TÜRK LOYDU

TECHNICAL CIRCULAR

Circular No: S.P 03/17 **Revision:1** **Page: 1** **Adoption Date:07.12.2019**

Related Requirement: Part B, Chapter 4, Machinery, Section 2, Internal Combustion Engines and Air Compressors, B, 5.
Subject : Alternative Survey Arrangement guidelines under Alternative Certification Scheme for Trunk Engines manufactured in Mass or in Series.
Entry into Force Date: 01.01.2020

In order to have an uniform and consistent application of Alternative Survey Arrangement (ASA) of Trunk Engines manufactured in mass or in series under Alternative Certification Scheme (Classification and Survey Rules, Section 2, F) annexed guideline is to be used.

For the purpose of this programme, mass or serial production of engines is defined as follows:

Category A – Mass produced engines:

The engine type is produced in a considerable number where normal production often is for other applications than the marine use and that engines for TL class are randomly taken from the production.

Category B – Serially produced engines:

The engine type is produced mainly for the marine application, normally not to stock, but for specific projects.

This programme may be applied for ASA of engines produced in mass or in series. The ASA will cover either mass or serially produced engines within the following categories:

Category A *– Engines with cylinder bore of ≤ 300 mm and produced in mass.*

Category B – Engines produced in series.

Category B1 *– Engines with a bore of ≤ 300 mm*

Category B2 *– Engines with a bore of > 300 mm and ≤ 400 mm*

Category B3 *– Engines with a bore of > 400 mm*

Deviations or alterations from this guideline must be consulted with Head Office and no agreement shall be made unless a permission from Head Office given regarding deviations/alterations.

TÜRK LOYDU

MASS AND SERIAL PRODUCED ENGINES ALTERNATIVE PRODUCT CERTIFICATION SCHEME

Mass And Serial Produced Engines Alternative

Product Certification Scheme

SECTION 1

GENERAL

A. Introduction

The Society's rules for Classification and Surveys Section 2,F. accepts that a alternative survey arrangement (ASA) may be established with the manufacturer as an alternative to the survey described in the applicable rule chapters when the procedures and processes of a manufacturer's quality system are in compliance with the rules.

B. Objective

The objective of this programme is to describe an alternative product certification scheme for mass or serial produced reciprocating internal combustion trunk engines, including the establishment of ASA. Reciprocating internal combustion trunk engines are in this programme designated as engines.

For engines to be certified based on an ASA and this programme, parts of the Society's verification scope will be based on verification of the manufacturer's quality system and, hence, the manufacturer's ability to control product quality, as an alternative to the Society attending certain tests as specified in the ASA.

Application of an ASA established and maintained in accordance with this programme represents an equivalent way of verifying compliance with **TL** rules for mass or serial produced engines.

C. Scope

When establishing an ASA, the manufacturer and the Society shall agree on the scope of tests that shall be covered by the ASA. This programme gives a maximum scope of tests that may be covered by an ASA for mass or serial produced engines, i.e. tests that based on the ASA may be documented with works certificates as an alternative to **TL** product certificate.

D. Application

1. Type Approval

An ASA will cover specific engine types/engine series. A condition for ASA of mass or serial produced engines is that the engine types to be covered by the ASA are type approved.

2. Mass Production and Categories of Engines

This programme may be applied for ASA of engines produced in mass or in series. The ASA will cover either mass or serially produced engines within the following categories:

Category A – Engines with cylinder bore of ≤ 300 mm and produced in mass. Category B – Engines produced in series.

Category B1 – Engines with a bore of ≤ 300 mm

Category B2 – Engines with a bore of > 300 mm and ≤ 400 mm

Category B3 – Engines with a bore of > 400 mm

For the purpose of this programme, mass or serial production of engines is defined as follows:

- The materials and components used are manufactured in compliance with all the production and quality controls specified by the engine manufacturer and recognized by **TL**.

- The engine components shall be manufactured on machining units which have been specially adjusted for that purpose and for which are subjected to the inspections necessary to ensure quality assurance.

- The engine components shall completely satisfy the engine manufacturer's quality requirements, shall be interchangeable and shall be able to be fitted without reworking or adaptation.

- Category A – Mass produced engines:

  - The engine type is produced in a considerable number where normal production often is for other applications than the marine use and that engines for **TL** class are randomly taken from the production.

- Category B – Serially produced engines:

  - The engine type is produced mainly for the marine application, normally not to stock, but for specific projects.

TL will decide which engine types/engine series meet the requirements for the application of this programme.

3. Components Supplied By Subcontractors

Components supplied by subcontractors and castings and forgings which are used in the manufacture of, or as spare parts for engines of category A and category B shall be manufactured in the same way as described in 2. The inspections necessary for quality assurance shall comply with the agreed ASA.

E. Request for Manufacturing Survey Arrangement

Request for ASA for an engine type/engine series shall be submitted to the Society by the engine manufacturer. The application form may be obtained by contacting **TL** Head Office or local **TL** office.

SECTION 2

TESTING AND CERTIFICATION OF ENGINES IN MANUFACTURER'S WORKS

A. Category A - Mass-Produced Engines

This sub-section specifies requirements for testing of category A engines to be installed onboard **TL** classed vessels and produced in accordance with an agreed ASA.

1. Component Tests

All testing of components as defined in the **TL** rules, may be documented with test report (TR). These components shall be marked with evidence of the tests applied. Stamping of individual components by **TL** is not required. Details are defined in Sec.3 Table 1.

1.1 For tests of the materials of crankshaft, connecting rods and crankshaft bolts, the certificate (according to ISO 10474/EN 10204 – 3.1) completed by the works shall be prepared and filed for later assessment by **TL**. The certificate shall indicate the requirements and the actual test results. It shall be possible to identify the components by reference to the certificate. Validation of certificates by **TL** is not required.

1.2 The engine manufacturer shall ensure that the spares and stock parts subject to mandatory inspection conform to the current rules. The manufacturer shall mark the parts so that they can be recognized as original spares. Stamping of individual components by **TL** is not required.

2. Workshop Test

2.1 Engines to be installed onboard **TL** classed vessels are subject to a workshop test. Exceptions shall be agreed upon with **TL**.

2.2 **TL** reserves the right to require a special test program according to the character of the installation.

2.3 For main engines and the prime movers of electric generators the rated power shall be verified as minimum power.

2.4 **TL** does not need to be present during the workshop test.

3. Engine Documents to be Available at the Manufacturer

The following documents shall be made available for later assessment by **TL**:

- The engine manufacturer's confirmation that the engine subject to certification meets the engine manufacturer's quality requirements on which the ASA is based
- Certificates for testing of crankshaft, connecting rod and crankshaft bolt material
- Workshop test acceptance protocol validated by the engine manufacturer.

4. Engine Certification

4.1 Engines below 300 kW

Product certification is not required for engines below 300 kW. A copy of the type approval certificate (TA) and the workshop test report will be sufficient.

4.2 Engines above 300 kW

Mass produced engines above 300 kW shall be certified by **TL** according to the agreed ASA.

B. Category B1 - Serial Produced Engines

This sub-section describes the minimum requirements for testing of category B1 engines to be installed onboard **TL** classed vessels and produced in accordance with an agreed ASA.

1. Component Tests

All testing of components as defined in the **TL** rules, except crankshaft and connecting rod forgings, may be documented with works certificates. These components shall be marked with evidence of the tests

applied. Stamping of individual components by **TL** is not required. Details are defined in Sec.3 Table 2.

1.1 All works certificates shall be prepared and filed for later assessment by **TL**. The certificates shall indicate test results. It shall be possible to identify the components by reference to the certificate. Validation of certificates by **TL** is not required.

1.2 The engine manufacturer shall ensure that the spares and stock parts subject to mandatory inspection conform to the current rules. The manufacturer shall mark the parts so that they can be recognized as original spares. Stamping of individual components by **TL** is not required.

2. Workshop tests

2.1 Engines to be installed onboard **TL** classed vessels are subject to a workshop test. Exceptions shall be agreed upon with **TL**.

2.2 **TL** reserves the right to require a special test program according to the character of the installation.

2.3 For main engines and the prime movers of electric generators the rated power shall be verified as minimum power.

2.4 **TL** attendance at workshop testing of engines shall be agreed upon in the ASA.

3 . Engine Documents to be Available at the Manufacturer

The following documents shall be made available for later assessment by **TL**:

- The engine manufacturer's confirmation that the engine subject to certification meets the engine manufacturer's quality
- Requirements on which the ASA is based reports and works certificates
- Workshop test acceptance protocol validated by the engine manufacturer.

4. Engine Certification

4.1 Engines below 300 kW

Product certification is not required for engines below 300 kW. A copy of the type approval certificate (TA) and the workshop test report (TR) will be sufficient.

4.2 Engines above 300 kW

Serial produced engines of category B1 and above 300 kW shall be certified by **TL**.

C. Category B2 - Serial Produced Engines

This subsection describes the minimum of requirements for testing of category B2 engines to be installed onboard **TL** classed vessels and produced in accordance with an agreed ASA.

1. Component Tests

All testing of components as defined in the **TL** rules, except crankshaft and connecting rod forgings, may be documented with works certificate. These components shall be marked with evidence of the tests applied. Stamping of individual components by **TL** is not required. Details are defined in Sec.3 Table 3.

1.1 All works certificates shall be prepared and filed for later assessment by **TL**. The certificates shall indicate test results. It shall be possible to identify the components by reference to the certificate. Validation of certificates by **TL** is not required.

1.2 The engine manufacturer shall ensure that the spares and stock parts subject to mandatory inspection conform to the current rules. The manufacturer shall mark the parts so that they can be recognized as original spares. Stamping of individual components by **TL** is not required.

2. Workshop Tests

2.1 Engines to be installed onboard **TL** classed vessels are subject to a workshop test. Exceptions shall be agreed upon with **TL**.

2.2 **TL** reserves the right to require a special test program according to the character of the installation.

2.3 For main engines and the prime movers of electric generators the rated power shall be verified as minimum power.

2.4 **TL** shall be present during the workshop test of propulsion engines. Attendance at workshop testing of auxiliary engines shall be agreed upon in the ASA.

3. Engine Documents to be Available at the Manufacturer

The following documents shall be made available for assessment by **TL** during the workshop test:

- The engine manufacturer's confirmation that the engine subject to certification meets the engine manufacturer's quality requirements on which the ASA is based
- Reports and works certificates
- Workshop test acceptance protocol validated by the engine manufacturer.

4. Engine Certification

Serial produced engines of category B2 shall be certified by **TL**

D. Category B3 - Serial produced engines

This subsection describes the minimum of requirements for testing of category B3 engines to be installed onboard **TL** classed vessels and produced in accordance with an agreed ASA.

1. Component Tests

All testing of components as defined in the **TL** rules, except crankshafts and connecting rod forgings, may be documented with works certificates. These components shall be marked with evidence of the tests applied. Stamping of individual components by **TL** is not required. Details are defined in Sec.3 Table 4.

1.1 All works certificates shall be prepared and filed for later assessment by **TL**. The certificates shall indicate test results. It shall be possible to identify the components by reference to the certificate. Validation of certificates by **TL** is not required.

1.2 The engine manufacturer shall ensure that the spares and stock parts subject to mandatory inspection conform to the current rules. The manufacturer shall mark the parts so that they can be recognized as original spares. Stamping of individual components by **TL** is not required.

2. Workshop Tests

2.1 Engines to be installed onboard **TL** classed vessels are subject to a workshop test. Exceptions to be agreed upon with **TL**.

2.2 **TL** reserves the right to require a special test program according to the character of the installation.

2.3 For main engines and the prime movers of electric generators the rated power shall be verified as minimum power.

2.4 **TL** shall be present during the workshop test of all engines.

3. Engine Documents to be Available at the Manufacturer

The following documents shall be made available for assessment by **TL** during the workshop test:

- The engine manufacturer's confirmation that the engine subject to certification meets the engine manufacturer's quality requirements on which the ASA is based

- Reports and works certificates

- Workshop test acceptance protocol validated by the engine manufacturer.

4. Engine Certification

Serial produced engines of category B3 shall be certified by **TL**.

SECTION 3

OVERVIEW OF TESTING DEPENDING ON ENGINE CATEGORY

A. General

The information given in this section is for information and is intended to make the development of ASAs more easy and efficient.

Testing of components depends on engine size and production arrangements. Testing of components shall as a minimum be carried out according to the following tables. Agreements shall be clearly stated in the ASA.

B. Category A engines, bore ≤ 300 mm

Components of category A engines shall be subject to testing and certification as follows:

Table 1 Certificates required for category A engines

Object	***Additional description***	***Certificate type***	***Issued by***	***Certification standard****
Crankshaft: made in one piece	Component certificate	TR	Manufacturer	
	C+M	3.1		ISO 10474/ EN 10204
	UT+CD			
	Dimensional control			
Semi-built Crankshaft (Crankthrow, forged main journal and journals with flange)	Component certificate	TR	Manufacturer	
	C+M	3.1		ISO 10474/ EN 10204
	UT+CD			
	Dimensional control			
Connecting rod with cap	Component certificate	TR	Manufacturer	
	C+M	3.1		ISO 10474/ EN 10204
	UT+CD			
	Dimensional control			

Table 1 Certificates required for category A engines (cont.)

Object	*Additional description*	*Certificate type*	*Issued by*	*Certification standard**
Coupling bolts for crankshaft	Component certificate	TR	Manufacturer	
	C+M	3.1		ISO 10474/ EN 10204
	UT+CD			
	Dimensional control			
Accumulator	C+M	3.1	Manufacturer	ISO 10474/ EN 10204
	Pressure testing			
High pressure fuel injection pump body	C+M	3.1	Manufacturer	ISO 10474/ EN 10204
	Hydraulic testing			
High pressure fuel injection valves (only for not auto-fretted)	Hydraulic testing	3.1	Manufacturer	ISO 10474/ EN 10204
Turbocharger	Component certificate	3.1	Manufacturer	ISO 10474/ EN 10204
Torsional vibration damper	Component certificate	3.1	Manufacturer	ISO 10474/ EN 10204

* Unless otherwise specified the certification standard is **TL** rules.

C - Chemical composition M - Mechanical properties

UT - Ultrasonic testing CD - Crack detection by MPI or DP

TR = Test report issued by the manufacturer.

C. Category B1 engines, bore≤ 300 mm

Components of category B1 engines shall be subject to testing and certification as follows:

Table 2 Certificates required for category B1 engines

Object	*Additional description*		*Certificate type*	*Issued by*
Crankshaft: made in one piece	Component certificate		TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer
	Visual Inspection (Surveyor) Random, of fillets and oil bores			
Semi-built Crankshaft (Crankthrow, forged main journal and journals with flange)	Component certificate		TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer
	Visual Inspection (Surveyor) Random, of fillets and shrink fittings			
Connecting rod with cap	Component certificate	If finished by engine manufacturer	TL	Manufacturer
		If finished by sub supplier	TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer
Coupling bolts for crankshaft	Component certificate		W	Manufacturer
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer
Accumulator	C+M		W	Manufacturer
	Hydraulic testing **(1)**		W	Manufacturer
High pressure fuel injection pump body	C+M		W	Manufacturer
	Hydraulic testing **(1)**		TR	Manufacturer
High pressure fuel injection valves (only for not auto-fretted)	Hydraulic testing **(1)**		TR	Manufacturer

Table 2 Certificates required for category B1 engines (cont.)

Object	*Additional description*		*Certificate type*	*Issued by*
Turbocharger	Component certificate	Turbocharger of category B > 1 000 kW and ≤ 2 500 kW **(2)**	TL	Manufacturer
		Turbocharger of category C > 2 500 kW **(2)**	TL	Society
Torsional vibration damper	Design to be type approved		TA	Society

C+M = Material properties including chemical composition and mechanical properties. It includes also surface hardening (hardness, depth and extent), peening and rolling (extent and applied force).

NDT report = Non-destructive test report . Non destructive examination means e.g. ultrasonic testing, crack detection by MPI or DP.

TL = Product certificate issued by the Society based on the **TL** rules.

W = Works certificate issued by the manufacturer based on **TL** rules.

TR = Test report issued by the manufacturer based on **TL** rules).

TA = **TL** type approval certificate issued by the Society .

(1) *Hydraulic testing shall be applied on the water/oil side of the component equal to 1.5 times the maximum working pressure. High pressure parts of the fuel injection system shall be tested at 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. Dimensional control includes surface condition.*

(2) *Power served by each turbocharger. Note that turbocharger of category A ≤ 1 000 kW does not need to be certified.*

D. Category B2 engines, 300 mm < bore ≤ 400 mm

Components of category B2 engines shall be subject to testing and certification as follows:

Table 3 Certificates required for category B2 engines

Object	*Additional description*		*Certificate type*	*Issued by*
Welded bedplate	Component certificate		W	Manufacturer
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
Bearing transverse girders cast steel	Component certificate		W	Manufacturer
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
Welded frame box	Component certificate		TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
Crankshaft: made in one piece	Component certificate		TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer
	Visual Inspection (Surveyor) Random, of fillets and oil bores			
Semi-built Crankshaft (Crankthrow, forged main journal and journals with flange)	Component certificate		TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer
	Visual Inspection (Surveyor) Random, of fillets and shrink fittings			
Connecting rod with cap	Component certificate	If finished by engine manufacturer	TL	Manufacturer
		If finished by sub supplier	TL	Society
	C+M		W	Manufacturer
	UT+CD		NDT report	Manufacturer
	Dimensional control		W	Manufacturer

Table 3 Certificates required for category B2 engines (cont.)

Object	*Additional description*	*Certificate type*	*Issued by*
Coupling bolts for crankshaft	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Dimensional control	W	Manufacturer
Accumulator	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
High pressure fuel injection pump body	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
High pressure fuel injection valves (only for not auto-fretted)	Hydraulic testing **(2)**	W	Manufacturer
Cylinder liner	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
Cylinder head, cast steel	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT Report	Manufacturer
	Pressure testing	W	Manufacturer
Cylinder head, nodular cast-/ lamellar cast iron	Hydraulic testing **(2)**	W	Manufacturer
Forged cylinder head	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Pressure testing	W	Manufacturer
Bolts and studs for main bearings	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Bolts and studs for cylinder heads	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Bolts and studs for connecting rods	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Thread making	TR report	Manufacturer
High pressure fuel injection pipes including common fuel rail	C+M	W	Manufacturer
	Hydraulic testing **(2)** for those that are not auto-fretted	W	Manufacturer
High pressure common servo oil system	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer

Table 3 Certificates required for category B2 engines (cont.)

Object	***Additional description***		***Certificate type***	***Issued by***
Cooler, both sides **(1)**	C+M		W	Manufacturer
	Hydraulic testing **(2)**		W	Manufacturer
P > 400 kW/cyl				
Engine block, lamellar cast iron	Hydraulic testing **(2)**		W	Manufacturer
Engine block, nodular cast iron	M		W	Manufacturer
	Hydraulic testing **(2)**		W	Manufacturer
P > 800 kW/cyl				
Piping, pumps, actuators, etc. for hydraulic drive of valves, if applicable	C+M		W	Manufacturer
	Hydraulic testing **(2)**		W	Manufacturer
Engine driven pumps (oil, water, fuel, bilge) other than pumps used for hydraulic drive of valves and high pressure fuel injection pumps	Hydraulic testing **(2)**		W	Manufacturer
Bearings for main and crankpin	C		TR	Manufacturer
	UT (for full contact between basic material and bearing metal)		TR	Manufacturer
	Dimensional control		W	Manufacturer
Turbocharger	Component certifcate	Turbocharger of category B > 1 000 kW and ≤ 2 500 kW **(3)**	TL	Manufacturer
		Turbocharger of category C > 2 500 kW **(3)**	TL	Society
Torsional vibration damper	Design to be type approved		TA	Society

C+M = Material properties including chemical composition and mechanical properties. It includes also surface hardening (hardness, depth and extent), peening and rolling (extent and applied force).

NDT report = Non-destructive test report . Non destructive examination means e.g. ultrasonic testing, crack detection by MPI or DP.

TL = Product certificate issued by the Society based on **TL** rules.

W = Works certificate issued by the manufacturer based on **TL** rules.

TR = Test report issued by the manufacturer based on **TL** rules.

TA = **TL** type approval certificate issued by the Society.

(1) *Charge air cooler need only be tested on the water side*

(2) *Hydraulic testing shall be applied on the water/oil side of the component equal to 1.5 times the maximum working pressure. High pressure parts of the fuel injection system shall be tested at 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. Dimensional control includessurface condition.*

(3) *Power served by each turbocharger. Note that turbocharger of category A ≤ 1 000 kW does not need to be certified.*

E. Category B3 engines, bore > 400 mm

Components of category B3 engines shall as a minimum be subject to certification as follows:

Table 4 Certificates required for category B3 engines

Object	*Additional description*	*Certificate type*	*Issued by*
Welded bedplate	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Bearing transverse girders, cast steel	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Welded frame box	Component certificate	TL	Society
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Crankshaft: made in one piece	Component certificate	TL	Society
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Dimensional control	W	Manufacturer
	Visual Inspection (Surveyor) Random, of fillets and oil bores		
Semi-built Crankshaft (Crankthrow, forged main journal and journals with flange)	Component certificate	TL	Society
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Dimensional control	W	Manufacturer
	Visual Inspection (Surveyor) Random, of fillets and shrink fittings		
Connecting rod with cap	Component certificate – If finished by engine manufacturer	TL	Manufacturer
	Component certificate – If finished by sub supplier	TL	Society
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Dimensional control	W	Manufacturer
Coupling bolts for crankshaft	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Dimensional control	W	Manufacturer
Accumulator	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
Cylinder liner	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer

Table 4 Certificates required for category B3 engines (cont.)

Object	*Additional description*	*Certificate type*	*Issued by*
Cylinder head, cast steel	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Pressure testing	W	Manufacturer
Cylinder head, nodular cast-/ lamellar cast iron	Hydraulic testing **(2)**	W	Manufacturer
Cylinder head, forged	Component certificate	W	Manufacturer
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
Bolts and studs for main bearings	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Bolts and studs for cylinder heads	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Bolts and studs for connecting rods	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
	Thread making	TR report	Manufacturer
High pressure fuel injection pipes including common fuel rail	C+M	W	Manufacturer
	Hydraulic testing **(2)**, for those that are not auto-fretted	W	Manufacturer
High pressure common servo oil system	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
Cooler, both sides **(1)**	C+M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer
Piston crown, cast steel	Component certificate	TL	Society
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
Forged piston crown	Component certificate	TL	Society
	C+M	W	Manufacturer
	UT+CD	NDT report	Manufacturer
P > 400 kW/cyl			
Engine block, lammelar cast iron	Hydraulic testing **(2)**	W	Manufacturer
Engine block, nodular cast iron	M	W	Manufacturer
	Hydraulic testing **(2)**	W	Manufacturer

Table 4 Certificates required for category B3 engines (cont.)

Object	***Additional description***		***Certificate type***	***Issued by***
P > 800 kW/cyl				
Piping, pumps, actuators, etc. for hydraulic drive of valves, if applicable	C+M		W	Manufacturer
	Hydraulic testing **(2)**		W	Manufacturer
Engine driven pumps (oil, water, fuel, bilge) other than pumps used for hydraulic drive of valves and high pressure fuel injection pumps	Hydraulic testing **(2)**		W	Manufacturer
Bearings for main and crankpin	C		TR	Manufacturer
	UT (for full contact between basic material and bearing metal)		TR	Manufacturer
	Dimensional control		W	Manufacturer
Turbocharger	Component certificate	Turbocharger of category B > 1 000 kW and ≤ 2 500 kW **(3)**	TL	Manufacturer
		Turbocharger of category C > 2 500 kW **(3)**	TL	Society
Torsional vibration damper	Design to be type approved		TA	Society

C+M = Material properties including chemical composition and mechanical properties. It includes also surface hardening (hardness, depth and extent), peening and rolling (extent and applied force).

NDT report = Non-destructive test report .Non destructive examination means e.g. ultrasonic testing, crack detection by MPI or DP.

TL = Product certificate issued by the Society based on **TL** rules.

W = Works certificate issued by the manufacturer based on **TL** rules.

TR = Test report issued by the manufacturer based on **TL** rules.

TA = **TL** type approval certificate issued by the Society.

(1) *Charge air cooler need only be tested on the water side*

(2) *Hydraulic testing shall be applied on the water/oil side of the component equal to 1.5 times the maximum working pressure. High pressure parts of the fuel injection system shall be tested at 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. Dimensional control includessurface condition.*

(3) *Power served by each turbocharger. Note that turbocharger of category A ≤ 1 000 kW does not need to be certified***.**

F. TL requirement to be present at the workshop tests

TL requires to be present at the workshop test depending on the engine size and application. Table 5 shows the minimum requirement and should be used as guidance. Final agreement shall be agreed upon in the ASA.

Table 5 TL attendance at workshop tests

Engine size	Mass produced engines	Serial produced engine
P < 300 Kw	Attendence not required	Attendance not required
P > 300 kW and D < 300 mm	Attendance not required	Attendance shall be agreed upon
300 mm < *D* < 400 mm	Not applicable	Prop. engines to be attended Aux. engine to be agreed upon
D > 400 mm	Not applicable	All engines to be attended
D = *cylinder bore diameter (mm)*		