

Technical Data Document
Fire Detection Systems installed in Metro Lines 2 & 3 Stations

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**Technical Description of the Fire Detection System
Installed in the Base Project Stations**

GEORGAKAKIS SECURITY

TECHNICAL DESCRIPTION OF THE FIRE DETECTION SYSTEM IN THE DEPOT AND THE METRO STATIONS ON LINES 2 & 3

The Fire Detection network is made of:

- Fire alarm panels (FAP) BMS 32, BMS 80/LB and BMS 240 by SIEMENS
- Smoke detector BR 12 by SIEMENS with its mounting fixtures
- Heat sensors BD 957 by SIEMENS with its mounting fixtures
- Alarm buttons (break glass) red, Inergen release buttons yellow, and fire distinguishing command canceling buttons blue by SIEMENS
- Horns (audible alarm) by SIEMENS
- Low Level signaling point (LSP)
- Flash repeaters by SIEMENS (GMT)
- Mimic panels in Station Master Rooms (SMR)
- Wiring for the above equipment to the FAP and wiring from FAP to the contacts where signals are directed.

1. INTERFACING THE FIRE DETECTION AND INERGEN FIRE EXTINGUISHING SYSTEM WITH THE STATION E/M INSTALLATIONS

The Fire Detection and Extinguishing System is interfaced with the Heating, Ventilation and Air Conditioning (HVAC) system of the network. The following chapters present a short description of the interdependence among the systems. After contract signing, the Contractor shall receive complete specifications and analysis of the systems with a view of enabling him to participate in periodical inspections and tests conducted in order to verify their proper interface and operation.

The FAP communicates with all main switchboards of the Station, i.e.:

- SBS 3.1 switchboard in room 3.1 controlling ventilation
- SBS 3.7 in room 3.7 controlling the cooling systems
- The Fireman Box (FB) which controls the fan operation in case of fire in the tunnels and on the platform
- The mimic panel in the SMR which gives a full picture of the entire system

Communication among the above systems is implemented via SINEC L2 Bus communication system.

Moreover, SBS 3.1 communicates via a modem with SBI 3.1, i.e. the switchboard located in the shaft controlled by the Station. All SBS 3.1 of the system communicate with each other and with the two central Environment Control systems (ECS) computers in Syntagma Operations Control Centre (OCC) via a process bus.

In addition, the FAP communicates with the Damper Interface Box (DIB), The DIB controls the operation of the electrical fire dampers. SBS 3.1 and SBS 3.7 also receive signals about the mode of certain fire dampers controlled either thermically, or electromagnetically, or driven by small bellimo motors. These dampers are mainly located in rooms with electrical equipment also equipped with Inergen fire extinguishing system.

Activation of fire detectors

When a smoke detector detects smoke or when an alarm button is pressed, the signal is directly transmitted to the FAP.

The FAP transmits the signal to SBS 3.1 and SBS 3.7, which immediately inhibits the operation of the fans associated with the affected areas to prevent the supply of

oxygen to the fire. The DIB releases the respective fire dampers in order to isolate the affected area and to prevent the spreading of fire to adjacent areas.

There are also dampers not controlled by the DIB, but by a fusible fuse. These dampers transmit a signal to the panel that controls them in order to automatically suspend the operation of the fans if necessary.

A prerequisite for the activation of fire extinguishing with Inergen is the activation of two successive zones in the same room. The activation of the first zone automatically closes the fire damper of the air duct in this room stopping, thus, the operation of the fan. Subsequently and if a second zone is activated, then the motorized damper on the wall closes gradually so as to allow the air **to escape when the room is flooded with Inergen**. After a pre-defined time period, the damper closes completely to prevent the escape of Inergen and to achieve the required Inergen concentration in the room.

As soon as the procedure is completed, the fire damper must be opened and after a reset at the panel and the deactivation of the zones, the fan resumes its operation to clear the Inergen with the smoke, as well as any other gases produced by the fire. Replacement of the fire detectors is a pre-requisite for the activation of the zones.

All fire detection and extinguishing actions are depicted and recorded by the two SCADA systems in Syntagma OCC, i.e. ECS and PRCS.

Mimic panel

It displays the arrangement of the station, the intershafts, the recesses and the PPC rooms. The locations of the areas surveyed by fire detection zones and of the alarm buttons are displayed on the panel. Each fire detection zone is illuminated by led in case of an alarm. The panel is located within the SMR and shows the proper operation of the system.

Bear in mind that a fire detection zone is a set of interconnected fire detectors surveying one or more rooms. The fire detection zone can be also made up by one single detector.

Standard mimic panel

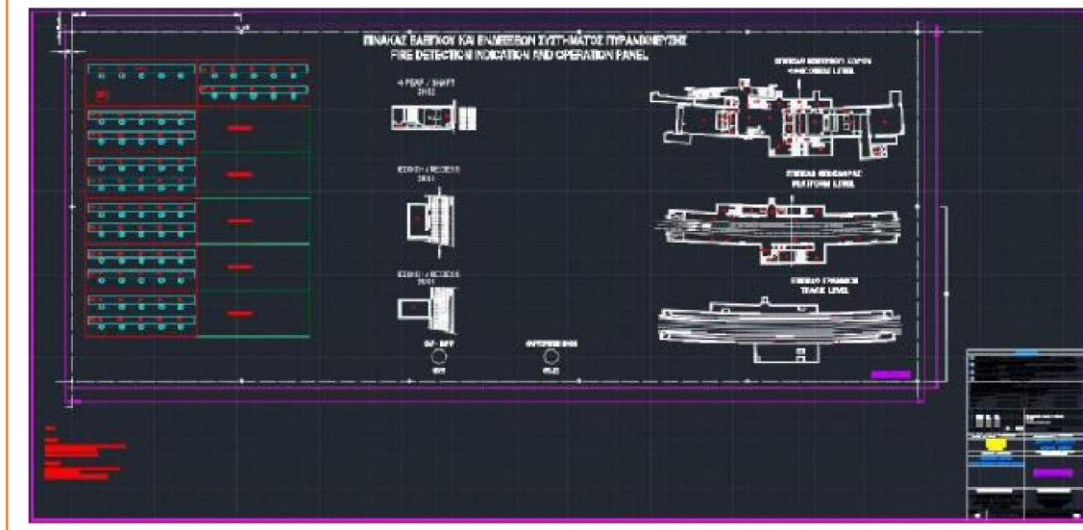


TABLE 1 Quantitative features of the fire detection system

STATION	BR12	BD57	DR9 RED	DR9 YELLOW	SIREN	LSP	BMS
DEPOT							
SIGNALLING TOWER	31		3	4	4	8	1(240)
TRAIN STABLING	16		5		4		1(32)
RUNNING SHED	194	25	22		16		1(32)
CENTRAL GUARDHOUSE	27	2	7		5		1(32)
WORKSHOP	50	10	16		16		1(32)
PPC SUBSTATION	16		2	2	2	6	1(80)
LINE 2							
SEPOLIA	150		10	5	12	10	1(240)
ATTIKI	160		16	6	13	10	1(240)
LARISSA	157		8	4	13	8	1(240)
METAXOURGIO	203		13	5	12	10	1(240)+1(80)
OMONIA	193		14	3	14	8	1(240)
PANEPISTIMIO	125		13	3	10	6	1(240)
SYNTAGMA	490		41	18	26	42	2(240)+1(80)
AKROPOLI	158		13	5	12	10	1(240)
SYNGROU – FIX	148	1	8	4	10	8	1(240)
NEOS KOSMOS	124		14	3	11	6	1(240)
AG. IOANNIS	140		8	5	13	12	1(240)
DAFNI	189		17	6	11	12	1(240)
LINE 3							
MONASTIRAKI	251		25	7	24	14	1(240)+1(80)
EVAGGELISMOS	130		12	3	10	6	1(240)
M. MOUSSIKIS	140		14	5	11	10	1(240)
AMBELOKIPI	131		10	3	12	6	1(240)
PANORMOU	216		20	5	14	10	1(240)
KATEHAKI	259		16	5	11	10	1(240)
ETHNIKI AMYNA	260		13	5	12	10	1(240)
TOTAL	3958	38	340	106	298	222	20(240)+4(32) +4(80)

EXAMPLE OF ZONE DIAGRAM

Zone No.	L.	Location of the detector zone	Detector type	No. of detectors	Software assignment	Control Ventilation	Special comments
Zone 1	C	Room 3.2/ 3.3	BR 12	2	Two Zone coincident	EXF ER,H1-4,LSP2,(LED08)	(KE11) Inergen deluge
Zone 2	C	Room 3.2/ 3.3	BR 12	2	Two Zone coincident	EXF ER,H1-4,LSP2,(LED08)	(KE11) Inergen deluge
Zone 3	C	Room 3.2/ 3.3	DR 9 (yw)	2		EXF ER,H1-4,LSP2,(LED08)	(KE11) Inergen deluge manual
Zone 4	C	Room 3.7	BR 12	4		H8,(LED33)	
Zone 5	C	Room 2.2/4.5	BR 12	2		(LED31,32)	
Zone 6	P	Room 3.21 [b]	BR 12	1		EXF LM (2),(LED38)	L# 2
Zone 7	C	Room 3.21 [a]	BR 12	1		EXF LM (1),(LED26)	L# 1
Zone 8	P	Room 3.21 [c]	BR 12	1		EXF LM (3),(LED57)	L# 3
Zone 11	C	Room 3.4 S/3.4T	BR 12	2	Two Zone coincident	EXF ER,H2-4,LSP1,(LED12)	(KE12) Inergen deluge
Zone 12	C	Room 3.4 S/3.4T	BR 12	2	Two Zone coincident	EXF ER,H2-4,LSP1,(LED12)	(KE12) Inergen deluge
Zone 13	C	Room 3.4 S/3.4T	BR 12	1	Two Zone coincident	EXF ER,H2-4,LSP1,(LED12)	(KE12) Inergen deluge (False fl.
Zone 14	C	Room 3.4 S/3.4T	BR 12	1	Two Zone coincident	EXF ER,H2-4,LSP1,(LED12)	(KE12) Inergen deluge (False fl.
Zone 15	C	Room 3.4 S/3.4T	DR 9 (yw)	2		EXF ER,H2-4,LSP1,(LED12)	(KE12) Inergen deluge manual
Zone 16	C	Escalator [2]	BR 12	1		(LED68)	Escalator machine room 2
Zone 17	C	Room 1.1/1.2	BR 12	4		(LED25)	
Zone 18	P	Room 3.19	BR 12	1		(LED37)	
Zone 21	T	Cable duct [1]	BR 12	14		(LED63,64,65)	Track 1
Zone 22	T	Cable duct [2]	BR 12	14		(LED60,61,62)	Track 2
Zone 23	C	Room 3.1	BR 12	2		(LED04)	
Zone 24	C	Room 3.9	DR 9 (yw)	1		EXF ER,H3,4,LSP3,(LED01)	(KE13) Inergen deluge manual
Zone 25	C	Room 3.9	BR 12	4	Two Zone coincident	EXF ER,H3,4,LSP3,(LED01)	(KE13) Inergen deluge
Zone 26	C	Room 3.9	BR 12	4	Two Zone coincident	EXF ER,H3,4,LSP3,(LED01)	(KE13) Inergen deluge
Zone 27	C	Room 3.13	BR 12	2		EXF ER,(LED07)	
Zone 28	P	Room 3.5	BR 12	1		(LED39)	
Zone 31	P	Room 2.13	BR 12	1		(LED58)	
Zone 32	C	Room 3.10	BR 12	2		(LED02,03)	
Zone 33	PC	Room 1.9/2.12/3.19	BR 12	7		(LED09,10,53,54,55,56)	
Zone 34	C	Room 3.20	BR 12	2		H4,(LED11)	
Zone 35	C	Room 3.20	BR 12	5		H4,(LED05,06)	
Zone 36	T	Room 3.14a [1]	BR 12	1		EXF P (1),(LED67)	Track 1
Zone 37	T	Room 3.14a [2]	BR 12	1		EXF P (1),(LED66)	Track 2
Zone 38	C	Room 1.4	BR 12	8		(LED23,24)	
Zone 41	C	Room 1.2/1.9	DR9	2		EXF P (1),(LED20,21)	
Zone 42	PC	Room 1.3/1.9	BR 12	6		(LED22,59)	
Zone 43	PC	Room 1.3/1.9	BR 12	7		(LED13,14,15,35,36)	
Zone 44	C	Room 2.3/3.8	BR 12	2		EXF ER; H4,(LED17,18)	
Zone 45	C	Room 2.8	BR 12	1		(LED19)	
Zone 46	C	Room 2.9	BR 12	2		(LED34)	
Zone 47	C	Room 2.4/2.7/2.5	BR 12	10		(LED28,29,30)	
Zone 48	C	Room 2.7	DR9	1		EXF P (1),(LED27)	
Zone 51	C	Room 2.7	BR 12	1		(LED74)	
Zone 52	C	Room 2.7	DR 9	1		EXF P (1),(LED16)	
Zone 53	P	Room 1.6	BR 12	14		(LED47,48,49)	
Zone 54	P	Room 1.6	DR 9	3		EXF P(1),(LED50,51,52)	
Zone 55	P	Room 1.6	BR 12	14		(LED40,41,42,43)	
Zone 56	P	Room 1.6	DR 9	3		EXF P(1),(LED44,45,46)	
Zone 57	C	Escalator [3]	BR 12	1		(LED73)	Escalator machine room 3
Zone 58	-	2U01_Recess	BR 12	2		EXF REC(1),(LED72)	2T01/ no detection in the offer

CALCULATION OF BATTERY SUPPLY AND CAPACITY

Central power supply system				(without external loads)					
Load	unit	single con-	total con- sume (A)	Remarks:	Load	unit	calc	single con-	total con- sume (A)
ZKR-module	1	0,065	0,065	Use the current values of the equip- ment of the largest fire section in the event of an alarm. It is not anticipated that all units of all fire sections will be tripped. <div style="border: 1px solid black; width: 100px; height: 20px; margin: 5px auto;"></div> designations of the selected fire section	ZKR-module	1	1		0,000
ZOA-module	1	0,090	0,090		ZOA-module	1	1	0,050	0,050
Operating panel	1	0,045	0,045		Operating panel	1	1	0,050	0,050
24V/4A power supply	3	0,025	0,075		24V/4A power supply	3			0,000
8GMG module	7	0,150	1,050		8GMG module	7	1	0,040	0,040
8PMG module			0,000		8PMG module	0			0,000
7/1 GMG-LA			0,000		7/1 GMG-LA	0			0,000
7/1 PMG-LA			0,000		7/1 PMG-LA	0			0,000
-			0,000		-	0			0,000
LS-Z module	3	0,007	0,021		LS-Z module	3	1	0,030	0,030
ZUEWST -Lines	6	0,007	0,042	perUEWST-Line	6	2	0,044	0,088	
-				-	0			0,000	
-				-					
-				-					
-				-					
-			0,000	-					
Alarm current	Total 1		1,388	Additional Alarm current	Total 2			0,258	
				Central closed-circuit current	Total 1			1,388	
				Additional Alarm current	Total 2			0,258	
				Central alarm current	Total 3			1,646	

Other loads powered by the central power supply												
closed-circuit current (loads deactivated in the event of an alarm)					Alarm current							
Only mains supply (FSA, etc.)				Mains and battery supply				Mains and battery supply (horns, UE, etc.)				
Load	unit	single con-	total con- sume (A)	Load	unit	single con-	total con- sume (A)	Load	unit	calcul. unit	single con-	total con- sume (A)
per relay				per relay				per relay				
-SAR	0	0,025	0,000	-SAR	0	0,025	0,000	-SAR	10	3	0,025	0,075
-BAR	0	0,012	0,000	-BAR	0	0,012	0,000	-BAR	27	5	0,012	0,060
			0,000				0,000	Alarm horn	15	4	0,025	0,100
			0,000				0,000	Flash light	3	3	0,250	0,750
			0,000				0,000	Solenoid valve	3	1	0,625	0,625
			0,000				0,000	Luminous sign post	10	4	0,625	2,500
Alarm current	Total 1		1,388	Alarm current	Total 1		1,388	Central alarm current	Total 3			1,646
Closed circuit	Total 4		1,388	Closed circuit current I_R	Total 5		1,388	Alarm Current I_{AL}	Total 6			5,758

Required battery capacity				closed circuit current I_R	
a) Emergency power supply period		4 h	<input type="checkbox"/>	Total 7 1,388	
		30 h	<input checked="" type="checkbox"/>		
		72 h	<input type="checkbox"/>		
c) calculation of the battery capacity K for emergency power supply period t_0				b) Values for the determination of the battery capacity	
				- closed circuit current I without recharging current	
				- alarm current I_{AL}	
				c) Recharging current I_W of the battery calculation	
$t_0 > 30$	$K = t_0 * I_R + 0,5 * I_{AL} =$	44,518 Ah	K_B battery =	65,000 Ah	
			I_W	=	3,250 A

Required quantity of power supply			base current I_B	
			5,756	
$I_{max} = I_W + I_B =$			9,006 A	
			quantity of PS 24V / 4A - H	1
			quantity of PS 24V / 4A - N	2

**Technical description of the Fire Detection System in Stations of Phase A'
Extension (e.g. EGALEO Station)**

1. FIRE DETECTION INSTALLATION

1.1 GENERAL

The fire detection system includes:

- (a) the fire detectors
- (b) the fire alarm button
- (c) the installation of auxiliary components of the automatic extinguishing systems
- (d) the installation of the Fire Alarm Panel (FAP) and the Fire Alarm Management (FAM)
- (e) the installation of the power supply network for detectors and other components

1.2 STANDARDS

The installation shall be designed in accordance with the following standards, regulations and specifications:

- (a) Presidential Decree (PD) 71 "Building fire protection regulation" (FEK 32-A-17/2/1988) and PD 374 FEK 168-A-12/8/1988
- (b) European Standards EN 54
- (c) US Standards NFPA 72 and NFPA 130 for those areas not covered by the Greek regulations.
- (d) Recommendations of the German Insurance companies: "VDS: RECOMMENDATIONS FOR AUTOMATIC FIRE DETECTION ALARM SYSTEMS"
- (e) ATTIKO METRO S.A. specifications and requirements.

1.3 CLASSIFICATION OF A STATION

Given that, for the time being, the Greek Legislation does not cover Metro projects with regard to their Active Fire Protection, further to our contacts with the responsible Fire Safety Section of the Fire Department, there will be a relevant legislation in the future. Nevertheless, the Fire Department has made some general suggestions regarding the Fire Protection of Stations, Shafts and Tunnels. These suggestions are going to be more concrete in the near future.

In view of the above, Active Fire Protection systems are installed in the shafts in accordance with the ATTIKO METRO S.A. specifications and specific recommendations by the Fire Department.

The required Active Fire Protection installations (related to fire detection) are the following:

- (a) Automatic fire detection and distinguishing system in high risk areas
- (b) Manual electrical alarm system
- (c) Fire announcement devices (horns, lights and flash repeaters)

1.4 FIRE DETECTION – DETECTORS INSTALLATION

1.4.1 Fire detection shall be analogue addressable, controlled from the Station FAP

1.4.2 The foreseen detectors shall be of the type of “visible smoke”, analogue “point” detectors and shall give precise signals in conditions of normal detection, as well as during the stage of pre-alarm and alarm.

1.4.3 As per the drawings, the fire detection installation shall cover all public areas, E/M rooms, warehouses, office areas, lifts at the highest point of the elevator shaft, the escalator motor areas, the high points of shafts (vertical risers) accommodating electrical installations, the areas above the false ceilings, the underfloor cable ducts and the areas below the false floors.

1.4.4 All areas foreseen to be equipped with automatic extinguishing systems are fitted with dual arrangement of detectors for reasons of confirmation of the system activation signal, as described in the chapter describing the automatic extinguishing systems.

1.4.5 Each visual type detector shall cover an area of 60- 80m².

1.5 FIRE ANNOUNCEMENT INSTALLATION

1.5.1 The fire announcement installation incorporates the proper number of manual alarm buttons, horns, lights and flash repeaters.

1.5.2 The manual alarm buttons are foreseen to be installed at the emergency exits, the fire hose cabinets and other locations, so that no spot on the plan view is at a distance of more than 30m from the buttons, unless the escape route passes through an alarm point within a distance of 50m.

1.5.3 The alarm announcement in the Station shall be implemented by means of horns and flashers, suitably located in the public areas, so as to cover all areas of the station. These shall be activated from the FAP.

- 1.5.4 In order to quickly and easily locate the place of fire, flashing repeaters shall be installed which shall start flashing when the pertinent detector is activated.
- 1.5.5 In case of fire, the passengers shall receive information and the relevant instructions for station evacuation by the Station Master via the Public Address (PA) system.
- 1.5.6 The automatic interface between the FAP and the PA system shall be implemented in the future in a manner to ensure that:
- (a) Whenever an initial alarm signal is received, a recorded announcement shall be made, so as to mobilize the station personnel.
 - (b) if the personnel does not respond to the announcement within a defined time period, or if a new alarm signal is received at the FAP, then a recorded message shall be transmitted to all zones giving instructions for evacuation.

1.6 AUXILIARY DEVICES OF THE AUTOMATIC FIRE EXTINGUISHING SYSTEMS

- 1.6.1 In areas foreseen to be flooded with Inergen by the automatic fire extinguishing system, the following auxiliary devices are foreseen:
- (a) outside every room and above its door, a horn with a flashing light shall be installed, as well as an illuminated "STOP" sign, which are activated whenever the room is flooded with Inergen to avert personnel approach.
 - (b) inside every room, for reasons of timely evacuation of employees, an electrical ringer and a flashing light shall be installed. The above devices shall be activated at the pre-alarm stage, i.e. after the activation of the detector and before releasing the Inergen.
 - (c) all doors of the rooms shall be of the self-closing type equipped with automatic door closure device and with the necessary electromagnets for keeping them open.
 - (d) a device for closing and confirming the fire damper position.
 - (e) the fan operation suspension so as not to disrupt the Inergen concentration.
 - (f) Finally, a controlled device is foreseen for all A/C units, fans, fan coil units (FCU) and fire dampers.

1.7 CENTRAL CONTROL PANEL (FAP)

- 1.7.1 The Central Fire Alarm Panel is foreseen to be analogue addressable, controlled by a micro-processor and shall be installed in the storage area of the

automatic extinguishing containers (room 3.13) at platform level. The Station FAP shall also control the east and west blast shafts.

1.7.2 The FAP shall include ten (10) loops of detectors as follows:

- (a) eight (8) detection loops
- (b) one detection loop for the automatic extinguishing systems
- (c) one stand-by detection loop (as per the regulations) for the automatic fire extinguishing systems, which automatically takes over all functions of the control loop in case of failure.

1.7.3 The central FAP must be able to interface with all other automation systems of the Metro (BMS, ECS etc.), which form the scope of another design. The interface points between the various automation systems and the fire detection system shall be jointly determined with the designers of these systems at a later stage and shall cover all functions described in the contractual documents.

1.7.4 In case of a fire alarm at the FAM computer, there will be a suitable graphic display of the area and the detector which transmitted the signal, and at the same time the incident shall be recorded.

1.8 INSTALLATION OF THE POWER SUPPLY NETWORK FOR DETECTORS AND OTHER DEVICES

1.8.1 The detectors and other control/monitoring devices shall be fed by fire resistant and halogen-free cables, as per the specifications, which shall be installed on LV trays and in ducts if required.

1.8.2 The minimum cable cross section shall be 0.8mm^2 and the maximum length of each loop shall be 2000m.

1.8.3 The fire damper control modules shall be fed with 24 VDC via 2.5mm^2 cables from the FAP; alternatively, local power supplies shall be foreseen.

1.8.4 The other control and monitoring modules shall be fed via an independent 2.5mm^2 cable with 12 VDC from the FAP.

DESCRIPTION OF THE SPECIALS FUNCTIONS OF THE FIRE ALARM PANEL AND THE FIRE ALARM MANAGEMENT SYSTEM

1. GENERAL – PURPOSE

The Fire Alarm Panel (FAP) and the Fire Alarm Management System (FAM), apart from their basic functions specified in the contract documents, shall also offer the following special functions:

- (a) Alarm signaling
- (b) Operational control of Lifts
- (c) Operational control of all Fans and Air Conditioning Units
- (d) Operational control of INERGEN Automatic Fire Extinguishing System
- (e) Communication with ECS-BMS installation

2. ASSOCIATED DRAWINGS AND DOCUMENTS

This list should always be read in conjunction with the latest version of the following documents and drawings.

2.1 Plan View Drawings

3SW4PS610C101 up to 3SW4PS610C105

2.2 Fire Detection Diagrams Drawings

3SW4PS610T701

2.3 BMS-ECS Control Diagrams

3SW4PS610T201 up to 3SW4PS610T208

2.4 BMS-ECS I/O Check Points

3SW4PS610R201 up to 3SW4PS610R208

2.5 Fire Detection Technical Description

3SW4PS610R101

3. Alarms

3.1 Applicable to all Station areas and activated:

- (a) upon activation of any detector or button

(b) upon their activation, the following functions are performed:

- ALARM indication on the FAP and the FAM computer, along with the appropriate graphic display for tracing the incident's location
- INCIDENT recorded on the FAM printer
- INCIDENT recorded on the panel's memory
- INCIDENT recorded on the FAM's memory
- Activation of the local alarm and the horn close to the Station Master Room
- Alarm indication on SYNTAGMA Operations Control Centre (OCC) (via the BMS) and reporting of the area/ group of areas where the incident occurs.

3.2 As regards the **Blast Shafts** and the **Recesses**, the alarm signal is only local. All other cases fall under the stipulations in the above para. 3.1.

4. LIFTS OPERATION

In this case and upon activation of a detector or button in station public areas, the lifts operation will stop and the lift house will travel to its highest travel level. Moreover, the operation of the fan in the lift house will be stopped.

5. OPERATION OF FANS AND AIR-CONDITIONING UNITS

The operation of fans and air conditioning units installed in areas not equipped with INERGEN Automatic Fire Extinguishing System shall be also controlled from the FAP, so that they can be turned off whenever a detector is activated in the zone where the fan or the air-conditioning unit is located.

6. CONTROL OF INERGEN AUTOMATIC FIRE EXTINGUISHING SYSTEMS

6.1 General

In each pertinent area, the control of INERGEN Automatic Fire Extinguishing Systems includes:

- (a) Pre-alarm activation
- (b) Closing of fire dampers and motorized dampers
- (c) Stopping the fan operation
- (d) Activation of INERGEN release valve
- (e) Manual system reset.

6.2 Pre-alarm Activation

Pre-alarm (horn – flashing light) is activated upon activation of any detector in areas with automatic fire extinguishing.

6.3 Closing of fire dampers and motorized dampers

The aforementioned dampers close if at least two detectors of the same zone but of different groups are activated. Damper closure takes place at an adjustable delay of 0 - 60 sec (after the command for INERGEN release) in order to prevent conditions of overpressure in the area flooded with INERGEN, while dampers inside air ducts close immediately.

6.4 Stopping the Fan operation

Fans are turned off during the pre-alarm phase.

6.5 Activation of INERGEN release valve

The INERGEN release valve is also activated if at least two detectors of separate groups are activated. Activation occurs with an adjustable delay of 0 - 30 sec.

6.6 Resetting the system to normal operation mode

Once fire extinction has been completed and INERGEN has been extracted, a reset command is manually given from the FAP and the area's ventilation is ready to be turned on by the BMS.

Fire dampers shall be opened again manually.

7. COMMUNICATION WITH ECS-BMS SYSTEM

Interface between the Fire Alarm Panel and the BMS-ECM system is implemented via a series of I/Os as shown on the corresponding drawings 3SW4PS610T201 to 3SW4PS610T208 and in Annex II.

Enclosures:

ANNEX I: Legend of Special Functions of the FAP and the FAM panels.

ANNEX II: List of Fire Detection I/O Check Points

Technical Description of the Fire Detection System

In the Northbound Extension of Line 3

(indicatively NOMISMATOKOPIO Station – 2 documents)

GEORGAKAKIS SECURITY

TECHNICAL DESCRIPTION OF THE FIRE DETECTION SYSTEM OF ONE TYPICAL STATION IN LINE 3 EXTENSION

The system comprises of one (1) central Fire Alarm Panel (FAP), the Fire Alarm Management (FAM) system, approximately 300 smoke detectors containing over 80 flash repeaters, 17 alarm buttons, 14 horns, 1 automatic fire extinguishing field; it receives signals (alarms) from fire-dampers and fire fighting cabinets and transmits commands to fire-dampers, fans, etc., either directly or through the BACS system, towards which it can also transmit information data. Details regarding fire detection zones and commands list, in line with the Detailed Final Design (DFD).

CENTRAL FIRE ALARM PANEL (FAP)

The central panel cabinet is floor-mounted, 2.200 mm high, 600 mm wide and 400 mm deep.

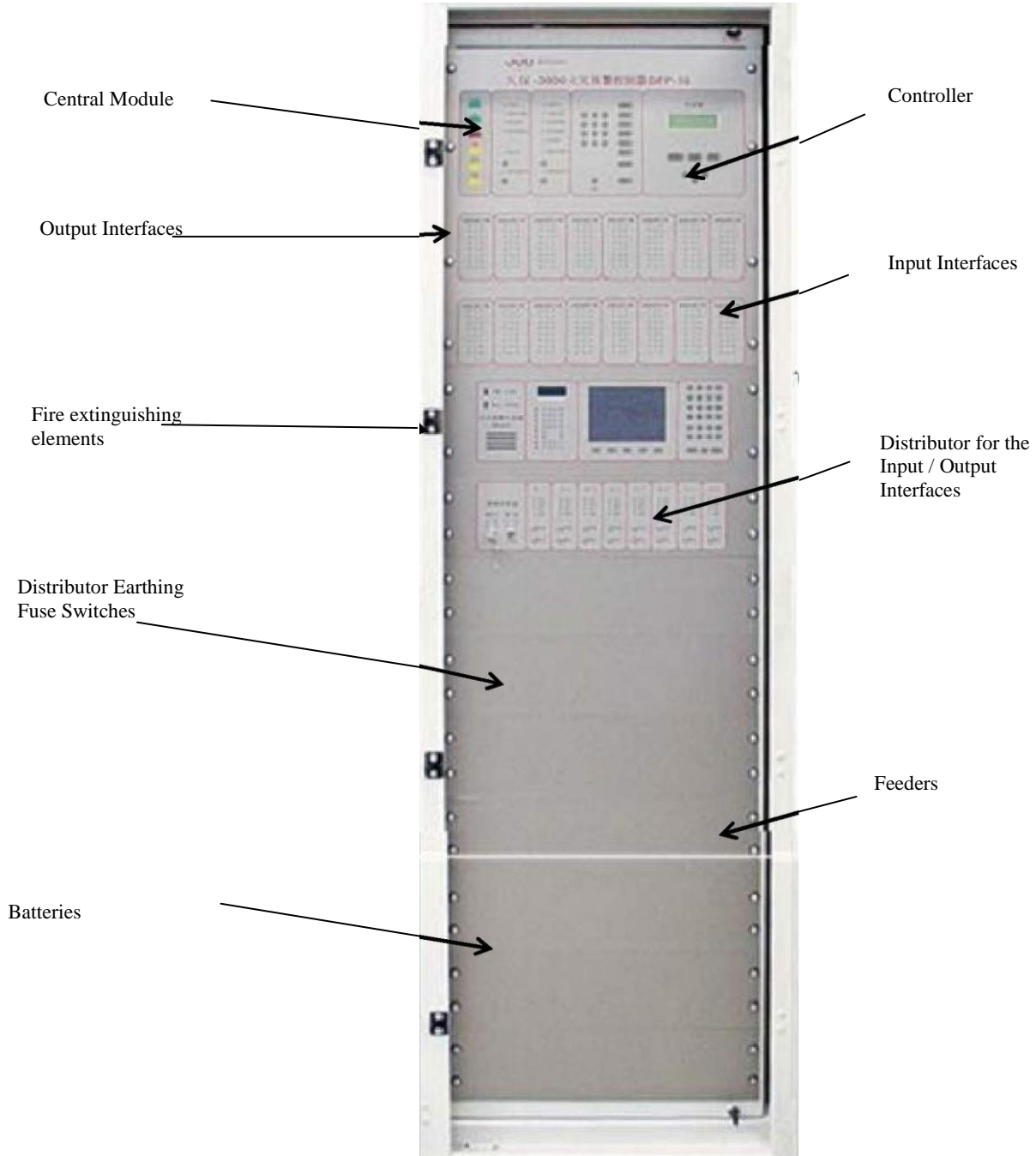
The panel comprises of the following parts, namely:

1. The central detection unit: 3016 DETECTOMAT / Germany, with the following modules:
 - 1 piece - CP CPU X2-R, a second CPU for redundancy purposes;
 - 5 pieces - DLI 3240 X2-R with 2 loop circuits;
 - 1 piece - CP ETB X2 for one fire extinguishing area;
 - 1 piece - RL 58 with 8 power relays;
 - 1 piece - SOC with a second standby central micro-computer.

2. The input / output signal interfaces:
 - Interfaces IOM 3311 for supervised input signals;
 - Interfaces OMS 3301 for supervised output signals;
 - Interfaces SC8 for 8 supervised output signals;
 - Several layouts with a total of 90 signals to BACS, etc.

3. The supply system, comprising of:
 - 2 pieces - Feeder 24V/192W for feeding the panel and the peripherals.

4. The batteries
 - 4 pieces – rechargeable closed type batteries 12V-65 AH



CENTRAL FIRE ALARM PANEL (FAP)

Calculation of batteries feeding and capacity

The modules of the central panel with the detectors connected to the loops consume 556mA at 24 VDC at rest.

The central panel at the state of alarm consumes 1.622 mA.

The interfaces, the fire-extinguishing and signals (alarms) features to the BACS system, horns, flashes, etc. consume 9,650mA at 24 VDC at the state of alarm.

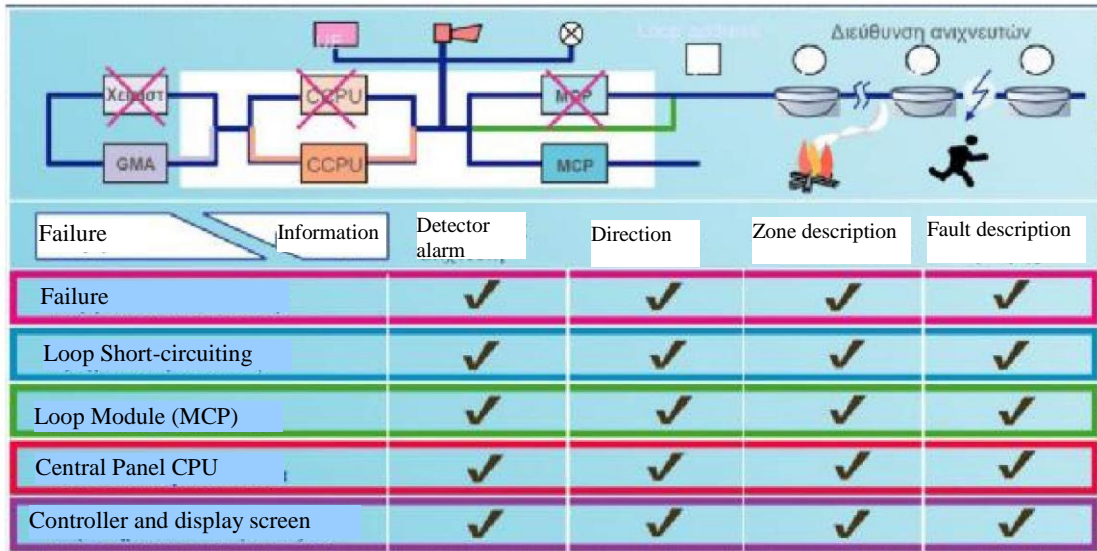
Therefore, the whole feeding layout should provide approximately 12.5A. Each feeder gives (minus the current needed for keeping batteries charged) approximately 7.5 A. Two pieces give 15 A.

In line with the specifications, in case the main supply is cut off or if it fails, then the panel should remain in operation for 30 hours and should be set and remain at the state of alarm for the first 30 minutes. The formula for calculating the capacity of the batteries is mentioned below:

$$\mathbf{K = 30h \times 2.556A + 0.5h \times 9.650A = 81.505 AH}$$

The panel shall be equipped with four (4) 65 AH batteries: each pair of the batteries is connected in series and the pairs are connected in parallel, so as to achieve 24 VDC and 130 AH.

REDUNDANCY OF THE DETECTOMAT SYSTEM



FIRE ALARM MANAGEMENT SYSTEM (FAM)

It shall be installed in the Station Master Room

Type: VD Basic 11

Manufacturer : Detectomat

It comprises of one Personal Computer (PC), one Printer and Special Software.

The Fire Alarm Management (FAM) System is supporting the user with all aids he/she requires in view of addressing and managing all signals transmitted from the entire fire detection and automatic fire-extinguishing system.

The procedure proposed for addressing an incident is shown automatically on the display unit (screen) and is printed out.

Supporting the user consists in providing him the plan view of the area and the location of the detector, as well as a plan view marked-up with the proposed route of the intervention team.

Incidents transmitted to the user verbally are entered into a special standard. The entire software has been designed to be user-friendly, while the main objective is the quick and easy training of the controllers.

The entire software consists of 4 basic parts:

Processing the alarms; summary status of the system; providing support by means of information and graphics; management of the incidents.

All incidents and controls are entered into an incident log and are printed out, as required.

The status line in the PC display unit shows all active alarms and the general status of the fire alarm panel and of the recording device.

The Station Master is informed about the alarm through a buzzer and the display unit.

Details about the alarm processing, graphics and activations of other systems are shown automatically on the display unit.

In case the PC fails, the controller of the central fire alarm panel is still in operation and provides all information about the system.

TECHNICAL DESCRIPTION OF THE FIRE DETECTION SYSTEM
NOMISMATOKOPIO STATION

**TECHNICAL DESCRIPTION OF THE FIRE DETECTION SYSTEM
NOMISMATOKOPIO STATION**

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TECHNICAL DESCRIPTION OF THE FIRE DETECTION SYSTEM NOMISMATOKOPIO STATION

1. GENERAL

- 1.1 The Technical Description includes the installation of a fire detection system and an intrusion-detection system for station areas, in line with AM technical specifications and requirements.
- 1.2 The Fire Detection Design has been compiled in line with Annex A of PD 3/81 and EN-54. A complete fire-detection system includes:

a) the panel featuring in particular:

1. Indications corresponding to each area served depending on the size of the system, the area or the building where intervention will take place.
 2. Main and auxiliary low voltage supply. The auxiliary supply should suffice for a 30-minute alarm.
 3. Automatic reset system.
 4. Line supervision system with selector switch for fault detection.
 5. Light repeaters turn on/off system.
 6. Alarm audible signals (horns, buzzers, electric bells)
- b) cabling, properly dimensioned
 - c) detectors with their base and an activation indication
 - d) light repeaters installed at visible locations
 - e) alarm horns, buzzers, electric bells
 - f) indication of activation of the manually operated alarm system

2. STANDARDS

- 2.1 The fire detection equipment/devices shall be manufactured in line with European Standards EN-54.
- 2.2 The planning, design, installation and commissioning of the fire detection system shall be made in compliance with EN-54 or VdS (Association of German Underwriters) and in compliance with any other standards referred to therein, which will be applied as required.
- 2.3 Fire detection equipment and devices shall have undergone the foreseen tests and shall be accompanied with an approval certificate issued by at least one of the following organizations responsible for the certification of fire detection system and devices, namely:
 - F.M. Factory, USA.
 - V.d.S., Germany.
 - AFNOR, France.
- 2.4 Apart from these requirements, the following provisions must also be met. More precisely:
 - Fire detection circuits shall comply with the requirements of NFPA 72, Class A, style Ea or VdS.
 - Command circuits through loop interfaces shall comply with the requirements of NFPA 72, Class A, style 7a or VdS.

3. DESCRIPTION OF FIRE DETECTION SYSTEM

- 3.1 The fire detection system shall feature combinations from the following items:
- Fire Alarm Panel (FAP).
 - Fire detectors of several types.
 - Break-glass boxes (manual call points, fire extinguishing gas release points).
 - Visual and audible signals (alarms) devices.
 - Control devices.
 - Cabling circuits.
 - Fire Alarm Management System (FAM) in the station (room 2.3).

The basic devices of the fire detection system, namely detectors, interfaces, central panel, parallel panels and fire detection signals (alarms) management software shall be of the same manufacturer, in order to secure absolute compatibility between the devices and the software and, in general, sound and flawless operation of the entire system.

- 3.2 The fire detection system shall be fully addressable.

- 3.3 The system shall be planned based on the following principles:
- All loop items shall be equipped with line isolators.
 - Command lines, such as command to an electromagnetic valve of a fire extinguishing row, horns in areas with fire extinguishing etc., shall be controllable.
 - Each fire detector, button and interface/command of one specific area with automatic fire extinguishing shall be connected to a loop separate from the corresponding devices existing in another area with automatic fire extinguishing system.
 - Each area protected with automatic fire extinguishing with gas shall be controlled by the fire detection system and shall be equipped with an independent loop. If the loop electronic module activating the automatic fire extinguishing fails, then there shall be automatic transfer to an auxiliary loop for ensuring uninterrupted system operation.
 - The Fire Alarm Panel shall be connected with the Fire Alarm Management System at the Station Master Room providing it with continuous information feed; it shall also record each identified system fault with the relevant detector unit and its corresponding zone. Monitoring shall be ensured through a graphic display while the entire fire fighting system shall be indicated on the plan view drawings of all areas. The FAM shall perform the same functions with the FAP (functions-commands). The basic signals shall be transmitted to the BACS of the station. The Fire Alarm Panel shall be installed in room 3.13 or in any other room indicated by AM.
 - The system shall detect fire automatically via detectors or shall be set in alarm upon activation of the fire safety button. Optic smoke detectors shall be utilized. In special cases, heat detectors, linear smoke detectors (areas with high ceiling where no false ceilings are installed, free of structural elements obstructing linear detection) shall be installed upon AM's pertinent approval. In addition, aspirators shall be installed in areas equipped with operation-critical electrical switchboards to be suggested by AM.

- 3.4 The required interfaces and the appropriate programming shall ensure implementation of the following functions:
- audible and a visual alarm signals to various locations.
 - an audible and visual alarm signal to the Station Master Room.
 - command for fire extinguishing to the automatic fire extinguishing systems.
 - an audible and visual pre-alarm signal and a fire extinguishing alarm signal outside and inside the technical rooms equipped with an automatic fire extinguishing system.
 - a command for closure of the fire dampers and motorized dampers.
 - a command for all fans to stop operating and for motorized dampers to close.
 - commands for all types of automations.
 - transmission of alarms signals and commands to BACS.
 - transmission of all signals through a serial port to the FAM computer.
 - Travel of the lifts to the specified travel level depending on the type of the alarm.
- 3.5 If a fire is generated and the relevant signal is displayed, the FAP shall turn off the ventilation system of the station in the relevant areas (rooms), but it shall be independent from the BACS system and, except the aforementioned function, it shall not be able to control the remaining ventilation system.
- 3.6 The relevant warning to the public and the instructions for the evacuation of the Station shall be provided through the Public Address System. There shall be a provision for the connection of the automatic public address system with the fire detection system. The public address system shall be – at first – the warning means in case of fire or another incident. Subsequently, horns will sound. The fire detection system (FAP / FAM) shall trigger the public address system after a certain time scheduling, so that a pre-recorded message similar to the one in case of emergency be transmitted.
- 3.7 During the design and installation of the fire detection network in the areas where the ventilation function concerns 5 changes per hour, applicable shall be the instructions of standard EN 54 (chapter A.6.5.1, paragraph d – ventilation and air movement), stating that more detectors than those ordinarily required must be added, so that the air movement phenomenon towards the detectors be addressed. In addition, standard VdS, indicating that the smoke detectors can be installed in areas – locations for air velocity up to 5m/s, must be taken into consideration.
- 3.8 Fire detectors shall be installed in horizontal and vertical cable routing pits.
- 3.9 The several types of fire detection devices and materials to be installed in the station areas shall be in accordance with AM specifications.
- 3.10 In all areas within false-ceilings and false-floors fire detectors shall be installed, in line with standards EN-54 and VdS.
- 3.11 The Station Master shall be informed and act through the FAM and BACS systems.

- 3.12 The opening of each fire-fighting cabinet / station shall be equipped with a magnetic switch to be connected with the fire detection system.
- 3.13 Fire detectors shall be installed in the fresh-air intake shafts, in order to address problems that may be encountered further to the smoke intake due to the use of smoke grenades at street level.
- 3.14 The programming of the fire alarm panel shall be effected on the basis of the fire scenarios per fire detection area / zone.

4. CABLING

- 4.1 The entire fire detection system cabling network shall be of a 3-minute halogen-free fire-rated cable, type: JE-H(ST)H Bd FE 180/e30, 2x2x0.8 or of more pairs. The 400/230 V AC power cables to be utilized in the fire detection system shall be in line with AM specifications.

5. FIRE ALARM MANAGEMENT SYSTEM (FAM)

- 5.1 The Fire Alarm Management (FAM) system shall consist of a Personal Computer (PC), capable to operate on a 24-hour basis, a high speed color printer and the specialized FAM software.
- 5.2 There shall be a two-way communication (dialogue communication) between FAM and FAP. The PC shall receive all incidents (alarms, faults, commands, etc.) and shall be able – through the keyboard and the mouse - to execute all controls.
- 5.3 The software shall be capable of determining at least 3 access levels as far as the PC control is concerned:
 - Level 1: Station Masters
 - Level 2: AMEL Technical Staff
 - Level 3: Servicers / Programmers

Access to every level shall be ensured through a 6-digit code, while the date and the hour of the access shall be recorded in the Incident Log.

- 5.4 In case of an emergency (alarm):
 - a) The plan view of the station shall be automatically displayed on the screen and the symbol of the detector / button in the area where it was activated shall flash;
 - b) By clicking on this spot, the area and the location of the alarm with the flashing detector shall be at a magnification and the operator shall be able to identify the subject area;
 - c) The printer shall print out automatically the plan view of the area marked up with the quickest access route;
 - d) The printer shall print out automatically instructions to the operator, the technical staff and the fire brigade, depending on the area that is in danger;
 - e) The incident shall be recorded in the software log.
 - f) The diagram with the signals (alarms) and actions induced by the emergency (alarm) shall be displayed on the screen.

- 5.5 The incident log and the remaining features of the software shall be stored automatically at pre-determined time intervals in magnetic means, outside the PC.
- 5.6 The FAM system shall possess the same control and commands options as the FAP system.
- 5.7 The basic signals (alarms) of the FAM system shall be transferred to the BACS system of the Station.

6. FUNCTIONS IN CASE OF ALARM AND INTERFACES

- 6.1 The Fire Detection System shall be interconnected with the Building Automation and Control System (BACS) of the Station. In addition, the Fire Alarm Panel (FAP) shall be interconnected with the Fire Alarm Management (FAM) System and shall be programmed in line with the alarm related cases, so as to control the automatic fire extinguishing system of the technical rooms and the HVAC switchboards.
- 6.2 The automatic fire extinguishing system of each technical room shall be activated by the fire detection system upon triggering of at least two (2) addressable detectors located in the specific room, while the FAP shall transmit the relevant information to the BACS system.
- 6.3 The fire detection system shall be interconnected (I/O – hardwired) with the PLC of the BACS and HVAC switchboards and shall stop the fans that are related to fire alarm. The signals (I/O) to be transmitted are defined in the following table:

I/O Signals from the FAP to the PLCs of the BACS System

Equipment	Monitoring & Control	Connection with PLC				Remarks
		DI	DO	AI	AO	
FAP	Supply Fault	1				Alarm
	General Fault of Sensors	1				Alarm
	ON	1				Κατάσταση
	OFF	1				Κατάσταση
	FAP Restored	1				Κατάσταση
Fire Alarm	Underneath the Platform	1				Alarm
	Platform	1				Alarm
	Public areas	1				Alarm
	Shafts	1				Alarm (1 per shaft)
	Technical Rooms	1				Alarm (1 per room)
	Personnel Areas	1				Alarm (1 per room)
	Escalators	1				Alarm (1 per group of escalators)
	Lifts	1				Alarm (1 per group of lifts)
Fire Damper	Pumping Station	1				Alarm
	FDTM closed	1				Alarm (1 ανά damper)
	FDETM closed	1				Alarm (1 ανά damper)

Where: DI - Digital Input, DO – Digital Output
AI – Analogue Input, AO – Analogue Output

Hard-wired signals from the FAP to the HVAC Switchboard

Equipment	Monitoring & Control	To SB	Remarks
FAP	Stop EXF-	1	Command (per fan)
	Stop SAF-E	1	Command (per fan)
	Stop HP	1	Command
	Stop ACU ...	1	Command (per ACU)
	Stop FCU ...	1	Command (per FCU)
	Closing MOD ...	1	Command (per MOO)
	FD Closed	1	Command (per fan system)

6.4 All necessary power and control cables from the FAP shall terminate to the corresponding terminals within the BACS PLC switchboards (fully and properly labeled). The communication protocol shall be fully compatible with the BACS system.

7. FIRE SCENARIOS

7.1 The Fire Alarm Panel shall be programmable and capable to perform the required functions for the following fire scenarios per area protected by the fire detection system.

7.1.2 Fire alarm in Platforms

In the event an automatic detector or a manually operated alarm button is activated in the platform area, the following functions shall be executed by the fire detection system. More precisely the alarm system shall:

- transmit an audible and a visual alarm signal to the Fire Alarm Panel.
- transmit an audible and a visual alarm signal to the Station Master Room.
- transmit the pertinent information on the status of the activated point (e.g. fire alarm, fault, etc.) to the FAP and FAM Mimic Board screens in the Station Master Room, as well as the point's identification data.
- activate the audible and a visual alarm signals of the station.
- stop the operation of the air intake fans.
- transmit commands for closure of the fire dampers and the motorized dampers.
- the fans and ventilation units disconnection circuit shall be activated.
- transmit commands for all types of automations.
- transmit alarm signals and commands to BACS.
- transmit all signals through a serial port to the FAM computer.
- fans in the emergency staircases are turned supplying air at high velocity.
- all lifts are successively sent to the concourse level, one of them to the street level.
- the air conditioning units cut off circuit is activated.
- In case of an emergency calling for the operation of BSF and UPE/OTE fans to control the fire via default scenarios, the system shall perform the functions specified in the specifications of the tunnel ventilation systems and the station HVAC system (HAP_DP230000), paragraph 9, monitoring and control.
- In case of an emergency, the station and train personnel shall notify the OCC operators immediately, who will activate the respective fire scenarios.
- In case the emergency scenarios must be activated manually, this shall be implemented from the Fireman Box (FB) to be installed at concourse or at street level. The FB should be easily accessed by firemen so as to make feasible the implementation of the emergency scenarios.

7.1.3 Fire alarm at the Station concourse area

In the event an automatic detector or a manually operated alarm button is activated in the station concourse area, the following actions shall be executed by the fire detection system. More precisely the alarm system shall:

- transmit an audible and a visual alarm signal to the Fire Alarm Panel.
- transmit an audible and a visual alarm signal to the Station Master Room.
- transmit the pertinent information on the status of the activated point (e.g. fire alarm, fault, etc.) to the FAP and FAM Mimic Board screens in the Station Master Room, as well as the point's identification data.
- activate the audible and a visual alarm signals of the station.
- stop the operation of the air intake fans.

- transmit commands for closure of the fire dampers and the motorized dampers.
- the fans and ventilation units disconnection circuit shall be activated.
- transmit commands for all types of automations.
- transmit alarm signals and commands to BACS.
- transmit all signals through a serial port to the FAM computer.
- fans in the emergency staircases are turned supplying air at high velocity.
- all lifts are successively sent to the concourse level, one of them to the street level.
- the air conditioning units cut off circuit is activated.
- In case of an emergency calling for the operation of BSF and UPE/OTE fans to control the fire via default scenarios, the system shall perform the functions specified in the specifications of the tunnel ventilation systems and the station HVAC system (HAP_DP230000), paragraph 9, monitoring and control.
- In case of an emergency, the station personnel shall notify the OCC operators immediately, who will activate the respective fire scenarios.
- In case the emergency scenarios must be activated manually, this shall be implemented from the Fireman Box (FB) to be installed at concourse or at street level. The FB should be easily accessed by firemen so as to make feasible the implementation of the emergency scenarios.

7.1.4 Technical rooms (3.2/3.3 – LAS, 3.9-RS, 3.4t and electrical switchboards areas) with automatic fire fighting system

In case the automatic fire extinguishing system in any technical room is activated, the following functions shall be executed by the fire detection system. More precisely the alarm system shall:

- transmit an audible and a visual alarm signal to the Fire Alarm Panel.
- transmit an audible and a visual alarm signal to the Station Master Room.
- transmit the pertinent information on the status of the activated point (e.g. fire alarm, fault, etc.) to the FAP and FAM Mimic Board screens in the Station Master Room, as well as the point's identification data.
- transmit an audible and visual pre-alarm signal and a fire extinguishing alarm signal outside and inside the technical rooms equipped with an automatic fire extinguishing system.
- transmit a command for closure of all fire dampers and motorized dampers in the specific room.
- transmit a command for all fans in the specific room to stop operating.
- transmit commands for all types of automations.
- transmits a command for fire extinguishing to the automatic fire extinguishing system of the specific room.
- transmits alarms signals and commands to BACS.
- transmit all signals through a serial port to the FAM computer.
- In case of emergency, the personnel of the station shall notify the OCC operators immediately who will activate the aforementioned fire scenarios, as mentioned above.

7.2 When programming the FAP, the installer of the fire detection system shall define all the fire scenarios as per AM requirements. The FAP shall be programmed prior to the approval of the fire detection system by AM. Programming requirements also apply to the signal outputs to BACS.

- 7.3 The table below presents the operation of the ventilation system and the position of the fire dampers under normal operation conditions (on/off) and under emergency operation conditions.

ΛΕΙΤΟΥΡΓΙΑ ΣΥΣΤΗΜΑΤΩΝ ΑΕΡΙΣΜΟΥ ΚΑΙ ΚΑΤΑΣΤΑΣΗ ΔΙΑΦΡΑΓΜΑΤΩΝ			
OPERATION OF VENTILATION SYSTEMS AND DAMPER POSITION			
ΑΡ. ΑΝΕΜΙΣΤΗΡΑ ΚΑΙ ΔΙΑΦΡΑΓΜΑ	ΚΑΝΟΝΙΚΗ ΛΕΙΤΟΥΡΓΙΑ ΣΥΣΤΗΜΑ ΕΝΤΟΣ	ΚΑΝΟΝΙΚΗ ΛΕΙΤΟΥΡΓΙΑ ΣΥΣΤΗΜΑ ΕΚΤΟΣ	ΛΕΙΤΟΥΡΓΙΑ ΕΚΤΑΚΤΗΣ ΑΝΑΓΚΗΣ
FAN AND DAMPER No.	NORMAL OPERATION SYSTEM ON	NORMAL OPERATION SYSTEM OFF	EMERGENCY OPERATION
HP-1 MFD-17 MD-1	ON OPEN OPEN	OFF CLOSED CLOSED	OFF CLOSED CLOSED

			INERGEN DISCHARGE	INERGEN EMPTY
EXF-SR-2 MFD-19 MFD-20 FD-TM-29 FD-TM-30 FD-TM-32 FD-TM-33	ON OPEN OPEN OPEN OPEN OPEN OPEN	OFF CLOSED CLOSED OPEN OPEN OPEN OPEN	OFF CLOSED CLOSED OPEN OPEN OPEN OPEN	ON OPEN OPEN OPEN OPEN OPEN OPEN
ALL FD-TM DUMPERS WILL CLOSE WHEN TEMPERATURE $\geq 72^{\circ}\text{C}$				
EXF-TR-2 MFD-16 FD-TM-39 FD-TM-40	ON OPEN OPEN OPEN	OFF CLOSED OPEN OPEN	OFF CLOSED OPEN OPEN	
FD-TM-39 / FD-TM-40 DUMPERS WILL CLOSE WHEN TEMPERATURE $\geq 72^{\circ}\text{C}$				
EXF-TR-1 MFD-15 FD-ETM-3 FD-TM-38 FD-TM-38A	ON OPEN OPEN OPEN OPEN	OFF CLOSED OPEN OPEN OPEN	OFF CLOSED OPEN OPEN OPEN	
FD-ETM-3 / FD-TM-38 / FD-TM-38A WILL CLOSE WHEN TEMPERATURE $\geq 72^{\circ}\text{C}$				

- 7.4 The tables below specify the operation of the ventilation systems and the position of the fire dampers as per the different fire scenarios, developed per fire compartment and after activation of any automatic detector or manually operated button in the station areas.

7.4.2 FIRE SCENARIOS – PLATFORM LEVEL

FIRE COMPARTMENT OF STATION AREAS	AREA	ACTIVATION OF ANY AUTOMATIC DETECTOR OR MANUALLY OPERATED BUTTON IN THE COMPARTMENT	AUDIBLE AND VISUAL ALARM SIGNAL TO FAM	ALARM ANNOUNCEMENT TO FAM	ACTIVATION OF FIRE DAMPER HORNS	TRANSMISSION OF ALARM SIGNAL AND COMMANDS TO BACS	LIFTS 1.10a AND 1.10b ARE DRIVEN TO THE CONCOURSE LEVEL AND LIFT 1.10c TO STREET LEVEL BY A COMMAND FROM FAP	EQUIPMENT (AIR INTAKE OR EXHAUST FAN, FCU, H.P.) FCOMMAND FROM FAP	FIRE DAMPER FD-TM “CLOSED” SIGNAL TO FAP	FIRE DAMPER MDF, FD-ETM ACTIVATION COMMAND FROM FAP	THERMO-ELECTRIC DAMPER FD-ETM. SIGNAL “CLOSED” TO FAP
3.19i 3.19j	3.19i	X	X	X		X		EXF-SR-8 OFF	FD-TM-52 FD-TM-54 FD-TM-53 CLOSE		
	3.19j	X	X	X		X		EXF-SR-8 OFF	FD-TM-51 FD-TM-54 FD-TM-53 CLOSE		
3.19h 3.19g	3.19h	X	X	X		X		EXF-SR-5 OFF	FD-TM-56 FD-TM-58 FD-TM-57 CLOSE		
	3.19g	X	X	X		X		EXF-SR-5 OFF	FD-TM-55 FD-TM-58 FD-TM-57 CLOSE		
3.19a 3.19b	3.19a	X	X	X		X		EXF-SR-7 OFF	FD-TM-44 FD-TM-42 FD-TM-43 CLOSE		
	3.19b	X	X	X		X		EXF-SR-7 OFF	FD-TM-44 FD-TM-42 FD-TM-41 CLOSE		
3.19c 3.19d	3.19c	X	X	X		X		EXF-SR-6 OFF	FD-TM-48 FD-TM-46 FD-TM-47 CLOSE		
	3.19d	X	X	X		X		EXF-SR-6 OFF	FD-TM-48 FD-TM-46 FD-TM-45 CLOSE		

7.4.3 FIRE SCENARIOS – CONCOURSE LEVEL

FIRE COMPARTMENTS – STATION AREAS	AREA	ACTIVATION OF ANY AUTOMATIC DETECTOR OR MANUALLY OPERATED BUTTON IN THE COMPARTMENT	AUDIBLE AND VISUAL ALARM SIGNAL TO FAM	ALARM ANNOUNCEMENT TO FAM	ACTIVATION OF FIRE DAMPER HORNS	TRANSMISSION OF ALARM SIGNAL AND COMMANDS TO BACS	LIFTS 1.10a AND 1.10b ARE DRIVEN TO THE CONCOURSE LEVEL AND LIFT 1.10c TO STREET LEVEL BY A COMMAND FROM FAP	EQUIPMENT (AIR INTAKE OR EXHAUST FAN, FCU, H.P.) COMMAND FROM FAP	FIRE DAMPER FD-TM “CLOSED” SIGNAL TO FAP	FIRE DAMPER MDF, FD-ETM ACTIVATION COMMAND FROM FAP	THERMO-ELECTRIC DAMPER FD-ETM. SIGNAL “CLOSED” TO FAP
3.22	3.22	X	X	X		X		EXF-SR-2 OFF	FD-TM-33 FD-TM-29 FD-TM-32		
3.19l 3.19m	3.19l	X	X	X		X		EXF-SR-2 OFF	FD-TM-32 FD-TM-30 FD-TM-33		
	3.19m	X	X	X		X		EXF-SR-2 OFF	FD-TM-32 FD-TM-33	MFD-19 CLOSE MFD-20 CLOSE	
3.19n 3.19p	3.19n	X	X	X		X		EXF-SR-3 OFF	FD-TM-36 FD-TM-34		
	3.19p	X	X	X		X		EXF-SR-3 OFF	FD-TM-36 FD-TM-35		
3.1	3.1	X	X	X	H8/1	X			FD-TM-36 FD-TM-3		
1.9g 1.9h 1.4 1.5a 1.5b 1.2 1.7	1.9g 1.9h 1.4 1.5a 1.5b 1.2 1.7	X	X	X	H3/1 H3/2 H2/1 H2/2	X	X	EXF-AT-2 OFF EXF-AT-1 OFF SAF-LM-1 OFF EXF-T-1 OFF	FD-TM-5 FD-TM-14 FD-TM-11 FD-TM-23 FD-TM-9 FD-TM-35 FD-TM-34 FD-TM-29 FD-TM-30 FD-TM-31		

FIRE SCENARIOS – CONCOURSE LEVEL

FIRE COMPARTMENTS – STATION AREAS	AREA	ACTIVATION OF ANY AUTOMATIC DETECTOR OR MANUALLY OPERATED BUTTON IN THE COMPARTMENT	AUDIBLE AND VISUAL ALARM SIGNAL TO FAM	ALARM ANNOUNCEMENT TO FAM	ACTIVATION OF FIRE DAMPER HORNS	TRANSMISSION OF ALARM SIGNAL AND COMMANDS TO BACS	LIFTS 1.10a AND 1.10b ARE DRIVEN TO THE CONCOURSE LEVEL AND LIFT 1.10c TO STREET LEVEL BY A COMMAND FROM FAP	EQUIPMENT (AIR INTAKE OR EXHAUST FAN, FCU, H.P.) COMMAND FROM FAP	FIRE DAMPER FD-TM “CLOSED” SIGNAL TO FAP	FIRE DAMPER MDF, FD-ETM ACTIVATION COMMAND FROM FAP	THERMO-ELECTRIC DAMPER FD-ETM. SIGNAL “CLOSED” TO FAP
3.18	3.18	X	X	X	H2/1 H2/2	X		EXF-SP-1 OFF	FD-TM-9 FD-TM-2		
2.9	2.9	X	X	X	H2/1 H2/2	X		EXF-SP-1 OFF	FD-TM-1 FD-TM-2		
3.19q	3.19q	X	X	X	H2/1 H2/2	X		EXF-SP-1 OFF	FD-TM-4 FD-TM-3		
2.7b	2.7b	X	X	X	H2/1 H2/2	X		FCU-3 OFF EXF-SP-1 OFF	FD-TM-5 FD-TM-6 FD-TM-7 FD-TM-8 FD-TM-3 FD-TM-2		
2.2	2.2	X	X	X	H2/1 H2/2	X		FCU-1 OFF EXF-SP-1 OFF	FD-TM-10 FD-TM-6		
2.3	2.3	X	X	X	H2/1 H2/2	X		FCU-2 OFF EXF-SP-2 OFF	FD-TM-13		
2.7a	2.7a	X	X	X	H2/1 H2/2	X		SAF-LM-1 OFF EXF-SR-1 FCU-2 EXF-T-1 OFF	FD-TM-19 FD-TM-16 FD-TM-15 FD-TM-13 FD-TM-14 FD-TM-22		

FIRE SCENARIOS – CONCOURSE LEVEL

FIRE COMPARTMENTS – STATION AREAS	AREA	ACTIVATION OF ANY AUTOMATIC DETECTOR OR MANUALLY OPERATED BUTTON IN THE COMPARTMENT	AUDIBLE AND VISUAL ALARM SIGNAL TO FAM	ALARM ANNOUNCEMENT TO FAM	ACTIVATION OF FIRE DAMPER HORNS	TRANSMISSION OF ALARM SIGNAL AND COMMANDS TO BACS	LIFTS 1.10a AND 1.10b ARE DRIVEN TO THE CONCOURSE LEVEL AND LIFT 1.10c TO STREET LEVEL BY A COMMAND FROM FAP	EQUIPMENT (AIR INTAKE OR EXHAUST FAN, FCU, H.P.) COMMAND FROM FAP	FIRE DAMPER FD-TM “CLOSED” SIGNAL TO FAP	FIRE DAMPER MDF, FD-ETM ACTIVATION COMMAND FROM FAP	THERMO-ELECTRIC DAMPER FD-ETM. SIGNAL “CLOSED” TO FAP
2.6a 2.6b	2.6a 2.6b	X	X	X	H2/1 H2/2	X		EXF-T-1 OFF	FD-TM-24		
3.7	3.7	X	X	X	H2/1 H2/2	X		HP-1 OFF			
3.1c	3.1c	X	X	X	H2/1 H2/2	X					

7.4.4 FIRE SCENARIOS – LEVEL -1

FIRE COMPARTMENTS – STATION AREAS	AREA	ACTIVATION OF ANY AUTOMATIC DETECTOR OR MANUALLY OPERATED BUTTON IN THE COMPARTMENT	AUDIBLE AND VISUAL ALARM SIGNAL TO FAM	ALARM ANNOUNCEMENT TO FAM	ACTIVATION OF FIRE DAMPER HORNS	TRANSMISSION OF ALARM SIGNAL AND COMMANDS TO BACS	LIFTS 1.10a AND 1.10b ARE DRIVEN TO THE CONCOURSE LEVEL AND LIFT 1.10c TO STREET LEVEL BY A COMMAND FROM FAP	EQUIPMENT (AIR INTAKE OR EXHAUST FAN, FCU, H.P.) COMMAND FROM FAP	FIRE DAMPER FD-TM “CLOSED” SIGNAL TO FAP	FIRE DAMPER MDF, FD-ETM ACTIVATION COMMAND FROM FAP
3.25a	3.25a	X	X	X	X	X		EXF-TR-2 OFF	FD-TM-39 FD-TM-40	
1.12 1.19	1.12 1.19	X	X	X	X	X	X		FD-TM-39 FD-TM-40	
3.25a 3.19s 3.19r 1.7a 1.7b	3.25a 3.19s 3.19r 1.7a 1.7b	X	X	X	X	X		EXF-TR-1 OFF	FD-TM-38 FD-TM-38A	
3.25c	3.25c	X	X	X	X	X		EXF-TR-1 OFF	FD-TM-38 FD-TM-38A	
3.12c	3.12c	X	X	X		X				

**Technical Description of the Fire Detection System
of a Typical Station in the Extension to ELLINIKO**

GEORGAKAKIS SECURITY

TECHNICAL DESCRIPTION OF THE FIRE DETECTION SYSTEM OF ONE TYPICAL STATION IN THE EXTENSION TO ELLINIKO

The system comprises of one (1) central Fire Alarm Panel (FAP), the Fire Alarm Management (FAM) system, approximately 300 smoke detectors containing 100 flash repeaters, 21 alarm buttons, 25 horns, 3 automatic fire extinguishing fields; it receives signals (alarms) from fire-dampers and fire fighting cabinets and transmits commands to fire-dampers, fans, etc., either directly or through the BACS system, towards which it can also transmit information data. Details regarding fire detection zones and commands list exist in the design leaflets.

CENTRAL FIRE ALARM PANEL (FAP)

The central panel cabinet is floor-mounted, 2.200 mm high, 600 mm wide and 400 mm deep.

The panel comprises of the following parts, namely:

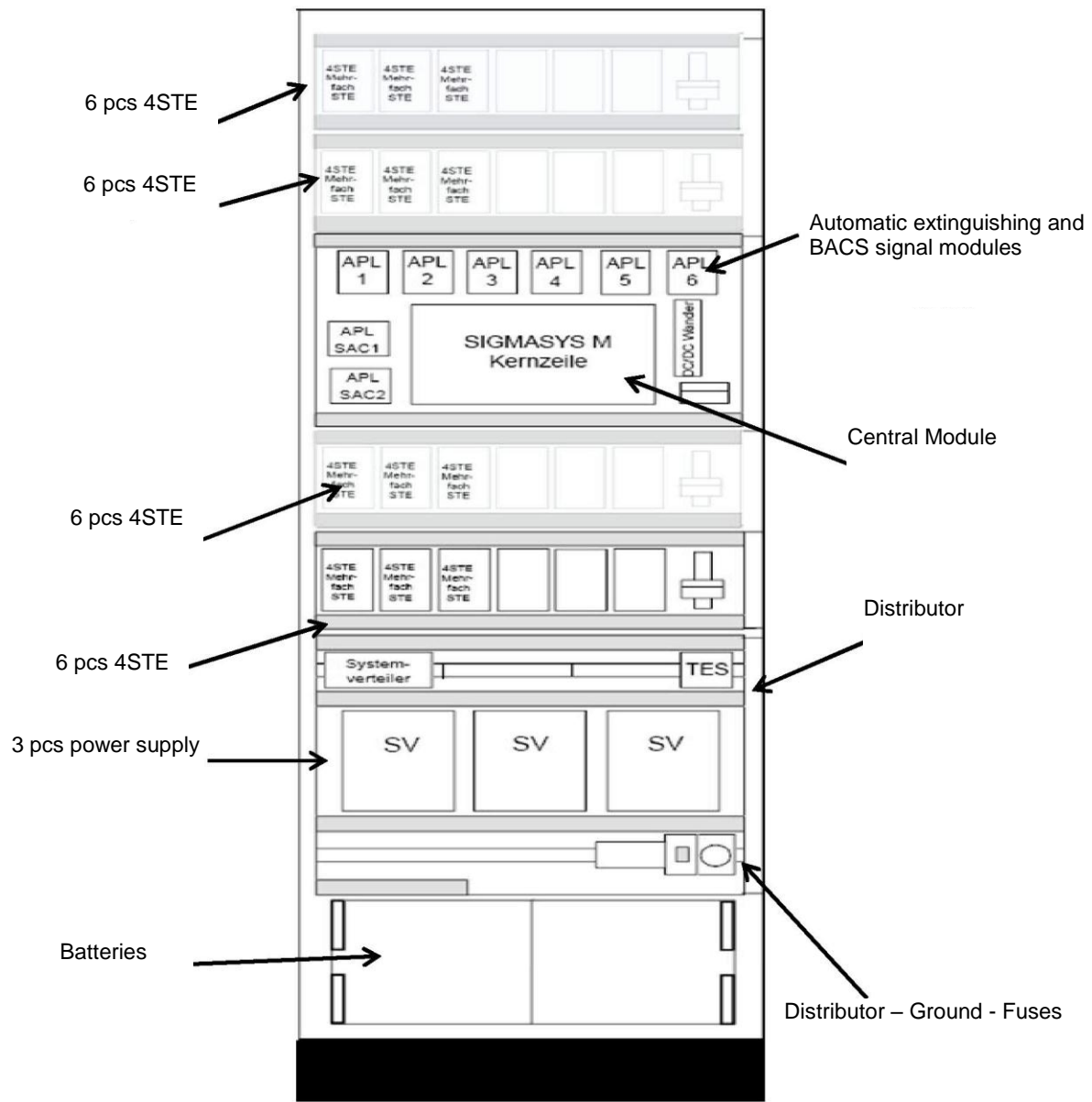
1. The central detection unit: Sigmasys M, with the following modules:
 - 3 pieces - Sigmasys MCP with 4 loop circuits;
 - 3 pieces – APL 20 with a 4 loop connection layout and electromagnetic interventions filters;
 - 1 piece – U – APL for automatic switch MCP;
 - 1 piece - SOC with a second standby central micro-computer.

2. The input / output signal interfaces and the 3 layouts for the fire-fighting fields:
 - 24 Interfaces 4STE with 4 I/O;
 - 3 layouts with 140 signals to BACS;
 - 3 layouts of automatic fire extinguishing SSL per VdS;

3. The supply system, comprising of:
 - 3 pieces - Feeder 24V/192W for feeding the panel and the peripherals.

4. The batteries
 - 4 pieces – rechargeable closed type batteries 12V-65 AH

5. The display and controls panel Sigmanet



Calculation of batteries feeding and capacity

The modules of the central panel with the detectors connected to the loops consume 3,915mA at 24 VDC.

The interfaces, the fire-extinguishing and signals (alarms) features to the BACS system, horns, flashes, etc. consume 9,650mA at 24 VDC.

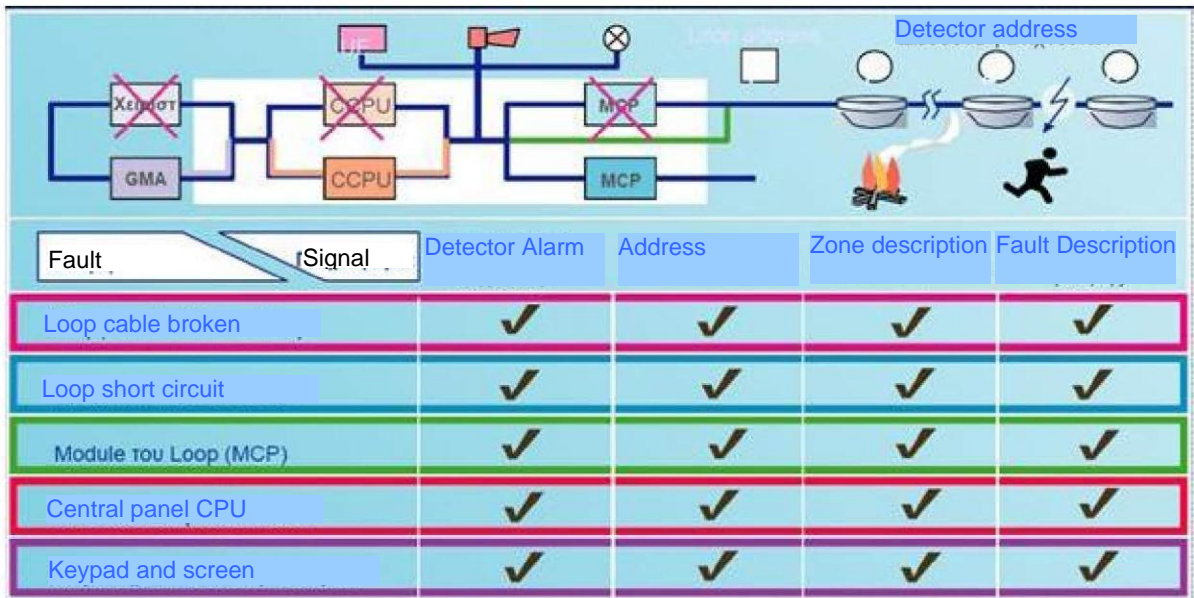
Therefore, the whole feeding layout should provide approximately 13A. Each feeder gives (minus the current needed for keeping batteries charged) approximately 6A. Three pieces give 18A.

In line with the specifications, in case the main supply is cut off or if it fails, then the panel should remain in operation for 30 hours and should be set and remain at the state of alarm for the first 30 minutes. The formula for calculating the capacity of the batteries is mentioned below:

$$\mathbf{K = 30h \times 3,915A + 0.5h \times 9.650A = 122,275 \text{ AH}}$$

The panel shall be equipped with four (4) 65 AH batteries: each pair of the batteries is connected in series and the pairs are connected in parallel, so as to achieve 24 VDC and 130 AH.

REDUNDANCY OF THE SIGMASYS SYSTEM



FIRE ALARM MANAGEMENT SYSTEM (FAM)

It shall be installed in the Station Master Room

Type: sis 700

Manufacturer : Siemens

It comprises of one Personal Computer (PC), one Printer and Special Software.

The Fire Alarm Management (FAM) System is supporting the user with all aids he/she requires in view of addressing and managing all signals transmitted from the entire fire detection and automatic fire-extinguishing system.

The procedure proposed for addressing an incident is shown automatically on the display unit (screen) and is printed out.

Supporting the user consists in providing him the plan view of the area and the location of the detector, as well as a plan view marked-up with the proposed route of the intervention team.

Incidents transmitted to the user verbally are entered into a special standard. The entire software has been designed to be user-friendly, while the main objective is the quick and easy training of the controllers.

The entire software consists of 4 basic parts:

Processing the alarms;

Summary status of the system;

Providing support by means of information and graphics;

Management of the incidents.

All incidents and controls are entered into an incident log and are printed out, as required.

The status line in the PC display unit shows all active alarms and the general status of the fire alarm panel and of the recording device.

The Station Master is informed about the alarm through a buzzer and the display unit.

Details about the alarm processing, graphics and activations of other systems are shown automatically on the display unit.

Each alarm is classified upon completion of the intervention, as false, true, etc.

In case the PC fails, the controller of the central fire alarm panel is still in operation and provides all information about the system.

**Technical description of the Fire Detection System of Haidari Station (current
AGHIA MARINA Station, similar to Peristeri & Anthoupoli Stations)**

1. FIRE DETECTION INSTALLATION

1.1 GENERAL

The fire detection system includes:

- (a) the fire detectors
- (b) the fire alarm button
- (c) the installation of auxiliary components of the automatic extinguishing systems
- (d) the installation of the Fire Alarm Panel (FAP)
- (e) the installation of the power supply network for detectors and other components
- (f) the installation of the Fire Alarm Management (FAM).

1.2 STANDARDS

The installation shall be designed in accordance with the following standards, regulations and specifications:

- (a) Presidential Decree (PD) 71 "Building fire protection regulation" (FEK 32-A-17/2/1988) and PD 374 FEK 168-A-12/8/1988
- (b) European Standards EN 54
- (c) US Standards NFPA 72 and NFPA 130 for those areas not covered by the Greek regulations.
- (d) Recommendations of the German Insurance companies: "VDS: RECOMMENDATIONS FOR AUTOMATIC FIRE DETECTION ALARM SYSTEMS"
- (e) ATTIKO METRO S.A. specifications and requirements.

1.3 CLASSIFICATION OF A STATION

Given that, for the time being, the Greek Legislation does not cover Metro projects with regard to their Active Fire Protection, further to our contacts with the responsible Fire Safety Section of the Fire Department, there will be a relevant legislation in the future. Nevertheless, the Fire Department has made some general suggestions regarding the Fire Protection of Stations, Shafts and Tunnels. These suggestions are going to be more concrete in the near future.

In view of the above, Active Fire Protection systems are installed in the shafts in accordance with the ATTIKO METRO S.A. specifications and specific recommendations by the Fire Department.

The required Active Fire Protection installations (related to fire detection) are the following:

- (a) Automatic fire detection and distinguishing system in high risk areas
- (b) Manual electrical alarm system
- (c) Fire announcement devices (horns, lights and flash repeaters)

1.4 FIRE DETECTION – DETECTORS INSTALLATION

1.4.1 Fire detection shall be analogue addressable, controlled from the Station FAP

1.4.2 The foreseen detectors shall be of the type of “visible smoke”, analogue “point” detectors and shall give precise signals in conditions of normal detection, as well as during the stage of pre-alarm and alarm.

1.4.3 As per the drawings, the fire detection installation shall cover all public areas, E/M rooms, warehouses, office areas, lifts at the highest point of the elevator shaft, the escalator motor areas, the high points of shafts (vertical risers) accommodating electrical installations, the areas above the false ceilings, the underfloor cable ducts and the areas below the false floors.

1.4.4 All areas foreseen to be equipped with automatic extinguishing systems are fitted with dual arrangement of detectors for reasons of confirmation of the system activation signal, as described in the chapter describing the automatic extinguishing systems.

1.4.5 Each visual type detector shall cover an area of 60- 80m².

1.4.6 The fire detector mounting assemblies installed in escalator pits and on track level must be moisture resistant.

1.5 FIRE ANNOUNCEMENT INSTALLATION

1.5.1 The fire announcement installation incorporates the proper number of manual alarm buttons, horns, lights and flash repeaters.

1.5.2 The manual alarm buttons are foreseen to be installed at the emergency exits, the fire hose cabinets and other locations, so that no spot on the plan view is at a distance of more than 30m from the buttons, unless the escape route passes through an alarm point within a distance of 50m.

- 1.5.3 The alarm announcement in the Station shall be implemented by means of horns and flashers, suitably located in the public areas, so as to cover all areas of the station. These shall be activated from the FAP.
- 1.5.4 In order to quickly and easily locate the place of fire, flashing repeaters shall be installed which shall start flashing when the pertinent detector is activated.
- 1.5.5 In case of fire, the passengers shall receive information and the relevant instructions for station evacuation by the Station Master via the Public Address (PA) system.
- 1.5.6 The automatic interface between the FAP and the PA system shall be implemented in the future in a manner to ensure that:
- (a) Whenever an initial alarm signal is received, a recorded announcement shall be made, so as to mobilize the station personnel.
 - (b) if the personnel does not respond to the announcement within a defined time period, or if a new alarm signal is received at the FAP, then a recorded message shall be transmitted to all zones giving instructions for evacuation.

1.6 AUXILIARY DEVICES OF THE AUTOMATIC FIRE EXTINGUISHING SYSTEMS

- 1.6.1 In areas foreseen to be flooded with Inergen by the automatic fire extinguishing system, the following auxiliary devices are foreseen:
- (a) outside every room and above its door, a horn with a flashing light shall be installed, as well as an illuminated "STOP" sign, which are activated whenever the room is flooded with Inergen to avert personnel approach.
 - (b) inside every room, for reasons of timely evacuation of employees, an electrical ringer and a flashing light shall be installed. The above devices shall be activated at the pre-alarm stage, i.e. after the activation of the detector and before releasing the Inergen.
 - (c) all doors of the rooms shall be of the self-closing type equipped with automatic door closure device and with the necessary electromagnets for keeping them open.
 - (d) a device for closing and confirming the fire damper position.
 - (e) the fan operation suspension so as not to disrupt the Inergen concentration.
 - (f) Finally, a controlled device is foreseen for all A/C units, fans, fan coil units (FCU) and fire dampers.

1.7 CENTRAL CONTROL PANEL (FAP)

1.7.1 The Central Fire Alarm Panel is foreseen to be analogue addressable, controlled by a micro-processor and shall be installed in the storage area of the automatic extinguishing containers (room 3.13) at E/M equipment (EQM) level.

1.7.2 The FAP shall include fourteen (14) loops of detectors as follows:

(a) ten (10) detection loops

(b) three detection loops for the automatic extinguishing systems

(c) one stand-by detection loop (as per the regulations) for the automatic fire extinguishing systems, which automatically takes over all functions of the control loop in case of failure.

1.7.3 The central FAP must be able to interface with all other automation systems of the Metro (BMS, ECS etc.), which form the scope of another design. The interface points between the various automation systems and the fire detection system shall be jointly determined with the designers of these systems at a later stage and shall cover all functions described in the contractual documents.

1.7.4 In case of a fire alarm at the BMS computer, there will be a suitable graphic display of the area and the detector which transmitted the signal, and at the same time the incident shall be recorded.

1.8 INSTALLATION OF THE POWER SUPPLY NETWORK FOR DETECTORS AND OTHER DEVICES

1.8.1 The detectors and other control/monitoring devices shall be fed by fire resistant and halogen-free cables, as per the specifications, which shall be installed on LV trays and in ducts if required.

1.8.2 The minimum cable cross section shall be 0.8mm^2 and the maximum length of each loop shall be 2000m.

1.8.3 The fire damper control modules shall be fed with 24 VDC via 2.5mm^2 cables from the FAP; alternatively, local power supplies shall be foreseen.

1.8.4 The other control and monitoring modules shall be fed via an independent 2.5mm^2 cable with 12 VDC from the FAP.

FIRE DETECTIONS CALCULATIONS

1. REGULATIONS

1.1 The Fire Detection installation calculations shall be based on the following standards and Decrees:

- (a) Presidential Decree (PD) 71 “Building fire protection regulation” (FEK 32-A-17/2/1988)
- (b) Appendices A, B and C of the Fire Department Regulation No. 3
- (b) European Standards EN 54
- (c) Recommendations of “VDS” “RECOMMENDATIONS FOR AUTOMATIC FIRE DETECTION ALARM SYSTEMS”.
- (d) US Standards NFPA 72 and NFPA 130 for those areas not covered by the Greek regulations
- (e) ATTIKO METRO S.A. specifications.

2. REQUIRED NUMBER OF DETECTORS

2.1 The required number of detectors per each protected area is dependant upon the total area covered by each detector, the type of the ceiling and the room’s height, according to DIAGRAM 6.01, 6.02, 6.03, 6.04, 6.05, 6.06 and 6.07 of the VDS (see attached appendix).

For flat surfaces (gradient <10cm/m), please see diagram 6.01 of the APPENDIX.

3. SEGREGATION OF DETECTOR LOOPS – ZONES

3.1 Each detector loop shall not have more than 127 detectors (VDS, page 7, paragraph 4.1.3)

3.2 When more than one rooms are connected to a zone of detectors, the following requirements apply:

- (a) The rooms must be neighboring
- (b) Their overall area shall not be more than 1000m²
- (c) Suitable flashing repeaters shall be installed.

4. WIRING

- 4.1 The circuit wiring shall be of fire resistant and halogen free cables, with a minimum diameter of 0.8mm, or in accordance with the manufacturer's recommendations.
- 4.2 The cables shall run inside galvanized steel pipes or on trays and shall be routed in closed type systems. Exception to this rule is the cable routing in technical rooms or, in general, areas inaccessible to the public (open type).

FIRE DETECTION ZONES

TRACK LEVEL

ZONE	AREA	COVERAGE SURFACE
Z1101	Corridor – 1.5m<3m wide	Detectors' spacing 15m
Z1102	Corridor – 1.5m<3m wide	Detectors' spacing 15m
Z1201	Corridor – 1.5m<3m wide	Detectors' spacing 15m
Z1202	Corridor – 1.5m<3m wide	Detectors' spacing 15m

PLATFORM LEVEL

ZONE	AREA	COVERAGE SURFACE
Z901	Area height 3.5m, <40m ²	60m ²
Z903	Area height 3.5m, <40m ²	60m ²
Z904	Area height 3.5m, <40m ²	60m ²
Z905	Area height 3.5m >80m ²	60m ²
Z906	Area height 3.5m, <40m ²	60m ²
Z907	Area height 3.5m, <40m ²	60m ²
Z908	Area height 3.5m, <30m ²	60m ²
Z909	Area height 3.5m, 20m ²	60m ²
Z910	Area height 2m >80m ²	60m ²
Z911	Area height 2m, <40m ²	60m ²
Z1001	Area height 3.5m, <40m ²	60m ²
Z1003	Area height 3.5m, <40m ² 60m ²	60m ²
Z1004	Area height 3.5m, <40m ²	60m ²
Z1005	Area height 3.5m >80m ²	60m ²
Z1006	Area height 5.4m, 78 m ²	60m ²
Z1007	Area height 2m >80m ²	60m ²
Z1008	Area height 2m <40m ²	60m ²
Z1009	Area height 3.5m <30m ²	60m ²
Z1010	Area height 3.5m, <30m ²	60m ²
Z1011	Area height 3.5m, <30m ²	60m ²
Z1013	Area height 2m <40m ²	60m ²

CONCOURSE LEVEL

ZONE	AREA	COVERAGE SURFACE
ZSO1	Area height 4.8m <40 m ²	60m ²
ZS02	Area height 3.3m <40 m ²	60m ²
ZS03	Area height 1.5m <40 m ²	60m ²
ZSOS	Area height 4.8m, 390 m ²	60m ²
ZS06	Corridor 2.5Sm wide	Detectors' spacing 15m
ZS07	Area height 4.8m, <60 m ²	60m ²
ZS09	Area height 4.8m <20 m ²	60m ²
ZS10	Area height 4.8m <20 m ²	60m ²
Z1311	Area height 2m <20 m ²	60m ²
Z1312	Area height 2m <20 m ²	60m ²
Z1313	Area height 2m <20 m ²	60m ²
Z1314	Area height 4.8m <20 m ²	60m ²
Z131S	Area height 2m <20 m ²	60m ²
Z1316	Area height 2m <20 m ²	60m ²
Z1317	Area height 2m <20 m ²	60m ²
Z1318	Area height 2m <20 m ²	60m ² -
Z1319	Area height 4.8m <20 m ²	60m ²
Z1320	Area height 2m, <20 m ²	60m ²
Z1321	Area height 4.8m, <20 m ²	60m ²
Z1322	Area height 2m <20 m ²	60m ²
Z1323	Area height 2.8m <20 m ²	60m ²
Z1324	Area height 2.8m <20 m ²	60m ²
Z132S	Area height 2.8m, 420 m ²	60m ²
Z1326	Area height 2.8m, 420 m ²	60m ²
Z1327	Area height 2.8m <20 m ²	60m ²
Z1328	Area height 2.8m <20 m ²	60m ²
Z1329	Area height 2.8m <20 m ²	60m ²
Z1330	Area height 2.8m, <20 m ²	60m ²
Z1331	Area height 2.8m, <60 m ²	60m ²
Z1332	Area height 4.8m <60 m ²	60m ²
Z601	Area height 4m., 740 m ²	60m ²
Z602	Area height 1m, 145 m ²	60m ²
Z603	Area height 1m	60m ²
Z604	Area height 1m	60m ²

CONCOURSE LEVEL

ZONE	AREA	COVERAGE SURFACE
Z605	Area height 2m <20 m ²	60 m ²
Z606	Area height 2m, <20 m ²	60 m ²
Z607	Area height 2m, <20 m ²	60 m ²
Z608	Area height 2m 60 m ²	60m2
Z609	Area height 2m <20 m ²	60 m ²
Z610	Area height 2m <20 m ²	60 m ²
Z612	Area height 4.8m, <20 m ²	60 m ²
Z619	Area height 1m 145 m ²	60 m ²
Z701	Area height 1.8m, 52 m ²	(Spacing (distance) D=6.7/2=3,35m)
Z702	Area height 1.8m 52 m ²	(Spacing (distance) D =6.7/2=3 35m)
Z703	Area height 3m 52 m ²	(Spacing (distance) D =6.7/2=3 35m)
Z704	Area height 3m, 52 m ²	(Spacing (distance) D =6.7/2=3 35m)
Z801	Area height 4m 740 m ²	60 m ²
Z802	Area height 9m, 145 m ²	60 m ²
Z808	Area height 4m 240 m ²	60 m ²
Z809	Area height 4m 300 m ²	60 m ²
Z810	Area height 4m 60 m ²	60m2
Z811	Area height 2.8m 60 m ²	60m2
Z812	Area height 2.8m 60 m ²	60m2
Z813	Area height 2.8m 60 m ²	60m2
Z814	Area height 2.8m, <20 m ²	60 m ²
Z815	Area height 2.8m <20 m ²	60 m ²
Z816	Area height 2.8m <20 m ²	60 m ²
Z817	Area height 9m, 145 m ²	80 m ²

E/M INSTALLATIONS LEVEL

ZONE	AREA	COVERAGE SURFACE
Z101	Area with bays – 1.7m high	One detector in each bay
Z103	Area with bays – 1.7m high	One detector in each bay
Z104	Area with bays – 1.7m high	One detector in each bay
Z105	Area with bays – 1.7m high	One detector in each bay
Z106	Area with bays – 1.7m high	One detector in each bay
Z107	Area with bays – 1.7m high	One detector in each bay
Z108	Area with bays – 1.7m high	One detector in each bay
Z111	Area with bays – 1.7m high	One detector in each bay
Z112	Area with bays – 1.7m high	One detector in each bay
Z203	Area with bays – 1.7m high	One detector in each bay
Z204	Area with bays – 1.7m high	One detector in each bay
Z205	Area with bays – 1.7m high	One detector in each bay
Z206	Area with bays – 1.7m high	One detector in each bay
Z207	Area with bays – 1.7m high	One detector in each bay
Z208	Area with bays – 1.7m high	One detector in each bay
Z210	Area with bays – 1.7m high	One detector in each bay
Z211	Area with bays – 1.7m high	One detector in each bay
Z217	Area with bays – 1.7m high	One detector in each bay
Z301	Fire Extinguishing area, with beams 1.7m	Spacing (Distance) $D=6.7/2=3.35m$ At least one detector in each bay
Z302	Fire Extinguishing area, with beams 1.7m	Spacing (Distance) $D=6.7/2=3.35 m$ At least one detector in each bay
Z401	Fire Extinguishing area, with beams 1.7m	Spacing (Distance) $D=6.7/2=3.35m$ At least one detector in each bay
Z402	Fire Extinguishing area, with beams 1.7m	Spacing (Distance) $D=6.7/2=3.35m$ At least one detector in each bay

ANNEX

(it is in the English language and is attached hereto as a hard copy)