

UNIFIRE

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FlameRanger

Revolutionary Firefighting Robot

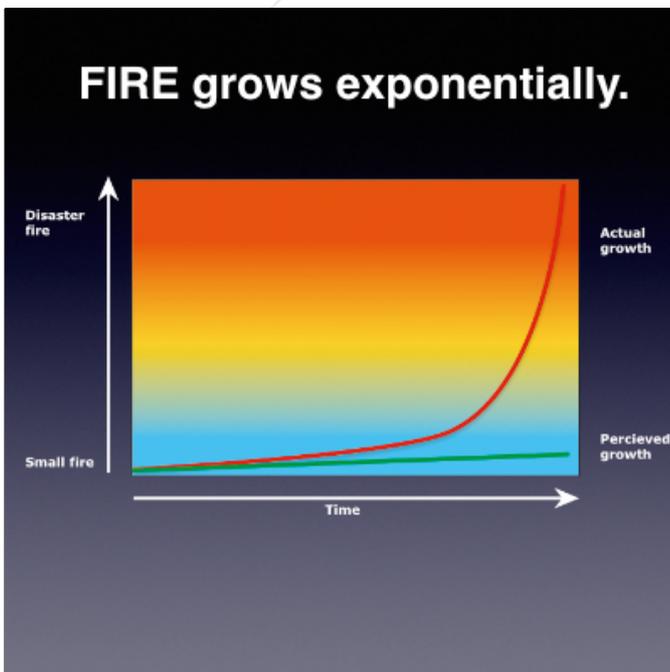
Introducing the first-of-its kind, fully automatic fire detection & suppression system using advanced, high flow robotic nozzles.



A first-person perspective from a firefighter. A large, powerful stream of water is being discharged from a hose, filling the lower half of the frame. In the background, a fire is burning brightly, with flames and smoke visible. The scene is dimly lit, primarily by the fire and the water stream. The firefighter's helmet and part of the hose are visible in the foreground.

**Welcome to
21st Century
Firefighting!**

Traditional Method, with a 21st Century Kick



The Problem

Fire grows exponentially quickly. Traditional methods often result in late detection of a fire and long waits until adequate suppression can begin. By that time, loss to property and life can be catastrophic.

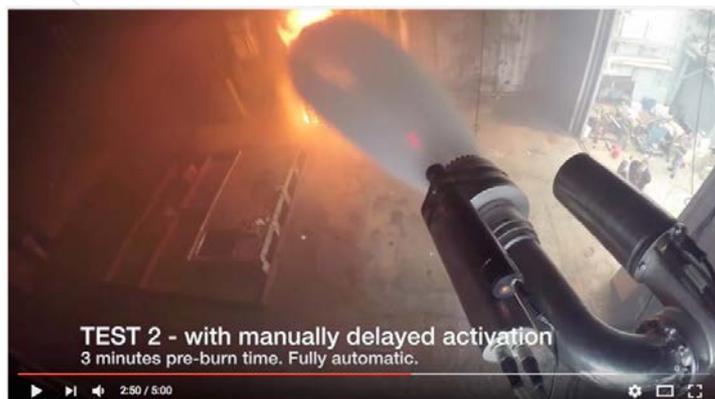
The Solution

Rapid detection, coupled with rapid, high-flow suppression, is the key to maximizing the chances of successfully fighting a fire—before it spreads out of control.

Enter FlameRanger. It constantly detects for the presence of flames, 24/7/365. Any fire that breaks out is detected almost instantaneously. Unifire's sophisticated computing and software technology guide its advanced robotic nozzles with precision to aim a high volume of water or foam to directly douse the fire (or fires) at its source. Fire suppression commences in as little as 5 seconds, long before it gets out of control.

Problem → Solved.


Click to Watch the Video on YouTube.



**Detect,
Aim,
Suppress,
Automatically,
Robotically,
24/7/365.**

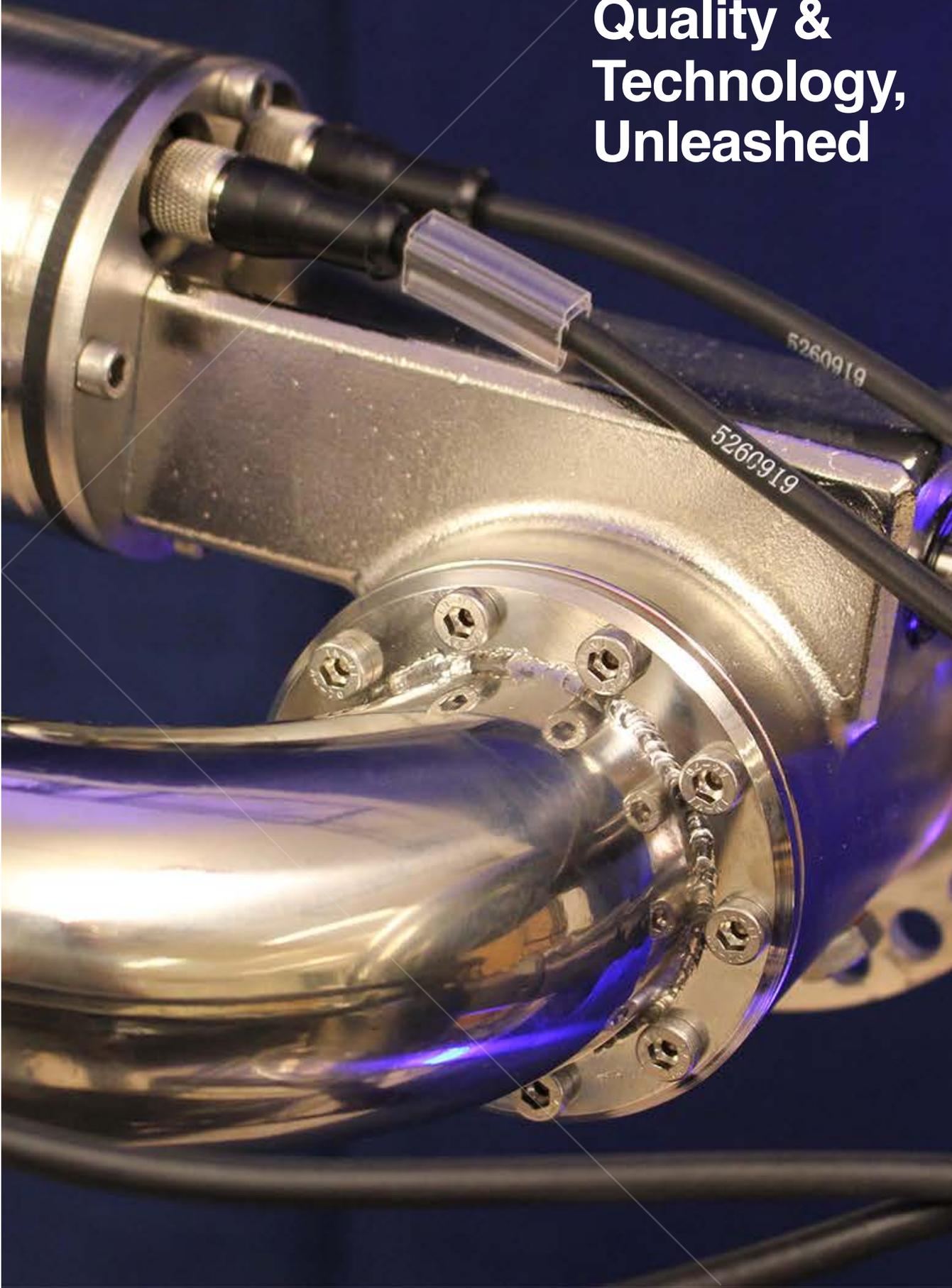


Enter the Age of Robotics

FlameRanger is the first-of-its-kind robotic nozzle system that automatically detects a fire, determines its size and location in three dimensions, and directs a high volume of water or foam, with great accuracy, directly onto the fire—all within seconds of a fire breaking out, and without any human intervention.

Unifire's Force Robotic Nozzles are the World's Most Advanced, Intelligent Firefighting Robots

**Quality &
Technology,
Unleashed**



So, What Is It, Exactly?

With regard to robots, in the early days of robots people said, 'Oh, let's build a robot' and what's the first thought? You make a robot look like a human and do human things. That's so 1950s. We are so past that.
Neil deGrasse Tyson

Background & Objective:

Every large fire starts as a small fire and grows exponentially. Rapid detection and suppression are crucial to successfully fighting a fire before it has a chance to develop into a catastrophic, fully developed fire.

What FlameRanger Does:

The FlameRanger is a high capacity, fully automatic, fire detection and suppression robotic nozzle system that operates completely autonomously around the clock, while providing constant system status information and human operator intervention and remote control at all times.

How it Works:

The system uses 2 x FV300 Array IR Detectors to detect and locate a fire in 3 dimensions (x, y, z). Up to 4 fires can be detected simultaneously.

When a flame is detected, the system guides our advanced robotic nozzles to aim at the fire and open the valve (or start the pump) when the nozzle is aimed at the target fire.

A large flow of water (or foam) is then accurately aimed directly onto the target fire (or fires). The spray angle is also automatically adjusted. The stream dynamically follows the flame if the flame moves or spreads. Fire location and robotic nozzle position are updated ten times a second.

When fire is no longer detected, the system automatically shuts off and returns to stand-by mode, and the water supply closes automatically, takes the robotic nozzle back to stow position, and the system remains ready to reactivate should a flame reignite.

InterAct™ - Graphical User Interface:

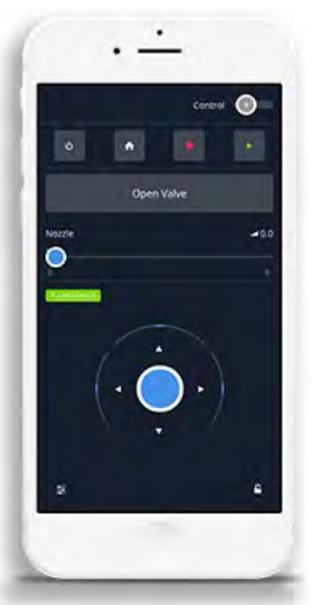
Each individual, fully self-contained, stand alone system has a user-friendly, intuitive graphical user interface, called the Unifire InterAct™. InterAct provides secure, remote monitoring and remote control of all systems, providing personnel, in the control room and/or in the field, with the exact status of each unit 24/7/365.

InterAct also makes it possible to manually remote control any system on the network at any time, regardless of whether a fire has been detected or not. This provides all of the benefits of traditional remote control monitor system and the speed and reliability of advanced high-tech flame detectors and robotics.

Groups of FlameRangers Can Cooperate:

A FlameRanger system that detects a flame can be programmed to activate its neighboring systems to provide support to the suppression and to provide protection to the surrounding areas.

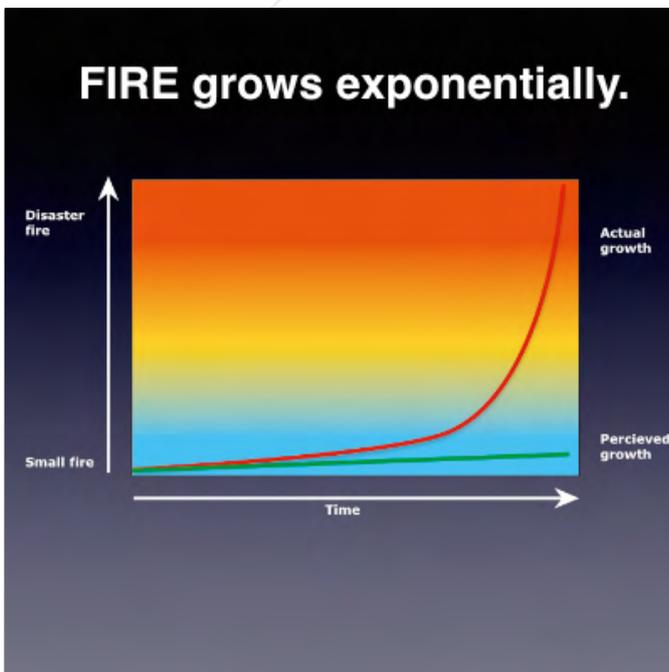
InterAct™ Graphical User Interface



A first-person perspective from a firefighter looking through a hose nozzle. A large, powerful stream of water is being directed towards a fire. The fire is bright orange and yellow, with flames reaching upwards. The background is a dark, industrial-looking structure, possibly a warehouse or factory. The water stream is a mix of white and blue, indicating high pressure. A red laser line is visible on the water stream. The overall scene is dramatic and intense.

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Enter FlameRanger. It constantly detects for the presence of flames, 24/7/365. Any fire that breaks out is detected almost instantaneously. Unifire's sophisticated computing and software technology guide its advanced robotic nozzles with precision to aim a high volume of water or foam to directly douse the fire (or fires) at its source. Fire suppression commences in as little as 5 seconds, long before it gets out of control.

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Unifire's Force Robotic Nozzles are the World's Most Advanced, Intelligent Firefighting Robots

**Quality &
Technology,
Unleashed**



A Melange of Technology, Seamlessly Blended



Unifire Force™ Robotic Nozzle

Industrial robot BLDC motors, highest quality internal gears, stainless steel 316L construction.



Tyco FV311 IR Array Flame Detectors

Accurate detection of flames, long range, two-dimensional coordinate data, optional CCTV camera, & extraordinarily low false alarm risk.



Advanced Computing & Software

Seamlessly enable interactive data and control from any authorized device anywhere in the world.



Unifire InterAct™ Graphical User Interface

Complete, secure monitoring and control from anywhere in the world.



Full Situational Awareness

While completely autonomous and fully automatic, Unifire's revolutionary InterAct™ graphical user interface informs authorized personnel anywhere in the world of real-time system status, fire alarms with exact location, and full remote control intervention capabilities.



Fully Automatic, with Remote Oversight & Total Control

Fully Networked, of Course



An infinite number of FlameRanger systems can be easily networked, monitored, and remote controlled from anywhere in the world.

The system provides 24 hour peace of mind by instantly alerting the appropriate individuals of any fire detected, its exact location and size, and allows for full, manual, remote control on- or off-site from any authorized device—smart phone, tablet, laptop, or PC.

Moreover, the system is self-monitoring, around the clock. If any faults on the system are detected, the system instantly alerts authorized individuals to the error and provides complete details of the exact component or issue in need of attention.

FLAMERANGER

Room 21 Lvl 13 192.168.1.158

Fire Detected

3D Tools: [Icons for zoom, pan, reset, refresh]

2D Overscan: [Button]

Active Alarms

Trigger	Time	Coordinates	Height	Sys Action
Fire Detected	16 seconds ago	x5 y50	3 m	Valve Open

Flame Detectors
Combined Scannings

Alarm Trigger level
Attention level
Normal operation

Detector 1 Status: AUTO EXTI

Alarm Level: 5
Alarm Type: [Fire Icon]
Analog scan: [Heatmap]

Detector 2 Status: AUTO EXTI

Alarm Level: 4
Alarm Type: [Fire Icon]
Analog scan: [Heatmap]

Raw Data

N_RX	N_WVE	N_WWP	WMKADC4
RECV	4.25 V	78 W	0.3093

N_RX	N_WVE	N_WWP	WMKADC4
RECV	4.13 V	66 W	0.2073

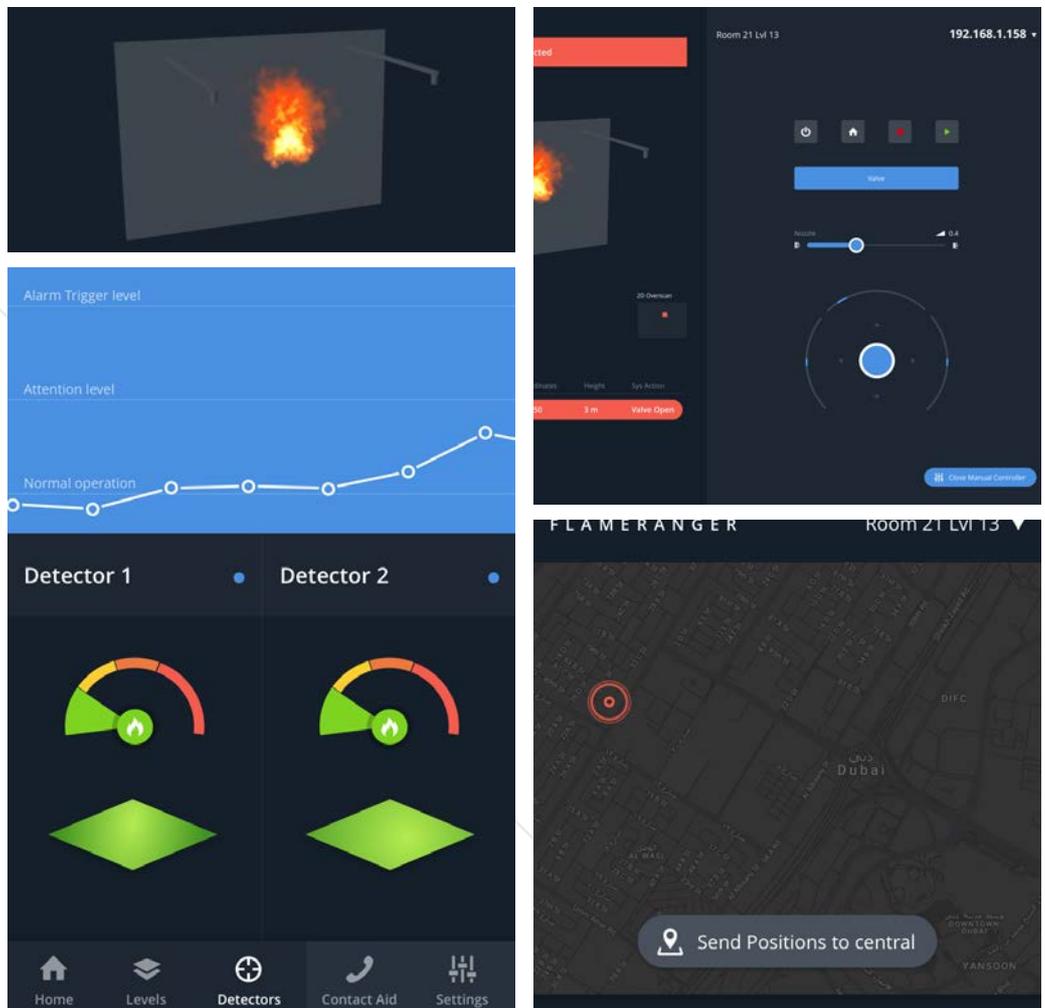
Water Cannon Status: AUTO EXTI

Valve: **OPEN**

Position: x-axis: -51° y-axis: 12°

[Icon] Open Manual Controller

All Data. All the Time. At Your Fingertips.

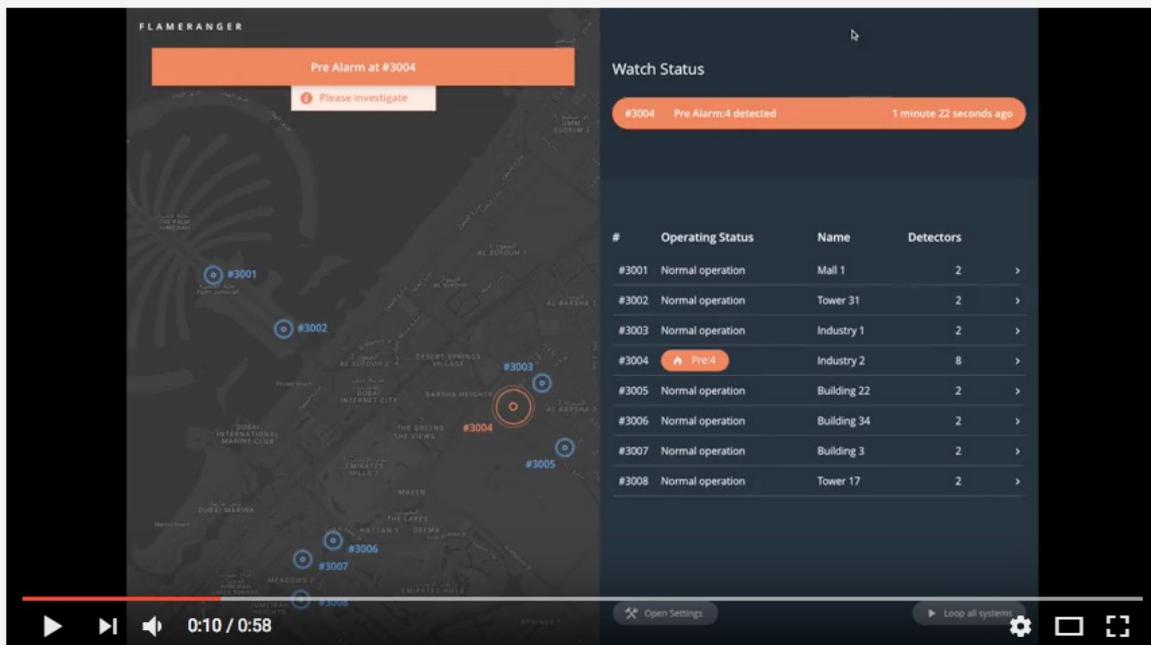




InterAct™

A Simple User Interface for Exquisite Nozzle Control

Click to Watch the Video on YouTube.



Unlimited Applications

To name just a few...



Marine Fire Protection

Aircraft carriers and other large storage areas on naval vessels and ships present a significant challenge to fire safety. FlameRanger provides ideal automatic fire protection on the high seas.



High-Rise Building Exteriors

Protecting the exteriors of high-rise buildings is a formidable challenge. Until now. Unifire's FlameRanger XT has been specifically developed to detect and suppress these fires with speed & precision.



Oil & Gas Facilities

Unmatched detection and suppression for oil & gas facilities of many kinds. Targeted, high-volume foam suppression begins in seconds of a fire's breaking out. Large networked systems centrally monitored & controlled.



Tunnel Fire Protection

Tunnel fires are among the most difficult to combat and among the most destructive in terms of loss of life and property. FlameRanger is like having a firefighting crew on site the moment fire erupts.



Factories, Warehouses, Storage Facilities ...

Traditional methods of protecting large open spaces in building interiors from fire are often ineffective. FlameRanger offers unprecedented fire protection capabilities in these environments.



Aircraft Hangars

Trust FlameRanger to protect even the highest value aircraft and hangar facilities. Our system detects fires around the clock and, in seconds of breakout, deploys a high volume of foam, directly on the fire, until it's out!

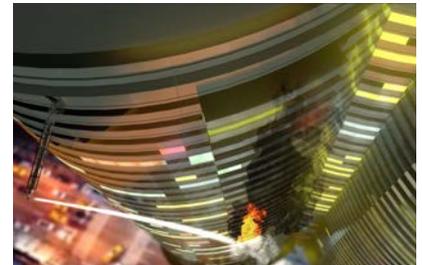
Unparalleled Quality

DS/EN ISO 9001:2008 Certified
Manufacturing Facilities



Introducing FlameRanger XT

Protecting High-Rise Building Exteriors.



Flame Detectors Monitor Building

Flame Detectors are mounted so as to view the building's façades around the clock. In the event of fire, the robotic nozzles extend and aim to immediately begin suppressing the fire.

Boom Extends to Suppress

When a fire is detected, a boom with the Force™ Robotic Nozzle automatically extends from the building, aims at the fire, opens the valve and begins suppressing with a high volume of water.

Fire Suppression Starts in Seconds

Suppression commences within seconds of detection. This is the key to successfully saving lives and property from catastrophic loss.



Click to Watch the
Video on YouTube.



Shift Your Paradigm.

The FlameRanger can be adopted to numerous types of installations to suit virtually any application.



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System Capabilities, Benefits & Specifications



I. General System Description



The Unifire FlameRanger™ is a fully autonomous and fully automatic fire detection and high-flow robotic nozzle fire suppression system. The system is designed to act around-the-clock as would a human firefighter equipped with an advanced, high-volume, remote-control, water/foam firefighting monitor.

The FlameRanger system operates 24/7/365 and is designed to rapidly detect the presence of flame, its size and position in three-dimensional space, and rapidly, autonomously and fully automatically guide an advanced, high-flow robotic nozzle to suppress the detected fire (or fires) with a high volume of water or foam, directly at the fire's source.

After a fire is fully suppressed and flames are no longer detected, the system automatically closes the valve and goes into stand-by mode, ready to react again if any new flames break out.

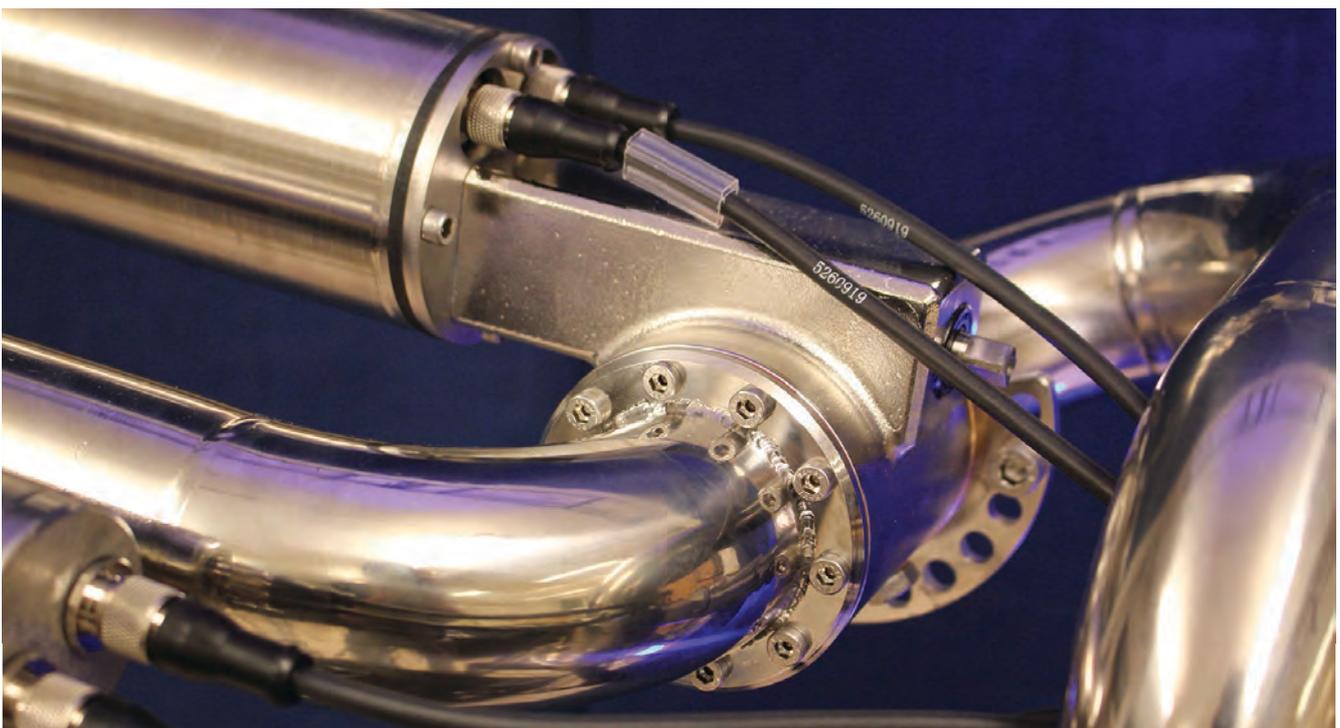
The system has an optional graphical user interface (GUI), called the Unifire InterAct™, which keeps operators remotely informed of the system's status, including notifications of any fires detected, as well as system information such as any errors or faults, allowing for immediate troubleshooting and repair.

InterAct also allows the operator to take manual, remote control of the system's valve and robotic nozzle at all times. This can be done not only via traditional joystick, but also via any device (laptop, desktop, tablet, smart phone, etc.) with secure access to the system network.

The FlameRanger can be easily networked for centralized display and control of multiple systems and can be custom programmed to the end-user's special requirements.

II. PRIMARY SYSTEM COMPONENTS

- ▶ Two to four (2-4) IR array flame detectors, each capable of rapidly detecting the presence of fire and providing the fire's location information via MODbus to the system's PLC; and
- ▶ A Unifire Force 80 high-flow (up to 5000 lpm @ 10 bars) robotic nozzle; and
- ▶ A 3" ball valve and actuator that automatically opens during fire suppression and closes after the fire has been completely extinguished; and
- ▶ Unifire's TARGA PLC with FlameRanger™ software and optional InterAct™ web server and Graphical User Interface (GUI), capable of:
 - ▽ triangulating the three-dimensional size and position of a fire based on the data provided by 2 or more flame detectors,
 - ▽ automatically opening the valve and guiding the Force 80 robotic nozzle and Integ 80 robotic nozzle jet/spray tip to dynamically suppress the detected fire accurately at its source,
 - ▽ update the nozzle guidance dynamically, much like a human firefighter, and at a rate of ten times per second (10 Hz);
 - ▽ performing self-tests and communicating any errors or faults of the electronic components when detected, and
 - ▽ allowing authorized operators and/or firefighting personnel to take over manual, remote control of the robotic nozzle and valve over a secure, user-friendly Graphical User Interface (GUI).



III. ITEMIZED SYSTEM CAPABILITIES

SYSTEM CAPABILITIES			
#	Feature	Unifire FlameRanger™	Competing Solution
C1	Fully autonomous and fully automatic fire detection?	✓	
C2	Fully autonomous and fully automatic fire suppression?	✓	
C3	Accurate, three-dimensional (3D) location of fire (including its size)?	✓	
C4	Maximum time from flame ignition to commencement of fire suppression (in multiple, live tests conducted):	< 15 seconds	
C5	Maximum flow of water/foam, in liters per minute:	5000 lpm	
C6	Accurate delivery of large volume of water/foam directly onto the fire's source?	✓	
C7	Continuously tracks and reacts in real time to the fire's changing size and position, in three-dimensional space?	✓	
C8	Fire position update & reaction rate (in cycles per second—Hz):	10 Hz	
C9	Maximum number of separate fires that can be detected and tracked simultaneously:	4	
C10	Automatically adjusts the spray trajectory to compensate for the distance of the fire from the robotic nozzle?	✓	
C11	Automatic spray pattern adjustment based on fire's size and distance from robotic nozzle?	✓	
C12	Automatically opens valve when the fire is detected and confirmed by 2 independent flame detectors?	✓	
C13	Automatically closes the valve after flames are no longer detected?	✓	
C14	Full manual remote control capability at all times?	✓	
C15	Programmable spray pattern record/play sequence in manual remote control operation?	✓	

SYSTEM CAPABILITIES (Continued)

#	Feature	Unifire FlameRanger™	Competing Solution
C16	Individual systems can be networked together?	✓	
C17	Optional graphical user interface that displays system's status, including any errors, flames detected, etc.?	✓	
C18	Human manual over-ride of automatic control?	✓	
C19	Human operator can control the robotic nozzle (monitor) by remote control at any time, regardless of flame detection status?	✓	
C20	Capable of programming customized behavior (e.g. delayed shut off after flames no longer detected, delayed reaction to allow human over-ride, etc.)?	✓	
C21	Testing Laboratory / Entity of the fully automatic detection and suppression system:	Jensen Hughes & US Naval Research Laboratory	

IV. ITEMIZED FIRE DETECTION FEATURES



SYSTEM'S FLAME DETECTION FEATURES

#	Feature	Unifire FlameRanger™	Competing Solution
D1	Fully automatic, 24/7/365 flame detection?	✓	
D2	Flame Detector type:	Tyco FV300 IR Array Flame Detector	
D3	Detection reaction time:	Very rapid (typically seconds)	
D4	Flame detector housing material:	Stainless Steel 316L	
D5	Detector Approvals:	FM, ATEX, CE Marked	
D6	System capable of three-dimensional (3D) location + size of fire?	✓	
D7	Capable of detecting and up to 4 fires simultaneously?	✓	
D8	Maximum number of flame detectors per robotic nozzle?	4	
D9	Virtual elimination of false alarm by requiring at least 2 independent flame detectors to simultaneously detect the same fire at the same place at the same time?	✓	
D10	Detection operating area:	50m x 50m (2500 m ²)	
D11	Field of view of each detector:	90° x 80°	
D12	Able to see flames through smoke and through high densities of solvent vapours thus increasing the probability of early detection of hydrocarbon fires?	✓	
D13	Consistent, high sensitivity, flame detection throughout a 90° field of view due to 256 individual sensors?	✓	



SYSTEM'S FLAME DETECTION FEATURES (Continued)

#	Feature	Unifire FlameRanger™	Competing Solution
D15	RS485 serial data port suitable for network connection using a MODBUS protocol?	✓	
D16	Regular self-testing of critical electronic circuits and regular monitoring of the detector window?	✓	
D17	Detector IP Rating:	IP66 / IP67	
D18	Software masking of identified unwanted sources of radiation in the detector field of view?	✓	
D19	Insensitive to artificial light sources, such as halogen lights, welding arcs?	✓	

V (A) FORCE 50 - 2" ROBOTIC NOZZLE



SYSTEM'S 2" FORCE 50 ROBOTIC NOZZLE (MONITOR) SPECS

#	Feature	Unifire FlameRanger™	Competing Solution
S1	Chassis Model:	Unifire Force 50 Robotic Nozzle	
S2	Nozzle Tip Model:	Unifire Integ 50 jet/spray robotic nozzle tip	
S3	Motor Type (Chassis & Nozzle Tip):	24VDC Brushless (BLDC)	
S4	Maximum Flow @ 10 Bars:	2000 LPM	
S5	Recommended operating pressure range:	3 - 12 Bars	
S6	Maximum operating pressure:	16 Bars	
S7	Mass including nozzle tip:	≈ 20 Kg	
S8	Dimensions:	50 x 35 x 22 cm	
S9	Internal Pipe Diameter:	50 mm	
S10	Horizontal Range of Motion:	360° rotation	
S11	Vertical Range of Motion:	180° vertical (+/- 90° from horizontal).	
S12	Positioning accuracy:	Better than 0,1°	
S13	Robotic Nozzle Chassis Material:	Stainless Steel 316L (EN1.4404)	
S14	Nozzle Tip Material:	Stainless Steel 316L & Bronze (CuSn12)	
S15	Input connection:	2" male BSP, or DN50 or DN65 Flange. ANSI or JIS flange optional.	
S16	Fully integrated and enclosed worm gears?	✓	
S17	Worm gear material:	Stainless Steel 316L	
S18	Gear wheel material:	Bronze (CuSn12)	

SYSTEM'S 2" FORCE 50 ROBOTIC NOZZLE (MONITOR) SPECS (Continued)



#	Feature	Unifire FlameRanger™	Competing Solution
S17	Manufactured at ISO Certified Facilities?	✓	
S18	Country of manufacture:	Denmark	
S19	Type Approval / Certificates:	Bureau Veritas (BV) Type Approval / CE Marked	
S20	Robotic nozzle Movement Velocity:	Standard: 18°/sec. rotational; 12°/sec. vertical (higher velocities are optional)	
S21	Modular design for capability of changing damaged pipe sections and gear housings?	✓	
S22	M12 water-resistant cable connection type for simple installation, maintenance & repair)?	✓	
S23	Progressive speed / movement control provides substantially increased accuracy of control?	✓	
S24	Simultaneous movement horizontally and vertically (true diagonal movement) capability?	✓	
S25	Programmable, real-time record / playback feature?	✓	
S26	Programmable end positions, set by software to any ranges desired?	✓	
S27	Programmable Park Position?	✓	

V (B.) FORCE 80 - 3" ROBOTIC NOZZLE



3" FORCE 80 ROBOTIC NOZZLE (MONITOR) SPECIFICATIONS

#	Feature	Unifire FlameRanger™	Competing Solution
S1	Chassis Model:	Unifire Force 80 Robotic Nozzle	
S2	Nozzle Tip Model:	Unifire Integ 80	
S3	Motor Type (Chassis & Nozzle Tip):	24VDC Brushless (BLDC)	
S4	Flow range:	2000 - 5000 LPM	
S5	Recommended operating pressure range:	3 - 12 Bars	
S6	Maximum operating pressure:	16 Bars	
S7	Mass including nozzle tip:	30 Kg	
S8	Dimensions:	71 x 50 x 33 cm	
S9	Internal Pipe Diameter:	80 mm	
S10	Horizontal Range of Motion:	360°	
S11	Vertical Range of Motion:	180° vertical (+/- 90° from horizontal).	
S12	Positioning accuracy:	Better than 0,1°	
S13	Robotic Nozzle Chassis Material:	Stainless Steel 316L (EN1.4404)	
S14	Nozzle Tip Material:	Stainless Steel 316L & Bronze (CuSn12)	
S15	Input connection:	DN80 or DN100 Flange. ANSI or JIS flange optional	
S16	Fully integrated and enclosed worm gears?	✓	
S17	Worm gear material:	Stainless Steel 316L	
S18	Gear wheel material:	Bronze (CuSn12)	

3" FORCE 80 ROBOTIC NOZZLE (MONITOR) SPECIFICATIONS



#	Feature	Unifire FlameRanger™	Competing Solution
S17	Manufactured at ISO Certified Facilities?	✓	
S18	Country of manufacture:	Denmark	
S19	Type Approval / Certificates:	Bureau Veritas (BV) Type Approval / CE Marked	
S20	Robotic nozzle Movement Velocity:	24°/sec. rotational; 12°/ sec. vertical	
S21	Modular design for capability of changing damaged pipe sections and gear housings?	✓	
S22	M12 water-resistant cable connection type for simple installation, maintenance & repair?	✓	
S23	Progressive speed / movement control provides substantially increased accuracy of control?	✓	
S24	Simultaneous movement horizontally and vertically (true diagonal movement) capability?	✓	
S25	Programmable, real-time record / playback feature?	✓	
S26	Programmable end positions, set by software to any ranges desired?	✓	
S27	Programmable Park Position?	✓	

VI. GRAPHICAL USER INTERFACE (GUI) FEATURES



SYSTEM'S GRAPHICAL USER INTERFACE FEATURES

#	Feature	Unifire InterAct™	Competing Solution
G1	Displays full system status information in real time, including any errors of any component?	✓	
G2	Display on any device with modern web browser (so long as connected to the network)?	✓	
G3	Allows for full system controls, including: open valve, close valve, nozzle spray pattern (jet/fog continues control), robotic nozzle movement horizontally and vertically, park, etc.?	✓	
G4	Allows multiple separate users to simultaneously view system status and activity?	✓	
G5	Features, look, language, etc. can be customized and programmed to customers's specific needs, including varying features and levels of control based on the operator's credentials?	✓	
G6	Simple to update software over network?	✓	
G7	Web server built-in with the system's PLC?	✓	
G8	Upgrade / reprogram the PLC via the web server?	✓	

VII. PROGRAMMABLE LOGIC CONTROL (PLC) FEATURES



SYSTEM'S PLC FEATURES

#	Feature	Unifire InterAct™	Competing Solution
P1	PLC Make / Model	Unifire X-TARGA	
P2	Built-in power converter (100-230VAC/24VDC(20A)	✓	
P3	IP Rating	IP66	
P4	Cable gland entry sealing system:	ROXTEC EzEntry 10	
P5	Cabinet type:	RITTAL type AE 1045.500	
P6	Cabinet dimensions:	500 x 400 x 210 mm	
P7	Number of digital inputs:	4 - 16	
P8	Number of analogue inputs:	4 - 32	
P9	Expandable number of digital inputs / outputs:	✓	
P10	Expandable number of analogue inputs / outputs:	✓	
P11	Number of DC Brushless Motor (BLDC) driver card slots:	6	
P12	USB port for simple software updates?	✓	
P13	Display and with push-button panel for setup and system diagnosis?	✓	
P14	Simple quick installation with M12 multi-connectors?	✓	
P15	Fully programmable and expandable?	✓	
P16	Electrical requirements:	24 VDC / 2 + 20A fuse	
P17	Average power consumption:	< 500 W	
P18	Capable of power via emergency battery backup?	✓	

Global Service

FlameRanger is available around the globe.

From initial consultation to project planning, sales, installation, support and service, Unifire and its world-class partners can assist around the globe.

Contact us.

www.FlameRanger.com

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