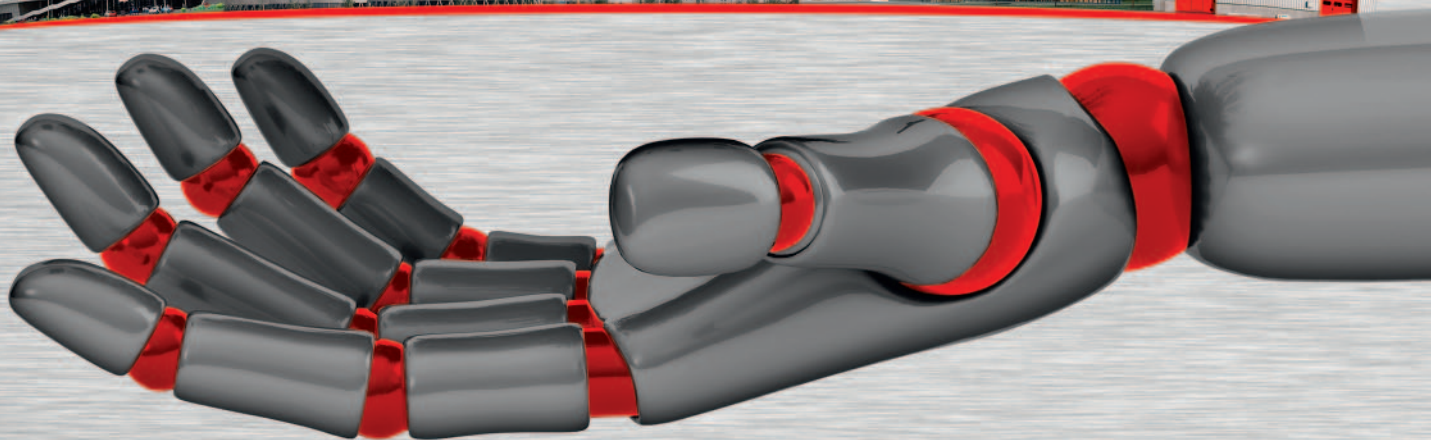




“FR” ENGINEERING CENTRE
OF FIRE ROBOTS
TECHNOLOGY, LLC



**FIRE ROBOTS AND
FIRE ROBOTS TECHNOLOGY**

Product
catalogue
2015-2016

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Introduction

Fire robots and fire monitors technologies in fire automatics and fire security

Modern innovative informational computer technologies have a considerable influence on industrial development. There are great changes also in fire automatics, which integral part the fire robots are.

Necessary to mention, that Russia is the first country in the world, where legally and normatively appeared a new type of automatic fire suppression systems – the robotic fire suppression systems. They are included in the federal law of the country about fire safety #123-FZ, the design norms of extinguishing system SP5.15130.2009 and the state standard SP5.15130.2009 for robotic fire suppression systems.

Fire robots have passed through a considerable way of evolution development. This year the first fire robot, created for protection of Kizhi, has a 30th anniversary. The robot was a start of the new direction of fire science – robotic fire suppression technology.

Technological disasters intensified elaborating of fire robots for extreme conditions.

After practical experience of using fire robots, new technologies of fire suppression were researched in Russian Scientific Research Institute of fire defense and Institute of physical-technical problems in Moscow, in State Project Institute “Spezavtomatika” in Leningrad and Laboratory of fire robots in Petrozavodsk.

In these works the new indexes for fire robots were determined, new terms and definitions were invented, practical researches of the stream ballistic were held to make recommendations for use.

The first robotic fire suppression system for protection of machinery halls of Leningrad APS and Petrozavodsk HPP were elaborated and implemented.

Nowadays fire robots and new technologies of fire suppression on their base are used almost in all fields of human activity, connected with fire danger.

Fire robot responds firemen dreams about firefighting much – it monitors deputed protected area and in case of ignition it will direct quickly and accurately a powerful load of water or foam.

Possibility of fire robot, on one side, to replace a human in hazardous conditions, and on other side – to collaborate with him, allows more effective and safe fire extinguishing.

High capacity, address delivery of extinguishing solution, its concentrate feeding onto local place of ignition, flexible system of control, self-testing – this is not full list of technical indexes of fire robots, that considerably enlarge technical possibilities of fire automatics and increase safety of units in the whole.

Having experience of application of universal monitors with



Chief Executive Officer Yury Gorban

dispersed streams as a part of fire robots and taking into account necessity of these product in the country, «FR» Engineering Centre of Fire Robots Technology had a task to elaborate native modern fire suppression technology under Russian standards with organizing of its serial production on the specialized factory.

Elaboration of new articles had been held for several years with different tests and certification.

Nowadays «FR» Engineering Centre of Fire Robots Technology is an innovative enterprise and takes a leading position in Russia and CIS in elaboration and manufacturing of fire robots and robotic fire suppression system under standard GOST R 53326-2009, fire monitors under GOST R 51115-97 and handline nozzles under GOST R 53331- 2009.

The range of manufactured production in different modification is more than 200 articles.

The products are certified in accordance with Russian fire safety standards, the requirements of maritime registers and explosion proofing.

The products are produced up to the world standards. The novelty of technical decisions is proved by patents.

In the catalogue one can find a wide range of fire robots and fire monitors, made by «FR». Technical characteristics are given with photos of general view of the articles.

There is detailed information for application of robotic fire suppression system and fire monitors for protection of hazardous units, including information necessary for design and construction engineers.

Certificates, patents, prizes

Certificate of self-regulated organization

«FR» Engineering Centre of Fire Robots Technology LLC. is a member of Self-regulated organization "Multiregional building union of designers of fire preventive defense" and has a certificate № P-150-B-519 dated 25.03.2015, which allows determined type or types of work, that influence on safety of capital projects. Types of work: works on preparing of measures of fire safety.

Certificate ISO 9001:2008

«FR» Engineering Centre of Fire Robots Technology is certified in the system of international quality standard ISO 9001:2008:

- Certificate № 11.0959.026 of quality management system conformity ISO 9001:2008 № 11.0959.026.
- Certificate № ROSS RU.ISO8.K01402 of conformity.

Membership in National Science Academy of Fire Defense

«FR» Engineering Centre of Fire Robots Technology has been a member of Non-Profit Partnership "National Science Academy of Fire Defense" since the year 2008.

Since 2012 «FR» Engineering Centre of Fire Robots Technology has been a member of methodic committee of technical regulation in the field of fire safety in the National Science Academy of Fire Defense, which was established according to decision of enlarged presidium meeting, academic board and member society of the National Science Academy of Fire Defense.

Patents

For the beginning of the year 2014 «FR» Engineering Centre of Fire Robots Technology has 20 valid patents of the Russian Federation for its production, 2 international applications, that are on the stage of consideration in the European Patent Office for giving European patent.

Diplomas and prizes

The articles of FR Engineering Centre are awarded with gold medal of Exhibition of Economic Achievements, honorary diplomas of international exhibitions and forums.

In 2014 the leading specialists of «FR» Engineering Centre got the prize of the National Science Academy of Fire Defense for science-technical elaborations in nomination Research and Technical Development, to be exact, for works with robotic fire suppression system.



Certificates

Certificate of fire monitors:

- Certificate S-RU.PB01.B.01791 of conformity, date of issue 12.01.2012, is valid until 12.01.2017.
- Russian maritime register if shipping type approval certificate № 12.00072.120, date of issue 03.08.2012, is valid until 03.08.2017.
- Certificate № TS RU S-RU.MSH06.V.00102 of conformity, date of issue 20.08.2015 on fire monitors of explosion-proof modification, is valid until 20.08.2020.
- JSC FGC UES licensing board Decision № 29-12 dated 21.05.2012 on LS-S20(15;25)U and LS-S40(20)Uo fire monitors acknowledging that they correspond to JSC FGC UES requirements and recommendations on how to be applied in JSC FGC UES facilities.

Certificate of handline nozzles

- Certificate № S-RU.PB01.V.01773 of conformity, date of issue 23.12.2011, is valid until 23.12.2016.
- Russian maritime register if shipping type approval certificate №12.00073.120, date of issue 03.08.2012 r., is valid until 03.08.2017.

Certificates on robotic fire suppression system

Certificate S-RU.PB01.V.01792 of conformity, date of issue 12.01.2012, is valid until 12.01.2017.

Certificates on control box of fire monitors and for drives of explosion-proof modification

- Certificate № TS RU S-RU.MSH06.V.00093 of conformity on control box, date of issue 11.08.2015 r., is valid until 11.08.2020.
- Certificate № TS RU S-RU.MSH06.V.00093 of conformity on actuators D.32, D.33, 36 от 03.08.2015 r., is valid until 13.08.2020.

Classification of firefighting equipment

1. Fire monitors

The fire monitors meet the requirements of GOST R 51115-97 and TU-4854-003-16820082-2008, they classified in accordance with GOST R 51115-97:

- LS** – fire monitor
- S** – fixed
- V** – vehicle-mounted
- P** – portable, mobile
- U** – universal, a dispersed water or foam stream with adjustable angle
- without index "U"** - forming the straight stream of water and foam
- D** – remote-controlled
- without index "D"** - manually-operated
- 20-330** - flow rate of water and foam former solution, l/sec.

An example of description for a water/foam universal fixed remote-controlled fire monitor with the flow rate of 100 l/sec is given: LSD-S100U.

For articles made by «FR» Engineering Centre of Fire Robots Technology» in accordance with TU 4854-003-16820082 -2008 the additional index is given in the article type definition, which should be in the end of article type definition under GOST, after index U to classify:

1. Constructive modification of fire monitor:
 - U** – tube construction
 - UI** – with lower installation of monitor
 - Uul** – with upper and lower (variable) installation of monitor
 - without index «D»** - with upper installation of monitor
 - Ub** – with ball-socket
2. Types of nozzles:
 - U** – with dispersed stream, universal (main modification)
 - without index U** - with straight stream, conic
 - Ui** – impact
 - Ue** – with foam eductor
 - Ua** – with automat nozzle
 - Ud** – with deflector
3. Additional devices:
 - U** – without additional devices
 - Uss** – with shielding screen device
 - Uo** – with oscillator
4. Extinguishing solution:
 - U** – water/foam (combined monitor)
 - Up** – powder (powder monitor)

After definition of monitor type the information of equipment modification for the conditions of environment is given:

1. Climatic modification:
 - TC, T, UM** - fire robots are produced in general industrial and marine modification
2. Protection type:
 - Ex** – explosion-proof, 1ExdIICT4 – type of 1ExdIICT4 explosion proof
 - IP55, IP65, IP66** - dust and moisture proof

2. Handline nozzles

Handline nozzles meet the requirements of GOST R 53331-2009 and TU 4854-004-16820082-08 and are classified in accordance with GOST P 53331-2009:

- HN-** combined universal handline nozzles,
- 20, 50, 70** - swivel base
- HP** - high pressure
- without HP index** - normal pressure

The following types of «FR» handline nozzles are produced:

- RSKU-50, RSKU-70** - combined (water-foam) universal handline nozzles with adjusting of flow rate and angle of a dispersed stream, with swivel base 50 and 70.
- RSKU-50e, RSKU-70e** - the same, with educting of foam from backpack, with possibility of immediate switching from water to foam and back, with swivel base 50 and 70.
- RSKU-50a, RSKU-70a FIREMAN'S AUTOMAT®** – automatic combined, universal handline nozzle, with manual and automatic adjustment of flow rate, adjustable stream spray angle, with swivel base 50 and 70, with flow rate from 2 up to 8 l/sec and from 4 up to 15 l/sec.
- RSKU-50a «FLUSH»** - automatic, combined, universal handline nozzle, with manual and automatic adjustment flow rate, adjustable stream spray angle, with swivel base 50, with flow rate from 2 up to 10 l/sec.
- RSKU-20hp** – high pressure universal handline nozzle with adjustable flow rate and stream angle, with shielding screen 120°.

3. Robotic fire suppression system

Robotic fire suppression systems meet the requirement of GOST R 53326-2009 and TU-4854-005-16820082-2005, and consist of:

- RFSS** - robotic fire suppression system
- 2(32)FR** - fire robots (FR) and as a component of RFSS,
- LSD-S20(100)U** - type of fire monitor, included in FR,
- IR-** with ignition detector device in IR-range,
- IR-TV** - with ignition detector device in IR-range and TV-camera.

Example of definition under GOST R 53326-2009 RFSS with 6 FR based on fire monitors (LSD) with flow rate 20 l/sec (20) with ignition detector device in IR-range (IR), TV-cameras (TV): RFSS-6FR-LSD-S20U-IR-TV.

Product range

1. Fire monitors

Modifications	Flow rate				
	20 l/sec	40 l/sec	60 l/sec	100, 125 l/sec	150, 200, 330 l/sec
Fixed manually-operated fire monitors					
With conic nozzle	LS-S20	LS-S40	LS-S60		
Universal piped	LS-S20(15,25)U	LS-S40(20,30)U	LS-S60(40,50)U	LS-S100(80,90)U	LS-S150(100,125)U
With automat nozzle	LS-S20Ua	LS-S40Ua	LS-S60Ua	LS-S100Ua LS-S125Ua	
With oscillator	LS-S20(15,25)Uo	LS-S40(20,30)Uo	LS-S60(40,50)Uo	LS-S100(80,90)Uo	
With foam eductor	LS-S20Ue	LS-S40Ue	LS-S60Ue	LS-S100Ue	
With deflector	LS-S20Ud				
With ball-socket*	LS-S20(15,25)Yb	LS-S40(20,30)Ub	LS-S60(40,50)Ub	LS-S100(80,90)Ub	LS-S150(100,125)Ub LS-S200(150)Ub LS-S330(200,250)Ub
Fixed remote-controlled fire monitors					
Universal piped	LSD-S20(15,25)U	LSD-S40(20,30)U	LSD-S60(40,50)U	LSD-S100(80,90)U	LSD-S150(100,125)U
With automat nozzle	LSD-S20Ua	LSD-S40Ua	LSD-S60Ua	LSD-S100Ua LSD-S125Ua	
With foam eductor	LSD-S20Ue	LSD-S40Ue	LSD-S60Ue	LSD-S100Ue	
On the 3rd extend of motion	LSD-S20(15,25)Uul	LSD-S40(20,30)Uul	LSD-S60(40,50)Uul	LSD-S100(80,90)Uul	
Impact	LSD-S20Ui				
With ball-socket	LSD-S20(15,25)Ub	LSD-S40(20,30)Ub	LSD-S60(40,50)Ub	LSD-S100(80,90)Ub	LSD-S150(100,125)Ub LSD-S200(150)Ub LSD-S330(100,125)Ub
Portable manually-operated fire monitors*					
Universal piped	LS-P20(15,25)U	LS-P40(20,30)U	LS-P60(40,50)U		
With oscillator	LS-P20(15,25)Uo	LS-P40(20,30)Uo	LS-P60(40,50)Uo		
With foam eductor	LS-P20Ue	LS-P40Ue	LS-P60Ue		
With ball-socket	LS-P20(15,25)Ub	LS-P40(20,30)Ub	LS-P60(40,50)Ub		
Portable remote-controlled fire monitors					
Universal piped	LSD-P20(15,25)U	LSD-P40(20,30)U	LSD-P60(40,50)U		
With ball-socket	LSD-P20(15,25)Ub	LSD-P40(20,30)Ub	LSD-P60(40,50)Ub		
Fire monitors with quick-release connection*					
Quick-release	LS-P/S20(15,25)U	LS-P/S40(20,30)U			
Fixed powder fire monitors					
Manually-controlled	LS-S20Up	LS-S40Up	LS-S60Up	LS-S100Up	
Remote-controlled	LSD-S20Up	LSD-S40Up	LSD-S60Up	LSD-S100Up	
Fixed remote-controlled explosion-proof fire monitors					
With induction motor	LSD-S20(15,25)U-Ex1	LSD-S40(20,30)U-Ex1	LSD-S60(40,50)U-Ex1	LSD-S100(80,90)U-Ex1	
With direct current motor	LSD-S20(15,25)U-Ex2	LSD-S40(20,30)U-Ex2	LSD-S60(40,50)U-Ex2	LSD-S100(80,90)U-Ex2	
Vehicle-mounted fire monitors					
For dispersed streams			LS-V60(40,50)U	LS-V100(80,90)U	LS-V150(100,125)U
With foam eductor			LS-V60Ue	LS-V100Ue	LS-V150Ue
With ball socket			LS-V60(40,50)Ub	LS-V100(80,90)Ub	LS-V330(200,250)Ub

Note:

* - fire monitors may have additional options a, e, d, ss, o in different combinations according to accepted classification

2. Handline nozzles

Modifications	Du-20	Du-50	Du-70
Universal		RSKU-50	RSKU-70
With foam eductor		RSKU-50e	RSKU-70e
Automatic		RSKU-50a	RSKU-70a
High pressure	RSKU-20hp		

3. Fire robots (FR) and robotic fire suppression system (RFSS)

Modifications	Flow rate			
	20 l/sec	40 l/sec	60 l/sec	100 l/sec
Fixed fire robots of general industrial modification				
Program-controlled	FR-LSD-S20U	FR-LSD-S40U	FR-LSD-S60U	FR-LSD-S100U
With IR-scanner	FR-LSD-S20U-IR	FR-LSD-S40U-IR	FR-LSD-S60U-IR	FR-LSD-S100U-IR
With IR-scanner and TV	FR-LSD-S20U-IR-TV	FR-LSD-S40U-IR-TV	FR-LSD-S60U-IR-TV	FR-LSD-S100U-IR-TV
With ball socket, android series	FR-LSD-S20Ub-IR-TV	FR-LSD-S40Ub-IR-TV	FR-LSD-S60Ub-IR-TV	
With ball socket and mechanism of rotation	FR-LSD-S20Ub-IR	FR-LSD-S40Ub-IR		
Portable fire robots of general industrial modification				
Program-controlled with radio channel	FR-LSD-S20Y			
Fixed explosion-proof fire robots				
Program-controlled	FR-LSD-S20Y-Ex	FR-LSD-S40U-Ex	FR-LSD-S60U-Ex	FR-LSD-S100U-Ex
With IR-scanner and/or TV-camera	FR-LSD-S20Y-Ex-IR-(TV)	FR-LSD-S40U-Ex-IR-(TV)	FR-LSD-S60U-Ex-IR-(TV)	FR-LSD-S100U-Ex-IR-(TV)
Robotic fire suppression system of general industrial modification				
Program-controlled	RFSS-2(32)FR-LSD-S20(100)U(b)			
With IR-scanner	RFSS-2(32)FR-LSD-S20(100)U(b)-IR			
With IR-scanner and TV	RFSS-2(32)FR-LSD-S20(100)U(b)-IR-TV			
Robotic fire suppression system of explosion-proof modification				
Program-controlled	RFSS-2(32)FR-LSD-S20(100)U-Ex			
With IR-scanner and/or TV	RFSS-2(32)FR-LSD-S20(100)U-Ex-IR-(TV)			

4. Fire towers

Name	Name
FT-2 - Fire tower with site for LS work of 2 m	FT-5 - Fire tower with site for LS work of 5 m
FT-2,5 - Fire tower with site for LS work of 2,5 m	FT-6 - Fire tower with site for LS work of 6 m
FT-3 - Fire tower with site for LS work of 3 m	FT-9 - Fire tower with site for LS work of 9 m
FT-4 - Fire tower with site for LS work of 4 m	FT-10 - Fire tower with site for LS work of 10 m

5. Component parts to add to a complete fire monitor set

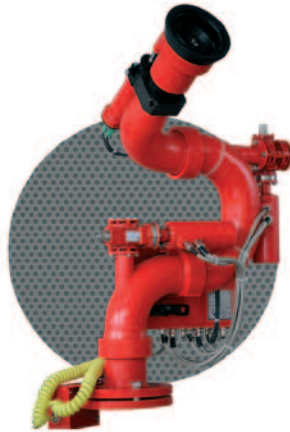
Name	Name
BV-80, BV-100 - butterfly valve with electric drive	RS-2RB-2R - power supply for fire robots
BV-80-Ex, BV-100-Ex - butterfly valve with electric drive of explosion-proof modification	IOD - Input-output device
HO-80 - hydraulic oscillator	RCD-LSD - Radio control device for one LSD
HO-100 - hydraulic oscillator	RCD-RFSS - Radio control device for RFSS with connection to RS-485 channel
SS - shielding screen device	CB-1B - Control box for LSD 380/220 with block of dynamic breaking, for one LSD up to 500 m
FFT - foam former tank V=210 l. (including ball valve and hose)	CB-Ex - Control box LSD-S100(60,40) in explosion-proof modification, for 1 LSD up to 100 m
RCC - remote control consol	CCD - Central control device
NCB - network controller box	

Note: Description and characteristics of fire monitors, handline nozzles, fire towers and components parts (items 1, 2, 4, 5 of product range can be found in additional catalogue

Fire robots. General types



FR-LSD-S20U



FR-LSD-S40U



FR-LSD-S60U
FR-LSD-S100U



FR-LSD-S20U-IR



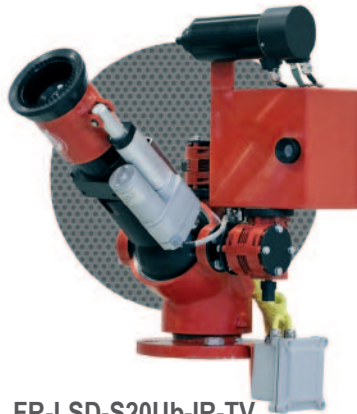
FR-LSD-S40U-IR



FR-LSD-S60U-IR
FR-LSD-S100U-IR



FR-LSD-S20Ub-IR
inbox



FR-LSD-S20Ub-IR-TV



FR-LSD-S40Ub-IR-TV



FR-LSD-P40U



FR-LSD-S60U-Ex
FR-LSD-S100U-Ex



FR-LSD-S60U-Ex-IR-TV
FR-LSD-S100U-Ex-IR-TV

Fire robots Specifications

General information, purpose and application

Fire robots are produced in accordance with Russian national standard GOST R 53326-2009 on the basis of fixed water-foam universal fire monitors. They can be program- or remote-controlled, can be supplied with IR-sensors and a video camera. Fire robots are included into robotic fire suppression system.

They are applied for formation of a dispersed stream of extinguishing solution with a adjustable spray angle from a straight stream up to shielding screen 90 deg., for automatic

extinguishing as a part of robotic fire suppression system.

Fire robot is used for fire extinguishing, cooling of building and technological structures, suppression of clouds of toxic or radioactive gases, fume and dust.

Fire robots are produced in general industrial, marine and explosion-proof modification.

Fire robots conform to requirements of GOST P 53326-2009 and TU 4854-005-16820082-2005.

Specifications

Characteristics	FR type on base of fire monitors GOST R 51115-97			
	FR-LSD-S20U-IR-TV	FR-LSD-S40U-IR-TV	FR-LSD-S60U-IR-TV	FR-LSD-S100U-IR-TV
1. Coordinate system	Spherical			
2. Movable object	Monitor with nozzle, forming a dispersed water stream			
3. Motion speed, deg/sec	3 - 12			
4. Nominal pressure, MPa	0,6	0,6	0,6	0,8
5. Operating pressure, MPa	0,4-0,8	0,4-0,8	0,6-1,0	0,6-1,0
6. Water flow rate, l/sec	20	40	60	100
7. Water foam solution flow rate, l/s	20	40	60	100
8. Maximum reach of stream (by outermost drops), m				
- Water	55	70	80	100
- Dispersed at a 30 degree angle	34	43	49	63
- Foam	50	60	68	85
9. Travelling area of monitor, degree				
-vertical	от +90 до – 40			
-horizontal	360			
10. Variation range of stream angle, deg	0-90			
11. Foam ratio, not less than	7			
12. Ignition detector device	IR-sensor			
13. Connection with external devices	with the interface RS-485			
14. Operating life, years	10			
15. Weight, kg, not more than	42	43	45	60

Notes:

1) Streams range capacities are given under the conditions that maximum discharge of fire-extinguishing liquid is used, with the angle of slope of monitor to the horizon of 30 degrees, which is fixed in operating position.

2) Foam ratio is given under the condition that general-purpose foam former solution PO-ZNP TU №38-00-05807999-20-93 is used.

3) Modifications of fire robots (FR) concerning discharge, installation methods (portable, vehicle-mounted, on platform, on lifting gear), types of explosion protection, dust and damp proof, use of educator for supply of foam former solution, impulse nozzles and video monitoring are made at the request of customer.

Robotic fire suppression system (RFSS)

General information, purpose and application

Robotic fire suppression system RFSS-2(32)-FR-LSD-S20(100)U-IR-TV consists of fire robots (FR) based on fire monitors with remote control, addressable fire alarm and system of program control. It relates to automatic fire suppression system.

RFSS is used for water and foam suppression by straight and dispersed stream with adjustable spray angle in high-floored buildings and outside units such as aircraft hangars, buildings for sport and entertainment events, timber storages, machinery

halls of heat-and-power plants and APPs, battery tanks of oil-product, railway platforms, monuments of wooden architecture and so on.

RFSS meets the requirements of GOST R 53326-2009 and TU 4854-015-16820082-2005

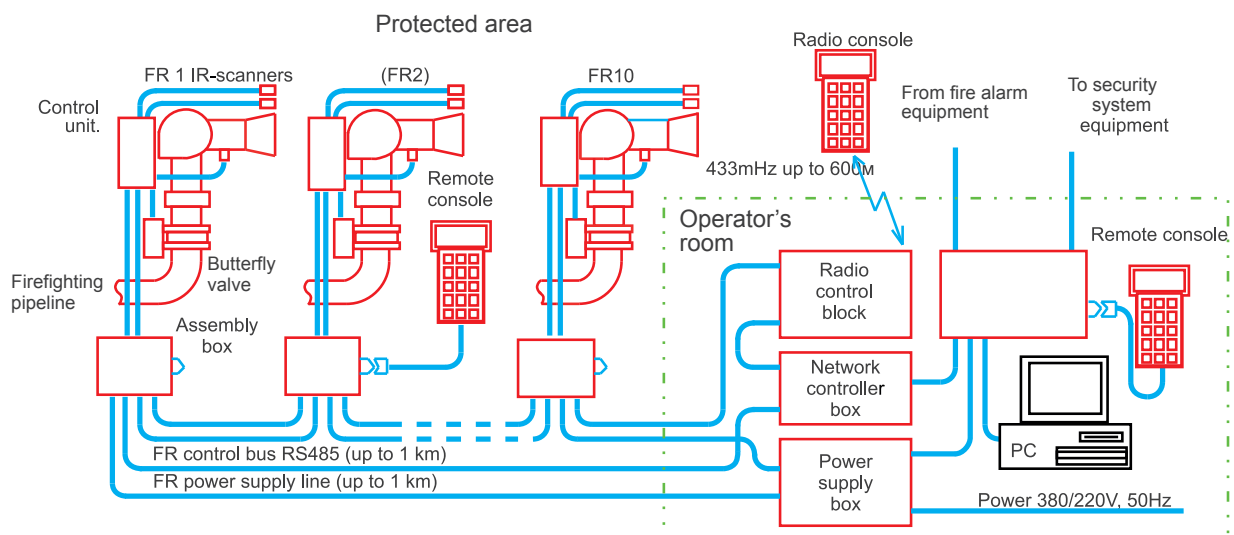
Example of RFSS's reference designation with eight fire robots with flow rate 50 l/sec with ignition detector device in IR-range: RFSS-8FR-LSD-S50U-IR under TU 4854-015-16820082-2005.

General purpose industrial version 1

Main technical features:

Characteristics	Values
Quantity of fire robots in the robotic fire suppression system	up to 32 pcs
Type of connection between devices in the robotic suppression system	By interface RS-485
Frequencies of radio control	433/868/915 MHz
Connection between central control device and control and indicating equipment	In accordance with a project
Electricity supply to devices in the robotic fire suppression system	220 V, 50 Hz, 1 class of reliability
Video monitoring system	TV-camera in viewable range
Ignition detector device	In accordance with a project
Operating modes:	- Automatic; - automatized; - remote; - manual.
Fire robot operation in an automatic mode	Positional and continuous control
Fire robot water stream ballistics when pointing at the object	Changing of pressure of extinguishing solution, distance to the aim and angle of directing in vertical plane shall be estimated.

TYPE SCHEME OF UNIT'S PROTECTION BY FIRE ROBOTS (FR)



For their purpose automatic systems are multipurpose systems, which make it possible to solve different problems of fire-preventive defense. Therefore, for example, an automatic foam extinguishing system with using of robotic fire suppression system is applied to disclose and extinguish fire with simultaneous alarm about work and condition of installation into operator’s room.

To cool supporting constructions of building and protected units in immediate proximity to a seat of fire it is possible to use robotic fire suppression system.

The robotic fire suppression system can be used for fire extinguishing and for cooling at the same time.

The robotic fire suppression system is used together with an installation of fire alarm and a system of TV observation which are applied for fire detection at an initial stage, transmitting a fire signal into a operator’s room (a fire post) and forming a signal to start up installation of fire extinguishing and monitoring a situation in the area of the seat of fire.

Operation of robotic fire suppression system

If addressable flame detectors start signaling, the control console gives light alarm with a number of stub and voice alarm. Multiple interface unit transmits a fire signal to central control device (CCD) of the robotic fire suppression system and the program of fire extinguishing starts.

There are 4 working mode of the robotic fire suppression system:

- remote,
- automatic,
- automatized,
- manual.

Remote mode of work of robotic fire suppression system

The remote mode is used during start-up works and direct visual control.

In this mode the control is operated by remote console, connected to terminal box of fire robot or to plug of CCD, or by radio control console in the area of radio signal activity.

It is possible to maintain the following commands:

- choice of fire robot for control;
- opening/closing of butterfly valve and solenoid valve;
- directing of FR (moving in horizontal and vertical planes);
- set of FR travel speed – 8 levels;
- adjustable of stream angle;
- setting of operating control (inline scanning of spherical square) and recording of operating program parameters into energy-independent memory of FR-8 programs;
- start/stop of operating program;
- setting of limits of fire robots rotation in vertical and horizontal plane.

There is provided information onto display of control console RCC or RCC-2 about condition of controlled fire robots:

- level of fire robots set speed
- level of active electric drive current;
- level of water pressure;
- information about work of electric drives;
- position of butterfly valve (open/closed);
- information about alarm status.

Automatic mode of robotic fire suppression system

An operator in a round-the-clock operators’s room takes a decision about a working mode of the robotic fire suppression

system. For video control the fire robot has a TV camera, which directs with fire robot onto a heat source and gives video information to the display about condition of unit in the area for following decisions. If the operator switches the robotic fire suppression system into automatic mode, the robotic fire suppression system starts automatically during 5 seconds after getting “Fire”-signal.

Program of robotic fire suppression system is provided the following operation algorithm in automatic mode for fire robot with a ignition detector device:

- a) if an address flame detectors starts, control and indicating equipment gives “Fire”-signal and number of working detector to CCD;
- b) by this signal CCD forms control signals for directing of proper fire robots, not less than 2, into set area;
- c) when the fire robot enters the set area, the program of heat source search starts, and ignition detector device after directing onto heat source give signals for CCD about flame angle coordinates;
- d) CCD determines coordinates of heat source in three-dimensional system of coordinates and forms an extinguishing program for heat source after getting of signals from 2 fire robots;
- e) after start of robotic fire suppression system CCD forms commands:
 - for switching off of technological and electrotechnical equipment (if necessary), ventilation, switching on of fire warning system;
 - for control box of pumping station for starting-up of pumps due to the program, maintained by separate project (if necessary);
 - for opening of butterfly valve and solenoid valves of proper fire robot;
 - for starting-up of fire robot;
- f) in fire extinguishing of heat source participate at least 2 monitors;
- g) under small distances, up to 15 m, fire extinguishing is operated under given spray angle, under bigger distances fire extinguishing is operated along the area by straight streams;
- h) stream feeding is operated along ballistic path. For this purpose CCD estimates angle of rising with correcting for possible changes of pressure in network, different from nominal.

During fire extinguishing the program of heat source search for adjacent areas continues its work, automatically controlling possibility of flame spread.

In case of changing of ignition coordinates the program of fire extinguishing is corrected automatically.

The program of fire extinguishing automatically stops after estimated period of time, and program of fire source search along protected area continues.

Program of fire source repeats periodically, if fire source is not detected and switched off.

In case of repetitive fire detection, the program of fire extinguishing starts.

Automatized mode of robotic fire suppression system

In this mode the work of the robotic fire suppression system is controlled by operator. After getting light and voice alarm “FIRE” the display of CCD indicates information about “Fire”-signal and command “Search of fire source”. After a duty person starts this command:

a) CCD forms control signals for direction of proper fire robots, not less than 2, onto set area;

b) after fire robot's enter into the set area, the program of fire source searching starts, and fire detector devices gives signals to CCD about angular coordinates of ignition;

c) after getting of signals from two fire robots CCD determines coordinates of fire source in three-dimensional system of coordinates and forms a program of fire source extinguishing. On the display appears a command “Fire extinguishing”.

After operator's activation of robotic fire suppression system for fire extinguishing CCD forms above described (in the part “Automatic mode of robotic fire suppression system”) commands. Fire robots operate extinguishing of fire source by scanning along the area. Display's mnemonic indicates work of RFSS.

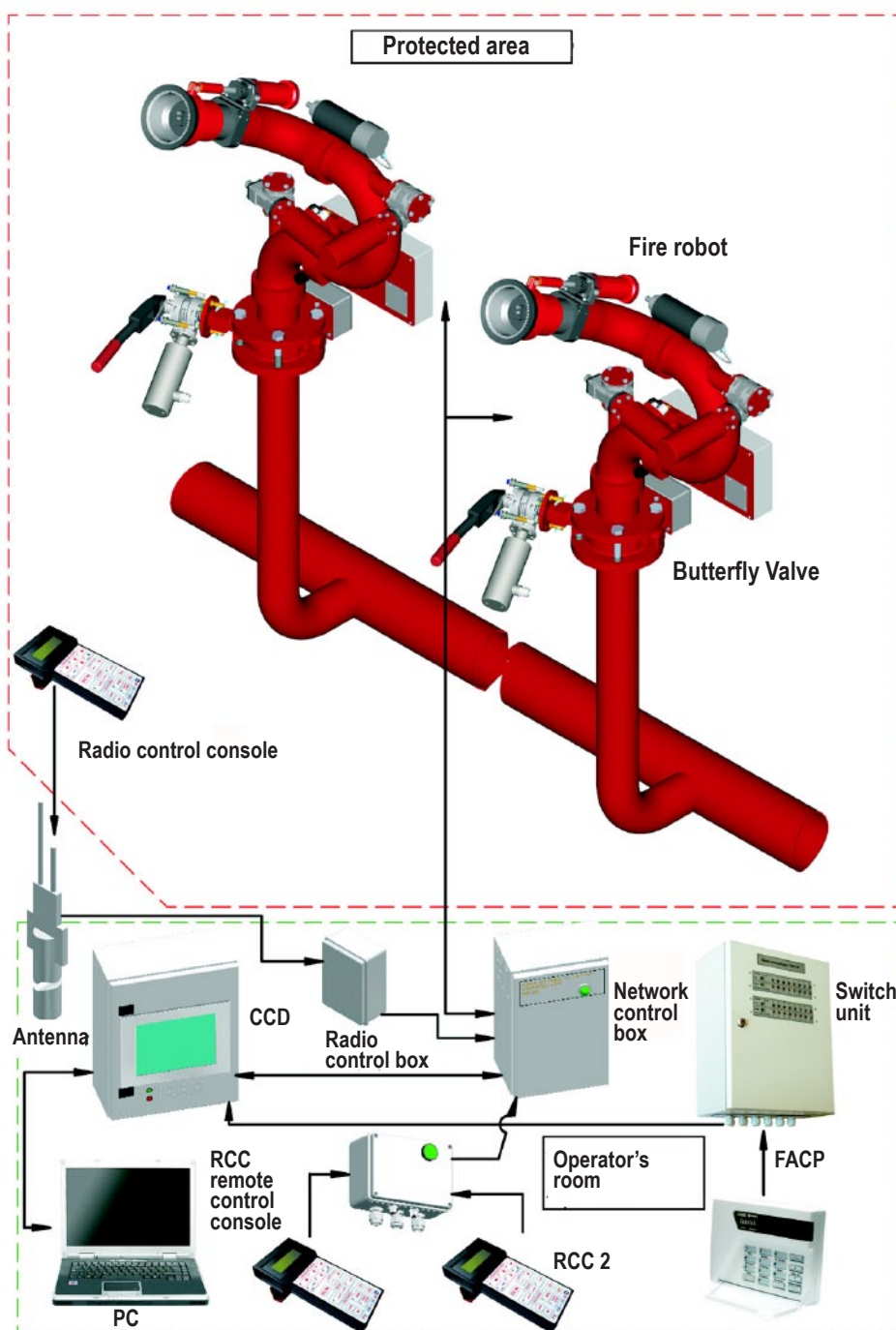
Operator can correct directing of fire robot and area of fire source scanning. For this purpose he chooses a fire robot, participating in fire extinguishing, and by virtual remote console corrects directing and area of scanning.

Operator can stop work of robotic fire suppression system if there is no ignition or reload it in case of ignition.

Manual mode of robotic fire suppression system

Manual mode is applied in case of emergency switch off of electricity network. In this mode the following actions can be provided:

- a) moving of fire robot “Left”, “Right”, “Up”, “Down” by handle for manual control;
- b) control of stream spray angle “Wide”, “Narrow” by rotating of outer race of nozzle with using of handles on the nozzle's base;
- c) control of butterfly valve “Open”, “Close” by handle for manual control.



Robotic fire suppression system. General purpose industrial version 2

Main technical features:

Characteristics	Values
Quantity of fire robots in the robotic fire suppression system	Up to 200
Type of connection between devices in the robotic fire suppression system	Ethernet
Frequencies of radio control	2,4 GHz
Connection between central control device and control and indicating equipment	Under the project
Electricity supply to devices in the robotic fire suppression system	220 V, 50 hertz, 1 reliability rating
Video monitoring system	TV camera in a visible range
Ignition detector device	Under the project
Operating modes:	- automatic; - manual; - blocking of start.
Fire robot operation in an automatic mode	Position or contour
Fire robot water stream ballistics when pointing at the object	Considering the change in fire-extinguishing agent pressure, the distance to the target and pointing angle in the vertical plane

Modes of operation are introduced under GOST 53325-2012.

Operation procedure of robotic fire suppression system

Automatic operation is identical to version 1.

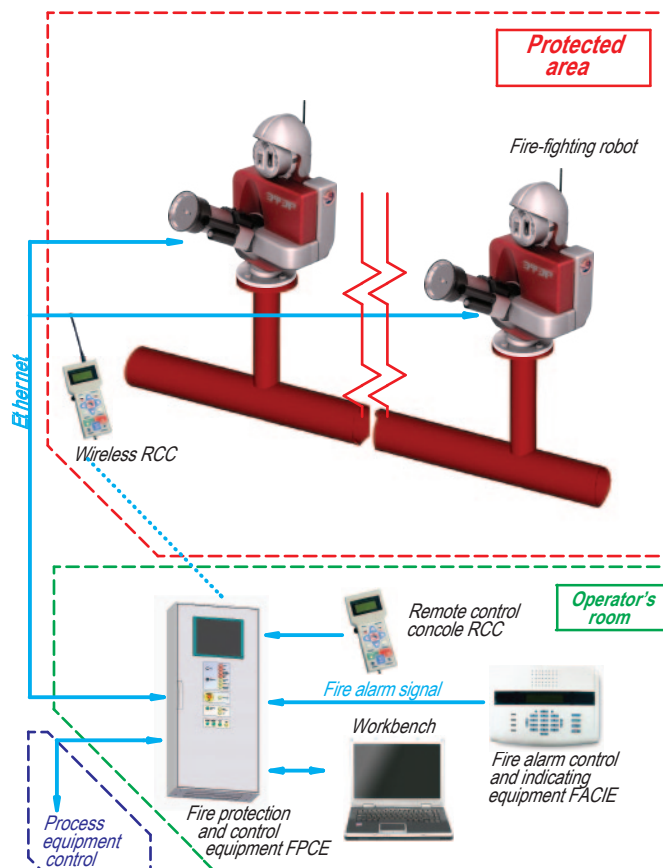
Countdown is introduced additionally for evacuation of people. An operator can stop a clock, hold it up or start a fire-extinguishing system. Counting time is set separately for each zone in the configuration data device according to the characteristics of the object.

Manual operation is identical to option 1 in the absence of the

supply voltage. If there is power an operator can manually search for the hotbed of fire and start extinguishing without a fire alarm signal being initiated.

Blocking of start mode is used for commissioning and maintenance work. In this mode automatic and manual start of fire-extinguishing agent is blocked.

This version of the robotic fire suppression system can be integrated into other fire-protection systems using the Ethernet data transfer standard. In order to improve noise immunity fiber-optic communication lines are applied.



Robotic fire suppression system of explosion-proof modification (RFC-Ex)

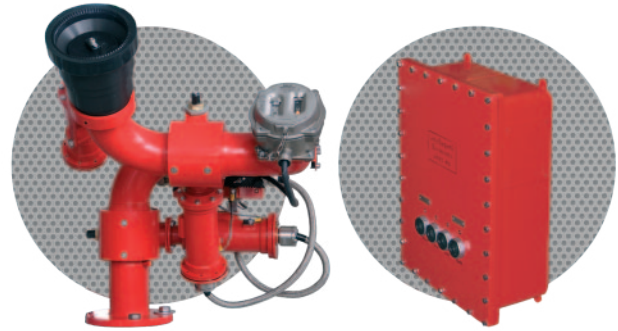
General information, purpose and application

Robotic fire suppression system of explosion-proof modification: 1ExdIICT4 has a built-in two-channel TV camera in an explosion-proof version for video monitoring and fire source detection. The system includes mounted on the outside control boxes (1ExdIICT4) containing start-up instrumentation and a microclimate system which regulate temperature and humidity.

The system is applied in highly explosive areas for fire extinguishing, building and technological structures cooling, precipitation of clouds of poisoned or radioactive gases, fumes and dusts. The following facilities can be protected: battery tanks, oil loading platforms, gas condensate installations, oil terminals, ammunition storage facilities and others.

The system provides the whole cycle of fire extinguishing in highly explosive areas which includes:

- connection with an automatic system of the unit's fire alarm, which activates the robotic fire suppression system;
- connection with a monitoring system to get angular coordinates of the fire source;
- determination of the position in 3-D coordinates;
- automatic aiming at the hotbed of fire taking into account stream ballistics and choice of elevation angle;
- determining of the ignition area and extinguishing program; automatic, automatized, remote and manual modes of RFSS;
- automatic ignition detection by two fire robots according to the set program and the soft program;

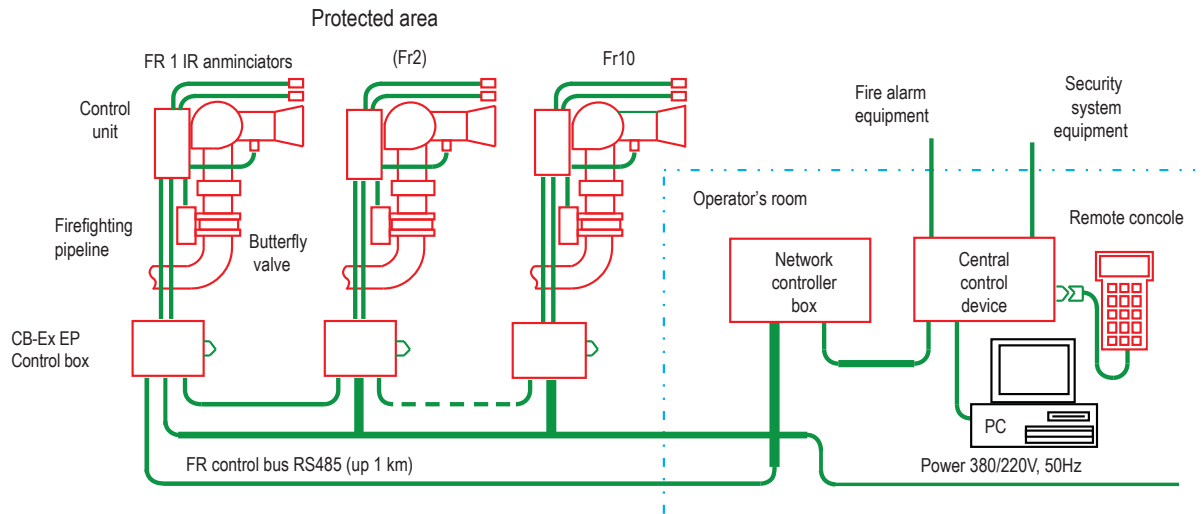


- remote fire extinguishing using the control consoles CC-P;
- remote fire extinguishing using control boxes by electric drives CB-Ex EP;
- manual fire extinguishing by the fire monitor;
- self-testing: in the automatic mode the system provides the functional diagnostics with transmitting of the readiness information to the monitoring system.

Features:

- explosion-proof modification of fire robots and control device equipped with the system of microclimate allowing working outside in winter conditions;
- application of the RFSS in extreme conditions dangerous for a human life;
- application of the two channel TV-camera in an explosion-proof modification as a system of the technical view for the video monitoring and fire source detection.

TYPICAL CIRCUIT OF UNIT'S PROTECTION BY FIRE ROBOTS (FR)



Oil platforms "Kravzovskoye", Kaliningrad region



Baltic tube system, the City of Primorsk



Kirishi petroleum refinery

Automatic fire-extinguishing system based on fire monitors with oscillators

General information, purpose, application

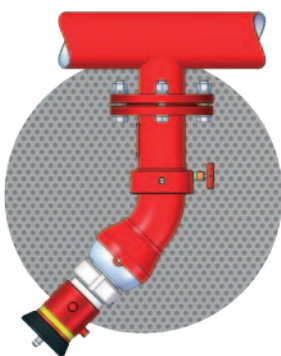
Automatic fire-extinguishing system based on fire monitors with oscillators (the automatic system) belong to automatic fire-extinguishing system and are used for water and foam fire extinguishing by straight and adjustable spray angle and for protection of industrial and civil facilities.

Automatic systems are able to provide high intensity of watering and are an effective option instead of drencher automatic systems of fire suppression.

One fire monitor can replace hundred irrigators and a tube network is limited only by a main tube line.

Automatic systems are used for reservoirs of oil products cooling, protection of shelving storages, energetic units and for making of water shields.

Fire monitors with oscillators are produced with butterfly valve, with foam eductor and deflector nozzles under GOST R 51115-97 and Technical requirements of “FR”: Fire monitors with oscillators – TU 4854- 003-16820082-2008, butterfly valve, foam eductor and deflector nozzles -TU 4854-003-16820082-2008.



Pic.2. LS-20Uoc

Automatic system elements

The automatic system consists of fire monitors with oscillators of LS-S20Uo, LS-S40Uo, LS-S60Uo, LS-S100Uo type (see pic. 1) and fire monitors with circular rotation oscillator of LS-S20Uoc, LS-S40Uoc, LS-S60Uoc, LS-S100Uoc type (see fig.2).

The fire monitors with oscillators are connected to a main feeding pipeline with usage of DGE-80, DGE-100 or DGE-80Ex, DGE-100Ex butterfly valve in explosion proof modification.

The fire monitors can be equipped with foam eductor to supply foam solution in the systems of foam extinguishing and deflector nozzles to form a narrow stream when water shields are made.

The functional principle of the automatic system

In case of fire a device of receiving control equipment (a control device) of fire alarm system included into the automatic system gives a signal to a control box for opening gates in the area where fire alarm gives signals.

At the same time the control device gives control signals to open a fire pump, to start an acoustic and light fire alarm and to control



Pic.1. LS-S20Uo

technological and ventilation systems etc.

After gates opening water or a foam solution are supplied to the automatic system from a main pipeline and it starts irrigating a protected area oscillating a stream along a preset area.

Peculiarities of automatic system engineering design

Choice and location of fire monitors with oscillators, angles of oscillation and number of fire monitors operating at the same time should be determined when designing taking into account features of the specific facility.

Automatic system location should include extended nonutilizable for extinguishing solution areas. It is allowed to use sprinkler, drencher or other local systems of fire suppression in these areas.

The average intensity of watering should be determined as a ratio of the total flow rate of active firefighting monitors (l/sec) to watering area (m²) during the cycle (sec) and it should be less than normal intensity of watering set for drencher systems.

The automatic system operates:

- in the mode of automatic watering the area of extinguishing;
- in the remote mode to control a butterfly valve by a control console;
- in the manual mode: opening/closing of butterfly valve, monitor pointing, setting of a spray angle.

The automatic system makes signals for switching on a fire hose, closing devices with electric drives, start of an acoustic and light alarm giving signals to a fire station, giving “Fire”-signal to a duty room and giving signals to control technological and ventilation systems after registration of fire signal received from an automatic system of fire alarm and other devices which initialize start of the automatic fire-extinguishing system based on fire monitors with oscillators.

Automatic water extinguishing system based on fire monitors applied in oil-filled power autotransformers: Engineering solution

The following engineering solutions “Automatic water extinguishing system based on fire monitors with oscillators applied for protection of oil-filled power autotransformers in Russian power engineering facilities” has been designed by «FR Engineering Centre of Fire Robots Technology».

The system includes fire monitors with oscillators LS-S40(20)U o. These fire monitors meet the requirements of Federal Grid Company of Unified Energy System JSC “FSK EES UES” (the Russian national power distributor) recommended for application on its facilities by Decision № 29-12 dated 21.05.2012 and included into the list “Equipment, technologies and materials”, valid for application on the facilities of JSC Russian Grids up to the year of 2017.

This system has several advantages:

- a loop pipeline with installed fire monitors is applied and a conventional piping with a distributing network of irrigators is excluded;
- location of fire monitors on an accessible height makes it easier to serve them as well as transformers and high-voltage equipment because in this case it is not necessary to apply lifting mechanisms and switch off transformer. Moreover the probability of extinguishing system’s breakdown in case of ignition is reduced;
- fire monitors have adjustment of stream direction horizontally and vertically as well as possibility to change flame angle of dispersed stream, that can increase effectiveness of extinguishing of local ignitions on autotransformer and surrounding grounds;
- considerable reduction of weight and dimensional indexes of the installation, possibility to use an existing water supply system (pipelines, extinguishing pump station) while keeping an adjusted intensity of irrigating reduce price and exploitation costs when replacing existing automatic fire-extinguishing with



drencher irrigators with oscillator fire monitors;

- application of fire monitors with oscillators reduces negative influence of the wind causing stream’s drifting, because an angle of water supply can be changed relative to a wind direction in order to choose optimal;
- position of fire monitors and their elements is identified by special devices fixed on fire monitors it allows to get back to initial settings if necessary, for instance, after fire monitor technical service.

The fig. 2,3 show the scheme of protection of the power oil-filled former by the automatic water fire-extinguishing system with the oscillators.

The fire monitors are installed on loop firefighting pipeline Du 200 along the perimeter of the transformer at a distance not less 2.55 m in accordance with Electrical installation code.

The location of fire monitors provides the irrigation of every autotransformer’s part by two streams at least giving “Fire”-signal to a fire post (to a duty room) and giving signals for control of technical systems, systems of ventilation and others.

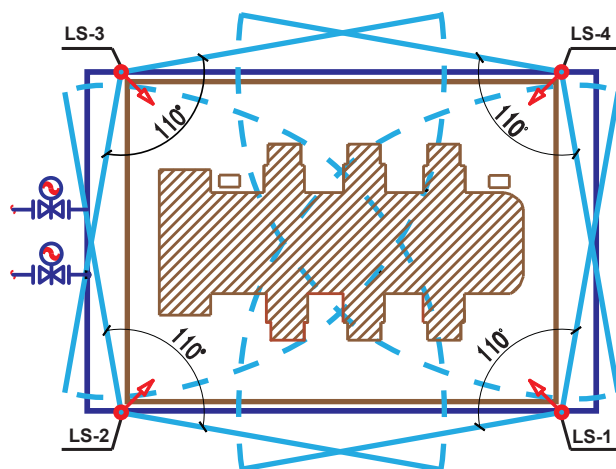


Fig.1 The scheme of protection of the power oil-filled former with application of oscillating fire monitors

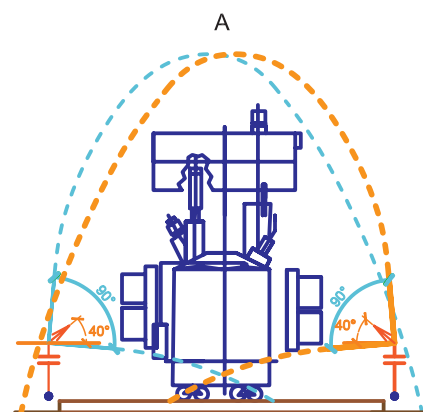


Fig.2. The scheme of installation of fire robots on the unit's plan

Robotic fire suppression and security system on the overseas ships

The robotic fire suppression system, completed with systems of detection of unauthorized access and surrounding area (systems of TV-observation with motion sensors and others, in accordance with customer's request), can be used on the overseas ships as a robotic fire suppression system for extinguishing and for protection against attacks.

The robotic fire suppression system with using of robots of double function protects the ship from attacks and to fling off pursuers on fast motor boats, misguiding them by powerful water stream, and to localize and extinguish fire on ships.

The system of the TV-observation, included into the robotic fire suppression system, means to observe a ship's water area, to detect the location of a fire source and to observe the situation.

The robotic fire suppression system includes a control device for fire complex CD, a video control device VCD, up to 32-x security fire robots sFR-LSD-S40U and a water supply system.

The fire robot sFR-LSD-S40U in marine modification, with a flow rate 40 l/sec provides the reach of stream of 70 m under the pressure of 0,8 MPa in a water supply network.

If the fire-extinguishing security robot is supplied with an around-the-clock observing TV-camera with motion sensors, the



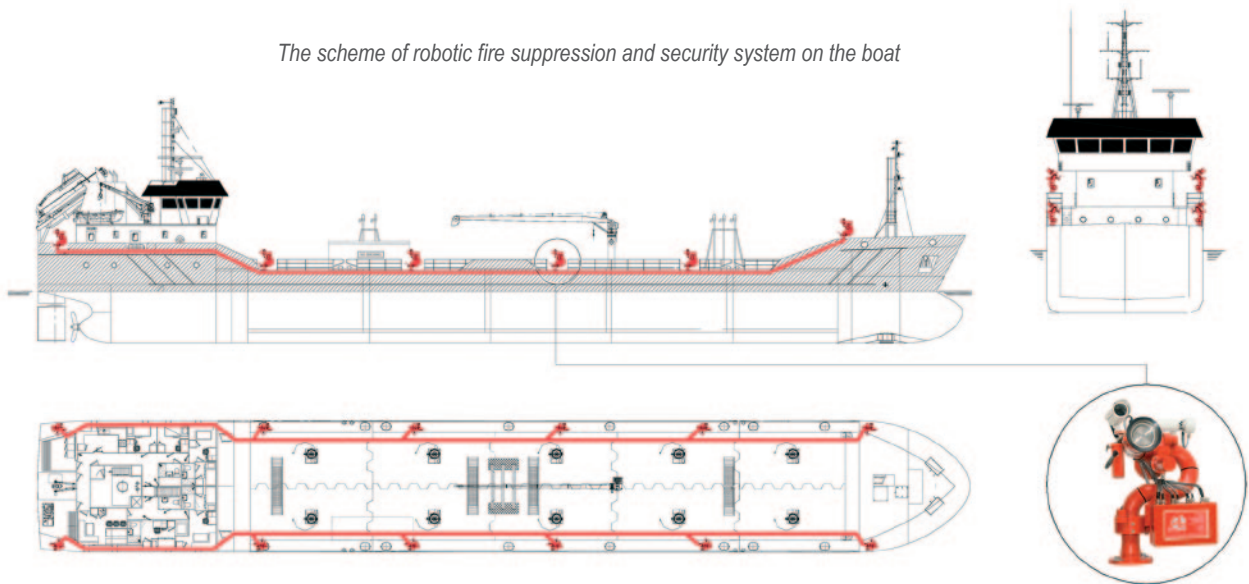
system of TV-observation makes it possible to detect moving units on water and their position in a surrounding water area.

The location of fire monitors provides the irrigation of every autotransformer's part by two streams at least giving "Fire"-signal to a fire post (to a duty room) and giving signals for control of technical systems, systems of ventilation and others.

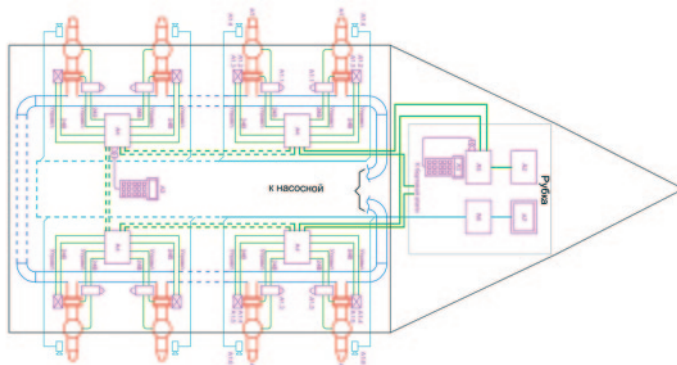
The robot directs automatically onto given coordinates and shoots the aim by a water stream within a command. The aim coordinates can be corrected in remote mode. The monitor with TV-cameras is stabilized for a given angle within ship motions.

For a stream's directing the manual, remote and automatic control modes are provided.

The scheme of robotic fire suppression and security system on the boat



The structural scheme of fire robots' installation on the unit's plan



Arbitrary notations

- A 1 - Security fire robot SFR-LSD-S40U-TV
- A 2 - CA 3 - Control console
- A 4 - Power unit
- A 5 - Network controller
- A 6 - Video multiplexer
- A 7 - Video control device
- A 1.1 - Program control unit
- A 1.2 - Butterfly valve with electric drive
- A 1.3 - Control unit of butterfly valve
- A 1.4 - TV-camera

Protection of aircraft and helicopter hangars

Hangar complexes for aircraft parking and maintenance work are fire-hazardous facilities of B1 class according to SP12.13130-2009, fire danger class P-1 according to PBU, with a degree of fire resistance II. Hangar complexes are recommended to be equipped with robotic fire suppression system. The robotic fire suppression system should be applied as a fire-extinguishing system subject to requirements for hangar complex, laid down by Russian Scientific Research Institute of Fire Defense and Russian EMERCOM. Application of robotic fire suppression system is proved by this extinguishing method effectiveness, impossibility to use sprinkler or drencher automatic fire extinguishing system for protection of buildings which are more than 20 m in height.

Taking into account a specific character of a unit needed to be protected aviation fuel spill is considered to be the main fire danger (kerosene oil TC-1, temperature of ignition more than 28°C, for airplane Boeing-737-BBJ the rest is 70 kg), that's why as a fire extinguishing agent it is recommended to take:

foam of low ratio based on water solution of fluorinated foam former for liquidation of possible seats of fire;

- water dispersed by fire monitor for supporting constructions and equipment irrigation;

- flame detectors as devices for fire detection;

- thermo cable as a device of girders' thermal overload.

Seat of fire extinguishing is provided by two fire robots (FR) with foam eductor which supply foam solution simultaneously.

Cooling of building constructions and airplanes near a seat of fire is recommended to be provided by water supply from 2 fire robots in manual and remote modes.

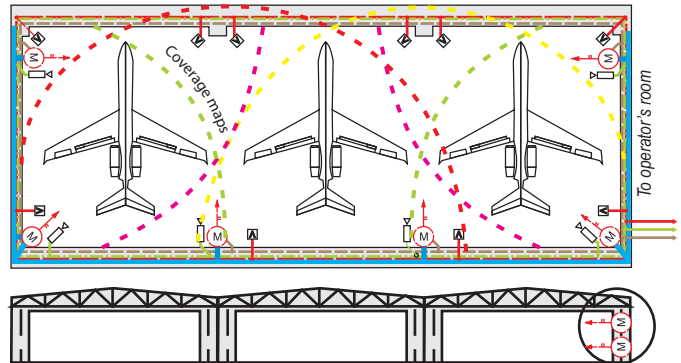
Working time of system of girders' cooling is considered taking in account working time of fire extinguishing system and time for precipitation of smoke.

For providing of possibility of fast disclosure and extinguishing of seat of fire along the square of hangar, including surface under airplane's body, fire robots and flame detectors are located in 2 levels.

Height of fire robots' location is determined by their characteristics, height of hangar and sizes of airplane. Such arrangement provides watering of every point of protected surface by two robots.

In huge hangars it is possible to use a system of forward coming fire robots from automatically opening doors in a floor or such an installation may be applied on the grounds under a lower chord of supporting girder.

Feeding water pipe of automatic fire suppression system – robotic fire suppression system is circular, water-filled (up to disk



Legend:

- Fire robot FR-LSD-S20U-IR
- Flame annunciators
- TV-camera
- Water-laking reinforcement
- TV-cable
- Control cable
- Feeding conduit
- Signalling train

The scheme of fire robots' installation on the unit's plan

gates); pressure in a duty mode is maintained by automatic water filler installed in a pumping station.

Recommended flow rate is 20 l/sec. Pressure before butterfly valve not less than 0,65 MPa. Total flow rate of system for work of 2 fire robots for extinguishing and of 2 fire robots for cooling: $2 \times 20 + 2 \times 20 = 80$ l/sec.

Working time of foam extinguishing system for facilities of class B1 for fire danger is considered to be 15 minutes.

Working time of water cooling system consists of working time of foam extinguishing system and additional time for precipitation of smoke.

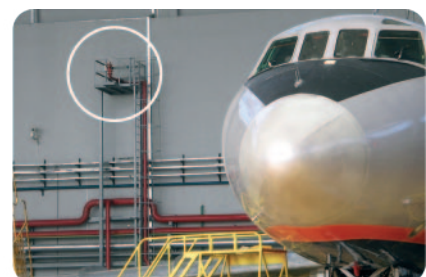
Main modes of work of robotic fire suppression system are automatic and remote.



"Ostafyevo"-airport, the City of Podolsk



VIP - hangar in "Vnukovo" -airport



Hangar building # 2 and airplanes service station in "Sheremetyevo-1"-airport

Protection of Air-Supported Structures

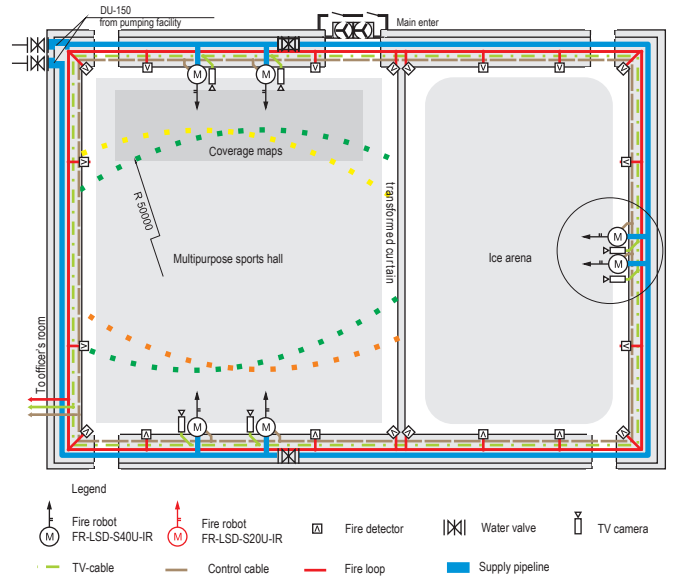
“FR” Engineering centre of fire robots technology” has elaborated projects of automatic suppression system with fire robots application which is based on remote-controlled fire monitors GOST R 51115-97 - robotic fire suppression system for protection of air-supported structures with an approximate square:

- 1000 sq. m - project 32-05-1-APT;
- 3000 sq. m - project 32-05-2-APT;
- 7000 sq. m - project 32-05-3-APT.

Projects are agreed with FGBU VNIPO of EMERCOM of Russia and are recommended for protection of analogue facilities in the letter dated 15.03.2006 under № 43/4.1/567.

Necessary parameters of water and electric power supply are determined in projects for undisturbed system operation.

Fire extinguishing pumping facility, fire alarm system, an installation of manual fire detectors are not provided with the system and should be purchased optionally.



Universal sport complex, the City of Yaroslavl



Universal sport complex of the EMERCOM Academy, the City of Novogorsk

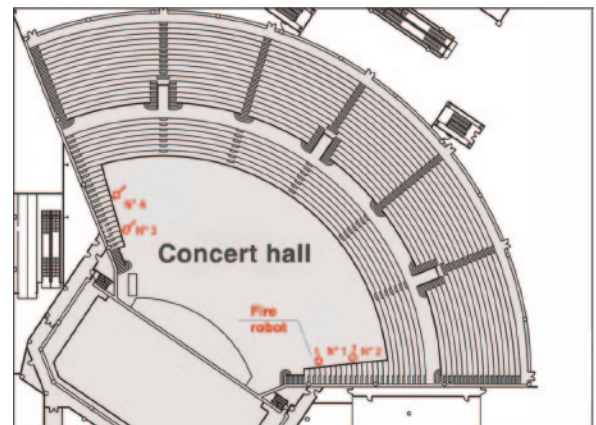
Protection of sports and social centres

Robotic fire suppression system projects with fire robots of “in box” version (in a niche) are applied for fire protection of sports and social centers.

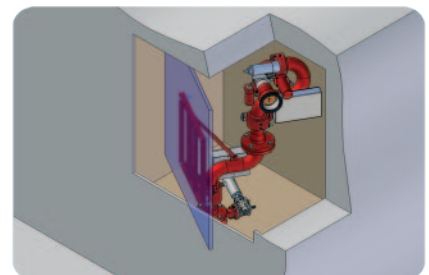
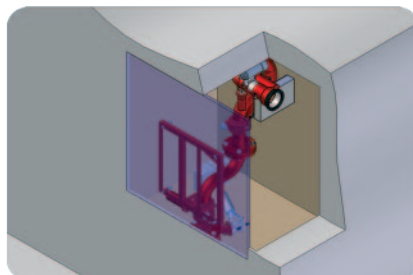
A fire robot is located in a niche behind an end panel in a duty mode making no changes to auditorium design.

In an “Alarm” mode a fire robot stands to a fire-fighting position, starts monitoring, finds a seat of fire and suppresses it.

When fire is suppressed a fire robot hides behind the niche and closes the aperture.



MEC “Crocus Expo”, the concert hall of the exhibition pavilion №3 (the City of Moscow)



Fire robots of “in box” modification

Protection of heliports

According to SP 136.13130.2012 “Heliports. Requirements for fire safety” the heliports should be equipped with fixed automatic foam extinguishing system.

The fixed automatic fire extinguishing system provides fire extinguishing and cooling of a helicopter fuselage as well as extinguishing of possible spread of flammable liquids within a heliport area.

For fire protection of a helicopter deck on the roof of business center in a Russian city Izhevsk a robotic fire suppression system with two fire robots FR-LSD-S20Ue-IR with 25 l/sec flow rate is applied. Flame annunciators are used as devices of fire detection. A seat of fire extinguishing is provided by simultaneous foam former supply by two fire robots with foam eductors.

The freeze-proof foam former PO-6MP is used for making of low ratio foam when extinguishing fire. The robotic fire suppression system provides for automatic control of foam solution leak (reduction of total volume of foam former by 5%). Measuring of foam solution is provided by foam eductors included as a part of a fire robot.

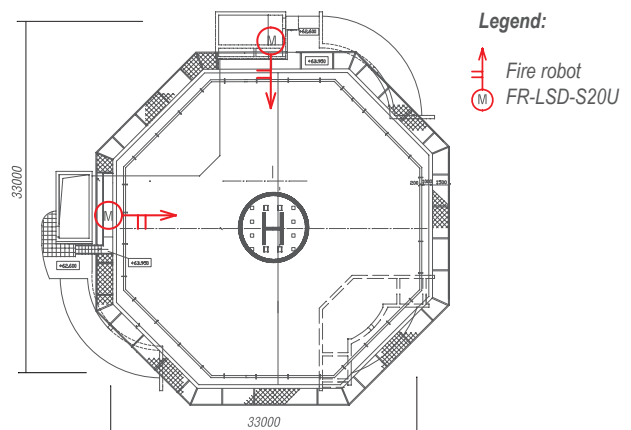
Separated tube lines with solenoid valves are laid from storage tank to an foam eductor of a fire robot for foam former supply.

Estimating a foam solution stock it is necessary to take the following conditions into account:

- time of foam supply is not less than 600 seconds;
- 100% of foam solution storage which is used if it is necessary to continue on fire extinguishing.



Helicopter deck on the roof of the business center, Izhevsk



The scheme of the robotic fire suppression system for protection of heliports

Protection of the chemical industry units

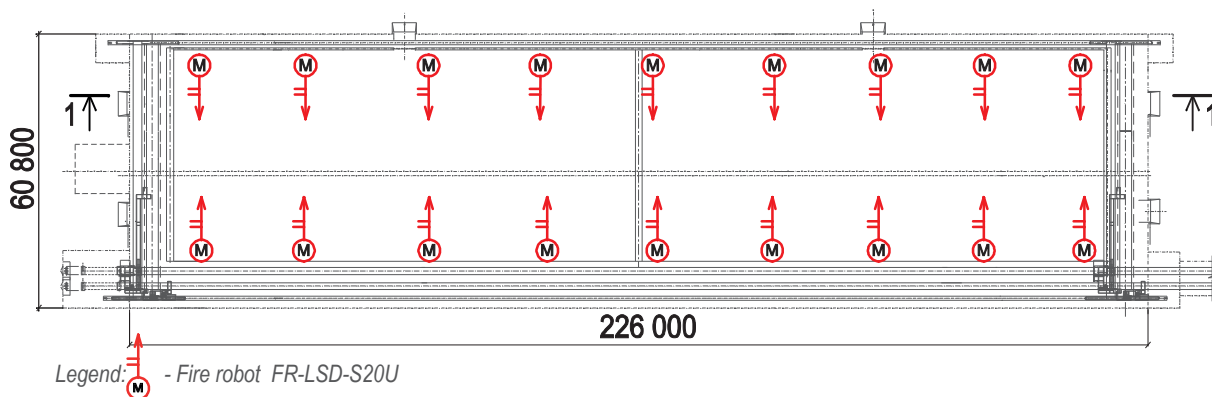
Equipping of sulfur storage with the robotic fire suppression system; an extinguishing solution is foam, an estimated area is fire of the deck of the area of 1000 m².

Special features: the system provides a fire source search, start of two closest fire robots and directing onto a fire source after getting of “Fire”-signal.

The fire robots are installed on the distance not less than 10 m from the deck on the towers along its length. An estimated time of foam supply for firefighting with application of the fire extinguishing system is 10 min.



PC “European sulfur terminal” Commercial port, Leningrad region. The City of Ust’-Luga



Protection of the units of oil and gas industry

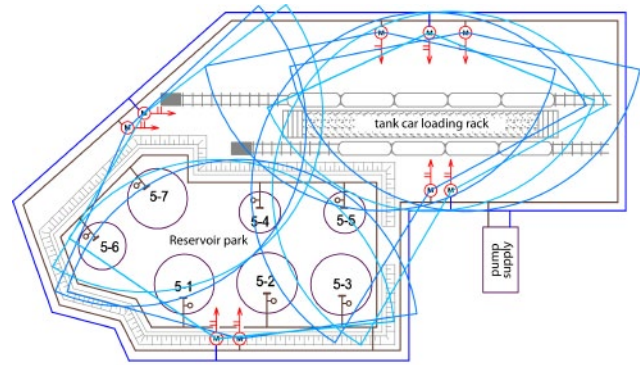
The earliest detection of emergency leaks and spills, and preventive local measures of precipitation, cooling and extinguishing on early stage to prevent development of emergency situation are the most important for explosive units of oil and gas industry on outside installations, feed, goods and reloading storages of the loading platforms.

Because of danger for a human the unattended technologies have been used more and more often; the fire robots are used for fire defense.

In explosive areas remote-controlled fire monitors and fire robots are used in explosion-proof modification. The placement of the monitors and robots, included into robotic fire suppression system, should be made, taking into account a effective stream range for providing of the best intensity.

It is over 90% of the foam solution range given in the characteristics sheet.

Within estimating of protected areas, it is necessary to consider, that each protected area should be in the range of two remote-



Legend:

- fire monitor
- fire monitor LSD-S20U
- firefighting pipeline
- foam pipeline
- foam nozzle for subsurface suppression

The scheme of fire robots on TNK "Karelianefteproduct", the City of Petrozavodsk

controlled fire monitors or fire robots. Watering maps of protected unit are made on this basis, and number and placement of remote-controlled fire monitors and fire robots are determined.



TNK "Karelianefteproduct", the City of Petrozavodsk



Oil terminals "Lukoil-2", the City of Vysozk, Vyborg territory, Leningrad region



Baltic tube system, the City of Primorsk

Protection of the berth complexes

The berth complex for reloading of the oil products of the Vitino-sea berth on the White Sea whole-year navigation serviced by nuclear ice breaker is protected by a water-foam fire suppression system.

For fire extinguishing on the technological there is provided a foam watering by two fire robots of the type FR-LSD-S60(20)U-Ex with a flow rate 30 l/sec working in the mode of extinguishing along a preset program.

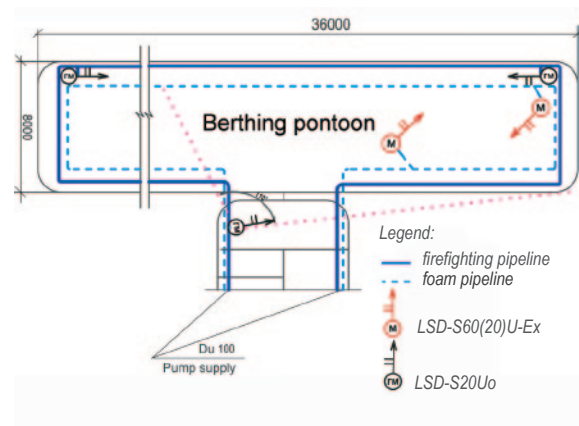
The fire monitors LS-S20Uo with oscillators and flat deflectors

with the total flow rate 40 l/sec are set along the berth to form a water shield of the height of 16,5 m between the berth and tanker of the type "Stena Arctica".

Cooling of metal constructions in the range of 10 m from technological area is provided by the fire monitor LS-S20Uo with oscillator with flow rate of 12,5 l/sec. The installation was constructed in 2008.



The berth complex for reloading of the oil products of the Vitino-sea berth on the White Sea

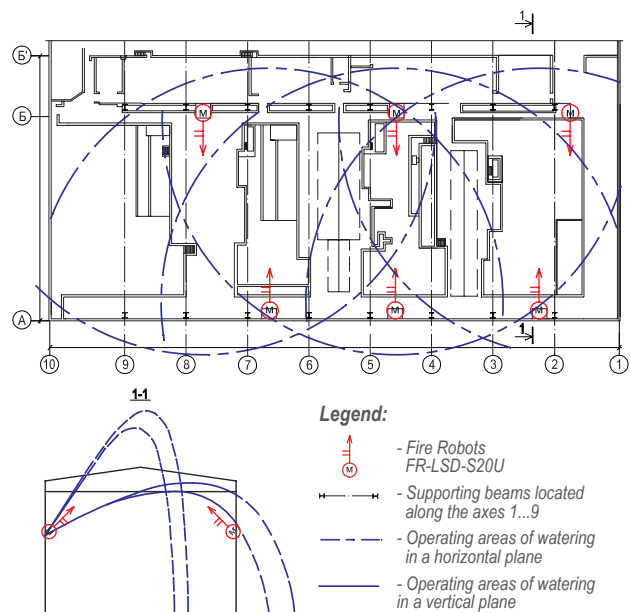


The scheme of the berth complex

Protection of energetic units – heat power stations, Heat power plants, State regional power stations

Cooling of metal constructions of machinery halls’ frames. Fire extinguishing at early stages. Possibility of operation in terms of poor visibility in the smokescreen.

The coverage of Petrozavodsk HPP machinery hall is based on 10 frames which are 39 m in length, 3,6 m in height. A frame interval is 12 m. The frames of welded construction of double angle section with throat of 22 mm. Three T-100-130 turbo generators of 110 MW are installed in the machinery hall. There are three oil tanks of 32 m3 in immediate proximity to the turbo generators. The machinery hall is a fire hazardous facility of B2 class under SP12.13130-2009 and fire danger class P-IIa under Electrical Installation Code. Six fire robots with 20 l/sec flow rate and 0,6 MPa pressure of fire line are installed to protect a machinery hall with an area of 4212 square meters at Petrozavodsk heat electropower station with an automatic fire extinguishing system based on robotic fire suppression system. Water flow rate is 40 l/sec when 2 fire robots operate simultaneously.



RFSS with watering maps scheme at Petrozavodsk heat electropower station



Fire robots in Petrozavodsk HPP machinery hall



Lugansk HPP



Kurakhovskaya Heat-and-Power Plant

Protection of highly explosive manufactures and facilities

For protection of highly explosive manufactures and buildings fire robots of explosion-proof version are applied.

The project of operation hall fire protection in the MIK unit («Roskosmos») with a total area of 1062 m2 and 16 m in height. The operation hall is a hazardous facility of A class under NPB Fire code 105-03 and B-1a class under Electrical Installation Code. An automatic and manual irrigation with water straight streams along the area with using of the robotic fire suppression system is provided for fire extinguishing of highly explosive areas.

The robotic fire suppression system water flow rate and working time are set in accordance with FGUP «26 ZNII MO RF» recommendations:

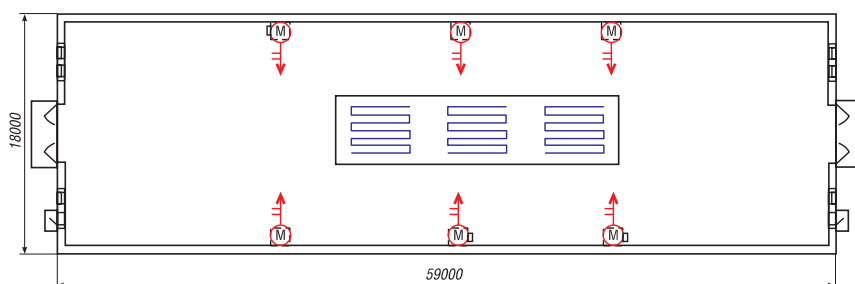
- 200 l/sec water flow rate if three fire robots with 67 l/sec water



Roskosmos units

- flow rate operate simultaneously;
- estimated time of robotic fire suppression system operation is 4 minutes.

The scheme of fire robots on the unit MIK («Roskosmos») location



Legend:

- Fire robots FR-LSD-S60U-Ex:
- Zone of line-by-line area scan

Product Map



Contacts

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