

|                                 |         |                               |          |                    |
|---------------------------------|---------|-------------------------------|----------|--------------------|
| <b>Technical File on Engine</b> |         | Technical file identification |          |                    |
|                                 |         | Approval number               |          |                    |
|                                 |         | Approval date                 |          |                    |
| Engine family                   | 6AYLW15 | <b>YANMAR CO., LTD.</b>       | Drawn    | <i>Y. Seto</i>     |
| Engine Serial No.               | 5110    |                               | Checked  | <i>S. Motoyama</i> |
|                                 |         |                               | Approved | <i>K. Abe</i>      |

The net mark in the column of technical file is applies to this engine.  
The details are according to attached technical file on engine  
(Technical File. ID. No. G2-48649-1820 )

| IDNo. | Engine Type | No. of cyl. | Cylinder Diameter (mm) | Stroke (mm) | Rated engine Speed (rpm) | Rated power |         | NOx mode |
|-------|-------------|-------------|------------------------|-------------|--------------------------|-------------|---------|----------|
|       |             |             |                        |             |                          | Crank       | M.G out |          |
| 1     | 6AYL-WET    | 6           | 155                    | 180         | 1500                     | 438         | -       | D2       |

**Bureau Veritas Marine & Offshore**  
**Section MOT331/35/11NOX**  
Examined in order to check the compliance with the applicable requirements of .....  
.....  
**MARPOL ANNEX.VI**.....  
.....  
On behalf of the administration of  
**IRELAND**.....  
All particulars not shown on this document are assumed to be as per the requirements of the aforesaid texts,  
  
**Paris, 06-Jun-2019**  
  
[Electronic document]  
**The plan approval office**

|  |         |   |               |                  |
|--|---------|---|---------------|------------------|
| <b>原動機取扱手引書</b><br><b>Technical File on Engine</b> |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |                  |
|  |         | 承認番号<br>Approval number                       | D2            |                  |
|  |         |   | E2            |                  |
|  |         | 承認年月日<br>Approval date                        |               |                  |
| 原動機ファミリー<br>Engine family                          | 6AYLW15 | ヤンマー株式会社<br>YANMAR CO.,LTD                    | 設計<br>Drawn   | M.Hibiwo         |
|  |         |   | 検図<br>Checked | <i>G. Kawano</i> |
| 承認<br>Approved                                     | H. Wada |   |               |                  |
|  |         |   |               |                  |

## 1. 原動機の要目

Particulars of the engine

### 1. 1 原動機の要目(ファミリー共通項目)

Particulars of the engine (common items of the engine family)

|  |   |          |  |
|--|---|----------|--|
| 原動機製作者<br>Engine manufacturer                  | ヤンマー株式会社<br>YANMAR CO.,LTD.   |          |  |
| ファミリー名称<br>Name of engine family               | 6AYLW15   |          |  |
| 原動機の型式名及び仕様<br>Engine type and specification   | 1. 2参照<br>See 1. 2  |          |  |
| 燃焼サイクル<br>Combustion cycle                     | 4ストロークサイクル、単動ディーゼル機関<br>4-stroke-cycle, single acting diesel engine |          |  |
| シリンダ数及び配置<br>Cylinder number and configuration | 1. 2参照<br>See 1. 2  |          |  |
| シリンダ当たりの排気量<br>Displacement per one cylinder   | 3396 cm <sup>3</sup>  |          |  |
| 燃焼室形式<br>Type of combustion chamber            | 単室式<br>Open chamber   |          |  |
| 弁穴配置<br>Valve and port configuration           | シリンダヘッド<br>Cylinder head  |          |  |
| 過給方式<br>Method of air aspiration               | 排気ガスタービン<br>Exhaust gas turbo charged                               |          |  |
| 冷却方式<br>Method of cooling                      | 水冷式<br>Water cooled   |          |  |
| シリンダ構造<br>Construction of cylinder             | 一体型<br>Monoblock  |          |  |
| 燃料(噴射)システム形式<br>Fuel injection system          | 集合型噴射装置<br>In-line  |          |  |
| 使用燃料<br>Fuel type to be used on board          | 留出燃料油<br>distillate   |          |  |
| その他の要目<br>Others                               | 排気ガス再循環<br>Exhaust gas re-circulation                               | 無<br>no  |  |
|  | 水噴射・エマルジョン<br>Water/emulsion injection                              | 無<br>no  |  |
|  | 空気噴射<br>Air injection   | 無<br>no  |  |
|  | 給気冷却<br>Charge cooling system                                       | 有<br>yes |  |
|  | 排ガス後処理<br>Exhaust after-treatment                                   | 無<br>no  |  |
|  |   |          |  |
|  |   |          |  |

|                                      |         |   |               |
|--------------------------------------|---------|---|---------------|
| 原動機取扱手引書<br>Technical File on Engine |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |
|                                      |         | 承認番号<br>Approval number                       | D2<br>E2      |
| 原動機ファミリー<br>Engine family            | 6AYLW15 | 承認年月日<br>Approval date                        |               |

1. 2 ファミリーに含まれる全ての原動機の型式及び仕様  
Engine type and specification of all engines within the family

| ID No. | 型式名<br>Engine Type | 気筒数<br>No. of cyl. | シリンダ径<br>Cylinder diameter (mm) | ストローク<br>Stroke (mm) | 定格速度<br>Rated engine speed (min <sup>-1</sup> ) | 定格出力<br>Rated power (kW) |
|--------|--------------------|--------------------|---------------------------------|----------------------|---|--------------------------|
| 1      | 6AYL-WET           | 6                  | 155                             | 180                  | 1500  | 438                      |

2. 原動機の用途 (適用テストサイクル)  
Use of engine (test cycles to be applied)

| ID No. | 型式名<br>Engine Type | 適用テストサイクル (○にて示す)<br>Test Cycle to be applied (indicated ○) |  |   |  |
|--------|--------------------|---|--|---|--|
|        |                    | 可変ピッチプロペラを有する主機<br>Constant Speed Main Propulsion           | 固定ピッチプロペラを有する主機および補助機関<br>Propeller Law operated Main and Propeller Law operated Auxiliary | 発電機を駆動する補助機関<br>Constant Speed Auxiliary Engine | 作業用機械を駆動するための補助機関<br>Variable Speed Variable Load Auxiliary Engine |
|        |                    | E2  | E3   | D2  | C1   |
| 1      | 6AYL-WET           | ○   |  | ○   |  |

3. 燃料噴射装置  
Fuel injection system

3. 1 燃料噴射時期  
Fuel injection timing

| ID No. | 型式名<br>Engine Type | 設定範囲<br>Allowable range of adjustments                            | 識別方法<br>Identification procedure                    |
|--------|--------------------|---|---|
|        |                    | 噴射時期<br>Static injection timing (クランク角) (°)<br>(crank angle) deg. |   |
| 1      | 6AYL-WET           | bTDC 13.5 ~ bTDC 14.5   | 図面番号 G2-48649-1830参照<br>See Draw. No. G2-48649-1830 |

|                                      |         |   |               |
|--------------------------------------|---------|---|---------------|
| 原動機取扱手引書<br>Technical File on Engine |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |
|                                      |         | 承認番号<br>Approval number                       | D2            |
|                                      |         |   | E2            |
| 原動機ファミリー<br>Engine family            | 6AYLW15 | 承認年月日<br>Approval date                        |               |

3. 2 燃料噴射弁開弁圧力  
Fuel injection valve operating pressure

| ID No. | 型式名<br>Engine Type | 設定範囲<br>Allowable range of adjustments | 識別方法<br>Identification procedure                              |
|--------|--------------------|--|---|
| 1      | 6AYL-WET           | 31±0.5MPa                              | ノズルテストにて確認<br>Attach the injection valve to the nozzle tester |

3. 3 燃料噴射弁  
Fuel injection valve  
燃料噴射ノズル型式 : 多噴口  
Fuel injection nozzle type : Multi hole nozzle  
識別刻印位置 : 燃料噴射弁  
Marking position : Fuel injection valve

| ID No. | 型式名<br>Engine Type | 識別番号<br>Identification number | ※噴口数<br>Number of Hole | ※噴口径<br>Diameter of Hole | ※噴口角度<br>Injection Angle | 識別方法<br>Identification procedure                          |
|--------|--------------------|-------------------------------|------------------------|--------------------------|--------------------------|---|
| 1      | 6AYL-WET           | TV                            | 8 / 4                  | 0.29 / 0.20 mm           | 160 / 90 ° (deg.)        | 図面番号<br>G2-48649-1830参照<br>See Draw. No.<br>G2-48649-1830 |

“※”印はノズル仕組側面で確認可能  
Marked “※” are able to check in nozzle component side.  
160 29 8 S 90 20 4 FA2

構造図(図面番号) : Z2-48649-0570  
Drawing (Drawing number) : Z2-48649-0570

3. 4 燃料噴射ポンプ(プランジャ、バレル及び燃料カムを含む)  
Fuel injection pump ( including Plunger, Barrel and Fuel cam )

| ID No. | 型式名<br>Engine Type | 型式<br>Type     | 識別番号<br>Identification number | 識別方法<br>Identification procedure                    |
|--------|--------------------|----------------|-------------------------------|---|
| 1      | 6AYL-WET           | 集合型<br>In-line | 6AYL                          | 図面番号 G2-48649-1830参照<br>See Draw. No. G2-48649-1830 |

燃料噴射ポンプ図面番号 : Z2-48640-0420  
Fuel Injection Pump drawing No. : Z2-48640-0420

|                                      |         |   |               |
|--------------------------------------|---------|---|---------------|
| 原動機取扱手引書<br>Technical File on Engine |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |
|                                      |         | 承認番号<br>Approval number                       | D2<br>E2      |
| 原動機ファミリー<br>Engine family            | 6AYLW15 | 承認年月日<br>Approval date                        |               |

3. 5 燃料噴射圧力 (コモンレイル方式)  
Fuel injection pressure (common rail system)

| ID No. | 型式名<br>Engine Type | 設定範囲<br>Allowable range of adjustments | 識別方法<br>Identification procedure |
|--------|--------------------|--|----------------------------------|
| 1      | 6AYL-WET           | 該当なし<br>Not Applicable                 | 該当なし<br>Not Applicable           |

4. 燃焼室  
Combustion chamber

4. 1 燃焼室  
Combustion chamber

| ID No. | 型式名<br>Engine Type | 構造図(図面番号)<br>Drawing ( drawing number ) |
|--------|--------------------|---|
| 1      | 6AYL-WET           | Z2-48649-0570                           |

シリンダヘッド  
Cylinder head

| ID No. | 型式名<br>Engine Type | 型式<br>Type             | 識別番号<br>Identification number | 識別方法<br>Identification procedure                    |
|--------|--------------------|------------------------|-------------------------------|---|
| 1      | 6AYL-WET           | 該当なし<br>Not Applicable | AY2                           | 図面番号 G2-48649-1830参照<br>See Draw. No. G2-48649-1830 |

ピストン  
Piston

| ID No. | 型式名<br>Engine Type | 型式<br>Type          | 識別番号<br>Identification number | 識別方法<br>Identification procedure                    |
|--------|--------------------|---------------------|-------------------------------|---|
| 1      | 6AYL-WET           | 単室式<br>Open chamber | AYR2                          | 図面番号 G2-48649-1830参照<br>See Draw. No. G2-48649-1830 |

|                                      |         |   |               |
|--------------------------------------|---------|---|---------------|
| 原動機取扱手引書<br>Technical File on Engine |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |
|                                      |         | 承認番号<br>Approval number                       | D2<br>E2      |
| 原動機ファミリー<br>Engine family            | 6AYLW15 | 承認年月日<br>Approval date                        |               |

#### 4. 2 圧縮比

Compression ratio

| ID No. | 型式名<br>Engine Type | 圧縮比<br>Compression ratio |
|--------|--------------------|--------------------------|
| 1      | 6AYL-WET           | 14.86                    |

トップクリアランス

Top clearance

| ID No. | 型式名<br>Engine Type | 設定範囲<br>Allowable range of adjustments | 識別方法<br>Identification procedure                    |
|--------|--------------------|--|---|
| 1      | 6AYL-WET           | 1.56±0.108mm                           | 図面番号 G2-48649-1830参照<br>See Draw. No. G2-48649-1830 |

シム厚

Shims

| ID No. | 型式名<br>Engine Type | 設定範囲<br>Allowable range of adjustments | 識別方法<br>Identification procedure |
|--------|--------------------|--|----------------------------------|
| 1      | 6AYL-WET           | 該当なし<br>Not Applicable                 | 該当なし<br>Not Applicable           |

#### 5. 給排気装置

Instrument of charge air and exhaust gas

| ID No. | 型式名<br>Engine Type | 構造図(図面番号) バルブの数、ポートの寸法<br>Drawing (Drawing number) valve number, porting size |
|--------|--------------------|---|
| 1      | 6AYL-WET           | Z2-48640-0270   |

|                                      |         |   |               |
|--------------------------------------|---------|---|---------------|
| 原動機取扱手引書<br>Technical File on Engine |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |
|                                      |         | 承認番号<br>Approval number                       | D2<br>E2      |
| 原動機ファミリー<br>Engine family            | 6AYLW15 | 承認年月日<br>Approval date                        |               |

## 6. 過給装置

Turbo charger

製作者 : 三菱重工業株式会社  
Manufacturer : MITSUBISHI HEAVY INDUSTRIES,LTD.

| ID No. | 型式名<br>Engine Type | 型式<br>Type                | 識別番号<br>Identification number | ※過給機仕様<br>Turbocharger Spcification | 識別方法<br>Identification procedure                          |
|--------|--------------------|---------------------------|-------------------------------|-------------------------------------|---|
| 1      | 6AYL-WET           | 空冷<br>ラジアル式<br>Air cooled | TD10L-<br>51VRC<br>34         | 51VRC-34                            | 図面番号<br>G2-48649-1830参照<br>See Draw. No.<br>G2-48649-1830 |

※ 過給機仕様詳細 : コンプレッサ仕様 - タービンハウジング仕様  
※ in Turbocharger Specification : Compressor spec. - Turbine Housing spec.

過給機図面番号 : J2-48640-0310  
Turbo charger drawing No. : J2-48640-0310

## 7. 空気冷却装置

Air Cooler

製作者 : サーク・ヒート・トランスファー  
Manufacturer : SERCK HEAT TRANSFER

型式 : フィン付多管式  
Type : Finned Multitubular

| ID No. | 型式名<br>Engine Type | 型式<br>Type          | 識別番号<br>Identification number | 識別方法<br>Identification procedure                    |
|--------|--------------------|---------------------|-------------------------------|---|
| 1      | 6AYL-WET           | 水冷式<br>Water cooled | 6AY2                          | 図面番号 G2-48649-1830参照<br>See Draw. No. G2-48649-1830 |

空気冷却装置図面番号 : Z2-48640-0430  
Air Cooler drawing No. : Z2-48640-0430

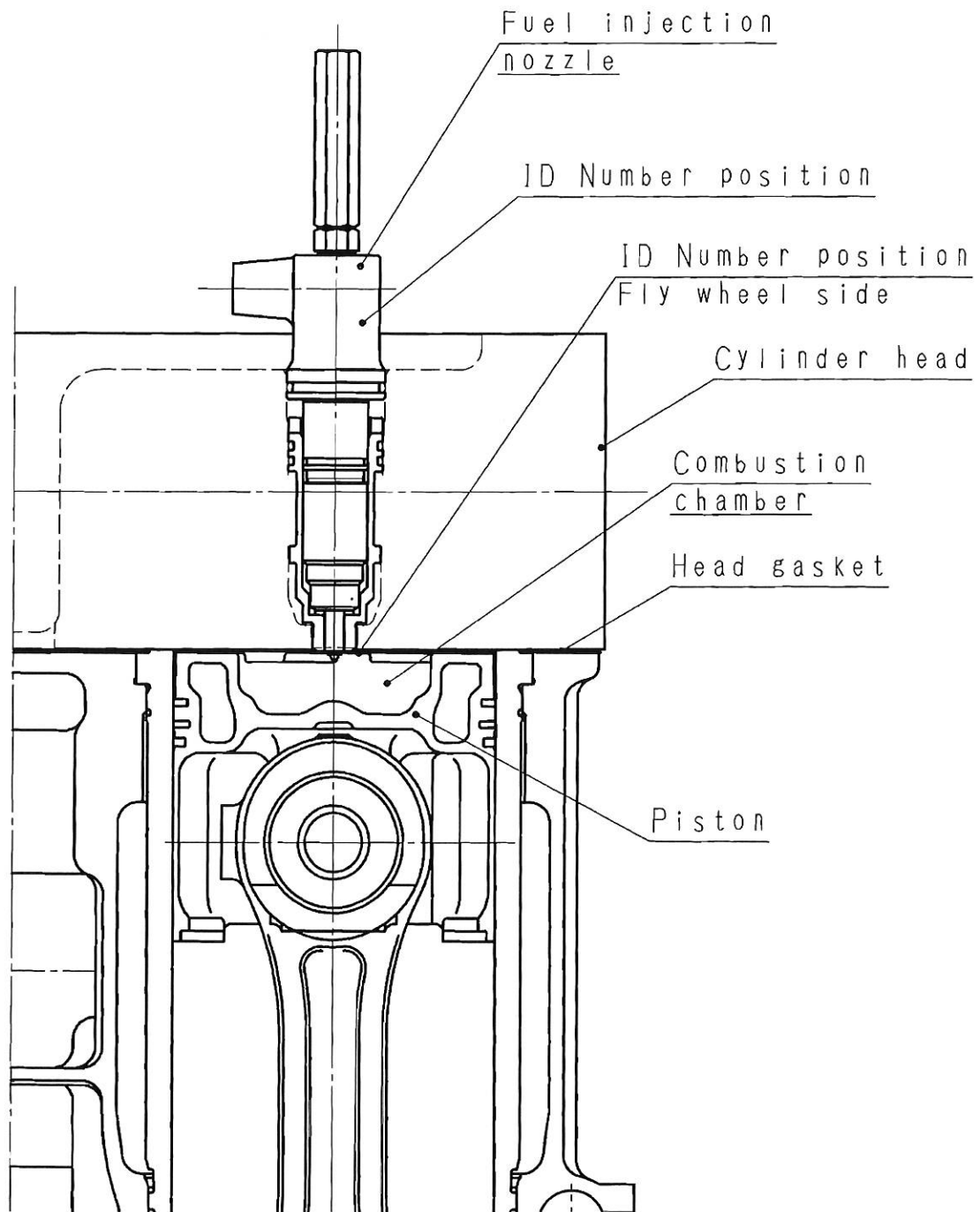
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|--------------------------------------|---------|---|---------------|
| 原動機取扱手引書<br>Technical File on Engine |         | 原動機取扱手引書文書番号<br>Technical File identification | G2-48649-1820 |
|                                      |         | 承認番号<br>Approval number                       | D2<br>E2      |
| 原動機ファミリー<br>Engine family            | 6AYLW15 | 承認年月日<br>Approval date                        |               |

#### 8. 認証試験時の親エンジンの運転条件

Condition at pre-certificating of Parent Engine

- ・ 機関入口冷却水温度:38°C  
Maximum fresh water temperature at engine inlet:38°C
- ・ 給気最高温度:46°C  
Maximum charge air temperature:46°C
- ・ 最高排気圧力:3.43kPa  
Maximum exhaust back pressure:3.43kPa
- ・ 過給機入口給気抵抗:2.45kPa  
Air intake Restriction:2.45kPa



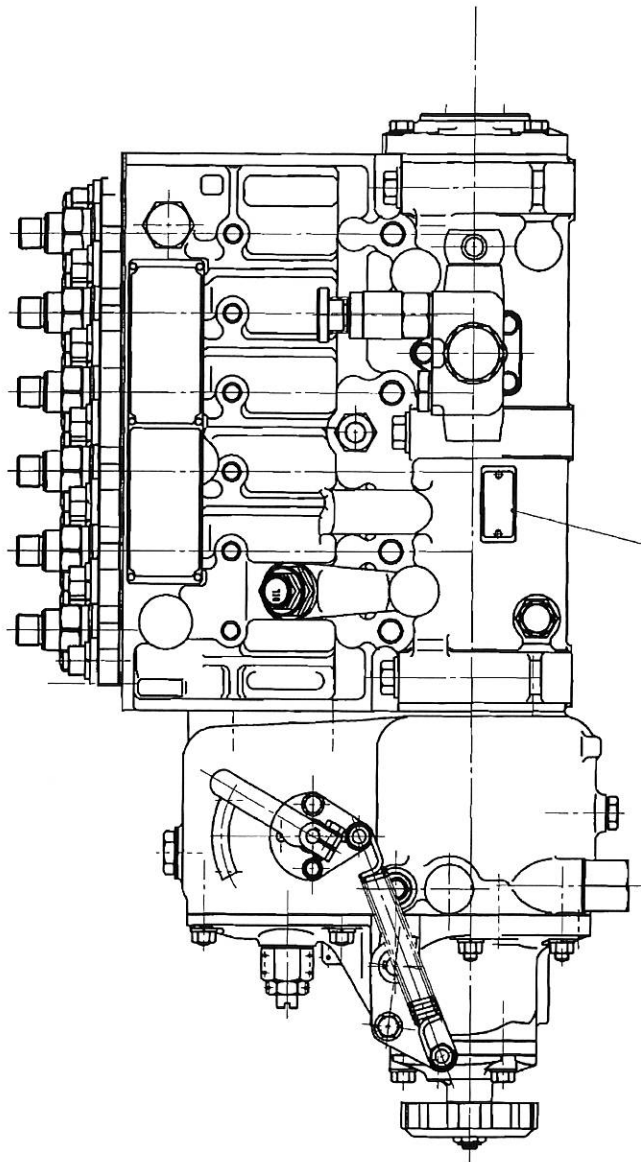


Combustion chamber

**YANMAR CO.LTD**

DWG.  
No.

Z2-48649-0570

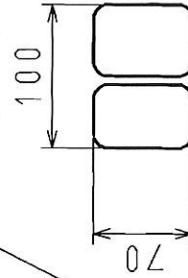
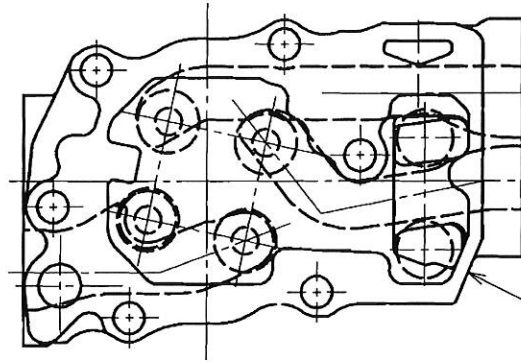
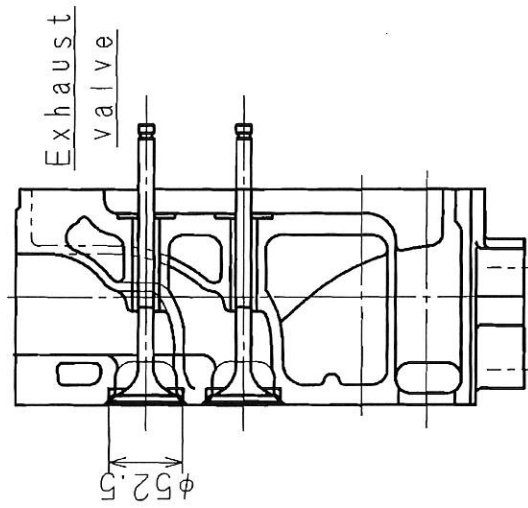
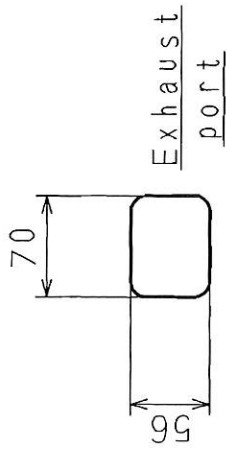


ID NUMBER POSITION

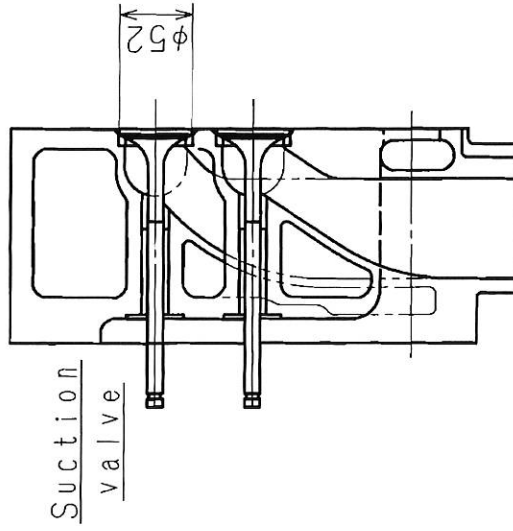
Fuel Injection Pump

**YANMAR OOLTR**

DWG. No. Z2-48640-0420

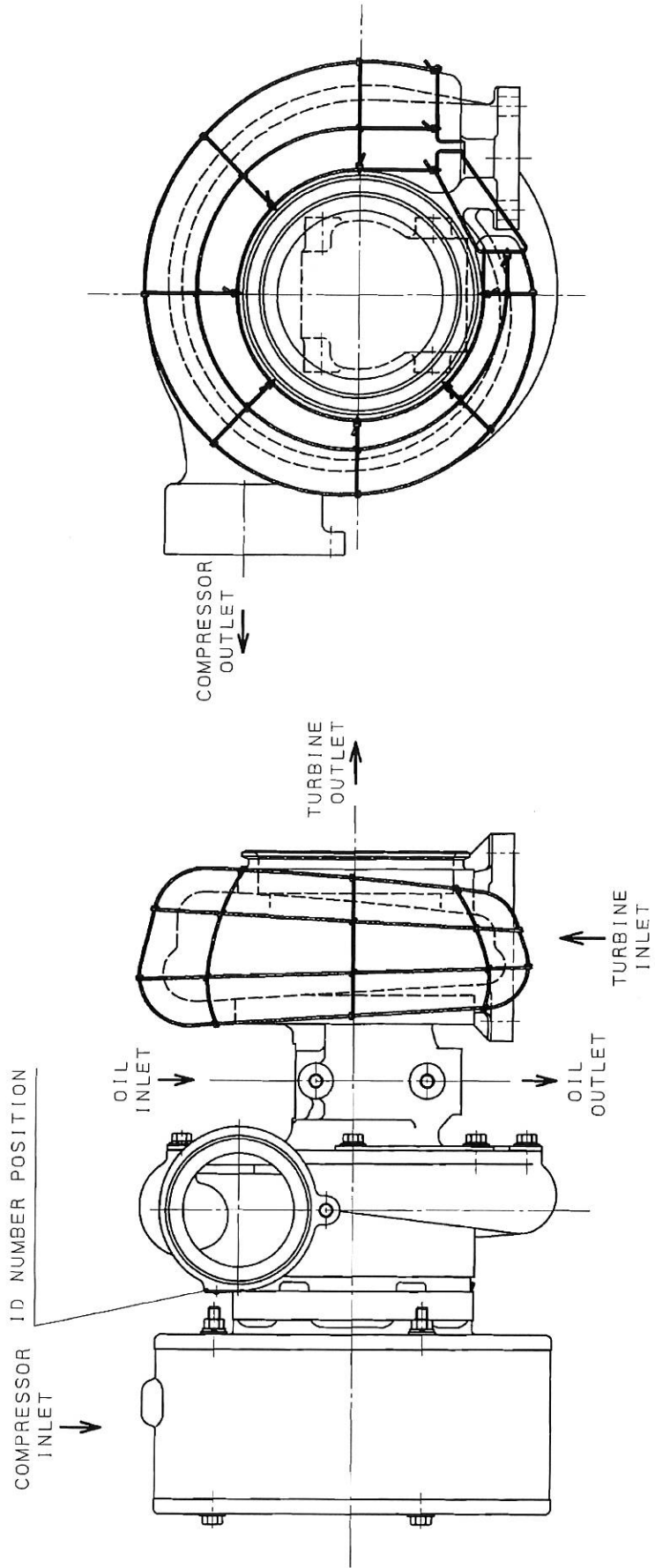


Suction port



ID Number position

|   |                        |
|---|------------------------|
| Instrument of charge air<br>and exhaust gas |                        |
| <b>YANMAR 00.LTB</b>                        | DWG. No. Z2-48640-0270 |

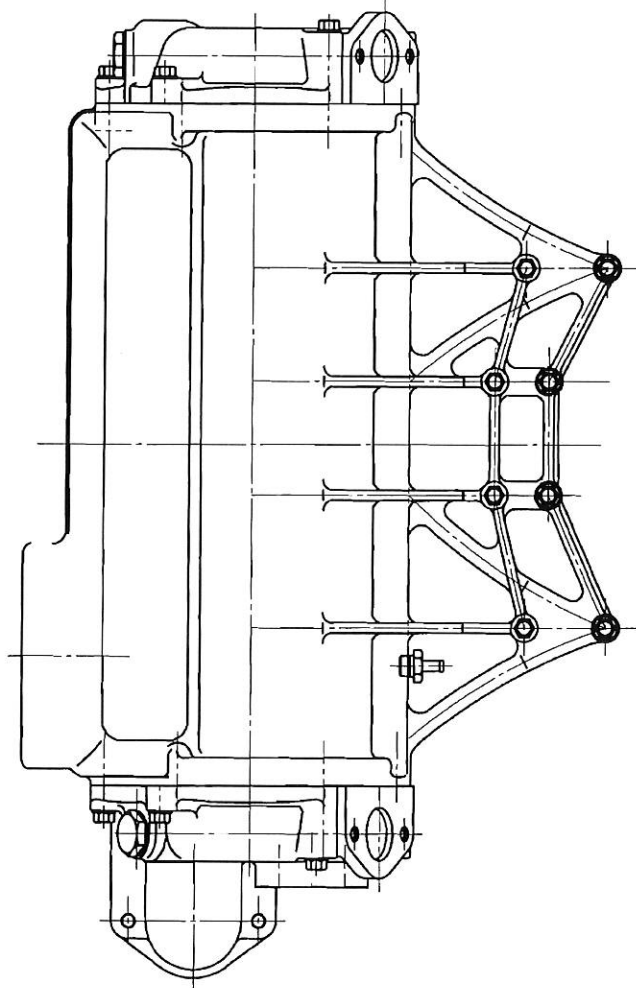


ID13 or ID10

Turbo charger

**YANMAR OOLTR**

DWG. No. J2-48640-0310



ID NUMBER POSITION

Air Cooler

**YANMAR OOLTR**

DWG. No. Z2-48640-0430

|  |         |                                    |    |               |           |  |
|--|---------|------------------------------------|----|---------------|-----------|--|
| 船上におけるNOx確認手順<br>On-board Verification Procedure |         | 文書番号<br>File identification number |    | G2-48649-1850 |           |  |
|  |         | 承認番号<br>Approval number            | D2 |               |           |  |
|  |         |                                    | E2 |               |           |  |
|  |         | 承認年月日<br>Approval date             |    |               |           |  |
| 原動機ファミリー<br>Engine family                        | 6AYLW15 | ヤンマー株式会社<br>YANMAR CO.,LTD         |    | 設計<br>Drawn   | M. Hibino |  |
|  |         |                                    |    | 検図<br>Checked | A. Kawano |  |
| 承認<br>Approved                                   | H. Wada |                                    |    |               |           |  |

原動機の構成部品の種類、取付方法及び調整範囲の確認方法は、以下の2つの手順により実行する。

An engine parameter check method shall be carried out using the two procedure as follows:

手順1[書類審査]

Procedure 1 : Documentation inspections of engine parameter

- ① 原動機取扱手引書 : G2-48649-1820  
Technical File on Engine : G2-48649-1820
- ② 原動機パラメータによる検証方法 : G2-48649-1830  
Verification procedures for the engine parameter survey : G2-48649-1830
- ③\* パラメータ記録簿  
Record book of engine parameters

※パラメータ記録簿には、同種交換及び許容範囲内での調整を含むエンジン構成部品、設定値に関する全ての変更点が日付順に記録されていること。

All changes, including for replacement and adjustments within the approved ranges made relative to an engine's components and setting, shall be recorded to "record book of engine parameters" in date order.

手順2[現物検査]

Procedure 2 : Actual inspection of engine components and adjustable features

必要に応じて、『原動機パラメータによる検証方法』に基づいて現物検査を実施する。

If it's necessary, actual inspection of engine components and adjustable feature shall be carried out according to "Verification procedure for the engine parameter survey".

Identification number of engine components and fuel injection timing as adjustable features shall be inspected.

|   |   |                            |               |                |           |
|---|---|----------------------------|---------------|----------------|-----------|
| 原動機パラメータによる検証方法<br>Verification procedures<br>for the engine parameter survey | 識別方法文書番号<br>Verification procedures<br>identification |                            | G2-48649-1830 |                |           |
|   | 承認番号<br>Approval number                               | D2                         |               |                |           |
|   |   | E2                         |               |                |           |
|   | 承認年月日<br>Approval date                                |                            |               |                |           |
| 原動機ファミリー<br>Engine family   | 6AYLW15   | ヤンマー株式会社<br>YANMAR CO.,LTD |               | 設計<br>Drawn    | M.Hibiwo  |
|   |   |                            |               | 検図<br>Checked  | G.Kawano. |
|   |   |                            |               | 承認<br>Approved | H.Wada    |

| 構成部品<br>Parameter  | 識別方法<br>Verification procedure  | 識別番号<br>Identification number |
|--|---|-------------------------------|
| 燃料噴射時期<br>Injection timing   | 1) 第6気筒を圧縮上死点前30~40度近傍に調整する<br>Bring No.6 cylinder to be adjusted near 30~40 degrees before T.D.C. of compression stroke.<br>2) 燃料噴射ポンプから第6気筒の噴射管を外し、デリバリアホルダの凹みに溜まっている燃料油を拭き取る<br>Disconnect No.6 fuel injection pipe from the fuel injection pump, and then wipe off fuel staying at the concavity of delivery holder.<br>3) フライホイールを機関回転方向にゆっくり回し、デリバリアホルダの凹みの穴に燃料油が現れた時に回転を止める<br>Turn the flywheel slowly in the direction of normal rotation of engine, and stop turning the moment when oil appears at the hole of concavity of the delivery valve holder.<br>4) この時のフライホイール指針が指している目盛(燃料噴射時期)を確認する<br>The scale graduation pointed out by the flywheel pointer at this time indicates the fuel injection timing.<br>*) 図面番号Z2-48660-0510を参照<br>Refer to the drawing No. Z2-48660-0510 | bTDC 13.5 ~bTDC 14.5          |
| 燃料噴射ノズル<br>Injection nozzle  | 1) 燃料弁を抜き出す<br>Pull out the injection valve<br>2) 燃料弁の識別記号を確認する<br>Check the identification number of the injection valve   | TV                            |
| 燃料ポンプ<br>(プランジャ,バレル,FOカム)<br>Injection pump<br>(including Plunger,<br>Barrel and Fuel cam) | 燃料ポンプ本体の識別記号を確認する(銘板を参照)<br>Check the identification number of the injection pump body.<br>See nameplate.   | 6AYL                          |
| 燃焼室<br>Combustion chamber  | 1) シリンダヘッドを外す<br>Remove the cylinder head.<br>2) ピストン頂部の識別記号を確認する<br>Check the identification number of the piston top.   | AYR2                          |
| シリンダヘッド<br>Cylinder Head   | シリンダヘッド上部の識別記号を確認する<br>Check the identification number of the cylinder head top.  | AY2                           |

|   |         |   |    |               |
|---|---------|---|----|---------------|
| 原動機パラメータによる検証方法<br>Verification procedures<br>for the engine parameter survey |         | 識別方法文書番号<br>Verification procedures<br>identification |    | G2-48649-1830 |
|   |         | 承認番号<br>Approval number                               | D2 |               |
|   |         |   | E2 |               |
| 原動機ファミリー<br>Engine family   | 6AYLW15 | 承認年月日<br>Approval date                                |    |               |

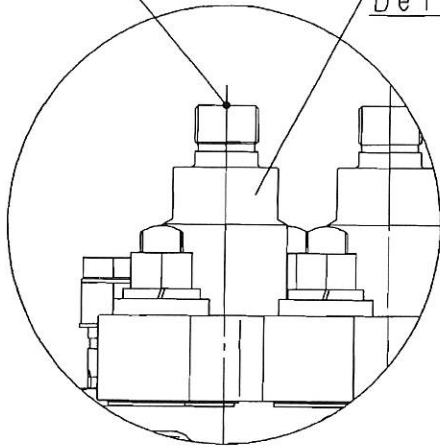
|                            |   |               |
|----------------------------|---|---------------|
| 圧縮比<br>Compression ratio   | 実クリアランスを確認する<br>Check for actual clearance.<br>1) シリンダヘッドを取り外す<br>Remove the cylinder head.<br>2) ピストン頂面に鉛又はプラスチックゲージを置く<br>Put the lead (plastic gauge) on the top of piston.<br>3) シリンダライナに元のヘッドパッキングを乗せシリンダヘッドを組付ける<br>Mount the cylinder head on the cylinder liner with the head packing of the same dimensions as that used previously.<br>4) 鉛が潰れるまでフライホイールを回す<br>Turn the flywheel until give way the lead.<br>5) 鉛の厚さを確認する<br>Confirm the thickness of the lead. | 1.56±0.108mm  |
| 過給機<br>Turbocharger type   | 過給機の識別記号を確認する(銘板を参照)<br>Check the identification number of the turbocharger body.<br>See nameplate.   | TD10L-51VRC34 |
| 空気冷却器<br>Charge air cooler | 空気冷却器の識別記号を確認する<br>Check the identification number of charge air cooler body.   | 6AY2          |



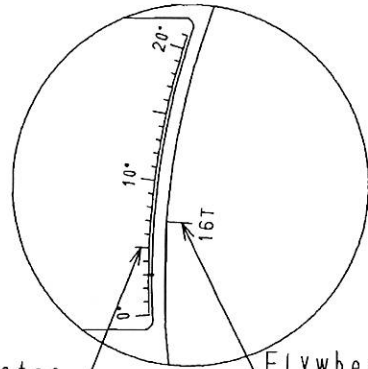
Fuel Oil

NO.6 Cylinder

Delivery Valve Holder



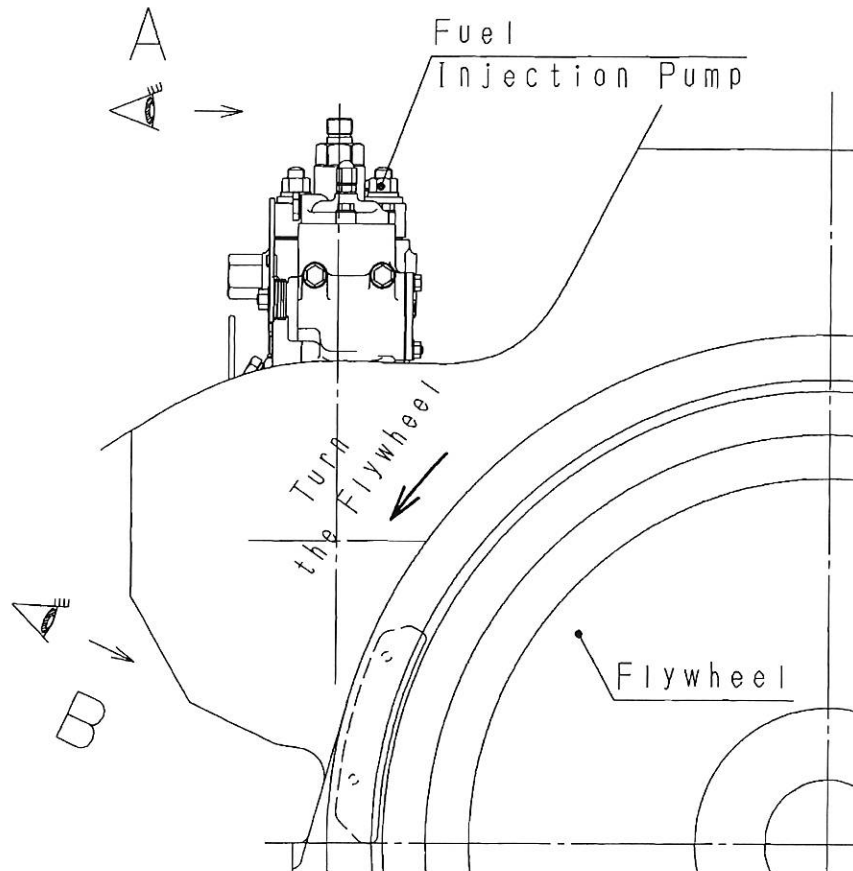
A



One scale indicates  
1-deg of crank angle

Flywheel  
Cyl.TOP Mark

B



Verification procedure  
of injection timing

**YANMAR CO.LTD.**

DWG.  
No.

Z2-48660-0510

Parts information related to NOx emission

|          |               |
|----------|---------------|
| Draw.No. | G2-48649-1840 |
| Date     | 14.Jun.2010   |

| Parts Name                         | Parts No.                                    | Identification Number | ID No. |   |
|------------------------------------|--|-----------------------|--------|---|
|                                    |  |                       | 1      | 0 |
| Fuel Injection pump                | 748640-51300<br>748640-51310<br>748640-51320 | 6AYL                  | 0      | 0 |
| Fuel Injection valve (Nozzle Assy) | 748640-53120<br>(148640-53100)               | TV                    | 0      | 0 |
| Cylinder Head                      | 148660-11032<br>148660-11033                 | AY2                   | 0      | 0 |
| Piston                             | 148699-22020                                 | AYR2                  | 0      | 0 |
| Turbo Charger                      | 148645-18020                                 | TD10L-51VRC<br>34     | 0      | 0 |
| Air Cooler                         | 133615-18621                                 | 6AY2                  | 0      | 0 |

|          |          |
|----------|----------|
| Drawn    | M.Hibino |
| Checked  | A.Kawano |
| Approved | H.Wada   |

|  |     |          |  |
|--|-----|----------|--|
| Engine Family / Engine Group Reference |     | 6AYLW15  |  |
| Parent Engine                          |     |          |  |
| Model / Type                           |     | 6AYL-WET |  |
| Nominated rated power                  | kW  | 438      |  |
| Nominated rated speed                  | rpm | 1500     |  |

|                             |      |        |
|-----------------------------|------|--------|
| Parent Engine test fuel oil |      |        |
| Reference fuel designation  |      |        |
| ISO 8217:2005 grade         |      |        |
| Carbon                      | %m/m | 86.1   |
| Hydrogen                    | %m/m | 13.9   |
| Sulphur                     | %m/m | 0.0005 |
| Nitrogen                    | %m/m | 0.3    |
| Oxygen                      | %m/m | 0.1    |
| Water                       | %V/V | 0.01   |

| Measured data (Parent Engine) |   |     |     |     |     |     |  |
|-------------------------------|---|-----|-----|-----|-----|-----|--|
| Power/Torque                  | % | 100 | 75  | 50  | 25  | 10  |  |
| Speed                         | % | 100 | 100 | 100 | 100 | 100 |  |
| Mode point                    |   | 1   | 2   | 3   | 4   | 5   |  |

| Engine Performance  |      |      |      |      |      |        |  |
|---|------|------|------|------|------|--------|--|
| Speed   | rpm  | 1500 | 1500 | 1500 | 1500 | 1500   |  |
| Power   | kW   | 438  | 329  | 219  | 110  | 44     |  |
| Fuel flow   | kg/h | 86.2 | 65.1 | 44.6 | 25.3 | 14.2   |  |
| Intake air flow wet   | kg/h | 2395 | 1951 | 1476 | 1043 | 1041.5 |  |
| Exhaust gas flow(qmew)  | kg/h | 2477 | 2016 | 1502 | 1045 | 1029.7 |  |
| Intake air temperature  | °C   | 32   | 32   | 32   | 33   | 32     |  |
| Charge air temperature  | °C   | 46   | 42   | 40   | 40   | 38     |  |
| Charge air reference temperature                                | °C   | 47   | 43   | 44   | 41   | 40     |  |
| Charge air pressure   | kPa  | 130  | 90   | 50   | 20   | 10     |  |
| Additional parameter(s) used for emission corrections (specify) |      |      |      |      |      |        |  |

| Ambient conditions                   |      |      |      |      |      |      |  |
|--------------------------------------|------|------|------|------|------|------|--|
| Atmospheric pressure                 | hPa  | 1008 | 1008 | 1008 | 1008 | 1008 |  |
| Relative humidity (RH) of intake air | %    | 45.4 | 47.6 | 47.6 | 48.6 | 50.8 |  |
| Dry bulb temperature of intake air   | °C   | 31.3 | 31.2 | 31.2 | 31.2 | 30.2 |  |
| Wet bulb temperature of intake air   | °C   | 22.4 | 22.6 | 22.6 | 22.8 | 22.4 |  |
| Absolute humidity of intake air      | g/kg | 13.1 | 13.6 | 13.6 | 13.9 | 13.8 |  |

| Emission concentrations |      |      |       |       |       |       |  |
|-------------------------|------|------|-------|-------|-------|-------|--|
| NOx concentration (dry) | ppm  | 865  | 769   | 690   | 460   | 159   |  |
| CO concentration (dry)  | ppm  | 78   | 85    | 75    | 113   | 114   |  |
| CO2 concentration (dry) | %    | 7.75 | 7.16  | 6.54  | 5.28  | 2.94  |  |
| O2 concentration (dry)  | %    | 9.89 | 10.69 | 11.68 | 13.48 | 16.78 |  |
| HC concentration (wet)  | ppmC | 114  | 129   | 159   | 183   | 185   |  |

| Calculated data (Parent Engine)     |       |       |       |       |       |        |     |
|-------------------------------------|-------|-------|-------|-------|-------|--------|-----|
| Intake air humidity                 | g/kg  | 13.1  | 13.6  | 13.6  | 13.9  | 13.8   |     |
| Charge air humidity                 | g/kg  | 28.3  | 27.9  | 32.0  | 40.4  | 39.5   |     |
| Test condition parameter, fa        |       | 1.035 | 1.035 | 1.035 | 1.035 | 1.030  |     |
| Dry / Wet correction factor, kwr    |       | 0.919 | 0.923 | 0.929 | 0.939 | 0.959  |     |
| NOx humidity correction factor, khd |       | 1.052 | 1.062 | 1.069 | 1.068 | 1.059  |     |
| Exhaust gas flow rate (qmew)        | kg/h  | 2477  | 2016  | 1502  | 1045  | 1029.7 |     |
| NOx emission flow rate              | g/h   | 3287  | 2411  | 1632  | 764   | 401    |     |
| CO emission flow rate               | g/h   | 171   | 153   | 101   | 107   | 135    |     |
| CO2 emission flow rate              | kg/h  | 267.8 | 202.2 | 138.4 | 78.5  | 44.0   |     |
| O2 emission flow rate               | kg/h  | 248.4 | 219.5 | 179.6 | 145.8 | 182.8  |     |
| HC emission flow rate               | g/h   | 135   | 124   | 114   | 91    | 91     |     |
| NOx emission                        | g/kWh |       |       |       |       |        | 7.4 |

|                |       |     |     |  |  |  |  |
|----------------|-------|-----|-----|--|--|--|--|
| Test cycle     |       | D2  | E2  |  |  |  |  |
| Emission value | g/kWh | 7.4 | 7.4 |  |  |  |  |

Technical Information

07.Aug. 2010

YANMAR CO.LTD

|                                  |                 |
|----------------------------------|-----------------|
| Fuel of type to be used on board | Diesel Fuel     |
| LAB.No.                          | 1 5 0 7 5 0 7 4 |
| Type of equipment                | 6 A Y L - W E T |
| Sampling date                    | 21.Jul. 2010    |

|                             |                      |            |
|-----------------------------|----------------------|------------|
| Densit(15/4°C)              | g/cm <sup>3</sup>    | 0. 8 2 1 1 |
| Flash point(P.M.)           | °C                   | 6 4. 0     |
| Viscosity at (50°C)         | mm <sup>2</sup> /sec | 2. 8 7 7   |
| Water content(Distillation) | mass %               | < 0. 0 1   |
| Cetane index (JISK2204)     | —                    | 5 8. 9     |
| Cetane index (JISK2280)     | --                   | 5 6. 0     |
| Sulfur content              | mass %               | 0. 0 0 0 5 |
| Nitrogen content            | mass %               | < 0. 3     |
| Carbon content              | mass %               | 8 6. 1     |
| Hydrogen content            | mass %               | 1 3. 9     |
| Oxygen content              | mass %               | < 0. 1     |
| Ash content                 | mass %               | < 0. 0 0 1 |
| Gross calorific value       | MJ/kg                | 4 5. 9 8   |
| Net calorific value         | MJ/kg                | 4 3. 0 9   |

Japan Analysts Co.Ltd Analytical Center  
Sagamihara-Shi Kanagawa Pref.,Japan

|         |                      |
|---------|----------------------|
| draw up | <i>Yumi Shioyama</i> |
| checked | <i>Yuzo Hirai</i>    |

# 試験成績表・TEST RECORD

ヤンマー株式会社  
YANMAR CO., LTD

|                      |                    |             |                               |      |      |      |
|----------------------|--------------------|-------------|-------------------------------|------|------|------|
| 機関形式<br>Engine model | 機関番号<br>Engine No. | 試験日<br>Date | 天候<br>Weather                 | 検査課  | 係長   | 職長   |
| 6AYL-WET             | 5/10               | 22 3 2019   | 晴 Fine<br>曇 Cloudy<br>雨 Rainy | (瀬戸) | (藤川) | (和田) |

|                           |                      |  |                        |
|---------------------------|----------------------|--|------------------------|
| 使用燃料油・Fuel Oil            | 使用潤滑油<br>Lube Oil    | 負荷方法・Method Of Load Test<br>水制動力計・Hyd,Dynamo | 判定:                    |
| A重油・M. O. D<br>軽油・L. O. D | 密度 Density<br>15W-40 | 形式・Model<br>PRS-45                           | 番号・No<br>BK-47         |
| 0268<br>(15°C)            |                      |  | 測定者 Recorder<br>m Tota |

| 項目<br>Item                       | 計測値<br>Measurement    |                   |              |               |                |                |                |                |                |                | 規格値<br>standard<br>(100%負荷時)<br>(at100%Load) |        |
|----------------------------------|-----------------------|-------------------|--------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|--|--------|
|                                  | 0                     | 25                | 50           | 75            | 100            | 100            | 110            |                |                |                |  |        |
| 負荷 %<br>Load                     |                       |                   |              |               |                |                |                |                |                |                |  |        |
| 時刻・Time                          | 8:40<br>9:00          | 9:06<br>9:20      | 9:20<br>9:40 | 9:40<br>10:00 | 10:00<br>10:30 | 10:30<br>10:50 | 10:50<br>11:00 | 11:00<br>11:15 | 11:15<br>11:30 | 11:30<br>11:45 |  |        |
| 機関回転速度<br>Engine speed           | min <sup>-1</sup>     | 1500              | 1500         | 1500          | 1500           | 1500           | 1500           | 1500           | 1500           | 1500           |  | —      |
| 出力<br>Output                     | kW                    | 0                 | 109.5        | 219           | 328.5          | 438            | 438            | 481.8          |                |                |  |        |
| 燃料消費量<br>Fuel Oil<br>Consumption | 計測量<br>Measuring vol. | kg                | 0.2          | 0.5           | 0.8            | 1.2            | 1.6            | 1.6            | 1.7            |                |  | —      |
|                                  | 時間<br>Time            | sec               | 74.3         | 72.3          | 63.9           | 64.7           | 64.7           | 64.9           | 63.1           |                |  | —      |
|                                  | 量/時<br>kg/h           |                   | 0.17         | 2.47          | 2.47           | 66.2           | 88.3           | 88.3           | 96.2           |                |  | —      |
|                                  | 量/出力・時<br>gr/kW·h     |                   | —            | 226           | 204            | 202            | 202            | 201            | 200            |                |  | ≤204.7 |
| 冷却水流量<br>Cooling Water<br>Flow   | ジャケット側<br>Jacket      | m <sup>3</sup> /h |              |               |                |                |                |                |                |                |  | —      |
|                                  | クーラー側<br>Cooler       |                   | —            | —             | —              | —              | ≥30            | —              | —              | —              | —  | —      |
| 周囲温度<br>Ambient Temp.            | °C                    | 19                | 20           | 21            | 22             | 23             | 24             | 25             |                |                |  | —      |
| 大気圧力<br>Atomosphere              | hPa                   | —                 | —            | —             | —              | 1008           | —              | —              | —              | —              | —  | —      |
| 排気色 Smoke                        |                       | —                 | —            | —             | —              | 0.20           | —              | —              | —              | —              | —  | ≤ 0.6  |

|                         |                               |       |       |       |       |       |                       |
|-------------------------|-------------------------------|-------|-------|-------|-------|-------|-----------------------|
| 燃料噴射ポンプ突始め角度(度)         | Fuel Injection Timing(Degree) |       |       |       |       |       | 過速度試験・Over Speed Test |
| No. of Cyl.             | No. 1                         | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | ( ) min <sup>-1</sup> |
| 上死点前<br>before T. D. C. | 集合 14 °                       |       |       |       |       |       | 1分間……良・good           |

備考  
Remark  
F . O . 係数  
Fuel pipe Buoyancy Factor × 0.9919



