CLEAN AGENT COMPARATIVE

Basic Agent Information	Halon 1301	FM-200™	SAPPHIRE™
NFPA Identification	Halon 1301	HFC-227ea	FK-5-1-12
(ASHRAE Class)			
Manufacturer	various	Great Lakes Chemical	3M
Type	Synthetic - Halon	Synthetic - HFC	Synthetic
Chemical Name	Bromotrifluromethane	Heptafluropropane	Fluroketone
Chemical Formula	CF3Br	CF3CHFCF3	$CF_3\ CF_2\ C(o)\ CF\ (CF_3)_2$
Notes:			

Environmental	Halon 1301	FM-200™	SAPPHIRE™
EPA "SNAP" Status	discontinued per Montreal Protocol	accepted, subject to use conditions	Accepted
Special Restrictions			
Ozone Depletion Potential (CFC-11 = 1)	16	None	None
Global Warming Potential (CO2 =1)	5,600	2,050	1
Atmospheric Life Time	65 years	31 to 42 years	0.014 years
Testing and Training Allowed ?	No	No	Yes

Release of Agent Allowed During Service / Maintenace?	No, must be recovered	No, must be recovered	Yes
Countries where installations have never been permitted, or where the sale or importation of the agent or the installation of new systems has been discontinued or severely	all countries that are signatories to the Montreal Protocol	Germany Denmark Switzerland Sweden United Kingdom Japan	Available Without Restrictions
Environment Canada Status	No new installations. (Essential use exempted). No mandatory removal dates at present. Subject to "Federal	Accepted * Subject to "Federal Halocarbon Regulations" †	Accepted

* An international consensus on Climate Change may result in future restrictive regulations beyond the Federal Halocarbon Regulations which are pending..

† Pending regulations, called the “Federal Halocarbon Regulations” will require mandatory record keeping, annual reporting on ownership, service only by certified companies, recovery of the agent, and reporting of any discharge within 24 hr. Owner of the system is held responsible. (Expect regulations to be in place by March 1997 and applicable to federal government installations at that time.)

Health and Safety	**Halon 1301**	**FM-200™**	**SAPPHIRE™**
Tested on Humans	Yes	No	No
Toxicity (LC50)	> 800,000 ppm	> 800,000 ppm	> 100,000 ppm
Cardiac Sensitization (NOAEL)	5.0%	9.0%	10% Concentration
Cardiac Sensitization (LOAEL)	7.5%	10.5%	> 10%
Thermal Decomposition, Levels from independent tests ‡	low, possible to exceed safe levels	very high, likely to exceed safe levels	none
Minimum Allowable O2 in the protected space (per EPA-SNAP)		16%	to be determined

Maximum Allowable CO2 n the protected space (per EPA-SNAP)		not applicable	to be determined

‡ Based on test reports from USCG, USNRL, NRC-Canada and LPC (U.K.)

Design, Approvals, Testing	**Halon 1301**	**FM-200™**	**SAPPHIRE™**
NFPA Standards	NFPA 12A (no new commercial installations)	NFPA 2001 accepted for normally occupied areas	NFPA 2004 accepted for normally occupied areas
Suppliers	Ansul, Kidde, Chemetron, Fike, others	Kidde, Fike, Chemetron	Ansul
Approvals	ULC / UL / FM	ULC / UL / FM	ULC / UL / FM
Principal Extinguishment Mechanism	80% chemical interruption / 20% Physical cooling	80% physical cooling, 20% chemical	100% physical cooling
Discharge Times for 95% of agent in room	10 seconds	10 seconds	10 seconds
Temperature on discharge (from approx. 20oC.)	9.3°C (49°F.)	-0.8°C (31°F)	60°F
Thermal Decomposition of Agent (Level / Effect on Equipment & Contents)	Low / Corrosion	Very High / Corrosion	None
Cup Burner Values (n-heptane)	2.9%	5.9 to 6.6%	4.50%
Minimum Design Concentration per ULC	5.0%	7.0%	4.2%
Design Concentrations in use in recent test programs	5.0%	7.0 to 10.1%	4.2%
LPC (U.K.) Test Results Number of Fires Extinguished	All	6 out of 8 @ 7.0% 6 out of 6 @ 8.6%	To be determine LPC Test Results
Boiling Point	-72°F. (-58°C)	-16°C. (2.6°F)	49.2°C
Vapour Pressure (at 25 deg.C. (77 deg.F.)	1,620 kpa (235 psia)	460 kpa (66 psia)	400 kpa
Superpressurization of cylinders:	nitrogen	nitrogen	nitrogen

Design, Approvals, Testing (continued)	Halon 1301	FM-200™	SAPPHIRE™
Cylinder storage Pressures (Nominal)	2,482 to 4,137 kPa (360 or 600 psig.)	2,482 kPa (360 psig.)	2500 kPa
Temperature Range, Protected Area	-40 to 93°C . (-40 to 200°F)	-12 to 93°C . (-10 to 200°F) (span t.b.a.)	
Temperature Range, Cylinders	0 to 54°C. (32 to 130°F)	0 to 54°C. (32 to 130°F)	
Pressure venting required	yes	yes	yes
Engineered Design	yes	yes	yes
Estimated / Nominal Distribution Pipe	25 m. (80 ft.)	18 m. (60 ft.)	30 to 40 m.
Distribution Pipe fittings	Sch.40, 150/300 lb. fittings	Sch.40, 300 lb. fittings	Sch.40, 300 lb. fittings
Vertical Flow Separations	no	no	no
Floor Foot Print for cyliners (based on halon =1 and assuming halon cylinders are approx. 200 kg. capacity)	1	1.8	0.6

Note: ULC / UL and FM approvals do not consider:
thermal decomposition of the agent and effects on people and equipment / contents
environmental considerations beyond US-EPA "SNAP" approval
temperature change in the protected space

The following information is the best available as of the date of publication. For certain items, where information has not been immediately available, reasonable estimates have been made where appropriate.