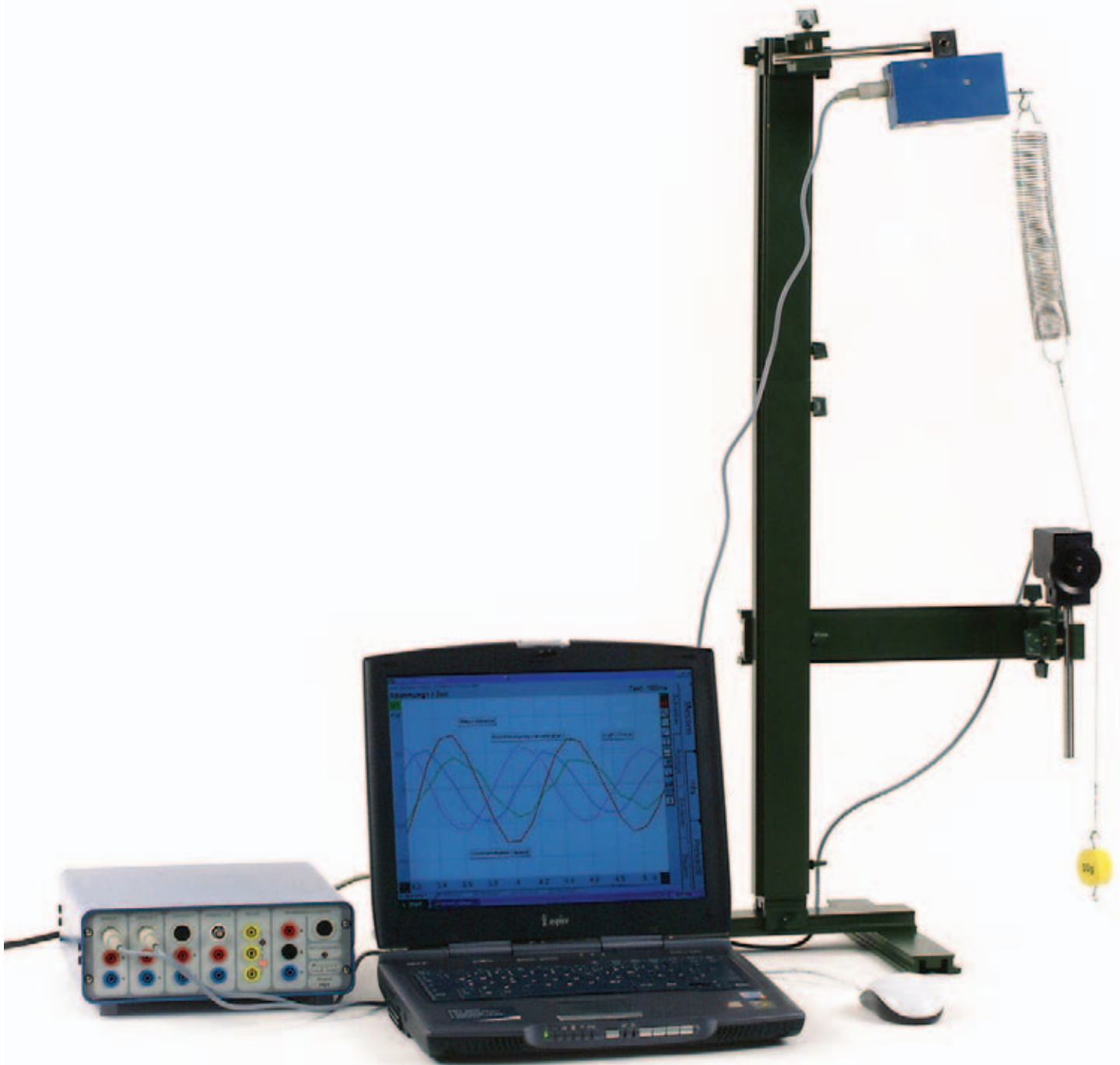


simple - fast - safe

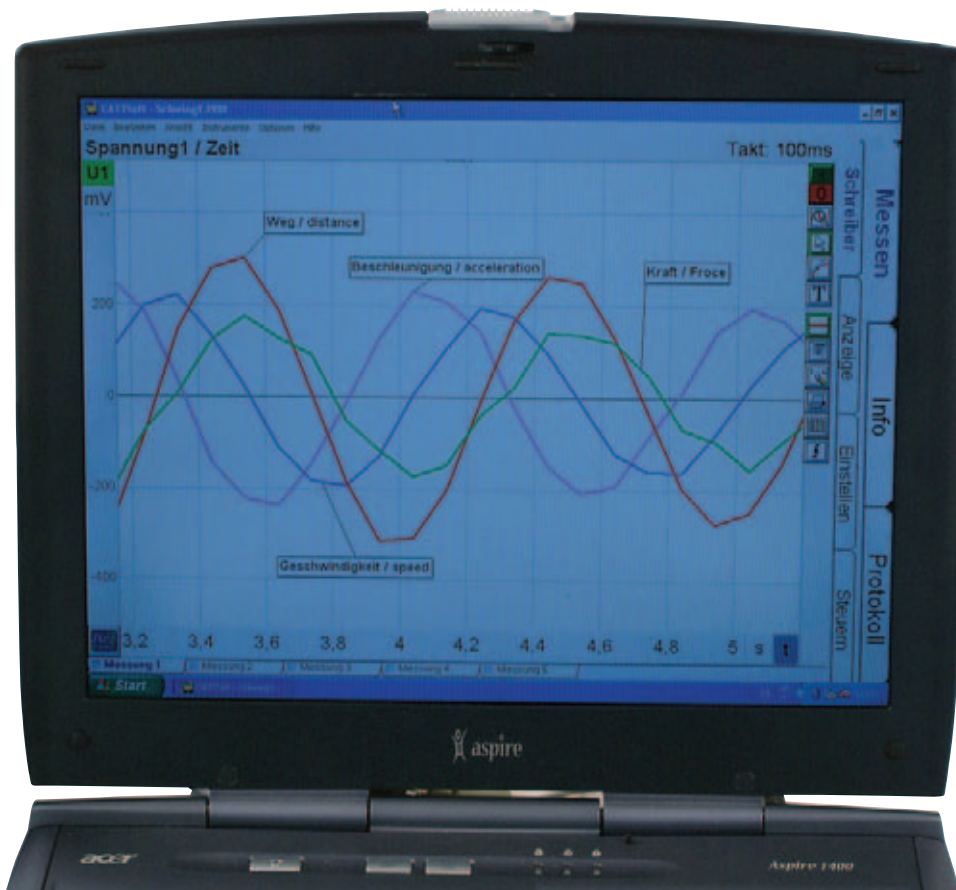


the world of experiments

computer physics



catt-soft
catt 4
catt 5
experiment manual
sensors





computer assisted technics teaching



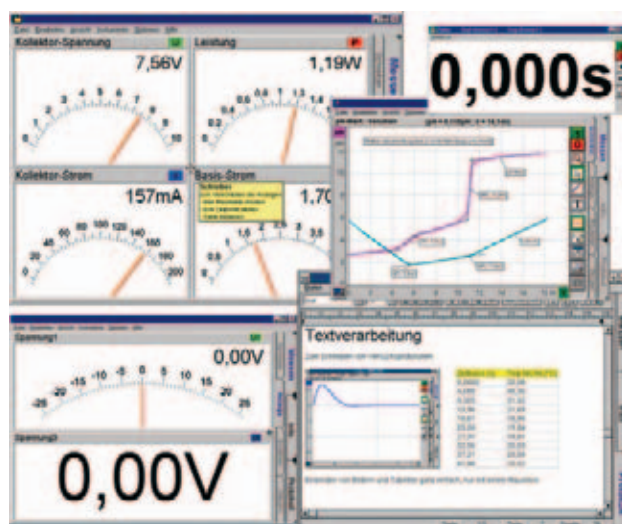
computer assisted technics teaching



CATT - Computer Assisted Technics Teaching The universal PC measuring system

This system for performing a wide variety of measurements and experiments consists of a PC interface and the CATT-SOFT software application. This is a universal computer-controlled measuring system developed together with users in order to ensure the highest possible degree of usability and ease of operation. This very positive aspect becomes evident already during hardware and software installation.

WYCIWYC (What You Click Is What You Change) stands for a simple, helpful user interface. This simple user interface, along with a convenient online help system, allows the system to be used almost intuitively, ensuring that both expert and novice PC users are swiftly able to operate the system without error.



CATT 4 for physics and CATT 5 for chemistry

- Intelligent, microprocessor-controlled interface
- User-friendly, multilingual application software: CATT-SOFT for Windows 95/98/2000/XP
- WYCIWYC - "What You Click Is What You Change": settings may be changed without having to call a submenu, minimising user errors and saving time
- Installed without absolutely ANY adaptations to the PC (connected to the serial port)
- Minimal hardware requirements (Pentium upwards, 64MB RAM)
- Integrated text editor for documenting results
- Mathematical processing of measurements
- Universal measuring instrument with large analogue and digital displays
- 8-channel XY or Y/t recorder
- Easy analysis and documentation of measurement data
- Data import and export (e.g. Word, Excel etc.)
- Storage of calibration data and measurement instrument settings
- Measurement and experiment manuals available
- Sturdy electrical and mechanical components
- Complete set including sensor package available
- Supplied with operation manual, power cord, 2-m serial cable and 9/25-pin adapter (USB to serial optionally available)



CATT 4 for physics

- + Universal counter, function generator and adjustable power supply
- + 10-V output for controlling external power sources (e.g. high current transformer, high voltage transformer)



CATT 5 for chemistry

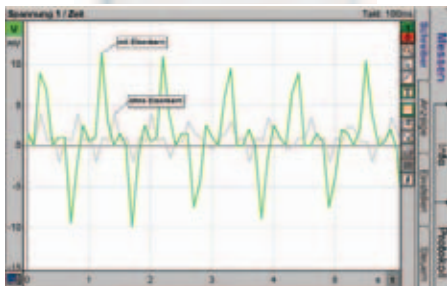
- + Automatic volume measurement for recording titration curves



catt-soft

CATT-SOFT

Analogue and digital measurement signals are registered by sensors, converted by the CATT interface into signals able to be read by the PC and transmitted to the computer by way of the RS232 interface. The signals are then evaluated by the PC. For carrying out the tasks of measurement, control and stimulation, we have developed CATT-SOFT, an easy-to-use application. Thanks to WYCIWYC ("What You Click Is What You Change"), CATT-SOFT is extraordinarily easy to use, and even beginners grasp it quickly. An optional caption balloon unobtrusively provides users with guidance for easy, problem-free use of the software. CATT-SOFT offers a variety of options for linking, displaying and doing calculations with measurement data. The required function (Recorder, Settings/Calibration, Display, Control) is obtained by clicking a register card symbol, and instruments (Counter, Generator, Power Supply) are also just a click away in the menu bar.



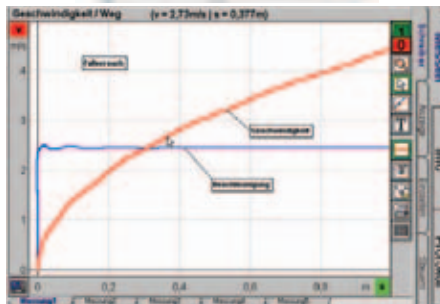
Measurement (CATT 4/5)

Measurement comprises all functions for registering, recording and evaluating signals. Digital and analogue instruments are found under Display, while Recorder contains an eight-channel XY and Y(t) recorder and Control allows measurement control by means of a bar chart with moveable ON-OFF markers. Settings allows inputs and measurements to be linked and calibrated and mathematical operations to be done on values. Both measured input values and calculated values can be displayed side by side on a PC monitor.

Farne	Farne	Größe	Einheit	Name
1	Farne	1	V	Spannung
2	Farne	2	V	Spannung
3	Farne	3	V	Spannung
4	Farne	4	V	Spannung
5	Farne	5	V	Spannung
6	Farne	6	V	Spannung
7	Farne	7	V	Spannung
8	Farne	8	V	Spannung

Settings / Calibration (CATT 4/5)

In this matrix, each CATT input source can be assigned to any channel, each represented by a coloured marker. At the same time, each channel is given attributes, including unit (e.g. "V" for volts), type (e.g. "U" for voltage) and name (e.g. "Voltage"). A given software channel is linked to an input source by way of a formula.



Recorder (CATT 4/5)

Up to eight channels can be selected and assigned to the y-axis, while the x-axis represents one channel or the time units. This works regardless of whether the recorder is operated in XY or Y(t) mode. Display modes may be switched at any time, even while recording.

By clicking the upper or lower end of the scale, the measuring range of the x- or y-axis can easily be shifted upward or downward, even while measurements are being recorded.

The zero-point of the x- and y-axis can be set by simply dragging the scale using the mouse. Using the Tools to the right of the recorder, the user can vary the thickness of curve lines, zoom in on a curve segment, draw tangents and perpendiculars to curves, label curves and, with just a click, automatically convert the curve into a table or graph and transfer it to the protocol form.

The user-friendly measurement application software...



Display (CATT 4/5)

Each of the four instrument displays can be switched from analogue to combined analogue and digital or digital mode with a mouse click. By dragging the intersection point of the display fields in four instrument mode with the mouse pointer, the size of the individual display fields can be changed or the number of fields reduced to two or one. This makes it very easy to, for example, switch to an analogue or digital display covering most of the screen. The measuring range is chosen by clicking the upper or lower end of the scale. The zero-point can likewise be shifted by dragging the scale. Clicking the coloured marker assigned to the particular display makes the channel selection table appear.

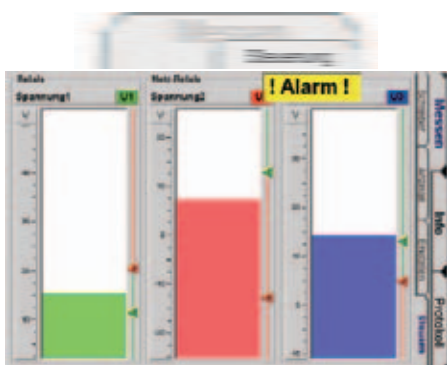


Power Supply (CATT 4)

Power Supply serves to control the auxiliary power supply of CATT 4 or, by means of the 7-pin port (10-V interface) to control external power supplies such as high current or high voltage transformers with a 10-V interface.



... controlling, stimulating and documenting using the CATT 4/5 measurement interface



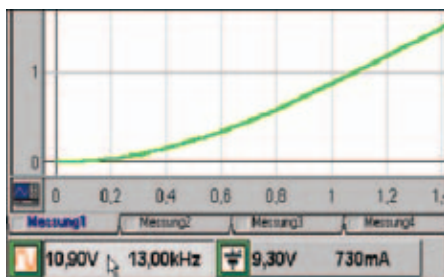
Control (CATT 4/5)

Control allows control mechanisms and conditions to be defined for a relay output with changeover contact, a mains output controlled by a relay (grounded outlet on the back) and for signalling an optical alarm. A measurement channel can be assigned to each of the three control channels with just a mouse click. The display bar with moveable coloured markers for ON (green) and OFF (red) allow thresholds to be set variably. Just as with the recorder and the displays, the measurement range of the bar graphs is adjusted by clicking on the upper or lower end of the scale. The zero-point can be set by simply dragging the scale.



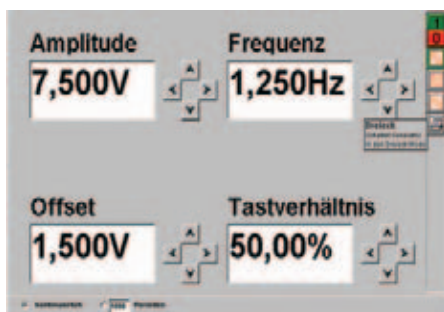
Counter (CATT 4)

The Counter makes CATT 4 a conventional digital counter featuring an up-to-date user interface that is easy to operate. Features include: measurement of start and stop times, frequency, period length and pulse length; measurement of total on- and off-intervals; and an event counter with or without a gate function.



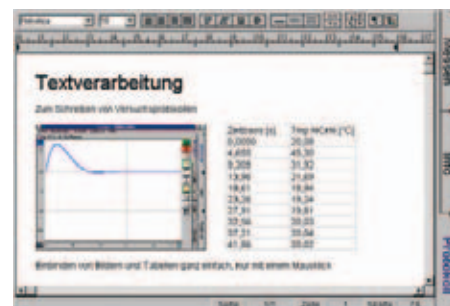
Instruments (CATT 4)

Instruments that can be made visible at will make CATT-SOFT even more versatile. Once activated in the menu, an instrument appears as a separate window offering all options for settings. If desired, the window can be reduced to appear along the lower edge of the screen while still clearly displaying the most significant operating parameters. Instruments are switched on and off by means of a mouse click. Double-clicking the reduced window causes the full-size window with all of the instrument settings to reappear.



Signal Generator (CATT 4)

This function allows easy operation of the generator. Either a sine, square or triangle waveform can be selected. Varying the duty cycle ratio causes a square wave to become a pulse, while a triangle becomes a sawtooth. Amplitude, offset, frequency and duty cycle ratio are set by means of four cursor fields (digit is selected and the value increased or decreased). The desired value may also be entered directly. The signal generator may be run indefinitely or for a limited time based on a pre-selected number of cycles. When shut down, the generator output is automatically put into a state of high resistance. This feature is useful in a number of applications, for example when observing signal decay. Calibrating the measuring chain (sensor - CATT) is fast and easy thanks to two-point calibration.



Info (CATT 4/5)

Helpful information on preparing, performing and documenting measurement runs, such as the description of the measurement or experiment set-up or information on required apparatus and materials, can be stored along with images in the Info section. This information can be stored together with any settings, calibration data and similar items and used over and over again. Protecting the information with a password ensures that it will remain useful to colleagues and students.

Protocol (CATT 4/5)

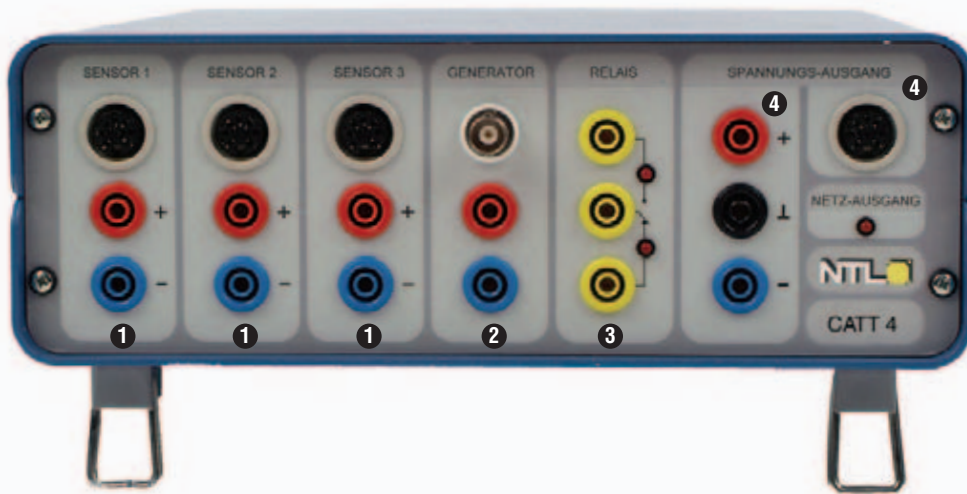
Manually recording and describing test results is often a time-consuming task. CATT-SOFT automatically records data while testing is underway and, upon completion, offers the option of professionally analysing the data and writing a protocol. Virtually automatically, that is, with just a mouse click, tables of values and signal curves are transferred to the protocol form where verbal explanations may easily be added using the word processing feature. Similarly, CATT-SOFT allows snapshots of analogue and digital displays to be entered into the protocol. The descriptive text of the protocol may be written using the text editor and, if desired, supplemented by external drawings, scanned graphics or images. Once completed, the protocol can be printed out in any desired quantity, either in colour or black and white.

Document (CATT 4/5)

The text editing programme built into CATT-SOFT offers added convenience, allowing experiments to be documented in the form of texts and graphics immediately, without having to switch to an external programme. Images in the most widespread formats (i.e. BMP, PCX, TIFF, WMF) may be integrated into the text.



catt 4 physics interface



1 Multifunctional sensor inputs

The sensor inputs consist of a combination of analogue and digital input ports. This makes it possible to alternatively connect digital sensors (e.g. light gate or encoder) or analogue sensors (e.g. pressure or force sensor) to an input port. In addition, values obtained by analogue measurement may be analyzed digitally. When a conventional analogue device is needed, CATT 4 may easily be used as a memory oscilloscope. Differential inputs allow voltage to be measured without directly referencing the common ground. Autoranging makes troublesome manual range selection unnecessary. This does not, however, affect the measuring range selected by the user to be displayed on the screen. The measurement of effective values and dynamic oversampling allow even extremely noisy signals to be measured. In addition, the three sensor inputs also allow measurement of start and stop times, times switched on and off and of cycles as well as event counting with or without a gate signal etc.

3 Relay output

The front panel features a switching relay (for opening and closing circuits) rated for a maximum load of 5 A. Twin LEDs indicate the current state of the contacts. Built-in varistors, for limiting the voltage on the contacts to 42 V, prevent sparks when inductive loads are switched on. Switching conditions, that is, levels for switching on and off as well as the input source and type, are set by means of the software.

Examples for use:

- Two-point control circuits (e.g. recharging or discharging batteries)
- Threshold alarm (e.g. with a buzzer)
- Control in experiments (e.g. excitation of a retaining magnet etc.)

2 Generator output / measurement input

The generator output is coupled with the current and voltage measurement function. This feature gives way to many possibilities and reduces the equipment needed for experiments.

Examples:

When measuring a current-voltage characteristic, merely the component to be tested needs to be connected, since both current and voltage are measured at the generator output terminal. In order to measure the cut-off behaviour of a source of inductance, just connect it to the generator output. Then set the generator to a DC voltage level suitable for cutting the current after a short time. Current and voltage at the generator output terminal are recorded simultaneously.

Options for generator output / measurement input:

Output of sine, square or triangle waveform signals in combination with current and voltage measurement. Output can be shut down after a preset number of cycles. Measurement of transient and decay of LC circuits etc. The measurement feature of the generator output can be used while measuring current or high-resistance voltage with reference to a common ground.

4 Auxiliary power supply and control output

Voltage output is balanced and may be adjusted (by means of CATT-SOFT) to a level between 0 and 15 V (at a maximum of 300 mA). It is suitable for general lab use as an auxiliary power supply. An integrated protection circuit safeguards against short circuits and reverse current. An additional, standardized interface (7 pins, 0 ... ±10 V) allows remote control of external power supplies such as the high-current and high-voltage transformers available from many manufacturers.



5 Power switch with IEC connector and fuse

Mains connector
230 V ±10 %, 47... 63 Hz, 35 VA (power cord supplied)

6 Power output (switchable)

Grounded outlet with protective cover (10 AF fine wire fuse) controlled by means of software. Load rating: 5 A/230 V - 1100 VA ON-OFF indicator (LED on the front panel)

7 PC interface

Serial interface (25-pin Sub-D connector, compatible with PC), interface cable and 9/25 pin adapter supplied.



P4100-4A CATT 4 (in new design)

P4100-4A CATT 4 physics interface

Weight: approx. 4.5 kg
W = 245 mm, H = 85 mm, D = 180 mm
System requirements:

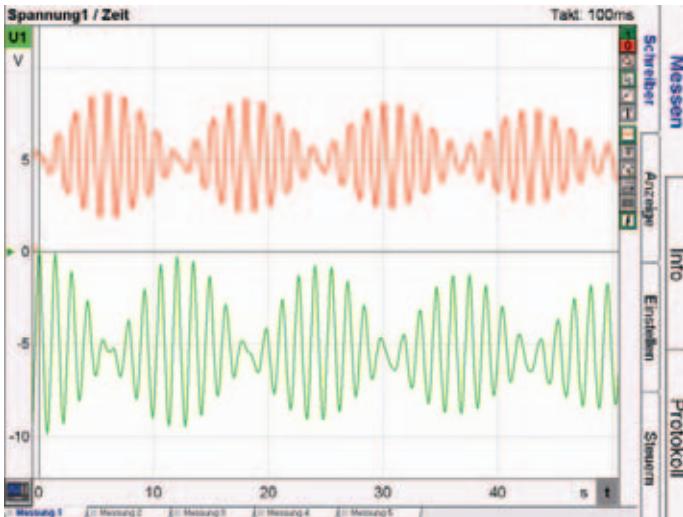
Hardware: Pentium upwards, 64MB RAM, serial port, keyboard, mouse, CD-ROM
Software: Windows 95/98/2000/XP

catt 4 physics interface



Possible applications of CATT 4 physics interface and CATT-SOFT

Voltmeter (DC & AC TRMS), ammeter (DC & AC TRMS), ohmmeter (DC & AC), conductivity measurement (DC & AC), wattmeter (DC & AC), function generator (sine, square, pulse, triangle and sawtooth waves, transformer, power amplifier and power supply control, frequency counter, event counter, time measurement (start-stop, chain times, cycle duration, pulse duration, time switched on and off), memory oscilloscope, XY recorder (8 channels), Y(t) recorder (8 channels), two-point control, force measurement, pressure measurement, magnetic field measurement, pH meter, redox measurement, luxmeter, thermometer, motion measurement (s, v, and a), Geiger counter etc.



Measurement: Coupled oscillations



CATT 4 PHYSICS SET P4900-1A

consisting of:

- CATT 4 physics interface
- CATT-SOFT
- Operating Instructions
- Power cord
- Serial PC cable and 9/25-pin adapter

Physics sensor package P4105-4A

For current, motion, force, temperature and light, consisting of:

- P4120-1B Motion sensor
- P4120-1K Force sensor 10 N
- P4120-3T Temperature converter for NiCrNi sensor
- P4120-1T Temperature sensor NiCrNi, -50/+300 °C
- P4120-1L Luxmeter 10000/5 Lux
- P4120-1S Current shunt, triple





catt 5 chemistry interface



1 Multifunctional sensor inputs (analogue)

8 measurement ranges, from 0 to 32 V, with automatic range adjustment (autoranging). Input by way of 7-pin DIN connector, with ± 15 V power supply for "intelligent" sensors, or banana plug jacks (parallel to DIN connector analogue input).

2 Temperature measurement input for NiCrNi thermocouples

Messbereich:
 Measuring range: -50 °C to $+100$ °C / 1000 °C
 Precision: 0.2/2.0 °C
 Curve correction: type K
 Connection by means of the thermocouple jack or the banana plug jacks (for wire couples).

3 pH/mV measurement input

Measuring range: 0 to 14 pH
 Precision: 0.02 pH
 Input resistance: > 1 tOhm
 Sensor connected by way of BNC or banana plug connector (parallel)

4 Conductivity measurement input

16 measurement ranges, from 5 μ s to 500 ms, including autoranging.
 Two-pulse measurement method with low charge consumption.
 Sensor connected by way of BNC or banana plug connector (parallel)

5 Relay output (voltage-free)

Switching relay for opening and closing, once each
 Contact load rating: 5 A / 42 V
 State indicated by 1 LED / contact
 Banana plug connector

6 Volume measurement input (drop counter)

Pulse count, measurement cycle triggered in TTL and CMOS
 Input by way of 7-pin DIN connector with ± 15 V
 Power supplied to "intelligent" sensors



7 Power switch with IEC connector and fuse

Mains connector
 230 V ± 10 %, 47... 63 Hz, 35 VA
 (power cord supplied)

8 Power output (switchable)

Grounded outlet with protective cover (10 AF fine wire fuse) controlled by means of software.
 Load rating: 5 A/230 V - 1100 VA
 ON-OFF indicator (LED on the front panel)

9 PC interface

Serial interface
 (25-pin Sub-D connector compatible with PC), interface cable and 9/25 pin adapter supplied.

C4000-5A CATT 5 chemistry interface

Weight: approx. 4.5 kg
 W = 245 mm, H = 85 mm, D = 180 mm

System requirements:

Hardware: Pentium upwards, 64MB RAM, serial port, keyboard, mouse, CD-ROM

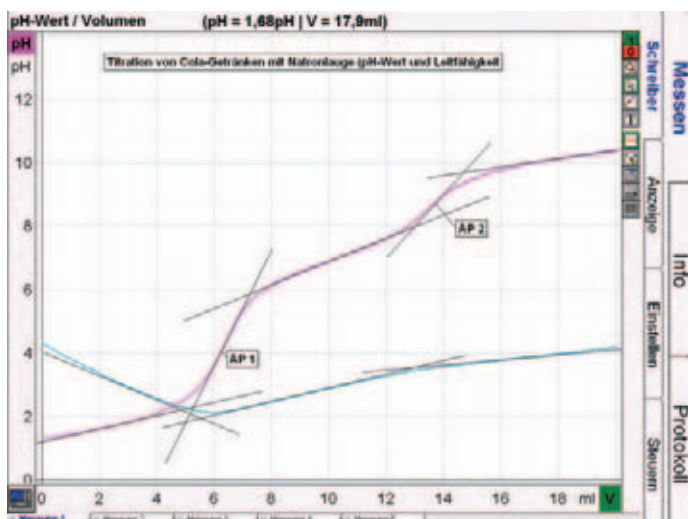
Software: Windows 95/98/2000/XP

catt 5 chemistry interface



Possible applications of CATT 5 chemistry interface and CATT-SOFT

Titration, conductometry, thermochemistry, pH values, electrochemistry and many areas of physics.



Experiment: Titration of cola beverages



Possible applications of CATT 5 C4900-1A chemistry interface and CATT-SOFT

consisting of:

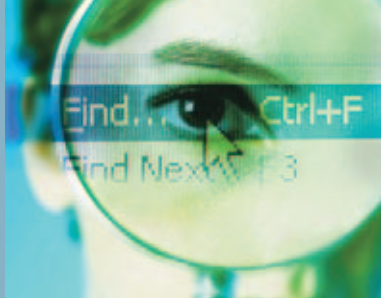
- CATT 5 chemistry interface
- CATT-SOFT
- Operating Instructions
- Power cord
- Serial PC cable and 9/25-pin adapter

Chemistry sensor package C4105-4A

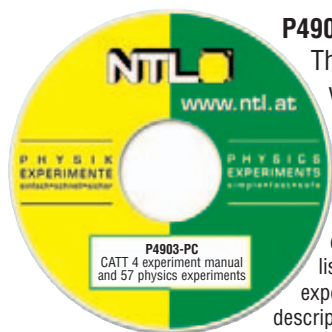
For temperature, pH values, conductivity, redox and counting, consisting of:

- C4120-5T Drop counter with sensor holder for 3 sensors
- C4120-1P pH electrode
- C4120-1R Redox electrode
- C4120-1L Conductivity electrode
- C4120-1T Temperature sensor, glass, -40/+110 °C





catt 4/5 experiment manuals for physics & chemistry



P4903-PC CATT 4 experiment manual

These experiments are designed in accord with modern teaching techniques and with the NTL principles: **simple, fast and safe.**

Since most teachers do not spend all of their time working with a computer interface, more preparation is required when the need does arise. This manual lets even teachers who are novice users prepare the topics listed below and perform the experiments in just a short time. The printed manual aids in assembling material and setting up the experiment. The CD-ROM includes the complete experiment instructions in the widespread Adobe Acrobat® format. All of the experiments listed below have been stored on the CD-ROM in CATT-SOFT format. Simply start CATT-SOFT, load the experiment from the CD-ROM - you are finished. All sensors and displays are then preset, and descriptions of the experiment and even partial results are available.



P4903-PC 57 Experiments with the CATT 4 physics interface

I. Mechanics

- MECA 01 Reflection time
- MECA 02 Non-accelerated motion
- MECA 03 Accelerated motion
- MECA 04 Free fall
- MECA 05 Dynamic measurement of mass
- MECA 06 Atwood's machine
- MECA 07 Elastic collision
- MECA 08 Unelastic collision
- MECA 09 Impulse-momentum theorem
- MECA 10 Static and sliding friction
- MECA 11 Hook's law
- MECA 12 Elastic hysteresis of rubber
- MECA 13 Plastic flow in wire
- MECA 14 Pressure in a balloon
- MECA 15 Pressure is independent of direction

II. Vibrations and waves

- SWCA 01 Speed of sound
- SWCA 02 Damped vibrations
- SWCA 03 Coupled vibrations

III. Thermodynamics

- TDCA 01 Pressure in a gas syringe

- TDCA 02 Pressure and temperature in a glass cylinder
- TDCA 03 Gas laws
- TDCA 04 Adiabatic compression
- TDCA 05 Temperature of a candle
- TDCA 06 Freezing mixture
- TDCA 07 Melting and freezing of sodium thiosulfate
- TDCA 08 Absorption and radiation
- TDCA 09 Thermostat
- TDCA 10 Calorimeter

IV. Magnetism

- MACA 01 Magnetic fields
- MACA 02 Inverse square law applied to magnets

V. Electricity

- ELCA 01 Parallel circuits of loads
- ELCA 02 Resistors in mixed circuits
- ELCA 03 A light bulb is not a constant resistor
- ELCA 04 Parallel circuits of light bulbs
- ELCA 05 Power of devices consuming electricity
- ELCA 06 Ohm's law
- ELCA 07 Voltage dividers
- ELCA 08 Two-phase alternating current

- ELCA 09 Coil in a rotating field
- ELCA 10 Model of a generator
- ELCA 11 Induction during free fall
- ELCA 12 Eddy current brake
- ELCA 13 Eddy current brake 2

VI. Electronics

- EOCA 01 Characteristic curve of a diode
- EOCA 02 Charging and discharging a capacitor
- EOCA 03 Measuring capacitance
- EOCA 04 Changing electrical resistance
- EOCA 05 HF filter
- EOCA 06 LF filter
- ELCA 07 Frequency-dependent voltage divider
- EOCA 08 Phase shifting

VII. Optics

- OPCA 01 Inverse square law applied to light
- OPCA 02 Refraction spectrum

VIII. Radioactivity

- RACA 01 Measuring radioactivity
- RACA 02 Deflection of beta rays in a magnetic field
- RACA 03 Inverse square law applied to gamma rays
- RACA 04 Shielding from beta radiation



C7410-5A 25 Experiments for and with the CATT 5 chemistry interface

Proven experiments that are **simple - fast - safe** to perform.

The experiments supplied with the CATT 5 may also be purchased separately. All of the experiments listed below have been stored on the CD-ROM in CATT-SOFT format. Simply start CATT-SOFT, load the experiment from the CD-ROM - you are finished. All sensors and displays are then preset.

C7410-5A 25 Experiments with the CATT 5 chemistry interface

I. Conductometry

- KCCA 01 Large display of conductance
- KCCA 02 Equivalent conductivity of electrolytes
- KCCA 03 Equivalent conductivity and dissociation constant of acetic acid
- KCCA 04 Conductivity of hydrochloric acid and formic acid as function of temperature
- KCCA 05 Conductivity titration of strong acids
- KCCA 06 Conductivity titration of weak acids
- KCCA 07 Conductivity titration of an ammonia solution with acetic acid
- KCCA 08 Conductivity titration of acid mixtures (e.g. cola)
- KCCA 09 Conductivity titration of barium hydroxide

- KCCA 10 Measuring chloride level using conductivity titration
- KCCA 11 Saponification of acetic acid ethyl ester in an alkaline environment

II. Thermochemistry

- TCCA 01 Thermometer and temperature recorder
- TCCA 02 Water equivalent of a calorimeter
- TCCA 03 Reaction enthalpy of redox reactions 1
- TCCA 04 Reaction enthalpy of redox reactions 2
- TCCA 05 Enthalpy of neutralization
- TCCA 06 Crystallization heat of sodium thiosulfate
- TCCA 07 Thermotitration of strong acids and bases
- TCCA 08 Decomposition of hydrogen peroxide

III. pH values

- PCCA 01 pH value of various solutions
- PCCA 02 Neutralization titrations of various acids, pKs values
- PCCA 03 Titration of an acid mixture (e.g. cola)

IV. Electrochemistry

- ECCA 01 Voltage of galvanic cells
- ECCA 02 Normal potential of half-cells
- ECCA 03 Determining halide level by redox titration



Sensors for physics, chemistry and biology

The sensors listed here can be used with the CATT 4 physics interface and/or the CATT 5 chemistry interface.

Do you need an additional sensor?

Do you wish to use your own or another industrial-standard sensor?

Thanks to its open architecture, the CATT system allows you to use various types of sensors.



PHYSICS

Art. No.	Description	CATT4	CATT5
P4120-1K	Force sensor 10/0.01 N for CATT 4&5	●	●
P4120-2K	Force sensor 100/0.1 mN for CATT 4&5	●	●
P4120-1M	MMagnetic field sensor, tangential, for CATT 4&5	●	●
P4120-2M	Magnetic field sensor, axial, for CATT 4+5	●	●
P4120-1S	Current shunt, triple, for CATT 4&5	●	●
P4120-1G	GM tube, simple (wo. HT source), for CATT 4	1	–
P4120-2G	GM-tube, sensitive (wo. HT source), for CATT 4	1	–
P4120-3G	High voltage source for GM tubes	●	–
P4120-1B	Motion sensor for CATT 4	●	–
P4120-1D	Pressure sensor 6/0.005 bar for CATT 4&5	●	●
P4120-1L	Luxmeter 10,000/5 Lux, for CATT 4&5	●	●
P4120-1T	Temperature sensor, NiCrNi, -50/+300 °C, 5 (4 w/ conv.)	2	●
P4120-2T	Temperature sensor, NiCrNi, 0/1,000 °C, 5 (4 w/ conv.)	2	●
P4120-3T	Temperature converter for NiCrNi, for CATT 4	●	●
P4120-2B	Light gate for CATT 4	●	–
P4120-5D	Air pressure sensor, 900-1100 mbar, for CATT 4&5	●	●
P4120-5F	Humidity sensor 0-100%, for CATT 4&5	●	●

CHEMISTRY

Art. No.	Description	CATT4	CATT5
C4120-1P	pH electrode for CATT 5 (4 w/ conv.)	3	●
C4120-1R	Redox electrode for CATT 5 (4 w/ conv.)	3	●
C4120-1L	Conductivity electrode for CATT 5	–	●
C4120-5T	Drop counter with sensor holder for 3 sensors	●	●
C4120-1T	Temperature sensor, glass, -40/+110 °C for CATT 4&5	●	●
C4120-1U	Converter for pH and redox electrodes	●	●
C4120-1F	Photometer (diode) for CATT 4&5	●	●
C4121-1K	Cuvettes, plastic, for photometer, 100 pcs	●	●

BIOLOGIE

Art. No.	Description	CATT4	CATT5
B4120-1H	Skin conductivity converter (wo. finger sensor) 4&5	●	●
B4120-1F	Finger sensor for skin conductivity converter 4&5	●	●
B4120-1V	ECG amplifier w/ set of cables	●	–
B4120-1E	Electrodes for ECG, 50 pcs.	●	–

- available for this interface
- not available for this interface

- 1) available for this interface, high voltage source P4120-3G additionally required
- 2) available for this interface, temperature converter NiCrNi P4120-3T additionally required
- 3) available for this interface, pH/redox converter C4120-1U additionally required



catt sensors



P4120-1B Motion sensor

The motion sensor is based on the same principle as an encoder. Ball bearings ensure little energy loss due to friction. The encoder is activated by means of a pulley with a hole for a cord. The sensor can be flexibly attached to a support stand with ease (cube with M6 socket).

Areas of use:

Experiments in mechanics such as: collision experiments, linear motion (s, v, a), tensile behaviour of wire (f-s diagram), gas laws etc.

Technical data:

1600 increments / revolution

Included:

Sensor, support rod (D=10 mm), 7-pin DIN cable



P4120-2B Light gate

This compact infrared light gate features a narrow detection range and a steep sensitivity curve, making it suitable for exactly measuring both low and high velocities. Sensitivity response may be set by means of a potentiometer.

Areas of use:

Experiments with track motion, vibration of strings or flat springs, swinging pendulums, falling objects etc.

Technical data:

Gate width inside: 74 mm
Operating voltage: ± 15 V DC

Included:

Light gate and 7-pin DIN cable



Force sensors

The force sensor is based on the principle of the bending beam. The weight is hung from a small hook on the flat steel spring jutting out of the case; the degree to which the spring bends is registered electronically.

Areas of use:

Mechanics experiments, measurements of force and weight

P4120-2K: electrostatic and electro-mechanical forces (e.g. current balance, attraction of capacitor plates)

Technical data:

Type:	P4120-1K	P4120-2K
Range:	0 ... +10 N	0 ... +100 mN
Precision:	0,01 N	0,1 mN
Output:	1 V/N ± 2 %	1 V/10 mN ± 2 %

Included:

Sensor, support rod, 7-pin DIN cable



P4120-1D Pressure sensor

The pressure sensor works according to the piezo principle, that is, the sensor has a thin silicone membrane that compares the external air pressure with the reference vacuum within and converts it into electrical potential. Additional electronic circuitry serves to correct for effects of temperature and to amplify signal strength to correspond to the nominal rating.

Areas of use:

For gas experiments, e.g. on the gas laws, hydrostatic pressure etc.

Technical data:

Measuring range:	0 ... 6 bar
Precision:	5 mbar
Output:	1 V/bar ± 3 %

Included:

Sensor with 1-m plastic hose and 7-pin DIN cable



P4120-1L Luxmeter

At the heart of the luxmeter is a photodiode which has been adjusted to respond to the visible light spectrum. Depending on light conditions, the diode generates a certain amount of photo-electric current which electronic circuitry then converts into corresponding voltage.

Areas of use:

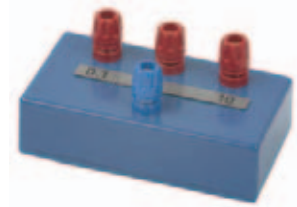
General measurement of light conditions in rooms, inverse square law etc.

Technical data:

Measuring range:	0 ... 10000 Lux
Precision:	5 Lux
Output signal:	1 V/1000 Lux ± 5 %

Included:

Luxmeter, support rod, 7-pin DIN cable



P4120-1S Current shunt

The shunt consists of an arrangement with three precision resistors. These are thermally coupled with the metal case of the device so that it can be subjected to a continuous electrical load of 10 W and brief loads of up to 25 W. It is connected by means of 4-mm screw terminals with through hole.

Areas of use:

Measuring electrical current, e.g. when recording the characteristic curve of a diode.

Technical data:

Triple shunt	0,1 Ohm - 1 Ohm - 10 Ohm
Accuracy:	1 %
Load rating:	10 W

Included:

Stromshunt



P4120-3T Temperature converter, NiCrNi

The NiCrNi thermocouple converter allows a NiCrNi thermocouple to be connected to the universal input ports of CATT 4 & 5. The converter is equipped with two banana connectors with clamps and a type K thermocouple connector. In this way, thermocouples either with a standard plug or with or without banana plugs may be connected.

Areas of use:

Temperature measurement with a NiCrNi thermocouple

Technical data:

Output signal: 1 V/100 °C

Included:

Converter, DIN cable



P4120-2T Temperature sensor, NiCrNi

Rod-shaped thermocouple with long probe for measuring flame temperatures. The component features a high degree of linearity, allowing exact temperature measurement in low ranges, e.g. around 100 °C. The temperature sensor is equipped with a type K thermocouple plug.

Areas of use:

General temperature measurement

Technical data:

Measuring range: 0 ... 1000 °C
Length: approx. 1 m (cable)
Linearization: type K
Probe diameter: 3 mm
Probe length: 230 mm
Total length: 300 mm

Included:

Thermocouple with type K plug



P4120-1T Temperature sensor, NiCrNi

Teflon-insulated wire thermocouple. The measuring contact is welded in an argon atmosphere to prevent oxidation. Thanks to the low heat capacity of the thermocouple, voltage is generated within seconds.

Areas of use:

General temperature measurement, measuring skin temperature while smoking

Technical data:

Measuring range: -50 °C ... +300 °C
Length: approx. 1 m
Linearization: Typ K

Included:

Thermocouple with type K plug



P4120-3G High voltage source

The high voltage source is used to supply power to a Geiger-Mueller tube. Output voltage / 100 (i.e. 0 to 8 V) is measured by means of two banana jacks and can be adjusted using a screwdriver to a plateau within a range of 0 and 800 V. The power source is connected to the tube using a BNC cable.

Areas of use:

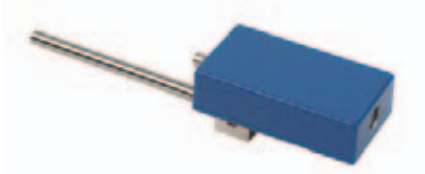
Power supply for Geiger-Mueller tube.

Technical data:

Voltage range: 0 V ... 800 V
Stability: ±2 %
Charging resistance: 1 MOhm (tube)

Included:

High voltage power source, 7-pin DIN cable



P4120-1G Geiger-Mueller tube (BNC)

The P4120-1G is self-quenching Geiger-Mueller tube mounted in a cast aluminium housing. A thin mica window ensures a high degree of sensitivity when registering alpha, beta or gamma radiation. The mica window is protected by a screen.

Areas of use:

Measurement of radioactivity.

Technical data:

Plateau: 350 ... 450 V
Window diameter: 9 mm
Density: 2 mg/cm²
Working life: 10¹⁰ Impulse

Included:

Geiger-Mueller tube, support rod, BNC connector cable



P4120-2G Geiger-Mueller tube (BNC)

Having a considerably larger mica window than the P4120-1G, the P4120-2G Geiger-Mueller tube features a higher level of sensitivity for radioactivity measurement. The tube is mounted in a sturdy aluminium housing. With the aid of a support rod, the P4120-2G can be mounted on a support stand.

Areas of use:

Measurement of radioactivity, exponential decay.

Technical data:

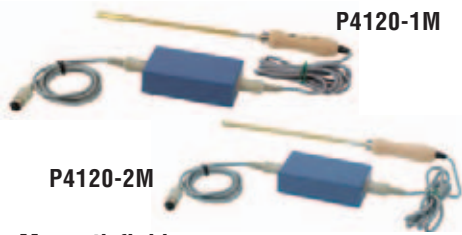
Plateau: 480 ... 550 V
Window diameter: 25 mm
Working life: 10⁹ pulses

Included:

Geiger-Mueller tube, support rod, BNC connector cable



catt sensors



Magneticfield sensors

The magnetic field sensor consists of a Hall Effect sensor and an electronic component. The Hall Effect sensor is built into a brass tube with handle. This makes it possible to measure magnetic fields within a relatively narrow space. The matching electronic component is housed in a separate case.

Areas of use:

Measurement of magnetic fields, e.g. B/I characteristic curve of iron cores.

Technical data:

P4120-1M: tangential
 P4120-2M: axial
 Range: 0 to ± 400 mT
 Precision: 0.5 mT
 Output: 3 V/100 mT ± 5 %

Included:

Hall Effect sensor, electronic component, 7-pin DIN connector cable



P4120-5D Air pressure sensor

The air pressure sensor works according to the piezo principle, that is, the sensor has a thin silicone membrane that compares the external air pressure with the reference vacuum within and converts it into electrical potential. This signal is then adjusted by electronic circuitry.

Areas of use:

Automatic air pressure measurement, observation and recording, weather stations etc.

Technical data:

Measuring range: 900 ... 1100 mbar
 Precision: 0.05 mbar
 Output: 1 V/10 mbar ± 3 %

Included:

Sensor, 7-pin DIN cable



P4120-5F Humidity sensor

The humidity sensor uses a sensor element working on the principle of capacitive measurement to measure relative humidity. This working principle ensures stable measurement over a long period of time, even under conditions of high humidity. The humidity sensor features a good dynamic response.

Areas of use:

Automatic humidity measurement, observation and recording, weather stations etc.

Technical data:

Range: 0 ... 100 % rel. humidity
 Working range: 10 ... 95 % rel. humidity
 Output: 0 ... 1 V = 0 ... 100 % rel. humidity

Included:

Sensor, 7-pin DIN cable



C4120-1T Temperature sensor, glass

This temperature sensor consists of an electronic thermometer for measuring temperatures in aggressive liquids. The DURAN glass tube contains an integrated temperature measurement circuit for determining temperatures with a high degree of linearity.

Areas of use:

Measurement of temperatures even in aggressive liquids, thermometric titration etc.

Technical data:

Range: -40 °C ... $+110$ °C
 Output: 10 mV/°C ± 2 %
 Precision: 0.1 °C
 Glass tube: 8 mm in diameter, approx. 180 mm in length

Included:

Sensor, 7-pin DIN cable



C4120-1P pH electrode (BNC)

This pH sensor, consisting of a glass shaft and a sturdy bulb membrane, is suitable for all types of pH measurements in liquid media.

Areas of use:

Measurement of the pH value of liquids, pH titration etc.

Technical data:

Range: 0 ... 14 pH
 Temperature range: 0 ... 100 °C
 Reproducibility: 0.03 pH
 Time constant: 95% within 3 s
 Dimensions: D= 12 mm
 Length: 120 mm

Included:

Sensor with 1-m connector cable (BNC plug)



C4120-1R Redox electrode (BNC)

Redox sensor for experiments and measurements in electrochemistry featuring a platinum electrode pin.

Areas of use:

Measurement of the redox potential of liquids.

Technical data:

Range: -1999 ... $+1999$ mV
 Temperature range: 0 ... 100 °C
 Dimensions: D= 12 mm
 Length: 120 mm

Included:

Sensor with 1-m connector cable (BNC plug)



C4120-1U Converter for pH and redox electrodes

The converter allows pH and redox sensors to be connected to the universal sensor input ports of CATT 4 and CATT 5. It ensures that sensors are connected under a very high resistance. It may be used with almost any sensor having a BNC or DIN plug that is available on the market.

Areas of use:

Measurement of pH values and redox potential of liquids, titration.

Technical data:

Measuring range: 0 ... ±10 V
Output: 0 ... ±10 V (Übersetzung 1:1)
Input resistance: approx. 1 TΩm
Input current: typically 2 pA (max. 10 pA)

Included:

Converter, 7-pin DIN cable



C4120-5T Drop counter

The drop counter is used to record the volume of liquid added when doing titrations. An opto-electronic system monitors the drops as they pass and an LED displays the recording of each drop. When used with the CATT 4 or CATT 5, the drop counter is an inexpensive, efficient substitute for scales or a motor burette.

Areas of use:

E.g. measuring the volume of liquids.

Technical data:

Precision: approx. 0.05 ml depending on burette

Sensor holders:

2 sensor holders D=12mm
1 sensor holder D=8 mm

Included:

Sensor with 1-m connector cable (BNC plug)



C4120-1L Conductivity electrode (BNC)

This conductivity cell is suitable for general lab measurements in liquid media. The active segment of the electrode is platinum-plated, so that it can even be used for measuring highly conductive liquids.

Areas of use:

Measuring the conductivity of liquids, conductivity titration.

Technical data:

Range: 0 ... 200 000 μs/cm
Temperature range: 0 ... 100 °C
Cell constant: ±10 %
Dimensions: D=3 mm, Länge= 120 mm

Included:

Sensor with 1-m connector cable (BNC plug)



C4120-1F Photometer (diode)

The photometer is used to measure light extinction of liquids within a certain spectral range. Three diodes emitting light of different wavelengths may be selected. The device is automatically reset to zero at the push of a button.

Areas of use:

Measuring the light extinction of liquids, water tests etc.

Technical data:

Wavelengths:
660 nm - red
565 nm - green
470 nm - blue

Included:

Diode photometer, 7-pin DIN cable



B4120-1H

B4120-1F

B4120-1H Skin conductivity converter

Skin contact is made by means of dry electrodes (e.g. the **B4120-1F** finger sensor or finger collars etc.). The electrodes are connected to the converter when measuring skin conductivity. A special pulse measurement method prevents the polarization of electrodes observed using conventional methods.

Areas of use:

Dynamic measurement of skin resistance, "lie detector"

Technical data:

Measuring range: 0,25... 25 μS
(4 MΩm ... 40 KΩm)

Included:

Skin conductivity converter, 7-pin DIN cable



B4120-1E

B4120-1V

B4120-1V ECG amplifier

By means of three ECG electrodes (e.g. disposable electrodes, stainless steel electrodes with electrode gel etc.) attached to the skin between the right and left arm, the voltage or potential difference of the heart muscle fibre during excitation is measured. The signal is processed by the ECG amplifier and then transmitted to the CATT 4 to be displayed on a monitor.

Areas of use:

Recording an electrocardiogram (ECG).

Recommended accessory:

B4120-1E Electrodes for ECG, 50 pcs.

Included:

ECG amplifier including cable set (3), 7-pin DIN connector cable