



# DESCRIPTION AND OPERATING INSTRUCTIONS OF IMPULSE FIRE EXTINGUISHING MODULE «IMPULSE STORM» GENERAL VARIANT

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## I. INTRODUCTION

1.1. The present description and operating instructions (description) are brief and allow familiarizing with the purpose, arrangement, and working principles of the impulse fire extinguishing module (IFM) "Impulse-Storm".

1.2. In order to work with IFM on a real fire the crew needs to complete supplementary training of the module usage tactics by employees of the Company Development Engineer – «New Impulse Technologies».

1.3. The Company - Development Engineer of IFM shall not be responsible for high quality operation of IFM, if the crew of the vehicle has not completed the supplementary training.

1.4. The Company - Development Engineer shall be entitled to further improve IFM by a request of the Client.

## II. PURPOSE OF THE IMPULSE FIRE MODULE

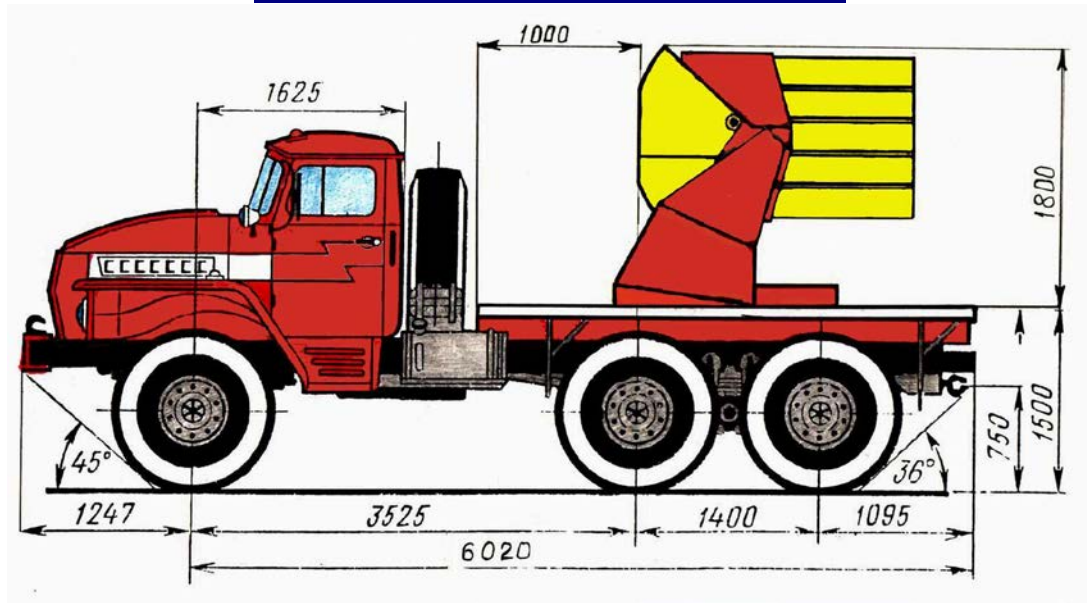
2.1. The impulse fire module IFM is destined for extinguishing fires of A, B, C, D, E categories (depending on the fire extinguishing composition applied).

2.2. Particular effectiveness of IFM is observed when extinguishing fires in closed premises (sheds, warehouses), large oil and gas inflammations on fields and refining installations.

2.3. The impulse fire module can be used in different climatic conditions at the air temperature ranging from  $-50^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ .

2.4. IFM is produced in the "UHL" climatic performance of "4" category according to the Russian state standard No. 15150-89.

### III. MAIN TECHNICAL DESCRIPTION



3.1 Technical description of IFM is set forth in Table 1.

**Table 1.**

No	Name of parameter	Value
1.	Heavy trailer	-
2.	Number of barrels, pcs	30
3.	Weight of fire extinguishing composition in one barrel, kg	25...30
6.	Effective extinguishing distance, m	20 --- 80
7.	Extinguishing sector, degrees	180
8.	Turning angle of the module relatively to horizon, degrees	+25, -15
9.	Turning, lowering, lifting mechanism of the module	Electrical
10.	Missile charge initiation from the automobile-borne network	Electrical
11.	Time to recharge barrels, min	No more than 20
12.	Weight of the equipped cassette, tn	5
13.	Crew, persons	2
14.	Length, mm	2 200
15.	Width, mm	2 500
16.	Altitude, mm	1 200

3.2. The module is mounted on any chassis.

#### IV.COMPOSITION OF THE IMPULSE FIRE MODULE

- 4.1. IFM consists of a basic plate with a turning platform mounted on it by means of a supporting and turning device.
- 4.2. The turning platform consists of a cassette with ..... spraying devices.
- 4.3. The turning, lifting, and lowering mechanisms of the cassette secure taking aim by the spraying devices in horizontal and vertical planes.
- 4.4. The cassette is equipped with two projectors and two laser target indicators, thereby improving aiming of the sprayers at the object of extinguishing.
- 4.5. The whole circuit diagram of the module is placed in the electrical cabinet disposed on the turning platform.
- 4.6. In order to control the module a remote control panel connected with the vehicle by a 45-meter cable is used.

#### V. ARRANGEMENT AND OPERATION OF COMPONENT PARTS OF THE IMPULSE FIRE MODULE

- 5.1. Starting point: IFM is mounted and fixed on the frame of the vehicle or tank. The electrical cabinet is connected to the vehicle-borne network (+24V). All connecting cables are connected to respective joints.
- 5.2. By switching on the vehicle-borne network toggle switch (VBN) voltage of +24V is supplied to the module circuit diagram (the diagram is protected from short circuit).
- 5.3. By the switches "**Right – Left**" and "**Top – Bottom**" switch on electric motors of reducers of horizontal and vertical cassette guidance.
  - 5.3.1. By switching on the "**Right**" the turning platform with the cassette turns to the right. By switching on the "**Left**" the turning platform with the cassette turns to the left.
  - 5.3.2. By switching on the "**Top**" the cassette is lifted, by switching on the "**Bottom**" the cassette is lowered.
  - 5.3.3. The switches have a mean fixed position of the handle. The "**Right**", "**Left**", "**Top**", and "**Bottom**" positions of the switch handle are non-fixed. After stopping pressing the handle by the finger, the handle returns to the mean (zero) position and switches off operation of the turning, lifting, and lowering motors.
  - 5.3.4. When maximum turning, lifting, and lowering angles are reached, blocking of power supply to the motors is envisaged.
- 5.4. The "**Projector**" button switches on two projectors placed on the cassette. The "**Laser**" button switches on two laser target indicators placed on the cassette.
- 5.5. Shooting control.
  - 5.5.1. The "**Selection**" switch has five positions and secures connection of one of the horizontal rows of sprayers to the "**Start**" button.
  - 5.5.2. The light-emitting diode matrix on the panel copies disposition and number of barrels on the cassette. When the "**Selection**" switch is fixed in one of the five positions, light-emitting diodes light up showing the number of sprayers and their row that take part in the volley when pressing the "**Start**" button.
  - 5.5.3. Three explosive charges that are joined in groups (I, II, III) are installed in each sprayer. Each group of explosive charges secures initiation (a shoot) of one charging by a fire extinguishing composition of all sprayers of the cassette. This speeds up the time for recharging the cassette by a fire extinguishing composition (but not more than three times).

5.5.4. The switching of groups of explosive charges is effected by switching a connector to one of the three sockets marked «I», «II», «III» and placed on the backside of the bottom part of the cassette.

## VI. DESCRIPTION OF ELECTRICAL EQUIPMENT OF IFM

6.1. Electrical equipment of the module consists of blocks connected with each other by electrical cables. The arrangement of the blocks and of connecting communication provides for ease of handling, maintenance, mounting, and dismantling of the module and of its components.

6.2. A remote control panel (RCP) connected by electrical cable with the moveless part of the module controls the module. RCP provides for the following:

- Switching on and off the module's electrical consumers;
- Control of the cassette's turning;
- Control of the cassette's lifting and lowering;
- Turning on laser target indicators;
- Turning on lighting projectors;
- Switching of group sets or single sprayers participating in a volley;
- Light-emitting diode indication of readiness of the sprayers participating in a volley;
- The same **"Start"** button effects an entire or individual shot from the sprayers.

6.3. All controlling means located on RCP operate at low current and secure operation of relays disposed on the module. The relays commute high current and secure uninterrupted operation of executive devices.

6.4. Operation of module circuit diagrams.

Let's consider an example of the electrical equipment operation in a regime of a shot from 6 sprayers of the 2<sup>nd</sup> row with preliminary cassette's aiming at the fire center.

6.4.1. Switch on the vehicle-borne network toggle switch (VBN). The electrical current arrives at all RCP controlling means.

6.4.2. By the **"Volley"** switch fix the second row of the sprayers.

6.4.3. By the toggle switches of the second row switch on all six sprayers in the row what is indicated by all six light-emitting diodes of the second row.

6.4.4. By the laser toggle switch on laser target indicators.

6.4.5. By the **"Right-Left"** and **"Top-Bottom"** switches fix direction of the cassette shooting towards the fire center visually. By means of laser rays (red spots) make more exact the shooting direction.

6.4.6. By pressing the **"Start"** button make a shoot.

## VII. A SYTEM FOR VIDEO CONTROL, VIDEO AIMING AND RECORDING

The system consists of:

1. Video camera disposed between the barrels.
2. Color liquid-crystal or plasma TV-set, its location to be determined by the user.
3. 25-meter communication cable between the camera and TV-set.
4. Electronic video signal record block (to be supplied at the users request).

The systems purpose is facilitating the process of exact aiming of the cassette at the object of extinguishing, visual control over the extinguishing process, recording a video signal for subsequent analysis.

## **VIII. GENERAL INSTRUCTIONS ON USAGE OF THE IMPULSE FIRE MODULE**

- 7.1. Before putting the module into operation, one should verify correctness of mounting and check the module units and elements for security of attachment.
- 7.2. Check the module set for completeness.
- 7.3. Make sure the connectors are correctly connected to the vehicle-borne network, to control panels in the electrical control cabinet and to the cassette's electrical equipment.
- 7.4. Check for explosive charges (EC) availability in plugs of the backs of the cassette barrels; check connections of the connectors to EC power circuits, check to ensure that the wires are intact.
- 7.5. Make sure visually that completed projectile-containers are available in the cassette barrels and that they are in working order (the container back must be in contact with the barrel bottom).

## **IX. SAFETY INSTRUCTIONS**

- 8.1. When working on the IFM module general rules of safety engineering when working with explosive materials and electrical equipment operation should be observed.
- 8.2. It is prohibited to switch on and work with drives at the vehicle-borne network voltage less than 22V. If there are signs of non-normative operation of horizontal and vertical guidance drives, they must be switched off and the fault should be cleared as soon as possible.
  - 8.2.1. Preventive measures when working with electrical guidance drives are as follows:
    - To verify that nothing bars turning of the platform and lifting and lowering of the IFM cassette outside the basic vehicle;
    - The cassette should be charged for throwing only once the VBN switch has been switched off that secures power supply from the vehicle-borne batteries;
    - Before switching on electrical guidance drives no person is allowed in the area of the platform's turning with the cassette for throwing.
- 8.3. The electrical equipment – control cabinet, power supply sources (storage batteries) should be earthen during stationary operation of the fire complex (module – vehicle).
- 8.4. The control cabinet, lifting and turning mechanisms, control panels should be constantly closed. Specially trained operators only are allowed to access the equipment.
- 8.5. It should be watched carefully that insulation of power and control wires and cables is in running order. The equipment should be prevented from moisture.
- 8.6. Unauthorized persons are not admitted near the working impulse fire module, especially in front of the muzzle section of the charged cassette.
- 8.7. Cleanness of the equipment should be strictly watched. The cassette should be cleaned of dust and moisture systematically.
- 8.8. No excessive bends and muddle up of cables and wires are allowed.
- 8.9. It is prohibited to work on IFM if any faults were revealed until they have been fully liquidated.

## **X. DISPOSITION, MOUNTING, AND PREPARATION FOR OPERATION**

- 9.1. The module should be placed on a specially prepared basic vehicle or in a stationary manner providing for a possibility to connect up to a power supply source.

- 9.2. When working with the module, the working zone should be well illuminated (naturally or artificially).
- 9.3. The module's mounting should be effected on a prepared frame with all the necessary connections and fixing thereof in a move less state relatively to the frame.
- 9.4. Fit the explosive charges into the plug of the back of the cassette's barrels.
- 9.5. Charge the barrels with projectile-containers, send them on to the end by means of a sender-on (cleaning rod).
- 9.6. Fix (to orient) the module's cassette at the necessary angle according to the rise angle, and the turning platform – according to azimuth depending on the distance from the object of action and on its location, having preliminary switched on power on the remote control panel (RCP).
- 9.7. Connect connectors on the moveless control panel to one of the three groups of explosive charges.
- 9.8. The IFM module is ready for operation. Switch off the vehicle-borne network toggle switch (VBN) and understand the task set.

## **XI. OPERATION ORDER**

- 10.1. Install IFM to the fire center.
- 10.2.** Start the basic vehicle engine, on the instrument check charging current of storage batteries from the generator and voltage of the power supply network.  
**In order to avoid discharging of storage batteries no operation of electrical guidance drives when the engine is not working is allowed!**
- 10.3. Turning of electrical guidance drives and their usage. In order to have the electrical drives of horizontal and vertical guidance switched on the following steps should be taken:
  - Switch on the VBN switches on RCP, while a VBN lamp should light up on RCP;
  - Guidance of IFM for throwing is effected by regulating the cassette's orientating according to azimuth and rise angle; the speed of the cassette's guidance in vertical and horizontal planes ranges between 5...10 degrees/min.
- 10.4. Switch the switch of row selection corresponding to the horizontal group of barrels, while light-emitting diodes of the respective row should light up indicating that explosive charges have been charged and their respective groups of contacts have been connected up. The number of barrels in one volley should not exceed 7 units what is determined by the largest horizontal row of barrels in the cassette.
- 10.5. If the selection is correct, press the large red button "Start" of volley fire, and a volley from the selected barrels should be effected. After the volley, on the shooting control panel the light-emitting diodes of the respective barrel row should go out from which the volley was made.
- 10.6. In order to make subsequent volleys the selection should be repeated, but for another row.
  - 10.6.1. By initiating the second volley with the "Start" button and having assured that the start was made, if necessary, switch on the third and so on groups of barrels until the fire extinguishing task has been completed in the scope of possibility of charging all 29 cassette's barrels.
  - 10.6.2. The guidance drives and control panels should be switched off in the order contrary to switching on.
- 10.7. After all barrels in the cassette have operated, they should be re-charged and then on a stationary control panel the toggle switch should be switched for commutation of the next group of explosive charges, taking into account that in general



there are three groups of explosive charges for each barrel. After that the module is ready for the second volley from five charged horizontal groups of barrels.

10.8. If further operation after the second full volley from all barrels is needed, the third re-charging of barrels should be effected and switching to the last, third group of explosive charges should be done respectively.

10.9. Once the reserve of all explosive charges has been totally used, one should effect their re-charging before the next operation in the plugs of the backs of the cassette's barrels.

## **XII. MAINTENANCE**

11.1. Maintenance should be performed by the personnel that knows the arrangement of IFM, the rules of its operation and safety engineering. Only serviceable instrument should be applied for the maintenance.

11.2. The following kinds of maintenance are envisaged to maintain IFM technically serviceable during its operation:

11.2.1. Control inspection to be performed before moving out the basic vehicle from the place of its permanent stand, during halts in case of undertaking a march in order to check whether the module is ready for fire extinguishing.

11.2.2. Everyday maintenance that is performed after each going out of the basic vehicle in order to prepare the module for its further operation during which the following should be checked:

- Condition of IFM surfaces;
- Reliability of connections of connectors groups on which deposition of spraying products is possible;
- Reliability of parts and mechanisms attachment;
- Condition of cables and wires – no muddling up and sharp bends is allowed.
- Condition of barrels and locations for explosive charges.

11.2.3. It is obligatory that after each shooting all surfaces outside and inside the cassette be checked and cleaned, and the wires and cables be checked to ensure that they are intact in order to prevent failure when shooting.

## **XIII. MARKING AND SEALING**

12.1. Control panels, control cabinet, cassettes and impulse fire module as a whole, as well as wires, connectors and cables, control panels RCP are subject to marking.

12.2. Control cabinet, power supply sources, connectors, cassette, and lifting and lowering and turning mechanisms of the module are subject to sealing.

12.3. In case the module is delivered in a sealed container, it shall be unsealed after transporting to the Client's place at the presence of a representative of the Client's Department for Technical Control and a respective Act shall be drawn up.

12.4. In case any claims are brought to the Manufacturer based on the Act of Acceptance and Unsealing, the Manufacturer shall send an authorized representative to the Client's place.

## **XIV. PACKING**

13.1. The Manufacturer shall determine the scope of dismantling of IFM for transportation convenience.

13.2. The IFM module should be preserved and packed in accordance with the preservation requirement for the module elements while transportation by any transportation means.

#### **XV. STORAGE RULES**

14.1. Preserved and packed component parts of the IFM module can be stored at the conditions stipulated for the storage group "1" for the period of 1 year.

14.2. The fittings necessary for the module operation packed in hermetic waterproof packing can be stored without losing their qualitative properties within 1 year from the date of packing.

#### **XVI. TRANSPORTATION**

15.1. Preserved and packed units and fittings of the IFM module packed separately at the Manufacturer's discretion can be transported by all transportation means securing their preservation.

15.2. Transportation by air is allowed in heated and hermetically sealed compartments of cargo-type planes.