



 SPAL

CORREGGIO ITALY



**SPAL**

**AUTOMOTIVE**

**HIGH-PERFORMANCE  
BRUSHLESS MOTOR FANS & BLOWERS**

# THE NEW GENERATION OF HIGH-PERFORMANCE BRUSHLESS: “THE EVOLUTION OF TECHNOLOGIES”

The company's new range of SBL brushless motors equips axial fans and centrifugal blowers for applications such as engine cooling, HVAC and auxiliary cooling including SBL300 and SBL500 sealed brushless motor that features a wide range of benefits. Because of the usage of cutting edge technology, high energy ferrite magnets (rare earth magnets available upon request), and a state-of-the-art sine wave sensorless drive, SBL motors can reach a remarkable electrical efficiency higher than 82%. This makes them among the most efficient motors in the 300 and 500 W power range. This is further sustained by the use of dedicated high-performance fan designs that optimize fluid dynamic performance. The result is high airside performance at minimum electrical load. SBL motors are IP68 and IP6K9K compliant, and that means that motors are fully sealed and can operate in the presence of any aggressive or hazardous substance. The integrated power and control electronics are separated within the motor to ensure the control electronics operate at lower surface temperature levels, this greatly increasing durability and overall product reliability. SBL motors have a double-sealed ball bearing design, guaranteeing an impressive product life of more than 30,000 hours (depending on working conditions).

## TYPICAL RATINGS @ CONTINUOUS OPERATION

- **OPERATING TEMPERATURE RANGE: -40 ÷ +120°C**
- **STORAGE TEMPERATURE RANGE: -40°C ÷ +125°C**
- **LIFETIME OVER 40.000 HOURS (DEPENDING ON SPECIFIC MISSION PROFILE)**
- **OPERATING VOLTAGE RANGE: 8 ÷ 16 VOLT AND 16 ÷ 32 VOLT**
- **STAND-BY CURRENT < 0.1 mA**

### SBL300+

- 300 W ELECTRICAL INPUT @ 100°C MOTOR-FAN AMBIENT TEMPERATURE
- 250 W ELECTRICAL INPUT @ 110°C MOTOR-FAN AMBIENT TEMPERATURE

### SBL500+

- 500 W ELECTRICAL INPUT @ 100°C MOTOR-FAN AMBIENT TEMPERATURE
- 450 W ELECTRICAL INPUT @ 110°C MOTOR-FAN AMBIENT TEMPERATURE

The maximum electrical input power depends on the maximum operating temperature of the fan module and can be customized accordingly.

## STANDARD FEATURES

- PWM and analog input for continuous adjustment of fan speed
- Open collector diagnostic output
- EMC directives: 2006/28/EC
- Protection:
  - Overtemperature
  - Overcurrent
  - Mechanical overload
  - Locked rotor
  - Load dump
  - Overvoltage
  - Undervoltage
- RoHS compliant: totally lead-free electronic assembly process

## NO WORRIES

- Patented internal and external design guarantees a 100% active and passive safety protection
- Fully sealed motor with internal built-in electronics
- **IP68 and IP6K9K protection**
- High resistance to vibration and mechanical stress
- Very long life under all operating conditions
- Spark free

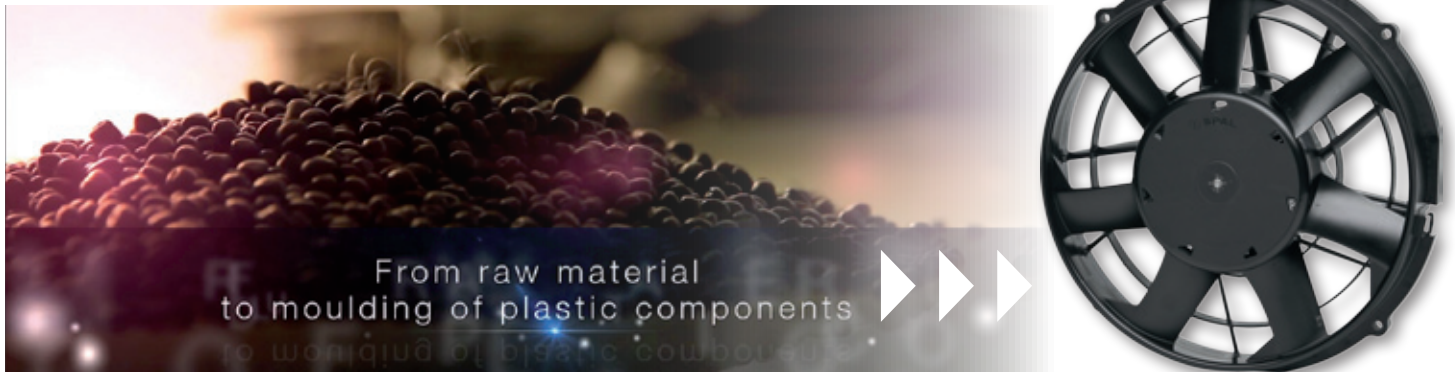
## ADVANCED FEATURES

- High efficiency and low power consumption
- Low Noise, Vibration and Harshness
- Electronic controls with on-board diagnostics
- Motor with integrated electronics
- Battery compensation system
- Proprietary sine-wave sensorless drive (Spal-patent)
- Low inertia inner rotor design
- Low weight motor
- Higher ambient working temperature

## OPTIONALS

- Full reversibility
- Active reverse polarity protection
- Personalised control strategies
- Black (cataphoresis) coating
- Noise dampers on shroud
- Speed control strategy for a direct interface to an external temperature sensor
- Heavy-duty configuration

# FULLY INTEGRATED PROCESSES: THE WHOLE MANUFACTURING PROCESS IS “INTEGRATED” IN THE SPAL PLANT



From the raw material to the moulding of plastic components; from the copper wire to the fabrication of the electric motor; from the complete assembly to the end of line test of the finished production part: **all steps of the manufacturing process are carried out in our facilities in Correggio.**

This high level of vertical integration allows us to control the quality of every single step of the manufacturing process and achieve the

well known “SPAL quality standard”, which for half a century has distinguished SPAL products in the marketplace.

A highly-qualified team of engineers aided by the latest software tools and state of the art rapid prototyping equipment ensure a seamless execution of our project; from customer’s requirements to production.

## DEVELOPMENT AND MANUFACTURING PROCESS FLOW

R&D DEPARTMENT

TESTING & RELIABILITY LABORATORIES

TOOL DESIGN AND SIMULATIONS

RAPID PROTOTYPING

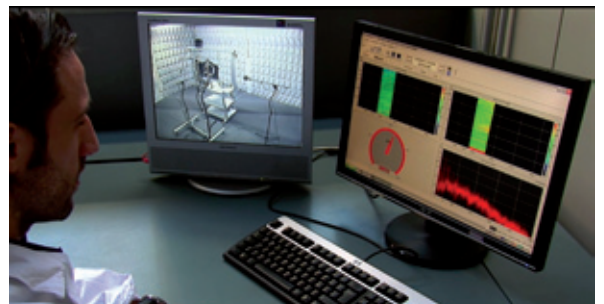
TOOL SHOP

ELECTRONIC BOARD MANUFACTURING (SMT)

INJECTION MOULDING DEPARTMENT

INDUSTRIAL ENGINEERING

E.C. BRUSHLESS ASSEMBLY LINE



# BACKGROUND ENGINEERING FOR THE BRUSHLESS: FAN DESIGN R&D

## INNOVATION

Spal maintains its leadership position in large part due to its continuous investment in innovation. Spal employs a large team of engineers, designers and technicians in new product development and prototype testing.

The R&D structure integrates all the know-how elements to master the product needs. Design and development of motors, fans and shrouds needs mandatory mastering of following know-how:

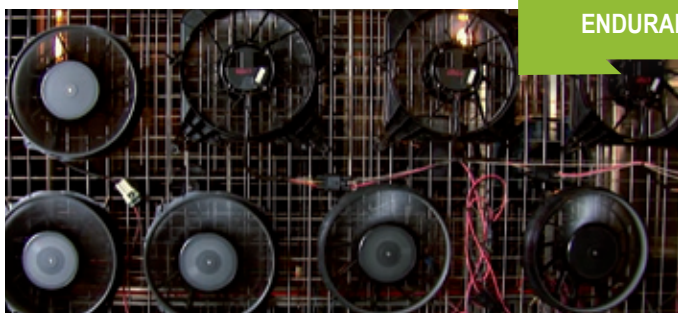
- FLUID-DYNAMICS
- THERMODYNAMICS
- ELECTRONICS
- ELECTRO-MAGNETIC
- MECHANICS

## THE FAN FLUID-DYNAMIC DESIGN PROCEDURE CONSISTS OF DIFFERENT PHASES:

- Optimization of airfoil profile
- 3D blade theoretical design (proprietary SPAL design code)
- 3D model
- CFD analysis
- FEM analysis
- Rapid prototyping of fans and shrouds
- Performance, efficiency and noise bench test
- **Reliability and environmental test (vibration, temperature, endurance, ...)**
- By random vibration analysis we get deformation and stress during component life cycles.

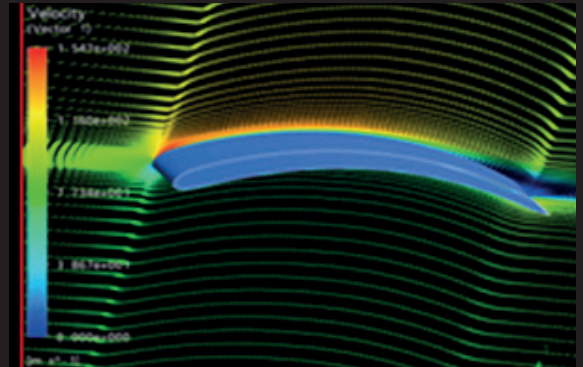


TEMPERATURE TEST

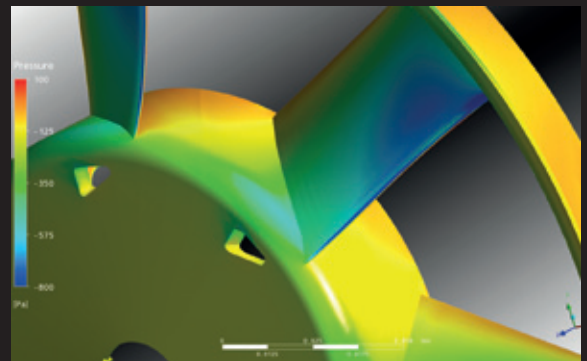


ENDURANCE TEST

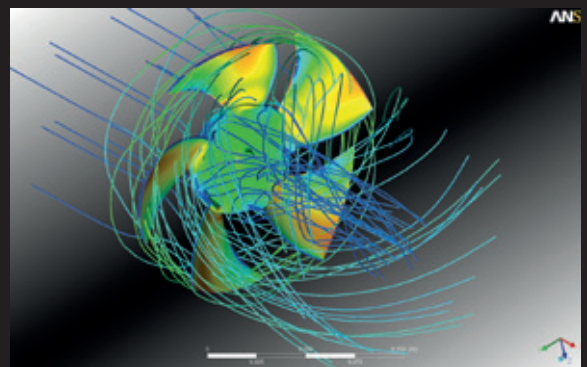
Optimization of airfoil profile



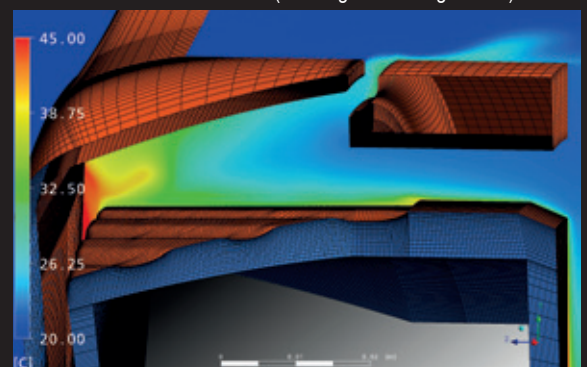
305 Ø fan with holes showing pressure field on blades and hub



The new 140 Ø mud resistant fan showing streamlines representative of the airflow velocity



Temperature distribution between hub and brushless motor for the new 305 Ø fan (showing shroud ring as well)



# RELIABILITY, INNOVATION AND SAFETY FOR EVERY ENVIRONMENTS SAFE & SEALED BRUSHLESS

## **Sealed** is better than **Open!**

SPAL has developed a new generation of Brushless motors with integrated electronics built to **IP68** and **IP6K9K** specification (TÜV certified IP6K9K, according EN 60529). Our motors are waterproof, provide superior performance and also a longer life under all operating conditions. Motor components are fully protected against dust, water, saline fog and chemicals aggressions. Maintenance free over full expected life. Open brushless motors are subject to ingress of external agents which may cause corrosion and degradation of performance and product life. The picture show rust on a not sealed motor of the competitors.



## **Mud and Sand** resistant

Brushless motor fans and blowers for all conditions

- product reliability in extremely tough operating conditions
- ideal for specific environments and conditions: heat, cold, humidity, shock, salt fog and vibration.
- manufacturing flexibility and custom tailored solutions
- the ability to match motor to country specific norms.



## **Safe** is better than **Sorry!**

The IP68 and IP6K9K protection guarantees fully sealed drive (motor with internal built-in electronics). The power board is separated from the electronic circuits for increased safety.

- SPAL SBL motors are intrinsically safe and self protected against mechanical and electrical overloads.
- SEALED MOTOR and ALUMINUM CASE are an additional guarantee that in case of overheating prevent fire generating from the motor.

# SPARK FREE

*Suitable for battery cooling  
where there exists a possibility  
of inflammable gas.*

# BRUSHLESS MOTOR FANS AND BLOWERS

## BRUSHLESS AXIAL FANS RANGE



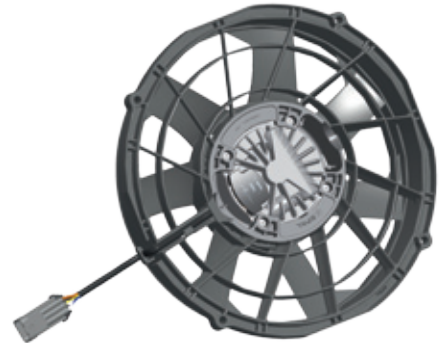
Ø 255mm

Ø 10" inches



Ø 280 mm

Ø 11" inches



Ø 305 mm

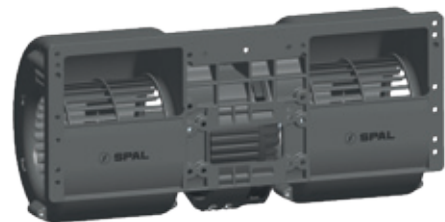
Ø 12" inches

## BRUSHLESS CENTRIFUGAL BLOWER RANGE

12V - 24 V d.c.



TYPE 019-BBL301-95



TYPE 020-BBL303-95

- PWM and analog input for continuous adjustment of fan speed
- EMC directives: 2006/28/EC
- RoHS compliant: totally lead-free electronic assembly process
- Nominal power 300W and 500W
- Operating temperature range:  $-40 \div +120$  °C
- Protection:
  - Overtemperature
  - Overcurrent
  - Mechanical overload
  - Locked rotor
  - Load dump
  - Overvoltage
  - Undervoltage

IP68 & IP6K9K PROTECTION  
VERY LONG LIFE (OVER 30.000 hrs)  
HIGH EFFICIENCY  
FAN DIAMETERS FROM 280 mm TO 405 mm  
AIRFLOWS UP TO 5.000 m<sup>3</sup>/h

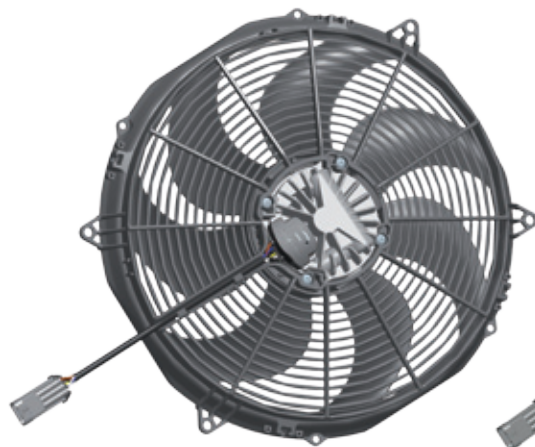
# HEATING, VENTILATION, AIR CONDITIONING, POWERTRAIN COOLING, BATTERY THERMAL MANAGEMENT SYSTEM, ON-BOARD ELECTRONICS, COOLING

12V - 24 V d.c.



Ø 355 mm

Ø 14" inches



Ø 385 mm

Ø 15" inches



Ø 405 mm

Ø 16" inches

Besides standard solutions, SPAL Automotive, for special requirements, can provide custom designed shrouds and fans.

## SOLUTIONS FOR EVER GROWING COOLING NEEDS

OUR CLIENTS ARE OUR BEST REFERENCE. WE WORK WITH THE BEST OEM MANUFACTURERS

RENEWABLE ENERGIES





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