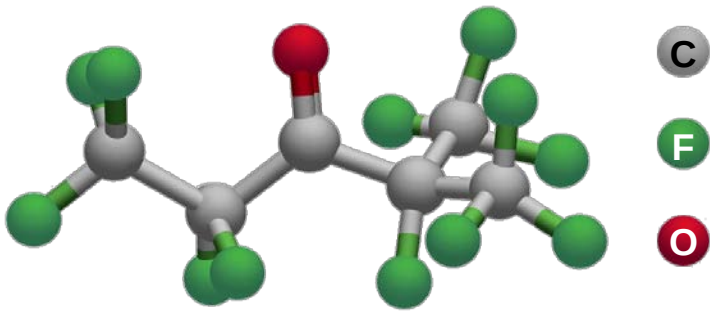
tyco
Fire Suppression
& Building Products

SAPPHIRE™

Total Flooding Systems

with

3M Novec™ 1230 Fire Protection Fluid



C_6 Fluoroketone

- Guideline -

Note: This guideline has been prepared with the best information available at the time of publication. Changes in standards mentioned or technical changes may apply without further notice.

Guideline For TSP Sapphire™ Extinguishing Systems

1) General Information

Novec™ 1230 has been developed as an alternative to Halon 1301, production of which ceased at the end of 1993, under the agreed adjustments made to the Montreal Protocol in November 1992.

Novec™ 1230 contains no Bromine or Chlorine and has therefore an Ozone depleting potential (ODP) of zero.

Sapphire™ systems utilize one or more storage tanks arranged to provide the protected area with a pre-determined quantity of gas.

Sapphire™ tanks are designed to hold Novec™ 1230 in liquid form and Nitrogen, which is used to super-pressurize the tank to 24.8 bar (360 psi) at 20°C.

Handling and installation of Sapphire™ equipment should only be carried out by persons experienced in dealing with this type of equipment.

2) Properties of Novec™ 1230

Under normal conditions Novec™ 1230 is a colorless and low odor fluid with a density around 11 times greater than air. It has negligible vapor pressure and is super-pressurized with Nitrogen to 24.8 bar (360 psi) when used in fire fighting applications. It contains no particulates or oily residues and is produced under ISO 9001 guidelines to strict manufacturing specifications ensuring product purity.

Present understanding of Novec™ 1230 is that fire fighting is through heat absorption and chemical means.

Novec™ 1230 decomposes at temperatures in excess of 500°C and it is therefore important to avoid applications involving hazards where continuously hot surfaces are involved. Upon exposure to the flame Novec™ 1230 will decompose to form halogen acids (HF). Their presence will be readily detected by a sharp, pungent odor before maximum hazardous exposure levels are reached. It has been concluded from fire toxicity studies that decomposition products from the fire itself specially carbon monoxide, smoke, oxygen depletion and heat may create a greater hazard.

Chemical Formula:	$CF_3CF_2C(O)CF(CF_3)_2$
Boiling Point @ 1 atm:	49 °C (120 °F)
Vapour Pressure @ 20°C:	0,40 bar (5,85 psig)
Gas Density @ 1 atm / 20°C:	13.6 kg/m³ (1.95 lb/ft³)
Liquid Density @ 20°C:	1610 kg/m³

3) Approvals

The Sapphire™ system and components have been tested and approved by LPCB (European system) and UL/ FM (non-European system).

Only approved components may be used in the Sapphire™ system.

Guideline For TSP Sapphire™ Extinguishing Systems

4) Safety Margins

	Used Conc.	NOAEL*	Safety Margin
Novec 1230™	**4% - 6%**	**10%**	**67% - 150%**
Halon 1301	5%	5%	Nil
HFC-227ea	6,4% - 8,7%	9%	3% - 29%

* No Observable Adverse Effect Level

5) Environmental Comparison*

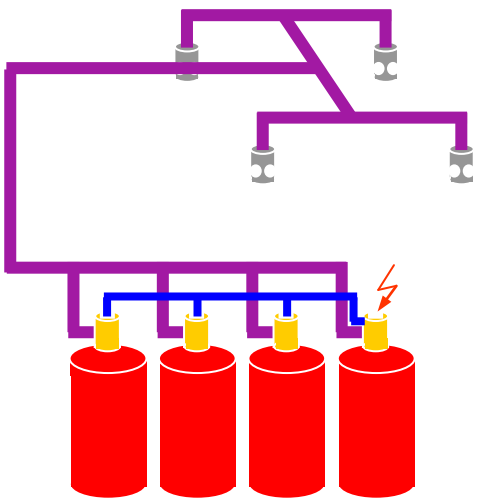
	Ozone Depletion Potential (ODP)	Global Warming Potential (GWP)	Atmospheric Lifetime (years)
Novec 1230™	**0**	**1**	**0.014**
Halon 1301	12	6900	65
HFC-227ea	0	3500	33

* IPCC 2001

6) General System Design

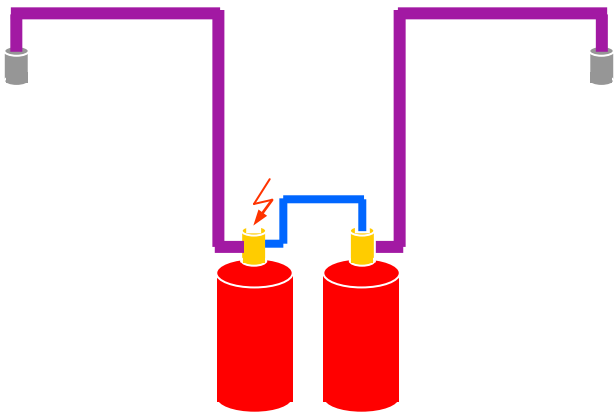
Total Flooding is the only approved application method for Sapphire™ systems!

Manifolded System



All tanks must be same size and same fill density !

Modularized System



Different tank size/ fill density is acceptable !

Guideline For TSP Sapphire™ Extinguishing Systems

7) Hazard Analysis

Note: A thorough hazard analysis is important for a qualified quotation.

The following questions should be answered:

PROJECT: (enter name if applicable; country must be indicated)

Name	Country

SUPPRESSION SYSTEM:

☐$HPCO_2$ ☐FM-200 ☐Novec™ ☐i2/i3 ☐Inergen ☐Other (specify) _____
Type

☐ NFPA ☐ ISO ☐ VdS ☐ UL ☐ FM ☐ LPCB ☐ VdS ☐ Other (specify) _____
Design Standard Approval

☐DOT ☐TPED ☐None ☐Other (specify) _____
Agent Tank Approval

☐Electric ☐ Manual ☐Pneumatic
System Release

☐Inside Hazard ☐Outside Hazard: _____ [m] horizontal distance _____ [m] vertical distance
Agent Tank Location

HAZARD:

No. Name		Hazardous Material

[°C]	[°C]	[m]
Minimum Temperature	Maximum Temperature	Altitude above/below sea level

Hazard Dimensions:

[m]	[m]	[m²]
Length	Width	Floor Area (alternative)

[m]	[m]	[m]
Height of Ceiling Void (if applicable)	Height of Room (excl. ceiling/floor void)	Height of Floor Void (if applicable)

Impermeable Building Structures: [m³]
Only permanent impermeable building structures within the area may be deducted from the gross volume

Note In the following cases please supply additional sketches/drawings with dimensions and any relevant details:
- irregular room shapes
- ceiling obstructions such as beams greater than 300 mm (12 in.) height
- other unusual conditions.

Further Information / Comments:

8) System Design

The system design requires the following steps:

1. Check on design standard / hazardous material involved to get the design concentration.
2. Determination of net* hazard volume.
   *Only permanent impermeable building structures within the hazard may be deducted from the overall hazard volume.
3. Determination of the extinguishing agent quantity
4. Check the max. reached concentration.
5. Determination of number and size of agent tanks.
6. Determination of nozzle size and quantity.
7. Determination of pipe sizes and pipe run.
   Note: Pipes and fittings are generally not supplied by TSP.

8.1) Novec™ 1230 Design Concentrations

	ISO 14520	CEA 4045	NFPA 2001	EN 15004
Surface Class A	5,3 %	5,8 %	4,2 % [3)]	5,3 %
Higher Hazard Class A [1)]	5,6 %	---	---	5,6 %
Class B (Heptane) [2)]	5,9 %	6,1 %	5,9 % [3)]	5,9 %

[1)] ISO 14520-1 § 7.5.1.3 I EN 15004-1 § 7.5.1.3
It is recognized that the wood crib and polymeric sheet class A fire tests may not adequately indicate extinguishing concentrations suitable for the protection of certain plastic fuel hazards (e.g. electrical and electronic type hazards involving grouped power or data cables such as computer and control room under-floor voids, telecommunication facilities, etc.). An extinguishing concentration not less than that determined according to clause 7.5.1.3, or not less than 95% of that determined from the heptane fire test in Annex C, Clause C.6.2, whichever is the greater, should be used under certain conditions. These conditions may include:
(1) Cable bundles greater than 100 mm in diameter
(2) Cable trays with a fill density greater than 20 percent of the tray cross-section
(3) Horizontal or vertical stacks of cable trays (closer than 250 mm)
(4) Equipment energized during the extinguishment period where the collective power consumption exceeds 5 kW

NFPA 2001 - 2008 Edition A.5.4.2.2 (7)(g)
Where any of the following conditions exist, higher extinguishing concentrations might be required:
(1) Cable bundles greater than 100 mm in diameter
(2) Cable trays with a fill density greater than 20 percent of the tray cross-section
(3) Horizontal or vertical stacks of cable trays (closer than 250 mm)
(4) Equipment energized during the extinguishment period where the collective power consumption exceeds 5 kW

[2)] For design concentrations for any other class B fuel see design standards or contact Tyco Technical Service.

[3)] NFPA 2001 - 2008 Edition Table A.5.4.2.2(b)

Important!
These design concentrations are **not applicable** (and are not to be used) **for Marine applications.**

8.2) Novec™ 1230 Flooding Factor Table

Table 1: Novec™ 1230 weight requirements per volume of protected space

Flooding Factors Novec 1230													
Design Temperature of Hazard	Specific Vapor Volume	Design Concentration											
		4.2 %	5.2 %	5.3 %	5.4 %	5.5 %	5.6 %	5.7 %	5.8 %	5.9 %	6.0 %	7.0 %	8.0 %	9.0 %
		Agent Weight Requirements per Volume of Protected Hazard (kg/m³)												
-20 °C	0.06092	0.7197	0.9004	0.9187	0.9370	0.9554	0.9738	0.9922	1.0107	1.0292	1.0478	1.2355	1.4274	1.6235
-15 °C	0.06229	0.7038	0.8806	0.8985	0.9164	0.9344	0.9524	0.9704	0.9885	1.0066	1.0247	1.2084	1.3960	1.5878
-10 °C	0.06366	0.6887	0.8616	0.8791	0.8967	0.9142	0.9319	0.9495	0.9672	0.9849	1.0027	1.1824	1.3660	1.5536
-5 °C	0.06503	0.6742	0.8435	0.8606	0.8778	0.8950	0.9122	0.9295	0.9468	0.9642	0.9815	1.1574	1.3372	1.5209
0 °C	0.06640	0.6603	0.8261	0.8429	0.8597	0.8765	0.8934	0.9103	0.9273	0.9443	0.9613	1.1336	1.3096	1.4895
5 °C	0.06777	0.6469	0.8094	0.8258	0.8423	0.8588	0.8753	0.8919	0.9085	0.9252	0.9419	1.1107	1.2831	1.4594
10 °C	0.06914	0.6341	0.7934	0.8095	0.8256	0.8418	0.8580	0.8742	0.8905	0.9068	0.9232	1.0886	1.2577	1.4304
15 °C	0.07051	0.6218	0.7779	0.7937	0.8096	0.8254	0.8413	0.8573	0.8732	0.8892	0.9053	1.0675	1.2333	1.4027
20 °C	0.07188	0.6099	0.7631	0.7786	0.7941	0.8097	0.8253	0.8409	0.8566	0.8723	0.8880	1.0471	1.2097	1.3759
25 °C	0.07325	0.5985	0.7488	0.7640	0.7793	0.7946	0.8099	0.8252	0.8406	0.8560	0.8714	1.0276	1.1871	1.3502
30 °C	0.07462	0.5875	0.7351	0.7500	0.7650	0.7800	0.7950	0.8100	0.8251	0.8402	0.8554	1.0087	1.1653	1.3254
35 °C	0.07599	0.5769	0.7218	0.7365	0.7512	0.7659	0.7807	0.7954	0.8103	0.8251	0.8400	0.9905	1.1443	1.3015
40 °C	0.07736	0.5667	0.7091	0.7235	0.7379	0.7523	0.7668	0.7814	0.7959	0.8105	0.8251	0.9730	1.1241	1.2785
45 °C	0.07873	0.5569	0.6967	0.7109	0.7250	0.7392	0.7535	0.7678	0.7821	0.7964	0.8107	0.9560	1.1045	1.2562
50 °C	0.08010	0.5473	0.6848	0.6987	0.7126	0.7266	0.7406	0.7546	0.7687	0.7828	0.7969	0.9397	1.0856	1.2347
55 °C	0.08147	0.5381	0.6733	0.6870	0.7007	0.7144	0.7281	0.7419	0.7558	0.7696	0.7835	0.9239	1.0673	1.2140
60 °C	0.08284	0.5292	0.6621	0.6756	0.6891	0.7026	0.7161	0.7297	0.7433	0.7569	0.7705	0.9086	1.0497	1.1939
65 °C	0.08421	0.5206	0.6514	0.6646	0.6779	0.6911	0.7045	0.7178	0.7312	0.7446	0.7580	0.8938	1.0326	1.1745
70 °C	0.08558	0.5123	0.6409	0.6540	0.6670	0.6801	0.6932	0.7063	0.7195	0.7326	0.7458	0.8795	1.0161	1.1557
75 °C	0.08695	0.5042	0.6308	0.6437	0.6565	0.6694	0.6823	0.6952	0.7081	0.7211	0.7341	0.8657	1.0001	1.1374
80 °C	0.08832	0.4964	0.6211	0.6337	0.6463	0.6590	0.6717	0.6844	0.6971	0.7099	0.7227	0.8522	0.9846	1.1198
85 °C	0.08969	0.4888	0.6116	0.6240	0.6364	0.6489	0.6614	0.6739	0.6865	0.6991	0.7117	0.8392	0.9695	1.1027
90 °C	0.09106	0.4815	0.6024	0.6146	0.6269	0.6392	0.6515	0.6638	0.6762	0.6885	0.7010	0.8266	0.9549	1.0861

8.3) Altitude Correction Factors

At elevations above sea-level, Novec™ 1230 has a greater specific volume because of the reduced atmospheric pressure. A system designed for sea-level conditions will therefore develop an actual higher concentration at levels above sea-level and an actual lower concentration at levels below sea-level.

Table 2:

Altitude (m)	-1000	Sea Level	1000	1500	2000	2500	3000	3500	4000	4500
Correction Factor	1.130	1.000	0.885	0.830	0.785	0.735	0.690	0.650	0.610	0.565

8.4) Determination of Novec™ 1230 Quantity

$$Q = V \times C_F \times C_{Alt}$$

Where Q = Agent quantity required [kg]
V = Hazard volume [m³]
C_F = Flooding factor [kg/m³] (see Table 1)
C_{Alt} = Altitude correction factor (see Table 2)

Example:

Type of hazard:	Computer room (surface class A) Design Standard: ISO 14520
Gros volume:	8.0 m x 4.25 m x 2.5 m = 85 m³
Minimum hazard temperature:	20°C
Maximum hazard Temperature:	30°C
Altitude:	1500 m

$$Q = 85 \times 0.7786 \times 0.83 = 54.93$$

Round up to the next full kg ➔ **Required agent quantity = 55 kg Novec™ 1230**.

8.5) Check the max. reached Novec™ 1230 concentration

To check the concentration C reached in the hazard the following formula can be used:

$$C = \frac{Q \times s \times 100}{V + (Q \times s)}$$

Where Q = agent quantity supplied from the system [kg] ➔ **at sea level !**
V = hazard volume [m³]
s = specific vapor volume [m³/kg] = 0.0664 + 0.000274 * T ➔ **at sea level !**
T = max. hazard temperature [°C]

Example:

Type of hazard:	Computer room (surface class A) Design Standard: ISO 14520
Gros volume:	8.0 m x 4.25 m x 2.5 m = 85 m³
Minimum hazard temperature:	20°C
Maximum hazard Temperature:	**30°C**
Altitude:	1500 m

A quantity of 55 kg Novec™ 1230 has been calculated at an altitude of 1500 m.

At sea level this would result in 55 kg / 0.83 = **66.27 kg Novec™**

What concentration is reached at the **max. hazard temperature of 30°C ?**

Specific vapor volume (s) for Novec™ 1230:
Formula: S = 0.0664 + 0.000274 * **30** =0.074

$$C = \frac{66.27 * 0.0746 * 100}{85 + 66.27 * 0.0746} = \frac{494.37}{89.94} = 5.5\%$$

Concentration is less than NOAEL (10%) – okay for occupied space !

8.6) Determination of number and size of tanks required

Each Sapphire™ tank assembly consists of
- Tank
- Tank valve with pressure gauge
- Siphon tube

Tanks are painted red as standard.

Tanks are fitted with a label which provides handling, maintenance and recharge instructions.
All tanks are designed for vertical mounting only.

Each assembly may be provided with a range of Novec™ 1230 fills to suit the design requirements.
After filling, the tanks are super-pressurised with dry nitrogen to 24.8 bar +5% (at a temperature of 20°C).

Minimum filling density for Novec™ 1230: ~0,5 kg/liter
Maximum filling density for Novec™ 1230: ~1,2 kg/liter*

* Unless a hydraulic flow calculation is done, approximate 75% of the max. filling should be used to determine a container size (this is a recommendation from experience, not a fixed technical value).

Table 3a: UK Sapphire™ Tanks manufactured to meet 84/527/EEC (TPED)

Tank Size	Tank Diameter	Height to Valve Outlet	ca. Tare Weight	Minimum Novec™ 1230 Filling	Maximum Novec™ 1230 Filling	Max. Tank Gross Weight*		Maximum practical tank filling - guideline - *
(litre)	(mm)	(mm)	(kg)	(kg)	(kg)	(kg)		(kg)
8	254	300	15	4.5	10.0	26		7.5
16	254	499	19	9.0	21.5	41		16.0
32	254	831	26	17.0	40.5	68		30.0
52	406	596	44	26.0	62.0	111		47.0
106	406	1020	72	53.5	128.0	205		96.0
147	406	1354	90	73.5	177.5	274		133.0
180	406	1633	106	90.5	209.0	332		156.0

Note: For extinguishing systems to be installed in Europe (EU) TPED compliant tanks must be used !

Table 3b: UK Sapphire™ Tanks manufactured to meet DOT

Tank Size	Tank Diameter	Height to Valve Outlet	ca. Tare Weight	Minimum Novec™ 1230 Filling	Maximum Novec™ 1230 Filling	Max. Tank Gross Weight*		Maximum practical tank filling - guideline - *
(litre)	(mm)	(mm)	(kg)	(kg)	(kg)	(kg)		(kg)
8	254	304	15	4.5	9.5	26		7.0
16	254	502	19	9.0	21.0	41		16.0
32	254	833	26	17.0	40.0	68		30.0
52	406	596	49	26.5	62.5	111		47.0
106	406	1020	72	53.0	127.0	205		95.0
147	406	1350	90	73.0	176.0	274		132.0
180	406	1630	106	90.5	208.0	332		156.0
343	610	1466	207	170.0	386.0	593		289.0

* Approx. 75% of max. filling. This data are not fixed values but recommendations from experiences with hydraulic flow calculations. Qualified results will be given from the hydraulic flow calculation software only.

Table 3c: Sapphire™ Tanks - USA

Shipping Assembly Part No.	Nominal Tank Size lbs.	(kg)	Agent Quantity lbs.	(kg)	Approximate Empty Weight lbs.	(kg)	Dimension "A" in.	(cm)	Diameter in.	(cm)	Valve Size
570635	20	(9.1)	9 to 21	(4 to 9.5)	33	(15)	12	(30.4)	10	(25.4)	1 in.
570636	50	(22.7)	20 to 47	(9.1 to 21)	41	(18.6)	19.8	(50.2)	10	(25.4)	1 in.
570637	90	(40.8)	37 to 88	(17 to 40)	57.5	(26)	32.8	(83.3)	10	(25.4)	1 in.
570638	140	(63.5)	58 to 138	(26 to 62.6)	108	(49)	23.5	(59.6)	16	(40.6)	2 in.
570639	280	(127)	116 to 280	(52.6 to 127)	158	(71.7)	40.2	(102)	16	(40.6)	2 in.
570640	390	(177)	161 to 389	(73 to 176)	198	(90)	53.3	(135)	16	(40.6)	2 in.
570641	450	(204)	194 to 459	(88 to 204)	233	(106)	64.3	(163)	16	(40.6)	2 in.
570586	850	(386)	375 to 851	(170 to 386)	456	(207)	57.7	(146.6)	24	(61)	3 in.

Example: using the DOT container out of the UK

Required agent quantity = 55 kg Novec™ 1230.

Tank size	Min. Filling 0,5 kg/l	Max. Filling 1,2 kg/l	Max. practical filling *	Tank Fill Level **	Comment
52 l	26.5 kg	62.5 kg	47.0 kg	88%	→ not o.k. / Filling over ~75%
106 l	53.0 kg	127 kg	95.0 kg	43%	→ o.k.
147 l	73.0 kg	176 kg	132.0 kg	31%	→ not o.k. / Minimum filling rate not reached

* 75% of max. filling

$$** \text{ Tank fill level} = \frac{\text{actual filling [kg]}}{\text{max. filling [kg]}}$$

1 x 106 liter tank required - filled with 55 kg Novec™ 1230

8.7) Determination of number and size of nozzles

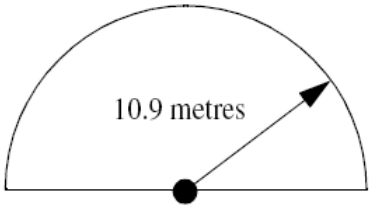
Sapphire™ Discharge Nozzles:

	180° Pattern	360° Pattern
Number of ports	7	16
Available size	15/20/25/32/40/50 mm (½, ¾", 1", 1¼", 1½", 2")	
Max. area of coverage	see right	
Max. coverage height	5.0 m	
Max. discharge quantity	~100 kg*	

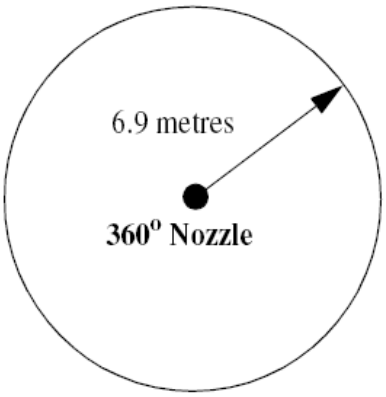
360° Nozzles to be placed as close to the center of the hazard as possible. 180° nozzles to be preferable placed on the longer side wall.
On multiple nozzle systems, the nozzles should be as equally spaced as possible.

* to avoid heavy turbulences in the area

Nozzle Coverage:



180° Nozzle

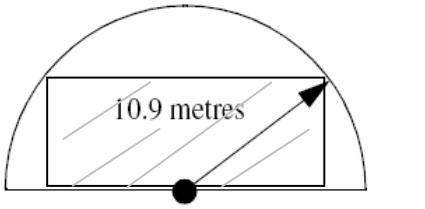


Sapphire™ Discharge Nozzles / UL and FM:

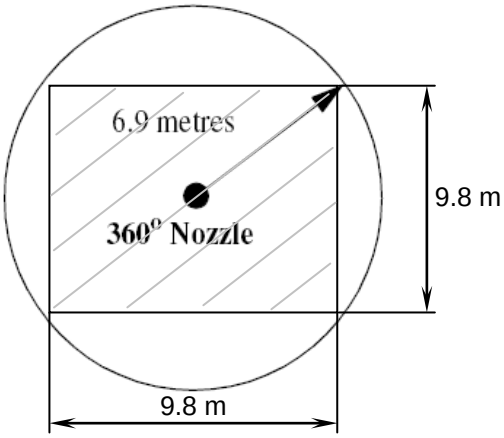
	180° Pattern	360° Pattern
Number of ports	7	16
Radial coverage	10.9 m	6.9 m
Available size	15/20/25/32/40/50 mm (½, ¾" , 1", 1 ½", 1 ¼", 2")	
Max. area of coverage	9.8 m spacing	
Max. coverage height	4.3 m	
Max. discharge quantity	Not specified	

360° Nozzles to be placed as close to the center of the hazard as possible. 180° nozzles to be preferable placed on the longer side wall.
On multiple nozzle systems, the nozzles should be as equally spaced as possible.

Nozzles to be located within 305 mm of the wall of the hazard.



180° Nozzle



Guideline For TSP Sapphire™ Extinguishing Systems

Example: non-UL/FM nozzles used

Hazard = 8.0 m x 4.25 m x 2.5 m

55 kg Novec™ 1230

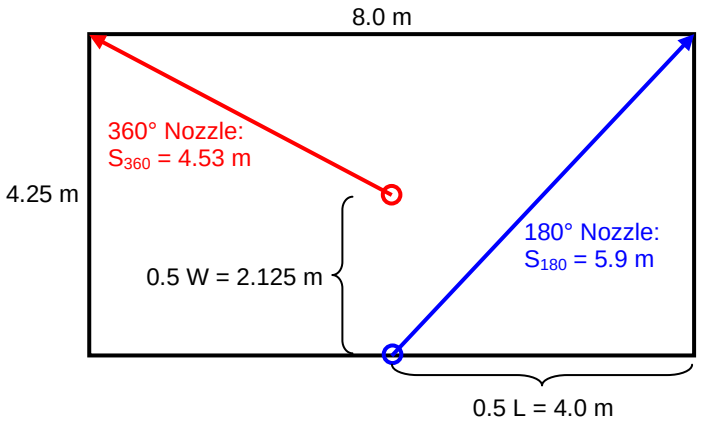
Note:
Discharge time for a *Sapphire*™ system is always **max. 10 seconds**.

A) Number of nozzles:

- check nozzle coverage vs. hazard area
- check max. discharge quantity per nozzle (~100 kg) vs. agent quantity
- check max. coverage height (5 m) vs. height of hazard

1 nozzle 180° or 1 nozzle 360° possible.

Check of nozzle coverage



B) Nozzle size:

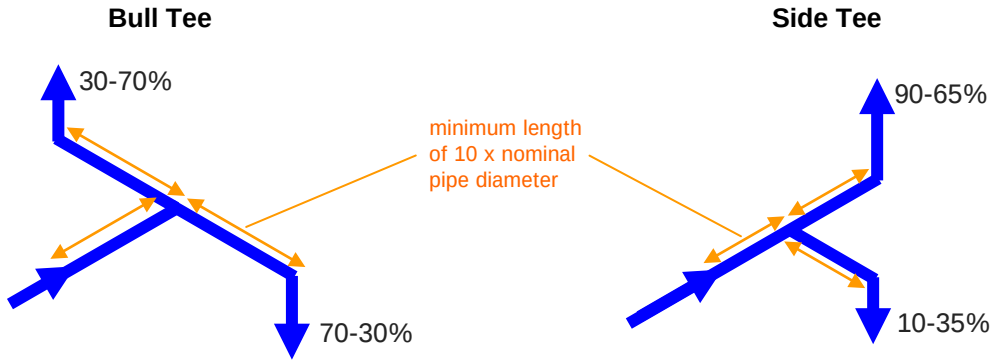
- check agent flow [kg/s] per nozzle and determine nozzle size from table 4 (see § 8.8)

Agent flow = 5,5 kg/s
Nozzle size = 32 mm (1 1/4")

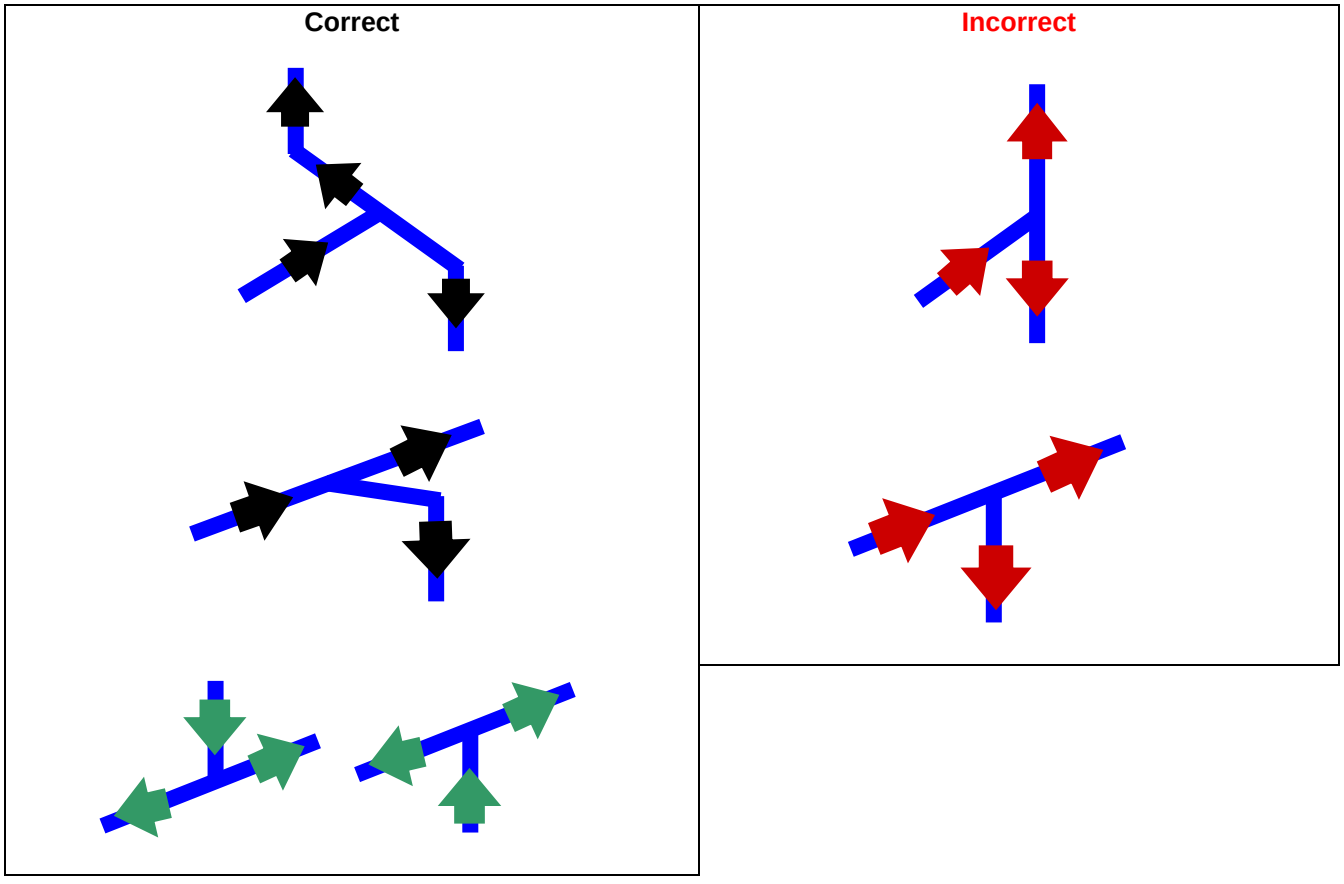
8.8) Determination of pipe sizes and pipe run

System Limitations

Flow limitations at T-splits



Pipe arrangements at T-splits



Guideline For TSP Sapphire™ Extinguishing Systems

Pipe Size Estimation

Use table 4 to determine the pipe size according to the agent flow.

Note: Table 4 is for estimation purpose only. The final pipe size will be determined by the hydraulic flow calculation software.

Example:

- Total quantity = 55 kg Novec™ 1230 (in 10 s)
- ➔ 5,5 kg/s
- find the next higher value in "*Max. Flow*" column

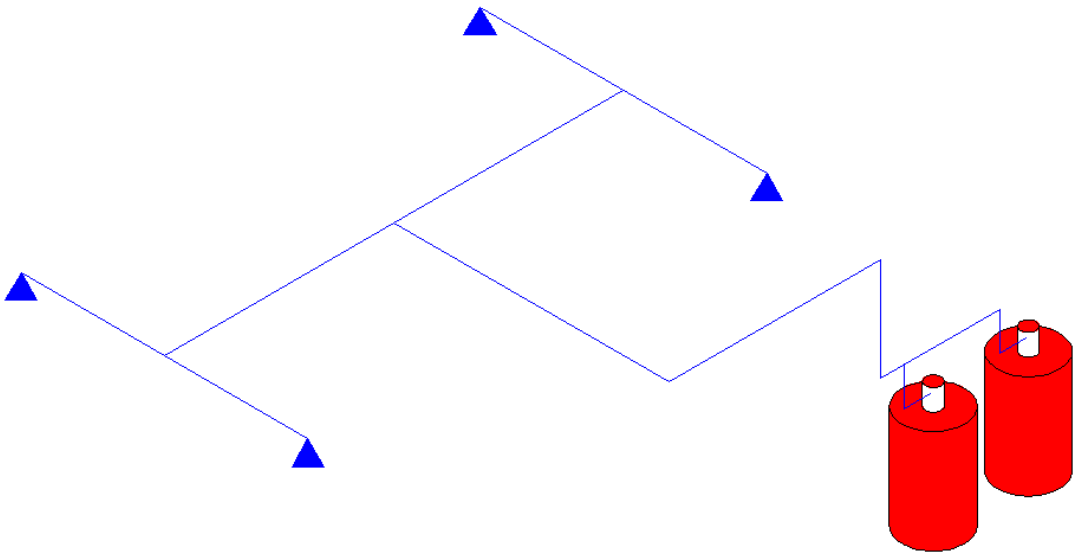
➔ **estimated pipe size = 32 mm (1¼")**

Table 4: Novec™ 1230 Flow in Schedule 40 Pipe

Pipe Type	Pipe Diameter	Internal Diamter	Min Flow (kg/sec)	Max Flow (kg/sec)
40T	15 mm	15,8	0,454	1,361
40T	20 mm	20,93	0,907	2,495
40T	25 mm	26,64	1,59	3,855
40T	32 mm	35,05	2,72	5,67
40T	40 mm	40,89	4,08	9,072
40T	50 mm	52,5	6,35	13,61
40T	65 mm	62,71	9,072	24,95
40T	80 mm	77,93	13,61	40,82
40T	100 mm	102,25	24,95	56,7
40T	125 mm	128,2	40,82	90,72
40T	150 mm	154,05	54,43	136,1

General Piping Practices and Rules

- Piping material must comply with the local regulations.
- Always try to design a symmetric pipe run.



9) Pressure Venting

The designer of a fire suppression system should be aware that the discharge of any gaseous extinguishing agent into an enclosure will raise the pressure within that enclosure, which could affect the structural integrity of the enclosure.
The protected enclosure will require a pressure relief device.

To calculate the free venting area, use the following formular:

$$A = \frac{Q_{Agent} \times v_{Agent}}{\sqrt{\Delta p \times v_{HOM}}} \times c_2$$

A	required free venting area (m²)
Q	Novec™ 1230 flow (kg/s)
v	specific volume of agent (m³/kg)*
Δp	max. allowable pressure increase (Pa)**
v_{HOM}	specific volume of the homogeneous air / Novec™ 1230 mixture***
c_2	resistance coefficient for the opening****

* Use 0,072 m³/kg for Novec™ 1230.
** A value between 100 and 300 Pascal's should be used if there is no other value offered by the client or clients representative.
*** 0.53 is a good average value for 5,3% Novec™ 1230 concentration.
**** $0,5<c_2<1$; to simplify the formular, use $c_2=1$

Example: 55 kg Novec™ 1230 to be discharged (within 10 seconds).
Maximum overpressure allowed = 300 Pa.

$$A = \frac{5,5 * 0,072}{\sqrt{300 \times 0,53}} \times 1 = \frac{0,4}{12,6} = 0.032\ [m^2]$$

0.04 m² free venting area is required.

10) Bill of Material

This list contains the system parts to be supplied by TSP.

8 Liter Tank Assembly TPED
16 Liter Tank Assembly TPED
32 Liter Tank Assembly TPED
52 Liter Tank Assembly TPED
106 Liter Tank Assembly TPED
147 Liter Tank Assembly TPED
180 Liter Tank Assembly TPED
8 Liter Tank Assembly D.O.T.
16 Liter Tank Assembly D.O.T.
32 Liter Tank Assembly D.O.T.
52 Liter Tank Assembly D.O.T.
106 Liter Tank Assembly D.O.T.
147 Liter Tank Assembly D.O.T.
180 Liter Tank Assembly D.O.T.
25 mm (1") Union Adapter
50 mm (2") Union Adapter
Novec 1230 ™ Agent (Kg)
Tank Straps/Channel 8 - 32 Liter Tank
Tank Straps/Channel 52 - 180 Liter Tank
Discharge Hose 25 mm (1")
Discharge Hose 50 mm (2")
65mm 2 port manifold c/w check valve 25mm
65mm 3 port manifold c/w check valve 25mm
65mm 4 port manifold c/w check valve 25mm
80mm 2 port manifold c/w check valve 50mm
80mm 3 port manifold c/w check valve 50mm
80mm 4 port manifold c/w check valve 50mm
80mm 5 port manifold c/w check valve 50mm
100mm 2 port manifold c/w check valve 50mm
100mm 3 port manifold c/w check valve 50mm
100mm 4 port manifold c/w check valve 50mm
100mm 5 port manifold c/w check valve 50mm
100mm 6 port manifold c/w check valve 50mm
150mm 3 port manifold c/w check valve 50mm
150mm 4 port manifold c/w check valve 50mm
150mm 5 port manifold c/w check valve 50mm
150mm 6 port manifold c/w check valve 50mm
150mm 7 port manifold c/w check valve 50mm
150mm 8 port manifold c/w check valve 50mm
150mm 9 port manifold c/w check valve 50mm
150mm 10 port manifold c/w check valve 50mm
Manifold Bracket 80 mm
Manifold Bracket 100 mm
Manifold Bracket 150 mm
Removable Electric Solenoid, 24V DC (0.2 amps)
Local Manual Actuator
Remote Manual Actuator (Cable Opt.)

Pneumatic Actuator
Flexible Pilot Hose 1/4" BSP Swivel
Male Adaptor 1/4" BSPT x 1/4" BSPP
Male Tee 1/4" BSPP x 1/4" BSPT
Male Elbow 1/4" BSPT x 1/4" BSPP
Entrance Warning Sign, Normally Occupied Area
Entrance Warning Sign, Normally Non-occupied
Manual Release Sign
Aluminium Nozzle 15 mm - 180°
Aluminium Nozzle 15 mm - 360°
Aluminium Nozzle 20 mm - 180°
Aluminium Nozzle 20 mm - 360°
Aluminium Nozzle 25 mm - 180°
Aluminium Nozzle 25 mm - 360°
Aluminium Nozzle 32 mm - 180°
Aluminium Nozzle 32 mm - 360°
Aluminium Nozzle 40 mm - 180°
Aluminium Nozzle 40 mm - 360°
Aluminium Nozzle 50 mm - 180°
Aluminium Nozzle 50 mm - 360°

Note:

- Manifolds are supplied from the UK only
- Nozzles are provided in aluminium as standard for Europe, but are available in brass or stainless steel to order. For brass nozzles add '/B' to regular part numbers and for stainless steel add '/S' to regular part number.
- UL systems require brass nozzles

Optional Components

Supervisory Pressure Switch *
Discharge Pressure Switch
Supervisory Pressure Switch BASEEFA *
Discharge Pressure Switch BASEEFA

* Supervisory pressure switch has to be factory fitted!