

EQUIPMENT: **FM-200® (UL/FM)**

PUBLICATION: 14A-07H

ISSUE No. 02

DATE: 2010-03



FM-200® TOTAL FLOOD FIRE SUPPRESSION SYSTEMS

ENGINEERED SYSTEM DESIGN AND INSTALLATION MANUAL (UL/FM VERSION)

SECTION 1 - INTRODUCTION

About this Manual	5
Definitions	5
Introduction	5
Approvals and Standards	5
FM-200® Agent	6
Manufactured Systems	6
Health and Safety	6
First Aid.	7
FM-200® Agent Characteristics	7
Agent Physical Properties	8
Table 1.	8
Table 2.	8
Table 3: Toxicology/Environmental	8

SECTION 2 - SYSTEM COMPONENTS

System Components	9
FM-200® Container.	9
Table 4: DOT Container details	10
Table 5: UL/TPED Container details.	10
Table 4a: DOT Container - valve equivalent lengths	10
Table 5a: UL/TPED Container - valve equivalent lengths	10
Container Label.	11
Valve Assembly	12
Principle of Operation	13
Burst Disc.	13
Low Pressure Switch (Standard Open On Fall)	14
Low Pressure Switch (Special Close On Fall)	14
Low Pressure Switch (Alternate - Transfer On Fall - Option #1).	15
Low Pressure Switch (Alternate - Transfer On Fall - Option #1).	15
Fixing Brackets.	16
Manual Actuator	17
Pneumatic Actuator.	17
Removable Electrical Actuator (Suppression Diode)	18
Removable Electrical Actuator (Bridge Rectifier)	18
25 mm (1") and 50 mm (2") Flexible Discharge Hose	19
80 mm (3") Discharge Hose/Check Valve Assembly	20
80 mm (3") Discharge Hose	20
80 mm (3") Valve Single Tank Adaptors	21
Manifold Check Valve	21

Manifold	22
Table 6: Manifolds	22
Table 6: Manifolds (Continued)	23
Manifold Inlets (Sockets)	24
Table 7: Manifold Inlets	24
Construction of Manifolds	25
Table 8: Manifolds	25
Table 8: Manifolds (Continued)	26
Manifold Bracket Assembly	27
Flexible Pilot Hose	27
Male Adaptors	28
Male Pilot Hose Connector	28
Street Elbow	29
Male Tee	29
Male Elbow.	30
Pressure Switch.	30
Discharge Nozzle.	31
Table 9: Discharge Nozzles	32
Door Notice.	33
Manual Release Notice.	33
Liquid Level Measuring Device	34
Typical Manifold System	35

SECTION 1 - INTRODUCTION

About this Manual

This manual is a comprehensive guide that contains all the information necessary to design, install and maintain the FM-200® Engineered Extinguishing system. However the manual does not address information relating to fire detection.

Users of this manual are assumed to be competent fire engineers with a basic knowledge of such systems. The contents are arranged in a logical order describing the various procedures in turn, alternatively specific sections can be referred to as required. Users who are not familiar with the equipment should first read the complete manual.

Definitions

FM-200®	FM-200® is a registered trade mark of the Du Pont.
System	In this manual 'system' refers to the extinguishing equipment and does not include any detection system which may initiate an agent release.
Engineered	Hydraulic flow program used to predict the two phase flow of FM-200® through a pipe network.

Introduction

FM-200® is a clean, safe fire fighting agent for use in total flooding automatic extinguishing systems. It is intended as a long term replacement for Halon 1301 and, whilst maintaining the excellent fire suppression properties of Halon, has none of the environmental problems. Storage and distribution requirements are similar to Halon and the majority of system components are identical. However, FM-200® is not a direct replacement for existing Halon 1301 installations due to the difference in agent quantity and discharge characteristics. The minimum FM-200® design concentration for Class A hazards is 6.4% for UL Listed systems or 7.17% for FM Approved systems, and for Class B hazard is at least 9.0%.

The US Environmental Protection Agency (EPA) accepts use in normally occupied areas where the concentration doesn't exceed 9%. The safe use criteria has further been confirmed by the Halon Alternative Group (HAG) report. Refer to NFPA 2001, 2008 edition "Clean Agent Fire Extinguishing Systems," Section 1-5 "Safety," for additional exposure requirements.

The systems described in this manual are 'engineered'. Engineered systems for example, may consist of several FM-200® containers, modularised or manifolded together and connected via a pipe network to a number of discharge nozzles.

Systems may be activated mechanically or electrically. Mechanical manual actuation is via a manual actuator attached to the container valve. Electrical actuation is via a removable side mounted solenoid or a top mounted electrical actuator. Actuation can occur automatically via a signal from a detection and alarm control panel.

Users of this manual should find that sufficient information is provided to plan, design, purchase components, install, operate and maintain the system. However, in the event that part of the document is not understood, or if there is any concern as to the suitability of the protection, do not hesitate to contact one of our specialist engineers for the matter to be quickly resolved.

Approvals and Standards

The manufactured equipment and the FM-200® agent have comprehensive approvals and listings providing further support to the overall product.

FM-200® Agent

Approvals include, but are not limited to:

- FM Approved
- Underwriters Laboratories Inc. (UL) Recognised Component
- NFPA 2001 Clean Agent Fire Extinguishing Systems (Listed Alternative)
- US EPA SNAP Rpt. (Unrestricted Listed Alternative)
- Australian Industrial Chemicals Notification (Approved)
- German Institute for Environmental Hygiene and Medicine (Approved)

Manufactured Systems

- Underwriters Laboratories Inc.
- Loss Prevention Certification Board
- Factory Mutual (FM)

FM-200® systems are manufactured in strict accordance with the internationally recognised Quality assurance Standard, BS EN ISO 9000 and approved to ISO 9001.

FM-200® Extinguishing System units are to be designed, installed, inspected, maintained, tested and recharged by qualified, trained personnel in accordance with The Standard on Clean Agent Fire Extinguishing Systems, NFPA2001, 2008 edition and to be used in accordance with Environmental Protection Agency (EPA) Significant New Alternatives Program (SNAP). Where determined to be appropriate by the authority having jurisdiction, other applicable standards may additionally be utilised to specific system requirements for these purposes.

Health and Safety

A properly designed and installed extinguishing system should not present any significant health or safety problems, however, there are basic precautions to be taken to avoid accidents, and aspects of the system operation that should be understood. End-users often require reassurance regarding the safety of personnel, and this can only be given if a thorough understanding of the properties of the agent and its effects in different situations are known. Best practice should be observed.

FM-200® extinguishes primarily through heat absorption, and does not sufficiently deplete oxygen levels.

Therefore, exposure to FM-200® at the design concentration of 7.17%*, and up to 9.0%, is not hazardous to health. Exposure to higher concentrations is permissible for limited periods. Refer to NFPA 2001, 2008 edition Section 1-5 "Safety," for exposure requirements. As with halons, the US EPA and the National Fire Protection Association (NFPA) 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.

FM-200® can decompose at high temperatures to form halogen acids. If so, their presence is readily detected as a sharp, pungent odour long before hazardous maximum exposure levels are reached. Fire toxicity studies conclude that generally decomposition products from the fire itself, especially carbon monoxide, smoke, heat, and oxygen depletion, create a greater hazard.

The noise created by the FM-200® agent discharging can be loud enough to startle people in the vicinity, but is unlikely to cause any permanent injury. Turbulence caused by the high velocity discharge can dislodge substantial objects directly in its path, and cause enough general turbulence within the protected area to move paper and light objects.

Direct contact with the vaporising liquid discharged from an FM-200® nozzle has a chilling effect on objects and in extreme cases can cause frostbite to the skin. The liquid phase vaporises rapidly when mixed with air and therefore limits the risk to the immediate vicinity of the nozzle. Minor reduction in visibility may occur for a brief period due to the condensation of water vapour.

HMIS: 2-0-0/heptafluoropropane/contents under pressure. 0-0-0/nitrogen expellant gas/very cold, contents under pressure.

Consult: DuPont de Nemours (Nederland) B.V., Baanhoekweg 22, NL-3313 LA Dordrecht, The Netherlands.

Emergency phone number: +44 (0)8456 006640.

WARNING

The discharge of clean agent systems to extinguish a fire can result in a potential hazard to personnel from the natural form of the clean agent or from the products of combustion that results from exposure of the agent to the fire or hot surfaces. Unnecessary exposure of personnel either to the natural agent or to the products of decomposition shall be avoided.

* UL Design Concentration - See Page 5

SECTION 1 - INTRODUCTION

First Aid

Refer to the FM-200® Material Safety Data Sheet within Appendix C.

FM-200® Agent Characteristics

FM-200® (HFC-227ea) is a clean agent containing no particles or oily residues. It is produced under ISO 9002 guidelines to strict manufacturing specifications ensuring product purity. FM-200® leaves no residue or oily deposits on delicate electronic equipment, and can be removed from the protected space by ventilation.

FM-200® is thermally and chemically stable, but without the extremely long atmospheric lifetimes associated with some other clean agents. The atmospheric lifetime of FM-200® has been determined to be 36.5 years. The US EPA SNAP does not consider FM-200® to be a long lived substance when discharged, and as such has placed no restrictions on its use. (Environmental Protection Agency's Significant New Alternatives Program).

Typical areas that may be protected by an FM-200® system are detailed below; the list is by no means exhaustive:

Bank Vaults
Libraries
Rare Book Stores
Electronic Data Processing
Telephone Exchanges
Studios
Communication Centres
Transformer and Switchrooms
Control Rooms
Test Laboratories
Flammable Liquid Stores

The present understanding of the functioning of FM-200® is that 80% of its fire fighting effectiveness is achieved through heat absorption and 20% through direct chemical means (action of the fluorine radical on the chain reaction of a flame). Complete suppression using FM-200® has the following advantages:

- Less visual obscurity and minimal risk to personnel.
- Low toxicity.
- Most effective when used with automatic detection to introduce FM-200® with a 10 second discharge.
- The ability to prevent re-ignition providing concentration levels are maintained.

FM-200® is stored as a liquified compressed gas and is discharged into the protected area as a vapour. It is stored in approved DOT or TPED containers and is super-pressurised with dry nitrogen to 25 bar @ 21 °C (360 psi @ 70 °F).

WARNING

FM-200® shall not be used on fires involving the following materials unless they have been tested to the satisfaction of the authority having jurisdiction:

- Certain chemicals or mixtures of chemicals, such as cellulose nitrate and gunpowder, that are capable of rapid oxidation in the absence of air.
- Reactive metals such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium and plutonium.
- Metal hydrides.
- Chemicals capable of undergoing autothermal decomposition, such as certain organic peroxidase and hydrazine.

Agent Physical Properties

Table 1.

Agent Physical Properties	HFC-227ea
Chemical structure	CF ₃ CHFCF ₃
Chemical name	Heptafluoropropane
Molecular weight	170
Boiling point	-16.40 °C (2.4°F)
Freezing point	-131 °C (-204 °F)
Critical temperature	101.7 °C (214 °F)
Critical pressure	2912 kPa (424 psi)
Critical volume	274 cc/mole (0.0280 ft ³ /lbm.)
Critical density	621 kg/m ³ (35.77lbm./ft ³)
Saturated vapour density @20 °C (68 °F)	31.18 kg/m ³ (1.95 lb./ft ³)

(Reference: NFPA 2001, 2008 edition)

Table 2.

Agent Physical Properties	
Chemical structure	N ₂
Chemical name	Nitrogen
Molecular weight	28.0
Boiling point	-195.80 °C (-320.4 °F)
Freezing point	-210.00 °C (-346 °F)
Critical temperature	-146.90 °C (-232.4 °F)
Critical pressure	3399 kPa (492.9 psi)

Table 3: Toxicology/Environmental

	FM-200®
Environmental	
Ozone Depletion (ODP)	0
Atmospheric Lifetime (yrs)	36.5
Toxicology	
Acute Exposure LC50	>80%
Cardiac Sensitization No Observed Adverse Effect Level (NOAEL)	9.0%
Lowest Observed Adverse Effect Level (LOAEL)	10.5%

(Reference: NFPA 2001, 2008 edition)

SECTION 2 - SYSTEM COMPONENTS

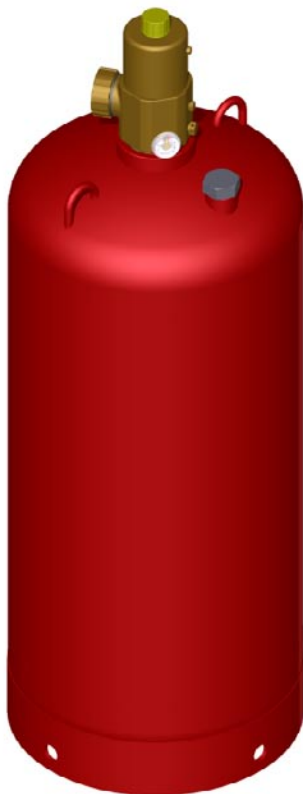
System Components

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

FM-200® Container

The container assembly consists of a container fitted with a valve and internal syphon tube, factory filled with FM-200®, and super-pressurised with dry nitrogen to 25 bar @ 21 °C (360 psi @ 70 °F). Containers sharing the same manifold shall be equal in size and fill density. Containers are finished in red and are available in various sizes. A nameplate is fixed to the container displaying the agent weight, tare weight, gross weight, fill density, charge date and fill location.

Figure 1 - FM-200® Container



Technical Information

The 4.5, 8, 16, 32, 52, 106, 147 and 180 litre containers are manufactured in accordance with DOT 4BW500 or 4BW450, the 343 litre container in accordance with DOT 4BW450 and the 40, 67.5 and 80 litre containers in accordance with DOT 3AA 580.

Material:	Carbon Steel
<u>4BW500</u>	
Hydraulic test pressure:	69.0 bar (1000 psi)
Working Pressure:	34.5 bar (500 psi)
<u>4BW450</u>	
Hydraulic test pressure:	62.1 bar (900 psi)
Working Pressure:	31.0 bar (450 psi)
<u>3AA580</u>	
Hydraulic test pressure:	70.0 bar (1015 psi)
Working Pressure:	40.0 bar (580 psi)
Paint Specification:	Red epoxy polyester or red polyester powder coated

The 8, 16, 32, 52, 106 and 147 litre containers are also available manufactured in accordance with EN 13322-1.

Material:	Carbon Steel
Hydraulic test pressure:	40.0 bar (580 psi)
Working Pressure:	34.5 bar (500 psi)
Paint Specification:	Red epoxy polyester or red polyester powder coated

Table 4: DOT Container details.

Part No. (Nominal Volume)	Minimum and Maximum Fills		Valve Size		Height from floor to outlet (nominal)		Diameter		Nominal Tare Weight	
	kg	(lbs)	mm	(in)	mm	(in)	mm	(in)	kg	(lbs)
303.205.026 (4.5 litre)	2.3 to 4.5	(5 to 10)	25	(1")	280	(11")	178	(7")	7.7	(17)
303.205.015 (8 litre)	4.0 to 8.0	(9 to 18)	25	(1")	304	(12")	254	(10")	14.8	(32.6)
303.205.016 (16 litre)	8.0 to 16.0	(18 to 35)	25	(1")	502	(19.8")	254	(10")	18.4	(40.6)
303.205.017 (32 litre)	16.0 to 32.0	(35 to 71)	25	(1")	833	(32.8")	254	(10")	26.1	(57.5)
303.205.030 (40 litre) *	20.0 to 40.0	(44 to 88)	50	(2")	1352	(53.2")	227.2	(9")	52.2	(115)
303.205.018 (52 litre)	26.0 to 52.0	(58 to 115)	50	(2")	596	(23.5")	406	(16")	49.1	(108.3)
303.205.031 (67.5 litre) *	33.8 to 67.5	(75 to 149)	50	(2")	1526	(60")	265	(10.4")	81.6	(180)
303.205.032 (80 litre) *	40.0 to 80.0	(88 to 176)	50	(2")	1685	(66.3")	276	(11")	95.3	(210)
303.205.019 (106 litre)	53.0 to 106.0	(117 to 234)	50	(2")	1021	(40.2")	406	(16")	71.8	(158.3)
303.205.020 (147 litre)	73.5 to 147.0	(162 to 324)	50	(2")	1354	(53.3")	406	(16")	89.9	(198.2)
303.205.021 (180 litre)	90.0 to 180.0	(198 to 397)	50	(2")	1634	(64.3")	406	(16")	105.8	(233.2)
303.205.022 (343 litre)	171.5 to 343	(378 to 756)	80	(3")	1466	(57.7")	610	(24")	207	(456)

* For UL Listed Systems Only (Not FM Approved)

Table 4a: DOT Container - valve equivalent lengths.

Part No. (Nominal Volume)	Equivalent Lengths (m)
303.205.026 (4.5 litre)	6.096
303.205.015 (8 litre)	6.096
303.205.016 (16 litre)	6.096
303.205.017 (32 litre)	6.096
303.205.030 (40 litre)	10.668
303.205.018 (52 litre)	10.668
303.205.031 (67.5 litre)	10.668
303.205.032 (80 litre)	10.668
303.205.019 (106 litre)	10.668
303.205.020 (147 litre)	10.668
303.205.021 (180 litre)	10.668
303.205.022 (343 litre)	25.91

EQUIPMENT: **FM-200® (UL/FM)**

PUBLICATION: 14A-07H

ISSUE No. 02

DATE: 2010-03

SECTION 2 - SYSTEM COMPONENTS

Container Label






The container label details the weight of FM-200® contained, empty weight, fill density and charge date. Once the label is applied to the container surface, and to avoid possible tampering it can not be removed intact.

Technical Information

Material:	Aluminum
Adhesive:	Pre-applied 3M adhesive 9485
Certification:	UL Recognised
Overall Size:	241.3 mm x 165.1 mm (9.5" x 6.5") (Part No. 314.205.021) (Part No. 314.205.045)*
	558 mm x 50.8 mm (22" x 2") (Part No. 314.205.022) (Part No. 314.205.046)*
Weight:	0.0416 kg (0.092 lbs) (Part No. 314.205.021) (Part No. 314.205.045)*
	0.0300 kg (0.066 lbs) (Part No. 314.205.022) (Part No. 314.205.046)*

* For UL Listed Systems Only (Not FM Approved)

Figure 2 - Container Label (Part No. 314.205.021 Shown)

INSPECTION OF EXTINGUISHING SYSTEM MONTHLY INSPECTION - EXAMINE PIPING AND NOZZLES TO MAKE CERTAIN THEY ARE UNOBSTRUCTED - CHECK CONTAINER PRESSURE IF LOSS EXCEEDS 10% (WHEN ADJUSTED FOR TEMPERATURE), REFILL OR REPLACE CONTAINER. 6-MONTHLY INSPECTION - CHECK AGENT QUANTITY AND PRESSURE. REFILL OR REPLACE IF A LOSS IN AGENT QUANTITY OF MORE THAN 5% OR A LOSS IN PRESSURE (ADJUSTED FOR TEMPERATURE) OF MORE THAN 10% IS DETERMINED. REFER TO ENGINEERED SYSTEM INSTALLATION MANUAL, PART NO. 14A-07H, (AVAILABLE FROM MACRON), AND NFPA 2001, FOR ADDITIONAL INSPECTION AND MAINTENANCE INSTRUCTIONS. THIS SYSTEM IS MADE UP OF UNITS TESTED WITHIN LIMITATIONS CONTAINED IN THE DETAILED INSTRUCTION MANUAL. THIS SYSTEM SHOULD BE PERIODICALLY INSPECTED BY TRAINED PERSONNEL. THE SYSTEM DESIGNER MUST BE CONSULTED WHENEVER CHANGES ARE PLANNED FOR THE SYSTEM OR AREA OF PROTECTION. CAUTION UNCONTROLLED VALVE OPERATION COULD RESULT IN SEVERE INJURY OR DEATH TO OPERATORS OR BYSTANDERS. ENSURE SAFETY OUTLET CAP IS IN PLACE IF CONTAINER IS DISCONNECTED FROM PIPE WORK. CONTAINERS SHOULD NOT BE POSITIONED IN DIRECT SUNLIGHT.				WARNING THE DISCHARGE OF CLEAN AGENT SYSTEMS TO EXTINGUISH A FIRE CAN RESULT IN A POTENTIAL HAZARD TO PERSONNEL FROM THE NATURAL FORM OF THE CLEAN AGENT OR FROM THE PRODUCTS OF COMBUSTION THAT RESULT FROM EXPOSURE OF THE AGENT TO THE FIRE OR HOT SURFACES. UNNECESSARY EXPOSURE OF PERSONNEL EITHER TO THE NATURAL AGENT OR TO THE PRODUCTS OF DECOMPOSITION SHALL BE AVOIDED. CONTACT MACRON IMMEDIATELY AFTER A DISCHARGE OR FIRE SITUATION.	
 CLEAN AGENT FIRE EXTINGUISHING SYSTEM UNIT		 RECYCLING PROTECTS THE ENVIRONMENT DO NOT DISPOSE, DISCHARGE ONLY IN CASE OF FIRE. IF CONTAINER CONTENTS MUST BE REMOVED FOR SERVICE, MAINTENANCE OR DISMANTLING OF THE CLEAN AGENT SYSTEM - PRIOR TO REMOVAL, CONTACT YOUR LOCAL INSTALLER OR MANUFACTURER FOR INSTRUCTIONS ON HANDLING EQUIPMENT AND ON RECLAIMING OR RECYCLING CLEAN AGENT. DO NOT COVER, REMOVE OR DEFACE THIS LABEL.			
 APPROVED		<small>FM-200® HMIS 2-0-0/HEPTAFLUOROPROPANE / SEE WARNINGS ON PRODUCT LABEL / CONTENTS UNDER PRESSURE. NITROGEN EXPELLANT GAS HMIS 0-0-0 / VERY COLD DISCHARGE. CONTENTS UNDER HIGH PRESSURE.</small> <small>CONSULT DUPONT DE NEMOURS (NEDERLAND) B.V., BAHNHOFKIEG 22, NL-3313 LA DORDRECHT, THE NETHERLANDS. +31-78-630-1011 FOR MATERIAL SAFETY DATA SHEET.</small>			
THIS CONTAINER IS FILLED WITH FM-200® (HEPTAFLUOROPROPANE) AND IS SUPERPRESSURIZED TO 25 BAR (360 PSI) AT 21°C (70°F) WITH DRY NITROGEN				THE DATE OF MANUFACTURE IS ON THE CONTAINER SUITABLE FOR USE IN AMBIENT TEMPERATURES OF 0°C TO 54°C (32°F TO +130°F) 16, 32 AND 52 LITRE CONTAINERS MUST BE TRANSPORTED AND STORED IN THE VERTICAL POSITION FACTORY TESTED TWICE DOT SERVICE PRESSURE STAMPED ON THE CONTAINER	
PART NO.:					
AGENT WEIGHT:	KG	(lb)			
TARE WEIGHT:	KG	(lb)			
GROSS WEIGHT:	KG	(lb)			
FILL DENSITY:	KG/L	(lb/ft³)			
CHARGE DATE:					
FILL LOCATION:					
<div>Macron Safety Systems (UK) Ltd., Burlingham House, Gapton Hall Industrial Estate, Great Yarmouth, Norfolk, NR31 0NN Tel no. +44 (0)1493 417600 Fax no. +44 (0)1493 417700</div>					

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. 302.205.002

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 (L) x 62mm (Dia) (5.12" (L) x 2.44" (Dia))
Weight:	2.96 kg (6.526 lbs)
Equivalent Length:	6.096 m (20 ft)

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 (L) x 100mm (Dia) (6.12" (L) x 3.94" (Dia))
Weight:	9.18 kg (20.238 lbs)
Equivalent Length:	10.668 m (35 ft)

80 mm (3") Valve

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" NPT
Solenoid Adaptor Port:	None
Overall Size:	241mm (L) x 129mm (Dia) (9.50" (L) x 5.06" (Dia))
Weight:	18.82 kg (41.491 lbs)
Equivalent Length:	25.91 m (85 ft)

*Outlet adaptors are available for 3" NPT, BSP and grooved.

SECTION 2 - SYSTEM COMPONENTS**Principle of Operation**

The FM-200® 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 FM-200® 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 (122 °F)
Thread:	M18 x 1.00
Hole Orientation:	90° to Body
Torque:	35 Nm (25.8 lbs.ft)
Overall Size :	20mm (L) x 18mm (Dia) (0.79" (L) x 0.71" (Dia))
Weight:	0.028 kg (0.062 lbs)

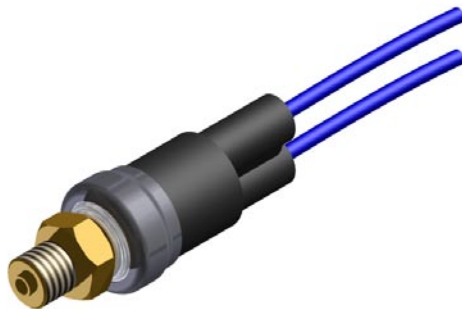
80 mm (3") Valve

Body:	Brass UNS-C36000
Rating:	52 bar (760 psi) @ 50 °C (122 °F)
Thread:	0.9375-16UN-3A
Hole Orientation:	90° to Body
Torque:	68 Nm (50 lbs.ft)
Overall Size :	33.3mm (L) x 18mm (Dia) (1.3125" (L) x 0.71" (Dia))
Weight:	0.088 kg (0.195 lbs)

Low Pressure Switch (Standard Open On Fall)

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.

Figure 5 - Low Pressure Switch (Part No. 304.205.006)



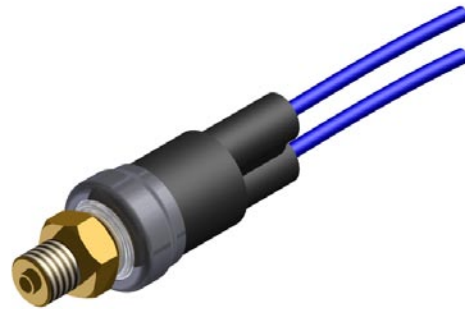
Technical Information

Body:	Hermetically sealed Stainless Steel
Switch Type:	Normally Open at Atmospheric Pressure
Switch Point:	Open on Fall at 20 bar (290 psi) Close on Rise at 24.1 bar (350 psi)
Tolerance:	+/-0.7 bar (\pm 10 psi)
Proof Pressure:	345 bar (5003 psi)
Electrical Housing:	Epoxy Sealed terminals
Connection:	Brass 1/8" NPT
Max. Current:	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)

Low Pressure Switch (Special Close On Fall)

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.

Figure 6 - Low Pressure Switch (Part No. 305.209.005)



Technical Information

Body:	Hermetically sealed Stainless Steel
Switch Type:	Normally Closed at Atmospheric Pressure
Switch Point:	Close on Fall at 20 bar (290 psi) Open on Rise at 24.1 bar (350 psi)
Tolerance:	+/-0.7 bar (\pm 10 psi)
Proof Pressure:	345 bar (5003 psi)
Electrical Housing:	Epoxy Sealed terminals
Connection:	Brass 1/8" NPT
Max. Current:	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)

SECTION 2 - SYSTEM COMPONENTS**Low Pressure Switch****(Alternate - Transfer On Fall - Option #1)**

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 20.3 bar (294 psi) the switch operates to enable the condition to be signalled to a control unit.

This low pressure switch is the primary supply, (option #1), of a dual source component used in order to maintain the supply chain and ensure that adequate stock levels are available to fully support customers and installers.

Figure 7 - Alternate Low Pressure Switch (Part No. 305.209.007) Option #1

**Technical Information**

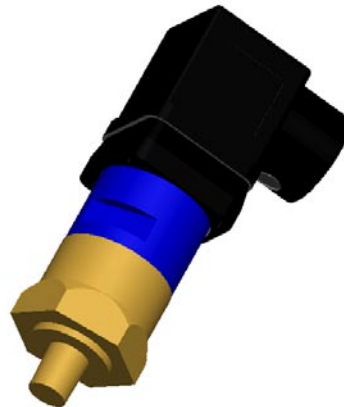
Body:	Zinc Plated Steel and Kapton
Switch Type:	Single Pole, Double Throw (SPDT)
Switch Point:	Transfers on Fall at 20.3 bar (294 psi) Resets on Rise at 24.1 bar (350 psi)
Tolerance:	+/-0.7 bar (± 10 psi)
Proof Pressure:	206.8 bar (3000 psi)
Contact Reset Method:	Auto Resetting Contacts
Connection:	1/8" NPT Male
Electrical Rating:	5 A at 24 v dc (Resistive)
Electrical Connection:	DIN 43650A Connector with 1/2" NPT Female Conduit Connection
Certification:	UL Recognised
IP Rating:	IP65
Overall Size:	104mm (L) x 28mm (Dia) (4.10" (L) x 1.12" (Dia))
Weight:	0.16 kg (0.35 lbs)

Low Pressure Switch**(Alternate - Transfer On Fall - Option #2)**

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.

This low pressure switch is the secondary supply, (option #2), of a dual source component used in order to maintain the supply chain and ensure that adequate stock levels are available to fully support customers and installers.

Figure 8 - Alternate Low Pressure Switch (Part No. 305.209.007) Option #2

**Technical Information**

Body:	Brass and Anodised Aluminium
Switch Type:	Single Pole, Double Throw (SPDT)
Switch Point:	Transfers on Fall at 20 bar (290 psi) Resets on Rise at 22.8 bar (330 psi)
Tolerance:	+/-1.0 bar (± 15 psi)
Proof Pressure:	413.7 bar (6000 psi)
Contact Reset Method:	Auto Resetting Contacts
Connection:	1/8" NPT Male
Electrical Rating:	5 A at 24 v dc (Resistive)
Electrical Connection:	DIN 43650A Connector with 1/2" NPT Female Conduit Connection
Certification:	UL Recognised
IP Rating:	IP65
Overall Size:	104mm (L) x 32mm (Dia) (4.40" (L) x 1.25" (Dia))
Weight:	0.21 kg (0.46 lbs)

Fixing Brackets

The bracket assembly consists of one back channel and a nut and bolt with two bracket half straps. To securely hold the container in position during the system discharge, two bracket assemblies are required per container. The only exceptions are the 4.5 and 8 litre containers which only require one.

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:	Black Polyethylene powder-Plascoat LDPE
Mounting:	Unistrut Channel
Weight:	0.34 kg (0.75 lbs) (Part No. 311.205.020) 0.30 kg (0.66 lbs) (Part No. 311.205.013) 0.46 kg (1.01 lbs) (Part No. 311.205.014) 0.28 kg (0.62 lbs) (Part No. 311.205.021) 0.30 kg (0.66 lbs) (Part No. 311.205.017) 0.34 kg (0.75 lbs) (Part No. 311.205.018) 0.71 kg (1.56 lbs) (Part No. 311.205.019)

Part Number	Container Size	Length of Back Channel mm (in)
311.205.020	4.5 litre 178 mm dia. (7")	400 (15.75")
311.205.013	8, 16, 32 litre 254 mm dia. (10")	500 (19.69")
311.205.014	52, 106, 147, 180 litre 406 mm dia. (16")	600 (23.6")
311.205.021*	40 litre (Seamless) 227 mm dia. (9")	400 (15.75")
311.205.017*	67.5 litre (Seamless) 265 mm dia. (10.4")	400 (15.75")
311.205.018*	80 litre (Seamless) 276 mm dia. (11")	400 (15.75")
311.205.019	343 litre 610 mm dia. (24")	693 (27.3")

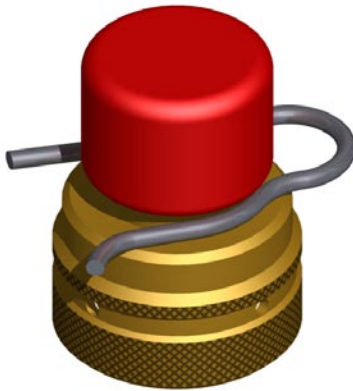
* For UL Listed Systems Only (Not FM Approved)

SECTION 2 - SYSTEM COMPONENTS

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
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 CZ121
Actuation Pin:	Stainless Steel
Piston Rod:	Brass CZ 121
Pipe connection:	1/4" NPT Female
Min. Actuation Pressure:	4 bar (58 psi)
Max. Working Pressure:	56 bar (812 psi)
Overall Size:	48mm (L) x 41.5mm (Dia) (1.89" (L) x 1.63" (Dia))
Weight:	0.228 kg (0.503 lbs)

Removable Electrical Actuator (Suppression Diode)

The removable electrical actuator locates to the top of the container valve. 24 v dc is required for solenoid operation. Provision is made for the connection of a manual actuator to the top of the actuator assembly. The suppression diode electrical actuator must be wired up correctly with the positive supply from the control panel connected to terminal 1, and the negative supply connected to terminal 2. The removable electrical actuator has a life span of 10 years from manufacture, which is indicated on the label.

Figure 12 - Electrical Actuator - Suppression Diode (Part No. 304.205.010)



Technical Information

Body:	Mild Steel & Dull Nickel
Swivel nut:	Brass CZ121
Actuation Pin:	Stainless Steel
Actuation Type:	Latching
Reset Requirement:	Manually via Reset Tool supplied
Connection:	1" BSPP Brass
Nominal Voltage:	24 v dc
Nominal Current:	0.25 A
Max. Monitoring Current:	25 mA
Manual Actuation Force:	50 N (11.24 lbf)
Nominal Pin Travel:	4.4 mm (0.17")
Electrical connection:	3-pin plug connector
Back EMF Protection:	Suppression Diode
Certification:	UL Recognised
Overall Size:	104mm (L) x 44mm (Dia) (4.09" (L) x 1.73" (Dia))
Weight:	0.95 kg (2.09 lbs)

Removable Electrical Actuator (Bridge Rectifier)

The removable electrical actuator locates to the top of the container valve. 24 v dc is required for solenoid operation. Provision is made for the connection of a manual actuator to the top of the actuator assembly. Due to the design of the bridge rectifier it will operate regardless of how it is wired up; the positive supply from control panel can be connected to either terminal 1 or 2 with the reverse for the negative supply. The removable electrical actuator has a life span of 10 years from manufacture, which is indicated on the label.

Figure 13 - Electrical Actuator - Bridge Rectifier (Part No. 304.209.001)



Technical Information

Body:	Mild Steel & Dull Nickel
Swivel nut:	Brass CZ121
Actuation Pin:	Stainless Steel
Actuation Type:	Latching
Reset Requirement:	Manually via Reset Tool supplied
Connection:	1" BSPP Brass
Nominal Voltage:	24 v dc
Nominal Current:	0.25 A
Max. Monitoring Current:	25 mA
Manual Actuation Force:	50 N (11.24 lbf)
Nominal Pin Travel:	4.4 mm (0.17")
Electrical connection:	3-pin plug connector
Back EMF Protection:	Bridge Rectifier
Certification:	UL Recognised
Overall Size:	104mm (L) x 44mm (Dia) (4.09" (L) x 1.73" (Dia))
Weight:	0.95 kg (2.09 lbs)

SECTION 2 - SYSTEM COMPONENTS**25 mm (1") and 50 mm (2") Flexible Discharge Hose**

FM-200® container installations may be connected to the system by means of a flexible discharge hose. This enables containers to be disconnected for maintenance or recharge without dismantling other container mountings, manifold connections and pipework, etc. The flexible discharge hose is provided with a swivel fitting at the inlet.

Figure 14 - Flexible Discharge Hose



25 mm (1") Hose Part No. 306.207.002

50 mm (2") Hose Part No. 306.207.003

Technical Information25 mm (1") Hose

Hose Construction: Twin steel wire braided oil resistant seamless synthetic rubber core to DIN EN 853 1SN

Connection: Zinc Passivated Mild Steel
25 mm (1" NPT) Straight Fixed Male
25 mm (1" BSPP) 90° Female Swivel Union

Max. Bend Angle: 15° @ 0 °C (32 °F)

Max. Working Pressure: 88 bar (1276 psi)

Overall Size: 405mm (L) x 92mm (W)
(15.95" (L) x 3.62" (W))

Weight: 1.25 kg (2.76 lbs)

Equivalent Length: 3.14 m (10.3 ft)

50 mm (2") Hose

Hose Construction: Twin steel wire braided oil resistant seamless synthetic rubber core to DIN EN 853 2SN

Connection: Zinc Passivated Mild Steel
50 mm (2" NPT) Straight Fixed Male
50 mm (2" BSPP) 90° Female Swivel Union

Max. Bend Angle: 15° @ 0 °C (32 °F)

Max. Working Pressure: 80 bar (1160 psi)

Overall Size: 520mm (L) x 125mm (W)
(20.47" (L) x 4.92" (W))

Weight: 3.90 kg (8.60 lbs)

Equivalent Length: 5.36 m (17.6 ft)

80 mm (3") Discharge Hose/Check Valve Assembly

The discharge hose/check valve assembly combines the elbow, hose, check valve, and swivel coupling for connection to the valve discharge outlet and the discharge manifold. The check valve provides the facility for a 40 mm (1½") height adjustment.

Figure 15 - 80 mm (3") Discharge Hose / Check Valve Assembly (Part No. 306.205.006)



Technical Information

Hose:	Double braid stainless steel
Elbow:	Stainless steel UNS 30400
Valve Swivel Nut:	Stainless steel UNS 30400
Check Valve Swivel Nut:	Cadmium plated mild steel
Check Valve Body:	Cadmium plated mild steel
Check Valve Seal and Seat:	Brass UNS 36000
Spring:	Stainless steel 2.84 kg (6.27 lbs)
Max. Working Pressure:	35 bar (507.5 psi)
Overall Size	619mm (L) x 254mm (W)
(Minus Check Valve):	(24.37" (L) x 10.00" (W))
Weight:	20.50 kg (45.20 lbs)
Equivalent Length:	15.85 m (52 ft)

80 mm (3") Discharge Hose

The discharge hose is used with the 3" NPT single tank adaptor and 90° elbow to connect the container valve outlet to the distribution piping in single tank systems. The hose is constructed of corrugated stainless steel tubing with stainless braid cover.

Figure 16 - 80 mm (3") Discharge Hose (Part No. 306.205.005)



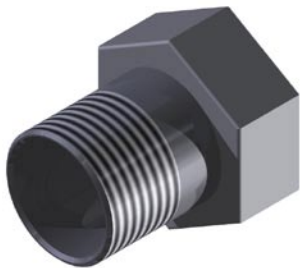
Technical Information

Hose Construction:	Double braid stainless steel
Max. Working Pressure:	35 bar (507.5 psi)
Min. Bend Radius:	460mm (18")
Overall Size:	406mm (L) x 76mm (Dia) (15.98" (L) x 2.99" (Dia))
Weight:	3.00 kg (6.61 lbs)
Equivalent Length:	1.55 m (5.1 ft)

SECTION 2 - SYSTEM COMPONENTS**80 mm (3") Valve Single Tank Adaptors**

When a single 343 litre container is being used without a manifold, three swivel adaptors are available for connection to the discharge outlet, either NPT, BSP or grooved.

Figure 17 - 80mm (3") Valve Single Tank Adaptor

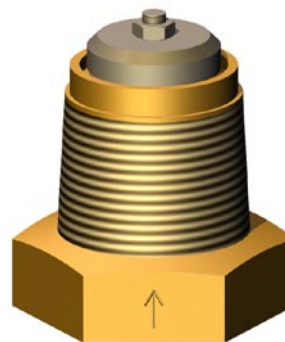


3" Flared to 3" BSPT	Part No. 309.002.013
3" Flared to 3" NPT	Part No. 309.002.014
3" Flared to 3" Grooved	Part No. 309.002.015

Manifold Check Valve

Manifold check valves are of mushroom pattern type and lift into the manifold as discharge occurs. The function of the check valve is to prevent loss of extinguishing agent during discharge from an outlet, should a container have been removed. All check valves are ordered separately to the manifold assembly.

Figure 18 - Manifold Check Valve



25 mm (1") Check Valve Assembly
Part No. 302.209.004

50 mm (2") Check Valve Assembly
Part No. 302.209.005

Technical Information

Body: Cadmium plated mild steel

3" Flared to 3" BSPT

Overall Size: 115mm (L) x 102mm (W)
(4.51" (L) x 4.00" (W))
Weight: 2.84 kg (6.27 lbs)
Equivalent Length: 0.55m (1.8 ft)

3" Flared to 3" NPT

Overall Size: 115mm (L) x 102mm (W)
(4.51" (L) x 4.00" (W))
Weight: 2.84 kg (6.27 lbs)
Equivalent Length: 0.55m (1.8 ft)

3" Flared to 3" Grooved

Overall Size: 72mm (L) x 102mm (W)
(2.82" (L) x 4.00" (W))
Weight: 1.95 kg (4.30 lbs)
Equivalent Length: 0.55m (1.8 ft)

Technical Information

Body: Brass CZ122
Stem: Stainless Steel
Spring: Stainless Steel
Bottom Plate: Brass CZ122
Top Plate: Stainless Steel
Seal Material: Nitrile

25 mm (1") Check Valve

Inlet Connection Thread: 25 mm (1" NPT) Female
Outlet Connection Thread: 40 mm (1½" NPT) Male
Overall Size: 54mm (L) x 52.4mm (W)
(2.13" (L) x 2.06" (W))
Weight: 0.63 kg (1.39 lbs)
Equivalent Length: 0.40m (1.3 ft)

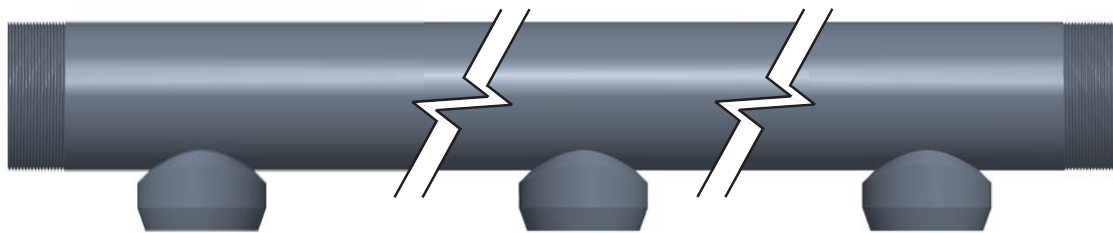
50 mm (2") Check Valve

Inlet Connection Thread: 50 mm (2" NPT) Female
Outlet Connection Thread: 65 mm (2½" NPT) Male
Overall Size: 73mm (L) x 83mm (W)
(2.87" (L) x 3.25" (W))
Weight: 1.60 kg (3.53 lbs)
Equivalent Length: 6.66m (21.8 ft)

Manifold

Manifolds are fabricated sections of steel pipework. They enable multiple containers to be connected to a common pipe network. They may also be used in systems where main / reserve containers arrangements are required.

Figure 19 - Typical Manifold Assembly



Technical Information

Material: ASTM A106 Gr B / BS 3601 Schedule 80
 Inlet: NPT socket
 Outlet: BSP Taper / NPT Taper / 6" Flange
 Test Press. 90 bar (1305 psi)
 Finish: Primed, Ready to paint on site.

Note: Assemblies do not include check valves and end caps.
 For 343 litre manifolds the check valves are part of the hose.

Table 6: Manifolds

Part No.	No. of Inlets	Manifold Pipe Size	Inlet to End Cap Distance mm	Inlet to Inlet Distance mm	Inlet to End Connection Distance mm	Container Size	Overall Length mm	End Thread Connection
307.209.022	2	65mm (2.5")	150 (6")	350 (14")	150 (6")	4.5 L to 32 L	650 (25.6")	BSPT
307.209.023	3	65mm (2.5")	150 (6")	350 (14")	150 (6")	4.5 L to 32 L	1000 (39.4")	BSPT
307.209.024	4	65mm (2.5")	150 (6")	350 (14")	150 (6")	4.5 L to 32 L	1350 (53.1")	BSPT
307.209.001	2	65mm (2.5")	150 (6")	350 (14")	150 (6")	4.5 L to 32 L	650 (25.6")	NPT
307.209.002	3	65mm (2.5")	150 (6")	350 (14")	150 (6")	4.5 L to 32 L	1000 (39.4")	NPT
307.209.003	4	65mm (2.5")	150 (6")	350 (14")	150 (6")	4.5 L to 32 L	1350 (53.1")	NPT
307.209.025	2	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	808 (31.8")	BSPT
307.209.026	3	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1316 (51.8")	BSPT
307.209.027	4	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1824 (71.8")	BSPT
307.209.028	5	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2332 (91.8")	BSPT
307.209.029	6	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2840 (111.8")	BSPT
307.209.004	2	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	808 (31.8")	NPT
307.209.005	3	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1316 (51.8")	NPT
307.209.006	4	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1824 (71.8")	NPT
307.209.007	5	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2332 (91.8")	NPT
307.209.008	6	80mm (3")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2840 (111.8")	NPT

SECTION 2 - SYSTEM COMPONENTS

Table 6: Manifolds (Continued)

Part No.	No. of Inlets	Manifold Pipe Size	Inlet to End Cap Distance mm	Inlet to Inlet Distance mm	Inlet to End Connection Distance mm	Container Size	Overall Length mm	End Thread Connection
307.209.030	2	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	808 (31.8")	BSPT
307.209.031	3	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1316 (51.8")	BSPT
307.209.032	4	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1824 (71.8")	BSPT
307.209.033	5	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2332 (91.8")	BSPT
307.209.034	6	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2840 (111.8")	BSPT
307.209.009	2	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	808 (31.8")	NPT
307.209.010	3	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1316 (51.8")	NPT
307.209.011	4	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	1824 (71.8")	NPT
307.209.012	5	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2332 (91.8")	NPT
307.209.013	6	100mm (4")	150 (6")	508 (20")	150 (6")	52 L to 180 L	2840 (111.8")	NPT
307.209.014	3	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	1416 (55.7")	Flange
307.209.015	4	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	1924 (75.7")	Flange
307.209.016	5	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	2432 (95.7")	Flange
307.209.017	6	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	2940 (115.7")	Flange
307.209.018	7	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	3448 (135.7")	Flange
307.209.019	8	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	3956 (155.7")	Flange
307.209.020	9	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	4464 (175.7")	Flange
307.209.021	10	150mm (6")	150 (6")	508 (20")	200 (8")	52 L to 180 L	4972 (195.7")	Flange
307.209.038	2	100mm (4")	150 (6")	711 (28")	150 (6")	343 L	1011 (40")	BSPT
307.209.039	3	100mm (4")	150 (6")	711 (28")	150 (6")	343 L	1722 (68")	BSPT
307.209.040	4	100mm (4")	150 (6")	711 (28")	150 (6")	343 L	2433 (96")	BSPT
307.209.035	2	100mm (4")	150 (6")	711 (28")	150 (6")	343 L	1011 (40")	NPT
307.209.036	3	100mm (4")	150 (6")	711 (28")	150 (6")	343 L	1722 (68")	NPT
307.209.037	4	100mm (4")	150 (6")	711 (28")	150 (6")	343 L	2433 (96")	NPT
307.209.041	2	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	1111 (43.7")	Flange
307.209.042	3	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	1822 (71.7")	Flange
307.209.043	4	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	2533 (99.7")	Flange
307.209.044	5	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	3244 (127.7")	Flange
307.209.045	6	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	3955 (155.7")	Flange
307.209.046	7	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	4666 (183.7")	Flange
307.209.047	8	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	5377 (211.7")	Flange
307.209.048	9	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	6088 (239.7")	Flange
307.209.049	10	150mm (6")	150 (6")	711 (28")	200 (8")	343 L	6799 (267.7")	Flange

Note: For ease of assembly flanged manifolds are available for 150 mm diameter.

150mm flanged manifolds with either 3 or 4 ports are supplied as a one piece assembly. Whilst manifolds with 5 to 10 ports are made up from smaller sections due to the size and weight as listed below:

5 port manifold - 3 port end and 2 port mid section

6 port manifold - 3 port end and 3 port mid section

7 port manifold - 3 port end and 2 port mid section

8 port manifold - 4 port end and 3 port mid section

9 port manifold - 3 port end and two 3 port mid sections

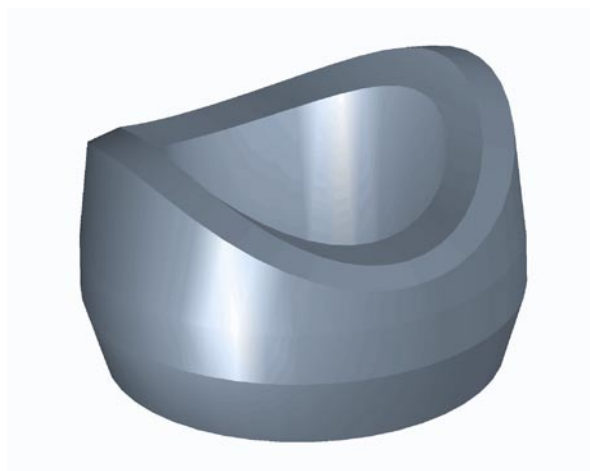
10 port manifold - 4 port end and two 3 port mid sections

All 150mm flanged manifolds include an end cap.

Manifold Inlets (Sockets)

Manifold inlets are available for the construction of system manifolds.

Figure 20 - Threaded Inlet for Manifolds.



Technical Information

Material: Carbon Steel to
ASTM A105 / ASTM A350 LF2

Dimensions: ANSI B16.11 / BS3799

Pressure Rating: 3000lb

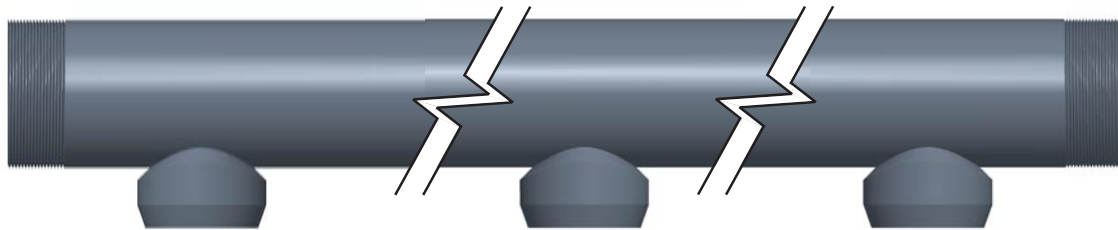
Table 7: Manifold Inlets

Part No.	Manifold Pipe Size	Container Size	Overall Diameter mm	Thread Connection	Overall Height mm	Weight kg
17036	65mm (2½")	4.5 L to 32 L	75 dia. (2.95")	1½ in. NPT	44 (1.73")	0.71 (1.57 lbs)
17037	80mm (3")	52 L to 180 L	100 dia. (3.94")	2½ in. NPT	63 (2.48")	1.20 (2.65 lbs)
17038	100mm (4")	52 L to 180 L	100 dia. (3.94")	2½ in. NPT	63 (2.48")	1.52 (3.35 lbs)
17467	150mm (6")	52 L to 180 L	100 dia. (3.94")	2½ in. NPT	63 (2.48")	1.54 (3.40 lbs)
15332	100mm (4")	343 L	122 dia. (4.80")	3 in. NPT	70 (2.76")	2.05 (4.52 lbs)
15333	150mm (6")	343 L	122 dia. (4.80")	3 in. NPT	63 (2.48")	1.53 (3.37 lbs)

SECTION 2 - SYSTEM COMPONENTS**Construction of Manifolds**

For customers wishing to manufacture their own manifolds they must be constructed as detailed below, and use the manifold inlets specified on Page 24, (Figure 20 and Table 7).

Figure 21 - Manifold construction



- PIPING MUST BE SCHEDULE 80
- TEST PRESSURE - 90 BAR (1300 psi)
- ALL DIMENSIONS MUST BE WITHIN $\pm 1/8"$
- AFTER WELDING, MAKE CERTAIN ALL INLET HOLES IN THE PIPE ARE CLEAN OF ANY WELD SPATTER AND OPEN COMPLETELY

Table 8: Manifolds

No. of Inlets	End Connection	Overall Length mm	Inlet to End Cap Distance mm	Inlet to Inlet Distance mm	Container Size	Socket Part No.
2	2½ in. BSPT / 2½ in. NPT	650 (25.6")	150 (6")	350 (14")	4.5 L to 32 L	17036
3	2½ in. BSPT / 2½ in. NPT	1000 (39.4")	150 (6")	350 (14")	4.5 L to 32 L	17036
4	2½ in. BSPT / 2½ in. NPT	1350 (53.1")	150 (6")	350 (14")	4.5 L to 32 L	17036
2	3 in. BSPT / 3 in. NPT	808 (31.8")	150 (6")	508 (20")	52 L to 180 L	17037
3	3 in. BSPT / 3 in. NPT	1316 (51.8")	150 (6")	508 (20")	52 L to 180 L	17037
4	3 in. BSPT / 3 in. NPT	1824 (71.8")	150 (6")	508 (20")	52 L to 180 L	17037
5	3 in. BSPT / 3 in. NPT	2332 (91.8")	150 (6")	508 (20")	52 L to 180 L	17037
6	3 in. BSPT / 3 in. NPT	2840 (111.8")	150 (6")	508 (20")	52 L to 180 L	17037
2	4 in. BSPT / 4 in. NPT	808 (31.8")	150 (6")	508 (20")	52 L to 180 L	17038
3	4 in. BSPT / 4 in. NPT	1316 (51.8")	150 (6")	508 (20")	52 L to 180 L	17038
4	4 in. BSPT / 4 in. NPT	1824 (71.8")	150 (6")	508 (20")	52 L to 180 L	17038
5	4 in. BSPT / 4 in. NPT	2332 (91.8")	150 (6")	508 (20")	52 L to 180 L	17038
6	4 in. BSPT / 4 in. NPT	2840 (111.8")	150 (6")	508 (20")	52 L to 180 L	17038
3	6 in. Flange	1366 (53.8")	150 (6")	508 (20")	52 L to 180 L	17467
4	6 in. Flange	1874 (73.8")	150 (6")	508 (20")	52 L to 180 L	17467
5	6 in. Flange	2382 (93.8")	150 (6")	508 (20")	52 L to 180 L	17467
6	6 in. Flange	2890 (113.8")	150 (6")	508 (20")	52 L to 180 L	17467
7	6 in. Flange	3398 (133.8")	150 (6")	508 (20")	52 L to 180 L	17467
8	6 in. Flange	3906 (153.8")	150 (6")	508 (20")	52 L to 180 L	17467
9	6 in. Flange	4414 (173.8")	150 (6")	508 (20")	52 L to 180 L	17467
10	6 in. Flange	4922 (193.8")	150 (6")	508 (20")	52 L to 180 L	17467

Table 8: Manifolds (Continued)

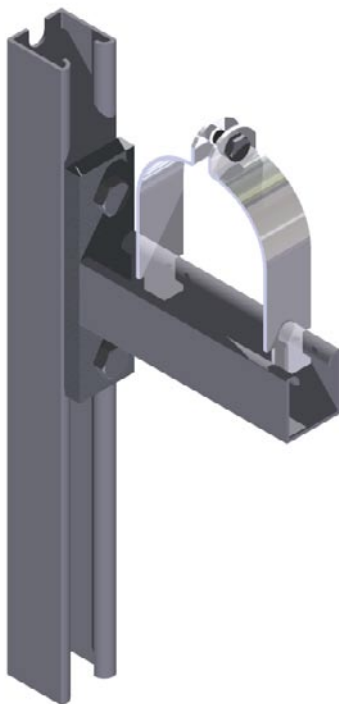
No. of Inlets	End Connection	Overall Length mm	Inlet to End Cap Distance mm	Inlet to Inlet Distance mm	Container Size	Socket Part No.
2	4 in. BSPT / 4 in. NPT	1011 (40")	150 (6")	711 (28")	343 L	15332
3	4 in. BSPT / 4 in. NPT	1722 (68")	150 (6")	711 (28")	343 L	15332
4	4 in. BSPT / 4 in. NPT	2433 (96")	150 (6")	711 (28")	343 L	15332
2	6 in. Flange	1061 (42")	150 (6")	711 (28")	343 L	15333
3	6 in. Flange	1772 (70")	150 (6")	711 (28")	343 L	15333
4	6 in. Flange	2483 (98")	150 (6")	711 (28")	343 L	15333
5	6 in. Flange	3192 (126")	150 (6")	711 (28")	343 L	15333
6	6 in. Flange	3905 (154")	150 (6")	711 (28")	343 L	15333
7	6 in. Flange	4616 (182")	150 (6")	711 (28")	343 L	15333
8	6 in. Flange	5327 (210")	150 (6")	711 (28")	343 L	15333
9	6 in. Flange	6038 (238")	150 (6")	711 (28")	343 L	15333
10	6 in. Flange	6749 (266")	150 (6")	711 (28")	343 L	15333

SECTION 2 - SYSTEM COMPONENTS

Manifold Bracket Assembly

A manifold bracket assembly consists of two lengths of unistrut, mounted vertically on a wall or bulk head to enable height adjustment of the manifold assembly. Cantilever brackets are fastened to the unistrut and each are held in position using a unistrut long spring, washer and hex head screw. Manifold brackets slot into the cantilever and are clamped using a hex head screw and plain nut. Each manifold bracket assembly is supplied in pairs.

Figure 22 - Manifold Bracket



Technical Information

65 mm (2.5") Manifold Bracket	(Part No. 311.205.015)
Unistrut Channel Length:	400 mm (15.75")
Cantilever Arm Length:	150 mm (5.91")
80 mm (3") Manifold Bracket	(Part No. 311.205.010)
Unistrut Channel Length:	500 mm (16.69")
Cantilever Arm Length:	300 mm (11.81")
100 mm (4") Manifold Bracket	(Part No. 311.205.011)
Unistrut Channel Length:	500 mm (16.69")
Cantilever Arm Length:	300 mm (11.81")
150 mm (6") Manifold Bracket	(Part No. 311.205.012)
Unistrut Channel Length:	500 mm (16.69")
Cantilever Arm Length:	300 mm (11.81")

Flexible Pilot Hose

The flexible pilot hose is used to connect pressure activated devices to the system, e.g. the pilot cylinder to the slave container to the pressure switch.

Figure 23 - Flexible hose (Part No. 306.205.003)



Technical Information

Outer sheath:	Stainless Steel Braided
Inner sheath:	PTFE to BS 4976
Max. Working Pressure:	190 bar (2755 psi)
Max. Bend Radius:	60 mm (2.4") @ 0 °C (32 °F)
Connections:	Zinc Passivated Mild Steel 2 off 1/4" BSP Female Swivel
Overall Size:	710mm (L) x 7mm (Dia) (27.95" (L) x 0.28" (Dia))
Weight:	0.15 kg (0.33 lbs)

Male Adaptors

This adaptor (309.013.005) connects the pilot hose to the 25 mm (1") and 50 mm (2") container valve assembly. The male adaptor (309.013.006) connects to the 80 mm (3") container valve assembly and also to the pressure switch.

Figure 24 - Male Adaptor



Technical Information

Material:	Steel 230 M07 Pb
Connection:	1/4" BSPP x 1/4" BSPT (Part No. 309.013.005) 1/4" BSPP x 1/4" NPT (Part No. 309.013.006)
Max. Working Pressure:	350 bar (5076 psi)
Overall Size:	34mm (L) x 19mm (W) (1.35" (L) x 0.75" (W))
Weight:	0.034 kg (0.08 lbs)

Male Pilot Hose Connector

The male pilot hose connector is used to connect two pilot hoses together for systems where a second container of a different size is used to protect a different enclosure. For example: a large container is protecting a room and a separate smaller container protects the subfloor, and both containers are to actuate simultaneously, and a hose longer than Part No. 306.205.003 is required.

Figure 25 - Male Pilot Hose Connector (Part No. 309.013.007)



Technical Information

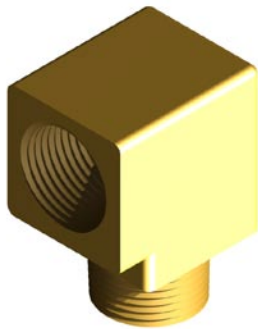
Material:	Steel 230 M07 Pb
Connection:	1/4" BSPP x 1/4" BSPP
Max. Working Pressure:	350 bar (5076 psi)
Overall Size:	30mm (L) x 19mm (W) (1.18" (L) x 0.75" (W))
Weight:	0.034 kg (0.08 lbs)

SECTION 2 - SYSTEM COMPONENTS

Street Elbow

This elbow can be used to connect a pilot hose to an 80 mm (3") valve. The street elbow's 1/4" NPT male thread screws into the valve body actuation port. The 1/4" NPT thread of the male adaptor (Part No. 309.013.006) screws into the street elbow. The flexible pilot hose (Part No. 306.205.003) would then screw onto the male adaptor.

Figure 26 - Street Elbow (Part No. 309.013.008)



Technical Information

Material:	Brass
Connection:	1/4" NPT x 1/4" NPT
Overall Size:	28mm (L) x 18mm (W) (1.10" (L) x 0.71" (W))
Weight:	0.042 kg (0.09 lbs)

Male Tee

This is used primarily in manifold systems for connecting pilot lines from one slave container to the next.

Figure 27 - Male Tee (Part No. 309.013.021)



Technical Information

Material:	Brass
Connection:	1/4" BSPP x 1/4" BSPP x 1/4" NPT
Max. Working Pressure:	450 bar (6527 psi)
Overall Size:	42mm (L) x 29mm (W) (1.65" (L) x 1.14" (W))
Weight:	0.075 kg (0.17 lbs)

Male Elbow

This elbow can be used on the last slave container when the pressure switch connection is taken from the manifold or piping networks.

Figure 28 - Male Elbow (Part No. 309.013.009)



Technical Information

Material:	Brass
Connection:	1/4" BSPP x 1/4" NPT
Max. Working Pressure:	450 bar (6527 psi)
Overall Size:	28mm (L) x 25mm (W) (1.10" (L) x 1.00 (W))
Weight:	0.050 kg (0.11 lbs)

Pressure Switch

The pressure switch is activated by pressure from the agent during discharge and can be used to signal to a control panel that the system has actually discharged. The pressure switch latches on operation and has a reset button. The pressure switch is supplied with a 1/4" BSPP x 1/4" NPT male adaptor (Part No. 309.013.006).

Figure 29 - Pressure Switch (Part No. 304.205.007)



Technical Information

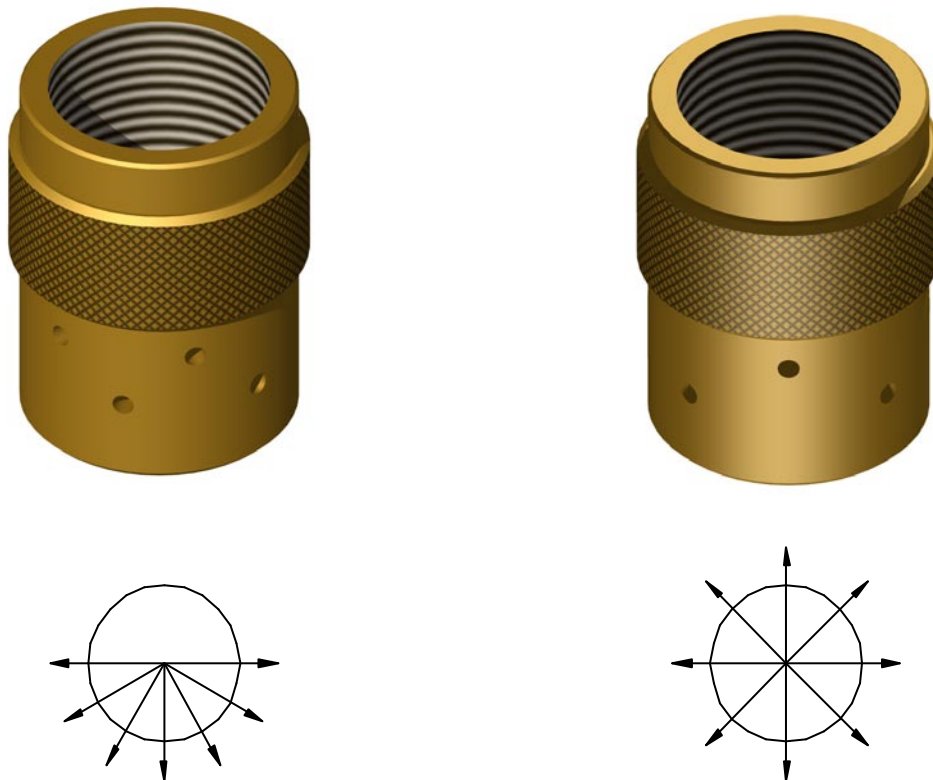
Housing:	Die-cast Aluminium
Pressure Connection:	Nickel Plated Brass
Switch Point:	4 bar Rising (58 psi)
Tolerance:	± 0.34 bar (± 5 psi)
IP Rating:	IP65
Connection:	1/4" NPT Female
Conduit Thread:	1/2" NPT Female
Max. Working Pressure:	103.4 bar (1500 psi)
DC Switch Rating:	1A 24v dc
Installation Environment:	non-corrosive / indoor
Overall Size:	165mm (L) x 101mm (W) (6.50" (L) x 3.98 (W))
Weight:	1.22 kg (2.69 lbs)

SECTION 2 - SYSTEM COMPONENTS

Discharge Nozzle

FM-200® 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 eight 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 as BSPP or NPT with Stainless Steel as an option.

Figure 30 - 7 & 8 Port Nozzle Brass Configuration



Technical Information

Material:	Brass / Stainless Steel
Thread Type:	BSPP / NPT
Drill Incrementation:	0.1 mm
Nozzle Type:	8 Port 360° / 7 Port 180°
Max. Distance from Ceiling:	300mm
Max. Agent per Nozzle:	100 kg (220 lbs)
Orientation:	Pendant / Upright

Table 9: Discharge Nozzles

Part Number	Nozzle Size	Nozzle Type	Nozzle Material	Thread Type
310.205.201	10 mm (3/8")	7 Port 180°	Brass	BSPP
310.205.202	10 mm (3/8")	8 Port 360°	Brass	BSPP
310.205.203	15 mm (1/2")	7 Port 180°	Brass	BSPP
310.205.204	15 mm (1/2")	8 Port 360°	Brass	BSPP
310.205.205	20 mm (3/4")	7 Port 180°	Brass	BSPP
310.205.206	20 mm (3/4")	8 Port 360°	Brass	BSPP
310.205.207	25 mm (1")	7 Port 180°	Brass	BSPP
310.205.208	25 mm (1")	8 Port 360°	Brass	BSPP
310.205.209	32 mm (1 1/4")	7 Port 180°	Brass	BSPP
310.205.210	32 mm (1 1/4")	8 Port 360°	Brass	BSPP
310.205.211	40 mm (1 1/2")	7 Port 180°	Brass	BSPP
310.205.212	40 mm (1 1/2")	8 Port 360°	Brass	BSPP
310.205.213	50 mm (2")	7 Port 180°	Brass	BSPP
310.205.214	50 mm (2")	8 Port 360°	Brass	BSPP
310.205.215	10 mm (3/8")	7 Port 180°	Brass	NPT
310.205.216	10 mm (3/8")	8 Port 360°	Brass	NPT
310.205.217	15 mm (1/2")	7 Port 180°	Brass	NPT
310.205.218	15 mm (1/2")	8 Port 360°	Brass	NPT
310.205.219	20 mm (3/4")	7 Port 180°	Brass	NPT
310.205.220	20 mm (3/4")	8 Port 360°	Brass	NPT
310.205.221	25 mm (1")	7 Port 180°	Brass	NPT
310.205.222	25 mm (1")	8 Port 360°	Brass	NPT
310.205.223	32 mm (1 1/4")	7 Port 180°	Brass	NPT
310.205.224	32 mm (1 1/4")	8 Port 360°	Brass	NPT
310.205.225	40 mm (1 1/2")	7 Port 180°	Brass	NPT
310.205.226	40 mm (1 1/2")	8 Port 360°	Brass	NPT
310.205.227	50 mm (2")	7 Port 180°	Brass	NPT
310.205.228	50 mm (2")	8 Port 360°	Brass	NPT

Part Number	Nozzle Size	Nozzle Type	Nozzle Material	Thread Type
310.205.301	10 mm (3/8")	7 Port 180°	Stainless	BSPP
310.205.302	10 mm (3/8")	8 Port 360°	Stainless	BSPP
310.205.303	15 mm (1/2")	7 Port 180°	Stainless	BSPP
310.205.304	15 mm (1/2")	8 Port 360°	Stainless	BSPP
310.205.305	20 mm (3/4")	7 Port 180°	Stainless	BSPP
310.205.306	20 mm (3/4")	8 Port 360°	Stainless	BSPP
310.205.307	25 mm (1")	7 Port 180°	Stainless	BSPP
310.205.308	25 mm (1")	8 Port 360°	Stainless	BSPP
310.205.309	32 mm (1 1/4")	7 Port 180°	Stainless	BSPP
310.205.310	32 mm (1 1/4")	8 Port 360°	Stainless	BSPP
310.205.311	40 mm (1 1/2")	7 Port 180°	Stainless	BSPP
310.205.312	40 mm (1 1/2")	8 Port 360°	Stainless	BSPP
310.205.313	50 mm (2")	7 Port 180°	Stainless	BSPP
310.205.314	50 mm (2")	8 Port 360°	Stainless	BSPP
310.205.315	10 mm (3/8")	7 Port 180°	Stainless	NPT
310.205.316	10 mm (3/8")	8 Port 360°	Stainless	NPT
310.205.317	15 mm (1/2")	7 Port 180°	Stainless	NPT
310.205.318	15 mm (1/2")	8 Port 360°	Stainless	NPT
310.205.319	20 mm (3/4")	7 Port 180°	Stainless	NPT
310.205.320	20 mm (3/4")	8 Port 360°	Stainless	NPT
310.205.321	25 mm (1")	7 Port 180°	Stainless	NPT
310.205.322	25 mm (1")	8 Port 360°	Stainless	NPT
310.205.323	32 mm (1 1/4")	7 Port 180°	Stainless	NPT
310.205.324	32 mm (1 1/4")	8 Port 360°	Stainless	NPT
310.205.325	40 mm (1 1/2")	7 Port 180°	Stainless	NPT
310.205.326	40 mm (1 1/2")	8 Port 360°	Stainless	NPT
310.205.327	50 mm (2")	7 Port 180°	Stainless	NPT
310.205.328	50 mm (2")	8 Port 360°	Stainless	NPT

Nozzle Weights

Nozzle Size	Brass	Stainless Steel
10 mm (3/8")	0.10 kg (0.22 lbs)	0.09 kg (0.20 lbs)
15 mm (1/2")	0.15 kg (0.33 lbs)	0.14 kg (0.31 lbs)
20 mm (3/4")	0.21 kg (0.46 lbs)	0.20 kg (0.44 lbs)
25 mm (1")	0.27 kg (0.60 lbs)	0.25 kg (0.55 lbs)
32 mm (1 1/4")	0.41 kg (0.90 lbs)	0.38 kg (0.84 lbs)
40 mm (1 1/2")	0.46 kg (1.01 lbs)	0.43 kg (0.95 lbs)
50 mm (2")	0.83 kg (1.83 lbs)	0.78 kg (1.72 lbs)

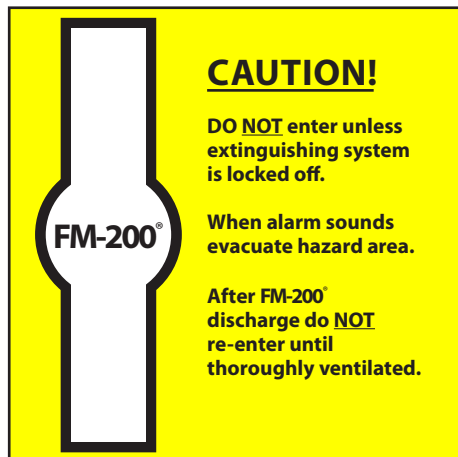
Nozzle Overall Sizes

Nozzle Size	Length	Diameter
10 mm (3/8")	33.5 mm (1.32")	25 mm (0.98")
15 mm (1/2")	41 mm (1.61")	29 mm (1.14")
20 mm (3/4")	47 mm (1.85")	34.5 mm (1.36")
25 mm (1")	52 mm (2.05")	41.3 mm (1.63")
32 mm (1 1/4")	62 mm (2.44")	50 mm (1.97")
40 mm (1 1/2")	68 mm (2.68")	60 mm (2.36")
50 mm (2")	89 mm (3.50")	76 mm (2.99")

SECTION 2 - SYSTEM COMPONENTS**Door Notice**

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

Figure 31 - Door Notice (Part No. 314.205.001)

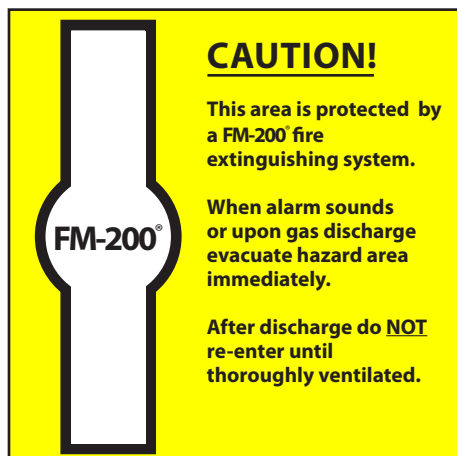


For areas protected by concentrations greater than NOAEL (unoccupied spaces only).

Manual Release Notice

A notice should be located at each manual release position.

Figure 32 - Manual Release Sign (Part No. 314.205.003)



For areas protected by concentrations less than NOAEL (Part No. 314.205.002).

Technical Information

Material	2 mm (0.08 in) Craylon
Finish	Gloss, scratch resistant
Overall Size:	212mm (L) x 75mm (W) (8.35" (L) x 2.95" (W))
Weight:	0.011 kg (0.024 lbs)

Technical Information

Material	2 mm (0.08") Craylon
Finish	Gloss, scratch resistant
Overall Size:	210mm (L) x 210mm (W) (8.27" (L) x 8.27" (W))
Weight:	0.025 kg (0.055 lbs)

Liquid Level Measuring Device

The measuring device is used to measure the level of liquid FM-200® in 106, 147, 180, and 343 litre containers. The weight of the FM-200® in the container is determined by converting the level measurement into a weight measurement using the weight conversion tables in appendix D of this manual. The operating temperature range for the liquid level measuring device is 0 to 54 °C (32 to 130 °F).

The liquid level is found by lifting the measuring tape from inside the tube to the end (or approximately 75 mm (3") above the anticipated liquid level) and slowly lowering the tape until a magnetic interlock with the float is felt. The tape will then remain in the up position, allowing a reading at the top of the housing. This measurement is accomplished without removing the tank from the fire suppression system.

The device must be installed in an empty container assembly before filling, the liquid level measuring device must be ordered as a separate line item.

106 litre Part No. 300.015.127

147, 180, 343 litre Part No. 300.015.128

Technical Information

Mounting Thread: 1.3125-12UN-2A

Stem Material: Brass

Mounting Material: Brass

Float Material: ECCO

Model: Diptape Indicator

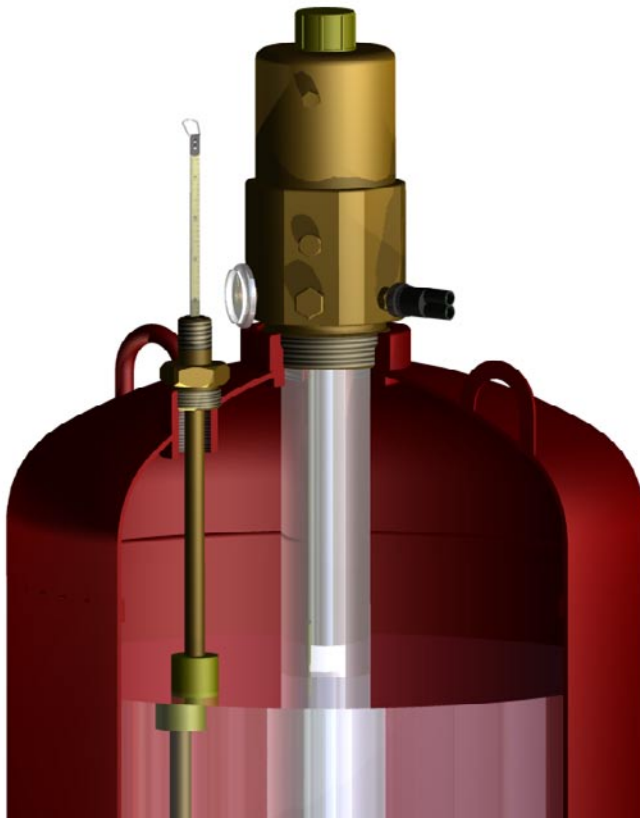
Approximate Length: 814 mm (32") (Part No. 300.015.127)

1093 mm (43") (Part No. 300.015.128)

Weight: 1.13 kg (2.49 lbs) (Part No. 300.015.127)

1.52 kg (3.36 lbs) (Part No. 300.015.128)

Figure 33 - Liquid Level Measuring Device



SECTION 2 - SYSTEM COMPONENTS

Typical Manifold System

Figure 34 indicates a typical two container system complete with electrical actuation, manual actuator, pressure switch, 2 x low pressure switch, flexible connections, distribution pipework and nozzles.

Figure 34 - Typical Manifold System

