PROPOSED CLEAN AGENT (NOVEC1230) FIRE SUPPRESSION SYSTEM CATALOUGE

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SAPPHIRE SUPPRESSION SYSTEMS

Clean Chemical Agent Fire Suppression System

Introduction

Hygood SAPPHIRE Fire Suppression System delivering 3M™ Novec™ 1230 Fire Protection Fluid is an environmentally friendly clean agent system, and the solution of choice for protecting people and high value assets.

The Hygood **SAPPHIRE** Engineered System is an automatic, fixed nozzle, fire suppression system using 3M **Novec 1230** Fire Protection Fluid for Class A, B, and C fires. The system is designed and installed in accordance with the ISO 14520 or National Fire Protection Association (NFPA) Standard 2001, "Clean Agent Fire Extinguishing Systems."

It is listed by LPCB and Underwriters Laboratories, Inc. (UL) , Underwriters of Canada (ULC), and approved by Factory Mutual (FM).

The system is capable of automatic detection and actuation and/or remote manual actuation. The detection portion of the fire suppression system allows for automatic detection by means of the smoke detectors. Exposure to Novec1230 fluid at design concentrations up to 10% (NOAEL) is not hazardous to health. As with Halons, the EPA, LPCB and the National Fire Protection Association recommend that unnecessary exposure to any agent be avoided and that personnel evacuate protected areas as quickly as possible to avoid the decomposition products of the fire.

The system is installed and serviced by authorised distributors that are trained by the manufacturer.

The SAPPHIRE Engineered Clean Agent Fire Suppression System is particularly useful for suppressing fires in hazards where an electrically nonconductive medium is essential or desirable; where clean up of other agents present a problem; or where the hazard is normally occupied and requires a non-toxic agent.

The basic system consists of extinguishing agent stored in steel containers. Various types of actuators, pneumatic and electric, are available for release of agent into the hazard area. The agent is distributed and discharged into the hazard area through a network of pipe and a nozzle.

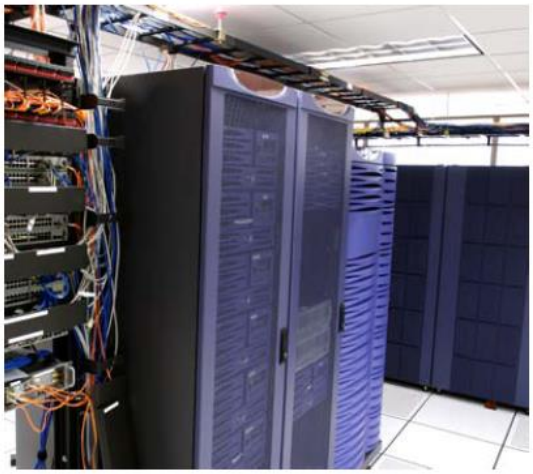
Application

The SAPPHIRE™ Engineered System utilises 3M™ Novec™ 1230 Fire Protection Fluid as the suppression agent. Novec 1230 fluid can effectively be applied in total flooding fire suppression applications in the following areas:

Data Processing Centres

- Tape Storage
- Vaults
- Telecommunications including Cellular
- All normally occupied or unoccupied electronic
- areas where equipment is either very sensitive or Irreplaceable sites and Switching Centres
- Military Systems including Combat Vehicles and Marine Engine Rooms
- Transportation including Merchant Marine Vessels and Mass Transit Vehicles Recreation including Pleasure Craft and Race Cars





Features

- UL/ULC Listed
- FM Approved
- LPCB Approved
- Effective Total Flooding on Class A, B,and C Fires
- Clean Agent Suitable for Protection of High Value Assets
- Long-Term, Sustainable Alternative To Halon, HFCs and PFCs

Environmental

The SAPPHIRE Clean Agent Fire Suppression System utilises 3M Novec1230 Fire Protection Fluid. This fluid has a zero ozone depletion potential, an atmospheric lifetime of just five days, and

a global warming potential of 1.0.

Novec 1230 fluid is registered with the U.S. EPA under TSCA and European ELINCS. It has met the requirements of registration under SNAP (Significant New Alternatives Policy) and is approved for use as an alternative to Halon 1301 for total flooding applications in occupied spaces.

Properties	Novec 1230	HFC 125	HFC 23	HFC-227ea
Ozone depletion potential (ODP)	0	0	0	0
Global warming potential	1	3,500	14,800	3,220
Atmospheric lifetime (years)	0.014	29	270	24.2
SNAP*	Yes	Yes	Yes	Yes

*SNAP - Significant New Alternatives Policy (US EPA) Environmental data from 4th Assessment report of IPCC 2007 and EPA's tables of ozone depleting substances

2. SAPPHIRE NOVEC-1230 GASEOUS FIRE SUPPRESSION SYSTEM DEVICES

System Components

This section describes the individual components that comprise a complete system. Some items are optional depending on the application, and are indicated as such.

SAPPHIRE® Container

The container assembly consists of a container fitted with a valve and internal syphon tube, factory filled with NOVEC™ 1230, and super-pressurised with dry nitrogen to 25 bar @ 21 °C (360 psi @ 70 °F).

Figure 1 - SAPPHIRE® Container

Containers sharing the same manifold shall be equal in size and fill density. Containers are finished in red and are available in various sizes.

Technical Information

The 4.5, 8, 16, 32, 52, 106, 147 and 180 litre containers are manufactured in accordance with DOT 4BW500 or 4BW450, and the 343 litre container in accordance with DOT 4BW450.

Material:	**Carbon Steel**
4BW500Hydraulic test pressure:	**69.0 bar (1000 psi)**
Working Pressure:	**34.5 bar (500 psi)**
4BW450Hydraulic test pressure:	**62.1 bar (900 psi)**
Working Pressure:	**31.0 bar (450 psi)**
Paint Specification:	**Red epoxy polyester or red polyester powder coated**

DOT Container details.

Part No. (Nominal Volume)	Minimum and Maximum Fills kg	(lbs)	Valve Size mm	(in)	Height from floor to outlet (nominal) mm	(in)	Diameter mm	(in)	Nominal Tare Weight kg	(lbs)
303.207.010 (4.5 litre)	2.3 to 5.4	(5 to 11)	25	(1")	280	(11")	178	(7")	7.7	(17)
303.207.001 (8 litre)	4.0 to 9.6	(9 to 21)	25	(1")	304	(12")	254	(10")	14.8	(32.6)
303.207.002 (16 litre)	8.0 to 19.2	(18 to 42)	25	(1")	502	(19.8")	254	(10")	18.4	(40.6)
303.207.003 (32 litre)	16.0 to 38.4	(36 to 84)	25	(1")	833	(32.8")	254	(10")	26.1	(57.5)
303.207.004 (52 litre)	26.0 to 62.4	(58 to 137)	50	(2")	596	(23.5")	406	(16")	49.1	(108.3)
303.207.005 (106 litre)	53.0 to 127.2	(117 to 280)	50	(2")	1021	(40.2")	406	(16")	71.8	(158.3)
303.207.006 (147 litre)	73.5 to 176.4	(163 to 388)	50	(2")	1354	(53.3")	406	(16")	89.9	(198.2)
303.207.007 (180 litre)	90.0 to 208	(199 to 459)	50	(2")	1634	(64.3")	406	(16")	105.8	(233.2)
303.207.008 (343 litre)	171.5 to 386	(379 to 851)	80	(3")	1466	(57.7")	610	(24")	207	(456)

Valve Assembly

The container valve is the result of extensive research and development and incorporates many unique safety features. The valve assembly is factory-fitted to the container and is supplied pre-assembled with a low pressure switch (to be ordered separately), pressure gauge and burst disc.

Figure 3 - Valve Assembly

25 mm (1”) Valve Assembly Part No. 302.209.001

50 mm (2”) Valve Assembly Part No. 302.209.002

80 mm (3”) Valve Assembly Part No. 302.207.009

Technical Information

25 mm (1”) Valve

Body Material:	Brass CZ 121
Outlet Anti-Recoil Cap Material:	CZ122
Max. Working Pressure:	34 bar (493 psi)
Outlet:	25mm (1” BSPP)
Low Pressure Switch Port:	1/8” NPT
Gauge Port:	1/8” NPT
Pilot Pressure Port:	1/4” BSPP
Solenoid Adaptor Port:	1/8” NPT
Overall Size:	130mm x 62mm
Weight:	2.96 kg / 6.526 lbs

50 mm (2”) Valve

Body Material:	Brass CZ 121
Outlet Anti-Recoil Cap Material:	CZ122
Max. Working Pressure:	34 bar (493 psi)
Outlet:	50mm (2” BSPP)
Low Pressure Switch Port:	1/8” NPT
Gauge Port:	1/8” NPT
Pilot Pressure Port:	1/4” BSPP
Solenoid Adaptor Port:	1/8” NPT
Overall Size:	173mm x 100mm
Weight:	9.18 kg / 20.238 lbs

80 mm (3”) Valve

Body Material:	Brass CZ 121
Outlet Anti-Recoil Cap Material:	Brass UNS36000
Max. Working Pressure:	34 bar (493 psi)
Outlet:	80mm (3” Flared*)
Low Pressure Switch Port:	1/8” NPT
Gauge Port:	1/8” NPT
Pilot Pressure Port:	1/4” BSPP
Solenoid Adaptor Port:	None
Overall Size:	241mm x 129mm
Weight:	18.82 kg / 41.491 lbs

Principle of Operation

The SAPPHIRE® valve is a high-flow-rate device specially designed for use in fire systems. Operation is by means of a pressure-differential piston. Container pressure is used within the valve to create a positive force on the piston, sealing the valve closed.

Operation of the valve occurs when the upper chamber is vented faster than the 'make up device' in the shuttle can replace the pressure. Thereby allowing the shuttle to be forced up, and free flow of NOVEC™ 1230 from the valve. Upper chamber pressure is released by the electrical, mechanical or pneumatic actuator.

The valve incorporates the following features:

- A pressure operated safety release device (burst disc).
- Main outlet, fitted with anti-recoil cap.
- A connection for a pneumatic, mechanical or electrical actuator, fitted with safety cap.
- A connection for an electrical solenoid.
- A connection for the pneumatic actuation port.

Burst Disc

A burst disc is factory fitted to every valve assembly. It is designed to rupture when the container becomes over pressurised when subjected to temperatures above the designed storage temperature of the container.

Figure 4 - Burst Disc

Burst Disc for 25 mm (1”) Valve
Part No. 20915

Burst Disc for 50 mm (2”) Valve
Part No. 20915

Burst Disc for 80 mm (3”) Valve
Part No. 15330

Technical Information

25 mm (1”) Valve & 50 mm (2”) Valve

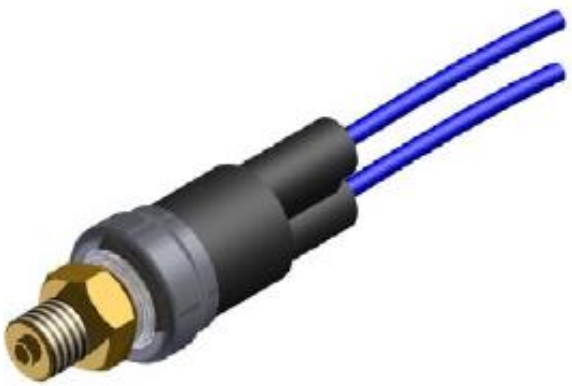
Body:	Brass CZ 121
Rating:	53.4 bar (774.5 psi) @ 50 °C
Thread:	M18 x 1.00
Hole	90° to Body
Orientation:	35 Nm (25.8 lbs.ft)
Torque:	20mm (L) x 18mm (Dia)
Overall Size:	0.028 kg / 0.062 lbs
Weight:	

80 mm (3”) Valve

Body:	Brass UNS-C36000
Rating:	52 bar (760 psi) @ 50 °C
Thread:	0.9375-16UN-3A
Hole	90° to Body
Orientation:	68 Nm (50 lbs.ft)
Torque:	33.3mm (L) x 18mm (Dia)
Overall Size:	0.088 kg / 0.195 lbs
Weight:	

Low Pressure Switch (Optional)

A low pressure warning switch is fitted to every container and must be ordered separately. The device continuously monitors the container pressure and in the event of the pressure dropping below 20 bar (290 psi) the switch operates to enable the condition to be signalled to a control unit.



Low Pressure Switch (Close On Fall)
(Part No. 305.209.005)

Low Pressure Switch (Open On Fall)
(Part No. 305.209.006)

Technical Information

Body:	Hermetically sealed Stainless Steel
Switch Type:	Normally Open at Atmospheric Pressure
Switch Point (Open on Fall):	Open on Fall at 20 bar (290 psi) Close on Rise at 24.1 bar (350 psi)
Switch Point (Close on Fall):	Close on Fall at 20 bar (290 psi) Open on Rise at 24.1 bar (350 psi)
Tolerance:	+/-0.7 bar (± 10 psi)
Proof Pressure:	345 bar (5003 psi)
Electrical Housing:	Epoxy Sealed terminals
Connection:	Brass 1/8” NPT
Max. Current:	Max 2.9 A
Voltage Range:	5-28 v dc
Electrical Connection:	0.9m (3ft) x 2 Core Cable
Certification:	UL Recognised
IP Rating:	IP65
Wire Leads:	1.82 m (6 ft)
Overall Size:	38mm (L) x 16mm (Dia)(1.50” (L) x 0.63” (Dia))
Weight:	0.087 kg (0.192 lbs)

Fixing Brackets

The bracket assembly consists of one back channel and two nuts and bolts with a bracket. To securely hold the container in position during the system discharge, Min. one bracket assemblies are required per container.

Each strap is notched for insertion into the back channel allowing the container to be properly aligned. The bracket assembly is designed to be mounted to a rigid vertical surface with the container assembly resting fully on the floor.

Figure 9 - Fixing Bracket (Strap Style)

Technical Information

Material:	Mild Steel	
Coating:	Silver Paint	
Mounting:	Unistrut Channel	
Weight:	0.34 kg (0.75 lbs) (Part No. 311.205.020)	4.5 litre Cylinder
	0.30 kg (0.66 lbs) (Part No. 311.205.013)	8, 16, 32 litre Cylinder
	0.46 kg (1.01 lbs) (Part No. 311.205.014)	52, 106, 147, 180 litre Cylinder
	0.71 kg (1.56 lbs) (Part No. 311.205.019)	343 litre Cylinder

Manual Actuator

The manual actuator is used to mechanically operate the system at the container position and is fitted to the top of the valve assembly or removable electrical actuator. Inadvertent operation is prevented by a safety clip which has to be removed before activation.

Figure 10 - Manual Actuator (Part No. 304.209.002)

Technical Information

Body:	Brass CZ 121
Actuation Pin:	Stainless Steel
Knob:	PVC (Colour: Red)
Safety Pin:	Stainless Steel 303
Piston Rod:	Brass CZ 121
Min. Actuation Force:	25.5 N (5.73 lbf)
Overall Size:	52mm (L) x 41.5mm (Dia)(2.05” (L) x 1.63” (Dia))
Weight:	0.265 kg (0.584 lbs)

Pneumatic Actuator

The pneumatic actuator is used to pneumatically operate the system at the container position and is fitted to the top of the valve assembly or removable electrical actuator. Pressure from a 'master' container is used to actuate the valve, via small bore piping or a flexible hose.

Figure 11 - Pneumatic Actuator (Part No. 304.209.004)

Technical Information

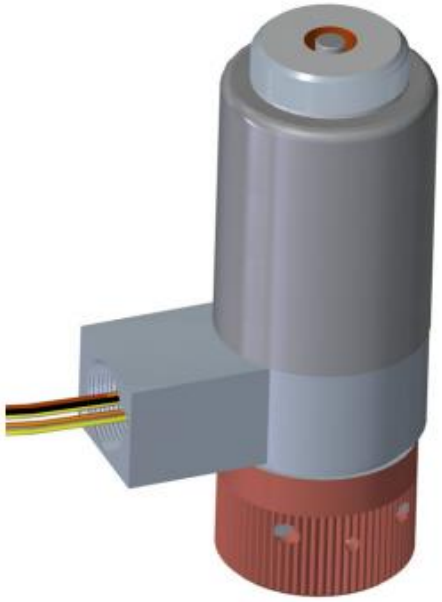
Body:	Brass CZ 121
Actuation Pin:	Stainless Steel
Piston Rod:	Brass CZ 121
Pipe connection:	1/4" NPT Female
Min. Actuation Pressure:	4 bar (58 psi)
Min. Actuation Pressure:	75 bar (58 psi)
Piston Rod:	Brass CZ 121
Min. Actuation Force:	25.5 N (5.73 lbf)
Overall Size:	48mm (L) x 41.5mm (Dia)
Weight:	0.228 kg (0.503lbs)

Electrical Actuator

The electrical actuator electrically operates the system's master container. The electrical actuator is fitted with an internal placement switch to provide a fault indication at the panel if incorrectly fitted. A manual, manual-pneumatic, pneumatic, or CPM actuator fits on top of the electrical actuator.

The reset tool is attached to the actuator.

Note: If no additional actuator is fitted to the top of the electrical actuator, the protection cap must remain in place.



Location on system

The electrical actuator is installed to the top of the container valve.

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Technical information

Body:	Mild steel and dull nickel
Body finish:	Electroless nickel plate
Actuation pin:	Stainless steel
Loose nut:	Brass CZ121 (CW614N)
Actuation type:	Latching
Reset requirement:	Manually with reset tool supplied
Connection:	1 in. BSPP
Nominal voltage:	24 VDC
Minimum firing voltage:	CE 20.5 VDC UL 864 65% of nominal voltage (15.6 VDC)
Minimum current:	0.32 A
Nominal current:	0.43 A
Maximum current:	0.54 A
Maximum monitoring current:	30 mA
Minimum duration of trigger signal:	1 s
Duty:	Continuous
Manual actuation force:	50 N (11.00 lbf)
Nominal pin travel:	4.57 mm (0.18 in.)
Electrical connection:	1/2 in. NPT Female conduit with inbuilt bridge rectifier
Back EMF protection:	Bridge rectifier
Working temperature range:	-20 °C to 50 °C (-4 °F to 122 °F) (CE) -18 °C to 54 °C (0 °F to 130 °F) (UL and FM)

Life span:	25 years
Testing:	100% check on start / finish position
Maximum humidity:	80% to 90% RH non-condensing
Ingress Protection class:	IP54
Approvals and listings:	UL, FM, and CE
Certification:	EN 12094-4
CE certification number:	0832-CPR-S0072 2831-CPR-S0072
Year of CE marking:	2019 (304205030) 2020 (304205040)
CE marking requirements:	Manufacturer's mark, part number, serial number, 24 VDC , 0.90 A, CE_{0832} or CE_{2831}
Method of marking:	Laser or engraved
Overall size:	132 mm (L) x 73 mm (W) (5.19 in. (L) x 2.87 in. (W))
Weight:	1 kg (2.2 lb)
Actuation force / PIN travel:	Minimum 66.4 N at 1 mm from unactivated Minimum 60.7 N at 2 mm from unactivated Minimum 55.0 N at 3 mm from unactivated Minimum 49.3 N at 4 mm from unactivated

DISCHARGE PRESSURE SWITCH

The discharge pressure switch activates from agent pressure during discharge and signals to a control panel that the system discharged. The discharge pressure switch latches on operation and contains a reset plunger.

The discharge pressure switch ordered under part number 437900 is supplied with a 3/8 in. NPT Male x 1/4 in. NPT Female adaptor. To connect to an actuation hose, use a 1/4 in. NPT x 1/4 in. BSPP Male adaptor (Part number 309.013.006).

Technical information

Switch case and cover:	C.R. steel (painted red)
Body:	C37700 forged brass
Switch point:	2.8 bar rising (40 psi)
Tolerance:	± 0.7 bar (± 10 psi)
IP rating:	IP65
Electrical connection:	1/2 in. and 3/4 in. conduit knockouts with #6-32 UNC terminal screws
Pressure connection:	3/8 in. NPT Female
Adaptor:	3/8 in. NPT Male x 1/4 in. NPT Female
Range:	1 bar to 3 bar
Reset method:	Manual through plunger
Minimum actuation pressure:	3.4 bar (50 psi)
Maximum operating pressure:	200 bar (2900 psi)
Electrical ratings:	10 A 250 VAC 15 A 125 VAC 3/4HP, 250 VAC 1-, 2-, or 3-phase
Switch configuration:	Three pole, double throw (3PDT)
Installation environment:	Indoor / non-corrosive
Working temperature range:	-20 °C to 50 °C (-4 °F to 122 °F) (LPCB) -18 °C to 65 °C (0 °F to 149 °F) (UL / FM)
Conformity:	EN 12094-10
Marking requirements:	Manufacturer's mark, part number, maximum working pressure, serial number
Method of marking:	Permanent, non-flammable
Overall size:	114 mm (L) x 114 mm (H) x 67 mm (W) (4.49 in. (L) x 4.49 in. (H) x 2.64 in. (W))
Weight:	1.0 kg (2.20 lb)
Approvals and listings:	LPCB (Part number 305.209.009) UL / FM (Part number 437900)

Discharge Nozzle

NOVEC™ 1230 is distributed within the protected area by the discharge nozzle which is sized to ensure the correct flow of agent for the risk. Nozzles are available with seven or sixteen ports to allow for 180° or 360° horizontal discharge patterns. Ports are drilled in 0.1 mm (0.004 in) increments to the specified system design. Nozzles are supplied as standard in Brass NPT.

Figure 30 - 7 & 16 Port Nozzle Brass Configuration

Technical Information

Material:	Brass / Stainless Steel
Thread Type:	BSPP / NPT
Drill Incrimination:	0.1 mm
Nozzle Type:	16 Port 360° / 7 Port 180°
Max. Agent per Nozzle:	100 kg (220 lbs)
Orientation:	Pendant / Upright

Nozzle Weights

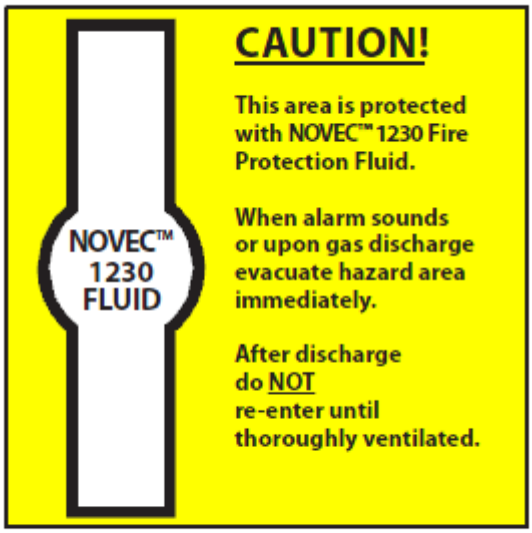
Nozzle Size	Brass
15 mm (1/2")	0.16 kg (0.35 lbs)
20 mm (3/4")	0.22kg (0.49 lbs)
25 mm (1")	0.28 kg (0.62 lbs)
32 mm (1¼")	0.42 kg (0.93 lbs)
40 mm (1½")	0.47 kg (1.04 lbs)
50 mm (2")	0.84kg (1.85 lbs)

Nozzle Overall Sizes

Nozzle Size	Length	Diameter
15 mm (1/2")	41 mm (1.61")	47.6 mm (1.87")
20 mm (3/4")	47 mm (1.85")	53.1 mm (2.09")
25 mm (1")	52 mm (2.05")	58.9 mm (2.32")
32 mm (1¼")	63.1 mm (2.48")	66.5 mm (2.62")
40 mm (1½")	68 mm (2.68")	72.9 mm (2.87")
50 mm (2")	89 mm (3.50")	88.9 mm (3.50")

Door Notice

A door notice is required at each entrance to the risk to advise personnel that they are entering a protected area.



For areas protected by concentrations less than NOAEL (Part No. 314.207.001).

Technical Information

Material:	2 mm (0.08”) Craylon
Finish	Gloss, scratch resistant
Overall Size:	210mm (L) x 210mm (W)
Weight:	0.025 kg (0.055 lbs)