DNV·GL

EC-TYPE EXAMINATION CERTIFICATE (MODULE B)

Certificate No:
MEDB0000086
Revision No:
1

Application of: Directive 2014/90/EU of 23 July 2014 on marine equipment (MED), issued as "Forskrift om Skipsutstyr" by the Norwegian Maritime Authority. This Certificate is issued by DNV GL AS under the authority of the Government of Norway.

This is to certify:

That the Oil discharge monitoring and control system for an oil tanker

with type designation(s)
ODME S-3000 Version 2

Issued to
KSB Seil Co., Ltd.
Busan, Republic of Korea

is found to comply with the requirements in the following Regulations/Standards:
Regulation **(EU) 2019/1397,**
item No. MED/2.5. Marpol 73/78 as amended, Annex I Regulation 31, IMO Res. MEPC.108(49) as amended by IMO Res. MEPC.240(65) and IMO MEPC.1/Circ.858

Further details of the equipment and conditions for certification are given overleaf.

This Certificate is valid until **2025-05-11**.
Issued at **Høvik** on **2020-05-12**

DNV GL local station:
Gimhae Station

Approval Engineer:
Erik Istad

Notified Body
No.: **0575**

for **DNV GL AS**

Digitally Signed By: Torill Grimstad Osberg
Location: DNV GL Høvik, Norway
on behalf of

Roald Vårheim
Head of Notified Body

NORWEGIAN ACCREDITATION PROD 019

The mark of conformity may only be affixed to the above type approved equipment and a Manufacturer's Declaration of Conformity issued when the production-surveillance module (D, E or F) of Annex B of the MED is fully complied with and controlled by a written inspection agreement with a Notified Body. The product liability rests with the manufacturer or his representative in accordance with Directive 2014/90/EU.
This certificate is valid for equipment, which is conform to the approved type. The manufacturer shall inform DNV GL AS of any changes to the approved equipment. This certificate remains valid unless suspended, withdrawn, recalled or cancelled.
Should the specified regulations or standards be amended during the validity of this certificate, the product is to be re-approved before being placed on board a vessel to which the amended regulations or standards apply.

Product description

Intended for installation onboard oil tankers for ballast water monitoring control and alarm of contents of oil at discharge overboard.

Controller:
ODME S-3000 Version 2: Cpu: s3c6410, embedded Linux C program

Analyzer:
ODME S-3000 Version 2: Cpu: Atmega 128, Codevision C program

Application/Limitation

ODME S-3000 Version 2:
The oil content meter is tested and approved for crude oils, "black" and "white" products as per IMO Resolution MEPC.108(49), and the blends of petroleum oil and bio-fuels as given in IMO MEPC.240(65) and MEPC.1/Circ.761, to meet the requirements for testing bio-fuel blends containing 99% and 75% or more of petroleum oil.

The ODME for Energy-rich fuels is covered by this certificate as given in IMO.MEPC.1/Circ.879 and MEPC.2/Circ.24

Tested and approved blends of petroleum and bio-fuel:

- FAME 25 % and Diesel 75 %
- FAME 1 % and Diesel 99 %
- Vegetable oil 25 % and Diesel 75 %
- Vegetable oil 1 % and Diesel 99 %
- Alkanes (>60 °C) (C10-C26) 25 % and Diesel 75 %
- Alkanes (>60 °C) (C10-C26) 1 % and Diesel 99 %
- Alkanes (≤60 °C) (C10-C26) 25 % and Diesel 75 %
- Alkanes (≤60 °C) (C10-C26) 1 % and Diesel 99 %
- Ethyl alcohol 25 % and Gasoline 75 %
- Ethyl alcohol 1 % and Gasoline 99 %

Enclosure protection of electrical components in engine room and pump room to be minimum IP44.

Transmitters and other electrical components/ systems in pump room to be arranged 'intrinsically safe'.

Type Examination documentation

DWG No.:	*Rev.:*	*Name:*
Version 2:		
MK-SV-3030	0-8	Oil Content Meter Dimension Drawing
MK-SV-3030	1-2	Oil Content Meter Dimension Drawing
MK-SV-3101	1-4	Bulkhead Penetration for Motor/ Pump
MK-SV-3141	0-1	Bulkhead Penetration for ppm Measurer
MK-SV-3141	1-1	Bulkhead Penetration for ppm Measurer
MK-SV-3141	2-1	Bulkhead Penetration for ppm Measurer

MK-SC-3130	0	Schematic Drawing for Oil Content Meter (2)
MK-SC-3140	0	Schematic Drawing for Oil Content Meter (3)
MK-SC-3150	0	Schematic Drawing for Oil Content Meter (4)
MK-SC-3160	0	Schematic Drawing for Oil Content Meter (5)
MK-SC-3170	1	Schematic Drawing for Oil Content Meter (6)
MK-SX-3050	0-2	Dimension for Name Plate
MK-SV-3010	0-11	Controller Dimension Drawing
MK-SC-3010	2	Layout for Controller Electronic Parts
MK-SC-3020	1	Schematic Drawing for Controller (1)
MK-SC-3030	2	Schematic Drawing for Controller (2)
MK-SC-3040	2	Schematic Drawing for Controller (3)
MK-SC-3050	1	Schematic Drawing for Controller (4)
MK-SC-3060	2	Schematic Drawing for Controller (5)
MK-SC-3070	2	Schematic Drawing for Controller (6)
MK-SC-3110	2	Layout for Oil Content Meter Electronic Parts
MK-SC-3120	1	Schematic Drawing for Oil Content Meter (1)

Operational Manual:
S-3000 MEPC 108(49) & MEPC 240(65), Oil Discharge Monitoring Equipment, Operation Manual

Tests carried out

Test Reports:

ODME S-3000 Version 2:

- Tested in accordance with the requirements of the specification contained in Part 1 of the Annex to the Guidelines and Specification contained in IMO Resolution MEPC.108(49), for oil content meter, witnessed and signed by Det Norske Veritas, Pusan, July 2004.

- Tested in accordance with the requirements of the specification contained in Part 2 of the Annex to the Guidelines and Specification contained in IMO Resolution MEPC.108(49), for environmental testing oil content meter and control section, witnessed and signed by Det Norske Veritas, Pusan, July 2004.

- Korea Marine Equipment Research Institute, *Environmental test for controller: Vibration test report with evidence*, dated 26.02.2015.

- Korea Marine Equipment Research Institute, *Environmental test for controller: Low temperature, high temperature, humidity report with evidence*, dated 15.09.2014.

- KSB Seil Co., Ltd., *Environmental test for controller: Fluctuation in power supply test, inclination test, report and evidence*, dated 10.11.2014, witnessed by DNV GL.

- KSB Seil Co., Ltd., *Type approval test report for bio-fuel blends,* dated 10.11.2014, witnessed by DNV GL.

Marking of product

For traceability to this type approval, each unit is to be marked with:
- Manufacturers name or trade mark
- Type designation
- Serial No.

Mark of Conformity

The manufacturer is allowed to affix the Mark of Conformity according to Article 11 in the Council Directive 96/98/EC on Marine Equipment and shall issue a Declaration of Conformity, only when the module D or E or F of Annex B in the same directive is fully complied with.

Module D: The quality system for production and testing shall be approved by the Notified Body.

Module E: The quality system for inspection and testing shall be approved by the Notified Body.

Module F: Compliance of the products to type as described in this EC Type-Examination Certificate must be verified by the Notified Body who also shall issue a Certificate of Conformity.

This certificate is replacing previous EC Type-Examination Certificate No. MED-B-0000086

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APPENDIX

TEST DATA AND RESULTS OF TESTS CONDUCTED ON AN OIL CONTENT METER IN ACCORDANCE WITH PART 1 OF THE ANNEX TO THE GUIDELINES AND SPECIFICATIONS CONTAINED IN IMO RESOLUTION MEPC.108(49), as amended by Resolution MEPC.240(65).

Oil content meter submitted by	KSB Seil Co., Ltd., Busan, Republic of Korea
Test Location	KSB Seil Co., Ltd., Busan, Republic of Korea
Method of sample analysis	ISO 9377-2
Test rig according to drawing	Report No.14-699-Tao11
Samples Analysed by	SGS Korea, Ulsan, Korea

Environmental testing of the electronic section of the oil content meter has been carried out in accordance with part 2 of the annex to the Guidelines and Specifications contained in IMO resolution MEPC.108(49), as amended by Resolution MEPC.240(65). The equipment functioned satisfactorily on completion of each test specified in the environmental test protocol.

		Readings (ppm)				
		Indicated	Measured	Grab sample	**REMARKS**	
CALIBRATION AND	0	0	0	0		
ZERO TEST	15	15	15	14		
	50	51	48	55		
	100	100	96	105		
	200	200	193	192		
	400	405	384	412		
	600	602	576	595	TEST WATER TEMPERATURE	28°C
	800	802	768	787		
	1000	984	1080	1012	RE-ZERO	~~YES~~/NO
					RECALIBRATE	~~YES~~/NO

RESPONSE TESTS

NO.1 CRUDE OIL					**REMARKS**	
	15	14	15	13		
	100	100	96	98	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	901	864	894	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a

NO.2 CRUDE OIL					**REMARKS**	
	15	14	15	11		
	100	100	96	93	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	907	864	910	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a

NO.3 CRUDE OIL					**REMARKS**	
	15	13	15	19		
	100	100	96	106	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	901	864	930	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a

NO.4 CRUDE OIL					**REMARKS**	
	15	15	15	16		
	100	101	96	95	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	902	864	879	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a

NO.5 CRUDE OIL					**REMARKS**	
	15	15	15	15		
	100	98	96	91	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	901	864	886	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a

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MARINE RESIDUAL FUEL OIL RMG 35-ISO 8217					**REMARKS**	
	15	15	15	17	RE-ZERO	~~YES~~/NO
	100	100	96	94	TIME	n.a
90% M.F.S.V. =	900	889	880	905	RECALIBRATE	~~YES~~/NO
RECORDED ZERO					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a
AUTOMOTIVE GASOLINE					**REMARKS**	
	15	13	15	13	RE-ZERO	~~YES~~/NO
	100	97	100	101	TIME	n.a
90% M.F.S.V. =	900	877	872	913	RECALIBRATE	~~YES~~/NO
RECORDED ZERO					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a
KEROSENE					**REMARKS**	
	15	14	15	13		
	100	101	100	95	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	900	872	898	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a
MARINE DISTILLATE FUEL OIL					**REMARKS**	
	15	15	15	15		
	100	99	94	103	RE-ZERO	~~YES~~/NO
90% M.F.S.V. =	900	895	876	881	TIME	n.a
RECORDED ZERO					RECALIBRATE	~~YES~~/NO
					TIME	n.a
					CLEAN	~~YES~~/NO
					TIME	n.a

M.F.S.V = Maximum Full Scale Value

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INDIVIDUAL BIOFUEL BLENDS AND CONCENTRATIONS

		Readings (ppm)				
		Indicated	Measured	Grab sample	**REMARKS**	
CALIBRATION AND	0	0	0	0		
ZERO TEST	15	17	15	13	Bio-fuel blends containing FAME 25% and Diesel 75%	
	50	55	52	54		
	100	104	103	103		
	200	204	198	194		
	400	410	406	393		
	600	634	602	623	TEST WATER TEMPERATURE	23,5°C
	800	847	810	825		
	1000	976	993	1016	RE-ZERO	NO
					RECALIBRATE	NO
~~* **BIO-FUEL BLEND**~~					~~**REMARKS**~~	
~~**75% Petroleum Oil**~~						
~~75% Nahphta~~						
~~25% Tert-Amyl Ethyl Ether~~					~~RE-ZERO~~	~~YES/NO~~
	~~15~~	~~-~~	~~-~~	~~-~~	~~TIME~~	~~Mins~~
	~~100~~	~~-~~	~~-~~	~~-~~	~~RECALIBRATE~~	~~YES/NO~~
~~90% M.F.S.V. =~~	~~900~~	~~-~~	~~-~~	~~-~~	~~TIME~~	~~Mins~~
~~RECORDED ZERO~~					~~CLEAN~~	~~YES/NO~~
					~~TIME~~	~~Mins~~
~~* **BIO-FUEL BLEND**~~					~~**REMARKS**~~	
~~**99% Petroleum Oil**~~						
~~99% Naphtha~~						
~~1% Tert-Amyl Ethyl Ether~~					~~RE-ZERO~~	~~YES/NO~~
	~~15~~	~~-~~	~~-~~	~~-~~	~~TIME~~	~~Mins~~
	~~100~~	~~-~~	~~-~~	~~-~~	~~RECALIBRATE~~	~~YES/NO~~
~~90% M.F.S.V. =~~	~~900~~	~~-~~	~~-~~	~~-~~	~~TIME~~	~~Mins~~
~~RECORDED ZERO~~					~~CLEAN~~	~~YES/NO~~
					~~TIME~~	~~Mins~~

BIO-FUEL BLEND **75% Petroleum Oil** 75% Diesel 25% Alkanes (C10-C26) linear and branched with a flash point >60ºC					**REMARKS**	
					RE-ZERO	~~YES~~/NO
	15	20	19	18	TIME	Mins
	100	98	104	98	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	898	912	865	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins

BIO-FUEL BLEND **99% Petroleum Oil** 99% Diesel 1% Alkanes (C10-C26) linear and branched with a flash point >60ºC					**REMARKS**	
					RE-ZERO	~~YES~~/NO
	15	20	18	20	TIME	Mins
	100	93	99	93	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	939	907	947	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins

BIO-FUEL BLEND **75% Petroleum Oil** 75% Diesel 25% Alkanes (C10-C26) linear and branched with a flash point ≤60ºC					**REMARKS**	
					RE-ZERO	~~YES~~/NO
	15	20	17	17	TIME	Mins
	100	105	100	101	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	894	911	932	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins

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BIO-FUEL BLEND					**REMARKS**	
99% Petroleum Oil						
99% Diesel						
1% Alkanes (C10-C26) linear and branched with a flash point ≤60°C					RE-ZERO	~~YES~~/NO
	15	19	19	16	TIME	Mins
	100	104	97	96	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	906	886	923	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins
BIO-FUEL BLEND					**REMARKS**	
75% Petroleum Oil						
75% Gasoline						
25% Ethyl Alcohol					RE-ZERO	~~YES~~/NO
	15	11	15	15	TIME	Mins
	100	97	98	100	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	907	911	896	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins
BIO-FUEL BLEND					**REMARKS**	
99% Petroleum Oil						
99% Gasoline						
1% Ethyl Alcohol					RE-ZERO	~~YES~~/NO
	15	19	16	18	TIME	Mins
	100	107	102	105	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	932	898	934	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins
BIO-FUEL BLEND					**REMARKS**	
75% Petroleum Oil						
75% Diesel						
25% F.A.M.E.					RE-ZERO	~~YES~~/NO
	15	13	15	13	TIME	Mins
	100	100	95	103	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	896	901	893	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins

BIO-FUEL BLEND					**REMARKS**	
99% Petroleum Oil						
99% Diesel						
1% F.A.M.E.					RE-ZERO	~~YES~~/NO
	15	14	17	14	TIME	Mins
	100	98	95	99	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	910	899	912	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins
~~**BIO-FUEL BLEND***~~					~~**REMARKS**~~	
~~**75% Petroleum Oil**~~						
~~75% Diesel~~						
~~25% Tert-Amyl Ethyl Ether~~					~~RE-ZERO~~	~~YES/NO~~
	~~15~~	-	-	-	~~TIME~~	~~Mins~~
	~~100~~	-	-	-	~~RECALIBRATE~~	~~YES/NO~~
~~90% M.F.S.V. =~~	~~900~~	-	-	-	~~TIME~~	~~Mins~~
~~RECORDED ZERO~~					~~CLEAN~~	~~YES/NO~~
					~~TIME~~	~~Mins~~
~~**BIO-FUEL BLEND***~~					~~**REMARKS**~~	
~~**99% Petroleum Oil**~~						
~~99% Diesel~~						
~~1% Tert-Amyl Ethyl Ether~~					~~RE-ZERO~~	~~YES/NO~~
	~~15~~	-	-	-	~~TIME~~	~~Mins~~
	~~100~~	-	-	-	~~RECALIBRATE~~	~~YES/NO~~
~~90% M.F.S.V. =~~	~~900~~	-	-	-	~~TIME~~	~~Mins~~
~~RECORDED ZERO~~					~~CLEAN~~	~~YES/NO~~
					~~TIME~~	~~Mins~~
BIO-FUEL BLEND					**REMARKS**	
75% Petroleum Oil						
75% Diesel						
25% Vegetable Oil					RE-ZERO	~~YES~~/NO
	15	20	17	21	TIME	Mins
	100	97	100	102	RECALIBRATE	~~YES~~/NO
90% M.F.S.V. =	900	889	893	889	TIME	Mins
RECORDED ZERO					CLEAN	YES/~~NO~~
					TIME	15 Mins

BIO-FUEL BLEND					**REMARKS**	
99% Petroleum Oil						
99% Diesel						
1% Vegetable Oil					RE-ZERO	YES/NO
	15	16	18	18	TIME	Mins
	100	97	98	98	RECALIBRATE	YES/NO
90% M.F.S.V. =	900	864	880	881	TIME	Mins
RECORDED ZERO					CLEAN	YES~~/NO~~
					TIME	15 Mins

F.A.M.E = Fatty Acid Methyl Esters

* Crossed out Bio-Fuel blends has not been tested and are not covered by the certificate.

RESPONSE TIMES

First detectable reading			7	Seconds
	63	ppm	15	seconds… (1)
	90	ppm	25	Seconds
Stabilized maximum reading or 100ppm	105	ppm	43	seconds
First detectable drop			7	seconds
	37	ppm	15	seconds… (2)
	10	ppm	25	seconds
Stabilized minimum reading	0	ppm	42	seconds
RESPONSE TIME= $\frac{(1)+(2)}{(2)}$			15	seconds

OIL FOULING AND CALIBRATION SHIFT

10% oil concentration test				
First detectable response			8	seconds
	15	ppm	8	seconds
	100	ppm	15	seconds
Off scale on highest range			25	seconds
On scale on highest range			8	seconds
	100	ppm	16	seconds
	15	ppm	25	seconds
Minimum reading	0	ppm	86	seconds
Further cleaning required	~~YES/~~NO			
Time			--	minutes

100% oil concentration test				
First detectable response			7	seconds
	15	ppm	7	seconds
	100	ppm	14	seconds
Off scale on highest range			25	seconds
On scale on highest range			15	seconds
	100	ppm	15	seconds
	15	ppm	25	seconds
Minimum reading	0	ppm	113	seconds
Further cleaning required	~~YES~~/NO			
Time			--	minutes
Calibration shift	**0**	ppm		

CONTAMINANT TEST

Meter reading shift with 300 ppm non-oil contaminants mixed with water and No.2 crude oil in oil concentrations of:

• 15ppm	**0**	ppm
• 100ppm	**+1**	ppm
• 300ppm	**+5**	ppm

AIR ENTRAINMENT TEST

Meter reading shift with 1% air entrained in water and No.2 crude oil added in concentrations of:

• 15ppm	**0**	ppm
• 100ppm	**+2**	ppm
• 300ppm	**+9**	ppm

OIL PARTICLE SIZE TEST

Meter reading shift	**0**	ppm

TEMPERATURE TEST

Calibration test water temperature	**26**	ºC
Meter reading shift at 10ºC	**0**	ppm
Meter reading shift at 65ºC	**+1**	ppm

SAMPLE PRESSURE OR FLOW TEST

Meter reading shift at 50ºC of normal	**0**	ppm
Meter reading shift at 200ºC of normal	**0**	ppm

Deviations from this test should be stated, if necessary n.a

SHUT-OFF TEST

Meter reading before shut-off	**101**	ppm
Meter reading after start-up (minimum dry period 8 hours)	**101**	ppm
Damage to meter as follows:	None	

UTILITIES SUPPLY VARIATION TEST

110% voltage effects	0
90% voltage effects	0
110% air pressure effects	n.a
90% air pressure effects	n.a
110% hydraulic pressure effects	n.a
110% hydraulic pressure effects	n.a

OTHER COMMENTS

None

CALIBRATION AND ZERO DRIFT TEST

Calibration Drift	**1**	ppm
Zero Drift	**0**	ppm

SHUTDOWN AND RE-ENERGIZATION TEST

Span drift	**1**	ppm
Zero Drift	**0**	ppm
Time for warm-up and calibration	**8**	mins