



**+ 10,000**  
machines supplied



**30**  
Countries




More than  
**70 years**  
of tradition





## WIND TUNNELS

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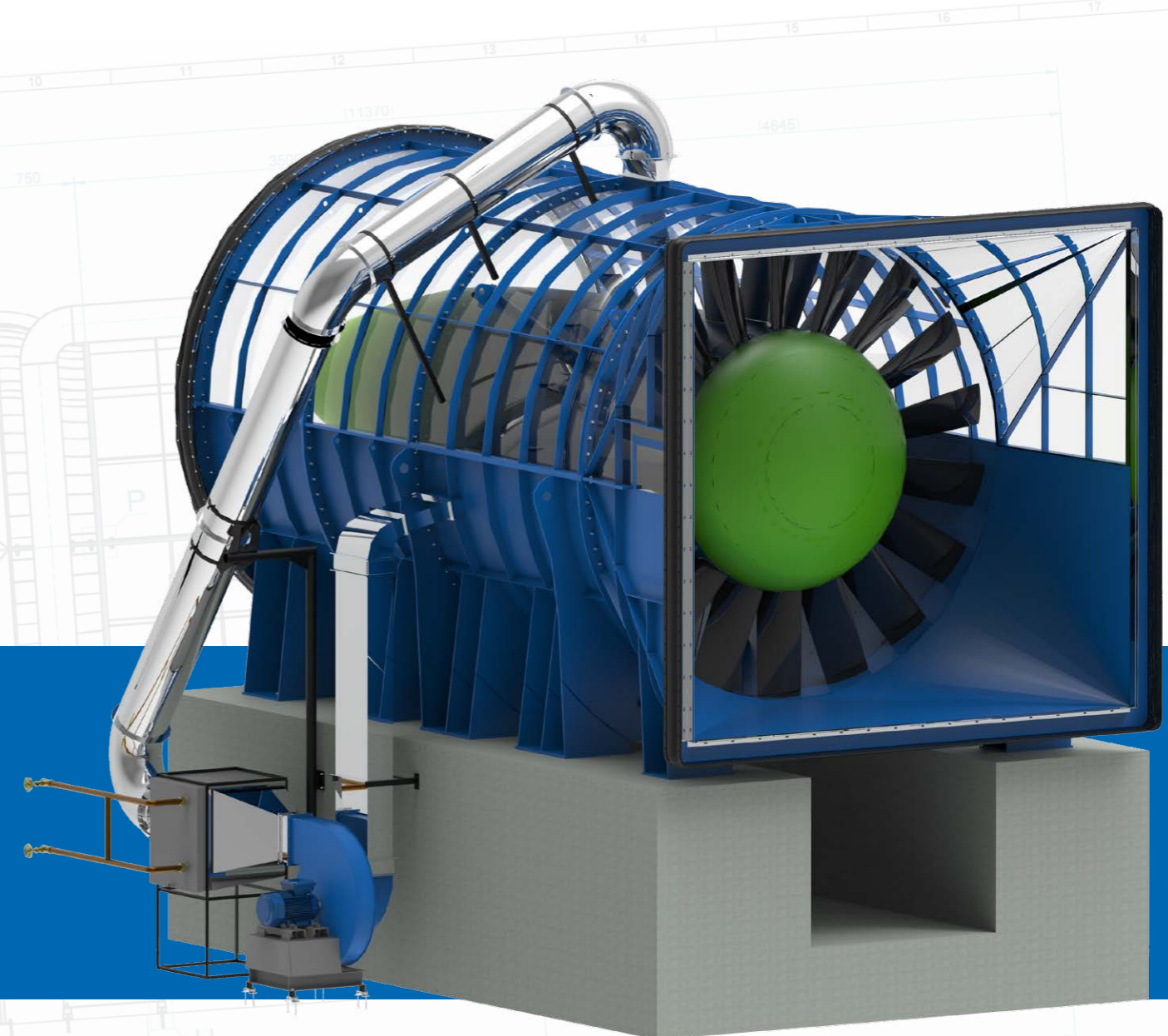
 www.zvvz.cz



**ZVVZ MACHINERY**  
Member of ZVVZ GROUP



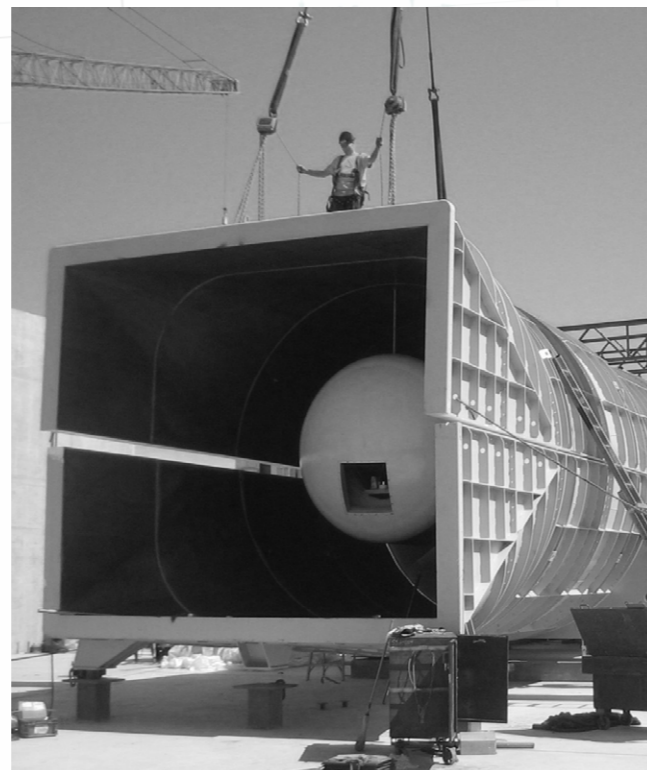
**ZVVZ MACHINERY**  
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## WIND TUNNELS

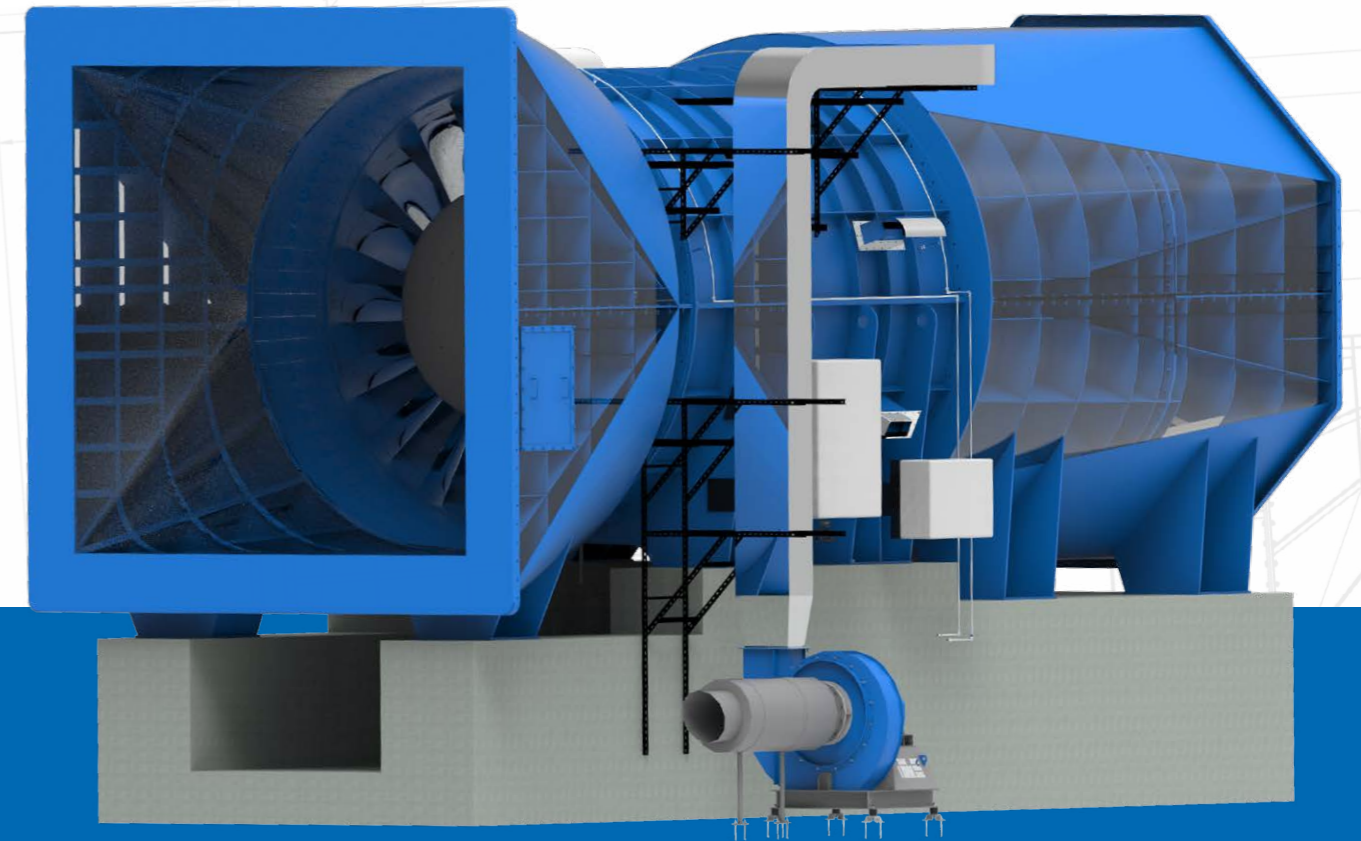
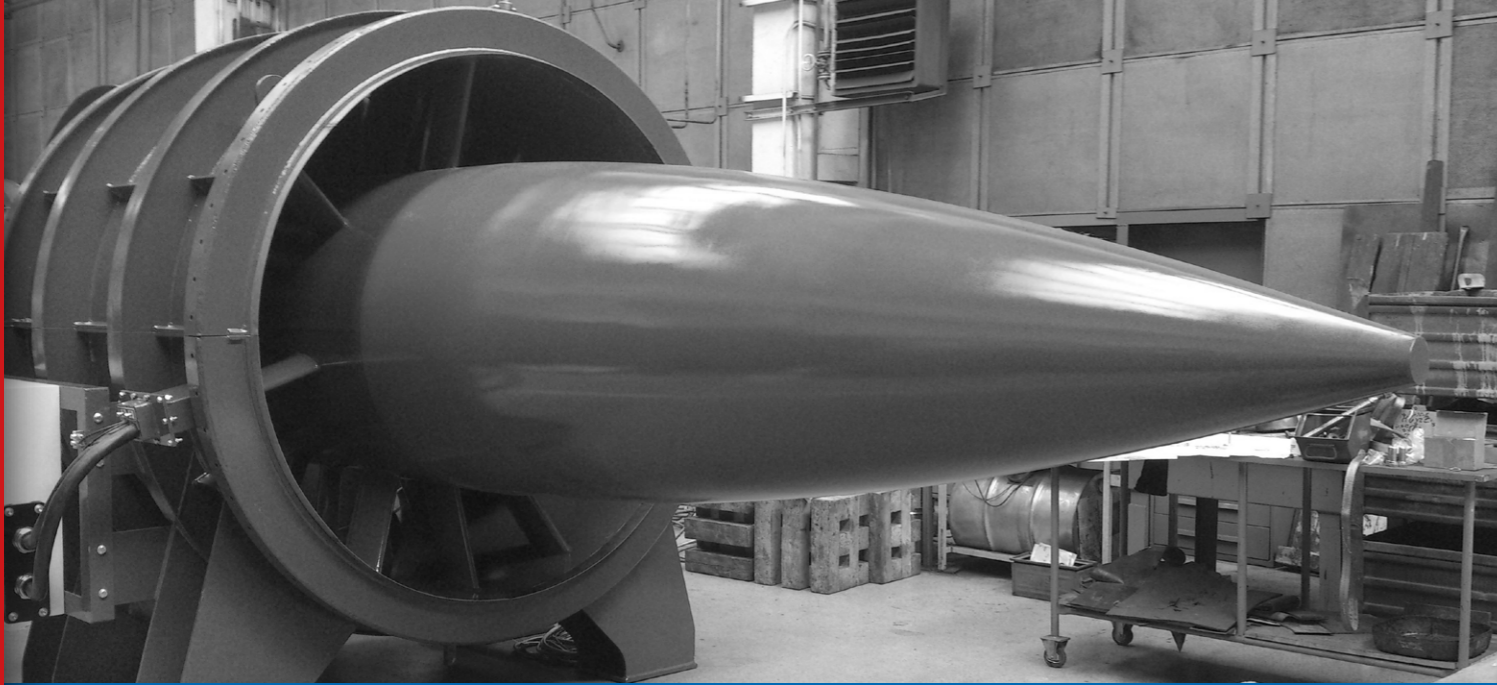
THE WIND TUNNEL FANS ARE A RELATIVELY YOUNG, BUT VERY FAST AND DYNAMICALLY DEVELOPING.

We often encounter very specific requirements for the wind tunnel fans. One of them is a large air mass flow, a stationary flow field at the fan discharge with a minimum radial and tangential component of velocity and a minimum acoustic power. Shortly, this industry branch is strictly a domain of axial, mostly overpressure fans. In extreme cases, when the overpressure fans are not sufficient with their working pressure, proven, but specially modified, axial impulse-type fans can be used. Due to very small changes in resistance during different modes of operation of the wind tunnel, the ventilation performance of the fans is controlled by changing the speed of the impeller of the fan – electric motor, i.e. using frequency converters.



Therefore, the ZVVZ cooperates with leading research institutes both in the field of state-of-the-art composite materials for the production of impeller blades, and in the field of aerodynamics and acoustics. Thanks to this, the ZVVZ fans for wind tunnels work with very high efficiency. Efficiency above 90% is no longer any exception nowadays, and it rather belongs within standards of the machine. In addition, these fans are designed

with maximum regard for their low acoustic performance to satisfy even the most demanding requirements when used in an aero-acoustic tunnel.



## THE PRODUCTION OF WIND TUNNEL FANS

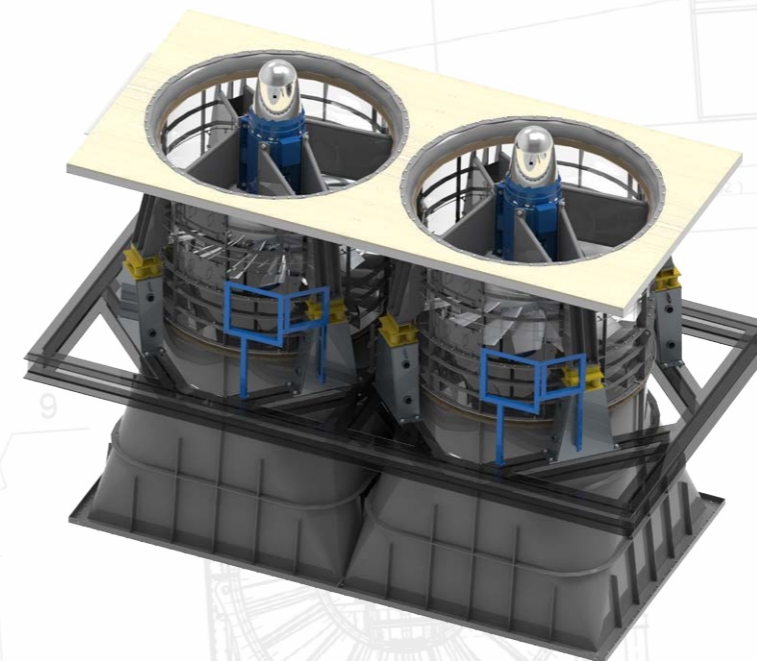
THE PRODUCTION OF WIND TUNNEL FANS TAKES PLACE UNDER STRICT TECHNOLOGICAL SUPERVISION WITH STRICT INTERNAL QUALITY CONTROL. VERY OFTEN, THE PRODUCTION OF A GIANT WIND TUNNEL FAN DOES NOT ESCAPE FROM MEDIA FOCUS, THE VIEWFINDER OF WHICH WILL NOT MISS ANY COMPLICATIONS ASSOCIATED WITH ITS DELIVERY, WHETHER IN THIS COUNTRY, IN EUROPE, OR ON ANOTHER CONTINENT.

The ZVVZ company has been closely monitoring and evaluating this branch since its inception. Thanks to this, the ZVVZ fans drive to the general satisfaction of customers not only climatic or aero-acoustic tunnel of many top car manufacturers, but also in aerodynamic, aero-acoustic, climatic or environmental tunnels of leading Czech and foreign scientific research centres.



The fans for wind tunnels are supplied by ZVVZ with all turnkey accessories, i.e. including the drive and its cooling, modern service software, etc.

The ZVVZ carefully deals with every requirement, every challenge. The ZVVZ is able to satisfy the most demanding customer by resolving various degrees of complexity. On the other hand, the company will gladly meet the requirements for simplicity and price.



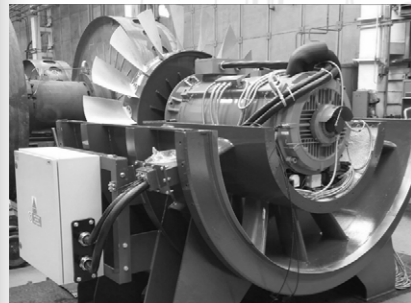
-  EXTENSIVE WORK AREA OF HIGH EFFICIENCY
-  RELIABLE OPERATION EVEN AT LOW POWER
-  AERODYNAMIC CONTROL BY TURNING THE ROTOR BLADES
-  OPERATING RELIABILITY
-  ALTERNATIVE MATERIALS OF ROTOR BLADES



THE WIND TUNNEL FANS ARE THE TOP OF FANS PRODUCTION IN GENERAL. THEY ARE A REPRESENTATION OF EACH MANUFACTURER, REPRESENTING THE FLAGSHIPS IN THE FIELD OF FANS. THE ZVVZ COMPANY ALSO TAKES CARE OF TOP TECHNICAL SOLUTIONS IN ALL ITS ASPECTS OF MACHINE DESIGN.

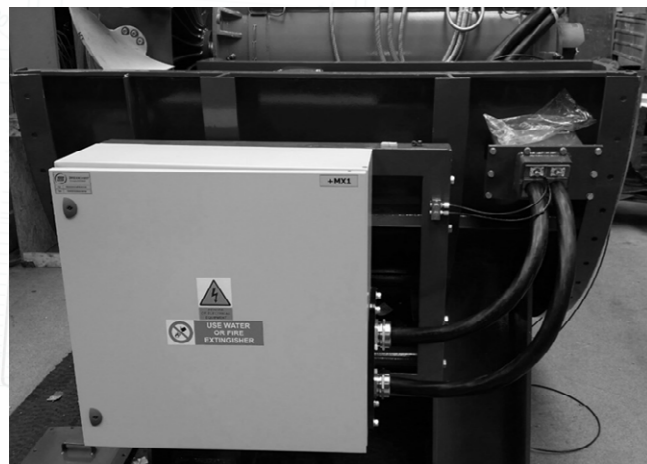
# THE COMPLETENESS OF THE DELIVERY IS ONE OF THE WAYS HOW THE ZVVZ COMPANY ATTEMPTS TO MAKE THE CUSTOMER'S WORK, COSTS AND OPERATION EASIER

## MOTOR

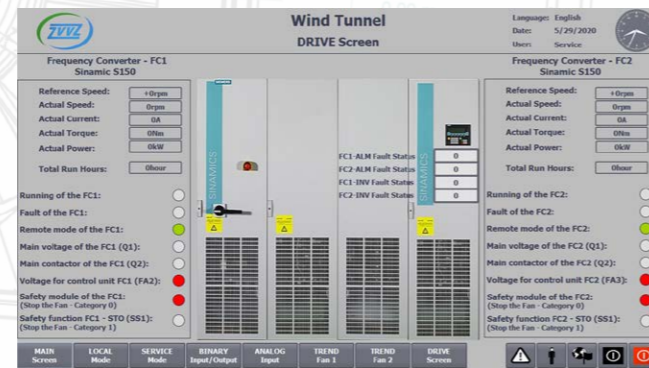


› The motors are dimensioned for each application separately, among other things, the calculation of bearings in relation to the weight of the impeller is made.

- › Typically, the motors use special cables to lead out of the stator force due to the limited size of the fan centre nacelle. This solution allows the ZVVZ to use a larger drive.
- › It is also common to use a motor with so-called open winding, cooling is then resolved externally, see below
- › The supply cables used are specially shielded to prevent high-frequency interferences from FC
- › Power and control cables from the central space of the fan are always routed in a separate space.
- › Especially in climate tunnels, the ZVVZ also uses the heating of the fan nacelle and the motor winding, thus preventing from possible condensation. The heating is controlled automatically from the ZVVZ system based on the temperature measurement.



## FREQUENCY CONVERTER



- › The possibility of quick starts and fast braking of the fan impeller allows the wind tunnel operators to simulate real conditions reliably. Also for this reason, FC enabling recuperation is often used.
- › The inverter is always verified by the calculation with regard to required starting and braking dynamics of the fan impeller.
- › The FC meets the highest requirements of SIL or PL standards
- › FC cooling is resolved using air or water, and it is also a part of the comprehensive supply by the ZVVZ.



## CONTROL



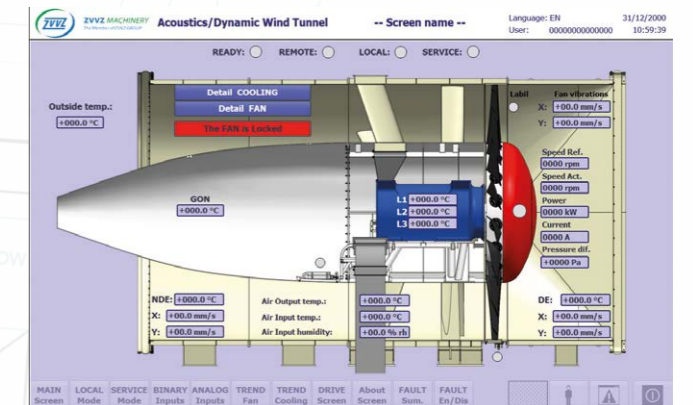
- › Communication by the superior system is usually conducted via the PROFINET communication bus; if required, the entire system can also be built using so-called SAFETY components.
- › The delivery can also include remote access via GSM, which meets the highest IT security (Siemens SCALANCE). The ZVVZ is then able to detect any fault without any need for a service trip, or to prepare a service intervention according to specific needs.



- › The fan control system is based on Siemens components (Simatic –S7). It contains an HMI panel which visualizes the entire technology supplied by the ZVVZ.

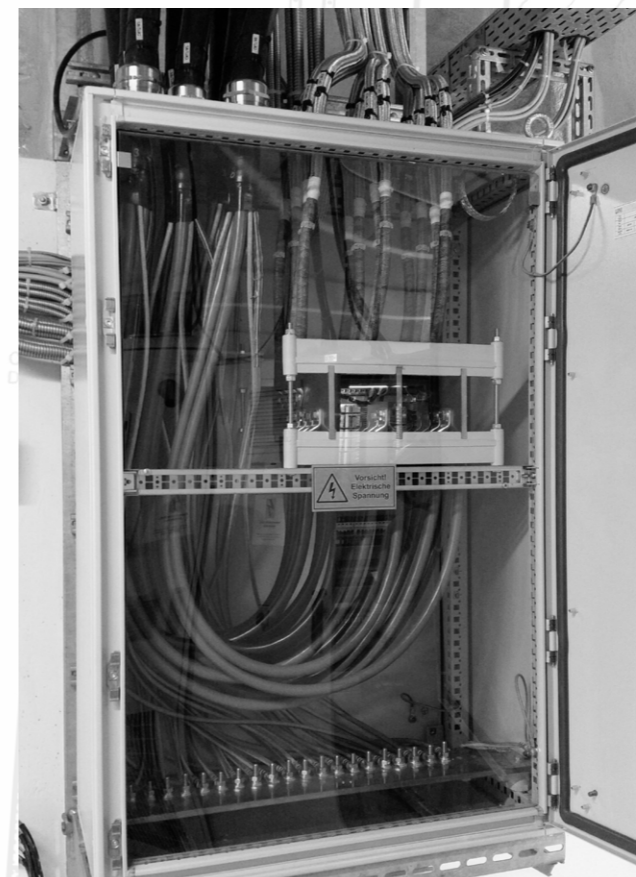
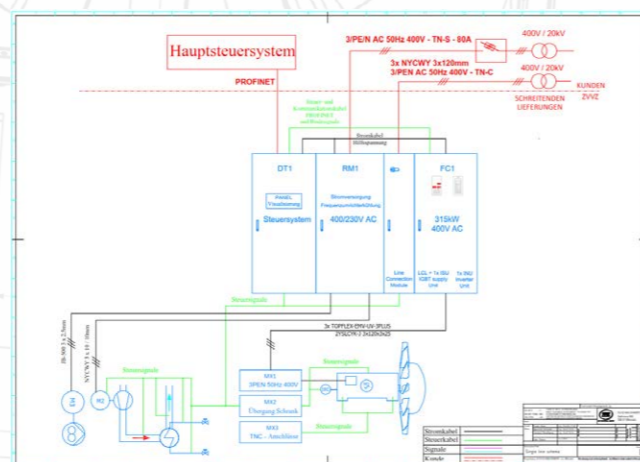
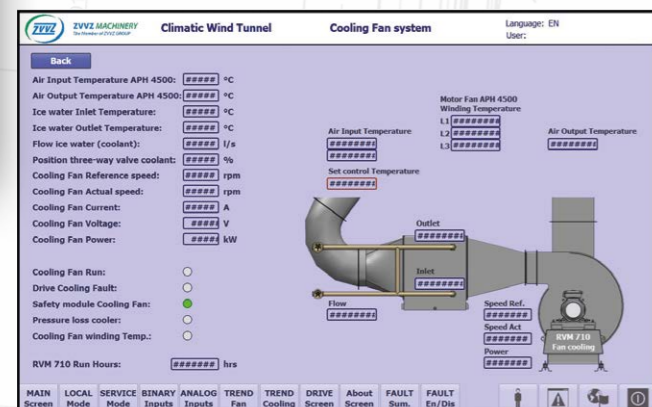
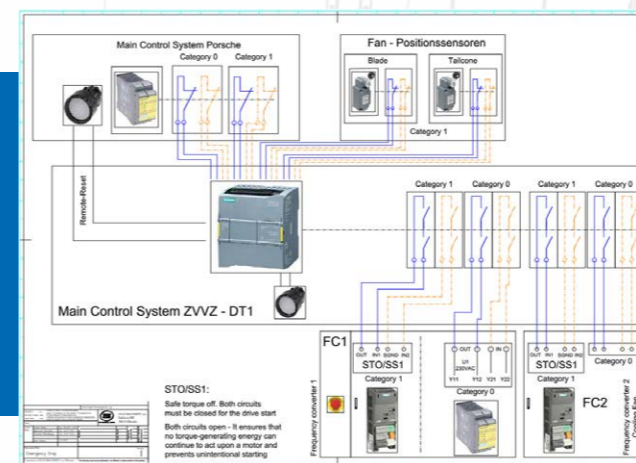
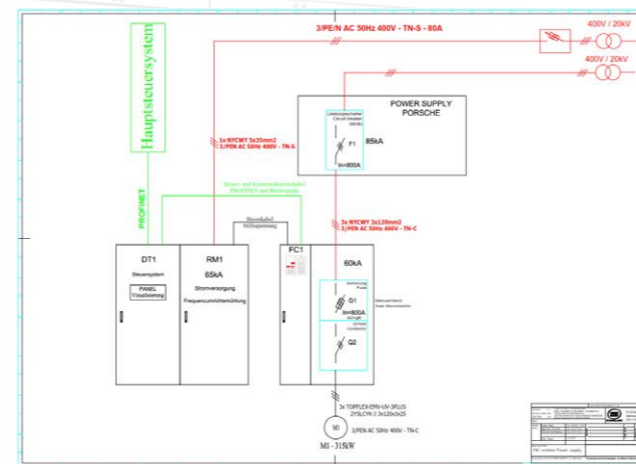
## DIAGNOSTIC SYSTEM

- › The system is used for continuous monitoring of the condition of critical mechanical components. When the setpoint limit values are reached, local (LEDs, HMI panel) and remote signalling will occur.
- › The ZVVZ considers the use of bearing temperature sensors and stator winding of motor, as well as bearing vibration sensors, to be a standard equipment. Vibration values can be monitored in terms of effective speed (in RMS) as well as acceleration values (a RMS). It is also possible to evaluate the current state of bearings according to the fault frequency. Recorded data is analysed by internal software (S7-1200) and stored by the SM 1281 module (vibration status monitoring). The S7-1200 control system is fully integrated into the automation system via the TIA V15 portal. The communication with the main control systems is implemented by unified 4-20mA signals. The schematic diagram is created in the Eplan P8 software.





## WE SUPPLY FANS FOR WIND TUNNELS, INCLUDING ALL ACCESSORIES



### MOTOR COOLING

For the motor cooling is often used a separate cooling system, from own production of ZVVZ.

#### The cooling circuit can be as follows:

- › Open circuit, i.e. using a small radial fan made by ZVVZ, the ambient air is sucked in, and blown then into the engine through the pipes and out.
- › Closed circuit – the piping is designed as a cooling circuit which includes, among other things, a radial ZVVZ fan, water-air heat exchanger. Instrumentation for the measurement of relative humidity, flow, pressure and coolant temperature is also installed in the circuit. This provides the operator with perfect control over the motor cooling process.
- › Usage of the motor with its own water cooling.

### TRANSFORMER

A high to low voltage transformer can also be included in the delivery.

### CABLE LINE

Delivery of power and control cable lines within the entire range is a matter of course, i.e. The transformer – converter – motor route.

### PRESSURE SENSING

On the inlet and outlet part of the fan, it is possible to install a device for sensing the pressure difference.

### A COMMON PART

of so-called nacelle, i.e. the inner space of the fan central part, is lighting, socket, condensate drainage equipment. Furthermore, the fan is equipped with position sensors for inspection manholes.

### DELIVERIES OF OTHER PARTS OF WIND TUNNELS OR COMPLETE TUNNELS

The ZVVZ company is able to supply complete and individual parts of wind tunnels, such as

- › Piping parts
- › Suction nozzle
- › Distribution walls
- › Steel structure