



shaping the future of field optical tactical communications



## TACTICAL OPTICAL NETWORK

The complete solution

OPTOKON - your key supplier for C4 ISR command and control centers



NATO supplier code: 1583G

4<sup>th</sup> Edition

[WWW.OPTOKON.COM](http://WWW.OPTOKON.COM)



# HW ARCHITECTURE FOR C2/C4 ISR SYSTEM OF SYSTEMS

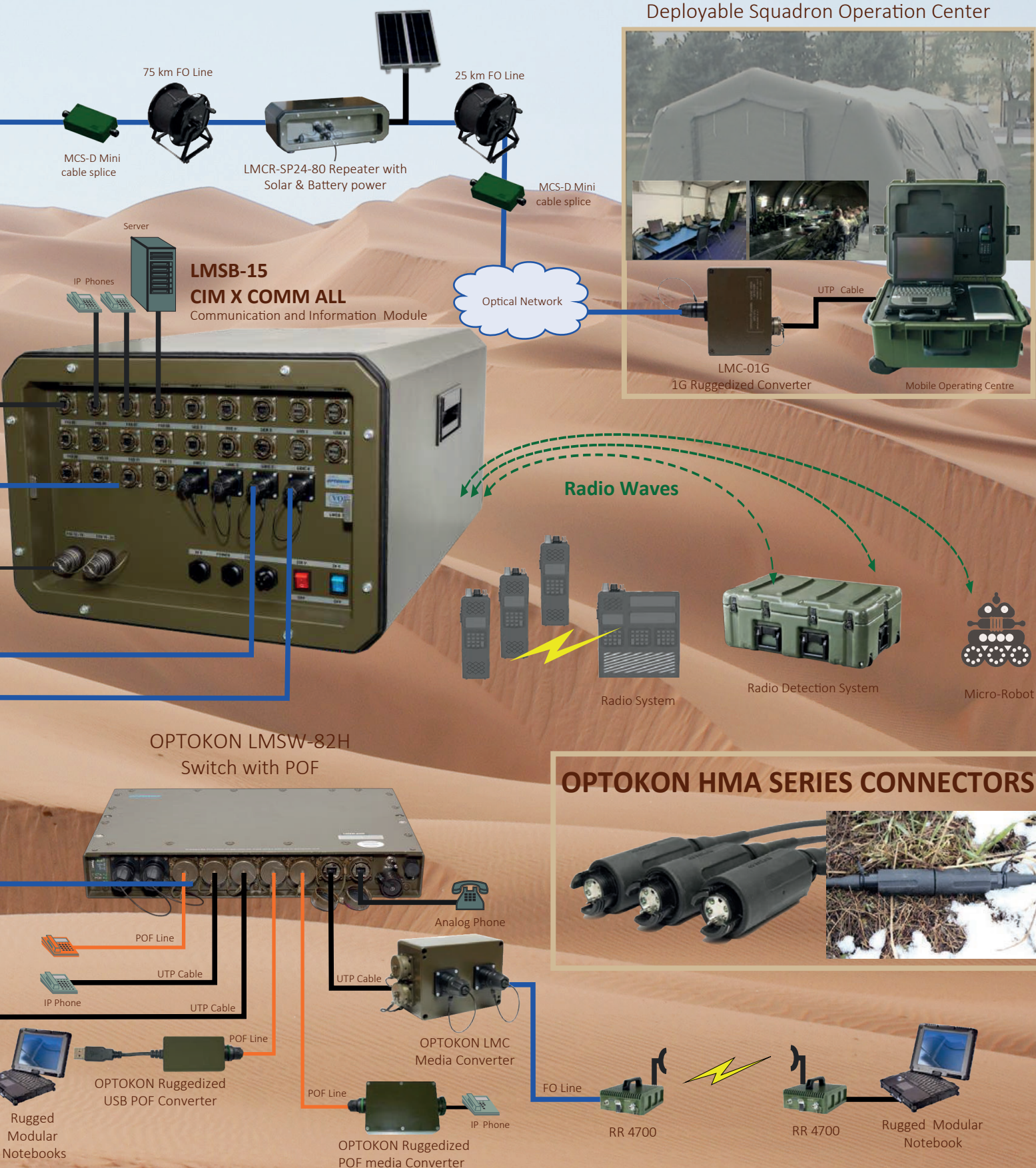


LMSW-10 & LMSW-08 ruggedized switches have been developed as part of the Integrated System for NATO Armed Forces





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



# Components for Military Communication

LMC-01.BC, LMC-01.GC, LMC-02.GC - Fast/Gigabit Ethernet Mini Media Converter Ruggedized type	5
LMC-series - Fast/Gigabit Ethernet Media Converter Ruggedized type	6
LMCR-SP24-80 - Ruggedized FO Repeater with Solar Power Supply	6
LMSW M series Ruggedized PoE Gigabit Ethernet Managed Switches	7
LMSW H series Ruggedized PoE Ethernet Managed Switches	8
LMSW E series with UPS Ruggedized PoE Ethernet Managed Switches	9
LMSW-F6 Optical Switch	10
LMR-15.A, LMR-15.B, LMR-12B (C) - Light Mobile Ruggedized Router	11
LMSB-14.1 - Ruggedized Switchboard	12
LMSB-14.1G - Ruggedized Switchboard, Extension Gateway	13
LMSB-14.2 TCS - Tactical Communication System in Rugged Rack Case	14
LMSB-14.3 Red LAN (Secret), LMSB-14.4 Black LAN - Communication and Information Module	15
LMSB-15R - Unified Communication and Information Module	16
LMSB-16C - Dispatching Touch Communication System for all wireless radio networks and all telephone types	17
LMCP-28H - Mobile Computing Platform	18
LMCP-41H - Mobile Computing Platform	19
LMS-41H – Light Mobile Server	19
LMUPS-24, LMUPS-48 - Ruggedized Uninterruptible Power Supply	20
HMA-J Series - Harsh Environmental Expanded Beam	21
HMA-S Series, HMA-M Series - Harsh Environmental Expanded Beam Connector	22
HMA-JF Series - Harsh Environmental Ferrule Connector	23
Optical cables for mobile and tactical use, LD single jacket cable	24
Optical cables for mobile and tactical use, OPK-U-SPC-2(4×1,8)A9AHEU	25
OPHC-04 - OPTOKON Hybrid Connector (fiber optic + copper wires)	25
OMK-SR-MCSJ - Mini Cable Splice Tool Kit – J type	26
MCS-04 - Mini Cable Splice	26
LMJB-6 - 6-pairs Surge Protected Junction Box	26
Cable Drums	27
Termination, Repair & Maintenance Tool Kits	28
OMK-SR-OTS.2 - Diagnostic Set	29
OFT-920 - Ruggedized Optical Test Set	30
OFTE-930 - Ruggedized Hybrid Cable Tester	30
MOT-940 - A - Mini OTDR	31
HW ARCHITECTURE FOR C2/C4 ISR SYSTEM OF SYSTEMS	32
BRIGADE MAIN COMMAND POST	34
Example of Implementation - Combat Communications and Radio System integrated into a wheeled combat vehicle	36
Example of Implementation - Cable Reel Transport Integrated solution	37
Example of Implementation - OPTOKON - Your key supplier for C4 ISR command and control centers	38
LMEC-8 - Renewable Energy Power Station Container	39
APG-20 - Automatic Power Generator	39



# LMC-01.BC

# LMC-01.GC

# LMC-02.GC

Fast/Gigabit 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 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 if use the SM fiber. LED indicators show the power status of the converter, LAN port and fiber activity.

The basic LMC-01.BC / LMC-02.BC configuration includes the media converter in ruggedized box. Data transmission and power supply are ensured via the same connectors, PoE (PD – powered device) or unused wires in data cable. Optical and copper wires cables might be ordered as accessories.

The basic LMC-01.GC 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. Power supply is ensured via 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 Supply3	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-02.GC 0.8 kg



LMC-01.GC

## Ordering code

LMC-01.BC 100M converter	- XX	- HMA	PD - (BK <sup>2</sup> )
	<b>Fiber Type</b> M5: MM 50/125 µm M6: MM 62.5/125 µm S3: SM 1310 nm	<b>Connector Type<sup>1</sup></b>	<b>Power Supply</b> PD: PoE powered <sup>3</sup>

LMC-XX.GC	- XX	- HMA	- XX	- XX - (BK <sup>4</sup> )/M
LMC-01.GC 1G converter LMC-02.GC 2x 1G converter	<b>Fiber Type:</b> M5: MM 50/125 µm M6: MM 62.5/125 µm S3: SM 1310 nm S5 <sup>3</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

Note:

- 1) HMA standard, other on request
- 2) Standard green khaki RAL 6014 mat color please use –BK in P/N code if black color RAL 9005 mat required, application: industry, broadcasting, ...
- 3) power supply: 4-5 wires +voltage, 7-8 wires –voltage

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) 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.BF

# LMC-01.GF

# LMC-02.GF

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 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.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



LMC-01.BF



LMC-02.BF

LMC-02.GFD

## 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.CZ

## Ordering code

LMC-01.BF LMC-01.GF LMC-02.GF	- XX	- HMA	- XX	- XX /(FR <sup>3</sup> )
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 <sup>4</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 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 signalization LEDs)
- 4) 1550 nm – DFB laser, 50 km distance connectivity

# LMCR-SP24-80

Ruggedized FO Repeater with Solar Power Supply

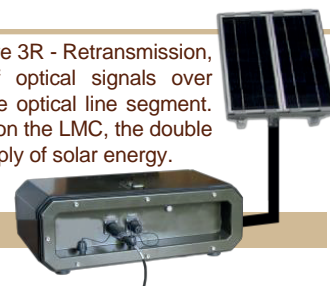
## Key Features

- 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

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.

## Ordering code

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





# LMSW M series

## Ruggedized PoE Gigabit Ethernet Managed Switches, Layer 2

2x (3x, 4x or 8x) 100/1000Base-X HMA  
4x (8x,16x, 20x or 24x) 10/100/1000Base-T

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 industrial enterprises, oil refineries and mining plants, and can be used in rescue situations 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 10-32 V DC and 230 V AC power systems simultaneously (redundant power supply). The switch operates in a wide operating temperature range -40 +70 °C.

### Key features

- Robust compact design resistant to harsh environmental conditions and rough handling
- 2x (3x, 4x or 8x) 100/1000Base-X HMA fiber connectors
- 4x (8x,16x, 20x or 24x) 10/100/1000Base-T connectors
- Interface with support of IEEE802.3af/at PoE+ output (30 W per Port) Built-in power booster designed for up to 55 V DC for PoE/PoE+ output
- Redundant dual input power 10-32 VDC/ 90-264 VAC



Optional power pack for LMSW-62M, 82M, 83M



LMSW-82M

### Specifications

Regulated PoE output voltage (55VDC) to stabilize PoE device, and guarantee delivery PoE power distance to 100meter (Figure 9) (IGS-402SM-4PH24, IGS-803SM-8PH24)	
Provides 4/8 port IEEE802.3af / 802.3at PoE output (30W per Port)	
Advanced PoE Management, PoE PD Failure Auto Checking and auto reset when PD fail, PoE port on/off weekly scheduling, PoE configuration for power planning	
Cable diagnostics, Measuring cable OK or broken point distance	
Supports Green Ethernet IEEE802.3az EEE (Energy Efficient Ethernet) management to optimize power consumption	
STP, RSTP, MSTP, ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) for redundant CABLING	
Provides 5 ring instances that each can support μ-Ring, u-Chain or Sub-Ring type for flexible uses. Supports up to 5 rings in one device.	
μ-Ring for Redundant Cabling, recovery time<10ms in 250 devices	
DHCP Server/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	
Flexibility 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 upgrade failure	
Supports IEEE1588 PTP V2 for precise time synchronization to operate in Ordinary-Boundary, Peer to Peer Transparent Clock, End to End Transparent Clock, Master, Slave mode by each port	
RMON, MIB II, Port mirroring, Event sys log, DNS, NTP IEEE802.1ab LLDP	
Supports IPv6 Telnet server /ICMP v6	
CLI, Web based management, SNMP v1/v2c/v3, Telnet server for management	
Provides SmartConfig for quick and easy mass configuration	
Supports SmartView for centralized management	
Supporting Central EMS for management of up to 50 SmartView Server	
Environmental Fulfils MIL-STD 810E	
Mechanical Fulfils MIL-STD810E, IP 63 Protection	
Temperature Operating:	-40°C to +70°C
Temperature Storage:	-40°C to +75°C
Dimensions	LMSW-42M 200 x 200 x 60 mm
(without connectors)	LMSW-62 (82, 83)M 430 x 260 x 65 mm
	LMSW-164 (204, 240)M 430 x 260 x 130 mm

### Ordering code

LMSW - XXX		M	X		X	X		XX		XX		XX			
Ports:		Platform: Industry Layer 2	PoE+ ports		Speed of RJ-45 ports		Connector type		GbE Fiber optic		Fiber distance		Power Supply		
42	4x RJ-45 + 2x 100/1000Base-X		0	-	F	100BaseX Fast Ethernet		M	MRJ	M5	MM 50/125 μm	XX	MM	AD	AC/DC
82	8x RJ-45 + 2x 100/1000Base-X		4	4x PoE+				M6	MM 62.5/125 μm	10	10 km	AC	AC		
83	8x RJ-45 + 3x 100/1000Base-X		8	8x PoE+				S3	SM 1310 nm	30	30 km	DC	DC		
164	16x RJ-45 + 4x 100/1000Base-X		16	16x PoE+	R	RJF	S5	SM 1550 nm	50	50 km					
204	20x RJ-45 + 4x 100/1000Base-X		24	16x PoE+			G	1000BaseX Gigabit Ethernet							
240	24x RJ-45														



# LMSW H series

**Ruggedized PoE Ethernet  
Managed Switches, Layer 2+  
1x or 2x 100/1000Base-X HMA  
6x (7x,8x,16x,24x) 10/100Base-TX**



LMSW-82H

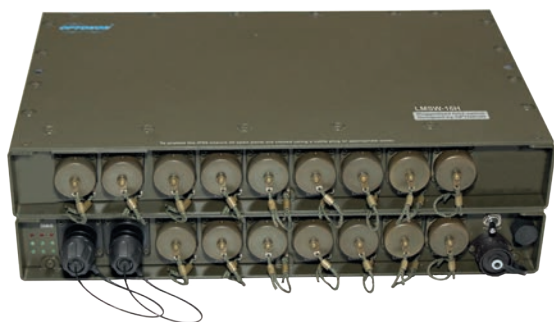
The OPTOKON LMSW-82H Switch is an ultra-rugged Cisco IOS-managed Layer 3 network switch subsystem integrating Embedded Services Switch technology. The integrated PoE Injector is designed to transmit power along with data over an Ethernet network. It is ideal for powering PoE capable devices where running an AC power feed is either not possible or cost effective.

The switch is optimized for mobile and embedded networks that require switching capability in harsh environments with an isolated MIL-STD-1275/704 power supply in an IP67 (dust/water proof) sealed aluminum chassis with MIL-C-26500 connectors. The unit provides reliable local area network (LAN) switching capabilities with the ease of use, secure access, and manageability expected from Cisco based-technology.

Two levels of Cisco IOS software (LAN Lite or LAN Base) are available to support access layer connectivity and needs for data security, voice, and video traffic at the network edge for stationary or mobile-network-nodes.

## 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 100Base-TX Ethernet ports
- LAN 1-4 or 1-8 10/100Base-T with PoE
- PoE Standard IEEE 802.3af, 15.4 Wats per port
- Redundant dual power supply
- 10-30 V DC / 90-264 V AC
- RS-232 console
- Operating Temperature: -40 to +80 °C
- Storage Temperature: -40 to +85 °C



LMSW-16H

## 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 2 routing	IPv4 Static Routing
Interface	Metallic - mechanical resistant, watertight connectors Optical - HMA-J 20/125 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 2km SM optical cable, full duplex: 10, 30, 50 km
Environmental Temperature	Fulfils MIL-STD 810E Operating: -40 °C to +80 °C Storage: -40 °C to +85 °C
Humidity	10% to 95%
Mechanical	Fulfils MIL-STD 810E, IO 63 protection
Power supply: Redundant DC/AC	10 - 30 V DC 90-264 V AC external rugged adapter 250W Optional Powerpack
Dimensions (without connectors)	LMSW-62(71,82)H 430 x 260 x 65 mm LMSW-162(242)H 430 x 260 x 130 mm



Optional UPS power pack for LMSW-62H, 71H, 82H

## Ordering code

LMSW - XXX		H	X		X	x		XX		XX		XX	
Ports:		Platform: Cisco ESS-2020 Layer 2+	PoE+ Number ports		Software Licence	Connector type		GbE Fiber optic		Fiber distance		Power Supply	
62	6x 10/100Base-T + 2x 100/1000Base-X		0	-	L	LAN Lite	M	M5	MM 50/125 µm	XX	MM	AD	AC/DC
71	7x 10/100Base-T + 1x 100/1000Base-X		4	4x PoE+	B	LAN Base	R	M6	MM 62.5/125 µm	10	10 km	AC	AC
82	8x 10/100Base-T + 2x 100/1000Base-X		8	8x PoE+				S3	SM 1310 nm	30	30 km	DC	DC
162	16x 10/100Base-T + 2x 100/1000Base-X		16	16x PoE+				S4	SM 1550 nm	50	50 km		
242	24x 10/100Base-T + 2x 100/1000Base-X												

# LMSW E\* series with UPS

Ruggedized PoE Ethernet  
Managed Switches, Layer 3  
2x 100/1000Base-X HMA  
8x or 16x 10/100/1000Base-T  
2x FXS voice port VoIP

Army code: LMSW-10(M)



LMSW-10M

The OPTOKON LMSW E series Ethernet Switch is a compact, ruggedized access switch that handle security, voice, and video traffic across harsh environment networks. Ethernet Series Switches are fixed platforms that deliver Layer 2 switching with proven Cisco IOS Software. Their extensive certifications, as well as a wide range in power supply voltage input with uninterruptible power source and operation temperature, make them suitable for almost all harsh environment applications. The switch provides customers with highly secure access and military and industry-leading convergence using Cisco Resilient Ethernet Protocol (REP). The switch is designed for low cost, low ports, and small sizes

## Key Features

- Robust compact design, resistant to harsh environmental conditions and rough handling
- 2x 100/1000Base-X FO HMA-J uplink ports
- 8 or 16x 10/100Base-TX Ethernet ports
- LAN 1-4 with PoE (2x PoE+)
- PoE Standard IEEE 802.3af, 15.4 Wats per port
- Redundant dual power supply: 10-30 V DC  
90-264 V AC
- RS-232 console, Fast Boot, Express Setup, Web Device Manager
- Operating Temperature: -40 to +75 °C
- Storage Temperature: -40 to +85 °C

The LMSW 10 ruggedized switch has been developed as a part of the Integrated System (ISSR) for Armed Forces of the Czech Republic  
Czech Army Technical specifications: TP-LMSW10-OPT01-08



## Product Specifications

Easy deployment: Zero-touch discovery using Dynamic Host Control Protocol (DHCP), express setup, and fast bootup time (60 seconds) to help in migrating to an Ethernet environment without resistance

Security: 802.1x, port security, and DHCP allow dynamic port-based authentication; Secure Shell (SSHv2); SNMPv3 provides encrypted administrator traffic during Telnet and SNMP sessions; TACACS+ and RADIUS authentication facilitate centralized control and restrict unauthorized users

Resiliency: Cisco REP ring protocol and PROFINET- Media Redundancy Protocol (MRP)

Manageability: Auto SmartPort, Web Device Manager, Telnet, HTTPS access, SNMP, CNA, and Cisco Prime Infrastructure

Network Address Translation (NAT): Line-rate, hardware-enabled 1:1 static address translation designed to enable duplicate IP address usage in the Layer 2 machine node networks

Layer 3 routing: IPv4 and IPv6

Industrial PoE: PoE (IEEE 802.af) and PoE+ (802.3at) supported on selected models

## Switch Performance and Scalability

Maximum Forwarding/ Switching Bandwidth 3.8/7.6 Gbps

Maximum Forwarding rate: 5.66Mpps with 64-byte packets (Line-rate at all packet sizes)

Egress buffer: 2 MB; Unicast MAC addresses: 8000

Internet Group Management Protocol (IGMP) multicast groups: 255

Maximum virtual LANs (VLANs): 1005

IPv4 routing: 3500 routes, IPv6 routing: 1750 routes

## VoIP gateway

- Is provided with 2 FXS port onboard for connecting analogue telephone and facsimile sets, USB port is intended for connecting 3G/4G modem
- All basic audiocodex used in VoIP networks (G.711, G.723.1, G.726, G.729)
- Supporting automated control on the basis of TR-069 and protocols

## Power supply with UPS

- Input 10 - 30 V DC, 6A , input start/stop voltage thresholds (default start at 11 V, stop at 6 V) or 100 - 242 V AC.
- Battery Capacity Li-Ion - 21.6 V - 13.4 Ah.
- Backup Time: without PoE, at least 10 hours

Dimensions (W x D x H): 374 x 242 x 184 mm

## Ordering code

LMSW	XXX	E	X	X	X	XX	XX	XX
Light Mobile SWITCH	Ports:		PoE(+) ports	Combo ports	Software Licence	GbE Fiber optic	Fiber distance	Power Supply
82	8x 10/100Base-T + 2x 100/1000Base-X	Platform: Cisco IE-2000 Layer 3 routing	0	0	L	M5	XX	AD
162	16x 10/100Base-T + 2x 100/1000Base-X		4	2	B	M6	10	AC
			8	2	E	S3	30	DC
					P	S5	50	DC



# LMSW-F6

## Optical Switch



LMSW-F6

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 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.

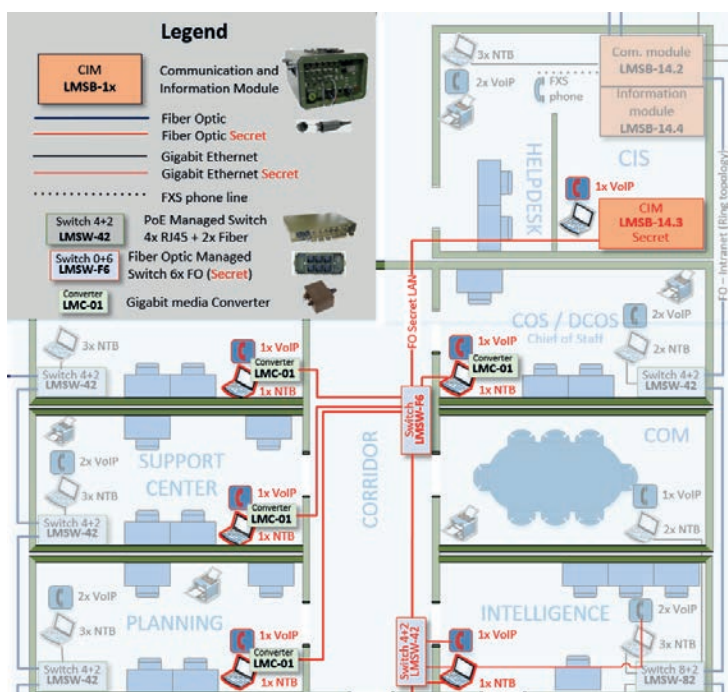
### Key Features

- 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 60 V DC
Optional power pack	
Dimensions	205 x 83 x 175 mm (W x D x H)

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



# LMR-15.A

# LMR-15.B

# LMR-12B (C)

## Light Mobile Ruggedized Router



LMR-15.A

The LMR-15 is a rugged Cisco IOS-managed mobile 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 Cisco 5915 ESR 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 Fast Ethernet interfaces (two routed and three switched), and a rich Cisco IOS Software feature set, providing investment protection for customers deploying bandwidth-intensive applications in mobile or embedded networks in mobile, airborne, ground, manned or unmanned vehicle and sensor applications.

### LMR-15 Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- Two routed combo ports Fast Ethernet/ Serial line RS232 and three switched Fast Ethernet interfaces
- Onboard hardware acceleration
- High performance in a small form factor
- Cisco Mobile Ready Net with self-forming temporary ability
- Sophisticated networking capabilities such as quality of service (QoS) to ensure the most important data gets through when links are degraded
- Security to protect the network and the data transmitted over the network
- Remote voice services with Cisco Unified Communications Manager Express (Cisco Unified CME) supports up to 48 phones for remote IP telephony
- Streaming multicast video support
- Input power 10-30 V DC (optional powerpack)



Optional power pack for LMR-15

The LMR-12 is a rugged Low-Cost router with five to eight 10/100/1000 Ethernet ports and with cutting edge multicore CPU. If you need many millions of packets per second - Cloud Core Router is your best choice.

The cloud core router is powered by RouterOS, a fully featured routing operating system which has been continuously improved for fifteen years. Dynamic routing, hotspot, firewall, MPLS, VPN, advanced quality of service, load balancing and bonding, real-time configuration and monitoring - just a few of the vast number of features supported by RouterOS. RouterOS is MikroTik's stand-alone operating system based on linux with standalone Windows GUI configuration tool, Powerful command-line and advanced web based configuration interface.

The LMR-12C has seven to eight Gigabit ethernet ports, a serial console cable and a USB port. The LMR-12C has two SODIMM slots, by default it is shipped with 2GB of RAM, but has no memory limit in RouterOS (will accept and utilize 16GB or more).

The LMR-12C utilizes the ruggedized aluminum case design of the LMSW switches tested in Military Environmental standard MIL-STD-810G.

It comes with 10,5 to 30 VDC power supply and 1U rack mount kit.

### LMR-15 Specifications

- Cisco 5915 Embedded Services Router
- Onboard hardware encryption processor (IPsec, SSL/TLS, Secure RTP, 3DES, AES, IKE)
- Memory: DRAM 512 MB, Flash memory 256 MB
- One RS-232 console port
- Two versions of connectors used (Amphenol/RJ-45)
- Temperature operating -40°C to +80°C, storage -40°C to +85°C
- Humidity 10% to 95%
- Altitude up to 4 500 m
- Fulfills MIL-STD 810E, IP 63 protection
- Dimensions 85 x 185 x 180 mm (W x D x H), weight 2,5 kg



LMR-12B

### LMR-12 Specifications

#### Firewall

- Statefull filtering, Source and destination NAT
- NAT helpers (h323, pptp, quake3, sip, ftp, irc, tftp)
- Internal connection, routing and packet marks
- Filtering by IP address and address range, port and port range, IP protocol, DSCP and many more
- Address lists, Custom Layer7 matcher

#### Routing

- Policy based routing, Interface routing
- IPv4 dynamic routing protocols: RIP v1/v2, OSPFv2, BGP v4
- IPv6 dynamic routing protocols: RIPng, OSPFv3, BGP

#### VPN

- Ipsec – tunnel and transport mode, certificate or PSK, AH and ESP security protocols.
- Point to point tunneling ( OpenVPN, PPTP, PPPoE, L2TP, SSTP)
- Advanced PPP features (MLPPP, BCP)
- Simple tunnels ( IP/IP, EoIP) IPv4 and IPv6 support
- 6to4 tunnel support (IPv6 over IPv4 network)
- VLAN – IEEE802.1q Virtual LAN support, Q-in-Q support
- MPLS based VPNs

#### DHCP

- Per interface DHCP server
- DHCP client and relay
- Static and dynamic DHCP leases
- RADIUS support
- Custom DHCP options
- DHCPv6 Prefix Delegation (DHCPv6-PD)
- DHCPv6 Client



## Ruggedized Switchboard



The LMSB-14.1 series includes a microprocessor board with PBX software. The PBX server is based on SIP standard (Session Initiation Protocol), which can handle more than 30 VoIP connections simultaneously. There are two FXS cards on the microprocessor board for connection analog phone sets via the connector on the front panel in the basic LMSB-14.1 series configuration. The IP phones can be connected to LAN ports; some of these are able to provide PoE 802.3af to connected devices. The other IP phones can be connected to switches used in overall LAN installation. The total number of phones in the PBX network is about 300.

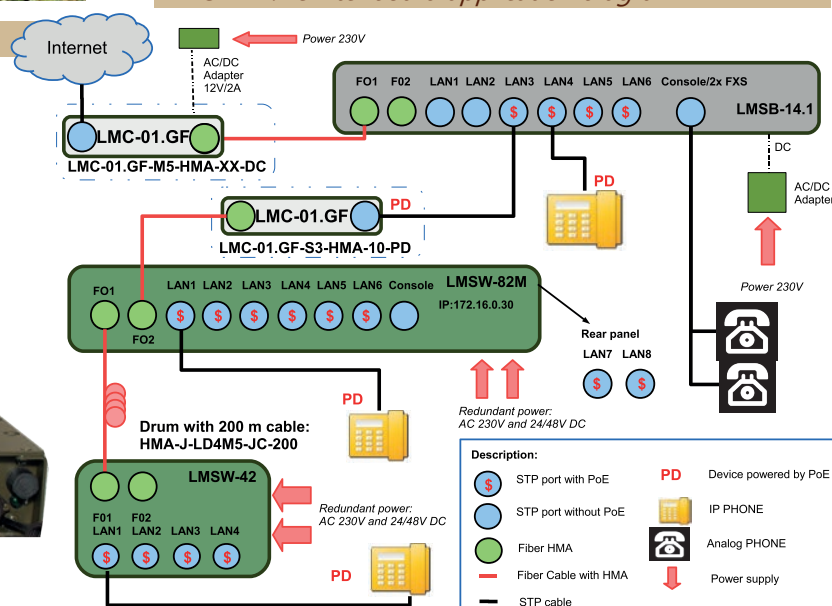


## Optical Interface

Note: 1) HMA-J (Expanded Beam) standard, other on request

### Key Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- WAN interface:
  - 1x FO optical interface, either MM or SM
- LAN interface
  - 1Gbps ports
  - 100 Mbps ports with PoE 802.3af
- Console port
- Power supply 10-36 V DC (optional powerpack)



<b>LMSB-14.1(B<sup>1</sup>)</b>	<b>- XX - XX</b>	<b>-</b>	<b>X<sup>1</sup></b>	<b>40</b>	<b>-</b>	<b>DC</b>
FO - WAN uplink port <b>XX:</b> Fiber optic <b>XX:</b> Distance (FO)			Gigabit LAN interface <b>3</b> 3 Gbps ports LMSB-14.1 <sup>1</sup> <b>5</b> 5 Gbps ports LMSB-14.1B <sup>1</sup>	Interfaces <b>4</b> 100 Mbps, PoE <sup>3</sup> <b>0</b> FXS ports		Power supply <sup>4</sup> <b>DC:</b> 10-36 V DC

- 1) LMSB-14.1- up to 3x 10/100/1000Base-TX and 4x 10/100Base-TX with PoE, **RJF connectors**, 1x FO LMSB-14.1B-up to 5x 10/100/1000Base-TX and 4 x 10/100Base-TX with PoE, **MRJ connectors**, 1x FO
- 2) MM fiber – the distance depends on fiber type, up to 2 km. SM fiber – other wavelength and distance on request
- 3) IEEE 802.3af, PoE (Power over Ethernet) – PSE, power supplying equipment
- 4) standard power supply: DC, please define if required different

# LMSB – 14.1G

Ruggedized Switchboard,  
- extension gateway

# LMSB – 14.1F

Ruggedized Switchboard, FXS gateway



LMSB-14.1G gateway



LMSB-14.1F gateway

The LMSB-14.1G introduces a ruggedized gateway for connection to PBX - switchboard designed for use in harsh environmental conditions. It offers FXS ports for analogue phone sets, FXO ports for connection to PVX lines, E&M interfaces for cooperation with radio systems and E1 digital line. The LMSB-14.1G gateway can be connected to tactical network via 100 Mbps Ethernet line or via up-link port based on optical fibers cable, which is equipped with HMA Expanded Beam connector.

## LMSB 14.1G Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- WAN interface:
- 1x 10/100Base-TX RJ-45 port
- 1x FO optical interface<sup>1</sup>,
- FXS interfaces 2, FXO interfaces 3
- E&M ports, 1x E1 port, Console port
- Power supply 10 - 36 V DC

The LMSB-14.1F introduces a ruggedized FXS gateway for connection to PBX - switchboard designed for use in harsh environmental conditions. It offers FXS ports for operation of analogue phone sets. The LMSB-14.1F gateway can be connected to tactical network via 100 Mbps Ethernet line or via up-link port based on optical fibers cable, which is equipped with HMA Expanded Beam connector.

## LMSB 14.1F Features

- Robust compact design resistant to harsh environmental conditions and rough handling
- WAN interface:
- 1x 10/100Base-T(X) RJ-45 port
- 1x FO optical interface<sup>1</sup>,
- FXS interfaces<sup>2</sup>
- Console port
- Power supply 10 – 36 V DC

## Ordering code:

Note:

- 1) define the number of relevant ports
- 2) other type of interface upon request (MB, BRI, ..)
- 3) MM fiber – the distance depends on fiber type, up to 2 km.  
SM fiber – other wavelength and distance on request
- 4) standard power supply: DC, please define if required different
- 5) total number of analogue modules is 8, it might be combined as follows:
  - 9.1 FXS module 4 ports (8 x 4 = 32 FXS ports)
  - 9.2 FXO module 2 ports (8 x 2 = 16 FXO ports)
  - 9.3 E&M module 2 ports (8 x 2 = 16 E&M ports)
- 6) other type of interface upon request (FXO, E&M, E1, MB, BRI, ..)
- 7) MM fiber – the distance depends on fiber type, up to 2 km, SM fiber – other wavelength and distance on request

LMSB-14.1G	-	UTP XX - XX	-	FXS - FXO - EM - E1 <sup>1,2,5</sup>	-	DC
WAN uplink port: UTP / Fiber Optic				Analogue/ digital interface		Power supply <sup>4</sup>
XX: Fiber optic		XX: Distance (FO)		FXS 0 – 32 FXS		DC:
M5 MM 50/125 µm		XX <sup>3</sup> Multimode		FXO 0 – 16 FXO		10-36 V DC
M6 MM 62.5/125 µm	10	10 km		EM 0 – 16 E&M		
S3 SM 1310 nm	30	30 km		E1 1x E1 2 Mbps		

## Technical Parameters

### WAN Interface

Connector	HMA-J4
Cable type	MM: 62.5/125 µm, 50/125 µm or SM: 9/125 µm
Data rate	1000Base-FX
Wavelength	MM: 1300 nm, SM: 1310, 1550 nm

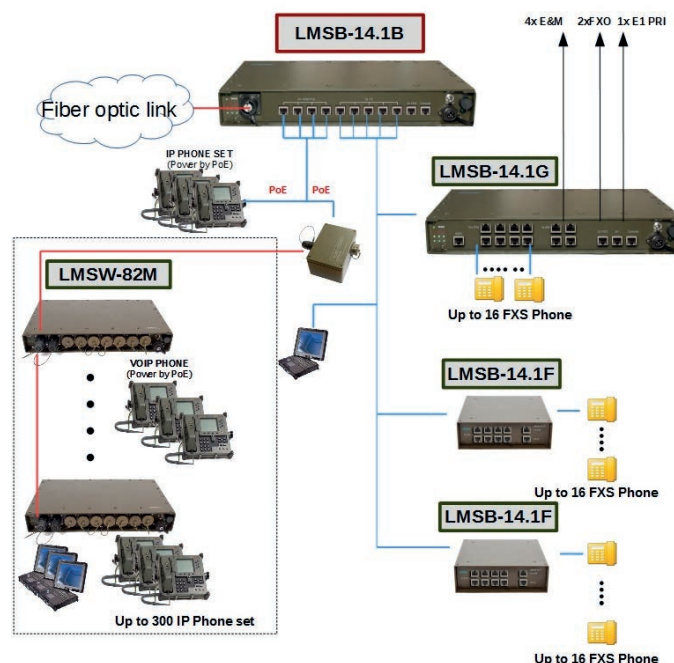
### UTP

Connector	RJ-45
Data rate	10/100Base-TX
Cable	10Base-T Cat. 3, 4, 5, UTP, 10/100Base-TX Cat.5, 5e or higher

### 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 2x FXS or analog fax
Console	Connector 1x RJ-45 – serial line
RS232	Data rate 115.200 kbps, 8 bits, 1 stop bit, no parity

## Application diagram:



LMSB-14.1F	-	UTP XX - XX	-	16 <sup>6</sup>	-	DC
WAN uplink port: UTP / Fiber Optic				Analogue/ digital interface		Power supply <sup>4</sup>
XX: Fiber optic		XX: Distance (FO)		FXS 16x FXS		DC:
M5 MM 50/125 µm		XX <sup>7</sup> Multimode				10-36 V DC
M6 MM 62.5/125 µm	10	10 km				
S3 SM 1310 nm	30	30 km				



# LMSB-14.2 TCS

## Tactical Communication System in Rugged Rack Case



LMSB-14.2 TCS

The LMSB-14.2 TCS is cutting edge, Voice over IP (VoIP) and comprehensive Networking solution for users in harsh environments. Combining rugged high-performance VoIP gateway, Switch, Router and high reliability power conditioning with temperature control in deployable shock-isolation case provides the ultimate solution for operating in challenging tactical situations. The LMSB-14.2 is a unified communications call control platform that can connects any PC and Phone subscribers 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 TCS is connected to a higher system via optical and metallic cables, radio relay systems and satellite devices.

The LMSB-14.2 module has a built-in DC/AC inverter with UPS function and can be powered from any local power grid, generator, vehicle. The LMSB-14.2 is also designed to power supply Computing and Information Module LMSB-14.4 CIM.

### 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

### The LMSB 14.X includes

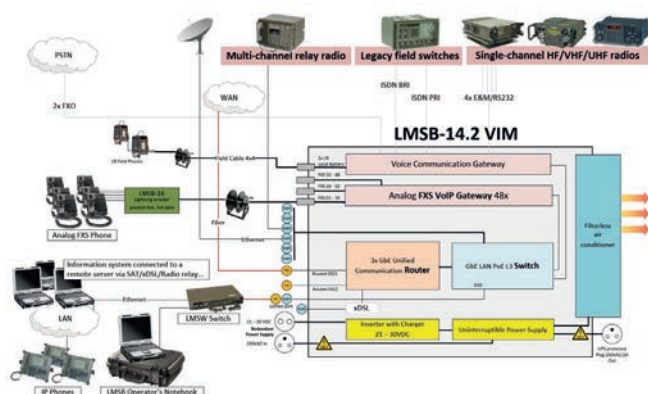
#### LMSB-14.2 Main Communication block, ensures power supplying for LMSB-14.4 as well

- LAN block - Managed L3 PoE switch
- Router and Call manager - 24x FXS port
- Power supply with UPS
- VoIP Gateway
- Air conditioning system

#### LMSB-14.3 Red LAN secret Information Module (with Power Supply)

- LAN block - Managed L3 PoE switch
- Router and Call Manager - 24x FXS port
- Main and BackUp Server
- Air conditioning system
- Power supply with UPS

**LMSB-14.4 Black LAN Information Module** with Application and Video server - video projection of C2/C4 simulations, respective 3D projections. Power Supply and VoIP function provides LMSB-14.2.



### Product Specifications

Cisco Router with Unified Communications	<ul style="list-style-type: none"> <li>● WAN performance of up to 2 Gbps, even during heavy traffic loads.</li> <li>● A range of WAN access connectivity options such as 4G, LTE, T1/E1, T3/E3, xDSL, serial, and fiber Gigabit Ethernet</li> <li>● Performance 50 Mbps upgradable to 100 Mbps</li> <li>● Default Flash (DRAM)/ max Flash (DRAM): 4/8 GB</li> <li>● 100 SIP/H.323 sessions</li> <li>● Maximum 16 switched Ethernet ports, PoE support</li> </ul>
Voice Communication Gateway (VCG)	<ul style="list-style-type: none"> <li>● VoIP services with support of SIP and IAX protocols</li> <li>● Interfaces to and integration of digital and analogue telephone systems</li> <li>● Automatic access to radio networks</li> <li>● Radio access control via RS-232 or Ethernet interface</li> <li>● Proprietary radio management SW with broad spectrum of configurable functions and option to be customized to the specific radios of a customer</li> <li>● Remote GUI based management for a user friendly control of the radio communications and configuration of the VCG</li> <li>● Configurable interconnection between all voice interfaces</li> <li>● QoS, IEEE 802.1q, IEEE 802.1x support, SNMP support</li> </ul> <p>Interfaces:</p> <ul style="list-style-type: none"> <li>- 1x E1 (ISDN PRI)</li> <li>- 1x ISDN BRI (2B+D)</li> <li>- 2x FXS analogue interface</li> <li>- 2 x FXO</li> <li>- 2 x LB (Local battery)</li> <li>- 4 x E&amp;M radio analogue interface</li> </ul>
VoIP analog Gateway	<ul style="list-style-type: none"> <li>● 24x, 36x, 72x FXS ports,</li> <li>● maximum length of line – 6 km, current and voltage port protection</li> <li>● PBX functionality, high quality Voice</li> <li>● support of all basic audio codecs used in VoIP-networks (G.711, G.723.1, G.726, G.729)</li> <li>● automated control on the basis of TR-069 and DHCP (DHCP-autoprovision)</li> </ul>
Switch	<ul style="list-style-type: none"> <li>● 10, 12 or 24 port design, PoE support</li> <li>● Layer 2+ and Layer 3 capable</li> </ul>
UPS Capacity	<ul style="list-style-type: none"> <li>● 5 - 10 min</li> </ul>
Power supply	<ul style="list-style-type: none"> <li>● Input 21-30 VDC/ 230 VAC (any is main or backup - redundant)</li> <li>● Power Consumption up to 227 W max (577 W with air conditioner)</li> <li>● Output for LMSB-14.4 up to 505 W max (732 W with air conditioner)</li> </ul>
Environmental temperature and humidity	<ul style="list-style-type: none"> <li>● Fulfills MIL-STD 810E, IP 63 protection</li> <li>● Operating: -30°C to +50°C</li> <li>● Storage: -40°C to +65°C</li> <li>● Humidity 10% to 95%</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>● 583 x 845 x 400 mm (W x D x H)</li> </ul>



# LMSB-14.3 Red LAN (Secret)

# LMSB-14.4 Black LAN

## Communication and Information Module



LMSB-14.3

The LMSB-14.3(4) is a Communication and Information Module (CIM) 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 V DC and 230 V AC 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 50 - 90 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

Cisco Router with Unified Communications	<ul style="list-style-type: none"> <li>● WAN performance of up to 2 Gbps, even during heavy traffic loads.</li> <li>● A range of WAN access connectivity options such as 4G, LTE, T1/E1, T3/E3, xDSL, serial, and fiber Gigabit Ethernet</li> <li>● Performance 50 Mbps upgradable to 100 Mbps</li> <li>● Default Flash (DRAM)/ max Flash (DRAM): 4/8 GB</li> <li>● 100 SIP/H.323 sessions</li> <li>● Maximum 16 switched Ethernet ports, PoE support</li> </ul>
24x FXS subscribers	<ul style="list-style-type: none"> <li>● 12x RJ-45 ports, 12 lines in two MP34 (3x4 pairs) or MP54 (5x4 pairs) connectors</li> <li>● SIP protocol for analog phones, fax machines and legacy PBX systems. SIP sessions: 200</li> </ul>
VoiP analog gateway ports	<ul style="list-style-type: none"> <li>● Supported voice/Fax codecs include G.711, G.723.1, G.726A/B, iLBC, T.38 Fax</li> <li>● Identity management using authentication, authorization, and accounting (AAA) and public key infrastructure</li> <li>● Embedded hardware-accelerated VPN encryption</li> <li>● 4 SIP Server profiles per system and independent SIP account per port</li> </ul>
Main Server	<ul style="list-style-type: none"> <li>● 10 x 2.5" hot-swap SAS/SATA drive bay</li> <li>● Dual socket R3 (LGA 2011) supports Intel® Xeon® processor E5-2600 v4/ v3 family</li> <li>● Up to 2TB ECC 3DS LRDIMM , up to DDR4- 2400+MHz ; 16x DIMM slots</li> </ul>
BackUp Server	<ul style="list-style-type: none"> <li>● Riser card support: 1 PCI-E 3.0 x32, 1 PCI-E 3.0 x16</li> <li>● Intel® X540 Dual port 10GBase-T</li> <li>● 10x SATA3 (6Gbps); RAID 0, 1, 5, 10</li> <li>● Integrated IPMI 2.0 and KVM with Dedicated LAN</li> <li>● 6x USB 3.0 (4 rear, 2 via header)</li> <li>● Total 10 System Ports Gigabit Ethernet + Two mini-GBIC expansion slot</li> </ul>
Managed PoE L3 Switch	<ul style="list-style-type: none"> <li>● 8x any of the RJ-45 ports support 802.3af PoE and 802.3at PoE, Maximum power of 15.4 W</li> <li>● Switching can be fully managed using the Web GUI or CLI</li> <li>● Switching Capacity 20 Gigabits per Second</li> <li>● Support for up to 4096 VLANs simultaneously, Voice VLAN, Multicast TV VLAN</li> <li>● IP telephony support: embedded QoS intelligence to prioritize delay-sensitive services</li> <li>● Static routing/Layer 3 switching between VLANs</li> <li>● IPv4 DHCP Server, IPv6 support</li> </ul>
UPS capacity	<ul style="list-style-type: none"> <li>● 5-10 min</li> </ul>
Strong security	<ul style="list-style-type: none"> <li>● Embedded security, Extensive access control lists (ACLs), Guest virtual LANs (VLANs), Bridge Protocol Data Unit (BPDU), Secure Core Technology (SCT)</li> </ul>
Surge protection	<ul style="list-style-type: none"> <li>● Nominal discharge current (8/20 <math>\mu</math>s) In 20 kA Maximum discharge current (8/20 <math>\mu</math>s) I<sub>max</sub> 40 kA</li> </ul>
Power supply	<ul style="list-style-type: none"> <li>● Input 21 to 30 V DC/160 - 294 V AC (any can be used for main or backup - redundant)</li> <li>● Power Consumption up to 227 W max (577 W with air conditioner)</li> <li>● Output for LMSB-14.4 up to 505 W max (732 W with air conditioner)</li> </ul>
Temperature and humidity	<ul style="list-style-type: none"> <li>● Fulfils MIL-STD 810E, IP 63</li> <li>● Operating -30°C to +50°C, Storage -50°C to + 65°C</li> <li>● Humidity 10% to 95%</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>● 583 x 845 x 400 mm (W x D x H)</li> </ul>



# LMSB-15R

## Unified Communication and Information Module

The LMSB-15R is the Unified Communication and Information Module that can connect up to 200 SIP/H.323 sessions, PC subscribers and any type of communication systems (VHF, HF, UHF, SAT, TETRA, GSM, PSTN, etc.). The LMSB-15R includes Gigabit Ethernet switching and routing functions and the LAN ports are equipped with enhanced PoE capability. The workstation architecture is built on the Cisco enterprise-class network.


The connection of the LMSB-15R module to a higher network level is ensured via optical and copper wires cables, radio relay systems or satellite communication devices. The standard fiber optic interface is equipped with single mode HMA-J connectors, operation at wavelength 1310 nm. The LMSB-15R also includes an encryption unit for operation of classified data. The kit is designed for classification up to the SECRET level and supports the full suite of Cisco feature sets for enterprise-class security and reliability against man-in-the-middle attacks and keeps your Cisco environment secure.

The technical solution allows to use the module in mobile communication nodes. The module is fitted with a built-in inverter with UPS function.

### Key Features

- Flexible integration of IP communication
- System mobility and modularity
- Local or network operation with Unified Communications Manager Express
- Ruggedized and weather-proof design
- Easy and fast installation
- 2x FO HMA-J, single mode 1310 nm
- Copper cable, RRL and satellite connection Proven Expanded Beam HMA connector technology
- Based on Cisco IOS technology
- Interoperation with radio systems
- Rugged ALU 6U or plastic 6U (8U) box

### LMSB-15 Series Unified Communication Module (Demonstration of three variants)

LMSB-15 W	LMSB-15 S																						
<table border="1"> <tr> <td>Inverter</td><td>AKU</td></tr> <tr> <td colspan="2">Gigabit L3 Switch 8-port</td></tr> <tr> <td colspan="2">SERVER Main 1U</td></tr> <tr> <td colspan="2">SERVER Backup 1U</td></tr> <tr> <td colspan="2">Router - Unified Communications Manager</td></tr> <tr> <td colspan="2">NAS or 24 port PoE switch</td></tr> </table>	Inverter	AKU	Gigabit L3 Switch 8-port		SERVER Main 1U		SERVER Backup 1U		Router - Unified Communications Manager		NAS or 24 port PoE switch		<table border="1"> <tr> <td>Inverter</td><td>AKU</td></tr> <tr> <td colspan="2">Gigabit L3 Switch 8-port</td></tr> <tr> <td colspan="2">SERVER Backup 1U</td></tr> <tr> <td colspan="2">SERVER Main 2U</td></tr> <tr> <td colspan="2">Router - Unified Communications Manager</td></tr> </table>	Inverter	AKU	Gigabit L3 Switch 8-port		SERVER Backup 1U		SERVER Main 2U		Router - Unified Communications Manager	
Inverter	AKU																						
Gigabit L3 Switch 8-port																							
SERVER Main 1U																							
SERVER Backup 1U																							
Router - Unified Communications Manager																							
NAS or 24 port PoE switch																							
Inverter	AKU																						
Gigabit L3 Switch 8-port																							
SERVER Backup 1U																							
SERVER Main 2U																							
Router - Unified Communications Manager																							
LMSB-15 R																							
<table border="1"> <tr> <td>Inverter</td><td>AKU</td></tr> <tr> <td colspan="2">Gigabit L3 Switch 8-port</td></tr> <tr> <td colspan="2">SERVER Main 1U</td></tr> <tr> <td colspan="2">SERVER Backup 1U</td></tr> <tr> <td colspan="2">2U</td></tr> <tr> <td colspan="2">Router - Unified Communications Manager (CallManager)</td></tr> </table>	Inverter	AKU	Gigabit L3 Switch 8-port		SERVER Main 1U		SERVER Backup 1U		2U		Router - Unified Communications Manager (CallManager)												
Inverter	AKU																						
Gigabit L3 Switch 8-port																							
SERVER Main 1U																							
SERVER Backup 1U																							
2U																							
Router - Unified Communications Manager (CallManager)																							



LMSB-15R

### Product Specifications

#### Server

10 x 2.5" hot-swap SAS/SATA drive bay  
 Dual socket R3 (LGA 2011) supports Intel® Xeon® processor E5-2600 v4/ v3 family  
 Up to 2TB ECC 3DS LRDIMM , up to DDR4- 2400+MHz ; 16x DIMM slots  
 Riser card support: 1 PCI-E 3.0 x32, 1 PCI-E 3.0 x16  
 Intel® X540 Dual port 10GBase-T, 10x SATA3 (6Gbps); RAID 0, 1, 5, 10  
 Integrated IPMI 2.0 and KVM with Dedicated LAN  
 6x USB 3.0 (4 rear, 2 via header)

#### Cisco Router with Unified Communications

WAN performance of up to 2 Gbps, even during heavy traffic loads.  
 A range of WAN access connectivity options such as 4G, LTE, T1/E1, T3/E3, xDSL, serial, and fiber Gigabit Ethernet  
 Performance 50 Mbps upgradable to 100 Mbps  
 Default Flash (DRAM)/ max Flash (DRAM): 4/8 GB  
 100 SIP/H.323 sessions  
 Maximum 16 switched Ethernet ports, PoE support

#### Advanced Managed L3 Switch:

10 x GbE PoE+ ports, two combo SFP ports.

#### VoIP Gateway:

8 FXS ports, supports dual protocols: ITU-H.323 V4 and IETF SIP V2.

#### Power supply:

Redundant Input 21-30 VDC/ 230 VAC.

#### Inverter:

UPS function capacity 5-10 min, uninterrupted power 1500 W, true wave output.

#### Air Conditioning: Internal filterless

#### Dimensions (W x D x H):

Plastic LLDPE Rack Box 6U: 680 x 915 x 495 mm  
 Plastic LLDPE Rack Box 8U: 680 x 915 x 590 mm (Extended version)  
 Aluminium Rack Box 6U: 583 x 800 x 400 mm.

Rugged Case for Notebook and other accessories:

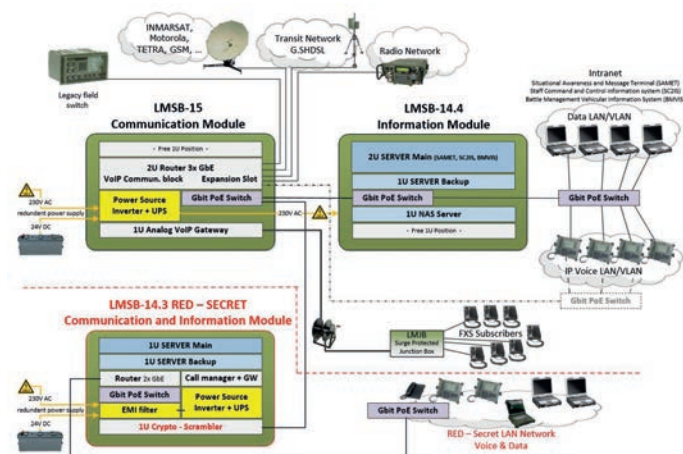
Polypropylene 470 x 357 x 176 mm.

Weight: Rack Box approx. 80 kg + 13 kg Case.

#### Environmental:

- Fulfills MIL-STD 810E, IP 63 protection.

- Temperature: operating -30 °C to +50 °C, storage -50 °C to +70 °C



RED-classified and Black-unclassified side

# LMSB-16C

Dispatching Touch Communication System for all wireless radio networks and all telephone types



DTC-DOT dispatching console

The LMSB-16C system is based on the LMSB-15 module and the DTC-DOT dispatch console.

## The LMSB-16 includes:

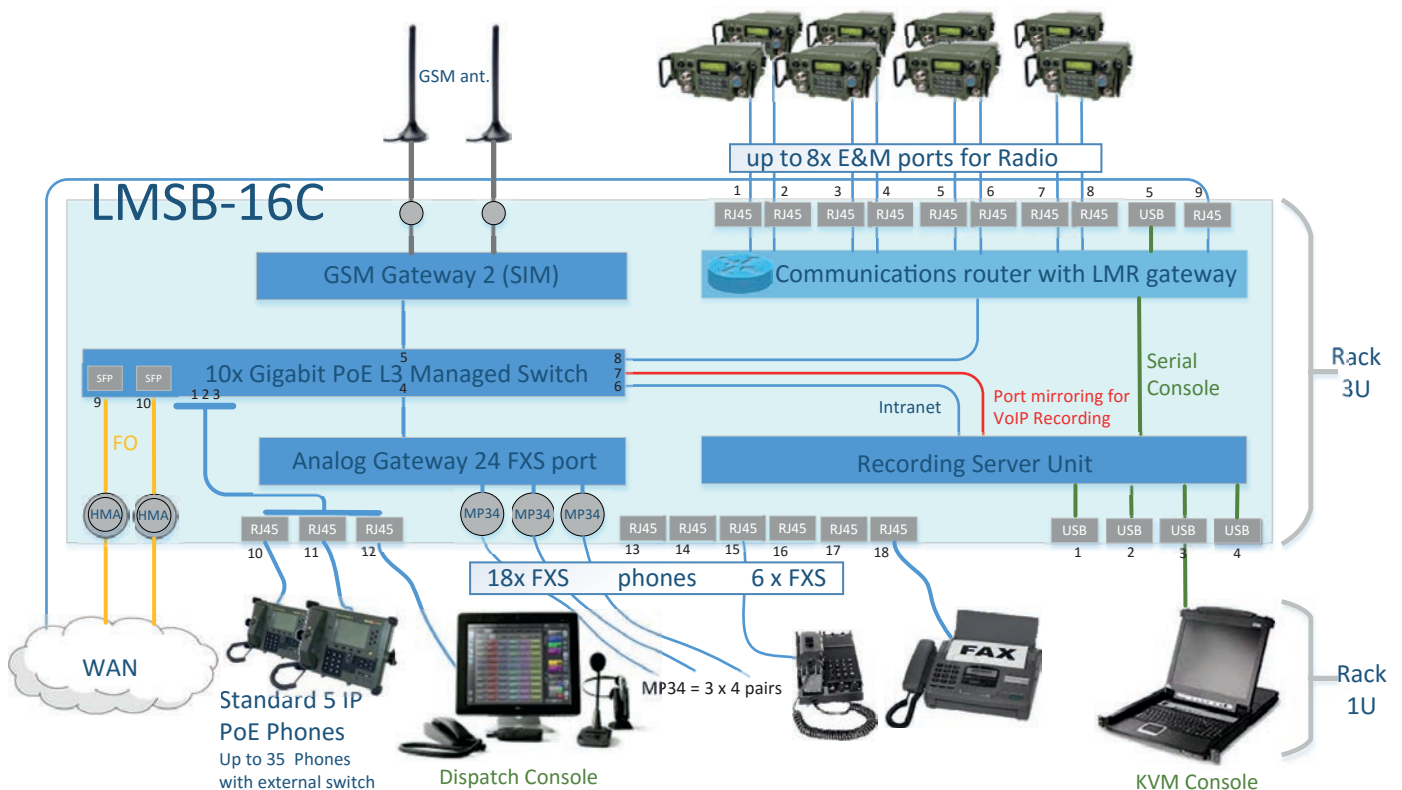
- DTC-DOT dispatching console
- DTC-RGW radio gateway
- DTC-LGW legacy gateway
- DTC-OBC conferences server
- DTC-AS application server
- DTC-HD work, listening, taking calls, and sharing information in groups

## Technical specifications

- Operating system: DTC-OS Linux
- Interface: Capacitive 17" touchscreen in industrial design, two redundant Ethernet 10/100/1000
- Independent audio: the handset, speakerphone, headset
- Voice channels, Processing: voice activity detector VAD, Comfort Noise Generation (CNG), packet loss concealment (PLC)
- Codecs: G.711, G.723, G.729, iLBC, Speex, AMR, AMR-WB, G.722, G.722.1, others are also available
- Power supply: 12 V/80 W (external AC inverter 230 V or 110 V)
- Mechanical Specifications Console DTC-DOT:  
Size: 390 x 330 x 280 mm, Weight 6.9 kg, Adjustable stand

## Terminal DTC-DOT

The DTC-DOT dispatch console is the core product of the DisTouchCom series. It is intended for complex controlling tasks, planning, fast communication and telephone call processing. It can work as a single terminal, but can also be deployed in complex control systems benefiting from the easy integration options for the DisTouchCom products.





# LMCP-28H

## Mobile Computing Platform



LMCP-28 Mobile computing platform

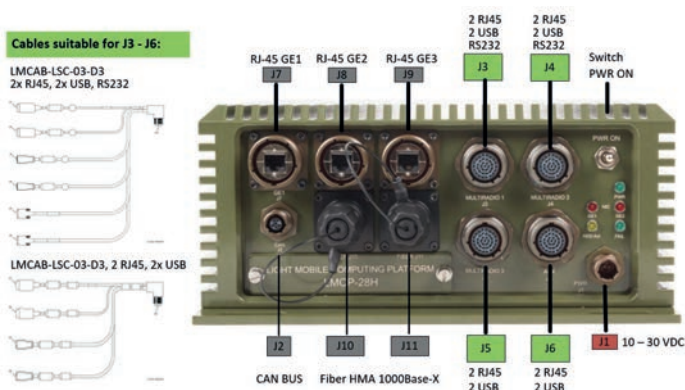
The OPTOKON LMCP-28H introduces a mobile computing system that entangles the connection and management of additional digital audio, video, data signals. The system is fitted with the powerful Intel® Xeon® processor D family, and offers up to 64 GB DDR4 SODIMM with ECC memory and a removable tray for SSD.

The LMCP-28H is available in rugged boxes to fulfill all demands on communication systems used in harsh environmental conditions.

The innovative design ensures the capability for deployment in the toughest environments where high performance and total reliability are critical. Benefiting from the Expanded beam technology, the precision optical alignment system ensures immunity from water, mud, dust, oil and other contaminants. The power supply is ensured from DC power source 10.5 - 30 V.

### Advanced features

- Rugged compact box, high performance processor
- High capacity supported memory (64 GB)
- High number of interfaces MIL-DTL-38999 series
- Advanced GUI management from the BIOS level via a dedicated Ethernet port
- Supports very fast PCIe M.2 NVMe SSD
- VoIP SIP services
- Supports Linux, Windows Server 2008 R2 SP1 / 2012 / 2012 R2 Windows 7 and 8.1, VxWorks 7.x



### Features and Benefits:

Intel® Xeon® processor D-1528, 9MB, 6-Core, 12 Threads, 1.9- 2.2GHz

Up to 64GB ECC RDIMM DDR4 2133MHz or 64GB ECC/non-ECC UDIMM in 4 sockets

#### On-Board Devices

1 PCI-E 3.0 x16,

M.2 PCI-E 3.0 x4 (SATA support), M Key 2242/2280

SATA3 (6Gbps) port, 2.5" SATA SSD

#### Switch Features

8x 10/100Base-TX PoE and 2 x 100/1000Base-X SFP

STP, RSTP, MSTP, ITU-T G.8032 Ethernet Ring

µ-Ring for Redundant Cabling, recovery time

DHCP Server/Client/Relay/Snooping/

QoS, IEEE802.1q VLAN, MAC based VLAN,

Dynamic IEEE 802.3ad LACP Link Aggregation,

Security : Port based and MAC based IEEE802.1X, RADIUS, ACL, TACACS+, HTTP/HTTPS, SSL/SSH v2

Supports IPv6 Telnet server /ICMP v6

CLI, Web based management, SNMP v1/v2c/v3,

Switch Architecture 7.6Gbps Full wire-speed

#### Input / Output

3x 1GbE, Supports 10GBASE-T, 100BASE-TX, and 1000BASE-T

8x FE PoE LAN RJ-45 ports

2 x GbE Fiber Optic HMA connectors

4 x USB 2.0

2 x RS232 with galvanic isolation

1 x CAN bus 2.0A (11-bit ID) and 2.0B (29-bit ID)

#### Routing

Linux-based router solutions supports a multitude of routing protocols:

For IPv4 it supports RIP v1 and v2, OSPF v2, BGP v4.

For IPv6 it supports RIPng, OSPFv3 and BGP.

#### 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 (Fan speed, temperature, voltage, power failure, power consumption, disk health, and memory health)

HW Notifications sent via email and SNMP traps

Temperature oper. 0 to +55 °C, Humidity 5% to 95%

Fulfills MIL-STD 810, MIL-STD-461 IP 65 protection

Dimensions 290 x 305 x 125 mm (W x D x H)

Weight: 10 kg

Installation option: 19-inch rack mounting

### Two versions of LCMP:

- 1) LMCP-28H with IP67 sealed connectors (62GB series MIL-DTL-2648 and IP67)
- 2) LMCP-28H version with connectors (MIL-DTL-38999 Series III) that are compatible with the Harris RF-7800N-CP (MCP)

# LMCP-41H

## Mobile Computing Platform



LMCP-41H Mobile computing platform

The OPTOKON LMCP-41H introduces a mobile computing system that entangles the connection and management of additional digital audio, video, data signals. The system is fitted with the powerful Intel® Xeon® processor D family, and offers up to 128 GB DDR4 SODIMM with ECC memory, build in SSD and a removable tray for SSD.

The LMCP-41H is available in rugged boxes to fulfill all demands on communication systems used in harsh environmental conditions.

### LMCP-41H features

- Rugged compact box, high performance processor
- High capacity supported memory (128 GB)
- High number of interfaces MIL-DTL-38999 series
- Advanced GUI management from the BIOS level via a dedicated Ethernet port
- Supports very fast PCIe M.2 NVMe SSD
- Removable SSD 2.5 inch Up to 4 TB 540 MB/s
- Build in SSD 2.5 inch Up to 4 TB 540 MB/s
- VoIP SIP services
- Supports Linux, Windows Server 2008 R2 SP1 / 2012 /2012 R2 Windows 7 and 8.1, VxWorks 7.x

# LMS-41H

## Light Mobile Server

The LMS-41H is based on the compact design LMPC-28H while providing platform performance LMCP-41H. The server platform is simplified and does not contain a switch, router and CanBus. The Server is designated as the main / backup server or data storage device

### LMS-41H features

- Rugged compact box, high performance processor
- D-1541, 12MB, 8-Core, 16 Threads, 2,1- 2.7GHz
- High capacity supported memory up to 128 GB
- Advanced GUI management from the BIOS level via a dedicated Ethernet port
- Supports very fast PCIe M.2 NVMe SSD
- Up to four removable SSD 2.5 inch Up to 4 TB 540 MB/s
- Two high speed USB 3.0 ports
- Supports Linux, Windows Server 2008/ 2012
- Dimensions 290 x 305 x 125 mm (W x D x H)

The innovative design ensures the capability for deployment in the toughest environments where high performance and total reliability are critical. Benefiting from the Expanded beam technology, the precision optical alignment system ensures immunity from water, mud, dust, oil and other contaminants.

The power supply is ensured from DC power source 10.5 - 30 V.

### LMCP-41H Features and Benefits:

Intel® Xeon® processor D-1541, 12MB, 8-Core, 16 Threads, 2,1- 2.7GHz
Up to 128GB ECC RDIMM DDR4 2400MHz or 64GB ECC/non-ECC UDIMM in 4 sockets
<b>On-Board Devices</b>
1 PCI-E 3.0 x16,
M.2 PCI-E 3.0 x4 (SATA support), M Key 2242/2280
SATA3 (6Gbps) port, 2.5" SATA SSD
<b>Switch Features</b>
8x 10/100/1000Base-TX PoE and 2 x 100/1000Base-X SFP
PoE management, max. output power budget 60 W
STP, RSTP, MSTP, ITU-T G.8032 Ethernet Ring
µ-Ring for Redundant Cabling, recovery time
DHCP Server/Client/Relay/Snooping/
QoS, IEEE802.1q VLAN, MAC based VLAN,
Dynamic IEEE 802.3ad LACP Link Aggregation,
Security : Port based and MAC based IEEE802.1X, RADIUS, ACL, TACACS+,
HTTP/HTTPS, SSL/SSH v2
Supports IPv6 Telnet server /ICMP v6
CLI, Web based management, SNMP v1/v2c/v3,
Switch Architecture 7.6Gbps Full wire-speed
<b>Input / Output</b>
3x 1GbE, Supports 10GBASE-T, 100BASE-TX, and 1000BASE-T
8x 10/100/1000Base-TX PoE LAN ports
2 x GbE Fiber Optic HMA connectors
4 x USB 2.0
4 x RS232 with galvanic isolation
1 x CAN bus 2.0A (11-bit ID) and 2.0B (29-bit ID)
<b>Routing</b>
Linux-based router solutions supports a multitude of routing protocols:
For IPv4 it supports RIP v1 and v2, OSPF v2, BGP v4.
For IPv6 it supports RIPng, OSPFv3 and BGP.
<b>Management and monitoring</b>
KVM with dedicated LAN, Support for Intelligent Platform Management Interface v2.0 with virtual media over LAN and KVM-over-LAN
Hardware Monitoring (Fan speed, temperature, voltage, power failure, power consumption, disk health, and memory health)
HW Notifications sent via email and SNMP traps
Temperature oper. 0 to +55 °C, Humidity 5% to 95%
Fulfills MIL-STD 810, MIL-STD-461 IP 65 protection
Dimensions 330 x 305 x 125 mm (W x D x H)
Weight: 11 kg
Installation option: 19-inch rack mounting



# LMUPS-24

# LMUPS-48

## Ruggedized Uninterruptible Power Supply



LMUPS-24

The Military-Grade Uninterruptible Power Supply UPS unit is designed for extreme environmental and demanding electrical conditions of military ethernet switches. OPTOKON's UPS features a proven design and rugged packaging technologies of OPTOKON switches LMSW series. The electronic circuitry and battery are contained in a sealed chamber constructed from a die-cast aluminum chassis that is weather-proof and shock-proof. This UPS will accept a wide range of input voltage values while delivering a well-conditioned 22/48 VDC output to the ethernet switch. Highly efficient power electronic circuitry achieves a high power level and battery run-time in a low-profile, low-weight, rack-mountable package.

The UPS was designed to provide user specified regulated power output from a wide input voltage, battery backup and cell balancing. The unit automatically switches the power path in between the battery and main DC input and provides buck-/boost output regulation.

The UPS provides intelligent features over a USB interface. Windows detects UPS as a battery and automatically shows the battery in the system tray. In the case of low battery situations, the system can send an ON/OFF pulse (or by reporting remaining battery capacity via the USB) to a motherboard in an attempt to gracefully shut down the system. The UPS has strong Windows / Linux support.

Charge current, float voltage and bulk charging parameters can be setup via USB interface into the UPS non volatile flash memory. UPS provides accurate fuel gauge capabilities by precisely measuring the input and output current flow.

### LED Status blink modes:

Main LED status:

- 1. Initial delay
- 2. UPS standby (improper function)
- 3. UPS running from Input

Battery LED status:

- 1. Charging
- 2. Battery is fully charged 100%
- 3. System is running on battery

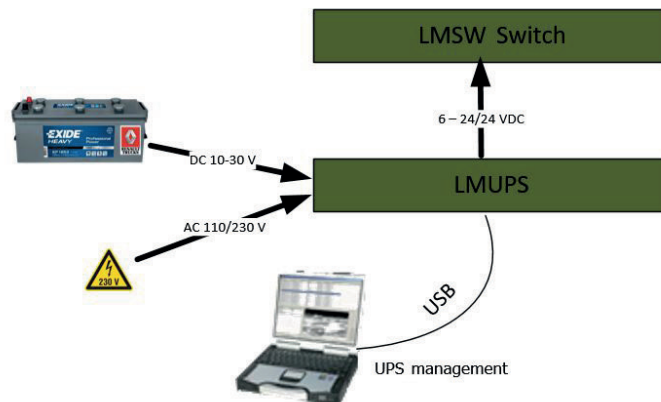
### Product Specifications

- Input 10 – 30 VDC, 6A or 100-242 VAC
- Input start/stop voltage thresholds ( default start at 11V, stop at 6V)
- Switchable output 6 – 24 V or 48 VDC (User configurable via USB port)
- Deep Sleep Current Consumption. < 50uA (Only DC)
- Maximum output current: 6A\* Peak output Current: 10A (<30 seconds)
- 2 x Display LED: Status battery and Main LED (more blink modes)
- Operating temperature -20°C - 60°C (discharging)
- Weight (kg): 5 kg (0,7 kg battery cells)
- Dimensions: 430 x 300 x 65 mm (W x D x H)

### Battery Cells specifications:

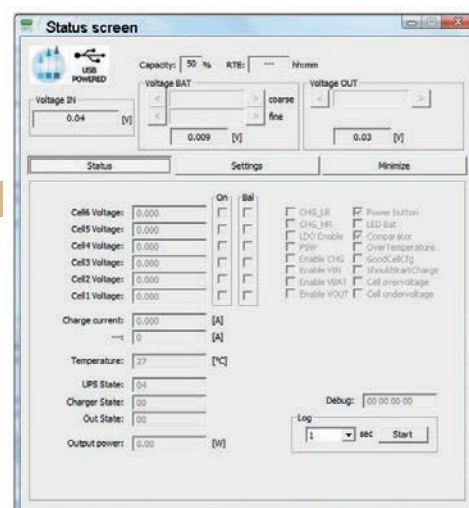
- Chemistry Lithium Ion
- Minimum Capacity 6,7 Ah
- Watt Hour Capacity 147 Wh
- Charging Time Std. 4,5 h.
- Weight (max.) 0,7 kg
- Discharge Temperature -20 to +60°C
- Storage Temperature -20 to +50°C

The UPS has the rack adapter as accessories.



### Ordering code:

LMUPS	XX	X	XX
	Output	Battery capacity ( Li-Ion 21,6 V)	Power Supply
24	6 - 24 VDC, User configurable	1 6,7 Ah	AD AC/DC
48	Switchably 6-24 or 48 V DC	2 13,0 Ah	DC DC



# 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 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.

### MIL-DTL-83526 specification

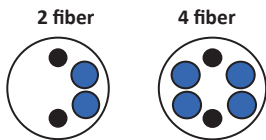
Key Features	Application	Benefits
<ul style="list-style-type: none"> <li>Ruggedized field design</li> <li>Hermaphroditic interconnection</li> <li>Easy cleaning - removeable sleeves</li> <li>4 Fiber channels</li> <li>Single mode and/or Multimode</li> </ul>	<ul style="list-style-type: none"> <li>Military 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  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)
<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 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°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

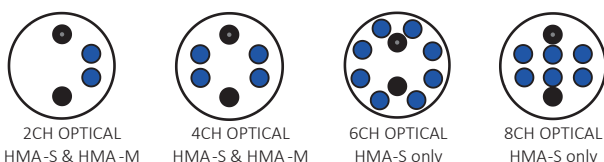
HMA-J plug

HMA-M plug

## Ordering code

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

## Optical insert arrangement:



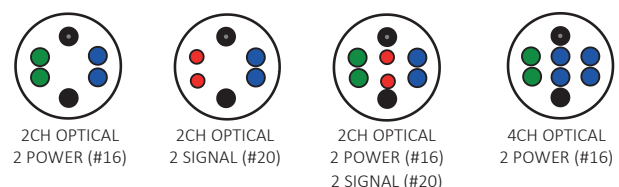
2CH OPTICAL  
HMA-S & HMA-M

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



HMA-JF plug

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 excellent transmission parameters are desired. The unique design of the HMA-JF enables users to ensure high SFF performance. The coupling sleeves are removed 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

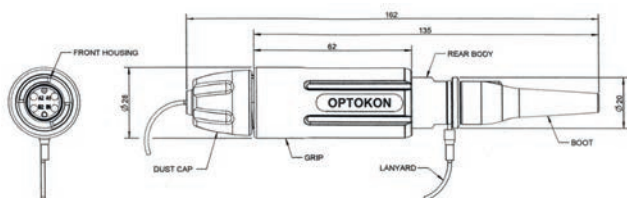
### Benefits

- 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

### Technical drawings



HMA-JF-4xUPC/LD4 S7A-0.6-002

### 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)
<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
<b>-</b>		Expanded Beam				
<b>F</b>		Ferrule				
<b>P</b>		POF				
						<b>plug</b> <sup>2</sup>
						<b>BN</b> bulkhead <sup>3</sup> jam nut
						<b>BNB</b> bulkhead jam nut with boot
						<b>BF</b> bulkhead flange
						<b>BFB</b> 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

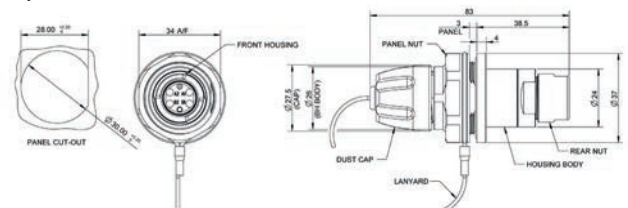


HMA-JF-BN bulkhead

#### 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 insert arrangement

#### Hybrid insert arrangement



2CH OPTICAL



4CH OPTICAL



2CH OPTICAL



2CH OPTICAL



# Optical cables

for mobile and tactical use  
LD single jacket cable



LD-04-OM2-PUR-BK

Tactical optical cables with 2-4 fibers. This cable type has a number of tight buffered optical fibers, surrounded by a heavy layer of aramid yarns. The jacket made of polyurethane. The cable is suitable for indoor and outdoor use. The cable has low abrasion and good cut resistance.

## Based on military norm MIL-C-85045

### Construction

#### Optical Fibers

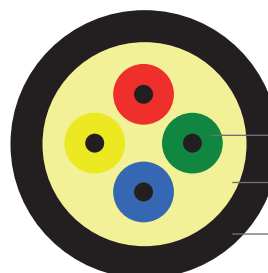
The cable can be supplied with SMF 9/125  $\mu\text{m}$  or 50/125  $\mu\text{m}$  and 62.5/125  $\mu\text{m}$  multimode fibers. For fiber properties, see the appropriate Fiber Specification. The fibers are individually color-coded for easy identification.

#### Cable Core

The cable core consists of a number of 900  $\mu\text{m}$  tight buffered fibers, surrounded by a heavy layer of aramid yarns

#### Sheath

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



LD cable jacket

Hard acrylate tight buffered optical fiber

Water swellable Aramid yarn

Flame-retardant PUR outer jacket

### Application

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



### Mechanical and Environmental properties

Parameter	Reference acc. to IEC 794-1	Value
Max. tensile strength (install/perm)	*E1A	1100N / 500N
Crush resistance	*E3	440 N/cm
Impact resistance	*E4	200 impacts
Minimal bending radius	*E11a	10x outer diameter
Temperature range	*F1	-60°C to +85°C
Cable informative nominal weight(calc.)		see table bellow
Standard put-up length		2000 m with accuracy $\pm 5\%$ on plywood reel

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

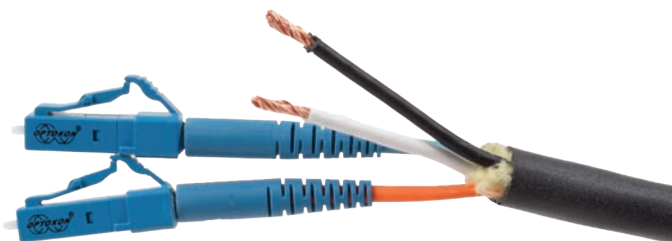
Fiber Count	Outer jacket min.	Outer diameter	Cable inf. Weight (calc.)	Plywood drum
2	1,0 mm	5,7 $\pm$ 0,4	24	60x25x42
4	1,0 mm	5,7 $\pm$ 0,4	25	60x25x42

### Ordering code

LD	-	XX	-	YY	-	PUR	-	BK
		<b>XX – Number fibers</b> 2 – 4			<b>YY – Type of fiber</b> S2D 9/125 $\mu\text{m}$ , G.652.D S7A1 9/125 $\mu\text{m}$ , G.657.A1 S7B2 9/125 $\mu\text{m}$ , G.657.B2 OM1 62,5/125 $\mu\text{m}$ , optimized 1 Gbps OM2 50/125 $\mu\text{m}$ , optimized 1 Gbps OM2 50/125 $\mu\text{m}$ , optimized 10 Gbps			
						<b>jacket color</b> Standard <b>Black (code BK)</b> Option <b>Beige (code BE)</b> Option <b>Green (code OL)</b>		

# Optical cables

for mobile and tactical use  
OPK-U-SPC-2(4x1,8)A9AHEU



OPK-U-SPC-2(4x1,8)A9AHEU

- for outdoor or indoor applications
- for camera systems

## Mechanical and Environmental properties

Test	Value	Test method
Wire DC resistance	< 13,7 Ω/km	
	400 N	EN 60974-1-2-E1
Max. Compressive 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

## Optical parameters (in the cable)

Fiber type	Maximum attenuation (dB/km)		
	1310 nm	1550 nm	1625 nm
G.657.A1, G.657.A2	0,5	0,3	0,5

Fiber (subunits) count	Wire Count	Cable OD (mm)	Subunit OD (mm)	Wire OD (mm)
2	2	7,3±0,5	1,8	1,8

Flame-retardant PUR jacket

Core wrapping

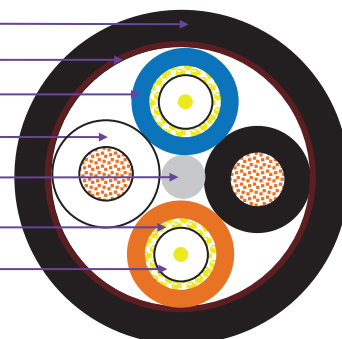
Flame-retardant subunit (simplex)

Stranded Cu wire AWG 16, PP insulation

Strength member

Aramid yarn

0,9 mm tight-buffered optical fiber (TB IV)



Subunits color  
1-blue, 2-orange

Wire color  
1-black, 2-white

Marking:

Method:

Print colour:

Print legend:

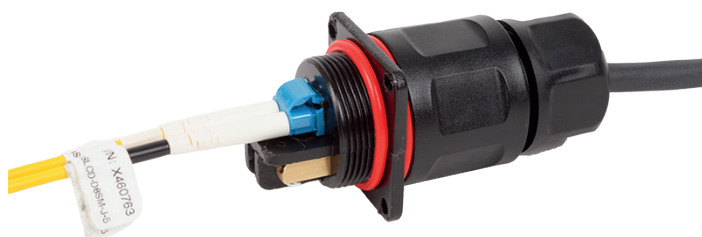
Ink-Jet

White

OPK – cable type – lot number- (length marking per 1 m) (customer print legend available on request)

# 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.



### Typical configuration<sup>1</sup>:

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

Note: 1) on request

OPHC-04 4x FO (LC connector)

## Application

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





# OMK-SR-MCSJ

Mini cable splice tool kit – J type

## MCS-04

Mini cable splice



The OPTOKON OMK-SR-MCSJ Mini cable splice tool kit introduces a cost effective version of the J-type MCSJ – 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. Based on standard mechanical splice technology of the MCSJ mini cable splice, the tool kit provides low loss fiber jointing in just a few minutes.

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.

### Application

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

### Specifications

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

### Available types

- |           |                         |
|-----------|-------------------------|
| ● MCSJ-04 | 4 fibers optical cables |
| ● MCSJ-02 | 2 fibers optical cables |
| ● MCS-04  | 4 fiber optical cables  |
| ● MCS-02  | 2 fiber optical cables  |

## LMJB-6

6-pairs Surge Protected Junction Box



LMJB-6

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 6-Port Junction Box employs a main cable running in close proximity to telephones and other electronic equipment, then acts as a distribution point for independent cables to each device, allowing quick replacement or repair.

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.

### Lemo EHE Connector (In/Out)

- Multipole 6 contacts
- Push-Pull self-latching
- Hermaphroditic blind mating
- Lightweight
- Solder or crimp contacts
- Dark finish aluminum alloy shell
- Protection standard IP68
- Cable diameter:  $\varnothing$  3.6 to 10 mm
- Temperature range: -55°C to 125°C

### Features

- 6-pair surge protection box for all types of telephone and data lines
- Surge protection for all types of telephone and data lines
- Max. discharge current ( $I_{max}$ ) 8/20  $\mu$ s impulse 1 times: 20 kA
- Nom. discharge current ( $I_n$ ) 8/20  $\mu$ s impulse 10 times: 5 kA
- Removable protection circuit
- Rugged aluminium alloy housing
- IP65 protection standards
- Corrosion resistant
- No maintenance required
- Size without connectors 170 x 120 x 55 mm

### Connectors Amphenol RJ45 TV (Separate Links)

- RJ45 cordset retention in the plug: 100 N in the axis
- Mating cycles: 500 min
- 10 BaseT, 100 BaseTX and 1000 BaseT networks Cat 5e
- Protection standard: IP67
- Salt spray: >500 h with Olive Drab Cadmium
- Thermal shock: 5 cycles at -40°C to +100°C
- Temperature range: -40°C to +85°C

# Cable Drums



BBD-500

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

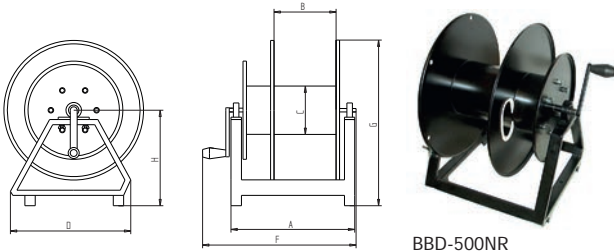
Heavy duty drum with direct crank rewind permanently attached to the axle. Designed for installation on military vehicles or TBD-500 type trolley suitable for mobile applications.

The same dimensions apply for the 200m and 500 m models; the only difference is the cable length. The BBD-200 drum contains 200 m of cable. The BBD-500NR drum is supplied with 500 m of 6mm diameter cable. The BBD-1001 drum is supplied with 1 km of cable.

Reel Dimensions BBD-200, BBD-500, BBD-1000<sup>1</sup>

A <sup>1</sup>	B <sup>1</sup>	C	D	E	F <sup>1</sup>	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

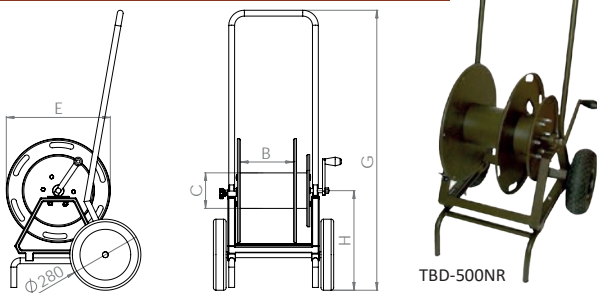
## TBD-500NR

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.

Reel Dimensions TBD-500NR

A	B	C	D	E	F	G	H
460	210	140	450	405	490	1090	380



TBD-500NR

## MBD-500 for CAPM Cassette

Termination of tactical cable with FC connectors



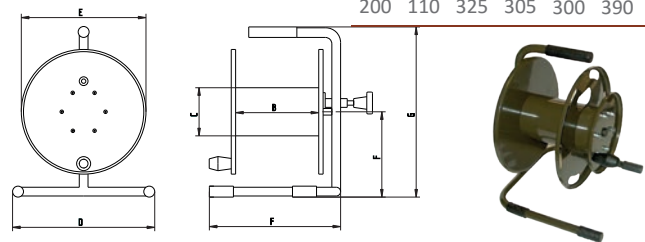
## SBD-200

NSN: 8130160037687

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

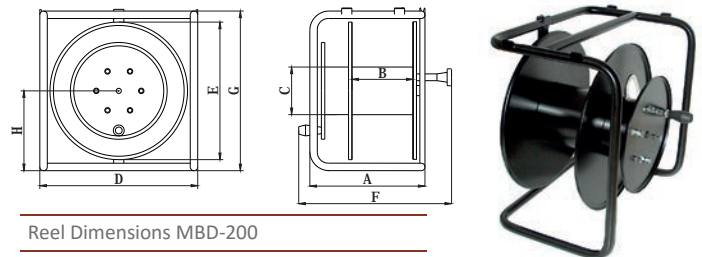
B	C	D	E	F	G	H
200	110	325	305	300	390	30



## MBD-200, MBD-500

MBD-200  
NSN: 8130160042616

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

A	B	C	D	E	F	G	H
340	210	140	465	405	450	470	235

## RBD-200, RBD-500

RBD-200  
NSN: 8130160045568

Mobile drum, with strap belts for shoulder wear. Suitable for use in the field. The weight with HMA connectors on 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.



RBD-200

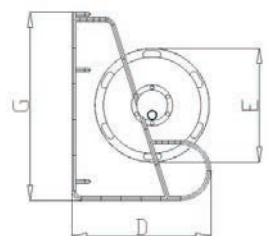
RBD-500

Reel Dimensions RBD-200

A	B	C	D	E	F	G	H
-	200	110	310	305	360	570	-

Reel Dimensions RBD-500

A	B	C	D	E	F	G	H
-	325	110	320	305	430	570	-





# Termination, Repair & Maintenance tool kits

## OMK-SR-UNI

The OMK-SR-UNI Termination & Repair Tool Kit is designed for military connectors. The tool kit is supplied in an 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-UNI

## OMK-SR-SPL

NSN : 5180160065290

This fast repair tool kit contains an 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

NSN: 518016AB25384

The Maintenance Clean Kit OMK-SR-CLN is intended for cleaning and inspecting 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-moulds cut to fit each item. Case is made from extremely resistant Copolymer Polypropylene and fitted with an automatic pressure release valve. Due to the copolymer polypropylene and extra-thick wall it will not get scratched or damaged easily.

### Specifications

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



## OMK-SR-FSK

The OPTOKON OMK-SR-FSK splice kit 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.



# 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, 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
- 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

### 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 wavelengths
- 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

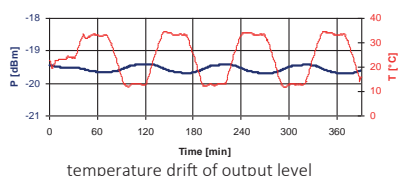


OFT-920

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 sources combinations
- Internal memory



### Ordering Code

light source code	description <sup>1</sup>	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 request

Czech Army part number:

OFT-920-MM-HMA2-LD850-LED30

OFT-920-MM-HMA4-LD850-LED30

NATO stock number:

NSN: 6650-16-006-2311

NSN: 6650-16-006-2316

### Light Source

Output power		Note:
LD 850 nm, LED 850, 1300 nm	-26 dBm (62.5/125 $\mu$ m fiber)	
LD 1310, 1490, 1550, 1625 nm	-16 dBm	typ. value
Stability (1 hour, delta/2):		tested after 20 min warm up temperature 23 $\pm$ 1°
LD 850 nm, LED 850, 1300 nm	$\pm$ 0.03 dB	
LD 1310, 1490, 1550, 1625 nm	$\pm$ 0.05 dB	

### Power Meter

Photodetector	1 mm InGaAs		
Working wave-lengths	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: -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-920	XX	XXXX	XXX
M5 (MM) M6 SM	MM 50/125 mm MM 62.5/125 mm Singlemode		Source wavelength as below
HMA2	Connector type <sup>2</sup> HMA <sup>1</sup> Expanded Beam connector (non-contact optics), 2 fibers		
HMA4	HMA <sup>1</sup> 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

### Ordering Code

OFTE-930	-	XX	- XXXXX	- XXX
M5 (MM) M6 SM		MM 50/125 mm MM 62.5/125 mm Singlemode		Source wavelength as below
3K93C other		Connector type <sup>2</sup> SMPTE compatible HDTV connection system 3K.93C series on request		

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.

Includes optical parameters of OFT-920 optical loss test set and functionality of electrical wires checking.

### Electrical wires checking

Electrical wires continuity

Short circuit Isolation

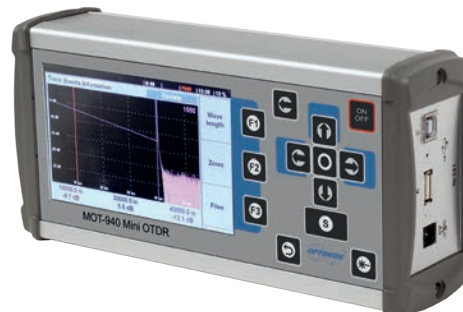
Electrical contacts –pin interconnection



OFTE-930

# MOT-940 - A

## Mini OTDR



MOT-940

The MOT-940 Mini optical reflectometer series comes in a compact metal housing with all functions as a full OTDR. The reflectometer determines the distance to reflecting and non-reflecting events and measures insertion loss of optical line and attenuation loss. In addition, the MOT-940 is fitted with an optical power meter and a visible light source. The internal memory allows the storage more than 1000 traces, USB interface is designed for saving of data onto USB flash memory.

The power supply is ensured with inbuilt rechargeable Li-Ion battery, which provides long term working time. The MOT-940 is designed for testing single mode and multimode optical fiber parameters in the process of installation, operation and maintenance, respectively the fault location in field conditions.

### Key Features

- Portable, light weight reflectometer
- MM + SM measurement
- Large LCD color screen
- Optical trace analysis
- High dynamic range
- PMH module – measures optical power
- VFL module – visible light source 650 nm
- PC control option
- TopOTDRViewer evaluation SW – reporting solution
- Internal memory for 1000 traces
- File in Bellcore format
- Upgrading of internal software via USB

### General specifications

OTDR module <sup>1</sup> PN:	940-01 940-A-85-30/31-55		940-02 940-A-31-55	940-03 940-A-31-49-55	940-04 940-A-31-55/62		940-05 940-A-31-49-55/62		940-24 940-A-31-55-62												
Fiber Type	MM	SM	SM	SM	SM		SM		SM												
Wavelength (nm)	850/1300	1310/1550	1310/1550	1310/1490/1550	1310/1550	1625	1310/1490/1550	1625	1310/1550/1625												
Dynamic range <sup>2</sup> (dB)	28/30	39/38	41/40	41/39/40	41/40	39	41/38/39	39	41/40/39												
Pulse width (ns)	MM	5, 10, 20, 50, 100, 300, 1 000, 3 000, 10 000																			
	SM	5, 10, 20, 50, 100, 300, 1 000, 3 000, 10 000																			
Distance range (km)	0.25 - 250																				
Event dead zone <sup>3</sup> (m)	0.8 m																				
Attn. dead zone <sup>3</sup> (m)	4.5 m																				
Sampling points	Up to 128 000																				
Data point spacing	0.2 – 20 m																				
Distance uncertainty	±(1+0.005%*distance+data point spacing) m																				
Linearity	0.04 dB/dB																				
Trace file format	Telcordia Tech. SR-4731																				
Trace file storage	1000 traces internal memory, next 1000 traces on external memory																				
Internal memory	2 GB																				
Data transfer to PC	USB 2.0 (type B); USB-flash memory > 8 GB																				
OTDR modes	Auto / Expert / Real Time																				
<div>Power Meter</div> <div>Power range (dBm)</div> <div>Accuracy (dB)</div> <div>Resolution (dB)</div> <div>Working wavelength (nm)</div> <div>Units</div> <div>Light Source</div> <div>Spectral width (nm)</div> <div>Output power (dBm)</div> <div>Stability @ 1310/1550 nm (dB)</div> <div>Visual fault locator</div> <div>Light source</div> <div>Wavelength (nm)</div>																					
											PM: -85 to +6    PMH: -60 to +10										
											0.3										
											0.01										
											850, 1310, 1490, 1550, 1625										
											dBm, dB, mW										
											< 5										
											> -3										
											±0.25										
											Laser										
											650										

Note:

1) For complete details of all available configuration refer to Ordering code one port module: 940-02, 940-03, 940-24 two ports module: 940-01, 940-04, 940-05

2) Typical dynamic range with three minutes averaging at SNR=1

3) Typical dead zone for single mode fiber for Return loss > 45 dB, 5 ns pulse

Power Meter	
Power range (dBm)	PM: -85 to +6 PMH: -60 to +20
Accuracy (dB)	0.3
Resolution (dB)	0.01
Working wavelength (nm)	850, 1310, 1490, 1550, 1625
Units	dBm, dB, mW
Light Source	
Spectral width (nm)	< 5
Output power (dBm)	> -3
Stability @ 1310/1550 nm (dB)	±0.25
Visual fault locator	
Light source	Laser
Wavelength (nm)	650
Output power <sup>4</sup> (mW)	0.8
General specifications	
Size (mm)	225 x 110 x 55
Weight (kg)	0.8 kg
Power source	Li-Ion battery
Display	LCD 800 x 480, 5 inch color display

### Ordering Code

MOT-940 – A - wavelength - PMH<sup>7</sup> - VFL<sup>8</sup> - YYY

Light source:

as below

YYY - connector type

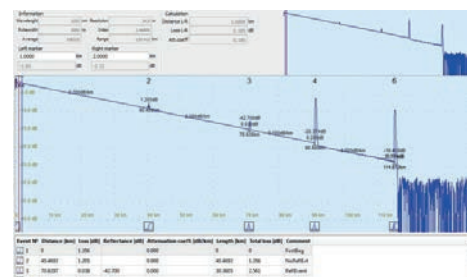
UPC	FC/UPC	USC	SC/USC
NPC	FC/APC	NSC	SC/APC

Note – standard equipped modules:

7) PMH High power meter

8) VFL Visual Fault Locator

Light source code	Description
31-55	One port: 1310 and 1550 nm
31-49-55	One port: 1310, 1490 and 1550 nm
31-55-62	One port: 1310, 1550 and 1625 nm
31-55/62	One port: 1310, 1550 nm, Second port: 1625 nm
85-30/31-55	One port: 850 and 1300 nm Second port: 1310 and 1550 nm
31-49-55/62	One port: 1310, 1490 and 1550 nm, Second port: 1625 nm

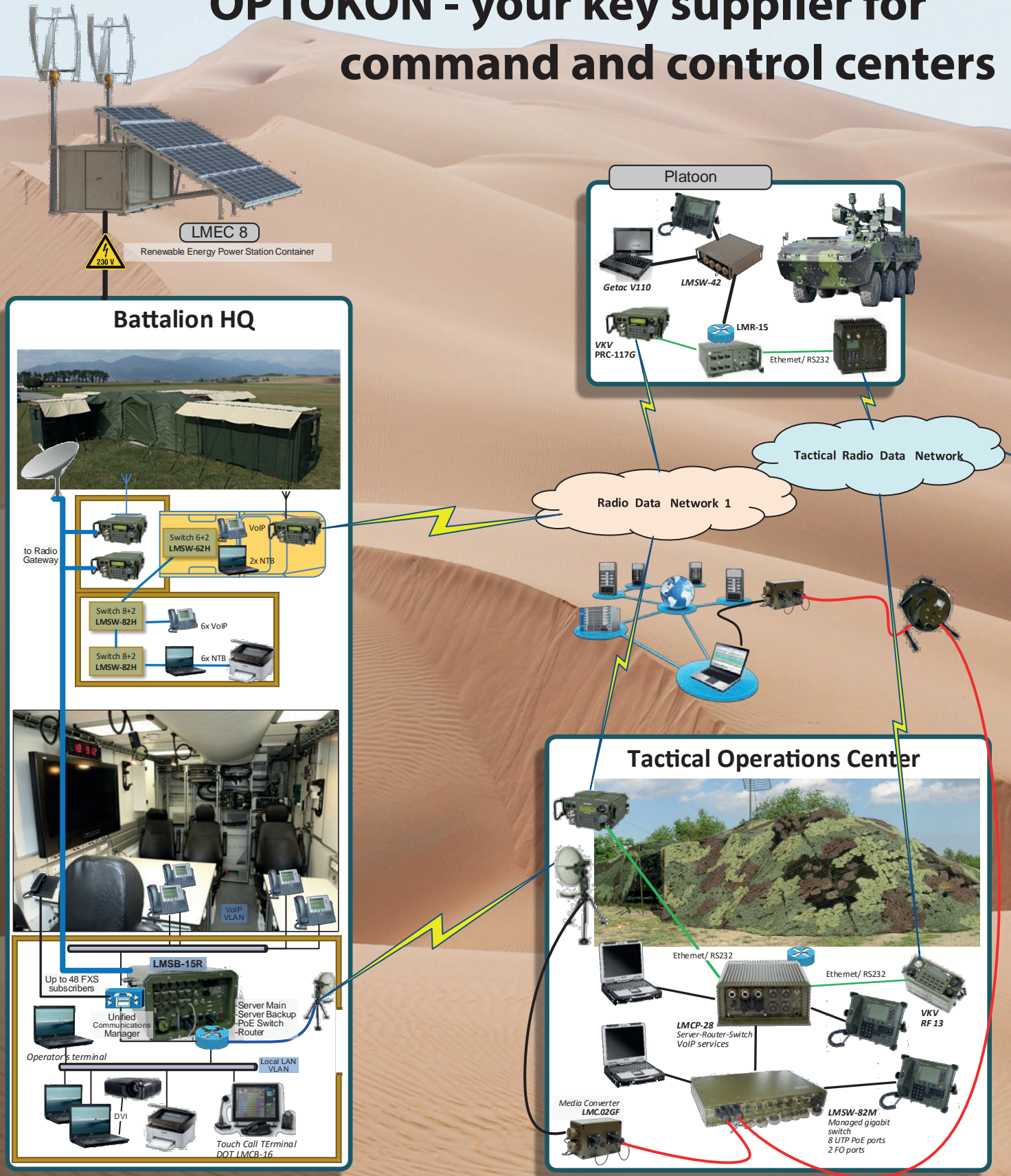




# HW ARCHITECTURE FOR C2/C4 ISR SYSTEM OF SYSTEMS

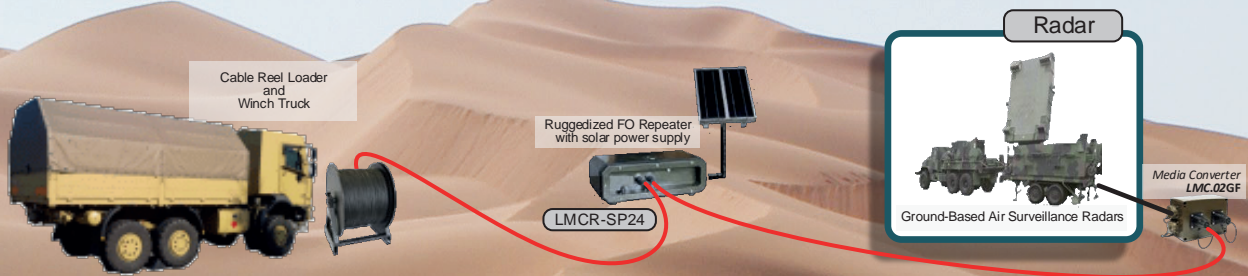
## Examples of implementation

# OPTOKON - your key supplier for command and control centers





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

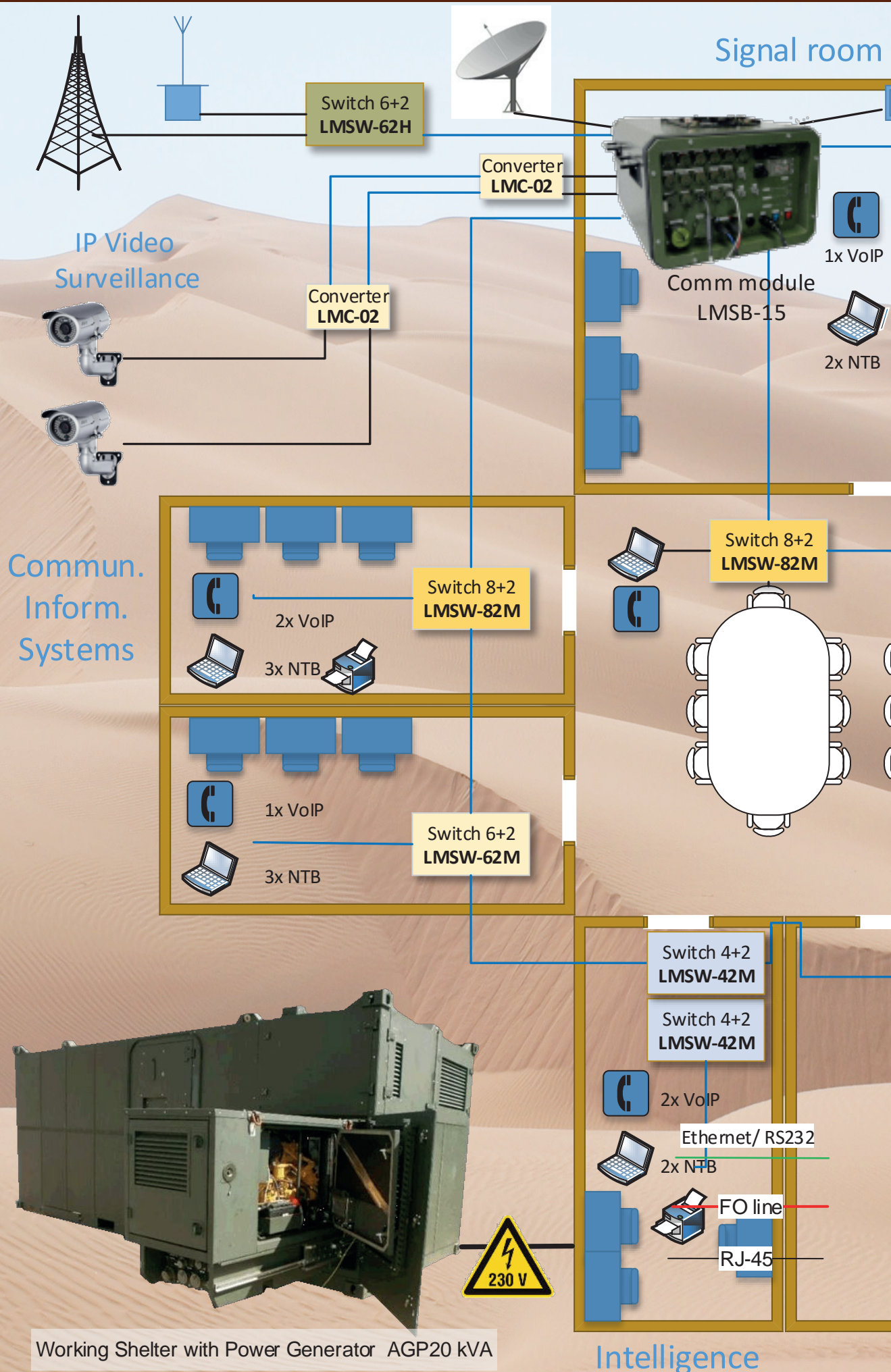


## Brigade Main Command Post

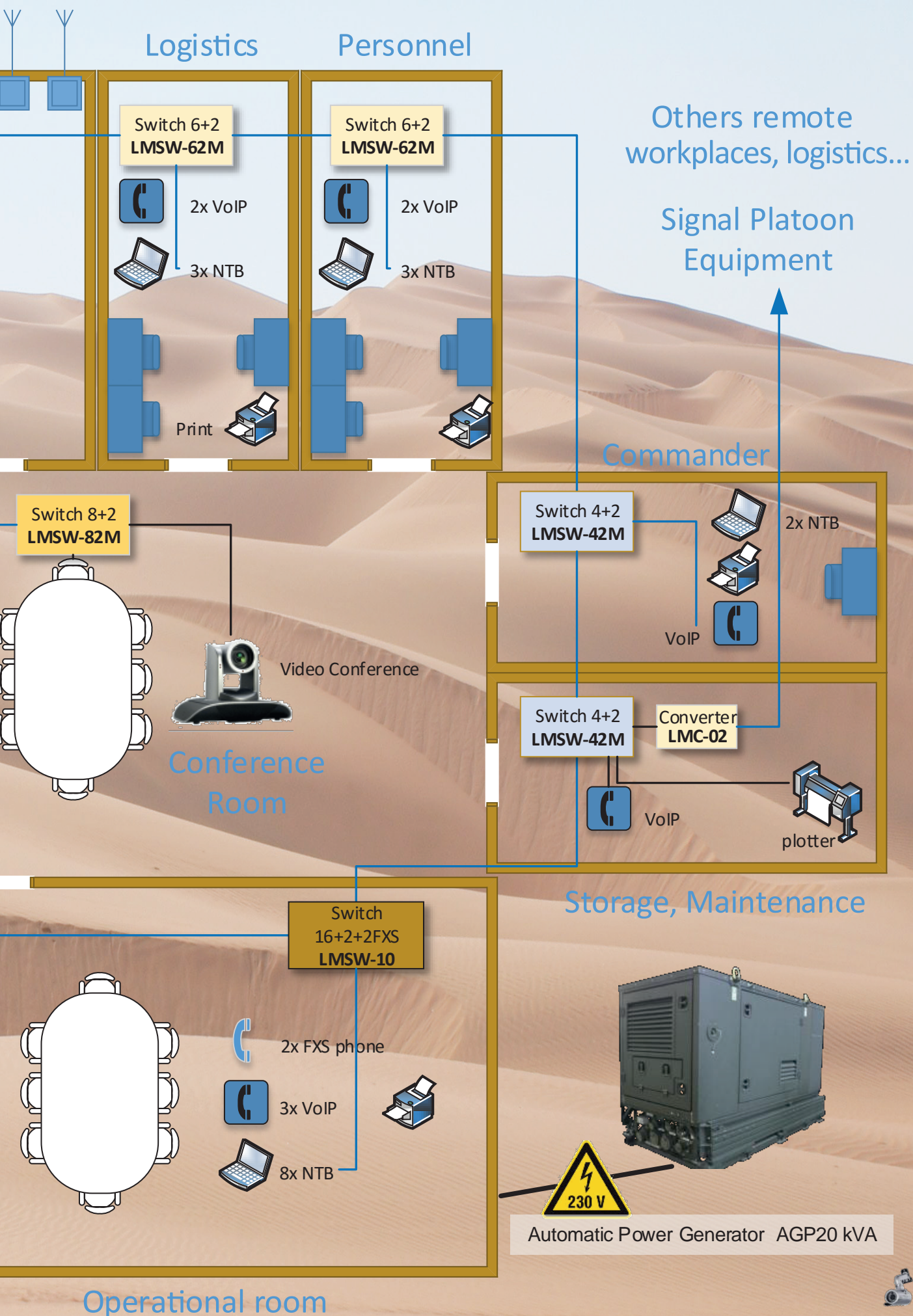




# BRIGADE MAIN COMMAND POST



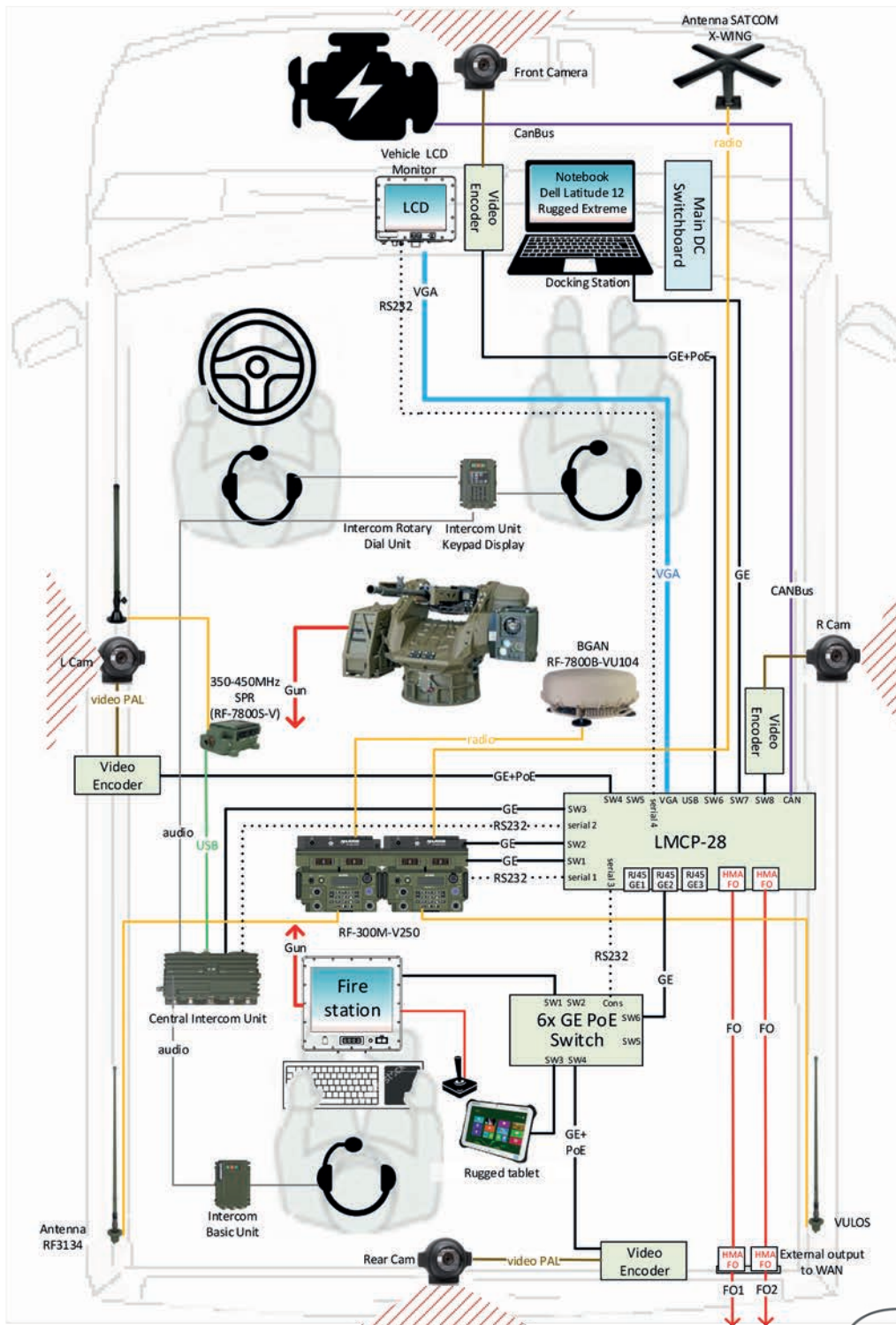






# Example of implementation

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 application BMVIS.

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-28 Mobile computing platform



LMSW-42M

HMA-S plug connector

HMA-J plug connector

HMA-M plug connector



# Example of implementation

Cable Reel Transport  
Integrated solution



## Cable Reel Winch

The cable reel winch is designed for automatic deployment and retraction of fiber optic cables on OPTOKON standardized reels.



### Accessories

- Cable Drums 2 x 5 000 m
- Cable Drums 2 x 4 000 m
- Cable Drums 4 x 1 000 m
- Cable Drums 5 x 500 m
- Cable Drums 5 x 200 m
- Termination & Repair Tool Kit
- 2 x Cable Reel Winch
- 4 x Splitter
- 2 x LMSW-10 14x 100Base-T + 2x1000Base-X ports
- 4 x LMSW-82M 8x 1000Base-T + 2x1000Base-X ports
- 3x LMC-01 Gigabit Ethernet Media Converter
- 3x LMC-02 Gigabit Ethernet Media Converter

## Cable Reel Loader and Winch Truck

The Armored SUV TATRA T810-1R0R26 13,177 6x6.1R platform type version with tarpaulin is equipped with two winches of fiber optic cables and a set of optical cables with accessories. It is used for laying fiber optic cables in the field. It works in semi-automatic mode of unwinding, winding and laying. Winches and optical cables with coils and accessories are mounted on the rear deck of a vehicle. The components are attached to the frame by simple quick-coupling mechanisms.



## Cable Reel Loader Winch Vehicle and Winch Trailer

The armored SUV TOYOTA Hilux and trailers are equipped with a set of fiber optic cables and a fiber optic cable winch. It is used for laying fiber optic cables in the field. It works in semi-automatic mode for unwinding, winding and laying.

### Vehicle accessories

- Cable Drums 1x 5 000 m
- Cable Drums 1x 1 000 m
- Cable Drums 1x 500 m
- 2 x Splitter
- Cable Reel Winch
- Termination & Repair Tool Kit



### Trailer accessories

- Cable Drums 1x 5 000 m
- Cable Drums 1x 1 000 m
- Cable Drums 1x 500 m
- 2 x Splitter
- Cable Reel Winch
- Termination & Repair Tool Kit





# Example of implementation

OPTOKON - Your key supplier for C4 ISR command and control centers



## Command Shelter (COS)

The COS container is an independent mobile command post for 6 operators. In the basic version the COS container is equipped with the following systems:

- Diesel Generator, UPS
- ACU unit with heating, NBC unit
- Camera system that covers 360° around the container
- Alarm system that reports main equipment failure and fire
- Power and data interface on the outside of the container



## CNS, SWS, TMS, COS Resistance

The containers are also resistant to EMI/EMC electromagnetic interference according to MIL-STD461F, Army ground. (Attenuation, radiation, sensitivity, NEMP)

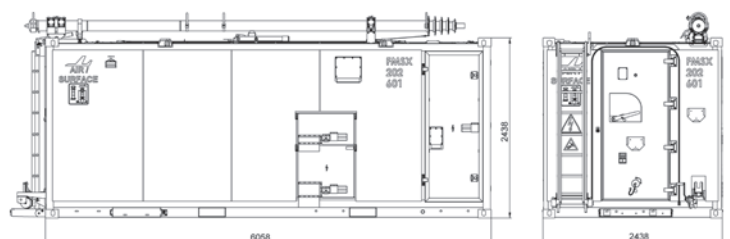
- Shock resistance during transport - 100 m/s<sup>2</sup>
- Vibration resistance during transport - 10 m/s<sup>2</sup>
- The internal noise level when all equipments is on < 60 dB(A).



## CNS, SWS, TMS, COS Equipment

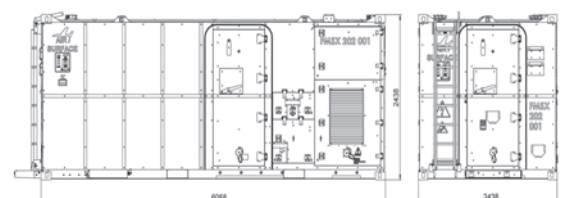
In the basic version, the containers are equipped with the following systems:

- UPS, ACU unit with heating including temperature control mode, NBC unit
- Alarm system that reports main equipment failures and fire
- Power and data interface on the outside of the container
- RJ45 and LC (optics) data distributor, 6 x 19"
- IT rack
- Cabinets for tools
- LED illumination with masking mode



## Dimensions

	CNS10	CNS20	SWS, COS	TWS
in accordance with	ISO 668 1D	ISO 668 1C		
Length	2991	6058		
Width	2438	2438		
Height	2438	2438		
Weight*	4300	8500	9000	7350



\*Total weight of the container excluding radios and IT equipment



# LMEC-8

Renewable Energy Power Station Container

# APG-20

Automatic Power Generator



LMEC-8

## LMEC-8

Renewable Energy Power Station Container

### Power Station Features

- Immediate deployment by land or air
- Simple and quick installation
- Fully automatic system (no operator required)
- GSM, Ethernet, on-line monitoring (optional)
- High efficiency and service life of all systems
- Variety of models and applications
- During transport all components are in the container
- Floor: reinforced flooring with anti-slip 20 mm laminated plywood
- Insulation: Icynene - made in Canada as a leading global insulation product.

Container - 20' ISO 1C container with plate certified by Germanischer Lloyd and CSC safety approval plate

- External dimensions (mm): 6 058 x 2 438 x 2 591
- Internal dimensions (mm): 5 898 x 2 344 x 2 376
- Maximum payload (kg): 10 000
- Maximum floor loading (kg/m²): 750
- Maximum lifting weight at 1,5 kg: 6 500
- Maximum stacking weight (kg): 17 000 (stackable up to 3-high)
- Fork lift pockets distance centre (mm): 2 050

### Power Backup System Technical Parameters

Diesel generator MP 56 TDE (5 kW output). Additional fuel tank with 150 liters capacity.

## APG-20

Automatic Power Generator

The gen-set consists of diesel combustion engine started by an electric starter. The clutch transfers the torsion from the engine over to the generator where voltage is generated. Electronic circuits correct voltage generation and distribution. The engine uses diesel stored in a tank located below the gen-set.

The APG-20 connected loads are powered by the APG-20 or the mains. The APG-20 has an extended lifecycle and extended time between failures. The APG-20 is certified to fulfil the requirements according to MIL-STD461F, RE102, CE102.

### General

Length:	1 946 mm
Width:	917 mm
Height:	1 196 mm
Weight:	1 190/1300 kg

### Caterpillar Generator set

Manufacturer	Olympian GEP22-4
Performance standby	22 kVA/17,6 kW
Performance Prime	20 kVA/16 kW
Electrical System	TN-S, 400/230 V, 50 Hz
Battery charger	24 VDC static

### 404D-22G Perkins Engine

4 in line in line, 4 Stroke. Water method cooling.  
Fuel consumption max. 5.39 l/hour 100% load (16 kW)

### Photovoltaic System

- 31 Polycrystalline PV panels with output 250 Wp each with anti - reflex solar glass (Made in Germany).
- Panel size: 1 650x992x40 mm. Total maximum output 7,75 kWp.
- Inverter: Multifunctional DC/AC inverter Victron with intelligent power management system
- Charge controller: 4 pieces 40A 48V (Made in Germany).
- Solar Batteries: 32 solar lead-acid batteries with capacity 200 Ah each (Made in Germany),
- Total capacity of energy storage 1 600 Ah/48V.
- Battery backup: 1 battery backup with 2 fuses and connecting cable.
- PV cabling and plugging: 200 meters with cross-section 6 mm². 24 pieces of MC4 plugs.

### Wind System Technical Parameters

Wind turbine: 3 composite turbine blades (1,8m diameter) with vertical axes with 2,4 kWp max. rated power, controlled by microprocessor with USB2 service interface.

### LG air conditioning

4,8kW 18,000 btu Heat Pump DC Inverter Under Ceiling System.

### Ventilation

K 100 XL Circular duct fan 230 V/50 Hz, Max. airflow: 256 m³/h

### Operation profile APG-20

- Operates when traveling and when stationary.
- Can be tilted 20 degrees in an arbitrary angle without fuel leaking.
- Can start and operate 300 m above sea level at a temperature of +40°C, with full performance.
- Can start and operate after max 30 minutes preheating, at 300 m above sea level and at a temperature of -32°C with full performance.

### Fuel system

The fuel tank is dimensioned for at least 24 hours operation at nominal load and has a filling pump, with automatic filling function, to fill the fuel tank from external fuel source. The fuel tank has a separate water separation "pocket". The engine's fuel-system is self-aired. The fuel tank volume is 137.5 dm³ - diesel.

### Olympian Alternator LL1014N

No. of bearings	1
Insulation Class	H
Wires.	12
AVR Model	Leroy Somer D510
Overspeed	2250 RPM



APG-20

# 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 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
- 27 years experience on the global fiber optic market
- NATO supplier code: 1583G
- More than 20 years experience of supplying the militaries of over 27 countries
- National Security Authority certified
- ISO and AQAP certified
- Accredited Calibration Laboratory No.: 2315

## OPTOKON PORTFOLIO, SERVICES & DIVISIONS

### ■ FIBER OPTIC DIVISION

- Connectors, Cable Assemblies
- Fiber Optic & Hybrid Cables
- Cable Management Systems
- Splitters, WDM, CWDM and DWDM
- Data Network Equipment
- Test Equipment
- Harsh Environment Optical Network
- Service and Calibration Center



### ■ SERVICE DIVISION

## OPTOKON GROUP HEADQUARTERS PRODUCTION & RESEARCH CENTER CZECH REPUBLIC



**OPTOKON, a.s.**  
Červený Kříž 250, Jihlava  
**OPTOKON Prague Office**  
Venušina 1149/3, Prague 10



**OPTOKON Kable**  
- Optical cable manufacturing



**OptoNET Communication**  
- Complete solution for ISP  
- Management of optical networks  
- Datacenter and telehouse services



OPTOKON Baltic



OPTOKON Germany



OPTOKON Malaysia



OPTOKON Poland



OPTOKON Saudi Arabia



OPTOKON Serbia



OPTOKON Slovenia



OPTOKON Ukraine



Your local partner



EUROPEAN UNION  
European Regional Development Fund  
Operational Programme Enterprise  
and Innovations for Competitiveness

OPTOKON, a.s. reserves the right to make changes without notice to the products described in this document in the interest of improving design, operational function and/or reliability.

OPTOKON, a.s., Červený Kříž 250, 586 01 Jihlava, Czech Republic  
tel. +420 564 040 111, fax +420 564 040 134, [WWW.OPTOKON.COM](http://WWW.OPTOKON.COM), [INFO@OPTOKON.COM](mailto:INFO@OPTOKON.COM)

Revision: 20170209