NK

Protect Global Marine & Offshore Life and Property

Green Promise for the People

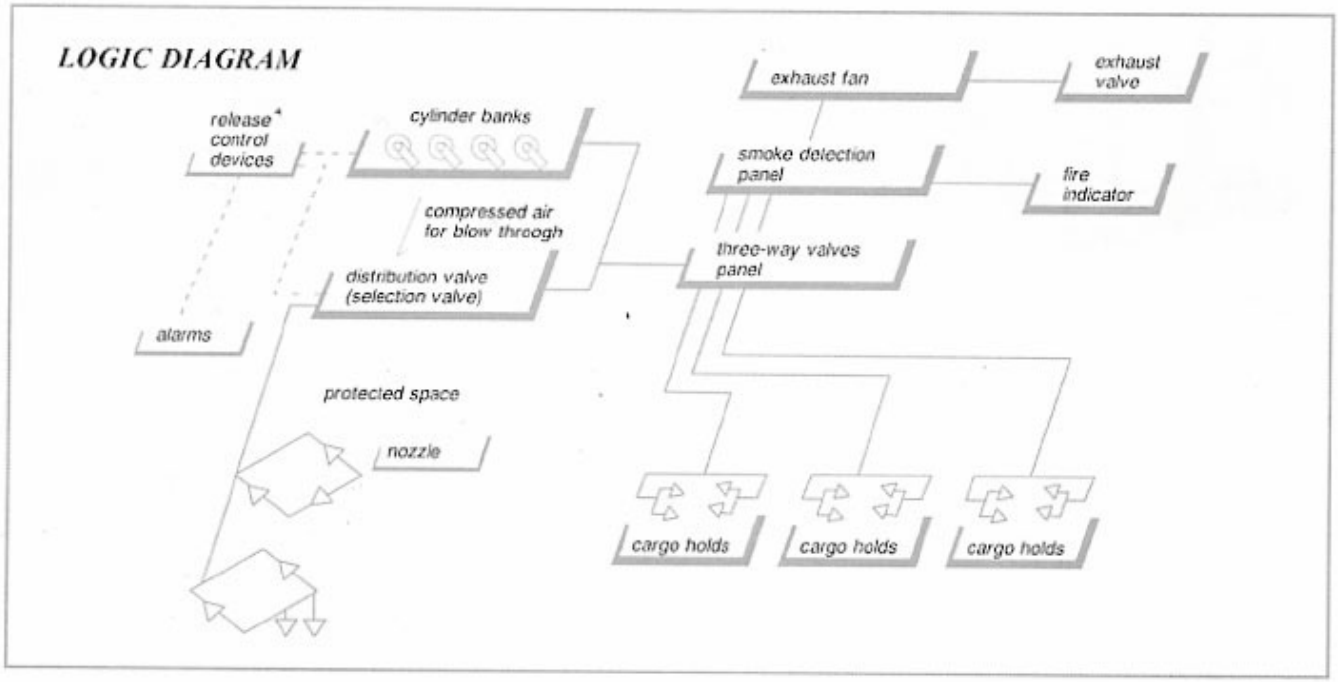
High Pressure Carbon Dioxide Extinguishing System

The carbon dioxide extinguishing system is fixed system to extinguish fire by smothering action with CO2.
It is a most effective system for protection of machinery spaces, paint store and cargo holds along with advantages ;

* As a fire exinguishing agent, CO2 is non-corrosive and causes no chemical reaction on matals, electrical insulations and oil, nor an mechanical damage to applied surfaces. CO2 does not deteriorate with age and can therefore be stored for an indefinite time.
* CO2 leves no residue to be cleaned up after extinguishment of fire. Therefore the equipment that has not been damaged by fire can be re-used at once.

* NK's versatile and unigue actuating devices enable simple and reliable actuation of the carbon dioxide extinguishing system. By the use of copper tube for the contro. lines, the cost of the actuating system is extremely low.

* NK carbon dioxide extinguishing systems have been approved by principal countries' governmental authorities and classification societies and equipped on over thousand ships.

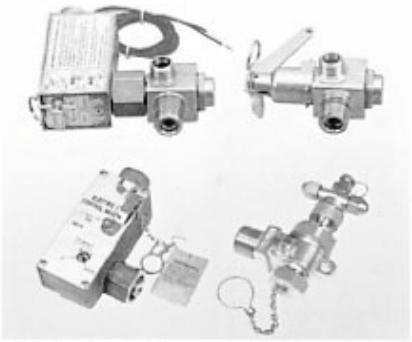


* Total Flooding System for Engine Room, Pump Room, Cargo Holds, etc.
The total flooding system is desined to discharge at least 85% of the total quantitiy of CO2 required for the protected space within two ninutes so that any fires in the space can be extinguished at once.
The total flooding system is the best method wich allows the carbon dioxide extinguishing system to fully exhibit its advantages.
* The semi-total flooding system is also available.
The semi-total flooding system is suited for the cargo space loading the self-propelled vehicles, and is capable of discharging two thirds of the total quantity of CO2 required for this particular space within ten minutes.
* Manual Release system for cargo Holds ;
Nature of fires can vary with cargoes and possibly range ro surface fires to deep-seated ones.
The manual release system is designed to individually release the CO2 cylinders one by one or by group in sequence depending upon the state of fires.

High Pressure Carbon Dioxide Extinguishing System

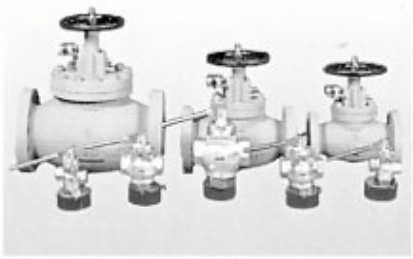
CO2 Cylinders

The CO2 cylinders manufactured by NK are ceritified by IACS Classfication Societies and principle Countries
administrations according to internationally recognized standards such as US DOT 3AA, EN, BS, JIS, etc. Versatile line of cylinders are also available, including 68ℓ and 82.5ℓ type cylinder.



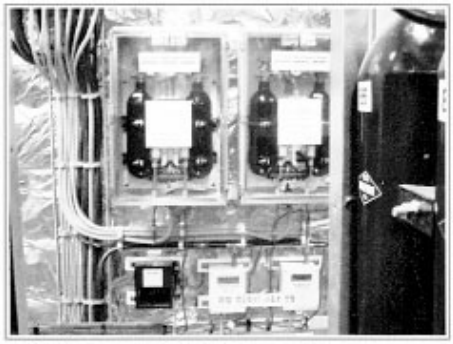
Cylinder Valve

Cylinder Valve is installed on each CO2 cylinder and can quickly be opened by gas pressure from the actuating
cylinder or by manual operation, or by ecectric actuation.



Distribution / Selection Valves

These selection valves allow rapid dischage of CO2 within spaces such as engine room where the total flooding
system is installed.
The valve is remote opened by gas pressure from the actuating cylinder. It is also possible to manually open the valve.



Actuating Cabinets

The actuating cabinet is available in two types i.e. The cabinets are equipped with limit switches for stopping the fan and initianting the evacuation alarms.
the cabinets are installed near
the entrances to the protected spaces, the fire control center or the
CO2 botle room.

Discharge Nozzles

Discharge nozzles are installed to develop a uniform concentration of
the extinguishing agent in all parts of the protected
spaces. Discharge nozzle is used in such areas as engine room and pump room where the thtal flooding system is installed. When used in the Smoke Sampling Type Fire Detection System, accumulation type discharge nozzle also serves as air in-take.

3-way Distribution valves for Cargo Holds

The 3-way manifold valve is used as selection valve in the manual release system for the cargo holds. It is also used as manifold valve when the carbon dioxide extinguishing system is combined with the smoke sampling type fire detection system. In the latter installation,
the air sampling intakes installed in the cargo holds are connected with the smoke detection panel throught the manifold valves for continuous monitoring of the cargo holds. In case of fire, as the lever on the valve is turned,
the air sampling intake
(also serving as discharge nozzle)
is connected with the CO2
cylinders through the valve so that CO2 can be discharged into the affected zone.

Delay Discharge Unit

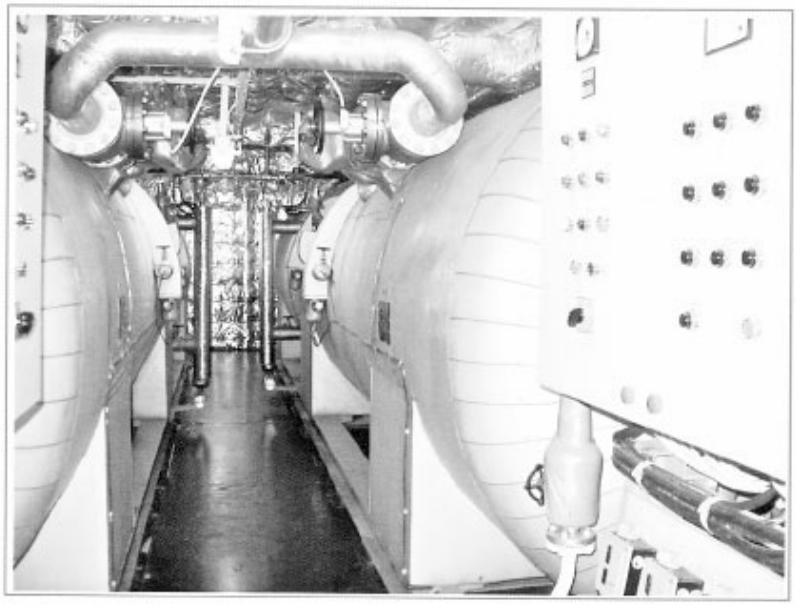
An audible evacuation alarm be given for a duration of at least 20 seconds before discharging CO2. The delay
discharge unit holds up CO2 discharge for more than 20 seconds after releasing the actuation cylinder.

Alarms

Low Pressure Carbon Dioxide Extinguishing System

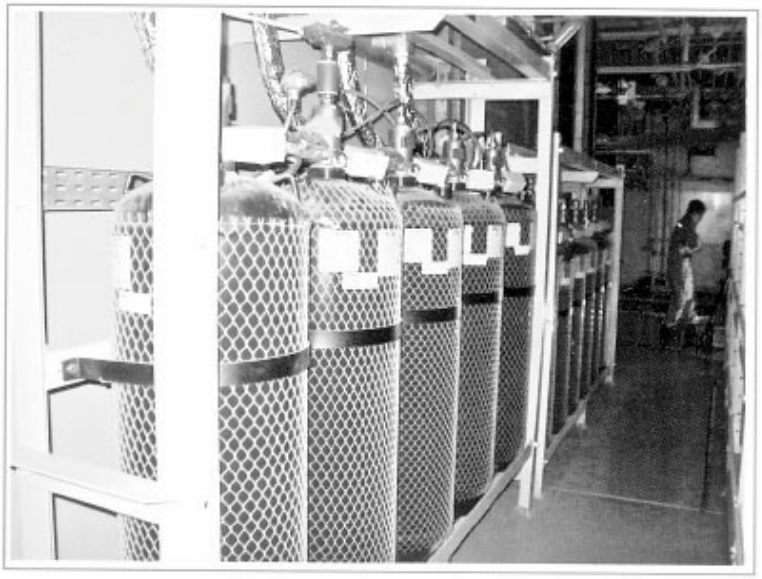
NK LP/CO2 System offer all of the advantages of carbon dioxide fire protection plus :

- Large system economy
- Minimal maintenance
- Greater versatality
- Greater effectiveness in local application and hand hoseline systems
- Easy modification to add protection for additional hazards
- Reserve capability at little added cost
- Space saving
- High flow capacities
- Easy refilling by tank truck.



In Low Pressure storage, a single insulated pressure vessel is filled to over 90% of its volume with liquid carbon dioxide and maintained at approximately 20bars, and -20'C, by refrigeration. Units with up to 60 tons capacity are available. In the Low Pressure system, a central bulk unit normally serves to protect various hazards spread throughout the facility. Hazard distances of 150 meter. or more can be accommmodated but, wherever possible, the units are located near the hazard, or centrally to a group of hazards. The refrigeration of the Low Pressure storage units is accomplished by a commercial grade compressor, and refrigeration coil within the vessel near the top, Its only function is to maintain the pressure 18 to 23 bars. Failure of this refrigeration will cause the presure to rise slowly. An alarm system is available to alert personnel to abnormal pressure levels and, if no repairs are made within a reasonable time, the unit will refrigerate inself by bleeding off vapor. Loss rates for this self refrigeration are very low.

Clean Agents Extinguisthing System



Halon fire extinguishant were regarded for many years as the most effective fire supperessants for a wide range of applications.
Amendments to the Montreal Protocol of 1987 focused on the manufacture of Halon, however, and their production
has now ceased in recognition of their damage to the ozone layer.
NK fire protection systems now recognised by NFPA 2001 IMOFP 44/INF.3, MSC circular 848 /773 as alternative to the halons including :

Halocarbon Agents
These are chemical agents that contain chlorine, fluorine, or in some combination.
Classes of agents include hydrochlorofluorocarbons(HCFCs), hydrofluorocarbons(HFCs), perfluorocarbons(PFCs), and fluoroiodocarbons(FICs).

These agents share several common characteristics, with the details varying between chemicals. These common charcteristics include electrically non-conductive, clean agents (vaporize readily and leave no residue), and liquefied gases or compressible liquids.

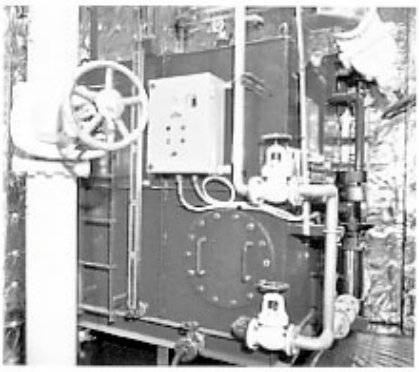
Inert Gases- Inert gas systems are designed to reduce the ambient oxygen concentration in a protected space to between 10-14%, a level that is breathable but will not support flaming combustion. These systems use inert gases such as argon and introgen, either as mixtures or alone. Inert gases are electrically non-conductive, clean agents.

NK clean agents systems comprise versatile line of cylinders, valves and related components for release as well as variety of extinguishants for use in the applicable environments so that maximum economy in installation can be ensured.

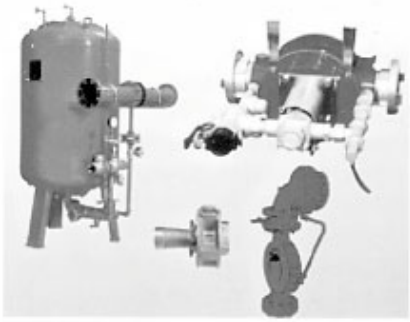
Low Expansing Foam Extinguishing System

Low expansion foam extinguishing system make use of the smothering and cooling effects to extinguish fire which are secured by foam layer covering the burning surface and shutting off air supply to the seat of fire.
The systems are particulary suited for oil fires. Chiefly used as an extinguishing system for the cargo tank and process decks of tanker and as an additional installation to other extinguishing system in the machinery space with automatic release devices.

Water Form Monitors & Nozzles



Modularized Foam Supply & Mixing Unit



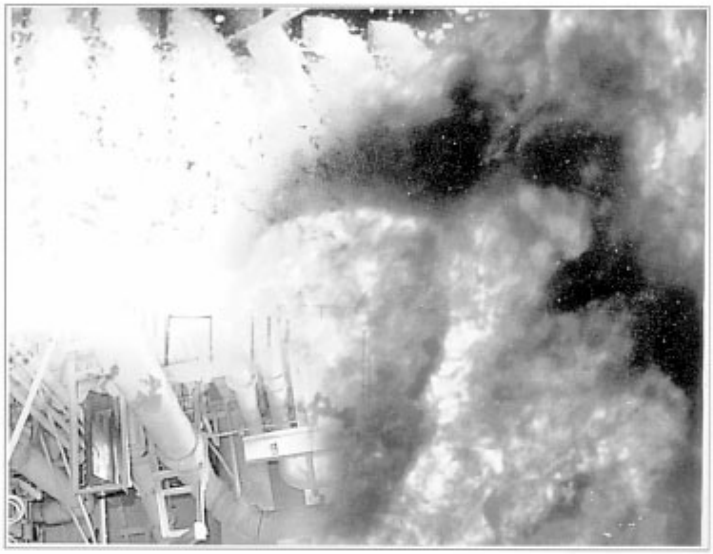
Form Mixing Unit

High Expansion Foam Extinguishing System

The System extinguishes the fire through cooling, suffocation and inert gas from the foam.

The System consists of foam concentrate with its storage tank, fire water pump, foam supply & mixing unit, piping, foam generators and control devices.

The foam concentrate is multi purpose foam with 2% mixture for high expansion, The foam premix solution does not resist polar solvents, however, fires with most of polar solvents can be extinguished by the high expansion system.
The quality of the foam depends on the fire scenario, burning material, type of smoke, and temperature, etc.

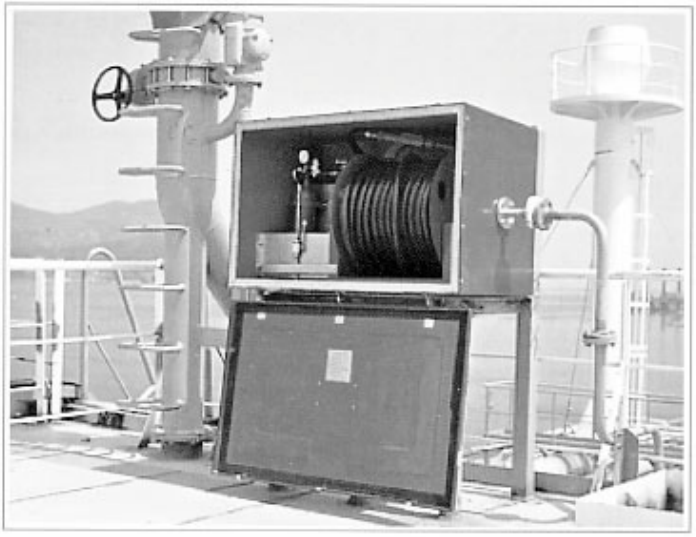


The NK high expansion foam system can be installed whenever / wherever
- Space permits for either total flooding or local applications
- The applicable standard(s) permit for combined use with low expansion foam.
- Water and / or electricity cannot simply be maintained by the self-contained system.

The NK high expansion foam system comprises two versions of using either inside air or outside air, Both of which work, alternatively with fresh water and sea water in terms of comprehensive application for various hazards and cost saving for installation.

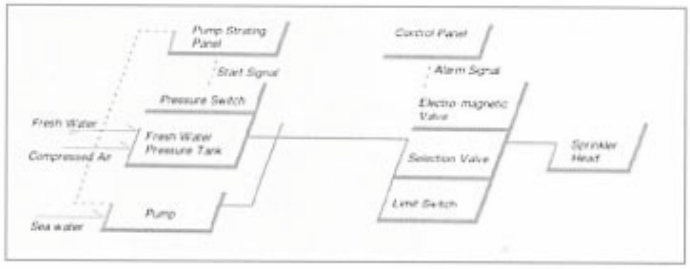
Dry Chemical Extinguishing System

Dry chemical extinguishing systems are best suited for extinguishing flammable gas fires.
LNG and LPG carriers are required to have the dry chemical extinguishing systems on their upper decks. Combined with hand-hose lines (a maximum hose length of 33mm) and monitor nozzles arranged for loading stations, the system is capable of protecting the entire area of the upper deck of these vessels.
Dry chemical extinguishing systems have also been installed on fireboats as part of twin agent system.



Pressurized Water Spray System

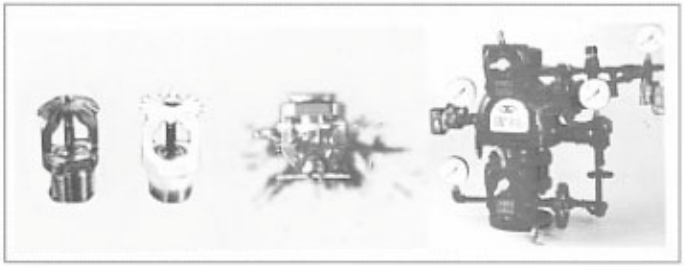
Besides its installation on car decks principally loading automobiles, the water spray systems can also be used for cooling the upper decks of LNG /LPG carriers with water spray, and for fire extinction of engine room and pump room. By discharging water in the form of fine fog, the water spray systems secures excellent cooling and smothering effects on oil fires as well as ordinary fires.

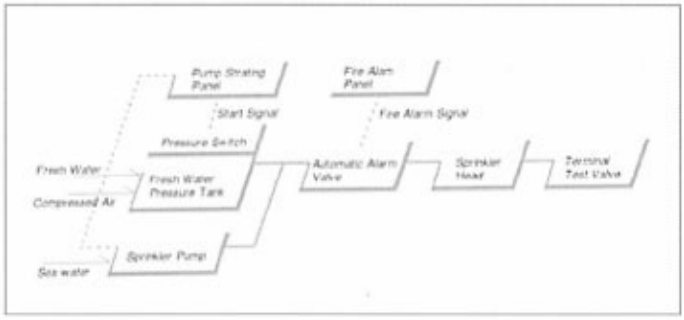


1. During the normal supervisory state, the pipings extending up to the valves are kept filled with pressurized water from the fresh water pressure tank.
2. The area of fire occured to be identified.
3. The Selection valve for the afected area is opened.
4. As the valve is opened, the pressure in the water tank falls, causing the pressure switch on the tank to actuate, this starts the pump motor, and water is discharged from the spray head.

Automatic Sprinkler Systems

This system is instlled in accommodation spaces and other service spaces on the vessels such as passenger ships and car ferries.
The sprinkler system is most effective in extinguishing fire in its early stage.
Statistics show that about 70% of all fires have been extinguished by less than three spinkler heads.





1. During the normal supervisory state, the pipings extending up to the sprinkler heads are kept filled with water under pressure by fresh water pressure tank.
2. When a fire breaks out and the heat sensitive element of a spinkler head reaches a specific operating tempertature (normally 72'C), the sprinkler head opens and discharges water.
3. The flow of water through the sprinkler piping caused by water discharge from the sprinkler head is detected by the automatic alarm valve, which in turn sends an alarm signal to the fire alarm panel.
4. At the same time, the pressure within the piping drops. This activates the pressure switch on the fresh water pressure tank, which then stars the pump motor. Thus, water is continuously discharged from the spinkler head to extinguish the fire.

Water Mist System

NK water mist system is based on a completely new principle - the fire is rapidly extinguished by water mist - and ensure advantages over alternative fire fighting systems and products as well as reducing the amount of damage caused by extinguishing a fire.

The system comprises :
High Pressure Water Mist System
Low Pressure Water Mist System
Accumulated Water Mist System

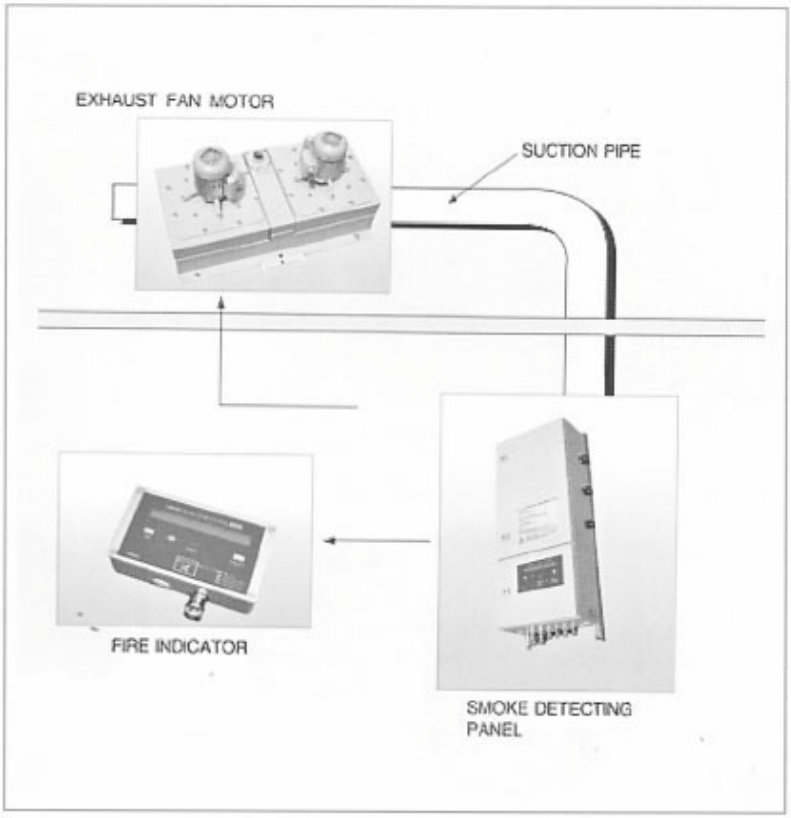
The system is ideal to protect :
- Accommodations for Super Fast Ferries / High Speed Craft, Ferries, Ro / Ro, Luxury Yachts, Naval Vessels, Offshore Rigs(incl. accommodation rigs).
- Machinery space category A, class 1, including, total flooding Turbine enclosures, point protection for high risk areas
- Specific Hazard / Areas, including main engines, aux. engine rooms, oil fired boiler, at incineratiors, purifier rooms,
  HVAC control rooms, technical & switchboard rooms, galley hoods

The system is an integrated system for the detection and active control of fires which comprises 3 principal components in consideration of advantages that customer may save cost and secure more reliable installation by installation of both smoke detection and automatic sprinkler system simultaneously woth singal source and responsibility as requred Maritime regulations.

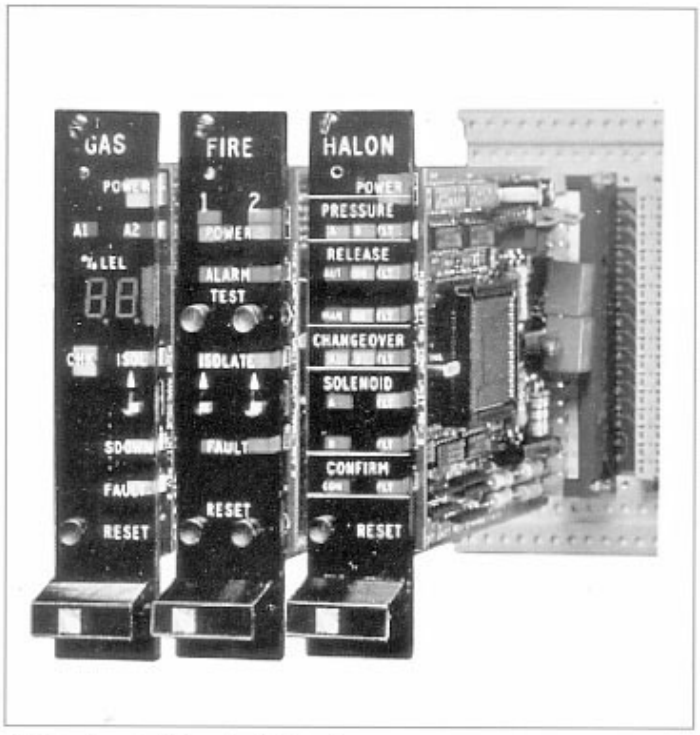
Smoke Sampling Type Fire Detection System

The smoke sampling type fire detection system used with the carbon dioxide gaseous extinguishing system continually draws air from each protected spaces and checks for the presence of smoke by means of the smoke detection panel, which initiates an alarm on detection of smoke. Early detection of fire by the small of smoke coming out of the exhaust valve is also possible. The smoke sampling type fire detection system is designed to have a wide range of minitoring areas extending up to 46 zones. Combined with the gaseous extinguishing system, it provides more effective fire protection.

In the event of fire, the indicator address the fire zone. Each detection unit of the panel is equipped with a sensitivity switch so that any change in the detector sensitivity resulting from its contanination, etc. can properly be compensated. Additional annunciators can be connected. Exhaust fan motors are explosion proof contruction. Samples of air cancollectively be drawn from all protected areas eliminating time loss.



Fire & Gas Detection and Control System



Detection & Control Panel

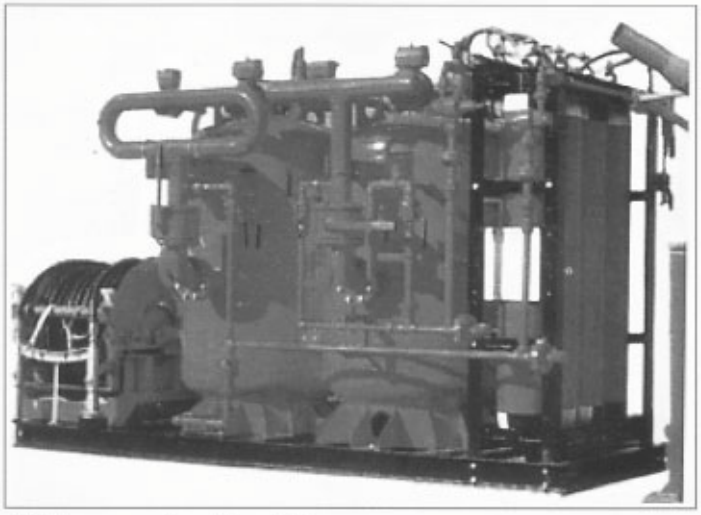
Detection & Manual Call Point

Portable & Wheeled Fire Extinguishers

ITEM	CAPACITY	DISCHARGE RANGE, METER	DISCHARGE TIME, SEC.
CO2	2.3kg	1 - 2	17 - 19
	3.4kg	2 - 3	17 - 19
	4.5kg	2 - 4	15 - 25
	6.8kg	3 - 5	25 - 30
FORM	9ℓ	4	30
DRY CHEMICAL	1.5kg	3 - 4	10 - 11
	2.5kg	3 - 4	12 - 13
	3.3kg	3 - 4	13 - 15
	4.5kg	4 - 5	16 - 18
	6.5kg	4 - 5	24 - 27
	9kg	4 - 5	24 - 27
	12kg	4 - 5	24 - 27
WATER	9L	4 - 6	30

ITEM	CAPACITY	DISCHARGE RANGE, METER	DISCHARGE TIME, SEC.
CO2	23kg	3 - 5	40
	45kg	5 - 7	60
FORM	45ℓ	6 - 9	60
	135ℓ	6 - 9	100
DRY CHEMICAL	25kg	6 - 9	30
	50kg	6 - 10	45

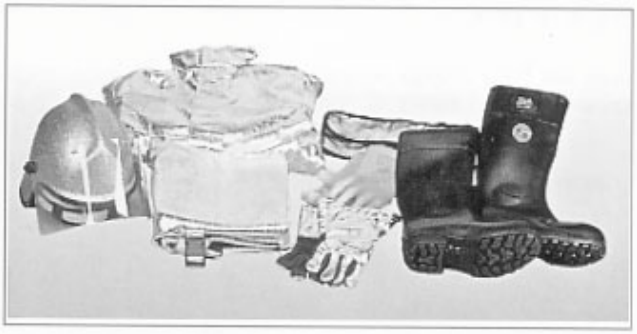
Skid mounted & Package Fire Extinguishers



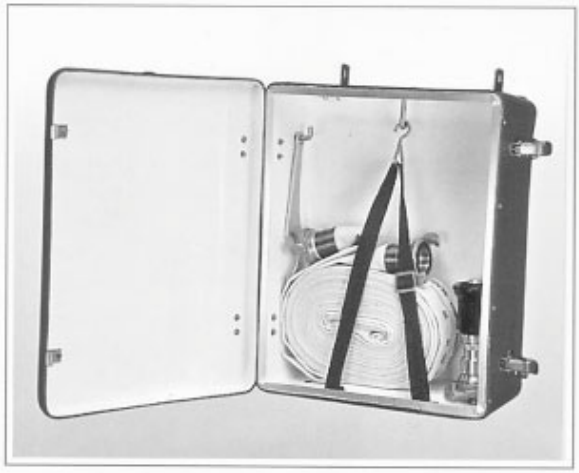
Skid mounted extinguishers

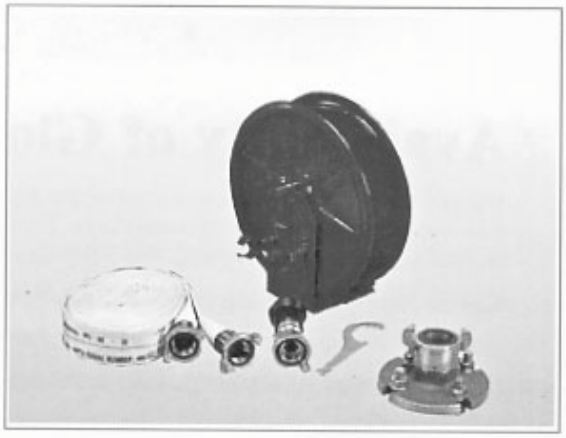
Package type extinguishers

Safety & Rescue Equipment

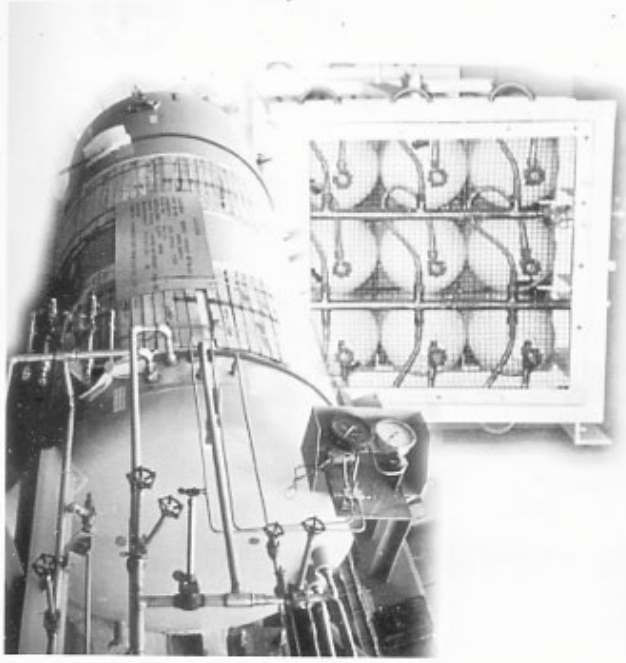


Hose & Ancillaries





Service Gas System



Gas Welding Equipment