



Symach

DryKing

2020

1. GENERAL DESCRIPTION



The DryKing (DK) paint booth is a conventional operating paint booth using the highest quality of construction materials, components, electronics, ventilation, burner, lighting and operating system.

Symach uses innovative ventilation techniques in its makeup air; involving plenum, fans and platform, offering superior ventilation during painting and circulation during baking, exceeding conventional standards.

A direct flame burner reaches the curing temperature of the paint in the shortest time.

We have created a new unique parabolic reflector for our LED lights that offers purity of color and lighting power providing optimum Lux on the vehicle's vertical and horizontal surfaces.

The DK is configurable in both height and length, matching the needs of all bodyshops for painting passenger cars and light commercial vehicles.

We gave the DK a unique and captivating line and design, aesthetically finished. It is not only a spray booth, but a fundamental partner for the bodyshop that any painter will be proud to use.

2. LAYOUT CONFIGURATIONS



Different heights available



The ventilation unit



Several entries available



2.1. 2.1. THE AVAILABLE HEIGHTS:

- the height is available in:
 - Internal height m. 3,00 (9.8ft), external m. 3,60 (11.8 ft) *recommended for passenger cars*
 - internal height m. 3,50 (11.5 ft), external m. 4.10 (13.4 ft) *recommended for commercial vehicles*

2.2. THE WIDTH OF THE CABIN

- the inner width is m. 4,5 (14.7 ft) the outer one is m. 4,7 (15.4 ft).

We have chosen to build a booth of cm 50 (20 inches) wider than all those on the market to adapt to new SUV cars that compared to a conventional car are larger.

2.3. THE LENGTH OF THE CABIN IS CONFIGURABLE

- the inner length of m. 8,00 (26.2 ft), the outer length m. 8,10 (27.6 ft) *recommended for passenger cars*
- the inner length of m. 10,00 (32.8 ft) the outer length m. 10,10 (33.1 ft) *recommended for commercial vehicles*

2.4. THE AVAILABLE ENTRY

- The front and/or back doors can be:
 - wide m. 3,00 (9.8 ft) and high m. 2,90 (9.5 ft)
 - wide m. 3,00 (9.8 ft) and high m. 3,40 (11.1 ft)

The DK can be configured as a front entry booth or a front to back entrance booth. Enter on one side and exit the opposite side with the car crossing the booth in the direction of length. These doors are glass doors surrounded by a polished stainless finish.

2.5. THE SIDE ENTRANCE DOOR

- long m. 6,70 (22.0 ft) and high m. 2,20 (7.2 ft)
- pneumatic powered opening/closing

One or two white pre-painted aluminum steel side doors for loading and unloading the car, to cross the cabin in the direction of width, using the CarMover on the rails.

2.6. PEDESTRIAN OR EMERGENCY DOOR

This is a white painted steel door with glass insert.

- long m. 0,90 (35.4 inches) and high m. 2,10 (82.6 inches)

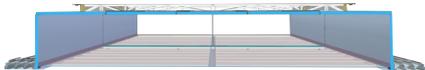
2.7. VENTILATION GROUP

- The ventilation group that includes, fans, burner and recycling valve. This group of mechanical components can be placed in the front or either side of the cabin.
- The measurements of the ventilation group are:
 - width m. 1,30 (4,3 ft)
 - length m. 4,00 (13,1 ft)
 - height m. 3,00 (9,8 ft)

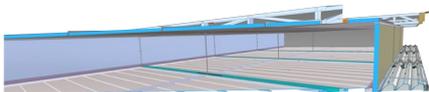
3. THE COMPOSITION CABIN, COMPONENTS AND MATERIALS



Wall module



Front section roof



Roof spizza 45



Plenum panels



Filters



Deflectors

The booth is built with top-quality materials, treated and pre-painted for anti-corrosion. All components are produced directly by Symach in the Bologna manufacturing facility in Italy.

3.1. THE WALLS

Booth walls consist of three parts:

- **interior panels** are in pre-painted steel, 12-tenths (18 gauge) thick and one meter (40 inches) wide, reinforced on the sides with an internal frame of 1 m. width.
- Internal **insulation rock wool** of cm 5 (2 inches) thick, with density 40 kg/m^3 (88 pound/35 sq. ft) and with a reduced thermal conductivity of $0.037 \text{ W/mK } \lambda$
- **External aesthetic panel** options:
 - CoverTop, an injection-printed ABS plastic panel available in 8 different colors.
 - pre-painted white sheet metal panels.
 - polish stainless steel panels.

3.2. THE PLENUM

The plenum is composed:

- From support **truss**, positioned in width relative to the booth.
Study and calculations allowed us to design a compact beam of only cm 15 (6 inches) in height, but with high characteristics of strength and payload, considering the weight of the roof with all the accessories plus the eventual weight of the Drying Robot.
- **The plenum** is closed externally by 12-tenths (18-tenth) thick galvanized sheet metal panels.
 - To break down heating consumption and avoid dispersing energy, the panels are insulated with rock wool of cm 3 (1.2 inches) density 40 kg/m^3 (88 pound/35 sq. ft) and with a reduced thermal conductivity - $0.037 \text{ W/mK } \lambda$
- **The air filters** inside the plenum are m. 3,20 (10.5 ft) wide for the entire length of the cabin; the purpose of ceiling filters is to purify the incoming air, preventing impurities in the air from being deposited on the paint.
 - the filter panel is made of felt from polyester fibers.
 - M5 filter class according to EN 779
 - The fibers are thermally bound, obtaining considerable mechanical resistance and processed in order to obtain an adhesive surface of high-density fibers, in order to increase the filtration power and hold dust/paint particles.
 - The filter has a 100% stopping power of particles $>10\mu$ that, if passed, would cause visible imperfections on the painted surfaces. The filter is approved to work with a maximum air flow of 34000 mc/h ($35.3 \text{ ft}^3/\text{hr}$) and a maximum air temperature, of 80°C (176°F)
- **Air speed-addressing and acceleration deflectors** allow even better washing on the walls, avoiding turbulence and resulting reels of sprayed paint.
 - The incoming air to the plenum is mixed using a calibrated mixing grid, to achieve a uniform temperature across the entire booth width.
 - With the deflectors, we achieve constant and uniform flow and speed along the entire ceiling area.

- **The air input**, as a result of the positioning of the ventilation group, can be placed frontally, on the right side or on the left side of the booth.
- **A pressure probe** is positioned on the ceiling inside the cabin, that interfacing with the software will vary the speed of the input and extraction fans with inverter, obtaining the correct pressure value, eliminating any dust input from the outside.

3.3. THE LIGHTS

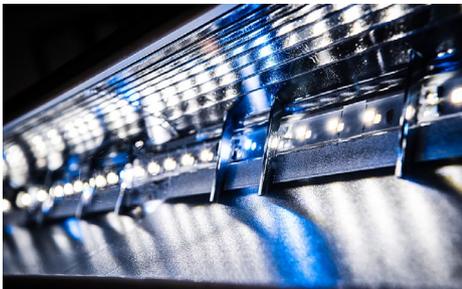
The lights are arranged in 3 rows per side of the booth and come in two versions:



3 rows of LED lamps



LED



LED reflector

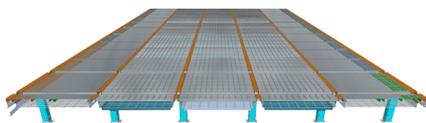
- **LED – PowerLED** is a LED light with a special parabola formed by several mirror steps, that reflect the cone light by concentrating it more on the vertical sides of the car, allowing the painter to have excellent visibility during painting.
 - Technical data of LED lights
 - Color temperature 6000°K
 - Color yield 0.94 Ra
 - Installed power:
 - M. 8,0 booth (26.2 ft) = 1344 W
 - M. 10,0 booth (32.8 ft) = 1680 W
 - Medium illumination per cm. 100 (40 inches) from the ground on the different parts of a car 2000 Lux (185.8 foot candle)

→ More information about LED light is available in the PowerLED catalogue
- **NEON – PowerLux** is a neon light with a special parabola that converges the light on the vertical sides of the vehicle.
 - NEON Lighting Technical Data
 - Color temperature 5200°K
 - Color yield 0.93 Ra
 - Installed power:
 - M. 8,0 booth (26.2 ft) = 1944 W
 - M. 10,0 booth (32.8 ft) = 2430 W
 - Medium illumination per cm. 100 (40 inches) from the ground on the different parts of a vehicle 1200 Lux (111.5 foot candle)

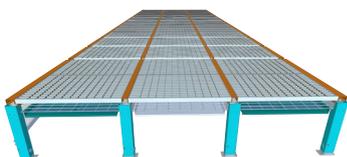
→ More information about NEON light is available in the PowerLux catalogue

3.4. THE BASEMENT

- **The pit** of the plinth is cm 60 (23.6 inches) deep, optimal measure to create an adequate container from which to extract the exhausted air.
- **The structure** of the base consists of reticular beams made of galvanized steel of 15 and 20 tenths (16-18 gage) that rest at the bottom of the pit positioned at cm 80 away from each other.
- **The floor** of the plinth consists of 4 different levels:
 - **Tanks** with guillotine modulation of the air passage individually lined in order to a perfect homogeneous ventilation on the entire floor of the cabin.
 - The ventilation system, working at 70% of its power, produce a vertical laminar flow inside the cabin with an average speed of 0.3 m/second (1 ft/second) at a distance of 1 meter from the floor on the entire surface.
 - The modulation of ventilation, managed by inverters, from 70% to 100% power, is used to counteract the progressive clogging of the filters while keeping the air speed in the cabin unchanged by 0.3 m/second (1 ft/second)



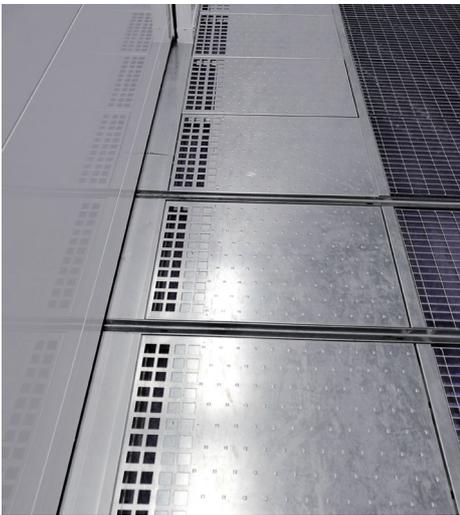
5 rows of grids, recommended



3 rows of grids

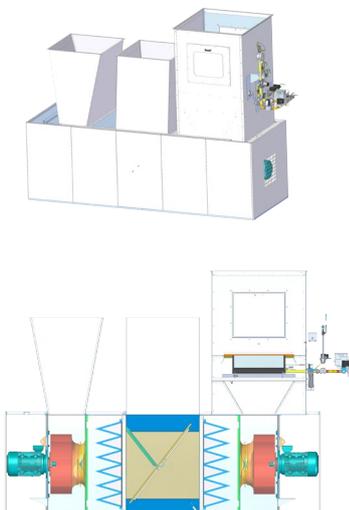


Tank with guillotine air passage regulation



Comfort walking

4. VENTILATION GROUP



Ventilation group

- **Electro-solted net**, in order to form an air distribution chamber between the paint-stop filter and the tubs for modulation of the flow, in order to create a room in which you have a depression and uniform air speed.

Another advantage of having evened the air flow is that the overspray of the paint will clin on the paint filter progressively in equal measure ensuring a longer life.

- **The paint-stop filter** used has the following technical data:
 - Class G3 complying to EN 779
 - Max crossing speed 0,75 m/sec (29.5 inches/second)
 - Over-spray capture efficiency 97% for particles 15 µm
 - Over-spray accumulation capacity 8 kg/mq (17.6 pound/10.7 sq. ft)
- **Basement Grid** is available in 4 versions:
 - **3 rows of grids** cm 80 wide (31.5 inches) with a payload of kg 800 (1,764 pound). *Recommended for passenger cars*
 - **3 rows of grids** wide 80cm (31.5 inches) with a payload of kg 1000 (2,204 pound). *Recommended for commercial or armored vehicles*
 - **3 rows of grids plus 2 rows of Comfort Walking** cm. 80 wide (31.5 inches) with a payload of kg 800 (1,764 pound). *Recommended for passenger cars*
 - **3 rows of grids plus 2 rows of Comfort Walking** cm 80 wide (31.5 inches) with a payload of kg 1000 (2,204 pound). *Recommended for commercial or armored vehicles*
 - **Comfort Walking** in the 5-line configuration, the two side rows, left and right, are made of galvanized steel panels with anti-slip coating and guillotine slits on the wall side, for balancing the passage of air and to keep the cabin wall cleaner from the over-spray by painting.
This floor is designed to reduce the fatigue of the painter's legs, offering a full support platform.

3.5. FIRE SPRINKLERS

- The booth is prepared, with specific housings, for the sprinkler fire-fighting system.

The ventilation group consists of three parts made of pre-painted white steel 12 and 30 tenths thick (18-11 gage).

4.1. AIR INPUT GROUP

- Ziehl Abegg's **fan** with backward blades 34000 mc/h (20011 CFM) with a total static pressure of 500 Pa, controlled by inverter.
- **Pocket Filter** protection to the G4 class fan with a filter area of mq. 2,2 (21.5 sq Ft).
- A **digital pressure probe** installed inside the filter box, which measures the deterioration of the filter.
The pressure value is displayed on the Cabin control Touch screen and is also sent to REMO data center (*see REMO service*).
When the filter is to be changed the operator is informed by a message on the touch screen and REMO sends an email to the customer's people registered in REMO.



Fan

4.2. AIR EXTRACTION GROUP

- Ziehl Abegg's **fan** with backward blades, 34000 mc/h (20011 CFM) with a total static pressure of 500 Pa, controlled by inverter.
- **Pocket Filter** G4 class to protect the fan, with a filter area of mq. 2,2 (21.5 sq ft).
- A **digital pressure probe** is installed inside the filter box, which measures the deterioration of the filter. The pressure value is displayed on the booth's Touch control screen and is also sent to the REMO data center (see *REMO service*). When it's time to change the filter, the operator is informed by a message on the touch screen and REMO sends an email to the customer's technician registered in REMO.

4.3. RECIRCULATION AIR EXCHANGE VALVE

The air-operated valve mixes the air between extraction and input, this function is used during the drying phase.

During the drying phase, the valve reuses hot air in extraction and puts it partially, about 80%, in the input circuit, achieving significant energy savings.

4.4. DIRECT FLAME BURNER

Two different direct flame burner models are available:



Burner

- **Burner 300.000 Kcal/h**, (1,191,000 Btu/hr)
 - The burner consists of a V-Shape stove long cm. 60, (23.6 inches).
 - Burner efficiency is more than 97%
 - The burner complies with international standards:
 - Canada: CSA B149.3-15
 - USA: NFPA 86
 - UE: EN 746-2
 - Australia: AS 3814
 - This burner allows you to get to the drying temperature of 65 degrees Celsius (150 degrees Fahrenheit) in 3:30 minutes, starting from a cabin temperature of 23°C (74°F)
Recommended for all countries of the world where the temperature can drop to minus 25°C (-13°F)
- **Burner 200.000 Kcal/h**, (714,605 Btu/hr)
 - The burner consists of a V-Shape stove along) 45cm (17.7 inches).
 - Burner efficiency is more than 97%
 - The burner complies with international standards:
 - UE: EN 746-2
 - Australia: AS 3814
 - This burner configuration allows you to get to the drying temperature of 60°C (150°F) in about 7:00 minutes, starting from a cabin temperature of 23°C (74°F)
Recommended for all the countries of the world where the temperature never drops below 5°C (40°F).

Both burners have gas rams and dual-stage safety valves, as well as the temperature control probe.

5. THE DUCTS OF THE AIR

5.1. INPUT AND EXTRACTION CHANNEL

- The channels for air input and extraction are made of galvanized steel with an anchor flange that measures cm. 90 x 90 (35.4 x 35.4 inches).
- A probe is installed on the input channel to measure the external temperature of the air, and it is connected to the PLC.

6. ELECTRICAL



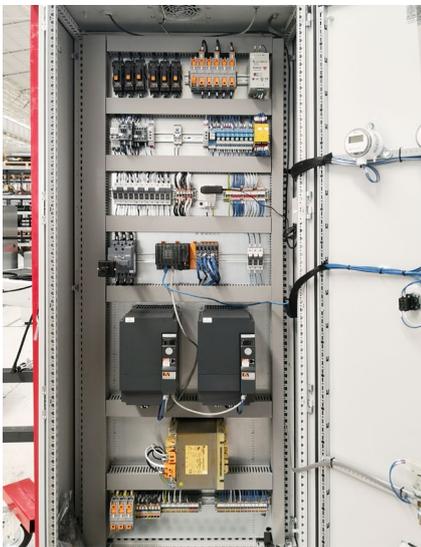
Electrical panel under construction

6.1. ELECTRICAL PANEL

- All electrical components including inverters, are enclosed in an enclosure with following dimensions: H m. 2.20 x m. 0.40 x m. 0.80 (H 86.6 Inches x 15.7 inches x 31.5 inches).
- All electrical components are of primary brands such as:
 - Siemens,
 - B&R,
 - Omron,
 - Meanwell,
 - Finder
 - PLC B&R

6.2. THE PLC MANAGES THE OPERATING LOGIC

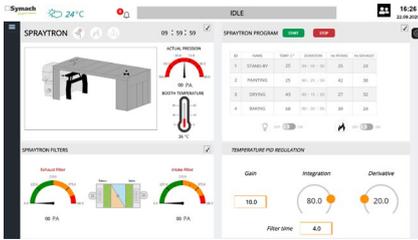
- The user makes a video of 15.6 full HD inches to interface with the paint booth.
- The PLC manages:
 - The **speed of the air** automatically, using the probes placed in the ventilation group, compensating for the saturation of the filters.
 - The **temperature inside the booth** automatically, using the temperature probe inside the cabin and the temperature probe placed in the air input channel.
 - The **recirculation valve** automatically, based on the choice of the drying program.
 - The **malfunctions of each component** by alerting the operator on the touch screen and sending the information to the REMO data center.
 - The **change of programs** between:
 - Clima Comfort
 - Painting
 - Primer wet-on-wet or Sealer
 - Water-based drying
 - Clear-coat drying (1)
 - Clear-coat drying (2)
 - Clear-coat drying (3)
 - The PLC automatically switches the program between 'comfort' and 'painting' when the painter starts spraying with the gun, and automatically returns to the comfort climate program at the end of the paint cycle.



Electrical panel



15.6 inch full HD touch screen



User interface

- The **lights** automatically turns on when the booth is turned on in the comfort and painting climate programs, and automatically turns off at the end of the painting phase.
- The PLC constantly interfaces with the REMO program to the data center by transmitting maintenance and fault or failure data.
- When maintenance tasks expire, the REMO program sends the alert information to the customer, including training tutorials, such as:
 - Change the filters
 - Burner Maintenance
 - Fans Maintenance
 - Clean the basement compartment
 - Clean the plinth grids
 - Clean the walls, changing roof sheets

→ More information about REMO can be found in relevant chapter

7. VENTILATION PERFORMANCE

7.1. THE TEMPERATURE

- The temperature in the booth **is automatically stabilized by the PLC** using the temperature probe installed inside the booth and the one installed in the input channel, that measures the outside temperature of the air.
- Using the touch screen you can set an external temperature threshold for which the burner starts automatically.
- Under special climatic conditions, this function allows to avoid delays in the ignition of the burner during the painting phase, avoiding temperature changes that would create imperfect paints.
- You can set the start and stop of the burner in automatic or manual mode, using the Fast-Warming function.

7.2. THE VENTILATION

- Booth ventilation **is automatically balanced at a constant rate** by the PLC connected to the probes installed in the input and extraction air crane, that measure the clogging of the filters.
- The ventilation is evenly calibrated at the end of installation, using the tanks with guillotine adjustment located in the basement. In this way, an average speed of 0.3 m/sec is obtained during testing across the entire surface of the cabin measured at a height of 1.0 (3ft), from the floor.
- The fans, with new filters, operate at 70% of their capacity and at this stage can guarantee a speed of 28000 m³/h (988,800 ft³/h) and an average speed of 0.3 m/sec (1 ft/second) at m. 1,0 (3.0 ft) from the basement. Based on the clogging of the filters, the fans increase their capacity to the maximum, with a result that the air speed in the cabin is 0.3 m/second (1ft/second). The operator receives the message to change the filters when they are over used.

7.3. THE VENTILATION PROGRAM

- The ventilation can be set from the Touch Screen with different programs, for example:
 - **The Comfort Climate Program** is used during the masking and washing phases, normally configured with a range of about 12000 m³/h (423.700 ft³/h) ensuring an average temperature of 23°C (74°F) even in harsh winter temperatures.
 - **Painting Program**, the speed is as fast as possible, adjusted as explained in sub-chapter 8.2.
The painting phase is controlled by the PLC, using a device that detects the airbrush drive by automatically changing the program from comfort climate to painting program.
At the end of the painting the same device will automatically return to the comfort climate program.
 - **Drying program**, the touch screen offers the possibility to preset multiple drying programs, for example for wet on wet primer, water-based and even multiple clear-coat programs.
The PLC acting on the burner, the recirculation valve and the temperature probes, increases the temperature as indicated in the drying program, still mixing a 20% clean air from the outside.
Each drying program can have a different temperature and speed of air, may or may not use the recirculation valve, for example: the program for clear application is calibrated to an average temperature of 66°C (150°F) even though the cabin can reach the temperature of 80°C (176°F).
The temperature of 66°C, in a cabin of m. 8.0 (26,2 ft), can be reached in 3.30 minutes starting from a temperature inside the cabin of 20°C (68°F).

7.4. THE PROGRAMMING OF THE PRESSURE IN THE BOOTH

- The pressure in the cabin is controlled and managed by the PLC via the fans and a probe located inside the booth.
 - For each work program you can **assign a different pressure**, as a standard configuration the pressure in the cabin is set in a range between -10 and +15 Pa, which allows the painter to make a clean paint.

8. SAFETY

8.1. COMPLIANCE TO EUROPEAN, NORTH AMERICAN AND AUSTRALIAN STANDARDS

- **The spraying of paint**, which containing solvent can be potentially explosive, is interlocked to the flow of clean air in the input by two probes and two electrovalves that intercept the power to the air brush.
- **The gas supply to the burner** is interlocked and controlled with probes that detect the correct airflow in and out of the booth.
- **Maximum temperature safety thermostat**, is installed inside the booth and calibrated in order to avoid damage to people or things; the correct operation of the thermostat is controlled by the PLC through a special program.