val gear meter and pulse generator

Operating instructions



Contents:

1. General details
1.1 Intended use
1.2 Design and functional description
1.3 Technical data

2. General safety instructions
2.1 Information on safety at work
2.2 About safety instructions
2.3 Safety instructions concerning hazards that may arise in connection with the oval gear meter

3. Assembly

4. Installation

5. Routine operation
5.1. Output of liquid during normal operation (Normal Mode)
5.2 Output of liquid with display of current flow rate (Flow Rate Mode)

6. Calibration
6.1 Definitions
6.2 Why calibrate the meter at all?
6.3 Calibration mode

7. Configuration of the oval gear meter

8. Maintenance
8.1 Exchanging batteries
8.2 Cleaning

9. Troubleshooting

10. Repair/service

11. Manufacturer's declaration

12. Exploded drawing

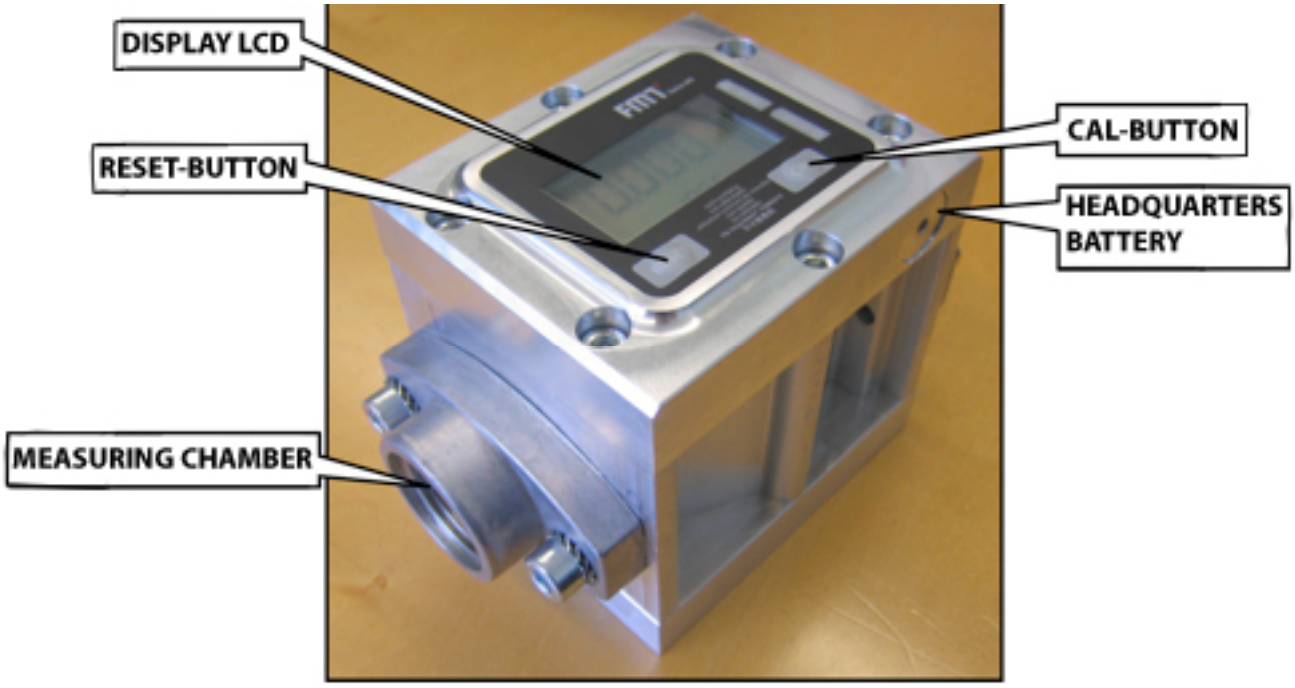
1. General details

1.1 Intended use

- This oval gear meter has been designed and built for measuring volumes of various media featuring different viscosities, and for the storage of data so collected.
- The oval gear meter is intended for installation at the end of an output hose, e.g. a hose reeler.

1.2 Design and functional description

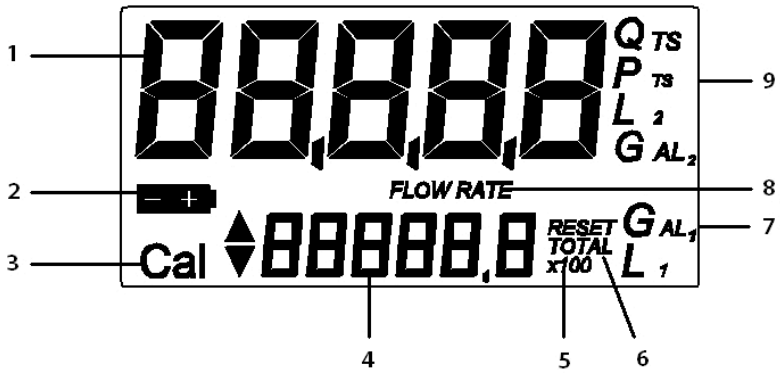
- The oval gear meter is a fluid meter with electronic counter & memory and digital display.
- The medium flowing through the meter sets a number of oval gears in rotation. The revolutions of the gears are converted into electronic pulses and sent to the electronic counter by a Reed switch. The electronics, finally, uses a certain multiplication factor to convert the pulses into an intelligible volume of liquid having gone through the device, which is then shown on the LCD display.
- The multiplication factor has been pre-set at the factory using an average that has turned out to be useful in normal operation. However, it can be easily adapted to specific requirements by the user.
- The total volume measured is stored and can be called up by pressing the TOTAL button.
- Data collection and analysis are being constantly monitored by the electronics. Errors are reported immediately.
- The electronic counter needs a two-phase input signal that's being monitored for phase errors. A self test is being carried out before every reset.
- The user needs only two membrane key switches for operation: Reset and Total (i.e. total volume).
- The body of the device is made of aluminium.
- The two flanges for installation are aligned in a straight axis.
- There is a coarse sieve at the inlet to protect the counting mechanism.



The electronic components and LCD display sit at the top of the meter, far away from and well insulated against the wet measuring chamber. There is a cover to protect them against the working environment.

1) LCD display

The meter's LCD display is equipped with two numeric registers and different types of display modes showing information to the user only when it is actually needed with the operation / function going on at the moment.



Key:

1. Register of partial volume (5 digits with floating decimal: 0.000+99999) showing the amount of liquid that has been delivered since the RESET button was last pressed.
2. Battery charge.
3. Calibration mode.
4. Register of total volume (6 digits with floating decimal 0.0-999999x10/x100) showing two different kinds of total volumes:

4.1. Non-resettable total volume (TOTAL)
4.2. resettable total volume (Reset TOTAL)
5. Total volume multiplication factor (x10/x100);
6. Type of total volume display (TOTAL / Reset TOTAL)
7. Units for total volume: L = litres, Gal = gallons.
8. Flow rate.
9. Display of measuring unit for partial volumes:
Qts = quarters; Pts = pints; L = litres; Gal = gallons;

2) User controls

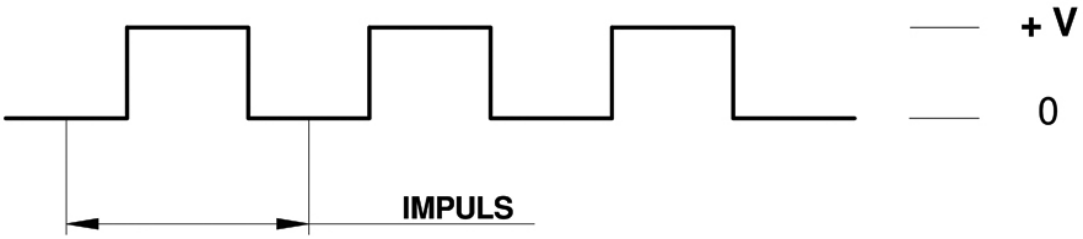
e) There are two push buttons on the meter (RESET and CAL), each controlling two main functions (pressed individually) and various auxiliary sub-functions (pressed simultaneously).

Main functions:

- RESET button: Resetting the partial volume register and the (resettable) total volume register (Reset Total).
- CAL button: Calling up the calibration mode.
Pressed together, the two buttons call up the configuration mode where you select the unit of measurement.

Pulse generator

The pulse generator version is a pulse generator (reed relay) which converts the changes in the magnetic field generated by the rotation of the gears into electrical pulses which are sent to an external receiver. The pulse generator requires no separate power supply because it is supplied directly by the connection with the receiver. The generated pulse is a square wave generated by voltage regulation and can be described as follows:



3) Measuring chamber

The measuring chamber is located in the centre of the meter. The meter is equipped with inlet and outlet flanges. The cover at the bottom allows access to the measuring mechanism (for cleaning etc.).

There are oval gears in the measuring chamber, set in rotation by the flow of liquid. Each revolution will generate an electrical pulse that is processed by the microprocessor on the control circuit board.

The microprocessor uses a calibration factor (i.e. a 'weighting' assigned to each pulse) to convert the pulses generated by the gears' revolutions into an intelligible value representing the volume of liquid that has passed through. It is then displayed in the unit pre-set before in the corresponding registers of the LCD display for partial and total volumes, respectively.

All our oval gear meters leave the factory with a default calibration factor = 1000 called "FACTORY K FACTOR". There is a possibility to 'calibrate' the meter in order to adapt that factor to the physical properties of different liquids.

However, there is always a possibility to return to the manufacturer's default setting.

4) Battery compartment

The meter is powered by two 1.5V standard batteries (N1).

The battery compartment is equipped with a tight screw cap protecting the compartment but allowing for easy access and exchange of batteries.

1.3 Technical data

Oval gear meter

Denomination		19 692	19 693	19 694
Measuring system		Oval gears		
Resolution	l/pulse	0.019	0.028	0.038
	pulse/l	52	35	26
Flow rate range	l/min.	5 + 50	10 + 100	15 + 150
Operating pressure	bar	70	30	20
Bursting pressure	bar	140	60	40
Storage temperature	°C	-20 - +70		
Storage humidity	R.H.	95 %		
Operating temperature (max.)	°C	-10 ÷ + 60		
Flow rate loss at max. flow (diesel oil)	bar	0.3		
Compatible liquids		oil, diesel oil, petrol		
Viscosity range	cSt	2 - 2000		
Accuracy (within flow rate range)		± 0.5		
Repeatability		0.2 %		
Weight	kg	1,8	2	2,2
Inlet / outlet threads		G 1″	G 1″	G 1″
Power supply (batteries)		2x 1.5 Volt		
Standby current draw		50µA		
Operating current draw		370µ.....800µA		
Lifetime of batteries (est.)	h	14000 - 30000		

Pulse generator

Denomination		19 692 690	19 693 690	19 694 690
Max. switching current	mA	500		
Max. switching voltage	V	200 DC or AC peak		
Max. switching power	W	10		
Mechanical contact		Read switch / 1 channel		
Max. pulse acquisition		Up to 100 Hz, at duty cycle 50%		

Table 1-3: Technical data

2. General safety instructions

2.1 Information on safety at work

- The oval gear meter has been designed and built in compliance with the applicable safety and health requirements of the relevant EU directives.
- However, hazards may result from this product if it is not used for its intended purpose or with the necessary care.
- In every case, local safety and accident prevention regulations apply, as well as the safety instructions in these operating instructions.

2.2 About safety instructions

The safety instructions used in these operating instructions indicate various levels of hazards. Various levels of hazards are indicated in the instructions with the following keywords and icons:

Icon	**Keyword**	**Consequences of failure to comply with the safety instructions.**
	CAUTION	Possible light or moderate bodily injury or material damage.

Table 2-1: Classification of the safety instructions according to type and gravity of the hazard

In addition, you will notice general information and tips for handling the product from time to time.

Icon	**Keyword**	**Meaning**
	Tip	Background information and tips on the right way of using the product.

Table 2-2: General information

2.3 Safety instructions concerning hazards that may arise in connection with the oval gear meter



CAUTION

- The oval gear meter has been designed and is suitable for operation with media of low flammability, exclusively.
- Do not operate this oval gear meter in areas with potentially explosive atmospheres.



Tip

Be sure to know and respect, in particular, any water management laws that may exist. In Germany, for instance, § 19g of the German Water Management Act ("WHG") provides that equipment for filling must be designed, constructed, installed, maintained and operated in such a way that bodies of water are not affected in any critical ways.

The owner / operator of filling equipment is obliged to permanently check and manage any such equipment for compliance with the afore-mentioned requirements at the place of installation.

3. Assembly

- The oval gear meter comes fully assembled and ready to go.
- There may be accessories that can or must be fitted. This depends on the model you chose.



Tip

During assembly, make sure everything is perfectly clean. Take particular care that components are well aligned and connected and fit tightly.

4. Installation

The inlet and outlet of the meter are aligned in a straight axis and equipped with 1" threads. The meter may be installed in any given position, as a fixed unit in a pipeline and/or as a mobile unit on a spigot.

The meter does not have a pre-defined flow direction. Both ends may alternatively serve as inlet or outlet, as needed. However, it is absolutely important that the side that is used as inlet (where the pipeline arrives) is equipped with a filter with suitable performance characteristics. Solid particles getting into the measuring chamber might clog up the gears.

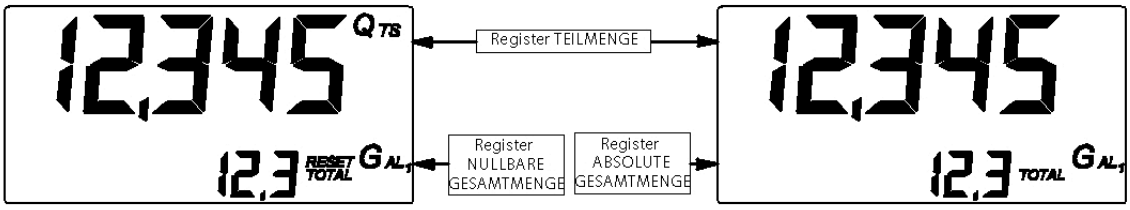
5. Routine operation

The oval gear meter comes pre-assembled and ready to go.

Even after periods of prolonged storage, it will be ready for operation without any lengthy preparations.

The only manoeuvre that may be necessary from time to time during normal operation is to reset the registers of partial and/or resettable total volumes.

To accomplish that, call up the two displays for normal operation. The first normal operation display contains the partial volume and resettable total volume (Reset Total). The other display shows the partial volume and the non-resettable (absolute) total volume. The LCD switches between resettable and absolute total automatically. This has been set at the factory and cannot be influenced by the user.



The register of the absolute total (Total) cannot be reset by the user. It will continue counting during the entire lifetime of the meter. The resettable and non-resettable registers of total volumes (Reset Total and Total) share the same 'window' and the same digits of the LCD display. For that reason, the two numbers cannot be viewed at the same time.

The meter has been programmed so that the one or the other total is visible at certain moments / in certain modes during operation (never both at a time).

- The absolute total volume (Total) is visible in standby mode.
- The resettable total (Reset Total) is visible at the following times / in the following modes.
- For a short moment (several seconds) after resetting the (resettable) partial volume.
- During the output of liquid.

For a few seconds after the output of liquid. As soon as this time span is over, the meter will switch back to standby mode, and the display of the lower register will show the absolute total.

Tip

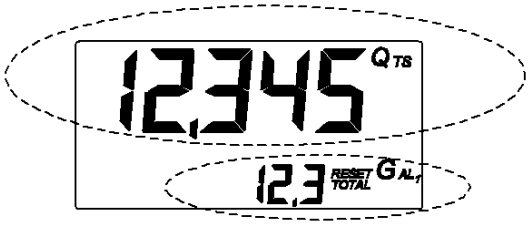
For the display of total volumes, there are 6 digits available, plus two

icons x10 / x100. The increments are activated in the following sequence:

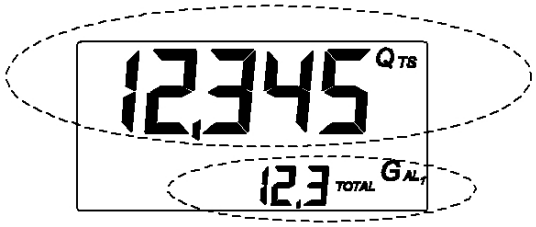
0.0 ---> 99999.9 ---> 999999 ---> 100000 x10 ---> 999999 x10 ---> 100000 x100 ---> 999999 x100

5.1. Output of liquid during normal operation (Normal Mode)

During standard output of liquid, the meter will count and at the same time display the volume having gone through the device so far, and the resettable total (Reset Total).



Accidental pressing of the RESET and/or CAL buttons does not have any effect in this state.



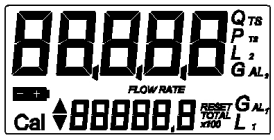
A few seconds after you're finished, the display of the lower register will change from **resettable total** to **absolute total**: The word **RESET** above the word **TOTAL** will disappear, and the value of the **resettable total** will be replaced by the **absolute total**.

We call this state (or mode) "standby". It will persist as long as the user does not carry out any more actions on the meter.

5.1.1 Resetting partial volumes



For resetting the partial volume register: Press the RESET button while the meter is in standby, i.e. while you see the word <<TOTAL>> in the LCD display.



When you press RESET, the display will first switch on all the segments, one after the other, and then switch them all off again.

When the reset is complete, the display will first show the partial volume having been reset and then Reset Total.



After a couple of seconds, Reset Total will be replaced by the NON-resettable total volume (Total).



5.1.2 Resetting the resettable total volume (Reset Total)



You can reset the resettable total only if you have reset the register of the partial volumes before. To reset the resettable total: press RESET for several seconds. The display will show the words RESET TOTAL (see fig.):

You must carry out the following steps (in this order):



1. Wait until the display is back to default standby mode (i.e. showing only "Total").
2. Press RESET shortly.
3. The meter will now start resetting the partial volume register.



4. While the display shows the Total to be reset, press RESET again for at least one second.
5. The display will show all the segments again. Only then follows the phase where all segments are switched off. Finally, there will be a display showing the total that has been reset (Reset Total).



5.2 Output of liquid with display of current flow rate (Flow Rate Mode)



It is possible to output a liquid and have the following displays available:

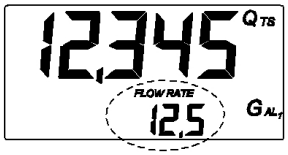
- partial volumes having been output:

-Current flow rate (Flow Rate) in [unit of partial volume per min.], as shown below.
This is how you get into this mode:

- Wait until the meter is default standby mode (i.e. the display shows only the total volume).
- Shortly press the **CAL button**.
- Start output operation.

The display of the current flow rate will be updated every 0.7 secs. For that reason the display may 'flutter' somewhat with low flow rates. However, the higher the flow rate, the more stable the display will be.

Please note: The current flow rate will be shown in the unit set for the partial volume register. That means if partial and total volume have been set to different units (as shown in the example below) you must bear in mind that the flow rate shown is in the unit set for partial volumes. In the example shown, the flow rate is in qts./min.



The word "Gal" next to the flow rate refers to the register of the (resettable and non-resettable) total volumes which will be displayed again as soon as you leave the 'current flow rate' display mode.

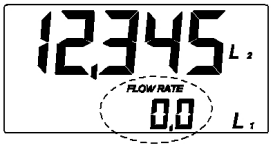
In order to go back to the default standby mode, press the CAL button again.

Accidental pressing of the RESET and/or CAL buttons does not have any effect in this state.

Please note: Reset Total and absolute total (Total) are not shown in this mode. However, the values nevertheless go up, of course. You can check after you're finished. Wait for the default standby mode and press CAL shortly.

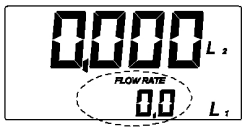
5.2.1 Resetting partial volumes

In order to reset the partial volume register, you must first complete the output of liquid. Wait until the display shows a flow rate of 0.0 (see fig.).



Then, press the reset button shortly.

The effect is different from what you would have if you press Reset in default standby mode. There is no phase where all the segments are first switched on and then off again. Instead, the register will display the reset partial volume immediately.



6. Calibration

6.1 Definitions

Calibration factor -> "K Factor": That's the multiplication factor the system ascribes to the electronic pulses it receives in order to convert them into a plain unit of measurement.

- Factory K Factor: Calibration (default) factor pre-set at the factory. Factory K Factor = 1000.

This calibration factor guarantees the highest degree of precision under the following operating conditions:

Liquid: _____engine oil type 10W30

Temperature: _____20°C

Flow rate: _____2-20 litres per min.

You can always return to the original Factory K Factor even after you have changed the value. The procedure is simple.

- User K Factor: That's the calibration factor the user has set to adapt the meter to specific requirements (i.e. the user has carried out a calibration procedure).

6.2 Why calibrate the meter at all?

The oval gear meter comes to you with a calibration factor pre-set at the factory that will guarantee the most precise measurements under most operating conditions.

However, there may be extreme cases, for instance:

- liquids having a viscosity close to the admissible limits (e.g. antifreeze with low viscosity, high-viscosity oils for gearboxes)
- extreme flow rates (i.e. close to upper or lower limits)

In such a case it may be advisable to calibrate the meter under the actual operating conditions.

6.3 Calibration mode

The meter has a fast and precise electronic calibration mode where you simply change the so-called calibration factor (Factory K Factor).

There are two calibration procedures you may choose from:

- Simulated operation + calibration (requiring actual output of liquid to be carried out).

- Direct calibration (simply changing the calibration factor).

You may want to call up the calibration procedure for the following reasons (press Cal button for a prolonged period of time):

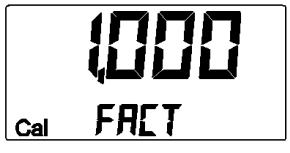
- **To display** the valid calibration factor.
- **To reset** the calibration factor pre-set at the factory (Factory K Factor) after calibration by the user.
- **To change** the calibration factor using one of the two available calibration procedures.

During calibration, the registers on the LCD display - that normally show partial and total volumes of liquid output - will take on new meanings.

During calibration, the meter cannot carry out normal output operation.

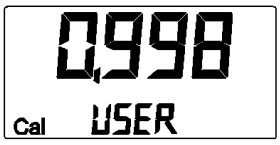
During calibration, the count of the absolute total volume of liquid having been output (non-resettable Total) will not increase.

Please note:
The oval gear meter is equipped with a non-volatile memory so that calibration data and total volume will remain in store for a long period of time – even without power supply. That means you don't have to re-calibrate after you have exchanged the batteries.



6.3.1 Displaying the valid calibration factor - resetting the factory calibration factor (if necessary)

Go to default standby mode. Press the CAL button. The display shows the valid calibration factor.



Two situations are possible:

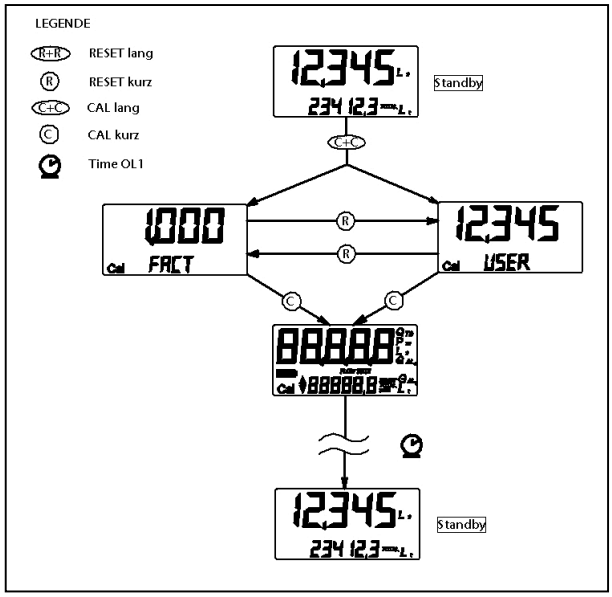
a) User never changed the calibration factor and/or user restored the factory calibration factor after changing it: the display will show the following:

The word "FACT"(ory) indicates that the valid calibration factor is the factor pre-set at the factory.

b) If the user has changed the calibration factor, the display will show the new value (in our example: 0.998).

The word "User" indicates that the calibration factor currently used was entered by the user.

The flow chart below shows the schematics of the display modes the LCD display may go through.



In this mode, the user may press RESET and thus change to the Factory K Factor .

In order to confirm your choice: Shortly press CAL while the display shows either "User" or "Fact".

After re-start, the meter will use the new calibration factor you just confirmed.

Please note: When you confirm restoration of the Factory K Factor, the old user factor will be deleted from memory.

6.3.2 Calibration during simulated operation

This procedure is basically a simulated output of liquid into a calibration vessel under actual operating conditions (flow, rate, viscosity etc.). The procedure must be carried out with utmost care.

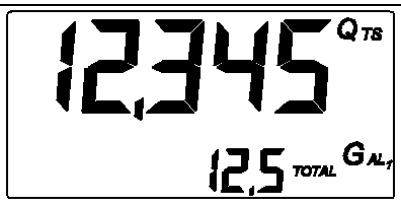
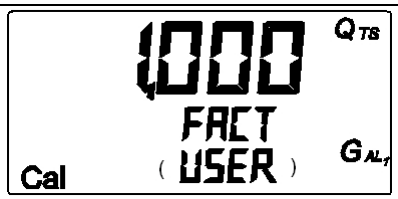
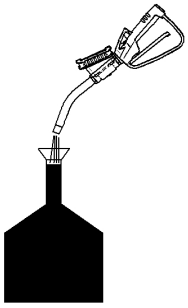
Please note:

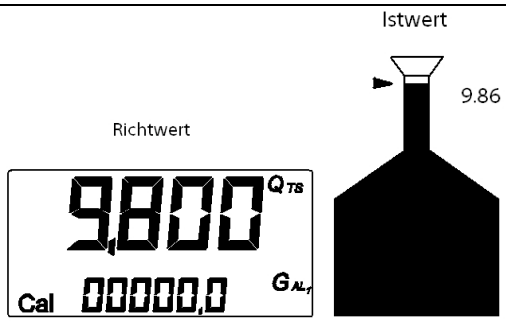
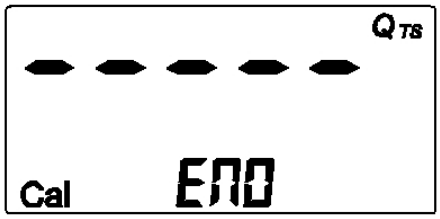
Absolutely bear in mind the following points in order to guarantee proper calibration:

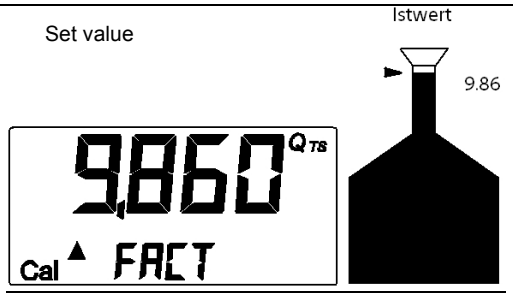
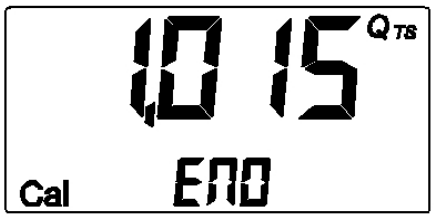
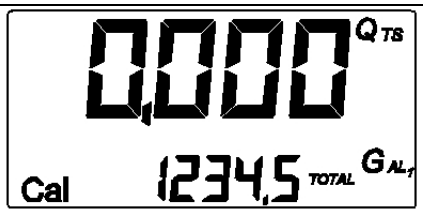
- Have your equipment properly vented before calibration.
- Use a calibrated vessel holding at least 5 litres with a precise full mark.
- For calibration, tap a certain amount of test liquid with a constant flow rate, exactly as you would do in normal operation. Continue until the vessel is full.
- Do not decrease the flow rate when you approach the full mark. Instead, turn the spigot on and off and fill the vessel in small batches, but make sure the flow rate remains unchanged.

- When you're finished be sure to wait a few minutes and let air bubbles escape that may still be in the calibration vessel. Otherwise there is a danger you get a wrong value because the level in the vessel may still go down.
- Be sure to carry out the following procedure correctly.

6.3.3 Meter calibration during simulated operation:

	Action	Display
1	NONE Meter is in default standby mode, not counting.	
2	PRESS CAL SEVERAL SECS. Meter switches to calibration mode, displaying "CAL". Display no longer shows total, but valid K Factor. "Fact" or "User" indicate whether valid calibration factor is Factory K Factor or User K Factor .	
3	PRESS RESET SEVERAL SECS. Meter shows "CAL" display -> resettable total register displays zeroes. Meter is now ready for simulated operation calibration.	
4	FILL LIQUID INTO CAL VESSEL. Start simulated operation, but do not press any buttons yet.  Simulated operation may be interrupted and continued as necessary. Continue filling the vessel until full mark is reached. It is not necessary to top out at any specific value.	

		
5	PRESS RESET SHORTLY. This is how the meter 'knows' that simulated operation for calibration is complete. Make sure cal vessel has really been filled up to full mark before you do this. For calibration you must correct the count indicated by the partial volume register (ex.: 9,800), entering the actual value, i.e. the volume of the cal vessel. There's an arrow bottom left of display (pointing up or down) indicating the direction of changing USER K FACTOR (up or down) to carry out actions 6 or 7.	
6	PRESS RESET SHORTLY. Direction of arrow flips. This may be repeated as often as necessary.	
7	PRESS CAL SHORTLY / SEVERAL SECS. Value indicated will change as indicated by arrow - one increment per each pressing of CAL; - continuously if CAL is pressed continuously (first 5 increments slowly, then fast). - If you overshoot, go back to point 6 and repeat (6).	
8	PRESS RESET SEVERAL SECS. This is how the meter 'knows' that calibration is now complete. <u>Before you press the button, be absolutely sure the display shows the correct value (volume of vessel).</u>	

	 The meter will now calculate the new USER K FACTOR: This may take a couple of secs. depending on the complexity of the correction. The arrow will disappear during this phase, but the word Cal will remain unchanged. If you carry out this action right after point 5 the new USER K FACTOR will be equal to the FACTORY K FACTOR. It will be ignored, therefore.	
9	NONE. When calculation is complete the new USER K FACTOR will be displayed a few secs. Next, the meter will re-start. Finally, the meter will be back in default standby mode. **Please note:** From now on, the new value set will be used as the new valid K Factor and will remain even after replacement of batteries.	
10	NONE. The meter stores the new K Factor for operation and is now ready for serious operation using the newly set USER K FACTOR.	

6.3.4 Changing the K Factor directly

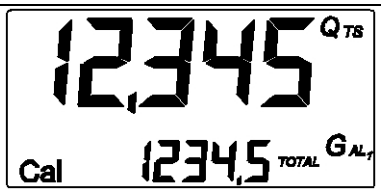
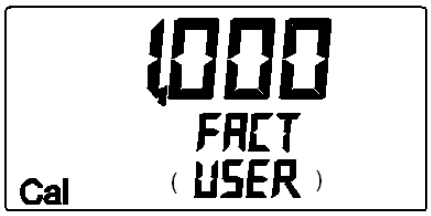
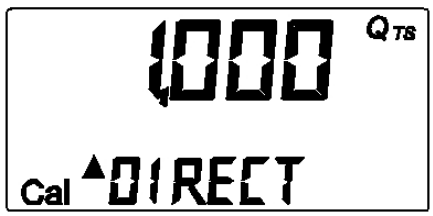
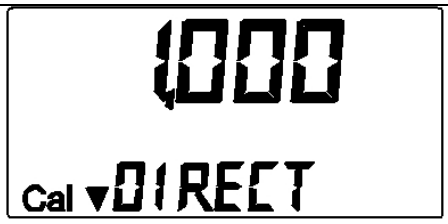
This procedure is helpful for the correction of a 'mean error' that may be determined by monitoring a certain number of output operations. In the event you observe a mean percentage error during normal meter operation you may carry out a correction by changing the valid User K Factor by that percentage. In order to calculate the correction of the USER K FACTOR, proceed as follows:

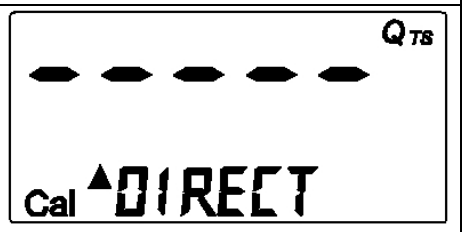
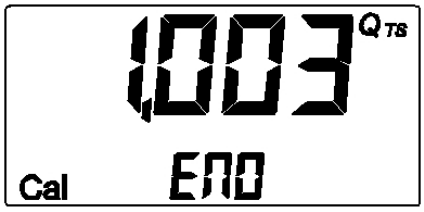
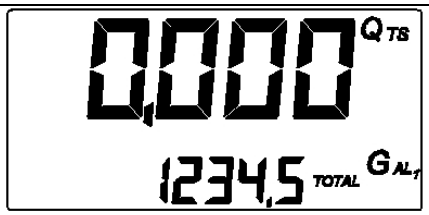
$$\text{New calibration factor} = \text{old calibration factor} \times \left(\frac{100 - E\%}{100} \right)$$

Example:

Observed mean percentage error E%	-0.9 %
Current K Factor	1,000
New USER K FACTOR	1,000 x [(100-(-0.9))/100]=
	1000 x [(100+ 0.9)/100]=
	1,009

If the meter displays less than the actual amount of liquid output (negative error), the new K Factor must be greater than the old one (see example). The opposite is true if the value indicated is greater than the actual amount (positive error).

	ACTION	DISPLAY
1	NONE Meter is in default standby mode, not counting.	
2	PRESS CAL SEVERAL SECS. Meter changes to cal mode displaying valid K Factor instead of partial volume. "Fact" or "User" indicate whether valid calibration factor is Factory K Factor or User K Factor .	
3	PRESS RESET SEVERAL SECS. Meter shows "CAL" display -> resettable total register displays zeroes. Meter is now ready for simulated operation calibration.	
4	PRESS RESET SEVERAL SECS. Changing valid K Factor directly: Display shows "Direct"plus valid K Factor. There's an arrow bottom left of display (pointing up or down) indicating the direction of changing USER K FACTOR (up or down) to carry out actions 5 or 6.	
5	PRESS RESET SHORTLY. Direction of arrow flips. This may be repeated as often as necessary in order to set the correct direction.	

6	PRESS RESET SHORTLY / SEVERAL SECS. Value indicated will change as indicated by arrow - one increment per each (short) pressing of CAL; - continuously if CAL is pressed continuously. Display will 'roll' more quickly if button is held permanently. If you overshoot, go back to point 5 and repeat (5).	
7	PRESS RESET SEVERAL SECS. This is how the meter 'knows' that calibration is now complete. Before you press this button, be absolutely sure the value indicated is the value you wanted to set.	
8	NONE. After the following calculation the new USER K FACTOR will be displayed a few secs. Next, the meter will re-start. Finally, the meter will be back in default standby mode. **Please note:** From now on, the new value set will be used as the new valid K Factor and will remain even after replacement of batteries.	
9	NONE. The meter stores the new K Factor for operation and is now ready for serious operation using the newly set USER K FACTOR.	

7. Configuration of the oval gear meter

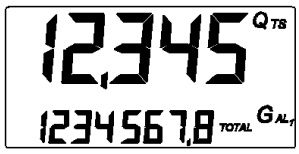
The meter has a menu to assist users in the selection of the main unit of measure: quarters (Qts), pints (Pts), litres (Lit), gallons (Gal):

Combining partial-volume and total-volume units is possible as shown in the following table:

Combination no.	Unit Register of partial volumes	Unit Register of total volumes
1	litres (L)	litres (L)
2	gallons (Gal)	gallons (Gal)
3	quarters (Qts)	gallons (Gal)
4	pints (Pts)	gallons (Gal)

This is how you select any of the combinations proposed:

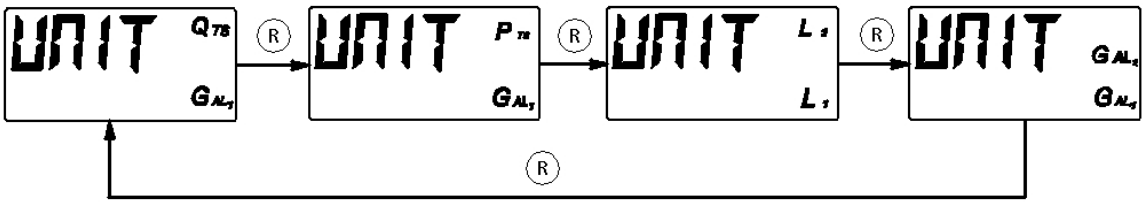
Wait until the meter is in default standby



mode. Simultaneously press CAL and RESET until the display shows the word "UNIT" displaying the valid unit being used at present (in our example: litres/litres).



Every time you (shortly) press RESET, one of the other combinations of units will be displayed one after the other (see figs.).



Press CAL several secs. to store the new combination. The meter will re- start and is then ready for operation using the newly selected combination of units.

Please note:
The registers of the resettable and non-resettable totals will automatically switch over to the new units set.

You do NOT have to re-calibrate after changing the units.

8. Maintenance

This oval gear meter has been designed for minimum maintenance requirements. What remains to be done from time to time:
- Exchange the batteries when discharged.

- Clean the measuring chamber. This may be necessary from time to time depending on the specific liquid(s) being measured and/or when foreign matter gets into the chamber (inlet filter not sufficient).

8.1 Exchanging batteries

The meter is supplied complete with two 1.5 V alkaline batteries (1N).

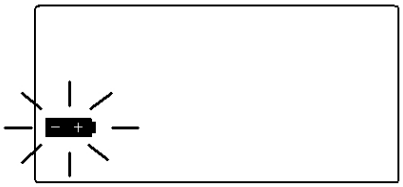
The meter has a two-step low battery indicator:

1) As soon as the batteries dip below the first charge level the battery icon in the display will light up.

The meter will continue to operate correctly, but the user is informed that the batteries should be exchanged as soon as possible.



2) If the batteries are not exchanged, the battery will sooner or later reach the second alarm level. Normal operation is no longer possible. At this state, the battery icon will flash, being the only thing that is still visible in the display.



Please note:
Do not throw batteries in the dustbin. Be sure to know and respect local regulations concerning proper disposal.

Proceed as follows (see spare parts list):

- Press RESET in order to update total volume.
- Remove the cap of the battery compartment (item 17).
- Remove the old batteries.
- Insert new batteries. Observe + and - icons on batteries and cap (item 24).
- Replace battery cap properly and screw down tightly. Make sure the seal (item 16) and spring (item 15) are in their correct positions.
- The meter will go on automatically and revert to default standby mode. Routine operation may now be continued.

The values of the resettable and non-resettable totals and partial volume will be the same as before.
Neither will the calibration (K) factor change in the case of power failures and/or exchange of batteries. It is not necessary to re-calibrate the meter after exchange of batteries.

8.2 Cleaning

It is possible to clean the measuring chamber of this oval gear meter without having to remove the device from the pipeline and/or spigot.

Please note:
Always make sure that ALL the liquid has been removed from the device before you start cleaning it.

To clean the measuring chamber, proceed as follows (see spare parts list):

- There are six screws in the top cover (item). Remove them.

- Remove the cap (item 5) and seal (item 6).

- Remove the oval gears.

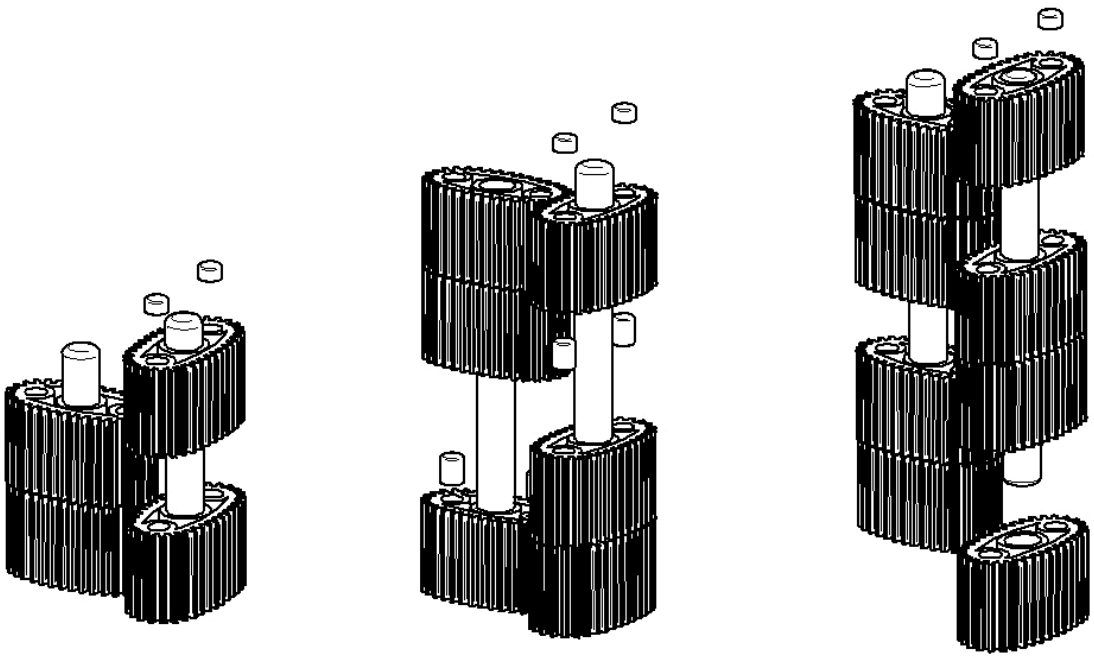
- Clean the chamber. Use a brush and/or a small pointed tool (e.g. a small screwdriver).

Be careful not to damage the body of the device and/or the gears.

- Re-assemble the device in reverse order.

Please note:

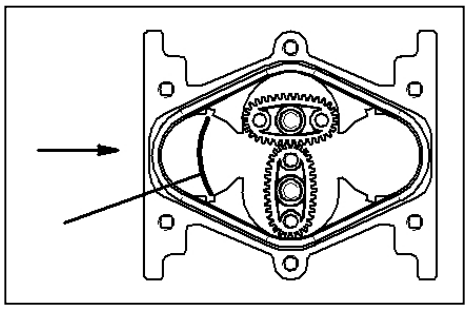
Replace the gears. Be sure to observe the following assembly drawings.



19692 19693 19694

Please note:
Only one of the two modular coupled gears (see above) is equipped with magnets. It is absolutely important that the position of the magnetic gear is exactly as in the drawing. Insert the second (non-magnetic) gear. Make sure the axis with respect to the first gear is more than 90 degrees.

Cleaning the inlet filter:



It is possible to clean the filter of this oval gear meter without having to remove the device from the pipeline and/or spigot.

Make sure the gears can move freely before you replace the cover.

Please note:
Always make sure that ALL the liquid has been removed from the device before you start cleaning it.

To clean the filter, proceed as follows (see spare parts list):

- There are four screws in the cap (item 1). Remove them.
- Remove the cap (item 2) and seal (item 4).
- Pull out the filter (item 7).
- Use compressed air to clean the filter.
- Re-assemble the filter in reverse order.

9. Troubleshooting

Problem	Cause	Solution
LCD display: no display.	Batteries do not contact properly.	Check batteries for good contact.
Accuracy of measurements is insufficient.	K FACTOR wrong.	Check valid K FACTOR. See section 6.3.
	Meter operates below admissible min. flow rate.	Increase flow rate to acceptable level.
Reduced flow rate, no flow at all.	Gear(s) blocked.	Clean measuring chamber.
Display flashing "Err 1".	Data stored in electronic memory are damaged.	Sorry, irreparable.
Short displays of "Err 2".	Limited error reading data (usually when exchanging batteries).	Control circuit board automatically switches on and off to restore proper operation.
No readings although flow rate is normal.	Wrong installation of gears after cleaning.	Disassemble and re-assemble. Focus on proper installation of magnetic gear.
	There may be a problem with the control circuit board.	Contact your dealer.

10. Repair/service

This oval gear meter has been designed and built in compliance with the highest quality standards.

If a problem should occur despite all quality measures taken, please get in touch with our service contact partners:

FMT Swiss AG
Tel. +49 9462 17-216
Fax +49 9462 1063
service@fmtag.ch

Manufacturer's declaration

We hereby state that the equipment described below, in the model which we have made commercially available, complies in its design and construction with the applicable requirements. If the equipment is used other than for its intended purpose, this declaration loses its validity.

Equipment	Oval Gear Meter
Complies with EU directive	89/336/EEC (EMC directive) and pertinent amendments.
Relevant EU standards:	EN 61000-6-1 EN 61000-6-3 EN 55014-1-2000 EN 55014-2-97

22.02.2011

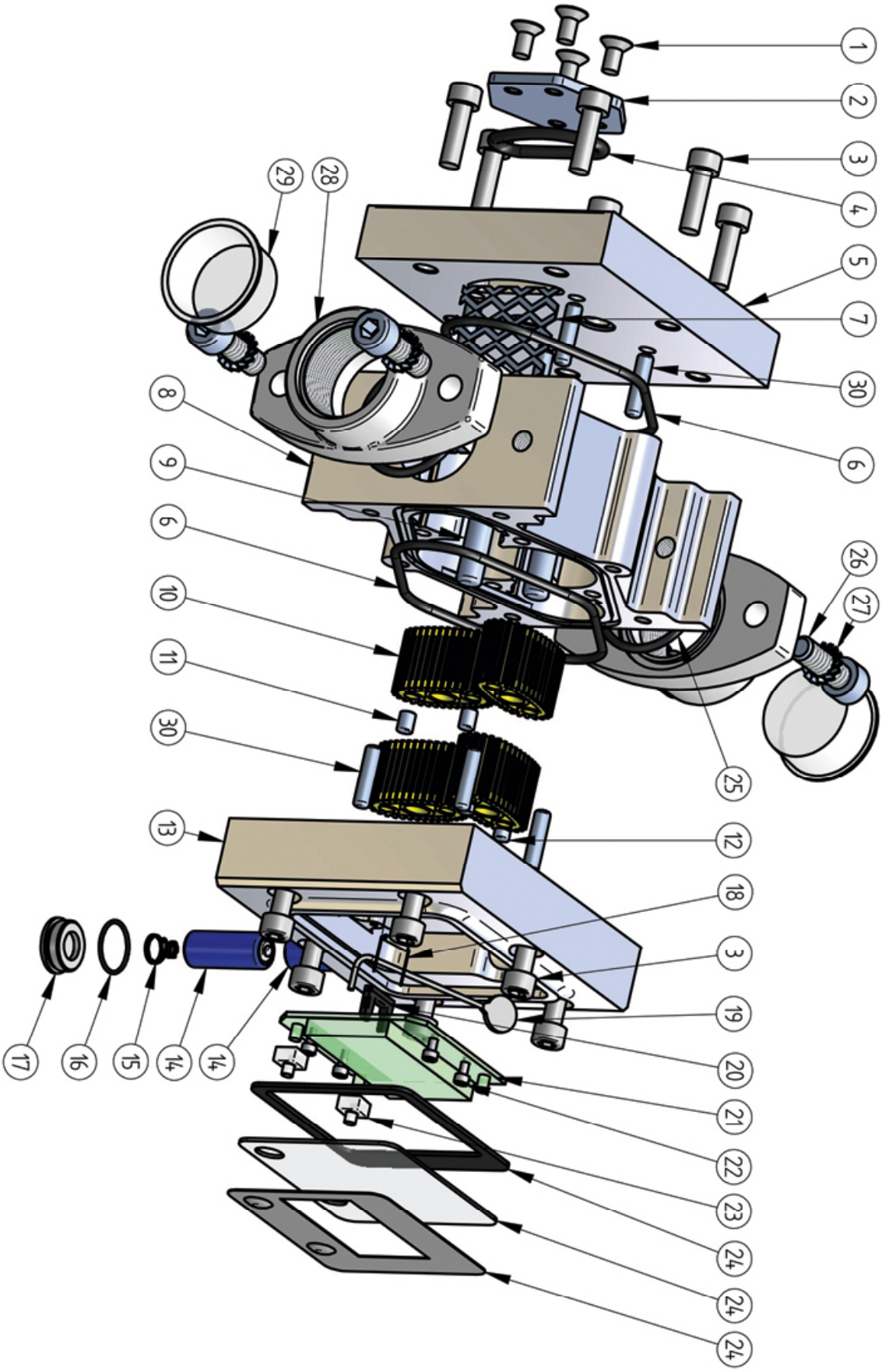
FMT Swiss AG

Dipl.-Ing. Rudolf Schlenker

11. Exploded drawing

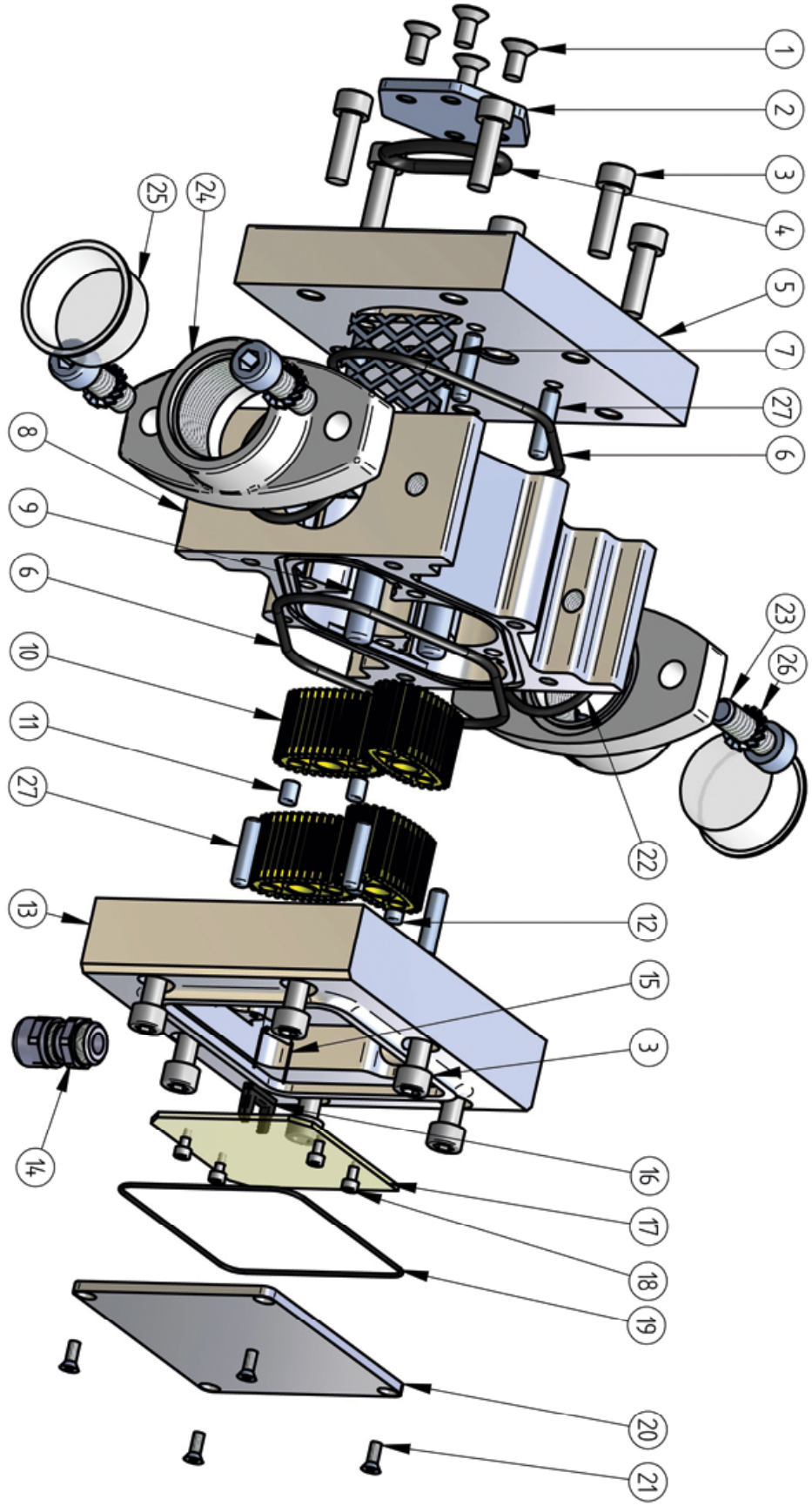
Oval gear meter

			19 692	**19 693**	**19 694**
Item	Qty.	Designation	Prod. no.	Prod. no.	Prod. no.
1	4	Countersunk screw	85 576	85 576	85 576
2	1	Filter cap	85 564	85 564	85 564
3	12	Allen screw	85 574	85 574	85 574
4	1	O ring	85 575	85 575	85 575
5	1	Lower meter body	85 563	85 563	85 563
6	2	O ring	85 573	85 573	85 573
7	1	Filter screen	85 565	85 570	85 571
8	1	Oval gear meter	85 558	85 568	85 569
9	2	Bearing bolt	85 566	85 567	85 577
10	See Art. no.	Oval gear	88 405 4 pcs.	88 405 6 pcs.	88 405 8 pcs.
11	See Art. no.	Cylindrical pin	85 559 2 pcs.	85 559 4 pcs.	85559 6 pcs.
12	2	Disk magnet 5x3 mm	88 416	88 416	88 416
13	1	Control circuit board cover	85 560	85 560	85 560
14	2	Battery	88 431	88 431	88 431
15	1	Pressure spring	03 181	03 181	03 181
16	1	O ring	00 725	00 725	00 725
17	1	Screw plug	88 414	88 414	88 414
18	1	Reed contact	85 610	85 610	85 610
19	1	Earth cable	85 611	85 611	85 611
20	1	Sensor mounting	85 601	85 601	85 601
21	1	Circuit board for oval gear meter with display	85 617	85 617	85 617
22	4	Oval head screw	85 572	85 572	85 572
23	2	Buttons	85 600	85 600	85 600
24	1	Display cover	85 616	85 616	85 616
25	2	O ring	00 251	00 251	00 251
26	4	Allen screw	00 249	00 249	00 249
27	4	Tooth washer	87 130	87 130	87 130
28	2	Pump flange	89 301	89 301	89 301
29	2	KAPSTO taper plug	04 394	04 394	04 394
30	8	Cylindrical pin DIN 7 M6 5x6 - A2	83 501	83 501	83 501


1
2
3
4
5
7
30
6
26
27
25
12
18
3
19
20
21
22
23
24
24
24
29
28
8
9
6
10
11
30
13
17
16
15
14
14

Pulse generator

			19 692 690	**19 693 690**	**19694 690**
Item	Qty.	Designation	Prod. no.	Prod. no.	Prod. no.
1	4	Countersunk screw	85 576	85 576	85 576
2	1	Filter cap	85 564	85 564	85 564
3	12	Allen screw	85 574	85 574	85 574
4	1	O ring	85 575	85 575	85 575
5	1	Lower meter body	85 563	85 563	85 563
6	2	O ring	85 573	85 573	85 573
7	1	Filter screen	85 565	85 570	85 571
8	1	Oval gear meter	85 558	85 568	85 569
9	2	Bearing bolt	85 566	85 567	85 577
10	See Art. no.	Oval gear	88 405 4 pcs.	88 405 6 pcs.	88 405 8 pcs.
11	See Art. no.	Cylindrical pin	85 559 2 pcs.	85 559 4 pcs.	85559 6 pcs.
12	2	Disk magnet 5x3 mm	88 416	88 416	88 416
13	1	Pulse generator circuit board cover	84 243	84 243	84 243
14	1	Cable gland	84 026	84 026	84 026
15	1	Reed contact	85 610	85 610	85 610
16	1	Sensor mounting	85 601	85 601	85 601
17	1	Circuit board for pulse generator	84 226	84 226	84 226
18	4	Oval head screw	85 572	85 572	85 572
19	1	O ring	84 241	84 241	84 241
20	1	Circuit board cover	84 244	84 244	84 244
21	4	Countersunk screw	84 242	84 242	84 242
22	2	O ring	00 251	00 251	00 251
23	4	Allen screw	00 249	00 249	00 249
24	2	Pump flange	89 301	89 301	89 301
25	2	KAPSTO taper plug	04 390	04 390	04 390
26	4	Tooth washer	87 130	87 130	87 130
27	8	Cylindrical pin	83 501	83 501	83 501



FMT Swiss AG
Fluid Management Technologies Swiss AG • Gewerbestr. 6 • CH-6330 Cham/Schweiz
Tel. +41 41 712 05 37 • Fax +41 41 720 26 21 • info@fmtag.ch • www.fmtag.ch