Technical Information
Ampere-hour Meters
AZ 2000 DSZ

Contents

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 the use 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

- **- ampere-hour meter**
- **- ampere-minute meter**
- **- ampere-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 Descripfion of the controls

Summation counter

Insert the reset key here to reset the summation counter

AZ 2000 DSZ
Ah / Amin- ZÄHLER

3 0

sec
100
Ah/Amin

Netz   ◄ MB ►

Mains lamp (green)

LED signal lights above or below the measuring range

Signal lamp for dosing puls

Pre-setting of dosing time
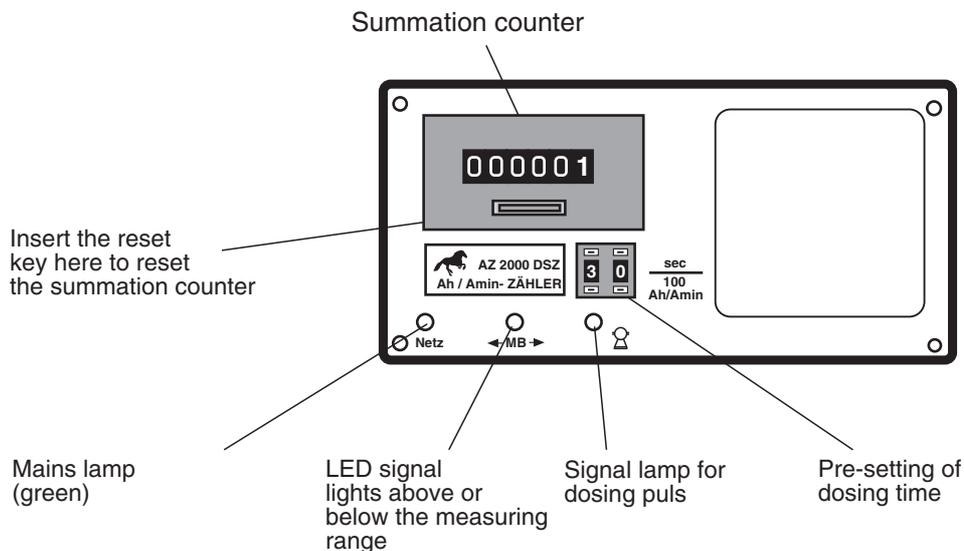
3. Operating principle

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 which stops the count.

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

3.1 Block circuit diagram
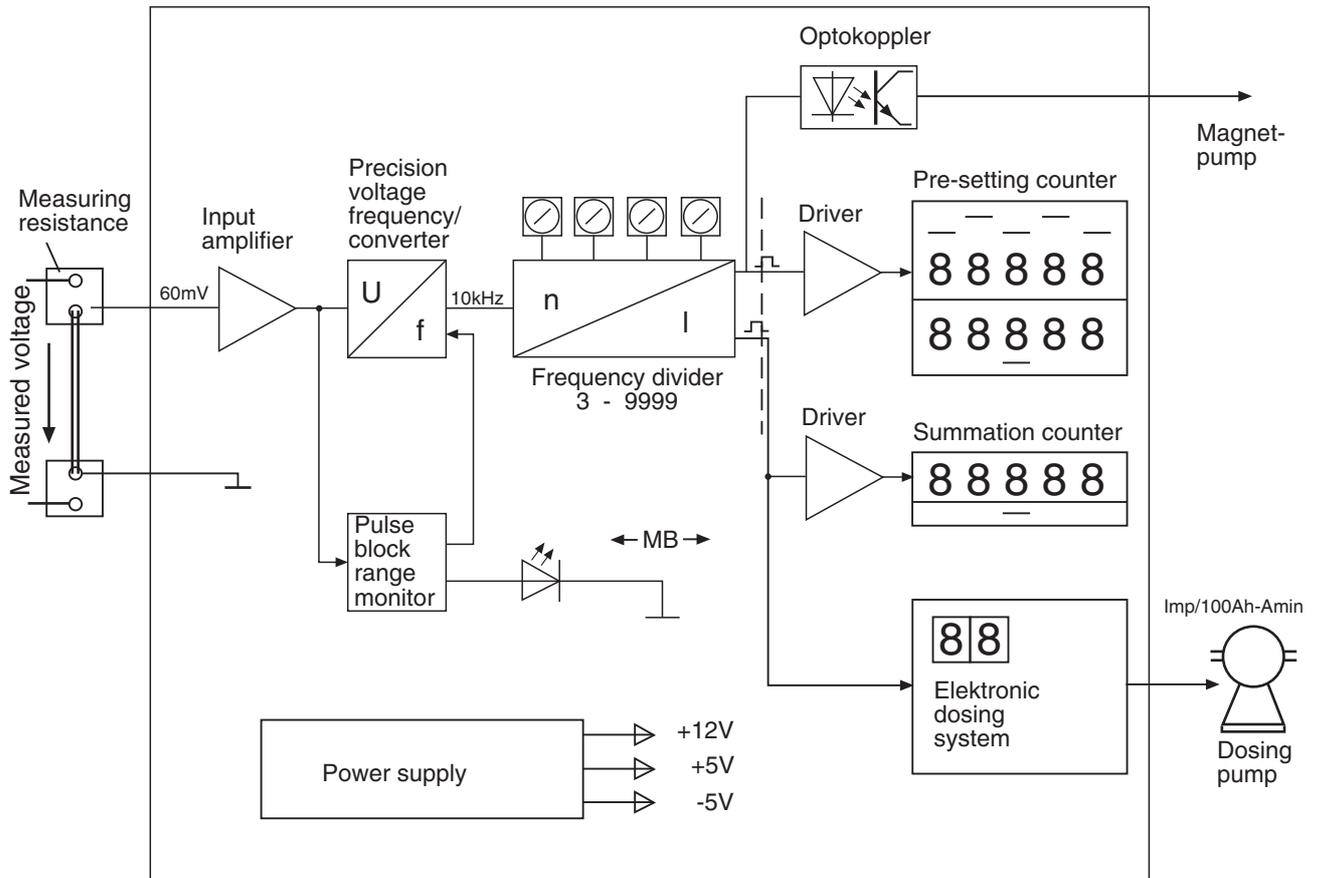
4. Instrument descriptions
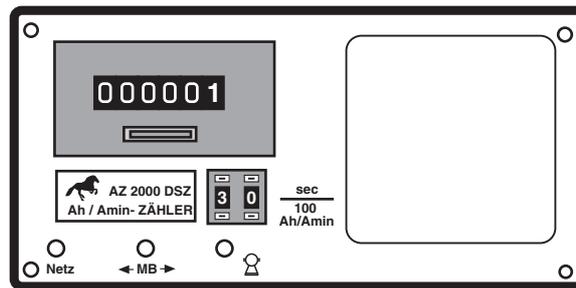
AZ 2000 DSZ

This instrument operates as a summation counter witb a 6-digit electromechanical counter. The reading is reset with a key. This prevents unintentional changes in the counter reading.
With a difterent case size (W x H 144x72) it is possible to incorporate an electronic dosing system DSZ in this unit.
Connection to the gamma/4-b magnetic-dosing pump is possible with the standard optocoupler output.

Range monitor -MB-

The AZ 2000 DSZ 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 no longer assured.

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

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 DSZ** as the total summation current.

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

The **AZ 2000 DSZ** 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)
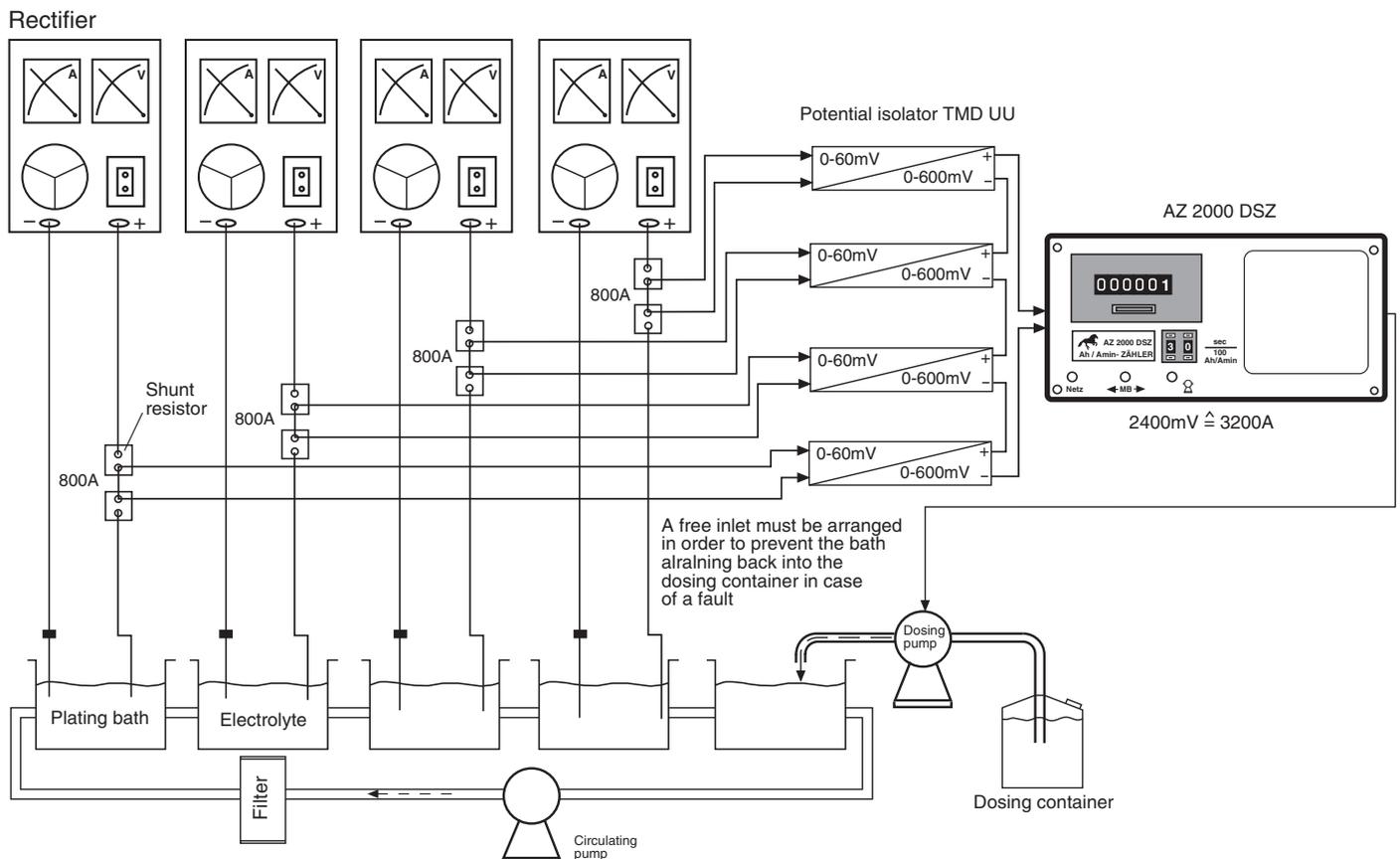
6.   Description electrical dosing systems

6.1   Introduction

During electrochemical processes in electroplating beths the electrical current causes metals to be deposited.

The quantity of metal deposited depends on the magnitude of the electrical current, the plating time, and the electrochemical equivalent of the metal.

In order to ensure that the plating bath has a uniform quality it is necessary to replase the deposited metal and to feed in other chemical additives.

It provides for accurate, current-related dosing of the necessary substances.

We have developed the following dosing system for the different applications:

-DSZ: selection of the dosing time in sec/min per 10/100/1000 Ah/Amin

-AZ/gamma/4-b: Setting the Ah/Amin after which a control pulse output is produced. This is selected directly on the programmble gamma/4-b magnetic dosing pump.

The operation of the electronic dosing systems is described in detail in Sections 6.2-6.5.
The basic arrangement of a dosing system is illustrated in the functuional circuit diagram below.
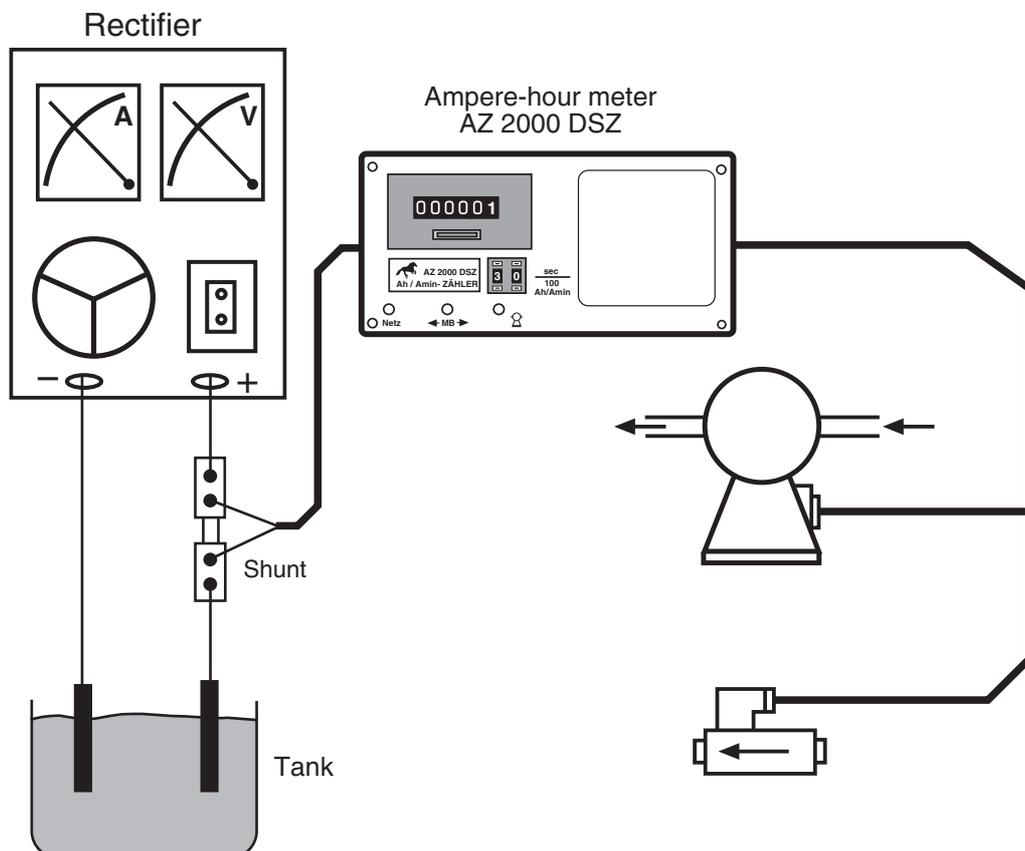
6.2 Electronic dosing system DSZ

The dosing System DSZ causes a timer to be started up at intervais of 10 / 100 or 1000 Ah/Amin.

The on-time of the timer can be adjusted between 1 and 99 seconds on the front panel of the AZ. An option is an build in adjustment range.

Example:

Selected on-time: 30 sech 100 Ah/Amin.

Operating mode: every 100 Ah/Amin a dosing pump or a solenoid valve is energised or opened for a duration of 30 seconds.

The dosing quantity depends on the output of the pump or on the flow rate at the solenoid valve.

The output of the dosing system DSZ consists of a volt-free switching contact (8 A /250 V) which controls the supply voltage of the dosing pump or solenoid valve.

6.2.1 Functional circuit diagram DSZ on dosing equipment
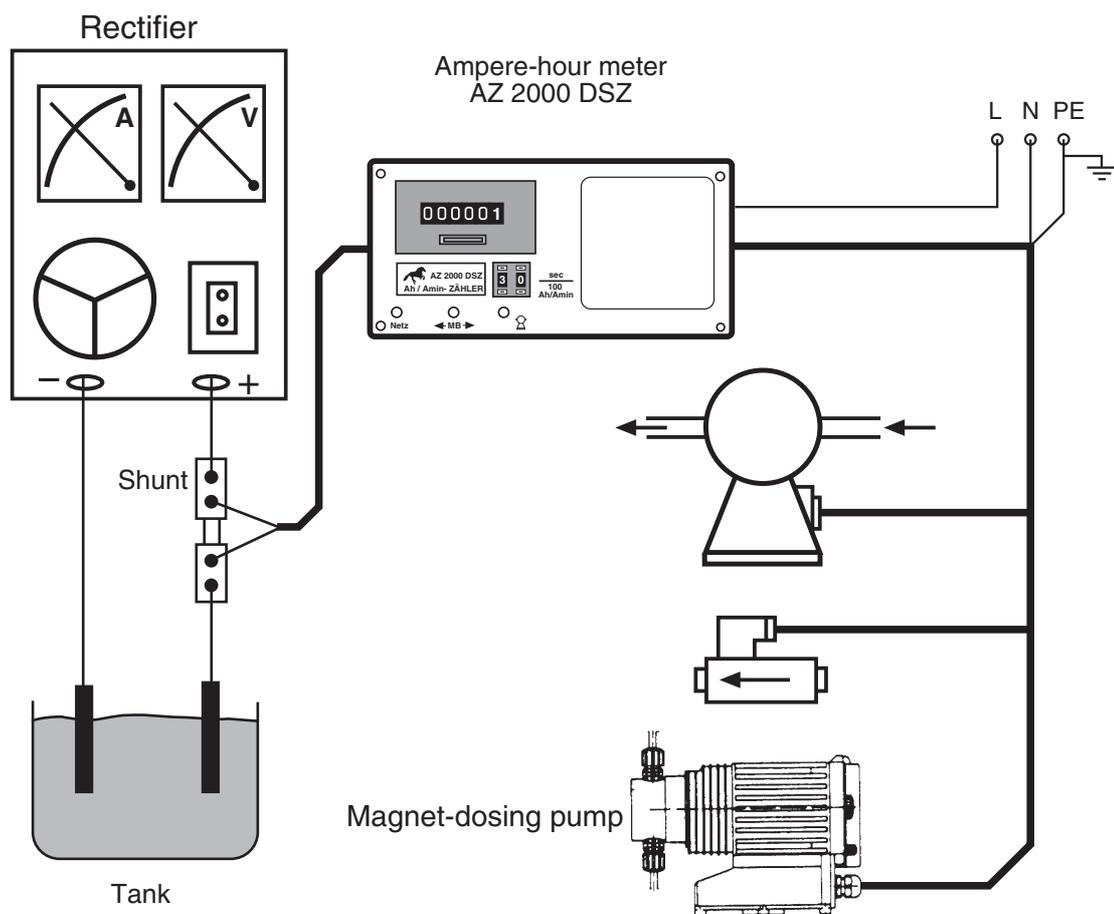
7. Ampere-hour meter AZ 2000 DSZ with magnetic dosing pump

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 magnetic 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.

7.1 Functional circuit diagramm AZ 2000 DSZ with gamma/4-b
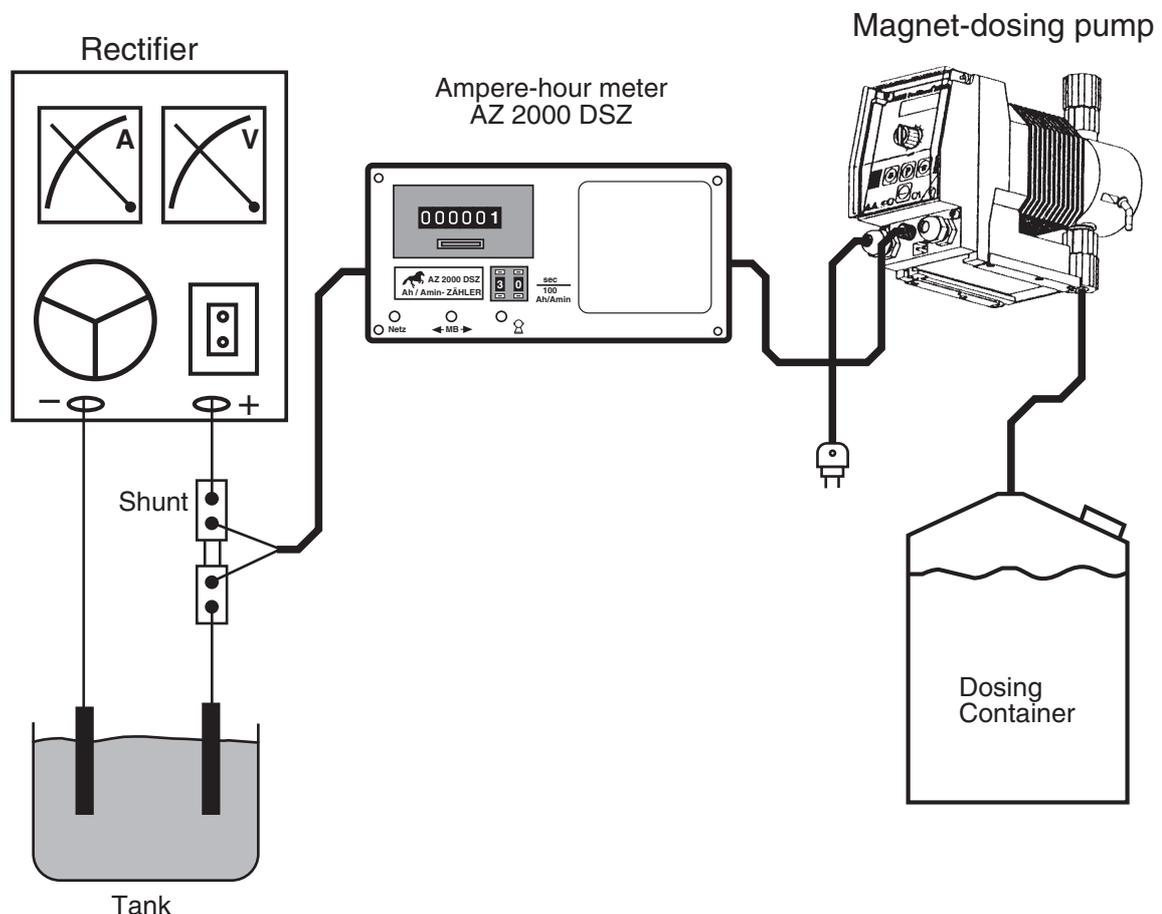
8. Technical data

Countermodel	AZ 2000	AZ 2000 DSZ	AZ 4000	AZ4000 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 gammal4-b pump	X		X	
Floating relay output to control the gamma/4-b pump		X		X
Relay output 8 AI250 V 50160 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.

9. Connection diagrams

9.1 Connection AZ 2000 DSZ

Circuit board

+ Current-input for
internal shunt
I (max. 12A optional)

C E
I Data-output
C optokoppler 2
+

Input for external re-
setting of the
electronic pre-
setting counters

C E
I Data-output
optokoppler 1
C +

Relay-output for
pre-setting counter

Power (230V-AC/50Hz)

Amperehourmeter (Backview)

AZ 2000 DSZ

use shielded cable

Shunt

Rectifier

L
N
PE
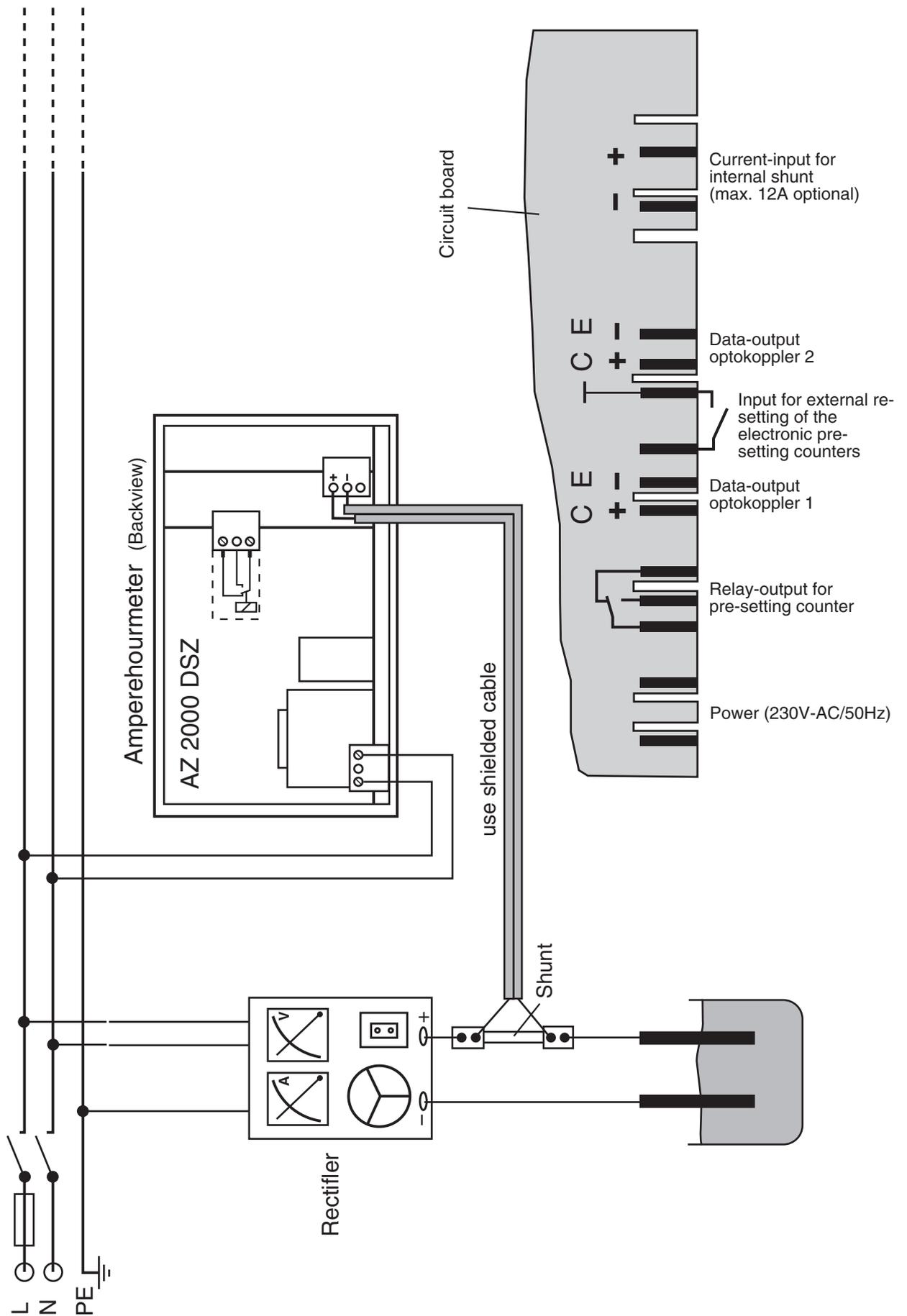
9.2 Connection isolating modules to AZ 2000 DSZ

○□		*NEUKUM elektronik GmbH*		□○	
○□		**TMD U / U**		□○	
○□		Betriebsspannung: 230 V AC		□○	
⊘□	6	- Ausgang	230 V AC	1	□⊘
⊘□	5	+ Ausgang	230 V AC	2	□⊘
⊘□	4	+ Eingang	Eingang -	3	□⊘

Shunt **n**

+   -
from rectifler

Potential-disconnect module
TMD U/U

○□		*NEUKUM elektronik GmbH*		□○	
○□		**TMD U / U**		□○	
○□		Betriebsspannung: 230 V AC		□○	
⊘□	6	- Ausgang	230 V AC	1	□⊘
⊘□	5	+ Ausgang	230 V AC	2	□⊘
⊘□	4	+ Eingang	Eingang -	3	□⊘

Shunt **2**

+   -
from rectifler

○□		*NEUKUM elektronik GmbH*		□○	
○□		**TMD U / U**		□○	
○□		Betriebsspannung: 230 V AC		□○	
⊘□	6	- Ausgang	230 V AC	1	□⊘
⊘□	5	+ Ausgang	230 V AC	2	□⊘
⊘□	4	+ Eingang	Eingang -	3	□⊘

Shunt **1**

+   -
from rectifler

Innenconduct

Shield

AZ 2000 DSZ

Shuntconnection

-    **+**
Shield   Innenconduct

L
N
PE

Power

Magnet-Dosing pump

Ampere-hour-meter (Backview)

AZ 2000 DSZ

Shunt

Rectifler

L
N
PE

10.   Setting instructions for the counters Series AZ....

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

10.1 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 DSZ

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.

10.2 Setting procedure

The rotary switches **SA, SB, SC, SD** 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 pre-setting counter and summation counter each have in addition a set of **3** switches in order to determine the number of places after the decimal point. 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.

10.3.1   Ampere-**hour** meter AZ 2000 DSZ

Shunt	Pre-setting switches				Summation counter reading / **hour**			Pre-setting counter reading / **hour**		
	A	B	C	D	S1	S2	S3	S4	S5	S6
40 A	9	0	0	0	0040,00	00040,0	000040	040,00	0040,0	00040
50 A	7	2	0	0	0050,00	00050,0	000050	050,00	0050,0	00050
60 A	6	0	0	0	0060,00	00060,0	000060	060,00	0060,0	00060
80 A	4	5	0	0	0080,00	00080,0	000080	080,00	0080,0	00080
100 A	3	6	0	0	0100,00	00100,0	000100	100,00	0100,0	00100
150 A	2	4	0	0	0150,00	00150,0	000150	150,00	0150,0	00150
200 A	1	8	0	0	0200,00	00200,0	000200	200,00	0200,0	00200
250 A	1	4	4	0	0250,00	00250,0	000250	250,00	0250,0	00250
300 A	1	2	0	0	0300,00	00300,0	000300	300,00	0300,0	00300
400 A	0	9	0	0	-	00400,0	000400	400,00	0400,0	00400
500 A	0	7	2	0	-	00500,0	000500	500,00	0500,0	00500
600 A	0	6	0	0	-	00600,0	000600	600,00	0600,0	00600
800 A	0	4	5	0	-	00800,0	000800	800,00	0800,0	00800
1000 A	0	3	6	0	-	01000,0	001000	-	1000,0	01000
1200 A	0	3	0	0	-	01200,0	001200	-	1200,0	01200
1500 A	0	2	4	0	-	01500,0	001500	-	1500,0	01500
2000 A	0	1	8	0	-	02000,0	002000	-	2000,0	02000
2500 A	0	1	4	4	-	02500,0	002500	-	2500,0	02500
3000 A	0	1	2	0	-	03000,0	003000	-	3000,0	03000
4000 A	0	0	9	0	-	-	004000	-	4000,0	04000
5000 A	0	0	7	2	-	-	005000	-	5000,0	05000
6000 A	0	0	6	0	-	-	006000	-	6000,0	06000
8000 A	0	0	4	5	-	-	008000	-	8000,0	08000
10000 A	0	0	3	6	-	-	010000	-	-	10000

(only 1 .... may be connected)

SA   SB   SC   SD
Pre-selecting switch

S4 S5 S6   S1 S2 S3

IC

Board

Connection block

Trafo

Circuit board for electronic dosing

LED yellow

Circuit board for dosing preparation

LED green
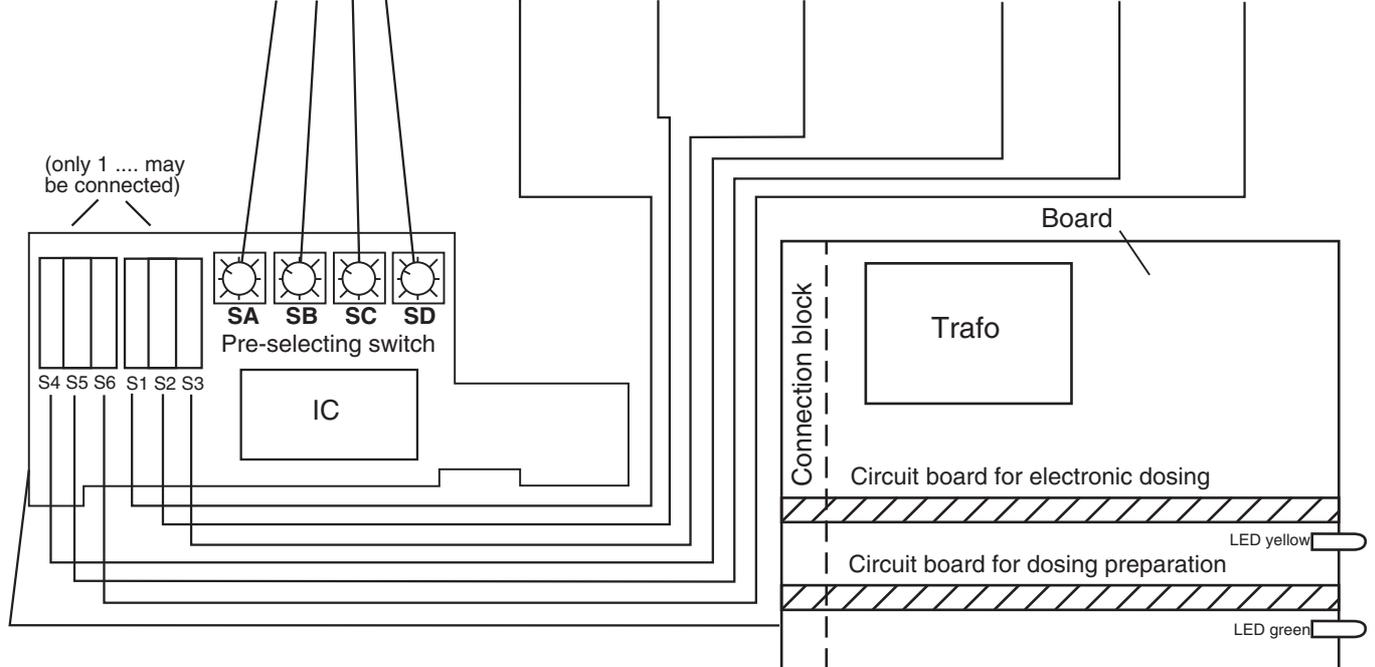
10.3.2   Ampere-**minute** meter AZ 2000 DSZ

	Pre-setting switches				Summation counter reading / **minute**			Pre-setting counter reading / **minute**		
Shunt	**A**	**B**	**C**	**D**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**
1 A	6	0	0	0	0001,00	00001,0	000001	001,00	0001,0	00001
2 A	3	0	0	0	0002,00	00002,0	000002	002,00	0002,0	00002
4 A	1	5	0	0	0004,00	00004,0	000004	004,00	0004,0	00004
5 A	1	2	0	0	0005,00	00005,0	000005	005,00	0005,0	00005
6 A	1	0	0	0	0006,00	00006,0	000006	006,00	0006,0	00006
10 A	0	6	0	0	-	00010,0	000010	010,00	0010,0	00010
15 A	0	4	0	0	-	00015,0	000015	015,00	0015,0	00015
20 A	0	3	0	0	-	00020,0	000020	020,00	0020,0	00020
25 A	0	2	4	0	-	00025,0	000025	025,00	0025,0	00025
40 A	0	1	5	0	-	00040,0	000040	040,00	0040,0	00040
50 A	0	1	2	0	-	00050,0	000050	050,00	0050,0	00050
60 A	0	1	0	0	-	00060,0	000060	060,00	0060,0	00060
100 A	0	0	6	0	-	-	000100	100,00	0100,0	00100
150 A	0	0	4	0	-	-	000150	150,00	0150,0	00150
200 A	0	0	3	0	-	-	000200	200,00	0200,0	00200
250 A	0	0	2	4	-	-	000250	250,00	0250,0	00250
300 A	0	0	2	0	-	-	000300	300,00	0300,0	00300
400 A	0	0	1	5	-	-	000400	400,00	0400,0	00400

(only 1 .... may be connected)

SA   **SB**   **SC**   **SD**
Pre-selecting switch

S4 S5 S6 S1 S2 S3

IC

Board

Connection block

Trafo

Circuit board for electronic dosing

LED yellow

Circuit board for dosing preparation

LED green