

EXFIRE360 FIRE&GAS CONTROL PANEL

The EXFIRE360 control system is a dual-CPU, programmable and versatile control panel developed to perform integrated functions related to fire alarm management and fire suppression actuation. EXFIRE360 can be manufactured according to the safety requirements and is easily configurable using "Protection" software. EXFIRE360 panels can be networked via TCP/IP, RS-485, RS-232 and fiber optics, making it possible to design a network system with remote chassis. All communications are redundant, while Enterprise software (if required) provides central or supervising station capabilities. The panel is modular, consisting of 19-inch racks with I/O cards for fire detection and/or suppression and/or building automation. The cards are located inside the panel, while the displays (with RS-485 redundant communication) are installed at the front.

In case of failure, cards can be replaced quickly without having to operate on the terminals. In fact, terminals of the cards are accessible from the rear side of the panel. EXFIRE360 offers a series of cards (with *hot swapping capability*) for monitoring analogue addressable detectors, conventional lines, analogue/digital inputs and outputs and for the control of fire suppression systems. All card displays are **touch-screen** with command keys for various functions, such as viewing events or perform advanced diagnostics on inputs and outputs.



EXFIRE360 fire&gas control panel (views from outside and inside)

System certifications and approvals

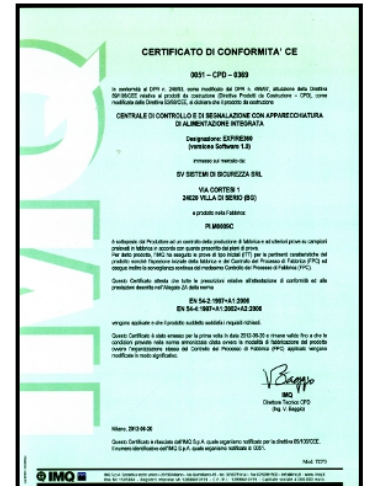
- **EN 54-2:1997+A1:2006**
"Fire detection and fire alarm systems - Part 2: control and indicating equipment"

In addition to the mandatory requirements, the following optional functions are certified:

- output to fire alarm devices;
- output to fire alarm routing equipment;
- output to fire protection equipment;

- delays to outputs;
- dependency on more than one fire alarm signal (type C);
- alarm counter;
- fault signal from initiating/notification devices;
- output to fault warning routing equipment;
- disabled condition of addressable devices;
- test condition;
- normalized input/output interface.

- **EN 54-4:1997+A1:2002+A2:2006**
“Fire detection and fire alarm systems - Part 4: power supply equipment)”
- **EN 12094-1:2003**
“Fixed firefighting systems - Components for gas extinguishing systems - Part 1: requirements and test methods for electrical automatic control and delay devices (only for EX6EV-C card)”



Available (certified) options with requirements:

- delay on extinguishing signal;
- signal representing the flow of extinguishing agent;
- monitoring of the status of components;
- emergency hold device;
- manual only mode;
- triggering of equipment within the system;
- triggering of equipment outside the system;
- extinguishing signal to reserve cylinders;
- discharge inhibition.

- **IEC 61508**
“Functional safety of electrical/electronic/programmable electronic safety-related systems”

The following configurations were considered:

- safety function 1: automatic fire suppression with analog input trigger;
- safety function 2: analog redundant gas detection and gas valve shutoff;
- safety function 3: automatic fire suppression with input trigger from analogue addressable devices.

- **EN 60079-29-1:2007**
“Explosive atmospheres. Gas detectors. Performance requirements of detectors for flammable gases”

- **Hochiki ESP compatibility**

Mechanical description

Standard EXFIRE360 fire&gas control panel is composed and assembled on a self standing IP54 cabinet, RAL7035, with front access and predetermined size 2100 (h) x 800 (W) x 1600 (D) mm. Cabinets with reduced dimensions are also available, on the basis of the actual composition of the panel.

The panel consists of the following components:

- a main base rack with a touch-screen display (with integrated keyboard) and two CPUs;
- additional racks for I/O modules (installed on the rear side of the panel);
- a series of chassis for housing the card displays;
- a power supply unit (two front-end 40 A units);
- battery controller for monitoring primary and secondary power supplies;
- battery package designed to meet the requirements of secondary power supply.

Set of input and output modules

Up to six subracks for the I/O modules can be installed in the EXFIRE360 panel. Each subrack is designed for a maximum of ten modules; the maximum number of modules for a single panel is therefore equal to sixty.

Following is the list of modules available to perform fire detection, fire alarm and suppression functions:

EX8SI	module with eight supervised inputs
EX2GSI	module with two 4-20 mA analogue input lines
EX8RO	module with eight SPDT relay outputs
EXLOOP-E	analogue addressable module for Hochiki ESP devices
EX6SO	module with six supervised 24 V outputs
EX8D I/O	module with eight digital inputs and outputs
EX6EV	module for the activation of solenoid valves (to be combined with EX8SI for fire suppression purposes)
MULTIBUS	module for the communication with third-party systems
EX6EV-C	EN 12094-1 certified fire extinguishing control module (combines EX6EV and EX8SI). Provides ten supervised inputs, four supervised outputs, two SPDT relays and fourteen open collector outputs.

Every I/O module is equipped with seven open collector outputs (except for EX8RO).



EXFIRE360's I/O modules

Main technical specifications

- Primary power supply: 230 Vac, 50/60 Hz
- 24Vdc power: power supply unit certified according to EN 54-4 standard
- Battery controller: EN 54-4 certified
- Maximum current required: 10 A @230 Vac
- Maximum output current: 40A (redundant if required), to be supplied to the panel and the load.
- Maximum charging current (to standby batteries): 40 A
- Rated output voltage: 27,7 Vdc
- Output voltage interval: 23 ÷ 29 Vdc
- Minimum voltage without primary power: 20 Vdc
- Maximum battery capacity: 2x12 V, 700Ah
- Output float voltage: 30mV (0.1%, measured)
- Operating temperature: from -5 to +40°C
- Maximum number of CPUs: 2
- Maximum number of I/O modules per cabinet: 60 I/O modules
- Maximum number of fire suppression modules: 29 EX6EV-C modules
- CPU redundancy: yes
- Hot replacement of I/O modules: yes
- Communication protocols available: TCP-IP, CANbus, RS-485, 1019E, Modbus.

- Graphical monitoring software: SV Enterprise, graphical user interface for stand-alone or networked panels.
- Communication interfaces: n.1 RS-232, n.1 100 Mbps Ethernet with RJ45 connector o F.O. connector available with additional EXMULTIBUS module.
- Default outputs: available on primary EX6SO module.
- Modules for initiating device circuits: EX8SI, EX2GSI, EXLOOP-E (for analogue fire detectors),

Can Bus protocol

EXFIRE360 system is based on CAN bus protocol for the communication between the I/O modules and the main processing unit. This introduces a series of advantages over the proprietary protocols, which can be summarized as follows:

- fixed response time, which represents a critical requirement in process control and fire safety applications: CAN technology offers a full range of hardware and software tools whereby a big number of devices can be connected to the network while respecting rigorous response time intervals.
- Ease and flexibility: CAN bus is a serial link based on a twisted pair (either shielded or not). Network nodes do not have an identification address, therefore nodes can be added or removed without having to rearrange the system.
- High immunity to disturbances: ISO 11898 standard requires that processors dedicated to CAN bus communication shall work even under extreme circumstances, such a single-open or ground fault of a conductor.
- Proven reliability: error detection and retransmission of data is hardware-controlled with five different methods (two at the bit level and three related to the messages).
- Error confinement: each node is capable of detecting any abnormal condition and self-disabling. This mechanisms permits to comply with the stringent time-response requirements, thus avoiding that any node impairs the operation of the entire system.
- Broadcast Communication: each of the devices on the network has a CAN controller chip and is therefore intelligent. All devices on the network see all transmitted messages. Each device can decide if a message is relevant or if it should be filtered. This structure allows modifications to CAN networks with minimal impact. Additional non-transmitting nodes can be added without modification to the network.
- Priority: every message has a priority, so if two nodes try to send messages simultaneously, the one with the higher priority gets transmitted and the one with the lower priority gets postponed. This arbitration is non-destructive and results in non-interrupted transmission of the highest priority message. This also allows networks to meet deterministic timing constraints.
- Experience: the broad diffusion of CAN bus protocol over the last twenty years has lead to the development of several microprocessors, transceivers, development tools, with a significant cost reduction. CAN bus is currently considered a standard protocol in the industry.

CPU redundancy:

EXFIRE360 system is provided with dual redundant CPUs. CPUs are equipped with a static un-buffered RAM for the storage of operating data of the panel, while the configuration settings are stored in a NAND flash memory. This solution increases significantly the reliability of the CPUs.

Operator's interface:

EXFIRE360 introduces a new concept of diagnostics of inputs and outputs. Each module has a touch-screen display with real-time information of the status of each channel, card diagnostics and temperature and humidity of the card. These data simplify the interaction between the operator and the panel in case of alarm, trouble and during functional testing and maintenance.



Touch-screen displays of I/O modules

Architecture of the fire alarm system: key concepts

Designing a fire alarm system with EXFIRE360 control panel provides the following key advantages:

1. the system is fully certified for fire detection, fire alarm and suppression according to EN mandatory standards
2. the most critical fire protection functions are also certified for the functional safety (up to SIL 3 rating) by a third-party agency. This ensures lower lifecycle costs, improves quality & reliability and reduces risk (accidents) and liability.
3. The panel is modular, thus permitting to expand the system if required without having to install additional panels.
4. All input/output modules are hot pluggable, thus minimizing downtime costs in case of failures. The operator could directly replace faulty modules with spare ones. Modules are also automatically addressed by the panel, which further simplifies any maintenance work.
5. Advanced diagnostics increases the information available to the operator, who has therefore the possibility to supervise the status of each input and output as well as the operating parameters of each module with no specific tools or instruments.
6. CAN bus protocol provides the ability to connect remote chassis or network the fire alarm control panels, thus improving the flexibility of the system.
7. MULTIBUS module makes available a series of interfaces (Ethernet, RS485, CAN Bus) for transmitting signals to third-party systems (e.g. DCS) or for connecting monitoring stations with Enterprise graphical software.

A simplified architecture of the fire alarm system considered in this project is shown below.

