

# OPERATING INSTRUCTIONS

## ELTRIP-85n

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Hiltusentie 23 A 5  
90620 Oulu  
FINLAND

p. +358 (0)10 5792 300  
[www.trippi.fi](http://www.trippi.fi)  
tuki@trippi.fi

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# 1. TECHNICAL INFORMATION

Display: Graphic with touch panel

FEATURES: (\* - depending on model and options)

- 5 distance counters, of which 1-4 can be active at any time
- Distance resolution 10m / 1m / 0.1m (\*)
- Reverse measurement (\*)
- Distance counter time (hours : minutes)
- Total distance counter for each distance counter
- Speed with 0.1km/h resolution
- Computer/bluetooth connectivity (\*)
- Temperature measurement (\*)
- Friction measurement (\*)
- Driving log
- Language selection

DIMENSIONS: 125x95x23mm (W x H x D)

WEIGHT: approx 240 g

OPERATING VOLTAGE: 10-30V

CURRENT CONSUMPTION: Display on 150mA, display off 50mA

OPERATING TEMPERATURE RANGE: -30° - +60° C

FUSE: max 400mA

SENSOR: multiple options

## 2. INTRODUCTION

We congratulate you for having selected reliable and durable ELTRIP-meter.

This manual will instruct you on how to use your ELTRIP-meter. Please read the following information carefully to familiarize yourself of installation, calibration and usage of the meter to maximize the benefits you will gain from it.

If you have problems, see chapter 8 of this manual. If problem persists, please contact your supplier for further instructions. Although we know that you are professional on many fields, please do not attempt to repair the meter yourself as electricians inside the meter requires special tools and knowledge. Warranty does not cover self-made modifications or repairs of the unit.



When your meter has reached end of its life, please return it to the dealer or Trippi oy so it can be properly recycled. This return does not cost you anything. For detailed information, please contact Trippi oy.

### 2.1. MEASUREMENT METHOD

Eltrip-85 uses speed pulse from vehicle wheel to measure distance. This can be acquired from vehicle systems (drive log system or speedometer), by using for example CAN-BUS converter, or separate sensor installed directly to vehicle wheel. Best measurement accuracy is achieved with separate sensor.

Friction measurement can be based on vehicle's speed pulse and brake information, or internal accelerometer. When using GPS signal, only accelerometer option is available.

### 3. INSTALLATION OF ELTRIP-85

#### 3.1. *INSTALLATION LOCATION*

Install meter to a location where you can reach it easily and it does not interfere with vehicle controls. Avoid location with direct sunlight or heater vents. When using GPS signal, meter's rear must have unobstructed view to sky for best signal reception.

#### 3.2. *CAUTION!*

Disconnect be meter for the duration of welding, as even if meter is protected against normally occurring electrical disturbances, high voltages and/or currents during welding may cause damage to the meter.

Only replace fuse with same type and rating of the original (max 400 mA, fast). Warranty does not cover damage caused by improper installation.

#### 3.3. *CONNECTING SENSOR AND POWER WIRES*

Install sensor as per separate instructions.

It is recommended that meter is supplied with continuous +12v current, even when vehicle is turned off.

#### **NOTE! DANGER OF FIRE!**

**If vehicle's main power switch is connected to negative (-) terminal of battery and you wish to connect meter to continuous power, contact manufacturer for instructions. Connecting meter directly to battery may cause meter to bypass mains switch and cause fire.**

**Black:** Connect to ground/device chassis (negative/- voltage)

**Red:** Power supply, 10 .. 30v, fused max 400mA fast. Can be taken from vehicle fuse box or other suitable place where normal vehicle operations are not disturbed. Wires must be protected with small enough fuse.

**White and Purple:** Connection of these depends on chose measurement method and sensor as follows:

1. When using speed pulse and (optionally) reverse signal. If you are not sure, use this connection.
  - White: Sensor's positive (+) wire is connected to white wire and sensor's negative (-) wire to vehicle ground (black wire). White can be connected to vehicle's speed pulse output if available. Some sensors and vehicle systems may require additional adapter before pulse can be used.
  - Purple (reverse signal, optional): If you wish meter to count down when reversing, connect to positive wire of reverse light. This wire may be left

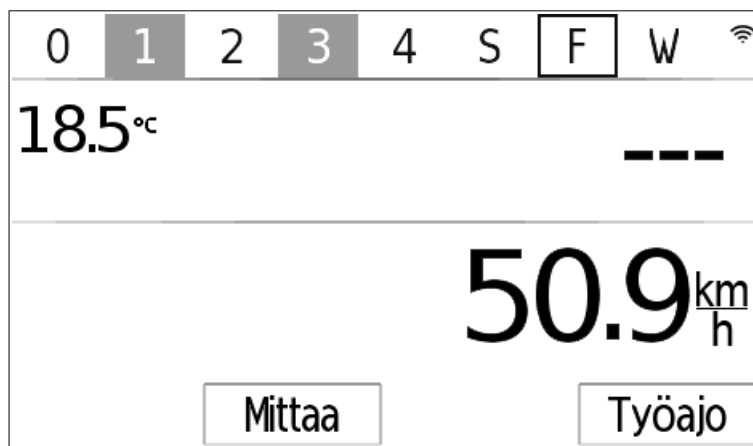
unconnected.

**Yellow:** Selectable based on meter model. Positive signal to suspend distance measurement; Brake signal for friction; or pulse signal for extra counter. See *External pulse* in settings (page 19).

**Green:** Pulse/signal output (buzzer or such, depending on meter model)

#### 4. USING ELTRIP-85

Eltrip-85 has been designed to be easy to use in vehicles. All the most important functions are selectable directly from the screen.



*Eltrip-85 main display*

Meter's display is divided in different parts.

At the very top the counters are listed; in here distance counters 1 and 3 are active, and friction (F) display is currently selected. Additionally at the top right meter status information is shown, here with active WLAN connection icon.

Next is meter's main display, in this case friction measurement in prepared and waiting for measurement/braking, with temperature shown at left.

Below is changeable additional display, with driving speed currently selected.

At the action bottom are buttons that change based on current main display selection.

Main display counter can be selected by either clicking counter icons at the top of the display, or by pulling/swiping main display sideways left or right. Additional display also can be changed by pulling/swiping it sideways.

Main display's subcounters (time/total) can be selected by clicking it again at the top icons, or pulling/swiping shortly downwards from main display

Available main displays depend on meter model, options and settings. Displays are:

- 0-4 Distance counters, with 10m, 1m or 0.1m resolution depending on model
- S Speed
- F Friction
- W Driving log/work drive counter

#### 4.1. ADDITIONAL DISPLAY

Meter's lower, additional display can be selected from many screens, exact list of which depends on selected main display. Display can be changed by pulling/swiping it sideways.

Selectable are (by main display)

*Distance counters:* Speed; time/date; counter's time/total; temperature; maintenance; compass (requires GPS)/time/speed

*Speed:* time/date; temperature; maintenance; compass/time/speed

*Friction:* speed, time/date

*Work drive:* speed; time/date; temperature; maintenance; compass; connection and work log status; current work type

#### 4.2. PULL-UP MENU

Pull-up menu is opened by swiping from the very bottom of the display glass upwards.



*Pull-up menu opened*

In pull-up menu is the display brightness slider and with gear icon meter settings are opened.

### **4.3. DISTANCE COUNTERS**

Distance counters are numbered 0-4. Number of counters and their display resolution depends on meter model, selected measurement method and options. When using GPS-based measurement the display resolution is limited to 10 metres, with speed pulse to 1 metre and with encoder-type sensor to 0.1 metres.

Distance counters have also time- and total distance counters as subcounters. These are selected by swiping down starting from main display, or by clicking again counter item at top of the screen.

Distance counters have *Clear*, *Start* and *Stop* buttons. When distance counter or time is selected, *Clear* will clear both; if total counter is selected, *Clear* will clear it. Counters 0 and 1 are alternate; when other is started, the other stops.

In settings clearing can also be connected to external signal connected to meter's yellow signal wire. In this case external signal (e.g. button) works the same way as *Clear* selection on screen. For more information, see pages 6 and 19.

When using counter 0 *Settings* is also available. This allow selection of distance pre-setting, counting down- or upwards. Down-counting affects counter 0 only; other counters count normally regardless of this setting.

There are also other features tied to counter 0, for further details see page 10.

### **4.4. SPEED (S)**

Meter shows current driving speed.

### **4.5. TEMPERATURE (T OR F)**

If meter has friction feature main display has no separate temperature view and temperature is shown together with friction.

Temperature shows outside temperature with 0.1 degree C resolution. If display shows '--' or '++' verify sensor connections. '--' means that sensor or wires are shorted, and '++' means that sensor is missing or wires are broken/cut.

### **4.6. FRICTION (F)**

Friction display shows at left side outside temperature (if available, see Temperature chapter above) and on right side friction measurement status/result.

When meter is ready for measurement, right side shows '--' or '---' (2 or 3 dashes). During and immediately after braking more lines are shown. When measurement is ready, meter shows measured result on the screen.

After measurement is ready, select *Send* to send result to computer or phone, or to be sent to Trippi oy's servers. *Measure* reset measurement to standby state for new measurement.



For further instructions, see page 10.

#### **4.7. DRIVING LOG (W)**

Driving log is visible only if this feature has been enabled via meter's settings. When driving log is enabled, button for starting and stopping work drive is always visible at lower right part of the screen for immediate access, except for counter 0 where its' settings is shown instead.

Driving log view shows "Work drive" or "Own drive", depending on whether work drive is enabled, and in case of work drive, given description and driven distance for this drive. For more instructions see page 12.

Driving log uses WLAN connection to connect to Trippi oy's web service for logging drive data. For more information on how to enable and use this service, contact Trippi oy.

## 5. SPECIAL FEATURES

This chapter describes in more detail some of the meter's advanced features.

### 5.1. EXTERNAL DISTANCE MEASUREMENT PAUSE

An external signal can be used to temporarily suspend distance measurement. Connect yellow wire to source that generates pulse of over +3v when measurement needs to be stopped (0v otherwise) and select *External pulse* → *Pause measurement* from settings. Meter will then suspend all distance counters when this pulse is active.

### 5.2. FRICTION MEASUREMENT (K-MODELS)

When using distance pulse for friction measurement, make sure that *External pulse* → *Brake* is selected in meter settings.

Friction measurement must be calibrated before accurate measurements can be made. This is done typically twice a year – at fall and in middle of winter. For details about friction calibration process, see page 17.

To guarantee the reliability of measurements it is very important that the measurement is performed exactly the same way every time. Measurement is done as follows when friction view (F) is selected on meter:

- Note! With hybrid or electric vehicle the recuperation/regeneration of braking energy must be set to zero or lowest possible setting, and "single pedal" drive mode cannot be used; vehicle must roll completely freely when accelerator pedal is released. In other automatic transmission vehicles it is recommended to use Neutral gear during braking.
- Drive with constant, 40-50 km/h speed
- Click *Measure* on meter display to start new friction measurement. Screen shows three dashes ('---') to indicate readiness.
- **Important!** First make sure that no one that could crash into you is driving behind you!
- Release accelerator pedal completely, letting car to roll freely for approx 3-4 seconds.
- Push brake pedal all the way down quickly (maximum strength braking)
- Hold brake pressed for 2 seconds, and then completely release brake quickly. Let car still roll freely.
- When meter has measured the friction and it is shown, you can verify measurement and click *Send* to store result and send it for further processing.

### 5.3. INTERVAL MARKING (AV-MODEL)

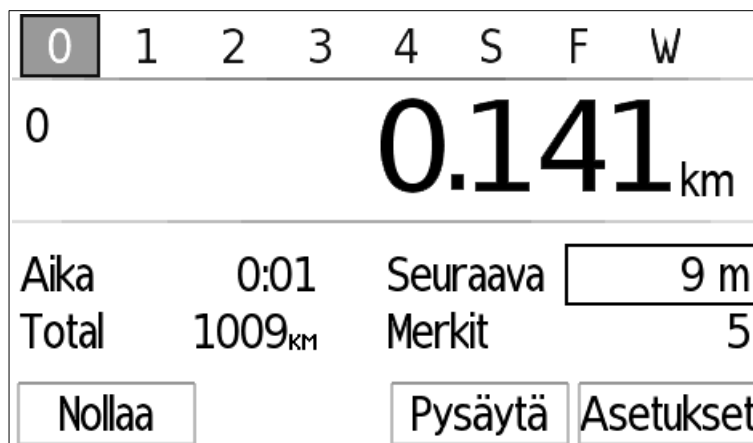
Interval marking requires speed pulse (sensor) measurement to operate.

With interval marking meter gives out a signal (e.g. buzzer sound) when user-set distance is reached. This is used for example for placing items (road markers, lamp placement etc) accurately over given distance.

Buzzer or marking device is connected to meter's green wire. Meter gives out short positive (+12v) pulse, and other wire of buzzer is connected to ground.

Interval marking is always connected to operation of counter 0. Marking is enabled from 0-counter's *Settings*-menu, opened from *Settings* button at 0-counter's view (see following picture)

Aktivate this by checking *Mark distance*-checkbox, and set desired mark distance by clicking numeric distance value that follows the checkbox. This enables also current distance to next mark and total mark counter in Time/Total-view (see picture).



*0-laskimen tiedot määrävälitiedoilla*

When this is activated, meter will calculate distance and generate pulses regardless of current meter view or mode, increasing total mark count counter at the process.

If you want to add a mark at non-standard location, you can click the 'to next distance' box in additional view (see picture) to immediately generate signal and add mark. Distance to next mark is reset and marking resumes normally after this.

### 5.4. EXTRA COUNTER (AV-MODEL)

Extra counter counts, instead of distance, some other signal, such as gravel used for road conditioning. When extra counter is enabled, it replaces normal distance counter 4 with counter E. This counter counts signal from meter's yellow signal wire and works like normal distance counter, except without downwards (reverse) counting or time- and total subcounters.

To use extra counter, meter's yellow wire is connected to sensor measuring this, such as gravel dispenser. Select also *External pulse* → *Extra counter* in settings to enable this.

When this is enabled in settings, *Extra counter calibration* also appears in settings menu. This calibration works similarly to distance calibration: amount of pulses corresponding to 1.000 units can be entered manually or measured in the calibration view.

## **5.5. DRIVING LOG**

To use driving log it must be enabled first in the meter's settings, *Driving log* page (see page 19). At the same page you can also specify timeout for automatic ending of work drive after vehicle stops (in minutes, zero to disable), and how soon of net time (e.g. effective work time) counting stops after vehicle stops.

Work drive information is moved to Trippi oy servers via internet connection where web browser can be used to list and browse them. For this meter needs WLAN connection (configured in settings). Connection does not need to be continuously available, but it is recommended that meter should be within network reach at least weekly, if not daily. If WLAN is not configured, meter will show yellow WLAN icon in the main screen as a warning.

Work drive can be started from any counter view except 0, by selecting *Start work*. Meter then enters drive start screen, where previously used work description can be used or new name entered.

Normally drive report will contain all the work drives listed. If a drive needs to be invoiced separately, select *Separate invoicing* option when starting drive or change this setting during drive from separate work drive info page.

When work drive is on and W-counter is selected in the main view, the sub view includes an information page where you can edit the description of current work drive (by clicking the name), or enable or disable separate invoicing.

At the end of work drive select *End work* and accept ending from separate view. If automatic work drive end has been enabled in settings, meter will stop work automatically after vehicle has been standing still for this period.

## 5.6. COMPUTER CONNECTIVITY

Eltrip-85 *c*-models have ability to send measurement results and to be controlled either via wired RS-232 link or via Bluetooth by computer, phone or other suitable device.

### 5.6.1. CONNECTING

RS-232 uses following line parameters:

Connector:	RS232 D9 female
Bitrate:	Selectable from meter settings 1200, 9600 or 19200 bps
Data format:	8 bits, no parity, 1 stop bit
Flow control:	none

Bluetooth connection uses RFCOMM protocol. Meter is searchable only when in Settings-mode as ET85-nnnnn, where nnnn is the serial number of meter), but once connected, connection can be opened any time later at any meter mode.

### 5.6.2. DISTANCE MEASUREMENT

Remote can be read and control all meter's counters freely using simple text-based protocol that is backwards compatible with Eltrip-45 and Eltrip-65 series meters. This can be used at any mode of the meter. Command is sent from remote and meter responds to command. All commands and responses are terminated with <cr>.

Meter's normal user interface is usable when also used remotely.

**Responses.** Meter responds to commands with requested data or following status codes:

+<cr>	Command accepted
I<cr>	Invalid counter number
C<cr>	Invalid command

**Read commands.** In following *n* is counter index, 0-5. *c* character can be appended after following to commands (for example A0c<cr>) to make meter send data out continuously until next command is received.

An<cr>	Read counter <i>n</i> distance (e.g. A2<cr>). Response in format kkk.mmm<cr>.
Bn<cr>	Read counter <i>n</i> time. Response as hhh.mm<cr>.
Dn<cr>	Read counter <i>n</i> total. Response as kkkkk<cr>.
S0<cr>	Read driving speed. Response as nnn.n<cr>
I0<cr>	Read calibration constant of distance. Response as nnnn<cr>. With GPS measurement this returns always 1000.

### Counter control (*n* being counter index 0-5)

Cn<cr>	Clear distance and time of counter
En<cr>	Clear total of counter
On<cr>	(Letter O) Start counter n. In case if counter 0 or 1, other will stop.
Fn<cr>	Stop counter n. In case of counters 0 or 1, other will start.

### Calibration

K0nnnn<cr>	Set calibration constant for distance. Note that there always must be 0 (zero) after letter K.
------------	--

### Example

Remote:	K03612<cr>	(Set calibration 3612)
Eltrip:	+<cr>	
Remote:	A8n<cr>	(invalid counter)
Eltrip:	I<cr>	
Remote:	A2c<cr>	(continuous transmit)
Eltrip:	492.525<cr>	
Eltrip:	492.527<cr>	
Eltrip:	492.528<cr>	
Eltrip:	492.530<cr>	
Remote:	B0<cr>	(read time; stop continuous transmit)
Eltrip:	001.51<cr>	
Remote:	C0<cr>	
Eltrip:	+<cr>	
Remote:	B0<cr>	
Eltrip:	000.00<cr>	

### 5.6.3. FRICTION MEASUREMENTS

When friction has been measured, it can be sent to connected remote devices by pressing *Send*.

Meter sends friction measurement as two NMEA formatted messages:

\$PTRPF, , -3.2, 0.372\*46

\$PTRPG, , -3.2, 0.372, B, 500, 30, 1000, 85000999\*1A

PTRPF is sent for compatibility with older systems and has same format as Eltrip-65/45 meters; weather, temperature and friction results. PTRPG includes these and also new fields;

- Weather (empty/not used by Eltrip-85 at the moment)
- Temperature
- Friction measurement result
- Measurement method; A=accelerometer, B=pulse/brake signal
- Calibration scaler used (see page 17)
- Constant (B) or sensitivity (A) used
- Temperature calibration constant
- Meter serial number (8 numbers)

More data fields may follow these in PTRPG message. System parsing this data must properly handle and ignore following data it does not know how to handle.

## 6. METER CALIBRATION

### 6.1. TESTING SIGNALS

In Settings-menu there is "Test signals" option that allows easy testing of meter signalling during the installation. In this mode meter shows signal states and counts generated pulses. When signal is low (grounded) background of number is black; when signal is high background is white.

Distance pulse: Meter has internal pull-up to +5v for distance pulse so this shows high when unconnected. Counter increases by one when signal goes low.

Reverse: Normally low. Number grows by one when reverse is first enabled and then released.

Extra signal: (for example brake for friction measurement) Normally low. When connected to steady-state signal (e.g. brake light) this should grow by one when brake is pressed down, and again by one when brake is released.

"Sig. out"-button (*av* model) generates short, half second test signal for buzzer or other connected external device.

### 6.2. DISTANCE CALIBRATION

When using distance/speed pulse based measurement, meter must be calibrated for best measurement accuracy. Calibration is done by using measurement track of known length, for example specifically designed road administration markers.

Open Settings menu and *Distance calibration* at the start of track. Meter shows current calibration constant setting, followed by measured pulses and calculated distance based on current settings.

Matka-kalibrointi	
Vakio	1000
Pulssit	0
Matka	0m
<input type="button" value="Sulje"/> <input type="button" value="Nollaa"/> <input type="button" value="Käytä"/>	

*Distance calibration view*

At start of the track click *Clear* to start measurement. Drive to the other end of track carefully, as straight as possible and avoiding wheel slippage. Stop car at the end of the track. If track is one kilometre long, you can select *Use* directly to take current



pulse measurement to use as calibration value. With track of different length, calculate reading (for example 932 pulses/500m → 1864 pulses/km), click box surrounding *Constant* setting and enter this value.

Verify measurement then by clearing measurement and driving track again; *Distance* reading should read 1000m (or track length) at the end. If needed, correct calibration and re-test track.

### 6.3. FRICTION CALIBRATION

**NOTE!** When using accelerometer-based measurement, the meter's orientation must be calibrated first. The *Acceleration* reading shown in calibration screen should read as close to zero as possible, preferably below 10 when car is on even surface. If not, stop car on even surface and click *Cal.Position* to calibrate meter orientation.

Friction calibration is performed in known conditions where meter is set to measure specific friction on known surface.

Perform friction measurement first few times as instructed in chapter 5.2 (page 10) Make sure that result is always approximately same, and thus that measurement is performed same way every time.

Open Settings, and *Friction calibration*.

Kitka-kalibrointi - Kiihtyvyyys	
Kerroin	<input type="text" value="600"/>
Herkkyyys	<input type="text" value="45"/>
Kiihtyvyyys	0
<input type="button" value="Sulje"/>	<input type="button" value="Kal.asento"/>

*Friction calibration display with accelerometer setting*

Scaling of friction measurement is determined with *Scaler* factor. If measured reading is too small, increase the scaler by selecting it and entering new value. For example, if measured reading is 10% too small, increase this number by 10%. Typical range is 300 .. 700.

Scaler can be inputted as new reading directly, or percentual modifier (e.g. entered value 10% → increase by 10%).

*Sensitivity* is visible when using accelerometer based measurement. If meter triggers measurement too easily due to road unevenness, increase this value. Too large sensitivity value will however prevent measurement from starting when it is very

slippery (meter does not detect braking). Default value is 45.

*Acceleration* is visible when using accelerometer based measurement. When vehicle is standing still on even surface this should read as close to zero as possible. If needed, click *Cal.Position* to perform automatic re-calibration.

*Constant* is visible when using speed pulse based measurement. This is used to fine tune measurement based on car's normal deceleration. Range for this is typically 10 .. 50.

#### **6.4. TEMPERATURE CALIBRATION**

When determining road condition, the temperature range around 0 degrees C is typically the most important, so meter is calibrated to measure most accurately just around this temperature.

In temperature calibration sets calibration point. Default value is 1000, and increasing this value by 10 decreases measured temperature by 1.0 degrees.

## 7. SETTINGS

Meter settings are opened via pull-up menu's (see chapter 4.2, p. 7) gear-icon. Meter is discoverable via Bluetooth when in settings mode, but after pairing is established, remote can open connection at any time.

Visible settings depend on meter model:

- Distance calibration: Calibration of impulse-based measurement, see p. 16.
- Speed unit: Display speed can be shown as km/h, m/s or m/min.
- Friction measurement method: *Impulse* uses distance- and brake signals for determining friction. *Acceleration* uses internal accelerometer and can also be used with GPS-based distance measurement.
- Friction calibration: Friction measurement must be calibrated to be accurate. See page 17.
- Temperature calibration, page 18.
- RS232 speed: Line speed for RS232 connection in bps. Other settings are 8 bits, no parity, 1 stop bit.
- Test signals allows easy testing of meter signals. See page 16.
- Driving log: This opens driving log settings. See p. 12.
- Maintenance interval: Meter can be programmed to notify when specific service interval, in kilometres, is full. When enabled and maintenance is required, this is shown as wrench icon on main display.
- External pulse: Selectable depending on meter model: Pausing distance counter (p. 10), brake signal for friction (p. 10), extra counter (p. 11), clearing selected counter (p. 8)
- WLAN: Meter can update its firmware via WLAN connection. Connection does not need to be continuous, and connection at for example garage is sufficient. Connection is also used to send driving log- and friction measurement results to Trippi oy services.
- GPS: Even when GPS is not used for distance measurement, meter follows its signal and warns about it on main display with yellow satellite icon. GPS can be turned completely off via this menu. Meter can also update time from GPS signal. This requires that time zone is also set. Meter does not update for DST automatically.
- Time: Manual set meter time and timezone
- Language: Meter operating language
- Touch sensitivity: Touch panel sensitivity can be changed. Zero is the least sensitive setting.
- Licenses: Meter features can be upgraded with software licenses. Available licenses are shown on this screen, and *New* opens entering license code that can be used to activate new licenses.
- Software update: *Update* connects to server via WLAN connection to check for new update. If new software is available, meter loads it automatically on background when connection is available. When update is loaded, it can be

intalled with *Update software* setting.

## 8. PROBLEMS?

Here are few instructions for solving some of the general problems. If these do not help, contact manufacturer or dealer for further instuctions.

Do not open meter enclosure as internal meter electronics can be damaged. Warranty does not cover usage or installation done against these instructions.

Meter can show following symbols during use:


📶 White: WLAN connection established. Yellow: Meter's WLAN connection needs to be configured for meter to operate properly with current settings.

📶 Bluetooth connection open (remote connected)aite yhdistetty)

📶 Yellow: GPS location fix missing (bad signal). Meter's GPS anternna is inside it, at back, on upper left corner when looked at from front. Make sure antenna as unobstructed view to the sky.

🔑 Vehicle maintenance interval reminder.

📶 Software update is ready to be installed.

	Trippi Oy Pilvitie 6 90620 Oulu, Finland	p. +358-44-5130 576 <a href="http://www.trippi.fi">www.trippi.fi</a> toni.rasanen@trippi.fi
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