M72 Certification of Engine Components

(Feb 2015) (Corr.1 Aug 2015) (Rev.1 Mar 2016) (Rev.2 Jan 2019) (Rev.3 Apr 2023)

1. General

1.1 The engine manufacturer is to have a quality control system that is suitable for the actual engine types to be certified by the Society. The quality control system is also to apply to any sub-suppliers. The Society reserves the right to review the system or parts thereof. Materials and components are to be produced in compliance with all the applicable production and quality instructions specified by the engine manufacturer. The Society requires that certain parts are verified and documented by means of Society Certificate (SC), Work Certificate (W) or Test Report (TR).

1.2 Society Certificate (SC)

This is a document issued by the Society stating:

- conformity with Rule requirements.
- that the tests and inspections have been carried out on:
  - the finished certified component itself; or
  - on samples taken from earlier stages in the production of the component, when applicable.
- that the inspection and tests were performed in the presence of the Surveyor or in accordance with special agreements, i.e., Alternative Certification Scheme (ACS).

Note:

1. The requirements of UR M72 are to be uniformly implemented by IACS Societies to engines with an application for certification dated on or after 1 July 2016.

2. Rev.1 of this UR is to be uniformly implemented by IACS Societies to engines with an application for certification dated on or after 1 July 2017.

3. Rev.2 of this UR is to be uniformly implemented by IACS Societies to engines with an application for certification dated on or after 1 January 2020.

4. Rev.3 of this UR is to be uniformly implemented by IACS Societies to engines with an application for certification dated on or after 1 July 2024.

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1.3 Work's Certificate (W)

This is a document signed by the manufacturer stating:

- conformity with requirements.
- that the tests and inspections have been carried out on:
  - the finished certified component itself; or
  - on samples taken from earlier stages in the production of the component, when applicable.
- that the tests were witnessed and signed by a qualified representative of the applicable department of the manufacturer.

A Work's Certificate may be considered equivalent to a Society Certificate and endorsed by the Society if:

- the test was witnessed by the Society Surveyor; or
- an ACS agreement is in place between the Class Society and the manufacturer or material supplier; or
- the Work's certificate is supported by tests carried out by an accredited third party that is accepted by the Society and independent from the manufacturer and/or material supplier.

1.4 Test Report (TR)

This is a document signed by the manufacturer stating:

- conformity with requirements.
- that the tests and inspections have been carried out on samples from the current Production batch.

1.5 The documents above are used for product documentation as well as for documentation of single inspections such as crack detection, dimensional check, etc. If agreed to by the Society, the documentation of single tests and inspections may also be arranged by filling in results on a control sheet following the component through the production.

1.6 The Surveyor is to review the TR and W for compliance with the agreed or approved specifications. SC means that the Surveyor also witnesses the testing, batch or individual, unless an ACS provides other arrangements.

1.7 The manufacturer is not exempted from responsibility for any relevant tests and inspections of those parts for which documentation is not explicitly requested by the Society. The manufacturing process and equipment is to be set up and maintained in such a way that all materials and components can be consistently produced to the required standard. This includes production and assembly lines, machining units, special tools and devices, assembly and testing rigs as well as all lifting and transportation devices.

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2. Parts to be documented

2.1 The extent of parts to be documented depends on the type of engine, engine size and criticality of the part.

2.2 Symbols used are listed in Table M72.1. A summary of the required documentation for the engine components is listed in Table M72.2.

M72.1 Symbols used in Table M72.2

Symbol	Description
C	chemical composition
CD	crack detection by MPI or DP
CH	crosshead engines
D	cylinder bore diameter (mm)
GJL	gray cast iron
GJS	spheroidal graphite cast iron
GS	cast steel
M	mechanical properties
SC	society certificate
TR	test report
UT	ultrasonic testing
W	work certificate
X	visual examination of accessible surfaces by the Surveyor

2.3 For components and materials not specified in Table M72.2, consideration will be given by the Society upon full details being submitted and reviewed.

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M72.2 Summary of required documentation for engine components

Item	Part [4), 5), 6), 7), 8)]	Material properties [1)]	Non-destructive examination [2)]	Hydraulic testing [3)]	Dimensional inspection, including surface condition	Visual inspection (surveyor)	Applicable to engines:	Component certificate
1	Welded bedplate	W(C+M)	W(UT+CD)			fit-up + post-welding	All	SC
2	Bearing transverse girders GS	W(C+M)	W(UT+CD)			X	All	SC
3	Welded frame box	W(C+M)	W(UT+CD)			fit-up + post-welding	All	SC
4	Cylinder block GJL			W[10)]			>400 kW/cyl	
5	Cylinder block GJS			W[10)]			>400 kW/cyl	
6	Welded cylinder frames	W(C+M)	W(UT+CD)			fit-up + post-welding	CH	SC
7	Engine block GJL			W[10)]			>400 kW/cyl	
8	Engine block GJS	W(M)		W[10)]			>400 kW/cyl	
9	Cylinder liner	W(C+M)		W[10)]			D>300mm	
10	Cylinder head GJL			W			D>300mm	
11	Cylinder head GJS			W			D>300mm	
12	Cylinder head GS	W(C+M)	W(UT+CD)	W		X	D>300mm	SC
13	Forged cylinder head	W(C+M)	W(UT+CD)	W		X	D>300mm	SC
14	Piston crown GS	W(C+M)	W(UT+CD)			X	D>400mm	SC
15	Forged piston crown	W(C+M)	W(UT+CD)			X	D>400mm	SC
16	Crankshaft: made in one piece	SC(C+M)	W(UT+CD)		W	Random, of fillets and oil bores	All	SC
17	Semi-built Crankshaft (Crankthrow, forged main journal and journals with flange)	SC(C+M)	W(UT+CD)		W	Random, of fillets and shrink fittings	All	SC

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Item	Part [4), 5), 6), 7), 8)]	Material properties [1)]	Non-destructive examination [2)]	Hydraulic testing [3)]	Dimensional inspection, including surface condition	Visual inspection (surveyor)	Applicable to engines:	Component certificate
18	Exhaust gas valve cage			W			CH	
19	Piston rod	SC(C+M)	W(UT+CD)			Random	D>400mm CH	SC
20	Cross head	SC(C+M)	W(UT+CD)			Random	CH	SC
21	Connecting rod with cap	SC(C+M)	W(UT+CD)		W	Random, of all surfaces, in particular those shot peened	All	SC
22	Coupling bolts for crankshaft	SC(C+M)	W(UT+CD)		W	Random, of interference fit	All	SC
23	Bolts and studs for main bearings	W(C+M)	W(UT+CD)				D>300mm	
24	Bolts and studs for cylinder heads	W(C+M)	W(UT+CD)				D>300mm	
25	Bolts and studs for connecting rods	W(C+M)	W(UT+CD)		TR of thread making		D>300mm	
26	Tie rod	W(C+M)	W(UT+CD)		TR of thread making	Random	CH	SC
27	High pressure fuel injection pump body	W(C+M)		W			D>300mm	
		W(C+M)		TR			D≤300mm	
28	High pressure fuel injection valves (only for those not autofretted)			W			D>300mm	
				TR			D≤300mm	
29	High pressure fuel injection pipes including common fuel rail	W(C+M)		W for those that are not autofretted			D>300mm	

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Item	Part [4), 5), 6), 7), 8)]	Material properties [1)]	Non-destructive examination [2)]	Hydraulic testing [3)]	Dimensional inspection, including surface condition	Visual inspection (surveyor)	Applicable to engines:	Component certificate
		W(C+M)		TR for those that are not autofretted			D≤300mm	
30	High pressure common servo oil system	W(C+M)		W			D>300mm	
		W(C+M)		TR			D≤300mm	
31	Cooler, both sides [9)]	W(C+M)		W			D>300mm	
32	Accumulator	W(C+M)		W			All engines with accumulators with a capacity of >0,5 l	
33	Piping, pumps, actuators, etc. for hydraulic drive of valves, if applicable	W(C+M)		W			>800 kW/cyl	
34	Engine driven pumps (oil, water, fuel, bilge) other than pumps referred to in item 27 and 33			W			>800 kW/cyl	
35	Bearings for main, crosshead, and crankpin	TR(C)	TR (UT for full contact between base material and bearing metal)		W		>800 kW/cyl	

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FOOTNOTES:

1. Material properties include chemical composition and mechanical properties, and also surface treatment such as surface hardening (hardness, depth and extent), peening and rolling (extent and applied force).

2. Non-destructive examination means e.g., ultrasonic testing, crack detection by MPI or DP. When certain NDE method on the finished component is impractical (for example UT for items 12/13), the NDE method can be performed at earlier appropriate stages in the production of the component, see M72.1.2.

3. Hydraulic testing is applied on the water/oil side of the component. Items are to be tested by hydraulic pressure at the pressure equal to 1.5 times the maximum working pressure. High pressure parts of the fuel injection system are to be tested by hydraulic pressure at the pressure equal to 1.5 maximum working pressure or maximum working pressure plus 300 bar, whichever is the less. Where design or testing features may require modification of these test requirements, special consideration may be given.

4. Material certification requirements for pumps and piping components are dependent on the operating pressure and temperature. Requirements given in this Table apply except where alternative requirements are explicitly given elsewhere in the IACS URs.

5. For turbochargers, see M73.

6. Crankcase explosion relief valves are to be type tested in accordance with M66 and documented according to M9.

7. Oil mist detection systems are to be type tested in accordance with M67 and documented according to M10.

8. For speed governor and overspeed protective devices, see M3.

9. Charge air coolers need only be tested on the water side.

10. Hydraulic testing is also required for those parts filled with cooling water and having the function of containing the water which is in contact with the cylinder or cylinder liner.

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