CMT
monitoring systems

Condition Monitoring

Product Catalogue

Introduction

World Class Innovations in Condition Monitoring

CMT is a specialised manufacturer for on-line and on-site condition monitoring solutions. Our equipment enables onsite engineers to make on the spot informed decision helping with the daily maintenance job.

CM Technologies, formerly known as Kittiwake GmbH help prevent unplanned breakdown and maximise plant availability. There are various different on-the-run tools available for condition monitoring:

- Condition monitoring for operating fluids (lubricants, fuel, water / on-site or in a lab)
- Vibration Analysis, Acoustic Emission or Sound
- Monitoring physical properties (speed, rpm, temperature, pressure, power ....)

Most of the condition monitoring technologies can be used as online or offline version whereas both variants do not provide the same results.

The best solution is often a combination of two or three of the condition monitoring tools, but it depends very much on the type of your condition monitoring equipment you have in use, the criticality of that equipment, the running conditions (speed, rpm, temperature ...) of your equipment, and how perceptive your organization is to training.

CMT, formerly known as Kittiwake GmbH can offer you a complete solution as on- or offline system. We are pleased to help you finding the right solution.

We would like to give this catalogue to interested parties and to customers who would like to acquire more knowledge about available solutions or update their already kept information.

The CMT-Team

Quality assured manufacturing with a focus on continuous improvement

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001:2015 = ISO 14001:2015

Ever since CM Technologies GmbH was founded, formally known as Kittiwake GmbH, its paramount objective has been to manufacture and sell only high-quality products that reflect the state-of-the-art technology and meet customer requirements, with the aid of motivated employees. This self-imposed quality obligation and our experience in condition monitoring technology have enabled us to succeed in achieving a prominent market position. In line with the aspiration to continue to guarantee the highest degree of quality to our customers in future and not only to cement the reputation of our company and related market position, but to enhance it further, we introduced a quality management system in accordance with DIN EN ISO 9001 across our entire company. In addition, we would like to fulfil our customers' requirements by maintaining a very close partnership with them, demonstrating that customers can rely on us and that we deserve their trust.

Environmental protection and sustainable development

are priority objectives of CM Technologies GmbH corporate policy. Already from the beginning, the shareholders have adopted guidelines to the environmental care. To achieve this, we have implemented an Integrated Environmental Management System that meets the requirements of ISO 14001. This policy is periodically reviewed and is monitored by measurable objectives, as part of a continual improvement process. All staff are briefed on this policy and made aware of the objectives. The policy is displayed on the company website, to demonstrate our commitment to the environment.

Oil Condition Monitoring

Water Condition Monitoring

Vibration Monitoring

Performance and Efficiency Monitoring

Service and Training

Oil Condition Monitoring

1. Onsite Oil Test & Solutions

CMT's oil test kit range provides on-site test equipment invaluable for any engineers responsible for high value lubricated machinery or hydraulic equipment. Economically priced these condition monitoring tools quickly will become the backbone of your maintenance regime.

Engineers and maintenance managers are given the ability to conduct oil analysis directly on-site at the running machine. Spot out-of-spec fuels and lubricants before they become a critical problem by using our kits. You can choose from a wide range of different options including complete test cabinets ensuring you get the right tool for your machinery.

Engine Oil Test Kit

Some of our test devices need chemicals for the test routines. CMT continually invests in new developments to reduce the number of chemicals needed.

As a result of this we are currently in the position to supply most of our test kits without reagents which are hazardous for shipping. All our water in oil test devices use non-hazardous reagents. At the same time they still work with any old style reagents offered on the market. On the other hands our reagents can be used in any other test device available on the market. With this backward compatibility the user enjoys a great deal of flexibility when it comes to buying refill reagents or any new or replacement test device.

On-site oil analysis equipment provides your chance to monitor the condition of your oil between laboratory checks. Based on our experience in oil condition monitoring our kits are made to be used by anyone because no training or special knowledge is needed. Important oil parameters can be measured in a few minutes. Step by step instructions and on screen user guides make using the kits as simple as ever.

CMT Onsite Oil Test Solutions are available as single Parameter Test Kit or as a multiparameter.

Your Benefits:

- Fast and accurate results.
- Regular use of CMT´s oil condition monitoring equipment helps avoid expensive machinery failures
- Allow you to make informed on-site maintenance decisions.
- Accurate results are available on-board or in the field immediately without any time delay.
- Allow you to act before critical failure arise.
- Robust and reliable for use in harsh environments.
- Save time and money by knowing exactly when to change the oil.

Multi Parameter Combinations

CMT test kits are supplied either in durable aluminium cases or in wall mounted steel cabinets. Our Multi Parameter Test Kits contain all of the necessary equipment and consumables for your oil condition monitoring needs.

With CMT you have the choice to order a single device or you choose one of CMT's Multi Parameter Combinations. Those combinations give you the advantage of having all the needed tests for certain situations in one place. As listed on the next two pages the combinations, they are being delivered in either a high quality aluminium case of a steel cabinets.

The aluminium case has the advantage of mobility. Take the Test Kit where ever you need it.

The cabinets offer a lot more space and can be mounted to a wall. Misplacing and searching will be a thing of the past.

Multi- Parameter Combinations - Test Kits

Digital / Manual Test Kits

Product name	Part number	Combination						
		Viscotube	Water in Oil Cell	Combined Water in Oil/BN Cell	Salt Test	Insoluble	AN Test	Viscostick
WaVis Oil Test Kit	OTC-CT-20001		☒					☒
Basic Oil Test Kit	OTC-CT-20002		☒		☒	☒		☒
Engine Oil Test Kit	OTC-CT-20003			☒		☒		☒
Field Oil Test Kit	OTC-CT-20004			☒		☒	☒	☒
Engine Oil Test Kit II	OTC-CT-20005	☒		☒		☒		☒
Marine Oil Test Kit	OTC-CT-20006			☒	☒	☒		☒
Hydraulic Oil Test Kit	OTC-CT-20007	☒	☒				☒	

		Water in Oil Cell	Density Hydrometer	Low Range Falling Ball Viscometer	Free Fatty Acid Test/ AN Test	Visual Test (Cleanliness)
Diesel Oil Test Kit	OTC-CT-20008	☒	☒	☒	☒	☒

Electronic Cylinder Drain Oil Test Kit

Oil Test Kit

Multi Parameter Combinations - Cabinets

Fuel and Lube Test Cabinet Configurations

	Part Number	Electronic Water & BN Cell	Heated Viscosity Meter	Density Meter	Dispersency Spot Test	Electronic Insolubles Test	Compatibility Meter	Salt Test	Pour Point	Electronic AN Test	Cat Fines
Marine Fuel & Lube Test Cabinet	OTC-CT-30010	☒	☒	☒	☒			☒	☒	(Option)	
Diesel Engine Power Plant Cabinet	OTC-CT-30011	☒	☒	☒	☒	☒	☒	☒	☒	(Option)	
Gas Engine Power Plant Cabinet	OTC-CT-30012	☒	☒		☒	☒				☒	
Heavy Fuel Oil Cabinet	OTC-CT-30014	☒	☒	☒			☒				☒
Electronic Oil Analysis Centre	OTC-CT-30013	☒	☒		☒	☒				☒	

All cabinets can be ordered with an optional Flash Point Tester.

	Part Number	Electronic CDO BN Cell	Electronic Iron Console	Electronic Insoluble	Electronic Water Test
CDO Analysis Kit	OTK-CT-11220	☒	☒	(Option)	(Option)

Electronic Oil Analysis Centre

Oil Analysis Cabinet

Iron II Test

Patent
(No. 2910933)

The main indicator for wear in 2 stroke diesel engines remains iron. Testing cylinder drain oil for iron content and residual base number (BN) is a very commonly applied technique for screening drain oil samples on-board seagoing vessels. CM Technologies now introduces a complete new technology for testing Iron onsite. The new & improved Iron Test has become much faster, easier and much more accurate than anything else currently available.

The newly patented CMT **Iron Test II** is based on a simple two component wet chemistry which is tested in an electronic photometer. An electric shaker will assist the user to perform the test.

The simple test procedure just takes 3 minutes to achieve an accurate iron test result. For higher iron readings the user can do a second test to test for corrosive iron only. This will provide the values for total, corrosive and abrasive iron.

Iron glass Vial after filtration

Monitoring of the iron content in the cylinder drain oil and the launching of remedial actions in due time can help to avoid cold corrosion and unnecessary abrasive wear in the cylinder liner.

Together with the CMT **CDO BN Test Kit** the **Electronic Iron Analysis Kit** allows to monitor the most important parameters of the drain oil on site providing the user with the necessary information to optimize the feed rate of the cylinder oil and at the same time to avoid unnecessary wear of the individual cylinder liners. Both kits are also available as a combined CDO Test Kit.

CMT also offers a complete Cylinder Drain Oil Service which includes the onsite **CDO Test Kit** and a periodical onshore independent laboratory oil analysis providing complete results about wear, contamination, oil condition and additives together with a diagnostic statement from our tribology and engine experts.

Your Benefits:

- Greatly increased repeatability and accuracy (+/- 20 ppm)
- Differentiation between corrosive and abrasive iron
- No soot dependence of the test allows for most reliable results
- Fastest onsite wet chemistry test
- Intuitive usage due to touch screen functionality
- Large memory for storing data
- Easy trending thanks to a high resolution graphic display
- Simple USB data transfer to a PC
- No hazardous chemicals involved

Ordering Information

OTK-CT-11228
Electronic Iron II SM Test Kit

Range:	50 - 1500 ppm
Corrosive iron:	0 - 100 % of total
Abrasive iron:	0 - 100 % of total
Accuracy:	+/- 20 ppm
Repeatability:	10 ppm
Test Time (ave.):	3 min. per Test
No. of initial Tests:	50
Memory:	last 20 reading / cyl. 14 cylinders
Reagents:	non hazardous

SW-C00002-CT
Download Option Console
License for data download

OTS-CT-13034
Iron II Test Reagent Pack (Version II)

No. of Tests:	50 drain oil samples
Reagents:	non hazardous

OTS-CT-13024
Iron Test Reagent Pack (Version I)

No. of Tests:	50
Reagents:	non hazardous

OTS-CT-13029
Glass Vial Consum. Pack (for S/N > 400)
Glass Vials with cap: 100

OTR-CT-12010
Vial Cleaner

Size	250 ml
Reagent:	non hazardous

OTS-CT-13025
Iron Test Consumables Pack (Version I)

Glass Tubes (blue caps):	24

Set of Syringes

Iron Console

Ferrous Wear Debris Meter

Testing lubricant samples for ferrous wear debris is an established method to detect developing and impending damages as well as gaining knowledge about the wear life cycle of the tested equipment. CMT´s newest addition to its product range - the Ferrous Wear Debris Meter - is an accurate, easy-to-use solution for offline and at-line measurements of ferrous wear debris concentrations.

Gain the insight necessary to determine the condition of your equipment. Applicable for diverse applications like Cylinder Drain Oil of 2-stroke diesel engines gearboxes or other machinery.

The **Ferrous Wear Debris Meter** provides repeatable and accurate determination of ferromagnetic material concentration down to single ppm levels.

It provides a mass proportional output from any size or quantity of ferrous contaminant particles, even sub-micron particles. Particle size does not affect the measurement (in contrast to spectrometric methods). Readings are unaffected by properties (dielectric) of fluid base, or additive package, or water content. Readings are straightforward and are presented in mass/volume standard units, i.e.: mg Fe per liter, or ppm.

Ordering Information

OTK-CT-11223
FWDM Ferrous Wear Debris Meter

Range:	0 - 2000 ppm
Sensitivity (ferrous):	down to 1 ppm
Repeatability:	+/- 1 ppm typically
Power supply:	12 V DC
Weight (device):	980 g
Test time:	1 second

OTS-CT-13039
FWDM Consumables Pack

No. of 2 ml Test tubes:	250

FPQ Ferrous Debris Monitor

Rapid screening of oil samples for ferrous wear debris using a PQ Index instrument has become an established method in most used oil laboratories. It is a brilliant wear indication and provides even further information if seen in relation to other elementary analysis methods.

There are several sources for iron wear particles in lubricants or grease such as scratched surfaces, erosion or broken parts. Often the particles are larger than 5 microns which is a size which will not be detected by laboratory methods like ICP (Inductively Coupled Plasma).

A high PQ index often indicates a serious wear problem which causes large particles to appear in the sample. The device measures all ferrous particles in a sample regardless of the size. Its innovative sensor and data processing guarantee a good stability and high sensitivity.

The instrument´s standard USB connection can be used to transfer data directly into an existing LIMS system.

The FPQ has been designed to work with standard 100 ml sample bottles. This allows to take the measurement without having to transfer the sample to another specialized container. The device can also be used with standard 2 ml grease pots. Adapters for different sample vessels are available on request.

Ordering Information

OTK-CT-11224
FPQ Ferrous Debris Monitor

Range:	0 - 15000 PQ
Repeatability:	+/- 5 PQ for < 500 PQ 1% for results > 500 PQ
Power supply:	230 V DC (50/60 Hz)
Test time:	10 seconds
Dimensions:	430 x 380 x 155 mm
Weight:	7.5 kg

SAM-CT-70288
100 ml Sample Bottles, (288)

Neck:	38 mm
Material:	PETG

SAM-CT-70289
100 ml Sample Bottles, (288)

Neck:	38 mm
Material:	HDPE

IR Analyser (ATR)

With the newly developed CMT IR Analyser, based on attenuated total reflection, a new chapter of IR spectroscopy is opened in the middle infrared spectral range. Due to the no-moving-parts design, applications even in harsh environmental conditions are made possible. The small size and low power consumption clearly stands out from conventional IR spectrometers available on the market.

IR spectroscopy is a powerful technique for measuring the concentration of organic molecules. The physical effect of infrared light absorption by molecules contained in the sample is being measured. Each molecule absorbs light of a certain wavelength. The intensity of the absorption is a measure of the concentration of the particular molecule.

During the life cycle of an oil, different decomposition and conversion processes occur at the molecular level. A drop of oil acts as an information memory for both equipment and oil condition, which can be decrypted by IR spectroscopy.

Three interacting mechanisms together form the process of oil aging:

- Base oil degradation,
- Additive depletion and
- Contamination

Base oil degradation predominantly is driven by oxidation processes caused by oxygen and heat. Typical oil condition parameters are: Oxidation, AN, BN, nitration, sulphation, ...

Commonly used additives are e.g. antifoaming additives, anti-wear additives and antioxidants. During oil aging the concentration of additives decreases and degradation products emerge. This oil aging mechanism is being indicated by the concentration of molecules with central ions of zinc, molybdenum, phosphorus, calcium, magnesium, barium or sodium.

Oil contamination is often caused by foreign substances such as water, glycol, diesel, petrol or other oils.

The oil condition sensor of the **IR Analyser** detects the three major oil degradation mechanism simultaneously. The standard oil condition parameters, that are commonly obtained by laboratory based analysis, are being calculated from the measured IR spectra.

The sensor is based on a spectral apparatus that is being constructed with no moving parts, which makes it durable and virtually maintenance free. Meaningful oil condition parameters are calculated from the recorded spectra by a previously built oil-specific calibration (chemometric model).

In addition to portable systems for rapid on-site analysis, device models for use in the laboratory are available – as well as rugged field installations for inline operation.

Ordering Information

OTK-CT-11215
Electronic IR Analyser
Infrared Analyser based on ATR

Including software displaying:

- Water Content
- Soot Content
- Antioxidant Depletion
- Glycol Contamination
- Sulphate
- Oxidation
- Nitration
- Phosphate.

Specification IR Analyser

Spectral Range	2.5 - 5.0 µm (4000 - 2000 cm $^{-1}$) or 5.5 - 11.0 µm (1818 - 909 cm $^{-1}$)
Communication	Ethernet / USB / Bluetooth
Protection	IP 64
ATR Crystal	ZeSe
Number of Reflections	9
Display	External software on PC (not supplied)
Power	Battery pack LiPo - 5 V DC, 4 Watt
Housing Material	Aluminium, anodized
Dimensions	170 x 76 x 40 mm
Weight	730 g

Water in Oil

CMT Water TouchCell

Water is the biggest threat any oil lubricated system faces. Depending on the application water can cause serious problems for the equipment or safety. Maintain and protect your equipment by monitoring the water content.

Most parameters can be trended well by offline laboratory oil tests. This is not the case when it comes to water ingress. Water is not a by-product of the aging of oil or a result of the usage of the oil. Water ingress can come quickly and without any prior warning. Once established water levels may rise very fast. Therefore a trend analysis in a shore based laboratory does not allow a close enough monitoring of the water content to avoid problems due to a sudden water ingress.

Your benefits:

- All parts (sensor, display, battery pack etc.) can be exchanged when needed
- Now 30% bigger backlit display for better visibility
- Solid rugged metal housing for higher durability
- Multiple ranges for exact readings
- Multilingual software
- No hazardous reagents needed
- Undercut in the bottom to assist dosing the chemicals for all tests

WIO Reagents

Ordering Information

OTK-CT-11201
Electronic Water in Oil Test Kit

Range:	0 - 1500 ppm, (lowest reading 100 ppm) 0 - 6000 ppm, (lowest reading 200 ppm) 0 - 1 %, 0 - 5 %
Accuracy:	+/- 0.01 % free water
Weight:	490 g
Test Time:	5 minutes
Reagents:	non hazardous
Memory:	last 10 readings for each individual oil

OTS-CT-13001
Water TouchCell

OTS-CT-13004
Set of O-Rings for TouchCell

SW-C00004-CT
Download Option TouchCell
License for data download

The newly developed **Electronic Water in Oil TouchCell** does provide highest accuracy on site when testing Water in Oil giving results after a few minutes.

- Prevent corrosion, cavitation or failure of your machinery by detecting water in oil, before any damage occurs.
- Minimize instability of additive packages and damaging microbe growth by monitoring your oil.

Combined TouchCell

CMT is offering a Combined TouchCell which offers both Water in Oil and BN testing in one device.

With the **Combined TouchCell** you only need one device to measure two important parameters.
You can switch freely between the two modes in the software and of course you will have the same accuracy as with the individual TouchCell. With the Combined TouchCell you have an economic but powerful onsite measuring tool in your hand.

Ordering Information

OTS-CT-13003
Combined TouchCell (Water + BN)

Specs:	Please see the Water in Oil and Base Number sections

OTS-CT-13004
Set of O-Rings for TouchCell

SW-C00004-CT
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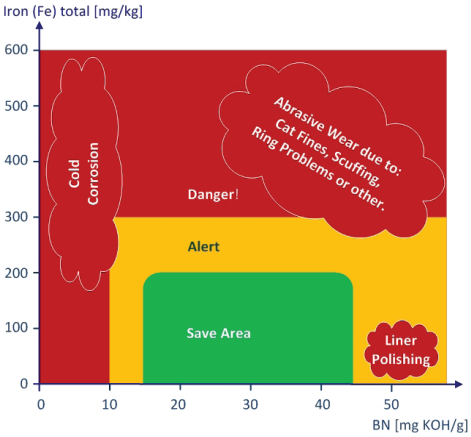
Base Number (BN)

CMT Electronic BN TouchCell

BN Reagent

Electronic BN TouchCell



Measure the alkaline reserve in engine oils is important to maintain the ability of the lubricant to neutralize acids resulting from combustion.

To avoid acid corrosion inside a combustion engine it is essential to maintain a certain alkalinity reserve. Additives (mostly calcium) are added to the oil to neutralize any acid which might build up during the combustion process.

Normally the BN of an engine lube oil decreases with the running hours. In two stroke engines the circulation oil gets contaminated with leaking cylinder oil which has a much higher BN. This leads to a steep increase of the BN value of the engine system oil.

The CMT BN Test Kit provides state of the art analysis and gives fast, accurate results within a couple of minutes.

The **Standard BN Test Kit** has been developed for all standard applications like testing the system oil used in all kinds of diesel engines and the **CDO BN Test Kit** has been specially developed to test the scraped down cylinder drain oil in two stroke crosshead engines.

The CDO BN Test Kit software has been developed specifically to give reliable results despite the fact that used drain oil may have dropped down to only 10% BN reserve left compared to the fresh oil.

The CMT **BoB BN Test Kit** allows to test the base number of cylinder oils blended on board. It will report the BN of the blend as well as the mixing ratio. Furthermore the BOB BN Cell allows to test the remaining BN of the drain oil and the remaining BN of the system oil. For easier handling it allows to store calibration for 5 different system oils and 3 different cylinder oils for drain oil testing.

Following Test Kits are available:

Standard BN - for system oil only

CDO BN - for cylinder drain oil only

BoB BN - for system oil, cylinder drain oil and blending

Ordering Information

OTK-CT-11202
Standard BN Test Kit (for system oil)
Range: 1-180 BN
Accuracy: Typically +/- 5 % of fresh oil BN
Dimensions: Ø 68 mm x 84 mm
Weight: 490 g
Test Time: 5 minutes
Memory: last 10 readings for each individual oil
Reagents: non hazardous

OTK-CT-11214
CDO BN Test Kit (for cylinder drain oil)
Range: 1-180 BN
Accuracy: Typically +/- 5 % of fresh oil BN
Dimensions: Ø 68 mm x 84 mm
Weight: 490 g
Test Time: 5 minutes
Memory: last 10 readings for each individual oil
Reagents: non hazardous

OTK-CT-11217
BoB BN Test Kit
(for blending, cylinder drain oil)
Range: 1-500 BN
Accuracy: Typically +/- 2% or +/- 3 of fresh oil BN
Dimensions: Ø 68 mm x 84 mm
Weight: 490 g
Test Time: 5 minutes
Memory: last 10 readings for each individual oil
Reagents: non hazardous

Reagent & Spares

OTS-CT-13002:
Spare BN TouchCell

OTS-CT-13027:
Spare CDO BN TouchCell

OTS-CT-13006:
Spare BOB BN TouchCell

OTS-CT-13004
Set of O-Rings for TouchCell

SW-C00004-CT
Download Option TouchCell
License for Datadownload

Viscosity / Density Meter

New

Viscosity / Density Meter with hydrometer

The **Viscosity / Density Meter** can measure at 25°C, 40°C, 50°C or 60°C and displays results at 40°C, 50°C and 100°Cvl. It also allows to measure very high viscosities with pin point accuracy.

The **Viscosity / Density Meter** is supplied with a hydrometer. Density is measured at 50°C and directly shown converted to 15°C, giving fast, accurate results. No calculation is needed.

As with all CMT Devices, the software is easy and intuitive to simplify the procedure as much as possible. All steps are easily explained on the screen.

CMTs Viscosity / Density Meter combines two very important parameters for condition monitoring. The inhouse developed device will guide you through the procedure and give you fast results with a high accuracy.

Testing the viscosity and density is important in every aspect of the marine or industrial areas.
The efficiency of every engine depends on the right viscosity of the fuel.
Viscosity is fundamental to maintaining the integrity of a lube oil film.
Lubrication is very important to prevent metallic contact, scuffing, micro welding and wear of sliding surfaces.

- Measuring the oil viscosity provides an early detection of contamination, fuel ingress and shear thinning.
- Suitable for all mineral oils or fuels down to 1.5 cSt up to 999 cSt (heated viscometer only).
- Allows to calculate the combustion performance (CCAI) of fuel or injection / storage temperature.

The right amount of fuel cannot be determined by volume or weight alone. Depending on the injection temperature these values might vary widely. Density is required for quantity calculations and also to determine the optimum size of the gravity disc for the centrifuge.
Diesel / fuel oil density also gives an indication of other fuel characteristics, including specific energy and ignition quality (CCAI).
The density is used to confirm the quantity and grade of fuel delivered.

- Ensure the correct amount and grade of fuel has been delivered to your ship
- Ensure you have been supplied with fuel and not a mixture from fuel and gas (cappuccino effect)

Viscosity / Density Meter with accessories

Ordering Information

OTK-CT-11231
Viscosity / Density Meter

Viscosity

Range:	2.6-865 cSt @ 40 °C 2.2-683 cSt @ 50 °C
Test Time:	Heating from ambient temperature ca. 5 minutes about 3 minutes test time
Calculation:	Injection Temperature Storage Temperature
Reagents:	N/A

Density

Range:	800 to 1010 kg/m³
Accuracy:	Typically with +/-0.5 %
Test Time:	Heating from 15°C about 10 minutes
Repeat Test:	maximum 2 minutes
Cleaning:	10 minutes
Reagents:	N/A

Device

Display:	Backlit LED Touchinput
Power:	90W
Input DC:	24V / min 3,75A
Weight:	2 kg
Dimensions:	26 x 24 x 6 cm³ (H x W x D) (without stand)
Accuracy:	Typically with +/- % or +/- 2cSt
Interface:	Micro-USB

OTR-CT-11000
Test Kit Cleaner (250 ml)

Your benefits:

- Fast and accurate results.
- Combination of two tests within one device.
- Simple measurements for compelling results.
- Avoid wear by keeping track of the viscosity.
- Increase efficiency with the right volume.
- Measure Density for quantity and grade of fuel.

Viscosity

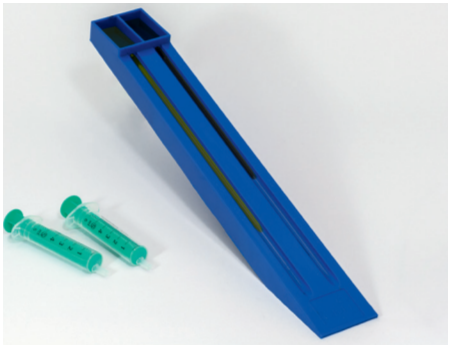
Viscotube

The **CMT Viscostick** provides information whether the viscosity has increased or decreased. Typically it will detect 5-10% fuel dilution as well as increases in viscosity due to oil contamination like water. It can not be used to get an actual viscosity value but you will get an idea whether the viscosity is greater or smaller than the viscosity of the reference oil. It is essential that both oils have the same temperature at the time of the measurement.

The **CMT Viscotube** is a falling ball viscosimeter allowing to measure the viscosity of oil in centistokes on site.

The Viscotube closes the gap between the low cost viscosity stick and the highly accurate Heated Viscosity Meter.

The Viscotube is equipped with a clear screw cap at each end allowing to see the falling ball arrive at the other end. A tripod support stand on a mirror base plate helps to monitor the falling ball. The device is supplied with three sizes of balls to cover a wide range of viscosity. A digital thermometer is used to measure the temperature after completing the test.



Viscostick

Ordering Information

OTK-CT-11005
Viscotube Oil Test Kit

Range:	20-600 cSt @ 40°C, using three sizes of balls
No. of Tests:	Unlimited
Test Time:	1 - 10 minutes
Reagents:	N/A

OTK-CT-11004
Viscosity Oil Test Kit

Range:	go / no go
Application:	Lubricating oils, viscous hydraulics
No. of Tests:	Unlimited
Test Time:	1 minute
Reagents:	N/A

OTR-CT-11000
Test Kit Cleaner (250 ml)

Compatibility Tester

With the growing use of low sulphur fuels and increased frequency of bunkering, testing the stability of the fuel oil and its compatibility for blending is becoming increasingly important.

Whilst every fuel oil is manufactured to be stable - in that it does not have the tendency to produce asphaltic sludge - two stable fuel oils are not necessarily compatible when blended or mixed together.

Compatibility Tester

With the Sulfur Cap of 2020 more paraffinic blend components are used in VLSFO. Therefore the stabilizing effect on asphaltenes from aromatics are lost. Mixtures can become instable much faster.

The **Compatibility Tester** will quickly identify potential fuel stability problems.

It will also rapidly determine if a fuel is compatible with existing fuel stocks.

- Identify possible stability problems before mixing fuels, giving you peace of mind when accepting fuel deliveries.
- Prevent sludge deposits, failure of fuel handling systems and costly combustion related engine damage.

Your benefits:

- Easy test procedure.
- Avoid sludge build up.
- Check fuels to comply with the Sulfur Cap 2020.

Ordering Information

OTK-CT-11216

Electronic Compatibility Tester

Range:	As per ASTM D4740
Accuracy:	Variation of 1 rating in 20 repeat tests
Test Time:	20 minutes (attended), 1 hour (unattended)

OTS-CT-13032
Spare Chromatography Paper (100)

OTS-CT-13030
Consumables Glass Pack (10)

OTR-CT-11000
Test Kit Cleaner

Econ and Electronic Cat Fines II Test

Patent
(No. 3121596, 3121595)

Cat Fines, primarily chemical aluminium and silicon compounds, are catalysts, which are used to optimise the cracking process in the refineries for the production of petrol and other fuels.

Although useful for the fuel production Cat Fines are extremely abrasive and have to be removed from the oil residues after the refining process to avoid severe damages to the engines running with residual fuel oil.

Econ Cat Fines Test Kit - economic go / no go indicator

As a means of self-preservation, vessels collect representative fuel samples during bunkering and then send them off for laboratory analysis. However, the test results often only become available once the vessel is already sailing again, by which time the fuel might be in use already and significant engine damage may already be in progress.

The new **Econ Cat Fines Test Kit** has been specifically designed to provide the crew with a clear sail or don't sail indication with regards to fuel quality.

The **Econ Cat Fines Test** can indicate HFO samples that are contaminated with dangerous levels of cat fines even before the fuel has even been pumped aboard. The test can be completed within a few minutes, is cost effective and is simple to perform.

Laboratory results show that the new test is capable of identifying those fuel samples that have a cat fines concentration of > 60 ppm (Al + Si), and which therefore exceed the limit recommended by ISO 8217:2012.

It also allows to check roughly if the filters and separators bring out the required amount of cat fines and therefore avoiding damage to the engine.

Electronic Cat Fines II Analyser - accurate high end device

Although the amount of Cat Fines in the bunkered fuel is normally known from the documentation provided by the supplier, the Cat Fines content before the fuel oil separators and consequently before entering the engine is usually unknown.

Due to accumulation of Cat Fines in storage- or day tanks over time the concentration of Cat Fines before separators and consequently before the engines may deviate significantly from the demanded value, especially during rough sea passages.

To measure the actual and current Cat Fines concentration in the fuel on board with a reasonable degree of accuracy has not been possible so far.

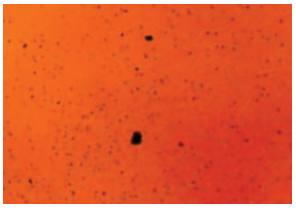
With the new **Electronic Cat Fines II Test Kit** you are capable of determining the concentration of catalytic fines in fuel.

The affordable test is easy to perform and the device displays directly the measured values in "**ppm**" with high accuracy.

Econ Cat Fines

~15 ppm

~40 ppm



~100 ppm

Your benefits:

- Revolutionary new system
- Allows multiple tests at different sampling points
- Low costs per test
- Only small fuel sample size needed

Electronic Cat Fines II

Ordering Information

OTK-CT-11229
Cat Fines II SM Test Kit

Range:	8 - 70 (140) ppm
Accuracy:	+/- 5 ppm (Al)
Test Time:	10 minutes
No. of Tests:	30

OTR-CT-12013
Cat Fines II Reagent Pack (30)

OTR-CT-12010
Vial Cleaner

OTS-CT-13029
Glass Vial Consumables Pack (100)

OTK-CT-11222
Econ Cat Fines Test Kit

Range:	15-200 ppm
Accuracy:	+/- 5 ppm (Al)
Test Time:	1 minute
No. of Tests:	30

OTR-CT-12014
Econ Cat Fines Reagent Pack (30)

SAM-CT-70071
500 ml Fuel Oil Sample Bottle Pack

SW-C00002-CT
Download Option Console
License for data download

XRF Onboard Sulfur Tester

New

The XRF Onboard Sulfur Tester is an easy-to-use and robust analyzer, designed to provide high-precision ISO 8754 and D4294 sulfur analysis for the marine industry in preparation for the IMO 2020 regulation. It is able to deliver the most practical and effective solution to meet customer's application needs.
The Sulfur Tester was developed to measure sulfur in hydrocarbons like crude oil, mineral oil, diesel, gasoline, marine fuel, jet fuel, kerosene and lubricants.

In 2015, SECA trade partners restricted sulfur emissions to 0.1% sulfur content within 24 nautical miles (or less) from shore. On January 1, 2020, the International Maritime Organization's (IMO) revised MARPOL Annex VI rule will come into effect, which will lower the maximum global sulfur cap for emissions from 3.50% to 0.50%.
While the Emission Control Areas (ECAs) will remain at the 2015 standard of 0.10% S content. To ensure compliance with both regulations, merchant ships will need to strictly monitor sulfur content in fuel. XRF Onboard Sulfur Tester was designed to meet these needs with easy, rapid, and precise sulfur analysis.

The XRF Onboard Sulfur Tester delivers fast and precise sulfur testing with a limit of detection as low as 0.0050% - well below the new regulatory limits. To ensure lab-quality results and compliance with methods approved for marine-fuel testing (covered under ISO 8217), the XRF Onboard Tester is compliant with ISO 8754 and ASTM D4294 regulations in the concentration range of 0.01%-5%.

An innovative sample carrier that is compatible with both sample bottle and sample cup opens the field of use for the compact and robust XRF Onboard Sulfur Tester making it the perfect solution for onboard use. The sample is inserted with the sample window vertical, ensuring that any accidental sample leak goes into a drip tray which could be simply removed and cleaned. If desired, the sample preparation is as easy as replacing the sample bottle cap with a Z-cap with a built-in thin film.

Thanks to its easy and intuitive software this analyzer can be operated by a crew member with minimal training, in some cases less than 15 minutes.

The robust stability has been tested through continuous measurement of standard NIST fuel oil sample 1619b (0.698%) within the temperature range from 10 °C to 30 °C.

With corrected net counts, the calibration covers the whole range of marine application with one linear curve, ensuring robust calibration with precise sulfur analysis.

	XRF Onboard Sulfur Tester
Dynamic Range	Sulfur 50 ppm - 5 wt%
Applications	S in hydrocarbons like crude oil, mineral oil, diesel, gasoline, marine fuel, jet fuel, kerosene, and lubricants
Method Compliance	ASTM D4294, ISO 8754 & IP 336
Measure time	30 - 900 seconds
Calibration	- 30 different calibration curves - Linear (automatic custom Calibration available)
Sample volume cap bottle	- 7-10 ml - 25 ml
Connections	USB, Ethernet
Data Output	Printout, USB and Ethernet to PC
Dimensions	23 cm x 30 cm x 26 cm 7,2 kg
AC Power Supply	110-240 VAC ± 10%, 50-60 Hz
Battery Power	98Wh > 4 hours continuos
Operating temp.	5 °C - 40 °C
Operating Humidity	30 - 85%

Your benefits:

- Robust design for maritime environment
- Onboard, offshore, or on-land testing
- Portable with built-in battery
- Minimum sample preparation with sample bottle
- Advanced detector to ensure long-term stability
- Trusted precision with lab-quality results
- Robust calibration with one curve covering whole range
- Complies with ASTM D4294, ISO 8754, and IP 336Quidetor

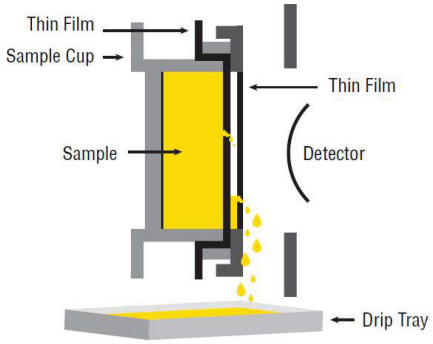
Ordering Information

OTK-CT-11227
XRF Onboard Sulfur Tester

HDXRF Sulfur and Multi Element Analyser

CMTs HDXRF Analysers can measure the concentration of different elements within the oil. We offer one analyser for sulfur only and a second for multiple elements like P, Cl, K, Ca, V, Cr, Mn, Fe, Co, Ni, Cu and Zn.

The analysers are powered by High Definition X-Ray Fluorescence (HDXRF®) technology: an elemental analysis technique offering significantly enhanced detection performance over traditional XRF technology. This technique applies state-of-the-art monochromating and focusing optics, enabling dramatically higher signal-to-background ratio compared to traditional polychromatic X-Ray fluorescence.

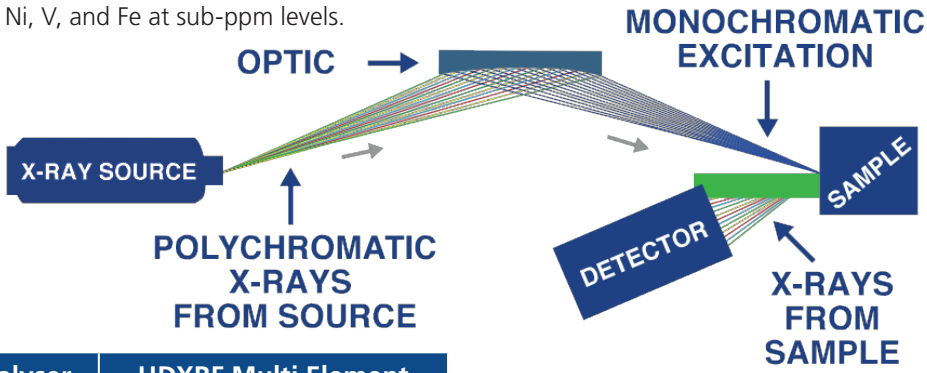


Petroleum laboratories depend on reliable, robust analytical solutions for their fast-paced environment. The analysers was designed to meet these needs with an innovative sample introduction system that directs accidental spills to a drip tray and away from valuable components.

The analysers comply with ASTM D4294 and ISO 8754 for sulfur analysis of hydrocarbons like crude oil, diesel, gasoline, jet fuel, and lubricants. The Sulfur Analyser delivers precise sulfur analysis with limits of detection as low as 2.6 ppm. The Multi Element Analyser delivers sulfur measurements with a limit of detection as low as 5.7 ppm with rapid monitoring of critical elements like Ni, V, and Fe at sub-ppm levels.

Your benefits:

- Higher signal-to-background ratio.
- Improved recision.
- lower limits of detection.
- Drip tray to prevent sample leakage.
- Lightweight, robust design
- No need for purge gas or vacuum



The graphic above shows the basic configuration of HDXRF and its use of focused monochromatic excitation. HDXRF reduces background noise and improves signal definition that enables lower limits of detection and dramatically better precision.

	HDXRF Sulfur Analyser	HDXRF Multi Element
Measured Elements	S	S, P, Cl, K, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn
Range (S)	2,6 ppm -10 wt%	5,7 -10 wt%
Other Ranges (x ppm - 10 wt%)	/	P : 17, Cl : 3, K : 0,7, Ca : 0,4, V : 0,1, Cr : 0,09, Mn : 0,07, Fe : 0,07, Co : 0,07, Ni :0,04, Cu : 0,1 , Zn : 0,1
Measure Time	30 - 900 seconds	
Calibration	30 different calibration curves	
Sample Volume	7 ml	
Connections	USB, Ethernet	
Dimensions	36,8 cm x 41,9 cm x 15,3 cm 12,7 kg	
Operating Temp.	5 °C - 40 °C	
Opperating Humidity	30 - 85 %	

Ordering Information

OTK-CT-11226
HDXRF Sulfur Analyser
Elements: S

OTK-CT-11225
HDXRF Multi Element Analyser
Elements: S, P, Cl, K, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn

Insoluble

Insoluble are a build up in combustion engines due to the burning fuel in the engine. They are combustion related debris and oxidation products within the lubrication oil.

Regular monitoring of insoluble helps to prevent lacquer formation on hot surfaces, sticking of piston rings, wear of cylinder liner and bearing surfaces.

The detergent property of the oil will also decrease, speeding further deterioration.

- Detect insoluble from diesel engine combustion such as partially oxidized fuel, carbon, fuel ash, oil oxidation products and used lubricant additives.
- Simple and quick to use even for untrained people.
- The insoluble tests give you actionable results, helping to maintain your engine.

Electronic Insolubles TouchCell

The **CMT Electronic Insoluble Test Meter** is a self-contained device to test insolubles and soot in your engine oil.

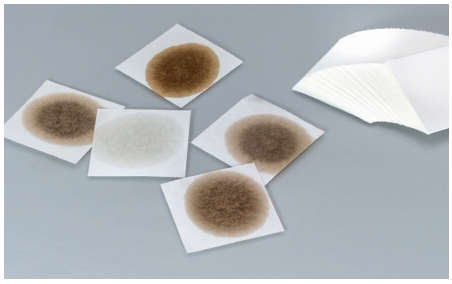
It is suitable for all combustion engine oils regardless of the fuel in use.

It contains the latest technology to provide excellent repeatability and rapid results in the field.

Visible light is used to test the oil for soot and insoluble.

Just add one drop of your well mixed oil sample into 10 ml reagent and present the sample tube to the device.

The measuring range is detected automatically and the result is presented within seconds.



Insolubles Test Kit

The **CMT Insoluble Spot Test Kit** is a simple spot test on a specially developed filter paper to get an indication of both, the insoluble load and the dispersancy of your lubricant.

Just drop one drop onto the paper and wait for the paper to dry. Just compare the filter paper with the pictures in the manual provided with the test.

Ordering Information

OTK-CT-11205
Electronic Insoluble Test Meter

Range:	0-2.4 Vol%
Accuracy:	Typically +/-0.1 %
Test Time:	< 2 minutes
No. of Tests:	30 Tests
Reagents:	non hazardous
Reagent Pack:	OTR-CT-12007

OTR-CT-12007
Insoluble Reagent Pack

No. of Tests:	30 Tests
Reagents:	non hazardous

OTS-CT-13021
Spare Insoluble PhotoCell

OTS-CT-13029
Glass Vial Consumables Pack (100)

OTK-CT-11002
Insoluble Spot Test Kit

Range:	good / poor
Test Time:	one hour (unattended)
Reagent:	non hazardous

Salt Water Contamination

For sea-water cooled systems on older vessels it is essential to know the source of the water in the oil. The CMT Salt Water Test does allow the user to identify whether the water contamination of the oil is sea- or freshwater. Use the Salt Water Contamination Test together with the Electronic Water in Oil Kit to identify the problem clearly.

Especially in four-stroke engines water evaporates over time but the salt stays in the oil resulting in corrosion problems.

- Provides a fast indication if salt is present, even if all the water has been evaporated already.
- Fast and easy to understand results within minutes.
- Usable for all oils

Ordering Information

OTK-CT-11003
Salt Water Contamination Test Kit

Range:	go / no go
Application:	Lubricating oil, fuel, water
Test Time:	1 hour (unattended)
No. of Tests:	25
Reagents:	Non hazardous

Acid Number (AN)

Electronic Acid Number TouchCell

Acid Number Drop Test Kit

Acid Number or AN is an important oil parameter for hydraulic systems and gas engines. It is a measure of the organic and inorganic acids present within the oil.

Maintaining the acid level of an oil prevents unexpected oxidation problems.

- The test kit is supplied with all reagents needed for 25 tests.
- Titration point can be observed with the help of an advanced electronic photo cell.
- Providing you with easy to interpret results, suitable for use by untrained personnel.

Two versions are available. An economical and easy to use **Acid Number Drop Test Kit**. Just count the drops you need to get a colour change and get your reading from a table provided.

Alternatively we offer our **Electronic Acid Number Test Kit** which gives highest accuracy in the same measuring range.

Ordering Information

OTK-CT-11209
Electronic Acid Number Test Kit

Range:	0-6 AN
Accuracy:	+/- 0.1 AN
Test Time:	2 minutes
No. of Tests:	25
Reagents:	UN1993

OTR-CT-12008
Acid Number Reagent Pack

No. of Tests:	25
Reagents:	UN1993

OTS-CT-13022
Spare Acid PhotoCell

OTS-CT-12008
Acid Number Test Reagent Pack

OTS-CT-13029
Glass Vial Consumables Pack (100)

OTK-CT-11001
Acid Number Drop Test Kit

Range:	0-6 AN
Accuracy:	+/- 0.3 AN
Test Time:	2 minutes
No. of Tests:	25
Reagents:	UN1993

Flash Point Tester

The CMT Flash Point Tester is an automated closed cup instrument using just a 2 ml sample size.

Increased flash point in engine oils to about 200°C is an early indication for fuel dilution which can result in crankcase explosion.

The flammability of a material also determines its safety classification and the regulations under which it must be handled, stored and transported.

The **Electronic Flash Point Tester** is a compact, bench top / portable, Closed Cup Flash Point Tester designed to carry out 'flash / no flash' tests or to determine flash point values up to 300°C using either Ramp or Rapid Equilibrium methods.

The operating principle is that a cup containing the sample to be tested is electrically heated in a ramp function to automatically increment the temperature for repeated tests until a flash is

observed, or the end of the search range is reached, allowing rapid determination of samples.

The device also features a user-friendly yes/no test. It is heated to a user set test temperature. At the set temperature, a shutter in the lid is opened and a test flame is dipped into the vapour space above the sample. It can be determined if a sample has a flash point above or below the test temperature by detecting whether a flash has occurred or not.

Ordering Information

OTK-CT-11204
Electronic Flash Point Tester

Temp Range:	Ambient temperature (+5) to 300°C
Sample Size:	2-4 ml
Test Time:	OK in 2 minutes
Temp Running:	2° C/min.
Test Method:	Closed Cup
Resolution:	0.5°C
Accuracy:	0.5°C
Flash Detection:	Automatic
Voltage:	110-250 V
Frequency:	50/60 Hz
Power:	200 W
Weight:	4,3 kg

Note: A standard butane (lighter) refill cartridge is required for operation.

OTR-CT-11000
Test Kit Cleaner (250 ml)

Fuel Bacteria Test

Bacteria, moulds and yeasts can all grow rapidly in fuel tanks! Free water, warmth and condensation in the fuel form the basis for growth of the Diesel Bugs.

Standard grades of diesel are clear and usually light yellow. The smallest discoloration can be a sign of the Diesel Bug. To be sure, you have to test it!

The addition of environmentally friendly biodiesel to the fossil diesel offers microbes an excellent source of nutrition. Microbes grow more than ever and form increased amounts of "biomass". This leads to clogged filters, corrosion and to engine failure.

The CMT **Fuel Filter Bacteria Tests** can be used to test the Diesel Fuel for bacteria. The Dip Slide Test is used in case of a clogged filter. A thin film of the residues from the clogged filter can be incubated on the dip slide to evaluate if the filters clogging because of bugs or other dirt.

Ordering Information

OTK-CT-11006
Fuel Filter Bacteria Test (Dip Slides)

Range:	low / moderate / heavy
Test Time:	24 - 48 h at 27 - 30°C 1-4 days at ambient temperature
No. of Tests:	10

The Fuel Filter Bacteria Test:

- provides evaluation of Diesel Bug count (bacteria, yeast and moulds altogether).
- Easy to use.
- Provides precise and reliable result.
- Allows fast and safe handling.
- Suitable for all qualities of diesel fuel inclusive biodiesel.

Reagents and Consumables

Produced under strict ISO guidelines (DNV GL certified) CMT´s reagents and consumables can be used for nearly all test kits on the market regardless of the manufacturer.

All reagent packs contain necessary consumables as well and are therefore user friendly.

Also packing innovations like the pre portioned sachets of the Water in Oil Reagent B make the usage of the reagents as easy as possible for the user on site.

Also as part of the reagent & consumables range CMT supplies cleaning agents.

A Test Kit Cleaner for cleaning and maintaining the individual test devices and a vial cleaner for cleaning glass materials used in optical measurements can be ordered from us.

Ordering Information

OTR-CT-12001
Water in Oil Reagent Pack
No. of Tests: 50 Test

OTR-CT-12002
Base Number Reagent Pack
No. of Tests: 50 Test

OTR-CT-12007
Insolubles Reagent Pack
No. of Tests: 30 Test

OTS-CT-12005
AN Reagent Pack 0-3
No. of Tests: 50 Test
UN: UN1993

OTR-CT-12006
AN Reagent Pack 0-6
No. of Tests: 50 Test
UN UN1993

OTR-CT-11000
Test Kit Cleaner
Size 250 ml

OTR-CT-12010
Vial Cleaner
Size 250 ml

Cold Filter Plugging Point / Pour Point

The wax-like solidification of fuel when exposed to low temperatures determines its temperature usability boundary. The relevant indicator for that is the CFPP (Cold Filter Plugging Point).

To prevent that the fuel blocks filters due to insufficient cold resistance it is important to know the CFPP.

CMT's test kit allows a quick and easy determination of the temperature boundary above which it is safe to use the fuel. In addition it allows to measure the pour point.

Your benefits:

- Cheap compared to available lab and electronic devices
- Usable for untrained personnel
- No complex parts guarantee a long service time

Ordering Information

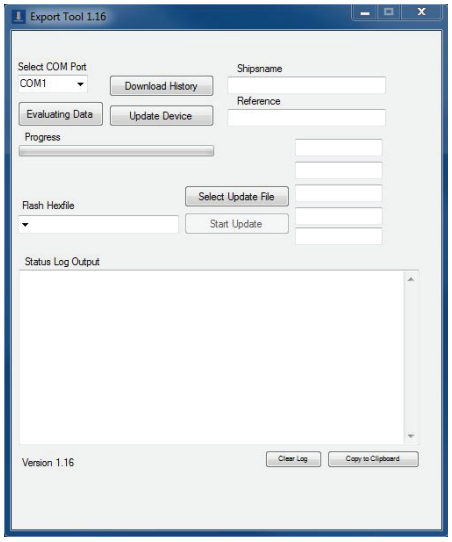
OTK-CT-11212
CFPP / Pour Point Test

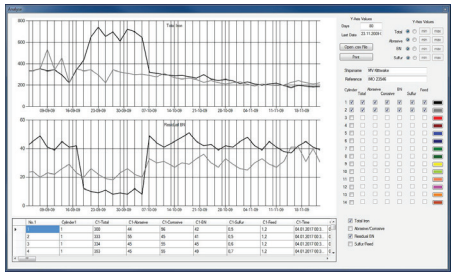
Range:	- 10°C to 10°C
Test Time:	10 minutes
No. of Tests:	20

Export-Tool

The Export Tool is a powerful software tool which allows the download and evaluation of measured data from all devices of our newest generation

The software exports stored data from our electronic devices (with enabled Download Option) when connected to a PC via an USB connection.
Exported data can be added to older exported values so that trending becomes an easy thing.
Furthermore it offers an integrated graphic data evaluation module which helps bringing the data to life.
This makes the evaluation much easier and quicker. Multiple indicators can be displayed by the software allowing a comprehensive overview of the equipment tested.





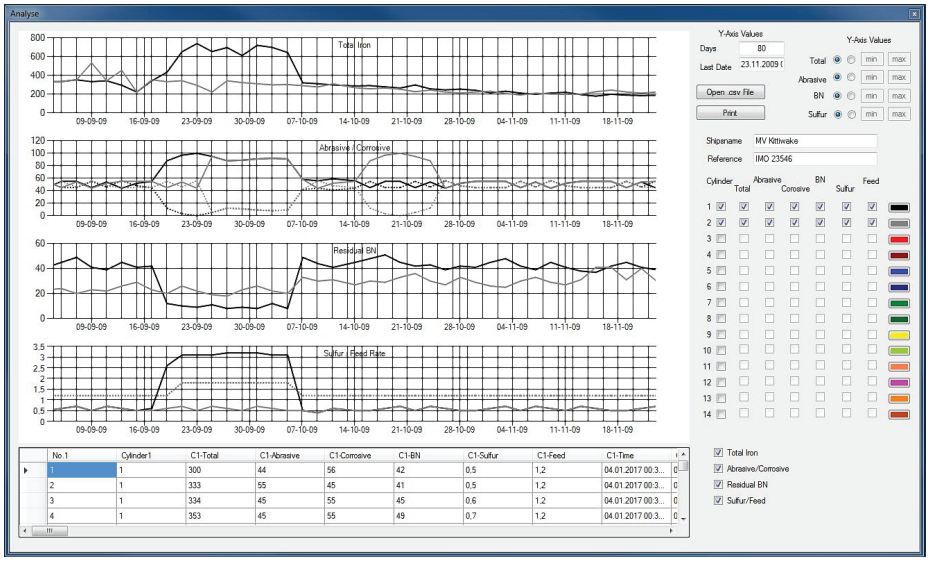
Ordering Information

SW-C00002-CT
Download Option Console

SW-C00004-CT
Download Option TouchCell

Your benefits:

- Save all readings to create a comprehensive trend on your computer
- Evaluate your measurements with the Export Tool
- Graphic display of the values for easy trending and identification of problems
- Adjustable graphs allow to customize the display as per your needs
- Detect even slow developing performance issues and impending damages



2. Cylinder Drain Oil Management

Overview

While in the past abrasive wear was the predominant wear mechanism creating problems like scuffing or sudden severe wear these days corrosive wear has become the predominant wear in the new generation of engines, whereas abrasive wear is no longer the predominant problem for the new generation of engines.

Main parameters influencing the corrosive wear in the combustion chamber are the sulphur in the fuel, part load optimisation such as T/C-cut out, the load pattern and naturally the lubrication rate and the BN level of the cylinder oil. The corrosive wear will be indicated by the BN values and the iron content of the drain oil from the cylinder lube oil.

Sulphuric acid forms during the combustion of sulphur containing fuels. The sulphuric acid may condensate on the cylinder liner wall depending on the temperature of the wall and the pressure in the cylinder. In modern engines the dew point of sulphuric acid may be as low as 280°C leading to a higher amount of acid condensation compared to an older design engine with the same fuel consumption.

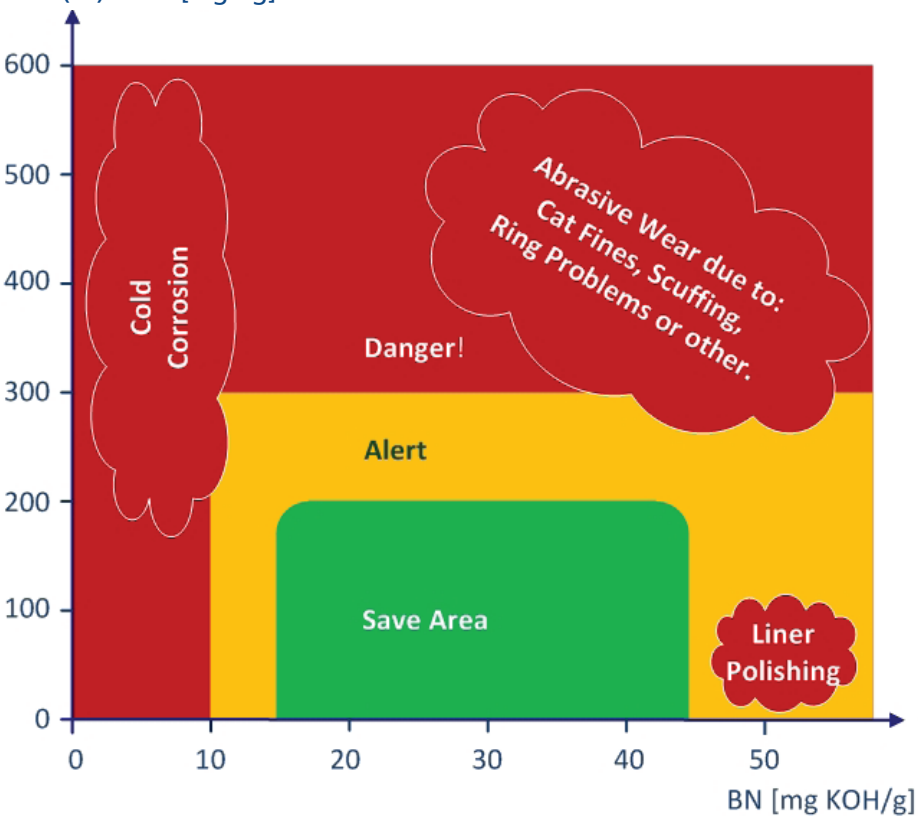
The measured BN in the drain oil is an indication of the oils remaining ability to neutralise this acid. A low BN value indicates that the oils alkalinity reserve is close to exhaustion and therefore the protection of the engine from the acid corrotion might be insufficient. The concentration of iron particles in the oil is composed of the abrasive wear and the corrosive wear. It is important to monitor both parameters, BN and iron content closely to avoid damage to the cylinder liner.

Laboratory oil analysis provides a detailed insight into the engines condition at the time of sampling. Until the sample report has arrived on the vessel a considerable amount of time may have passed due to the logistics of landing and sending the sample and later the analysis itself.

Furthermore laboratory oil analysis can only be done in longer time intervals. With permanently changing conditions in the engine just a laboratory oil analysis would not offer in time enough insurance that a reduced feed rate does not harm the engine.

The CMT Cylinder Drain Oil Service does consist of two important major components:

- **Frequent on board oil tests** of **BN** (base number) **and iron content**. For the on board iron measurements, it is essential to measure all the iron – both iron from corrosion and from abrasion and adhesion.
- **Periodical onshore independent laboratory oil tests** providing a complete result about wear, contamination, oil condition and additives together with a diagnostic statement from our tribology experts.



This chart shows the relation between total iron content and remaining BN in the drain oil from the scavenge space.

Taking a cylinder drain oil sample from the scavenge space.

On-Site Drain Oil Analysis Kit

Patent
(No. 2910933)

By analysing scrape down oil collected from the scavenge space shipboard personnel are able to monitor the condition of the engine's cylinders, avoid corrosive or abrasive wear by means of launching corrective actions and detect changes as they occur.

In order to monitor wear conditions in an engine, with minimum delay between sampling and diagnosing a situation of high wear, on-board test kits are available to detect abnormal wear and therefore enable the operator to take immediate corrective action to increase the lubricant feed.

The **Electronic Drain Oil Analysis Kit** includes an easy to perform BN- and iron test kit allowing to measure the magnetic and corrosive iron separate. It provides quick results of the drain oil's most important properties relative to the engine's cylinder operating condition.

Taking that in mind it becomes obvious, that a frequent onsite analysis of the most important parameters becomes necessary together with a regular laboratory oil test in case you aim to reduce the feed rate and at the same time want to limit the risk of a liner wear problem.

Besides measuring the remaining alkalinity reserve and possibly some other oil condition indicators like water and viscosity in the scrape down oil it is crucial to measure the wear rate if you are optimizing the feed rate. Since there is no fixed optimum it is necessary to have the possibility to measure the iron content on a very frequent base.

On-site Drain Oil Analysis Kit

On board oil tests are designed to measure only single parameters. Use them as a essential supplement to the Laboratory Oil Test - not as a substitute. A comprehensive laboratory oil analysis together with the frequent onboard test is essential as part of an effective cylinder drain oil monitoring.

Ordering Information

OTK-CT-11230
Cylinder Drain Oil Analysis Kit
1) Iron II SM Test

Range:	50 - 1500 ppm
Corrosive iron:	0 - 100 % of total
Abrasive iron:	0 - 100 % of total
Accuracy:	+/- 20 ppm
Repeatability:	10 ppm
Test Time (ave.):	3 min. per Test
No. of initial Tests:	50
Memory:	last 20 reading / cyl. 14 cylinders
Reagents:	non hazardous

2) CDO Alkalinity Reserve (BN) Test

Range:	1-180 BN
Accuracy:	+/- 5% of new oil BN
Number of Tests:	50
Test Time:	5 minutes
Memory:	last reading
Reagents:	non hazardous

LAB-CT-17601
Laboratory SDA Drain Oil Analysis

OTS-CT-13034
Iron Test II Reagent Pack

No. of Tests:	50 drain oil samples
Reagents:	non hazardous

OTS-CT-13029
Glass Vial Consumables Pack (100)

OTR-CT-12002
Base Number Reagent Pack

No. of Tests:	50
Reagents:	non hazardous

OTR-CT-11000
Test Kit Cleaner (250 ml)

Size	250 ml
Reagent:	non hazardous

OTR-CT-12010
Vial Cleaner

Size	250 ml
Reagent:	non hazardous

OTS-CT-13035
Electric Shaker

OTS-CT-13027
Spare CDO BN TouchCell

SW-C00002-CT
Download Option Console
License for Data download

SW-C00004-CT
Download Option TouchCell
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Patent
(No. 2910933)

On-Site Drain Oil Analysis Kit

CDO BN TouchCell

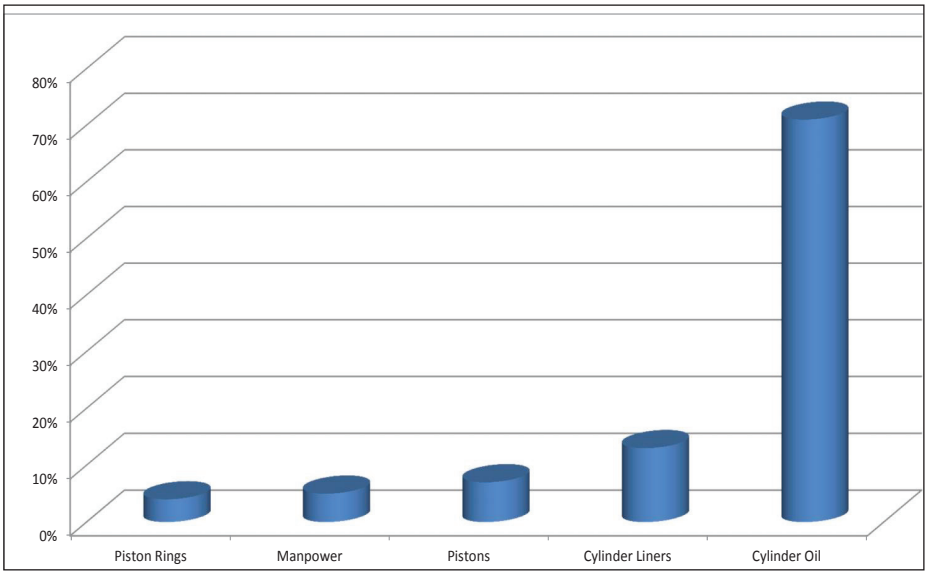
The Cylinder Drain Oil Analysis Set consists of two different tests:

- Analysis of the total iron content (corrosive and abrasive)
- Analysis of the remaining alkalinity reserve compared to the fresh oil alkalinity.

Parameters like Water, Viscosity and others can be measured with our portable On-Site Oil Test & Analysis solutions.

CDO Total Iron II Test

Rapid Return of Investment



This chart shows that the cost of cylinder oil and the liner itself are the biggest cost factors when operating a main engine. Existing installations have proved that significant cost savings can be achieved with return on investment achieved in less than a year in some cases. .

Feed Rate Optimization

Optimization means reducing to the minimum level which still ensures good lubrication and at the same time sufficient neutralisation of combustion related acids. Minimum level also means having enough oil to clean the piston surface. Even current standard electronic lubrication systems are based only on experience and standard inputs as rpm or the sulphur level of the fuel. Currently there is no system available which provides a feed back about the current liner condition. As one of the engine's largest overheads, an average container ship can spend $8 million and more on cylinder lubrication in its life time. Depending on the vessels trade, engine load, engine running hours and other factors, constant monitoring is a vital tool in optimising cylinder lube oil feed rate and, as a result, improving efficiency, decreasing lubricant costs and avoiding issues related with over and under lubrication.
Engines are regularly over lubricated in an attempt to avoid problems including scuffing, but this practice not only causes high lubrication costs, it can sometimes lead to associated problems such as bore polishing. Therefore, although optimising cylinder lubricant usage is one method of achieving commercial advantage, there is a point where savings can be eroded by increased maintenance costs.

Practical approach:

If the BN value in the drain oil is too low or the iron content is too high, the cylinder lube oil feed rate must be increased.

If the BN value is high and the iron content is low, the cylinder lube oil feed rate may be decreased.

Cylinder Drain Oil Laboratory Oil Service

Laboratory scrape down oil analysis from CMT provides comprehensive testing of the oil samples with a full set of data and a diagnostic statement from a tribology engineer.

- 100 ml sample-bottle (prepaid)
- Addressed envelope to return the sample bottle to our lab
- Sample Information Form with barcode label
- Laboratory tests: All samples are analysed and diagnosed by the end of the next business day. (As long as the samples arrive at our laboratory before noon, in our prepaid sample bottle with a correctly filled out sample information form).
- Laboratory report complete with a highly detailed diagnostic statement (prepared by a mechanical engineer)
- Dispatch of the laboratory report via mail, email, fax or data-file
- Online-recall of all laboratory reports and analysis data

Source: Oelcheck GmbH

You will get a detailed lab report completed with a very detailed diagnostic statement prepared by a tribology engineer. It will be an one page report per sample with a simple rating system which quickly alerts you to problems with your oil or equipment.

There is no need for you to work through a long report of several pages. The report contains a historical look at the last 4 samples with the complete history available from our web server (including trend graphs). If you have any questions relating to your report or equipment you can call one of our service engineers to discuss your results and provide advice. The lab report will be sent to you by mail, email or fax as agreed with you.

It is possible to get the current lab reports even faster and to have, at the same time, a comparison with earlier analysed samples.

If you require your results sooner, instead of waiting for an e-mail, fax or mail you can directly log on to our fire wall protected web server. Where, as soon as we have evaluated your sample, we inform you by e-mail that the results are available. You can see the analysis results in the original version of the lab report and print it or forward it to interested parties.

This service offers you to:

- Easily check online data entry for new samples
- Quickly view of all your samples
- Check sample status
- Display all lab reports
- Translate lab reports into different languages
- Forward lab reports via e-mail
- Graphically view trend analysis values for individual samples
- Display of the IR spectrum and other diagrams
- View photos of the sample and the inside of the cap / lid
- View photos of the spot test, solid contaminants and much more

Ordering Information

LAB-CT-17601
Laboratory SDA Drain Oil Analysis

SDA Laboratory Report

The CMT SDA laboratory report in cooperation with OelCheck is a compact data set showing the complete details for all cylinders. Even at first glance, it provides essential information about where action needs to be taken.

A matrix provides further information about the state of the cylinder oils, the lubricant feed rate in each cylinder, additives and alkalinity reserve, viscosity and abrasion, as well as other impurities such as cat fines, water, soot, silicon and metals such as nickel and vanadium.

Under a separate heading, the values for iron particles, chrome, copper and the PQ index (value for magnetic iron particles) are shown as important indicators of any wear.

Diagrams will illustrate the results as a trend. An experienced diagnostic engineer proposes further measures in an Individual comment.

The new **SDA laboratory report** contributes substantially to the cost-effective and reliable operation of your engine. The informative laboratory reports are prepared in a clear and well structured form.

They contain not only the data for the current samples, but also the values of up to the four previous examinations. This provides the user with a basic overview of the operation of the engine and the performance of the cylinder oil.

SDA LAB REPORT

CMT monitoring systems
Marie-Curie-Str. 5 • 25335 Elmshorn • Germany
Phone +49 4121 700 890 • info@cmtechnologies.de

OELCHECK

Page 1 of 4

IMO number: IMO XXXXX
Vessel name: MS OELCHECK
Component: 2 stroke marine diesel engine

OELCHECK GmbH · Postfach 1116 · 83094 Brannenburg

Typical Laboratory Report
OELCHECK
Postfach 1116
83094 Brannenburg

Customer number: 2631100	Total operating hrs: 24507 h
Manufacturer: XXXX	Engine model: XXXX
Engine load: 77 %	Engine speed: 79 rpm
All turbochargers in operation: Yes	Scavenge air temperature:
Ambient temperature: 45 °C	Humidity: 42 %
Longitude: 41°, 26.6 min W	Latitude: 23°, 50.2 min S
Fuel grade: RMK380	Fuel viscosity: 325.7 cSt
Fuel sulphur content: 3.1 %	Fuel Al-Si content: 23 mg/kg
Fuel vanadium content: 87 mg/kg	
Oil brand name: XXXXX XXXXXXXXX XXX	
System oil: XXXXXX XXXXXXX XXX	
Date sample taken: 01.07.2014	Date tested: 08.07.2014
Contact: OELCHECK	Phone number: 0049-8034-9047-210

Diagnosis for the current laboratory values

Residual BN is adequate to avoid corrosion but low on cylinders 3 and 7. A feed rate increase on cylinders 3 and 7 is recommended to ensure that corrosion is controlled. Residual BN is not high enough on some cylinders to safely recommend a feed rate reduction. Iron, Chrome and Copper are in the normal range. PQ Index is higher than expected for cylinders 1, 3, 4 and 5 but not critical. Vanadium and nickel contents are high but not a cause for concern. Soot contents are all low and well within the expected range. System oil content in cylinders 2 and 4 is high as are the copper contents. This could indicate wear of the stuffing box seals. Viscosity at 40°C is relatively high but does not require attention. I recommend that you send us the next sample for trend observation in line with the recommendation of your engine supplier or your insurance company.
Recommendation: Please complete all sample information in future, this allows a more detailed assessment to be made.
Dipl. Wi-Ing. (FH) Steffen Bots

Average rating

Action

ANALYSIS RESULTS										
LAB NUMBER			Average	1702922	1702923	1702924	1702925	1702926	1702927	1702928
CYLINDER NUMBER				1 of 7	2 of 7	3 of 7	4 of 7	5 of 7	6 of 7	7 of 7
SAMPLE RATING										
PREVIOUS SAMPLE RATING										
08.07.2014										
24.06.2014										
24.06.2014										
Feed rate		g/kWh	0.9	0.8	0.8	0.8	0.8			
WEAR										
Iron	Fe	mg/kg	92	78	136	122	93			
Chrome	Cr	mg/kg	5	7	8	10	5			
Copper	Cu	mg/kg	3	2	6	5	5			
PQ index			30	27	< 25	29	28			
CONTAMINATION										
Silicon	Si	mg/kg	103	108	136	113	90			
Aluminum	Al	mg/kg	23	24	39	29	23			
Sodium	Na	mg/kg	120	105	162	163	127			
Nickel	Ni	mg/kg	178	156	259	240	183			
Vanadium	V	mg/kg	591	527	841	801	597			
Sulphur	S	mg/kg	28370	26720	34149	31904	28574			
Water		%	2.11	2.62	2.14	2.40	2.06			
Soot content		%	0.1	0.2	< 0.1	0.1	< 0.1			
Excess system oil > 20%			18.7	11.9	32.5	16.9	26.9			
OIL CONDITION										
Viscosity at 40°C		mm²/s	486.44	431.89	549.15	597.91	480.15			
BN		mgKOH/g	27.62	54.90	31.70	17.81	24.69			
ADDITIVES										
Calcium	Ca	mg/kg	25270	23282	23656	22975	24500			
Magnesium	Mg	mg/kg	114	127	159	132	114			
Zinc	Zn	mg/kg	187	180	242	189	186			
Phosphorus	P	mg/kg	29	19	52	27	43			

SDA LAB REPORT

IMO number: IMO XXXXX
Vessel name: MS OELCHECK
Component: 2 stroke marine diesel engine
Manufacturer: XXXX — Engine model: XXXX
Oil brand name: XXXXX XXXXXXXXX XXX
System oil: XXXXXX XXXXXXX XXX
Contact: OELCHECK — Phone number: 0049-8034-9047-210

CMT monitoring systems
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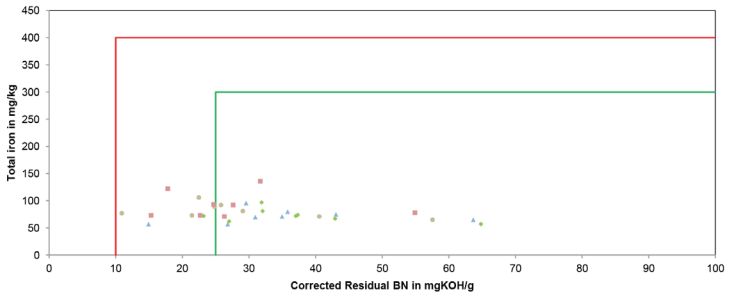
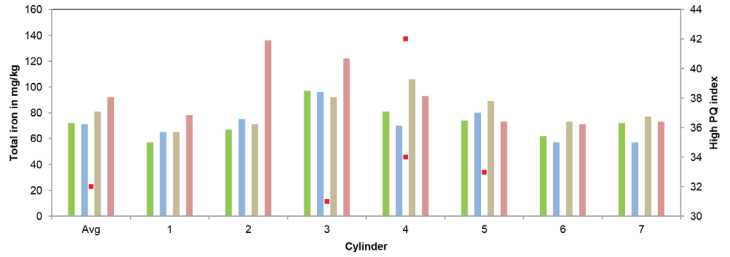
OELCHECK

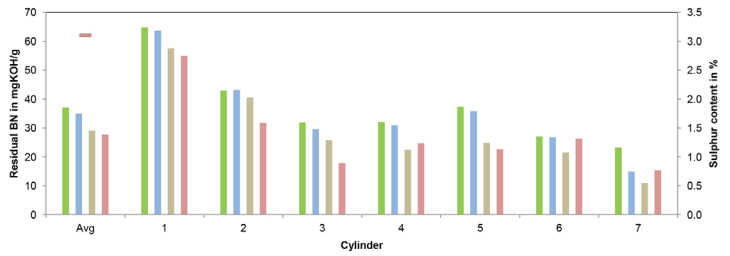
Page 2 of 4

FOUR SAMPLE TREND

Dataset 7 Date: 10.06.2014
Dataset 8 Date: 17.06.2014
Dataset 9 Date: 24.06.2014
Dataset 10 Date: 01.07.2014







OilDoc

SDA LAB REPORT

IMO number: IMO XXXXX
Vessel name: MS OELCHECK
Component: 2 stroke marine diesel engine
Manufacturer: XXXX
Engine model: XXXX
Oil brand name: XXXXX XXXXXXXXX XXX
System oil: XXXXX XXXXXXX XXX
Contact: OELCHECK
Phone number: 0049-8034-9047-210

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OELCHECK

FOUR SAMPLE TREND

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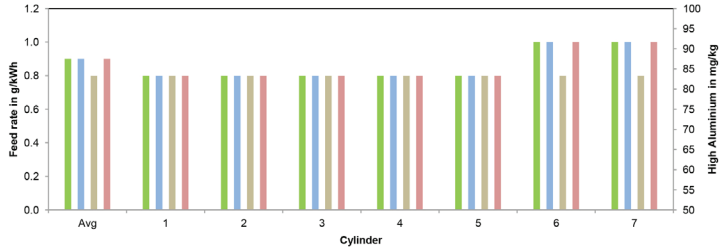

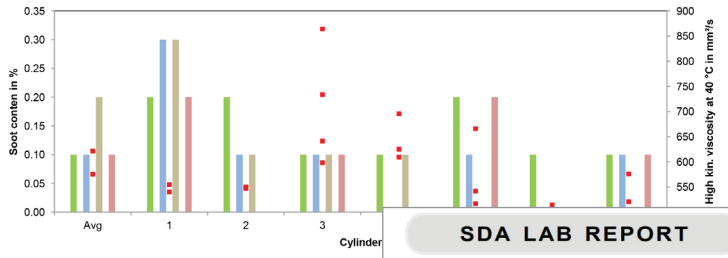

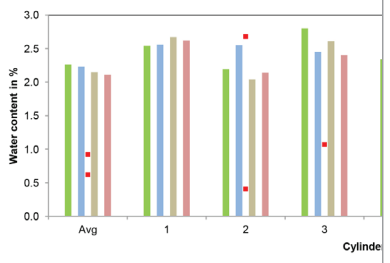

SDA LAB REPORT

IMO number: IMO XXXXX
Vessel name: MS OELCHECK
Component: 2 stroke marine diesel engine
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Engine model: XXXX
Oil brand name: XXXXX XXXXXXXXX XXX
System oil: XXXXXX XXXXXXX XXX
Contact: OELCHECK
Phone number: 0049-8034-9047-210

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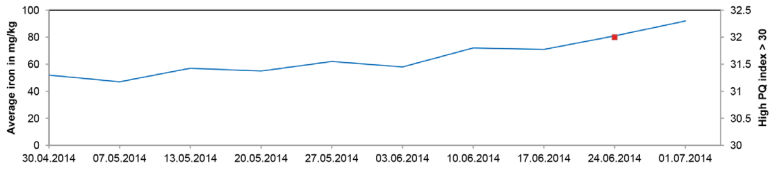
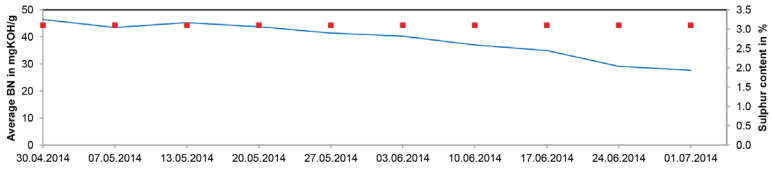
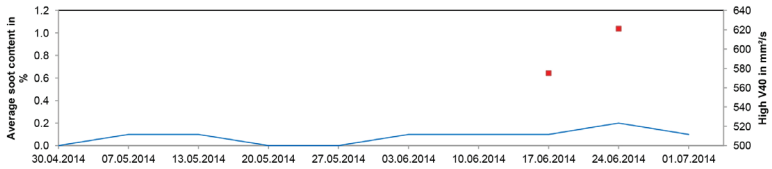
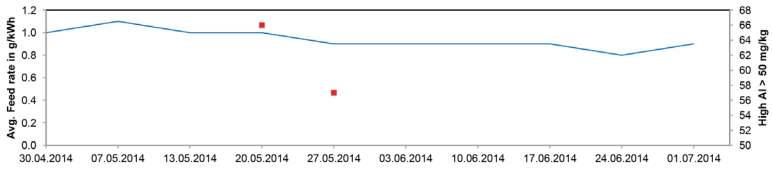
OELCHECK

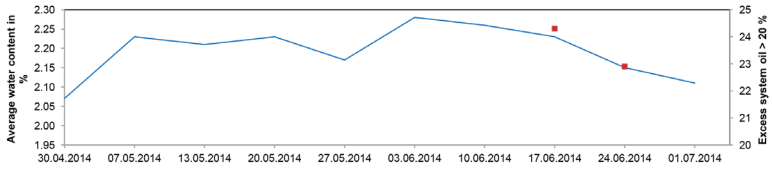
LONG TERM TREND











OilDoc

3. Independent Laboratory Oil Test

Lubrication Oil Test Service

The oil itself is an excellent data medium which is full of valuable information if tested correctly and the findings actioned. This information highlights the condition of the oil and the machine, enabling you to identify the optimal moment for an oil change. Wear particles can be directly related or assigned to a damaged part of a given machine giving information of the condition of the plant and providing early warnings in the fight to reduce and prevent damage.

The CMT Marine Oil Test Service is a comprehensive insight into the functioning of your engine. It covers analysis of the combustion process, cylinder oil feed rates, fuel problems and identification of potential issues such as piston and liner wear, incomplete combustion and crankcase system oil analysis. In particular, we work very hard to minimize your costs related to oil consumption and feed rate. It is not in the interest of CMT to let you spend more on lubrication than necessary.

CMT has formed a strategic partnership with a certified and accredited laboratory with over 15 years experience in used oil lab analysis. A database of more than one million used oil samples from more than fifteen thousand customers all over the world and our cooperation with lube oil suppliers and engine manufacturers allows us to give you appropriate independent recommendations based on the oil analysis.

Typical applications for our independent marine oil lab service on board ships are:

Diesel Engine System Oil, Cylinder Drain Oil, Stern Tube Oil, Hydraulic Oil, Gear Box Oil and other Lubricants

Scope of analysis: (can vary with oil type)

Wear metals:	Iron, Chrome, Tin, Aluminium, Nickel, Copper, Lead, Molybdenum, PQ-Index
Contaminants:	Cat Fines (Aluminium / Silicon), Potassium, Sodium, Soot, Glycol, Fuel, Water %
Oil condition:	Viscosity @ 40° and 100°C including Viscosity-Index, Base Number (BN) Oxidation, Nitration, Sulfation, Sludge carrying properties
Additives:	Calcium, Magnesium, Zinc, Phosphor, Barium, Boron, Sulphur and Molybdenum

Ordering Information

LAB-CT-17599
Independent Laboratory Oil Analysis

The CMT service includes:

- 100 ml sample-bottle (prepaid)
- Addressed envelope to return the sample bottle to our lab
- Sample Information Form with barcode label
- Laboratory tests: All samples are analysed and diagnosed by the end of the next business day. (As long as the samples arrive at our laboratory before noon, in our prepaid sample bottle with a correctly filled out sample information form).
- Laboratory report complete with a highly detailed diagnostic statement (prepared by a mechanical engineer)
- Dispatch of the laboratory report via mail, email, fax or data-file
- Online-recall of all laboratory reports and analysis data
- Easily check online data entry for new samples
- Quickly view of all your samples
- Check sample status
- Display all lab reports
- Translate lab reports into different languages
- Forward lab reports via e-mail
- Graphically view trend analysis values for individual samples
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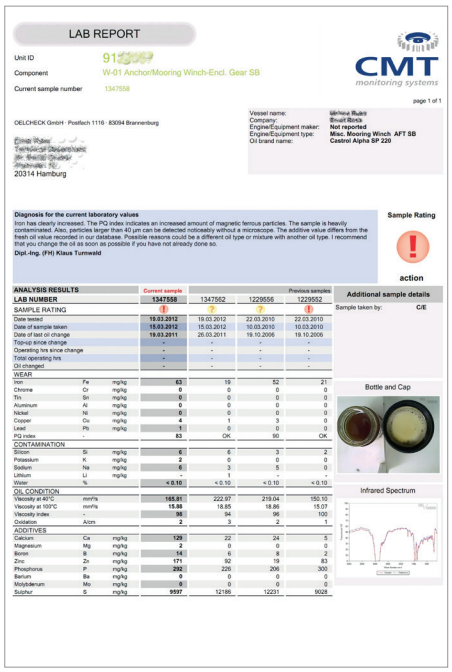
- View photos of the sample and the inside of the cap / lid
- View photos of the spot test, solid contaminants and much more


LAB REPORT

CMT monitoring systems

W-01 Anchor/Mooring Winch-Encl. Gear SB

Diagnosis for the current laboratory values

Sample Rating

action

Additional sample details

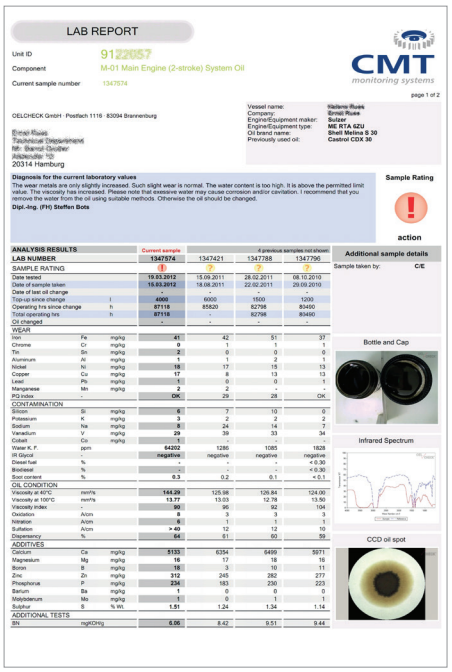
Bottle and Cap

Infrared Spectrum

Internet:

It is possible to get the current lab reports even faster and to have, at the same time, a comparison with earlier analysed samples.

If you require your results sooner, instead of waiting for an e-mail, fax or mail you can directly log on to our fire wall-protected web server. Where, as soon as we have evaluated your sample, we inform you by e-mail that the results are available. You can see the analysis results in the original version of the lab report and print it or forward it to interested parties.


LAB REPORT

CMT monitoring systems

M-01 Main Engine (2-stroke) System Oil

Diagnosis for the current laboratory values

Sample Rating

action

Additional sample details

Bottle and Cap

Infrared Spectrum

CCD oil spot

The Independent Marine Oil Laboratory Test Service works with the following test methods for standard engine oils.

Test methods	Result	Unit	Test prescription
Optical Emission Spectroscopy according (OES) ICP/RDE	Wear-, contamination- and additive elements	mg/kg = ppm	DIN 51396-3 ASTM-D 6595
PQ-Index	Index for ferrous magnetic particles	Index	OPV-9-16
FT-Infrared-Spectroscopy	Contamination: Water, Soot, variation to the fresh oil reference	H^2O and Soot in %	JOAP and reference methods
FT-Infrared-Spectroscopy	Oil Condition: Oxidation, Nitration, Sulfation	A/cm	DIN 51451 DIN 51452
Viscosity	Viscosity at 40°C and 100°C	mm^2/s	DIN 51562
Viscosity Index (VI)	VI for the viscosity/temperature behaviour	Index	DIN ISO 2909
Visual Inspection	Sample picture	None	OPV 9-12
Sludge Carrying Properties	Ability of dispersants	% (of remaining reserve)	OPV-9-30
Gas Chromatography (GC) for the detection of low boiling compounds	Fuel (MFO)	%	OPV 9-32
Water by KF	Content of water	ppm	DIN ISO 12937
Base Number (BN)	Alkalinity reserve (compared to the fresh oil)	mgKOH/g	ISO 3771
Particle Counting	Cleanliness Code	Number of particle	ISO 4406

Note: Many other tests can be done as needed. The above are typical test methods for engine oils. Hydraulic oil, gear oils and some others may require additional testing, which will be carried out as required.

Source: Oel Check GmbH

4. Online Oil Sensors

While maintenance costs increase and production capacity and equipment performance is optimized the demand for on-line machinery and oil condition monitoring is increasing permanently. CMT had designed a range of instruments to accomplish the primary objectives of oil analysis.

New technologies deliver new ways to protect your investments. Using our oil sensors to monitor the condition of the oil can now be applied as the technology is available and has proven its worth in the field.

Now more than ever it is necessary to get the most out of the machinery, to minimize downtimes, streamline maintenance and to avoid unnecessary costs.

Online oil sensors are a great addition to your offline oil analysis program giving you an early alert about critical situations. They also might allow to extend the sampling intervals but do give at the same time an indication when an additional oil sample should be sent to a laboratory for more detailed information and double check of the problem.

Water Monitor

The effect of water ingress into an oil system can be rapid and catastrophic. The Water Monitor removes the risks associated with periodic off-line testing and potential human error. In comparison to other techniques for water monitoring, CMT's Water Monitor measures the total concentration of water in oil, not just the dissolved water. CMT's Water Monitor already has been installed on a multitude of seafaring vessels, where it proves its worth every single day!

A robust design with an IP65 housing ensure that CMT's **Water Monitor** can provide permanent, repeatable accurate and reliable real time data in harsh marine and industrial environments.

Continuous on-line monitoring provides the most representative picture of oil condition. Changes are highlighted as they occur and not just at scheduled laboratory analysis. Preventative action can then be taken before a significant damage can occur.

The **Water Monitor** provides accurate feedback of the water concentration in your oil system. With local and optional remote alarms, Water Monitor instantly puts the information enabling the engineers to act accordingly.

In order to enable a long-term record of data, the sensor is equipped with internal data storage unit which can be read out over the serial interface.

Specifications

Ambient Temperature:	+5°C to +55°C
Oil Pressure Range:	2 to 10 bar
Maximum Oil Temperature:	< 60°C (at oil inlet)
Power:	110 / 230 V AC 50/60 Hz
Analogue Outputs:	2 x 4 - 20 mA
Connectivity:	USB, RS 232

Ordering Information

SEN-CT-16901
CMT Water Monitor

	Specific Oil Calibration	Generic Oil Calibration
Accuracy	+/- 2%	+/- 5%
Resolution	100 ppm	200 ppm

Combined Oil Condition and Moisture Sensor

The Combined Oil Condition and Moisture Sensor goes beyond the normal protection systems.

CMT's Combined Oil Condition and Moisture Sensor is a real-time, in-line sensing technology for monitoring the health state of lubricating fluids. The device provides continuous insight to oil health, promoting condition-based maintenance practices such as optimized fluid drain intervals and reduced dependence on offline analysis.

Lubricants are used to increase operating efficiency and to maximize life of equipment with relative moving surfaces. While the means by which lubricants perform their function are complex, the main areas for how lubricants lose their functional performance during use can be summarized as:

1. Increased Contaminants
2. Loss of Contaminant Control
3. Loss of Surface Protection

The **Combined Oil Condition and Moisture Sensor** measurement hardware and associated interpretation methods evaluate lubricant health with respect to these degradation modes. The underlying technology for the Sensor is electrochemical impedance spectroscopy (EIS), wherein a dynamic electrical signal is applied to the lubricant and changes in the fluid's electrical response to the signal with time are measured and correlated to chemical and physical changes of the lubricant.

Specifications

Working Pressure:	150 psi (10.3 bar) max
Ambient Temperature:	-40 to 110°C
Oil Temperature Range:	-40 to 150°C
Storage Temperature:	-40 to 125°C
Viscosity:	Viscosity Independent
Flow Rate:	Flow Rate Independent
Port Type:	-8 SAE J1926-1
Communications:	RS-485 - Modbus RTU, CAN - J1939
Default RS-485 Settings:	115200 baud, 8-bit, no parity, 1 stop bit
Default CAN Settings:	250 kbps
Material:	Nylon 6 / 304 Stainless Steel
Weight:	0.18 kg
Ingress Protection:	IP67
Power Supply:	10-30 Vdc, 100 mA
Output parameters:	Moisture in rh %, impedance

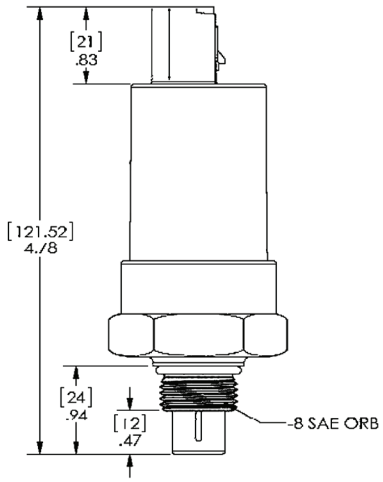
Key Features:

- CAN-J1939 compatible
- RS485-Modbus RTU compatible
- Multi-frequency analysis
- No moving parts
- Small form factor, easy to install
- Supports all oil types

Ordering Information

SEN-CT-16903
Combined Oil Condition and Moisture Sensor

An EIS measurement of a lubricant typically results in characterization of both the bulk solution and the interfacial reactions. When high frequency interrogation signals are applied to a lubricant system, the response is dominated by polar additives, oxidation by products, and polar contaminants. At low frequencies, the response is dominated by the presence, type, and health of surface-active additives that form films on the electrode surfaces. By measuring both bulk and interfacial properties of a lubricant, EIS offers excellent insight into lubricant health and function.



The **Combined Oil Condition and Moisture Sensor** relative humidity sensing elements use a hydroscopic dielectric compound in a capacitive sensing element to produce an output which correlates with the severity of water contamination. Much like water is detected in the atmosphere by monitoring relative humidity; relative humidity sensors in oil provide a measure of the dissolved water present. While in the dissolved state, water poses relatively low risk to the system; however, as the level approaches the oil's saturation point the risk of free water and emulsion formation greatly increases.

For detailed instruction on the use and interpretation of data provided by the oil condition monitor, please contact CM Technologies.

Your benefits:

- Optimize oil drain and sampling intervals
- Improve asset health state awareness
- Identify contamination events
- Detect oil changes and top-up events
- Verify proper lubrication system maintenance

Oil Sensor Box

Oil Sensor Box

Consisting of a combination of oil sensors, the Oil Sensor box has been developed to offer real-time monitoring of oil on critical plant such as a wind turbine gearbox. The Sensor Box makes frequent inspections of remote oil and machine health a feasible option. The risk of sampling error is eliminated and data from the sensors can be streamed via any network system, allowing remote monitoring and increasingly effective maintenance planning.

Designed for mounting into the lubrication system of a machine, the sensor box reports optional metallic particle, oil condition, moisture content of the oil or viscosity. The Sensor Box is part of the CMT Thruster Monitor System.

Individual Oil Sensor Suites are installed local to each thruster measuring the following parameters:

- Metallic Particle
- Oil Condition
- Moisture Sensor
- Oil Temperatur
- Flow (yes / no)

Additional parameters are available on request.

Sensor Boxes are being provided including a pump to guarantee effective oil circulation.

Online Oil Sensors:

- Ensure good lubricant condition.
- Control contamination.
- Control the wear rate to ensure longer service life.
- Increase the surveillance level of the machine between oil samples.
- Low cost of purchase and ownership.
- Minimal annual servicing costs.
- Minimal installation costs.

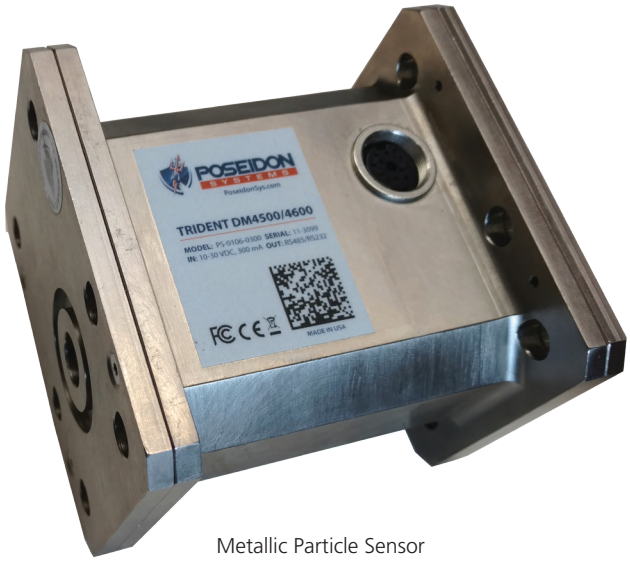
Ordering Information

CMS-CT-13009
Standard Oil Sensor Box

Contains:
- Metallic Particle
- Oil Condition
- Moisture
- Flow Control
- Oil Pump
  (Additional parameters are available on request.)

Sealing: IP 65

Metallic Particle Sensor



Metallic Particle Sensor

CMT's Metallic Particle Sensor is a real-time, in-line fluid sensing technology for the detection of metallic wear debris and particulates in a lubrication system.
By continuously monitoring wear debris generation, the device alerts users to faults in their earliest stages, allowing for lower cost correction actions than conventional schedule based maintenance.

The **Metallic Particle Sensor** will detect, categorize (ferrous vs. non-ferrous), and size metals within a machinery lubrication system. The monitor will detect and measure particles with an estimated spherical diameter of 50 micron ferrous and 150 micron non-ferrous and larger. The compact, robust device can be mounted within just about any lubrication system on any machine.
The sensor communicates in real-time using the MODBUS® serial digital communication standard over RS485 or RS232. This industry standard allows for easy integration into your current systems. But a wide range of output formats are available including particle type/size, approximate mass, and particle counts in user configurable bins.

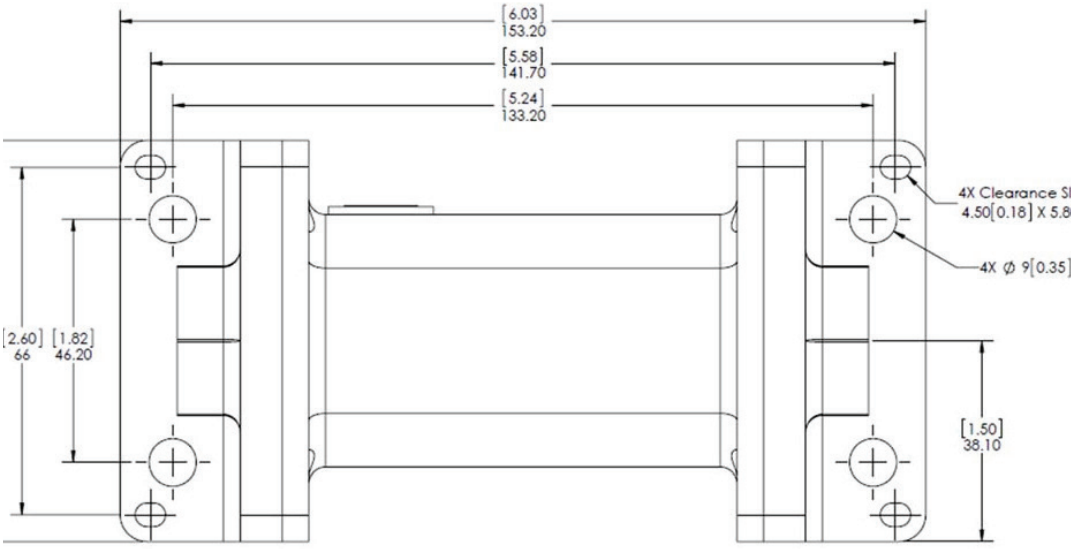
When connected to a host system the device will give indication of the machinery condition relative to wear metals generated. This gives you the control to improve your asset health management by being able to make informed maintenance decisions based on real-time data.

Specifications

Detection Sensitivity (Debris)	40 µm Ferrous & 150 µm Non-Ferrous Metallic Particles
Communications	RS48/RS232 Modbus RTU, Pulse Output
Oil Connection	3/4" -16 SAE Female, -8 JIC Male, -8 BSPP Male, or 1/2" Compression
Ambient Temperature	-40 to 85°C
Fluid Temperature	-40 to 85°C
Volumetric Flow Rate	0.95 - 38 LPM (0.25 - 10 GPM)
Sensor Bore Diameter	(12 mm)
Ingress Protection	IP65
Power Supply	10-30 VDC, 300 mA
Weight	0.68 kg

Ordering Information

SEN-CT-16904
Metallic Particle Sensor



Mounting Pattern of Metallic Particle Sensor

Density and Viscosity Sensor

Density and Viscosity Sensor

CMT's Density and Viscosity Sensor is a breakthrough liquid sensing technology that monitors density, viscosity, specific gravity and temperature in real time.
Density and Viscosity are very important to ensure an oil film for optimal lubrication on all parts. Lubrication will keep moving metal parts from producing wear and ensure a long lifetime of your engine. The efficiency of your engine can improve with the right viscosity of the fuel.

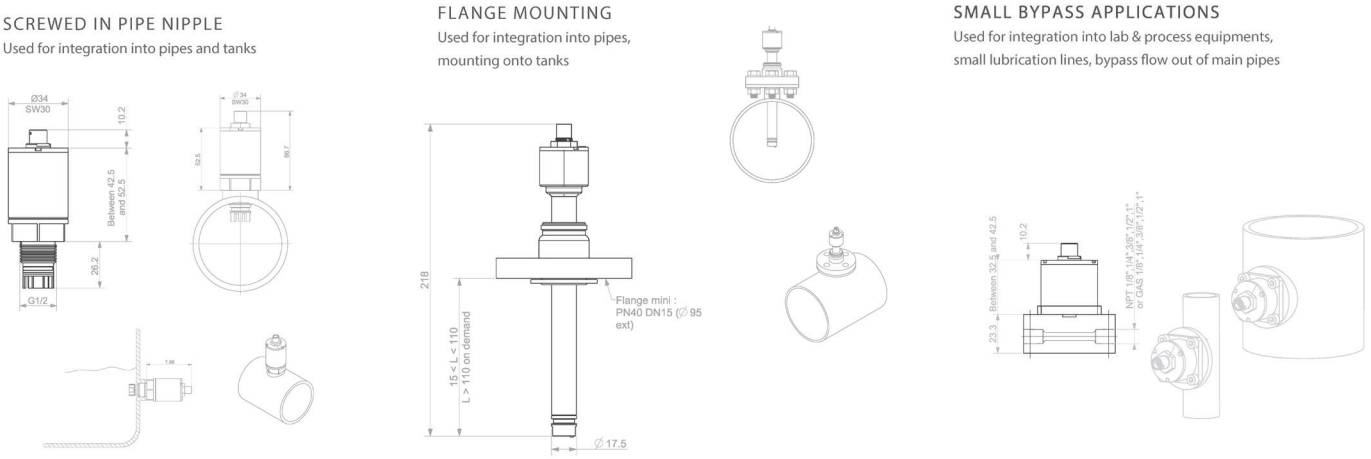
The **Density and Viscosity Sensor** is a newly developed sensor with multiple application areas in marine or industrial areas. Testing the viscosity and density is important for diesel or heavy oil to optimise the efficiency of your engine and minimise wear. The compact sensor enables simple installation within the oil cycle. There are different options for installation within the oil cycle. It can be mounted as a bypass (Nessi compatible), a flange within the pipe or even from the tank with a pipe nipple. Alternatively measurements can be simply inserted in the top. All material in contact with the liquid is stainless steel to make the sensor as reliable as possible. The rugged, patented MesoScale® all metal construction provides unrivalled sensitivity, integrity and dynamic response to changes in liquid composition improving the accuracy of the sensor to 0,0045 g/cc in density and 2% on viscosity.
Measurements are being taken in a frequency of 1Hz and can be seen on- or offline on any computer via a standard USB connection (alternatives available).
As sealing the **Density and Viscosity Sensor** uses high quality Viton® (alternatively Kalrez®).
Available mounting options are base plates 1/8", 1/4", 1/2" and 1" NPT (Nessi) or to screw the sensor in the pipe G1/2".

Specifications

Density Range	650 kg/m³ - 1350 kg/m³
Viscosity Range	0,3 cP - 100 cP
Density Accuracy	0,0045 g/cc
Viscosity Accuracy	2%
Acquisition frequency	1 Hz
Operating Temperature	-40°C - 85°C
Operating Pressure	Atm - 10.0 bar (optional 40 bar)
Communication	RS232 TTL, USB, RS485
Dimensions	38,2 mm x 38,2 mm x 74,6 mm
Weight	320g

Ordering Information

SEN-CT-16911
Density and Viscosity Sensor



Mounting Options of Density and Viscosity Sensor

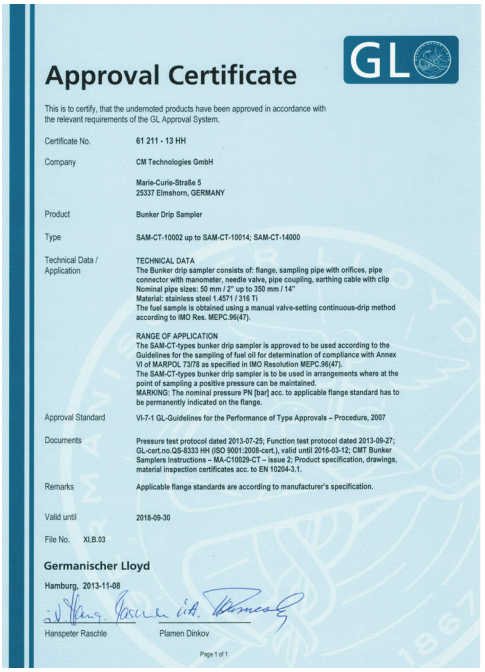
5. Sampling Solutions

One of the most important aspects of any oil analysis program is the sampling method and the sampling equipment used. The sample needs to be representative for the total amount and uncontaminated. Oil samples are required for regulatory analysis but also for commercial and regulatory purposes.

A representative oil sample will provide an accurate representation of the contaminants, additives, oxidation, particulates and wear condition. If a sample does not represent the real condition of the oil and component at the time of sampling, the reliability of both the test result and it's interpretation is in doubt.

Representative fuel oil samples are required for both regulatory and commercial purposes. Crucial aspects of the sampling process include taking the sample, the sampling location and witnessing the process.

CMT's sampling solutions provide you with everything you need to easily gather an uncontaminated, representative sample of your running liquids.



Approval Certificate

GL

This is to certify, that the undernoted products have been approved in accordance with the relevant requirements of the GL Approval System.

Certificate No.	61 211 - 13 HH
Company	CM Technologies GmbH Marie-Curie-Straße 5 25337 Elmshorn, GERMANY
Product	Bunker Drip Sampler
Type	SAM-CT-10002 up to SAM-CT-10014; SAM-CT-14000
Technical Data / Application	TECHNICAL DATA The Bunker drip sampler consists of: flange, sampling pipe with orifices, pipe connector with manometer, needle valve, pipe coupling, earthing cable with clip Nominal pipe sizes: 50 mm / 2" up to 350 mm / 14" Material: stainless steel 1.4571 / 316 Ti The fuel sample is obtained using a manual valve-setting continuous-drip method according to IMO Res. MEPC.96(47). RANGE OF APPLICATION The SAM-CT-types bunker drip sampler is approved to be used according to the Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78 as specified in IMO Resolution MEPC.96(47). The SAM-CT-types bunker drip sampler is to be used in arrangements where at the point of sampling a positive pressure can be maintained. MARKING: The nominal pressure PN [bar] acc. to applicable flange standard has to be permanently indicated on the flange.
Approval Standard	VI-7-1 GL-Guidelines for the Performance of Type Approvals – Procedure, 2007
Documents	Pressure test protocol dated 2013-07-25; Function test protocol dated 2013-09-27; GL-cert.no.QS-8333 HH (ISO 9001:2008-cert.), valid until 2016-03-12; CMT Bunker Samplers Instructions – MA-C10029-CT – issue 2; Product specification, drawings, material inspection certificates acc. to EN 10204-3.1.
Remarks	Applicable flange standards are according to manufacturer's specification.
Valid until	2018-09-30
File No.	XI.B.03

Germanischer Lloyd

Hamburg, 2013-11-08

Hanspeter Raschle Plamen Dinkov

Page 1 of 1

Drip Type Bunker Sampler Flange

Using a so called drip sampler is the most common and economic way to obtain a representative sample according MARPOL 73/78 Annex VI.

Our bunker samplers are:

- Manufactured under strict ISO 9001 quality assurance standards.
- Compliant with IMO MARPOL 73/78 Annex VI helping you to stay within the legal requirements for bunker fuel sampling.
- Weight optimized.
- Simple to install on all common flanges between 2" and 14".
- One size sampler can be used on most common different standard flanges even for different pressure.

In cases when you have a negative pressure at the point of sampling please use our automatic samplers.

Selecting the Correct Size of Drip Type Bunker Sampler

Select the nearest size Bunker Sampler with an **outer diameter** smaller than the flanges Pitch Circle Diameter minus the flanges Bolt Hole Diameter.

The **inner diameter** must be larger than the Nominal Pipe Size of the flange.

Material:

Stainless Steel 1.4571 / 316Ti
Nominal Flange Thickness: 25/26 mm
Total Thickness
(Including gaskets): 31/32 mm

Ordering Information Flange (other sizes are available on request) - Material: Stainless Steel 1.4571 / 316T

Part Number	Nominal Pipe Size	Inner Diameter	Outer Diameter	Weight	Flange Standard Correlations
SAM-CT-10002	50 mm/2"	63 mm	95 mm	3.5 kg	JISB2210 5K, 10K, 16K, BS 4504 PN10, PN16, BS10 D, E, F, ANSI B16.5 150, 300
SAM-CT-10003	75 mm/3"	86 mm	127 mm	4.0 kg	JISB2210 5K, 10K, 16K, BS 4504 PN16, BS10 D, E, F, ANSI B16.5 150,300
SAM-CT-10004	100 mm/4"	116 mm	157 mm	4.3 kg	BS 4504 PN16, BS10 D, E, F ANSI B16.5 150, 300
SAM-CT-10005	125 mm/5"	144 mm	188 mm	5.0 kg	JISB2210 5K, 10K, 16K, BS 4504 PN16, BS10 D, E, ANSI B16.5 150
SAM-CT-10006	150 mm/6"	171 mm	216 mm	5.5 kg	JISB2210 5K, 10K, 16K, BS 4504 PN10, PN16, BS10 D, E, F, ANSI B16.5 150, 300
SAM-CT-10007	175 mm/7"	194 mm	241 mm	6.2 kg	JISB2210 5K, 10K
SAM-CT-10008	200 mm/8"	221 mm	266 mm	6.5 kg	JISB2210 5K, 10K, 16K, BS 4504 PN10, PN16, BS10 D, E, F, ANSI B16.5 150
SAM-CT-10009	225mm/9"	260 mm	307 mm	6.7 kg	ANSI B16.5 300
SAM-CT-10010	250mm/10"	281 mm	328 mm	7.1 kg	JISB2210 10K, 16K, BS 4504 PN10, PN16, BS10 D, E, F, ANSI B16.5 150, 300
SAM-CT-10011	275mm/11"	319 mm	361 mm	7.2 kg	JISB2210 10K, BS 4504 PN10, PN16, BS10 d, E
SAM-CT-10012	300mm/12"	340 mm	401 mm	7.5 kg	JISB2210 16K, BS10 F, ANSI B16.5 150, 300, BS 4504 PN10, PN16, BS10 D, E, F
SAM-CT-10014	350mm/14"	375 mm	420 mm	8.0 kg	ANSI B16.5 150,300

Fuel Sampler

Normally samplers are installed at the ships manifold between the manifold flange and the flange from the bunker hose.

However, sometimes it is more practical to install the sampling device permanently at a different place.

The CMT **Fuel Sampler** is designed to be installed direct into an existing fuel pipe anywhere in the supply line.

It can easily be removed for cleaning. After initial installation the fuel line can be used with or without the sampler being inserted.

Your benefits:

- Designed specifically for fuel oils
- Easy retrofit
- Service pipes from 2 inch up to 14 inch
- Compliant with ISO 3170

Ordering Information

SAM-CT-14000
Fuel Sampler

Size: 2" - 14"
50 - 350 mm

Weight: 2.0 kg

MARPOL Bunker Cabinet

The CMT MARPOL Bunker Sample Storage Cabinet is a complete unit providing everything needed to comply with the IMO MARPOL regulations. It contains everything for collection, retention and storage of bunker fuel oil samples as required by the IMO MARPOL Annex VI regulations.

The bunker sample collection and storage is defined in MEPC.96(47). In the guidelines it is defined that a retained sample of all fuel oil as supplied, is drawn at the ships receiving manifold, sealed, signed and then retained under the ship's control until the subject fuel has been substantially consumed, but for at least 12 months from the date of delivery.

Your Benefits

- A robust, fully lockable metal case allows the safe and secure sample storage according the regulations.
- Everything you need is provided in the same cabinet ensuring compliants with IMO MARPOL 73/78 Annex VI regulations.
- Its supplied with log book to record your sample details.

Replacement consumable and a full range of drip type or automatic bunker samplers are easily available at short notice on request.

Ordering Information

SAM-CT-20000
MARPOL Bunker Cabinet

Content:
- 40 Sample Bottles and Mailer Kit
- 45 MARPOL Fuel Sample Label
- 45 Clear Adhesive MARPOL Over Label
- 40 Seals for bottles and sampler
- 24 Cubitainer (5 litre)

Automatic Fuel Sampler

Especially bigger vessels are facing the problem of negative pressure at the bunker manifold. Traditional Drip Samplers cannot be used here. They need a positive pressure to allow the sample to flow into the sample container by gravity. The solution is the Automatic Fuel Sampler which does work with vacuum up to -0.8 bar.

The **Automatic Fuel Sampler** is connected to the main bunker line by a flexible hose for the mobile solution or by pipe fittings for the permanent installed version.
After start it will automatically sample into the cubitainer and stop after the preset bunker time. The sampler can sample into all size bottles or cubitainers. On special request we can provide a version which can sample into up to 5 individual sample bottles simultaneously or in a sequence. For highest flexibility the sampler can either be mounted on a trolley or permanently installed next to the manifold.

The standard version works as time proportional sampler ensuring a representative sample. For applications with changing flow rates we also offer a flow proportional version.

Because of ATEX regulations the sampler does not use electricity. All our samplers are pneumatically driven with normal working air between 6 and 8 bar. The samplers can be used under all weather conditions. All fittings are made from stainless steel AISI 316, designed and produced to survive in a harsh environment.

Automatic Fuel Sampler Type 50

This **Automatic Fuel Sampler** is mounted on a trolley to easy restore after bunkering. The waterproof sampler is equipped with a flushing tank and made of stainless steel. It does have a DNV type approval and complies with MARPOL Annex VI.

The sampler is also available as a wall mounted version

The heavy duty sampler can be installed right on the manifold. It is fully pneumatic driven with bunker timer and does have an automatic stop function. This model is also produced in a low temperature version.

Ordering Information

SAM-FS-05051
Automatic Fuel Sampler Type 50

Size:	350 x 250 x 500 [mm]
With trolley:	1100 x 500 x 500 [mm]
Weight:	15 / 40 kg
Material:	AISI 316

Compressed Air Pressure

Max. pressure:	12 bar
Normal pressure:	6-8 bar

Fuelline pressure

Standard:	-0.4 bar
Optional	-0.8 bar

Bunker Timer: 1 – 16 hours

Automatic Fuel Sampler Type 70

This very advanced **Automatic Fuel Sampler**, which can sample into 4 bottles simultaneously, is very popular on bunker barges but is also used on merchant ships.

The sampler can sample under all conditions even with very high negative pressure in the bunker line and does give you four most representative samples. This sampler is optional also available for 5 bottles.

The sampler is also available as a vertical wall mounted version.

In addition to the Type 50 specification it does come with a circulating pump to have a heating functionality. It does also have a DNV type approval and complies with MARPOL Annex VI.

Ordering Information

SAM-FS-07014
Automatic Fuel Sampler Type 70

Size:	600 x 600 x 600 [mm]
Weight:	35 / 55 kg
Material:	AISI 316

Working Air Pressure

Max. pressure:	12 bar
Normal pressure:	6-8 bar

Fuelline pressure

Standard:	-0.4 bar
Optional	-0.8 bar

Bunker Timer: 1 – 16 hours

Your benefits:

- High flexibility and reliability.
- Easy integrated flush system for cleaning purposes.
- Sample container is always filled after bunkering.
- No overflow!
- MARPOL and MEPC.96(47) compliant.
- Time or flow proportional sample.
- No electricity = no ATEX problem.

Specifications:

- Size: 350 x 250 x 500 [mm]
- With trolley: 1100 x 500 x 500 [mm]
- Weight: 15 kg (40 kg with trolley)
- Material: AISI 316
- Max pressure: 12 bar
- Min pressure: - 0.4 bar (- 0.8 bar)
- Working air: 6 – 8 bar

Vacuum Sampling Pump

Vacuum Sampling Pump with 100 ml bottles

Adapter for other bottle sizes

Sampling from tanks, drums and / or engine sumps does create sometimes challenges because the access is difficult. Especially in tanks and drums it is important to not only sample from the top or bottom but to get a representative sample for the total volume.

CMT supplies reliable and easy to use hand operated vacuum sample extraction pumps for simple lube oil sampling.

The vacuum pumps can be used for sample bottles with different necks. The 28 mm sample pump is designed to fit CMT 50 ml sample bottles and the 38 mm plastic pump is designed to fit 100 ml bottle.

Other sizes and special adapters are available on request.

Sample Extraction Tube (LDPE) - Clean LDPE tubing to fit sample extraction pump which can be used with most oil systems. Supplied in 15 meter rolls.

Ordering Information

SAM-CT-30028
Vacuum Pump 28 mm Neck
(for 50 ml Sample Bottle)

SAM-CT-30038
Vacuum Pump 38 mm Neck
(for 100 ml Sample Bottle)

SAM-CT-30021
Adapter for 500/1000 ml Sample Bottle
Suitable for 38 mm Neck

SAM-CT-30015
Sample Extraction Tube
(about 15 meter)

Sample Bottles and Cubitainer

1000 ml sample bottles

50 / 100 / 100 / 120 ml sample bottles.

Cubitainer with caps

Cubitainer in a cardboard box

CMT produces various different sample bottles for fuel, oils and water.

Sample Bottles - CMT produces a range of **HDPE (translucent)** and **PET (clear)** sample bottles for fuel oil and lubricants.

They are designed to allow oil sampling of warm oils direct from the equipment.

Sample Bottles are supplied in following sizes:

- 50 ml
- 100 ml
- 120 ml
- 500 ml
- 1000 ml

Standard bottle neck is 38 mm to fit on the CMT vacuum sampling pump. For all other sizes we provide adapters allowing to sample with the CMT vacuum sampling pump.

Cubitainers - fuel samplers use disposable 'cubitainers'. These hold the oil sample before mixing and transfer to the sample bottles and keep out all external contamination.

Ordering Information

SAM-CT-70040
1000 ml Sample Bottle and Mailer Kit (40)
Neck: 54 mm
Material: HDPE

SAM-CT-70070
1000 ml Sample Bottle Pack (70)
Neck: 54 mm
Material: HDPE

SAM-CT-70041
500 ml Sample Bottle and Mailer Kit (40)
Neck: 54 mm
Material: HDPE

SAM-CT-70071
500 ml Sample Bottle Pack (70)
Neck: 54 mm
Material: HDPE

SAM-CT-70250
120 ml Sample Bottles (250)
Neck: 38 mm
Material: PETG

SAM-CT-70288
100 ml Sample Bottles (288)
Neck: 38 mm
Material: PETG

SAM-CT-70289
100 ml Sample Bottles (288)
Neck: 38 mm
Material: HDPE

SAM-CT-70360
50 ml Sample Bottles (360)
Neck: 28 mm
Material: HDPE

SAM-CT-70024
Cubitainers - 5 litre (24)
Neck: 38 mm
Material: HDPE

SAM-CT-70025
Cubitainers - 10 litre (24)
Neck: 38 mm
Material: HDPE

Sampling Accessories

Seals and label

Cubitainer Adapter for DNV Sampler
Sampler Adapter for DNV Bottles

Seals for bottle shoulder and valve

Mailing box for 1000 ml sample bottles

Plug for Bunker Sampler

Accessories like mailer kits, labels, adapters and mailing cartons are available for sampling, storage and shipping.

Sample Bottle Labels - CMT does provide self adhesive, pre-printed labels for fuel or lube oil samples. Label for bunker fuel samples are according MARPOL regulations.

Clear Over Labels - Clear self adhesive, over labels to protect label and user annotations.

Bottle Shoulder and Valve Seal - Some authorities, for example the Port of Singapore, require that the sample flow rate is fixed throughout the bunkering period. The Bottle Shoulder and Valve Seal can be used for securing the valve as well as sealing the bottles for storage.

Cubitainer Adapter - The Cubitainer Adapter allow to use CMT Cubitainers on bunker samplers from other manufacturers like DNVPS. Other version to use the CMT drip sampler with customized sampling container are available on request.

Sampler Gauge - On bigger vessels the oil often falls several meters down from the ships manifold into the fuel oil storage tank. This can result in unusual pressure conditions. The pressure often becomes negative. A gauge is available for monitoring this to prevent the sample being drawn back into the line.

Elbow Kits - For alternative positions CMT does provide a special elbow kit to position the sampler at an angle to the vertical. Elbow kits allow to keep the cubitainer bag hanging vertically.

Ordering Information

SAM-CT-90001
Label for Fuel Sample Marpol Label (180)

SAM-CT-90002
Label for Fuel Sample Marpol Label (990)

SAM-CT-90003
Clear Adhesive Marpol Over Label (990)

SAM-CT-90004
Bottle Shoulder and Valve Seals (100)

SAM-CT-90006
Cubitainer Adapter for DNV Sampler

SAM-CT-90020
Sampler Adapter for DNV Bottles

SAM-CT-90007
Sampler Gauge

SAM-CT-90008
Elbow Kit for 45 degree Elbow

SAM-CT-90009
Elbow Kit for 90 degree Elbow

SAM-CT-10023
Plug for Bunker Sampler

Water Condition Monitoring

Marine Water Test Kits

Offshore installations and vessels have a variety of systems that require monitoring for either optimal performance, meeting current or forthcoming legislation and to minimize the risks for the crew or visitor's Health and Safety on board.

With these in mind, a new range of CMT Marine Water Kits has been developed to assist and adhere with the above requirements.

The systems that will require monitoring are:

- Potable Water
- Sewage Water
- Boiler & Cooling Water
- Ballast Water
- Fire fighting Foam, sprinkler systems

According to the ever changing legislations CMT is permanently updating the range of Marine Water Test Kits to comply with the current legislations.

1. Marine Potable Water Test Kit

Potable water is our most important nutrient and is used for both drinking and cooking. The water being used for personal hygiene and all types of cleaning requires the same high quality. It is therefore important to have enough water of satisfactory quality to cover all types of usage.

International regulations regarding the Potable Water Quality Monitoring and Control were driven by the World Health Organization (WHO) via its International Health Regulations (IHR). And soon enough adapted for on-board potable water, as part of the overall Ship Sanitation Certificate.

MLC 2006 does apply to all seagoing vessels and is in force since the 20th August 2013. Monitoring and control compliance procedures are laid out in the Guide for Ship Sanitation detailing:

- The systems that require monitoring,
- The method and frequency
- The record keeping requirements

Simple regular assessment and testing of the potable water system for microbiological activity, biocide (disinfection control) and implementing a correct control scheme (i.e. temperature monitoring), will ultimately reduce the risk of a disease and save lives.

The CMT **Marine Potable Water Test Kits** were developed to offer rigs and vessels the complete monitoring solutions for their water systems, with additional extras if required.

Potable Water Test Kit

Suitable control schemes with adequate testing & monitoring will aid with the compliance of the current ILO MLC (2006). These test kits provide real time analysis and simple to perform tests which require no specialist training.

According to ILO MLC (2006) also a qualified person is required on board the vessel or rig to perform the test. CMT provides a complete training for **Marine Potable Water Tests** to ensure the attendee is qualified to perform all test according the legislations. At the end of the training each attendee will get a certificate proving the respective qualification.

Ordering Information

WTK-CT-80051
Standard Potable Water Test Kit
Digital Incubator
UV Lamp
Digital Temperature Meter

Chlorine LR (Free & Total)	0 – 1 ppm
Chlorine LR:	0 – 5 ppm
Chlorine HR:	0 – 250 ppm
pH:	4 pH – 11 pH
Aerobic Bacteria:	0 – 1400 CFU/ml
Coliforms/E Coli:	1 CFU/100 ml

The CMT Marine Water Test Solutions comply with:

- MLC (2006)
- WHO Health Regulations (2005)
- ILO 178 (2009)
- European Drinking Water Regulations
- Norwegian Drinking Water Regulations (applies for ALL ships calling Norwegian ports!)

The CMT **Potable Water Test Kit** enables ships staff to monitor the quality of the drinking water on board the ship by providing tests for important operational control parameters and verification tests for bacteria that can be of risk to human health.

The range of tests can be used on the ship either as a standalone control solution or as a supplement to laboratory analysis, dependant on flag state guidelines.

CMT is offering 2 different versions of the **Potable Water Test Kit**. The standard version includes tests for Aerobic Bacteria as well as E Coli. The **Full Potable Water Test Kit** extends the standard test kit with tests for Enterococci and Pseudomonas bacteria.

Both Test Kits include a Digital Incubator to ensure consistent results with same conditions on every test.

Features:

- Self-contained testing kit for E. Coli and Coliforms.
- Helps you to meet MLC 2006 recommendations for the quality of drinking water.
- Includes compact and robust sample incubator.
- USB with training material.

Your benefits:

- Incubator ensures that you achieve consistent test results.
- Additional test kits can be added as required to
- Meet flag state and / or company requirements.
- USB training material supports you with crew training and competency.

WTK-CT-80052
Full Potable Water Test Kit
Same as Standard Test Kit plus:
Enterococci: 1 CFU/100 ml
Pseudomonas: 1 CFU/100 ml

WTK-CT-80053
Marine Potable Chlorine Test Kit
Comparator & Cells
Chlorine (Free & Total) VLR: 0 – 1 mg/l
Chlorine (Free & Total) LR: 0 – 5 mg/l
Chlorine HR: 0 – 250 mg/l

WTK-CT-80054
Marine Potable Bacteria Test Kit
Digital Incubator
UV Lamp
Digital Temperature Meter
Coliform/E Coli Test: 1 CFU/100 ml
Aerobic Bacteria Test: 0 – 1400 CFU/ml

A logbook is included in every Test Kit

Reagents (Full refill of respective Test Kit)

WTK-CT-85051
Standard Potable Water Kit Consumables

WTK-CT-85052
Full Potable Water Test Kit Consumables

WTK-CT-85053
Potable Chlorine Test Kit Consumables

WTK-CT-85054
Potable Bacteria Test Kit Consumables

Incubator Option

CMT's new portable incubator brings lab like conditions to the field of onsite testing of bacterial contamination.

To create reliable and repeatable incubation conditions when in the field has been a problem in the past because small and portable but on the other hand reliable and temperature stable incubators were not available.

A bacteriological analysis, which is included in many of the CMT Marine Water Test Kits, demands an incubator to create repeatable results.

CMT's **Digital Incubator** offers a reliable, temperature stable environment for the incubation of bacteriological samples and that while being portable and affordable.

Portable Incubator for all Bacterial Test

Applicable for testing of a multitude of different parameters

Your benefits:

- Portable and therefore usable in the field and in the lab
- Digitally adjustable temperature with real time display of the actual inside temperature
- Clear viewing lid

Ordering Information

WTK-CT-80020
Digital Incubator
Capacity: 3.2 l
Dimensions: 215 x 161 x 170 mm
Operating Temp.: 35°C - 45°C
Power: 100 / 240 V AC 50/60 Hz
Weight: 4 kg

Options for Potable Water Test Kits

Turbidity Test Tube

Colour Colorimeter

Chlorine Test Kit

To allow full compliance with international regulations MLC (2006) and ILO 178 including local regulations like the Norwegian Drinking Water Regulations it is essential to do some additional testing not included in the CMT Potable Water Test Kits.

Those tests will be provided with options from CMT. It is also essential to have a proper record keeping which can be done with the CMT log book provided with the manual in the standard kit. International regulations further specify that a trained person needs to be on-board each vessel or rig to perform the tests. CMT does provide different seminars ensuring proper qualification. A certificate will document the respective qualification. You will find our seminar program at the end of this catalogue.

Colour Colorimeter:

Equip your Water Test Kits with the Handheld **Colorimeter** to measure true Colour more effectively.
True colour is caused by dissolved compounds in water and can be natural, artificial or both.
Apparent colour, caused by both dissolved and suspended solids, is measured in Platinum-Cobalt units (PCU). The AWWA (American Water Works Association) recommends < 15 PCU.

CMT's **Colorimeter** makes it easy to measure with only one small device. Not only size is an advantage over chemicals, it is also more accurate.

Chlorination Option:

The **Chlorination Test Kit** will enable the operator to complete the disinfection process correctly and maintain chlorination levels.
The chlorine HR test is used to check that chlorine has been dosed to the correct levels and the starch/ potassium iodide strips are used to make sure the chlorine has been neutralised. The chlorine LR test is then used to check that chlorine reserves are kept to the maximum permitted level of 0.5 ppm.

The pH test strips are used to check that pH values are between 5 -6 pH during chlorination. The pH should be carefully monitored because acidic pH solutions below 4 can cause the release of chlorine gas which is toxic. When using chlorine as a disinfectant it is important that the pH be 5 - 6 to improve its bacteria reducing properties.

Ordering Information

WTK-CT-85026
Copper Comparator Test
Range: 0 - 1 ppm
Disc & Reagents: 50 tests

WTK-CT-85027
Copper Test Strips
Range: 0 - 5 ppm
Strips for: 25 tests

WTK-CT-85028
Iron Comparator
Range : 0 - 1 ppm
Reagents: 50 tests

WTK-CT-85029
Iron Test Strips
Range: 0 - 5 ppm
Strips for: 25 tests

WTK-CT-85030
Turbidity Test
Range: 5-500 JTU
No. of Test: unlimited

WTK-CT-85031
Colour Colorimeter
Range: 0-500 PCU
Resolution: 5 PCU
Accuracy: +/- 5%

WTK-CT-85032
Colour Colorimeter Standards

WTK-CT-80055
Chlorination Test Kit
Base Equipment
Chlorine HR Test: 0 - 250
Chlorine LR Test: 0 - 1 ppm
pH Test Strips: 0 - 14 pH
Starch/Potassium Iodide Test Strips

Legionella Test Strip

Legionella Industrial Kit

pH / Temp Meter

Conductivity / TDS Meter

Legionella Option

Legionella is a bacteria which can cause a pneumonia-like disease called "Legionnaires' Disease". Infection occurs when the bacteria is inhaled from aerosols of contaminated water. Aerosols can be produced anywhere water is splashed or sprayed but some of the most common sources associated with Legionnaires' Disease are showers.

The **Legionella Industrial Test Kit** is a breakthrough technology from CMT for the rapid detection of Legionella bacteria in marine potable water systems– delivering test results in minutes instead of days. The test kit contains everything required to perform 5 tests – including sample collection containers and disposable pipettes.

- Optimised for use with hot and cold water systems on-board ships.
- Simple to use and fast, with no interpretation required.
- Results are easy to read and obtained within 25 minutes.
- No chemicals.
- Immediate understanding and response to the water conditions.
- Reduce risk of outbreaks and litigation.
- Increase confidence in your Legionella control.

Conductivity Option:

Conductivity is an indirect measurement of total dissolved solids. Typical value (approximately) for untreated distillates is 50 µS/cm. Water from shore sources should have around 500 µS/cm. Seawater has about 50,000 µS/cm. Therefore a high conductivity could be an indication for seawater ingress. A too low conductivity value should trigger evaluation of corrosive processes in the piping and existing of heavy metals due to corrosion.

pH Option:

Ideal pH value depends on the materials used. A pH value above 8 does not allow effective water disinfection with chlorine and gives evidence that self produced water may not be re-mineralized adequately. Further assessment of water quality should be performed.

Ordering Information

WTK-CT-80010
CMT Legionella Industrial Kit (5)
(Distribution System)

Detection Limit:	100 CFU/L
Operator Time:	< 2 minutes
Development Time:	< 35 minutes

WTK-CT-80040
CMT Legionella Biofilm Test Kit (5)
(Biofilm Cold Water Storage Tank)

Detection Limit:	200 CFU/ swapped area
Operator Time:	< 2 minutes
Development Time:	< 35 minutes

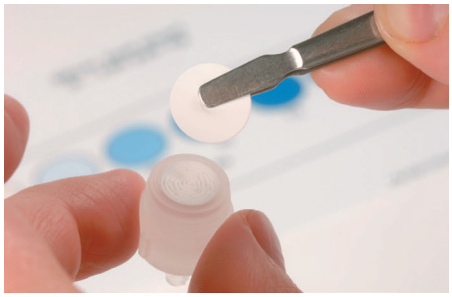
WTK-CT-85012
Conductivity / TDS Meter

Range:	0 – 2000 µS; 2 – 20 mS; 0 – 13000 ppm
Accuracy:	+/- 2%
Test time:	< 1 minutes
Reagents:	non hazardous
Calibration Pack:	WTK-CT-85005

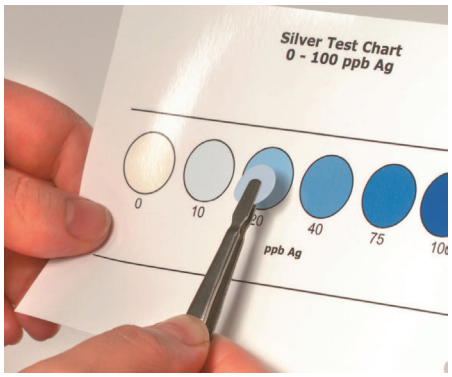
WTK-CT-85013
pH Meter

Range:	
pH:	-2 – 16
Temp:	0 – 90°C
Accuracy:	+/- 0.02 pH / 0.3°C
Test time:	< 1 minutes
Reagents:	non hazardous
Buffer Solution 4.0:	WTK-CT-85014
Buffer Solution 7.0:	WTK-CT-85015
Buffer Solution 10.0:	WTK-CT-85016

Silver Copper Ionisation Test Kits



Silver Test



Colour comparisation on Silver Test

Copper HR Colorimeter

Silver Iron Photometer

Silver Copper Ionisation Test Kits

Water treatment systems that electrolytically generate copper and silver ions for the control of bacteria (including planktonic Legionella) in hot and cold water systems are becoming more and more common. Silver concentration should be a minimum of 20 ppb and higher with hard water feed.

It is important that installers of ionisation systems take into consideration regulations on maximum allowable copper and silver levels (The Water Supply (Water Quality) Regulations), as well as local water quality.

Hardness and pH are two important factors that can affect the efficiency of the whole process. Copper ions are also required to complete the synergy.

To perform an analysis, simply add a reagent sachet to 50 ml of sample water; filter this through a small membrane and compare the colour of the membrane with the standard colour chart.

The test takes just a few minutes to complete, ensuring correct operating conditions. Ideal for checking sentinel outlets on a monthly basis and representative taps on a rotational basis.

Copper HR Colorimeter

The **Copper HR Colorimeter** is a simple, accurate and cost effective way to measure high ranges of copper.

Designed as a more accurate alternative to chemical tests, the Colorimeter provides quick, accurate results in four easy steps.

The Colorimeter uses an adaptation of the EPA method. The reaction between copper and the reagent causes a purple tint in the sample.

Silver Iron Photometer

The **Silver Ion Photometer** is a small, lightweight digital photometer, specifically designed to accurately measure silver ions in water.

The Photometer features an advanced optical system; the combination of a special 570 nm LED lamp, a narrow band interference filter, and silicon photocell ensuring accurate photometric readings every time.

Ordering Information

WTK-CT-80006
Silver (Free) Ionisation Test Kit
Range: 10 - 100 ppb
No. of tests: 100

WTK-CT-85023
Silver Ion Photometer
Range: 0.0 - 0.2 ppm (0-200 ppb)
Resolution: 0.01 ppm
Accuracy: +/- 2%

WTK-CT-80050
Copper Comparator Test Kit 0-1 ppm
Range: 0-1 ppm
No. of tests: 100

WTK-CT-80049
Copper LR Colorimeter 0-5 ppm
Range: 0-5 ppm
Resolution: 0.01 ppm
Accuracy: +/- 5%

WTK-CT-85021
Silver (Free) Ionisation Consumables Pack
No. of tests: 100

WTK-CT-85024
Silver Ion Photometer Calibration Kit

WTK-CT-85025
Silver Ion Photometer Reagent Kit
No. of tests: 100

It is currently the easiest to use, quickest and most accurate silver ion measurement tool on the market. Using the highly accurate span calibration method for faster more accurate results than conventional silver ion meters.

2. Marine Sewage Water Test Kits

MARPOL Annex IV contains a set of regulations regarding the discharge of sewage into the sea from ships, including regulations regarding the ships' equipment and systems for the control of sewage discharge, the provision of port reception facilities for sewage, and requirements for survey and certification (ISPPC – International Sewage Pollution Prevention Certificate).

The discharge of raw sewage into the sea can create a health hazard, while in coastal areas sewage can also lead to oxygen depletion and an obvious visual pollution.

Environmental issues are still a hot topic these days. The shipping community expresses its concern about the ecosystem and the pollution of the seas. In this market where low freight rates, new rules and regulations and a higher customer demand are pressuring our business-results, we still desire to comply with new rules and regulations but preferably in a cost-effective and efficient way

To test the discharge of Sewage treatment plants CMT offers a quick and easy drop test for testing the free chlorine content.

As set out in Annex 22 Resolution MEPC.227(64) adopted on the 5th October 2012, sewage treatment plants installed prior to 1st January 2010, on ships other than passenger ships operating in MARPOL Annex IV special areas and intending to discharge treated effluent into the sea, should comply with resolution MEPC.2(VI) adopted on 3rd December 1976.

ISPPC (International Sewage Pollution Prevention Certificate) are issued upon successful inspection and are valid for 5 years.

For renewal and random inspections, maintaining the system operating requirements in line with the effluent standards will be required. With this in mind, the CMT Marine Sewage Effluent Test Kit will provide simple and accurate testing.

Requirements from MARPOL Annex IV Resolution MEPC.159(55) – Effluent & Performance Standards are defined as follows:

- BOD up to 25 ppm
- COD up to 125 ppm
- Total Suspended Solids max. 35 ppm
- Coliforms up to 100 CFU / 100 ml
- pH 6.0 – 8.5
- Chlorine (Free) up to 0.5 ppm

Nowadays tests in the market are complicated and comprehensively. The Chief-Engineers almost need to have a chemist-degree in order to understand and execute the time consuming tests. The CMT Sewage Effluent Test Kits are simple and very user-friendly.

The **Budget Sewage Effluent Kit** provides an indication for the key parameters set out in MARPOL Annex IV. The coliform dip slides provided will require an incubator to ensure accuracy, which can be purchased separately. For complete accuracy you will need to purchase the standard range of sewage effluent kits. These come complete with a coliform plate method and incubator. The coliform plate method provides a MPN count, which will provide more accuracy than the coliform dip slides.

Regular testing will allow rapid corrective action to take place if required, helping to maintain optimum operating conditions, minimum downtime and reducing costs. Ultimately the CMT Marine Effluent Cabinet will aid compliance with MARPOL Annex IV.

The CMT Marine Water Test Solutions comply with:

- MARPOL Annex IV: Resolution
  - MEPC.2 (IV)
  - MEPC.115 (51)
  - MEPC.159 (55)

Ordering Information

WTK-CT-80041
Sewage Effluent Test Kit 1
Complies with MEPC 2(VI)
Commission before 2010

Coliform Bact. (12):	0 – 2424 CFU/100ml
TSS (unlimited):	5 – 500 mg/l
BOD (unlimited):	7.5 – 255 mg/l O_2
Thermometer:	-50 to 150°C
Digital Incubator	25 - 45°C

WTK-CT-80042
Sewage Effluent Test Kit 2
Complies with MEPC 159(55)
Commission 2010 and later
Additionally to WTK-CT-80041:

COD Test (25):	0 – 300 mg/l
pH Test Strips (50):	4 – 10 pH
Free Chlorine (100):	0 – 1.0 ppm
Free Chlorine (100):	0 – 30 ppm

WTK-CT-80043
Sewage Effluent Test Kit 3
Complies with MEPC 159(55) & 227(64)
All Passenger Ships
Additionally to WTK-CT-80041:

COD Test (25):	0 – 1500 ppm
pH Test Strips (50):	5 – 11 pH
Free Chlorine (100):	0 – 1.0 ppm
Free Chlorine (100):	0 – 30 ppm
Total Nitrogen (25):	0.5 - 25 ppm
Total Phosphorus(25):	2 - 2.6 ppm

WTK-CT-80044
Budget Sewage Effluent Test Kit

Dip Slides (10)	0 - 100,000 CFU / ml
TSS (unlimited):	5 – 500 mg/l
BOD (unlimited):	7.5 – 255 mg/l O_2
COD (100):	0 - 300 mg/l
pH Test Strips (50):	5 – 11 pH
Free Chlorine (100):	0 – 1.0 ppm
Free Chlorine (100):	0 – 30 ppm
Thermometer:	-50 to 150°C

Reagents (Full refill of respective Test Kit)

WTK-CT-85041
Sewage Effluent Consumables Pack 1

WTK-CT-85042
Sewage Effluent Consumables Pack 2

WTK-CT-85043
Sewage Effluent Consumables Pack 3

WTK-CT-85044
Sewage Effluent Consumables Pack Budget

3. Ballast Water Test Kit

As everyone in the industry knows, ballast water exchange is an important process, but it's one which involves several complex processes. There are guidelines which need to be followed in order to ensure the water is as safe and hygienic as it can possibly be.

The presence of any harmful bacteria, viruses and invasive species on a ship can have catastrophic effects, so our highly developed ballast water test kits are vital. Easy to use and reliably accurate, the kit enables user companies to remain compliant with current and future legislation and guidelines.

Exchanging ballast water in a timely, efficient and safe manner is an important aspect of modern marine life, but it should always be monitored effectively. With CMT on your side, you can be sure that your vessels and offshore installations are operating properly.

A successful inspection will valid a 5 year certificate for the system. For a renewal or random inspections the ballast water system should be in line with the IMO Ballast Water Convention (2004).

The IMO Ballast Water Convention (2004) specifies three different standards:

1) The **Ballast Water Exchange Standard** specifies the exchange of ballast water at sea. Ships performing ballast-water exchange shall do so with an efficiency of 95% volumetric exchange of ballast water.

The exchange procedure shall be carried out in an 'open ocean condition' at least 200 nautical miles from the nearest land and in waters at least 200 meters in depth. This can be monitored with each of the CMT Ballast Water Test Kit.

2) The **Ballast Water Performance Standard** cares about the performance of the system and specifies the maximum number of viable organism in the ballast water.

50 µm or above – less than 10 living organisms per cubic metre (1000 litres).

10 µm – 50 µm – less than 10 living organisms per millilitre.

3) The **Ballast Water Health Standard** defines limits for indicators which could cause health problems. It specifies the maximum number of Cholerae, E. coli and Enterococci bacteria as well as the total viable count of any bacteria in the ballast water.

Total Bacteria less than 1000 CFU/100 ml
E. coli less than 250 CFU/100 ml
Enterococci less than 100 CFU/100 ml
Vibrio Cholera (O1 & O139) Zero/100 ml

Ships are required to have an **Ballast Water Management Plan** and a **Ballast Water Record Book**. The Ballast Water Record Book is essential to prove compliance with the three Ballast Water Standards.

Ordering Information

WTK-CT-80033
Ballast Water Test Kit I
(VGP 2013 US Coastguard BWTS Requirements)

Total Bacteria (10):	0 – 1400 CFU
E-Coli Test (10):	0 – 2424 CFU
Enterococci Test (10):	0 – 115 CFU
Vibrio Cholera:	yes/no (O1 & O139)
Incubator:	110 / 240 V
UV Lamp	

WTK-CT-80034
Ballast Water Test Kit II
additionally to WTK-CT-80033:
Salinity Refractometer (salt in seawater)
Zooplankton Filter Test (50) (10 µm)
Zooplankton Filter Test (50) (50 µm)

WTK-CT-80035
Ballast Water Test Kit III
additionally to WTK-CT-80033:
Salinity Refractometer (salt in seawater)
Digital handheld Fluorometer for Zooplankton

Reagents (Full refill of respective Test Kit)

WTK-CT-80048
Ballast Water Consumables Pack 1

WTK-CT-80046
Ballast Water Consumables Pack 2

WTK-CT-80047
Ballast Water Consumables Pack 3

Options for residual Biocide Monitoring

WTK-CT-85045
Chlorine Dioxide Comparator (20)
Range: 0 - 6.65 ppm

WTK-CT-85046
Chlorine Comparator Test (20)
Range: 0 - 1.0 ppm

WTK-CT-80036
Ozone Comparator Test (20)
Range: 0 - 3.4 ppm

WTK-CT-80037
Peracetic Acid Drop Test (20)
Range: 0 - 20 ppm

WTK-CT-80038
Hydrogen Peroxide Comp. Test (20)
Range: 0 - 50 ppm

The CMT test Kits meet the rules of the US Coastguard requirements (VPG 2013), according to which a large number of flag states handle the ballast water treatment.

This includes among others:

1) Ballast Water System Functionality Monitoring.

Ballast water treatment systems use physical and/or chemical processes to achieve reductions in living organisms (i.e. filters, chlorine dioxide, cavitation, UV & hypochlorite). To assess the BWTS functionality, monitoring of the BWTS functionality is required at ***least once per month*** for specific parameters that are applicable to your system.

2) Effluent Biological Organism Monitoring

This must be conducted ***6 times during the first year*** the system is installed or used. If the sampling results are within the below parameters for two consecutive events, the vessel may ***reduce monitoring to 1 time per year*** after the first year.

Parameters & Limits

Total Bacteria less than 1000 CFU/100 ml
E. coli less than 250 CFU/100 ml
Enterococci less than 100 CFU/100 ml

3) Residual Biocide Monitoring

You must conduct monitoring of the vessel ballast water discharge for any residual biocide used in the treatment process. Initial monitoring is 3 times in the first 10 discharge events (not exceeding a 180 day period), thereafter under maintenance monitoring 2 times per year.

Parameters & Limits

Chlorine Dioxide: max.. 0.2 ppm
Chlorine: max. 0.1 ppm
Ozone: maximum 0.1 ppm
Peracetic Acid: max. 0.5 ppm
Hydrogen Peroxide: max. 1 ppm

Exchanging ballast water in a timely, efficient and safe manner is an important aspect of modern marine life, but it should always be monitored effectively.

CMT is offering 3 different Ballast Water Test Kits to suit your needs.

Rapid Ballast Water Test Kit

New

The CMT Rapid Ballast Water Validation Test Kit provides a simple rapid method for determining the efficiency of ballast water treatment systems.

Our validation kit provides ship operators, Port State Control (PSC), and other compliance officers with a simple, effective tool to assess the risk of discharging ballast water.

Complete Solution for Regulatory Compliance

The 2004 BWM Convention guidelines include recommendations on methodologies for sampling and analysis to test for compliance with the convention.

Utilizing three instruments, the CMT **Rapid Ballast Water Test Kit** satisfies the testing protocol for the D1 standard, allows a user to quickly and easily decide if a system is in gross exceedance of the D2 standard, and provides a simple solution to test total residual oxidant levels in chemical disinfection systems.

A salinity refractometer provides a simple test to confirm that an exchange occurred.

A portable, pocket size digital fluorometer tests for photosynthetically active chlorophyll, like that found in living phytoplankton, in less than 3 minutes. This will provide an indication of whether or not the treatment of the ballast water system was effective .

A waterproof colorimeter tests for Total Residual Oxidant (TRO) with a range of 0 to 5 ppm free & total chlorine in less than 3 minutes.

The handheld fluorometer requires no training prior to use - simply place the sample in the cuvette, press “Read” and view the risk of discharge (Fail, High, Low).

Ship operators can easily verify whether the ballast water treatment system has adequately treated water prior to discharge.

Compliance officers can quickly determine whether a ship exceeds D2 standards. In case of positive results further in-depth laboratory analysis can then be performed.

Ballast water treatment system providers rapidly assess treatment system performance during testing.

Ship service providers - diagnose treatment system failures

Ordering Information

WTK-CT-80045
Rapid Ballast Water Test Kit

Salinity Refractometer (salt in seawater)
- Scale Range: 0 - 100 ppt
- Accuracy: +/- 1 ppt

Digital handheld Fluorometer
- Dynamic Range: 3 orders of magn.
- Resolution: 12 bits

Chlorine Colorimeter
- Range: 0 - 5.00 mg/l
- Resolution: 0.01 mg/l
- Accuracy: +/- 0.03

4. SHIPSAFE® Cooling and Boiler Water Test Kits

Engine cooling systems contain carefully blended additives that prevent scale deposits and corrosion of engine waterways. It is very important that the concentration of the additives is maintained at the correct level for optimum protection.

Every industry that operates boiler and cooling water systems – ranging from power plants, vessels or other industrial plants – needs to regularly test the water to analyze a number of parameters. This is imperative as it avoids corrosion and malfunction. CMT offers the ideal solution for all specific requirements.

CMT is dedicated to providing our customers with the most convenient, reliable and secure systems for all analyses purposes. To specifically serve all industries that employ or deal with water testing.

pH / Temp Meter Conductivity / TDS Meter

CMT supply treatment test kits for engine cooling water and steam boiler water.

The kits are very simple to operate and will enable the ships engineer to monitor scale and corrosion inhibitor concentrations. Regular testing will allow rapid corrective action to take place helping you to maintain optimum operating conditions, minimise down-time and reduce energy costs.

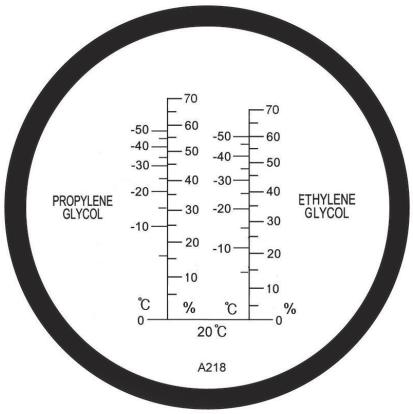
Low and medium pressure steam boilers are treated with special corrosion and scale inhibitors.
It is vitally important to maintain precise levels of these additives to ensure correct and efficient steam generation. Failure to regularly maintain and monitor treatments will inevitable end in system failure and expensive corrective maintenance.

To measure Chloride in cooling water treated with the corrosion inhibitor Glysacorr G-93/94 the standard Chloride test, also from other suppliers, will not work. To specifically serve our customers using Glysacorr G-93/94 as additive, the new **Glysacorr Chloride Test Kit** has been developed.

To measure the level of Glycol in cooling water CMT also provides a **Glycol Refractometer**. The refractometer allows easy tests of the level for Propylene and Ethylene Glycol up to 70% securing a protection down to -50°C.

Your benefits:

- Optimise operating conditions
- Reduce energy costs
- Measure key boiler and cooling water inhibitors
- Simple step-by-step instructions



Ordering Information

WTK-CT-80015
Cooling Water Test Kit

Chloride	20 - 12000 ppm
Nitrite	10 - 2000 ppm
pH Test Strips	4,5 - 10 pH
No. of tests:	100

WTK-CT-80058
Marine Boiler Water Kit

Chloride	20 - 12000 ppm
P-Alkalinity	0 - 2400 ppm
pH Test Strips	7-14 pH
No. of tests:	100

WTK-CT-80059
Marine Boiler & Cooling Water Kit
Combines WTK-CT-80058 & -80015
No. of tests: 100

WTK-CT-80065
CMT Total Hardness LR & HR Drop Test
Range: (0-1200 ppm)

WTK-CT-80064
Glysacorr Chloride Test
Range: (50-300 ppm)

WTK-CT-80017
Glycol Refractometer
Range: 0-70%

WTK-BW-80026
BRIX Refractometer
Range: 0-10 BRIX

WTK-CT-85013
pH Meter

Range:	pH:	-2 - 16
	Temp:	0 - 90°C
Accuracy:		+/- 0.02 pH / 0.3°C
Test time:		< 1 min
Reagents:		non hazardous
Buffer Solution 4.0:		WTK-CT-85014
Buffer Solution 7.0:		WTK-CT-85015
Buffer Solution 10.0:		WTK-CT-85016

Tablet Count Boiler and Cooling Water Test Kit Options

Alternatively to the Drop Tests CMT is also offering tablets tests for boiling and cooling water.

Tablet count methods have been historically used in the marine industry. The tablet count process forces the sample water to change colour based on the number of tablets added.
The value can then be determined on a conversion table based on the number of tablets it takes for the colour to change.

Tablet count methods are classed as hazardous for shipping and less accurate than the recently developed drop test methods. For non-hazardous options please refer to the SHIPSAFE® range of boiler and cooling water test kits.

Ordering Information

WTK-CT-80060
310 Boiler Water Kit
Alkalinity (P) Tablets 250 pc.
Chloride Tablets 250 pc.
pH Test Strips 7-14 100 pc.

WTK-CT-80061
309 Cooling Water Kit
Chloride Tablets 250 pc.
Nitrite No 1 Tablets 100 pc.
Nitrite No 2 Tablets 250 pc.
pH Test Strips 4-10 100 pc.

WTK-CT-80062
313 DEHA Kit
DEHA Test Solution 1 65 ml
DEHA Test Solution 2 30 ml
Comparator Unit

WTK-CT-80063
312 Hydrazine Kit
Hydrazine Test Powder 40 g
Comparator Unit

5. Marine Automatic Fire Sprinkler System Test Kit

New

**The reliability of an automatic fire sprinkler is very important.
To prevent malfunction during an emergency the water inside of the system needs to be monitored to control corrosion and other hazards.**

The IMO has issued revised guidelines (contained in circular MSC.1/CIRC. 1516) for in-service testing of automatic sprinkler and automatic mist systems.

The amended guidelines advise shipowners, operators and system manufacturers to actively monitor and assess the effectiveness of automatic sprinkler and automatic mist systems on a planned periodical basis. Water quality testing should be performed on a quarterly basis and results recorded.

Corrosion can cause major catastrophic problems with these systems, potentially causing system failure and leakage (pin-hole size leaks). We have included within the test kit testing for pH, conductivity

and testing microbiological levels (total count of bacteria & sulphate producing bacteria).

Salt water ingress normally occurs when the system has been used (fresh water) and once depleted is normally by-passed directly using sea water. If this occurs the system is flushed through with fresh water. A chloride test is provided to ensure the sea water is not present which can cause corrosion problems.

Any part of the system may be subjected to freezing temperatures in service. Anti-freeze (mono-ethylene & mono-propylene glycol) is used as standard to protect these systems from freezing. A glycol refractometer is supplied to ensure the systems are being maintained at the correct freeze point or percentage product.

Ordering Information

WTK-CT-80057
Marine Automatic Fire Sprinkler System Test Kit
pH Stick Meter
Conductivity Meter
BT2 Dip Slides (10)
SRB Dip Slides (10)
BC1 Potassium Chromate Indicator (65 ml)
BC2 Chloride HR Titrant (65 ml)
Glycol Refractometer
250 ml Wide Neck HD Bottle

6. Produced Foam Test Kit

New

The CMT Produced Foam Test Kit has been designed for the validation, testing and calibration of produced fire fighting foam induction systems.

It offers fire safety professionals real time analysis so that the systems being tested are managed and calibrated correctly.

Application and Use

It is suitable for testing to the following International Produced Foam Test Standards:

NFPA 11 2002 (paragraphs 10.6.2 and 3)
BS5306

It is also suitable for use with AFFF, Protein and AR Foams.

Fire fighting foam induction systems require regular performance testing and often as a result recalibration.

The **Produced Foam Test Kit** enables systems to be easily calibrated, without the need to send samples

Ordering Information

WTK-CT-80029
Produced Foam Test Kit

7. Scrubber Caustic

New

Both IMO and EU policies require ship operators to reduce the sulphur emissions of their ship operations. Vessels operating in a Sulphur Emission Control Area (SECA) need to use either low sulphur distillate fuels or have an approved exhaust gas treatment system installed onboard to capture sulphur emissions.

When vessels are operating in SECAs, closed loop scrubbing is required. In order to maintain alkaline levels in the scrubbing water, and as either fresh or sea water pH range can be 6.5 - 8.5, for the effective scrubbing sodium hydroxide (NaOH) in a 50% solution is commonly used.

This kit has been developed to simply and quickly allow the crew to sample and analyse the caustic soda during bunkering in order to validate the % solution supplied matches the supply specification and if not to adjust system dosing accordingly or reject delivery.

Ordering Information

WTK-CT-80066
Scrubber Caustic Test Kit

Range	1-50 %

8. CMT Cutting Fluid Test Kit

Cutting fluids are required in metal machining to improve tool life, reduce work piece thermal deformation, enhance surface finish and to flush chips from the cutting zone. These fluids degrade with time due to bacterial growth and contamination with tramp oil. Testing is not just essential, its required!

Health risks exist for lathe operators by both fluid contact (dermatitis) and breathing of the mist / vapour (asthma, extrinsic allergic alveolitis and other breathing problems). Biocidal additives improve the life of the fluid and reduce the hazard to health.

The **Cutting Fluid Test Kits** measure the key parameters necessary to optimise cutting fluid performance and enable enumeration and safe control of microbiological contamination.
The basic kit is supplied with tests for cutting fluid concentration, pH, & water hardness.

Your benefits:

- Compact and portable
- Designed for compliance with Health and Safety legislation
- Simple step-by-step instructions
- Rapid results
- Safely controls microbiological contamination.

A deluxe version, incorporating a dip slide incubator is also available for accurate trend analysis over a number of months.

Ordering Information

WTK-CT-80039
Basic Cutting Fluid Test Kit

RBS Dual Dip Slides (TVC & Yeasts/Moulds)	10
pH Meter	1
Hardness Test Strips	50
Nitrite/Nitrate Test Strips	50
Brix Refractometer	1

WTK-CT-80056
Deluxe Cutting Fluid Test Kit

Same as Basic Test Kit	
Dipslide Incubator	1

Vibration Monitoring

1. Vibration Meter

Bearing problems are the most common cause for machine and plant damage. Slight misalignment or imbalance creates significant greater than expected load for a bearing.

Very often bearing lubrication is found insufficient. All of these factors reduce the service life of bearings. The identification of insufficient lubrication or a source for a bearing damage is no great matter and done in a few minutes.

A detailed problem analysis is important. So it happens that engineers suspect a bearing damage, but gear problems are actually present. The bearings are replaced now, costs are incurred without eliminating the problem. Therefore it is essential to find the cause of the problem.

Just changing a bearing where an imbalance or a misalignment is causing the problem does not solve the problem and the bearing will fail shortly again creating more cost.

Statistics show that insufficient bearing lubrication is the highest cause for most bearing damages. Finding lubrication problems is simple and fast with the CMT vibration and devices. A single measurement of only a few seconds gives information about the lubrication of the bearing. Avoid bearing damage and unnecessary costs without much effort.

What is vibration diagnostics?

Vibration diagnostics is a major part of predictive machine maintenance programs. Vibration diagnostics has over the years proven to be the most effective method for checking “machinery health“.

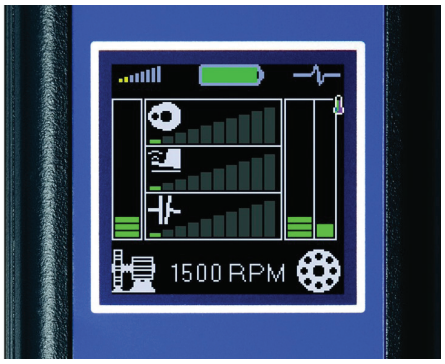
Vibration diagnostics tools are here to help us to predict the machine failures. When predictive maintenance is applied and the machines are checked regularly, machine faults can be discovered at an early stage and appropriate action can be taken. By doing so you can avoid unexpected machine shutdowns and you can prevent replacement of parts which are still in good condition.

CMT supplies a full range of vibration diagnostics equipment, from simple data collectors to advanced vibration analyzers and on-line monitoring systems. The data from the devices can be transferred to Adash software for further analysis.

How does it work?

Running machines generate vibrations, which contain a lot of information about their condition. A vibration meter or analyzer is used to measure this vibration. The sensor needs to be mounted on an appropriate point on the machine (e.g. bearing housing). The instrument measures the vibration signal, tells you the severity of the vibrations and also possible machine faults. The most frequent faults are bearings faults, unbalance, misalignment and looseness.

Vibration Meter Marine



CM Technologies GmbH complements its range of easy to use monitoring tools with the new Vibration Meter Marine.

CMT´s goal is to provide the right solution for the job at hand and is proud to present the new version of their Vibration Meter specifically made for the Marine industry.

Crews of seagoing vessels are under constant stress and the crew changes in fixed intervals. Therefore to successfully use a Vibration Monitoring device onboard it must be easy and intuitive to use. It needs to offer measurement results which the crew can immediately understand and which help the crew with their task of maintaining the vessels machinery. The **Vibration Meter Marine** offers measuring modes exclusively for the Marine industry.

A powerful Expert system provides on the spot usable results without the need to send the information on shore for evaluation, even beginners can use these results right away without any training or knowledge about vibration analysis.

Ordering Information

VIB-CT-50035
CMT Vibration Meter Marine
(Including one acceleration sensor)

VIB-CT-50030
CMT Vibration Meter Marine PLUS
With Memory and PC software
(including one acceleration sensor)

VIB-CT-50017
PELTOR Heavy Duty Headphone
Signal: 8 Ohm / 0.5 W

VIB-CT-50075
Transport Case for VibrationMeter

A lubrication mode allows monitoring and control of lubrication processes of grease lubricated machinery. This ensures proper lubrication and on the other hand spares costs and avoids damages due to over lubrication. Define the values of the shown limits specifically to your set up.

The device offers additionally an integrated IR temperature probe, a stroboscope and flash light which are valuable tools for the day to day work.

The "PLUS" version of the device allows storing or all data into an internal memory and evaluation with an external PC software at a later stage. As part of the delivery of the PLUS version our customers get the powerful data diagnostic software for storage and evaluation of vibration and technical data. Collecting data with the integrated Route function has never been easier. The software allows trending and a deeper analysis on site or at remote locations.

The software allows engineers to plan measurement routes and upload these to the device so that every crew member is able to collect the data.

With the purchase of the **Vibration Meter Marine** you get everything you need to start right away. Scope of delivery includes the device, acceleration sensor, DDS software (PLUS version only) and accessories all in a small rugged case for storage in between usage.

Optional high quality headphones are available for the acoustic evaluation of the bearings. Using the headphones an experienced user is able to spot problems in seconds.

Both experts and users without knowledge of vibration analysis can use the device immediately. For the latter the FASIT-Mode (fault source identification tools) has been introduced for simple and rapid damage analysis. It gives an immediate analysis of the problem according to the "traffic light" principle.

Already at the first measurement simple pictograms show whether a lubrication problem, an unbalance, loose parts or a bearing damage is present.

This single meter undertakes:

- FASIT Expert System
- RMS Vibration Level
- Bearing Lubrication

With this unique measuring device, unskilled users can perform following additional measurements:

- IR-Temperature
- Stroboscope / Speed
- Torch
- Headphones

In addition it incorporates a handy inspection torch.

Your benefits:

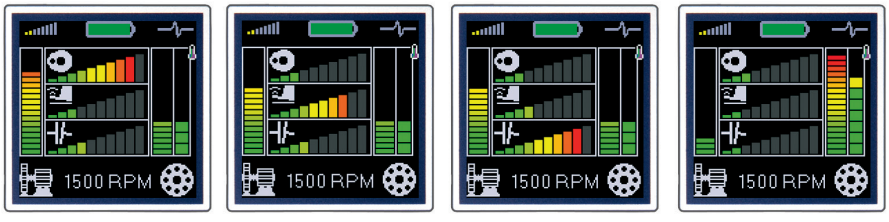
- Specifically made for the needs and challenges of the Marine industry
- Easy & fast trending
- Quick diagnosis of the machines condition via simple traffic lights.
- Optional route measurements with free supplied software customized for the Marine sector
- Easy to understand, easy to use
- All results obtained can be directly used and understood by the user on board.
- Set the measuring limits according to the specific of your machinery

Using Headphones

The device does allow connecting headphones to this instrument and listen to vibration signals. Do not consider this method out of date! If you measure transmissions or slow-running bearings, you will quickly understand its usefulness. With a little bit of experience this will allow you to distinguish good bearings from bad bearings. You can also hear the gear mesh in case of gearboxes. Last but not least this is an excellent method to hear if a bearing is lubricated well. If you use this while lubricating your bearing you know exactly when the bearing is well lubricated. This avoids over or under lubrication which can both be critical for your equipment.

With its excellent attenuation, the The CMT Headphones offers unique acoustic performance in very high noise environments. The proven and durable design ensures high comfort levels, allowing long term use under very tough conditions.

Specification Vibration Meter Marine	
Input	1 x ICP powered accelerometer 100 mV/g (60g)
Display	1.5 inch / 38 mm (128 x 128 pixel) colour OLED display
Output	1 x AC 8 Ohm / 0.5 W signal for external headphones
Velocity	10 - 1000 Hz
Acceleration	500 - 16 000 Hz
Stroboscope	10 - 18000 rpm
Power	2 x AA batteries for 8 hours operation
Operating Temp.	-5 – 50°C
Dimensions	150 x 60 x 35 [mm]
Weight	330 g device including battery / 540 g complete



Unbalance Looseness Misalignment Bearing faults

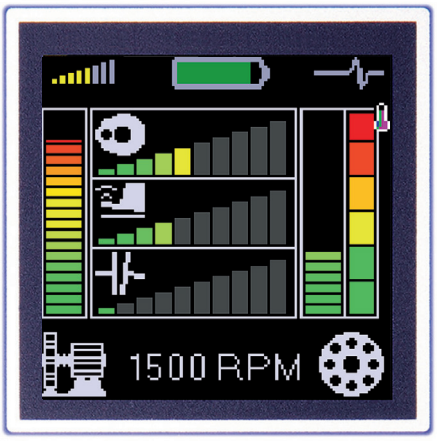
Vibration Meter

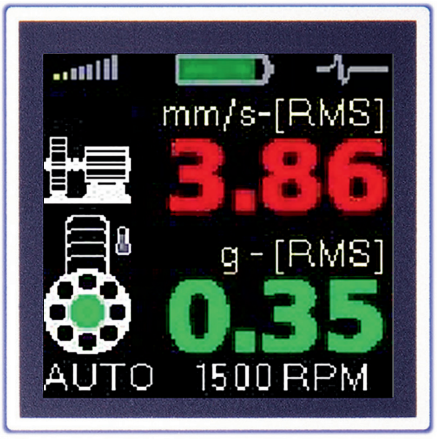
Vibration Meter is a revolutionary instrument with a completely new design! The operation of the instrument is so easy that anybody can learn to use it very quickly. The instrument uses the colours green, yellow and red to display the status. Determination of individual machine or bearings defect types is done directly during operation, without a need to use a computer or software.

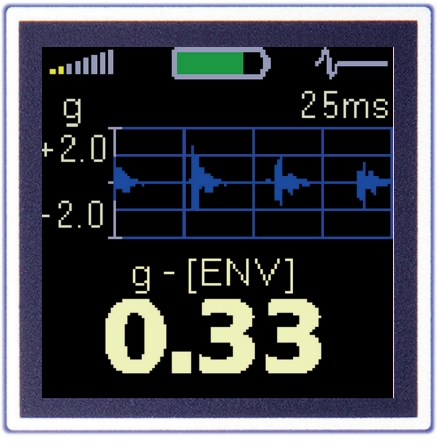
CMT **Vibration Meter** is sold as complete set with a quality accelerometer, coiled cable, magnetic base, transit case and optional headphones. You can connect headphones to this instrument and listen to vibration signals. Do not consider this method out of date! If you measure transmissions or slow-running bearings, you will quickly understand its usefulness.

Instruments in this cost-effective category have been able to measure only total vibration values so far. But the **Vibration Meter** is different. For each point on the machine this device produces many different measurements:

Examples of the different modes:







Unbalance, looseness and misalignment, lubrication and bearing damages

This screen is all you need for a quick diagnosis. It gives an overview by traffic light of unbalance, looseness, misalignment, lubrication condition and damages of the bearing.

RPM is automatically detected and displayed at the bottom of the screen.

This screen has been introduced especially for users with no or limited experience in vibration analysis.

RMS Vibration levels

The device measures the RMS vibration level; and compare with the severity limits of ISO10816-3. Readings changes in Traffic Light colour when an exceeding occurs.

Bearing temperature is measured by infra-red and indicated in traffic light. An overheating of the bearing can be easily identified as a RED bar as shown in the figure (left side). Temperature reading in °C and °F is shown in another screen.

RPM is automatically detected and displayed at the bottom of the screen.

Bearing fault detection

Vibration Meter measures the g-ENV, which represents the condition of the bearing. **Vibration Meter** also display the vibration time signal.

You can visualize the vibration impact due to bearing fault by looking at its time signal. It is useful in differentiating whether the increase in g-ENV is due to bearing fault or just lack of lubrication

Listen to the vibration signal through the audio output is a proven technique for bearing fault detection especially for slow rotating machine.

Ordering Information

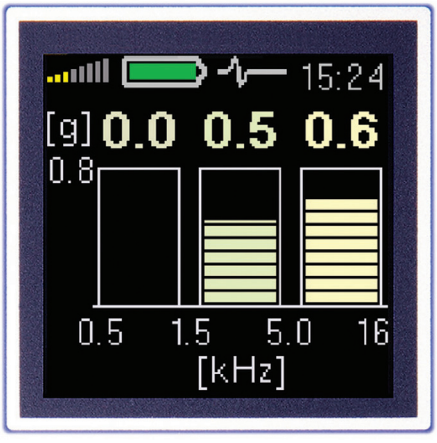
VIB-CT-50001
CMT Vibration Meter
(Including one acceleration sensor)

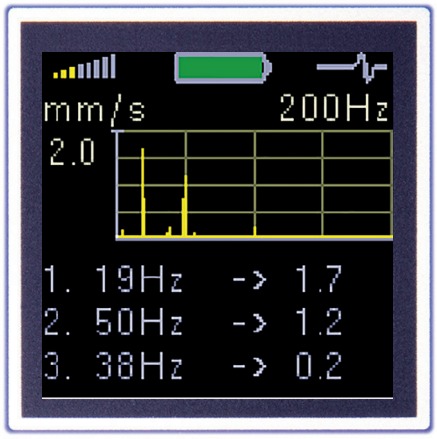
VIB-CT-50022
CMT Vibration Meter PLUS
With Memory and PC software
(including one acceleration sensor)

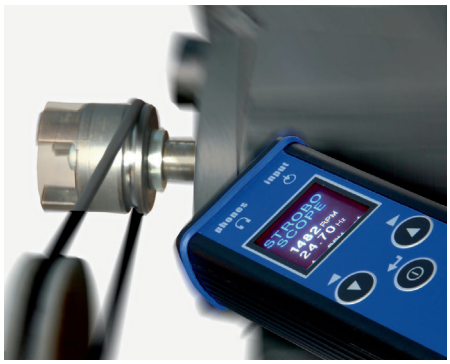
VIB-CT-50031
CMT Vibration Meter Ex
With Memory and PC software
(including one acceleration sensor)

VIB-CT-50017
PELTOR Heavy Duty Headphone
Signal: 8 Ohm / 0.5 W

VIB-CT-50075
Transport Case for VibrationMeter







Vibration Spectrum (FFT)

Vibration Meter measures the FFT spectrum in the range of 0-200 Hz and displays the most three dominates peaks including the velocity value in mm/s. The information is useful for detection of unbalance and looseness.

Stroboscope

The build-in stroboscope inside the **Vibration Meter** represents the unique innovation in the handheld vibration equipment. A high intensity LED is being used.
The stroboscope is very handy for inspection of rotating or moving machinery (belt, fan, coupler…). For example, missing screw can be seen without stopping the machine - can be a big cost saving. The device can automatically detect the rotating speed of the machine and freeze the movement by setting its flashing frequency the same as the rotating parts. Frequency can also be set manually.

The Vibration Meter Plus is a step further in the long term history of the Vibration Meter production at CMT.

It is the same instrument as the standard device but includes on top a memory and an USB connector for data transfer. The measured data can be stored in the device and transferred to a PC.

The **Vibration Meter Plus** can be used as a data collector. Together with the newly developed data acquisition software (DDS) it becomes a really handy tool.

The **Vibration Meter** is a multi-function portable meter that bridges the gap between the basic Vibration meter and advanced FFT data collector / analyser.

It is a complete machine condition monitoring system that gives results without the use of a computer or laptop. It is designed for the technician, engineer and consultant who needs to analyse a rotating machine on-site without investing and carrying expensive instruments to site. Using the CMT **Vibration Meter** cannot be easier!

Both experts and users without knowledge of vibration analysis can use the device immediately. For the latter the FASIT-Mode (fault source identification tools) has been introduced for simple and rapid damage analysis. It gives an immediate analysis of the problem according to the "traffic light" principle.

Already at the first measurement simple pictograms show whether a lubrication problem, an unbalance, loose parts or a bearing damage is present.

This single meter undertakes:

- FASIT Expert System
- RMS Vibration Level
- Three band spectrum
- Time Wave Form
- FFT spectrum

With this unique measuring device, unskilled users can perform following additional measurements:

- IR-Temperature
- Stroboscobe / Speed
- Torch
- Headphones

In addition it incorporates a handy inspection torch.

Specification Vibration Meter

Input	1 x ICP powered accelerometer 100 mV/g (60 g)
Display	1.5 inch / 38 mm (128 x 128 pixel) colour LED display
Output	1 x AC 8 Ohm / 0.5 W signal for external headphones
Memory (PLUS version only)	4 MB (900 measurements of 800 lines or 2048 samples time signal
Interface	USB 2.0 compatible
Velocity	10 - 1000 Hz
Acceleration	500 - 16 000 Hz
Displacement	1 - 1000 Hz
Velocity Spectrum	0 - 200 Hz
Stroboscope	10 - 18000 rpm
Power	2 x AA batteries for 8 hours operation
Operating Temp.	-5 - 50°C
Dimensions	150 x 60 x 35 mm
Weight	330 g device including battery / 540 g complete

The Vibration Meter is now also available in an Ex version. All basic vibrio diagnostic measurements are available.

Overall Values, FFT Spectrum, Time signal, Frequency bands, Route measurement and Expert system. You can listen to the signal with the headphones supplied with every unit.

The **Vibration Meter Ex** communicates with the DDS software, which you can download for free from the website.

The new **Vibration Meter Plus** does measure the same data as the standard **Vibration Meter**.

Vibration Meter Ex - ATEX class	
II	Non-mining
2	Zone 1
G	Gas atmosphere
Ex ib	Principle of protection: Intrinsic Safety En 60079-11, Zone 1
IIC	Gas group - Acetylene, Hydrogen
T4	Temperature class 135°C
Gb	Equipment Protection Level - Zone 1 (high protection)

Velocity [mm/s, ips]:

RMS 10 - 1000 Hz

Peak 10 - 1000 Hz

Spectrum 1 000 Hz 800 lines

Time Waveform 10-1000Hz 2048 samp.

Acceleration [g]:

RMS 500 - 16000 Hz

Peak 500 - 16000 Hz

Spectrum 16000 Hz 800 lines

Time Waveform 1-16000 Hz 2048 lines

Demod RMS 500 - 16000 Hz

Demod Peak 500 - 16000 Hz

Demod Time Waveform 500 - 16000 Hz

Demod Spec. 500 - 16000 Hz 800 lines

Displacement [µm, mil]:

RMS 2 - 100 Hz

0-Peak 2 - 100 Hz

Peak - Peak 2 - 100 Hz

Temperature measurement

0 - 380°C

32 - 716°F

LED Stroboscope

0,17 - 300 Hz (10 - 18000 rpm)

Grease Meter

The Grease Meter is a plant tool used for monitoring and control of the lubrication process. It measures the actual bearing lubrication status and informs the operator when the lubrication state is optimal.

The instrument helps to ensure that Bearings will not be under or over lubricated.

The use of the **Grease Meter** extends the bearings life and avoids wasting lubricant. Headphones can be connected to listen to the bearing condition. The device is simple to operate and also enables you to perform basic measurements and diagnosis of bearing condition.

With the Software provided it is possible to load a measurement route to the device.

The instrument is supplied as a complete measurement kit including an industry standard piezoelectric sensor, magnet and coiled cable for industrial use.

The lubrication status is indicated by traffic light colours:

Lubrication OK

Add grease

Dry bearing

Ordering Information

VIB-CT-50023
Grease Meter
(Including one acceleration sensor and grease gun)

VIB-CT-50024
Standard Grease Gun

VIB-CT-50017
PELTOR Heavy Duty Headphone
Signal: 8 Ohm / 0.5 W

Vibration Analyser VA3Pro

CMT Vibration Analyser VA3Pro is a professional and robust 2 channel Vibration Analyser which is a valuable tool for maintenance engineers for fault diagnosis and data collection.

The **Vibration Meter VA3Pro** is equipped with 2 signal inputs plus 1 tacho / trigger input to measure the speed / rpm. The second signal input offers connectivity to a triaxial sensor allowing to measure all 3 channels simultaneously.

The simple to understand expert system can automatically detect machine faults such as unbalance, looseness, misalignment or bearing faults.

There is a non-contact IR temperature sensor allowing immediate bearing temperature measurement as well as a LED light which can be used as stroboscope or torch.

The **Vibration Meter VA3Pro** has been designed for one-handed operation. With a weight of just 780 g and a battery live time of more than 10 hours of operation, the device is suitable for long route measurement.

The **Vibration Meter VA3Pro** can be configured according your requirements by choosing optional modules.

Optional modules can be purchased at a later stage and downloaded to the instrument without the need of sending the unit back to our factory.

Standard Test Modes:

- Standard Vibration Meter
- Speed / Stroboscope
- Expert System "FASIT" – Fault Source Identification Tool

Optional Test Modes:

- Analyser
- Balancer
- Route Measurement
- Data Recorder
- Run-Up
- Ultrasound

Ordering Information

VIB-CT-50016
Vibration Analyser VA3Pro
(Including one acceleration sensor and a case)

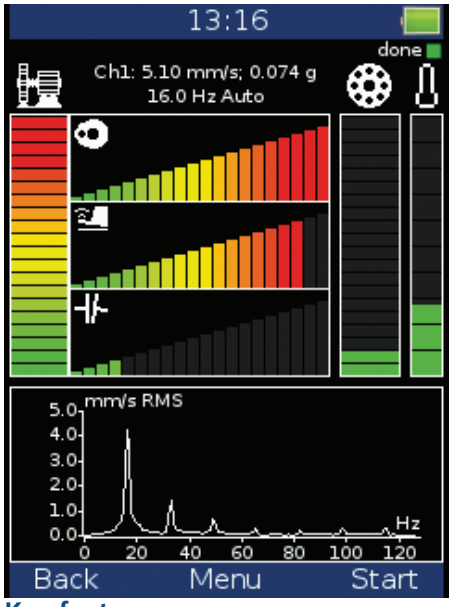
Optional Test Modes

VIB-CT-50025	Analyser Mode
VIB-CT-50026	Route Mode
VIB-CT-50027	Balancer Mode
VIB-CT-50028	Recorder Mode
VIB-CT-50034	Run-Up Mode
VIB-CT-50037	Ultrasound

VIB-CT-50038
US-Microphone

VIB-CT-50006
Laser Tacho Probe

VIB-CT-50040
Silicone Protection Cover for VA3Pro



Key features:

- Expert System “FASIT” - Fault Source Identification Tools
- FFT spectrum with 25,600 lines
- 3 AC/DC + tacho channel Stroboscope / Torch
- IR Temperature Sensor
- USB connection for data transfer
- Colour display 240 x 320
- Route Memory 8 GB

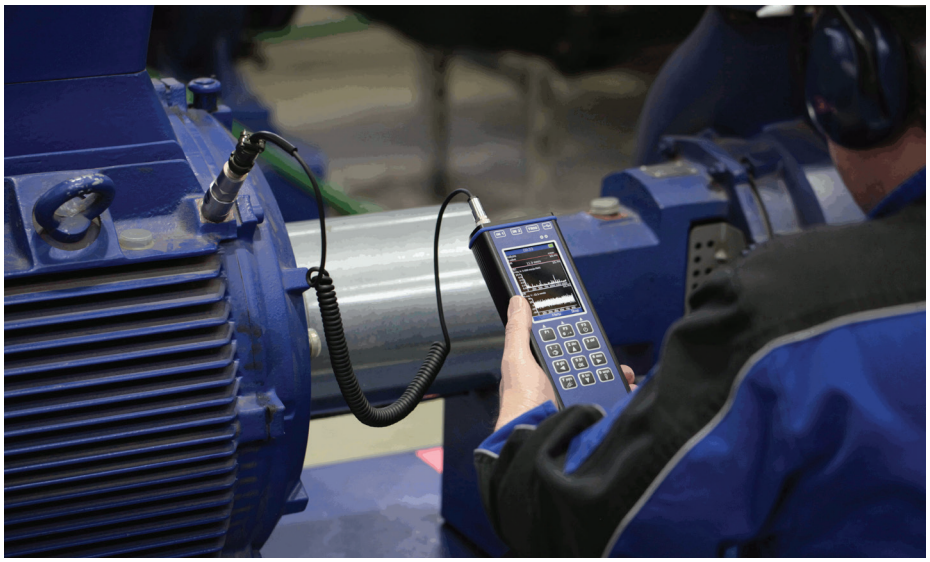
Measurement of 2 channels simultaneously gives a lot of flexibility in fault diagnosis.

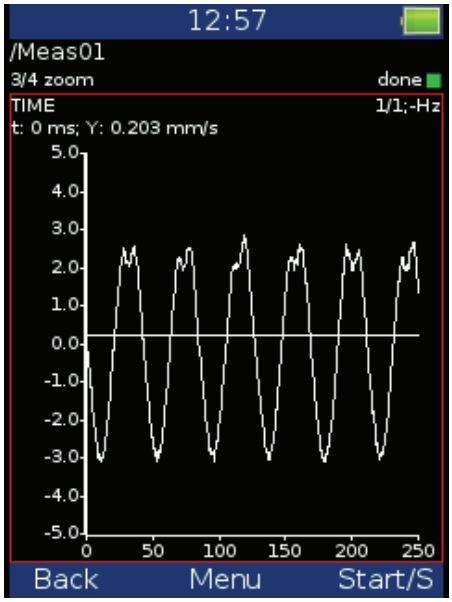
For instance, you can get a good insight of the alignment by measuring the radial and axial vibration across the coupling of the motor and pump.

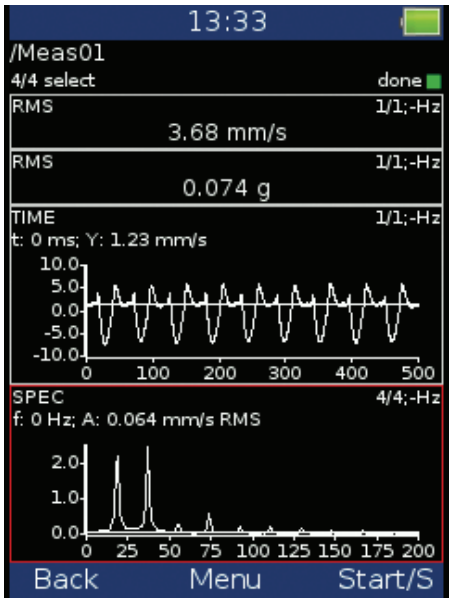
8 GB allows continuous recording of 2 channel raw signals up to 25.6 kHz. Even under pressure, you don’t have to worry that important data could be missed.

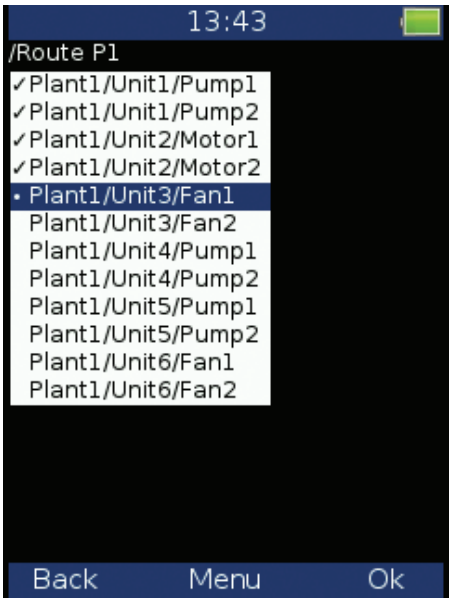
Specification Vibration Analyser VA3Pro

Processor	ARM Cortex A8 / 1GB RAM
Input	2 x ICP powered accelerometer 100 mV/g or 1 x triaxial sensor 2 x DC ± 24 V / 4-20 mA 1 x Tacho / rpm input 0.5 Hz – 1000 Hz
Display	240 x 320 pixel colour TFT display
Memory	8 GB
Interface	USB 3.0, 2.0 compatible
Frequency ranges	0.35 Hz – 25.6 kHz / max sample freq. 65,5 kHz
FFT spectrum lines	25 – 25 600 lines
Cursor	Single, Harmonics, Sidebands
Scaling	Linear and logarithmic, both X and Y axis
Window	Rectangular, Hanning, Exponential, Transient
Stroboscope	60 – 6660 rpm
Power	Li-Ion battery pack, more than 8 hours measurement
Operating Temp.	-10 – 50°C
Dimensions	230 x 82 x 32 mm
Weight	0.78 kg









Vibration Analyser VA5Pro

New

CMT Vibration Analyser 5 is a professional and robust 4 channel Vibration Analyser / Recorder, which is a valuable tool for maintenance engineers for fault diagnosis, balancing and data collection / recording.

The new Pro contains these measurement modes:

- Signal Recorder
- Signal Analyser
- Data Collector (Route measurements)
- Run Up (Coast Down) measurements
- Balancer
- FASIT – Fault Source Identification Tool
- Lubrication Control
- Ultrasonic Mode
- Octave Analysis
- Thermal imaging

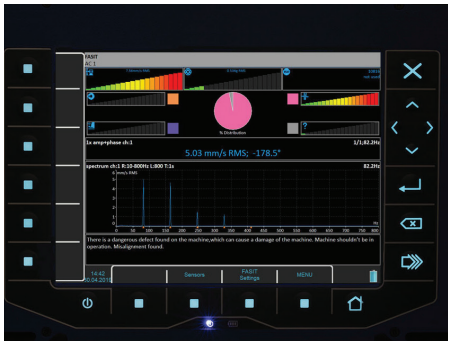
Key features:

- FASIT - Fault Source Identification Tools
- FFT spectrum with 25,600 lines
- 4 AC + tacho + 4 DC channels (temp. pressure...)
- Balancing Advisor helps you with balancing

Measurement of 4 channels simultaneously gives a lot of flexibility in fault diagnosis. For instance, you can get a good insight of the alignment by measuring the radial and axial vibration across the coupling of the motor and pump.

64GB allows 20 hours continuous recording of 4 channel raw signals up to 25.6 kHz. Even under pressure, you don't have to worry that important data could be missed.

Some examples of the different modes:

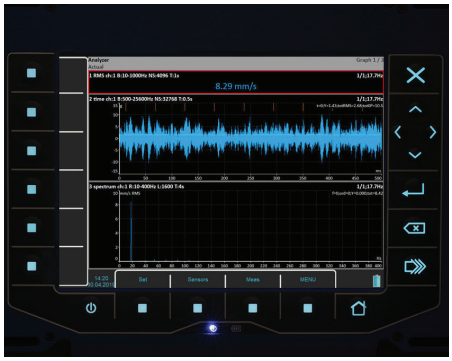


FASIT - Fault Source Identification Tools

FASIT allows immediate assessment of the overall vibration severity according to ISO10816-3 and identification of the following faults using colour scale:

- Bearing fault
- Unbalance
- Misalignment
- Looseness

FASIT is a handy tool for even an experienced vibration analyst.



Simultaneous Measurement

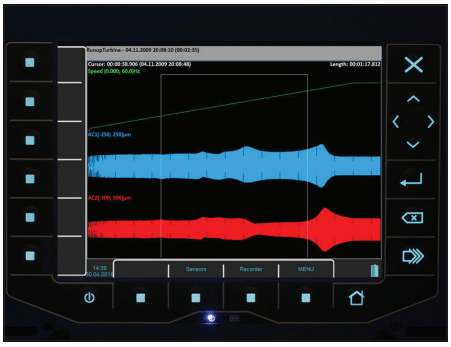
Readings can be taken in parallel for a single measurement point on 4 channels plus the speed probe, which saves time and improves consistency of the gathered data especially when the machine speed or running condition varies with time.

Balancing

Vibration Analyser provides a professional 2-plane balancing function.

The whole balancing process will be on screen guided with easy-to-understand diagrams and instructions.

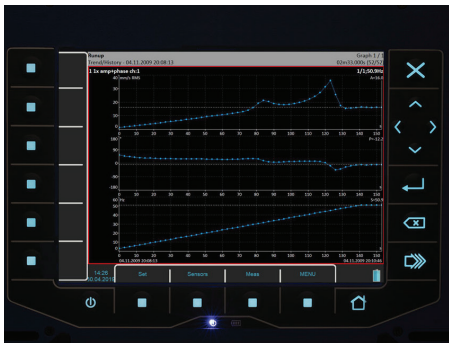
The weights will be automatically splitted and calculated for machinery where available locations for the weights are limited, e.g. a fan.



Data Collector

Vibration Analyser can be used as a Data Collector for routine data collection. Parallel Measurements are performed simultaneously, that reduces the time needed for the data collection at each measurement point. It also improves consistency of the data especially when the speed or process condition of the machine varies with time.

For experienced users, historical data can be downloaded for on-site trending and comparison, so that a diagnosis can be made immediately.



Run-up / Coast Down

Run-up / Coast-down or Vibration Time History (overall & spectrum vs time) can be easily carried out on Vibration Analyser. Raw time data can also be recorded as a backup for critical machinery. 4 DC Process Parameters can be measured at the same time for correlation analysis with vibration readings.

Different graphs are available for run-up / coast-down analysis:
Bode plot (amplitude and phase vs rpm), Nyguist plot, Waterfall plot (vs RPM or Time) or Cascade plot

Specification Vibration Analyser VA5Pro

Processor	Atom 1.9 GHz / 2 GB RAM
Input	4 x ICP powered accelerometer 100 mV/g 4 x DC ± 24 V / 4–20 mA 1 x Tacho / rpm input 0.5 Hz - 1000 Hz
Display	1125 x 800 pixel colour LCD display
Memory (Internal SSD)	64 GB, max 16 GB for one route.
Interface	USB 3.0, 2.0 compatible
Frequency ranges	0.35 Hz – 90 kHz / max sample freq. 196,6 kHz
FFT spectrum lines	100 – 3267800 lines
Cursor	Single, Harmonics, Sidebands
Scaling	Linear and logarithmic, both X and Y axis
Window	Rectangular, Hanning, Exponential, Transient
Order analysis parameters	1/2 – 10th order
Power	Li-Ion battery pack, 8 hours measurement
Operating Temp.	-10 – 50°C
Dimensions & Weight	295 x 230 x 49 mm, 2.0 kg
Camera(s)	5MPx autofocus, thermal imaging camera (optionally)

Ordering Information

VIB-CT-50065
Vibration Analyser VA5Pro
(Including one acceleration sensor and a case)

VIB-CT-50006
Laser Tacho Probe

VIB-CT-50038
US-Microphone

VIB-CT-50066
Transport Case for VA5

VIB-CT-50017
PELTOR Heavy Duty Headphone

VIB-CT-50067
Thermal Imaging Camera

Range:	-10°C ~ 150°C

VIB-CT-50005
Acceleration Sensor Complete

Sensitivity	100 mV/g
Sealing	IP68
Resonance Freq.	30 kHz
Operating Temp.	-55 - 140°C
Connector	MIL2

Pocket Analyser

The Pocket Analyser is a pocket sized 4 channel vibration analyser.

Connect the **Pocket Analyser** to any computer by USB and use the unit for data analysing, collecting and the recording of vibration signals.

The instrument is enhanced by modules for dynamic balancing, measurement of run up and coast down and acoustic measurement mode.

The instrument is equipped with an expert system which automatically detects machinery faults.

The instrument is powered directly by USB connection so no external power is needed.

Ordering Information

VIB-CT-50032
Pocket Analyser
(No sensor included)

VIB-CT-50005
Acceleration Sensor Complete

Sensitivity	100 mV/g
Sealing	IP68
Resonance Freq.	30 kHz
Operating Temp.	-55 - 140°C
Connector	MIL2

VIB-CT-50006
Laser Tacho Probe

VIB-CT-50038
US-Microphone

Specification Pocket Analyser

Input	4 x ICP powered accelerometer 100 mV/g 4 x DC ± 24 V / 4–20 mA 1 x Tacho / rpm input 0.5 Hz - 1000 Hz
Interface	USB 3.0, 2.0 compatible
Frequency ranges	0.35 Hz – 90 kHz
FFT spectrum lines	25 – 3267800 lines
Power	5V over USB
Operating Temp.	-10 – 50°C
Dimension	110 x 115 x 35 mm
Weight	0.25 kg

Connect the CMT **Pocket Analyser** to your laptop or PC and get all functions of 4 channel Vibration Analyser VA5Pro.

The free download of the Virtual Unit software enables you to perform all functions of the analyzer on your computer.

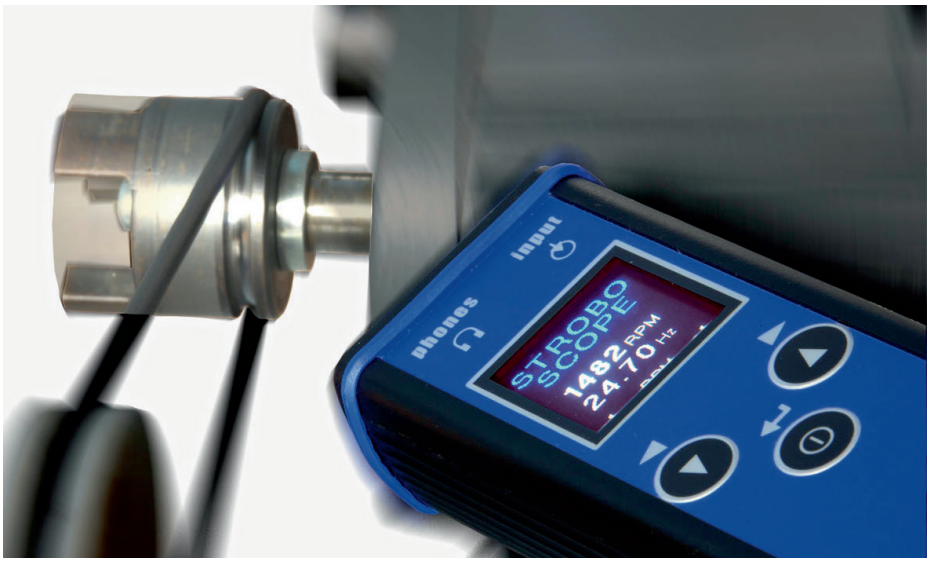
The pocket size 4 channel Vibration Analyzer provides the following input channels:

- 4 AC, ICP® (On/Off),
- 4 DC,
- 1 TACHO

Strobo

The build-in stroboscope inside the Vibration Meter represents the unique innovation in the handheld vibration equipment. A high intensity LED is being used.

The **Stroboscope** is very handy for inspection of rotating or moving machinery (belt, fan, coupler…). For example, missing screw can be seen without stopping the machine - can be a big cost saving. The device can automatically detect the rotating speed of the machine and freeze the movement by setting its flashing frequency the same as the rotating parts. Frequency can also be set manually.



Stroboscope enables to ostensibly stop rotating or generally periodic (reciprocating) motion of a machine. It allows also to find out the speed of rotation or to perform synchronized measurements without having to use reflective markers on the shaft.
The **Stroboscope** uses three ultra-bright LEDs with optical system as a source of flashes. The device is equipped with a colour graphic display and 3 operational buttons.

Operation is very easy and intuitive. Two standard or rechargeable AA batteries are used for powering. The **Stroboscope** can be used also as a tachometer by connecting an external speed probe.

Ordering Information

VIB-CT-50053
Strobo

VIB Simulator

The **VIB Simulator** device behaves like a standard ICP® acceleration sensor with a sensitivity of 100 mV/g. The unit generates precise amplitude levels on 80 Hz and 8 kHz frequencies. The **Vib Simulator** enables the user to check measurement precision and functionality of analyzers, vibration meters, protection and monitoring systems.

Key features:

- Simulates the acceleration sensor 100 mV/g
- Two output connectors - MIL, BNC
- Quick check of cables and devices

Ordering Information

VIB-CT-50042
VIB Simulator
Simulates one standard sensor 100 mV/g

3. Vibration Monitor

The series of Vibration Monitors are powerful online monitoring and diagnostics systems. They have been designed to increase the reliability of strategic rotating machinery.

The Vibration Monitor systems can operate as an independent monitoring system or they can be used as extension of an existing protection system.

The **Vibration Monitor** software is designed for the control of the data collection and archiving. Setting up the program allows to easily configure the required measurements.

The software enables the real time online display of the current measurement values on the predefined channels. The DDS software system is designed for the follow up processing and archiving of all the collected data.

The setting and control of all **Vibration Monitors** is done in DDS software. The setting has never been easier. The only thing which needs to be done is to create the tree of machines, measurement points,required readings and assign them to appropriate channels. Then you just press START and the readings are done automatically.

Data acquisition

Data acquisition can be done conventional with fixed defined time intervals. Some important value changes in between those measurements can been lost with this method. Every measured data is saved, so the values with no information (same value as before) are saved and take valuable space.

To improve this we have developed a new Adaptive Algorithm of Data Acquisition. Data are measured continuously, so nothing can be missed out. But only selected values are saved. If the measured value is not changing significantly, it is not saved. Adaptive Algorithm selects which data to save and which not.

Single **Vibration Monitor** modules can be easily composed together creating a wide channel system. Different versions of the Vibration Monitors can be mixed together in one system all controlled by one software on one computer.

There are 3 version of the Vibration Monitor available.

- A3800 Vibration Monitor Compact
- A3716 Vibration Monitor Standard
- A3716 Vibration Monitor Plus

The **A3800 Vibration Monitor Compact** is a 4 to 16 channel on-line monitoring and diagnostic system. The compact size enables it to be placed directly on the DIN rail in a switchboard.

The unit has an optional number of AC and DC input channels - 4, 8, 12 or 16. AC and DC channels are separate. This means that the 4-channel configuration allows you to connect 4 AC and 4 DC channels. Depending on the number of active input channels, it uses 1 - 4 independent TACHO inputs.

The number of active channels can be extended by purchasing additional licenses. Each group of 4 channels allows fully simultaneous measurements. Groups of 4 input channels are switched via an internal multiplexer.

The Vibration Monitor Compact is available with an optional WiFi module.

The **Vibration Monitor Standard** and **Plus** system contains 16 AC, 16 DC and 4 TACHO inputs. All channels are measured simultaneously.

The Standard version only needs 2 Slots (90 mm height) in your 19" aluminium rack while the Plus version will need 3 Slots (135 mm height). The Compact version is placed directly on the DIN rail in the switchboard.

The plus version also offers additional connections like 16 relay outputs, 16 (4-20 mA) current loops and 16 BNC outputs.

Vibration Monitor Compact

Ordering Information

VIB-CT-50044
Vibration Monitor Plus (3U)
16 channel synchronous measurement

VIB-CT-50003
Vibration Monitor Standard (2U)
16 channel synchronous measurement

VIB-CT-50056
Vibration Monitor Compact
4 channel synchronous measurement
extendable to 4x4 channel multiplex

VIB-CT-50057
Vibration Monitor Compact License
(licence for additional 4 channels)

VIB-CT-50058
Vibration Monitor Compact WiFi Module
WiFi Standard 802.11b/g/n

VIB-CT-50006
Laser Tacho Probe

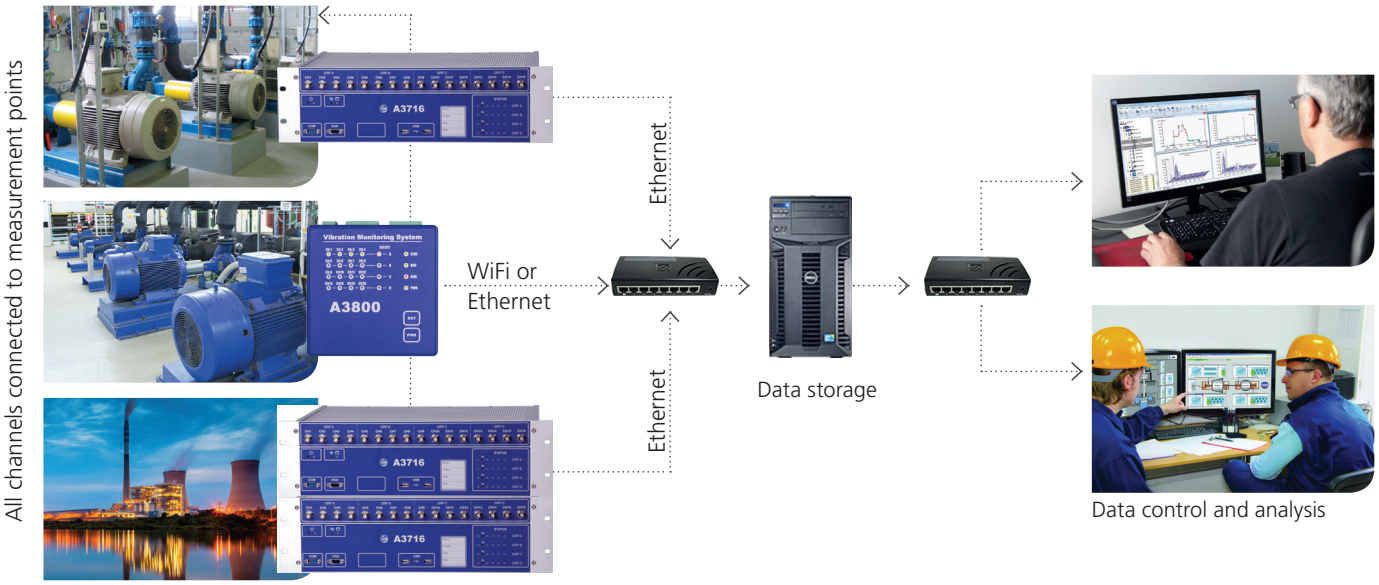
SEN-CT-16910
Inductive Tacho Sensor

VIB-CT-50059
Data Manager
Setup of Online Systems

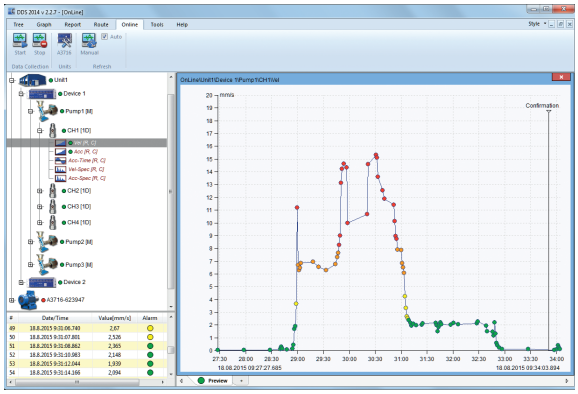
Vibration Monitor Plus (3U)

Vibration Monitor Standard (2U)

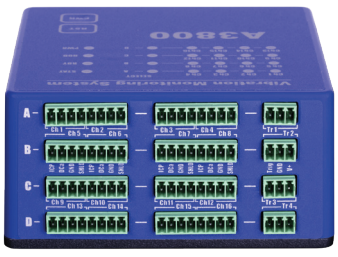
APPLICATION SCHEME OF VIBRATION MONITOR UNITS



SET UP AND CONTROL



- The set up and control of the Online units is done by the Data Manager. The set up has never been easier. Storage of data and evaluation is handled with the DDS software.
- The new data acquisition control system was developed for the Vibration Monitor. Now the unit reads the vibration continuously, not only at predefined time intervals. The adaptive algorithm saves the readings to the database as needed.
- The Vibration Monitor unit continuously monitors the required machines and adaptively saves the readings to the data storage computer. The data is accessible from various workstations for control and analysis.
- The great advantage of the DDS software is its very easy set-up. There is no difficult installation of the server anymore and no complicated set-up of parameters. The demands for transfer and data storage are minimized.



Vibration Monitor Compact - top

Vibration Monitor Compact - bottom

Vibration Monitor Standard rack mounted

Vibration Monitor Compact WiFi Module

Key Features VM Compact

- Optional number of input channels
- 4 – 16 channels AC
- 4 – 16 channels DC
- 1 – 4 TACHO inputs
- Adaptive algorithm of data acquisition
- Compact size, DIN rail mounting

Key Features VM Standard / Plus

- 16 x 4-20 mA (Plus)
- 16 channels AC
- 16 channels DC
- 4 TACHO inputs
- 16 BNC buffered outputs of signals from sensors (plus version only)
- 16 programmable relays outputs (plus version only)
- Adaptive algorithm of data acquisition

	Vibration Monitor Plus	Vibration Monitor Std.	Vibration Monitor Compact
Dynamic Input Channels (AC)			
Number of synchronous channels:	16 AC		4 x 4 AC
Frequency range:	90 kHz (196.6 kHz sampling frequency)		25,6 kHz (65,5 kHz sampl.)
Input range:	+/- 12 V (only one range, no gains)		
Measurement timing:	Fully synchronous 16 channel		Fully synchronous 4 channel
A/D Resolution / dynamic range:	24 bit input, 64 bit double floating point / 120 dB		
Channel configuration:	Voltage or ICP (individually for every channel) - 100 kOhm		
Input type / accuracy:	Acceleration, velocity, displacement, / < 0.5%		
High pass filter:	1 Hz -12.8 kHz (user definition)		
Low pass filter:	25 Hz -25.6 kHz (user definition)		
RPM Input Channels			
Number:	4 independent rpm inputs		1 to 4
Speed range / accuracy:	0,8 Hz - 1000 Hz / < 0.5%		
Input range / impedance:	+ 10 V (only one range, no gains) / 80 kOhm		
Trigger level:	0.1 -9.9 V, user defined / positive or negative		
Static Input Channels (DC)			
Number:	16 DC		4 / 8 / 12 / 16 DC
Input range:	+/- 24 V or 4-20 mA		
Input impedance:	100 kOhm (VDC), 250 Ohm (mADC)		
A/D Resolution / accuracy:	12 bit input / 0.1% fsd		
Additional In- and Output Channels			
16 x Current loops	4 – 20 mA current outputs	---	---
16 x Relay outputs (NO,COM,NC)	Contains relay clamps	---	---
16 x BNC sensor signal on front	Dynamic input	---	---
4 x power output	2 x 5V / 1A and 2 x 12V / 1A	---	---
8 x Binary inputs	Logical inputs states 0 or 1	---	---
General			
Processor:	Intel Core2 - 2.5 GHz		Intel Atom E3815 - 1.46 GHz
RAM:	4 GB		4 GB
Internal data disk:	SSD 128 GB		SSD 32 GB
Power supply:	AC 110-240 V, 45-65 Hz		DC 12 V
Operating temperature:	-10°C - +50°C, 15°F - 120°F		
EMC:	CE tested		
Dimensions (in mm):	430 x 360 x 135	430 x 360 x 90	117 x 117 x 58
Weight:	6,2 kg	4,7 kg	0,8 kg
Measurement Functions			
Triggering:	Free run / impulse / external (voltage) (0,8-1000 Hz)		
Data acquisition:	Overall values / time signal / real-time FFT / envelope demodulation / ACMT low speed bearing measurement, order analysis / user band pass analysis / RPM measurement / DC measurement / orbit measurement / speed measurement		
Frequency ranges:	Max. 25,600 kHz (65,5 kHz sampling)		
FFT spectrum lines:	100 - 25600 lines		
Communications			
Interface:	Ethernet 1GB RJ45		
Output (monitor):	VGA (1 x front / 1 x rear)		HDMI
USB (keyboard and mouse)	2 x front / 2 x rear		2 x
COM Port	RS 232 1 x front / 1 x rear		---

4. Software

Data Diagnostic Software

The vibration analysis software DDS is a powerful tool for storage and evaluation of vibration and technical diagnostics data. It allows the user to work with data collected by portable data collectors and online systems.

The full version includes all functions necessary for data transfer, evaluation, analysis and data storage. Using standard Microsoft OS logic the program is easy to understand and operate.

The common database for portable and on-line units is a unique feature of the **DDS**.

Optional instrument interfaces allow the user to connect all measuring instruments in a single database system.

This feature saves money and time. The DDS system also fully supports route measurements. The database of the **DDS** system uses SQL and ODBC standards to process data. It can also work with an SQLite database for customers who do not want to use MS SQL Databasis.

It is an open system which can receive and send information to other information systems.

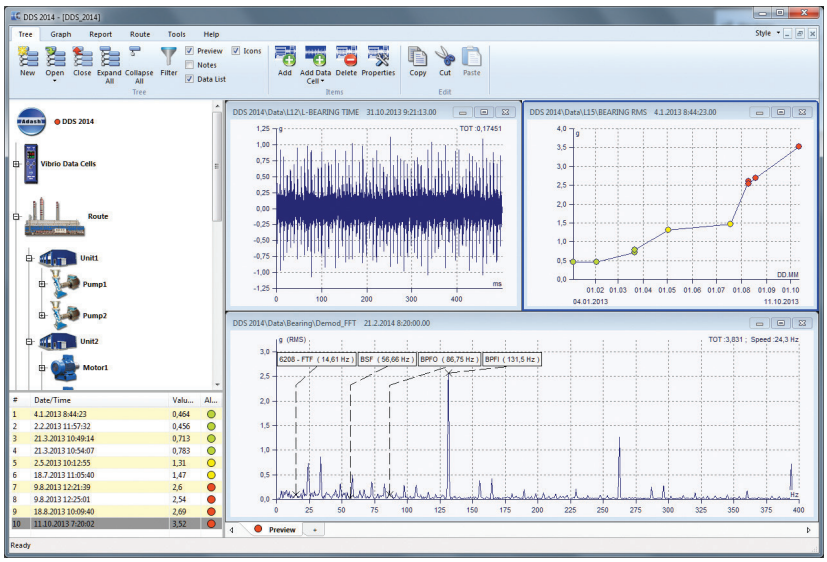
The **DDS** system fulfils all network operation requirements. Several users at the same time may work with one database.

Output reports, data communication, a fast processing of output messages or reports were among the basic requirements imposed on **DDS**.

Ordering Information

VIB-CT-50004
DDS Data Diagnostic Software
(Full access / no limits)

VIB-CT-50045
DDS Data Diagnostic View Software
(No changes of the tree)



Different versions of the DDS-Software:

DDS

- Create all possible data cells
- Unlimited database size and numbers of databases
- Dongle key required.

DDS View

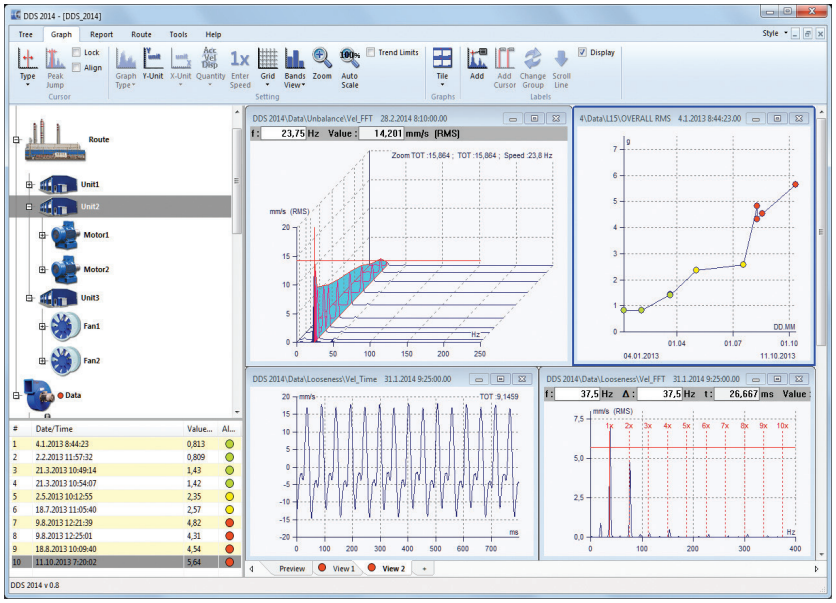
- Open and view all databases or data from all devices
- Unlimited database size and number
- No editing of tree items or data
- Dongle key required.

DDS Free

- Create only selected measurement types (all Vibration Meter measurement types)
- 200 MB limited database size
- Only one database

DDS Data Diagnostic Software

- Free update for new versions
- Routes and Tree concept
- Including Bearing database
- Aligned cursors in graph view
- No service database. All data are stored in one database
- Can be used with all devices.
- Free version available for Vibration Meter and Vibration Analyser VA3 (limited functions)



Animated Deflection Shapes Software

The Animated Deflection Shapes software is based on the method of operating deflection shapes.

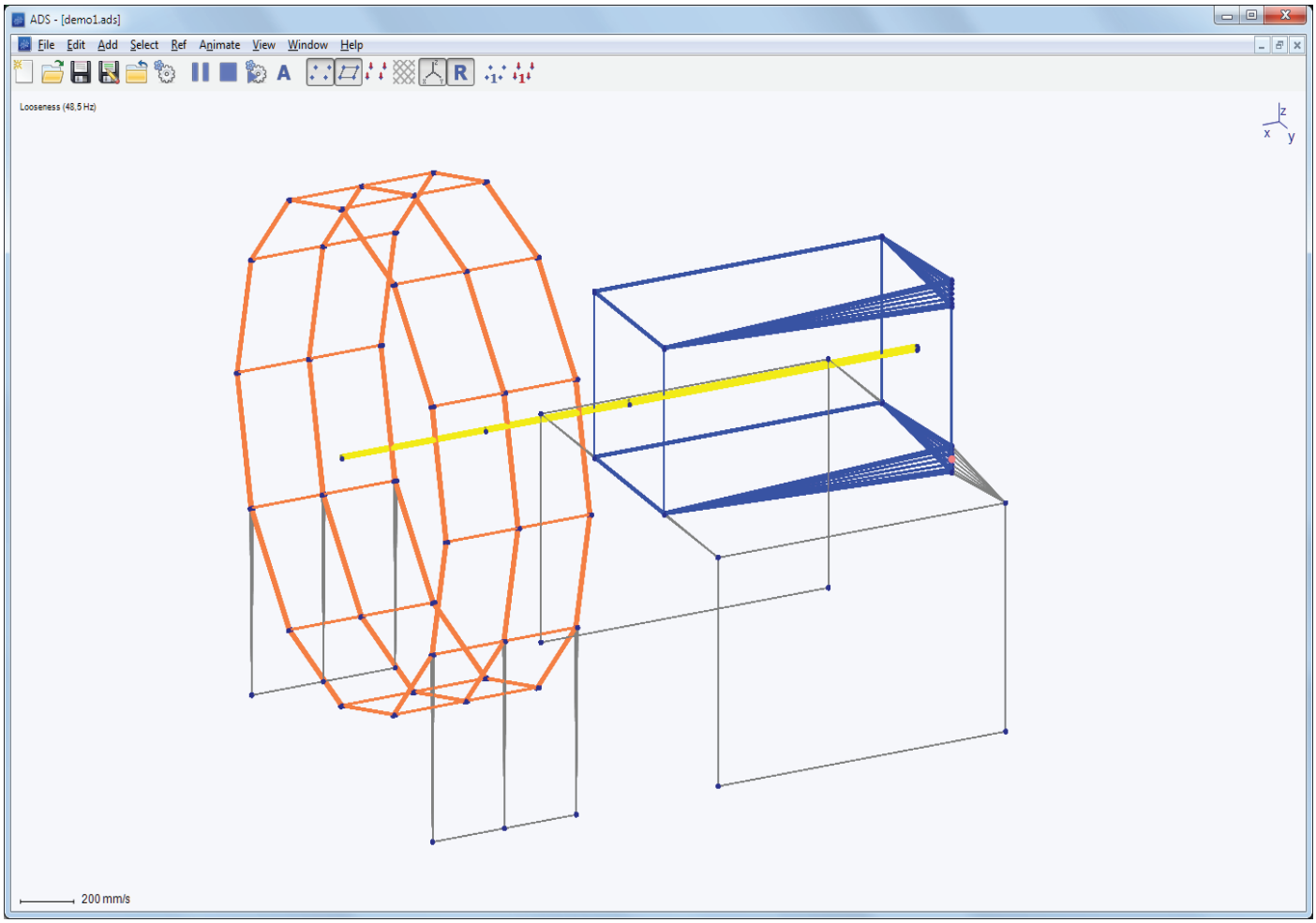
This means that we visualize the vibrations of the machine by animation. During the animation the vibration movement is slowed down to very low frequency and the amplitude of the motion is increased so we can see the vibration.

It is a combination of vibration measurement and software processing.

The output of the method is vibration movement animation on one forcing frequency or on multiple forcing frequencies. The output of the method is easily understandable for everybody.

Ordering Information

VIB-CT-50033
ADS Animated Deflection Shapes Software



5. Spares and Accessories

Sensor, Cables and Connectors

Our range of AC 100 mV/g accelerometers is designed for use with all types of data collectors and online systems using two-wire constant current method of drive.

The range includes standard, high performance premium accelerometers, each manufactured to the highest ISO standards and backed by our outstanding technical customer support services.

Options include sensitivities of standard 100 mV/g, or choose from: 10 mV/g, 30 mV/g, 50 mV/g, 250 mV/g or 500 mV/g.

The complete acceleration sensors do come with sensor, coiled cable and magnet since this is the most common combination for data collectors.

Acceleration Sensor Complete

Acceleration Sensor Single

US-Microphone

Laser Tacho Probe

Ordering Information

VIB-CT-50047
Acceleration Sensor Complete push /pull
(Including spiral cable and magnet base)

Sensitivity	100 mV/g
Resonance Freq.	30 kHz
Operating Temp.	-55 - 140°C
Connector	push / pull

VIB-CT-50005
Acceleration Sensor Complete binder
(Including spiral cable and magnet base)

Sensitivity	100 mV/g
Resonance Freq.	30 kHz
Operating Temp.	-55 - 140°C
Connector	Binder 712

VIB-CT-50012
Acceleration Sensor Single

Sensitivity	100 mV/g
Sealing	IP68
Resonance Freq.	30 kHz
Operating Temp.	-55 - 140°C
Connector	MIL2
Mounting Thread	1/4"-28 UNF female

VIB-CT-50015
MIL2 Connector for Acceleration Sensor

VIB-CT-50038
US-Microphone
Option for Vibration Analyser VA3 & VA4

VIB-CT-50006
Laser Tacho Probe
Option for Vibration Analyser VA3 & VA4
Option for Vibration Monitor

VIB-CT-50009
5 m Extension Cable for Sensor
Push / pull or Binder 712

VIB-CT-50010
10 m Extension Cable for Sensor
Push / pull or Binder 712

Quick Connection Box

The Connection Box is used as a terminal to collect the signals from multiple channels and to supply them for external readings.

There is no need to check on every measurement point. Just connect your sensors to the Quick Connection Box and you can take all measurements at the box.
Easily switch from one Sensor to the next.

This high quality product is made from stainless steel and is IP 66 certified. That makes it perfect for the use on board of a vessel.

The Quick Connection Box is compatible with all of CMT's vibration devices. There are multiple output options available on request.

Key features:

- Provides a terminal to take readings from accelerometers via a portable data-collector
- Multiple outputs via multiple connectors
- Compatible with all of CMT's vibration devices
- IP66 certified
- Intrinsically safe version available on request

Specifications

Inputs	Via accelerometer
Single input M12	ø3.5-7 mm cable
Single input M20	ø7-13 mm multicore cable
Output	BNC as standard
Material	304 Stainless Steel
Termination	Klippon Type
EMC	EN61326-1:2013
Sealing	IP66

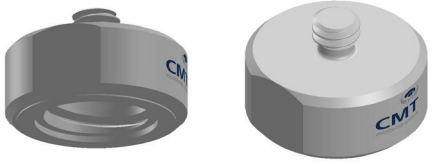
Ordering Information

VIB-CT-50055
Quick Connection Box

Sensor Bases & Magnets

Magnet - Pole Piece

Magnet - Flat Face



Quick Fit Base for Sensor

As a standard connection to achieve reliable results it is intended to use a Measuring Pad on the machine with the magnet mounted to the sensor.

CMT provides two different magnets for curved and flat surfaces.

The most optimal measuring results will be achieved with the newly designed CMT Quick Fit connection. This requires one Quick Fit Base attached to the sensor and on each measuring point a Quick Fit Measuring Pad which is also protected with a yellow cap while it is not in use.

Permanently installed sensors should have a bolt-on connection using the measuring pad with a stud.

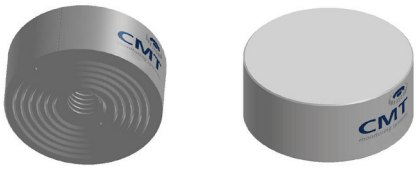
Ordering Information

VIB-CT-50029
Magnet - Pole Piece
Stud for Sensor 1/4"-28 UNF male
Diameter / Height: 25 /18 mm
Pull Strength: 20 kg

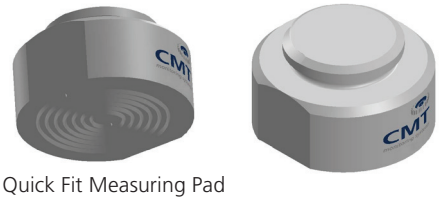
VIB-CT-50021
Magnet - Flat Face
Stud for Sensor 1/4"-28 UNF male
Diameter / Height: 30 /10 mm
Pull Strength: 25 kg

VIB-CT-50048
Quick Fit Base for Sensor
Mounting Thread quick fit
Stud for Sensor 1/4"-28 UNF male
Diameter / Height: 24 /10 mm
Wrench size: 22 mm

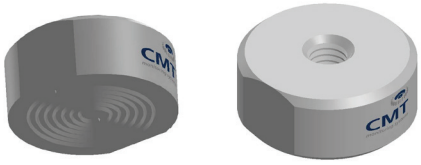
Measuring Pads



Measuring Pad for Magnet



Quick Fit Measuring Pad



Measuring Pad for Studs

To achieve a comparable measuring trend it is recommended to stick to the same routine at every measurement.

To help with consistent measurements CMT is offering Measurement Pads.

The Measuring Pads are glued on the machine to guarantee that the same measuring spot is being used at every measurement.

Most important for good results is a tight and firm connection between sensor and machine. The established best practice is to use CMT Measuring Pads.

The Measuring Pads are equipped with a yellow protection cap for easy recognition and protection against any dirt or paint.

CMT uses specially packed rapid curing synthetic metal glue to permanently mount measuring pads on metal surfaces. Simple hand mixing ensures activation reaction between the concentrically packed components.

All loose material, rust and surface contaminants, including existing coatings, must be removed and the surface roughened by using an angle grinder etc.

Ordering Information

VIB-CT-50051
Measuring Pad for Magnet (10)
Flat surface
(Including protection cap)
Diameter / Height: 24 /10 mm

VIB-CT-50050
Quick Fit Measuring Pad (10)
Mounting Thread quick fit
(Including protection cap)
Diameter / Height: 24/10 mm
Wrench size: 22 mm

VIB-CT-50011
Measuring Pad for Stud (10)
(Recommended for permanent installation)
Mounting Thread M6 x 1 mm
Diameter / Height: 24 /10 mm
Wrench size: 22 mm

VIB-CT-50052
Screw Studs (10)
Threads: M6 x 1 / 1/4”-28 UNF

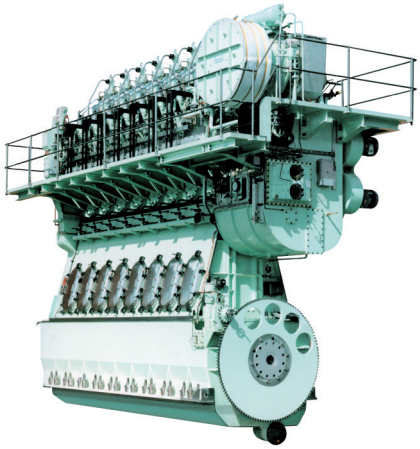
VIB-CT-50018
Epoxy Metal Glue for Measuring Pads
Drying time: 2 hours at 20°C
Max. Temp: 120°C
Handling time:
Capacity: 20 - 30 pads

Performance and Efficiency Monitoring

Diesel Performance Monitoring

Sea going vessels require large amounts of fuel to operate. Therefore diesel engine performance is paramount to a ships owner's bottom line. Most marine diesel engines operate on lower-quality fuels that can cause ignition delays and incomplete combustion.

CMT's Diesel Performance Analysers can provide early detection of worn or damaged engine components such as piston ring leakage, burnt piston crown, exhaust valve leakage and much more. It also ensures that the engine is well balanced and the injection timing is correct. An optional feature is an acoustic emission sensor that measures fuel injection without penetrating the fuel system. This option delivers enhanced engine performance by utilizing some of the latest technological innovations designed specifically for marine engines.



CMT provides five different systems:

- Peak Pressure Indicator: Easy, simple and efficient tool to measure peak pressure.
- PREMET M: Modern economic and easy to use device with all features needed.
- PREMET X: Ultra accurate device with a large colour display and advanced connectivity.
- PREMET Online Single Sensor: Similar to the PREMET X functionality but permanently wired up always ready to take a measurement.
- PREMET Online 24/7: Measures continuously the performance of the main engine so will not miss any problem.

Your benefits:

- Reduced fuel consumption
- Well balanced engine
- Correct ignition timing
- Overload protection
- Improved maintenance efficiency
- Reduced spare parts purchases
- Reduced emissions

1. Mechanical Peak Pressure Indicator

The CMT Peak Pressure Indicator is an easy, fast and cost effective way to maintain your diesel engines.

It measures the maximal firing pressure and the compression pressure of two and four stroke combustion engines. It helps balancing and optimising your engine and with that you will be able to make the most out of your engine and fuel.

By cutting the fuel for one cylinder for a short time you can easily detect any possible blow by to avoid unwanted loss of energy.

Optimising your engine cannot be easier with the help of the CMT **Peak Pressure Indicator**.

We have designed the new CMT **Peak Pressure Indicator** with the engineer on site in mind. It has been designed for easy operation and to protect its user in case of excessive cylinder pressure.

A safety glass gauge and protection by a blow out back wall are just two examples for our features to avoid accidents during the usage.

Every single device will be tested and calibrated according to our ISO 9001 quality standards and will be supplied with a calibration certificate proving the accuracy of the device.

Your benefits:

- Prevents unbalanced peak pressure
- Detects blowbys
- Helps to avoid uncontrolled vibration
- Prevents loss of efficiency
- High accuracy at all speeds and pressure ranges
- Extremely robust
- Steel-gauge in safety construction

Ordering Information

Peak Pressure Indicator Types:

DPA-CT-00140
Peak Pressure Indicator 140
Range: 0-140 bar

DPA-CT-00180
Peak Pressure Indicator 180
Range: 0-180 bar

DPA-CT-00220
Peak Pressure Indicator 220
Range: 0-220 bar

DPA-CT-00250
Peak Pressure Indicator 250
Range: 0-250 bar

DPA-CT-02000
Peak Pressure Indicator 2000
Double Scale
Range: 0-150 bar
0-2000 Psi

DPA-CT-03000
Peak Pressure Indicator 3000
Double Scale
Range: 0-225 bar
0-3000 Psi

DPA-CT-12116
Spare part set for Peak Pressure Indicator

2. PREMET® M

New

Newly developed and part of CMT´s modern range of PREMET® diesel performance analysers the PREMET® M is the way to go if you are looking for an economic approach to monitor your engines without sacrificing quality and accuracy. Brand new technologies give the user an unparalleled accuracy and will ensure you are getting results you can act on. Designed by marine engineers to be used from marine engineers the PREMET® M helps balancing cylinder load, optimise injection timing and detect worn or damaged engine components and thus reducing the engine's operating cost.

Balancing the cylinder load helps extend engine life, increases efficiency, and reduces emissions to assist with environmental compliance.

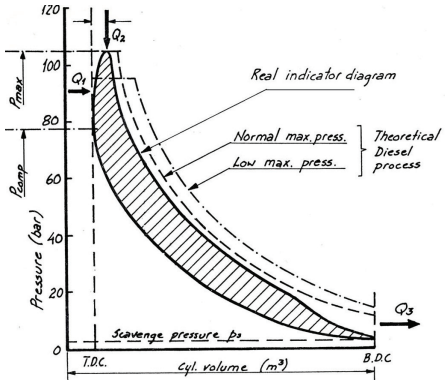
PREMET® M with Sensor

Proper ignition timing reduces exhaust gas temperature and the rate of excess carbon build-up. Tuning the engine may reduce specific fuel oil consumption (SFOC). For each degree that the ignition is retarded SFOC increases by approximately 2%. The PREMET® M may protect against costly downtime by implementing predictive maintenance. Major defects can be easily detected. Engine maintenance can be planned, thus saving in parts and labor by changing engine parts based on need, not on timed intervals.

The PREMET® M has a rugged housing and uses a Kistler PiezoSMART pressure sensor of latest design which is being connected to the indicator valve of the cylinder for a measurement. 4-stroke engines can be measured without pick up with high accuracy but to achieve an even higher accuracy a pick up can be used. For the measurement of 2-stroke engines a pair of pick up is available as optional extra. The integrated compensation of torsional vibrations enables an unparalleled accuracy when measuring on 2-stroke engines.

The PREMET® M is compact, easy to use and very intuitive. Data is being exported via USB and can be analyzed further with the software supplied together with the device. For personnel managing multiple vessels CMT offers a Fleet Management Software.

The non-volatile memory stores up to 18 engine records or up to 125 cylinders. The angle precision of the PREMET® M is 0.17 deg. The max. cylinder pressure the sensor can be used with is 350 bar. CM Technologies GmbH offers a measurement evaluation service to help you getting the most out of your CMT instrument. Also individual training courses can be arranged either at CMT, at your office or even on board.



Your Benefits

- Shock prove protector available
- Newly designed using up to date technology
- New analysis software
- Fleet Management software available
- Rugged design for onboard use
- High accuracy
- DNV GL Eco Insight ready
- Economic initial costs
- Exchange Sensor without new calibration of the device

Specification

Ignition pressure range	0-350 bar
Sensor	Kistler 6019A 11S
Speed range	20-3000 rpm
Max. number of engines	18
Max. number of cylinders over all engines	125
Max. temperature	400°C
Compensation of torsional vibration	✓
Compensation of pressure vibration	✓
Display	Alphanumeric, size 75 x 25 mm, resolution 20 x 4 char
Accuracy	0.17% degree crank angle

Ordering Information

DPA-CT-12021
PREMET® M Device
- KISTLER Piezo-SMART-Sensor
- New Premium Analysis Software (PREMET Viewer)

DPA-CT-12022
PREMET® TDC pick up for 4-stroke engines

DPA-CT-12023
PREMET® pair of Pick ups for 2-stroke engines

DPA-CT-12029
Optical TDC Pick-up for 4-stroke engines

DPA-CT-12027
15m Premet pick up connection cable

3. PREMET® X

New

PREMET® X with Sensor

The PREMET® diesel indicators are known to be rugged and reliable. The newly developed PREMET® X now adds a brand new software, new sensor technology and connectivity to obtain, show, analyse and export the important pressure data of your diesel engine during operations. This device gives you the opportunity to fine tune your engine to a higher efficiency resulting in lower costs.

Compatible with low-, medium- and high-speed engines the **PREMET® X** is the perfect system to optimise your fuel injections to reduce fuel consumption but also to avoid repairs and damages as part of a condition monitoring regime. The **PREMET® X**, Made in Germany, is using high-quality materials and is equipped with the newest PiezoSMART sensor from Kistler Switzerland. Latest designed engines run with peak pressures up to 350 bar and high exhaust gas temperatures. The new sensor technology ensures high performance and accurate results for the complete range. The storage of calibration data inside the sensor makes it possible to easily exchange sensors without calibration of the device.

The new software allows to do an in depth analysis of your engine ensuring you will be in control of the condition of the engine without being an expert user. If your job includes responsibility for multiple vessels the Fleet Management Software will make your life much easier and for worldwide access CMT is offering a Cloud solution as well. The integrated WiFi connection increases the ease of data transfer considerably.
A WiFi network with an internet connection, which can easily be established with a standard mobile phone in the next port will allow an automated upload of the data into the cloud.

The large internal memory of the **PREMET® X** allows to save as many engine set ups as you like up to 40 cylinders per engine. The integrated compensation of torsional vibrations enables ultra accurate measurements for 2-stroke engines. 4-stroke engines can be measured with an extra TDC sensor with high accuracy. Using an acoustic emission sensor the fuel injection can be monitored with no need to tamper with the high pressure fuel lines during installation. Ignition delay and other critical timings during combustion will become visible.

CM Technologies GmbH offers a measurement evaluation service to help you getting the most out of your CMT instrument. Also individual training courses can be arranged either at CMT, at your office or even on board.

Your benefits:

- Revolutionary new sensor technology
- New analysis software
- WiFi connection for easy data transfer
- Rugged design for onboard use
- Highest available accuracy
- DNV GL Eco Insight ready
- Cloud based Fleet Management

Ordering Information

DPA-CT-12020
PREMET® X Device
- KISTLER Piezo-SMART-Sensor
- New Premium Analysis Software (PREMET Viewer)

DPA-CT-12022
PREMET® TDC Pick up for 4-stroke engines

DPA-CT-12023
PREMET® pair of pick ups for 2-stroke engines

DPA-CT-12029
Optical TDC Pick-up for 4-stroke engines

DPA-CT-12027
15m Premet pick up connection cable

Specification

Ignition pressure range	0-350 bar
Sensor	Kistler 6019A 11S
Speed range	20-3000 rpm
Max. number of engines	Unlimited
Max. number of cylinders (per engine)	40
Max. temperature	400°C
Compensation pressure	✓
Compensation of torsional vibration	✓
USB connection	✓
WiFi connection	✓
Display	Colour, size 160 x 90 mm, resolution 800 x 480
Accuracy	0.17% degree crank angle

Acoustic Emission (AE) waves are commonly defined as transient elastic waves within a material caused by the release of localized stress energy. Hence, an event source is the phenomenon which releases elastic energy into the material, which then propagates as an elastic wave.

AE events that are commonly studied among material failure processes include the extension of a fatigue crack, or fibre breakage in a composite material.

AE is also related to an irreversible release of energy that can be generated from sources not involving material failure including friction, cavitation and impact. Acoustic emissions can be detected in frequency up to 100 MHz.

Specifications

Frequency Range:	300-700 kHz (Acoustic Emission)
Operating Temperature:	130°C
Power Supply:	5.0 +/- 0.25 VDC
Output Signal:	0.5-4.0 VDC
Attachment:	Alnico Magnet, 5.2 kg pull force
Diameter:	26 mm
Connector:	Neutrik, NC4MP-BAG

The Acoustic Emission Sensors is a piezoelectric sensor with built-in amplifier and signal conditioning. It is optimised to detects waves in the range of 300 to 700 KHz , which are caused by the injection of the fuel through the nozzle, exhaust gas flow through the valve, impact of the injector needle, closing and opening of the fuel pump spill.

The AE sensor is used to measure the angle at which these events occur and to detect deviations in injection timing, late burning of fuel in the cylinder, leaking injectors.

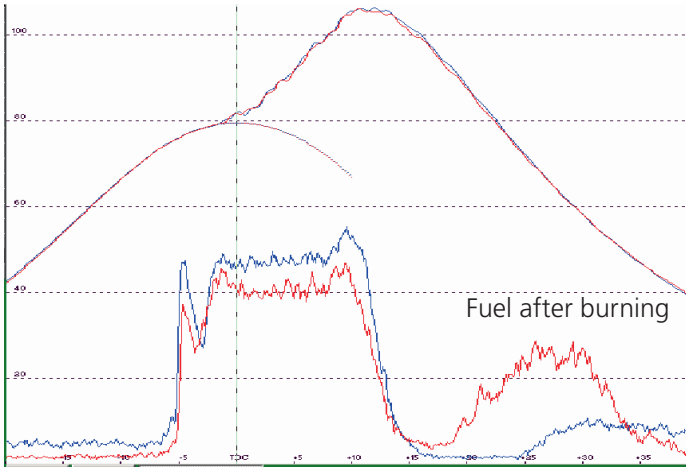
The optional Acoustic Emission (AE) Sensor can be used for the **PREMET® X**, **PREMET® Single Sensor** and **PREMET® 24/7**. It is not suitable for the use with the **PREMET® M**.

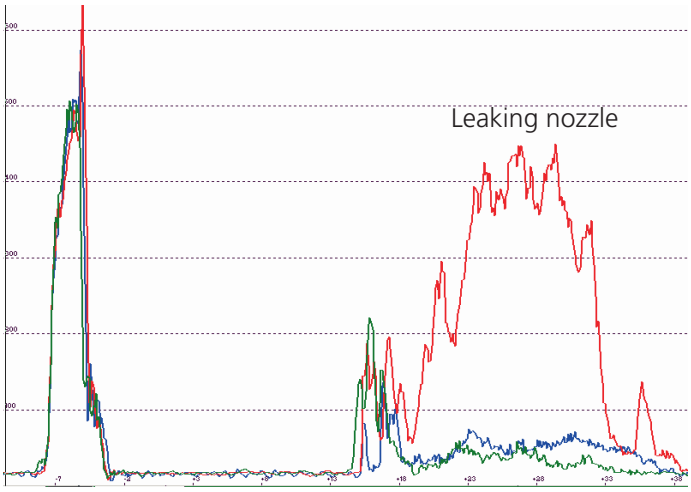
Your benefits:

- No penetration of the fuel system
- Eliminates possible fuel leakage
- Applicable for 2-stroke and 4-stroke engines

Ordering Information

DPA-CT-12026
Acoustic Emission Sensor





4. PREMET® Software

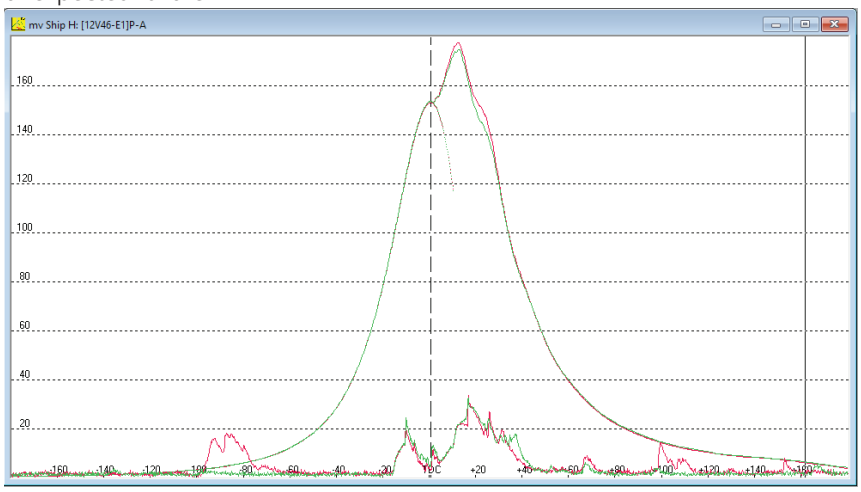
PREMET® Viewer

The PREMET® Viewer helps to analyse the combustion process more efficiently. With an import of measurement data from a PREMET® X or M you can create TDC graphs, Combustion and Decomposition Curves and p-V Diagrams to help with the condition monitoring of your engines.

The software is included in the delivery of a PREMET from the newest generation. It facilitates the evaluation of the engine condition. A variety of diagrams, bar plots and tables present the measurements incl. manually entered data in a user friendly way.

Data from older generations of PREMETs, DieselSCOPE and Diesel Indicator, DPA devices by DREW Chemicals and all BAEWERT and HLV devices by Kistler or MAN can be evaluated too. Therefore, the transition from an older diesel performance analyser is much easier and you can see trends immediately with the data of your previous devices.

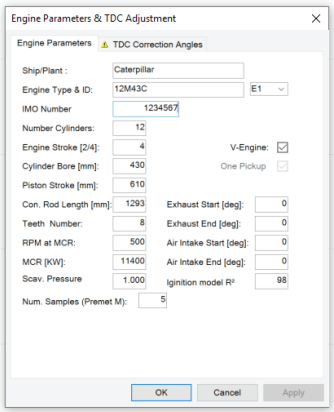
The correct adjustment of the engine helps to reduce the engine's operating costs. Cylinder-to-cylinder load balancing and the correct fuel injection settings will optimise the engine performance and minimize the specific fuel oil consumption. Another main feature of the software is the trend analysis. These trends can help to detect worn parts or incorrect adjustment and plan you repairs as well as avoid unexpected failure.



Combustion process

Your benefits:

- Easy comparison with previous or sea trial data.
- Upload of Records into the optional PREMET Cloud Solution.
- Allows to read in records from other devices like:
  - PREMET all devices from 2nd and 1st generation
  - Diesel SCOPE and Diesel Indicator previously sold by CMT
  - All DPA devices sold by DREW Chemicals
  - All BAEWERT and HLV devices sold by Kistler or MAN
- Showing the first and second derivate to conclude correct TDC (Top Dead Centre) setting.
- Combustion Decomposition Curve.
- Logarithmic view of p-V Diagram (pressure-volume) to find TDC problems as well as thermal or pressure leakages during combustion process.
- High resolution data processing with the option of filtering to smooth the graph with adjustable low pass filter.
- Can be upgraded to Fleet Management Software including fleet comparison and trending capability.
- Simple adjustable and flexible report creation with all necessary parameters.
- Free of charge with every purchase of a PREMET X or M.

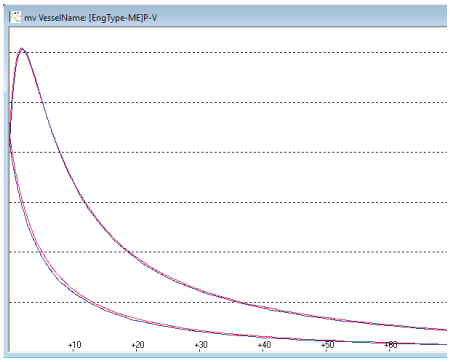


Engine setup

The most used functions of the PREMET Viewer for evaluation are:

- The Pressure-Volume (p-V) diagram can indicate leakage or the incorrect setting of the TDC.
- The TDC Correction is used maximise the power generated by the engine with lower lost.
- The Combustion Pressure Decomposition Curve is especially for modern engines with a very late ignition point.

All the insights gained can be incorporated into prepared reports for better compilation and distribution so that action can be taken quickly.



p-v Diagram

Ordering Information

DPA-CT-12039
PREMET® Viewer
- Included with every purchase of a PREMET

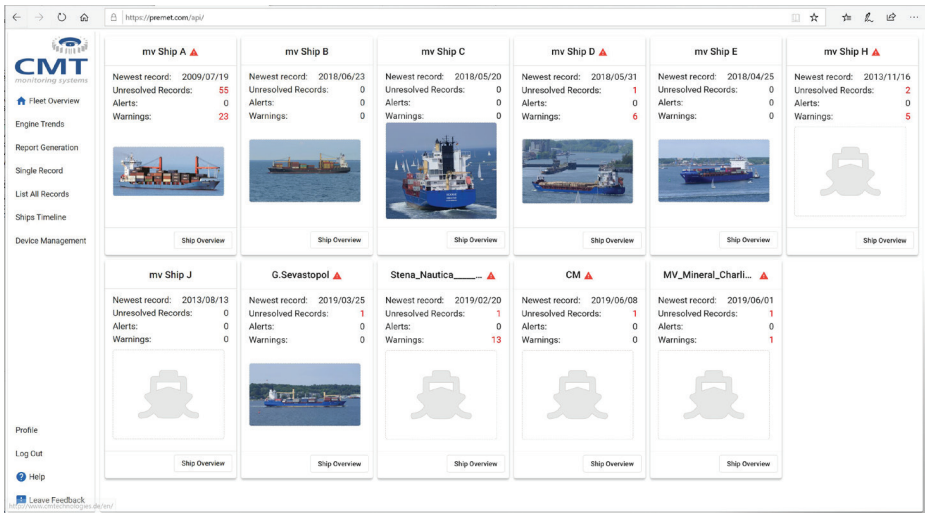
DPS-CT-12133
Data Transfer Kit PREMET® SW

DPS-CT-12134
Data Transfer Kit HLV-Device

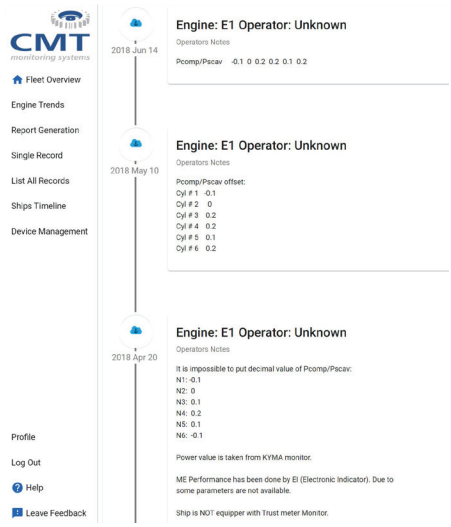
DPA-CT-12024
PREMET® Fleet Management Software

PREMET® Cloud

There are many cloud solutions in the marine world in the meantime but the PREMET Cloud is not just any other cloud. The PREMET Cloud solution serves as exchange platform and analyzing tool for your diesel performance data or your entire fleet. You can manage your fleet, trend performance data and compare data from sister engines.



Why not using one of the many other performance clouds available? Because normal fuel performance and ship performance clouds use a limited amount of data while a record of diesel performance data consists of a large array of data which are all necessary to get a conclusive analysis for the diesel engine.
If needed calculated performance data can be exported to be used in other clouds. The big advantage of the PREMET Cloud is the instant availability of data. The ship can easily upload data. Either from a registered computer or from a PREMET X device. The uploaded files are just a few kilobytes in size. Data is then at once available for the super-intendent or any data analyst who can analyse the data immediately. Data is accessible from any device with internet access from anywhere in the world.



Your benefits:

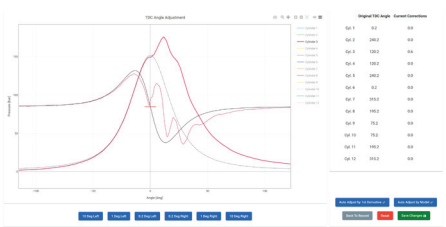
- All analytic features of the PREMET Viewer on the go.
- Access to insights in the engine performance and historical trends for each ship.
- Instant availability of the data to anyone anywhere.
- All records can be downloaded for offline analysis and reporting.
- Automatic Upload with the PREMET X via a WiFi connection.
- Backwards compatibility with older generations of PREMETs and other devices.
- Prebuild reports for fast and direct actions for the crew.
- Optional worry free analysis from an expert from CMT.

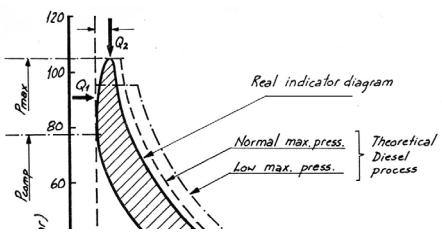
Ordering Information

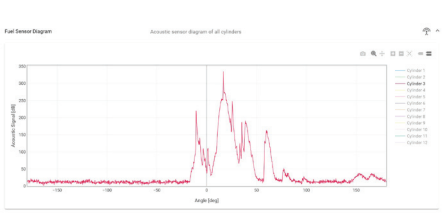
DPA-CT-12025
PREMET® Fleet Management Cloud Subscription

DPA-CT-12028
Evaluation Service per record
(PREMET® Cloud Subscription required)

DPA-CT-12040
Evaluation Service per vessel and year
(PREMET® Cloud Subscription required)

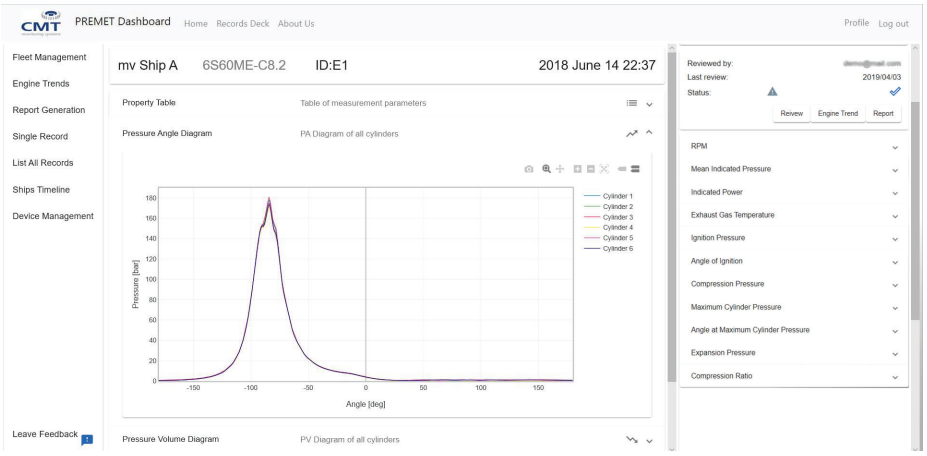


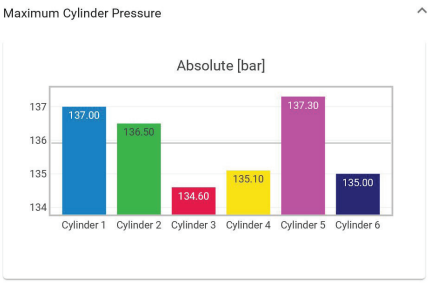


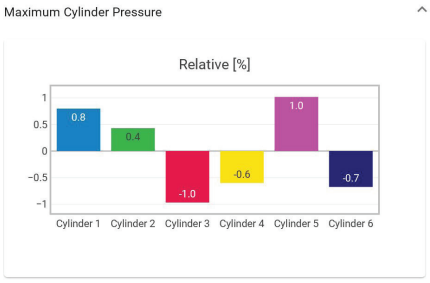


Access to data and its processing, evaluation and actions derived from them is a problem for every industry but for the Marine industry this is an ongoing problem centuries old. CMT´s Premet Fleet Management Cloud Solution offers a revolutionary approach to Diesel Performance Monitoring.

With CMT´s new PREMET devices and their software, engine indicating measurement data taken by the crew onboard are available in seconds all over the world, in every office and with every Superintendent wherever they may be. All you need is a little bit of bandwidth and you have a near real time view of the condition of the most important machines there are onboard a vessel – the engines.
Results can be uploaded directly from the PREMET X device via a WIFI network.
If there is no network on board, this can be provided by any modern smartphone in the next port of call or alternatively be uploaded via a computer with internet access.
Results are evaluated similar to the PREMET Viewer software giving you all the charts, diagrams and trends.

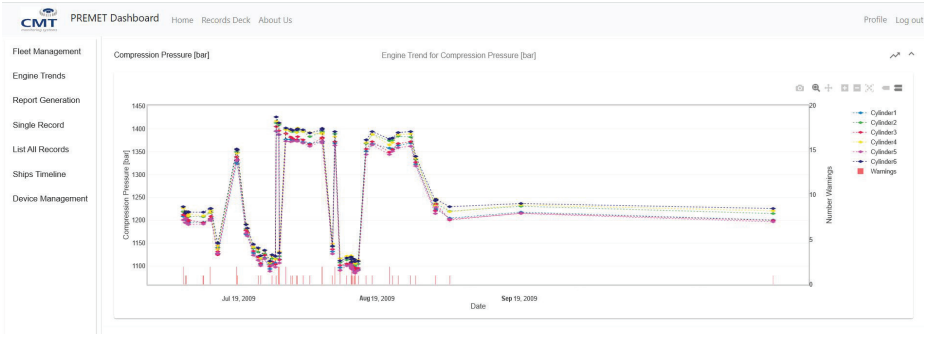


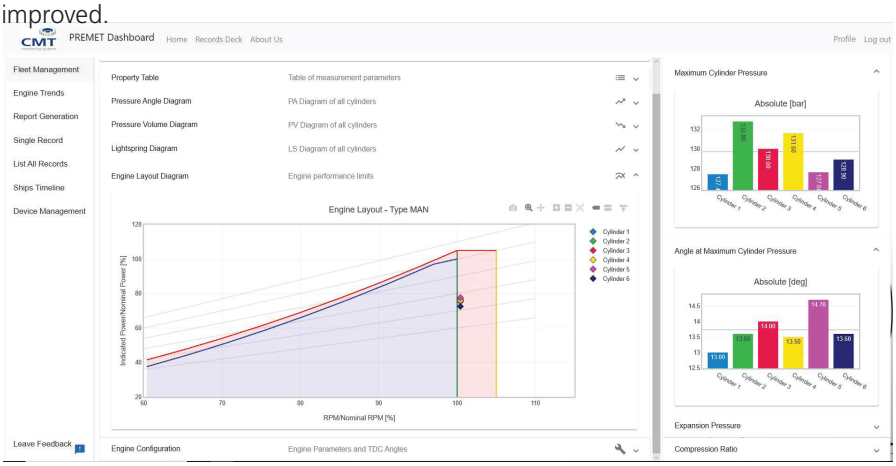


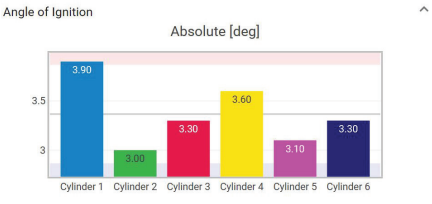


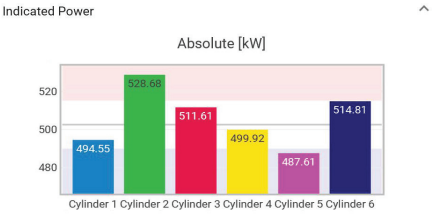
After evaluation a prebuild report sheet can be filled with all the necessary data and completed with little adjustments for the crew to reduce the fuel consumption. This can be done by anyone in the shore office or, for little extra cost, by an expert from CM Technologies.
CM Technologies offers optional remote analysis which is always performed by an engineer with adequate experience.

The experienced engineer evaluates the data and generates a full report with recommended actions sent to the office and / or vessel. The engineer is also available for questions and recommendations by phone or email regarding the engine performance. Although this is adding operational cost to start with, it provides an easy way to reduce fuel consumption significantly while reliability and maintenance are improved.









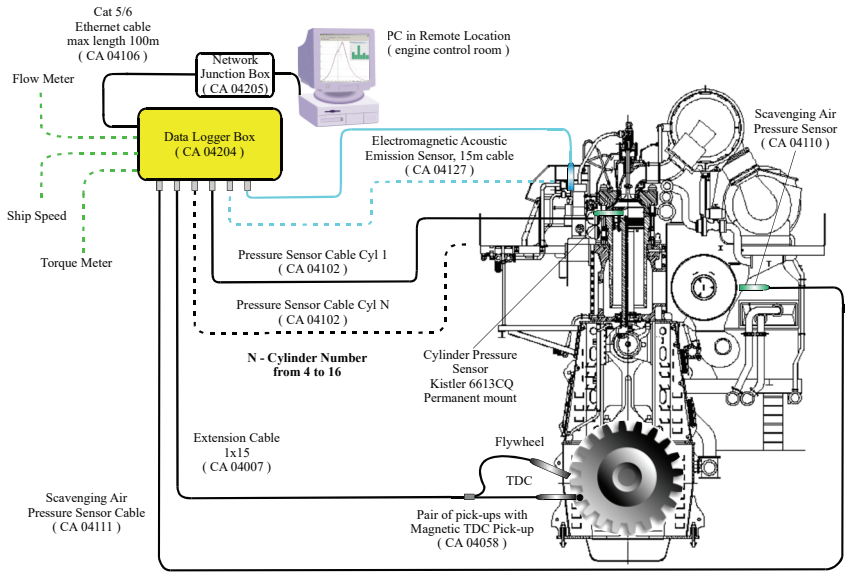
5. PREMET Online - 24/7

The PREMET® Online 24/7 is the most advanced system for continuous diesel engine performance. It has been developed to be used for one Main Engine Only.

It can monitor up to 16 cylinders and log the data permanently. The Electronic Combustion Analyser is a comprehensive system for continuous engine performance measurement and monitoring which will provide the key knowledge for obtaining optimum and reliable engine performance data. Using the combustion information you will have minimum engine wear, an optimum emission and fuel consumption.

Technical Data Sensor

Measuring Range:	A24 (0...200 bar), A14 (0...103 bar), A34 (0...300 bar)
Sensitivity:	A24 (50 µA/bar), A14 (100 µA/bar), A34 (33,3 µA/bar)
Overload:	300 bar
Connector (IP67):	M12x1
Linearity at 23°C:	< ± 0,75 %FSO
Mounting Torque:	15 N • m
Zero Point (no pressure):	10 mA
Signal Stroke FSO	10 mA
Operating temp. range, Sensor front:	-50...350 °C
Operating temp. at cable connect.:	-20...200 °C
Operating temp. Charge amplifier:	-10...85°C
Supply Voltage:	16...30 V DC
Weight:	150 g



MAIN ENGINE MONITORING SYSTEM

Your benefits:

- Longer lifetime of components
- Optimized maintenance planning
- Early fault detection
- Increased operational safety
- Lower fuel consumption
- Easy technical reporting

Your Features:

- Synchronous cylinder pressure measurement of up to 16 cylinders
- 3 x 4-20 mA Inputs
- 4 x Digital Outputs
- 2 x 62 Diagrams Buffer
- p(max) alarm record
- USB data transfer to PC

Ordering Information

Customized system
- Please contact our office to discuss details

6. Shaft Power Meter

The CMT Shaft Power Meter is the cost effective solution when reliable shaft power measurement is required. It is a permanent monitoring system which continuously measures the shaft (effective) torque, power and RPM.

The **Shaft Power Meter** itself consists of two metal tapes with magnetic pattern, two sensors and a transmitter.

A 4-20 mA signal, proportional to the shaft torque in % of the MCR value is averaged by a preset number of up to 255 consecutive revolutions.

The 4-20 mA torque output and the pulse RPM signal can be connected with any ship automation. Shaft power is calculated by torque and RPM. All data can be transferred to a PC via the USB connector.

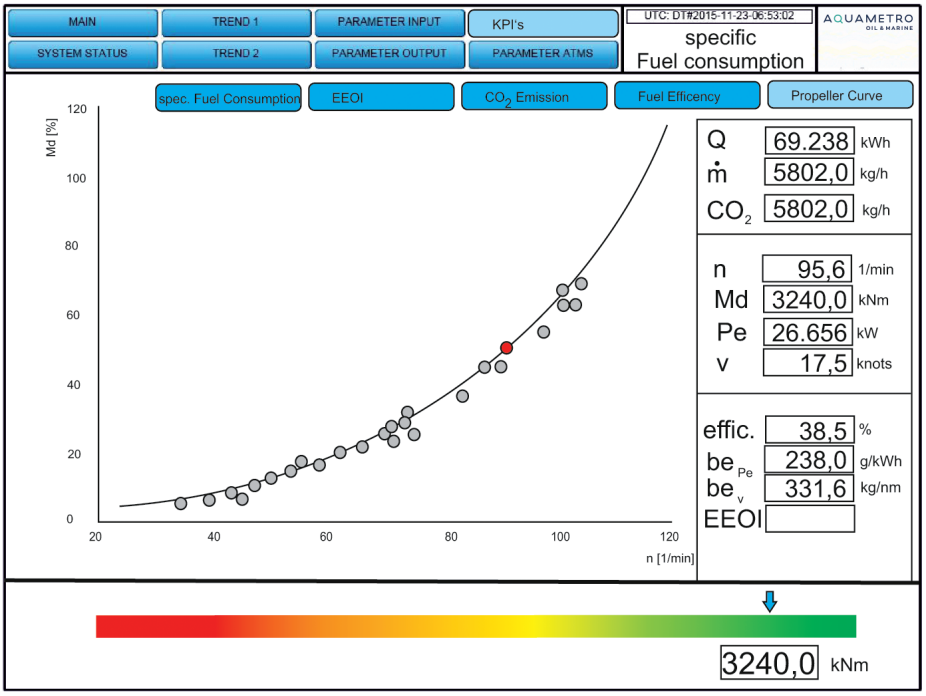
The measured data is saved in a preset period.

The software displays trends of the saved data and the current and saved measurements on the main engine power / rpm diagram, as defined by the engine manufacturer.

The measured data can be exported in an Excel compatible CSV (Comma Separated Values) file for further calculations and analyses.

The system is easy to install and requires no electronic parts on the shaft. The system operates absolutely contact free.

The microprocessor based transmitter detects the shift of pulses of the second tape (the twist of the shaft), caused by the torque and calculates the actual torque reading.



Scope of delivery

- Plate for fixing the U profile
- U-profiled Bracket for Sensor holder (Depending on distance of ship frame to shaft surface)
- Sensor holder (U-profiled)
- 2 SPM Sensors
- Magnetic bands (length is depending on Shaft diameter)
- Rubber to cover the magnetic bands
- 2 converting boxes (130x110x80)
- Control cabinet (300x200x150)

Following questions need to be clarified prior final quoting:

- Shaft design / diameter / hollow shaft / (drawing to be provided)
- Material specification of the shaft
- Installation conditions (photos)
- Distance from ship frame installation point to shaft surface
- Free space for installation of sensor brackets contactless to shaft (min. 1,5 m)

Ordering Information

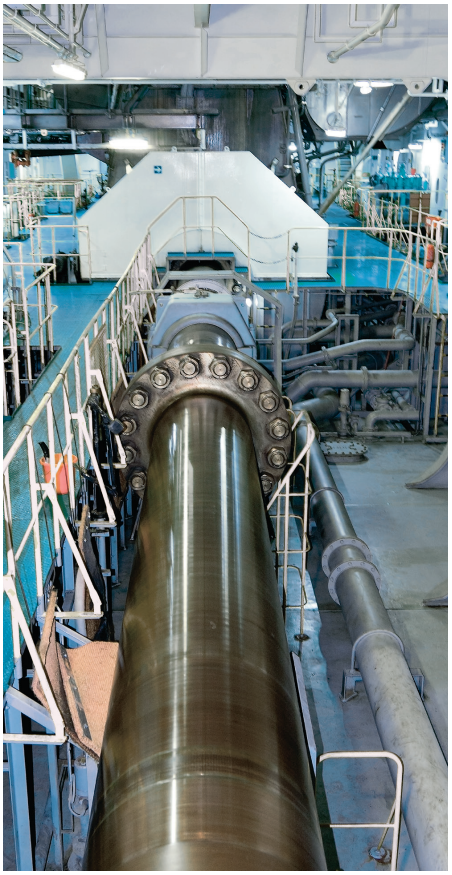
SPM-CT-18001
Shaft Power Meter System
Contact free method for permanent torque & power measurement

Shaft diameter:	200-1200 mm.
Speed:	0 - 800 rpm
Sensor:	Contact-free

Electrical installation SPM

Electrical installation Shaft Power Meter

- Power supply at installation point converter box Shaft Power Meter 24 VDC
- Position control cabinet Shaft Power Meter (overview drawing requested)
- Power supply 110/240 VAC, 50-60 Hz, 2 A
- LAN connection
- Remote LCD display (separate power supply 24 VDC, 0,3A required)
- LCD display in control cabinet
- Length of cable converting box (analysis board) to control cabinet
- Length of cable control box to remote LCD display

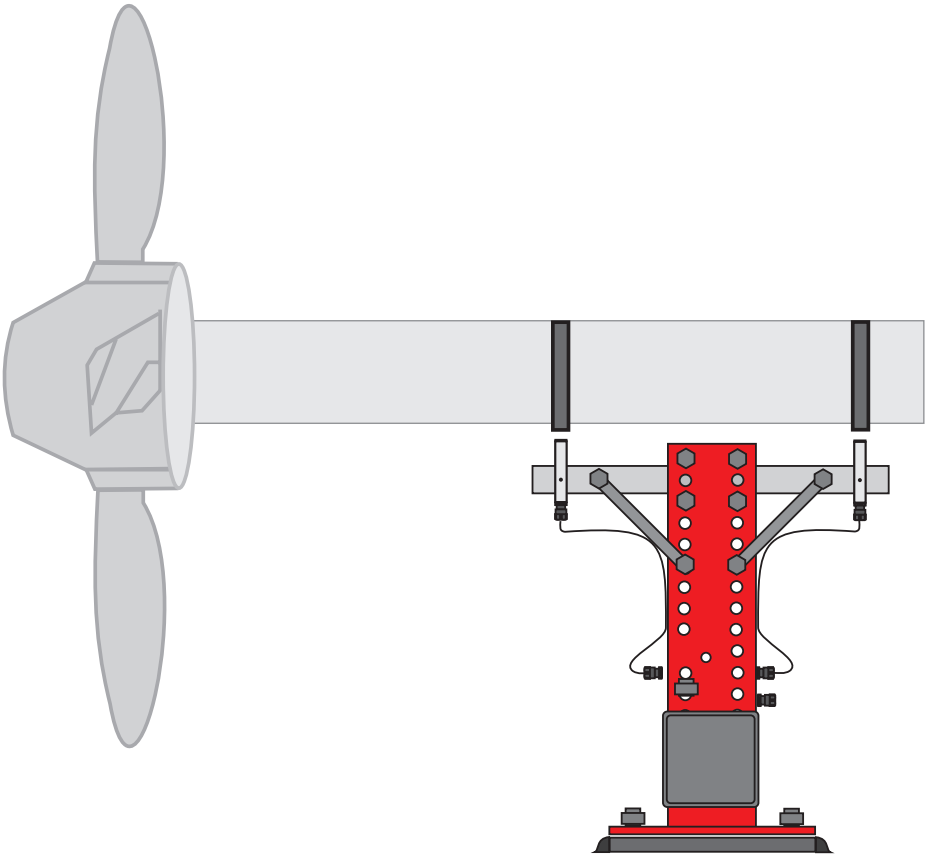


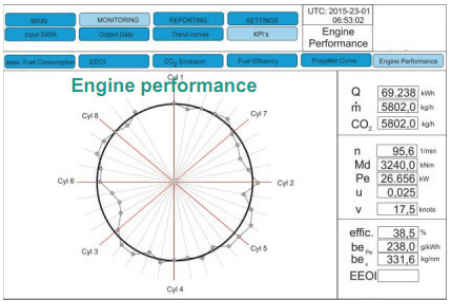
Features

- PCL based system
- Contact Free Digital Sensors
- High Precision, time resolution of 100 nanoseconds
- RPM, Torque and Power signals stored on SD card
- Key component for fuel performance System
- No need to provide power to the components on the shaft
- No need to transfer any signals from rotating components
- Not Affected by Centrifugal Forces, temperature change, propeller thrust or shaft misalignment and stress
- No Mechanical Wear, No zero drifting over time;

Your benefits:

- Simple & Easy to Install, plug & play
- Cost effective
- No installation of electronic or electric components on shaft
- Easy to re-install after stern –tube inspections;
- Zero calibration procedure done by the push of a button
- Maintenance Free System
- Continuous Actual (effective) Power Output
- Real Time Measurements of any Diesel Engine
- Shaft Torque in % of the MCR value averaged by up to 255 consecutive revs.
- Gives feedback about engine balancing
- Expandable to fuel performance system





Transmitter Output Signals

Output 1:	4 - 20 mA (Shaft rpm signal)
Output 2:	4 - 20 mA (Shaft power signal)
Output 3:	4 - 20 mA (torque signal)
Output 4:	4 - 20 mA (free configurable)
RPM at MCR:	0 - 800 RPM
Sensor Accuracy	+/- 0.1% torque
Operating temp.:	0...50°C
Power Supply:	24 V DC

7. Fuel Performance and CO_2 Reporting

Recording the fuel performance is important to run a sea-going vessel efficiently. With the rising prices of fuel and the ecological awareness it gets more important to monitor the fuel consumption.

Especially large ships require large amount of fuel and it is necessary to monitor the fuel consumption to guarantee an efficient performance as well as to obey the new EU guide lines for CO_2 reporting.

CMT offers an easy way to monitor the performance based on the actual use of fuel on given distances. The system can not only monitor the engine performance, but also the whole ships efficiency which includes propeller and hull.

One of the large and still growing emission sources is the greenhouse gas, produced by international shipping. Due to that matter the EU wants to reduce the CO_2 emissions from maritime transport of EU flag states. The level of 2005 should be lowered at least by 40% until 2050.

As a first step, large ships using EU ports will be required to report their verified annual emissions and other relevant information from January 2018.

CMT offers a new online monitoring system for fuel performance and CO_2 reporting. The System **FPS 2.0** requires minimum maintenance and has the following concept:

- Simple standard PLC system with class type approval certificate
- Web based open configuration
- 2nd screen in ECR to display main values with status
- Data history on board & data export on shore
- Standard data interface (open structure) 4 – 20 mA, 0 – 10 V, pulse, NMEA, Modbus Slave
- Engine performance or report of all available data

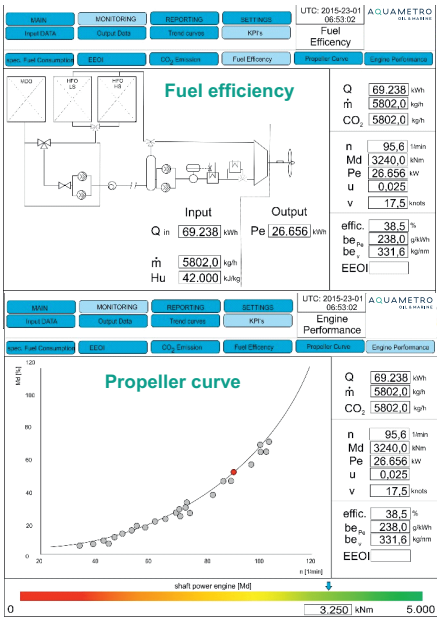
The System has a web based visualization which enables access to measured data over every computer. Therefore your performance can be managed everywhere, no matter if it is the office, the bridge or the ECR.

For the CO_2 reporting it is furthermore required to determine the actual density of the bunkered fuel and the fuel in the individual tanks. The following methods are allowed:

- On-board measurement
- Fuel supplier
- Laboratory test

While the fuel supplier can only specify the density of the fuel delivered the fuel in tanks can only be measured onboard or in a lab.

CMT does provide a simple and cost effective method of measuring density on-board avoiding high laboratory costs. (See density section)



Ordering Information

FPS-CT-18002
Fuel Performance System FPS

FPS-CT-18003
FPS External Display
Size: 3,4 inch

FPS-CT-18004
Flow Meter for FPS

FPS-CT-18005
Power supply for FPS
Power: 24 V DC / 230 V AC

FPS-CT-18006
Analogue output modul
Output: 4 channels
Current: 4-20 mA

FPS-CT-18007
Interface modul
RS485,RS 422, RS 232 port

FPS-CT-18008
Digital input modul
Input: 8 channels
Power: 24 V DC 2,5H

8. Pressure and Temperature Calibration

New

Pressure Pump

Calibration of measuring devices is very important to guarantee precise results even a long time after manufacturing. Most devices will suffer from degradation of accuracy over a longer period of time. CMT offers an inhouse calibration service or alternatively devices for the calibration of pressure and temperature measuring devices on board. They are available as standalone or in a combined kit.

The Temperature Calibrator is a true calibration with no simulation. It works with a dry heat block and no liquids are required for stabile and accurate heat measurements. Therefore the stability of the Temperature Calibrator is as low as 0,1%. The range enables calibration of devices from 30°C - 650°C and is heated for measurements within 14 min.

The Pressure Calibrator also operates with true calibration. The device can be fine adjusted with the valve on the site. With a complete sealed system, the Pressure Calibrator can keep compressions from -0,8 to 60 bar stable.
Different adapters can be used with many different fluids to calibrate a huge variance of devices. The pressure is generated with a handpump, so no external compressor is needed. The size makes it perfect for every calibration on board and the simplicity enables the use by every crewmember.

The PM205 is a microprocessor controlled, accurate and versatile digital pressure measuring and calibration instrument with integrated fast peak-, max.- and min.-function.
The PM205 is supplied with an internal battery with 1000 hours continous operation in MANO-Mode, guaranteed by the AUTO SWITCHOFF function.
This digital pressure gauge finds its specific utilization in marine industry, onboard ships and mobile offshore units and in general manifold industrial fields.

Temperature Calibrator

Calibration Combi Set

Your benefits:

- Onboard recalibration of equipment
- More precision for measurements
- More efficiency with accordingly calibrated equipment.

Ordering Information

CBT-CT-00001
Temperature Calibrator TC65M
Range: 30 - 650 °C

CBT-CT-00002
Pressure Calibrator PM205
Range: (-)0,8 - 60 bar

CBT-CT-00003
Calibration Kit for TC/PM

CBT-CT-00005
Calibrators Temp./Pres. Combination
Combines all of the above incl. case

Service and Training

Overview Training and Services

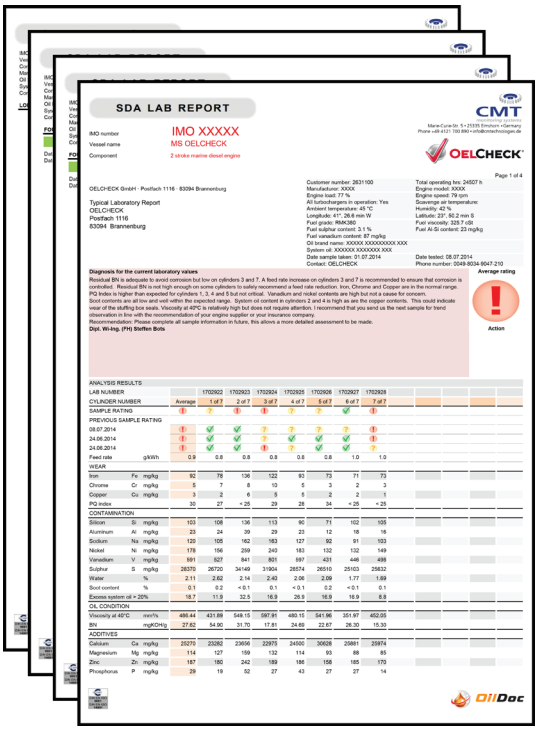
Condition Monitoring is the basis for condition based maintenance. CMT does not stop at providing condition monitoring technologies but does go a step beyond to provide also services to get a CM system running and also to keep the equipment in a good condition.

CMT offers a broad range of modernization and optimization solutions that keep the vessel competitive and prolong its profitable life cycle. Retrofit options are provided to enhance productivity, safety, energy efficiency and environmental impact. By choosing CMT you gain a dedicated partner with capability for consulting, implementing and overseeing the complete modernization project.

Services available include turnkey installation, commissioning, remote data analysis and reporting, as well as suggested reliability improvements based on the monitored results.

1. Evaluation Service

Make the most out of your existing measuring tools or get our help to get started. CMT experts will help you to make sense of data gathered by Diesel Performance Analysers, Vibration Monitoring Equipment or your Fuel oil and Lube Oil Condition Monitoring devices. CMT will accompany you from the purchase of the device, implementation up to the interpretation of the data gathered.



In today's busy and hectic work environment it is more and more difficult to get the most out of the tools which are available due to time constraints or limited available personnel. Also measuring tools which have been identified as useful and valuable are not being purchased because of the already full work schedule of the personnel responsible for the implementation.

In other cases the knowledge of the intended user is being considered as inadequate to use the tool effectively or there are even fears a misinterpretation of achieved results will interfere with normal operations and cause a disruption rather than be a help.

However most technical personnel agree that if monitoring tools are being used correctly and the evaluation of the results is being done properly it will help to bring down maintenance costs, prevent down times and improve the bottom line.

CMT has recognized this and is offering an evaluation service for results obtained for Diesel Performance, Vibration and Oil condition. It does not start and end with the interpretation of the results but we will offer help for the implementation of the devices, the individual set up of the instruments and training. Either let us help to get you started or let us provide our service the whole way. We are prepared to offer individual services as per your need- just get in touch and we will find a solution.

Deliverables:

- Help & guidance to set up your monitoring regime
- CMT Experts interpret and evaluate measuring data
- Reports which indicate problems and help to find the reason

Benefits:

- No need for an in house specialist
- Free your personnel so that they can focus on their duties
- Get an expert opinion
- Make sure purchased tools are being used efficiently
- Prevent damages and keep your equipment running

2. Installation and Commission Service

Our long experience with installation and commissioning on board seagoing vessels ensures cost-effective retrofit or new building installations including final commissioning that are carried out with a minimum on interruption to your business. As a turn-key supplier we can handle every phase of a project from design and engineering to installation, commissioning and training.

CMT has a qualified team of installation and commissioning engineers with a wealth of experience in on site requirements. Installations and commissioning can be offered with all equipment purchased from CMT.

The expanding world fleet operates in an uncertain environment, with ever tougher competition and increasing price pressures, which puts the spotlight on safe and cost-effective ship operation. This requires a partner able to maintain the new, more advanced vessels as well as keeping the ageing fleet operating safely, more efficiently, and up to date to stricter standards. Off-hire must be mitigated or prevented.

Highly skilled and qualified support for the start-up of your condition monitoring system.

We have teams of experienced and qualified technicians to provide you with support for the turn-key installation and commissioning of condition monitoring systems purchased from CMT.

When we provide installation and commissioning services – whether for a control systems or a complete package – our technicians work alongside the project managers and engineers to ensure smooth and efficient installation to the highest standard.

In the early stages of your system life we want to ensure you get everything you need to meet project time lines and site needs.

Our services include:

- Installation
- Pre-commissioning and Commissioning
- Site Acceptance Testing
- Personnel Introductory Training
- Support at system start up
- Operating and Maintenance Documents
- Spares installation / repair
- Fault Finding

A tailored commissioning visit proposal can also be produced (if not offered as part of the original contract) based on a set of specific terms and conditions. CMT service engineers regularly travel the World, keeping our valued overseas clients equipment in full working order. In most cases seven days notice is needed to arrange a commissioning visit.

Even if the condition monitoring equipment was not installed by CMT, our team will be happy to quote for a commissioning visit, safety inspection, or full material handling service contract. Just make a request and we'll take care of your condition monitoring equipment service needs.

CMT has developed commissioning routines that ensure the work is carried out safely and effectively, and that your crew has the knowledge and confidence to operate the vessel to a high standard.

All CMT Automation products are designed with easy installation and commissioning in mind and will have passed comprehensive testing at the factory before they reach the shipyard or the vessel. The commissioning process follows established routines that ensure the work is carried out effectively, safely, and to a high standard which will provide the foundation for reliable life cycle performance.

The on-site commissioning activities include visual inspection, electrical and mechanical tests on equipment, and functional and integration tests on systems. The commissioning phase ends with sea trials which include the final tuning of the equipment, handover of updated documentation, and performing the official tests for the equipment and vessel.

Your benefits:

- Worldwide Service with flying crew.
- System installations and commissioning of systems are undertaken with minimum interruption to your facility
- Flexibility for challenging vessel schedules, weekend or evening work
- Method statements and risk assessments carried out
- Special training programmes undertaken - see Training section for more information

We are always happy to discuss specific requirements and our business is based on tailoring services to your exact needs - please contact us for any further information you require.

3. Calibration Service

New

CMT offers a calibration for a huge number of devices. Calibration is very important to guarantee precise results even a long time after manufacturing.

We recommend calibration for all of our devices every two years.

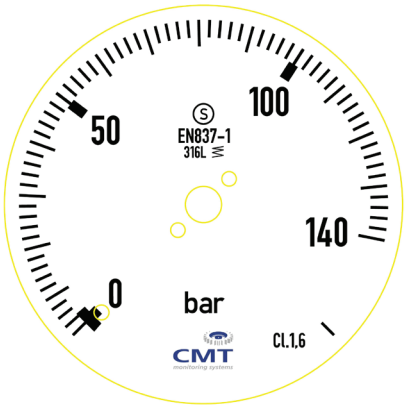
The next calibration date from our devices will be noted on a label on the device as well as on the calibration certificate.

We also calibrate devices similar to our own.

Calibration of test equipment is essential to maintaining confidence and reliance on the readings obtained from them to get reliable condition monitoring results. Whether motivated by regulatory requirements or by the need for assurance of measurements critical to a manufacturing process, regular calibration of your instrument is critical to having a reference based on known standards. Besides the reference measuring instruments and the calibration services that CMT offers, we also offer a line of calibration standards that you can use to validate your devices in use.

Beside a calibration service for all devices from our own portfolio we cover many other calibration services for any third party product.

Calibrations are performed in an expeditious fashion, with turnaround times of less than one week in most cases. Calibration price is at a Flat Rate cost and covers all labour and equipment to perform one calibration required to meet our specifications. The calibration is provided by CMT as an ISO 9001:2015 certified company to ensure highest quality and traceability. If your instrument requires repairing, the repair service will include standard calibration. Custom calibration or accredited calibration can also be included for an additional fee.



Traceable Calibration

Calibration means that the test results from a measuring device of unknown accuracy, are compared with a device whose accuracy is known. This device is universally accepted as a “reference”.

Calibrations are traceable to the International System of Units (SI) through National Metrological Institutes, and natural physical constants.

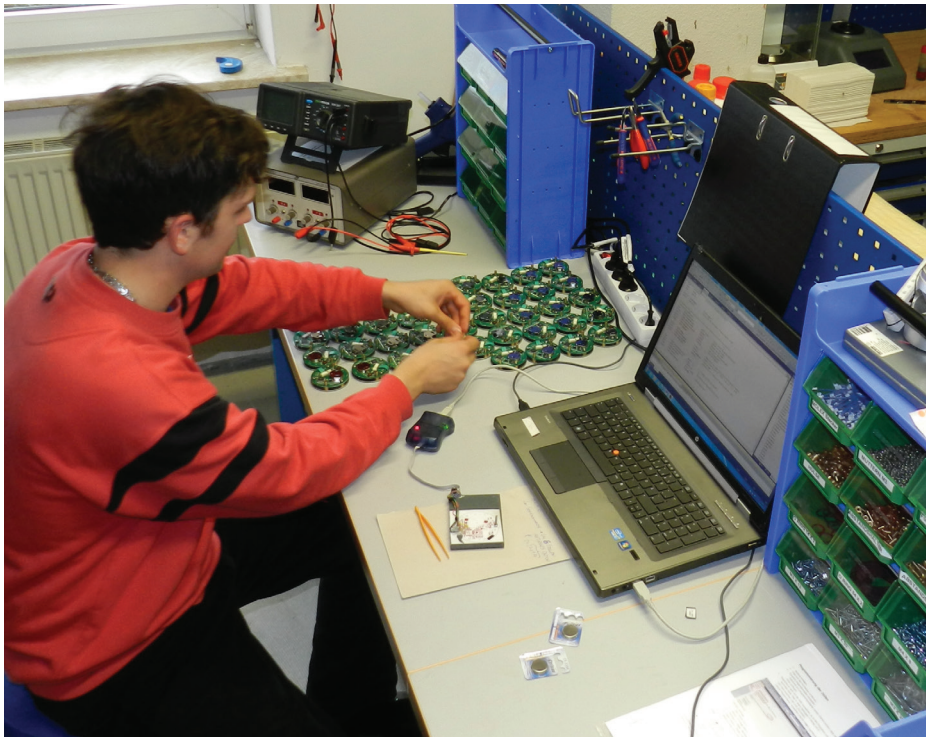
Calibration records any deviation from this standard and corrects it when necessary. Each instrument has a specific calibration procedure which indicates exactly how and what must be checked. Regular and traceable calibration combines the forces of accuracy and certainty and provides you with the key aspect of ISO 9001:2015 certification.

Your benefits:

- Ensure highly accurate measurements
- Provide certification and mandatory documentation for instrument calibration standards
- Enjoy peace of mind with CMT-certified calibration expertise and components

Ordering Information

The calibration process varies for each device group. Please contact our sales team for specific informations or quotes.



Overview Training

Doing business in an environment which relies heavily on the help of machinery to get the job done put high demands on the education of the employees seeing to the operation and maintenance.

Vessels, machines, plants and industrial sites are environments where a good education of the work force makes sure to protect your investment and is key for a flawless operation.

Either make sure that your employees are properly trained in the use of a tool you have invested in or raise their level of knowledge about a specific topic both will make sure that your equipment life will be optimal, lowest maintenance cost levels are achieved and reliability is at a maximum.

We at CM Technologies GmbH understand that and are offering several training courses for fixed topics. However we also understand that the background of the participants can be very different and that each customer looking for a training may have unique requirements therefore we are able to offer customized trainings suited for the needs of the individual customers.

Trainings are being held at our facility or a nearby conference centre. Upon request trainings can be held on site at the customer facilities may they be a marine vessel, factory or office.

Small groups ensure an efficient training so we usually limit the number of participants to a maximum of 8-12 persons. If you have a larger group you want to book a training for, contact us to discuss possibilities.

Standard course duration is usually one working day, customized trainings may deviate.

Deliverables:

- Training on basic to advanced monitoring topics, professionally delivered by knowledgeable CMT trainer and, as appropriate, by external speaker.
- Certificate to participants.
- Detailed seminar documentation for later reference.
- Small groups for most effective training.

Your benefits:

- Increase competency and value of personnel.
- Increase equipment life, reliability and availability through effective and efficient monitoring practices.
- Opportunity for engineering / maintenance personnel to learn and exchange useful information.
- Updated on most current industry knowledge and experience as well as on latest legislation.

4. Oil Testing Seminar

Oil is used in various crucial different applications and has different important tasks to fulfil. Lubrication oil is used to avoid friction between moving parts and therefore to avoid wear or damages.

Hydraulic oil is used to transmit forces and the hydraulic systems are used in nearly all industries. Oils are also expected to cool or to avoid contaminations which would cause harm to the engine. Oils in modern equipment are complex and expensive liquids. It is therefore important to understand and maintain the oil. Oil can tell us long stories about the performance of the equipment.

Source: Oel Check GmbH

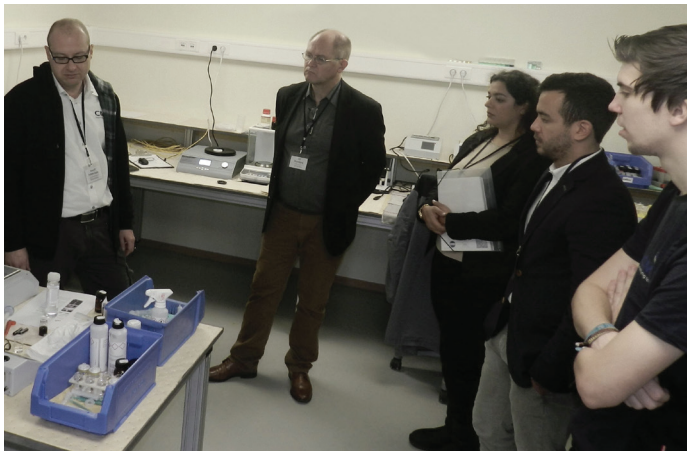
Lube oil is the life blood of your engine!

Training Topics:

- Introduction
- Basic tribology
- Friction, wear and lubrication
- Life-cycle of the oil
- Sampling and sample handling
- Trend analysis in laboratories
- Interpretation of results
- On-site testing - blessing or burden
- Frequencies of testing

Target Group:

- Sales personnel of mineral oil companies
- Technical application engineers
- Technical crews from seagoing vessels
- Technical superintendents
- OEM and component producers
- Service providers in the area of lubrication, lubricants and tribology



Specification:

- Participants: max. 12
- Location: Training Centre Elmshorn or on-site
- Duration: 1 day 9:00 – 17:00

Deliverables:

- Training held by industry professionals
- Modified training content on request
- Hot lunch
- Non-alcoholic beverages & snacks during training
- Training documents (printed and on a USB Flash drive)
- Certificate of participation

5. Monitoring with Vibration Analysis Seminar

Vibration diagnostics tools are here to help us to predict the machine failures. When predictive maintenance is applied and the machines are checked regularly, machine faults can be discovered at an early stage and appropriate action can be taken. By doing so you can avoid unexpected machine shutdowns and you can prevent replacement of parts which are still in good condition.

To use the tools effectively and to help with the implementation CMT offers a Vibration seminar. Depending on the level of the knowledge of the participants the seminar can be amended accordingly. Also in some cases an on site training may be beneficial so make sure to let us know your requirements.

Increase the lifetime of your equipment!

Training Topics :

- Introduction into Vibration Analysis Monitoring
- Measuring parameters or perform vibration diagnosis
- Vibration monitoring devices
- Machinery vibration diagnostic
- Bearing vibration diagnostic
- Air leaks detection
- Working with DDS Database
- Hands-on training with VA portable instruments
- Using routes for effective data collection
- FFT Frequency analysis and data export
- Typical failure modes
- Field experience

Target Group:

- Technical application engineers
- Technical crews from seagoing vessels
- Technical superintendents
- Service and maintenance personnel
- Service providers in the area of vibration monitoring

Specification:

- Participants: max. 12
- Location: Training Centre Elmshorn or on-site
- Duration: 1 day 9:00 – 17:00

Deliverables:

- Training held by industry professionals
- Modified training content on request
- Hot lunch
- Non-alcoholic beverages & snacks during training
- Training documents (printed and on a USB Flash drive)
- Certificate of participation

6. Diesel Performance Seminar

The challenge of upholding a maintenance regime on board ships is to protect the vessel against costly downtime and to operate it cost effectively. Engine maintenance can be planned, thus saving in parts and labour by changing engine parts based on need, not based on timing intervals.

Slow or late combustion is one of the most common problems in diesel engine operation. Balancing the cylinder load extends engine life, increases efficiency, and reduces emissions to assist with environmental compliance. Proper ignition timing reduces the exhaust gas temperature and rate of excess carbon build-up. Tuning the engine may reduce specific fuel oil consumption resulting in significant savings which are paramount to a ship owner´s bottom line.

Improve the efficiency of your engine!

Training Topics :

- Introduction into Diesel Engine Performance Analysis
- Defining different pressures and angles, calculate indicated power
- Identification of problems by using the pressure / angle and pressure / volume diagram
- Cylinder load balance
- What influences the ignition time?
- Results of late ignition and how can it be identified?
- Slow or late combustion. Results and how can it be identified?
- Interpreting results and taking actions.
- Field experience

Target Group:

- Technical application engineers
- Technical crews from seagoing vessels
- Technical superintendents
- OEM and component producers
- Service providers in the engine maintenance

Specification:

- Participants: max. 12
- Location: Training Centre Elmshorn or on-site
- Duration: 1 day 9:00 – 17:00

Deliverables:

- Training held by industry professionals
- Modified training content on request
- Hot lunch
- Non-alcoholic beverages & snacks during training
- Training documents (printed and on a USB Flash drive)
- Certificate of participation

7. Cylinder Drain Oil Management Seminar

Cylinder oil in a main engine has two main tasks. It should lubricate the engine to have an acceptable low wear level and it has to neutralize the sulphuric acid to avoid unexpected acid corrosion in the liner.

By analysing scrapedown oil collected from the scavenge space shipboard personnel are able to monitor the condition of the engine's cylinders and detect changes as they occur. This task helps to protect the engine, optimise the feed rate, monitor for mechanical & corrosive wear and reduce maintenance and operating costs.

Protect the liner of your engine!

Training Topics :

- How is a cylinder lubricated / piston running conditions / different lubrication systems
- Cylinder wear, types of wear and how is it detected and measured / monitored
- Low / high sulphur fuel – what does sulphur in respect of the lubrication regime? Legislations
- The sulphur / base balance – optimise the feed rate
- Cylinder Drain Oil Analysis – onshore / on board
- Sampling the drain oil, how and when
- Interpreting results and taking actions
- Field experience

Target Group:

- Sales personnel of mineral oil companies
- Technical application engineers
- Technical crews from seagoing vessels
- Technical superintendents
- Service providers in the area of lubricants and tribology

Specification:

- Participants: max. 12
- Location: Training Centre Elmshorn or on-site
- Duration: 1 day 9:00 – 17:00

Deliverables:

- Training held by industry professionals
- Modified training content on request
- Hot lunch
- Non-alcoholic beverages & snacks during training
- Training documents (printed and on a USB Flash drive)
- Certificate of participation

8. Marine Water Tests Seminar

Water is an important topic onboard a vessel which due to different regulations concerning it also a quite complicated one. As key topics we have identified Potable Water, Sewage Water and Ballast Water for which we each offer training courses.

If you would like to combine topics let us know and we will work on a customized seminar that is tailored to your needs. Our experienced seminar speaker will tackle topics that need to be addressed as well as answer questions which originate from the daily work experience of the participants.

Safe potable water secures good health!

Training Topics:

- Introduction into potable water
- Risks for fresh water supply and making on board
- Hazardous contaminations (microbes / chemical elements)
- Different methods of disinfection
- Legionella and other bacteria
- Legislation framework
- Risk Management and Water Safety Plan
- Ship owners / masters duties
- Water testing: What, When, Where, Why?
- How to use on-board test kits

Target Group:

- Technical application engineers
- Technical crews from seagoing vessels
- Technical superintendents
- Service and maintenance personnel
- OEM and component producers
- Service providers in the area of water monitoring

Specification:

- Participants: max. 12
- Location: Training Centre Elmshorn or on-site
- Duration: 1 day 9:00 – 17:00

Deliverables:

- Training held by industry professionals
- Modified training content on request
- Hot lunch
- Non-alcoholic beverages & snacks during training
- Training documents (printed and on a USB Flash drive)
- Certificate of participation

Notes

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