
# Air Force IR Glass Dryers

Natgraph manufacture a range of Air Force IR Glass Dryers that has been developed from years of experience gained in the production of 100's of IR High Temperature Conveyorised Systems, that are in world-wide daily use. These versatile dryers have the ability to dry typically 'slow' pine oil and water miscible inks using a combination of Infra Red radiation with Hot Air and ambient or refrigerated air cooling from above and below.

These dryers have been designed, developed and manufactured for drying surface coatings applied to glass products from 0.6mm through to 24mm thick and up to 3m wide. This glass is used in the automotive, architectural, domestic appliance, solar energy, electronic display and furniture industries. Whatever the requirement for drying ceramic inks onto glass, Natgraph have a solution.

With 5 standard belt widths, Touch Screen PLC Control System, 4 layouts, combined Hot Air/IR lamp systems, double sided cooling, special transport systems and modular design, this range of dryers is extremely adaptable, versatile and efficient.


Natgraph

# Air Force IR Glass Dryers

The Natgraph range of Air Force IR Glass Dryers is available in 5 belt widths from 70cm through to 260cm, with a comprehensive selection of module types available depending upon the production line requirements. A combination of IR/Hot Air, with extra Hot Air, Extraction, Ambient Cooling or Refrigerated Cooling Modules, make these dryers extremely adaptable.

### Air Force IR Glass Dryer Features

- Touch Screen, PLC Control System
- High temperature operation, optionally up to 200°C
- 16 medium wave IR lamps per 2m module
- High efficiency vented stainless steel reflectors
- Gas filled lifting arms on the hood
- Steel bar or P.T.F.E coated fibre glass mesh transport systems
- Modular construction
- Castors & jacking feet
- Colour coded to industry standards
- Optional recirculation filters
- Variable output of IR lamps
- Optional inlet filter
- Available in 5 sizes

# Optimum Dryer Design

The solvents contained in ceramic inks are commonly pine oil based and so, very slow to force dry. Also the glass can be up to 24mm thick, thus forming a massive 'heat sink' below the ink, absorbing the energy that is needed to accelerate the evaporation of solvents. When Natgraph configures the specification of a glass dryer, the considerations are:-

• Ink type • Ink layer thickness • Line speed • Maximum glass thickness • Maximum & minimum glass sizes • Glass exit temperature

Taking these factors into account, the dryer is specified utilising a combination of the following modules:-

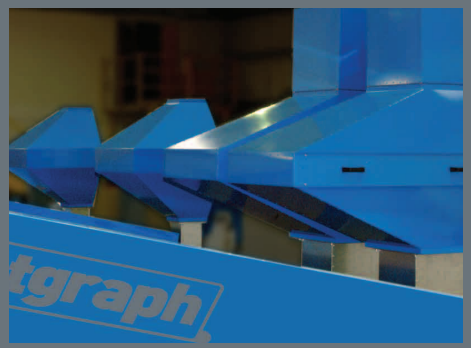
IR Hot Air Modules: The construction of these High Temperature Dryers is completely different from standard units, with extra insulation layers and air gaps required to keep the external surfaces cool, even though it can be over 200°C inside the dryer. The air recirculation system uses a different principle, as the hot air needs to be retained in a specially insulated, inner ducting system that has additional insulation layers.

Extraction Modules: To ensure safe and efficient operation, all gases emitted from the ink during the drying process are extracted from the dryer, internal extraction ducting is provided within the heating modules, or alternatively a separate evaporation/extraction module can be included.

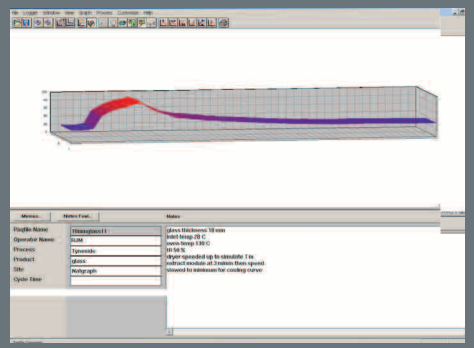
Cooling Modules: The required exit temperature of the glass determines the type and number of cooling modules needed. Natgraph's unique, double sided cooling system uses either ambient or refrigerated air. The refrigerated air modules recirculate the air through an internal cooling coil (with air filter), that is connected to an external chiller plant by flexible pipework. Water is cooled by the chiller plant as required to maintain a controlled air temperature within the module. The chiller plant requires a separate electrical power supply, but is controlled from the dryers PLC system.

Transport Systems: Flat glass to be screenprinted can typically vary in thickness from 0.6mm to 24mm, with sizes from 10cm to 3m wide, weighing up to 500kgs per piece, therefore the transportation for each application may require a specific conveyor system. Variable speed, P.T.F.E. coated, fibre glass mesh belts are the most common and economical solution. If very large, heavy glass is to be reliably transported, a driven chain/bar system or driven rollers will be required, the choice of which will depend upon the minimum glass size. These systems support the glass with the minimum of contact to maintain the dryer's efficiency of heating and cooling. In the case of refrigerated cooling, the transport system is assembled in 2 sections, split in the 1m Extraction Module, this separates the hot conveyor from the refrigerated one thereby increasing the efficiency of the dryer.

Peak roller transport system



Inlet air filter stacks



Glass cooling graph

Infra red lamps

# Specifications: Air Force IR Glass Dryers

| The following specifications are common to all Air Force Dryers | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Belt Height** | 98cm - 113cm (38" - 44") Adjustable by the feet, higher options available | | | | | | |
| **Belt Speed** | 1-10m per minute (3' - 30') Other speeds are available to order | | | | | | |
| **Module Height** | Model 90- 170 = 142cm - 157cm (56" - 62") Adjustable by the dryer's feet | | | | | | |
| **Module Length** | 2m (78") | | | | | | |
| **Voltage** | Three Phase 400V 50Hz.AC | | | | | | |
| | **These figures apply to individual model sizes.** | | | | | | |
| **Model No.** | **90** | **130** | **155** | **170** | **225** | **260** | **300** |
| **Belt / Drying / Curing Width** | 90cm (36") | 130cm (51") | 155cm (61") | 170cm (67") | 225cm (89") | 260cm (102") | 300cm (118") |
| **Module Width** | 240cm (95") | 280cm (111") | 305cm (120") | 320cm (126") | 415cm (164") | 448.5cm (177") | 488.5cm (193") |
| (Weights can be confirmed by Natgraph depending upon the size / type and number of modules used.) | | | | | | | |
| **Electrical** | | | | | | | |
| **Module Type** | **2m, IR medium pressure, hot (160°C maximum), air modules** | | | | | | |
| **Model No.** | **90** | **130** | **155** | **170** | **225** | **260** | **300** |
| **Heating Elements** | 30kW | 36kW | 36kW | 42kW | 42kW | 72kW | 72kW |
| **Current (Max. Amps)** | 44 | 52 | 52 | 60 | 60 | 104 | 104 |
| **Infra Red Lamps (16)** | 26.4kW | 38.4kW | 44.8kW | 48kW | 64kW | 75.2kW | 75.2kW |
| **Current (Max. Amps)** | 38 | 55.5 | 65 | 70 | 93 | 108.6 | 108.6 |
| **Motor(s)** | 3kW | 3kW | 4kW | 5.5kW | 8kW | 8kW | 8kW |
| **Current (Max. Amps)** | 4.4 | 4.4 | 5.7 | 7.7 | 11.4 | 11.4 | 11.4 |
| **Module Type** | **1m, extraction (change over), modules** | | | | | | |
| **Motor(s)** | 1.5 | 1.5 | 1.5 | 2.2 | 3 | 3 | 3 |
| **Current (Max. Amps)** | 2.4 | 2.4 | 2.4 | 3.4 | 4.4 | 4.4 | 4.4 |
| **Module Type** | **2m, high pressure cold (ambient), air modules** | | | | | | |
| **Motor(s)** | 7.4kW | 7.4kW | 10kW | 12kW | 13.5kW | 13.5kW | 13.5kW |
| **Current (Max. Amps)** | 11.2 | 11.2 | 14.5 | 17 | 19 | 19 | 19 |
| **Module Type** | **2m, high pressure cold (refrigerated), air modules** | | | | | | |
| **Motor(s)** | 4.4kW | 4.4kW | 6kW | 8kW | 8kW | 8kW | 8kW |
| **Current (Max. Amps)** | 6.7 | 6.7 | 8.8 | 11.4 | 11.4 | 11.4 | 11.4 |
| **Extended Chiller Unit** | 13.9kW | 13.9kW | 18kW | 18kW | 18kW | 18kW | 18kW |
| **Current** | 23 | 23 | 31 | 31 | 31 | 31 | 31 |
| **Air** | **Figures are in 1,000m³/hour, per 2m module** | | | | | | |
| **Model No.** | **90** | **130** | **155** | **170** | **225** | **260** | **300** |
| **Module Type** | **2m, high pressure, hot (160°C maximum), air modules** | | | | | | |
| **Recirculated Air** | 4.8 | 5.5 | 6.3 | 7 | 8.5 | 11 | tbc |
| **Exhaust Air (adjustable)** | 0.5 - 1 | 0.7 - 1.2 | 0.8 - 1.5 | 0.8 - 1.5 | 1 - 2 | 1.4 - 2.4 | tbc |
| **Module Type** | **1m, extraction, (change over) air modules** | | | | | | |
| **Exhaust Air** | 1.5 | 1.5 | 2 | 2 | tbc | tbc | tbc |
| **Module Type** | **2m, cold (ambient), air modules** | | | | | | |
| **Intake Air** | 6 | 7 | 7.5 | 8 | 10 | 12 | tbc |
| **Exhaust Air** | 7 | 8 | 8 | 8 | 12 | 13 | tbc |
| **Module Type** | **2m, high pressure, cold (refrigerated), air modules** | | | | | | |
| **Re-circulated Air** | 6 | 7 | 7.5 | 8 | 10 | 12 | tbc |

NOTE: When calculating power supply sizes for Air Force Dryers, add all the motor and heating element currents of the modules involved together to give the final figure. For Air Force/UV Combinations, add all the motor currents of the modules involved to the lamp current, but do not include the heating elements. This is because a safety interlock ensures that the air heating elements and UV lamps cannot be used at the same time. The UV lamp currents are calculated with 2 lamps at full power.

Example: Model 110 Air Force Dryer, 2m warm, 2m cold = 26 + 7 + 7 = 40 Amps.,
Model 110 Air Force UV/Combination Dryer, 2m warm, 2m 2 lamp UV cold = 7 + 60 +7 = 74 Amps.

Typical power consumption of a Model 110 Air Force Dryer, 2m warm, 2m cold, running at 50°C with an ambient temperature of 20°C is 10kW per hour (including all motors), at average U.K. power costings, this represents a running cost of below 70p per hour.



## Options

### Inlet Filters

An optional Inlet Filter stack can be fitted to each dedicated air inlet s ensure that the air being drawn into the dryer is free of dirt and dust. This freestanding filter stack has a replaceable, slide in unit, with a filter rating of EU4 (4 microns) and has been designed to maintain air efficiency for the dryer, whilst prevent-ing contamination.

### Variable Output of IR Lamps

An optional system can be fitted to control the output (power level), of the Infra Red lamps on a percentage basis, this system can be very useful when the effects of the IR can be critical, or are unknown. This system is controlled by the Touch Screen PLC Control System with a digital output.

### Inverter Drives for Fan Motors

An optional Inverter Drive can be fitted to control the air speed at the glass surface. This can be useful when very thin, or metallic inks are to be dried at high speed in the same dryer to be used for thicker, conventional ceramic inks.

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