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GUIDELINES FOR EXHAUST GAS RECIRCULATION SYSTEMS

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CHAPTER 1 GENERAL

1.1 Application

1.1.1 Exhaust Gas Recirculation(EGR) systems fitted for the purposes of reducing diesel engine NOx emissions are considered primary exhaust emission reduction techniques forming part of the total engine design and as such are to be integrated by, or under authorization of, the engine designer. Requirements contained within this Guideline are supplementary to, and to be applied in association with, the requirements for diesel engines under the Rules for the Construction and Classification of Steel Ships(hereinafter refered to as the Rules).

1.1.2 Those EGR systems that incorporate extensive off-engine systems that are designed for the purposes of removing the sulfur by-products from the exhaust gases that originate from the fuel and incorporate, for example, water scrubbing and water cleaning systems, may be assigned an additional **EGR** notation. Where a water treatment system is incorporated in the EGR system, the washwater discharge criteria is to meet the requirements of IMO Resolution MEPC.184(59).

1.1.3 The **EGR** notation is not intended to be applied to those vessels that have installed engines that incorporate all EGR system components within the base engine design and, for example, may be primarily designed for use with low sulfur fuels. For those engines, the EGR system, or EGR version of the engine, is to be approved by incorporation to the existing diesel engine approval.

1.2 Plans and Data to be Submitted

1.2.1 Plans and specifications covering the EGR arrangements are to be submitted and are, as applicable, to include:

(a) General arrangement of the EGR installation, layout, and systems

(b) Documentation detailing the EGR specification and associated water treatment systems, including details of EGR specific components such as coolers, blowers, valves, etc.

(c) Hull plans showing the foundation and attachments of accessories to the vessel’s structure, including scantlings, welding details, and foundation details of principal components

(d) Material specifications for the EGR equipment and associated systems, including coolers, blowers, pumps, valves, storage/process tanks, residue tanks, piping, distribution systems, separators, and associated components, including a corrosion assessment detailing the corrosive effect of system liquids, vapors, and gases on the materials used in the system

(e) Arrangement and capacity of tanks for storage, chemicals, process washwater, exhaust gas cleaning residues, etc.

(f) Details of all piping systems, including details of piping and associated components, design pressures, temperatures, insulation, and drip trays, where applicable

(g) Descriptions and schematic diagrams for the control and monitoring systems, including set points for abnormal conditions and details of the location and position at which exhaust emission or EGR rate monitoring and washwater monitoring are to be located

(h) Details of all electrical equipment installed for the EGR unit and associated systems, including computer-based systems

(i) Failure Modes and Effects Analysis (FMEA) to determine possible failures and their effects in the safe operation of the EGR system

(j) Emergency shutdown arrangements

(k) EGR FMEA integration test report

(l) Operating and maintenance instruction manuals, including MSDS sheets and details for handling of hazardous and non-hazardous chemicals used in the system

(m) Testing procedures during installation and commissioning trials

CHAPTER 2 DESIGN REQUIREMENTS

2.1 General Requirements

2.1.1 In addition to the requirements in these guidelines, pipes, valves, pipe fittings, auxiliaries, etc. are to satisfy corresponding requirements of the Rules for the Construction and Classification of Steel Ships(hereinafter refered to as the Rules).

2.1.2 EGR systems are to be designed to enable continued operation of the engine at the times the EGR system is not in operation, either through operational selection, equipment failure, or system deterioration through partial blocking/clogging

2.1.3 The response of the mechanical and electrical systems of the first EGR unit in a particular design series is to be demonstrated by the FMEA integration test of 2.6.

2.1.4 The integration of an EGR system to an already approved diesel engine is not considered an engine type defining parameter change.

2.2 Compatibility with the Engine

2.2.1 Installation and operation of the EGR system is to be compatible with the engine and not to cause any adverse effects on the engine performance such as excessive back pressures or temperatures during operation.

2.2.2 The range of suitable fuels for which the EGR system is capable of continual operation, in particular with respect to sulfur content and other fuel elements known to cause fouling issues, is to be declared by the EGR manufacturer and included in the EGR specification documentation and instruction manuals.

2.3 Redundancy

2.3.1 Redundancy of equipment is to be provided for those rotating and reciprocating components such as pumps, fans, blowers, etc. that form part of the EGR essential supplementary systems.

2.3.2 Consideration will be given to alternative means of compliance or operation to meet this objective on a case-by-case basis. The provision of sufficient spare parts onboard is an example of vessel specific arrangements that may be considered by CR as meeting this objective and should be justified with reference to the FMEA.

2.4 Prevention of Flooding

2.4.1 For EGR systems that incorporate a wet washwater scrubbing process, arrangements are to be provided to prevent the ingress of scrubber washwater into the engine under any circumstance.

2.4.2 Monitoring, alarm, and shutdown arrangements are to be provided to prevent an abnormal rise of washwater level in the EGR scrubber unit.

2.5 Inclination

2.5.1 EGR systems are to be designed for proper operation at the inclination requirements of 1.6.1 of Part IV of the Rules.

2.6 Failure Modes and Effects Analysis (FMEA) Integration Test

2.6.1 An integration test is to be undertaken on the first EGR unit in a particular design series to verify that the operation and response of the complete EGR mechanical and electrical systems are as predicted for all operational modes. The scope of these tests is to be determined based on the FMEA required by 4.1.2.

CHAPTER 3 EXHAUST GAS RECIRCULATION SYSTEM

3.1 Equipment

3.1.1 Pumps / Blowers

(a) Where provided, pumps used in EGR SOx scrubber washwater, dosing, discharge, etc., systems, essential for the continual operation of the EGR system, are to be tested and certified in accordance with relevant requirements of the Rules. This is applicable to exhaust emission abatement systems connected to diesel engines rated at 2250 kW and above or having cylinders of more than 300 mm bore.

(b) Unless alternative means of compliance in accordance with 2.3 are applicable, redundant washwater, dosing, discharge, etc., pumps, essential for the continual operation of the EGR water systems, are to be provided. There are to be at least two of these essential pumps, and the capacity of the pumps, with any one pump out of service, is to be sufficient for continuous operation of the EGR system at full rating.

For vessels fitted with two or more identical EGR systems, the provision of a common standby pump (for each essential system) capable of serving all EGR units will suffice rather than providing individual standby pumps for each EGR unit.

(c) Unless alternative means of compliance in accordance with 2.3 are applicable and where exhaust fans or blowers form part of the EGR system and are essential for continual operation of the system at full rating, such fans or blowers are to be installed in a redundant arrangement. The number and power of the fans or blowers should be such that if one unit, or a group of units, is out of service, the capacity of the remaining unit(s) is not to be less than 100% of the total required.

3.1.2 Heat exchangers / EGR exhaust gas coolers

(a) Where provided, heat exchangers are to be designed, constructed, and certified in accordance with relevant requirements of Part V of the Rules.

(b) EGR exhaust gas coolers are not subject to 3.1.2(a). Suitability of the cooler materials for the exhaust gases is to be demonstrated.

The coolers are to be hydrostatically tested on the water side to 4 bar, but not less than 1.5 times the design pressure on the water side, either in the manufacturer's plant or in the presence of the Surveyor, after installation onboard the vessel.

3.1.3 Chemical treatment system

(a) The specific requirements for chemical treatment system components are given under 3.2.3.

3.1.4 Electrical system

The electrical system and electrical equipment are to satisfy corresponding requirements of Part VII of the Rules.

(a) Electrical load analysis

The number and capacity of generators are to be sufficient under normal seagoing conditions with one generator in reserve to carry those loads for essential services, which include the EGR system, and for minimum comfortable conditions of habitability.

(b) Standby pump/fan arrangements

(i) In the event of failure of the essential EGR system pumps or fans/blowers, the standby pump or fan/blower required by 3.1.1, where provided, is to be automatically started and put into service. This failure is to be alarmed at the local and remote control station(s), as applicable.

(ii) Where provided, each standby pump or fan is to be fed from separate sections of the switchboard such that in the event of failure of one section of the switchboard the standby pump or fan may be fed from the other separate section of the switchboard.

(c) Circuit protection devices and compatibility

Circuit breakers are to be installed for miscellaneous EGR system electrical loads and are to be compatible with the prospective short circuit current level calculated at the switchboards.

3.2 Piping Systems

3.2.1 Exhaust gas piping systems

(a) Exhaust gas piping materials located before the EGR SOx scrubber, where fitted, may be of the same material specification as the standard engine exhaust gas piping.

(b) The sections of the scrubber that are subjected to washwater (e.g., the interior reaction chamber or washwater piping/nozzles, etc.) are to be constructed of suitable corrosion resistant materials.

(c) Exhaust gas piping materials used after the EGR SOx scrubber unit are to be of a corrosion resistant material such as stainless steel.

(d) Hot surfaces of EGR systems or their associated equipment or systems likely to come into contact with the crew during operation are to be suitably guarded or insulated. Where the surface temperatures are likely to exceed 220℃ and where any leakage, under pressure or otherwise, of fuel oil, lubricating oil, or other flammable liquid is likely to come into contact with the EGR unit or exhaust pipes, these surfaces are to be suitably insulated with non-combustible materials that are impervious to such liquids. Insulation material not impervious to oil is to be encased in sheet metal cladding or an equivalent impervious sheath.

3.2.2 Washwater piping systems

(a) The piping material for the corrosive scrubber washwater system is to be selected based on the corrosive nature of the liquid media.

(b) Pipes and piping components made of thermoplastic or thermosetting plastic materials, with or without reinforcement, may be used in piping systems subject to compliance with the requirements of 2.8 of Part VI of the Rules. For the purpose of the Rules, “plastic” means both thermoplastic and thermosetting plastic materials, with or without reinforcement, such as polyvinyl chloride (PVC) and fiber reinforced plastics (FRP). Plastic washwater piping is to meet Level 3 fire endurance testing requirements (see 2.8.4 of Part VI of the Rules)

(c) Flexible hoses are to comply with the requirements of 2.9 of Part VI of the Rules.

(d) The overboard discharges of any EGR system are not to be interconnected to other systems.

(e) Due consideration is to be given to the location of overboard discharges with respect to vessel propulsion features, such as thrusters or propellers.

3.2.3 Chemical treatment piping systems

The requirements for the washwater chemical treatment system detailed in this subsection are based on the use of Caustic Soda (NaOH) in the EGR scrubber water treatment system, as applicable. If other chemicals are to be used, the requirements should be consistent with the intent of the requirements for Caustic Soda but would need to be assessed on a case-by-case basis.

The requirements detailed below are also based on an arrangement whereby the EGR residue tank is also used as an overflow tank for the NaOH storage tank. Arrangements that separate these functions into separate tanks may be applied, and in which case, the requirements for the overflow tank are detailed in 3.2.3 and the requirements for the residue tank in 3.2.4.

(a) Material for piping systems, NaOH storage tank and EGR residue/NaOH overflow tank

The material of the NaOH related piping systems, NaOH storage tank, EGR residue/NaOH overflow tank, drip trays, and any other components which may come into contact with the NaOH solution or sludge is to be of a suitable grade of stainless steel or other corrosion-resistant material established to be suitable for the application. Aluminum, zinc, brass, or galvanized steel components are not to be used.

(b) Bunkering of NaOH

(i) The bunker station(s) for NaOH is to be located on the open deck away from sources of ignition and arranged such that a spill at a bunker station would not result in NaOH contacting or mixing with other incompatible materials. Alternatively, closed or semi-enclosed bunker stations may be approved subject to the provision of effective ventilation.

(ii) Spill trays, which may be of the dry type or having means of drainage to the EGR residue/ NaOH overflow tank, are to be provided.

(c) Arrangement of the NaOH storage tank and EGR residue/NaOH overflow tank

(i) General

The NaOH storage and EGR residue/NaOH overflow tank are not to be situated where spillage or leakage there from can constitute a hazard by falling onto combustibles or heated surfaces. In particular, these tanks are not to be located over boilers or in close proximity to steam piping (supply or returns).

Where necessary, the NaOH storage tank is to be provided with an appropriate heating system to prevent freezing.

(ii) Filling

The NaOH storage tank is to be provided with a fill line from the bunker station, and a shutoff valve is to be provided at the bunkering station.

Overflow and/or drains leading to the EGR residue/NaOH overflow tank are to enter at or near the top of the tank. However, if this is determined to be impracticable, these lines are to be fitted with a non-return valve at the EGR residue/NaOH overflow tank.

(iii) Vents

The NaOH storage and EGR residue/NaOH overflow tanks are to be provided with vent pipes complying with 3.2 of Part VI of the Rules, and the outlets are to terminate in a safe location in the weather.

The vents that are open to the weather should not be subject to deterioration due to the concentrations involved, and the arrangement is to be such that the potential source of moisture from the vents does not present any danger to the crew or vessel. Alternatively, the tanks are to be fitted with appropriately sized pressure/vacuum valves.

(iv) Overflow protection

Means are to be provided to prevent NaOH from spilling or accidently overflowing from the storage and EGR residue/NaOH overflow tanks. Accordingly, the NaOH storage tank is to be fitted with a high

level alarm. Alternatively, the NaOH storage tank may be fitted with an overflow arrangement complying with 3.2 of Part VI of the Rules that is led to the EGR residue/NaOH overflow tank. Further, in all cases, the EGR residue/NaOH overflow tank is to be fitted with a high level alarm. Other anti-spilling arrangements may be considered on a case-by-case basis.

(v) Sounding

Sounding arrangements are to be provided for the NaOH storage and EGR residue/NaOH overflow tanks, and are to comply with the sounding requirements applicable to fuel oil tanks of 3.4 of Part VI of the Rules.

A sight glass is not to be used unless the materials of construction are compatible with the concentration of caustic soda solution involved, it is well protected from mechanical damage, and the arrangements are equivalent to that of flat "glass-type" fitted with a self-closing valve at each end.

In addition to local level gauging, the NaOH storage and EGR residue/NaOH overflow tanks are to have remote level gauging indication at the manned control station.

(vi) Temperature indication

The NaOH storage and EGR residue/NaOH overflow tanks are to be provided with local and remote temperature monitoring arrangements. The remote temperature indication is to be installed at the manned control station.

(d) Spill trays

(i) Those areas of the NaOH storage and EGR residue/NaOH overflow tanks that could result in leakage, locations where leakage from pumps and other associated equipment such as strainers, heaters, flanges, valves, etc., which may require occasional dismantling for examination or maintenance may occur, and where leakage may otherwise normally be expected are to be located within spill trays.

(ii) Either drainage arrangements for the spill tray that lead to the dedicated EGR residue/NaOH overflow tank are to be provided or arrangements to activate an alarm in the event of spillage are to be provided. Where drainage arrangements are provided, the drain line to the EGR residue/NaOH overflow tank is to be fitted with a non-return valve.

(e) Miscellaneous piping arrangements

(i) The NaOH piping systems are to be independent of other ship service piping and/or systems.

(ii) Piping systems for NaOH systems are not to be located in accommodation, service, or control spaces.

(iii) Every pipe emanating from a tank containing NaOH, which, if damaged, would allow NaOH to escape from the tank, is to be provided with a positive closing valve located directly on the tank. The positive closing valve is to be provided with means of closure both locally and from a readily accessible and safe position outside of the space.

(iv) The pipe joints are to be kept to a minimum. The direct connections of pipe lengths are to be all welded except for necessary flanged connections to valves and other equipment for maintenance in order to minimize risk of leakage from the pipe lines.

(v) Supply, bunkering and transfer lines for NaOH systems are not to be located over boilers or in close proximity to steam piping, exhaust systems, hot surfaces required to be insulated, or other sources of ignition.

(f) Ventilation arrangements

(i) The NaOH storage and EGR residue/NaOH overflow tanks may be located within the engine room or in a separate compartment. In either location, the area is to be served by an effective mechanical exhaust ventilation system with ventilation inlets located where any vapors would be expected to accumulate. In addition, if located in a separate compartment, the ventilation system is to be capable of being controlled from outside the compartment.

(g) Personnel protection

(i) For the protection of crew members, the vessel shall have on board suitable protective equipment consisting of large aprons, rubber gloves with long sleeves, rubber boots, coveralls of chemical-resistant material, and tight-fitting chemical safety goggles or face shields or both. The protective clothing and equipment shall cover all skin so that no part of the body is left unprotected. An eyewash and safety shower should be nearby.

(h) Safety notices

(i) Safety instructions relating to precautions and corrective response actions are to be posted in the compartment containing NaOH, and beside the entrance to the compartment. Detailed guidelines given in the MSDS are to be followed.

3.2.4 Residue systems

(a) The residues generated from the exhaust gas cleaning process are to be stored in a designated residue tank, separate from the engine room sludge tank, and arranged for discharge to appropriate shore reception facilities.

The EGR residue tank is to be designed to facilitate cleaning.

Where EGR residue tanks used in closed loop chemical treatment systems are also used as the overflow tank for the NaOH storage tank, the additional requirements of 3.2.3 are to be applied.

(b) The material of the EGR residue tank is to be selected based on the corrosive nature of the EGR residue.

(c) The capacity of the EGR residue tank is to be based on the expected residue volumes applicable to the exhaust gas cleaning process and the maximum period of voyage between ports where EGR residue can be discharged. In the absence of precise data, a figure of 30 days is to be used.

(d) The EGR residue tank is to be provided with vent pipes complying with 3.2 of Part VI of the Rules.

(e) The residue tank is to be arranged with a high level alarm.

(f) Sounding arrangements are to be provided for the EGR residue tank in accordance with 3.4 of Part VI of the Rules.

(g) For those vessels that do not undertake onboard incineration and collect all engine room sludge for disposal ashore, consideration will be given to arrangements utilizing a combined engine room sludge and EGR residue tank, provided the tank meets the requirements of 3.2.4(a) through (f), EGR residue record logs satisfy the requirements of MEPC.184(59), and residues are disposed at MARPOL reception facilities.

Combined engine room sludge and EGR residue tanks are to be sized to provide adequate capacity based on the sludge tank capacity requirements of the Rules plus the capacity requirements for EGR residue tanks of 3.2.4(c).

CHAPTER 4 CONTROL, ALARM, AND MONITORING SYSTEMS

4.1 General

4.1.1 The EGR control system is to be integrated with, or in direct communication with, the engine control system. Control systems for associated systems, such as water treatment plants, may be connected to an integrated control system or may be a standalone system

4.1.2 The system is to be designed such that a single fault of a component will not lead to a potentially dangerous situation for human safety and/or the vessel. An FMEA, or equivalent, demonstrating the safety system design basis is to be submitted.

4.2 Control and Monitoring System

4.2.1 Automatic control, monitoring (including washwater discharge criteria), alarm, and safety functions are to be provided for the EGR system so that operations remain within preset parameters for all engine operating conditions. For vessels with **CAS** or **CAU** notations, the alarm and monitoring systems are to be integrated in the vessel's centralized monitoring systems that conform to the requirements for **CAS** or **CAU** notations

4.2.2 The temperatures, pressures, and flows in the EGR system and associated systems are to be controlled and monitored as follows:

(a) A local control and monitoring system for the EGR system is to be provided to enable safe operation, maintenance, and effective control in the event of an emergency or failure of any remote controls. This may be integrated with the engine control system and/or be a standalone system.

(b) The design of the control system is to provide identification of faults in the equipment, as well as the process system.

(c) Indications of parameters necessary for the safe and effective operation of the exhaust emission abatement process are to be provided at the local and, as applicable, remote control station(s), as per Table 4-1, and are to include the following parameters:
- EGR system pump/fan/blower/motor operational status
- Status of any EGR system valves
- EGR system parameters for operational safety
- Level indication of EGR system tanks
- Status of any EGR system alarms, shutdowns and Emergency Stop

(d) The computer-based control systems are to comply with the applicable requirements of the Rules.

4.2.3 The power supply arrangements for the control and monitoring system are to meet the requirements of 2.8 of Part VIII of the Rules.

4.3 Safety Shutdown System

4.3.1 An independent shutdown system is to be provided. This safety shutdown system is to be based on the following principles:

(a) Means are to be provided to indicate the parameters causing shutdown.

(b) Upon activation of the safety shutdown system, alarms are to be given at the normal control position and at the local control position.

(c) In the event where shutdown by the safety shutdown system is activated, the restart should not occur automatically, unless after the system is reset.

4.3.2 Monitoring and safety shutdowns are to be in accordance with Table 4-1.

Table 4-1
Monitoring and Safety System Functions for EGR Systems

Monitored Parameters	Display	Alarm Activated	Automatic EGR Shutdown
EGR exhaust fan/blower motors	Running	Stop (1)	
EGR exhaust bypass, isolation, mixing valves, where provided	Position		
Control-actuating medium of the EGR exhaust bypass or isolation valves	Running	Failed	
Exhaust gas temperature before EGR unit	X	High	X (High-High)
Exhaust gas temperature after EGR unit	X	High	X (High-High)
Engine air intake O_2 concentration (or EGR rate)	X	Low/High	X (Low-Low/High-High)
Differential pressure across EGR scrubber unit or EGR circuit, as applicable	X	High	X (High-High) (2)
EGR washwater pumps, alkali system pumps	Running	Stop (1)	
EGR washwater or alkali system valves	Position		
Control-actuating medium of the EGR washwater and alkali system valves, where provided	Running	Failed	
EGR washwater and alkali system supply pressure	X	Low	X (Low-Low)
EGR washwater and alkali system supply temperature	X	High	X (High-High)
Water level in EGR scrubber	X	High	X (High-High) (2)
Alkali storage tank temperature	X	Low/High	X (High-High)
Alkali storage tank level	X	Low/High	X (Low-Low)
Alkali system drip tray level	X	High	X (High-High) (3)
EGR residue tank level	X	High	X (High-High)
Control power supply	Running	Failed	
Emergency shutdown	X	X	X

Notes:

1. Failure of essential EGR system motors driving pumps, fans or blowers is to activate the standby units, where fitted(see 3.1.4(b)).
2. Independent safety shutdown system as required by 4.3.
3. Automatic shutdown is to activate the close coupled alkali storage tank valves required by 3.2.3(e)(iii).

CHAPTER 5 SURVEYS DURING CONSTRUCTION

5.1 General

5.1.1 This subsection pertains to surveys during fabrication at the manufacturer's facility and installation and testing of EGR equipment and associated systems onboard. These surveys may be incorporated with the certification, shop test, and shipboard tests required by the applicable requirements of the Rules. For surveys at the manufacturer's facility, the scope of the survey will be confined to only those items that are supplied by the manufacturer.

5.2 Surveys at Manufacturer's Facility

5.2.1 Survey requirements for equipment components and packaged units at the manufacturer's facility are to be in accordance with applicable requirements of the Rules. Reference can be made to Table 5-1.

5.3 Surveys during Installation

5.3.1 The following surveys are to be carried out to the satisfaction of the attending surveyor on the EGR equipment and associated systems during installation and testing:

(a) Inspection and verification that the foundations and attachments of the principal components of the EGR equipment and associated systems are in accordance with the approved plans and particulars.

(b) Piping systems are to be visually examined and pressure-tested, as required by Part VI of the Rules.

(c) Electrical wiring and connections are to be in accordance with Part VII of the Rules and checked for continuity and proper workmanship.

(d) Instrumentation is to be tested to confirm proper operation as per its predetermined set points.

(e) Pressure relief and safety valves installed on the unit are to be tested.

(f) Control system and shutdowns are to be tested for proper operation.

(g) The EGR system is to be checked for proper operation in accordance with the installation test procedure.

5.4 Surveys during Trials

5.4.1 During the initial commissioning trials, the EGR equipment and associated systems are to be confirmed for their satisfactory operation, including associated controls, alarms, and shutdowns. The tests are to be conducted in accordance with the testing procedure during sea trials approved by the Society.

Table 5-1
Certification of EGR Equipment and Systems at the Manufacturer's Facility[1]

Code	Explanation
DR	Design Review – Design review required.
MS	Manufacture Survey – Product is to be surveyed during fabrication stages by the Surveyor.
FS	Final Survey – Finished product is to be subject to final hydrostatic, nondestructive, operational testing, or any other required tests, and witnessed by the Surveyor at manufacturer's facility.

Equipment	DR	MS	FS
EGR SOx scrubber unit, as applicable	X	X	X
Exhaust piping	X		
Exhaust bypass or mixing valves	X		
Exhaust fans/blowers	X		X
Heat exchangers	X		X
Water treatment system	X		X
Washwater, alkali system and essential EGR system pumps[2]	X		X
Washwater, alkali and EGR residue associated piping	X		
Control system	X		
Automatic shutdown and safety system	X		

Notes:

1. This table has been prepared for guidance only and annotated to agree with the Rules. The list is not to be considered exhaustive; should additional equipment not listed be fitted onboard, same will be subject to special consideration for compliance with the Rules. This list is not to be considered as substitutive or integrative of the content of the Rules and/or other applicable regulations. In case of conflict between the content of this list and the Rules and other applicable regulations, the latter are to be considered applicable.
2. Applicable to pumps fitted to EGR systems connected to diesel engines rated at 2250 kW and above or having cylinders of more than 300 mm bore.