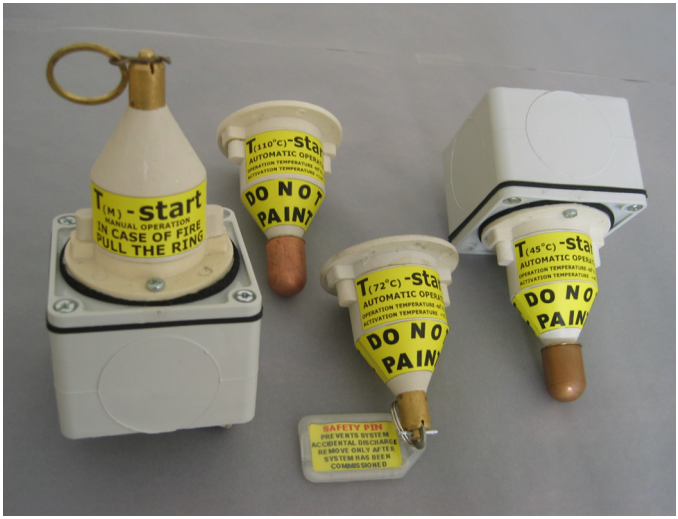
AUTONOMOUS DETECTION

AND ACTIVATION DEVICE

SERIES T-start

Models
$T_{(45°)}$-start
$T_{(72°)}$-start
$T_{(110°)}$-start
$T_{(M)}$-start



User Manual

Design, Operation & Installation Manual

CONTENTS

1. INTRODUCTION

This document represents a user manual and provides technical information on design, operation and maintenance of T-start. It also includes warranty.

2. GENERAL

T-start is a unique autonomous thermal activation and detection device that allows detecting a fire and activating a powder, aerosol or gaseous fire suppression system. Also device has features such as providing signal to fire panel and additional output to shut down electrical equipments or to activate alarm (depend on modifications).

Complied with the specially designed junction box it provides intrinsically safe interface and can be used us a safety sensor in hazardous areas.

T-start can also be used as a thermal detector with a fixed temperature reading and can be connected to the existing fire detection circuit or fire-indicating panel.

3. DESIGN & OPERATION

3.1 Design

The T-start device is designed for autonomous activation of a fire suppression system. No external power supply is required. There are two base models of T-start. The first model is for automatic activation and second one is for manual activation.

3.2 Operation

A schematic diagram of T-start for automatic operation is shown in Figure 1.

When a heat-sensitive element (7) reaches its rated temperature a spring-loaded rod (10) mounted inside a nosepiece (9) is being released.

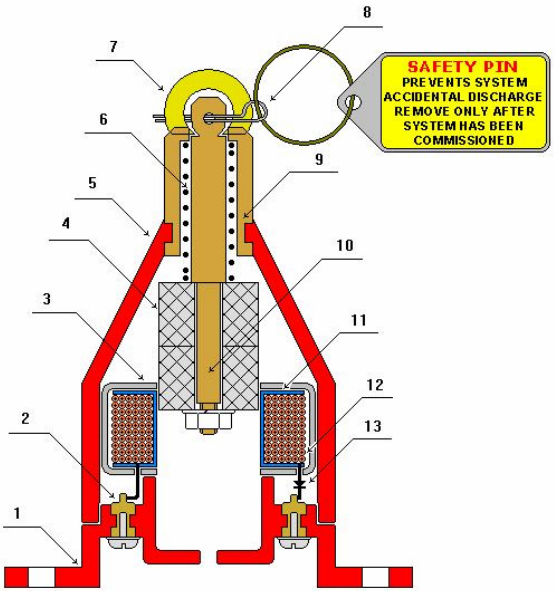


Figure 1 Schematic diagram of T-start (automatic model)

1 Base
2 Electric terminals
3 RF & EMI shielded protective cover
4 Magnets
5 Housing made from high-temperature plastic
6 Compression spring

7 Heat sensitive lock made from a shape memory alloy
8 Safety pin
9 Bronze nose piece
10 Bronze rod
11 Frame of reel
12 Electromagnetic coil
13 Diode

The spring moves a cylindrical shape magnets (4), mounted on the rod (10), through an induction coil (12). The induction coil generates an electric impulse. The impulse is transmitted to the electrical terminals (2) and further to the aerosol or powder fire extinguishers.

A schematic diagram of T-start for manual operation is shown in Figure 2.

$T_{(M)}$-start – is a device which is designed for **manual** activation of a fire suppression system. It operates as follows. In a case of fire a split pin (6) is removed from the device by manually pulling a ring (5). This action releases a spring-loaded pin (9). Further sequence of events is similar to that for T-start with a heat-sensitive element.

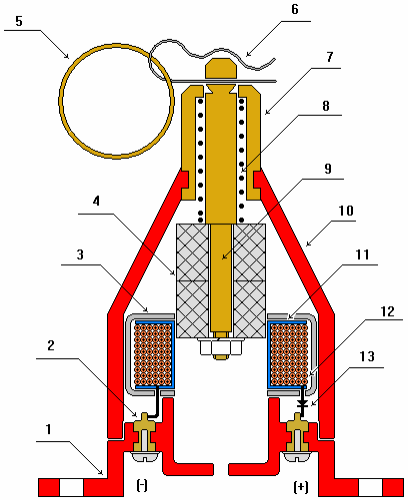


Figure 2 Schematic diagram of $T_{(M)}$-start (Manual operation)

1 Base
2 Electric terminals
3 RF & EMI shielded protective cover
4 Magnets
5 Pull ring
6 Split pin
7 Bronze nose piece
8 Compression spring
9 Bronze rod
10 Housing made from high-temperature plastic
11 Frame of reel
12 Electromagnetic coil
13 Diode

3.3 Modification

A device has three modifications that make it easier to adopt it for use in different applications. These three modifications can be combined according to design requirement.

First modification.

The T-start can be used in harsh environment. For this application device should be installed with protective cup (see figure 3 bellow).

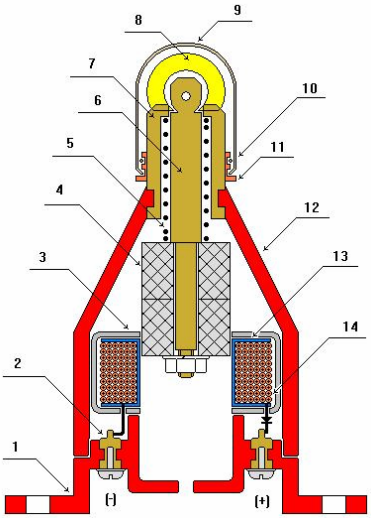


Figure 3. Schematic diagram of T-start with protective cover

1 Base
2 Electric terminals
3 RF & EMI shielded protective cover
4 Magnets
5 Compression spring

6 Bronze rod
7 Bronze nose piece
8 Heat sensitive lock made from a shape memory alloy
9 Protective cup
10 “O” Ring
11 Bushing
12 Housing made from high-temperature plastic
13 Frame of reel
14 Electromagnetic coil

Attention: Protective cup will reduce the sensitivity of the heat-sensitive element and as a result the activation time increases.

Second modification.

For most of applications it is very convenient to use activation devices as well as a thermal detector. It allows connecting devices to the existing fire detection line or directly to fire panel. This feature is available with the specially designed junction box (JB) (see figure 4. bellow).

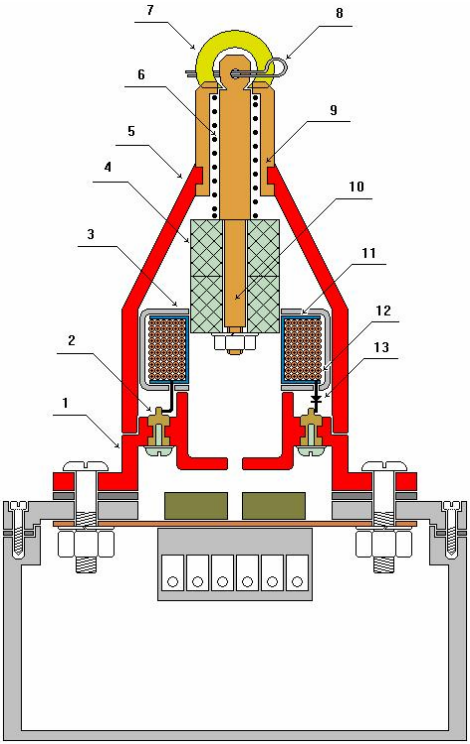
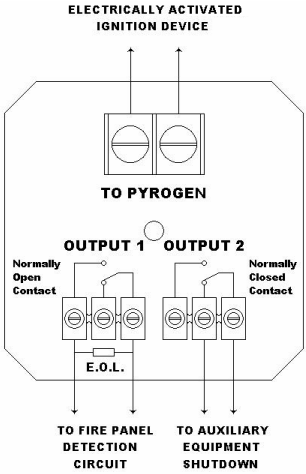


Figure 4. Schematic diagram of T-start with junction box

Electrical connection diagram is shown in Figure 5 below.



Wiring diagram of T-start thermal detector & activator

Figure 5 connection diagram

Third modification

Junction Box connected to fire panel through intrinsically safe detection circuit allows using this modification of T-start in hazardous areas. For more information please contact you nearest dealer.

4. PRODUCT RANGE AND TECHNICAL CHARACTERISTICS

4.1 Product range

The T-start devices come in four different models. Three models operate automatically, similar to the thermal detectors with rated temperatures. The fourth model is designed for manual activation of the fire extinguishers.

The following models are available:

1. Model $T_{(45°)}$-start (suitable for cold areas)
2. Model $T_{(72°)}$-start (standard application)
3. Model $T_{(110°)}$-start (suitable for motor rooms and tracks)
4. Model $T_{(M)}$-start (designed for manual activation)

Attention: All models can be supplied with protective cup and junction boxes.

4.2 Technical characteristics

4.2.1 Dimensions and Mass (protective cup and junction box excluding)

1. Length, mm – not more than 85mm;
2. Diameter, mm – not more than 65mm;
3. Total mass, kg – not more than 0.2

4.2.2 Operation Temperature Ranges

1. $T_{(45°)}$-start from –60 to +30ºC;
2. $T_{(72°)}$-start from –60 to +55ºC;
3. $T_{(110°)}$-start from –60 to +95ºC;
4. $T_{(M)}$-start from –60 to +95ºC

4.2.3 Rated Activation Temperature

1. $T_{(45°)}$-start +45ºC±5ºC
2. $T_{(72°)}$-start +72ºC±5ºC
3. $T_{(110°)}$-start +110ºC±5ºC

4.2.4 Activation Time

Activation time depends on the model of T-start, initial ambient temperature and temperature increase rate.
The temperature increase rates (TIR) of **3ºC/min** and **30ºC/min** have been selected as standard. For TIR 30ºC/min activation time should be in the range of 58 – 144 seconds and for TIR 3ºC/min - in the range of 580 –960 seconds.

Test results for the $T_{(72°)}$-start and $T_{(110°)}$-start activation times are shown in the Table 1.

		TIR 30ºC/min		TIR 3ºC/min	
$T_{(xx°)}$-start Model	Initial Ambient Air Temp. (ºC)	Maximum Time Delay, s	Minimum Time delay, s	Maximum Time Delay, s	Minimum Time Delay s
$T_{(72°)}$-start	35	93	85	740	724
$T_{(110°)}$-start	70	137	125	950	937

Table 1. Activation times for $T_{(72°)}$-start and $T_{(110°)}$-start

4.2.5 Electrical parameters

An electrical diagram of the device is shown in Figure 6.

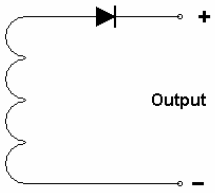


Figure 6 Electrical diagram of T-start

The device generates an electric impulse with amplitude of 3.5V DC at the circuit resistance of 1.0 Ohm.

The duration of the electric impulse is not less than 1 millisecond for the amplitude of not less than 3.0V DC.

The device can activate the following types of electrical initiators: MB-2H, 3A-1, PP-9, YGP-10, and similar.

5 APPLICATIONS

Industrial

- Electrical substations, high voltage transformers, transportation tunnels supporting infrastructures, flammable material storage facilities, broadband mobile cellular communication system, warehouses

Electrical Cabinet

- Power factor correction cabinets, motor control cabinets, process automation control cabinets, high current DC converter cabinets, high voltage cabinets transformer cabinets, uninterrupted power supplies, electrical enclosures electronic control boxes

Mining

- Conveyer lines, tunnels, hazardous areas, underground electrical substations, high voltage transformers, mobile equipment, generator & compressor rooms, cable trays

Automotive and mobile equipment

- Buses & coaches, Trucks, Off-road vehicles, Earth moving equipment, Mining mobile equipments, Farming equipments, Armored vehicles, Cars & SUVs, Rolling stocks, marine, domestic (garage), etc.

6 LIMITATIONS OF USE

1. Volume protected by one device shall not exceed 18m³.

2. The dimensions of a protected area shall not exceed:

   Height - 3.0 meters
   Width - 2.4 meters
   Length - 2.5 meters

3. The device should be located in the middle of the protected area at 100-150 mm below the ceiling.

4. The device is capable of sustaining vibration from 0.5 to 200 Hertz with acceleration of 4g.

5. The device is capable of sustaining impacts of up to 4g-force of 2 to 50 milliseconds duration.

6. The device is suitable for application in hazardous areas of 2ExeIIT6 category.

7. The spark-less design modification of the T-start with Junction Box makes it suitable for hazardous areas of POExiaI category.

8. Maximum relative humidity – 98% (no condensation).

7. INSTALLATION & WIRING

1. One circuit shall have not more than 10 devices.

2. The length of the cable between two devices in a loop shall not exceed 3 meters.

3. The devices shall be connected in parallel. Normal polarity of "+" to "+" shall be observed.

4. The device can be used in high density electromagnetic and high frequency energy zones.

5. Activation cables shall be fire-resistant with copper conductors. A cross-section area of each conductor should not be less than 1 mm^2 or 0.5 mm^2 if a multiple core cable is used.

6. If connection cable is passing through a high frequency energy zone, such as a two-way radio, a sonar etc, the cable should be screened.

7. If connection cable is passing through the electric magnetic fields of high density, such as high voltage transformers in power substations or cable tunnels, the cable should be enclosed in a steel conduit.

8. Cable screen and steel conduit shall be grounded in accordance with the standard requirements.

9. If there is a likelihood of any mechanical damage the cable should be enclosed into a plastic or metal conduit.

8. SAFETY REQUIREMENTS

1. The device is fire safe.

2. The device shall be installed and maintained in accordance with its design requirements and technical specifications.

3. Only authorized personnel can install, re-set and service the device.

4. The device shall only be used as intended - for activation of fire suppression systems.

5. The attached safety pin shall be in its place during any installation, maintenance or service work in the area to prevent an accidental discharge of the fire suppression system.
   Attention: Before reinserting the safety pin all activation wires must be disconnected from the canisters. All electrical circuits must be electrically isolated. Failure to do so may result in unwanted spurious discharge of the fire extinguishing system.

6. The heat-sensitive element shall be reliably fixed into its position in the device.

7. All screws on electrical terminals shall have spring washers.

8. The device should be attached to an appropriate junction box to ensure proper cable connections.

9. The device is incapable of generating the electric impulses at levels dangerous for humans or animals.

10. The connecting of the cable to the extinguishing units shall always be the last wiring procedure.

11. **After the system has been commissioned remove the safety pin** (protective cupper cup can be installed if required after this) **to ensure the system is left in operable condition.** Before removing the pin ensure the heat-sensitive lock (6) is firmly attached to the bronze rod (10).

12. To avoid the dropping of the protective copper cup please bend the edge of the cup inside the bushing groove in two opposite places.

9. SERVICE LIFE & MAINTENANCE

1. The device maintenance is free. The reliability of the device is not less than 50,000 hours under normal ambient conditions. The service life of the device is 10 years.

2. If device is damaged or exposed to the fire it shall not be used.
3. Should the heat-sensitive element be damaged, the device shall not be used.

4. Should the device be set off by an accident it shall be returned back to the supplier for repairing. It shall not be re-used as the heat-sensitive element might have been damaged or overheated.

10. ACCESSORIES

1. Device **T-start**
2. User guide and manual (one for ten devices)
3. Copper cup for dust and water splash environments.
4. Junction box

11. PACKAGING

1. The devices are placed in a cardboard box. There are 10 devices per box.

2. Inside the box the devices are placed in rows with a space between the devices filled with a carton packaging material.

3. A packaging list, a user guide and manual are enclosed in a plastic envelope and placed onto the top row (one envelope per every ten devices).

4. The following labels shall be attached to each cardboard box with the devices:

- Fragile
- Keep in dry place
- Do not drop
- Delicate equipment

12. DISCLAIMER

This manual is for use by trained and authorized personnel only. The information contained in the document is protected by patents. The document is accurate at time of issue, however, is subject to changes to its content from time to time.

13. WARRANTY

The manufacture claims that **T-start** has undergone a quality control and has no defects. Warranty applies for one year from the date of purchase.

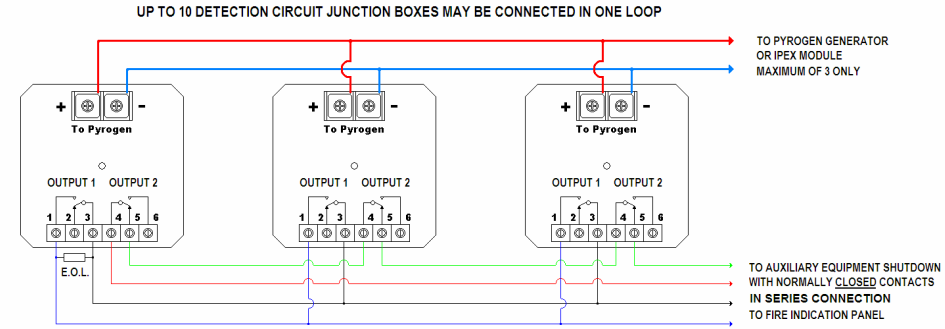
This limited warranty does not cover any **T-start** device that has been damaged or rendered defective as a result of an accident, misuse or abuse, or serviced by anyone other than authorized service person, or by using the parts that are not manufactured or sold specifically for this device, or any modification done without written permission of the manufacturer.

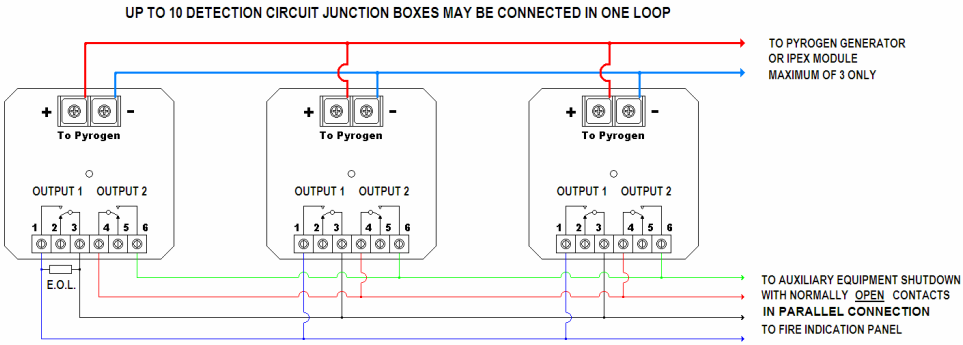
14. APPENDIX 1

1. Multiple T-start devices with the J-boxes

Multiple connection of the T-start device with the junctions boxes is shown in the schematic diagram below.

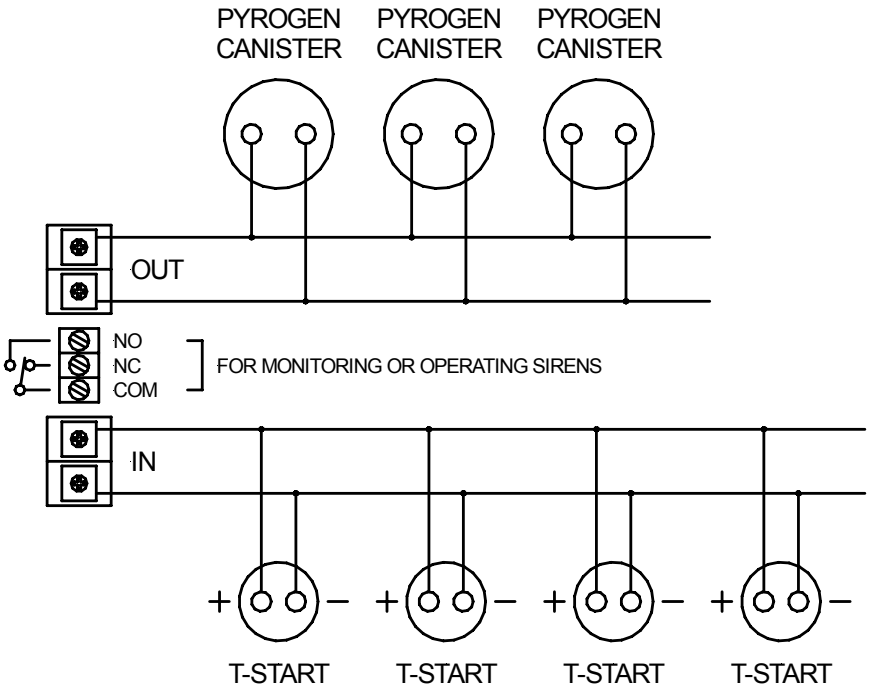
Where any auxiliary equipment is required to be shut down simultaneously with the activation of an extinguishing system one of the following two schematics applies. A parallel connection schematic applies for normally open contacts. A schematic for connection in series applies for normally close contacts.





2. $T_{(P)}$-Start Power device

Multiple connection of the T-start Power device with the junction boxes and multiple extinguishing modules are shown on a schematic diagram below.



Wiring diagram of the $T_{(P)}$-start Power

The operation of the $T_{(P)}$-start Power is as follows.

A red alarm light on the box indicates if a $T_{(P)}$-start is tripped regardless whether the discharge is isolated or not.

- If the red alarm light is "on" when discharge is NOT isolated then the discharge will occur immediately.

- If the red alarm light is "on" when discharge is isolated then the discharge will only occur when the isolation switch is returned to "ARM" position.
  If discharge is to be aborted, the alarm should be cancelled by pressing the "RESET" switch.

The control box also has the alarm change over contact, which could be used for monitoring by a security or a fire alarm system, or for operating the alarm sirens via external power. The contact is rated at 2A, 24VDC.

Note: In order to minimise a potential wiring error, the control box terminals for the T-start devices have NO polarities, however the T-start devices themselves must be wired with the correct polarities.

The T-Start Power increases the capability of a T-Start by boosting the discharge current to a maximum of 10A.

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