# *Technical Information*
# *Ampere-hour Meters*
# *AZ 2000*

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# 1. Important

Before starting up the equipment the Operating Instructions should be read carefully.Special attention must be paid to all notes referring to dangerous hazards in theuse of the equipment.

This equipment is constructed and tested to Protection Class II according to **DiN 57 411 Part 1, VDE 0411 Part 1.** Protective measures for electronic measuring equipment. It has left the factory in perfect condition with regard to all safety aspects.

Any repair or any replacement of components must only be carried out by a special ist fully familiar with the hazards involved and with the contents **VDE Regulations 0411.**

# 2. Introduction.

In the Ampere-hour Meters Az 2000 - 4000 we have developed a modern equipment design for electroplating technology.

The units are of modular construction. They are therefore very easy to service and all models can be supplied from stock on short delivery.

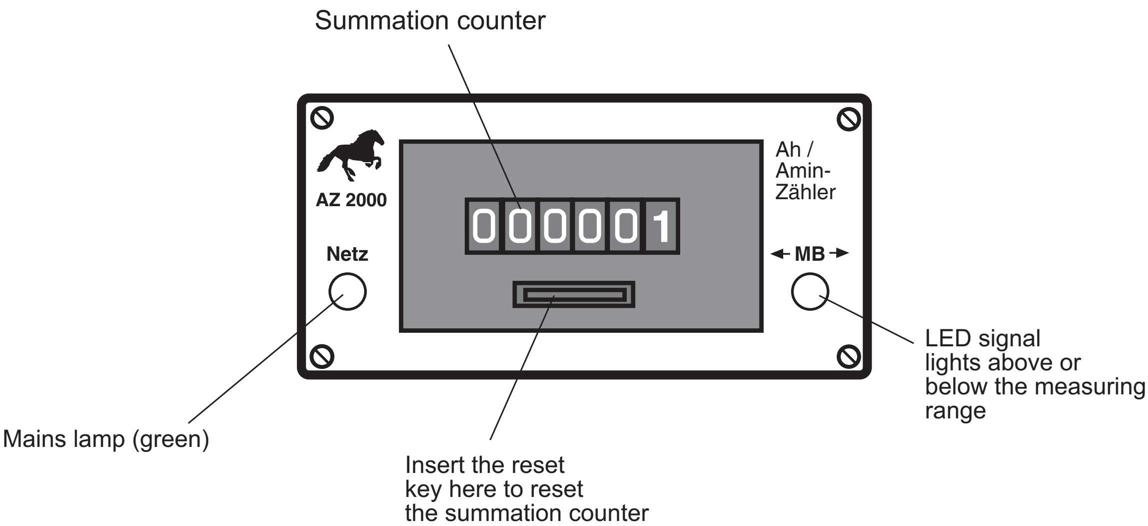
These measuring instruments can be used as

- **amper-hour meter**
- **amper-minute meter**
- **amper-second meter**
- **metal weigtit meter**

The calibration can be changed by the user himseif.

All models are available with built-in electronic dosing systemwhich offers current-related dosing of chemical additives.
The automatic uniform dosing of additives ensures a constant bath composition (and therefore uniform quality).

## 2.1 Description of the controls



# 3. Operating principle

All the instrument models have the same basic design.

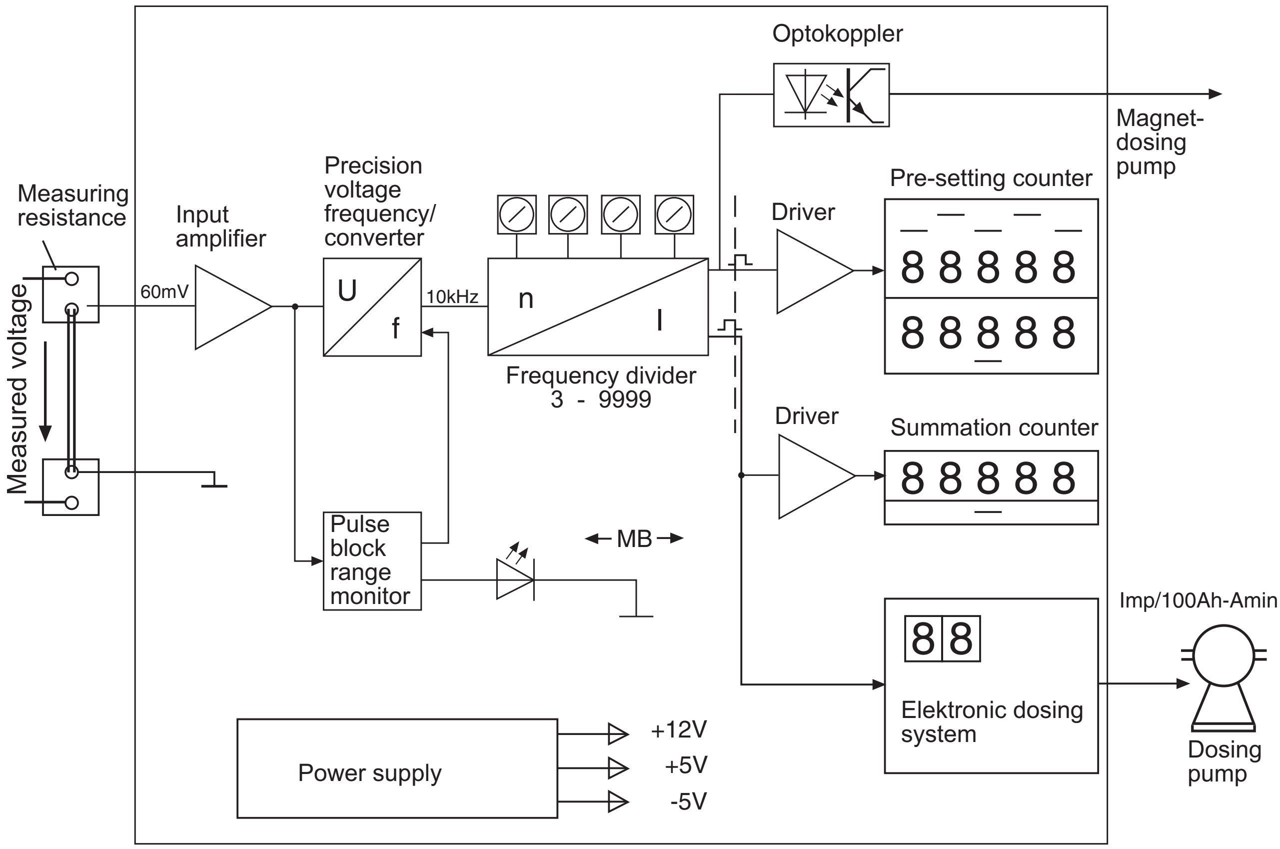
A voltage proportional to the plating current is produced across the measuring resistance (shunt); this is amplified in the input amplifier. A voltage/frequency converter changes the amplified voltage into a proportional trequency.

A programmable frequency divider ensures that the Ah or Amin reading corresponds to the summation current.

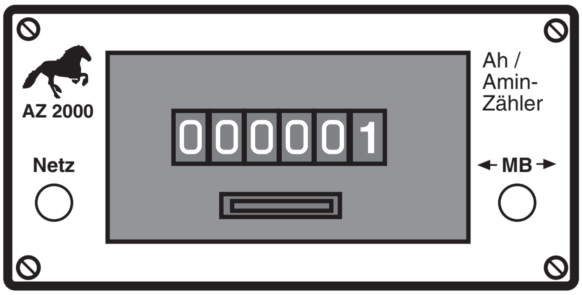
The LED ,,MB Monitor" is operated when the measured voltage exceeds a pre-set-maximum or falls below a pre-set minimum. It indicates that reliable measurement is no longer ensured.
When the voltage falls below the minimum value, a pulse blockage 5 activated wbich stops the count.

The counting pulses of the summation counter are also used to control the electronic dosing system.

## 3.1 Block circuit diagram



## 4. Instrument descriptions




### AZ 2000

This instrument operates as a summation counter with a 6-digit electromechanical counter.

The reading is reset with a key.

This prevents unintentional changes in the counter reading.

The AZ 2000 with case 48x96 has no electronic dosing system.

Connection to the gamma/4-b magnet-dosing pump is possible with the standard optocoupler output.

### Range monitor ◄ MB ►

The AZ 2000 is equipped with a signal monitoring device.

If the input voltage is smaller than approx. 1mV and arger than approx. 170 mV (nominal signal voltage = 60 mV) this is indicated by the LED marked MB.

Under these conditions reliable measurement is <u>no longer assured.</u>

# 5. Evaluation of summation currents with the potential Isolation modules TMD U/U and the AZ 2000

When several plating rectifiers in a plant are operated with a common electrolyte,manual or automatic dosing of electrolyte additives involves the total summation current.
This 5 achieved by connecting to each plating rectifier a **TMD U/U** and evaluating the plating current through the so-called shunt voltage.

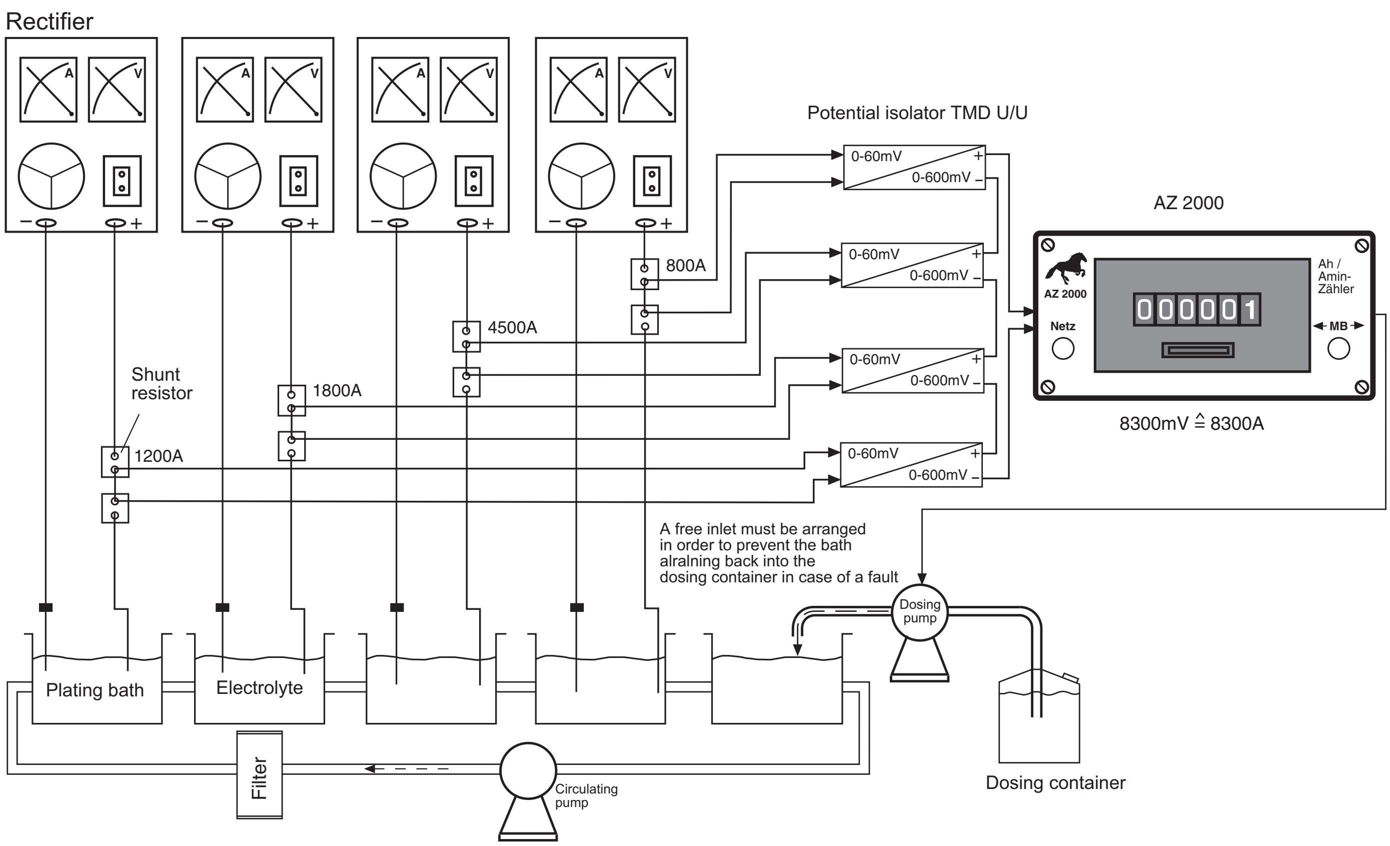
The outputs of the potential isolation modules TMD U/U are connected in series (summated) and passed to be **AZ 2000** as the total summation current.

The measuring voltage of the AZ 2000 is corresponding directely to the plating current. (see the drawing)

The **AZ 2000** is used for indicating the total summation current, and for controlling the dosing equipment.

## 5.1 Functional circuit diagram

The output of the TMD is corresponding to the shunt current, eg.500A = 500mV.
So the relation is 1:1. (1A = 1mV)



# 6. Ampere-hour meter AZ 2000 with magnetic dosing pump.

Operating an ampere-hour meter in conjunction with the programmable magnetic dosing pump gamma/4-b produces dosing in accordance with a pre-selected number of Ah/Amin.

On each step of the totalising counter or presetting counter the ampere-hour counter outputs a pulse through its optocoupler output to the dosing pump gamma/4-b.

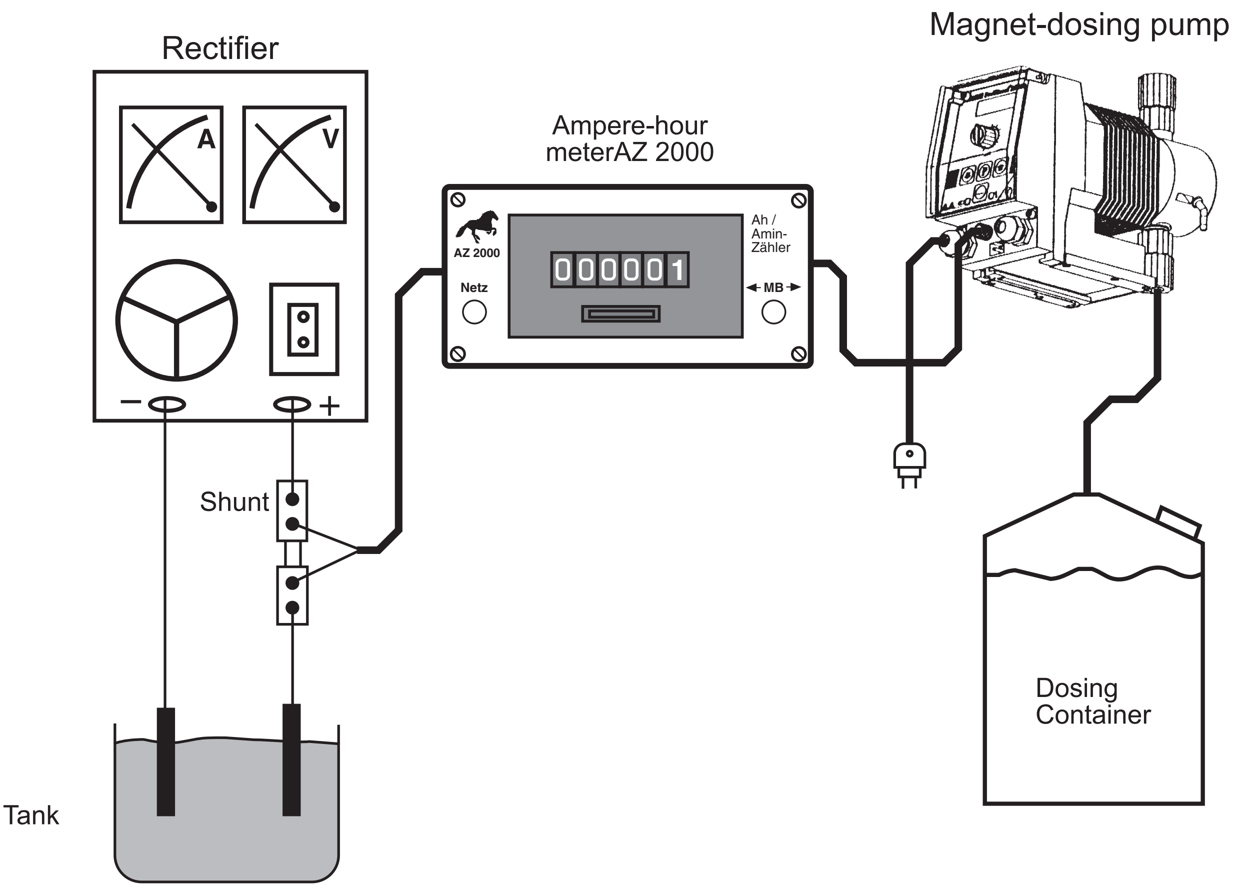
The gamma/4-b pump must now be set to produce a certain number of dosing strokes for each step of the totalising or presetting counter.

In the conversion of AZ pulses to dosing strokes there is a choice between a step-up and a step-down ratio of the control pulses.

**Step-up:** a single totalising or presetting counter pulse of the AZ generates **n** dosing strokes.

**Step-down:** **n** totalising or presefling counter pulse of the AZ generate a single dosing stroke.

## 6.1 Functional circuit diagramm AZ with gamma/4-b



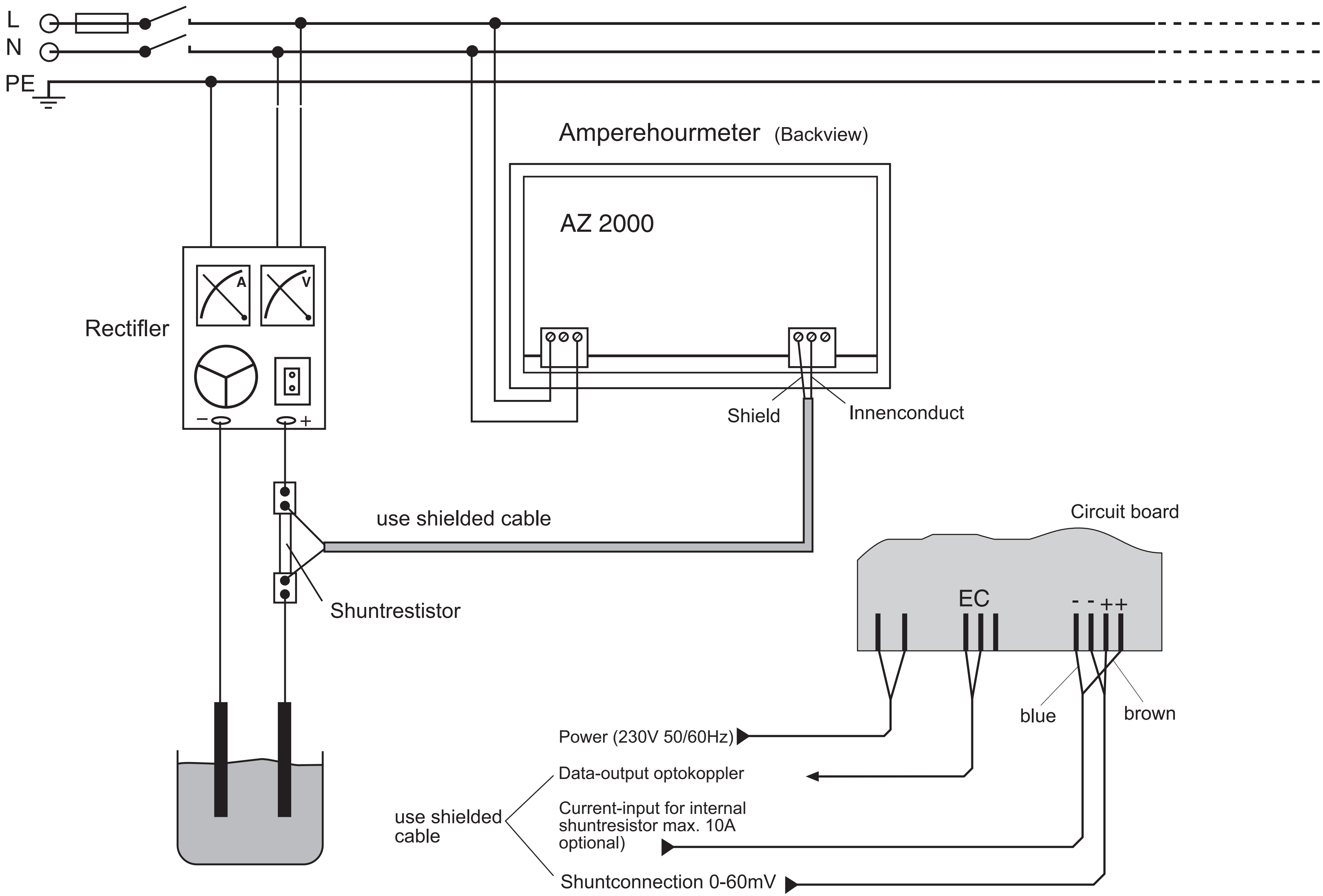
# 7. Technical data

| Countermodel | AZ 2000 | AZ 2000 DSZ | AZ 4000 | AZ 4000 DSZ |
|---|---|---|---|---|
| Summation counter 6-digit, mechanical | X | X | X | X |
| Pre-sefling counter 6-digit, electronic | | | X | X |
| Floating Opto-coupler output to control the gamma/4-b pump | X | | X | |
| Floating relay output to control the gamma/4-b pump | | X | | X |
| Relay output 8 A/250 V 50/60 Hz | | | X | X |
| Measurement accuracy | 0,1% | 0,1% | 0,1% | 0,1% |
| Ambient temperature | 0-50°C | | | |
| Supply | 230V 50 Hz/60 Hz (Other voltages to special order) | | | |
| Protection | IP 44 | | | |
| Weight | 550 g | 1000 g | 1100 g | 1150 g |
| Panel cut-out (mm) | 90,5x43 | 137x66 | 137x66 | 137x66 |
| Dimensions (mm) WxHxD | 48x96x180 | 72x144x180 | 72x144x180 | 72x144x180 |

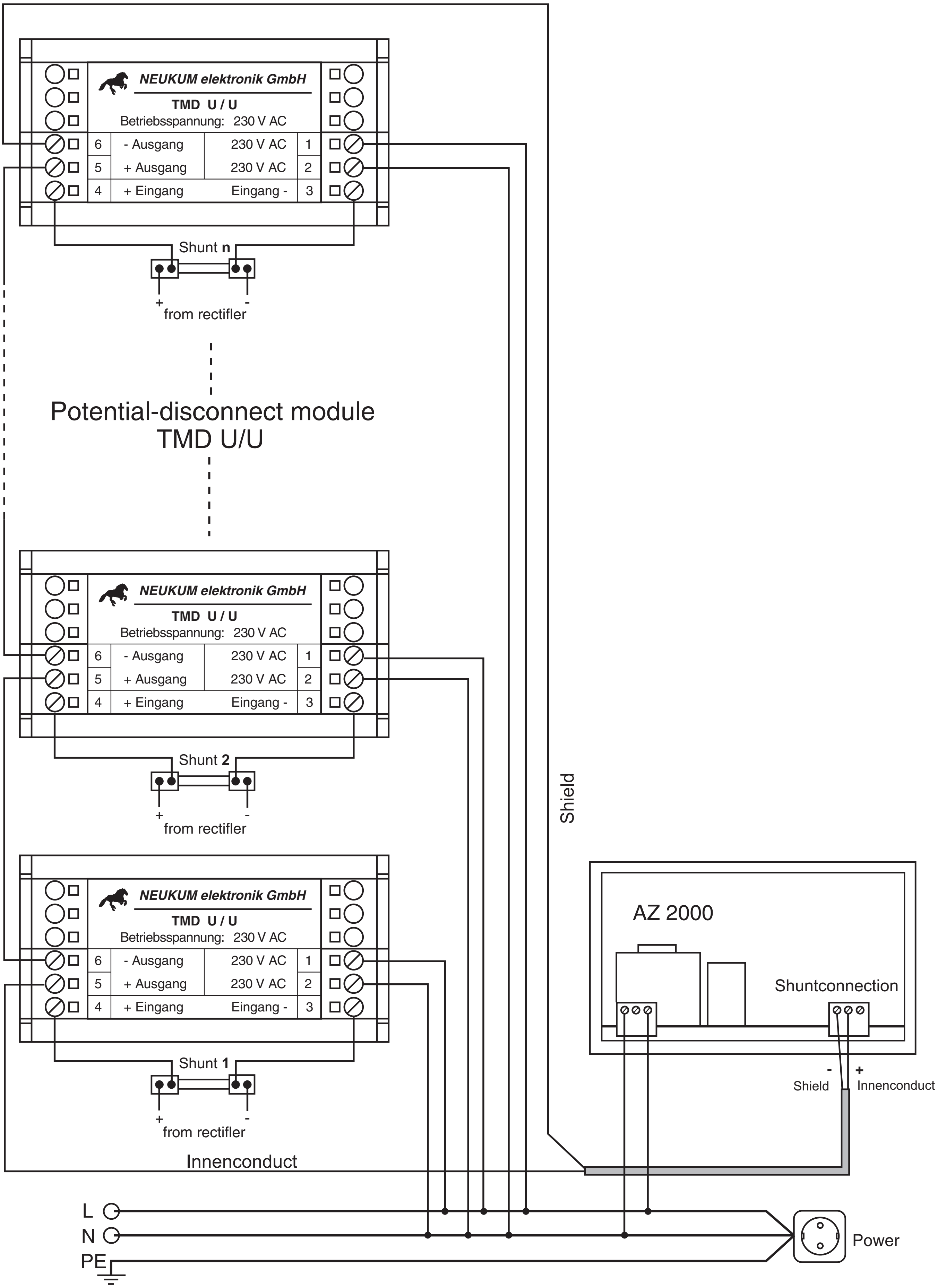
**Note:** If a contactor operated by the relay output does not drop out when the relay contact is open, the RC interference suppressor next to the relay output has to be removed. In order to avoid severe wear on the relay contacts the RC interference suppressor is then connected in parallel with the inductive load.

# 8. Connection diagrams

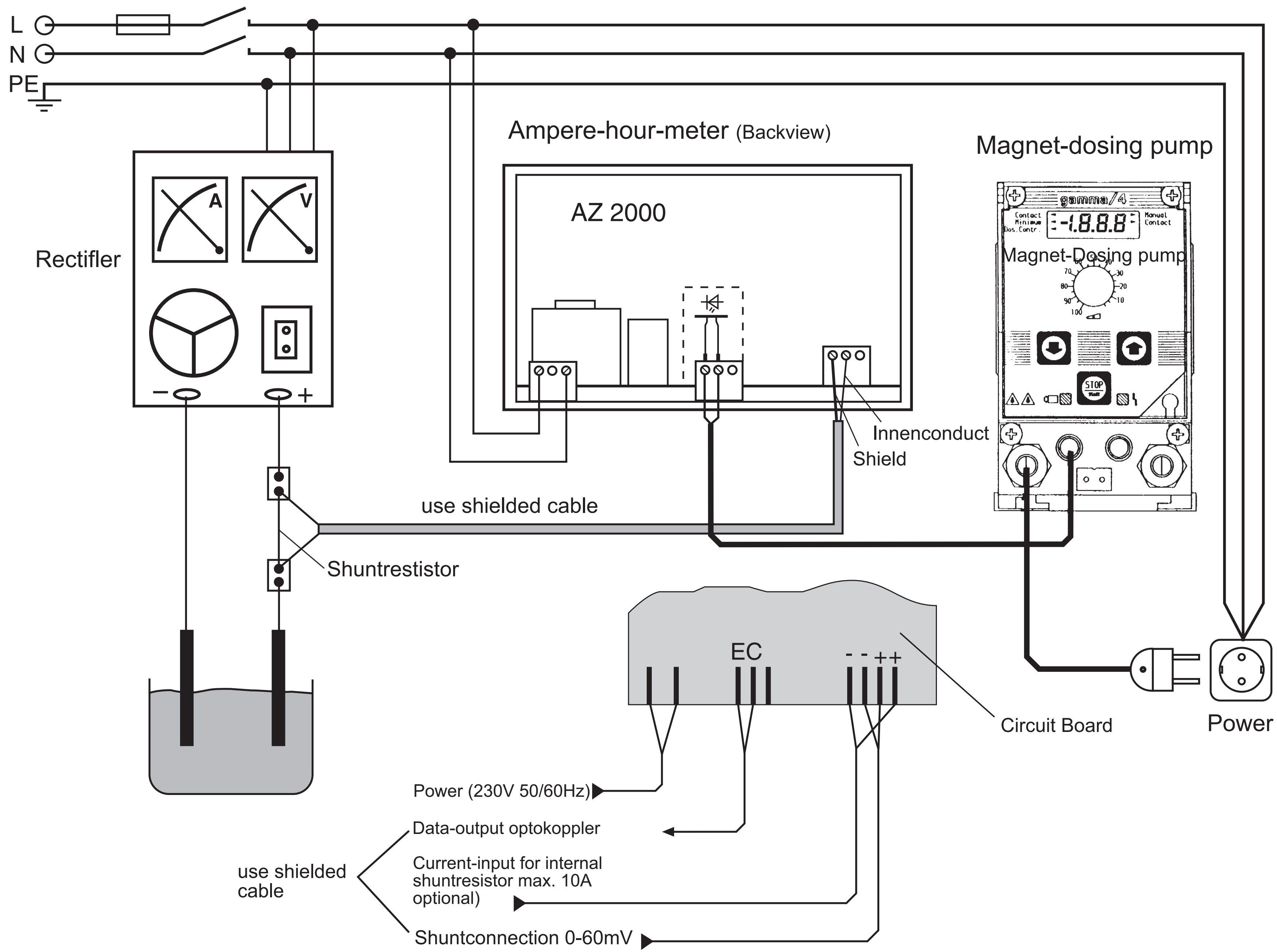
## 8.1 Connection AZ 2000



## 8.2 Connection isolating modules to AZ 2000



## 8.3 Connection AZ 2000 to magnetic dosing pump gamma/4-b



# 9 Setting instructions

The following notes and setting tables apply to the calibration of the AZ and to changing the indication accuracy (resolution).

## 9.1 Preparation of the unit

**IMPORTANT:**

**Before opening the unit, check that it is not live!**
**Otherwise the operation is extremely hazardous!!**

**The circuit board must onty be touched at the edges!**

**Make sure that you do not carry any electrostatic charges, otherwise the sensitive MOS components may be destroyed. Discharge any static charge by touching a metai object at ground potential, such as water pipe, earth connection, or a large metal object such as a bench.**

**AZ 2000**

1. Open the back panel and carefully remove the circuit board.
2. Make the adjustments according to the table. The location of the controls is shown in the diagrams below.
3. After the adjustments have been made, slide the circuit board back into the housing. Take care with the front and the controls. Replace the back panel.

## 9.2 Setting procedure

The rotary switches **S1, S2, S3, S4** are used to set the division ratio. The settings depend on the shunt resistance used, and also on the required measuring unit (Ampere-hour, Ampere-minute).

The equipment is set at the factory according to your order details.
It can however readily be changed with reference to the tables.
(Please use a small watchmaker´s screwdriver!)

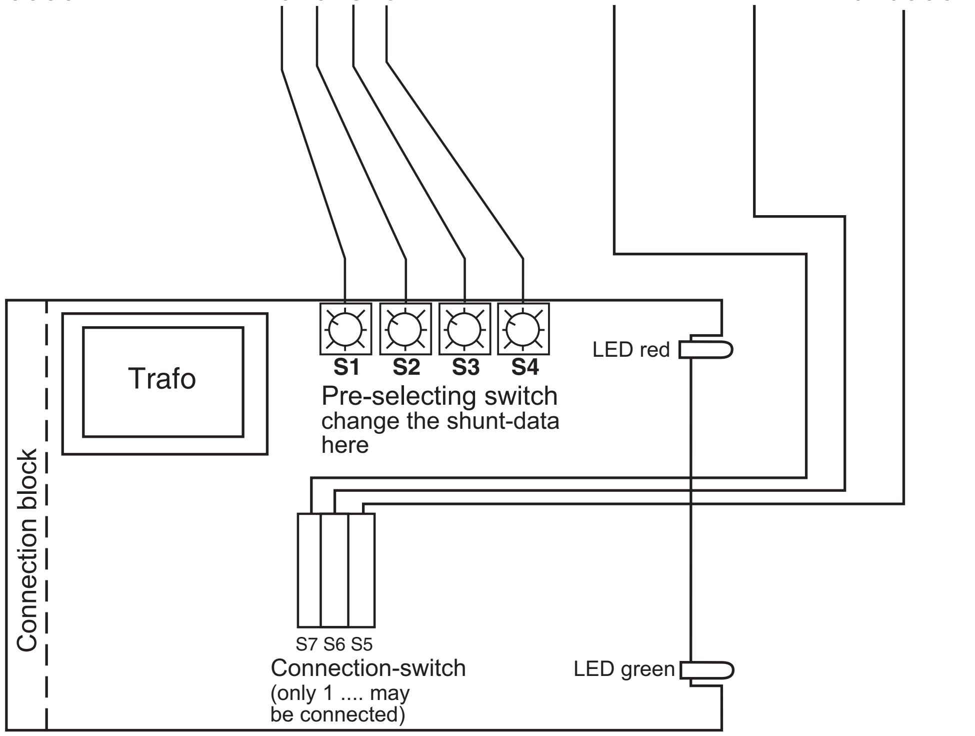
The tables show the values for the various shunt resistances.

Please note that the counters may have to be provided with a **"decimal point"** (label).
Appropriate symbols are placed on the internal face of the housing back.

## 9.3 Setting tables Ampere-hour meter/Ampere-minute meter

### 9.3.1 Ampere-**hour** meter AZ 2000

| | Pre-setting switches | Summation counter reading / **hour** | | |
|---|---|---|---|---|
| **Shunt** | **1 2 3 4** | **S7** | **S6** | **S5** |
| 40 A | 9 0 0 0 | 0040,00 | 00040,0 | 000040 |
| 50 A | 7 2 0 0 | 0050,00 | 00050,0 | 000050 |
| 60 A | 6 0 0 0 | 0060,00 | 00060,0 | 000060 |
| 80 A | 4 5 0 0 | 0080,00 | 00080,0 | 000080 |
| 100 A | 3 6 0 0 | 0100,00 | 00100,0 | 000100 |
| 150 A | 2 4 0 0 | 0150,00 | 00150,0 | 000150 |
| 200 A | 1 8 0 0 | 0200,00 | 00200,0 | 000200 |
| 250 A | 1 4 4 0 | 0250,00 | 00250,0 | 000250 |
| 300 A | 1 2 0 0 | 0300,00 | 00300,0 | 000300 |
| 400 A | 0 9 0 0 | - | 00400,0 | 000400 |
| 500 A | 0 7 2 0 | - | 00500,0 | 000500 |
| 600 A | 0 6 0 0 | - | 00600,0 | 000600 |
| 800 A | 0 4 5 0 | - | 00800,0 | 000800 |
| 1000 A | 0 3 6 0 | - | 01000,0 | 001000 |
| 1200 A | 0 3 0 0 | - | 01200,0 | 001200 |
| 1500 A | 0 2 4 0 | - | 01500,0 | 001500 |
| 2000 A | 0 1 8 0 | - | 02000,0 | 002000 |
| 2500 A | 0 1 4 4 | - | 02500,0 | 002500 |
| 3000 A | 0 1 2 0 | - | 03000,0 | 003000 |
| 4000 A | 0 0 9 0 | - | - | 004000 |
| 5000 A | 0 0 7 2 | - | - | 005000 |
| 6000 A | 0 0 6 0 | - | - | 006000 |
| 8000 A | 0 0 4 5 | - | - | 008000 |
| 10000 A | 0 0 3 6 | - | - | 010000 |



# 9.3.2 Ampere-**minute** meter AZ 2000

| Shunt | Pre-setting switches 1 | 2 | 3 | 4 | Summation counter reading / **minute** S7 | S6 | S5 |
|---|---|---|---|---|---|---|---|
| 1 A | 6 | 0 | 0 | 0 | 0001,00 | 00001,0 | 000001 |
| 2 A | 3 | 0 | 0 | 0 | 0002,00 | 00002,0 | 000002 |
| 4 A | 1 | 5 | 0 | 0 | 0004,00 | 00004,0 | 000004 |
| 5 A | 1 | 2 | 0 | 0 | 0005,00 | 00005,0 | 000005 |
| 6 A | 1 | 0 | 0 | 0 | 0006,00 | 00006,0 | 000006 |
| 10 A | 0 | 6 | 0 | 0 | - | 00010,0 | 000010 |
| 15 A | 0 | 4 | 0 | 0 | - | 00015,0 | 000015 |
| 20 A | 0 | 3 | 0 | 0 | - | 00020,0 | 000020 |
| 25 A | 0 | 2 | 4 | 0 | - | 00025,0 | 000025 |
| 40 A | 0 | 1 | 5 | 0 | - | 00040,0 | 000040 |
| 50 A | 0 | 1 | 2 | 0 | - | 00050,0 | 000050 |
| 60 A | 0 | 1 | 0 | 0 | - | 00060,0 | 000060 |
| 100 A | 0 | 0 | 6 | 0 | - | 00100,0 | 000100 |
| 150 A | 0 | 0 | 4 | 0 | - | - | 000150 |
| 200 A | 0 | 0 | 3 | 0 | - | - | 000200 |
| 250 A | 0 | 0 | 2 | 4 | - | - | 000250 |
| 300 A | 0 | 0 | 2 | 0 | - | - | 000300 |
| 400 A | 0 | 0 | 1 | 5 | - | - | 000400 |