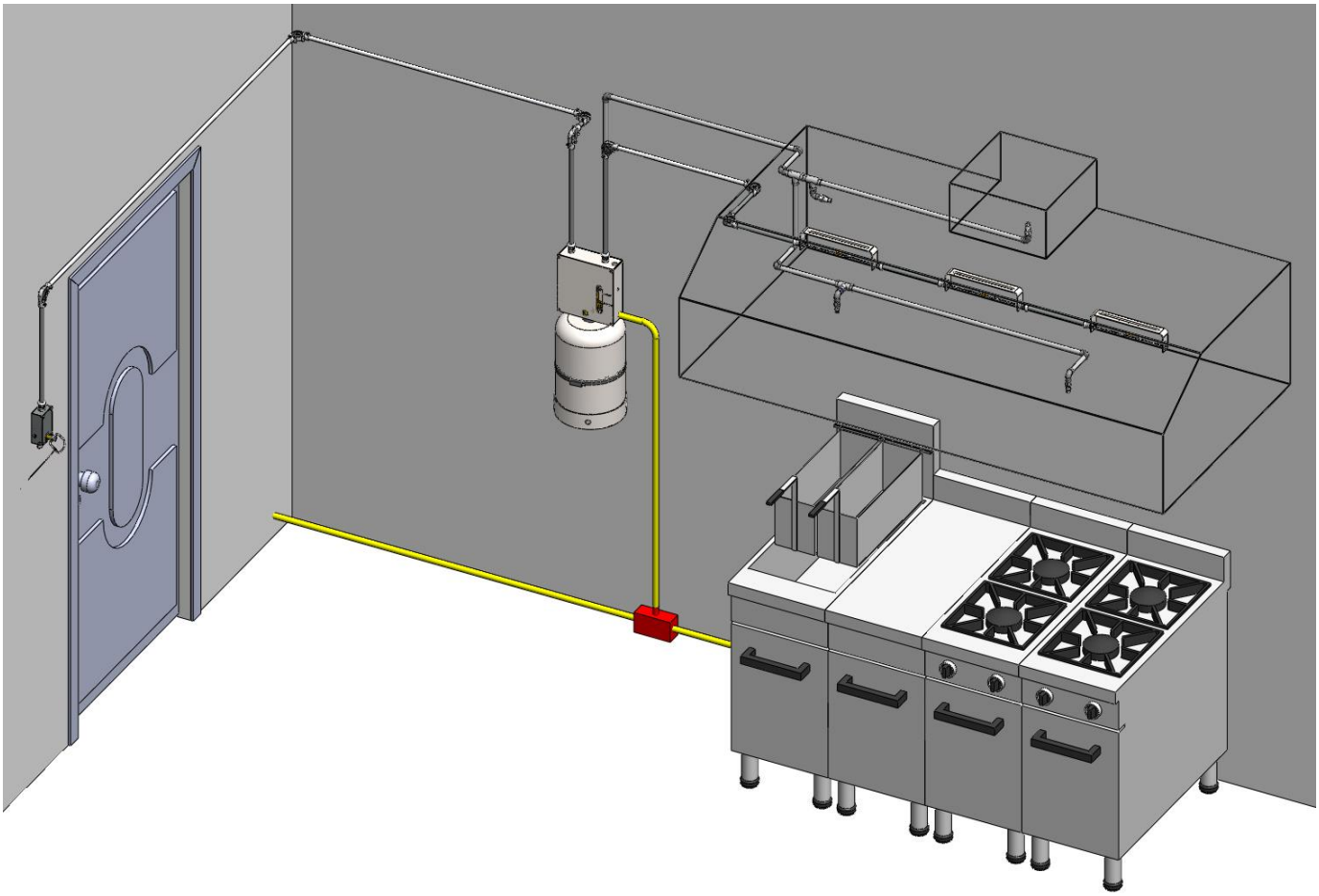
Güvenilir Yangın Söndürme



# DEFENDER KITCHEN COOKING EQUIPMENT AND KITCHEN HOOD EXTINGUISHING SYSTEM

**Model No:**
**DEFENDER DM- 8**
**DEFENDER DM-12**
**DEFENDER DM-18**

LPS 1223: Issue 2.3
Cert/LPCB ref. 1530a

## SHORT MANUAL

**Manufacturer: Finder Yangın Güvenlik Elektronik Systems Mühendislik San.ve Tic. A.Ş**
**Kepez Mah. 5071 Sok. No:10 Kepez Antalya/TURKİYE**

## GENERAL DESCRIPTION

Fires triggered by foodstuffs like solid and liquid oils with plant origin causes losses of lives and properties and bodily injuries. Such types of fires are different from the other fires based on their realization forms. This differences are defined as per the standards by the standards institutes such as National Fire Protection Association (NFPA) in USA and LPCB in the United Kingdom.

The special structures of such types of fires paved the way for the cited organizations to define new classification method and develop new standards for cooking oils. The tests executed by the standard institutes in all over the world revealed new ideas as to such unique fire dangers.

Unlike other flammables such as gasoline, motor oils, thinner and solvents, ignition temperatures of the cooking oils automatically used for frying may change significantly. Automatic ignition may be realized at any temperature between 285°C and 385°C based on the type and usage of oil used. For automatic ignition of the oil in a small pan or commercial frying pans, it is required to heat all of the oil over certain temperature. However, at the time of combustion, the composition of oil would change a little and starts to another ignition temperature automatically. This new automatic ignition temperature may around 30°C lower than the original temperature. If all of the oil will not be cooled to a new temperature under the ignition temperature.

It was discovered in the mid of 1960s with application of sodium or potassium carbonate to the cooking oils that a new phenomenon called “saponification” was occurred. All cooking liquid and solid oils contain saturated oils in free oily acid form. When Alkalic extinguishing medium (e.g. potassium carbonate salt solution) is added, free oil acids interact with potassium carbonate salt solution, and soapy bubble is occurred on the surface of the oil (this process is known as saponification). This bubble acts as fire extinguishing bubble. The flammable gases occurred shall be secured producing steam and extinguishing the fire.

Automatic systems using specifically designed nozzles are tested and found as highly effective in the tests conducted in real frying pans as per LPS 1223 fixed fire extinguishing systems for catering equipment**.**

The System may be activated manually or automatically in extinguishing fire in kitchen hood. Automatic operation of the system is realized by temperature sensitive Detectors/ sensors placed under the oil filters (plenum).

In commercial kitchens, frying pans and other devices are generally heated and ensured be ready for use when needed, by opening formerly. It is common application that the employees would leave such zone and take care of other devices when this equipment is still hot. Similarly, the kitchens may be left or frying pans may be left unattended when they are not switched off yet.

According to the fire reports, fires becoming uncontrollable occurs when the frying pans were left unattended and there was no one to use the extinguisher. Automatic systems, on the other hand, do not require availability and personnel. Automatic extinguishing of the fire is also valid for the kitchen hood discharge ways. The fires inside the discharge channel may occur in a manner not to be noticed and it is difficult to determine it at the commencement phase. It is difficult to extinguish these specific fires without any fixed system; indeed, it is a real problem to reach manual extinguishing equipment.

**SUMMARY**
This user manual is to be used by qualified and trained personnel having the information of any and all other valid standards in force and NFPA and LPCB standards. This user manual explains design, installation operation manual and maintenance transactions of the fire extinguishing systems using chemical extinguishing liquid.

Finder Yangın Güvenlik Elektronik Sis. A.Ş. shall not be held liable for application of the system other than applying it in this manual strictly. The technical data in the manual is only for informational purposes. Finder Yangın Güvenlik Elektronik Sis. A.Ş. believes that such data is true and accurate; however, all such data shall not imply warranty for any manner.

Finder Fire and Safety Systems disclaims all liabilities related to use or originated from use of such data and information included by any and all parties.

**Safety Summary**
**Definitions**

**Please note that…!**
This warning note is placed for noticing the user for some information more, preventing damages to the system, system failures, physical injuries and loss of life in some cases.

**General Warning**

- Protective glasses are to be put on during use of pressurized cylinders. It may cause losses of lives and properties significantly.

- In re-filling of cylinders, filled-cylinders shall never be filled without filling apparatus or splash protection plate.

- Where such equipment is equipped, filled cylinders should be tightened in a manner to withstand pressure which may occurred in accidental opening of the valve.

- Do not use oxygen welding to remove piping installation. Using oxygen welding is too dangerous. Availability of small amount of oil may cause explosion so that this may cause loss of life and property and physical injuries.

- The system uses high pressure. Safety goggles are to be placed. Loose the mechanism slowly and carefully.

- Do not dispose pressurized cylinders. The cylinders are to be discharged fully before disposal. The filled gas cylinders may cause danger when they will not be carried as needed.

- Do not heat the cylinders over 49°C. It may cause loss of live and/ or property and physical injuries. Overheated pressurized cylinders may explode so that such situation may cause loss of live and/ or property and physical injuries.

**Pressurized Cylinders**

- Pressurized cylinders used in the system; therefore, the personnel in charge of the fire extinguishing systems is to be notified of the dangers for failure in handling, installation or maintenance of the equipment duly.

- Fire Extinguishing system service personnel shall have been trained fully on handling, installation and maintenance of the equipment duly, and comply with the operating instructions in this manual strictly.

**Moving Cylinders**: Cylinders are to be shipped in upright position and required measures in compact manner. The cylinders should not rolled, dragged, and skipped. It is not permitted to skip the cylinders from the luggage covers of the vehicles. Proper trolley, stacking equipment and rolling platform or other similar equipment are to be used.

**Careless Handling:** Cylinders are not to be fallen or they are not allowed to hit each other or other surfaces hardly.

**Storing:** Cylinders are to be stored in upright position at a place in which there will be stand safe without tripping

## 1. System Description

Where kitchen hoods used in commercial kitchens would be used for long periods without cleaning long time, it is very difficult to extinguish the fires caused by ignition of the oils accumulated inside the kitchen hood, filter or flue. Also, it is very likely occurrence of fire in the cooking equipment in the kitchen. Kitchen hood and cooking equipment extinguishing system is the easiest and most effective solution in extinguishing of these fires.

### 1.1 Fire Class Definition

Plant and animal origin liquid oil containing fires are defined as “K” Class fire in the United States of America and F Class Fire (EN Form) in the European Countries. Such product is designed and tested for K and F class fires. In European norms, the applicable standard details are given under EN3-7/A2.

### 1.2. Operating Temperature Limits

System operating temperature is between +5ºC and +49ºC. In higher ambient temperatures, ventilation or ambient cooling are required. At the temperatures over +49 ºC, unexpected activations may be caused in CO2 cartridge in the system tube or activation mechanism.

### 1.3. Standards and Approvals

- System Cylinders according to 201/68/EU Pressurized equipment directive (No: HPiVS/P1020-012-I-04 Annex: III Module C2) has CE Certificate.
- Manufacturing firm has ISO-9001/2008 (TÜV Cert Saar – TIC/T/144) quality certificate.
- Manufacturing firm has LPS 1223 Certificate (Certificate xxxx).
- System design fulfills the requirements of NFPA 17A and NFPA 96.
- System TSE-ISO15371 standard requirements are performed in limited manner.

### 1.4. Manufacturer Warranty Requirements

The product is under 2-year warranty against production faults unconditionally for components. Warranty period shall start as of the date of sales invoice, and end two years thereafter. The defective part/ product shall be replaced with a new one in the event of production defects within 30 days.

***“This system consists of the units tested in the limits included in the detailed use and maintenance manual. The system designer is to be consulted when any modification is planned in the system or protection area. After discharge of the system, the authorized installer or system designer are to be consulted.”***

## 2. Operation principle

The System works in two ways as automatic or user activated. In automatic activation, the temperature sensitive glass detectors (thermo bulbs) placed specifically in the kitchen hood system are broken and the system is activated fully. When it is requested to be activated manually, the activation is ensured by dragging the ring in the activation button in the system or ring in the activation mechanism. After activation of the system, Fire Eraser® chemical extinguishing liquid is sprayed on the cooking equipment, inside the filter of the kitchen hood, and the chimneys, via nozzles, ensuring extinguishing of the oils on fire.

**It operates with breaking of the thermal sensitive glass detectors (Thermo-Bulbs) with heat or triggering of the activation bulb with activation mechanism started by dragging the activation rings.**

### 2.1 Fundamental Configuration

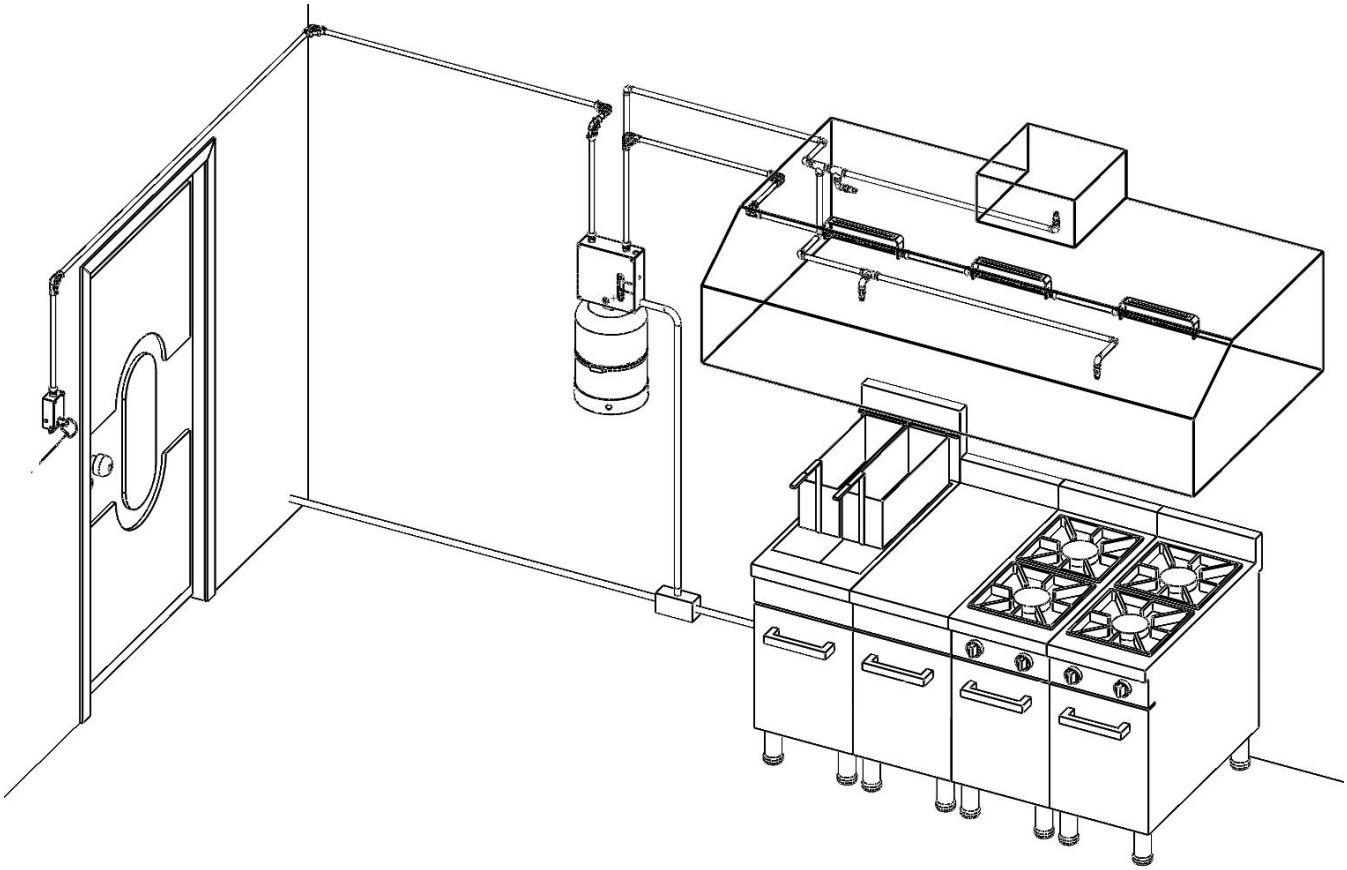


**Figure 1: Sample application scheme in a Fundamental kitchen configuration.**

## 2.2 Activation Diagram

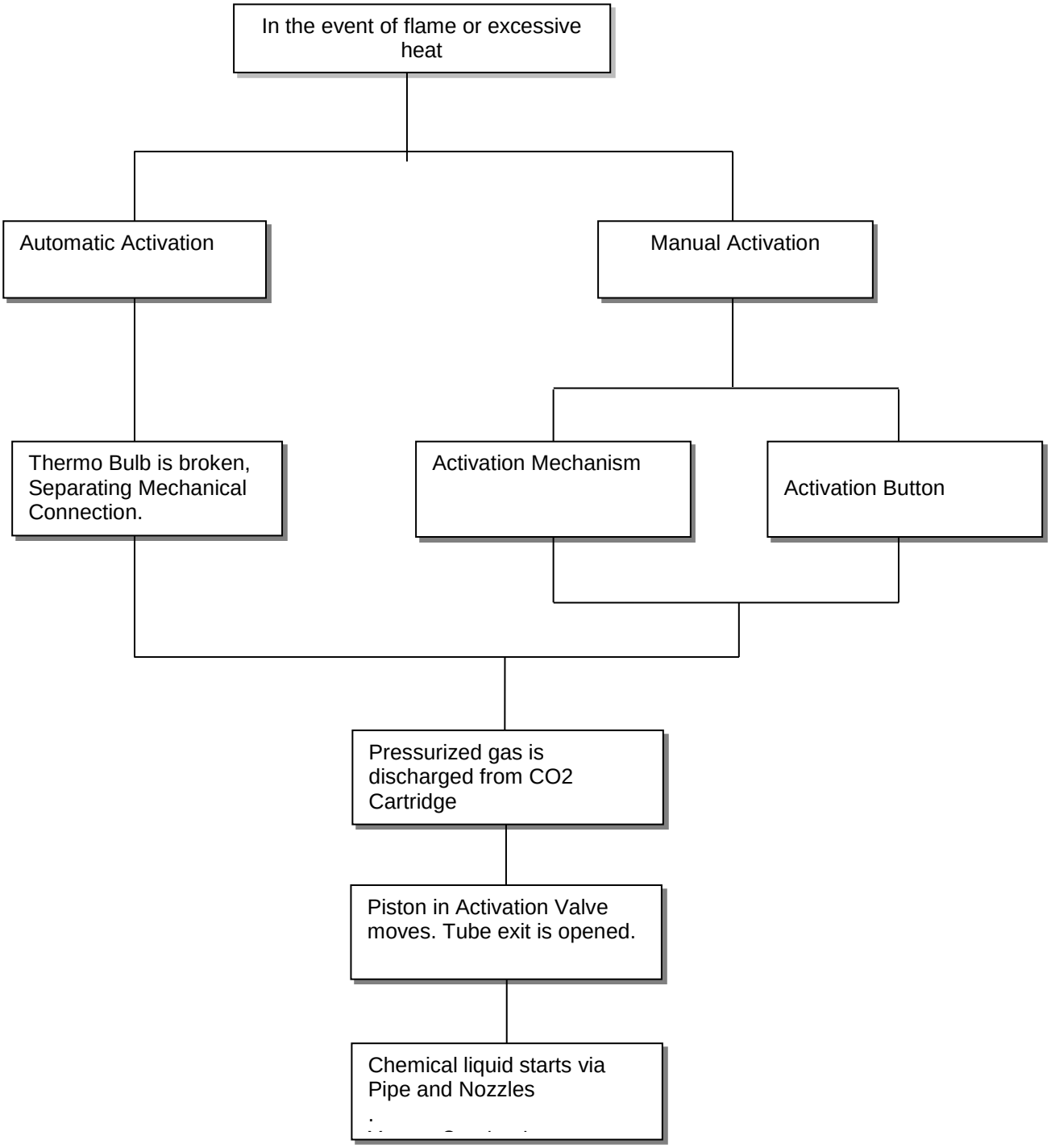



**Figure 2: Activation Diagram**

### 3. System models by extinguishing capacities

| | |
|---|---|
| DM8 | 8 Flow capacity extinguishing system |
| DM12 | 12 Flow capacity extinguishing system |
| DM18 | 18 Flow capacity extinguishing system |

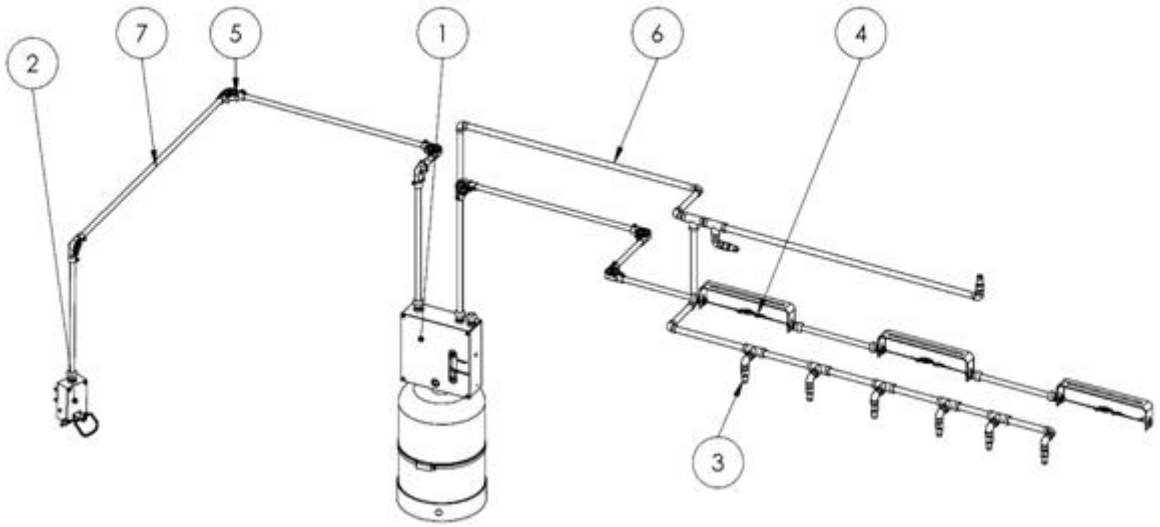



**Figure 3 : DM SERIES extinguishing system representative installation scheme**

| Item No | Component |
|---|---|
| 1 | System cylinder and activation mechanism |
| 2 | Button |
| 3 | Nozzles |
| 4 | Heat detectors (thermobulb link) |
| 5 | Corner Pulley |
| 6 | 3/8” AISI 304 discharge line |
| 7 | Activation line |

## 4. System main components

- Activation mechanism
- Button
- Pressurized cylinder
- Nozzles
- Heat detectors (thermobulb link)
- Activation line
- Discharge line

### 4.1 P1100-A / P1100-B Activation mechanism

For system operation 2 activation mechanism models are used developed as per various scenarios.

Selection of these models are to be conducted as per the type of the cooking equipment and ambient conditions, and in line with the suggestion of the project engineer and customer request.

- **P1100-A** Activation mechanism operating with the detection line and button formed of the heat sensor detectors

- **P1100-B** Activation mechanism operating with the dragging pin set on the detection line, button and mechanism formed of the heat sensor detectors

#### 4.1.1 P1100-A

The spring tensioned lever is released with breaking of the heat sensor detectors (thermobulb link) or dragging of the button pin. Lever pushes the cartridge needle and pins the pressurized CO2 cartridge. The hammer pushes the piston covering the valve outlet mouth. And the opening mouth is opened with the opening mouth, and pressurized Fire Eraser extinguishing liquid is filled to discharge line and fire is extinguished with nozzles.

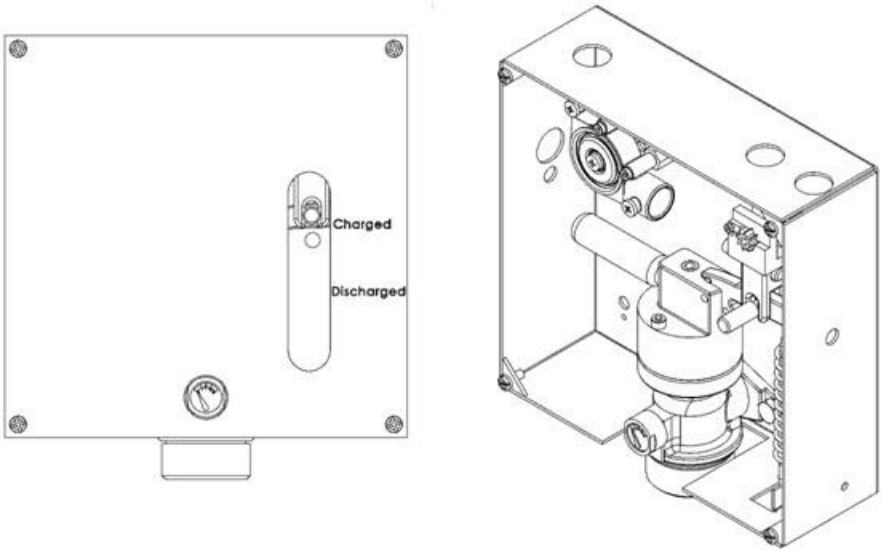



**Figure 4 : P1100-A General appearance**

### 4.1.2 P1100-B

Spring tension lever on the mechanism is released with removal of the pull pin set on the mechanism or pull pin set of the button premium or breaking of Heat sensor detectors (thermobulb link). The lever pushes the cartridge needle and pins the pressurized CO2 cartridge. The hammer pushes the piston covering the valve outlet mouth. And the opening mouth is opened with the opening mouth, and pressurized Fire Eraser extinguishing liquid is filled to discharge line and fire is extinguished with nozzles.

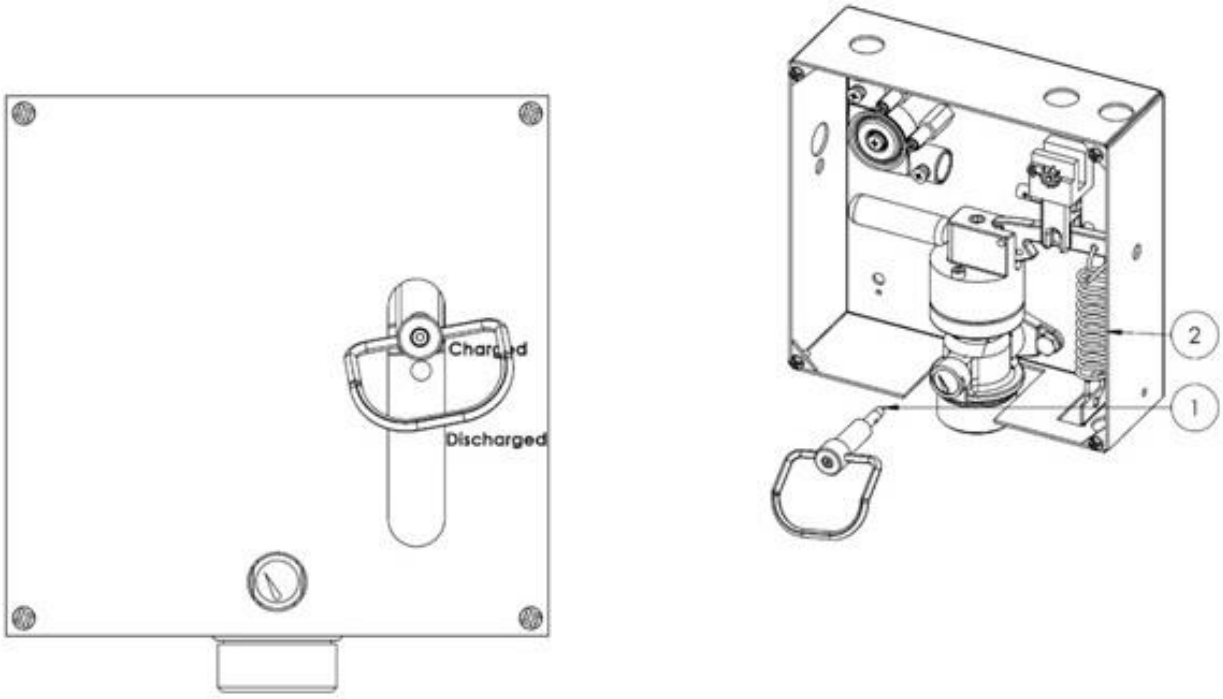



**Figure 5 : P1100-B General appearance**

| Item No | Part No | Description |
|---|---|---|
| 1 | P1300 | Pull pin set |
| 2 | P1100-A | Activation mechanism |

### 4.2 Activation valve : P1000

In the system, there is an activation valve. The activation mechanism and the valve cover are integrated with the cover. When mechanism is triggered, the lever cover pushes the needle inside the cover, exploding the CO2 cartridge. Piston is moved with pushing of hammer on the gas valve cover by the pressurized gas coming out of CO2 cartridge, and valve outlet is opened. Fire Eraser Extinguishing liquid discharge inside the system cylinder is transmitted to the liquid discharge pipes. Manometer on the activation valve is monitored with the manometer.

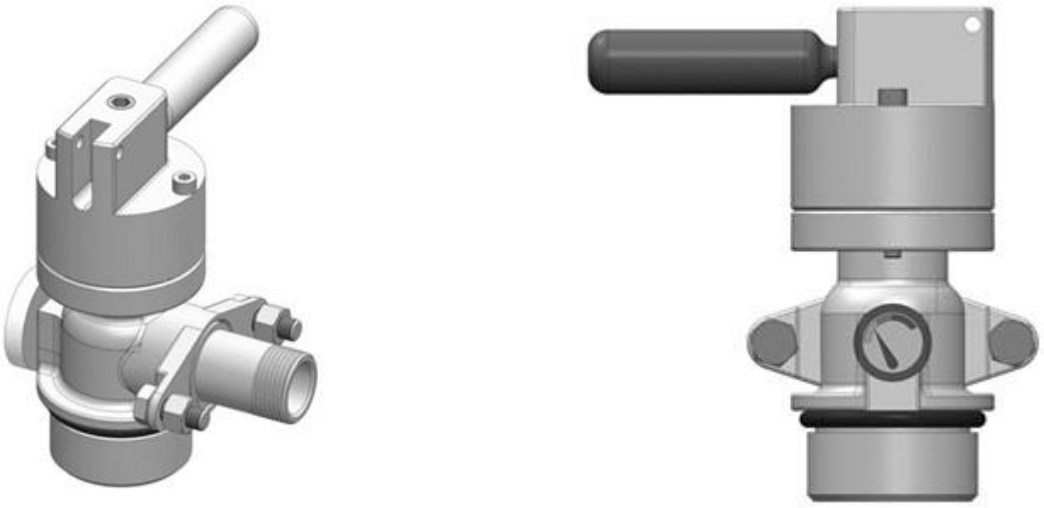


**Figure 10:**Valve installation appearances

## 5. Manuel activation button (P1200)

There is an activation button to operate the system manually. Button box is to be mounted with 4 screws on a firm place at the height of the shoulder (i.e. 140 -160 cm from the ground). The button should not be moved at its place. It should be mounted with Detection line to look upward necessarily. After installation of the system, safety ring is to be installed (i.e. fixed) and sealed as per the standards.

| |
|---|
| The Button should be installed in a place between fire escape and the system. For secure manual activation, button installation distance from system should be at least 3 m. |

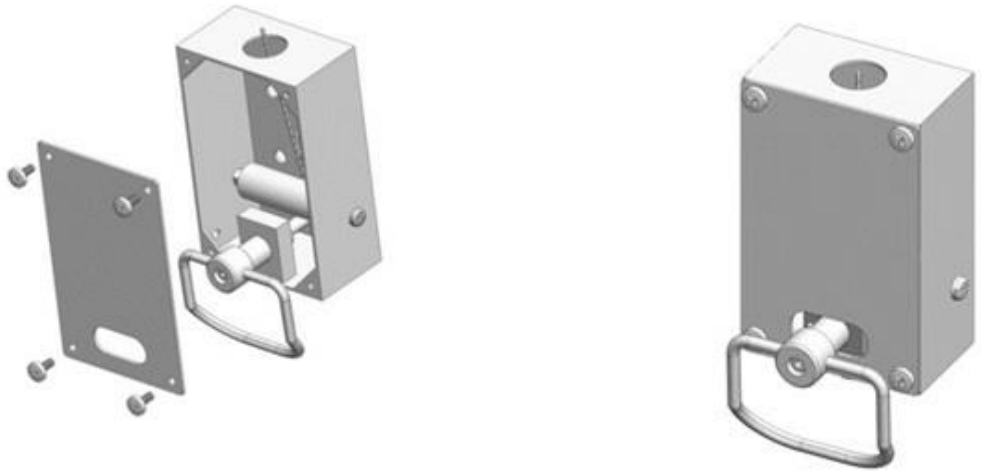


**Figure 13:**Activation button

## 6. Pressurized cylinders

In DM series fire extinguishing systems, cylinders are used in 3 capacities.

P2150 / DM8 Cylinder
Capacity 9,5 LT
Dimension 265 mm x 394 mm

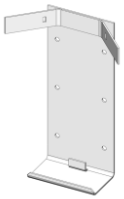
P2250 / DM12 Cylinder
Capacity 15 LT
Dimension 265 mm x 564 mm
Material : EN 10111 DD11
Muff connection: 2" BSPP
Siphon connection: 3 ¼" BSPP
Operating pressure:9 bar
Test pressure: 25 Bar
Operating temperature: +5C / +49 C

P2350 / DM18 Cylinder
Capacity 22,7 LT
Dimension 265 mm x 804 mm

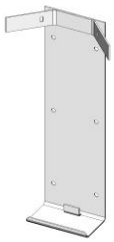
### 6.1 Cylinder hangs and apparatus

In the system, there are two types of installation apparatuses: wall and ground installation apparatuses.
Ground installation apparatus is used with wall installation apparatus.
Tube fixing clamp exists together with screw and wall installation apparatus.

DM8
Cylinder Hang
P/N: P2401



DM12
Cylinder Hang
P2501



DM18
Cylinder Hang
P/N: P2601

Flat Ground Installation
Apparatus
P/N: P9101

Cylinder Clamp

P/N: P2404

**Figure 14: Cylinder accessories**

## 7 Heat sensor detectors :

**P2750-P2850-P2950 (thermobulb link)**

In DM series fire extinguishing systems, JOB thermobulb link detectors are used working at 3 different heat detection levels.

**Figure 20:** Thermobulb Link

| Temperature | Part No: | Color code | Area of Use | Cooking Equipment |
|---|---|---|---|---|
| 182 ºC | P/N: 2750 | Purple | Medium Temperature | Ground or Set-top Gas/Electrical Ovens Plate, Wok |
| 141 ºC | P/N: 2850 | Blue | Low Temperature | Devices without open flame |
| 260 ºC | P/N: 2950 | Black | High temperature | Barbecue, grill and oven with open flame |

**Detector Installation Kit : P2700-P2800-P2900**

Detector installation should be made as shown in the following pictures. 1/16” (7x7x1,5 mm 304L) Steel ropes are to be used in detector connection. Installation kit tips are to be conducted with ½” EMT couplings. Detectors steel should be connected to the rope with S hook for easy installation.

**Figure 21:** Detector installation leg

**Figure 22:** Thermobulb link-leg installation

## 8 Corner Pulley : P9000

Used in all bends in the detection line installation. It is not allowed to use more than 20 corner pulleys in any detection line.

**Figure 23:**Corner Pulley

**11. CO2 Propellant gas cartridge P/N:P1030**

Used for Automatic discharge valve activation and pressurized with 12 gr CO2 gas. It is for single use. The tooth at the tip of the Cartridge is UNF3/8". The filled weight of CO2 cartridge is 42 gram (+/-1 gr), and its empty weight is measured as 31 gram (+/-1 gr). CO2 cartridges are to be checked as part of service and replaced annually.

**Figure 29 : $CO_2$ Carbon dioxide cartridge**

**11.1 Micro-switch P/N:P2000**

Activation mechanism micro-switch is available in the system optionally. One closed and one open contact are available in the Micro-switch. At the time of operation of the system, position of the contacts is changed and the required command output is obtained. The contact outputs support 220 Volt 1 Ampere. The contact outputs may open and close the devices like fan, gas, electric or siren included in the system optionally. At the same time, warning command may be sent to this switch fire system. Installation apparatuses and screws required for installation of the micro-switch are provided together.

FINDER recommend to install microswitch to shut off ventilation fans in case of fire. Shutting off the fans acts better performance of fire suppression of system.

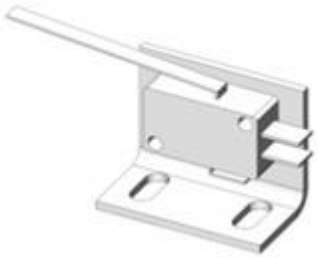


**Figure 30: Micro-switch**

## 12. Nozzles

There are 3 types of nozzles used in the System.

- A Nozzle (P/N: P1500)
- F Nozzle (P/N: P1600)
- R Nozzle (P/N: P1700)

They have different flow volume, spraying angle and number of flows. All nozzle types are to be fixed with the cooking area at the center. The nozzle has an internal part ensuring pulverization. There are no filters or strains in the nozzles. It allows passing of the particles up to 1 mm of diameter. It does not clog. In the tips of the nozzles, foil oil covers are available to prevent clogging outside with the oily cooking steams. The oil covers are to be in a manner not to allow removal manually. Under the oil covers, aluminum oil protection foils must be available. Nozzle types may be defined with the descriptive lines:1, 2 or 3 lines, and the printed type letters. During installation of the nozzles, it shall be ensured that the users could not remove the nozzles or change their directions.

### 12.1. A Type Nozzle P/N:P1500

It has 1 flow capacity.
Areas of use;
Chimney
Filter
Plate
Single or dual ground stoves

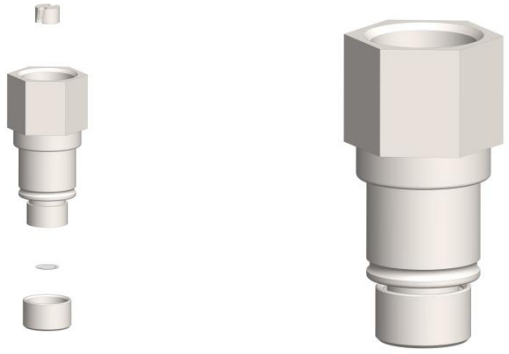


**Figure 31: A Type Nozzle**

### 12.2. F Type Nozzle P/N:P1600

It has 2 flow capacity.
Areas of use;
Deep fryer
Bratt pan

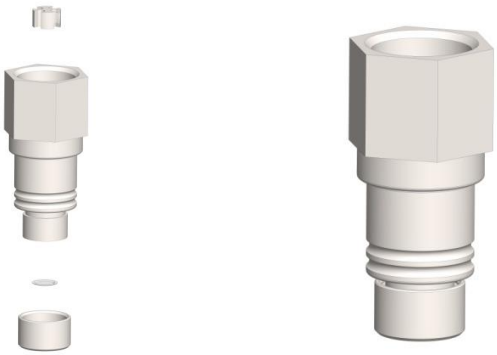


**Figure 32: F type Nozzle**

### 12.3. R Type Nozzle P/N:P1700

It has 1 flow capacity.
Areas of use;
4- (quadruple) gas stoves (Set-top)

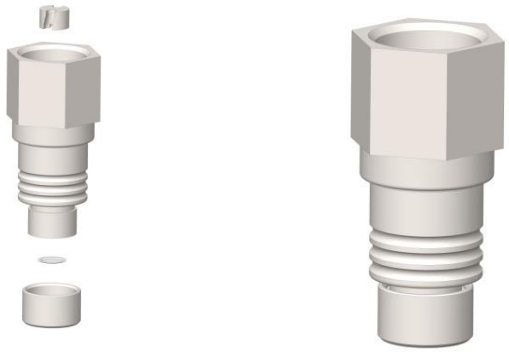


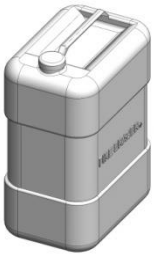
**Figure 33: R Type Nozzle**

## 13. Refilling bins

3 different types are available in refilling to be used in re-fillings of the activated systems. Barrels are filled at the manufacturing place and single use covers are covered. The barrels with open covers may not be used..

9,5-Liter Fire Eraser Re-filling Bin
P/N: P3100
Weight Min:13,5 Kg

15-Liter Fire Eraser Re-filling Bin
P/N: P3200
Weight Min: 22,5 Kg



22,7-Liter Fire Eraser Re-filling Bin
P/N: P3300
Weight Min:33,0 Kg

**Figure 34: Refilling bins**

## 14. External components

### 14.1. Mechanical Gas cutting Valve P/N : P1800

They are available at the product components as standard. However it may be difficult in some regions. It is used under the circumstances where Main gas pipe passes under the activation mechanism. The valve is checked with 1/16" stainless steel Rope connected to activation mechanism. 1/6" steel Rope Length may not be more than 2 meters.

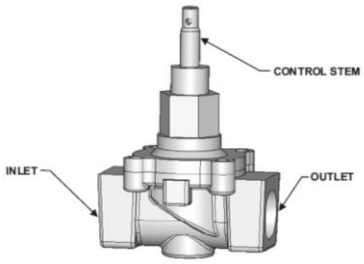



**Figure 35: Mechanical Gas cutting Valve**

### 14.2. Electrical Gas cutting Valve P/N :P8100

It is used in the product components as standard. However, it may be difficult to use them in some areas. Main gas pipes supplying the area pass through from 2-meter away or pass outside the zone, electrical cutting valves are used. These valves may be controlled with the micro-switch contacts inside the activation mechanism.

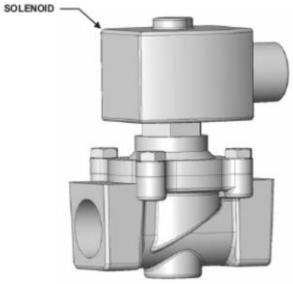



**Figure 36: Electrical Gas cutting Valve**

## 15. System design

Although there are three capacities of the systems, it is allowed to design systems in different combinations. In the system design, nozzle and detector placements, tube capacity, discharge pipes limits and kitchen hood system placement criteria are important.

### 15.1. Single Tube Systems

1 System must have, as minimum:
One unit of activation mechanism,
One unit of System cylinder
Sufficient number of Thermo bulb detectors and proper types of nozzles,
And activation button.

**Figure 37: System example having two discharge lines**

**Figure 38: System example having triple discharge lines**

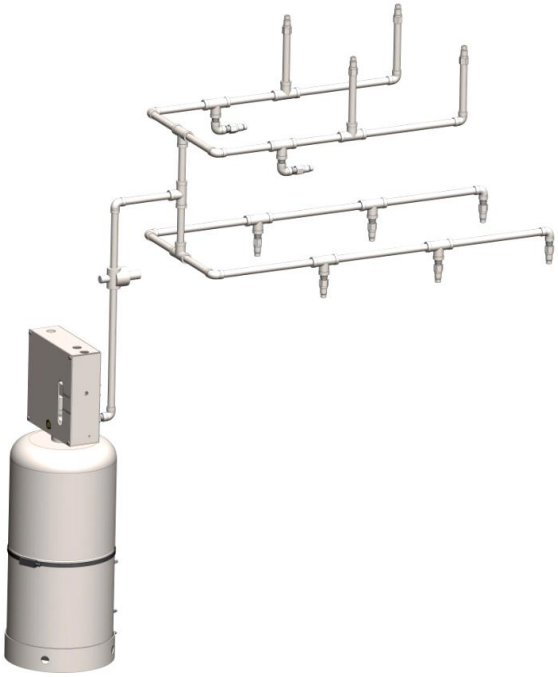


**Figure 39: System example having quadruple discharge lines**

**15.1.1. Installation Criteria for Electrical Barbecue Protection**

**A Type Nozzle Installation Criteria**

Flat metal cooking surface is available between the heat source and the foods. For cooking surfaces over 61 cm X 61 cm, two nozzles are used. Nozzle is to be positioner perpendicular to the cooking surface and according to the center of the surface. In compulsory situations the nozzle angle may be provided not to exceed 45 degree, at minimum 61 cm and maximum 122 cm of heights. The nozzle may be positioned at any place in the combed or gray color area in the below figures.

**15.1.2. Installation Criteria for Gas Type Barbecue Protection**

**F Type Nozzle Installation Criteria**

Flat metal cooking surface is not available between the heat source and the foods. For the grills fueled with LPG or LNG, F type nozzles with 2 flow coefficients are to be used except the oils. The nozzle may be positioned at any place in the combed or gray color area in the below figures.

**15.1.3. Installation Criteria for Wood Barbecue Protection**

**F Type Nozzle Installation Criteria**

Flat metal cooking surface is not available between the heat source and the foods. For the grills fueled with wood or its derivatives, F type nozzles with 2 flow coefficients are to be used except the oils, depending on the extra burning feature of such materials. The nozzle may be positioned at any place in the combed or gray color area in the below figures

**15.1.4. Installation Criteria for Bratt pan Protection**

**F Type Nozzle Installation Criteria**

The most important matter to be considered in bratt pans is positioning of the nozzle on the spray angle. Pan cover or movement of the pan is to be outside the spray angle of the nozzle.

**15.1.5. Installation Criteria for Rotary stove Protection**

**A Type Nozzle Installation Criteria(Gas, Electrical, Wood or Coal)**

For such devices, heat source and food are open simultaneously the risk is high. However, as oil accumulation would be very little, it is protected with 1 unit of A-type nozzle. The nozzle is to be positioned at the center of the cooking surface to cover all cooking surface.

**15.1.6. Nozzle Installation Criteria for Chimney Protection**

**A Type Nozzle Installation Criteria**

The square type chimneys are to be positioned in a manner that the nozzle would be at the center. For the chimneys with perimeter over 160 cm, 2 units of A type nozzles are used, and positioned as per the criteria specified in the above figure. The distance injection of the nozzle into the chimney should not exceed 3 cm. If there is more than one chimney in the system, A type nozzle is to be used for each chimney.

**Exemption**

If the chimney inlet and the upper point of the channel is less than 50 cm, A type nozzle should be positioned inside the channel and at the direction of air channel suction.

**15.1.7. Nozzle Installation Criteria for Filter Protection**

**A Type Nozzle Installation Criteria**

The nozzles used for filter protection are to be placed under the filter. It should be positioned at the center of the cavity in “V” form formed at the back. If more than one nozzle will be use for protection, the nozzles are to be placed in a manner not dead zone will be left. It means that both nozzles are to be placed to cover both surfaces of two filters.

**16. Electric, Gas cutting, Fan Closing and Alarm System Connection**

If too many devices are to be controlled, the micro-switch contacts are used to operate the proper relay; however, the relay is not included in the system. The contact outputs may trigger a fire alarm system or operate an alarm siren.

## 17. Pipe Limits and Hydraulic Calculation

### 17.1. Discharge Pipe and Fittings Materials

All pipe and fitting materials to be used in the system shall be made of 304L quality chromium steel(SCH40).The thickness of the materials should not be less than 2.30 mm. This thickness is required for threads at the ends of the pipe. In each system, pipe diameter is used in the size of 3/8", and the lengths are defined as per hydraulic account. In the system, metric untreated copper pipe may be used though use of AISI 304L SS stainless steel pipe is recommended. Copper fittings are used in the installations in which copper pipe is used.

### 17.2. Discharge Pipes Limits

For highest performance operation of the system, it should be ensured that extinguishing liquid is sprayed in the expected quantity and pressure in all nozzles. Some limits are placed by calculating the hydraulic calculation.

## 18. Detection Line and Detectors

## 19. Detector line placement

Steel rope used in the detector line should be carried to the activation mechanism with the aluminum pipes with the diameters of 18x2 mm. It shall be fixed to detector installation kit with EMT couplings. Aluminum pipes are fixed with metal clamps at each 150 cm inside and the kitchen hood and until the activation mechanism. In the corners, roller bends are to be used. As a result of positioning of the detector line, it shall allow very easy movement with 1/16" (7x7+1) AISI 304 stainless steel Rope.

## 20. Extinguishing liquid

In the System, Fire Eraser® (FE) chemical extinguishing liquid is used. Different extinguishing liquid may not be used in the system.
Filling quantities (+/- %5) ;
DM–8 Systems: 9,5-Liter
DM–12 Systems: 15-Liter
DM–18 Systems: 22,7-Liter.
The content of Extinguishing liquid is formulated with $K_2CO_3$. It has higher viscosity and heavier than the water by volume.

MSDS Report of the Fire Eraser® liquid chemical extinguisher is attached.

**PLEASE ATTENTION !!!**
**-Cylinder liquid quantities are to be calculated in Kilogram. The quantity is to be defined and filled with the volume containers since the specific weight of Fire Eraser® is higher.**
**- After filling of Fire Eraser®, all equipment and hands are to be washed with hot water.**
**In the event of prolonged contact of the liquid with the skin, it has irritation feature even though it is not too harsh. It should not be consumed as a drink or food and contaminated with the foods or drinks. All food materials contaminated with the liquid at the system activation should be destroyed. It shall not be consumed in any manner.**