

Oil Mist Detection Efficiency Approval



Maximum false alarm immunity

Minimum response time

OMDEA - What is it about

Oil Mist Detection today is accepted as an engine protection system of highest importance. In 1998, a first approach has been started by SCHALLER AUTOMATION to define a test procedure to determine the efficiency of Oil Mist Detection (OMD) Systems on large combustion engines.

Following a long procedure of investigations, SCHALLER AUTOMATION started in 2002 to execute specific measurements on different engine types -in cooperation with the engine makers- in order to integrate its **VISATRON®** Oil Mist detection Systems in a best possible manner into the different types of Diesel, Gas and Dual Fuel engines.

This test procedure is called **OMDEA Oil Mist Detection Efficiency Approval**.

The idea of **OMDEA** is to find out the highest possible OMD sensitivity and so the shortest response time at maximum false Alarm immunity.

With release of The Unified Requirements (UR) M10 ('Protection of internal combustion engines against crankcase explosions') and M67 ('Type Testing Procedure for Crankcase Oil Mist Detection and Alarm Equipment') in 2006, IACS first-time requested similar tests via classification societies for new engine types resp. vessel new buildings.

Affected by UR M10 are new developed resp. redesigned engine types.

Moreover, **OMDEA** tests are also suitable for the improvement of existing OMD installations.

For a best possible integration of the OMD-Systems into new engine types, the following 3 **OMDEA** steps should be carried out in cooperation with the engine maker:

Step 1 Determination of best possible oil mist sampling point per engine compartment

considering the different engine running conditions

This step is mandatory for a good OMD system functionality

Step 2 Determination of the oil mist distribution and behaviour within engine crankcase

considering the different engine running conditions.

Some influencing criteria are e.g. the wash out effect of splashing lubeoil, execution of crankcase ventilation or blow-by-effects of piston ring/cylinder liner-combinations.

Step 3 Design and adaptation of an appropriate OMD System

based on results of Step 1 and 2 and particularities of the relevant engine type. Results of Step 1 and 2 give e.g. an appropriate OMD sensitivity setting and hints for the mechanical design of the tubing system

The examples on following pages shall give you an idea about procedure and result of a typical **OMDEA** measurement project.



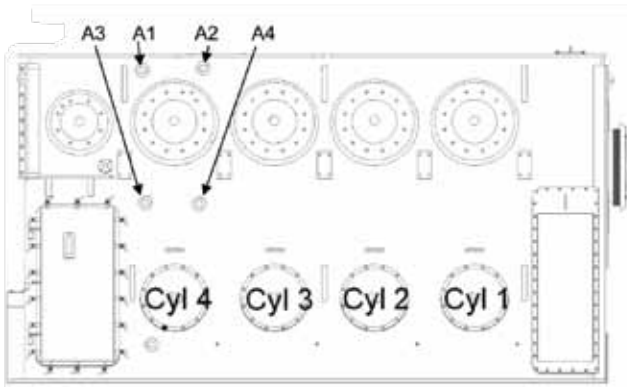
The Procedure

Step 1: How to determine the best possible Oil Mist sampling point per engine compartment

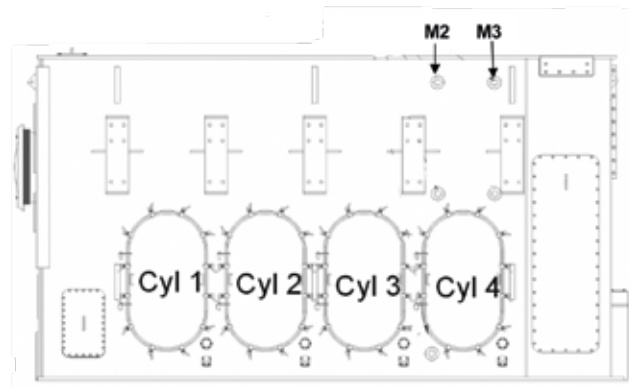
Together with the engine manufacturer, some reasonable positions for sample points for oil mist extraction should be chosen and, if necessary, holes have to be drilled to install the sampling equipment. In some applications a special mechanical device is needed to be installed on the compartment to allow the sample point to be adjusted from outside the engine while engine is running.



choice of possible sampling points



Engine wall of a 2-stroke engine, Exhaust side



Engine wall of a 2-stroke engine, Manoeuvre side

Each chosen sampling point is connected with hoses of the same length to its own dedicated **OMDEA**-measuring unit.

The detected oil mist concentrations of all detectors will be recorded in parallel or repeated after change the sample point position.

For the tests in compartment No. 4, shown as a sample in above engine crankcase, a certain quantity of oil will be evaporated during a certain time, utilizing a special **OMDEA** -oil mist generator.

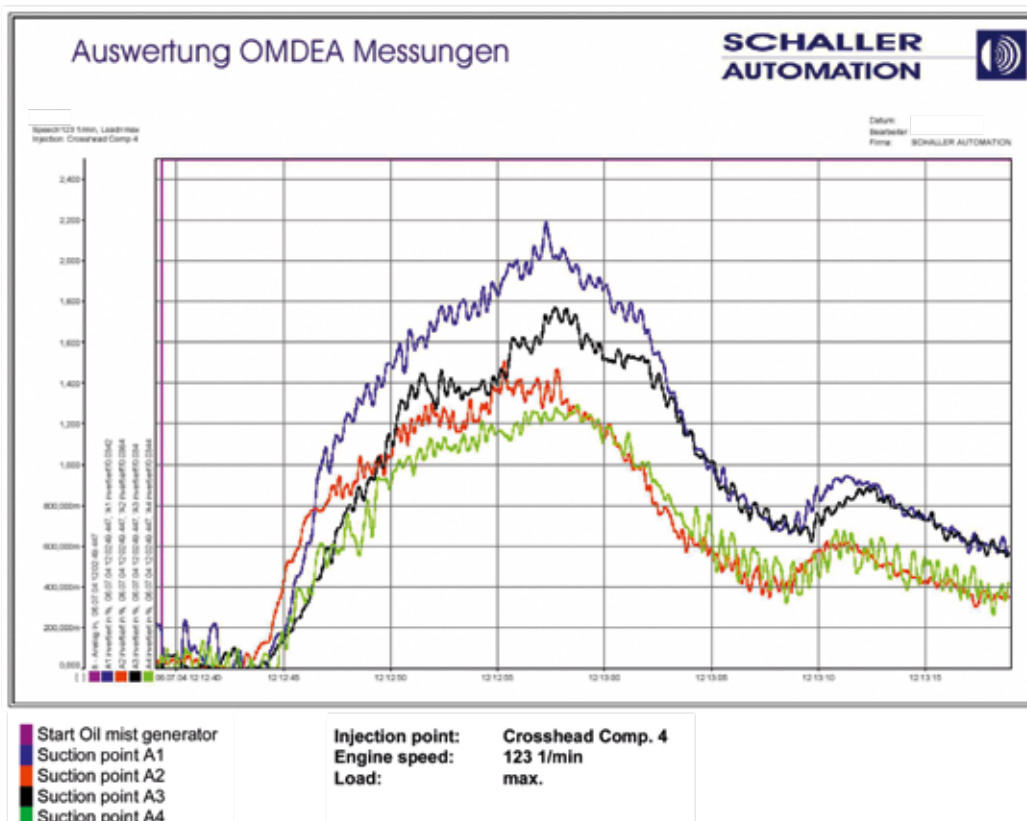
The oil mist is lead into the engine crankcase/chain drive under utilization of pressurized inert gas, also for safety reason.

The tests are getting conducted under different realistic engine load and speed conditions, in agreement with engine manufacturer:

Definition of test procedure to determine best possible oil mist sampling point:

Test-No.	Injection point		Suction points	Engine conditions	
	Comp.	Bearing		speed	load
12	4	Crosshead	Comp.4: M2,M3,A1-4	60 RPM	Min.
13	4	Main bearing	Comp.4: M2,M3,A1-4	60 RPM	Min.
14	Aft	Chain drive	Comp.4: M2,M3,A1-4	60 RPM	Min.
15	4	Crosshead	Comp.4: M2,M3,A1-4	125 RPM	Min.
16	4	Crosshead	Comp.4: M2,M3,A1-4	125 RPM	Max.
17	4	Main bearing	Comp.4: M2,M3,A1-4	125 RPM	Max.
18	Aft	Chain drive	Comp.4: M2,M3,A1-4	125 RPM	Max.
19	4	Main bearing	Comp.4: M2,M3,A1-4	125 RPM	Min.
20	Aft	Chain drive	Comp.4: M2,M3,A1-4	125 RPM	Min.

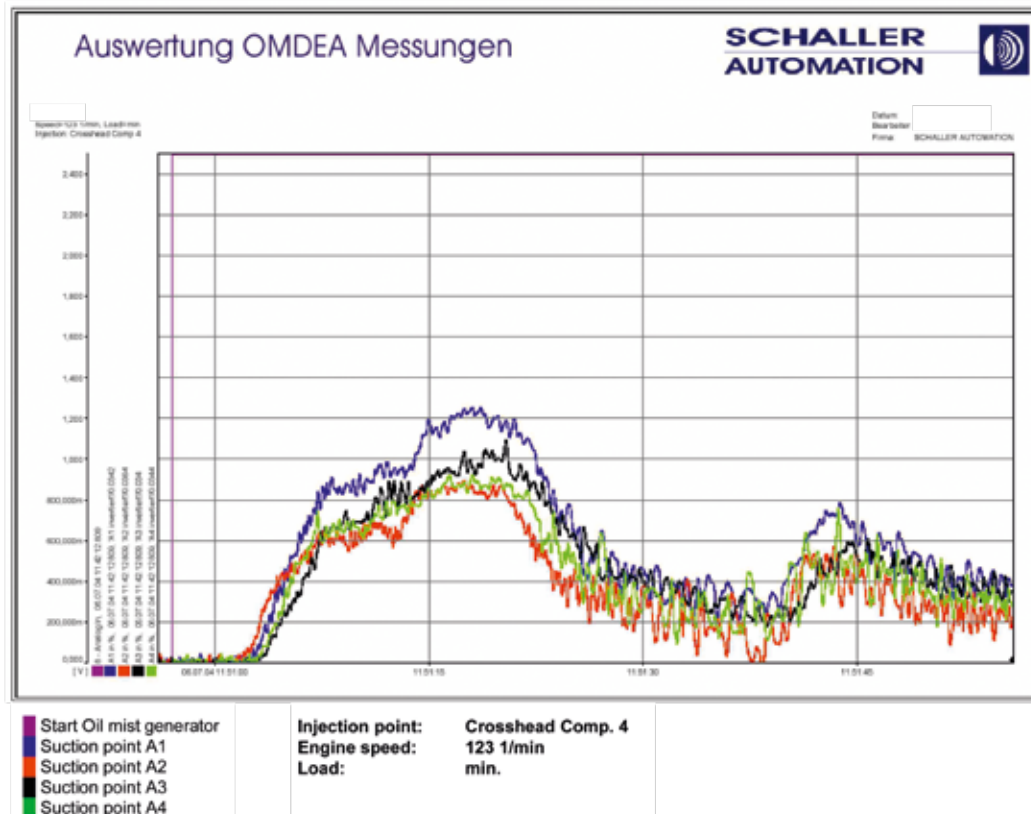
OMDEA Measurement to determine best sampling point, sample of result at max. engine load





The Procedure

OMDEA Measurement to determine best sampling point, sample of result at min. engine load



Result

Best position for oil mist suction:

Sensitivity of each suction point A1 – M3 is assessed.

Suction point with highest sensitivity is evaluated with 1 point, next lower one with 2 points and so on.

Suction point with lowest sum is the best one:

Test-No.	Injection point		Engine conditions		Suction point assessment					
	Comp.	Bearing	speed	load	A1	A2	A3	A4	M2	M3
13	4	Main bearing	60 RPM	Min.	2	4	2	4	3	1
14	Aft	Chain drive	60 RPM	Min.	1	3	1	2	2	1
15	4	Crosshead	125 RPM	Min.	1	3	2	3	4	3
16	4	Crosshead	125 RPM	Max.	1	3	2	3	4	5
17	4	Main bearing	125 RPM	Max.	1	3	1	3	2	1
18	Aft	Chain drive	125 RPM	Max.	1	4	2	2	3	1
19	4	Main bearing	125 RPM	Min.	1	4	1	3	2	1
20	Aft	Chain drive	125 RPM	Min.	1	3	1	2	2	1
			Sum		9	27	12	22	22	14

Result: Most sensitive sampling point on engine's exhaust side is sampling point A1,

Result: Most sensitive sampling point on engine's manoeuvre side is sampling point M3

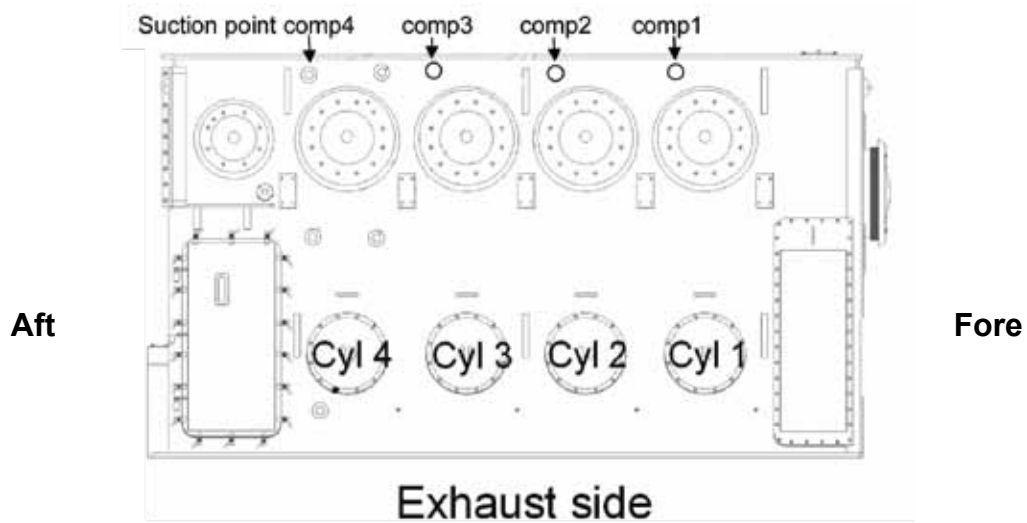
Step 2

Determination of Oil Mist distribution and behaviour within engine crankcase considering the different engine running conditions

Position of suction points

To investigate the oil mist distribution within engine crankcase, the best sampling point per compartment is chosen as the result of Step 1 investigation.

Engine Exhaust side:



Test procedure

Every sampling point is getting connected with hoses of same length to its own dedicated OMDEA-measuring unit.

The detected oil mist concentrations of all detectors will be recorded.

For all tests, a specially designed OMDEA Oil Mist Generator is used to generate a certain amount of real oil mist for test purposes. The oil mist is lead into the engine crankcase/chain drive under utilization of pressurized inert gas, also for safety reason.

The tests are getting conducted under different realistic engine load and speed conditions, in agreement with engine manufacturer:



Test equipment on 4-stroke engine



Test equipment on 2-stroke engine

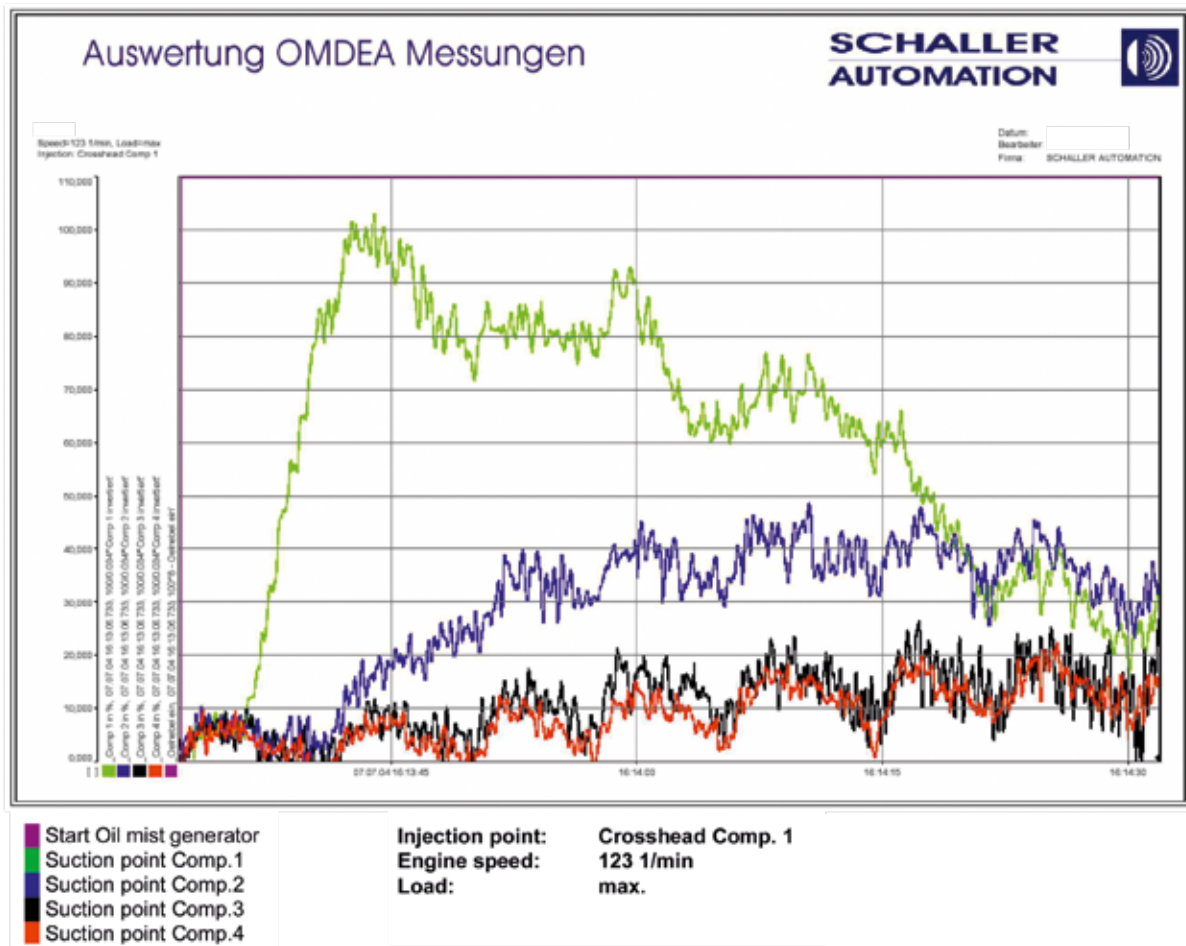


The Procedure

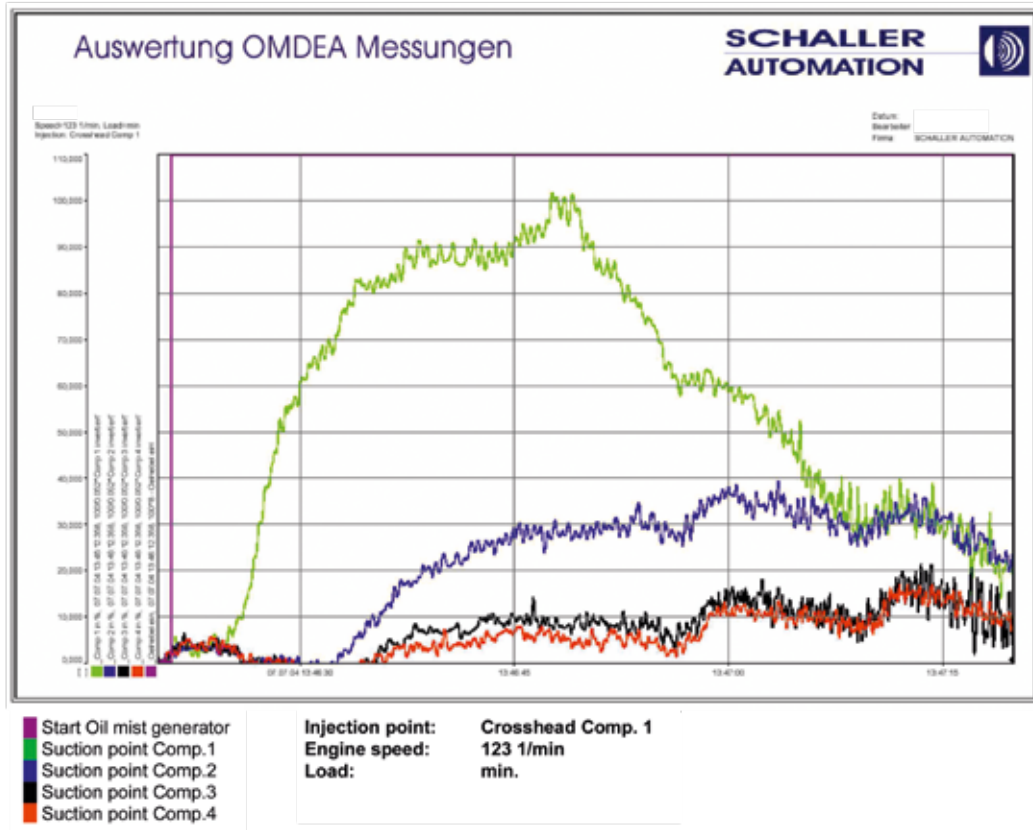
Definition of test procedure to investigate the Oil Mist distribution inside engine crankcase:

Test-No.	Injection point		Suction points	Engine conditions	
	Comp.	Bearing		speed	load
23	3	Crosshead	M2, M3, Comp.1-4	60 RPM	Min.
24	3	Main bearing	M2, M3, Comp.1-4	60 RPM	Min.
25	2	Crosshead	M2, M3, Comp.1-4	60 RPM	Min.
26	2	Main bearing	M2, M3, Comp.1-4	60 RPM	Min.
27	1	Crosshead	M2, M3, Comp.1-4	60 RPM	Max.
28	1	Main bearing	M2, M3, Comp.1-4	60 RPM	Max.
29	4	Crosshead	M2, M3, Comp.1-4	60 RPM	Max.
30	4	Main bearing	M2, M3, Comp.1-4	60 RPM	Min.
⋮	⋮	⋮	⋮	⋮	⋮

OMDEA Measurement to investigate oil mist distribution, sample of result at max. engine load



OMDEA Measurement to investigate oil mist distribution, sample of result at min. engine load



Oil mist distribution inside the crankcase

Example shown on simulated damage in compartment 1

Test-No.	Injection point		Engine conditions		Relation of suction point			
	Comp.	Bearing	speed	Load	Comp	Comp	Comp	Comp
27	1	Crosshead	60RPM	Min.	100%	35%	15%	8%
28	1	Main bearing	60RPM	Min.	100%	85%	32%	15%
39	1	Crosshead	123RPM	Min.	100%	35%	15%	15%
40	1	Main bearing	123RPM	Min.	100%	80%	45%	38%
49	1	Crosshead	123RPM	Max.	100%	40%	20%	20%
50	1	Main bearing	123RPM	Max.	100%	80%	30%	30%

Interpretation:

Result: Damage at crosshead in compartment 1 creates opacity of 100% in compartment 1.

A sampling point in compartment 2 will detect 35%, in compartment 3 15% and in compartment 4 being farthest away 8%.

Result: Damage at Main bearing in compartment 1 creates opacity of 100% in compartment 1.

A sampling point in compartment 2 will detect 85%, in compartment 3 32% and in the 4 being farthest away 15%.

The Procedure

STEP3

Design and adaptation of an appropriate OMD system based on results of Step 1 and 2 and particularities of relevant engine type



After analysis and evaluation of step 1 and 2, the choice of a suitable OMD system with appropriate sensitivity setting finalizes the investigation and the mechanical adaptation can be completed.

As a confirmation, a last test run, similar to Step 2, needs to verify the final result which will also be documented.

The OMDEA test procedure can be used, together with drawing documentation of OMD installations on particular engine type requested by IACS and classification societies, to match the Unified requirements given in UR M10.8 and UR M10.9.

Documentation of the OMDEA-Tests

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Industrielle Automationstechnik KG Tel [+49(0)6842506] ☎[- 0 / Fax [-]260 / eMail: info@schaller.de / www.schaller.de



OMDEA- Basic tests on a

OMDEA-tests on a 2-stroke diesel engine

Place :

Date :

Operators:

Dipl. Ing. Manfred Dürr
Dipl. Ing. Helmuth Uebel
Hr. Franz Kunz

**Responsible for OMDEA-
tests (HPV)**

Dipl. Ing. Manfred Dürr

1. The aim of the tests:

- 1.1 Clarify the best point for oil mist suction for this type of diesel engine, within an exemplary crankcase compartment.
- 1.2 Clarify the oil mist distribution inside the entire crankcase of this type of diesel engine.

2. Measurements:

2.1 Measurement to verify the best suction point.

2.1.1 Arrangement.

2.1.1.1 Position of suction points.

To find out the best suction point to detect oil mist inside a selected compartment, 6 suction points were installed on compartment 4:

Exhaust side: **A1:** Upper aft side of compartment 4
 A2: Upper fore side of compartment 4
 A3: Middle of the crosshead-way, aft side
 A4: Middle of the crosshead-way, fore side



Your Advantage

OMDEA includes the requests, given in the following highlighted paragraphs within IACS R M10

IACS

INTERNATIONAL ASSOCIATION
OF CLASSIFICATION SOCIETIES

M10

M10 Protection of internal combustion engines against crankcase explosions

(1972)
(Rev.1
1991)
(Corr.
1997)
(Rev.2
Jan
2005)
(Corr.1
Nov
2005)
(Corr.2
Oct
2007)

M10.7 A warning notice is to be fitted either on the control stand or, preferably, on a crankcase door on each side of the engine. This warning notice is to specify that, whenever overheating is suspected within the crankcase, the crankcase doors or sight holes are not to be opened before a reasonable time, sufficient to permit adequate cooling after stopping the engine.

M10.8 Where crankcase oil mist detection/monitoring arrangements are to be fitted to engines they are to be of a type approved by classification societies and tested in accordance with UR M67 and comply with UR M10.9 to UR M10.20.

M10.9 The oil mist detection/monitoring system and arrangements are to be installed in accordance with the engine designer's and oil mist manufacturer's instructions/recommendations. The following particulars are to be included in the instructions:

- Schematic layout of engine oil mist detection/monitoring and alarm system showing location of engine crankcase sample points and piping arrangements together with pipe dimensions to detector/monitor.
- Evidence of study to justify the selected location of sample points and sample extraction rate (if applicable) in consideration of the crankcase arrangements and geometry and the predicted crankcase atmosphere where oil mist can accumulate.

• The manufacturer's maintenance and test manual.

• Information relating to type or in-service testing of the engine with engine protection system test arrangements having approved types of oil mist monitoring equipment.

M10.10 A copy of the oil mist detection/monitoring equipment maintenance and test manual required by UR M10.9 is to be provided on board ship.

M10.11 Oil mist monitoring and alarm information is to be capable of being read from a safe location away from the engine.

M10.12 Where there are multi engine installations, each engine is to be provided with oil mist detection/monitoring and a dedicated alarm.

M10.13 Oil mist detection/monitoring and alarm systems are to be capable of being tested on the test bed and board under engine at standstill and engine running at normal operating conditions in accordance with test procedures that are acceptable to the classification society.

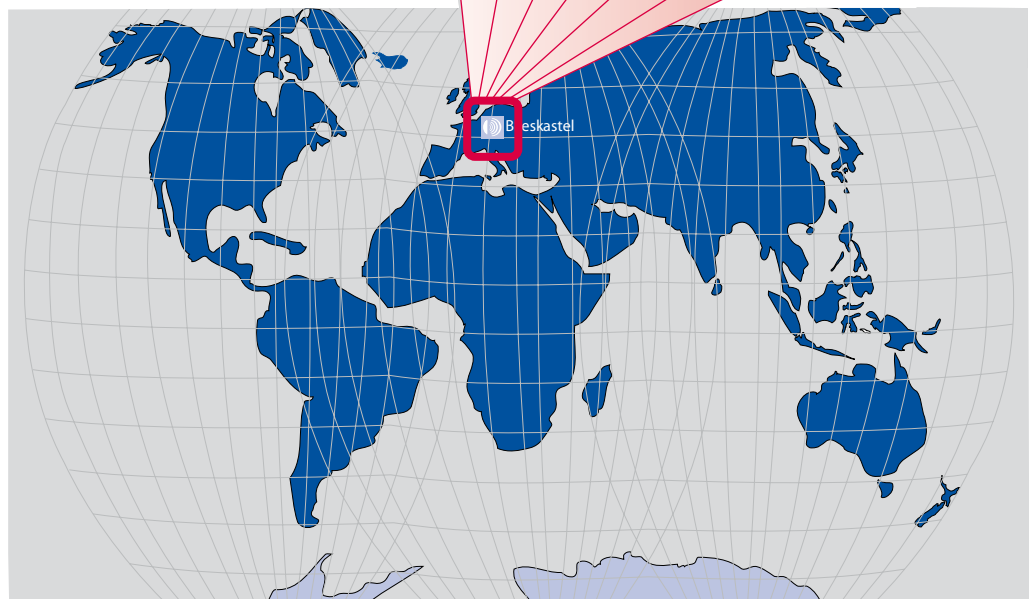
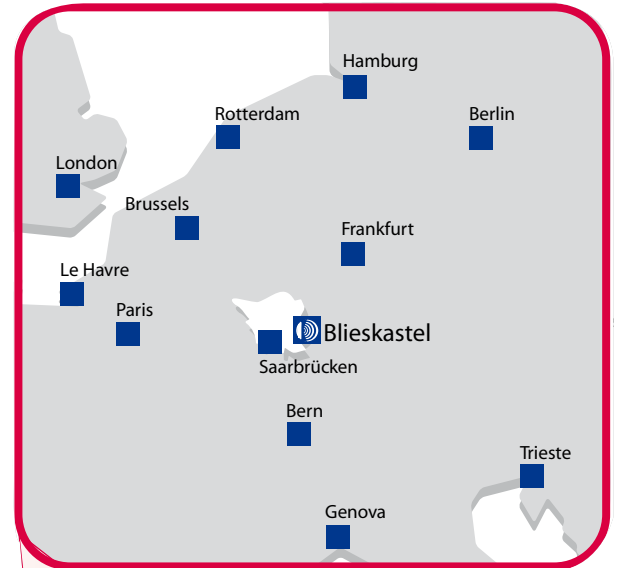
M10.14 Alarms and shutdowns for the oil mist detection/monitoring system are to be in accordance with UR M35 and UR M36 and the system arrangements are to comply with UR M29 and UR M30.

M10.15 The oil mist detection/monitoring arrangements are to provide an alarm indication in the event of a foreseeable functional failure in the equipment and installation arrangements.

M10.19 The equipment together with detectors/monitors is to be tested when installed on the test bed and on board ship to demonstrate that the detection/monitoring and alarm system functionally operates. The testing arrangements are to be to the satisfaction of the classification society.



- Australia
- Brasil
- China
- Denmark
- Germany
- Greece
- Italy
- Japan
- Korea
- Netherlands
- Norway
- Poland
- Singapore
- Spain
- U.A.E.
- United Kingdom
- USA



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