consilab
Gesellschaft für Anlagensicherheit

1

Determination of Safety-Related Parameters of Liquids and Gases

To ensure the safe handling of chemicals in laboratory, pilot plant or production facility, the knowledge of the safety-related parameters is essential. In case of liquids and gases these are for example, the flash-point or auto-ignition temperature.

We determine the above mentioned parameters using modern, state of the art testing methods.

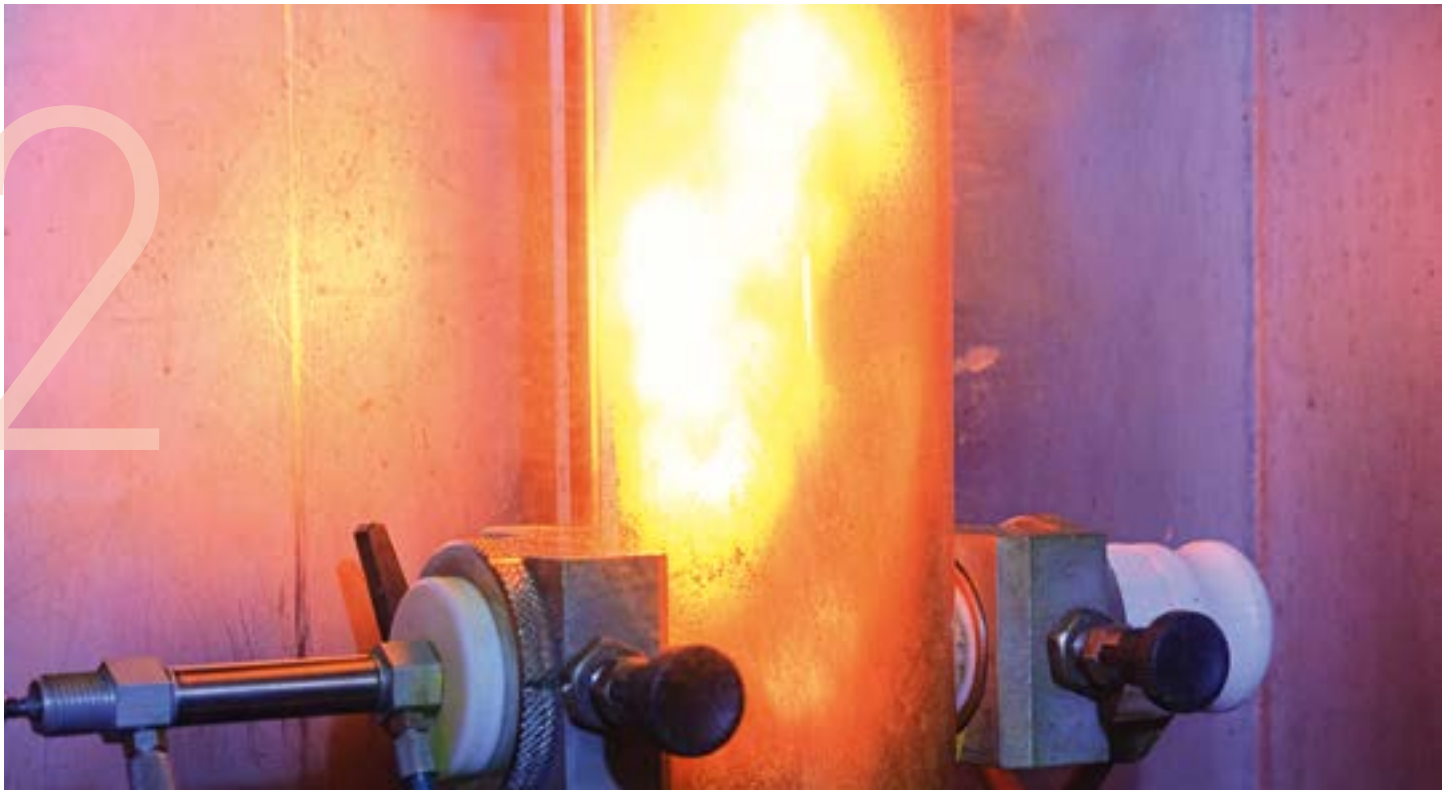
1.1 TESTS REGARDING THE EXPLOSION AND FIRE RISK OF LIQUIDS AND GASES

DIN EN ISO 3679	Flash-Point (Rapid-Tester) (Screening and Full Test)
DIN EN ISO 2719	Flash-Point (Pensky-Martens) (Screening and Full Test)
DIN EN ISO 13736	Flash-Point (Abel) (Screening and Full Test)
DIN 51794	Auto-Ignition Temperature (Liquids and Gases)
DIN EN 14522	Auto-Ignition Temperature (Liquids and Gases)
DIN EN 60079-0	Temperature Classes (based on Auto-Ignition Temperature)
DIN EN ISO 9038	Sustained Combustion
DIN EN 15794	Lower Explosion Point of Liquids and Liquid Mixtures
DIN EN 1839	Lower Explosive Limit and Upper Explosive Limit, Explosive Range
DIN EN 15967	Limiting Oxygen Concentration
DIN EN 15967	Explosion Characteristics (p_{max}, K_G–Values)
A.14.	Explosion Risk of Liquids
A.21.	Oxidising Properties of Liquids
TRAS 410	Thermal Stability

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

2



Determination of Safety-Related Parameters of Solids and Dusts

To ensure the safe handling of chemicals in laboratory, pilot plant or production facility, the knowledge of the safety-related parameters is essential. In case of solids these are for example, the burning number or minimum ignition energy.

We determine the above mentioned parameters using modern, state of the art testing methods.

2.1 TESTS REGARDING THE EXPLOSION AND FIRE RISK OR SELF-IGNITION BEHAVIOUR OF DEPOSITED DUSTS AND BULK SOLIDS

VDI 2263 Blatt 1	Combustibility Index (Burning Number) at Ambient Temperature and 100 °C
VDI 2263 Blatt 1	Burning Behaviour (UN Test N.1)
DIN EN 50281-2-1	Minimum Ignition Temperature of a Dust Layer (Smoldering Temperature)
DIN EN 15794	Lower Explosion Point of Solvent Wetted Bulk Solids
VDI 2263 Blatt 1	Self-Ignition in the Grewer-Oven (0–400 °C; in Air, pure Oxygen or Partially Inerted)
	Self-Ignition in the DSC under 25 bar Air (0–700 °C)
DIN EN 15188	Heat Storage in the Wire Basket:
	Isoperibolic Temperature Control (Cube; 1 Litre; 10 × 10 × 10 cm)
	Isoperibolic Temperature Control (Cube; 15,625 ml; 2,5 × 2,5 × 2,5 cm)
	Adiabatic Temperature Control (Cylinder; 400 ml; 8 × 8 cm)

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

2

2.2 TESTS REGARDING THE EXPLOSION RISK OF SUSPENDED DUSTS

VDI 2263/1	Dust Explosibility using the Modified Hartmann-Tube with Spark / Glow-Coil Ignition
DIN EN 14034-3	Dust Explosibility in the 20-L-Sphere
DIN EN 14034-3	Lower Explosive Limit in the 20-L-Sphere
	Limiting Oxygen Concentration in the modified Hartmann-Tube
DIN EN 14034-4	Limiting Oxygen Concentration in the 20-L-Sphere
DIN EN 14034-1+2	Dust Explosion Characteristics in the 20-L-Sphere (pmax and KSt-Values, Dust Explosion Class)
DIN EN 13821	Minimum Ignition Energy with and without Inductive Resistance
	Minimum Ignition Energy with Inductive Resistance at Elevated Temperatures
DIN EN 50281-2-1	Minimum Ignition Temperature of Dust Cloud (Godbert-Greenwald-Oven)
ISO 13320	Particle Size Distribution

2.3 BUNDLES

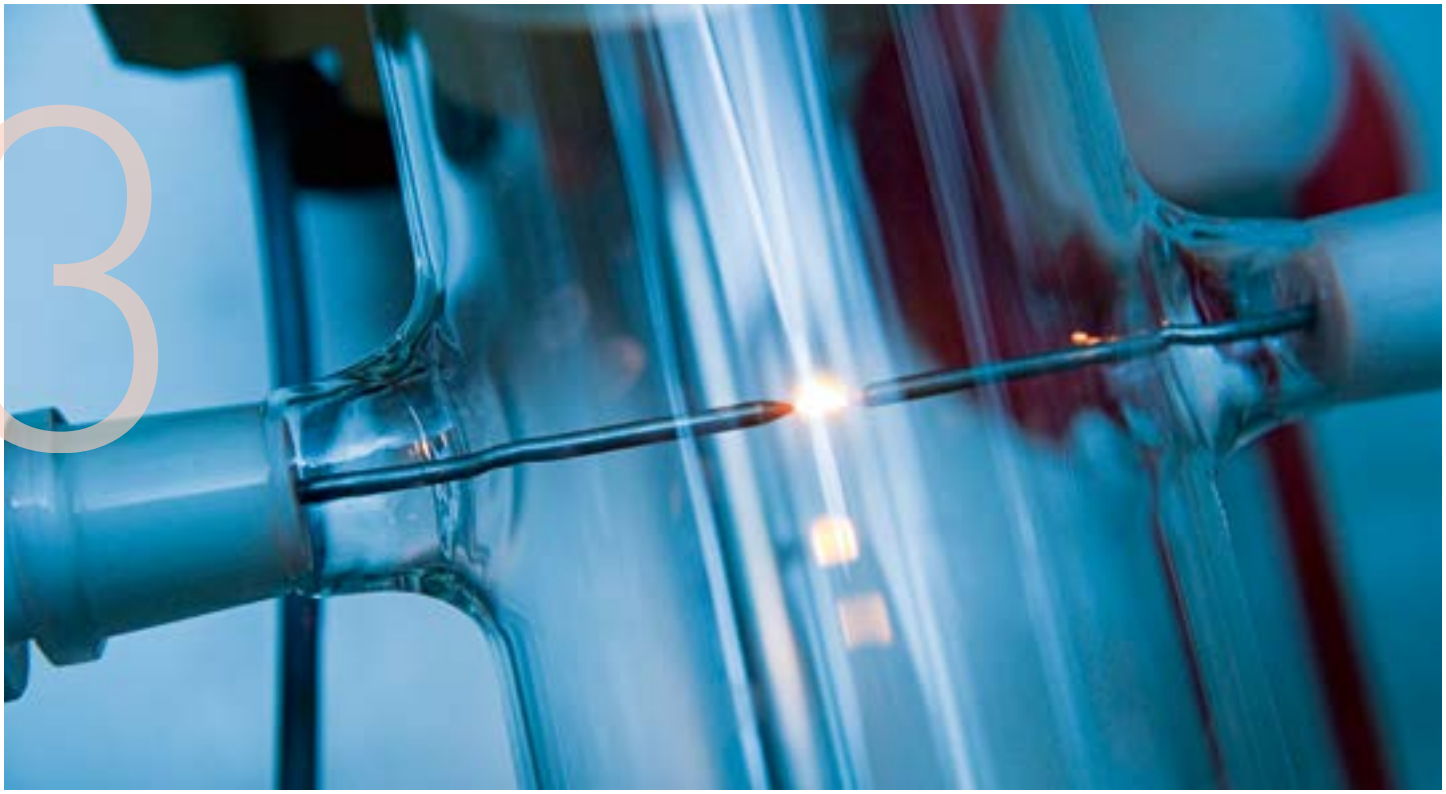
Of course we offer not only single tests, but also packages tailored to your needs, e.g.:

Basic Test Package for Safety-Related Parameters of Dusts

- Combustibility Index (Burning Number) at Ambient Temperature and 100 °C
- DSC (Multiple Determination in a Glass, - Steel- or Gold Crucible) /
- DSC under 25 bar_g Air in a Glass Crucible
- Self-Ignition in the Grewer–Oven (with and without Kieselguhr)
- Dust Explosibility Using the Modified Hartmann-Tube
- Minimum Ignition Energy with Inductive Resistance and Dust Explosibility in the 20-L-Sphere
- Particle Size Distribution
- Residual Moisture

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

3



Electrostatics

To be able to assess the ignition risk presented by an electrostatic discharge, the knowledge of the conductivity, respectively the resistance of the material, the powder or liquid needs to be known. The necessary tests can be carried out in our laboratory under defined conditions (humidity, temperature).

TRGS 727	Powder Volume Resistivity
DIN 51412	Electric Conductivity of Liquids and Suspensions
	Relaxation Time
IEC 600093	Surface and Volume Resistivity
DIN EN 62631-3-2	Surface Resistivity of Foils and Layers
	Ignition Capability of Capacitive Electrical Discharges

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

4 Thermal Stability

Numerous processes proceed with energy liberation in the form of heat, which in case of uncontrolled release can lead to self-accelerating reactions. In a number of cases the accumulated heat can be the trigger of further energetic side- or consecutive reactions, or the simple thermal decomposition of a compound.

If you require tests which are not listed below, please contact us. We carry out a number of further tests, e.g. according to ASTM and national guidelines.

4.1 SCREENING METHODS

Screening methods, which only require small amounts of sample, will give a first indication of the potential danger of a compound or mixture. They are the method of choice in the early stages of chemical development and laboratory synthesis.

Test Systems	DSC
	ARSST
	Radex
	Sedex
Parameters	Decomposition Onset (Tonset)
	Temperature of Safe Handling (Texo according to TRAS 410)
	Decomposition Energy
	Melting- and Boiling Range
	Gas Evolution
	Parameters determined under increased partial Pressure and special Gas Atmospheres (Air, Test- and Inert Gases)

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

4

4.2 MAIN METHODS

Further investigations under adiabatic conditions give parameters like heat and gas evolution rates of a decomposition reaction, induction times (TMR), and the adiabatic decomposition temperature (ADT24). In addition, characteristics have to be established, in how far a »hot spot« of specific atmospheres can affect a system.

Using the optimised and recognised methods, the determined parameters can be used to establish safe operating conditions for a process, without affecting the efficiency of the process more than necessary.

Test systems	Adiabatic Reaction Calorimeter VSP2
	Adiabatic Heat Storage Test (stirred and not-stirred)
Parameters	Decomposition Onset (Tonset)
	Temperature of Safe Handling (Texo according to TRAS 410)
	Reaction Power
	Maximum Heat Release
	Adiabatic Temperature Increase
	Adiabatic Induction Time (TMR)
	Adiabatic Decomposition Temperature (ADT24)
	Maximum Storage Temperature (e.g.: Self-Accelerating Decomposition Temperature SADT)
	Permanent Gas Formation
	Gas Evolution Rate
	Maximum Pressure Increase
Specialities	Parameters determined under increased partial Pressure and special Gas Atmospheres (Air, Test- and Inert Gases)
	Storage Temperatures up to 300 °C, Pressures up to 200 bar_g
	Deflagration Risk
	Explosion Risk

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

5

Chemical Reactions

To ensure the safe progress of a chemical reaction in laboratory, pilot plant of production facility, the knowledge of the safety-related parameters of the process is necessary. For chemical reactions these are e.g. total energy release, heat release rate and the adiabatic temperature increase. With the help of these data a process can be assessed regarding the desired conditions as well as possible deviations. We determine the above mentioned safety-related parameters for your process using modern state of the art reaction calorimetric methods.

5.1 INVESTIGATION OF THE DESIERED PROCESS (TRAS 410)

Test Systems	DSC
	Radex
	Sedex
	Dewar-Test
	Reaction Calorimeter RC1e (-40 °C to 250 °C; vacuum to 300 bar_g; up to 3 parallel Additions)
Parameters	Heat of Reaction
	Heat Capacity
	Reaction Power
	Maximum Heat Release
	Adiabatic Temperature Increase
	Maximum Thermal Accumulation
	Permanent Gas Formation
	Gas Evolution Rate
	Maximum Gas Formation
	pH-Value
	Oxygen Level
	Concentration Profiles (Sampling from Liquid and/or gas phase)
Specialities	Parameters determined under increased partial Pressure and special Gas Atmospheres (Air, Test- and Inert Gases)
	Temperatures from -40 °C to 250 °C, Pressures up to 300 bar_g
	Direct Measurement of adiabatic Course of a Reaction of an accumulated Reaction Mixture

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

5

5.2 INVESTIGATION OF PROCESS DEVIATIONS (E.G. LOSS OF COOLING, DOSING ERROR)

Test Systems	DSC
	Radex
	ARSST
	Dewar-Test (20 °C up to 500 °C; vacuum up to 100 bar_g; Air or other Gases)
	Adiabatic Reaction Calorimeter VSP2
	Adiabatic Heat Storage Test (stirred and not-stirred)
Parameters	Heat of Reaction
	Adiabatic Reaction Power
	Maximum Heat Release
	Adiabatic Temperature Increase
	Maximum Thermal Accumulation
	Permanent Gas Formation
	Gas Evolution Rate
	Maximum Gas Formation
	Oxygen Concentration
	Concentration Profiles (Sampling from Liquid and/or gas phase)
Specialities	Parameters determined under increased partial Pressure and special Gas Atmospheres (Air, Test- and Inert Gases)
	Temperatures from -40 °C to 250 °C, Pressures up to 300 bar_g
	Direct Measurment of adiabatic Course of a Reaction of an accumulated Reaction Mixture

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

6

Classification for Transport and GHS

To ensure the safe handling of a compound during use, storage and transport, specific tests to determine the safety parameters depending on type and severity of the danger are necessary. Such investigations required by the relevant guidelines, are readily available in our laboratory.

- UN-Transport Regulation (UN-Recommendations on the Transport of Dangerous Goods)
- GHS (Globally Harmonised System of Classification and Labelling of Chemicals)
- CLP (Regulation on Classification, Labelling and Packaging of Substances and Mixtures)

6.1 TESTS ACCORDING TO UN-TRANSPORT REGULATIONS, GHS AND CLP

UN-Class 1	Explosivity	
	UN-Test 1(b), 2(b)	Thermal Sensitivity (Koenen Test)
	UN-Test 1(c), 2(c)	Time-Pressure-Test
	UN-Test 3(a)	Impact Sensitivity (BAM-Drop Hammer)
	UN-Test 3(b)	Friction Sensitvity (BAM-Friction Apparatus)
	UN-Test F.3	BAM Trauzl Test
	UN-Test	DSC Screening
UN-Class 2	Flammable Aerosols	
	UN-Test	Foam Aerosol: Flammability Test
	UN-Test	Spray Aerosol: Ignition Distance - and Enclose Space Ignition Test
UN-Class 3	Flammable Liquids	
	UN-Test	Flash Point
	UN-Test L.2	Sustained Combustion
	ISO 2137	Penetrometer Test
UN-Class 4.1	Flammable Solids	
	UN-Test N.1	Readily Combustible Solids

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

6

UN-Class 4.1	Self-reactive Compounds	
	UN-Test C.1	Time-Pressure-Test
	UN-Test C.2	Deflagration Behaviour in an Open System
	UN-Test E.1	Thermal Sensitivity (Koenen Test)
	UN-Test E.2	Dutch Pressure Vessel Test
	UN-Test F.3	BAM Trauzl Test
	UN-Test H.2	Determination of the SADT from an Adiabatic Heat/Pressure Accumulation Test
	UN-Test	DSC Screening
UN-Class 4.2	Combustible Compounds	
	UN-Test N.2	Pyrophoric Properties of Solids
	UN-Test N.3	Pyrophoric Properties of Liquids
	UN-Test N.4	Isoperibolic Test in the 1 L or 15,625 mL Wire Basket (Bowes-Cameron-Cage Test)
	UN-Test	Screening in the Grewer-Oven
	UN-Test	Adiabatic Test in the Wire Basket
UN-Class 4.3	Liberation of Flammable Gases on Contact with Water	
	UN-Test N.5	Liberation of Flammable Gases on Contact with Water
UN-Class 5.1	Oxidising Compounds	
	UN-Test O.1	Oxidising Solids
	UN-Test O.2	Oxidising Liquids
	UN-Test O.3	Oxidising Solids
UN-Class 8	Corrosiveness against Metals	
	UN-Test C.1	Corrosive Properties

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

7 Investigations under GLP and REACH

As a certified GLP-Test Facility we offer the tests listed below under GLP (Good Laboratory Practice) as well as without GLP. Investigations under GLP and REACH include a report conforming to IUCLID. In addition, GLP includes Quality Assurance and archiving of documents and a retained sample.

We test according to relevant, recognised guidelines, like EC-Regulation 440/2008, OECD- and OCSPP-guidelines, the UN-transport regulations as well as CLP-Regulation 1272/2008 (GHS) and CIPAC-Regulations and others.
With very few exceptions our catalogue of services covers all the physcio-chemical tests which are necessary for the registration of a new compound.

7.1 TESTS ACCORDING TO EC REGULATIONS 440/2008

A.1.	Melting-/Freezing Temperature (-75 °C to 700 °C) (DSC, Capillary Method)
A.2.	Boiling Temperature (Ambient Temperature to 700 °C) (DSC, Capillary Method)
A.3.	Relative Density of Solids and Liquids
A.4.	Vapour Pressure of Solids (Vapour Pressure Balance) and Liquids (Dynamic Method)
A.5.	Surface Tension
A.6.	Water Solubility (Flask- und Column Elution Method)
A.8.	Partition Coefficient (HPLC-, Shake-Flask- und »Slow-Stirring«-Method)
A.9.	Flash Point
A.10.	Readily Combustible Solids

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

7

7.1 TESTS ACCORDING TO EC REGULATIONS 440/2008 (CONTINUANCE)

A.12.	Flammability (Formation of Flammable Gases on Contact with Water)
A.13.	Pyrophoric Properties of Solid and Liquid Compounds
A.14.	Explosive Properties of Solids and Lquids
A.15.	Ignition temperature (Liquids and Gases)
A.16.	Relative Auto Ignition Temperature
A.17.	Oxidising Properties of Solids
A.21.	Oxidising Properties of Solids of Liquids
C.7.	Hydrolysis – Abiotic Degradability Depending on pH
C.19.	Adsorption Coefficient

7.2 TESTS ACCORDING TO OECD-GUIDELINES

OECD 101	Recording of UV/VIS-Absorption Spectra
OECD 102	Melting Temperature (-75 °C to 700 °C) (DSC, Capillary Method)
OECD 103	Boiling Temperature (Ambient Temperature to 700 °C) (DSC, Capillary Method)
OECD 104	Vapour Pressure of Solids (Vapour Pressure Balance) and Liquids (Dynamic Method)
OECD 105	Water Solubility (Flask- und Column Elution Method)
OECD 107	Partition Coefficient (HPLC-, Shake-Flask- und »Slow-Stirring«-Method)
OECD 109	Density of Solids and Liquids
OECD 110	Particle Size Distribution
OECD 111	Hydrolysis – Abiotic Degradability Depending on pH
OECD 112	Dissociation Constant of aqueous Solutions
OECD 113	Thermal Stability
OECD 114	Viscosity of Liquids
OECD 115	Surface Tension
OECD 117	Partition Coefficient n-Octanol/Water (HPLC Method)
OECD 121	Adsorption Coefficient
OECD 123	Partition Coefficient n-Octanol/Water (Slow-Stirring Method)

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

7

7.3 TESTS ACCORDING TO US EPA OCSPP-TEST GUIDELINES

OPPTS 830.6315	Flammability
OPPTS 830.6316	Explosivity
OPPTS 830.7000	pH-Value
OPPTS 830.7050	UV/VIS-Spectra
OPPTS 830.7100	Viscosity
OPPTS 830.7200	Melting Point
OPPTS 830.7220	Boiling Point
OPPTS 830.7550	Partition Coefficient n-Octanol/Water (shake/flask method)
OPPTS 830.7570	Partition Coefficient n-Octanol/Water (HPLC method)
OPPTS 830.7950	Vapour Pressure
OPPTS 830.7300	Relative Density
OPPTS 830.7370	Dissociation Constant in Aqueous Solution
OPPTS 830.7520	Particle Size Distribution
OPPTS 830.7840	Water Solubility

7.4 CIPAC-TESTS METHODS

In addition, we offer a multitude of CIPAC- and other test methods, e.g. acidic and alkaline reserve.

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

Safety-Relevant Calculations

To deal with safety-related questions consilab has a number of recognised experts, with many years of experience as well a number of sophisticated simulation programs like Flowmaster®, SuperChems® and ChemCAD®.

PROTECTION OF PRESSURE EQUIPMENT

For the design of pressure equipment, consilab experts help with the careful analysis of potential causes of a pressure increase. In case of a process deviation the mass flow that needs to be dissipated from the equipment depends significantly on the identified scenario. When calculating the mass flow that can be dissipated two-phase flow may have to be considered. In complex cases, like protection of a reactor, dynamic simulation scenarios may be necessary. Generally the following scenarios are looked at by consilab:

- Analysis of Pressure Build Up Scenarios
- Protection of Chemical Reactors
- Sizing of Pressure Limiting Devices (Safety Valves/Rupture Disks/Vents) (also for two-phase flow)
- Mathematical Checking of Discharge Pipes (also for two-phase flow)
- Sizing of Catch Systems
- Recording of Pressure Limiting Devices and Catch Systems in a Plant

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

8

EVALUATION OF DEVIATIONS AND IMPACTS

The effects of process deviations in plants that fall under the extended obligations of the Chemical Plant Accident Directive (Störfallverordnung) need to be described. Also in connection with the Land-Use-Plannings, effects of deviations need to be assessed. Such effects are then used by our experts accredited to BImSchG § 29b in their reports. consilab offers:

– Source Term Computation (Evolved Mass Flow Rates from leaks, spills etc.)
– Dispersion Calculation for Neutral- und Heavy Gases (VDI 3783, AUSTAL2000)
– Open Jet Calculation (Explosible Cloud, Heat Radiation, Explosion Pressures)
– Assessment of the impact of Fires and Explosions

FLUID DYNAMIC COMPUTATIONS

Our experts carry out stationary and dynamic computations for flows in pipes. Besides optimisation, mainly safety-relevant questions are at focus. Pressure surges (»water hammer«) when closing a valve or fast depressurisation processes require careful analysis with dynamic simulation programs. consilab offers the following services:

– Sizing of Apertures and Orifice Plates
– Pressure Drop Calculations (also for two-phase flow)
– Analysis of Pressure surges (»water hammer«), induced e.g. by fast Closure of a Valve
– Optimisation of Pipe Networks
– Protection of Storage Tanks
– Calculation of Flow Induced Forces in Pipes (Reactive Forces)
– Sizing of Gas Outlets and Relief Systems

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

Consulting

Our experienced experts analyse your plants and processes, discover potential risks and find tailor-made solutions for the protection of the plant. Hereby we work independently from the plant, authorities, technical inspectorates and insurance companies. Hence we can advise you in all areas of process safety fast, economically, and without conflicts of interest.

- Leading and Moderation of Process Safety Reviews, e.g. HAZOP / PAAG, Fault Tree Analysis
- Minuting of Process Safety Reviews
- Support in Establishing Risk Analyses
- Expert Statements (§29b BImSchG)
- Expert Statements for Land-Use-Planning
- Incident Investigations
- Safety Reports for Approval Procedures
- Advice in Explosion Protection and in Generating of explosion protection documents
- Process Safety Concepts for Process Steps, e.g.
  - Processes at Risk of Dust Explosion, like Spray Dryers, Silos
  - Safe Operation of Exothermic Chemical Reactions
  - Handling of Readily Combustible Solids in Production
  - Protection of Pressure Vessels
  - Safe Operation of Tank Farms
- Assessments of Safety Relevant Data
- Dossiers for Registration of New Compounds / Generation of IUCLID5 Dossiers
- Training Seminars

consilab
Gesellschaft für Anlagensicherheit

Industriepark Höchst · Brüningstraße 50 · Gebäude G830 · D-65926 Frankfurt am Main · Tel.: +49(0)69-305-30012 · Fax: +49(0)69-305-30014
Chempark Leverkusen · Kaiser-Wilhelm-Allee 1 · Gebäude Q18L, Büro 252 (2. OG) · D-51368 Leverkusen · Tel.: +49(0)214-2605-56458
kontakt@consilab.de · www.consilab.de

consilab
Gesellschaft für Anlagensicherheit

Höchst zuverlässig.

consilab Gesellschaft für
Anlagensicherheit mbH

FRANKFURT
Industriepark Höchst
Brüningstraße 50
Gebäude G830
D-65926 Frankfurt am Main
Tel.: +49(0)69-305-30012
Fax: +49(0)69-305-30014
Germany

LEVERKUSEN
Chempark Leverkusen
Kaiser-Wilhelm-Allee 1
Gebäude Q18L, Büro 252 (2. OG)
D-51368 Leverkusen
Tel.: +49(0)214-2605-56458
Germany

kontakt@consilab.de
www.consilab.de