IOM FPS-SCE0

SINGLE INTERLOCK, ELECTRO-ELECTRICALLY ACTUATED, LOCAL RESET, PRESSURE REDUCING PREACTION SYSTEM

Installation Operation & Maintenance manual

Fire Protection

RAPHAEL VALVES INDUSTRIES

RAPHAEL FP

IOM FPS-SCE0

Single Interlock, Electro-Electrically Actuated, Local Reset, Pressure Reducing Preaction System

DESCRIPTION

The preaction system is based on a controlled deluge valve and a clapper check valve installed downstream. The riser check valve is held closed by the pressurized automatic-sprinkler pipeline. The space between the downstream side of the closed deluge valve and the closed clapper of the riser check valve serves as the intermediate chamber, where the acoustic alarm and the pressure switch are connected. The system is equipped with a pressure-reducing pilot that controls downstream pressure to maintain the set value. In a fire situation, the flames heat and shatter one or more of the automatic sprinklers, causing the pipeline to depressurize. When one or more smoke detectors are activated, they send an electrical signal to the main control board. This is considered an actuation event. Only when this single actuation event occurs does the control board open the SOV and the FDV deluge valve, admitting water to the automatic-sprinkler pipeline.

The system is equipped with the PSA, which serves as a hydraulic latching device and is essential for the local reset procedure.

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PARTS LIST

Single Interlock, Electro-Electrically Actuated, Local Reset, Pressure Reducing Preaction System

1. Riser check valve
2. Air supply check valve ¼" NPT female
3. Riser check valve drain ball valve – 1/2" NPT female
4. Downstream pressure gauge
5. PRPV- Pressure Reducing Pilot Valve
6. Alarm pressure switch
7. Control chamber pressure gauge.
8. Set/Test 3-way valve
9. Air/water pressure gauge
10. SOV solenoid valve
11. PSA Pressure Supply Arrestor
12. HAV-2 2-way hydraulic actuator
13. Needle valve
14. MEU emergency unit
15. MADV drain valve Check Valve
16. Upstream drain (plugged)
17. Check Valve
18. Water motor alarm connection 1/2 NPT female
19. Trim pressure supply (1/2 NPT female)
20. "Y" Strainer

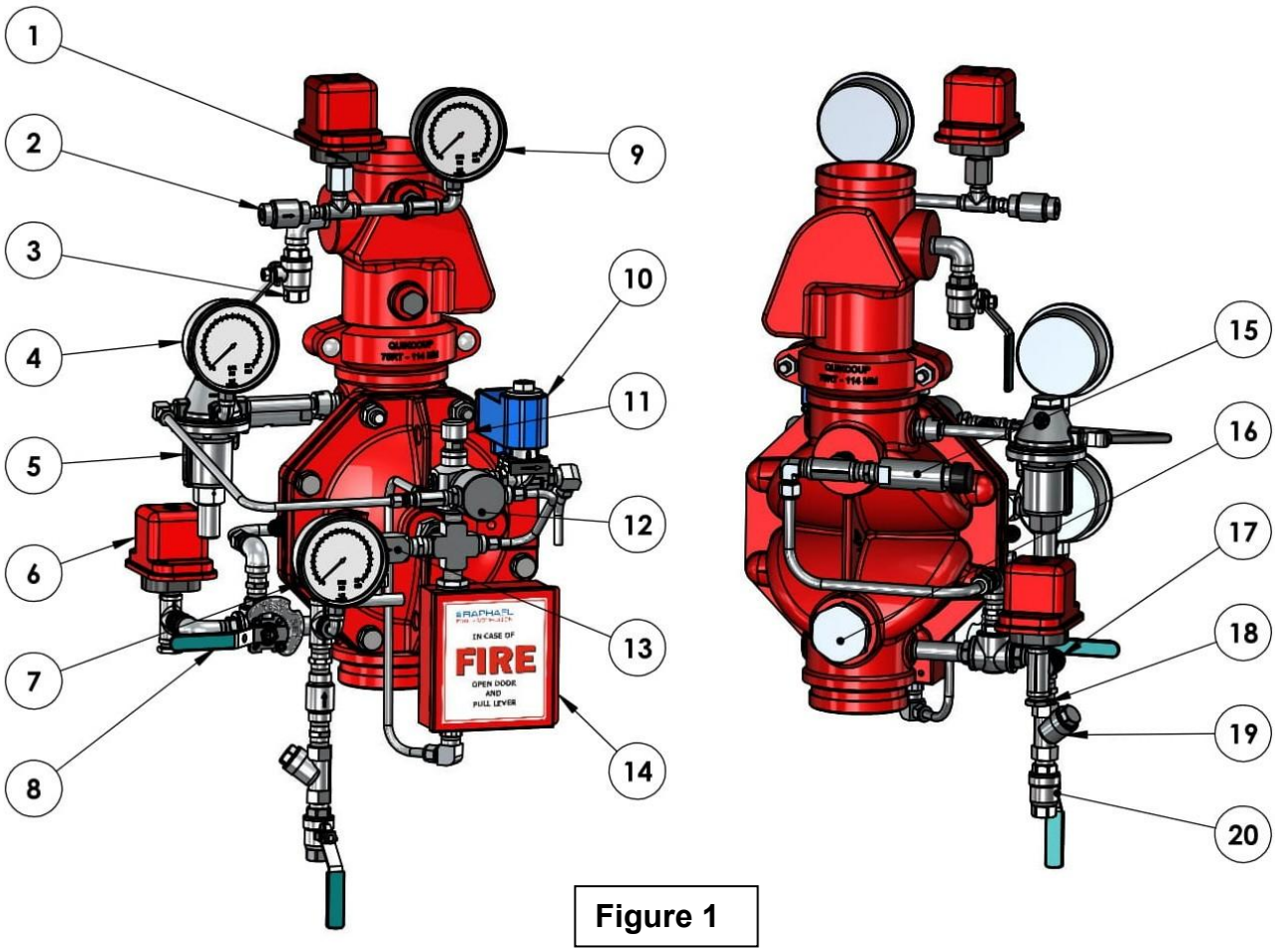

Figure 1

OPERATION (Reference Figure 1)

SET position:

The trim pressure is supplied through ball valve (**20**) and the Y-strainer (**19**) and fills the FDV control chamber. Pressurized water in the valve's control chamber is trapped by the check valve (**17**), the closed SOV (**10**), and the closed emergency valve unit (**14**), keeping the deluge valve in the closed position.
The sprinkler pipeline is pressurized by the Air Supply Kit through a check valve (**2**) and is monitored by the air/water pressure gauge (**9**).
The pneumatic pressure is trapped by the clapper of the riser check valve (**1**), by the closed check valve (**2**), by the drain ball valve (**3**), and by the automatic sprinklers.
A series of smoke and heat detectors is installed over the protected area and electrically connected to the main FP control board (**15,** figure **2)**.

Fire Situation

When one or more smoke detectors are triggered by fire, a signal is sent to the main fire-protection control board.
The main control board then opens the solenoid valve (**10**), and the FDV control chamber drains, causing the deluge to open, but water is not yet admitted to the sprinkler pipeline.
When the flames heat and shatter one or more of the automatic sprinklers, the trapped pneumatic pressure drops. The hydraulic pressure drop in the FDV control chamber pushes the internal elastomeric ball in the PSA (**11**) against the upper internal orifice, blocking it. When blocked, the upstream pressure flow to the FDV control chamber stops and the FDV valve becomes latched open.
At this point, the open deluge admits water to the sprinkler pipeline. Downstream pressure is controlled by the PRPV (**5**) pilot and reduced to the set pressure.
Opening the emergency ball valve bypasses all conditions, drains the FDV control chamber, and opens the valve immediately.

Reset Position

The reset procedure is described in detail on page 10, **Commissioning the system - phase 3: Resetting and placing in service.**

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INSTALLATION (Reference Figure 2)

1. This system is supplied pre-assembled and factory pre-adjusted. Any changes made to the system's trim-component settings or arrangement, pipe or tube lengths, or auxiliary-connection port sizes will affect system operation and are therefore prohibited.
2. The system (the FDV valve and the riser check valve) cannot be installed in a location where it may be exposed to freezing temperatures.
3. Sufficient space around the system must be maintained to allow assembly, disassembly, and maintenance work.
4. It should be considered that water will be drained during routine maintenance, during periodic test procedures, and when operating under fire conditions. Therefore, a drainage plan should be provided.
5. The system described is to be installed vertically only. Systems with identical operation intended for horizontal installation are marked with the prefix "H", e.g., HFPS-SCE0.
6. It is essential that the PSA be installed vertically only, regardless of the deluge valve orientation.
7. The downstream pipe connected to the riser check valve must be firmly supported to prevent the weight of the pipeline from being transferred to the system.
8. The use of pipe or thread-reduction fittings installed at open ports designated for auxiliary components (such as the water-motor alarm, pressure switch, trim-pressure supply, FPS-valve drains, solenoid drainpipe, etc.) is prohibited.
9. All connections to water supply, alarms etc. should be done in accordance with figure 2:
   (**1**) – Trim pressure supply connection (1/2" NPT female)
   (**7**) – Water motor alarm connection (connect ½" to ¾" NPT nipple) - optional
   (**8**) – Pressure switch connection – (1/2" NPT female) - optional
   (**5**&**6**) – ASK In and Out air connections (1/4" NPT female)
10. (**13**) – Riser check valve drains ball valve (1/2" NPT female)
    (**14**) – Air supply check valve (1/4" NPT female)
    Pressure switch wiring: - Alaram pressure switch (**7**) needs to be wired using the N.O. contacts so its function will be: closing contacts at pressure increase.
11. Before performing the high-pressure leak test, make sure that the butterfly valve or the OS&Y valve upstream of the deluge valve is closed, in order to prevent damage to the diaphragms in the valve and in the trim components.

12. Make sure that the gong connected to its designated outlet is supported so that its weight, along with the weight of the piping attached to it, is not applied to the valve trim.

INSTALLATION PARTS LIST (Reference Figure 2)

Single Interlock, Electro-Electrically Actuated, Local Reset, Pressure Reducing Preaction System

1. Trip supply valve (1/2” NPT female)
2. “Y” Strainer
3. Check Valve
4. 3-way Test/Set ball valve
5. ASK air supply unit fast filling ball valve.
6. ASK air supply unit supply ball valve (1/4” NPT female)
7. Water motor alarm connection * (1/2” NPT female)
8. Alarm pressure switch * (1/2” NPT female connection)
9. Control chamber presser gauge
10. PRPV - Pressure Reducing Pilot Valve
11. Downstream pressure gauge
12. MADV – Manual Automatic Drain Valve
13. Air / water drain valve on riser check valve Main control board
14. Air supply check valve
15. Main control board
16. Heat/Smoky detection sensors
17. Downstream separation butterfly valve.
18. Air pressure gauge
19. PSA – Pressure Supply Arrestor
20. Solenoid valve (2 way)
21. HAV-2 –hydraulic actuator valve - 2 way
22. Needle valve
23. MEU manual Emergency Unit
24. Upstream separation butterfly valve.

*** Optional**

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INSTALLATION

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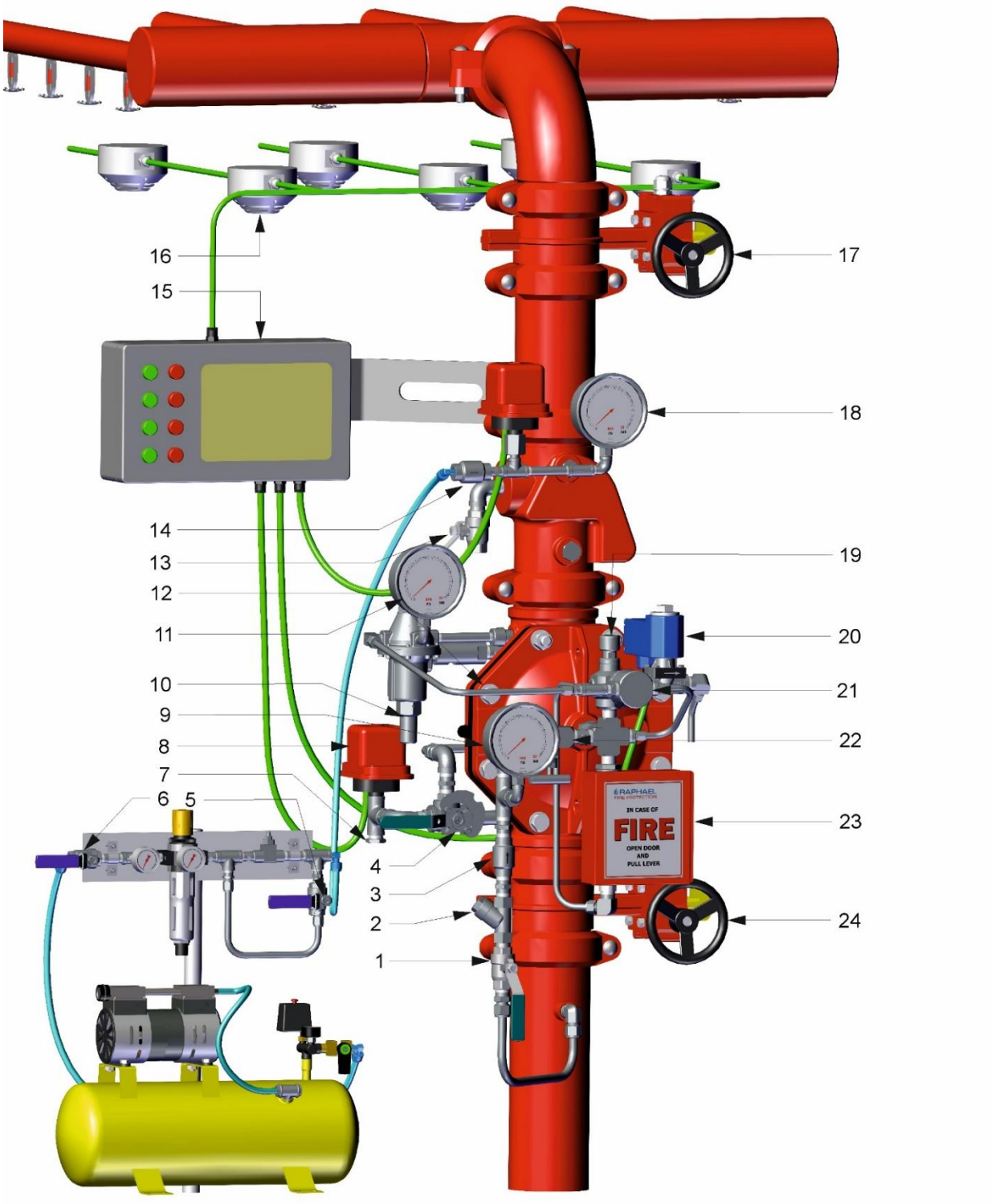

OPERATING INSTRUCTIONS (Reference Drawing - figure 2)

Commissioning the system - Phase 1

Filling and pressurizing the system.

The procedure described should be carried out after system installation completion and a comprehensive inspection.
(Reference Drawing - figure 2)

1. Close the Upstream & Downstream butterfly valves (**17 & 24**).
2. Make sure the solenoid (**20**) is de-energized.
3. Close the trim pressure supply ball valve (**1**).
4. Make sure that the Emergency valve at the MEU (**24**) is fully closed.
5. Open the Air supply flow rate selection ball valve, mounted vertically at the ASK (**5**), move its handle to the horizontal position and open the supply ball valve of the ASK (**6**).
6. Pressurize the sprinkler's pipeline to set pressure – observe air pressure gauge (**18**). When the pipeline has been fully pressurized, move the Air supply flow rate selection ball valve handle to the vertical position (**5**).
7. It is recommended to verify the system's sealing by closing the ASK air supply valve (**6**) and monitoring air pressure for over 1 hour. If no air pressure decrease was observed, re-open the ASK air supply valve (**6**).
   Note: the ASK needle valve opening is factory set and should not be changed.
8. If ok, open the trim supply ball valve (**1**) and press the PSA (**19**) push-button until the pressure gauges **9** shows the upstream pressure reading. By that, the Deluge control chamber becomes pressurized, and the valve is closed.
9. Open the upstream butterfly valve (**24**).
10. Push the MADV (**12**) push-button and drain the space between the riser check valve and the deluge valve downstream – the "intermediate chamber". Note that air leakage indicates a clapper sealing malfunction and water leakage indicates FDV sealing issue.
11. If ok, open the downstream butterfly valve (**17**).

The system is ready for the "fire situation simulation".

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Commissioning the system - phase 2.

Fire Situation Simulation

The procedure described should be carried out after the system was pressurized and a comprehensive leakage inspection was commissioned.

Energizing the solenoid can simulate a fire situation and cause the system to response by opening the FDV deluge valve.

NOTICE:
Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.
Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personnel and the close central fire station must be reported.
(Reference drawing - figure 2)

1. Make sure that the downstream butterfly valve (**17**) is close
2. De-pressurize the space between the check valve's clapper and the downstream butterfly valve by opening Clapper Check valve drain-valve (**13**).
3. Make sure that the Air pressure switch transfers a signal to the main control board (**15**).
4. Initiate false alarm activation, for fume or heat detection sensors system at the control board (**15**), to energize and open the SOV (**20**), and drain the FDV control chamber.
   The FDV deluge valve should open, force the check valve's clapper to open as well and admit water into the blocked spray sprinklers pipeline part.
5. **Water should run out of the open Clapper-Check-valve drain-valve (13). Both alarms** (water motor alarm & pressure switch, should be activated.
6. Adjust the downstream pressure by performing the 'Downstream Set Pressure Adjustment' procedure, on page 10.
7. Stop the false alarms on the main control board to de-activate the SOV (**20**).
   Make sure that the Preaction system continues admitting water through the riser check valve's drain valve. By that, the PSA's operation as a latching device was verified.

End of Fire Situation Simulation

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Downstream Set Pressure Adjustment

PRPV – Pressure Reducing Pilot Valve setting (10 fig 2):

The downstream set pressure needs to be performed during the fire simulation phase, after the valve opened and water flow out through the riser check valve drain ball valve. Pressure.

1. Partly unscrew the M4 socket screw at the adjustment screw cover to enable the cover unlocking and opening.
2. Unscrew the adjustment screw cover.
3. Use a 17mm wretch to partly unscrew the locking M10 nut.
4. Use a 10mm wretch to turn the adjustment screw:
   to increase the downstream pressure, ***turn the adjustment screw clockwise****.*
   to decrease the downstream pressure, ***turn the adjustment screw counterclockwise****.*
5. When done partly and gradually close the riser check valve drain ball valve. Observe the downstream pressure increase correction back, to set pressure.
6. Open gradually the drain valve to a fully open state. Observe the downstream pressure decrease correction back, to set pressure.
7. If ok, lock the M10 locking nut and simultaneously avoiding the adjustment screw turning.
8. Re-install the adjustment screw cover and lock it by tightening the M4 socket screw.

Commissioning the system - phase 3.

Resetting & placing in service (Reference Drawing - figure 2)

The procedure described should be carried out after any periodic operational test - simulated or real fire situation.

After a real fire situation, make sure that the SOV is closed by de-energizing its coil (through the FP main control board). (Reference drawing - figure 2)

1. Close the upstream butterfly valve (**24**).
2. Close the air supply ball valve at the ASK (**6**).
3. Drain the downstream pipeline part through the riser drain valve (**13**) and open the air supply ball valve at the ASK. In addition, open the needle valve bypass ball valve (**5**) and let the air stream "push" the residual water out of the pipe part.
4. When the air stream looks dry and no water drops can be seen drifting through the open drain valve outside, close the drain valve (**13**) and pressurize it to set pressure. Observe the air pressure gauge (**18**) for the set reading.
5. Press the push button of the PSA (**19**) to fill and pressurize the deluge valve control chamber. Push the button until the pressure gauges show the upstream pressure**.** This will close the deluge valve.
6. Gradually open the upstream butterfly valve (**24**).
7. Press the push button of the MADV drain valve (**12**) and drain the space between the closed FDV deluge valve diaphragm, and the riser check valve clapper – the "Intermediate chamber".
   If a dripping or leakage is observed, there is a sealing issue at the FDV deluge valve.
   If you hear or feel an air leak noise, there is a sealing issue at the riser check valve clapper.
8. Open downstream butterfly valve (**17**) the ASK will compensate for any air pressure loss to set pressure.
9. Move the ball valve bypass ball valve at the ASK (**5**) back to its close state.
10. Close the supply ball valve at the ASK and check for any air pressure decrease at list for 1 hour. If ok, fully open this ball valve.

The system is in SET state and placed in service.

MAINTENANCE (Reference Figure 2)

Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.
Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personnel and the close central fire station must be notified.

***Maintenance and inspection procedures follow the NFPA 25 instructions for deluge valves**.*

Daily Inspection

Make sure that the deluge valve's heating system (If equipped), functions correctly and that the Fire protection valve surrounding temperature is 4°C min.

Monthly Inspection

1. Observe the Preaction system for external damage: observe the piping and hose connections for leakage or damage.
2. Verify that the upstream butterfly valve (**24**) and the Trim pressure supply valve (**1**) are in fully open position. Upstream drain valve (if equipped) is fully close.
3. Press the PSA push-button (**19**) for about 5-10 sec. to assure that FDV valve control chamber is pressurized and then, release.
4. Push the MADV (**12**) and make sure that after emptying condensing water, the drain flow/dripping stops. If a constant leakage is observed, it might indicate a deluge valve sealing problem.
5. Move the 3-way SET/TEST valve to TEST (**4**). The acoustic alarm should sound, and the alarm pressure switch (**8**) should transmit a signal to the main control board.

Annual test procedure

1. Conduct the monthly inspection procedure.
2. Follow the procedure described in chapter - **Commissioning the system - phase 2. -** Fire Situation Simulation. Check and confirm the system's proper operation.
3. Follow the procedure described in chapter - **Commissioning the system - phase 3. -** Resetting & placing in service. Check and confirm the system's proper operation.

Periodic testing of systems for pressure leakage

Once every 3 years for air leakage, using one of the following test methods:

With the system at normal system pressure, shut off the air source (compressor or shop air) for 4 hours. If the low air pressure alarm goes off within this period, the air leaks shall be addressed.

Every 5 years inspection procedure

This major inspection and maintenance procedure includes the removal of the trim, the dismantling of the FDV's valve cover and the performance of a comprehensive internal part examination. Then, the relevant trim accessories should be replaced. After completion, the Annual maintenance procedure is to be conducted.

1. Close the upstream butterfly valve (**24**) and the trim pressure supply valve (**1**).
2. Open the upstream drain valve (if equipped). Drain the FDV's control chamber using the EMU Emergency valve (**23**).
3. Turn off or disconnect all relevant electrical circuits.
4. Release all relevant tubes fitting nuts and the central union pipe connection (if equipped) at valves cover center.
5. Remove the disassembled trim.
6. Remove all the FDV's cover bolts. The cover will hang on its studs (4" and up). Release both nuts and remove the cover carefully.
7. Observer the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or pealing).
8. Worn or damaged parts should be replaced. Consult Raphael's local representative or the service department for any maintenance issue or part replacement issue.

9. Replace the Diaphragm. The identification tongue should point to the valve's stamped size (diameter in inch) side.
10. Reinstall the valve's cover: use the Anti-seize paste tube supplied in the maintenance kit for bolts and nuts lubrication. Tight them in accordance with "Bolt's torque moments table".
11. Reinstall the trim carefully: avoid causing twists or dents on bent tubes and do not overtight the compression fitting's nuts.
12. When the system is fully reassembled, perform the "**Commissioning the system - phase 1** - Filling and pressurizing the system" procedure.
13. Perform the "Annual maintenance procedure".

Bolt's Torque Moments Table

Valve size	1.5"	2"	2.5"	3"	4"	6"	8"	10"
Torque lb/ft	22	29	36	54	65	72	87	118

Equivalent pipe length for FDV deluge valves

Valve size		1.5"	2"	2.5"	3"	4"	6"	8"	10"
Equivalent length value	ft	11	24	25	28	31	46	72	117
	m	3.6	7.3	7.6	8.5	9.4	14	21.9	35.6

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MARKING

The FDV valves are marked by a laser engraved, black anodized, 0.8mm (0.031”) thick metal plate, riveted to the valve’s cover.

The marking plate contains the data about (top to bottom):

- *Company name and trademark.*
- *Short description (Italic letters)*
- *Application’s type*: FPS-SCE0 – Single Interlock, Electric /Electric actuation with Local Reset and Pressure Reducing Preaction system
- (P/N) *The Application’s part number*: System properties–Valve properties
- *Rated pressure*: 250 psi
- *Equivalent Length:* reference table - page 13.
- *Serial Number*: Work order number-MM-YY-Number in batch 01-99
- *The UL listing mark & QR code:* EXxxxxx
- *The FM approved mark*
- *The Application’s* diameter in inch: XX”

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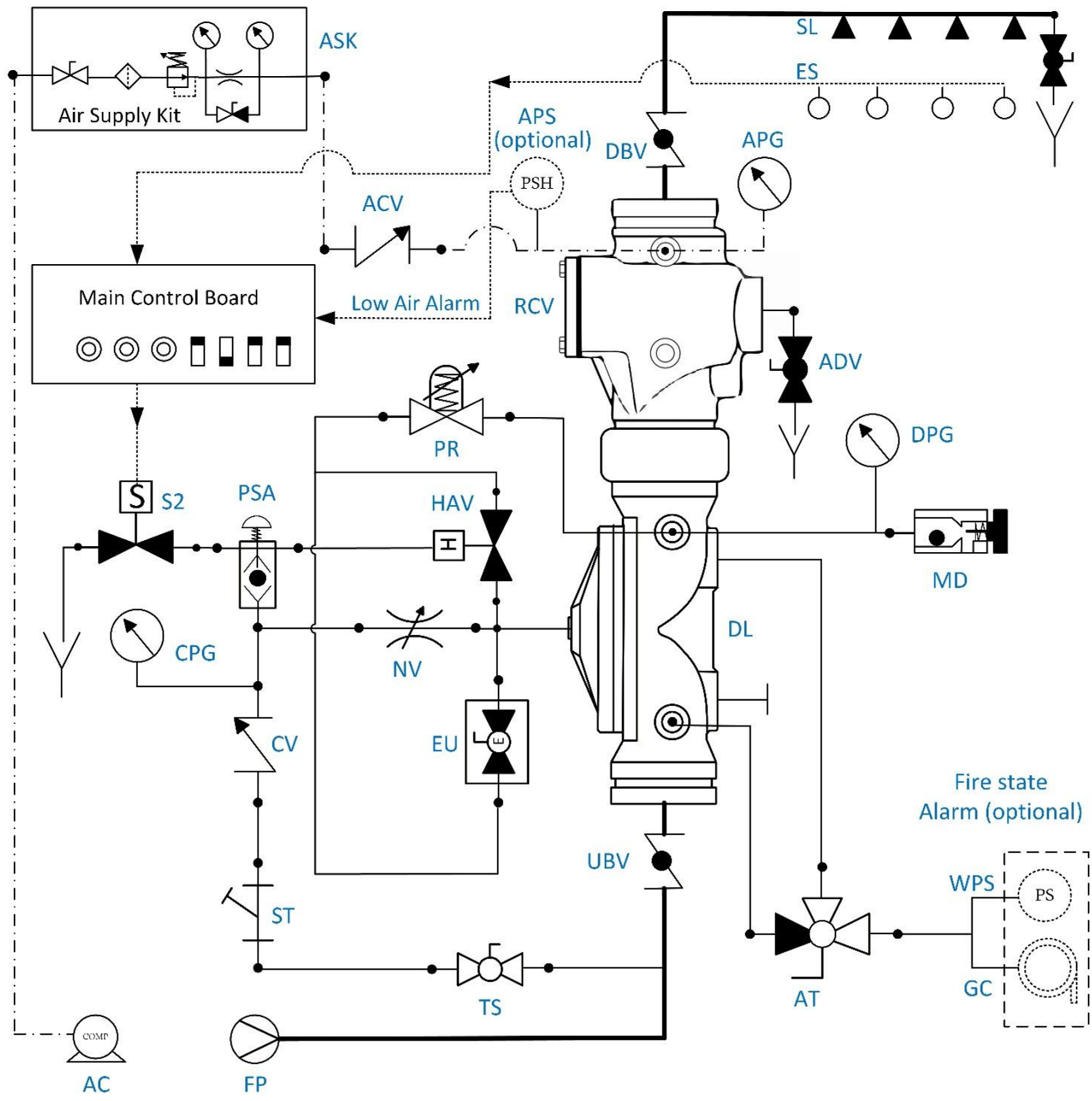

TS -	Trim supply	UBV -	Upstream Butterfly Valve		Water lines
ST -	Strainer	DBV -	Downstream Butterfly Valve		Air line
AT -	Alarm Test valve	CPG -	Control Chamber P. gauge		Electrical line
GC -	Gong connection	DPG -	Downstream Pressure gauge		
CV -	Check Valve	APG -	Air Pressure gauge	ACV -	Air Check Valve
NV -	Needle Valve	EU -	Manual Emergency Valve	AC -	Air Compressor
WPS -	Water Pressure Switch(optional)	SL -	Sprinkles Line	S2 -	2-way Solenoid valve
HAV -	Hydraulic Actuator Valve	ADV -	Air Drain Valve	APS -	Air Pressure Switch (optional)
MD -	MADV – Man./ Auto. Drain Valve	FP -	Fire Pump	RCV -	Riser Check Valve
ES -	Electric Sensors System	PR -	Pressure Reducing Pilot	ASK -	Air Supply Valve

RAPHAEL, founded in 1949, is the first Israeli manufacturer of water control valves. RAPHAEL´s research department constantly strives to introduce new and innovative products and solutions for water control systems including water works, fire-protection and irrigation systems.

Waterworks | Fire Protection | Irrigation | Smart Solutions

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