SAF

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Professional

Microwave Radio Solutions for Data and Voice Communication

SAF Tehnika

SAF Tehnika is a Latvian (Europe) designer, producer and distributor of digital microwave data transmission equipment. SAF Tehnika products provide wireless backhaul solutions for digital voice and data transmission to mobile and fixed network operators, data service providers, governments and private companies. The Company offers 3 product lines: **CFIP family** – Lumina FODU (with Optical Gigabit Ethernet interface) and 108Mbps FODU (Fast Ethernet interface), **CFQ family** – high capacity radio equipment (SDH) and **CFM family** – low to medium capacity radio equipment (PDH).

Overview of SAF Tehnika Products



SAF CFIP Product Line – Ethernet radio

CFIP FODU – up to 108 Mbps

Model		CFIP-7 / 8	CFIP-10 / 11	CFIP-13 / 15	CFIP-18 / 23	CFIP-24*	CFIP-26	CFIP-38			
Capacity			3.5-108 Mbps								
Channel bandwidth	IS**	3.5	3.5MHz / 7MHz / 14MHz / 28MHz (for 18GHz - 3.5MHz / 7MHz / 13.75MHz / 27.5MHz)								
Max. transmit powe	er (dBm) SP/HP***										
Modulation	128QAM	14/22	14 / 20	14/20	14	0	14	12			
	32APSK	17 / 25	17 / 23	17/23	17	3	17	15			
	16APSK	18/26	18/24	18/24	18	4	18	16			
	QPSK	19/27	19/25	19/25	19	5	19	17			
Ports											
Flange		UBR 84	UBR100	UBR 140	UBR 220	Circular 10 mm	UBR 320	UBR 320			
Ethernet with powe	r over Ethernet cable	RJ-45 (data traffic, management port, power)									
4 E1			18-pin connector (bal. 120 Ohm)								
RSL port, RSSI, BNC	connector		Output voltage vs RSL: 0 to 1.4 V vs -90 to -20 dBm								
Serial port for confi	guration	RS-232, Twin BNC connector									
Other data											
Power consumption	SP/HP***	19-25W / 27-33W									
Temperature range		-33℃ to +55℃									
Dimensions: HxWx[), mm / weight, kg		288x288x80 / 3.5								

Total payload capacity (Mbps)									
Modulation	Channel bandwidths (MHz)**								
	3.5	7	14	28					
QPSK	3 - 4	8 - 10	17 - 21	34 - 43					
16APSK	7 - 8	17 - 20	34 - 41	69 - 84					
32APSK	8 - 9	21 - 25	43 - 55	100 - 108					
64QAM	11	28 - 32	52 - 52	-					
128QAM	-	-	69 - 75	-					

* under development

** according to specific channel plan

*** Standard Power / High Power

CFIP 108 Mbps Highlights

- Excellent system gain allows efficiently upgrade PDH radios to 108Mbps capacity avoiding the antenna size change;
- Low power consumption enables power over Ethernet wires operation and use of solar/wind power;
- ACM and ATPC for high availability and high density deployments;
- Very high flexibility allows to configure the system to various channel bandwidths, modulation schemes and capacity settings.
- SNMP support for remote network monitoring and management.

CFIP FODU Application Examples

Carrier Gigabit Ethernet trunk distribution with CFIP Lumina FODU

- Superb for extending Fiber Optics network over high capacity radio;
- Ideal for crossing mountains and interconnecting Gigabit Ethernet networks;
- Designed for building Ethernet backhaul network.



Metro Ethernet and Mesh Networks with CFIP 108 Mbps FODU

- Suitable for any 100 Mbps Ethernet network topology star, ring, mesh network;
- Full Outdoor solution with Power over Ethernet wires is efficient for All Outdoor Base station connectivity,
- Last Mile Access for demanding power user and many other applications;
- Gigabit Ethernet backhaul can be supported with SAF CFQ Series products.



CFIP Lumina FODU – up to 366 Mbps

Model		Lumina 7 / 8	Lumina 10 / 11	Lumina 13 / 15	Lumina 18 / 23	Lumina 24	Lumina 26	Lumina 38		
Capacity		16-360 Mbps								
Channel bandw	idths*		14MHz / 28MHz / 40MHz / 56MHz							
Max. transmit p	ower (dBm)									
Modulation	256QAM	12	12	12	12	-2	12	10		
	128QAM	14	14	14	14	0	14	12		
	32APSK	17	17	17	17	3	17	15		
	16APSK	18	18	18	18	4	18	16		
	QPSK	19	19	19	19	5	19	17		
Ports										
Ethernet		Optical 1 or 2 ODC ports, or Electrical 1 or 2 RJ-45								
RSL port, RSSI, I	BNC connector	Output voltage vs RSL: 0 to 1.4V vs -90 to dBm								
Serial port for c	onfiguration	RS-232, Twin BNC connector								
Other data										
Power consump	tion			2	5-35W					
Temperature range -33°C to +55°C					C to +55°C					
Dimensions: Hx	WxD, mm /			288x2	288x80 / 3.9					
weight, ka										

* according to specific channel plan

CFIP Lumina Highlights

- Most up-to-date technology with up to 256QAM modulation and 56MHz channel bandwidth allows high capacity throughput up to 366 Mbps;
- Optical Ethernet connections provide excellent protection against lightning strikes and allow long distances from user equipment to radio;
- Up to 4093 concurrent VLAN traffic allows building many port-to-port networks paths for specific client services;
- 2 Gigabit Ethernet ports provide simple (management and user traffics on separate ports) and advanced configuration (various network protection schemes and topologies);
- Jumbo frame size supports up to 9728 bytes, which allows using longer header info (VLAN, MPLS) and transmitting more useful content and less headers, thus gaining on total throughput.

SAF CFQ Product Line – SDH radio

		CFQ C	DU									
Model		CFQ-6	CFQ-6-HP*	CFQ-7	CFQ-8	CFQ-8-HP*	CFQ-10**	CFQ-11	CFQ-11-HP*	CFQ-13	CFQ-15	CFQ-18
Capacity		SDH - STM-	SDH - STM-1; PDH/Eth/GigE - up to 155 Mbps; up to 63E1									
Channel bandwidth (M	Hz)	7 / 13.75 / 1	14 / 27.5 / 28	MHz (accord	ling to speci	fic channel pl	an)****					
Received thresholds	Modulation											
dBm (guaranteed***) / Max transmit power	QPSK	-86/+27	-86/+32	-87.5/+30	-86/+27	-86/+32	-86/+27	-86/+26	-86/+32	-87.5 /+28	-86.5/+27	-86 /+22
dBm BER10-6 at	QAM16	-81/+24	-81/+29	-79/+27	-81/+24	-81/+29	-81/+24	-81/+23	-81/+29	-79/+25	-78/+24	-77.5 /+19.5
28MHz / 56MHz	QAM32	-75/+24	-75/+29	-76/+24	-74/+24	-74/+29	-74/+24	-74/+24	-74/+29	-76/+23	-75 /+21	-74.5 /+18
	QAM128	-69/+22	-69/+27	-70/+24	-68/+22	-68/+27	-68/+21	-68/+21	-68/+26	-70/+22	-69 /+21	-68.5 /+18
Flange type		UDR70	UDR70	UBR84	UBR84	UBR84	UDR120	UBR100	UDR100	UBR140	UBR140	UBR220
Power consumption		IDU: from 3	30 to 50W ; O l	DU : from 24	to 42W (dep	pending on ca	pacity and r	nodules inst	alled)	1		
Temperature range ID	U	-5°C to +45°C										
Temperature range OI	DU	-33°/-45°C to +55°C	-33°/-45°C to +55°C	-45°C to +55°C	-33°/-45°C to +55°C	-33°/-45°C to +55°C	-33°/-45°C to +55°C	-33°/-45°C to +55°C	-33°/-45°C to +55°C	-45°C to +55°C	-45°C to +55°C	-45°C to +55°C

* HP - high power

** Under development

*** Typical received thresholds are up to 3 dBm better than guaranteed thresholds (depending on frequency, channel bandwith and modulation)

**** To find out specific modulation for each bandwidth, please contact your sales representative



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CFQ ODU

CFQ-SD-IDU

CFQ-SD-IDU – up to 624 Mbps

CFQ-SD-IDU Data Modules

Base Modules						
Standard Base Link capacity: 50 / 100 / 155Mbps Enhanced Base Supports ADM up to 63E1 via STM-1	A standard module provides connectivity up to 155Mbps, e.g., 100Mbps Ethernet and 16E1. By adding an expansion module – up to 37 x E1. Interfaces: - 14 x E1, high-density Molex connector; - 2 x E1, RJ-48C connector;					
	- Voice, Data ORW RJ-48C connectors; - 100BaseTX, 25-100 Mbps, two RJ-45 ports					
42E1 Base	Provides 63E1 capacity with 21E1 expansion module. Interfaces: - 42 x E1, 3x high-density Molex connector; - Voice, Data ORW RJ-48C connectors; - 100BaseTX, 25-100 Mbps, two RJ-45 ports					
GigE Base	Provides connectivity for Gigabit Ethernet. Interfaces:					
Enhanced GigE Base	- 4x10/100/1000Base-T ports with RJ-45 connector;					
With jumbo frames size up to 9728 bytes	- Ethernet SFP port;					
Enhanced GigE Base Supports ADM up to 63E1 via STM-1 and jumbo frames size up to 4000 bytes	- 2 x E1, N-46C connector; - Voice, Data ORW RJ-48C connectors					
Optional Modules						
16E1 Expansion module	- 14 x E1, high-density Molex connector; - 2 x E1, RJ-48C connector					
21E1 Expansion module	21 x E1, 2x high-density Molex connector					
STM-1 Optical mini module	STM-1, Single mode 1310 nm, SC Duplex Transceiver. Unconditionally eyesafe laser IEC 825/CDRH Class 1 Compliant					
STM-1 Electrical mini module	STM-1, 2xBNC, ITU-T Rec. G.703, 75 Ω					
2xSTM-1 Optical expansion module	2xSTM-1, Single mode 1310 nm, SC Duplex Transceiver. Unconditionally eyesafe laser IEC 825/CDRH Class 1 Compliant					
2xSTM-1 Electrical expansion module	2xSTM-1, 2xBNC, ITU-T Rec. G.703, 75 Ω					
2xSTM-1 SFP module	2 SFP ports for connection various optical or electrical adapters corresponding to STM-1 standards					

				CFQ W	/idebar	nd ODU	l						
CFQ	-23	CFQ-26	CFQ-38	CFQ-6-WB	CFQ-7-WB	CFQ-8-WB	CFQ-10-WB**	CFQ-11-WB	CFQ-13-WB	CFQ-15-WB	CFQ-18-WB	CFQ-23-WB	CFQ-26-WB
				SDH - 2 x STM-1; PDH/Eth/GigE - up to 310 Mbps									
				13.75 / 14 /	27.5 / 28 / 30	/ 40 / 56 MHz	(according to s	pecific channe	l plan)				
-85/-	+22	-84/+23	-83.5/+20	-83/+27	-83/+27	-83/+27	-83/+26	-83/+26	-82/+25	-82/+25	-82/+23	-80/+23	-80/+23
-76.5	5/+19	-79/+20	-75/+17	-78/+24	-78/+24	-78/+24	-78/+23	-78/+23	-74/+22	-74/+22	-77/+21	-72/+21	-72/+20
-73.5	5/+17	-73/+20	-72/+15	-72/+24	-72/+24	-72/+24	-71/+23	-71/+23	-71/+23	-74/+22	-73/+21	-69/+21	-69/+20
-67.5	5/+16	-67/+18	-68/+14	-66/+22	-66/+22	-66/+22	-65/+21	-65/+21	-65/+21	-66/+20	-65/+19	-64/+19	-64/+18
UBR2	220	UBR260	UBR320	UDR70	UBR84	UBR84	UBR100	UBR100	UBR140	UBR140	UBR220	UBR220	UBR260
IDU: from 30 to 50W ; ODU: from				U : from 24 to	942W		1		1				
				-5°C to +45°C									
-45°0 +55°	C to C	-33°/-45°C to +55°C	-45°C to +55°C	-33°/-45°C t	o +55°C								

SAF CFQ Application Examples

CFQ Ring STM-1, 63E1

- CFQ-SD-IDU provides the ability to demultiplex 63 x E1 PDH signal from SDH signal.
- STM-1 Mux Demux feature requires Enhanced module
- The ring is divided into 2 parts the active ring and the protection ring. During normal operation, data only flows in a counter-clockwise direction around the ring. If the active ring goes down, the protection ring comes into service.

CFQ 624 Mbps 2+0 East/East Solution

- Ethernet capacity up to 624 Mbps by using 2x56 Mhz channels. 311Mbps by using 2x28 MHz channels;
- Protected system loss of a link reduces bandwidth only by 50%;
- Optional E1 expansion;
- Available with Dual-polarization and Single-polarization antenna with a coupler;
- Also 3+0 and 4+0 solutions available.



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CFQ Highlights

- Ring configuration with built-in add-drop functionality for up to 63E1;
- 311 Mbps radio (56 MHz) for capacities of up to 933 Mbps per link in 3+0 configuration;
- 63E1 + 25-30Mbps Ethernet with a single ODU (28 MHz);
- Easy upgrade of existing set-up to 1+1 or 2+0, 3+0, 4+0 configurations with GigE.

SAF CFM Product Line – PDH radio CFM ODU

Specification			Frequency						
			5 GHz	7 GHz	8 GHz	10 GHz*	11 GHz*		
Frequency band (GHz)			4.4-5	7.1-7.9	7.7-8.5	10.15-10.65	10.7-11.7		
Modulation			4FSK, QPS	(· ·		
Channel plans accordin	g to		ETSI	ETSI	ETSI	ETSI	ETSI, FCC		
Duplex offset (Mhz)			300	154; 161; 168; 245	119; 126; 266; 310; 311.32	350	490; 530		
Max. Transmit power (dBm)			+33	+27	+27	+27	+27		
	Bandwidth	Capacity			·				
Received thresholds/	3.5 MHz	4Mbps	-/-	-84 / 111	-84 / 111	-85 / 111	-85 / 111		
System gains	7 MHz	8Mbps	-82 / 115	-84.5 / 111.5	-84.5 / 111.5	-83 / 110	-83 / 110		
(guaranteed dBm) BER 10-6**	14 MHz	16Mbps	-79/112	-80 / 107	-80 / 107	-81 / 108	-81 / 108		
according to ETSI	28 MHz	34Mbps	-76 / 109	-77 / 104	-77 / 104	-77 / 104	-77 / 104		
Flange			N-Type	UBR 84	UBR 84	UBR 100	UBR 100		
Power consumption			IDU: from 7.8 to 16.8W / ODU: from 8.3 to 18.4W / FODU: from 13.8 to 22.2W (depending on						
Temperature range			IDU: -5°C to +45°C / ODU: -33°C to +55°C						

* compatible only with CFM-M-MUX (30W PS)

** by using IDU with FEC, sensitivity figures are improved up to 3dB





CFM-MP-MUX

SAF CFM Application Examples

Ethernet Connectivity with CFM FODU



CFM FODU – up to 34Mbps

Specification	Capacity								
	4 Mbps	8 Mbps	8 Mbps	34 Mbps					
FODU model	2E1 FODU - CFM-xGHz-F2E1	4E1 FODU - CFM-xGHz-F4E1	8Mbps Ethernet FODU - CFM-xGHz-FR8	34Mbps Ethernet FODU - CFM-xGHz-FR34					
Frequency	7/8/10/11/13/15/	7 / 8 / 10 / 11 / 13 / 15 / 18 / 23 / 26 / 32 / 38 GHz							
Fixed interface modules	Fixed 2E1	Fixed 4E1	Fixed 10/100 Ethernet port + software configurable 2E1 interface	Fixed 10/100 Ethernet port + software configurable 2E1 interface (30+2+2 / 32+2 / 34Mbps)					
Compatibility with CFM Radio	CFM L4	CFM LM*	CFM LM*	CFM LM*					

* compatible with CFM-M-MUX and CFM-MP-MUX IDU

13 GHZ	15 GHz	18 GHz	23 GHz	26 GHz	32 GHz	38 GHz
12.75-13.25	14.4-15.35	17.7-19.7	21.2-23.6	24.5-26.5	31.8-33.4	37.05-40.0
ETSI	ETSI	ETSI, FCC	ETSI, FCC	ETSI	ETSI	ETSI, FCC
266	315; 322; 420; 490; 728	1008; 1010; 1092.5; 1526	1008; 1200; 1232	1008	812	700; 1260
+20/+23	+20	+19	+19	+19	+16	+14/+19
						· · · · ·
-83 / 103	-83 / 103	-83.5 / 103.5	-83.5 / 102.5	-82 / 101	-81 / 97	-79.5 / 93.5
-81 / 101	-81 / 101	-81 / 100	-80.5 / 99.5	-79 / 98	-78 / 94	-76.5 / 90.5
-78 / 98	-78 / 98	-77 / 96	-78.5 / 97.5	-76 / 95	-75 / 91	-73.5 / 87.5
-75 / 95	-75 / 95	-74/93	-75.5 / 94.5	-73 / 92	-72 / 88	-70.5 / 84.5
LIBR 140	UBR 140	UBR 220	UBR 220	UBR 260	UBR 320	UBR 320

CFM IDU – up to 37Mbps

Specification	Capacity	Capacity								
	4 Mbps	8/16/34 Mbps	8/16/34/37 Mbps							
IDU model	M Series 1+0 and 1+1* Modular IDU - CFM-M4-MUX / CFM-M4P-MUX	M Series 1+0 and 1+1* Modular Multirate IDU - CFM-M-MUX / CFM-MP-MUX	M Series 1+0 and 1+1* Modular Multirate IDU (with FEC) - CFM-M-MUX / CFM-MP-MUX							
Optional interface modules	1-port 10/100Base-T Ethernet, single E1, V.35	1/2-port 10/100Base-T Ethernet, single E1, 4-port E1 (1x25 unbal, 1xDB-25 bal, 4xRJ-45 bal), V.35, E3	1/2-port 10/100Base-T Ethernet, single E1, 4-port E1 (1x25 unbal, 1xDB-25 bal, 4xRJ- 45 bal), V.35, E3							
Port capacity configuration options	2 slots: 1. 0-4Mbps; 2. 0-2Mbps; 2 Mbps step	4 slots - 1. 0-34Mbps; 24. 0-16Mbps; 2 Mbps step	4 slots - 1. 0-36Mbps; 24. 0-18Mbps; 2 Mbps step							
Compatibility with CFM Radio	CFM L4	CFM LM	CFM LM							

* M-MUX and M4-MUX can operate in 1+1 FD or HSB by using 2 IDUs connected via alarm port

SAF NMS – Network Management System

SAF NMS is a flexible and full-featured element management system that provides centralized management and control of geographicallydispersed PDH and SDH nodes and subnetworks. SAF NMS supports a client-server model and is built for Windows NT platform.

SAF NMS allows subdividing network into various layers of administration according to geographical or planning considerations. It allows zooming in and navigating across the various subnetwork layers with ease and flexibility as well as arranging and placing subnetwork and element icons against custom background maps. For each managed subnetwork and network element, SAF NMS provides a graphical view of the current alarm conditions in color-coded displays using tables and icons.

All SAF Digital Radio parameters are accessible in three ways:

- 1. Using a standard web-browser via HTTP top access the built in webserver;
- 2. Via SNMP using the fully featured MIB, allowing for automation of data collection and network manage-ment;
- 3. Via a command line client accessible from a terminal client connected to the serial port, or telnet over the NMS Ethernet.

Control of the SAF digital radio family is supported as follows:

- PC-based Graphical User Interface;
- Other Network Management options



SAF Tehnika stands for:

- Independent European manufacturer;
- Highly reliable and durable quality products;
- One of the best price performance;
- Competent technical and customer service support;
- Fast delivery terms;
- Fast warranty service;
- Developed partners network worldwide.



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