

WHITEPAPER

# Ensuring Safety and Efficiency in Combustion Valve Trains Through Over Pressure Protection

**ECCO**

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## Introduction

In industrial and commercial settings such as furnaces, ovens, boilers, and thermal fluid heaters, the efficient operation of combustion valve trains is crucial for both safety and performance. Over pressure protection is designed to prevent the pressure in the piping system from exceeding a value that would cause unsafe operation of any connected and properly adjusted combustion system. Over pressure protection is a critical aspect addressed by standards like CSD-1, NFPA 54, NFPA 86, and NFPA 87, which outline specific requirements to mitigate potential hazards associated with high-pressure situations. This paper aims to clarify the necessary requirements of over pressure protection in combustion valve trains and how Pietro Fiorentini offers effective solutions to meet these regulatory demands.





**Over Pressure Device (OPD)**  
Worker + Monitor



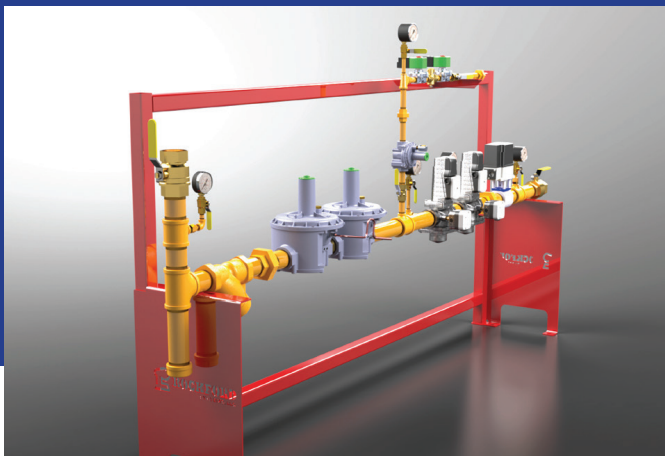
## Understanding NFPA Requirements

NFPA 54, NFPA 86, NFPA 85, and NFPA 87 stipulate conditions under which over pressure protection must be provided and the methods through which it can be achieved. According to NFPA 86 (2023), over pressure protection (OPP) is mandated in two main scenarios (nearly identical language is used in the other NFPA standards):

- When the supply pressure exceeds the maximum operating pressure of any downstream component.
- When the failure of a single upstream line regulator or service pressure regulator leads to a supply pressure exceeding the maximum operating pressure of any downstream component.

The NFPA standards specifies specific means to ensure over pressure protection, including monitor and worker regulators, full-capacity pressure relief valves, high gas pressure switches, and over pressure cutoff devices such as slam-shut valves.

When designing a valve train, the engineer needs to consider the maximum allowable operating pressure of all components downstream of the main regulator. This includes gas pressure switches, ratio regulators, control butterfly valves, etc. If the upstream pressure to your main regulator is 15 psig, are these components rated for that full 15 psig of pressure if the main regulator were to fail?



## Understanding the NFPA Requirements

These requirements are designed to prevent catastrophic failures due to over pressure situations, which could compromise the integrity of combustion systems, leading to potential hazards like explosions or equipment damage. Compliance with these standards not only enhances safety but also ensures the longevity and reliability of industrial equipment.

## Pietro Fiorentini Solutions

Pietro Fiorentini offers advanced solutions that can solve the NFPA requirements for over pressure protection in combustion valve trains. By incorporating slam-shut valves and on-board monitors, Pietro Fiorentini regulators provide robust safeguards against over pressure events.

- **Slam-Shut Valves:** Pietro Fiorentini has a variety of options to solve your requirements including independent slam-shut valves. The slam-shut valves act as rapid response mechanisms to shut off the gas supply in the event of a regulator failure and pressure surge, which prevents downstream components from being exposed to excessive pressures beyond their operational limits. An optional underpressure protection is also available as well as an optional position switch.
- **Monitor and Worker Regulators:** The monitor and worker solution is having two regulators in series. The upstream regulator is the monitor and the downstream regulator is the worker. In the event the worker fails, the monitor takes over at a safe pressure, approximately 3-10% above the worker set point, protecting the system and still allowing the equipment to operate.



## Conclusion

Over pressure protection is a code requirement which ensures the safe and efficient operation of combustion valve trains in industrial applications. Compliance with NFPA standards, such as NPFA 54, NFPA 86, NFPA 85, and NFPA 87, is essential to mitigate the risks associated with high-pressure situations. Pietro Fiorentini regulators, equipped with slam-shut valves, independent slam-shut valves, and monitor and worker regulator set ups, offer reliable solutions to meet these regulatory requirements effectively, thereby enhancing safety and operational efficiency in combustion systems.