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1 Introduction

1.1 General

Thanks for choosing this IMES quality product. You receive a product, which features technical innovation, high accuracy, reliability and a very long lifetime.

1.2 Other products from IMES

IMES offers a variety of products for the application of cylinder pressure measurement:

- HTT Cylinder pressure sensors
- CPS Cylinder pressure sensor
- TCS Two-stroke combustion sensor
- IPT Injection pressure sensors
- Compri Compression pressure tester
- CCM Combustion monitoring system

1.3 IMES-Service

For all specific questions which you may have after studying this manual, we would be pleased to offer our service to you and to advise you on application specific problems to achieve optimum results.

Fig. 1: EPM-XP Electronic indicator
2 Scope of supply

Fig. 2: Instrument case with all components

Note: For IPOWER- and IMEP calculation an additional hardware dongle must be ordered to open the functions.
IMES order no.: IW-1558

3 Important information

Please study this manual carefully, before using the equipment. This will ensure that you will receive maximum benefits from using this engine performance tuning tool with its versatile functionality and it will guarantee optimum benefits over its lifetime.

3.1 Use of the operator manual

We strongly recommend you to read the complete manual before using the equipment. If you have already experience with IMES systems you may only read the relevant chapters for the required information.

It was our intention to structure this manual in a clear layout, to enable you to get easy and instant access to the information you are looking for. Please keep this manual in a safe place where it is always available for easy access.

We ask for your understanding, that we will reserve the right to change information and instructions in this manual if necessary without giving notice in advance.
4 Description

4.1 Introduction

The electronic indicator EPM-XP is a handy-, battery powered-, portable device to measure and evaluate cylinder pressure on diesel engines at speed up to 1500 RPM.

The EPM-XP collect 10 consecutive pressure measurements (cycles) and calculates peak pressure, engine speed. The measured data are displayed in numerical format on the LCD screen and can be stored in memory.

Up to 20 measurement data sets can be stored in the EPM-XP. The stored data can be downloaded via USB-interface to a personal computer for evaluation.

The scope of supply includes software for Windows which allows additional evaluation and visualization of the collected data.

4.2 Measure functions

Pmax: average maximum pressure of 10 cycles
Pcomp: compression pressure (only on two stroke application)
RPM: engine speed

A complete individual pressure curve average over the 10 cycles will be stored in the EPM-XP memory with each measurement.

4.3 Functional description

The cylinder pressure will be measured with the EPM-XP unit incl. high temperature pressure sensor at indicator cock on marine diesel engines.

Memory : for 20 data sets
Application 2 – stroke: 40 – 300 RPM
Application 4 – stroke: 200 – 1500 RPM

The battery must be re-charged after approximately one hour of continuous operation.
5 Operation

5.1 Operator push buttons

Remarks: After switching "On" the EPM-XP display automatically shows application on 2-stroke engines.

For automatic 4-stroke engine mode selection after switch „On“ the user must connect the EPM-XP via USB cable to PC.

Press “Read” and “Measure“ for automatic 4-stroke engine mode selection.

After display unhand immediately the push buttons to get selected mode.

If user is in 4-stroke mode the EPM-XP can be switched to automatic 2-stroke mode selection after switch „On“ the user must connect the EPM-XP via USB cable to PC.

Press “Read“ and “Measure“ for automatic engine selection to start mode 2-stroke.
### 5.2 Operating functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Key board push button</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch On/Off</td>
<td>On/Off</td>
<td>*Cyl: 1 RPM: 0 4Stroke Pmax: 0</td>
<td>Basic settings will be displayed after switching on: Cyl: 1 = cylinder no. 1 2 stroke = 2 stroke engine 4 stroke = 4 stroke engine Pmax in bar ; RPM: speed</td>
</tr>
<tr>
<td>Selection of 2-stroke or 4-stroke engine</td>
<td>2/4</td>
<td>*Cyl: 1 RPM: 0 25Stroke Pmax: 0</td>
<td>Push key “2/4” and change mode of operation to the desired value (4 or 2 stroke application).</td>
</tr>
<tr>
<td>Battery check</td>
<td>2/4</td>
<td>Battery ok 48% Temp.: 35°C</td>
<td>Push key “2/4” two times to check the battery status. Also temperature at measuring element will be displayed.</td>
</tr>
<tr>
<td>Sensor check</td>
<td>2/4</td>
<td>Press. 0 bar Sensor offset ok</td>
<td>Push key “2/4” three times to check the sensor status at 0 bar.</td>
</tr>
<tr>
<td>Selection of cylinder</td>
<td>↑↑ ↑↑↓ ↓ ↓↓</td>
<td>*Cyl: 2 RPM: 0 25Stroke Pmax: 0</td>
<td>Push arrow key “↑↑↑↓↓” and change the displayed value to the number of the selected cylinder.</td>
</tr>
<tr>
<td>Start measurement</td>
<td>Measure</td>
<td>recording cylinder 1 -</td>
<td>During measurement the following information “Recording cylinder” will be indicated.</td>
</tr>
<tr>
<td>Start measurement</td>
<td>Measure</td>
<td>*Cyl: 1 RPM: 39 25Stroke Pmax: 78</td>
<td>Display indication (1-2 s) of measured cylinder values. Then EPM-XP unit switches automatically to the next cylinder.</td>
</tr>
<tr>
<td>Read Pmax</td>
<td>Read</td>
<td>Rc: l: 1 RPM: 119 25Stroke Pmax: 83</td>
<td>The measured value for Pmax of the selected cylinder will be displayed.</td>
</tr>
<tr>
<td>Read Pcomp (only on two stroke engines)</td>
<td>Read</td>
<td>Press 2x</td>
<td>The measured value for Pcomp of the selected cylinder will be displayed.</td>
</tr>
<tr>
<td>Delete measurements</td>
<td>Read +</td>
<td>Cylinder 1 Data deleted!</td>
<td>Push “Read” and “↑” at the same time for 2 s to delete the currently displayed measurement.</td>
</tr>
</tbody>
</table>
5.3 Installation of visualisation- and USB driver software

The scope of supply includes the IMES visualisation software on USB stick for displaying and analysing the measured data in numeric and graphic format.

Hardware requirements:
IBM PC Pentium or 100 % compatible, USB port
Windows XP, 7, 8 and 10
Main memory minimum 16 MB RAM,
VGA-monitor with minimum resolution of 1024 x 768 pixel.

Install USB stick on your Personal Computer. Open directory software and make a double click at setup.exe for installation of visualisation- and necessary USB driver software.

The program will install automatically a directory at hard disc and places an icon on the desktop of your computer.

USB driver will be installed automatically
Press enter to finalize USB driver installation

### 5.4 Select COM port of PC

For selection of COM Port the EPM-XP should be connected via USB cable to PC

- Switch on EPM-XP
- Connect USB port of PC via USB cable to EPM-XP
- Run “Visualisation software” with double click on the desktop icon.

For selection of COM Port the EPM-XP should be connected via USB cable to PC and visualisation software should started with double click on desktop icon.

With mouse click on “Tools” and selection “Interface” the COM port of PC will be selected.

### 5.5 Charge battery

The EPM-XP has a re-chargeable battery. The battery charging will start automatically after the EPM-XP unit has been connected via USB cable from USB port to PC (fig. 5,6,7,8)
**Note:** At first usage please connect EPM-XP via USB cable to PC. Charge battery for 2h continuously without disconnecting to PC!

![Fig. 5: USB-port of EPM-XP](image)

![Fig. 6: EPM-XP connected via USB cable to PC](image)

![Fig. 7: Indication during charging process](image)  ![Fig. 8: Indication charging process completed](image)

Do not change battery during charging process while EPM-XP is connect via USB cable to PC.

When the indicator is connected by USB, the battery charging runs automatically. The indicator can detect the charging status and continues charging until the battery is fully loaded. Then the charging process stops automatically. It is not recommended to interrupt the charging process before it is automatically stopped. The charging process is finished when the display message "EPM-XP charging..." disappeared.

If the battery status is low and the charging process stops after 5-10 minutes, then the user can manually force the unit to charge the battery for 90 minutes by pressing both arrows at the EPM-XP unit for 2 seconds (Forced Charging Mode).

**Note:** It is not recommended to use the Forced Charging Mode when the battery charge condition is more than 40%, due to the risk of overcharging. Please see chapter 5.2 for a description how to check the charge state.

### 5.6 Change battery

**Note:** Please only use re-chargeable battery E-block type “ANSMANN 270 mAh NiMH”

For to change re-chargeable battery the battery cover on the back side of EPM-XP must be opened (fig.9,10,11). Do not change battery during charging process while EPM-XP is connect via USB cable to PC.
Fig.9: Battery cover  Fig.10: Re-chargeable E-block battery type: Ansmann

The battery should only be installed by correct pole of battery!

Fig.11: Battery installed on backside of EPM-XP

Note: If battery of standard NiMh 270 mAh type Ansmann cannot be charged or is not available than operator can use for measurements Alkaline battery 9V only for a short time. In this case please disconnect EPM-XP unit after transferring data to PC!

5.7 Mounting instructions on marine engines

Measuring at the indicator valve
• Before mounting the adapter, please clean the indicator valve by opening (1-2s).

To avoid measurement distortion:
• Check adaptor and sensor periodically for dirtiness and clean it if necessary.

DANGER!
The indicator valve ejects hot gas under high pressure. Danger of sparks and burning. Hot gases and particles may be ejected.
War gloves and safety glasses!

It must be tighten the sensor and adapter connection part firmly before measuring operation for safety of worker. Please see also chapter 10.

Fig. 12: EPM-XP with HTT sensor mounted in adaptor at the indicator valve

Note: It is not allowed to use a hammer or equivalent tool to open or close the adaptor. The user must use spanner tool on pins for to close or open adaptor on indicator cock!
5.8 Measurements with EPM-XP

- **Charge battery**
  Charging time: min. 2 hours

- **Start measurements on the engine**
  2- and 4 stroke application
  Open indicator cock and close. Install sensor with adaptor at cylinder no.1 and open indicator cock
  Press “On” at EPM-XP
  Press “Measure” and wait about 5-10 s

Fig.13: Indication during measurement on cylinder

Fig.14: Indication (1-2 s) of measured values from cylinder

After indication of measured cylinder values (1-2s) the display switches automatically to next cylinder.

**Repeat measuring procedure for all remaining cylinders!**

For to change engine mode 2- or 4-stroke press “2/4” to select application on a 2- or 4 stroke engine

**Remark: The EPM-XP has an overheating protection of measuring cell for temperature > 300°C**

**Remark: The EPM-XP turns off automatically after 2 minutes without pressing any push button!**
6 Visualisation software release 1.0.7.8

6.1 Main tool bar buttons

Load new measurement data from EPM-XP

Open stored measurement data set

Save all data to ASCII file

Print screen page

Print all screen pages

Cross On function

Program exit

Delete measurements at EPM-XP

Selection of “Motored curve” on 4-strokes
Selection of derivative curve

Selection of all cylinder in screen page “Engine diagram”

Selection of Pmax bar graph function

Save value of shifted curves

Function “Derivative curve”

Function for to optimize Pcomp position

Function “Motored curve” only on 4-strokes
**Functions for power calc. function. Only visible with Dongle IW-1558**

- Selection window of cylinder
- Motored curve
- Derivative curve
- p/v single, p/v all diagram
- Indication Pmax 10 cycles
- Indication of Pcomp 10 cycles

- Close and open reference file
- Save a reference file

- Selection of engine type

- Select files (*.ext format)

- Select start and stop date

- Input of indicated engine power and selection deviation in %

- Selection of values

- Selection of cylinder
6.2 Load measured data from EPM-XP to PC

At first visualisation software must be started. EPM-XP must be connected via USB cable to PC.
Press “New” to load measurement data from EPM-XP to PC.

The software opens a window to name the file for storing on PC.

After entering a file name and storing the data will be transmitted to PC.

After this procedure the measured data will be monitored at visualisation software.

6.3 Load measured data from hard disc to PC

At first the visualisation software must be started.
Press “Open” to load measurement data from EPM-XP to PC.

The software opened a window for to open a stored file on PC.

After this procedure the selected data file will be monitored at visualisation software.
6.4 Monitoring of combustion data

6.4.1 Screen page “Cylinder pressure curve”

Indication of pressure curves of measured cylinder 1…n.
(n = measured cylinder; max:20)

Indication of Engine Report

Indication of Pmax diagram

Indication of Pmax Balancing

Remark field
Field „Engine data“ Selection of scav. air pressure

Motored curve
Derivative curve
Indication of all measured curves overlapped or single cylinder selection

Pmax bargraph diagram
10 cycles

Arrow function to shift curves with 0.1 resolution on 2 strokes.
On 4-strokes shift curves with 0.5 resolution.

“Optimize” function

6.4.1.1 Indication of all cylinder

Cylinder selection
Zoom-function

**Zoom function on:** Hold left mouse button pushed down and draw across the curve from top left down to right bottom corner.

**Zoom function off:** Hold left mouse button pushed down and draw across the curve from right bottom up to top left corner.

### 6.4.1.2 Cross On function

Cross On: Push with mouse “Cross On” button and move mouse to the position of curve
Cross Off: Push with mouse “Cross Off” button

Indication of pressure [bar] and crank angle position [CA]
6.4.1.3 Save to ASCII
Press “ASCII-File” to save all measurement data to Excel (*.csv) files.

The software opened a window to store data to (*.csv) files.

6.4.1.4 Optimize function for application on two-strokes
IMES algorithm for automatic Pcomp position calculation on two-strokes can be influenced by some noises on the pressure signal. If Pcomp Position is not exact centred on TDC position than please press button “OPTIM

Remarks: Optimum Pcomp position influences also IPower and IMEP calculation for application with dongle IW-1558 !

1. Check all curves

Some curves should be checked for optimum position of Pcomp !
2. Check deviation

If lowest point of derivative curve is before TDC, then press “Optimize”

Select “Derivative curve”

3. Press “Optimize”

Press “Optimize”
1. All curves shifted

![Image showing all curves shifted into optimum Pcomp position]

6.4.1.5 Save Shift

After shifting curves the operator has the possibility to save shifted data as *.ext file under new name.
6.4.1.6 Automatic Pcomp calculation on four-strokes

During the first opening of measurement data file (*.ext) the Pmax value is centered at TDC (0°CA). For Pcomp calculation on 4-stroke calculation the operator should press “Optimize” button.

Press “Optimize”

After pressing”Optimize“
Please wait for calculation of Pcomp of each cylinder. Calculation time 5…8 s / cylinder
6.4.1.7 Additional functions

6.4.1.7.1 Save shift

After automatic Pcomp calculation the operator has the possibility to save shifted data as *.ext file under new file name.

6.4.1.7.2 Save reference curve

After selecting a cylinder as a reference curve press button “Save Ref-File”.

6.4.1.7.3 Open reference curve for comparison to other cylinder

6.4.1.7.4 Shift curve into reference-curve
Note: The reference file can only be compared with measurements at same load.

6.4.2 Screen page “Pmax diagram”

Shifted curve into reference curve

Pmax- and Pcomp values will be displayed.

6.4.3 Screen page “Engine report”

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6.4.4 Screen page “Pmax balance”

![Image of Pmax balance screen page]

6.4.5 Screen page “Remarks”

The user can write in this field important remarks and save it.

6.4.6 Screen page “Engine data”

![Image of Engine data screen page]

Manual input of scaveng air pressure in 0.1 steps from 0.1 … 4 bar. For confirmation “OK” must be pressed.

6.5 Delete measurement on EPM-XP

EPM-XP must be connected via USB cable to PC

After transferring data to PC the operator has the opportunity to delete all measurements via visualisation software or to override existing data during next measurement on the engine.

Press “Delete Measurement” to delete all measurement at EPM-XP.

For to delete selected measurements at EPM-XP unit please see also chapter 5.2!
6.6 Open *.csv files in Excel

Start Excel program and open selected *.csv file (Microsoft Office Excel Comma Separated Values File)

- Mark measurement data of cylinder
- Select diagram type
- Curves can be copied to own report
6.7  **IW-1558 IPOWER- and IMEP calculation on two stroke engines**

On two stroke applications the software calculates based on mathematic algorithm automatic IPOWER and IMEP value of each cylinder. Please check optimum of Pcomp position on chapter 6.4.1.5  which influences IPOWER and IMEP calculation.

On four stroke application the software calculates based on mathematic algorithm automatic the curve to optimized TDC position for to get IPOWER and IMEP value of each cylinder. Please see also chapter 6.4.1.6.

6.7.1  **Overview of additional functions**

![USB Dongle IW-1558](https://example.com/usb_dongle.png)

For to visible additional power calc. function and trending on Vis-Software the Dongle part no.: IW-1558 must be installed on USB port of PC.

**Fig.15: USB Dongle IW-1558**

6.7.1.1  **Power calculation function**

![Power Calculation Function](https://example.com/power_calc.png)

Selection of:
- Derivative curve
- Motored curve (only on 4-stroke)
- single
- all cylinder
- PV single
- PV all
- Pmax or Pcomp 10 cycles

Remarks: For power calculation it is necessary to enter specific engine parameter (bore, stroke and conrod length in mm) at screen page “Engine data”
6.7.1.2 Indication of cylinder pressure (single) versus volume

6.7.1.3 Indication of all cylinder pressure (all) versus crank angle

6.7.2 Screen page “Pcomp Balance”
6.7.3 Screen page “IMEP”

6.7.4 Screen page “IMEP Balance”
6.7.5 Screen page “Engine data”

Please enter: Shipname, Engine type and Engine no. For power calculation it is necessary to enter specific engine parameter (bore, stroke and conrod length in mm).

Important specific engine data from MAN B&W are stored in the program (Open Engine selection). For correct values of bore- stroke and con-rod length please see also our list of specific engine data.

Also the operator has the possibility to enter measurement conditions for example exhaust gas temperature.

The input of scavenge air pressure influences Pmax and Pcomp values!

For calculation of specific fuel oil consumption[g/kWh] please enter the following data from “Flowmeter” in Screen page “Enine data”:
- Fuel oil consumption in [l/h] in 1h
- Density at 15 °C [kg/l]
- Mechanical Efficiency [%]
- Temperature for counter in [°C]

After entering values of measurement conditions the user must press “Save” and “Apply” for to display values in “Engine report”
### 6.7.5.1 Calculation of Effective Power (= shaft power)

For calculation of effective Power please enter the following data for different load from shop test:

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>5181</td>
<td>83.3</td>
</tr>
<tr>
<td>50</td>
<td>3830</td>
<td>92.4</td>
</tr>
<tr>
<td>75</td>
<td>14562</td>
<td>94.1</td>
</tr>
<tr>
<td>90</td>
<td>17403</td>
<td>94.6</td>
</tr>
<tr>
<td>100</td>
<td>13263</td>
<td>94.3</td>
</tr>
</tbody>
</table>

Click "Save" and "Apply" to use shop test data.
6.7.6 Screen page “Engine report”

Indication of fuel rack position

Indication of exhaust gas temperatures

6.7.7 Screen page “Trending”

The trending function is a useful tool to compare measurement data at same engine output or load to find deviations in combustion process for preventive maintenance on engine. A max. of 32 measurement data files (*.ext) can monitored with trend function.

Remark: The format of data files are only *.ext.
Selection of engine type

Input of indicated engine power and selection deviation in %. Default value 100 %

Selection of values

Selection of cylinder

Information available by mouse click

Information of about time of measurement data
7  Free internet software download

Customers can check if a new EPM-XP software release free of charge is available at IMES website.

Please enter in your internet browser: http://www.imes.de/support.html

The following message appears:

![Username and Password required]

For username and password please ask your local agent or engine supplier!

8  Accuracy check

The EPM-XP is adjusted at IMES workshop at different pressure values (0...300 bar) and temperature values (50°C-200°C). The values are described at calibration certificate (see fig.16). A calibration certificate will be delivered with each EPM-XP unit.

The EPM-XP has a very stable and long life cylinder pressure sensor type HTT. We emphasize to check calibration values of EPM-XP at pressure calibrator by hydraulic oil once a year.

![Calibration certificate]

Fig.16: Calibration certificate of EPM-XP unit
8.1 Connection of EPM-XP to pressure calibrator

Connect EPM-XP unit with thompson adaptor to pressure calibrator (fig. 18). Please check possible leakage at adaptor by generating pressure.

![Connection of EPM-XP to pressure calibrator](image)

Note: The pictured pressure calibrator is an example to generate pressure. At your workshop you can use your standard pressure calibrator.
8.2 Generate pressure at pressure calibrator

We emphasize to check EPM-XP at most frequently measured Pmax-value on engine.

For example pressure values at 0 bar and between 100 bar – and 200 bar.

Fig.18: Example for indication of static pressure (0 bar) by generating pressure at pressure calibrator and indication of static pressure value on EPM-XP display

Fig.19: Example for indication of static pressure (150 bar) by generating pressure at pressure calibrator and indication of static pressure value on EPM-XP display

Checking procedure:

a) Switch – On by pressing operating key “On/Off “ at EPM-XP
b) Generate pressure 0 bar at pressure calibrator (fig.18)
c) Press 3 x operating key “2/4“ at EM-XP. The static pressure value will be displayed (fig.18)
d) Generate pressure for example between 100- and 200 bar at pressure calibrator (fig.19)
f) Check displayed pressure (fig.19)
g) Compare generated pressure at pressure calibrator and displayed pressure value at EPM-XP.
8.3 Example of displayed EPM-XP values during pressure check

<table>
<thead>
<tr>
<th>Indicated pressure [bar] at calibrator</th>
<th>Displayed pressure [bar] at EPM-XP</th>
<th>Deviation +/-2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>99</td>
<td>1</td>
</tr>
<tr>
<td>200</td>
<td>198</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: The max. acceptable difference between adjusted pressure at pressure calibrator by ambient (20-25°C) temperature and displayed static pressure at EPM-XP is +/- 2.5 bar. By increasing pressure difference we emphasize to send EPM-XP unit to IMES workshop for new adjustment and calibration.

The accuracy of the EPM-XP unit acc. technical data is +/- 0.5% full scale (0…300 bar) between adjusted temperature range of 50°C- 200 °C.

8.4 Disconnect EPM-XP from pressure calibrator

The thompson adaptor of EPM-XP must be dismounted from adaptor of pressure calibrator. After disconnection the thompson adaptor incl. gas channel of HTT cylinder pressure sensor must be cleaned from oil by using pressurized air.
9 Cleaning

9.1 Periodically cleaning

Clean gas channel of thompson adaptor by compressed air periodically (see fig. 21)

Fig. 21: Periodically cleaning of gas channel

9.2 Cleaning in case of hard deposit

For elimination hard deposit please disconnect sensor from adaptor by using tools with wrench size 19mm and 22 mm (fig.22). Before disconnection of sensor from adaptor spring must be disconnected from adaptor (fig.23).

This procedure should only be done if accuracy of measured values is incorrect!

Fig.22: Disconnection of spring

Fig.23: Disconnection of HTT cylinder pressure sensor from adaptor
9.3 Cleaning procedure of adaptor

Please use a drill with 2.5 mm diameter for to clean gas channel of adaptor (fig. 24 and fig. 25)

Fig. 24: Drill 2,5 mm

Fig. 25: Drill in case channel for cleaning

Clean gas channel of adaptor with a drill 2.5 mm and clean gas channel of cylinder pressure sensor with special tool.

9.4 Cleaning procedure of cylinder pressure sensor

Please use the special drill tool and clean gas channel of HTT cylinder pressure sensor, (fig. 26 and fig. 27). The length of gas channel is 29 mm. The max. entering length of special drill tool into gas channel is 28 mm which is marked. Do not try to drill more than 28 mm into gas channel!

Fig. 26: Special drill tool

Fig. 27: Special drill tool in gas channel of sensor
10 Check tightening of sensor on adaptor

It must be tighten the sensor and adapter connection part firmly before measuring operation for safety of worker. Please check regularly tightening of sensor on adaptor. Use tools with wrench size 19mm and 22 mm (fig.28 and fig.29). Max. torque 30 Nm.

Note: It is not allowed to use a hammer or equivalent tool to open or close the adaptor. The user must use spanner tool on pins for to close or open adaptor on indicator cock!
## 11 Basic check for fault finding

Before contacting your local agency or service partner, check the problem guide below.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Indication at EPM-XP</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No display indication after switch “On”</td>
<td></td>
<td>Charge battery by connecting to USB port from EPM-XP to PC</td>
</tr>
<tr>
<td>Low battery after full charging&lt;br&gt; <em>If the battery status is low and charging process finished after 5-10 minutes then the user can charge battery manually 90 min.</em></td>
<td><img src="image" alt="Low Battery" /></td>
<td>Connection to USB port of PC Press 2 s both arrows + − at EPM-XP</td>
</tr>
<tr>
<td>Over temperature indication&lt;br&gt; <em>Indication after temperature of measuring cell &gt; 300 °C</em></td>
<td><img src="image" alt="High Temp" /></td>
<td>Disconnect sensor from indicator cock and wait 5-10 minutes</td>
</tr>
<tr>
<td>High offset</td>
<td><img src="image" alt="High Offset" /></td>
<td>Sensor is defect. Please send EPM-XP unit to IMES workshop</td>
</tr>
<tr>
<td>No signal&lt;br&gt; <em>Engine speed is lower than 10 RPM or Indicator cock is not opened</em></td>
<td><img src="image" alt="No Signal" /></td>
<td>Open indicator cock</td>
</tr>
</tbody>
</table>

* If battery of standard NiMh 270 mAh type Ansmann can not be charged or available than operator can use for measurements Alkaline battery 9V for a short time. Please disconnect EPM-XP unit after transferring data to PC!

**Note:** It is not recommended to use the Forced Charging Mode when the battery charge condition is more than 40%, due to the risk of overcharging. Please see chapter 5.2 for a description how to check the charge state.

**Note:** Please only use re-chargeable battery E-block type “ANSMANN 270 mAh NiMh”

![Re-chargeable E-block battery type: Ansmann](image)
12 Nomenclature

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPM</td>
<td>Engine speed</td>
</tr>
<tr>
<td>Pmax</td>
<td>Mean value of maximum pressure [bar]</td>
</tr>
<tr>
<td>Cycles</td>
<td>Number of working cycles</td>
</tr>
<tr>
<td>dp/ca</td>
<td>Maximum rise of pressure curve [bar/ca]</td>
</tr>
<tr>
<td>Pcomp</td>
<td>Compression pressure [bar]</td>
</tr>
<tr>
<td>IMEP</td>
<td>Mean Indicated pressure [bar]</td>
</tr>
<tr>
<td>IPOWER</td>
<td>Indicated power [kW]</td>
</tr>
</tbody>
</table>

13 Technical data

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0...300 bar</td>
</tr>
<tr>
<td>Accuracy (EPM-XP incl HTT cylinder pressure sensor)</td>
<td>≤ 0,5 % Full Scale</td>
</tr>
<tr>
<td>Natural frequency HTT sensor</td>
<td>&gt;80 kHz</td>
</tr>
<tr>
<td>Max. temperature at measuring cell</td>
<td>300 °C, short time 1 minute 350 °C</td>
</tr>
<tr>
<td>Storing capacity</td>
<td>20 measurements / engine</td>
</tr>
<tr>
<td>Interface</td>
<td>USB</td>
</tr>
<tr>
<td>Battery</td>
<td>E-block re-chargeable type ANSMANN 270 mAh NiMh</td>
</tr>
<tr>
<td>Dimension</td>
<td>180 x 24 x 52</td>
</tr>
<tr>
<td>Weight (incl. battery)</td>
<td>350 g</td>
</tr>
</tbody>
</table>

14 Warranty

The warranty period is 12 month after delivery according to the general terms and conditions of the electric industry of Germany.
15 Sales- and service organisation

Please select your local partner from our website:

http://www.imes.de/sales-team.html
# 16 EU Declaration of Conformity

In accordance with EN ISO 17050-1:2010

| Manufacturer: | IMES GmbH  
| Dr.-Herbert-Kittel-Str.2  
| D- 87600 Kaufbeuern |
| Name: | Electronic Indicator  
| Type: | EPM-XP |

The object of the declaration described above is in conformity with the relevant EU harmonisation legislation:

- 2014/30/EU Electromagnetic Compatibility Directive
- 2014/35/EU Low Voltage Directive
- 2011/65/EU Restrictions of Hazardous Substances Directive

Conformity is shown by compliance with the applicable requirements of the following documents:

- DIN EN 61326, including
- DIN EN 61000-4-2
- DIN EN 61000-4-3
- DIN EN 61000-4-4
- DIN EN 61000-4-5
- DIN EN 61000-4-6
- DIN EN 61000-4-11

Signed for and in behalf of:

IMES GmbH  
Dr.-Herbert-Kittel-Str.2  
D-87600 Kaufbeuren  
Tel. +49(0)8341-966173 0  
Fax.+49(0)8341-96617318

Kaufbeuren, 02nd. April 2016  
Stefan Neumann  
(Managing director)