

# PROCESS SAFETY IS OUR MUTUAL GOAL

Risk Analysis

Explosion protection testing laboratory

Combustible dust testing laboratory

Flammability testing laboratory

Notified Body 1019 (ATEX)



**VVUU**

RISK ANALYSIS  
TESTING  
CERTIFICATION

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# Contact

## RISK ANALYSIS

### Ing. Stanislav Cáb

Head of Risk Analysis

Mobile: +420 724 865 181

Phone: +420 596 252 179

e-mail: cabs@vvuu.cz

riskanalysis.vvuu.cz



## CERTIFICATION

### Ing. Tomáš Dorazil

Head of Certification

Mobile: +420 602 409 036

Phone: +420 596 252 268

e-mail: dorazilt@vvuu.cz

certification.vvuu.cz/en



## TESTING

### Ing. Jakub Zdebski

Head of Testing Laboratory

Mobile: +420 606 744 198

Phone: +420 596 252 347

e-mail: zdebskij@vvuu.cz

testing.vvuu.cz/en



## SALES DEPARTMENT

### Ing. Martin Kulich, Ph.D.

Head of Sales Department

Mobile: +420 602 525 394

Phone: +420 596 252 180

e-mail: kulichm@vvuu.cz

vvuu.cz/en



# About us

The current company VVUÚ was established in 1952 as a Scientific and Research Coal Institute dealing with testing and risk analysis in mining with a focus on the Ostrava-Karvina coalfield. Over the course of seven decades, the company has undergone significant change. During this period, we have transformed from a research institute specializing in mining safety to a modern, dynamic company offering an extensive portfolio of services in the areas of testing, risk analysis and product certification.

This challenging process has tested our capabilities, strength and allowed us to realign our focus to best match global requirements in risk analysis, testing and product certification.

Today, the company VVUÚ, a.s. clearly defined direction - **safety in industry**. Our customers are not only mining companies, but all companies in which there is a risk of an industrial accident associated with a dust explosion or fire.



# Risk analysis

Our expert team will assess the risks of fire and explosion in your technological processes. Our main mission is to help our clients analyze the risks they face and ensure the desired / optimal safety status of their operations and technological processes.

## Our offer

DHA - Dust Hazard Analysis

Explosion protection document 1999/92/EC

External influences identification protocols

HAZOP – Hazard and Operability Study

SIL – Safety Integrity Level

Structural explosion prevention projects

Risk analysis of electrical and non-electrical equipment

Technical assistance and advice on the equipment certification process

Seminars and educational activities



## Legislation



### ATEX 153 - Social directive

Directive ATEX 153 (1999/92/ES) specifies the health and safety requirements for working in potentially explosive atmospheres.



### ATEX 114 - Product directive

Directive ATEX 114 (2014/34/EU) specifies the requirements for equipment and protective systems in potentially explosive atmospheres.

**Our team of experts is ready to consult and address your needs and requirements. Based on our know-how and experience, we can help you find the optimal safety solutions for your projects, plants and facilities.**

# Our services

## **DHA – Dust Hazard Analysis**

Identification of specific scenarios, hazards and risks, including the documentation of existing protective measures that are in place to reduce these risks and an assessment of the need for additional measures. The DHA analysis is thus a useful basis for the preparation of the Explosion Protection Document according to ATEX 153 (1999/92/EC).

## **HAZOP – Hazard and Operability Study**

HAZOP is the systematic identification of the hazardous and emergency conditions of complex processing equipment.

It is applicable to all types of processes and equipment. It can also be applied to different phases of the project or in the life cycle of any equipment or technology.

## **Explosion protection document 1999/92/EC**

In plants where flammable substances (gases, vapors or dusts) are used, it is necessary to assess the risk of explosion in the interior of the equipment or in its surroundings. Based on this analysis, adequate measures must be taken to reduce the risk of explosion.

## **SIL – Safety Integrity Level**

SIL (Safety Integrity Level) builds on the HAZOP method. The aim is to provide classification for all SIF (Safety Instrumented Function) within the scope of work.

SIL is defined as the reduction in relative risk provided by a particular function.

## **External influences identification protocols**

External influences are all the factors combined that affect the installed electrical equipment in a certain place / technology.

The Protocol on the Identification of External Influences thus classifies and specifies the conditions that determine the selection and design of the electrical equipment installed.

## **Structural explosion prevention projects**

The design and implementation of structural blast prevention systems is carried out on the basis of a project that ensures that the optimal technical solution for the application is selected according to the applicable legislation.

## **Risk analysis of electrical and non-electrical equipment**

This is an assessment of the selection of the installed and operated electrical or non-electrical equipment in areas with a risk of explosion. The output is a report on the suitability of placing certain equipment in a hazardous area.

## **Technical assistance and advice on the equipment certification process**

Consultations and advice on the certification process for equipment intended for use in potentially explosive atmospheres in accordance with ATEX 114 (2014/34/EU) and the compilation of declarations of conformity. Preparation of the risk analysis and risk assessment of machinery - the basic material for the certification of equipment.

# Explosion protection testing laboratory

VVUU is a European leader in the testing of explosion protection systems. Thanks to its extensive testing facilities, the company provides its customers with comprehensive explosion prevention services. **Testing laboratory VVUU, a.s. No. 1025 is the Accredited Body according to ČSN EN ISO/IEC 17025:2018.**



## We offer



### Explosion tests

Verification of operational and mechanical safety of protective systems and equipment

Educational activities in explosion protection technologies and systems

Development and application activities in explosion protection

### Wide range of high-pressure test vessels

The testing laboratory is equipped with 15 test vessels with volumes from 400 dm<sup>3</sup> to 60 m<sup>3</sup>. They meet the design requirements according to the applicable technical regulations and they have high pressure resistance up to 16 bar.

### Maximum explosion parameters in real volumes

The maximum explosion parameters can be set in the vessels in an enclosed space in order to test containment systems under realistic and the most risky conditions of explosion.

### Accredited determination of explosion parameters in 1 m<sup>3</sup> volume

The advantage is the possibility to determine the maximum explosion parameters of dust mixtures in a standardized 1 m<sup>3</sup> vessel, the accuracy and quality of which has been confirmed by CaRo interlaboratory comparison tests. This allows the use of customer-supplied combustible powders that best suit the needs for the application of tested protection systems.

### State-of-the-art recording and measuring technology

The testing laboratory has state-of-the-art technology for the recording and subsequent

**Our experts are able to assess the risks present in explosion prevention, to design and determine the necessary explosion and flammability parameters and to test appropriate protective measures at the Testing and training center Ostrava (TTC).**

# Our Services

evaluation of the explosion tests performed. Almost all computational designs need to be practically verified by large-scale simulation tests.

The use of two independent test lines makes it possible to test different protection systems in parallel in a given test cycle.

## Large-scale tests

Large-scale tests also play an indispensable role in the development of new protective systems and equipment, where without these tests the product cannot be certified for use in hazardous areas.

The output of these types of tests is an accredited report.

## Test, evaluation, accredited protocol, ATEX certificate

The testing laboratory offers the possibility of performing large-scale explosion tests, including their subsequent professional evaluation. Our experts provide individual approach and support in solving the issues of testing protection systems according to accredited test procedures.

Upon customer request, the explosion protection test facility will submit the accredited test report to the Notified Body for conformity assessment.

<https://certification.vvuu.cz/en>

**VVUÚ is the Notified Body 1019 according to the legislation 2014/34/EU for the certification of protective systems for use in explosion hazardous environments.**

# Accredited examinations at TTC Ostrava

<b>EN 14373</b>	explosion suppression systems (automatic high rate discharge suppressor or HRD systems)
<b>EN 14797</b>	explosion venting devices (bursting panel device, explosion doors or flaps, relief valves)
<b>EN 16009</b>	flameless explosion venting devices (mesh, ceramic, ribbon devices for flameless venting)
<b>EN 14460</b>	explosion resistant equipment (filters, cyclones, redler conveyors, elevators, dryers and other explosion-proof equipment)
<b>EN 16447</b>	explosion isolation flap valves
<b>EN 15089</b>	explosion isolation systems (rotary valve, float valves, quick-closing gate valves, fire extinguishing barriers)
<b>EN 14034-1</b>	determination of the maximum explosion pressure $p_{max}$ in a 1 m <sup>3</sup> vessel
<b>EN 14034-2</b>	determination of the maximum rate of explosion pressure rise $(dp/dt)_{max}$ in a 1m <sup>3</sup> vessel

## Testing explosion suppression systems in accordance with EN 14373

This test determines the effectiveness of the explosion suppression system in different volumes of closed test vessels.

The result of the testing is the value of the maximum reduced explosion pressure for different unit volumes depending on the value of the explosion constant  $K_{st}$ .

## Testing explosion resistant equipment in accordance with EN 14460

The accredited test assesses the ability of a structure to withstand internal blast pressure without compromising its integrity and preventing dangerous blast effects from reaching the surroundings.

## Testing explosion venting devices in accordance with EN 14797

The venting device is subjected to type testing to achieve maximum vent efficiency, functionality and mechanical strength.

## Testing explosion isolation flap valves in accordance with EN 16447

The accredited test assesses the effectiveness and mechanical integrity of the explosion isolation flap valves.

## Testing flameless explosion venting devices in accordance with EN 16009

The flameless explosion venting device is subjected to type testing to achieve maximum efficiency, prevention of flame transmission, mechanical integrity and the external effects of the flameless explosion vent device.

## Testing the efficiency of explosion isolation systems in accordance with EN 15089

The accredited test assesses the resistance of the equipment under test to explosion, flame transmission and functional tests of the various types of explosion isolation equipment (active and passive isolation valves, fire barriers and rotary feeders).

## The determination of the maximum explosion pressure $p_{max}$ and the maximum rate of explosion pressure rise $(dp/dt)_{max}$ in a 1 m<sup>3</sup> vessel in accordance with EN 14034-1 and EN 14034-2.

The values of these parameters are necessary for testing of explosion protection systems, for the qualified calculation and design of explosion protection elements.



# Explosion protection remote test site Štramberk

The explosion protection testing laboratory is a unique complex of three explosion galleries in Štramberk with a length of up to 300 meters, where explosions with real parameters corresponding to mine conditions as well as other technologies with flammable substances can be simulated.

## Testing the effectiveness of explosion-proof enclosures in accordance with EN 14591-2

The test of water and explosion-proof dust enclosures preventing the transmission of explosions in mines complies with the requirements of the Czech Mining Bureau, Decree No. 10/1994 Coll., as amended, as well as with the requirements of the EN 14591-2 standard, where for a defined explosion pressure there must be no burst of explosive flame at a specified distance.

## Pressure resistance test

Testing the pressure resistance of gates, doors, fire doors, windows and covered passages of buildings, stressed by explosion pressure up to 450 kPa, extremely from 0.5 to 1.0 MPa.

# Other activities of our testing laboratory

Assessing the resistance of buildings and protection systems to pressure and thermal exposure to dust-air or gaseous mixtures, including experimental verification - evaluation of explosion dynamics

Verifying the causes and consequences of an explosion of coal dust or methane-air mixtures

Monitoring explosion dynamics – the development and decline of the explosion processes in space of 1D and 2D propagation

Active involvement in R&D projects, experimental and development activities in areas dealing with explosions and fires in enclosed spaces

Rental of explosion galleries in Štramberk

# Combustible dust testing laboratory

VVUÚ, a.s. is a European leader in the testing of combustible dust. The testing laboratory is comprehensively equipped for testing flammable dusts. **VVUÚ, a.s. is testing laboratory no. 1025, accredited under ČSN EN ISO/IEC 17025:2018.**



## Our offer



Determination of the fire-technical characteristics according Directive 2014/34/EU of the European Parliament and of the Council (ATEX)

## Accredited examinations

<b>EN 933-1</b>	determination of granularity by sieve analysis (medium grain size)
<b>ISO 562</b> <b>ISO 1171</b> <b>ISO 579</b>	basic chemical analysis (determining the content of water, ash and volatile combustibles)
<b>EN ISO/IEC 80079-20-2</b>	determination of flammability of dust or combustible flyings (screening test; GO/No Go test)
<b>EN ISO/IEC 80079-20-2</b>	determination of the minimum ignition temperature of settled dust.
<b>EN ISO/IEC 80079-20-2</b>	determination of the minimum ignition temperature of dust clouds.
<b>EN 14034-3+A1</b>	determination of the lower explosive limit of dust clouds
<b>EN 14034-1+A1</b> <b>EN 14034-2+A1</b>	determination of the explosion characteristics of dust clouds ( $p_{max}$ , $(dp/dt)_{max}$ VA-20L)
<b>EN 14034-4+A1</b>	determination of the oxygen content limit
<b>EN 13821</b> <b>EN ISO/IEC 80079-20-2</b>	determination of the minimum initiation energy of ignition of dust clouds
<b>ISO 567</b> <b>ISO 1013</b>	determination of bulk density gravimetrically
<b>EN 1237</b>	determination of powder density gravimetrically
<b>EN 15188 ADR/RID 2.2.42- Class 4.2-Pyrophoric substances</b>	determination of susceptibility to spontaneous ignition by the isothermal method
<b>EN 17077</b>	classification of dust layers into flammability classes according to their combustion behavior
<b>EN ISO/IEC 80079-20-2</b>	determination of the volumetric resistance of dust

# Fire-technical characteristics

Technical measurements and safety parameters are obtained. These parameters provide input information for safety data sheets for assessing risks in technologies.

The testing standards used are harmonised according to Directive 2014/34/EU of the European Parliament and of the Council (ATEX).

## **VA-20L explosion autoclave (manufacturer Kühner AG)**

The testing laboratory has two VA-20L explosion autoclaves, which are fully compliant with the European standards of the EN 14034+A1 series.

## **MIKE 3 (manufacturer Kühner AG)**

As an additional test vessel, a modified Hartman tube with a volume of 1.2 l and MIKE 3 designation, is used and is fully compliant with the European standard EN 13821.

## Other activities of our testing laboratory

Determination of the susceptibility of dust to spontaneous combustion using the Olpinský method

Determination of the lower explosive limit of gases,

Determination of gas explosion indicators

Expert opinions on explosiveness

Conducting risk analysis tests

Conducting research on explosive materials

## Accredited protocol

The laboratory provides expert opinions and interpretations of test results.

The output of the measurement is an accredited test report and the issuance of fire-technical characteristics.

# Flammability testing laboratory

VVUU, a.s. is a European leader in testing the flammability of materials, parts and products for mineral extraction, for processing plastics, liquids and solids, for the chemical, electrotechnical, automotive and textile industries. **VVUU, a.s. is testing laboratory no. 1025, accredited under ČSN EN ISO/IEC 17025:2018.**



## Our offer



Flammability tests using fire simulation, where we examine the resistance of materials to flame stress and further simulate fires for the purpose of training mine rescuers. The laboratory is also equipped with a special fire gallery for large-scale fire simulations.

The tunnel is one of the most unique workplaces in the Czech Republic and EU in terms of its focus and capabilities. It has a length of 46 m and cross-section of 10 m<sup>2</sup>, and it offers the possibility of setting the speed of the air flow and is used for testing materials in real fire conditions with the possibility of measuring temperatures and sampling combustion emissions in different parts of the fire tunnel.

## Accredited examinations

### Underground materials

<b>Directive No. 9/1986 SZI Instruction No. 34 SZ</b>	flammability tests of plastic ventilation pipes in a fire testing tunnel
<b>EN 14591 - 2, Annex B.</b>	tests efficiency of explosion barriers (trays and bags) in the conditions in a fire testing tunnel
<b>EN ISO/IEC 80079 - 38, Article 6.2</b>	test of flammability of non- metallic materials
<b>DIN 22 100 - 5</b>	flammability test of plastic hoses and pipes

### Conveyor belt tests according to the requirements of EN 14973 and EN 12882

<b>EN ISO 340</b>	determination of flame resistance
<b>EN ISO 20238</b>	determination of resistance to ignition by friction
<b>EN 12881 - 2 + A1</b>	flammability test in a fire testing tunnel
<b>EN 12881 - 1, outside chapter 7</b>	determination of resistance to ignition and burning on a flat gas burner in a fire testing tunnel
<b>EN ISO 284</b>	determination of surface electrical resistance

<b>Liquids</b>	
<b>EN ISO 2719</b>	determination of flash point - Pensky-Martens closed cup method
<b>EN 57:1995</b>	determination of flash point - Abel-Pensky closed cup method
<b>EN ISO 2592</b>	determination of flash and fire points - Cleveland open cup method
<b>EN 14522:2006</b>	determination of ignition temperature
<b>Plastics, plastic hoses and pipes</b>	
<b>EN ISO 4589 - 2, UIC 564 - 2 Annex 7</b>	determination of burning behavior by oxygen index method
<b>UL 94, Ed.6 - art.7, EN 60695 - 11 - 10</b>	flammability of plastic materials, horizontal burning (HB)
<b>UL 94, Ed.6 - Article 8, EN 60695 - 11 - 10</b>	flammability of plastic materials, vertical burning (V-0,V-1,V-2)
<b>UL 94, Ed.6 - Article 9, EN 60695 - 11 - 20</b>	flammability of plastic materials, vertical burning (5VA,5VB)
<b>UL 94, Ed.6 - Article 11</b>	flammability of plastic materials, vertical burning of thin materials (VTM-0, VTM-1, VTM-2)
<b>UL 94, Ed.6 - Article 12</b>	flammability of plastic materials, horizontal burning of foam materials (HBF, HF - 1, HF - 2)
<b>Textile</b>	
<b>EN ISO 6940, 95/28/EC, Annex VI, UNECE No. 118, Annex 8</b>	determination of ease of ignition
<b>EN ISO 6941, 95/28/EC, Annex VI, UNECE No. 118, Annex 8</b>	measurement of flame propagation speed of vertically oriented specimens
<b>Vehicle interior materials</b>	
<b>95/28/EC Annex IV, UNECE No. 118 Annex 6, ISO 3795, TL1010, DBL 5307 Article 5.1, WSK - M4D556 A / A3 / A4 / A5, FMVSS 5571.302, VW 96243, MS 300 - 08</b>	measurement of flame propagation speed, determination of flammability
<b>Solids</b>	
<b>ISO 871</b>	determination of flash, ignition and glow temperature
<b>Chemical substances and chemical preparations</b>	
<b>Commission Regulation (EC) No. 440 / 2008 Method A.12</b>	determination of flammability of substances and agents reacting with water
<b>Solid alternative fuels</b>	
<b>EN ISO 21644, Annex B: B.7, B.8, B.9</b>	determination of biomass content
<b>Fuel tanks for motor vehicles</b>	
<b>UNECE 34.01 ch. 5 paragraph 5.1.7</b>	fire resistance test

## Other activity

Stringent testing according to the individual requirements of the customer done on site, on the equipment and professionalism of workers, including the processing of records from the measurement of temperatures, combustion emissions, with the possibility of regulating the speed of air flow, and used, for example, in the verification of the causes of accidents/expert reports, the development of new materials, and the verification of the parameters required for establishing the safe operation of technologies.

# Certification of protective systems intended for use in potentially explosive atmospheres

**VVUU, a.s. is the Notified Body 1019 for the conformity assessment of protective systems intended for use in potentially explosive atmospheres (ATEX).** It is authorized to carry out conformity assessment activities pursuant to Government Regulation No. 116/2016 Coll., transposing Directive 2014/34/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.

For manufacturers of protective systems designed for use in potentially explosive atmospheres, we offer the comprehensive certification of their products before they are placed on the EU market. The activities of the Notified Body VVUU, a.s. build on the services of an accredited testing laboratory, which offers accredited tests of protective systems in a fully equipped testing center with a wide range of test vessels ranging from 0.5 m<sup>3</sup> to 60 m<sup>3</sup>.

## Types of protection systems for conformity assessment

<b>EN 14373</b>	explosion suppression systems (automatic high rate discharge suppressor or HRD systems)
<b>EN 14797</b>	explosion venting device (bursting panel device, explosion doors or flaps, relief valves)
<b>EN 16009</b>	flameless explosion venting devices (mesh, ceramic, ribbon devices for flameless venting)
<b>EN 14460</b>	explosion resistant equipment (filters, cyclones, redler conveyors, elevators, dryers and other explosion-proof equipment)
<b>EN 16447</b>	explosion isolation flap valves
<b>EN 15089</b>	explosion isolation systems (rotary valve, float valves, quick-acting slide valves, fire extinguishing barriers)

## What is needed to start the certification process?

- general description of the product
- conceptual design, manufacturing drawings and schemes of components, sub-assemblies, circuits, etc.
- descriptions and explanations necessary for understanding of those drawings and schemes and the operation of the product
- list of harmonised standards applied in full or in part
- description of the solutions chosen adopted to meet the essential health and safety requirements, including a list of other relevant technical specifications applied
- results of design calculations, examinations carried out, etc.
- test reports
- analysis and assessment of the risk(s)
- safety instructions manual (preliminary)
- design of the marking of the protective system and design of the marking label

## Procedure for the certification of EU-type examination (MODULE B)

- the application for conformity assessment and the required technical documentation and its examination
- proposal for the certification process including the tests necessary for issuing the certificate, subsequent approval
- supply of samples
- conducting tests, issuing test reports
- preparation of an evaluation report
- **in the case of COMPLIANCE – issuing an EU-type examination certificate**
- **subsequent the conformity assessment according to Module D or Module F**

### MODULE D - conformity to type based on the quality assurance of the production process

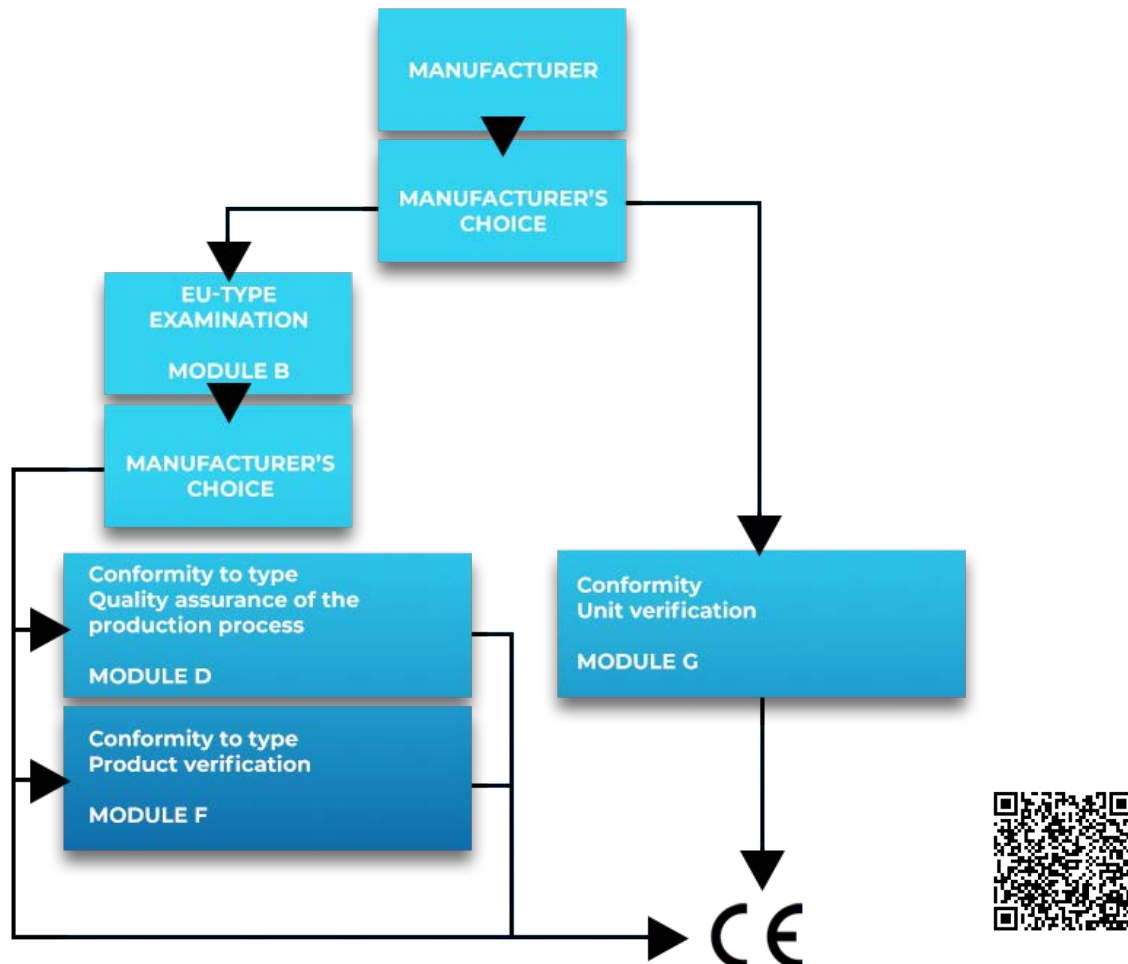
- assessment and surveillance of the quality control system used by the manufacturer to ensure the conformity of its products with the type described in the EU-type examination certificate. The audit shall include an assessment visit to the manufacturer's premises

### MODULE F - conformity to type based on product verification

- examinations and tests to verify the conformity of products with the approved type described in the EU-type examination certificate and relevant legislation

## Procedure for the certification of each individual product (MODULE G)

- the application for conformity assessment and the required technical documentation and its examination
- proposal for the certification process including the tests necessary for issuing the certificate, subsequent approval
- supply of samples
- conducting tests, issuing test reports
- preparation of an evaluation report
- **in the case of COMPLIANCE – issuing a certificate of conformity**



# Seminars and educational activities

Our work in the field includes the organization of regular seminars that focus on the danger of explosion of flammable gases, flammable liquid vapors and combustible dust, and on eliminating the risk of explosion in industrial plants.

As part of these seminars, we conduct demonstrations of the burning and explosion of combustible dust. We are ready to offer you our professional experience and will be glad to show you what combustible dust can do.



Engineering, analysis and assessments in operational and process safety. Comprehensive services and solutions in explosion prevention and protecting industrial operations. Our team of risk analysis experts is ready to consult and address your needs and requirements in the explosion protection document, external influence identification protocols, and in undertaking a risk analysis of electrical and non-electrical equipment.



The testing laboratory VVUU, a.s., No. 1025, is accredited by the Czech Institute for Accreditation according to ČSN EN ISO/IEC 17025:2018 for tests of flammability, explosion protection and protective systems, flow, dustiness and technical acoustics, explosives and blasting equipment, explosiveness of flammable dust, PPE and mining machinery.



VVUU is the Notified Body 1019 engaged in assessing the conformity of personal protective equipment against falls from height and slips, protective systems for use in explosive atmospheres (ATEX), explosives for civil use, and selected types of machinery for use underground. The certification body VVUU is also accredited to certify protective and rescue equipment for working at heights, conveyor belts and flexible medium volume bags for non-hazardous materials.

VVUU has been assessing and defining fire and explosion risks for more than 70 years. VVUU, a.s. is a market leader, a company with modern and complex laboratory, testing and development facilities.

Ensuring industry safety is the clearly defined direction of the company's core activity. VVUU offers its services to all companies at risk of industrial accidents, explosions or fires.



VVUU, a.s.  
Pikartská 1337/7  
Ostrava – Radvanice  
716 00  
Czech Republic

Phone: +420 596 252 111  
E-mail: [vvuu@vvuu.cz](mailto:vvuu@vvuu.cz)  
Web: [www.vvuu.cz](http://www.vvuu.cz)