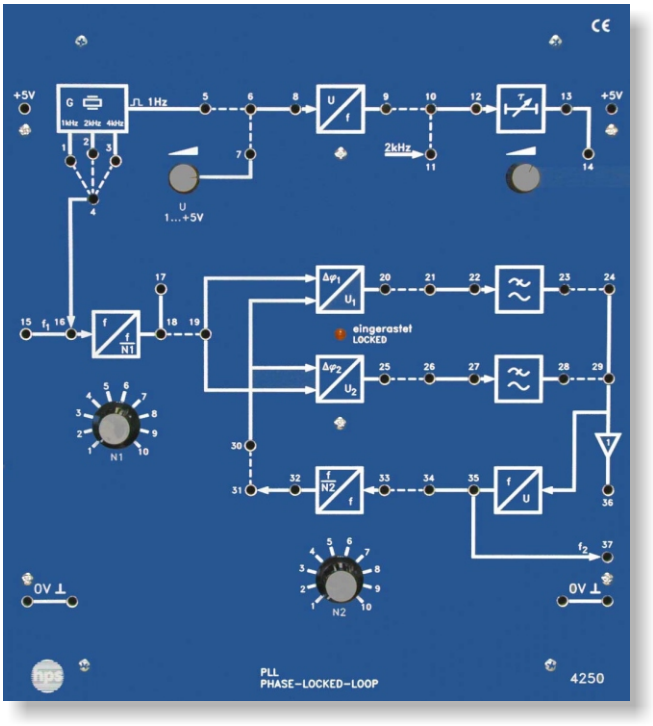
Communications

Phase-Locked-Loop (PLL)

Type 4250



- **Universal training system on the subject of PLL**
- **All function blocks of the PLL circuit are equipped with test jacks and can be decoupled**
- **Generators, frequency dividers and phase shifter integrated in the Board**
- **Low demand on additional measuring equipment**
- **With detailed experiment descriptions**

With the Phase-Locked Loop (PLL) training system, hps SystemTechnik offers a concept for practical teaching of the function and application possibilities of this technology.

PLL systems are being used in electronics for a wide range of applications such as:

- Frequency synthesis (e. g. setting radio and TV channels including channel search and memory – fixed frequencies)
- Accurate motor speed control (e. g. CD players)
- Phase shifter
- Modulation and demodulation (AM, FM, PM, FSK)
- Stereo decoder and PAL decoder (TV)
- Pulse synchronous operation and much more

The hps training system on PLL is designed didactically in such a way that the theoretical contexts can be presented clearly and comprehensibly.

It consists of the following components:

- 2 different phase detector types (comparators)
- 2 loop filters, low-pass characteristic
- Voltage-controlled oscillator (VCO)
- 2 digital frequency dividers, divider factor adjustable from 1 ... 10

The Phase-Locked Loop Board contains additional auxiliary equipment for conducting tests and experiments:

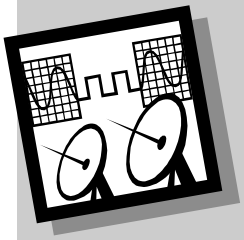
- Crystal-stable squarewave generator for reference frequencies
- Variable squarewave generator for the generation of input frequencies
- Phase shifter for examining the phase detectors

The frequencies in the Phase-Locked Loop are in the AF range so that a problem-free measuring technique can be applied and no great demands need to be made on additional measuring equipment (oscilloscope, multimeter, frequency meter).

The inputs and outputs of the individual function blocks are equipped with 4 mm jacks as test points. Individual blocks (components) can be decoupled with 4 mm connecting plugs from the overall complex if necessary, in order to conduct individual measurements.

A separate manual „Phase-Locked Loop“ (Type V 0068) describes and analyses the individual experiments in detail in the Experiments and Solutions sections in addition to providing the fumdamentals of PLL.

hps SystemTechnik
Lehr- + Lernmittel GmbH
Altdorfer Strasse 16
88276 Berg (Germany)
Tel.: + 49 7 51 / 5 60 75 80
Fax: + 49 7 51 / 5 60 75 77
Web: www.hps-systemtechnik.com
E-Mail: export@hps-systemtechnik.com



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Technical Data

Squarewave generator (crystal-stable)
- Frequency: 1 Hz; 1 kHz; 2 kHz; 4 kHz

DC voltage source
- Voltage: 1 V ... 5 V (adjustable with potentiometer)

Voltage-controlled oscillator
- Input voltage: 0 ... +5 V
- Output voltage: +5 V (symmetrical squarewave)
- Output frequency: approx. 20 Hz ... 6 kHz

Comparator(phase detector)
- Type I: phase sensitive (XOR)
- Type II: phase and frequency sensitive (JK flip-flops with charging pump via tristate)

Low pass (loop filter)
- Type I: RC low pass (approx. 300 Hz)
- Type II: R/RC low pass (approx. 3 Hz)

2 frequency dividers
- Factor: N_1 and N_2 = 1 ... 10 (adjustable with rotary switch)

Phase shifter
- = -7°... -230° or +7°... +230° (adjustable with potentiometer); referred to 2 kHz

Other
- Operating voltage and current: +5 V DC/150 mA (through external power supply)
- LED for displaying lock-in state of the PLL circuit
- Measuring amplifier (impedance converter)

Mechanical data
- The front panel of the Phase-Locked Loop is made of 5 mm thick laminate, matt blue in colour with white engraving representing the built-in function groups.
- The rear of the Board is protected with a grey plastic cover. Its shape allows the Board to be placed at an ergonomically favourable angle for example on a table.

Dimensions
- 266 x 297 x 95 mm (w x h x d)

Weight
- 1.3 kg

Accessories Recommended

- Experiment manual: „Phase-Locked Loop“ (Type V 0068)
- Power supply unit (e. g. 5 V SUPPLY BOARD, Type 1002.3)
- Oscilloscope
- Multimeter (standard)
- Frequency meter
- Connecting plugs and leads

Subject to technical modifications.