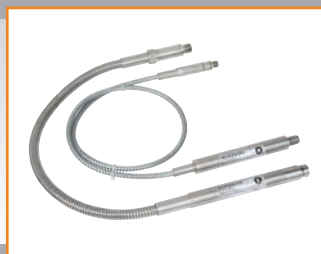
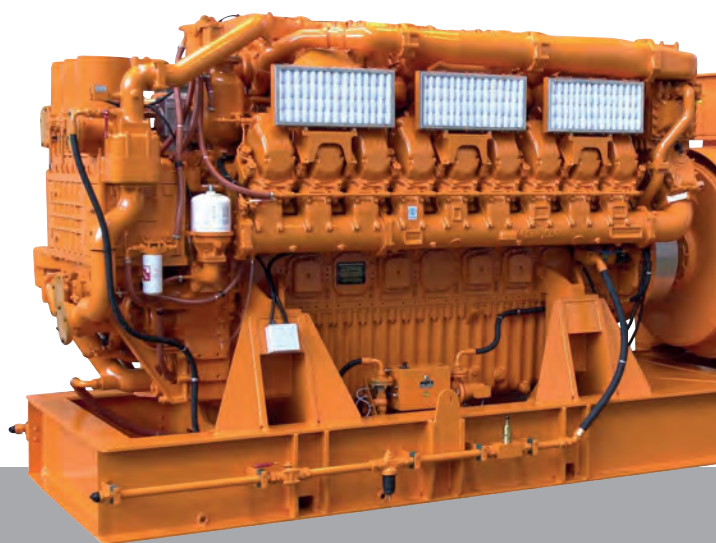


TRITON CPM

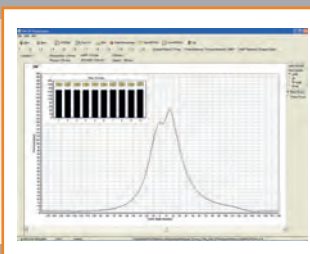
Cylinder Pressure Control & Monitoring



Electronic Cylinder Pressure Indicator



Pressure Sensors for Combustion Control



Visualisation



Marine Portable Case

- ✓ Replaces mechanical indicators on diesel engines
- ✓ Helps to improve combustion
- ✓ Supports to reduce fuel consumption and emissions

TRITON CPM

Cylinder Pressure Monitoring (CPM 500)

The proven advantage of the electronic TRITON CPM 500 System compared to mechanical engine indicators is a considerably simpler and far more accurate operation.

After acquisition, recorded data can be downloaded immediately to a PC or notebook via USB and processed through HEINZMANN's software. Transmitted by telephone or internet, information becomes available for expert analysis and condition monitoring at a remote location. An optional software extension allows power calculation for every cylinder to assist cylinder balancing. Designed for periodic monitoring of cylinder pressure on diesel engines, the electronic indicator CPM 500 can record cylinder pressure values on a maximum of 20 cylinders (prospective option: 160 cylinder values) on two-stroke diesel engines operating at speeds of 40 to 300 rpm and on four-stroke engines with rated speeds up to 1,500 rpm.



TRITON CPM Benefits

- ✓ **Periodic and accurate monitoring of cylinder pressure on diesel engines**
- ✓ **Accurate, reliable, durable and cost-effective pressure sensor**
- ✓ **User friendly electronic measuring and recording device**
- ✓ **Maximum pressure values for up to 20 cylinder**
- ✓ **USB interface for data downloading**
- ✓ **Rechargeable battery**
- ✓ **Software upgrade available**
- ✓ **Pressure calculation without TDC (Top Dead Centre) encoder system**

Conventional mechanical indicators are only partly suited to modern internal combustion engines since they can no longer achieve the required accuracy as peak cylinder pressures and temperatures rise.

Optimised engine settings based on accurate cylinder pressure readings. This helps to improve combustion and thus reduces fuel consumption and emissions.

This became increasingly important as a method of ensuring that NO_x emissions are kept in compliance with the IMO Tier II limits, which came into effect from January 2011.



CPM 500 with HTT sensor mounted in adapter at the indicator valve

DESIGNED FOR ROBUSTNESS, PRECISION AND LONG LIFE

The CPM 500 cylinder pressure indicator is characterised by its high accuracy, reliability and ease of use. Central to the performance of CPM 500 is the proven accuracy, reliability, longevity and cost effectiveness of HEINZMANN's advanced type HTT (High Temperature Transmitter) pressure sensor employing TiON (titanium oxynitride) thin film technology. More than 25,000 type HTT sensors have been delivered for a range of closed loop control applications.

They are affordable and their robustness and performance has been proven in many applications. As a result, standard effective life is more than 16,000 operating hours on both diesel and gas engines. On this basis we believe that our sensors offer the best combination of robustness, longevity, reliability, price and, above all, accuracy available on the market.

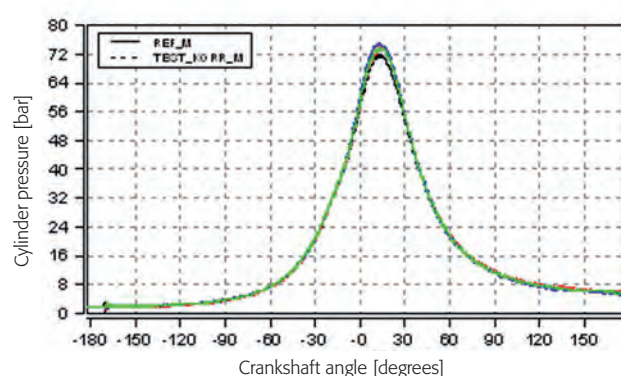
With our hand operated pump and manometer device, TRITON CPM provides customers with a quick and straightforward way of investigating apparently anomalous readings as well as achieving compliance with the ISO 9001 requirement for end user testing of measuring equipment. The HEINZMANN device is capable of loading the CPM 500 with static pressures up to 300 bar so that verifying its performance is a simple matter of comparing the readouts of the CPM 500 and the test manometer.

This technology of cylinder pressure monitoring is already standard application for all newly coming MAN B&W MC/MC-C and Wärtsilä RTA/RT flex engines (04/2010) by Hyundai Heavy Industries and was supplied on Kawasaki Heavy Industries built MAN B&W two-stroke engines (04/2010).

The unit was tested after 5 years of frequent operation. The result of deviation zero offset was neglectable 0.22 %.



HTT cylinder pressure sensor used for CPM 500



Comparison to water cooled piezoelectric reference sensor



CPM 500 connected to a hand operated pneumatic testing pump incl. manometer set

USER FRIENDLY ELECTRONIC ENGINE INDICATOR

Data recording with the HEINZMANN TRITON CPM 500 device has proven considerably more simple and more accurate than with mechanical engine indicators.

As well as key engine operating information which can be read out from the CPM 500 after data acquisition, recorded values can be rapidly downloaded to a PC or notebook via a USB cable.

The device is designed for periodic cylinder by cylinder monitoring of combustion pressure on diesel engines and in its standard version can record the cylinder pressure values from up to 20 cylinders. Further versions are offered for different loadings on a maximum of 160 cylinder values on two-stroke engines operating at speeds from 40 to 300 rpm.

Without requiring a connection to an encoder or pickup on the engine flywheel, the CPM 500 calculates p_{max} and p_{comp} , imep and ipower for every cylinder using a specially developed mathematical algorithm.

The CPM 500 instrument can also be used on the four-stroke auxiliary genset engines with rated speeds up to 1,500 rpm typically installed alongside two-stroke main engines in many ships (e.g. container ships, tankers, bulkers, etc.).



CPM 500 connected via USB cable to PC

Charging process of standard rechargeable 9 V block battery is effected via the USB port of PC or notebook and does not require any additional charging station in order to reduce the number of components.



Instrument case of TRITON CPM

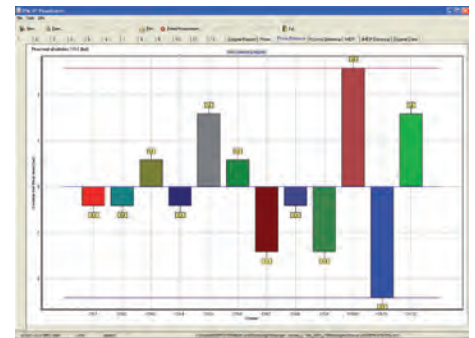
VISUALISATION SOFTWARE FOR A RANGE OF APPLICATIONS AND FOR CUSTOMER REQUIREMENTS

There are several different versions of TRITON CPM 500 software available. The range begins with a CPM 500 package which without TDC (Top Dead Centre) position marking calculates P_{comp} values on two-strokes and goes up to an advanced visualisation software which calculates ipower and imep using a mathematical algorithm.

The range begins with a CPM 500 package which calculates p_{comp} values on 2-stroke and 4-stroke engines without TDC position marking. The enhanced version calculates ipower and imep using a mathematical algorithm. The most advanced CPM 500 software version allows to monitor a maximum of 160 measurements on different load cycles. Optionally with or without a connection to a TDC encoder system.

The HEINZMANN visualisation and data processing software is used to process acquired values and display the derived information at leisure. Similarly, the resulting files can be transmitted over a radio (satellite, mobile phone) to the engine builder and ship owner for separate, independent evaluation.

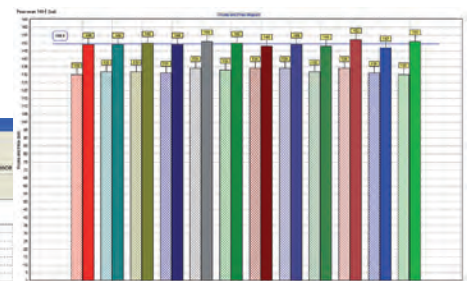
Calculation of indicated engine power



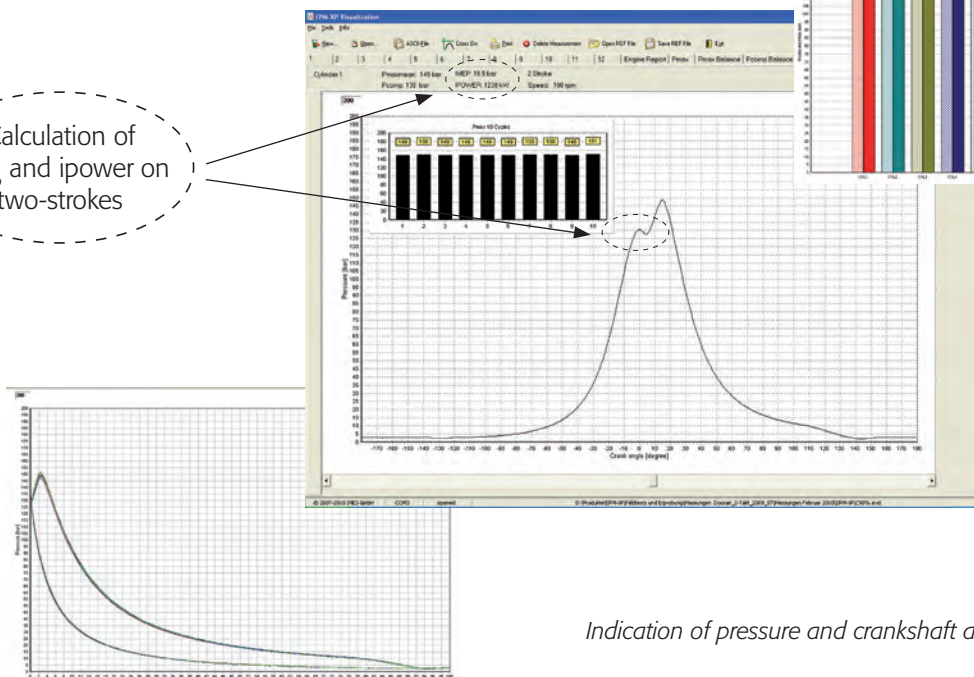
Total POWER = 15.432 (kW)

	Pressure min.	Pressure max.	Pressure mean	Pressure gase	Pcomp	IPWCA	IPW	IPWPER	IMEP
	[bar]	[bar]	[bar]	[bar]	[bar]	[bar/degree]	[kNm]	[kW]	[bar]
Cyl. 1	151	148	148	145	130	4.4	880	1238	16.5
Cyl. 2	151	148	148	15.0	132	4.6	880	1268	19.4
Cyl. 3	152	148	153	15.0	132	4.5	880	1285	19.6
Cyl. 4	150	147	149	13.5	131	4.5	880	1273	19.5
Cyl. 5	153	148	151	14.0	134	4.6	880	1279	19.5
Cyl. 6	152	148	150	14.0	133	4.5	880	1314	20.1
Cyl. 7	150	147	148	14.0	134	4.4	880	1295	18.8
Cyl. 8	151	148	148	14.0	134	4.5	880	1314	20.1
Cyl. 9	150	147	148	15.5	132	4.5	880	1342	20.5
Cyl. 10	154	152	152	16.5	134	4.8	880	1272	19.4
Cyl. 11	148	147	147	13.5	131	4.5	880	1281	19.3
Cyl. 12	152	150	151	14.0	130	4.5	880	1313	20.1
Mean	151.2	148.7	148.4	14.3	132.2	4.5	880.9	1288.2	19.7

Measured data with pressure balancing diagram for each cylinder



Calculation of p_{comp} and ipower on two-strokes



Indication of pressure and crankshaft angle position

The HEINZMANN Group

Quality & Precision since 1897



The Group started 1897 with Heinzmann GmbH & Co. KG, and now includes REGULATEURS EUROPA, HEINZMANN DATA PROCESS and CPK Automotive as member companies.

The HEINZMANN Group boasts a combined total of fifteen global subsidiaries, including eight production sites and an international distributor network.

The product portfolio comprises engine management system solutions, as well as exhaust gas aftertreatment solutions, for industrial combustion engines and turbines; it also encompasses automation systems, primarily for the shipping industry.

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