EQUIPMENT LIST



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LABORATORY OF ADVANCED MATERIALS AND TECHNOLOGIES

| № | Name | Photo | Description | Technical Specifications | Type of measurement (or analysis) |
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| 1 | Atomic absorption spectrometer (Analytic Jena contra 300) | | The instrumental method of quantitative elemental analysis (modern techniques of atomic-absorption analysis allow to determine the content of almost 70 elements of the Periodic system) by atomic absorption spectra to determine the content of metals in solutions of their salts: in natural and waste waters, in solutions-mineralizates, technological and other solutions. | Spectral range, 185 to 900 nm, optical density B reading range of 0 to 3.99, optical density B measurement range of 0.1 to 2.0, wavelength range of acceptable absolute error of wavelength setting, ±0.004 nm | Qualitative and quantitative spectrometric analysis. |
| 2 | Anton Paar Multiwave 3000 | | A modern modular microwave system designed for tasks such as decomposition, extraction and evaporation, concentration, hydrolysis, UV-oxidation, combustion in O2. | Volume 100 ml, Controlled pressure 20 atm, Maximum pressure 70 atm, Test pressure 140 atm, Maximum temperature 200 ° C. | Sample preparation |
| 3 | Portable X-ray fluorescence spectrometer (analyzer) ALPHA Series, Innov X systems Aplha. | | Designed for rapid analysis of the composition of metals and alloys. The analyzer is designed specifically for production conditions and allows large quantities of material to be analyzed in a short time. The analyzer determines concentrations of chemical elements in the range from Phosphorus to Uranium. 25 elements (preset set - Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Hf, Ta, W, Re, Pt, Au, Pb, Bi, Zr, Nb, Mo, Pd, Ag, Cd, Sn, Sb) are determined simultaneously. | Excitation source - X-ray tube, silver or tantalum anode, Adjustable voltage up to 40 kV, Current up to 100 μ A, 5 filters, Si PiN diode detector, Peltier cooling, Mass fraction measuring range from tens of parts per million to 100%, Measuring time 3-120 sec, Analyte range P15 to U92 | Qualitative and quantitative analysis |

| 4 | Laarmann LMFTM flotation machine | Designed to separate relatively fine solids suspended in a liquid (or to separate them from the liquid) based on their ability to adhere to gas bubbles, oil droplets, etc., introduced into the suspension. etc. in order to extract the useful component. | Digital control with touch screen; Flotation chamber volume from 0.2 to 7 liters; Flotation, Grinding, Mixing, Stirring; Standard acrylic cells and stainless steel impellers; Stainless steel cells and impellers for high temperature flotation; | Ore enrichment and concentrate production |
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| 5 | Bruker Aplha IR spectrometer | Conducting routine infrared investigations is as easy as it can be. Quality control - this FT-IR spectrometer allows efficient and fast quality control of finished products, intermediate and starting raw materials in various industries: pharmaceutical, chemical and petrochemical, polymer, paint, automotive, packaging, electronics, microelectronics | Measurement range on the wave number scale, cm^{-1} - 3100 - 537, Spectral resolution (0.3 nm at 1.250), cm^{-1} - 8000 - 350, Signal-to-noise ratio when recording absorption spectra, accumulation time 1 min, (resolution 4 cm^{-1}), not less than 55000, Signal-to- noise ratio when recording absorption spectra, number of scans 6, (resolution 4 cm^{-1}), not less than 2400. | Spectrometric analysis of solid and liquid samples |
| 6 | Metal reactor with stirrer R-201 | The metal stirred reactor R-201 is designed for various chemical processes at pressures up to 400 bar and temperatures up to 600 °C. The reactor has a metal lid fixed to the base, on which all the main structural elements are placed. The vessel is made of stainless steel or a more resistant alloy, such as Hastelloy C-276. | Capacity: 100 ml - 10 1 (optional: 20 1 - 1000 1) Rated pressure: 20 - 400 bar Design temperature: -30 - 600 °C Material of construction: Stainless steel (316SS), Hastelloy C- 276, Monel (nickel-copper alloy), Inconel (nickel alloy), Titanium alloy, Zirconium alloy. Power supply: 220V, 50Hz Electric heater output: 0.5 - 10KW Stirrer motor power: 60, 90, 180, 360, 720, 1400W Stirring speed: 0 - 3500 rpm Magnetic stirrer torque: 16, 32, 64, 120 in-lb Stirring frame: Floor-standing or table type | Conducting synthesis and ore leaching |
| 7 | Electric muffle furnace SNOL | Snol 8,2/1100 furnace - for material hardening, firing of objects and heating of ceramic and other surfaces. Designed for heating and analytical work with different materials under laboratory conditions. Depending on the furnace model, the heat treatment takes place at a maximum temperature of 1100 C to 1400 C. | Power - 180 W. Power supply - 220 V/50 Hz. Phase - 1. Temperature auto-adjustment - from 50 to 1100 °C (range +/-2 °C). | Sample firing |

| Combined pH, ion concentration and conductivity module with stirrer. 856 Conductivity Module, 867 pH Module, 801 Stirrer. | A modular system for every application With the pH and conductivity modules, you can build the system you need. You can use these modules as stand-alone instruments, with the 900 Touch Control, or integrate them into an existing Metrohm system based on proven and reliable software. | $\begin{array}{llllllllllllllllllllllllllllllllllll$ | Electrometric analysis of liquid samples |
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| Laboratory liquid thermostat LAUDA ECO | Liquid thermostats are designed to create and control temperature conditions in the thermostat bath or in the external thermostat circuit. | Temperature range, °C - \pm 20 150; Temperature stability, °C - \pm 0,01; Heater output, kW - 1,3; Delivery speed, l/min - 22; Maximum delivery pressure, bar - 0,55. | Temperature controller |
| Air Sterilizer Model ГП-20 СПУ | Sterilization, disinfection and drying of instruments, utensils, laboratory supplies, materials. | Volume, 1 - 20 l, Disinfection temperature, 120°C time, 45 min, Sterilization I - temperature, 180°C time, 60 min, Sterilization II - temperature, 160°C time, 150 min, Maximum deviation of sterilization (disinfection) temperature from the nominal temperature values in the loaded sterilization chamber, °C ±3. | Sterilization of very pure samples |
| Master GC Dani Instruments | Designed to determine the composition of samples of substances and materials in various studies and works in the field of chemistry, petrochemistry, natural gas analysis, analytical control and environmental studies. | Column thermostat Maximum temperature, °C 500 Maximum heating rate, °C/min 140, Cooling rate from 300°C to 50°C, min 4, Temperature programming 25 steps, 26 isotherms. Detectors - PID, TID, PFD. | Qualitative and quantitative analysis of petroleum products |
| Autoclave Buchi GlasUster Cyclone 075 | Laboratory reactor for works related to chemical synthesis at overpressure up to 60 bar. | flask volume from 100 to 300 ml, pressure up to 60 bar, operating temperature up to 250 C, material of which the parts in contact with the medium are made of stainless steel. | Chemical synthesis at high pressures |

| Globe Laboratory Reactor (Syrris) | The Globe laboratory chemical reactor can handle a wide range of temperatures (-90 +250°C) and pressures (50 mbar 3 bar). For operation up to 3 bar, e.g. for hydrogenation, carbonylation and gas dissolution processes. Synthesis parameters (stirring speed, temperature, pH, etc.). | Working volume of the vessel: 1 1. The coolant drain system, quick couplings for hoses and clamp for securing the vessel allow the vessel to be replaced within one minute. Wide temperature range: -90°C to + 250°C Wide pressure range: from 50 mbar to 0.25bar (or 3bar g for Globe Pressure system). up to 800 rpm (overhead stirrer) | Chemical synthesis at atmospheric pressure |
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| Automatic flame photometer ΦΠΑ-2-01 | To measure the concentration of chemical elements in solutions by photometric measurements of a gas burner flame in which the solution to be analyzed is introduced in a spray form. Under the action of the thermal energy of the flame a spectrum of radiation characteristic of the given element appears. The spectral line of this element is extracted by a diffraction grating and detected by a spectrometric ruler. Processing of the current information and control of the photometer operation is performed by the built-in microcomputer. | Wavelength range emitted by the diffraction grating and the line of photodetectors, nm from 350 to 950. Solution consumption per measurement, not more than 2.5 ml. Measured elements: Na, Ca, K, Li (Sr). Used gas propane-butane | Quantitative photospectrometric analysis of samples |
| Determination of flash point in an open crucible ATBO-20 | Apparatus for determining the flash point in an open crucible with electrical ignition of the test product (GOST 4333-87, GOST 33141-2014, ISO 2592-73, ASTM D-92) | Unique built-in electrospark ignition design simulates a 4 mm diameter igniter flame; Automatic fixation and memorization of flashpoint temperature with automatic correction for atmospheric pressure; Automatic maintenance of product heating rate and spark ignition power; | Open crucible flash point of diesel fuel |
| Determination of the flash point in a closed crucible ATBT-20 | The apparatus provides automatic performance of the following functions: -Sample stirring and programmed temperature rise of the product at a predetermined rate; -Stopping the stirrer, opening the lid and lowering the igniter into the crucible, testing the product by spark ignition for 1 second, returning the igniter and crucible lid to their original state, continuing stirring; -automatic fixation and memorization of flash point temperature; -Automatic correction of barometric pressure in the range from 630 to 810 mm Hg according to State Standard 6356-75; -Stopping the test process at the end of analysis with audible alarm; -Storage, viewing and printing through a serial port RS-232 up to 200 test results. | Automatic renewal of the heat transfer medium after the end of the test shortens the time between tests; Integration with the Lintele Link data collection system allows the collection and transmission of laboratory test results from the unit to a personal computer via wireless communication. Integration with the laboratory information system Lintel LIS provides comprehensive automation of laboratory activities; The high-contrast color TFT display provides an intuitive user interface with a display of all necessary information when testing and viewing | Flash point in a closed crucible of diesel fuel |

| | | | results; | |
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| Potentiostat Galvanostat | | Potentiostat-Galvanostat PGSTAT 302N Metrohm-Autolab for the study of electrochemical processes, including corrosion processes. | Potential range: +/- 10V Output voltage: +/- 30V Maximum current: +/- 10A Current sensing range: 1A to 100nA over 9 decades Potential resolution: 0.3 μ V Current resolution: 0.0003% of current range Potential (current) accuracy: +/-0,2% (+/-0,2%) Input impedance: greater than 1Tom Frequency Bandwidth: 1 MHz | Measuring the potentials of electrochemical processes |
| Salt Spray Cabinets - Salt Spray Test Cabinets | 2 de sector de la considerá | The salt spray test is an accelerated corrosion test that produces a corrosive effect on coated specimens in order to predict their suitability for use as a protective coating. The appearance of corrosion products (oxides) is evaluated after a certain period of time. The duration of the test depends on the corrosion resistance of the coating; the more corrosion-resistant the coating is, the longer the test period without signs of corrosion. | Operating room temperature range : $RT \sim 50^{\circ}C$ Humidifying tower temperature range : $RT \sim 63^{\circ}C$ Temperature uniformity : ≤ 2 no load) Temperature stability : ≤ 0.5 without load) Process room temperature deviation : ± 1.0 Temperature rise rate : $RT \rightarrow 55^{\circ}C$ less than 60 minutes working room) ; $RT \rightarrow 63^{\circ}C$ less than 60 minutes (saturated barrel) Compressed air supply : The customer should prepare an air compressor which can offer clean, water-free and oil-free compressed air, the pressure is $0.4MPa \sim 0.8MPa$ | Corrosion testing of paintwork materials |
| Digital adhesion tester | | The BGD 500 Digital Pull-off Adhesion Tester is a hand-held, hand-operated instrument used to measure the force required to pull a coating of a given diameter from a substrate using hydraulic pressure. The pressure is shown on the digital display and represents the adhesion strength of the coating to the substrate. | Size: 20 mm (standard); 10 mm, 14 mm, 50 mm (optional). Resolution: 0.01MPa. Accuracy $\pm 1\%$ of full scale. Max. tear pressure 2.8-80 MPa (10 mm); 1.4-40 (14 mm) 0.7-20 (20 mm); 0.4-3.5 (50 mm). Size/weight 360 mm×75 mm×115 mm/3 kg | Testing the adhesion strength of paint coatings |
| Tubular Impact Tester | aire. | The impact test describes a method for evaluating the resistance of a dry film of paint, varnish, or related product to cracking or peeling from a substrate when it is subjected to deformation caused by falling weight. The test coating is applied to suitable, usually thin metal panels. After the coating has cured, a standard weight is dropped on each panel from a height that will cause deformation of the coating and substrate. | Instrument scale length 0-100 cm (40 inches). The graduation is 1 cm. Drop weights Drop weights Main weight with indentor : 1000g (1pc) .Additional weight : 1000g (1pc) .Additional weight : 2000g (1pc) . | Paint and varnish impact test |

| Dry Film Thickness | | Using a magnetic induction or eddy current sensor, this electronic gauge provides accurate thickness measurements of non-magnetic coatings such as paint, zinc, etc., on iron F steel sensor, as well as insulating materials on nonferrous FN non-ferrous substrates. | $\begin{array}{llllllllllllllllllllllllllllllllllll$ | Measuring the thickness of paint coatings |
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| Wet Abrasion Scrub Tester | | Paint often gets dirty, especially near doorways, windows, and work and play areas. Coated surfaces should be tested for abrasion resistance caused by brushing, sponging or other means. The Wet Abrasion Scrub Tester can create repetitive controlled conditions to simulate daily use or wear and tear BGD 526 The Wet Abrasion Scrub Tester is the latest machine developed by Biuged. It can investigate washability and related properties affecting stain resistance of coatings. | Stroke length: 300 mm Brush specification: 5/4 shaped nylon bristles protruding 19mm from the block. Brush weight (including brush holding device) : 454±10g ASTM D 2486) ; 135±1g (ISO 11998) Frequency of movement ~95 times/minute (adjustable) Counting range : 0~9.999 times Test Plate Size : 430×150×0.03mm Motor power : 25W Power supply : 110V~220V ; 50/60Hz Overall Size : 590mm×460mm×300mm (L×W×H) Net weight:27Kg Water tank capacity : 1L | Paint and varnish testing for abrasion resistance |
| Film applicator with holder | Image: Contract of the second of the seco | The automatic film applicator is used to apply films to test tables, panels and thin substrates in a uniform and reproducible manner. | Adjustable variable speed: 0mm/s~ 500mm/s High precision linear guide rail to ensure the rate of descent be more stable. Reasonable bracket design, easy and simple to operate, and can add any load to apply on easily bent substrates. Can set the starting point freely, suitable for different size substrates Four types of application distance can be selected freely. Applicable to all Biuged applicators of different types and sizes and wire rods Better repeatability when applying film : | Paint and varnish sample preparation |

| Small Xenon Test Chamber | Used to simulate rain and moisture when the material is used outdoors | Xenon lamp: One 1.8 kW Xenon lamp, Daylight filter Exposure area : 1000cm2 (can fit 9 standard samples 150mm×70mm) Adjustable temperature range of black panel : RT+20°C~90°C Inner Material : Stainless Steel SUS 304 Outer chamber material : Powder coating 1000mm×650mm×1020mm Net weight : 135Kg (176Kg gross) Power supply : 220V 50/60HZ (optional) Max. current: 12A Max. Power supply : 2.5KW | Testing of paint coatings for resistance to humidity and outdoors |
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| Intelligent sensor rotary viscometer Basic | Designed to continuously monitor rotational speed and the entire testing process. Completes the viscosity measurement automatically under computer control and displays the test results on the screen. They can be used to measure viscosity resistance and absolute fluid viscosity and are widely used in chemistry, medicine, food, light industry, textile industry, scientific research, etc. | Measuring range (mPa.s) 10 - 6,000,000 (6M). R.P.M. (per minute) 0.1-100 (stepless speed control) . Measurement Accuracy ±1.0 % (of full range). | Measuring and testing the viscosity resistance of liquid samples |
| Intelligent Drying Time Recorder | This is a powerful and intelligent linear drying time recorder that can fulfill all the different requirements for analyzing the drying performance of different samples. It has three split track pairs, each channel has two operating channels. Compared to BGD 261, BGD 262 Intelligent Line Drying Time Recorder has many functions as shown below large 5 inch touch screen size and shows three channels of working parameters at the same time very easy and convenient to set working parameters wide and flexible time range can be set from 1 minute to 48 hours. This makes the BGD drying time recorder suitable for fast drying of aqueous coatings as well as very slow drying paints that may take several days to dry. | Simultaneous testing of 6 samples - saving time Four different speeds : 6-12-24-48 hours - for any application Diameter of probes (with rounded tip): 2mm±0.05mm (6 pcs.) Supplied with 6 stainless steel weights (5 grams per weight) to record drying results Comes with calibration certificate Meets the standards: ASTM D 5895- 03, ISO 9117-4 Dimensions: 500 mm × 220 mm × 140 mm (L × W × H) | Measuring paint materials for drying time |

| Olympus Vanta C X-Ray Fluorescence Analyzer with Silver Anode | Olympus "VANTA C" spectrometer with silver (Ag) anode Portable X-ray fluorescence spectrometer with the following modes: Geochemistry mode: Al, Si, P, S, Cl, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Y, Zr, Nb, Mo, Ag, Cd, Sn, Sb, Ba, W, Hg, Pb, Bi, La, Ce, Pr, Nd, Th, U; Additional elements: Au, Re, Sc; Alloy +" mode: Al, Si, P, S, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Sr, Zr, Nb, Mo, Pd, Ag, Cd, Sn, Sb, Hf, Ta, W, Re, Pb, Bi; Mode "Precious metals": Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, Zr, Mo, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, W, Os, Ir, Pt, Au, Pb, Bi; Country of production USA | The C series analyzers combine high speed, improved detection limits (LOD) and an extended range of detectable elements. The C series analyzers are equipped with a silicon drift detector and an X-ray tube (40 kV) with a Rh or W anode, or a 50 kV tube with a silver (Ag) anode. | Qualitative and quantitative analysis |
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| Jaw crusher ЩД 10 | The Jaw Crusher ЩД 10 is designed for crushing brittle bulk materials of varying strength and hardness. The crusher is electromechanically driven by electromechanical drive. The climatic modification of the crusher is УХЛ -4 according to GOST 15150-69. | Feed opening dimensions, mm : 100x200 The size of the initial piece not more than, mm: 70 Discharge gap width adjustment range, mm: 325 Average particle size of the end product (at the minimum gap), mm:2 Overall dimensions, mm: Length 745 Width 475 Height: 630 Crusher complete on support: Length 745 Width 475 Height 918 Capacity of hopper, 1 -Full 26 -Full 18 Electric motor supply voltage, V- 380 Country of manufacturer: Russia. | Crushing of ore materials |

| Laboratory shredder LS84 | The sealed grinder is a kind of small laboratory grinder for grinding ore sample material into powder. Widely used in geology, mining, metallurgical, coal, energy, chemical and construction industry laboratories for testing samples without contamination. | Load capacity of one bowl, 100 g Number of bowls, pcs one Size of feed material, mm, max. 12 Minimum particle size of the regrind is 100-200 mesh. Grinding time, min: 2-5 Electric motor power: 1,1 kW Input voltage, 50 Hz, V 380 Grinding bowl material: steel with high manganese content. Country of manufacturer: China. | Grinding ore sample material into powder |
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| Set of sieves for 304 stainless steel vibrating mill. | Laboratory sieves are designed for sieve analysis in laboratories of various profiles and for the sieving operation of powder materials in order to separate homogeneous powders from lumpy and solid components in laboratory analysis and small-scale production. Country of manufacture: China. | 200x50 mm 200 mesh sieve 200x50 mm sieve 200x50 mm 300 μm 200x50 mm sieve 400 μm 200x50 mm sieve 600 μm 200x50 mm sieve 600 μm 200x50 mm sieve 200x50 mm 2.50 μm 200x50 mm sieve 200x50 mm 100 μm 200x50 mm sieve 200x50 mm 1.00μm 200x50 mm sieve 200x50 mm 1.00μm 200x50 mm sieve 200x50 mm 3,15 mm 1 650 000 650 000 200x50 mm sieve 200x50 mm 4,00 mm Attachment clamp 2 pieces and cover. | Sieve analysis of powder materials |

| pH- Conductivity/TDS/Salinity Meter Model pH/Conductivity/TDS/Salinity Meter 902 | | pH: The multi-parameter hand-heid meter features a large backitt LCD display. Button calibration from 1 to 5 points with automatic buffer recognition. Automatic electrode diagnosis with pH value and offset. Selection of pH buffer group (US / NIST / DIN) or use of custom calibration solutions. Oxidation-Potential ORP: 1-point offset calibration allows the display value to be adjusted to a known standard. Relative and absolute millivolt modes provide reliable ORP measurements. Ions: Selectable from 2 to 5 point calibrations containing 8 concentration points. Automatically recognizes ion selective electrodes, no need to specify ion type. Direct reading of ion concentration simplifies the measurement process. The mV measurement mode can be used to calculate the concentration of ions. Selectable concentration units include ppm, mg/l and mol/l. Conductivity/total dissolved solids TDS/salinity/resistance: The 1 to 5 point calibration button automatically recognises the calibration solutions. Selectable cell constant (0.1 / 1/10), normalized temperature (20/25°C), TDS ratio, linear and pure water compensation, seawater and practical salinity measurement modes. Dissolved Oxygen, DO: Salinity and barometric pressure compensation ensure reliable measurement results. Automatic temperature compensation ensures accurate readings over the entire range. Battery indicator shows remaining battery power. Auto power-off effectively saves battery power. A multi-mode power scheme (battery, power adapter or USB port) ensures that use of the meter is smooth. 1 or 2-point calibration using air-saturated water or zero-oxygen solution. Selectable unit of measurement including mg/l. ppm. | pH - Range -2.00 ~ 20.00 Accuracy ±0.002 Calibration point - 1 - 5 (USA / NIST / DIN) mV - Range - ±1999.9 mV Accuracy ±0.2mV Calibration Point - 1 (Relative mV mode only) Yon - Range - 0.001~199999 ppm, mg/L, mol/L (Depending on range of ISE) Accuracy - ±0.5 % (monovalent), ±1 % (divalent) Calibration Point - 2 to 5 TDS - Range - 0 - 10,00; 1000, 1000 mg/L, 10,00; 100 µg/L (max 200) Accuracy - ±1% TDS coefficient - 0.01 - 1.00 (Default 0.5) | Measurement of pH, conductivity, salinity and ORP of solutions |
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| LED SCREEN TILE UP TO | | Plate up to 550 C with magnetic stirrer MS series. | Explosion-proof, maintenance-free | Slurry | stirring | at | high |
|-----------------------|------|---|--|-----------|----------|----|------|
| 550 S WITH MAGNETIC | | The stainless steel work plate with ceramic coating provides good | brushless DC motor; | temperatu | ure | | |
| STIRRER MS SERIES | | chemical properties; | Digital temperature control with max. | | | | |
| | | Remote function provides PC control and data transfer. | temperature up to 550°C; | | | | |
| | | I I I I I I I I I I I I I I I I I I I | Digital speed control with max, speed | | | | |
| | | | up to 1500 rpm: | | | | |
| | | | Max stirring amount of water up to 20 | | | | |
| | | | litrace | | | | |
| | | | Sofety sheins protect against | | | | |
| | | | Safety chains protect against | | | | |
| | | | overneating; | | | | |
| | | | The "HOT" warning will flash if the | | | | |
| | | | plate temperature is above 50 °C, even | | | | |
| | DUAB | | if the burner is switched off; | | | | |
| | | | External temperature control is | | | | |
| | | | possible by connecting a temperature | | | | |
| | | | sensor (PT 1000) with an accuracy of \pm | | | | |
| | | | 0.2 °C. | | | | |
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