IPC EDUCATIONAL TRAINERS

POWER ELECTRONICS LAB UNIT

MODEL: - IPC- 550- PE

EXPALNATION OF THE POWER ELECTRONICS TRAINER

The Power Electronics Trainer IPC-550-PE has been specially developed for the measuring exercises in course. It forms the basis for all basic circuits in the field of D.C and A.C power controllers as well as the 1-. 2-, 3- and 6-pulse power converter circuits in rectifier mode and inverter mode. It can be used not only for the passive loads but also for active loads.

The unit is designed for the operation on the 3 x 38 / 22V mains, the connection being made via laboratory leads to the 4-mm plugs. Care should be taken that, for reasons of the synchronization of trigger pulses, the unit is to be connected to the three outer conductors and the neutral conductor for all exercises. By virtue of the transparent front panel, the construction of the technical equipment can easily be seen and the arrangement of the plugs is the basis for each connection layout of all experiment circuits the printed symbols shall guarantee a quicker circuit construction without any problems.

The conductor L1, L2 and L3 are applied to input of the communication chokes

(Lk = 2mH; 10A) via fine wire fuses (4Aff) and the main switch. The control lamps H1-H3 indicate the function of the fuses and are lit in the case of a blown fuse.

The limiting values for controlled valves V1-V6 are

URRN = UDRM = 1000V; ITAVM = 10A

And for uncontrolled valves V10-V60

URRM = 1000V; IFAVM = 10A

The AHS circuits consists, together for all twelve valves, of an RC element with the following data

RTSE = 100Ω, 5W; CTSE = 0,047µF, 400V

The main currents, the valve currents and the load currents can be converted into a proportional measuring voltage by means of the built-in precision resistor 1Ω. Since the voltage supply of the controlled unit is protected via fuse F4, switch S is used for pulse enabling and pulse inhibit.

The twelve trigger-pulse outputs are electrically isolated from each other and are divided into three pulse groups. For example, pulse group U1 is assigned to phase voltage UL1N.

The two upper pulses being in phase used to control the negative half-wave of the voltage. The plugs marked with "G" are provided for the gate terminal and the plugs marked with the "K" for the terminal at the cathode-side of the thyristor.

The potentiometer R serves for the adjustment of the control angle of the phase voltages ranging from $0° \leq \alpha \leq 180$.

The two other potentiometers are provided for the matching of the control range to respective switching situation. Potentiometer α GR (GR = Rectifier) is used to adjust the pulse-finish position at the beginning whereas the pulse-finish position at the end is set by operating potentiometer α WR (WR = Inverter).

NOTES ON THE FURTHER TECHNICAL EQUIPMENT

The essential part of the circuits of exercises and test in course "Power Electronics" can be constructed using converter-Rectifier Trainer IPC-550-PE.

For a number of additional exercises a modern laboratory with some additional power-converter equipment must be available.

Explanations for the Worksheets of Course IV

The worksheets for the 16 practice circuits are given in the order of the circuit code numbers. The worksheets belonging to a circuit for exercise consists of two general pages with the proper worksheets.

The general pages consist of a circuit diagram, a component layout or a terminal connection diagram, the specification of the equipment necessary for the exercises and a short description of the circuit and the exercises.

The following worksheets consist of – divided into subsection – the respective task including the necessary technical information and the corresponding tables, diagrams or equation. The determined measured values and results have to be inserted there.

The given exercises to the particular circuits are rather suggestion for the systematic procedure for exercises.

It is not intend that each student should perform every single experiment in course. It is left to the instructor to select optimum number of exercises according to the method of teaching.

These exercises can be carried out by the student in groups. Of course it is possible that each group of students does a different exercise. In any case the result of the exercise should be compared and discussed by the students among themselves.

Course: PE	**POWER ELECTRONICS**	**Circuit:**
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Notes on the Measuring Method

"Power Electronics" is designed so that the exercises are carried out – according to later practice – directly on the 38/22V mains voltage. To avoid the dangers of electric current, the teacher and in particular have to follow strictly VDE specification. At the beginning of the practical exercises, it is necessary to explain in detail the dangers of measurements techniques in power electronics.

When measuring with oscilloscope, special problems may occur. Since different oscilloscopes are used in the training center as well as in practice, we intend to point out the possible disadvantageous effects in the following for examples.

In addition, it is necessary that all voltage measurements with the oscilloscope are executed using probe with a divider ratio 10: 1. The input circuit of the oscilloscope is consequently loaded at a minimum and also the amplitudes of high voltage can be displayed on the screen of the oscilloscope. It is must also be demanded from the students that each circuit construction and each change in the configuration have to be carried out in disconnected state. Any connection of the mains voltage calls for a preceding check of the circuit and the permission of the teacher to begin with the measurements.

LIST OF EXPERIMENTS: -

1- Half-wave centre –tap circuits M1U
2- Full-wave bridge circuits B2U
3- Three-pulse centre-tap circuit M3U
4- Six-pulse bridge circuit B2U
5- Half-wave power converter M1C
6- Fully-controlled bridge circuit B2C
7- Controlled three-pulse power converter M3C
8- Symmetrical half-controlled bridge circuit B2HK
9- Asymmetrical half-controlled bridge circuit B2HZ
10- Half-controlled three-phase bridge circuit B6H
11- Fully-controlled three-phase bridge circuit B6C with active load
12- Rotational-speed controlled D.C. motor
13- Half-Controlled A.C. power controller W1H
14- Fully-Controlled A.C. power controller W1C
15- Half-Controlled three phase power controller W3H
16- Fully-Controlled three phase power controller W3C