# M60 Control and Safety of Gas Turbines for Marine Propulsion Use

M60
(1997)
(Rev.1
Nov 2021)

## 1 Governor and Over speed protective devices

1.1 Main gas turbines are to be provided with over speed protective devices to prevent the turbine speed from exceeding more than 15% of the maximum continuous speed.

1.2 Where a main gas turbine incorporates a reverse gear, electric transmission, controllable pitch propeller or other free-coupling arrangement, a speed governor independent of the over speed protective device is to be fitted and is to be capable of controlling the speed of the unloaded gas turbine without bringing the over speed protective device into action.

## 2 Miscellaneous automatic safety devices

2.1 Details of the manufacturer's proposed automatic safety devices to safeguard against hazardous conditions arising in the event of malfunctions in the gas turbine installation are to be submitted to the Classification Society together with the failure mode and effect analysis (FMEA).

Unless the FMEA required by this UR proves otherwise, the shutdown functions for gas turbines are to be provided in accordance with Table 1 of this UR in addition to the general monitoring and safety system functions given by the Classification Societies.

2.2 Main gas turbines are to be equipped with a quick closing device (shut-down device) which automatically shuts off the fuel supply to the turbines at least in case of:

a) Over speed

b) Unacceptable lubricating oil pressure drop

c) Loss of flame during operation

d) Excessive vibration

e) Excessive axial displacement of each rotor (Except for gas turbines with rolling bearings)

f) Excessive high temperature of exhaust gas

g) Unacceptable lubricating oil pressure drop of reduction gear

h) Excessive high vacuum pressure at the compressor inlet

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Note:

1. Rev.1 of this UR is to be uniformly implemented by IACS Societies for vessels contracted for construction on or after 1 January 2023.

2. 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.

**M60 (cont)**

2.3 The following turbine services are to be fitted with automatic temperature controls so as to maintain steady state conditions throughout the normal operating range of the main gas turbine:

a) Lubricating oil supply

b) Oil fuel supply (or automatic control of oil fuel viscosity as alternative)

c) Exhaust gas

2.4 Automatic or interlocked means are to be provided for clearing all parts of the main gas turbine of the accumulation of liquid fuel or for purging gaseous fuel, before ignition commences on starting or recommences after failure to start.

2.5 Hand trip gear for shutting off the fuel in an emergency is to be provided at the manoeuvring station.

2.6 Starting devices are to be so arranged that firing operation is discontinued and main fuel valve is closed within pre-determined time, when ignition is failed.

**3 Alarming devices**

3.1 Although in principle alarming devices listed in Table 1 are to be provided, they can be added or omitted, taking into account the result of FMEA specified in item 2.1.

3.2 Suitable alarms are to be operated by the activation of shutdown devices.

**M60**
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Table 1 List of alarm and shutdown

| Monitoring parameter | Alarm | Shutdown |
|---|---|---|
| Turbine speed | high | x |
| Lubricating oil pressure | low* | x |
| Lubricating oil pressure of reduction gear | low* | x |
| Differential pressure across lubricating oil filter | high | |
| Lubricating oil temperature | high | |
| Oil fuel supply pressure | low | |
| Oil fuel temperature | high | |
| Cooling medium temperature | high | |
| Bearing temperature | high | |
| Flame and ignition Failure | x | x |
| Automatic starting Failure | x | |
| Vibration | high* | x |
| Axial displacement of rotor | high | x |
| Exhaust gas temperature | high* | x |
| Vacuum pressure at the compressor inlet | high* | x |
| Loss of control system | x | |

**Footnotes:**

1) Alarms marked with "*" are to be activated at the suitable setting points prior to arriving the critical condition for the activation of shutdown devices.

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