



SAPPHIRE® COMPACT Fixed Fire Suppression System

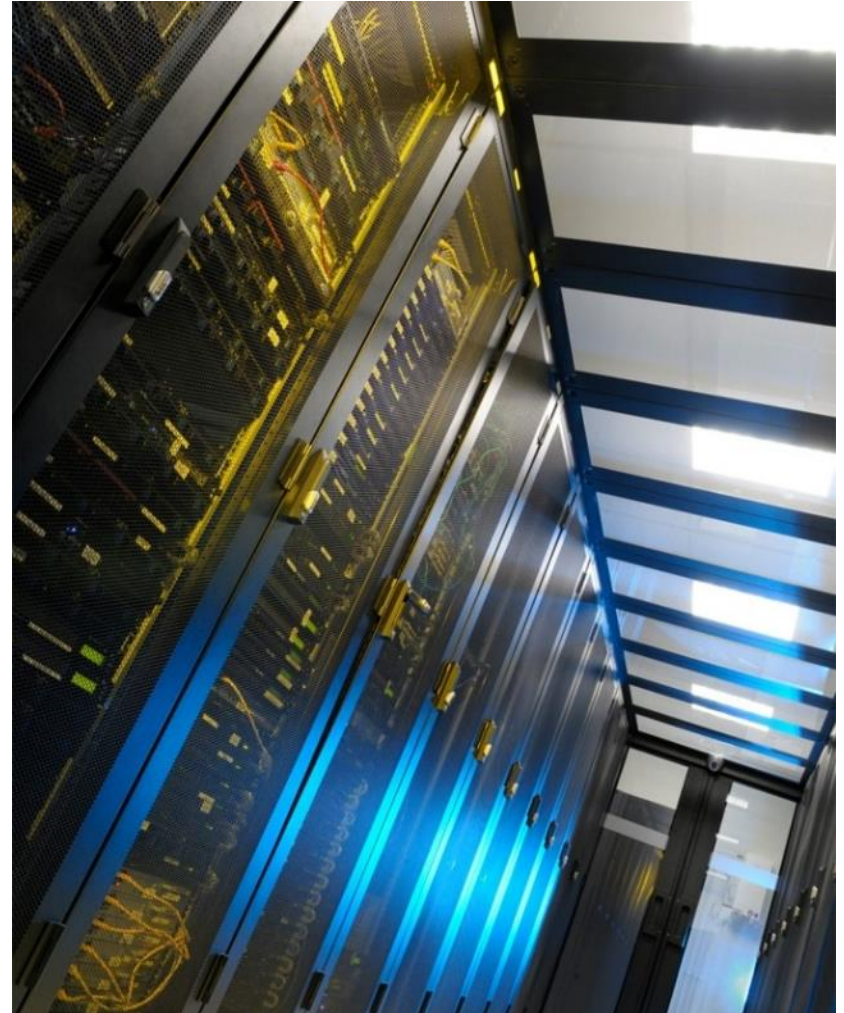
13th November 2019



Application

- Small enclosures
- Electrical enclosures
 - Distribution
 - Control
 - Communication
 - Servers
- CNC machines
- Wind Turbines

- Other applications that fall within the design criteria



Application – Cabinet Protection

Challenges

- Difficult to identify fire
- Especially in **well sealed** enclosures
- **Limited egress** of combustion products/heat

Achievements

- **Stop migration** of fire to neighbouring enclosures
- Reduces significantly losses and disruption



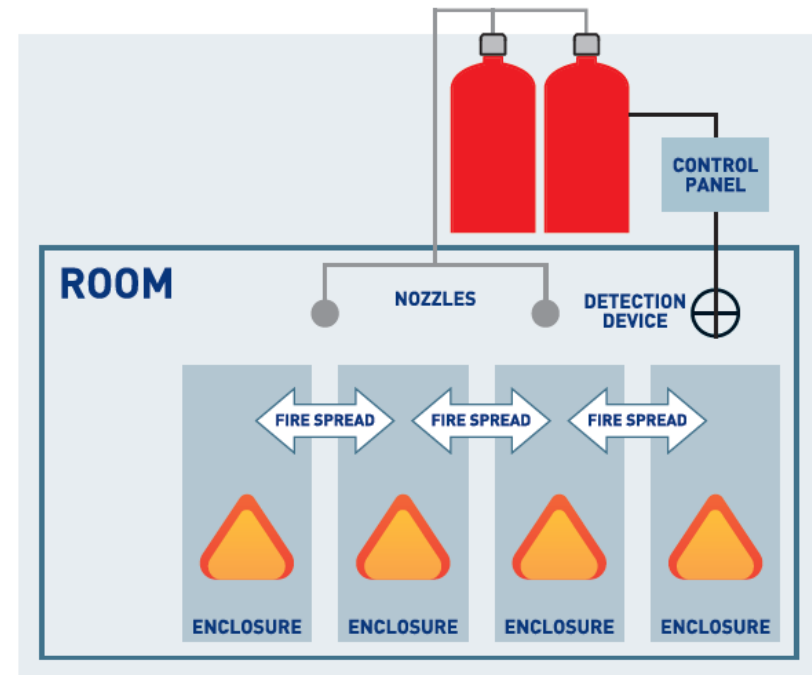
Existing Solution

Detection

- Sensitive detection device is required
- Sealed enclosures (may have high IP rating)
→ limited egress of combustion products or heat

Extinguishing performance

- Engineered system
- Designed to extinguish fires in all sizes of enclosure



Complimentary Solution

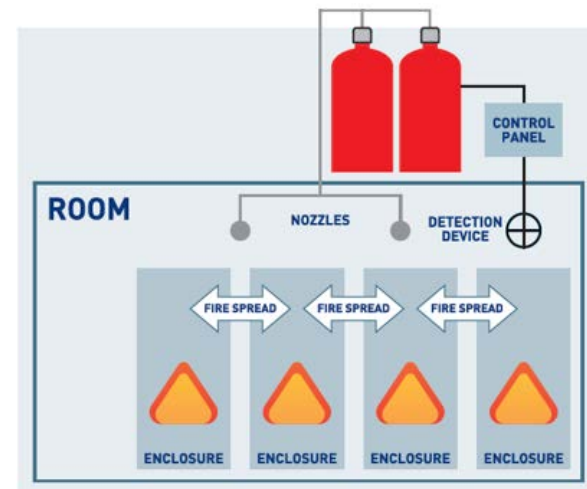
Detection

- Tube detection & discharge
- Proximity to any fire (or high temp.)
→ may operate more quickly
INSIDE than detection devices
OUTSIDE the cabinet

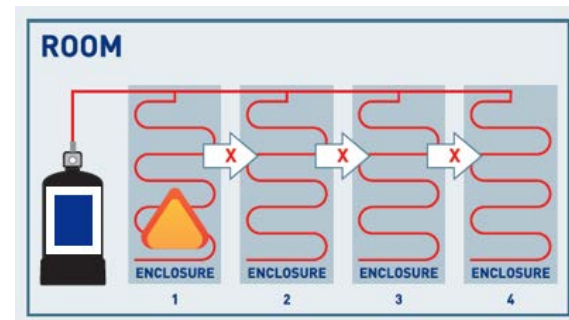
Extinguishing performance

- Discharge **directly** into the cabinet
→ high localized concentration
→ delivered to the problem
- Minimises equipment damage, generation of combustion by-products, fire spread
- In some cases **may prevent** the deployment of room protection

Cabinet systems COMPLIMENTARY to full room protection.



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Advantages

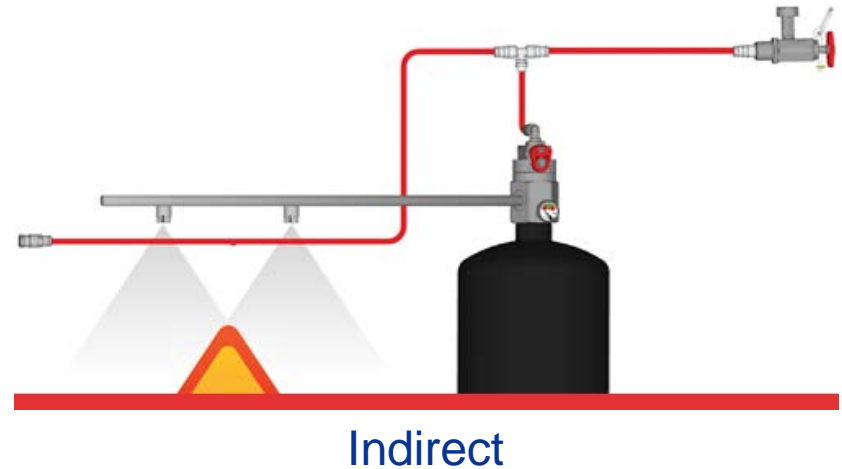
- Automatic
- Simple
- Appropriate extinguishing agent
- Linear heat & flame detection
- Flexible detection tubing adjacent to fire risk areas
- Detection tube remains unaffected by dirt, dust, debris and oil
- **Totally self-contained**. No need for power supply for detection or actuation
- 24/7 ready
- Easy design & installation, failsafe
- Suppression
- Unlimited number of detection points
- Fast action
- Resistant
- **Remains operational** during power interruption

Operation

- **DLP: Direct Low Pressure**
- **DHP: Direct High Pressure**



- **ILP: Indirect Low Pressure**
- **IHP: Indirect High Pressure**



Operation

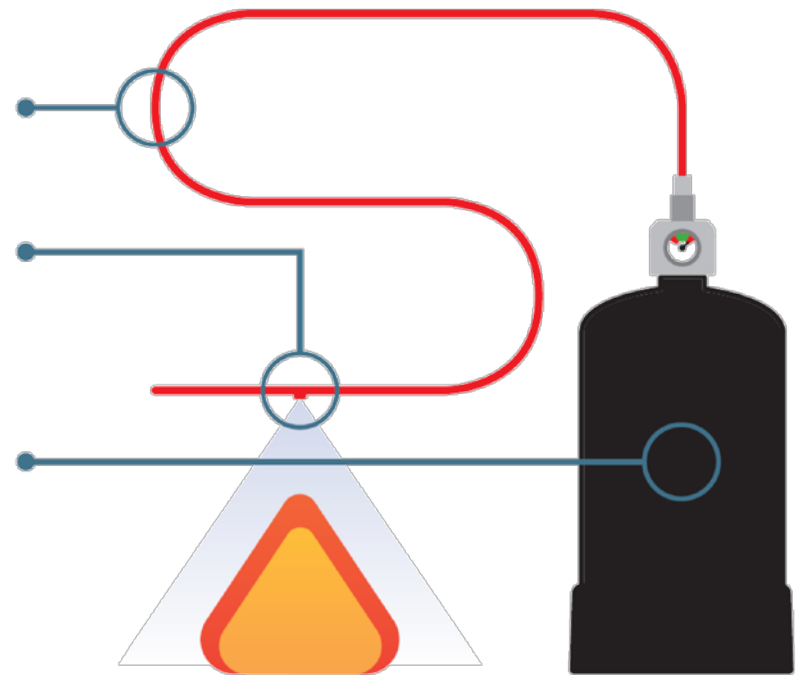
DLP: Direct Low Pressure Fire Suppression

Detection – Pneumatic Heat Detection

- Flame impingement or high ambient temperature
- Detection tube ruptures with a burst at the hottest point

Suppression - Direct Discharge: single method of detecting and delivery

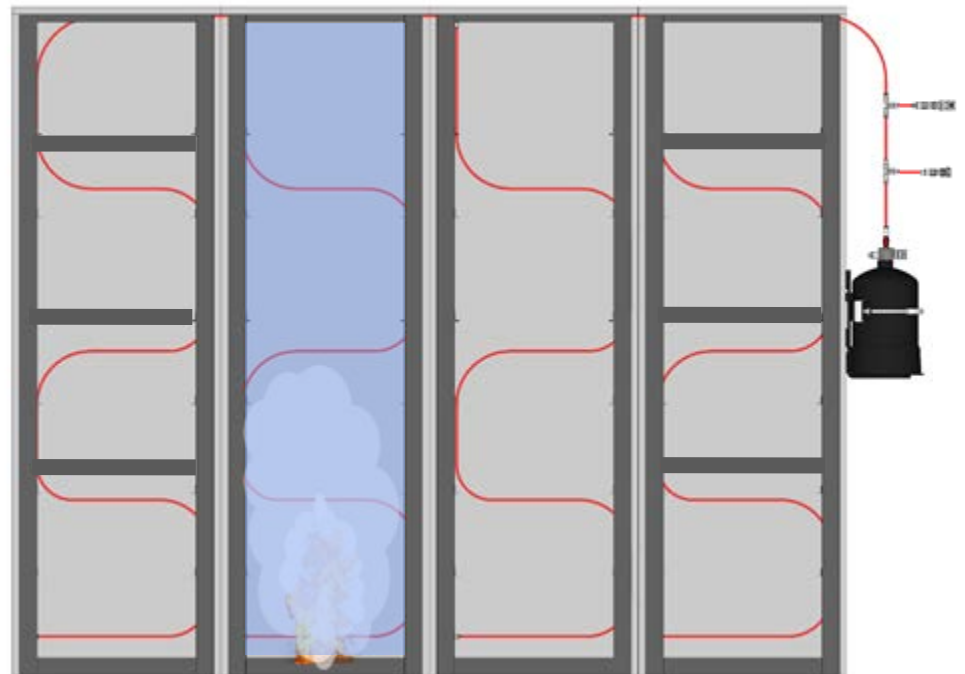
- The agent is discharged through the burst hole at the heart of the fire
- From the pressurised container
- Via the detection tube



Operation

- The discharge of the agent is from the point of burst into the vicinity of the fire
- Can protect up to 4 enclosures with just one system
- Each enclosure may be multi-compartment
- The system is sized based on the largest enclosure being protected
- Each enclosure must have a volume $\leq 2 \text{ m}^3$

Extinguishant only discharged into this enclosure



The risk assessment must assume that there will only be one fire in one of the enclosures / compartments at any one time.

LPCB Certification

- Sapphire Compact systems in accordance with the system manual (def.) are approved by LPCB to LPS 1666.
- LPS 1666: Requirements and test procedures for the LPCB approval of direct low pressure (DLP) application fixed fire suppression systems.
- **the only system** certified to LPS 1666 with 3M™ Novec 1230™ Fire Protection Fluid, that has allowance for both **VENTS** (openings) and **AIRFLOW** (fans)
- www.redbooklive.com



Appendix to Certificate No: 587c Issue: 01

Macron Safety Systems (UK) Ltd

SAPPHIRE COMPACT 3M™ Novec™ 1230 Direct Low Pressure (DLP) Application Fixed Fire Suppression Systems

Product Name (Drawing No)	Container Size	Description	Detector Tube	Ventilation (Enclosed or Open Vents)	Air Flow (Forced / Natural)	LPCB Ref. No.
30315000X (F13516)	2 kg	SAPPHIRE COMPACT 2kg DLP system	304150013	Enclosed & open options ¹	Forced & natural ¹	587c/01
30315000X (F13517)	2.5 kg	SAPPHIRE COMPACT 2.5kg DLP system	304150013	Enclosed & open options ¹	Forced & natural ¹	587c/02
30315000X (F13518)	3 kg	SAPPHIRE COMPACT 3kg DLP system	304150013	Enclosed & open options ¹	Forced & natural ¹	587c/03

Notes:

- SAPPHIRE COMPACT DLP Systems are supplied under brand names HYGOOD, LPG, GEM, ANSUL.
- SAPPHIRE COMPACT DLP Systems shall be configured, installed, serviced and maintained in accordance with:
 - HYGOOD Design, Installation and Maintenance Manual Reference 14A-50H Rev.00
 - LPG Design, Installation and Maintenance Manual Reference 14A-50L Rev.00
 - GEM Design, Installation and Maintenance Manual Reference 14A-50G Rev.00
 - ANSUL Design, Installation and Maintenance Manual Reference PN44592 Rev.00
- These systems are intended solely to provide enhanced local fire protection. They are not intended for use as whole room or building fire protection systems.
- The systems use a single method for detection and delivery of the extinguishing agent to the activation point.
 - System operation pressure: 15 bar @ 20°C.
 - System operation temperature range: -20°C to +60°C.
- The above systems may have air vents at low and/or high level (refer note 2).
- The above systems may have forced ventilation (refer note 2).

Design

SAPPHIRE COMPACT



The Product



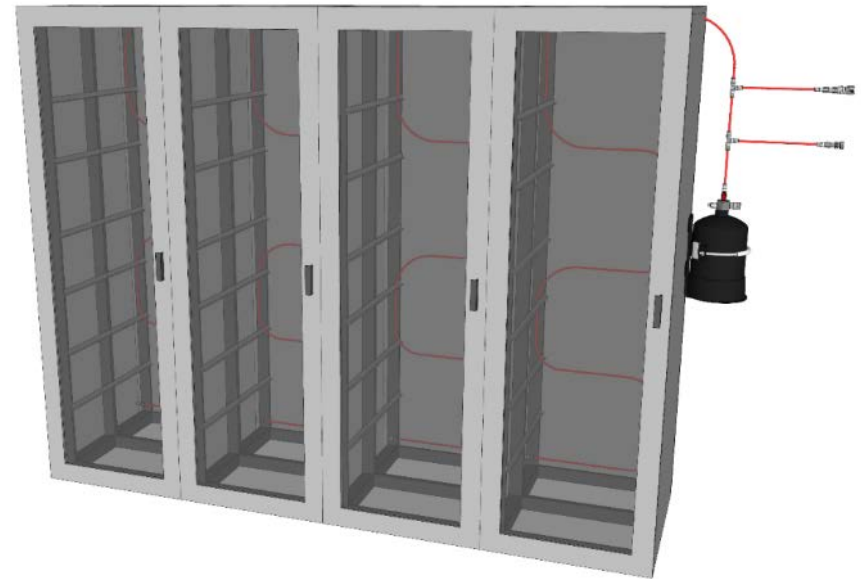
- Container + Hardware
- 3M™Novec™1230

System Capacities

- Design concentration:
6.7% @ 20°C
- Flooding factor: 1 kg/m³

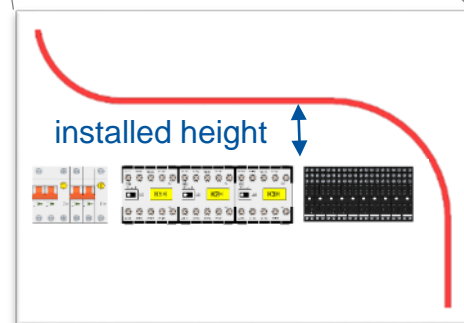
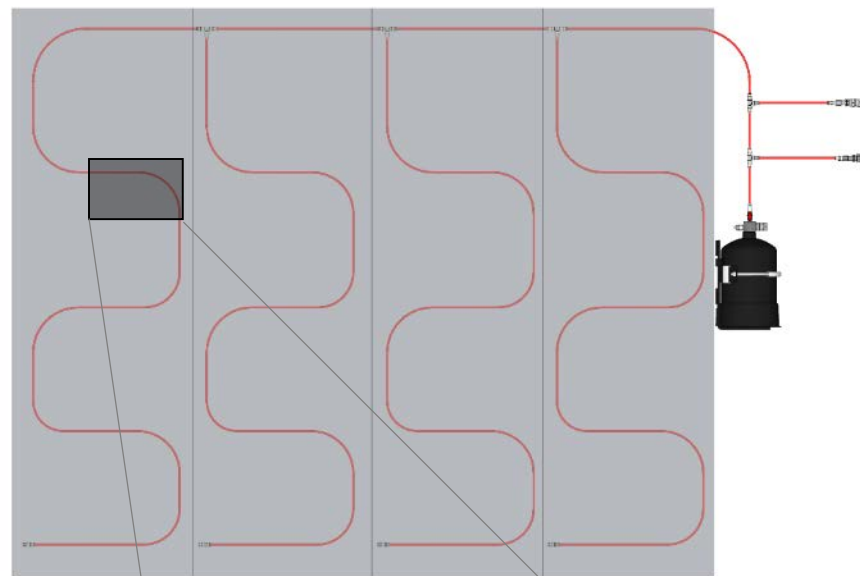
Considerations:

- Air Vents (natural convection cooling)
 - Fans (forced ventilation cooling)
 - Closed loop cooling systems
-
- Each system can support a maximum of **4** separate detection / discharge tube branches



2 Kg Capacity System

	2 kg System
Max Individual Enclosure Volume (m ³)	2 m ³
Max Number of Individual Enclosures Protected by 1 System	4
Max Tube Length From Valve to Any Furthest Point (def.) (m)	10 m
Max Total Tube Length (m) / per system	45 m
Max Tube Connections (n)	22
Minimum installed height above the protected risk (mm)	0 **
Maximum installed height above the protected risk (def.) (mm)	100
Extinguishant agent quantity	2 kg
Detection Tube Valve Outlets	1
Operating Pressure	15 bar @ 20°C
Operating Pressure range	11 – 17.8 bar
Operating Temperature Range	-20°C to + 60°C
Charging gas for container and detection tube line	Nitrogen
System low pressure monitoring	Mandatory
System discharge monitoring	Recomm.

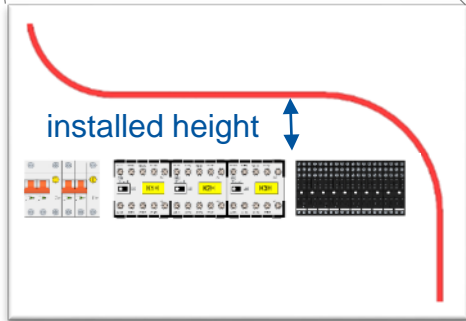
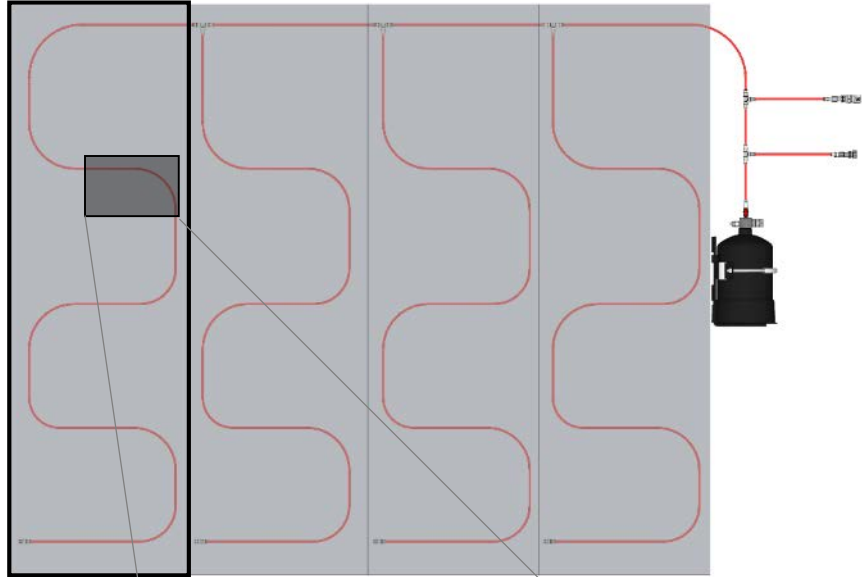


** surface temperature of the protected risk is below 65°C

2.5 kg Capacity System

2.5 kg System

Max Individual Enclosure Volume (m ³)	2 m ³
Max Number of Individual Enclosures Protected by 1 System	4
Max Tube Length From Valve to Any Furthest Point (def.) (m)	10 m
Max Total Tube Length (m) / per system	45 m
Max Tube Connections (n)	22
Minimum installed height above the protected risk (mm)	0 **
Maximum installed height above the protected risk (def.) (mm)	100
Extinguishant agent quantity	2.5 kg
Detection Tube Valve Outlets	1
Operating Pressure	15 bar@20°C
Operating Pressure range	11 – 17.8 bar
Operating Temperature Range	-20°C to + 60°C
Charging gas for container and detection tube line	Nitrogen
System low pressure monitoring	Mandatory
System discharge monitoring	Recomm.



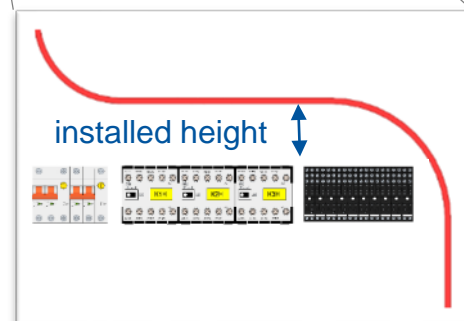
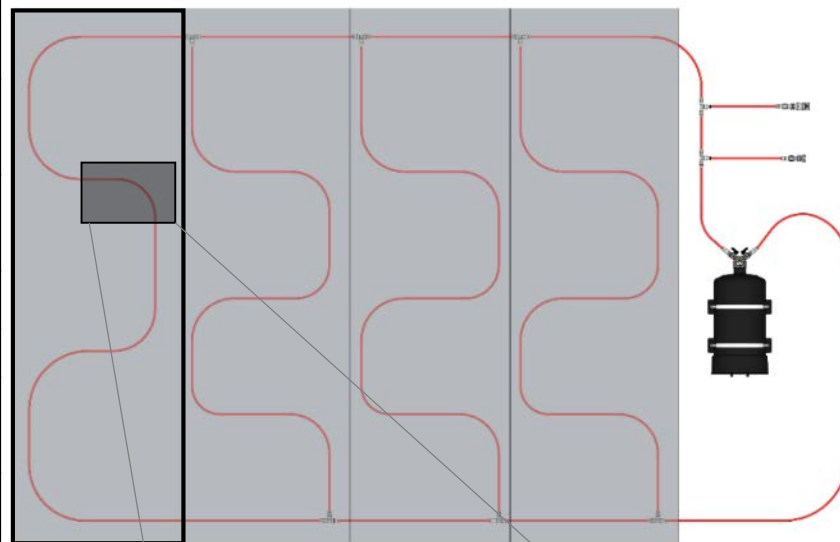
** surface temperature of the protected risk is below 65°C



3 kg Capacity System

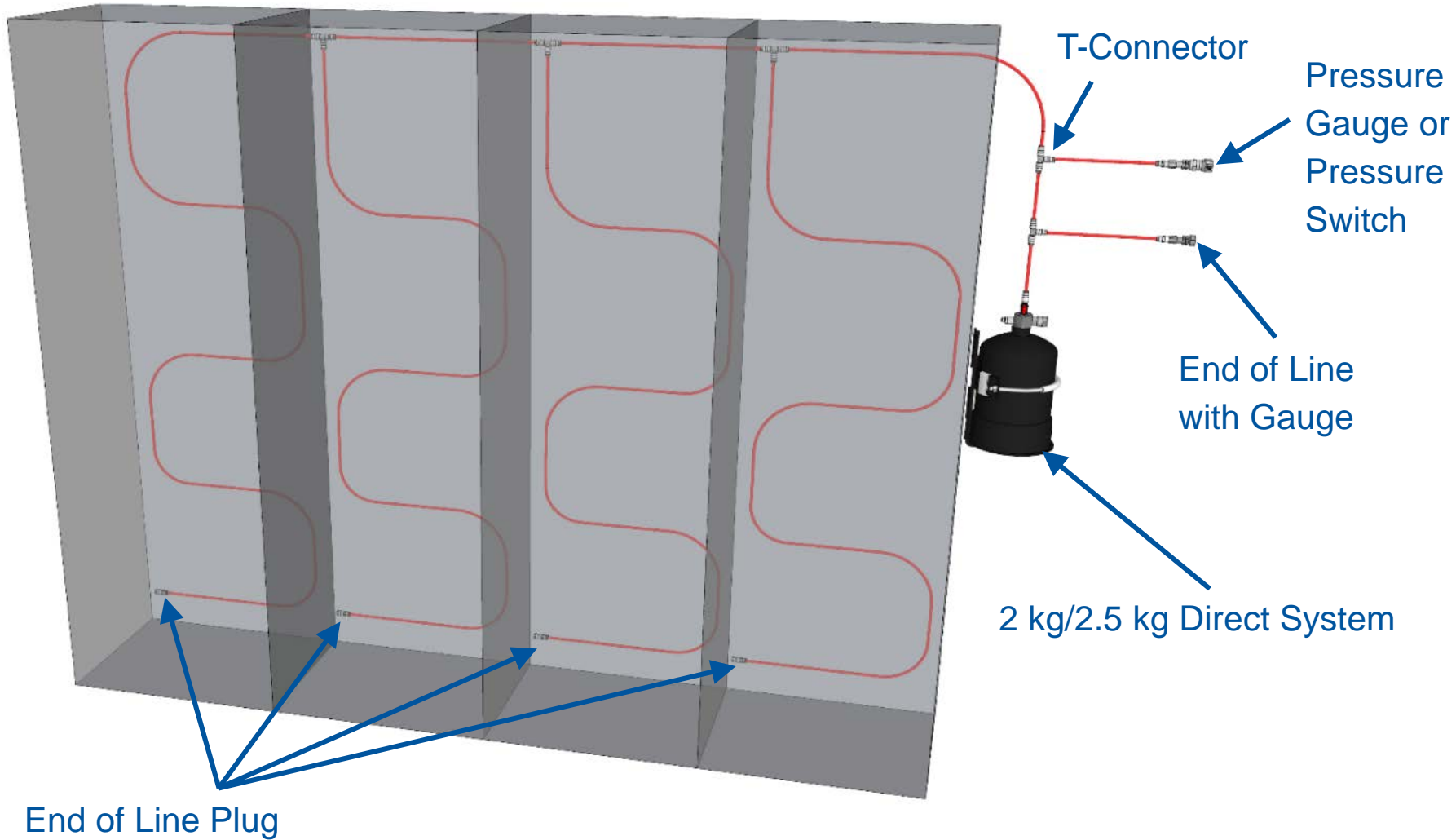
3 kg System

Max Individual Enclosure Volume (m ³)	2 m ³
Max Number of Individual Enclosures Protected by 1 System	4
Max Tube Length From Valve to Any Furthest Point (def.) (m)	10 m
Max Total Tube Length (m) / per system	66 m
Max Tube Connections (n)	28
Minimum installed height above the protected risk (mm)	0 **
Maximum installed height above the protected risk (def.) (mm)	100
Extinguishant agent quantity	3 kg
Detection Tube Valve Outlets	2
Operating Pressure	15 bar@20°C
Operating Pressure range	11 – 17.8 bar
Operating Temperature Range	-20°C to + 60°C
Charging gas for container and detection tube line	Nitrogen
System low pressure monitoring	Mandatory
System discharge monitoring	Recomm.

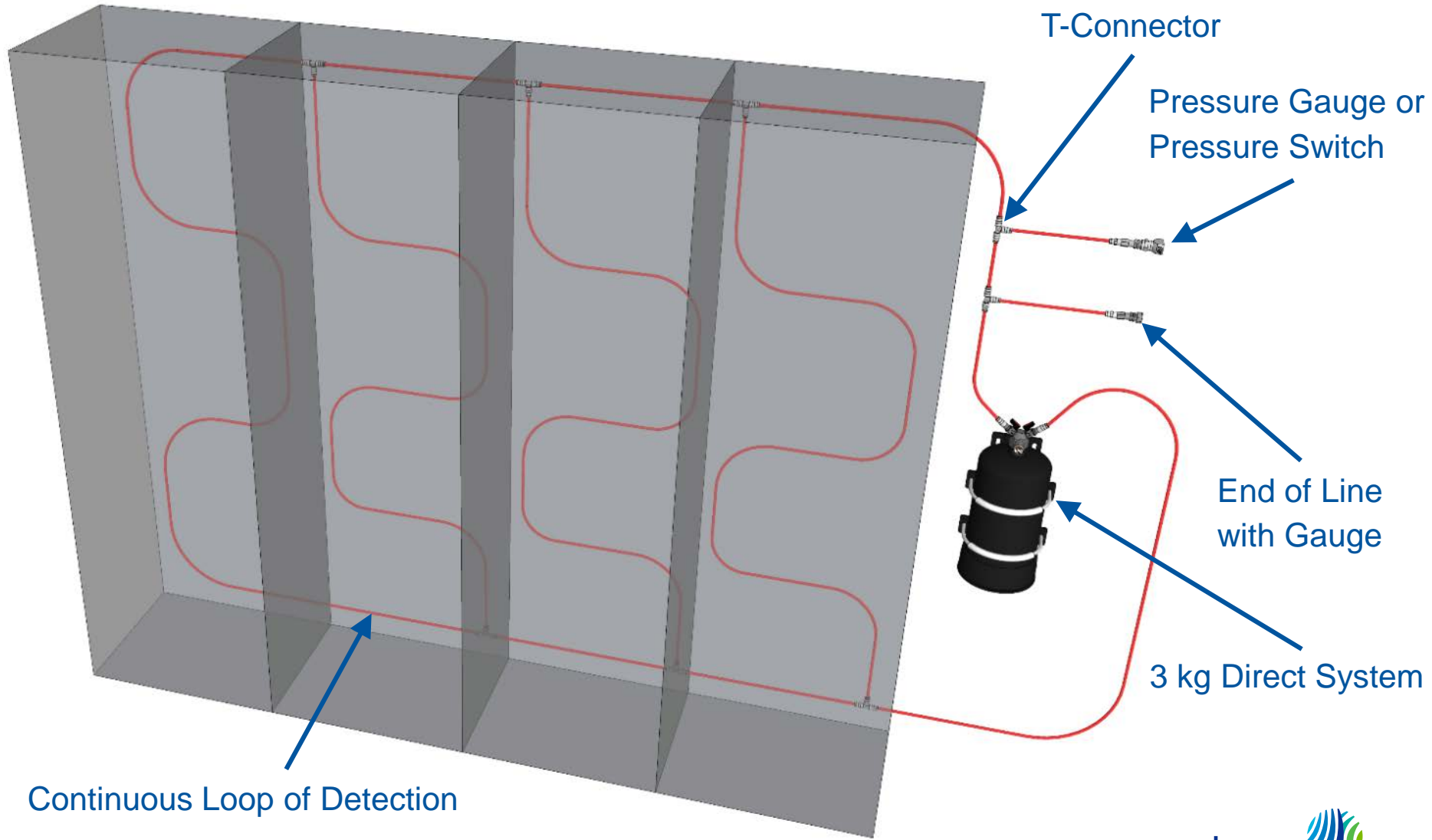


** surface temperature of the protected risk is below 65°C

System Layout – 2 kg / 2.5 kg System



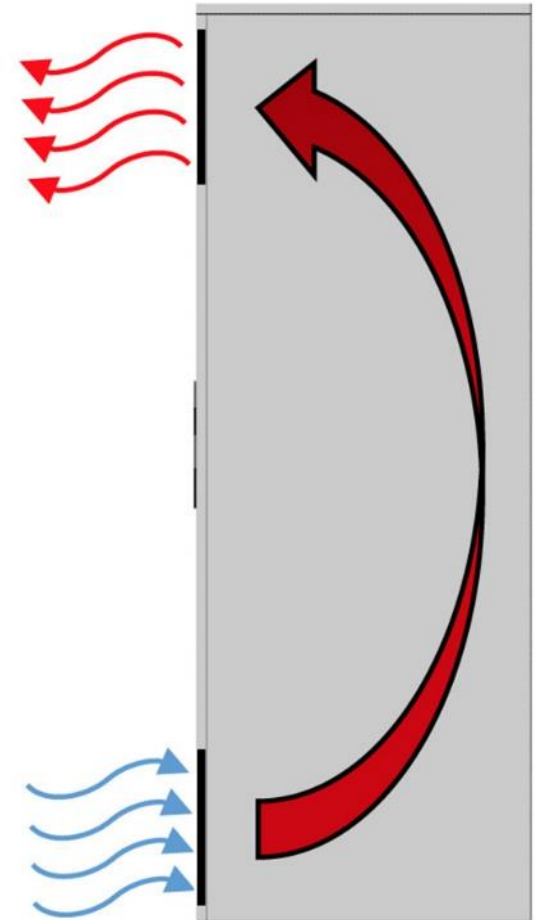
System Layout – 3 kg System



Compensation for Air Vents (Natural Convection Cooling)

- Air vents at low and/or high level for cooling purposes
- Natural convection
- Larger amount of extinguishant **may** be required
- Based on a maximum enclosure volume of **2 m³**



System Size (Mass of Novec 1230 Fluid)	Max Low Level Vent Area (def.) (cm ²)	Max High Level Vent Area (def.) (cm ²)
2 kg	≤ 100 cm ²	≤ 100 cm ²
2.5 kg	≤ 156 cm ²	≤ 156 cm ²
3 kg	≤ 187 cm ²	≤ 187 cm ²

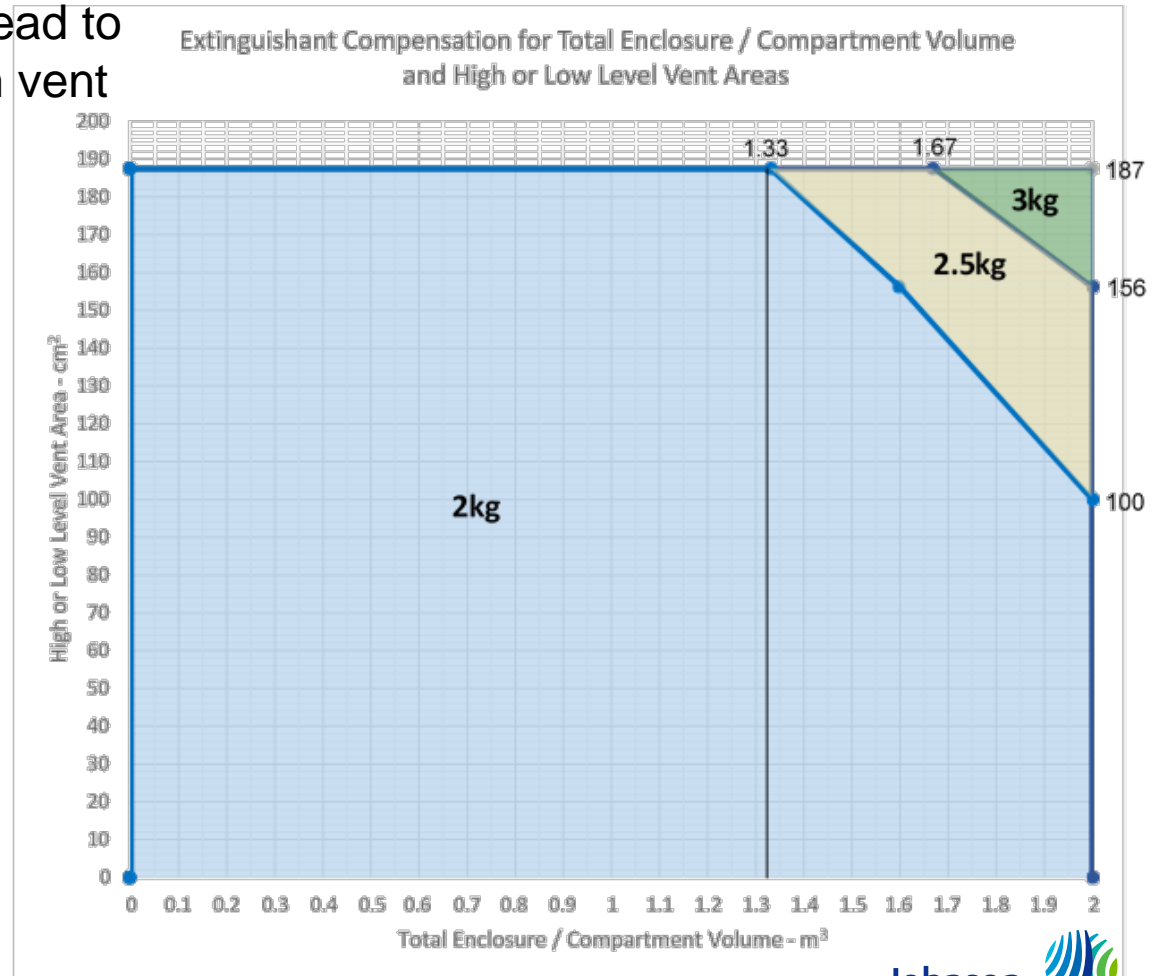


Compensation for Air Vents (Natural Convection Cooling)

Compensation for Air Vents in Reduced Enclosure Volumes

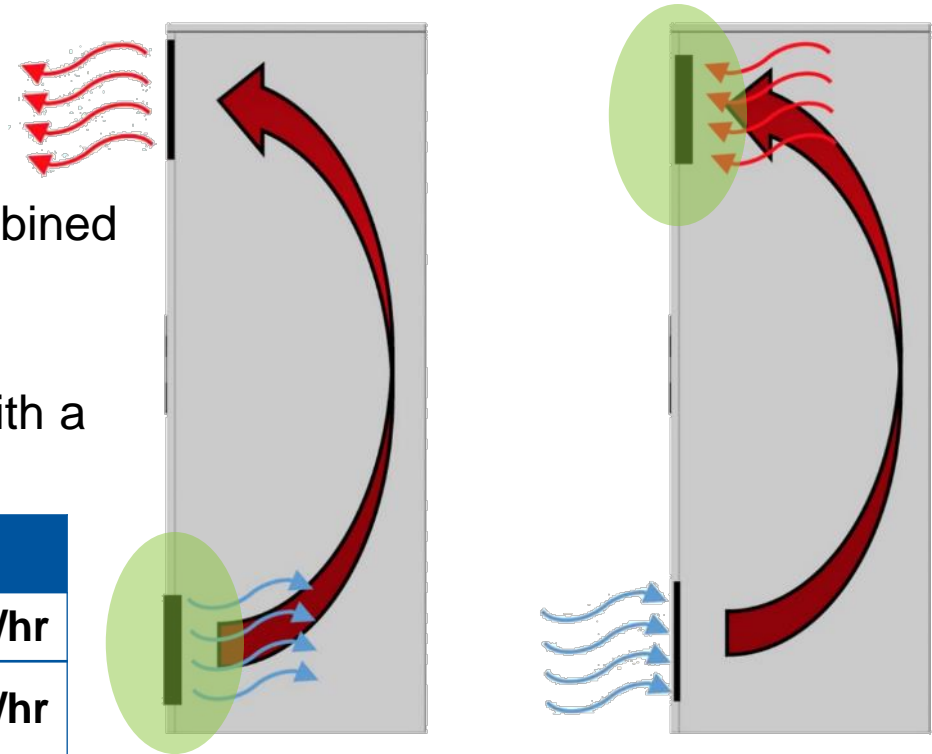
- volumes **below 2m³** can lead to increases in the maximum vent areas that can be allowed

	 [cm]	 [cm]
100 cm²	10.0	11.3
156 cm²	12.5	14.1
187 cm²	13.7	15.4



Compensation for Fans (Forced Ventilation Cooling)

- can be used to evacuate large amounts of heat efficiently
- Configuration 1 – Fan at low level blowing air into the enclosure, combined with a high level air vent outlet.
- Configuration 2 – Fan at high level extracting air from the enclosure with a low level air vent inlet.



Configuration 1

Configuration 2

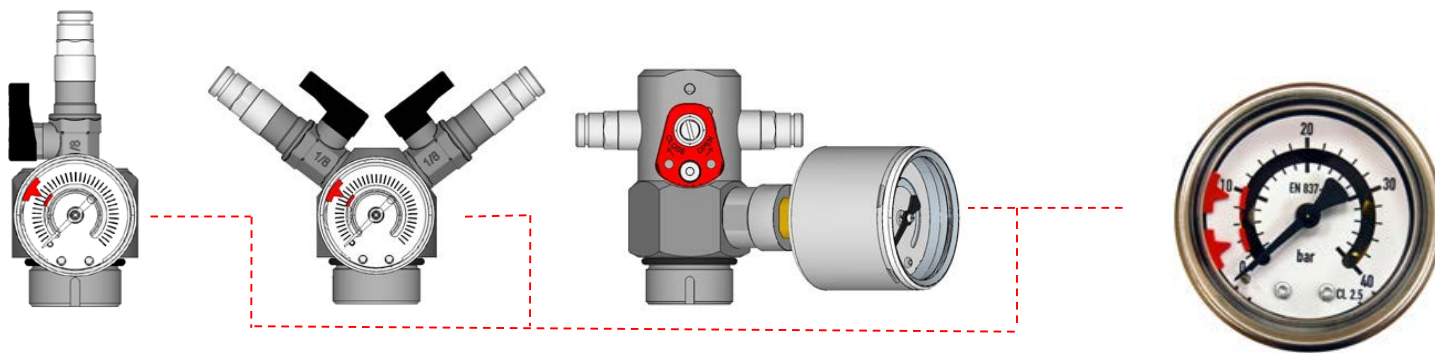
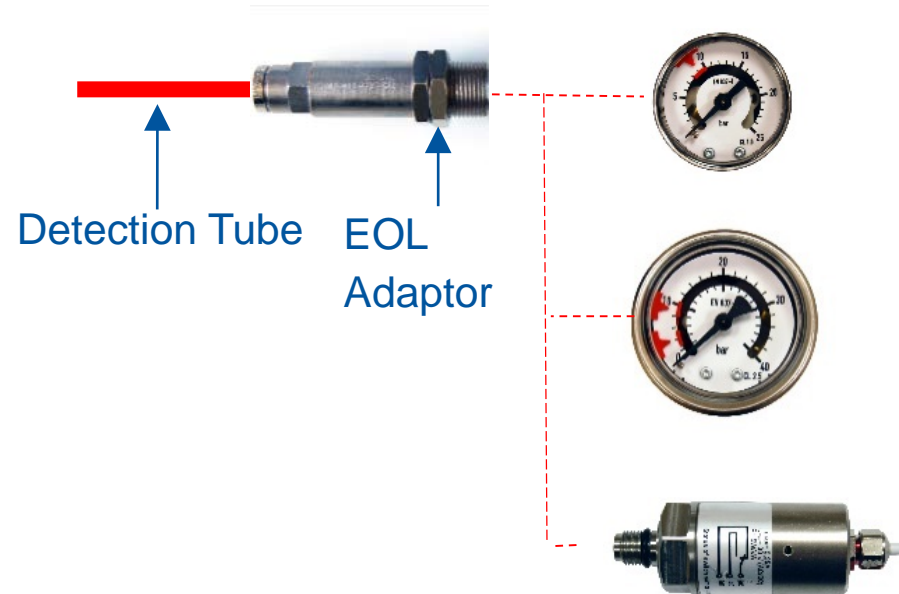
2 kg System		
1	Ventilation at High Level Vent Inlet (m ³ /hr)	Max. 315 m³/hr Min. 110 m³/hr
	Max High Level Vent Area (cm ²)	≤ 500 cm²
2	Ventilation at Low Level Vent Inlet (m ³ /hr)	Max. 315 m³/hr Min. 110 m³/hr
	Max Low Level Vent Area (cm ²)	≤ 500 cm²

Low Pressure Monitoring

- systems **must** be fitted with monitoring devices to indicate system health (low pressure)

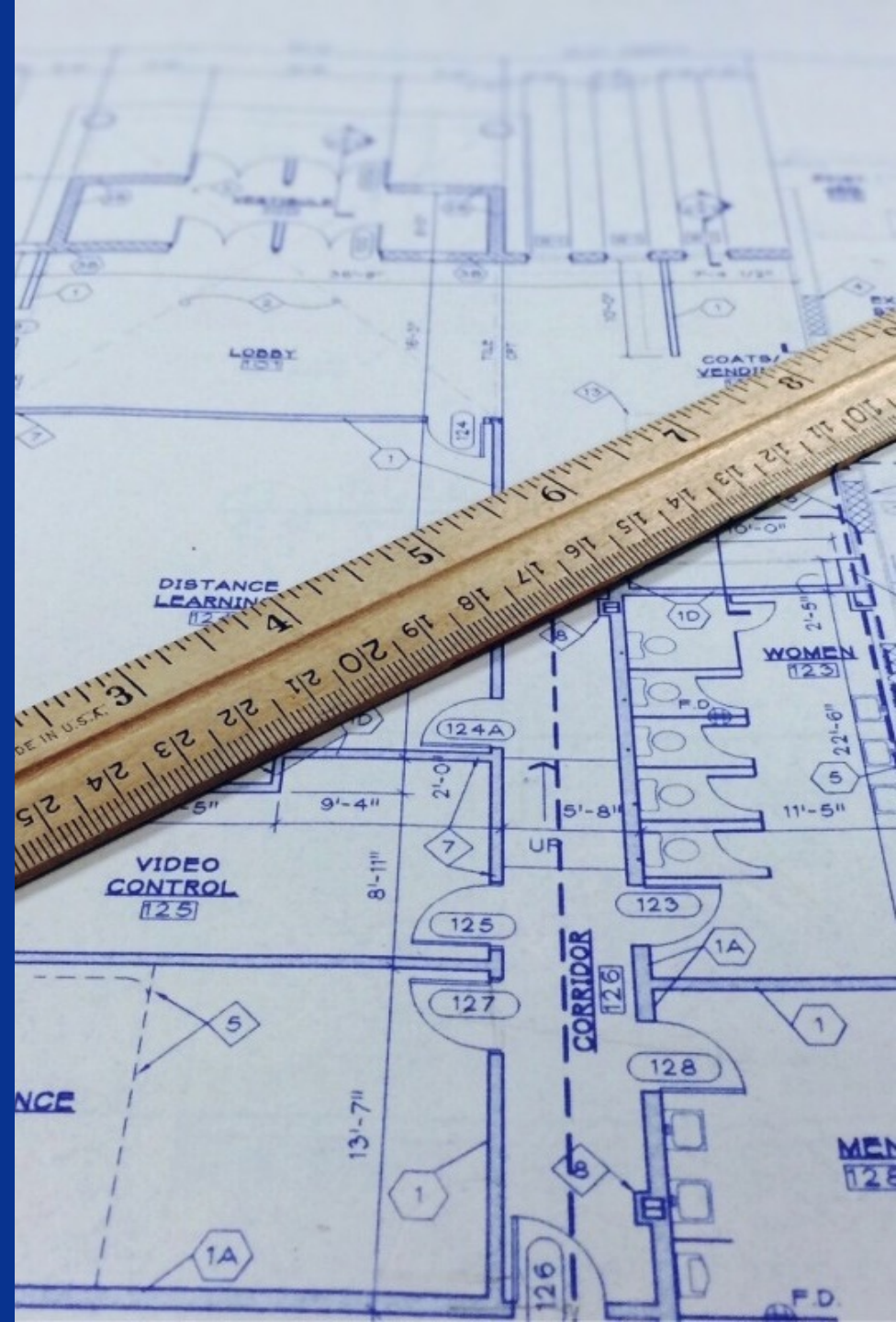
Pressure gauges with switch contacts fulfil this requirement and can be fitted to either

- the detection tubing or
- the container valve



Design Examples

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Design Example A

Control cabinet

- Dimensions: 600 x 800 x 2200 mm
- No vents
- No fans
- Propose a fire protection system!
- Volume of the individual enclosure:
 $0.6 \times 0.8 \times 2.2 = 1.056 \text{ m}^3$
- TABLE 1: (PAGE 5-2 of the design manual)
 - Maximum individual enclosure volume = 2 m^3
 - Maximum number of enclosures = 4
- **Basic system (2 kg)**



Design Example B

Control cabinet

- Dimensions: 800 x **600** x 2000 mm
- 4 individual compartments
- **2 vents on each compartment**
- **Diameter = 140 mm** ●
- No fans
- Propose a fire protection system!

- Volume of the individual enclosure:
 $0.8 \times 0.6 \times 2 = \mathbf{0.96 \text{ m}^3}$
- Area of each vent = $(d^2\pi)/4 =$
 $(14 \times 14 \times 3.14)/4 = \mathbf{153.86 \text{ cm}^2}$
- TABLE 2: (PAGE 5-4)
 - Maximum low level vent area < 156 cm²
 - Maximum high level vent area < 156 cm²
- **2.5 Kg Capacity System**

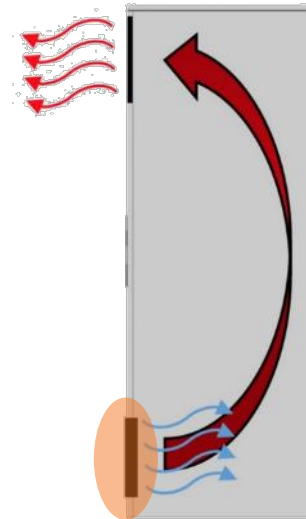


- Graph 1: (PAGE 5-5)
- **Basic system (2 kg)**
- TABLE 1: (PAGE 5-2)
 - Max. ind. enclosure volume = 2 m³
 - Max. number of enclosures = 4

Design Example C

Control cabinet

- Dimensions: 800 x 1200 x 2000 mm
- 1 individual compartment
- **2 vents**
- **Rectangle of 100x100 mm**
- **Equipped with low level fan @ 2500 l/min**
- Propose a fire protection system!
- Volume of the individual enclosure:
 $0.8 \times 1.2 \times 2 = 1.92 \text{ m}^3$
- Area of vent = $10 \times 10 = 100 \text{ cm}^2$
- Fan flowrate = $2500 \text{ l/min} = 150 \text{ m}^3/\text{hr}$
- TABLE 3: (PAGE 5-6)
 - $110 \leq \text{Ventilation flow rate} \leq 315 \text{ m}^3/\text{hr}$
 - Maximum high level vent area $\leq 500 \text{ cm}^2$



- **Basic system (2 kg)**
- TABLE 1: (PAGE 5-2)
 - Max. ind. enclosure volume = 2 m^3
 - Max. number of enclosures = 4

Components

SAPPHIRE COMPACT



Components

- Brands
 - HYG00D
 - LPG
 - GEM
 - ANSUL
- Fill: 2, 2.5 or 3kg
- All container Assembly part numbers include:-
 - Filled container c/w label
 - Bracket, Caution sign



- Standard or lockable valve
- PGS or PGSD (NO or NC)

SAPPHIRE COMPACT
suppression systems

2KG SYSTEM CYLINDER

HYGOOD



NOTE: PICTURED FOR ILLUSTRATIVE PURPOSES

	N/C		N/C
	N/O		N/O
303150001 2kg HYG00D STD PGS Single Switch Standard Valve		303150004 2kg HYG00D STD PGSD Double Switch Standard Valve	
	N/C		N/C
	N/O		N/O
303150007 2kg HYG00D LCK PGS Single Switch Lockable Valve		303150010 2kg HYG00D LCK PGSD Double Switch Lockable Valve	
SWITCH POLARITY : N/C = Normally Closed N/O = Normally Open			
↑ THIS WAY UP ↑			

SAPPHIRE COMPACT
suppression systems

2.5KG SYSTEM CYLINDER

HYGOOD



NOTE: PICTURED FOR ILLUSTRATIVE PURPOSES

	N/C		N/C
	N/O		N/O
303150002 2.5kg HYG00D STD PGS Single Switch Standard Valve		303150005 2.5kg HYG00D STD PGSD Double Switch Standard Valve	
	N/C		N/C
	N/O		N/O
303150008 2.5kg HYG00D LCK PGS Single Switch Lockable Valve		303150011 2.5kg HYG00D LCK PGSD Double Switch Lockable Valve	
SWITCH POLARITY : N/C = Normally Closed N/O = Normally Open			
↑ THIS WAY UP ↑			

SAPPHIRE COMPACT
suppression systems

3KG SYSTEM CYLINDER

HYGOOD



NOTE: PICTURED FOR ILLUSTRATIVE PURPOSES

	N/C		N/C
	N/O		N/O
303150003 3kg HYG00D STD PGS Single Switch Standard Valve		303150006 3kg HYG00D STD PGSD Double Switch Standard Valve	
	N/C		N/C
	N/O		N/O
303150009 3kg HYG00D LCK PGS Single Switch Lockable Valve		303150012 3kg HYG00D LCK PGSD Double Switch Lockable Valve	
SWITCH POLARITY : N/C = Normally Closed N/O = Normally Open			
↑ THIS WAY UP ↑			

Components

- Pressurising Hose Assembly (Includes Filling Tool on outlet, M/F Quick Disconnect Coupling, Hose Vent Valve, High Pressure Hose, Master Pressure Gauge)



- Pressure Gauge with switch contact, 0 – 40 bar, 9 bar switch point, M10 x 1 (N/O & N/C)



- Pressure Gauge with 2 switch contacts, 0 – 40 bar, 4 bar & 9 bar switch points, M10 x 1 (N/O & N/C)



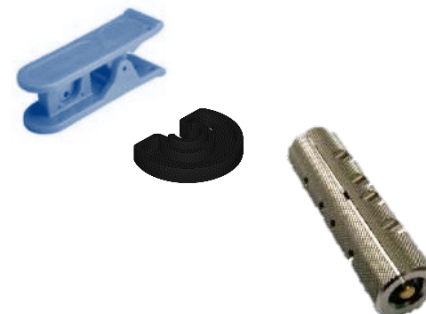
- Pressure Gauge with 2 switch contacts, **Liquid Filled** 0 – 40 bar, 4 bar & 9 bar switch points, M10 x 1 (N/O & N/C)



- Signal Generator / Pressure Switch
4.0 - 8.0 bar switch point, M10 x 1, 3 wire



- Detection Tube cutter
- Detection Tube release device
- Detection Tube deburr tool

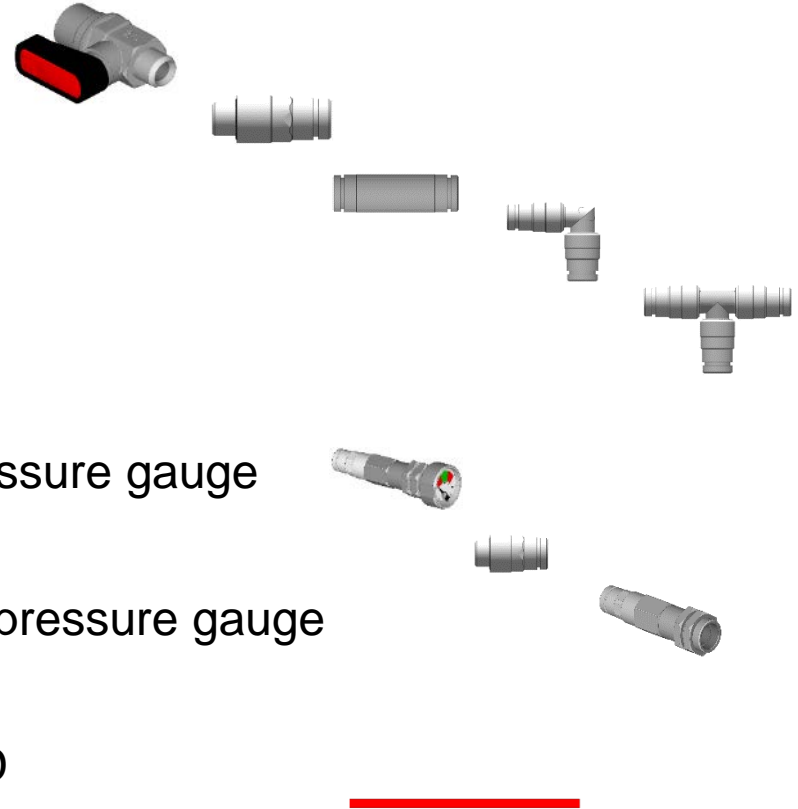


Components

- Ball valve G1/8" male - G1/8" female.
- Connector, G1/8" male - 4 x 6 Tube
- Straight connector - 4 x 6 Tube
- 90° connector - 4 x 6 Tube
- T - connector - 4 x 6 Tube

- End of line adaptor (4 x 6 Tube), with pressure gauge
- End of line plug - 4 x 6 Tube
- End of line adaptor (4 x 6 Tube), without pressure gauge

- Detection tubing – Standard – 4x6 – RED



Components

- Local Alarm Units (N/O & N/C)
 - Orange – Low pressure
 - Blue – System discharged
 - Red – System isolated



See ***Local Alarm Unit Manual***
for Installation and Use

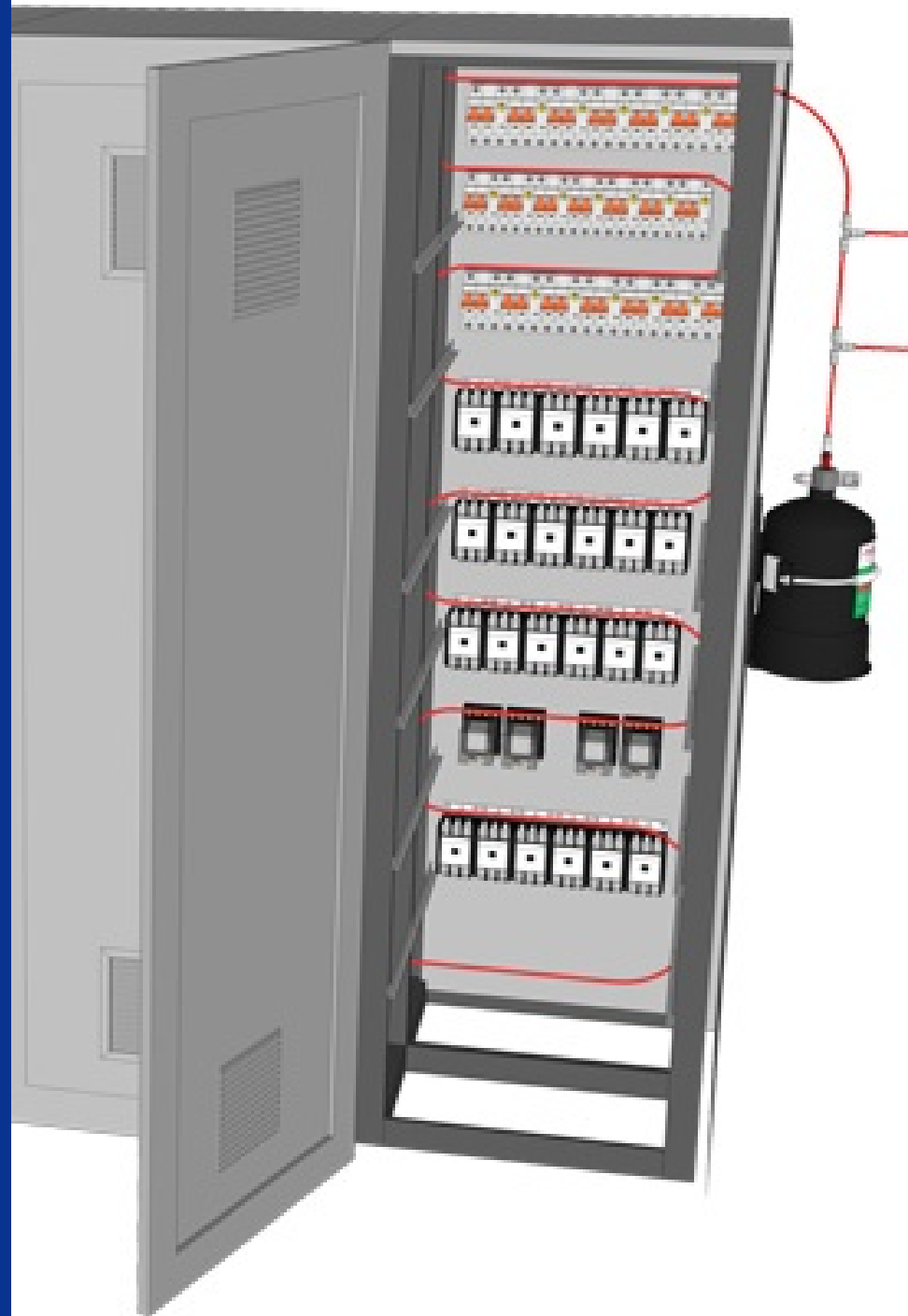
System Calculator

- System size estimator
- Component configurator
- BOM



Commissioning

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Maintenance & Service

SAPPHIRE COMPACT



System Maintenance

Visual Inspection

- at least **monthly**
- by **responsible person**

Basic Service

- **yearly** (\pm 1 month)
- from the date of commissioning
- disregard any refilling, or part replacement
- may be reduced
- by **competent person**

Overhaul

- **every 10 years**
- by **approved installer**



Sales Information

SAPPHIRE COMPACT



Route to Market

- Existing **JCI SAPPHIRE** distribution channels
- Distributors **must attend** SAPPHIRE COMPACT training
 - 1 day
 - Design, Install, Service & Maintenance
- **Periodic inspection** of Approved installers in accordance with LPS1666 requirements
- **Refresher training** every 3 years



Competition

Entity	Country	Agent	Enclosures	Vents
Air Fire	Italy	HFC-227ea	Enclosed & Open	Natural only
Cease Fire	India	HFC-236, HFC-227ea	Enclosed & Open	Natural & Forced venting
EKC	UAE	Novec 1230, HFC-227ea	Enclosed only	No Venting
Firetrace	USA, UK	Novec 1230, HFC-227ea	Enclosed only	No Venting
Regulus	USA	Novec 1230, HFC-227ea	Enclosed only	No Venting
NAFFCO	UAE	HFC-236, HFC-227ea	Enclosed & Open	Natural & Forced venting
JCI	UK	Novec 1230	Enclosed & Open	Natural & Forced venting

SAPPHIRE COMPACT : The **only system** using **NOVEC 1230** that can be used in **open enclosures** for both **natural & forced ventilation**

Marketing

SAPPHIRE COMPACT



INSPECTION
THE SYSTEM SHOULD BE SUBJECT TO REGULAR VISUAL INSPECTION. IF THERE IS ANY EVIDENCE OF DAMAGE, PRESSURE LOSS OR CORROSION OF THE PRESSURE GAUGE OR OTHER DAMAGED COMPONENT, THE SYSTEM SUPPLIER MUST BE CONTACTED FOR REPAIR AND / OR CORRECT EXAMINATION.
THIS SYSTEM IS MADE UP OF PARTS TESTED WITHIN LIMITATIONS COVERED BY THE SUPPLIER'S MANUFACTURING MANUAL.
ALL OPERATIONS AND FILLED SHOULD BE CONDUCTED BY TRAINED AND COMPETENT PERSONNEL. REFER ONLY TO THE MANUFACTURER'S APPROVED PRODUCTS AND SUPPLIERS AND IN ACCORDANCE WITH THE SUPPLIER'S MANUFACTURING MANUAL.

WARNING
UNCONTROLLED RELEASE OF PRESSURE COULD RESULT IN PERSONAL INJURY OR DEATH TO OPERATORS OR BYSTANDERS. ENSURE SAFETY OUTLET CAP IS IN PLACE IF CONTAINER IS DISCONNECTED FROM PRESSURE CONTAINERS SHOULD NOT BE PORTIONED IN DIRECT SUNLIGHT.

WARNING
THIS IS A PRESSURIZED CONTAINER AND PART OF A FIRE SUPPRESSION SYSTEM. IT MUST NOT BE REPAIRED OR EXPOSED TO EXCESSIVE HEAT OR HEAVY IMPACT. SHOULD ANY ATTEMPT BE MADE TO REMOVE THE COVER, REMOVE BATTERY PLUGS OR PROTECTIVE DAMAGED, ONLY COMPETENT PERSONNEL WHO HAVE BEEN CORRECTLY TRAINED ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

CONTAINERS MUST BE KEPT UPRIGHT. NEVER EXPLODE IF HEATED. MAY EXPLODE IF HEATED AND UNDER PRESSURE. CONTACT SUPPLIER FOR REPAIR AND / OR CORRECT EXAMINATION. CONTACT SUPPLIER FOR REPAIR AND / OR CORRECT EXAMINATION. CONTACT SUPPLIER FOR REPAIR AND / OR CORRECT EXAMINATION. CONTACT SUPPLIER FOR REPAIR AND / OR CORRECT EXAMINATION.

THIS CONTAINER IS FILLED WITH HYGOOD 100 (DODGE CAP) WITH A METRIC PRESSURE GAUGE AND IS DESIGNED TO 10 BAR AT 20°C WITH AN OVERPRESSURE PROTECTION.

HYGOOD

Value Proposition

Customer Problem – End User

“I need to find a cost effective, reliable and environmentally friendly solutions to protect small electrical enclosures, without the need to release total flooding system. It is important to me that business continuity is maintained in an event of a fire.”

Features

- Self contained fire protection system
- Uses 3M Novec 1230
- Low pressure
- Cost effective
- Estimating tool
- Protect Electrical Enclosures up to 2m³
- Protect multiple enclosures with one system
- PED approved containers
- LPCB Certificated – LPS 1666
- Simple design
- Tube actuated detection
- Systems health monitoring
- UK manufactured
- High local concentrations

Benefits

- Integrated detection and agent release
- Environmentally safe
- Fast acting – applied direct to flame
- Ease of Handling
- Economical
- Quick and easy to design and price
- Complimentary to room protections systems
- European approved pressure vessel
- Approved system
- Suitable for ventilated enclosures
- Visual / Electrical indications of low pressure
- Established technology

Value Proposition Statement

A low cost, self contained fire protection system for small electrical enclosures to supplement total flooding systems

Marketing Plan

Marketing Objectives:

- **Increase sales and grow market share** in the Novec 1230 and Halocarbon markets
- **Promote SAPPHIRE COMPACT** as an integral part of the SAPPHIRE portfolio
- **Position SAPPHIRE COMPACT** into a new niche market for JCI

Marketing Strategy:

Create the push into the market by

- Educate sales/BD team on the F&B of SAPPHIRE COMPACT
- Deliver marketing support material in all brands
- Targeted marketing campaign to niche market

Create a pull from the market by

- Reaching out to end users, consultants and specifiers directly through integrated face-to-face programs as well as relevant media and advertising campaign

Marketing Tactics:

Strategy	Awareness	Educational	Customer contact	Sales & BD Support
Objectives	Educate the market, raise awareness	Provide educational content to raise interest	Generate sales leads by positioning SAPPHIRE COMPACT	Ensure Sales & BD are fully equipped to sell
Tactics	<ul style="list-style-type: none"> • Website • Social Media and Digital Strategy • PR & Media coverage • Video to download • Collaterals to download 	<ul style="list-style-type: none"> • Technical documentation to download • Marketing materials to download • Video • Training 	<ul style="list-style-type: none"> • Events: Webinars, Engineered Systems Distributor Conference EU&A • Exhibitions/shows • Seminars/Roadshows • Email campaign • Technical Training 	<ul style="list-style-type: none"> • Launch webinars (internal 13th Nov – EU&A, APAC, ME and LATAM) • Marketing collaterals • Sales presentation • Video

Thank You!

Q & A

