

The logo for SAF, consisting of the letters 'SAF' in a bold, white, sans-serif font, enclosed within a red square. The square has small white vertical bars on its top and bottom edges.

SAF



Connecting
Ideas

Affordable PDH Data Microwave Radio Solutions

SAF Tehnika Profile

SAF Tehnika AS is a 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: CFM family – low to medium capacity radio equipment (PDH), CFQ family – high capacity radio equipment (SDH) and the new CFIP family – 100Mbps capacity radio equipment.

CFM Product Family

SAF CFM is a safe and affordable wireless communications point-to-point system operating over 5, 7, 8, 10, 11, 13, 15, 18, 23, 26, 32 or 38 GHz frequency bands. It provides voice and data transmission in both urban and rural areas covering up to 60 km distance between two sites. CFM is available with 4, 8, 16, 34 and 37 Mbps data transmission rate.

According to the needs of your business, you may find it handy to use either CFM system's modular equipment – radio (ODU) and interface block (IDU) installed separately – or Full Outdoor Units (FODU) comprising IDU and ODU in one device. By choosing CFM family products with appropriate interface you can build transmission systems for voice (nxE1 or E3), data (Ethernet or V.35), as well as mixed solutions for voice and data combination (E1, Ethernet or V.35).

The 4 Mbps 2 slot M Series Modular Indoor Unit – **CFM-M4-MUX** is designed to provide flexibility and modularity of traffic interfaces at small capacities.

The latest item in M Series Modular Indoor Units is **CFM-M4P-MUX**. IDU provides 1+1 HSB/SD/FD protection switching for CFM radio installations. Both IDU models support one or two interface modules with total traffic capacity from 0 Mbps to 4 Mbps.

The model **CFM-M-MUX** is a modular multi-rate software configurable Indoor Unit operating at 8/16/34Mbps rates. It can be equipped with E1, V.35 and 10/100Base-T Ethernet interface

modules. SAF's **CFM-MP-MUX** is a solution for 1+1 protected HSB/SD/FD installations. Its modular design allows installing various traffic interfaces that operate at 8-34Mbps (software configurable).

The new CFM-M-MUX and CFM-MP-MUX modification is available with **FEC feature** enabled. 2 modes of operation can be configured from software:

- 1) improved Rx sensitivity keeping data rate of 34 Mbps;
- 2) improved capacity up to 37 Mbps.

CFM Full Outdoor Units have ultra compact "all in one" design comprising IDU and ODU units in one device. The system is initially designed to provide 4 or 8 Mbps of traffic capacity implemented as 2xE1 or 4xE1 (G.703) channels. Full Outdoor equipment is perfect for mobile operators and users who do not require equipment located indoors. The last item in CFM Full Outdoor series is 34 Mbps Ethernet Full Outdoor Unit equipped with 10/100 Ethernet Port and software configurable 2xE1 interfaces. Available capacity combinations are 30+2+2; 32+2; 34Mbps.

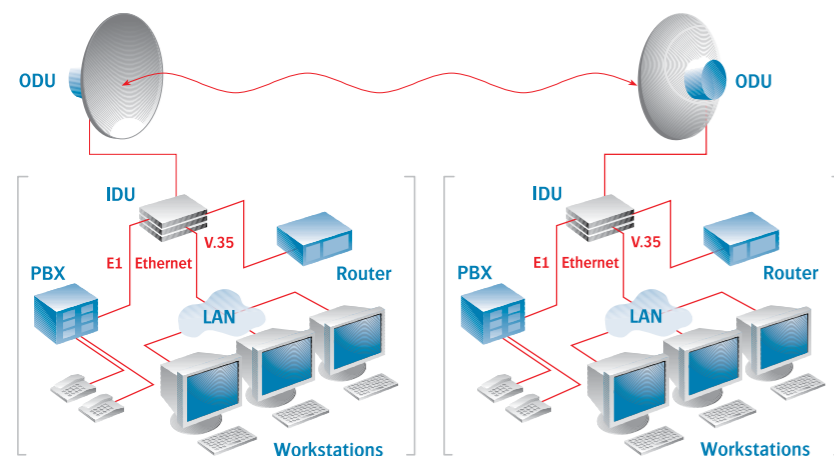
SAF CFM supports the following link configurations:

- 1) Non protected (1+0)
- 2) Protected Hot Standby (1+1)
- 3) Protected Hot Standby Space Diversity (1+1)
- 4) Protected Frequency Diversity (1+1)

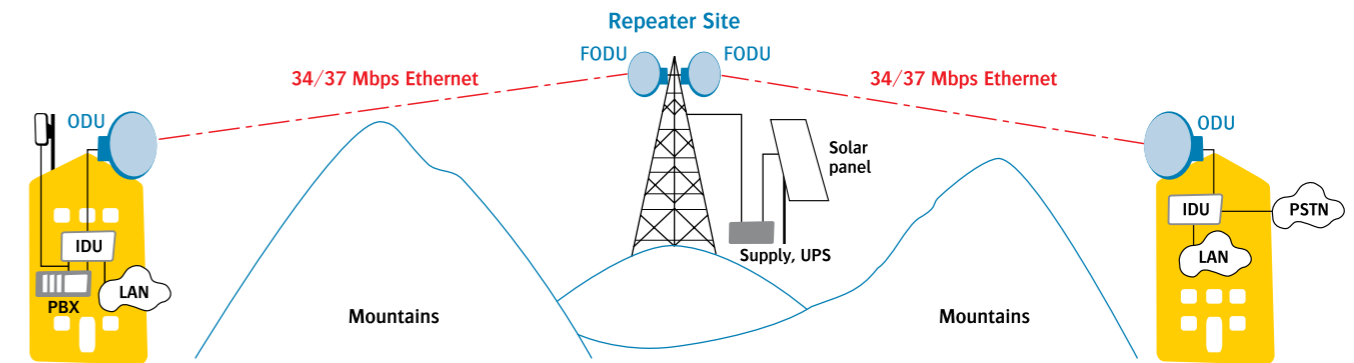
Our advanced approach grants our products:

- Excellent reliability
- Perfect modularity
- Wide compatibility of data and voice interfaces
- Outstanding technical parameters for radio and data traffic interfaces
- Attractive pricing
- Compact and handy design
- Low power consumption
- User-friendly management system

CFM Network Applications



CFM Application Example Ethernet Connectivity with FODU Repeater



CFM IDU/FODU Management Features

Specification	FODU	E1 IDU	M Series IDU
Physical Interface	Twin BNC, 18-PIN	DB-9 & RJ-45	DB-9 & 2xRJ-45
Interface	RS232 & 10/100 Base-T		2x10/100 Base-T
Network Management	SAF Network Management System (NMS)		
Engineering Orderwire	Via optional VoIP handset		
TCP/IP	WEB, SNMP, Telnet – Local & Remote		
ASCII Terminal	Local		
ATPC	for all IDUs except E1 IDUs		
Alarm Port	1 output	Optional, 4 inputs/4 outputs	
Loopback test facility	+	+	+
Front panel LCD and keypad	-	+	+
Service Channel	+	+	+
SNMP Monitoring/Traps	+	+	+
Alarm Monitoring & Logging	+	+	+
Performance Monitoring & Logging	-	-	+
Loopbacks	Baseband (local & remote) radio, E1 and V.35 interface		

CFM System's General Features		
Electrical		
Power supply	20 to 60V DC, any polarity can be grounded	
Power consumption		
IDU	from 7 to 15W (according to capacity & modules installed)	
ODU	from 8 to 19W	
FODU	from 13 to 23W	
Protection Circuit for IDU/Protected IDU	1.35A/2.5A	
Cable (IDU-ODU): single coaxial	up to 300m long LMR 400 or up to 100 long RG-213, N-type connectors/up to 20dB attenuation @ 350MHz	
Environmental		
Ambient	IDU	-5°C to +45°C
Temperature	ODU/FODU	-33°C to +55°C
Altitude	in accordance with climatic standards	
Mechanical		
IDU - HxWxD mm/weight kg/H in HU		
Fixed and modular (w/o modules)	44x482x270/1.7/1U	
1+1 Modular Multirate IDU (CFM-MP-MUX)	88x482x270/2.33/2U	
ODU/FODU mm/weight kg	280x85/2.5; FODU: 3.0 kg	
Standard compliance		
ETSI, ITU, ANSI FCC Part 101, FCC Part 2		
EMC	EN 301 489	
Operational, ODU/FODU	EN 300 019, Class 4.1	
Operational, IDU	EN 300 019, Class 3.1 E	
Storage, IDU & ODU/FODU	EN 300 019, Class 1.2	
Transportation, IDU & ODU/FODU	EN 300 019, Class 2.3	
Safety	EN 60950	

CFM Indoor Units, Outdoor Units and Full Outdoor Units Technical Specification

Specification	Frequency												
	5 GHz*	7 GHz	8 GHz	10 GHz*	11 GHz*	13 GHz	15 GHz	18 GHz	23 GHz	26 GHz	32 GHz	38 GHz	
Frequency band (GHz)	4.4-5	7.125-7.725	7.9-8.5	10.15-10.65	10.7-11.7	12.75-13.25	14.4-15.35	17.7-19.7	21.2-23.6	24.5-26.5	31.8-33.4	37.0-39.5	
Channel plans according to	ETSI	ETSI	ETSI	ETSI	ETSI, FCC	ETSI	ETSI	ETSI, FCC	ETSI, FCC	ETSI	ETSI	ETSI, FCC	
Duplex offset (MHz)	300	154; 161; 168	119; 126; 266	350; 91	530	266	420; 490; 728	1010	1008; 1232; 1200	1008	812	1260	
# of subbands/min tuning range (MHz)	2/120	3/52; 3/42; 3/32	2/38; 2/38; 2/105	1/122.50	-	2/112	2/206; 2/220	1/108; 2/467	2/550; 2/590	1/584; 2/444	2/388	2/556	
Transmitter power (dBm)	+33	+27	+27	+27	+27	+20	+20	+20	+19	+19	+16	+14	
Transmitter power attenuator (dBm); 1dBm step	0 to +33	-10 to +27	0 to +27	0 to +27	0 to +27	-10 to +20	-10 to +20	-10 to +19	-10 to +19	-10 to +19	-10 to +16	-10 to +14	
Flange Type	N type	UBR 84	UBR 84	UBR 100	UBR 100	UBR 140	UBR 140	UBR 220	UBR 220	UBR 260	UBR 320	UBR 320	
Received thresholds/System gains (guaranteed dBm):													
BER 10 ⁻³	4 Mbps	-/-	-87/114	-87/114	-87/114	-87/114	-86/106	-86/106	-87/106	-87/106	-84/103	-85/101	-83/97
	8 Mbps	-85/118	-87.5/114.5	-87.5/114.5	-87/114	-87/114	-84/104	-84/104	-84/103	-84/103	-84/103	-82/98	-80/94
	16 Mbps	-82/115	-84/111	-84/111	-84/111	-84/111	-81/101	-81/101	-80/99	-80/99	-81/100	-79/95	-77/91
	34 Mbps	-79/112	-81/108	-81/108	-79/106	-79/106	-78/98	-78/98	-77/96	-79/98	-78/97	-76/92	-74/88
BER 10 ⁻⁶ **	4 Mbps	-/-	-84/111	-84/111	-85/111	-85/111	-83/103	-83/103	-83.5/103.5	-83.5/102.5	-82/101	-81/97	-79.5/93.5
	8 Mbps	-82/115	-84.5/111.5	-84.5/111.5	-83/110	-83/110	-81/101	-81/101	-80.5/99.5	-80.5/99.5	-79/98	-78/94	-76.5/90.5
	16 Mbps	-79/112	-80/107	-80/107	-81/108	-81/108	-78/98	-78/98	-77/96	-78.5/97.5	-76/95	-75/91	-73.5/87.5
	34 Mbps	-76/109	-77/104	-77/104	-77/104	-77/104	-75/95	-75/95	-74/93	-75.5/94.5	-73/92	-72/88	-70.5/84.5
Noise Figure (NF)	4dB	4dB	4dB	4dB	4dB	4dB	4dB	4dB	4dB	4dB	6dB	6dB	
Antenna port													
Antenna gain (dBi)	0.25 m	-	-	-	-	-	-	-	32	34	-	-	-
	0.30 m	-	-	-	-	-	29.2	32.2	32.9	35	35.9	38.4	39.3
	0.60 m	-	30.2	30.9	34.6	34.6	36	36.9	38.3	39.9	41	43.5	44.3
	1.20 m	32.6/33	36.5	37	40.1	40.1	42	43	44.3	45.9	46.8	-	-
	1.80 m	36.6	40.7	41.2	-	-	45.2	46.2	48.1	49.5	-	-	-
	2.40 m	-	43.1	43.6	-	-	47.3	49.5	-	-	-	-	-
	3.00 m	-	45.1	45.6	-	-	-	-	-	-	-	-	-
Max. Input power at antenna port	0 dBm												
Polarization	Vertical or horizontal, field selectable												
Mounting options	Direct or via flexible waveguide												

* compatible only with CFM-M-MUX (30W PS) ** by using IDU with FEC, sensitivity figures are improved up to 3dB

Specification	Capacity						
	4 Mbps ETSI	8 Mbps ETSI	16 Mbps ETSI	34 Mbps ETSI	8/16/34 Mbps ETSI	8/16/34/37 Mbps (with FEC) ETSI	6/13/27 Mbps FCC
Channel bandwidth (MHz)	3.5	7	14	28	7/14/28	7/14/28	5/10/20
Emission Codes	3M50F7W	7M00F7W	14M0F7W	28M0F7W	7M00F7W/14M0F7W/28M0F7W	7M00F7W/14M0F7W/28M0F7W	-
Modulation	4FSK						
Intermediate Frequency	Transmit - 350MHz; Receive - 140MHz						
Transmitter/Receiver source	Synthesized						
Frequency stability	+/-10 PPM						
Background BER	<10 ⁻¹¹						

CFM M Series Modular Indoor Units

Specification	Capacity		
	4 Mbps	8 Mbps	8/16/34 Mbps
Indoor Unit type	M Series 1+0 and 1+1 Modular Indoor Unit	M Series 1+0 and 1+1 Modular Multirate Indoor Unit	M Series 1+0 and 1+1 Modular Multirate Indoor Unit (with FEC)
Model name	CFM-M4-MUX* / CFM-M4P-MUX	CFM-M-MUX* / CFM-MP-MUX	CFM-M-MUX* / CFM-MP-MUX
Product number	CFGM4001; CFGM4002R** / CFGM4P02; CFGM4P02R	CFGMX001; CFGMX002R** / CFGMXP02; CFGMXP02R	CFGMF001; CFGMF002R** / CFGMFP02; CFGMFP02R
Number of slots for modules	4		
Optional interface modules	1-port 10/100Base-T Ethernet, single E1, V.35	1-port 10/100Base-T Ethernet, single E1, 4-port E1(1x25 unbal, 1xDB-25 bal, 4xRJ-45 bal), V.35	1-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	Slot 1: 0-4 Mbps; Slot 2: 0-2 Mbps; 2 Mbps step	Slot 1: 0-34 Mbps; Slots 2&3&4: 0-16 Mbps; 2 Mbps step	Slot 1: 0-36 Mbps; Slot 2&3&4: 0-18 Mbps; 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 ** with alarm port

E1 (ITU-T G.703) Indoor Units

Specification	Capacity				
	4 Mbps	8 Mbps	16 Mbps	34 Mbps	34 Mbps
Indoor Unit type	2xE1 Indoor Unit	4xE1 Indoor Unit	8xE1 Indoor Unit	16xE1 Indoor Unit	E3 Indoor Unit
Model name	CFM-4-2E1	CFM-8-4E1	CFM-16-8E1	CFM-34-16E1	CFM-34-E3
Fixed interface modules	Fixed 2xE1 (bal/unbal)	Fixed 4xE1 (bal/unbal)	Fixed 8xE1 (bal/unbal)	Fixed 16xE1 (bal/unbal)	Fixed E3 (bal/unbal)
Port capacity configur. opt.	-	-	-	-	-
Compatibility with CFM Radio	CFM L4	CFM LM	CFM LM	CFM LM	CFM LM

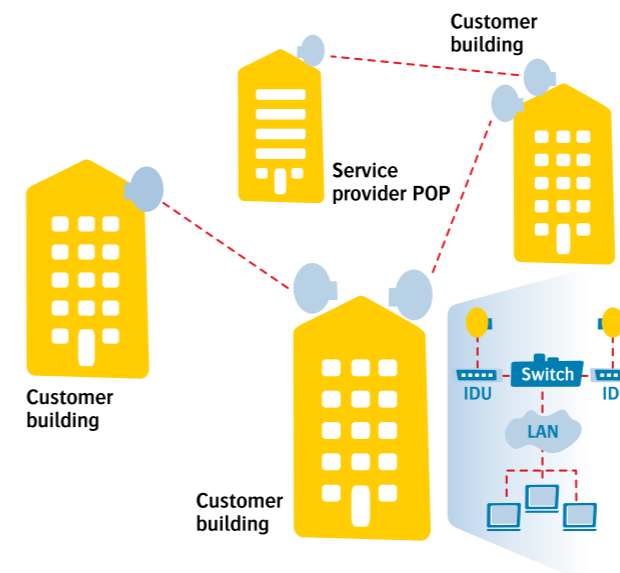
CFM Full Outdoor Units

FODU can be equipped with a FODU Termination panel or Outdoor Terminal cabinet

Specification	Capacity		
	4 Mbps	8 Mbps	34 Mbps
Unit type	2xE1 Full Outdoor Unit	4xE1 Full Outdoor Unit	34 Mbps Ethernet Full Outdoor Unit
Model name	CFM-x*-F2E1	CFM-x*-F4E1	CFM-x*-FR34
Fixed interfaces	Fixed 2E1	Fixed 4E1	Fixed 10/100 Ethernet Port + software configurable 2E1 interface (30+2+2; 32+2; 34 Mbps)
Compatibility with CFM IDU/ODU	CFM L4***	CFM LM**	CFM LM**

* frequency 7/8/13/15/18/23/26/32/38 GHz ** compatible with CFM-M-MUX and CFM-MP-MUX IDU *** compatible with CFM-M4-MUX and CFM-M4P-MUX IDU

CFM Network Management System (NMS)



All of the CFM 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 management;
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 CFM digital radio family is supported as follows:

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



We are offering:

- High quality products
- Flexible delivery terms
- Professional technical and customer service support
- Fast warranty service
- Developed partners network



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