

Issued by Notified Body No. 0402 according to Directive 2014/32/EU MID annex II Module B, regarding:

## Taximeter system M2

Issued to

**Semel Oy**

Valimotie 21, FI-00380 Helsinki, Finland

### In accordance with

Annex II Module B of the Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments, implemented in Swedish law by SWEDAC Regulation STAFS 2016:1 and STAFS 2016:8 Regulation and Guidelines concerning Taximeters. RISE Certification Rule SPCR 302 has been applied.

### Type of instrument and type designation

Taximeter, taximeter system M2

### Conclusion of the examination

For the instruments mentioned in this Certificate, the following essential requirements of Directive 2014/32/EU apply:

- Annex I, Essential requirements
- Annex IX, (MI-007), Taximeters
- For the instruments, the following harmonized standards or normative documents will be applied:
- OIML R21, edition 2007, (E), Taximeters Metrological and technical requirements, test procedures and test report format (applied partly)

For the instruments, the following technical specifications will be applied additionally:

- WELMEC 12.1, Taximeter common application, Directive 2017/32/EU, Annexes I & IX (2020)
- WELMEC 7.2, Software Guide (Issue 2015)

The measuring instrument's technical design which is described below complies with the above-mentioned essential requirements. With this Certificate, permission is given to attach the number of this Certificate to the instruments that have been manufactured in compliance with this Certificate.

### Rated operating conditions

Measurand:	Time and or distance	Mechanic environment class:	M3
Measurement range:	Maximum 99999.99 on the display (corresponding to the fare to be paid) Pulse range: 500 – 150000 pulses/km Maximum pulse frequency: 11 kHz (pulse input 1)	Electromagnetic environment class:	E3
Accuracy:	- Time elapsed: $\pm 0,1\%$ - Distance travelled: $\pm 0,2\%$ - Calculation of the fare: $\pm 0,1\%$ - Measuring range: 500-150000 pulses/km	Climatic environment:	-25 to +55 °C Condensing Closed (installed in a car)

Originally issued: 2018-04-23  
Valid until: 2028-04-23

This certificate replaces earlier issues.



Martin Tillander

Certificate 0402-MID-502305 | issue 4 | 2022-07-07

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### The instruments must meet the following provisions:

#### 1. Design of the instrument

##### 1.1 General description/Construction

###### Product names

The instrument is sold under 2 brand names: Semel M2 and Halda M2 respectively.

Semel M2 consists of:

- TM208 (Central processor unit)
- TT430 (Touch display)
- RX90hn (Printer) can be connected to the system, but is not a requirement according to directive 2014/32/EU
- TT430 can be mounted in RM1c casing, but is not a requirement according to directive 2014/32/EU
- TT430 can be mounted in RM1r casing, but is not a requirement according to directive 2014/32/EU

Halda M2 consists of:

- TM208 (Central processor unit)
- TT430 (Touch display)
- RX90hn (Printer) can be connected to the system, but is not a requirement according to directive 2014/32/EU
- TT430 can be mounted in RM1c casing, but is not a requirement according to directive 2014/32/EU
- TT430 can be mounted in RM1r casing, but is not a requirement according to directive 2014/32/EU

###### Measuring system description

The taximeter is designed to measure time and receive information to calculate distance. Time is measured by its internal real time clock and distance is calculated by the number of pulses received from the pulse generator of the car in relation to the given pulse constant. The supply voltage is taken from the battery of the vehicle. For connections see the schematic pictures below.

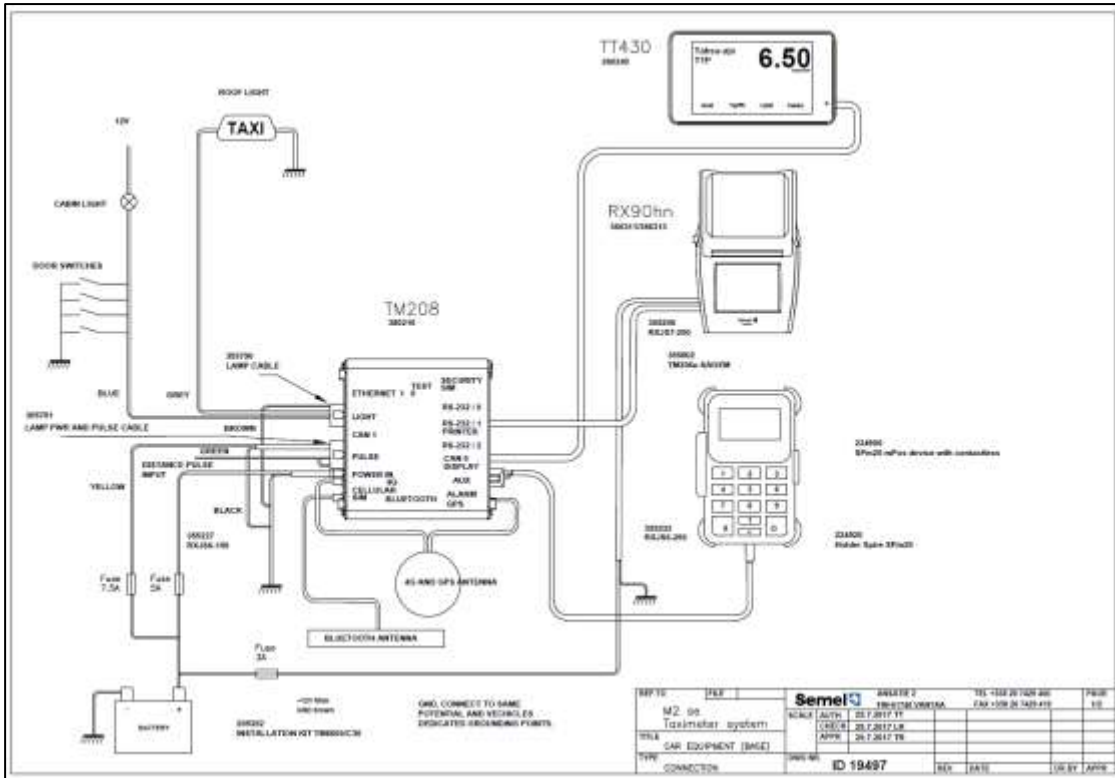


Figure 1: Connections between CPU and other parts of the system

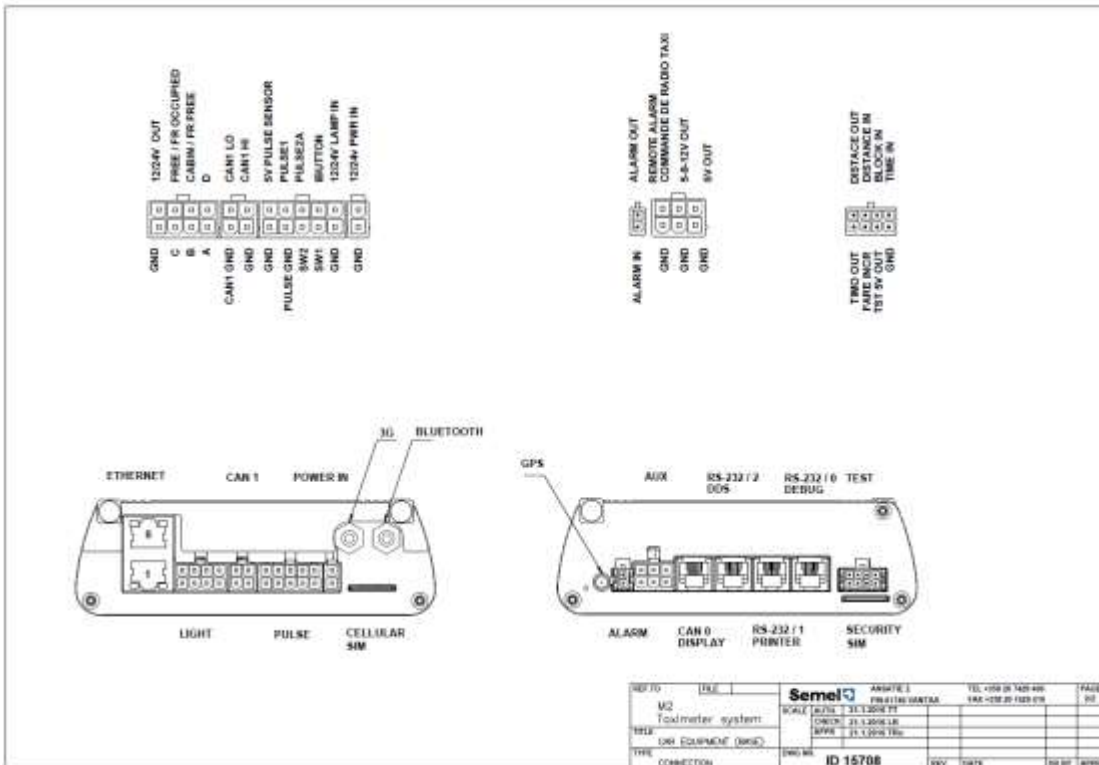


Figure 2: Connectors on CPU



Figure 3: CPU, TM208

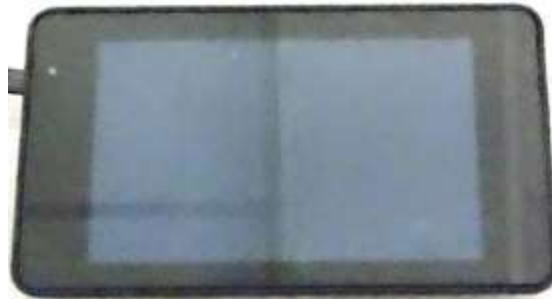


Figure 4: Display, TT430



Figure 5: Display, TT430 in casing RM1r



Figure 6: Display, TT430 in casing RM1c

### Supply voltage

Taximeter: 9-32 V according to manufacturer specifications.

NOTE: Tests have been performed at 9V and 16V as described in OIML R21 for a system with 12 V nominal voltage.

## 1.2 Sensor

### Connection to the pulse generator of the vehicle

The pulse from the pulse generator of the car must fulfil the following requirements according to the manufacturer:

7.5.5 Pulse input 1	
Pulse input 1 is car battery level input for vehicle speed sensor pulses. The input specifications are OIML-R21 compliant:	
HIGH to LOW transition	1.17 V
LOW to HIGH transition	2.84 V
Hysteresis	1.63 V
Input impedance, $Z_{in}$	10 k $\Omega$
Maximum input signal frequency	11 kHz
Input is also protected with 33 V TVS diode for protection against wrong cable connections and negative voltages.	

Figure 7: Manufacturer specifications, pulse input 1

7.5.6 Pulse input 2	
Pulse input 2 is car battery level input for vehicle speed sensor pulses. The input specifications are compliant to MB Sprinter, MB Vito (2014 ->), MB E (2013 ->), MB B (2014 ->), MB C (2015 ->) VW Crafter and Ford C-Max datasheets:	
HIGH to LOW transition	2.46 V
LOW to HIGH transition	3.85 V
Hysteresis	1.39 V
Input impedance, Zin	10 kΩ
Maximum input signal frequency	16 kHz
Input is also protected with 33 V TVS diode for protection against wrong cable connections and negative voltages.	

Figure 8: Manufacturer specifications, pulse input 2

NOTE: Pulse input 2 specification is not OIML R21 compliant (3V high may not be recognized).

### 1.3 Measurement value processing

#### Hardware

CPU type TM208

Display type TT430. The display can also be inside a rear mirror in casing RM1c or RM1r.

A printer can be connected to the system but is not requirement according to directive 2014/32/EU.

#### Software

The validation of software was based on the essential requirements given in MID and WELMEC Guide 7.2 (2015).

#### Software version

The following program versions are approved:

Type of program	Program version	Checksum
TM208 CPU software	M2.Dcc.bo780X.XXXXXXX	1734540780
	M2.Dcc.bo805X.XXXXXXX	501314805
TT430 display software	1.0.0	166338774
	2.0.2	1233926214

For cc.bo see table "BuildOptions".

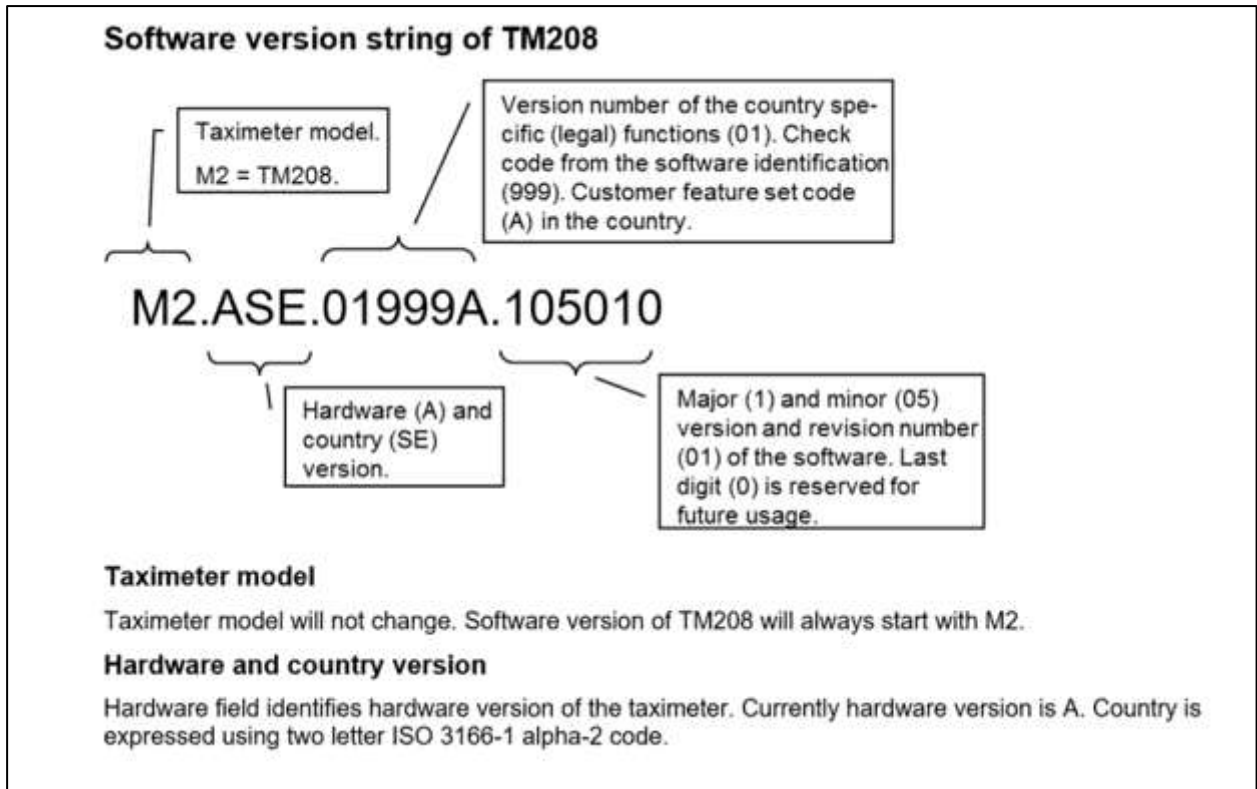


Figure 9: Manufacturer specifications, description of software version naming

Buildoptions Calculation Rule			
Remote Control	Divided Payment	Discount	BuildOption Value
0	0	0	00
0	0	1	01
0	1	0	02
0	1	1	03
1	0	0	04
1	0	1	05
1	1	0	06
1	1	1	07

BuildOptions		
	cc = CountryCode	bo = BuildOption
Sweden	SE	06
Finland	FI	07
Denmark	DK	06
Norway	NO	07
Estonia	EE	07
Other MID Country	cc	00

Figure 10: Manufacturer specifications, description of software build options

NOTES regarding country specific build options:

Remote Control: This function allows remote pre-settings like chosen tariff from a booking centre. The driver must manually confirm any remotely transferred setting by physically press a button on the taximeter. The functionality of this setting is not considered to be a remote control in the meaning of Welmec 12.1. This setting is in line with Welmec 12.1.



Divided Payment: Shared payment of total price to be paid. The total price can be split in several parts, but it does not affect total sum of the price to be paid. This setting is in line with Welmec 12.1.

Discount: A function to give discount at payment. This setting is not in line with Welmec 12.1 where discount is not allowed.

The MID checksum and taximeter version can be viewed in the display as follows:

**9.4 View MID Check sum**  
Shows MID check sum on the display.





Note	Taximeter display	Function/Explanation
The taximeter is in OFF mode.		By pressing the taximeter non iconic area, will the numeric keypad be opened.
The taximeter numeric keypad is opened.		Insert code 96 using the numeric keypad and confirm the inserted code by pressing <input checked="" type="checkbox"/> key.
The taximeter shows the MID Check sum.		Touch the screen to return to a previous state.
The taximeter is in OFF mode.		

Figure 11: Manufacturer instructions, view MID checksum on display

The function to view taximeter version has been added to command 96 (as addition to information above). By using up and down arrows more information can be viewed.



Figure 12: View MID checksum on display



Figure 13: View software version on display

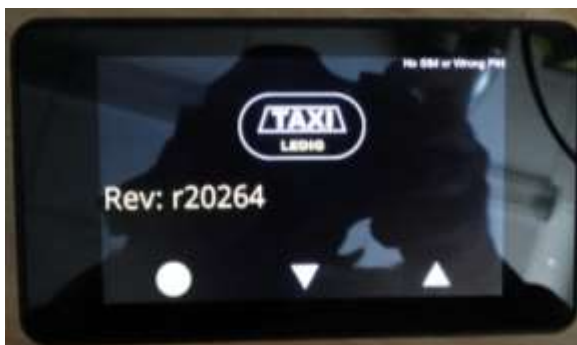


Figure 14: View software revision display

#### 1.4 Indication of the measurement results

The indication of the measurement result is shown on display TT430.

#### 1.5 Optional equipment and functions subject to MID requirements

None identified

#### 1.6 Technical documents

For market surveillance the construction, software and included components are described in 1.1, 1.2 and 1.3.

Technical description: "Semel TM208-1 Technical Description" ver. 0.6 2016-03-08.

Installation manual: "Semel M2 Touch Screen Taximeter Installation Manual", ID 20417, ver. 3, 31.10.2017.

Connection diagram: "M2 se Taximeter System, Car equipment (base), connection", ID 19497, 25.7.2017.



### 1.7 Integrated equipment and functions not subject to MID

Software to fulfil national requirements or to communicate with booking central etc. must not influence the accuracy of measurements such that the maximum permissible error is exceeded or the required functions are changed.

### 1.8 Parameter settings

Even if program version and checksum are the same as required, functionality can be altered by changing parameters. Compared to the requirements of directive 2014/32/EU the following additional parameters are to be set: Parameters can be read by using code 601E.

Parameter	Taximeter display	Press / Scroll	Setting to fulfil the requirements of Directive 2014/32/EU
LOG.WAR	Free space percentage of the MID log. Notification when memory full	1-100 5=DEFAULT	MID=5
INF.MID	MID log overwrite allow/deny	0 = log overwrite allowed, 1 = log overwrite denied, need command 902 to clear log.(DEFAULT)	MID=1
MID.MIN	Handling minimum price	0 = minimum price is shown only after cashier. 1 = minimum price is shown instantly. (DEFAULT)	MID=1
MID.EXT	Extra included/not included in price	0 = Included 1 = Not included (DEFAULT) 2 = Included with additional extra on left	MID=1
MID.OP	Show OFF and FOR HIRE status	0 = Not shown on display 1 = OFF mode (shift off) and FOR HIRE mode is indicated on display.(DEFAULT)	MID=1
DIS.OFF	Display shut down	0 = display is always on (DEFAULT) 1 = display can be shut down, so it does not show anything.	MID=0

## 2. Technical data

### 2.1 Rated operating conditions

#### Measurand

Time and or distance.

#### Measurement range

Maximum 99999.99 on the display (corresponding to the fare to be paid)

Pulse range: 500 - 150000 pulses/km Maximum pulse frequency: 11 kHz (pulse input 1)

#### Accuracy class

Time elapsed:	± 0,1 %
Distance travelled:	± 0,2 %
Calculation of the fare:	± 0,1 %
Pulse range:	500-75000 pulses/km

### Environmental conditions / influence quantities

Mechanic:	class M3
Electromagnetic:	class E3
Ambient temperature limits:	-25°C to +55°C
Humidity:	condensing
Location:	closed (inside a car)

### 2.2 Other operating conditions

Not applicable.

### 3. Interfaces and compatibility conditions

See clause 1.1

### 4. Requirements on production, putting into use and utilization

The requirements of the installation manual are to be followed when installed in a car and put into use.

#### 4.1 Requirements on production

No special requirements identified.

#### 4.2 Requirements on putting into use

The taximeter must be adapted to the vehicle.

#### 4.3 Requirements for consistent utilizations

No special requirements identified.

### 5. Checking of instruments which are in operation

#### 5.1 Documents required for the test

The procedure to control the accuracy after installation in a car is described in the user's manual.

#### 5.2 Special test facilities or software

A stop watch or other time measure equipment is needed.

#### 5.3 Identification of hardware and software

See 1.3 Measurement value processing

#### 5.4 Calibration/adjustment procedure

The taximeter can be controlled after installation in a car in the following way.

To check the accuracy of distance measurement a distance control report can be initiated according to section 9.2 in user's manual:

Note!  
To test distance constant is previously measured exactly 1000-metres length roadway needed.

Note! The taximeter control reports are available in FOR HIRE and OFF mode.

**Example:**













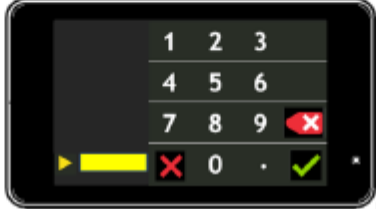





Note	Taximeter display	Function/Explanation
The taximeter is in FOR HIRE mode.		Press the key  to get to the next available functions
		Press the key  to get to the next available functions
		Press the key  to get to the next available functions
		Press the key  to get to the next available functions
		Press the key  . The Control report will be printed automatically.
The taximeter returns to a For Hire mode.		

Figure 15: Manufacturer instructions – distance measurement

To check the accuracy of time measurement the procedure as described in user's manual section "6.2.3 Clock test (TD)" is to be followed to perform a 30 minutes time measurement test:

Note	Taximeter display	Function/Explanation
The taximeter is in FOR HIRE or OFF mode.		By pressing the taximeter non iconic area, will the numeric keypad be opened.
The taximeter numeric keypad is opened.		Insert code 93 using the numeric keypad and confirm the inserted code by pressing  key.
The taximeter is in test mode.		By pressing the text "Seuraava" is testing started.
An additional timer is needed.		Press Enter on the display simultaneously with an additional timer.
Display will show AIKA and the calculation is running. The display shows in this phase an accuracy of 1 second.		Continue this test for 30 minutes.
		When time on the display is 30 minutes, stop the calculation by pressing "Seuraava" and at the same time stop the additional timer.




<p>The taximeter numeric keypad is opened.</p>		<p>Insert the manually received time from your own timer (MMSS) and confirm it with  key.</p> <p>The taximeter automatically prints the offset out on the printer. This should be attached to the control report.</p>
<p>The taximeter returns to a previous state.</p>		

Figure 16: Manufacturer instructions –time control test

## 6. Security measures

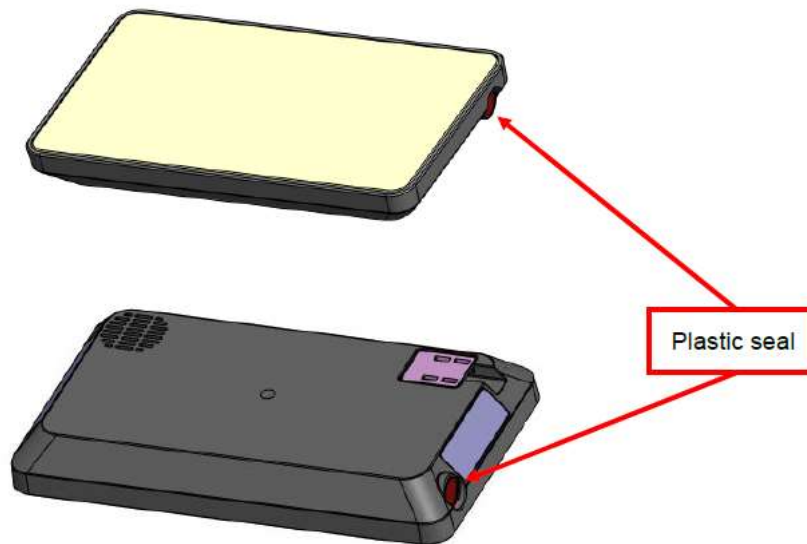
### 6.1 Mechanical seals

The display is to be sealed according to following description from manufacturer.

### 2.3.1 TT430 sealing

Opening and closing the Semel M2 taximeter (display TT430) sealing.

The TT430 touch screen display seal is located on the right side of the display upper end.



The display must be sealed using a plastic seal.

Make sure the taximeter is in the OFF-Mode before opening the sealing.

The mechanical sealing is opened by breaking and removing the plastic seal.

Underneath the mechanical seal is located an electrical sealing switch. To open the electrical seal, press the switch awhile and the taximeter removes to a "Open seal state".

To close the electrical seal, press the electrical sealing switch awhile and the taximeter sealing will be closed.

Mark the plastic seal with a specific sealing code as ordered by a local authority.

Insert the new plastic seal by pressing it to a sealing hole.

Figure 17: Sealing of display





Figure 18: Sealing of display TT430 in RM1c casing, marked with a read ring



Figure 19: Sealing of display TT430 in RM1r casing, marked with a read ring



Figure 20: Sealing-key to display TT430 in casing RM1r and RM1c

The CPU is sealed to the vehicle by means of sealed cables. The cables are sealed to the taximeter by the sealing lock plate which covers the connectors to prevent loosening of cables without opening of seal. The CPU is to be sealed according to following description from manufacturer.

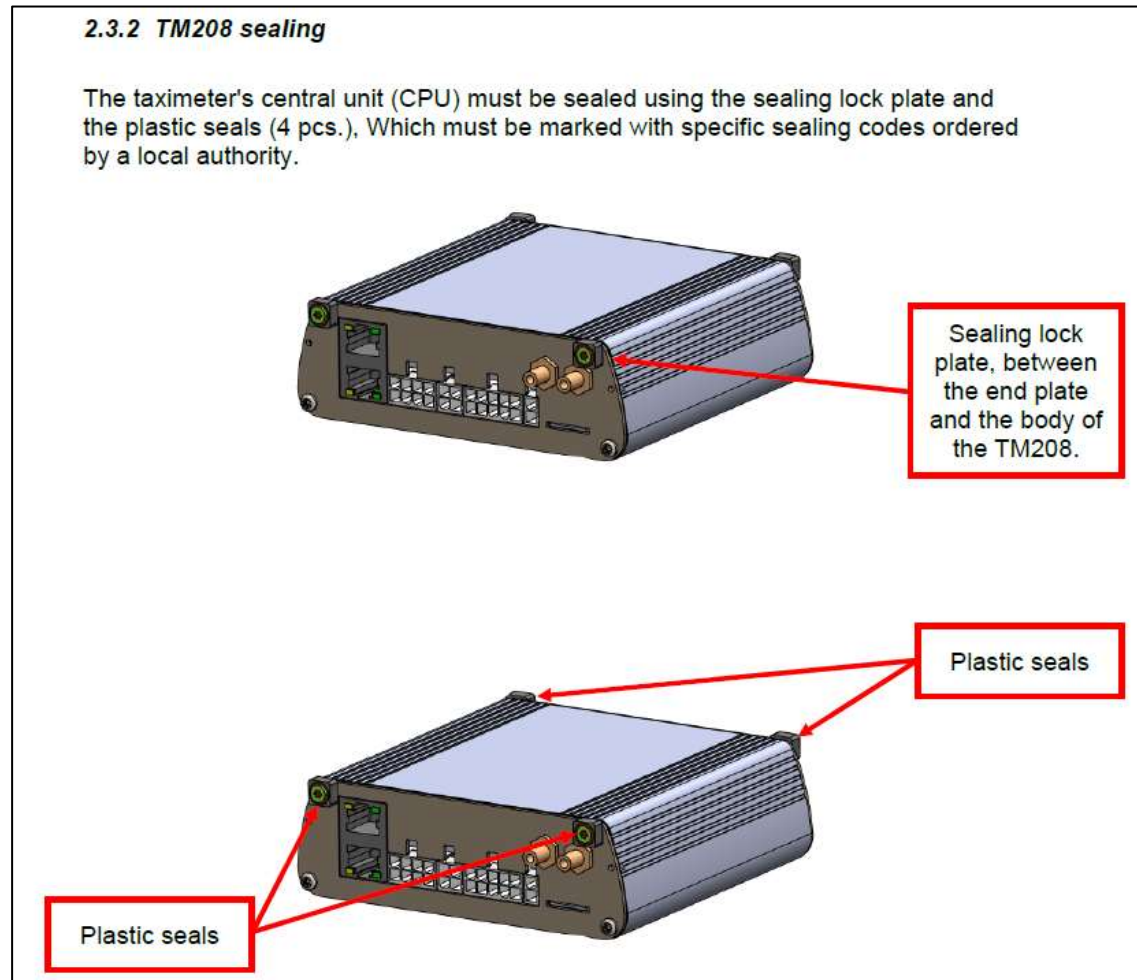







Figure 21: Sealing of CPU

Device constant; k min - k max: 500 - 150000 pulses/km. The device constant is stored in a non-volatile memory and the value is secured by the sealing of the CPU.

**8.8 Skriv ut log [98] SKR.LOG**  
Skriver ut händelselogg.

Förklaring	Taxameter display	
Taxametern i OFF läge		Tryck  +  <small>Slida till höger</small> för att gå till andra undermenyn
		
Bläddra tills du kommer till SKR.LOG		Skriver ut händelselogg

## 6.2 Software seals

Values are automatically stored to non-volatile RAM. According to the manufacturer the totalized values are stored for one year by using automatic memory backup to non-volatile RAM. The taximeter is designed to maintain an adequate stability of its metrological characteristics.

## 7. Labelling and inscriptions

### 7.1 Information to be borne by the instrument

The marking on the instrument shall contain the following information:

- The manufacturer's mark and name
- The name and postal address of the manufacturer
- The accuracy
- Measurement capacity
- Measurement range (Maximum pulse frequency and minimum pulses/km)
- The designation or type name (according to "Product names" on page 2)
- The serial number
- The EU type-examination certificate number, 0402-MID-SCXXXX-YY
- Markings regarding other approvals
- Marking regarding additional devices not being covered by MID

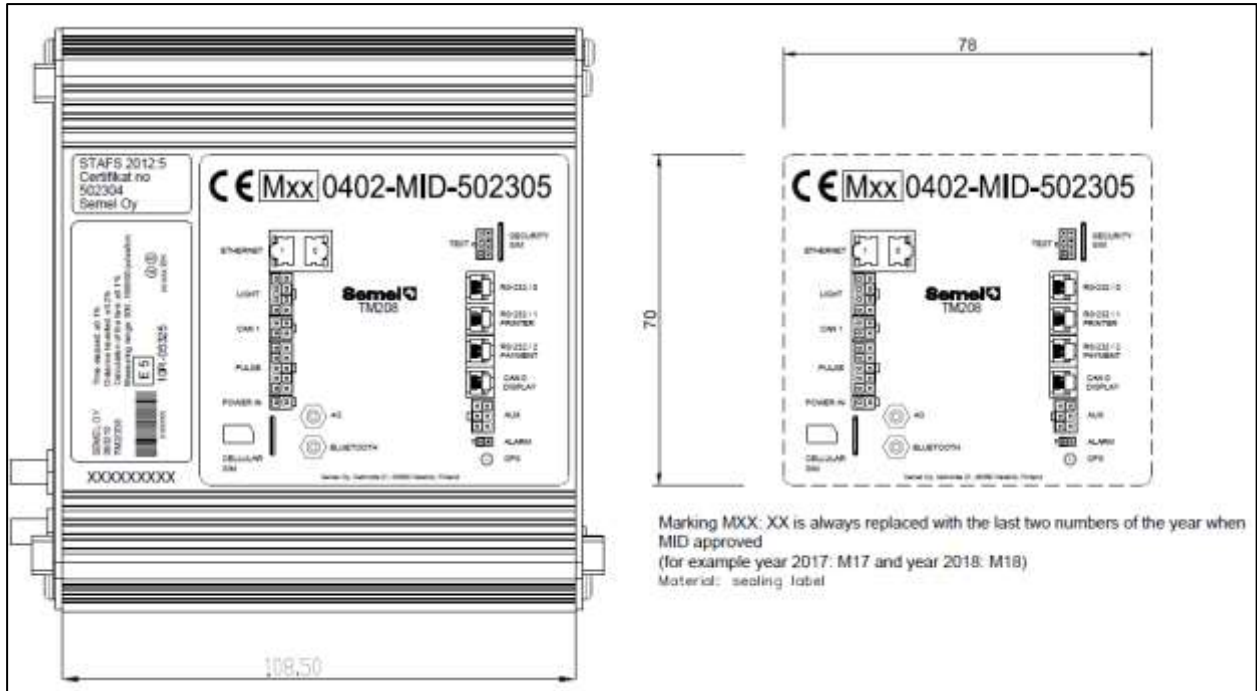


Figure 22: Placement of markings on CPU.

Figure 23: Connection label

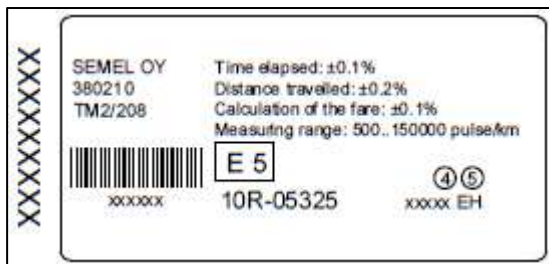


Figure 24: Type label.

Marking of display unit is to be placed on the backside of the unit. Markings are located as parts 6 and 7 in picture below.

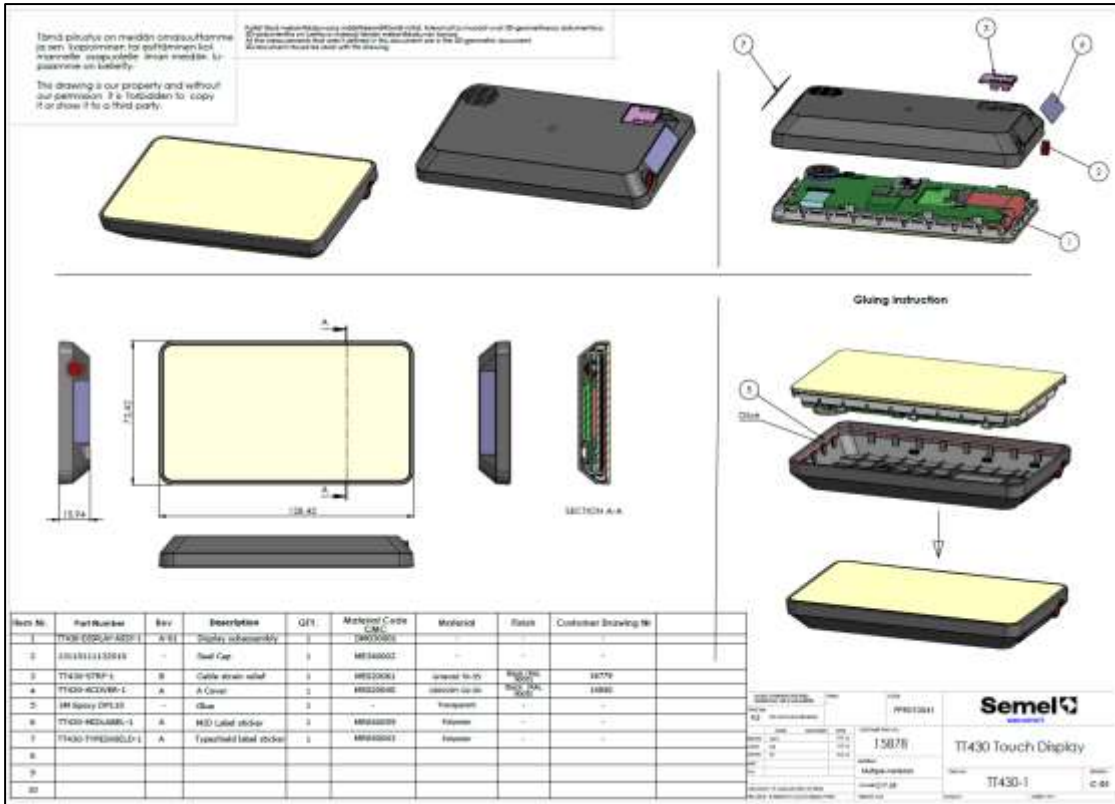


Figure 25: Placement of marking on the main display.



Figure 26: MID label sticker.



Figure 27: Typeshield label sticker.

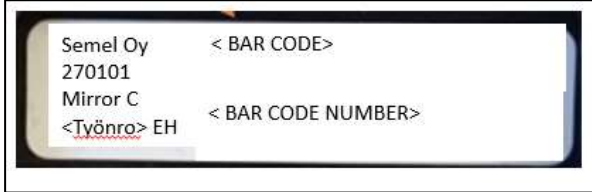


Figure 28: Example of label sticker for display TT430 in casing RM1c.



Figure 29: Placement of sticker for display TT430 in casing RM1c.



Figure 30: Example of label sticker for display TT430 in casing RM1r.



Figure 31: Placement of sticker for display TT430 in casing RM1r.

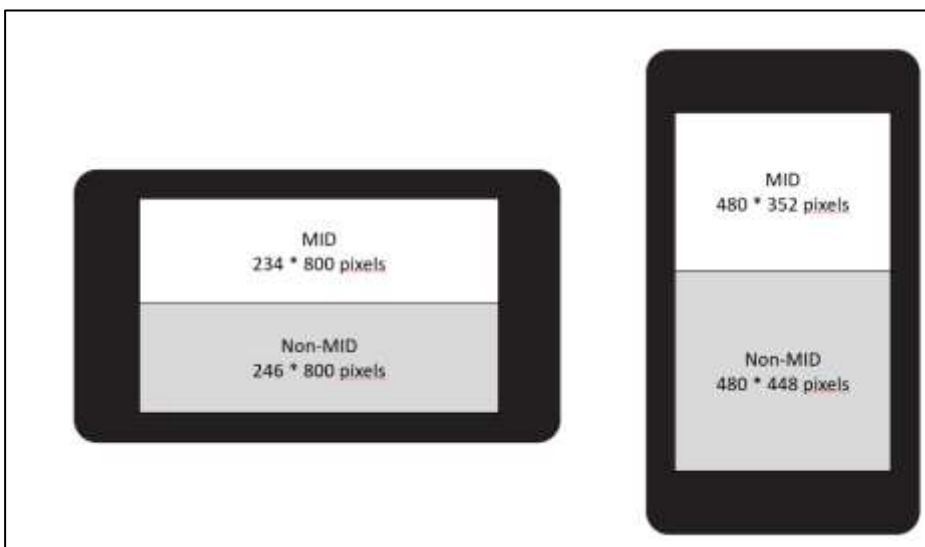




Figure 31: The TT430 display is divided into the legally relevant part and the legally nonrelevant part.

The TT430 display is divided into the legally relevant part and the legally nonrelevant part.

Horizontal installation: The legally relevant part is the uppermost 234 pixel rows of the display. The legally nonrelevant part is located at the bottom 246 pixels of the display.

Vertical installation: The legally relevant part is the uppermost 352 pixel rows of the display. The legally nonrelevant part is located at the bottom 448 pixels of the display.

Only the legally relevant part of the taximeter is allowed to update the upper part of the display. The legally nonrelevant code is allowed to update the bottom part of the display. The legally relevant part of the software contains a filter which detects any attempts by the non-legally relevant part to write to the top part of the display. When such an attempt is detected, the taximeter enters error state.

### 7.2 Conformity marking in accordance with MID article 21

The instrument shall be marked in accordance with MID article 21 which e.g. describes the CE-marking together with M, year of marking and the id number of the notified body responsible for module D.

### 7.3 Further inscriptions, if necessary

Further inscriptions e.g. e- or E-marking and national markings are necessary, but are not connected to this directive.

## 8. Manuals

The following manuals are to accompany the different systems in the official language of the country of use (the manufacturer is responsible for the translation of approved documents).

<b>Title of manual</b>	<b>Document version</b>	<b>Language of examined version</b>
"M2 User Manual with TT430", ID 17308	ver.6 14.11.2016	English
"Semel M2 Touch Screen Taximeter Installation Manual", ID 20417	ver. 3, 31.10.2017	English
M2 T Användarmanual (ID 18055)	Ver. 1.1, 29.10.2018	Swedish

For installation purposes the installation manual "Semel M2 Touch Screen Taximeter Installation Manual", ID 20417 ver. 3, 31.10.2017 (examined in English version) is to be followed.

## 9. Figures

See 1.1 General description/Construction.

## 10. Testing and examination

Testing and examination have been carried out in accordance with Evaluation Report 5P09828-MID in accordance with Directive 2014/32/EU Annex II, module B, paragraph 5. The principal characteristics, approval conditions are set out in this certificate. The plans, schematic diagrams and documentations are recorded under reference RISE files 5P09828.

### Vibration

Testing was carried out with the following severity in accordance with OIML R21, Annex A clause A.5.4.4 (IEC 60068-2-64):

<b>Total frequency range</b>	<b>10-150 Hz</b>
Total RMS level	7 m/s <sup>2</sup>
ASD level 10-20 Hz	1 m <sup>2</sup> /s <sup>3</sup>
ASD level 20-150 Hz	-3 dB/octave

Testing was carried out in three mutually perpendicular axes for 0.5 hours in each direction and the instrument was connected to power during testing.

### Dry Heat

Testing of Dry heat was carried out according to OIML R21, Annex A clause A.5.4.1 (IEC 60068-2-1, IEC 60068-2-2 and IEC 60068-3-1), with the duration 16h and the highest temperature +55°.

The taximeter was connected to power during the test.

### Cyclic damp heat

Testing of damp heat cyclic (condensing) was carried out according to OIML R21, Annex A clause A.5.4.2 (IEC 60068-2-30 and IEC 60068-3-4). The taximeter was not connected to power during testing. After the 2 cycles the taximeter was connected to power and a function control was carried out.

### Cold

Testing of cold was carried out according to OIML R21, Annex A clause A.5.4.1 (IEC 60068-2-1, IEC 60068-2-2 and IEC 60068-3-1), with the duration 16h and the lowest temperature -25°C. The taximeter was not connected to power during testing.

### Emission

EN 55022, Class B

EN 55032, Class A

### Immunity

OIML R21 A.5.4.5.1 Radiated immunity, according to IEC 61000-4-3, 24 V/m

OIML R21 A.5.4.5.2 Injected RF immunity, according to IEC 61000-4-6, 24 V

OIML R21 A.5.4.6 Electrostatic discharge, according to IEC 61000-4-2, 6 kV CD/8 kV AD

OIML R21 A.5.4.7.1 Automotive transient immunity on supply lines, according to ISO 7637-2, Pulse 1, 2a, 2b, 3a, 3b, 4, level 4

OIML R21 A.5.4.7.2 Automotive transient immunity on signal lines, according to ISO 7637-3, Pulse 3a, 3b, level 4

Immunity according to Directive 2014/32/EU with provisions of Welmec CT-007:2019

1.3.3a Starting profile, Level III according to ISO 16750-2:2012(E)

1.3.3a Load dump, Test B according to ISO 16750-2:2012(E)

Automotive voltage transient immunity ISO 7637-2, level 4, pulse 5

### 11. Revision history / Traceability of reports concerning EU type examination

#### Certificate

<i>Issue</i>	<i>Dated</i>	<i>Description</i>
1	2018-04-23	Certificate issued
2	2021-06-30	Update due to software and hardware changes to the display TT430
3	2021-09-20	Update due to software changes
4	2022-07-07	Update due to hardware changes

#### EU type examination

<i>Report</i>	<i>Title</i>	<i>Date</i>
5P09828-MID	EU type examination of taximeter (module B)	2018-03-09
5P09828-01	Evaluation of Taximeter Software according to Welmec 7.2	2017-08-17
5P09828-07	Evaluation of Risk Analysis	2017-08-03
5P09828-E3	EMC test of Semel M2 taximeter system	2017-01-25

#### Supplementary EU type examination

<i>Report</i>	<i>Title</i>	<i>Date</i>
P110697.DP1.A1-1	Supplementary EU type examination of taximeter (module B)	2021-06-29
P114211.DP01.A01	Supplementary EU type examination of taximeter (module B)	2022-06-07