Operating instructions for the ultrasonic transmission oil level meter

ECHOMETER 1077.080-A

Rev. 1.0

KARL DEUTSCH Prüf- und Messgerätebau GmbH + Co KG
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1 About this manual

This operating manual is valid for the device version **ECHOMETER 1077.080-A** (from the ECHOMETER complete package 1077.901-A) or W000 588 09 19 00 (part number Mercedes-Benz workshop equipment).
Instructions marked with the symbol ⚠ must be read and observed to avoid any danger to life and limb. The sections marked with the warning symbol ⚠ must be observed in order to maintain the quality of the testing process. Additional notes of interest are marked with the info symbol 𝒊.

2 Proper use, accessories

Proper use: The ECHOMETER 1077.080-A is a device for measuring transmission oil levels in vehicles of Daimler AG. The operation of the device is designed for technically trained personnel as commonly found in automotive workshops. The measurement is based on the transit time of ultrasonic signals which are sent from below through the oil in the transmission by a probe attached to the oil sump and reflected at the oil surface. The device is intended exclusively for use with the probe (Art. No. 1498.276) included in the scope of delivery. The correct handling of the meter for its intended use is described in this manual. This also means that the meter and its accessories must not be modified.

Accessories: If accessories are required for the intended use, only device-specific KARL DEUTSCH accessories or accessories expressly approved by KARL DEUTSCH may be used.

3 Scope of delivery

Image 1: Scope of delivery in case (illustration without documents)

- ECHOMETER 1077.080-A in protective holster, with carrying loop in case
- 2 batteries, alkaline manganese, size AA
- Probe cable (art. no.: 1616.023)
- Probe (art. no. 1498.276)
- Two spare plastic protective discs (art. no.: 1930.010) to be glued onto the sound outlet surface of the probe
- Test block (art. no.: 1713.006) for function control of device and probe
- multilingual test book with delivery test certificate of the device
- multilingual quick guide
- CD with PDF files of the manuals in several languages

4 Conformity

EG-Konformitätserklärung
EC-Declaration of Conformity

DIN EN ISO 9001
KARL DEUTSCH
DO-9.1-044-10

Angaben zum Gerät:
Details on the Device

Gerät: *Instrument*	**Echometer**
Typ: *Type*	**1077.080-A**
Fertigungsnummer: *Serial Number*	

Wir bestätigen hiermit, dass das Gerät / System in Übereinstimmung mit der Niederspannungs-Richtlinie (2014/35/EU) und der EMV-Richtlinie (2014/30/EU), sowie der Richtlinie 2011/65/EU (RoHS 2) und der RoHS- Richtlinie EU2015/863 (RoHS 3) entwickelt und gefertigt wurde.

We hereby confirm that the device / system complies with the EC directives "Low voltage equipment" (2014/35/EC) and "Electromagnetic compatibility" (2004/30/EC), also with the guidelines 2011/65 (RoHS 2) and with the RoHS guidelines EU2015 (RoHS 3).

Zur Beurteilung wurden die folgenden harmonisierten Normen und Standards herangezogen:

The following harmonized technical standards and regulations have been used for judgement:

EN 61000-4-2:2008; Störfestigkeit gegen Entladung statischer Elektrizität (ESD)	*Electromagnetic compatibility (EMC) Immunity - Electrostatic discharge immunity test*
EN 61000-4-3:2006 + A1:2007 + A2:2010; Störfestigkeit gegen hochfrequente elektromagnetische Felder	*Electromagnetic compatibility (EMC) Immunity - Radiated, radiofrequency, electromagnetic field*
EN 55011 :2016 + A1 :2017; Industrielle, wissenschaftliche und medizinische Geräte - Funkentstörungen - Grenzwerte und Messverfahren Gruppe 1, Klasse B	*Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement group 1, class B*
EN 61326-2-2:2013; Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 2-2: Besondere Anforderungen - Prüfanordnung, Betriebsbedingungen und Leistungsmerkmale für ortsveränderliche Prüf-, Mess- und Überwachungsgeräte für den Gebrauch in Niederspannungs-Stromversorgungsnetzen	*Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems*
EN 61326-1:2013; Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen	*Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements*
EN 61010-1:2020; Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte; Teil 1: Allgemeine Anforderungen	*Safety requirements for electrical equipment for measurement, control and laboratory use; Part 1: General requirements*

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08.04.2020.....
(Datum *date*)

i.A. (Stefan Grünewald)
(Unterschrift *signature*)

EMV-Beauftragter / *EMC Authorized Person*
Entwicklung Elektronische Seriengeräte *Development of Portable Instruments*
(Angaben zum Unterzeichner *position of signer*)

KARL DEUTSCH Prüf- und Messgerätebau GmbH + Co KG · Otto-Hausmann-Ring 101 · D-42115 Wuppertal · Tel. (+49 -202) 71 92 - 0 · Fax (+49 -202) 71 49 32 · e-mail: info@karldeutsch.de

CE We hereby confirm that the device/system has been developed and manufactured in accordance with the Low Voltage Directive (2014/35/EU) and the EMC Directive (2014/30/EU), as well as the 2011/65/EU Directive (RoHS 2) and the EU2015/863 RoHS Directive (RoHS 3).

The following harmonized norms and standards were used for evaluation:

- EN 61000-4-2:2008; Electromagnetic compatibility (EMC) Immunity - Electrostatic discharge immunity test
- EN 61000-4-3:2006 + A1:2007 + A2:2010; Electromagnetic compatibility (EMC) Immunity - Radiated, radiofrequency, electromagnetic field
- EN 55011 :2016 + A1 :2017; Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement Group 1, Class B
- EN 61326-2-2:2013; Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance characteristics for portable test, measurement and monitoring equipment used in low voltage distribution systems
- EN 2-1:2013; Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
- EN 61010-1:2020; Safety requirements for electrical equipment for measurement, control, and laboratory use; Part 1: General requirements

5 Contact to KARL DEUTSCH

You can reach us as follows:

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Company address	Otto-Hausmann-Ring 101 42115 Wuppertal Germany

6 Important notes (read before commissioning!)

⚠ ***Danger! Do not operate in an explosive environment:*** *The device must not be operated in explosive environments. Observe the safety regulations that apply to you.*

⚠ ***Regularly check display accuracy:*** *In order to prevent influences on the measurement result that cannot be detected in any other way, the display accuracy should be checked before starting measurements (and from time to time during longer measurements) using the test block (art. no. 1713.006) included in the delivery. The proper function of the test system can be tested by means of regular control measurements.*

⚠ ***Protective disc:*** *A thin plastic disc is glued to the sound outlet side of the probe, which protects the sound outlet surface and ensures that the probe fits well in the bayonet mount on the gearbox. Before inserting the probe into the bayonet mount, ensure that the adhesive is intact and the plastic disc is undamaged.*

⚠ ***Batteries:*** *If the instrument is not to be operated for a long period of time, please remove the inserted batteries to avoid any potential damage as a result of leaking batteries.*

7 Instructions for use

Coupling: The reliability and accuracy of all measurements depends, among other things, on how well the probe is coupled to the workpiece to be measured. Follow the instructions for attaching the probe to the gear housing (see section 11.3). Before applying the coupling agent, remove any debris or other deposits from the contact surfaces of the probe and the probe holder in the oil sump.

Coupling symbol: Always make sure that the coupling symbol shows a fully attached probe (see section 11.4.3). Should the measured value fluctuate or the coupling symbol constantly change, you should improve the coupling (unscrew the probe from the holder, clean the contact surfaces and screw the probe with coupling agent back in again) and confirm the measured value with comparative measurements.

Voltage monitoring: The ECHOMETER monitors battery capacity and automatically switches off if the supply voltage is insufficient. The settings are retained when the instrument is switched off.

8 Connections

Image 2: Connection socket with eyelet for the carrying loop

1 = Probe connection socket
2 = Eyelet for carrying loop

9 Test block

Image 3: Test block

1 = Test block (art. no. 1713.006)

10 Probe

Image 4: Side view of the probe with connection cable

The connection cable of the probe (art. no.: 1498.276) is plugged in at the back (left in the picture) and can be released by simply pulling it out (Do not pull the cable! Grasp the plug housing to pull out the cable!).

⚠ *The ring surrounding the connector socket is an integral part of the probe unit. Do not loosen the grub screw provided for securing!*

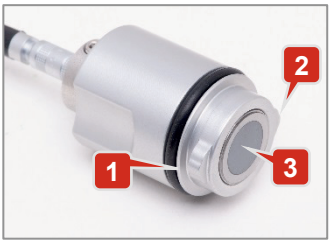


Image 5: Probe viewed from the sound outlet surface (gray circular area)

On the front side with the sound outlet surface (position 3 in Image 5, gray circular area) of the probe there are two lugs (positions 1 and 2 in Image 5) for locking in the bayonet lock.

11 Operation

The keys of the ECHOMETER have different functions depending on the operating mode of the device, which are explained in the following sections:

11.1 Keypad with signal LED

- ON / OFF - button
- Confirmation of the input or the displayed value
- Menu call
- Activate selected menu item

In the further course of the text, this key is symbolized with MENU OK.

The pressure point of the key is located under the character ⏻.

- Switching from a submenu item to the higher-level menu item
- Switching from a main menu item to the measured value display
- Activating and deactivating the display illumination

(press and hold for approx. 2 s)

*This button switches the menu item **backlighting OFF** to **Always** (lighting off) or **Never** (lighting on).*

In the further course of the text, this key is symbolized with ESC.

The pressure point of the key is located under the letters ESC.

If you keep the key pressed during power-on, ESC *the device will be reset to the factory settings (see also section 13.1.6) with the subsequent option of language selection (see section 13.1.4). If the device was inadvertently switched to an unknown operating language, the desired operating language can be activated.*

- Move the menu selection bar upward

- Move the menu selection bar downward

- Under the white dot to the right of the ECHOMETER lettering, there is the signal LED (lights up when switching off and when sending measured values).

11.2 Insert battery, replace battery

Image 6: Opening the battery compartment

- The device is operated with two AA/IEC R6 (Mignon) size 1.5 V cells.
- Proceed as follows to insert or replace batteries:
  - Loosen knurled screw on the back of the device (Image 6, top)
  - Remove the cover of the battery compartment (Image 6 bottom).
- The symbols in the battery compartment base provide information on the correct polarity when inserting the batteries.

⚠ *Only change batteries when the device is switched off!*

Both lithium and AlMn batteries (size AA/IEC LR6, 1.5 V) can be used. Lithium batteries have a longer service life due to their significantly higher capacity.

⚠ *The USB socket above the battery compartment is for service purposes* only. *Do not connect a cable here. The data of the normal test operation can be transmitted wirelessly, see section 13.1.1.*

11.3 Connecting the probe and attaching it to the transmission oil sump

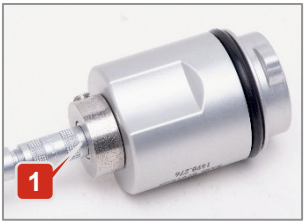


Image 7: Sensor with cable connection

- Plug the probe cable into the socket on the back of the probe (position 1 in Image 7).

Image 8: View of the probe with O-ring (1) and round protective disc (2)

- Ensure that a suitable O-ring (DIN3771 22X2.5 NBR70, position 1 in Image 8) is fitted in the guide groove.
- Check that the protective disc (position 2 in Image 8) is undamaged and centered on the sound outlet surface of the probe.

⚠ *Replace damaged protective discs (see section 16)!*

Image 9: Probe before insertion into the transmission oil sump socket

- Apply some coupling agent to the protective disc (position 1 in Image 9). The protective disc must be provided with a thin layer of coupling agent over the entire surface.

You can find approved coupling agents in the Mercedes-Benz repair document

AR27.00-P-0270-02EWN.

⚠ *Please observe the corresponding safety data sheets.*

Image 10: Inserting the probe

- The socket in the oil sump is equipped with a bayonet lock. The probe is locked by a plug-and-turn movement.
- Insert the probe in the direction of the arrow into the oil sump socket intended for measurement.

To lock the probe in place, turn the lugs of the probe *(positions 1 and 2 in Image 5) behind respective catches in the socket.*
When inserting the probe, rotate it so that the locking lugs are guided past the catches in the socket and the sound outlet surface (see Image 5) of the probe presses against the transmission wall.

Image 11: To lock the probe, push it in and turn it to the right

- Press the probe fully into the socket and turn it to the right until it is in front of the locks. The locking is then achieved by a further rotation of about 30° so that the probes' lugs are guided behind the locks. It may be necessary to press the probe slightly into the socket again.

11.4 Measuring mode

11.4.1 Activating and deactivating

Activate by pressing MENU OK. After the device ID is briefly displayed, the last active settings are retrieved and the device switches to the measuring mode.

Deactivate by pressing and holding down . After a short and a long flash of the signal LED, the device is deactivated. Current settings are saved for the next time the device is switched on again.

⚠ *If the device is to remain switched off for a longer period of time: Remove the batteries to avoid potential damage to the device as a result of battery leakage.*

The language selection can be called up directly after activation (see section 11.1).

11.4.2 Starting measurements

After activation, the device automatically calls up the measuring mode with the settings that were current when it was previously deactivated:

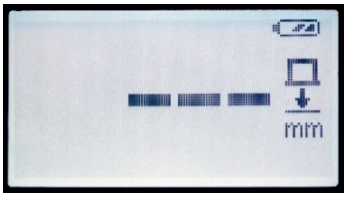


Image 12: No measurement: Three horizontal lines and the symbol of the lifted probe

Battery level indicator

empty ▸ ▸ full

Briefly before automatic switch-off due to undervoltage, the empty battery symbol starts to flash.

No measured value available

Symbol "lifted probe": No measurement is taken because, for example, the probe is not inserted or connected in the oil sump holder or the coupling conditions are insufficient (e.g. due to insufficient coupling agent). This symbol together with the three horizontal lines also indicates that the measuring range has been exceeded.

Display unit "Millimeters""

11.4.3 Performing measurements

When a sound coupling occurs, normally after inserting the probe into the oil sump socket, the measurement starts automatically:

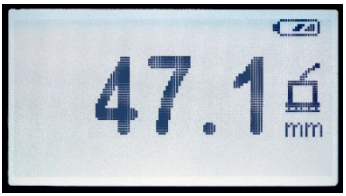


Image 13: Current measured value with coupling symbol

- The coupling symbol changes to .

If the displayed value fluctuates significantly, this usually means that the coupling is insufficient.
Remedy: Unscrew probe, clean coupling surfaces, check protective disc for intactness (replace if necessary), reinsert probe with new coupling agent.

- The currently measured value is displayed on the screen.

11.4.4 Ending measurements

When the measurement is finished, e.g. by unscrewing the probe from the holder, the image changes:

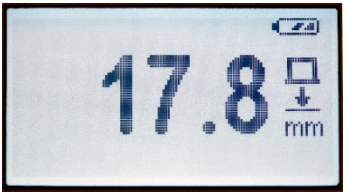


Image 14: Last measured value with coupling symbol. With this pairing symbol, the measured value is not current.

- The coupling symbol changes to and thus indicates that there is no more evaluable sound coupling.
- The displayed measured value remains unchanged for about 3 seconds and is then replaced by three horizontal lines .

⚠ *Please note that a measured value displayed with is* ***not up to date****. The displayed measured value originates fron the last successful measurement!*

11.4.5 Regular control measurements

⚠ *The measurement quality must be checked at the beginning of a work shift or once a day (and in the case of longer measurements also during measurement breaks) using the supplied test block. Any devices with which a proper control measurement cannot be carried out must be shut down and repaired before further use.*

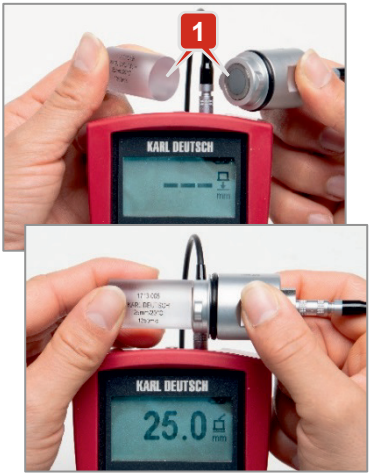


Image 15: Measurement on the test block as regular control measurement

- Ensure that the test block used is clean and without any signs of damage or wear.
- Ensure that the temperature of all components involved in the control measurement is within the range of 10 °C to 30 °C (50 °F to 86 °F).
- Switch on the device.
- Apply a small amount of coupling agent to the front of the test block or to the sound outlet of the probe (position 1 in Image 15Image 15Place the probe on the test block.
- **The device works properly if the measurement on the test block produces a measured value in the range 24 mm to 26 mm (25 mm ± 1 mm).**

⚠ *Recommendation: The control measurement should be performed between 15 °C and 25 °C (temperature for environment, device, test block, coupling agent, etc.)!*

ℹ *The measured value cannot be determined with a mechanical length gauge, e.g. a caliper gauge.*

ℹ *The table at the end of this manual (section 23) can be used to record the regular control measurements. If there is not enough space, it is recommended to copy an empty table page and use it for the recordings (a PDF file of this manual can be found in the download area of our website www.karldeutsch.de).*
To ensure seamless traceability, make absolutely sure that the records are not lost!

12 Menu structure

The symbol ◉ in the following table indicates the default values after loading the factory settings of the instrument (see section 13.1.6).

Level	Menu item	
1	Device options	
2	Wireless	
3	◉ Off	
3	○ On	
2	Brightness	
3	○ Normal	
3	◉ Bright	
2	Backlight off	
3	○ Always	
3	○ 15 Sec.	
3	◉ 1 Min.	
3	○ Never	
2	Language	
3	○ German	☞ The language selection is retained here even after the factory setting has been loaded.
3	○ English	
3	○ Español	
3	○ Italiano	
3	○ Nederlands	
3	○ Svenska	
3	○ Polski	etc. (is continuously extended)
2	Auto Off	
3	○ Never	
3	◉ 5 Min.	
2	Load Factory Set.	
3	Factory Set. Ok? (Security query)	
2	Info (display of device info: Device, S/N, SW-Ver, memory, battery	
1	Service	
2	Option code	
3	Entry of option code for special functions	

13 Operating menu

The character ◉ in the following sections indicates the default values after resetting the device to factory settings (see 13.1.6).

- MENU OK calls up the operating menu.
- Use the arrow keys to select the desired menu item and activate it with the key MENU OK. If necessary, you can branch to further submenus in the same way.
- Settings are confirmed with MENU OK. Use ESC to leave the menu item without activating it and return to the next higher menu level (see menu structure in section 12).

There are two main menu items:

- **Device options** are provided to adapt the operation of the device to its use (detailed description from section 13.1).
- **Service** is intended for optional extension of device features and is accessible after entering an option code. Optional extensions are not included in this manual and are described separately.

13.1 Device options

13.1.1 Wireless

◉ Off	Wireless communication over short distances is disabled.
○ On	Wireless communication over short distances (WPAN, IEEE 802.15.1) with apps on appropriately equipped external devices (workshop diagnostic system, smartphone or similar) is possible. When the external device searches for devices to be coupled, the oil level meter is displayed as "ECHOMETER 1077 SN: nnnnnn" (nnnnnn stands for the production number of the oil level meter).

The top left corner of the display shows the symbol when the "Wireless" option is enabled.

By pressing the button ESC, the currently displayed measurement value is sent to external receivers.

Power consumption increases when wireless communication is enabled.

13.1.2 Brightness

○ Normal	Display of the display content with normal brightness.
◉ Bright	Display of the display content with increased brightness.

The power consumption increases in proportion to the intensity of the brightness.

13.1.3 Backlight off

○ Always	The backlight of the display is switched off.
○ 15 Sec.	The backlight of the display is switched off after 15 seconds without key operation or measurement.
◉ 1 Min.	The backlight of the display is switched off after 1 minute without key operation or measurement.
○ Never	The backlight remains constantly on.

Increased power consumption when the backlight is switched on reduces battery life.

*The key ESC (longer pressing) switches this menu item between **Always** and **Never** during the display of the measuring screen.*

13.1.4 Language

Select the operating language from the options offered here.

The selection of languages offered may vary depending on the respective device.

The set language is retained after resetting to the factory setting (as described in section 13.1.6).

If the device was inadvertently switched to an unknown operating language: Refer to the section 11.1on calling up the language selection menu.

13.1.5 Auto Off

Specify here whether the device should switch itself off automatically if no key is pressed or no measurement is performed for a certain period of time.

○ Never	The device does not switch itself off automatically.
◉ 5 Min.	Automatic switch off after 5 minutes without key operation or measurement.

Canceling the automatic switch-off: Press the key while the power-off screen is displayed.

Settings and parameters remain stored when the device is switched off.

13.1.6 Load Factory Set.

The device can be reset to the factory settings, which are the settings that are active at delivery.

Factory Set. OK: Confirm the security query with the key MENU OK to activate the factory settings.
The device then continues to perform measurements with the default values of the factory settings (see section 12).

When loading the factory settings with this menu item, the selected language is retained.

13.1.7 Info

Call up individual instrument information on your ECHOMETER.

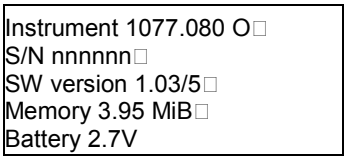


Image 16: Information display

Device:
Item number of the device

Serial no.:
Individual, five-digit serial number of the device

SW Ver:
Version number of the operating software / no. of the FPGA / software variant

Memory:
Size of the internal memory

Battery:
Current value of the supply voltage of the batteries used

14 Application tip, battery warning

***Tip:** If you cannot understand the measured values and suspect that there is a problem with the settings, **loading the factory settings** will help in many cases. Use the menu item "Load Factory Settings" (see section 13.1.6).*

Flashing symbol in the center of the display immediately after switching on, the unit then switches off.

Reason: Battery capacity is depleted, so that measuring operation with reliable measured values (according to the technical data) is no longer guaranteed.
Remedy: Insert fresh batteries.

15 Temperature influence

The speed of sound of materials changes with temperature. This applies both to the test material and to the search unit with its protective layer and/or plastic flow path.

The temperature sensitivity of the measured values is stored in the Mercedes-Benz diagnostic device and is compensated there.

16 Replacing the protective disc on the sound outlet surface

The sound outlet of the probe is protected by a transparent plastic disc (see Image 8, position 2).

Damaged protective discs must be replaced in order not to influence the measurement quality.

- Two self-adhesive replacement protective discs (art. no.: 1930.010) are included in the scope of delivery of the device.
- Completely remove the remains of a glued-on protective disc before applying a new protective disc.
- Only use alcohol, e.g. isopropanol, to clean the sound outlet surface.

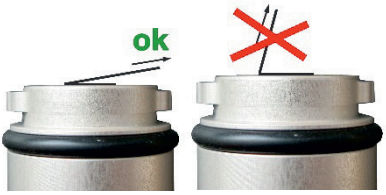


Image 17: Remove larger residues only at an acute angle (as parallel as possible to the sound outlet surface) (left)

- When removing larger residues, ensure that the angle of removal is as acute as possible (see Image 17) in order not to damage the sound outlet surface!
- The adhesive side of the discs is protected with a white foil. Remove the foil before sticking it on by carefully separating the foil and the adhesive surface with a sharp object (knife, scalpel or similar) without damaging the adhesive surface.
- The adhesive surface which is now exposed and unprotected must not be soiled.
- Glue the new protective disc centrally on the sound outlet surface.
- Gently rub out any trapped air bubbles with a soft cloth, applying slight pressure from the inside to the outside.

17 Cleaning the device

The membrane keyboard is largely insensitive to dirt and, like the rest of the housing, easy to clean.

- However, any soiling should be removed with a cloth immediately after it has occurred.
- Normally a cloth moistened with a gentle cleaning agent is sufficient.

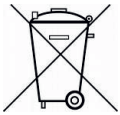
⚠ *Under no circumstances should you use cleaning agents that dissolve plastic or agents that can attack the surface of the viewing window.*

- When cleaning, always avoid mechanical abrasion, scratching or scraping.
- Also make sure that no moisture penetrates into the interior of the housing during cleaning.

18 Disposal

Waste electrical and electronic equipment contains valuable, reusable materials that are collected for reprocessing. Please pay particular attention to any environmentally harmful components that may be present. At the end of its useful life, the device must therefore be disposed of properly, e.g. at the local collection point for waste electrical and electronic equipment. Under no circumstances may the device be disposed of in normal household waste.

To ensure proper disposal, the batteries/accumulators used must first be removed and sent for separate environmentally friendly disposal, e.g. via private or public disposal companies within the joint take-back system (collection boxes, recycling stations).



Within the European Economic Area the end user is legally obliged to return spent batteries/accumulators. Under no circumstances may the batteries/accumulators used be disposed of in normal household waste (so-called unsorted municipal waste). This is indicated by the symbol of the crossed-out dustbin opposite, with which the batteries/accumulators are marked.

KARL DEUTSCH is a member of the Joint Battery Recycling System GRS. Therefore, all batteries/accumulators purchased from KARL DEUTSCH can be returned after use free of charge or disposed of at other collection points of the GRS (trade, public waste management authorities). By returning used batteries/accumulators you make a substantial contribution to protecting our environment.

Please contact KARL DEUTSCH for all open questions regarding disposal.

19 Technical data according to DIN EN 15317

DISPLAY

Type of display	Liquid crystal display (FSTN)
Display size	52.6 x 27.5 mm²
Form of display	Graphic display 128 x 64 dots
Viewing window	44 x 16 mm²
Font height max.	12.5 mm

DEVICE MEASUREMENT UNCERTAINTY

Resolution	0.1 mm
Maximum measurement uncertainty	± 0.1 mm (at a sound velocity of 1350 m/s)

MEASUREMENT RANGE

14.5 mm oil min.
121.7 mm oil max.
Upper limit adapted to the stored gear unit parameters

POWER SUPPLY

Battery operation	2 lithium batteries (primary cells) or 2 AlMn batteries, each type AA/IEC R6, 1.5 V
Operating time	16 h in normal measuring mode with lithium batteries 9 h in normal measuring mode with alkaline manganese batteries
Battery capacity indicator	Four-level battery symbol in the display. Before reaching an undervoltage condition, the battery symbol starts flashing.
Automatic switch-off	If the batteries are undervoltage (< 2.0 V)
Stability during voltage changes	In the range of the permissible battery voltage of 2 V to 3.5 V the amplitude change at the amplifier output is less than 0.1 %.

PERMISSIBLE AMBIENT CONDITIONS

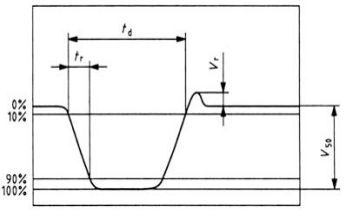
Operating temperature	0 to +50 °C
Storage temperature (without batteries)	-20 to +60 °C
Dust and humidity	Protection class IP54 (splash-proof)

OUTSIDE

Dimensions (HxWxD)	120 x 65 x 25 mm³
... with housing protection	131 x 81 x 32 mm³
Front foil (HxW)	55 x 80 mm²
Weight	Housing protection: approx. 77 g, device: approx. 114 g, batteries: approx. 46 g, total approx. 237 g
Housing material	ABS (UL-94 HB)
Housing protection material	TPE
Keyboard material	Polyester

Probe connection socket	Lemo 00
Data connection socket	USB-Micro-B (only for maintenance tasks)

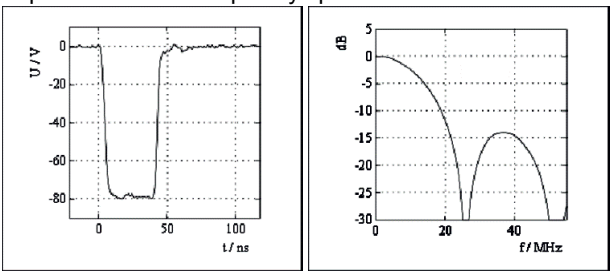
Additional information according to DIN EN 15317



Definitions

tr [ns]: typ. 3
td [ns]: 20 to 400, resolution: 20
V50 [V]: -70
Vr [V]: <2

Impulse form and frequency spectrum of the transmitter at pulse width 40 ns



20 Software update

The operating software of the ECHOMETER 1077.080-A can be updated. You require a computer with Internet access for this purpose[1].

- On our homepage www.karldeutsch.de open the section Downloads " Software Updates " ECHOMETER 1077.080-A (oil level meter).
- Follow the instructions given there to carry out the software update.

21 Regular check of the measuring device

According to the specifications for measuring instruments in EN 15317, section 7b, *ultrasonic testing equipment for thickness measurement*, which also includes the ECHOMETER 1077.080-A transmission oil level meter, must be inspected **at least once a year** for proper functioning. The period begins with the date of issue of the last quality inspection certificate.

A quality inspection certificate is attached to the device on delivery and in case of successful repairs as standard.

For an inspection by the manufacturer, please contact KARL DEUTSCH (contact information: see section 5)

[1] If no Internet access is available, please contact KARL DEUTSCH (see section 5) to find an alternative way to update the software.

22 Information about the built-in wireless module

22.1 Countries with official approval

The built-in wireless module BM71 (BM71BLES1FC2) has the official approval for the following countries:

- BT SIG/QDID:74246
- United States/FCC ID: A8TBM71S2
- Canada/ISED-IC: 12246A-BM71S2- HVIN: BM71BLES1FC2
- Europe/CE
- Japan/MIC: 005-101150
- Korea/KCC: MSIP-CRM-mcp-BM71BLES1FC2
- Taiwan/NCC No: CCAN16LP0010T5
- China/SRRC: CMIIT ID: 2016DJ2787:

22.2 United States

Contains Transmitter Module FCC ID: A8TBM71S2

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

22.3 Canada

Contains IC: 12246A-BM71S2

This device complies with Industry Canada's license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radio électrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain must be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

22.4 Japan

Label that refers to the type certified module inside:

22.5 Korea

Label with certificate number of the built-in module according to the KC mark requirements:

22.6 Taiwan

NCC mark with identifier:

注意！

依據低功率電波輻射性電機管理辦法第十二條經型式認證合格之低功率射頻電機，非經許可，公司、
商號或使用者均不得擅自變更頻率、加大功率或變更原設計
之特性及功能。
第十四條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；
經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信規定作業之無線電信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用
電波輻射性
電機設備之干擾。

22.7 China

This device contains SRRC approved Radio module CMIIT ID: 2016DJ2787:

23 Table for regular control measurements

The results of the recommended regular control measurements (see section 11.4.5) can be recorded in this table. If there is not enough space, we recommend that you copy this blank sample page and use it for recording.

Date	Tester	Temperature [°C]	Measured value [mm]	Test equipment OK	
				yes	no