

# The Z-diode as voltage stabilizer (Item No.: P1401000)

## Curricular Relevance

**Area of Expertise:**  
Physics**Education Level:**  
Age 16-19**Topic:**  
Electricity**Subtopic:**  
Electronics**Experiment:**  
The Z-diode as  
voltage stabilizer**Difficulty**

Intermediate

**Preparation Time**

10 Minutes

**Execution Time**

10 Minutes

**Recommended Group Size**

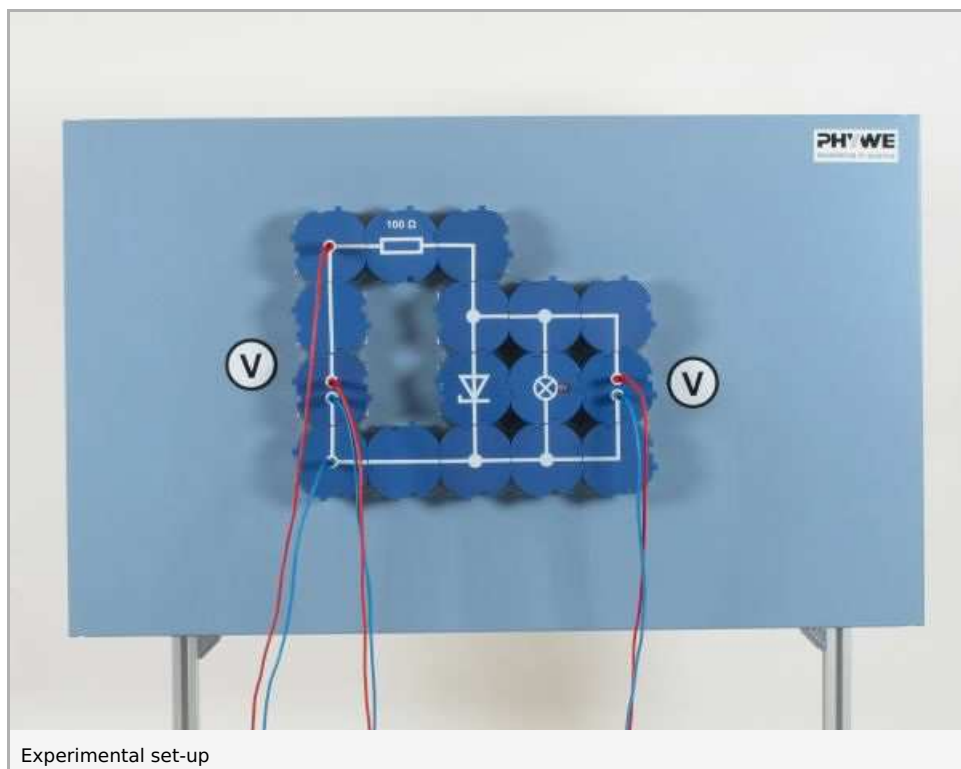
2 Students

**Additional Requirements:****Experiment Variations:****Keywords:**

## Principle and equipment

### Principle

It is to be demonstrated that a direct voltage can be stabilized with the help of a Z-diode.



Experimental set-up

## Equipment

Position No.	Material	Order No.	Quantity
1	Multimeter ADM2, demo., analogue	13820-01	2
2	PHYWE power supply, universal DC: 0...18 V, 0...5 A / AC: 2/4/6/8/10/12/15 V, 5 A	13500-93	1
3	Demo Physics board with stand	02150-00	1
4	Socket for incandescent lamp E10 ,module DB	09404-00	1
5	Connector interrupted, module DB	09401-04	2
6	Resistor 100 Ohm,module DB	09413-10	1
7	Z-diode ZF 4.7,module DB	09452-00	1
8	Electr.symbols f.demo-board,12pcs	02154-03	1
9	Connector, straight, module DB	09401-01	2
10	Connector, angled, module DB	09401-02	3
11	Connector, T-shaped, module DB	09401-03	4
12	Connector, angled with socket, module DB	09401-12	2
13	Filament lamps 4V/0.04A, E10, 10	06154-03	1
14	Connecting cord, 32 A, 1000 mm, red	07363-01	2
15	Connecting cord, 32 A, 1000 mm, blue	07363-04	2
16	Connecting cord, 32 A, 750 mm, red	07362-01	1
17	Connecting cord, 32 A, 750 mm, blue	07362-04	1

## Set-up and procedure

- Set up the experiment as shown in Fig. 1; first switch the Z-diode in the inverse direction; select the 30 V measurement range for measuring the operating voltage and 10 V- for measuring the voltage on the Zdiode
- Increase the direct voltage in steps of 1 V; read the values of the operating voltage and the voltage on the Z-diode and enter them in Table 1

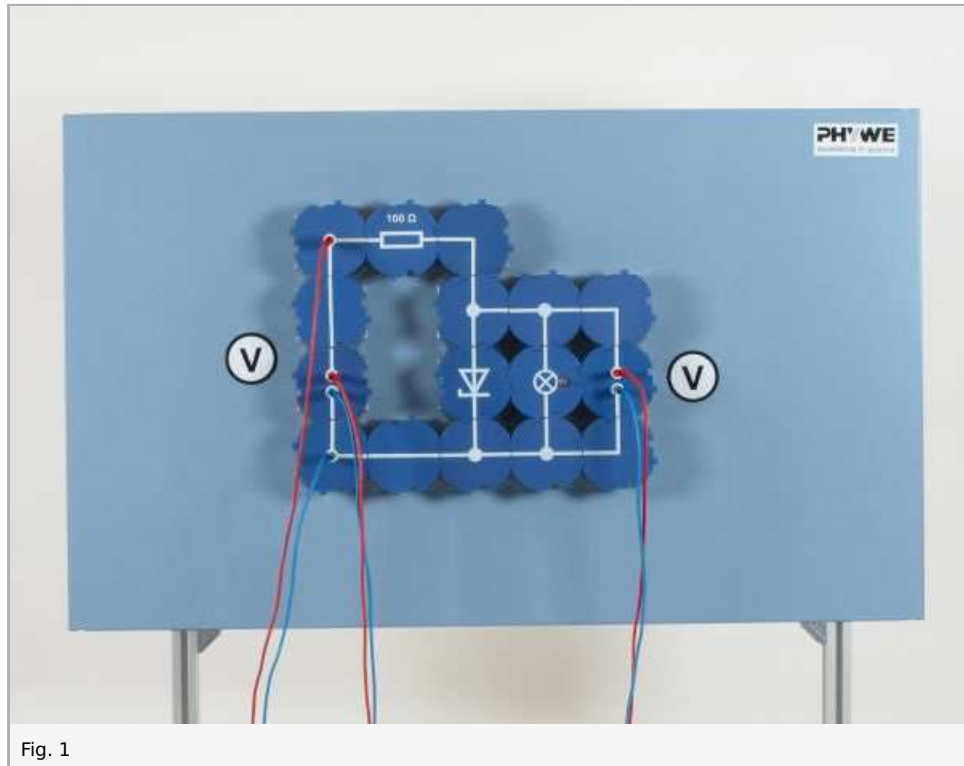


Fig. 1

## Observation and evaluation

### Observation

Tabelle 1

$\frac{U_B}{V}$	$\frac{U_Z}{V}$
0	0.0
1	0.0
2	0.5
3	1.0
4	1.5
5	2.5
6	3.2
7	3.8
8	4.3
9	4.5
10	4.6
11	4.7
12	4.7
13	4.7
14	4.75
15	4.8
16	4.8
17	4.85
18	4.9

### Evaluation

From the graphical representation in Fig. 2 it is clear that the voltage on the Z-diode changes very little when the operating voltage is increased by 9 V. A change in the operating voltage of  $\Delta U_O = 9 \text{ V}$  results in the far smaller change in the voltage on the Z -diode of  $\Delta U_Z = 0,4 \text{ V}$ .

A Z-diode can manage that only little change on the operating direct voltage on a component (here a filament lamp) is caused by changes in the operating voltage and the changes in the load.

With Z-diodes, direct voltages can be stabilized and electronic components and circuits protected from too high a voltage.