M35 Alarms, remote indications and safeguards for main reciprocating I.C. engines installed in unattended machinery spaces

(1980) (Rev.1 1993) (Rev.2 1996) (Rev.3 1997) Rev.4 1999) (Rev.5 Aug 2008) (Rev.6 July 2013)

35.1 General

Alarms, remote indications and safeguards listed in Table 1 and 2 are respectively referred to ~~slow speed (~~cross-head~~)~~ and ~~medium/high speed (~~trunk-piston~~)~~ reciprocating i.c. engines.

35.2 Alarms

A system of alarm displays and controls is to be provided which readily ensures identification of faults in the machinery and satisfactory supervision of related equipment. This may be provided at a main control station or, alternatively, at subsidiary control stations. In the latter case, a master alarm display is to be provided at the main control station showing which of the subsidiary control stations is indicating a fault condition.

The detailed requirements covering communications of alarms from machinery spaces to the bridge area and accommodation for engineering personnel, are contained in M29.

35.3 Remote indications

Remote indications are required only for ships which are operated with machinery space unattended but under a continuous supervision from a position where control and monitoring devices are centralized, without the traditional watch service being done by personnel in machinery space.

35.4 Safeguards

35.4.1 Automatic start of standby pumps – slow down

A suitable alarm is to be activated at the starting of those pumps for which the automatic starting is required.

Note:

1. The requirements of M35 Rev.5 are to be uniformly implemented by IACS Societies for engines:
   i) when an application for certification of an engine is dated on or after 1 January 2010; or
   ii) which are installed in new ships for which the date of contract for construction is on or after 1 January 2010.

2. The requirements of M35 Rev.6 are to be uniformly implemented by IACS Societies for engines:
   i) when an application for certification of an engine is dated on or after 1 January 2015; or
   ii) which are installed in new ships for which the date of contract for construction is on or after 1 January 2015.

~~2~~3. The “contracted for construction” date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of “contract for construction”, refer to IACS Procedural Requirement (PR) No. 29.

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35.4.2 Automatic reduction of power

If overriding devices of the required automatic reduction of power are provided, they are to be so arranged as to preclude their inadvertent operation, and a suitable alarm is to be activated by their operation.

35.4.3 Automatic stop – shut down

If overriding devices of the required automatic stops are provided, they are to be so arranged as to preclude their inadvertent operation, and a suitable alarm is to be operated by their activation. When the engine is stopped automatically, restarting after restoration of normal operating conditions is to be possible only after manual reset, e.g. by-passing the control lever through the 'stop' position.
Automatic restarting is not permissible (see M30.2.8).

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Table 1 Cross-head diesel engines

	Gr 1			Gr 2	Gr 3
Monitored parameters for ~~slow speed~~ cross-head diesel engines	**Remote Indication**	**Alarm activation**	**Slow down with alarm**	**Automatic start of standby pump with alarm**	**Shut down with alarm**
1.0 Fuel oil system					
Fuel oil pressure after filter (engine inlet)	x	low		x	
Fuel oil viscosity before injection pumps or Fuel oil temp before injection pumps		high low			
Leakage from high pressure pipes		x			
Level of fuel oil in daily service tank[1]		low			
Common rail fuel oil pressure		low			
2.0 Lubricating oil system					
Lub oil to main bearing and thrust bearing, pressure	x	low	x	x	x
Lub oil to crosshead bearing pressure[2]	x	low	x	x	x
Lub oil to camshaft pressure[2]		low		x	x
Lub oil to camshaft temp[2]		high			
Lub oil inlet temp		high			
Thrust bearing pads temp or bearing outlet temp		high	x		x
Main, crank, crosshead bearing, oil outlet temp or Oil mist concentration in crankcase[3]		high	x		
Flow rate cylinder lubricator. Each apparatus		low	x		
Level in lubricating oil tanks[4]		low			
Common rail servo oil pressure		low			
3.0 Turbocharger system					
Turbocharger lub oil inlet pressure[9]		low			
Turbocharger lub oil outlet temp each bearing[10]		high			
Speed of turbocharger	x				
4.0 Piston cooling system					
Piston coolant inlet pressure[5]		low	x	x	
Piston coolant outlet temp each cylinder		high	x		
Piston coolant outlet flow each cylinder[8]		low	x		
Level of piston coolant in expansion tank		low			
5.0 Sea water cooling system					
Sea water pressure		low		x	

Gr 1 Common sensor for indication, alarm, slow down
Gr 2 Sensor for automatic start of standby pump with alarm
Gr 3 Sensor for shut down

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Table 1 (continued)

	Gr 1			Gr 2	Gr 3
Monitored parameters for ~~slow speed~~ cross-head diesel engines	**Remote Indication**	**Alarm activation**	**Slow down with alarm**	**Automatic start of standby pump with alarm**	**Shut down with alarm**
6.0 Cylinder fresh cooling water system					
Cylinder water inlet pressure		low	x	x	
Cylinder water outlet temp (from each cylinder) or Cylinder water outlet temp (general)[6]		high	x		
Oily contamination of engine cooling water system[7]		x			
Level of cylinder cooling water in expansion tank		low			
7.0 Starting and control air systems					
Starting air pressure before main shut-off valve	x	low			
Control air pressure		low			
Safety air pressure		low			
8.0 Scavenge air system					
Scavenge air receiver pressure	x				
Scavenge air box temp (fire)		high	x		
Scavenge air receiver water level		high			
9.0 Exhaust gas system					
Exhaust gas temp after each cylinder	x	high	x		
Exhaust gas temp after each cylinder. Deviation from average.		high			
Exhaust gas temp before each T/C	x	high			
Exhaust gas temp after each T/C	x	high			
10.0 Fuel valve coolant					
Pressure of fuel valve coolant		low		x	
Temperature of fuel valve coolant		high			
Level of fuel valve coolant in expansion tank		low			
11.0 Engine speed/direction of rotation.	x				
Wrong way		x			
12.0 Engine overspeed					x
13.0 Control-Safety-Alarm system power supply failure		x			

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1 High-level alarm is also required if no suitable overflow arrangement is provided.

2 If separate lub oil systems are installed.

3 When required by UR M10.8 or by SOLAS Reg. II-1/47.2.

4 Where separate lubricating oil systems are installed (e.g. camshaft, rocker arms, etc.), individual level alarms are required for the tanks.

5 The slow down is not required if the coolant is oil taken from the main cooling system of the engine.

6 Where one common cooling space without individual stop valves is employed for all cylinder jackets.

7 Where main engine cooling water is used in fuel and lubricating oil heat exchangers.

8 Where outlet flow cannot be monitored due to engine design, alternative arrangement may be accepted.

9 Unless provided with a self-contained lubricating oil system integrated with the turbocharger.

10 Where outlet temperature from each bearing cannot be monitored due to the engine/turbocharger design alternative arrangements may be accepted. Continuous monitoring of inlet pressure and inlet temperature in combination with specific intervals for bearing inspection in accordance with the turbocharger manufacturer's instructions may be accepted as an alternative.

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Table 2 Trunk-piston diesel engines

	Gr 1			Gr 2	Gr 3
Monitored parameters for ~~medium and high speed~~ trunk-piston diesel engines	**Remote Indication**	**Alarm activation**	**Slow down with alarm**	**Automatic start of standby pump with alarm**	**Shut down with alarm**
1.0 Fuel oil system					
Fuel oil pressure after filter (engine inlet)	x	low		x	
Fuel oil viscosity before injection pumps or Fuel oil temp before injection pumps[1]		high low			
Leakage from high pressure pipes		x			
Level of fuel oil in daily service tank[2]		low			
Common rail fuel oil pressure		low			
2.0 Lubrication oil system					
Lub oil to main bearing and thrust bearing, pressure	x	low		x	x
Lub oil filter differential pressure	x	high			
Lub oil inlet temp	x	high			
Oil mist concentration in crankcase[3]		high			x
Flow rate cylinder lubricator. Each apparatus		low	x		
Common rail servo oil pressure		low			
3.0 Turbocharger system					
Turbocharger lub oil inlet pressure[5]	x	low			
Turbocharger lub oil temperature each bearing[8]		high			
4.0 Sea Water cooling system					
Sea Water pressure	x	low		x	
5.0 Cylinder fresh cooling water system					
Cylinder water inlet pressure or flow	x	low	x	x	
Cylinder water outlet temp (general)[6]	x	high	x		
Level of cylinder cooling water in expansion tank		low			
6.0 Starting and control air systems					
Starting air pressure before main shut-off valve	x	low			
Control air pressure	x	low			

Gr 1 Common sensor for indication, alarm, slow down
Gr 2 Sensor for automatic start of standby pump with alarm
Gr 3 Sensor for shut down

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Table 2 (continued)

Monitored parameters for ~~medium and high speed~~ trunk-piston diesel engines	Gr 1 Remote Indication	Gr 1 Alarm activation	Gr 1 Slow down with alarm	Gr 2 Automatic start of standby pump with alarm	Gr 3 Shut down with alarm
7.0 Scavenge air system					
Scavenge air receiver temp		high			
8.0 Exhaust Gas system					
Exhaust gas temp after each cylinder[7]	x	high	x		
Exhaust gas temp after each cylinder. Deviation from average[7]		high			
9.0 Engine speed	x				
10.0 Engine overspeed					x
11.0 Control-Safety-Alarm system power supply failure		x			

1 For heavy fuel oil burning engines only.

2 High-level alarm is also required if no suitable overflow arrangement is provided.

3 When required by UR M10.8 or by SOLAS Reg. II-1/47.2. One oil mist detector for each engine having two independent outputs for initiating the alarm and shut-down would satisfy the requirement for independence between alarm and shut-down system.

4 If necessary for the safe operation of the engine.

5 Unless provided with a self-contained lubricating oil system integrated with the turbocharger.

6 Two separate sensors are required for alarm and slow down.

7 For engine power > 500 kW/cyl.

8 Where outlet temperature from each bearing cannot be monitored due to the engine/ turbocharger design alternative arrangements may be accepted. Continuous monitoring of inlet pressure and inlet temperature in combination with specific intervals for bearing inspection in accordance with the turbocharger manufacturer's instructions may be accepted as an alternative.

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