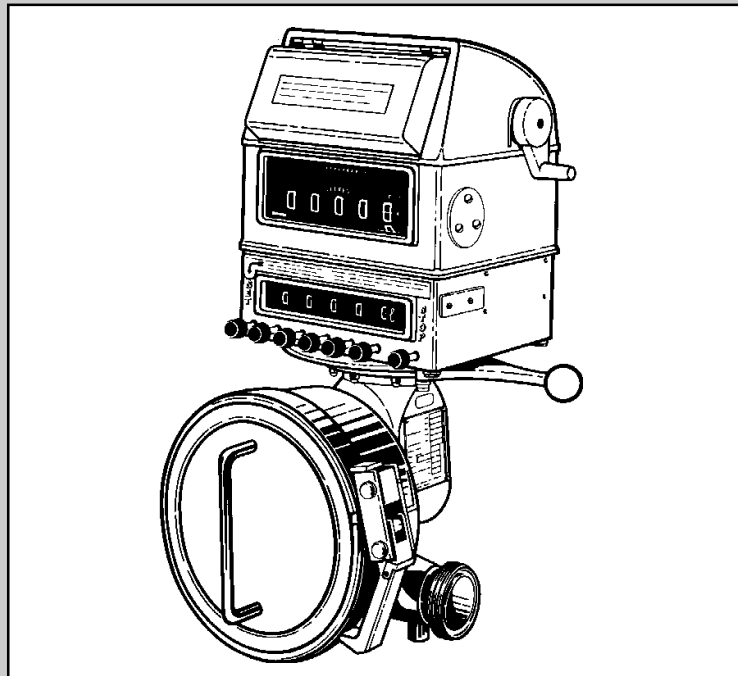


## Operating Manual

# Koltek OT-Liquid Meters K10 and K11



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**Machinery Plate**

<b>OT-meters</b>	Type	<input type="text"/>
	NS	<input type="text"/> mm
Type Approval	No.	<input type="text"/>
Manufacturing	No.	<input type="text"/>
	Year	<input type="text"/>
Rotary piston		<input type="text"/>
Cyclic volume		<input type="text"/> litres
Flow	min. <input type="text"/> max. <input type="text"/>	l/min.
Pressure	max. <input type="text"/>	bar
Measuring Temperature	max. <input type="text"/>	°C
Quantity	min. <input type="text"/>	litres
99181384 Meter is approved for measuring of potable liquids.		

### Application

The stainless steel OT-meters are specifically designed for measuring and dosing liquid food products and other products requiring hygienic design and great accuracy.

### Description

The OT-meter measures the volume of a liquid flowing through the measuring chamber. The measurement is based on the movement of a piston which is rotated by the liquid. One revolution of the is equivalent to an exact and known volume.

#### Type K10

The movement of the piston is registered on either a mechanical counter, a pulse transmitter or both simultaneously. They are both driven by the piston through a magnetic coupling, thus avoiding sealing and problems.

If both a counter and a pulse transmitter are mounted the transmitter is mounted directly on the gear box of the measuring part and the counter on top of the transmitter. In this case a special intermediate drive between transmitter and counter is required.

#### Type K11

The pulse transmitter is integrated with the measuring unit and picks up the signals from a permanent magnet in the piston, one signal per revolution. Each signal is then divided into several pulses by the transmitter.

The meter is not calibrated so the calibration is to be made on the control unit that is connected to the transmitter.

The Type K11 is capable of measuring both flow directions

### Standard design

The OT-meter is available with male part or clamp connections according to required standard. Three types of rotary pistons, N, P, and S, are available. The type to be used depend on product and cleaning temperatures. For selection, please see page 7.

The standard flow direction is from left to right as seen when facing the front of the meter. This direction can be changed or the meter can be delivered with the opposite flow direction, if required.

### Materials

The casing, cover, and clamp assembly are of stainless steel, AISI 304.

The parts are inside precision ground and outside polished to facilitate accuracy and cleaning. The rotary piston is made of a special hard rubber compound which withstands some mechanical impacts.

The casings for counters and gearbox for type K10 are made of cast light metal with a non corrosive coating.

The meter can be delivered with rubber seals in Nitrile (NBR), EPDM, or Viton (FPM) as per requirement.

#### Available sizes

38 mm (1 1/2"), 51 mm (2"), and 76 mm (3").

# Technical data

## Measuring part

Size mm	38	51	76
Flow rate l/h	900 to 9000	2000 to 25000	6000 to 60000
Max. operating pressure	300 kPa, 3 bar	400 kPa, 4 bar	400 kPa, 4 bar
On special order	800 kPa, 8 bar	800 kPa, 8 bar	600 kPa, 6 bar
Temperature range °C	0 to +40	0 to +40	0 to +40
On special order °C	+40 to +80	+40 to +80	+40 to +80
Accuracy, better than %	0.25	0.25	0.25
Repeatability, better than %	0.05	0.05	0.05
Viscosity, up to mPa.s (cP)	2000	2000	2000
Net weight without counter type K10, kgs	19	25	60
Net weight type K11	16	22	57

For cleaning liquid temperature, please see table page 7.

### Counters for type K10

Counter, flow up to	99,999	litres
Increment	0.1	litres
Digit size	18	mm
Totalizing counter up to	99,999,999	litres
Printer (if included)	99,999	litres
Printing increment	1	litre
Preset (if included) up to	99,999	litres
Increment	1	litre

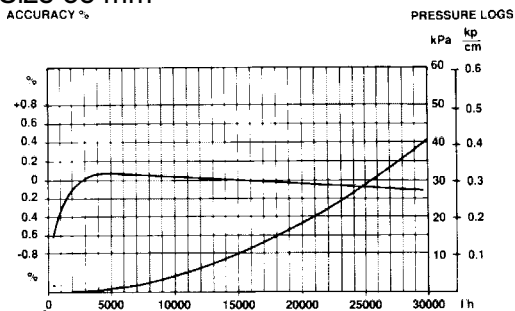
### Counters for type K10

Supply voltage:	12-24 V DC
Output:	Transistor NPN open collector 40 V. open circuit
Channels:	Single channel, 16 pulses per revolution.
Connections:	3 wire cable.

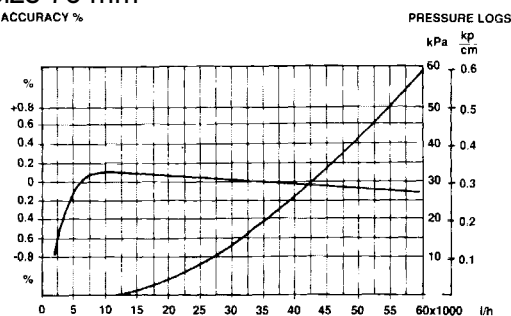
## Accuracy and pressure drop

The curves below show both the accuracy and the pressure drop of the meters as functions of the flow rate when tested with water.

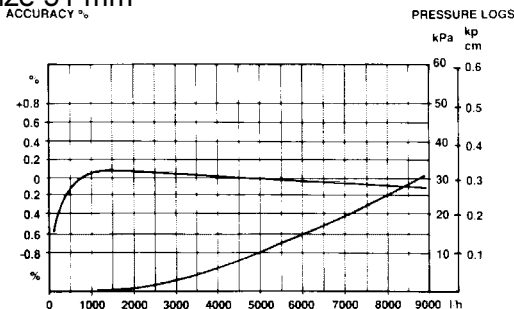
### Size 38 mm



### Size 76 mm



### Size 51 mm



## Viscosity

The pressure loss in the meter is dependant of the meter size, the flow rate, and the viscosity of the liquid being measured.

In order to maintain the mechanical durability of the meter, the maximum value of the pressure loss is limited. This means that the maximum flow rate is reduced when liquids of viscosities higher than that of water are measured.

Almost all liquids with viscosities up to 2000 mPa.s (cP) can be measured.

Most liquids will have increasing viscosity when the temperature is lowered which must be taken into account when selecting the meter or when determining the max. allowable flow.

The table below gives allowable flows at various viscosities.

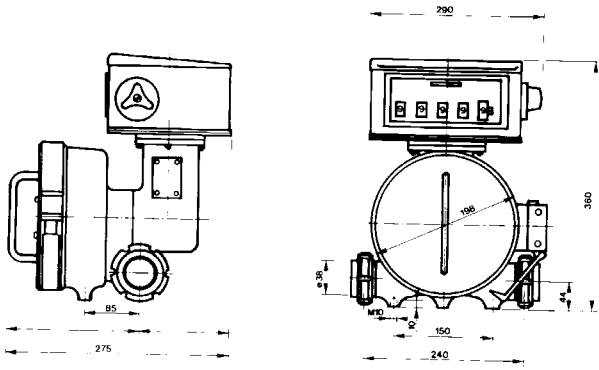
Size of meter mm	Nominal flow min - max	Viscosity of liquid mPa.s (cP)	Allowable flow rate l/h		
			min.	max. continuous	max. intermit. 1)
38	900 - 9000	1	900	9000	10800
		10	720	9000	10200
		100	480	6600	7800
		500	360	4500	6000
		1000	300	3600	4800
		2000	180	1800	2400
51	2000 - 25000	1	2000	25000	30000
		10	1500	25000	27000
		100	1000	17500	22000
		500	750	12500	17000
		1000	600	9000	12000
		2000	400	5000	6000
76	6000 - 60000	1	6000	60000	72000
		10	4800	60000	66000
		100	3000	42000	54000
		500	2400	30000	36000
		1000	1800	20000	27000
		2000	1200	12000	15000

1) These values are for guidance only. The lubrication properties of the liquids and possible contents of soft particles may set limitations.

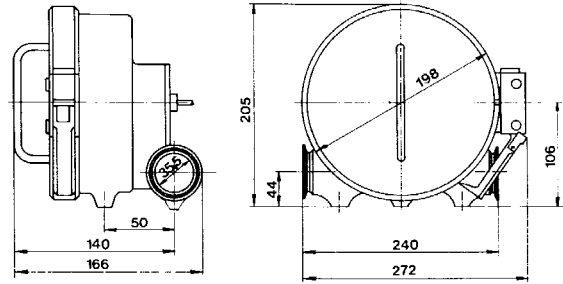
# Dimensions

**OT-meters type 10 with counter only.**  
**Dimensions in mm.**

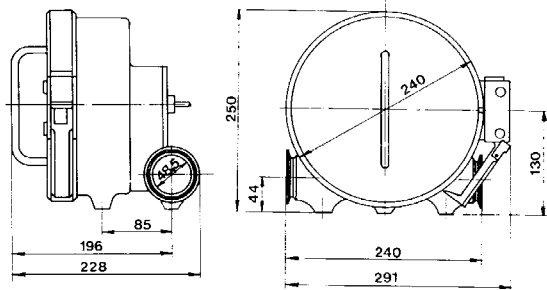
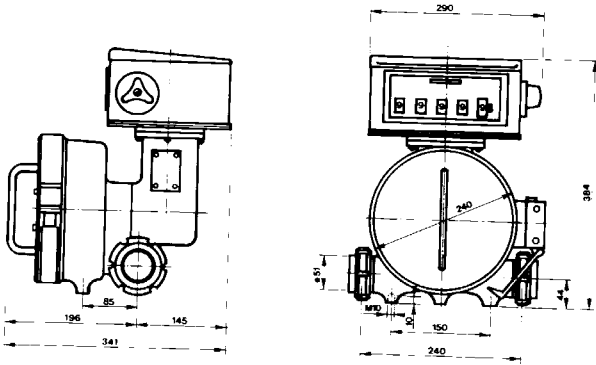
Size 38 mm



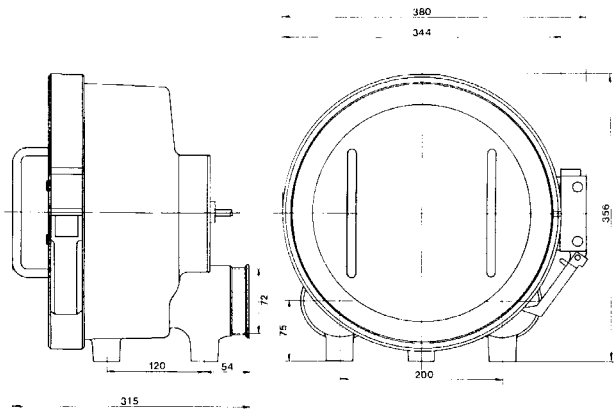
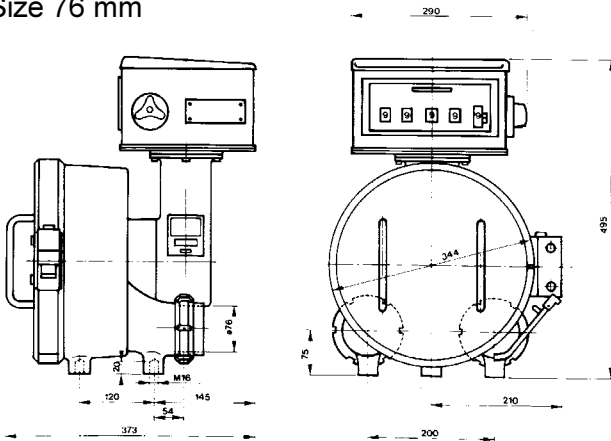
**OT-meters type 11**



Size 51 mm



Size 76 mm



**Products**

The OT meter is suitable where stainless steel AISI 304 and the available rubber types Nitrile (NBR), EPDM, or Viton (FPM) are resistant to the products. This means that it can be used for most products within the food industry.

The liquid to be measured must not contain any solid particles which can harm the rotary piston.

However, liquids containing soft, non liquid substances such as concentrated juices may be measured.

**Cleaning and selection of rotary piston**

Three different types of pistons are available: N, P, and S.

The pistons are marked with the type designation at the end of the stainless steel pivot.

The selection of the proper type for a specific duty is to be based on:

- product temperature
- cleaning temperature.

Product temperature

All pistons N, P, and S are in the standard execution useable for product temperatures up to +40°C (94°F).

On special order the P and S types can be delivered for product temperatures between 40°C and 80°C (94°F and 175°F). The meter must then be calibrated accordingly.

Cleaning temperature

If the rotary piston is removed from the measuring chamber during cleaning the meter can be cleaned at a temperature of up to 100°C (212°F) independent of the type of piston. The piston and the coupling drum may then also be cleaned by hand at the same temperature.

**Warning! When dismantling, washing and assembling the meter all parts must be handled with greatest care. Any distortion of the parts may result in a reduced accuracy of the meter.**

If the piston is left in the meter during CIP cleaning the following instructions should be observed:

The CIP liquid flow must not exceed the max. flow for the meter.

**Rotary piston type N**

Max. cleaning temperature 60°C.

If the temperature changes quickly, 10 to 20°C/sec, from one cleaning stage to the next the piston can be left in place, if the change in temperature is less than 30°C.

If the temperature is changed slowly, less than 20°C/min, the rotary piston need not to be removed.

**Rotary piston type P**

Max. cleaning temperature 95°C.

If the temperature changes quickly, 10 to 20°C/sec, from one cleaning stage to the next the piston can be left in place, if the change in temperature is less than 50°C.

If the temperature is changed slowly, less than 20°C/min, the rotary piston need not to be removed.

**Rotary piston type S**

Max. cleaning temperature 95°C.

If the temperature is changed quickly, 10 to 20°C/sec, from one cleaning stage to the next the piston can be left in place, if the change in temperature is less than 80°C.

If the temperature is changed slowly, less than 20°C/min, the rotary piston need not to be removed.

The selection of the proper rotary piston can be based on the following table, where “dt” is the temperature change:

Piston type	product temperature °C		CIP temperature quick temp. change °C	Piston not removed slow temp. change °C
	standard	special order		
N	0 to +40		max. 60, dt < 30	max. 60
P	0 to +40	+40 to +80	max. 95, dt < 50	max. 95
S	0 to +40	+40 to +80	max. 95, dt < 80	max. 95

## Installation / Dismantling and assembly, measuring part

### Installation

The pipe system must enter the meter in horizontal direction.

Check that the maximum values of flow rate, product pressure and product temperature are not exceeded and that the flow direction is correct. Any possible pressure shocks must not exceed the max. allowed pressure of the meter.

If there is any risk of solid particles, f.ex. ice, in the liquid to be measured, a suitable strainer must be fitted in front of the inlet. The meter must never be allowed to freeze.

If the liquid may contain air it is absolutely necessary to install an air separator in front of the meter in order to maintain the accuracy.

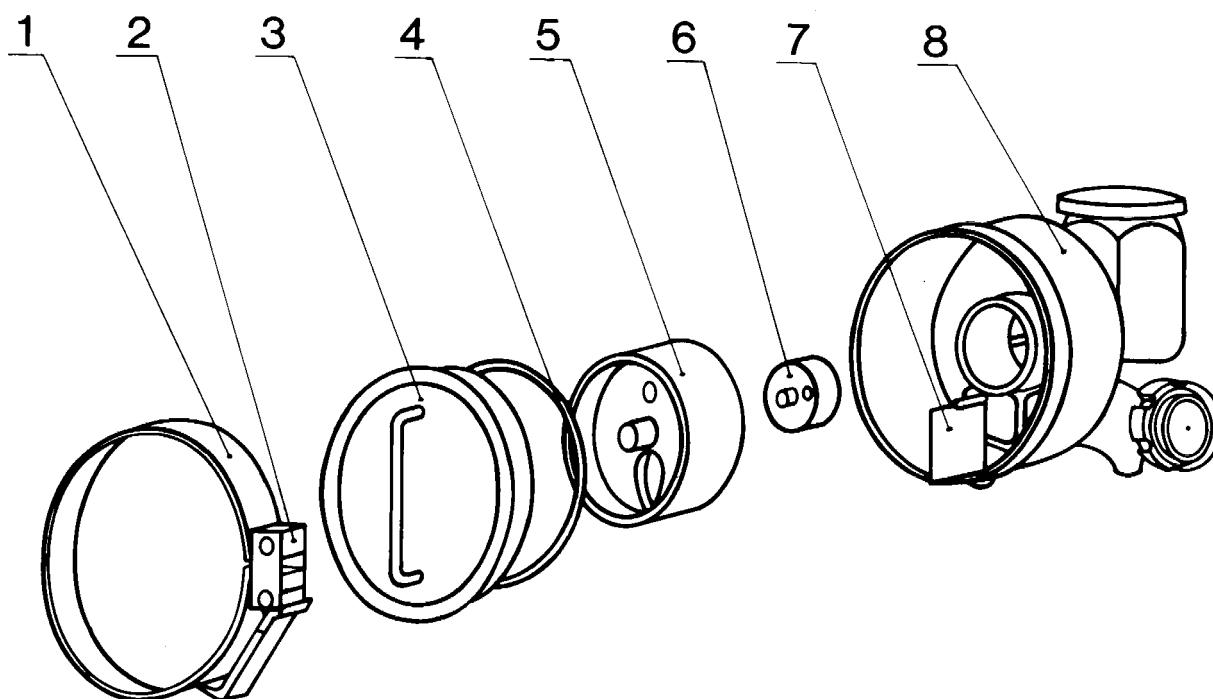
### Dismantling and assembly, measuring part

**Warning! Before opening the measuring chamber, check carefully that there is no pressure in the chamber.**

**During dismantling and assembly all parts of the meter must be treated with great care and protected against shocks.**

To open the measuring chamber release the clamp handle from the locked position and remove the clamp. Pull off the lid. If it sticks to the body, pry it off in the groove between body and lid. When the lid is removed, the piston 5, the coupling drum 6 and the partition 7 can be removed.

The assembly is carried out in reverse order. Lubricate the seal ring with a thin film of edible silicone grease or oil.



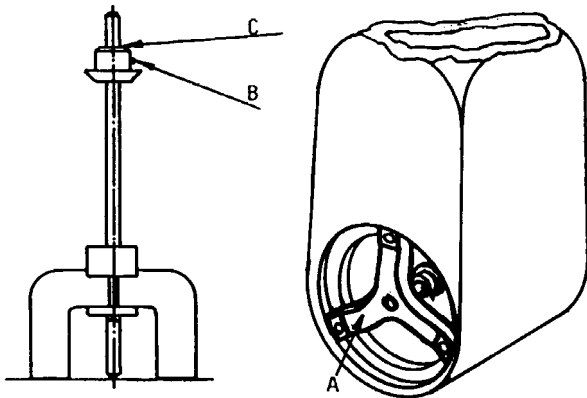
1. Retaining clamp
2. Clamp locking device
3. Lid of measuring chamber
4. Seal ring

5. Rotary piston
6. Magnetic coupling drum
7. Partition
8. Body

# Change of flow direction / Adjustment of retaining clamp

## Change of flow direction, type K10

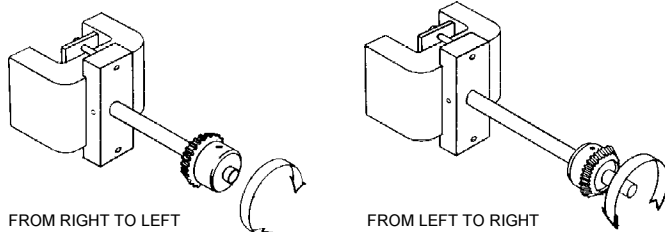
The standard flow direction is from left to right as seen when facing the front of the meter. If it is necessary to change the flow direction proceed as follows:



1. Remove the cover at the rear of the gear box.
2. Remove the magnetic coupling shaft from the gear box.
3. Release the gear wheel by unfastening the stop screw (B).
4. Replace the gear wheel on other way around and then put the magnetic coupling shaft back into the gear box.
5. Gear wheel clearance is adjusted with shaft in place with a help of special tool (A).

Magnetic coupling drum must be in place when adjusting the clearance. Fasten the stop screw in the gear and secure the gear by using glue (Loctite or similar) on one side only (C).

6. Gear clearance is correct when:
  - shaft rotates freely
  - shaft rotates centric
  - small clearance appears on any shaft position
7. Replace the cover.
8. Check that the meter moves freely by turning the magnetic coupling drum by hand.



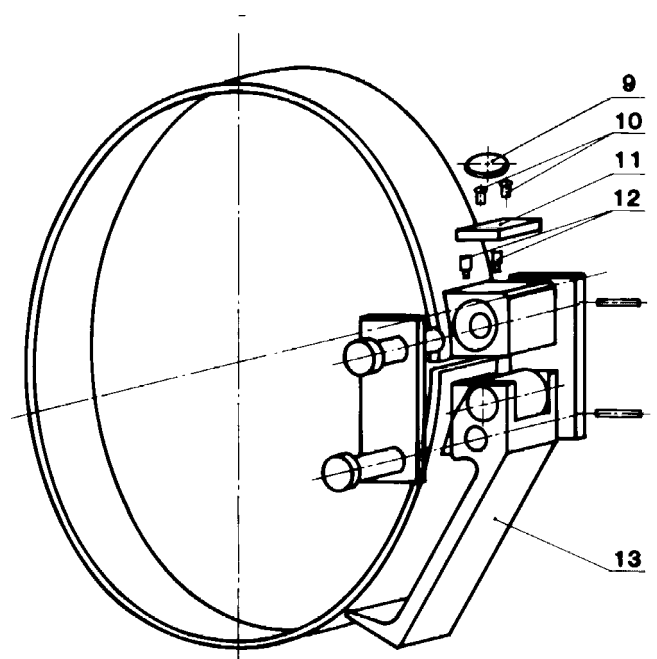
## Adjustment of retaining clamp

The retainer clamp has been adjusted, individually for each meter, by the manufacturer. After adjustment the serial number of the meter has been stamped on the measuring chamber, the lid and on the retainer clamp.

The adjustment is correct when a force of 8 to 10 kgs (18 to 22 lbs.), measured at the end of the handle, is necessary to open the clamp.

If for some reason it is necessary to readjust the clamp, proceed as follows:

1. Remove lead 9, screws 10, and sealing piece 11.
2. Place the measuring chamber lid in its correct position on the measuring chamber. Fit the retainer clamp in its correct position and press the handle into its closed position.
3. Turn the adjusting screws 12 until the force for opening the clamp is 8 to 10 kgs measured at the end of the handle.
4. After adjustment fit sealing piece 11, screws 10 and lead 9 again and seal.



# Maintenance / Read-out correction

## Maintenance

The OT-meter requires only a minimum of maintenance. All bearings are of the self-lubricating type and do not require any further lubrication.

All parts of the meter, especially the parts inside the measuring chamber must be protected against shocks and damage, which could have a detrimental effect on the measuring accuracy.

## Moisture protection

The meter must be protected externally against water splash. The meter is manufactured water-tight, but seals age and may then admit water penetration.

When not in use the meter should be protected with the plastic cover which was supplied with the meter.

## Moisture absorbing package

The counter is provided with a moisture absorbing package to remove possible moisture from condensation inside the counter. The package contains silica gel, which has a blue colour when dry. Along with the moisture absorption the colour turns into red and the absorbing capacity diminishes.

The colour of the gel can be observed through the cover of the package cap. When the gel has lost its effect the package must be dried at a temperature of 100°C or the gel must be renewed.

## Read-out correction, type k10

The read-out obtained from the counter can be corrected by changing a pair of adjusting gears between the counter and the gear box.

In order to determine the error a number of measurements (5 - 10) are to be taken on a known quantity of liquid, f. ex. from a calibration tank. The indicated quantity (read-out) on each measurement is noted and the mean indicated quantity is calculated.

Finally the error percentage is calculated according to the following formula:

$$\text{Error \%} = \frac{\text{Mean indicated quantity} - \text{Actual (known) quantity}}{\text{Actual quantity}} \times 100$$

## Positive error

If the actual quantity is smaller than the indicated quantity, i.e. the counter indicate too much, the error is positive (+).

## Negative error

If the actual quantity is bigger than the indicated quantity, i.e. the counter indicate too little, the error is negative (-).

When the error percentage has been calculated, the necessary correction can be determined from the table page 12. First note the gear combination, Z1/Z2, actually fitted. Find this combination in the center column of the table. From this move horizontally to the left if the error is positive, or to the right if the error is negative until the error percentage closest to the calculated error percentage is reached. From there move upwards and to the right or downwards and to the left along the small inclined lines until the center column is reached again. Here you can read the correct gear combination.

# Replacement of adjusting gears

## Replacement of adjusting gears, type K10

Proceed as follows:

1. Remove cap nuts 1 and lift off the counter.
2. Remove disc 2 with gears by removing the two screws.
3. Insert pin 3 (diameter approx. 2 mm) into hole
4. Unscrew retainer nut and remove gear Z<sub>2</sub>.
4. Lift and turn shaft 5 until it is in locked position  
Remove retaining screw and detach gear Z<sub>1</sub>.
5. Replace gears and assemble in reverse order.

The clearance between gears can be adjusted by turning disc 2. A small, barely detectable clearance is recommended.

6. After assembly check that gears and counter move freely by turning the magnetic coupling part in the measuring chamber by hand.

