

◆ Understanding Class A Ovens Requirements for thermal processing products with flammable solvents or combustible vapors



If you process a flammable product or remove combustible vapors from a product in an oven, you will need a Class A oven that meets NFPA 86 requirements. Flammable volatiles that pose a potential explosion or fire hazard can originate from paints, powders, inks, and adhesives. Potential threats may also originate from finishing processes, such as dipped, coated, sprayed, and impregnated materials as well as from polymerization or other molecular rearrangements. Combustible materials include substrate material, wood, paper, plastic pallets, spacers and packaging materials.

Class A ovens are used in industries that process a combustible product or remove combustible vapors from a product in the oven. Inadequate training of operators, lack of proper maintenance, and improper application of equipment can cause serious injury. For the latest safeguards required to minimize explosion hazards, get a copy of NFPA 86 Standard for Ovens and Furnaces, 2019 Edition, from the National Fire Protection Association (www.nfpa.org).

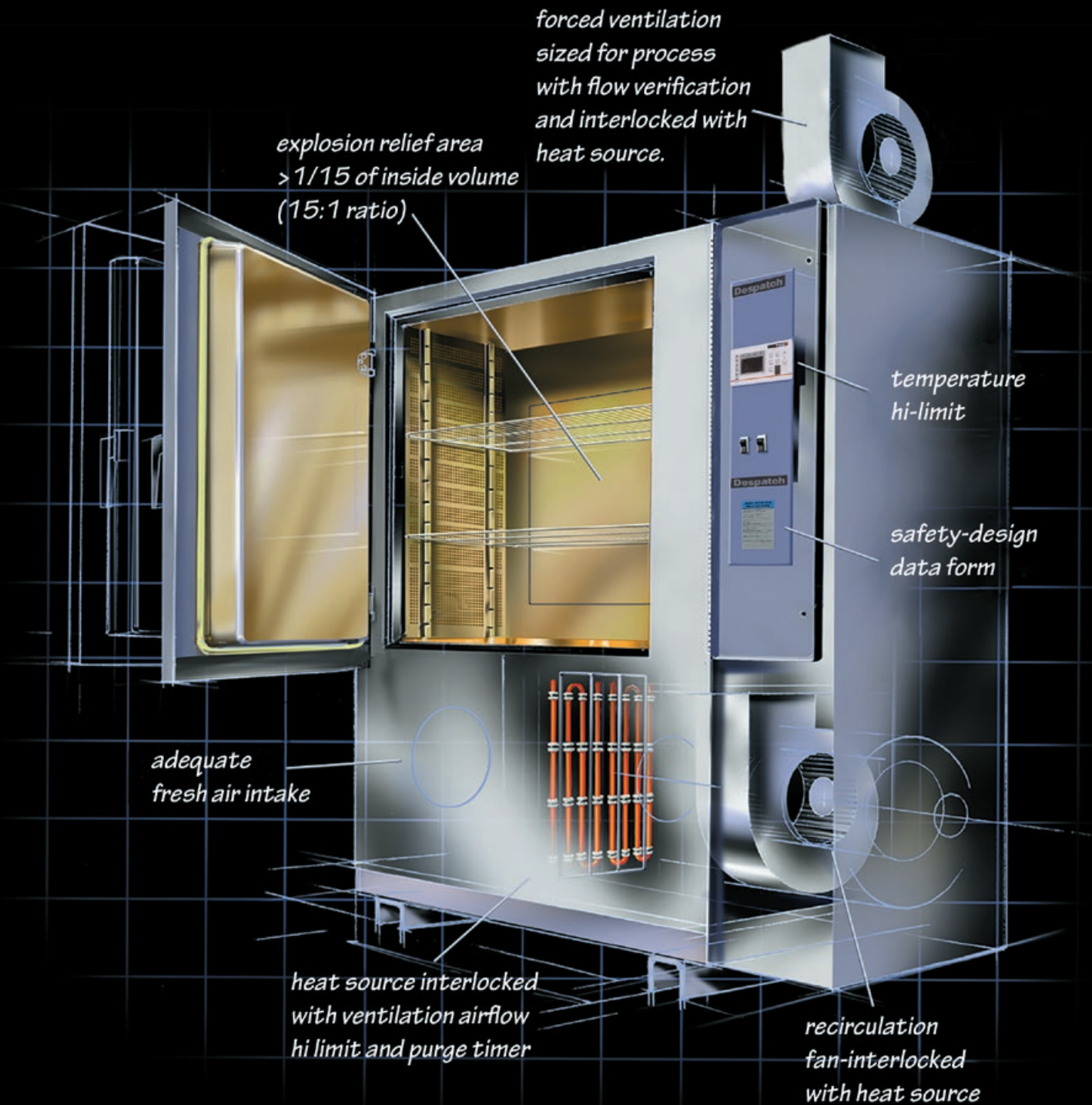
DESIGN INFORMATION AND SPECIFICATION	
THIS EQUIPMENT (SERIAL NUMBER) _____ HAS BEEN DESIGNED SPECIFICALLY FOR _____	
AND THE FOLLOWING CONDITIONS: USE OF EQUIPMENT _____	
AMOUNT OF PRODUCT _____	
HEATING TIME _____	
MAX. OPERATING TEMPERATURE _____°C _____°F	
F.A. DUCT _____ EXH. DUCT _____	
F.A. DAMPER BLADE CUT TO _____	
EXH. DAMPER BLADE CUT TO _____	
MINIMUM PURGE TIME REQUIRED _____ MINUTES	
TYPE OF SOLVENT (FLAMMABLE LIQUID OR GAS) _____	
MAXIMUM AMOUNT ALLOWED _____	
DO NOT CHANGE THIS EQUIPMENT OR THE PROCESS STATED ABOVE WITHOUT WRITTEN PERMISSION FROM _____	



Figure 1. A typical safety design data form outlines the operating parameters of Class A ovens operating with solvent atmospheres.

Class A Oven Design Requirements

Figure 2



NFPA 86 Requirements for Class A Ovens

National Fire Protection Association standards

Class A ovens must have an explosion-relief area. The required explosion-relief area must be equivalent to at least one-fifteenth of the oven's interior volume, or a 15:1 volume-to-venting-area ratio. For example, an oven with a total volume of 45 ft³ needs to have at least 3 ft² of relief vent area.

Class A ovens must also have positively forced ventilation sized to accommodate the amount of combustible product in the maximum oven load. The normal ventilation requirement for a solvent-drying batch oven must be sufficient to render the average vapor concentration below 10 percent of the lower flammable limit if the oven is operated at 250°F (121°C) or below. If the oven is operated between 250 to 500°F (121 to 260°C), the required normal ventilation ratio increases to 14:1. Above 500°F, special consideration must be taken to determine the ventilation ratio. The reason for the high ventilation requirements is due to the high rate of initial solvent released when a batch of parts is placed in a hot oven. Continuous ovens however, require a lower ratio of 4:1 because the product is fed at a constant rate, producing much smaller peaks in solvent vaporization.

The exhaust ventilation of the oven must be proven before powering the heat source, through an airflow switch or by other means of verifying the exhaust. In addition, the exhaust and recirculation fan motors must be electrically interlocked to prevent the heat source from being energized if the fan motors are not running.

Class A ovens must have a purge period before the heat source can be energized. This purge period must be long enough to get at least four air changes of interior volume. An oven with an interior volume of 100 ft³ and exhaust ventilation of 125 ft³/min would require 3.2 min purge time ($100 \text{ ft}^3 \times 4 = 400/125 = 3.2 \text{ min}$).

Further requirements include a safety-design data form that must be completed and attached to the oven if solvent atmospheres are present. This form, shown in **Figure 1**, must include the solvent in quantity per hour or batch, purge time, operating temperature, and exhaust rating.



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In addition to these equipment requirements, operators must be trained to understand the ratings of the equipment and how they relate to the processing of the product. **Figure 2** displays a general oven configuration highlighting major areas that must be included in the design of any Class A oven.

The environment in which the oven resides tempers all of the above requirements. Class A ovens without additional modification are not usable in hazardous atmosphere areas such as those requiring Class 1, Group D electrical construction. If they are to be utilized in hazardous areas, additional safety precautions spelled out by the National Electric Code must be met.

Understanding and complying with these National Fire Protection guidelines is the best way to ensure long-term safe operation of ovens that are either fuel-fired, process combustible, or include flammable solvent materials.

When purchasing a Class A oven you will need to provide; the process or solvent type along with a Material Safety Data Sheet (MSDS) on the solvent, the amount per batch per hour, the temperature profile including maximum temperature and time to temperature, and information on solvent release time if available.

Note: The complete definition, including the calculations required for determining exhaust ventilation rates for different volatile solvents, are contained in NFPA 86 Standard for Ovens and Furnaces.

DID YOU KNOW?

Despatch incorporates all pertinent NFPA required safety testing, visual inspection and required documentation in all Preventative Maintenance and Calibration Service Agreements.

NFPA 86 has requirements for annual inspection, operational testing, documentation of testing, and visual inspection of certain oven components such as:

1. Safety interlocks
2. Set point of temperature, pressure, and flow devices used as safety interlocks.
3. Pressure and explosion relief panels.
4. Gas heater components.

Contact your Despatch Sales Representative for more information. www.despatch.com

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