

TUBE-BASED CLEAN AGENT SUPPRESSION SYSTEM

Product Overview: The Tube-Based Clean Agent Fire Suppression System is a highly specialized, automatic, and localized fire protection solution designed for enclosed electrical and electronic equipment. By using pressurized clean agents and advanced heat-sensitive pneumatic detection tubes, the system ensures fast, power-independent fire detection and suppression. The system is ideal for mission-critical applications where equipment downtime and damage must be minimized. Designed for both retrofit and new installations, it is compatible with integrated control systems and capable of multi-zone protection.

1. GENERAL DATA :-

Manufacturer	Palladium Safety Solutions Pvt. Ltd.
Trade Mark/Brand	“PALEX”
Type	Tube Based Suppression System



2. SUPPRESSION AGENT :-

Agent	FK-5-1-12
Chemical Composition	Dodecafluoro-2-methylpentan-3-one
Type	Clean Agent
Applications	Class A, B, C, & Electrical
Properties / Remarks	Non-Conductive, zero residue, safe for electronics
Ozone Depletion Potential	0.00
Atmospheric Lifetime	5 days
Global Warming Potential	<1
Boiling Point	49°C
Toxicity	Approved for occupied spaces (as per NFPA 2001)

3. SYSTEM CONFIGURATIONS :-

- a. **Direct System** : - Heat-sensitive pneumatic polymer tubing acts both as a linear heat detector and agent discharge line.
 - When exposed to flame or elevated temperature (110°C), the tube ruptures at the hottest point.
 - Clean agent is discharged directly through the burst opening, flooding the fire zone.
 - Ideal for small enclosures with single-point risk concentration.

- b. Master Control Unit (MCU) :** - Provides electrical supervision, alarm activation, zone-based control, and user interface.
- Includes fail-safe battery backup, sounder relays, system health indicators.
 - Integrates with building fire alarm systems and SCADA/BMS systems.

4. COMPLETE SYSTEM COMPONENTS (WITH TECHNICAL DETAILS) :-

CYLINDER :

Material	Steel (CRCA), SS31L (Optional)
Volume	2kg, 4kg, & 6kg
Working Pressure	15 bar (FK-5-1-12)
Testing Pressure	35 bar (LP systems)
Fittings	M16x1.5 thread with O-ring sealing
Mounting	Vertical wall bracket with anti-vibration clamps
Finish	Powder coated RAL 3000, min. 50 micron
Accessories	Safety cap, label, tamper seal

DLP VALVE (DIRECT LOW PRESSURE) :

Material	Chrome-Plated Brass or Nickel-Plated Brass
Function	Opens on pressure drop caused by tube rupture
Connection Ports	Tube port: M10x1F or 1/4" NPT Fill port: 1/8" NPT (with stainless plug) Pressure Gauge Port: 1/8" BSP/NPT Pressure Switch Port: 1/8" NPT
Valve Body	Machined brass block, leak-tested to 50 bar
Includes	Manual reset lever (optional), non-return valve mechanism

FIRETRACE DETECTION TUBING (FDT) :

Material	Special thermoplastic (nylon blend)
Outer Diameter	6mm or 8mm
Wall Thickness	1mm typical
Burst Pressure	≥75 bar
Burst Temperature	110°C ± 10°C
Color	Red (Standard), UV-resistant
Fittings Compatibility	Firetrace compression-style fittings only
UL listed	UL 521 for fire detection

CONNECTORS AND FITTINGS :

Straight Connector	Nickel-Plated Brass, 1/4" tube OD x M10x1 thread
Elbow Connector	90 deg. angled brass fitting, swivel or fixed
Union Connector	Tube-to-tube brass coupler
End-of-line Plug	Solid brass cap for terminal end
T-Connector	for multiple branches from same cylinder
Pressure Test Port Adaptor	Used for nitrogen leak test and commissioning

PRESSURE GAUGES :

Type	Bourdon tube, dial 0-25 bar
Dial Size	1.5" or 2"
Mounting	Axial or radial (valve mounted)
Material	SS case with polycarbonate window

PRESSURE SWITCH :

Type	SPDT micro-switch, silver contacts
Activation Range	60 -80 psi
Electrical Rating	1A @ 30VDC
Enclosure	IP 65 brass or stainless enclosure

END-OF-LINE ADAPTOR :

Function	Terminates the end of the detection tube in a secure, leak-proof way
Material	Solid Brass or SS 304 depending on application
Thread Type	M10x1 internal or push-fit depending on model
Sealing	Equipped with compression ferrule and sealing cap
Mounting	Panel fixed or floating type
Use Case	Required for pressure sealing of final tubing branch in DLP system.

MASTER CONTROL UNIT (MCU) :

Input Supply	220V AC, 50/60 Hz
Output Supply	24VDC stabilized, battery backup supported
Operating Voltage MCU	5VDC
Battery Capacity	1.85A Max discharge current
Relay Outputs	Fire, Faults, Alarm (NC, C ,NO), 1A / 30VDC
Sounder Output	0.75A Max
Fuse Ratings	1A / 250V (glass type, 5x20mm) for both AC & DC
Panel Functions	Reset, Silence, Test, Fire Drill
Status Indicators	Power, Fault, Fire, Zone indicators
Enclosure Type	Wall-mounted, lockable with IP-rated steel enclosure.

5. ENVIRONMENTAL SPECIFICATIONS :-

Operating Temp. Range	-20°C to +60°C
Storage Temp. Range	-30°C to +70°C
Humidity Tolerance	5% to 95% RH, non-condensing
Vibration Resistance	Conforms to IEC 60068 shock tests
IP Rating	IP55 / IP66 based on installation

6. SYSTEM FEATURES :-

- **Power-Free Operation (Direct System) :** Operates entirely without electrical input, making it ideal for 24x7 protection in unattended or remote environments.

- **Rapid Detection & Suppression** : The heat-sensitive pneumatic detection tube reacts instantly to localized heat rise and discharge the agent within seconds, minimizing flame spread and collateral damage.
- **Modular & Scalable Design** : System can be configured for single-enclosure or multi-zone protection using branch tubing and customized cylinder sizing.
- **Non-Conductive & Non-Corrosive Agent** : Suitable for electrical installations -agents like FK-5-1-12 leave no residue, cause no corrosion, and pose no risk to electronics.
- **Zero Residue Suppression** : Clean agent discharge ensues there's no water or powder mess, eliminating downtime caused by post-fire cleaning.
- **MCU Option Integration** : Systems can be enhanced with a Master Control Unit for electrical monitoring, alarm output, SCADA/BMS interfacing, and test drills.
- **Environmentally Responsible** : FK-5-1-12 have zero ozone depletion potential and low global warming potential.

7. APPLICATION AREAS (Reinforced) :

- Server racks, telecom enclosures, network nodes.
- Electrical Panels ; MCC, PDB, LDB, UPS banks.
- CNC, VMC machines, robotics panels
- Renewable energy hubs (solar, battery storage)
- Defence electronics, vehicle cabinets
- Retail ATMs, ticketing machines, kiosks
- Medical diagnostics cabinets, fume hoods

8. SAFETY & HANDLING :-

- Always use original PSS fittings and valves.
- Cylinders must be sealed with caps during transport.
- Only trained personnel may refill or inspect.
- Keep away from direct sunlight or corrosive environments.
- Do not kink/crush FDT during handling or installation.

9. COMPLIANCE AND STANDARDS :-

- UL Recognized Detection Tubing
- ERTL certified Master Control Panel

10. MAINTENANCE & INSPECTION :-

- **Monthly** – Visual check of tubing, pressure gauge, and tamper seals.
- **Semi-Annual** - Weight and pressure verification; inspect FDT integrity.

- **Every 5 Years** - Visual inspection of cylinder and FDT; hydrostatic testing per CE requirements.

11. WARRANTY :-

- **System Warranty** : 1 year on all components.
- **Detection Tubing life** : 10 years under normal conditions.

12. NOTES & WARNINGS :-

- Never transport charged cylinders without safety plugs.
- Do not kind or damage Fire trace tubing.
- The unit must be installed vertically and away from environmental hazards.
- Only trained personnel should handle installation and servicing.

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