Emission testing of exhaust gas cleaning systems according MEPC.259(68)

1. General

Emission Testing should follow the requirements of Revised IMO MARPOL Annex VI and NO_X Technical Code 2008 (NTC) as well as Resolution MEPC.259(68) „2015 Guidelines for exhaust gas cleaning systems“.

2. Requirements

Item	Source	Requirement		Proved acc. to Regulation / Std.	Req. Fulfilled	
					Yes	No
Analyzer Type	MEPC.259(68)	CO_2	NDIR	NA		
		SO_2	NDIR or NDUV			
Other systems or analyser principles may be accepted, subject to the approval of the Administration, provided they yield equivalent or better results to those of the equipment referenced above. Evidence that the measurement method yields equivalent results to those of the approved reference method for SO_2 (NDIR or NDUV, dry or wet) and CO_2 (NDIR, dry).						
Analyzer Ranges	NTC, App. 3, 1.3	CO_2 Typical: CO_2 0-12%	Measured conc. between 15% and 100% of Range	NA		
		SO_2 Typical: SO_2 0-500ppm				
Analyzer Output	NTC, 5.9.7.1	Analyser output shall be recorded continuously at calibration and measuring.		NA		
Data recording	MEPC.259(68) 5.4.2	SO_2 / CO_2 Data acquisition rate not less than 0.0035 Hz (each 4.76 min.)		NA		
	MEPC.259(68) 5.4.3	Similar sampling and measurement times of SO_2 and CO_2 so that the SO_2 / CO_2 ratio is representative		NA		
	MEPC.259(68) 7.1, 7.4	Robust and tamper-proof with read-only capability Data available for a period of at least 18 months		NA		
EMC	NTC, App. 3, 1.5	Analyzer shall be able to work, unaffected by magnetic fields		NA		
Precision (Precision is defined as 2.5 times the std deviation of 10 repetitive responses)	NTC, App. 3, 1.7	Conc. >100ppm	max ± 1% of FS	ISO 5725-1 ISO 5725-2		
		Conc. <100ppm	max ± 2% of FS			
Noise	NTC, App. 3, 1.8	The analyser peak-to-peak response to zero and calibration or span gases over any 10 seconds period shall not exceed 2% of full scale on all ranges used.		ISO 5725-1 ISO 5725-2		
Drift	NTC, App. 3, 1.9 NTC, App. 3, 1.10	Zero drift	max ± 2%/h of FS on lowest range used	ISO 5725-1 ISO 5725-2		
		Span drift	max ± 2%/h of FS on lowest range used			

Item	Source		Requirement		Proved acc. to Regulation / Std.	Req. Fulfilled	
						Yes	No
Linearity	General	NTC, App. IV, 5.5.1.1	Calibration curve established by at least 6 points + zero		NA		
			Calibration curve is calculated by method of least squares. A best fit line may be used.				
			Max. ± 2% deviation of reading or max. ± 0.3% deviation of FS Whichever is greater				
	Cal. < 15% FS or below 155ppm	NTC, App. III, 1.4	Additional calibrations are to be made to ensure the accuracy of the calibration curves				
Calibration	NTC, App. IV		Analyser and span check procedures shall be verified for their correctness.		NA		
Calibration interval	NTC; 5.9.9		The calibration interval should be selected in a way to ensure that the difference between the responses to the zero gas and to the span gas between the interval is less than 2% of the initial span gas concentration		NA		
Alternative calibration methods	NTC, App. IV 5.5.1.5		Alternative calibration methods (e.g. computer, electronically controlled range switch) could be approved if these alternatives can give equivalent accuracy.		NA		
Sampling	MEPC.259(68) 6.4; 6.9		CO_2	If CO_2 is reduced by the EGC it can be measured at the EGC inlet	NA		
			SO_2	Representative sampling point downstream of the EGC unit			
	MEPC.259(68) 6.5, 6.6, 6.8		in situ	determination of water content to correct SO_2 reading to a dry basis	NA		
			extractive	avoid condensed water in sampling system and loss of SO_2			
	NTC, App. IV 4		System leackage test shall be performed with either the end plugged or other arrangements.		NA		
	Use of multi-hole probe is recommended				NA		
Gas drying (if SO_2 is measured dry)	MEPC.259(68) 6.7		Sufficient Kind of gas dryer or cooler that does not result in loss of SO_2 in the sample as analysed		NA		
	NTC, App. III, 2		Chemical dryers are not permitted.		NA		
Heated Tubes	MEPC.259(68) 6.6		Extractive exhaust gas samples for SO_2 determination should be maintained at a sufficient temperature to avoid condensed water in the sampling system and hence loss of SO_2		NA		

Item	Source	Requirement	Proved acc. to Regulation / Std.	Req. Fulfilled	
				Yes	No
Calculation procedures	MEPC.259(68)	Calculations of Ratio Emission SO_2 (ppm) / CO_2 (% v/v)	NA		
Cross-Sensivity to water	If CO_2 and/or SO_2 are measured on a wet basis, the cross-sensivity against water must be checked		Calculation acc. NTC 9.2.2		
Interference Check	It has to be specified if cross-sensitivities to other gases occurs		NA		
Sample gas flow	Influence of sample gas flow		NA		
On-board monitoring manual (OMM)	Please specify: - necessary ancillary services such as sample transfer lines - service, maintenance and calibration requirements - analyser zero and span check procedures		MEPC.259(68) 8.2		

3. Test Report

The tesing has to be done by the client and shall be presented in a suitable test report.
Following items should be included in the test report:

- Precise description of the equipment
- Measurement principle and functionality
- Rated operating conditions
- Measuring range
- Software, data recording and processing device
- Precision
- Noise
- Drift Zero
- Drift Span
- Calibration interval
- Linearity
- Check if cross-sensitivities to other gases occurs
- Exemplary text for future On-board monitoring manuals (OMM)
- Strategy for heavy fuel compatibility
- Complete set of calibration protocols, copy of calibration certificates of used span gases, photos
- Evaluation/Interpretation of results
- Conclusion

All given data should be traceable.

The instruction manual should include the neccessary service, maintenance- and calibration frequency.