aggregation Control Protocol)
IEEE 802.3x	Flow control for Full Duplex
IEEE 802.3af	PoE (Power over Ethernet)
IEEE 802.3at	PoE+ (Power over Ethernet enhancements)
IEEE 802.1ad	Stacked VLANs, Q-in-Q
IEEE 802.1p	LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization
IEEE 802.1ab	Link Layer Discovery Protocol (LLDP)
IEEE 802.3az	EEE (Energy Efficient Ethernet)
Switch Backplane	(Switching Fabric): 22 Gbps Architecture
Data Processing	Store and Forward
Flow Control	IEEE 802.3x for full duplex mode Back pressure for half duplex mode
PoE standard	IEEE802.3af, IEEE802.3at
PoE RJ-45 pin	8x RJ-45 port support IEEE 802.3af/at
Assignment	End-Span, Alternative A mode Positive (VCC+): RJ-45 pin 1, 2 Negative (VCC-): RJ-45 pin 3, 6 Data: 1,2,3,4,5,6,7,8
Network	8x RJ-45 10/100/1000BaseT(X) auto
Connector	Negotiation speed, Auto MDI/MDI-X, Full/Half duplex
Console	RS-232 (RJ-45)
Network Cable	UTP/STP above Cat. 5e cable EIA/TIA-568 100 Ohm (100 m)
Protocol	CSMA/CD
Reverse polarity protection	
LED signalization	

Mechanical & environmental parameters:		Electromagnetic compatibility tests
Interface	RJ-45 port: ruggedized, watertight connectors FO: HMA-J Expanded Beam connector	<b>EMC – Electromagnetic compatibility:</b> MIL-STD 461E: 1999, methods RE102, CE102 MIL-STD 461F methods CS101, CS114, CS115, CS116, RS103
Distance	UTP cable (10Base-T, 100Base-TX, 1000Base-T): 100 m	
Environmental temperature	Fulfils MIL-STD 810G Operating: -40 °C to +70 °C Storage: -40 °C to +85 °C	<b>Safety tests</b>  <b>LVD – Low Voltage Directive:</b> EN 60950-1 ed.2:2006
Mechanical	Fulfils MIL-STD 810G, IP 65 protection	
Power supply: DC <sup>2</sup> AC	10.5-36 / 20-57 V DC 176-242 V AC	
Dimensions	430 x 275 x 65 mm (W x D x H)	
Weight	4.5 kg	

## Ordering code

LMSW-83M -	XX	-	XX	-	XX
	<b>Fiber optic</b> M5: MM 50/125 μm S3: SM 1310 nm S5: SM 1550 nm		<b>Distance (FO)</b> XX <sup>1</sup> : Multimode 10: 10 km 30: 30 km 50: 50 km		<b>Power supply<sup>2</sup></b> AC: 176-242 V AC DC: 10.5-36 V DC DC5: 20-57 V DC AD: AC+DC

Note:

1) distance depends on optical fiber parameters

2) standard power supply: DC: 10.5-36 V, please define – if required different

# LMSW-E33

Ruggedized 1/10 Gigabit

Ethernet Layer 2 Managed PoE Switch

2x 10G WAN, FO HMA or RJ-45

8 or 24x LAN 10/100/1000Base-T, PoE



LMSW-E33-82P-S310/MRJ

The OPTOKON® LMSW-E33 ruggedized switch based on Cisco® Embedded Service Switch (ESS) 3300 extends switching capabilities to mobile and embedded networks that operate in extreme environments. The flexible, compact form factor of the switch, powered by Cisco IOS® Software, provides highly secure data, voice, and video communications to stationary and mobile network nodes, making it ideal for use in harsh environmental conditions. 10G fiber optic ports are terminated with HMA “Expanded Beam” connectors, which allows interconnection of the nodes of tactical network by the help of cables with optical fibers. The used “Expanded Beam” technology preserves all advantages of signals transmission through the optical lines in field harsh environmental conditions. The switch supports a variety of management functions, including Web UI, MIB, SmartPort, SNMP, syslog, DHCP server, SPAN session. The switch is able to fit all the common 24 V DC power systems. The switch operates in wide operating temperature range -40 to +70°C. The switch can operate as standalone device or in addition the 19” brackets allow switch installation into 19” rack. Two switches can be connected on the side and mounted in a 19” rack.

## Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- 10G uplinks, 1G downlinks
- WAN – 2 ports of 1G/10G (copper or fiber)
- LAN – 8x 1G ports:
  - 4x of 1G combo
  - 4 ports of 10Base-T/100Base-TX/1000Base-T or LAN – 24x ports 10Base-T/100Base-TX/1000Base-T



LMSW-E33-82P-S310/D38999



LMSW-E33-242-S310/MRJ

## Primary features:

### 10G uplinks, 1G downlinks

Enables high-quality video and data communication for next generation of bandwidth-intensive use cases such as tactical data centers, HD video surveillance, self-driving vehicles, and future-proofing

### Robust compact design

A compact form factor that can withstand harsh environments (-40 to +70°C operating temperature)

### Security

Enterprise-grade Cisco IOS-XE switching security features ensure highly secure voice, video, and data communication

### Manageability

Facilitates easy deployment and rapid configuration with easy-to-use WEB UI and familiar Cisco CLI

### Power over Ethernet

PoE standard IEEE 802.3af on request with visibility and management from Cisco IOS-XE Software

### Layer 2 switching

Enables to offer enterprise-grade Layer 2 switching feature set to end customers

### Quality of service

Allows customers to prioritize flows and ensure make sure that mission-critical flows are not affected by low-priority traffic

## Product Specifications

Interface: RJ-45 port: ruggedized, watertight connectors

D38999: multipin connector, FO: HMA-J Expanded Beam connector

Distance: UTP cable (10Base/100Base/1000Base-T): 100 m

Power supply: 20-40 V DC

Dimensions (W x D x H) 8x LAN ports

MRJ: 220 x 400 x 60 mm (with HMA)

D38999: 220 x 380 x 90 mm (with HMA)

24x LAN ports MRJ: 440 x 400 x 90 mm (with HMA)

Weight 4.5 / 6.0 kg, MTBF: 180 000 hrs

Electromagnetic compatibility tests:

EMC – Electromagnetic compatibility: MIL-STD 461F methods RE102, CE102 CS114, RS103

Mechanical: MIL-STD 810G, IP 65 protection

Environmental: MIL-STD 810G

Operating temperature: -40 °C to +70 °C

Storage temperature: -40 °C to +85 °C

IEEE standards:

IEEE 802.1D MAC Bridges, STP

IEEE 802.1p Layer2 COS prioritization

IEEE 802.1q VLAN

IEEE 802.1s Multiple Spanning-Trees

IEEE 802.1w Rapid Spanning-Tree

IEEE 802.1x Port Access Authentication

IEEE 802.1AB LLDP

IEEE 802.3ad Link Aggregation (LACP)

IEEE 802.3ah 100BASE-X SMF/MMF only

IEEE 802.3x full duplex on 10BASE-T

IEEE 802.3 10BASE-T specification

IEEE 802.3u 100BASE-TX specification

IEEE 802.3ab 1000BASE-T specification

IEEE 802.3z 1000BASE-X specification

RFC compliance:

RFC 768: UDP

RFC 783: TFTP

RFC 791: IPv4 protocol

RFC 792: ICMP

RFC 793: TCP

RFC 826: ARP

RFC 854: Telnet

RFC 959: FTP

RFC 1157: SNMPv1

RFC 1901,1902-1907 SNMPv2

RFC 2273-2275: SNMPv3

RFC 2571: SNMP Management

RFC 1166: IP Addresses

RFC 1256: ICMP Router Discovery

RFC 1305: NTP

RFC 1492: TACACS+

RFC 1493: Bridge MIB Objects

RFC 1643: Ethernet Interface MIB

RFC 1757: RMON

RFC 2068: HTTP

RFC 2131, 2132: DHCP

RFC 2236: IGMP v2

RFC 3376: IGMP v3

RFC 2474: DiffServ Precedence

RFC 3046: DHCP Relay Agent

Information Option

RFC 3580: 802.1x RADIUS

RFC 4250-4252 SSH Protocol



# LMSW-E2U

## Ruggedized Ethernet Layer 2

### Managed Switch

2x 1G WAN, FO HMA or RJ-45

4x LAN 10/100BASE-T



LMSW-E2U

The OPTOKON® LMSW-E2U ruggedized switch based on Cisco® technology extends switching capabilities to mobile and embedded networks that operate in extreme environments. The flexible, compact form factor of the switch, powered by advanced Cisco IOS® Software, provides highly secure data, voice, and video communications to stationary and mobile network nodes, making it ideal for use in harsh environmental conditions. The switch is able to fit all the common 24 V DC power systems. The switch operates in wide operating temperature range -40 to +75°C.

#### Key features

- Robust compact design resistant to harsh environmental conditions and rough handling
- 1G uplinks, 100M downlinks
  - WAN: 2(1)x ports of 1G fiber HMA or copper
  - LAN: 4x 100M ports RJ-45
- 256 MB DRAM with ECC memory
- 1 GB removable SD flash memory card (CG swap drive) – 128MB space available
- Advanced quality of service (QoS)
- Supervisory Control and Data Acquisition (SCADA)
- IEC 61850 Generic Object Oriented Substation Events (GOOSE) messaging
- Comprehensive network security features
- 20 – 40 V DC power supply

# LMSW-E1

## Ruggedized Ethernet Layer 2

### Managed Switch

2x 1G WAN, FO HMA or RJ-45

4x LAN 10/100BASE-T with PoE/PoE+

The OPTOKON® LMSW-E1 ruggedized switch based on Cisco® technology extends switching capabilities to mobile and embedded networks that operate in extreme environments. It is an attractive entry level product as a GUI-based, lightly-managed switch. The IE 1000 is a good fit for locations with harsh temperatures and small spaces and is Power over Ethernet (PoE) capable with zero IT management. The switch is able to fit all the common 24 V DC power systems. The switch operates in wide operating temperature range -40 to +60°C.

#### Key features

- Robust compact design resistant to harsh environmental conditions and rough handling
- 1G uplinks, 100M downlinks
  - WAN: 2x ports of 1G fiber HMA or copper
  - LAN: 4x 100M ports RJ-45
- LAN with PoE/PoE+
- Maximum Forwarding Bandwidth 2.8 Gbps
- Maximum Switching Bandwidth 5.6 Gbps
- Input voltage range 20-40 V DC

#### Specifications

Rugged Design for Substation Compliance and Durability

Compliant with IEEE 1613 and IEC-61850-3 substation standards for rugged design.

Convection cooled, with no moving parts or fans for maximum reliability and reduced network outages.

Network Security

Advanced Cisco IOS® Software features such as 802.1x, Dynamic ARP Inspection, DHCP Snooping.

Layer 2 - Layer 4 access control lists (ACLs), port security, protected port/private VLAN, user network interfaces/enhanced network interfaces (UNI/ENI) in default shutdown mode and configuration file security to prevent unauthorized network access and reduce operational costs of securing the network.

High Availability and Redundancy

Advanced Cisco IOS Software features such as Resilient Ethernet Protocol (REP) and FlexLink provide fast reconvergence in ring and hub-and-spoke topologies, reducing network downtime and associated costs.

Supports Parallel Redundancy Protocol (PRP) on 8 and 16 port models.

Field-replaceable components such as power supplies and SFPs reduce redeployment time.

Redundant DC power inputs.

Easy integration:

Zero-touch IP discovery or Dynamic Host Configuration Protocol (DHCP)IP addressing and simple web GUI-based management

PnP (Plug and Play):

Automates the process of provisioning the new devices in to the network by applying configurations, installing required image without manual intervention

Manageability:

Web GUI interface, and diagnostics and analysis options through Simple Network Management Protocol (SNMP) and syslog

Security:

secure access; port-security; TACACS+ and RADIUS AAA Client: Security protocols to control access into networks

IEEE 802.1x security:

Provides an authentication mechanism to devices wishing to attach to the network. Single host mode with MAC authentication bypass

Minimize data load:

VLAN aware, Internet Group Management Protocol (IGMP) and DHCP snooping to filter unwanted data

Industrial PoE:

Four (IEEE 802.af) and PoE+ (802.3at) supported

# LMSW-F6

## Optical Switch



The LMSW-F series is a managed ruggedized Gigabit switch with 4-6 optical ports designed for operation in harsh environmental conditions. The optical interface is equipped with HMA-J connectors, based on "Expanded Beam" technology. This enables to use all the advantages of optical networks such as high speed data transmission over long distances in industrial networking, security automation applications, intelligent transportation systems (ITS) and are also suitable for many military and utility market applications where environmental conditions exceed commercial product specifications. The optical switch supports a variety of management functions, including STP/RSTP/MSTP/ ITU-T G.8032 Ring and multiple u-Ring for redundant cabling, layer 2 Ethernet IGMP, VLAN, QoS, Security, IPv6, bandwidth control, port mirroring, cable diagnostic and Green Ethernet.

The extended operating temperature range -40 to 75°C fulfills the special needs of field optical networks applications.

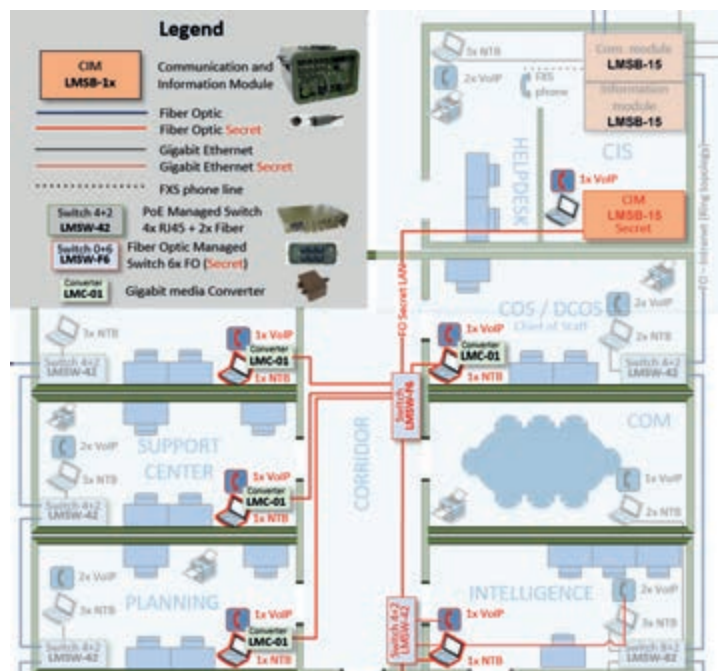
### Key Features

- 6x 100/1000Base-X, HMA-J fiber optic ports
- Supports Green Ethernet IEEE802.3az EEE (Energy Efficient Ethernet) management to optimize the power consumption
- STP, RSTP, MSTP, ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) for redundant cabling
- Provides 5 instances that each can support u-Ring, u-Chain or Sub-Ring type for flexible uses
- Supports up to 5 rings in one device
- u-Ring for Redundant Cabling, recovery time < 10ms in 250 devices
- DHCP client/Relay/Snooping/Snooping option 82/Relay option 82
- QoS, Traffic classification QoS, CoS, bandwidth control for Ingress and Egress, Storm Control, DiffServ
- IEEE802.1q VLAN, MAC based VLAN, IP subnet based VLAN, Protocol based VLAN, VLAN translation, GVRP, MVR
- Dynamic IEEE 802.3ad LACP Link Aggregation, Static Link Aggregation
- IGMP snooping V1/V2/V3, IGMP Filtering/ Throttling, IGMP query, IGMP proxy reporting, MLD snooping V1/V2
- Security: Port based and MAC based IEEE802.1X, RADIUS, ACL, TACACS+, HTTP/HTTPS, SSL/SSH v2
- Software upgrade via TFTP and HTTP, redundant firmware to avoid in case of upgrade failure
- Support IEEE1588 PTP V2 for precise time synchronization to operate in Master, Boundary, Slave mode by each port
- RMON, MIB II, Port mirroring, Event syslog, DNS, NTP/SNTP, IEEE802.1ab LLDP
- Supports IPv6 Telnet server /ICMP v6

### Product Specifications

Standard data	IEEE 100/1000Base-X
Protocol	CSMA/CD
Interface	Optical - HMA 62.5/125 μm or 50/125 μm MM 9/125 μm SM optical cable
Wavelength	MM: 1300 nm, SM: 1310 nm, 1550 nm
Distance	MM optical cable, full duplex: 2 km SM optical cable, full duplex: 10, 30, 50, 80 or 120 km
EMC Test Regulations	EN 55022 ed.3: 2011, Class B ITE EN 61000-6-3 ed.2: 2007 + A1: 2011 MIL-STD 461E: 1999, method RE102, CE102 MIL-STD 461F methods CS101, CS114, CS115, CS116, RS103
Environmental	Fulfills MIL-STD 810E
Temperature	Operating: -40 to +75°C
Storage	-40 to +85°C
Mechanical	Fulfills MIL-STD 810G, impact, vibration
IP 63 protection	
Power supply	10 to 36 V DC
Optional power pack	
Dimensions	215 x 215 x 65 mm (W x D x H)

### Classified (RED) LAN Network created using the LMSW-F6 switch



# LMSB – 14.1G

## Ruggedized Switchboard, - extension gateway



LMSB-14.1G gateway

The LMSB-14.1G introduces a ruggedized gateway for connection to the PBX - switchboard designed for use in harsh environmental conditions. It offers FXS ports for analogue phone sets, FXO ports for connection to PBX lines, E&M interfaces for cooperation with radio systems and an E1 digital line. The LMSB-14.1G gateway can be connected to a tactical network via 100 Mbps Ethernet line or via an up-link port based on optical fibers cable, which is equipped with an HMA Expanded Beam connector. Four channels GSM module available on request. The LMSB-14.1G power supply can be ensured from any DC source 10.5 - 36 V. The LMSB-14.1 switchboard can be mounted on a vehicle as well as deployed on a stationary workstation.

### Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- VoIP gateway with application in SIP trunking, PBX IP
- Trunking and PSTN access for local IP tel. solutions.
- OS Linux, Asterisk SW
- WAN interface:
  - 1x 10/100Base-T(X) RJ-45 port
  - 1x 10/100Base-T(X) RJ-45 port or 1x FO optical interface<sup>1</sup>
- FXS interfaces<sup>2</sup>, FXO interfaces<sup>3</sup>, E&M ports 1x E1 port
- Console port
- Power supply 10.5 – 36 V DC

Note: 1) FO HMA port on request, either MM or SM

2) Four FXS interfaces terminated in one RJ-45 socket

3) Four FXO interfaces terminated in one RJ-45 socket



### Technical Parameters

#### WAN Interface

FO Connector	HMA-J <sup>4</sup>
Fiber type	MM: 62.5/125 μm, 50/125 μm or SM: 9/125 μm
	Data rate 10/100 Mbps
Wavelength	MM: 1300 nm SM: 1310, 1550 nm
UTP Connector RJ-45	Data rate 10/100 Mbps Cable 10Base-T Cat. 3, 4, 5, UTP, 10/100Base-TX Cat.5, 5e or higher

Note: 4) HMA-J (Expanded Beam) standard, other on request

#### FXS - analogue phone port

Voice codecs: G.729a, G.726, G.711, GSM  
Call Control Protocols: SIP  
Telephony Signaling: DTMF tone detection/generation, DTMF relay: in-band, RFC 2833 and SIP info  
Call forward: unconditional, no answer and busy  
Number of channels: 10 at once

Subscribers interface: Subscriber lines: FXS, FXO, E&M, ....

Console Connector: 1x RJ-45 – serial line  
RS232: Data rate 115.200 kbps, 8 bits, 1 stop bit, no parity

### Application diagram:

### Ordering code:

LMSB-14.1G	UTP XX - XX	FXS - FXO - EM - E1 <sup>5,6,9</sup>	DC	(/GSM4)
WAN uplink port: UTP / Fiber Optic		Analogue/ digital interface		Power supply <sup>8</sup>
XX: Fiber optic	XX: Distance (FO)	FXS 4, 8, 12 - 32 FXS ports	DC: 10.5-36 V DC	
M5 MM 50/125 μm	XX <sup>7</sup> Multimode	FXO 2, 4, 6 - 16 FXO ports		
M6 MM 62.5/125 μm	10 10 km	EM 2, 4, 6 E&M		
S3 SM 1310 nm	30 30 km	E1 1x E1 2 Mbps		

Note:

5) define the number of relevant ports

6) other types of interface available upon request (MB, BRI, ..)

7) MM fiber – the distance depends on fiber type, up to 2 km.

SM fiber – other wavelength and distance on request

8) standard power supply: DC, please define if required different

# LMCP-7H

## Compact, ultra-durable server

8<sup>th</sup> Generation Intel® Core™ processor i7-8665UE with 4 cores

Dual Channel DDR4-2400 up to 32 GB, eMMC up to 64 GB

2x1 Gbps Ethernet



LMCP-7H

The OPTOKON compact, ultra-durable LMCP-7A server is equipped with 8<sup>th</sup> Gen Intel® Core™ CPU, SSD discs and 2x Gigabit Ethernet ports. The LMCP-7A supports up to 64 GB of DDR4 memory, resulting in a reduction in overall power consumption compared to DDR3-based servers.

The LMCP-7A offers military grade features in a rugged housing making it the ideal platform for applications in harsh and rugged environments. The LMCP-7A can operate in harsh environments under a temperature range from -40 to +85 °C. The power supply is possible from any DC voltage within range 20 – 40 V DC input design. Sealed against dust and debris, our Rugged Line stands up to shocks, vibrations and wide temperature range.

### Advanced features

- Rugged design for harsh environmental use
- Whiskey Lake-U 14 processor 1.70 -4.40 GHz
- 64 GB total RAM
- Dual removable high capacity SSD discs
- 2x 1 GbE
- MRJ connectors
- Extended operating temperature range
- Wide power supply voltage range: 20-40 V DC
- Compact small design, light weight

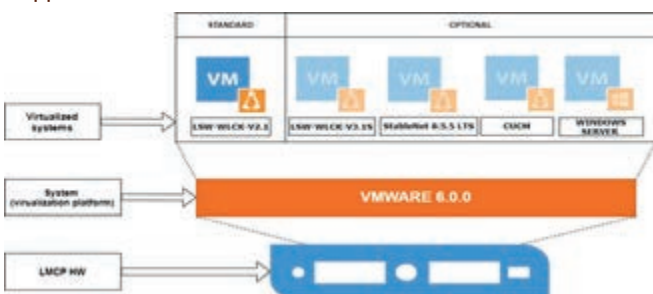
# LMCP – SW

## Basic operating software for LMCP mobile computing platform:

- LMCP-28H-NG
- LMCP-41H
- LMS-41

The OPTOKON LMCP series introduces the new generation of highly versatile mobile computing platform which delivers a powerful and rugged network router, network switch, server and VoIP call manager.

The system is equipped with power full Intel® Xeon® processor, high capacity RAM, two removable Storage disc SSD and wide range of connection ports, both fiber optic and copper wires.



Basic SW configuration

### Specification

Processor: Intel® Core™ i7-8665UE quad core processor with 1.7 GHz, 8 MB Intel® Smart Cache, Intel® UHD Graphics 620

Memory: Dual Channel DDR4-2400 up to 32 GB, onboard eMMC up to 64 GB

#### Interface<sup>1</sup>:

- 2x 10/100/1000 Mbps Ethernet
- 1x RS-232/422/485
- 4x USB 3.1
- 2x USB 2.0
- 1x HDMI1.4 / 1x DP1.2
- 1x CAN Bus 2.0

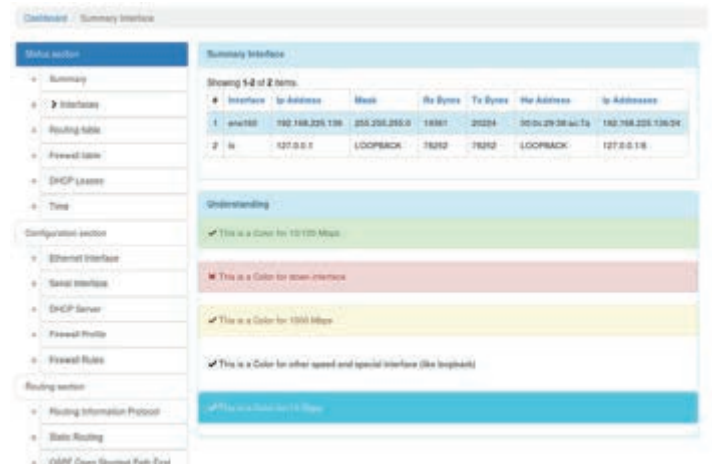
#### Discs<sup>2</sup>:

- 2x SSD 256 GB, remove able
- M.2 M-Key 2280 supports NVMe
- OS support list: Linux, Windows 10, iManager & SW APIs, WISE-PaaS/DeviceOn

#### Mechanical & Environmental:

- Size W x H x D: 180 x 100 x 210 mm (W x H x D)
- Weight: 4.9 kg
- Power supply: 20 - 40 V DC
- Power consumption: 35 W
- Operating temperature: -40 °C to +85 °C
- Storage temperature: -40 °C to +85 °C
- Environmental design complies with MIL-STD-810G
- EMC – Electromagnetic compatibility: MIL-STD-461F: RE102, CE102, CS114, RE103,

Note: 1) Other interface (general purpose digital I/O, Line-in/Line-out/MIC ...) on request  
2) Other disc capacity on request



Example of SW window:

# LMCP-28H-NG

## Light Mobile Computing Platform

2x 100/1000Base-X HMA uplinks

8x 10/100/1000Base-T switched PoE LAN ports

3x or 5x 10/100/1000Base-T routed WAN ports

-1x of them 10GBase-T



LMCP-28H-NG Mobile computing platform

The OPTOKON introduces the LMCP-28H-NG new generation of highly versatile mobile computing platform which delivers a powerful and rugged network router, network switch, server and VoIP call manager in a single low-SWaP device. As the center of the mobile data network, it provides an integrated and versatile communications server for military, public safety, C4ISR and other network-centric communications systems.

The system is equipped with power full Intel® Xeon® processor which delivers exceptional value and unmatched performance density per watt in an SoC package, high capacity RAM, two removable Storage disc SSD and wide range of connection ports, both fiber optic and copper wires. The LMCP is available in rugged boxes to fill all demands on communication system used in harsh environmental conditions. Fiber optic ports are equipped with rugged HMA connectors operated according to Expanded Beam technology, which allows to use all advantages of highspeed data transmission in field conditions.

### Advanced features

- Robust compact design resistant to harsh environmental conditions and rough handling
- Intel® Xeon® processor D-1500 product family
- Up to 64 GB RAM ECC DDR4 2400 MHz
- Dual removable SSD 2.5 inch
- On board expansion slot M.2 NVMe PCI-E 3.0 x4
- 1x 10GBase-T of 3/5 routed 1 GbE ports
- 8x 10/100/1000Base-T switched PoE+ ports
- 2x 100/1000Base-T/X ports4
- Advanced PoE+ management, max. output power budget 60 W
- Circular connectors MIL-DTL-D38999 series
- Linux-based router solutions supports a multitude of routing protocols
- Wide range power input 20-40 V DC
- Passive fan less cooling, no-moving-parts



LMCP-28H-NG Mobile computing platform in stack with LMSW-E33 switch

### Features and Benefits:

#### Server:

Intel® Xeon® processor D-1528  
9 MB, 6-Core, 12 Threads 1.9 GHz  
System memory up to 64 GB DDR4 2133 MHz

#### Solid State Drives

1x M.2 NVMe PCI-E 3.0 x4, up to 512 GB  
Dual removable 2.5" SATA SSD up to 2x 2 TB  
2 Drive Tray less Hot Swap SATA Mobile Rack  
iData Guard for abnormal power failure

#### Input / Output

Up to 7 routed 1 GbE ports  
Linux-based router solutions supports RIP v1, v2 and OSPF v2  
10 GbE 1x of 7 ports  
10x USB 2.0 and 1x USB 3.0  
8x serial RS232  
CAN bus, High-speed CAN transceiver 82C251  
Video VGA port

#### Switch:

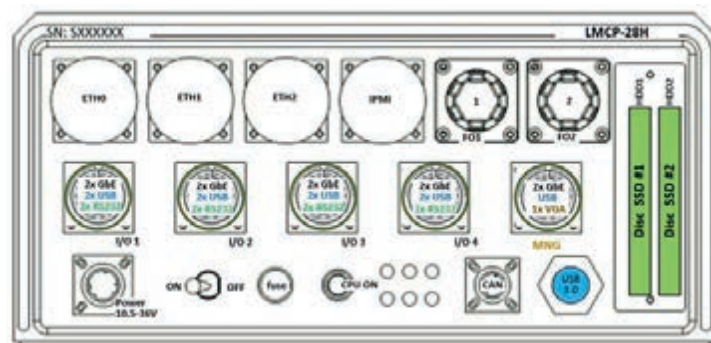
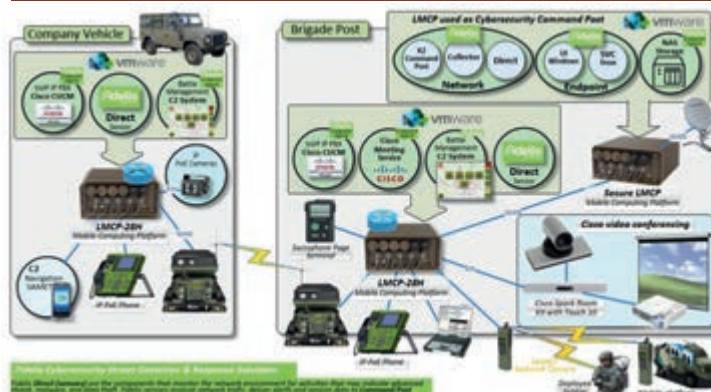
8x 10/100/1000Base-T LAN RJ-45 ports with PoE  
2x 1 Gbps or 1x 1/101 Gbps fiber optic HMA connectors or UTP, RJ-45

#### Management and monitoring

IPMI with dedicated LAN, Support for Intelligent Platform Management Interface v2.0 with virtual media over LAN and KVM-over-LAN  
HW Monitoring (CPU, temperature, voltage, failure,...)  
HW Notifications sent via email and SNMP traps

#### Power consumption

Nominal conditions 75 W  
Maximum load 120 W + PoE power budget 60 W



# LMCP-41H

## Mobile Computing Platform

8-Core CPU Intel Xeon, 128 GB RAM

5x 10/100/1000Base-T routed WAN ports

2x 100/1000Base-X + 8x 10/100/1000Base-T  
switched PoE LAN ports

The LMCP is highly versatile mobile computing platform which delivers a powerful and rugged network router, network switch, server and VoIP call manager in a single low-SWaP device. As the center of the mobile data network, it provides an integrated and versatile communications server for military, public safety, C4ISR and other network-centric communications systems.

### Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- Intel® Xeon® processor D-1500 product family
- Up to 128 GB RAM ECC DDR4 2400 MHz
- Dual removable SSD 2.5 inch
- On board expansion slot M.2 NVMe PCI-E 3.0 x4
- 8x 10/100/1000Base-T switched PoE+ ports and 2x 100/1000Base-X ports
- Advanced PoE+ management, max. output power budget 60 or 100 W
- Circular connectors MIL-DTL-D38999 series
- Linux-based router solutions supports a multitude of routing protocols
- Wide range power input 20-30 V DC
- Removable filter less fan cabinet cooling

# LMS-41H-2U

## Rugged Fanless Server

Up to 128 GB RAM

8-Core Intel Xeon

The OPTOKON introduces highly versatile mobile Server in a single low-SWaP device. As the center of the mobile data network, it provides an integrated and versatile server for military, public safety and C4ISR systems.

The system is equipped with power full Intel® Xeon® processor witch delivers exceptional value and unmatched performance density per watt in an SoC package, up to 128 GB RAM, two or four removable Storage discs SSD and wide range of connection ports, both fiber optic and copper wires. The LMS is available in rugged boxes to fill all demands on communication system used in harsh environmental conditions and Extended operating temperature (-20 to 60°C).

### LMS-41H features

- Robust compact design resistant to harsh environmental conditions and rough handling
- Intel® Xeon® processor D-1541
- Up to 128 GB RAM ECC DDR4 2400 MHz
- On board SSD disc M.2 NVMe and 2x Dual removable SSD 2.5
- 2x 10/100/1000Base-T ports and
- 2x 1000Base-X FO uplinks
- Rugged MRJ connectors series
- Linux-based router solutions supports a multitude of routing protocols



LMCP-41H Mobile computing platform

### Features and Benefits:

**Server:** Intel® Xeon® processor D-1541 (12 MB, 8-Core, 16 Threads, 2.1 GHz)  
System memory Up to 128GB DDR4 2133MHz

#### Solid State Drives

1x M.2 NVMe PCI-E 3.0 x4, up to 1024 GB  
Dual removable 2.5" SATA SSD up to 2x 2 TB  
2 Drive Trayless Hot Swap SATA Mobile Rack  
iData Guard for abnormal power failure

#### Input / Output

3 or 5 routed 1 GbE, Linux-based router solutions supports RIP v1, v2 and OSPF v2  
8x USB 2.0 and 1x USB 3.0 and 8x serial RS232  
CAN bus, High-speed CAN transceiver 82C251, Video VGA port Switch  
8x GbE LAN RJ-45 ports with PoE+  
2x GbE Fiber Optic HMA connectors

#### Management and monitoring

IPMI with dedicated LAN, Support for Intelligent Platform Management Interface v2.0 with virtual media over LAN and KVM-over-LAN  
HW Monitoring (CPU, temperature, voltage, failure,...)  
HW Notifications sent via email and SNMP traps  
Nominal power conditions 85 W  
Maximum load 130 W + PoE power budget 120 W



LMS-41-2U/MRJ

### Features and Benefits:

**Server:** Intel® Xeon® proc. D-1541 (8-Core, 16 Threads, 12 MB Cache, 2.1-2.7 GHz)  
Up to 128 GB ECC RDIMM DDR4 2400 MHz or 128 GB ECC/non-ECC UDIMM

#### Solid State Drives

1x M.2 NVMe PCI-E 3.0 x4, M Key 2242/2280 up to 480 MB  
2x Dual removable 2.5" SSD Drive Trayless Hot Swap SATA Mobile Rack  
SATA3 (6 Gbps); RAID 0,1,5,10 RSTe up to 4x 1 TB  
iSMART disk health monitoring, iData Guard for abnormal power failure

#### Management and monitoring

KVM with dedicated LAN, Support for Intelligent Platform Management Interface v2.0 with virtual media over LAN and KVM-over-LAN  
Hardware Monitoring (temperature, voltage, power failure, power consumption, disk health, and memory health)  
HW Notifications sent via email and SNMP traps  
Monitors for CPU Cores, System level control

#### Input / Output

Panel Mount Receptacle  
2x FO HMA, 2x GbE RJ-45, 1x KVM with dedicated LAN RJ-45, 2x USB 3.0, 4x USB 2.0, 1x RS232, Video VGA port  
Power input 10.5-36 VDC, Nominal conditions: 65 W, Maximum load: 95 W  
EMC Standards According to MIL-STD-461G

# LMSR-R63

## Ruggedized next Gen Gigabit Router 2x GE WAN + 4x GE LAN ports



LMSR-R63/MRJ



LMSR-R63/RJFTV

The OPTOKON LMSR-R63 ruggedized router based on Cisco Next Gen GE Embedded Router 6300 is optimized for military networks that require IP routing and services. The compact router provides highly secure data, voice, and video communications to stationary and operational tactical network nodes.

The OPTOKON LMSR-R63 is a high-performance, ruggedized router designed for use in harsh environments—offering reliable operation in extreme temperatures and under shock and vibration conditions typical for mobile applications in rugged terrain. With onboard hardware encryption, the router offloads encryption processing from the routing engine to provide highly secure yet scalable video, voice, and data services for mobile and embedded outdoor networks. The router offers high performance, five Gigabit Ethernet interfaces (two routed and four switched), and a rich Cisco IOS Software feature set, providing investment protection for customers deploying bandwidth-intensive applications in mobile or embedded networks in heavy industrial, public safety, transportation, defense, and energy markets.

The router supports a variety of management functions, including Cisco DNA, Web UI, IOx, MIB – SNMP (version 2 and 3), syslog etc. It is able to fit all the common 24 V DC power systems. The router operates in wide operating temperature range -40 to +70°C and can operate as a stand alone device or it can be installed into 19" rack.

### Features

#### 2 GE WAN, 4 GE LAN,

The router LMSR-R63 provides two routed and four switched Gigabit Ethernet interfaces, enabling the router to serve as an aggregation point for on-demand network connectivity in mobile or fixed deployments.

#### Robust compact design

A robust and compact design that can withstand harsh environments (-40 to +70°C operating temperature)

#### Security

Enterprise-grade Cisco IOS-XE switching security features ensure highly secure voice, video, and data communication, with support FIPS-140 certified Security – IPsec, Suite-B

#### Manageability

Facilitates easy deployment and rapid configuration with easy-to-use WEB UI and Cisco DNA (Cisco Digital Network Architecture)

- Interface support:
  - 4 GE LAN ports, RJ-45 interface
  - 2 GE WAN ports, RJ-45 interface
  - (4x FXS ports – option)
- Crypto throughput (250 Mbps)
- 1 x RS-232 and USB console
- Advanced next generation Cisco IOS-XE SW
- Low power 12 W consumption

### Specifications:

6 x RJ-45 port: ruggedized, watertight connectors (MRJ or RJFTV)	
Routing protocols	
Simple Network Management Protocol (SNMP) Versions 2 and 3	
Telnet	
Console port	
RADIUS	
TACACS+	
Cisco Service Assurance Agent	
Syslog	
Response Time Reporter	
Network Time Protocol (NTP) Client	
Trivial File Transfer Protocol (TFTP) Client and Server	
Dynamic Host Configuration Protocol (DHCP) Client and Server	
DHCP Relay	
Hot Standby Router Protocol (HSRP)	
Radio routing	
Radio-Aware Routing (RAR)	
Dynamic Link Exchange Protocol (DLEP)	
VLANs	
Up to 32 VLANs supported per router	
IPv4 and IPv6	IPv4 support, IPv6 (routing and Cisco Express Forwarding switching, IPv6 QoS, IPv6 tunneling support, Cisco IOS Zone-Based Firewall for IPv6 traffic)
Security protocols: IPsec, SSL/TLS, SRTP, 3DES, AES, IKE	
Voice - Cisco Unified Communications Manager Express	
With support for up to 48 phones	
QoS – traffic management	
Generic traffic shaping	
Class-based Ethernet matching and mobile access routing (802.1p class of service)	
Committed access rate	
Flow-based Weighted Random Early Detection (WRED)	
Class-Based Weighted Fair Queuing (CBWFQ)	
Low Latency Queuing (LLQ)	
Priority Queuing	
Weighted Fair Queuing (WFQ)	
Link fragmentation and interleaving (LFI)	
Traffic Policing Resource Reservation Protocol (RSVP)	
Dimensions W x D x H MRJ connectors	220 x 400 x 60 mm
Dimensions W x D x H RJFTV connectors	220 x 380 x 90 mm
Weight	5.0 kg
Power supply	20 - 40 V DC power supply



LMSW-E33 and LMSR-R63  
Installation into 19" Rack

# LMIPT-41

## High-class Rugged IP Phone

Proven Cisco technology  
Five programmable line keys  
Encrypted voice communications  
Widescreen VGA backlight color display



The OPTOKON LMIPT-41 is a rugged IP phone specifically designed for use in harsh environmental conditions. The IP phone delivers the latest technology and advancements in IP telephony based on the Cisco 8841 platform and provides communication over the same data network as your computer, allowing you to place and receive phone calls, put calls on hold, transfer calls, make conference calls, etc. The OPTOKON LMIPT-41 is built into a fully sealed and vibration proof aluminum chassis.

The LMIPT-41 offers five programmable line keys. The keys can be configured to support either multiple directory numbers or call features such as speed dial. Productivity can be boosted by handling multiple calls for each directory number, using the multi call-per-line feature. Fixed function keys provide one-touch access to applications, messaging, the directory, as well as regular call features such as hold/resume, transfer, and conference. The backlight acoustic keys provide flexibility for audio path selection and switching.

### Key Features

- The OPTOKON LMIPT-41 offers a 5-inch high-resolution (800 x 480) widescreen VGA backlight color display. Localized language support, including right-to-left on-screen text, meets the needs of global users.
- The phone supports a built-in Gigabit Ethernet switch for PC connection.
- Support for Cisco EnergyWise™ technology makes the IP phone more energy-efficient and eco-friendly; the phone is qualified by the Energy Star organization.
- Stand alone or wall mount version can be ordered.



### The phone has the following keys

- Line keys, Soft keys
- Back and release keys
- Four-way navigation and select keys
- Hold/Resume, Transfer, and Conference keys
- Messaging, Application, and Directory keys
- Standard keypad
- Volume-control toggle key
- Speakerphone, headset, and mute keys

Audio codec support: G.711a-law and  $\mu$ -law, G.722, G.729a, Internet Low Bit rate Codec (iLBC), and Internet Speech Audio Codec (iSAC)

### LMIPT-41 Specifications

#### Ethernet switch and PoE

An internal 2-port Cisco Ethernet switch allows for direct connection to a 10/100/1000BASE-T Ethernet (IEEE 802.3i/802.3u/802.3ab) through an RJ-45 interface with single LAN connectivity for both the phone and a co-located PC. The system administrator can designate separate VLANs (IEEE 802.1Q) for the PC and phone, providing improved security and reliability of voice and data traffic IEEE Power over Ethernet class 2. The phone is compatible with both IEEE 802.3af and 802.3at switchblades and supports both Cisco Discovery Protocol and Link Layer Discovery Protocol - Power over Ethernet (LLDP-PoE).

#### Network features

Session Initiation Protocol (SIP) for signaling  
Session Description Protocol (SDP)  
IPv4 and IPv6  
User Datagram Protocol (UDP) (used only for Real-Time Transport Protocol [RTP] streams)  
Dynamic Host Configuration Protocol (DHCP) client or static configuration  
Gratuitous Address Resolution Protocol (GARP)  
Domain Name System (DNS)  
Trivial File Transfer Protocol (TFTP)  
Secure Hypertext Transfer Protocol (HTTPS)  
VLAN  
Real-Time Transport Protocol (RTP)  
Real-Time Control Protocol (RTCP)  
Cisco Peer-to-Peer Distribution Protocol (PPDP)  
Cisco Discovery Protocol  
LLDP (including LLDP-MED)  
Switch speed auto-negotiation

#### Security features

Secure boot  
Secure credential storage  
Device authentication  
Configuration file authentication and encryption  
Image authentication  
Random bit generation  
Hardware cryptographic acceleration  
Certificate Authority Proxy Function (CAPF)  
Manufacturer-Installed Certificates (MIC)  
Locally Significant Certificates (LSC)  
Ethernet 802.1x supplicant options: Extensible Authentication Protocol-Flexible Authentication via Secure Tunneling (EAP-FAST) and Extensible Authentication Protocol-Transport Layer Security (EAP-TLS)  
Signaling authentication and encryption using TLS  
Media authentication and encryption using SRTP  
HTTPS for client and server  
Secure Shell (SSH) Protocol server  
SSL-based VPN client



# LMIPT-21

## Rugged IP Phone

Proven Cisco technology  
Power over Ethernet (PoE)



LMIPT-21

OPTOKON LMIPT-21 is a rugged IP phone specially designed for use in harsh environmental conditions. The phone offers an easy-to-use interface and provides a traditional telephony-like user experience. Fixed function keys give you one-touch access to service, messaging, directory, hold/resume, transfer, and conference features. The phone is based on a Cisco IP Phone 7811. It is built into a fully sealed and vibration proof aluminum chassis.

### Features

- Rugged design for harsh environmental use
- Voice services on Cisco or third-party platforms
- Supports CDP and 802.1Q/p standards
- Signaling protocol: SIP Session Initiation Protocol
- Codec support: G.711a/μ, G.722, G.729a, iLBC, OPUS
- Cisco Unified Communications Manager 8.5.1, 8.6.2, 9.1.2, 10.x and later
- Display 3.28" 384x106 pixel-based
- Colors: Box-green RAL 6014, handset-black, keyboard-BW

### Specifications

#### Security:

- 802.1X authentication
- Media encryption using Secure Real-Time Transfer Protocol (SRTP)
- Signaling encryption using Transport Layer Security (TLS) Protocol
- Encrypted configuration file, digest authentication, password login, HTTPs secure provisioning
- Mandatory/optional secure call

#### Environmental and dimensions:

- IP 65 protection
- Operating temperature: -20 to +55 °C, MIL-STD-810G Method 501.5 procedure II
- Storage temperature: -20 to +65 °C, MIL-STD-810G Method 501.5 procedure I
- Dimensions: 250 x 215 x 45 mm (L x W x D)
- Weight: 2.8 kg

# LMAT-116

## Rugged Analog Phone

OPTOKON LMAT-116 is a rugged analog phone specially designed for use in harsh environmental conditions. The phone offers an easy-to-use interface and provides a traditional telephony user experience.

### Features

- Manufactured in accordance with military standards and fulfill all of its functions completely under vibration and shock conditions
- Designed for the harsh environment of ships and military use with high vibration and shock effect.
- Guarantees continuous working under humidity, salty and extreme temperature conditions in ships and land forces
- CB – central battery operation
- Although it is used at military vehicles, the phone is ergonomics for easy use.
- Ring tone and volume adjustment.
- Back light level adjustment at keypad.
- The handset cord is selected appropriate to the security norms set in the highly shocked environments
- DTMF - Dual-tone multi-frequency signaling



LMAT-116

### Specifications

- Dimensions: 245 x 183 x 94 mm
- Weight: 1.93 kg
- Color: black
- Operating temperature: -32 to +60 °C, MIL-STD-810G, method 502.4, procedure II, method 5021.4, procedure II
- Storage temperature: -33 to +63 °C
- Mechanical Waterproof and dust protection: IP55
- Vibration: MIL-STD-810G, method 514.6, procedure I, category 20
- Shock: MIL-STD-810G, method 516.6, land vehicles
- EMC/EMI: MIL-STD-461F: RE102, CE102, RS103, CS101, CS114, CS115, CS116



# LMUPS-80-24V

**Ruggedized  
Uninterruptible Power Supply**

**Input** AC/DC  
**Output** 24 V DC, 15 A



LMUPS-80-24V

The LMUPS-80 Series is a high efficiency, DC power supply and battery charger that brings sophisticated features into a ruggedized design. The LMUPS-80 allows the battery charge to be regulated independently from the DC outputs, meaning that the battery will always receive the optimal charging current without the load being affected. Intelligent 3-stage charging will bring a battery back to a full state of charge much faster than trickle or float charging can.

In addition, the LMUPS-80 offers various functions like min. load disconnect, battery disconnect and external signal shutdown. Through the Battery-Parameter software adjustments at the UPS can be done via PC.

## Features

- 24 V DC UPS device
- Ruggedized design 3 RU height box
- Operates as a DC UPS, providing uninterrupted DC power
- Wide-ranging power factor corrected AC/DC input
- Battery hot swap
- Easy battery access - separate battery compartment

# LMCAB LAN Cables

Ruggedized high reliability Ethernet cord sets

The cable contains 4 twisted pairs, cabled, double shielded with kevlar reinforcement strands, jacketed in black UV resistant Polyurethane HFFR. Designed for fixed or portable applications in harsh environments.



LMCAB-RJ45-RJFTV6MG-RJ45

## Main characteristics

- Sealed against fluids and dusts (IP68)
- Shock, vibration and traction resistant
- No cabling operation in the field and no tools required
- Mechanical coding / Polarization (4 positions)
- Improved EMI protection
- Tri Start Thread coupling mechanism (D38999 series III type) with anti-decoupling device - Shell size 19
- Robust aluminium shells, olive drab cadmium plating
- RJ45 cord set retention in the plug: 100 N in the axis
- Mating cycles: 500 min

## Product Specifications

### Power:

Input Voltage Range 176-242 V AC / 22-29 V DC

Output Voltage 24 V DC

Output voltage/on network operation/for DC/nominal value 24 V

Output voltage/in buffering mode/with DC/rated value 24 V

Voltage increase time/of the output voltage/typical 1 s - 60 ms

Output current/nominal value 15 A

delivered active power/typ. 360 W

Active power loss/during battery operation/typical 15 W

### Protection an monitoring

protection against reverse battery voltage polarity Yes

protection against polarity reversal on input voltage Yes

### Mechanical:

Dimensions 430 x 275 x 3U1 mm (W x D x H)

Weight 8 kg

Protection degree IP65

Interface USB

# LMCAB Multi Cables

Ruggedized High reliability Ethernet cord sets



LMCAB-LSC-02-D3\_26WD35PN-2xRJ45\_1xUSBF3\_1xVGA

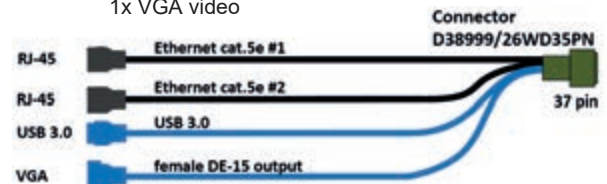
LMCP management cable:

LMCAB-LSC-02-D3\_26WD35PN-2xRJ45\_1xUSBF3\_1xVGA

2x 10/100/1000 Mbps Ethernet

1x USB 3.0

1x VGA video



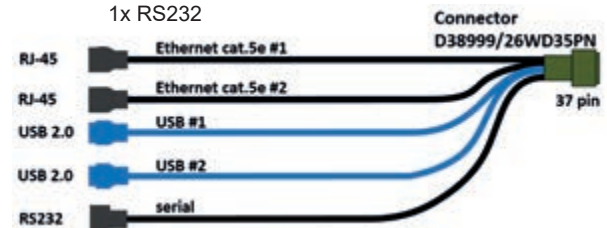
LMCP Multi Full I/O cable

LMCAB-LSC-02-D3\_26WD35PN-2xRJ45F\_2xUSBF\_1xDB15F

2x 10/100/1000 Mbps Ethernet

2x USB 2.0

1x RS232



# HMA-J Series

## Harsh Environmental Expanded Beam



HMA-J plug connector

The OPTOKON HMA-J connector series, a medium size Expanded Beam connectors, 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 harsh environmental field 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 Single mode and Multimode daisy chained links in a variety of platforms 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.

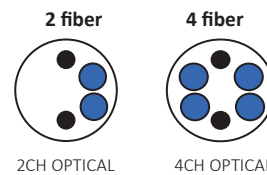
### MIL-DTL-83526 specification

Key Features	Application	Benefits
<ul style="list-style-type: none"> <li>● Ruggedized field design</li> <li>● Hermaphroditic interconnection</li> <li>● Easy cleaning - removeable sleeves</li> <li>● 4 Fiber channels</li> <li>● Single mode and/or Multimode</li> </ul>	<ul style="list-style-type: none"> <li>● Military communications</li> <li>● Telecomms</li> <li>● Surveillance</li> <li>● Broadcasting</li> </ul>	<ul style="list-style-type: none"> <li>● No adaptors required</li> <li>● Excellent transmission parameters</li> <li>● SFF ferrule termination procedure</li> </ul>

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



#### Optical insert arrangement:



Other cable sizes available on request

All tests compliant to EN 186000-1 specifications

### Ordering code

HMA	XX	XXX	X(SM, M5, M6) - Y(D,P)
<b>M</b> Mini			<b>X</b> fiber number
<b>J</b> Junior (4)			<b>YD</b> contact number, size 20
<b>S</b> Senior (6)			<b>YP</b> contact number, size 16
- Expanded Beam		- plug	
<b>F</b> Ferrule		<b>BN</b> bulkhead jam nut	
<b>P</b> POF		<b>BNB</b> bulkhead jam nut with boot	
		<b>BF</b> bulkhead flange	
		<b>BFB</b> bulkhead flange with boot	



HMA-J bulkhead

# HMA-S Series

# HMA-M Series

Harsh Environmental  
Expanded Beam Connector



HMA-M plug      HMA-J plug      HMA-S plug

The OPTOKON HMA-S connector series (large size Expanded Beam connector) and the HMA-M connector series (a mini-sized Expanded Beam connector) are designed to connect tactical network nodes using fiber optical cables. The Expanded Beam technology preserves all the benefits of signals transmission through suitable optical lines in harsh environmental field 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 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. HMA Hermaphroditic coupling eliminates the need for adaptors and male and female mating halves. Hermaphroditic housings enable rapid deployment, creating low loss Single mode 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 to 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 the Pro Beam Senior connector

### Specifications

Optical Loss HMA-S	50/125 @ 850/1300 nm: 1 to 4 channels: 1.0 dB max 6 & 8 channels: 1.5 dB max 9/125 @ 1310/1550 nm: 1 to 4 channels: 1.5 dB max 6 & 8 channels: 2.0 dB max
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	Size 20 & size 16 MIL-C-39029.
Contacts (HMA-S only)	Contact resistance <4 mΩ. Operating voltage 1000 VAC. Operating current 5A (short term 15 A)
Operating temperature	HMA-S -40°C to +70°C, HMA-M -55 to +85°C
Storage temperature	-55°C 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

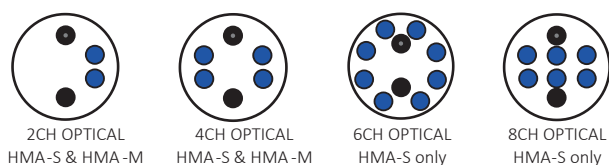


HMA-S plug  
HMA-J plug  
HMA-M plug

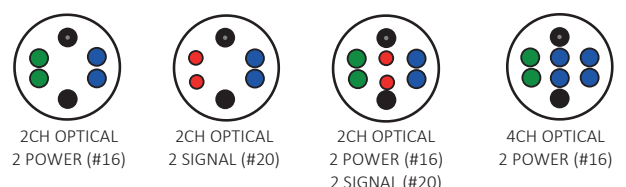
### Ordering code

<b>HMA</b>	-	<b>XX</b>	-	<b>XXX</b>	-	<b>X(SM, M5, M6)- Y(D,P)</b>
<b>M</b>	Mini					<b>X</b> fiber number
<b>J</b>	Junior (4)					<b>YD</b> contact number, size 20
<b>S</b>	Senior (6)					<b>YP</b> contact number, size 16
-	Expanded Beam					- plug
<b>F</b>	Ferrule					<b>BN</b> bulkhead jam nut
<b>P</b>	POF					<b>BNB</b> bulkhead jam nut with boot
						<b>BF</b> bulkhead flange
						<b>BFB</b> bulkhead flange with boot

### Optical insert arrangement:



### Hybrid insert arrangement HMA-S only



# Optical cables

for mobile and tactical use

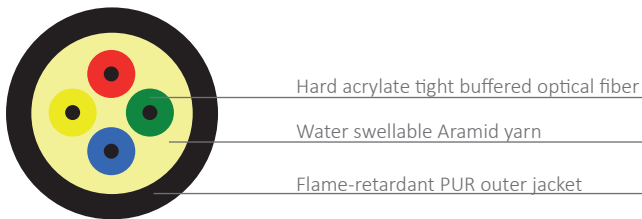
Based on military norm MIL-C-85045



LD-04-OM2-PUR-BK

## LD single jacket cable

Tactical 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 made of polyurethane. The cable is suitable for indoor and outdoor use. The cable has low abrasion and good cut resistance.



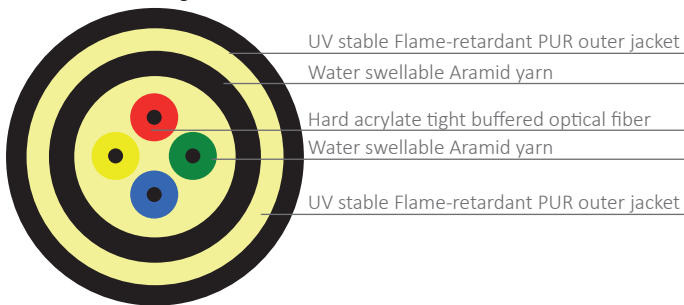
LD cable jacket

### Mechanical and Environmental properties

Test	Value	Test method
Tensile strength (short/long term)	1800/1000 N	*E1
Max. Compressive loading	4500 N	*E3
Min. bend radius Not load	10x OD	*E11
Min. bend radius Load	15x OD	
Temperature range	-60 to +85°C	*F1

\* IEC 60794-1-2, TIA/EIA-455-xx military request

## LDD dual jacket cable



LD cable dual jacket

Test	Value	Test method
Tensile strength (short/long term)	2500/800 N	*E1
Max. Compressive loading	4400 N	*E3
Min. bend radius Not load	10x OD	*E11
Min. bend radius Load	15x OD	
Temperature range	-60 to +85°C	*F1

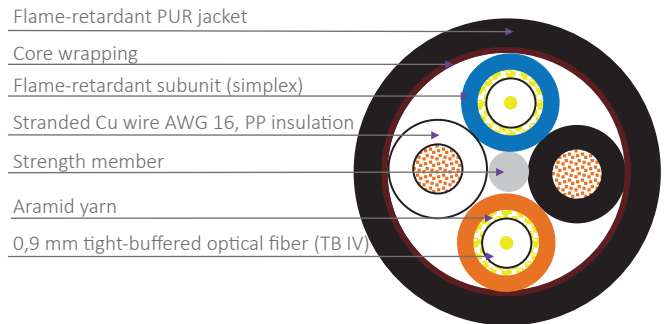
### LD cable Ordering code

LD'	XX	YY	PUR	BK
	XX – Number fibers	YY – Type of fiber S2D 9/125µm, G.652.D S7A1 9/125µm, G.657.A1 S7B2 9/125µm, G.657.B2 OM1 62,5/125µm, optimized 1 Gbps OM2 50/125µm, optimized 1 Gbps OM2 50/125µm, optimized 10 Gbps		jacket color Standard Black (code BK) Option Beige (code BE) Option Green (code OL)

NOTE:  
1) LD - single jacket cable  
LDD - dual jacket cable

## OPK-U-SPC-2(4×1,8)A9AHEU

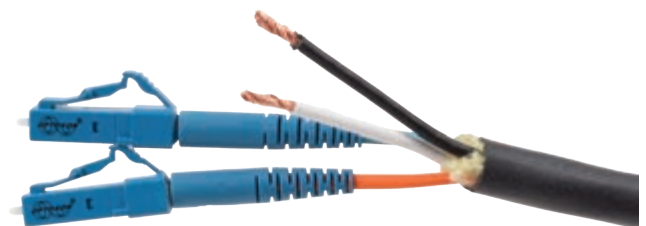
- for outdoor or indoor applications  
- for camera systems



Flame-retardant PUR jacket  
Core wrapping  
Flame-retardant subunit (simplex)  
Stranded Cu wire AWG 16, PP insulation  
Strength member  
Aramid yarn  
0,9 mm tight-buffered optical fiber (TB IV)

### Mechanical and Environmental properties

Test	Value	Test method
Wire DC resistance	< 13,7 Ω/km	
Max. Compressive loading	400 N	EN 60974-1-2-E1
Max. Impact loading	1500 N	EN 60974-1-2-E3
Max. Impact loading	15 N.m	EN 60974-1-2-E4
Min. bend radius	5x OD	EN 60974-1-2-E11
Temperature range	-40 to +70°C	EN 60794-1-22-F1



OPK-U-SPC-2(4×1,8)A9AHEU

### Ordering code

OPK-U-SPC-2(4×1,8)A9AHEU

# OPHC-02-3C

OPTOKON hybrid connector-adapter  
(fiber optic + copper wires)

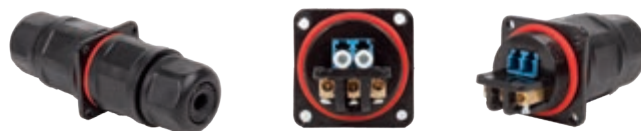


OPHC-04

The OPTOKON OPHC-xx series connector-adapter introduces hybrid rugged design fiber optic – copper wires connector. The OPHC includes the LC duplex adapter and electrical contacts in rugged housing, which allows interconnection of hybrid cables: two optical fibers terminated with LC connectors and up to three copper wires.

### Application

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



Typical configuration1:

**OPHC-02-3C:** 2x FO (LC connector) + 3x Cu wires

Note: 1) on request

**OPHC-04:** 4x FO (LC connector)

# MCS-04

Mini cable splice & OMK-SR-MCS tool kit

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.

The OPTOKON OMK-SR-MCS Mini cable splice tool kit introduces a cost effective version of the J-type MCS – Mini Cable Splice. The tool kit provides all necessary tools and components for field usable, quick repairs of tactical cables in the toughest of environments. Utilizing the proven mechanical splice in both single mode and multimode applications, there is no need for power, heat or complicated termination procedures.



MCS-04

### Application

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

OMK-SR MCS  
Includes all necessary tools  
for optical cable mechanical splicing



# LMJB-6

6-pairs Surge Protected Junction Box

The LMJB-6 Junction Box is designed for splitting of incoming multi pairs copper cable into a separate phone/data link. The heavy-duty junction box is designed for use in high-risk environments where the cost of failure is significant.

The LMJB-6 unit is designed to protect, against surge voltages, and terminals connected to telephone or data networks. The electrical diagram is based on GDT and clamping diodes to guarantee maximum efficiency. The protection printed circuit is removable for easy and fast maintenance.

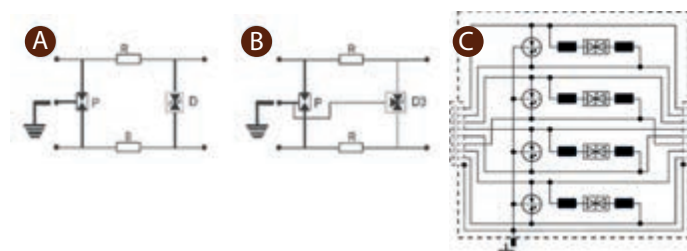
### Functionality:

- Interface: RJ-45 port, ruggedized, watertight connectors
- RJ TV series
- Mating cycles : 500 min
- 10 BaseT, 100 BaseTX and 1000 BaseT networks Cat. 6
- Mechanical: Fulfils MIL-STD 810G, IP 65 protection
- Salt Spray : > 500 h with Olive Drab Cadmium
- Thermal Shock: 5 cycles at -40 °C / +100 °C
- Temperature Range : -40 °C / +85 °C
- Dimensions: 430 x 275 x 65 mm (W x D x H)
- Weight 4 kg



LMJB-6

Application	Phone line, ADSL	ISDN-T0, 48 V line	Leased line, 4-20 mA	RS232	RS422, RS485	RJ-45 Cat. 6
Application Code	A	S	L	3	4	T
Nominal line voltage (Un)	150 V	48 V	24 V	12 V	6 V	48 V
Maximum line voltage (Uc)	170 V	53 V	28 V	15 V	8 V	57 V
Minimum clamping voltage	190 V	60 V	35 V	20 V	10 V	57 V
Protection level (Up)	220V	70 V	40 V	30 V	20 V	25 V
8/20 μs impulse - 5 kA						
Nominal discharge current (In)			5 kA			2,5 kA
8/20 μs impulse - 10 times						
Max. discharge current (Imax)			20 kA			10 kA
8/20 μs impulse - 1 time						
Lightning current (Iimp)			5 kA			0,5 kA
10/350 μs impulse - 2 times						
Type of Electrical diagram	A			B		C
End of life Short-circuit	Short-circuit					



# Cable Drums



BBD-500NR

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

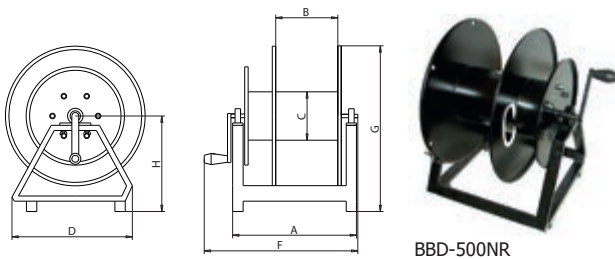
BBD-200/500  
NSN: 8130160045567

Heavy duty drum with direct crank rewind permanently attached to the axle. Designed for installation on military vehicle or a TBD-500 type trolley suitable for mobile applications.

The drum BBD-500NR is designed for winding of up to 500 m cable diameter 5.5 mm. Type BBD-1000/1500N is wider and allows storage up to 1/1.5 km cable diameter 5.5 mm.

Weight: BBD-500NR:11.4 kg, BBD-1000:13.3 kg, BBD-1500N:15.5 kg

Reel Dimensions BBD-500NR, BBD-1000/1500N (mm)							
A	B	C	D	E	F	G	H
360	210	140	330	410	480	480	280
570	420	140	330	410	690	480	280
780	630	140	330	410	890	480	280



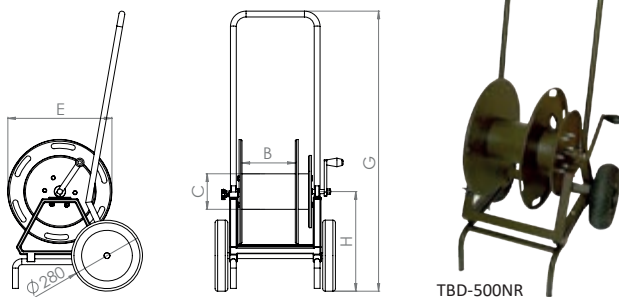
BBD-500NR

## TBD-500NR

NSN: 8130160042614, NSN: 8130160042615

Trolley drum with one-piece foot, rubber tyres and removable steel handlebars for long-term shipping and storage. Large wheel diameter allows easy field operations. The BBD drum is installed on a mobile chassis. Weight: TBD-500NR: 23 kg

Reel Dimensions TBD-500NR (mm)							
A	B	C	D	E	F	G	H
460	210	140	450	410	490	1090	390



TBD-500NR

## MBD-500 for CAPM Cassette

Termination of tactical cable with FC connectors

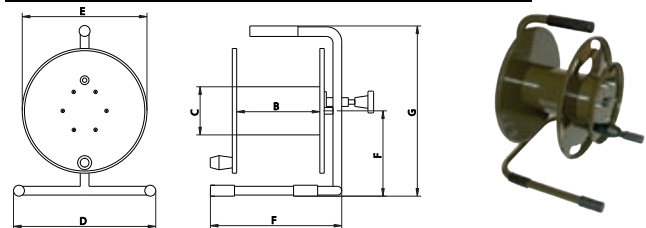


## SBD-200

NSN: 8130160037687

Small, lightweight and durable design for quick and easy use, ideal for applications where 200 m lengths of cable are deployed out over large areas. For a typical cable diameter of 5.5 mm, the SBD drum will accept 250 m of cable. Weight: SBD-200: 6.2 kg

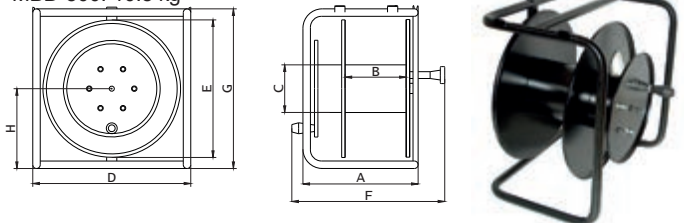
Reel Dimensions SBD-200 (mm)						
B	C	D	E	F	G	H
200	110	325	305	300	390	30



## MBD-200, MBD-500

NSN: 8130160042616

These reels are stackable for maximum transport and storage efficiency, rugged steel construction throughout, including square tubular frame. Two different drums dimensions. The MBD-200 drum will accept 200 m, the MBD-500 up to 500 m cable of 5.5 mm diameter. Weight: MBD-200: 8.0 kg, MBD-500: 10.8 kg



Reel Dimensions MBD-200, MBD-500 (mm)							
A	B	C	D	E	F	G	H
290	200	110	375	305	385	370	185
340	210	140	465	410	420	470	235

## RBD-200, RBD-500

NSN: 8130160045568

Mobile drum, with strap belts for shoulder wear. Suitable for use in the field. 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. Weight: RBD-200: 9.7 kg, RBD-500: 10.7 kg



RBD-200

RBD-500

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

# Termination, Repair & Maintenance tool kits



## OMK-SR-UNI.2

OMK-SR-UNI.2 Termination & Repair Tool Kit is designed for military connectors. Tool Kit is delivered in aluminum case suitable for military tactical applications. 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 secures tooling during transit and allows simple checking inventory. 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-UNI

## OMK-SR-SPL.2

NSN : 5180160065290

OMK-SR-SPL.2 Quick Repair Tool Kit is delivered in anticorrosive case. All instruments are placed in special pre formed plastic foam secures tooling during transit and allows simple checking inventory. Surface of case can be washed.

### Specifications

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



## OMK-SR-CLN.2

NSN: 518016AB25384

The Maintenance Clean Kit 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.

### Equipment

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



## OMK-SR-FSK.2

The OPTOKON Splice Kit OMK-SR-FSK is intended for the quick repair of damaged or broken mobile tactical optical cables. The Kit contains portable mobile fusion splicer S121A 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-moulded cut to fit each item. The Case is made from extremely resistant Copolymer Polypropylene and equipped with automatic pressure release valve.





# OMK-SR-OTS.2

## Diagnostic Set

NSN: 665016AA53320

The diagnostic set includes measuring instruments and tools for diagnosing faults on fiber optic cables with 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, lightweight
- 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
- Built-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
- Built-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



OMK-SR-OTS.2

### Rugged Case

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 wavelengths
- measurement of optical networks during construction and operation

### Equipment included in OMK-SR-OTS.2

Hard carry case	IP67
Protocol	CSMA/CD
Measuring instruments:	Light source: LS-800V-P2-FC-LED850-30 Power meter: PM-800V
Reference patch cords:	PC-280M2-J-002 HMA-J-4xPC-LD40M2-J-002 CTOS-4xPC-LD40M2-002 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

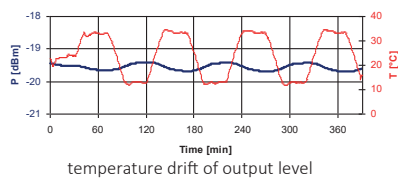


OFT-920

The OFT-920 ruggedized optical test set is designed for testing optical networks terminated with connectors operating in harsh environments. It combines both a light source and optical power meter in one common box. The test set is designed to meet 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
- Built-in Li-Pol rechargeable battery charging via USB port
- Displayed units: dBm, dB
- High dynamic range
- Up to 4 light source combinations
- Internal memory



### Czech Army part number:

OFT-920-MM-HMA2-LD850-LED30  
FT-920-MM-HMA4-LD850-LED30

### NATO stock number:

NSN: 6650-16-006-2311  
NSN: 6650-16-006-2316

# OFT-855D

## SMPTE Hybrid Cable Checker Set

The OFT-855D set consists of SMPTE Tester and SMPTE Remote unit – Loopback. The hybrid cable checker is designed for testing of optical power level in optical fibers and continuity of copper pairs in hybrid cables. It combines optical light source, optical detector and copper wires checker.

It is ideal for testing large spaces of SMPTE Hybrid System for Broadcast Infrastructure Networks. The ruggedized aluminium case makes the unit ideal for field operation. The Lithium rechargeable battery ensures long term working with minimal operation costs.

### Key Features

- Hybrid cables – fiber optic and Cu pairs checking
- Ruggedized aluminium case equipped with Display
- Automatic operation check all fibers and wires
- Able to detect incorrect fiber and wire, disconnection and short circuit connection
- Built-in charger, battery status indicator
- Easy to use

### 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	can be customized
	SM: 1310, 1490, 1550, 1625 nm	
Uncertainty	± 12%	1310, 1550 nm @ -20 dBm
Resolution	0.1	
Dynamic range	-55 dBm to +10 dBm	1300, 1310, 1490, 1550, 1625 nm, 850 nm
	-53 dBm to +17 dBm	

### General specifications

Dimensions	145 x 145 x 56 mm	without connectors
Weight	400 g	with battery
Temperature	operating	-10 to +50°C
	storage	-40 to +70°C
Humidity (non condensing)	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-855D

### Optical Light Source:

#### Output power>

850 nm, 1300 nm -26 dBm (62.5/125 μm fiber)  
1310, 1490, 1550, 1625 nm -16 dBm

#### Stability (1 hour, delta/2):

850 nm, 1300 nm ± 0.10 dB  
1310, 1490, 1550, 1625 nm ± 0.10 dB

### Optical Power Meter:

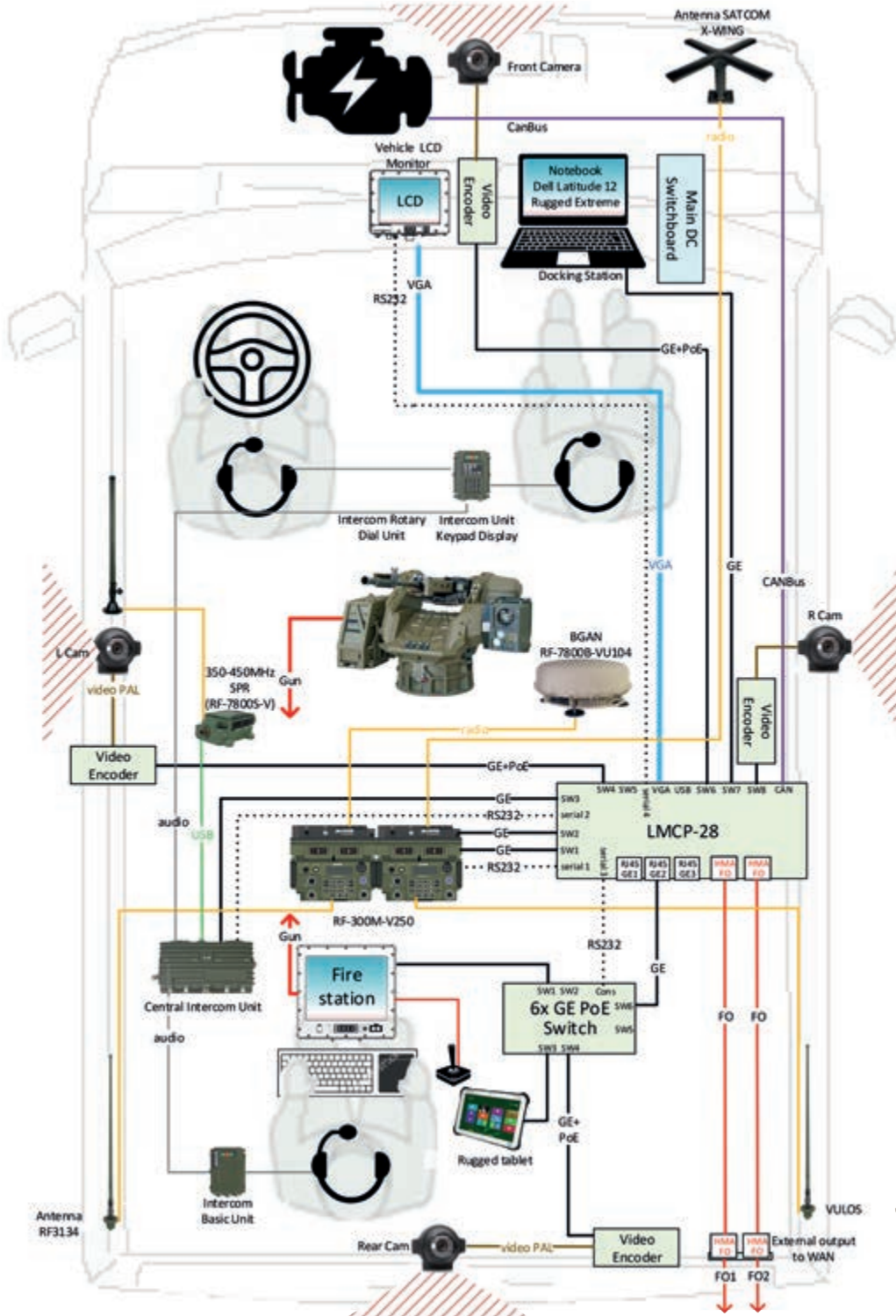
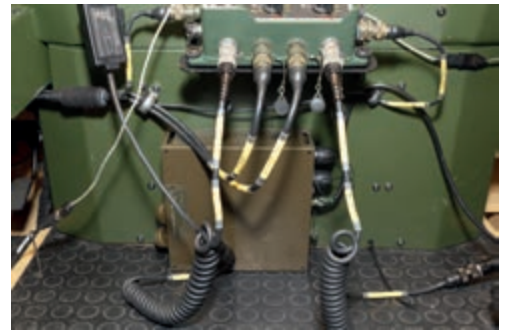
Photodetector 1 mm InGaAs

### Working wavelengths

MM: 850, 1300 nm  
SM: 1310, 1490, 1550, 1625 nm  
Uncertainty ± 12%  
Resolution 0.01  
Dynamic range -60 dBm to +10 dBm, -53 dBm to +17 dBm

# Example of implementation

Combat Communications and Radio System integrated into a wheeled combat vehicle



The driver uses a camera system with night vision and video recording (LMCP).

The commander of the vehicle is working on the Battle Management Vehicular Information System (BMVIS).

The gunman controls the Fire station and the movement of the units on his tablet with the BMVIS application.

The entire crew of the vehicle communicate via intercom (Each member can join the radio network).

Receiving data messages and voice communication is routed via LMCP-28.

Multi-mission communication with wideband networking, SATCOM and legacy narrowband interoperability provides RF-300-V250 designed for long-range applications and increased communications reliability.

Communication with the crew out of the vehicle ensures SPR (RF-7800S-V).

Land Mobile Broadband Global Area Network (BGAN) Terminal provides high-speed tactical network access to mobile units when SATCOM is the only option.





















Vehicular Satcom X-wing antenna provides SATCOM-On-The-Move applications.



LMCP-28H-NG





# Transport boxes

<p><b>Portable case</b></p>  <p>Ordering code: OPT-ZYX1-45.35.18 Ex-Size: 450x350x180 (85+95) In-Size: 390x290x150 (70+80) Weight: 4 kg</p>	<p><b>Portable case</b></p>  <p>Ordering code: OPT-BXX1-48.34.16 Ex-Size: 480x340x162 (65+97) In-Size: 420x280x140 (50+90) Weight: 3.7 kg</p>	<p><b>Portable box - BSX</b></p>  <p>Ordering code: OPT-BSX2-50.48.36 Ex-Size: 500x480x360 (100+260) In-Size: 440x420x336 (88+248) Weight: 7.7 kg</p>	<p><b>Backpack box - LGX</b></p>  <p>Ordering code: OPT-LGX6-72.49.37 Ex-Size: 720x490x370 (120+250) In-Size: 632x416x309 (100+209) Weight: 12.8 kg</p>
<p><b>Backpack box - LGX</b></p>  <p>Ordering code: OPT-LGX8-55.39.21 Ex-Size: 515x360x210 (85+50+75) In-Size: 480x325x180 (75+45+60) Weight: 7.5 kg</p>	<p><b>Easy-transport and storage box - TYX</b></p>  <p>Ordering code: OPT-TYX4-80.60.19 Ex-Size: 800x600x185 (85+100) In-Size: 726x526x122 (55+67) Weight: 9.6 kg</p>	<p><b>Backpack box - CWX</b></p>  <p>1 box unfolding folding size: 600x500 (75x425)x408 unfolding size: 1110x440x600 weight: 38 kg</p>	<p><b>Backpack box - CWX</b></p>  <p>2 boxes used together unfolding size: 1805x440x805 weight: 38 kg</p>
<p><b>Backpack box - CWX</b></p>  <p>3 boxes used together unfolding size: 2915x440x805 weight: 38 kg</p>	<p><b>Backpack box - CWX</b></p>  <p>Portable box inside the above group Ex-Size: 518x403x200 In-Size: 438x327x186.5 Weight: 4.8 kg</p>	<p><b>Backpack box - CWX</b></p>  <p>drawer1 Ex-Size: 518x403x105 In-Size: 438x327x94.5 Weight: 2.4 kg</p>	<p><b>Backpack box - CWX</b></p>  <p>drawer2 Ex-Size: 518x403x105 In-Size: 438x327x92 Weight: 2.4 kg</p>
<p><b>Footlocker box - TGX</b></p>  <p>Ordering code: OPT-TGX2-82.43.30 Ex-Size: 820x430x300 (100+200) In-Size: 755x365x240 (75+165) Weight: 10.8 kg</p>	<p><b>Footlocker box - TGX</b></p>  <p>Ordering code: OPT-TGX13-110.70.70 Ex-Size: 1100x700x700 (148+552) In-Size: 1020x620x591 (121+470) Weight: 32 kg</p>	<p><b>Footlocker box - TGX</b></p>  <p>Ordering code: OPT-TGX13A-110.70.70 Ex-Size: 1100x700x700 (148+552) In-Size: 1020x620x646 (121+525) Weight: 32 kg</p>	<p><b>Transport &amp; storage box - DLX</b></p>  <p>Ordering code: OPT-DLX1-80.60.72 Ex-Size: 800x600x720 (125+595) In-Size: 728x528x635 (80+555) Weight: 18.5 kg</p>
<p><b>Navy-customize box - HJY</b></p>  <p>Ordering code: OPT-SKM1-63.37.40 Ex-Size: 630x370x400 In-Size: 570x326x330 Weight: 14.6 kg</p>	<p><b>Navy-customize box - HJY</b></p>  <p>Ordering code: OPT-XKM1-63.37.40 Ex-Size: 630x370x400 In-Size: 570x326x330 Weight: 14.9 kg</p>	<p><b>Army-customize box for medical care - LJY</b></p>  <p>Ordering code: OPT-ZYX1-60.50.42 Ex-Size: 600x500x420 (140+280) In-Size: 528x428x370 (118+252) Weight: 13.5 kg</p>	<p><b>Army-customize box for medical care - LJY</b></p>  <p>Ordering code: OPT-TYX1-60.50.63 Ex-Size: (90+508) 600x500x630 In-Size: (60+480) 540x428x120 Weight: 20.7 kg</p>
<p><b>Army-customize box for medical care - EYX</b></p>  <p>Ordering code: OPT-TYX2-60.50.43 Ex-Size: 600x500x425 Weight: 10 kg</p>	<p><b>Ordinary box - YSX</b></p>  <p>Ordering code: OPT-YSX6-75.75.149 Ex-Size: 750x750x1490 In-Size: 660x640x1335 Weight: 66 kg</p>	<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-3UX-66.65.30 Ex-Size: (68x2+528) 664x645x295 In-Size: (30x2+550) 610x19x3U rack depth: ≤500 mm</p>	<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-4UX1-79.59.34 Ex-Size: (90x2+610) 790x590x336 In-Size: (70x2+610) 750x19x4U rack depth: ≤500 mm</p>

# Transport boxes

<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-4UX2-82.59.34 Ex-Size: (105x2+610) 820x590x336 In-Size: (72x2+610) 754x19x4U rack depth: ≤550 mm</p>	<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-4UX3-83.59.34 Ex-Size: (105+115+610) 830x590x336 In-Size: (28+72+610) 710x19x4U rack depth: ≤550 mm</p>	<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-5UX1-80.69.45 Ex-Size: (95x2+610) 800x686x454 In-Size: (67x2+610) 744x19x5U Weight: 25.5 kg , rack depth: ≤550 mm</p>	<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-5UX2-66.56.37 Ex-Size: (57x2+550) 664x560x365 In-Size: (40x2+550) 630x19x5U Weight: 19.8 kg rack depth: ≤500 mm</p>
<p><b>Shock absorber box - JZX</b></p>  <p>Ordering code: OPT-8UX4-80.57.46 Ex-Size: (147+130+530) 807x570x460 In-Size: (94x67+544) 705x19x8U rack depth: ≤500 mm</p>	<p><b>Removable hospital YLX</b></p>  <p>Ordering code: OPT-YLX1-120.80.80 Ex-Size: 1200x800x800 (200+600) In-Size: 1100x700x710 (155+555) Weight: 68 kg</p>	<p><b>Field desk ZYZ</b></p>  <p>Ordering code: OPT-ZYZ2-56.66.74 Ex-Size: 564x660 (110+550)x735 Unfolding size: 1270x540x735 Weight: 32 kg</p>	<p><b>Field desk ZYZ</b></p>  <p>drawer1: Ex-Size: 437x480x105 In-Size: 400x448x65 drawer2: Ex-Size: 437x470x120 In-Size: 400x438x113 drawer3: Ex-Size: 437x470x248 In-Size: 400x428x240</p>
<p><b>Field desk ZYZ</b></p>  <p>Ordering code: OPT-ZYZ3-64.60.73 Ex-Size: 640x600 (80+520)x730 Unfolding size: 1370x640x730 Weight: 40 kg</p>	<p><b>Field desk ZYZ</b></p>  <p>drawer1: Ex-Size: 566x480x118 In-Size: 530x455x90 drawer2: Ex-Size: 566x480x145 In-Size: 530x455x120 drawer3: Ex-Size: 566x480x228 In-Size: 530x455x200</p>	<p><b>Field desk ZYZ</b></p>  <p>Ordering code: OPT-ZYZ4-54.57.72 Ex-Size: 536x570 (70+500)x720 Unfolding size: 1228x504x720 Weight: 30 kg</p>	<p><b>Field desk ZYZ</b></p>  <p>drawer1: Ex-Size: 435x480x124 In-Size: 382x435x108 drawer2: Ex-Size: 435x480x181 In-Size: 382x435x165 drawer3: Ex-Size: 432x478x253 In-Size: 382x435x235</p>
<p><b>Field desk ZYZ</b></p>  <p>Ordering code: OPT-ZYZ5-59.50.70 Ex-Size: 590x500 (60x2+380)x700 Unfolding size: 1915x590x700 Weight: 47 kg</p>	<p><b>Field desk ZYZ</b></p>  <p>drawer1: Ex-Size: 487x378x108 In-Size: 448x352x101 drawer2: Ex-Size: 487x378x148 In-Size: 448x352x141</p>	<p><b>Field desk ZYZ</b></p>  <p>drawer1: Ex-Size: 435x480x124 In-Size: 382x435x108 drawer2: Ex-Size: 435x480x181 In-Size: 382x435x165 drawer3: Ex-Size: 432x478x253 In-Size: 382x435x235</p>	<p><b>Field desk ZYZ</b></p>  <p>drawer1: Ex-Size: 480x430x120 In-Size: 440x390x105 drawer2: Ex-Size: 480x430x250 In-Size: 440x390x230</p>
<p><b>2 in 1 desk ZHZ</b></p>  <p>Ordering code: OPT-ZHZ1-100.50.74 Single size: 1000x500x740 Weight: 17.5 kg</p>	<p><b>2 in 1 desk ZHZ</b></p>  <p>Ordering code: OPT-ZHZ3-110.55.75 Single size: 1100x550x750 Weight: 21 kg</p>	<p><b>Single desk ZDZ</b></p>  <p>Ordering code: OPT-ZDZ1-110.55.75 Single size: 1100x550x750 Folding size: 1100x550x70 Weight: 10.3 kg</p>	<p><b>Single desk ZDZ</b></p>  <p>Ordering code: OPT-ZDZ1-110.55.75 Folding size: 1100x550x70 Weight: 10.3 kg</p>

<p><b>Folding table with 8 chairs ZDZ</b></p>  <p>Ordering code: OPT-ZHCZ1-110.110.57 Unfolding size: 1100x1100x570 Weight: 33 kg</p>	<p><b>Folding table with 8 chairs ZDZ</b></p>  <p>Ordering code: OPT-ZHCZ1-110.110.57 Folding size: 1100x550x140</p>
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# HW ARCHITECTURE FOR C2/C4 ISR SYSTEM OF SYSTEMS

## Examples of implementation

### command and control centers

