

## EPM-XG Gas Engine Balancer



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## 1 Introduction

### 1.1 General

Thank you for choosing this **IMES** quality product. You have purchased a product which features technical innovation, high accuracy, reliability and a very long effective life.

IMES USA is the U.S. and Canadian distributor for IMES products.

### 1.2 Other products from IMES

**IMES** offers a range of products for the measurement of pressure on combustion engines and reciprocating compressors:

- **HTT** Cylinder pressure sensors
- **CPS** Cylinder pressure sensor
- **IPT** Injection pressure sensors
- **EPM-XP** Electronic Indicator for diesel engines
- **Compri** Compression and cylinder leakage meter
- **CMS** Combustion monitoring system

### 1.3 IMES-Service

Please review this manual carefully. After completing your review, if you have any questions or comments, please contact Dave Morris at IMES USA using the contact information listed below.

276-451-5265  
*Dave.Morris@imes-usa.com*



Fig. 1: EPM-XG Gas Engine Balancer



## **2**     *Scope of supply*



Fig.2: Instrument case with all components

## **3**     **Important information**

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

### **3.1**     *Use of the operator manual*

As stated above, we strongly recommend that you read the complete manual before using the equipment.

It was our intention to structure this manual with a clear and concise layout to allow easy and quick access to the information you are looking for. Please keep this manual in a safe place where it is always available for ready access.

We ask for your understanding that we reserve the right to change information and instructions in this manual as necessary without advance notice.

## 4 Description

### 4.1 Introduction

The **EPM-XG** Gas Engine Balancer is a handheld, battery powered, portable device for measuring and balancing cylinder pressures on 2-stroke and 4-stroke gas engines.

The **EPM-XG** records 50 consecutive pressure measurements (cycles) and calculates peak pressure and engine speed. The measured data are displayed in numerical format on the EPM-XG's LCD screen and can be stored in the EPM-XG's memory.

Up to 20 measured data sets can be stored in the **EPM-XG**. The data is stored in non-volatile flash memory that is retained until the data is erased or overwritten. The data is retained even if the battery dies or is removed.

The stored data can be downloaded via a USB cable to a personal computer (PC) for evaluation. Windows-based PC software for visualizing and analyzing the cylinder pressure data is included in the EPM-XG kit.

### 4.2 Measurement functions

Pmax: average maximum pressure of 50 cycles in psi for a single cylinder

Pave: All-engine average of Pmax values

RPM: engine speed

Temp: Pressure sensor temperature in degrees C

Battery: Battery charge in %

### 4.3 Functional description

The EPM-XG measures cylinder pressure by means of a high temperature/accuracy strain gauge pressure sensor at the indicator valve.

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

The battery must be recharged after approximately one hour of continuous operation.

## 5 Operation

### 5.1 Operator buttons

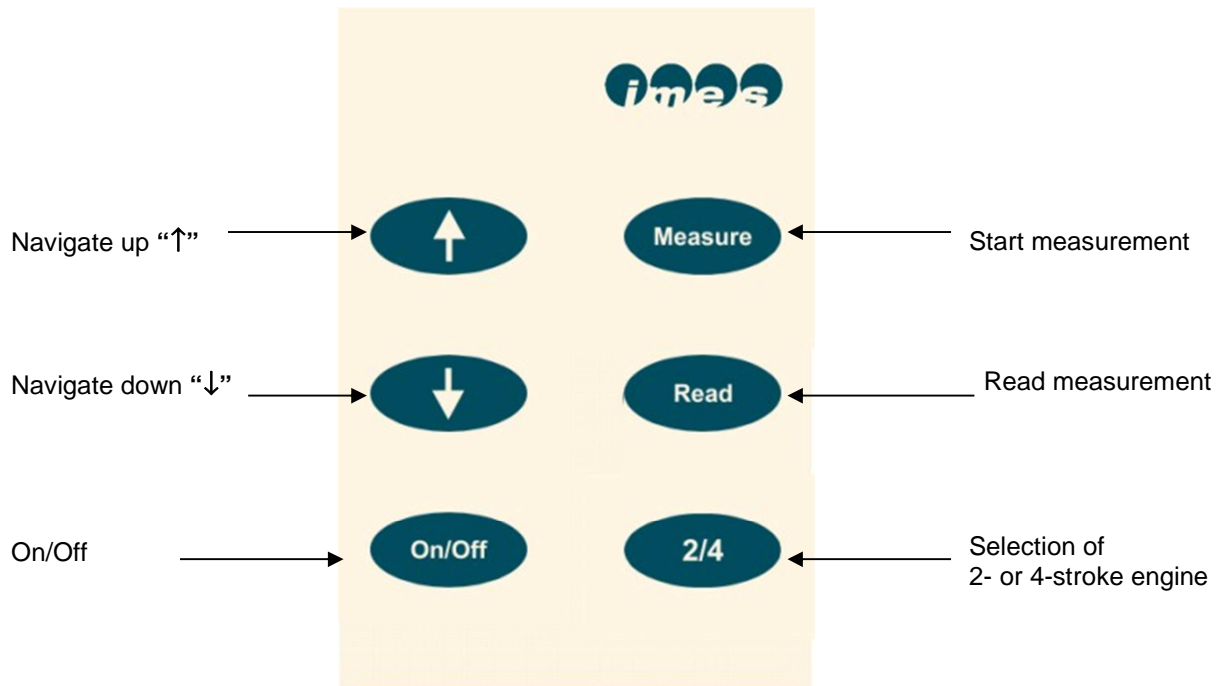


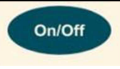




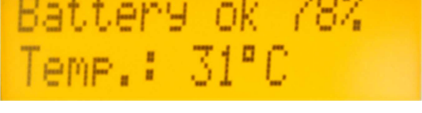

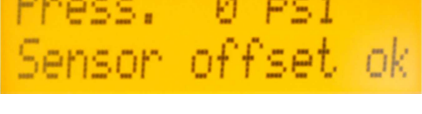


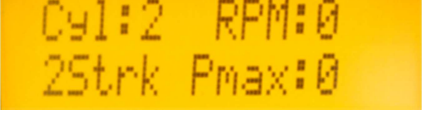




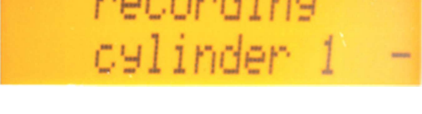
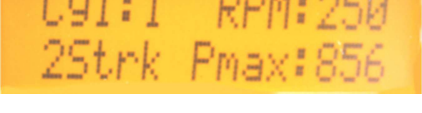

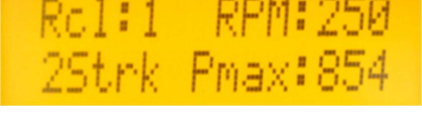
Fig. 3: Push buttons

**Remarks:** As set by the factory, the EPM-XG automatically starts in 2-stroke mode after switch-on. To configure the EPM-XG to start in 4-stroke mode, connect the EPM to a PC via the USB cable. Press "Read" and "Measure" simultaneously until the display indicates 4-stroke mode.






Edit Start Mode  
Stroke: 4

To switch back to default 2-stroke mode, repeat this procedure.

## 5.2 Operating functions

Function	Button	Display	Notes
Switch On/Off			Basic settings that are displayed after switching on: Cyl:1 = cylinder no.1 2 stroke = 2-stroke engine 4 stroke = 4-stroke engine RPM: speed ; Pmax in psi
Selection of 2 -stroke or 4 –stroke engine			Push the “2/4” button to change mode of operation to the desired value (2- or 4-stroke application) within 5 secs after power on.
Battery check			Push the “2/4” button twice to check the battery status. The temperature of the pressure sensor will also be displayed.
Sensor check			Push the “2/4” button three times to check the sensor status at 0 psi. If not OK, see “Basic diagnostics checks”.
Cylinder selection	 		Push one of the arrow buttons “↑” or “↓” to change the selected cylinder.
Cylinder balancing order	 		Push both arrow buttons “↑” or “↓” simultaneously to invoke the cylinder balancing order feature.
Start measurement		 	While measuring pressure the EPM-XG will display: “Recording cylinder” # The measured cylinder values are displayed for 1-2 secs. The EPM-XG then automatically switches to the next cylinder.
Read Pmax			The measured Pmax value for the selected cylinder will be displayed in psi.

### Operating functions (continued)

Function	Button	Display	Notes
Read Engine Average Pmax			
Delete measurements	 + 		Push "Read" and "↑" simultaneously for 2 seconds to delete the currently displayed measurement.

### 5.3 Installation of Visualization and USB driver software

The EPM-XG kit includes the **IMES** visualization software on a USB stick for displaying and analyzing the measured data.

#### Hardware requirements:

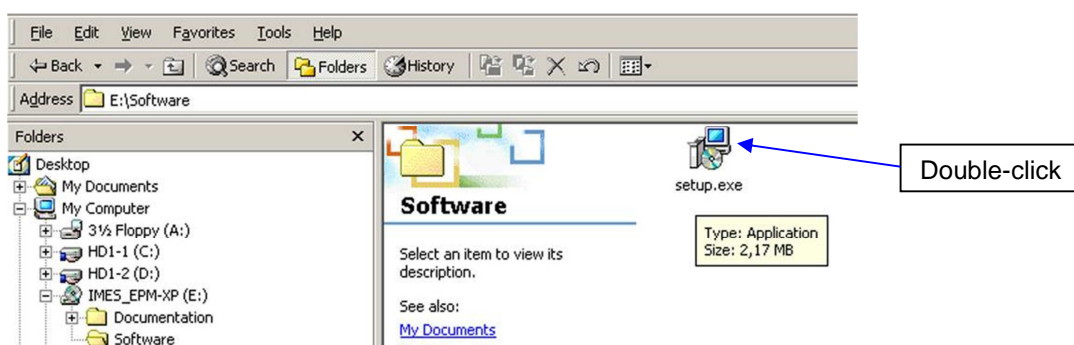
IBM PC Pentium or 100 % compatible, USB port

Windows 10, 7, or XP

Main memory minimum 16 MB RAM,

VGA-monitor with minimum resolution of 1024 x 768 pixels.

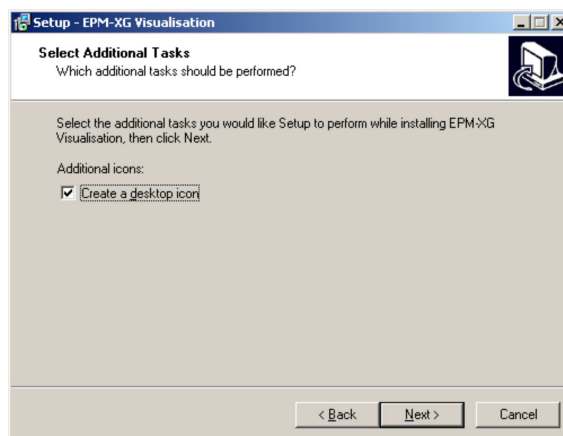
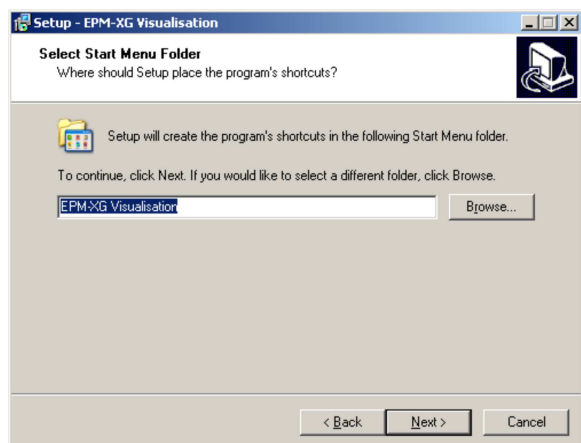
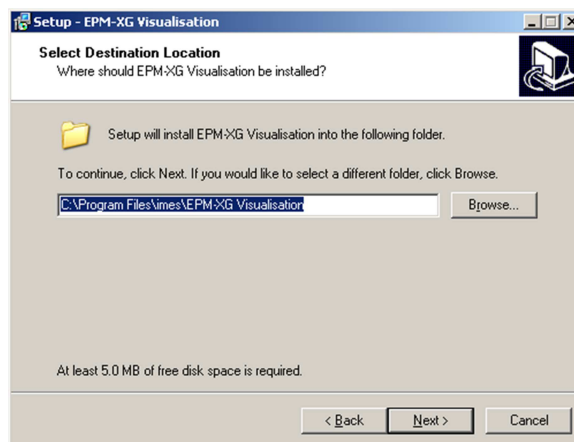
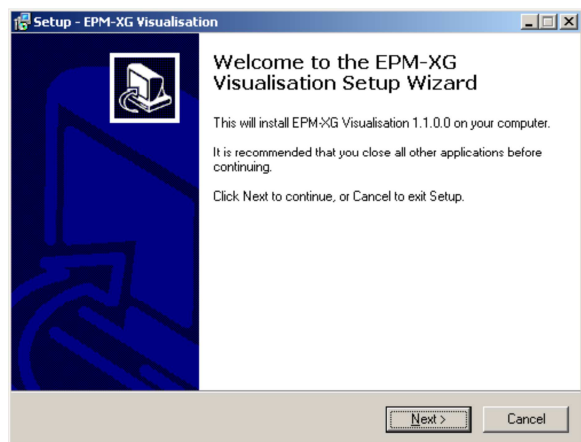
Install the USB stick on your PC. Open the software directory and double-click on **setup.exe** for installation of the visualization and USB driver software.



The EPM-XG installer automatically installs the visualization program and USB driver and places an icon on the desktop of your computer.

# EPM-XG Operation Manual

Software Release 1.1.1.3



```
C:\DOCUME~1\PCCANS~1\CAN\LOCALS~1\Temp\ckz_LG4X\DPInst_Monx86.exe
32-bit OS detected
"C:\DOCUME~1\PCCANS~1\CAN\LOCALS~1\Temp\ckz_LG4X\DPInstx86.exe"
Installing driver.....

FTDI CDM Driver Installation process completed.
Press enter.
```

Press enter to complete the USB driver installation.

## 5.4 Select COM port of PC

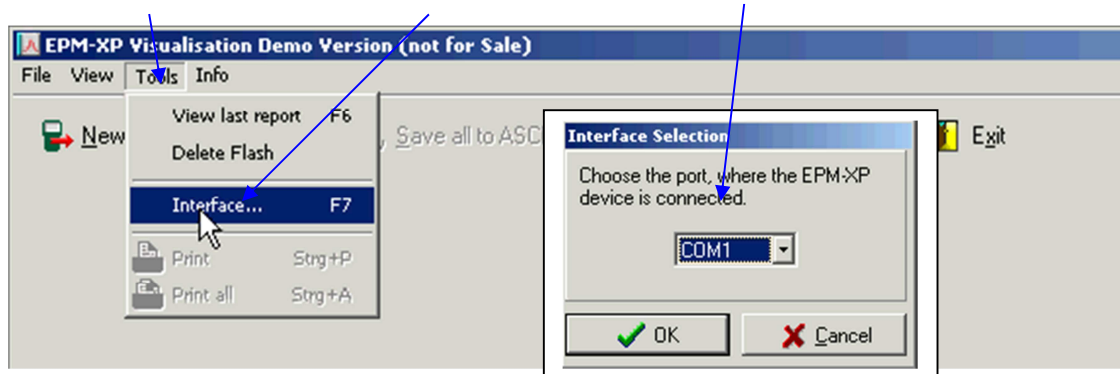
To select a COM Port:

1. Connect the EPM-XG to a PC using the USB cable that was supplied with the EPM-XG kit.
2. Turn on the EPM-XG.
3. Double-click on the EPM-XG visualization software icon on the PC's desktop.



Fig.4: EPM-XG connected via USB cable to PC

Click on “**Tools**”, then click on “**Interface**”, then select the **COM port** that you want to use.





## 5.5 Charge battery

The EPM-XG has a rechargeable battery. Battery charging will start automatically as soon as the EPM-XG has been connected to the PC using the USB cable supplied (Figs. 5, 6, 7, & 8).

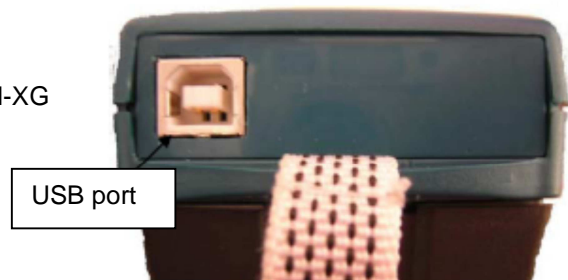


Fig. 5 USB port of EPM-XG

**Note: After you receive your EPM-XG, please connect it to a PC with the USB cable to charge the battery. To fully charge the battery, charge it for 2 hours continuously without disconnecting it from the PC!**



Fig. 6: EPM-XG connected via USB cable to PC

A fully charged battery in good condition should provide about one hour of EPM-XG operation. As the battery ages, operating time will be reduced. If a charged battery provides less than 30 minutes of operation, it should be replaced with a new ANSMANN NiMH 300 mAh rechargeable battery.

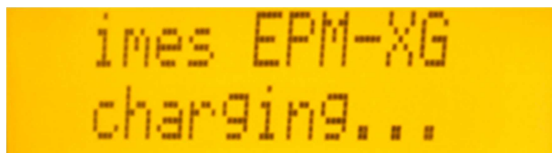


Fig. 7: EPM-XG display during charging process

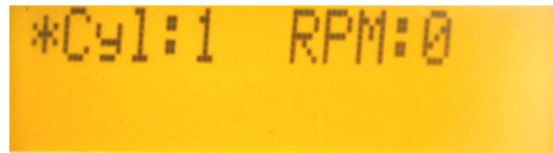


Fig. 8: EPM-XG display after charging process is completed

**imes** recommends recharging the EPM-XG whenever the battery charge level drops below 10% or after about one hour of use. A good practice is always to recharge the battery before making cylinder pressure measurements.

Do not remove the battery from the EPM-XG during the charging process.

When the EPM-XG and PC are connected by the USB cable, the battery charges automatically. The EPM-XG continues charging the battery until it is fully charged, then the charging process stops automatically. To obtain maximum battery charge, do not interrupt the charging process before it is stopped. The charging process is complete when the "EPM-XG charging..." message is no longer displayed.



If the EPM-XG is used heavily and there is not sufficient time to recharge the battery with the PC between cylinder pressure measurements, an “ANSMANN Powerline 2” battery charger may be purchased that will charge two ANSMANN 9V batteries in two hours. The ANSMANN battery charger may be purchased through various Internet retailers or from IMES USA.

## 5.6 Change battery

**Note: Use only ANSMANN 300 mAh NiMH rechargeable batteries!**

To exchange the rechargeable battery, the battery cover on the back side of EPM-XG must be removed (Figs.7, 8, & 9). Do not exchange the battery while it is being charged.



Fig.7: Battery cover



Fig.8: Rechargeable ANSMANN battery



+ Pole  
- Pole

**Make sure that the battery is installed with the correct polarity!**

Fig.9: Battery installed on backside of EPM-XP

**Note:** If a charged ANSMANN NiMH 300 mAh battery is not available, then a 9V Alkaline battery may be used for a short time.

**If you use a 9V Alkaline battery, the EPM-XG must be disconnected from the PC immediately after uploading the measurement data to the PC!**

## 5.7 Mounting instructions

### Measuring at the indicator valve

Before mounting the adaptor, please clear the engine indicator valve of deposits by opening it for 1-2 seconds.

### To avoid measurement distortion:

Check the adaptor and sensor periodically for dirt and soot deposits and clean it if necessary.



Fig. 10: EPM-XG with HTT sensor mounted on the Thompson adaptor at the indicator valve

### **DANGER!**

**Danger of sparks and burning.**

**The indicator valve ejects hot gases and combustion particles under high pressure. Wear insulated gloves and safety glasses!**

**To ensure safe operation and accurate measurements, the Thompson adaptor must be firmly tightened before opening the indicator valve!**

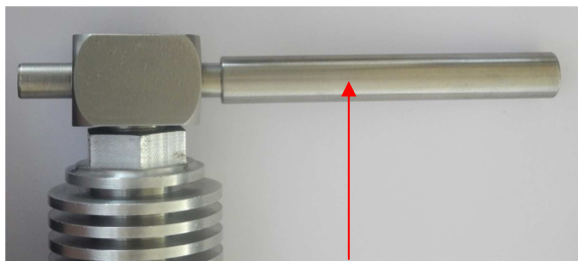


Fig. 11: Thompson adaptor wrench

**Note: Do not use a hammer or a similar tool to tighten or remove the Thompson adaptor on / from the indicator cock. Use the adaptor wrench that is supplied with the EPM-XG kit.**

## 5.8 Measurements with EPM-XG

1. Charge battery or install a charged battery before going to the engine room.
2. Turn on the EPM-XG and select 2 or 4 stroke mode (if needed).
3. Go to cylinder 1 for in-line engines or 1L for V engines.
4. Open indicator cock for 2 seconds and close.
5. Install Thompson adaptor on the first cylinder and open the indicator cock again.
6. Press the EPM-XG's "On" button.
7. Wait about 10 seconds for the cylinder pressure to stabilize.
8. Press "**Measure**" and wait about 5-10 seconds. The EPM-XG will display the "recording cylinder" message shown in Fig. 12.
9. After the EPM-XG completes the measurement cycle, it will display the measured values for two seconds (Fig. 13), then will advance automatically to the next cylinder.

**Repeat steps 3-9 for all of the remaining cylinders.**

The EPM-XG automatically displays cylinder 1L first, then indexes up to 10L, then 1R to 10R.

If your engine is an in-line engine, using 1L through 10L is recommended.

If your engine is a V engine with less than 20 cylinders, you can use the Up arrow button to index from the last left cylinder (say 6L) to the first right cylinder (1R). The EPM-XG will automatically index to 2R after 1R's pressure data is recorded.

### EPM-XG's Automatic Index Pattern

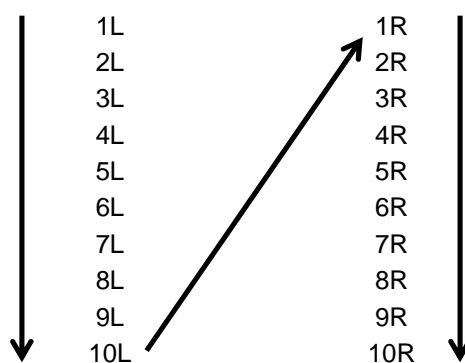




Fig.12: Display during cylinder measurement

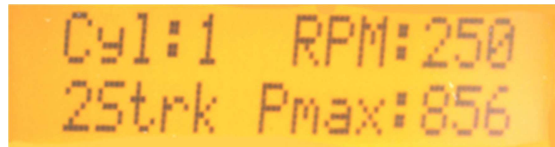


Fig.13: Display after cylinder measurement

**Remark: The EPM-XG displays an “Over Temp” warning if the sensor temperature exceeds 300°C. If this warning is displayed, remove the Thompson adaptor from the indicator valve and allow the sensor to cool for 5-10 minutes.**

**Remark: To conserve the battery charge, the EPM-XG turns off automatically after 2 minutes if no buttons are pressed and no cylinder pressure is detected!**

## 5.9 Cylinder Balancing Order

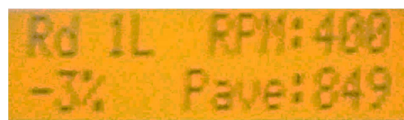
Cylinder Balancing Order allows the operator to collect cylinder pressures and balance the engine without having to leave the engine room.

Here's how it works:

1. First use the EPM-XG to collect the peak pressures from all of the cylinders. These pressures are the “As-Found” engine balance.
2. You can view the peak pressures (Pmax) for each cylinder by using the Up and Down arrow buttons to step through the cylinders. Push the “Read” button once to read the peak pressure for that cylinder.

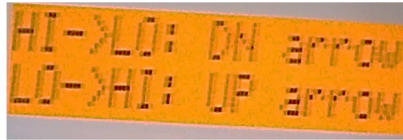


Push the “Read” button a second time to display the % Out-of-Balance for that cylinder and the average peak pressure for the engine (Pave).

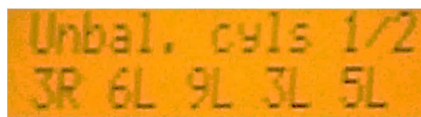


3. You may upload the “As-Found” balance pressures to a PC using the EPM-XG Visualization program. This step is optional.
4. If any of the cylinders are out-of-balance (not within +/-5% of the engine average), the engine needs to be balanced.

5. Push the up and down arrow buttons simultaneously for 2 seconds to make the EPM-XG list which cylinders are out-of-balance.



6. You can then select whether to balance from HI to LO pressures by pushing the down arrow or LO to HI pressures by pushing the up arrow.
7. The EPM-XG then displays all of the cylinders that are out of balance.



8. Push the down arrow button (for HI > LO) or the up arrow button (for LO > HI) to display the out-of-balance cylinders one at a time.



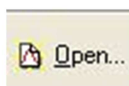
9. Once you have adjusted the out-of-balance cylinders, re-measure the peak pressures for all of the cylinders. Note that the peak pressures will be different for all of the cylinders, not just the ones that you adjusted, so all of the cylinders should be re-measured.
10. Upload the peak pressure data to your PC using the EPM-XG Visualization program to create your "As Left" engine balance report.

## 6 Visualization software release 1.1.1.3

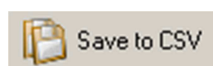
### 6.1 Main tool bar buttons



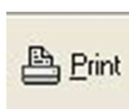
Loads new cylinder pressure measurement data from the EPM-XG



Opens a stored measurement data set



Saves the report file to a .csv file that can be opened with MS Excel.



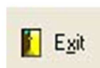
Prints the current screen page



Deletes the measurement data stored in the EPM-XG.



Saves the EPM .EXT report file, including comments.



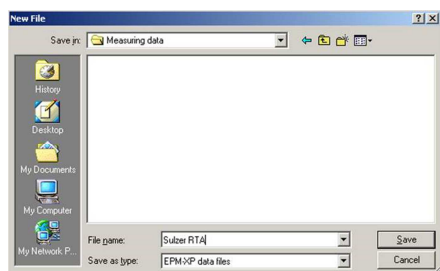
Program exit

#### 6.1.1 Upload measured data from EPM-XG to PC

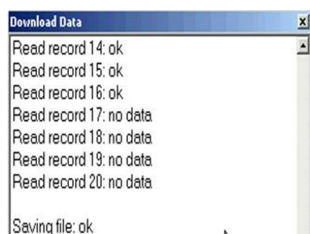
Start the EPM-XG visualization program. The EPM-XG must be connected via USB cable to the PC. Press “New” to upload measurement data from the EPM-XG to the PC.



Specify a filename for storing the measurement data on the PC.



After a filename is entered the EPM-XG will upload the measurement data to the PC.



After the measurement data is uploaded it may be viewed using the visualization program.

### 6.1.2 Load measured data from hard disk to PC

Start the EPM-XG visualization program.

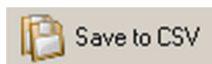
Press “Open” to load measurement data from a file stored on the PC.



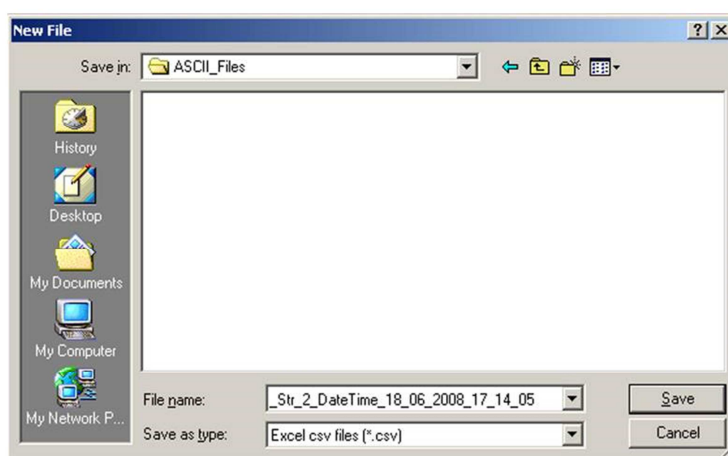
The measurement data may now be viewed using the visualization program.

Save to CSV file

Click “Save to CSV” to save the measurement data to an Excel (\*.csv) file.



Specify where to store the file and the filename.

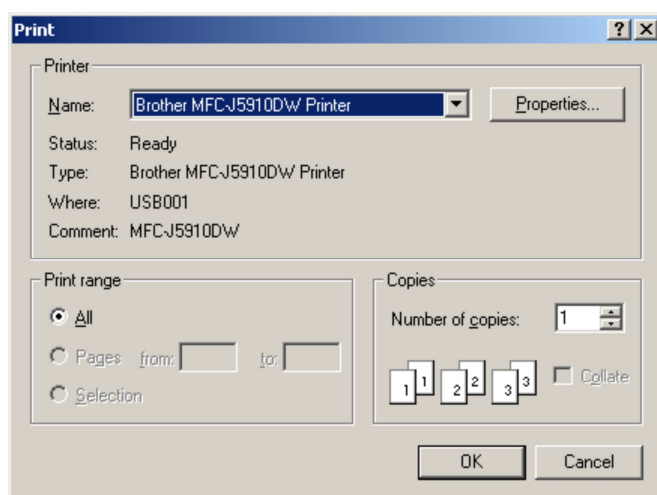




### 6.1.3 Print



Click "Print" to print the current screen page. Select the printer, configure properties if needed, and then click "OK".

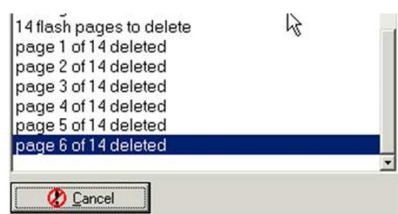


### 6.1.4 Delete Measurement



The EPM-XG must be connected to the PC by the USB cable.

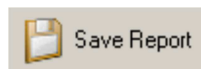
After transferring the measurement data to the PC, the operator can delete all of the measurement data in the EPM-XG by clicking "Delete Measurement". The PC will confirm that the measurement data has been deleted by displaying the window shown below.



Alternatively, the operator may overwrite the existing measurement data one cylinder at a time during the next measurement procedure on the engine. To delete EPM-XG measurement data one cylinder at a time, see section 5.2.

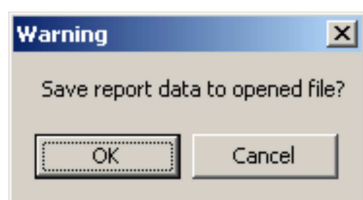


### Save Report



Click "Save Report" to save the report file in the .EXT file format.

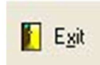
The PC will display the following warning.



Click "OK" if you want to overwrite the existing .EXT file with the changes that you have made on the PC. You would normally want to do this after entering information on the "Engine Report" and/or "Engine data" pages.

If you do not want to overwrite the existing file, click "Cancel".

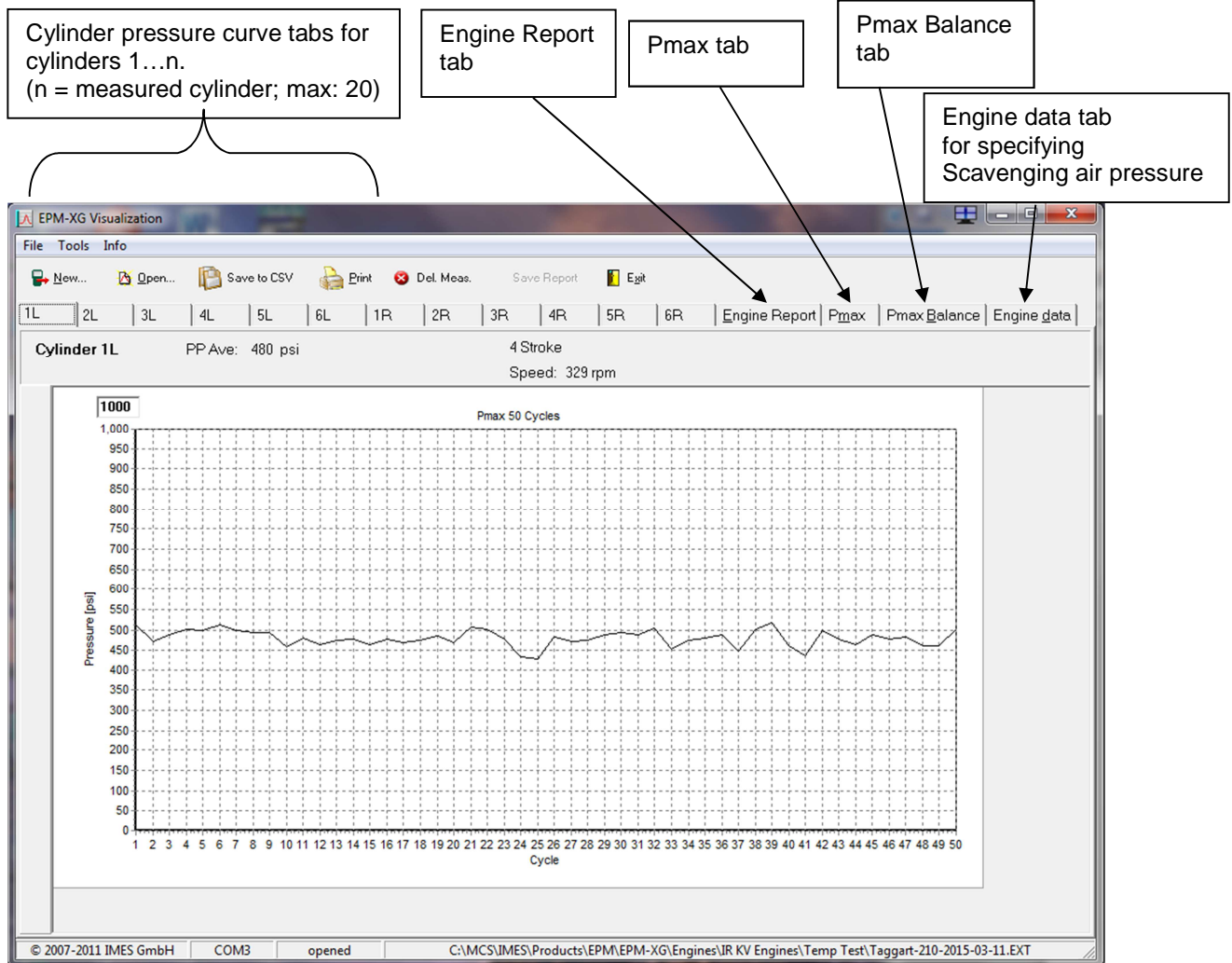
### 6.1.5 Exit



Click "Exit" to close the EPM-XG visualization program. Be sure to click "Save Report" first if you have made changes to the "Engine Report" or "Engine data" pages that you want to save.

## 6.2 Monitoring combustion data

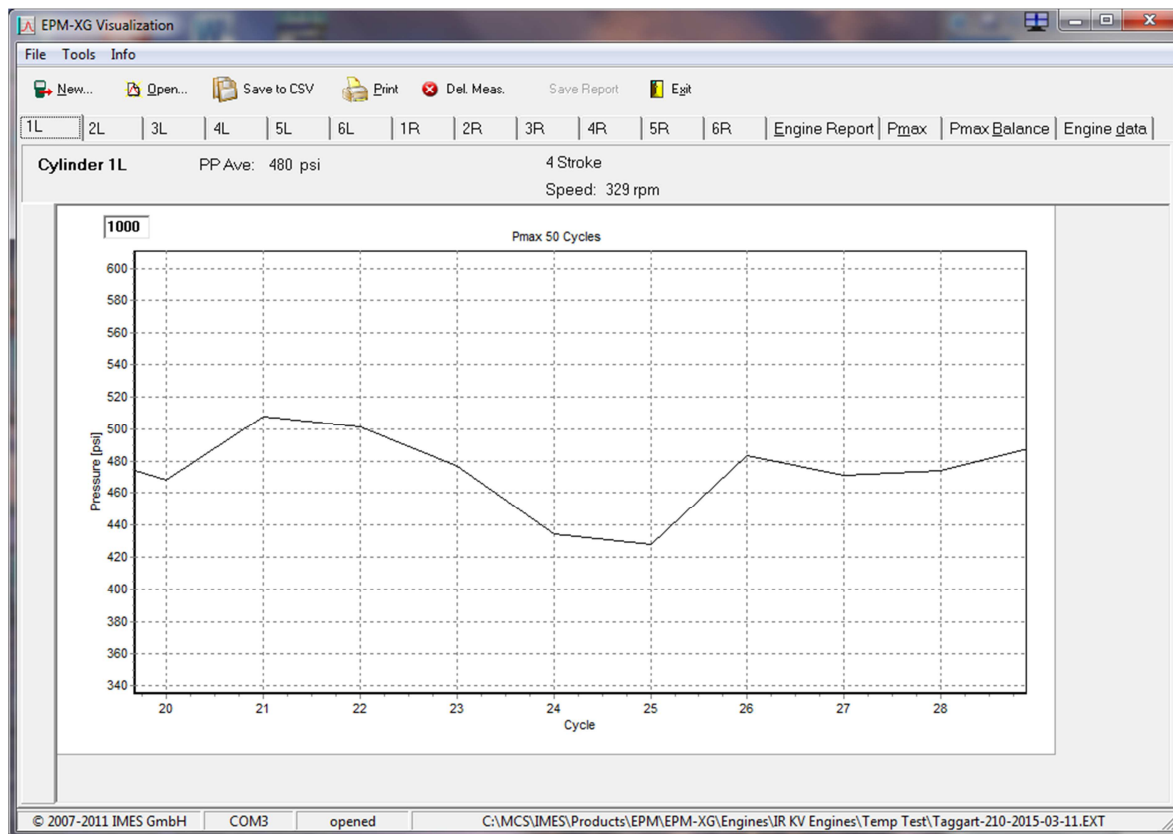
### 6.2.1 Cylinder tabs



The cylinder tabs display a graph of the peak pressure measured on 50 consecutive engine cycles. The cylinder number, the average peak pressure and RPM measured over the 50 cycles, and the 2/4 stroke mode are displayed above the graph.

The user can adjust the peak pressure scale.

## 6.2.2 Zoom function

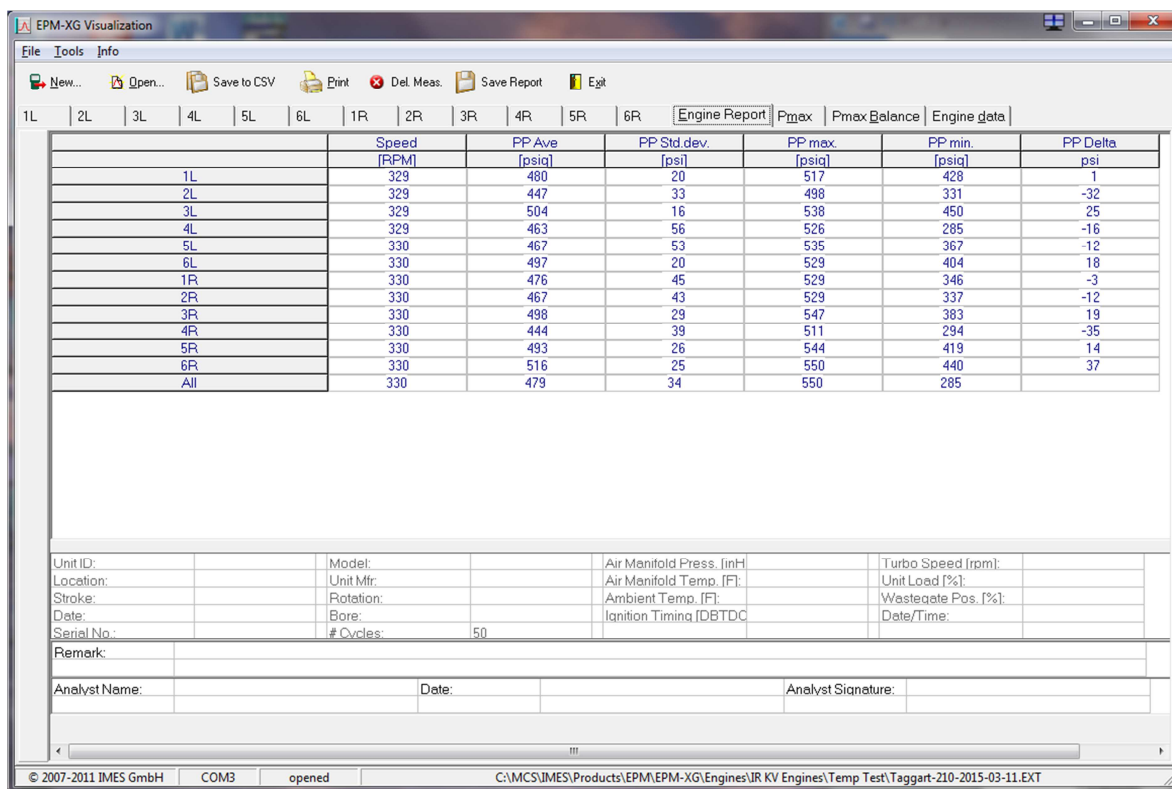


The user may zoom in or out on the Pmax curve.

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

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

### 6.2.3 “Engine Report” tab



	Speed [RPM]	PP Ave [psig]	PP Std.dev. [psi]	PP max. [psig]	PP min. [psig]	PP Delta [psi]
1L	329	480	20	517	428	1
2L	329	447	33	498	331	-32
3L	329	504	16	538	450	25
4L	329	463	56	526	285	-16
5L	330	467	53	535	367	-12
6L	330	497	20	529	404	18
1R	330	476	45	529	346	-3
2R	330	467	43	529	337	-12
3R	330	498	29	547	383	19
4R	330	444	39	511	294	-35
5R	330	493	26	544	419	14
6R	330	516	25	550	440	37
All	330	479	34	550	285	

Unit ID:      Model:      Air Manifold Press. [inH]      Turbo Speed [rpm]:      Unit Load [%]:      Waste gate Pos. [%]:      Date/Time:     

Location:      Unit Mfr.:      Air Manifold Temp. [F]:      Unit Load [%]:      Waste gate Pos. [%]:      Date/Time:     

Stroke:      Rotation:      Ambient Temp. [F]:      Ignition Timing [DBTDC]      Date/Time:     

Date:      Bore:      Ignition Timing [DBTDC]      Date/Time:     

Serial No.:      # Cycles: 50      Date/Time:     

Remark:     

Analyst Name:      Date:      Analyst Signature:     

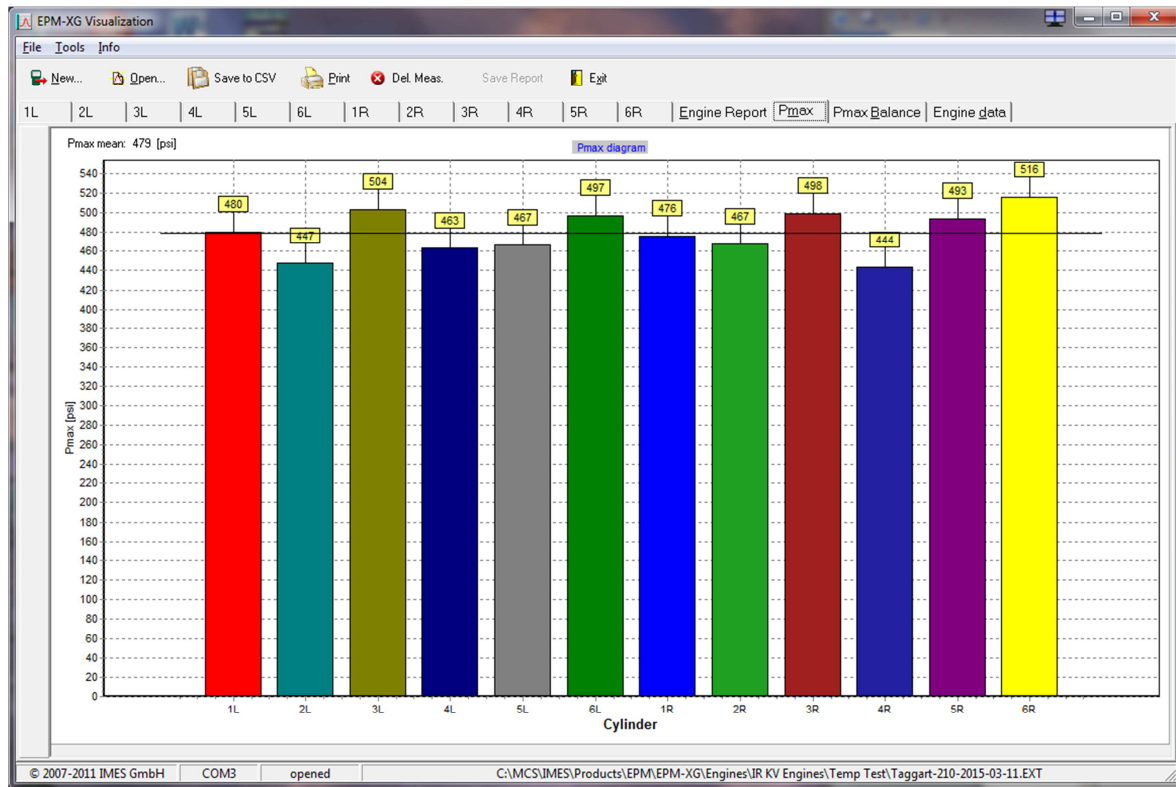
© 2007-2011 IMES GmbH      COM3      opened      C:\MCS\IMES\Products\EPM\EPM-XG\Engines\JR KV Engines\Temp Test\Taggart-210-2015-03-11.EXT

The “Engine Report” tab provides a summary report for the engine. The following information is provided based on the measured cylinder pressure over 50 cycles.

Parameter	Units	Description
Speed	RPM	The speed measured for each cylinder and an engine average speed.
PP Ave	psi	The average peak pressure for each cylinder and for the engine.
PP Std. dev.	psi	The standard deviation of the peak pressure distribution for each cylinder. “All” is the average standard deviation for all cylinders.
PP max	psi	The maximum peak pressure for each cylinder and the engine.
PP min	psi	The minimum peak pressure for each cylinder and the engine.
PP Delta	psi	“PP Ave” for the cylinder – “PP Ave” for the engine (All)

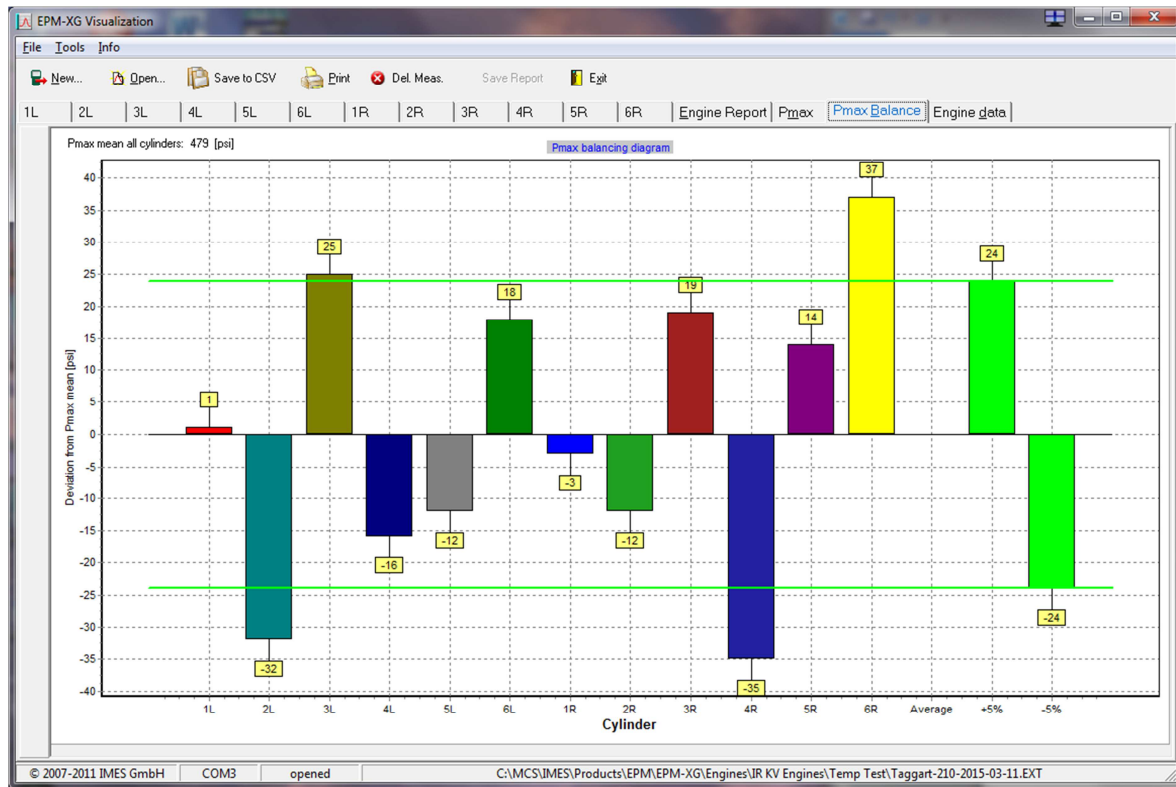
At the bottom of the page is engine information recorded by the operator for the test set.

## 6.2.4 “Pmax” tab



The “Pmax” tab displays the peak pressure measured for each cylinder in bar chart form. The engine's average peak pressure, “Pmax mean” is displayed as a horizontal line.

## 6.2.5 “Pmax Balance” tab



“Pmax Balance” shows the peak pressure difference for each cylinder relative to the engine average in bar chart form. The light green lines and bars show the +/-5% thresholds.

## 6.2.6 “Engine data” tab

Measurement condition

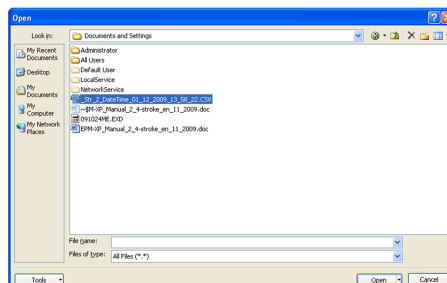
Scav. air press. [psi]

Enter the scavenging air pressure (charge air pressure) in psi, then click “OK”.

NB: On 4-stroke engines “scavenging air pressure” is frequently referred to as “charge air pressure”, i.e. the turbocharging pressure.

### 6.3 Open \*.csv files in Excel

Start Excel and select the desired \*.csv file (Microsoft Office Excel Comma Separated Values File).



Excel will display an engine report file with the following format.

EPM-XG ENGINE BALANCE REPORT							
Cyl.	Speed RPM	PP Ave psig	STDDEV psi	PP MAX psig	PP Min psig	PP Delta psi	
1	281	514	34	574	394	34	
2	280	483	37	543	379	3	
3	281	461	39	537	297	-19	
4	280	554	25	601	501	74	
5	280	548	50	622	355	68	
6	278	393	57	546	327	-87	
7	280	379	82	522	279	-101	
8	279	532	41	610	428	52	
9	280	586	58	714	455	106	
10	280	427	104	601	288	-53	
11	280	544	35	622	467	64	
12	281	336	74	498	273	-144	
All	280	480	53	714	273		
Unit ID:		907		Model:		KVS412FT	
Location:		Shelbyville		Unit Mfr.:		IR	
Stroke:		4		Rotation:			
Date:		6/21/2012		Bore:		5 in	
Serial No.:		1					
Air Manifold Press.:		20 inHG		Turbo Speed:		10000 rpm	
Air Manifold Temp.:		80 F		Unit Load:		80 %	
Ambient Temp.:		70 F		Wastegate Position:		65 %	
Ignition Timing:		10 DBTDC					
# Cycles:		50					
Date/Time:		050412 11:30am					
Engine Average PP:		480 psig					
Current Balance:		30 %					
5% Out-of-Balance Threshold:		24 psi					
Cylinders Out of Balance:		1 4 5 6 7 8 9 10 11 12					
Remarks:							
Analyst Name:							
Analyst Signature:						Date:	

## 7 Free internet software download

Customers can check IMES' website for new EPM-XG Visualisation software releases free of charge.

Please enter the following address into your internet browser:

<http://www.imes.de/downloads/software/epmxgvis.zip>

The following window will be displayed:



For your user name and password please contact Dave Morris at IMES USA.



## 8 Accuracy check

The EPM-XG is calibrated by IMES' at pressures ranging from 0 to 150 bar (0 to 2175 psi) and temperatures ranging from 50°C to 200°C. The calibration points are listed on the EPM's calibration certificate (see fig.18). A calibration certificate is delivered with each new EPM.

The EPM-XG uses the very stable and long life HTT cylinder pressure sensor. IMES recommends checking the EPM calibration annually using a hydraulic oil pressure calibrator. See section 8.1.


Kalibrierzertifikat							
Calibration certificate				imes gmbh dr.-herbert-kittel-str. 2 87600 kaufbeuren fon +49 (0) 8341 966173-0 fax +49 (0) 8341 966173 18 <a href="http://www.imes.de">http://www.imes.de</a>			
1523-10-0002-0							
Temp.	Pressure	p	StdDev	Temp.	Pressure	p	StdDev
203.1	0.00bar	3.99	0.012				
201.8	60.00bar	7.19	0.012				
201.3	120.00bar	10.40	0.007				
200.8	180.01bar	13.61	0.007				
200.6	240.00bar	16.81	0.006				
200.9	300.00bar	20.00	0.006				
200.1	0.04bar	4.01	0.005				

Fig.14: EPM Calibration certificate

### 8.1 Connecting the EPM to the pressure calibrator

Connect the EPM's Thompson adaptor to pressure calibrator as shown in Fig.19. Tighten the Thompson adaptor using the adapter wrench then check for leakage at the adaptor by generating pressure.



Fig.15: Connecting the EPM to the pressure calibrator

Note: The pictured pressure calibrator is an example of a handheld pressure calibrator used to generate calibration pressures. Other types of calibrated pressure sources may also be used.

## 8.2 Generating pressure with the pressure calibrator

Be sure to check the EPM calibration at most frequently measured Pmax values for your engine(s).

The following calibration example is for pressure values at 0 bar (0 psi), 50 bar (725 psi) and 100 bar (1450 psi).



Fig.16: Generate 0 bar (0 psi) with the pressure calibrator



Fig.17: Generate 50 bar (725 psi) with the pressure calibrator



Fig.18: Generate 100 bar (1450 psi) with the pressure calibrator

#### Calibration procedure:

1. Turn on the EPM-XG
2. Generate 0 pressure with the pressure calibrator
3. Press the EPM's "2/4" button 3 times. The static pressure value will be displayed
4. Generate the maximum expected pressure with the pressure calibrator
5. Check displayed pressure
6. Compare the pressures generated by the pressure calibrator with the pressures displayed by the EPM-XG

### 8.3 Checking the EPM-XG's calibration values

Calibration Pressure (psi)	EPM Measured Pressure (psi)	Deviation (+/- psi)
0	0	0
725	715	10
1450	1442	8

The EPM-XG's accuracy specification is +/- 0.5% of full scale range (0...2000 psi) between 50°C and 200 °C.

At room temperature (20-25 C), the EPM-XG's accuracy is +/-1.0% of full scale range. The maximum acceptable difference between the calibration pressure and EPM-XG measured pressure (deviation) is +/- 20 psi. If any of the calibration points have a deviation greater than +/-20 psi the EPM-XG should be returned to IMES for recalibration.

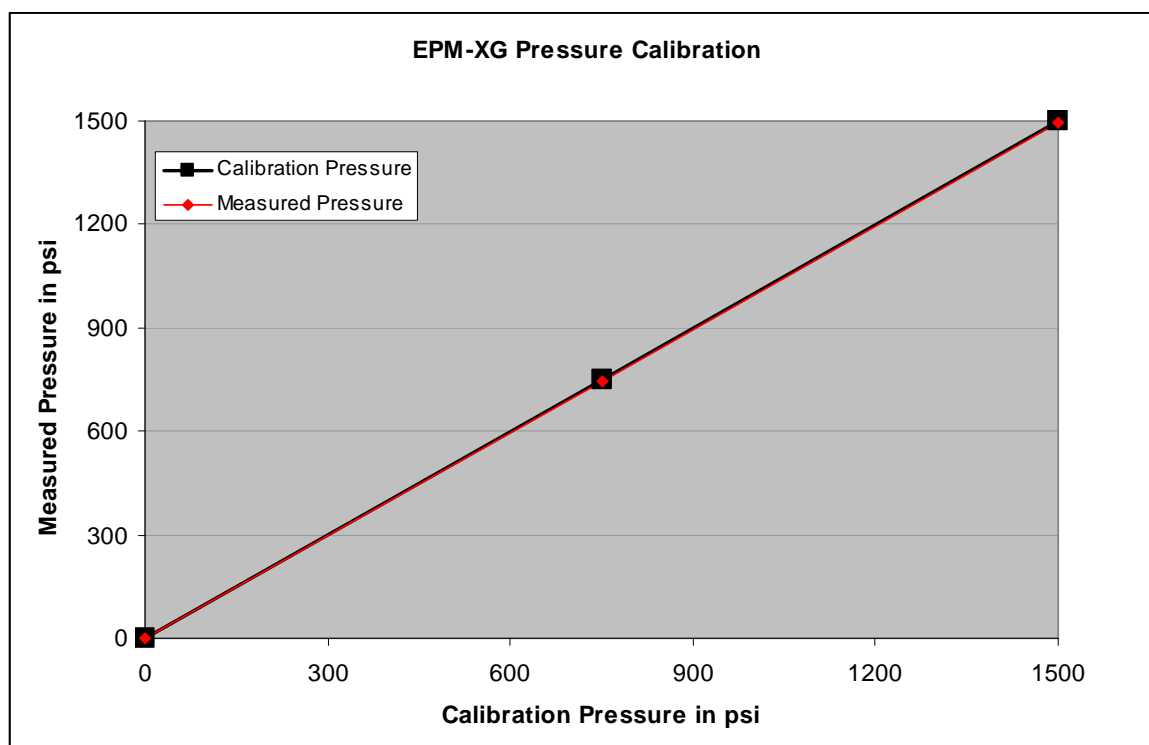


Fig.19: Calibration check example

### 8.4 Disconnecting the EPM from the pressure calibrator

Disconnect the EPM's Thompson adaptor from pressure calibrator, and then remove the hydraulic oil from the sensor and adapter using compressed air.



## 9 Cleaning

### 9.1 Routine cleaning

Periodically clean the HTT sensor's gas channel using compressed air.



Fig. 20: Cleaning the gas channel with compressed air

### 9.2 Cleaning hard deposits

1. Remove the spring retaining screw with a 2.5 mm Allen wrench (Fig. 21)
2. Remove the spring from the Thompson adaptor
3. Remove the sensor from the Thompson adaptor using 19 mm and 22 mm wrenches (Fig. 22)
4. We recommend placing the adaptor-sensor assembly in a vice

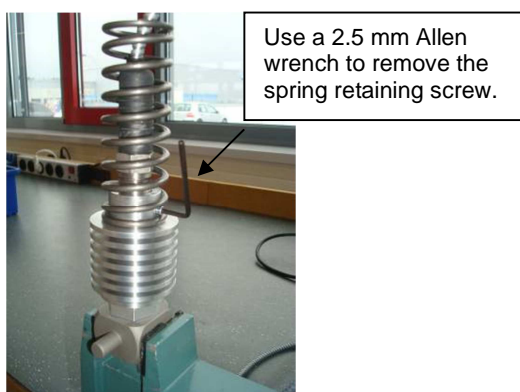


Fig.21: Removing the adaptor spring

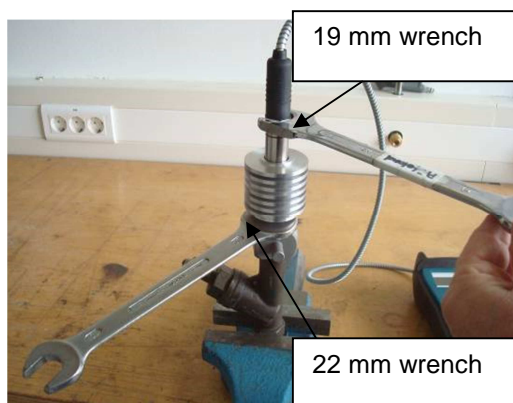


Fig.22: Removing the HTT sensor from the adaptor

### 9.3 Cleaning the Thompson adaptor

Use a hand drill with 2.5 mm bit to clean the gas channel of the Thompson adaptor.

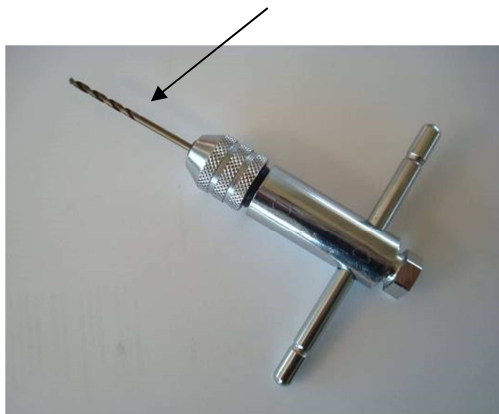


Fig. 23: 2.5 mm bit & ratchet tap wrench



Fig. 24: Cleaning the adaptor with the drill

Clean the gas channel of the Thompson adaptor with a 2.5 mm drill bit. A ratchet tap wrench is ideal for gently rotating the drill bit.

### 9.4 Cleaning the cylinder pressure sensor

Use a 2.5 mm bit to clean the gas channel of the HTT cylinder pressure sensor. A ratchet tap wrench is ideal for rotating the drill bit. The length of gas channel is 29 mm. Mark the drill bit 28 mm from the tip. **Do not drill deeper than 28 mm into gas channel!**

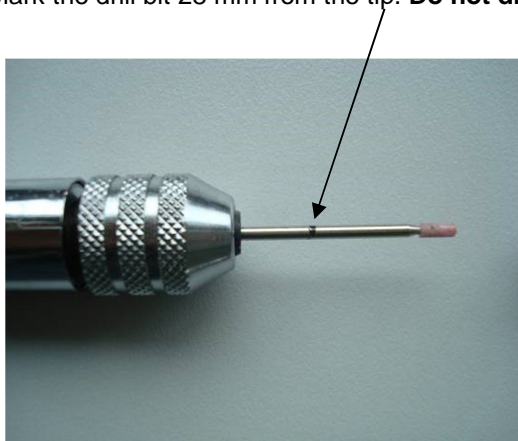


Fig. 25: The 2.5 mm drill bit with mark at 28 mm



Fig. 26: Cleaning the sensor gas channel



## 10 Installing the sensor in the Thompson adaptor

To ensure operator safety, the HTT sensor must be tightly installed in the Thompson adaptor. Use 19 mm and 22 mm wrenches as shown in Fig. 20 to tighten the sensor.

Use a crow's foot socket in a torque wrench instead of one of the open jaw wrenches to check the maximum torque of 40 ft. lbf (30 Nm).

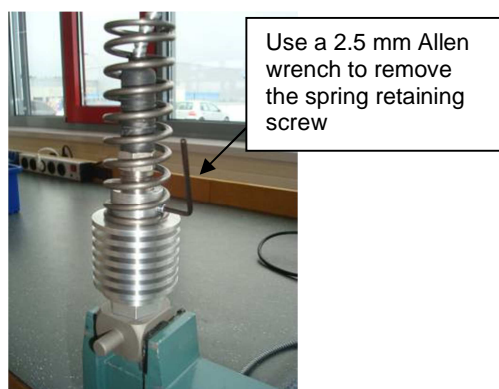


Fig. 27: Removing the adaptor spring

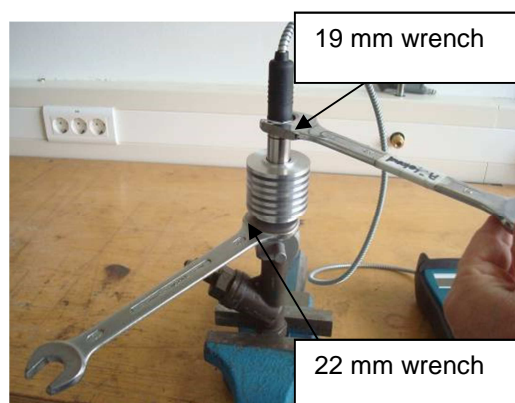


Fig.28: Installing the HTT sensor in the adaptor

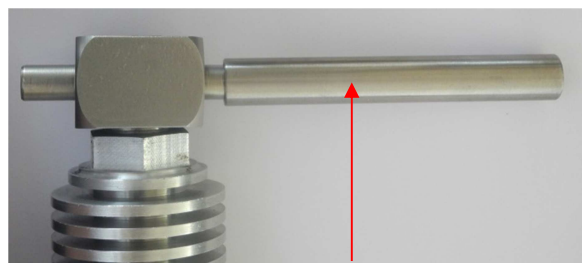

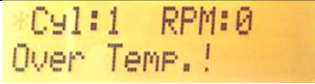

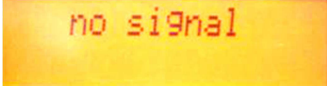


Fig. 29: Thompson adaptor wrench

**Note: Do not use a hammer or a similar tool to tighten or remove the Thompson adaptor on / from the indicator cock. Use the adaptor wrench that is supplied with the EPM-XG kit.**

## 11 Basic diagnostic checks

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

Problem	EPM-XG Display	Action
EPM-XG display is blank after pushing the "On/Off" button.		Recharge the battery. See section 5.5.
Over temperature indication <i>The EPM-XG will display "Over Temp" if the temperature of the sensor measuring cell exceeds 300 °C.</i>		Disconnect the Thompson adaptor from the indicator valve and let it cool for 5-10 minutes.
High offset		Sensor is out-of-calibration or defective. Return the EPM-XG to IMES for repair.
No signal <i>Engine speed is lower than 10 RPM or the Indicator valve is closed</i>		Open indicator valve

## 12 Technical data

Measuring range	0...2000 psi
Accuracy (EPM-XG incl. HTT cylinder pressure sensor)	≤ 0.5 % Full Scale
Max. temperature at measuring cell	300 °C
Storing capacity	20 measurements / engine
Interface	USB
Battery	ANSMANN NiMH 300 mAh rechargeable 8.4 V E-block batteries
Dimension	200 x 50 x 80 mm
Weight (incl. battery)	1200 g

## 13 Warranty

The warranty period is 12 month after delivery according to the General Terms and Conditions of the Electrical Industry of Germany.

## 14 IMES Sales and service organization

<https://www.imes.de/sales-team.html>