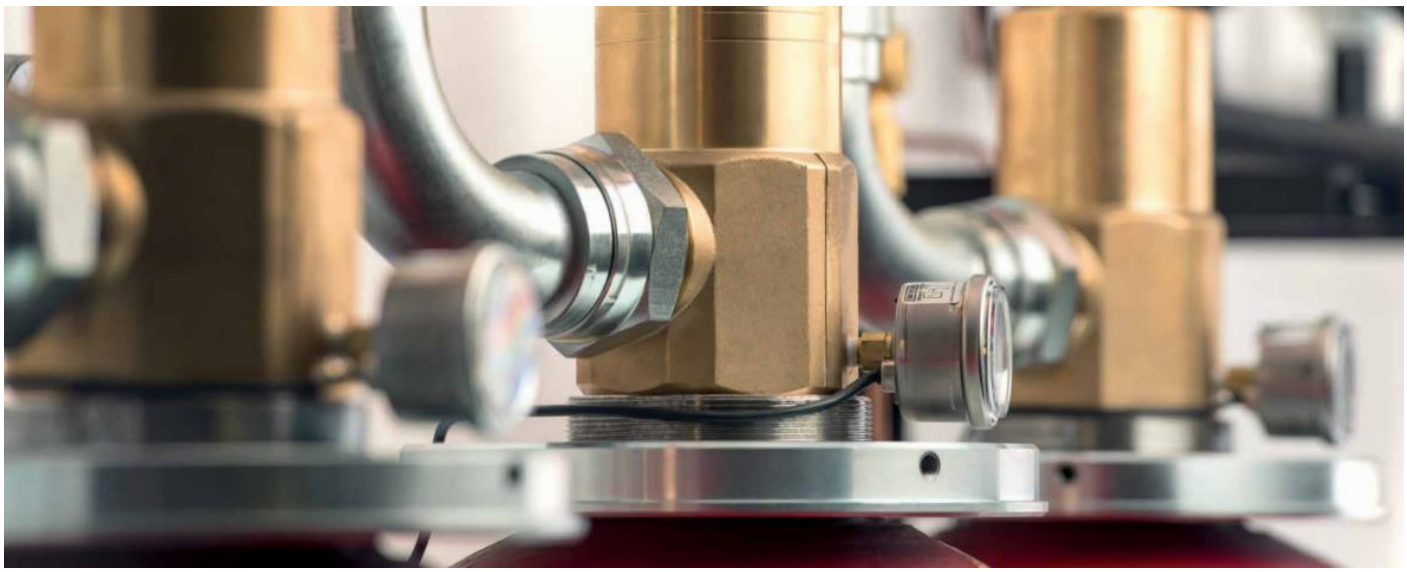


SAPPHIRE PLUS GASEOUS FIRE SUPPRESSION SYSTEM COMPONENTS

SAPPHIRE PLUS
suppression systems

Clean Chemical Agent Fire Suppression System

Introduction

HYGOOD SAPPHIRE® Fire Suppression Systems delivering 3M™ Novec™ 1230 Fire Protection Fluid or FK5112 Agent is a safe, environmentally friendly clean agent that instantly vaporizes upon discharge, absorbing heat and providing total flooding of protected spaces.

SAPPHIRE PLUS is a 70 bar system, which helps reduce the footprint, installation and service time by offering higher fill densities up to 1.4kg/L to reduce the number of containers. The increased pressure also permits the containers to be located much further from the protected space and increases the ability to introduce selector valves to protect multiple hazards from a single container bank. Additionally, pipe sizes may be reduced increasing the economy and design flexibility.

The SAPPHIRE system has a proven track record for protecting people, the environment and high value assets. This clean agent system is custom engineered to quickly suppress fires without causing harm and where clean-up of other agents poses a problem.

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.

SAPPHIRE systems work fast, delivering the agent within 6 to 10 seconds, suppressing fires before they have the chance to spread. Most importantly, when a fire is suppressed quickly, the result is less damage, lower refurbishment costs and reduced downtime

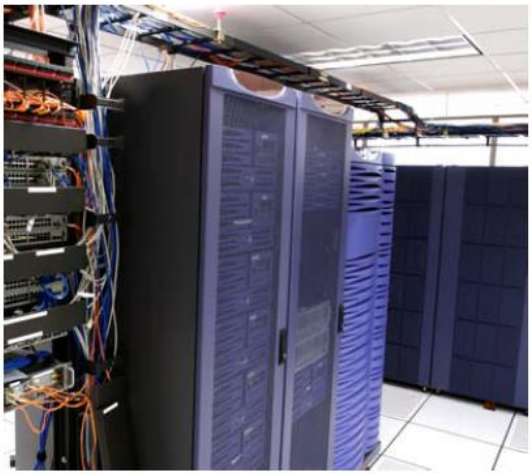
Application

The SAPPHIRE™ Engineered System utilises 3M™ Novec™ 1230 Fire Protection Fluid or FK5112 Agent as the suppression agent. Novec 1230 fluid or FK5112 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



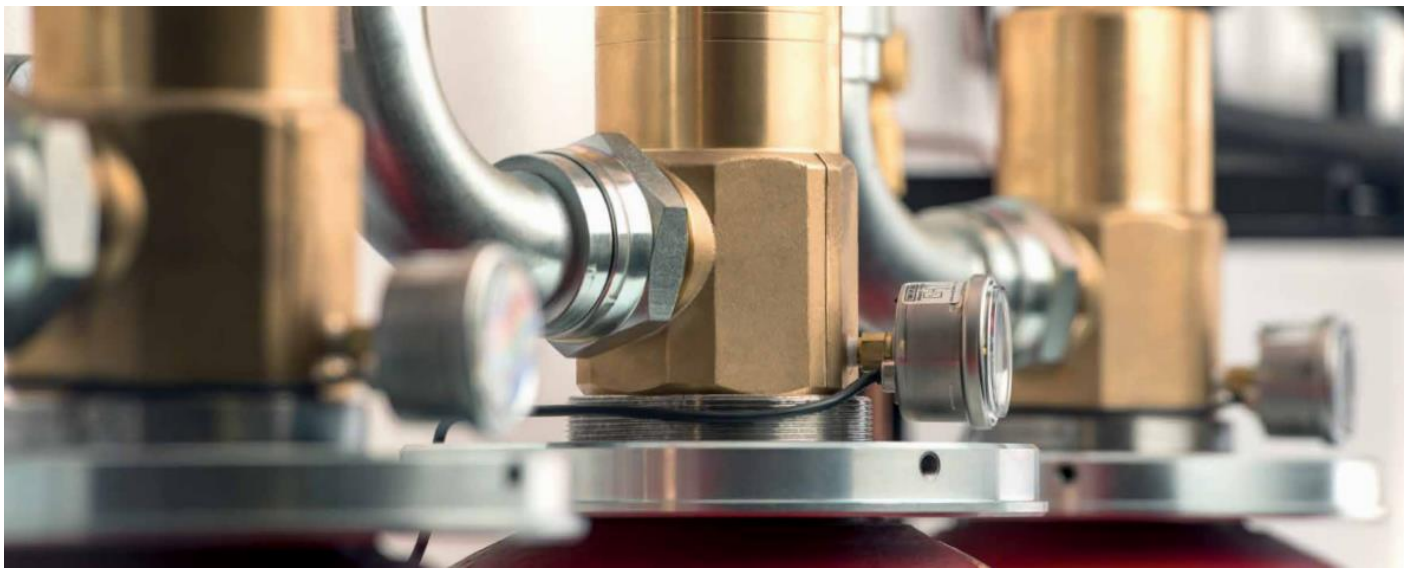


Features

- 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 plus Clean Agent Fire Suppression System utilises 3M Novec1230 Fire Protection Fluid or FK5112 . This fluid has a zero ozone depletion potential, an atmospheric lifetime of just five days, and a global warming potential of 1.0.



1. SAPPHIRE NOVEC-1230 GASEOUS FIRE SUPPRESSION SYSTEM DEVICES

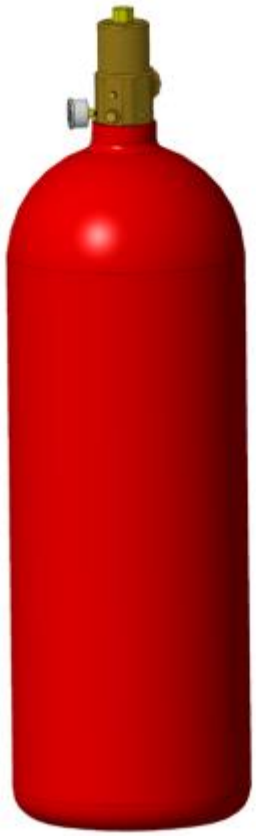
System Components

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

AGENT CONTAINER AND VALVE ASSEMBLY

The container assembly consists of a container fitted with a valve and internal siphon tube, factory filled with Novec 1230 fluid, and super-pressurized with dry nitrogen to 70 bar at 20 °C (1015 psi at 68 °F). TPED, DOT/TPED, or PESO recognized containers sharing the same manifold shall be equal in size and fill density.

The containers are finished in red and are available in various sizes. A nameplate is mounted to the container displaying the valve and container assembly part number, agent weight, tare weight, gross weight (including nitrogen), fill density, fill date, and fill location.



Technical Information

Nominal working pressure:	70 bar at 20 °C (1015 psi at 68 °F)
Maximum system pressure:	102.3 bar (1484 psi) at 50 °C (122 °F)
	89.0 bar (1291 psi) at 65 °C (149 °F)
Maximum fill density:	1.40 kg / L (87.4 lb / ft^3) at 50 °C (122 °F)
	1.35 kg / L (84.3 lb / ft^3) at 65 °C (149 °F)
Minimum fill density:	0.3 kg / L (18.7 lb / ft^3)
Temperature rating:	-20 °C to 50 °C (-4 °F to 122 °F) (LPCB)
	-18 °C to 50 °C (0 °F to 122 °F) (UL / FM)
	0 °C to 65 °C (32 °F to 149 °F) (UL / FM)

TPED and DOT/TPED container technical information

The containers are manufactured in accordance with ISO 9809-1 and ISO 9809-2 as applicable, and are stamped π and USA for TPED and DOT approval respectively.

Hydraulic test pressure:	200 bar (2900 psi)
Maximum service pressure:	120 bar (1740 psi)
Material:	Carbon steel

Part Number	Nominal Size L (lb)	Pressure Gauge Type	Temp. °C (°F)	Fill Density Min. kg/L (lb/ft³)	Fill Density Max. kg/L (lb/ft³)	Minimum and Maximum Fills (Weight) Min. kg (lb)	Minimum and Maximum Fills (Weight) Max. kg (lb)	Valve Size mm (in.)	Height from Floor to Outlet (Nom.) mm (in.)	Dia. mm (in.)	Nominal Tare Weight kg (lb)	Nominal Gross Wgt. at Max. Fill Density excluding N_2 kg (lb)
303700013	15 (50)	PG	65 (149)	0.3 (18.7)	1.35 (84.3)	4.5 (10)	20.3 (44)	25 (1.0)	694 (27.3)	204 (8.0)	29.3 (64.6)	49.6 (108.6)
303700019		CPG										
303700014	30 (100)	PG	65 (149)	0.3 (18.7)	1.35 (84.3)	9 (20)	41 (89)	25 (1.0)	972 (38.3)	229 (9.0)	38.8 (85.5)	79.3 (174.5)
303700020		CPG										
303700015	45 (140)	PG	65 (149)	0.3 (18.7)	1.35 (84.3)	14 (30)	60.8 (133)	25 (1.0)	1071 (42.2)	267 (10.5)	60.4 (133.2)	121.2 (266.2)
303700021		CPG										
303700016	60 (190)	PG	65 (149)	0.3 (18.7)	1.35 (84.3)	18 (40)	81 (178)	50 (2.0)	1425 (56.1)	267 (10.5)	80.1 (176.6)	161.1 (354.6)
303700022		CPG										
303700017	120 (370)	PG	65 (149)	0.3 (18.7)	1.35 (84.3)	36 (80)	162 (357)	50 (2.0)	1546 (60.9)	360 (14.1)	140.6 (310.0)	302.6 (667)
303700023		CPG										
303700018	180 (560)	PG	65 (149)	0.3 (18.7)	1.35 (84.3)	54 (120)	243 (535)	50 (2.0)	1783 (70.2)	406 (15.9)	214.8 (473.6)	457.8 (1008.6)
303700024		CPG										

Container Details Table.

Container Description	Coating System	Color
15 L Seamless	Wet paint system - Epoxy primer, acryl-poly-urethane top coat	Red body (RAL3000)
30 L Seamless		
45 L Seamless	Powder paint system – Akzo nobel D1036	
60 L Seamless		
120 L Seamless		
150 L Seamless		
180 L Seamless		

Container Paint Details Table.

Valve Assembly

The valve assembly is factory-fitted to the container and is supplied pre-assembled with a pressure gauge or contacted pressure gauge. A replacement valve assembly is available. The 25 mm (1 in.) and 50 mm (2 in.) valve assemblies are supplied with a plug in the pressure gauge port.

The replacement pressure gauge (Part number 302700003) and the replacement contacted pressure gauge (Part number 302700004) must be ordered separately. The replacement valve is 100% leak tested before it leaves the factory.

Figure 3 - Valve Assembly

Location on system

The valve assembly connects to the container

Technical Information

Valve size:	25 mm (1 in.) Valve	50 mm (2 in.) Valve
Part number:	302700001	302700002
Body material:	Brass CZ122	Brass CZ122
Thread type:	2 in. 8UN	3 1/4 in. 8UN
Outlet connection:	1 in. BSPP	2 in. BSPP
Outlet safety cap material:	Brass CZ121	Brass CZ121
Maximum working pressure:	120 bar (1740 psi)	120 bar (1740 psi)
Maximum system pressure:	102.3 bar at 50 °C (1484 psi at 122 °F) at 1.4 kg/L (87.4 lb/ft^3) 89 bar at 65 °C (1291 psi at 149 °F) at 1.35 kg/L (84.3 lb/ft^3)	102.3 bar at 50 °C (1484 psi at 122 °F) at 1.4 kg/L (87.4 lb/ft^3) 89 bar at 65 °C (1291 psi at 149 °F) at 1.35 kg/L (84.3 lb/ft^3)
Test pressure:	180 bar (2610 psi)	180 bar (2610 psi)
Free flow cross sectional area:	507 mm² (0.78 in.²)	1810 mm² (2.8 in.²)
Equivalent length:	6.096 m (20 ft)	10.668 m (35 ft)
Syphon tube:	Rigid straight	Rigid straight
Minimum actuation force:	76 N (17.09 lb_f)	76 N (17.09 lb_f)
Burst disc rating:	180 bar ± 5% at 50 °C (2611 psi ± 5% at 122 °F)	180 bar ± 5% at 50 °C (2611 psi ± 5% at 122 °F)
Burst disc port:	M18 x 1.0	M18 x 1.0
Low pressure port:	1/8 in. NPT (plugged off)	1/8 in. NPT (plugged off)
Gauge port:	1/8 in. NPT	1/8 in. NPT
Pilot pressure port:	1/4 in. BSPP	1/4 in. BSPP
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)	-20 °C to 50 °C (-4 °F to 122 °F) (LPCB) -18 °C to 65 °C (0 °F to 149 °F) (UL / FM)
Weight:	3.36 kg (7.40 lb)	8.74 kg (19.27 lb)
Approvals and listings:	LPCB / UL / FM	LPCB / UL / FM
Certification:	EN 12094-4	EN 12094-4
CE certification number:	0832-CPR-S0072	0832-CPR-S0072
Year of CE marking:	2018	2018
CE marking requirements:	Manufacturer's mark, part number, DN25, serial number, CE_{0832}	Manufacturer's mark, part number, DN50, serial number, CE_{0832}
Method of marking:	Laser or engraved	Laser or engraved
Valve type:	Type 2	Type 2
Overall size:	157 mm x 100 mm (6.18 in. x 3.94 in.)	211 mm x 130 mm (8.31 in. x 5.12 in.)

Principle of Operation

The SAPPHIRE Plus® 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 with safety cap.
- A connection for an electrical solenoid.
- A connection for the pneumatic actuation port.

Burst Disc

Each valve incorporates a safety burst disc assembly. It is designed to relieve pressure if the container becomes over pressurized when subjected to temperatures above the designed storage temperature of the container. Both burst discs can be used on either the 1 in. (25 mm) valve or the 2 in. (50 mm) valve.

Part Number	Description
26140	M18 180 bar burst disc (WEHBERG*)
26141	M18 180 bar burst disc (MATRIX*)

Technical Information

Valve size:	25 mm (1 in.) and 50 mm (2 in.) Valve	25 mm (1 in.) and 50 mm (2 in.) Valve
Part number:	26141 (MATRIX)	26140 (WEHBERG)
Body material:	Brass	Brass
Rating:	180 bar ± 5% at 50 °C (2611 psi ± 5% at 122 °F)	180 bar ± 5% at 50 °C (2611 psi ± 5% at 122 °F)
Thread:	M18 x 1.00	M18 x 1.00
Hole orientation:	90° to Body	90° to Body
Torque:	35 N•m (25.8 ft-lb)	35 N•m (25.8 ft-lb)
Working temperature range:	-20 °C to 50 °C (-4 °F to 122 °F) (LPCB)	-20 °C to 50 °C (-4 °F to 122 °F) (LPCB)
	-18 °C to 65 °C (0 °F to 149 °F) (UL / FM)	-18 °C to 65 °C (0 °F to 149 °F) (UL / FM)
Overall size:	20 mm (L) x 18 mm (Dia) (0.79 in. (L) x 0.71 in. (Dia))	20 mm (L) x 18 mm (Dia) (0.79 in. (L) x 0.71 in. (Dia))
Weight:	0.028 kg (0.062 lb)	0.028 kg (0.062 lb)

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)

Fixing Brackets

The bracket assembly consists of a nut and bolt with two bracket half straps and a back channel of UNISTRUT*, Series P1000T 41 mm x 41 mm (1.6 in. x 1.6 in.), to securely hold the container in position. Each container requires two bracket assemblies.

Each strap is notched for insertion into the back channel allowing for the proper alignment of the container. The bracket assembly mounts to a rigid vertical surface with the container assembly resting fully on the floor.

Container bracket assemblies are available for single containers (Part numbers 311700002 to 311700006) and for multi-containers (Part numbers 311700007 to 311700012).

Technical Information

Material:	Stainless steel 316
Mounting:	UNISTRUT channel

Part Number	Description	Nominal Container Size L (lb)	Container Diameter mm (in.)	Weight kg (lb)
311700002	Container bracket	15 (50)	204 (8)	1.67 (5.50)
311700003	Container bracket	30 (100)	229 (9)	1.72 (3.80)
311700004	Container bracket	34 (110), 45 (140), 60 (190), 80 (250)	267 (11)	1.78 (3.92)
311700005	Container bracket	120 (370), 150 (470)	360 (14)	2.43 (5.36)
311700006	Container bracket	180 (560), 120 (370) (PESO)	406 (16)	2.50 (5.51)
311700007	Multi-container bracket assembly x 4 containers	120 (370), 150 (470)	360 (14)	9.62 (21.20)
311700008	Multi-container bracket assembly x 6 containers	120 (370), 150 (470)	360 (14)	13.66 (30.12)
311700009	Multi-container bracket assembly x 8 containers	120 (370), 150 (470)	360 (14)	17.78 (39.20)
311700010	Multi-container bracket assembly x 4 containers	180 (560), 120 (370) (PESO)	406 (16)	9.85 (21.70)
311700011	Multi-container bracket assembly x 6 containers	180 (560), 120 (370) (PESO)	406 (16)	14.11 (31.10)
311700012	Multi-container bracket assembly x 8 containers	180 (560), 120 (370) (PESO)	406 (16)	18.19 (40.10)

Manual Actuator

The manual actuator operates the system's master container. The actuator may be fitted to the top of the valve assembly or electrical actuator. A safety clip prevents inadvertent operation which is 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) 75 bar (58 psi)
Min. Actuation Pressure:	
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

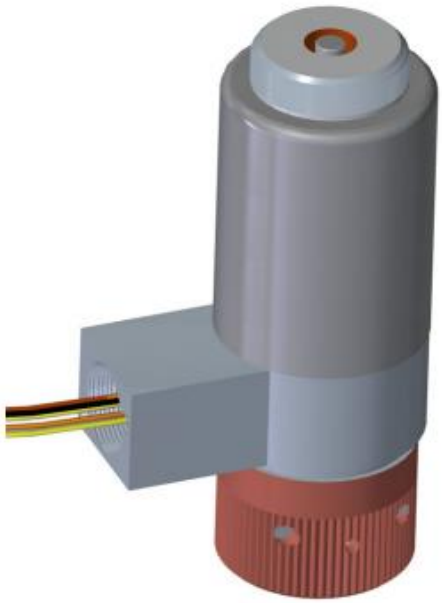
The electrical actuator electrically operates the system's master container. The electrical actuator is fitted with an internal placement switch to provide a fault indication at the panel if incorrectly fitted. A manual, manual-pneumatic, pneumatic, or CPM actuator fits on top of the electrical actuator.

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.



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)

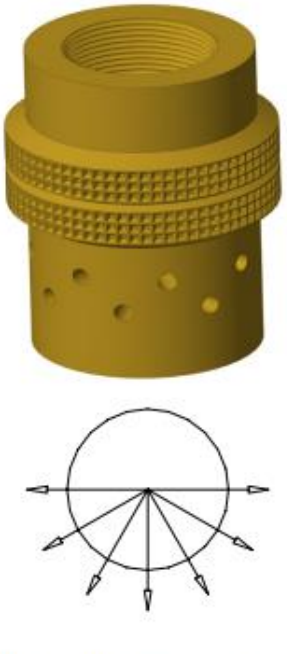
Life span:	25 years
Testing:	100% check on start / finish position
Maximum humidity:	80% to 90% RH non-condensing
Ingress Protection class:	IP54
Approvals and listings:	UL, FM, and CE
Certification:	EN 12094-4
CE certification number:	0832-CPR-S0072 2831-CPR-S0072
Year of CE marking:	2019 (304205030) 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 Nozzle

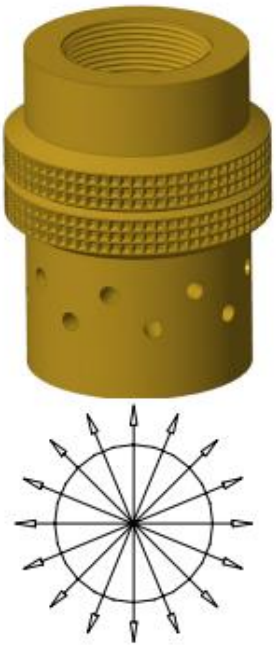
NOVEC™ 1230 is distributed within the protected area by the discharge nozzle which is sized to ensure the correct flow of agent for the risk. Nozzles are available with seven or sixteen ports to allow for 180° or 360° horizontal discharge patterns. Ports are drilled in 0.1 mm (0.004 in) increments to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

Technical Information

Material:	Aluminum, brass, or stainless steel
Thread type:	BSPT or NPT Female (NPT thread is denoted by v-groove around knurling)
Sizes:	15 mm, (1/2 in.), 20 mm (3/4 in.), 25 mm (1 in.), 32 mm (1 1/4 in.), 40 mm (1 1/2 in.), and 50 mm (2 in.)
Drilling increments:	0.1 mm
Nozzle types:	16 port (360°) or 7 port (180°)



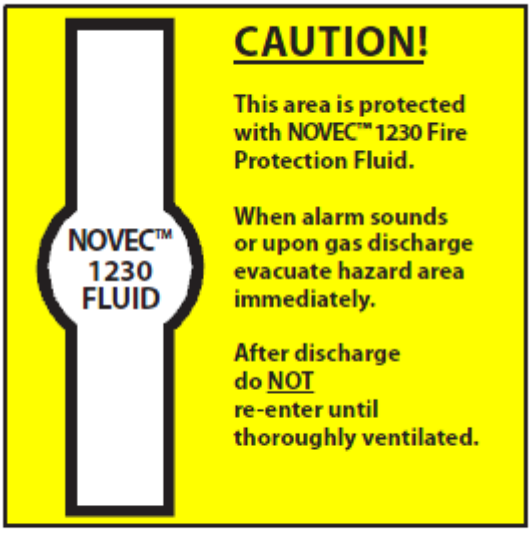
180° nozzle pattern (7 ports)



360° nozzle pattern (16 ports)

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)